

Typology of health regions: structural determinants of regionalization in Brazil¹

Tipologia das regiões de saúde: condicionantes estruturais para a regionalização no Brasil

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Abstract

The socioeconomic development, supply and complexity of health actions and services in a regional context may be considered structural constraints to the success of the current process of health care regionalization in Brazil. The main objective of this study is to identify the structural determinants of the regionalization process by building a typology of health regions in Brazil. A typology of Brazilian health regions was developed from available secondary data sources. The dimensions and groups that form the typology were identified through factor analysis and cluster analysis. The type of service provider both for out and inpatients was also identified. Results: the regions were classified into five independent groups according to their socioeconomic profile and characteristics of the health service supply. The characterization of Brazilian health regions through the typology demonstrates high levels of heterogeneity throughout Brazil, and the complex organization of the regional health systems. The proposed typology could contribute to future research and better understanding of this complex and contradictory scenario, supporting the urgently required development of integrated regional public policies that simultaneously involve economic and social development and the strengthening of regional spaces of governance in order to promote the organization of regional health systems grounded on the principles of the SUS (Brazilian National Health System), under a shared, joint management with the objective of ensuring the universal right to health.

Keywords: Regionalization; Health Policy; SUS; Brazilian National Health System.

¹ Funding: CNPq process number 404997/2013-9 (Policies, planning and managing of the health regions and networks in Brazil).

Resumo

O desenvolvimento socioeconômico, a oferta e a complexidade das ações e dos serviços de saúde no contexto regional podem ser considerados condicionantes estruturais para o êxito do atual processo de regionalização da saúde no Brasil. O presente estudo tem como objetivo identificar os condicionantes estruturais do processo de regionalização por meio da construção de uma tipologia das regiões de saúde no Brasil. Foi construída tipologia das regiões de saúde Brasileiras a partir de fonte de dados secundários disponível. A identificação das dimensões e dos Grupos - que compõem a tipologia - foi realizada por meio de análise fatorial e de agrupamentos/*clusters*. Também foram identificados o tipo de prestador de ações e os serviços predominantes na região tanto para a produção ambulatorial quanto para a internação. As regiões foram classificadas em cinco Grupos, de forma independente, de acordo com suas características socioeconômicas e de oferta de serviços de saúde. A caracterização das regiões de saúde Brasileiras, a partir da tipologia apresentada, demonstra heterogeneidade do território nacional e a complexidade de organizar sistemas de saúde regionais. A tipologia proposta pode auxiliar na investigação e no melhor entendimento desse cenário contraditório e complexo, apoiando o urgente desenvolvimento de políticas públicas regionais integradas que envolvam, concomitantemente, desenvolvimento econômico e social; e o fortalecimento dos espaços de governança regional, a fim de promover a organização de sistemas de saúde regionais alicerçados nos princípios do SUS e numa gestão compartilhada e solidária que tenha como imagem-objetivo a garantia do direito à saúde. **Palavras-chave:** Regionalização; SUS; Sistema Único de Saúde; Políticas de Saúde.

Foreword

In the last 25 years two phenomena have emerged in Brazilian public health policy, with varying degrees of impact in different States and regions. The first is the decentralization of health policy formulation, management and implementation; the second, the increase in the number and type of actors involved in the provision and management of services, with the growing role and importance of non-governmental actors in these activities. This process is associated with the emergence of several initiatives to outsource management, procurement and delivery of health actions and services to private companies (Souza; Carvalho, 1999; Viana; Lima, 2011). Meanwhile, “managerial” ideas (focused on the most cost-effective actions) for the operational governance of health services have spread and gained a central position in politics (Barbosa; Elias, 2010).

These two phenomena, the decentralization of regulatory and decision-making power to sub-national levels of government and the spread of private service management and provision, have been contemporary, strategic factors in shaping the Brazilian National Health System, introducing specific cycles over the course of the implementation of the Brazilian National Health System (SUS). One of these cycles ran through the 1990s, aimed at increasing decentralization to the municipalities, and another, in the 2000s, with greater emphasis on regionalization, designed to overcome the obstacles arising from highly unequal service provision, but still with little impact on the functional organization of the health system (Lima et al., 2012).

