Inter-American Development Bank
Banco Interamericano de Desarrollo
Latin American Research Network
Red de Centros de Investigación
Research Network Working paper #R-436

Social Exclusion and the Two-Tiered Healthcare System of Brazil

by

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December 2001

Cataloging-in-Publication data provided by the
Inter-American Development Bank
Felipe Herrera Library

Alves, Denisard.

Social exclusion and the two-tiered healthcare system of Brazil / by Denisard Alves, Christopher Timmins.

p. cm. (Research Network working papers ; R-436)
Includes bibliographical references.

1. Marginality, Social--Brazil. 2. Medical care--Brazil. I. Timmins, Christopher. II. Inter-American Development Bank. Research Dept. III. Latin American Research Network. IV. Title. V. Series.

305.56 A482--dc21

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Abstract[1]

In Brazil, there exists a two-tiered system of healthcare access. Those with sufficient means have access to a private system of healthcare that provides quality treatment on demand, while the remainder of the country relies on an overburdened system of public clinics and hospitals. Household survey data are used to determine which socio-demographic groups rely most on this public healthcare system. Current demographic trends suggest that the public healthcare infrastructure will become more and more heavily used in the coming decades. A stylized model of healthcare choice is estimated, and its parameters are used to conduct counterfactual simulations of the welfare implications of this increased congestion, and of policies to offset it, like private healthcare subsidies.

[1] The authors gratefully acknowledge the financial support of the Inter-American Development Bank. Ignez Tristao and Fabiana Tito provided outstanding research assistance. Helpful comments and advice were received from Paul Schultz, Chris Udry, and all the participants of the Yale University Development Lunch and the IDB seminars associated with this research initiative.

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1. Introduction

In Brazil there exists a two-tiered system of healthcare. Those with sufficient means, or whose employers provide health coverage, have access to a private system of healthcare that provides quality treatment on demand. The rest of the population relies on a system of public clinics and hospitals. As is the case with most public healthcare systems around the world, the Brazilian system is characterized by long waiting times and questionable quality, with the practical implication that those who are forced to rely on the system spend more time being sick and, subsequently, have a diminished health stock.

This two-tiered system of healthcare is a particularly relevant concern in Brazil in light of recent changes in the country's socio-demographic structure. In 1990, only 6.7 percent of Brazil's population was over age 60, but by 2010 this is expected to be 9.7 percent and by 2030, 16.9 percent (World Bank, 1994 and 2000). During the last twenty years, family sizes among the poorer segments of Brazilian society (i.e., those who typically rely most on the public provision of healthcare), have been larger than in wealthier segments of society. This large population group has been aging, and it is nearing a time when its healthcare needs will grow rapidly (Cutler and Meara, 1998). Concerns have been raised that the Brazilian public health system will not be up to meeting this growing demand. In particular, already-long waiting times for treatment will continue to grow, with the practical implication that many of the poorest segments of society will receive no healthcare at all. This mechanism of social exclusion of the poor, elderly, and rural population will increase at the rate at which this segment of the Brazilian population is growing.

This mechanism may have long-run feedback effects as well. Growing demand due to the increasing size of the poor, elderly population, as well as the increasing cost of treatment for a limited supply of public health services, will mean that the poorest segments of Brazilian society will begin to lose access to healthcare. This will result in a declining health stock for the poor, reinforcing their socio-economic position. To the extent that the poor continue to have larger families (e.g., as a retirement-insurance mechanism or a source of labor for subsistence agriculture), this will lead to further strains on the public healthcare system in the future and the likelihood of further failures.

This paper seeks to accomplish three tasks. First, an outstanding set of Brazilian household survey data will be used to characterize which social groups have access to private healthcare. These data include the 1998 PNAD, a broad household survey that provides detailed information on health, healthcare consumption, and, most importantly, the source from which one receives health services. On the basis of these data, it can be argued that certain groups are systematically denied access to private healthcare in an indirect fashion. After identifying which groups are subject to this form of exclusion, the second part of the study will construct and empirically identify a stylized model of choice between alternative sources of healthcare provision, from which it will be possible to derive a crude measure of the welfare consequences of the increased healthcare congestion costs that are likely to accompany the demographic transition currently observed in Brazil. With these welfare conclusions, the final part this study will analyze the implications of policy alternatives such as private healthcare subsidies.

Section 2 of this paper describes the healthcare system in Brazil. Section 3 describes the household survey data used in the analysis. Section 4 outlines the methodological approach for demonstrating that indirect exclusion exists and measuring its consequences, reporting how the implicit "price" of public healthcare varies across socio-demographic groups in Brazil. Section 5 carries out two counterfactual simulations. The first examines the impacts of an increase in the implicit price of public healthcare, such as that which would arise from the increased congestion that would accompany the predicted increases in healthcare demand in Brazil.[2] The second simulation considers the impact of a private healthcare subsidy being provided by the government, making that option more accessible to groups who had previously been able to afford only public healthcare. Given the propensity of individuals to switch their source of healthcare provision, such a policy might only result in rent transfers to those segments of society that would not be considered "excluded." Section 6 concludes by suggesting limitations to, and possible extensions of, this research.

[2] It is important to note that these simulations could just as well describe any change in the public provision of healthcare in Brazil that (i) increased the implicit price of obtaining services, or (ii) reduced the quality of services received, relative to private healthcare. Available data do not permit a distinction between price and quality of healthcare received. Instead, it is necessary to speak in terms of the implicit price of "effective" units of healthcare. Higher quality healthcare allows one to receive "effective" units at a lower price in this analysis (i.e., it requires fewer trips to the doctor to get a fixed quantity of services), just as would a discount provider of low-quality healthcare. More will be said about this later

2. The Brazilian Healthcare System

The healthcare system in Brazil is rooted in a belief that individuals and households should, at the most basic level, be protected by the public sector. Therefore, while many Brazilian citizens rely on private sources of healthcare provision, the system also includes a very large public component, which is intended to act as a "safety net." The public system, which has its own hospital facilities and is federally financed by the SUS (Sistema Único de Saude, or Unified Health System in English), is intended to provide resources to meet the healthcare demands of those parts of the Brazilian population that do not have private insurance to cover medical expenses. The need for such a system in Brazil is very real. Public health figures show the persistence of endemic diseases, leading to an annual mortality rate is 0.6 percent (i.e., approximately 1 million people). The UN estimates that the Unified Health System provided for 12.6 million hospitalizations in about 2,000 public and private hospitals in 1995, and 1.2 billion consultations in out-patient clinics. Similarly, there are some 507,000 hospital beds in Brazil (about 1 per 300 members of the population), of which about one third are in public establishments. Alves, Carvalheiro and Heimann (2000) show that, in the state of São Paulo, 48.9 percent of the health services used in 1998 were paid by the SUS, 6 percent were paid directly by the users and 45.1 percent of the health services were pre-paid.[3] Among the total population of the state of São Paulo, 44.2 percent have some type of health insurance coverage, while 55.8 percent have none. Those without health insurance coverage have to rely entirely on the SUS. Alves (2000) shows that for the city of São Paulo, located in the more developed southern area of Brazil, close to 40 percent of the population is cared for by the public healthcare system. In the rest of Brazil, over 50 percent of the population relies on this public health system.

In terms of its structure, the SUS is a decentralized system that provides healthcare by districts down to the municipal level. The Municipal Health Secretary has jurisdiction over SUS health centers, hospitals, labs and services, and administers funds provided by the federal, state and municipal governments. A Municipal Health Council consists of organization members, citizens and school personnel, and it approves health programs; establishment of this type of council is necessary for the municipality to receive federal funds. Districts and municipalities can cooperate

in the paper.

