Revista Brasileira de Estudos Regionais e Urbanos
v. 19, n. 3, p. 289-309, 2025
DOI: 10.54766/rberu.v19i3.1180

Inequalities in health care in the Northeast region: An analysis considering the different stages of life

Anderson Moreira Aristides dos Santos[1] | Arthur Brasil Araújo[2] | Lívia Madeira Triaca[3]

[1] Professor of the Postgraduate Program in Economics at the Federal University of Alagoas. E-mail: anderson.santos@feac.ufal.br
[2] Student of the Economic Sciences course at the Federal University of Alagoas. E-mail: arthur.brasil@feac.ufal.br
[3] Professor of the Postgraduate Program in Economics at the Federal University of Pelotas. E-mail: liviamtriaca@gmail.com

ABSTRACT
This paper aims to analyse inequalities in access to health care in the Northeast region compared to Brazil, considering the distinct stages of an individual's life. The analysis is based on data from the 2013 and 2019 National Health Survey. The major results reveal a pro-rich inequality across all the age groups examined in the Northeast region. Although this inequality is less pronounced than the national average, it exhibited an increasing trend across all age groups, except for children, whose inequality index showed a decreasing trend. The older adults group exhibited the lowest rate of inequality. Regarding the associated socioeconomic factors, health insurance emerged as a significant explanatory variable, accounting for a considerable proportion of these inequalities across all cases. The Family Health Strategy reduces pro-rich inequality for all age groups, especially the older adults. Health needs factors have shown to contribute more to older individuals (adults and older adults). Therefore, there is a compelling need to implement or enhance more targeted and effective public policies that can address regional and socioeconomic specificities with greater robustness.

KEYWORDS
Health care, Northeast, Inequalities, Stages of life

Desigualdades na atenção à saúde na região Nordeste: Uma análise considerando os diferentes estágios da vida

RESUMO
Este artigo tem como objetivo analisar as desigualdades no acesso aos cuidados em saúde na região Nordeste em perspectiva comparativa ao Brasil, considerando as diferentes fases da vida do indivíduo com base nos dados da Pesquisa Nacional de Saúde dos anos 2013 e 2019. Os principais resultados mostram uma desigualdade pró-rico para todas as faixas etárias analisadas na região Nordeste, essa desigualdade é menor do que para o Brasil, mas ela apresentou tendência crescente em todas as faixas com exceção das crianças que tiveram tendência decrescente em seu índice. A faixa etária dos idosos é a que apresentou o menor índice de desigualdade. Em relação aos fatores socioeconômicos associados, o plano de saúde é uma variável que explica uma parte significativa dessas desigualdades em todos os casos. A Estratégia Saúde da Família reduz a desigualdade pró-rico para todas as faixas etárias, principalmente para os idosos. No caso dos fatores de necessidade de saúde, eles se mostraram com contribuições maiores para os indivíduos mais velhos (adultos e idosos). Portanto, é importante a implementação ou melhorias de políticas públicas mais direcionadas e eficazes, que possam abordar as especificidades regionais e socioeconômicas de forma mais robusta.

PALAVRAS-CHAVE
Cuidados em saúde, Nordeste, Desigualdades, Fases da vida

JEL CLASSIFICATION
I10, I14, I18, D63

Recebido: 02/04/2025. Aceito: 21/05/2025
e-ISSN: 2447-7990 | https://revistaaber.org.br/rberu

1. Introduction

Brazil faces considerable challenges in its health care system, characterised by a complex interplay of socioeconomic, geographical, and structural factors. More Doctors Programme (PMM) and the Family Health Strategy (ESF) are notable implemented initiatives designed to enhance access to health care. However, persistent barriers continue to affect both equity and the quality of services available. Rural and peripheral areas often face significant limitations, reinforcing existing disparities in access to care while more developed regions of the country have better infrastructure and greater access to health professionals (Travassos et al., 2006; Travassos e Castro, 2012; Passarelli-Araujo e de Souza, 2023; Coube et al., 2023).

The establishment of the Unified Health System (SUS) in 1990, following the promulgation of the 1988 Constitution, marked a significant milestone in the ongoing effort to ensure equitable access to health care for all Brazilian citizens. The SUS has a universal and comprehensive access to free health services, promoting health equity across the entire population. Despite considerable advances, there are disparities in resource allocation. It exacerbates socioeconomic inequalities regarding factors such as income, schooling, and access to health insurance, impeding the effective achievement of equitable health care (Paim et al., 2011).

These inequalities are consistent with global patterns observed in middle and high-income countries, where people from lower socioeconomic backgrounds face significant barriers to access, ranging from financial constraints to lack of infrastructure and proximity to services (Marmot, 2005; Wagstaff et al., 1989; Mackenbach, 2012). These disparities are exacerbated in Brazil by the historical concentration of investment in more developed regions, such as the Southeast and South, leaving less favoured areas, like the Northeast, at a structural disadvantage (Paim et al., 2011; Massuda et al., 2018).

In this context, the health inequalities in the Northeast show how socioeconomic and geographical conditions can influence on the access to services. The region, which is historically known for lower human development indices and high levels of poverty, presents challenges that must be considered. Although initiatives, such as the ESF, have led to progress, there are significant gaps in the supply and use of health services, which vary according to the age groups of the population.

It is important to consider the stages of an individual's life to comprehend how inequalities manifest themselves throughout them. The distinct demands and vulnerabilities associated with childhood, adulthood and older adulthood have a significant impact on health needs and the ability to access services. Research shows that early childhood represents a critical period for interventions, since adverse conditions can have long-term impacts on health and human development (Victora et al., 2011; Geelhoed et al., 2020). Conversely, the older adults often face challenges related to chronic diseases and functional limitations, which demand greater attention and resources

(World Health Organization, 2015; Maresova et al., 2019; Rony et al., 2024).

In this context, this study seeks to answer the following research question: to what extent do inequalities in access to health care in the Northeast region differ from the national pattern, considering the different phases of the Brazilian population's life cycle? To this end, the study analyses socioeconomic inequalities in access to health services based on data from the 2013 and 2019 National Health Survey (PNS), adopting a comparative perspective between regions and age groups. In methodological terms, inequality is quantified by means of the concentration index (CI) and, subsequently, a decomposition is carried out that allows the identification of the factors that contribute to this inequality.

The study is based on the theory of the economics of well-being, which recognizes health as a meritorious good whose unequal distribution compromises efficiency and social justice (Musgrave, 1957; Culyer, 1989). Thus, the inequalities observed reflect market failures and justify public intervention to promote greater equity in the health system (Arrow, 1963).

The importance of this study lies in the need to guide more equitable public policies, capable of considering the regional and age specificities of the population. Despite the extensive literature on inequalities in access to health services, there are few analyses that simultaneously address these two dimensions (Macinko e Lima-Costa, 2012; Viacava et al., 2019; Mullachery et al., 2020; Coube et al., 2023). By emphasizing these disparities, the findings contribute to the development of more effective public policies directed to the characteristics of the population analysed.

2. Literature Review

Inequality in access to health services is a persistent global challenge, with relevance in developing countries. This systematic review, conducted according to the PRISMA method (Moher et al., 2009), analysed 23 scientific papers that employ quantitative methods to examine disparities in access to health in different national contexts. The reviewed studies reveal three main research lines: (1) the influence of socioeconomic determinants (income, schooling, and geographic location) on access to services; (2) the role of public policies in reducing inequalities; and (3) the variations in access barriers between different age groups.

