

# Trends in the dental surgeon workforce in Brazil 2007-2014: a time series study using data from the National Registry of Health Services

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## Abstract

**Objective:** the objective was to analyze trends in the dental surgeon workforce in Brazil between 2007 and 2014. **Methods:** this is a time series study using data from the Brazilian National Register of Health Establishments and the Brazilian National Institute of Geography and Statistics. Prais-Winsten generalized linear regression was used to estimate time trends and to calculate the annual percent change in the dental surgeon workforce over the period. **Results:** the number of dental surgeons working as general practitioners and as specialists grew on average by 12.7% and 17.3% per annum, respectively; dental surgeon workforce expansion in relation to general practitioners (0.5%) and specialists (11.6%) was lower in the public sector, compared to the private sector (24.5% and 30.3%, respectively). **Conclusion:** the number of dental surgeons in Brazil is high, although they are not equally distributed between both sectors. This may imply barriers to dental care access in Brazil.

**Keywords:** Labor Force; Dental Staff; Time Series Studies.

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## Introduction

Dentistry was regulated as a profession in Brazil in 1884,<sup>1</sup> in witness of the emergence of a new occupation system. In 1966, the practicing of dentistry was regulated by law, resulting in rapid growth of the profession, exemplified by the creation of countless dentistry degree and postgraduate courses, as well as its scientific and technological evolution.<sup>2</sup>

During most of the 20th century, dentistry was essentially a private service, directed towards aesthetic and tooth replacement demands of the wealthier segments of the population.<sup>2</sup> Public dentistry services were incipient, involving provision of services linked to welfare programmes restricted to certain population groups, or by means of outsourcing agreements between the State and the private sector, for those who contributed to National Institute of Social Security Medical Assistance.<sup>3</sup>

*Investments in scaling up the availability of dental services intensified with the launch of the National Policy on Oral Health in 2004.*

The Unified Health System (*Sistema Único de Saúde* - SUS) was created in 1988 by the new Federal Constitution aiming universal access by the population to health services, including dentistry, became a citizenship right guaranteed by the State.<sup>4</sup> Investments in scaling up the availability of dental services intensified with the launch of the National Policy on Oral Health in 2004, driving an increase in the number of dental surgeons working in the public sector.<sup>5</sup>

Published studies have sought to assess the dental surgeon workforce in Brazil. Pinto,<sup>6</sup> based on Federal Dentistry Council (Conselho Federal de Odontologia - CFO) data, found that the number of dental surgeons increased between 1960 and 1980 at a rate greater than the growth of the general population. He estimated that if growth continued in this way, there would be one dental surgeon for every 954 inhabitants in Brazil by 2010. Morita et al.<sup>7</sup> described the number and socio-economic and demographic profile of dental surgeons per state capital and region of Brazil in 2008. Paranhos et al., in a series of publications on analyses based on CFO data, described the number of inhabitants per dental

surgeon in the Brazilian states between 2003 and 2007.<sup>8-12</sup> Arouca et al.<sup>13</sup> conducted a demographic census of the dental specialty workforce in Brazil based on CFO data up until March 2012, analyzing its characteristics and correlation with municipal population, geographic and economic indicators.

Studies published until then used data provided by CFO. Another source of data containing periodical records on professions which is now being used to analyze the Health sector workforce is the National Registry of Health Establishments (Cadastro Nacional de Estabelecimentos de Saúde – CNES).<sup>14</sup>

Given the absence of recent publications on the dental surgeon workforce in Brazil, this study used CNES data with the aim of analyzing trends in this workforce between 2007 and 2014, describing them according to the country's macroregions, municipalities, sector (public or private) and type of professional (general practitioner or specialist).

## Methods

This is a time series study using secondary data from the CNES and Brazilian Institute of Geography and Statistics (IBGE) databases, retrieved via the SUS Information Technology Department (DATASUS) website. The data were accessed in January 2015 and refer to the period from December 2007 to December 2014.

CNES was created by Ordinance No. 376 on October 3<sup>rd</sup> 2000.<sup>15</sup> It standardizes the process of health service registration throughout the entire country. The registry contains information on health establishments with regard to their physical area, human resources, inpatient and outpatient equipment and services, as well as the professionals who carry out health actions or services in Brazil, whether or not they operate through SUS. It is an important source of data, given that it is the only health registry to cover private consulting rooms, professionals working for cooperatives and foreign professionals, thus forming a tool that enables the profile of professionals working in health services to be mapped.<sup>14</sup> CNES is an open access database (<http://cnes.datasus.gov.br/>).

