

The Connection between Cohort Income Inequality, Health Gradients and Labor Force Characteristics of the Brazilian Elderly *

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Abstract

Our paper addresses inequality in income older age (~ 50 and older) in Brazil. The focus is on individual level and systemic factors associated with these differences, and on the ways such inequalities impact on well-being and the quality of life of older persons. Particularly, we investigate the robustness of the connection between cohort income inequality, health gradients and labor force characteristics of Brazilian elderly, with attention to the effects of race and changing family living arrangements as potential confounders. Using data from 1998 to 2008 Brazilian household sample surveys, the paper addresses the discussion of inequality and poverty among elderly in Brazil, in the context of the country's demographic changes, at the macro-level, to a rapidly ageing population, and at the micro-level, to an increase in unconventional living arrangements. The hypothesis is that those changes are crucial to the analysis of the trends of the relationship between the socioeconomic status and health of the elderly in Brazil.

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Introduction

Brazil is one of the countries with the greatest inequality in the world. The richest 10 percent of the population concentrate the highest proportion of resources (47% of total income), and the poorest 40 percent receive the lowest proportion (8%). This high inequality in Brazil encompasses several dimensions. First, the poor not only get lower incomes than the rich, but they share this income among more individuals, resulting in greater income per capita inequalities. Other characteristics that make the households in the top 10 percent of the distribution different from the poorest 30 percent are education, health and labour force participation. One interesting aspect about these characteristics is that these are strongly interrelated decisions made within the family (and not only at the individual level). One complication is that the causality between the variables is obviously very difficult to disentangle.

The purpose of this paper is to shed some light on the large differences between poor and rich Brazilian households regarding health outcomes of the elderly population, i.e., understanding inequality in health outcomes in Brazil, examining the link between the health of Brazilian elderly and a variety of socioeconomic factors. Finding appropriate measures of health status is a challenge. Primarily, this is an examination of the well-being across the distribution of family income. Goods and services provided by income are not all that there is to the well-being of a population. Health is not only instrumental in enabling people to earn a living, and to enjoy the fruits of their labour, but is an important element of well-being in its own right. Health status is correlated with income for individuals, but the correlation is far from perfect so that looking at health leads to different assessments of well-being than come from looking only at income.

Decades of research about older people indicate a strong association between level of wealth and status of health. This association has led some to conclude that senior citizens who have more household wealth are healthier simply because they can afford better health care as they age. The implication of this view is that programs providing poorer elderly citizens with more funds for health care would minimize the existing disparity in health status and enable these poorer individuals to function as effectively as their wealthier counterparts. More-recent research, however, has suggested that this diagnosis and its accompanying prescription are based on an oversimplified picture of the interrelationship between health and wealth. Therefore, there is not a clear grasp of how health and socioeconomic status (SES) interact and affect the lives of the elderly.

In this paper, we consider some components of health and income. In particular, we are concerned with the implications of inequality in the health domain, and whether health inequality in Brazil is linked to income inequality. Social inequality in health is a widely recognized problem. It is well known that wealthy people live longer and have lower morbidity, on average, than do poor and less well educated people. However, the magnitude of the differences varies across ages. In general, health is more related to socioeconomic status in extreme ages. The positive correlation between income and health is not limited to the extremes of the income distribution. The gradient in health status, i.e. relatively wealthier people have better health, is evident throughout the income distribution. The hypothesis is that there are strong gradients, so that people in the bottom quantiles report worse outcomes than do people in the top quantiles. Moreover, in the bottom quantiles of income, positive outcomes decline more rapidly with age. These facts motivate a study of the role of family structure in health outcomes. The central argument is that there is a strong relationship between these outcomes and measures of family structure and socioeconomic status,

including income and employment of their members.

There are multiple causal links between these variables. Income and education affect health, and health affects the ability to be educated and the ability to work. There are also third factors that affect the variables, and that contribute to the correlation between them. It is difficult to determine whether the relationship exists primarily because health and education affects socioeconomic status, whether socioeconomic status has a direct impact on health and education, or whether both are affected by some third factor; in other words, it is difficult to find a single correct answer to this question of causality. Since it means the effect of one endogenous variable on another with unobserved variables/processes influencing both, correlations are made, not causation, controlling for other variables.

Until recently there has been little or no data with which to assess the nature and magnitude of the role which socioeconomic factors play in the incidence and severity of such problems. Using a large and nationally representative data set, we investigate whether the Brazilian health of the elderly is positively related to household income, and whether the relationship between household income and health status becomes more pronounced as people grow older.

We use data from the 1998 and 2008 National Household Sample Survey (PNAD) - Health Supplement, of the Brazilian Census Bureau (IBGE), to present evidence on income gradients and estimate the correlation of elderly health, family structure and some potential sources of financial resources available to the family. Although there are numerous studies investigating the impact of family resources on health outcomes and research on elderly well-being is certainly not a new area, whether income and family structure truly matters is still a debated issue. The promotion and assessment of well-being are topics of increasing concern to researchers, policy makers and the public as a whole. Our findings are of interest because they provide insight into the determinants of elderly well-being. Hypotheses on the causes of the relationship between income and health are difficult to untangle in adulthood, and there is little consensus on the relative importance of mechanisms that lead from low income to poor health and of those that lead from poor health to low income.

