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Oral health condition and the use of dental services among the older adults living in the rural area in the south of Brazil

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Abstract *Objectives: To evaluate the oral health, the use of dental services and associated factors among individuals aged 60 years, or more, living in the rural area. Method: This is a population-based, cross-sectional study carried out in the rural area of a medium-sized municipality in the extreme south of Brazil. The outcome was to have used dental services in the 12 months before the date of the interview. The analysis included a description of the sample, prevalence of the use of dental services for each category of independent variables and multivariate analysis through Poisson Regression. Results: In total, 1,030 older adults were interviewed, of which 49.9% were totally edentulous patients, and 13.9% had dental visits in the last year. The probability of visits was higher in females, with a partner, higher schooling, of the highest economic levels and that reported some oral health problem. On the other hand, elderly who reported being former smokers or were current smokers had fewer visits. Conclusions: Health planning should be reorganized to prioritize population groups with more significant difficulties in the use of dental services.*

Key words *Dental services, Oral health, Elderly, Rural population, Dental care*

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Introduction

Although Brazilian population aging requires greater health care, the existing services did not adequately meet the needs of seniors. It is believed that dental visits are unnecessary for this age group due to the high rates of edentulism[1,2]. This context can be attributed to a care model that for a long time was focused on mutilating practices and resulted in poor oral health, and dental services do not consider this group a priority[2-4].

The use of dental services through early interventions and frequent and periodic follow-ups brings several benefits to oral health, with enabling actions aimed at health promotion, prevention, diagnosis, treatment and rehabilitation[2,5-7]. Several factors lead to seeking medical or dental visits, including demographic, economic, educational, psychological characteristics, morbidity profiles, as well as patterns of popular culture and traditions that may be affected by current health policies and the characteristics of the health system[7-9].

Public dental services were reorganized and improved with the implementation of the National Oral Health Policy to change the reality of the oral health condition of Brazilians. The combination of guidelines and actions at the individual and collective levels, encompassing the insertion and expansion of oral health at all levels of care in the Unified Health System (SUS) facilitated access to dental procedures that were previously exclusive to the private sector[10-12]. However, comparing the last two national epidemiological surveys, namely, the National Oral Health Surveys conducted in 2003 and 2010 (SBBrasil), even with the significant improvement of the DMFT (decayed, missing and filled teeth) rate in the young population, among the elderly from 65 to 74 years of age, this rate practically remained unchanged, reaching 27.5 teeth in 2010, whereas in 2003, the average was 27.8 teeth, mostly corresponding to "extracted" or "missing"[13,14]. This dental loss of older adults is unfortunately still popularly seen as part of the aging process, not as a shortcoming of public policies, which are not geared toward the adult population so that it can reach senility with its natural teeth[15].

Besides Brazilian oral health care having been historically restricted to a limited range of dental procedures provided in large urban centers, which present a higher concentration of public and private health services, Brazilian rural areas have worse indicators of income, basic sanitation, and schooling levels[12,16]. Such a setting may favor an increased burden of morbidities and health problems. The recognition of the needs of this population, through epidemiological studies, is essential for the planning of realistic interventions aimed at improving access and quality of health care, reorganization of services and redistribution of care resources[12,17].

With the intention of increasing information on the pattern of dental visits in rural areas, this study aimed to describe oral health, the use of dental services and associated factors among individuals aged 60 years or more residing in the rural area, located in a municipality in the extreme south of Brazil.

Material and methods

This study was carried out in the rural area of Rio Grande, Rio Grande do Sul, and was part of a more extensive study – a research consortium – covering several health aspects of certain segments of the rural population. In 2017, the population was estimated at 209,378 inhabitants, of which 4% lived in the rural area[18]. This is a cross-sectional, population-based type study which included a population of individuals 60 years of age and over who lived in the rural area. Individuals institutionalized in nursing homes or hospitals were excluded. Older adults with an intellectual impairment that prevented their understanding of the questions were not interviewed.

In order to estimate the prevalence of dental services utilization in the last year, a prevalence of 20%, an error of 2 p.p. and 95% confidence level was used in the calculation of sample size, with a 10% increase for losses and refusals, resulting in 679 individuals. The following parameters were defined to calculate the associated factors: statistical power of 80% to find a relative risk (RR) of at least 2, 95% confidence level, prevalence in non-exposed patients of at least 20%, and non-exposed to exposed ratio of at least 4:1, including 10% increase for losses and refusals and 20% for control of possible confounding factors (n = 722).

