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Health inequalities in Brazil: proposed prioritization to achieve the Sustainable Development Goals

Desigualdades de saúde no Brasil: proposta de priorização para alcance dos Objetivos do Desenvolvimento Sustentável

Desigualdades en salud en Brasil: propuesta de priorización para alcanzar los Objetivos de Desarrollo Sostenible

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Abstract

This study aimed to develop a prioritization index to speed up the achievement of national health targets proposed in the 2030 Agenda. This is an ecological study that addressed the Health Regions in Brazil. The index incorporated 25 indicators with analytical proximity to the official indicators of the 2030 Agenda whose data are available from public municipal sources for the period of 2015-2019. According to our study, the index was a powerful method to support health management decisions. The results showed the most vulnerable territories are located in the North Region of the country, and therefore, these are priority areas for resource allocation. The analysis of subindices highlighted local health bottlenecks, reinforcing the need for municipalities in each region to set their own priorities while making decisions for health resource allocation. By indicating Health Regions and priority themes for more investments, this investigation shows paths to support the implementation of the 2030 Agenda, from the local to the national level, in addition to providing elements that can be used by policy makers to minimize the effects of social inequalities on health, prioritizing territories with worse indices.

Sustainable Development; Health Management; Health Planning; Health Priorities

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Introduction

The 2030 Agenda, signed in September 2015 by all 193 Member States of the United Nations, is an ambitious global action plan to eradicate poverty and promote a decent life for all. The agreement has 17 Sustainable Development Goals (SDGs) and 169 targets developed to guide the actions of individuals, states, and other institutions towards a sustainable 2030 [1,2].

The progress of the 2030 Agenda is monitored through a set of 232 internationally defined indicators to allow a comparative assessment from the local to the global level. These indicators seek to provide information to national and subnational governments for the definition of strategies to support the formulation of public policies [3,4,5].

Institutionalization of monitoring routines based on these indicators is an important path to establish national capacities that can change social and environmental determinants of health [6]. Such routines offer important subsidies to public and private agents for more effective and equitable decisions of resource allocation, especially in a context of reduced fiscal space and low systematization in the allocation process, which affects the quality of actions and services provided by the Brazilian Unified National Health System (SUS) [7].

Without more objective criteria, SUS resources, which are shared among the three government levels, expose the system to underfunding, producing inequalities in resource allocation in the territory [8]. This scenario is aggravated by the tendency to reduce the public budget due to austerity policies. In fact, a reduction in per capita resources in SUS has been observed since 2015, reinforcing the historical underfunding [9,10]. Massuda et al. [9,11] discuss the concept of health system resilience and highlight that although SUS shows strong resilience in various crises, adequate funding and resource allocation in strategic areas would expand this capacity, making it less vulnerable to austerity policies. Cavalcanti & Fernandez [12], when analyzing studies related to SUS governance and decisions made by its administrators regarding resource allocation, found the main challenges refer to the use of health information/evidence and proper models to support the process.

Thus, allocating scarce health resources to meet the growing needs of the population in a context of competitive demands, variable care models, demographic changes, and growing political interference that ignores technical reference is a challenging task. The decision about which services to offer in order to achieve a balance between the demand for goods and services that improve the population health, considering fiscal limitations, involves making choices among various alternatives [13], which requires systematic, objective, and transparent methods [14].

Among the most common methods for the rationalization of public policies is the development of synthetic prioritization indexes. The advantages of synthetic prioritization indexes include the fact that they provide objective criteria for decisions of resource allocation. However, synthetic prioritization indexes have important limitations; for instance, lack of methodological clarity in its development stages and the risk of simplistic and unidirectional understandings of more complex realities [15]. It suggests that technical solutions and adaptations to these indices are required in order to ensure a more rational alternative for decisions regarding resource allocation.

This article seeks to fill these gaps by developing a synthetic prioritization index to speed up the achievement of national health goals proposed in the 2030 Agenda. The empirical analysis of the study is focused on the Health Regions of Brazil, allowing a portrait of health inequalities in the country and supporting the decision-making process of health management for the allocation of public resources in health issues related to the SDGs and in the territory, thus contributing to a stronger SUS.

Method

This is an ecological study, where the units of analysis are the Health Regions of Brazil. These are continuous geographic spaces, resulting from the combination of neighboring municipalities, according to cultural, social, and economic identities, thus sharing infrastructure and communication networks [16].

