THE POLITICAL ECONOMY OF HEALTH SERVICES PROVISION AND ACCESS IN BRAZIL

AHMED MUSHFIQ MOBARAK
(University of Colorado at Boulder)

ANDREW SUNIL RAJKUMAR
(World Bank)

MAUREEN CROPPER
(University of Maryland, College Park and World Bank)

Abstract

This paper examines the impact of local politics and government structure on the allocation of publicly subsidized (SUS) health services across counties in Brazil, and on the probability that uninsured individuals who require medical attention actually receive access to those health services. Higher per capita levels of SUS doctors, nurses and clinic rooms increase the probability that an uninsured individual gains access to health services when he or she seeks it. The per capita provision of doctors, nurses and clinics is greater in counties with a popular local leader and in counties where the county mayor and state governor are politically aligned. They also rise with political participation, income inequality, and the percentage of votes going to leftist candidates. Administrative decentralization of health services to the county decreases provision levels and reduces access to services by the uninsured unless it is accompanied by good local governance.

Corresponding Author
A. Mushfiq Mobarak
Assistant Professor, Department of Economics
256 UCB, University of Colorado
Boulder, CO 80309
Phone: 303-492-8872
Email: mobarak@spot.colorado.edu

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 counties, the SUS is the main source of medical treatment for the poor.

This paper addresses two questions that are essential to evaluating the success of public health care provision: (1) How do politics and government structure influence the distribution of public health services—doctors, nurses and clinics—across counties? (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 models to explain variation in the numbers of public clinics, doctors and nurses per capita across counties (*municipios*) in Brazil in 1998. We also examine the determinants of changes to county health budgets following local elections. To answer the second question we use a large household survey (the 1998 *Pesquisa Nacional por Amostra de Domicilios* (PNAD)) to see whether people without private health insurance who rely on publicly financed health care are more likely to receive medical attention in counties with more public clinics and health care workers per capita. Because decentralization in the administration of health services may affect their placement within

a county and the types of services offered, we also examine the impact of decentralization variables on the likelihood that the uninsured receive medical care.

We use a probabilistic voting model (Grossman and Helpman 2001; Foster and Rosenzweig 2001) to provide a theoretical foundation for the provision of public health care. Two parties compete for the votes of citizens who favor public provision of health care (e.g., the uninsured) and those who do not (e.g., the insured). In a voting equilibrium, the level of public health care provided reflects the shares of the two groups of citizens in the voting population, and is limited by the size of the public budget.

The model has four implications for the provision of public health care: (1) Provision should increase with average income in a county since this raises the level of tax revenues in the public budget constraint; (2) If the uninsured receive greater utility from public health care than the insured, one should expect to see higher levels of public health care in counties with a greater share of uninsured persons, *ceteris paribus*; (3) Since what matters for public goods provision is the share of each group in the population of *voters*, areas in which a higher percentage of the uninsured vote should receive a higher level of public health care services, *ceteris paribus* (4) Provision of public health care should be greater in counties that are able, through negotiations with the state and federal governments, to receive higher grants (transfers) for health care. The model thus implies that the political power of local officials and their influence with state and federal officials should increase the public provision of health care, as should higher voter turnout by persons favoring publicly provided health care. We find empirical support for both effects.

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 county. The traditional arguments in favor of decentralization are that (a) local governments are likely to be more responsive to local preferences than are state governments (Oates 1972; Besley and Coate 1999), and (b) decentralization promotes government accountability (Bardhan and Mookherjee 2000). This should improve the targeting of public health services (e.g., where clinics are located or the types of services offered), and may also improve their delivery to people that need them most.

We model decentralization in the provision of health services as a variable that affects the effective level of health services provided by a given vector of health care inputs (doctors, nurses, clinic consultation rooms). The theoretical impact of decentralization on the quantity of health care inputs chosen is ambiguous, and we find that decentralization of authority over public health care by itself does not affect the level of health care personnel and clinics provided. Counties with full authority over health care provision that also have a governance plan do, however, provide more health care services per capita than decentralized counties that lack a governance plan. We also find that decentralized counties receive much larger increases in their health budgets following a local election than their state-run counterparts.

The effective level of health services per capita depends not only on the amount of health inputs provided, but also on their placement. We examine the impact of doctors, nurses and clinics as well as other factors that may affect where such inputs are located—on the probability that an uninsured person both sought and received health care

when ill. We find that households living in counties with more public health service provision are more likely to be able to see a health professional when they need to. The impact of decentralization depends on the governance capacity of the county. The probability of an uninsured individual receiving medical attention is no higher in counties with full control over the allocation of health care resources than in counties with only partial control. However, the probability of receiving attention is lower under decentralization if the county does not have a governance plan.

By creating county 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 (e.g. Rodrik 2000). 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 it is accompanied by the required governing capacity.

The next section discusses the administrative structure of the health care system in Brazil and recent reforms. Section 3 presents our theoretical model. In section 4 we demonstrate that the number of SUS doctors, nurses and clinic rooms in a county increases the chance that an uninsured person receives medical attention when he needs

it. Models to explain variation in the number of SUS doctors, nurses and clinics across countries are presented in Section 5. Section 6 concludes.

2. The Health Care System 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, 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, the "Unified and Decentralized Healthcare System" (SUS) was established in 1990 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 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 private health insurance in 1998-99 (Alvarez 1998). These 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 is publicly financed. The following sections discuss the ownership and administration of facilities in the SUS system and how public health care is financed.[1]

---

[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).

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 county facilities. In 1999 67% of all SUS hospitals were privately owned; while state and county governments accounted for 8% and 23% of hospitals respectively. In contrast, county governments owned 69% of clinics, while only 27% were private (Pesquisa Assistencia Medico Sanitaria, 1999).

Irrespective of ownership, all SUS facilities are administered by either state or county governments. The 1988 Constitution required that the *administration* of public health care provision should gradually devolve to county governments, with financial and technical assistance provided by the federal and state governments (Lobato and Burlandy 2001). Currently, each county 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 county manages the provision of basic or primary health care,[2] and the state manages more complex types of provision; and (iii) Full County System Management, where the county manages the provision of basic as well as complex care. A county government that wishes to attain the Basic Assistance or Full Management status must negotiate this with the federal government. Full Management status is awarded only if the county government asks for it, and if the federal government judges it capable of handling this enhanced administrative role. At

---

[2] 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 start of 1999, 8% of all counties had attained Full County 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. County governments with either Basic Assistance or Full Management status administer basic care transfer funds. These transfers are divided into two categories: (i) "fixed" population-based transfers where the per capita amount transferred is the same for most counties; 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 counties.

Only county governments with Full County System Management status can handle transfers for complex care. These transfers are meant solely for the reimbursement of SUS providers for services rendered, and are subject to two constraints: (i) they must follow 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 the 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 counties that are politically important or politically allied to the state in some form.

Each state and county 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 providers qualify 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 County Management, sometimes also from state funds. About 30% of the payments to SUS providers come from sub-national government revenues. The states and counties have taxing authority over land, property and transportation, and also receive 'general purpose' transfers from the federal government.

3. Theoretical Model

In Brazil publicly financed health care is, effectively, a local public good. The level of basic health care provision is chosen by the county,[3] as is the level of complex health care services in the case of full decentralization (Full System Management). Because county officials in Brazil are democratically elected, it is natural to use a voting model of public goods provision as a framework for our empirical analysis. We adapt the two-party strategic voting model outlined in Grossman and Helpman (2001) for this purpose.

The population of each county is normalized to 1. A fraction r of the county population are "rich", while the remaining ($1-r$) are "poor". Our aim here is to draw a distinction between two classes of people who differentially benefit from public health services. We could also characterize the two groups as "insured" and "uninsured."

---

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

Throughout, the superscript u represents the "upper" income group, and the superscript l the "lower" income group. y^g, $g = u,l$, denotes the income of each group. All individuals within an income group have identical incomes.

Public revenues for the county come from two sources: Transfers from the state government, T, which are determined through political negotiations between the county and the state, and local tax revenues from taxing the incomes of the rich and the poor at a common rate t. These revenues are used solely to finance public health services. Each unit of "effective health service per capita" is denoted h,[4] and it is delivered at a per-unit cost p. The public budget constraint is thus:

$$T + t(1-r)y^l + t \cdot r \cdot y^u - p \cdot h = 0 \tag{1}$$

Two parties, denoted A and B, have fixed positions on a set of issues, and choose the amount of effective health service (h) and tax rate (t) to offer, in order to compete for the votes of both rich and poor households. The parties can credibly commit to carry out their platforms in the event that they win the election. Each voter recognizes that his vote will slightly increase the subjective probability that the party he has chosen will win the election. His dominant strategy is to vote for the party he prefers, since this slightly raises his expected welfare. We assume that all rich people vote, while a fraction v of the poor (uninsured) vote.[5]

Voters receive utility $W^g(h,c)$ from the public health service (h) and a private consumption good, c. Since all after-tax income is spent on c, the utility of a voter in

---

[4] This "effective health service" should be interpreted as the actual service received by the consumer. It incorporates not just the amount of services offered (e.g. the number of clinics), but also their placement within a county and the types of procedures offered at each location. h is of course a function of health *inputs* such as clinics, doctors and nurses.
[5] This assumption is not crucial to the results, but it reflects empirical observations about voting patterns in Brazil. Voting is compulsory in Brazil; however people who are less likely to have insurance (due to a lack of formal sector work), are also more likely to escape being fined if they do not vote.

