ORIGINAL ARTICLE

Role of management and human resource factors on matrix support in secondary oral health care in Brazil

Mauro Henrique Nogueira Guimarães de Abreu [ID] | João Henrique Lara do Amaral |
Lívia Guimarães Zina | Mara Vasconcelos | Rafaela da Silveira Pinto [ID] |
Marcos Azeredo Furquim Werneck

Department of Community and
Preventive Dentistry, School of Dentistry,
Universidade Federal de Minas Gerais,
Belo Horizonte, Brazil

Correspondence
Mauro Henrique Nogueira Guimarães de
Abreu, Department of Community and
Preventive Dentistry, School of Dentistry,
Universidade Federal de Minas Gerais,
Avenida Antônio Carlos, 6627 – Belo
Horizonte, Minas Gerais, Brazil.
Email: maurohenriqueabreu@gmail.com

Abstract

Objectives: To investigate the association between health management and human resource factors on matrix support (MS) in a nationally representative sample of Dental Specialty Centres (DSCs) in Brazil.

Methods: This survey included 1042 DSCs (Response rate = 94.99%) in the second cycle of the National Program for the Improvement of the Quality and Access to the Dental Specialty Centres (PMAQ-CEO, in Portuguese) in 2018. Previously trained interviewers extracted information on MS, health management and human resources of the DSC by using a structured instrument. An MS score was created by adding the number of positive answers to the 10 MS questions. Negative binomial regression models were used to estimate the unadjusted and adjusted rate ratios (RR) and corresponding 95% confidence interval (CI).

Results: Of all the DSCs ($n = 1042$), 116 (11.1%) performed all 10 MS procedures. Those DSCs with a manager who had a higher education degree in the area of Public Health or Public Management (RR = 1.01, 95% CI, 1.01–1.02) and with human resources that received incentives, bonuses or financial awards for performance related to the PMAQ-CEO result (RR = 1.01 95% CI 1.01–1.02) are more likely to perform MS, when compared to the reference categories. The DSCs that are more likely to perform MS include those that developed actions as a result of periodic planning and evaluation with confirmatory documentation (RR = 1.06, 95% CI; 1.01–1.10); those that received support for planning and organizing the work scheme (RR = 1.03, 95% CI; 1.01–1.05); those that monitored and analysed the goals set for each specialty offered at the DSC, with (RR = 1.06, 95% CI; 1.01–1.10) or without confirmatory documentation (RR = 1.06, 95%CI; 1.02–1.11); those whose team periodically performed self-assessment processes, using the Ministry of Health's formal self-assessment (AMAQ in Portuguese) (RR = 1.04, 95% CI; 1.02–1.05); those who followed clinical guidelines (with confirmatory documentation) regarding the referral of patients from primary care to the DSC (RR = 1.02, 95% CI; 1.01–1.04). On the contrary, DSCs that did not use the results achieved in previous PMAQ cycles in the organization of the

DSC's team work scheme proved to be less likely to perform MS (RR = 0.98, 95% CI; 0.96–0.99).

Conclusions: Matrix support is associated with human resources and management factors in secondary oral health care in Brazil. Continuing professional development and some management characteristics are important for secondary dental care quality and could be considered in health policy initiatives.

KEYWORDS
dental health services, health care evaluation mechanisms, interprofessional relations

1 | BACKGROUND

The construction of a poly-hierarchical structure of the Brazilian public oral healthcare network, under a Unified Health System (SUS in Portuguese), a universal healthcare system funded by federal, state and municipal budgets, has been a challenging matter. In this system, primary health care (PHC) is the entry level and it is expected to solve 80% of oral health care. Since 2006, patients requiring the service from a medium-complexity unit have been referred to Dental Specialty Centres (DSCs), where oral cancer diagnoses, special needs patient care endodontics, specialized periodontics and minor oral surgery of hard and soft tissues procedures are developed. Tertiary oral health care involves dental procedures for groups that need hospital care. The access for all patients is free and there is no co-payment for those services.[1] However, the institutionalization of a national secondary oral health care[1] and the integration of these two levels of care, PHC and secondary health care, has been considered a relevant public health issue in Brazil and other countries.[1-3] Both difficulties in integrating these two levels of oral health care nationally[4] as well as in the development of the oral healthcare network in a Brazilian southeastern state have been recently identified,[5] presenting lack of structure and limited access to secondary oral health care.[4,5]