The analysis at the level of 450 Health Regions allows a study with a higher level of territorial disaggregation when compared to studies conducted at the state level. On the other hand, the

analysis at the Health Regions level generates more stable estimates when compared to analyses at the municipal level, which are affected by excessive variability of indicators, especially in municipalities with small populations.

We decided to conduct this study based on a 5-year time frame, from 2015 to 2019 to avoid contamination of results by brief punctual changes in work processes, ensuring estimates with lower spurious variability. The analyses were performed until 2019 to obtain the largest time frame with more homogeneous data, considering the performance of municipalities in 2020 was affected by the COVID-19 pandemic.

The analysis in this time frame under the 2030 Agenda is a challenge for the country, given the postponement of the population census, which interrupted the 10-year periodicity of the survey. As the main source of municipal data, the 2020 *Demographic Census* was initially postponed because of the pandemic and then because of a reduction in the budget of the Brazilian Institute of Geography and Statistics (IBGE) implemented by the Federal Government.

The synthetic prioritization index proposed in this study was based on 25 indicators with analytical proximity to the official indicators of SDGs and for which data are available from public and official sources at the municipal level for the evaluated period. The basic reference for the development of the indicators was a document published by the Institute for Applied Economic Research (IPEA) with the national indicators and sources agreed by the National Commission for the SDGs (CNODS), which sought alternatives for the subnational evaluation of globally harmonized official indicators by the Inter-Agency and Expert Group on Sustainable Development Goal Indicators (IAEG-SDGs) [17]. Both the numerator and denominator of health indicators also observed the criteria set by the Inter-Agency Health Information Network (RIPSA).

The set of developed indicators allows a broad assessment of health. Table 1 presents the main metadata and sources of indicators based on the thematic areas defined by the World Health Organization (WHO), as follows: (1) reproductive and maternal health; (2) newborn and child health; (3) infectious diseases; (4) noncommunicable diseases; (5) injuries and violence; (6) environmental hazards; and (7) universal health coverage and health systems [18]. In addition to these, for the inclusion of the percentage of the population covered by the Brazilian Income Transfer Program, an important variable for the determination of health inequalities, an additional theme was defined: (8) other health-related indicators.

For the synthetic prioritization index development, partial indices – or subindices – were calculated for each of the 25 indicators. The transformation of data into normalized indices is important to ensure the measurements of the indicators are expressed in the same interval, using a unified and unidirectional criterion when assessing the set of indicators. Then it is possible to avoid indicators with measurement units of larger magnitude from indirectly presenting a higher weight in the final prioritization index.

Algebraically, partial index of high type indicators is better (the higher the indicator, the better the health status of the population) as it consists of the quotient between the difference of the value observed by the minimum value and the difference between the maximum value and the minimum value found in the country. As for low-type indicators, its value is calculated by subtracting from the unit the result obtained in the previous step. The value observed for every Health Region was defined as the average annual indicator of that region, while the minimum and maximum values as the worst and the best performance of the indicator observed in the Health Region, respectively (Table 1). Synthetic indices often use targets instead of the maximum value. However, in our study, this approach was not used because not all SDG monitoring indicators have pre-defined targets to be reached by 2030. Global and national targets agreed by the UN and the CNODS, respectively, offer a higher level of aggregation and are directly associated with the 17 SDGs, while the 232 indicators may refer to methods to achieve the 169 targets or even sub-themes not explicitly addressed in the target [17].

Table 1

Selected health indicators and data sources used to calculate the historical series.