[3]In Brazil the main pre-paid health care services are group-medicine plans, medical cooperatives, or corporate plans. All

in sharing expenses and resources with the aim of enhancing healthcare efficiency.

The history of the SUS goes back more than a decade, to the Brazilian constitution of 1988, which mandated a free, universal health care system as a result of a long social movement to counter the inequitable health policies of previous regimes. Previous military regimes in Brazil had left a healthcare system that was highly centralized and with little capacity—in effect, a system that was extremely unresponsive to Brazil's local needs and regional diversity. In the 1970s, inflation was rampant and the Brazilian economy was in crisis. A severe recession followed in the early 1980s and public healthcare expenditures fell substantially, driving down the quality of both health services and infrastructure. In response to this, a council consisting of federal ministry representatives undertook the Reforma Sanitaria, a health care reform effort. The first phase of this reform was the Integrated Health Actions, an effort to improve coordination and decentralize service delivery from the Ministry of Health and INAMPS (Instituto Nacional de Assistencia), the main financing mechanism, to state and municipal levels. The second phase of the reform was the creation of the SUDS (Sistemas Unificados e Decentralizados de Saude) in 1987-88, which completed the process of decentralization. Then came along the new constitution in 1988, which paved the way for the creation of SUS, the third and final phase of the reform. Since that time, the SUS has begun to contract-out a large majority of patient care to a network of private and philanthropic hospitals, clinics, and other facilities. Alves, Carvalheiro, Heimann (2000) estimate that 20 percent of the available hospital beds in Brazil used by the SUS in 1998 belonged to private hospitals. The government itself owns just 31 percent of the hospital beds it supports and has been gradually decentralizing the control of publicly owned facilities. This trend towards decentralization and privatization in Brazilian healthcare reform will be important to the policy conclusions in Section 5.

Private healthcare in Brazil has grown rapidly, with about 26 percent of Brazilians covered by such plans. The plans vary a great deal in terms of price and quality but usually exclude expensive, catastrophic conditions, leaving them to be covered by the public system. The private plans are also subject to virtually no regulation. Attributes of the available private plans are described in Section 3.

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of them offer pre-paid services for individuals, family and other entities such as firms and unions.

While the state is theoretically responsible for healthcare in Brazil, state expenditures on healthcare represent only about 4.2 percent of GNP each year, a low figure relative to some of Brazil's neighbors and countries like India. In comparison, the US allocates about 12.7 percent of its GNP to health care, France about 9 percent, El Salvador about 6 percent, and Paraguay 3 percent. This low level of spending has led to many questions about the quality of publicly provided healthcare in Brazil. Less than $80 per capita was spent on healthcare in Brazil last year, whereas the corresponding per capita expenditure in Argentina was more on the order of $300 and in the US, $2,300. Almost $16 billion was spent on health care in 1995, of which $2.7 billion was used to pay staff and $2.9 billion was used to cover old loans.

Alvarez (1998) states, "the private sector in Brazil currently does a reasonably good job of providing for the 25% of the population that its plans and services reach. However, the public sector SUS is doing a poor job of servicing the other 75%." Numerous anecdotes and some empirical evidence illustrate just how ineffective the SUS may be. For example, the world record for hospitalizations occurred in Campo Grande do Sul in the State of Parana in Brazil, where over 60 percent of the population was hospitalized in one year. An audit of the system then revealed that about 24.1 percent of all diagnoses were false. The detailed household survey data in the 1998 PNAD, which are described in the following section, makes it possible to look specifically at individual perceptions of healthcare quality. In particular, the PNAD questions individuals as to whether they sought healthcare during the previous two weeks, and if so, were they able to receive it. If they were unable to receive healthcare, questions determine whether it was, among other causes, because doctors were not present at the healthcare facility or equipment was malfunctioning. Table 1 divides the sample of heads-of-households in the PNAD into those who use the private healthcare system, and those who rely on the public system, and examine their answers to each of these questions. The results indicate a clear-cut superiority of the private health system over the SUS system. For the country as a whole, the private system exhibited lower waiting times than did the public system. The responses "No Vacancy" (in the case of hospitals) and "No Attending Doctors" have higher rates for the public system. The remaining attributes of the quality of the health systems, as perceived by patients, are similarly unfavorable towards the SUS. At the regional level the picture is similar, although less reliable due to the smaller number of observations.

A World Health Organization (WHO) Report released in June of 2001 placed Brazil 125th out of 191 countries in the world and claimed that its health situation is comparable to that in countries like Nepal, Cambodia, and Vietnam. Brazil's low ranking is mostly attributed to the inequitable manner in which the healthcare system is financed; the WHO generally concludes that Brazilians have to pay too much for healthcare, and that the poor suffer the most under the Brazilian system. There are huge income disparities in Brazil: 35 million of the 120 million Brazilians without private health insurance are below the poverty line.

According to the World Bank Operations Evaluation Department (1998), Brazil's health system might appear to be efficient (it substantially separates financing from the provision of services), but it is inching toward crisis. The public system is underfinanced and therefore exhibits severe regional inequalities, rationing, and declining quality. The World Bank Report goes further:

> ...the hyperinflation of the late 1980s and early 1990s and the irregular flow of resources to health have contributed to the evolution of a fee structure for medical treatment that has not kept pace with costs, and payment can be sporadic. Doctors frequently must work at several sites to make ends meet. Stories of long lines for hospital services, mistakes in emergency care, strikes and walkouts by medical professionals, arbitrary triage, and other crises are reported daily in the press.

This system covers about 70 percent of inpatient and outpatient care. However, local governments are given responsibilities under the decentralization of the public health care system, but do not necessarily have the resources or incentives to deliver cost-effective services. Expenditures do not target the poor, and institutions are extremely fragmented and expensive. Brazil has one of the lowest ratios of nurses to doctors in the developing world (0.33:1 in 1996) and an average of only 13 doctors per 10,000 residents. Moreover, the SUS has also brought with it a decrease in physicians' pay. According to the National School of Public Health at Brazil's Oswaldo Cruz Foundation, a doctor of the old National Institute would have received a much higher salary there than he can now, even though he still performs the same functions and maintains the same caseload and hours.

In summary, in Brazil and in most Latin American countries,[4] the public sector still has a major responsibility for the provision of health services. The Brazilian government uses general revenues to pay for the healthcare of middle- and low-income population groups, while upper income groups tend to use their own resources to pay for private healthcare. Those with low income and education, as well as members of certain racial groups, tend to be discriminated against by the system in the sense that, for public health care, access is more difficult, waiting times on lines are longer, as are travel distances, yet these groups do not have the financial resources to take part in the private system without inordinate sacrifices of other consumption. Given this two-tiered system of service provision, healthcare utilization would be expected to exhibit large variance across the population, and this is supported by the literature indicating that utilization of health services differs vastly by income groups in Brazil (Alves, 2000).

3. Data

The 1998 PNAD is an annual household survey on socio-economic conditions of the Brazilian population, collected under the responsibility of the Instituto Brasileiro de Geografia e Estastistica (IBGE). The 1998 PNAD has a special supplement dealing with the health conditions of the Brazilian population, making it particularly suitable for this analysis. The survey covers 344,975 individuals and 98,166 households. In the present analysis, however, the number of observations is smaller due to missing values for some important variables, particularly income per person in the household. The use of this survey data presents a number of advantages. First, it is one of the only surveys to collect data on health of the population in a consistent fashion. Second, data collection on health is accompanied by a full set of socio-economic data on the individual and the household. Use of the PNAD also presents some disadvantages. The collection of such data relies on the training of data enumerators to record health status. Thus, when looking at reported illnesses, the accuracy might not be as high as it would be if medical professionals were examining the individuals and reporting their illnesses. In addition, data in the Northern region of Brazil are restricted to the urban sector and are, therefore, not representative of the entire region. The full data set, however, does cover thoroughly the remaining regions of Brazil, and the exclusion of the rural North does not

[4] See Parker and Wong (1997) and Wong (2000) for an analysis of the Mexican health system.

harm the survey's representativeness, since this population is very scarce. The present analysis uses the household data set instead of the larger individual sample data. Decisions on healthcare utilization are major decisions made at the level of the household, and using individual data would likely introduce correlations between household members.

