DOI: https://doi.org/10.17921/2447-8938.2022v24n2p148-156

Analysis of Oral Health Indicators in the Municipalities of the Metropolitan Region of Baixada Santista – SP

Análise dos Indicadores de Saúde Bucal dos Municípios da Região Metropolitana da Baixada Santista – SP

Daniel Brito Zanolli[a]; Tatiana Ribeiro de Campos Mello[ab]; Fernanda Campos Sousa de Almeida-Carrer[c]; Mariana Gabriel[a]

[a]Universidade de Mogi das Cruzes, Programa de Pós-Graduação Stricto Sensu em Políticas Públicas. SP, Brasil.
[b]Universidade de Mogi das Cruzes, Curso de Odontologia. SP, Brasil.
[c]Universidade de São Paulo, Faculdade de Odontologia, Programa de Pós-Graduação Stricto Sensu em Ciências Odontológicas. SP, Brasil.
*E-mail: danielzanolli@yahoo.com.br

Abstract

The Ministry of Health, in recent decades, has been recommending that health system administrators incorporate the use of indicators in the assessment and monitoring of oral health care. In 2013, the Ministry of Health Policy Guidelines, Objectives, Goals and Indicators (2013-2015) proposed three indicators on oral health. The objective of this research was to collect and analyze the indicators on oral health and health expenditures of the municipalities that constitute the Baixada Santista - SP from 2009 to 2020. The indicators were collected and analyzed, correlating the data and IDH-M of each county, using the Pearson correlation test, with a significance level of 95 %. The cities of Bertioga and Cubatão were the ones that invested the most in health, despite not necessarily having the best indicators in oral health. A strong positive correlation was found between the "IDH-M" and the "average of the collective action of supervised toothbrushing", and a moderate positive correlation between the "average expenditures /inhabitants" and the "ESB coverage in AB", as well as between the "percentage of expenditure on health" and the "proportion of tooth extractions in relation to procedures". It is concluded that the oral health indicators, as well as the health expenditure indicators are important tools mechanisms which can be used in the development of public policies in oral health, supporting strategic planning of oral health actions.

Keywords: Health Policy. Health Information Systems. Oral Health. Unified Health System.

Resumo

O Ministério da Saúde, nas últimas décadas, vem recomendando que gestores do sistema de saúde incorporem o uso de indicadores na avaliação e no monitoramento da atenção em saúde bucal. Em 2013, o Caderno de Diretrizes, Objetivos, Metas e Indicadores do Ministério da Saúde propôs três indicadores em saúde bucal. O objetivo desta pesquisa foi coletar e analisar os indicadores em saúde bucal e gastos com saúde dos municípios da Baixada Santista – SP entre 2009 a 2020. Foram coletados e analisados os indicadores relacionando-os entre si e com o IDH-M por meio do teste de correlação de Pearson, com nível de significância de 95%. Os Municípios de Bertioga e Cubatão foram os que mais investiram em saúde apesar de não apresentarem os melhores indicadores em saúde bucal. Foi encontrada uma correlação forte positiva entre o "IDH-M" e a "média da ação coletiva de escovação dental supervisionada", e uma correlação moderada positiva entre a "média de gastos/habitantes" e a "cobertura da ESB na AB", bem como entre o "percentual de gastos em saúde" e a "proporção exodontia em relação aos procedimentos". Conclui-se que os indicadores em saúde bucal, bem como os indicadores de gastos em saúde são importantes instrumentos que podem ser utilizados na formulação de políticas públicas em saúde bucal, subsidiando o planejamento estratégico das ações de saúde bucal.

Palavras-chave: *Política de Saúde. Sistemas de Informação em Saúde. Saúde Bucal. Sistema Único de Saúde.*

1 Introduction

The history of oral health in Brazil shows that this sector has never been a priority sector to the public sector investments and the trend to neglect the oral health, concerning the public policies, has lasted for decades[1,2].

The oral health problems in Brazil were evidenced with the national 2003 SB Brazil survey and, given the window of opportunities for this subject to take part of the Federal Government agenda of priorities, in that same year, the National Oral Health Policy (PNSB), also known as *Brasil Sorridente* Program. The success of the implementation phase is notorious, providing an advance in the coverage of basic and specialized services in the national territory, however, from 2016, a stagnation was noticed due to the Brazilian political-economic situation. Yet, PNSB was a great advance in the public oral health field[1,3].

The PNSB operationalization has been running into difficulties with recent fiscal austerity measures and decreased resources, limiting the public budget and strengthening the supplementary health. The Bill of Law 6836/2017, which intends to include the oral health in the Brazilian Unified National Health System (SUS), is an excellent initiative in the oral health area for the PNSB not to be a policy restricted only to governments, but a SUS policy, seeking for continuous advance with quality[3,4].

