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Configuration of Health Care Networks in the SUS: analysis based on primary and hospital care components

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Abstract *This study seeks to point out the different configurations of Health Care Networks in primary care (AB) and Hospital Care (AH), dimensioned based on coverage, quality, and resolvability characteristics in health macro-regions. Cross-sectional study used the cluster analysis and segmented 103 macro-regions into different profiles of coverage, quality and resolubility: group 1 (high coverage/AB and medium/AH; low quality AB-AH with high resolubility); group 2 (high coverage/AB and low/AH; low quality AB-AH with medium resolubility) and group 3 (high coverage/AB and medium/AH; high quality AB-AH with high resolubility). Coverage in AB was classified as high for 100% of the Brazilian population and in AH low to 9.70% and medium to 90.29%. Quality/AB-AH is low for 58.54% and high for 41.15%. Resolubility is high for 90.29% and medium for 9.70%. In Brazil, there is expansion of coverage with low quality/AB; shortage of hospital beds and low quality/HA with high resolution. However, in the Southeast and South, high AB-AH quality prevails. The structuring of health networks is still characterized by low resolution, demanding incentives for the governance of inter-federal arrangements.*

Key words *Primary health care, Tertiary health care, Health services coverage, Quality, access, and evaluation of health care, Regionalization of health*

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Introduction

In Brazil, the universality of the right to health, which since the 1988 Constitution has emerged as a Unified Health System (SUS), constituted of public actions and services that, integrated into a regionalized and hierarchical network, require the combination of different services and professionals. Notwithstanding, epidemiological, and demographic aspects of the population, coinciding with an agenda of State reform, strengthening of neoliberal policies, scientific and technological innovation, and social and regional inequalities, impose challenges for the organization of comprehensive, well-advised, and participatory health care[1-5].

It is known that Primary Health Care (PHC), conceived as a care coordinator and organizer of the Health Care Network (RAS), is one of the requirements of regional dynamics[6]. In Hospital Care (AH), hospitals must act in conjunction with PHC and be oriented towards the design of the loco-regional RAS[1,7,8]. However, the need to develop continuing education programs in PHC with institutionalization of monitoring and evaluation practices in local teams draws attention[9]. In AH, the need to improve contractual instruments stands out, qualifying the role of the hospital in providing services and improving its relationship with the municipality and other levels of care[7].

In the field of planning and management, regionalization has long been established as an alternative for the design of public policies and, in health, the organization of services in health regions as a strategy to make the system more equitable and efficient has been substantiated[2,3,5,7,10]. Such a strategy encompasses the intergovernmental relationship 3 and highlights the importance of articulating regional policies, basic and specialized care, regulation, and coordination for the integration of actions[11].

In the monitoring and evaluation policy for SUS qualification, two important instruments for planning and structuring health care networks in SUS have been implemented in recent years: the Program for Improving Access and Quality of Primary Care (PMAB-AB)[12] and the National Program for Health Services Evaluation (PNASS)[13], an instrument for evaluating hospital care.

On the other hand, the insufficient resources allocated to SUS; the specificities of Brazilian federalism and the involvement of different agents in the provision of services[2,5,14] form disjointed municipal systems with low intergovernmental relations[15], highlighting in SUS the dynamics between cooperation and competition as one of the main flaws[16]. As a result, PHC and specialized care are characterized by high fragmentation, fragile integration, and communication between services; by deficiency in access regulation processes and lack of effective devices for coordinating user flows and specialist schedules[17].

In studies carried out, Viana and Iozzi[3] draw attention to the fact that both region and networks did not have their strengthening matured during the regionalization process. Bousquat *et al.*[15], in turn, draw attention to the difficulty of consolidating RAS without a robust PHC, capable of coordinating care. At the same time, the PHC cannot perform its role without a solid regional arrangement and coordination between federated entities.

