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Impact of the *Mais Médicos* (More Doctors) Program in reducing physician shortage in Brazilian Primary Healthcare

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Abstract *The* Mais Médicos *(More Doctors) Program (PMM) was put in place in Brazil aiming to reduce inequalities in access to Primary Healthcare. Based on diverse evidence that pointed to a scenario of profound shortage of doctors in the country, one of its central thrusts was emergency provision of these professionals in vulnerable areas, referred to as the* Mais Médicos para o Brasil (More Doctors for Brazil) *Project. The article analyses the impact of the PMM in reducing shortage of physicians in Brazilian municipalities. To do this, it uses the Primary Healthcare Physicians Shortage Index, which identifies and measures the shortage in the periods of March 2003 and September 2015, before and after implementation of the program. The results show that there was a substantial increase in the supply of physicians in primary healthcare in the period, which helped reduce the number of municipalities with shortage from 1,200 to 777. This impact also helped reduce inequalities between municipalities, but the inequities in distribution persisted. It was also found that there was a reduction in the regular supply of doctors made by municipalities, suggesting that these were being simply substituted by the supply coming from the program. Thus, an overall situation of insecurity in care persists, reflecting the dependence of municipalities on the physician supply from the federal government.*

Key words *Physician shortage,* Mais Médicos *Program, Primary Healthcare*

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Introduction

The *Mais Médicos* Program (*Programa Mais Médicos*, or PMM) was launched in July 2013 on the basis of Provisional Measure 621, later converted into Law 12871 in October 2013, based on evidence that indicated a scenario of profound shortage of doctors in the country, especially in primary healthcare[1-3]. These evidences indicated an insufficient number of doctors per unit of population, compared to other countries[4], unsatisfactory distribution in the Brazilian territory[5-7], difficulty of attracting and fixing professionals in regions of need[4,8] and a social perception that the shortage of doctors was the principal problem of the Single Health System (*Sistema Único de Saúde* – SUS)[9]. Added to this picture are the signals relating to the medical labor market which, over the years 2000 and the beginning of the 2010s, showed growing salaries, formalization of work positions, positive balances of employments in the formal economy, low rates of unemployment and high rates of demand and use of vacancies in training courses[10].

The concept of scarcity, which is more normally used in economics, is usually used to refer to situations in which the resources available are insufficient to meet the demands. When we talk of scarcity of a good or resource we mean that it does not exist in sufficient quantity to satisfy all the individuals at the levels that they need it. The intensity of the scarcity can vary in degree (strong/weak), and in nature, and may be considered artificial in the cases in which governments could, if they decided to do so, make the resource in question available for all the levels of demand. In the case of the demand for healthcare, specifically of doctors, scarcity refers to situations of neediness and privation that are incompatible with democratic states, since they describe inequalities in access to social resources that can have an impact on the course of people's lives[11].

The problem of scarcity of doctors has been worsening over the first decade of the twenty first century throughout the world. Approximately 50% of the world's population lives in rural and remote areas, which in turn are served by less than 25% of the medical workforce[12]. To the scarcity of doctors is added the difficulties of retaining them in more isolated, poor and vulnerable regions, and various studies attest the constant effort of countries in investigating the problem and proposing strategies for its solution[4,7,8,12,13]. Among the principal strategies, as well as monetary incentives, the following are quoted: Discounts on debts contracted by doctors during their graduation training; mandatory service in rural and non-assisted areas; recruitment of foreign doctors; and extension of residents' visas for foreign doctors[12-15]. The reality is that even with these various strategies adopted by various countries, the problem has never been completely eradicated, and behaves like a chronic illness which although there is no cure requires constant handling.