The outline of the paper will be as follows: we begin by describing the data and variables used in the analysis. Then we establish some facts about the relationship between elderly's well being and the distribution of family income in Brazil. We then explore the extent to which the relationship between income and health can be explained by other characteristics of the social environment, such, presenting descriptive statistics and the results of our multivariate analysis.

Descriptive Analysis of Data

In our analysis we use data from the 1998 and the 2008 PNAD (Pesquisa Nacional por Amostra de Domicílios – Brazilian Household Sample Survey), accomplished by the *Instituto Brasileiro de Geografia e Estatística* – IBGE – (the Brazilian census bureau). PNAD is a cross-sectional survey that collects annual data of a large nationally representative sample of households, whose members are either interviewed directly. There are 345,000 people in the sample each year. Our interest is in understanding the relationship between family income and structure and the health of the elderly, and for this reason we restrict our core sample to all individuals aged 50 years and over for whom family income is reported.

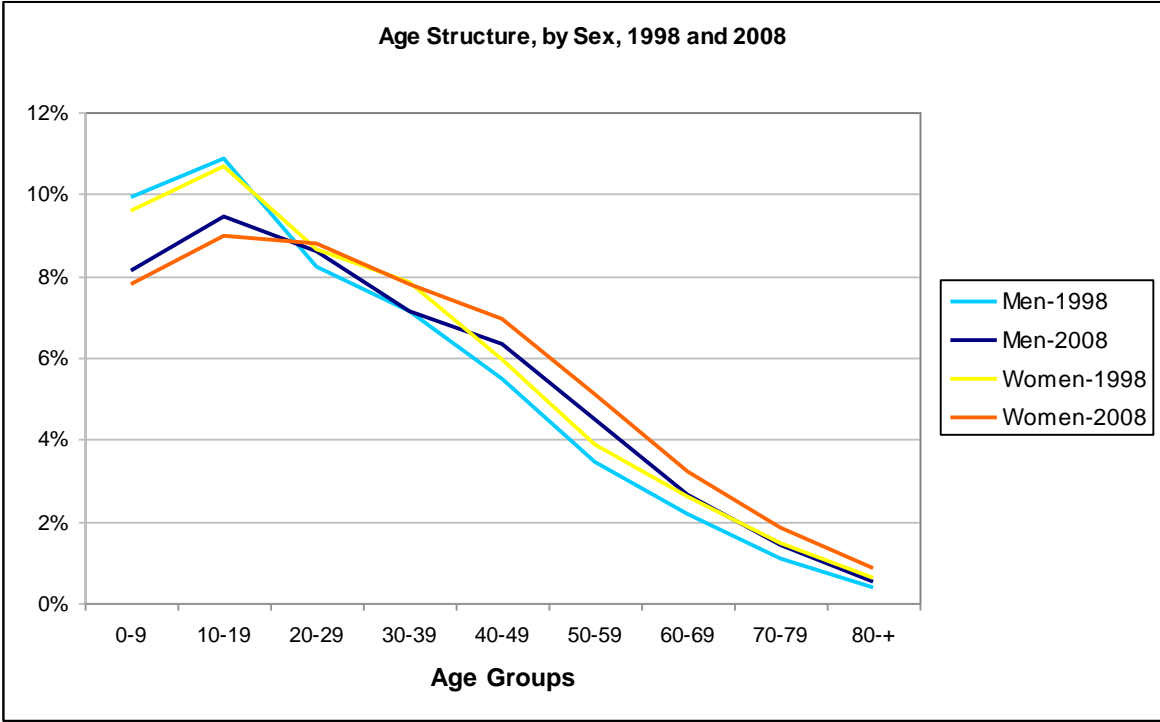
PNAD presents socioeconomic information for each family that is interviewed. The survey has an additional survey on health issues and also collects extensive information on chronic

and acute health conditions, doctor visits, and hospital stays, for Brazilian adults and children. Demographic, education, labour force, income and health information is collected for all members of the household. The health related questions include self-reported measures of health status (five different answer categories: very good, good, fair, poor, or very poor)¹, chronic conditions (12 kinds, including asthma, heart disease, etc.), whether the individual was hospitalized in the past year, and measures of physician care. It is likely that all self-reported measures of health status suffer from some biases, and some of these biases may vary with socioeconomic status. For instance, individuals of higher socioeconomic status may be more likely to be diagnosed given that they have chronic conditions. In this sense, we do not choose a best measure, but examine a range of available measures.

We implicitly assume in our multivariate analyses that health is the outcome of socioeconomic factors such as income and family structure. It is certainly possible, however, that the opposite causal effect may be true in some cases. For example, severe health problems may reduce family income by limiting the paid work. Unfortunately, there is little that can be done about this problem currently given the lack of identifying variables for a more complete structural model. Our approach is best viewed as one means of exploring the joint distribution of the variables which we believe to be of relevance to the process which determines health and development.

The next figures contain descriptive statistics for our sample, on the set of variables we analyze, by family income deciles.