In Brazil, some experiences in collaborative care planning and educational support from an interprofessional perspective (from different healthcare levels or from the same healthcare level) to others, called "matrix support" (MS),[6] has been considered an interesting experience to overcome the flaws in the development of the healthcare network and to increase the quality of care. Some evidence of MS can be found in the areas of mental health,[7] respiratory diseases[8] and nutritional health care,[9] and there is evidence that matrix support actions can positively impact the quality of PHC teams.[10] MS could also be considered a technical and educational background for the human resources at PHC to enhance the quality of their healthcare actions and integrate different specialties.[6-9] As an example, in the mental health area, the training of human resources at PHC and specialists in mental health enhanced the actions for patients with mental diseases at PHC.[7] Also, health training for general physicians has influenced the knowledge on respiratory diseases and decreased the number of referrals to secondary pulmonology.[8]

On the contrary, internationally, the impact of practice-based interventions designed to improve interprofessional collaboration,[11] a concept similar to MS, has shown limited proof of this practice in the healthcare outcomes among developed countries. The authors point out that the difficulties faced by health professionals when collaborating in clinical practice could explain these results.[11] Human resources and health management factors could interfere in the healthcare provisions[12,13] and MS.[6,7] In recent years, the growth of work instability, resulting from the neoliberal model of employment, may well explain some of these factors.[14] Nonetheless, evidence of the influence of these factors on MS in secondary oral health care is scarce. Thus, investigating factors associated with the MS could generate useful knowledge to make interprofessional collaboration more effective in oral health networks. Hence, this study aimed to investigate the association between health management and human resource factors within the MS in a nationally representative sample of DSCs in Brazil.

2 | METHODS

The present study involved secondary analysis of data from the second cycle of the Program for Improvement of the Quality and Access to the Dental Specialty Centres (PMAQ-CEO in Portuguese), carried out in 2018. All 1097 DSCs were free to participate. Fifty-five out of the 1.097 DSCs were excluded by PMAQ-CEO evaluation criteria either because they were closed, not treating patients or merely refused to participate in the Program, resulting in data collected from 1042 DSCs (Response rate = 94.99%).

The PMAQ-CEO program consists of a four-phase agreement, development, external evaluation and re-contractualization—which complement each other and form a continuous evaluation cycle of DSC teams. The external evaluation phase is comprised of a questionnaire applied at the PHC units, in addition to its verification. The questionnaires were based on the principles of PHC and Donabedian's model for the evaluation of healthcare services, examining the structure, process and outcomes, and including questions concerning the structure of dental facilities, dental instruments, executed dental procedures, dentists' profiles, as well as management and service organization.[15] The questions involved dichotomous

responses (yes/no) and were answered in a face-to-face interview with a representative dentist from each DSC unit.

The service evaluation involved a team of 85 interviewers, all dentists, who had no professional connection with the evaluated service and who underwent a 24-h training program regarding DSC in SUS, survey methods and PMAQ-CEO questionnaires to enable them to conduct this survey nationwide. All interviewers underwent formal evaluation to assess their abilities prior to beginning the study. The Brazilian Ministry of Health developed a mobile app with the relevant questions, which sent responses to a central online database. The PMAQ-CEO questionnaire was specifically constructed to evaluate SUS through a partnership between Ministry of Health (MofH) and teaching and research institutions in Brazil. In the present study, our outcome was questions related to the delivery of 10 MS questions (Table 1). MS is a collaborative care planning and educational support from an interprofessional perspective (from different healthcare levels or from the same healthcare level).[6] All of these questions, originally identified in the PMAQ-CEO survey as related to MS, were part of the external evaluation phase of PMAQ-CEO, Module II, involving data gathered in face-to-face interviews with the dentist at the DSC unit. Whilst the overall PMAQ-CEO, Module II, had 346 questions, these 10 items were selected to be part of this research considering the aim of this study.

A variable called the 'MS Score' (MSS) was developed in relation to the 10 MS questions, much like the method used in another study.[16] Each 'yes' answer in the above items resulted in one point. Each answer 'no/not needed' ('Does the DSC's team receive support from other professionals to help solving cases considered complex?'), 'no defined periodicity' ('How often does the DSC's team provide support to the Primary Oral Healthcare Teams?') and 'no' (for all the other eight questions) scored zero. Thus, this score varied from zero to ten, with each DSC receiving a score relevant to one

of these values. Higher scores reveal that the DSC performed more MS.

