

1 **Factors related to the performance of the periodontal specialty in secondary oral**  
2 **health in Brazil.**

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NOTE: This preprint reports new research that has not been certified by peer review and should not be used to guide clinical practice.

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## 1 **Abstract**

2 **Objective:** The aim of this study was to investigate, at a national level, which individual factors of  
3 the work process/infrastructure are associated with the achievement of goals in the periodontics  
4 specialty in Brazilian Dental Specialty Centers (CEO). **Methods:** This was a quantitative, analytical,  
5 cross-sectional study. Secondary data from DATASUS and the external evaluation of the second  
6 cycle of the CEO Access and Quality Improvement Program were used. Variable description was  
7 carried out in the first stage, and then the bivariate Poisson regression was performed to verify  
8 possible associations between the variables and the outcome (achievement of goals in Periodontics in  
9 the CEO). In this analysis, the covariates that were associated with the outcome at the  $p < 0.20$   
10 significance level were included in the next step of the analysis. Multivariate Poisson regression with  
11 a robust estimator was then performed with those that met the above criterion. The variables that  
12 showed a  $p$  value  $< 0.05$  were considered in the final model. **Results:** The outcome was achieved in  
13 more than seven months of the year (mean 7.03 months, SD 4.20). Most CEO monitored the  
14 established goals (93.2%), had referral as the only way of access (61.7%), had only municipal  
15 coverage (68.4%), carried out planning and periodic evaluation of actions (89.2%). A minority has  
16 quotas of procedures by Oral Health teams (OHTs) in Primary Health Care (PHC) (18.8%). The  
17 presence of a specialist in periodontics was (on average) 1.16 per CEO and the sum of the workload  
18 of dentists working in this specialty was 31.1 hours (SD = 23.9). **Conclusion:** It was concluded that  
19 the individual factors of the work process/infrastructure associated with the achievement of goals in  
20 periodontics in Brazilian CEO are: monitoring of established goals, CEO scope and number of  
21 professionals working in the specialty.

22

23 **Keywords:** Secondary Care. Periodontics. Dental Specialty. Dental Health Services. Health Services  
24 Research.

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## 1 **Introduction**

2           With the implementation of the National Oral Health Policy (PNSB, *Política Nacional de*  
3 *Saúde Bucal*) in 2004, by the Ministry of Health (MoH), oral health care in the Brazilian Unified  
4 Health System (SUS, *Sistema Único de Saúde*), historically characterized by difficult access and  
5 limited to mutilating techniques, started to include the promotion, prevention and recovery of oral  
6 health of the Brazilian population. Therefore, the reorganization and qualification of the service  
7 provided by the SUS was crucial (1,2).

8           From this perspective, the PNSB promoted the expansion of the coverage provided by the oral  
9 health teams (OHTs) in the Family Health Strategy (FHS) to reorganize access to oral health in  
10 Primary Health Care (PHC) and implemented the Dental Specialty Centers (CEO, *Centros de*  
11 *Especialidades Odontológicas*), aiming to expand access to Secondary Oral Health Care (SOHC)  
12 (1,2). The CEO are health care establishments listed in the National Register of Health Establishments  
13 (CNES, *Cadastro Nacional de Estabelecimentos de Saúde*), which are obliged to offer basic oral  
14 health services in the Oral Diagnosis, Advanced Periodontics, Minor Oral Surgery, Endodontics and  
15 Dental Care specialties to patients with special needs. The granting of funding for the CEO  
16 maintenance is linked to the achievement of goals by the specialty (1).

17           The CEO are classified according to their composition regarding the number of dental chairs  
18 in the establishment. Therefore, Modality I, II and III of the CEO consist of three, four to six, and  
19 more than seven dental chairs, respectively. These establishments operate for 40 hours a week and  
20 the number of professionals working there varies according to the modality, with the achievement of  
21 goals being monitored by the MoH (3).

22           However, in addition to offering greater access to SOHC, it was necessary to invest in  
23 evaluation processes at this level of care, aiming to attain better quality of the services offered by the  
24 CEO. For this purpose, the MoH implemented the CEO component in the National Access and  
25 Quality Improvement Program (PMAQ, *Programa Nacional de Melhoria do Acesso e da Qualidade*)  
26 through Ordinance GM/MoH N. 261, of February 21, 2013, having its rules revised by Ordinance

1 GM/MoH N. 1,599, of September 30, 2015 (3). The PMAQ-CEO, until 2018, corresponded to the  
2 federal initiative for the evaluation and monitoring of the SOHC in Brazil.

