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The financial protection impact of the public health system and private

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This research assesses the effectiveness of the Brazilian public health system and of private insurance in Brazil in providing financial protection in health care. The determinants of catastrophic health expenditures are estimated by probit regressions with Heckman selection adjustment controlling for health-care need. Findings show that the public system provides a significant reduction (47%) in the probability of a household having catastrophic health expenditures, and that private insurance makes such expenditures *more* likely by 36%. Recommendations include improvements in the quantity, accessibility, quality and reliability of public providers, more appropriate provision of drugs by the public system and tighter regulation of private insurance.

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I
Introduction

The concept of financial protection in health concerns the risk that high health expenditures pose to the financial security of vulnerable populations. Households may be impoverished because of high levels of spending on health care relative to their capacity to pay (Gertler and Gruber, 2002; Strauss and Thomas, 1998; WHO, 2000). Poorer households are less able to manage health shocks successfully because they possess fewer buffers in the form of liquid assets (Hulme and Shepard, 2003). A core challenge to development is to improve the resilience of poor households to shocks, since this will increase income-earning potential, as it encourages investment in human capital and in higher-risk, higher-return activities (World Bank, 2001).

One method for assessing the extent of financial protection ability in a health system is to determine the proportion of households that have a very high total health spending compared to capacity to pay (WHO, 2000; Waters, Anderson and Mays, 2004). Kawabata, Xu and Carrin (2002) propose the term "catastrophic health expenditures" when the expenditures exceed 40% of a household's capacity to pay, although different thresholds can be used. According to Xu, Evans and others (2003), Brazil is the Latin American country with the highest proportion of households with catastrophic expenditures (10.3%). In a direct assessment of the impact of health payments on poverty, Murray, Xu and others (2003) measured the difference in the percentage of households under the poverty line before and after health payments. For Brazil, this difference was 5.1 percentage points, amongst the highest for the 59 countries studied.

The high financial burden associated with health care in Brazil is at odds with the design —or at least the premise— of the unified health system (the *Sistema Único de Saúde*, or SUS), which, in principle, provides universal access, with no charge at point of delivery. The absence of user fees and other charges should reduce, if not eliminate, the financial burden associated with health care, with the exception of taxation needed to cover the costs of the system. Nevertheless, private expenditures for health care exceed public spending (PAHO, 2003) and 25% of the population pay premiums to purchase health insurance (IBGE, 2000). These individuals and families effectively duplicate their contribution, indirectly contributing to tax revenues to finance SUS and directly to complementary health insurance schemes. Unlike in other countries, such as Chile, individuals cannot "opt out" of public financing if they demonstrate private coverage.

The apparent contradiction between the high financial burden of health care in Brazil, on one hand, and the basic features of the unified health system, on the other, highlights the importance of studying the determinants of catastrophic health expenditures in the country. The ability of the public system to reduce the financial burden of health care is one important indicator of the performance of the system (WHO, 2000). This study will attempt to explain the apparent contradiction and will provide recommendations on how the system might be reformed in order to enhance its financial protection capability. The main objective of the study is to determine how the unified health system, private health insurance and household income affect the probability that a household might incur catastrophic levels of health expenditures.

II
The Brazilian context: public health-care system and private health insurance

Since the Federal Constitution was approved in 1998, Brazil has had a unified health system (SUS) with universal coverage, free to all at point of delivery. Unlike in most other Latin American countries, access is not confined to those who participate in the social security system. In this case, households do not have to decide whether to join SUS before the need for health care arises. Care is also delivered through the private

supplementary health system. It includes group medicine organizations, medical cooperatives, health insurance and charitable organizations. Private facilities can also be paid directly by patients. Private plan beneficiaries maintain their full right to coverage under SUS. Hence, once the need for health care arises, individuals must decide whether to use a provider through SUS or through their private health insurance plans, or pay directly for private care (Bós and Bós, 2004).

For 76% of the population, care is provided exclusively by the public system (PAHO, 2005, 13). Under the law, the three levels of government —federal, state, and local— should participate in the funding and operation of SUS, organized in a network that is linked, regionalized, hierarchical, and decentralized (PAHO, 2007, 150). Municipalities have primary responsibility for providing health care to their respective populations, with technical and financial assistance from the federal government and the states.

The term "private insurance" includes market-based insurance and other pre-payment contracts obtained through employment in government or government-owned institutions and insurance obtained through private employment or directly purchased from the insurer. This definition is similar to the one used by Sekhri and Savedoff (2006). Around 80% of supplementary health-care users are served by group medicine, medical cooperatives and health insurance (Fernández, Pires and others, 2007). Among those with private insurance, 57% obtained it through their workplace, where employers pay a part of the premium, and 43% bought it directly from the insurer. Co-payments are present in 21% of health plans (IBGE, 2000). Of the population covered by the supplementary system, 75% have coverage from private plans and insurance, while 25% are covered by systems for government employees.

In 1998, national health expenditure, including both public and private spending, was estimated at 7.9% of GDP. Public spending was 41.2% of the total, or 3.25% of GDP. The federal level was responsible for 53% of the resources provided, the states for 22% and the municipalities for 25%. In the first half of the 1990s, the absence of stable sources for financing at the federal level led to a significant drop in the quality of services provided by both public entities and private contractors, which did not begin to be reversed until 1995-1996. The compulsory resources provided under Constitution Amendment No. 29 of 2000 regularized financial flows for the sector to a reasonable degree, and this had a significant impact on the capacity for medium-and long-term planning (PAHO, 2005, 40).

Table 1 illustrates the extraordinary expansion of the public and private health-care network, in particular the outpatient network, between 1980 and 1999. The number of health facilities without hospitalization —ambulatory units— more than tripled during the period. This was a clear indication of the beginning of a reversal of the once dominant hospital-centered model (Escorel, Giovanella and others, 2007; Gershman and Santos, 2006). Until the mid-1980s, State-provided curative services were concentrated in the cities and their hospitals, open only to the minority of workers who were employed in the formal sector. As shown in the table, in 1980, 33% of health facilities were hospitals, whereas in 1999 hospitals comprised only 16% of health facilities. The table also indicates that, whereas most ambulatory units (73%) are public, most hospitals (66%) are private. However, nearly 83% of the private hospital beds were available to SUS, through contract (PAHO, 2005, 14).