Theme/Indicator	Numerator	Denominator	Source	Weighted average (2015-2019)		Annual median	
				Minimum	Maximum	2015	2020
(1) Reproductive and maternal health							
Maternal mortality ratio/100,000 live births	Maternal deaths by municipality and year of death	Live births by the mother's place of residence	DATASUS [50]	0.0	135.9	55.7	65.4
Births in health facilities (%)	Live births in the place of occurrence: hospital or other health facility	Live births by the mother's place of residence	DATASUS [51]	74.2	100.0	99.7	99.5
Teen birth rate/1,000 women	Live births of women aged 10 to 19 years	Number of women aged 10 to 19 years	DATASUS [51]	16.2	82.8	33.5	26.8
(2) Newborn and child health							
Prevalence of stunting (%)	Number of children under 5 years of age with low and very low height and weight for their age, as indicated in SISVAN	Total number of children under 5 years of age monitored by SISVAN	Secretary of Primary Health Care, Brazilian Ministry of Health [52]	5.2	31.6	11.0	11.3
Prevalence of malnutrition (%)	Number of thin and significantly thin children under 5 years of age, as indicated in SISVAN	Total number of children under 5 years of age monitored at SISVAN	Secretary of Primary Health Care, Brazilian Ministry of Health [52]	1.5	9.5	4.8	4.9
Mortality under 5 years of age/1,000 live births	Deaths of children under 5 years of age	Live births by the mother's place of residence	DATASUS [53]	8.1	32.1	14.3	13.0
Neonatal mortality/1,000 live births	Deaths of infants from 0 to 27 days old	Live births by the mother's place of residence	DATASUS [54]	4.1	16.6	8.8	8.1
Vaccination coverage (%)	Total number of children under 5 years of age who had access to age-related vaccines	Total number of children under 5 years of age	DATASUS [55]	0.0	90.6	92.7	75.1
(3) Infectious diseases							
New HIV infections/100,000 inhabitants	AIDS cases by year of diagnosis and municipality of residence	Population of the municipality	Department of Diseases, Chronic Conditions and Sexually Transmitted Infections, Secretary of Health Surveillance, Brazilian Ministry of Health [56]	0.0	55.2	12.1	9.0

(continues)

Table 1 (continued)

Theme/Indicator	Numerator	Denominator	Source	Weighted average (2015-2019)		Annual median	
				Minimum	Maximum	2015	2020
Incidence of tuberculosis/100,000 inhabitants	Confirmed cases by municipality of residence and year of diagnosis	Population of the municipality	DATASUS [57]	5.6	143.0	22.4	21.1
Hepatitis B/100,000 inhabitants	Confirmed cases of hepatitis B	Population of the municipality	DATASUS [58]	0.0	67.9	2.9	1.1
(4) Noncommunicacle diseases							
Premature mortality from chronic diseases/100,000 inhabitants	Number of deaths (people aged from 30 to 69 years) due to CNCDs recorded as ICD-10 codes: I00-I99; C00-C97; J30-J98; E10-E14 – in a certain place/year	Population (aged 30 to 69 years) living in a certain place/year	DATASUS [53]	107.8	474.5	290.0	287.6
Suicide mortality/100,000 inhabitants	Number of deaths recorded as ICD-10 codes: X60-X84 and Y87.0	Population of the municipality	DATASUS [53]	0.0	18.9	5.8	7.4
(5) Injuries and violence							
People directly affected by disasters/100,000 inhabitants	Number of deaths, missing people, and people directly affected by disasters	Population of the municipality	Brazilian Ministry of Integration and Regional Development [59]	0.0	1598.9	0.0	45.3
Mortality from traffic accidents/100,000 inhabitants	Number of deaths from traffic accidents (ICD-10 codes: V01-V89) of residents in the municipality	Population of the municipality	DATASUS [60]	2.1	40.6	22.1	18.0
Women suffering intimate partner violence/1,000 women	Number of women aged 15 years or older who were victims of physical, sexual or psychological violence from current or former partner in the reporting year	Number of women aged 15 and older	DATASUS [61]	0.0	90.8	4.9	6.1
Women suffering non-intimate partner violence/1,000 women	Number of women aged 15 years or older who were victims of physical, sexual or psychological violence from someone other than current or former partner in the reporting year	Number of women aged 15 and older	DATASUS [61]	0.0	50.9	6.5	7.8
Mortality due to occupational accidents/100,000 inhabitants	Number of deaths due to occupational accidents in the municipality	Number of people living in the municipality	DATASUS [60]	0.0	10.5	1.7	1.6

(continues)

Table 1 (continued)

