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Factors associated with Brazilian adolescents' satisfaction with oral health

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Objective: To identify the sociodemographic, clinical and self-reported indicators of oral health associated with Brazilian adolescents' satisfaction with oral health. ***Methods:*** Secondary data were used following the examination of 4,231 adolescents, aged 15 to 19 years, participating in a national oral health survey (*SBBrasil 2010*). The independent variables were grouped into demographics, predisposition/facilitation, oral health conditions and perceived dental treatment need. Satisfaction with oral health was considered the dependent variable. Ordinal logistic (multiple) regression models tested the variables in sequence (hierarchical), as per the conceptual model, assuming $p \leq 0.05$ as the criterion for remaining in the model (Wald test). Adjustment of the model was evaluated with the Akaike information criterion (AIC) and -2 Log L. ***Results:*** Participants with perceived treatment need (OR=2.36, 95% CI = 2.14-2.61), toothache (OR=1.18, 1.10-1.28), presence of oral impacts on daily performance (OIDP) (OR= 1.55, 1.44-1.68), severe and very severe dental aesthetic index (DAI) (OR=1.17, 1.08-1.27), were female (OR=1.16, 1.10-1.23), were of black/brown ethnicity (OR=1.10, 1.04-1.17), and had caries in anterior (OR=1.20, 1.08-1.32) and posterior teeth (OR=1.22, 1.13-1.32) presented lower satisfaction with oral health. ***Conclusion:*** Satisfaction with oral health in Brazilian adolescents is linked to a multidimensional structure of factors that include demographic aspects, such as gender and ethnic group, self-perception aspects, such as perceived treatment need and oral health impact on daily activities, and clinical aspects, such as the presence of toothache, severe malocclusion and caries in anterior and posterior teeth.

Key words: *Epidemiology; Oral health, Self-reported oral health*

Introduction

Life satisfaction can be defined as "a judgmental process, in which individuals assess the quality of their lives based on their own unique criteria." Thus, this cognitive appraisal of the overall quality of a person's life, according to self-selected standards - depends on the person's own criteria of health perceptions (Pavot *et al*., 2013).

Considering that factors such as cultural, psychological and social situation and clinical status (Matos and Lima-Costa, 2006; Borges *et al.*, 2010; Sischo and Broder, 2011; Tessarollo *et al.*, 2012; Peres *et al.*, 2013; Vale *et al.*, 2013; Silvola *et al.*, 2014; Tomazoni *et al.*, 2014), can influence an individual's health perception, it is reasonable to hypothesize that, in a country like Brazil, with its continental dimensions and with a colonization model that promoted great cultural as well as economic, social and behavioral differences, patterns of satisfaction with oral health may differ among individuals with different conditions and characteristics. Therefore, a study with national epidemiological data can help better understanding these patterns.

The last National Oral Health Survey (SBBrasil 2010), conducted by the Ministry of Health, collected and made available sample data on a national scale (Brasil, 2011), to contribute to understanding the problems of collective oral health in Brazil and formulating a public health policy (Peres *et al.*, 2013). In addition to epidemiological data, in-depth knowledge of the context of the adolescents' life is fundamental. Adolescence is a sensitive developmental period in which puberty and rapid brain maturation lead to new behavior modes and capabilities that trigger or enable transitions in family, peer, and educational domains, as well as in health behaviors (Viner *et al.*, 2012). When including data about satisfaction with oral health in research, a powerful dimension is added to help understand this age group of such particular characteristics.

Against this backdrop, the aim of this study was to identify demographic, clinical and self-reported indicators of oral health associated with oral health satisfaction in Brazilian adolescents.

Materials and Methods

This was a quantitative, analytical, cross-sectional study using secondary data from the National Oral Health Survey, *SBBrasil 2010* (Brasil, 2011), conducted according to the standards required by the Declaration of Helsinki and approved by the National Research Ethics Committee under registration no. 15498, dated January 7, 2010.