The advent of the universal health care system has significantly reduced the pre-existing inequality in access between different population groups and regions

TABLE 1

Brazil: health-care facilities, by type of care and provider entity, 1980-1999

Year	Health-care facilities with hospitalization				Health-care facilities without hospitalization				Without hospitalization (%)
	Total	Public	Private	Public (%)	Total	Public	Private	Public (%)	
1980	6 110	1 217	4 893	19.9	12 379	8 828	3 551	71.3	67.0
1999	7 806	2 613	5 193	33.5	41 009	29 993	11 016	73.1	84.0
Increase (%)	16	114	6		231	240	210		

Source: PAHO (2005).

of the country. The proportion of poor households accessing health services rose by almost half between 1992 and 2004 (Cornwall and Shankland, 2008). As shown in table 2, the regional distribution of hospital beds shows a profile similar to the distribution of the population. There has been substantial growth in the number of consultations and hospitalizations per inhabitant in the poorest regions of the country (north and north-east). Implementation of SUS also led to better distribution of health professionals in the country, as shown in table 3. The number of physicians per 1,000 people grew 54% at the national level in the period 1997-2001. This growth occurred in all regions, but significant inequality persisted among regions: the south-east, south and centre-west had professionals available at levels significantly higher than did the north-east and north.

A major initiative to enhance the coverage of primary care is the Family Health Programme (Escorel, Giovanella and others, 2007), which provides comprehensive health care in a particular territory, assigning patients to a multi-professional team composed of at least one doctor, one nurse, nursing auxiliaries, and community health agents. Each health team is responsible for some 1,000 families. In 2005, the programme was being carried out in 4,837 Brazilian municipalities, with 22,683 family health teams providing care for approximately 73 million people, or 40% of the population (PAHO, 2007, 147). Solla, Reis and others (2007) observed that the programme has been instrumental in reducing regional inequalities in access to primary care.

Major inequalities in the supply of services and access to intermediate- and high-complexity health care persist among regions. In 2002, 83% of optical equipment, 73% of the equipment for radiation therapy, 74% of magnetic resonance imaging equipment and 75% of computed tomography (CT) scanners in the country were located in the south-eastern and south regions of the country (PAHO, 2005, 20-21). These two regions comprise 57.4% of the Brazilian population.

Despite the continuing regional disparity, in general health indicators have improved significantly. Table 4 shows the favourable trend in the rates for infant mortality and life expectancy at birth. Abreu, César and França (2007) observed that mortality from avoidable causes had decreased since SUS began and concluded that the decrease was partially due to the increase in the availability of and access to health services brought about by the reorganization of the Brazilian health-care system.

TABLE 2:

Brazil: distribution of hospital beds and population, by region, 1999

Region	Percentage of beds	Percentage of population
North	5.6	7.4
North-east	26.1	28.2
South-east	43.6	42.6
South	16.7	14.9
Centre-west	8.0	6.8

Source: PAHO (2005).

TABLE 3

Brazil: number of health professionals, by region, 1997 and 2001
(Per 1,000 inhabitants)

Region	Physicians		Nurses	
	1997	2001	1997	2001
Brazil	1.35	2.08	0.45	0.52
North	0.61	1.12	0.30	0.35
North-east	0.80	1.20	0.35	0.42
South-east	1.86	2.81	0.54	0.60
South	1.36	1.99	0.48	0.59
Centre-west	1.22	2.34	0.37	0.47

Source: PAHO (2005).

TABLE 4

Brazil: infant mortality rate and life expectancy at birth, 1991-2006

	1991	2000	2006
Infant mortality rate (per 1,000)	45.2	30.4	24.9
Life expectancy at birth	66.9 years	70.4 years	73.4 years

Source: IBGE (2006).

No financial charges are associated with use of the public system. However, households might prefer to spend money on private providers and health insurance (Ribeiro, Barata and others, 2006; Bós, 2007) because the public system excludes certain aspects of health care (Ocké-Reis, Silveira and Andreazzi, 2002), or because of suboptimal quality (Costa and García, 2003), accessibility, or waiting time (Marinho and

Cardoso, 2007) in public providers. The expansion of private health plans in Brazil in the 1980s and 1990s was at least partly a function of the poor quality of public providers (Alves and Timmins, 2003), which deteriorated during the 1980s following a series of economic crises, slow economic growth and a shortage of public resources (Malta, Cecílio and others, 2004).

Almost all private health plans cover doctor's visits, complementary examinations and hospitalizations (PAHO, 2005, 33). According to Fernandes, Pires and others (2007), supplementary health operators are concentrated in the low-value health plan ranges and participants seek plans that provide basic services. As in other countries with universal health systems, private plans in Brazil tend to exclude the treatment of chronic diseases that require prolonged and expensive care, and have strict limits on maximum length of hospital stay or total spending (Farias and Melamed, 2003; Pinto and Soranz, 2004; Rocha and Simões, 1999). From the perspective of the insured household, these constraints increase the possibility of catastrophic health expenditures, as the household must still rely on the public system —while continuing to pay insurance premiums— or, if their concerns about quality and access are strong enough, pay directly for the care as an added expense (Ocké-Reis, 2005). Furthermore, there is evidence that these insurance constraints are more significant for poorer households, whose benefit packages tend to be more limited (Bahia, 2001). In fact, a significant portion of the population covered by the supplementary system uses the public network, especially for highly complex or costly procedures or treatments such as transplants and conditions such as HIV/AIDS (Porto, Santos and Ugá, 2006). In these circumstances, private health insurance might not be effective in reducing health expenditures, especially if the household purchases the insurance directly and has to pay the full premium.

III
Empirical Model

Health expenditures are classified as catastrophic if they exceed a given threshold, such as 40% of household income. To estimate this concept we define the binary variable *CHE* (for catastrophic health expenditures), which takes a value of 1 when health expenditures are above the threshold and 0 when it is below. The empirical model is:

$$Probability\ [CHE = 1] = Probability\ [bo + b1.logP + b2.logY + b3.X + u1 > 0]$$

Here, P is the price of health care, Y is income, and X represents the various demographic factors (sex, age, race and so forth), health insurance indicators, and local health-care infrastructure that might affect health spending. This equation attempts to estimate how important these explanatory factors are in determining the presence of catastrophic health expenditures, and will be estimated via probit regression.

If *CHE* were defined as a binary variable without any other adjustments, the value of zero would include three groups: those who sought health care but for whom the level of expenditures was below the threshold, those who did not receive health care although they needed it, and those who did not have a need for health care at all. This strategy is clearly inappropriate: it does not distinguish among a favourable outcome (assuming that proper health care was provided with expenditures below the threshold), an unfavourable one (health care not received, although needed), and a neutral one (health care not needed). In the present analysis, two steps are taken to avoid this. First, the analysis is restricted to those who needed health care, as described in the next section. Second, we remove from the probit estimation the persons that did not seek health care, via the Heckman selection model.