PNSB also redirected the planning, monitoring and assessment of the oral health actions, and the oral health

indicators started to be important instruments for the oral health systematization in Primary Care. In 2006, the Pact for Health (SUS consolidation) emerges, approving the Operational Directives in three aspects: Pact for Life, Pact or Management and Pact in Defense of SUS. The Pact becomes a formal negotiation instrument among the Municipal, State and Federal Managers, with goals to be reached regarding the previously agreed health indicators[5,6].

For guiding and developing the programming of the oral health actions to be conducted, it is necessary to take the current care model, the diagnosis of the health conditions and the treatment needs of the population assigned to the concerned territory into consideration. The information becomes crucial for decision making and directs the actions to be developed, with view to health promotion, prevention of diseases and organization of the provided services[7].

In Brazil, as of 2004, the Ministry of Health has expanded the guidance to the managers in the planning, execution, assessment and monitoring processes of their actions. Public policies were instituted in order to improve SUS access and qualification. Several programs, projects and agreements among the states were instituted, always accompanied by health indicators appropriate for them[8].

The oral health indicators were included late in 2010: estimated population coverage of the Oral Health Teams (ESBs) in the Family Health Team (ESF) and average of the collective action of supervised toothbrushing. In 2011, the Public Health Action Organizational Agreement (COAP) was institutionalized in order to organize on a shared basis the actions and services in the health region and incorporate the health assistance[5,9].

In 2013, the Directives, Objectives, Goals and Indicators for the 2013-2015 period were defined, with view to strengthening the integrated SUS planning and the COAP implementation. The indicators allow to follow-up the achievement of the goals, being essential both for the monitoring and assessment, and may serve to comparatively analyze the performance, contributing for the continuous improvement of the organizational processes, as well as to support the critical analysis of the obtained results, assisting in the decision making[5].

Health information system can be defined as an integrated database, and through it it is possible to obtain the indicators, where the production units are, for data analysis and dissemination, with view to support the elaboration and assessment of the health actions developed. From this system, the data are selected and turned into information intended to implement the health system's decision, planning, funding and assessment processes[10].

In the assessment of the health actions impacts, the analysis of indicators collected from databases, such as the SIA-SUA (SUS' Outpatient Information System), associated to socioeconomic data, such as the IDH-M (Municipal Human Development Index), is very significant, assisting with the appropriate planning of the service provision[7].

Despite the changes to the indicators over the years, with the inclusion and exclusion of oral health indicators and their dramatic reduction in the last two years, the use of indicators allows us to analyzed the provided services, assisting in the the services assessment, whether they are appropriated or not and sufficient to meet the existing demand. They also show if the actions must be improved and/or changed, and if the level of compliance with such actions is compatible with SUS real needs[11].

Based on the oral health indicators proposed in the Ministry of Health's 2013-2015 Directives, Objectives, Goals and Indicators Journal, this study was intended to describe the progress of the oral health and health budgets indicators of the municipalities that constitute the Baixada Santista, SP, in the 2009-2020 period, associating them to the IDH-M of each municipality, thus supporting the political decision making informed by scientific evidence.

2 Material and Methods

This is a descriptive-observational cross-sectional study, where the data collection was conducted in the public domain databases. It is also an analytical quantitative study when, following the data collection, the oral health indicators of such municipalities were related to each other, with Brazil's indicators, such as the IDH-M, as well as with the expenditure on health of such municipalities.

2.1 IDH-M

IDH-M is a measure comprising indicators of three aspects of the human development (health, education and income) and measured by means of life expectancy (health); level of schooling (education); and GDP per capita expressed as the purchase power (income)[12].

According to Atlas Brasil, IDH-M is a number which ranges between 0.000 and 1.000. The closer to 1.000, the higher the human development of a state, municipality or metropolitan region, ranging from very low (0.000 to 0.499) to very high (0.800 to 1.000). In this study, the last assessed IDH-M of the municipalities, which was related to 2010[16], will be taken into consideration[13].

2.2 Estimated oral health population coverage in primary healthcare

The estimated population coverage by oral health in primary healthcare is given by the percentage of the population covered by ESBs linked to the family health teams and by equivalent and parameterized oral health teams in the traditional primary healthcare concerning the population estimates. This is a datum which is already calculated in the E-Gestor (E-Manager) electronic portal[14,15].

2.3 Average of the collective action of supervised toothbrushing

It is the percentage of people participating in the collective action of supervised toothbrushing. Such action is necessarily directed to a group of individuals, and not to the individual action where the educational activities are conducted in the clinical scope for a single person. The data for this indicator were collected in the DATASUS and E-Gestor sites[16].

The calculation method is given by the number of people attending the collective supervised tooth brushing action, conducted in a certain place in twelve months (SIA/SUS code: 01.01.02.003-1), divided by the population in the same place and period, multiplied by 100[16].

