

An evaluation of PMAQ-AB effects on hospitalization for conditions susceptible to Primary Care

Uma avaliação dos efeitos do PMAQ-AB nas internações por condições sensíveis à Atenção Básica

César Soares¹, Marília Ramos²

DOI: 10.1590/0103-11042020126091

ABSTRACT The aim of this article was to evaluate the effect of the National Program for Access and Quality Improvement in Primary Care (PMAQ-AB) on access and quality of Primary Care. Hospitalization for conditions susceptible to Primary Care were used as a dependent variable and indirect indicator of quality and access to that level of care. The quantitative method of study was applied, adopting all Brazilian municipalities as unit of analysis. The study was divided into two phases. The first one performed an exploratory descriptive time series analysis on the Brazilian municipalities for the period from 2010 to 2014. The second phase was characterized for evaluating the effect of the Program, during the same period, on access and quality of Primary Care by means of the statistical regression technique with counting data. The results, analyzed by region, showed that the Program exerts a significant effect on the quality and access of Primary Care, especially in the Northeast region of Brazil. This article contains an important report on health policies in Brazil, and is a mean of instructing managers and the various actors involved in the development and discussion of one of the main programs in Primary Care.

KEYWORDS Hospitalization. Health evaluation. Primary Health Care.

RESUMO O objetivo deste artigo foi avaliar o efeito do Programa Nacional de Melhoria do Acesso e da Qualidade da Atenção Básica (PMAQ-AB) no acesso e na qualidade da Atenção Básica. As internações por condições sensíveis à Atenção Básica foram utilizadas como variável dependente e indicador indireto da qualidade e do acesso a esse nível de atenção. Utilizou-se o método quantitativo de estudo, tendo como unidade de análise todos os municípios brasileiros. O estudo se dividiu em duas fases: na primeira, foi realizada uma análise descritiva exploratória em série temporal sobre os municípios brasileiros, abrangendo o período de 2010 a 2014; e a segunda fase se caracterizou por avaliar o efeito do Programa, durante o mesmo período, no acesso e na qualidade da Atenção Básica, por meio da técnica estatística de regressão com dados de contagem. Os resultados, analisados por região, apontaram que o Programa está apresentando um efeito significativo na qualidade e no acesso da Atenção Básica, principalmente na região Nordeste. Este artigo surge como um importante informativo sobre as políticas de saúde no Brasil e, também, como um meio de instrumentalizar os gestores e os diversos atores envolvidos no desenvolvimento e discussão de um dos principais programas da Atenção Básica.

¹Universidade de São Paulo (USP) – São Paulo (SP), Brasil.
cpscesar@usp.br

²Universidade Federal do Rio Grande do Sul (UFRGS) – Porto Alegre (RS), Brasil.

PALAVRAS-CHAVE Hospitalização. Avaliação em saúde. Atenção Primária à Saúde.



Introduction

The Ministry of Health (MS), seeking to improve the level of quality and access of health services offered to citizens by Primary Care (AB), launched, in 2011, the National Program for Improving Access and Quality of Primary Care (PMAQ-AB). The Program is organized in cycles, being currently in its third cycle.

The first cycle covered 3,965 municipalities, involving a total of 17,203 AB teams. Among them, 17,165 teams were certified and enabled to receive the Program incentives. The federal government's investment achieved R\$70 million in 2011 and R\$700 million in 2012. In the second cycle, 30,522 AB teams participated in the Program, as did 19,700 Oral Health Teams (ESB), 1,800 Family Health Support Centers (Nasf), and 857 Dental Specialized Centers (CEO), spread out among 5,211 municipalities. The amount of R\$1.7 billion was invested in 2013, and more than R\$2.5 billion in 2014¹. During the first cycle, the MS defined the limit of teams enabled for the Program, what did not happen in the second cycle, which incorporated, in addition, the ESB, Nasf and CEO¹. This research is only circumscribed to the first two cycles, which occurred in the years 2011-2012, and 2013-2014, respectively.

In a way to achieve its objectives, the Program was organized by means of a set of strategies for qualification, monitoring and evaluation of the health teams' work. Indicators capable of measuring AB access and quality patterns were previously defined, which later served as a parameter for the final evaluation. The indicators selected are infrastructure, management for AB development, worker appreciation, access and quality of health care, and user satisfaction¹.

The participation in the PMAQ is voluntary, in a way that the municipality, as well as its AB teams, has the autonomy to decide whether or not it will adhere the Program, which has an adherence incentive component, ensuring an initial transfer of 20% of the total amount

provided for the adhering territories. The remaining transfer of resources depends on each team performance, and can reach 100% of its transfer or suspension¹.

As an AB program, PMAQ is an important tool for that level of care, especially by proposing the improvement of quality and access to health in Brazil. The reason is the ability of the work carried out by AB to produce positive effects on the population health, such as: reducing social inequalities in health by providing greater access to services; increasing the quality of care by focusing on its actions in health prevention and promotion; addressing health problems early; and reducing specialized care. Consequently, that level of care propitiates lower mortality rates due to whatever cause, in addition to increasing life expectancy of individuals and their self-perception of their own health².

Within a broader care context, AB embodies a level of care whose strategy and resources indicate a greater and more diversified access to health services, seeing that teams at that level are more likely to provide continuous and comprehensive care. By presenting a more comprehensive range of action, characterized by measures towards health promotion, disease prevention, treatment and rehabilitation, AB contributes to the reduction of hospitalization rates and use of emergency services, therefore reducing overall spending on health services². In addition, there is robust evidence that health systems oriented on AB show results indicating greater decrease in mortality and wider access to preventive services compared to other programs that do not emphasize that level of care. Those are important characteristics provided that they have the ability to contribute to the reduction of health inequities³.

Since PMAQ is one of the most important actions not only within AB sphere but throughout the Unified Health System (SUS), being recognized by MS as a program that embodies strategies that seek the restructuring of municipal health systems, this work evaluated

PMAQ effect on those characteristics based on the hypothesis that the Program is contributing to AB increase of access and quality.

‘Access’ is understood in this research as accessibility. That is, the adequacy of professionals and material resources used in basic health services to the health needs of patients⁴. The concept of ‘quality’ applied to AB improvement is adopted in this article as an advance in the service effectiveness. That is, AB ability to offer care capable of contributing, in the best possible way, to the health condition improvement of the individual and the population⁵. In this sense, considering that PMAQ main components indicate an improvement of AB services encompassing the definition of access and quality mentioned above, this research assumes that, if this occurs, it impacts the population health. Therefore, hospitalization for Conditions Susceptible to Primary Care (ICSAP) emerges as an indicator capable of capturing that issue⁶.