Once the analysis is restricted to those who needed health care, the lack of selection in the Heckman model indicates unmet need: i.e., individuals and households that did not seek health care, but needed it. People who have a need for health care but do not get it can also have a catastrophic event (and this is equally a failure of financial protection), but they are not at risk for catastrophic expenditures (Waters, 2000). The Heckman sample selection model is an appropriate analytical model in this case (Dow and Norton, 2003), because it is designed to analyse a situation where a potential outcome exists—health expenditures by those who have chosen to seek care. Because non-care-seeking people (with unobserved health expenditures) are likely to be

systematically different from care-seeking people (with observed expenditures), the estimation is likely to suffer from selection bias in the absence of a correction such as the Heckman model (Dow and Norton, 2003).

The setup of the Heckman selection model in a probit estimation is described below. The specific implementation of the model, including an account of unmet health-care needs in Brazil, is presented in section IV.

As in other probit models, it is assumed that an underlying relationship exists between a continuous variable (y^*_j) —health expenditures as a fraction of household income— and a set of explanatory variables (u_{1j}), as specified in the equation below:

$$y^*_j = x_j \beta + u_{1j} \qquad \text{latent equation}$$

In this equation, β is the set of parameters to be estimated and u_{1j} are the residuals of the estimation. However, we measure the binary outcome (y_j^{probit}) only if the latent variable is above a given threshold (t), as given in the equation below:

$$y_j^{probit} = (y^*_j > t) \qquad \textit{probit} \text{ equation}$$

The dependent variable, however, is not always observed, as households might choose not to seek health care even if they need it. Rather, the dependent variable for observation j is observed if households choose to seek health care, as specified in the equation below (Van de Ven and Van Pragg, 1981).

$$y_j^{select} = (z_j \vartheta + u_{2j} > 0) \qquad \text{selection equation}$$

In the selection equation, y_j^{select} is another binary variable (1= households sought health care; 0 = they did not), z_j is a set of explanatory variables for the selection decision and ϑ is the new set of parameters to be estimated. The residuals of the latent and selection equations (u_{1j} and u_{2j}) are normal variables, with average equal to zero and standard deviation equal to one. The correlation between the residuals is expected to be positive and it is measured as *rho* in the estimates below.

To estimate the Heckman model we need variables that influence the selection (the probability of seeking health care), but do not directly affect the ultimate dependent variable (the probability of catastrophic health expenditures). For this purpose, three indicators relating to total health-care infrastructure at the regional level are used: the total number of ambulatory units, hospital beds, and physicians per capita. These are the identifying variables (also called instrumental variables) in the model, as they are used in the Heckman selection equation but not in the probit equation.

Using the procedures suggested by Murray (2006), one of the instruments —the total number of ambulatory units per capita— was found to be both "strong", i.e., statistically significant in the selection equation (table 6) and "valid" (not significant if introduced in the main probit equation). As expected, this variable only influences health-care spending when health care is sought. On the other hand, the other two instruments were weak under most health-care need definitions. Further analysis—also suggested by Murray (2006)— was conducted by repeating the estimations with the removal of these weaker instruments. This procedure generated no important changes in the results. One final observation is that there are weak correlations between the instruments used in the selection equation and three similar control variables used in the main probit equation—number of private ambulatory units, hospital beds and physicians per capita.

IV

Data sources and empirical specifications

1. Data sources

The present research uses the dataset from the 1998 National Household Survey conducted by the Brazilian Institute of Geography and Statistics (IBGE). The survey uses a three-level sampling process: municipalities within each state, census tracts and households, based on the 1991 census (IBGE, 2000). Adjustments necessary to make the results representative for the country population in 1998 were based on projections of birth, death, and migration rates. The total sample size was 112,434 households and 344,975 individuals. We controlled for clustering resulting from the survey design by defining states as the clusters and using

probability weights for each household, as provided by the dataset (StataCorp, 2005).

An additional data source is the survey on medical and sanitary assistance for 1999 (Ministry of Health of Brazil, 2004). Information gathered from this source includes the total public and private per capita health-care infrastructure, as detailed below. Given the aggregation levels of the reported results for the National Household Survey dataset, these indicators are used at the state and metropolitan area level.

2. Dependent variables

Health expenditures were calculated by adding the following expenditures: medicines, health insurance premiums —net of any contribution by employers— doctor visits, visits to other health-care professionals, hospital stays, home-care nursing, tests, dental-care fees, glasses and lenses, orthopaedic equipment, and other health-care expenses. Since the questions on the survey asked about the household's direct spending, these expenditures are expected to include the costs associated with co-payments and to take into account reimbursements from health insurance plans. These results are adjusted to a monthly basis, as the recall period for the expenditures was the previous three months with the exception of medicines, where the recall period was one month. Monthly household income is also available in the National Household Survey.

For the probability of the household having catastrophic health expenses in a given month (probit equation), we estimate three alternative thresholds:

(i) Total health expenditures equal to or greater than 20% of income (12% of households surpass this threshold);
(ii) Total health expenditures equal to or greater than 40% of income (3.7% of households);
(iii) Out-of-pocket health expenditures, not including private health insurance premiums, equal to or greater than 10% of income (20% of households).

These gross estimates of catastrophic health expenditures are very similar to the findings of Diniz, Servo and others (2007), who used a different dataset: that of the Survey of Household Budgets. The 3.7% estimated value found using the 40% threshold is substantially lower than the 10.3% value reported by Xu, Evans and others (2003), and this does not seem to be explained by the methodological distinctions between the studies. Diniz Servo and others (2007) provides a detailed account of how the small sample size, the lack of national representativeness, and the research objectives of the dataset used by Xu, Evans and others (2003) might have led these authors to overestimate the extent of catastrophic health expenditures in Brazil.

For the selection equation, the dependent variable is based on whether anyone in the household sought health care in the two weeks prior to the survey. Using the broadest definition of health care need ("Health-care need No.1" as defined in the next section) we can identify three groups:

(i) Households that did not need health care (52,504 households, or 58% of the total sample);
(ii) Households that sought health care (32,895 households, which is equivalent to 36% of the total sample or 86% of those who needed health care); and
(iii) Those households that did not seek health care, although they needed it (5,514 households, which is equivalent to 6% of the total sample or 14% of those who needed health care).

Unmet needs are a significant feature of the survey sample, with one in every seven households that needed health care not accessing it. Among those households that suffered from unmet needs, 31% indicated lack of sufficient money, 26% indicated problems with scheduling and delay of service, 15% indicated access issues, including transportation difficulties, and 27% cited other issues. An interesting feature that arises from this dataset is that not actually receiving care, after actively seeking it, is not a widespread problem. Only 2% of the households that sought care did not receive it after multiple attempts. One application of these findings is that an analysis of poor access to health care in Brazil by Ribeiro, Barata and others (2006) underestimates the problem, since it focuses on care actually received instead of the decision not to not seek necessary care. Similarly, the conclusion reached by PAHO (2007, 148) that access to health services seems to be assured for the vast majority of the Brazilian population is unwarranted.