Descriptive statistical analysis with the calculation of proportions and central tendency measures was performed. The analysed dependent variable was the MSS. Negative binomial regression models were used to estimate the unadjusted and adjusted rate ratios (RR) and corresponding 95% confidence interval. First, we carried out unadjusted negative binomial regression models to estimate unadjusted RR (95% CI) and p-values for each of the 18 covariates separately. In this first step, any covariate with a p-value of less than .25 was a candidate to be tested in the final adjusted negative binomial regression model.

Because the interest was focused on the independent effects of each covariate, all potential variables were included in the unadjusted model. Secondarily, the regression models were analysed based on Brazilian regions (South, Southeast, Center, Northeast and North). Only covariates with a p-value of less than .05 were maintained in the final model. To evaluate the goodness of fit of the final model, the ratio between residual deviance and degree of freedom, and the chi-squared test of the results of residual deviance, was recommended.[17,18] This study was submitted to and approved by Ethics Committee for Human Research of the Universidade Federal de Pernambuco (protocol number 23458213.0.1001.5208).

3 | RESULTS

The most frequently MS action was receiving support from other professionals. The less frequent action on MS was the joint construction of therapeutic projects with professionals from the Primary Oral Healthcare Teams (Table 1). From the total of DSCs ($n = 1042$), 116 (11.1%) performed all 10 health matrix activities. Two hundred

TABLE 1 Frequency of questions used to construct the matrix support score (MSS) among Dental Specialty Centres, Brazil, 2018

Questions	Frequency (%)
Does the DSC's team receive support from other professionals to aid in solving cases considered complex? (Yes)	812 (77.9)
How often does the DSC's team provide support to the Primary Oral Healthcare Teams? (weekly, biweekly, monthly, quarterly, semiannual)	369 (35.4)
Discussion of clinical cases, sentinel events, difficulty and challenging cases. (Yes)	775 (74.4)
Shared clinical actions with the professionals of the Primary Oral Healthcare Teams. (Yes)	681 (65.4)
Training with primary care professionals in the detection of oral cancer. (Yes)	641 (61.5)
Joint construction of therapeutic projects with the professionals of the Primary Oral Healthcare Teams. (Yes)	469 (45.0)
Continuity of professional development training together with the professionals of the Primary Oral Healthcare Teams. (Yes)	615 (59.0)
Clinical protocol construction and discussion. (Yes)	725 (69.6)
Specialty Benchmark Package. (Yes)	775 (74.4)
Make home visits with the professionals of the Primary Oral Healthcare Teams, when requested. (Yes)	472 (45.3)

ninety-five DSCs presented scores below five, 156 clinics presented scores of zero and one, twenty clinics presented a score of two, and 42 and 77 clinics presented scores of three and four, respectively. The median MSS was 7 (Q1: 4; Q3: 9) (Figure S1).

Those DSCs with a manager who had a higher education degree in the area of Public Health or Public Management (RR = 1.01, 95% CI; 1.01–1.02) and with human resources that received incentives, bonuses or financial awards for performance related to the PMAQ-CEO result (RR = 1.01, 95% CI; 1.01–1.02) are more likely to perform MS actions, as compared to the reference categories. DSCs that developed actions as a result of periodic planning and evaluation with confirmatory documentation (RR = 1.06, 95% CI; 1.01–1.10); those that received support for planning and organizing the work scheme (RR = 1.03, 95% CI; 1.01–1.05); those that monitored and analysed the goals set for each specialty offered in the CEO, with (RR = 1.06, 95% CI; 1.01–1.10) or without confirmatory documentation (RR = 1.06, 95% CI; 1.02–1.11); those whose team periodically performed self-assessment processes, using AMAQ (RR = 1.04, 95% CI; 1.02–1.05); those that followed clinical guidelines (with confirmatory documentation) regarding the referral of patients from primary care to the DSC (RR = 1.02, 95% CI; 1.01–1.04) are more likely to perform MS actions. By contrast, DSCs that did not use the results achieved in previous PMAQ cycles in the organization of the DSC team's work scheme are less likely to perform MS actions (RR = 0.98, CI 95%; 0.96–0.99) (Table 2). All the covariates in this final model were identified in the models stratified by Brazilian regions. There were some differences in the covariates retained in the final models considering the different Brazilian regions (Table S1). Parameters of goodness of fit were adequate. Chi-squared test of the residual deviance results in a *p*-value equal to 1, indicating that the model fit well.

