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# Distribution of Dental Schools and dentists in Brazil: an overview of the labor market

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## ABSTRACT

Considering the expansion of the Dental Schools (DS) and the increase in the number of dentists in Brazil, this study aimed to describe the distribution of DS and dentists in Brazil, as well as to compare the proportion of number of inhabitants by dentist (NI/dentist) with the World Health Organization (WHO) indicators. Data on the amount of DS and dentists were obtained through the Federal Council of Dentistry (Conselho Federal de Odontologia/CFO). The number of habitants estimated for each site was investigated by Brazilian Institute of Geography and Statistics (Instituto Brasileiro de Geografia e Estatística/IBGE) data. The NI/dentist concentration was calculated to compare with the index recommended by the WHO. In order to analyze if the DS number is correlated to the dentists number and the NI/dentists, the Pearson correlation test was performed. We identified 220 DS, being mostly private (75%) and located in the Southeast (43.6%). The North region was the one that presented the least DS (10%). A total of 274,000 dentists were identified, mainly concentrated in the Southeast region (55.7%) followed by the South region (16.8%). Thus, Brazil presented twice more dentists than WHO recommends. Similar to this, all regions of Brazil have more dentists than recommended by WHO, and the Southeast presents approximately three folds more. A correlation of 0.98 was observed between dentist's number and DS number while a correlation of 0.44 was observed between NI/dentist. Therefore, the Brazilian dental labor market is saturated, with a much larger number of professionals than the one recommended by WHO. Still, there is a concentration of professionals in the most developed and rich regions of the country.

**Descriptors:** Job Market. Health Services Needs and Demand. Dental Schools.

## 1 INTRODUCTION

Dental education, especially in the last decades, has undergone several changes to adapt the egress profile to a new social context, current population needs and opportunities of the labor market<sup>1</sup>. Globally, a decrease in the prevalence of dental caries (still the main public dental problem) has been observed<sup>2</sup>. It is estimated that to treat all dental diseases would be necessary to spend approximately 5% of the Global Health Expenditure, meaning that treat dental diseases has a significant financial impact on the health systems and for the individuals. In Brazil, with the insertion of Dentistry in the Family Health Program in 2000, changes in the dental curriculum were carried out to promote the articulation of the Universities with the Unified Health System (SUS)<sup>3</sup>.

Data from the 2010 National Oral Health Survey (SB-Brasil 2010) already showed a decrease in caries occurrence, mainly due to the increase in the fluoridation of public water supply and the presence of fluoride in toothpastes<sup>4</sup>. Besides, there is a polarization of the disease, which today is mainly concentrated in socioeconomically disadvantaged populations and deprived of public health policies<sup>5</sup>. In this context, the formation of professionals with a curative profile is no longer the main focus of the Dental Schools that started to encourage changes in the dentists' profile, which should work in the health-disease process, with the knowledge to identify the risk factors in populations and have a practice towards preventive dentistry<sup>6</sup>.

In 2002, the National Curricular Guidelines for the Undergraduate Course in Dentistry were established in Brazil, seeking to consolidate the training of professionals capable of acting in individual and collective health, working together with other health

professionals, with social sensitivity, capacity to make decisions, plan and administer community health services, in order to bring the student closer to practical activities and make SUS as a new job market<sup>7</sup>. This policy was concomitant with the expansion of public dental services, both in primary and specialized care. This increase was mainly due to the National Oral Health Policy, known as Brazil Smiling (Brasil Sorridente), which in ten years increased by 445% the offering of dental services to the population<sup>8</sup>. In fact, such approach has changed the Dentistry work market, which previously had almost exclusively the private service as an option, and the National Health systems emerged as a new possibility for dentists.

Besides the expansion of dentistry within SUS, the last two decades were marked by a broad expansion of the Brazilian Universities. However, few studies have evaluated this expansion, especially in recent years. In 2009, there were already 189 Dental Courses in Brazil, concentrated mainly in the Southeast and South<sup>9</sup>. This concentration of dental courses may also influence the concentration of dentist in these locations, while several regions of Brazil lack these professionals. According to the World Health Organization (WHO), the ratio of one dentist per 1,500 inhabitants would be considered sufficient to meet local population demands<sup>10</sup>. In this way, the understanding of how Dental Schools and dentists are distributed in the country could be a valuable indicator for both educational and professional planning.

