The impact of the COVID-19 pandemic on SUS (Universal Health System) primary preventive dental care in Brazil during the first two years of the pandemic

Abstract

Objective: Public health in Brazil has witnessed substantial transformations over the past four years due to the impact of the COVID-19 pandemic. This study aimed to quantify and compare the dental preventive procedures performed within the Brazilian Public Health System (SUS) during the initial two years of the COVID-19 pandemic (2020-2021) against the preceding two-year period (2018-2019), assessing the pandemic's impact on public dental health services

Methods: Data were retrospectively obtained from the Outpatient Information System (SIA/SUS) and the Brazilian Institute of Geography and Statistics (IBGE). Annual and total procedure numbers for 3 variables were established in each region. The indicators were: Educational activity/guidelines for groups in primary care, collective action of fluoride mouthwash and collective action of supervised toothbrushing. Descriptive analysis with annual percentage change (APC) was used.

Results: The preventive procedures decreased from 2018 to 2021, drastically dropping from 2020 to 2021. There was a 54% reduction in educational activity/guidelines for groups in primary care. There was a drastic reduction in the collective actions of fluoride mouthwash and supervised toothbrushing.

Conclusion: Dental preventive procedures in the SUS decreased from 2018 to 2021, but a greater decrease was observed in the first two years of the pandemic.

Keywords: Dentistry. Pandemics. COVID-19. Unified Health System. Public Health

INTRODUCTION

Public health in Brazil has undergone significant changes in recent decades, but it has undoubtedly never been as overwhelming as the pandemic caused by COVID-19. Almost five years and more than 700,000 deaths later, it is possible to say that Brazilian public health suffered a big blow, which, despite everything, continues to resist. One of the pillars of this resistance is the combed Family Health teams, an integral part of the Family Health Program (FHP). The FHP was created to contribute to reorganizing health care and prioritizing health prevention, promotion, and recovery actions.[1-4] With the advancement of these public policies, dentistry was more significant in teams, with a consequent focus on collective procedures aimed at visiting oral health prevention.

Some preventive dental procedures of oral health teams are focused on children, with educational activities such as supervised toothbrushes and topical fluoride applications via monitored mouthwash. These educational activities are mainly carried out within municipal and state public schools during the class period. Oral health education within schools deserves to be highlighted, as it has a low cost and a great possibility of dental impact at the public and collective level.[5]

As a measure of containment of the dissemination and transmission of the virus, in March 2020, there was a suspension of the present classes and the closure of schools. Each municipality had the autonomy to order this closure most conveniently.[6] Also, in March 2020, the Ministry of Health issued a technical note (n.9/2020) whose primary orientation was suspending elective SUS dental care, maintaining only the maintenance of urgent cases, which should be carried out individually to avoid disseminating the virus.[7] Collective procedures are applied primarily in elementary schools, and it is believed that the permanence and frequency of these procedures in the school environment, coupled with other factors, contributes to caries rates in children being controlled.[8] With these social isolation and distancing measures, collective prevention dental procedures fell dramatically during 2020 and early 2021.

The impacts of these actions were widely studied during the year 2020.[9-12] However, most of these studies evaluated the effect that quarantines and elective care suspensions have generated on private dental services. Much

remains to be understood about these suspensions' impact on dental care provided by the Unified Health System (SUS), particularly concerning collective preventive procedures.

Access to health services is still precarious for many of the Brazilian population.[13] In this context, access to oral health has been related as a gateway to a health care service.[14] Many children find in these collective educational activities that they only have access to oral health care information and weekly brushing.