In Brazil, before implementation of the PMM, approximately 20% of Brazil's municipalities had scarcity of doctors, especially those that were smaller, more distant or more difficult to access, located in the North and Northeast regions of the country[7]. The PMM was instituted in July 2013, seeking to resolve this problem, and is considered one of the most wide-ranging public policies so far adopted by the Brazilian government to deal with the scarcity of doctors, which in fact affects a large part of the population, in particular the poorest and most vulnerable[15]. Thus, the program was structured based on three directions of action, aiming to expand the supply of doctors and improve conditions of healthcare in Brazilian municipalities: (i) investment in improving the infrastructure of the healthcare network; (ii) expansion of the offer of courses and vacancies in medicine, including broad educational reforms in medical graduation and residency; and (iii) implementation of the *Mais Médicos para o Brazil* Project (PMMB), which deals with emergency provision of doctors in areas that are priority for the SUS, and reduction of distributive inequalities[1,2].

This paper analyzes the impact of the third of these three – that is to say, the provision of doctors by the PMM, in reduction of scarcity of doctors in primary healthcare in Brazilian municipalities. We aim to demonstrate that there was a substantial increase in the supply of doctors between 2013 and 2015, above all in areas identified as having scarcity, which helped to reduce inequalities of distribution between the municipalities. However, the present situation is still one in which the distributive inequalities persist. We will show that the current presence of doctors is only a relief for situations of scarcity, since a large proportion of the municipalities still live with insecurity of care – in that some of them have simply substituted the regular supply that they used to provide with the supply given by the PMM, making them dependent upon the program.

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Methodology

For this article we use an indicator that identifies and measures the scarcity of doctors in primary healthcare in Brazilian municipalities. By the analysis of this indicator, at two points in time, we find to what extent the supply of doctors by the PMM, added to the regular supply realized by the municipalities, helped to reduce regional inequalities and relieve situations of scarcity. This indicator was created by the Market Signals Research Station (2010)[11], and is referred to as the Primary Healthcare Doctors Scarcity Index. It makes it possible to characterize the supply of doctors beyond the criterion usually used of number of doctors per unit of population. Thus, to this ratio are added indicators relating to socioeconomic deprivations, high health needs, and barriers of access to health services that are experienced by the populations studied, making it possible to characterize situations of permanent care insecurity and states of deprivation. Summing up, not only situations of notable insufficiency of medical professionals were identified, but also situations which, even with adequate parameters of supply, are vulnerable in socioeconomic terms, of high health needs and needs for access to health services.

The scarcity index is an indicator comprising four dimensions. The first refers to the supply of doctors, and is represented by the number of doctors per unit of population. For the numerator, we use the data of the National Health Establishments Register (CNES) of the Health Ministry for the months of March 2013 and September 2015, that is to say one period prior to the PMM and another period that is more recent. We identify as the supply of doctors in primary healthcare, in each period, not only the supply coming from the public services, but also from private services. For this reason we make an extraction, according to the specialty registered, selecting the doctors in the primary specialties of Family Health, Clinical Medicine and Pediatric Medicine. The counting of professionals was made based on units of time comprising a weekly workload: Each 40 outpatient hours in the selected specialties corresponded to the equivalent of one doctor in healthcare in the municipality. For counting of the number of inhabitants in the denominator, we used the population estimates of the Brazilian Geography and Statistics Institute (IBGE) of the corresponding years, 2013 and 2015.

The doctors of the PMM in September 2015 were counted independently of the registered specialty. To identify them, we carried out an exercise of compatibility between the CNES of that period and the registry files of the Health Professionals Provision Planning and Regulation Department (DEPREPS) of February 2016. The exercise of compatibility was made using the personal tax number (CPF) of the professionals and the code number of the municipality in which he operated through the program, both these pieces of information being available in the two registration databases. A total of 14,256 professionals of the program were identified in the CNES, distributed in 3,755 Brazilian municipalities.

The other three dimensions of the scarcity index were treated as follows: (i) Socioeconomic need: measured as the proportion of households in situation of poverty in the municipality, in accordance with the cut-off defined by the Family Grant Program (*Programa Bolsa Família* – PBF) as per capita income below R$ 140.00; (ii) High health needs: measured by the Infant Mortality Rate per thousand live births; and (iii) Barriers to access to health services: measured by the travel time from the municipality to the head office of the health region (CIR). The data for (i) and (ii) were collected from the IBGE census of 2010, and the data for (iii) by the geo-codification of the municipal headquarters.

