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Prevalence of chronic diseases and access to health services in Brazil: evidence of three household surveys

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Abstract *Chronic non-communicable diseases (NCDs) are the leading causes of death globally, impacting heavily on the most vulnerable populations. This study aimed to analyze changes in the prevalence of these diseases, health conditions, access, and health services in Brazil between 2008 and 2019. Tests of differences and generalized linear models were used as analytical tools, considering complex sampling from the PNAD 2008, PNS 2013, and PNS 2019 surveys, to test temporal changes in the prevalence and the prevalence ratio estimates, adjusted by sociodemographic variables. An increase in the prevalence of Depression, Diabetes, Cancers, Neuropsychiatric Disorders, Chronic Pulmonary problems, and Musculoskeletal problems was observed. A decline in rheumatoid arthritis, chronic renal failure, and diseases of the circulatory system was identified. Among Brazilians with at least one NCD, an increase in coverage by the family health strategy over time was observed. However, there was a reduction in timely medical care and obtaining of free prescription drugs.*

Key words *Chronic noncommunicable diseases, Surveys, Generalized linear models, Access to health*

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Introduction

Chronic Noncommunicable Diseases (NCDs) are the leading causes of illness and death worldwide. The higher burden of disease from this group of causes is related to population aging, habits and lifestyle changes, socioeconomic disparities and access to health services. These diseases encompass several health conditions that have a common multifactorial origin, associated with long-term exposure related to modifiable risk factors, which promote injuries, disabilities, and deaths[1-5].

The World Health Organization (WHO) considers as NCDs only circulatory system diseases (CSD), cancers (CA), chronic respiratory diseases (CRD), and diabetes mellitus (DM), as their natural history shares risk and protection factors, simplifying the development of prevention and control policies[6-7]. However, other chronic health conditions also have a significant impact on the burden of disease and the estimates of Disability Adjusted Life Years (DALY), such as Work-related Musculoskeletal Disorders (WMSD) and Joint Diseases, Chronic Renal Failure (CRF), and Neuropsychiatric Disorders (NPD)[1,7]. In 2013, 66 million Brazilians (45.1%) reported at least one NCD, excluding hypertension . The most prevalent were Back problems (18.5%), Depression (7.6%), Arthritis (6.4), and DM (6.2%). Those that promoted a very intense or intense limiting degree were NPD (49.4%), back problems, and WMSD (32.1%)[8].

Developed countries have the highest incidence rates of NCDs. However, due to inequalities in food, education, and health care access, 80% of deaths occur in low- and middle-income countries, with more than 30% of deaths occurring in individuals under 60 years of age[1-2]. Eighty percent of deaths from NCDs globally are due to CSD, CA, CRD, and DM[1-2,5].

The natural history of these diseases and their treatment can lead to disabilities, reducing individual and household income, exacerbating socioeconomic and health inequalities. They also affect the health system due to the need for prolonged and more expensive care[6-7]. For example, in Brazil, it is estimated that 72% of deaths are due to NCDs and associated with the main modifiable risk factors, as well as socioeconomic inequalities, difficulty in accessing health services, and education and health information deficiencies[8-10].

In the last decade, it was observed an increase in mortality from CA and DM and a decline in the mortality rates from CSD and CRD in Brazil[8-9], potentially related to the lower prevalence of tobacco use in the population, increased access to health care after the implementation of the System Health Service (Sistema Único de Saúde - SUS, in portuguese), expanded of primary health care (PHC), and broader access to essential drugs. However, this mortality rate reduction profile is not uniform across the Brazilian territory, and is more pronounced in regions with greater socio economic development and access to health services[8-9,11-12].

Aiming to reduce mortality from NCDs and the prevalence of the main modifiable risk factors (tobacco use, alcohol abuse, physical inactivity, and unhealthy eating habits), the Ministry of Health (MH) presented the Strategic Action Plan for Combating Chronic Noncommunicable Diseases in Brazil, 2011-2022, to promote the development and implementation of effective, integrated, and sustainable evidence-based public policies for the prevention and control of NCDs, including Stroke, Acute Myocardial Infarction (AMI), Hypertension, CA, DM, and CRD. The Plan pillars are surveillance, information, evaluation and monitoring, health promotion, and comprehensive care[14]. Among the main actions already carried out are the Health Academy, Popular Pharmacy, PHC and Family Health Strategy (Estratégia de Saúde da Família - ESF, in portuguese) expansion, Urgent and Emergency Care Network, and NCD Care Networks[13].

The National Health Surveys allows to identify the health profile and the distribution of risk factors in a population, with regular updates and sequential comparisons over time and across geographic areas[14]. Faced with the need for continuous surveillance of NCDs, this study aims to assess temporal changes in the prevalences of chronic diseases and the access and use of health services among national household surveys carried out in Brazil in 2008, 2013, and 2019. The study assesses the NCDs defined by the WHO, in addition to Neuropsychiatric Disorders (NPD), Work-related Musculoskeletal Disorders (WMSD) and Joint Disorders, and Chronic Renal Failure (CRF).

Methods

Study design and data sources

This is a panel study to assess temporal changes in the prevalence of Chronic non-communica-

ble diseases, health conditions, and access to and use of Brazilian health services, using self-reported information from national household surveys. Also, we evaluated changes over time and the influence of sociodemographic factors on the prevalence, in addition to having described the reasons for not having access to care and medications. Data were obtained from the 2008 National Household Sample Survey (PNAD) and the 2013 and 2019 National Health Surveys (PNS) performed by the Brazilian Institute of Geography and Statistics (IBGE)[15-17].

The PNAD is published annually and is part of the Brazilian household survey system, with essential information to analyze the country's socio economic development. Additional surveys are regularly carried out on some topics, such as the Supplementary Health Survey. With five-year intervals, the aim is to produce population-based data on access and coverage of public and private health care as well as estimating the prevalence of some health problems and other self-reported factors. The sample is probabilistic, obtained in three stages (municipalities, census tracts, households), and representative for Brazil, the Five Macro-Regions, and Federation Units[15].

The 5-year PNS aims to assess the performance of the national health system; the health conditions of the Brazilian population; the surveillance of noncommunicable chronic diseases and associated risk factors[14]. Probabilistic samples consist of stratification and clustering in three stages (census tracts, households, and individuals over 18 years of age)[16-17].

Integrated database

The variables used in this study were related to individual and household identification, sample plan, sociodemographic conditions, chronic diseases (except hypertension), health plan coverage, access to and use of health services, stratified by type of health service (public or private) and type of health service obtainment (direct payment/health insurance/SUS), of the Q and J modules of the 2013 and 2019 PNS questionnaires, and the 2008 PNAD Health Supplement. Common variables in the three surveys or between PNS were selected, creating an integrated database after harmonization (including variable cleaning, evaluation of completeness, pairing of variables, standardization of categories between surveys). The analyzed population corresponded to all participating individuals aged over 18 who were selected in the surveys (selected in the PNS; resident of the selected household, being the person himself or another resident of the household in the block of health characteristics in the PNAD), and who had the status of the survey interview carried out.