The absolute number of dental surgeons was obtained from the CNES database using the following options: Human Resources (*Recursos Humanos*); Occupations (*Ocupações*) – According to 2002 Brazilian Occupations Classification (*Segundo CBO 2002*) – Brazil (*Brasil*). All 23 dental surgeon occupations

were included, namely: Auditor, General Practitioner, Cosmetic Dentistry, Temporomandibular Dysfunction, Endodontist, Epidemiologist, Stomatologist, Implantologist, Geriatric Dentistry, Occupational Dentistry, Dentistry for Patients with Special Needs, Forensic Dentist, Paediatric Dentist, Orthopaedist and Orthodontist, Oral Pathologist, Periodontist, Prosthetic Dentist, Oral and Maxillofacial Prosthetics, Radiologist, Oral Rehabilitation, Oral and Maxillofacial Traumatology, Public Health and Family Health Strategy.

Dental surgeons were classified according to whether they worked as general practitioners or specialists. The specialist dental surgeon category grouped together all categories except general practice. Although four occupations listed on CNES (Auditor, Epidemiologist, Geriatric Dentistry and Oral Rehabilitation) are not considered to be specialties, according to the Federal Council of Dentistry (CFO), the option was taken to categorize these professionals as specialists, since the aim of this study was to analyze the available workforce. To some extent, the occupations of these professionals relate to a specialized service distinct from general practice. Excluding these occupations would result in the available workforce being underestimated.

The sector in which they worked was classified according to CNES records, either as 'Brazilian National Health System' or as 'Not Brazilian National Health System', the latter being used as a proxy for working in the private sector.

In order to calculate the inhabitant / dental surgeon ratio, the number of inhabitants was divided by the number of dental surgeons. When performing this calculation, the average population between 2007 and 2012 was taken from IBGE data for Brazil as a whole and also for its macroregions and municipalities. 2012 was the most recent year with a population estimate available in January 2015. 80% of Brazil's population is estimated to use SUS.<sup>16</sup> As such the reference population used to obtain the inhabitant / dental surgeon ratio in the public sector was 80% of the country's general population and 20% for the private sector. The parameter taken for the purposes of comparing this ratio was based on Brazilian Health Ministry recommendation for dentists working in primary health care: one dental surgeon per 3,000 inhabitants, on average.<sup>17</sup>

The data was input onto Excel spreadsheets and exported for analysis using Stata 11.0 statistical software (StataCorp., College St., TX, 2009). First we obtained the

number of dental surgeons in the period analyzed, in Brazil, its macroregions and municipalities, by sector (public/private) and type of work (general practice or specialty). In order to facilitate data viewing, only the figures for the years 2007 and 2014 have been presented. Following this, generalized linear regression was performed using the Prais-Winsten estimation method to estimate trends over the seven year period and to calculate annual percentage change (APC), using a 95% confidence interval (95%CI), in the number of dental surgeons and the inhabitant / dental surgeon ratio, according to the characteristics investigated. The following formulae were used to obtain  $APC = 100 * (-1 + 10^b)$  and  $95\%CI = 100 * (-1 + 10^{[b \pm t*EP]})$ .<sup>18</sup> The trend was considered to be rising when the coefficients were positive, falling when negative and stable when the regression coefficients were not significantly different to zero ( $p > 0.05$ ). In order to illustrate the inhabitant / dental surgeon ratio in the Brazilian municipalities in 2007 and 2014, two maps were drawn up with the aid of Tab for Windows-Datasus version 4.14.

This Study was approved by the Human Being Research Ethics Committee of Faculdade de Odontologia da Universidade Federal de Pelotas on June 26<sup>th</sup> 2015 (Report No. 1.127.177).

## Results

112,283 dental surgeons were registered on the CNES database in 2007, and 173,261 in 2014. In 2007, 70,748 (63%) dental surgeons were working in the public sector and although in absolute numbers there was an increase (86,380), in percentage terms the proportion of professionals working in this sector in 2014 fell to 49.9%. Between 2007 and 2014 there was an increase in the number and proportion of specialists in both the public and the private sector. The country's Southeast region had the highest number of dental surgeons working in general practice in both sectors – public and private. The greatest number of specialists working in the public sector was found in the Northeast region, while in the private sector this number was higher in the Southeast region (Table 1).

