

Inequalities in the profile of using dental services in Brazil

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Abstract *This study aimed to examine the influence of socioeconomic factors on inequality in the use of dental services within the Brazilian population. The methodology was based on a sectional study, using secondary data from the 2013 National Health Survey (PNS, in Portuguese). The database contains information on 60,202 individuals over 18 years of age. The dependent variables were “frequency of dental appointments” and “type of dental treatment performed in the last appointment”. The independent variables were sex, age group, education, social class measured using the Brazil criterion, and geographic region. The odds-ratio of outcomes were evaluated in the multivariate analysis using a multinomial logistic regression model. It was noticed that the population subgroups comprising Blacks and those residing in the North/Northeast, with lower social class and education, had a greater chance of having irregular follow-up and never having been to the dentist. In addition, this population stratum also had a greater chance of undergoing surgical or emergency dental procedures in the last dental appointment. Data from the 2013 PNS reveal a picture of social inequality in access to dental services in Brazil.*

Key words *Oral health, Health inequalities, Access to health services, Oral health services*

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Introduction

For years, dentistry stood on the sidelines of public health policies, with state-sponsored dental care reflecting intense exclusion from access and low impact on epidemiological indices, given that care was centered on emergencies and priority groups¹. Therefore, health-related injuries in Brazilians represent an important public health issue due to their prevalence and magnitude².

According to data from the 2013 National Health Survey (PNS, in Portuguese), 55.6% of Brazilians had not used dental services in the last 12 months³. Further, in a study carried out in a city with a large population, Carreiro *et al.*⁴ observed that the elderly, people with a monthly income below the minimum wage, and self-perceived oral health as “fair/poor/very poor” were associated with less access to dental services, considering a greater lack of access to dental services among those who are the most socially vulnerable. Conversely, Vieira *et al.*⁵ observed that the probability of not using these services was lower among women, adults with mixed skin color, and those with perceived dental needs.

Such findings point to health inequalities, which refer to the presence of differences between subgroups of the same population, while inequities are differences considered unfair based on a value judgment⁶. Establishing a direct relationship with these concepts, the Brazilian Unified Health System (SUS, in Portuguese) introduces equity as one of its doctrinal principles, which recognizes the differences in living and health conditions and in people’s needs, considering that the right to health surpasses social differences and must take diversity into account⁷.

Public health in Brazil has vigorously sought to emphasize that overcoming inequalities in health requires equitable public policies, which implies recognizing health as a right of citizenship and prioritizing needs as an essential category for promoting justice^{6,7}. This context reflects the still present need to examine the profile of access to health services and devise meaningful strategies to address the needs of this portion of Brazilians seeking health equity, considering that there are still challenges posed by the Brazilian socioeconomic and political reality.

Therefore, the sociodemographic aspects of inequities in relation to these services still need to be highlighted to recognize that inequalities are persistent. Thus, analyzing the use of dental services is essential to assessing the effective reach of equity and universal access to health, key principles of SUS.

Although some studies have been conducted aimed at verifying inequalities in access to dental appointments in Brazil⁸⁻¹⁰, there is a paucity of national studies that assess the type of dental treatment performed in the last appointment, this being an important outcome to be analyzed, considering that inequalities can influence the type of dental treatment. Thus, this study aimed to describe the pattern of use of dental services in the Brazilian population based on sociodemographic factors, relating the frequency of dental appointments and the distribution of the type of dental treatment in the last appointment to income, race, age, geographic region, and education.

Method

Study design and participants

The design consisted of a cross-sectional study, using secondary data from the 2013 PNS, which was a population-based nation-wide household survey carried out by the Brazilian Institute of Geography and Statistics (IBGE, in Portuguese) in partnership with the Ministry of Health. The PNS was performed by means of conglomerate sampling in three stages in which census tracts or sets of sectors form the primary sampling units, households form second-stage units, and residents aged 18 years and over form third-stage units. More specific details can be found in the final report³.

The database contains information on 60,202 individuals, corresponding to those selected for the interview, comprising residents aged 18 or over per household (tertiary units), for the variables of interest. These data are freely accessible and are available on the IBGE website¹¹. The PNS is complied with all ethical requirements for conducting research on human beings in accordance with the resolution of the National Health Council No. 466 of December 12, 2012, obtaining Consent No. 328159.

Study variables

The first dependent variable was the frequency of dental appointments, using Module J, which concerns the “Use of Health Services” of the PNS. Variable J013 was used in this module, which refers to when the participant last saw a dentist. This variable was broken down into three groups: (a) has regular follow-ups (refers to people who have seen a dentist “in the last twelve months” or “from 1 year to less than 2 years”),

(b) has irregular follow-up (refers to people who have seen a dentist “from 2 years to less than 3 years” or “3 years or more”), and (c) has never been to the dentist.

The groups were defined based on the clinical guidelines of the National Institute for Health and Care Excellence¹², which advocates that the longest period of time between dental visits for patients aged 18 years and over should be 24 months. Conversely, evidence of lack of access to dental care throughout life was considered for the group that never went to the dentist. The other individuals who had already had a dental appointment at least once during their lifetime for more than 2 years were considered to have irregular follow-up. A sample of 60,202 individuals was used for this outcome.

