



Equity in the Accessibility to Specialized Care in Oral Health in Brazil: Analysis of PMAQ-CEO External Evaluation Data According to the User's Perspective

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Abstract

Objective: To analyze the distribution of Centers of Dental Specialties (CEO) implemented in Brazil until 2014 and identify the contextual and individual variables associated with the geographical accessibility, considering the user's perspective. **Material and Methods:** The study was conducted with data from the Improving Access and Quality of CEOs (AVE/PMAQ CEO) External Evaluation and contextual characteristics of states and municipalities. The AVE/PMAQ CEO was an evaluative research with cross-sectional observational character, performed in all CEOs in Brazil, with 932 services evaluated and 8,897 users interviewed. Data analysis was conducted in two stages, considering the study dimensions. Analyses were conducted on the availability of units by region, state, population size of the municipality and contextual variables. Then, the relationship between explanatory variables and the user's displacement time and with the intention to change the service location was evaluated using generalized linear regression analysis. **Results:** The 932 CEOs evaluated were located in 780 of the 5,570 municipalities of the country and the majority was located in the northeastern (38.3%) and southeastern regions (36.2%), with the northern and mid-western regions presenting the lowest absolute number of units. The average displacement time to the CEO was 28.4 minutes, while the intention to change CEO location due to the distance from home was reported by 7.8% of users. Lower geographical accessibility was reported in the northern region and for individuals who reported living in the rural area and in cities with larger populations. **Conclusion:** The availability of CEOs in the country is still low and not equitably distributed among states and regions.

Keywords: Health Services Accessibility; Health Equity; Dental Health Services.

Introduction

The National Oral Health Policy (PNSB), launched in 2004 and nicknamed "Brasil Sorridente" aims at universal access and comprehensive oral health care. To that end, it seeks to consolidate a care model guided by the principles and guidelines of the Unified Health System (SUS), where the Family Health Strategy (PSF) reorients this model in primary care with the expansion of oral health teams to ensure the integrality of dental care, with the provision of specialized assistance through the Centers of Dental Specialties (CEO) [1].

In this sense, a good coverage of primary care that allows the coordination between levels of care and the adequate use of oral health services are requirements to achieve the desired quality. It is also necessary to take into account that the use of services can be influenced by their accessibility.

Accessibility is defined as a characteristic of the relationship between need, demand and supply to health actions and services, being composed of two dimensions: socio-organizational and geographic. The first is related to the characteristics of the service offering, that is, resources that make it easier or difficult for people to reach care. The second refers to displacement, such as distance, time and cost to reach the service [2,3].

The barriers in accessibility affect different social groups in different ways, especially those of greater social vulnerability, being relevant for research on equity in health systems. Barriers such as cost and transportation difficulties, structural problems and human resources of health units, time waiting for care, among others, tend to be higher for lower income groups, who generally live in areas where the availability of services is lower, making access difficult [4]. Groups with better socioeconomic conditions have an easier way to overcome the imposed access difficulties [5].

In addition, there is evidence that contextual characteristics, such as population size and the Human Development Index (HDI) of regions served by CEOs, are related to their performance [6-8]. However, few studies have addressed the distribution of supply and its influence on accessibility and equity. Thus, the aim of this study was to analyze the distribution of CEOs implemented in Brazil up to year 2014, as well as to identify the contextual and individual variables associated with geographical accessibility, considering the user's perspective.

Material and Methods

Improving Access and Quality for CEOs Program

The study was developed with data from the 1st cycle "Improving Access and Quality of CEOs (AVE/PMAQ CEO) External Evaluation" Program (AVE / PMAQ-CEO) and contextual characteristics of states and municipalities. The AVE / PMAQ-CEO was an evaluative research with a transverse observational character, performed in all Brazilian CEOs, who joined the PMAQ-CEO in the first phase of the program, according to Administrative Rule No. 261 / GM / MS, of February 21, 2013, totaling 932 evaluated services and 8,897 users interviewed.

The AVE / PMAQ-CEO evaluation was held in the year 2014 and was composed of the in loco verification of a set of structure quality standards and work process of CEOs. This work

comprised the verification of the following dimensions: I - Certification of the performance of CEOs and municipal managements participating in the PMAQ / CEO; II - Evaluation of the access of CEOs: consisting of an evaluation process that contemplates the evaluation of the local health network.