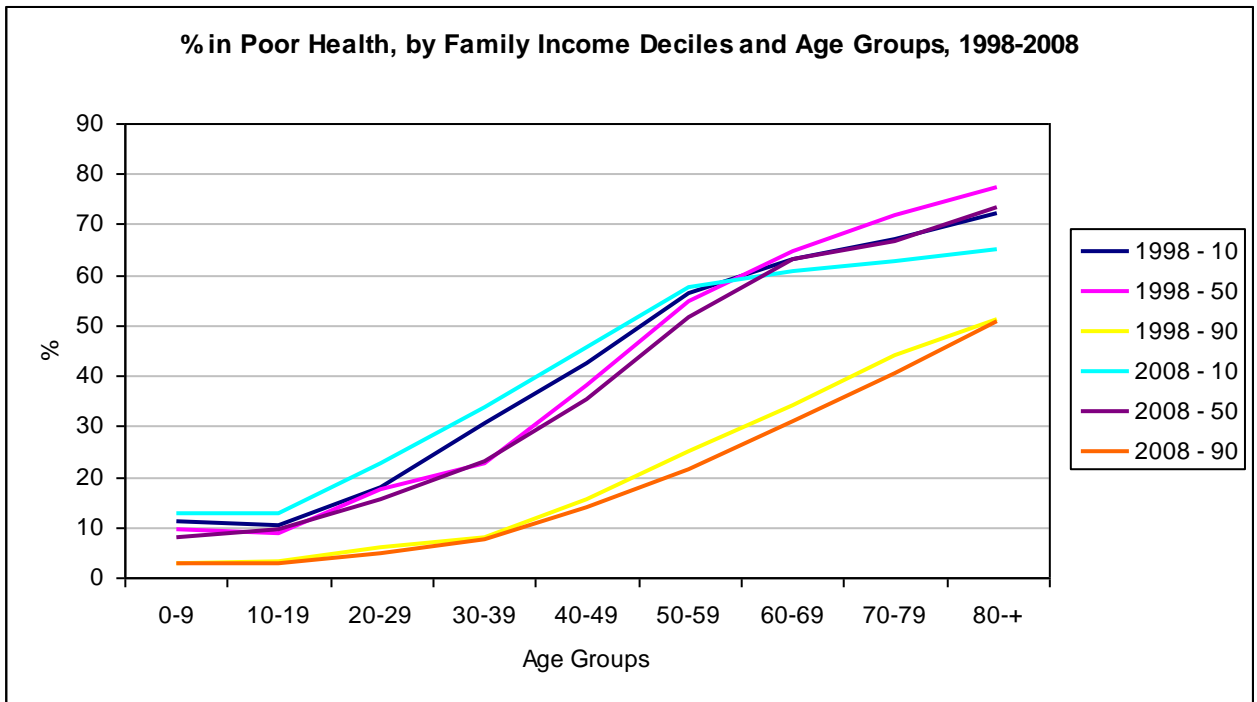
Figure 1



Source: PNAD 1998 and 2008.

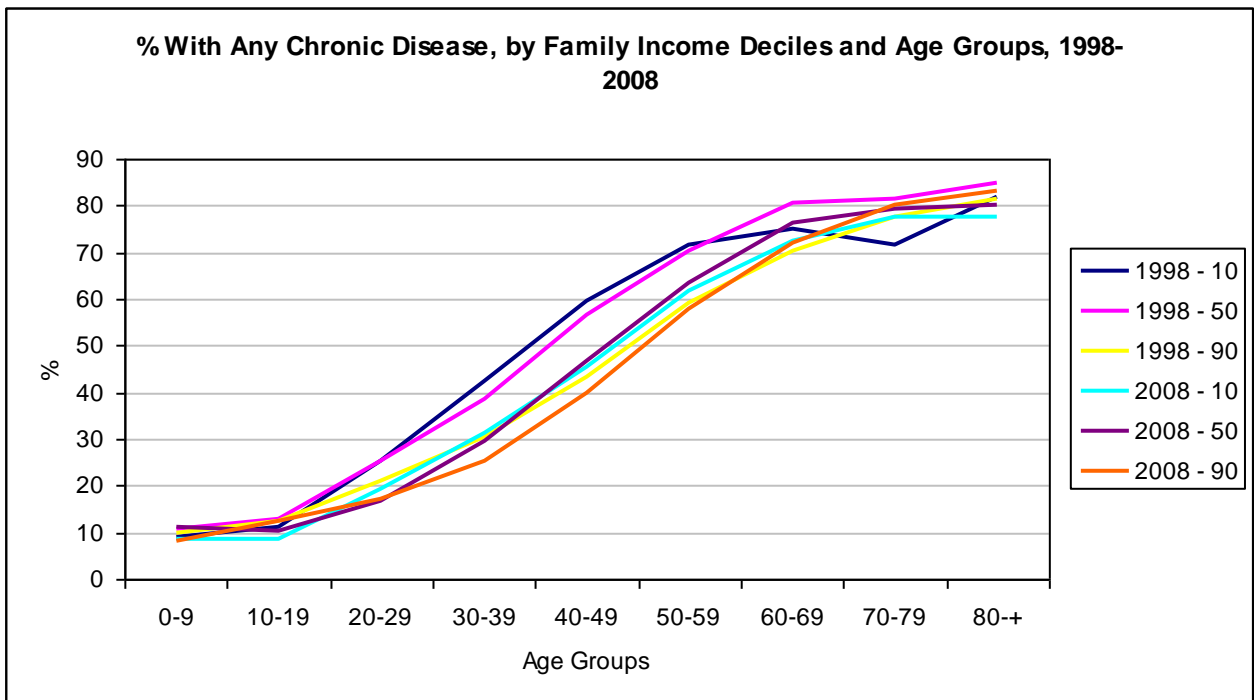
Figure 2

¹ Health is rated on a scale of 1 to 5, with 1 being poor and 5 being excellent. We define poor health as the bottom three measures on this scale and good health as the upper two measures.