Between 2007 and 2014 there was a significant rising trend in the number of professionals in Brazil and in its regions. These trends were greater in the private sector when compared to trends in the public sector. In the private sector, for instance, the number of general

practice and specialist dental surgeons grew by 24.5% and 30.3% per annum on average, respectively, whilst in the public sector respective growth was 0.5% and 11.6%. The number of general practitioners working in the public sector only showed stable trends ( $p>0.05$ ) in relation to the total number for Brazil and the Southeast and Midwest regions. The number of specialists showed a rising trend, more so in the North and Southeast regions in both the public and the private sectors (Table 1).

In 2007, Brazil had one dental surgeon working in general practice per 2,880 inhabitants and one specialist per 4,169 inhabitants. These numbers went down in 2014 to 1:1,965 inhabitants and 1:2,520 inhabitants, respectively. In Brazil as a whole the proportion of inhabitants per dental surgeon in the private sector was

lower than in the public sector, in relation to both general practitioners and specialists. There was a significant falling trend in this proportion, more so in the private sector when compared to the public sector. The proportion of inhabitants per general practice dental surgeons remained stable ( $p>0.05$ ) in Brazil as a whole and in the Southeast and Midwest regions. The greatest reductions in the proportion of inhabitants per dental surgeon were seen in the North and Southeast regions, in both the public and the private sector, in keeping with the greater increase in professionals in those regions (Table 2).

According to the records, the density of the proportion of inhabitants per dental surgeon was lower than the average recommended by the Brazilian Ministry of Health (one dental surgeon per 3,000 inhabitants, on average)

**Table 1 – Distribution of the absolute number, annual change rate and trends in the general practice and specialist dental surgeon workforce, overall and by sector, Brazil and regions, 2007-2014**

Regions and Brasil	General practice dental surgeon				Specialist dental surgeon			
	2007 N	2014 N	% annual change (95%CI) <sup>a</sup> 2007-2014	Valor p <sup>b</sup>	2007 N	2014 N	% annual change (95%CI) <sup>a</sup> 2007-2014	Valor p <sup>b</sup>
<b>Overall</b>								
North	2,454	4,414	18.3 (15.0;21.8)	<0.001	2,342	4,526	23.3 (17.3;29.7)	<0.001
Northeast	11,153	14,587	8.4 (4.6;12.4)	0.001	14,786	21,639	12.8 (9.1;16.6)	<0.001
Southeast	34,358	51,049	13.2 (7.0;19.6)	0.002	16,606	30,701	21.2 (12.7;30.3)	0.001
South	13,011	18,880	12.5 (8.1;17.0)	<0.001	7,783	11,749	14.2 (11.9;16.5)	<0.001
Midwest	5,436	8,423	14.5 (5.2; 24.7)	0.008	4,354	7,293	18.0 (12.7;23.6)	<0.001
<b>Brasil</b>	<b>66,412</b>	<b>97,353</b>	<b>12.7 (7.1;18.6)</b>	<b>0.001</b>	<b>45,871</b>	<b>75,908</b>	<b>17.3 (11.8;23.0)</b>	<b>&lt;0.001</b>
<b>Public sector</b>								
North	1,812	2,151	3.4 (0.5;6.4)	0.03	2,028	3,388	17.7 (12.9;22.8)	<0.001
Northeast	6,426	6,272	-1.5 (-2.0;-1.1)	<0.001	13,011	17,692	10.0 (7.5;12.6)	<0.001
Southeast	20,084	20,422	-0.2 (-2.5;2.1)	0.818	10,819	16,245	13.6 (8.6;18.8)	<0.001
South	6,216	6,735	2.0 (0.5;3.5)	0.016	5,161	6,695	8.8 (8.2;9.4)	<0.001
Midwest	2,377	2,802	5.0 (-0.1;10.5)	0.055	2,814	3,978	11.2 (9.5;12.8)	<0.001
<b>Brasil</b>	<b>36,915</b>	<b>38,382</b>	<b>0.5 (-1.3;2.4)</b>	<b>0.515</b>	<b>33,833</b>	<b>47,998</b>	<b>11.6 (8.7;14.6)</b>	<b>&lt;0.001</b>
<b>Private sector</b>								
North	642	2,263	47.1 (29.1;67.8)	<0.001	314	1,138	50.6 (34.4;68.9)	<0.001
Northeast	4,727	8,315	19.4 (9.9;29.7)	0.002	1,775	3,947	28.6 (15.1;43.6)	0.001
Southeast	14,274	30,627	27.3 (15.0;40.9)	0.001	5,787	14,456	33.0 (18.2;49.6)	0.001
South	6,795	12,145	20.3 (12.7;28.4)	<0.001	2,622	5,054	23.5 (16.7;30.7)	<0.001
Midwest	3,059	5,621	20.8 (8.1;34.9)	0.006	1,540	3,315	28.0 (16.1;41.1)	0.001
<b>Brasil</b>	<b>29,497</b>	<b>58,971</b>	<b>24.5 (13.5;36.5)</b>	<b>0.001</b>	<b>12,038</b>	<b>27,910</b>	<b>30.3 (17.8;44.2)</b>	<b>0.001</b>