It is clear that federative coordination[18], involves aspects related to planning and management; regulation; institutionality; financing; the provision of services and the construction of network and care flows[1,5], demanding integration between providers of the municipal basic and regional specialized networks[3], as well as dialogue on the role of the hospital and its articulation with PHC and other services in the territory[8,13].

In this framework, the present study aims to point out the different configurations of Health Care Networks in Primary Care (AB) and Hospital Care (AH), based on characteristics of coverage, quality, and resolvability in health macro-regions[18]. Therewith, we seek to identify the prevalent designs of regional organization for the provision of services in SUS.

Method

This is a cross-sectional study[20] that used as a database the certification score of teams from the 2nd cycle PMAQ-AB[12] and the performance score of hospitals evaluated in PNASS[13], presented in Chaves *et al.*[21]; the EqAB population coverage of the e-Gestor Primary Care System; the total number of hospital beds (inpatient and complementary) for the municipalities included in DATASUS, according to the methodology applied by Lima (p. 63)[22] and the Hospital Admission Authorization (AIH) from the Hospital Information System (SIH-RD/SUS) in the year 2016 of DATASUS, according to the methodology applied by Morais (Chart 1)[23]. The choice of the analyzed periods refers to data collection from PMAQ-AB[13], and application of the questionnaire in PNASS[13].

Chart 1. Object, characteristic, variable, calculation method and indicator used in grouping/cluster analysis.

Object	Characteristics	Variable	Calculation method	Indicator
Primary care	EqAB Certification Note in the 2nd cycle of PMAQ-AB.	Quality Component/AB.	Average EqAB certification score by health macro-region.	Average quality/ AB component by health macro-region.
	Population coverage of Primary Care Teams (Family Health Teams and Primary Care Teams).	Population coverage estimated by EqAB.	Sum of population coverage/ AB in the health macro-region/total population in the health macro-region x 100.	Population coverage estimated by EqAB by health macro-region.
Hospital care	Performance score of Hospitals evaluated in PNASS (2015-2016).	Hospital risk and quality component.	Average performance score of hospitals evaluated in the PNASS by municipality. From the average per municipality, the average for the health macro-region was calculated.	Average risk and quality component of PNASS hospitals by health macro-region
	Beds available for SUS hospitalization (except ambulatory care beds) and additional beds in October/2015.	Beds per thousand SUS inhabitants.	Total number of SUS Hospital beds in the macro-region / total population in the health macro-region x 1000.	Beds per thousand inhabitants/SUS by health macro-region.
	Hospital admission resolubility rate (year 2016)	Resolubility rate for medium complexity hospital admissions.	Number of hospitalizations of medium complexity (MCH1 and MCH2) carried out by residents of the health micro-region, in the micro-region of residence / Total of hospitalizations of medium complexity (MCH1 and MCH2) carried out by residents of the health micro-region x 100.	Average resolubility rate for medium-complexity hospital admissions by health macro-region

Source: Authors.

AB and AH are understood as strategic spaces for the organization of the health system and central challenges for the constitution of a Region and RAS in SUS[1]. A country with strong orientation towards PHC and expansion of coverage by the Family Health Strategy (ESF) has better and more equitable health results[24]. Furthermore, AH, composed of a combination of specialized and complex work processes and an environment in which various institutional arrangements proliferate, constitutes an urgent strategic challenge for SUS[1]when it comes to diagnose problems and reorient planning[13]. According to Facchini 9, quality is the essential measure to evaluate the completeness and responsiveness of SUS to the country's health needs. The provision of services must be able to guarantee accessibility for users within the scope of the sanitary territory, promoting the integration of actions in RAS[23].

The level of analysis was the health macro-region, an expanded region that guarantees the resolution of RAS[19]. The period used to identify the health regions was 2018. Changes in the coverage of the regions in different periods stand out, influencing their quantity. The present analysis covered 103 macro-regions of the 104 established in the Regionalization Master Plan (PDR) in the states, encompassing 5,552 municipalities. The population estimate used data available in e-SUS Primary Care (July/2015).