The external evaluation instrument was organized into three modules: module I - Direct observation of the infrastructure conditions, equipment, instruments, materials, inputs and medicines. The quality assessor was followed up by a team professional evaluated during the on-site visit at the health facility to be evaluated; Module II - Interview with professionals (manager and dentist surgeon of CEOs) to obtain information about the team's work process and about the organization of the care with users; Module III - Interview with users to verify their satisfaction and perception regarding health services, in relation to their access and use.

The quality evaluators of PMAQ-CEO, selected and trained by the Institutions of Education and Research, have applied tools to verify access and quality standards achieved by professionals and management. Observations of CEO's infrastructure were made, interviews with CEO's Managers, one dental surgeons and 10 users (over 18 years of age) and document verification.

Distribution of CEOs in the Country

Initially, a description was given of the CEO number by region, unit of the federation and population size of municipalities in which CEOs were present. Then, the number of CEOs per 100,000 inhabitants (CEO / inhabitant) and number of dentists with minimum specialties in the CEO's per 100,000 inhabitants (CD / inhabitant) for each region and unit of the federation (UF). For the calculation of rates, the population estimate for the year 2014 provided by the Brazilian Institute of Geography and Statistics was used. The contextual variables HDI and Gini index of the income distribution for each UF, extracted from the Atlas of Human Development in Brazil [9], were also used to evaluate the distribution of health units.

Accessibility from the User's Perspective

Variables time to reach the CEO (in minutes) and answer to the question if the user would change the CEO location if he had the option, considering only the 'far from home' motivation, of module III of the external evaluation instrument, were considered as Proxy for the geographic accessibility to the specialized oral health service from the user's perspective. The following contextual variables were defined as explicative: region, population size and HDI of the municipality (HDI-M), CEO / inhabitant, CD / inhabitant, Oral Health Team coverage in the municipality, type of access to the CEO, unit absenteeism percentage; and individual variables: self-declared race / color, dwelling area, number of people in the household, schooling, income and money received from the family allowance program.

Data Analysis

Data analysis was conducted in two stages, considering the study dimensions: 1) Analysis of the distribution of CEOs; and 2) Analysis of user accessibility. In the first step, after descriptive analysis of data by region and population size of the municipality, analysis was carried out using scatter plots between health indicators and contextual variables.

In the second stage, the relationship between explanatory variables and outcomes was evaluated through generalized linear regression analyses. As the displacement time variable presented exponential distribution, the association between the outcome and the independent variables was evaluated considering the Gamma distribution, with model adjustment by the maximum likelihood method. The logarithmic function was used and coefficients were expressed as averages for categorical variables or variation in the displacement time according to the coefficient for continuous variables. For the outcome related to the option of change the CEO location, the Poisson distribution was used, also using a logarithmic link function, expressing the rate ratio effect (proportions) for the categorical variables or rate variation according to the coefficient for continuous variables. Variables with $p < 0.10$ in the crude analyses were included in the adjusted analysis. The number of individuals with missing data was low ($< 5\%$), except for variable CEO absenteeism percentage, which presented a high percentage of loss ($> 30\%$), which required the imputation of data through the multiple imputation method. All analyses were performed using the Stata SE Software, version 13. The significance level was set at 0.01.

Ethical Aspects

The AVE / PMAQ-CEO project was approved by the Ethics Research Committee of the Federal University of Pernambuco under CAAE No. 23458213.0.0000.5208.

Results

The 932 CEOs surveyed were located in 780 of the country's 5,570 municipalities. While almost 70% of Brazilian municipalities had up to 20,000 inhabitants, only 11.7% ($n = 109$) of CEOs were located in one of these municipalities. On the other hand, almost 40% ($n = 371$) of CEOs were in municipalities with more than 100,000 inhabitants, 27.7% ($n = 257$) in municipalities with more than 200,000 inhabitants. Little more than 5% of Brazilian municipalities had population of more than 100,000 inhabitants in 2014.

Most of the evaluated CEOs were located in the northeastern (38.3%) and southeastern regions (36.2%). The northern and mid-western regions had the lowest absolute number of CEOs. When evaluated by the number of inhabitants, the northern region was highlighted by the lowest number of CEOs (0.348 per 100,000 inhabitants) and the northeastern region by the highest number (0.635 per 100,000 inhabitants). The state of Roraima presented the most unfavorable population indicators, both in relation to the number of CEOs and the number of dental surgeons in the minimum specialties. The best indicators were found in Paraíba. Variables and health indicators are described in Table 1.