These movements resulted in the intense fragmentation of the supply capacity, decision-making and planning of health actions and services. The system is fragmented according to different logics orchestrated into micro decision-making spaces which are highly sensitive and permeated by local interests at the expense of action based on the principles of universality and equity. It is worth recalling that the most urgent challenges faced by the SUS include expanding access to, and ensuring the fitness of services. In Brazil, the organization of regions and health care networks has been the

primary regionalization strategy in recent years to overcome these challenges (Brasil, 2011). This same strategy has been utilised in several countries which also base their health systems on the principle of universality (Leatt; Pink; Guerriere, 2000; Jakubowski; Saltman, 2013; Almeida, 2010). In those countries, positive results in terms of access, improved care and fair health service provision have been proven (Saltman; Bankauskaite; Vrangbaek, 2007; Stoto, 2008).

The regionalization of health care is an even more complex phenomenon in Brazil. The country's continental dimensions, the number of potential users (over 200 million), inequalities and underlying regional differences, the scope of the State's responsibilities in health care and the multiple actors (governmental and non-governmental, public and private) involved in conducting and provisioning health care are some of the characteristics that exemplify this complexity (Dourado; Elias, 2011).

The regionalization process can interfere positively in universal access to health care as it allows health care network services to be planned and organized according to regional needs, establishing a rational and fair integration of such programs and services according to the supply and needs found in a particular social-sanitary context, optimizing human and technological resources in the regional health complex, catalyzing shared policies and responsibilities between the actors (Lima et al., 2012).

Moreover, the diversity and the huge socio-spatial inequalities in Brazil associated to the federative model, which conditions SUS planning and regional management opens up new aspects of the ongoing regionalization process (Albuquerque, 2014). Despite the proposal's potential, its implementation faces significant obstacles, including the institutionalization of a homogeneous care network in a heterogeneous territory, composed of autonomous entities and marked by intense political dispute (Machado, 2009; Santos, Giovanella, 2014).

Against this backdrop the socioeconomic development, supply and complexity of health actions and services in the regional context can be considered

as important structural conditioning factors for the success of the current health regionalization process in Brazil (Viana; Lima; Ferreira, 2010). The objective of this article, therefore, is to identify the structural determinants of this regionalization process in Brazil through the construction of a national typology of the health regions that were formally established by January 2014, i.e., after the approval of Decree 7508/2011, which marked a new era in the regulation of the decentralization and regionalization processes in the SUS (Brasil, 2011).

Methodology

A national typology of health regions formally established by January 2014 was built. Based on the typology created in 2010 for the old Regional Management Committee, (Viana, Lima; Ferreira, 2010), the current one was constructed from a smaller number of components without loss of discriminative power. This operational simplification is important in light of any changes in the health regions which may occur over time, allowing for flexibility and adjustments when necessary.

The data sources employed were the 2010 Population Census conducted by the Brazilian Institute of Geography and Statistics (IBGE), the data bases of the Brazilian National Health System available on Datasus², the Annual Social Information Report (RAIS), provided annually by the Ministry of Labor³, and the Regional Accounts System (IBGE).

The units of analysis were the health regions, considering the 436 which comprise the 5,565 municipalities in Brazil. The dimensions and groups that form these events were identified using the statistical methods of factor analysis and cluster analysis (Hair, et al., 2006).

The factor score components were standardized with a mean equal to 0 and variance equal to 1. The variance explained by the factor analysis model was 74.3% (Tables 1 and 2). The operationalization of the two dimensions - socioeconomic status and supply and complexity of health services - by the factor analysis can be described as:

² Available at: www.datasus.gov.br

³ Available at: www.mte.gov.br

Table 1 - Factor score size of "Provision and Complexity of Health Services"

Components	Coefficient
% health plan beneficiaries (excluding dental care)	0.305
% highly complex admissions in SUS of the total admissions	0.356
% of physicians per 1,000 inhabitants	0.402
% of hospital beds per 1,000 inhabitants	0.229

Table 2 - Factor score size of "Socioeconomic Situation"

Components	Coefficient
Household incomes <i>per capita</i> (in reais)	0.257
Population density (inhab./km ²), 2011	0.118
% people aged 10 years old and over with at least primary education	0.26
% people aged 10 years old and over with at least secondary education	0.259
GDP <i>per capita</i> (in R\$ 1,000.00)	0.234

- Socioeconomic situation: related to the degree of socioeconomic development of the municipalities in the regions.
- Supply and complexity of health services: related to the complexity of services offered in those regions.

