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Primary Health Care in Northern and Northeastern Brazil: mapping team distribution disparities

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Abstract *This study analyzes the spatial pattern of implementation of Primary Health Care (PHC) teams in Northern and Northeastern Brazil. This is an ecological study on the rates of Community Health Workers (ACS), Family Health Team (eSF), Oral Health Team (eSB), and Family Health Extended Center (NASF) based on data from the Ministry of Health (MoH). The analysis of the area data identified patterns of spatial dependence of the municipalities for the rates, using Moran indices and scatterplots to visualize critical areas' clusters (95% confidence). Municipalities of the North (n=450) and Northeast (n=1,794) had 132,174 ACS, 18,405 eSF, 13,017 eSB, and 2,205 NASF. The proportion of municipalities with rates within the recommended by the MoH were: ACS (>1.33), 96% in the North and 98.5% in the Northeast; eSF (>2.9/1,000), 54% and 80% in the respective regions; eSB (>2.9/10,000) 28% and 59% in these respective regions. NASF teams were deployed in 70% of the North and 89% of the Northeast. Except for ACS, the North was a critical team area, mainly in Pará, Rondônia, Amazonas, and Amapá. In the Northeast, these areas were smaller and concentrated mainly in western Bahia and eastern Maranhão. The Northeast showed a better composition of teams and a smaller extent of critical areas.*

Key words *Primary Health Care, Health workforce, Space analysis*

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Introduction

The development of public policies for universal health coverage, expressed in the millennium goals and the 2030 Agenda, has been encouraged by international organizations since 2005[1,2]. The concept of universality in health in Brazil refers to the assumptions of a universal public system, the Unified Health System (SUS). It is reaffirmed by the national PHC policy, which seeks to structure comprehensive services and universal access to comprehensive care with inter and multidisciplinary work[3].

Primary care is essential for being the preferred gateway and communication center of the health care network (RAS), with excellent resolving potential when introduced in a self-regulated and user-centered health system. The primary strategy for expanding and consolidating the PHC, the Family Health is the primary care coordinating and regulatory base for the RAS, restructuring the SUS care model, although there are several models and heterogeneous territories[4].

Population-based data showed an increase in the Family Health Strategy (ESF) coverage from 50.9% in 2008 to 53.4% in 2013 in Brazil[5]. This trend is similar to that observed in the Ministry of Health's administrative data, which identified a more significant increase for the North. In 2013, the most extensive coverage was in the Northeast (65%), states of Tocantins, Paraíba, and Piauí (>80%) and their capitals (>69%). Half of the capitals in these regions ranked below the national average (40%)[6]. Advancing ESF coverage in these regions means, in part, offsetting PHC setbacks[4].

Access to health is provided by heterogeneous locoregional Brazilian realities, with differences in the structuring of the RAS, marked by socioeconomic and developmental inequalities of SUS guidelines in different areas of the country, especially evident in the least favored territories, isolated from urban centers, such as rural and riverside communities in the Amazon region[7]. These are settings for the regular lack of services, which exacerbate the insufficient integration of PHC in the RAS[4-6].

Shortage and high turnover of human resources in primary care is a challenge for some Brazilian territories. Incentive programs, such as the *Mais Médicos* ("More Doctors") Program[8], were adopted in response to the most critical component – doctors –, which, along with the NASF, joined to strengthen PHC, increasing the scope and development of PHC[9,10].

In this context, it is imperative to think in spatial terms to understand better the local and regional adequacy of deployed PHC teams. The approach allows visualizing the distribution patterns in similar and critical areas[11]. Analyses of spatial data in public health can contribute to finding insufficient and unequal structuring of primary care and, thus, support the design of PHC extension actions towards health integrity. This work aims to analyze the spatial pattern of implementing PHC teams in the North and Northeast of Brazil in 2017.

Methods

This is an ecological study based on secondary data of the spatial pattern of the geographic distribution of PHC teams deployed in the cities of the North and Northeast. An exploratory description of the magnitude of the rates in the municipalities was carried out as a preliminary step.

The number of primary care teams in the municipalities was the monthly average for 2017, obtained from the *eGestor* data reported by the Family Health Department (DESF) of SAPS/MS[12]. The source of the population estimates was the DataSUS website (http://tabnet.datasus.gov.br/cgi/deftohtm.exe?popsvs/cnv/popbr.def). Data from administrative records of the DESF/MS were consistent and timely in analyses on the ESF[5,13].