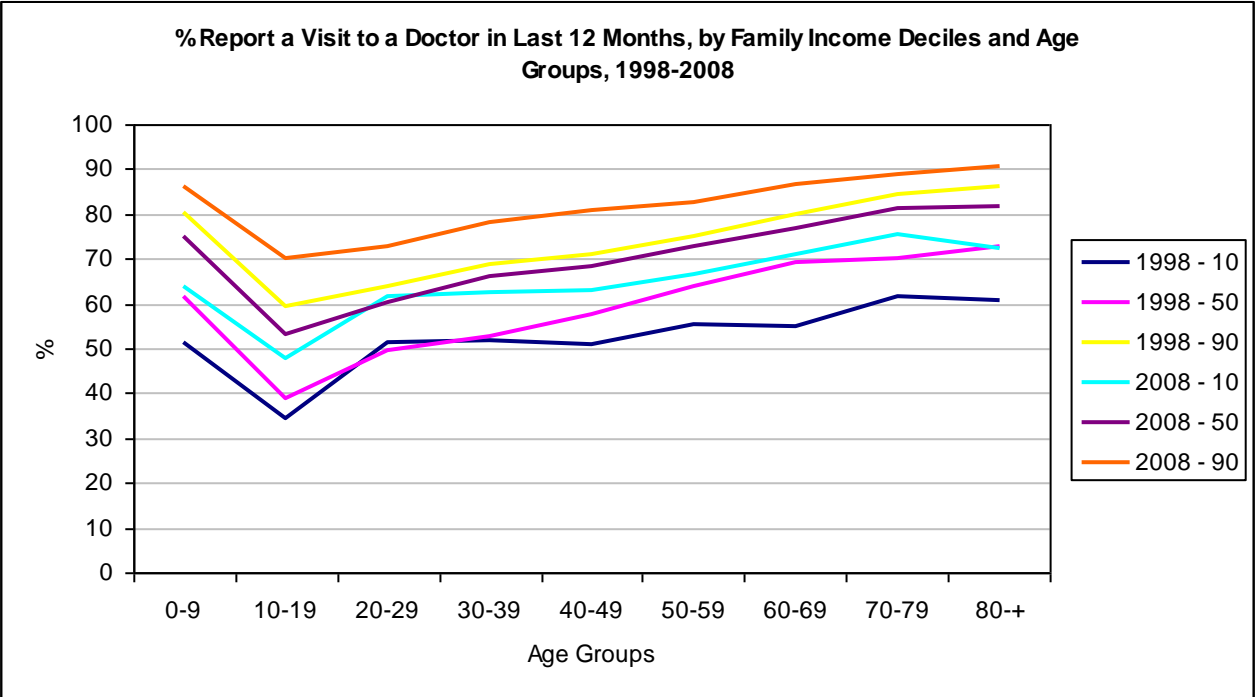
Source: PNAD 1998 and 2008.

Figure 3



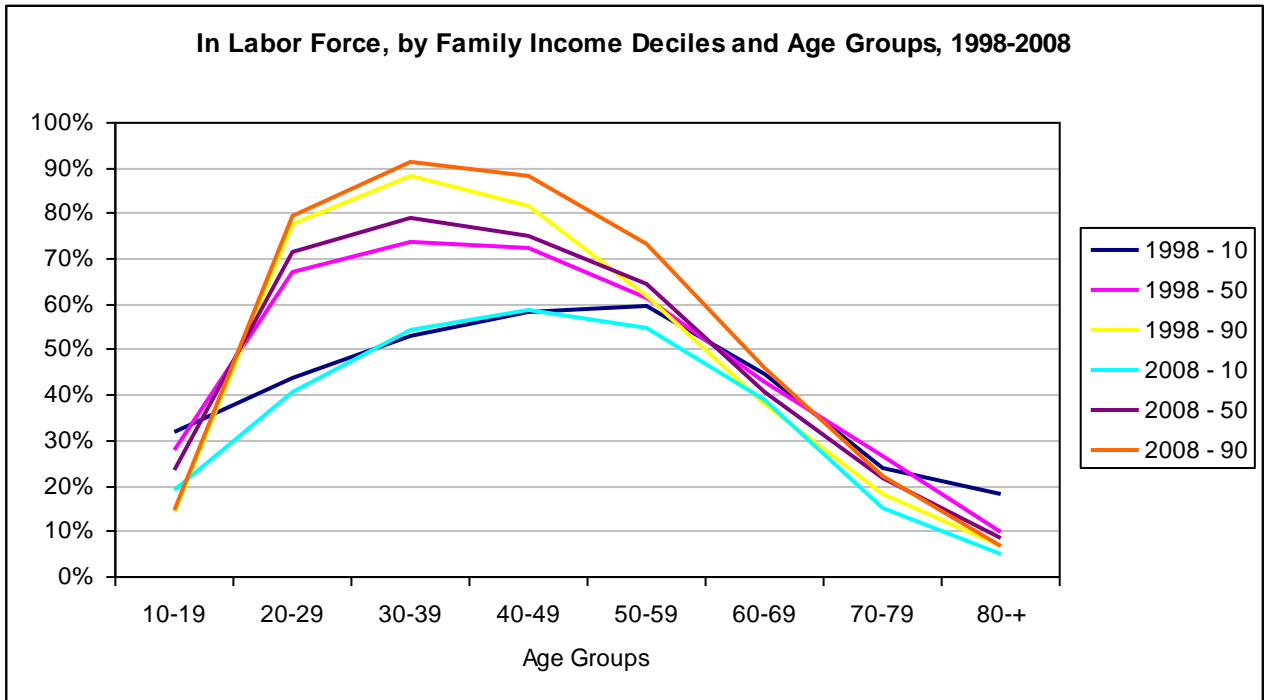
Source: PNAD 1998 and 2008.

