

# Primary Care Dentistry in Brazil

## From Prevention to Comprehensive Care

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**Abstract:** This cross-sectional study aimed to evaluate the association between sociodemographic characteristics, health care indicators, work process characteristics, and the performance of preventive dental procedures by oral health care teams (OHCTs) assessed during the first phase of the PMAQ in Brazil. A census of 10 334 primary OHCTs was conducted. The outcome included topical application of fluoride, application of sealants, detection of oral lesions, and monitoring of suspected or confirmed cases of oral cancer. The multilevel Poisson regression model was used to obtain crude and adjusted prevalence ratios. The performance of preventive dental procedures was 29.46% (3044/10 334; 95% confidence interval, 28.57-30.33), which was considered low.

**Key words:** *access, comprehensive dental care, dental health services, evaluation of health care, evaluation of health services, preventive dentistry, public oral health care, quality*

**T**HE CONTROL of oral disease depends on availability and accessibility of oral health systems, but disease risk reduction is possible only if services are oriented toward primary

health care and prevention. Clinical and public health research has shown that a number of individual, professional, and community preventive measures are effective in preventing most oral diseases. However, optimal intervention in relation to oral disease is not universally available or affordable because of escalating costs and limited resources. This, together with insufficient emphasis on primary prevention of oral diseases, poses a considerable challenge for many countries, particularly the developing countries and countries with economies and health systems in transition (World Health Organization [WHO], 2000).

Although common dental diseases are preventable, not all community members are informed of or are able to benefit from appropriate oral health-promoting measures, which is close to the inverse prevention law, since underserved population groups are found in both developed and developing countries. In many countries, moreover, oral health care is not fully integrated into national or community health programs (WHO, 2000).

In Brazil, starting in 2000, a model based on the inclusion of dentistry in primary health care brought new possibilities for approaches

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and structuring of work processes owing to the incorporation of characteristics including user reception, continuity of care, and the presence of multiprofessional teams. This approach allowed the creation of strategies to improve the quality of life via prevention, promotion, and recovery of health (Ministério da Saúde, 2004).

Relevant studies have shown the benefits of this care model on health indicators more than a decade after its implementation. Macinko et al. (2006) and Aquino et al. (2009) have reported that the primary health care model adopted in Brazil, namely, the Family Health Strategy, helps decrease infant mortality rates and health inequalities.

In contrast with these findings on child mortality, the authors such as Souza and Roncalli (2007) and Pereira et al. (2012) concluded that most Brazilian cities have made little or no progress in the oral health care model. These contradictory results question whether this phenomenon is related to the work processes or to the care model (Pereira et al., 2012; Souza & Roncalli, 2007). In addition, a wide variation in the provision of dental services has been observed, raising concerns about the adequacy of care offered to users (Brennan & Spencer, 2005).

In 2011, the Ministry of Health launched the National Program for Improvement of Access and Quality of Primary Health Care (PMAQ-AB) aimed at promoting expansion of the management capacity of the Unified Health System (SUS) and increasing the availability and quality of primary health care services, considering the health needs of the population. The PMAQ-AB has provided additional financial resources to the participating municipalities, and the receipt of these benefits is conditioned to the achievement of access and quality standards. The participation of the municipalities involves the phases of joining and contracting, development, external evaluation, and recontracting. The PMAQ-AB completed the first phase of evaluation in August 2012 and established the concept of health evaluation in Brazil, particularly in the context of the Family Health Strategy, which is the predominant primary health care model in the SUS (Barreto, 2015).

This study went a step further by establishing a correlation between the current policies used to evaluate health care services in Brazil and scientific evidence for assessing the process of constructing these policies. The development of evidence-based health policies helps ensure that decision making will be based on the best research evidence available, although we acknowledge that several other factors affect the formulation of policies for assessing health services (Shroff et al., 2015).

Therefore, this study aimed to evaluate the association between sociodemographic characteristics, health system indicators in Brazilian municipalities, work processes, and performance of preventive dental procedures by oral health care teams (OHCTs) assessed during the first phase of the PMAQ-AB in Brazil.

## MATERIALS AND METHODS

### Study design and source data

This cross-sectional and exploratory study collected multicenter data from 17 479 primary care teams across Brazil. The PMAQ-AB was joined and sanctioned by 3972 Brazilian municipalities (71.3%). This program evaluated infrastructure and environmental conditions in all the basic health units (38.811%-100%), analyzed 17 479 primary health care teams (of which 12 403 contained OHCTs), and interviewed 65 700 users in all regions of Brazil.