Table 2 shows some major characteristics of the data set. The variable *With_HP* measures the proportion of household heads who have a private health insurance plan paid either by himself or by his employer. This amounts to 17 percent of total household heads. The remaining households use the public health system. The variable *PrivHP* indicates whether a household pays for its own health plan, and *Whopay* indicates that a household has a private plan that is paid for by an employer. The average household income in the sample is R$ 962.50 monthly. The average payment of health insurance for the 6.9 percent who pay their own medical insurance is R$ 150.31 and their average household income is higher than the sample average, at R$ 2,137.50 and R$ 781.19 of household per capita income (income reported in Table 2 is the average household per capita income). The average per capita income for the households paying for a private health plan is twice the average per capita income of the household sample.

The mean of the *Metro* variable gives the proportion of the household heads living in Brazilian metropolitan areas. *Age60* is a variable that specifies whether the head of the household is over 60 years of age, while *Child_14* indicates the proportion of persons, below age 14, living in the household. The set of race-differentiation variables are *White*, *Mixed*, *Black* and *Asian*. The proportion of Blacks is quite small, although it should be noted that a large portion of the people who include themselves in the Mixed racial would generally be perceived as Black. The proportion of households not reporting illness is 49.1 percent. The remaining 50.9 percent reported the occurrence of at least one illness, and the proportion of people seeking medical treatment in the last two weeks is 13.1 percent. Table 1 reports the results of users' evaluations of the quality of the healthcare sought by those households. Illnesses are self-reported by the head of the household.

The characteristics of the private health insurance plans are presented at the bottom of Table 2. The health plan attributes are defined by a set of dummy variables. The variable *plcons* takes a value of 1 when the health plan allows for the prior appointment of a doctor consultation and zero otherwise. Table 2 shows that 98.04 percent of the health insurance plans cover pre-appointment for visits to doctors. *Pllist* is 1 when the health insurance policy presents a list of authorized doctors, hospitals and laboratories that can be used by the policyholder and 0 otherwise; 92.47 percent of the private health insurance policies present a list of authorized doctors, hospitals and laboratories. The value for the variable *plreemb* indicates that 30.99 percent of the health plans permit reimbursement of medical expenses when the individual is attended by doctors or health centers not affiliated with the health plan. *Plother* indicates that 81.15 percent of policyholders can be attended by doctors, hospitals and laboratories in cities other than the one in which they reside, and *pldent* indicates that only 21.94 percent of health insurance plans cover dental treatment. This attribute is clearly not a widespread characteristic of private health insurance, and plans with this attribute are more expensive than those without. *Paymore* is a variable capturing the fact that some health insurance policies impose a ceiling on what they pay for healthcare expenses, and any expense above this limit has to be paid by the policyholder.[5] The variable *plexam* indicates that 95.60 percent of health plans allow the policyholder to take complementary lab exams during treatment. Among private policyholders, 92.83 percent are covered for hospitalization, as indicated by the variable *plinter*. *Platend* indicates that 80.54 percent of policyholders are attended by medical services under contract with their heath insurance company. Very few health plans cover the acquisition of medicines and drugs. *Plmedic* indicates that this attribute is very special and covers only 4.85 percent of the private health insurance holders. Among health insurance holders, only 3.07 percent of plans cover orthodontal treatment. This aspect of the health insurance is represented by the variable *odonto*.

This detailed list of private health plan attributes will prove valuable in the following analysis in that it makes it possible to impute prices for a "standardized" private health plan (i.e., a simplified plan without any of the "bells and whistles" described above) for every member of the sample, regardless of whether they actually bought a private health plan (of any type). Calculation of these imputed prices will be necessary for determining the welfare consequences for each individual of facing an increase in the shadow price of public healthcare.

[5] This is the only attribute among the eleven described here for which the dummy variable assumes the value of one when it indicates a detrimental characteristic of the health plan.

4. Research Methodology

In order to characterize indirect exclusion from private healthcare in Brazil, a two-pronged methodological approach is adopted. First, the detailed survey information in the 1998 PNAD data set, described in Section 3, is employed to determine generally which groups in Brazilian society have access to private health insurance and which rely on public healthcare. Being relegated to public healthcare is not a direct form of exclusion, but rather one based on relative prices for private and public healthcare that may be different for individuals from different segments of society. Moreover, differences in employment patterns for individuals from different socio-economic groups will influence their access to employer-provided private health insurance.[6]

4.1 Public v. Private Healthcare and Brazilian Socio-Demographic Groups

Certain groups, delineated by race, education, and location in Brazil, are expected to be systematically more reliant on the public healthcare system. The question of which groups fall into this category is determined with a simple Probit regression (Greene, 2000) of the following form:

$$P(y_i = 1) = \Phi(X_{i,j}\_\beta) \qquad (4.1.1)$$

where

y_i = form of healthcare coverage for individual *i* (1 = private, 0 = public)

X_i = socio-economic attributes of individual *i*; these include

- Race (Black, Asian, Mixed, White)
- Age
- Education is defined by years of schooling
- Household Income
    - Regional Indicators:
- Percentage of Persons in the Household with less than fourteen y ears of age
- Percentage of People above 60 years of Age

[6] This difficult issue (i.e., health insurance as an attribute of a job for which an individual may or may not face a corresponding reduction in pay) is avoided by considering only those individuals who either buy private insurance directly (i.e., those who do not receive it through an employer) or use the SUS.

- Household Income: the total sum of wage and other types of income of individuals living in the household.

The results of this regression, which are found in Table 3, correspond to general perceptions about Brazilian healthcare. Those who tend to be more reliant on the public system are less educated, female, come from the Black and Mixed racial groups and from the Northern and Center-Western regions of Brazil, have lower incomes, and are elderly. The presence of people above sixty years of age in the household is highly significant, while the presence of people below fourteen years of age does not make a difference in the household's health insurance decision. Given the results described in Table 1 regarding differences in the quality of healthcare across providers, this alone could be considered evidence of exclusion of these groups.

Table 4 provides additional evidence along these lines. Specifically, it presents the results of a number of Probit regressions in which a dummy variable indicating that an individual has suffered from a particular disease (e.g., depression, arthritis, cancer, diabetes, respiratory ailment, hypertension, cardiac disease, tuberculosis, cirrhosis, tendonitis, and kidney disease) is regressed on a set of individual attributes, including the form of healthcare provision (i.e., SUS vs. private) that the individual uses. The idea here is that an individual's health stock, which determines how likely he is to suffer from any of these ailments, is, in part, determined by the effective quantity of healthcare he consumes. This is directly a function of its quality, as well as its (shadow) price. An individual who relies on the public system might, therefore, receive lower quality care, or less care in general (if waiting times for treatment are longer), leading to a lower health stock and a higher likelihood of disease because the quality of public healthcare is low, and it is difficult to consume effective healthcare units. These results should be interpreted with extreme caution, however, as the form of healthcare provision may be simultaneously determined with the individual's health stock; e.g., an individual who knows he is likely to develop cancer might purchase private health insurance in order to guarantee himself a higher quality of care. The presence of an endogenous variable in a Probit regression can potentially lead to inconsistent estimates of all the model's parameters.