In building the typology, the two factors were classified into three categories, defined in relation to the entire data set, through the Z score: socioeconomic status: low (-1.707 to -0.3515), average (-0.3514 and 0.8509) and high (0.8510 to 3.5070); supply and complexity of health services: low (-1.2133 to -0.1250), average (-0.1249 to 0.9140) and high (0.9141 to 2.3751).

Subsequently, for each group, their main sociodemographic features, service provision profile and coverage were identified. In addition, the predominant type of provider in the region was ascertained both for outpatient treatment and for hospitalization. Therefore, the rate of the public provider's total outpatient production in the health region in 2013 out of the total outpatient services in 2013 was considered; and likewise for hospital admissions. From the distribution of these values, cut-off points were defined and two groups established for outpatient treatment and three for hospitalizations. The regions in which the outpatient treatment rate was equal to or greater than 90.0% were classified

as predominantly public service, and those with lower rates were considered as mixed. As regards the hospitalization profile, regions with rates equal to or higher than 77% were considered predominantly public, those with rates less than 50% as predominantly private and the rest as mixed.

Results and discussion

It should be highlighted that this is the first time that a typology of health regions has been developed for the whole country, since in 2010 the municipalities of the states of Acre, Amazonas, Roraima, Maranhão and Piauí could not be analyzed. (Viana; Lima; Ferreira, 2010).

By cross-referencing the socioeconomic development and health care service provision profile data, the regions were classified independently and according to their socioeconomic and healthcare provision characteristics. Five groups were identified: **group 1** (low socioeconomic development and low service provision); **group 2** (average/high socioeconomic development and low service provision); **group 3** (average socioeconomic development and average service provision); **group 4** (high socioeconomic development and average service provision); and **group 5** (high socioeconomic development and high service provision). The spatial distribution and

the main characteristics of the different groups can be seen in Table 3 and Map 1.

The regions that achieve the highest values in the socioeconomic development indicator are characterized by the group of more urbanized, populous, industrialized and economically dynamic municipalities. The indicator for the provision and

complexity of health services is related to the complexity of services offered in the regions/CIR, where higher values indicate greater supply and complexity of the health system.

Group 1 (low socioeconomic development and low service provision) includes 175 regions, 2,159 municipalities and 23.6% of Brazil's population.