Data on the health care team were obtained by an external evaluation conducted during the first phase of the PMAQ-AB. Secondary data related to the participating Brazilian municipalities were collected from the Brazilian Institute of Geography and Statistics (Instituto Brasileiro de Geografia e Estatística [IBGE], 2016) and the Performance Index of the Unified Health System (Índice de Desenvolvimento do Sistema Único [IDSUS], 2016).

### Study census

The present study involved 10 334 OHCTs, corresponding to 83.3% of the 12 403

OHCTs evaluated in Brazil, as shown in Figure 1.

### Status of the OHCTs and data collection

According to the methodological notes of the PMAQ-AB, the program was organized into 4 complementary phases, which formed a continuous development cycle of processes aimed at ensuring greater access and quality of primary health care (Nota metodológica PMAQ, 2013).

These phases comprised (1) joining and contracting of the program by each municipality; (2) development of training programs for work and management processes; (3) external evaluation of the results of primary health care teams and managers; and (4) recontracting of the program to improve the indicators of health quality and encourage systematization of the evaluation made by the PMAQ-AB (Nota metodológica PMAQ, 2013).

The third phase of the PMAQ-AB was the external evaluation. To operationalize this phase, the Ministry of Health gained the support of education and research institutions that visited the primary health care teams and applied evaluation instruments with qual-

ity criteria established according to the standards, protocols, principles, and guidelines that consolidate actions and practices, as well as current technical and scientific knowledge, considering the competence of the participants (Nota metodológica PMAQ, 2013).

The external evaluation in the first phase of the PMAQ-AB was organized into 3 modules: (I) assessment of primary health care units; (II) interviews with primary health care teams and verification of documents; and (III) interviews with users of primary health care services to assess their satisfaction and conditions of access and use of health services.

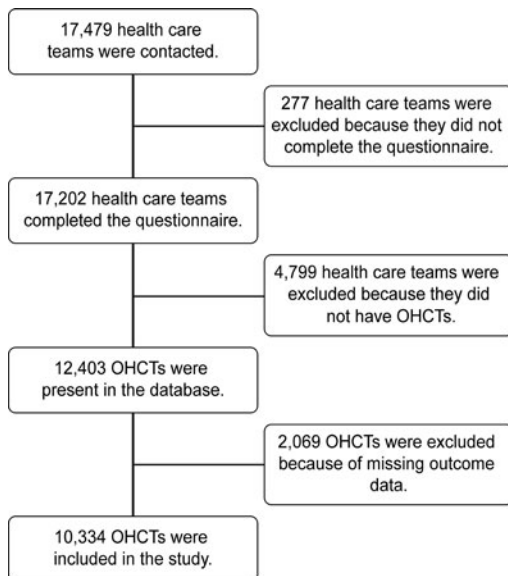
The data from this study refer to module I evaluations, where infrastructure conditions were assessed in all primary health care units in Brazil, and module II, which was answered by health care professionals using interviews and the verification of documentation on-site; a total of 12 403 OHCTs were evaluated. For this study, the census data of the OHCTs that joined the PMAQ-AB were analyzed.

The evaluation instruments were applied between May and December 2012. For fieldwork, external evaluators were selected and trained consistently using a field manual prepared by the Department of Primary Health Care (Departamento de Atenção Básica) of the Ministry of Health and teaching and research institutions that partnered with the PMAQ-AB. Notably, the evaluation instruments were produced by consensus among researchers and were previously tested (Nota metodológica PMAQ, 2013).

For data collection, the evaluators used portable tablet computers. Upon completion of the external evaluation, the data were sent electronically to a Ministry of Health server to be validated and were then input into the PMAQ-AB database.

### Study variables

The dependent variable of this study was the performance of all preventive dental procedures present in module II of the external evaluation instrument of the PMAQ-AB. For this purpose, a variable based on the topical application of fluoride, application of sealants, detection of oral lesions, and monitoring of suspected or confirmed cases of



**Figure 1.** Flowchart of inclusion and exclusion of oral health teams in the study. OHCT indicates oral health care team.

mouth cancer was created. The outcome was dichotomized among the health teams that performed or did not performed all of the aforementioned preventive procedures.

The independent variables were divided into 2 groups: contextual variables and variables related to the OHCT.

The evaluations at the contextual level addressed sociodemographic characteristics and characteristics of the health system of the municipalities evaluated by the PMAQ-AB. The sociodemographic variables included the macro region, population size of each municipality, and human development index (HDI). The following indicators were used to evaluate the health care system: oral health coverage, percentage of hospitalizations sensitive to primary health care (HSPHCs) (Brasil Ministério da Saúde, 2008), average ratio of collective action of supervised toothbrushing, and percentage of tooth extractions among the dental procedures selected.