The results, however, are very much consistent with a priori expectations about health and about the Brazilian health system. Women, generally, are less likely to suffer from almost all diseases but cirrhosis; i.e., women seem to be healthier than men. Higher income follows good health, meaning that poor people are more likely to suffer from some of the illnesses defined in the PNAD survey. One important point to note, however, is that people with private health plans, either self paid or employer paid, are more likely to suffer from some of the illnesses, while healthier people are less likely to go to a private paid health plan. This might simply be the result of getting better diagnoses from a private healthcare provider than from a public clinic. Certain illnesses seem more likely to strike the Northeastern region, while people from the Southern and Southeastern regions are more likely to report cardiac disease, cancer, depression and respiratory diseases.

4.2 A Model of Individual Healthcare Choice

While describing which elements of Brazilian society are more likely to rely on publicly provided healthcare, the preceding analysis does not provide any way of measuring the welfare consequences of this indirect form of exclusion. In order to do so, it is necessary to develop a more elaborate model that takes into account the fact that individuals optimally choose what form of health insurance to obtain in the face of market prices and a budget constraint. The second part of the empirical analysis develops such a model. The binding constraints on the scope of the conclusions that can be taken away from this model come from the lack of data describing individuals' full income endowments and actual expenditure patterns on health and non-health commodities. Instead, the model takes a stylized view, describing the individual's choice of health coverage as a choice between alternative types of insurance in a static context. To the extent that individuals change health insurance status during the course of their life, this may bias answers.

In particular, it is assumed that individual *i* chooses his form of healthcare provision in order to maximize a utility function of the form:

$$U(C_i, H_i) = C_i^{a_i} H_i^{1-a_i} \qquad (4.2.1)$$

subject to a simple budget constraint:

$$C_i + P_i^H H_i = 1_i \qquad (4.2.2.)$$

C_i represents i's consumption of a composite numeraire commodity, H_i represents the consumption of *effective* healthcare services (the price for these services, P_i^H is allowed to differ by individual, and to reflect the quality of the nominal healthcare consumed), and I_i represents the individual's income. P_i^H will also differ according to the form of healthcare provision chosen; i.e.,

P_i^S for SUS healthcare and P_i^P for privately provided healthcare. The chief source of difficulty in this analysis is that P_i^S is not observed (all SUS healthcare is nominally free), but is rather only a shadow price of SUS healthcare consumption.

Utility maximization subject to this budget constraint yields the following indirect utility function:

$$V(P_i^H, I_i) = (\alpha_i I_i)^{\alpha_1} \left(\frac{(1-\alpha_i) I_i}{P_i^H} \right)^{1-\alpha_1} \qquad (4.2.3)$$

which differs by whether the individual chooses SUS healthcare ($V(P_i^S, I_i)$) or private healthcare ($V(P_i^P, I_i)$). Taking the optimal allocation of income between composite consumption and healthcare as given, individual *i*'s choice between the two forms of healthcare provision can be modeled as a comparison of these two indirect utility functions. In particular, individual *i* will choose SUS healthcare as long as:

$$V(P_i^s, I_i) \geq V(P_i^P, 1_i) \qquad (4.2.4)$$

Because of the simple functional forms adopted for the present purpose, condition (4.2.4) boils down to P_i^S. P_i^P. The price of an effective unit of public healthcare is not an observed magnitude; nominally, public healthcare is free to everyone in Brazil. It has a price, however, in the form of time in and disutility of crowded waiting rooms and other factors (see discussion in Section 2). This price would be expected to differ across individuals according to their opportunity cost of time, preferences for cleanliness and quality, and disutility of congestion; i.e., differences for which control may be possible with a set of observable individual attributes (X_i).

The available data make it possible to recover each individual's shadow price for an effective unit of public healthcare by using inequality (4.2.4). Once this is done, all the tools necessary are available for considering the welfare impacts of an increase in the congestion costs associated with receiving health services from the SUS. In particular, assuming that the individual chooses the healthcare option that maximizes his indirect utility (with the individual's perception of the quality difference between public and private provision factored into that price), private healthcare will be chosen if P_i^P. P_i^S.

4.3 Estimation of the "Shadow" Price of Public Health Service

P_i^P is observed in available data. P_i^S, on the other hand, is not observed and has to be estimated. In particular, in PNAD data the price is observed of the private health insurance paid for everyone who opted for that form of coverage. Private health insurance premiums are imputed for the rest of the sample using the Heckman selection model:

$$P_i^p = Z_i \gamma + u_1 \qquad (4.3.1)$$

where Z_i are dummy variables describing the characteristics of the health plan and γ is a vector of coefficients associated with the matrix of attributes.

P_i^P is not observed for all households, but rather only for those who purchased private health insurance. It is not known, however, which households were more likely to purchase private health plans, even if they had not actually acquired one. The probability can be described by the Probit regression in equation (4.1.1). Equation (4.1.1) thus describes the sample selection component of a Heckman Selection Model (Greene, 2000). Private health insurance premiums are imputed for the whole sample by estimating equation (4.3.1), accounting for selection into private health provision with a Heckman selection correction as specified in equation (4.1.1). The results of this model are presented in Table 5. After estimating the parameters of equation (4.3.1) it is possible to forecast the private premium for a standardized policy for all individuals. In particular, the standardization adopted sets all of the attributes of the healthcare policy to their simplest values—i.e., to give the price of a policy without any "bells or whistles." This creates a level playing ground for comparison of the individual's decision between public and private coverage (i.e., what would be the welfare effect of an increase in the price of public healthcare if everyone had the same simple private option to choose as an alternative). Using this procedure, it is possible to estimate a shadow price, P_i^S, which establishes how much each household would pay for the use of the public health system.

The natural logarithm of P_i^S is paramaterized as a linear function of individual attributes (X_i) and an unobservable determinant (ε_i), which is assumed to be identically and independently normally distributed with a variance σ^2 and a zero mean. The choice of private health coverage is then determined by the following condition being satisfied:

$$\ln P_i^P \; LE \; X_i \_\beta + \varepsilon_i \qquad (4.3.2)$$

which will be the case if:

$$\ln P_i^P - X_i\_\beta \; LE \; \varepsilon_i \quad (4.3.3)$$

which occurs with probability $1 - \Phi[(\ln P_i^P - X_i\beta)/\sigma]$. Similarly, the probability that individual i chooses public health coverage is given by $\Phi[(\ln P_i^P - X_i\beta)/\sigma]$. The likelihood of observing all of the health coverage choices of the individuals in the data set (y_i), given their observable attributes (X_i) and private healthcare price (P_i^P), can therefore be written as:

$$L(\overline{y}, \overline{X}, \overline{P}^P; \beta, \sigma) = \prod_{y_i=0} \left[\Phi\left(\frac{\ln P_i^P - X_i\_\beta}{\sigma} \right) \right] \prod_{y_i=1} \left[1 - \Phi\left(\frac{\ln P_i^P - X_i\_\beta}{\sigma} \right) \right] \quad (4.3.4)$$

This likelihood function is maximized over the parameter vector, β, using data describing the decisions and attributes of a 10 percent subsample of household heads in the PNAD. The use of only household heads eliminates the correlation in insurance type between members of a household that exists in the full data set, and the 10 percent subsample is chosen for computational tractability. Eliminating data with missing observations for some variables, this yields a sample size of N = 8267. Coefficient estimates and standard errors are reported in Table 6. The parameter σ is not identified in this discrete choice model; in particular, the parameters β are only identified up to a scaling parameter introduced by σ. This regression is therefore performed for a range of plausible values for the conditional standard deviation of $\ln P_i^S$: 0.5, 1, 2, and 3; higher and lower values of the standard deviation lead to numerical problems. Results for each of these standard deviations are reported in columns of Table 6.