According to Chisini *et al*.[1], collective procedures have decreased recently. Lucena *et al*.[15] reported that access to oral health in primary care was reduced due to the Covid-19 pandemic. However, they did not evaluate how exactly the collective procedures decreased by the Covid-19 pandemic. Based on this information, This study aimed to quantify and compare the dental preventive procedures performed within the Brazilian Public Health System (SUS) during the initial two years of the COVID-19 pandemic (2020-2021) against the preceding two-year period (2018-2019), assessing the pandemic's impact on public dental health services

MATERIAL AND METHODS

A retrospective longitudinal ecological study was conducted using secondary public data from the Brazilian Institute of Geography and Statistics (IBGE) and DATASUS.[16]

This report adheres to the guidelines outlined in the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement.[17]

Source:

The data was obtained from DATASUS with the TABNET tool, which offers information to facilitate an objective analysis of the healthcare system, inform evidence-based decision-making, and aid in developing health action programs.[18] Data extraction was conducted independently by two investigators who had been previously trained and calibrated (ACC and TF). The method was based on a previous study.[18]

Data acquisition

A search comprising provided dental treatments and the SUS codes related to any dental preventive procedures provided by SUS at outpatient settings (patients who did not require an overnight hospital stay but visited a hospital, clinic, or affiliated facility for diagnosis or treatment) was performed from 2018-2021. Data was collected on June 6th, 2020.

Sample size calculation was unnecessary, as the entire database available in the system was used.

The categories of preventive dental procedures were the following variables: Educational activity/guidelines for groups in primary care, Collective action of fluoride mouthwash, and Collective action of supervised toothbrushing. Their definitions and additional information are in Table 1.

Educational activity/guidelines for groups in primary care (code: 0101010010)	Educational activities (presentations) on health promotion and prevention actions conducted in a group setting. A minimum of 10 (ten) participants is recommended, with a minimum duration of 30 (thirty) minutes. The number of activities carried out per month should be recorded.
Collective action of fluoride mouthwash (code: 0101020023);	Mouth washing with a fluoride solution, conducted by population groups under the guidance and supervision of one or more healthcare professionals, weekly (0.2% NaF) or daily basis (0,05% NaF)
Collective action of supervised toothbrushing (code: 0101020031).	Dental brushing is conducted with population groups under the guidance and supervision of one or more healthcare professionals. Action is recorded by the user per month, regardless of the frequency at which it is performed (daily, weekly, bi-weekly, monthly, or two, three, or four times a year).

Table 1: Preventive Dental Procedures Description

After all the data had been collected, they were cleaned as follows: empty or null fields were identified and removed. Identification and removal of duplicate

records. Standardization of numerical formats. Identification and removal of outliers.

A descriptive analysis was conducted to determine the number of procedures performed in each state, along with their relative percentages within Brazil's socio-demographic regions (South, Southeast, Northeast, North, and Midwest)

RESULTS

Overall, the total number of preventive procedures decreased from 2018 to 2021 (Table 2), with a drastic drop in 2020 compared to 2019 (Figure 1).

There was a decrease in all evaluated preventive procedures from 2018 to 2021 (Table 2 and Figure 2A-C). Fluoride mouthwash and supervised toothbrushing showed a reduction of approximately 90% in the first two years post-pandemic compared to the two years before the emergence of COVID-19 (Figure 2B-C).

Educational activity/guidelines for groups in primary care showed a decreased rate in all regions in the evaluated periods (Table 3). The exceptions occurred in the Southeast Region (+25.41%) and in the Southern region (+8.69%), where there was an increase in the period 2020-2021 (Table 3).

The Collective action of fluoride mouthwash showed a discreet increase in the Southern region (+1.19%) from 2018-2019. All other periods evaluated demonstrated a decrease rate, more pronounced after 2019-2020 (Table 3). Brazil's total data showed a reduction of -98.48% in 2018-2021(Table 3).

The Collective action of supervised tooth brushing presented a decrease rate in 2018-2021 of -96.37% (Table 3). All rates evaluated showed a decrease in all periods, mainly 2019-2020 (Table 3).

