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# FAMILY HEALTH EXPENDITURE AND DEMAND: AN ANALYSIS BASED ON THE CONSUMER EXPENDITURE SURVEY - POF- 2002/2003

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## Abstract

**T**his paper aims at analyzing healthcare expenditure and demand of families, by estimating income-elasticity and price-elasticity for ten groups of products using the so-called model Linear Almost Ideal Demand System (LAIDS). The 2002/03 consumer expenditure surveys (POF) of the Fundação Instituto Brasileiro de Geografia e Estatística – FIBGE (Brazilian census bureau) are used, providing extremely detailed information on family expenditure for the Brazilian states and major metropolitan areas. The variables used in estimating the model were directly taken from the microdata of such surveys. Such a procedure has allowed that logarithms of prices and monthly family earnings per capita could be estimated directly from individual observations and not from the aggregate data for the original income groups of POFs. Estimating the demand by using a two-stage model has pointed out to an income-elasticity of healthcare higher than the unit, showing that healthcare is price-inelastic, a result valid for all observed healthcare subgroups.

— Key words: family expenditures, health expenditures, income deciles, demand for health, elasticity  
Classification JEL: I11, D12.

## Why to Study Family Healthcare Expenditure and Demand?<sup>1</sup>

Different healthcare funding models coexist in the world today, which *grosso modo* can be divided into public and private funding. In OECD countries, such funds are mostly provided by sources controlled by the public sector (about 70%); in Latin America, where split-up systems prevail, the participation of public resources is well lower – less than 50% (WHO, 2004). Ribeiro *et al* (2004) split the Brazilian healthcare system into four large groups based on funding sources, which in some cases constitute communicating vessels: 1) that comprising the so-called *Sistema Único de Saúde* (a unique healthcare system), which is universal, free, and funded with public resources (through taxes and contributions); 2) that comprising private healthcare plans and insurance, voluntarily contracted, funded with family and/or employers' resources; 3) that comprising the exclusive system attending public servants – military and civil servants –, funded by the public sector or the servants themselves – the so-called “closed clientele” system; and 4) that system offered by private independent healthcare providers, directly and immediately accessed by means of out-of-pocket payment.

According to estimates of the World Health Organization (WHO, 2004), 7.6% of GDP would be allocated to health in Brazil, out of which 58.4% (or 4.44% of GDP) would be privately expended, whose major amount would directly stem from families (approximately 70%). As a matter of fact, studies previously accomplished – using data from 1995-96 POFs – have estimated that about R\$ 36 billion (approximately US\$ 10,9 billion<sup>2</sup>) were allocated by the families for their healthcare expenditures in the period (Silveira *et al*, 2002a), an amount equivalent to that allocated by the Ministry of Health in health actions and services for the year 1995 (Ribeiro *et al*, 2004). Such a result would be in line with the WHO estimates<sup>3</sup>. However, the private funding share in the Brazilian healthcare system should be precisely known so as to draw any inference from it. This issue refers to the study of families/people's behavior as “health items” consumers – in other words, the private share of the Brazilian families' demand for healthcare.

In this way, the first part of this paper is in line with other studies accomplished in Brazil (Reis *et al*, 2003; Silveira *et al*, 2002a and 2002b; Médici; 2002, Andrade and Lisboa, 2002) as it analyzes family healthcare expenditures. The database used here, however, allows the analysis to improve in two different aspects: the 2002/2003 POF is nation-wide<sup>4</sup> and it accounts for what has been called nonmonetary earnings, which amplifies the observation of family healthcare expenditures.

The second part is designed to estimating the demand function for goods and services in health, such as healthcare plans, drugs, etc. Once the demand function is known, estimating price

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<sup>2</sup> We used the IMF representative exchange rate for January 2003.

<sup>3</sup> Brazil does not count on a system of health national accounts, which would allow estimates of public and private expenditures comparable to GDP. Therefore, double accounting in estimating healthcare expenditure through other methodologies may be occurring.

<sup>4</sup> Andrade and Lisboa (2002) based on the 1998 *Pesquisa Nacional por Amostra de Domicílios* – PNAD, FIBGE (national household sample survey).

and income elasticities for all such products becomes possible. In developed countries, the demand function is estimated based on time series. However, in Brazil as in most developing countries, consumption time series are scarce. For this reason, consumption habits and estimating elasticities in particularly are rarely explored in Brazil. Most studies with this purpose use simple demand functions and estimate income elasticity alone. For a good review on elasticity in Brazil, see Asano and Fiusa (2003).

In order to achieve its purpose, this paper is divided into four sections in addition to its introduction and conclusion. The following Section presents the database used – *Pesquisas de Orçamento Familiar* – POF (consumer expenditure surveys) of the *Fundação Instituto Brasileiro de Geografia e Estatística*, FIBGE (the Brazilian census bureau), viewing mainly to highlight its differentials in relation to previous POFs. Next, an analysis of family healthcare expenditures is accomplished, with a view to find answers to issues, such as: the structure of average family expenditures and the weight of healthcare expenses in this structure; the structure of family healthcare expenditure by subgroups (drugs, healthcare plans and insurance, medical appointments, etc.); how differentiated are these structures by income decile. Section 3 shows the model used for estimating the demand function, while Section 4 discusses the major results. Then a conclusion follows.

## **1. The Consumer Expenditure Survey 2002/2003: Database Used for Studying Family Expenditures**

The Consumer Expenditure Survey (POF) of FIBGE depicts the structures of family expenditures and earnings and functions as the basis for weighting structure of consumer price indexes of FIBGE, such as the IPCA (amplified consumer price index). Furthermore, by providing such detailed information, these data allow inferences and analyses concerning family expenditure profiles, family earning structures, and that of food consumption behavior, which thus provide a basis for studying and estimating indigence and poverty in the country. Due to their great amplitude and details, they give room for discussing public policy, such as analyses of taxation (see Silveira and Diniz, 2005; Magalhães *et al*, 2001) and those of family food, healthcare and education expenses among others (see Reis *et al*, 2003; Silveira *et al*, 2002a and 2002b; Menezes *et al*, 2002 and 2003; Bertasso, 2000; Hoffmann, 2000a and 2000b).

The most recent POF was accomplished in 2002-2003 and was a nationwide survey through which 48,568 consumption units were investigated. The Consumption Unit or Household – according to the survey definition – “comprises one sole dweller or a number of dwellers sharing the same food source, i.e., using the same food stock and/or spending money on a set of common foodstuffs. In case neither food stock nor common food spending existed, identification was made through housing expenditures” (FIBGE, 2004b).