Parameter estimates generally have the expected sign and tend to be statistically significant. Those who would be expected to have greater disutility from factors such as congestion (i.e., from having a greater opportunity cost of time) face a higher imputed price for SUS healthcare. This is true of older and more educated individuals, although once individuals are over the age of 60 (i.e., when they begin to retire), their imputed SUS healthcare price falls. Individuals with higher incomes face a higher price, also because of a greater opportunity cost of time, and urban individuals face a greater cost than rural individuals, possibly because congestion problems are worse in cities.

Individuals in the South, Southeast, and Center-West regions of Brazil face higher prices than those in the North and Northeast, and Blacks and those in the Mixed racial category face lower prices than Whites, while Asians face higher prices. While the magnitudes of the various effects may differ, the signs of each of these effects are consistent across possible values of σ.

As a measure of model fit, the predicted health coverage decisions of this model can be compared with the decisions observed in the data. The model does well, correctly predicting the choices of 87 percent of all individuals irrespective of the assumed value of σ. When the model fails to predict correctly, it tends to be in the case of incorrectly forecasting the choices made by those individuals who opt for private health coverage; i.e., high-income, more educated, and older (younger than 60 years) individuals.

5. Results and Policy Analysis

5.1 Analyzing Welfare Effects of a Change in the Price of Public Healthcare

The initial goal of this study was to determine which groups would suffer the most as a result of the increasing congestion of the public healthcare infrastructure that will likely accompany the socio-demographic trends currently observed in Brazil. In order to measure the welfare cost of increased waiting time for public health provision, which might result from an increase in the number of elderly Brazilians relying on the SUS without a corresponding increase in supply, it is necessary only to consider the effect on different individuals in the sample if the price of public healthcare were to increase (e.g., by 50%), taking into account the optimizing insurance decision each person makes to this price increase. Many individuals who had chosen public healthcare, for example, might stick with that choice and bear the brunt of the price increase, while others might find it optimal to pay more and switch to private healthcare. Those who had chosen private health coverage prior to the price increase would experience no change in price or disposable income. The decisions of each individual in the data set are simulated, backing-out the overall change in the price of receiving healthcare he or she faces after all is said and done under each of the possible values that σ might take. The last item considered is the difference in the natural logarithms of the prices ultimately faced by each individual, before and after the price change. This measure provides a proportional measure of the compensating variation in income needed to maintain the same level of utility:

$$\ln P_i^{H'} - \ln P_i^{H} = \frac{1}{1-\alpha_1}\left(\ln I_i^{'} - \ln I_i\right) \quad (5.1)$$

where P_i^H and I_i represent the price of healthcare provision and the accompanying required level of income needed to reach the original level of utility, after the increase in the price of SUS health coverage. Note that the compensating variation in income cannot be calculated directly, because it is not possible to determine α_i for each individual. This results from the fact that an individual's *full* income endowment (i.e., an endowment including the value of available time, etc.) is not observed, but only the individual's monetary income, which is not expended at all if SUS healthcare is employed. This means that it is impossible to ultimately determine whether the difference in log prices is attributable to a compensating variation in income, or to heterogeneity in preferences. For the following discussion, the former is assumed.

In order to quickly summarize the welfare implications of an increase in the price of SUS healthcare, like that which would accompany increasing congestion of that system, this proportional measure is regressed on a vector of socio-demographic attributes in order to determine which groups in Brazilian society will suffer the most. The difference in magnitude of the effect across groups is something that could not be determined from the simple Probit analysis described in Section 4.1, because that analysis did not describe how different types of individuals' behaviors would change in response to a price change. In all, the model (assuming $\sigma = 1$) predicts that 6.6 percent of all individuals consuming public healthcare prior to the price change would switch from public to private health coverage in response to this simulated price increase.[7] Accounting for optimizing responses is therefore important.

The results of this regression, performed separately for each potential value of σ, appear in Table 7. Those in the South (i.e., the excluded region) fare worse than those in the rest of Brazil, especially the Center-West and Southeast. Blacks and those in the Mixed racial group fare worse than Whites, while Asians generally do better (owing to their greater predisposition to have been using private healthcare before the price increase). Older individuals do better (as they are also more likely to have been using private healthcare in the first place), until they reach the age of 60, at which point they generally rely more on public healthcare and do much worse. Men generally fare worse

[7] Note that this number falls dramatically as σ rises toward 3.

than women, while those with more education and higher levels of income do better in the face of rising SUS prices, again reflecting predispositions towards using private health coverage. The directions of these effects are consistent across possible values of σ.

5.2 Analyzing the Welfare Effects of a Private Healthcare Subsidy

The apparatus developed above also makes it possible to consider the implications of counterfactual policies designed to offset increasing congestion in the provision of public healthcare, where a simple reduced-form analysis, like that described at the start of Section 4.1, cannot. In particular, the implication can be considered for individuals' optimizing choices of a private healthcare subsidy, designed to expand the individual's budget constraint *only* if the income is used for the purchase of private healthcare. The welfare implications of such a policy could then (with better data describing the *full* income endowment) be compared to the implications of a simple income subsidy that could be used for any sort of consumption, indicating the value of a relatively paternalistic policy. In the absence of such data, the welfare consequences of a simple 50% price subsidization of private healthcare (i.e., the government pays 50 cents on every 1 real spent by the individual on private healthcare) are considered. In order to describe how the resulting welfare gains (again, a *proportional* measure of the compensating variation in income, assuming homogenous preferences, after the optimizing provider of healthcare is chosen[8]) differ across socio-demographic groups, these gains are regressed on a vector of socio-demographic attributes. The results of this regression are described in Table 8 for each of the four values of σ considered. The directions of each of the marginal effects are consistent across alternative values of σ. Negative numbers describe reductions in income that return individuals to their original levels of utility (i.e., indicating a benefit). Individuals in the Center-West and Southeast regions seem to benefit most from this price subsidy, while those in the North and Northeast benefit the least. Whites and Asians benefit more than Blacks and those in the Mixed racial group, and those with higher levels of education benefit more than those with less. Similarly, richer and older individuals (under the age of 60) benefit more from

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[8] The model (assuming $\sigma = 1$) predicts that approximately 13.3% of all individuals consuming public healthcare prior to the price subsidy would switch to private health coverage. With such a large increase in the demand for private healthcare, the government might want to undertake policies to facilitate entry by new private healthcare providers in addition to the subsidy, so as to avoid new congestion costs.

the subsidy. Generally, these relative benefits reflect a greater predisposition towards (or propensity to switch to) private healthcare provision.

The natural question is how might such a private healthcare subsidization policy be targeted to benefit those individuals who would suffer most under an increase in the price of public care. To the extent that such subsidies, when applied broadly, seem to benefit high-income, high-education individuals in the more developed parts of Brazil, they simply represent a transfer of rents, since those individuals suffer less than the poor from the increasing price of public healthcare. One possible alternative would be to implement the subsidy as part of an income tax collection regime, where participation criteria could easily be established so as to make the subsidy available only to low income residents. Problems of fraud in the reporting of private healthcare expenditures, however, might make this approach difficult. Instead, it might be preferable to focus on the results of the first counterfactual simulation, and target subsidy funds geographically so as to reach those individuals who lose most under the simulated increases in public prices. Such is true, for example, of Black and Mixed race residents,[9] particularly those with low levels of education and in rural areas. One possible solution that would certainly benefit the most disadvantaged groups would be to target subsidy funds toward lowering the cost of private healthcare in rural areas, possibly by establishing new healthcare facilities in areas where none were previously present. It is important to remember as well the relatively large magnitude of the negative effect on members of the Black and Mixed racial groups of increasing public healthcare prices, even in urban areas.