DISCUSSION

The COVID-19 pandemic has profoundly impacted dental care worldwide.[19] In Germany, where a tendency to postpone dental care was observed, approximately 20% of Germans opted to delay their consultations

during the pandemic despite the relatively shorter duration of restrictions.[20] Similarly, in China, the pandemic led to a significant reduction in dental emergency care utilization due to medical advice and fear of contamination. The closure of conventional care facilities during this period further exacerbated the population's decline in oral health management.[21]

In England, a country severely affected by COVID-19, public health services initially focused solely on urgent care for patients who could not be monitored remotely. Even after clinical activities were restored, a notable 67% decline in service utilization was observed in October 2020 compared to the same month in 2019.[22]

These findings highlight the wide-ranging impact of the COVID-19 pandemic on dental care utilization across different countries. The postponement of consultations, reduced access to emergency care, and decline in routine dental services emphasize the importance of tailored strategies to address oral health challenges during global health crises.

This research examines the impact of the COVID-19 pandemic on dental care indicators in the public healthcare system in Brazil. The study focuses on the period between 2018 and 2021, revealing noteworthy trends and disparities in preventive dental services utilization among the population.

The criteria for choosing the three indicators was based on their importance in Brazilian public health. Educational activity/guidelines for groups play a key role in bringing patients together for verbal guidance, such as teaching correct brushing techniques and the importance of oral hygiene. Collective actions of supervised tooth brushing and fluoride mouthwash are essential actions carried out by oral health teams to prevent dental caries, especially in low-income children, as they are carried out in municipal public schools.

All prevention indicators evaluated in the public service declined from 2018 to 2019, followed by a sharp drop in 2020 and further deterioration in 2021 (Table 2). Given that the public service is primarily accessed by individuals with lower income and limited access to private dental care, it is evident that a significant portion of the population, particularly children, experienced substantial setbacks in their dental control and prevention, including issues like caries and periodontal disease.

Educational Activities specifically tailored for children to introduce them to oral hygiene and its significance experienced a decline from 2018 to 2021. However, this indicator demonstrated relative resilience compared to others during the pandemic. Despite decreasing by more than half during the evaluated time frame, these activities were vital in mitigating cleaning deficiencies among children.

In contrast, Fluoridated Mouthwash and supervised tooth Brushing indicators faced severe challenges. These indicators showed a modest decline between 2018 and 2019, but the situation worsened significantly between 2019 and 2020. The steep decline in procedures stems from their implementation in public schools, which were closed for nearly two years during the pandemic in Brazil, preventing these activities from taking place. Fluoridated Mouthwash utilization plummeted by 90.14%, while supervised tooth Brushing frequency dropped by 88.16%. The decline continued from 2020 to 2021, with Fluoridated Mouthwash witnessing an 80.82% decrease and supervised tooth Brushing showing a drop of 58.99% (Table 2).

When we evaluate the independent individuals through each region of Brazil, we can see that virtually all indexes had a percentage decrease in the assessed periods (Table 3). Notably, the Educational Attitude - Group Orientation Indicator (table 3) was the least affected in the period valued between 2018 and 2021 but still had a sharp drop in all regions of the country. The Southeast region was the least affected region, with a total reduction of 35.31% in the period (Table 3). This region is considered the country's wealthiest region, where the public health system receives more significant investment in the state, which contributes substantially to the effectiveness of its service.

However, the Fluorided Mouthwash (Table 3) and Supervised tooth brushing Brushing (Table 3) indicators showed a substantial drop in all regions. In both indicators, the region with the highest decrease was the southern region, with a decline of –96.32% (Table 3) and –94.03% (Table 3), respectively. The region with lower falls, even if substantial, was the northern region, with falls of -87.14% (Table 3) and -91.78% (Table 3), respectively. However, it is noteworthy that there is a significant population difference between these two regions. The Northern Region, according to the latest census,[16] in 2022, has a total population of 17,349,619, while the Southern region has a population of 29,933,313

inhabitants. This data shows that the three states in the southern region have 57.96% more inhabitants than the seven states in the northern region, and this population volume in a smaller area also helps to explain the most significant drop in data in the southern region.