3 This study aims to assess the achievement of the goals in the periodontics specialty of  
4 Brazilian CEO. In this specialty, the goal to be achieved varies according to the type of CEO,  
5 comprising 60 procedures for CEO type I, 90 for type II and 150 for type III (4), which were verified  
6 by the PMAQ-CEO evaluation process in its second cycle, in 2018 (5)

7 The epidemiological picture of periodontal conditions in Brazil is still considered inconclusive  
8 (6). However, if one considers the CDC/AAP (Centers for Disease Control/ American Academy of  
9 Periodontology) criteria, the prevalence of periodontal disease in Brazil is still higher than in  
10 developed countries (6). In the United States, the prevalence of severe periodontitis ranges from 6.7  
11 to 11.7%, while in Brazil it ranges from 34.4% to 63.8% in individuals aged 35 years or older (6).

12 The need to analyze compliance with periodontics goals in the CEO is justified, as there are  
13 no studies in this area with this specific approach, making it an unprecedented analysis. Moreover, it  
14 is necessary to consider the critical role of CEO in relation to the attention/control of periodontal  
15 disease, considering that, in terms of public policy, it corresponds to the only access for most  
16 Brazilians to periodontal care at a specialized level, via SUS.

17 The aim of this study is to investigate, at a national level, which individual factors are  
18 associated with the achievement of goals in the periodontics specialty in Brazilian CEO.

19

## 20 **Method**

### 21 **Ethical aspects**

22 The microdata used in this study were obtained from National Information Systems with  
23 public and unrestricted access.

24 The PMAQ-CEO was approved by the Research Ethics Committee (CEP) of the Federal  
25 University of Pernambuco (UFPE), under CAAE number: 23458213.0.0000.5208, complying with  
26 the requirements of Resolution n. 466/12 of the National Health Council.

## 1 **Study design and context**

2 This is an analytical cross-sectional study using secondary data and reported in accordance  
3 with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement  
4 (7). The study uses data from the external evaluation of the 2<sup>nd</sup> cycle of the National Program to  
5 Improve Access and Quality of Dental Specialty Centers (PMAQ-CEO), carried out in 2018, in Brazil  
6 (3). Microdata related to modules I and II of the PMAQ-CEO were used, which evaluated the structure  
7 and work process in these establishments, respectively.

## 9 **Study universe and sample**

10 The universe of the study comprises the municipalities in which the CEO adhered to the  
11 PMAQ and who answered the external evaluation questionnaire. Of the CEO implemented in the  
12 Brazilian territory in 2018, 1097 answered the external evaluation questionnaire. Of these, 104 were  
13 excluded for showing zero production in all months of the year, 15 for not having identified the type  
14 of CEO and 05 for not providing individual data in the database of the PMAQ-CEO 2<sup>nd</sup> cycle.  
15 Therefore, the final sample consisted of 973 CEO from 809 municipalities in Brazil. The authors did  
16 not had access to information that could identify individual participants during or after data collection

## 18 **Analyzed variables**

19 The variables used in the study are described in Chart 1.

21 **Chart 1** Variables (outcome and independent) used in the study.

Variable	Categories	Data source
<b>Outcome</b>		
Number of months in which the goal was achieved in the periodontics specialty	Achieved the goal. Did not achieve the goal.	DATA-SUS
<b>Independent variables of the 1<sup>st</sup> level: related to CEO.</b>		
Type of access	Referral only. Mixed (spontaneous and referral)	PMAQ-CEO
Quotas of procedures per oral health team in PHC	Yes No	PMAQ-CEO
Monitoring of established goals	Yes No	PMAQ-CEO
Sum of periodontics workload	Description (Number)	PMAQ-CEO

Variable	Categories	Data source
Number of dentists working in periodontics	Description (Number)	PMAQ-CEO
Planning and periodic evaluation of actions	Yes No	PMAQ-CEO
CEO scope	Yes No	PMAQ-CEO
CEO type	Type I Type II Type III	PMAQ-CEO
Legend: CEO = Dental Specialty Centers; PHC = Primary Health Care; PMAQ-CEO = National Access and Quality Improvement Program of Dental Specialty Centers		

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## 2 **Data organization and statistical analysis**

3 All secondary data were organized in spreadsheets that comprised the researcher's own database,  
4 using the Microsoft Excel program. All statistical analyses were performed using the SPSS software,  
5 version 23.0. Variable description was performed in the first stage, and then the bivariate Poisson  
6 regression analysis was used to verify possible associations between the independent variables and  
7 the outcome. In this analysis, the covariates that were associated with the outcome at the significance  
8 level of p-value <0.20 were included in the next step of the analysis. Poisson multivariate regression  
9 with a robust estimator was then performed with those variables that met the previous criterion. The  
10 variables that reached a p-value <0.05 were considered in the final model.

