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Characterization of the self-perception of oral health in the Brazilian adult population

Caracterização da condição percebida de saúde bucal na população adulta brasileira

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Abstract *This article aims to perform an analysis of the factors that determine the self-perception of oral health of Brazilians, based on a multidimensional methodology basis. This is a cross-sectional study with data from a national survey. A household interview was conducted with a sample of 60,202 adults. Self-perception of oral health was considered the outcome variable and sociodemographic characteristics, self-care and oral health condition, use of dental services, general health and work condition as independent variables. The dimensionality reduction test was used and the variables that showed a relationship were submitted to logistic regression. The negative oral health condition was related to difficulty feeding, negative evaluation of the last dental appointment, negative self-perception of general health condition, not flossing, upper dental loss, and reason for the last dental appointment. The use of a multidimensional methodological basis was able to design explanatory models for the self-perception of oral health of Brazilian adults, and these results should be considered in the implementation, evaluation, and qualification of the oral health network.*

Key words *Oral Health, Perception, Self-evaluation, Cross-Sectional Studies, Data Mining*

Resumo *O objetivo deste artigo é realizar uma análise dos fatores que determinam a autopercepção de saúde bucal dos brasileiros sob base metodológica multidimensional. Estudo transversal, com dados provenientes de inquérito em âmbito nacional. Foi realizada entrevista domiciliar com uma amostra de 60.202 adultos. Considerou-se a autopercepção de saúde bucal como variável desfecho e características sociodemográficas, de autocuidado e condição de saúde bucal, de utilização de serviços odontológicos, de condição de saúde geral e de trabalho como variáveis independentes. Empregou-se o teste de redução de dimensionalidade e as variáveis que apresentaram relação passaram pelo teste de regressão logística. A autopercepção negativa de saúde bucal apresentou-se relacionada à dificuldade para se alimentar, avaliação negativa do atendimento recebido durante a última consulta odontológica, autopercepção ruim da condição de saúde geral, não utilização de fio dental, perda dental superior e motivo da última consulta com o cirurgião dentista. A utilização de base metodológica multidimensional foi capaz de (re)desenhar modelos explicativos para a condição percebida de saúde bucal de adultos brasileiros, devendo, os seus resultados serem considerados na implementação, avaliação e qualificação da rede de saúde bucal.*

Palavras-chave *Saúde bucal, Percepção, Autoavaliação, Estudos transversais, Mineração de dados*

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Introduction

The personal assessment of living and becoming ill is characterized by the interpretation that an individual performs on his/her own health[1,2]. Several factors have been pointed out in the literature as capable of influencing this self-assessment: personal characteristics, especially the access to information[3], demographic aspects[4-12], level of acculturation[4,6], beliefs, values, health practices[3,6,13], physical and cognitive ability, and emotional relationships[14,15].

Due to the subjective nature of the object, classical epidemiological studies are not able to apprehend the elements that are related to the evaluation of the health status of the individuals, since they are mainly devoted to aspects of human biology, clinical, and laboratorial methods. Although biologically based information is essential for the quantification of the population health conditions, since they subsidize the planning, organization, and monitoring of health services, personal measures are increasingly recommended by the World Health Organization[16]. Authors affirm that through these measures the individual conscience on health status is reflected[17], constituting also an important contribution to the orientation of political and social decisions that have as a goal the quality of life[3,6] and to increase the search, adherence, and motivation of individuals for treatment and self-care[4].

In the oral health field in Brazil, despite the importance of assessing patients' self-perception on broad and effective bases, most studies have focused on isolated conditions such as clinical (use of dental prosthesis, cavities, and periodontal disease), socioeconomic (income and level of education), socio-demographic (gender, age, and ethnicity), and behavioral factors (consumption of tobacco, alcohol, and other drugs), as well as specific habits of oral hygiene[3-12,18].

The empirical evaluation of self-perception of oral health should incorporate as many critical, social, and biological indicators as possible, aiming at the formation of a synthesis measure, influenced in a micro and macro dimensional way, with repercussions on people's quality of life[6].