While the unit of analysis for health expenditures is the household, the unit for health-care use is the individual. The aggregation at the household level is necessary because both income and the benefits of some health expenditures —notably the insurance premium— are shared amongst household members.

3. Need for health care

We use two alternative definitions of the need for health care. **Health-care need No.1** indicates households

where at least one person needed health care in the two weeks before the survey, irrespective of reason. This definition encompasses 42% of households. **Health-care need No. 2** indicates households where at least one person had two or more chronic conditions and needed health care in the two weeks before the survey. This definition encompasses 18% of households.

Given the nature of the data available, the characteristics of the public health system and the objectives of this analysis, the regressions are confined to the individuals and households who needed health care. Simple logistic regressions on each of these health-care need definitions indicate how they restrict the sample. Given space constraints, detailed accounts of these analyses are not provided, but the main results are summarized. Under the No. 1 definition, need is more likely for households with a higher percentage of females, households with at least one elderly person, larger households, and those in urban areas. Poorer households have the same likelihood of needing health care as their richer counterparts.

The results for definition No. 2 are similar, with more marked importance of female participation and the presence of an elderly person, and poorer households indicating a greater need for health care than richer households. Notably, a health-need gradient according to income is lacking in the broader definition of health-care need (No. 1), but is present in the definition that incorporates chronic conditions (No. 2). These findings suggest that the stronger need for health care among poorer households is associated with the higher prevalence of chronic conditions in this group, as noted by Almeida, Barata and others (2002).

Health-care need was recorded for the previous two weeks in the survey, while the health expenditure information used to estimate catastrophic expenditures was collected for the previous three months (except medicines, which were for one month). This difference in time periods might have introduced a bias towards the individuals and households that had more frequent need for health care and, therefore, were more likely to be captured by the two-week recall in the survey. In this case, this bias is identical to the one introduced by restricting the analysis to those who needed health care, as discussed above.

4. Explanatory variables of interest

Our primary variables of interest are:

(i) Whether the household used the Brazilian public health system (SUS) for its health-care needs in the two weeks previous to the survey (yes = 44% of households that sought health care). This variable was not used in the selection equation.

(ii) Whether anybody in the household had private health insurance (33.5% of households).

(iii) Log of monthly family income, in Brazilian reais.

The use of SUS and private health insurance affiliation are not mutually exclusive, as private affiliation does not preclude use of the public system. Still, among the households that received health care and had insurance, only 21% used SUS. This overlap between the public system and private insurance might affect the results for these two variables. However, replications conducted to assess the impact of the overlap showed that it did not affect the results significantly. Specifically, the regressions were estimated by removing one of the variables and checking how the other variable was affected, and new regressions were performed with interaction indicators between them. For the sake of brevity, these results are not shown.

Private health insurance might be endogenous to health status, as those with worse health might try to obtain insurance (adverse selection). The available data do not allow this possibility to be ruled out, but it does not appear to be likely. For instance, there is little relationship between the number of chronic conditions and health insurance. Whereas 26% of the individuals with no chronic conditions have insurance, 24% of those with one condition and 22% of those with two conditions have it. Along similar lines, coverage is higher among those with excellent or good self-assessed health (25.9%) and lower for those with poor or very poor self-assessed health (14.5%) (IBGE, 2000). This pattern seems to be compatible with insurers' risk selectivity but incompatible with simple adverse selection. In a more rigorous analysis of the same dataset used in this research, Bahia, Costa and others (2002) concluded that adverse selection was not important.

As expected, poorer households are more likely to rely on the public health system and less likely to have private insurance. Dividing the sample into halves, based on per capita household income, 70% of the poorest households that received health care in the previous two weeks used SUS, whereas only 36% of the richest households did so. Only 13% of the poorest have insurance coverage, compared with 55% of the richest households. These relationships indicate the importance of controlling for income when analysing the impact of the public system and private insurance on the level of health expenditures. All the regressions were replicated for the poorer and richer sub-samples. For the sake

of brevity, a detailed account of these replications is not provided here. In general, they confirm the main findings of the full-sample analysis.

5. Control variables

Table 5 describes the control variables.

TABLE 5

Brazil: control variables

Private health-care infrastructure at the state and metropolitan levels (only for probit equation)	Number of ambulatory units that do not serve SUS/1000 people	average: 0.06; range: 0.01 to 0.22
	Number of hospital beds that do not serve SUS/1000 people	average: 0.38; range: 0.02 to 0.87
	Number of physicians that do not serve SUS/1000 people	average: 1.3; range: 0.08 to 2.79
Demographics	Sex: percentage of females in the household	average: 51.7
	Race: whether household head is mulatto/mulatta (% of the sample)	39
	Race:[a] whether household head is black (% of the sample)	6.8
	Children: whether household has at least one child 10 years old or younger (% of the sample)	44
	Older persons: whether household has at least one person 65 years old or older (% of the sample)	17.4
	Education: highest educational attainment in the household, measured in years of schooling	average = 7.8 years
	Household size	1 person = 9% 2 persons = 17% 3 to 5 persons = 60% 6 or more = 14%
	Whether household lives in a rural area (% of the sample)	16
Health-care prices at the state and metropolitan levels	Average cost of a hospital stay as approved by SUS	average: 357 reais; range: 207 to 566 reais
	Average value of an ambulatory procedure as approved by SUS	average: 3.3 reais range: 2.0 to 4.4 reais
Total health-care infrastructure at the state and metropolitan levels (only for selection equation)	Total number of ambulatory units/1000 people	average: 0.24; range: 0.11 to 0.61
	Total number of hospital beds/1000 people	average: 3.0; range: 1.8 to 4.0
	Total number of physicians/1000 people	average: 4.3; range: 0.8 to 6.7

Source: IBGE (2000) and Ministry of Health of Brazil (2004).

[a] The base category for race is, basically, white (53.5% of sample); other races would be only 0.7% of sample.