The technique used was cluster analysis, which allows classifying elements into groups and identifying a "natural" structure of observations based on a multivariate profile[25,26].

Previously, the variables were standardized using the mean values and standard deviation (Z-Score). Once the proximity measurement (similarity) was chosen and the Euclidean dis-

tance similarity was adopted, the partition procedure chosen was the hierarchical method[25]. In the hierarchical partition procedure, it is necessary to define the clustering algorithm to determine how similarity is defined between multi-member clusters in the process. The complete linkage method was used to define the similarity between two clusters. The process of creating clusters generated a tree diagram (dendrogram)[25,26]. Finally, the NbClust function was used (available at NbClust library: https://CRAN.R-project.org/package=NbClust) to evaluate the optimal number of groups.

The average scores for the variables were measured and the authors defined a scale for classifying the groups based on the percentile, as follows: low (below P_{50}); medium (between P_{50} and P_{70}) and high (above P_{70}). For variables that did not present a normal distribution, the scale was considered low (below 50.0); medium (between 50.0 and 70.0) and high (above 70.0). Thus, the groupings were classified for the variables as follows:

AB quality: low (below 52.59), medium (52.60 to 55.51), high (above 55.52).

Coverage/Family Health Team: low (below 50.0), medium (between 50.0 and 70.0) and high (above 70,0).

Quality in AH (Risk component and quality of hospitals /PNASS): low (below 64.64), medium (64.65 to 71.52), high (above 71.53).

Coverage/hospital bed: low (below 1.65), medium (1.66 to 1.89), high (above 1.9).

Resolvability rate: low (below 50.0), medium (between 50.0 and 70.0) and high (above 70.0).

Subsequently, the description of the groupings compared the average score obtained in each variable with the constructed classification scale. Thereby, in the interpretation stage, it was possible to examine the characteristics of the clusters and identify substantial differences between them.

Finally, the Shapiro-Wilk test was applied to assess whether the distribution resembles the normal distribution and the Kruskal-Wallis test was applied to compare variables by region, grouped into profiles related to coverage, quality and resolvability. All statistical analyses were performed using R software (R Core Team, 2018).

To use PMAQ-AB data, the project obtained approval from the Research Ethics Committee of the Federal University of Minas Gerais (UFMG) under number 1,275,911. For other data, a public domain secondary database was used, without nominal identification, in accordance with Federal Government Decree No. 7,724, May 16, 2012[27], and Resolution No. 510, April 7, 2016[28].

Results

The descriptive statistic for Brazil (Table 1) presents 2-variable equations (population coverage estimated by EqAB) and the 3-variable one (Risk component and quality of hospitals/PNASS) with the greatest variability in the set of elements. The distribution is normal for 1 (AB quality component), 3 (Risk component and quality of hospitals/PNASS) and four variables (beds per thousand inhabitants – SUS).

Table 2 shows the average per state for the AB and AH variables, and in the comparison between regions there is evidence that at least one indicator belonging to a region differs from the others: 1) *"AB quality component"* – the South with the highest and the North with the lowest average indicator, showing differences between the regions: Southeast and Northeast, Southeast and North, South and Central-West, South and Northeast, in addition to South and North; 2) *"Population*

Table 1. Descriptive statistics for the original values of the variables in the study.

Variable	Average	Standard deviation	Minimum value	Maximum value
Primary care				
1. AB quality component	52.36	5.85	37.38	66.30
2. Population coverage estimated by EqAB	79.99	14.46	43.81	100.00
Hospital care				
3. Hospital risk and quality component/PNASS	63.38	14.47	26.78	94.89
4. Beds per thousand inhabitants - SUS	1.7	0.44	0.61	2.91
5. Resolubility Rate	77.61	11.46	45.02	98.05

Source: Authors.

Tabela 2. Comparação entre as regiões e os estados para as variáveis de atenção básica e atenção hospital hospitalar no Brasil.