2.4 Tooth extraction ratio compared with the procedures

It reflects the ratio of permanent teeth extractions compared to the total of individual clinical procedures in dentistry produced for residents in a municipality in a certain year. The lower the indicator, the higher the quality of the treatment provided by the oral health in the municipality, showing that the actions cover a higher number of restorative/preservative and preventive procedures, to the detriment of the individual mutilating procedures. The data for this indicator was collected in the DATASUS and E-Gestor sites[16].

The calculation method is given by total number of tooth extractions in a certain place and period*, divided by the total number of clinical individual preventive and curative procedures selected in the same place and period**, multiplied by 100[16].

* SIA/SUS codes: Tooth extractions (Codes: 0414020138 permanent tooth extraction and 0414020146 multiple extractions with alveoloplasty per sextant)[16].

** SIA/SUS codes: Code: 31 procedure codes: 0101020058 Application of cariostatic agent (per tooth); 0101020066 Application of sealant agent (per tooth); 0101020074 Topical application of fluorine (individual per session); 0101020090 Provisional sealing of dental cavity; 0307010015 Pulp capping; 0307010031 Anterior permanent tooth restoration; 0307010040 Posterior permanent tooth restoration; 0307020010 Access to dental pulp and medication (per tooth); 0307020029 Temporary dressing with or without biomechanical preparation; 0307020037 Endodontic treatment of deciduous tooth; 0307020045 Endodontic treatment of permanent two-root tooth; 0307020053 Endodontic treatment of permanent tooth with 3 or more roots; 0307020061 Endodontic treatment of permanent anterior tooth; 0307020070 Dental pulpotomy; 0307020088 Endodontic retreatment of permanent two-root tooth; 0307020096 Endodontic retreatment of permanent tooth with 3 or more roots; 0307020100 Endodontic retreatment of permanent single root tooth; 0307020118 Sealing of root perforation; 0307030016 Supragingival scaling, smoothing and polishing (per sextant); 0307030024 Subgingival scaling, smoothing (per sextant); 0307030032 Crown-root scaling (per sextant); 0414020022 Apicectomy with or without retrograde obturation; 0414020073 Periapical curettage; 0414020138 Permanent tooth extraction; 0414020146 Multiple Extraction with alveoloplasty per sextant; 0414020154 Gingivectomy (per sextant); 0414020162 Gingivoplasty (per sextant); 0414020219 Dental sectioning/root extraction/tunneling; 0414020243 Dental re-implant and transplant (per element); 0414020367 Surgical treatment for dental traction; 0414020375 Periodontal surgical treatment (per sextant)[16].

2.5 Expenses with own health resources per inhabitant, per year according to the municipalities

They are the expenses with own resources represent the total of health expenses; the expenses settled and paid in the year and the committed and unpaid expenses, registered as Accrued Liabilities until the limit of the cash availability at the end of the year, consolidated in the Health Fund[17].

They allow us to analyze the geographic and time variations of the expenses with ASPS (Public Health Actions and Services) per inhabitant, identifying inequality situations and trends demanding specific actions and studies, in addition to assisting the public health policies planning, management and assessment processes. Such indicator is already calculated in SIOPS (Public Health Budget Information System). All the values in this study were updated to December/2020, so as to eliminate the ranges due to the inflationary process and only measure the real variation of the values spent per inhabitant[18].

2.6 Percentage of own revenues invested to health according to Constitutional Amendment 29/2000 per year according to the municipalities

In order to ensure the municipalities budget share in the SUS context, the Constitutional Amendment (EC) no. 29, of 09/12/2000 was created, which binds part of the revenues from their own taxes and transferred to the health area, establishing a minimum rate of 15%. These data data were also extracted from SIOPS website[18].

After collecting the data, they were organized and tabulated by using the Microsoft Excel® (2019) program. In the quantitative statistical analysis, the Pearson correlation test was used, with a significance level of 95% and linear dispersion charts by using the same program. For the monetary correction of the expenditure on health to December 2020, the IGP-DI – FGV index and the calculator available in the Central Bank website were used[19].

3 Results and Discussion

The data from 2020 were not included in the oral health indicators average due to the Coronavirus pandemics, because from March 2020 and throughout 2020, the Brazilian Health Surveillance Agency, by means of Technical Note no. 04/2020, recommended the elective dental services to be suspended in the whole country, and that the services were restricted to

urgencies and emergencies. This model was adopted by all the municipalities that constitute the Baixada Santista in 2020[20].

According to Lucena et al.[21] the access to oral health in the primary healthcare between 2019 and 2020 decreased due to COVID-19 pandemic, and this phenomenon will negatively affect the oral health epidemiological data in Brazil. It is important that the municipalities that constitute the Baixada Santista monitor such indicators, particularly in the post-2020, year when the Coronavirus pandemic started and the elective dental treatments were suspended, negatively affecting the oral health epidemiological data in Brazil.