V
Results and analysis

Table 6 shows the results for both the probit and selection equations. In the probit equation, marginal effects are presented for the probability that a household has catastrophic health expenditures if health care is sought. In the selection equation, the marginal effect of the probability that a household sought health care is shown. In both cases, for the continuous independent variables, the marginal effects show how the dependent

TABLE 6

Brazil: results of the regressions

	Health-care need No. 1			Health-care need No. 2		
	Catastrophic health expenditures 20%	Catastrophic health expenditures 40%	Catastrophic health expenditures, out-of-pocket	Catastrophic health expenditures 20%	Catastrophic health expenditures 40%	Catastrophic health expenditures, out-of-pocket
Probit equation[a]	y=0.232	y=0.074	y=0.378	y=0.347	y=0.142	y=0.546
Income (log)	-0.135[b]	-0.077[b]	-0.127[b]	-0.168[b]	-0.118[b]	-0.136[b]
Whether used SUS	-0.063[b]	-0.035[b]	-0.041[b]	-0.094[b]	-0.058[b]	-0.052[b]
With health insurance	0.096[b]	0.027[b]	-0.004	0.140[b]	0.053[b]	0.001
Private ambulatory	0.204[d]	0.045	-0.089	0.385	-0.047	0.137
Private hospital beds	0.100[b]	0.042[c]	0.082[b]	0.106	0.034	0.047
Private physicians	-0.028[c]	-0.012	-0.010	-0.030	-0.007	0.003
Female percentage	0.074[b]	0.027[b]	0.072[b]	0.078[b]	0.031[d]	0.057[b]
Race: mulatto	-0.052[b]	-0.029[b]	-0.050[b]	-0.071[b]	-0.042[b]	-0.065[b]
Race: black	-0.057[b]	-0.032[b]	-0.048[b]	-0.094[b]	-0.057[b]	-0.080[b]
With children	-0.076[b]	-0.041[b]	-0.111[b]	-0.041[b]	-0.040[b]	-0.054[b]
With older persons	0.134[b]	0.063[b]	0.158[b]	0.096[b]	0.059[b]	0.099[b]
Highest level of education in household	0.002	0.001	0.000	0.002	0.003[c]	0.002
Household size	-0.005[b]	-0.001	-0.003	-0.008[b]	-0.002	-0.007[b]
If in rural areas	0.011	0.003	0.015	-0.006	0.003	0.002
Hospital cost (log)	-0.073[b]	-0.009	-0.109[b]	-0.100	-0.034	-0.180[c]
Ambulatory cost (log)	0.099[b]	0.018	0.104[b]	0.186[b]	0.047	0.202[b]
Selection equation	y=0.886	y=0.886	y=0.887	y=0.7970	y=0.797	y=0.797
Income (log)	0.032[b]	0.031[b]	0.034[b]	0.046[b]	0.045[b]	0.049[b]
With health insurance	0.047[b]	0.047[b]	0.046[b]	0.064[b]	0.064[b]	0.063[b]
Total ambulatories	0.207[b]	0.213[b]	0.195[b]	0.213[c]	0.218[c]	0.205[d]
Total hospital beds	-0.006	-0.008	-0.004	-0.002	-0.004	0.001
Total physicians	0.008[c]	0.008[c]	0.007[b]	0.010	0.010	0.010
Female percentage	0.004	0.004	0.003	0.011	0.011	0.011
Race: mulatto	-0.025[b]	-0.025[b]	-0.025[b]	-0.035[b]	-0.035[b]	-0.035[b]
Race: black	-0.028[b]	-0.028[b]	-0.028[b]	-0.012	-0.012	-0.013
With children	0.041[b]	0.041[b]	0.042[b]	-0.011	-0.011	-0.010
With older persons	-0.015[b]	-0.014[b]	-0.016[b]	0.009	0.008	0.008
Highest level of education in household	0.006[b]	0.006[b]	0.006[b]	0.006[b]	0.005[b]	0.005[b]
Household size	-0.001	-0.001	-0.001	-0.002	-0.002	-0.002
If in rural areas	-0.043[b]	-0.043[b]	-0.042[b]	-0.073[b]	-0.073[b]	-0.072[b]
Hospital cost (log)	0.049	0.052[d]	0.049[b]	0.077	0.080	0.074
Ambulatory cost (log)	0.114[b]	0.113[b]	0.116[b]	0.213[b]	0.167[b]	0.170[b]
Rho statistic	-0.625[b]	-0.554b	-0.804b	-0.484[b]	-0.530[b]	-0.704[b]
Observations	36 738	36 738	36 738	15 317	15 317	15 317
F-statistic	137.38[b]	102.07[b]	169.38[b]	52.24[b]	63.07[b]	51.41[b]

Source: IBGE (2000) and Ministry of Health of Brazil (2004).

[a] "y=" indicates the probability of the outcome
[b] Significant at 1%,
[c] Significant at 5%
[d] Significant at 10%.

variable changes as the independent variable changes by a small (infinitesimal) amount, and they are calculated at the mean of the independent variable. For the binary variables, the effects were calculated as the discrete change in the dependent variable as the independent variable changes from 0 to 1. The significance tests are based on Huber-White robust estimators of variance.

1. Selection analysis

Households with higher income are more likely to receive health care, a finding similar to those of other Brazilian studies (Bahia, Costa and others, 2002; Farias and Melamed, 2003; Mendoza-Sassi, Béria and Barros, 2003; Neri and Soares, 2002). Households with private health insurance are between 5% and 8% more likely to receive care, a similar result to Pinheiro and Travassos (1999), Mendoza-Sassi, Béria and Barros (2003), Neri and Soares (2002) and Viacava, Souza-Júnior and Szwarcwald (2005). Even in the context of a unified health system free of charge, access to health care is constrained by household income and health insurance. Households with lower income and without private insurance are more likely to find some of their health care needs unmet.

2. Determinants of catastrophic health expenditures (probit equation)

As expected, income has an important impact, as poorer households that seek care tend to spend more on health care as a percentage of income. Using SUS decreases the likelihood that a household will have catastrophic health expenditures by 47% (0.035/0.074, at the 40% threshold and using health-care need No. 1). As this variable refers to a period of only two weeks, the impact over a full month would be even higher.

Table 7 compares health-care expenditures as a percentage of total health spending for the different thresholds. The largest expenditure is on medicines, followed by health insurance premiums (obviously, not in the out-of-pocket threshold), dental care, hospital stays and doctor visits. It is worth noting the higher importance for hospital stays in the 40% threshold; if somebody in the household is hospitalized, there is a substantial increase in the likelihood that this threshold will be crossed.