Few studies on the self-perception of oral health consider representative samples of the entire country[11], and this fact precludes the access of formulators and implementers of public policies to a true and near panorama of the evaluation of the health conditions of individuals and collectivities.

Thus, the objective of the present study was to perform a more comprehensive analysis of the factors that determine self-perception of oral health of Brazilians, based on a multidimensional methodological basis.

It is believed that the results of this study will contribute to the effectiveness of evaluation and planning of public oral health actions, making it possible to resize and qualify them.

Methods

This is a cross-sectional quantitative study with data from the population-based survey – National Health Survey (NHS), proposed by the Ministry of Health and conducted in 2013 by the Brazilian Institute of Geography and Statistics (IBGE)[19].

The National Health Survey

The research is in a household level and the sampling plan used was based on a cluster sampling in three stages, with the sectors or groups of census tracts being the primary sampling units, the households the secondary, and the selected elderly inhabitants, the tertiary units[19].

The sample size was defined considering the level of precision desired for the estimates of some indicators of interest, resulting in a sample of 60,202 adults interviewed[19]. Details on the sampling and weighting process are available in the PNS report[19].

Previously calibrated researchers collected the data. The information was obtained through individual interviews and stored on handheld computers. Only individuals older than 18 years old participated in the research. The interview was directed by three forms: the domicile, referring to the characteristics of the house; the residents of the house; and the individual, answered by a drawn resident of the house[19]. For the present study it was considered exclusively the data of the drawn resident from the last two forms.

The survey was approved by the National Commission for the Protection of Human Subjects of the Ministry of Health. The data used are in the public domain from the National Health Survey. Being the data available without link: http://www.pns.icict.fiocruz.br/index.php?pa=resultados.

Treatment and data analysis

The outcome variable "self-perception of oral health" is the result of the question: *In general, how do you evaluate your oral health (teeth and gums)?* Possible answers were: very good, good, regular, poor and very poor. For the purpose of analysis in the present study, the responses were grouped into positive (very good and good) and negative (regular, poor and very poor).

In the exploration phase of the data, 47 variables of interest were cataloged in order to compose the independent variables, related to: sociodemographic characteristics (eight variables); oral self-care (five variables); oral health condition (five variables); use of dental services (five variables); general health condition (eighteen variables); job characteristics (six variables).

In order to verify the existence of one or more chronic diseases, regardless of the disease installed, a new variable grouping all the diseases listed above was created, entitled "presence of one or more chronic diseases."

The variable 'number of natural teeth present in the mouth' was also developed. For that, it was subtracted the number of upper and lower teeth lost from all natural teeth (n = 32). Subsequently, the variable was categorized, according to a previous study, into more than 10 natural teeth present and 10 natural teeth present or less[8].

After the complete database treatment, dimensionality reduction was performed using the *Correlation-based Feature Selection* (CFS) algorithm using the 10-fold cross validation technique. This data mining test is recommended to be used in a large set of data and variables as proposed in the present study. It evaluated, according to response patterns, the entire data set and the 47 variables at a single time to look for variables highly related to the outcome variable and not related to each other. In this way, it does not only consider the utility of variables individually, but also the correlation level between them, thereby eliminating any and all confounding relationships. The variables with nonexistent or weak and/or redundant relations, which do not bring information gain to the model, are all eliminated by the algorithm, without needing any researcher's influence.

Thus, it is possible to validate the pure and strict relations of the independent variables to the outcome variable with much more precision than other tests commonly used in the literature.

After, the variables related to 'Self-perception of oral health' were evaluated through logistic regression to measure the magnitude of the associations. The model had an explanatory capacity of 73%. All analyzes were performed using the software WEKA (Waikato Environment for Knowledge Analysis) environment.

The WEKA software does not report the individual confidence intervals and p values for each OR; it considers the default values of 95% confidence interval and p value < 0.05. In this type of analysis, the possibility of influencing the confidence interval due to the sample size is eliminated in the steps preceding the regression analysis.