There is currently a strong debate concerning access to health care services, reflecting an attempt to achieve a balance from a health perspective, with several nations conducting intensive research. Among these studies, the research conducted by Malik et al. (2021) is noteworthy. They analysed the inverse relationship between the Social Health Protection Initiative (SHPI) and the level of inequity in Pakistan. They used data from the SHPI for the years 2016 and 2017, applying multivariate logistic regression to examine variables such as age, type of treatment, cost, location of health services and list of health centres. The results showed that the use of private

services presented significantly low variations, with only increasing age influencing higher spending on private services, leading to adherence to public services.

Awiti (2014) analysed the use of certain health services in Kenya. The study employed data sourced from the 2005 and 2006 Kenya Integrated Household and Budget Survey, which includes socioeconomic information concerning household demographics, to analyse the determinants of health service use. Furthermore, an analysis was conducted on the period in which individuals attended health providers of various kinds. This analysis was performed using a multinomial probit model. The study concluded that, across all age groups, poverty indicators (such as household size and distance from health centres) are crucial factors hindering the use of health services.

García-Altés et al. (2018) conducted a cross-sectional study between 2014 and 2015, which focused on understanding the direct relationship between economic recession and the impact on health. The aim of the study was to evaluate the effectiveness of the health care policy in Catalonia, Spain, where the health services are free; however, the cost of prescription medications depends on the income of the patient. To analyse this, the Primary Care Minimum Basic Data Set (MBDS) was used, and attendance rates were consequently evaluated.

Pan et al. (2019) analysed levels of health inequality using data from the Chinese Longitudinal Healthy Longevity Survey (CLHLS) from 2000 to 2014, focusing on the 65-74 age group. The Economy Prediction System (EPS) was used for socioeconomic variables. The methods used included the Quality of Well-Being (QWB), the Wagstaff Index (WI), the Erreygers Index (EI), the Shapley decomposition method and the RIF-I-OLS. They concluded that access to health care is related to the individual's financial contribution.

Kocot (2023) analysed the factors that contribute significantly to unmet health care needs (UHCN). The paper used Eurostat data from 2019, along with the European Health Interview Survey (EHIS) and the EU Statistics on Income and Living Conditions (EU-SILC). The EHIS was used to define the level of health need, while the EU-SILC represented the entire population without health needs. After using these analysis methods, the conclusion is that the rate of UHCN was higher in the 15 to 64 age group than in older age groups.

Başar et al. (2021) studied the best reorganisation of the health system through an overview of Primary Health Care (PHC). They used data collected in 2015 by the Turkish Statistical Institute (TSI) to identify the probability of not having a medical care in Turkey. An estimation analysis with a probit model was performed based on the survey's questionnaire model, which is based on the temporal utilisation of health services. The results showed that of the 17,242 individuals, 25% did not use health services due to three main reasons: distance, waiting time and cost. Waiting time (14.6%) and cost (13.8%) were the most common reasons found.

Mullachery et al. (2020) investigated the reduction of inequalities in access to can-

cer screening tests in Brazil, focusing on Pap smear and mammography. Using representative data from 2003, 2008 and 2013, the authors applied the Inequality Concentration Index and the Relative Inequality Index to measure socioeconomic inequalities in using these procedures. The analysis showed that inequality in having mammograms reduced significantly over the period, especially among women with a medical visit in the previous year. However, in 2013, women with higher education were still 2.27 times more likely to have mammograms than illiterate women.

Macinko e Lima-Costa (2012) analysed horizontal equity in using health services in Brazil between 1998 and 2008. The authors investigated the use of medical and dental consultations and hospitalisations using data from representative national surveys. They applied the Horizontal Inequity Index to measure inequalities between different socioeconomic groups. Variables such as age, sex, chronic conditions, and family income were considered. The findings revealed a decline in inequalities, with greater equity in using medical consultations and hospitalisations over the period observed.

Dullak et al. (2011) analysed the various possibilities of Primary Health Care (PHC) in Paraguay, using a variety of data from different periods. They considered socioeconomic indicators such as the Gross Domestic Product (GDP) from 2000 to 2005, the population below the national poverty line in 2007 and the number of hospitals per one thousand inhabitants in 2007. The data covered the period from 2002 to 2007. The analysis employed a case study method to verify PHC governance. As a result, the policies were effective in addressing access to health care, as evidenced by the observed increase in access levels.

Schenkman e Bousquat (2021) assessed the role of health equity in international health outcomes by conducting a comparative analysis from 2010 to 2015. They used the Fixed Effects Model panel and Data Envelopment Analysis as the research method. The effect variables used were life expectancy at birth and infant mortality. The human development index (HDI) score was used in relation to the decrease associated with multidimensional inequality, from the economic (income) and social (education and health) points of view to assess inequality. The paper defined direct payment for access to health services as harmful, while education was protective against infant mortality. Although the existence of social or private insurance was initially considered beneficial for life expectancy, this association was not maintained in the final model. The latter emphasised equity, together with per capita health expenditure, as determinants of longer survival.

Yaddanapalli et al. (2019) analysed the best possible health policy for Tenali mandal in India, seeking a deeper understanding of socioeconomic needs. They examined the use of public and private health services by measuring the number of visits per year, or the number of people who had at least one visit in the previous year. They collected the data from their own cross-sectional study conducted in 2017 with a sample of 1,500 participants. The conclusion was that the distance to a public hospital centre is a strong factor associated with not accessing health services.

Hwang (2018) analysed the understanding of barriers to accessing health services, using data from the Korean National Health and Nutrition Examination Survey (KNHANES) between 2010 and 2012. The study focused on the level of satisfaction with care at certain health centres. The Andersen's Health Behaviour Model (HBM) was used for the analysis. The conclusion was that a lower income and lower educational level in both women and men increased the likelihood of having unmet needs related to accessibility. The study also identified that younger age groups and women living alone were associated with a higher probability of experiencing unmet needs related to availability.

Garcia-Ramirez et al. (2020) assessed inequality in using health services among the older adults in Colombia, based on data from the 2015 Colombian Survey on Health, Well-Being, and Aging. Using Andersen's health care model as a theoretical framework, they performed analyses that included multivariate logistic regressions and concentration indices. They concluded that wealth quintile, urban housing, type of health insurance and multimorbidity were significant predictors of the use of all health services, apart from hospitalisation.

Souliotis et al. (2019) analysed the understanding of citizens' preferences for a given health service and the creation of a profile of those in favour of PHC in Greece. They used the data collected by the researchers themselves in 2017, March and October. The first month had 1002 responses and the second 1001, with questions related to the level of satisfaction with health services, location, cost, and barriers to access. Logistic regression was used to analyse the results, which showed that the use of private services decreased because of the policies implemented, although the average use of private services in both months was 47.25%.

Chovar Vera et al. (2014) analysed inequity and inequality in Chile from 2000 to 2011 in a cross-sectional manner: 2000, 2003, 2009 and 2011. They used the National Socioeconomic Characterisation Survey (CASEN) database, relating to access to certain types of health services. The concentration index (CI) was used to calculate inequality, and the health inequality index (HII) was used to calculate socioeconomic standards. Finally, the authors indicate higher levels of inequality in using specialised medical services in the children's groups and higher levels of inequality in the adults' group.