Differently from the 1987-88 and 1995-96 POFs, which covered the 9 Brazilian most important metropolitan areas (São Paulo, Rio de Janeiro, Belo Horizonte, Salvador, Recife, Fortaleza, Belém, Curitiba and Porto Alegre), besides the Federal District – FD – and Goiânia, the sample design of the 2002-03 POF allows the construction and analysis of household condition for Brazil and major regions, i.e., information on urban and rural areas. As for states, the sample includes data on the situation of a state as a whole and those concerning the urban situation. Finally, inferences

concerning the 11 areas considered in the previous surveys are now possible, which in this way guarantees a comparison between surveys as to such areas<sup>5</sup>.

Other 2002-03 POF differences in relation to previous surveys are worth mentioning. The first is related to the reduced size of the sample for the metropolitan areas, including the Federal District and the city of Goiânia, which decreased from 13,307 and 16,060 consumption units covered in the 1987-88 and 1995-96, respectively, to 6,594 consumption units surveyed in 2002-03. Another significant difference is concerned with the quantity of products surveyed, which increased from 3,300 in 1987-88 and 1995-96 to more than 10,000 products in the 2002-03 POF. In addition to such differences, the 2002-03 POF was the only one among these three surveys to investigate expenditure and nonmonetary earnings too, i.e., that portion of earnings which has come from “everything produced, fished, hunted, collected or goods received (barter, donation, business earnings, own production or salaries and wages paid in goods) used or consumed all through the survey reference period and that have not passed through the market at least during the last transaction accomplished” (FIBGE, 2004b). The sole difference between nonmonetary expense and nonmonetary earnings is the estimated rent, i.e., “rent assigned to the household, the occupation condition of which was other than rental” (Idem). This was the only service accounted as nonmonetary expense. “In order to set a value on nonmonetary earnings corresponding to dwelling rental, expenses incurred with maintenance and repairs, taxes, fees of household services and insurance were deducted from the value of the estimated for the consumption units “ (Ibdem). This makes the 2002-03 POF unique in relation to the other surveys investigating income in the country (such as PNADs and demographic censuses).

As for healthcare expenditures, some differences in the FIBGE tabular plan between the 1987-88 and 1995-96 and the 2002-03 POFs can immediately be perceived. Whereas the first two POFs divided healthcare expenditures into 7 subgroups, such as drugs, health insurance, medical assistance association, dental treatment, medical appointment, hospitalization, eye-glasses and lenses, and health expenses, the 2002-03 POF shows 10 healthcare subgroups comprising drugs, healthcare plans/insurance, dental appointment and treatment, medical appointment, ambulatory medical care, surgery services, hospitalization, various laboratory tests, treatment material and other health expenses. Drugs, healthcare plans and insurance, dental appointment and treatment, and medical appointment would be coincident. As for hospitalization, ambulatory care (cauterization, dressings, nebulization, laser applications, hemodialysis and others) and surgery services (surgery services, anesthesia and obstetrics; anesthesia for surgeries and childbirths; obstetrics for surgeries and childbirths, surgery for operations and childbirths, surgery – of any kind, surgical procedures) were broken down from the label hospitalization (under which hospitalization, hospitalization in first aid centers, maternity wards and hospitals). The label eye-glasses and Lenses was incorporated in Treatment Material. Therefore, comparing healthcare expenditures requires a specific methodological construction. This will not be the aim of this paper as it deals with the 2002-03 data alone.

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<sup>5</sup> It is worth noting that survey reference dates diverge: that for the 1987-88 survey is October 15, 1987, the one for the 1995-96 is September 15, 1996, and that for the 2002-2003 survey is January 15, 2003. The surveys were all accomplished during a one-year period: the first POF was carried out from March 1987 through February 1988; the second from October 1995 through September 1996; and the last from July 2002 through June 2003.

In addition to these more generic issues about the survey and its amplitude, the difficulty in working with it due to its data organization complexity should be highlighted, and this requires an advanced knowledge for treating the FIBGE's microdata. Differently from demographic censuses and PNADs, which involve two databanks (people and households), this POF is divided into 13 substructures according to their seasonality and the investigated object. Thus, the *Caderneta de Despesas* (expenditure notebook) inquires about expenses with food and beverages, personal care and home cleaning products, home-use fuels (except for gas and firewood), food and products for animal use, other petty purchases (candles, batteries, electric bulbs, etc.) incurred in a period of seven consecutive days. As for the individual expense questionnaire, other items are also inquired for a seven-day nonconsecutive period, as for example transportation, outdoor food, tobacco, etc. In this very questionnaire, expenses with entertainment, sports, cellular phone calls as well as those with pharmaceutical items are referred to for a period of thirty days. Personal services (hair cutting, shoe shining, shoe repairing, etc.), however, are referred to for a ninety-day period. The twelve-month period expenses refer to the ones such as those included in the questionnaire for joint expenses, as for example, real estate acquisition, purchase of electric home appliances, among others. It is precisely based on the handling and crossing of these 13 substructures that the POF analysis is started up.

As previously stated, this paper focuses on the analysis of data from the 2002-03 POF, in an attempt to highlight some information not included in the previous surveys, particularly those relating their reach (e.g., national and possibly those covering the states) and to include the nonmonetary portion of both expenditure and income<sup>6</sup>.

## 2. How Differentiated is Healthcare Expenditure in Brazil?

Before analyzing family healthcare expenditure, we will briefly discuss on income differentials as well as the relevance of nonmonetary earnings for each income decile. Such discussions make up a background for the analysis of family healthcare expenditure.

Many works question about the high degree of inequalities in Brazil by stating that one of the hindrances faced is the lack of information on nonmonetary earnings and that this would be mostly relevant for poor families, mainly those living in rural areas (see, among others, Schwartzman, 2004). The information on nonmonetary earnings in the 2002-03 POF and their value later assigned constitute an important advancement.

The data validate inferences concerning the relevance of nonmonetary earnings. As can be seen in Table 1, such earnings are much more important for poor families (at the first income deciles) than for those richer: 35% of total income comes from nonmonetary earnings at the first income decil, as compared to only 10% at the last decil. Taking only monetary earnings into account, the average income of the 10% richer families is approximately 36 times higher than that of the 10% poorer.

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<sup>6</sup> As said before, estimated rental is the only service for which information on the nonmonetary earnings is available. However, for other services, such as public education, healthcare services, among others, data on nonmonetary earnings are not available. Healthcare was the only item for which values of nonmonetary expenditure in services were estimated. However, this is the only item for which FIBGE has not yet disclosed information on nonmonetary expenditure both for products and services.

