

Distribution of dental schools in Brazil, 2015

Emílio Prado da Fonseca, Carla Martins Rocha¹, Estie Kruger², Marc Tennant²,
Fábio Luiz Mialhe, Marcelo de Castro Meneghim

Department of Social Dentistry, Piracicaba Dental School FOP/UNICAMP, Brazil, ¹International Research Collaborative - Oral Health Equity, University of Western Australia, ²School of Anatomy, Physiology and Human Biology, University of Western Australia, Australia

Address for correspondence:

Dr. Emílio Prado da Fonseca,
Piracicaba Dental School, Unicamp,
Avenue Limeira, 901, 13414-903
Piracicaba, São Paulo, Brazil.
E-mail: emiliopraddo@ig.com.br

ABSTRACT

Introduction: The geographical distribution of dentistry schools has been the object of study in Brazil and in other parts of the world. **Aim:** To analyze the distribution of dentistry schools in Brazil by states and to correlate with the number of dentists in 2015. **Methods:** This is a cross-sectional study. The analysis of the courses distribution was carried out by states and categorized by public or private schools. All the institutions' addresses were geocoded and mapped to illustrate the spatial distribution of dental courses. To determine the association between the number of faculties by state and the number of dentists, the Spearman correlation test was applied with the level of decision ($\alpha = 0.05$) for correlating the variables. **Results:** The distribution of schools and dentists were irregular. In 2015, there were 232 dental courses in operation; being 56 (24%) public and 176 (76%) private in Brazil, and all 26 states and the Federal District have dental courses. The Spearman test showed a strong positive correlation between the number of dental schools and the number of dentists. **Conclusion:** The distribution of dental schools has reflexes in the distribution of health professionals.

Key words

Dental education, dental schools, dentistry, spatial distribution

INTRODUCTION

The dentistry, along with the medicine and nursing, constitutes the basic nucleus of professionals of higher level of health in Brazil.^[1-4] Despite the WHO dentist to population rate recommendation, there is no consensus regarding the ideal number of dentist per capita and workforce geographic distribution plays a fundamental role in access to dental services.^[4-7] The geographical distribution of schools offering tertiary courses in health sector, especially dentistry course has been the object of study in Brazil and in other parts of the world.^[8-13] A trend toward an increase in the number of courses in dentistry, especially in private schools, was shown across Brazilian.^[1,3,8,14] In 1991, there were 83 dental courses in operation and this number rose to 219 courses in 2013.^[15]

However, inequality in the geographical distribution of schools and dentists is evident. In addition, the number of trained dental surgeons does not seem to translate into effectiveness of the health system, given a large number of dental schools in Brazil and the extremely poor oral health condition of the population, reported lack of access to dental services.^[1,6,7,11,16,17] In 2013, a study showed that in Brazil, 16 million people or 11% of the population over the age of 18 years had lost all their teeth and 44.4% (89.1 million people) had visited a dentist in the past 12 months before the research.^[18] The context of inequality in the distribution of dental schools may reflect the distribution of dentists and staff shortages of qualified health care, especially in remote areas, small municipalities and urban outskirts with

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difficult access.^[5,11,19-21] The Brazilian health system, known as the Unified Health System (SUS) follows the universal health coverage model.^[22,23] Consequently, the access to oral health services is offered by the government to all Brazilian citizens without extra (out-of-pocket) costs.^[6,7,23] In Brazil, the dentistry course is offered by public and private educational institutions.^[14,15] In public institutions, the student does not pay any course fees, whereas in private schools, the students pay a monthly fee or uses a model of university fees financing offered by the government or directly in institution.^[14,15] The entry requirements for dental students vary between institutions, but the selection process usually consists of an entry test.^[14,15] The adequacy of the dental workforce dental may be insufficient, given that there are unmet needs of oral health in low-income populations, gaps in services coverage, and the geographic barriers.^[11,19] Currently, in Brazil, it is not clear whether there is a balance in the geographical distribution of dentistry schools and if it is reflected on dentists' distribution.^[5] The aim of this study is to analyze the distribution of dentistry schools in Brazil by states and to correlate with the number of dentists in 2015.