Theme/Indicator	Numerator	Denominator	Source	Weighted average (2015-2019)		Annual median	
				Minimum	Maximum	2015	2020
Victims of sexual violence/10,000 inhabitants	Number of people aged 19 or under who were victims of sexual violence in the reporting year	People aged 19 years and younger	DATASUS [62]	0.0	75.4	2.1	3.1
(6) Environmental hazards							
Mortality due to poor sanitation/100,000 inhabitants	Number of deaths from diarrhea (ICD-10 codes: A00, A01, A03, A04, A06-09), intestinal nematode infections (ICD-10 codes: B76-B77, B79), and protein-calorie malnutrition (ICD-10 codes: E40-E46)	Total population of the municipality	DATASUS [53]	0.0	27.8	5.3	3.9
Mortality due to accidental poisoning/100,000 inhabitants	Deaths from causes recorded as ICD-10 codes: X40, X43, X44, X46- X49	Total population of the municipality	DATASUS [53]	0.0	1.0	0.0	0.0
Schools with access to water for human consumption (%)	Number of basic and high schools with access to water for human consumption	Number of basic and high schools	Anísio Teixeira Brazilian National Institute of Educational Studies and Research [63]	29.7 *	100.0 *	-	98.1
(7) Universal health coverage and health systems							
Primary care coverage (%)	Estimated number of people served by primary care	Total number of people in the municipality	Secretary of Primary Health Care, Brazilian Ministry of Health [64]	0.0	100.0	93.4	89.7
Coverage of live birth records (%)	Estimated number of live births notified at SINASC	Estimated number of live births in the municipality	IBGE [65]	89.6	100.0	98.2	-
(8) Other health-related inducators							
Population covered by Brazilian Income Transfer Program(%)	Number of families covered by Brazilian Income Transfer Program	Estimated number of poor families – Demographic Census (IBGE/2010)	Secretariat for Evaluation, Information Management and Single Registry, Brazilian Ministry of Development and Social Assistance, Family and Fight against Hunger [66]	52.8	100.0	100.0	96.7

CNCDs: chronic noncommunicable diseases; DATASUS: Brazilian Health Informatics Department; IBGE: Brazilian Institute of Geography and Statistics; ICD-10: 10th revision of the International Classification of Diseases; SINASC: Brazilian Information System on Live Births; SISVAN: Brazilian Information System on Food and Nutrition Surveillance.

Source: developed by the authors.

* Includes 2019 data only.

The overall synthetic prioritization index was defined as the geometric mean for the 25 subindices in the Health Region. The geometric mean is commonly used in the literature as a method to ensure the index is not so influenced by outliers, as seen with the arithmetic mean. Likewise, the geometric mean establishes that all targets must progress together [198,20,21,22,23]. That is, the indicators have the same weights in the synthetic prioritization index, an implicit hypothesis in the use of the unweighted arithmetic mean. Then, each of the 450 Health Regions in the country has a single synthetic prioritization index. The lower the synthetic prioritization index of a region, the higher the prioritization for public investment. On the other hand, regions with high synthetic prioritization indexes can teach important lessons and provide parameters to speed up the development in other regions.

To facilitate the analysis, three prioritization intervals were defined: (I) 0.00 to 0.40: regions with insufficient performance; that is, priority regions for health resource allocation; (II) 0.41 to 0.69: regions with medium performance – to be improved; and (III) 0.70 to 1.00: regions with adequate performance – an example to be followed by other territories [24].

The analyses were performed using R 4.0.2 (http://www.r-project.org), packages *rgdal*, *tidyverse*, *ggplot2*, and *factoextra*.

Results

Table 2 summarizes basic statistics of the distribution of Health Regions in the synthetic prioritization index intervals for each Brazilian state. The best performance was found for the Northeast Region, where only 2 of the 129 regions were classified as insufficient and 2 as adequate. The Southeast and Central-West regions had the second best performance with 5 and 1 Health Regions, respectively, presenting synthetic prioritization index classification as insufficient and 11.5% and 20.5% of Health Regions as medium. The South and North regions presented the worst performance, with adequate synthetic prioritization index for only 30 of 68 (44%) and 20 of 45 (44%) Health Regions, respectively.

Figure 1 shows the geographic distribution of Health Regions by synthetic prioritization index classification, with a high concentration of Health Regions presenting medium and insufficient synthetic prioritization index in the North and South regions. Also, the regions with the worst performance are not isolated in the territory, as they generally border other low-performance regions as well.

The spatial representation of subindices (Figure 1) illustrates the greatest challenges of the country: maternal and reproductive health, newborn and child health, and non-communicable diseases. In all these cases, the number of Health Regions with insufficient level is much higher than the general index. In addition, different patterns can be observed in the country, defying the higher homogeneity indicated by the synthetic prioritization index. While the North Region has Health Regions with the worst performance in aspects such as maternal and reproductive health and health system coverage, the Health Regions with the worst performance in non-communicable diseases are distributed throughout the national territory. On a small scale, infectious diseases and injuries and violence are also well distributed in the territory. Newborn and child health is more problematic in the Northeast Region (besides the North Region).