Municipalities with scarcity of doctors in primary healthcare were considered to be those which: (i) had a ratio of population per doctor higher than that specified by the Family Health Strategy (ESF), of one doctor for each 3,000 people, and those with absence of doctors; (ii) those with one doctor per 1,500 up to 3,000 inhabitants, and TMI more than 100% above the state average; and (iii) with ratio of one doctor for 1,500–3,000 inhabitants and more than 50% of the households in poverty.

Among the municipalities identified with scarcity of doctors, the degree of scarcity was measured. For this, the four indicators selected were classified on a gradient of 0 to 5 in accordance with the intensity of the occurrence of each event. The simple sum arising from the values in each one of the indicators is the value of the scarcity index, a variable between 1 and 20. The closer to 1, the lower is the degree of scarcity, and the closer to 20, the greater. The values were aggregated into five categories representing intensity of scarcity (1 to 4: traces of scarcity; 5 to 8: low scarcity; 9 to 12: moderate scarcity; 13 to 16: high scarcity; 17 to 20: severe scarcity). The municipalities with absence of doctors were automatically classified as having severe scarcity.

As well as the calculation of the scarcity index in the two periods, March 2013 and September 2015, a scenario was constructed relating to the most recent period that considers only the regular supply of doctors in primary healthcare provided by the municipalities. This is a hypothetical scenario that subtracts (eliminates) the PMM doctors, making it possible to verify what would be the present situation if the supply of the program had not existed, even if the regular supply has been impacted by the supply of the program, as will be shown.

In relation to the statistical method, descriptive analyses were carried out, and a comparative analysis based on odds ratio. The measure represents the chance of an outcome taking place, in this case the existence of scarcity of doctors. The calculation is of the quotient between the probability of its existence and the probability of its non-existence[16]. The objective was to verify the chance of the municipalities of a given region or of a given size of population having scarcity of doctors, in relation to the municipalities of other regions or scales. The program used for statistical analysis was the *Statistical Package for the Social Sciences* (SPSS).

Results

Table 1 shows the number of doctors in primary healthcare in Brazil in March 2013 and September 2015, and the relative participation of the doctors of the PMM in the later period, by region and by scale of population of the municipality. In the total of the country, there was an absolute increase of 12,652 doctors from one period to the other (from 99,163 to 111,815). This increase was lower than the number of doctors of the PMM that were active in September 2015, of 14,256. The difference makes it possible to affirm that there was a deficit of 1,649 professionals in regular supply provided by the municipalities. The relative participation of the number of doctors of the program in relation to the total of primary healthcare was 12.7% in 2015.

The Northeast was the region that received the largest number of doctors of the program, 4,849, followed by the Southeast, with 4,372. In spite of this, the relative impact was higher in the Northeast, with a participation of 18.1% in relation to the total of doctors in primary healthcare, against 8.7% in the Southeast. The North, although it received a lower supply, of 1,715, was the region that had the largest participation of doctors of the program, 23.7%, with a highlight for the effect of the directing of supply to the areas of greater need. We note also that the North and Northeast presented a balance, between 2013 and 2015, lower than the number of doctors of the PMM received in the period. While the absolute increases of doctors in primary healthcare were 1,491 and 2,675, respectively, the supplies of doctors from the PMM were 1,715 and 4,849.

Table 1. Numbers of doctors in primary healthcare*, and relative participation of the doctors of the PMM, by Brazilian Region and by scale of population of municipality – Brazil, March 2013 and September 2015.