Table 1. Description of the number of CEOs, interviewed users, HDI, Gini index and CEO indicators included in the study, according to the federation unit.

UF	Number of CEOs	Users Evaluated	HDI	Gini	CEO/inh.	CD/inh	Time to Reach the CEO	Population in 2014
Northern	60	492	-	-	0.366	2.691	39.896	17.261.983
AC	2	10	0.663	0.63	0.253	1.139	47.000	790.101
AM	11	64	0.674	0.65	0.284	1.575	44.313	3.873.743
AP	3	23	0.708	0.60	0.400	4.927	88.696	750.912
PA	29	266	0.646	0.62	0.359	2.613	40.880	8.104.880
RO	7	67	0.690	0.56	0.400	2.974	28.313	1.748.531
RR	1	4	0.707	0.63	0.201	0.604	31.500	496.936
TO	7	58	0.699	0.60	0.468	3.474	23.897	1.496.880
Northeastern	357	3.405	-	-	0.751	4.875	26.610	56.186.190
AL	22	190	0.631	0.63	0.662	4.155	29.863	3.321.730
BA	75	705	0.660	0.62	0.496	3.385	28.356	15.126.371
CE	80	768	0.682	0.61	0.905	5.993	29.966	8.842.791
MA	26	256	0.639	0.62	0.380	2.189	27.688	6.850.884
PB	53	526	0.658	0.61	1.344	8.241	19.633	3.943.885
PE	40	394	0.673	0.62	0.431	3.083	27.175	9.277.727
PI	28	261	0.646	0.61	0.877	5.698	21.636	3.194.718
RN	23	207	0.684	0.60	0.675	4.254	19.976	3.408.510
SE	10	98	0.665	0.62	0.451	3.514	41.051	2.219.574
Southeastern	337	3.296	-	-	0.399	3.381	27.272	85.115.623
ES	9	90	0.740	0.56	0.232	1.750	27.911	3.885.049
MG	83	829	0.731	0.56	0.400	3.309	31.468	20.734.097
RJ	66	610	0.761	0.59	0.401	3.748	28.307	16.461.173
SP	179	1.767	0.783	0.56	0.406	3.372	24.914	44.035.304
Southern	116	1.141	-	-	0.464	3.898	31.466	29.016.114
PR	48	465	0.749	0.53	0.433	3.745	32.344	11.081.692
RS	25	249	0.746	0.54	0.223	1.410	30.124	11.207.274
SC	43	427	0.774	0.49	0.639	5.515	31.293	6.727.148
Mid-western	62	563	-	-	0.422	3.822	29.952	15.219.608
DF	9	89	0.824	0.63	0.316	3.085	48.809	2.852.372
GO	28	267	0.735	0.55	0.429	4.185	26.468	6.523.222
MS	15	117	0.729	0.56	0.573	4.848	29.111	2.619.657
MT	10	90	0.725	0.55	0.310	2.140	22.733	3.224.357
Brazil	932	8.897	0.727	0.60	0.460	3.515	28.424	202.799.518

CEO / inh, Center of Dental Specialties per 100,000 inhabitants; CD / inh, number of dentists in the minimum specialties of CEO per 100,000 inhabitants.

The evaluation of the scatter plots between contextual variables and number of CEOs by inhabitants shows a general tendency towards the equity in the availability of secondary care in oral health in the federative units of the country. The graphs, however, are not linear. The existence of states with greater vulnerability and lower number of CEO per inhabitant is identified, especially the northern region and some states of the northeastern region, such as Maranhão, Pernambuco and Sergipe. On the other hand, many states in the northeastern region, with worse social indicators, have high availability of secondary care. Excluding northeastern states, the trend towards equity reverses (Figure 1). For the number of dental surgeons in the minimum specialties, the results were similar.