Map 1 - Spatial distribution of the five groups of health regions

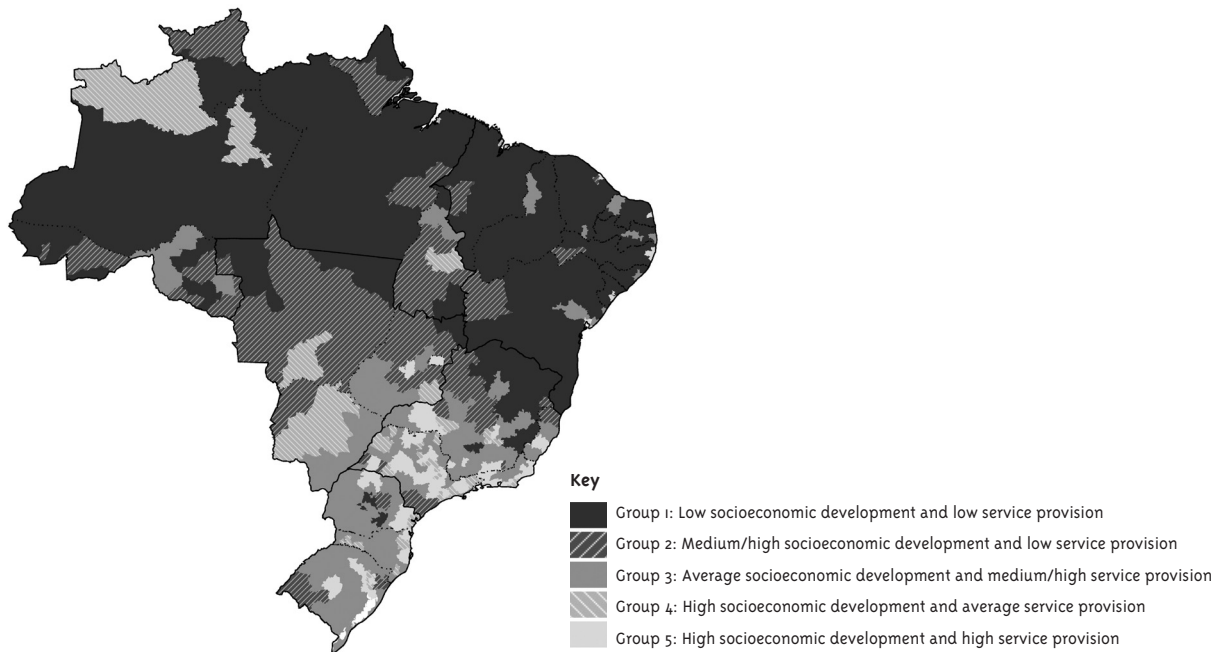


Table 3 - Characterization of regions by group, 2013

Features	Group 1	Group 2	Group 3	Group 4	Group 5
Number of health regions	175	53	123	35	50
% out of total regions	40.1	12.2	28.2	8	11.5
Number of municipalities	2,159	590	1,803	388	630
% out of total municipalities	38.8	10.6	32.4	7	11.3
Population (2013 projection)	45,466,120	14,063,158	38,722,577	24,786,600	77,994,259
% of the total population	23.6	7.3	20.1	12.9	40.5
Average municipalities by Region	12	11	15	11	13
Average population by municipality	21,059	23,836	21,477	63,883	123,800
Health plan beneficiaries as % of the population	5.7	14.7	24.6	40.3	59.7
Physicians per 1,000 inhabitants	0.57	0.85	1.33	1.49	2.54
SUS physicians out of total number of physicians (as %)	92.3	86.7	83.5	77.9	71.1
Hospital beds per 1,000 inhabitants	1.7	1.7	2.5	1.9	2.6
SUS hospital beds out of total hospital beds (as %)	89.3	76.9	73.6	69.1	62.7

It is the Group with the lowest rates of the private system beneficiaries, physicians and hospital beds per thousand inhabitants. This group is evidently concentrated in macro-regions of the North and Northeast.

Group 2 (**medium / high socioeconomic development and low service provision**) is composed of 53 regions and 590 municipalities, accounting for a smaller portion of the Brazilian population (7.3%). Most of these regions are located in the states of Roraima, Mato Grosso, Mato Grosso do Sul, Goiás and Tocantins (Map 1). This is an area of recent, peripheral territorial occupation, which occurred as a result of the expanding farming boundaries and intensive and mechanized use of the land, controlled by global mechanisms and often within the production cycle of food companies (Santos; Silveira, 2001). This process explains the overall improvement in socioeconomic indicators and also, due to the development model adopted, the low supply of health services, creating a very particular scenario.

Group 3 (**average socioeconomic development and medium/high service provision**) includes 123 regions, 1,803 municipalities and 20.1% of the Brazilian population, predominantly in the Southeast and South. This group reports increases number of hospital beds in relation to Groups 2 and 3, but at the same time the percentage of SUS beds in relation to total beds is lower (Table 3).

Group 4 (**high socioeconomic development and average service provision**) includes 35 regions, 388 municipalities and 12.9% of the population, predominantly in the Southeast and South (Table 3).

Group 5 (**high socioeconomic development and high service provision**) includes 50 regions, 630 municipalities and 40.5% of Brazil's population. The metropolitan regions and other economically dynamic areas feature in this Group. The substantial presence of the private sector is a reflection of this dynamism, reaching almost 60% of the population.