Region/estate	Variables				
	Primary care		Hospital care		
	AB quality component	Population coverage estimated by EqAB	Hospital risk and quality component/ PNASS	Bed coverage per thousand inhabitants - SUS	Resolubility Rate
North					
Acre	39,20	91,78	57,12	1,71	88,95
Amapá	40,78	90	26,78	1,38	64,91
Amazonas	39,37	67,52	42,29	1,39	85,17
Pará	46,98	61,94	51,98	1,43	83,13
Rondônia	41,43	76,67	67	2,01	71,09
Roraima	47,14	78,19	65,32	1,75	75,9
Tocantins	49,83	94,31	47,73	1,57	66,75
Average/region	43,53	80,05	51,2	1,6	76,55
North east					
Alagoas	48,38	83,91	58,38	1,53	56,70
Bahia	51,58	80,48	62,34	1,57	80,23
Ceará	57,39	91,61	62,65	1,74	66,33
Pernambuco	50,93	83,98	56,13	1,81	64,34
Maranhão	44,10	91,89	39,86	1,78	73,54
Paraíba	48,97	97,90	46,39	1,94	52,39
Piauí	50,02	99,29*	43,07	1,95	73,47
Rio Grande do Norte	56,45	87,91	49,73	1,86	54,28
Sergipe	49,93	89,89	72,64	1,24	45,02
Average/region	50,27	88,74	54,68	1,72	70,32
Central-west					
Goiás	50,74	72,14	54,36	1,72	66,06
Mato Grosso	49,85	72,02	45,41	1,72	83,03
Mato Grosso do Sul	49,12	73,06	76	1,54	95,25
Distrito Federal	48,72	61,94	60,91	1,55	97,27*
Average/region	50,17	70,97	56,8	1,67	75,73
Southeast					
Espírito Santo	44,68	73,39	54,83	1,58	85,28
Minas Gerais	54,58	86,79	66,84	1,58	80,29
São Paulo	55,56	60,42	77,93*	1,44	82,06
Rio de Janeiro	44,97	60,33	61,56	1,61	91,67
Average/region	54,5	71,53	72,2	1,50	81,74
South					
Paraná	54,03	80,40	76,61	1,92	80,08
Rio Grande do Sul	52,39	74,43	66,49	2,18*	85,65
Santa Catarina	61,11*	87,21	73,96	1,87	87,19
Average/region	56,64	81,37	71,9	1,98	85,22
Brazil average	52,36	79,99	63,38	1,7	77,61

Colors for the Average Score of the variables according to the classification scale: low (red) – average (blue) – high (green).
* Highest average for the variable.

Source: Authors.

coverage estimated by EqAB" – Northeast presented the highest and Central-West the lowest average indicator, with a difference between the Northeast and Central-West, in addition to the Southeast and Northeast; 3) "*Risk component and quality of hospitals evaluated in PNASS*" – South-

east the highest and the North the lowest average indicator, with differences between North and Northeast, Southeast and Northeast, Southeast and North, South and Northeast, in addition to South and North; 4) *"SUS Beds per thousand inhabitants"* - South and Southeast presented the highest and lowest average indicators, respectively, presenting difference between South and Southeast and 5) *"Resolvability rate"* – South with the highest average indicator and Northeast with the lowest, indicating differences between Southeast and Northeast and, ultimately, South and Northeast (Kruskal-Wallis test, $p < 0.05$).

Characteristics and spatial distribution of the clusters are presented in Table 3 and Figure 1. Group 1 (High Coverage/AB and Medium/AH; Low quality/AB-AH with High resolvability) – compiles 47 health macro-regions. It has higher population percentage (49.13%) and municipalities (48.23%), in addition to affecting all geographic regions. It has the highest average score for coverage and lowest for quality/AB-AH. Altogether, it indicates an intermediate scenario for coverage, quality, and resolvability.

Group 2 (High Coverage/AB and Low/AH; Low quality/AB-AH with Medium resolvability) – consists of a smaller number of macro-regions (8), distributed in the Central-West and Northeast, illustrating lower population percentage (9.7%) and municipalities (7.31%). It presents the lowest average score for coverage/AB-AH and resolvability. When comparing groups, it indicates the worst-case scenario.