Figure 2 illustrates the distribution of subindices by theme and macro-region of the country, showing the number of outliers by macro-region under each theme and the important inequalities observed in the national territory. The number of outlier municipalities in the Health Region with inadequate performance in the Southeast Region is a highlight, although this region has the highest average in partial indices and high homogeneity of its Health Regions (expressed as the shortest interquartile distance) – which is seen in most of the themes evaluated.

Also, in reproductive and maternal health and newborn and child health, the North and Northeast regions present lower performance when compared to the Southeast Region and, particularly, the South, which presents the best results in the country in these themes. The figure shows that, to a large extent, the second worst performance of the South Region in the general index is due to its worst condition in noncommunicable diseases and Brazilian Income Transfer Program coverage (other indicators). The region also presents low performance in infectious diseases, environmental hazards, and injuries and violence.

Table 2

Number of Health Regions by states and geographic regions of Brazil according to prioritization interval and descriptive statistics.

Region/States	Health Regions	Priorization interval		Minimum	Median	Mean	SD	Maximum
		Medium	Adequate					
North	45	14	31	0.59	0.73	0.71	0.06	0.78
Rondônia	7	0	7	0.73	0.77	0.76	0.02	0.78
Acre	3	2	1	0.59	0.68	0.67	0.07	0.73
Amazonas	9	5	4	0.59	0.67	0.66	0.06	0.74
Roraima	2	2	0	0.66	0.66	0.66	0.00	0.66
Pará	13	5	8	0.59	0.72	0.71	0.05	0.76
Amapá	3	0	3	0.71	0.74	0.74	0.02	0.76
Tocantins	8	0	8	0.72	0.76	0.76	0.02	0.78
Northeast	133	1	132	0.67	0.79	0.79	0.03	0.88
Maranhão	19	1	18	0.67	0.75	0.75	0.03	0.78
Piauí	11	0	11	0.74	0.76	0.76	0.02	0.78
Ceará	22	0	22	0.76	0.80	0.80	0.02	0.83
Rio Grande do Norte	8	0	8	0.78	0.80	0.80	0.01	0.82
Paraíba	16	0	16	0.79	0.82	0.82	0.02	0.88
Pernambuco	12	0	12	0.75	0.78	0.78	0.02	0.83
Alagoas	10	0	10	0.78	0.79	0.79	0.01	0.81
Sergipe	7	0	7	0.76	0.79	0.79	0.02	0.81
Bahia	28	0	28	0.73	0.79	0.79	0.03	0.83
Southeast	165	1	164	0.70	0.80	0.80	0.03	0.86
Minas Gerais	89	0	89	0.72	0.80	0.80	0.03	0.86
Espírito Santo	4	0	4	0.77	0.79	0.78	0.01	0.79
Rio de Janeiro	9	1	8	0.70	0.77	0.76	0.03	0.79
São Paulo	63	0	63	0.72	0.81	0.81	0.02	0.86
South	68	0	68	0.71	0.77	0.77	0.03	0.83
Paraná	22	0	22	0.72	0.79	0.79	0.03	0.83
Santa Catarina	16	0	16	0.73	0.79	0.78	0.02	0.83
Rio Grande do Sul	30	0	30	0.71	0.76	0.76	0.02	0.81
Central-West	39	3	36	0.64	0.78	0.76	0.04	0.82
Mato Grosso do Sul	4	1	3	0.67	0.75	0.74	0.05	0.78
Mato Grosso	16	2	14	0.64	0.75	0.74	0.04	0.80
Goiás	18	0	18	0.75	0.79	0.79	0.02	0.82
Federal District	1	0	1	0.82	0.82	0.82	-	0.82

SD: standard deviation.

The analysis of subindices by indicator identified those with the worst performance in each theme and region. More significant fragilities are related to the themes of noncommunicable diseases and health of newborns and children. The five indicators with the worst national performance are: premature mortality from chronic diseases (especially in the South Region), mortality due to traffic accidents (especially in the Central-West Region), maternal mortality (especially in the North and Northeast regions), prevalence of malnutrition (especially in the North and Northeast regions), and suicide mortality (mainly in the South Region) (Table 2).

Figure 1

Map of synthetic prioritization index, general and categorized by theme, Brazil.