Groups 3, 4 and 5 reinforce the idea of the concentrated area, an expression used by Milton Santos in the late 1970s (Santos; Silveira, 2001). The concentrated region is characterized by the density of the

system of relations that enhances the flow of goods, capital and information, the formation of which influences the entire domestic macro-economy. This uneven growth, highly concentrated in the southeast and south (Toledo, 2011), has important consequences with regard to the distribution of goods and services, especially those related to the health sector. It is precisely in these regions that the private health sector has a more significant presence.

Regarding the type of provider, a distinct pattern is observed between outpatient treatment and hospitalization. In outpatient procedures, the public sector contributes heavily to the output: with a mean average of 88.3%, median of 90.20% and 25th percentile of 82.4% of the rate of procedures performed in the public sector as opposed to by privately-hired services. This result can be explained as a reflection of the growth in primary care services witnessed in Brazil in recent decades (Castro; Faust, 2012). Nevertheless, differences are observed between the various health region groups (Table 4). The providers are predominantly public in 220 regions, of which 132 are in Group 1, of low socioeconomic development. Group 3 reports a predominantly mixed outpatient profile, that is, in places of higher socioeconomic development there is more private sector services supply.

As regards hospital admissions, the private sector's prevalence is evident. Regions that report more public hospitalizations are only found in groups 1 and 2 (Table 5). But it is important to remember that this predominance occurs precisely in the places with the worst rates of hospital beds and physicians *per capita*. Once again the lack of adequate public funds for the provision of necessary hospital procedures is clear. This is undoubtedly an important structural constraint in these regions, a challenge that requires articulated social and economic development policies. On the other hand, in Groups 3, 4 and 5, contracted private sector services are predominant. The distribution of SUS services provided between public and private providers is influenced by economic and political criteria. Furthermore, one can note a trend of customer segmentation ac-

4 World Bank database available at: <http://data.worldbank.org>

Table 4 - Group of health regions according to socioeconomic and health conditioning factors by provider in relation to outpatient services

	Low socioeconomic development and low service provision		Medium/high socioeconomic development and low service provision		Average socioeconomic development and medium/high services provision		High socioeconomic development and average service provision		High socioeconomic development and high service provision		Total	
	n	%	n	%	n	%	n	%	n	%	n	%
Predominantly Public	132	75.4	37	69.8	28	22.8	8	22.9	15	30.0	220	50.5
Mixed	43	24.6	16	30.2	95	77.2	27	77.1	35	70.0	216	40.9
Total	175	100.0	53	100.0	123	100.0	35	100.0	50	100.0	436	100.0

Table 5 - Group of health Regions according to Socioeconomic and Health Conditioning Factors by provider in relation to hospital admissions

	Low socioeconomic development and low service provision		Medium/high socioeconomic development and low service provision		Average socioeconomic development and medium/high services provision		High socioeconomic development and average service provision		High socioeconomic development and high service provision		Total	
	n	%	n	%	n	%	n	%	n	%	n	%
Predominantly Public	68	38.9	22	41.5	6	4.9	7	20.0	6	12.0	109	25.0
Mixed	42	24.0	10	18.9	12	9.8	6	17.1	15	30.0	85	19.5
Prevalenceprivate	65	37.1	21	39.6	105	85.4	22	62.9	29	58.0	241	55.5
Total	175	100.0	53	100.0	123	100.0	35	100.0	50	100.0	436	100.0

according to market logic, which has been gradually increasing (Santos; Gerschman, 2004).

The availability of hospital beds also varies between the groups, indicating the inequality in the provision of hospital admissions. The hospital bed rate per 1,000 inhabitants in Brazil was 2.3, below countries such as Canada (2.7), Spain (3.2) and the UK (3.0), which also have universal health systems (World Bank, 2010)⁴. The situation is even more critical when one considers that, of the total number of hospital beds in Brazil the rate of beds available in the SUS is 1.7 per 1,000 inhabitants (IBGE, 2010). The differences between the groups of regions are evident. These distortions are accentuated because one of the limitations of this study and of the current health information systems in Brazil is the difficulty to collect the data of procedures and services offered exclusively to users of private health plans.

