ORIGINAL ARTICLE

Need for orthodontic treatment among Brazilian adolescents: evaluation based on public health

Carolina Vieira de Freitas\textsuperscript{a}, João Gabriel Silva Souza\textsuperscript{b}, Danilo Cangussu Mendes\textsuperscript{a}, Isabela Almeida Pordeus\textsuperscript{c}, Kimberly Marie Jones\textsuperscript{a}, Andréa Maria Eleutério de Barros Lima Martins\textsuperscript{a,}\textsuperscript{*}

\textsuperscript{a}Universidade Estadual de Montes Claros (UNIMONTES), Montes Claros, MG, Brazil
\textsuperscript{b}Universidade Estadual de Campinas (Unicamp), Piracicaba, SP, Brazil
\textsuperscript{c}Universidade Federal de Minas Gerais (UFMG), Belo Horizonte, MG, Brazil

Received 4 May 2014; accepted 8 September 2014

Abstract

Objective: To identify the prevalence and the severity of malocclusions and to analyze factors associated with the need for orthodontic treatment of Brazilian adolescents.

Methods: This exploratory, cross-sectional study was carried out based on secondary data from the national epidemiological survey on oral health in Brazil (2002-2003). Socio-demographic conditions, self-perception, and the existence and degree of malocclusion, using the Dental Aesthetic Index, were evaluated in 16,833 adolescent Brazilians selected by probabilistic sample by conglomerates. The dependent variable - need orthodontic treatment - was estimated from the severity of malocclusion. The magnitude and direction of the association in bivariate and multivariate analyzes from a Robust Poisson regression was estimated.

Results: The majority of the adolescents needed orthodontic treatment (53.2\%). In the multivariate analysis, the prevalence of the need for orthodontic treatment was larger among females, non-whites, those that perceived a need for treatment, and those that perceived their appearance as normal, bad, or very bad. The need for orthodontic treatment was smaller among those that lived in the Northeast and Central West macro-regions compared to those living in Southeast Brazil and it was also smaller among those that perceived their chewing to be normal or their oral health to be bad or very bad.

DOI of original article: http://dx.doi.org/10.1016/j.rpped.2014.04.006

*Corresponding author.
E-mail: martins.andreamebl@gmail.com (A.M.E.B.L. Martins).
Conclusions: There was a high prevalence of orthodontic treatment need among adolescents in Brazil and this need was associated with demographic and subjective issues. The high prevalence of orthodontic needs in adolescents is a challenge to the goals of Brazil’s universal public health system.

© 2015 Sociedade de Pediatria de São Paulo. Published by Elsevier Editora Ltda. All rights reserved.

Introduction

Brazil has great regional and social inequalities. To address such disparities, the New Constitution of Brazil (1988) recognized health as a right of each citizen and the responsibility of the government, and established the ideological basis for the creation of Brazil’s universal public health care system, the Unified System of Health (SUS). This has increased access to healthcare for a great part of the Brazilian population. At Brazil’s 11th National Health Conference in 2000, the principles of comprehensive care, humanization and equity were restated as goals for the consolidation of SUS. Additionally, the need to strengthen collective actions regarding public health services and to assure governmental compliance with its responsibility to provide universal, comprehensive, and equitable health care to all Brazilians was stressed.

Previous studies have evaluated oral health status, indicating the need for implementation of health public policies for improvement of these conditions and universality of health, considering socioeconomic characteristics. Malocclusion, the third most prevalent oral pathology has been considered a priority in global public health and has many adverse consequences, such as psychosocial maladjustment, periodontal disease and unfavorable mastication.