group g is given by: $W^g\left(h, y^g(1-t)\right)$. W^g is assumed to be increasing and concave in both arguments, and additively separable in the two arguments. We expect $W_h^u(\cdot) < W_h^l(\cdot)$, which means that the poor (uninsured) enjoy greater marginal benefits from public health services than do the rich. Each voter's welfare from voting for a particular party depends on the (h, t) combination offered by that party as well as his preferences over the fixed (e.g. ideological) positions of that party. A person i in income group g votes for party A over party B if:

$$W^g\left(h_A, y^g(1-t_A)\right) - W^g\left(h_B, y^g(1-t_B)\right) + \delta\varepsilon_{Ai} - \delta\varepsilon_{Bi} \geq 0 \qquad (2)$$

ε_i is the individual-specific preference for the fixed platforms of each party, and δ is the relative weight placed on such ideological considerations. If the relative ideological preference of a voter for party A over party B, $(\varepsilon_{Ai} - \varepsilon_{Bi})$, is distributed uniformly over the interval $\left[-\frac{1}{2}, \frac{1}{2}\right]$, then the expected number of votes for party A is given by:

$$EV_A = r\left[\frac{1}{2} - \frac{W^u\left(h_B, y^u(1-t_B)\right) - W^u\left(h_A, y^u(1-t_A)\right)}{\delta}\right] + v(1-r)\left[\frac{1}{2} - \frac{W^l\left(h_B, y^l(1-t_B)\right) - W^l\left(h_A, y^l(1-t_A)\right)}{\delta}\right] \qquad (3)$$

Each party proposes a tax rate (t_A or t_B) and an amount of effective public health service (per capita) to be delivered (h_A or h_B) to maximize its chances of winning the election (EV_A or EV_B), given the (h,t) choice of the other party, and subject to the public budget constraint. The first order condition for h from the Lagrangian of this maximization problem is $r\frac{\partial W^u}{\partial h_A} + v(1-r)\frac{\partial W^l}{\partial h_A} - \lambda \cdot p = 0$, where λ is the Lagrange multiplier associated with the public budget constraint. This states that the party's choice of h equates the weighted marginal utility of the two groups to the marginal cost of provision, where the weights are the proportions of each group in the voting population.

It is instructive to substitute an expression for h_A in terms of t_A from the budget constraint (1) into party A's maximand (3), and solve the resulting one-variable unconstrained optimization problem for party A:

$$\max_{t_A} \quad r\left[\frac{1}{2} - \frac{W^u\big(h_B(t_B), y^u(1-t_B)\big) - W^u\big(h_A(t_A), y^u(1-t_A)\big)}{\delta}\right] +$$
$$v(1-r)\left[\frac{1}{2} - \frac{W^l\big(h_B(t_B), y^l(1-t_B)\big) - W^l\big(h_A(t_A), y^l(1-t_A)\big)}{\delta}\right]$$

This results in the following first-order condition for party A:

$$r\frac{\partial W^u}{\partial h_A} + v(1-r)\frac{\partial W^l}{\partial h_A} = \frac{p}{\bar{y}}\left[ry^u\frac{\partial W^u}{\partial c_A} + v(1-r)y^l\frac{\partial W^l}{\partial c_A}\right] \tag{4}$$

where $\bar{y} = ry^u + (1-r)y^l$, is the population-weighted average income. Equation (4) shows that party A chooses h to equate the weighted marginal utility of h to its weighted marginal tax cost, where the weights are the proportion of voters in each group. Party B's maximization problem and first-order conditions are identical, which implies that in the unique Nash equilibrium, both parties offer the same tax–public health service policy. The h that emerges in equilibrium is the same regardless of which party wins the election.

By totally differentiating (4), it is possible to examine the impacts of changes in the parameters of the model on the quantity of effective per capita health care (h) delivered in equilibrium. For example, an increase in r (proportion of people who are rich) has an ambiguous effect on h:

$$\frac{dh}{dr} = \left[\left(\frac{\bar{y}}{p}W_h^u - y^u W_c^u\right) - v\left(\frac{\bar{y}}{p}W_h^l - y^l W_c^l\right) + \left(\frac{y^u - y^l}{p}\right)\cdot\left(rW_h^u + v(1-r)W_h^l\right)\right]\cdot X \tag{5}$$

(X is a positive number that equals $-(p/\bar{y})/[rW_{hh}^u + v(1-r)W_{hh}^l]$.) The first term on the RHS of (5) is the net marginal benefit of health services to the rich (net of consumption costs), while the second term is net marginal benefits of h to the poor multiplied by their voting rate. If the net marginal benefits of public health accruing to the poor are sufficiently larger than those accruing to the rich, then the sum of the first two terms is negative, which causes h to decrease with r. This is an effect of party platforms: with an increase in the proportion of rich people in the population, the (h,t) combination offered by each party caters more to the preferences of the rich segment of the population. The positive last term is due to a relaxation of the public budget constraint. An increase in r raises average incomes and tax revenues, and the parties can afford to offer a larger amount of public health care.

The two distinct and opposite impacts of an increase in r on h are (1) the effect of a changing composition of the voting population, which alters policy in favor of the rich, and (2) the effect of increasing average income, which leads to greater public service delivery. In our empirical work, we seek to distinguish these two effects by measuring the proportion of poor/uninsured in the population separately from average incomes. Holding the proportion poor constant, the model predicts that an increase in average income should have a positive impact on the amount of effective health care (per capita) delivered by the county. And, holding average income constant, an increase in the proportion of poor/uninsured in the population should also have a positive impact.

The model predicts that an increase in the voting rate of the poor (v) will increase public health care provision as long as the marginal benefits to the poor of an extra dollar of tax (in terms of the extra health services that tax dollar will provide) exceed its

marginal consumption cost: $\frac{dh}{dv} = \left[\frac{\bar{y}}{p} W_h^l - y^l W_c^l \right] \cdot (1-r)X$. An increase in v causes

politicians to alter policy in favor of poor people's preferences, and if the poor prefer that

tax rates be raised to fund more public health care, then that is what will happen.

Finally, the effect of greater transfers from the state to the county (T) is

straightforward: it simply relaxes the public budget constraint and allows the political

parties to offer more public health care for any given level of tax revenues. For every

extra dollar that the county is able to bring in from the state through the inter-

governmental political negotiations process, h increases by $1/p$ units.

The effective level of health care per capita, h, is unobservable. What we can

observe are the levels of inputs—doctors, nurses and clinics—used to produce health

care. Suppose that health services per capita are produced under constant returns to scale.

The amount of effective health care per capita is, however, dependent on the placement

of health inputs vis-à-vis the population, as well as on how efficiently these inputs are

managed. We therefore assume that h is a function of doctors, nurses and clinics (or

clinic rooms) per capita, as well as descriptors of the geographic distribution of the

population (P) and measures of the decentralization of health care (d):

$$h = f(D, N, C; P, d) \tag{6}$$

Once h is determined as an outcome of the political process, we assume that

health care inputs are chosen to minimize the cost of achieving h. This implies that

doctors, nurses and clinics per capita will depend on the factors affecting h in the voting

model, as well as on measures of decentralization and the geographic distribution of the

population, which affect the amount of effective health care provided by a given vector of

health inputs. In our empirical models, we explain variation in health care inputs across

counties as a function of the determinants of h from the voting model, as well as variables P and d.

4. The Impact of SUS Doctors, Nurses and Clinics on Access to Public Health Care

We estimate the impact of political variables and government structure on access to health care in two stages. First we establish that the number of doctors, nurses and clinic rooms in SUS facilities increase the probability of an uninsured person receiving health care when he needs it. Having demonstrated that public health care inputs matter, in section 5 we explain variation in the level of public health inputs—SUS doctors, nurses and clinics (or clinic rooms) per capita—across counties. This section describes the variables included in the model of access to health care and presents our results.

A. A Model of Access to Health Care

Our model of access to health care explains whether or not an individual dependent on the SUS had adequate access to health care in 1998. The data are obtained from a special health module of the 1998 *Pesquisa Nacional por Amostra de Domicilios* (PNAD), a survey of 344,886 individuals from 112,434 households.[6] 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 were 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

_____

[6] The survey is representative of all of Brazil except for certain rural areas in the North.

14

classified as not having access to health care. [Details on the relevant survey questions

and responses are provided in the *Data Appendix*.]   Of the 33,541 individuals in our

sample, 24% (8,077) did not have adequate access to health care; 76% did.

The probability that an individual who uses the SUS has access to health care, as

defined above, depends on the level of effective health care provided (equation (6)

above), but also on the effort that the individual invests in seeking health care. This is

likely to depend on the nature and severity of his illness. We include dummy variables

describing the nature of the individual's illness, including diarrhea, respiratory disease

and diabetes. For two of these conditions—diarrhea and respiratory disease—an

interaction term with the individual's age is 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 is captured by the number of days within the 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.

B.   *Factors Affecting Effective Health Care*

1. *Public Health Inputs*

We posit that the level of effective health care per capita provided by the SUS

system depends on the number of SUS doctors, nurses and clinics, as well as on factors

affecting the placement of these inputs, such as decentralization in health care

administration. The public health inputs included in the model (each expressed per 1,000

residents) are: the number of doctors (including specialists), nurses (including "nursing

auxiliaries" and "nursing technicians"), and clinic consultation rooms in the SUS

system.[7] Clinics are defined as all units providing medical care without inpatient facilities (pharmacies and facilities providing purely diagnostic services, such as laboratories, are not included).[8] We also include measures of private health inputs—the number of private doctors, nurses and clinic rooms per capita—since the uninsured may elect to use these services.

2. Variables Influencing the Effectiveness of Public Health Inputs

The effective level of public health care received by residents of a county for a given per capita number of doctors, nurses or clinics, depends on the geographic distribution of these services within the county. 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 county residents living in urban areas; (ii) population density; and (iii) a dummy for counties officially classified as belonging to a major metropolitan area.