METHODS

This is a cross-sectional study using free access data sources; therefore, it was not submitted to the Ethics Committee. The methodology was based on previous studies that have investigated the distribution of dental schools in India, Chile, and EUA.^[11,19,20] The complete list of dental schools in Brazil was obtained from the Ministry of Education and Culture (MEC) website^[24] and the National Institute of Studies and Educational Research Anísio Teixeira and cross-checked with the list provided by the Federal Council of Dentistry (CFO) between June and July 2015.^[15,24-26] Then, the data were compared to the data of official websites of educational institutions that offer the dentistry course. Data on the distribution of dentists per state was obtained through the CFO website on the same period.^[26] In Brazil, it is a mandatory requirement for all dentists to be registered in the Regional Dental Council of the state in which he works.^[26] Collecting the data in the same period of time from all websites is important because both the list of faculties and the list of dentists available in the databases can suffer updates at any time. In addition, it was adopted as a criterion the number of courses offered and not the number of institutions that offer the dentistry course. This standardization is important because in Brazil an educational institution (public or private) can offer more than one course of dentistry. However, as the data were obtained from different databases consistency issues can arise, and we strive to minimize this problem with a cross-checking between the databases. The analysis of the courses distribution was done by states and categorized by public or private schools. A digital cartographic base of Brazil by the Brazilian Institute of

Geography and Statistics was used.^[27] All the institutions' addresses were geocoded, and the maps of the spatial distribution of dental courses were developed in TerraView computer software® (Version 4.2.2).^[28] Microsoft Excel 2007 was used to tabulate and for descriptive analysis. BioEstat® (version 5.3) software was used to check if the data was a normal distribution through Shapiro-Wilk statistical test with $P = 0.05$ and data did not show a normal distribution.^[29] Then to determine the association between the number of faculties by state and the number of dentists, the Spearman correlation test was applied with level of decision ($\alpha = 0.05$).^[29] The correlation between the variables: Number of schools and the number of dentists, number of public schools and the number of dentists, number of private colleges and the number of dentists, number of faculties and the population, and the number of dentists and the population were analyzed.^[11]

RESULTS

All dentistry courses registered in the MEC and the CFO were located and georeferenced. The distribution of the dental courses was uneven across regions and states [Figure 1].

In 2015, there were 232 dental courses in operation, being 56 (24%) public and 176 (76%) private in Brazil. All 26 states and the Federal District have dental courses. However, in four states of the North region (Acre, Amapá, Rondônia, and Roraima) and in one state in the Midwest region (Mato Grosso) there are no dental courses offered by public institutions. The states of Acre and Roraima have only one dental course each, and they are offered by private institutions. The state of São Paulo has 48 (21%) of the courses of dentistry in the country, being seven offered by public institutions and 41 by private [Table 1].

The dentists' distribution was also irregular and concentrated in regions and states of the Southeast and South regions with better social and economic indicators. The most densely populated states are those with the highest school numbers, and the relationship between the numbers of dentist/population was considered low. The national rate was one dentist for 745 inhabitants. All the states of the South, Southeast, and the Federal District showed a low dentist to population rate. However, the states of Maranhão (Northeast region) and Pará (North region) showed high dentist/population ratios, with 1:2.050 and 1:1.763 inhabitants per dentist, respectively. In 9 (33%) of the states studied, the rate was lower than the national rate [Table 1]. The regions with the highest concentration of courses were the Southeast with 94 courses (40%) and the Northeast with 51 (21%) courses, respectively. The Midwest region has 19 (8%) courses and represents the area with the smallest number of dental schools. The biggest difference between the number of public and private schools was observed