COVID-19 pandemic has somewhat given visibility to the structural problems and to the lack of resources, whether human or not, which were already neglected even before the pandemic. The oral health teams are exposed to aerosols produced during the dental treatment, as well as in continuous contact with saliva, one of the main transmission routes for COVID-19, therefore, the reorganization of the oral health care is crucial, thus protecting professionals and users of the public and private health systems[22].

Thus, the 2020 data were included in this research, but the analysis was conducted on an isolated basis, because the inclusion could negatively interfere in the average supervised toothbrushing and in the extractions and clinical procedures ratio, resulting in a false scenario of the reality in such municipalities. The results were divided into analyzed category, followed by the Pearson correlation test.

3.1 IDH-M

All the municipalities that constitute the Baixada Santista from 2010 reached a high IDH-M, and Santos was the only one to achieve a very high IDH-M. A positive evolution of all the municipalities that constitute the Baixada Santista was noted concerning the IDH-M.

3.2 Estimated oral health population coverage in primary healthcare

The results are expressed in Table 1, where the municipalities were shown in decreasing order from the largest coverage to the smallest coverage, taking the average of the studied period into consideration.

Table 1 – Annual average of the estimated oral health population coverage in primary healthcare

Municipality	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020*	Average of the 2009-2019 period
Cubatão	67.58	66.29	60.96	65.61	61.88	52.14	47.77	43.78	41.01	40.91	43.04	38.06*	53.72
Brazil	49.17	50.30	51.76	52.67	52.89	52.03	52.02	51.98	51.51	52.51	52.83	51.83*	51.79
Peruíbe	50.79	52.27	52.26	39.09	43.22	44.96	48.58	45.45	34.82	29.59	46.19	44.65*	44.29
Itanhaém	39.18	44.26	50.86	51.21	42.78	48.52	45.80	37.47	30.92	43.22	41.82	41.53*	43.28
Santos	40.75	41.92	40.87	41.79	39.34	36.69	37.89	40.34	41.45	38.21	34.47	30.87*	39.43
Guarujá	20.76	15.49	18.13	22.47	41.32	42.61	46.97	57.64	52.26	53.49	52.75	55.25*	38.54
Bertioga	38.77	47.93	43.77	35.51	38.09	38.77	28.18	24.05	23.34	25.08	26.00	23.67*	33.59
Praia Grande	20.01	19.51	21.00	24.03	22.94	18.81	23.15	28.09	27.99	36.53	41.21	37.38*	25.75
São Vicente	19.16	18.71	18.88	19.98	20.15	20.41	20.68	20.18	17.94	16.64	16.58	14.75*	19.03
Mongaguá	34.37	30.62	25.92	21.74	18.76	14.07	8.72	2.86	5.39	4.84	10.79	10.58*	16.19

* 2020 was not included in the average

Source: Resource data.

Based on the collected data and on the national coverage average as a reference, only the municipality of Cubatão achieved a higher coverage than the oral health coverage in the national primary healthcare. All the other municipalities that constitute the Baixada Santista fell short with respect to the national average. Two municipalities presented a very low coverage, São Vicente and Mongaguá, being possible to infer, concerning the access, that the populations living in such municipalities do not have access to dental services on an equitable basis, and/or are not being assisted on an appropriate basis.

Comparing 2009 with 2019, it was noticed that only three municipalities, Itanhaém, Guarujá and Praia Grande, presented an increase in the oral health coverage in the primary healthcare. Emphasis should be given to Praia Grande and Guarujá, with an increase in coverage of 105.94% and 154.09 %, respectively. The national increment from 2009 to 2019 was 7.44%.

Concerning the oral health coverage in the primary healthcare, only Cubatão achieved an average that is higher than the national average. All the other municipalities fell short regarding the national average. Bordin and Fadel[9], when checking such indicator per Brazilian regions, found a coverage higher than the national average (32.45%) only in the Northeast region (36.6%), being that the South, North and Southeast regions presented lower coverage values: 29.53%, 28.08 % and 17.51%, respectively.

Only the municipalities of Itanhaém, Guarujá and Praia Grande presented an increase in the oral health coverage in the primary healthcare, with 6.73%, 105.94% and 154.09%, respectively. Itanhaém, despite of the increase, was still under the national increment of 7.44%.

Lamy[23], assessing the oral health indicators in the State of Minas Gerais between 2005-2012, found an increase of 7.5% in indicator "estimated population coverage by the ESBs", with 55.3% in 2008 and 59.4% in 2012, being that the increase of the national average for this period was also 7.5%.

