

Private health insurance, healthcare spending and utilization among older adults: Results from the Brazilian Longitudinal Study of Aging

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Abstract

Brazil has a universal national health service that exists alongside a supplementary private sector used by about one-quarter of the population. Older adults are generally more likely than younger ones to have a private health plan in Brazil, despite having lower income on average. In this study, we investigate the effects of having a private health plan on health expenditures, utilization and quality of care among Brazilian adults aged 50 and over who participate in the Brazilian Longitudinal Study of Aging (ELSI). Results show that healthcare expenditures are overwhelmingly concentrated among the upper two deciles of consumption, but ratios of out-of-pocket expenditures to household consumption are similar among those with public (9.4%) and private (10.4%) coverage. However, once selection into healthcare expenditures is accounted for, such differences are no longer statistically significant. Healthcare utilization (doctor visits) is significantly higher among those with private health plans, especially for the use of specialist services, but the effect of private health plans is attenuated and no longer significant once endogeneity is controlled. While there is no discernable difference in the technical quality of care (proxied by the presence of undiagnosed hypertension), a measure of the quality of provision of healthcare that focuses on timeliness and other organizational features of healthcare delivery is consistently higher among those with private health plans, suggesting that the preference for such plans may be driven primarily by their convenience and customer-service orientation.

Keywords: Private insurance, aging, Brazil, healthcare

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1. Introduction

Healthcare represents an important part of most households' budget. A stylized fact is that older individuals in most countries tend to have greater healthcare needs, and, depending on the level of health insurance and other social protections, are likely to have higher healthcare expenditures than households with younger members, all else equal (de Meijer et al., 2013; Yang et al., 2003; Zweifel et al., 2004).

In countries with a mix of public and private healthcare provision, understanding healthcare expenditures and utilization can be challenging. For instance, in Brazil, all individuals are covered by the national health service (Sistema Único de Saúde or SUS in Portuguese) that provides all forms of primary, secondary and tertiary care and most medications free of charge at the point of service. The public healthcare system is funded by all taxpayers, regardless of healthcare utilization (Mendes, 2013; Oliveira et al., 2022; Pinto Junior et al., 2014).

Despite access to a well-developed healthcare network provided by the SUS, many Brazilians elect to purchase voluntary private health plans. Note we intentionally use the term “private health plan” because there is no indemnity-type insurance in Brazil. Instead, private sector healthcare organizations (akin to **HMOs**) enroll individuals through monthly premiums and are required to provide all necessary health services to their enrolled **population**. In 2019, 28.7% of Brazilians were covered by some type of private dental or health plan, representing approximately 60 million people (Souza Júnior et al., 2021). For some individuals, private health plans are a benefit obtained through their employer, but the majority purchase private health plans through monthly premiums paid out of pocket. Among workers in the formal labor market (47,4% of the total workforce), 30.7% pay premiums directly to private health plans (Souza Júnior et al., 2021). Health plans are highly concentrated among wealthier, more educated individuals living primarily

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in the capitals of the South and Southeast regions of the country (Costa Filho et al., 2020; Malta et al., 2017; Pinto and Soranz, 2004).

Private health plans also represent an important part of healthcare spending in Brazil. In 2019, 59% of all healthcare expenditures (which totaled 10% of GDP) were incurred through private funds, a figure that increased slightly from 56% a decade earlier (World Health Organization, 2021). In 2019, the average health plan premium per capita was R\$495, while the national monthly minimum wage was R\$998 (Souza Júnior et al., 2021). No other country with a universal healthcare system has such a high percentage of private spending (Castro et al., 2019).

The literature suggests several reasons why individuals may choose to purchase supplemental private health insurance. One of the most common reasons is quicker access to care, including the ability to avoid long waiting room times at public providers and waits for referrals to some forms of specialist and diagnostic care (Fontenelle et al., 2017). Another common explanation is the perceived quality of the physical space and the friendliness of the staff (Gerschman et al., 2007). There may be also perceptions that the technical quality of care is better in the private sector (Fontenelle et al., 2017). These perceptions are complicated by the fact that in Brazil as in many other countries, the very same healthcare providers may work in both the public and private sectors (Ocké-Reis et al., 2006).

Considering that older individuals may simultaneously face greater health needs alongside potentially lower incomes post-retirement, one might expect private healthcare coverage to be lower among older as compared to younger households. But this is not the case in Brazil. Private health plan coverage actually increases with age: about 30% of those aged 70 and above report having at least one private health plan (Veras et al., 2008). Furthermore, greater healthcare needs, the presence of chronic conditions or worse self-rated health status do not seem to be drivers for

private health plan coverage (Barros et al., 2006; Hernandez et al., 2012). In fact, those who have better health are more likely to have private health plans (Souza Júnior et al., 2021). Finally, among those with private health plans, roughly 13% of the times they seek care they use public and not private services. In terms of volume, private sector users represent about 7% of all healthcare visits to the public sector among those seeking care in the past two weeks (Fontenelle et al., 2019). Private health plans in Brazil therefore provide an intriguing case study on the use of private health insurance among older adults.

This paper explores differences in healthcare expenditures, utilization, and quality among older adults that use the public and private sectors in Brazil. It is intended to stimulate discussion about the use of supplemental private health insurance within the context of a middle-income country with universal health coverage.