Cooper et al. (1998)' analysis of equity in general practice, outpatients and inpatients drew upon a database comprising a survey of British households, published by the Office for National Statistics (ONS) from 1991 to 1994. The multivariate logistic regression method was used to assess the influence of socioeconomic background and ethnicity of the child or adolescents on the use of each health service, after controlling for perceived health needs. The findings indicated an absence of variation in health care use among children and young individuals based on their socioeconomic status, thereby suggesting the attainment of equity in health care access.

González e Triunfo (2020)' analysis of Uruguay's reform focused on access to health services. They used the Integrated National Health System (SNIS) which is related to secondary data from the 2014 National Health Survey (ENS). The study started with the principle of the individual's quality of life, habits, health expenditure, and socioeconomic characteristics. The concentration index method was used to analyse the level of socioeconomic inequality present in access to health care. The study revealed that there is a pro-rich inequality in medical services, which is often associated with their cost.

Saito et al. (2016) analysed the main sources of inequality in the use of, and access to health services in Nepal, constructing a concentration index to illustrate inequality in access to health care. The authors concluded that the analysis found no evidence of low-income people using public health services more often, and even less after adjusting for inequality in health needs factors. Financial barriers, because of high out-of-pocket payments, may be a contributing factor to the observed limited access to public and private health facilities.

Samadoulougou et al. (2022) conducted a study about the impact of the Free Health care Policy (FHCP) on reducing socioeconomic inequalities in using health services among children in Burkina Faso. A pre-policy analysis was conducted between 2010 and 2014, followed by a post-policy analysis in 2017 and 2018. The data was extracted from the following surveys: The Burkina Faso 2010 Demographic and Health Survey (DHS), and the Malaria Indicator Surveys (MIS) conducted in 2014 and 2017-2018, respectively. To measure socioeconomic inequalities, a concentration index was made by country (before and after the policy). The results demonstrated an enhancement in the well-being of children under the age of five. Nevertheless, social inequalities in health remain prevalent, favouring the rich.

Regarding national research, there are Viacava et al. (2019), Travassos et al. (2000) and Travassos et al. (2006) whose studies were based on inequality in access to health services involving geographic and social issues. They used data from the National Household Sample Survey (PNAD) and the National Health and Nutrition Survey (PNSN).

Travassos et al. (2000) sought to understand equity in using health services based on two dimensions: geographical and social. The researchers used data from the PNSN in 1989 and the Living Standards Survey (PPV) in 1996 and 1997. Travassos et al. (2006) compared the patterns of geographical and social inequalities in access to health services in 2003 with those existing in 1998. The Brazilian health system is characterised by a high degree of complexity, composed of numerous health service markets, each of which functions according to its own distinct supply and demand dynamics. These markets are interconnected and exacerbate inequalities in access to health services. Consequently, the system is characterised by its pro-rich nature, exhibiting no alterations over time.

Viacava et al. (2019) examined health inequality and access to health care services

across the country's five primary regions. Using data from the National Household Sample Survey (PNAD) and the National Health Survey (PNS) from 1998 to 2013, the researchers examined the relationship between schooling and health inequality. To assess the utilisation of health services, the proportions of individuals who reported having consulted a physician were selected as indicators. The different quintiles were then compared to assess disparities. The results indicated that, as education levels increase, there is greater use of health services, even in areas with long distances.

Stopa et al. (2017) analyse the use of health services in the Brazilian population according to sociodemographic factors, based on the 2013 National Health Survey (PNS). In the population-based household survey, PNS data provide strong information regarding access to and use of health services. They used a 95% confidence interval, by age group, level of education of the head of household, and in the macro regions. People living in the South and Southeast regions still have greater access to health services, as those whose head of household has a higher level of education. The (re)formulation of health policies to reduce disparities must consider the differences found between regions and between social levels.

Russo et al. (2021) analysed the introduction of the first pay-for-performance (P4P) scheme of the National Programme to Improve Access and Quality in Primary Care (PMAQ). Their impact on hospitalisations for Ambulatory Care Sensitive Conditions (ACSCs) is sought, using a Fixed Effects (FE) model to measure the association of the PMAQ on hospitalisation rates for ACSCs from 2009 to 2018, covering the different age groups 0-4, 5-19 and 20-64. This study had data extracted from the Hospital Information System (SIH/DATASUS). Instead of using the use of a certain health service (yes/no) as a dichotomous variable, it was preferable to relate PMAQ participation to Family Health Teams (FHTs). This shows that there is a negative and statistically significant association between the launch of the PMAQ and ACSCs rates for all age groups.

Coube et al. (2023) demonstrated that, despite the advances made by the SUS in reducing health inequalities, significant disparities persist in access to preventive and curative services, especially in the poorest regions of the country. Analysing data from PNAD and PNS between 1998 and 2019 and using the Concentration Index, the authors identified that, although pro-rich inequalities have decreased over time, they remain more pronounced in services such as mammograms and Pap smears, particularly in regions exhibiting limited socioeconomic development.

Despite the extensive literature – from international cross-sectional analyses to Brazilian studies that employ the concentration index – two gaps remain not very well explored. Firstly, most of the national studies address inequalities in aggregate terms, without distinguishing between the various stages of the life cycle. Secondly, few of them analyse the Northeast, a structurally more vulnerable region compared to the national pattern. To our knowledge, there is still no investigation that combines (i) a regional perspective, (ii) age group (children, adults, and older adults), and (iii)

decomposition of the concentration index with more recent data from the PNS (2013 and 2019). Thus, the present study fills these gaps by quantifying and decomposing socioeconomic inequalities in access to health care at different stages of life, explaining how the determinants vary between the Northeast and Brazil.

3. Methodology

3.1 Data

A cross-sectional study was conducted on the level of inequality regarding access to health care in 2013 and 2019. The micro data from the National Health Surveys (PNS) conducted in 2013 and 2019 by the Brazilian Institute of Geography and Statistics (IBGE) was analysed. It offers a comprehensive overview of the health status of the Brazilian population, with a focus on access to and use of health care services, as well as the health conditions of the Brazilians.

The PNS is a set of records made by the IBGE in 2013 and 2019. It includes data on the health of the Brazilian population. The data set encompasses characteristics related to access to and use of health services, health conditions, and risk factors associated with chronic noncommunicable diseases. However, this analysis is in line with the main factors in inequity in access to health. The PNS provides a comprehensive overview of the health status of the Brazilian population, systematically organised according to sociodemographic and regional variables.

3.2 Concentration Index and Decomposition

The Concentration Index (CI) is a statistical measure that has been employed in a variety of fields, including economics, sociology, and public health, for assessing the distribution of a particular attribute within a population. In health, the CI is particularly useful for analysing the concentration of health services, such as medical consultations, among different population groups or geographical regions.

The CI is calculated based on the distribution of the values of an attribute in a population and ranges from -1 to 1. A CI value close to 0 indicates that the attribute is evenly distributed among the individuals or groups analysed. However, a value close to 1 means an outcome concentration among the richest, while closer to -1 among the poorest. There is a need to perform a correction for binary variables, thus we apply the proposal by Erreygers (2009) considering its properties, it can be calculated by the following formula:

$$IE_t = 8cov(h_{it}, R_{it}) \tag{1}$$

where h means the health care indicator, being medical consultations in this paper; R is the ranking of the individual classified from the poorest to the richest and their fraction in this ranking; i is the subscript for the individual; t is the PNS (2013 or 2019, measured cross-sectionally for each survey), while cov is the covariance between h and

R.