It highlights here that these indicators were listed from the IDSUS, which publishes a number of health indicators, seeking to make a contextualized measurement of performance of the SUS of compliance with its principles and guidelines (IDSUS, 2016).

For a description of the macro regions, the classification of the IBGE was used: Northeast, North, Midwest, South, and Southeast (IBGE, 2016). The population size of each municipality was classified into fewer than 5000 inhabitants, between 5000 and 10 000 inhabitants, between 10 000 and 50 000 inhabitants, between 50 000 and 100 000 inhabitants, between 100 000 and 500 000 inhabitants, and more than 500 000 inhabitants, following the parameters adopted for PMAQ-AB certification (Nota metodológica PMAQ, 2013). The HDI was classified as low ( $\leq 0.62$ ), intermediate (between 0.62 and 0.70), and high ( $> 0.70$ ) (PNUD, n.d.), following the tertile distribution. Oral health coverage was categorized into small municipalities (with up to 4000 inhabitants) assigned to an OHCT and into larger municipalities, following the IDSUS parameters (IDSUS, 2016). For the remaining indicators, the parameters listed in the IDSUS (2016) were used as follows: 28.6% of HSPHCs rela-

tive to all clinical admissions; ratio between the average number of residents who participated in the collective action of supervised toothbrushing during the year and the population of a given municipality (8 residents per 100 inhabitants); and the percentage of dental extractions of residents in a given municipality and year (8% of tooth extractions). The last indicator, in particular, was used to demonstrate that the range of action covers a larger number of preventive and curative procedures; therefore, the lower the percentage of this indicator, the higher the quality of care provided by primary care dental services. These indicators were classified as above or below the values shown earlier.

The OHCTs were evaluated by considering the following variables: presence of dental care supplies (cements and sealants), user reception, user reception based on risk and vulnerability assessment, continuity of care, performance of home visits by dentists, and type of OHCT.

For the study of variables related to the availability of dental care supplies, cements and sealants were categorized as available or unavailable. User reception was defined by the question: "Is there welcoming of spontaneous demand specific to oral health? Yes or No." The user reception was evaluated by the question: "Is the offer defined according to the risk identified? Yes or No." The presence or absence of continuity of care was evaluated by the question: "Does the team ensure the provision of continued care for users who initiate treatment?" The performance of home visits was identified by the question: "Which team members perform home care?" where dentists should be indicated as one of the professionals involved. Furthermore, the type of OHCT was assessed using a question on the "minimum number of primary health care professionals" in which dentists (Ds), dental technicians (DTs), and dental assistants (DAs) should be identified, and this variable was categorized as "Ds and DTs are not available," "at least one DA from type I OHCT is available," and "DTs and DAs from type II OHCT are available," according to the legislation in force (Brasil Ministério da Saúde, 2012).

The independent variables related to the characteristics of the health care team and available dental care supplies were identified using modules I and II of the external evaluation instrument of the PMAQ-AB (Ministério da Saúde, 2012).

### Data analysis

The hierarchical approach was used as a reference in this study to evaluate the association between contextual variables of sociodemographic and health system characteristics, as well as the characteristics of the OHCTs and available dental care supplies, following the hierarchical analysis proposed by Fuchs et al. (1996), as shown in Figure 2. The choice of a study with a multilevel analytical approach has to address the particularities of the Brazilian Health System, whose financial management and management of work processes in primary care take place at the municipal level.

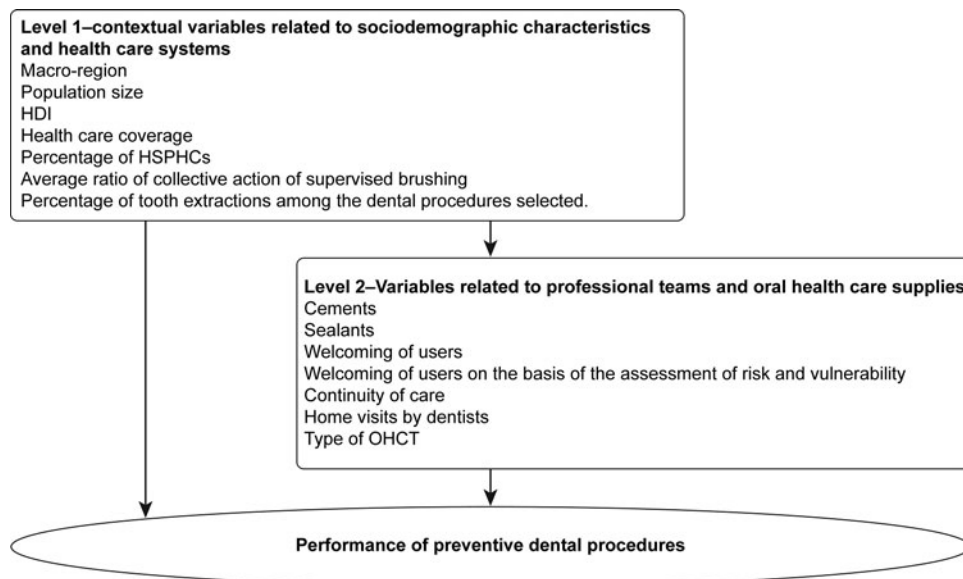
The contextual variables and those related to the OHCT were initially described using absolute and relative frequencies. Multilevel analysis was used to evaluate the association

