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Factors associated with the municipal provision of orthodontics in the Brazilian Unified Health System

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Background: The Brazilian federal government issued Ministerial Ordinance No. 718 in 2010 to expand the funding of orthodontic treatment provided by Brazilian municipalities via the Unified Health System (SUS in Portuguese). ***Aim***: To identify social and structural factors associated with Brazilian municipalities that provide fixed orthodontic appliance therapy and interceptive orthodontic therapy. ***Methods***: Official Brazilian government databases were used for data collection. Poisson regression with robust variance was used for statistical analysis. ***Results***: Municipalities hosting Dental Specialty Centers (DSCs) with greater installed capacity (type III DSC with 7 dental chairs or over), which employed dentists specializing in pediatric dentistry and orthodontics, were more likely to offer orthodontic services via SUS. ***Conclusions***: Federal, state, and municipal managers need to review the funding of orthodontic services via SUS, which can be used for creating DSCs and hiring professionals with expertise in orthodontics.

Keywords*: Orthodontics, Health Policy, Public Health Dentistry, Dentofacial Deformities*

Introduction

Dentofacial deformities (DFD) affect the soft and hard tissues of the face and can cause serious physical (Alogaibi *et al.*, 2020), mental (Baram *et al.*, 2019) and social (Sharma *et al.*, 2017) problems, as well as negatively interfere with quality of life (Zamboni *et al.*, 2019) and lead to bullying among children and adolescents (Tristão *et al.*, 2020). However, many functional changes that accompany DFD can be corrected through orthodontic interventions and/or are associated with other areas, such as breathing (McNamara *et al.*, 2015), phonetics (Farronato *et al.*, 2012), chewing, swallowing (Gameiro *et al.*, 2017) and aesthetics (Vučić *et al.*, 2020).

Multidisciplinary orthodontic approaches are being developed to prevent and control the worsening of DFD. Preventive, interceptive, and corrective orthodontic therapy integrated into other fields has helped reduce DFD damage, resulting in improved quality of life (Abreu *et al.*, 2016). The earlier that DFD can be diagnosed, the greater the treatment possibilities, which can range from preventive procedures to the more complex orthodontic corrections associated with orthognathic surgery (Zamboni *et al.*, 2019; Vučić *et al.*, 2020). Early diagnosis can also positively impact the cost/benefit ratio of treatment.

DFD are common worldwide, with the highest prevalence in Africa (81%), followed by Europe (72%), America (53%) and Asia 48% (Lombardo *et al.*, 2020). In a Latin American study with Mexican students, 24% of students with malocclusion showed severe or very severe malocclusion and was associated with temporomandibular joint disorders (Sánchez-Pérez *et al.*, 2013). Another Mexican study found that 70% of participants had malocclusion in the mixed dentition (mean age 9.2 years), with 48.1% being severe or very severe cases (García Pérez *et al.*, 2021).

Brazil has a prevalence of cleft lip and palate of 5.86 per 10,000 live births (Sousa and Roncalli, 2017). In addition, oral health surveys (SB Brazil 2003 and 2010) have found that the prevalence of malocclusion in 12-year-old children ranged from 38% (Brasil, 2012) to 58% (Brasil, 2004), with a high number of severe (16% in 2003 and 11% in 2010) or very severe (21% in 2003 and 6.5% in 2010) cases. Other findings include a need for orthodontic treatment in 53% of Brazilian adolescents (Freitas *et al.*, 2015), delayed surgery to correct cleft lip and/or palate in children (Sousa and Roncalli, 2021), and less than 20% of children with cleft lip and/or palate were receiving corrective surgery via the Brazilian Unified Health System (SUS) (Sousa and Roncalli, 2017). Therefore, pursuant to the SUS ideals of universality, integrality and equity, it is imperative that health managers and professionals carry out oral health actions that meet this need.

To improve the limited access to oral health services in Brazil, several oral health policies have been implemented since SUS was founded. Among them was the development of Cleft Lip and Palate Treatment Centers in 1994 (Diário Oficial da União, 1994). These centers provide comprehensive multidisciplinary treatment, including pediatrics, surgery, psychology, speech therapy, physical therapy, orthodontics and other related treatment.