Malocclusions are not classified as diseases and are difficult to define, unlike other issues of oral health, highlighting the importance of a clear definition, as well as an improvement in diagnostic criteria for obtaining epidemiological data regarding these issues in order to facilitate the planning of public health prevention and care. Therefore, there was a need to develop an epidemiological instrument to identify and classify malocclusions and recognize the dental and aesthetic need for orthodontic treatment of a given population to compare such needs among populations or longitudinally. In response to this need, Jenny & Cons developed the Dental Aesthetic Index (DAI) in 1986. It quantifies aesthetic factors and clinical presentations, using both subjective and objective measures to produce a single numerical value that reflects all aspects of malocclusion. The DAI is composed of ten variables and results in a numerical value that classifies the individual on a scale of 13 to 80, which can be categorized into cutoff points.
has been proposed by the World Health Organization (WHO) for the evaluation of malocclusions at the age of 12 and in 15-19-year-old adolescents.

Malocclusion has been singled out as an important problem of oral health among adolescents in Brazil, with prevalence rates above 40%. At national level, besides the high prevalence, greater severity of malocclusion among teenagers has been associated with the worst socioeconomic conditions and subjective conditions of oral health, based on data from the epidemiological survey of the oral health conditions of the Brazilian population in 2010. In the years 2002 and 2003, upon the recommendation of WHO, the Ministry of Health in Brazil completed an epidemiological study of oral health conditions in Brazil called SB2000, currently renamed Project SB Brazil 2002-2003. Despite more than a decade after the achievement and dissemination of the results of the SB Brazil 2002-2003 and running a new survey in 2010, no studies were identified in the literature that recorded the prevalence of malocclusion and associated factors with the need for orthodontic treatment among Brazilian adolescents, not allowing comparisons and identification of improvements that have occurred over the years. In this context, this study examined the prevalence and severity of malocclusion and factors associated with the need for orthodontic treatment of Brazilian adolescents, using data from Project SB Brazil 2002-2003 and contextualizing those data within the public health movement in Brazil.

Method

This exploratory, cross-sectional study was carried out based on secondary data from the national epidemiological survey on oral health (SB Brazil 2002-2003). This survey, conducted by the Ministry of Health, investigated different oral health conditions of 108,921 Brazilians from different age groups (18-36 months of age, 5, 12, 15-19, 35-44 and 65-74 years old), living in 250 municipalities of urban and rural areas of all five geographical macro-regions of the country.

The participants were examined and interviewed in their homes. Data was collected regarding their socioeconomic conditions, their use of dental services, and their self-perception of their oral health. Assessments of conditions and problems of oral health were based on criteria established by the World Health Organization (WHO) in 1997. A probabilistic cluster sample was used. In each macro-region of the country, cities were randomly selected based on their inclusion in five stratum defined by population size (less than 5,000 habitants, 5,001-10,000, 10,001-50,000, 50,001-100,000, and more than 100,000). All state capitals were included prior to the random sorting process, and hence were not included in this process. Following the random selection of cities, neighborhoods and households were also randomly selected. The response rate for the age group of 15-19 year olds was 84.5%, resulting in the inclusion of 16,833 adolescents in the survey. Dentists, who were trained and calibrated (k=0.61) in accordance with the criteria established by the WHO in 1997, carried out at-home interviews and exams. The present study is based on data from this sample of adolescents between the ages of 15 and 19 years.

The dependent variable, the need for orthodontic treatment (NOT), was constructed based on the DAI (Table 1) and has four possible outcomes: lack of normality or mild malocclusions/no need for orthodontic treatment (DAI<25), defined malocclusion/elective NOT (DAI=26-30), severe malocclusion/highly desirable NOT (DAI=31-35), and very severe or disabling malocclusion/essential NOT (DAI>36). In accordance with the possible outcomes of DAI, this numerical score was categorized into two categories for the dependent variable of this study: no NOT (DAI<25) and NOT (DAI>25).

The independent variables tested were socio-demographics (sex, age, self-reported race, place of residence, macro-region) and subjective conditions (self-perceived need for treatment, oral health, appearance, chewing perception, effect of oral health on relationships). The variable sex (male, female) was maintained in its original form from the original data bank, age was re-categorized into two sets (15-16 years old and 17-19 years old), self-declared skin color was re-categorized into white and non-white categories. Location of residence (urban or rural) and macro-region of Brazil (North, Northeast, South, Southeast, Central-West) were maintained in their original form.