The effective level of public health care is also likely to be affected by the decentralization of health care administration. 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 counties where the management of both basic and complex care provision has been decentralized to county governments. No differentiation is made between counties where the management of only basic care

---

[7] These data were obtained from were obtained from the *Pesquisa Assistencia Medico-Sanitaria*, a survey of all health facilities in Brazil conducted in 1999.

[8] We do not use hospitals or hospital beds as provision measures because hospitals are "lumpy" units that are located in a limited number of counties. They are meant to serve residents from a fairly large geographical area that includes several counties. Thus, the county is not the appropriate unit of analysis.

16

provision has been decentralized and those under Full State Management. 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. According to our definition, 30% of the 752 counties in the PNAD sample are decentralized.

Which counties the government chooses to decentralize is endogenous, since counties deemed more administratively capable may be decentralized first. Therefore, simply comparing outcomes across decentralized and state-administered counties would not allow us to infer anything causal about the impact of decentralization on service delivery. For this reason, we use data on the quality of governance to compare outcomes across three groups of counties: (1) decentralized counties with good governance, (2) decentralized counties without good governance, and (3) non-decentralized (state-administered) counties.

Our measures of governance are derived from the *Pesquisa de Informações Basicas Municipais*, a questionnaire on planning capacity, management ability and organizational structure that was administered to all Brazilian counties in 1999. One question asks whether the county 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." Our "good governance" measure indicates whether the answer to this question is "Yes." According to this definition, 53% of our PNAD sample survey respondents live in counties that have "good

17

governance." Although this fraction varies somewhat between decentralized and non-decentralized counties (60% and 50% respectively), there is only a weak positive correlation (+0.11) between the decentralization and governance quality indicators.[9]

C. Empirical Results

Table 1 presents summary statistics for the variables in our access to health care equation. The 33,541 persons in our sample live in 752 of the 793 counties sampled in the 1998 PNAD survey.[10] Compared to all counties in Brazil, the 752 PNAD counties are more urbanized and have more SUS doctors and nurses, but fewer clinic consultation rooms, per thousand residents. Health care is fully decentralized in a higher percentage of these counties than in Brazil as a whole.

Seventy-six percent of the uninsured persons in the PNAD who were ill in the two weeks prior to the survey both sought and obtained medical attention. 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 an illness of longer duration.

---

[9] We constructed two alternative governance measures based on two other survey questions: (i) whether the county 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 county. 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. Approximately 62% of our survey respondents live in counties that have health councils, while only 15% live in counties that have a strategic plan.

[10] These counties are distributed across all states except Brasilia. All regressions reported in this paper include state dummies to ensure that the results are not driven by a state-level omitted factor.

Table 2 reports the results of estimating a logit model to explain whether an individual obtained health care when ill as a function of individual and household characteristics, measures of public and private doctors and nurses and clinic consultation rooms (per capita), geographic variables and measures of decentralization and good governance. The coefficients of individual characteristics indicate that females, whites, richer and better educated people (the omitted education category is less than primary education) are significantly more likely to have sought and received health care when ill. Women are 3.7 percentage points more likely to seek and receive attention than men, and a person with a college education is 7.2 percentage points more likely to seek and receive attention than a person with a less than primary school education. For every R$160 increase in per-capita monthly household income, the probability of receiving medical attention increases by 6.3 percentage points.

The duration and nature of illness also influence the probability of seeking and receiving health care. An additional day of illness increases the probability of seeking health care by 1 percentage point. Curiously, people with back/spine problems, arthritis and kidney disease are less likely, while people with heart/blood pressure problems and diabetes are more likely, to report seeking and receiving treatment when compared to individuals not suffering from any chronic afflictions.

Measures of the supply of public (SUS) health service inputs have strong positive impacts on individual access. An increase in SUS doctors by 1 per 1,000 increases the probability of receiving health care by 5 percentage points, while an increase in clinic consultation rooms by 1 per thousand residents leads to a 3 percentage point increase in the probability that individuals will receive treatment when required. Increases in the

19

non-SUS private provision of health professionals or clinics have no statistically significant effect on access. This is not surprising, since our sample consists only of uninsured individuals who typically would not seek private health care.

Measures of the spatial distribution of population are not significant here; however, respondents living in urban areas are almost 10 percentage points more likely to seek and receive health care than those in rural areas. Decentralization of service delivery actually reduces the chances of receiving health care if it is not accompanied by good governing capacity. Individuals living in decentralized counties that lack the governing capacity are 4.6 percentage points less likely to be treated by a health professional than individuals living in counties where the administration of SUS is still under state control. On the other hand, individuals in decentralized counties with a governance plan are no more likely to report adequate access compared to individuals in counties where health care is administered by the state.[11] The access probability is over 5 percentage points higher in decentralized counties with a governance plan than in decentralized counties without the governance plan, and this difference is statistically significant.

5. Why Do SUS Doctors, Nurses and Clinics Vary Across Counties?

Having demonstrated that health care inputs and the decentralization of health care administration increase the probability of an uninsured person having access to health care, we now attempt to explain variation in health care inputs across counties. In

---

[11] When we replace the governance plan measure with the two alternative indicators of governance (whether the county has a strategic plan and whether it has a health policy council), we continue to observe that living in a decentralized county without the requisite governing capacity has a significant negative impact on access.

estimating these equations we use data for 4,338 counties for 1998. Variation in doctors, nurses and clinics across counties should depend on the variables P and d, and also on the determinants of h in the voting model of section 3. Although one might suspect that current levels of health care inputs were determined by historic factors that happen to be correlated with current political variables, there is some margin for public SUS inputs to actually respond to current political conditions. This is because SUS contracts out a large portion of its services to private facilities, which makes the provision of clinics and healthcare workers somewhat elastic, as private providers can be moved in and out of the SUS system. The fact that we exploit the cross-sectional variation in health inputs may lead to concerns that political outcomes whose effects on service delivery we intend to study are themselves influenced by the quality of health services delivered. We use data on *changes* in county health budgets subsequent to elections to deal with such concerns.

A. Voter Preferences and Incomes

In the model of section 3, the amount of public health care provided depends on the size of the public budget constraint and on the distribution of voter 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 county ($\bar{y}$). 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 county is of the same party as the governor of the state) which are discussed more fully below.

We assume that preferences for publicly provided health care should increase with the percentage of uninsured people in the county. This should be correlated with the

percentage of households falling below a given income level. Holding mean income constant, the percentage of households below a given income threshold is increasing in the Gini coefficient for the county. Other variables that might be correlated with the demand for public health care include the percentage of households living in slums and the racial composition of the population (e.g., the percentage of population that is indigenous, and the percentage of the population that is non-white).

Voters' desires 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 county residents who voted for either of the two clearly left-leaning candidates in the 1998 Presidential elections - Lula and Ciro Gomes.[12] These two candidates accounted for about 35% of the votes on average across the sample counties.

According to the model of section 3, the amount of public health care provided depends not only the proportion of households in a county that favor public health care, but on the proportion of *voters* that do. 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 proxy for political participation by persons favoring public health care (ν) is the proportion of residents in each county who voted in the 1996 county elections. 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 voting

---

[12] 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 who ran on a clearly leftist platform was Ciro Gomes, of the ex-communist Popular Socialist Party.

rate of those without formal sector jobs (the segment of the population more likely to use SUS services).

It is of course possible that our taste variables affect public health care through other routes. In a regression of federal SUS transfers to counties that is reported in appendix table A.1, we indeed find a positive relationship between transfers (T) and the Gini coefficient, and between transfers and the percentage of votes cast for a left-leaning candidate, suggesting that these variables may affect public health care through both tastes and transfers.[13] This suggests that our models to explain health care inputs should be interpreted as reduced-form models.

It is also the case that political participation may capture more than support for public health care. A regression of the fraction of persons who voted in the 1996 on covariates (see Table A.1) suggests that political participation is highly correlated with education. To control for the fact that variation in the voting rate may reflect the proportion of the population that is illiterate, we also include this variable in some empirical models.

B. Factors Affecting Transfers

Political factors are likely to play a key role in determining the size of transfers to counties from the state and federal governments. SUS allocations and other transfers may be favorable for counties that are politically important or that have close ties to the state capital (Lima 2002). These counties may also be favored in other ways, such as through special training programs, preferential access to the services of medical staff, and better state-owned health care facilities located in the county. We include four variables

---

[13] Surprisingly, the political participation in the 1996 mayoral election is negatively associated with transfers.

as proxies for political connections: (1) the distance of each county from the state capital; (2) a measure of 'political alliance' indicating whether the mayor of the county elected in 1996 and the state governor elected in 1994 were from the same party;[14] (3) the winner's vote share in the 1996 mayoral election; and (4) the product of the winner's vote share and whether the mayor and state governor are from the same political party. The winner's vote share is included because locally elected officials with a strong popularity base possibly have greater political capital to expend in their negotiations with state legislators over the size of their health budget. It is important for state politicians to keep strong local leaders happy. We interact this measure with the 'political alliance' variable, since we expect the effect of a popular local politician on funds transfers to be stronger when the state and county politicians are in a coalition.

In appendix table A.1, only the 'political alliance' variable turns out to be a statistically significant determinant of federal per-capita SUS transfers to counties. We still choose to include all four variables as potential determinants of health inputs because (a) there may be ways other than larger transfers through which politically important or politically aligned counties are favored by upper-level governments and (b) in a reduced-form empirical specification, there may be other mechanisms through which these variables impact the quantities of health inputs. For example, politically important counties may receive a larger stock of state-owned or federal-owned hospitals and clinics, even if they do not receive larger flows of annual transfers. Conversely, a large vote

---

[14] This occurs in 13.6% of counties in our sample. We do not use 1998 gubernatorial election results, because the new governor elected in 1998 would take office in 1999. Our dependent variables are measured in 1998 and 1999, and we are allowing for a time lag since we expect political actions to have a delayed rather than immediate impact on provision. We also expanded the definition of the 'political connections' variable to indicate whether the state governor's party and county mayor's party formed a coalition in that state, but the qualitative results do not change under this alternative definition.

share for the elected mayor indicates a lack of political competition in the county, which may have an independent effect on public service delivery.