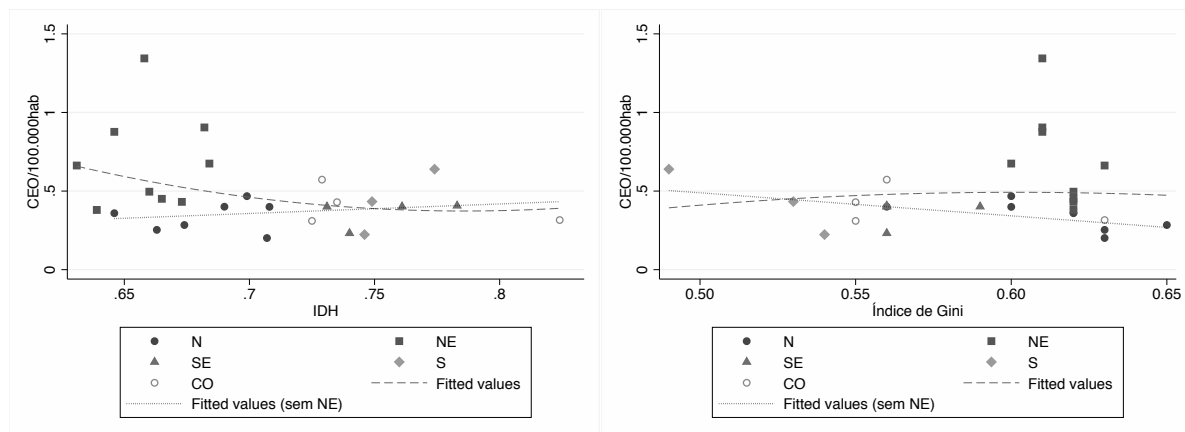


Figure 1. Scatter plots between number of CEOs per 100,000 inhabitants and contextual variables HDI and Gini index.

Of the 932 CEO, 8,897 users were evaluated during the PMAQ-CEO external evaluation phase. Most of the interviewees were female (69.8%), living in the urban area (83.9%), with income of up to 2 minimum wages (64.2%) and self-reported non-white color / race (59.7%). Only 6.9% of the interviewed users reported being from another municipality. Regarding the time reported by users the time required to reach the service, data in Table 1 demonstrate that there is not, in general, equity in accessibility to services. The average time to reach the CEO was 28.4 minutes. Users interviewed in CEOs in the state of Paraíba also reported shorter times to reach the CEO, while the highest times were reported in Amapá, even though this state had high availability of professionals of the minimum specialties per inhabitant. Again, it was identify that the variables are not linearly related. The states of Acre and Amazonas, which present low HDI and high-income inequality, presented high displacement time. On the other hand, all northeastern states, with low HDI, presented mean displacement times of less than 30 minutes, except for the state of Sergipe.

In the users' analyses, the longer average displacement times were reported in the northern region. In this region, the highest values were also found, which probably express displacement time longer than one day. Longer times were also found for users of municipalities with larger population sizes and higher HDI-M, and CEOs with higher absenteeism percentage and whose access was only of the referenced type. Users living in states with higher number of CEOs per inhabitant and municipalities with greater BSE coverage reported less displacement time. Longer times were also found for individuals who reported not being white; living in the rural area and households with high number of residents, lower income and schooling and those participating of the family allowance program. Table 2 describes the mean displacement time of users according to the categories of independent variables.

Regarding the question, if the user would change the CEO location if there was possibility, 13.9% ($n = 1,238$) answered yes, a little more than half ($n = 691$) were motivated by the 'far from home' reason. In general, the highest percentages were found in the same categories of the longest average displacement times, except for variables HDI-M, number of CEOs and CD per inhabitant, type of access to CEO and absenteeism percentage of the unit (Table 2).

Table 2. Displacement time and option to change the CEO location due to the distance from home reported by users, according to the categories of independent variables.