**Table 1**  
**Brazil and Metropolitan Areas, Including Goiânia and FD:**  
**income Deciles, According to Total Per Capita Family Income,**  
**Nonmonetary Average Monthly Family Income, and**  
**% of Nonmonetary Income in Total Income**  
(R\$ as of January 2003)

<b>Brazil</b>					
<b>Decile</b>	<b>Nonmonetary average monthly income</b>	<b>Monetary monthly income</b>	<b>Total monthly income</b>	<b>% of Nonmonetary income in total income</b>	<b>Population (BR)</b>
1	84.3	155.0	239.3	35.2	17,568,475
2	119.7	294.1	413.9	28.9	17,554,082
3	136.0	415.2	551.2	24.7	17,578,454
4	149.9	520.0	669.9	22.4	17,625,311
5	172.3	645.9	818.3	21.1	17,584,730
6	185.4	790.1	975.5	19.0	17,594,289
7	217.8	1,036.9	1,254.7	17.4	17,582,089
8	265.0	1,357.6	1,622.6	16.3	17,584,163
9	340.9	2,113.8	2,454.8	13.9	17,568,238
10	660.2	5,663.0	6,323.2	10.4	17,606,133
<b>Total</b>	<b>261.0</b>	<b>1,552.8</b>	<b>1,813.8</b>	<b>14.4</b>	<b>175,845,964</b>
<b>Metropolitan Areas</b>					
<b>Decile</b>	<b>Nonmonetary monthly income</b>	<b>Monetary monthly income</b>	<b>Total income</b>	<b>% of Nonmonetary income in total income</b>	<b>Population (Metropolitan)</b>
1	128.6	252.6	381.2	33.7	5,418,921
2	166.5	471.0	637.5	26.1	5,426,690
3	173.0	633.1	806.1	21.5	5,426,444
4	218.3	794.7	1,013.0	21.5	5,426,896
5	216.0	983.0	1,199.0	18.0	5,407,223
6	239.0	1,177.8	1,416.8	16.9	5,419,803
7	296.5	1,516.1	1,812.5	16.4	5,445,709
8	334.3	2,083.2	2,417.5	13.8	5,411,842
9	445.7	3,224.2	3,669.9	12.1	5,424,805
10	748.2	7,314.4	8,062.5	9.3	5,441,970
<b>Total</b>	<b>328.1</b>	<b>2,194.5</b>	<b>2,522.6</b>	<b>13.0</b>	<b>54,250,303</b>

*Note:* The value of average monthly family income obtained by the authors is different from that of found by FIBGE (2004b).

*Source:* Prepared by the authors based on microdata from the Consumer Expenditure Survey of FIBGE – POF/IBGE (2002/03).



Nevertheless, if total income (monetary and nonmonetary) is taken into account, this difference would drop to about 26 times as high. That is, although still high, such a difference would be reduced if nonmonetary income was added. As for the metropolitan areas<sup>7</sup>, the relevance of nonmonetary earnings is similar to that observed for the country as a whole. The average monetary income of the 10% richer is 26 times higher than that for the 10% poorer. However, when the average total income (monetary and nonmonetary) is observed, this difference falls to 21 times as high<sup>8</sup>.

When the current expenditure distribution is analyzed, it can be seen that housing is the highest family expenditure category, followed by food and transportation expense. Healthcare comes fourth as a disaggregated expenditure item<sup>9</sup> showing a nonnegligible percentage - 5.7% of total income. Focusing on healthcare expenditure, the average monthly expenditure with this item in Brazil amounts to R\$ 95.14 (see Table 2).

**Table 2**  
**Value of Expenditure and Participation in Current Expenses**  
**of Larger Groups, Average Monthly Family Income and Average Family Size**

Item	Value (in R\$ as of Jan. 2003)	% of total current expenditure
Food	304.1	18.3
Housing	520.2	31.4
Clothing	83.2	5.0
Transportation	270.2	16.3
Healthcare	95.1	5.7
Hygiene, personal care and services	46.6	2.8
Entertainment and Culture	35.0	2.1
Education	59.9	3.6
Tobacco	10.2	0.6
Miscellaneous	233.8	14.1
Total current expenses	1,658.2	100.0
Average Family Size	3.6	
Average monthly family income <sup>1</sup>	1,813.8	

*Source:* Prepared by the authors based on microdata from the 2002-03 POF of FIBGE.

<sup>1</sup>The value estimated from microdata differs from that presented by FIBGE in the publication of Preliminary Results.

<sup>7</sup> The following metropolitan areas (São Paulo, Rio de Janeiro, Belo Horizonte, Salvador, Recife, Fortaleza, Belém, Curitiba, Porto Alegre), the Federal District – FD – and Goiânia were considered in this paper.

<sup>8</sup> Deciles were constructed based on the distribution for Brazil as a whole. Then, for all these metropolitan areas, people found in each decil were analyzed (in accordance with the income group – decil – established for the country as a whole). We are not discussing distribution and the impacts of nonmonetary income in this work.

<sup>9</sup> However, one should remind that the item “other current expenses” – in which taxes and fees are included – exceeds those with healthcare. Nevertheless, such expenses are not included as consumption expenditure.

Two subitems account for most part of family healthcare expenditure: drugs and healthcare plans. In Brazil, out of the R\$95.14 spent, an average of R\$38.55 would go to drugs and R\$27.07 to healthcare plans, i.e., approximately 60% of such an expense item would be employed in these two subitems (see Table 3).

**Table 3**  
**Average Monthly Family Expenditure and Participation**  
**in Total Healthcare Expenditure of Health Subgroups**

States/ Regions	Value (in R\$ as of Jan. 2003)	% of total healthcare expense
Drugs	39	40.5
Healthcare plans/insurance	27	28.4
Dental appointment and treatment	10	10.1
Medical appointment	5	5.4
Hospitalization, surgery and ambulatory	6	6.6
Diverse tests	3	3.0
Treatment material	5	5.2
Others	1	0.9
Total Health Expense	95	100.0

*Source:* Prepared by the authors from microdata of 2002-03 POF.

Additionally, in a country with high social inequalities like Brazil, differences between healthcare expenditures of poor families and those of richer ones are expected. When analyzing data from Table 5, several items are worth mentioning: 1) poor families are in average twice as greater as those at the last income decil; 2) current expenses of the last income decil are 10 times higher than those for the first decil. Attention should also be drawn to that – up to the seventh decil – monthly family income is lower than current expenditures (budget deficit), and they become positive (surplus) in the following deciles and families in the richest decil show a surplus of approximately R\$1,500. Such a difference is equivalent to the current expenditure of those families placed between the seventh and eighth deciles of expense distribution.