Finally, dealing with the impacts of rising public healthcare costs on the elderly (a major concern given current socio-demographic trends) by subsidizing the consumption of private healthcare seems especially futile, since those over the age of 60 are predicted to benefit less than most other groups from this policy. This arises from the model's prediction that members of this group are not as likely to switch to private health coverage even with the change in relative prices. Indeed, in order to limit the adverse effects on this group of rising congestion in public healthcare consumption without affecting huge rent transfers to those who are less adversely impacted, the

[9] Reaching these particular racial groups might be difficult, unless the subsidies took the form of monies to establish new private healthcare facilities in racially segregated neighborhoods.

government will likely have to take steps to directly increase the supply of public healthcare provision.

6. Conclusions and Extensions

The goal of this analysis was to determine which groups in Brazilian society were most "excluded" from private healthcare. Private healthcare is generally considered to be of a higher quality than its public counterpart; this perception is generally supported by the PNAD survey data. Such exclusion is not of a direct form as would be racial exclusion from a club, but is rather based on individuals facing different relative prices for public and private healthcare owing to differences in their observable attributes and preferences for healthcare consumption. The initial analysis of PNAD survey data documents what is generally perceived to be the case—that poor, rural, Black and Mixed-race Brazilians tend to rely more on public healthcare. This alone would not necessarily represent a source of social inequity, except that the price of this form of healthcare is expected to increase in the coming decades owing to the increasing congestion of an already-overburdened system, and these groups are expected to suffer disproportionately because of their inability to switch to private health coverage. In order to determine how these price increases would be distributed over different socio-economic groups, a more elaborate model of optimal individual decision-making is needed; i.e., a model that makes it possible to determine how individuals would behave under current and counterfactual relative-price scenarios. Operating under constraints of data availability, it is assumed that each individual was required to consume a single unit of some form of healthcare coverage (i.e., public or private), and that differences in the quality of care across forms would be internalized in the price confronting the individual. Differences in price might also arise from observable individual attributes (i.e., a direct form of discrimination), or from an individual's preferences for healthcare consumption (e.g., individuals with strong preferences for healthcare consumption might face an even higher price for an effective unit of public care than a similar individual who had weak preferences for healthcare consumption), but available data do not make it possible to identify these effects. From a simple and stylized model of utility maximization, it was possible to recover estimates of the price of public health coverage, and use those estimates to infer which socio-demographic groups would suffer most from an increase in the congestion of the public healthcare system. The conclusions of this analysis conform to the general perceptions regarding race, education, and income groups, and suggest that rural individuals are more at risk than those living in metropolitan areas. Moreover, they suggest that using private healthcare subsidies as a solution to increased congestion of the SUS will chiefly result in rent transfers to the least affected groups. This result is significant in light of the Brazilian government's propensity toward privatization of the provision of public healthcare in response to similar problems over the last ten years. Instead, it is clear that the SUS system itself must be expanded to meet the growing demand.

With even more detailed data on the attributes of the alternative forms of healthcare provision (e.g., quality), it might also be possible to build a more realistic hedonic model in which individuals with weak preferences for healthcare would choose to consume the type that exhibits low levels of amenities and a low price, while those who derive a great deal of utility from the consumption of healthcare might choose a "deluxe" form of healthcare provision. This could be important in predicting how different individuals would respond to an increase in the congestion of the public system, which would increase *waiting times* for treatment (i.e., a specific trait of the healthcare commodity). For example, certain socio-demographic groups might exhibit a strong distaste for waiting time, and they would thus tend to bear more of the burden of increasing congestion of the SUS. Other survey data (e.g., the 1997 PPV) provide some indication of waiting time incurred in the receipt of healthcare services, but these data exhibit many missing observations, and it is unclear whether they will be appropriate for such an analysis.

Even with the limitations and simplifications described above, the current model is suggestive of which groups are most likely to suffer from the increasing congestion of the public healthcare infrastructure that is likely to accompany current demographic trends in Brazil. From an equity perspective, these groups are generally those about whom the greatest concern exists, suggesting that some policy (i.e., subsidization of private healthcare or the expansion of the public infrastructure) must be undertaken. The results of the counterfactual simulations suggest that the latter would be a more cost-effective vehicle for delivering the healthcare assistance to the groups who need it most.

Table 1. Perceptions of Healthcare Quality by Type of Coverage

Region	Health Care Type 0 = SUS 1=Private	% Who Received Health Care Sought	Reason for failing to receive healthcare (for those seeking healthcare during previous two weeks)					
			No Vacancy	No Attending Doctor	No Attending Expert	Malfunc-tioning Equipment	Had To Wait Too Long	Other
North	0	93.6	31.1	53.3	4.4	4.4	4.4	4.4
	1	97.7	0	50	0	0	25	25
NE	0	93.8	39.5	29.7	10.3	4.9	5.4	10.3
	1	98.2	15.4	7.7	15.4	0	7.7	53.9
CW	0	94.1	50	22.1	8.8	1.5	7.4	10.3
	1	96.8	50	40	10	0	0	0
SE	0	95.4	43.1	28.8	13.1	5	3.8	6.3
	1	98.8	52.9	23.5	0	0	0	23.5
South	0	94.7	61.6	17.2	3	0	4	7.1
	1	99.1	33.3	16.7	16.7	0	0	33.3
All	0	94.6	45.6	28.5	9.3	3.6	4.9	8
	1	98.5	36	24	8	0	4	28

Table 2. Data Summary, Household Heads
(N = 98,166)

Variable	Mean	Variable	Mean
Sex	0.727	Age	44.524
Educ	6.612	Age60	0.176
Income	338.591	f_kind2	0.284
Black	0.068	PrivHP	0.069
White	0.526	whopay	0.101
Mixed	0.400	Arthrit	0.148
Yellow	0.004	Cancer	0.004
Urban	0.831	Cardiac	0.074
Metro	0.413	Cirrhose	0.003
dcwest	0.109	Backache	0.312
dseast	0.342	Depress	0.078
dsouth	0.178	Diabets	0.037
dnorth	0.068	Hipert	0.197
dneast	0.302	Kidney	0.047
With_HP	0.170	Respir	0.042
Migrator	0.009	Tendon	0.032
Value	79.474	Tuberc	0.002
Attend	0.131	Healthy	0.491
Characteristics of Private Health Plan (N=6639)			
plcons	0.980	plexam	0.956
pllist	0.925	plinter	0.929
plreemb	0.310	platend	0.805
plother	0.811	plmedic	0.045
pldent	0.219	odonto	0.031
paymore	0.178		

Table 3. Probit Regression PrivHP
N = 82900, Log Likelihood = -16753.661

Variable	Estimate	Standard Error	Variable	Estimate	Standard Error
Male	0.0051	0.0173	Southeast	0.3056	0.0345
Education	0.1173	0.0020	Northeast	0.0823	0.0356
Income	0.0003	0.00001	South	0.0411	0.0374
Black	-0.4785	0.0855	Age	0.0233	0.0008
White	-0.1862	0.0785	Age60	-0.2696	0.0290
Mixed	-0.4284	0.0799	Child_14	-0.0195	0.0206
Center-West	-0.0668	0.0409	Constant	-3.3594	0.0964