Figure 4



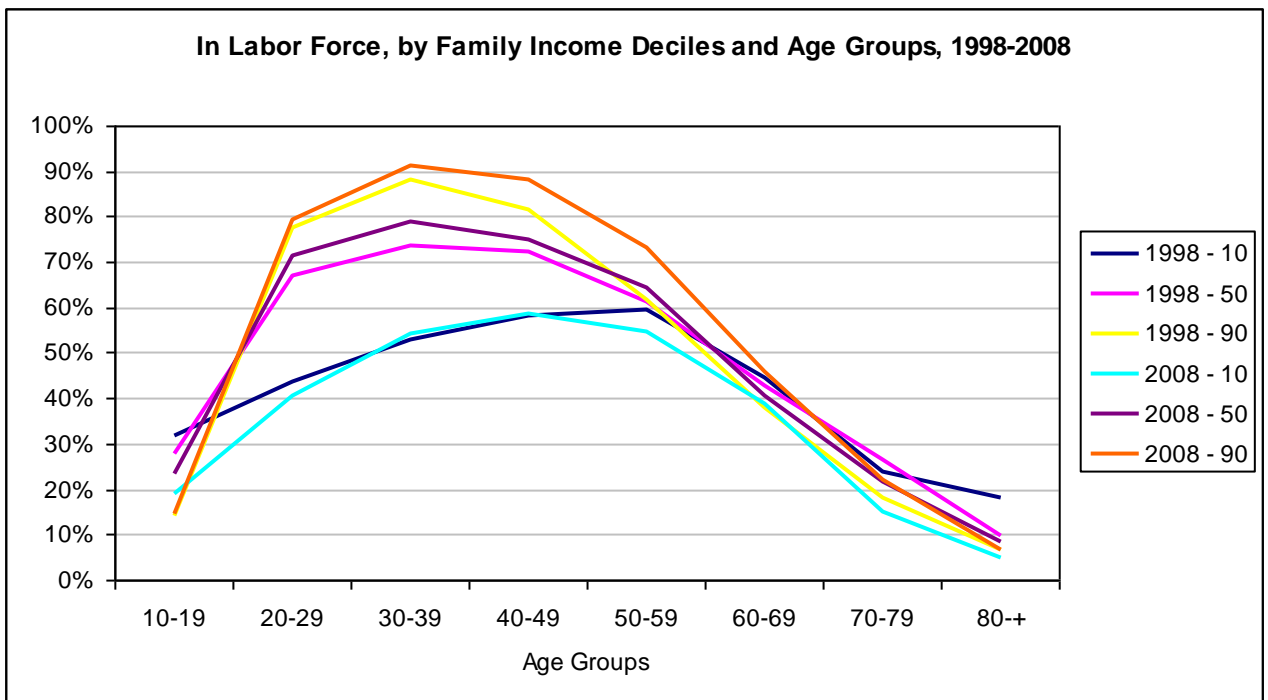
Source: PNAD 1998 and 2008.