The three surveys considered individuals who reported having had a medical diagnosis for the following NCDs, classified into five groups of diseases and chronic conditions: (1) Circulatory System Diseases (CSD): General CSD infarction, Angina, and Heart failure); Stroke;

(2) Neuropsychiatric Diseases (NPD): Depression; Schizophrenia; Bipolar disorder; Obsessive-Compulsive Disorder (OCD); Having at least one of the last three (Other NPD);

(3) Cancer (CA): Some Cancer; Skin; Lung;-Colorectal; Gastric; Breast, Cervical; Prostate cancer;

(4) Other NCDs: Some Chronic Pulmonary Disease (pulmonary emphysema, chronic bronchitis, COPD – Chronic Obstructive Pulmonary Disease); Asthma or Bronchitis; Diabetes Mellitus (DM); Arthritis and Rheumatism; Chronic Back Problem (Any chronic Back problem such as Chronic Back or Neck pain, low Back pain, Sciatica, Vertebrae, or Disc problems); WMSD; and Chronic Renal Failure (CRF).

Among individuals who reported having at least one of the following diseases in the three surveys (Circulatory System Disease, Depression, at least one Cancer, Asthma or Bronchitis, Diabetes Mellitus, Arthritis and Rheumatism, or CRF), some available health conditions were observed. This included self-perceived health status (Very Good/Good, Fair/Poor/Very Poor); interruption of daily activities due to health reasons in the last two weeks (No/Yes); if bedridden in the last two weeks (No/Yes).

Access to health services can be measured by their demand and use, including care, routine or emergency visits, and obtaining prescription drugs[18]. Among the individuals with at least one of the common NCDs in the three surveys, access to and use of health services were measured by: prevalence of people with health plan; if the household is covered by the Family Health Strategy Program (ESF); habit of going to the same doctor or health service; if a doctor was visited in the last 12 months; sought and was seen by a doctor due to illness in up to two attempts in the two weeks before the survey; prescription and obtainment of drugs; hospitalization in the last 12 months, has used home emergency service, and has used an ambulance. Also, some of these variables were stratified by type of service (public/

private) or way of obtaining assistance/medication according to coverage information by health plan, payment of any amount of money for the health service (paid/plan/SUS). Finally, some reasons for not accessing health care and not obtaining the prescribed drugs were described.

The sociodemographic variables used were: Macro-region of residence (Northeast, Midwest, North, Southeast, South); Age (18-39, 40-59, and 60 years or older); Gender (Female/Male); Schooling (Up to elementary school, high school, or higher); Ethnicity/skin color (White, Non-White); Residence Area (Rural/Urban).

Statistical analysis

The first step of the statistical analysis was to assign the sample design, using the different sample weights and design effects of the three surveys integrated in a single harmonized database, considering an interaction term between the sample stratum and the observation period in defining the design sample[19].

The prevalence and the respective 95% confidence intervals of NCDs, health conditions, and health access and use variables were estimated considering the survey periods and according to sociodemographic variables. The differences between these prevalence rates were tested using the chi-square test with Rao-Scott correction, which considers sample weights and design effect in the calculations[20]. The significance of the differences was evaluated through the p-values of the tests and not by the overlapping of confidence intervals between the categories of variables, which can lead to false evidence since there is an increased probability of detecting untrue differences (Type I Error). Some variables were only available in the PNS; thus, time differences for these variables were only assessed between 2013 and 2019. Prevalences were estimated concerning the motives for not accessing or using health services or not obtaining prescription drugs for at least one chronic condition.

Subsequently, the Prevalence Ratios and the 95% Confidence Intervals of NCDs, health conditions and access to and use of health services variables were estimated using Generalized Linear Models (GLM) with Poisson probability distribution[21]. The primary independent variable of the study was the year of the survey, and the sociodemographic variables as Macro-Region of residence, age, and gender were used for adjustment. Among the NCDs, we also evaluated the significance of interaction terms between sociodemographic variables and year to assess changes in prevalence in population subgroups over time. All point and interval estimates, tests of differences in proportions, and regression models considered the sample weights and correction for design effects[22], through the *survey* package[23] of the R[24] statistical software.

Results

The integrated base was formed by the sum of 391,868, 205,546, and 293,725 individuals from PNAD 2008, PNS 2013, and PNS 2019, respectively. Of these, 97,589 had at least one Circulatory System Disease, Depression, at least one Cancer, Asthma or Bronchitis, Diabetes Mellitus, Arthritis and Rheumatism, or CRF. The results of this study will be described by group blocks of NCDs, health conditions, and access to and use of health services, highlighting only statistically significant differences.

Table 1 presents the point and interval estimates of the prevalence and Prevalence Ratios (PR) of NCDs from at least two surveys and the tests of differences between years. PRs were adjusted by residence region, age and gender, 2008 was the basis of comparison for diseases assessed in the three years, and 2013 for diseases observed only in the PNS. Figure 1 shows the point and interval estimates of the prevalence in each group of chronic diseases, according to sociodemographic variables. The significant interactions between these variables and the year were described. Table 2 shows the prevalence by year and the Prevalence Ratios (PR) adjusted for health conditions and variables of access to and use of health services among individuals with at least one of the NCDs observed in the three surveys. Figure 2 shows the frequency distributions of reasons for not accessing health care and not obtaining prescription drugs.

The prevalence of having at least one of the NCDs observed in the three surveys (Circulatory System Disease, Depression, at least one Cancer, Asthma or Bronchitis, Diabetes, Arthritis and Rheumatism, and CRF) increased significantly between the periods, ranging from 22.40 to 29.52% between 2008 and 2019 (Table 1).

Circulatory System Diseases (CSD)

A decrease in the overall prevalence of CSD was observed from 2008 to 2013, growing again in 2019, while Infarction and Stroke declined

Table 1. Estimates of prevalence and difference tests. adjusted Prevalence Ratios (PR) * (and 95% confidence intervals) for chronic diseases between the periods of the surveys.