Factors associated with the dependent variable were identified. Analyses were conducted using the software PASW® (Predictive Analytics Software) version 17.0 for Windows (Statistics for Windows, Version 17.0. SPSS Inc. Chicago, EUA). Significant associations between dependent and independent variables were verified using the chi-square test considering the value for rejection of the null hypothesis to be p<0.05 in bivariate analysis. The magnitude and direction of the association in bivariate and multivariate analyses from a Robust Poisson regression were estimated, and a prevalence ratio (PR) with a confidence interval of 95% was estimated.

Table 1 Descriptive analysis of Brazilians aged 15-19 years (2002-2003) according to demographic variables.

|                      | n   | %   |
|----------------------|-----|-----|
| **Sex**              |     |     |
| Male                 | 7,015 | 41.7 |
| Female               | 9,818 | 58.3 |
| **Age**              |     |     |
| 15-16                | 8,115 | 48.2 |
| 17-19                | 8,718 | 51.8 |
| **Self-reported skin color** |     |     |
| White                | 7,071 | 42.1 |
| Non-white            | 9,725 | 57.9 |
| **Place of residence** |     |     |
| Rural                | 2,244 | 13.3 |
| Urban                | 14,569 | 86.7 |
| **Brazilian macro-region** |     |     |
| Southeast            | 2,981 | 17.7 |
| North                | 3,877 | 23.0 |
| Northeast            | 3,998 | 23.8 |
| South                | 3,841 | 22.8 |
| Midwest              | 2,136 | 12.7 |
Table 2  Descriptive analysis of Brazilians aged 15-19 years (2002-2003) according to subjective variables.

|                          | n   | %    |
|--------------------------|-----|------|
| **Self-perceived need for treatment** |     |      |
| No                       | 3,811 | 22.9 |
| Yes                      | 12,810 | 77.1 |
| **Self-perceived oral health status** |     |      |
| Great/good               | 8,408 | 53.0 |
| Normal                   | 5,673 | 35.8 |
| Bad/very bad             | 1,780 | 11.2 |
| **Self-perception of appearance** |     |      |
| Great/good               | 9,264 | 58.4 |
| Normal                   | 4,789 | 30.2 |
| Bad/very bad             | 1,815 | 11.4 |
| **Self-perception of chewing** |     |      |
| Great/good               | 12,293 | 76.4 |
| Normal                   | 2,706 | 16.8 |
| Bad/very bad             | 1,091 | 6.8  |
| **Self-perception of speech** |     |      |
| Great/good               | 13,630 | 85.7 |
| Normal                   | 1,734 | 10.9 |
| Bad/very bad             | 535  | 3.4  |
| **Self-perception of relationships** |     |      |
| Not affected             | 11,871 | 79.3 |
| Affected                 | 3,104 | 20.7 |

Calculating the need for orthodontic treatment among Brazilian adolescents: evaluation based on public health principles calculated. Data collection was conducted in accordance with the ethical principles contained in the Resolution of the National Health Advisory Board (CNS), n° 196/95, n° 581/2000 of the Brazilian Ministry of Health.14

**Results**

The majority of the 16,833 adolescents were females between 17 and 19 years old, self-identified as white and living in urban zones (Table 1). Regarding the subjective conditions, most of the adolescents perceived the need for treatment and their oral health as good or excellent (Table 2). There was a greater prevalence of crowding and abnormal molar ratios in the evaluation of components of the DAI. The prevalence of need for orthodontic treatment was 53.2% (Table 3).

In the bivariate analysis, the need of orthodontic treatment was associated with the following variables: sex, skin color, macro-region, and self-reporting of the need for treatment, oral health, chewing, speech, and relationships with others (Table 4).