Results

The descriptive analysis shows that about 34% of the individuals interviewed evaluated their oral health negatively (Table 1). In the results of the attribute selection analysis, it was verified that the variables most strongly related to self-perception of oral health were: difficulty feeding, upper dental loss, self-perception of the general health condition, evaluation of the last dental appointment, reason for last dental appointment and flossing. No variables related to sociodemographic and job characteristics were related to self-perception of health.

Table 1 shows the distribution of adults, considering the variables used in the study that did not present a strong relation with the dependent variable. Table 2 also describes the sample according to the independent variables that presented a relation with the self-perception of oral health. Table 3 shows the reasons for the chance of reporting negative oral health status according to independent variables.

The variable that most influenced the evaluation of oral health was the difficulty in feeding, where individuals who reported difficulty (11%) presented 5.81 more chance of having a poor perception of health in detriment to those without difficulty. The upper tooth loss was also linked to self-perception of health. The partial loss of upper teeth increases the probability of having a negative perception of oral health in 1.49, while the total loss of teeth was shown to be a protective factor (OR = 0.86).

Individuals who negatively evaluated their overall health (49%), presented 1.91 more chance of evaluating their oral health as bad. Regarding to the use of dental services, the search for dental consultations for reasons other than prevention (treatment or others) and negative evaluation of care increases the chances of the individual to have a negative perception of oral health.

Still, most of the individuals reported using dental floss, this condition linked to a good per-

Table 1. Descriptive analysis of the independent variables that do not presented a relation with the self-perception of oral health. Brazil, 2013 (n = 60202).

Variables	Class	Total		Positive Perception		Negative Perception	
		n	%	n	%	n	%
Self-perception of oral health		**60202**	**100**	**39572**	**66**	**20630**	**34**
Sociodemographic Characteristics							
Gender	Male	25920	43	16570	64	9350	36
	Fame	34282	57	23002	67	11280	33
Age	18 a 30	15750	26	11309	72	4441	28
	31 a 40	14139	23	9629	68	4510	32
	41a 50	11160	19	7075	63	4085	37
	51 a 60	10426	17	5279	51	5147	49
	More than 60	8727	14	6280	72	2447	28
	Negative	21061	35	10226	49	10835	51
Skin color/ ethnicity	White	24106	40	17183	71	6923	29
	Black	5631	9	3411	61	2220	39
	Asian	533	1	344	65	189	35
	Mixed-race	29512	49	18390	62	11122	38
	Indian	417	1	242	58	175	42
	Ignored	03	0	2	67	1	33
Live with spouse	Yes	34522	57	22433	65	12089	35
	No	25680	43	17139	67	8541	33
Marital status	Married	23741	39	15800	67	7941	33
	Separated or Divorced	4727	8	3186	67	1541	33
	Widowed	4708	8	2899	62	1809	38
	Single	27026	45	17687	65	9339	35
Literacy	Yes	54335	90	36638	67	17697	33
	No	5867	10	2934	50	2933	50
Level of education	Literate	7630	13	4337	57	3293	43
	Elementary school	15288	25	8979	59	6309	41
	High School	18589	31	12849	69	5740	31
	University	8109	13	6499	80	1610	20
	Postgraduate	487	1	417	86	70	14
	Did not answer	10099	17	6491	64	3608	36
Region of residence	North	12536	21	7830	62	4706	38
	Northeast	18305	30	10861	59	7444	41
	Southeast	14294	24	10167	71	4127	29
	South	7548	13	5476	73	2072	27
	Midwest	7519	12	5238	70	2281	30
Oral Health Condition							
Lower dental loss	None	21133	35	16571	78	4562	22
	Some	32121	53	18625	58	13496	42
	All teeth missing	6948	12	4376	63	2572	37
Number of natural teeth present	None	10019	17	5907	59	4112	41
	> 10	50183	83	33665	67	16518	33
Use of dental prosthesis	≤ 10	24431	41	14269	58	10162	42
	No	14932	25	8970	60	5962	40
	Yes, but needs to replace some teeth	5558	9	3668	66	1890	34
	Yes, but needs to replace all teeth	15281	25	12665	83	2616	17