a) 95%CI: 95% confidence interval.

b) Prais-Winsten regression.

**Table 2 – Distribution of the absolute number, annual change rate and trends in the proportion of inhabitants per general practice and specialist dental surgeons, overall and by sector, Brazil and regions, 2007-2014**

Regions and Brasil	Inhabitants per general practice dental surgeon				Inhabitants per specialist dental surgeon			
	2007 N	2014 N	% annual change (95%CI) <sup>a</sup> 2007-2014	Valor p <sup>b</sup>	2007 N	2014 N	% annual change (95%CI) <sup>a</sup> 2007-2014	Valor p <sup>b</sup>
<b>Overall</b>								
North	6,394	3,555	-15.5 (-17.9;-13.0)	<0.001	6,700	3,467	-18.9 (-22.9;-14.7)	<0.001
Northeast	4,772	3,649	-7.8 (-11.0;-4.4)	0.001	3,600	2,460	-11.4 (-14.3;-8.4)	<0.001
Southeast	2,351	1,582	-11.6 (-16.4;-6.6)	0.002	4,864	2,631	-17.5 (-23.3;-11.3)	0.001
South	2,121	1,461	-11.1 (-14.5;-7.5)	<0.001	3,545	2,348	-12.4 (-14.1;-10.7)	<0.001
Midwest	2,570	1,659	-12.7 (-19.8;-4.9)	0.008	3,209	1,916	-15.3 (-19.1;-11.3)	<0.001
<b>Brazil</b>	<b>2,880</b>	<b>1,965</b>	<b>-11.2 (-15.7;-6.6)</b>	<b>0.001</b>	<b>4,169</b>	<b>2,520</b>	<b>-14.7 (-18.7;-10.6)</b>	<b>&lt;0.001</b>
<b>Public sector</b>								
North	6,928	5,836	-3.3 (-6.0;-0.5)	0.03	6,190	3,705	-15.1 (-18.6;-11.4)	<0.001
Northeast	6,627	6,789	1.5 (1.1;2.0)	<0.001	3,273	2,407	-9.1 (-11.2;-7.0)	<0.001
Southeast	3,217	3,164	0.2 (-2.1;2.6)	0.815	5,973	3,978	-12.0 (-15.8;-7.9)	<0.001
South	3,551	3,277	-2.0 (-3.4;-0.5)	0.016	4,277	3,297	-8.1 (-8.6;-7.6)	<0.001
Midwest	4,703	3,989	-4.8 (-9.5;0.2)	0.055	3,972	2,810	-10.0 (-11.4;-8.7)	<0.001
<b>Brazil</b>	<b>4,145</b>	<b>3,986</b>	<b>-0.5 (-2.3;1.3)</b>	<b>0.516</b>	<b>4,522</b>	<b>3,188</b>	<b>-10.4 (-12.8;-8.0)</b>	<b>&lt;0.001</b>
<b>Private sector</b>								
North	4,888	1,387	-32.0 (-40.4;-22.5)	<0.001	9,995	2,758	-33.6 (-40.8;-25.6)	<0.001
Northeast	2,252	1,280	-16.2 (-22.9;-9.0)	0.002	5,997	2,697	-22.2 (-30.4;-13.1)	0.001
Southeast	1,132	527	-21.4 (-29.1;-13.0)	0.001	2,792	1,118	-24.8 (-33.1;-15.4)	0.001
South	812	454	-16.8 (-22.1;-11.2)	<0.001	2,104	1,092	-19.0 (-23.5;-14.3)	<0.001
Midwest	914	497	-17.2 (-25.9;-7.5)	0.006	1,815	843	-21.9 (-29.1;-13.9)	0.001
<b>Brazil</b>	<b>1,297</b>	<b>649</b>	<b>-19.7 (-26.7;-11.9)</b>	<b>0.001</b>	<b>3,178</b>	<b>1,371</b>	<b>-23.3 (-30.6;-15.1)</b>	<b>0.001</b>

a) 95%CI: 95% confidence interval.  
 b) Prais-Winsten regression.