C. Empirical Results

Table 1 presents summary statistics for the counties used to estimate our health care input models. Our sample consists of the 4,338 counties (out of approximately 5,000 total) for which data on the variables in column (1) were available. The average county in our sample has about 1 doctor and 1.4 nursing professionals working at SUS facilities, and approximately 2 SUS clinic consultation rooms per thousand residents. Average county per capita GDP is R$3,020. The average Gini coefficient, 0.53, reflects the high degree of income inequality in the Brazilian population. The average county is approximately 50% white, with 59% of the population living in urban areas, but is located outside of a major metropolitan area.

Table 3 reports equations for doctors (per capita), estimated by ordinary least squares. Model (2) contains a parsimonious specification of the health input equation that includes only those variables that should affect h in the voting model of section 3. Model (3) adds measures of decentralization and other political variables, while model (4) expands the list of variables that might affect the allocation of resources in the SUS system. Table 4 presents the results of estimating model (4) for three other health inputs—nurses, clinics, and clinic consultation rooms. We also explain the *change* in the per-capita health budget for each county following the 1996 county mayoral elections to allay concerns that past provision of health services has resulted in the current popularity of elected officials (or similar reasons).

Model (5) contains the same covariates as model (4), but allows for spatially auto-correlated errors. We expect some spatial autocorrelation in the cross-sectional county sample, since region-specific unobserved factors are likely to affect the demand for health services in similar ways in counties located close to one another. When Moran's I statistic (Anselin 1988) is computed to test for spatial autocorrelation in the errors in model (4), the null hypothesis of no spatial autocorrelation is rejected for two forms of the spatial weighting matrix—one in which the neighbors of each county are defined to be those counties with which it shares a border, and one in which the neighbors are all counties within a certain radius of the county in question. This leads us to estimate a spatial autoregressive errors model of the form

$$z = X\beta + u, \quad u = \lambda Wu + \varepsilon ; \varepsilon \sim N(0,\sigma^2 I) \quad (7)$$

using a generalized moments estimator (Kelejian and Prucha 1999). W is a distance-based weighting matrix, and z is a measure of per-capita health input.[15]   Finally, model (6) studies the provision of doctors in a subset of urbanized counties to check whether our results hold when rural areas are excluded.

Table 3 presents five different specifications for the SUS doctors per capita equation, in order to check whether results are robust to changes in the set of conditioning variables, the sample, and the treatment of spatial correlation in errors. In describing the results below, we will focus on model (4) for doctors, along with its analogous specifications for nurses, clinics and consultation rooms (models 7, 8 and 9 presented in table 4). These models use the entire sample of 4,338 county observations, and control for the full set of conditioning variables.

[15] It is preferable to define a county's neighbors based on distance rather than contiguity, given the great variation in county area (see figure 1). The spatial pattern in the provision of doctors is much more evident than in the provision of other health inputs.

Four results stand out. First, voter preferences matter. Holding per capita income constant, counties with a less equal distribution of income—suggesting a greater proportion of persons relying on the SUS—are likely to have more SUS clinic rooms, and especially more doctors and nurses.[16] A one standard deviation change in the Gini coefficient increases SUS doctors by about 4% (model 4) and nurses by about 5%.[17] Counties where voters express greater redistributive preferences are also more likely to have more SUS services. When the vote share for the two left-leaning candidates in the 1998 Presidential election increases by one standard deviation (i.e. 14 percentage points), provision of doctors, nurses and clinics increase by 3.5%, 4.7% and 3.9% respectively.

Second, the provision of SUS doctors, nurses and clinics is greater in counties where a higher fraction of persons who are likely to favor public health care vote. A one standard deviation (or 8.6 percentage point) increase in the percentage of persons voting in the 1996 mayoral election increases clinics (and clinic consultation rooms) by about 8%. Counties with a one standard deviation larger voting rate also experience 8% larger increases in their health budgets subsequent to the 1996 elections. As we argue above, variation in the voting rate (holding literacy constant) is likely to reflect an increase in the percentage of uninsured persons voting, since persons in the informal sector (who are less likely to be insured) are less likely to be penalized for not voting. The impact of political participation on doctors stays positive in all specifications in table 3, but gets smaller

---

[16] As expected, counties with higher average incomes have more SUS doctors, nurses and clinics per capita. This effect is large: a one standard deviation increase in per capita income increases doctors and nurses per capita by about 11% and clinic rooms per capita by 7%.

[17] We find this effect after controlling for other variables that may also proxy the share of uninsured in the population, such as the % of population living in slums and the % of population voting for leftist candidates. In the more parsimonious specifications (i.e. models 2 and 3), the impact of the Gini coefficient is even larger. A one standard deviation increase in the Gini increases doctors by about 6 - 7%.

once we control for the illiteracy rate and the spatial correlation in errors.[18] The illiteracy rate itself has large negative impacts (of -5% to -18% for a one standard deviation increase) on the allocation of health inputs and changes in health budgets.

Third, our proxies for political leverage in negotiations with higher levels of government are often significant and increase the level of public health inputs. The higher the winner's share of the vote in the 1996 county mayoral elections, the stronger the mayor's power in negotiating transfers from federal and state governments. A one standard deviation (or 8.9 percentage point) increase in the mayor's vote share increases clinics and clinic rooms by over 15% and increases doctors and nurses by about 6% and 3% respectively. This effect is statistically significant for all four inputs. It is possible that the mayor's popularity is influenced by the quality health services he has delivered in the past. However, we also find that counties where the mayor won a one standard deviation larger share of the vote in the 1996 elections experienced an 11.5% larger increase in their health budget between 1995 and 2000. This makes it unlikely that the reverse causality drives this result entirely. Consistent with these results, Finan (2003) reports that federal deputies in Brazil reward counties where they win larger vote shares by making greater public investments in those areas.

The fact that the county mayor and state governor are of the same party may also increase the county's leverage in negotiations with the state. This holds in the equations for doctors and nurses, and increases the provision of doctors by 27% and nurses by 33% at their respective sample means. These results are in line with a more descriptive study by Lima (2002), who finds that total federal transfers to states for all purposes are

---

[18] In the model with spatial autocorrelation in errors, we do find strong evidence of positive autocorrelation with respect to geographic neighbors. This reduces statistical significance for covariates which themselves follow a spatial pattern (e.g. voting rates, see figure 1).

significantly larger in Brazilian states that are politically aligned with the federal government. We hypothesized that the benefits of being a popular mayor would increase if the state governor were of the same political party; however, the results for this interaction effect (which should be positive in sign) are mixed. This is also true for Distance to the State Capital, which, as expected, is negative for doctors, clinics and consultation rooms, but positive in the case of nurses.

Finally, decentralization in the administration of health care services has an ambiguous effect on the level of public health care services. There is no evidence that decentralized counties provide higher levels of public health services than state-run counties, but they do experience significantly larger increases in their health budgets after the 1996 elections. Once the set of decentralized counties is subdivided into two groups—those that have a governance plan and those that do not—some interesting results emerge. For each of the four inputs, the coefficient on the indicator for decentralized counties with a plan for governance is more positive than the coefficient on the indicator for decentralized counties without a governance plan. Further, in the doctors and nurses regressions, the former is positive and statistically significant, suggesting that decentralized counties with the required governing capacity have 11% more doctors and 18% more nurses than counties that are not decentralized. In the sample of urbanized areas, we find that within the set of decentralized counties, those with a governance plan provide 3.4% more doctors than those without. Thus, decentralization seems to increase health inputs only if it is accompanied by good local governance.

Our strongest results with respect to decentralization come from the model of changes in the county health budgets between 1995 and 2000 (model 10 in table 4). Decentralized counties experience about 75% larger increases in their health budgets than state-run counties over this time period. Additionally, this effect is significantly larger for decentralized counties with a governance plan.

6. Conclusions

In Brazil the role of decentralization in the provision of health care has both an administrative aspect (it affects the targeting of services to the poor) and a fiscal one (it affects county budgets). Data from the 1998 PNAD survey suggest that more SUS doctors, nurses and clinic rooms in a county increase the chances that an uninsured person receives medical attention when ill. Decentralization of service delivery actually reduces the chances of receiving health care if it is not accompanied by good governing capacity. It also appears from our analyses that decentralization, when accompanied by good governance, increases the amount of public health services provided in a county.[19] Our results on decentralization conditional on good governance are consistent with Bardhan and Mookherjee's (1998) theoretical proposition that the impact of decentralization on service delivery depends on the relative degree of capture that local versus national governments are prone to.

In explaining variation in the level of SUS doctors, nurses and clinics across counties our models suggest that the preferences of voters matter. Counties with a higher proportion of voters who are likely to rely on the SUS system have more SUS doctors,

---

[19] Faguet (2004) finds a similar result in Bolivia. He examines patterns of government investment by sector following the transfer of authority to county governments and finds that more investment occurs in counties that need it most (e.g., there is more investment in education in counties with greater illiteracy).

nurses and clinics. This is consistent with the results of Foster and Rosenzweig (2001) who find that districts in India with a higher proportion of poor voters receive more pro-poor public goods. We also find that political participation matters—counties with a higher proportion of people voting in the 1996 mayoral election have more SUS services—a finding consistent with Besley and Burgess (2003), Stromberg (2004) and Betancourt and Gleason (2000). In our data, greater political participation rates correspond to larger voting rates for the poor and uninsured who demand these health services. Similar to our findings, Banerjee (2002) reports in a review paper that politically "disempowered" groups lack access to public services in India. Political variables that proxy the power of the county mayor—his share of the vote in the mayoral election; whether he is of the same party as the state governor—also tend to be positively related to provision of SUS health services. Generally, the impacts of politics on health service delivery that we document for Brazil echo other researchers' findings on India, another large developing country that has been studied more frequently by development economists.