Thus, the objective of the present study was to describe the distribution of Dentistry Courses and dentists in Brazil, in the states, capitals, and countryside, as well as to compare the population density per dentist with the WHO indicators.

## 2 METHODS

The cross-sectional descriptive study was performed using secondary data from the Federal Council of Dentistry (Conselho Federal de Odontologia/CFO) and the Brazilian Institute of Geography and Statistics (Instituto Brasileiro de Geografia e Estatística/IBGE). Data collection was carried out from May to June 2016.

Data collection was conducted at CFO website (<http://cfo.org.br/servicos-e-consultas/dados-estatisticos>) consulting the number of dentists registered in each state and its capital, the quantity and distribution of the DS.

The number of inhabitants (NI) estimated for each location was investigated in the IBGE websites. Initially, the consultation was carried out at IBGE states (<http://ibge.gov.br/estadosat/>), to consult the total population of each state. Subsequently, a search was made on the website of the IBGE cities (<http://cidades.ibge.gov.br>), consulting the estimated population of the capitals. The number of inhabitants estimated for the countryside of each state was obtained by subtracting the total number of inhabitants of the state with the population estimated for the capital.

After obtaining these data, the proportion of inhabitants and dentists (NI/dentist) was calculated for each state and region of Brazil, as well as for all the capitals and the countryside of the states. The NI/dentist ratio was compared to those recommended by the WHO. In addition, to analyze if the number of DS is correlated to the number of dentists and the NI/dentist, the Pearson Correlation test was performed.

The data were tabulated using the software Microsoft Excel 2013 (USA, Microsoft ©) where they were analyzed descriptively. Also, Stata software version 12.0 (USA, College Station) was used to calculate

Pearson's correlation. A value of  $p < 0.05$  was considered significant.

## 3 RESULTS

Table 1 presents the results of the Dentistry Courses distributed by the states and regions, separated between public and private courses. A total of 220 DS were identified in Brazil at the time of data collection, and it was possible to observe that they are mostly private institutions (75%). The courses were more prevalent in the Southeast region, where we observed 96 institutions (43.6%), being 21 public and 75 private. In addition, the South region was the second with the highest number of courses, 40 (18.2%) in total. On the other hand, the North region was the one that presented less DS, with only 10% of the Brazilian amount.

The search for the number of dentists registered in the CFO resulted in about 274,000 registered dentists in Brazil (table 2). In a similar way to the distribution of Schools, the dentists are mainly concentrated in the Southeast region (55.7%) followed by the South region (16.8%). The North and Central-West regions had the lower number of dentists, approximately 5.2%, and 6.46%, respectively.

When we related the population of each region to the dentist's number, we observed a great difference between the regions: the Northeast region presented the highest NI/dentist ratio followed by the North region. On the other hand, the Southeast and South regions had the lowest relationships, about one dentist for every 561 and 562 inhabitants, respectively. When comparing these results with those recommended by the WHO, we observed that all Brazilian regions had more dentists than recommended, and the Southeast region has approximately three times more dentists than the recommendation. In total, Brazil presented one

dentist for 735 inhabitants, two times more than the WHO recommendation.