ICSAP was proposed by studies whose objective was to create an indicator measuring hospital activity that would be able to effectively capture AB operation regarding health. It involves a set of diseases that affect individuals, for which hospitalization can be avoided, provided AB action is effective. Thereby, the indicator emerges as an indirect way of evaluating the quality of service and the access to SUS-AB⁶.

Based on the mentioned hypothesis, it is possible that the result expected by this study be characterized by the occurrence of PMAQ significant effect on ICSAP decrease for the reason that high rates of ICSAP are related to deficiencies in service coverage and/or AB low resolution for certain health problems⁶.

The relation between the indicator and AB accessibility and quality may become clear by observing the decrease in hospitalization due to AB specific characteristics, such as: the extent of coverage of Family Health Strategy; the existence of health clinics in areas of professional scarcity; and the provision of AB consultations a continuously and integrally basis⁷.

The indirect measurement of those factors allows ICSAP to be an important indicator for evaluating AB accessibility and quality. It is to note, however, that both characteristics are dealt together when using the indicator, hampering to state to what extent the effect on ICSAP is related to AB accessibility or quality, or to both^{6,8}. Despite that characteristic, the use of the indicator, in addition to being agreed between the MS and the Brazilian municipalities with the aim of AB monitoring, was performed in several studies⁷⁻¹¹.

Starting from the research problem represented by the question ‘Is the program called PMAQ exerting any effect on AB access and quality?’, the proposal to evaluate the Program aims to instrumentalize managers and the various actors involved in the development and discussion of the Program. Understanding that PMAQ is in a constant process of improvement once it occurs by cycles, its evaluation becomes an important source of information, which can contribute to possible reformulations and enhancements of further cycles. Finally, this research, based on ICSAP indicator, aimed to contribute to another evaluative perspective of the Program: the effect of that public action on the population health.

Methodology

The study, characterized by having adopted the quantitative method, introduced the ICSAP of Brazilian municipalities as an indirect AB indicator of quality and access to health. It encompassed two phases. The first one distinguished itself by being exploratory and descriptive, applying an ICSAP time series in Brazil and its regions for the period 2010 to 2014. The base year was 2010, i.e. year in which the PMAQ had not yet been implemented. The first cycle of the program was implemented in years 2011 and 2012, while the second cycle lasted from 2013 to 2014. The second phase distinguished itself by being an ecological study that encompassed the same

period 2010 to 2014 in order to observe the PMAQ effect on ICSAP.

It is important to note that the municipality participation in PMAQ first cycle did not necessarily indicate the inclusion of all existing AB teams in the location since MS limited the number of teams allowed to participate in that stage of the program. Thus, not all teams wishing to adhere were allowed to do so, therefore indicating a possible positive bias in relation to which teams participated, once there is the possibility that the 'best teams' in the municipality were selected intentionally. Moreover, it was not possible to control that effect on the statistical model proposed in this research as the variable referring to the number of teams that adhere PMAQ in the first and second cycles presented a colinear relations with the main explanatory variable. Therefore, it was excluded from the analyses due to methodological requirements, since it would steal the effect of that variable.

The research was supported by secondary data, and adopted the Brazilian municipalities as unit of analysis. In total, 5,556 municipalities were considered, although the total number of municipalities achieved 5,570 in 2014. Sixteen municipalities were removed from the analysis for the reason that they were recognized by the State exactly in 2012, when the research was already being carried out. Therefore, as to facilitate statistical analyses, we chose to disregard the new municipalities and to exclude those that undertook geographical changes because of the new division of territories.

However, as 99.71% of the Brazilian municipalities were contemplated in the research, it was considered in the analyzes that the total universe of territories was addressed, not being characterized as a sample. In addition, it is important to add that the analyses covered the Brazilian population aged 0-79 years old of all 5,556 municipalities, being data examined by country and region, that is, Brazil and Regions North, Northeast, Southeast, South and Midwest. That age group was selected because previous studies using the same

dependent variable^{6,12} considered the range 0-79 years old, once, after that, hospitalization did not reveal important correlation with procedures related to AB⁶. As for the models of analysis, the effects were stratified by the following large age groups: 0-4, 5-19, 20-59 and 60-79 years old, so to control the effects by age group.

In order to obtain the necessary subsidies for the construction of the variables, secondary information was collected from sites that provide public data. Those data are exhibited in *chart 1*. The information concerning ICSAP, the dependent variable adopted in this study, was obtained by means of Datasus website, provided by the Hospital Admission Authorization (AIH). It is a document used to feed the Hospital Information System of the Unified Health System (SIHSUS) and responsible for releasing the hospitalization of each patient. There are two types of AIH: AIH-1, characterized by being the normal type, of exclusive issuance by SUS municipal or state managers; and AIH-5, of complementary nature, refers to long-term hospitalization, such as psychiatric or chronic diseases. In this study, only AIH-1¹³ was applied due to AIH-5 complex characteristics.

An important feature regarding AIH-1 in the study on ICSAP is that it informs the International Classification of Diseases 10 (ICD-10) about the reason of hospitalization. Thus, since ICSAP list is composed of diagnoses, that information becomes crucial. The list contains 120 categories of ICD-10 and 15 subcategories representing 20 types of diagnoses that are grouped as for the possibilities of intervention and extent of the disease⁶.

Additionally, it is also important to inform that Stata version 12.0 was the computer program used for the research data processing and statistical analysis.

Chart 1 contains the dependent and independent variables, their respective descriptions, sources of data retrieval and year of reference.

Chart 1. Description of the variables applied to the research, Brazil, 2010 a 2014

Indicator	Indicator description	Data source	Year
Dependent variable			
Number of ICSAP	Total number of hospitalizations due to conditions susceptible to primary care, per age group and gender.	SIH-Datasus ¹⁴	2010 a 2014
Independent variables			
Adhesion to PMAQ	Dichotomous qualitative variable, in which number 1 indicates that the municipality adhered to PMAQ and number 0 indicates that it did not adhere.	DAB-PMAQ ¹⁵	2010 a 2014
Percentage of ICSAP in male/female individuals	Calculation: total number of ICSAP of male/female individuals, per year, geographic area and age, divided by the total number of ICSAP per year, geographic area and age, and multiplied by 100.	SIH-Datasus ¹⁶	2010 a 2014
AB coverage	Population coverage estimated by primary care teams. Calculation: number of Family Health Teams (ESF) plus the number of equivalent ESF, multiplied by 3,000, divided by the population of the same place and period, multiplied by 100.	Pactuações-DataSUS ¹⁶	2010 a 2014
Number of beds per inhabitant	Calculation: total number of beds available in the municipality, divided by the total local population.	CNES-Datasus ¹⁷ ; Instituto Brasileiro de Geografia e Estatística (IBGE) ¹⁸	2010 a 2014
Health plan coverage	Calculation: total number of private health plan beneficiaries, per municipality, year and age, divided by the population of the same place, period and age, multiplied by 100.	Agência Nacional de Saúde Suplementar (ANS) ¹⁹ ; IBGE ¹⁸	2010 a 2014
Gini index	Measure of inequality that ranges from 0 to 1, in which 0 corresponds to complete equality in relation to income and 1 corresponds to complete inequality.	PNUD ²⁰	2010
Municipality population aged 0-79 years old	Total number of individuals per age group and gender.	IBGE ¹⁸	2010 a 2014
Number of physicians of Mais Médicos Program per thousand inhabitants	Calculation: total of physicians actually working for the Mais Médicos program, divided by the total local population, multiplied by 1,000.	Região-Redes ²¹	2014