2. Materials and methods

2.1. Data

This study uses data from the second wave of ELSI-Brazil survey, a nationally representative population-based cohort study of people aged 50 years and older conducted between 2019 and 2021. The ELSI-Brazil sampling plan combined stratification of primary sampling units (municipalities), census tracts, and households. The final sample comprised 9949 participants from all 5 Brazilian geographic regions. Details on the ELSI study have been described elsewhere (Lima-Costa et al., 2018). The ELSI-Brazil study was approved by the Committee on Research Ethics of the Fundação Oswaldo Cruz, Minas Gerais (CAAE: 34649814.3.0000.509).

2.2. Measures

Three sets of outcome measures are reported here. The first set of outcomes is self-reported healthcare expenditures. These include total expenditures, which is a combination of health plan premiums and out of pocket spending on several categories (hospital, doctor visit, dentist visit, diagnostic exams, medications, nutritionist visit, rehabilitation services, occupational and physical therapy, and home healthcare). All expenditure categories are normalized to a 30-day period and reported in local currency.

The second set of outcomes assess healthcare utilization and includes any doctor visit in the past year, the number of doctor visits among those with at least one, and the number of consultations with a general practitioner or a specialist. All utilization measures are based on self-report.

The third set of outcomes reflect two different aspects of the quality of healthcare. The first is a previously-validated index (ranging from 0 to 12) composed of positive responses (always/almost always versus rarely or never) to a series of questions regarding organizational barriers to the receipt of primary care composed of positive responses to the following questions: 1) is it easy to make an appointment with a doctor? 2) can you get an appointment within 24 hours? 3) can you phone your doctor? 4) do you see the same doctor for each consultation? 5) does your doctor listen to your complaints? 6) does your doctor explains things well? 7) does your doctor know the medications you are taking? 8) does your doctor resolve your health problem? 9) does your doctor know your main health problems? 10) do consultations last sufficient time? 11) does your doctor speak with a specialist? 12) does your doctor/office help you to make a specialist appointment? These questions have a high level of internal consistency (Cronbach's alpha = 0.8567) and factor analysis indicated that the first component explains almost 80% of the variance of this scale.

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The second quality measure is intended to capture the technical quality of healthcare received. We use the average of the second and third measurements of systolic and diastolic blood pressure conducted on each respondent to classify them as hypertensive or not, based on current diagnostic criteria (systolic blood pressure greater or equal to 140mmHg or diastolic blood pressure greater than or equal to 90mmHg). Then, we compare self-reports of previous hypertension diagnosis (restricted to those who report any doctor visit in the past year) with blood pressure readings to construct a measure of undiagnosed hypertension. The argument is that if an individual aged 50 or over with elevated blood pressure had a doctor visit in the past year, then a hypertension diagnosis should have been made.

The main exposure variable is the type of healthcare coverage (public versus private), based on self-report. We use the participants' response as to whether they are covered by any private health plan, rather than nonzero expenditures on private healthcare given that there is some dual use of private sector services even among those otherwise exclusively covered by the public sector.

Household economic conditions include self-reported consumption on a wide range of goods and services, monthly income from all sources, and assets (the market value of all houses and vehicles). Possession of financial assets such as retirement accounts or savings are relatively rare in Brazil (Bonomo et al., n.d.; World Bank, 2022). Based on recent work comparing household equivalence scales for measuring poverty among adults (Abanokova et al., 2020; Bjorn Gelders, 2021; Karvonen et al., 2021; OECD, 2011; Regier et al., 2019), we adjusted consumption, income and asset measures by the square root of household size. Sensitivity tests using a simple per capita equivalence scale were largely similar to results obtained here. We created an indicator of income

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Barroso WKS, Rodrigues CIS, Bortolotto LA, Mota-Gomes MA, Brandão AA, et al. Brazilian Guidelines for Hypertension - 2020. *Arq Bras Cardiol.* 2021 Mar;116(3):516-658. English, Portuguese. doi: 10.36660/abc.20201238. PMID: 33909761.

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poverty defined as household per capita income of <R\$457 (Brazilian Reais), according to official poverty line in 2019 (REF).

We also included an indicator of economic distress, whether the respondent reports either skipping a meal due to financial reasons and a measure of household coping strategies, namely whether the respondent reports receiving any money from friends or family (not specific to healthcare).

Because health needs represent a primary driver of healthcare utilization and expenditures, we created a variable to represent an individual's level or severity of health problems. The measure is derived from principal components analysis of a list of self-reported and measured health problems including: self-reported diagnosis of any of the following chronic conditions (hypertension, diabetes, any cardiovascular disease, stroke, arthritis, depression, and cancer), measured obesity as $\geq 30\text{kg/m}^2$, any self-reported difficulties with basic activities of daily living, and poor self-rated health. We then created tertiles based on the extracted principal component which represent individuals with no or only a few health problems (tertile 1), those with some health problems (tertile 2), and those with many health problems (tertile 3).

Other covariates include demographic characteristics (age, sex, marital status), educational attainment, current working status, rural residence, and categorical variable representing residence in 1) the poorest and least populated North and Northeast regions, 2) the richest and largest Southeast region, and 3) the South and Midwest regions.

2.3 Statistical analyses

We calculate mean and median values for all expenditure categories both for the entire sample and for those with nonzero expenditures in each category. We also dropped 2 extreme outliers because

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exploratory analyses suggested values for consumption were an order of magnitude higher than all other respondent values, suggesting an error.