As for healthcare expenditure by subgroups, significant differences by deciles can be observed. Families in the last decile spend in average R\$300.4 per month with healthcare, while those in the first decile spend R\$16.9. Such differences are higher for healthcare plans and insurance and expenditure of families in the last decile amounts to R\$ 117, while those placed in the poorer half of these deciles do not spend more than R\$ 6. Differences are also quite significant as for dental appointment and treatment (a difference equal to 113 times as high between the richest and the poorest deciles) and hospitalization (164 times). As a matter of fact, it is possible to state that these expenditures are almost inexistent in the first deciles; in other words, they are marginal and can be found only for few families. Such differences are smaller as for drugs (5 times as high for the rich) than for other expenditure items. Dada from the PNAD supplement for 2003 (FIBGE, 2005)

show that only 2.9% of family members with earnings lower than the minimum wage<sup>10</sup> possessed healthcare plans, while the corresponding percentage went up 83.8% for people in families whose earnings were higher than 20 minimum wages. This very database also shows that 31% of people in families with up to one minimum wage have never had an appointment with a dentist. This percentage dropped to less than 3% in families with earnings above 20 minimum wages. Differences are lower for medicines (five times as high) than for other expenditure items (see Table 4).

**Table 4**  
**Brazil: Average Monthly Family Expense with Healthcare and**  
**Total Current Expenses, Average Family Size, Average Monthly Family**  
**Income and Population According to Population Deciles**  
(R\$ as of 2003)

Decile	Drugs	Healthcare plans/insurance	Dental appointment and treatment	Medical appointment	Hospitalization, surgery and ambulatory	Diverse tests
1	13.4	0.8	0.3	0.9	0.2	0.5
2	17.3	0.8	1.3	1.1	0.2	0.8
3	20.0	1.1	1.6	1.9	1.4	1.2
4	23.5	2.7	2.4	2.1	0.9	1.7
5	28.7	5.9	3.9	2.9	1.5	2.1
6	31.9	8.0	4.2	3.8	2.7	2.3
7	35.4	13.6	7.3	4.9	3.7	2.9
8	43.5	19.6	10.7	5.4	2.7	2.9
9	55.1	44.4	15.1	8.8	4.9	4.8
10	80.3	117.3	32.9	12.5	32.2	6.2
<b>Total</b>	<b>38.6</b>	<b>26.8</b>	<b>9.6</b>	<b>5.1</b>	<b>6.3</b>	<b>2.9</b>

  

Decile	Treatment material	Others	Healthcare (total)	Total current expenses	Average family size	Average monthly family income
1	0.5	0.4	16.9	462.7	5.4	239.4
2	0.9	0.5	22.9	595.8	4.8	414.0
3	1.8	0.4	29.3	692.1	4.4	551.7
4	1.9	0.5	35.8	796.0	4.0	669.8
5	2.6	0.6	48.2	935.2	3.7	818.5
6	3.1	0.4	56.3	1,038.2	3.4	975.4
7	3.7	0.6	72.3	1,306.5	3.3	1,254.7
8	4.1	1.1	90.0	1,595.3	3.1	1,622.6
9	6.6	0.8	140.5	2,282.0	3.0	2,454.9
10	16.7	2.3	300.4	4,794.6	2.7	6,323.2
<b>Total</b>	<b>4.9</b>	<b>0.9</b>	<b>95.1</b>	<b>1,658.2</b>	<b>3.6</b>	<b>1,813.8</b>

Source: Prepared by the authors from microdata from POF (2002/03) of FIBGE.

<sup>10</sup> In January, 2003, the Brazilian minimum wage was R\$ 200.

**Table 5**  
**Brazil: Participation of Subgroups in Healthcare Expenses by Income Decile**

Decile	Drugs	Healthcare plans/ insurance	Dental appointment and treatment	Medical appointment	Hospitalization, surgery and ambulatory	Diverse tests	Treatment material	Others	Healthcare (total)
1	79.4	4.5	1.7	5.0	1.2	3.1	2.9	2.2	100.0
2	75.7	3.5	5.5	4.6	1.0	3.5	4.1	2.2	100.0
3	68.0	3.6	5.3	6.5	4.7	4.1	6.2	1.5	100.0
4	65.7	7.6	6.8	6.0	2.5	4.7	5.3	1.4	100.0
5	59.6	12.3	8.1	6.1	3.1	4.3	5.4	1.3	100.0
6	56.6	14.1	7.4	6.7	4.8	4.1	5.6	0.7	100.0
7	49.0	18.8	10.2	6.8	5.2	4.1	5.2	0.8	100.0
8	48.3	21.7	11.9	6.0	3.0	3.3	4.5	1.2	100.0
9	39.2	31.6	10.7	6.3	3.5	3.4	4.7	0.6	100.0
10	26.7	39.0	10.9	4.2	10.7	2.1	5.6	0.8	100.0
<b>Total</b>	40.6	28.2	10.1	5.4	6.7	3.0	5.2	0.9	100.0

Source: Prepared by the authors from microdata from POF (2002/03) of FIBGE.

When analyzing the weight of each healthcare component in total expenditure for each income decile, as shown in Table 5, expenditures of the poorest families are concentrated in drugs (79.4% of total healthcare expenditure), while health expenditures for the richest families are concentrated in healthcare plans and insurance (82.8%).

It should be reminded that the existence of SUS is a very important factor to be considered in the analysis of healthcare family expenditures for the poor (see Silveira *et al*, 2002b). The 2003 PNAD analyses (FIBGE, 2005) show that, out of all health assistance in that year, 57.2% were funded by SUS. Furthermore, 98% of people seeking assistance in the two weeks previous to the reference week were attended. A significant number of people not searching for assistance reported that they have not done so because there had been no need for it (97%). Major barriers to healthcare access reported by people not seeking health services when needed (2%) were: financial barriers (23.8%), attendance delay (18.1%) and geographic barriers (12.7%).

Once significant differences among income deciles have just been analyzed, the following section attempts to explain the behavior of families' demand for healthcare as to changes in price and income.

### 3. A Two-Stage Estimation of Demand

#### 3.1 A two-stage budget and estimation of elasticities

Total family consumption is usually composed of low products, as follows: rice, beans, bus, drugs, etc.. For this reason, the demand function estimation requires a series of restrictive hypotheses about consumers' behavior. Alternatively, knowledge of all prices and quantities of all consumption

items would be required and this would make the model implementation virtually impossible. Solving these problems Deaton and Muellbauer (1980) proposed a functional form for the demand function called *Almost Ideal Demand System (AIDS)*, which is described below:

$$w_i = \alpha_i + \sum_j \gamma_{ij} \ln p_j + \beta_i \ln(x/P) \quad (1)$$

$$\ln P = \alpha_0 + \sum_k \alpha_k \ln p_k + \frac{1}{2} \sum_k \sum_l \gamma_{kl} \ln p_k \ln p_l \quad (2)$$

$$\gamma_{ij} = \frac{1}{2}(\gamma_{ij}^* + \gamma_{ji}^*) = \gamma_{ji} \quad (3)$$

where,  $w_i$  is the expenditure share of product  $i$ ;  $p_j$  is the price of all products comprising the individual consumption basket and  $x$  corresponds to consumption expenditure.