Variables	PNAD2008	PNS2013	PNS2019	p-value	PR (95% CI)	
					2013 vs. 2008	2019 vs. 2008 (2013) **
At least one NCD [1]	22.04 (21.78-22.31)	24.46 (23.83-25.10)	29.52 (28.96-30.09)	< 0.0001	1.07 (1.04-1.10)	1.22 (1.19-1.25)
Circulatory System Diseases (CSD)						
General CSD [2]	5.33 (5.21-5.44)	4.18 (3.85-4.51)	5.30 (5.03-5.57)	< 0.0001	0.73 (0.68-0.79)	0.85 (0.80-0.90)
Heart attack	-	1.27 (1.10-1.44)	1.56 (1.42-1.69)	0.0123	-	1.10 (0.94-1.28)
Angina	-	0.75 (0.64-0.86)	0.8 (0.71-0.90)	0.4867	-	0.97 (0.80-1.17)
Heart failure	-	1.16 (1.01-1.31)	1.13 (1.00-1.25)	0.7272	-	0.88 (0.74-1.03)
Stroke	-	1.53 (1.35-1.70)	1.96 (1.81-2.11)	0.0003	-	1.15 (1.00-1.31)
Neuropsychiatric Disorders (NPD)						
Depression	5.74 (5.59-5.88)	7.64 (7.22-8.06)	10.24 (9.85-10.62)	< 0.0001	1.31 (1.23-1.39)	1.71 (1.64-1.79)
Schizophrenia	-	0.23 (0.16-0.30)	0.34 (0.29-0.40)	0.0205	-	1.49 (1.06-2.10)
Bipolar disorder	-	0.40 (0.31-0.49)	0.62 (0.54-0.71)	0.0012	-	1.58 (1.21-2.05)
OCD	-	0.17 (0.12-0.22)	0.41 (0.33-0.50)	< 0.0001	-	2.47 (1.70-3.60)
One or more NPD[3]	-	0.63 (0.52-0.74)	1.15 (1.03-1.27)	< 0.0001	-	1.84 (1.50-2.26)
Neoplasms (CA)						
Some cancer	0.77 (0.73-0.82)	1.83 (1.63-2.03)	2.56 (2.38-2.74)	< 0.0001	2.20 (1.96-2.48)	2.79 (2.56-3.05)
Skin	-	0.30 (0.23-0.36)	0.52 (0.44-0.59)	< 0.0001	-	1.55 (1.19-2.02)
Lung	-	0.02 (0.01-0.04)	0.08 (0.05-0.11)	< 0.0001	-	3.04 (1.60-5.78)
Intestine	-	0.15 (0.08-0.21)	0.16 (0.12-0.20)	0.6842	-	0.98 (0.59-1.63)
Stomach	-	0.05 (0.02-0.09)	0.07 (0.04-0.10)	0.5226	-	1.16 (0.55-2.46)
Breast	-	0.80 (0.60-0.99)	1.16 (0.98-1.34)	0.0096	-	1.34 (1.01-1.78)
Cervical	-	0.24 (0.15-0.33)	0.51 (0.40-0.61)	0.0003	-	2.03 (1.34-3.06)
Prostate	-	0.59 (0.44-0.74)	0.79 (0.65-0.93)	0.0631	-	1.13 (0.84-1.53)
Other Chronic Diseases (Other NCDs)						
Some lung[4]	-	1.78 (1.59-1.98)	1.66 (1.49-1.84)	0.3700	-	0.89 (0.77-1.04)
Asthma or Bronchitis	4.01 (3.92-4.11)	4.40 (4.10-4.70)	5.27 (4.99-5.55)	< 0.0001	1.10 (1.02-1.18)	1.32 (1.24-1.40)
Diabetes	5.00 (4.90-5.10)	6.50 (6.15-6.84)	8.04 (7.74-8.35)	< 0.0001	1.21 (1.14-1.28)	1.36 (1.30-1.42)
Rheumatoid arthritis	7.94 (7.77-8.11)	6.41 (6.07-6.76)	7.57 (7.23-7.91)	< 0.0001	0.75 (0.71-0.79)	0.81 (0.77-0.85)
Spine/back chronic problems[5]	-	18.47 (17.84-19.10)	21.58 (21.02-22.13)	< 0.0001	-	1.12 (1.08-1.17)
WMSD	-	2.44 (2.19-2.68)	2.51 (2.26-2.75)	0.6993	-	1.03 (0.89-1.18)
CRF [6]	1.71 (1.63-1.79)	1.42 (1.26-1.59)	1.47 (1.33-1.60)	0.0142	0.80 (0.71-0.91)	0.78 (0.71-0.87)

[1] At least one NCD among General CSD, depression, some cancer, asthma or bronchitis, diabetes, arthritis and rheumatism, CRF. [2] CSD: heart attack, angina, heart failure, among others. [3] At least one NPD among schizophrenia, bipolar disorder, and OCD. [4] Some chronic lung disease: pulmonary emphysema, chronic bronchitis, COPD - Chronic obstructive pulmonary disease. [5] Any chronic back problems such as chronic back or neck pain, low back pain, sciatica, vertebrae or disc problems. [6] CRF: Chronic Renal Failure. * Prevalence Ratios adjusted by region of residence, age, and gender.
** 2019 vs. 2013 for comparison between outcomes that appear only in the PNS.

Source: Brazilian Institute of Geography and Statistics. National Household Sample Survey 2008. National Health Surveys 2013 and 2019.

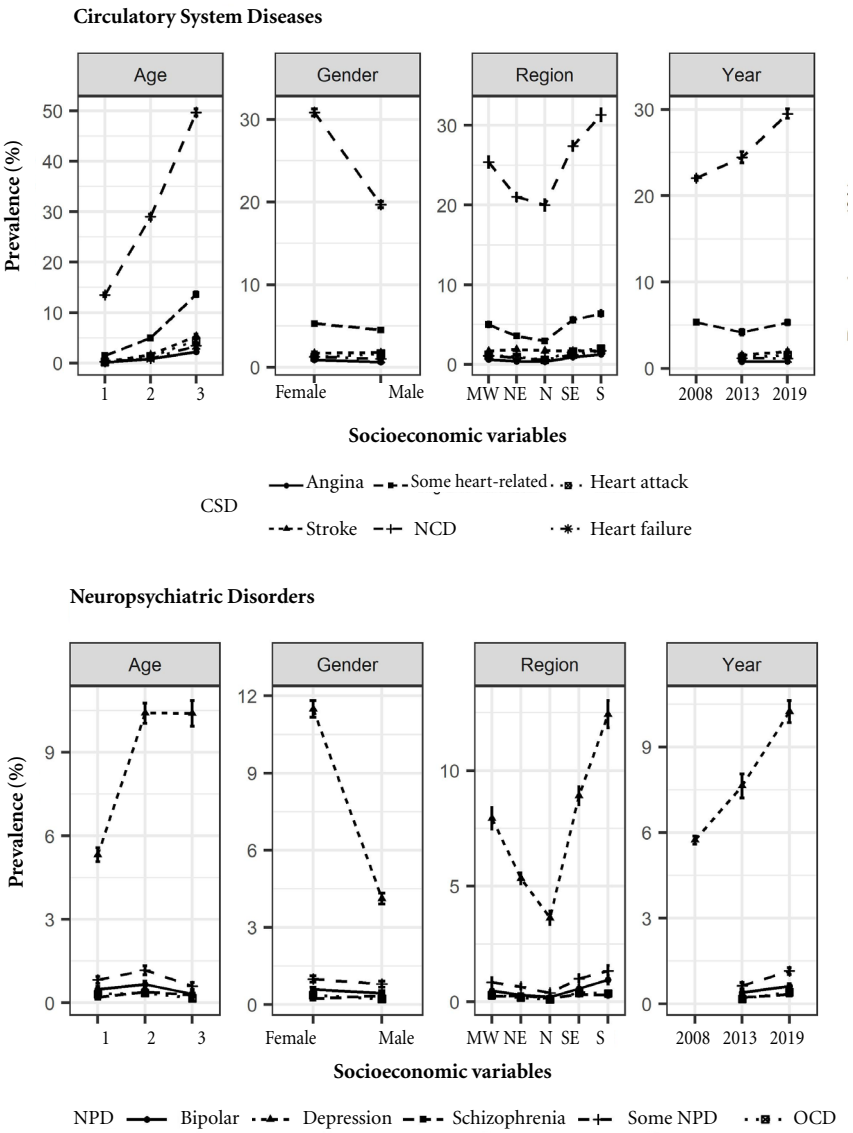

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Figure 1. Prevalence of each group of chronic diseases, by sociodemographic variables region of residence, age, gender, education and year of survey / Caption: Age :1 (18-39 years), 2 (40-59 years) and 3 (≥ 60 years).

from 2013 to 2019 (Table 1). CSD are more prevalent in the South, Southeast, and Midwest, while infarction and angina in the Southeast and South, and Heart Failure in the South (Figure 1). CSD decreased in 2013 in the North and increased in the Southeast. In 2019, the Midwest showed a decrease in CSD, Infarction, and Heart Failure, which also declined in the South.