The use of the CI in public health analyses is fundamental for identifying inequalities in access to and use of health services. Interpreting the results of the CI makes it possible to identify areas that need intervention to improve equity in access to health services.

The decomposition of factors associated with inequalities will consider the proposal by Wagstaff (2005) with correction by Erreygers (2009):

$$IE_t = 4(\sum \hat{\beta}_{kt}.GCI(x_{kt})) + \epsilon \tag{2}$$

where $\hat{\beta}$ is a coefficient to be estimated of the relationship between the binary variable medical consultations and the associated factors (x_k). In this study, the average marginal effect of a probit model was used.

The use of this model was predicated on the binary nature of the response variable. The calculations were performed considering the logit model and the linear probability model, which generated similar results[1]. The term ϵ represents the contribution of residual factors that explain this inequality in medical consultations. The GCI is a concentration index in its generalised version given by:

$$GCI = 2cov(x_{kit}, R_{it}) \tag{3}$$

3.3 Econometric Model

Table 1 shows the variables used in this study: the health care response variable, income (socioeconomic status) and other associated factors.

The dummy referring to sex was used to observe the existence of different probabilities in relation to access to health. The objective of this analysis was to acquire a more profound understanding of which factors have the greatest influence on access to health services.

The dummies related to Federal Units in the Northeast have the state of Maranhão as the base category, since it has a prevalent poverty rate.

The variable referring to no level of education of the head of the household is used for the dummies related to schooling. The reason for it is to use the same variable for all age groups, since children are not in school or naturally have few years of schooling. It is expected that as the respondent's level of education increases, there will be a constant coefficient related to visits to health services.

Regarding the residence, a dummy variable was used to compare the opportunity of access to health services between individuals living in urban and rural areas. Positive values are expected, since residents of urban areas have greater access to health

[1]These additional results are available to interested parties through contact with the authors.

services, as most of them are in the main population centres.

Table 1. Description of the variables incorporated into the model

Variable	Description
Medical consultations	Response variable, dummy is 1 if the individual has been to an appointment in the last twelve months.
Sex	Dummy is 1 if the one is healthy and 0 otherwise.
Age	Age of the individual in years.
Self-rated health	Dummy is 1 if health is self-rated as particularly good or good and 0 otherwise.
Restriction of activities	Dummy is 1 if there was a restriction of activity in the 15 days preceding the interview and 0 otherwise.
Skin colour	Dummy is 1 if the individual is self-declared black or mixed-race and 0 otherwise.
lnincome	Natural log of per capita household income.
Schooling	Categorical variable of the education level of the head of the household: no education (base category); incomplete primary education; complete primary education; incomplete secondary education; complete secondary education; incomplete higher education; and complete higher education.
Family Health Strategy (ESF)	Dummy is 1 if the individual's household is registered with the ESF and 0 otherwise.
Health insurance	Dummy is 1 if the individual has health insurance and 0 otherwise.
Urbanite	Dummy is 1 if the individual lives in an urban area and 0 otherwise.
UF	Dummies of the Federal Units with Maranhão as the base category.

These chosen variables are based on the literature, such as Almeida et al. (2013), whilst also considering the availability of data for the sample of all individuals[2]. They include the health need variables: sex, age, self-rated health, and activity restrictions. There are also the non-need variables, that is, socioeconomic factors possibly related to access to medical consultations, such as income, schooling, and health insurance.

The analysis will be conducted considering distinct stages of the individuals' lives: childhood (0-11 years old), youth (12-20 years old), adulthood (21-59 years old) and the older adulthood (60 years old or more).

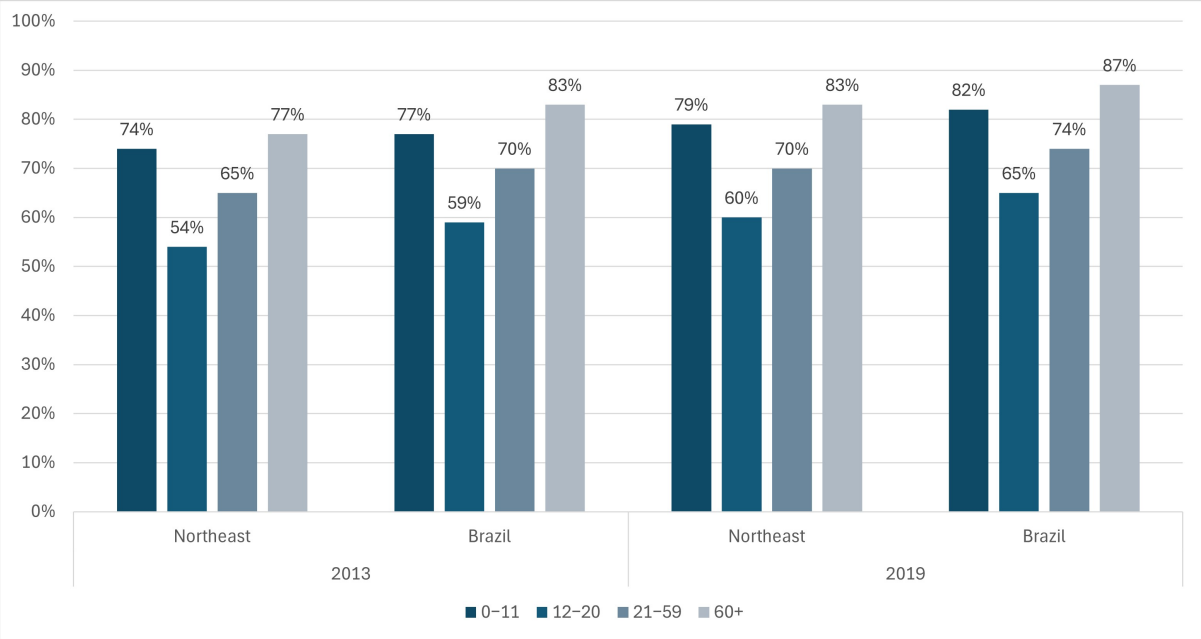
4. Results Analysis

Graph 1 shows the proportion of visits to medical consultations in the last 12 months for distinct stages of life in the Northeast region compared to Brazil in 2013

[2]It is worth highlighting the existence of blocks of questions for one selected adult from each household (18 years old or older in the 2013 PNS and 15 years old or older in the 2019 PNS). However, as this study uses information from all individuals in a comparative way, the variables used were limited to the blocks with responses for all households.

and 2019. Attendance at medical appointments in the last 12 months prior to the interview was higher for children and older adults, with percentages of 82% (77% in 2013) and 87% (83% in 2013), respectively. Conversely, there are lower values for adolescents aged 12 to 20, with 65% (59% in 2013), and 74% for adults aged 21 to 59 (70% in 2013).