It is necessary a parameter restriction to guarantee the demand function properties: additivity, homogeneity, and symmetry. The additivity property guarantees that changes in  $i^{\text{th}}$  commodity price and/or consumer income don't change expenditure budget. The homogeneity property in turn states that when  $i^{\text{th}}$  commodity price ( $p_i$ ) and income ( $x$ ) change at the same direction and proportion, the budgeting share of  $i$ -th commodity does not change. Symmetry guarantees that cross-price elasticities of commodity  $i$  in relation to commodity  $j$  is equal to the cross price elasticity of product  $j$  in relation to product  $i$ .

1) The additivity property requires, for every  $j$ , that

$$\sum \alpha_i = 1, \quad \sum_i \gamma_{ij} = \sum \beta_i = 0 \quad (4a)$$

2) Homogeneity is met if – and only if – for every  $j$

$$\sum_i \gamma_{ji} = 0 \quad (4b)$$

3) Whereas symmetry is satisfied provided that

$$\gamma_{ij} = \gamma_{ji} \quad (4c)$$

Estimating the unrestricted model (1) automatically satisfies the additivity property (4a). However the restrictions (4b) and (4c) need to be tested.

From the econometric point of view, the major characteristic of model AIDS is its quasi-linearity, although  $P$  as described in (2) is a nonlinear component in this model. Deaton and Muellbauer (1996, cap 3, pp. 76) argue that restrictions on parameters  $g$  and  $a$  turn  $P$  a linear homogenous function of individual prices. Once price are collinear  $P$  could be substitute by a price index, e.g., the Stone Price Index, which is given by  $\sum w_i \ln p_i$ .

This linear approximation of model AIDS is known in the literature as LAIDS and it is usually estimated as follows:

$$w_i = \alpha_i + \sum_j \gamma_{ij}^* \ln p_j + \beta_i \ln \left( \frac{x}{P^*} \right)$$

$$P^* = \sum w_i \ln p_i \quad (5)$$

$$\sum \alpha_i = 1, \quad \sum_i \gamma_{ij}^* = \sum_j \gamma_{ji}^* = \sum \beta_i = 0$$

The functional form of the individual demand function described above can be easily aggregated for families. The problems and hypotheses related to this aggregation feasibility are detailed in chapter 6 in Deaton and Muellbauer (1996) and are also presented in Deaton and Muellbauer (1980). The resulting functional form is similar to that proposed above.

Deaton and Muellbauer (1996a, sec. 5.2) proposed that estimating demand function for all products in their lowest level of aggregation (drugs, rice, buses, etc.) is based on a two-stage budget estimation. For this, the hypothesis of feable separability of preferences will suffice. The idea is a simple one and implies that budget resources are allocated in two independent moments.

The functional form described in (5) is estimated in two stages. Firstly, budget is allocated in  $n$  groups of aggregated products, i.e., food, housing, clothing, healthcare, etc. Secondly, expenses with healthcare group are distributed among products comprising drugs, healthcare plans, medical and dentistry appointments, etc.

However, an important problem still remains related to budget allocation in the first stage. It consists in the difficulty of substituting a single price index for the price of all products. The necessary and sufficient conditions for consistency in price aggregation are discussed in Gorman (1956). The two conditions he described basically imply the following: firstly, that preferences are homothetic within each group, turning conditional income elasticities into unitary ones. The second condition implies the hypothesis of a strong separability of preferences. Both conditions are very restrictive and somehow implausible. However, authors like Michalek and Keyser (1992), and Edgerton (1997) show that a two-stage budget leads to a nearly correct budget allocation under two plausible conditions: firstly, that the feable separability theorem of preferences is satisfied; secondly, that the price index of each group is not so sensible to changes in utility function. Under such conditions, relations between elasticities in the two stages are liable to be maintained.

### 3.2 Estimating the model

Following Edgerton (1997) the Two-Stage Budgeting System-TSB was estimated using LAIDS model. TSB is applied in this study to estimate a demand function for Brazil and – based on estimated parameters – price and expenditure elasticity are estimated for the healthcare subgroup. This estimation strategy takes for granted that – in the first stage – the consumer chooses the amount of personal income to be spent in food, housing, clothing, transportation, healthcare, hygiene and personal care expenses, entertainment, tobacco, and education. In the second stage,

consumer's expenses would be allocated in four subgroups as for healthcare expenditure: drugs, healthcare plans and insurance; dental treatment and medical appointments. In the first stage, the complete model is described as follows:

$$w_{rmk} = \alpha_0 + \sum \gamma_{rs} \ln p_{rm} + \beta_r \ln[x_{mk} / P^*] + Z_{mk} + \xi_{rmk} \quad (6)$$

where:  $w_{rmk}$  is the participation of group  $r$  of income level  $k$  of RM (meaning metropolitan area)  $m$ ;  $\ln p_{rm}$  is the logarithm nepperian price of products of group  $r$  in RM  $m$ ;  $x_{mk}$  corresponds to the average family income of level  $k$  in RM  $m$ . Finally,  $Z_{mk}$  corresponds to the demographic variables that may be affecting family consumption and  $x$  is the random term. The AIDS model is nonlinear; for estimation purposes, its linearization follows that of Deaton and Muellbauer (1980). Thus, price index  $P^*$  corresponds to the Stone Price Index given by:  $\ln P^* = \sum w_{rmk} \ln p_{rm}$

In the second stage, the model described below is specified as follows:

$$w_{i(r)mk} = \alpha_0 + \sum \gamma_{i(r)s} \ln p_{i(r)m} + \beta_{i(r)} \ln[x_{mk} / P^*] + Z_{mk} + \xi_{i(r)mk} \quad (7)$$

This model is similar to the previous one, except for that the participation of product  $I$  in total expenditure with group  $r$  is now estimated.