Categories of PHC workers considered are ACS, eSF, eSB 1 and 2, and NASF teams 1, 2, and 3, per the definition and composition of the national primary care policy-PNAB that establishes guidelines for their organization within the SUS. ACS rates were calculated per one thousand inhabitants, eSF and eSB per 10 thousand inhabitants, and NASF per 100,000 inhabitants. The denominator was the population residing in the municipalities in 2017.

The magnitude of the rates of teams deployed in the municipalities was typified by their medians and interquartile ranges (first=Q1 and third=Q3) as they better represent the set of indicators for the variables under study, i.e., they are not sensitive to extreme values. The variables explaining the rates of deployed teams were the North and Northeast; capital and not capital; metropolitan and non-metropolitan area; and population size (up to 20 thousand, 20 to 50 thousand, 50 to 100 thousand, 100 to 200 thousand, and 200 thousand and over).

The adequacy parameters recommended by the PNAB for the types of teams investigated in this study were adopted. A maximum number of 750 people monitored by ACS, or an appropriate rate above 1.33 per thousand inhabitants. The population enrolled by eSF from 2,000 to 3,500 people, which corresponds to a rate of 2.9 to 5.0 per 10,000 inhabitants, considered adequate rates above 2.9/10 thousand. The same parameter was applied for eSB. As the policy does not define parameters for the NASF, it establishes that the criterion of inadequacy is defined by the lack this type of team in place in the municipality.

The spatial analysis was based on the area data analysis technique to identify spatial dependence patterns of the municipalities for the rates of ACS, eSF, eSB, and NASF implemented in 2017. The indicators were normalized and subsequently submitted to the (I) Moran Global and Local (Local Indicator of Spatial Association - LISA) Indices.

Moran's Global Index (I) provides a single spatial association value for the entire dataset. Values close to zero indicate the absence of spatial autocorrelation or spatial randomness. Values close to +1 refer to positive spatial autocorrelation and those close to -1, negative spatial autocorrelation[14].

Moran's Local Index (I) (LISA), using first-order neighborhood criteria (adjacent local neighbors), allows checking the spatial dependence and identifying the spatial patterns of each location[15]. Moran's scatterplot was generated to visualize the results.

According to the results (95% confidence level of significance), the municipalities were classified in values from 0 to 4: 0 (not significant); 1 corresponds to the values of Q1 (high-high) – high values of the indicator with the neighborhood with also high mean; 2 (Q2) (low-low) – low values of the indicator with neighbors with also low values. These areas are homogeneous and with a positive spatial association. While the areas of quadrants 3 (Q3) high-low and 4 (Q4) low-high, with high values of the indicator close to neighbors with low values and vice versa, are areas with a negative spatial or heterogeneous association[14,15]. We considered a critical area, which was classified in the Moran scatterplot as Q2 (low-low), i.e., places where the PHC structuring is insufficient.

The free software TerraView 4.2.2, developed by the National Institute for Space Research (INPE), was used for spatial data analysis. The study worked with secondary data records with non-nominal basis, under Decree No. 7,724, of May 16, 2012[16], and Resolution No. 510, of April 7, 2016[17].

Results

The municipalities of the North (n=450) and Northeast (n=1,794) had 132,174 ACS, 18,405 eSF, 13,017 eSB and 2,205 NASF teams. Municipalities without eSB and NASF were 4.4% and 30% in the North and 1.1% and 11% in the Northeast, mainly in municipalities with less than 100,000 inhabitants.

The median of ACS rates in the North was 2.5/thousand inhabitants, remaining within the recommended parameter (≥1.33/thousand inhabitants) in inland municipalities and with up to 200,000 inhabitants. This pattern was similarly reproduced in the Northeast, with slightly lower values (Table 1). The UFs reached medians above 1.33/thousand (Table 2). However, only four capitals reached this value (Table 3). Municipalities with inadequate rates were 4% (n=18) in the North and 1.5% (n=27) in the Northeast.

The median of eSF rates in the Northeast was 3.8/10 thousand inhabitants, with inland municipalities up to 50 thousand inhabitants within the parameter (≥2.9/10 thousand inhabitants). The North followed an equivalent profile but with lower values (Table 1). The medians of the UFs were above 2.9/10 thousand (Table 2), but only one capital had an adequate rate (Table 3). Rates below recommended in municipalities were 20% (n=359) in the Northeast and 46% (n=207) in the North.