To assess factors associated with out-of-pocket (OOP) expenditures, we use a two-part model. The first part consists of a probit regression that determines the probability of incurring any OOP expenditure and the second part estimates the level of OOP spending among those who had any OOP spending (any value greater than 0), given that 49% of the survey participants did not report any healthcare expenditures.

Another difficulty arises in accounting for the process leading people to incur any healthcare expenditures and for selection into private insurance. For outcomes related to healthcare expenditures, we use linear and probit Heckman selection models for continuous and binary outcomes variables, respectively. The identifying variable is having had any doctor visit in the past year. The rationale is that 85% of all OOP spending in this sample goes to two related categories: doctor-prescribed medication and doctor visits. It is therefore reasonable to assume that going to the doctor explains most of the variance between those who have and those who do not have any OOP expenditures.

For models of healthcare utilization, we use two-stage-least squares (2SLS) regression to account for the endogenous nature of having a private health plan. Candidate instrumental variables to identify selection into private health plan coverage are based on previous literature (Galárraga et al., 2010; Hidayat et al., 2004; Jung and Streeter, 2015; Sapelli and Vial, 2003; Waters, 1999) and, after testing a range of candidates the final variables, include 1) the average value of the respondent's vehicle and 2) neighborhood social capital, measured by the respondent's response to the question whether people in their neighborhood can be trusted (always, almost always, almost never, never). The argument for first instrumental variable is that it represents a

preference for spending on luxury goods (since the public system is readily available for use without additional expenditures). Those who purchase private health plans are often doing so for reasons related to convenience, better perceived quality of the physical characteristics of the private healthcare facility, and greater value on a customer service orientation. These factors are unlikely to affect use of healthcare on their own, rather the preferred type of healthcare (public versus private). The second potential instrument represents a measure of social capital, which has been associated with trust in government and government institutions (Algan, 2018; Keele, 2007; Newton, 2001). Those who have low levels of social trust may exhibit negative opinions regarding the public sector and public healthcare providers and may therefore be more likely to purchase a private health plan. We argue that instruments that attempt to account for individual propensity to seek care are less relevant in the Brazilian context, given similarly high levels of access and fewer barriers to obtaining healthcare within the public sector (Costa Filho et al., 2020; Fontenelle et al., 2019; Gerschman et al., 2007).

For each outcome that is estimated using 2SLS regression, we report results from the J test for overidentifying restrictions, the F-statistic for whether all excluded instruments are significantly different from zero, a test for the exogeneity of regressors obtained by running an auxiliary regression of residuals from the first stage regressions for all endogenous regressors and report the joint F or Wald-Test that such coefficients are equal to zero (Wooldridge, 2019).

Model building relied on factors previously identified in the literature as well as by comparing AIC and BIC statistics. All descriptive statistics and regressions estimates use survey weights and control for the complex survey design. Data preparation and analysis were conducted in Stata 17.

3. Results

Appendix [Table 1](#) shows demographic and other characteristics of respondents. While there was no statistically significant difference between those with public and private health coverage in terms of age, sex, marital status, or health problems, those with a private health plan were significantly better off in terms of socioeconomic status: absence of formal schooling was less prevalent among private health plan holders and they had almost three times the rate of reporting 11 or more years of formal schooling. Private health plan holders were less likely to report any financial distress, and had rates of household consumption, income, and assets that were two or more times higher than those reported by individuals who only use the public sector. In terms of geography, private health plan holders are less likely to live in the North and Northeast regions. [They](#) were more likely to be in the Southeast region and were considerably less likely to live in rural areas.

Table 1 presents healthcare utilization and expenditures by healthcare coverage. About 80% of the sample relies entirely on the public sector whereas nearly 20% reports having supplemental private health plan coverage. In terms of overall healthcare expenditures 50% of the sample had nonzero health expenditures, varying from 43.9% among users of the public sector and 90.5% among those with private health plan. Considering only out-of-pocket (OOP) expenditures, 42% of those in public sector reported having had any OOP payment while 61.5% of those with private health plan report having had any OOP payment. That difference between the percentage of the individuals that had any healthcare expenditure and any OOP expenditure within each group indicates that there is an important reduction of OOP payment among those with private plan because of their healthcare coverage. Of all individuals with private health plan coverage, around 80% reported paying premiums directly to private health plans (the remaining fifth has their

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premiums paid by their employer or another person). Among those with any expenditures the average out-of-pocket spending was about R\$253 per month for those in the public sector versus R\$354 per month in the private sector. Insurance premiums were, as expected, concentrated among those in the private sector although a small proportion of those in the public sector also reported non-zero health insurance premiums but these were relatively small (15) compared to those with private sector coverage (671). It is possible that these were related to the purchase of a “discount card” that can help people get better prices on medications and lab exams, but not gain full access to private sector healthcare services (REF).