4 | DISCUSSION

Secondary dental care in Brazil developed at DSCs has no hegemonic practice of MS, since only a few centres actually performed all of the MS actions. Moreover, the DSCs most often received support from other health teams than gave support to PHC. Human resources and management factors were associated with the development of MS.

According to the National Oral Health Policy, the DSCs are referral units for oral health teams at PHCs, and, as such, they must have integrated planning with them and with other regional health establishments. In addition, it is expected that professionals who today in the care network will be co-responsible for the comprehensiveness of care as well as contribute to the development of competencies and technical skills of PHC professionals.[1]

It seems that DSCs have a more passive profile regarding MS, since they commonly received more help from other health services, confirming findings from MS in mental health area.[19] The balance between giving and receiving support in a healthcare system could be achieved by an exchange between knowledge from different professions[11] and could be considered relevant for improving the quality of healthcare services. In another qualitative research developed

at PHCs in Brazil,[19] health professionals conduct MS using a more traditional educational role, based on assimilation of the transmitted contents.[19] In the current study, even in MS developed from DSCs to PHCs, the most common actions involved the development of criteria to refer patients from PHCs to DSCs, as well as the discussion of clinical cases. Other MS, such as training and home visits, in which in-depth interaction may occur, are less frequently performed. Moreover, the MS is not performed as a regular action within DSCs, considering the high frequency of 'no defined periodicity'. These latter factors suggest a weak relationship between PHC and secondary care that have been identified in Brazil[4] and in the UK,[19] as well as difficulties in the more horizontal educational relationship between these two levels of care.[20]

Two human resource factors were associated with better MSS, the formation of the manager and the existence of financial incentives for health professionals. For both covariates, the MSS increased by approximately 1% when the manager has formation in Public Health or when there is a financial incentive. Despite not being a strong association, the workforce should be aware, properly trained and prepared to meet healthcare system needs.[21] In recent decades, the Brazilian government has implemented a national healthcare worker training within the SUS system, including certificates (ie specialization) in public health and family health.[22] Globally, human resource management, and understanding what it means, is essential to the healthcare system and can ensure improved care.[21] The evaluation of some experiences has shown a good impact in developing competencies within the public health scenario.[23,24] These competencies can explain the high MSS among DSCs with managers who have a higher education degree in public health. Another interesting finding is the direct association between MSS and financial incentives for health professionals. PMAQ-CEO has developed its evaluation policies based on payment for performance. In this approach, these programs provide financial rewards to individual healthcare professionals linked to the achievement of the metrics of delivery, utilization, efficiency or outcomes in health care. Although there is no consensus concerning the effectiveness of payment for performance on the outcomes and processes of health care,[25,26] in the current study, incentives, bonuses or financial rewards received by DSC professionals positively impacted the MSS. A systematic review focuses on interprofessional collaboration at PHC settings has found that professional training and financial incentives are key factors to facilitate collaborative relationships.[27] Lack of financial incentives in countries with universal health systems was also perceived as a barrier to enhance interprofessional collaboration at PHC.[28,29] On the other hand, some covariates such as the mere presence of a manager, the time of work of this manager, and the fact that the manager was an oral health professional had no effect on MS.

Dental Specialty Centres that performed more planning actions and those that received support from managers increased the MSS in 6% and 3%, respectively. It seems that services that are more well-organized in terms of healthcare plans tend to have better work schemes, which also includes educational practices. Healthcare planning, management, evaluation and monitoring are considered key aspects of any healthcare

TABLE 2 Factors associated with matrix support score (MSS) among Dental Specialty Centres (N = 1042), Brazil, 2018