The distribution pattern of eSB implanted in the Northeast is similar to that of eSF in the region but with lower values. The eSB median was within the recommended range (≥2.9/10 thousand inhabitants) for the total number of municipalities in the region (3.2/10 thousand inhabitants), inland municipalities, and up to 20 thousand inhabitants. In the North, the median eSB rate was below that recommended for all variables analyzed, mainly larger cities (Table 1). Among UFs, the median was above 2.9/10 thousand in eight units in the Northeast and three in the North (Table 2). The number of eSB was below the parameter in 41% (n=736) of the municipalities in the Northeast and 72% (n=324) in the North, including all capitals (Table 3).

The median rate of NASF teams was 5.6/100 thousand inhabitants (17,857 people per team) in the Northeast and 2.9/100 thousand inhab-

Table 1. Median rates of teams in primary care (Q1-Q3 quartiles), by geographic characteristics of municipalities in the North (n=450) and Northeast (n=1,794) of Brazil, 2017.

	ACS (per 1,000 inhabitants)		ESF (per 10,000 inhabitants)		ESB[a] (per 10,000 inhabitants)		NASF[b] (per 100,000 inhabitants)	
	North	Northeast	North	Northeast	North	Northeast	North	Northeast
Total	2.5 (2.2; 2.8)	2.3 (2.1; 2.5)	3.0 (2.0; 3.9)	3.8 (3.1; 4.4)	1.9 (1.0; 1.3)	3.2 (2.1; 4.1)	2.9 (0.0; 8.5)	5.6 (2.8; 10.7)
Capital								
Yes	0.8 (0.5; 1.5)	0.9 (0.5; 1.4)	1.5 (0.8; 1.7)	1.4 (0.9; 2.2)	0.5 (0.1; 1.1)	0.9 (0.4; 1.6)	0.5 (0.2; 1.0)	0.6 (0.3; 1.2)
No	2.6 (2.2; 2.9)	2.3 (2.1; 2.5)	3.0 (2.1; 3.9)	3.8 (3.1; 4.4)	1.9 (1.0; 3.1)	3.2 (2.1; 4.1)	3.0 (0.0; 8.6)	5.6 (2.9; 10.8)
Metropolitan								
Yes	2.5 (2.1; 2.7)	2.3 (2.0; 2.4)	3.3 (2.5; 3.9)	3.8 (3.0; 4.4)	2.5 (1.5; 3.7)	3.6 (2.4; 4.2)	5.7 (2.4; 13.2)	5.9 (3.2; 12.9)
No	2.6 (2.2; 2.9)	2.3 (2.1; 2.5)	2.9 (2.0; 3.9)	3.8 (3.1; 4.4)	1.8 (0.9; 2.9)	3.1 (2.1; 4.1)	2.4 (0.0; 7.1)	5.6 (2.7; 10.1)
Population size								
<20 thousand	2.7 (2.4; 3.0)	2.4 (2.2; 2.6)	3.6 (3.0; 4.2)	4.1 (3.6; 4.7)	2.7 (1.7; 3.7)	3.8 (2.8; 4.4)	6.5 (0.0; 16.3)	8.3 (5.5; 15.2)
20 a 50 thousand	2.4 (2.0; 2.7)	2.2 (2.0; 2.4)	2.2 (1.7; 2.8)	3.3 (2.8; 3.8)	1.4 (0.7; 2.0)	2.5 (1.6; 3.3)	2.3 (0.0; 3.9)	3.6 (2.6; 4.5)
50 a 100 thousand	2.2 (1.7; 2.5)	2.0 (1.8; 2.3)	1.7 (1.2; 2.4)	2.7 (2.2; 3.1)	0.9 (0.5; 1.4)	1.6 (1.2; 2.5)	1.3 (0.2; 2.0)	2.0 (1.5; 3.2)
100 a 200 thousand	1.7 (1.2; 1.9)	1.7 (1.4; 1.9)	2.0 (1.2; 2.1)	2.4 (1.9; 2.8)	0.8 (0.6; 1.3)	1.6 (0.8; 1.9)	1.2 (0.9; 1.8)	1.7 (0.9; 2.3)
200 thousand +	1.1 (0.7; 1.6)	1.3 (1.0; 1.7)	1.4 (0.8; 1.8)	1.7 (1.2; 2.4)	0.4 (0.1; 0.8)	1.0 (0.6; 1.5)	0.3 (0.1; 0.7)	1.2 (0.5; 2.2)

Notes: [a] Oral health teams 1 and 2; [b] NASF team 1, 2 and 3. Parameters recommended by the PNAB for all team types, adequate rates: ACS>1.33 por thousand inhabitants; eSF>2.9/10 thousand; eSB>2.9/10 thousand, and as the policy does not define parameters for NASF, we consider inadequacy as the lack of this type of team in the municipality.