In its turn, in a study of the Northwest macro-region of the State of São Paulo conducted between 2011-2014 and its respective Regional Health Departments (DRS), Hirooka[24] concluded that approximately 50% of the population was covered by oral health teams, and that there was a 3%[23] decrease in this indicator in such period.

3.3 Average of the supervised collective toothbrushing action

The results are expressed in Table 2, where the municipalities were in decreasing order from the highest average in the studied period of the action of supervised collective toothbrushing to the lowest average found.

Table 2 - Average of the action of supervised collective toothbrushing

Municipality	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020*	Average of the 2009-2019 period
Santos	3.20	3.21	2.97	2.94	2.89	4.22	8.97	14.37	3.31	1.92	3.87	0.49*	4.72
Peruíbe	2.81	10.76	0.00	2.11	2.08	5.59	8.35	2.58	2.58	1.40	3.07	0.00*	3.76
São Vicente	3.70	3.03	2.96	3.77	2.87	3.08	2.98	2.29	2.31	2.09	2.09	0.03*	2.83
Itanhaém	2.56	2.40	1.77	0.00	5.05	2.69	8.65	2.84	1.48	0.00	0.00	0.00*	2.49
Brazil	2.62	2.78	2.71	2.34	2.21	2.35	2.06	1.49	1.19	0.67	0.50	0.06*	1.90
Guarujá	0.62	0.06	0.00	1.11	5.52	6.80	4.19	1.00	1.19	0.00	0.00	0.00*	1.86
Mongaguá	1.61	0.71	0.99	3.17	1.31	1.70	1.77	1.36	1.14	1.24	2.74	0.00*	1.61
Cubatão	3.91	0.59	1.25	3.11	1.93	2.82	0.86	1.13	0.78	0.61	0.50	0.00*	1.59
Praia Grande	0.96	1.27	1.95	1.68	2.21	1.02	1.63	0.57	0.05	1.04	1.71	0.03*	1.28
Bertioga	0.03	0.18	0.09	0.03	0.01	0.11	0.50	0.23	0.09	0.00	0.01	0.00*	0.12

* 2020 was not included in the average

Source: Resource data.

According to the collected data, it is possible to infer that almost half of the municipalities: Santos, Peruíbe, São Vicente and Itanhaém, obtained an average that is higher than the national average of the collective action of supervised toothbrushing, although Itanhaém did not present any average in 2012, 2018 and 2019. It is worth emphasizing the municipality of Bertioga presenting the worst average for such indicator, showing the almost non-existence of supervised toothbrushing actions, or the inappropriate insertion of its production into the information systems.

There was an increment in the annual average of supervised toothbrushing from 2009 to 2019 in four municipalities, Santos, Peruíbe, Mongaguá and Praia Grande. Emphasis to Praia Grande where there was an increase of 78.12% which, although presenting a good increment, still shows a low average compared, for example, with the average observed in the municipality of Santos. An important fact is noted in 2020, year when the Covid-19 pandemic started, where an expressive drop is noticed in all the municipalities.

Concerning the average of supervised toothbrushing, Santos, Peruíbe, Mongaguá and Praia Grande presented an increase within the average comparing 2009 and 2019, where Praia Grande had a significant increase of 78.12%, while the national average from 2009 to 2019 decreased 80.91%.

Chaves et al.[25], analyzing the oral health policy transformations in Brazil, noticed, for the action of supervised collective toothbrushing procedure, a decrease in the number of procedures in the analyzed period (2008-2017) (41.5%) and the average of the action of supervised collective toothbrushing remained constant up to 2011, presenting a decrease during the following years, and in 2017 it presented a lower result.

Indicator "average of supervised collective toothbrushing", although limited to a type of collective action and that low coverage does not imply absence of access to preventive oral health and health promotion actions, estimates the proportion of people who had access to toothbrushing directed/supervised by an oral health professional, contributing for the planning, monitoring and assessment of the prevention, promotion and self-care actions[13].

Zermiani et al.[7] believe that municipalities which presented supervised lower toothbrushing averages are justified by the fact that the practice of conducting collective procedures in such municipalities is not considered as relevant to the population health, being, in general, incorrectly registered or are not even conducted on a standardized way. This may apply, for example, to the municipality of Bertioga, which presented the worst average for such indicator (0.12).

3.4 Proportion of tooth extractions in relation to procedures

The results of this indicator are expressed in Table 3, where the municipalities are shown in decreasing order from the lowest average in the studied period to the highest average found, i.e., from the "best" average to the "worst" average.

