A comparative analysis of the implementation of the Mais Médicos (More Doctors) Program in municipalities in the State of Rio Grande do Sul, Brazil

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Abstract *The* Mais Médicos *(More Doctors) Program has led to an increase in the number of doctors and medical treatment in primary health care services across Brazil. This article presents the results of a case-control study of groups of municipalities based on secondary data sources. It aims to explore and discuss a set of indicators of primary health care service delivery. An improvement in performance against structural indicators was observed in municipalities where the program was implemented. With respect to the outcome indicators, a slight improvement in service delivery was observed in municipalities where the program was implemented. However, no difference was observed in impacts between the case and control municipalities. These results may have been influenced by the fact that the program has only been underway for a limited time, by underreporting of doctors by the National Health Facilities Register (CNES, acronym in Portuguese), and the predominantly substitutive nature of the allocation of medical professionals under the program in the selected municipalities.*

Key words Regional medical programs, Foreign medical graduates, Distribution of doctors, Primary Health Care doctors, Primary Health Care

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Introduction

The distribution, supply and permanence of doctors and health occupations tend to be influenced by a complex combination of personal, institutional, corporate, political and economic factors.

According to Brazil's Federal Council of Medicine (CFM, acronym in Portuguese), the World Health Organization (WHO) and the Pan American Health Organization (PAHO) do not determine or recommend minimum or optimum doctor-population ratios (CFM, 2013). Even so, the Brazilian Health Ministry has established a national parameter and goal of 2.5 doctors per 1,000 population[1].

Shortages of doctors and health workers to meet health needs are common in the majority of less developed countries, particularly in primary health care. The *World Health Report 2006*[2] estimates that, worldwide, only 38% of the nursing workforce and 25% of doctors serve the needs of rural areas, despite the fact that the world population is predominantly rural. These shortages and the uneven distribution of health workers is frequently seen as a major obstacle to ensuring equity of access to basic health services and achieving national health goals.

Although the overall active doctor-population ratio in Brazil is viewed as fair in comparison with international averages, the proportion of doctors to citizens in large urban peripheries and areas with lower population densities is particularly low. When compared with countries with similar social and economic characteristics, the country generally occupies lower positions in the rankings: for example, Brazil was ranked 31st in a comparison between 42 countries made in 2011[3].

Disparities and inequities also occur in the availability, distribution and permanence of medical professionals and respective health occupations, given the variety of spatial and social contexts in the country. The main problem lies in the unequal distribution of medical professionals by socioeconomic group and population density.

A recent assessment showed that the number of professionally active physicians has grown exponentially and that the rate of growth in the population of doctors is greater than that in the general population. It also showed that there has been a significant increase in the number of places offered on medical courses, that more doctors are entering the labor market than leaving it, and that doctors commonly work long hours[3,4].

However, the same study showed inequalities in the geographical distribution and supply of medical occupations, both in general terms and with regard to specialist areas, and disparities in supply between the public and private sectors[4]. In Brazil, the supply of doctors is greater in major urban centers and municipalities with larger populations and better economic conditions. Furthermore, the ratio of doctors to patients is four times greater in the private health system than in the public Unified Health System (*Sistema Único de Saúde* - SUS).

Further highlighting the problem in question, a national survey carried out at the beginning of 2011 showed that 58% of respondents said that the main problem faced by the SUS is the "lack of doctors"[5].

In the middle of 2013, the Brazilian government created the "More Doctors Program" (*Programa Mais Médicos* - PMM), initially as a temporary measure and later as a federal law that included the *Projeto Mais Médicos para o Brasil* (PMMB). The primary aim of this initiative was to increase the provision of doctors in primary health teams and services in areas with an absence or shortage of doctors. The program also sought to improve primary health care facilities in the same areas and expand and enhance the training and specialization of doctors with emphasis on PHC.

From the perspective or processes and logistical patterns, the PMM can be considered as a programmatic type of an (inter-)institutional strategy, since it represents the concrete implementation of a particular institutional policy, based on the management of resources to meet specific ends, the definition of predetermined objectives and a single, normative oversite[6].