Why do households need to spend money when they use SUS? One possible answer is that somebody in the household did not use SUS, whereas others did. The segmentation in the Brazilian private health insurance market (Pinto and Soranz, 2004; Bahia, 2001) —primarily covering households with higher income, which are less likely to use SUS— suggests that this situation is not very common. Another issue is that for the households that used SUS, and had a need for health care (need No. 1), 66% of the average health expenditures were for medicines, indicating that SUS coverage is particularly weak in this category (Nóbrega, Marques and others, 2007). SUS only dispenses medicines in public ambulatory units and pharmacies. If a patient, with a prescription from an SUS doctor, cannot obtain the medicine from the public facility, he or she needs to pay for it in a private pharmacy. This transfer of expenditures —from the public provider to the individual patient— is a significant source of household health expenditures. This problem was also identified by Silveira, Osório and Piola (2002), Lima-Costa, Baretto and Giatti (2003) and Arrais, Luciara and others (2005).

TABLE 7

Brazil: health-care expenditures
(Percentages of total health spending)

Expenses	Health care 20% (%)	Health care 40% (%)	Health care, out-of-pocket (%)
Medicines	41.6	42.3	53.6
Insurance premium	20.9	13.3	---
Dental care	13.9	13.1	18.1
Hospital stays	7.5	13.5	7.5
Doctor visits	4.6	5.6	6.0
Glasses and lenses	3.9	2.9	5.5
Tests	3.2	4.0	3.9
Others	4.5	5.2	5.3

Source: IBGE (2000).

Private health insurance is associated with a 36% increase in the probability of catastrophic health expenditures (0.027/0.074, at the 40% threshold and using health-care need No. 1). This appears to be a counterintuitive result since insurance is supposed to be protective (Sekhri and Savedoff, 2005). Private insurance was not effective in reducing the household financial burden associated with health care; the financial costs of premiums were more significant than the expected reduction in financial expenditures when health care was used. In fact, as shown in table 6, the private health insurance variable is non-significant in the probit regression for the case of the out-of-pocket expenditure threshold. This finding indicates that health insurance has no impact on out-of-pocket expenses at the household level. Insurance is associated with significant increases in health-care expenditures across all categories. Part of this increase is explained by the higher use of health care, but even if we restrict the calculation to households that used health care over the previous 14 days, the average total expenditure of those with insurance (251 reais) almost quadruples that of those without insurance (63 reais). Of this increase, 44% is attributable to the average health-care premium.

The importance of insurance premium costs in the total health-care budget was also observed by Silveira, Osório and Piola (2002) and Kilsztajn, Camara and Carmo (2002). The results above are also compatible with the observation by Viacava, Souza-Júnior and Szwarcwald (2005) that individuals with private health plans do not always use their insurance to pay for services. Farias (2001) explains the decision to purchase private health insurance in four ways: quality, access, reliability and social status. Public providers are perceived as being of lower quality, since doctors have limited time and resources for each consultation, there are longer waits before arranging an appointment, and there is no guarantee that a consultation in SUS will be possible at a given time. Farias also suggested that using a private provider might be seen as a strategy to maintain social status. Data from National Household Survey show that 80% of the insurance plans provide services through their own health-care networks and 88% have a network of contracted private providers. The doctors, hospitals, labs and other services in the first group (own network) are clearly not accessible to a person who does not have health insurance, and the same is largely true for the second group (contracted network).

The motivation to buy private insurance is access to services of better quality and reliability (as the results from our selection equation regression indicate), not necessarily to reduce out-of-pocket expenditures, as shown in the results for our probit equation regression. Similarly, another possibility concerns intra-household distinctions, if the insurance does not cover all household members. If the individuals who do not have coverage would, nevertheless, avoid using SUS —given concerns about access, quality, and social status— they would have to bear the full financial burden of private providers. This is a very important point, since in 40% of households with some health insurance coverage, at least one person is not covered by it.

VI
Conclusions

The Brazilian public health system provides a significant reduction (47%) in a household's probability of having catastrophic levels of health expenditures. This benefit is more important for poorer households, which tend to rely more on the public system (Ribeiro, Barata and others, 2006). Other authors, including Ocké-Reis, Silveira and Andreazzi (2002), Diaz (2003) and Porto, Santos and Ugá (2006), have noted the protective impact of SUS. The high financial burden associated with health care in Brazil, in comparison with other countries, can be attributed to those aspects of health care not well covered by the public system —most notably prescription and non-prescription drugs— and the deficiencies in quantity, accessibility, quality and reliability of the public providers that lead many households to rely on the private sector, including the purchase of private health insurance (Bós, 2007).

In Brazil, for a large majority of the population, private health insurance does not provide effective financial protection and does not reach the poorer households. While it is a tool to gain access to private providers, it does not reduce out-of-pocket expenditures at the household level and the premiums are relatively expensive. It follows, then, that private health

insurance is positively associated with catastrophic health expenditures.

Since 1998, health services provided under private plans have been subject to regulations, standards, monitoring and oversight by the National Agency for Supplementary Health. This new regulation has had some mandatory benefits, but it increased premium costs significantly and still has limited impact (Farias and Melamed, 2003; Ocké-Reis, 2005; Fernandes, Pires and others, 2007). For the purposes of the present research, it can be assumed that the new regulations were not aimed at enhancing the financial protection of health insurance clients, but at minimizing the practice of risk selection by insurance companies (Malta, Cecílio and others, 2004). Therefore, the results presented above are not expected to have changed significantly since then. For instance, Ocké-Reis and Cardoso (2006) found that although the National Agency for Supplementary Health regulates the prices charged by some private health plans, the prices in this regulated sector increased more rapidly than health sector inflation in the 2001-2005 period. Along similar lines, Diniz, Servo and others (2007) report that average inflation-adjusted household spending with health plan premiums was higher in 2003 than in 1996, and Andrade and Maia (2007) found very few differences in the determinants of the demand for private health insurance between 1998 and 2003.

Recommendations for changes in the Brazilian unified health system include further improvements in the quantity, accessibility, quality, and reliability of the public providers. As the public health-care system improves, more households will choose it and fewer will be subjected to catastrophic levels of health expenditures. In addition, we found that the seeking of health care is constrained by the health-care infrastructure at the regional level, especially at the primary care level. Further investments in the number of primary care providers —both public and private— will enhance access and reduce the probability of health-care needs going unmet. Enhancing the public network will have the double benefit of not only providing access to care, but also improving financial protection at the point of delivery. In terms of the public system's direct impact on health spending, it is clear that the emphasis should be on a more extensive and appropriate provision of prescription and non-prescription drugs. The recent effort to provide non-branded drugs (generics) in public and private pharmacies is beneficial as it reduces the costs to the public system in public pharmacies, and the costs to patients in private pharmacies, but the impact of this programme is still limited. Bertoldi, Barros and Hallal (2005) estimated that generics comprised only 4% of all medicines used. A stronger effort to enhance access to medicines is necessary, despite the associated high costs for the public system and the complexities of an effective control system. The way SUS provides most health-care services —in addition to using public providers, it reimburses private providers for services— is inconsistent with its provision of medicines, which are available only through public dispensaries and pharmacies. At some point in the future, SUS should start reimbursing private pharmacies for dispensing medicines to its patients.

