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# Variables associated with the performance of Centers for Dental Specialties in Brazil

## *Variáveis associadas ao desempenho de Centros de Especialidades Odontológicas no Brasil*

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**ABSTRACT:** The aim of this study was to evaluate the performance of the Centers for Dental Specialties (CDS) in the country and associations with sociodemographic indicators of the municipalities, structural variables of services and primary health care organization in the years 2004–2009. The study used secondary data from procedures performed in the CDS to the specialties of periodontics, endodontics, surgery and primary care. Bivariate analysis by  $\chi^2$  test was used to test the association between the dependent variable (performance of the CDS) with the independents. Then, Poisson regression analysis was performed. With regard to the overall achievement of targets, it was observed that the majority of CDS (69.25%) performance was considered poor/regular. The independent factors associated with poor/regular performance of CDS were: municipalities belonging to the Northeast, South and Southeast regions, with lower Human Development Index (HDI), lower population density, and reduced time to deployment. HDI and population density are important for the performance of the CDS in Brazil. Similarly, the peculiarities related to less populated areas as well as regional location and time of service implementation CDS should be taken into account in the planning of these services.

**Keywords:** Secondary Care. Oral Health. Specialties, Dental. Unified Health System. Employee Performance Appraisal. Health Services.

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**RESUMO:** O objetivo do presente estudo foi avaliar o desempenho dos Centros de Especialidades Odontológicas (CEOs) no País e associações com indicadores sociodemográficos dos municípios, variáveis estruturais dos serviços e de organização da atenção básica nos anos de 2004 a 2009. O estudo utilizou dados secundários dos procedimentos realizados nos CEOs para as especialidades de periodontia, endodontia, cirurgia e atenção básica. Análise bivariada pelo teste de  $\chi^2$  foi realizada para testar a associação entre a variável dependente (desempenho do CEO) e as independentes. Em seguida, realizou-se análise de regressão de Poisson. No que se refere ao cumprimento global das metas (CGM), observou-se que a maioria dos CEOs (69,25%) apresentou desempenho considerado ruim/regular. Os fatores independentes associados com o desempenho ruim/regular dos CEOs foram: municípios pertencentes às regiões Nordeste, Sul e Sudeste, com menor Índice de Desenvolvimento Humano (IDH), menor densidade demográfica e menor tempo de implantação. O IDH e a densidade demográfica são fatores importantes para o desempenho dos CEOs no Brasil. Da mesma forma, as peculiaridades referentes a territórios com menor densidade populacional, bem como a localização regional e o tempo de implantação dos CEOs, devem ser levadas em conta no planejamento desses serviços.

**Palavras-chave:** Atenção Secundária. Saúde Bucal. Especialidades Odontológicas. Sistema Único de Saúde. Avaliação de Desempenho. Serviços de Saúde.

## INTRODUCTION

A major breakthrough in the quest for universal access to oral health actions and services was the incorporation of oral health teams in the Family Health Strategy starting in 2000, which enabled the adoption of a more active stance of primary oral health care, representing a new scenario for expanding the supply of dental care in the country<sup>1,2</sup>.

Currently, the scope of comprehensiveness has been a major challenge for the Unified Health System (SUS), with the implementation of secondary care. The main strategy adopted for specialized dental care was the implementation of the Dental Specialty Centers (DSC)<sup>3</sup>. However, the work process needs to structure itself in full within these models, particularly with the deployment of the referral and counter-referral system.

Data from the Ambulatory Information System (SIA/SUS) from 2002 and 2003 revealed that only 3.5% of all dental procedures performed during this period in Brazil were specialties, showing the great disparity in the provision of basic and specialized dental procedures<sup>4</sup>.

Furthermore, the result of the National Oral Health Project (SB Brazil 2010) highlighted the need for the organization of levels of complexity in dental care, since the severity and precocity of tooth loss related to inequality of access to services were identified, as well as the existence of almost 56% of completely edentulous elderly<sup>5,6</sup>.

Such epidemiological data support the importance of DSC as a privileged strategy of the National Oral Health Policy to ensure secondary care and to increase the solvability of basic health care<sup>7</sup>.

DSCs are reference units for Primary Care and must be integrated into the local regional planning, including the possibility of being deployed and managed by Intercity Consortia. They should, at least, offer the specialties of periodontics, endodontics, and service to users with disabilities, oral diagnosis and minor oral surgery<sup>3</sup>.