	March 2013 N	September 2015 N	Difference 2015-2013 N	PMM doctors N	Relative participation of the PMM doctors %
North	5,742	7,233	1,491	1,715	23.7
Northeast	24,085	26,760	2,675	4,849	18.1
Southeast	45,237	50,057	4,820	4,372	8.7
South	16,826	19,446	2,620	2,365	12.2
Center-West	7,273	8,319	1,046	955	11.5
State capitals and metropolitan regions	38,149	41,403	3,254	2,889	7.0
Population Over 100,000	20,002	23,355	3,353	2,275	9.7
Population 50,000-100,000	9,767	11,906	2,139	1,832	15.4
Population 20,000-50,000	13,614	15,487	1,873	3,078	19.9
Population 10,000-20,000	10,019	11,103	1,084	2,283	20.6
Population Up to 10,000	7,612	8,561	949	1,899	22.2
Brazil	**99,163**	**111,815**	**12,652**	14,256	12.7

* 'Number of doctors' in the specialties of Family Health, Clinical Medicine and Pediatric Medicine, measured as full-time work equivalent (each 40 outpatient hours in the specialties in question corresponds to 'one doctor').
Source: Authors, based on CNES/MS (2013, 2015) and DEPREPS/MS (2016).

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These figures indicate a loss in the regular supply of professionals provided by the municipalities, which did not take place in the other regions.

In relation to scale of population, the data show that the municipalities with between 20,000 and 50,000 inhabitants, and the state capitals and metropolitan regions, were those that most received doctors from the PMM in absolute terms, 3,078 and 2,889, respectively. On the other hand, the relative impact was greater in municipalities with up to 10,000 inhabitants, in which the 1,899 professionals received corresponded to 22.2% of the total. It is seen that the larger the scale, the lower was the impact of the program, which is explained by a larger supply of doctors from outside the ESF, especially clinical specialists and Pediatricians. The smaller-scale municipalities are those that organize themselves more around the supply of family health doctors, to the detriment of the other specialties, and were the most vulnerable in terms of healthcare. On this point, it was to be expected that there would be a greater impact at these strata, in view of the preference to the PMM for the ESF, and for the regions with greater need. The municipalities with population up to 50,000 showed a deficit in regular supply provided by the municipalities, which was not the case in those of larger scale (Table 1).

Table 2 permits a detailed analysis of the numbers of doctors comparing September 2015 and March 2013. It shows the number of doctors in primary healthcare that practice clinical medicine, pediatric medicine and family health and those that were on the PMM (in this case, of any specialty), added to or subtracted from the general stock. We note that the total balance of the country and of all the regions and scales were positive and that they were lower than the number of doctors of the PMM for the North and Northeast regions and in those municipalities with up to 50,000 inhabitants, as already shown above. However, when we look only at the balances in family health, all the values are negative, totaling a loss of 7,142 doctors, with highlights for the Northeast (loss of 3,098) and the Southeast (loss of 1,593) and the municipalities with population between 20,000 and 50,000 (loss of 1,872) and those between 10,000 and 20,000 (loss of 1,565),

These negative balances indicate the substitution of the regular supply of doctors provided by local prefectures, by the federal supply, in view of the fact that they refer directly to the Family Health Strategy (in contrast to the clinical specialists and pediatricians of the conventional primary healthcare and of the Supplementary Health Services). It is noted that all the strata had positive increases of clinical specialists, and almost all of them of pediatricians, which compensated the losses of Family Health doctors in the Southeast, South and Center-West regions and in the large-scale municipalities – precisely those with the least dependence on the Family Health Strategy.

Table 3 shows the number and proportion of municipalities with scarcity in March 2013, September 2015, and the hypothetical scenario (in which the number of PMM doctors is subtracted from the total of supply, in the later period), by geographical region and population scale of the

Table 2. Changes in numbers of doctors* between March 2013 and September 2015: in clinical medicine, pediatric medicine, family health and in the PMM – by geographical region and size of municipality.