Regarding healthcare utilization, three-quarters of the sample reports at least one doctor visit in the past year, with private health plan holders reporting a 15-percentage point higher rate than those in the public sector. Among those with at least one doctor visit, the mean number of doctor visits was 2.65 for those in the public sector and 4.19 for private health plan holders. While nearly half of the overall sample reported a specialist visit, compared with those using the public sector, respondents with private health plans had a 31-percentage point higher rate of specialist use, and among those with at least one visit, private plan holders reported on average one additional specialist visit than those in the public sector. The situation was reversed regarding general practitioner (GP) visits where nearly 50% of those in the public sector reported at least one such visit as compared to about 38% among those with private health plan coverage. However, among those who had at least one GP visit those in the private sector reported slightly higher (3.43 versus 2.77), albeit not statistically significant, volume of GP visits. The average quality of care index was (out of 12) 8.29 among those in the public sector and 9.97 among those with private health plan coverage. About 15% of the sample was classified as having undiagnosed hypertension.

While private health plan holders had rates were 3 percentage points lower than those covered by the public sector, this difference was not statistically significant at the $p < 0.05$ level.

Figure 1 shows the distribution of healthcare spending, by household consumption decile. It shows a progressive increase by consumption decile in terms of out-of-pocket expenditures as well as health plan premiums paid. The proportion of total health expenditures to household consumption was about 5% among those in the lowest income decile and gradually increased to about 17% among those in the sixth decile, and then rose again to 32% of household consumption among those in the highest income decile. The proportion of out-of-pocket payments to household consumption ranged from a low of about 5% among those in the lowest decile, peaked at 14% among those in the sixth decile, and stayed at similar levels among progressively higher consumption deciles.

Table 2 shows the effects of private health plan coverage on different measures of healthcare expenditures. The first two columns present results of a two-part model. For the measure of any out-of-pocket expenditures as well as the mean nonzero expenditures, having private health plans is positively and statistically significant associated with greater out of pocket spending. However, when selection into healthcare spending is controlled for in the Heckman model, private health plan coverage is no longer statistically significantly associated with a higher volume of OOP spending. A similar pattern is seen when reporting results for different thresholds of out-of-pocket spending to total household consumption: models that do not control for selection tend to show positive and significant associations with private health plan coverage, but when selection is controlled for, these associations are no longer statistically significant.

Regression results for measures of healthcare utilization are displayed in Table 3. In the case of any doctor visit, number of doctor visits, any specialist visit, and number of specialist visits,

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models that do not control for the endogenous nature of private health plan coverage tend to show positive and statistically significant associations with each measure of healthcare utilization. Once endogeneity is handled using instrumental variables (IV), these associations lose statistical significance. The exception is for GP visits, where private health plan coverage is negatively associated with having had any GP visit in the past year, but this association likewise becomes insignificant in the IV models.

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Regression models for measures of healthcare quality are presented in Table 4. Here, the 12-point index representing organizational quality of care is statistically significantly higher among those with a private health plan coverage. This is the case for both models that do and do not control for the endogenous nature of private health plan coverage, although for this outcome the two-stage least squares model is not preferred to OLS regression. In alignment with the bivariate analysis, the multivariable analysis suggests that there is a 1.4 higher score on the index of organizational quality of care among those who use the private sector. In terms of the other measure of healthcare quality, undiagnosed hypertension, both models reveal no statistically significant differences between those with private health plans and those covered by the public sector.

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Discussion

Our study sought to understand the relationship between private health plan coverage and three related outcomes: out-of-pocket spending, healthcare utilization and quality of care among Brazilians aged 50 and over. To our knowledge, this is the first study relying on nationally representative data that combines both the financial and the health domains of such phenomena. We found that older adults with private health plans are wealthier, more educated and

geographically concentrated in the South and Southeast regions of the country, which is in accordance with previous studies on the general Brazilian population (Fontenelle et al., 2017; Pinto and Soranz, 2004; Souza Júnior et al., 2021). Nonetheless, the percentage of individuals with private health plans was slightly lower in our sample (20%) than reported for the general population (29%) (Araujo and Coelho, 2021).

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Out-of-pocket (OOP) spending was found to be 39% higher among private health plan holders (R\$354 per month) than among those in the public sector (R\$253 per month). For those who use private health plans, premiums constitute the bulk of their healthcare spending. Among private health plan users, differences in total healthcare spending (that includes premiums) were 488% of the mean expenditures incurred by those who use the public sector. Although probit regression results (first part of the two-part model shown in Table 2) indicate that private health plan holders are more likely to incur any OOP spending, the level of OOP was not found to be associated with having a private health plan when we control for sample selection using Heckman models. In general, no association was found between having a private health plan and out-of-pocket spending among older adults, suggesting that higher healthcare spending may be primarily driven by socioeconomic status and health needs.

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According to the 2017/2018 Brazilian Family Budget Survey, households spent on average 13% of total consumption on healthcare, which is close to the total reported here of 14.5% (Araujo and Coelho, 2021). Similar to our findings, medicines constituted the largest source of health spending (46%), varying from 84% of total healthcare spending in the lowest consumption decile to 29% in the top consumption decile, figures that are very close to those reported here. However, our results differ from those obtained using the Family Budget Survey when looking at the ratio of OOP to consumption. In the Family Budget Survey, the lowest decile spent 11.6% on OOP and

the top decile spent 7.7%, while our results show a positive gradient from 4.75% in the lowest decile to 13% among the highest decile, a trend that was consistent for total health expenditures as well. (See appendix table 2). This contrasting finding is likely due to differences in each survey's target population (the Family Budget Survey includes all households, while our data focus on those aged 50 and older). Older Brazilians have both lower overall consumption and higher healthcare expenditures than the general population. In addition, the Family Budget Survey uses a much broader definition of medications in its calculation of healthcare expenditures, which in this study were limited to prescribed medications only (Araujo and Coelho, 2021).