CSD increased with age, with high values above 60 years, in white people (no difference for general CSD and stroke), low schooling level, and urban residents (no difference for Angina and Stroke). In 2013, general CSD decreased in people over 60 and increased in the urban area, while infarction decreased in the 40-59 years age group. In 2019, general CSD decreased in those over 40 and in less-educated individuals. Angina decreased in the less educated, and stroke increased in the rural area. Women have a higher prevalence of general CSD, Angina, Heart Fail-

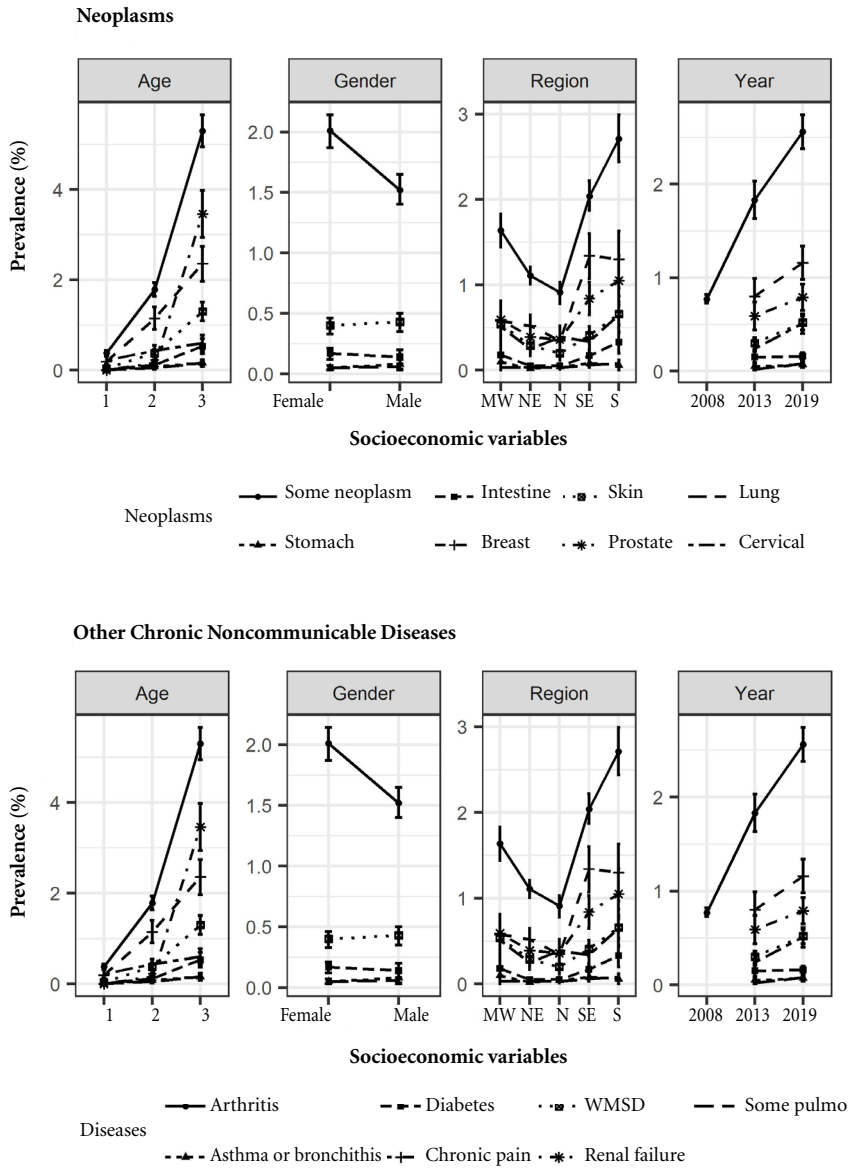


Figure 1. Prevalence of each group of chronic diseases, by sociodemographic variables region of residence, age, gender, education and year of survey / Caption: Age :1 (18-39 years), 2 (40-59 years) and 3 (≥ 60 years).

Source: Brazilian Institute of Geography and Statistics. National Household Sample Survey 2008. National Health Surveys 2013 and 2019.

ure, while men have a higher prevalence of Acute Myocardial Infarction. An increase in general CSD was identified among men in 2019.

Neuropsychiatric Disorders (NPD)

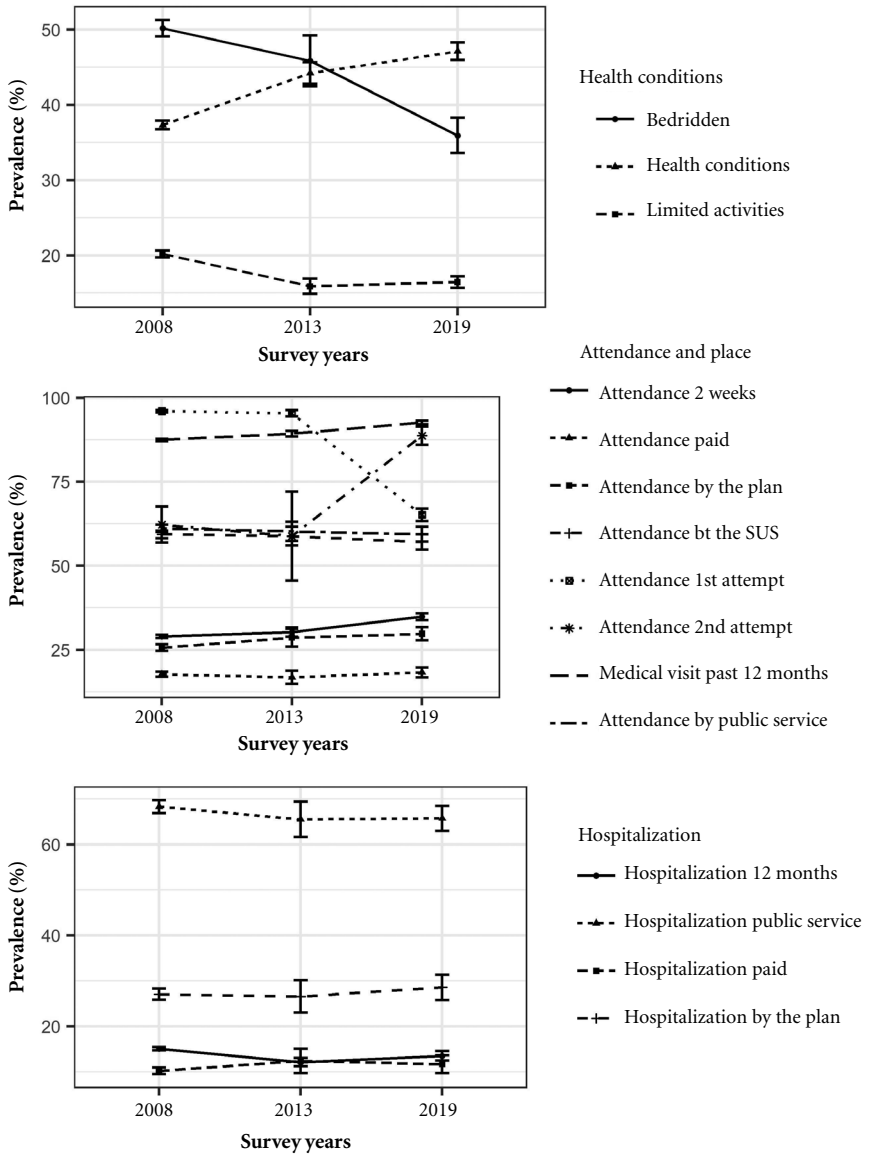
There was a significant increase in the prevalence of depression and for the other NPDs (Schizophrenia, Bipolar Disorder, and OCD) in the period. The prevalence of having at least one of these three NPDs increased from 0.63% in 2013 to 1.15% in 2019 (Table 1). Depression was more prevalent in the South, followed by the Southeast and Midwest (Figure 1). The Bipolar Disorder was more prevalent in the South. In 2019, a decrease was observed in this NPD