Source: DESF/SAPS/Ministry of Health.

Table 2. Median rates of primary care teams (Quartiles Q1-Q3) in municipalities in the states of the North and Northeast of Brazil, 2017.

	ACS (per 1,000 inhabitants)		ESF (per 10,000 inhabitants)		ESB[a] (per 10,000 inhabitants)		NASF[b] (per 100,000 inhabitants)	
	Median	(Quartiles Q1-Q3)	Median	(Quartiles Q1-Q3)	Median	(Quartiles Q1-Q3)	Median	(Quartiles Q1-Q3)
Acre	2.5	(2.2; 2.7)	3.4	(3.0; 3.8)	2.6	(1.7; 3.0)	4.9	(2.4; 5.7)
Amapá	1.9	(1.5; 2.5)	3.5	(2.7; 4.0)	3.0	(2.2; 4.0)	5.7	(1.6; 11.5)
Amazonas	2.8	(2.4; 3.1)	3.2	(2.7; 3.9)	1.6	(1.3; 3.0)	3.3	(0.0; 6.0)
Pará	2.9	(2.6; 3.2)	3.6	(2.6; 4.3)	2.8	(1.7; 3.5)	4.4	(0.0; 6.5)
Rondônia	2.7	(2.3; 3.1)	3.2	(2.4; 4.2)	1.1	(0.6; 1.8)	0.0	(0.0; 0.0)
Roraima	2.3	(2.0; 2.6)	3.8	(3.3; 4.1)	3.3	(1.9; 4.0)	7.5	(2.7; 9.2)
Tocantins	2.7	(2.4; 3.0)	3.7	(3.3; 4.3)	3.3	(2.2; 4.0)	14.4	(7.9; 24.5)
Alagoas	2.4	(2.3; 2.6)	4.0	(3.6; 4.4)	3.7	(2.8; 4.2)	9.2	(6.7; 14.3)
Bahia	2.3	(2.1; 2.5)	3.7	(3.3; 4.2)	2.7	(2.0; 3.5)	6.2	(3.4; 8.3)
Ceará	2.3	(2.1; 2.4)	4.1	(3.6; 4.4)	3.3	(2.5; 4.0)	6.1	(5.1; 8.0)
Maranhão	2.8	(2.7; 3.1)	3.8	(3.5; 4.3)	3.0	(2.3; 3.7)	5.7	(1.2; 8.5)
Paraíba	2.3	(2.2; 2.5)	4.3	(3.9; 4.8)	4.1	(3.7; 4.6)	13.8	(7.0; 21.1)
Pernambuco	2.3	(2.0; 2.4)	3.9	(3.4; 4.4)	3.4	(2.5; 4.3)	6.7	(5.0; 8.6)
Piauí	2.5	(2.4; 2.6)	4.7	(4.4; 5.1)	4.6	(4.2; 5.1)	16.5	(10.4; 22.2)
Rio Grande do Norte	2.3	(2.1; 2.5)	4.4	(3.8; 4.9)	4.2	(3.7; 4.8)	12.3	(7.7; 21.7)
Sergipe	2.3	(2.0; 2.3)	3.6	(3.1; 4.3)	3.1	(2.2; 3.6)	0.0	(0.0; 9.3)

Notes: [a] Oral health teams 1 and 2; [b] NASF team 1, 2 and 3. Parameters recommended by the PNAB for all team types, adequate rates: ACS>1.33 por thousand inhabitants; eSF>2.9/10 thousand; eSB>2.9/10 thousand, and as the policy does not define parameters for NASF, we consider inadequacy as the lack of this type of team in the municipality.

Source: DESF/SAPS/Ministry of Health.

Table 3. Team rates in primary care in the capital and inland municipalities (median) in the North and Northeast of Brazil, 2017.