Source: Elaborated by the authors.

It is to note that the independent variable ‘municipality adherence to PMAQ’ is the most important one, upon which the program effects will be analyzed. Variable ‘Percentage of ICSAP in males/female individuals’ was inserted in the models with the aim to control the effects that both issues may present in this type of hospitalization, as highlighted in the study that approved the ICSAP list in Brazil⁶. The information was applied separately for different age groups.

Variables related to health services and facilities – AB coverage, number of beds per inhabitant and health plans coverage – and to socioeconomic issues – Gini index and the age of 0-79 years old – were adopted because studies using ICSAP highlighted the importance of observing these data when analyzing hospitalizations^{6,12}. Due to lack of data availability, the use of the 2010 Gini index for all years stands out as an analysis limitation, requiring caution when examining its results.

The number of physicians hired by the Mais Médicos (More Doctors or More Physicians) Program per thousand inhabitants was considered a confounding variable. The Program is a public policy implemented in 2013 that could influence ICSAP reduction as it allocates physicians in regions where AB faces scarcity or absence of those professionals²².

Another potential limitation may appear regarding data collection on municipalities by the agencies, requiring a careful analysis of the results, as shown in the following sections of this article (*chart 1*).

Methods of data analysis

Data analysis employed a multivariate regression model adjusted for data panel with

negative binomial response and models of fixed effects, controlled for each municipality population by means of the offset command, for the years 2010-2014. Negative binomial regression is indicated to analyze numerical data resulting from counting in situations in which there is data overdispersion, that is, when data show variance values higher than the mean²³, as is the case of ICSAP here analyzed. The technique was also adopted for being widely used in studies that employ ICSAP as a dependent variable¹².

The panel database used in the analysis was weighted, provided that the information from all the municipalities on the main dependent and independent variable is available for the five years. The model of fixed effects was defined after Hausman’ test application. Finally, the association between ICSAP rate and the study covariates was estimated by ICSAP incidence rates, at 95% confidence interval.

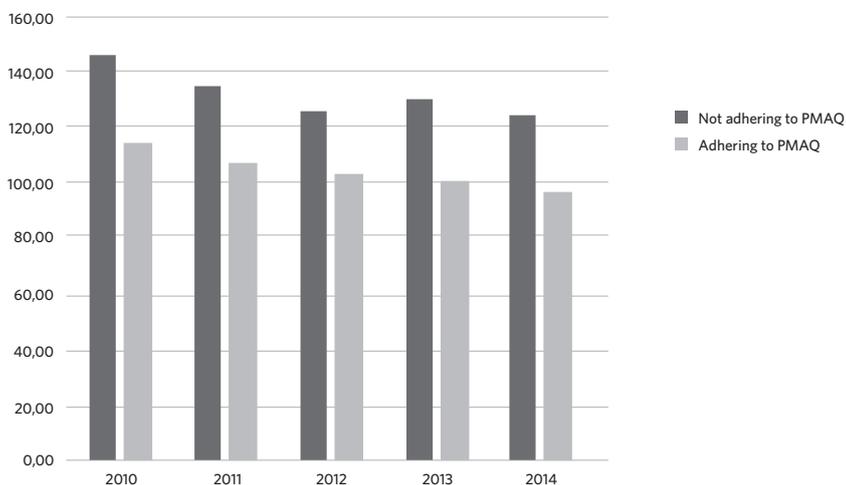
Results

Description of ICSAP

The graphs in this text were constructed with the objective of comparing ICSAP among the municipalities that either adhered or not the PMAQ both at the national and regional levels.

Graph 1 depicts the decrease in ICSAP rates per 10,000 inhabitants for both groups over the years, revealing that the group not adhering to ICSAP showed an increase in hospitalizations over the program cycle change from 2012 to 2013.

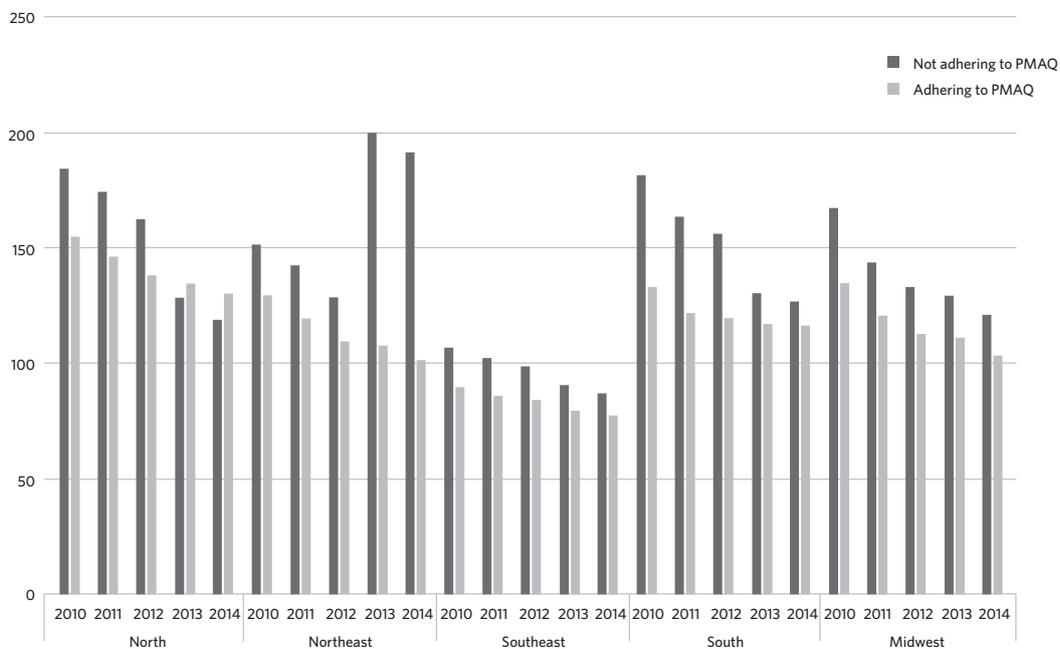
Graph 1. ICSAP rates per 10,000 inhabitants/year, municipalities adhering and not adhering to PMAQ, Brazil, 2010 to 2014



Source: SIH-Datasus¹⁴, IBGE¹⁸ and Department of Primary Care (DAB)-PMAQ¹⁵.