The second dependent variable corresponds to the type of dental treatment sought by the participants, comprising individuals who reported regular dental follow-ups. This was obtained from the recategorization of variable U009, which corresponds to the main reason for the last visit to the dentist. The distribution of the type of dental treatment resulted in: (a) prevention/follow-up appointments (cleaning, review, maintenance, prevention, and radiography), (b) surgical or emergency procedures (toothache, extraction), and (c) dental treatment (gum problem, treatment of wound in the mouth, orthodontic appliance, placement/maintenance of prosthesis, or dentures and dental implants). Group composition considered that keeping prevention and follow-up appointments is an indicator of the pattern of access and periodic use of dental services¹³. However, with regard to the outcome of dental appointments for surgical and emergency procedures, the lack of access to preventive and care measures increases the severity of the problem, causing pain and with tooth extraction as the only possible approach or as an indication for pain relief due to the lack of access to other types of treatment¹⁴. Curative or restorative procedures were included as dental treatment.

The options where the main reason for the last visit was to request an estimate or some other reason were excluded from the recategorization, resulting in data on 24,151 participants. The smaller size of the sample for this outcome is due to the lack of information on individuals who have never been to the dentist or whose last appointment was more than three years ago.

Predisposing individual factors were used in selecting independent variables, according to

the Andersen Behavioral Model¹⁵, recognized as factors associated with inequalities in the use of dental services worldwide: age, sex, race/color, and educational and socioeconomic level¹⁶. The geographic region was also included to consider health inequalities in a national context⁹. The independent variables were: age categorized into age groups (18-29, 30-39, 40-59, ≥ 60 years), self-reported color or race (white, Black, and Brown), region of residence (North, Northeast, Southeast, South, Midwest), “Brazil Criterion” categorized into social classes (A, B and C, D and E), and years of schooling (12 or over, 9-11, 5-8, 1-4 years, and no formal education). The “Brazil Criterion” is a socioeconomic stratification based on ownership of assets and education (years of schooling) where, based on a weighting, socioeconomic strata from A to E were created¹⁷.

Statistical analysis

The data analysis module of complex samples of the SPSS software (Statistical Package for the Social Sciences) was used. Descriptive statistical analyses were performed using relative frequency, with expansion to the resident Brazilian population in the year of the study. This expansion was made through complex sampling. Descriptive analysis of the data used the weighted estimate of the sampling units in three stages. Each observation then incorporated its sample weight to calculate the estimates and their respective confidence intervals. Thus, data were described using prevalence estimates for the Brazilian population and their 95% confidence intervals (95%CI). A bivariate analysis using multinomial logistic regression was performed to obtain the odds ratios for the outcomes between the groups. Subsequently, a multivariate analysis was performed using a multinomial logistic regression model. Variables with a value of $p < 0.2$ were included in the initial modeling, and variables with a value of $p < 0.05$ were kept in the final model, considering a 5% confidence level.

Results

Table 1 shows the characteristics of the study population. The largest proportion is female, aged between 40-59 years, white skin color, residing in Southeastern Brazil. With regard to the “Brazil Criterion” and years of education, 63.9% (95%CI: 62.9-64.8) of the population belongs to classes C and B, while 35.1% (95%CI: 34.2 -35.9)

have between 9 and 11 years of schooling, respectively.

Tables 2 and 3 present the bivariate analysis and odds ratios for the outcomes, frequency of dental appointments, and type of dental treatment performed in the last appointment, respectively, according to the independent variables.

Table 4 presents the multivariate analysis for the frequency of dental appointments outcome. The 60 years or older age group has a greater chance of having an irregular follow-up (OR=2.94; $p<0.001$); however, such an effect was not observed in terms of having never been to the dentist. With regard to race or color, it is observed that Black individuals have a greater chance of not having regular follow-ups (OR=1.33, $p<0.001$) or never having seen a dentist (OR=2.23, $p<0.001$) than white individuals. Similar results were found for brown-skinned individuals. Residents of the North of Brazil are more likely to have irregular follow-ups (OR=1.40; $p<0.001$) and have never been to the dentist (OR=2.58, $p<0.001$).

When considering the “Brazil Criterion” indicator, it is clear that individuals from classes D and E have the greatest chance of having irregular follow-ups (OR=1.32, $p<0.001$). Nonetheless, the effect of socioeconomic class in increasing the chance of never having had a dental appointment throughout one’s life was not observed. When analyzing the variable of years of education, that is, the level of formal education, it is clear that those who are categorized as having no formal education have the greatest chance of having irregular follow-ups (OR=5.76, $p<0.001$) and never having been to the dentist (OR=23.66, $p<0.001$) (Table 4).

Regarding Table 5, which refers to the type of dental treatment, it can be seen that the 30 to 39 years age group has a lower chance of undergoing surgical and urgent procedures (OR=0.82, $p<0.001$) than individuals aged 18 to 29 years. The group corresponding to 60 years or older is likely to undergo dental treatment (OR=2.17, $p<0.001$). Black individuals are more likely to require surgical or emergency procedures (OR=1.37; $p<0.001$).