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In 2004, the National Oral Health Policy was implemented to consolidate dentistry within the scope of primary and secondary health care (Pucca *et al.*, 2009). This policy expanded oral health teams and created Dental Specialty Centers (DSCs), which provide services in endodontics, minor oral surgery, oral cancer diagnostics, periodontics, and care for special needs patients (Pucca *et al.*, 2015). In an effort to streamline oral health actions, Ministerial Ordinance 718 (2010) expanded the scope of orthodontic procedures in the SUS network (Brasil, 2010). However, although more than a decade has passed since it was approved, few studies have reported successful experiences (Castro *et al.*, 2010; Guzzo *et al.*, 2014a) with SUS orthodontics services (Hebling *et al.*, 2007).

The lack of studies reporting factors that can empower municipalities to provide orthodontic services in the public health network demonstrates the need for baseline studies to fill this gap in the literature and address challenges to implementing and/or expanding orthodontics in the SUS network. Also, describing the factors associated with municipalities that offer orthodontics through the public health system can contribute to the organization and consolidation of health care services to physical and mental morbidities in children and their families, and mitigate inequalities (social vs health) (Alhammadi *et al.*, 2018). Therefore, the aim of this study was to describe social and structural factors associated with Brazilian municipalities that provide fixed orthodontic appliance therapy and interceptive orthodontic therapy. We hypothesized that municipalities with higher health budgets, greater coverage of Oral Health Teams and DSCs and available orthodontists in the public health network would be associated with the provision of orthodontic services in SUS.

Methods

This study used only online governmental/public data at the municipal level and therefore was exempted from Ethics Committee approval.

This cross-sectional study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines. Data were collected from June to August 2020. Municipalities qualified as having provided orthodontic treatment had to have performed at least 12 outpatient treatments in 2019. The number of outpatient treatments in each municipality was determined using data from the SUS Database DATASUS (Ministério da Saúde, 2020a).

The study used two outcome variables: municipal provision of fixed orthodontic appliance therapy and the provision of preventive/interceptive orthodontic treatment. The fixed orthodontic appliance therapy analysis included 45 municipalities that performed outpatient procedures in DSCs or Cleft Lip and Palate Treatment Centers. The preventive/interceptive analysis included 76 municipalities that performed outpatient procedures in Primary Health Care, DSCs or Cleft Lip and Palate Treatment Centers. Municipalities that only provided outpatient maintenance procedures for orthodontic/orthopedic appliances and/or requests for fixed orthodontic/orthopedic appliance installation (Ministerial Ordinance 718) (Brasil, 2010) in 2019 were excluded (0 municipalities). The inclusion and exclusion criteria are shown in Table 1.

Table 1. Municipality inclusion and exclusion criteria.

Criteria	*Preventive and interceptive procedures*	*Fixed orthodontic and orthopedic procedures*
Inclusion*	Bilateral fixed appliance for diastema closure (0701070013)*	Fixed orthodontic appliance (0701070170)*
	Removable orthopedic and orthodontic appliances (0701070021)*	
	Space maintainer (0701070064)*	Fixed orthopedic appliance (0701070161)*
	Inclined plane (0701070080)*	
Exclusion	Maintenance/repair of orthodontic/orthopedic braces (0307040127)*	Fixed orthodontic/orthopedic appliance installation (0307040119)*

*Codes relate to the procedures regulated by Ministerial Ordinance 718 of 2010.

Data on the independent variables of municipality, municipal population (referring to 2019), and per capita gross domestic product (GDP) (referring to 2010) were obtained from the Brazilian Institute of Geography and Statistics (IBGE, 2020).

The municipal health budget was determined using revenue data collected from the Public Health Budget Information System website (Ministério da Saúde, 2020b) data referring to the 6th bimester of 2019, base year 2018). Municipal human development index (HDI) data were collected from the United Nations Development Program Human Development Atlas in Brazil 2010 data (PNUD, 2020).