	ACS (per 1,000 inhabitants)		ESF (per 10,000 inhabitants)		ESB[a] (per 10,000 inhabitants)		NASF[b] (per 100,000 inhabitants)	
	Capital	Non capital	Capital	Non capital	Capital	Non capital	Capital	Non capital
Acre	1.5	2.4	1.6	3.4	0.7	2.6	0.5	4.4
Amapá	0.8	1.9	1.1	3.1	0.4	2.7	1.0	4.3
Amazonas	0.5	2.7	0.8	2.8	0.4	1.6	0.1	2.8
Pará	0.4	2.5	0.7	2.3	0.1	1.2	0.7	1.2
Rondônia	0.8	2.3	1.5	2.9	1.1	0.8	0.2	0.0
Roraima	0.9	2.3	1.7	3.7	0.0	3.3	0.3	6.6
Tocantins	1.7	2.6	2.7	3.8	2.0	3.1	2.3	13.5
Alagoas	0.5	2.3	0.8	3.7	0.4	3.2	0.6	6.3
Bahia	0.4	2.2	0.8	3.3	0.4	2.2	0.3	4.0
Ceará	0.8	2.2	1.4	3.6	0.9	2.7	0.2	4.3
Maranhão	0.7	2.8	1.0	3.6	0.4	2.6	1.2	4.0
Paraíba	1.8	2.3	2.4	4.2	2.2	4.0	4.1	11.9
Pernambuco	1.2	2.1	1.6	3.3	0.9	2.6	1.2	3.9
Piauí	1.6	2.5	3.0	4.7	2.7	4.5	0.4	15.2
Rio Grande do Norte	0.5	2.3	0.9	4.3	0.7	4.1	0.3	10.0
Sergipe	1.2	2.2	1.9	3.4	1.1	2.7	1.2	1.2

Notes: [a] Oral health teams 1 and 2; [b] NASF team 1, 2 and 3. Parameters recommended by the PNAB for all team types, adequate rates: ACS>1.33 por thousand inhabitants; eSF>2.9/10 thousand; eSB>2.9/10 thousand, and as the policy does not define parameters for NASF, we consider inadequacy as the lack of this type of team in the municipality.

Source: DESF/SAPS/Ministry of Health.

itants (34,883 people per team) in the North. In both regions, the rates were higher in inland municipalities, metropolitan areas, and cities with less than 20,000 inhabitants. The median of NASF teams ranged from zero to 14.4/100 in the states (Table 2), while rates ranged from 0.1 to 4.1/100 thousand in the capitals (Table 3).

Team distribution maps illustrate how most locations have adequate numbers of ACS in both regions. The Northeast also has a larger area with adequate rates of eSF, eSB, and NASF teams. The states of Piauí, Rio Grande do Norte, and Paraíba stood out as the most prominent areas with the recommended number of eSF and eSB. On the other hand, most of the other states had shortcomings, mainly in the implementation of eSB (Figure 1).

Spatial autocorrelation was observed for all teams When analyzing the spatial pattern of the distribution of deployment of PHC teams, using the (I) Global Moran Index with p=0.01 (I_{ACS}=0.286; I_{eSF}= 0.348; I_{eSB}=0.436; and $I_{N\text{-}ASF}$=0.32). By applying LISA and obtaining the Moran scatterplot (Figure 2), we visualized clusters of homogeneous, statistically significant areas whose locations have more pronounced spatial dependence, establishing priority areas. The North was a critical area in almost all its extension, mainly in Pará, Rondônia, Amazonas, and Amapá for all teams, except for ACS. While the critical areas reached a lower proportion in the Northeast, concentrating by teams in ACS (Coast of Ceará, South of Sergipe, and dispersed territories of Bahia and Pernambuco); eSF (Central region of Ceará and metropolitan region of Fortaleza, North and West of Bahia, and Central and West regions of Pernambuco, and metropolitan region of Recife); eSB (West of Maranhão, west coast of Ceará, metropolitan region of Recife and North of Bahia, mainly); NASF (North and West of Maranhão, Ceará, Pernambuco, south of Sergipe, and North and West of Bahia). Tocantins displayed a behavior more similar to the states of the Northeast.