Estimating demand function in two stages provides several advantages, the major of which is a flexible functional form. The products are found in their lowest level of aggregation, with some degree of segmentation, such as fruits, cereals, etc. However the AIDS model is estimated using a higher aggregation level, that places some restrictions on the demand pattern. As competition among different products tends to be greater within the same subgroup, such a restriction among products in different subgroups is taken as an advantage of model LAIDS. A second advantage of this model is that aggregation of consumer's preferences does not require a linear Engel curve, which is greatly relevant for this study, since data used here possess some aggregation degree. Finally, another convenient property of demand function – derived from model LAIDS – is that it necessarily crosses the price axis, impeding the emergence of virtual or negative prices.

Based on the demand system (6), expenditure, own, and cross price elasticity of demand can be derived. In the first stage, they assume the following format:

$$\eta_r = 1 + \frac{\beta_r}{w_r} e^{\varepsilon_{rs}} = \frac{\gamma_{rs} - \beta_r w_s}{w_r} - \delta_{rs} \quad (8)$$

whose share of each group of commodities in the budget being defined as

$$w_r = (P_r Q_r)/y \quad (9)$$

where  $h_r$  is income elasticity,  $e_{rs}$  price elasticity and  $d_{rs}$  is the Kronecker delta, which is equal to 1 for  $s = r$ , and zero for otherwise. The price index and quantity vectors are  $P_r$  e  $Q_r$ , respectively. In the second stage, income and price elasticities, and conditional cross price elasticity are estimated in a similar way as those in the previous one, i.e.,:

$$\eta_{(r)i} = 1 + \frac{\beta_{(r)i}}{w_{(r)i}} e \varepsilon_{(r)ij} = \frac{\gamma_{(r)ij} - \beta_{(r)ij} w_{(r)j}}{w_{(r)i}} - \delta_{ij} \quad (10)$$

The share of product  $i$  in total expenditure of group  $r$  is given by

$$w_{(r)i} = (p_{ri} \cdot q_{ri})/x_r \quad (11)$$

where  $h_{(r)i}$  is the income elasticity and  $e_{(r)ij}$ , price elasticity and cross price elasticity, estimated within each group. Once more,  $d_{ij}$  is the Kronecker delta, which is equal to 1 for  $i = j$ , and zero for the remaining cases.

Elasticities, as those found in (10), describe percentage variations of price and income in relation to expenditures within each group. Combining results in the first and second stages is a need so as to find elasticities in relation to total expenditures.

Additionally, it is worth emphasizing that income and substitution effects are embedded in the formula for the above price elasticity<sup>11</sup>. In order to identify the substitution effect alone derived from price variation, using an estimation formula for compensated price elasticity is required. Elasticities of total income, total price, and total compensated price are defined in accordance with Edgerton (1997) and they show the following format:

$$E_i = h_{(r)i} \cdot h_i \quad (12)$$

$$e_{ij} = \delta_{rs} \varepsilon_{(r)ij} + \eta_{(r)i} w_{(s)j} [\delta_{rs} + \varepsilon_{rs}] \quad (13)$$

$$\tilde{e}_{(r)(s)} = \varepsilon_{rs} + E_{(r)j} w_{(s)} \quad (14)$$

$$\tilde{e}_{ij} = \delta_{rs} \tilde{e}_{(r)ij} + E_{(r)i} w_{(s)} \tilde{e}_{(r)(s)} \quad (15)$$

where total expenditure elasticity is  $E_r$ , and total price elasticity  $e_{ij}$ . The total compensated price elasticities for the group and product are defined as  $\tilde{e}_{(r)(s)}$  e  $\tilde{e}_{ij}$ . Equation (13) may be interpreted as follows: for two commodities  $i$  and  $j$  of group  $r$ , total price elasticity ( $e_{ij}$ ) is equal to its price elasticity within group  $r$  ( $\varepsilon_{(r)ij}$ ), increased by a factor equal to the relative change in the price index [ $1 + e_{rs}$ ], multiplied by its effect on expenditures with group ( $w_{(r)i}$ ) and expenditure elasticity within group ( $h_{(r)i}$ ).<sup>1j</sup>

<sup>11</sup> For a definition of income and substitution effects, see Pindyck and Rubinfeld, 1994. Microeconomia. Editora Makron Books do Brasil, Edição 2, São Paulo.



When price elasticity among groups is equal to the unit ( $e_{rr} = -1$ ), expenditures with this commodities group are not affected by price variation, i.e., total elasticity is equal to conditional elasticity  $e_{ij} = e_{(r)ij}$ . On the other hand, if  $e_{rr} = 0$ , then price variation has an effect on expenditures with this commodities group in the same proportion. It should be also noted that the smaller the income elasticity within group ( $h_{(r)i}$ ) and participation ( $w_{(r)i}$ ), the smaller the difference between price elasticity within the group ( $e_{(r)ij}$ ) and total price elasticity ( $e_{ij}$ ).

#### 4. Estimation of Elasticities and Analysis of Results

This paper was prepared based on microdata from POFs of FIBGE for 2002-03. For the first stage, such data were aggregated in 10 income levels and 10 metropolitan areas, and 100 observations by groups of products selected by FIBGE were dealt with in the first stage. The metropolitan areas (RMs) studied were: Belém, Fortaleza, Recife, Salvador, Belo Horizonte, Rio de Janeiro, São Paulo, Curitiba, Porto Alegre and the Federal District<sup>12</sup>. The product groups included in the analysis are those aggregated by FIBGE, namely: food, housing, clothing, transportation and communications, healthcare, hygiene and personal care, entertainment, culture and tobacco, and education.

Equations (6) and (7) were estimated using the method Iterative Seemingly Unrelated Regression (ISUR), which is equivalent to Full Information Maximum Likelihood (FIML). When ISUR is used for estimating LAIDS model, the additivity property of demand function turns the variance and covariance matrix of the system into a singular one. The solution of the mentioned problem consists in removing one of the equations from the system; whatever the equation is removed, the result is the same. All other prices must be normalized by the price of the equation previously removed in order that homogeneity property is kept. The coefficients of the equation absent from the system are recovered a posteriori in function of the additivity property. The symmetry property is introduced during the estimation. Afterwards, the coefficients are used for estimating elasticities, and the significance of elasticities is estimated based on the delta method as proposed by Deaton (1986).

Table 6 shows the first stage estimated coefficients. The own price and expenditure elasticities were calculated substituting such coefficients in equations 8 and 9. All expenditure elasticities estimated in the first stage showed positive and significant signs (see Table 7). The group food alone was considered as necessary, since its income elasticity was smaller than the unit. Elasticities for transportation<sup>13</sup>, healthcare and education were higher than the unit and these may be considered as luxury goods. Goods in the remaining groups were considered as normal, since their elasticities were near 1. Table 7 also describes price elasticity and compensated cross-price elasticity, which were estimated based on equation (14). It was then tested whether estimated price elasticities were different from zero. All compensated price elasticities were different from zero with a probability at 10%.