Group 3 (High Coverage/AB and Medium/AH; High quality/AB-AH with High resolution) – covering 48 macro-regions located in the Northeast, Center-West, Southeast and South, represents 44.45% of the Brazilian population and has 2468 municipalities. It presents the highest average score for quality/AB-AH and resolvability. It also indicates the best scenario for coverage, quality, and resolvability.

Overall, groups 1 and 2, showing the worst results for quality/AB-AH, represent 58.54% of the Brazilian population and group 3, with the best results, 41.15%. Coverage was classified as high for 100% of the population (groups 1, 2 and 3) in AB and, in AH, it is average for 90.29% of the population (groups 1 and 3) and low for 9.7% (group 2). Resolvability is high for 90.29% of the population (groups 1 and 3) and average for 9.7% (group 2).

By region, the distribution of the clusters shows that the macro-regions of **North** were classified in group 1. **Northeast**, with macro-regions in the three groups, concentrates (66.66%) in group 1; (16.66%) in group 2 and (16.66%) in group 3. A scenario of high resolvability and low AB-AH quality stands out for 83.33% of the macro-regions. **Central-West** classifies (62.5%) of macro-regions in group 1. **Southeast**, displaying macro-regions in groups 1 (18.75%) and 3 (81.25%), divergent for AB-AH quality, with Minas Gerais corresponding of 84.61% of the macro-regions in group 3 (best scenario) and São Paulo 88.23%. **South** classifies 75% of the mac-

Table 3. Average scores of the variables for each group and their classification (high, medium and low) followed by the characteristics for each group.

Variable	Group 1	Group 2	Group 3
Primary care			
AB Quality Component	48.09 (low)	51.98 (low)	56.60 (high)
Population coverage estimated by EqAB	81.83 (high)	78.14 (high)	78.50 (high)
Hospital care			
Risk and quality component of evaluated hospitals/PNASS	54.14 (low)	59.05 (low)	73.16 (high)
Beds per thousand inhabitants - SUS	1.76 (average)	1.54 (low)	1.66 (average)
Resolubility rate	77.07 (high)	53.04 (average)	82.24 (high)
Characteristics			
Number of macro-regions	47	8	48
% of total macro-regions	45.63	7.76	46.60
Number of municipalities	2678	406	2468
% of total municipalities	48.23	7.31	44.45
Population (2014 projection)	99,583,898	19,662,830	83,408,168
% of the total population	49.13	9.70	41.15

Source: Authors.