In the multivariate analysis, the need for orthodontic treatment was higher among females, non-whites, those that perceived a need for dental treatment, and those that perceived their appearance as normal, bad, or very bad. The need for orthodontic treatment was lower among those that lived in the Northeast and Central-West macro-regions compared to those of the Southeast macro-region, and also smaller among those that perceived their chewing to be normal or their oral health to be bad or very bad (Table 5).

**Discussion**

This study identified a high prevalence of malocclusion (53.2%), and consequently, a high need for orthodontic treatment. It is widely accepted that adolescents are more vulnerable to socio-demographic and psychosocial factors, and that the lifestyle adopted by them may increase their...
Table 4  Bivariate analysis of factors associated with the necessity for orthodontic treatment in 15-19 year old Brazilians, 2002-2003.

|                                   | Yes |   | No |   | PR (95% CI) | p     |
|-----------------------------------|-----|---|----|---|-------------|-------|
|                                   | n   | % | n  | % |             |       |
| Sex                               |     |   |     |   |             |       |
| Male                              | 3,819 | 54.4 | 3,196 | 45.6 | 1           | <0.01 |
| Female                            | 5,141 | 52.4 | 4,677 | 47.6 | 1.01 (1.00-1.02) | <0.01 |
| Age                               |     |   |     |   |             |       |
| 15-16                             | 4,338 | 53.5 | 3,777 | 46.5 | 1           |       |
| 17-19                             | 4,622 | 53.0 | 4,096 | 47.0 | 0.99 (0.98-1.00) | 0.56 |
| Self-declared skin color          |     |   |     |   |             |       |
| White                             | 3,690 | 52.2 | 3,381 | 47.8 | 1           |       |
| Non-white                         | 5,254 | 54.0 | 4,471 | 46.0 | 1.01 (1.00-1.02) | 0.01 |
| Location of residence             |     |   |     |   |             |       |
| Rural                             | 1,199 | 53.4 | 1,045 | 46.6 | 1           |       |
| Urban                             | 7,753 | 53.2 | 6,816 | 46.8 | 1.00 (0.98-1.01) | 0.84 |
| Brazilian macro-region            |     |   |     |   |             |       |
| Southeast                         | 1,616 | 54.2 | 1,365 | 45.8 | 1           |       |
| North                             | 2,083 | 53.7 | 1,794 | 46.3 | 0.99 (0.98-1.01) | 0.69 |
| Northeast                         | 2,134 | 53.4 | 1,864 | 46.6 | 0.99 (0.97-1.01) | 0.49 |
| South                             | 2,068 | 53.8 | 1,773 | 46.2 | 0.99 (0.98-1.01) | 0.76 |
| Midwest                           | 1,059 | 49.6 | 1,077 | 50.4 | 0.97 (0.95-0.98) | <0.01 |
| Self-perception of need for treatment |     |   |     |   |             |       |
| No                                | 1,862 | 48.9 | 1,949 | 51.1 | 1           |       |
| Yes                               | 6,992 | 54.6 | 5,818 | 45.4 | 1.03 (1.02-1.05) | <0.01 |
| Self-perception of oral health status |     |   |     |   |             |       |
| Great/good                        | 4,210 | 50.1 | 4,198 | 49.9 | 1           |       |
| Normal                            | 3,204 | 56.5 | 2,469 | 43.5 | 1.04 (1.03-1.05) | <0.01 |
| Bad/very bad                      | 1,025 | 57.6 | 755  | 42.4 | 1.05 (1.03-1.06) | <0.01 |
| Self-perception of appearance     |     |   |     |   |             |       |
| Great/good                        | 4,473 | 48.3 | 4,791 | 51.7 | 1           |       |
| Normal                            | 2,791 | 58.3 | 1,998 | 41.7 | 1.06 (1.05-1.07) | <0.01 |
| Bad/very bad                      | 1,184 | 65.2 | 631  | 34.8 | 1.11 (1.09-1.13) | <0.01 |
| Self-perception of chewing        |     |   |     |   |             |       |
| Great/good                        | 6,445 | 52.4 | 5,848 | 47.6 | 1           |       |
| Normal                            | 1,474 | 54.5 | 1,232 | 45.5 | 1.01 (1.00-1.02) | 0.05 |
| Bad/very bad                      | 639  | 58.6 | 452  | 41.4 | 1.04 (1.02-1.06) | <0.01 |
| Self-perception of speech         |     |   |     |   |             |       |
| Great/good                        | 7,170 | 52.6 | 6,460 | 47.4 | 1           |       |
| Normal                            | 978  | 56.4 | 756  | 43.6 | 1.02 (1.00-1.04) | <0.01 |
| Bad/very bad                      | 318  | 59.4 | 217  | 40.6 | 1.04 (1.01-1.07) | <0.01 |
| Self-perception of relationships   |     |   |     |   |             |       |
| Not affected                       | 6,177 | 52.0 | 5,694 | 48.0 | 1           |       |
| Affected                           | 1,804 | 58.1 | 1,300 | 41.9 | 1.04 (1.02-1.05) | <0.01 |