Analogously, a similar graph depicting the ICSAP at the regional level is added below.

Graph 2. ICSAP rates per 10,000 inhabitants/year, municipalities adhering and not adhering to PMAQ, Brazilian regions, 2010 to 2014



Source: SIH-Datasus¹⁴, IBGE¹⁸ and Department of Primary Care (DAB)-PMAQ¹⁵.

Graph 2 reveals that all regions showed higher total rates for the group that did not adhere to PMAQ for the whole period 2010-2014. Exception to the North region, the group adhering to the Program exhibited higher rate than the group that did not adhere during 2013-2014 second cycle. Besides, the Northeast region, in a contrary path to the other regions, showed an abrupt increase in ICSAP from the second cycle on in municipalities not adhering to the Program. Such behavior may be accounted to PMAQ, as explained in the following section.

The PMAQ effect on ICSAP

Table 1 shows in the column referring to Brazil that PMAQ incidence rate (IRR) indicated that, for the period 2010-2014, municipalities that adhered to the Program exhibited a ICSAP 9% inferior to those that did not adhere, kept other variables constant. Regarding the variables 'health plan coverage' and 'physicians allocated by the Mais Médicos Program', one can affirm that the former showed a 1% ICSAP decreasing for each unit added to the health plan coverage; while the latter showed a 35% decrease in the same hospitalizations for each physician added to the Mais Médicos

Program per 1,000 inhabitants.

In the opposite direction, the variable 'number of beds per inhabitant' revealed an increase in the incidence rate in the values in 23% of ICSAP for each bed added, kept other variables constant. On the other hand, the variables related to gender/age, as well as to AB coverage, did not show significant results. The Gini index presented a peculiar behavior, since its value, for all regions, stayed close to zero, suggesting that the indicator apparently did not fluctuate over the period. The cause may be related to the adoption of the 2010 Gini index for all years, thus not changing its values. The choice may have generated some bias, harming the interpretation.

The column referring to the North region revealed the same scenario as for Brazil, but with different values: the municipalities adhering to PMAQ presented a ICSAP 6% lower than those that did not adhere; the values in 8% of ICSAP experienced an increase in their incidence rate for each bed added, kept other variables constant; a 2% ICSAP decreasing for each unit added to the health plan coverage; and a 45% decrease in the same hospitalizations for each physician added to the Mais Médicos Program per 1,000 inhabitants.

Table 1. Results of regression with estimated counting data using ICSAP incidence rates and their association to the study covariates, Brazil and Brazilian regions, 2010 to 2014

Variables	Brazil		North		Northeast	
	IRR	Confidence Interval (95%)	IRR	Confidence Interval (95%)	IRR	Confidence Interval (95%)
PMAQ	0,91	0,90-0,91	0,94	0,91-0,96	0,86	0,85-0,88
Hospitalization 0-4 years old Female	1,00	1,00-1,00	1,00	1,00-1,01	1,00	1,00-1,00
Hospitalization 0-4 years old Male	1,00	1,00-1,00	1,01	1,00-1,01	1,00	1,00-1,00
Hospitalization 5-19 years old Female	1,00	1,00-1,00	1,00	1,00-1,00	1,00	1,00-1,00
Hospitalization 5-19 years old Male	1,00	1,00-1,00	1,00	1,00-1,01	1,00	1,00-1,00
Hospitalization 20-59 years old Female	1,01	1,00-1,01	1,01	1,01-1,02	1,00	1,00-1,01
Hospitalization 20-59 years old Male	1,01	1,00-1,01	1,01	1,01-1,02	1,00	1,00-1,01

Table 1. (cont.)

Variables	Brazil		North		Northeast	
	IRR	Confidence Interval (95%)	IRR	Confidence Interval (95%)	IRR	Confidence Interval (95%)
Hospitalization 60-79 years old Female	1,01	1,00-1,01	1,00	1,00-1,01	1,00	1,00-1,01
Hospitalization 60-79 years old Male	1,00	1,00-1,01	1,00	1,00-1,00	1,00	1,00-1,00
AB Coverage	1,00	1,00-1,00	1,00	1,00-1,00	1,00	1,00-1,00
# of beds per inhabitant	1,23	1,16-1,30	1,08	0,74-1,58	0,95	0,83-1,08
Health plan coverage	0,99	0,99-0,99	0,98	0,97-0,99	0,99	0,99-1,00
Gini index	0,00	0,00-0,00	0,00	0,00-0,01	0,00	0,00-0,01
Mais Médicos physicians per thousand inhabitants	0,65	0,61-0,69	0,55	0,45-0,68	0,64	0,57-0,71
Constant	0,01	0,01-0,02	0,00	0,00-0,00	0,00	0,00-0,01

Source: SIH-Datasus¹⁴, IBGE¹⁸, DAB-PMAQ¹⁵, Pactuações-Datasus¹⁶, Cadastro Nacional de Estabelecimentos de Saúde (CNES)-Datasus¹⁷, ANS¹⁹, PNUD²⁰ e Região-Redes²¹.

Incidence rate (IRR).

In the Northeast region, the municipalities adhering to PMAQ presented a ICSAP 14% lower than those that did not adhere. In this case, a decrease was observed in the incidence rate in the values in 5% of ICSAP for each bed added. The variable 'health plan coverage' showed a 1% decrease in ICSAP for each additional unit in the coverage, and the variable 'physicians allocated by the Mais Médicos Program' indicated a 36% ICSAP decreasing for each physician added to the Program per thousand inhabitants. The variables related to AB coverage, age/sex and Gini index followed the same pattern as the previous models, what

keeps the same explanation valid for this case.

The column related to the Southeast region revealed the same scenario observed as for Brazil: the municipalities that adhered to PMAQ presented a ICSAP 5% lower than those that did not adhere; the values in 29% of ICSAP experienced an increase in their incidence rate for each bed added, kept other variables constant; a 3% ICSAP decreasing was observed for each additional unit of health plan coverage; and there was a 22% decrease in hospitalizations for each physician added to the Mais Médicos Program per thousand inhabitants (table 2).