In terms of geographic region, individuals who live in the South of the country have a lower chance of having dental treatment appointments (OR=0.72, $p<0.001$), whereas those who live in the Northeast have a greater chance of needing surgical or emergency procedures (OR=1.77, $p<0.001$) (Table 5).

Table 1. Estimations and respective 95% confidence intervals of prevalence for the variables used in this study. Brazil, 2013.

Variables	Estimation (%)	95%CI
Sex		
Male	47.1	46.4-47.9
Female	52.9	52.1-53.6
Age range		
18-29 years	26.1	25.4-26.7
30-39 years	21.6	21.0-22.2
40-59 years	34.2	33.6-34.9
60 years or over	18.0	17.4-18.7
Skin color/Race		
White	48.1	46.9-49.3
Black	9.3	8.8-9.9
Brown	42.6	41.5-43.7
Geographic region		
North	7.4	6.8-8.2
Northeast	26.6	25.0-28.3
Southeast	43.8	41.7-46.0
South	14.8	13.4-16.2
Midwest	7.4	6.7-8.1
Frequency of Dental Appointments		
Regular follow-up	63.7	62.8-64.5
Irregular follow-up	33.0	32.2-33.8
Has never been to the dentist	3.3	3.0-3.7
Type of dental treatment		
Appointment for prevention/follow-up	56.8	55.5-58.2
Surgical or urgency procedures	15.9	15.0-16.8
Dental treatment	27.3	26.0-28.6
Categorized Brazil Criterion		
A	1.6	1.4-1.9
B and C	63.9	62.9-64.8
D and E	34.5	33.5-35.5
Categorized years of study		
12 years or over	18.3	17.4-19.2
9-11 years	35.1	34.2-35.9
5-8 years	14.7	14.1-15.3
1-4 years	17.7	17.0-18.4
No formal education	14.3	13.6-15.0

Source: Authors.

When looking at data from the “Brazil Criterion”, classes D and E are more likely to undergo surgical or emergency procedures than preventive visits (OR=1.41, $p<0.001$), while individuals

Table 2. Bivariate analysis of frequency of dental appointments according to the studied variables. Brazil, 2013.

Variables	Frequency of Dental Appointments						
	Regular follow-up		Irregular follow-up		Has never been to the dentist		
	Prevalence (%) (95%CI)	Prevalence (%) (95%CI)	OR (95%CI)	P-value	Prevalence (%) (95%CI)	OR (95%CI)	P-value
Age range							
18-29 years	73.6 (72.2-74.9)	22.9 (21.7-24.2)	1	-	3.5 (3.1-4.1)	1	-
30-39 years	71.6 (70.2-72.9)	25.6 (24.4-26.9)	1.19 (1.13-1.25)	<0.001	2.8 (2.4-3.3)	0.72 (0.63-0.82)	<0.001
40-59 years	62.8 (61.5-64.22)	34.5 (33.2-35.8)	1.83 (1.75-1.92)	<0.001	2.7 (2.3-3.1)	0.90 (0.80-1.01)	0.062
60 years or over	41.6 (39.8-43.5)	53.5 (51.6-55.3)	4.40 (4.17-4.64)	<0.001	4.9 (4.1-5.7)	2.38 (2.11-2.67)	<0.001
Skin color/Race							
White	69.4 (68.3-70.6)	28.6 (27.6-29.7)	1	-	1.9 (1.6-2.3)	1	-
Black	58.2 (56.0-60.5)	36.4 (34.3-38.6)	1.56 (1.47-1.66)	<0.001	5.3 (4.3-6.5)	3.33 (2.89-3.83)	<0.001
Brown	58.2 (57.0-59.3)	37.4 (36.3-38.5)	1.44 (1.39-1.50)	<0.001	4.5 (4.0-5.0)	2.47 (2.23-2.74)	<0.001
Geographic region							
Southeast	68.0 (66.6-69.4)	30.1 (28.8-31.5)	1	-	1.9 (1.5-2.3)	1	-
North	54.4 (52.1-56.7)	37.8 (35.7-39.9)	1.37 (1.31-1.44)	<0.001	7.8 (6.3-9.7)	3.51 (3.06-4.04)	<0.001
Northeast	56.4 (55.0-57.9)	38.1 (36.8-39.5)	1.26 (1.21-1.32)	<0.001	5.4 (4.8-6.2)	2.69 (2.35-3.08)	<0.001
South	69.1 (67.0-71.2)	29.3 (27.4-31.3)	0.79 (0.74-0.83)	<0.001	1.5 (1.2-2.0)	0.81 (0.65- 1.00)	0.046
Midwest	62.5 (60.7-64.2)	33.9 (32.3-35.5)	1.11 (1.05-1.17)	<0.001	3.6 (2.9-4.5)	1.63 (1.36-1.94)	<0.001
Brazil criterion							
A	85.9 (81.2-89.6)	14.0 (10.4-18.8)	1	-	0.0 (0.0-0.2)	1	-
B and C	68.2 (67.2-69.1)	29.6 (28.7-30.5)	2.16 (1.80-2.58)	<0.001	2.2 (2.0-2.6)	4.79 (1.98-11.57)	0.001
D and E	54.4 (53.1-55.6)	40.1 (38.9-41.4)	3.57 (2.99-4.28)	<0.001	5.5 (4.9-6.2)	14.13 (5.85-34.10)	<0.001
Years of study							
12 years or over	85.5 (84.2-86.7)	13.9 (12.7-15.2)	1	-	0.6 (0.4-0.8)	1	-
9-11 years	74.3 (73.1-75.4)	24 (23.0-25.1)	1.99 (1.87-2.11)	<0.001	1.7 (1.4-2.2)	3.04 (2.35-9.23)	<0.001
5-8 years	59.9 (58.0-61.6)	36.8 (35.1-38.6)	3.66 (3.42-3.91)	<0.001	3.3 (2.8-4.0)	9.54 (7.38-12.33)	<0.001
1-4 years	45.5 (43.6-47.4)	50.4 (48.5-52.2)	6.75 (6.33-7.20)	<0.001	4.2 (3.5-5.0)	15.00 (11.65-19.30)	<0.001
No formal education	36.6 (34.9-38.3)	53.8 (52.0-55.6)	8.75 (8.19-9.34)	<0.001	9.6 (8.5-1.,8)	36.48 (28.58-46.58)	<0.001