SBBrasil 2010 was conducted by the Ministry of Health to outline the oral health conditions of the Brazilian population, their socioeconomic and demographic

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characteristics and their quality of life. A representative sample of the Brazilian population, comprising 37,519 individuals living in 177 municipalities (from all of Brazil's 27 state capitals), incorporating the five index ages and age groups recommended by the World Health Organization (WHO), in which adolescents were represented by the 15-19 age group. Probabilistic cluster sampling was structured in two stages for the capital cities of the 26 states plus the Federal District of Brasilia, and in three stages for the municipalities in Brazil's five interior regions. The complex sampling cluster design was used for both sample calculation and data analysis. The primary sampling units were: (a) municipality, for interior regions, and (b) census division, for capital cities. The individuals to be included were drawn according to several criteria: the number of permanent private urban residences in each census division, based on data on the 2007 census made available by the Brazilian Institute of Geography and Statistics (IBGE) and the proportion of individuals within each age group in the Brazilian age pyramid. This process generated a value for the sampling interval, based on which a number of individuals to be examined was drawn from each of the age ranges.

The accuracy study considered the demographic domains grouped according to the degree of density of the total population and the internal variability of the oral health indices (DMF index – Decayed, Missing and Filled). Estimates for the mean variance of the DMF index for the 15-19 age group were expressed as mean=6.17, SD=4.82, calculated using data from the previous survey (Brasil, 2004). The initial results were corrected to offset response rates in the region of 80%, and a design effect equal to 2, to compensate for the aggregate design on the initial accuracy value, thus adopting the process of simple random sampling.

The individuals were examined at home by dentists working for the public health system, previously trained and calibrated, based on the World Health Organization approach. A weighted Kappa coefficient was calculated for each examiner, each age group and each health problem studied, with a minimum acceptable limit of 0.656. Oral examinations were carried out to determine the prevalence and severity of the main clinical oral health indicators, according to the codes and criteria recommended by the WHO (Brasil, 2009).

Structured interviews collected data on socioeconomic conditions, use of dental services and health perceptions from residents of the household who met the eligibility criteria. The first part of the interview (socioeconomic characterization of the family) was answered by the head of household, since the data were common to all the residents. The second (schooling, perceived treatment need and use of services) and third parts (self-perception and impacts on oral health) were answered individually by the adolescents (Brasil, 2011).

For the present study, satisfaction with oral health was considered the dependent variable, assessed by one question: *"With regard to your teeth and your mouth, are you...?"* The responses were grouped into three categories: *satisfied* (encompassing those satisfied and very satisfied), *neither satisfied nor dissatisfied,* and *unsatisfied* (encompassing those unsatisfied and very unsatisfied).

The independent variables selected were: location of residence (capital or inner city), macro-region of residence, gender, ethnic group, schooling, family income, presence of caries in anterior or posterior teeth, loss of anterior or posterior teeth through caries, periodontal condition, severity of malocclusion, perceived treatment need, toothache, access to dental services and impact on daily life. These variables were arranged according to the proposed hierarchical model (Figure 1). The schooling variable was dichotomized by the median of the sample. The dental aesthetic index (DAI) was dichotomized in order to group together those with severe/very severe malocclusion (DAI> 30), since the need both for highly desirable treatment and for prioritized treatment is an important evaluative factor of care priority.

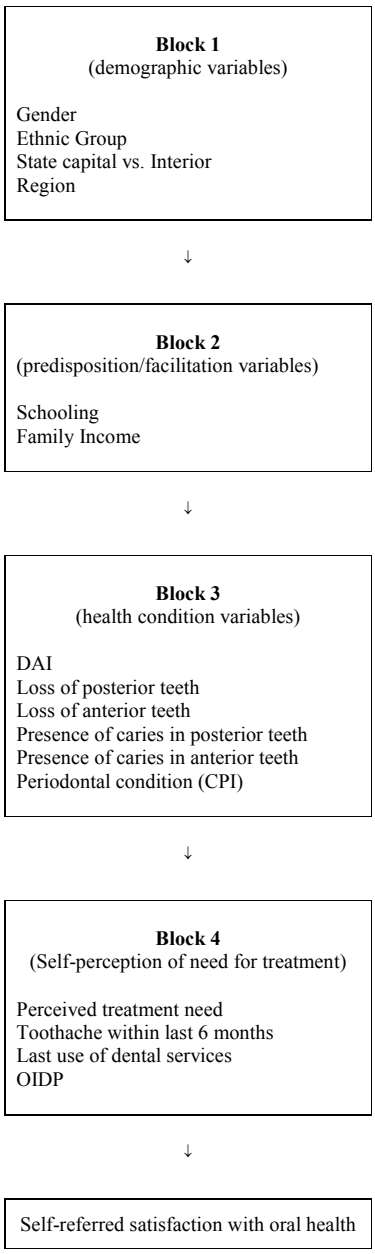

Figure 1. *Hierarchized model with independent variables, adapted from the explanatory model proposed by Gift et al. (1998)*