In terms of catastrophic health expenditures (CHE), the Family Budget Survey estimated that about one third of Brazilian households incurred CHE when defined as 10% of total household consumption (Araujo and Coelho, 2021). This number varied from over 37% among those in the lowest consumption decile to around 8% at the highest consumption decile. When the threshold for defining CHE is set at 25%, catastrophic healthcare spending was found to affect 11.5% of households and declined with increasing deciles of household consumption. In contrast, this study found a positive income gradient for all CHE thresholds, suggesting that older households, in contrast to younger ones, are spending a significant amount of their budget on healthcare and private health plan coverage and that this pattern closely follows that of overall consumption. For example, in our study 34% of those in the highest consumption decile report 40% of consumption spent on health (including insurance premiums), whereas only 4.6% of households in the lowest decile reach such a high ratio of healthcare spending.

The lack of statistical association between having a private health plan and greater financial protection (lower overall or OOP healthcare spending), motivated further examination of reasons

why individuals purchase private health insurance in a country with a free and comprehensive public healthcare system available for all citizens.

One possibility is that private health plan holders simply use more healthcare. Using naïve regression models for utilization outcomes, we found that having private health plan is associated with higher likelihood of having any doctor visit, having any specialist visit, greater number of doctor visits, great number of specialist visits and lower probability of having any GP visit, compared to those in the public sector. However, when we controlled for selection into private insurance using an instrumental variable approach, none of these associations remain statistically significant, again favoring the hypothesis that socioeconomic and health status, rather than private insurance per se, may be driving greater utilization.

Another possibility is that additional healthcare expenditures among those with a private health plan were used to buy better quality of care. For this analysis, we focused on two outcomes: (1) an index of organizational quality of care and (2) the presence of undiagnosed hypertension. For the latter, the rates of undiagnosed hypertension were equivalent between those in the public and private sector. For the index of organizational quality of care, we found that having a private health plan was associated with reporting an average quality of care score that was about 11% higher (1.4 higher score out of 12) among users of the public health system.

Our study has several strengths that deserve mentioning. It relies on nationally representative cohort data with rich information on demographic, financial, consumption and health domains that allowed us to investigate relationships until this time unexplored in a national sample. Moreover, a wide range of outcomes and sensitivity tests were employed to study the relationship between having private health plan and healthcare spending, utilization and quality of

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care. The careful use of models to deal with sample selection bias and selection into private insurance was another important contribution of our study.

This study also has important limitations. First, the cross-sectional nature of the study design does not allow us to observe temporal developments of the phenomenon or to make strong causal inference. Future studies should assess how gaining (or losing) private health insurance affects changes in healthcare spending within the same households. Second, we cannot rule out the risk of recall bias and this assuredly affected respondents' ability to recall how much was spent on different household items. That being said, private health plan premiums are paid on a monthly basis and are unlikely to vary significantly from month to month. While it may be easier for respondents to recall whether they had any doctor visit, measures of the intensity of healthcare utilization are also likely affected by recall bias. Our sample is made up of community-dwelling [older adults](#) and excludes more vulnerable or sicker individuals residing in hospitals or other institutional settings.

The use of instrumental variables is fraught with peril. However, it is essential in order to parse out the effects of socioeconomic and health status from having a private health plan on healthcare utilization. Our results are generally consistent and suggest that it is overall socioeconomic and health status that may drive higher levels of expenditure and utilization among private health plan holders. While technical quality of care was nearly equivalent across the public and private sectors, it seems that private health plans have been able to organize their services in such a way as to better cater to the utilization patterns and expectations of wealthier patients. This is also consistent with the greater intensity of healthcare financing for private sector health plans which is nearly twice that of the public sector on a per capita basis. Nevertheless, it is still possible that there is selection into private insurance by other unobservable factors, such as people's opinion

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about the competence of their local government or fear of being associated with health services that may be viewed by the upper and middle classes as appropriate only for the poor.

Another limitation is that there is no universal consensus on which items should be classified as medical expenditures. Our data do not report expenditures for over-the-counter medication, for example, that may represent a large proportion of family medication expenditures. This may also partially explain why our results diverge from those based on the Brazilian Family Budget Survey. Health expenditure data are also complicated by the nature of private health plan coverage in Brazil. While insurance premiums may be considered part of the [households'](#) overall consumption, different types of health plans provide different levels of protection and, especially in the context of cross-sectional data collection, some expenditures could be reimbursed at a later date. This is particularly relevant in Brazil because private health plan premiums themselves are reimbursed by the government through tax credits. This is consistent with our finding that the majority of healthcare spending among the wealthiest families go to private health plan premiums, a portion of these premiums would be reimbursed through government tax credits.

The Brazilian national health service is now 30 years old and there have been numerous studies documenting increased access, equity, and quality of care provided at all levels of care (Castro et al., 2019). The public sector's Family Health Strategy is considered a premier example of community-based primary care and had been associated with a range of improved health outcomes (REF). Despite its accomplishments, the SUS has a number of important limitations. Access and quality of specialty and diagnostic care vary considerably across the country, with sizeable gaps in some [specialties](#). And there can be shortages of basic supplies and medications in some municipalities. Nevertheless, the SUS provides the majority of intensive and expensive treatments, such as organ transplantation, dialysis, and some types of imaging because private health plans are

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rarely able to provide such services on their own. Private insurers are legally required to reimburse the public sector for these services, although in practice this does not happen with regularity. While there is a regulatory body overseeing Brazil's private sector health plans, there is still relatively little known about access, quality, and effectiveness of the services provided by this large and diverse set of organizations.