Table 1. Dental Schools distributed by Brazilian States and regions

State/Region	Federal	State	Municipal	Private	Total
Tocantins	-	-	1	4	5
Pará	1	-	-	2	3
Roraima	-	-	-	1	1
Rondônia	-	-	-	3	3
Amazonas	1	1	-	5	7
Acre	-	-	-	1	1
Amapá	-	-	-	2	2
<b>North</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>18</b>	<b>22</b>
Bahia	1	2	-	8	11
Pernambuco	1	1	-	5	7
Ceará	1	-	-	3	4
Paraíba	2	1	-	2	5
Maranhão	1	-	-	3	4
Rio Grande do Norte	1	1	-	1	3
Alagoas	1	-	-	2	3
Piauí	1	1	-	2	4
Sergipe	1	-	-	1	2
<b>Northeast</b>	<b>10</b>	<b>6</b>	<b>-</b>	<b>27</b>	<b>43</b>
Mato Grosso do Sul	1	-	-	2	3
Mato Grosso	-	-	-	5	5
Goiás	1	-	-	4	5
Distrito Federal	1	-	-	5	6
<b>Central-West</b>	<b>3</b>	<b>-</b>	<b>-</b>	<b>16</b>	<b>19</b>
São Paulo	-	6	5	36	47
Rio de Janeiro	2	1	-	17	20
Minas Gerais	5	1	-	19	25
Espírito Santo	1	-	-	3	4
<b>Southeast</b>	<b>8</b>	<b>8</b>	<b>5</b>	<b>75</b>	<b>96</b>
Santa Catarina	1	-	2	8	11
Rio Grande do Sul	3	-	-	11	14
Paraná	1	4	-	10	15
<b>South</b>	<b>5</b>	<b>4</b>	<b>2</b>	<b>29</b>	<b>40</b>
<b>Brazil</b>	<b>28</b>	<b>19</b>	<b>8</b>	<b>165</b>	<b>220</b>

Data until 02/26/2015

Table 2. Population, number of dentists and inhabitant/dentist proportion by Brazilian regions

Region	Population	Number of dentists	Inhabitants/dentist
Southeast	85.745.520	152.823	561
South	29.230.180	46.203	632
Central-West	12.527.402	17.728	706
North	17.472.636	14.315	1.220
Northeast	56.560.081	43.159	1.310
<b>Total</b>	<b>201.535.819</b>	<b>274.228</b>	<b>735</b>

In table 3 it is possible to observe the relation of NI/dentist in the capitals and the countryside of the Brazilian states. In all the capitals we observed a high dentist concentration, with the city of Macapá having the highest ratio (one dentist for 852 inhabitants) and the city of Vitória the smallest (one dentist for 196 inhabitants). On the other hand, while the Brazilian capitals have a concentration of dentists higher than that recommended by the WHO, the interior of the Brazilian states in the North and Northeast regions showed a deficit of dentists, except for Tocantins and Rondônia. Additionally, in the interior of the South, Southeast and Central-West regions an excessive number of dentists were also observed.

The Pearson's correlation test showed that the number of dentists and the number of Schools had a high correlation (0.98), which was significant ( $p < 0.001$ ) (graph 1). Meanwhile, the NI/dentist and number of DS presented a low correlation (0.44), although they presented a statistical association ( $p = 0.020$ ).

#### 4 DISCUSSION

This study observed a large number of DS distributed throughout the country, which is also reflecting in the large number of dentists present in Brazil, more than two times that recommended by the World Health

Organization. Considering this fact and the distribution of dentists in the entire country we can estimate that there is an overpopulated dental work market, especially in the capital of the Brazilian states and in the countryside of the majority of the states, whereas only the interior of the North and Northeast region present deficit of professionals<sup>11</sup>.