Variables	Displacement Time b ^a		Would Change CEO Location ^b	
	Mean	SD	N	%
Contextual Variables				
Region				
Northern	39.9	89.7	67	13.6
Northeastern	26.6	29.1	249	7.3
Southeastern	27.3	26.7	203	6.2
Southern	31.5	29.4	121	10.6
Mid-western	30.0	30.4	51	9.1
IDH-M				
≤ median (0.726)	26.3	37.4	347	7.8
> median	30.6	31.9	344	7.8
Population Size				
Up to 20,000 inhabitants	20.3	22.9	42	4.0
20,001 to 200,000 inhabitants	26.0	34.6	430	8.0
More than 200,000 inhabitants	37.1	37.6	219	8.9
Number of CEOs in the UF / 100.000 inhabitants				
≤ median (0.429)	29.1	39.3	332	7.1
> median	27.7	29.0	359	8.5
Number of Dentists in the UF / 100.000 inhabitants				
≤ median (3.385)	28.8	37.9	368	7.5
> median	28.0	30.6	323	8.0
BSE Coverage in the Municipality				
≤ median (0.7806)	31.4	37.2	476	8.7
> median	23.7	30.0	215	6.2
Type of Access to CEO				
Spontaneous Demand	27.4	35.5	20	16.8
Referenced	29.0	31.6	279	7.6
Mixed	27.9	39.5	691	7.7
Absenteeism Percentage				
≤ median (0.20)	27.9	29.5	258	7.3
> median	30.5	32.2	118	6.5
Individual Variables				
Race / color				
White	26.3	26.1	241	6.8
Non-white	29.9	39.7	446	8.5
Living Area				
Urban	24.7	28.3	499	6.7
Rural	47.9	54.0	192	13.4
Number of People in the Household				
≤ 3	27.0	28.8	285	6.9
> 3	29.7	39.2	406	8.5
Schooling				
Illiterate/ Literate / Incomplete Elementary School	33.1	35.0	264	7.9
Complete Elementary School or Above	25.6	34.4	427	7.7
Income				
≤ 2 MW	31.5	39.9	469	8.4
> 2 MW	23.2	23.1	222	6.7
Receives Family Allowance				
Yes	33.4	42.2	269	9.9
No	26.1	30.5	417	6.8

^aTime in minutes; ^bConsidering only the 'far from home' motivation.

The measures of effect and their respective confidence intervals in the crude and adjusted analyses are described in Tables 3 and 4 for the variables dependent on displacement time and change of CEO location, respectively. In relation to the time spent for the user to reach the health

unit, the southeastern and mid-western regions presented shorter displacement time compared to the northern region; the higher the HDI-M and the population size of the municipality, the longer the displacement time; the higher the number of CEO / inhabitant and the smaller the number of CD / inhabitant, the shorter the displacement time. Factors such as CEOs whose access form is exclusively given by spontaneous demand; non-white color / race, living in the rural area, high number of people in the household, lower schooling and income and some family member receiving family allowance are associated with longer displacement times.

Table 3. Gamma regression analysis for the displacement time to CEO, according to independent variables.

Variables	Crude Analysis			Adjusted Analysis		
	exp(β)	CI 99%	p-value	exp(β)	CI 99%	p-value
Contextual Variables						
Region (ref.: Northern)						
Northeastern	0.667	0.580; 0.767	<0.001	0.898	0.777; 1.037	0.054
Southeastern	0.684	0.594; 0.787	<0.001	0.740	0.638; 0.858	<0.001
Southern	0.789	0.674; 0.922	<0.001	0.866	0.730; 1.028	0.031
Mid-western	0.751	0.628; 0.898	<0.001	0.727	0.602; 0.877	<0.001
HDI-M	3.560	2.272; 5.577	<0.001	6.063	2.903; 12.662	<0.001
Population Size (ref.: up to 20,000 inh)						
20,001 to 200,000 inhabitants	1.281	1.151; 1.425	<0.001	1.194	1.081; 1.319	<0.001
More than 200,000 inhabitants	1.828	1.626; 2.054	<0.001	1.760	1.533; 2.020	<0.001
Number of CEOs / inhabitant (UF)	0.725	0.640; 0.823	<0.001	0.340	0.192; 0.601	<0.001
Number of CD / inhabitant (UF)	0.955	0.934; 0.976	<0.001	1.157	1.060; 1.262	<0.001
ESB Coverage in the Municipality	0.995	0.994; 0.997	<0.001	0.999	0.997; 1.000	0.033
Type of Access to CEO (ref.: spont. demand)						
Referenced	0.801	0.600; 1.069	0.048	0.727	0.562; 0.940	0.001
Mixed	0.758	0.567; 1.014	0.014	0.686	0.530; 0.887	<0.001
Absenteeism Percentage	1.006	1.002; 1.010	<0.001	1.001	0.998; 1.005	0.371
Individual Variables						
Race						
Non-white (ref.: white)	1.138	1.064; 1.217	<0.001	1.069	1.004; 1.137	0.006
Living Area						
Rural (ref.: urban)	1.940	1.782; 2.111	<0.001	2.105	1.941; 2.284	<0.001
Number of People in the Household						
> 3 (ref.: ≤ 3)	1.098	1.027; 1.173	<0.001	1.065	1.003; 1.130	0.007
Schooling	0.918	0.901; 0.936	<0.001	0.962	0.946; 0.978	<0.001
Income	0.844	0.819; 0.870	<0.001	0.865	0.838; 0.893	<0.001
Receives Family Allowance						
No (ref.: yes)	0.782	0.728; 0.840	<0.001	0.895	0.833; 0.962	<0.001