Table 2. Results of regression with estimated counting data using ICSAP incidence rates and their association to the study covariates, Brazilian regions, 2010 to 2014

Variables	Southeast		South		Midwest	
	IRR	Confidence interval (95%)	IRR	Confidence interval (95%)	IRR	Confidence interval (95%)
PMAQ	0,95	0,94-0,96	0,92	0,91-0,93	0,89	0,87-0,92
Hospitalization 0-4 years old Female	1,00	1,00-1,00	1,00	1,00-1,00	1,00	1,00-1,00
Hospitalization 0-4 years old Male	1,00	1,00-1,00	1,00	1,00-1,00	1,00	1,00-1,00
Hospitalization 5-19 years old Female	1,00	1,00-1,00	1,00	1,00-1,00	1,00	1,00-1,00
Hospitalization 5-19 years old Male	1,00	1,00-1,00	1,00	1,00-1,00	1,00	1,00-1,00
Hospitalization 20-59 years old Female	1,01	1,00-1,01	1,00	1,00-1,01	1,01	1,00-1,01
Hospitalization 20-59 years old Male	1,01	1,00-1,01	1,00	1,00-1,01	1,00	1,00-1,01

Table 2. (cont.)

Variables	Southeast		South		Midwest	
	IRR	Confidence interval (95%)	IRR	Confidence interval (95%)	IRR	Confidence interval (95%)
Hospitalization 60-79 years old Female	1,00	1,00-1,01	1,00	1,00-1,01	1,01	1,00-1,01
Hospitalization 60-79 years old Male	1,00	1,00-1,01	1,00	1,00-1,01	1,00	1,00-1,01
AB Coverage	1,00	1,00-1,00	1,00	1,00-1,00	1,00	1,00-1,00
# of beds per inhabitant	1,29	1,19-1,40	1,11	1,00-1,24	1,48	1,16-1,89
Health plan coverage	0,97	0,97-0,97	0,98	0,98-0,98	0,99	0,98-0,99
Gini index	0,00	0,00-0,00	0,01	0,00-0,01	0,04	0,01-0,12
Mais Médicos physicians per thousand inhabitants	0,78	0,69-0,89	0,71	0,63-0,79	0,78	0,59-1,04
Constant	0,01	0,00-0,03	0,01	0,00-0,06	0,00	0,00-0,00

Source: SIH-Datasus¹⁴, IBGE¹⁸, DAB-PMAQ¹⁵, Pactuações-Datasus¹⁶, Cadastro Nacional de Estabelecimentos de Saúde (CNES)-Datasus¹⁷, ANS¹⁹, PNUD²⁰ e Região-Redes²¹.

Incidence rate (IRR).

Finally, the South and Midwest regions. The existence of PMAQ in the South region municipalities indicated a ICSAP 8% lower than in those ones in which the program did not exist; the values in 11% of ICSAP experienced an increase in their incidence rate for each bed added; there was a 2% ICSAP decreasing for each additional unit of health plan coverage; and a 29% decrease in hospitalizations for each physician added to the Mais Médicos Program per thousand inhabitants.

As for the Midwest region, the municipalities adhering to PMAQ indicated a ICSAP 11% lower than in those that did not adhere; the values in 48% of ICSAP experienced an increase in their incidence rate for each bed added; there was a 1% ICSAP decreasing for each additional unit of health plan coverage; and a 22% decrease in hospitalizations for each physician added to the Mais Médicos Program per thousand inhabitants.

Comments

So, PMAQ exerted a significant effect on ICSAP reduction throughout the regions and in Brazil. Besides, the Northeast region seems

to be the most benefited from the Program. Given that, it is natural to question the factors that contributed to that Region standing out in relation to the other regions.

One trying answer is to consider the peculiarities inherent to Brazil, that is, to evaluate the results by taking into account that the country presents a variety of historical-structural characteristics that directly affect SUS configuration. Thus, the studies using data collected by PMAQ were given an in-depth analysis so to know the singularities of those municipalities that adhered to the Program.

Regarding that aspect, a study²⁴ aimed to analyze the physical structure of Basic Health Units (UBS) based on the set of environments recommended by the Physical Structure Manual issued by UBS-MS. It applied the data collected from the municipalities that adhered to PMAQ first and second cycles. The results reveal that the improvement throughout the whole country was due to the enhancing across the regions of the environments recommended in the Manual, that is, the dental office, the dressing and procedures room, the vaccination room, the nebulization room, and the toilets. Those are one of the factors that may have contributed to the ICSAP national decreasing between 2010 and 2014.

However, the article²⁴ accounts the Northeast region for the place where vaccination rooms, dressing and procedures rooms, meeting rooms, and educational activities achieved the highest increases. It is also noted that Northeast and North regions saw their one-to-three-UBS environments and four-to-six-UBS environments experiencing the greatest reduction than the other regions from one PMAQ cycle to the other. In addition, the units carrying seven-to-nine-UBS environments also increased more than proportionally in these two regions.

In connection to this, other study²⁵ advocated the meeting room as an important space in the UBS so it focuses on activities that enrich the clinical care itself, contributing to the enhancing of programmatic actions and service management. Accordingly, another article²⁶ holds the absence of that space responsible for hindering the carrying out of also the collective activities involving the community as the planning and evaluation of health team actions. Therefore, the gradual replacement of less capacity UBS for more adequate spaces may indicate an improvement in the attention to the population.

The South region stood out for being the territory where those characteristics were available in greater quantity during the whole study, while the increase of those subsidies from one PMAQ cycle to the other only occurred more intensely in the Northeast region²⁴. More clearly, the increase here does not indicate that the region carries out a more adequate quantity of the factors described, but, instead, that it experienced a positive oscillation from 2011 to 2014.

Similarly, another study²⁷ based on the construction of a UBS structure typology applying data retrieved from PMAQ first cycle adopted the dimensions related to types of team, expertise of professionals, operation shifts, available services, and facilities and resources. The results revealed that the proportion of worst structures were found in the North region, although the North and Northeast regions

carried out the worst ones in terms of absolute values. The best structures were mostly located in the South and Southeast regions. Considering the prominence of the Northeast region in that research²⁷, and that data collected referred to PMAQ first cycle, it is possible to assume that the Program contributed to the improvement of its structure from one cycle to the next.