Table 2. Prevalence estimates by year of survey and Prevalence Ratios – adjusted PR* (and 95% confidence intervals) of health conditions, and indicators of access to and use of health care among individuals who had at least one NCD** .

Variables	Prevalence (95%CI)				Adjusted prevalence ratio (95%CI)	
	2008	2013	2019	P-valor	2013 vs 2008	2019 vs 2008
Self-assessed health status (Very Good/Good)	37.31 (36.73-37.88)	44.23 (42.79-45.67)	47.11 (45.96-48.27)	< 0.0001	1.17 (1.13-1.21)	1.27 (1.23-1.30)
Limited routine activities	20.18 (19.72-20.64)	15.89 (14.87-16.92)	16.46 (15.70-17.22)	< 0.0001	0.79 (0.74-0.84)	0.81 (0.77-0.86)
Bedridden	50.18 (49.06-51.29)	45.83 (42.46-49.21)	35.92 (33.57-38.27)	< 0.0001	0.91 (0.84-0.98)	0.71 (0.66-0.76)
Has health insurance plan	29.63 (28.90-30.35)	34.44 (32.81-36.06)	33.3 (32.12-34.49)	< 0.0001	1.16 (1.10-1.22)	1.12 (1.07-1.17)
ESF coverage [1]	49.86 (48.71-51.01)	61.9 (59.95-63.86)	69.15 (67.62-70.68)	< 0.0001	1.24 (1.20-1.29)	1.39 (1.35-1.43)
Seeks the same service or doctor	78.91 (78.27-79.54)	81.60 (80.36-82.84)	78.97 (78.02-79.91)	0.0003	1.03 (1.02-1.05)	1.00 (0.99-1.01)
Medical visit in 12 months	87.45 (87.12-87.79)	89.3 (88.47-90.14)	92.66 (92.14-93.19)	< 0.0001	1.02 (1.01-1.03)	1.06 (1.05-1.06)
Seeking medical care in the last two weeks	29 (28.48-29.53)	30.31 (28.94-31.69)	34.86 (33.83-35.88)	< 0.0001	1.04 (0.99-1.10)	1.2 (1.16-1.24)
Received care at the 1st attempt	96.02 (95.68-96.36)	95.39 (94.43-96.35)	65.19 (63.32-67.07)	< 0.0001	0.99 (0.98-1.00)	0.68 (0.66-0.70)
Received care at the 2nd attempt	62.26 (56.95-67.58)	58.84 (45.58-72.09)	88.72 (85.97-91.46)	< 0.0001	0.93 (0.73-1.18)	1.38 (1.26-1.52)
Performed in public service	61.1 (60.02-62.18)	60.29 (57.45-63.13)	59.41 (57.17-61.64)	0.5339	0.99 (0.94-1.04)	0.97 (0.93-1.01)
Performed in the SUS	59.33 (58.23-60.43)	58.81 (56.00-61.62)	57.14 (54.87-59.40)	0.3269	0.99 (0.94-1.04)	0.96 (0.92-1.00)
Performed through health plan	25.62 (24.66-26.59)	28.64 (25.99-31.30)	29.78 (27.77-31.79)	0.0273	1.12 (1.01-1.23)	1.17 (1.08-1.26)
Performed against the payment of some amount	17.7 (16.96-18.45)	16.81 (14.80-18.81)	18.31 (16.82-19.80)	0.3445	0.95 (0.83-1.07)	1.05 (0.95-1.14)
Prescribed medication in the last two weeks	66.91 (65.99-67.82)	69.73 (67.21-72.25)	63.62 (61.55-65.68)	0.0001	1.04 (1.00-1.08)	0.95 (0.92-0.99)
Obtaining any medication prescribed in the last two weeks						
Through the health plan	-	6.86 (5.34-8.37)	3.57 (2.54-4.60)	0.0003	-	0.90 (0.85-0.95)
Paid some amount	-	78.93 (75.78-82.09)	78.55 (76.04-81.07)	0.8541	-	0.99 (0.94-1.04)
Through the PFP [2]	-	31.39 (28.30-34.49)	25.88 (23.38-28.39)	0.0063	-	0.83 (0.73-0.95)
Public service	-	51.21 (47.53-54.90)	42.76 (40.02-45.50)	0.0003	-	0.84 (0.76-0.92)
Hospitalization in the last 12 months	15.07 (14.72-15.43)	12.12 (11.23-13.02)	13.49 (12.44-14.54)	0.0002	0.81 (0.75-0.87)	0.89 (0.82-0.97)
Health plan	27.06 (25.80-28.32)	26.54 (22.98-30.11)	28.56 (25.78-31.33)	0.5047	1.00 (0.86-1.15)	1.04 (0.94-1.16)
Paid some amount	10.21 (9.46-10.95)	12.39 (9.70-15.08)	11.69 (9.73-13.64)	0.3022	1.20 (0.95-1.52)	1.16 (0.97-1.38)
Public service	68.31 (66.88-69.73)	65.51 (61.64-69.39)	65.71 (62.96-68.46)	0.3284	0.95 (0.90-1.02)	0.96 (0.92-1.01)
Home emergency	4.59 (4.36-4.81)	2.98 (2.48-3.48)	4.71 (4.24-5.18)	< 0.0001	0.65 (0.55-0.78)	1.02 (0.91-1.14)
Ambulance use	56.61 (54.20-59.03)	63.04 (55.59-70.50)	44.15 (39.42-48.87)	< 0.0001	1.11 (0.98-1.25)	0.79 (0.71-0.89)
SUS	75.37 (73.23-77.51)	82.46 (76.98-87.93)	80.23 (76.24-84.23)	0.0953	1.09 (1.01-1.17)	1.06 (1.00-1.12)
Health plan	13.52 (11.88-15.16)	12.44 (7.69-17.18)	14.75 (10.92-18.58)	0.6309	0.94 (0.63-1.41)	1.10 (0.83-1.45)
Paid some amount	7.26 (6.14-8.37)	2.44 (0.65-4.22)	7.40 (4.99-9.8)	0.0043	0.33 (0.16-0.68)	1.06 (0.75-1.51)