The rural area of the municipality of Rio Grande consists of 24 census tracts with approximately 8,500 inhabitants distributed around 2,700 permanently inhabited households[19]. The sampling process was random and systematic to select 80% of households from the draw of a number between "1" and "5". The number drawn

corresponded to the address considered a skip. For example, if the number "3" was drawn, every household with a number "3" of a sequence of five households was not sampled, that is, it was skipped. This procedure ensured that four out of five households were sampled.

Fieldwork was conducted from April to October 2017 by a team of interviewers and field supervisors. After elucidating the study subject and agreeing to participate, the old man signed the Informed Consent Form, and then the questionnaire was applied. Caregivers signed the form on behalf of seniors with disabilities. The study was approved by the Research Ethics Committee of the Federal University of Rio Grande, and confidentiality of individual information of the participants was assured. The collection tool used was an electronic questionnaire, previously tested in a pilot study performed in households excluded from sampling. Data were collected through tablets using the RedCap® program[20]. Data stored on tablets were sent daily to the FURG server (redcap.furg.br) via an internet connection. On a weekly basis, the data quality control (data quality tool) was performed on the server to identify variables with no response or errors. After correction, data were sent back to the server. Also, a weekly database backup was performed on a Microsoft Excel® worksheet to ensure no loss of information. A short version of the tool was applied in 10% of individuals interviewed. Data agreement was analyzed by Kappa statistic.

The dependent variable consisted in the use of dental services in the 12 months before the interview (yes or no), from the question "From <MONTH> last year to this date, have you visited a dentist?" Information was collected if the older adult had already used the services through the question "Have you ever visited a dentist in your life?" Independent variables included gender (male or female); age (in full years); self-reported skin color (white, black, yellow, indigenous or brown); marital status (without or with a partner), schooling (in full years); economic class according to the Brazilian Association of Research Companies (ABEP)[21]; reason for last visit (urgent visit, common treatment and revision); perception of the need to use dentures; report of oral health problem in the 12 months before the interview (difficulty in eating, sleeping or participating in social activities); type of service used in the last visit (public health post, public service other than health post, covenant and private service); health plan; tobacco use (never smoked, has smoked or currently smokes); alcohol consumption in the last month; depression; total number of teeth reported in the upper and lower arches (in quartiles); use of dentures and self-perceived oral health (very poor/poor, fair and good/very good). Individuals with black, brown, indigenous and yellow skin color were grouped in a category called "other" because they were small groups. The common treatment in the variable "reason for using the last visit" is the segment of two visits or more that did not fit into the other categories. The variable depression was collected by the PHQ-9 (The Patient Health Questionnaire) tool, with a cut-off point ≥ 9 points.

Statistical analyses were performed in the Stata® program version 14.0[22]. A descriptive analysis of the independent variables was performed. The prevalence of the outcome and its respective confidence interval (95% CI) and prevalence according to the associated factors were calculated using the Chi-square test of heterogeneity (bivariate analysis) in this stage. Then, the Poisson regression with robust adjustment of variance[23] and backward stepwise method was used to estimate the crude and adjusted prevalence ratios and their respective confidence intervals (95% CI). The multivariate analysis followed a hierarchical theoretical model of determination by levels, as described in Figure 1. This model establishes a chain of determinants organized in levels of determination that influence the distal or proximal outcome[24]. The first level included the variables gender, age, self-reported skin color, schooling, economic class and marital status. Tobacco use, alcohol consumption and depression were inserted at the second level. The third level included variables health plan, oral health problem and self-perceived oral health. The variables of each level were adjusted at the same level and the higher level. Those with p-value < 0.20 were maintained to control possible confounding. Statistical significance was measured by the Wald's test of heterogeneity and linear trend, with a p-value < 0.05 of a two-tailed test.