The base population for this analysis consisted of 5,445 individuals aged 15-19 years. Any individual whose clinical examination was not performed was excluded (n=78). Other exclusions were individuals belonging to the 'yellow' and 'indigenous' ethnic groups, due to low representation in the sample (1.8% and 0.8% respectively / n=123) (26). Then, any individuals without any calculated DAI values were excluded (n=968), followed by the remaining individuals who had not answered any of the questions on impact on daily life (n=10). Finally, those who did not answer the oral care self-perception questionnaire were excluded (n=35), yielding a final sample of 4,231 adolescents, resulting in a non-response rate of 22%. Although volunteers were excluded from the present study based on predefined criteria, the sample size was analyzed (Epi Info 7.1) and the test power was greater than 0.9.

The selected independent variables were classified based on the theoretical model proposed by Gift *et al.* (1998), with a few alterations. In their model, *Gift et al. (1998)* hypothesize that self-perceived overall oral health status, as indicated by perceived condition of natural teeth is a function of multiple factors, including individual demographic and enabling factors, other health perceptions and orientations, actual levels of diseases and conditions, and self-defined need for treatment (Figure 2). For the present study, the distal level (Blocks 1 and 2) was made up of demographic and predisposition/facilitation characteristics. Demographic factors are immutable characteristics that define an individual. The predisposition/facilitation characteristics include the resources that provide the means for individuals to take actions, as well as underlying beliefs, such as care guidance and global health perceptions. These two blocks of variables influence the intermediary level (Block 3), which includes health state, and the proximal level (Block 4) of questions related to perceived treatment need and oral impacts on daily performance (OIDP). The composition of the blocks, as well as the order of their entry in the hierarchical modeling, was based on previous models, including recognized factors associated with perceived oral health: Blocks 1 and 2 (Matos and Lima-Costa, 2006; Vale *et al.*, 2013; Peres *et al.*, 2013), Block 3 (Matos and Lima-Costa, 2006; Borges *et al.*, 2010; Tessarollo *et al.*, 2012; Vale *et al.*, 2013; Peres *et al.*, 2013; Silvola *et al.*, 2014; Tomazoni *et al.*, 2014) and Block 4 (Matos and Lima-Costa, 2006; Sischo and Broder, 2011; Vale *et al.*, 2013) (Figure 1).

The variables maintained in the multiple model of each block were included in the hierarchical ordinal regression analysis. The Block 1 variables were the first to be included, and were retained as adjustment factors for the other blocks. Afterwards, Block 2 variables were added sequentially. Only those significant at $p \leq 0.05$ after adjustment were retained. Model adjustment was evaluated by the Akaike information criterion (AIC) and -2 Log L. The relationship between the independent and the dependent variables was presented as the adjusted odds ratios and 95% confidence intervals (95% CI). All the analyses were performed using the SAS software application.