* Prevalence Ratios adjusted by region of residence, age, and gender. ** At least one NCD among General CSD, depression, some cancer, asthma or bronchitis, diabetes, arthritis and rheumatism, CRF.
[1] Home coverage by the Family Health Strategy Program. [2] PFP: Popular Pharmacy Program

Source: Brazilian Institute of Geography and Statistics. National Household Sample Survey 2008. National Health Surveys 2013 and 2019.



it continues

Figure 2. Prevalence of access to health services, medicines and health conditions, by survey year.

in the Southeast. Depression increased with age and was higher after 40. The same was observed for schizophrenia, although there was a downward trend from the age of 60, the age group in which Bipolar Disorder was less frequent. In 2013, Depression declined among individuals over 40 and among less-educated individuals, and Schizophrenia increased among individuals over 60. The declining Depression continued in 2019, along with a decrease among men. In 2019, Schizophrenia increased in the 40-59 years age group. A higher prevalence of Depression, Bipolar Disorder, and OCD was observed among women and of Schizophrenia among men. Depression and Schizophrenia were more prevalent among less-educated individuals, while Bipolar Disorder and OCD occurred more among the more educated. NPDs were more frequent in whites (with no difference for Schizophrenia) and urban residents.

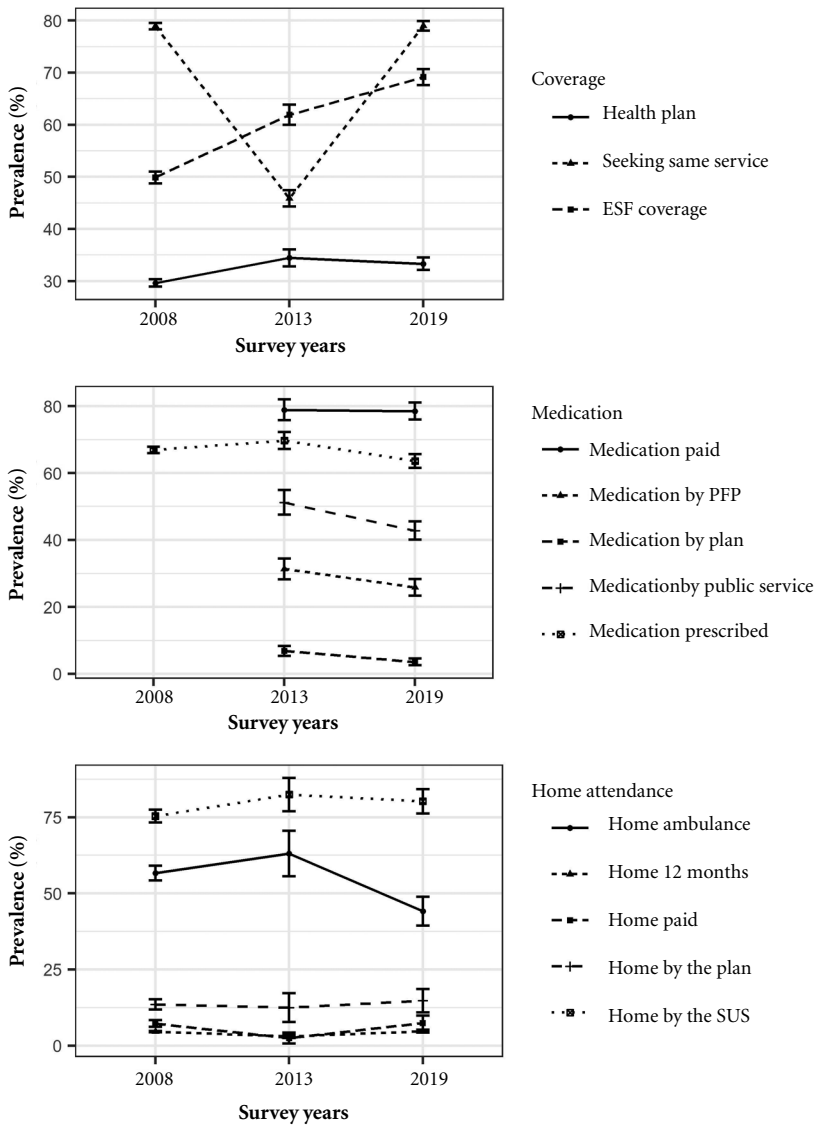


Figure 2. Prevalence of access to health services, medicines and health conditions, by survey year.

Source: Brazilian Institute of Geography and Statistics. National Household Sample Survey 2008. National Health Surveys 2013 and 2019.

Cancer (CA)

All types of Cancer increased with year and age, except for Colorectal and Gastric Cancer (Table 1). A high prevalence was observed among people over 60 years of age for Skin, Lung, Prostate, and Gastric Cancer over 40 (Figure 1). The South and Southeast had a high prevalence of Skin Cancer, and the Midwest and South had a high prevalence of Cervical Cancer. A decline in Cervical Cancer was identified in the North in 2019.

Most Cancers were more prevalent among whites and less educated individuals (with no difference for Lung and Colorectal). Men had more Gastric Cancer, and Breast Cancer was more prevalent in urban areas. In 2019, a decrease in Lung Cancer was observed among non-whites.

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However, an increase was noted in Cervical Cancer among less-educated women and Prostate Cancer in urban areas.

Other Chronic Diseases

Among the other NCDs, an increase in the period was identified in the prevalence of Asthma or Bronchitis, Diabetes Mellitus, Arthritis, and Rheumatism (from 2013 to 2019) and Chronic Back problems (Table 1). Conversely, a decline was observed in CRF and Rheumatoid Arthritis. The prevalence of most of these diseases increased with age, especially for those over 60, in white individuals, with low schooling (more educated have more Asthma), and urban area residents (rural residents had more WMSD and chronic back problem) (Figure 1).

A high prevalence of Respiratory Diseases was identified in the South, Southeast, and Midwest regions, more CRF in the Midwest and South, more DM and WMSD in the South and Southeast. In 2013, an increase in Asthma was noted in the North and decreased in the South until 2019. In 2019, Asthma and Diabetes Mellitus declined in the Southeast, and the latter in the North and South. Women had a higher prevalence of Asthma, Diabetes, Arthritis and Rheumatism, Chronic Spine/Back problem, and WMSD.

Health conditions and access to and use of health services

An increase was observed in the prevalence of individuals with good or very good self-rated health status and a decrease in the prevalence of individuals who reported limitations in performing routine activities due to the disease and individuals who were bedridden in the last two weeks. The proportion of individuals with health plans increased significantly from 2008 to 2013, with no apparent increase in the next period. Households covered by the Family Health Strategy program showed a significant increase between all periods.