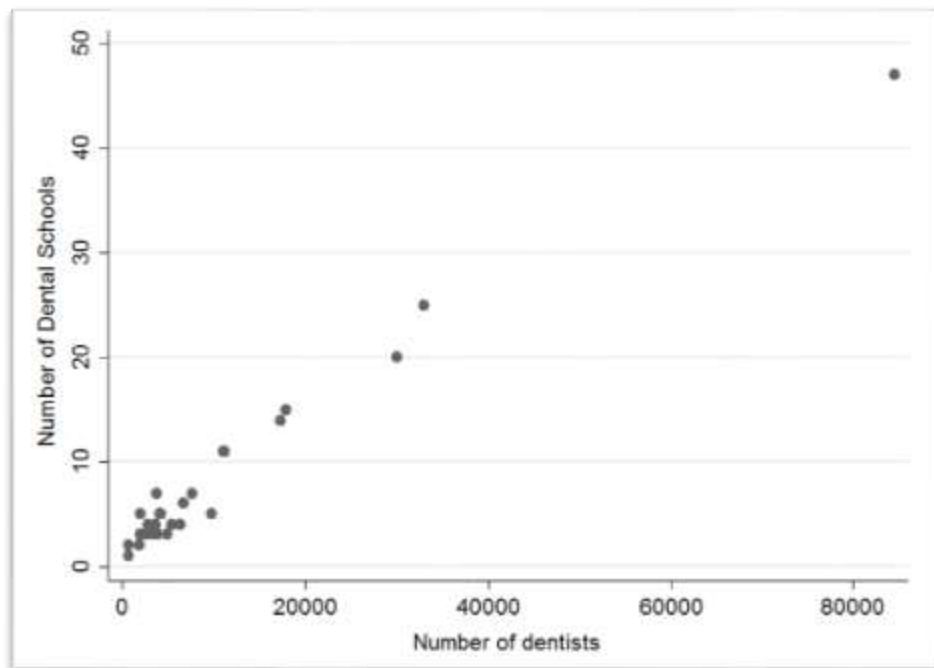
The expansion of both the number of Dental Schools and the number of new professionals has contributed to this saturation of the market. A study carried out in 1983 showed that even at that time the Ministry of Education had recommended the prohibition of new courses and the expansion of vacancies in order to slow down the saturation of the work market<sup>12</sup>. In the 1980s there were 66 dental schools, forming about 5,200 dentists/year. In the 2010s, more than 200 courses formed more than 12 thousand dentists annually<sup>9</sup>. The opening of new Dental Schools was already discussed in the National Oral Health Conferences (1986, 1993) and by the Brazilian Association of Dental Education (Associação Brasileira de Ensino Odontológico/ABENO). In all situations, there was a concern with the need and the quality of Dental Education. Considering that the quality is related to the Dental School's educational model, there is a constant need for supervision regarding curricular planning and infrastructure of the institutions<sup>13</sup>.

Table 3. Population, number of dentists and inhabitant/dentist proportion by Brazilian States, Capital and Interior

Region/State		State			Capital			Interior		
		Population	Dentists	Inhab/D	Population	Dentists	Inhab/D	Population	Dentists	Inhab/D
North	Tocantins	1.515,126	1.916	790	272,726	568	480	1.242,400	1,348	921
	Pará	8.175,113	4.847	1686	1.439,561	2,711	531	6.735,552	2,136	3,153*
	Roraima	505,665	616	820	320,714	568	564	184,951	48	3,853*
	Rondônia	1.768,204	2,000	884	502,748	787	638	1.265,456	1,213	1043
	Amazonas	3.938,336	3,672	1072	2.057,711	3,194	644	1.880,625	477	3,942*
	Acre	803,513	649	1238	370,550	454	816	432,963	195	2,220*
	Amapá	766,679	615	1246	456,171	535	852	310,508	80	3,881*
Northeast	Bahia	15.203,934	11,178	1360	2.921,087	5,008	583	12.282,847	6,170	1,990*
	Pernambuco	9.345,173	7,601	1229	1.617,183	3,910	413	7.727,990	3,691	2,093*
	Ceará	8.904,459	6,292	1415	2.591,188	4,182	619	6.313,271	2,110	2,992*
	Paraíba	3.972,202	4,047	981	791,438	2,073	381	3.180,764	1,974	1,611*
	Maranhão	6.904,241	3,633	1900	1.073,893	1,969	545	5.830,348	1,664	3,503*
	Rio Grande do Norte	3.442,175	3,489	986	869,954	2,185	398	2.572,221	1,304	1,972*
	Alagoas	3.340,932	2,708	1233	1.013,773	2,104	481	2.327,159	604	3,852*
	Piauí	3.204,028	2,751	1164	844,245	1,838	459	2.359,783	903	2,613*
	Sergipe	2.242,937	1,866	1202	632,744	1,618	391	1.610,193	248	6,492*
Central-West	Mato Grosso do Sul	2.651,235	3,819	694	853,622	1,763	484	1.797,613	2,056	874
	Mato Grosso	3.265,486	4,231	771	580,489	1,531	379	2.684,997	2,700	994
	Goiás	6.610,681	9,678	683	1.430,697	4,575	312	5.179,984	5,103	1015
Southwest	São Paulo	44.396,484	84,518	525	11.967,825	29,930	399	32.428,659	53,588	605
	Rio de Janeiro	16.550,024	30,051	550	6.476,631	15,735	411	10.073,393	14,316	703
	Minas Gerais	20.869,101	32,909	634	2.502,557	8,026	311	18.366,544	24,883	738
	Espírito Santo	3.929,911	5,345	735	355,875	1,807	196	3.574,036	3,538	1,010
South	Santa Catarina	6.819,190	11,050	617	469,690	1,962	239	6.349,500	9,088	698
	Rio Grande do Sul	11.247,972	17,299	650	1.476,867	4,817	306	9.771,105	12,482	782
	Paraná	11.163,018	17,854	625	1.879,355	6,039	311	9.283,663	11,815	785