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Variables	Class	Total		Positive Perception		Negative Perception	
		n	%	n	%	n	%
Self-perception of oral health		**60202**	**100**	**39572**	**66**	**20630**	**34**
General Health Condition							
Difficulty getting around	Yes	1567	3	811	52	756	48
	No	58635	97	38761	66	19874	34
Difficulty seeing	Yes	23859	40	15951	67	7908	33
	No	36343	60	23621	65	12722	35
Consume alcoholic drinks	Yes	23002	38	15332	67	7670	33
	No	37200	62	24240	65	12960	35
Perform physical activity	Yes	17896	30	13189	74	4707	26
	No	42306	70	26383	62	15923	38
Use tobacco	Yes	8729	14	4853	56	3876	44
	No	51473	86	34719	67	16754	33
Presence of any chronic, physical or mental illness	Yes	27250	45	22983	84	4267	16
	No	32952	55	16589	50	16363	50
Use of dental services							
Time since the last dental appointment	In the last 12 months	25656	43	18688	73	6968	27
	Over 1 and under 2 years	11518	19	7622	66	3896	34
	Over 2 years	20942	35	12162	58	8780	42
	Never went to the dentist	2086	3	1100	53	986	47
Duration of dental appointment	≤ 30 minutes	17088	28	12274	72	4814	28
	30 < 61 minutes	7439	12	5648	76	1791	24
	> 60 minutes	1129	2	766	68	363	32
	Not applicable	34546	57	20884	60	13662	40
The dental appointment by	Health Insurance	4744	8	3835	81	909	19
	Private	14042	23	10647	76	3395	24
	SUS	6451	11	3947	61	2504	39
	Did not know/Not answered	34965	58	20884	60	14081	40
Individual health insurance	Yes	4744	8	3835	10	909	4
	No	20912	35	14853	38	6059	29
	Not answered	34546	57	20844	53	13662	66
Oral Self-care							
Brushing frequency	Never brushed	132	0	58	44	74	56
	Does not brush every day	520	1	191	37	329	63
	Once a day	4791	8	2229	47	2562	53
	Twice a day or more	53594	89	36575	68	17019	32
	Not answered	1165	2	519	45	646	55
Toothbrush	Yes	58719	98	38902	66	19817	34
	No	186	0	93	50	93	50
	Not answered	1297	2	577	44	720	56
Toothpaste	Yes	58669	97	38874	66	19795	34
	No	236	0	121	51	115	49
	Not answered	1297	2	577	44	720	56
Toothbrush replacement frequency	Less than 3 months	27958	46	19590	70	8368	30
	More than 3 months	30947	51	19405	63	11542	37
	Not answered	1297	2	577	44	720	56

it continues

Table 1. Descriptive analysis of the independent variables that do not presented a relation with the self-perception of oral health. Brazil, 2013 (n = 60202).

Variables	Class	Total		Positive Perception		Negative Perception	
		n	%	n	%	n	%
Self-perception of oral health		**60202**	**100**	**39572**	**66**	**20630**	**34**
Work characteristics							
Has a paid job	Yes	33990	56	23289	69	10701	31
	No	26212	44	16283	62	9929	38
Occupation	Domestic Work	2784	5	1640	59	1144	41
	Private sector employee	16267	27	11567	71	4700	29
	Public sector employee	5841	10	4416	76	1425	24
	Employer	1023	2	791	77	232	23
	Free-lancer	10092	17	6150	61	3942	39
	Unpaid worker	435	1	276	63	159	37
	Not answered	23760	39	14732	62	9028	38
Number of jobs	One	34776	58	23671	68	11105	32
	Two or more	1666	3	1169	70	497	30
	Not applicable	23760	39	14732	62	9028	38
Income	≤ 216 dollars	11661	19	6840	59	4821	41
	216 > 421 dollars	12319	20	8364	68	3955	32
	420 > 841 dollars	6988	12	5174	74	1814	26
	> 840 dollars	5027	8	4175	83	852	17
	Not applicable	24207	40	15019	62	9188	38
Number of hours worked per week	≥ 20 hours	4264	7	2247	53	2017	47
	20 > 41 hours	16576	28	10609	64	5967	36
	> 40 hours	15602	26	10132	65	5470	35
	Not applicable	23760	39	16584	70	7176	30
Works at night	Yes	5419	9	3795	70	1624	30
	No	31023	52	21045	68	9978	32
	Not applicable	23760	39	14732	62	9028	38

ceived oral health condition, with those who did not use it, 1.88 more likely to present negative oral health perception.