The decrease observed between 2019 and 2018 is probably due to the transition from the federal government and changes in public oral health policies that usually occur in changes of governments. However, the decrease was significantly noticeable compared to the initial two years of the pandemic.

Brazil is a country of continental dimensions, multicultural and unequal, with poverty distributed in some regions more than in others.[16,23,24] Preventive procedures declined substantially across all areas (Table 3). However, the most severe reductions were observed in the North, Northeast, and South regions (Table 3). Meanwhile, during 2020-2021, the Southeast region uniquely demonstrated a slight upturn in educational activities. This modest recovery contrasted with the declining trends observed in all other regions. It is reasonable to speculate that the long-term effects of these reductions may vary significantly between different regions. The North and Northeast are the poorest regions in Brazil.[23,24] These regions also showed the greatest reductions in educational activities in primary care. In contrast, the Northeast showed the greatest reduction in supervised tooth brushing procedures. This shows how unequal Brazil is and that although it has a health program known as SUS (Unified Health System), its implementation differs in different regions.

It is known that the people served by the FHP are among those with the lowest socioeconomic level and do not have private health insurance.[25] A study by Goldbaum et al.[26] showed that of the population seeking care at FHP, 42.9% comprises inactive people, unemployed people, and informal workers, a higher number than the number of employed people seeking this same service (11.8%).

These data show us that the FHP service plays a fundamental role in the oral health of people who are most likely to be most affected by health problems precisely because they have less financial means to prevent health problems, as can be done by people from lower social classes, who can seek private or health insurance services more regularly.[27]

When this neediest population does not seek FHP care due to the restrictions caused by COVID-19, we can understand that their only source of

prevention has also been restricted, and, therefore, we can assume that this period without care will lead to repercussions on the health of this population, which will be seen in the years following the end of restrictions. With less preventive care, we tend to have more demand in the future for patients in emergencies due to pain or other oral problems.

This reduction in dental caries prevention procedures and oral hygiene guidance could probably lead to an increase in caries shortly. It is of great importance that the health system is prepared to face this scenario in the short term and provide these measures in the event of new waves or pandemics. Some measures that can be adopted include Investment in technology and tele-dentistry, which can be useful for maintaining continuity of care and educational actions, even when physical contact is restricted. Develop communication strategies to educate and engage the community about the importance of oral health and the need to maintain preventive care, even during crises. This can include awareness campaigns on social media, online workshops, and other formats that are accessible to the population. Strengthening Oral Health Teams to empower and train oral health teams to deal with the challenges posed by health emergencies.

A worldwide atypical situation such as a pandemic would be sufficient reason to generate fear and insecurity in the population, and the restriction orders added to the massive isolation campaigns aimed at preventing COVID-19 virus propagation in the falls presented in this study. However, it is still worth noting that the long-term effects on the oral health of young people will undoubtedly be considerable and can only be fought with a national public and oral health policy with significant investments.

CONCLUSION

The COVID-19 pandemic strongly impacted the dental prevention indicators of the public health network (SUS) from 2020, extending this fall to 2021. As a consequence of this decrease in preventive actions, there will be greater demand for corrective treatments in the coming years.

Ethical Approval:

As per international standards or university standards written ethical approval has been collected and preserved by the author(s).

Disclaimer (Artificial intelligence)

Option 1:

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

Option 2:

Author(s) hereby declare that generative AI technologies such as Large Language Models, etc. have been used during the writing or editing of manuscripts. This explanation will include the name, version, model, and source of the generative AI technology and as well as all input prompts provided to the generative AI technology

Details of the AI usage are given below:

1.

2.

3.

References

1. Chisini LA, Martin ASS, Pires ALC, Noronha TG, Demarco FF, Conde MCM et al. A 19-years study of the dental procedures performed in the Brazilian Unified Health System. Cadernos Saúde Coletiva 2019;27:345-353.

2. Frazão P, Narvai PC. Oral health in the Brazilian National Health System: twenty year offightingfor a publie poliey. Saúde em Debate 2009;33:64-71.