Note: CI: Confidence Interval; OR: Odds-Ratio.

Source: Authors.

in classes B and C have a better chance of following through on dental treatment than prevention and follow-up (OR=1.33, $p<0.001$). When analyzing the years comprising the study, it can be seen that the lower the level of education, the greater the chances of having undergone surgical and emergency procedures in the last dental appointment, reaching 6.59 times higher among those participants without formal education (OR=7.59; $p<0.001$) (Table 5).

Discussion

Based on this study's analysis, a marked inequality could be observed in the use of dental services

with Blacks and individuals belonging to D and E classes, without formal education, residents of the North/Northeast, and those over 60 years of age having greater chances of irregular follow-up, and/or never having been to the dentist as compared to regular follow-ups.

According to 2013 PNS data, 55.6% of Brazilians (111.6 million) had not used dental services in the last twelve months. It is noteworthy that this value reached 61.8% in Blacks and 63.4% in individuals with no formal education³. These results are in agreement with those in the National Household Sample Survey (PNAD, in Portuguese) of 1998 and 2003 with regard to the observation that white-skinned individuals residing in the South and Southeast use dental services

Table 3. Bivariate analysis of the type of dental treatment according to the studied variables. Brazil, 2013.

Variables	Type of Dental Treatment						
	Appointment for prevention/follow-up	Surgical or urgency follow-up			Dental treatment		
	Prevalence (95%CI)	Prevalence (95%CI)	OR (95%CI)	P-value	Prevalence (95%CI)	OR (95%CI)	P-value
Age Range							
18-29 years	61.9 (59.7-64.1)	18.2 (16.6-19.9)	1	-	19.9 (18.0-21.8)	1	-
30-39 years	60.4 (58.1-62.6)	15.1 (13.6-16.7)	0.86 (0.78-0.94)	0.001	24.6 (22.6-26.6)	1.14 (1.04-1.24)	0.004
40-59 years	53.0 (50.8-55.1)	14.8 (13.5-16.2)	0.98 (0.90-1.07)	0.693	32.2 (30.1-34.3)	1.65 (1.52-1.78)	<0.001
60 years or over	49.2 (45.8-52.7)	15.1 (12.9-17.6)	1.18 (1.05-1.33)	0.006	35.6 (32.5-38.9)	2.43 (2.20-2.70)	<0.001
Skin color/Race							
White	59.9 (58.0-61.9)	12.2 (11.2-13.4)	1	-	27.8 (26.0-29.7)	1	-
Black	53.8 (49.6-58.0)	20.6 (17.6-24.0)	1.96 (1.73-2.22)	<0.001	25.5 (21.8-29.6)	1.02 (0.91-1.15)	0.684
Brown	53.1 (51.4-54.9)	20.4 (18.9-21.9)	1.92 (1.78-2.07)	<0.001	26.5 (24.9-28.1)	1.08 (1.02-1.15)	0.014
Geographic region							
Southeast	56.6 (54.2-58.9)	12.5 (11.1-13.9)	1	-	31.0 (28.7-33.3)	1	-
Northeast	52.3 (49.9-54.7)	25.3 (23.3-27.5)	2.08 (1.89-2.30)	<0.001	22.4 (20.5-24.3)	0.75 (0.69-0.82)	<0.001
North	58.8 (54.7-61.2)	21.2 (18.7-24.0)	1.80 (1.61-2.01)	<0.001	20.8 (18.5-23.4)	0.76 (0.69-0.84)	<0.001
South	63.1 (60.2-65.9)	12.8 (11.1-14.7)	0.86 (0.76-0.98)	0.023	24.1 (21.7-26.6)	0.70 (0.64-0.77)	<0.001
Midwest	57.6 (55.0-60.2)	11.2 (9.9-12.7)	0.99 (0.87-1.35)	0.898	31.1 (28.7-33.6)	1.02 (0.92-1.12)	0.751
Brazil criterion							
A	63.5 (55.5-71.2)	7.0 (3.6-13.2)	1	-	29.5 (22.2-38.1)	1	-
C and B	58.3 (56.7-59.9)	14.2 (13.2-15.2)	2.55 (1.76-3.70)	<0.001	27.6 (26.1-29.1)	1.52 (1.20- 1.92)	<0.001
D and E	52.8 (50.8-54.9)	20.8 (19.2-22.5)	4.71 (3.25-6.83)	<0.001	26.4 (24.6-28.2)	1.69 (1.33-2.14)	<0.001
Years of study							
12 years or over	70.0 (67.7-72.2)	7.1 (6.0-8.4)	1	-	22.9 (21.0-25.5)	1	-
9-11 years	59.5 (57.6-61.4)	13.4 (12.1-14.8)	2.28 (2.04-1.48)	<0.001	27.1 (25.3-29.0)	1.37 (1.28-1.48)	<0.001
5-8 years	46.0 (42.9-49.2)	22.0 (19.7-24.6)	5.65 (4.97-6.44)	<0.001	32.0 (29.0-35.1)	1.95 (1.76-2.17)	<0.001
1-4 years	43.1 (39.6-46.7)	24.4 (21.6-27.5)	7.36 (6.42-8.44)	<0.001	32.5 (29.3-35.8)	2.66 (2.38-2.98)	<0.001
No formal education	38.7 (34.9-42.7)	32.9 (29.4-36.6)	9.11 (7.92-10.48)	<0.001	28.4 (24.8-32.2)	2.14 (1.88-2.43)	<0.001