Controversy surrounded the program's justification, purpose, methods of contracting and the type of doctors hired by the program during the initial phase of the PMM between 2013 and 2014. The program was emphatically contested and questioned by the medical profession, resulting in widespread repercussions in the media. Despite the protests, the PMM was implemented with wide-scale public approval[7].

The following research question may be posed regarding the regulation (legal, institutional and programmatic) and implementation of the program: what are the initial results of the implementation of this program in real contexts and cases?

However, studies addressing the implementation of the PMM and their respective publications are scarce, which justifies conducting further investigations in order to bring together

additional related information, hypotheses and evidence.

The present article outlines the results of an exploratory analysis of the initial phase of the PMM in selected municipalities in the State of Rio Grande do Sul. The article provides a brief description and comparative analysis of typical relevant primary health care indicators in two groups of municipalities – those where the PMM was implemented and those where the program was absent. Plausible hypotheses are then formulated to explain the results of the exploratory analysis that may serve as a basis for undertaking further studies in this area.

Material and methods

A study was conducted to evaluate longitudinal trends among groups of municipalities based on secondary data sources and using time series[8], comparative, and descriptive analysis. It comprises a community-based case-control study based on aggregate data[9], which has the advantage of being inexpensive (due to the use of secondary data sources) and providing easily interpretable results. This type of study is recommended for providing supporting evidence for hypotheses concerning interventions in macrosocial health contexts[10] such as the PMM. Limitations of this type of study include possible underreporting of data, biases occurring due to the heterogeneous distribution of the intervention, as well as possible confusion with other factors (collinearity).

The context chosen for the study was the State of Rio Grande do Sul, where a number of local governments started to implement the *Programa Mais Doctors* (PMM) in the middle of 2013. The distribution of doctors under the PMM throughout Rio Grande do Sul's macro health regions was as follows: Center-West (11.0%); Metropolitana (40.4%); Missioneira (9.1%); North (13.7%); Serra (5.3%); South (11.8%); and Vales (8.6%).

The first four cycles of the PMM (implemented up to 2014 - limit established for the present study) covered a large number of municipalities with varying characteristics in terms of coverage and diversity. It was therefore decided to aggregate municipalities from the abovementioned macro health regions into population size categories (described below) in order to ensure greater coverage in terms of location and diversity in terms of socioeconomic conditions, geopolitical structuring etc.

The proportion of medical professionals allocated to the state capital, Porto Alegre, was particularly large in comparison to other municipalities (around 12% of the total), which prevented the pairing of this municipality as a unit of analysis for comparative purposes. Thus, given its unique character, it was decided to exclude Porto Alegre from the study.

Given that the analysis was based on an aggregate data case-control study, the groups of municipalities that implemented PMM were called "cases" and those that had not implemented the program were called "controls".

The municipalities were categorized according to five population estimate bands. The number of municipalities was determined according to the proportion of municipalities in each population band in the state and in each macro health region (except in the case of bands with larger population estimates), as described in Table 1.

Data was obtained from the following public domain secondary data sources: the National Health Facilities Register (*Cadastro Nacional de Health facilities* - CNES); the Hospital Information System (*Sistema de Informações Hospitalares* – SIH); the Outpatient Information System (*Sistema de Informações Ambulatoriais* - SAI); the Primary Care Information System (*Sistema de Informação da Atenção Básica* - SIAB); and the Notifiable Diseases Information System (*Sistema de Informação de Agravos de Notificação* - SINAN). The trends analysis of the data obtained from the CNES was performed based on a time series comprising the months of December between 2010 through 2014.

The data was processed using simple frequency tables and calculation with the aid of the programs Tabwin (ver. 3,6b) and Excel.

The indicators used for the comparative analysis were doctor-population ratio (Nationally and in Rio Grande do Sul) and structural and outcome indicators[11] (process indicators were therefore disregarded) applicable to public primary health care services (Chart 1).

The frequency trend analysis was performed using annual indicator values over a five-year period with emphasis on two specific time periods: the period prior to the implementation of the PMM (2010 to 2013), and the initial phase of the program (2013 to 2014).

The study project was approved by the Research Ethics Committee of the School of Nursing at the Federal University of Rio Grande do Sul.

Main results

This section begins with a brief overview of the implementation of the PMM in Rio Grande do Sul and then proceeds to outline the main results of the comparison between the case and control groups.