Results

Of the 1,785 households sampled, 1,131 older adults were identified in the rural area of the municipality of Rio Grande in 2017. Of this total, 1,030 participated in the survey, which corresponds to a rate of 8.9% of losses and refusals. The prevalence of the use of dental services in the 12 months before the interview was 13.9% (95% CI, 11.8-16.2) and the prevalence of non-use of

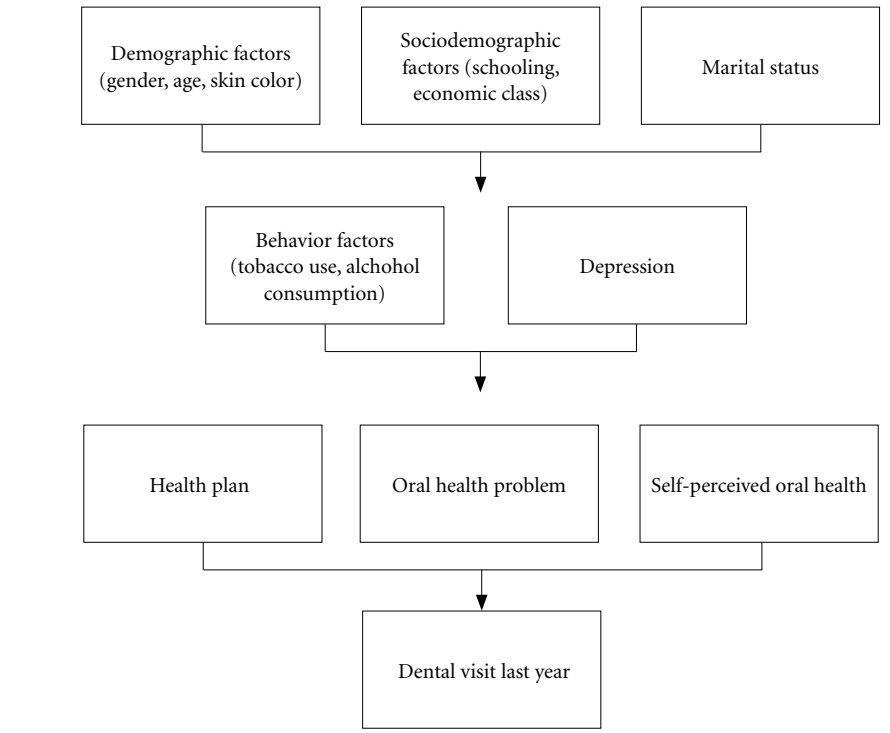

Figure 1. Hierarquical analysis model of the use of oral health services.

services was 86.1% (95% CI, 83.8-88.2). A 6.6% share of the seniors reported never having visited a dentist.

Table 1 shows the description of the main characteristics of the sample. There was a predominance of men (55.2%), white individuals (91.6%) belonging to economic class C (51.2%) and using some denture (74.8%). Approximately half of the individuals were totally edentulous (49.9%) and 73% had up to eight teeth in both arches.

The prevalence of the outcome according to the independent variables to the use of dental services and the crude and adjusted prevalence ratios are described in Table 2. After adjustment, it was noticed that women were 90% more likely to visit the service in the last 12 months when compared to men. Older people who had 8 or more years of study visited 155% more than those who did not study any year. Individuals of economic classes A/B used 289% more services than those of the D/E classes; and those who reported having a partner increased the likelihood of seeing the dentist by 77%. In turn, former smokers or smokers consulted 40% less. Older adults who reported a dental health problem that interfered with eating, sleeping, or participating in social activities increased the likelihood of using dental services in the last year by 121%.

Discussion

This study identified that the population has a high proportion of total edentulism (49.9%) in the rural area of Rio Grande and that the prevalence of the use of dental services in the last year was 13.9%. Gender, marital status, educational level, economic level, tobacco use and oral health problems influenced the use of services.

The use of health services is linked to access barriers, which can prevent or hinder the possibility of people using these services[6]. In a systematic review, Moreira et al.[3] pointed to barriers to the use of dental services due to low schooling and low income. In agreement with the literature,

Table 1. Description of the sample characteristics of the elderly living in rural areas. Rio Grande, RS, Brazil, 2018 (n = 1030).