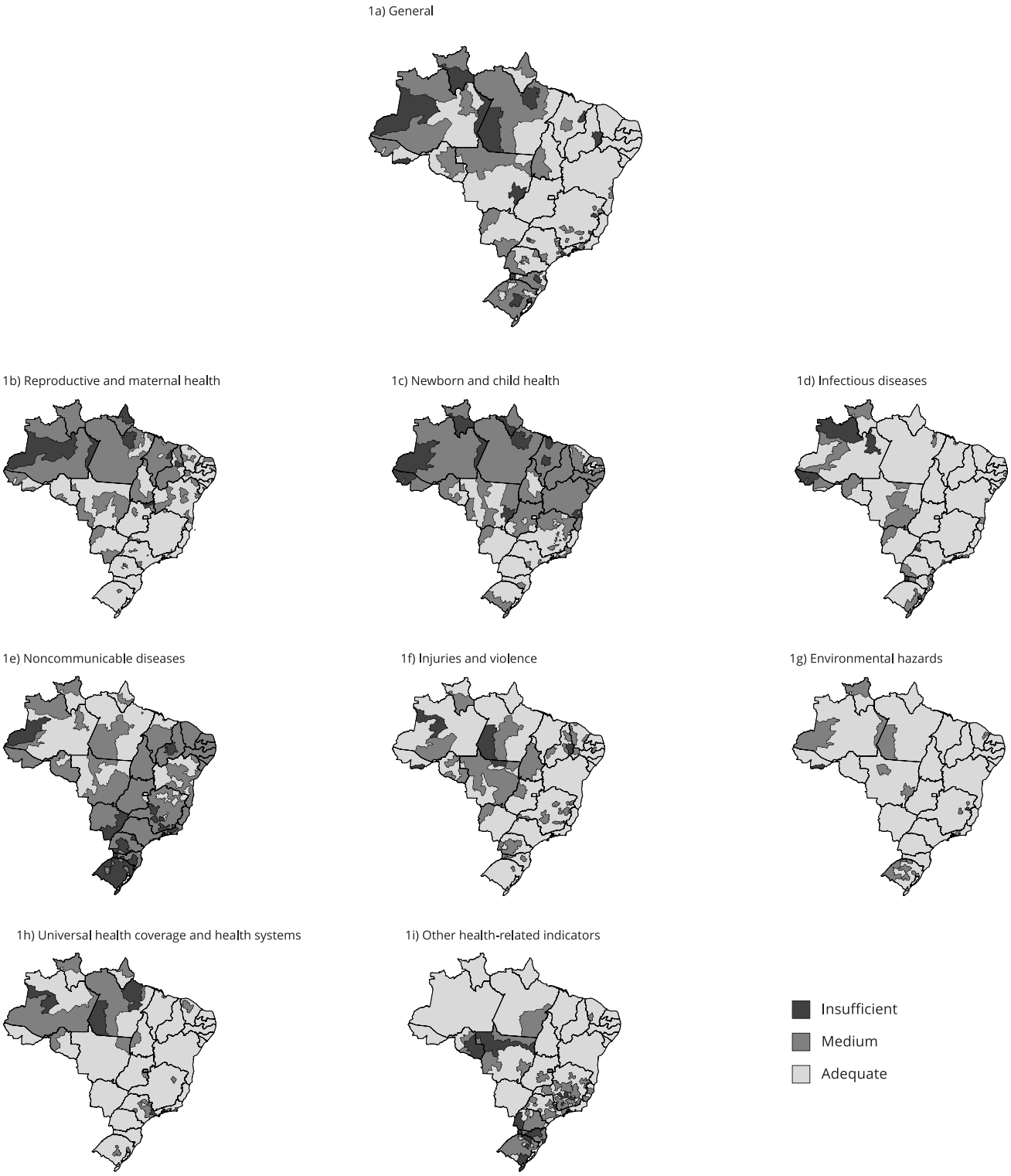