Note: CI: Confidence interval; OR: Odds-Ratio.

Source: Authors.

more frequently¹⁸. Therefore, it can be seen that despite the expansion of services, the persistence of a lack of access to dental services in some population groups is clear^{19,20}.

Looking to assess the trend of income inequalities in the use of oral health services by the Brazilian population from 1998 to 2013, Galvão and Roncalli¹⁹ observed that income plays an important role in accessing oral health services, that is, the lower the income, the lower the frequency of dental appointments throughout one's life, regardless of the year. These results reaffirm the persistence of inequalities in access to oral health services mediated by economic position, underscoring social status as a factor related to access

to social resources. Thus, when extrapolating the analyses, it becomes clear that inequalities in access to oral health services continue to prevail in certain socioeconomic and regional strata.

Assessing the effective reach of universal access to health care is essential when analyzing the use of dental services. Therefore, it was observed in this study that people residing in the North and people with lower socioeconomic status are more likely to have never been to the dentist.

Vieira *et al.*⁵ applied multilevel modeling to study the association of contextual and individual determinants with the non-use of dental services among adults residing in capital cities using data from the 2010 Brazilian Oral Health Survey.

Table 4. Multivariate analysis of the frequency of dental appointments according to the variables studied by means of multinomial logistic regression. Brazil, 2013.

Variables	Frequency of Dental Appointments			
	Irregular follow-up		Has never been to the dentist	
	OR (95%CI) aj.	P-value	OR (95%CI) aj.	P-value
Age range				
18-29 years	1	-	1	-
30-39 years	1.10 (1.04-1.16)	0.001	0.59 (0.51-0.68)	<0.001
40-59 years	1.44 (1.37-1.52)	<0.001	0.55 (0.48-0.62)	<0.001
60 years or over	2.94 (2.76-3.13)	<0.001	1.10 (0.95-1.27)	0.195
Skin color/Race				
White	1	-	1	-
Black	1.33 (1.24-1.42)	<0.001	2.23 (1.91-2.60)	<0.001
Brown	1.21 (1.16-1.26)	<0.001	1.47 (1.31-1.65)	<0.001
Geographic region				
Southeast	1	-	1	-
Northeast	1.12 (1.06-1.18)	<0.001	1.83 (1.58-2.12)	<0.001
North	1.40 (1.32-1.48)	<0.001	2.58 (2.21-3.01)	<0.001
South	0.82 (0.76-0.87)	<0.001	0.90 (0.72-1.13)	0.358
Midwest	1.16 (1.09-1.24)	<0.001	1.58 (1.31-1.90)	<0.001
Brazil criterion				
A	1	-	1	-
B and C	1.16 (0.96-1.40)	0.131	1.67 (0.62-4.52)	0.311
D and E	1.32 (1.09-1.60)	0.005	2.54 (0.94-6.87)	0.067
Years of study				
12 years or over	1	-	1	-
9-11 years	1.99 (1.87-2.11)	<0.001	2.42 (1.86-3.15)	<0.001
5-8 years	3.37 (3.14-3.61)	<0.001	7.38 (5.66-9.61)	<0.001
1-4 years	4.87 (4.54-5.22)	<0.001	12.32 (9.47-16.04)	<0.001
No formal education	5.76 (5.36-6.19)	<0.001	23.66 (18.30-30.60)	<0.001

Note: CI: Confidence interval; OR: Odds- Ratio.

Source: Authors.

It was found that adults living in cities with high HDI income and longevity are less likely to have never used dental services.