PR (95% CI), prevalence ratio (95% confidence interval).

Susceptibility to disease during adolescence and at future points in their life course. Adolescents may be particularly vulnerable because they no longer benefit from the care and attention given to children, and they also do not benefit from the maturity of adulthood. The prevalence of malocclusion that requires treatment varies from country to country. The prevalence among Brazilian adolescents was somewhat consistent with the prevalence of 53.15% in Mexican schoolchildren (12-18 years) in the city of Puebla, however, it is greater than the high need for orthodontic treatment reported in other countries, such as India (20-43%) and Nigeria (40.7%). When compared with the rates identified in some Brazilian cities, the values observed in the
Table 5  Multivariate analysis of factors associated with the necessity for orthodontic treatment in 15-19 year old Brazilians, 2002-2003.

|                                      | PR (95%CI) | p value |
|--------------------------------------|------------|---------|
| **Sex**                              |            |         |
| Male                                 | 1          |         |
| Female                               | 1.01 (1.00-1.02) | 0.01 |
| **Self-declared skin color**          |            |         |
| White                                | 1          |         |
| Non-white                            | 1.01 (1.00-1.02) | 0.01 |
| **Brazilian macro-region**            |            |         |
| Southeast                            | 1          |         |
| North                                | 0.99 (0.97-1.00) | 0.33 |
| Northeast                            | 0.98 (0.96-1.00) | 0.05 |
| South                                | 1.01 (0.99-1.02) | 0.21 |
| **Self-perception of need for treatment** |  |         |
| No                                   | 1          |         |
| Yes                                  | 1.02 (1.01-1.03) | <0.01 |
| **Self-perception of oral health status** |  |         |
| Great/good                           | 1          |         |
| Normal                               | 1.00 (0.99-1.01) | 0.39 |
| Bad/very bad                         | 0.97 (0.95-0.99) | 0.03 |
| **Self-perception of appearance**    |  |         |
| Great/good                           | 1          |         |
| Normal                               | 1.06 (1.05-1.08) | <0.01 |
| Bad/very bad                         | 1.12 (1.10-1.14) | <0.01 |
| **Self-perception of chewing**       |  |         |
| Great/good                           | 1          |         |
| Normal                               | 0.98 (0.96-0.99) | 0.02 |
| Bad/very bad                         | 0.99 (0.97-1.01) | 0.73 |

PR (95% CI), prevalence ratio (95% confidence interval).

more advanced treatments by oral health specialists in clinical and functional rehabilitation.25 Tertiary care in Brazil’s public oral health care programs includes some high-cost procedures, performed primarily by private providers and public university hospitals, and paid for with public funds at prices close to market value.23 Considering this organization of comprehensive care, orthodontic treatment is within the secondary service network.