Despite having the world's largest national health service, in terms of population covered, the proportion of total health expenditures coming from public sources in Brazil is substantially lower than the OECD average (Castro et al., 2019; Souza, 2020). Underfunding of the public system may be one of the drivers for seeking private healthcare coverage (Funcia, 2019; Reis et al., 2016) and has been exacerbated by the austerity scenario that froze health and educational investments for 20 years (Menezes et al., 2020). The austerity measures implemented over the past five years were meant to shrink the public sector and modernize and stimulate the economy. Yet, such measures have not led to increased economic growth, except among richer households and may have contributed to deterioration of previous health gains (Arestis et al., 2021).

In comparison to countries in the BRICS block, Brazil has similar total, governmental, and out-of-pocket expenditures per capita (Jakovljevic et al., 2017). Nonetheless, Brazil has a uniquely comprehensive public health system and a particular private sector. In Russia only 5% of population has voluntary private health insurance (Rao et al., 2014), although all citizens have some sort of healthcare access through the Federal Compulsory Medical Insurance Fund (Khalfin et al., 2019). In India, around 29% of households are covered by some type of health insurance (mostly national or state), but only 2.1% has voluntary private insurance (Khan et al., 2021). A study with older adults in China (Jin et al., 2016) found that only about 12% had voluntary private health insurance, while the vast majority (over 90%) was covered by public insurance. In South

Africa, it is estimated that roughly 15% of the population has private health insurance (Day et al., 2021). Despite important health reforms in these countries, there is still heavy reliance on private sector providers. Low levels of financial protection persist with important reliance on out-of-pocket spending (Marten et al., 2014). In China and India this is mainly through OOP spending and in Brazil and to some extent South Africa, through pre-paid private insurance (Rao et al., 2014). Experts in the field of healthcare financing have pointed that out that economic growth will not be sufficient to ensure achievement of universal health coverage in the BRICS countries and that an appropriate public-private mix of healthcare financing is absolutely vital (Chou et al., 2015; Rao et al., 2014; Tediosi et al., 2016). For these reasons, it is essential to understand the extent to which older adults rely on private sources to meet their essential healthcare needs.

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Table 1: Healthcare utilization and expenditures, by health coverage and household consumption

	Public	Private	Difference ¹	Total sample
Healthcare expenditures (in \$R)³				
Any out-of-pocket expenditures, %	41.93	61.49	-19.56***	45.5
Mean out of pocket ²	253.32	354.16	-100.84*	127.00
Any insurance premiums, %	4.04	80.37	-76.33***	15.52
Mean insurance premiums ²	15.86	671.24	-655.38***	766.23
Any healthcare expenditures (total), %	43.93	90.51	-46.58***	49.98
Mean healthcare expenditures (total) ²	122.69	766.23	-643.54***	238.30
Healthcare utilization				
Any doctor visit, %	71.86	86.85	-14.99***	74.62
Number of doctor visits, mean ²	2.65	4.19	-1.54***	2.95
Any specialist visit, %	41.99	73.22	-31.23***	47.89
Number of specialist visits, mean ²	2.86	3.86	-1.00**	3.16
Any GP visit, %	49.92	37.66	12.26***	47.49
Number of GP visits, mean ²	2.77	3.43	-0.66	2.87
Quality of care				
Quality of care index (0-12), mean	8.29	9.97	-1.68***	8.64
Undiagnosed hypertension, %	16.2	12.9	3.3	15.5
Summary measures				
Total health exp/consumption, %	10.39	34.20	-23.81*	14.51
OOP/consumption, %	9.40	10.41	-1.01	9.56
10% spent on OOP, %	42.64	51.48	-8.84**	44.48
25% spent on OOP, %	32.12	39.91	-7.79**	33.81
40% spent on OOP, %	27.43	35.65	-8.22*	29.23
N (weighted %)	8055 (80.83)	1821 (19.65)		9876