A total of 1,066 doctors were allocated across 382 municipalities during the first four cycles of the PMM in Rio Grande do Sul (76.8% of all municipalities): 76 (7.1%) in the first cycle; 319 (30%) in the second; 240 (22.6%) in the third; and 427 (40.2%) in the fourth.

Although the Metropolitana macro region received the largest proportion of new doctors, the doctor-population ratio appeared to be greater in the North and South macro regions: 1.0/10,000 population in the Center-West, 0.9/10,000 popu-lation in Metropolitana; 1.0/10,000 population in Missioneira, 1.3/10,000 population in the North; 0.5/10,000 population in Serra, 1.2/10,000 population in the South, and 1.1/10,000 population in Vales.

The following key is used to facilitate the discussion of the results (as in Table 1):

- **A1.** Municipalities with a population of less than 10,000;

- **A2.** Municipalities with a population of between 10,000 and 25,000;

- **A3.** Municipalities with a population of between 25,000 and 50,000;

- **A4.** Municipalities with a population of between 50,000 and 100,000;

- **A5.** Municipalities with a population of over 100,000.

Table 1. Description of population size categories in municipalities of Rio Grande do Sul State, with and without the implementation of the PMM, selected for the study sample.

Aggregated municipalities and population categories	Macro Heath Regions	Aggregated municipalities		Total	%
		Cases (with PMM)	Controls (no PMM)		
A1- Fewer than 10,000 inhabitants	7	34	34	68	62.9
A2- More than 10,000 and fewer than 25,000 inhab.	7	9	9	18	16.6
A3- More than 25,000 and fewer than 50,000 inhab.	7	6	6	12	11.1
A4- More than 50,000 and fewer than 100,000 inhab.	6	3	3	6	5.5
A5- More than 100,000 inhab.	4	2	2	4	3.9
Total		**54**	**54**	**108**	100

Source: Study.

Chart 1. Systemic structural and outcome indicators selected for the study analysis.

Structural Indicators	Outcome indicators
- Coverage rate by Community Health Agents per 750 inhabitants (standard of the National ABS policy – PNAB) - Coverage rate by teams from the Family Health Strategy per 4,000 inhabitants (standard of the National ABS policy – PNAB) - Per capita state and federal transfers (in BRL$) for costs of the ABS - Per capita federal transfers (in BRL$) for costs of the Family Health Strategy (Lower Care Level, variable fraction).	- proportion of admissions for sensitive causes in the ABS/APS, - admission rate for Acute Respiratory Infection (ARI) in under-fives, - hospitalization rate for Acute Diarrhea in under-fives, - Rate of admissions for ambulatory care per habitant/year - Rate of admissions for complications relating to Diabetes Mellitus. - Rate of admissions for Cerebral Vascular Accidents (CVA). - Rate of admissions for Cardiac Congestive Failure - Incidence rate for positive pulmonary tuberculosis.

Source: Study.

Doctor-population ratio: the case of Rio Grande do Sul within the Brazilian context

According to data produced by the FCM[3], around 390,000 doctors were registered in Brazil as at the end of 2013, which is equivalent to 1.97/1,000 population. However, according to CNES data, approximately 324,000 of the doctors registered in the CFM in December of the same year (approximately 83%) were registered in public and private health facilities, reducing the number of doctors to 1.6/1,000 population, with a greater concentration in the states de São Paulo, Rio de Janeiro and in the Federal District. In the same period, 5.4% of municipalities had no doctors registered in health facilities, while 80.6% of municipalities had less than one doctor per 1,000 population (CNES).

Between December 2010 and 2014, the proportion of medical professionals registered in health facilities providing services under the SUS declined from 74% to approximately 69%. In Rio Grande do Sul the decrease was less pronounced (75% to 73%) (CNES).

CNES data on medical professionals registered in primary health care facilities linked to the SUS show that during the middle period of the time series (December 2013) the number of doctors per capita nationally and in the majority of states was significantly lower: 0.2/1,000 population nationally and in the State of Rio Grande do Sul. Nationally, approximately 30% of municipalities did not have doctors registered in primary health care facilities linked to the SUS, while in Rio Grande do Sul this proportion was approximately 41%.