<sup>12</sup> The price vector for POF 2002/03 was constructed based on prices made available by FIBGE for 1999 and brought to 2003 by means of IPCA (amplified consumer's price index) for the period. As information on drugs for Goiânia was not available in the original data, this city was not included

<sup>13</sup> It is worth noting that the result found for transportation is due to that "expenses with fuel" are include in transportation expenses. The result would be different if elasticity related to public transportation alone was estimated.

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**Table 6**  
**Estimated Coefficients for the Demand Function by Groups of Products – POF (2002-03)**

2002/2003							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant	0.071	-0.040	-0.075	-0.002	0.017	0.076	-0.047
(t-val)	(1.34)	(1.74)	(4.22)**	(0.05)	(0.50)	(2.45)*	(2.43)*
Food	-0.040	-0.003	0.030	-0.010	0.000	-0.010	0.039
(t-val)	(1.74)	(0.17)	(2.92)**	(0.45)	(0.01)	(0.75)	(3.63)**
Housing	-0.075	0.030	-0.007	0.071	-0.011	0.019	-0.018
(t-val)	(4.22)**	(2.92)**	(0.47)	(3.73)**	(0.79)	(2.16)*	(1.88)
Clothing	-0.002	-0.010	0.071	-0.104	-0.008	-0.021	0.079
(t-val)	(0.05)	(0.45)	(3.73)**	(2.34)*	(0.29)	(1.03)	(4.81)**
Transportation	0.017	0.000	-0.011	-0.008	0.008	0.002	-0.027
(t-val)	(0.50)	(0.01)	(0.79)	(0.29)	(0.22)	(0.07)	(1.89)
Healthcare	0.076	-0.010	0.019	-0.021	0.002	-0.050	-0.017
(t-val)	(2.45)*	(0.75)	(2.16)*	(1.03)	(0.07)	(1.45)	(1.83)
Hygiene and personal care	-0.047	0.039	-0.018	0.079	-0.027	-0.017	0.007
(t-val)	(2.43)*	(3.63)**	(1.88)	(4.81)**	(1.89)	(1.83)	(0.46)
Entertainment, Culture and Tobacco	-0.107	0.003	-0.008	0.052	0.022	0.003	0.032
(t-val)	(6.79)**	(0.25)	(1.30)	(4.68)**	(2.82)**	(0.69)	(4.29)**
Income	0.002	0.002	0.000	-0.003	-0.000	-0.001	0.001
(t-val)	(0.74)	(1.21)	(0.02)	(1.68)	(0.27)	(1.50)	(0.56)
Schooling	-0.038	0.005	0.006	0.031	-0.008	0.005	-0.009
(t-val)	(1.64)	(0.28)	(0.73)	(1.86)	(0.71)	(0.82)	(0.85)
Age	4,E -04	-7,E -05	6,E -05	-4,E -04	1,E -04	-5,E -05	1,E -04
(t-val)	(1.65)	(0.35)	(0.61)	(1.97)*	(0.83)	(0.74)	(0.84)
Age*Age	-0.039	-0.131	0.029	0.075	0.007	0.004	0.02 9
(t-val)	(0.70)	(3.20)**	(1.39)	(1.88)	(0.25)	(0.29)	(1.12)
Gender	0.015	0.051	-0.018	-0.053	0.007	-0.017	-0.020
(t-val)	(0.57)	(2.77)**	(1.62)	(2.74)**	(0.51)	(2.29)*	(1.54)
Race/ethnical origin	1.965	0.006	-0.214	-0.928	0.182	0.190	-0.054
(t-val)	(3.80)**	(0.02)	(1.14)	(2.58)*	(0.67)	(1.05)	(0.22)
Observations	100	100	100	100	100	100	100

Absolute value of z statistics in parentheses

\* significant at 5%; \*\* significant at 1%

**Table 7**  
**Expenditure Elasticity, Price Elasticity, and Compensated Cross-Price Elasticity for Groups of Nondurable Goods – POF (2002-03)**

	2002/2003							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<b>Expenditure Elasticity</b>	<b>0.673</b>	<b>1.014</b>	<b>0.907</b>	<b>1.327</b>	<b>1.272</b>	<b>1.055</b>	<b>1.638</b>	<b>1.074</b>
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Price and Compensated Cross-Price Elasticity								
Food	<b>-0.46</b>							
(p)	(0.00)							
Housing	0.08	<b>-0.81</b>						
(p)	(0.24)	(0.00)						
Clothing	-0.15	0.23	<b>-1.00</b>					
(p)	(0.01)	(0.00)	(0.00)					
Transportation	0.15	0.11	1.02	<b>-1.50</b>				
(p)	(0.18)	(0.32)	(0.00)	(0.00)				
Healthcare	0.13	0.08	-0.06	0.03	<b>-0.82</b>			
(p)	(0.21)	(0.35)	(0.74)	(0.88)	(0.08)			
Hygiene and personal care	0.28	0.00	0.28	-0.08	0.07	<b>-1.96</b>		
(p)	(0.00)	(0.97)	(0.01)	(0.52)	(0.85)	(0.00)		
Education	-0.09	0.24	-0.17	0.55	-0.28	-0.29	<b>-0.82</b>	
(p)	(0.11)	(0.00)	(0.15)	(0.00)	(0.11)	(0.12)	(0.00)	
Entertainment, Culture and Tobacco	0.05	0.02	-0.06	0.01	0.27	0.00	-0.01	<b>-1.34</b>
(p)	(0.27)	(0.07)	(0.00)	(0.85)	(0.52)	(0.03)	(0.01)	(0.00)

Probability – accept  $H_0$  (in parentheses)

Groups including food, dwelling, healthcare and education are inelastic as their elasticities are smaller than the unit. As expected, cross-elasticities of price are usually nonsignificant or very low. Particularly for the healthcare group, based on the elasticities' signs, the relations between "healthcare and clothing" and "healthcare and education" are perceived to be of substitution, i.e., a rise in price in the healthcare group reduces expenses in these two other groups.

Parameters estimated for the second stage can be found in Table 8. This table describes the estimated coefficients for the product price and income for each equation of the system. Symmetry and homogeneity properties are put. Equation for medical appointments has not been included in the model due to the singularity of the variance and covariance matrix. Additional explaining variables were included aiming at capturing the demographic characteristics that would be affecting the consumers' behavior, such as: gender and age of householder, squared age and race of householder.

Table 9 describes total income elasticities (which were estimated based on [12]) elasticities of total price and total cross-price elasticity both compensated and estimated based on (15). Such elasticities were estimated for the subgroups in the healthcare group described above. The subgroup drugs alone may be considered a necessary good as it is the only one presenting a smaller than 1 income elasticity.