Variable	n	%
Gender (1030)		
Male	568	55.15
Female	462	44.85
Age in full years (1029)*		
60-64	267	25.95
65-69	262	25.46
70-74	197	19.14
75-79	130	12.63
80 and over	173	16.82
Self-reported skin color (1028)*		
White	942	91.63
Other	86	8.37
Marital status (796)*		
Without a partner	170	21.36
With partner	626	78.64
Schooling in full years (1017)*		
0	206	20.26
1-3	364	35.79
4-7	336	33.04
8 and over	111	10.91
Economic class# (1018)*		
D-E	407	39.98
C	526	51.67
A-B	85	8.35
Tobacco use (1029)*		
Never smoked	545	52.96
Smoked or currently smokes	484	47.04
Alcohol consumption (1030)	172	16.7
Depression (994)*	81	8.15
Type of service used (945)*		
Public health post	126	13.33
Public service. except for health post	84	8.89
Covenant	76	8.04
Private service	659	69.74
Health plan (960)*	99	10.31
Reason for using the visit (952)*		
Emergency visit	91	9.56
Standard treatment	796	83.61
Revision	65	6.83
Oral health problem (953)*	29	3.04
Upper and lower arch teeth (1010)*		
1st quartile (0-8)	738	73.07
2nd quartile (9-16)	129	12.77
3rd quartile (17-24)	108	10.69
4th quartile (25 and over)	35	3.47
Use dentures (1030)	770	74.76
Need to use dentures (958)*	592	61.8
Self-perceived oral health (1026)*		
Very poor/poor	50	4.87
Fair	199	19.4
Good/very good	777	75.73

* Loss of sample information. # Economic classification of the Brazilian Association of Research Companies[21].

it continues

older adults of better economic classes[2,8,12,25-27] and higher schooling[2,5,8,9,12,25-30] visited the dentist more. About 69.7% of the total number of individuals used the private service in their last visits, which is higher than the 55.2% frequency pointed by the national epidemiological survey conducted in 2010[14] regarding their use. This result, together with the low prevalence of the use of dental services in this study, may indicate that older adults living in rural areas have greater difficulties in accessing public dental services since the dental coverage of the health facilities in rural Rio Grande does not reach 60%[31]. Low adherence to health plans that cover dental visits (10.3%) may also be a factor for older adults seeking a greater proportion of independent private services. Another factor that denotes access is the proportion of people who have never been to the dentist[32]. Approximately 6.6% of seniors in this study reported never having gone to the dentist. This value was lower when compared to the SBBrasil 2010[14] data, which was 14.7%, but was similar when compared to the South region (5.1%), confirming the disparity between the Brazilian regions[14,33,34].

The prevalence of the use of dental services in Anglo-Saxon countries is almost five times higher when compared to our study, denoting the differences regarding the health system, contextual values regarding the use of services and health behavior[27-29].

Our findings, in agreement with a study carried out in Pelotas[1], showed no association be-

Table 2. Crude and adjusted analysis for the use of dental services, in the last year, among older adults living in rural areas in 2017, and associated factors. Rio Grande, RS, Brazil, 2018.

Level	Variable	Prevalence (%)	Crude Analysis		Adjusted Analysis	
			PR (IC 95%)	p value	PR (IC 95%)	p value
1º	Gender			< 0.01		< 0.001[c]
	Male	11.09	1		1	
	Female	17.39	1.57 (1.14-2.15)		1.90 (1.34-2.67)	
	Age (full years)			0.08[a]		0.7[a]
	60-64	17.06	1		1	
	65-69	15.98	0.94 (0.63-1.39)		1.11 (0.72-1.72)	
	70-74	13.30	0.78 (0.49-1.23)		1.01 (0.60-1.70)	
	75-79	13.68	0.80 (0.47-1.36)		1.31 (0.75-2.30)	
	≥ 80	6.96	0.41 (0.22-0.77)		0.77 (0.36-1.65)	
	Self-reported skin color			0.5		0.6
	Other	11.25	1		1	
	White	14.11	1.25 (0.66-2.37)		1.27 (0.58-2.78)	
	Schooling (full years)			< 0.001[b]		< 0.01[b,c]
	0	7.73	1		1	
	1-3	8.96	1.16 (0.63-2.13)		1.03 (0.53-2.02)	
	4-7	15.38	1.99 (1.13-3.50)		1.68 (0.91-3.10)	
	≥ 8	35.78	4.63 (2.63-8.12)		2.55 (1.27-5.11)	
	Economic class*			< 0.001[b]		< 0.001[b,c]
	D-E	6.52	1		1	
	C	14.65	2.25 (1.44-3.52)		1.65 (0.95-2.85)	
	A-B	40.48	6.21 (3.88-9.97)		3.89 (2.04-7.41)	
	Marital status			0.05		0.04[c]
	Without a partner	8.97	1		1	
	With partner	15.49	1.73 (1.01-2.94)		1.77 (1.04-3.02)	
2º	Tobacco use			0.02		0.01[c]
	Never smoked	16.57	1		1	
	Smoked or currently smokes	11.06	0.67 (0.48-0.93)		0.60 (0.39-0.89)	
	Alcohol consumption			0.2		0.9
	No	13.33	1		1	
	Yes	16.97	1.27 (0.87-1.86)		0.99 (0.63-1.55)	
	Depression			0.9		0.5
	No	14.30	1		1	
	Yes	14.67	1.03 (0.58-1.81)		1.2 (0.66-2.21)	
3º	Health plan			< 0.01		0.2[c]
	No	12.78	1		1	
	Yes	24.24	1.90 (1.29-2.80)		1.34 (0.89-2.01)	
	Oral health problem			0.09		0.01[c]
	No	13.64	1		1	
	Yes	24.14	1.77 (0.91-3.44)		2.21 (1.18-4.14)	
	Self-perceived oral health			0,8[b]		0,3[b]
	Very poor/poor	10,26	1		1	
	Fair	14.05	1.37 (0.51-3.71)		1.62 (0.36-7.29)	
	Good/very good	14.15	1.38 (0.54-3.55)		1.86 (0.43-8.07)	