The northern region presented higher proportion of users who would change the CEO location due to the 'far from home' motivation, compared to the southeastern and northeastern regions; the larger the population size, the greater this proportion. In addition, greater proportion of users whose form of access is exclusively given by spontaneous demand was found; and living in the rural area, having lower income and some family member receiving family allowance are associated with the intention to change CEO location.

Table 4. Poisson regression analysis for change of CEO location according to independent variables.

Variables	Crude Analysis			Adjusted Analysis		
	exp(β)	CI 99%	p-value	exp(β)	CI 99%	p-value
Contextual Variables						
Region (ref.: Northern)						
Northeastern	0.537	0.377; 0.765	<0.001	0.638	0.417; 0.977	0.007
Southeastern	0.452	0.315; 0.650	<0.001	0.484	0.316; 0.743	<0.001
Southern	0.779	0.526; 1.153	0.101	0.910	0.563; 1.472	0.615
Mid-western	0.665	0.412; 1.074	0.028	0.676	0.390; 1.172	0.067
HDI-M	2.393	0.641; 8.942	0.088	13.602	0.974; 189.970	0.011
Population Size (ref.: up to 20,000 inh)						
20,001 to 200,000 inhabitants	1.985	1.309; 3.010	<0.001	1.844	1.179; 2.883	<0.001
More than 200,000 inhabitants	2.207	1.430; 3.405	<0.001	2.114	1.220; 3.661	<0.001
Number of CEOs / inhabitant (UF)	0.763	0.515; 1.133	0.078	0.857	0.128; 5.727	0.835
Number of CD / inhabitant (UF)	0.953	0.891; 1.019	0.066	1.015	0.768; 1.343	0.888
ESB Coverage in the Municipality	0.997	0.994; 1.001	0.039	1.000	0.996; 1.005	0.802
Type of Access to CEO (ref.: spont. demand)						
Referenced	0.458	0.254; 0.827	0.001	0.406	0.213; 0.772	<0.001
Mixed	0.454	0.250; 0.824	0.001	0.407	0.213; 0.776	<0.001
Absenteeism Percentage	1.004	0.993; 1.016	0.312		-	
Individual Variables						
Race						
Non-white (ref.: white)	1.252	1.019; 1.538	0.005	1.187	0.947; 1.487	0.050
Living Area						
Rural (ref.: urban)	2.006	1.611; 2.496	<0.001	1.952	1.539; 2.477	<0.001
Number of People in the Household						
> 3 (ref.: \leq 3)	1.242	1.018; 1.516	<0.001	1.148	0.927; 1.421	0.096
Schooling	0.977	0.926; 1.031	<0.271		-	
Income	0.845	0.765; 0.933	<0.001	0.877	0.784; 0.981	0.002
Receives Family Allowance						
No (ref.: yes)	0.685	0.560; 0.838	<0.001	0.747	0.587; 0.952	0.002

Discussion

Ecological analyses demonstrate the role of the northeastern region in attenuating the inequities in the accessibility to specialized oral health observed in Brazil. On the other hand, when considering only the states of the other regions, the relationships with contextual indicators show the tendency to inequity in the distribution of CEOs implemented in the country. The low number of CEOs, in spite of the rapid evolution, and their concentration in municipalities with larger population sizes, mean that individuals with greater health needs have greater difficulties in accessing the service, reproducing the reverse care law [10], already demonstrated in other collective oral health actions in the country, such as fluoridation of public water supply [11]. This incongruence between need and specialized oral health care has already been previously identified, when 339 CEOs were implemented in the country in the year 2006 [12]. In addition, the greater geographic and social distances, cultural and economic barriers faced by the most vulnerable populations undermine regionalization policies, reaffirming existing inequalities [7,13,14].