between the variables and the outcome with the adjustment for confounding factors for the independent variables at each level of analysis (Bastos et al., 2015 Fuchs et al., 1996; Rabe-Hesketh & Skrondal, 2008). A multilevel Poisson regression model (*xtpoisson* command, with the subcommand *re* for random effects) was used to determine the crude and adjusted prevalence ratios (PRs) and their respective 95% confidence intervals (CIs) at a level of significance of 5%.

Crude analyses were initially performed at each level (contextual and health teams). For the adjusted analysis, the contextual variables at  $P < .10$  were considered adjustment factors or controls for confounding factors for the variables related to health teams. The variables with  $P < .05$  were considered associated with the outcome. Stata software (version 11) was used for data analysis.

### Ethical considerations

This study was registered under protocol no. 21904 and approved by the Research Ethics Committee of the Federal University of Rio Grande do Sul.



**Figure 2.** Hierarchical approach to evaluate the association between contextual variables of sociodemographic and health system characteristics, as well as the characteristics of the OHCTs and available dental care supplies. HDI, human development index; HSPHC, hospitalizations sensitive to primary health care; and OHCT, oral health care team.

## RESULTS

The analysis of the prevalence of the performance of preventive dental procedures, classification of the outcome from the topical application of fluoride and sealants, detection of oral lesions, and monitoring of suspected or confirmed cases of oral cancer indicated that among the 10 334 OHCTs assessed, 29.46% (3044/10 334) (95% CI, 28.57-30.33) performed all the preventive procedures.

The prevalence of preventive dental procedures was higher in the South (37.5%) and Southeast regions (37.3%) than in the other regions. Moreover, the prevalence of the outcome was higher in cities with more than 500 000 inhabitants (44.8%), in cities with an HDI higher than 0.7 (38.9%), and in cities with oral health coverage of up to 4000 inhabitants per team (32.4%).

In addition, the prevalence of the outcome was higher when the percentage of HSPHCs was less than 28% (39.9%), when the average collective action of supervised toothbrushing was 8 residents or more per 100 inhabitants (34.5%), and when the percentage of tooth extractions among the selected procedures was less than 8% (35.4%) (Table 1).

The analysis adjusted for contextual variables of sociodemographic and health care system-related characteristics indicated that the prevalence of the outcome in the Southeast region was 59% higher than that in the North region (PR = 1.59; 95% CI, 1.26-2.01;  $P < .001$ ). With regard to population size, the prevalence of the outcome in cities with more than 500 000 inhabitants was 1.40 times higher than that in cities with fewer than 5000 inhabitants (PR = 1.40; 95% CI, 1.05-1.87;  $P .022$ ). The prevalence of the outcome was 62% higher in towns with HDI greater than 0.7 than in towns with HDI less than 0.62 (PR = 1.62; 95% CI, 1.35-1.96;  $P = .001$ ). Among the variables related to the health care system, the probability of completing preventive dental procedures was 16% higher (PR = 1.16; 95% CI, 1.04-1.28;  $P = .005$ ) and 26% higher (PR = 1.26; 95% CI, 1.11-1.44;  $P < .001$ ), respectively, in the municipalities with an

HSPHC percentage less than 28% and in those with an average ratio of collective action of supervised toothbrushing was 8 residents or more per 100 inhabitants (Table 1).

With regard to the variables of the health care team and dental care supplies, the prevalence of the outcome was higher in cases in which cement was available (30.5%), sealants were available (34.7%), referrals were accepted (32.0%), referrals were evaluated on the basis of the assessment of risk and vulnerability (32.2%), continuity of care was adopted (32.0%), home visits were conducted (37.2%), and both OHCT types were present (42.1%) (Table 2).