Table 4. Probit Regressions, Determinants of Diseases

Diseases Variable	Arthritis	Cancer	Cardiac	Cirrhosis	Backache	Depression
Sex	-0.3636 (29.867)*	-0.0801 (-2.074)**	-0.2590 (-18.250)*	0.3099 (5.621)*	-0.1864 (-18.116)*	-0.5768 (-42.920)*
Age	0.0323 (52.069)*	0.0168 (7.935)*	0.0270 (36.155)*	0.0096 (4.333)*	0.0215 (45.530)*	0.0129 (19.772)*
Educ	-0.0461 (-27.706)*	0.0051 (0.978)	-0.0124 (-6.447)*	-0.0275 (-4.357)*	-0.0368 (-29.233)*	-0.0050 (-2.807)*
Income	-0.00005 (-4.307)*	-7.73e-06 (-0.263)	-0.00002 (-1.998)**	-0.00003 (-0.591)	-0.00006 (-7.246)*	-0.00006 (-5.194)*
Black	0.2166 (2.308)**	3.714 (22.035)*	0.3320 (3.214)*	0.0048 (-0.014)	0.1259 (1.796)	-0.1970 (1.789)
White	0.2207 (2.406)**	3.1977 (25.526)*	0.1884 (1.866)	0.0223 (-0.069)	0.1608 (2.357)**	0.2730 (2.536)**
Mixed	0.2545 (2.764)*	3.8188 (25.907)*	0.1967 (1.938)**	0.1196 (0.367)	0.1610 (2.349)**	0.2719 (2.515)**
Age60	-0.1085 (-5.474)*	0.0302 (0.466)	-0.0364 (-1.560)	-0.2681 (-3.568)*	-0.2775 (-16.240)*	-0.1887 (-8.087)*
f_kind2	-0.0760* (-4.529)	-0.1978 (-2.934)*	-0.1109 (-5.304)*	-0.1288 (-2.320)**	-0.0064 (-0.545)	-0.1018 (-5.565)*
dcwest	-0.3241 (-12.958)*	0.2203 (1.935)**	0.0331 (1.035)	-0.0873 (-1.053)	-0.1318 (-6.310)*	-0.0085 (-0.284)
dseast	-0.5745 (-26.363)*	0.2412 (2.337)**	-0.0355 (-1.268)	-0.01793 (-2.450)**	-0.2450 (-13.413)*	-0.0581 (-2.230)**
dneast	-0.3596 (-17.034)*	0.0751 (0.714)	-0.1752 (-6.222)*	-0.2243 (-3.123)*	-0.0930 (-5.168)*	-0.0772 (-2.988)*
dsouth	-0.3832 (-16.065)*	0.3750 (3.530)*	0.0631 (2.087)**	-0.1592 (-1.911)**	-0.1983 (-9.918)*	0.0590 (2.094)**
With_HP	-0.0434 (-2.428)**	-0.0383 (-0.708)	0.0430 (2.177)**	0.0266 (0.409)	0.0135 (1.011)	0.0002 (0.008)
N	95565	95565	95565	95565	95565	95565
Log Likelihood	-32729.57	-2274.64	-21995.40	-1875.49	-55542.89	-24502.90

1- Z- statistics are in parentheses, * significance level for 1%, ** significance level for 5%

Table 4. (continuation), Probit Regressions, Determinants of Diseases

Diseases Variable	Diabetes	Hypertension	Kidney Disease	Respiratory	Tendonitis	Tuberculosis	Healthy
Sex	-0.1779 (-10.124)*	-0.2975 (-26.486)*	-0.0095 (-0.563)	-0.1998 (-12.069)*	-0.3358 (-18.811)*	0.0935 (1.484)	0.3300 (31.543)*
Age	0.0290 (30.030)*	0.0337 (60.244)*	0.0130 (16.570)*	0.0038 (4.890)*	0.01105 (12.620)*	0.0079 (2.847)*	-0.0325 (-70.269)*
Educ	-0.0023 (-0.973)	0.0150 (-10.564)*	-0.0333 (-15.026)*	-0.0121 (-5.638)*	0.0060 (2.678)*	-0.0248 (-2.877)*	0.0296 (24.692)*
Income	0.00003 (2.289)**	-0.00002 (-1.885)	-0.00009 (- 4.560)*	-0.000005 (-0.360)	0.00004 (3.738)*	-0.0002 (-1.589)	0.00004 (4.684)*
Black	0.1286 (1.150)	0.3107 (4.204)*	-0.0305 (-0.266)	0.2334 (1.833)	0.1738 (1.264)	-0.1437 (-0.423)	-0.2140 (-3.266)*
White	0.0138 (0.127)	0.0863 (1.181)	0.0148 (0.132)	0.2103 (1.689)	0.1964 (1.468)	-0.3173 (-0.957)	-0.1921 (-3.024)*
Mixed	0.0162 (-0.148)	0.1273 (1.732)	0.0134 (0.120)	0.2115 (1.691)	0.2212 (1.645)	-0.2295 (-0.689)	-0.1989 (-3.112)*
Age60	-0.1718 (-5.952)*	-0.1925 (-10.469)*	-0.1600 (-5.194)*	0.0279 (9.076)*	-0.1186 (-3.850)*	-0.2536 (-2.585)*	0.1571 (8.896)*
Child_14	-0.1546 (-5.498)*	-0.1099 (-7.545)*	0.01118 (0.594)	-0.0241 (-1.157)	-0.0773 (-3.214)*	-0.0220 (-0.316)	0.0382 (3.452)*
dcwest	-0.0700 (-1.637)	0.0909 (3.653)*	0.0314 (1.057)	0.0566 (1.600)	-0.1783 (-4.644)*	-0.1003 (-0.727)	0.1243 (6.007)*
dseast	0.0481 (1.334)	0.0794 (3.646)*	-0.3460 (-12.628)*	-0.0146 (-0.466)	-0.2185 (-6.657)*	0.0542 (0.486)	0.2505 (13.775)*
dneast	-0.0585 (-1.607)	-0.0076 (-0.348)	-0.4078 (-14.966)*	-0.1817 (-5.711)*	-0.2026 (-6.229)*	0.0503 (0.461)	0.1925 (10.669)*
dsouth	-0.0091 (-0.231)	0.0557 (2.347)**	-0.2549 (-8.443)*	0.1740 (5.222)*	0.0488 (1.409)	0.0834 (0.683)	0.1482 (7.479)*
With_HP	0.1178 (5.065)*	0.0961 (6.489)*	-0.0512 (-2.153)**	-0.0048 (-0.214)	0.1397 (6.128)*	-0.2064 (-1.869)	-0.0677 (-5.327)*
N	95565	95565	95565	95565	95565	95565	95565
Log Likelihoo	-13340.13	-40920.07	-17382.01	-16213.18	-12853.73	-1107.16	-58161.94

1- Z- statistics are in parentheses, * significance level for 1%, ** significance level for 5%