(Original: English)

Bibliography

Almeida, M.F., R.B. Barata and others (2002): Prevalence of self reported chronic diseases and health services consumption from the National Household Sample Survey of 1998 in Brazil, *Ciência & saúde coletiva*, vol. 7, No. 4, Rio de Janeiro, Associação Brasileira de Pós-Graduação em Saúde Coletiva.

Alves, D. and Ch. Timmins (2003): Social exclusion and the two-tiered healthcare system of Brazil, in J. Behrman, A. Gaviria and M. Szekely (eds.), *Who's In and Who's Out: Social Exclusion in Latin America*, Washington, D.C., Inter-American Development Bank.

Andrade, M.V. and A.C. Maia (2007): Demanda por planos de saúde no Brasil, in F.G. Silveira, L.M. Servo and others (eds.), *Gasto e consumo das famílias brasileiras contemporâneas*, vol. 2, Brasilia, Institute of Applied Economic Research (IPEA).

Arrais, P.S., L.B. Luciara and others (2005): Prevalence and determinants of medicines consumption in Fortaleza, Ceará, Brazil, *Cadernos de saúde pública*, vol. 21, No. 6, Rio de Janeiro, Escola Nacional de Saúde Pública.

Bahia, L. (2001): Private health plans: light and shadow in the 1990s health sector debate, *Ciência & saúde Coletiva*, vol. 6, No. 2, Rio de Janeiro, Associação Brasileira de Pós-Graduação em Saúde Coletiva.

Bahia, L., A.J.L. Costa and others (2002): Segmentation of the demand of the plans and private insurances of health: an

analysis of the information of PNAD/98, *Ciência & saúde coletiva*, vol. 7, No. 4, Rio de Janeiro, Associação Brasileira de Pós-Graduação em Saúde Coletiva.

Bertoldi, A.D., A.J.D. Barros and P.C. Hallal (2005): Generic drugs in Brazil: known by many, used by few, *Cadernos de saúde pública*, vol. 21, No. 6, Rio de Janeiro, Escola Nacional de Saúde Pública.

Bós, A.M. (2007): Health care provider choice among the elderly in a state in Brazil: a structural model, *Pan American Journal of Public Health*, vol. 22, No. 1, Washington, D.C., Pan American Health Organization.

Bós, A.M. and A.J. Bós (2004): Determinants of elders' choice between private and public health care providers, *Revista de Saúde Pública*, vol. 38, No. 1, São Paulo, Faculty of Public Health, University of São Paulo.

Cornwall, A. and A. Shankland (2008): Engaging citizens: lessons from building Brazil's national health system, *Social Science & Medicine*, vol. 66, No. 10, Amsterdam, Elsevier.

Costa, J. and J. García (2003): Demand for private health insurance: how important is the quality gap?, *Health Economics*, vol. 12, No. 7, New York, Wiley & Sons.

De Abreu, D.M.X., C.C. César and E.B. França (2007): The relationship between deaths that are avoidable with adequate health care and the implementation of the Unified Health System in Brazil, *Pan American Journal of Public Health*, vol. 21, No. 5, Washington, D.C., Pan American Health Organization.

Diaz, M.D.M. (2003): Desigualdades socieconômicas na saúde, *Revista brasileira de economia*, vol. 57, No. 1, Rio de Janeiro, Getulio Vargas Foundation.

Diniz, B.P.C., L.M.S. Servo and others (2007): Gasto das famílias com saúde no Brasil: evolução e debate sobre gasto catastrófico, in F.G. Silveira, L.M. Servo and others (eds.), *Gasto e consumo das famílias brasileiras contemporâneas*, vol. 2, Brasilia, Institute of Applied Economic Research.

Dow, W.H. and E.C. Norton (2003): Choosing between and interpreting the Heckit and two-part models for corner solutions, *Health Services & Outcomes Research Methodology*, vol. 4, Springer.

Escorel, S., L. Giovanella and others (2007): O Programa de Saúde da Família e a construção de um novo modelo para a atenção básica no Brasil, *Pan American Journal of Public Health*, vol. 21, No. 2, Washington, D.C., Pan American Health Organization.

Farias, L.O. (2001): Individual health protection strategies: a study on adherence to the supplementary health system, *Ciência & saúde coletiva*, vol. 6, No. 2, Rio de Janeiro, Associação Brasileira de Pós-Graduação em Saúde Coletiva.

Farias, L.O. and C. Melamed (2003): Market shares in the Brazilian health sector, *Ciência & saúde coletiva*, vol. 8, No. 2, Rio de Janeiro, Associação Brasileira de Pós-Graduação em Saúde Coletiva.

Fernández. E., H.M. Pires and others (2007): An analysis of the supplementary health sector in Brazil, *Health Policy*, vol. 81, No. 2-3, Amsterdam, Elsevier.

Gershman, S. and M.A.B. Santos (2006): The Brazilian Public Health System (Sistema Único de Saúde) as the unfolding of twentieth century health policies, *Revista brasileira de ciências sociais*, vol. 21, No. 61, São Paulo, Associação Nacional de Pós-Graduação e Pesquisa em Ciências Sociais.

Gertler, P. and J. Gruber (2002): Insuring consumption against illness, *American Economic Review*, vol. 92, No. 1, Nashville, Tennessee, American Economic Association.

Hulme, D. and A. Shepherd (2003): Conceptualizing chronic poverty, *World Development*, vol. 31, No. 3, Amsterdam, Elsevier.

IBGE (Brazilian Geographical and Statistical Institute) (2000): *Pesquisa Nacional por Amostra de Domicílios: acesso e utilização de serviços de saúde – 1998*, Rio de Janeiro.

_____ (2006): *Tábulas completas de mortalidade – 2006*, Rio de Janeiro.

Kawabata, K., K. Xu and G. Carrin (2002): Preventing impoverishment through protection against catastrophic health expenditure, *Pan American Journal of Public Health*, vol. 80, No. 8, Geneva, World Health Organization.

Kilsztajn, S., M.B. Camara and M.S.N. Carmo (2002): Private health expenditures and income distribution in Brazil, *Revista da Associação Médica Brasileira*, vol. 48, No. 3, São Paulo, *Associação Médica Brasileira*.

Lima-Costa, M.F., S.M. Barreto and L. Giatti (2003): Health status, physical functioning, health services utilization, and expenditures on medicines among Brazilian elderly: a descriptive study using data from the National Household Survey, *Cadernos de saúde pública*, vol. 19, No. 3, Rio de Janeiro, Escola Nacional de Saúde Pública.