Table 3 - Annual average of the proportion of tooth extractions in relation to procedures

Municipality	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020*	Average of the 2009-2019 period
Cubatão	3.04	3.25	3.47	2.05	1.16	0.80	2.31	3.50	0.17	5.23	8.17	12.24*	3.01
São Vicente	3.69	4.22	3.96	4.24	4.56	4.73	4.19	4.72	5.78	5.74	5.79	11.69*	4.69
Guarujá	4.12	5.03	5.24	5.16	5.06	4.67	5.24	6.98	7.34	7.49	5.60	7.52*	5.63
Itanhaém	6.00	5.99	5.58	8.36	5.37	9.38	11.54	13.81	13.53	5.99	6.87	15.14*	8.40
Santos	2.30	2.26	0.77	2.16	9.22	2.83	61.19	4.26	4.94	5.57	5.65	12.19*	9.20
Praia Grande	8.17	7.14	7.46	6.46	4.76	6.67	6.61	9.25	9.46	33.62	9.25	16.77*	9.90
Brazil	13.26	8.65	10.32	9.40	9.45	7.38	9.95	11.14	13.96	14.22	12.16	9.54*	10.90
Bertioga	14.47	14.18	0.28	5.75	22.91	13.01	2.95	10.24	11.62	13.32	15.27	25.88*	11.27
Peruíbe	12.98	14.46	10.69	18.08	13.09	25.20	19.49	16.43	21.81	17.76	18.15	20.39*	17.10
Mongaguá	16.21	14.99	13.94	17.03	25.00	24.60	21.05	16.91	21.40	21.58	21.32	37.38*	19.46

* 2020 was not included in the average

Source: Resource data.

It is possible to notice that most of the municipalities that constitute the Baixada Santista presented a "better" average of this indicator compared to the national average. Namely: Cubatão, São Vicente, Guarujá, Itanhaém, Santos and Praia Grande. The "worst" averages were assigned to the municipalities of Bertioga, Peruíbe and Mongaguá.

The municipalities of Bertioga, Mongaguá and Praia Grande were among the four municipalities presenting the worst indicators in the three assessed indicators, along with Peruíbe, which remained within the four worst indicators in the extraction ratio concerning the procedures; Cubatão, which remained within the four worst indicators in the collective action of supervised toothbrushing, and São Vicente, which remained among the four worst ones in the estimated oral health population coverage in the primary healthcare.

All the municipalities presented an increase in the proportion of tooth extractions in 2019 compared with 2009. This may indicate that all the municipalities are in the opposite way of the national policies (showing a drop), i.e., mutilating treatments still prevail to the detriment of the curative/preventive procedures.

The proportion of tooth extractions in relation to procedures is an indicator which presents limitations, such as, for example: people requiring tooth extraction may not have access to dental services; the proportion between the quantity of procedures may mask if such quantity is the recommended one for providing the best oral health to the population and to calculate such indicator, small additions or subtractions to the denominator for small quantities in the numerator, may cause great variation in the results[13].

All the municipalities that constitute the Baixada Santista presented an increase in the indicator "proportion of tooth extractions in relation to procedures" in 2019 compared with 2009, exactly opposite which occurred with the national average, indicating that all the studied municipalities are in the opposite way compared to the national level, with prevalence of mutilating treatments instead of curative/preventive procedures.

The State of Minas Gerais presented a decrease in such indicator (12.7% in 2008 to 6.9% in 2012), accompanying a national decrease in the same period (10.9% in 2008 to 9.3% in 2012). According to Lamy[23], such decrease may be related to an attempt to reorganize the oral health services, both by the primary and the secondary healthcare, seeking for full oral health care to the users, with practices directed to PNSB.

Zermiani et al.[7] found low values of extractions per inhabitant in the Metropolitan Region of Curitiba and emphasize the importance of obtaining at least the average of extractions per inhabitant, because this shows the health model adopted by a municipality, indicating if it is focused on promoting health or it only develops based on mutilating aspects.

In the study by Araújo and Machado[5], the authors verified a high index of extractions between 2008 and 2015 in municipalities in Rio Grande do Norte, with the prevalence of a dental service of mutilating character which can be associated to the socioeconomic conditions, level of schooling, lack of access or to the culture of replacing the teeth with prosthetic works. Still according to the authors, the fact that the implementation of Brasil Sorridente has been intended to increase the quantity of dental prosthesis laboratories and their offer, and the fact that some people consider replacing a tooth which could be treated as more practical and less costly, can be contributing for the increase in the number of extractions.

3.5 Expenses with own health resources per inhabitant, per year according to the municipalities

The results of the own health expenses per capita of the municipalities that constitute the Baixada Santista are shown in Table 4, being that the municipalities that constitute the Baixada Santista were classified according to such average per capita expense for the period from 2009 to 2020.