Gender differences and cultural factors affect the prevalence of malocclusions. The prevalence of need for orthodontic treatment was higher among female Brazilian adolescents, perhaps due to the smaller jaw size in females that may lead to the lack of an adequate amount of space for the teeth,24 or perhaps because women generally are more concerned with aesthetics,25,26 or because they are more prone to seeking preventive care.27 Socioeconomic, cultural, and behavioral differences between racial groups and macro-regions may also account for some of the inequalities in the need for orthodontic treatment between these groups.26

Similarly, a variety of sociocultural and psychological factors may influence self-perception of the need for orthodontic treatment. Adolescents who seek out orthodontic treatment may be concerned about improving their appearance and social acceptance, since people with malocclusion may feel shy, lose employment opportunities, and feel sorry for themselves, due to the compromised appearance of their teeth. Different types of malocclusions may produce changes not only in the aesthetic acceptability of appearance but in functionality and quality of life in terms of chewing, swallowing, breathing, smiling, and speaking, as well as experiences of pain and temporomandibular joint disorders.27 In this study there was a greater prevalence of the need for treatment among those that perceived their oral health to be bad or very bad and among those who perceived their chewing as normal.

While the oral health strategies developed by SUS have led to positive outcomes for many Brazilians, inequalities based on socio-demographic factors persist.1 Therefore, the public system has yet to fully meet its goals of providing equitable, universal, and inclusive care to meet the oral health care needs of all Brazilian citizens. To better attend to core principles of the public health system, such as universality, comprehensive care, and equity with regards to oral, and consequently overall health, access to orthodontic treatment within the public health care sector needs to be continually expanded in Brazil.

The estimates of the oral health conditions of the Brazilian population produced by this project have been discussed in the literature, but full data of the research were not published.28,29 The data used were generated over a decade ago; however, such associations had not been exploited yet by previous studies. Furthermore, given the methodological characteristics, cause-and-effect relationships between associations cannot be established. Despite these limitations, a high prevalence of need for orthodontic treatment among adolescents in Brazil was identified, associated with demographic and subjective issues that define oral health. The high prevalence of orthodontic needs in adolescents is a challenge to the goals of Brazil’s universal public health system.
Funding

This study did not receive funding.

Conflicts of interest

The authors declare no conflicts of interest.