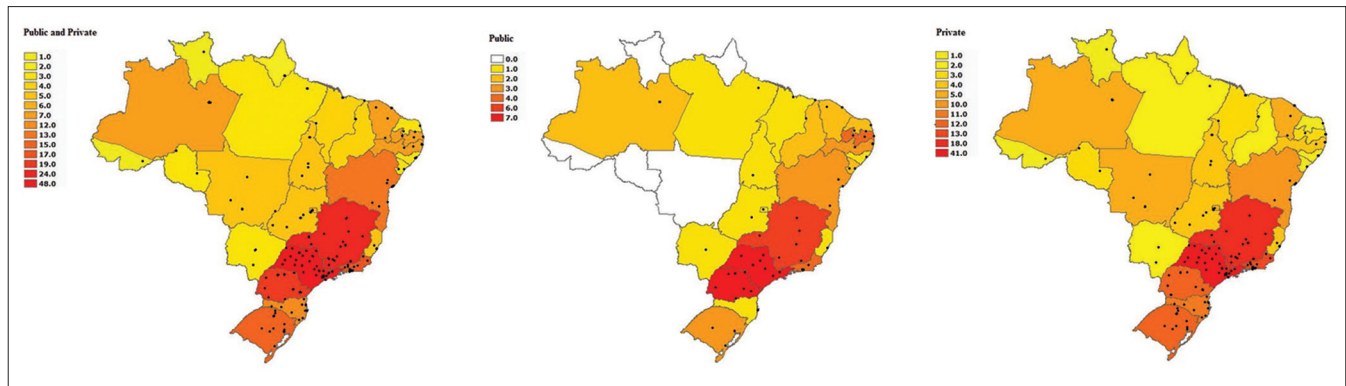


Figure 1: Geographic distribution of public and private dentistry courses among Brazilian states, 2015

Table 1: Comparison of dental schools and dentists distribution among states, Brazil, in 2015

State	Region	Schools (%)	Public	Private	Dentists	Population*	Rate**
DF	Midwest	6 (2.5)	1	5	6650	2,852,372	429
GO	Midwest	5 (2.1)	1	4	9196	6,523,222	709
MS	Midwest	3 (1.2)	1	2	3704	2,619,657	707
MT	Midwest	5 (2.1)	0	5	3967	3,224,357	813
AC	North	1 (0.4)	0	1	597	790,101	1323
AM	North	7 (3.0)	2	5	3375	3,873,743	1148
AP	North	2 (0.8)	0	2	535	750,912	1404
PA	North	3 (1.2)	1	2	4580	8,037,924	1763
RO	North	3 (1.2)	0	3	1860	1,748,531	940
RR	North	1 (0.4)	0	1	573	496,936	867
TO	North	5 (2.1)	1	4	1823	1,496,880	821
AL	Northeast	3 (1.2)	1	2	2589	3,321,730	1283
BA	Northeast	13 (5.6)	3	10	10,609	15,126,371	1426
CE	Northeast	7 (3.0)	2	5	5968	8,842,791	1482
MA	Northeast	4 (1.7)	1	3	3342	6,850,884	2050
PB	Northeast	7 (3.0)	4	3	3882	3,943,885	1016
PE	Northeast	7 (3.0)	3	4	7182	9,277,727	1292
PI	Northeast	4 (1.7)	2	2	2.544	3,194,718	1256
RN	Northeast	3 (1.2)	2	1	3.310	3,408,510	1030
SE	Northeast	3 (1.2)	2	1	1778	2,219,574	1248
PR	South	19 (8.1)	7	12	17,217	11,081,692	644
RS	South	15 (6.4)	3	12	16,688	11,207,274	672
SC	South	12 (5.1)	1	11	10,559	6,727,148	637
ES	Southeast	5 (2.1)	1	4	5159	3,885,049	753
MG	Southeast	24 (10.3)	6	18	32,033	20,734,097	647
RJ	Southeast	17 (7.3)	4	13	29,846	16,461,173	551
SP	Southeast	48 (20.6)	7	41	82,524	44,035,304	534
Total	-	232 (100)	56	176	272,090	202,768,562	745

*2014 population estimated by Brazilian Institute of Geography and Statistics,**State population divided by the number of dentists

in Southeast region. The greater balance between public and private schools was in the Northeast region. In all regions, the number of private institutions was greater than the number of public schools [Figure 2].