3. Nascimento AC, Moysés ST, Werneck RI, Moysés SJ. Oral health in the context of primary care in Brazil. International Dental Journal 2013;63:237-243.

4. Pucca Jr GA. The national politics of buccal health as social demand. Ciência & Saúde Coletiva 2006;11:243-246.

5. Pauleto ARC, Pereira MLT, Cyrino EG. Oral health: A critical review about educative programmes for students. Saúde bucal: uma revisão crítica

sobre programações educativas para escolares. Ciência & Saúde Coletiva 2004;9:121-130.

6. Jamal M, Shah M, Almarzooqi SH, Aber H, Khawaja S, El Abed R et al. Overview of transnational recommendations for COVID-19 transmission control in dental care settings. Oral diseases 2021;27:655-664.

7. Brazil. Techinical Note Nº 9/2020 march 2020. COVID-19 and dental care at SUS. In: Health Mo, editor. 09. Brasília (DF); 2020: p. 5.

8. Junqueira SR. Effectiveness of "colective procedures"in oral health: dental caries in adolescents of the city of Embu, state of São Paulo, Brazil, 2005. Doctorate: University of São Paulo; 2007.

9. Cotrin P, Peloso RM, Oliveira RC, de Oliveira RCG, Pini NIP, Valarelli FP et al. Impact of coronavirus pandemic in appointments and anxiety/concerns of patients regarding orthodontic treatment. Orthod Craniofac Res 2020;23:455-461.

10. Cotrin P, Peloso RM, Pini NIP, Oliveira RC, de Oliveira RCG, Valarelli FP et al. Urgencies and emergencies in orthodontics during the coronavirus disease 2019 pandemic: Brazilian orthodontists' experience. Am J Orthod Dentofacial Orthop 2020;158:661-667.

11. Peloso RM, Pini NIP, Sundfeld Neto D, Mori AA, Oliveira RCG, Valarelli FP et al. How does the quarantine resulting from COVID-19 impact dental appointments and patient anxiety levels? Braz Oral Res 2020;34:e84

12. Ather A, Patel B, Ruparel NB, Diogenes A, Hargreaves KM. Coronavirus disease 19 (COVID-19): implications for clinical dental care. Journal of endodontics 2020;46:584-595.

13. Dantas MNP, Souza DLBd, Souza AMGd, Aiquoc KM, Souza TA, Barbosa IR. Factors associated with poor access to health services in Brazil. Revista Brasileira de Epidemiologia 2020;24:e210004

14. Fonseca EP, Fonseca SGO, Meneghim MC. Analysis of public dental services access in Brazil. ABCS Health Sciences 2017:85-92.

15. Lucena EHG, Freire AR, Freire DEWG, de Araújo ECF, Lira GdNW, Brito ACM et al. Access to oral health in primary care before and after the beginning of the COVID-19 pandemic in Brazil 2020.

16. IBGE IBGE-. IBGE IBdGeE-. Censo Demografico. https://www.ibge.gov.br/estatisticas/sociais/populacao/22827-censo-demografico-2022.html: Governo do Brasil;

2022.https://www.ibge.gov.br/estatisticas/sociais/populacao/22827-censo-demografico-2022.html: Governo do Brasil; 2022.

17. Von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. The lancet 2007;370:1453-1457

18. Dos Santos MBF, Pires ALC, Saporiti JM, Kinalski MA, Marchini L. Impact of COVID-19 pandemic on oral health procedures provided by the Brazilian public health system: COVID-19 and oral health in Brazil. Health Policy Technol 2021;10:135-142.

19. Keir G, Chengazi H, Tan D, Keir V, Kirsch CFE, Zohrabian VM. The early effect of COVID-19 on dental infections by neuroimaging in the emergency department setting. Clin Imaging 2023;102:31-36.