Figure 5



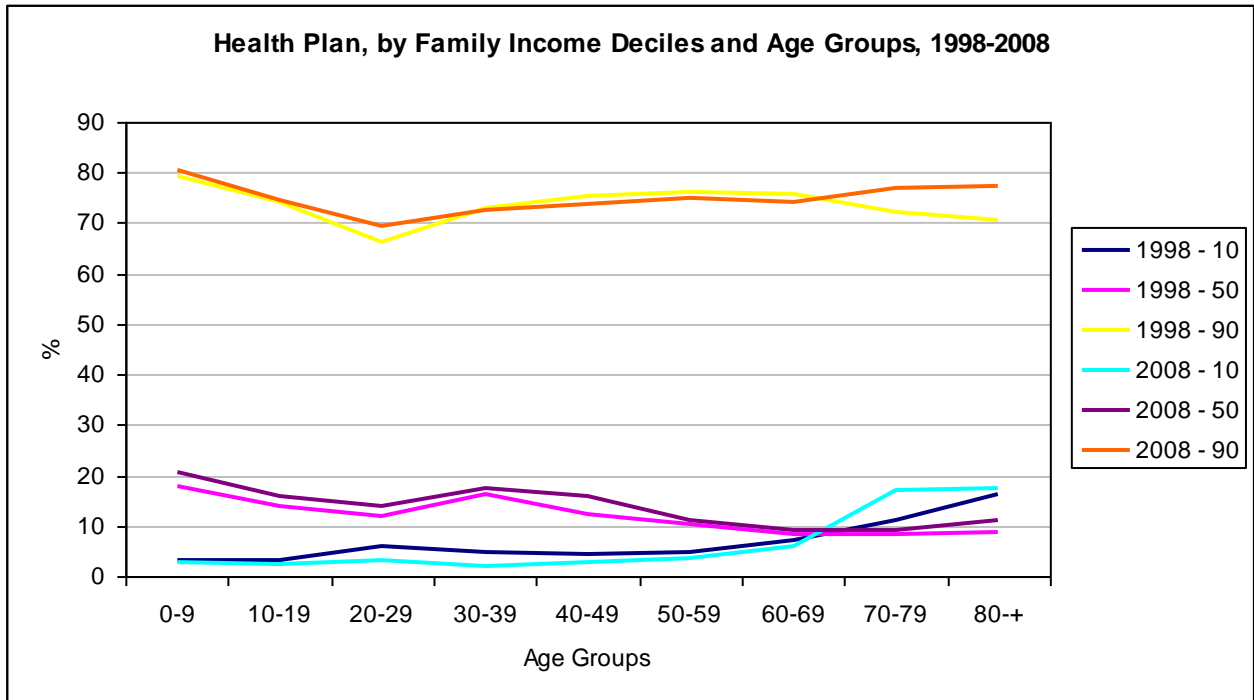
Source: PNAD 1998 and 2008.

Figure 6



Source: PNAD 1998 and 2008.

Figure 7



Source: PNAD 1998 and 2008.

Empirical Framework and Results

The health status is assumed to evolve over time: children are born with an initial health stock, H_0 . They receive shocks to their health in the form of chronic conditions, diseases requiring hospitalization, or other shocks. Socioeconomic status contributes to the ability of a family to both detect and treat a chronic condition in the short run, due to differences in lifestyle and/or environmental factors such as poor housing quality, lack of preventive care, inadequate nutrition, etc. Predictions emerge from this highly simplified model: there will be a positive relationship between socioeconomic status and health and this relationship will grow stronger as people age. In order to investigate these relationships in a multivariate context, estimates from regression models using the cross-sectional data that take the following form:

$$\text{health}_i = \alpha + \gamma(\text{inc})_i + \delta X_i + \varepsilon_i$$

where health is a measure of health, inc represents dummies for family income, X includes variables intended to capture other characteristics of the family and social environment which could affect health; the subscript i denotes the individual elderly. This model is estimated using several different measures of health, allowing to observe the pattern of health status for various conditions.

In multivariate analysis of health data, the dependent variable is seldom continuous and fully observed, and it requires a parametric non-linear estimation. There are numerous examples of health variables that take only two values – dead/alive, ill/not ill, go to doctor/do not go to doctor, etc. In some cases, there are only two possible values of the underlying characteristic e.g. dead/alive. In other cases, the underlying characteristic is continuous e.g. degrees of illness, but only two categories are observable in the data - ill/not ill. Let y_i be the characteristic of interest. Conventionally, $y_i=1$ indicates that observation i possesses the

characteristic, e.g. illness, and $y_i=0$ indicates that she does not. In general, a model of binary response can be defined by,

$$E[y | \mathbf{X}] = \Pr(y = 1 | \mathbf{X}) = F(\mathbf{X}; \beta)$$

where $E[]$ and $\Pr()$ indicate expected value and probability respectively. Different functional forms for $F()$ define different specific models. An obvious, and common, response is to choose some functional form for $F()$ that constrains estimated probabilities to lie in the (0,1) range. Our choice here is the logistic distribution, which gives the logit model. Estimation is carried out by maximum likelihood.

For this analysis we attempt to operate as many aspects as possible. Limitations within the data prevent us from including the depth and breadth of covariates that are indicated by previous research. Further, confinement to a cross-sectional perspective limits the analysis to a measure of associations, rather than using the data longitudinally to conduct a causal analysis. Our focus will be primarily on the indicators identifying socioeconomic status and family structure. Individuals were grouped according to their income decile. The independent variables comprise socioeconomic and demographic variables. A set of dummies for per capita family income, race, gender and family type (individuals belonging to families comprised by the couple or only the mother) is included. A dummy variable was included for the existence of health insurance coverage, since the healthcare plan establishes a better condition of access and the utilization of such services is greater. Dummy variables for region and place of residence (metropolitan, urban and rural) were also included. The complete list of variables is shown in Table 1.

Table 1: Variables

Variables	Description
<i>Dependent</i>	
healthst	health status: 1 – good; 0 – poor
chronic	any chronic diseases: 1 – yes; 0 – no
doctorvis	doctor visits (reference period: 12 months): 1 – yes; 0 – no
<i>Independent</i>	
deciles of family income	dummies for each decile of the per capita family income
famtype	family type: 1 – couple without kids; 2 – couple with kids; 3 – lone mothers; 4 – lonely
sex	sex: 1 – male; 0 – female
race	race: 1 – white; 0 – non-white
empstatus	employment status: 1 – employed; 2 – unemployed; 3 – out of labour force
region	Region of residence: 1 – north; 2 – northeast; 3 – southeast; 4 – south; 5 – west
Urban	area of residence: 0 – rural; 1 – metropolitan urban; 2 – non-metropolitan urban
Healthins	coverage of private healthcare plan: 1 – yes; 0 – no

Two models for each health measure are presented. The first model, the base relationships, presents the results of regressions for each dependent health variable and the dummies of the deciles of the per capita family income. This shows the relationships observed in the descriptive analysis. It is followed by models which includes all of the covariates in the multivariate regression.