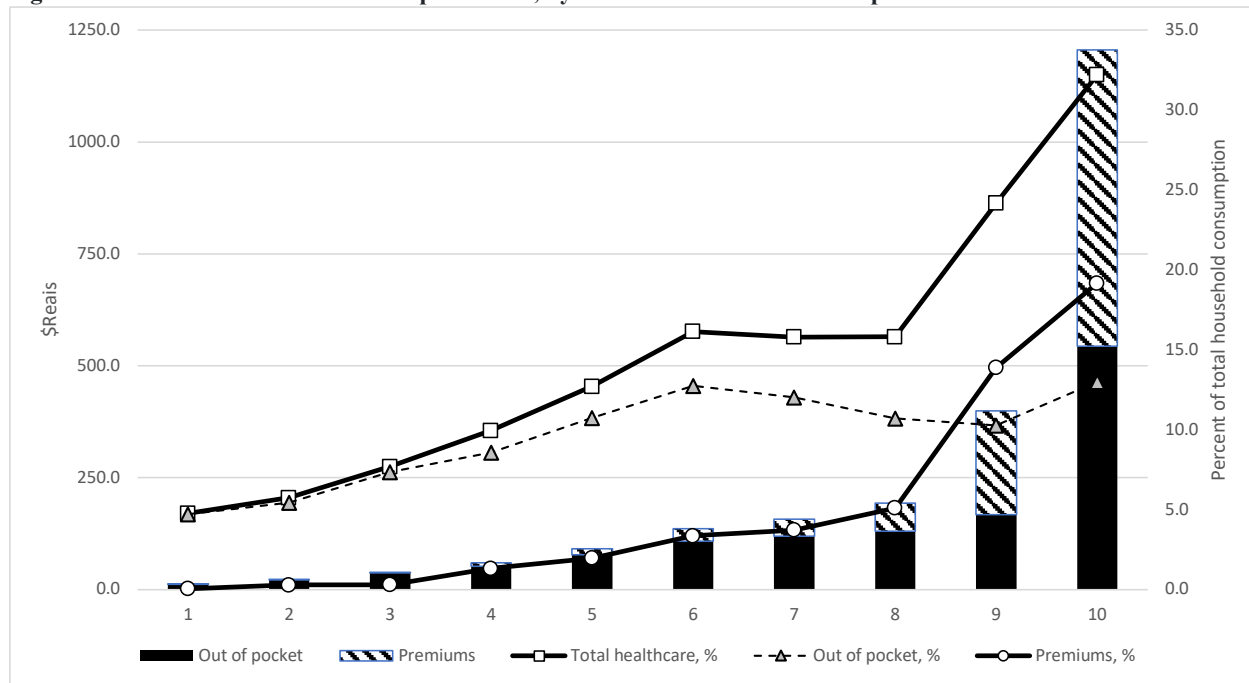
1. Statistical significance obtained from design-corrected F-tests for differences across categories and t-tests for differences between means.

2. Among those with nonzero values.

3. Means expressed in Brazilian \$Reais. At the time of the survey, \$1US was equal to approximately \$5.5 Brazilian reais.

*=p<0.05, **=p<0.01, ***=p<0.001

Figure 1: Distribution of healthcare expenditures, by decile of household consumption



Data source: ELSI-Brazil, round 2 data collected in 2019-2021.

Table 2: Effects of private health plans on healthcare spending measures

	Any OOP	Mean OOP	Mean OOP	OOP 10	OOP 10	OOP 25	OOP 25	OOP 40	OOP 40
Model	2PM Probit	2PM Reg	Heckman	Probit	Heckman ¹	Probit	Heckman ¹	Probit	Heckman ¹
Beta	0.44***	0.17*	43.72	0.27***	-0.15	0.26**	-0.16	0.36**	-0.05
se	0.07	.07	36.8	0.08	0.10	0.09	0.11	0.11	0.13
ME	.15***	123.48*	43.72	.08**	-0.05	0.05**	-0.06	0.05**	-0.02
se	.02	13.66	36.8	.02	0.03	.019	0.04	.019	0.04
Athrho			-0.03		-0.50		-0.79**		-0.70**
Se			0.03		0.29		0.24		0.24
Rho			-.026		-0.46		-0.66**		-0.60**
se			.03		0.23		0.14		0.15
N	6170	6170	6170	6170	6170	6170	6170	6170	6170

OOP = out of pocket, ME = marginal effect, se = standard error

OOP 10, 25 and 40 are 10%, 25%, and 40% of household consumption spent out of pocket on healthcare in the past 30 days, respectively.

*=p<0.05, **=p<0.01, ***=p<0.001

1. Heckprobit

All models are adjusted for complex survey design and sampling weights and additionally control for age, sex, marital status, educational attainment, working status, income poverty, top quintile of assets, receipt of financial help, rural residence, and region.

Table 3: Effects of private health plans on healthcare utilization measures

Model	Any doc visit		Num doc visits		Any spec visit		Num spec visits		Any GP visit		Num GP visits	
	Probit	IV	Reg	IV	Probit	IV	Reg	IV	Probit	IV	Reg	IV
Beta	0.39**	-1.1	1.18*	2.05	0.57***	0.26	1.03***	-2.03	-0.25**	0.01	0.68	3.69
se	0.13	0.8	0.48	6.09	0.13	1.41	0.3	2.92	0.08	1.67	0.4	4.77
ME	0.09**	-0.99	1.33*	0.64	0.20***	0.26	1.33***	-1.25	-0.09**	-0.23	-.001	1.97
se	0.03	0.62	0.43	4.93	0.45	1.41	0.43	2.40	0.03	0.90	0.22	4.84
J-test		0.011		1.79		1.26		0.17		0.123		4.77*
p-value		0.9165		0.180		0.2621		0.6766		0.7250		0.0289
F-test		12.56		12.56		12.68		12.68		12.28		12.28
p-value		0.0000		0.000		0.000		0.0000		0.0000		0.0000
Exogeneity test		0.82		0.03		0.02		0.82		0.11		1.76
p-value		0.4389		0.869		0.8932		0.3643		0.8922		0.1845

ME = marginal effect, se = standard error

*=p<0.05, **=p<0.01, ***=p<0.001

All models are adjusted for complex survey design and sampling weights and additionally control for age, sex, marital status, educational attainment, working status, income poverty, top quintile of assets, receipt of financial help, rural residence, and region.