Figure 1. Percentage of medical consultations in the last 12 months, Northeast and Brazil in 2013 and 2019



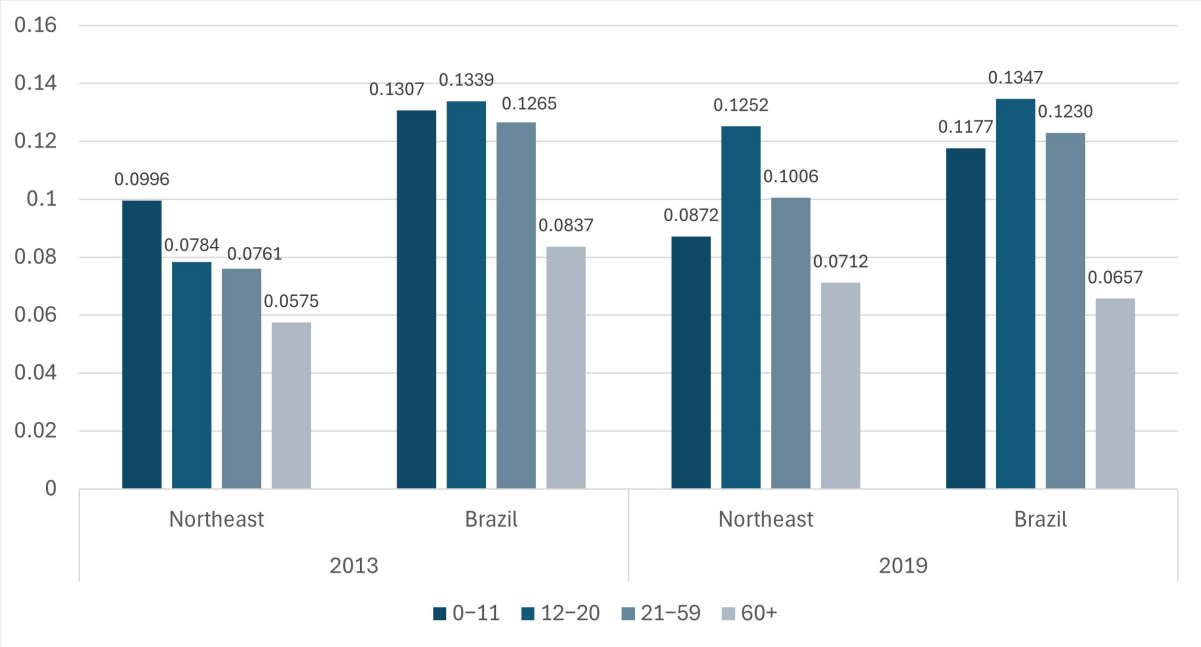
Source: Authors' calculations based on PNS 2013 and 2019 data.

There was an increase in the proportion of medical consultations both in the Northeast region and Brazil. This can be seen in all age groups; for instance, among children in this region, the variation was five percentage points.

Comparing the relative growth between regions, the Northeast shows a higher growth in medical appointments in almost all age groups compared to the national average. However, despite the improvements, the Northeast still presents significant disparities when compared to Brazil. Graph 2 shows the concentration index (corrected for binary variables) for the Northeast region and Brazil, for both years analysed in this study. In all cases, inequality is pro-rich, as expected, with medical consultations concentrated among individuals with a higher level of income. Concerning Brazil, there has been a significant decrease in concentration indices. On the other hand, the Northeast shows an increase in inequality in medical consultations in all age groups. As a result, there has been an overall increase in the concentration index in the Northeast in relation to 2013, while there has been a decrease in Brazil in 2013. Nevertheless, in terms of magnitude, inequality in Brazil is bigger than in this region of analysis. The result of pro-rich inequalities in regions of Brazil, including the Northeast, is also found in the study of Cambota e Rocha (2015), based on data from PNAD (2008). However, besides providing a more recent overview, the analysis here

considers the age group, seeking to contribute to the understanding of inequalities in distinct stages of life.

Figure 2. Concentration index of medical consultations in Northeast and Brazil in 2013 and 2019



Source: Authors' calculations based on PNS 2013 and 2019 data.

There is a common and similar decrease in the 0-11 age group. An analysis of the specific age groups shows that the concentration index for adolescents in the Northeast has increased significantly (from 0.0784 to 0.1252), in contrast to the stable index in Brazil (from 0.1339 to 0.1347). This discrepancy suggests that inequality in the distribution of medical consultations for adolescents is a growing problem in the Northeast.

While inequality in the distribution of medical consultations is decreasing in Brazil, the opposite is true in the Northeast. The significant differences in the concentration indices highlight the urgent need for differentiated and targeted public policies for the Northeast, aiming to reduce inequalities and improve equity in access to health services for all age groups.

In terms of age groups, we see that inequalities in health care are lower among the older adults, a group with increasing health needs. It is a challenge because other groups who can afford more preventive care have higher inequality rates.

Table 1 in the Appendix shows some descriptive statistics for the variables used in the inequality decomposition analysis. Table 2 shows the contributions of these socioeconomic factors to inequalities in medical consultations by age group in the Northeast region. First, in all cases, health insurance is a factor that contributes to the concentration index in a pro-rich way, given that it has a positive relationship

with medical consultations and is concentrated among the richest. This result is in line with those found for the Brazilian general population in Almeida et al. (2013) or in the more recent work of Mullachery et al. (2020). Therefore, despite the existence of a public and universal health care system, health insurance is a factor related to greater access to health care in the Northeast region, in all the age groups analysed. Schooling and income are also crucial factors in explaining inequalities in health care, although this second indicator made little contribution to the 2013 PNS survey. Both factors contribute to an inequality favourable to the wealthiest, formed by a positive relationship between schooling and income with medical consultations (according to the marginal effects in Table 2), although income was not statistically significant in 2013.

Table 2. Contribution to inequalities in medical consultations in the Northeast region in 2013 and 2019

	2013							
	Contribution and Percentage Contribution							
Variable	**0 to 11 years old**		**12 to 20 years old**		**21 to 59 years old**		**60 years old and +**	
Sex	0.0000	-0.01%	-0.0029	-3.70%	-0.0085	-11.11%	0.0021	3.60%
Age	0.0072	7.27%	-0.0040	-5.05%	0.0027	3.52%	0.0000	-0.06%
Health	-0.0090	-9.04%	-0.0088	-11.18%	-0.0278	-36.56%	-0.0201	-34.92%
Skin tone	0.0013	1.29%	0.0037	4.69%	-0.0013	-1.73%	0.0031	5.36%
Income	0.0252	25.31%	0.0039	4.98%	0.0131	17.20%	0.0054	9.36%
Schooling	0.0220	22.12%	0.0413	52.68%	0.0343	45.15%	0.0150	26.13%
Health insurance	0.0428	42.99%	0.0430	54.78%	0.0719	94.52%	0.0465	80.81%
Area of residence	0.0087	8.75%	0.0057	7.23%	0.0022	2.84%	0.0146	25.38%
PSF	-0.0041	-4.16%	-0.0082	-10.50%	-0.0083	-10.95%	-0.0125	-21.74%
Residual	0.0055	5.48%	0.0048	6.08%	-0.0022	-2.87%	0.0035	6.08%
	2019							
	Contribution and Percentage Contribution							
Variable	**0 to 11 years old**		**12 to 20 years old**		**21 to 59 years old**		**60 years old and +**	
Sex	0.0000	0.03%	-0.0042	-3.34%	-0.0054	-5.37%	0.0015	2.15%
Age	-0.0048	-5.53%	-0.0001	-0.08%	0.0042	4.21%	0.0021	2.90%
Health	-0.0040	-4.56%	-0.0107	-8.53%	-0.0234	-23.27%	-0.0258	-36.18%
Skin tone	-0.0004	-0.45%	0.0017	1.33%	-0.0014	-1.35%	0.0019	2.60%
Income	0.0352	40.43%	0.0496	39.64%	0.0422	41.96%	0.0320	44.89%
Schooling	0.0140	16.07%	0.0349	27.91%	0.0305	30.28%	0.0142	19.97%
Health insurance	0.0444	50.91%	0.0553	44.21%	0.0620	61.65%	0.0415	58.22%
Area of residence	0.0081	9.35%	0.0073	5.79%	-0.0007	-0.65%	0.0088	12.39%
PSF	-0.0065	-7.44%	-0.0064	-5.11%	-0.0067	-6.68%	-0.0109	-15.26%
Residual	0.0010	1.21%	-0.0023	-1.82%	-0.0008	-0.79%	0.0059	8.32%

Source: Authors' calculations based on PNS 2013 and 2019 data.