	Clinical medicine	Pediatric	Family health	PMM	Total
North	718	42	-984	1,715	1,491
Northeast	934	-9	-3,098	4,849	2,675
Southeast	1,939	102	-1,593	4,372	4,820
South	1,064	75	-884	2,365	2,620
Center-West	641	33	-583	955	1,046
State capitals and metropolitan regions	1,422	-37	-1,020	2,889	3,254
Population Over 100,000	1,561	227	-711	2,275	3,353
Population 50,000-100,000	1,033	44	-770	1,832	2,139
Population 20,000-50,000	698	-31	-1,872	3,078	1,873
Population 10,000-20,000	347	19	-1,565	2,283	1,084
Population Up to 10,000	234	19	-1,203	1,899	949
Brazil	**5,296**	**243**	**-7,142**	**14,256**	**12,652**

* 'Number of doctors' measured as full-time work equivalent (each 40 outpatient hours = one doctor).
Source: Authors, based on CNES/MS (2013, 2015) and DEPREPS/MS (2016).

Table 3. Numbers and proportions of Brazilian municipalities with scarcity, and odds ratio (likelihood of scarcity), by geographical region and municipal population – March 2013; September 2015; and hypothetical situation for September 2015.

		March 2013			September 2015			Hypothetical scenario (excl. PMM supply, 2015)		
	Total	**N**	**%**	**OR***	**N**	**%**	**OR***	**N**	**%**	**OR***
North	448	215	48.0	3.87	139	31.0	3.16	297	66.3	3.87
Northeast	1,793	450	25.1	1.35	325	18.1	1.63	899	50.1	2.37
Southeast	1,668	253	15.2	0.56	160	9.6	0.56	386	23.1	0.42
South	1,188	181	15.2	0.59	89	7.5	0.43	288	24.2	0.49
Center-West	465	101	21.7	1.01	64	13.8	0.98	151	32.5	0.83
State capitals and metropolitan regions	206	38	18.4	0.82	22	10.7	0.73	60	29.1	0.71
Population Over 100,000	163	22	13.5	0.56	12	7.4	0.48	28	17.2	0.35
Population 50,000-100,000	281	83	29.5	1.56	34	12.1	0.84	100	35.6	0.97
Population 20,000-50,000	954	281	29.5	1.68	183	19.2	1.60	431	45.2	1.56
Population 10,000-20,000	1,372	292	21.3	0.98	184	13.4	0.94	527	38.4	1.13
Population Up to 10,000	2,586	484	18.7	0.73	342	13.2	0.89	875	33.8	0.82
Brasil	**5,562****	**1,200**	**21.6**		**777**	**14.0**		**2.021**	**35.4**	

* OR: odds ratio. ** 8 municipalities were excluded from the analysis, because they did not exist at the time of the 2010 census, or due to absence of some of the information that makes up the scarcity index.
Source: Authors, based on CNES/MS (2013, 2015), DEPREPS/MS (2016) and IBGE Census, 2010.

municipality. It also shows the odds ratio, used here only as a measure of comparison – indicating the chance of the municipalities of a given region or populational scale having scarcity of doctors, in relation to the other municipalities.

It is seen that in the period immediately prior to the launch of the PMM, in March 2013, there was a total of 1,200 municipalities with scarcity of doctors, that is to say, 21.6% of the total of municipalities of the country. In September 2015, after approximately two years of the program, this number reduced to 777, representing 14%. It is important to highlight that among these municipalities, 272 did not have PMM doctors – 220 because they did not join the program, and the other 52 because they received professionals after September 2015. Among the 505 that had scarcity and had doctors from the PMM allocated, 63.4% continued to have a ratio of doctors per inhabitant higher than 1 per 3,000, and the others, even with the adequate parameter, had socio-economic situations of neediness and high health needs.

In the hypothetical scenario, which considers, for September 2015, only the regular supply of doctors in primary healthcare provided by the municipalities – the picture of scarcity would become more intense, at 2,021 municipalities with scarcity, or 35.4% of the total. It is important to highlight that this scenario does not inform what would be the scarcity situation if the PMM had not been implemented, because it is not possible to suppose what would have had happened in the context without intervention of the program. Indeed, the table makes it possible to illustrate that the scarcity would be more accentuated than that observed in 2013 if the PMM ceased to exist, highlighting the present situation of dependency of the municipalities in relation to the federal supply.