The pioneering and active participation of several actors in the northeastern region in the development and implementation of the current National Oral Health Policy has made the scenario in the region to be distinct [8,12], with a general attitude towards equity, with high availability of services in agreement with social and health indicators. As can be seen, this characteristic is capable

of influencing the general panorama of the country, underestimating inequities in the federative units of the other regions.

In addition, it should be considered that studies evaluating CEOs suggest that there is an inadequacy regarding procedures performed in these units, with the service being used as a substitute for primary care rather than complementary in the care network [7,15]. The inadequacy of the offered care can act as an aggravating factor to the low availability of the service and does not contribute to integrality in oral health [16].

Individually, the low accessibility to secondary care reported by users of CEOs in the northern region, of municipalities of greater population and residents of the rural zone stands out. These variables presented high effect measures for both variables used as outcome in the analyses. In addition, the HDI-M and the CEO / inhabitant indicator showed significant effect on the time required to reach the CEO, and the fact that access to the CEO did not take place solely by spontaneous demand showed a great protective effect in the intention to change CEO location. It is important to remember at the moment, that the outcomes were collected from the users, representing, therefore, the barriers faced by those who, somehow, already had access to the service. Thus, the results were interpreted in addition to previous analyses in order not to consider them as representative of the general population's access to secondary care in oral health. For example, the reports of users from larger municipalities show greater difficulties to access CEOs cannot be translated as better access to the service by the population of small municipalities, which, as observed, presented less availability of units.

Thus, the greater the population size of municipalities with CEOs, and, on average, higher HDI-M, greater distances and difficulties of urban locomotion can be faced by users. In addition, a smaller expansion of primary care in these municipalities [17] may compromise the care network. Although there was no effect of the percentage of BSE coverage in municipalities, perhaps due to the relative homogeneity of municipalities that presented secondary attention, the association of the lower intention of changing CEO location with the form of access to the CEO, which not only by spontaneous demand, can indicate that a better organization of the assistance network would favor the user's accessibility, in addition to the effectiveness of the principle of integrality [16]. On the other hand, another study demonstrated the impact of distance to the municipality with CEO on the use of services, suggesting that there is a relationship between primary care coverage and secondary care organization [14].

The results suggest the presence of inequities also among individuals who use the service, since users with worse socioeconomic conditions, living in the rural area and in the northern region reported worse geographical accessibility to CEOs. Considering that conditions of social vulnerability also lead to poorer oral health conditions [18-20], individuals with greater needs would be facing more barriers to access specialized services. Thus, difficulties in accessing the service can be considered as predictors of oral health conditions [21]. In addition, alternatives in the private network are also more difficult for individuals with greater social vulnerability [22]. Thus, the need

to expand specialized services should take into account the needs of the population and the organization of the health care network, with the aim of reducing inequities in the use and access to secondary care in oral health in the country. In addition, standardization in the CEOs coverage is necessary in order to guarantee minimum availability and access to services.

Conclusion

The availability of CEOs in the country is still low and unevenly distributed across states and regions, concentrating in larger municipalities. In addition, users from the northern region living in municipalities with more than 200,000 inhabitants and from the rural area have reported barriers in the geographical accessibility to these health units.