The Family Health Strategy is a policy that aims to reorganise primary care in the country by decentralising health services. It has teams responsible for a maximum of 4,000 people, although the recommended number is 3,000 to achieve greater equity and consider the country's socioeconomic vulnerability[3]. Our evidence shows that this policy reduces pro-rich inequalities in all age groups, since it has a positive relationship with medical consultations (Table 2) and is concentrated in the poorest, so its contribution to the concentration index is negative, and this effect is stronger for the older adults.

Health indicators (self-rated health and restriction of activities) contribute strongly

[3]For more details, see: https://www.gov.br/saude/pt-br/composicao/saps/estrategia-saude-da-familia.

to inequalities in health care for adults and the older adults, with lower percentages for children (0-11 years) and adolescents (12-20 years). This contribution is in favour of the poorest, because health is negatively related to health care, i.e. the worse the health, the greater the demand for goods and services in this sector, and better health is concentrated among the wealthier. These results are in line with Mullachery et al. (2016) and Grossman (1972)' theoretical model regarding the depreciation of health capital. Therefore, the inequalities formed by non-needs factors are proportionally greater for children and adolescents - as age increases, the greater the weight of health needs and their association with health care.

Therefore, our results are in line with previous studies in Brazil regarding evidence of pro-rich inequalities in medical consultations. It showed the importance of socioeconomic factors income and education, especially health insurance, as well as the relationship in the opposite direction (pro-poor) of the Family Health Programme (Mullachery et al., 2016; Almeida et al., 2013; Cambota e Rocha, 2015). However, this work innovates by finding evidence of total non-homogeneity when considering the different stages of life, such as smaller inequalities at the two extremes of life, as well as a more accentuated importance of the PSF in reducing inequalities for the older adults in the Northeast region.

5. Conclusion

The aim of this paper was to analyse inequalities in access to health care in the Northeast region in a national comparison. It considered the distinct stages of the individual's life in 2013 and 2019, using data from PNS. The importance of this analysis lies in the necessity of directing public policies and strategies to improve the use of health services and reduce disparities.

The results reveal a complex situation concerning access to health care services in Brazil. The data showed that there was an increase in the frequency of medical consultations in almost all age groups in 2013 and 2019. Children and older adults, for instance, exhibited a substantial rise in physician visits, which may be related to public policies such as the More Doctors Programme (PMM) and the Family Health Strategy (ESF).

The analysis highlighted the persistence of regional and socioeconomic inequalities. The Northeast region continues to face greater challenges compared to Brazil. There were lower proportions of people attending medical appointments, and inequalities - although lower than the country - increased between 2013 and 2019 for adolescents, adults, and older adults, with a decrease in the index only for children.

Health insurance proved to be a crucial factor in all cases, explaining inequalities in this region, regardless of the year analysed and the age group. Socioeconomic factors, such as income and schooling, continue to have a significant influence on access to health care, with higher concentration rates.

The Family Health Strategy has proved to be an important policy in reducing inequalities in pro-rich health care, particularly among the older adults (aged 60 and over). This underscores the significance of public primary care policies that consider multidimensional socioeconomic issues.

The analysis demonstrated that inequalities are not confined to regional disparities. Within the regions themselves, individuals from lower socioeconomic strata encounter greater challenges in accessing health care, exacerbating the existing inequities. Despite efforts to universalise access to health care, the study revealed that there are inequalities in all age groups.

Despite improvements in health service accessibility, the study shows that regional and socioeconomic inequalities persist as significant challenges. Implementing more targeted and effective public policies is imperative to address regional and socioeconomic specificities with greater efficacy.

It is important a robust Unified Health System (SUS). The expansion of preventative health programmes and health education, together with investments in health infrastructure – particularly in rural and peripheral regions – are essential to ensure equitable access to health services. An integrated approach that is specifically focused on the needs of the most vulnerable regions and populations is a key component in the quest for equitable access to health services in Brazil.

There are some limitations in this study: we do not have a longitudinal database available that would allow us to control the individual heterogeneity not observed, the analysis is based only on an outcome that is medical consultations, in addition we do not have information on whether the consultations are preventive or due to health problems, and they are not divided into specialist doctors and primary care physicians, and the relationships are based on associations and may contain endogeneity problems. Future studies may seek to overcome these problems with the use of other variables, databases, outcomes, and other econometric strategies.

References

Almeida, G., Sarti, F. M., Ferreira, F. F., Diaz, M. D. M., e Campino, A. C. C. (2013). Analysis of the evolution and determinants of income-related inequalities in the brazilian health system, 1998-2008. *Revista panamericana de salud pública*, 33:90–97.

Arrow, K. J. (1963). Uncertainty and the welfare economics of medical care. *American Economic Review*, 53(5):941–973.

Awiti, J. O. (2014). Poverty and health care demand in kenya. *BMC health services research*, 14:1–17.

Başar, D., Dikmen, F. H., e Öztürk, S. (2021). The prevalence and determinants of unmet health care needs in turkey. *Health Policy*, 125(6):786–792.

Cambota, J. N. e Rocha, F. F. (2015). Determinantes das desigualdades na utilização de serviços de saúde: análise para o brasil e regiões. *Pesquisa e Planejamento Econômico*, 45(2).

Chovar Vera, A., Vásquez Lavín, F., e Paraje, G. (2014). Desigualdad e inequidad en la utilización de servicios médicos según grupos etarios en chile, 2000-2011. *Revista Panamericana de Salud Pública*, 36:171–178.

Cooper, H., Smaje, C., e Arber, S. (1998). Uso dos serviços de saúde por crianças e jovens de acordo com etnia e classe social: análise secundária de uma pesquisa nacional. *BMJ*, 317(7165):1047–1051.

Coube, M., Nikoloski, Z., Mrejen, M., e Mossialos, E. (2023). Persistent inequalities in health care services utilisation in brazil (1998–2019). *International Journal for Equity in Health*, 22(1):25.

Culyer, A. J. (1989). The normative economics of health care finance and provision. *Oxford review of economic policy*, 5(1):34–58.

Dullak, R., Rodriguez-Riveros, M. I., Bursztyn, I., Cabral-Bejarano, M. S., Ruoti, M., Paredes, M. E., Wildberger, C., e Molinas, F. (2011). Atención primaria en salud en paraguay: panorámica y perspectiva. *Ciência & Saúde Coletiva*, 16:2865–2875.

Erreygers, G. (2009). Correcting the concentration index. *Journal of health economics*, 28(2):504–515.

Garcia-Ramirez, J., Nikoloski, Z., e Mossialos, E. (2020). Inequality in healthcare use among older people in colombia. *International journal for equity in health*, 19:1–15.

García-Altés, A., Ruiz-Muñoz, D., Colls, C., Mias, M., e Martín Bassols, N. (2018). Desigualdades socioeconômicas em saúde e uso de serviços de saúde na catalunha: análise dos dados individuais de 7,5 milhões de residentes. *Journal of Epidemiology and Community Health*.