Lóbrega, O.T., A.R. Marques and others (2007): Retail prices of essential drugs in Brazil: an international comparison, *Pan American Journal of Public Health*, vol. 22, No. 2, Washington, D.C., Pan American Health Organization.

Malta, D.C., L.C.O. Cecílio and others (2004): Perspectives of the regulation in the health insurance face the model assistance, *Ciência & saúde coletiva*, vol. 9, No. 2, Rio de Janeiro, Associação Brasileira de Pós-Graduação em Saúde Coletiva.

Marinhol, A. and S.S. Cardoso (2007): Um estudo multinível sobre as filas para internações relacionadas com a gravidez, o parto e o puerpério no SUS, *Economia aplicada*, vol. 11, No. 4, São Paulo, Economia Aplicada.

Mendoza-Sassi, R., J.U. Béria and A.J.D. Barros (2003): Outpatient health service utilization and associated factors: a population-based study, *Revista de saúde pública*, vol. 37, No. 3, São Paulo, University of São Paulo.

Ministry of Health (2004): Datasus, Brasilia. Available in: www.datasus.gov.br.

Murray, M.P. (2006): Avoiding invalid instruments and coping with weak instruments, *Journal of Economic Perspectives*, vol. 20, No. 4, Nashville, Tennessee, American Economic Association.

Murray, C.J.L., K. Xu and others (2003): Assessing the distribution of household financial contributions to the health system: concepts and empirical application, in C.J.L. Murray and D.B. Evans (eds.), *Health Systems Performance Assessment: Debates, Methods and Empiricism*, Geneva, World Health Organization.

Neri, M. and W. Soares (2002): Social inequality and health in Brazil, *Cadernos de saúde pública*, vol. 18, supplement, Rio de Janeiro, Escola Nacional de Saúde Pública.

Ocké-Reis, C.O. (2005): Challenges of the regulation of Brazilian private health insurance, *Public Finance and Management*,

vol. 5, No. 4, Harrisburg, Southern Public Administration Education Foundation Inc.

Ocké-Reis, C.O. and S.S. Cardoso (2006): *Uma descrição do comportamento dos preços dos planos de assitência à saúde*, discusión paper, No. 1232, Rio de Janeiro, Institute of Applied Economic Research (IPEA).

Ocké-Reis, C.O., F.G. Silveira and M.F.S. Andreazzi (2002): *Avaliação dos gastos das famílias com a assistência médica no Brasil: o caso dos planos de saúde*, discusión paper, No. 921, Rio de Janeiro, Institute of Applied Economic Research.

PAHO (Pan American Health Organization) (2003): *Health in the Americas, 2002 Edition*, Washington, D.C.

_____ (2005): *Brazil: Health System Profile*, Brasilia.

_____ (2007): *Health in the Americas*, vol. 2, Washington, D.C.

Pinheiro, R.S. and C. Travassos (1999): Inequality in health care use by the elderly in three district in the city of Rio de Janeiro, *Cadernos de saúde pública*, vol. 15, No. 3, Rio de Janeiro, Escola Nacional de Saúde Pública.

Pinto, L.F. and D.R. Soranz (2004): Private health plans: populational coverage in Brazil, *Ciência & saúde coletiva*, vol. 9, No. 1, Rio de Janeiro, Associação Brasileira de Pós-Graduação em Saúde Coletiva.

Porto, S.M., I.S. Santos and M.A.D. Ugá (2006): An analysis of health services utilization, by financing system, *Ciência e saúde coletiva*, vol. 11, No. 4, Rio de Janeiro, Associação Brasileira de Pós-Graduação em Saúde Coletiva.

Ribeiro, M.C.S., R.B. Barata and others (2006): Sociodemographic profile and utilization patterns of the public health system (SUS) – PNAD 2003, *Ciência & saúde coletiva*, vol. 11, No. 4, Rio de Janeiro, Associação Brasileira de Pós-Graduação em Saúde Coletiva.

Rocha, J.S.Y. and J.G. Simões (1999): Study of public and private hospital care on a populational basis, 1986-1996, *Revista de Saúde Pública*, vol. 33, No. 1, São Paulo, University of São Paulo.

Sekhri, N. and W. Savedoff (2005): Private health insurance: implications for developing countries, *Pan American Journal of Public Health*, vol. 83, No. 2, Geneva, World Health Organization.

_____ (2006): Regulating private health insurance to serve the public interest: policy issues for developing countries, *International Journal of Health Planning and Management*, vol. 21, No. 4, Keele, Centre for Health Planning and Management, Keele University.

Silveira, F.G., R.G. Osório and S.F. Piola (2002): Families' expenses with health, *Ciência & saúde coletiva*, vol. 7, No. 4, Rio de Janeiro, Associação Brasileira de Pós-Graduação em Saúde Coletiva.

Solla, J.J.S.P., A.A.C. Reis and others (2007): Recent changes of the Brazilian public health system federal financing: primary health, *Revista brasileira de saúde materna e infantil*, vol. 7, No. 4, Pernambuco, Instituto Materno Infantil de Pernambuco.

StataCorp. (2005): *Intercooled Stata 9.0*, College Station (TX).

Strauss, J. and D. Thomas (1998): Health, nutrition and economic development, *Journal of Economic Literature*, vol. 36, No. 2, Nashville, Tennessee, American Economic Association.

Van de Ven, W.P.M.M. and B.M.S. Van Praga (1981): The demand for deductibles in private health insurance: a probit model with sample selection, *Journal of Econometrics*, vol. 17, No. 2, Amsterdam, Elsevier.

Viacava, F., P.R.B. Souza-Júnior and C.L. Szwarcwald (2005): Coverage of the Brazilian population 18 years and older by private health plans: an analysis of data from the World Health Survey, *Cadernos de saúde pública*, vol. 21, supplement, Rio de Janeiro, Escola Nacional de Saúde Pública.

Waters, H.R. (2000): Measuring equity in access to health care, *Social Science & Medicine*, vol. 15, Amsterdam, Elsevier.

Waters, H.R., G.F. Anderson and J. Mays (2004): Measuring financial protection in health in the United States, *Health Policy*, vol. 69, No. 3, Amsterdam, Elsevier.

WHO (World Health Organization) (2000): *World Health Report 2000. Health Systems: Improving Performance*, Geneva.

World Bank (2001): *World Development Report 2001: Attacking Poverty*, Washington, D.C., Oxford University Press.

Xu, K., D.B. Evans and others (2003): Household catastrophic health expenditure: a multicountry analysis, *The Lancet*, vol. 362, No. 9378, Amsterdam, Elsevier.