In view of these results, it is important to address the relationship between access to oral health services and the effects of the social dimension on health. In this regard, a measure of access to health services corresponds to the use of these services and, therefore, the characterization observed in the analysis of these data corroborates a “social gradient in health”²⁰. This paradigm mirrors the way in which health is sensitive to social and economic factors, meaning that health conditions follow a social gradient so that the higher the social position, the better the health condition^{2,21}.

It is a fact that the socioeconomic aspect is decisive in seeking dental services²². Moreover, income is also decisive in choosing preventive or curative treatment. This assertion becomes evident when observing that no individual belonging to class A has not visited the dentist, while the highest rate of surgical or emergency procedures is observed in the most socioeconomically disadvantaged strata.

In addition, the highest prevalence of prevention or follow-up appointments occurred in younger patients who identified themselves as white, who reside in the southern part of the country, and who belong to class A, that is, with a higher socioeconomic status and a higher level of education. Conversely, the lowest prevalence

Table 5. Multivariate analysis of the Type of Dental Treatment according to the variables studied by means of multinomial logistic regression. Brazil, 2013.

Variables	Type of Dental Treatment			
	Surgical or urgency procedures		Dental treatment	
	OR (95%CI) aj.	P-value	OR (95%CI) aj.	P-value
Age range				
18-29 years	1	-	1	-
30-39 years	0.82 (0.74-0.91)	<0.001	1.13 (1.03-1.24)	0.011
40-59 years	0.83 (0.75-0.91)	<0.001	1.57 (1.44-1.71)	<0.001
60 years or over	0.85 (0.74-0.98)	0.025	2.17 (1.93-2.43)	<0.001
Skin color/Race				
White	1	-	1	-
Black	1.37 (1.19-1.57)	<0.001	0.99 (0.87-1.19)	0.845
Brown	1.29 (1.18-1.41)	<0.001	1.08 (1.00-1.16)	0.043
Geographic region				
Southeast	1	-	1	-
Northeast	1.77 (1.59-1.97)	<0.001	0.77 (0.71-0.84)	<0.001
North	1.55 (1.37-1.75)	<0.001	0.82 (0.74-0.91)	<0.001
South	0.93 (0.81-1.07)	0.290	0.72 (0.65-0.79)	<0.001
Midwest	0.99 (0.85-1.14)	0.840	1.07 (0.97-1.19)	0.174
Brazil criterion				
A	1	-	1	-
B and C	1.22 (0.83-1.79)	0.312	1.33 (1.04-1.69)	0.023
D and E	1.41 (0.95-2.08)	0.084	1.31 (1.02-1.68)	0.036
Years of study				
12 years or over	1	-	1	-
9-11 years	2.01 (1.79-2.26)	<0.001	1.45 (1.33-1.57)	<0.001
5-8 years	5.02 (4.38-5.75)	<0.001	1.95 (1.75-1.78)	<0.001
1-4 years	6.86 (5.92-7.94)	<0.001	2.13 (1.89-2.40)	<0.001
No formal education	7.59 (6.53-8.81)	<0.001	1.89 (1.65-2.17)	<0.001

Note: CI: Confidence interval; OR: Odds-Ratio.

Source: Authors.

of prevention/monitoring correspond to Blacks and Brown, North and Northeast regions, D and E economic classes, and no formal education. When evaluating the chances associated with the outcomes, it was observed that Black individuals, residents of the North and Northeast, and those with a lower level of education are more likely to have undergone surgical and emergency procedures in the last dental appointment.

Bonfim *et al.*²³ demonstrated the presence of racial inequalities in functional dentition among Brazilian adults, with a more precarious profile for Browns than for whites. Parallel to these results, Constante²⁴ reported that Browns and Blacks are more likely to frequent public dental services than Whites, reinforcing the greater confidence in this type of service by this population

group. These results confirm that inequalities in the availability of dental care are more pronounced in racial minorities, highlighting the importance of investments in the public dental service, given that racial minorities have more trust in this service, which could be a way to reduce inequalities in the use of dental services among racial groups.

People's behavior relative to the frequency of dental appointments exhibits a striking feature of inequality, with self-assessment and self-perception in oral health reflecting their social and educational conditions. As a result, it is possible to observe in this study, as well as in the study carried out by Borges *et al.*²⁵, a direct relationship between the use of dental services and years of the study. Seen from this perspective, this study

showed an inversely proportional relationship between age and frequency of appointments. The lower the individual's education, the more marked the inequalities in the chances of having irregular appointments, never having been to the dentist and having undergone surgical or emergency procedures in the last dental appointment.

Reduced access to oral health services by the elderly in Brazil also deserves special attention, since dental services historically do not prioritize this group when it comes to prevention and health promotion. Given an accumulated demand for treatment and the prevalence of tooth loss without prosthetic rehabilitation, resulting from a history of individualistic and low-complexity oral health models, restricted access generates higher rates of edentulism, in addition to caries and periodontal diseases in this population segment^{2,26}.

The results suggest that there are important social factors involved in accessing dental services, which exert a positive or negative influence on specific attitudes and behaviors in relation to oral health^{21,26}. Social inequalities can then lead to risk factors common to oral diseases; therefore, an analysis of social determinants in health provides a theoretical basis for further optimizing the promotion of oral health²².