Geelhoed, E., Mandzufas, J., George, P., Strahan, K., Duffield, A., Li, I., e Cross, D. (2020). Long-term economic outcomes for interventions in early childhood: protocol for a systematic review. *BMJ Open*, 10(8):e036647.

González, C. e Triunfo, P. (2020). Horizontal inequity in the use and access to health care in uruguay. *International Journal for Equity in Health*, 19:1–13.

Grossman, M. (1972). On the concept of health capital and the demand for health. *Journal of Political Economy*, 80(2):223–255.

Hwang, J. (2018). Understanding reasons for unmet health care needs in korea: what are health policy implications? *BMC Health Services Research*, 18:1–9.

Kocot, E. (2023). Unmet health care needs of the older population in european countries based on indicators available in the eurostat database. In: *Healthcare*, volume 11, Página 2692. Multidisciplinary Digital Publishing Institute.

Macinko, J. e Lima-Costa, M. F. (2012). Horizontal equity in health care utilization in brazil, 1998–2008. *International journal for equity in health*, 11:1–8.

Mackenbach, J. P. (2012). The persistence of health inequalities in modern welfare states: the explanation of a paradox. *Social science & medicine*, 75(4):761–769.

Malik, S., Sadiq, N., Anwar, S., e Qazi, U. (2021). Consumer choice of health facility among the lowest socioeconomic group in newly established demand-side health-financing scheme in pakistan. *East Mediterr Health Journal*, 27(10).

Maresova, P., Javanmardi, E., Barakovic, S., Barakovic Husic, J., Tomsone, S., Krejcar, O., e Kuca, K. (2019). Consequences of chronic diseases and other limitations associated with old age–a scoping review. *BMC public health*, 19:1–17.

Marmot, M. (2005). Social determinants of health inequalities. *The lancet*, 365(9464):1099–1104.

Massuda, A., Hone, T., Leles, F. A. G., De Castro, M. C., e Atun, R. (2018). The brazilian health system at crossroads: progress, crisis and resilience. *BMJ global health*, 3(4).

Moher, D., Liberati, A., Tetzlaff, J., e Altman, D. (2009). Preferred reporting items for systematic reviews and meta-analyses: the prisma statement. *PLoS medicine*, 6(7).

Mullachery, P., Macinko, J., e Silver, D. (2020). Have health reforms in brazil reduced inequities in access to cancer screenings for women? *The Journal of ambulatory care management*, 43(3):257–266.

Mullachery, P., Silver, D., e Macinko, J. (2016). Changes in health care inequity in brazil between 2008 and 2013. *International journal for equity in health*, 15:1–12.

Musgrave, R. A. (1957). A multiple theory of budget determination. *FinanzArchiv/Public Finance Analysis*, (H. 3):333–343.

Paim, J., Travassos, C., Almeida, C., Bahia, L., e Macinko, J. (2011). The brazilian health system: history, advances, and challenges. *The Lancet*, 377(9779):1778–1797.

Pan, X., Fan, L., Yang, B., e Deng, L. (2019). Desigualdade de saúde entre idosos na china rural e fatores influentes: evidências da pesquisa longitudinal de longevidade saudável chinesa. *International Journal of Environmental Research and Public Health*, 16(20):4018.

Passarelli-Araujo, H. e de Souza, G. M. (2023). Urban-rural health disparities in brazil: Do sociodemographic attributes play a role? *Preventive Medicine*, 175:107679.

Rony, M. K. K., Parvin, M. R., Wahiduzzaman, M., Akter, K., e Ullah, M. (2024). Challenges and advancements in the health-related quality of life of older people. *Advances in Public Health*, 2024(1):8839631.

Russo, L. X., Powell-Jackson, T., Barreto, J. O. M., Borghi, J., Kovacs, R., Junior, G. D. G., Gomes, L. B., Sampaio, J., Shimizu, H. E., de Sousa, A. N. A., et al. (2021). Pay for performance in primary care: the contribution of the programme for improving access and quality of primary care (pmaq) on avoidable hospitalisations in brazil, 2009–2018. *BMJ global health*, 6(7):e005429.

Saito, E., Gilmour, S., Yoneoka, D., Gautam, G. S., Rahman, M. M., Shrestha, P. K., e Shibuya, K. (2016). Inequality and inequity in healthcare utilization in urban nepal: a cross-sectional observational study. *Health policy and planning*, 31(7):817–824.

Samadoulougou, S., Negatou, M., Ngawisiri, C., Ridde, V., e Kirakoya-Samadoulougou, F. (2022). Effect of the free healthcare policy on socioeconomic inequalities in care seeking for fever in children under five years in burkina faso: a population-based surveys analysis. *International Journal for Equity in Health*, 21(1):124.

Schenkman, S. e Bousquat, A. (2021). From income inequality to social inequity: impact on health levels in an international efficiency comparison panel. *BMC public health*, 21:1–17.

Souliotis, K., Tsimtsiou, Z., Golna, C., Nikolaidi, S., e Lionis, C. (2019). Preferências cidadãs para a reforma da atenção primária à saúde na grécia. *Hipóquia*, 23(3):111–117.

Stopa, S. R., Malta, D. C., Monteiro, C. N., Szwarcwald, C. L., Goldbaum, M., e Cesar, C. L. G. (2017). Use of and access to health services in brazil, 2013 national health survey. *Revista de saude publica*, 51:3s.

Travassos, C. e Castro, M. S. M. d. (2012). Determinantes e desigualdades sociais no acesso e na utilização de serviços de saúde. *Políticas e sistema de saúde no Brasil*, 2:183–206.

Travassos, C., Oliveira, E. X. G. d., e Viacava, F. (2006). Desigualdades geográficas e sociais no acesso aos serviços de saúde no brasil: 1998 e 2003. *Ciência & Saúde Coletiva*, 11(4):975–986.

Travassos, C., Viacava, F., Fernandes, C., e Almeida, C. M. (2000). Desigualdades geográficas e sociais na utilização de serviços de saúde no brasil. *Ciência & Saúde Coletiva*, 5:133–149.

Viacava, F., Porto, S. M., Carvalho, C. C., e Bellido, J. G. (2019). Desigualdades regionais e sociais em saúde segundo inquéritos domiciliares (brasil, 1998-2013). *Ciência & Saúde Coletiva*, 24(7):2745–2760.

Victora, C. G., Aquino, E. M., do Carmo Leal, M., Monteiro, C. A., Barros, F. C., e Szwarcwald, C. L. (2011). Maternal and child health in brazil: progress and challenges. *The lancet*, 377(9780):1863–1876.

Wagstaff, A. (2005). The bounds of the concentration index when the variable of interest is binary, with an application to immunization inequality. *Health Economics*, 14(4):429–432.

Wagstaff, A., van Doorslaer, E., e Paci, P. (1989). Equity in the finance and delivery of health care: some tentative cross-country comparisons. *Oxford Review of Economic Policy*, 5(1):89–112.

World Health Organization (2015). *World report on ageing and health*. World Health Organization, Geneva.

Yaddanapalli, S. C., Srinivas, R., Simha, B. V., Devaki, T., Viswanath, V., Pachava, S., e Chandu, V. C. (2019). Utilização de serviços de saúde em tenali mandal, andhra pradesh - estudo transversal. *Jornal de Medicina de Família e Atenção Primária*, 8(9):2997–3004.

Funding Acknowledgement

This research was supported by the first author's productivity grant. We extend our deepest gratitude to the National Council for Scientific and Technological Development (CNPq) for its funding.