11

## 12 **Results**

13 Overall, the CEO reached goals in the periodontics specialty in more than seven months of the year (mean:  
14 7.03 months, SD: 4.20). Most CEO monitored the established goals (93.2%), had referral as the only way of  
15 access (61.7%), had municipal coverage only (68.4%), and carried out planning and periodic evaluation of  
16 actions (89.2%). A minority has quotas for OHT procedures in the PHC (18.8%). The presence of a specialist  
17 in periodontics was (on average) 1.16 per CEO and the sum of the workload of dentists working in this specialty  
18 was 31.1 hours (SD = 23.9) (Table 1).

19 Table 1 shows the analysis for the outcome (number of months in the year in which the CEO reached  
20 their goals in the periodontics specialty). Poisson regression showed this outcome was associated with  
21 variables related to the individual level of dental specialty centers. The CEO that monitors their established  
22 goals were 1.37 times more likely to achieve these goals than the ones who did not monitor the established

1 goals. In turn, a higher number of dentists who work in periodontics and CEO with regional coverage were  
 2 also variables associated with the achievement of goals.

3

4 **Table 1.** Analysis of independent variables and study outcome.

<b>Description</b>		<b>Crude analysis</b>		<b>Adjusted analysis</b>		
<b>Categorical independent variables</b>		<b>N (%)</b>	<b>PR (95%CI)</b>	<b>P</b>	<b>PR (95%CI)</b>	<b>P</b>
<i>Type of access</i>						
	Only spontaneous or mixed	364 (38.3)	1		1	
	Referral only	586 (61.7)	1.19 (1.13-1.25)	<0.001	1.16 (1.07-1.25)	<0.001
<i>Quotas of procedures per oral health team in PHC</i>						
	No	757 (81.2)	1		1	
	Yes	175 (18.8)	1.14 (1.08-1.21)	<0.001	1.08 (0.99-1.18)	0.064
<i>Monitoring of established goals</i>						
	No	65 (6.8)	1		1	
	Yes	885 (93.2)	1.37 (1.23-1.53)	<0.001	1.26 (1.00-1.58)	0.047
<i>Type of CEO</i>						
	Type I	372 (39.2)	1		1	
	Type II	446 (46.9)	1.04 (0.99-1.09)	0.166	0.96 (0.89-1.04)	0.344
	Type III	132 (13.9)	1.14 (1.06-1.22)	<0.001	0.92 (0.82-1.04)	0.180
<i>CEO scope</i>						
	Regional	300 (31.6)	1		1	
	Municipal	650 (68.4)	0.37 (0.21-0.65)	<0.001	0.90 (0.83-0.96)	0.003
<i>Planning and periodic evaluation of actions</i>						
	No	97 (10.2)	1		1	
	yes	853 (89.8)	1.19 (1.10-1.30)	<0.001	1.08 (0.93-1.25)	0.333
<b>Continuous independent variables</b>		<b>Mean (SD)</b>	<b>PR (95%CI)</b>	<b>P</b>	<b>PR (95%CI)</b>	<b>P</b>
<i>Sum of periodontics workload</i>		31.1 (23.9)	1.00 (1.00-1.00)	<0.001	1.001 (1.000-1.003)	0.049
<i>Number of dentists working in periodontics</i>		1.39 (0.81)	1.16 (1.13-1.19)	<0.001	1.11 (1.07-1.16)	<0.001
<b>Dependent Variable</b>		<b>Mean (SD)</b>				
	Number of months in which the goal was achieved in the periodontics specialty	7.03 (4.20)				

Legend: SD = Standard Deviation; CEO = Dental Specialty Centers; CI= Confidence Interval; PR = Prevalence Ratio; LR = Likelihood Ratio

5

## 6 Discussion

7 The findings of the present study demonstrate an association between the achievement of goals  
 8 in the specialty of Periodontics and factors that are proximal to the work process in Brazilian CEO.

1 To date, no publications have been identified with the same research object. Therefore, the  
2 information disclosed here and the problematization of the results contribute to the advancement of  
3 the construction of knowledge in the specific field of SOHC assessment in Brazil, having Periodontics  
4 as a guiding axis.

5 Different individual factors were identified, which are related to the number of months in  
6 which goals were met in Periodontics in Brazilian CEO. Therefore, the monitoring of the established  
7 goals, the CEO scope and the number of dentists working in the specialty suggest that issues intrinsic  
8 to the work process can contribute to a better performance of these establishments.

9 The monitoring of goals was significantly associated with the tendency to achieve them, since  
10 the monitoring and planning of the provided services are of the utmost importance to achieve good  
11 results in the quality indicators and standards (3). In terms of evaluation, this becomes relevant,  
12 considering that procedural issues inherent to the daily routine of the services can be used as support  
13 to guide the CEO team regarding the process of negotiating and contracting goals with managers, as  
14 well as defining priorities for improving the service quality based on the recognition of the achieved  
15 results, whether they are effective or in need of improvement regarding the intervention strategies  
16 (3).