Also in December 2013, the proportion of medical professionals registered in primary health care facilities linked to the SUS was only 13.7% of the total number of registered medical professionals. These proportions were higher in states in the Southeast and South Regions.

Also in December 2013, the overall number of medical professionals per capita in Brazil registered in health facilities and working in the SUS and in primary health care by population size category was as follows:

- Municipalities with a population of less than 10,000 - between 1.6 and 0.3/1,000 population;
- Municipalities with a population of between 10,000 and 24,999 - between 1.8 and 0.3/1,000 population;
- Municipalities with a population of between 25,000 and 49,999 - between 2.5 and 0.2/1,000 population;

-Municipalities with a population of between 50,000 and 99,999 - between 3.7 and 0.2/1,000 population;
- Municipalities with a population of over 100,000 - between 6.3 and 0.1/1,000 population.

It can therefore be observed that the number of medical professionals per capita by population size has increased significantly in ascending order, whereby the number of medical professionals per capita in the largest municipalities (population > 100,000) is almost four times greater than that in the smallest municipalities (population < 10,000). The opposite can be observed with respect to medical professionals working in the SUS in primary health care: that is, the number of medical professionals per capita in the largest municipalities was almost three times lower than in the smallest municipalities.

The number of medical professionals per capita in Rio Grande do Sul in the period December 2010 to 2014 was greater than the overall number per capita in Brazil and the differences between the different municipality sizes was smaller. With respect to medical professionals working in the SUS with primary health care, the number of medical professionals per capita in the state was greater than the overall number per capita in Brazil in all municipality size categories except 10,000 to 24,999 and over 100,000, where the number was equivalent to the national rate. It can be observed that, both overall in Brazil and in the State of Rio Grande do Sul, the number of medical professionals per capita working in the SUS with primary health care decreases considerably as municipality size increases.

In December 2013, the number of medical professionals per capita in Rio Grande do Sul was 2/1,000 population (CNES), while 11.2% of municipalities did not have doctors and 76% of municipalities had less than 1 doctor per 1,000 population. Between December 2005 and 2010, the number of medical professionals registered in health facilities in Rio Grande do Sul increased by 60.7%, while between December 2010 and 2014 the number increased by only 17.4%.

With respect to doctors working in the SUS with primary health care in Rio Grande do Sul (December 2013) there was an increase of 24.7% between 2005 and 2010 and of 6.6% between 2010 and 2014. With respect to doctors working in the SUS, there was an increase of 72% between 2005 and 2010 and 10.3% between 2010 and 2014. In other words, the increase during the implementation of the PMM was smaller than that in the period prior to the program.

With respect to the case municipalities, there was a difference in the number of doctors per capita allocated to SUS facilities and working with primary health care in some population size categories when compared to the previous period (2010 to 2013) and the initial phase of the PMM (2013 to 2014). In case municipalities with a population of between 10,000 and 25,000 (A2), the number of doctors registered in primary health care facilities linked to the SUS increased by 5.9%, against a decrease of 22% in the period prior to the program, while in municipalities with a population of between 25,000 and 50,000 there was a decrease of 10.6% compared to a decrease of 30.9% in the period prior to the program. In the other population size categories (A1, A4 and A5) the decrease in the number of doctors in the initial phase of the PMM was even more pronounced than in the period prior to the program (Table 2).

Comparative analysis of selected indicators

The comparative analysis of the case and control groups based on 12 selected indicators (four related to structural aspects and eight related to the direct and indirect results associated with primary health care services) covers the period 2010 to 2014 and concentrates on assessing rates and characterizing trends, especially the most significant changes. In order to visualize the context indicators and tendencies more effectively, the ideal way of presenting the data would be a summary table. However, given the large number of variables (each case and control municipal aggregate is followed by a description of the indicators of outcomes, population size categories and data by

year) this type of presentation in not appropriate for this article. As such, it was decided to provide a brief description of three indicators (two structural and one outcome indicator) and highlight the tendencies observed starting with the implementation of the PMM in the state, notably in 2014 (Table 3).