D:Dentist; Inhab: inhabitant; \* Inab/D greater than recommended by WHO

Graph 1. Correlation between the number of Dental Schools and the number of dentists in each state



In the South and Southeast regions, where the number of Dentistry courses was higher, dentist concentration was also elevated. This suggests that the dentists graduated in these regions are opting to remain in the region of formation and they are not moving to regions where there would be a higher need for professionals. Likewise, it was possible to show a high correlation (0.98) between the number of DS and the dentists present in each state, possibly due to the permanence of this professional in the place where they were graduated. In addition, there was no such strong correlation between the NI/dentist, suggesting that the population factor was not the main reason for dentist distribution, which tended to choose to remain in areas with universities and teaching institutions. This may be a reflection of the high number of dentists with specialization courses in Brazil<sup>9,14</sup>, evidencing that these professionals tend to pursue a continuing education after graduation, and end up staying in these regions where there is the

higher availability of continuum education courses (master/ Ph.D. programs or specialization courses). This contrasts with the lack of dentist only in the interior of the Northeast and North regions, which had the lowest number of Dental Schools.

Observing such data makes clear that there is no need to open new Dental Schools in Brazil and the dentists should be directed to the regions where they are needed, perhaps through public policies that stimulate the dentists to move to these regions. Also, considering the current configuration of the dental work market, it would be highly recommended that the Professional Organizations, the Ministry of Education and the lawmakers reconsider the requirements to open new dental schools and to indicate the reduction of vacancies in the regions where the market is overpopulated. For example, only the state of São Paulo has more courses than the whole of the northeast or south, as well as twice as many courses than northern region. Similarly, the



southern region has twofold more courses than Central-West and almost twofold than North. We should be taking in consideration that Brazil has reduced the population grew significantly in the last decades, and the growth of dentists has happened in a higher speed, and this represents a strong concern for the profession future.

It should also be highlighted that with the decrease in oral diseases (especially caries) and because of the competitive market, there is a crescent trend in Brazilian dentistry to look for new areas of professional activities such as Hospital Dentistry or dentistry for special needs individuals. However, in recent years there is a significant advance of the so-called “cosmetic dentistry” with a focus much more oriented to aesthetic appearance than related to health. Even though esthetics being important and having an impact on the individuals’ quality of life<sup>15</sup>, the cosmetic dentistry may rely more on procedures that are only related to the improvement of appearance rather than in the individual oral health. Also, in a competitive market, with a decreasing number of patients for each dentist, professionals could start to carry out dental procedures that are not required, such as replacement of acceptable restorations<sup>16-18</sup>, in order to have a financial return.

With the crescent number of new dental schools and with the increased number of professionals formed, the dental market has undergone greater transformations. In recent years, private plans for dentistry have appeared to provide dental care to those not willing to use public service or for those without conditions to attend the private practice. Also, popular dental clinics (pop clinics) have been installed, especially in bigger cities which provide dental treatment with lower cost, employing a group of dentists that will have a reduced financial return for their work. Moreover, the great change that occurred in Brazilian dental market was the

inclusion - in 2004 - of oral health policy (Brasil Sorridente) in the Brazilian Unified System<sup>8</sup>. Since then, the public sector has also become a considerable option for dentists. The number of dentists working in the public service increased approximately 50% (about 65,560 professionals in 2010), turning it the biggest employer for the dentists<sup>8</sup>. This service currently serves 5,034 of the 5,570 Brazilian municipalities and contains more than 24,000 Oral Health Teams throughout the country. It was estimated that about 24% of the dentists in Brazil have some link with the SUS, in partial or full time.