In line with these studies, a research²⁸ studied the influence of UBS structure and the working process of ICSAP health teams. Data were retrieved from the evaluations performed in PMAQ first cycle. Results showed that a greater coverage of income distribution programs combined with a higher percentage of UBS facilities working at minimum hours and a greater availability of vaccines are significantly related to the hospitalization decrease in the municipalities. It is to note here the availability of vaccines as a factor related to ICSAP decrease, seeing that it was precisely one of the components that stood out in the Northeast region before the other regions.

In short, these peculiar improvements, especially in the Northeast region, seem to have contributed to its prominence as for PMAQ effect on ICSAP. However, despite that increase and the observed effects, previous article²⁴ states that UBS still do not follow the ideal operating pattern recommended by MS.

Another work²⁹ corroborates the Northeast region good results in certain characteristics. The study aimed to describe the production conditions and the information recording generated in UBS by means of indicators retrieved from PMAQ first cycle data. The indicators assessed infrastructure and data processing conditions, continuing education, and working process. Thus, data analysis of two large regions, delimited in the study by North and Northeast, and South, Southeast and Midwest, allowed to observe that the first showed a higher value regarding the working process indicator, specifically the monitoring and analysis of health indicators and information.

Such fact evinces a concern of AB teams with the outcome of their actions towards the population health, enabling a critical positioning of the professional performance and a constant improvement of their work. Those data, reported by the Primary Care Information System (Siab), also allow for following the information related to ICSAP. Thus, greater surveillance and appraisal of those data could influence that Region teams to improve attention and, consequently, to decrease ICSAP in a more substantial way.

So, although the article²⁹ results gather the Northeast and the North regions together, the Northeast region emerges as the place to which PMAQ seems to have provided the population greater access and better quality of service, considered the other results mentioned above.

In this regard, the observed effects of other ICSAP independent variables are also important. One of them was the health plan coverage, which revealed that territories counting for most hospitalization also had the least coverage. Those data confirm other ones found in ICSAP literature¹². The health plan coverage in Brazil is an important access³⁰ indicator, and evidences the possible reason why it is negatively related to ICSAP in the results. That is, the greater the coverage of the private health plan the lower the number of hospitalizations for Primary Care susceptible conditions.

Another study^{8,31} concluded that territories carrying out higher number of private beds compared to those provided by SUS tend to decrease public hospitalization. That is, data indicate that the actual number of ICSAP located in places of high quantity of private beds may be, in fact, higher than the informed numbers, since the same may be occurring in other spaces. Thus, health plan coverages are not necessarily bringing more access and quality of care to issues focused by AB, but may, on the contrary, be hiding hospitalization, provided that data regarding the provision of private services are not available for public consultation.

Consequently, ICSAP may well show a lower incidence in municipalities with broader health plan coverage. However, the fact does not necessarily indicate an improvement in access and quality of care from the standpoint of health promotion and disease prevention, because ICSAP may still be occurring in a private environment, what reduces their counting as for SUS beds.

The observation of the variable related to the availability of beds remarks that, with the exception to the Northeast region, it was positively related to the dependent variable, indicating that the greater the number of beds the greater the number of ICSAP. So, it is worth noting that the availability of health services can induce its use by a given layer of the population. Conversely, the offer may occur due to the influence of the use, generating a feedback³¹ cycle. If the stimulus to the use of beds occurs in situations that apparently it would not be needed, i.e., by simply inducing the use due to supply availability, health system would not only be increasing the number of unnecessary hospitalizations but also preventing the access to people who really need the service. The high number of bed use in this circumstance is not necessarily related to an improvement in the quality of services^{8,31}. Regarding the Northeast region, new studies aiming to understand the opposite scenario are needed as for this variable.

Also, AB coverage did not show a significant influence on ICSAP incidence rates for the years 2010-2014. This issue may be associated to the fact that care has experienced its most expansion in the last years, increasing from 6.55% to 64.72%³². For this reason, AB coverage started to achieve more stable values during the research, since its sharp growth occurred in the years previous to the research.

The variable related to the Mais Médicos Program leads to a study⁸ that analyzed the proportion of ICSAP in relation to the total number of hospitalizations for other causes in 2012. The results showed a decline of that proportion in Brazil and found variables

associated to ICSAP decreasing, such as the supply of physicians in the municipalities. This last effect occurred differently across the Brazilian regions, leading the author to conclude that the adequate distribution of physicians is one of the guiding factors enhancing AB. In view of this argument, one can note that one of the Mais Médicos Program objectives is precisely to reduce the shortage of physicians in certain regions of Brazil. Therefore, the importance of this policy in AB improvement seems clear, once the variable influence on ICSAP decreasing was substantial.

Lastly, it is worthy to consider the socioeconomic determinants when analyzing PMAQ different effects on the Brazilian regions^{6-8,11,33-35}, seeing that they may be related to the population health conditions³⁶. As for the period 2001-2012, a section of the period analyzed in this study, Brazil witnessed a growth in the national Gross Domestic Product (GDP). The Northeast Region achieved the GDP highest increase³⁶. Also, the illiteracy rate decreased, conferring the Region the scenario where it occurred more markedly³⁶. That scenario, together with the decrease in the proportion of people with low income throughout Brazil and the rescue of 22 million people from the condition of extreme poverty³⁶, reveals an improvement in the Country socioeconomic conditions. So, the significant positive increase in socioeconomic indicators may also have contributed to the progress of the population health as ICSAP³⁷⁻³⁹ decrease in Brazil, mainly to the Northeast region.

This section of the article aimed to elucidate the scenario drafted by the results described, that is, the heterogeneity of the PMAQ effect on ICSAP across the Brazilian regions. This question seems to be answered by the literature discussion on the theme of this study, once it recognizes that regions carry different characteristics regarding actions, health resources and facilities, socioeconomic dynamics, and peculiar issues inherent to each place. These aspects may be connected to the various improvement degrees of AB access and

quality in the regions. In this case, it is essential to consider different factors for an in-depth analysis of the program effect on these places.

In general terms, data exhibited here confirm ICSAP downward trend in the Country, manifested in the studies that applied the indicator^{6,8,10,40,41}. Also, the results corroborate the literature by exposing the various scenarios concerning ICSAP rates in the Brazilian regions^{8,41}. The decrease in hospitalizations studied here and described in this article from PMAQ standpoint, corroborates the studies that confirm the importance of AB teams for hospitalizations reduction^{10,33,41}. The discussion makes it seem essential to consider the existence of intrinsic aspects to each region that may have influenced the scope of the Program's effect. Seeing that and in the light of the results obtained from the ICSAP indicator, there is need of an in-depth observation of the available health services and socioeconomic determinants of each location as they can easily or hinder the use of health devices^{6-8,11,33-35}.