Notes:  
 - Public sector reference population equivalent to 80% of Brazil's general population.  
 - Private sector reference population equivalent to 20% of Brazil's general population.

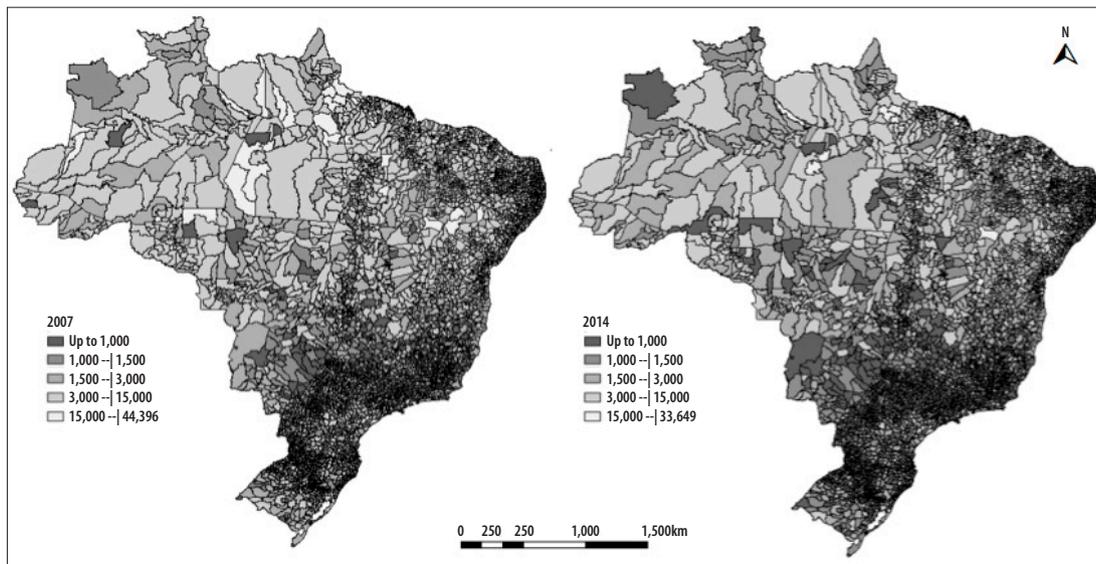
in 15% of municipalities. In Figure 1 it is possible to visualize the areas where this proportion decreased most, as well as greater density of professionals in the South and Southeast regions and in coastal cities in the Northeast region, both at the beginning and the end of the period analyzed.

### Discussion

This study used secondary data from national public domain databases, giving value to available information and producing new knowledge about Brazilian reality. CNES is the basis for making health information systems operational, providing service managers with knowledge of

the reality of the health care network, assisting with health planning, as well as giving visibility to the population's public policy watchdog role. CNES is a wide-ranging registry in terms of information on all procedures undertaken by health service providers, both public and private.<sup>14</sup>

This study has some limitations arising from the CNES database source. CNES records are not the same as CFO records. For example, 272,090 dental surgeons were registered with CFO in 2014 (<http://www.cfo.org.br>), whereas 173,261 were registered on CNES. In other words, a third of dentists registered with CFO are not registered on CNES. Although CNES registration is mandatory throughout Brazil, these professionals may be working without having their health establishment registration, or