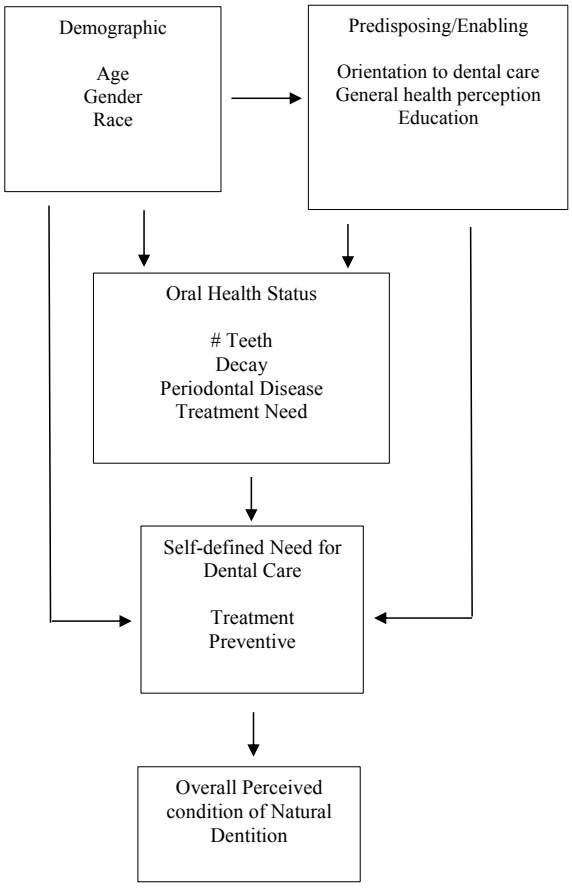

Figure 2. *Hierarchized model proposed by Gift et al. (1998)*

Results

Of the 4,231 adolescents, 54.8% were female and 59.3% declared themselves as black/brown. Most participants (55.9%) were satisfied with their oral health, whereas 25.5% stated that they were dissatisfied.

Table 1 describes the frequencies of the independent variables by satisfaction with oral health. Dissatisfaction was greater among females, those of black/brown ethnicity, those having lower schooling, lower family income, severe and very severe malocclusion, caries lesions in the anterior or posterior teeth, perceived treatment need, reporting toothache in the previous 6 months and having an impact on daily life.

Table 2 presents the hierarchized, multiple logistic regression analysis of the demographic variables (Block 1), in which gender and ethnic group remained in the model after the analysis. In Block 2, the prevalence of dissatisfaction among those whose monthly family income was less than R$ 500, and between R$ 500 and R$ 1,500, was 32.6% and 27.7%, respectively. Dissatisfaction was also greater among individuals of lower educational level. However, schooling and family income were not retained in the final model.

In Block 3, those who presented with caries in anterior or posterior teeth were less likely to be satisfied with their oral health, as were those with severe or very severe malocclusion.

Finally, participants with perceived treatment need, who had experienced toothache in the previous 6 months or who had an OIDP greater than zero were also more likely to be dissatisfied with their oral health.

Table 1. Frequencies of independent variables by satisfaction with oral health among 4,231 adolescents.

		Satisfied %	*Neither satisfied nor dissatisfied %*	*Dissatisfied %*
Block 1				
Gender	Male (1912)	59.9	18.4	21.8
	Female (2319)	52.6	18.8	28.6
Ethnic group	White (1720)	62.6	16.9	20.5
	Black/colored (2511)	51.3	19.8	29.0
Location	Capital (3270)	56.4	17.9	25.7
	Interior (961)	54.1	21.0	24.9
Region	North (1190)	51.7	16.3	32.0
	Northeast (1153)	56.2	17.8	26.0
	Southeast (755)	58.1	19.7	22.1
	South (541)	62.3	20.3	17.4
	Midwest (592)	54.9	21.8	23.3
Block 2				
Schooling	≤9 years (2308))	52.0	18.5	29.5
	>9 years (1915)	60.6	18.8	20.6
	doesn't know/ did not answer (8)	50.0	12.5	37.5
Family Income	≤ R$ 500 (677)	46.8	20.5	32.6
	R$ 501 to R$ 1,500 (2101)	54.2	18.2	27.7
	R$ 1,501 to R$ 4,500 (1065)	62.2	19.0	18.9
	≥ R$ 4501 (177)	68.4	21.5	10.2
	doesn't know/ did not answer (211)	59.7	12.3	28.0
Block 3				
DAI	none/elective (3501)	58.7	18.1	23.3
	desirable/severe (730)	42.3	21.2	36.4
Loss of posterior teeth	None (3371)	59.4	17.7	22.8
	1 (427)	41.9	21.3	36.8
	≥ 2 (433)	41.8	22.9	35.3
Loss of anterior teeth	None (4196)	56.0	18.6	25.4
	1 (23)	34.8	21.7	43.5
	≥ 2 (12)	41.7	8.3	50.0
Caries in posterior teeth	no caries (2062)	67.9	16.1	15.9
	Caries (2169)	44.4	20.9	34.7
Caries in anterior teeth	no caries (3642)	58.9	18.0	23.1
	Caries (589)	37.4	22.1	40.6
CPI	periodontal health (2006)	63.5	16.0	20.5
	bleeding/tartar (1709)	50.1	20.7	29.3
	Pocket (428)	44.2	21.5	34.3
	exam not performed (88)	52.3	23.9	23.9
Block 4				
Perceived treatment need	No (1281)	86.1	9.5	4.4
	Yes (2814)	41.6	22.6	35.7
	doesn't know/ did not answer (136)	66.2	20.6	13.2
Toothache	No (3210)	63.2	16.9	20
	Yes (1015)	32.8	23.9	43.3
	n/a (1)	0.0	100.0	0.0
	doesn't know / did not answer (5)	60.0	40.0	0.0
Last use of dental services	Never (587)	54.5	18.4	27.1
	less than a year (2071)	61.6	16.6	21.8
	1 - 2 years (993)	50.3	21.6	28.2
	3 years and over (524)	46.6	20.2	33.2
	doesn't know / did not answer (56)	46.4	26.8	26.8
OIDP	equal to 0 (2722)	67.6	16.1	16.3
	≥ 1 (1509)	34.8	23.1	42.1