Family Health Team (FHT) and Oral Health Team (OHT) coverage data were collected from the Ministry of Health's e-Gestor database December 2019 data (Ministério da Saúde, 2020b). Data on the number of FHTs, OHTs, DSCs, DSC type, and the number of pediatric dentistry and orthodontic specialists in the SUS network were collected from the National Registry of Health Establishments (CNES) according to team type, qualifications, and Brazilian occupational classification criteria (December 2019 data).

For the final database, data, collected in Excel (Microsoft, Redmond, CA, USA), were combined using the identification code for each municipality. The IBGE, CNES, and SIA/SUS (SUS Outpatient Information System) databases were accessed through the TABNET platform of the SUS Database DATASUS (Ministério da Saúde, 2020a). A single trained researcher (DDO) collected the data for 5,565 Brazilian municipalities included in the analysis.

For statistical analysis, the municipality variables were grouped according to Brazilian macro-regions (North, Northeast, Southeast, South and Midwest). The municipality populations, per capita GDP, health care budgets and HDI were categorized according median values. The FHT and OHT were categorized according to a cut-off point of 80% coverage (Stein *et al.*, 2020). The OHT/FHT ratio was then categorized as 1:1 or 1:2 or greater. Municipalities without an FHT (61/1.1%) or OHT (423/7.6%) were excluded from this analysis.

The municipalities were categorized according to the presence/absence of DSCs, with the DSC type categorized according to capacity (type I - 3 dental offices, II - 4 to 6 dental offices, or III - 7 dental offices or more). Municipalities without a DSC (4607/82.8%) were excluded from this analysis. The municipalities were also categorized according to the presence/absence of pediatric dentists and orthodontists.

Descriptive analyses considered the distribution of absolute and relative frequencies (N/%). Bivariate analyses with the chi-square test and Fisher's exact test ($p \leq 0.05$) determined the associations between independent and outcome variables, and Poisson regression with robust variance was used for multivariate analysis ($p \leq 0.05$) to produce prevalence ratios (PR) and confidence intervals (CI) identical to Cox regression. This used a time-at-risk value of 1 for each participant/municipality (there is no real participant follow-up in this type of study). Additionally, this type of model controls overestimation of the variance and produces adequate/corrected CIs (Coutinho *et al.*, 2008). There was no variable interaction in this model. SPSS version 20.0 (IBM, Armonk, NY, USA) was used for all analyses

The multivariate analysis used a hierarchical model with a distal level consisting of sociodemographic variables, an intermediate level of structure I variables (health team coverage), and a proximal level with structure II variables (secondary care) (Table 2). A backward stepwise approach and chi-square goodness-of-fit test were used in the multivariate analysis. Variables with $p < 0.20$ were selected for the final adjusted model.

Finally, when the hierarchical model was run for the first outcome variable (municipal provision of fixed orthodontic appliance therapy), the second outcome variable (municipal provision of preventive/interceptive orthodontic treatment) was entered as an independent variable and vice versa.

Table 2. Hierarchical model levels and blocks of independent variables.

Blocks of variables and hierarchical levels	*Municipality variables*
Distal Block of socioeconomic variables	Brazilian macro-region
	Population
	Per capita GDP*
	Health care budget
	Human development index
Intermediate Block I of structure variables	Family health team coverage**
	Oral health team coverage***
	Oral health team/family health team ratio
Proximal Block II of structure variables	Has dental specialty centers
	Dental specialty center (DSC) type****
	Has pediatric dentists
	Has orthodontists
	Municipalities that provide fixed appliance/preventive orthodontic treatment

* GDP = gross domestic product. ** Family health team (consisting of physician, nurse, licensed practical nurse, and community health workers). *** Oral health team (consisting of: Modality I: dental surgeon and oral health assistant; or Modality II: dental surgeon, oral health technician, and oral health assistant). ****Type I (3 dental offices); Type II (4 to 6 dental offices); Type III (7 dental offices or more).