Regarding physical-structural features, they can be classified into three types: Type I DSC (three dental chairs); Type II DSC (four to six dental chairs); and Type III DSC (more than seven dental chairs). DSCs must work 40 hours per week, and the number of professionals may vary depending on the type of DSC, as well as the monthly production goal due to the subgroup of procedures of the Ambulatory Information System of the Unified Health System (SIA/SUS)<sup>8</sup>.

Thus, the present study aimed to evaluate the performance of DSCs around the country and associations with socio-demographic indicators of the municipalities, structural variables of services and organization of primary care in the period between 2004 and 2009.

## METHODS

### TYPE OF STUDY

This is an analytical, cross-sectional study based on secondary data.

### DATA COLLECTION

Data from this study were collected from the database of the Information Technology Department of the Unified Health System (SUS-DATASUS)<sup>9</sup>, with information from the data of the Ambulatory Production of 2009. Through the tool TabWin<sup>10</sup>, all data were tabulated and exported to Excel, and then consolidated and grouped according to the subgroups of specialized dental procedures from the SIA/SUS Dental Procedures Table.

Information concerning the type of DSC was collected from the DATASUS – National Registry of Health (CNES) – Qualifications database<sup>11</sup>.

Population coverage by the Family Health and Oral Health Strategy in each municipality were obtained from the report on the evolution of the development and of the registry to such programs and strategies, and the population size and population density were obtained from the 2010 Census Report<sup>13</sup>. Through the United Nations Development Programme (UNDP), the Human Development Index of Municipalities (IDHM) was obtained<sup>14</sup>.

Through Excel, the association of the procedure production database with the databases of the National Brazilian Institute of Geography and Statistics (IBGE) and the Register of Health Service Establishments (CNES)/DATASUS, as well as reports from UNDP, was made.

## INCLUSION CRITERIA

All DSCs implemented in Brazil from 2004 to 2009, totaling 774 DSCs, spread over 704 municipalities in all regions of Brazil were considered. The dental specialties included in the study were primary care, periodontics, endodontics and surgery.

## VARIABLES ANALYZED

### Dependent variable (performance of the Dental Specialty Centers)

The performance evaluation of each DSC, considering the dental specialties included in the study, was constructed based on Ordinance No. 600/GM of March 23, 2006<sup>11</sup>, which defines the minimum monthly production of subgroups of procedures to be performed in DSCs, verified through the SUS Information Systems.

For performance evaluation, the average monthly number of procedures in one year, performed in each subgroup of specialties, and the number of procedures corresponding to the goal of this subgroup, with 4 performance categories being defined according to type (Type I, Type II and Type III according to Ordinance MS 599/2006)<sup>13</sup> and the referred subgroups (Chart 1) were considered.

### Independent variables

- Variables related to sociodemographic indicators of municipalities.
- Brazilian macroregions (North, Northeast, South, Southeast and Midwest), Municipal Human Development Index (dichotomized at the median in:  $\leq 0.77$  and  $> 0.77$ ) and population density (dichotomized at the median in:  $\leq 98.81$  and  $> 98.81$ ).
- Structural variables (Type of DSC – categorized as I, II and III) and Deployment time (dichotomized at the median:  $\leq 2$  years and  $> 2$  years).
- Variables according to the forms of organization of Primary Care: Percentage of coverage by the Family Health Strategy (dichotomized at the median in:  $\leq 67.10$  and  $> 67.10$ ), percentage of coverage of Oral Health Teams (dichotomized at the median in:  $\leq 42.76$  and  $> 42.76$ ).

## STATISTICAL ANALYSIS

A bivariate analysis was conducted by  $\chi^2$  test for the association between the dependent variable (performance of the DSC) and the independent variables. Then, the variables with  $p < 0.20$  in the bivariate analysis were tested in the Poisson regression model by stepwise regression. The prevalence ratio (PR) and corresponding 95% confidence intervals (95%CI) were estimated for the variables that remained in the multiple regression model at a 5% level. All statistical tests were performed using SAS 9.2 software, considering the level of statistical significance of 5%.