**Figure 1 – Distribution of the proportion of inhabitants per general practice or specialist dental surgeon in the municipalities, Brazil, 2007 and 2014**

they may be doing other jobs there that are not related to dental care, or they may not be working as dentists, whilst still maintaining their registration with CFO. The numeric code obtained by the health establishment when it registers with CNES is used to generate contract addenda between health service providers, health professionals, health care plan owners and operators. Nevertheless it is common for service managers to prioritize mandatory information required by DATASUS being input on CNES relating to professionals who performed procedures that generate payment.<sup>14</sup> In many situations, this is the case of dentistry professionals who are not registered on CNES, especially those who work exclusively in the private sector and do not undertake negotiations or make partnerships. Another difference between CFO and CNES records relates to specialty type. CFO returns information on professionals who have a postgraduate course certificate, whilst CNES returns information on professionals working in a given occupation and who may not necessarily be registered specialists. CFO provides information on the 19 specialties recognized by Dentistry, whilst CNES provides information on 23 possible forms of working with the provision of specialized services. A professional registered with CFO may not work in the specialty corresponding to their postgraduate certificate, and may also carry out his/her activities – either full-time or part-time – at a different place.<sup>13</sup> This type of limitation is less likely to happen when analyzing CNES

data whereby professionals are registered based on the place and the occupation they undertake at a given health establishment, and this may be seen as an advantage of CNES records. However, CNES may underestimate the real size of the workforce, since it estimates the number of professionals working at a given time. This means that this study has adopted a restricted definition of the concept of workforce, taking those professionals who were working in a given occupation during the period analyzed. Owing to inconsistencies in the number of oral health professionals working at technical and auxiliary level on the CNES database, it was not possible to estimate the Dentistry workforce in a broader manner. If, on the one hand, CNES is a very useful tool for monitoring trends and generating new hypotheses, on the other hand it places limitations for studying the workforce of health professionals currently working in Brazil.<sup>14</sup>

International studies indicate results similar to those found in Brazil, i.e. growth in the dental surgeon workforce together with its unequal distribution, whereby the supply of their services is lower in rural areas and developing countries.<sup>19-22</sup> Yamalik et al. investigated the dental workforce in 18 countries in 2012 and found that the supply of dental surgeon services was higher in developed countries in comparison to developing countries.<sup>21</sup> Among the developed countries assessed, the United States of America had the highest number of dental surgeons (185,084), followed by Germany

(53,767) and France (40,114). Among the developing countries analyzed, Cuba (12,144), Costa Rica (4,510) and Morocco (3,500) were the three countries with the largest number of these professionals. When comparing the supply of dental surgeons, Brazil (173,261 registered with CNES) is close to the pattern found in developed countries. According to the same study, 67% of developing countries had regions with an insufficient number of professionals and 78% of these same countries lacked specialists.

One factor that may explain differences in the distribution of dental surgeons over the Brazilian regions is the amount of dentistry degree and specialization courses available in each region. According to CFO, in 2014 there were 220 dental degree courses in Brazil, with 43.6% (N=96) concentrated in the Southeast, 19.5% (N=43) in the Northeast, 18.2% (N=40) in the South, 10% (N=22) in the North and 8.6% (N=19) in the Midwest. Between 1992 and 2008, there was considerable expansion in the number of dentistry degree courses available (132%), 72% of which were private courses.<sup>7</sup> This expansion continued between 2008 and 2014 (11.6%), although not to the same extent as in the preceding period. The majority of specialization courses is also found in the Southeast, which would explain the presence in this region of the majority of professionals with one (56%) or even two (54%) specialties.<sup>7</sup>

Growth in the number of dentistry courses between 2004 and 2008 was greatest in the Northern region compared to the country's other regions, whereby there was a 160% increase in public faculties and a 66% increase in private faculties.<sup>7</sup> This suggests a growing trend for forthcoming years and may also explain the greater increase in professionals in practically all analyses performed in relation to this region. Increased supply of degree courses over the last three decades has led to increased availability of professionals on the labour market, but this has not been accompanied by planning of their distribution or the ability of the labour market to absorb this increase.<sup>23</sup>

In a paper published in 2010, Cardoso et al.<sup>24</sup> assessed that poor distribution of professionals tends to continue, as indicated in our study. Although public policies on oral health, such as the Smiling Brazil Programme (*Programa Brasil Sorridente*) for instance, encourage professionals to move to the interior in order to improve access to dental services, they do not

guarantee significant redistribution of their services.<sup>24</sup> Many dental surgeons remain in large urban centres where dental training courses and people with greater purchasing power are located, seeking to work both in the public sector and in private practices or clinics.<sup>24</sup>

There are no recommended global parameters for the ideal proportion of inhabitants per dental surgeon, since the demand for them can vary according to the population's needs and different contexts. In Brazil, the National Primary Health Care Policy recommends that one dental surgeon, working together with a dental nurse, should be responsible for 3,000 people on average.<sup>17</sup> The more vulnerable the population is, the greater the number of professionals there should be.<sup>17</sup> In general terms, these Health Ministry recommended numbers appear to be adequate for the country and its macroregions.