Throughout the study period, the number of community health agents per 750 population in the case and controls, in accordance with the minimum standards set by the National Primary Health Care Policy (*Política Nacional de Atenção Básica* – PNAB)[12], did not show any marked differences, except in case municipalities with a population of less than 10,000. Significant increases in population coverage by community health agents in case municipalities were not observed.

The increase in the number of family health teams per 4,000 population (PNAB) was more pronounced in case municipalities than in the controls, except in the population size category A4. With respect to the case municipalities, coverage by family health teams increased across all population size categories (the greatest increases were observed in municipalities with a population of less than 25,000), particularly in 2014.

The increasing trend in rates of outpatient treatment since 2014 is particularly pronounced in case municipalities with a population of less than 10,000. Despite an increase as from 2013, there were no marked differences in annual state government funding of primary health care per capita between case and control municipalities in all population size categories. There were also no marked differences in annual central government funding of primary health care per capita between case and control municipalities in al-

Table 2. Proportional diferences of doctor supply rates (total and specifically for doctors who provide primary healthcare services of the SUS) in aggregated municipalities of the State of Rio Grande do Sul with the implementation of the PMM for different population categories, as selected for the study sample, 2010 – 2012 and 2013 – 2014.

Aggregated municipalities and population categories	% Dif. 2010-2012 Doctors	% Dif. 2013-2014 Doctors	% Dif. 2010-2012 Doctors ABS/APS-SUS	% Dif. 2013-2014 Doctors ABS/APS-SUS
A1- Fewer than 10,000 inhabitants	1.4	-9.7	-17.2	-31.7
A2- More than 10,000 and fewer than 25,000 inhab.	-2.4	9.5	-22	5.9
A3- More than 25,000 and fewer than 50,000 inhab.	4.9	-3.4	-30.9	-10.6
A4- More than 50,000 and fewer than 100,000 inhab.	-10.4	6.5	11.5	-19.0
A5- More than 100,000 inhab.	3.0	-14.8	3.1	-18.3

Source: CNES

most all population size categories, except control municipalities with a population of between 50,000 and 100,000, where the increase was more significant.

No substantial changes were found with regard to the proportion of hospital admissions for ambulatory care sensitive conditions in and between all case and control municipalities. A gradually decreasing trend in the proportion of hospital admissions was observed in all case and control municipalities over the study period, without any substantial changes during the four cycles of the program. In the case of case municipalities with a population of between 10,000 and 25,000 (A2), the proportion of hospital admissions for ambulatory care sensitive conditions gradually decreased from 33.1% in 2010 to 26.2% in 2014, without any substantial change after 2013 (the year in which the PMM started) (Graph 1).

No marked differences were found with regard to hospital admissions rates for acute respiratory infection in children under five years of age between case and control municipalities in the period prior to the implementation of the PMM (2010 to 2013) and during the initial phase of the program (2013 to 2014). There was a slight decrease in rates as from 2013 in case municipalities in the population size categories A3 and A5; however, these rates were very similar to those in control municipalities.

There was a pronounced reduction in hospital admissions rates for acute diarrhea in children under five years of age as from 2013 in case municipalities in the population size categories A1, A4, and A5, while in the control municipalities in the population size categories A1 and A4 there was an increase in admissions rates in the same period.

Table 3. Description of the values of the coverage rates for Community Heatlh Agents and family Health Teams (standards laid out in the PNAB) and for the production of ambulatory consultations (per habitant per year) in the aggregated municipalities for selected cases and controls. Historical series from 2010 to 2014.