Results

Of the 5,565 Brazilian municipalities, 45 (0.8%) provided fixed orthodontic appliance therapy and 76 (1.4%) provided preventive/interceptive orthodontic therapy. The team coverage of most municipalities was ≥ 80% (FHT: 4373/78.6%; OHT: 3267/58.7%). There was a 1:1 ratio of OHT/FHT in 3577 (69.6%) municipalities and a 1:2 or more ratio in 1566 (30.4%) (Table 3). A total of 958 (17.2%) municipalities had one or more DSCs, most of which were type I (442/46.1%), 319 (5.7%) had pediatric dentists and 169 (3.0%) had orthodontists.

In the bivariate analyses, all investigated factors were associated with the outcomes except for region, which was not associated with providing fixed orthodontic appliance therapy (Table 3). Municipalities with > 11,638 inhabitants, a per capita GDP > USD 1,698.29 (1.2%), a health care budget > USD 6,234,900.34 and an HDI > 0.662 were associated with providing fixed orthodontic appliance and preventive/interceptive orthodontic treatment compared to smaller municipalities or those with lower per capita GDP, smaller health care budgets or lower HDIs. Municipalities with < 80% FHT and OHT coverage and/or an OHT/FHT ratio of 1:2 or more were negatively associated with both outcomes. Municipalities with a DSC, a type III DSC, pediatric dentists and/or orthodontists were more likely to provide fixed orthodontic appliance therapy and interceptive treatment. Those that offered interceptive treatment were more likely to offer fixed orthodontic appliance therapy. Those that provided fixed orthodontic appliance therapy were more likely to provide interceptive treatment.

In multivariate analysis municipalities with more than 11,638 inhabitants, a health care budget > USD 6,234,900.34 and a DSC were more likely to provide fixed orthodontic appliance therapy than the reference categories (Table 4). There was also a 19% higher likelihood of the outcome in municipalities with type III DSC. Provision of fixed therapy was 4% more likely in municipalities with pediatric dentists, 21% more likely in those with orthodontists, and 13% higher in those that provided preventive/interceptive orthodontic treatment than municipalities with a type I DSC, no pediatric dentist, no orthodontist, and no preventive/interceptive treatment. Likewise, municipalities with ≥ 80% FHT coverage were less likely to provide fixed orthodontic treatment than the reference categories.

Municipalities with > 11,638 inhabitants, a per capita GDP > USD 1,698.29, a health care budget > USD 6,234,900.34, a HDI > 0.662, and a DSC were more likely to provide preventive/interceptive orthodontic treatment than the reference categories (Table 5). Municipalities with type III DSCs and orthodontists had a 33% and 31% higher outcome likelihood, respectively, than those with type I DSCs and no orthodontists. Municipalities with pediatric dentists were also more likely to provide

Table 3. Factors associated with offering fixed orthodontic appliance therapy and preventive/interceptive orthodontic treatment.

				Municipalities that provide treatment			
Variables	*Categories*	*Total*	*%*	*Fixed %*	*P*	*Interceptive %*	*P*
All municipalities		5565	100	0.8		1.4%	
Sociodemographics							
Region	North	449	8.1	0.4	0.774*	0.7	0.019
	Northeast	1794	32.2	0.9		1.1	
	Southeast	1668	30.0	1.0		2.2	
	South	1188	21.3	0.7		1.0	
	Midwest	466	8.4	0.6		1.3	
Population	≤ 11,637	2783	50.0	0.0	0.000	0.0	0.000
	≥ 11,638	2782	50.0	1.6		2.7	
Per capita GDP	≤ 1,698.28	2783	50.0	0.4	0.001	0.5	0.000
	≥ 1,698,29	2782	50.0	1.2		2.3	
Health care budget#	≤ 6,234,900.33	2782	50.0	0.1	0.000	0.1	0.000
	≥ 6,234,900.34	2781	50.0	1.5		2.6	
HDI	≤ 0.661	2784	50.0	0.4	0.000	0.4	0.000
	≥ 0.662	2781	50.0	1.3		2.4	
Team coverage							
FHT coverage	< 80%	1192	21.4	2.3	0.000	3.9	0.000
	≥ 80%	4373	78.6	0.4		0.7	
OHT coverage	< 80%	2298	41.3	1.4	0.000	2.7	0,000
	≥ 80%	3267	58.7	0.4		0.5	
OHT/FHT ratio	≥ 1:2	1566	30.4	1.7	0.000	2.4	0.000
	1:1	3577	69.6	0.5		1.0	
Secondary care							
DSC	No	4607	82.8	0.0	0.000	0.1	0.000
	Yes	958	17.2	4.7		7.6	
DSC type	Type I	442	46.1	1.8	0.000	2.3	0.000
	Type II	402	42.0	3.2		5.5	
	Type III	114	11.9	21.1		36.0	
Pediatric dentists	No	5246	94.3	0.3	0.000*	0.5	0.000*
	Yes	319	5.7	8.8		16.0	
Orthodontists	No	5396	97.0	0.1	0.000*	0.3	0.000*
	Yes	169	3.0	23.1		35.5	
Provides interceptive treatment**	No	5489	98.6	0.4	0.000*	-	-
	Yes	76	1.36	28.9		-	
Provides fixed treatment***	No	5520	99.2	-	-	1.0	0.000*
	Yes	45	0.8	-		48.9	