Discussion

Only the ACS coverage reached the adequacy parameter defined in the PNAB for the regions

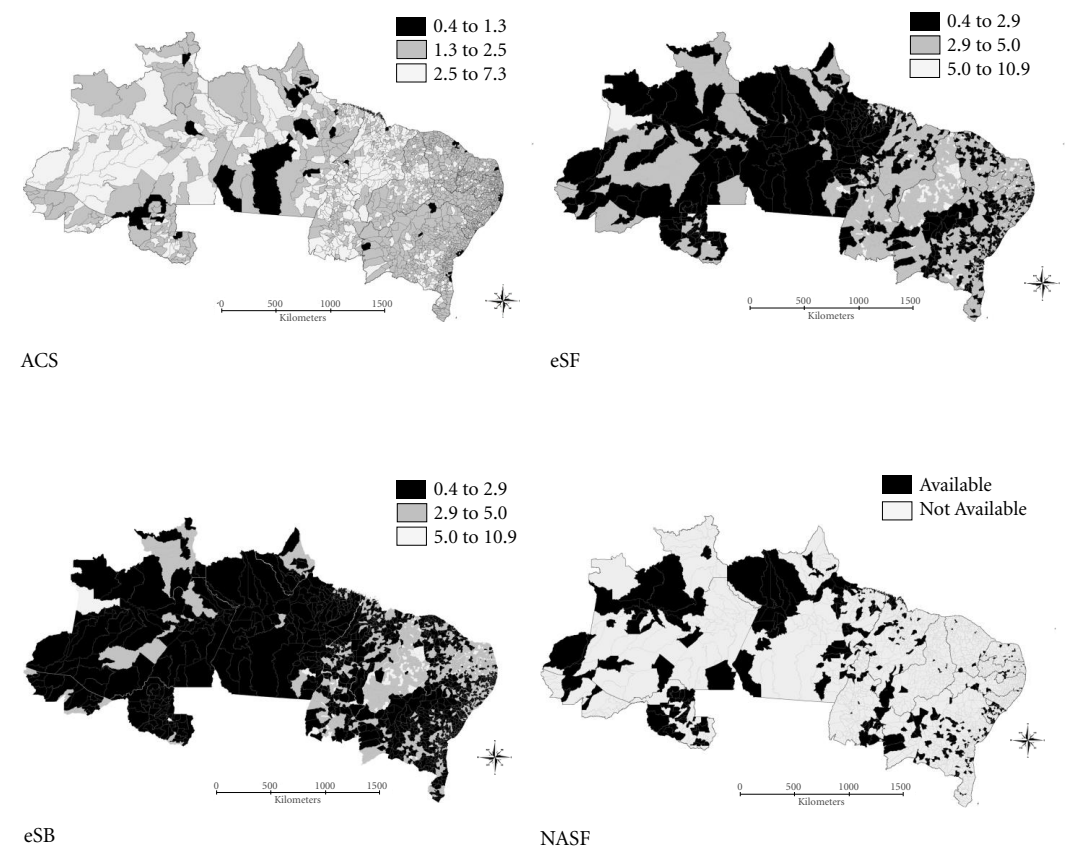

Figure 1. Team rates in primary care in North and Northeast cities, Brazil, 2017.

Notes: ACS rate (per thousand), eSF and eSB rates (per 10 thousand), and NASF rate (per 100 thousand). Parameters recommended by the PNAB for the types of teams, suitable rates: ACS>1.33 per thousand inhabitants; eSF>2.9/10 thousand; eSB>2.9/10 thousand, and as the policy does not define parameters for the NASF, the lack of this type of team in the municipality is considered an inadequacy.

Source: DESF/SAPS/Ministry of Health.

analyzed among the types of teams in the PHC. The Northeast of Brazil denoted even better composition and distribution of eSF, eSB, and NASF. The smaller the size of the municipality, the greater the adequacy of teams in the PHC and inland cities. The frequency of municipalities without NASF was not negligible, while the North had a more significant number of places with insufficient PHC structuring (critical areas). In the Northeast, the state of Bahia stood out for the persistent critical areas. Conversely, Piauí, Rio Grande do Norte, and Paraíba stood out with their adequate coverage.

The previous analyses[5-7] found settings compatible with the results found in this study. Better ESF structuring was identified in the Northeast and rural areas, with an increasing coverage inversely proportional to the size of the municipality, and higher coverage in Tocantins, Paraíba, Piauí, and its capitals. Some level of correspondence between this PHC coverage profile and the quality of primary care for the regions under analysis is observed. Municipalities with adequate team parameters meant better care coordination[3] and increased access for the population[18].