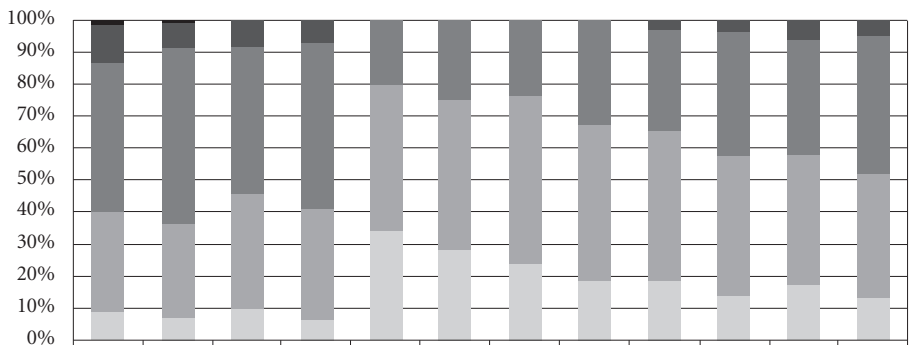
The reduction of scarcity from 2013 to 2015 took place in all the geographic regions, the highest reduction being in the North, reducing from 48% of municipalities with scarcity in March 2013, to 31% in September 2015. The Northeastern Region reduced from 25.1% to 18.1%. In spite of this impact, however, the regional inequalities were maintained, since these two regions still had the highest proportions, in comparison to the others. We observe that the North had 3.87 times more likelihood of having municipalities with scarcity in 2013 and, although this likelihood ratio had reduced in 2015, to 3.16, it was still high and higher than the other regions. The likelihood of municipalities in the Northeast having scarcity increased, in relation to the others, from 1.35 to 1.63. In terms of scale of population, we found that the municipalities with population between 50,000 and 100,000 had the greatest reduction of scarcity – from 29.5% para 12.1%, even though the likelihood ratio was only

slightly reduced, from 1.68 to 1.60. These were followed by the municipalities with population between 20,000 and 50,000, which reduced the proportion of scarcity from 29.5% to 19.2%, and the likelihood ratio from 1.56 to 0.84.

In the overall calculation, in the two periods, the municipalities of the North and Northeast regions and those of lower populational scale, with population of up to 50,000, were shown to be more vulnerable in comparison to the municipalities of the Southeast, South and Center-West regions and those of large scale, state capitals and metropolitan regions. These were the ones that most reduced this vulnerability as a result of the PMM, but the distributive inequalities were maintained, especially the insecurity of care that these localities have, even with the presence of the program. This is more evident when we look at the hypothetical scenario. In it, the North and Northeast would continue to have the highest percentages of municipalities with scarcity – respectively 66.3% (OR = 3.87) and 50.1% (OR = 2.37), and the scales of population with the highest percentages of municipality with scarcity remain those of the smaller scale.

Graphic 1 shows the distribution of the municipalities with scarcity of doctors in primary healthcare according to the degree of scarcity and region, in March 2013 and September 2015. In contrast to the previous analyzes that showed the impact of the PMM in reduction of scarcity, the objective of this chart is to analyze the impact on the intensity of the scarcity, especially the reduction of the more serious situations. In the first period, although the greater part of the municipalities of Brazil has low and moderate scarcity (almost 80% of those identified as having scarcity), what attracts attention is the number of municipalities with high scarcity, 63, and the fact that almost all of them are in the North and Northeastern regions. In the second period, approximately two years after the PMM was put in place, the number of municipalities with high scarcity fell by almost 50%, reducing to 34. In general, however, all the strata diminished the intensity of scarcity, although the most vulnerable regions continued to have higher degrees.