In the hierarchical analysis, after adjustments, among the factors related to the health team, the prevalence of the outcome in cities with user reception was 61% higher than that in cities that did not perform user reception (PR = 1.61; 95% CI, 1.38-1.88;  $P = .001$ ). The performance of home visits by dentists and implementation of continuity of care increased the probability of the outcome by 66% and 56%, respectively (PR = 1.66; 95% CI, 1.52-1.81;  $P < .001$ ; and PR = 1.56; 95% CI, 1.32-1.84;  $P < .001$ ). The OHCT type also influenced the outcome. The prevalence of the outcome when the OHCT had DA and type II OHCT was 1.42 times higher than in cases in which DAs or DTs were not available (PR = 1.42; 95% CI, 1.13-1.80;  $P = .003$ ) (Table 2).

The deviance in the empty model (without the independent variables) was -6612.66, and this value decreased to -6069.266 in the multivariate analysis.

## DISCUSSION

The unprecedented nature and relevance of this study are notable, considering that the global oral health care program of the WHO has given visibility to the strategic role of oral health in the agenda of public health policies across the globe and has emphasized the importance of an integrated approach for disease prevention. In addition, the risk factors of oral diseases are present in other serious chronic diseases and noncommunicable diseases and can be addressed via integration of

**Table 1.** Description of the Study Sample, Prevalence of Preventive Dental Procedures, and Crude and Adjusted PRs for Contextual Variables Related to Sociodemographic Characteristics and Health Care System in Brazil in 2012 (N = 10 344)

<b>Variable</b>	<b>n (%)</b>	<b>Prevalence of Preventive Procedures (95% CI)</b>	<b>Crude PR (95% CI)</b>	<b>Model 1<sup>a</sup> Adjusted PR (95% CI)</b>	<b>P<sup>b</sup></b>
<b>Macro region</b>					
North	659 (6.38)	17.9 (14.9-20.8)	1.0	1.0	
Northeast	4016 (38.86)	22.4 (21.2-23.8)	1.23 (0.99-1.53)	1.38 (1.10-1.73)	.006
Midwest	739 (7.15)	24.9 (21.8-28.0)	1.42 (1.08-1.85)	1.15 (0.87-1.53)	.312
Southeast	3263 (31.58)	37.3 (35.6-39.0)	2.07 (1.66-2.58)	1.59 (1.26-2.01)	<.001
South	1657 (16.03)	37.5 (35.3-39.9)	1.94 (1.55-2.45)	1.46 (1.14-1.88)	.003
<b>Population size</b>					
≤5000	754 (7.30)	28.6 (25.4-31.9)	1.0	1.0	
>5000 to ≤10 000	1027 (9.94)	23.4 (20.8-26.0)	0.82 (0.67-0.99)	0.93 (0.76-1.12)	.446
>10 000 to ≤50 000	4326 (41.86)	24.4 (23.1-25.6)	0.83 (0.72-0.97)	0.96 (0.82-1.13)	.632
>50 000 to ≤100 000	1232 (11.92)	28.0 (25.5-30.5)	0.96 (0.79-1.16)	0.99 (0.80-1.22)	.936
>100 000 to ≤500 000	1650 (15.97)	35.4 (33.1-37.8)	1.21 (1.01-1.45)	1.10 (0.89-1.36)	.382
>500 000	1345 (13.02)	44.8 (42.2-47.5)	1.66 (1.25-2.20)	1.40 (1.05-1.87)	.022
<b>HDI</b>					
≥0.62	2635 (25.50)	18.8 (17.3-20.3)	1.0	1.0	
0.6201-0.700	2816 (27.25)	23.0 (21.5-24.6)	1.23 (1.09-1.40)	1.14 (0.99-1.32)	.068
>0.70	4883 (47.25)	38.9 (37.6-40.2)	2.02 (1.80-2.26)	1.62 (1.35-1.96)	<.001
<b>Oral health care coverage</b>					
>4000	4089 (39.57)	25.0 (23.7-26.3)	1.0	1.0	
≤4000	6245 (60.43)	32.4 (31.2-33.5)	1.15 (1.04-1.26)	0.92 (0.82-1.03)	.152
<b>Percentage of HSPHCs</b>					
≥28%	7402 (71.64)	25.3 (24.3-26.3)	1.0	1.0	
<28%	2930 (28.36)	39.9 (38.1-41.7)	1.45 (1.31-1.60)	1.16 (1.04-1.28)	.005

*(continues)*

**Table 1.** Description of the Study Sample, Prevalence of Performance of Preventive Dental Procedures, and Crude and Adjusted PRs for Contextual Variables Related to Sociodemographic Characteristics and Health Care System in Brazil in 2012 (N = 10,344) (Continued)