The resulting parameters of our multivariate analyses are presented in Table 2. We report estimates of logit models for the likelihood of “good health status”, “presence of any chronic

disease” and “doctor visits”. In order to facilitate the interpretation of results, we present odds ratios. The odds ratios provide the percentage variation on the probability due to an increase/reduction in an explaining variable. For example, if the odds ratio estimated for a continuous variable is equal to 1.20, this means that the probability increases by 20% if the value of this variable is increased in 1 unit. For binary explaining variables, the odds ratios show the difference in probability in relation to the reference category. If the odds ratio estimated for a binary variable is equal to 0.20, the probability is 80% lower for this category in relation to the reference group.

First of all, Table 2 shows that there is a great deal of consistency across the estimators in terms of the levels of significance of the coefficients. Results for the probabilities of a good health status are presented in the first column, of reporting any chronic disease in the second, and of at least one routine doctor visit in the past year in the third. Next, we examine the odds ratios, comparing the probabilities of the health outcomes controlling for our independent variables.

Table 2: Odds Ratios of Logit Models for Health Outcomes of Individuals over 50 Years of Age

Independent Variables	Dependent Variables					
	Health Status		Chronic Diseases		Doctor Visits	
	1998	2008	1998	2008	1998	2008
<i>Model 1</i>						
2 nd decile	0.8521*	0.9159	1.1337	1.0646	1.1249	1.1332**
3 rd decile	0.7595*	0.9723	1.3308*	1.1064	1.4423*	1.2298*
4 th decile	0.8014*	0.9128	1.2425*	1.3426*	1.4007*	1.4419*
5 th decile	0.9010	0.9870	1.1775**	1.3310*	1.6017*	1.4710*
6 th decile	0.7063*	0.9564	1.5317*	1.5565*	1.8115*	1.6790*
7 th decile	1.1284**	1.2356*	1.0723	1.3288	1.7285*	1.7054*
8 th decile	1.2913*	1.4731*	1.0832	1.3479	1.9024*	1.7562*
9 th decile	1.6796*	2.0010*	0.9798	1.3001	2.1456*	2.0272*
10 th decile	3.0557*	3.4863*	0.7535*	1.1075**	2.8873*	2.6817*
Log-likelihood	-34270.93	-49616.29	-29406.65	-45204.17	-31609.36	-38349.17
<i>Model 2</i>						
2 nd decile	0.8697**	0.9123	1.1446	1.0689	1.1749**	1.1173
3 rd decile	0.8482*	0.9148	1.2170*	1.1357**	1.2977*	1.2147*
4 th decile	0.8344*	0.9499	1.2055*	1.1623*	1.3206*	1.2224*
5 th decile	0.9105*	0.9703	1.1485**	1.2229*	1.4502*	1.2835*
6 th decile	0.8281*	1.0137	1.3005*	1.2418*	1.4362*	1.3433*
7 th decile	1.0943	1.1275**	1.0378	1.1677*	1.3813*	1.3870*
8 th decile	1.2207*	1.2886*	1.0434	1.1561*	1.3818*	1.3317*
9 th decile	1.5263*	1.6654*	0.8732**	1.0653	1.3572*	1.3669*
10 th decile	2.6889*	2.6294*	0.7100*	0.8900**	1.4666*	1.4935*
couple with kids	1.3682*	1.2778*	0.7557*	0.7721*	0.8454*	0.8767*
lone mothers	1.2672*	1.3081*	0.8761*	0.8503*	0.8862*	0.7991*
Lonely	1.0921	1.2315	0.9710	0.9184	0.8929	0.8002
metropolitan urban	0.8843*	1.4245*	1.1272*	0.9035*	0.9782	1.2072*
non-metropolitan urban	0.8014*	1.1666*	1.2550*	1.0271	0.8557*	1.1035*
Northeast	1.2463*	1.0281	0.8762*	1.0052	1.0570	1.0078
Southeast	1.6177*	1.2863*	0.8140*	1.1509*	1.2065*	1.1836*
South	1.3977*	1.1131*	0.9279	1.3136*	1.1320*	1.1784*
West	1.1850*	1.0816**	0.8831**	1.1303*	1.2150*	1.0743
Unemployed	0.9252	0.8931	1.0417	1.1802**	1.1776**	1.2853**
out of labor force	0.5046*	0.5092*	1.5259*	1.8922*	1.5664*	1.5772*
Sex	1.2086*	1.0229	0.6726*	0.6613*	0.5581*	0.4344*
Race	1.0816*	1.1365*	0.9398*	0.9253*	1.0342	0.9599**
Healthins	1.2040*	1.2234*	1.0923*	1.2306*	2.1525*	2.0492*
Log likelihood	-33188.33	-48330.24		-43607.31	-30110.68	-36210.49

Source: PNAD 1998 and 2008. Number of observations: 51892 and 74376.