Among the variables of access to and use of health services, 78% looked for the same service or doctor in 2019. An increase in the number of medical visits held in 12 months was identified. Higher demand for medical care in two weeks occurred, but there was a decrease in health care made in the first research attempt over time. The prevalence of visits made in the second attempt increased from 62.26% to 88.72% in the period. There was no difference in the prevalence of care provided in public service, by the SUS, or paid over time, in contrast to the increase in the care provided by a health plan. A decreasing prevalence of prescribed drugs was identified. Among prescription drugs, a decrease was noted in the obtaining them through health plan, the Popular Pharmacy Program, and the Public Service, with a constant high proportion of acquisition drugs through payment. The prevalence of hospitalizations decreased in 12 months, and household emergencies via SUS increased, but with a decline in ambulance transport.

Among individuals with at least one NCD, Figure 3 shows the reasons for not seeking care or not obtaining the prescribed drugs. The main reasons for not having attended in the first attempt seeking medical care in the last two weeks were: lack of money; followed by the absence of a doctor or professional; and unavailable care. However, both the waiver to receive care and the inoperability of the unit or equipment in question were constant throughout the three surveys (Figure 3).

When analyzing why they were not seen the last time they sought care in the last two weeks (second service attempt), almost all categories showed an increase over time. The lack of money was only represented in 2008. Among the reasons for not obtaining the prescribed drugs were different patterns: not finding it necessary and lack of access (either due to the lack of proximity or the non-availability of the drug at the pharmacy) increased over time, while not having money, feeling better, and other reasons fell in 2013, but with a tendency to increase in 2019. A decrease was observed from 2008 to 2013 regarding the reasons for not having sought health care in the last two weeks, with subsequent increase or stability between 2013 and 2019 for almost all the categories of responses (Figure 3).

Discussion

NCDs now represent a high burden of disease in the country with the aging of the Brazilian population, with significant demand for health services and the household budgets. Therefore, population-based surveys are crucial in analyzing the profile of morbidity, prevalence of exposure to NCD risk and protective factors, and in the knowledge of access to health care[8]. Based on three population surveys carried out between 2008 and 2019, this study assessed temporal changes in the prevalence of NCDs, health condi-

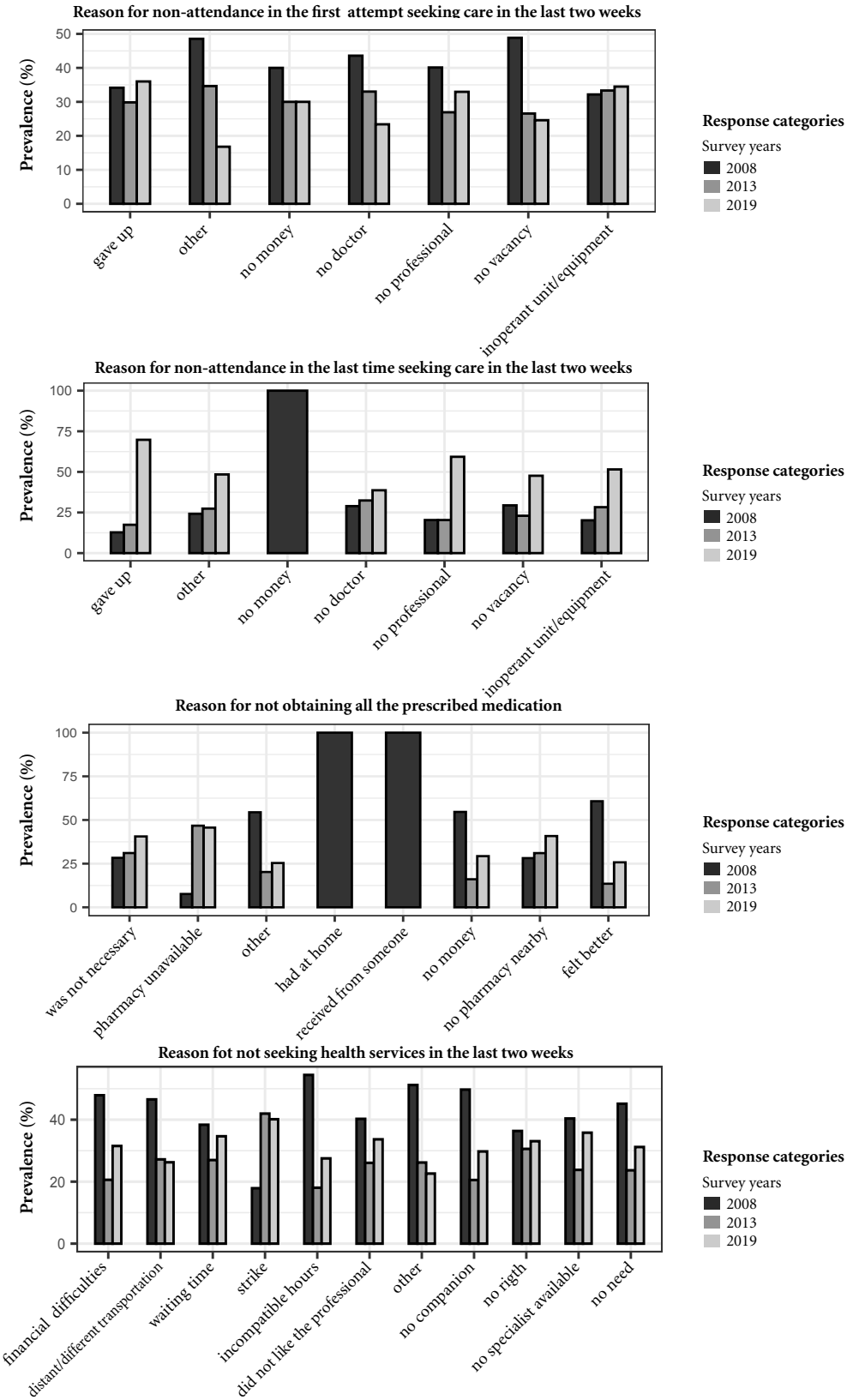

Figure 3. Prevalence of some of the reasons for not accessing and using health services and not obtaining prescription drugs, by survey year.

Source: Brazilian Institute of Geography and Statistics. National Household Sample Survey 2008. National Health Surveys 2013 and 2019.

tions, and access to and use of services, considering the influence of sociodemographic variables.

PNAD 2008, PNS 2013, and PNS 2019 should be compared with caution, as these surveys used different methodologies[15-17]. However, it is possible to properly extract relevant information for Public Health using sample designs and analysis methodology. Comparing chronic morbidities between the three surveys revealed an increase in all NCDs, except for Bowel and Stomach Cancer, Angina, Heart Failure, Lung disease, CRF, and WMSD. The higher frequency of these NCDs may be related to the aging of the Brazilian population associated with changes in habits and lifestyle, which occurred with urbanization and industrialization in the country. Every year, about 6 million deaths due to tobacco, associated with 70% of Lung Cancer, 42% of CRD, and 10% of CSD, are recorded globally.