## RESULTS

The overall records of the Ministry of Health showed a predominance of Type II DSCs (455), representing 54% of DSCs, followed by type I (324) representing 38%, and type III (67), with a smaller representation, 8%.

Chart 1. Structural characteristics, monthly goal per subgroup of specialties according to the type of Dental Specialty Center and their performance categories.

Structure	DSC Type I	DSC Type II	DSC Type III
Equipment	3	4 or 6	7 or more
Human resources – Surgeon dentist (SD)	3 or more	4 or more	7 or more
Human resources – Dental assistant (DA)	1 per dental office	1 per dental office	1 per dental office
Dental Specialty Center Subgroup of procedures	Monthly goal		
	DSC Type I	DSC Type II	DSC Type III
Primary care	80	110	190
Periodontics	0	0	50
Endodontics	5	0	95
Minor oral surgery	0	0	70
Categories	DSC's Performance		
Poor	DSCs that did not meet any or met just one of the goals		
Regular	DSCs that did not meet two goals		
Good	DSCs that did not meet three goals		
Great	DSCs that did not meet all four goals		

Considering the Brazilian macroregions, 38.50% of DSCs were deployed in the Northeast, 36.56% in the Southeast, 12.79% in the South, 6.33% in the Midwest and 5.81% in the North. Municipalities where the DSCs were deployed had a quite heterogeneous population level, ranging from 4,629 inhabitants in small municipalities to 11,253,503 inhabitants in large municipalities.

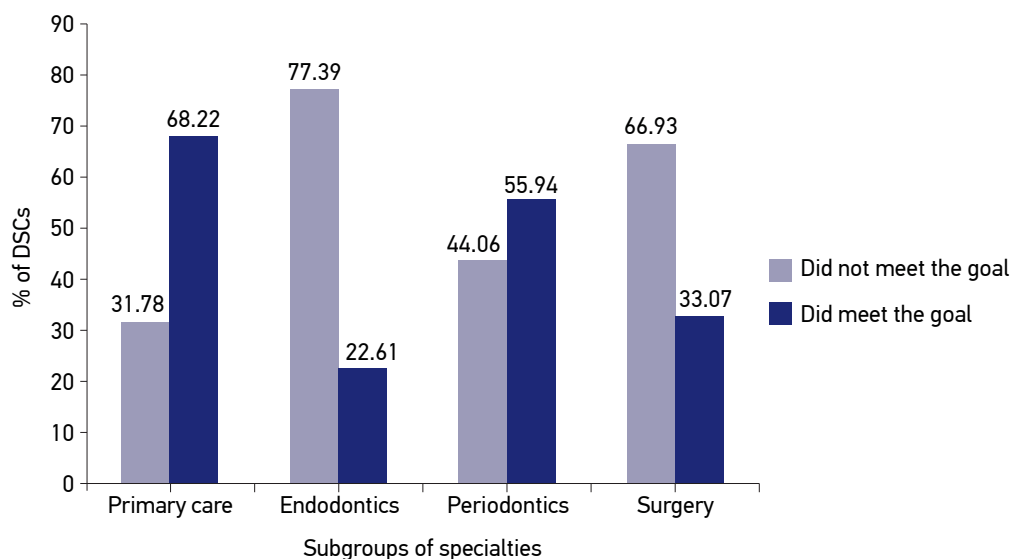
Of the 774 DSCs analyzed in the study, 193 (24.93%) were deployed in municipalities with less than 30 thousand inhabitants, 128 (16.53%) in municipalities with a population between 30 and 50 thousand inhabitants, 157 (20.28 %) in municipalities with a population between 50 and 100 thousand inhabitants, and 296 (38.24%) in municipalities with over 100 thousand inhabitants.

Regarding the distribution of the DSCs according to the population size of the municipalities, only 12% were deployed in the Brazilian capitals. Regarding the achievement of the goals, according to performance categories defined in this study, it was observed that 536 (69.25%) DSCs showed a poor/regular performance and 238 (30.75%) had good/great performance.

Figure 1 shows the achievement of goals according to the subgroup of specialized procedures (according to the table of the SIA/SUS). It is noteworthy that 68.22% of DSCs met the goals in primary care, followed by periodontics (55.94%), with smaller percentages for surgery (33.07%) and endodontics (22.61%).

Chart 1 shows the structural features, monthly targets by specialty subgroup according to type of DSC and their performance categories.