*Economic classification of the Brazilian Association of Research Companies21. a Wald's Heterogeneity test. b Wald's Linear Trend Test. c Variables of the final model. PR: Prevalence Ratio. CI: Confidence Interval. 1st level (n = 738); 2nd level (n = 738); 3rd level (n = 734).

tween the self-perceived need for dental treatment and the use of dental services, differing from previously reported results, which may be due to a high edentulism rate in both populations[26,30]. Still, almost 40% of older adults reported not requiring the use of dentures. One reason to explain this negative relationship is the high cost of prosthetic treatment[5]. Other studies still suggest that the absence of teeth is not perceived by the elderly as a significant oral health problem[35-37]. Moreover, unlike the evaluation measure of the quality of the prosthesis by a dental surgeon, many older adults consider their prostheses maladapted due to the difficulties of adaptation and retention of new prostheses[2].

While not a significant result of this study, the recent use of dental services has been inversely associated with older age, suggesting a decreased regular use of dental services among seniors and may generate reverse causality with high rates of edentulism[4,12].

In these and other studies[27,29], senior women were 90% more likely to visit a dentist than men, which may be due to men seeking health services less due to cultural and occupational factors[14,26]. Older adults who had a partner also visited more, perhaps because they had someone who supports the search for health care[27]. On the other hand, being a current smoker or former smoker has reduced the likelihood of using dental services. Although it is not a variable described in the literature, it is known that smokers take less care of their health and use fewer health services in general[29].

As expected, the elderly who reported having dental problems visited the dentist more in the last year and were more likely to do so than those who did not have oral problems[8,12,29]. Still, around 83.6% of the elderly mentioned common treatments as reasons for visits, to the detriment of only 9.5% for urgent visits. This proportion may also indicate a better coverage of dental services, since historically most of the Brazilian municipalities developed oral health actions only for the school age group, assigning to seniors only access to emergency services, which were often mutilating[32].

The increased access of older adults to dental services can be attributed to the gradual incorporation of oral health professionals into the Family Health Strategy Teams (ESF) and the Ministry of Health program called *Brasil Sorridente* ("Smiling Brazil"), which by establishing the National Oral Health Policy, facilitated greater attention and financing to oral health[2,10,12]. There was greater effort to promote the increased integration of oral health in the health services in general from the combination of knowledge and practices that pointed to health promotion, prevention and surveillance and the revision of the care practices that incorporated the family approach and life protection[38]. Specialized care was expanded and qualified, in particular, with the establishment of Dental Specialties Centers and Regional Dental Prosthesis Laboratories.

Possible methodological limitations may affect the observed results. The recall bias tends to be inferred in the reports, however, as the outcome was measured dichotomously, it may be easier to remember whether or not the dentist was visited. Another possible limitation refers to the response of the elderly's self-perceived oral health condition, when in the presence of a caregiver. This situation occurred in only 46 cases. In the remaining questionnaires, the answer was given by the respondent. Therefore, since the underestimation or overestimation of this prevalence occurred, it must have been shallow, not affecting the result found. Still, the findings regarding the number of teeth may not be accurate because they have been self-reported, and not obtained by clinical examination. However, a Brazilian cohort study suggests that information obtained from self-reports on oral health showed good sensitivity when compared to clinical examination[39]. As a positive aspect, it can be pointed out that the study was carried out in a medium-sized Brazilian municipality. Its findings can be extrapolated to similar municipalities and may provide subsidies on the characteristics of oral health care in a rural area.