This is a reflection of these new public policies that expanded the market in basic and specialized care, with the implementation of the Dental Specialties Centers (DSC)<sup>19</sup>. The DSC offer medium complexity care to the population assisted by the SUS<sup>19,20</sup>. In this way, specialized professionals have also found their space within the SUS. Noteworthy, Brazil is one of the few countries in the world to offer free dental care, not only for essential services but also for complex treatments, and such approach could also be one of the reasons for the improvement of oral health observed in the last few years<sup>8</sup>.

However, to distribute the Oral Health Teams, the Ministry of Health uses an average of 3,000 inhabitants per dentist, twice the number of inhabitants that the WHO recommends. It is important to highlight that these indicators, although widely used to assess the need and demand for dentists, do not consider some important factors for dentist distribution planning, such as oral health conditions, economic conditions, cultural aspects, and environmental and sanitation conditions<sup>21</sup>. Thus, considering the WHO indicator, which is the most used and considers a lower proportion of NI /dentist than the other indicators, we observed that the Brazilian dentist work market is saturated and the situation tend to be more challenging in

the future. As a comparison, the USA with similar territory and 50% more inhabitants than Brazil has less DS ( $n=65$ )<sup>22,23</sup>. Currently, Brazil has nearly 20% of the dentists in the world<sup>24</sup>. Still, the disproportionality of dentists among the different locations surveyed indicates a need for redistribution of dental services to the inland, in addition to the evaluation of the number of professionals being constantly trained.

Considering all the above reported, it should be expected that the regulation organs, the dental associations, the Government and the society could start to discuss solutions for a situation (dental work market) that is currently very challenging but could be worse in the next future.

## 5 CONCLUSION

In conclusion, Brazilian dental work market is saturated, with a much larger number of professionals than recommended by the World Health Organization. Most of the regions in the countries have a sufficient number of dentists and strategies should be carried out to promote the dentists to be in regions of higher needs. Also, there is a need for discussion and solutions that could help to improve the current situation in the future.

## RESUMO

### **Distribuição dos cursos de Odontologia e de cirurgiões-dentistas no Brasil: uma visão do mercado de trabalho**

Tendo em vista a expansão dos cursos de Odontologia (CO) e o aumento do número de cirurgiões-dentistas (CD) no Brasil, o objetivo do presente estudo foi descrever a distribuição dos CO e dos CD nas diferentes regiões do Brasil. Além disso, foi comparada a proporção do número de habitantes/dentista (NH/CD) com os indicadores da Organização Mundial da Saúde (OMS). Dados relativos à quantidade de CO e CD foram obtidos do Conselho Federal de Odontologia (CFO). O número de habitantes estimado para cada local foi investigado pelos

dados do Instituto Brasileiro de Geografia e Estatística (IBGE). Foram calculadas as concentrações NH/CD para comparação com o índice recomendado pela OMS. Todos os dados foram coletados entre maio e junho de 2016. Para analisar se o número de CO está correlacionado ao número de CD e NH/CD, foi realizado o teste de Correlação de Pearson. Foram identificados 220 cursos, sendo majoritariamente privados (75%) e localizados no Sudeste (43,6%). A região Norte foi a que menos apresentou CO (10%) e o menor número de CD. Foram identificados 274 mil CD registrados, concentrados principalmente na região Sudeste (55,7%), seguida pela região Sul (16,8%). Todas as regiões brasileiras apresentam menor razão de NH/CD que o recomendado pela OMS, indicando que há mais dentistas que o necessário na maior parte do país. Uma correlação positiva (0,98) foi observada entre o número de CO e o número de CD, enquanto uma correlação de 0,44 foi observada entre o NH/CD. Assim, o mercado de trabalho odontológico brasileiro mostra-se saturado e altamente competitivo, com um número muito maior de profissionais por habitante que o recomendado pela OMS. Ainda, existe concentração de profissionais nas regiões mais desenvolvidas e ricas do país.

**Descritores:** Mercado de Trabalho. Necessidades e Demandas de Serviços de Saúde. Escolas de Odontologia.

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