Table 5. Heckman Procedure to Impute the Price of Private Health Services

N= 82800, Log Likelihood = -27520.82

Variable	Estimate	Standard Error	Variable	Estimate	Standard Error
Male	0.1914	0.0244	pllist	0.0280	0.0386
Education	-0.0382	0.0492	plreemb	0.1252	0.0216
Income	0.00001	0.00001	plother	0.2927	0.0268
Black	-0.0087	0.0557	plcons	-0.7845	0.0625
White	-0.1418	0.0276	plexam	0.1088	0.0559
Asian	0.1438	0.9555	plinter	0.5942	0.0413
Center-West	-0.1110	0.0564	pldent	-0.3128	0.0235
Southeast	-0.2026	0.0484	plmedic	0.0395	0.0440
Northeast	-0.0128	0.0492	odonto	-0.0045	0.0564
South	-0.1704	0.0514	paymore	-0.3670	0.0257
Age	-0.0001	0.0013	depen	0.1983	0.0627
Age60	0.1520	0.0391	fam_dep	0.1447	0.0620
Child_14	0.0492	0.0278	platend	-0.0104	0.0243
Constant	6.6104	0.1695			
Selection Equation					
Male	-0.0098	0.0163	Southeast	0.2822	0.0319
Education	0.1161	0.0018	Northeast	0.0626	0.0328
Income	0.0003	0.00001	South	0.0653	0.0345
Black	-0.0654	0.0350	Age	0.0215	0.0008
White	0.2188	0.0174	Age60	-0.1998	0.0274
Asian	0.4010	0.0769	Child_14	0.0790	0.0199
Center-West	-0.0710	0.0377	Constant	-3.5883	0.0494

Table 6. Determinants of ln P_i^S
(N = 8,267)

Variable	Analysis of Estimate Sensitivity to Assumed Value of σ							
	σ = 0.5		σ = 1		σ = 2		σ = 3	
	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat
Constant	4.7355	88.009	3.5521	29.979	1.1756	4.751	-1.2034	-3.199
Education	.03127	15.562	.08772	19.236	.20130	20.788	.31508	21.282
Employee	-.13516	-6.311	-.25389	-5.253	-.49186	-4.811	-.73000	-4.678
Self-Employed	-.16128	-7.432	-.29376	-6.032	-.56029	-5.452	-.82723	-5.277
Domestic Worker	-.27520	-5.137	-.53145	-4.622	-1.0444	-4.407	-1.5574	-4.332
Family Size	-.02573	-3.961	-.04506	-3.147	-.08387	-2.802	-.12272	-2.696
Male	-.02050	-1.020	-.14301	-3.200	-.38863	-4.140	-.63430	-4.435
Age	.01781	19.854	.02704	13.754	.04561	11.138	.06421	10.322
Age > 60	-.01627	-.528	-.06543	-.952	-.16326	-1.130	-.26098	-1.185
Income Per Person	.00015	44.930	.00023	28.825	.00040	22.482	.00058	20.600
Black	-.31872	-8.112	-.48615	-5.704	-.82241	-4.651	-1.1591	-4.320
Mixed	-.17262	-8.505	-.26142	-5.844	-.43949	-4.703	-.61775	-4.348
Asian	.41099	4.092	.51005	2.096	.70864	1.320	.90733	1.091
Metro	.12928	7.682	.24534	6.507	.47933	6.036	.71375	5.896
Child_14	-.02329	-1.033	-.04119	-.817	-.07710	-.727	-.11303	-.699
Center-West	.15400	5.278	.23378	3.646	.39308	4.751	.55232	2.713
Northeast	.12446	4.490	.03421	.553	.39308	2.936	-.32815	-1.655
Southeast	.07870	3.627	.14061	2.868	.26577	2.559	.39135	2.467
North	.07897	2.074	.04931	.5856	-.01069	-.060	-.07078	-.264
Log-Likelihood	-3496.51		-2980.96		-2770.32		-2706.81	

Table 7. Socio-Demographic Effects on Proportional Measure of Compensating Income Variation From a 50% Increase in P_i^S
(N = 8,267)

Variable	Analysis of Estimate Sensitivity to Assumed Value of σ							
	σ = 0.5		σ = 1		σ = 2		σ = 3	
	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat
Constant	.50761	87.310	.50440	94.572	.49925	98.390	.49769	99.341
Education	-.01482	-57.227	-.01084	-45.660	-.00910	-40.283	-.00844	-37.857
Employee	.02847	10.956	.01503	6.304	.00782	3.448	.00665	2.972
Self-Employed	.02839	10.924	.01577	6.615	.00999	4.405	.00877	3.914
Domestic Worker	.04455	9.764	.01758	4.200	.00902	2.265	.00690	1.754
Family Size	.00248	4.319	.00085	1.605	.00069	1.370	.00071	1.434
Male	.02330	9.924	.016805	7.802	.01449	7.071	.01408	6.959
Age	-.00223	-23.455	-.16133	-18.468	-.00135	-16.231	-.00130	-15.848
Age > 60	.01999	5.460	.01386	4.126	.00988	3.090	.00964	3.054
Income Per Person	-.00003	-26.192	-.00004	-39.400	-.00004	-46.012	-.00004	-47.922
Black	.03493	9.483	.01591	4.707	.00953	2.9626	.00813	2.560
Mixed	.02110	10.182	.01007	5.296	.00657	3.6310	.00591	3.308
Asian	-.05146	-2.872	-.06987	-4.251	-.08442	-5.397	-.09729	-6.300
Metro	-.02115	-11.050	-.00978	-5.567	-.00597	-3.572	-.00577	-3.498
Child_14	-.00215	-.9265	-.00073	-.3447	-.00087	-.4269	-.00000	-1.095
Center-West	-.01535	-4.425	-.01078	-3.387	-.00936	-3.092	-.00956	-3.197
Northeast	-.00317	-1.105	-.00755	-2.872	-.00984	-3.934	-.01044	-4.228
Southeast	-.01725	-6.469	-.01060	-4.332	-.00992	-4.264	-.01058	-4.601
North	-.87364	-.2118	-.00085	-.2235	-.00312	-.8665	-.00463	-1.303
R^2	.561		.508		.497		.493	

Table 8. Socio-Demographic Effects on Proportional Measure of Compensating Income Variation From a 50% Reduction in P_i^P

N = 8,267

Variable	Analysis of Estimate Sensitivity to Assumed Value of σ							
	σ = 0.5		σ = 1		σ = 2		σ = 3	
	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat
Constant	.13868	16.174	.18410	20.486	.17196	19.657	.16534	19.164
Education	-.03238	-84.801	-.02291	-57.254	-.01762	-45.238	-.01595	-41.506
Employee	.06971	18.193	.03836	9.551	.01943	4.971	.01444	3.746
Self-Employed	.07370	19.231	.03905	9.722	.02208	5.647	.01834	4.755
Domestic Worker	.14139	21.013	.05355	7.593	.02206	3.213	.01577	2.329
Family Size	.00664	7.847	.00310	3.496	.00131	1.520	.00135	1.588
Male	.05934	17.137	.03629	10.000	.02683	7.595	.02404	6.899
Age	-.00480	-34.164	-.00345	-23.448	-.00261	-18.204	-.00238	-16.819
Age > 60	.03380	6.259	.03111	5.497	.02172	3.943	.01834	3.375
Income Per Person	-.00003	-18.538	-.00006	-36.940	-.00007	-44.557	-.00007	-46.916
Black	.09321	17.157	.04312	7.573	.02180	3.933	.01729	3.162
Mixed	.05404	17.683	.02645	8.259	.01495	4.794	.01191	3.873
Asian	-.06196	-2.344	-.13335	-4.814	-.16781	-6.223	-.18145	-6.823
Metro	-.05698	-20.181	-.02856	-9.652	-.01427	-4.952	-.01170	-4.119
Child_14	.00098	.287	-.00344	-.9583	-.00215	-.614	-.00272	-.787
Center-West	-.03182	-6.217	-.02395	-4.466	-.01790	-3.427	-.01676	-3.254
Northeast	.01186	2.808	-.01063	-2.400	-.01631	-3.781	-.01798	-4.228
Southeast	-.04273	-10.865	-.02299	-5.577	-.01739	-4.334	-.01789	-4.521
North	.00590	.971	-.00187	-.293	-.00399	-.642	-.00652	-1.065
R^2	.724		.587		.526		.511	

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