References

Alvarez, I. (1998). "21st Century, Challenges, Facing the Brazilian Health Sector". A Report on the 1998 Roundtable Held in Sao Paolo, Brazil, http://www.iamericas.org/publications

Alves, Denisard and Chris Timmins (2003). "Social Exclusion and the Two-Tiered Healthcare System of Brazil," in Behrman, Gaviria, and Szekely (eds.), *Who's In and Who's Out: Social Exclusion in Latin America*, Inter-American Development Bank, Washington, DC, 2003.

Anselin, Luc (1988). *Spatial Econometrics: Methods and Models*, Kluwer Academic Publishers, Boston

Banerjee, Abhijit (2002). "Who is Getting the Public Goods in India: Some Evidence and Some Speculation," mimeo, MIT.

Bardhan, Pranab and Dilip Mookherjee (1998). "Expenditure Decentralization and the Delivery of Public Services in Developing Countries," mimeo.

Bardhan, Pranab and Dilip Mookherjee (2000). "Capture and Governance at Local and National Levels," *American Economic Review*, 90 (2): 135-39.

Besley, T. and R. Burgess (2002), "The Political Economy of Government Responsiveness: Theory and Evidence from India," *Quarterly Journal of Economics* 117 (4): 1415-51, November

Besley, T. and S. Coate, (1999). "Centralized versus Decentralized Provision of Local Public Goods: A Political Economy Analysis," NBER Working Paper No.W7084

Betancourt, R. and S. Gleason (2000). "The Allocation of Publicly-Provided Goods to Rural Households in India: On Some Consequences of Caste, Religion and Democracy," *World Development* 28 (12): 2169-82, December.

Faguet, J.P. (2004). "Does Decentralization Increase Responsiveness to Local Needs? Evidence from Bolivia," *Journal of Public Economics* 88 (3-4), pp. 867-93, March.

Finan, Frederico (2003). "Political Patronage and Local Development: A Brazilian Case Study," unpublished paper.

Foster, A.D. and M.R. Rosenzweig (2001). "Democratization, Decentralization and the Distribution of Local Public Goods in a Poor Rural Economy, Research Paper.

Grossman, G. and E. Helpman (2001). *Special Interest Politics*. MIT Press. Cambridge, MA.

IPEA (2001). "Produto Interno Bruto dos Municipios Brasileiros: 1970, 1975, 1980, 1985, 1990 e 1996," mimeo.

Kelejian, H and I.R. Prucha (1999). "A Generalized Moments Estimator for the Autoregressive Parameter in a Spatial Model," *International Economic Review* 40, 509-533.

Lima, Edilberto C. P. (2002). "Transfers from the Federal Government to States and Counties in Brazil." Banco Nacional de Desenvolvimento Economico e Social. Brasilia, Brazil.

Lobato, Lenaura (2001). "Reorganizing the Health Care System in Brazil," Chapter 5 in Fleury, S. et al (eds.), *Reshaping Health Care in Latin America: A Comparative Analysis of Health Care Reform in Argentina, Brazil, and Mexico*, IDRC Books, Ottowa.

Lobato, Lenaura and Burlandy, Luciene (2001). "The Context and Process of Health Care Reform In Brazil," Chapter 4 in Fleury, S. et al (eds.), *Reshaping Health Care in Latin America: A Comparative Analysis of Health Care Reform in Argentina, Brazil, and Mexico*, IDRC Books, Ottowa.

Meeus, Jean (1999). *Astronomical Algorithms.* Second Edition. Willman-Bell Publishers. Richmond, VA.

Oates, W. (1972). *Fiscal Federalism*, Harcourt Brace Jovanovich, New York.

Rodrik, Dani (2000). "Participatory Politics, Social Cooperation, and Economic Stability," *American Economic Review, Papers and Proceedings* 90 (2): 140-144.

Stromberg, David (2004). "Radio's Impact on Public Spending," *The Quarterly Journal of Economics,* forthcoming.

Vajda, I.; P. Carvalho Zimbres and V. Tavares de Souza. 1998. *Constitution of the Federative Republic of Brazil 1988*. Translation and revision for the Brazilian Federal Senate. Brasilia.

World Bank (1999). "Brazil: Structural Reform for Fiscal Sustainability," World Bank Report No. 19593-BR, Washington, D.C.

World Bank (2003). "Decentralization of Health Care in Brazil: A Case Study of Bahia." May 16. Report No. 24416-BR. World Bank, Washington, D.C.
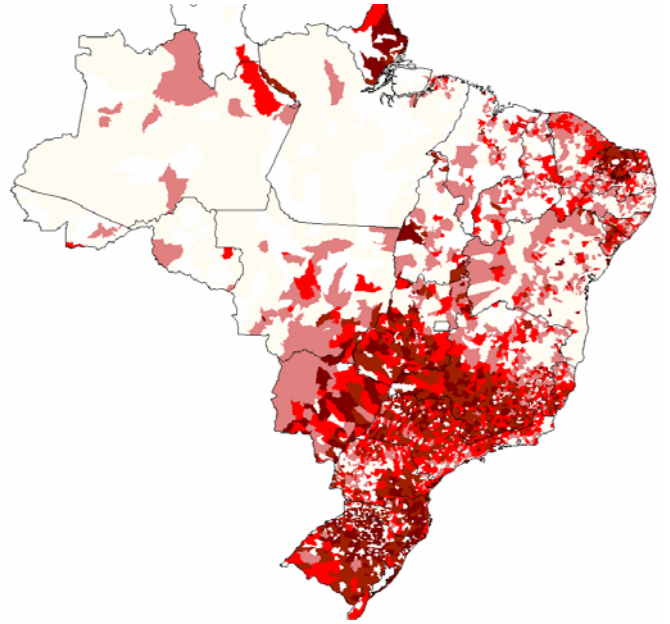
Figure 1. Spatial Patterns in the County Data

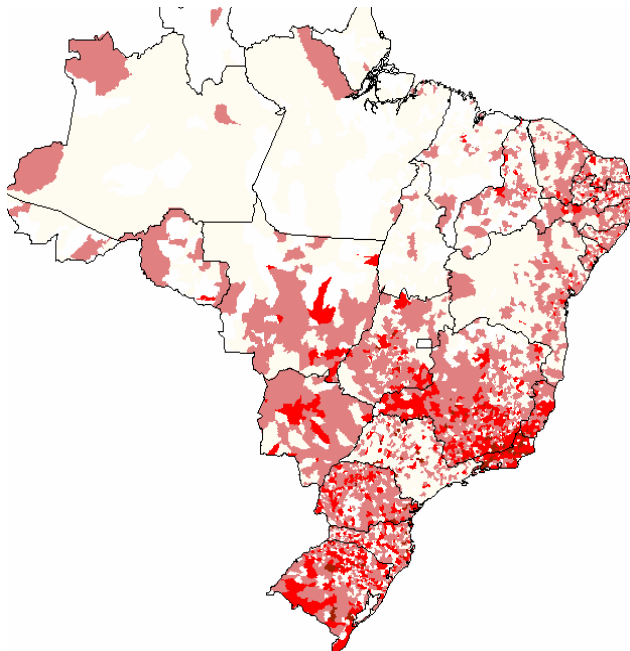Key: Darker colors imply more health services
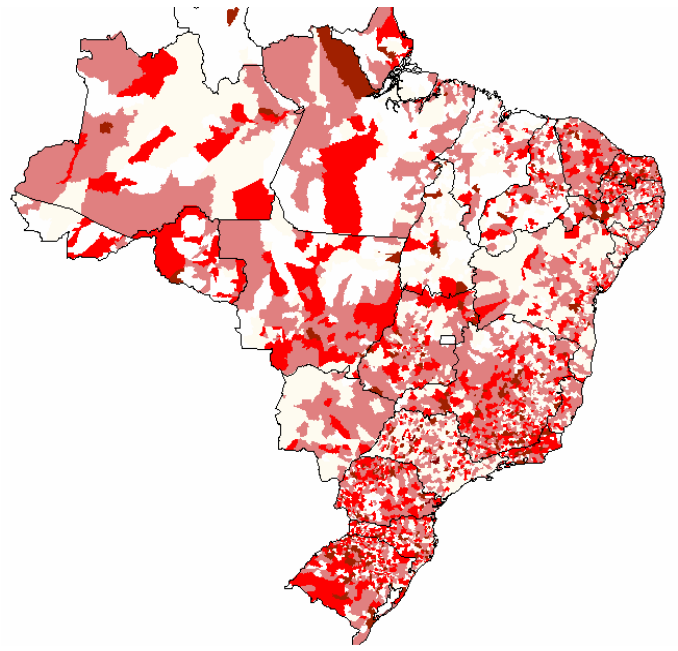
State and County Boundaries
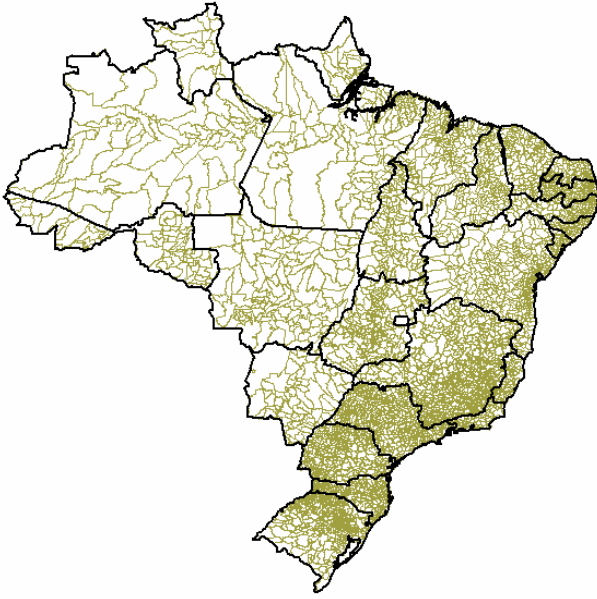
Political Participation (Voting) Rate