Table 2. Regression models for predictors of satisfaction with oral health

	Model 1		*Model 2*		*Model 3*		*Model 4 (final)*	
	**OR*	*&95% CI*	*OR*	*95% CI*	*OR*	*95% CI*	*OR*	*95% CI*
Gender (ref=male)	1.17	1.11-1.24	1.15	1.08-1.22	1.15	1.08-1.22	1.16	1.10-1.23
Ethnic group (ref=white)	1.26	1.19-1.33	1.20	1.13-1.27	1.15	1.08-1.22	1.10	1.04-1.17
Schooling (ref=>9.2 years)			1.14	1.07-1.21	1.08	1.02-1.15	-	-
Family Income			0.78	0.72-0.84	0.87	0.80-0.94	-	-
DAI (Ref= none/elective)					1.31	1.21-1.42	1.17	1.08-1.27
Loss of posterior teeth (ref= None)					1.18	1.07-1.31	-	-
Caries in posterior teeth (ref=no caries)					1.45	1.36-1.54	1.22	1.13-1.32
Caries in anterior teeth (ref=no caries)					1.26	1.16-1.36	1.20	1.08-1.32
Perceived treatment need(ref= No)							2.36	2.14-2.61
Toothache (ref= No)							1.18	1.10-1.28
OIDP (ref= equal to 0)							1.55	1.44-1.68

*OR = Odds ratio; CI = Confidence Interval

Discussion

Single-item global indicators such as self-referred satisfaction, while simpler than multiple and multidimensional scales, are powerful predictors, and may present some discrepancy with other indicators of oral health (Locker and Gibson, 2005).

The present study, together with those by Borges *et al.* (2010) and Peres *et al.* (2013), used self-reported oral health indicators in a national sample of Brazilian adolescents. Nevertheless, there are differences between this study and the other two: (i) Borges *et al.* (2010) used data obtained from the nationwide study of 2003, whereas we used the 2010 data, which is the most recent survey conducted by the Brazilian Ministry of Health and which provides a more up-to-date perspective; (ii) Peres *et al.* (2013) assessed oral health-related quality of life using OIDP, whereas our outcome was satisfaction with oral health.

Locker and Gibson (2005) described how some patients reported that their oral health was fair or poor yet were satisfied with their oral health, whereas others (to a lesser degree) rating their oral health as excellent or good were dissatisfied. This discrepancy could be observed in the present study, as 34.8% of the individuals who reported OIDP ≥1, and 41.6% of those who believed they needed dental treatment, also reported being satisfied with their oral health. A possible explanation for this discrepancy could be each individual's expectations and experiences, which vary and are influenced by a wide range of psychosocial and sociodemographic factors (Carr *et al.*, 2001). Consequently, someone who has poor health and low expectations may not realize the health impacts on their life, and report that they are satisfied. It is important to analyze these discrepancies to understand the frames of reference that people use in constructing their answers to questions aimed at perceived health.

The adolescents who believed they needed dental treatment at the time of the study, were the most dissatisfied with their oral health. WHO regards oral health as an integral part of general health, recognising that illnesses and health problems affecting the craniofacial system could impact people's daily lives, leading to limitations in school activities, at work and in domestic life (Petersen, 2003). The results of this study corroborate this assertion, as observed in the association between negative impact on OIDP and satisfaction with oral health.