Aggregated municipalities/ years	A1		A2		A3		A4		A5	
	Case	Control	Case	Control	Case	Control	Case	Control	Case	Control
Coverage rate by Community Health Agents per 750 inhabitants										
2010	1.1	1.6	0.8	1.1	0.9	0.9	0.2	0.7	0.4	0.5
2011	1.1	1.6	0.8	1.2	0.8	0.8	0.2	0.6	0.5	0.5
2012	1.2	1.7	0.8	1.4	0.9	1.0	0.3	0.6	0.5	0.6
2013	0.9	1.6	0.8	1.3	0.8	0.9	0.3	0.6	0.5	0.5
2014	1.3	1.6	0.8	1.3	0.8	0.9	0.3	0.7	0.4	0.5
Coverage rate by teams from the Family Health Strategy per 4,000 inhabitants										
2010	1.0	1.2	0.6	0.8	0.7	0.8	0.1	0.5	4.0	0.4
2011	1.0	1.2	0.6	1.0	0.8	0.8	0.2	0.5	0.4	0.5
2012	1.0	1.2	0.6	1.0	0.8	0.8	0.2	0.5	0.4	0.5
2013	1.0	1.2	0.6	1.0	0.8	0.8	0.2	0.6	0.6	0.6
2014	1.4	1.4	1.0	1.2	0.9	1.0	0.3	0.6	0.7	0.7
Rate of admissions for ambulatory care per habitant/year										
2010	3.8	2.2	1.4	2.1	1.1	2.6	1.5	1.3	1.2	1.8
2011	3.6	3.2	1.5	1.9	2.2	3.2	1.5	2.1	1.2	2.1
2012	2.4	3.7	1.5	1.4	1.2	2.1	1.3	1.1	1.0	2.1
2013	2.5	2.3	2.1	4.6	1.2	3.7	1.5	1.0	1.0	1.8
2014	4.5	3.1	1.3	4.2	1.5	2.9	2.3	1.2	1.0	2.2

Key: A1- A1- Fewer than 10,000 inhabitants; A2- More than 10,000 and fewer than 25,000 inhab; A3- More than 25,000 and fewer than 50,000 inhab; A4- More than 50,000 and fewer than 100,000 inhab; A5- More than 100,000 inhab.
Sources: CNES e SIAB.

There was a greater decrease in hospital admissions due to diabetes mellitus during the study period in case municipalities than in controls in the population size category A4, while there was an increase in admissions in case municipalities in the population size categories A1 and A4.

There was no difference in hospital admissions rates due to stroke and congestive heart failure during the study period between case and control municipalities.

A decreasing trend was observed with respect to the incidence of pulmonary tuberculosis in case municipalities in the population size categories A1, A3, A4, and A5.

In short, with regard to the structural indicators coverage by family health teams and outpatient treatment, it was possible to observe a slight differential increase in case municipalities as compared to control municipalities as from 2013. This was not the case with the structural indicators state and central government funding of primary health care. With respect to indirect indicators of the outcomes of the implementation and enhancement of primary health care service, there were no significant differences between the case and control groups, except with certain indicators in specific population size categories.

However, it should be noted that, in general, the case municipalities showed a slight positive improvement in performance against structural indicators (coverage by community health agents and family health teams, central government funding for primary health care and the family health strategy) in the initial phase of the PMM (2013 to 2014).

Discussion

Comprehensive analysis and discussion of results implies making comparisons with similar studies and engaging in dialogue with researchers seeking to understand and discuss the cases and processes in question. However, the empirical studies found in the scientific literature and reviewed by the authors bear little resemblance and their results are not comparable with the findings of this investigation. As such, this discussion concentrates on the findings and the formulation of hypotheses that may serve as a basis for future studies.

Considering the decrease in the number of registered doctors, notably in case municipalities during the implementation of the PMM in Rio Grande do Sul (2013 to 2014), the hypotheses of underreporting in the CNES and/or the predominance of substitution of medical professionals by new doctors during the first cycles is plausible; that is, the data supports the hypothesis that,
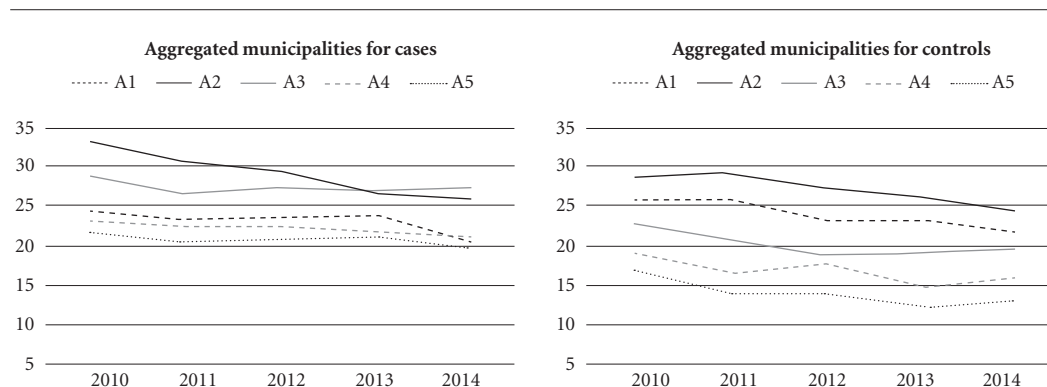
A1- Fewer than 10,000 inhabitants; A2- More than 10,000 and fewer than 25,000 inhab; A3- More than 25,000 and fewer than 50,000 inhab; A4- More than 50,000 and fewer than 100,000 inhab; A5- More than 100,000 inhab.