Appendix:

A.1. Descriptive statistics (mean) of the variables in 2013 and 2019

		0 to 11 years old		12 to 20 years old		21 to 59 years old		60 years old and +	
Variables		**2013**	**2019**	**2013**	**2019**	**2013**	**2019**	**2013**	**2019**
Sex (%)	Male	51.73	49.42	50.87	51.16	47.30	47.04	44.11	43.46
	Female	48.27	50.58	49.13	48.84	52.70	52.96	55.89	56.54
Age (years old)		5.78	5.68	15.96	15.99	37.94	39.03	70.29	70.70
Self-rated health (%)	Regular, bad, and very bad	15.66	13.14	17.75	17.22	36.72	37.37	65.01	63.64
	Very good or good	84.34	86.86	82.25	82.78	63.28	62.63	34.99	36.36
Restriction of activities (%)	No	93.10	91.88	95.31	94.24	92.01	91.52	87.12	87.47
	Yes	6.90	8.12	4.69	5.76	7.99	8.48	12.88	12.53
Skin tone (%)	Others	29.96	28.75	26.36	25.76	28.16	25.91	31.21	30.96
	Black or mixed-race	70.04	71.25	73.64	74.24	71.84	74.09	68.79	69.04
Health insurance	No	86.75	84.23	89.25	87.17	82.43	82.16	83.14	83.01
	Yes	13.25	15.77	10.75	12.83	17.57	17.84	16.86	16.99
Urbanite	Rural	29.33	29.25	27.89	28.99	22.78	24.56	28.26	27.21
	Urban	70.67	70.75	72.11	71.01	77.22	75.44	71.74	72.79
PSF	No	27.59	23.94	29.62	23.51	34.10	28.11	31.07	26.74
	Yes	72.41	76.06	70.38	76.49	65.90	71.89	68.93	73.26
lnincome		5.60	5.87	5.72	5.99	6.10	6.36	6.47	6.90
Education level of the head of the household									
Incomplete Primary Education		39.07	37.47	41.73	43.36	36.58	36.84	40.72	40.20
Complete Primary Education		9.78	7.80	9.02	6.65	8.71	7.06	5.45	4.32
Incomplete Secondary Education		4.90	7.73	4.55	6.55	4.41	5.58	1.62	2.20
Complete Secondary Education		20.68	26.28	17.17	20.49	22.97	25.74	10.22	12.85
Incomplete Higher Education		3.47	2.44	2.73	2.03	3.24	2.75	0.77	1.41
Complete Higher Education		6.54	9.31	5.60	7.80	8.87	11.25	6.39	8.97

Source: Authors' calculations based on PNS 2013 and 2019 data, IBGE.

A.2. Marginal effect of the Probit models of socioeconomic and demographic factors on medical consultations by age group in 2013 and 2019

		0 to 11 years old		12 to 20 years old		21 to 59 years old		60 years old and +	
Variables		**2013**	**2019**	**2013**	**2019**	**2013**	**2019**	**2013**	**2019**
Sex	Coef.	0.002	-0.004	**0.141**	**0.141**	**0.200**	**0.188**	**0.131**	**0.077**
	Standard Error	(0.010)	(0.009)	(0.014)	(0.010)	(0.008)	(0.005)	(0.013)	(0.008)
Age (years old)	Coef.	**-0.029**	**-0.028**	-0.005	-0.000	**0.001**	**0.002**	-0.000	**-0.002**
	Standard Error	(0.002)	(0.001)	(0.002)	(0.002)	(0.000)	(0.000)	(0.001)	(0.000)
Self-rated health	Coef.	**-0.102**	**-0.091**	**-0.159**	**-0.147**	**-0.122**	**-0.128**	**-0.158**	**-0.128**
	Standard Error	(0.016)	(0.013)	(0.022)	(0.016)	(0.009)	(0.006)	(0.016)	(0.010)
Restriction of activities	Coef.	**0.158**	**0.140**	**0.259**	**0.248**	**0.206**	**0.174**	**0.123**	**0.101**
	Standard Error	(0.019)	(0.012)	(0.027)	(0.018)	(0.012)	(0.009)	(0.015)	(0.010)
Skin colour	Coef.	-0.009	0.003	-0.028	-0.015	0.009	0.010	-0.017	-0.010
	Standard Error	(0.014)	(0.010)	(0.021)	(0.013)	(0.008)	(0.006)	(0.013)	(0.009)
Health insurance	Coef.	**0.132**	**0.117**	**0.174**	**0.183**	**0.194**	**0.163**	**0.144**	**0.107**
	Standard Error	(0.020)	(0.015)	(0.024)	(0.017)	(0.011)	(0.008)	(0.017)	(0.010
Urbanite	Coef.	0.021	0.017	0.010	0.018	-0.000	-0.008	**0.053**	**0.031**
	Standard Error	(0.018)	(0.013)	(0.021)	(0.015)	(0.011)	(0.007)	(0.015)	(0.010)
PSF	Coef.	**0.029**	**0.037**	**0.049**	**0.035**	**0.033**	**0.026**	**0.053**	**0.043**
	Standard Error	(0.014)	(0.014)	(0.017)	(0.015)	(0.009)	(0.007)	(0.015)	(0.011)
Incomplete Primary Education	Coef.	**0.076**	**0.038**	**0.047**	0.032	**0.035**	**0.022**	**0.040**	0.015
	Standard Error	(0.020)	(0.017)	(0.023)	(0.018)	(0.014)	(0.009)	(0.014)	(0.009)
Complete Primary Education	Coef.	**0.065**	**0.047**	**0.123**	**0.095**	**0.076**	**0.037**	**0.087**	0.002
	Standard Error	(0.027)	(0.023)	(0.032)	(0.024)	(0.017)	(0.012)	(0.023)	(0.016)
Incomplete Secondary Education	Coef.	**0.123**	**0.059**	**0.154**	**0.054**	**0.099**	**0.054**	-0.001	0.007
	Standard Error	(0.025)	(0.020)	(0.036)	(0.027)	(0.018)	(0.013)	(0.042)	(0.016)
Complete Secondary Education	Coef.	**0.106**	**0.079**	**0.119**	**0.100**	**0.091**	**0.062**	0.036	0.007
	Standard Error	(0.023)	(0.017)	(0.032)	(0.020)	(0.014)	(0.009)	(0.023)	(0.026)
Incomplete Higher Education	Coef.	**0.064**	0.052	**0.139**	0.058	**0.116**	**0.068**	0.036	**0.050**
	Standard Error	(0.031)	(0.042)	(0.045)	(0.050)	(0.019)	(0.019)	(0.055)	(0.012)
Complete Higher Education	Coef.	**0.098**	**0.055**	**0.167**	**0.125**	**0.114**	**0.103**	**0.070**	**0.086**
	Standard Error	(0.029)	(0.025)	(0.038)	(0.026)	(0.019)	(0.012)	(0.027)	(0.024)
Income	Coef	0.012	**0.016**	0.002	**0.024**	0.006	**0.019**	0.003	**0.037**
	Standard Error	(0.009)	(0.007)	(0.009)	(0.007)	(0.005)	(0.003)	(0.011)	(0.016)

Source: Authors' calculations based on PNS 2013 and 2019 data, IBGE.

Notes: Coefficients in bold indicate significance at 5% (p-value <5%). All models use fixed effects for the federation units of the Northeast region.