*= Fisher's exact test (less than 5 cases expected); **= Provides preventive/interceptive treatment for the fixed appliance therapy outcome; ***= Provides fixed appliance therapy for the preventive/interceptive outcome. #Values in US dollars; DSC = dental specialty center; FHT = family health team; GDP = gross domestic product; HDI = municipal human development index; OHT = oral health team.

preventive/interceptive orthodontic treatment and fixed orthodontic appliance therapy. Finally, municipalities with FHT coverage ≥ 80% were less likely to offer preventive/interceptive treatment than the reference categories.

Discussion

Preventive orthodontic interventions can reduce government costs, as malocclusions tend to worsen over time. Skeletal and dental problems require treatments of medium and high complexity, which involve high costs (Cuozzo *et al.*, 2013; Sousa and Roncalli, 2017). These factors may represent barriers for developing countries to offer orthodontic treatment in their public health systems.

In Brazil, Ministerial Ordinance 718 provided for fixed orthodontic appliance and interceptive orthodontic procedures in the SUS network and allocated federal funding, although without specifying the amount to be contributed by states and municipalities. Although Ministerial Ordinance 718 has been in force for 10 years, this study found that only 0.8% of Brazilian municipalities provide fixed orthodontic appliance procedures and 1.4% provide preventive orthodontic procedures. It is estimated that the treatment needs of the Brazilian

Table 4. Multivariate analysis of factors associated with offering fixed orthodontic appliance therapy.

		Crude analysis		*Adjusted analysis*	
Variables	*Categories*	*PR*	*95% CI*	*PR*	*95% CI*
Sociodemographics					
Population	≤ 11,637	1.0		1.0	
	≥ 11,638	1.01	1.01-1.02	1.01	1.01-1.02
Per capita GDP	≤ 1,698.28	1.0		1.0	
	≥ 1,698,29	1.01	1.00-1.01	1.01	1.00-1.01
Health care budget*	≤ 6,234,900.33	1.0		1.0	
	≥ 6,234,900.34	1.01	1.01-1.02	1.01	1.01-1.02
HDI	≤ 0.661	1.0		1.0	
	≥ 0.662	1.01	1.00-1.01	1.01	1.00-1.01
Team coverage					
FHT coverage	< 80%	1.0		1.0	
	≥ 80%	0.98	0.97-0.99	0.98	0.98-0.99
OHT coverage	< 80%	1.0		1.0	
	≥ 80%	0.99	0.98-0.99	1.00	0.99-1.00
OHT/FHT ratio	≥ 1:2	1.0		1.0	
	1:1	0.99	0.98-1.00	0.99	0.99-1.00
Secondary care					
DSC	No	1.0		1.0	
	Yes	1.05	1.03-1.06	1.05	1.03-1.06
DSC type	Type I	1.0		1.0	
	Type II	1.01	0.99-1.03	1.01	0.99-1.03
	Type III	1.19	1.12-1.27	1.19	1.12-1.27
Pediatric dentists	No	1.0		1.0	
	Yes	1.08	1.05-1.12	1.04	1.01-1.08
Orthodontists	No	1.0		1.0	
	Yes	1.23	1.17-1.29	1.21	1.15-1.28
Preventive orthodontics provided	No	1.0		1.0	
	Yes	1.28	1.19-1.39	1.13	1.04-1.23