The results achieved in this study strengthen the importance of PMAQ and reaffirm ICSAP as an indicator capable of evaluating AB access and quality, so contributing to the academic production on the theme and emphasizing the indicator usefulness for assessing the effects of AB public policies on the population health.

Final remarks

The results obtained meet the study hypothesis and enable to conclude that PMAQ is reaching its objective of enhancing AB access and quality. Among the various available perspectives under which this study could analyze these aspects, 'ICSAP' indicator was chosen. As for the indicator, the results require to list the possible limitations when evaluating PMAQ. As discussed in this article, there are various aspects in each region of the country capable of easing or hindering the use of health devices. Therefore, we underline not only the

ICSAP importance to evaluate PMAQ but also the weighting of other contextual factors in conjunction with the indicator. Both are essential to the Program analysis.

It is significant re-mentioning the limitations concerning the number of teams participating in PMAQ, especially in the first cycle. The limitations concern the limit of teams that could adhere the program; the use of the 2010 Gini index for all years of the research; and the possible bias in the municipality data collection by the agencies. They require caution when analyzing PMAQ effects on ICSAP.

Finally, it is noteworthy that the various regional realities existing in Brazil regarding the health area demand more and more strengthening of public policies mindful of local characteristics. Such requirement calls for the joint action of the three government levels – Union, states and municipalities –, seeing that only the cooperation will make it feasible to achieve a varied range of policies that meet the needs of each locality while assuring equity in the distribution of health services at the national level. The evaluation process appears in this context as an instrument responsible for shedding light on the path being followed, allowing for adjustments towards the achievement of quality and equity in the access to health services. Hereupon, this article emerges also as an

important report on public health policies in Brazil as a means of instrumentalizing managers and the various actors involved in the development and discussion of one of the main AB programs: the PMAQ.

We suggest that new studies on the theme discussed in this article address the PMAQ effects on ICSAP by exploring, in detail, age group, sex and diseases that cause hospitalizations, provided that the information can add up to the understanding of socioeconomic and environmental effect on the population health that go beyond AB action. It is of capital importance to analyze both PMAQ limits and possibilities and the scope of ICSAP indicator when proposing the indirect evaluation of AB access and quality.

Acknowledgements

The authors would like to thank Professor Dr. Sérgio Luiz Bassanesi (*in memoriam*) for important suggestions and comments in the preparation of the content of this article.

Collaborators

Soares C (0000-0001-7833-2695)* and Ramos M (0000-0003-0880-8269)* contributed equally to the preparation of the manuscript. ■

*Orcid (Open Researcher and Contributor ID).

References

1. Brasil. Ministério da Saúde. Departamento de Atenção Básica. [internet]. [acesso em 2018 dez 10]. Disponível em: <http://dab.saude.gov.br/portaldab/pnab.php>.
2. Starfield B, Shi L, Macinko J. Contribution of Primary care to health systems and health. *MIQUES*. 2005; 83(3):457-502.
3. Mendes EV. A Construção Social da Atenção Primária à Saúde. Brasília, DF: CONASS; 2015.
4. Donabedian A. Aspects of medical care administration. Boston: Harvard University Press; 1973.
5. Donabedian A. The seven pillars of quality. *Arch Pathol Lab Med*. 1990; 114:1115-1118.
6. Alfradique ME, Bonolo PF, Dourado I, et al. Internações por condições sensíveis à atenção primária: a construção da lista brasileira como ferramenta para medir o desempenho do sistema de saúde (Projeto IC-SAP – Brasil). *Cad. Saúde Pública*. 2009; 25(6):1337-49.
7. Nunes KR. Análise das internações por condições sensíveis à Atenção Primária em hospital de referência regional [tese]. Botucatu: Universidade Estadual Paulista; 2015.
8. Castro ALB, Andrade CLT, Machado CV, et al. Condições socioeconômicas, oferta de médicos e internações por condições sensíveis à atenção primária em grandes municípios do Brasil. *Cad. Saúde Pública*. 2015; 31(11):2353-66.
9. Cardoso CS, Pádua CM, Rodrigues-Júnior AA, et al. Contribuição das internações por condições sensíveis à atenção primária no perfil das admissões pelo sistema público de saúde. *Rev. Panam Salud Publica*. 2013; 34(4):227-34.
10. Carvalho SC, Mota E, Dourado I, et al. Hospitalizations of children due to primary health care sensitive conditions in Pernambuco State, Northeast Brazil. *Cad. Saúde Pública*. 2015; 31(4):744-54.
11. Melo MD, Egry EY. Determinantes sociais das Internações por Condições Sensíveis à Atenção Primária em Guarulhos, São Paulo. *Rev. esc. enferm. USP*. 2014; 489(esp):129-36.
12. Pereira FJR, Silva CC, Lima Neto EA. Condições Sensíveis à Atenção Primária: uma revisão descritiva dos resultados da produção acadêmica brasileira. *Saúde debate*. 2014; 38(esp):331-42.
13. Oliveira VB. Avaliação do Impacto das Ações do Programa de Saúde da Família na Redução das Internações Hospitalares por Condições Sensíveis à Atenção Básica em Adultos e Idosos. [internet]. BH: NESCON; 2012. [acesso em 2020 ago 4]. Disponível em: <https://www.nescon.medicina.ufmg.br/biblioteca/imagem/3261.pdf>.
14. Brasil. Ministério da Saúde. Sistema de Informações Hospitalares: DataSUS (SIH-DATASUS). [internet]. [acesso em 2018 nov 8]. Disponível em: <http://sihd.datasus.gov.br/principal/index.php>.
15. Brasil. Ministério da Saúde. Departamento de Atenção Básica: PMAQ (DAB-PMAQ). [internet]. [acesso em 2018 dez 10]. Disponível em: http://dab.saude.gov.br/portaldab/ape_pmaq.php.
16. Brasil. Ministério da Saúde. Indicadores de Saúde e Pactuações: DataSUS (PACTUAÇÕES-DATASUS). [internet]. [acesso em 2018 dez 10]. Disponível em: <http://www2.datasus.gov.br/DATASUS/index.php?area=0201>.
17. Brasil. Ministério da Saúde. Cadastro Nacional de Estabelecimentos de Saúde (CNES-DATASUS). [internet]. [acesso em 2018 dez 10]. Disponível em: <http://cnes.saude.gov.br/pages/downloads/arquivosBaseDados.jsp>.
18. Instituto Brasileiro de Geografia e Estatística. População. [internet]. [acesso em 2019 jan 3]. Disponível em: <https://www.ibge.gov.br/estatisticas-novoportal/sociais/populacao.html>.