Variable	Matrix Scores (mean; median)	Unadjusted Rate Ratio (CI 95%)	p-Value	Adjusted Rate Ratio (CI 95%)	p-Value
Human resource variables					
Is there a manager at DSC?					
No (N = 48)	3.9; 4.0	1	.001		
Yes (N = 994)	6.2; 7.0	1.08 (1.03–1.13)			
How long have you been in this DSC position as a manager?					
There is no manager/I do not know (N = 95)	4.5; 5.0	1			
Less than 1 year (N = 245)	6.2; 7.0	1.05 (1.02–1.08)	<.001		
1 to 2 years (N = 380)	6.3; 7.0	1.05 (1.02–1.08)	<.001		
3 to 4 years (N = 107)	5.9; 7.0	1.04 (1.01––1.08)	.005		
5 to 9 years (N = 166)	6.6; 7.0	1.06 (1.03–1.09)	<.001		
10 years or more (N = 49)	5.6; 7.0	1.04 (0.99–1.08)	.058		
Does the manager have or is in the process of studying for a higher education degree in the area of Public Health or Public Management?					
No (N = 641)	5.6; 6.0	1	<.001	1	.003
Yes (N = 401)	6.9; 7.0	1.03 (1.02–1.04)		1.01 (1.01–1.02)	
Is the manager a Dentist, Oral Health Technician or Dental Assistant?					
No (N = 119)	5.3; 6.0	1	.010		
Yes (N = 923)	6.2; 7.0	1.02 (1.01–1.04)			
Do professionals receive incentives, bonuses or financial awards for performance related to the PMAQ-CEO result?					
No/I do not know (N = 776)	5.7; 6.0	1	<.001	1	.014
Yes (N = 266)	7.1; 8.0	1.03 (1.02–1.04)		1.01 (1.01–1.02)	
Management variables					
Time DSC has been in operating (in years)					
		0.99 (0.99–1.00)	.034		
Are the actions developed in this DSC the result of periodic planning and evaluation?					
No (N = 114)	3.2; 2.0	1		1	
Yes, without confirmatory documentation (N = 185)	5.3; 6.0	1.11 (1.06–1.16)	<.001	1.04 (1.00–1.09)	.062
Yes, with confirmatory documentation (N = 743)	6.7; 7.0	1.15 (1.10–1.20)	<.001	1.06 (1.01–1.10)	.014
Does the DSC receive support for planning and organizing the work scheme?					
No/Does not perform planning and evaluation (N = 222)	3.9; 4.0	1	<.001	1	.005
Yes (N = 820)	6.7; 7.0	1.10 (1.07–1.12)		1.03 (1.01–1.05)	
Is there monitoring and analysis of the goals set for each specialty offered in the DSC?					
No (N = 85)	3.2; 2.0	1		1	
Yes, without confirmatory documentation (N = 125)	5.2; 6.0	1.10 (1.05–1.16)	<.001	1.06 (1.02–1.11)	.008
Yes, with confirmatory documentation (N = 832)	6.5; 7.0	1.14 (1.09–1.20)	<.001	1.06 (1.01–1.10)	.009
Are self-assessment processes periodically conducted by the DSC's team?					
No (N = 260)	4.1; 4.0	1		1	
Yes, using others types of self-assessment (N = 90)	5.1; 5.0	1.04 (1.02–1.07)	.002	1.01 (0.99–1.04)	.235
Yes, using AMAQ (N = 692)	7.0; 8.0	1.09 (1.07–1.11)	<.001	1.04 (1.02–1.05)	<.001

TABLE 2 (Continued)

Variable	Matrix Scores (mean; median)	Unadjusted Rate Ratio (CI 95%)	p-Value	Adjusted Rate Ratio (CI 95%)	p-Value
Have the results achieved in previous PMAQ cycles been considered in the organization of the DSC's team work scheme?					
First time in PMAQ evaluation (N = 247)	5.9; 6.0	1		1	
No (N = 248)	4.5; 5.0	0.96 (0.94–0.97)	<.001	0.98 (0.96–0.99)	.002
Yes (N = 547)	6.9; 8.0	1.02 (1.01–1.03)	<.001	1.00 (0.99–1.01)	.523
Are there any clinical guidelines (with confirmatory documentation) that guide the referral of patients from primary care to the DSC to any specialty?					
No (N = 216)	4.5; 5.0	1	<.001	1	.006
Yes (N = 826)	6.5; 7.0	1.06 (1.04–1.07)		1.02 (1.01–1.04)	
Does the continuity of professional development training address the demands and needs of the DSC's team?					
No action was performed (N = 303)	4.5; 5.0	1			
The actions did not address (N = 38)	5.3; 6.0	1.03 (1.00–1.06)	.077		
Yes, partially (N = 389)	6.6; 7.0	1.06 (1.05–1.08)	<.001		
Yes, fully (N = 312)	7.0; 8.0	1.07 (1.05–1.08)	<.001		
In the DSC's planning in the last 12 months, were the suggestions/opinions of the dentists taken into consideration?					
No/planning was not performed (N = 202)	4.4; 4.0	1			
Yes (N = 840)	6.5; 7.0	1.06 (1.05–1.08)	<.001		
Does the DSC's team plan/program its activities considering the challenges pointed out from the self-assessment – AMAQ?					
Planning was not performed (N = 194)	4.4; 4.0	1			
Plans/programs were based on other self-assessment methods (N = 290)	5.3; 6.0	1.03 (1.01–1.05)	.004		
Yes (N = 558)	7.1; 8.0	1.08 (1.06–1.10)	<.001		
Does the DSC's team perform the evaluation of planned/programmed actions?					
No (N = 324)	4.7; 5.0	1			
Yes, without confirmatory documentation (N = 194)	5.7; 6.0	1.03 (1.02–1.05)	<.001		
Yes, with confirmatory documentation (N = 524)	7.1; 8.0	1.07 (1.05–1.08)	<.001		
Does the management support the organization of the work scheme aimed at improving access and quality from the standards of the PMAQ-CEO?					
No (N = 141)	4.1; 4.0	1	<.001		
Yes (N = 901)	6.4; 7.0	1.08 (1.05–1.10)			
Does the DSC hold a team meeting?					
No (N = 124)	4.5; 5.0	1	<.001		
Yes (N = 918)	6.3; 7.0	1.05 (1.03–1.08)			