The Spearman test showed a strong positive correlation between the numbers of dental schools and the number of dentists in Brazil. The correlation was also strong for dentists and private schools variables ($r = 0.869$), dentists and population ($r = 0.903$), and population and total number

of schools ($r = 0.832$). There was also correlation between the number of dentists and public dental schools ($r = 0.683$), but this relationship was not strong. There was an inverse correlation between the rate (dentist/population) and the number of dental schools [Table 2].

DISCUSSION

In Brazil, there was a significant increase in the number of dental courses, in particular of the courses offered

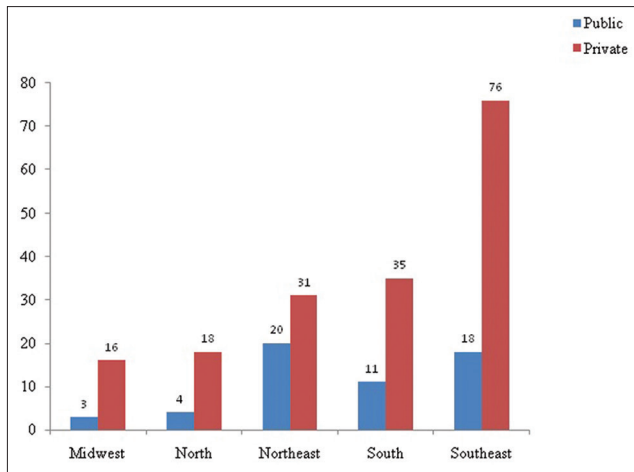


Figure 2: Distribution of dentistry course by region, Brazil, 2015

by private institutions. In absolute numbers, Brazil evolved from 83 courses in 1991 to 174 in 2004, and the largest increase was in the number of private institutions.^[8] Lucietto *et al.* reported the existence of 188 dental schools in Brazil, being 134 (71%) private and 54 (29%) public.^[12] Another study showed an increase of dental courses from 83 courses in 1991 to 219 dental courses in 2013 a total.^[14] Comparing the data from the present study to 2013 data, there was an increase of 13 (6%) dental courses in just 2 years.^[14] The present study confirmed the increasing trend in the number of dental courses in Brazil, especially in private institutions for the year 2015. In this study, there was also variation in the distribution of public schools and private. In Brazil, the MEC is responsible for the regulation of undergraduate courses and the criteria are not clear for implementing of new dentistry courses. This study showed that the regions with the worst socioeconomic indicators and oral health are those that have the lowest number of dentistry schools. The redistribution of dentistry course for regions with the worst social indicators or to places where there is a lack of oral health workforce can potentially retain more dentists in these areas and the improvement of access to dental treatments.^[11] The previous study conducted in an Australian university showed that 83% of graduated dental students remained in their school region.^[30] However, the increase in the number of schools and consequently the number of graduated students may not mean improved access to public or private dental service with quality.^[4,6,7,9,16,18] The dentistry schools redistribution for regions with fewer schools can help the training of graduated dentists working in distant regions of the schools and attract, retain, or motivate relocation of dentists into these regions because the schools represent a possibility of specialist support and postgraduating courses. In particular for the public schools that often provides services to the low-income population and cannot pay for dental treatment. However, in Brazil, when comparing the expansion of

Table 2: Spearman correlation test between states and demographic variables, Brazil, 2015