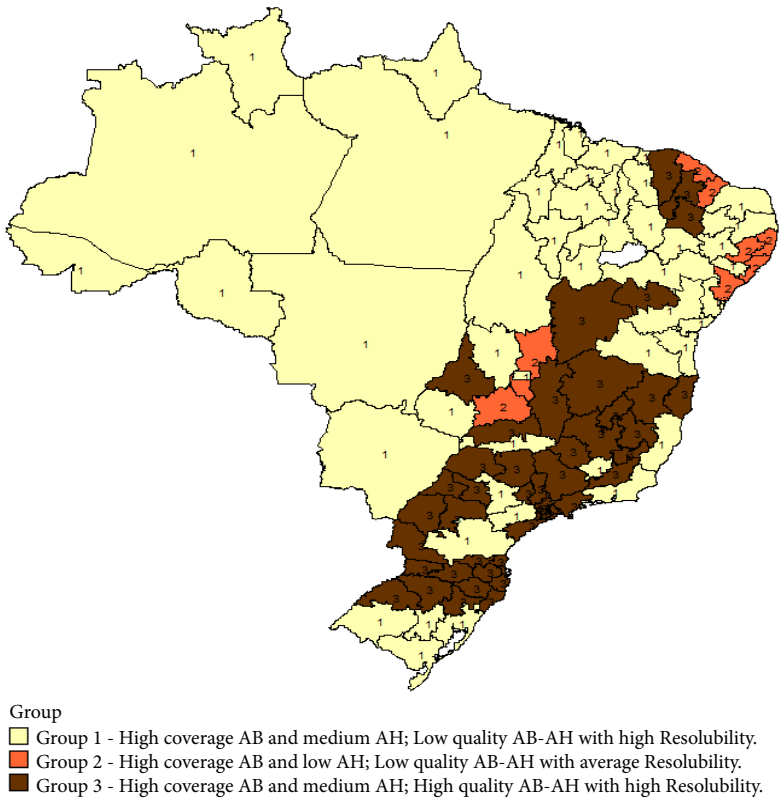

Figure 1. Spatial distribution of groups generated in the cluster analysis according to health macro-region in Brazil.

Source: Authors.

ro-regions in group 3, Santa Catarina displays 100% of the macro-regions in this group.

In Brazil, it is noteworthy that, in AB, the average score for quality is low in 77% of the states and, for coverage, it is high in 85%. There is a prevalence in Southeast and South of macro-regions classified in group 3 (best scenario). Additionally, even though the average score for coverage/AH was classified as high in some states, there was no classification of groups with high coverage/AH, with Southeast presenting the lowest average among the regions.

Across the country, no macro-region was identified that combined high quality and AB-AH coverage with high resolvability, but group 3 is the closest to this scenario.

Discussion

The study allowed a regional examination, based on the classification of health macro-regions into groups constructed by similarity (coverage, quality and resolvability in AB-AH), and by the difference between macro-regions.

The analysis showed that in AB, for 100% of the Brazilian population, coverage is high, according to the classification scale constructed in the study, with the average coverage variable being approximately 80% in the national territory. Also in AB, three-fifths of the population, 58.54%, access low-quality services and two-fifths, 41.15%, high-quality services. The results demonstrate a scenario of expansion of ESF coverage, in agreement with other studies[9,24,29]. Notwithstanding, if access to basic care services has increased, due to federal resources transfers, there has not yet been an equalization in the supply patterns between municipalities[30], (Table 2).

In AH, coverage is low at 9.70% and average at 90.29%. Comparable to AB, 58.54% access low quality services and 41.15% high quality. Resolvability is high for 90.29% of the population and average for 9.70%. In AH, low quality and average coverage are observed with high resolution. Although the study indicates average coverage for AH, with an average of 1.7 in the country (Table 2), there is an insufficiency of beds when compared to the average number of beds in OECD countries 31. Another issue refers to resolvability, which indicates accessibility of users for medium complexity hospital admission.

On the above facts, there is an inequality of access in AB to the level considered of high quality, suggesting fragility in the centrality of AB coordination in the organization of systems and networks[7,14]. For HA, there is a need for evaluation of its systemic effectiveness[1,15]. A recent study has presented a critical situation in the Brazilian health system to meet hospital demands generated by COVID-19 pandemic[32]. Another study highlights that, particularly in low- and middle-income countries, there is a need to improve access to high-quality care for critically ill patients in hospital[33]. However, what draws attention is the percentage of the population with high quality/AB-AH (41.15%), indicating the potential of the Brazilian system for the development of actions that encourage a systemic improvement in the quality of care provided by SUS.

Among regions, intra- and inter-regional asymmetries in health care were observed, in agreement with other studies[34,35]. The **North** region, with the lowest average indicators for quality/AB-AH; **Northeast**, with highest average for coverage/AB, corroborating data from Giovanella *et al.*[29], and lowest for resolvability; **Central-West** had the lowest average for coverage/AB; **South** had the highest average for quality/AB; coverage/AH and resolvability and **Southeast**, lowest average indicator for coverage and highest for quality in AH. Viana and Iozzi[3] highlight territorial equity as one of the biggest challenges in achieving comprehensiveness in SUS, and it is important to highlight the fragile role assumed by the states; inequalities in the distribution of resources; concentration of services in large cities; little integration between services and the fragility of planning.