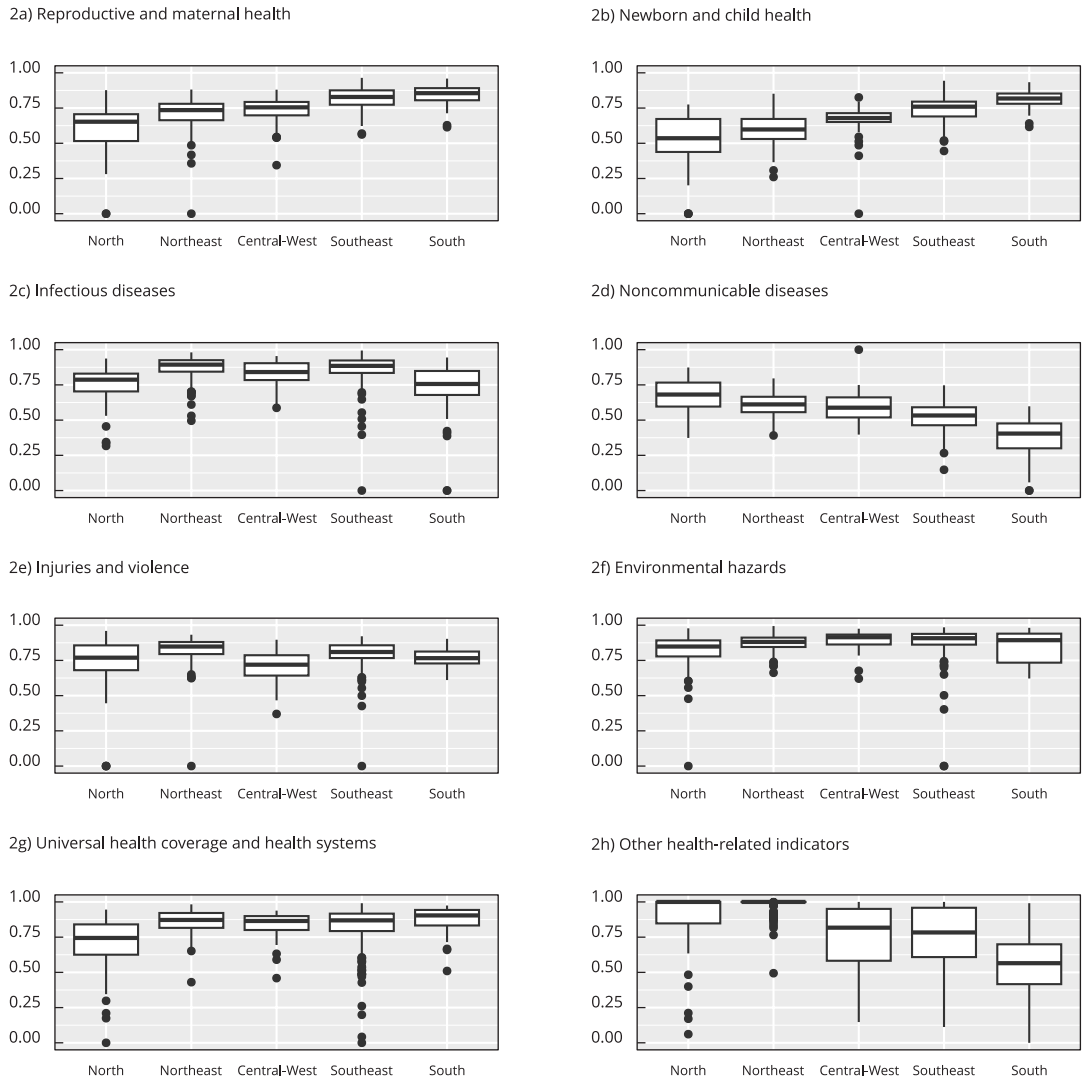