Grouped social disadvantages create conditions that marginalize and exclude people from society and limit their opportunities and choices in life, aggravating their sense of vulnerability and exclusion²⁷. Travassos and Castro²⁸ claim that inequities in accessing and using health services express segregated opportunities depending on the person's social position.

Therefore, inequality in oral health is striking and can be characterized as an unequal distribution of access to goods and services, which is strongly determined by the socioeconomic position people occupy. Furthermore, the results of this study indicate that inequalities in access to and use of dental services in Brazil regarding social groups are large and can be considered ethically and politically unacceptable, as they reveal obstacles in accessing and using services between disadvantaged social groups.

The National Oral Health Policy, implemented in 2004, seeks to expand access to dental services for all age groups by increasing the supply of services in both primary and secondary care²⁹. However, the proposed text makes no mention of overcoming inequalities in the use of dental services or strategies based on equity in oral health.

Therefore, inequalities in the area of oral health currently represent a challenge that lacks sufficient effort and investments in public policies, in particular the reformulation of the National Oral Health Policy, for its resolution. In view of the prevailing inequities in access to health services, there is a need for multiple, effective investments in public oral health to continue with the advances that have been made and for Brazil to become an example of universalization, comprehensiveness, and equity in oral health projects and programs.

Regarding limitations, the collected data used in this study are susceptible to the effect of the respondent's memory bias when pointing out the type of dental treatment performed in the last consultation; however, it is expected that the effect of this type of bias is random. Furthermore, contextual variables were not included in the analysis, which presents an expected effect on the outcome and should be better investigated in future studies.

In terms of its benefits, this study presents important results with national coverage, representing the pattern of use of dental services by the Brazilian population by demonstrating not only inequalities in access to dental services at an individual level, but also inequalities in the type of dental treatment, revealing more mutilating procedures being performed in the socially disadvantaged population.

Conclusion

The persistence of such inequities stands in stark contrast with the fact that access to oral health services in Brazil is now more accessible. For example, people who reside in the North/Northeast, who belong to a lower social class, who have less formal education, and who self-identify as Black are more likely to have irregular follow-ups or have never been to the dentist. In addition, this population stratum also has a greater chance of having undergone surgical or emergency dental procedures in the last dental appointment rather than performing restorative dental treatments and prevention or follow-up appointments.

The results of this study reinforce the need for equitable policies that minimize inequalities in oral health, along with reducing poverty and regional inequalities, thus ensuring that the most vulnerable population subgroups have access to it, according to their health needs.

Collaborations

MHR Galvão contributed to the conceptualization, formal analysis, investigation, and writing. ACO Souza contributed to the investigation and writing of the initial draft preparation. HGF Moraes contributed to the writing of the initial draft preparation, review, and editing. AG Roncalli contributed to conceptualization, supervision, and writing (review and editing).