*Values in US dollars. 95% CI = 95% confidence interval; DSC = dental specialty center; FHT = family health team; GDP = gross domestic product; HDI = municipal human development index; OHT = oral health team; PR = prevalence ratio.

population for DFD (Brasil, 2004, 2012; Cuozzo *et al.*, 2013) are not being fully met, given the demand found in Brazilian epidemiological surveys (2003-2010) and Cleft Lip and Palate Treatment Centers (Sousa and Roncalli, 2017). Furthermore, the limited and unequal supply of orthodontic services in the SUS network results in social inequality and exclusion (Brasil, 2010b). Therefore, to provide the population with greater access to orthodontic procedures via SUS, the Ministry of Health should review the low investment described in Ministerial Ordinance 718 and included in the Table of Procedures, Medicines, Orthoses/Prostheses, and Special Materials (Ministério da Saúde, 2020a).

In multivariate analysis, social and demographic variables showed no or limited relationships with municipalities providing fixed orthodontic appliance and preventive orthodontic therapies via SUS. For example, municipalities with higher budgets were found to offer fixed orthodontic appliance (1%) and interceptive orthodontic (2%) procedures via SUS more often than those with lower health care budgets. This finding can be an indicator for health authorities to consider in planning oral health actions for the population. We found no research reports examining the association of sociodemographic factors and the structure of the service network with municipalities providing orthodontics. Also, many countries do not offer public services for the treatment of patients with cleft lip and/or palate, and the presence of orthodontics and other specialties is required to consolidate care for people with this type of anomaly (Alhammadi *et al.*, 2018).

Structural factors, such as having pediatric dentists, orthodontists, and higher-capacity DSCs (type III), increased the likelihood that orthodontics were provided in the public health network. Thus, municipal health care managers might hire pediatric dentists and orthodontists, in addition to creating DSCs with resources from the National Oral Health Policy to increase access to orthodontic treatment and consolidate oral health in the SUS network (Pucca *et al.*, 2015; Stein *et al.*, 2020). Such measures will support the treatment of DFD to improve the population's quality of life (Abreu *et al.*, 2016).

Municipalities that employ pediatric dentists have a 9% higher likelihood of offering preventive/interceptive treatment. This may be because their work involves preventing and treating childhood oral health problems,

Table 5. Multivariate analysis of factors associated offering preventive and interceptive orthodontic treatment.

		Crude analysis		*Adjusted analysis*	
Variables	*Categories*	*PR*	*95% CI*	*PR*	*95% CI*
Sociodemographic					
Region	North	1.00		1.00	
	Northeast	1.00	0.99-1.01	1.00	0.99-1.01
	Southeast	1.01	1.00-1.02	1.01	1.00-1.02
	South	1.00	0.99-1.01	1.00	0.99-1.01
	Midwest	1.01	0.99-1.02	1.01	0.99-1.02
Population	≤ 11.637	1.00		1.00	
	≥ 11.638	1.03	1.02-1.03	1.03	1.02-1.03
Per capita GDP	≤ 1,698.28	1.00		1.00	
	≥ 1,698,29	1.02	1.01-1.02	1.02	1.01-1.02
Health care budget*	≤ 6,234,900.33	1.00		1.00	
	≥ 6,234,900.34	1.02	1.02-1.03	1.02	1.02-1.03
HDI	≤ 0.661	1.00		1.00	
	≥ 0.662	1.02	1.01-1.03	1.02	1.01-1.02
Team coverage					
FHT coverage	< 80%	1.00		1.00	
	≥ 80%	0.97	0.96-0.98	0.97	0.96-0.98
OHT coverage	< 80%	1.00		1.00	
	≥ 80%	0.98	0.97-0.98	0.99	0.98-1.00
Proportion OHT/FHT	≥ 1:2	1.00		1.00	
	1:1	0.99	0.98-0.99	1.00	0.99-1.01
Secondary care					
DSC	No	1.00		1.00	
	Yes	1.08	1.06-1.09	1.08	1.06-1.09
DSC type	Type I	1.00		1.00	
	Type II	1.03	1.01-1.06	1.03	1.01-1.06
	Type III	1.33	1.24-1.42	1.33	1.24-1.42
Pediatric dentists	No	1.00		1.00	
	Yes	1.15	1.11-1.19	1.09	1.05-1.13
Orthodontists	No	1.00		1.00	
	Yes	1.35	1.28-1.42	1.31	1.24-1.38
Fixed orthodontic appliance therapy	No	1.00		1.00	
	Yes	1.47	1.34-1.63	1.18	1.06-1.31