Graph 1. Trends for proportions (in %) of hospitalizations for sensitive PHC conditions in aggregated municipalities in Rio Grande do Sul State, with and without the implementation of the PMM, respectively "cases" and "controls", 2010 – 2014.

Source: Hospitalizations System (SIH).

during the first cycles, the PMM was characterized as being of a substitutive nature, at least in the municipalities included in the sample.

The same trend – the decrease in the number of doctors per capita (as a whole and specifically those working in primary health care facilities in the SUS) – was not so pronounced in the control groups. Regarding the control municipalities, only municipalities with a population of between 25,000 and 100,000 (A3 and A4) showed a decrease in the number of doctors per capita (A3 = -3.8% and A4 = -0.8%) and in the number of doctors working in primary health care facilities in the SUS (A3 = -35.3% and A4 = -21.2%).

The comparative analysis of structural indicators between the case and control groups shows that, in general, the availability of and coverage by community health agents and family health teams up to 2013 was better in the municipalities where the PMM had not been implemented (controls). This finding may support the hypothesis that the implementation the PMM in Rio Grande do Sul prioritized municipalities where the supply of health workers and coverage of primary health care services was most limited.

In general, based on the 12 indicators selected to compare case and control municipalities, there were no tendentially significant changes across any of the population size categories. The trends towards improving or worsening performance against given indicators resulted from slight and gradual changes throughout the study period.

The finding that there was an increase in coverage by family health teams in municipalities where the PMM was implemented supports the hypothesis that there may also have been associated improvements beyond the allocation of medical professionals. Family health teams rely on the work of other staff with different levels of education (elementary, secondary, university). However, associated improvements were not observed specifically with respect to community health agents.

At municipal level, primary health care is funded through local government funds and central and state government funding. Local government funding can be monitored by analyzing the records of the Public Health Budget Information System (*Sistema sobre Orçamentos Públicos de Saúde* - SIOPS), a secondary source that was not considered for this study. The annual indicators (per capita) of central and state government health care funding during the period showed that there was apparently no increase or improvements in funding. However, since central government funding of and part of expenditure on the PMM (principally the doctors' salaries) was not distributed through the primary health care funding block and a specific line item of the National Health Fund, it was not possible to breakdown this data and determine whether there have been structural improvements in funding.

As expected, few studies that specifically address structural indicators and the short term impacts of primary health care services were found in the national and international literature.

There are systematic reviews of studies addressing the supply and distribution of health workers and accessibility in remote rural areas focusing on political and institutional interventions aimed at dealing with these challenges. For example, a literature review of 110 related articles conducted by Wilson et al.[13] concluded that, although more coercive government strategies aimed at meeting recruitment demands, increasing supply and improving the distribution of health workers may generate immediate impacts, they tend to produce few positive long-term positive impacts.

The "Mission into the Neighborhood" program (*Misión Barrio Adentro* - MBA) is a similar multiphase strategy implemented by the Venezuelan government in 2003[14]. The second and third phases comprised the effective implementation and expansion of the program, achieving a 72% coverage rate by supplying over 13,000 Cuban doctors, 2,500 Venezuelan nurses, and 797 Venezuelan dentists. It is important to highlight that, despite achieving quantitative coverage goals, drawbacks and limitations were identified, such as a weak information and records system.

Báez[15] carried out an assessment of another international cooperation program involving Cuban doctors in South Africa using qualitative methods. The findings showed that the existing health services were excessively curative, which hampered the professional adaptation of the Cuban doctors.