system.[30,31] Health management should focus on appropriate interventions for individuals within a given population to diminish healthcare risks and costs.[32] In SUS, planning is a highly relevant aspect of health management.[33,34] In Spain and other countries with universal health care, it was also identified that management support could be a facilitator of interprofessional collaboration at PHC.[27,29] In the same sense, healthcare evaluation and monitoring also impacted the MSS. These actions are necessary to evaluate the performance of healthcare policies,

as well as to formulate the proper criteria to improve the healthcare system as a whole.[35,36] Other management factors, such as time of operating the DSC, self-evaluation and team meeting, had no effect on MSS. A systematic review of qualitative studies had identified that interprofessional collaboration is influenced by a net of complex factors that could be modified based on local level.[29]

The use of guidelines was positively associated with MSS. Guidelines are developed to support healthcare providers regarding

patients' dental health. These guidelines also enhance dentists' continuing education and can diminish the gap between dental research and clinical practice, contributing to the quality of care provided.[37,38] In PHCs, the existence of guidelines was also associated with a better performance of dental teams,[39] reinforcing its importance for the Brazilian oral healthcare network. Finally, regional differences and social inequalities in Brazil[1,4,13,16] can explain the different covariates that have influenced MSS in the different regions. Beside these differences, human resources and management factors had an effect on MSS in all five Brazilian regions, similar to the findings throughout the country.

Despite the advances in oral health policies in Brazil in recent decades,[1] new and serious challenges in SUS appeared with the new Federal Government of Brazil.[40] Hence, the human resources and management factors associated with MSS and that could be further developed are at risk of being discontinued. It is also important to point out that the world is facing the COVID-19 pandemic, and in this context, telehealth could be an interesting choice[41] for developing MS actions.

In this survey, we were not able to measure the reliability and reproducibility of the instrument used by the trained researchers. Moreover, the cross-sectional design also hindered causal inferences. Despite these limitations, this is the most comprehensive and large empirical evaluation focused on the MS in secondary oral healthcare in Brazil. It is possible to conclude that MS is associated with human resources and management factors in secondary oral healthcare in Brazil. Continuing professional development and some management characteristics are important for secondary dental care quality and could be considered in health policy initiatives. In order to reach advances in the MS and, more broadly, in the quality of secondary care, a long-term monitoring in the SUS is encouraged, ensuring, beyond other advantages, that our results had an impact in public health policies.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest to disclosure.

AUTHOR CONTRIBUTIONS

MHNGA, JHLA and MAFW were responsible for the conception of the study. MHNGA and RSP carried out the statistical analyses. MHNGA, JHLA, LGZ, MV and RSP were responsible for the interpretation of data. MHNGA drafted the article. All authors revised it critically for important intellectual content and final approval the version to be published.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are openly available on the Brazilian Ministry of Health website at http://aps.saude.gov.br/ape/pmaq/ciclo2ceo/.

ORCID

Mauro Henrique Nogueira Guimarães de Abreu https://orcid.org/0000-0001-8794-5725

Rafaela da Silveira Pinto https://orcid.org/0000-0002-6169-7708

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