Doctors

Nurses

Data Appendix

A. Data Sources for County 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 1998-99. For county-level GDP data, we rely on estimates for the year 1996 constructed by IPEA (2001) on the basis of the Censuses of Population, Industry, Agriculture and Services. These censuses are administered by the Brazilian national statistical institute (IBGE).[20]

The proportion of 'white' and 'indigenous' in the population and the Gini coefficient measure of income inequality were computed using data from the 1991 Demographic Census. Data on the proportion of residents living in temporary housing or slum areas, proportion urban and population density are from the *Base do Informações Municipais (BIM) 1996* produced by IBGE. The distance from each county to the state capital was computed from latitude and longitude coordinates for the "center" of each county also taken from *BIM*. It was assumed that each degree of latitude or longitude spans the same length of about 110 km. This is approximately correct for 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 counties conducted in 1999 by IBGE (*Pesquisa de Informações Basicas Municipais*). The decentralization dummy variable is calculated based on which counties have Full County 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 characteristics of all candidates running for office, and the number of votes received by each candidate in each county for Presidential, state gubernatorial and county mayoral elections held since 1992. Elections are held at four-year intervals, and county 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 1996 mayoral elections (excluding null and blank votes) in each county, as a fraction of the county population. We chose to normalize by population rather than by the number of registered voters, because the former definition gives us a more accurate measure of voting rates among those (the poor, uninsured who are more likely to not be employed in the formal sector) who would benefit from public health services.

---

[20] The geographic boundaries of some counties do not stay constant over time. We normalize all relevant variables by population data (obtained from IBGE) for the exact time frame for which the numerator was obtained.

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, representative for all of Brazil except for sparsely populated rural areas in the Northern states of Rondonia, Acre, Amazonas, Roraima, Para and Amapa. PNAD is a stratified sample, where included counties are divided into two groups: key counties (including those in the large urban areas) and second-tier ones. Households in each of the key counties are sampled, while a subset of second-tier counties are selected by stratification. The 1998 PNAD included households from 793 out of a total of 5008 Brazilian counties.

The 1998 PNAD consists of a basic questionnaire and an additional health module which asked detailed questions about health status and usage of health services. 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

Figure A.1 below outlines the process for constructing the individual health-access variable based on the 1998 PNAD survey questions. The following survey questions were used to create this variable:

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

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

(2) "When you looked for this treatment, were you treated?" (Yes/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;[21] (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) were also asked:

---

[21] Multiple choice options relating to payment for services - (e) for Question 3 and (b) for Question 4 – were provided because: (i) the survey includes potential users of non-SUS facilities where services are not free of charge, (ii) SUS may have to pay for prescription drugs out-of-pocket; and (iii) users may have to pay for their own transport to the health facilities.

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

Possible 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) to question 4 (286,885) were dropped from the analysis because they did not require health services. Those responding with (h) and (i) were also dropped, since these responses do not provide adequate information for us to judge their health care 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
- Those responding with (b), (c), (e) or (f) to question 3 (i.e. individuals who did not bother seeking care due to difficulties in access, totaling 7,985).

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 or missing county information – resulted in the final sample of 25,464 individuals classified as having health care access, and 8,077 persons (24.1%) classified as not having it.

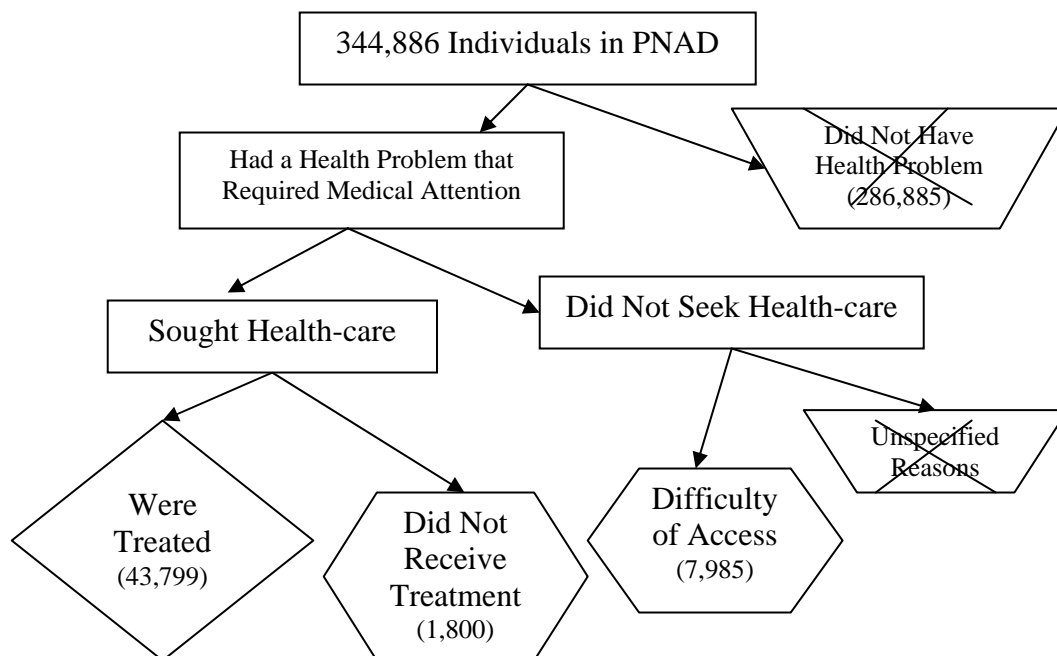**Figure A1: Construction of Individual Health Access Variable**

,

Table 1. Summary Statistics - County Level Variables

Variables	County Sample (4338 Obs.) Mean (Std. Dev.)	Range	Individuals With Health Access (25464 Obs.) Mean (Std. Dev.)	Range	Individuals Without Health Access (8077 Obs.) Mean (Std. Dev.)	Range	All Individuals (33541 Obs.) Mean (Std. Dev.)	Range
Public Doctors and Specialists per Thousand People	0.972 (0.954)	(0-21.55)	1.225 (0.979)	(0-21.55)	1.043 (0.665)	(0-21.55)	1.181 (0.916)	(0-21.55)
Public Nurses per Thousand People	1.358 (1.114)	(0-16.81)	2.097 (1.534)	(0-7.18)	1.807 (1.409)	(0-7.18)	2.027 (1.51)	(0-7.18)
Public Clinics per 1000 people	0.345 (0.26)	(0-2.67)						
Public Clinic Consultation Rooms per 1000 people	2.34 (1.472)	(0-13.02)	1.317 (1.167)	(0-8.8)	1.29 (1.021)	(0-8.8)	1.311 (1.133)	(0-8.8)
Change in County Health Budget per-capita 1995-2000	49.702 (42.58)	(-173.1-554)						
Federal SUS (health) Transfers to County, December 1996 (logged)	0.264 (1.047)	(-6.6-3.4)						
County GDP per Capita (logged)	7.694 (0.813)	(4.77-11.34)						
Gini Coefficient of Income	0.541 (0.064)	(0.32-0.84)						
Share of 1998 Presidential Election Votes Cast for a Left-Leaning Candidate	0.352 (0.14)	(0.06-0.91)						
% of Population Living in Slums (Improvised Housing)	0.004 (0.013)	(0-0.38)						
Proportion of County Population that is White	0.506 (0.28)	(0-1)						
Proportion of County Population that is Indigenous	0.003 (0.023)	(0-0.74)						
Political Participation in 1996 Mayoral Election	0.771 (0.086)	(0.34-0.96)						
Proportion of the County Population that is Illiterate	0.351 (0.179)	(0.02-0.87)						
Winner's Vote Share in 1996 Mayoral Election (Popularity of Elected Mayor)	0.299 (0.089)	(0.08-0.78)						
Counties Where the State Governor and County Mayor are from the Same Party	0.136 (0.342)	(0-1)						
Interaction: (Mayor's Vote Share) * (Mayor and Governor from Same Party)	0.04 (0.107)	(0-0.78)						
Distance to the State Capital	2.287 (1.505)	(0-13.32)						
Decentralized Counties (Healthcare County-Run) Without a Governance Plan	0.054 (0.226)	(0-1)	0.121 (0.326)	(0-1)	0.129 (0.335)	(0-1)	0.123 (0.328)	(0-1)
Decentralized Counties (Healthcare County-Run) With a Governance Plan	0.042 (0.2)	(0-1)	0.193 (0.395)	(0-1)	0.153 (0.36)	(0-1)	0.183 (0.387)	(0-1)
Indicator for Counties with a Governance Plan	0.342 (0.474)	(0-1)	0.547 (0.498)	(0-1)	0.49 (0.5)	(0-1)	0.533 (0.499)	(0-1)
Population Density	0.098 (0.526)	(0-12.41)	1.327 (2.161)	(0-12.41)	1.016 (1.891)	(0-12.41)	1.252 (2.104)	(0-12.41)
% of County Population Living in Urban Areas	0.587 (0.224)	(0.02-1)	0.796 (0.221)	(0.1-1)	0.727 (0.249)	(0.1-1)	0.78 (0.23)	(0.1-1)
Dummy for Major Metropolitan Region	0.041 (0.199)	(0-1)	0.369 (0.483)	(0-1)	0.291 (0.454)	(0-1)	0.35 (0.477)	(0-1)
Private Doctors and Specialists per Thousand People			0.428 (0.536)	(0-2.74)	0.316 (0.451)	(0-2.36)	0.401 (0.519)	(0-2.74)
Private Nurses per Thousand People			0.346 (0.475)	(0-2.12)	0.261 (0.41)	(0-2.12)	0.326 (0.461)	(0-2.12)
Private Clinic Consultation Rooms per 1000 people			0.254 (0.379)	(0-2.49)	0.209 (0.337)	(0-2.49)	0.243 (0.37)	(0-2.49)