References

1. Paim J, Travassos C, Almeida C, Bahia L, Macinko J. The Brazilian health system: history, advances, and challenges. Lancet. 2011;377:1778-97.
2. Travassos C. Equity in the brazilian health care system: a contribution for debate. Cad Saúde Publica. 1997;13:325-30.
3. Mendes EV. Distrito sanitário: o processo social de mudança das práticas sanitárias do Sistema Único de Saúde. São Paulo: Hucitec/Abraesco; 1993.
4. Wamala S, Merlo J, Boström G. Inequity in access to dental care services explains current socioeconomic disparities in oral health: The Swedish National Surveys of Public Health 2004-2005. J Epidemiol Community Health. 2006;60:1027-33.
5. Peres MA, Peres KG, Barros AJ, Victora CG. The relation between family socioeconomic trajectories from childhood to adolescence and dental caries and associated oral behaviours. J Epidemiol Community Health. 2007;61:141-5.
6. Abelsen B. What a difference a place makes: dental attendance and self-rated oral health among adults in three counties in Norway. Health Place. 2008;14:829-40.
7. Ngom PI, Diagne F, Benoist HM, Thiam F. Intraarch and interarch relationships of the anterior teeth and periodontal conditions. Angle Orthod. 2006;76:236-42.
8. Nelson S. Epidemiology for the practicing orthodontist. Semin Orthod. 1999;5:77-84.
9. Peres KG, Traebert ES, Marques W. Differences between normative criteria and self-perception in the assessment of malocclusion. Rev Saúde Publica. 2002;36:230-6.
10. Jenny J, Cons NC. Establishing malocclusion severity levels on the Dental Aesthetic Index (DAI) scale. Aust Dent J. 1996;41:43-6.
11. Marques LS, Barbosa CC, Ramos-Jorge ML, Pordeus IA, Paiva SM. Malocclusion prevalence and orthodontic treatment need in 10-14-year-old schoolchildren in Belo Horizonte, Minas Gerais State, Brazil: a psychosocial focus. Cad Saúde Publica. 2005;21:1099-106.
12. Claudino D, Traebert J. Malocclusion, dental aesthetic self-perception and quality of life in a 18 to 21 year-old population: a cross section study. BMC Oral Health. 2013;13:3.
13. Brizon VS. Má oclusão em crianças e adolescentes brasileiros: modelo multinivel [tese de mestrado]. Belo Horizonte (MG): UFMG; 2012.
14. Brasil - Ministério da Saúde. Projeto SB2000: condições de saúde bucal da população brasileira no ano 2000. Brasília: Ministério da Saúde; 2001.
15. Brasil - Ministério da Saúde. Condições de Saúde Bucal da população brasileira 2002-2003. Resultados Principais. Brasília: Ministério da Saúde; 2004.
16. World Health Organization. Nutrition in adolescence - issues and challenges for the health sector: issues in adolescent health and development [Who discussion Papers on Adolescence]. Geneva: WHO; 2005.
17. Perez AV, García RG, Cárdenas LA, Carrasco GR, Castro BC, Lezama FG, et al. Índice estética dental (DAI) y necesidad de tratamiento ortodontico en escolares, Verano 2007. Oral. 2008;9:472-5.
18. Dental Council of India. National oral health survey and fluoride mapping (India) 2002/2003. India: Dental Council of India; 2004.
19. Shivakumar KM, Chandu GN, Subba Reddy VV, Shafiulla MD. Prevalence of malocclusion and orthodontic treatment needs among middle and high school children of Davangere city, India by using Dental Aesthetic Index. J Indian Soc Pedod Prev Dent. 2009;27:211-8.
20. Onyeaso CO, Aderinokun GA. The relationship between dental aesthetic index (DAI) and perceptions of aesthetics, function and speech amongst secondary school children in Ibadan, Nigeria. Int J Paediatr Dent. 2003;13:336-41.
21. Brasil – Ministério da Saúde. Secretaria de Atenção à Saúde - departamento de atenção básica. Saúde da família: passo a passo das ações do departamento de atenção básica. Brasília: Ministério da Saúde; 2011.
22. Pinho VG. Saúde bucal coletiva. São Paulo: Ed. Santos; 2000.
23. Solla J, Chioro O. Specialized outpatient care. In: Giovanella L, editor. Policies and health system in Brazil. Rio de Janeiro: Fiocruz; 2008. p.627-73.
24. Al-Khateeb SN, Abu Alhaija ES. Tooth size discrepancies and arch parameters among different malocclusions in a Jordanian sample. Angle Orthod. 2006;76:459-65.
25. Paula Júnior DF, Santos NC, Silva ET, Nunes MF, Leles CR. Psychosocial impact of dental esthetics on quality of life in adolescents. Angle Orthod. 2009;79:1183-9.
26. Christopherson EA, Briskie D, Inglehart MR. Objective, subjective, and self-assessment of preadolescent orthodontic treatment need-a function of age, gender, and ethnic/racial background? J Public Health Dent. 2009;69:9-17.
27. Shah ND, Arruda A, Inglehart MR. Pediatric patients’ orthodontic treatment need, quality of life, and smiling patterns - an analysis of patient, parent, and provider responses. J Public Health Dent. 2011;71:62-70.
28. Narvai PC, Antunes JL, Moysés SJ, Frazão P, Peres MA, Peres KG, et al. Scientific validity of epidemiological knowledge based on data from the Brazilian Oral Health Survey (SB Brazil 2003). Cad Saúde Publica. 2010;26:647-70.
29. Martins AM, Jardim LA, Souza JG, Rodrigues CA, Ferreira RC, Pordeus IA. Is the negative evaluation of dental services among the Brazilian elderly population associated with the type of service? Rev Bras Epidemiol. 2014;17:71-90.