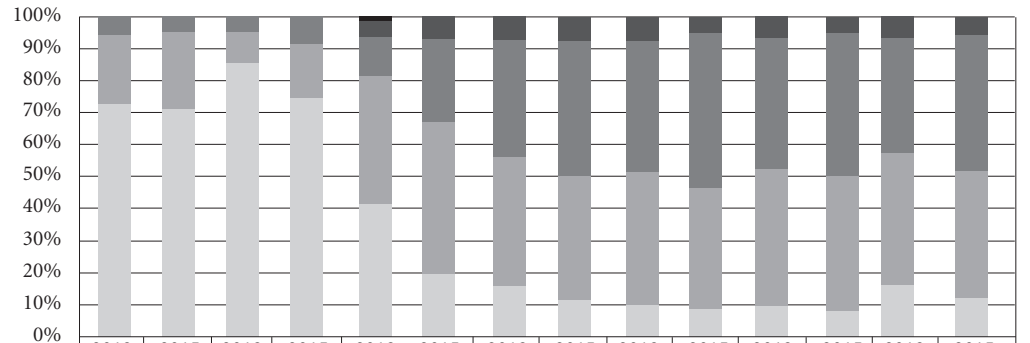
Graphic 2 shows the same comparison indicated in Graphic 1, but in relation to scale of population. We see a great concentration of the municipalities with high degrees of scarcity among those of lower scale, with population of up to 50,000. For these scales, the number of municipalities in this degree of scarcity reduced from 60 to 32, from 2013 to 2015. Also, the pattern of permanence of higher degrees of scarcity among



	2013	2015	2013	2015	2013	2015	2013	2015	2013	2015	2013	2015
	N		NE		S		SE		CO		Brasil	
Severe (N)	3	1	0	0	0	0	0	0	0	0	3	1
High (N)	25	10	36	22	0	0	0	0	2	2	63	34
Moderate (N)	102	77	208	168	51	40	43	29	33	25	437	339
Low (N)	66	41	163	114	115	74	95	43	47	28	486	300
Traces (N)	19	10	43	21	87	46	43	17	19	9	211	103

Graph 1. Numbers of municipalities with scarcity of doctors in primary healthcare, by degree of scarcity, geographical region and period – Brazil, March 2013 and September 2015.

Source: Authors, based on CNES/MS (2013, 2015), DEPREPS/MS (2016) and IBGE Census, 2010.



	2013	2015	2013	2015	2013	2015	2013	2015	2013	2015	2013	2015	2013	2015
	State cap.s, metropitan areas		Population Over 100,000		Population 50,000 –100,000		Population 20,000 –50,000		Population 10,000 –20,000		Up to 10,000		All Brazil	
Severe (N)	0	0	0	0	1	0	0	0	1	1	1	0	3	1
High (N)	0	0	0	0	3	2	19	11	18	7	23	14	63	34
Moderate (N)	2	1	1	1	11	9	100	80	120	90	203	158	437	339
Low (N)	8	5	2	2	33	16	113	69	120	68	210	140	486	300
Traces (N)	28	16	19	9	35	7	49	23	33	18	47	30	211	103

Graph 2. Number and distribution of the municipalities with scarcity of doctors in primary healthcare by degree of scarcity, populational scale and period – Brazil, March 2013 and September 2015.

Fonte: Elaboração própria a partir do CNES/MS (2013, 2015), DEPREPS/MS (2016) e Censo Demográfico IBGE (2010).

the more vulnerable municipalities (in this case, small and medium scale) was repeated here, although the general distribution has improved.

Discussion

The *Mais Médicos* Program has been making important steps toward making the right to health feasible for the Brazilian population. Partial results of the University of Brasília survey conducted in poor municipalities of the five regions of Brazil with users of the SUS, health managers and health professionals, revealed that among the users there is a high degree of satisfaction in the dimensions of 'waiting time for scheduling a consultation' and 'care given during the consultation'. The survey of managers and professionals indicated that the integration of the medical professional expanded the capacity for diagnosis of local problems, bringing agility and continuity of treatment for the user[17]. The report of the Operational Audit of the Federal Audit Board (TCU), in turn, indicated an increase in the supply of health services after the implementation of the program, highlighting a growth of 33% in the number of consultants carried out and 32% in the number of household visits[18].