Discussion

The variables most strongly related to the self-perception of oral health found in the study were: difficulty feeding, upper dental loss, self-perception of the general health condition, evaluation of the last dental appointment, reason for last dental appointment and flossing. Thus, it can be inferred that subjective conditions, which evaluate human experiences and health, are much more capable of explaining the variability of self-perception of oral health than objective measures, which mostly measure the context of the presence of diseases[11,20,21].

According to studies[5,8,20,22,23], individuals who report more dysfunctions, symptoms, and oral incapacities evaluate their oral health in a more negative way, in line with the findings of the present study, which demonstrate that difficulty feeding increases by 5.8 times the chance of the individual exhibiting a negative self-perception of oral health. These results may reflect the relation between masticatory limitation and the worsening of the psychosocial conditions by the embarrassment to feed in front of other people, or on physical or functional conditions, especially as the nuisance when swallowing food[5].

The literature shows that the number of teeth present in the mouth is an important determi-

Table 2. Descriptive analysis of the independent variables that presented a relation with the self-perception of oral health. Brazil, 2013 (n = 60202).

Variables	Class	Total		Positive Perception		Negative Perception	
		n	%	n	%	n	%
Oral Health Condition							
Difficulty eating	None	53336	89	38886	73	14450	27
	Some	6866	11	686	10	6180	90
Upper dental loss	No teeth lost	22387	37	17568	78	4819	22
	Some teeth lost	26806	45	15390	57	11416	43
	All teeth lost	11009	18	6614	60	4395	40
General Health Condition							
Self-perception of general health	Positive	39141	65	29346	75	9795	25
	Negative	21061	35	10226	49	10835	51
Use of dental services							
Reason for the last dental appointment	Prevention or check up	14048	23	11551	82	2497	18
	Treatment	11144	19	6859	62	4285	38
	Other	464	1	278	60	186	40
	Not answered	34546	57	20884	60	13662	40
Evaluation of the dental service received	Positive	23248	39	17520	75	5728	25
	Negative	2408	4	1168	49	1240	51
	Not answered	34546	57	20884	60	13662	40
Oral Self-care							
Use of dental floss	Yes	30699	51	23154	75	7545	25
	No	28206	47	15841	56	12365	44
	Not answered	1297	2	577	44	720	56

nant of a positive perception of oral health rather than edentulism[4,5,8,11,22]. However, in the present study, the loss of some upper teeth seems to impact more negatively on self-perception of oral health than the total loss of the lower teeth. In addition, upper edentulism was shown to be a protective factor for positive perception of oral health (OR = 0.89). In spite of the apparent incoherence of these results, the individuals seem to evaluate their oral health more positively when they do not present any tooth, than with the maintenance of few teeth in precarious conditions, in an insufficient number, and without access to prosthesis to ensure an effective and comfortable chewing[20,21]. Total edentulous patients were found also to be more prone to receive a low-complexity rehabilitative treatment with the use of total dentures, which can be collected by public health services compared to partial edentulous patients, whose dental treatment options are, for the most part, more complex and of difficult access[24]. These factors may induce partial edentulous patients to present greater functional and aesthetic impairments[24] and consequently, greater dissatisfaction with oral health.

On the other hand, the relationship between self-perception of general and oral health is in agreement with the findings of the current research[11,20]. In the present study, the prevalence of negative perceptions among individuals suffering from general health problems and biological frailty was higher[6,11,20]. Silva et al.[11] consider this to be a complex and multifaceted relationship, since some unfavorable general health conditions may act as predisposing factors for oral health impairment, as well as deficient oral conditions may generate general health problems[11,25]. This result confirms the importance of studying co-morbidities and common risk factors[6,26]. In this sense, it is important to focus in the relationship between self-perception of oral health and general health condition in order to draw up effective preventive strategies[11].