17 As the establishments that are regional referrals were more successful in meeting the goals, it  
18 is plausible that, in these CEO, as they are located in referral municipalities in the health regions,  
19 there may be better infrastructure, organization of patient flow and demand, as well as of the Oral  
20 Health Care Network. These factors may contribute to better results in relation to the outcome, when  
21 compared to CEO of municipal scope.

22 With regard to human resources, the number of dentists who work in the specialty of  
23 periodontics in CEO showed to be an important factor for the achievement of goals. The results show  
24 that, on average, there is more than one periodontist per CEO, which may be an assumption for the  
25 high number of procedures performed in this specialty (8).



1           The data presented herein are relevant because, in addition to being unprecedented, they can  
2 be used as guidelines for the planning and implementation of specific actions in the field of  
3 Periodontics, considering that a large part of the Brazilian population depends on public health  
4 services, especially in secondary oral health care (9). In this context, this becomes even more  
5 important, as it is known that data related to the prevalence of periodontal disease in Brazil are  
6 unequal (10). This can be justified by the characteristics of the country, such as diversity in  
7 socioeconomic, demographic, environmental and behavioral factors originating from its large  
8 territorial extension (11), which can be impacted by the lack of a care protocol and standardized  
9 criteria for characterizing the disease (12) in the SUS.

10           Regardless of the discrepancy of results, in a study carried out using the Centers for Disease  
11 Control/American Academy of Periodontology (CDC/AAP) criteria, considering the limit of clinical  
12 attachment loss  $\geq 3$ mm, it is suggested that Brazil has a higher prevalence of major periodontal  
13 diseases than that found in more developed countries, ranging from 34.4% to 63.8% in individuals  
14 aged 35 or over (6).

15           Thus, it indicates a challenge for the PNSB in minimizing limitations, especially those related  
16 to the work process, so that access to quality and effective services in periodontics can be promoted,  
17 impacting the oral health of the population. In this sense, it is necessary to resume the planning of  
18 implementation actions aimed at individuals/communities in a situation of greater risk and  
19 vulnerability, which is already foreseen in the PNSB (1), but which, since 2016, with the  
20 implementation of the fiscal austerity policy, has been suffering cutbacks and devaluation at a national  
21 level.

22           This has become a critical issue, as it is known that, in a country as unequal as Brazil, there is  
23 still an association between socioeconomic variables and the achievement of goals in periodontics,  
24 where the size of the population and the Municipal Human Development Index (MHDI) are  
25 associated with the CEO performance (13,14), and there is a correlation between contextual and

1 socioeconomic factors, suggesting inequality in the need for periodontal treatment in the Brazilian  
2 elderly population (15).

3 In this study, the number of months in which the goal of procedures was reached in the  
4 specialty of periodontics was, on average, more than seven months. The growing trend of CEO that  
5 meet periodontics goals may be related to the investment in oral health actions from 2003 to 2014,  
6 when the PNSB provided conditions to expand the supply and the capacity of services provided by  
7 this specialty (16).

8 This study has some limitations. Despite the representativeness of the sample, these data  
9 should be generalized with caution, as the CEO participation in the PMAQ-CEO evaluation process  
10 was not mandatory, but voluntary. Secondary data obtained from national information systems with  
11 public and unrestricted access offer numerous advantages, such as broad population coverage and  
12 low cost for information collection. However, as these data are usually collected in routine health  
13 services without a *priori* research purposes, the absence of important information for the analyses of  
14 interest can represent significant disadvantages (17).

15 In turn, the quality of information from databases can be assessed in two dimensions:  
16 completeness and accuracy. Completeness refers to the extent to which data are missing from the  
17 perspective of the outlined research question. Missing data is unavoidable; however, it is often  
18 necessary to understand the extent to which important variables are missing and the possible reasons  
19 for their absence. Another important dimension is accuracy. Information from electronic system  
20 records, such as procedure codes or numeric values, can sometimes be recorded inaccurately (17).

21 From an investigative perspective, it is suggested that new studies be carried out, exploring  
22 the interface between the Periodontics actions implemented in the PNSB, PHC and the use of the  
23 service by the user. Therefore, studies using mixed methods are essential, which have the power to  
24 go beyond quantitative generalizations, further analyzing critical issues inherent to the complexity of  
25 the health-disease process in the context of the SUS.

26

## 1 **Conclusion**

2 It was concluded that the factors associated with the achievement of goals in periodontics in  
3 Brazilian CEO include the monitoring of established goals, the CEO scope and the number of dentists  
4 working in the specialty.

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