Table 1. (cont.) Summary Statistics - Individual Level Variables

Variables	County Sample (4338 Obs.) Mean (Std. Dev.)	Range	Individuals With Health Access (25464 Obs.) Mean (Std. Dev.)	Range	Individuals Without Health Access (8077 Obs.) Mean (Std. Dev.)	Range	All Individuals (33541 Obs.) Mean (Std. Dev.)	Range
Access to Health Care							0.759 (0.428)	(0-1)
Indicator for Female Respondent			0.613 (0.487)	(0-1)	0.581 (0.493)	(0-1)	0.605 (0.489)	(0-1)
Respondent's Age			31.479 (22.602)	(0-98)	36.072 (22.066)	(0-107)	32.585 (22.56)	(0-107)
Respondent's Age Squared / 100			15.018 (17.123)	(0-96.04)	17.881 (17.886)	(0-114.49)	15.707 (17.353)	(0-114.49)
No. of Household Inhabitants Aged 9 or less			1.024 (1.209)	(0-12)	1.121 (1.348)	(0-11)	1.047 (1.244)	(0-12)
No. of Household Inhabitants Aged 10 Years or More			3.562 (1.799)	(1-16)	3.656 (1.852)	(1-15)	3.584 (1.813)	(1-16)
Highest Level of Education Completed by Respondent is Primary			0.122 (0.328)	(0-1)	0.081 (0.274)	(0-1)	0.113 (0.316)	(0-1)
Highest Level of Education Completed by Respondent is Secondary			0.139 (0.346)	(0-1)	0.087 (0.282)	(0-1)	0.126 (0.332)	(0-1)
Highest Level of Education Completed by Respondent is Tertiary			0.032 (0.176)	(0-1)	0.01 (0.098)	(0-1)	0.027 (0.161)	(0-1)
Respondent is Black			0.064 (0.245)	(0-1)	0.077 (0.266)	(0-1)	0.067 (0.25)	(0-1)
Respondent is Colored (but not Oriental or Indigenous)			0.444 (0.497)	(0-1)	0.543 (0.498)	(0-1)	0.467 (0.499)	(0-1)
Respondent is Indigenous			0.003 (0.056)	(0-1)	0.003 (0.057)	(0-1)	0.003 (0.056)	(0-1)
Household Income (logged)			4.655 (0.905)	(-0.18-9.26)	4.263 (0.908)	(0.69-7.98)	4.56 (0.921)	(-0.18-9.26)
Household Resides in Urban Area			0.815 (0.388)	(0-1)	0.658 (0.475)	(0-1)	0.777 (0.416)	(0-1)
No. of Days Respondent could not Engage in Usual Activities due to Illness			1.814 (3.648)	(0-14)	1.322 (3.161)	(0-14)	1.696 (3.543)	(0-14)
Respondent could not Engage in Usual Activities due to Diarrhoea/Vomiting			0.021 (0.145)	(0-1)	0.019 (0.135)	(0-1)	0.021 (0.143)	(0-1)
Interaction of Age and Preceding Diarrhoea Variable			0.401 (4.131)	(0-89)	0.527 (5.09)	(0-94)	0.431 (4.381)	(0-94)
Respondent could not Engage in Usual Activities due to Respiratory Illness			0.042 (0.2)	(0-1)	0.026 (0.16)	(0-1)	0.038 (0.192)	(0-1)
Interaction of Age and Preceding Respiratory Illness Variable			1.02 (7.038)	(0-98)	0.756 (5.97)	(0-95)	0.957 (6.797)	(0-98)
Respondent could not Engage in Usual Activities due to Heart/Blood Pressure Prob			0.036 (0.187)	(0-1)	0.025 (0.157)	(0-1)	0.034 (0.18)	(0-1)
Respondent could not Engage in Usual Activities due to Mental/Emotional Prob.			0.013 (0.115)	(0-1)	0.012 (0.111)	(0-1)	0.013 (0.114)	(0-1)
Indicator for Respondents with Back Problems			0.284 (0.451)	(0-1)	0.389 (0.488)	(0-1)	0.31 (0.462)	(0-1)
Indicator for Respondents with Arthritis or Rheumatism			0.17 (0.375)	(0-1)	0.252 (0.434)	(0-1)	0.19 (0.392)	(0-1)
Indicator for Respondents with Diabetes			0.051 (0.22)	(0-1)	0.042 (0.201)	(0-1)	0.049 (0.216)	(0-1)
Indicator for Respondents with Chronic Kidney Disease			0.06 (0.238)	(0-1)	0.086 (0.281)	(0-1)	0.066 (0.249)	(0-1)

Table 2. Access to Health-Care Regressions

Individual/Household Controls	(1)	ME[a]	County Level Controls	(1) cont.	ME[a]
Respondent and Household Characteristics			**Health Inputs (D, N, C)**		
Indicator for Female Respondent	0.218*** (8.58)	0.037	Public Doctors and Specialists per Thousand People	0.303*** (3.25)	0.051
Respondent's Age	-0.028*** (11.78)		Private Doctors and Specialists per Thousand People	0.076 (0.62)	0.013
Respondent's Age Squared / 100	0.022*** (7.04)	-0.002	Public Nurses per Thousand People	-0.068 (1.58)	-0.011
No. of Household Inhabitants Aged 9 or less	-0.013 (0.65)	-0.002	Private Nurses per Thousand People	0.003 (0.02)	0.000
No. of Household Inhabitants Aged 10 Years or More	0.017 (1.48)	0.003	Public Clinic Consultation Rooms per 1000 people	0.181*** (3.77)	0.030
Highest Level of Education Completed by Respondent is Primary	0.196*** (3.37)	0.031	Private Clinic Consultation Rooms per 1000 people	-0.102 (1.12)	-0.017
Highest Level of Education Completed by Respondent is Secondary	0.165*** (2.72)	0.027	**Health Production Function Shifters (dP)**		
Highest Level of Education Completed by Respondent is Tertiary	0.499*** (3.06)	0.072	Decentralized Counties Without a Governance Plan	-0.258** (2.02)	-0.046
Respondent is Black	-0.200*** (2.97)	-0.035	Decentralized Counties With a Governance Plan	0.031 (0.33)	0.005
Respondent is Colored (but not Oriental or Indigenous)	-0.090** (2.05)	-0.015	Indicator for Counties with a Governance Plan	-0.035 (0.40)	-0.006
Respondent is Indigenous	-0.355 (1.25)	-0.065	Population Density	0.010 (0.36)	0.002
Household Per Capita Monthly Income (logged)	0.377*** (12.55)	0.063	% of County Population Living in Urban Areas	0.083 (0.41)	0.014
Household Resides in Urban Area	0.542*** (7.28)	0.098	Dummy for Major Metropolitan Region	0.006 (0.06)	0.001
Illness (2 week recall)			Constant	1.338 (1.02)	
No. of Days Respondent could not Engage in Usual Activities due to Illness	0.061*** (11.24)	0.010			
Respondent could not Engage in Usual Activities due to Diarrhoea/Vomiting	0.185 (1.30)	0.029			
Interaction of Age and Preceding Diarrhoea Variable	-0.007 (1.61)	-0.001			
Respondent could not Engage in Usual Activities due to Respiratory Illness	0.091 (0.67)	0.015			
Interaction of Age and Preceding Respiratory Illness Variable	0.003 (1.12)	0.001			
Respondent could not Engage in Usual Activities due to Heart/Blood Pressure Prob	0.314*** (3.72)	0.048			
Respondent could not Engage in Usual Activities due to Mental/Emotional Prob.	-0.185 (1.34)	-0.032			
Chronic Conditions					
Indicator for Respondents with Back Problems	-0.190*** (4.83)	-0.032			
Indicator for Respondents with Arthritis or Rheumatism	-0.216*** (5.29)	-0.038	Chi-square stat for Equality of Decentralization [with/without Governance Plan] Coefficients	4.03	
Indicator for Respondents with Diabetes	0.262*** (3.73)	0.041			
Indicator for Respondents with Chronic Kidney Disease	-0.155*** (2.62)	-0.027	Prob > Chi-square	0.04	
Observations	33541				

Heteroskedasticity-corrected z statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%

Errors Clustered by County; State Dummies included in all Specifications

[a]Marginal Effect: increase in probability that the individual reports that s/he has access to health-care in response to a unit change in the independent variable (discrete 0 to 1 change for binary variables)