Table 4: Effects of private health plans on healthcare quality measures

	Quality index	Quality index	Undiagnosed hypertension	Undiagnosed hypertension
	Reg	IV	Probit	IV
Beta	1.38***	8.09*	-0.08	-0.26
se	0.17	3.67	0.09	1.0
ME	1.38***	8.09*	-0.02	-0.26
se	0.17	3.67	0.02	1.0
J-test		19.92***		0.024
p-value		0.0000		0.8782
F-test		12.97***		12.40***
p-value		0.0000		0.0000
Endogeneity test		10.19**		0.13
p-value		0.001		0.8750

ME = marginal effect, se = standard error

*=p<0.05, **=p<0.01, ***=p<0.001

All models are adjusted for complex survey design and sampling weights and additionally control for age, sex, marital status, educational attainment, working status, income poverty, top quintile of assets, receipt of financial help, rural residence, and region.

Appendix Table 1: Descriptive statistics of the sample

	Public coverage only		Private health plan		Total		Difference ¹
	Estimate	se	Estimate	se	Estimate	se	
Age (mean)	63.08	0.356	64.31	0.835	63.34	0.41	
Female %	54.35	1.28	54.45	1.88	54.37	1.19	
Partnered %	58.89	2.06	68.01	2.69	60.69	2.04	***
No formal schooling, %	14.74	1.48	3.84	0.65	12.6	1.38	***
4 years or less, %	41.62	1.24	25.36	2.55	38.43	1.25	***
5-10 years, %	26.04	1.21	22.91	1.75	25.43	1.09	***
11+ years, %	17.6	1.22	47.89	3.25	23.54	1.45	***
Worked, past 30 days, %	31.78	1.90	34.30	2.98	32.27	1.91	
Few/no health problems, %	36.43	1.37	35.51	2.40	36.25	1.35	
Some health problems, %	32.27	0.88	33.86	2.05	32.59	0.79	
Many health problems, %	31.3	1.64	30.63	1.79	31.16	1.45	
Any financial distress, %	33.25	1.26	24.43	2.20	31.51	1.2	***
Consumption (mean) ²	1128.0	150.3	2312.9	263.9	1331.8	152.9	***
Assets (mean) ²	90874.2	5579.3	217190.1	23020.6	114504.6	99251.1	***
Income (mean) ²	1606.2	57.4	3466.5	246.2	1960.8	84.7	***
North region, %	7.01	3.55	5.52	4.20	6.72	3.62	***
Northeast region, %	31.51	6.34	13.79	3.71	28.03	5.86	***
Southeast region, %	39.07	6.58	60.36	8.25	43.25	6.96	***
South region, %	13.77	4.71	11.77	5.42	13.37	4.76	***
Midwest region, %	8.65	3.82	8.56	3.36	8.63	3.68	***
Rural residence, %	18.28	2.68	4.73	1.07	15.62	2.46	***
N (weighted %)	8055 (80.83)		1821 (19.65)		9878		

All estimates control for the complex survey design and include sampling weights.

1. From design-corrected F-tests for differences across categories and t-tests for differences between means.
 2. Calculated from household-level totals divided by the square root of household size
- *=p<0.05, **=p<0.01, ***=p<0.00

Appendix Table 2: Healthcare expenditure and utilization measures, by household consumption decile

30-day expenditures on:	Decile of total household consumption, per capita										CI ¹
	1	2	3	4	5	6	7	8	9	10	
Hospital	0.00	0.07	0.07	0.01	0.93	0.06	2.31	0.94	5.08	24.25	0.8116*
Dentist	0.03	0.16	0.21	0.87	1.31	2.67	2.90	5.89	10.98	77.47	0.8100***
Doctors	0.66	0.96	1.92	4.31	5.67	8.27	8.98	9.82	13.75	30.43	0.4884***
Labs/exams	0.76	2.42	5.06	5.21	8.45	12.64	21.81	19.62	16.41	57.47	0.5068***
Medications	10.73	18.40	30.09	40.94	60.21	83.83	82.59	92.56	121.19	348.61	0.4974***
Other OOP ²	0.05	0.13	0.05	0.96	1.15	0.42	1.62	2.03	0.92	6.62	0.7805***
OOP (total) ³	12.24	22.13	37.35	52.00	77.63	107.76	119.63	130.65	168.12	543.80	0.5322***
OOP/consumption, %	4.72	5.45	7.37	8.57	10.74	12.76	12.01	10.70	10.26	13.00	0.1476***
Health plan premiums	0.17	1.15	1.60	8.32	14.19	28.01	37.53	63.01	231.82	661.76	0.7786***
Premiums/consumption, %	0.05	0.30	0.32	1.34	1.97	3.36	3.73	5.10	13.89	19.17	0.6137***
Total expenditures	12.42	23.28	38.99	60.63	91.91	135.91	157.74	193.88	400.14	1206.62	0.6433***
Total/consumption, %	4.77	5.75	7.70	9.95	12.72	16.14	15.80	15.82	24.17	32.20	0.3060***

Numbers are weighted means expressed in Brazilian \$ Reais, except where otherwise indicated.

1. CI = survey-weighted concentration index, calculated based on total household consumption per capita

2. Other OOP includes nutritionists, psychologists, home healthcare, physical and occupational therapists

3. All categories are classified as out of pocket, except insurance premiums

*=p<0.05, **=p<0.01, ***=p<0.001