The unfavorable structuring of the PHC in the North may be very critical due to the deployment of teams outside their coverage areas. This arrangement, teams to serve rural communities located in urban spaces, and the accumulation of service provision in the municipal seats hinder the entry to the health unit[7,19]. The service away from the households still hampers the professional-user bond in this type of territory, which

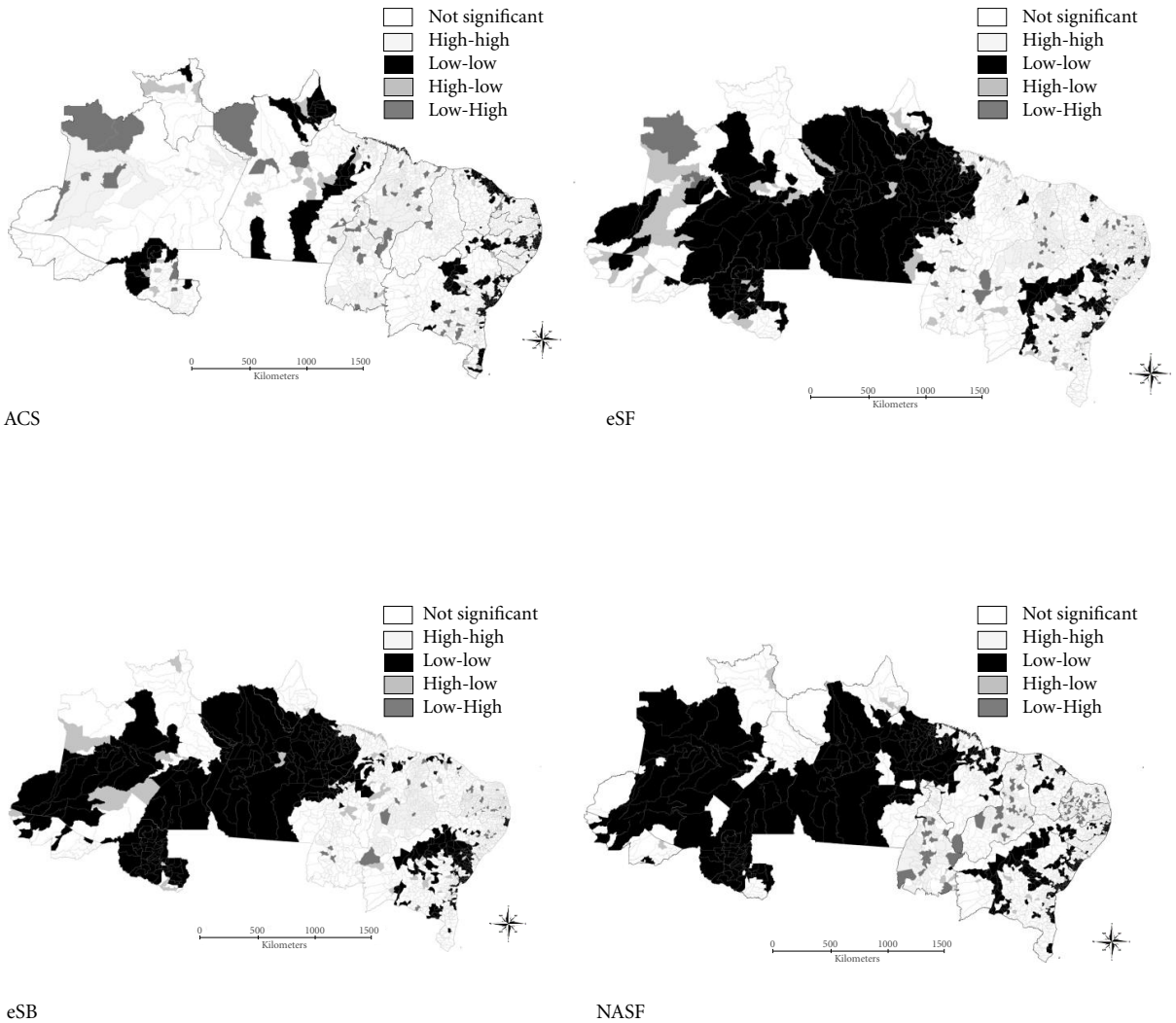

Figure 2. Moran scatterplot of teams' rates in primary care in Northern and Northeastern municipalities, Brazil, 2017.

Notes: ACS rate (per thousand), eSF and eSB rates (per 10 thousand), and NASF rate (per 100 thousand). Parameters recommended by the PNAB for the types of teams, suitable rates: ACS>1.33 per thousand inhabitants; eSF>2.9/10 thousand; eSB>2.9/10 thousand, and as the policy does not define parameters for the NASF, the lack of this type of team in the municipality is considered an inadequacy.