References

1. Brasil. Ministério da Saúde. Secretaria de Atenção à Saúde. Departamento de Atenção Básica. Coordenação Nacional de Saúde Bucal. Diretrizes da Política Nacional de Saúde Bucal. Brasília: Ministério da Saúde, 2004.
2. Travassos C, Martins M. A review of concepts in health services access and utilization. *Cad Saude Publica* 2004; 20(supl. 2):S190-8. doi: 10.1590/S0102-311X2004000800014.
3. Oliveira LS, Almeida LG, Oliveira MA, Gil GB, Cunha AB, Medina MG, Pereira RA. Access to primary health care in a sanitary district of Salvador. *Cien Saude Colet* 2012; 17(11):3047-56. doi: 10.1590/S1413-81232012001100021.
4. Travassos C. Equity in the Brazilian Health Care System: A contribution for debate. *Cad Saude Publica* 1997; 13(2):325-30. doi: 10.1590/S0102-311X1997000200024.
5. Neri M, Soares W. Social inequality and health in Brazil. *Cad Saude Publica* 2002; 18(Suppl):77-87. doi: 10.1590/S0102-311X2002000700009.
6. Figueiredo N, Goes PS. Development of secondary dental care: A study on specialized dental clinics in Pernambuco State, Brazil. *Cad Saude Publica* 2009; 25(2):259-67. doi: 10.1590/S0102-311X2009000200004.
7. Goes PS, Figueiredo N, Neves JC, Silveira FM, Costa JF, Pucca-Júnior G; Rosales MS. Evaluation of secondary care in oral health: A study of specialty clinics in Brazil. *Cad Saude Publica* 2012; 28(Suppl.):s81-9. doi: 10.1590/S0102-311X2012001300009.
8. Machado FC, Silva JV, Ferreira MA. Factors related to the performance of specialized Dental Care Centers. *Cien Saude Colet* 2015; 20(4):1149-63. doi: 10.1590/1413-81232015204.00532014.
9. Brasil. Programa das Nações Unidas para o Desenvolvimento. Atlas do Desenvolvimento Humano no Brasil 2013. Brasília: PNUD, Ipea, FJP, 2013.
10. Hart JT. The inverse care law. *Lancet* 1971; 1(7696):405-12.
11. Peres MA, Fernandes LS, Peres KG. Inequality of water fluoridation in Southern Brazil – the inverse equity hypothesis revisited. *Soc Sci Med* 2004; 58(6):1181-9. doi: 10.1016/S0277-9536(03)00289-2.
12. Saliba NA, Moimaz SA, Fadel CB, Bino LS. Brazilian oral health: A new fronting politic at national reality. *Rev Odontol Bras Central* 2010; 18(48):62-6.
13. Chaves SC, Soares FF, Rossi TR, Cangussu MC, Figueiredo AC, Cruz DN, Cury PR. Characteristics of the access and utilization of public dental services in medium-sized cities. *Cien Saude Colet* 2012; 17(11):3115-24. doi: 10.1590/S1413-81232012001100027.
14. Pinto VP, Teixeira AH, Santos PR, Araújo MW, Moreira MA, Saraiva SR. Evaluation of the accessibility to the Specialized Dental Care Center within the scope of the macro region of Sobral, in the state of Ceará, Brazil. *Cien Saude Colet* 2014; 19(7):2235-44. doi: 10.1590/1413-81232014197.09862013.
15. Herkrath FJ, Herkrath AP, Costa LN, Gonçalves MJ. Performance of Specialized Dental Care Centers considering the sociodemographic context of municipalities of the Amazonas State (Brazil, 2009). *Saúde Debate* 2013; 37(96):148-58. doi: 10.1590/S0103-11042013000100017.
16. Chaves SC, Barros SG, Cruz DN, Figueiredo AC, Moura BL, Cangussu MC. Brazilian Oral Health Policy: Factors associated with comprehensiveness in health care. *Rev Saude Publica* 2010; 44(6):1005-13. doi: 10.1590/S0034-89102010005000041.

17. Costa NR. The Family Health Strategy: Primary health care and the challenge of Brazilian metropolises. *Cien Saude Colet* 2016; 21(5):1389-98. doi: 10.1590/1413-81232015215.24842015.
18. Carnut L, Filgueiras LV, Figueiredo N, Goes PS. Initial validation of the index of oral healthcare needs for oral health teams in the family healthcare strategy. *Cien Saude Colet* 2011; 16(7):3083-91. doi: 10.1590/S1413-81232011000800008.
19. Bueno RE, Moysés ST, Bueno PA, Moysés SJ. Social determinants and adult oral health in Brazilian state capitals. *Rev Panam Salud Publica* 2014; 36(1):17-23.
20. Roncalli AG, Tsakos G1, Sheiham A, de Souza GC, Watt RG. Social determinants of dental treatment needs in Brazilian adults. *BMC Public Health* 2014; 14:1097. doi: 10.1186/1471-2458-14-1097.
21. Marshman Z, Porritt J, Dyer T, Wyborn C, Godson J, Baker S. What influences the use of dental services by adults in the UK? *Community Dent Oral Epidemiol* 2012; 40(4):306-14. doi: 10.1111/j.1600-0528.2012.00675.x.
22. Soares FF, Chaves SC, Cangussu MC. Local government and public dental health services: An analysis of inequality in use. *Cad Saude Publica* 2015; 31(3):586-96. doi: 10.1590/0102-311x00077214.