Physical inactivity is attributed to 3.2 million deaths and an increase from 20% to 30% of all causes of death. Alcohol abuse is responsible for approximately 2.3 million deaths, half of which are associated with NCDs[6-7]. The expansion of access to clinical diagnostic tests, laboratory tests, and treatment allowed identifying these morbidities in the population, and the increased survival of individuals affected by these diseases, especially DM, AMI, Stroke, and Cancer[9,11-12].

Having received a diagnosis of a clinical condition by a health professional or following drug treatment to control a disease implies having access to health services. The increase in the prevalence of a disease can be a positive indicator of access to services, such as broader access to exams and diagnostic tests[25]. The implementation of the SUS in Brazil improved the health conditions of the population due to increased access to health care, with a higher proportion of visits carried out in the last 12 months, family health strategy coverage, additional tests, gynecological prevention, and 95.25% of Brazilians who sought care in the last two weeks got care the first time their first care attempt[18,26]. These findings were corroborated by evaluating individuals who had at least one NCD in population surveys conducted between 2008 and 2019, since compared to 2008, when the models were adjusted by the residence region, gender, and age group, an increase the prevalence of the family health strategy coverage, a medical visit in the last year and care demand in the last two weeks were identified. The expanded access to health services may have contributed to the increase in the prevalence of Brazilians who self-reported their health as good or very good, a reduced prevalence of limited routine activities and Brazilians who were bedridden in the last year, and a lower prevalence of hospitalization in the last 12 months.

On the other hand, a lower prevalence of care was observed in the first care attempt in individuals seeking care in the last two weeks and a higher prevalence of care provided by a health plan (2019 vs. 2008), with the lower prevalence of obtaining medicines in public services and the popular pharmacy program. This situation may be associated with the lower budget allocated to Health after the Constitutional Amendment Project N°95, which reduced the budget for Social Security and the resources for the SUS. Brazil chose to reduce health financing at a time of accelerated population aging and increasing NCDs that demand greater performance from the health system, as these are morbidities with costly and long-term treatments and a high disabling capacity[8].

Cross-sectional population surveys allow the study of prevalent cases (diseases/health conditions), and thus characteristics correlated with survival will be more frequent among the cases (survival bias). Therefore, the higher prevalence of CSD, Cancers, DM, CRF, and Chronic Respiratory Diseases in urban areas and the country's most developed regions can be explained both by the survival bias and the age structure in these locations. More developed regions have less inequalities in access to health care, reducing the lethality of these morbidities[18,26], and have an older age structure.

The prevalence of CSD, CA, CRF, Rheumatoid Arthritis, DM, some Lung disease, Asthma, or Bronchitis differed by ethnicity/skin color and schooling, with a higher prevalence in white individuals with a low schooling level. In Brazil, health inequalities are associated with class and ethnicity; blacks and poor people access health services less due to structural, socioeconomic barriers, and difficulties faced by professionals addressing racial and class diversity[27-28]. Less-educated individuals may have a higher prevalence of these morbidities, except for Asthma or Bronchitis, as they are less exposed to protective factors such as healthy eating, physical activity, and access to health services. The use of health services was more prevalent in people with higher education. Conversely, reporting discrimination in health services was more frequent in people with low education[28-29].

The observed lower prevalence of CRF may be associated with greater control of SAH and

DM due to increased access to PHC and access to medications[25,29]. However, despite the reduced frequency of this health condition among surveys, this health condition is high (three to six million Brazilians) due to the high degree of disability and the high cost of its treatment for the SUS[8,30]. A 66.66% increase is estimated in the number of Brazilians undergoing Hemodialysis treatment in the 2005-2015 period, and 84.4% of treatments are funded by the SUS[30].

Rheumatoid Arthritis and Chronic Spine and Back pain were the chronic conditions most reported by Brazilians in the 2003 and 2008 PNAD, surpassed only by SAH[25], yet pain in the Lumbar and Cervical Spine was the leading cause of years lived with disability in Brazil in 1990 and 2016[1]. Furthermore, the loss of functionality increases health costs due to the need for medical visits with specialists, expenses with often high-cost analgesic medications, physiotherapy, and the impact on social security due to paid removal and early retirement[29-31]. In 2013, these morbidities and WMSD were responsible for 49.20% of the diseases that promote very intense or intense limitations to activities of daily living[8], associated with sedentary lifestyle and Depression, and thus increasing the risk of developing other NCDs[8,29,32]. The main factors associated with these conditions were being female, overweight or obese, performing domestic or working activities with high muscle load[29,32].

However, there are differences in the prevalence of Back and Spine pain and WMSD concerning the variables of schooling level and area of residence. Less-educated individuals living in rural areas have a higher prevalence of Back and Spine pain due to the more exhaustive work they perform[32]. The higher prevalence of WMSDs in the most developed regions of the country and urban areas may be associated with the specificities of the work process in these locations and the higher access to occupational medicine to diagnose work-related morbidities[32].

Another chronic condition that stands out in the epidemiological profile of the Brazilian population among the three surveys is Neuropsychiatric Diseases, especially Depression. It is argued that the increase in the burden of NPDs in the Brazilian population is related to sociodemographic and economic changes that have taken place in our country in recent decades, marked by economic crises and weakened labor relationships. In this context, the accelerated and unplanned urbanization stands out, in which large population groups reside in territories of high social vulnerability, strong presence of organized crime and exposure to violence, and absence of the State[33-35].

Conclusion

NPDs and the use of psychoactive substances have excessively contributed to the disease burden in Brazil. For example, in 2015, they represented 9.3% of the years of life lost due to disability (DALY)[36]. Reflecting the importance of NPDs in the Brazilian disease burden, climbing from sixth in 1990 to third in 2015, surpassed only by CSD and Cancers[33]. Corroborating this evidence, this study identified an increase in NPDs in the surveys analyzed, with a higher prevalence in 2019 (11.61%), especially Depression, which accounted for 88.20% of NPDs in this period.

The interaction between Mental Disorders and other chronic diseases is discussed in the literature, and some disorders may arise as a consequence of the incapacities generated by NCDs or emerge as risk factors for this set of diseases[33-34], as individuals affected by NPDs are at higher risk of adopting unhealthy habits and lifestyles such as inadequate diet, sedentarism, and alcohol abuse[35], which may explain the increased risk of coronary events in individuals with Depression[33-34]. However, signaling the importance of treating mental disorders, the SUS has some barriers to monitoring these morbidities, and there is still a strong social stigma that hinders the search for and adherence to treatment, besides the insufficient number of Psychosocial Care Centers (CAPS) and the lack of PHC team training for the reception and treatment of these users[33].

Among the limitations of the study are the differences in the sampling units between PNAD and PNS and changes in the collected variables, questionnaire questions and answer categories that demand a significant initial effort to harmonize and make the bases compatible (methodological and software processing), which are not described in detail in other studies, hindering the comparison of estimates. We also have the well-

known problem of survival bias and reverse causality inherent in cross-sectional studies. Furthermore, the prevalence of self-reported morbidities can be influenced by access to health services.

Collaborations

All four authors TC Simões, KC Meira, J Santos and DCP Câmara contributed at all points: conception and design or data analysis and interpretation; writing of the paper or its critical review; and approval of the version to be published.

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