20. Hajek A, De Bock F, Huebl L, Kretzler B, König HH. Postponed Dental Visits during the COVID-19 Pandemic and their Correlates. Evidence from the Nationally Representative COVID-19 Snapshot Monitoring in Germany (COSMO). Healthcare (Basel) 2021;9.

21. Guo H, Zhou Y, Liu X, Tan J. The impact of the COVID-19 epidemic on the utilization of emergency dental services. J Dent Sci 2020;15:564-567.

22. Stennett M, Tsakos G. The impact of the COVID-19 pandemic on oral health inequalities and access to oral healthcare in England. Br Dent J 2022;232:109-114.

23. Estatística IBGe. Poverty drops to 31.6% of the population in 2022, after reaching 36.7% in 2021; 2023.

24. Tavares FF, Betti G. The pandemic of poverty, vulnerability, and COVID-19: Evidence from a fuzzy multidimensional analysis of deprivations in Brazil. World Development 2021;139:105307.

25. Fernandes LS, Peres MA. Association between primary dental care and municipal socioeconomic indicators. Revista de Saúde Pública 2005;39:930-936

26. Goldbaum M, Gianini RJ, Novaes HM, César CL. Health services utilization in areas covered by the family health program (Qualis) in Sao Paulo City, Brazil. Rev Saude Publica 2005;39:90-99.

27. Fernandes LC, Bertoldi AD, Barros AJ. Health service use in a population covered by the Estratégia de Saúde da Família (Family Health Strategy). Rev Saude Publica 2009;43:595-603.