Variable	Spearman	t	P
Number of dentists to number of dental schools	0.891	9.838	<0.0001
Number of dentists to number of public dental schools	0.683	4.679	<0.0001
Number of dentists to number of private dental schools	0.869	8.783	<0.0001
Number of dentists to population	0.903	10.543	<0.0001
Population to number of dental schools	0.832	7.685	<0.0001
Rate to number of dental schools	-0.504	-2.918	0.0073

dental schools by region there was a great expansion for poor regions such as the Northeast that jumped from 30 in 2008 to 51 in 2015. In Brazil, the inequality in the distribution of dental schools ends up reflecting the unequal dentists' distribution.^[5] In relation to other countries, in the United States, there are 65 dental schools, of which 40 are public, 20 private, and five mixed, and the geographical distribution is not regular, but there are more public dental schools than private.^[13] A study in India showed that there was a variation in the distribution of dentistry schools and identified a total of 289 schools (39 public and 250 private) for a population of more than 1 billion.^[10] Proportionally, Brazil has more dental schools than US and India. In Chile, the number of dentistry schools jumped from 5 in 1997 to 34 in 2011 and the largest increase was for private schools.^[20] Studies have also shown that the increase in the number of course has been driven by market criteria, and the consequences can be negative with a decrease in income and unemployment in Brazil.^[3-5,9,12,18] The present study confirmed the concentration of dental schools in more developed states and in major urban centers.^[10] It is not clear whether the increase in the number of private or public schools in Brazil has improved the access of individuals from low socioeconomic backgrounds and from minority population groups to study dentistry. However, the government student financing has been suggested as an alternative for many students who wish to join and complete the course. Previous studies indicated that the distribution of the workforce in health and in dentistry are characterized by concentrations of workers in urban areas and shortages in remote areas or small towns.^[4,5,10,11,17,19,21] These facts reinforce the need to motivate professionals to work in these areas and offer better employment and income conditions. Therefore, the regions with the worst oral health conditions are the regions with the lowest number of faculties and professionals.^[4,5,14] Studies in Australia pointed out the need for dental workforce establishment and re-enforcement establishing not only in rural areas but also in socially disadvantaged areas.^[19,30] Incentives have been suggested and are utilized in several countries for relocation professionals to the regions with the worst oral health indicators.^[14] The

correlation between the variables showed in this study indicate that the most densely populated states end up having more schools (public and private) and more dentists than less populous states, and similar results were found in a previous study.^[11] A considerable number of states presented with a very low dentist/population rate and the vast majority showed lower numbers than recommended by the WHO (1:1.500). On the other, two states (Maranhão and Pará) have a ratio higher than the level recommended by the WHO. The study showed the inverse relationship between dentists per population rate and the total number of schools variables. Another reason that may have contributed to the increase in the number of dental courses in Brazil were the strategies to increase the oral health public workforce to cope with the poor oral health conditions presented by national epidemiological surveys.^[6,7,16,17] These strategies included the increased offer of jobs in the public sector, according to the implementation of the SUS, promoted by the insertion of the dentistry in the Family Health Strategy, the restructuring of the National Policy of Oral Health, and the creation of Oral Health Specialized Centers. However, 73% of dental consultations in Brazil are still provided by private dentists.^[18] It was not possible to evaluate the distribution of dental applicants and graduated dental students because the information available was outdated and represented limitations of the study. The duration, curriculum, and quality of the courses offered were not objects of this study although it is an important issue for future studies on dentistry workforce distribution in Brazil.

CONCLUSION

There was an increase in the number of dental schools in Brazil, mainly in private and also occur in other countries. The distribution of courses is irregular and concentrated in states with better socioeconomic conditions. The distribution of the faculties has reflexes in the distribution of health professionals. Studies on the distribution of schools of dentistry and dentists can provide subsidies for the planning of actions for the redistribution in dentistry workforce and in directing the future professionals for regions with the worst indicators of oral health.

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Conflicts of interest

There are no conflicts of interest.

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