References

1. Neves M, Giordani JMA, Hugo FN. Primary dental healthcare in Brazil: the work process of oral health teams/Atenção primária a saúde bucal no Brasil: processo de trabalho das equipes de saúde bucal. *Cien Saude Colet* 2019; 24(5):1809-1821.
2. Monteiro CN, Beenackers MA, Goldbaum M, Barros MBA, Gianini RJ, Cesar CLG, Mackenbach JP. Socio-economic inequalities in dental health services in Sao Paulo, Brazil, 2003-2008. *BMC Health Serv Res* 2016; 16(1):683.
3. Instituto Brasileiro de Geografia e Estatística (IBGE), Ministério da Saúde (MS). Ministério do Planejamento, Orçamento e Gestão. *Pesquisa Nacional de Saúde 2013 – Acesso e utilização dos serviços de saúde, acidentes e violências: Brasil, grandes regiões e unidades da federação*. Rio de Janeiro: IBGE; 2013.
4. Carreiro DL, Souza JGS, Coutinho WLM, Haikal DS, Martins AMEBL. Acesso aos serviços odontológicos e fatores associados: estudo populacional domiciliar. *Cien Saude Colet* 2019; 24(3):1021-1032.
5. Vieira JMR, Rebelo MAB, Martins NMDO, Gomes JFF, Vettore MV. Contextual and individual determinants of non-utilization of dental services among Brazilian adults. *J Public Health Dent* 2019; 79(1):60-70.
6. Silva ICMD, Restrepo-Mendez MC, Costa JC, Ewerling F, Hellwig F, Ferreira LZ, Ruas LPV, Joseph G, Barros AJD. Mensuração de desigualdades sociais em saúde: conceitos e abordagens metodológicas no contexto brasileiro. *Epidemiol Serv Saude* 2018; 27:e000100017.
7. Barros FPCD, Sousa MFD. Equidade: seus conceitos, significações e implicações para o SUS. *Saude Soc* 2016; 25:9-18.
8. Peres KG, Peres MA, Boing AF, Bertoldi AD, Bastos JL, Barros AJ. Redução das desigualdades sociais na utilização de serviços odontológicos no Brasil entre 1998 e 2008. *Rev Saude Publica* 2012; 46:250-258.
9. Peres MA, Iser BPM, Boing AF, Yokota RTDC, Malta DC, Peres KG. Desigualdades no acesso e na utilização de serviços odontológicos no Brasil: análise do Sistema de Vigilância de Fatores de Risco e Proteção para Doenças Crônicas por Inquérito Telefônico (VIGITEL 2009). *Cad Saude Publica* 2012; 28:s90-s100.
10. Pinto RDS, Matos DL, Loyola Filho AID. Características associadas ao uso de serviços odontológicos públicos pela população adulta brasileira. *Cien Saude Colet* 2012; 17(2):531-544.
11. Instituto Brasileiro de Geografia e Estatística (IBGE). Ministério da Saúde (MS). Ministério do Planejamento, Orçamento e Gestão. *Pesquisa Nacional de Saúde 2013* [Internet]. 2013 [acessado 2020 maio 18]. Disponível em: <https://www.ibge.gov.br/estatisticas/sociais/saude/9160-pesquisa-nacional-desaude.html>.
12. National Institute for Health and Clinical Excellence. *Dental checks: intervals between oral health reviews. NICE guidelines* [Internet]. 2004 [acessado 2020 maio 18]. Disponível em: <https://www.nice.org.uk/guidance/cg19>.
13. Newman JF, Helen CG. Regular pattern of preventive dental services - a measure of access. *Soc Sci Med* 1992; 35(8):997-1001.
14. Lacerda JTD, Simionato EM, Peres KG, Peres MA, Traebert J, Marcenes W. Dor de origem dental como motivo de consulta odontológica em uma população adulta. *Rev Saude Publica* 2004; 38:453-458.
15. Andersen R, Davidson P. Improving Access to Care in America: Individual and Contextual Indicators Improving Access. In: Andersen RM, Rice TH, Kominski GF (Org.). *Changing the US Health Care System Key Issues in Health Services Policy and Management*. [S.l.]: Jossey-Bass; 2007. p. 3-33.
16. Reda SF, Reda SM, Thomson WM, Schwendicke F. Inequality in utilization of dental services: a systematic review and meta-analysis. *Am J Public Health* 2018; 108(2):e1-e7.
17. Associação Brasileira de Empresas de Pesquisa (ABEP). *Critério Brasil: Critério de Classificação Econômica Brasil 2013: base LSE 2011*. São Paulo: ABEP; 2013.
18. Nico LS, Andrade SSCA, Malta DC, Pucca Júnior GA, Peres MA. Self-reported oral health in the Brazilian adult population: results of the 2013 National Health Survey. *Cien Saude Colet* 2016; 21(2):389-98.
19. Galvão MHR, Roncalli AG. Does the implementation of a national oral health policy reduce inequalities in oral health services utilization? The Brazilian experience. *BMC Public Health* 2021; 21(1):1-8.
20. Galvão MHR. *Acesso aos serviços de saúde bucal no Brasil: desigualdades na utilização e fatores associados à oferta de atenção secundária* [dissertação]. Natal: Universidade Federal do Rio Grande do Norte; 2019.
21. Chaffee BW, Rodrigues PH, Kramer PF, Vítolo MR, Feldens CA. Oral health-related quality-of-life scores differ by socioeconomic status and caries experience. *Community Dent Oral Epidemiol* 2017; 45(3):216-224.
22. Nova FAV, Ambrosano GMB, Pereira SM, Pereira AC, Meneghin MC. Associação do risco familiar com saúde bucal, qualidade de vida e variáveis socioeconômicas. *Rev Bras Med Fam Comunidade* 2015; 10(34):1-9.
23. Bomfim RA, Schneider IJC, de Andrade FB, Lima-Costa MF, Corrêa VP, Frazão P, Watt RG, Bastos JL, Oliveira C. Racial inequities in tooth loss among older Brazilian adults: A decomposition analysis. *Community Dent Oral Epidemiol* 2021; 49(2):119-127.
24. Constante HM. Racial inequalities in public dental service utilisation: Exploring individual and contextual determinants among middle-aged Brazilian adults. *Community Dent Oral Epidemiol* 2020; 48:302-308.
25. Borges TS, Schwanke NL, Reuter CP, Kraether Neto L, Burgos MS. Fatores associados à cárie: pesquisa de estudantes do sul do Brasil. *Rev Paul Pediatr* 2016; 34(4):489-494.
26. Bastos TF, Medina LPB, Sousa NFDS, Lima MG, Malta DC, Barros MBA. Income inequalities in oral health and access to dental services in the Brazilian population: National Health Survey, 2013. *Rev Bras Epidemiol* 2019; 22(Supl. 2):E190015.
27. Watt RG, Venturelli R, Daly B. Understanding and tackling oral health inequalities in vulnerable adult populations: from the margins to the mainstream. *Br Dent J* 2019; 227(1):49-54.

28. Travassos C, Castro MSM. Determinantes e desigualdades no acesso e utilização de serviços de saúde. In: Giovanella L, Escorel S, Lobato LVC, Noronha JC, Carvalho AI, organizadores. *Políticas e Sistema de Saúde no Brasil*. 2ª ed. Rio de Janeiro: Editora Fiocruz; 2012. p. 183-206.
29. Costa H, Solla J, Suassuna A, Pucca Jr GA. *Diretrizes da política nacional de saúde bucal*. Brasília: MS; 2004.

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