Note: * significant at 1%; ** significant at 5%.

Family Income

For the first models of each health outcome, our estimates suggest large effects of family income distribution, particularly huge is the effect of 10% richer location. Immediately apparent is the direct relationship between family income and the elderly health status, report of chronic diseases and visits to doctors. It is worthwhile to mention that health status is a positive outcome that is expected to be directly related to income, but a report of a chronic disease and a visit to a doctor have mixed meanings. In the first case, there could be just more awareness according to the income level of the respondent, and in the second case, it depends on the reason for visit – if it is a routine visit, it would be expected to vary directly with income, but if it is due to an acute illness, we could expect the opposite.

The first column of the first panel of Table 2 indicates that family income is positively and

significantly correlated with being in good health, so being in the top decile is associated with almost three times higher probability of reporting to be in good health and this relationship deepens over time. That is, the income gradient becomes larger. The second column shows that older people in the top decile in 2008 have a 10% larger probability of reporting a chronic disease and this means a shift from the 1998 results, although those in the intermediate deciles remains presenting the greatest odds. In the third column, we also see that the probability of an elderly having at least one visit to the doctor increases with income. The odds ratio is 2.68 in 2008 for those in the top income decile, which implies a 168% higher probability of a medical visit as compared to the probability of those in the bottom decile. Such a difference between the first and the second income groups is of 22% only. Regarding this outcome, the income gradient becomes less pronounced over time.

Many confounding factors might be operating to set these patterns of income-health relationships and we have to control for other variables to assess the net relationship of the family income distribution and the elderly health outcomes. This is what we do in the second set of models. Controlling for family structure, individual characteristics and some regional variables, the probabilities associated to the income dummies change for all health outcomes.

The bottom panel of Table 2 shows the adjusted family income odds ratios. Regarding the health status and doctor visits outcomes, the relationships continue to be direct and significant, but the income gradient has a much smaller magnitude. For the report of any chronic disease, the direction of the relationship with income changes, now showing that the elderly have a lower probability of reporting a chronic disease in the top income deciles. Examining the control variables included in the second models could suggest potential reasons for the observed changes in the family income-health relationships.

Family Structure

The logits add three indicators for family structure. We present in Table 2 the odds-ratios for family type – the effect for living with a partner and kids, the effect for a woman living only with her kids, and the effect for living alone. The reference category is living only with a partner. The comparison categories that include living with kids are associated with better health outcomes. Our estimates show that those elderly in families with a partner and kids show even better conditions. We find that the elderly living in this type of family are less likely to visit doctors and report a chronic disease and more likely to be in good health. On the other hand, the lonely elderly category shows no significant results.

Individual Characteristics

We found a higher incidence of problems among women. They have significant probabilities of negative outcomes for all health measures, except visits to a doctor, which could mean a greater care. Over time, gender differences in outcomes became smaller. So, in 1998 women are 20% less likely than men to be in good health, and in 2008 the difference is not significant. Women, in 2008, are 34% more likely to report a chronic disease and 56% more likely to have visited a doctor.

Race is significant for all outcomes, but with a small magnitude. White elderly are better off in terms of health status and chronic disease report and these facts changes little over time. In terms of visits to a doctor, whites have a smaller probability in 2008.

The association between elderly work and health is significant for all outcomes. Those individuals out of the labour force reports worse outcomes; it is an expected result since there is a great deal of reciprocity between labour and health variables. Unemployment seems to have impacts only in terms of visits to a doctor, increasing the probability.

Place of Residence

Variables for place of residence are included to control for the access to health services, which is supposed to be more difficult in rural and non-metropolitan areas, and in the North region (omitted categories). All associations between these variables and the health outcomes are significant, in the expected directions. Since these variables reflect the difficulties in access, elderly people in urban and metropolitan areas are more likely to report a good health status, less chronic diseases (in 2008) and more visits to doctors. The Southeast and South regions, that are more developed, present the best health outcomes.

Private Health Insurance

The access to private health insurance might be an important determinant of health status. Our finding that poorer elderly have worse health could be due to the fact that they have no insurance coverage, or insurance coverage that pays for lower quality care. We examine whether the relationships between income and health outcomes are altered when we include controls for insurance. The odds ratios presented in Table 2 indicate that those with private insurance present stronger associations to the utilization of health services, particularly visits to doctors, raising the probability by more than 100% relative to those who does not have a private health insurances. The variable is also significant in the case of the reported health status and chronic disease report. Our results suggest that controlling for insurance might alter the estimated effects of income on health.

Concluding Remarks

One of the limitations of this study is its cross-sectional design, a fact that prevents us from determining the directions of causation. For example, the relationships between living arrangements and income structure activities with health are likely to be reciprocal. Nevertheless, this study has provided evidence of the importance of simultaneously considering socio-economic position and household characteristics, as well as different health outcomes, in order fully to understand health inequalities among elderly people.

An extensive agenda of investigation can be delineated from the results of this study: (1) cohort dynamics (pooling the cross-section databases); (2) gender and racial differentials; (3) health and labour force participation of the elderly; (4) sources of family income; and (5) family structure and living arrangements, considering individual and average characteristics (education, work, earnings, etc.) of family members.

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