**Table 8**  
**Estimating Coefficients for Demand Function in the Second Stage for Subgroups of the**  
**Healthcare Group Based on Data from POF (2002-03)**

	2002-03		
	(1)	(2)	(3)
Constant	-2.251	-0.019	3.656
(t-val)	(1.29)	(0.01)	(2.48)*
Drugs	0.023	0.002	-0.060
(t-val)	(0.46)	(0.05)	(2.00)*
Healthcare plans/insurance	0.002	-0.067	0.070
(t-val)	(0.05)	(1.12)	(2.20)*
Dental appointment and treatment	-0.060	0.070	0.044
(t-val)	(2.00)*	(2.20)*	(1.38)
Income	-0.1 98	0.063	0.128
(t-val)	(7.44)**	(1.98)*	(5.85)**
Schooling	0.003	0.012	-0.022
(t-val)	(0.33)	(1.11)	(2.91)**
Age	0.145	-0.015	-0.156
(t-val)	(1.84)	(0.16)	(2.37)*
Age* age	-0.002	0.0004	0.002
(t-val)	(1.82)	(0.39)	(2.08)*
Gender	-0.003	-0.132	0.225
(t-val)	(0.02)	(0.73)	(1.70)
Race/ethnic origin (t-val)			
R2	0.84	0.67	0.50
Observations	99	99	99

Absolute value of z statistics in parentheses

\* significant at 5%; \*\* significant at 1%

Price elasticities show the expected signs, characterizing a semi-defined negative matrix. Then, a test has been done so as to verify whether the estimated price elasticities were different from zero.  $H_0$  at 5% was not rejected, which indicated inelastic prices (as price elasticities were smaller than 1). Healthcare was probably a necessary good for higher deciles. However, it should be considered a luxury good for lower deciles as these population strata took recourse of services rendered by SUS. “According to PNAD for 1998, no less than 95% of medical appointments and 93% hospitalizations of people belonging to the poorer 20% of population were covered by SUS services. This coverage progressively decreased as richer population strata were considered” (Silveira *et al*, 2002a).

As for income elasticity, ever since the work presented by Newhouse (1977) attempts have been made to determine whether healthcare is a luxury good or not (income elasticity higher than

the unit). One can not say that such efforts are conclusive. Getzen (2000) argues that income elasticities would be lower than the unit when individual expenses are considered, but higher than the unit for the cross-country data or aggregated data of healthcare expenditures and national income. However, in a literature review presented by this very author, health subgroups would show differentiated income elasticities: medical care expenses would show an income elasticity lower than the unit (necessary goods), whereas dental treatment could usually be considered a luxury good. For Getzen, the higher the aggregation level of data used for analysis, the higher the income elasticity. On the other hand, Rossi and Triunfo (2004), using data for family expenditures, found that the income elasticity of aggregated healthcare expenditure of people living in Montevideo would allow concluding that this was a luxury good.

As shown before, healthcare expenditures in Brazil are much concentrated in the superior deciles, while expenditures with drugs show a proportionately more significant impact on lower-income population. Therefore, even if elasticities may be found high, it seems reasonable to consider healthcare plans as a luxury good in Brazil.

The relation between substitution and complementarity among components of the healthcare group mostly meet the expectation, although coefficients are higher than expected. For example, a price rise in healthcare insurance and plans increases medical care and drugs expenses with and reduces dental treatment expenses. The relation between medical appointments and healthcare insurance is expected to be that of substitution. We were not able to establish a hypothesis for the relation between drugs and medical appointments. The remaining relations are those of complementarity.

**Table 9**  
**Expenditure Elasticity, Price Elasticity and Compensated Cross-Price Elasticity of Expenditure for Healthcare Group-POF (2002-03)**

	2002-03			
	Drugs	Healthcare plans/insurance	Dental appointment and treatment	Medical appointment
<b>Expenditure Elasticities</b>	<b>0.86</b>	<b>2.21</b>	<b>1.53</b>	<b>1.06</b>
(p)	(0.00)	(0.00)	(0.00)	(0.00)
Price and Compensated Cross-Price Elasticity				
Drugs	-0.09			
(p)	(0.84)			
Healthcare plans/insurance	<b>0.51</b>	0.44		
(p)	(0.00)	(0.33)		
Dental appointment and treatment	<b>0.26</b>	<b>-0.40</b>	-0.05	
(p)	(0.00)	(0.00)	(0.90)	
Medical appointment	-0.09	<b>0.65</b>	<b>0.53</b>	-0.01
(p)	(0.27)	(0.00)	(0.03)	(0.87)

## 5. Conclusions and Perspective for Future Studies

The present study aimed at analyzing family expenditures, especially focused on healthcare expenses. Previously to the analysis itself, we emphasized the importance of nonmonetary earnings being introduced in the POF for 2002-03. As has been observed, such earnings are proportionately more important for poorer families than for richer families and their introduction makes differences to decrease between deciles. However, such differences are still very high. As for current expenditures, the data analysis has indicated that healthcare is placed fourth as a proportion of disaggregated item of family expenses. Furthermore, drugs and healthcare plans represented the major amount of expenses with health in all states of the federation, accounting for 60% of the total for Brazil.

When the analysis is carried on by means of income deciles, it becomes clear that families at the last decile show expenditures with healthcare insurance and plans 146 times as higher as than those for families in the first decile. Differences are smaller for the subgroup of drugs (5 times as high). This subgroup has an important weight in poor families' expenditures with healthcare. These families allocate 79.4% of healthcare expenses for this component, while rich families allocate 82.8% of healthcare expenses with healthcare plans and insurance.

The two-stage demand estimates have revealed income elasticity higher than the unit, while health is indicated as an inelastic good by the price-elasticity estimates. Such a result is valid for all health subgroups.

This study is in line with others already accomplished focusing on both healthcare expenditures and general demand estimation. However, much work is to be done so as to better understand family decision-making concerning healthcare expenditure, interrelations between private expenditures and government expenditure, and the role of service supply as to private expenditure in Brazil. Additionally, the authors are willing to advance in intertemporal analyses, comparing the results of three POFs (1987-88, 1995-96 and 2002-03), in an attempt to answer questions, such as: 1) how do healthcare patterns of family expenditures change during this period? 2) What is the relevance of SUS in this system? 3) Which is the role of healthcare plans. And 4) did price elasticity change in the period? Furthermore, analysis of specific markets should also advance, such as those of healthcare plans and insurance and that of drugs. These questions show that much has to be studied in the field of health economy.

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