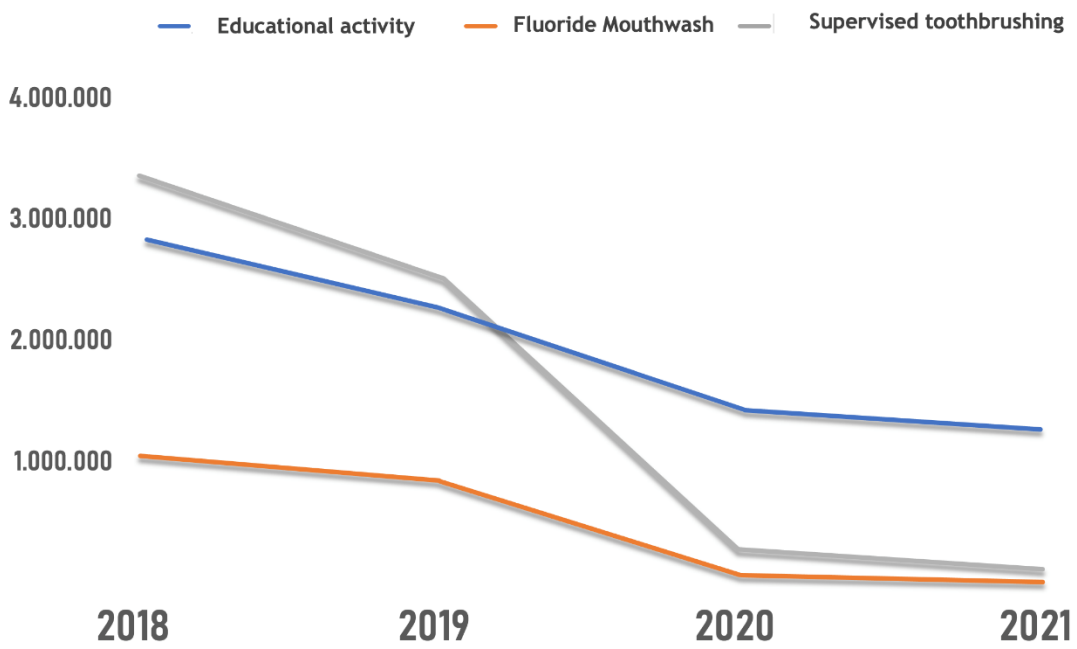
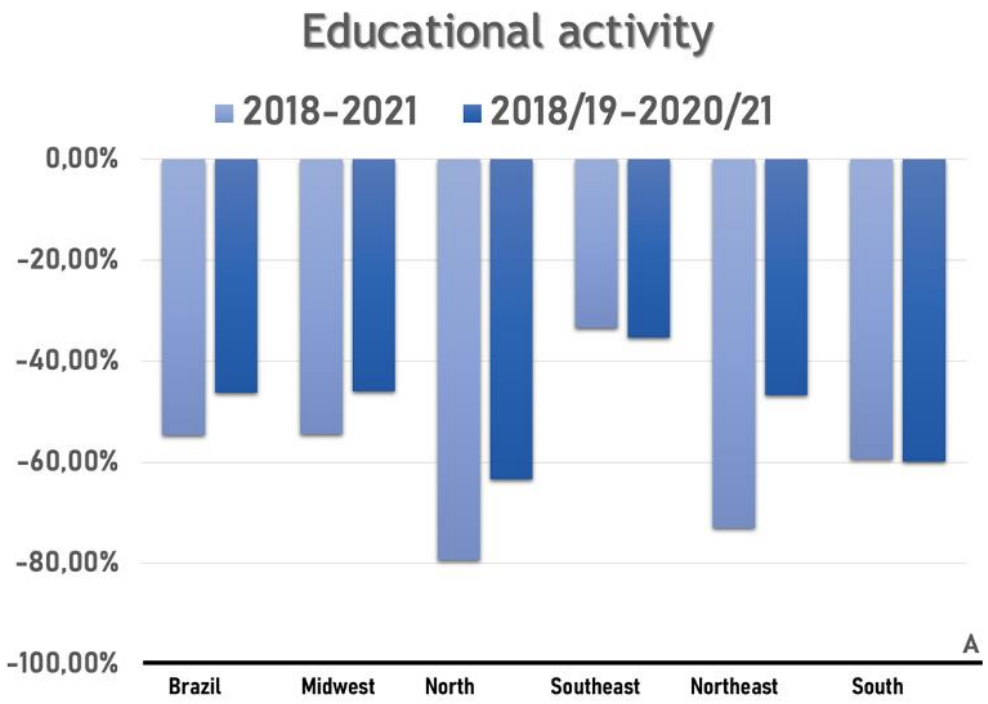
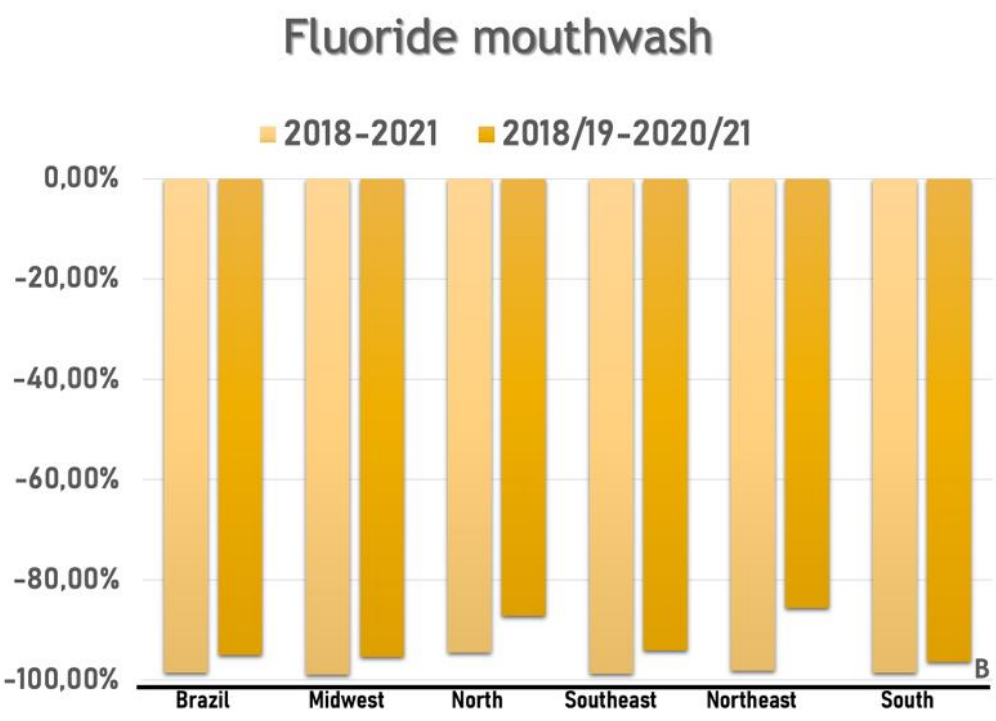