Viana *et al.*[36] discuss the territorial dimension and point out that it has not been strongly incorporated into the formulation of health policies. They add that regionalization has been directed more towards aspects of the organization of the service network at the intra-state level. Nonetheless, differences were also found in the classification of macro-regions within the same state, which refers to the difficulty in regional articulation. Ribeiro *et al.*[37] concluded that centralized Brazilian federalism does not produce strong local coordination of health policy, due to its competitive aspects at the subnational level and socioeconomic factors, representing important obstacles to redistributive policies. There is a weakness in regional planning[38] and the need to develop a solid institutional capacity that considers planning in tackling structural inequalities in health regions[39], a fact recognized since the promulgation of Decree 7508/2011[10].

Almost three-fifths of the population access low-quality services and two-fifths access high-quality services. One of the main guidelines of the Ministry of Health, in the development of the Monitoring and Evaluation Policy for SUS Qualification, aims to evaluate the performance of the health system in strategic dimensions of access and quality[36]. Despite the investments, the results indicate the persistence of problems in the quality of primary care[9] as found in other studies. Tomasi *et al.*[40], evaluating, for instance, aspects of the quality of prenatal care in the basic health network in Brazil, concluded that only 15% of the women interviewed received quality care.

In the present study, coverage/AB has been classified as high for 100% of the Brazilian population. There is a consensus among scholars on the equitable expansion of access and use of family health services and actions[40], with a progressive increase in the ESF, reaching 42,784 teams in 2019[41]. Other data[42] demonstrate that, from 1998 to 2006, the ESF coverage of approximately 7 % reached 46% of the population. Neves *et al.*[43] corroborate this by indicating that, between 2006 and 2016, coverage was 45.3% and 64%, respectively, with an increasing tendency. Almeida *et al.*[44] indicate an increase from 2007 to 2017, ranging from 48% to 64%. In another study[45], coverage in PHC (ESF and other care models), between 2008 and 2013, varied from 75.8% to 80.6%%.

However, we agreed with Ouverney et al.[46], because, even given the expansion scenario, it is not possible to conclude that coverage/AB is uniform across the national territory. A study that evaluates socioeconomic inequalities in the performance of ESFs based on the PMAQ suggests that municipal factors are important determinants of their performance[47]. Another study, analyzing the implementation of the Basic Care

Standard (PAB), concluded that there was an increase in access to AB services, but inequality between municipalities did not decrease[30]. PAHO also considers that the low availability of doctors to work in remote areas of the country is a limiting factor in the expansion of ESF coverage[45]. This set of findings corroborates the quality and coverage data found in the present study, highlighting the need to carry out new analyzes that deepen the coverage-quality relationship in SUS.

Throughout the national territory, a macro-region with high coverage/AH (above 1.9 beds/thousand inhabitants) was not classified, characterizing a huge difference compared to the number of beds in universal systems. In 2017, in OECD countries, the average number of beds was estimated at 4.7 beds/thousand inhabitants[31]. Brazilian results demonstrated average coverage for 90.29% of the population and low coverage for 9.70%, suggesting regional differences in access. A study that investigates the networks established for different types of demand for health services, including basic hospital care, demonstrated inequalities in access, which is even more striking in relation to more complex services[48]. Another study, working with the mapping of the number of ICU beds (adults in SUS) and ventilators and respirators existing in the country, found enormous regional heterogeneity and scarcity of resources in most regions of the country, indicating that it is essential to identify the most vulnerable regions to strengthen the response capacity of the health system at regional and local levels[11]. Data from PROADES[16] indicate, between 2007 and 2019, a decrease in the number of curative beds available to SUS in all major regions apart from the North region.

The situation is worsened by the concentration of hospitals in large and medium-sized cities[1] and in the Southeast, South and coastal regions[21] and, due to the way they are socially distributed throughout the national territory, concentrated in the richest areas of the capitals[49]. A recent study highlights that 30% of health regions (microregions) in the country are particularly vulnerable, due to a combination of ICU bed infrastructure below the minimum, and mortality from conditions similar to COVID-19, above the national median, highlighting the Southeast and Northeast regions[11].