19. Agência Nacional de Saúde Suplementar. Dados e indicadores de setor [internet]. [acesso em 2019 jan 10]. Disponível em: <http://www.ans.gov.br/perfil-do-setor/dados-e-indicadores-do-setor>.
20. Programa das Nações Unidas para o Desenvolvimento. Atlas de desenvolvimento humano do Brasil. [internet]. [acesso em 2018 dez 2]. Disponível em: <http://atlasbrasil.org.br/2013/pt/download/>.
21. Região e Redes: Caminho da universalização da saúde no Brasil. [internet]. [acesso em 2019 jan 5]. Disponível em: <http://www.resbr.net.br/indicadores/view/>.
22. Brasil. Programa Mais Médicos (SPMM). [internet]. [acesso em 2019 jan 5]. Disponível em: <http://mais-medicos.gov.br/conheca-programa>.
23. Universidade da Califórnia em Los Angeles. Data Analysis Examples. [internet]. [acesso em 2019 jan 10]. Disponível em: <https://stats.idre.ucla.edu/other/dae/>.
24. Cavalcanti PCS, Oliveira Neto AV, Silva LE, et al. Análise da Estrutura Física das Unidades Básicas de Saúde no Brasil. In: Gomes LB, Barbosa MG, Ferla AA, editores. Atenção básica: olhares a partir do programa nacional de melhoria do acesso e da qualidade (PMAQ-AB). Porto Alegre: Rede UNIDA; 2016. p. 127-160.
25. Facchini LA, Piccini RX, Tomasi E, et al. Desempenho do PSF no Sul e no Nordeste do Brasil: avaliação institucional e epidemiológica da Atenção Básica à Saúde. *Ciênc. Saúde Colet.* 2006; 11(3):669-81.
26. Moura BLA, Cunha RC, Fonseca ACF, et al. Atenção primária à saúde: estrutura das unidades como componente da atenção à saúde. *Rev. Bras. Saúde Mater. Infant.* 2010; 10(1):69-81.
27. Bousquat A, Giovanella L, Fausto MCR, et al. Tipologia da estrutura das unidades básicas de saúde brasileiras: os 5 R. *Cad. Saúde Pública.* 2017 [acesso em 2020 ago 4]; 33(8):e00037316. Disponível em: https://www.scielo.br/scielo.php?script=sci_arttext&pid=S0102-311X2017000805005.
28. Araujo WRM. Internações por condições sensíveis à atenção primária no Brasil: análise hierárquica de fatores de contexto, estrutura e processo de trabalho [dissertação]. São Luís: Universidade Federal do Maranhão; 2015.
29. Neves TCC, Montenegro LAA, Bittencourt SDA. Produção e registro de informações em saúde no Brasil: panorama descritivo através do PMAQ-AB. *Saúde debate.* 2014; 38(103):756-70.
30. Bahia L, Scheffer M. Planos e Seguros Privados de Saúde. In: Giovanella L, Escorel S, Lobato LVC, et al., editores. Políticas e sistemas de saúde no Brasil. Rio de Janeiro: Fiocruz; 2012. p. 1.636-1.656.
31. Travassos C, Castro MSM. Determinantes e Desigualdades Sociais no Acesso e na Utilização de Serviços de Saúde. In: Giovanella L, Escorel S, Lobato LVC, et al., editores. Políticas e sistemas de saúde no Brasil. Rio de Janeiro: Fiocruz; 2012. p. 677-766.
32. Cavalcanti PCS, Oliveira Neto AV, Sousa MF. Uma Narrativa Sobre o Programa Nacional de Melhoria do Acesso e da Qualidade na Atenção Básica. In: Gomes LB, Barbosa MG, Ferla AA, editores. Atenção básica: olhares a partir do programa nacional de melhoria do acesso e da qualidade (PMAQ-AB). Porto Alegre: Rede UNIDA; 2016. p. 17-48.
33. Nunes RP. Estratégia Saúde da Família e Internações por Condições Sensíveis à Atenção Primária: uma revisão sistemática. *APS;* 2018; 21(3):450-60.
34. Pinto Junior EP, Aquino R, Medina MG, et al. Efeito da Estratégia Saúde da Família nas internações por condições sensíveis à atenção primária em menores de um ano na Bahia, Brasil. *Cad. Saúde Pública* [internet]. 2018 [acesso em 2020 ago 4]; 34(2):e00133816. Disponível em: https://www.scielo.br/scielo.php?script=sci_abstract&pid=S0102-311X2018000205003&lng=es&nrm=iso&tlng=pt.
35. Barros FC, Matijasevich A, Requejo JH, et al. Recent trends in maternal, newborn, and child health in Brazil: progress toward Millennium Development Goals 4 and 5. *Am J Public Health.* 2010; 100(10):1877-89.

36. Brasil. Ministério da Saúde. Plano Nacional de Saúde: PNS, 2016-2019. [internet]. [acesso em 2020 maio 28]. Disponível em: <http://bibliotecadigital.seplanelanejamento.gov.br/handle/123456789/1048?show=full>.
 37. Bettenhausen JL, Colvin JD, Berry JG, et al. Association of Income Inequality With Pediatric Hospitalizations for Ambulatory Care–Sensitive Conditions. *JAMA Pediatr* [internet]. 2017 [acesso em 2020 ago 4]; 171(6):e170322-e170322. Disponível em: <https://jamanetwork.com/journals/jamapediatrics/fullarticle/2613462>.
 38. Roos LL, Dragan R, Schroth RJ. Pediatric ambulatory care sensitive conditions: Birth cohorts and the socio-economic gradient. *Can J Public Health*. [internet]. 2017 [acesso em 2020 ago 4]; 108(3):e257-e264. Disponível em: <https://pubmed.ncbi.nlm.nih.gov/28910247/>.
 39. Agha MM, Glazier RH, Guttmann A. Relationship between social inequalities and ambulatory care-sensitive hospitalizations persists for up to 9 years among children born in a major Canadian Urban Center. *Ambulatory Pediatrics*. 2007; 7(3):258-262.
 40. Ribeiro MGC, Araujo Filho ACA, Rocha SSD. Hospitalizações por condições sensíveis à atenção primária em crianças do Nordeste Brasileiro. *Rev. Bras. Saude Mater. Infant*. 2019; 19(2):491-498.
 41. Pinto LF, Giovanella L. Do Programa à Estratégia Saúde da Família: expansão do acesso e redução das internações por condições sensíveis à atenção básica (ICSAB). *Ciênc. Saúde Colet*. 2018; 23:1903-1914.
-

Received on 10/04/2019

Approved on 06/10/2020

Conflict of interest: non-existent

Financial support: non-existent