Table 4 – Per capita expense with municipal own Health resources according to the municipalities in the period of 2009 to 2020 (in Real in Dec/2020)

Municipality	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	average
Cubatão	1,642.95	1,949.64	2,098.15	1,606.44	2,162.39	2,168.65	2,164.65	1,737.76	1,367.46	1,422.98	1,436.09	1,196.86	**1746.17**
Bertioga	1,482.19	1,870.02	1,855.88	1,989.25	1,841.04	1,838.53	1,573.74	1,276.84	1,205.90	1,133.54	1,162.13	1,182.42	**1534.29**
Santos	816.08	850.50	887.24	923.83	974.08	1,019.07	1,030.97	1,081.26	1,098.19	1,057.53	1,180.65	1,030.07	**995.79**
Peruíbe	759.24	890.42	788.49	827.50	966.06	1,093.03	965.36	900.99	922.6	922.51	950.29	707.83	**891.19**
Mongaguá	688.03	810.44	845.51	961.87	786.23	744.95	745.04	799.88	761.44	857.12	1.027.08	790.64	**818.19**
Guarujá	554.19	534.99	641.25	695.01	855.90	779.03	739.08	669.74	754.91	804.36	873.34	843.17	**728.75**
Itanhaém	533.76	484.49	586.80	562.66	797.39	793.00	768.85	777.17	795.69	830.85	764.63	673.56	**697.40**
Praia Grande	571.46	635.84	629.36	704.18	662.08	669.55	604.10	656.58	671.16	689.42	785.17	637.40	**659.69**
São Vicente	523.75	450.51	458.01	438.19	526.07	611.81	583.01	511.08	523.86	474.40	465.73	404.90	**497.61**

Source: Resource data.

Cubatão was the municipality which made more investments in health per inhabitant for the studied period, Cubatão and Bertioga invested five times more than São Vicente, the municipality of the Baixada Santista which invested the least in health per inhabitant. Cubatão, Bertioga, Peruíbe and São Vicente, were the only municipalities which invested less in 2020 compared with 2009. The other municipalities started to invest more in 2020 than in 2009.

When it comes to budget, the scenario is that before PNSB, no budget resources were intended for the public oral health policies, therefore, its implementation allowed an advance in such an important area, but, at the same time, so neglected by the governments and in need of investments. Studies point out that there was an increase of 51.5% in the resources assigned to oral health compared to the periods of 1995 to 2002 and 2003 to 2013[1,26].

Concerning the expenses with own health resources per inhabitant, Cubatão and Bertioga were the municipalities of the Baixada Santista which invested more in health from 2009 to 2020, although Bertioga, as well as São Vicente, invested less in 2020 compared with 2009. All the other municipalities started to invest more in 2020 than they invested in 2009. This fact is supported by the study conducted by Santos Neto et al.[27], who, by analyzing the SUS funding and expenses of the municipalities of the Rota dos Bandeirantes region in the State of São Paulo, found an increase of 35% in expenditure on health in the period from 2009 to 2012.

Bertioga, even being one of the municipalities which made more investments, did not present satisfactory results in the analysis of its oral health indicators. The allocation of resources is closely related to how such resources are invested, being possible to spend a lot and at the same time to spend badly, as well as it is possible to spend a little, however, invest well, i.e., using the resources on an efficient way. Of course, when only the oral health indicators and general health expenses are analyzed, it would not be correct to state, based on such data, if a municipality is investing well in health, but it is possible to infer the importance of oral health to such municipality[28].

3.6 Percentage of the own revenue invested in health according to EC 29/2000 per year according to the municipalities

According to Table 5, it is noticed that Peruíbe invested more than twice the 15% indicated in EC 29/2000, however, all the municipalities which constitute the Baixada Santista invested more than such percentage required by the law.

Table 5 – Percentage of the municipality's own revenue invested in health according to the municipalities in the period from 2009 to 2020

Municipalities	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Average in the period
Peruíbe	26.90	30.26	28.49	30.60	36.54	37.63	35.98	34.93	33.91	33.60	34.78	31.30	32.91
São Vicente	31.54	29.73	26.43	26.06	31.08	34.07	35.05	30.46	30.06	29.10	27.90	28.77	30.02
Bertioga	26.64	32.02	34.32	37.32	34.52	33.66	30.67	25.44	22.71	22.42	22.67	26.27	29.06
Mongaguá	23.35	26.08	28.13	33.38	27.27	25.02	26.08	28.45	26.29	29.43	34.99	34.58	28.59
Itanhaém	21.92	20.15	22.95	21.85	31.43	29.27	29.80	31.46	29.93	30.96	28.45	30.83	27.42
Praia Grande	20.31	22.70	21.24	23.34	22.18	21.31	20.29	22.23	20.88	20.89	23.96	23.77	21.93
Cubatão	17.86	20.46	20.56	18.47	23.78	24.56	25.17	26.55	19.83	19.33	18.91	19.83	21.28
Guarujá	17.23	16.59	17.04	17.89	20.87	19.27	20.03	18.92	20.41	21.87	22.09	27.56	19.98
Santos	17.83	18.50	18.22	18.57	18.64	18.94	20.19	22.94	22.07	19.89	20.63	22.81	19.94

Source: Resource data.