Source: DESF/SAPS/Ministry of Health.

is commonly extensive and with a high population density. This spatial reality is exceptionally pronounced in the Amazon region. Thus, isolated results of medium coverage should be considered, as they may not necessarily translate into greater geographic or organizational accessibility for everyone.

ESF increased coverage often translates into an impact on the health of the population[20], but without representing changes in the care model[21]. The high level of PHC adequacy is accompanied by significant differences between states, incipient care provision on weekends, and weak reception of user demands[19].

The lower rate of ESF teams in capitals, a finding corroborated by a previous study[5], may mean an extended PHC coverage in urban centers, and the introduction of family health units to the preexisting structure of traditional units is not uncommon. When integrated into an organi-

zational and systemic structure, the composition of varying PHC access models has been perceived as a unique experience of comprehensive and robust systems. An adaptive variety of care strategies for the SUS united by general principles is relevant[4] given the heterogeneous health realities in different parts of the country.

Despite the obstacles, good PHC practices are confirmed, in particular prevention and health promotion activities aimed at specific groups, such as rural children in the North and Northeast.[22] Continuity of care in the ESF was a powerful equitable policy[23-25] when prioritizing the most vulnerable. On the other hand, the low availability of this strategy was related to failures in the prevention of diseases relevant to public health[26].

The PHC workforce in Brazil has been an example for innovating in teams that involve mid-level professionals and ACS with users and their families to provide health services, a people-centered scale quality condition[27]. However, the low regulation of human resources in health is a decisive condition for the expansion and development of PHC in Brazil. Although without solving this trajectory of regulatory deficit, the Mais Médicos Program expanded coverage and equity in PHC with the allocation of doctors in places with a more critical situation for the presence of this professional[10,28,29].

Experience has shown that universal health models based on PHC principles have achieved better results[30,31]. For a broader reach, the renewed commitment to PHC in the Astana Declaration[32] demands country leadership for user-centered technology innovation and models coordinated by multidisciplinary teams, powerful to overcome episodic and poorly equipped care networks[27,33,34]. While still a distant reality, the adoption of these technologies is seen as a possibility to scale the provision of quality primary care even in areas with a shortage of professionals and other access barriers[27], innovations allowing the world to address the determinants and the growing burden of accidents and diseases[35].

The universalization of PHC will not be possible without the integration and unity of the most varied care models found in practice and the adjustment of inadequacies in applying the PNAB principles and guidelines[4,30,31]. However, the changes introduced in this policy point in another direction, by promoting the relativization of universal coverage, the segmentation of access, and the recomposition of teams. In a country with such different realities and a decentralization process lacking betterments, it is a risk for the State to renounce its attribution of inducing national bases and unity for PHC[36].

In recent years, SUS has been subject to tensions resulting from fiscal austerity policies. The deteriorated health indicators signaled the effects of lower investments in health[37,38]. The recent COVID-19 epidemic escalated the pressure on health and revealed the obstructive capacity of political agents of the State when forming narratives of conflict with the good public health practices. Brazil's experience with other health emergencies, materialized in the response of the care and surveillance networks of the SUS, has prevented worse harm from uncertainties along the way[39,40].

The main limitation of this study is related to the nature of administrative data on teams deployed in the city. This information varies throughout the year due to the monthly update of the number of registered teams. To deal with this limitation, we calculated the monthly average for the studied year, as stated in the methods. Furthermore, some degree of data incompleteness and underreporting can affect the quality of secondary data. Finally, the spatial analysis unit can conceal differentials arising from aggregated data (ecological bias).

This study indicated a pattern in the composition and extent of PHC in the North and Northeast of the country. The level of adequacy and distribution of the different types of teams affects the different territories unevenly. The data suggest different structures and realities of primary health care, with an evident condition of inferiority for the North. Identifying critical coverage areas provides evidence to establish priority areas and plan specific primary health adequacy policies. From the perspective of universal health, it can guide the expansion of articulated PHC structures and strategies adjusted to the multiple Brazilian realities and inserted in a structured health care network to affect people's health.

Collaborations

AM Soares Filho and CH Vasconcelos contributed to the study conception and design and data acquisition, analysis, and interpretation. All authors contributed to the drafting of the preliminary versions, approved the final version of the paper, and declared themselves responsible for all aspects of the work, in order to ensure that issues related to the accuracy or integrity of any part of the work are properly investigated and resolved.

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