Table 1 shows the association between the DSC's performance (dependent variable) and the independent variables. It was found that region, Municipal Human Development



DSC: Dental Specialty Centers.

Figure 1. Achievement of goals of the Dental Specialty Centers, according to Decree nº600 of the Ministry of Health, 2006.

Table 1. Bivariate analysis by  $\chi^2$  test for the association between the dependent variable (performance of the Dental Specialty Center) and independent variables.

Variable	DSC's Performance				PR	95%CI	p-value
	Poor/regular		Good/great				
	n	%	n	%			
Region							
North	24	53.33	21	46.67	ref		
Northeast	244	81.88	54	18.12	1.54	1.16 – 2.03	< 0.0001
South	71	71.72	28	28.28	1.34	1.00 – 1.82	0.0245
Southeast	167	59.01	116	40.99	1.11	0.83 – 1.48	0.2896
Midwest	30	61.22	19	38.78	1.15	0.81 – 1.63	0.2863
Type of DSC							
Type 1	217	74.32	75	25.68	1.15	0.93 – 1.42	0.1050
Type 2	286	66.36	145	33.64	1.03	0.83 – 1.27	0.4684
Type 3	33	64.71	18	35.29	ref		
MHDI							
≤ 0.77	309	77.83	88	22.17	1.29	1.17 – 1.42	< 0.0001
> 0.77	227	60.37	149	39.63	ref		
Demographic density							
≤ 98.81	291	75.19	96	24.81	1.19	1.08 – 1.30	0.0002
> 98.81	245	63.31	142	36.69	ref		
FHS coverage							
≤ 67.10	244	63.05	143	36.95	ref		
> 67.10	292	75.45	95	24.55	1.20	1.08 – 1.31	< 0.0001
OHS coverage							
≤ 42.76	241	62.44	145	37.56	ref		
> 42.76	295	76.03	93	23.97	1.22	1.11 – 1.35	< 0.0001
Time of deployment of the DSC							
≤ 2 years	124	77.02	37	22.98	1.14	1.03 – 1.27	0.0106
> 2 years	412	67.21	201	32.79	ref		

PR: Prevalence Ratio; CI: Confidence Interval; MHDI: Municipal Human Development Index; FHS: Family Health Strategy; OHS: Oral Health Strategy; DSC: Dental Specialty Centers. The reference level of the dependent variable was the poor/regular category.



Index, population density, FHS and OHS coverage, and deployment time were significantly associated with the performance of the DSC.

According to the Poisson regression model (Table 2), the factors associated with the poor/regular performance of the DSC were: Northeast, South and Southeast regions,  $MHDI \leq 0.77$ , population density  $\leq 98.81$  and DSC deployment time  $\leq 2$  years. Thus, municipalities belonging to the Northeast (PR = 1.33), South (PR = 1.33) and Southeast regions (PR = 1.15) had a larger prevalence of DSCs with poor/regular performance than those located in the Northern region. Municipalities with  $MHDI \leq 0.77$  (PR = 1.09), with a population density lower than or equal to 98.81 (PR = 1.06) and DSC deployment time  $\leq 2$  years (PR = 1.09) had a greater prevalence of association with a poor/regular DSC performance.

Table 2. Poisson Regression for the performance of the Dental Specialty Centers.

Variable	DSC's Performance				Adjusted PR	95%CI	p-value
	Poor/regular		Good/great				
	n	%	n	%			
Region							
North	24	53.33	21	46.67	ref		
Northeast	244	81.88	54	18.12	1.33	1.17 – 1.52	< 0.0001
South	71	71.72	28	28.28	1.33	1.15 – 1.55	0.0002
Southeast	167	59.01	116	40.99	1.15	1.00 – 1.32	0.0435
Midwest	30	61.22	19	38.78	1.14	0.97 – 1.36	0.1168
MHDI							
≤ 0,77	309	77.83	88	22.17	1.09	1.00 – 1.18	0.0484
> 0,77	227	60.37	149	39.63	ref		
Demographic density							
≤ 98,81	291	75.19	96	24.81	1.06	1.00 – 1.13	0.0487
> 98,81	245	63.31	142	36.69	ref		
Time of deployment of the DSC							
≤ 2 years	124	77.02	37	22.98	1.09	1.02 – 1.17	0.0068
> 2 years	412	67.21	201	32.79	ref		

PR: Prevalence Ratio; CI: Confidence Interval; MHDI: Municipal Human Development Index; DSC: Dental Specialty Centers. The reference level of the dependent variable was the poor/regular category.