Variable	n (%)	Prevalence of Preventive Procedures (95% CI)	Crude PR (95% CI)	Model 1 <sup>a</sup> Adjusted PR (95% CI)	P <sup>b</sup>
Average collective action of supervised toothbrushing					
<8	9311 (90.12)	28.9 (28.0-29.9)	1.0	1.0	
≥8	1021 (9.88)	34.5 (31.5-37.4)	1.35 (1.17-1.54)	1.26 (1.11-1.44)	<.001
Percentage of tooth extractions among the selected procedures					
≥8%	4993 (48.33)	23.1 (21.9-24.2)	1.0	1.0	
<8%	5339 (51.67)	35.4 (34.1-36.7)	1.45 (1.33-1.59)	1.07 (0.97-1.19)	.158

Abbreviations: HDI, human development index; HSPHC, hospitalizations sensitive to primary health care; OHCT, oral health care team; PR, prevalence ratio.

<sup>a</sup>Model 1: Only the contextual variables related to sociodemographic characteristics and the health care system were included in the model.

<sup>b</sup>Refers to the adjusted PRs.

the oral health care within public health systems (WHO, 2016).

At the contextual level, these findings show that Brazil historically has an exclusionary development model, which promotes the concentration of political, economic, and social resources and consequently increases the historically evidenced social disintegration and health inequities in the 5 geographical regions of Brazil (Rocha et al., 2014).

In this context, critical problems identified approximately a decade ago by the Commission on Social Determinants of Health ([Comissão Nacional sobre Determinantes Sociais da Saúde], 2008) affect social development and health policies and can contribute to the unequal distribution of preventive procedures performed by oral primary health care teams in this study.

The current literature has advanced in the construction of explanatory models that evaluate the relationship between the way society is organized and developed and the health status of the population to thereby understand the correlation between socioeconomic macro indicators (eg, HDI) of society and health indicators. Herein, we emphasize the association of Southeast and South regions and an HDI higher than 0.70 with the performance of preventive dental procedures, which shows that the most important factor to explain the general health status in a country is not its total wealth but the way the wealth is distributed (Buss & Pellegrini Filho, 2006; De Vito et al., 2016).

A recent study conducted in Italy reported a low level of attention to health inequalities in the regional planning of prevention activities in Italy. Regional inequality in Italy seems to be associated with a lower expenditure on health care in relation to the regional Gross Domestic Product and a higher level of social capital in the region. In addition, the authors found that projects that address health inequalities are highly focused on prevention in high-risk groups (De Vito et al., 2016).

Our results indicate that primary health care in Brazil is a social construction and should advance continuously to develop a health care model capable of solving



**Table 2.** Description of the Study Sample, Prevalence of Performance of Preventive Dental Procedures, and Crude and Adjusted PRs for the Variables Related to the OHCT and Dental Care Supplies in Brazil in 2012 (N = 10 344)

<b>Variable</b>	<b>n (%)</b>	<b>Prevalence of Preventive Procedures (95%)</b>	<b>Crude PR (95% CI)</b>	<b>Model 1<sup>a</sup> Adjusted PR (95% CI)</b>	<b>P<sup>b</sup></b>
<b>Cements</b>					
Unavailable	891 (8.62)	18.2 (15.6-20.7)	1.0	1.0	
Available	9441 (91.38)	30.5 (29.6-31.4)	1.51 (1.28-1.78)	0.99 (0.84-1.18)	.955
<b>Sealants</b>					
Unavailable	2834 (27.43)	15.6 (14.3-16.9)	1.0	1.0	
Available	7498 (72.57)	34.7 (33.7-35.8)	2.04 (1.84-2.27)	1.78 (1.60-1.99)	<.001
<b>User reception</b>					
No	1392 (13.47)	13.6 (11.8-15.4)	1.0	1.0	
Yes	8942 (86.53)	32.0 (31.0-32.9)	2.17 (1.87-2.52)	1.61 (1.38-1.88)	<.001
<b>User reception on the basis of assessing risk and vulnerability</b>					
No	1646 (15.93)	14.7 (13.0-16.5)	1.0	1.0	
Yes	8688 (84.07)	32.2 (31.2-33.2)	2.04 (1.78-2.33)	1.56 (1.36-1.79)	<.001
<b>Performed continued care</b>					
No	1331 (12.88)	12.7 (10.9-14.6)	1.0	1.0	
Yes	9003 (87.12)	32.0 (31.0-32.9)	2.31 (1.97-2.70)	1.56 (1.32-1.84)	<.001
<b>Home visits were performed by dentists</b>					
No	4327 (41.95)	18.8 (17.6-20.0)	1.0	1.0	
Yes	5988 (58.05)	37.2 (36.0-38.4)	1.81 (1.66-1.98)	1.66 (1.52-1.81)	<.001
<b>Type of OHCT</b>					
DAs and DTs were not available	413 (4.10)	20.3 (16.4-24.2)	1.0	1.0	
Type I teams	8299 (82.34)	27.8 (26.8-28.7)	1.34 (1.07-1.69)	1.22 (0.98-1.53)	.074
Type II teams	1367 (13.56)	42.1 (39.5-44.7)	1.71 (1.34-2.18)	1.42 (1.13-1.80)	.003

Abbreviations: DA, dental assistant; DT, dental technician; OHCT, oral health care team; PR, prevalence ratio.