In this context, Viana et al.[1]draw attention to the integration of the hospital into the RAS and the leadership of state governments in the regional and state organization of specialized and hospital provision. It is clear, as discussed in Chaves *et al.*[21], that the distribution of the supply of beds needs to be based on the formation of regional arrangements that can implement[1] the proper inclusion of hospital services in a systemic network design. Negri Filho[49], when addressing the scarcity of beds, concluded that the hospital access crisis constitutes a reason for a strategic agenda of Brazilian hospital reform, covering[50] the dimensions of the social, financial, political, organizational, assistance and Teaching and Research crisis.

Resolvability is high for 90.29% of the population and average for 9.7%, suggesting accessibility to medium complexity procedures during hospital admission. Still, coverage/AH (classified as average for 90.29% of the population) indicates insufficient beds to meet the population's demands, referring, on the one hand, to the need to investigate AH[1,21,50], an extremely complex and challenging issue and on the other, the impacts of this scarcity of beds on hospital quality, corroborated by data from the present study, when 58.54% of the population access low-quality services, and 41.15% are discharged.

As limitations of the study, it is important to highlight that cluster analysis will always create groups, and finding them does not validate their existence, making it necessary to reconcile the interpretation of quantitative data with conceptual contextualization[25]. Finally, local, and micro-regional specificities were not highlighted or data for non-hospital specialized outpatient care were included, which is recognized as an important bottleneck in assistance when it comes to SUS.

Final considerations

The advances implemented in the field of public health since the creation of SUS in 1988 are undeniable. It stands out the contribution to access to health services and the expansion of the ESF with positive impacts on child health and the reduction of the mortality rate and hospitalization for cardiovascular diseases and stroke[45]. Also, the institution of the National Hospital Care Policy (PNHOSP), which established the guidelines for the organization of the hospital component in RAS, and the National Policy for Small Hospitals[8], considered important in the configuration of loco-regional assistance, to guarantee access to hospital admission and reduce regional inequalities[51].

Nonetheless, whether due to the recognized crisis of the federative pact, the challenges of the decentralization process, the discussion of

the role of municipalities, the role of the private health sector and its relationship with the public sector, or the need to improve social participation mechanisms[45], major challenges are posed to the management of the system. It is understood that, without adequate financing, regulation, and public participation in the provision of services, it is not possible to guarantee universal access in accordance with the health needs of the population[52].

The study also demonstrated the expansion of ESF coverage, yet, with low quality of health actions and services. Despite that, even though no grouping was found that would add high coverage, quality and resolvability, it is noteworthy that, for two-fifths of the population, a scenario of high coverage/AB and average/AH prevails; high quality/AB-AH with high resolvability; situation that accentuates the urgency of investments in the monitoring and qualification of SUS, with the development of studies that deepen the relationship between coverage and quality and that can also offer comparative parameters with other standards of organization of international health systems.

It is known that the interfederative relationship represents a major challenge in the design of public policies[4,39,53]. In view of what is presented in the study, it appears that the institutionalization of SUS[55] management still has low resolution in the national territory. There is a lag in intergovernmental relations, which is reflected in the regional functioning of health networks and makes cooperation between the federation entities difficult[55].

Thus, looking to the future, we understand the importance of a planning that addresses the management of the relationship between the federation entities to consolidate the system, drawing attention to the implementation of regional governance that incorporates articulation with the APS and strengthening its resolution capacity. For this, unquestionably, there is a need for adequate public financing, consideration of territorial dimensions, as well as the interdependence and political-administrative role of federated entities.

Collaborations

LA Chaves: work conception, organization of the database, statistical analysis, data interpretation, writing of the manuscript and critical review. EIG Andrade: work conception, drafting the manuscript and critical review. Santos AF: work conception and critical review.

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