The ratio of physicians per inhabitant shows the

great inequality in the distribution of this indicator, for in the group 1 and group 2 regions the ratio is below 1 physician for every 1,000 inhabitants, whereas in the group 5 regions it is 2.54 per 1,000 inhabitants (Table 3).

This situation of such inequality fosters another discussion, which involves the organization of the health work process. In Brazil health care is centered around the physicians themselves, and, as demonstrated by the data, their distribution among the regions is highly uneven. Thus, it is necessary to consider the regulation and definition of the scope of practice of the health care professions. Countries in North America and the European Community have been implementing efforts to reform their public regulation systems of professions based on scopes of non-exclusive practices and reserved acts, whereby the idea of overlapping scopes of practice is defended (Girardi; Seixas, 2002). In this regard, a

discussion promoted a recent editorial would seem relevant, which reflects on the recognition and strengthening of medical practice by nursing professionals, which could be central to fairer access at the ground level of regional health systems, primary health care (Martiniano et al., 2014).

These movements were not initiated by professional bodies (on the contrary, they were met with strong opposition), nor did they emerge in isolation, but rather within a broader process of administrative and social security system reforms, which sought, among other results, universal and equal access, without losing sight of the user's safety and welfare (Girardi; Seixas, 2002). They therefore demonstrated the importance of the State's role in public regulation, in favor of collective interests and movement towards universal access to health care in all Brazilian regions.

In view of the diverse and distinct structural conditioning factors, some of which were presented in the foregoing paragraphs, it is important to highlight the potential of the CIR (Intermanagerial Commission) in its central role as a space to overcome these obstacles on the course to ensuring health care access to all Brazilian citizens. This space may favor the creation of a dual-function regional institutional capacity in health: firstly focused on planning and territorial coordination of activities and services, within a regional approach, creating new planning instruments; and, secondly, focused on overcoming or neutralizing the various corporate interests in the provision of health services, by creating a local governance based on solidarity, democratic decision-making and intergovernmental cooperation, essential for achieving universal access to health in Brazil.

The creation of a regional institutional capacity requires political, administrative, technological and cognitive innovations for the development of advanced and coherent regional coordination of the available resources.

For many reasons, one of which is related to the State's loss of dynamism and consequent lack of prospect of development, regional planning and virtuous combination of universal social assets and economic growth, the creation of this institutional capacity may be hampered by several local and re-

gional constraints, as made clear in the characterization of the five groups of health regions.

Moreover, decentralization as it was implemented by health policy, without regional integration and with the State's weak ability in providing more complex services, meaning huge care voids in vast areas of Brazil, has allowed for the growth of private service provision funded by the State in the form of tax exemption - and by everyone when the cost is transferred to the prices of care by companies that undertake group plans.

Another problem is the fragile State regulation of the private sector in places where they often exert a strong influence over political decisions, often in informal spaces, gathered and organized by corporate segments of extensive power at the local level.

Final considerations

The characterization of the Brazilian health regions from the typology presented herein demonstrates the heterogeneity of the Brazilian territory and the complexity of organizing regional health systems. The proposed typology can help in research and toward gaining a better understanding of this complex and contradictory scenario, supporting the urgent development of integrated regional public policies which simultaneously involve economic and social development; and the strengthening of regional governance spaces in order to promote the organization of regional health systems underpinned by the principles of the SUS and in a shared and solidary management which has as the image and objective of guaranteeing the right to health.

Finally, we believe that the typology of regions may serve as a subsidy for the construction of public policies to promote local-regional development and thus reduce the significant inequalities in our country.

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Authors' contributions

Viana, Bousquat, Albuquerque and Ferreira were responsible for the design, development, data analysis, drafting and revising of this article. Pereira, Uchimura, Mota and Demarzo made data analysis, drafting and revising. All authors comprise the "Management Project Unit" of "Policy, planning and management of regions and health networks in Brazil" research.

Received: 14/10/2014

Approved: 17/03/2015