<sup>a</sup>Model 2: Contextual variables with P < .010 of model 1 combined with the variables related to the OHCT and dental care supplies.

<sup>b</sup>Refers to the adjusted PRs.

problems and providing continuous, proactive, and integrated health care actions for the achievement of a comprehensive model (Mendes, 2010). An analysis of health care systems on an international level indicates that these systems are fragmented and focused on the care of acute conditions and exacerbations of chronic diseases without focusing on preventive care (De Vito et al., 2016; Jakab, 2012).

Moreover, in countries such as Canada and Australia, scientific evidence has indicated the urgent need for public health managers to acknowledge the importance of programs focused on the structural determinants of health. In these countries, government prevention efforts are often focused on individual behaviors related to chronic diseases and not on the socioeconomic and cultural factors that lead to such behaviors and, ultimately, to the development of diseases (Baum & Fisher, 2011; Gore & Kothari, 2013).

In addition to the contextual variables addressed in this study, variables related to the level of OHCTs should be considered. Our results indicate that the teams that contain DAs and DTs and use sealants, those that do user reception and do so on the basis of assessing risk and vulnerability, those that provide continued care, and those whose dentists perform home visits showed a statistically significant association with the performance of preventive procedures.

A wide variation in the provision of dental services has been observed in Brazil, which raises concerns about the adequacy of care provided to users (Brennan & Spencer, 2005). Some authors, including Pitts (2004), suggest that welfare management is the state of the art in health care in some communities. The concept is an attempt to ensure that preventive care is optimized by early intervention and generates understanding and motivation to optimize and maintain health rather than suffering from an illness and its consequences. In the management of welfare, which is the philosophy that supports the outcome of this study, changes in the provision of dental care are necessary for the clinical management of oral diseases. Therefore, treat-

ment should be based on a complete diagnostic evaluation, which would help professionals and patients to take shared responsibility for individualized and preventive approaches for managing diseases throughout life (Pitts, 2004).

These theoretical aspects seem to explain why the independent variables found at the level of OHCTs, that is, user reception and doing so on the basis of assessing risk and vulnerability, provision of continued care, and performance of home visits by dentists, were positively associated with the outcome.

In recent years, Brazil has experienced a considerable expansion of the coverage of OHCTs and changes in the epidemiological profile of oral diseases. Notwithstanding these improvements, efforts are necessary to reduce inequalities in access to health services, improve care, and use epidemiology for planning oral health practices. At the primary level of attention, actions aimed at health promotion and protection at the individual or collective level and health recovery actions on an individual basis encompass from diagnosis to treatment of diseases (Calvo et al., 2012; Rocha & Goes, 2008).

In this sense, Goes and Figueiredo (2012) identified gaps in the assessment of public services that offer dental treatments in Brazil, and this lack of information hinders evaluations intended to improve the quality of oral health services provided to the population.

This study mainly deals with the importance of distinct structure and process variables on the provision of preventive care. It is important to note that the PMAQ-AB was developed as a program that aims to increase access and leads to the provision of better quality care, including oral health. Identifying aspects related to the available structure and working process adopted by oral health teams, which are fundamental for providing prevention and oral health promotion, is central to the implementation of management actions that are appropriate to the needs of oral health services. Finally, these findings may induce more effective preventive policies.

In fact, in the first PMAQ-AB cycle, attended the health teams that joined voluntarily to the

program, which may indicate that these teams were teams with better performance and better work processes; therefore, probabilistic sampling was not performed for teams that self-reported the performance of preventive procedures listed in the outcome. Moreover, the PMAQ-AB, has among its inherent limitations, the fact of being an instrument of mixed responses, in which some items were self-reported and others were assessed through on-site verification. The presence of this bias may limit the interpretation of prevalence, and the result may be overestimated; therefore, taking into account these limitations, the performance of preventive actions in Brazil can be even lower.

Furthermore, several interviewers conducted the external evaluation, and although they received training, this procedure may have led to information bias in the study. Besides these limitations, some important explanatory variables for the provision of oral health prevention and promotion were not addressed, including availability of fluoride varnishes and supplies needed to carry out oral cancer screening. Thus, results are prone to bias and this needs to be accounted for when interpreting findings.