Participants with severe and very severe malocclusion were less satisfied with their oral health. Severe and very severe malocclusion affects 6.6% and 10.3% of Brazilian adolescents, respectively (Brasil, 2011), causing not only functional disorders, but also aesthetic disturbances that compromise social interaction (Olsen and Inglehart, 2011), quality of life (Fernandes *et al.*, 2013), and satisfaction with dental appearance (Tessarollo *et al.*, 2012). These results corroborate those of the literature. Treatment of malocclusion can offer benefits to adolescents in terms of aesthetic self-perception (Feu *et al.*, 2012) and quality of life (de Oliveira and Sheiham, 2004). Moreover, adults treated for severe malocclusion improved their satisfaction with a nicer looking smile, and obtained a better oral health-related quality of life, primarily regarding such factors as discomfort and psychological incapacity (Silvola *et al.*, 2014).

Fewer females were satisfied with their oral health. The gender difference could be attributed to differences in health-related perceptions and the value placed on oral health (Kawamura *et al.*, 2008). Females experience more negative impacts of oral health in their daily tasks (Peres *et al.*, 2013), and girls seek treatment for less severe oral conditions (Harris and Glassel, 2011).

More individuals who experienced toothache in the preceding 6 months were dissatisfied with their oral health. It has been found that 24.7% of Brazilian adolescents experience toothache (Brasil, 2011), and this is associated with socioeconomic, as well as behavioral and demographic factors (Freire *et al.*, 2009). National wealth and income inequality, together with access to education, are the social drivers of health that most influence adolescents' health globally (Viner *et al.*, 2012). However, despite the higher prevalence of dissatisfaction found among adolescents with lower family income, family income did not remain in the final model. Adolescents constitute a group under constant exposure to other factors, such as emotional, social and physical situations, which make this analysis more complex. A possible explanation for these findings could be that psychosocial characteristics seem to contribute greatly to the oral health quality of life of adolescents, and appear to be more important than sociodemographic factors and clinical characteristics (Foster Page *et al.*, 2013).

More non-white individuals and those with carious lesions were disatisfied. Non-white Brazilians have worse malocclusion rates (Frazão and Narvai, 2006; Peres *et al.*, 2013) and greater risk of early tooth loss due to caries (Frazão *et al.*, 2003). Oral health-related racial inequities in Brazil have been reported, with the non-white population having higher vulnerability, and with contextual factors related to the human development profile, income distribution and access to healthcare policies playing what seems an essential role in characterizing the vulnerability of population groups to oral health problems (Guiotoku *et al.*, 2012). In this study, the relationship observed between oral health dissatisfaction and both ethnicity and presence of caries may be important indicators of Brazilian socioeconomic inequalities.

It is important to emphasize that research based on large samples, such as this one, has relatively higher precision and may protect the study from random error (Frazão and Narvai, 2006), although the cross-sectional nature of the design does not allow inference of causality from any associations found (Peres *et al.*, 2013); this was a limitation of the present study. There are other possible limitations: the collection of data on family income is very sensitive, and the information obtained from the individuals surveyed may not be accurate. Responses about perceptions may be influenced by social acceptability and desirability bias (Perera and Ekanayake, 2011). However, the *SBBrasil 2010* was carried out in accordance with the WHO recommendations for population-based surveys. This, plus the careful training of the team and conduct of the interviews (Brasil, 2009) support data validity. It should also be stressed that, although volunteers were excluded from the present study, based on predefined criteria, the sample size was still appreciable.

Satisfaction with oral health in Brazilian adolescents is linked to a multidimensional structure of factors. After adjusting in logistic regression, predictors of satisfaction were found to be perceived treatment need, toothache, impact on daily life, sex, ethnic group, severe and very severe malocclusion and caries in anterior and posterior teeth. Low socioeconomic conditions and lack of access to dental services also predicted low satisfaction with oral health. These results should be considered in the planning of health policies, since they add a powerful dimension to the understanding of this age group, by showing how these sociodemographic, clinical and self-reported indicators may affect the adolescents' satisfaction with their health. Public policies must be adopted and directed toward essential areas, to drive the quest to reducing the inequality in oral health.

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