## DISCUSSION

Recently, in Brazil, public assistance programs in oral health were restricted to primary care, accumulating a great demand for skilled clinical care and jeopardizing the establishment of appropriate referral and counter-referral systems<sup>1</sup>.

Comprehensiveness in oral health, however, has stressed the models of health care for structuring the secondary and tertiary levels of care.

The interface between primary and secondary care should be efficient and effective, ensuring that referrals are appropriate, timely and have adequate screening mechanisms, ensuring counter-referral after the treatment is completed<sup>7</sup>.

Performance evaluation of secondary services in Brazil has therefore been timely in order to improve processes and actions, seeking to increase the performance of these services.

Considering all DSCs, the data from this study indicate that only 30.75% of them have a good/great performance, emphasizing that the best results were observed in the subgroup of primary care procedures as opposed to the others, especially endodontics and surgery.

By individually testing variables of OHS and FHS coverage in the bivariate analysis, the results showed that municipalities with greater coverage had higher prevalence of poor/regular DSCs (Table 1).

Population density was not a parameter set up for the implementation of DSCs. However, this research drew on the “population density” variable as a performance analysis factor, in which municipalities with lower population density and lower human development index had a higher prevalence of poor/regular performance in DSCs, which is consistent with the results obtained by Goes et al., in which the municipalities with the lowest HDI had the poorest performance<sup>15</sup>.

With respect to municipalities with low MHDI, it appears that, possibly, educational variables and/or variables related to income should interfere with the population’s accumulation of dental needs. Misinformation and, further, non-awareness of the importance of oral health for people with less education have an impact on oral health, as well as the general health of people. School plays an important role in building this perception of the importance of teeth for kids — building and reshaping directions — and, in an objective, normative form, in that it can (and should) be a privileged locus of information on access to oral health for children and youth, it should positively impact on the prevention of diseases and disorders. Professionals and technicians from oral health teams use the school space for preventive and promotional activities of oral health, teachers can be trained in health educational activities, and the dissemination of information in this environment is favored etc. Therefore, there is both an educational (due to lack of basic information on how to take care of teeth) and cultural impact (by not valuing this care) in the oral health of the population.

Consequently, the search for services occurs according to the values and perceptions of the needs of its users. This, in turn, interferes with their performance due to the misuse of its resources or the lack of opportunity to intervene in time, as, in many cases, users have come

late to the DSC, leaving no other therapeutic options other than extraction. So, the human development of a nation is also a determining factor in the construction of their needs.

This demonstrates the importance of taking into account such variables in the planning of secondary dental care in the country.

Regarding the geographical distribution of the DSCs, the Northeast region was covered with a large number of these Centers, since it presents unfavorable social indicators. The analysis of the records of the SIA/SUS procedures subgroups can be considered a limiting factor in the study of the performance of DSCs, since the data studied are only in the numbers of treatments completed, not allowing a breakdown of user profiles, morbidity, treatments initiated versus treatments completed and others.

The profiles of users and morbidities provide an essential tool for decision making, the main objective of the evaluative processes of health programs and services. Data from this study can serve as a basis for other studies and may be associated with other documentary sources, aiming at future studies on the use of oral health services and contributing to the discussion on the role of DSCs in the oral health care network, including the need to adapt the criteria and standards for the implementation and monitoring of these services, considering that, for all variables, the highest percentage of DSCs presented a poor/regular performance.

It is pointed out that further research is fundamental, especially those related to the use of specific clinical protocols, implementation and effectiveness of referral and counter-referral protocols and evaluation of quality of care and satisfaction of users.

## CONCLUSION

The contribution of Dental Specialty Center for the oral health of the population is undeniable, considering its comprehensiveness. Efforts in a macrostructural level for improving the HDI across the country are important for improving the performance of DSCs in Brazil.

Similarly, the peculiarities related to less populated areas, as well as the regional location and deployment time of DSCs, should be taken into account in the planning of these services in order to overcome challenges that may result from those variables.

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