However, it should be noted that the presence of some chronic disease or a group of them, as a variable of interest, was not able to explain the

Table 3. Reasons for self-perceived negative oral health according to the independent variables.

Variable	Oddis Ratio (OR)
Difficulty eating	
None	1.00
Some	5.81
Upper dental loss	
None tooth lost	1.00
Some teeth lost	1.49
All teeth lost	0.86
Self-perception of general health	
Positive	1.00
Negative	1.91
Evaluation of the dental service received	
Positive	1.00
Negative	2.50
Reason for the last dental appointment	
Prevention, check-up	1.00
Treatment	1.07
Other	1.21
Use of Dental Floss	
Yes	1.00
No	1.88

self-perception of oral health, but only the general context of health. This finding indicates that general health situations transcends chronic conditions and reinforces that the complexity in the framework of health perceptions is much more involved with subjective issues than with objective clinical demands.

The reason and the evaluation of the last dental appointment were the only variables of the group of "use of dental services" that were related to the dependent variable. Visiting the dentist for check-up or prevention and positively evaluate appointment were self-referred factors of oral health protection. It is suggested that the explanation for this finding lies in the fact that routine visits to the dentist[8,20] and good dental service[27,28] can minimize dental loss and improve oral condition, as well as empower patients with healthy living habits and the health-disease process, making them more confident about their status of oral health.

A similar condition can be observed regarding flossing. Individuals who floss regularly have a better self-perception of oral health[6]. The study emphasizes that the lack of knowledge and motivation to adopt preventive and care practices aggravates the oral health condition and compromises the self-perception of oral health[4].

Moreover, it should be noted that the literature is rather vast and inconclusive in relation to factors that truly affect self-perception of oral health[3-6,8,10-13,18-23]. The only pattern that emerges from these studies is that most of the factors associated to sociodemographic, work characterize, lifestyle, health, and use of dental services by the individuals are related to the self-perception of oral health, however they do not contribute to the understanding of its variability. Given the diversity and the low power of association of the methods used to cross the factors of interest, the information obtained becomes little advantageous for the assertive decision making.

Through the feature selection test applied in the present study, it became possible to consider the pluralism of the social and health segments involved in the large database of the National Health Survey and to eliminate possible confounding or redundant factors, unraveling the variables that are truly important for the conformation of the self-perception of oral health. This condition becomes crucial for contributions that aim to increase the knowledge about self-perception of oral health in the Brazilian adult population, which can help supporting decision-making processes and redirection of oral health practices and resources.

Limitations of the study

As a limitation of the study, we highlight the subjectivity imbricated in the evaluation of self-perception of oral health, since it is susceptible to changes throughout life, day, week as a result of contextual conditions, psychological state experienced by the individual, as well as involving values and feelings not always expressed[29]. However, the subjectivity does not disqualify the relevance to guide policy and to plan decisions in health[3,6].

In addition, because this is a cross-sectional study, it was not possible to establish a temporal relationship between the associations found.

Conclusion

The use of a multidimensional methodological basis was able to (re)design explanatory models for the self-perception of oral health of Brazilian adults and its results should be considered in the

implementation, evaluation, and qualification of the national oral health network.

It is noteworthy that the determinants of the self-perception of oral health of Brazilians were difficulty feeding, use of dental floss, upper dental loss, self-perception of the general health condition, and reason and evaluation last dental appointment; and that factors related to sociodemographic and work characteristics, lifestyle, and presence of chronic diseases contributed little to the understanding of the variability of the self-perception of oral health of the adult population.

Collaborations

D Bordin delineated the study, interpreted the data and wrote the article. CB Fadel delineated the study and carried out the writing of the article. CB Santos conducted the statistical analysis, created the index for analysis and performed the interpretation of the data. CAS Garbin, SAS Moimaz and NA Saliba contributed writing and critical content review.

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