However, analysis by sector shows that this proportion is in fact not adequate. In the public sector there are few dental surgeons for many inhabitants, whilst in the private sector the contrary is the case, with many professionals and few inhabitants. In addition to this finding, the scarcity of professionals in some municipalities means that many Brazilians have restricted access to dental services.

As a universal health system, SUS is a health care reference for approximately 80% of Brazilians but, even so, one third of the population does not use this public service regularly.<sup>16</sup> Increased availability of dental surgeons in recent years may explain the fact that the proportion of people who have never had a dentist's appointment is reducing in Brazil.<sup>25</sup> Nevertheless, social iniquity in dental service use is still considerable<sup>25</sup> and this may also be explained by the unequal availability of dentists. According to the report of the 2013 National Health Survey, the proportion of people who had a dentist's appointment in the last year was 44.4%, whereby the North (34.4%) and Northeast (37.5%) regions showed the lowest proportions of this indicator, whilst the highest were found in the South (51.9%) and Southeast (48.3%) regions,<sup>26</sup> where the availability of dentists is greater. Also according to the Survey, of all the dental appointments in the last 12 months, only 19.6% took place in public services.<sup>26</sup> The inhabitants/dental surgeon ratio in the private sector is lower than that of the public sector, indicating that the labour market in the private sector may be undergoing a process of saturation, whilst there is more room for

exercising the profession in the public sector. Despite the market potentialities in the public sector, SUS professional training policies and job vacancies are still insufficient to absorb the considerable volume of dental surgeons who graduate every year, and the alternative that remains is the private sector labour market. The continuity of the Smiling Brazil Programme, aimed at expanding dental services in the public sector and greater availability of dental professionals in the country's interior, depends on political will and pressure from the population, since historically in Brazil government programmes are not the same as State programmes.<sup>27</sup> The application of resources in oral health in the last decade has contributed to increased employability in public dentistry services. However, diverse forms of temporary employment have been adopted and this gives rise to another problem, namely insecure employment conditions in the public sector.<sup>28</sup>

Changes seen in recent decades, such as the fall in private dental surgeon practice profits, the emergence of dental care plans, the indiscriminate increase in dental faculties and technological progress unabsorbed by the market, reflect the end of the "golden age" of Brazilian dentistry.<sup>29</sup> Dental surgeons' aspirations to work in the public sector, once seen with reservations, appear to be the result of the wish to achieve financial stability, mitigating the uncertainty of exercising the profession in the private sector.<sup>24</sup>

The new perspective of working in dentistry brings the challenge of producing professionals with a broader vision and committed to the purpose of their practice, capable of contributing to improving the population's health,<sup>30</sup> whether this is through public or private care.<sup>27</sup> This discussion reaffirms the importance of the continuity of public policies and programmes in all government levels, with the aim of achieving dental

service expansion and equitable distribution. The combination of health services supply and care quality may determine the next results in terms of access and use, oral health problem-solving and improved oral health status among the population.

According to CNES data, the workforce of dental surgeons working as general practitioners and specialists grew between 2007 and 2014, with the exception of general practitioners working in the public sector in the country's Southeast and Midwest regions, where a trend of stability in the relationship between the number of inhabitants and supply of these professionals can be seen. Workforce expansion was lower in the public sector in relation to the private sector. Differences in growth rates according to the country's macroregions and type of professional activity were found. Despite the number of dentists being high in Brazil, they are unequally distributed over the national territory, in both the public and the private sector, and this makes access to dental care difficult for many Brazilians. The results of this study can contribute to planning of dental health service supply and professional training, this being of great interest to government authorities, service managers, educators, health professionals and the community.

### Authors' Contributions

Cascaes AM designed the study, organized, analyzed and interpreted the data and wrote the manuscript. Dotto L reviewed the literature and assisted with data analysis and interpretation and with writing the manuscript. Bomfim RA contributed to data analysis and interpretation and to writing the manuscript. All authors approved the final version for publication and are responsible for all aspects of the study.

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