Figure 1: Total preventive dental procedures from 2018 to 2021.


Educational activity
2018-2021
2018/19-2020/21
0,00%
-20,00%
-40,00%
-60,00%
-80,00%
-100,00%
A
Brazil
Midwest
North
Southeast
Northeast
South


Fluoride mouthwash
2018-2021
2018/19-2020/21
0,00%
-20,00%
-40,00%
-60,00%
-80,00%
-100,00%
B
Brazil
Midwest
North
Southeast
Northeast
South


Supervised toothbrushing
2018-2021
2018/19-2020/21
0,00%
-20,00%
-40,00%
-60,00%

Figure 2(A-C): Decrease Rate of preventive procedures from 2018-2021 (A: Educational activity/guidelines for groups in primary care; B: Collective action of fluoride mouthwash; C: Collective action of supervised toothbrushing)

Table 2. Total preventive procedures from 2018 to 2021

Colective procedures	2018	2019	2020	2021
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Educational activity	2.831.005 (1.809.693)	2.291.220 (1.519.383)	1.452.148 (1.068.321)	1.285.271 (1.376.459)
Fluoride mouthwash	1.065.494 (1.130.760)	862.068 (1.249.100)	84.990 (66.222)	16.299 (15.855)
Supervised toothbrushing	3.378.575 (3.313.621)	2.520.988 (2.704.435)	298.380 (316.501)	122.358 (127.527)

Table 3. Total and regional variation in Preventive dental procedures from 2018 to 2021

Region	2018-2019 (%)	2019-2020 (%)	2020-2021 (%)	2018 - 2021 (%)	2018/19-2020/21(%)
Educational activity/guidelines for groups in primary care					
Brazil	-20%	-35%	-11.5%	-54.6%	-46.27%
Midwest	-21.24%	-35.21%	-10.68%	-54.41%	-45.96%
North	-22.6%	-47.72%	-53.3%	-79.35%	-63.41%
Southeast	-15.01%	-37.53%	+25.41%	-33.43%	-35.31%
Northeast	-35.45%	-5.88%	-55.55%	-73.01%	-46.67%
South	-5.63%	-60.37%	+8.69%	-59.37%	-59.86%
Collective action of fluoride mouthwash					
Brazil	-19.78%	-90.13%	-80%	-98.48%	-94.95%
Midwest	-12.47%	-91.31%	-85.41%	-98.89%	-95.35%
North	-90.98%	-5.72%	-35.15%	-94.48%	-87.14%
Southern	-42.73%	-85.87%	-84.11%	-98.71%	-94.08%

Northeast	-71.39%	-41.66%	-88.82%	-98.13%	-85.57%
South	+1.19%	-94.14%	-75.37%	-98.54%	-96.32%
Collective action of supervised toothbrushing					
Brazil	-25.38%	-88.16%	-58.99%	-96.37%	-92.86%
Midwest	-6.57%	-89.13%	-65.30%	-96.47%	-92.86%
North	-49.88%	-83.78%	-47.72%	-95.76%	-91.78%
Southern	-20.84%	-87.68%	-62.35%	-96.33%	-92.51%
Northeast	-51.68%	-79.04%	-79.79%	-97.95%	-91.79%
South	-23.73%	-91.56%	-36.44%	-95.91%	-94.03%