*Values in US dollars. 95% CI = 95% confidence interval; DSC = dental specialty center; FHT = family health team; GDP = gross domestic product; HDI = municipal human development index; OHT = oral health team; PR = prevalence ratio.

including harmful habits and tooth loss (Boronat-Catalá *et al.*, 2017; Kolawole and Folayan, 2019). In addition, preventive and interceptive orthodontics are indicated for pediatric patients, who may or may not be treated at Cleft Lip and Palate Treatment Centers.

Preventive and interceptive orthodontics procedures can be performed by pediatric dentists or trained general practitioners (Guzzo *et al.*, 2014b), reducing the severity of or even eliminating DFD and optimizing public resources. Having orthodontists in the SUS network was closely linked to 21% greater likelihood for fixed orthodontic appliance therapy and 31% higher for interceptive orthodontics. In this context, the orthodontist can act as a mentor to other professionals, guiding pediatric dentists and general practitioners in less complex cases. In addition, orthodontists have the skills for correcting more complex DFD (Farronato *et al.*, 2012; Cuozzo *et al.*, 2013; Baram *et al.*, 2019; Alogaibi *et al.*, 2020).

This study was limited by a potential risk of information bias due to under- or overreporting in the health information systems, which were the sources for the outcome data. The risk of systematic error was reduced by standardizing the data collection process. The DATASUS platform has been used in other studies to assess the potential and limitations of strategies for diagnosis, treatment, and monitoring of DFD via SUS (Sousa and Roncalli, 2017, 2021).

The study contributes to the literature on oral health in the SUS, filling a knowledge gap and serving as a baseline for future investigations on orthodontics, as well as reinforcing the importance of the Health Surveillance Policy for planning and/or redesigning oral health actions. It shows how the National Oral Health Policy can promote quality of life, and that sociodemographic factors can greatly contribute to orthodontic treatment in the SUS network. The importance of SUS for the Brazilian

population is also clear, given that the institutionalization of oral health is a duty of the state and a collective right. Furthermore, this study is unprecedented within the scope of DFD, orthodontics, and SUS.

New studies are needed to consolidate these results and investigate other predictors of municipal provision of orthodontic and orthopedic treatment, as well as studies that analyze treatment history and are stratified by units, such as DSCs and Basic Health Units. Finally, given the profile of SUS orthodontic treatment, three management levels (municipal, state, and federal) are suggested, including annual budget reviews to expand the National Oral Health Policy and maximize its effectiveness as a public health policy endorsed by social control (represented by health councils).

In conclusion, fewer than 2% of Brazilian municipalities provide orthodontics through the SUS network. Sociodemographic factors such as per capita GDP, health care budget, and municipal HDI indicated a low likelihood that municipalities would provide orthodontic services. Structural factors linked to public policies, such as whether the municipality employed pediatric dentists and orthodontists and whether it had a type III DSC, increased the likelihood of municipalities providing orthodontic treatment via SUS. Thus, the National Oral Health Policy should be consolidated with systematic budget reviews to allow greater investment in oral health, strengthening its coverage and improving health care quality for patients with DFDs.

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