In conclusion, the results of this study indicate poor oral health conditions of the Brazilian elderly living in rural areas. The rates of utilization of dental services are low, especially in illiterate men of lower economic level, without a partner, former smokers or current smokers and who reported they were unable to identify oral problems. Health planning should be reorganized with the aim of prioritizing these population groups, improving the available health care model. Also, intersectoral actions of public policies should seek better education and income indices to reduce the inequalities of these social determinants that are, to this date, considerable barriers to access to dental services.

Collaborations

FMM Schroeder participated in the conception, design, analysis and interpretation of data and writing of the article. RA Mendoza-Sassi participated in the analysis and interpretation of the data, its critical review and approval of the version to be published. RD Meucci participated in the design, writing of the article, its critical review and approval of the version to be published.

References

1. Silva AE, Langlois CO, Feldens CA. Uso de serviços odontológicos e fatores associados em idosos no sul do Brasil. *Rev Bras Epidemiol* 2013; 16(4):1005-1016.
2. Ferreira CDO, Antunes JLF, Andrade FBD. Fatores associados à utilização dos serviços odontológicos por idosos brasileiros. *Rev Saude Publica* 2013; 47(Supl. 3):90-97.
3. Moreira RS, Nico LS, Tomita NE, Ruiz T. A saúde bucal do idoso brasileiro: revisão sistemática sobre o quadro epidemiológico e acesso aos serviços de saúde bucal. *Cad Saude Publica* 2005; 21(6):1665-1675.
4. Astrom AN, Ekback G, Nasir E, Ordell S, Unell L. Use of dental services throughout middle and early old ages: a prospective cohort study. *Community Dent Oral Epidemiol* 2013; 41(1):30-39.
5. Martins AMEDB, Barreto SM, Pordeus IA. Uso de serviços odontológicos entre idosos brasileiros. *Rev Panam Salud Publica* 2007; 22(5):308-316.
6. Austregésilo SC, Leal MCDC, Marques APDO, Vieira JDCM, Alencar DLD. Elderly's accessibility to oral health services: an integrative review. *Rev Bras Geriatria e Gerontologia* 2015; 18(1):189-99.
7. Mendoza-Sassi R, Béria JU, Barros AJD. Outpatient health service utilization and associated factors: a population-based study. *Rev Saude Publica* 2003; 37(3):372-378.
8. Araújo CSD, Lima RDC, Peres MA, Barros AJ. Utilização de serviços odontológicos e fatores associados: um estudo de base populacional no Sul do Brasil. *Cad Saude Publica* 2009; 25(5):1063-1072.
9. Baldani MH, Brito WH, Lawder JADC, Mendes YBE, Silva FDFMD, Antunes JLF. Determinantes individuais da utilização de serviços odontológicos por adultos e idosos de baixa renda. *Rev Bras de Epidemiologia* 2010; 13(1):150-162.
10. Brasil. Ministério da Saúde (MS). *Diretrizes da Política Nacional de Saúde Bucal*. Brasília: MS; 2004.
11. Paim J, Travassos C, Almeida C, Bahia L, Macinko J. The Brazilian health system: history, advances, and challenges. *Lancet* 2011; 377(9779):1778-1797.
12. Herkrath FJ, Vettore MV, Werneck GL. Contextual and individual factors associated with dental services utilisation by Brazilian adults: A multilevel analysis. *PloS One* 2018; 13(2):e0192771.
13. Brasil. Ministério da Saúde (MS). *Projeto SB Brasil 2003: condições de saúde bucal da população brasileira 2002-2003 - resultados principais*. Brasília: MS; 2004.
14. Brasil. Ministério da Saúde (MS). *Projeto SB Brasil 2010*: *condições de saúde bucal da população brasileira - resultados principais*. Brasília: MS; 2012.
15. Colussi CF, Freitas SFT. Aspectos epidemiológicos da saúde bucal do idoso no Brasil Epidemiological aspects of oral health among the elderly in Brazil. *Cad Saude Publica* 2002; 18(5):1313-1320.
16. Pucca Junior GA, Lucena EH, Cawahisa PT. Financing national policy on oral health in Brazil in the context of the Unified Health System. *Braz Oral Res* 2010; 24(Supl. 1):26-32.