The strength of this study, other than to evaluate oral health services, was to understand the preventive oral health strategies in primary health care and then to produce evidence capable of improving these strategies. Furthermore, multilevel studies incorporate sociodemographic contextual variables and therefore can expand the scope of the PMAQ-AB and evaluate health services and teams to improve quality.

Regarding the level of independent variables related to the characteristics of the OHCTs and dental care available supplies, the results demonstrate that they are available to most OHCTs. A study in India noted that all the health centers that provided dental services possessed basic equipment both for identification of common oral diseases and for carrying out dental extractions and restorations, but preventive programs were not the focal point of the services provided (Simon et al., 2014). In contrast, an African study showed

that dental materials and equipment availability, skills of the practitioners, and the cost of services all play major roles toward provision and utilization of comprehensive oral care (Nyamuryekunge et al., 2015). It is likely that these factors are all interlinked and should be taken into consideration when studying any of the factors individually.

A recent systematic review aimed to identify the challenges for universal health coverage focused on the health workforce and to understand the role of humanization practices in primary health care. The results showed that it is necessary to overcome difficulties such as fragmented concepts of health and care and invest in multidisciplinary teamwork, community empowerment, and user reception to promote quality of life and universal health coverage (Schweitzer et al., 2016). The user reception and the user reception based on risk and vulnerability assessment make the health service user centered and lead to the reorganization of the work process such that its central thrust is shifted from the physician to the multiprofessional staff in charge of hearing users and becoming involved in solving their health problems (Franco et al., 1999).

Primary care providers have frequent contacts with families, providing opportunities to incorporate oral health promotion and prevention in nondental settings. Components of such an approach include screening, risk assessment, oral health counseling, and fluoride varnish application. Current research indicates that oral health counseling, particularly motivational interviewing, and fluoride varnish applied in the nondental setting positively affect patient outcomes and reduce costs related to the prevention of tooth decay (Douglass & Clark, 2015).

With regard to the important health care device represented by home visits, the findings of recent epidemiological studies emphasize the need to organize dentists' home visits in order to increase equality in the use of dental health care services (Komulainen et al., 2012). Next to the evidence demonstrated by the PMAQ-AB on home care in oral health in Brazil, the majority of Malaysian government dentists had not been involved in providing

domiciliary care for elderly patients, for example (Akmal et al., 2014).

Based on the foregoing, the availability of dental supplies and the characteristics of the OHCT work process play an essential role from prevention to comprehensive care.

Moreover, this study had the contribution of several theories, such as that of Lamarca and Vettore (2013), which referred to the “inverse prevention law,” a condition in which individuals more in need of benefiting from preventive interventions at the collective level are the least likely to receive them. That is, efficient and cost-effective interventions are more accessible to the most privileged social groups (those with a low risk of diseases) than they are to disadvantaged groups (those with a high risk of diseases), leading to an increase in social inequalities in health (Lamarca & Vettore, 2013). This hypothesis was confirmed by this study. To the best of our knowledge, no previous studies have confirmed this hypothesis for oral health.

Therefore, although the poorest communities have a greater need for curative and preventive health care, these, in general, do not benefit from health programs that depend on an equitable distribution of macro-contextual components related to living conditions. When these actions become available to the poorest communities, the benefits are very limited and do not meet their needs (Lamarca & Vettore, 2013).

Lorenc et al. (2012) performed a systematic review and observed that some types of interventions are more likely to increase inequality whereas others have the potential to decrease inequalities. In fact, downstream interventions do not appear to reduce social

inequities in health but rather can increase them, generating concerns about the interventions, including their effectiveness and type of services provided, as well as access, funding, and surveillance in health (Lorenc et al., 2012).

Furthermore, herein we emphasize the association between the process of knowledge production and the decision-making process for health policies and programs, which should be based on knowledge and scientific evidence. The collaboration between health research and health policies to promote comprehensiveness of care does not indicate the depoliticization of policy decisions on behalf of a centralizing rationality based on scientific evidence (Buss & Pellegrini Filho, 2006; Rocha et al., 2014).

## CONCLUSION

This study aimed to explore the unequal distribution of preventive dental procedures in Brazil, as well as their conditions and the effect of contextual variables on these inequalities, particularly in relation to macro-regional differences.

Health promotion aimed at confronting the intra- and interregional inequalities can strengthen the doctrinal and organizational principles of the SUS and improve the comprehensiveness of oral health care.

Therefore, the following strategies should be implemented: integrate oral health care in primary care systems, implement mechanisms for interprofessional collaboration, develop community-based prevention, and stimulate the promotion of oral health care by health care professionals.

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