All the municipalities showed an increase in the applied percentage comparing 2009 with 2020, except the municipalities of São Vicente and Bertioga which decreased their applied percentages.

By analyzing the percentage of the municipalities' own revenues invested in health, it was noticed an increase in the percentage invested in health in all the municipalities that constitute the Baixada Santista in 2020 when compared to 2009, except São Vicente and Bertioga which decreased their invested percentages, although both are among the three municipalities with more investments in health along with Peruíbe.

All the municipalities invested more than the minimum (15%) imposed by the law, with an average, in 2020 of 25.68% for the Baixada Santista and emphasis to Peruíbe which invested 31.30% in 2020, far above the required by the law. Santos Neto et al.[27], when studying the municipalities in the Rota dos Bandeirantes (SP) region, noted that all the municipalities presented a positive and significant evolution of the expenditure on health between 2009-2012, when the regional average of the own revenues invested in health was 27.3%, being that in the municipality of Carapicuíba it reached 37.5%, also significantly above the minimum required by the law.

3.7 Pearson correlation test

In the Pearson correlation between the oral health, IDH-m and expenditure on health indicators, a strong positive correlation was found between "IDH-M" and the "average of the collective action of supervised toothbrushing", leading us to conclude that the higher the IDH-M of a municipality, the higher the supervised toothbrushing coverage was.

A moderate positive correlation was noticed between the "average of expenses/inhabitants" and the "ESB coverage in AB", as well as between the "percentage of expenditures on health" and the "extraction vs. procedure ratio".

Only the strong and moderate correlations were considered in this study. Strong and moderate negative correlations were not found, only positive ones.

By relating the oral health indicators, IDH-M and expenses in health, some important correlations are found, such as: a strong, positive, correlation between "IDH-M" and the "average of the collective action of supervised toothbrushing", and a moderate, positive, correlation between the "average of expenditures/inhabitants" and the "ESB coverage in AB", as well as between the "percentage of expenditures on health" and the "extraction x procedure ratio".

Zermiani et al.[29] did not find any correlation between the "IDH-M" and the "average of the collective action of supervised toothbrushing", as well as they did not find any correlation between the extractions indicator and the socioeconomic indicators, however, they found that the higher the human development, the higher the number of first program consultations[7].

It is important to mention that the expenditures on health may not present correlations with health indicators, once the efficiency in investing the public health resources does not depend on the quantity of resources invested, by the way they are managed.

As well as Moura et al.[30], analyzing the relation between the public expenditures and health indicators in the city of Uberlândia, reported that even the municipality investing more than 15% as determined by the law, the results of the indexes were not satisfactory.

4 Conclusion

Following the presentation of the historical series, the indicators (budget and oral health) were related with each other and with the IDH-M, where it was noticed that municipalities such as Bertioga and Cubatão were the ones which presented more investment in health although they did not necessarily present the best oral health indicators. And when the indicators and the IDH-M were correlated, among the most important correlations, a strong positive correlation was found between "IDH-M" and the "average of the collective action of supervised toothbrushing", leading us to conclude that the higher the IDH-M of a municipality, the higher the supervised toothbrushing coverage was.

A moderate positive correlation was also found between the "average of expenditures/inhabitants" and the "ESB coverage in AB", as well as between the "percentage of expenditures on health" and the "extractions x procedure ratio", indicating that the higher the expenditure on health was, the higher the oral health coverage was, as well as less mutilating the oral health policy seems to be. Although the findings about Bertioga seem not to comply with this conclusion.

Even being aware of this study limitations, for example, the fact of working only with secondary data, and that the local reality is not being taken into consideration, it is still recommended that all the municipalities strengthen and extend the oral health coverage, since, except Cubatão, all the municipalities fell short with respect to the national average in this indicator; encourage the supervised toothbrushing, an important instrument for the health education and prevention of oral diseases; and that such municipalities, somehow, re-think the current assistance model, still focused on mutilating procedures (extractions) instead of preservative procedures.

The importance of the correct data input in the governmental databases should be emphasized, because the indicators, as assessment instruments, are important tools in the elaboration of public oral health policies. Future studies are also required in order to measure the Coronavirus pandemic impact to the oral health indicators.

It should be kept in mind that for a more complete assessment of a policy, the qualitative aspects and not only the quantitative ones must be taken into account, and that this study has limitations once it contains secondary data.

This study is expected to contribute for the oral health diagnosis of the municipalities that constitute the Baixada

Santista, and, thus, it may assist in the decision making and planning of more appropriate oral health policies for the territory, supporting the decision making informed by the scientific evidence and no longer by the mere guesswork and political convenience.

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