17. Manassero FB, Bavaresco CS. Inserção do cirurgião-dentista na ESF: revisão de literatura. *Rev APS* 2017; 19(2):286-291.
18. Instituto Brasileiro de Geografia e Estatística (IBGE). *IBGE Cidades*. Rio de Janeiro: IBGE; 2017.
19. Instituto Brasileiro de Geografia e Estatística (IBGE). *Censo Demográfico 2010*. Rio de Janeiro: IBGE; 2011.
20. Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research electronic data capture (REDCap) - a metadata-driven methodology and workflow process for providing translational research informatics support. *J Biomed Inform* 2009; 42(2):377-381.
21. Associação Brasileira de Empresas de Pesquisa (ABEP). *Critério de classificação econômica.* São Paulo: ABEP; 2015. [acessado 2017 Jan 10]. Disponível em: http://www.abep.org/codigosguias/ABEP_CCEB. pdf.
22. Stata Corporation. *Stata Statistical Software*: *Release 14*. College Station: StataCorp LLC; 2015.
23. Barros AJ, Hirakata VN. Alternatives for logistic regression in cross-sectional studies: an empirical comparison of models that directly estimate the prevalence ratio. *BMC Med Res Methodol* 2003; 3:21.
24. Victora CG, Huttly SR, Fuchs SC, Olinto MT. The role of conceptual frameworks in epidemiological analysis: a hierarchical approach. *Int J Epidemiol* 1997; 26(1):224-227.
25. Instituto Brasileiro de Geografia e Estatística (IBGE). *Pesquisa Nacional de Amostra de Domicílios 2003*: *microdados*. Rio de Janeiro: IBGE; 2004.
26. Matos DL, Giatti L, Lima-Costa MF. Socio-demographic factors associated with dental services among Brazilian older adults: a study based on the National Household Sample Survey. *Cad Saude Publica* 2004; 20(5):1290-1297.
27. Mariño RJ, Khan AR, Tham R, Khew CW, Stevenson C. Pattern and factors associated with utilization of dental services among older adults in rural Victoria. *Aust Dent J* 2014; 59(4):504-510.
28. Arcury TA, Savoca MR, Anderson AM, Chen H, Gilbert GH, Bell RA. Quandt SA. Dental care utilization among North Carolina rural older adults. *J Public Health Dent* 2012; 72(3):190-197.
29. Adams C, Slack-Smith L, Larson A, O'grady M. Dental visits in older Western Australians: a comparison of urban, rural and remote residents. *Aust J Rural Health* 2004; 12(4):143-149.
30. Matos DL, Lima-Costa MFF, Guerra HL, Marcenes W. Projeto Bambuí: estudo de base populacional dos fatores associados com o uso regular de serviços odontológicos em adultos. *Cad Saude Publica* 2001; 17(3):661-668.
31. Siqueira LGR. *Procedimentos Odontológicos*: *Um estudo de demanda em unidades básicas de saúde no município do Rio Grande, RS* [dissertação]. Pelotas: Universidade Federal de Pelotas; 2014.
32. Pinheiro RS, Torres TZGD. Access to oral health services between Brazilian States. *Cien Saude Colt* 2006; 11(4):999-1010.
33. Boccolini CS, Souza Junior PR. Inequities in Healthcare utilization: results of the Brazilian National Health Survey, 2013. *Int J Equity Health* 2016; 15(1):150.
34. Mullachery P, Silver D, Macinko J. Changes in health care inequity in Brazil between 2008 and 2013. *Int J Equity Health* 2016; 15(1):140.

35. Benedetti TRB, Mello ALSFD, Gonçalves LHT. Elderly people living in Florianópolis: self-perception of oral health conditions and use of dental services. *Cien Saude Colet* 2007; 12(6):1683-1690.
36. Ekanayke L, Perera I. Factors associated with perceived oral health status in older individuals. *Int Dent J* 2005; 55(1):31-37.
37. Silva SRC, Valsecki Júnior A. Avaliação das condições de saúde bucal dos idosos em um município brasileiro. *Rev Panam Salud Publica* 2000; 8(4):268-271.
38. Starfield B. *Atenção Primária:* equilíbrio entre necessidades da saúde, serviços e tecnologia. Brasília: Ministério da Saúde, Unesco; 2004.
39. Peres KG, Peres MA, Demarco FF, Tarquínio SB, Gigante DP. Oral health studies in the 1982 Pelotas (Brazil) birth cohort: methodology and principal results at 15 and 24 years of age. *Cad Saude Publica* 2011; 27(8):1569-1580.

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