It is also worth remembering that cooperation and the introduction of Cuban doctors is not new in Brazil. Paiva et al.[16] discuss the implications of this type of cooperation for the institutionalization of quality health care and the organization of the public health field in Brazil and point out some of the shortcomings and challenges arising from this type of international cooperation.

A research report elaborated by Miranda [17] as part of a Masters dissertation describes some

indicators associated with the short-term implementation period (1994 to 1996) of the then-named Family Health Program (*Programa Saúde da Família* - PSF) in the municipality of Quixadá in the State of Ceará. Also using secondary data sources, Miranda found that, despite the wide coverage of the PSF (particularly in rural areas), the cost of the Municipal Health System increased, while the costs of hospital admissions and demand for emergency outpatient care in the municipal hospital remained unaltered, and there was a decrease in performance against municipal morbidity and mortality indicators. In a more detailed analysis, Miranda observed that this was due to factors related to the implementation of the primary health care services, which created new demands on the local healthcare system that in turn led to an increase in costs. Furthermore, it was observed that the apparent decrease in performance was due to a reduction in underreporting and that costs of hospital admissions had not increased due to a change in the type of admissions and the average length of stay in hospital (management of more severe cases, lower patient turnover). Furthermore, the demand for emergency outpatient care remained unaltered since the demand for health care from local residents previously met by the system was substituted by demands from residents from neighboring municipalities.

A plausible hypothesis to explain why positive immediate impacts from the implementation or expansion of primary health care services were not observed in municipalities where the PMM was implemented is the new demand identification and inclusion cycle in the initial phases, which are characteristic of such situations.

It is plausible to assume that, in the initial phase, the implementation and expansion of the primary health care services, with the inclusion of doctors, as in the case of the PMM, may lead to an increase in the flow of specialized hospital and outpatient referrals, which could only be assessed by repeating the analysis after a longer period of time.

Another plausible hypothesis that may explain the results of the impacts relates to the predominantly substitutive nature of the allocation of medical professionals in health facilities (as a whole and in primary health care facilities linked to the SUS) during the initial cycles of the PMM. The analysis of the registration of these professionals throughout the study period suggests that there was no apparent increase in the number of doctors in the case municipalities.

This could also be hypothetically explained by underreporting in the CNES, or that is, the nonregistering of new medical professionals from the PMM. However, an analysis of historic trends in the registration of doctors shows apparent inconsistencies in 2011 (Chart 1).

In any event, although the initial allocation of new doctors was predominantly substitutive, new professionals were introduced, possibly along with new practices, technological innovations, and approaches to the organization and management of local primary health care services, which this kind of study is unable to assess or analyze.

Given the initial phase of the implementation of the PMM in Rio Grande do Sul, it would be premature to compare outcome measures based on the health status of the populations covered by these health services, other than those that support the formulation of hypotheses that may serve as a basis for future more in-depth studies over longer time periods. In the same way, given the descriptive and exploratory nature of this study, it would be counterproductive to associate the results exclusively with the specificities of the highlighted initiatives and measures.

It is therefore important to emphasize that the supply and availability related to structural aspects, such as health workers, resources and inputs (normative, financial, physical, technological etc.) is not enough to ensure and improve access to quality health services[12].

Therefore, the discussion and points raised by this article do not relate specifically to the accessibility and organization and management of health services, but rather address certain aspects of health care delivery and the measurable impacts of the implementation of the PMM as an institutional strategy to increase the supply and improve the distribution of medical manpower in groups of municipalities.

Conclusion

Descriptive and exploratory studies are not able and do not claim to provide explanatory evidence or determine whether a result is statistically significant. These limitations are particularly accentuated given the relatively short period of time of the initial phase of an institutional strategy that is intended to be long term.

Despite their limitations, the findings of studies of this nature provide the basis for the formulation of plausible hypotheses to help analyze the initial phase of the implementation of

programmatic strategies and primary health care services. This article aimed to contribute towards the discussion of plausible hypotheses that may be confirmed or refuted by further medium to long-term studies that have greater methodological consistency and employ a more in-depth analysis and are able to provide the necessary input to suggest improvements to the policies analyzed in this study.

Collaborations

AS Miranda and DA Melo participated in the elaboration of the research project, data collection, processing and analysis, and in the drafting and revision of the present article.

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