40

Table 3. County-Level Regressions of Public Doctors per Thousand People

		(2)	(3)	(4)	(5) Spatially Auto-correlated Errors	(6) Urbanized Areas
			Full Sample - OLS			
Voter Preferences and Incomes (y_u, y_l, r)	County GDP per Capita (logged)	0.237*** (10.82)	0.202*** (8.97)	0.133*** (5.59)	0.133*** (4.48)	0.133*** (4.01)
	Gini Coefficient of Income	1.073*** (6.63)	0.978*** (5.94)	0.599*** (3.48)	0.579** (2.43)	1.084*** (3.96)
	Share of 1998 Presidential Election Votes Cast for a Left-Leaning Candidate		0.478*** (3.94)	0.245* (1.69)	0.178 (1.29)	0.120 (0.64)
	% of Population Living in Slums (Improvised Housing)			-0.755* (1.81)	-0.673 (0.64)	-0.886 (1.62)
	Proportion of County Population that is White			0.128 (1.46)	0.133 (1.25)	0.164 (1.29)
	Proportion of County Population that is Indigenous			0.137 (0.48)	-0.041 (0.06)	-0.585 (1.18)
Voting Rate (v)	Political Participation in 1996 Mayoral Election	0.660*** (4.27)	0.678*** (4.45)	0.303* (1.95)	0.290 (1.38)	0.272 (1.21)
	Proportion of the County Population that is Illiterate			-0.970*** (7.11)	-1.013*** (4.9)	-1.118*** (4.88)
Transfers from State (T)	Winner's Vote Share in 1996 Mayoral Election (Popularity of Elected Mayor)	0.419** (2.39)	0.671*** (3.38)	0.736*** (3.77)	0.701*** (3.67)	0.559** (2.48)
	Counties Where the State Governor and County Mayor are from the Same Party		0.296*** (3.14)	0.264*** (2.85)	0.305** (2.3)	0.351*** (3.07)
	Interaction: (Mayor's Vote Share) * (Mayor and Governor from Same Party)		-0.763** (2.01)	-0.654* (1.72)	-0.75* (1.76)	-0.767* (1.68)
	Distance to the State Capital			-0.018** (2.03)	-0.015 (1.27)	-0.007 (0.48)
Health Production Function Shifters (d, P)	Decentralized Counties (Healthcare County-Run) Without a Governance Plan		0.034 (0.62)	-0.009 (0.17)	0.005 (0.07)	-0.077 (1.18)
	Decentralized Counties (Healthcare County-Run) With a Governance Plan		0.161*** (2.80)	0.104* (1.74)	0.124* (1.74)	0.080 (1.23)
	Indicator for Counties with a Governance Plan		-0.009 (0.36)	-0.016 (0.61)	-0.021 (0.72)	-0.019 (0.57)
	Population Density			-0.049*** (3.08)	-0.039 (1.29)	-0.048*** (2.99)
	% of County Population Living in Urban Areas			0.230*** (2.86)	0.208** (2.47)	0.290** (1.98)
	Dummy for Major Metropolitan Region			-0.177*** (3.09)	-0.148* (1.73)	-0.165** (2.49)
	Constant	-2.736*** (6.08)	-2.644*** (6.09)	-1.268*** (3.25)	-1.175* (1.85)	-0.793* (1.87)
	Parameter for Spatial Lag in Errors (λ)				0.185*** (18.17)	
	Observations	4338	4338	4338	4338	2708
	Adjusted R-squared	0.19	0.19	0.20	0.22	0.18
	F-stat for Equality of Decentralization [with/without governance plan] Coefficients		3.02	2.47		3.80
	Prob > F		0.08	0.12		0.05

Heterskedasticity-corrected t statistics in parentheses; State Dummies included in all Specifications
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 4. OLS Regressions of Health Service Provision per Thousand People

		(7) Nurses	(8) Clinics	(9) Consultation Rooms	(10) Change in per-capita Health Budget 1995-2000
Voter Preferences and Incomes (y_u, y_l, r)	County GDP per Capita (logged)	0.173***	0.019**	0.194***	9.974***
		(5.39)	(2.38)	(4.51)	(5.88)
	Gini Coefficient of Income	1.025***	0.041	0.717**	-35.086***
		(3.87)	(0.61)	(2.11)	(2.81)
	Share of 1998 Presidential Election Votes Cast for a Left-Leaning Candidate	0.453***	0.097***	0.117	-11.250
		(2.87)	(2.60)	(0.58)	(1.63)
	% of Population Living in Slums (Improvised Housing)	-1.474*	0.013	2.078	75.838
		(1.70)	(0.06)	(1.51)	(1.38)
	Proportion of County Population that is White	-0.186*	-0.065**	-0.312*	-6.680
		(1.67)	(2.26)	(1.96)	(1.25)
	Proportion of County Population that is Indigenous	0.423	0.446*	2.442***	33.113
		(0.63)	(1.84)	(2.68)	(1.00)
Voting Rate (v)	Political Participation in 1996 Mayoral Election	0.009	0.355***	2.234***	45.513***
		(0.03)	(5.79)	(6.94)	(3.97)
	Proportion of the County Population that is Illiterate	-1.065***	-0.139**	-0.703***	-19.167**
		(5.03)	(2.54)	(2.66)	(2.01)
Transfers from State (T)	Winner's Vote Share in 1996 Mayoral Election (Popularity of Elected Mayor)	0.443*	0.603***	5.135***	64.280***
		(1.83)	(10.33)	(14.84)	(5.92)
	Counties Where the State Governor and County Mayor are from the Same Party	0.452***	-0.056	-0.285	-10.126
		(2.82)	(1.43)	(0.93)	(1.40)
	Interaction: (Mayor's Vote Share) * (Mayor and Governor from Same Party)	-1.349***	0.212	1.209	35.550
		(2.58)	(1.50)	(1.08)	(1.41)
	Distance to the State Capital	0.028**	-0.010***	-0.018	1.475***
		(2.54)	(3.69)	(1.35)	(2.66)
Health Production Function Shifters (d, P)	Decentralized Counties (Healthcare County-Run) Without a Governance Plan	0.100	-0.028**	-0.204***	32.328***
		(1.39)	(2.33)	(2.92)	(7.99)
	Decentralized Counties (Healthcare County-Run) With a Governance Plan	0.242**	-0.018	-0.165*	42.726***
		(2.55)	(1.33)	(1.95)	(8.14)
	Indicator for Counties with a Governance Plan	0.066*	-0.019**	-0.080*	1.317
		(1.76)	(2.39)	(1.90)	(0.90)
	Population Density	0.021	-0.016***	-0.174***	-0.470
		(0.46)	(3.59)	(5.11)	(0.27)
	% of County Population Living in Urban Areas	0.285***	-0.314***	-0.763***	-2.294
		(3.08)	(13.52)	(5.97)	(0.58)
	Dummy for Major Metropolitan Region	-0.271***	-0.067***	-0.386***	-5.369
		(2.60)	(4.93)	(4.24)	(1.18)
	County Health Budget per capita - Initial Year (1995)				-0.187***
					(3.31)
	Constant	-0.780	-0.287	-3.516**	-60.323***
		(0.80)	(1.46)	(2.54)	(2.82)
	Observations	4338	4338	4338	3668
	Adjusted R-squared	0.19	0.26	0.30	0.13
	F-stat for Equality of Decentralization [with/without governance plan] Coefficients	1.66	0.33	0.15	2.78
	Prob > F	0.20	0.56	0.70	0.10

Heterskedasticity-corrected t statistics in parentheses; State Dummies included in all Specifications
* significant at 10%; ** significant at 5%; *** significant at 1%

Table A.1. Models of Federal (SUS) Health Transfers to Counties & Political Participation

	(11)	(12)	(13)
	Federal per-capita SUS transfers to County (logged)		Political Participation
County GDP per Capita (logged)		0.135***	0.008***
		(4.01)	(4.72)
Gini Coefficient of Income		2.558***	-0.070***
		(7.64)	(4.81)
Share of 1998 Presidential Election Votes Cast for a Left-Leaning Candidate		0.419***	
		(2.88)	
% of Population Living in Slums (Improvised Housing)		-2.431**	-0.191**
		(2.22)	(2.38)
Proportion of Municipal Population that is White		-0.012	0.052***
		(0.09)	(9.49)
Proportion of Municipal Population that is Indigenous		-0.929	0.005
		(1.24)	(0.11)
Political Participation in 1996 Mayoral Election		-1.141***	
		(4.66)	
Proportion of the Municipal Population that is Illiterate		-1.021***	-0.166***
		(4.30)	(12.25)
Winner's Vote Share in 1996 Mayoral Election (Popularity of Elected Mayor)	-0.142	-0.167	0.127***
	(0.70)	(0.83)	(13.24)
Municipios Where the State Governor and Municipio Mayor are from the Same Party	0.371**	0.336**	
	(2.36)	(2.18)	
Interaction: (Mayor's Vote Share) * (Mayor and Governor from Same Party)	-0.691	-0.537	
	(1.52)	(1.20)	
Distance to the State Capital	0.019	0.014	-0.006***
	(1.62)	(1.09)	(9.27)
Decentralized Municipios (Healthcare Municipio-Run) Without a Governance Plan	0.501***	0.397***	-0.008***
	(8.27)	(6.78)	(2.81)
Decentralized Municipios (Healthcare Municipio-Run) With a Governance Plan	0.594***	0.507***	-0.005*
	(10.92)	(9.94)	(1.79)
Indicator for Municipios with a Governance Plan	0.049	0.005	-0.003*
	(1.48)	(0.15)	(1.88)
Population Density	0.044	0.030	-0.003**
	(1.61)	(1.35)	(2.01)
% of Municipio Population Living in Urban Areas	1.408***	0.837***	-0.023***
	(16.75)	(8.81)	(4.45)
Dummy for Major Metropolitan Region	-0.149*	-0.193**	0.012***
	(1.85)	(2.57)	(3.29)
Proportion of Population with between 5 and 11 Years of Schooling			0.063***
			(2.95)
Proportion of Population with 12 or more Years of Schooling			-0.142***
			(2.74)
Density of Voting Locations			0.001
			(0.18)
Proportion of Votes Cast that were Null or Blank			-1.031***
			(55.63)
Constant	-1.411***	-2.200***	0.804***
	(4.05)	(4.24)	(32.86)
Observations	4190	4190	4338
Adjusted R-squared	0.24	0.29	0.72
F-stat for equality of Decentralization [with/without governance plan] coefficients	1.54	2.38	
Prob > F	0.22	0.12	

Heterskedasticity-corrected t statistics in parentheses; State Dummies included in all Specifications
* significant at 10%; ** significant at 5%; *** significant at 1%