The data analyzed here corroborate the positive evidences of the PMM, especially in relation to the scenario of scarcity of doctors in primary healthcare. The data suggests that there has been a significant increase in the coverage of doctors in municipalities in the North and Northeast regions, and in small municipalities, which represent the highest proportions of scarcity prior to the launch of the program and, thus, required immediate intervention through federal public policies of supply. However, it is in these regions and municipalities of these scales that the chances of the municipalities having scarcity continue to be higher and where there are significant substitutions of doctors from the regular supply provided by prefectures, using doctors provided by the program. The program also contributes to the reduction of intensity of scarcity: those municipalities that had the highest levels of scarcity and situations close to the limits of essential deprivation have reduced almost by half.

The impact of the PMM in the reduction of scarcity of doctors is even better evidenced when we introduce the hypothetical scenario that con-

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siders only the non-PMM supply, in which the number of municipalities with scarcity would more than double in the absence of the supply provided by the program. Clearly we should consider here that this scenario was constructed for the purpose of evaluating the impact of the PMM on the scenario of scarcity, showing a possible picture for 2015 in the absence of the professionals in the program. We do not intend here to state that the picture would be exactly like this if the program did not exist, principally due to the fact that, as some of the data has indicated, there may have substitutions of doctors who already worked in the municipalities by doctors of the PMM, and/or reduction of the supply of doctors provided by the municipalities themselves.

Limitations of the scarcity index, itself, should also be considered. First, because by setting the municipality as the geographical space in which the events that are components of the indicator are counted (ratio of doctors per inhabitant, TMI, proportion of households in poverty, distance to the regional health headquarters), we treat very different realities on an equal basis, omitting to consider, for example, territories that live with a situation of deprivation of doctors located in major urban centers, such as the poor regions of capitals and metropolitan regions. Second, because we do not incorporate into the scaling of the supply per inhabitant other human resources with clinical scope in primary healthcare, such as the nursing personnel (nurses and technicians), Community Health Agents, and other basic medical specialties, clinical and surgical, which if added to the supply already set out (clinical specialists, pediatricians and family health), in a weighted manner, could represent greater reliefs of scarcity. Third, because we calculate the TMI and the proportion of households in poverty based on the 2010 census, and, thus, the analysis does not capture possible changes that have taken place in these indicators between 2010 and 2015. We believe that this is a minor problem, but it is necessary to highlight that the observed reduction of scarcity or, at least its intensity, could have been greater if the socioeconomic shortfalls and the health needs had been reduced in the period.

It is clear that the PMM has widened the access to health service, and the guarantee of the right to health, for millions of Brazilians through the immediate supply, which has never previously been seen in history, of more than 14,000 doctors in Brazilian territory[19]. No regular supply of doctors would succeed in achieving such access in such a short period. We consider that the results obtained in this study indicate that the PMM had a positive impact in the reduction of scarcity of doctors in primary healthcare in Brazil, demonstrating a substantial increase in the supply of professionals between 2013 and 2015, especially in the more needed areas, and reduction of distributive inequalities. In spite of this relief of the scarcity, attributed to the program, there is still an unsatisfactory distribution of doctors in the territory. Further, a large part of the municipalities still live with healthcare insecurity, in that there has been reduction and substitution of the regular supply of doctors by the prefectures, from the federal supply. On this point, the PMM offered a relief of the scarcity, complying to a relative degree with its objective of emergency provision of doctors, but it could have made some municipalities dependent on the program, precisely those which historically had lived with situations of need and deprivation of health services.

Collaborations

SN Girardi and CL Carvalho worked on the conception of the project, significant critical revision of the content of the paper and final approval of the version to be published; ACS Stralen, JN Cella and LWD Maas worked on the collection, treatment, analysis and interpretation of the data, drafting of the paper, significant critical revision of the content and final approval of the version to be published. EO Faria worked in the collection and treatment of the data.

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