Figure 2

Boxplot of subindices, arranged by theme area, for the regions in Brazil.



Discussion

Resource allocation in health is a topic that has not been fully explored in the public health literature. Silva et al. [25] highlight the need for more research investments in public health management and policies, especially regarding the ethical, financial, and cost aspects, in order to support difficult decisions regarding resource allocation. When investigating resource allocation in health during the COVID-19 pandemic in Brazil, we found a lack of theoretical frameworks, indicating that resource allocation decisions promote ethical and moral conflicts for decision makers, who do not always feel prepared to make such decisions – a situation that may lead to physical and/or mental disorders in these individuals [25].

Table 3

Median of subindices according to geographic region and ranking of indicators for Brazil, 2015-2019.

Theme/Indicator	Central-West	Northeast	North	Southeast	South	Brazil	Ranking *
(1) Reproductive and maternal health							
Maternal mortality ratio	0.61	0.58	0.55	0.66	0.77	0.63	3
Teen birth rate/1,000 women	0.69	0.72	0.56	0.87	0.85	0.79	10
Births in health facilities (%)	0.98	0.98	0.93	0.99	0.99	0.99	24
(2) Newborn and child health							
Prevalence of malnutrition (%)	0.62	0.56	0.59	0.70	0.82	0.65	4
Neonatal mortality rate	0.66	0.60	0.58	0.73	0.79	0.69	6
Vaccination coverage	0.74	0.59	0.54	0.76	0.84	0.70	7
Mortality under 5 years of age	0.72	0.67	0.62	0.8	0.86	0.75	8
Prevalence of stunting (%)	0.75	0.70	0.55	0.84	0.85	0.77	9
(3) Infectious diseases							
New HIV infections/1,000 inhabitants	0.78	0.85	0.79	0.82	0.71	0.81	11
Incidence of tuberculosis/100,000 inhabitants	0.91	0.86	0.83	0.90	0.88	0.88	16
Hepatitis B/100,000 inhabitants	0.90	0.98	0.91	0.96	0.87	0.96	21
(4) Noncommunicable diseases							
Premature mortality from chronic diseases	0.55	0.56	0.69	0.45	0.37	0.50	1
Suicide mortality rate	0.63	0.72	0.68	0.66	0.45	0.66	5
(5) Injuries and violence							
Mortality from traffic accidents	0.31	0.49	0.55	0.63	0.50	0.54	2
Mortality due to occupational accidents/100,000 inhabitants	0.71	0.92	0.76	0.84	0.68	0.84	13
Women suffering non-intimate partner violence	0.90	0.93	0.89	0.73	0.80	0.84	14
Women suffering intimate partner violence	0.96	0.98	0.95	0.88	0.92	0.94	20
Victims of sexual violence	0.97	0.98	0.94	0.96	0.94	0.97	22
People directly affected by disasters/100,000 inhabitants	1.00	0.99	0.97	1.00	0.99	1.00	25
(6) Environmental hazards							
Mortality due to poor sanitation	0.87	0.81	0.90	0.86	0.90	0.86	15
Mortality due to accidental poisoning	0.90	0.92	0.89	0.91	0.92	0.91	19
Schools with access to water for human consumption (%)	0.96	0.95	0.78	1.00	0.93	0.97	23
(7) Universal coverage of health and health systems							
Coverage of live birth records	0.88	0.84	0.77	0.93	0.98	0.90	17
Primary care coverage (%)	0.85	0.96	0.79	0.86	0.85	0.90	18
(8) Other health-related indicators							
Population covered by Brazilian Income Transfer Program (%)	0.75	0.97	0.95	0.76	0.49	0.82	12

* National ranking (from the worst: 1, to the best: 25).

Indeed, factors such as population size, population density, and geographic proximity to capitals are more important than epidemiological characteristics and care capacity/demand when allocating SUS resources [26]. More recently, discretionary resource allocation has gained relevance through parliamentary amendments, contributing to unequal non-evidence-based distribution of health resources.

Then, effective management processes and continuous assessments must be adopted in health systems for an efficient distribution of resources at the local level [27]. After all, decision makers in health are constantly faced with the challenge to define priorities in their territory as a natural consequence of the imbalance between demands and available provisions, whether physical, material, or human resources. The definition of priorities should take into account different types of knowledge and actors in order to prevent the use of health planning and evaluation tools as instruments for different forms of domination [28].

The inclusion of different actors in the decision-making process requires simplifying language to express the health situation of population, allowing it to be understood by non-experts. The synthetic prioritization index used in this study, by incorporating indicators recommended in the 2030 Agenda, offers an important assessment of the health conditions of population and it is easy to replicate and understand, expanding its use at the local level to answer questions such as: what are the priority health problems in the various territories? In which territories should investments be prioritized?

The results of this study also show that more investments are required in health in the North Region of Brazil, in agreement with prior studies reporting the lowest rates of health service use by the population in this region [29], and presenting an availability of medical professionals (1/1,000 inhabitants) that is seven times lower than the ratios found in the capitals of the South Region (7.1/1,000) and the worst assessments of primary care services [30].

Studies addressing Health Regions in the Legal Amazon show that health policies from the Federal Government have low institutionality, discontinuity, and limited sensitivity to regional specificities [31]. According to the authors, the region also receives less resources than the national average, in addition to limited management capacity at the municipal level.

The findings also point to important inequalities among the regions regarding the thematic areas and the evaluated indicators that must be considered in decisions about resource allocation. Even if they are influenced by a higher reporting capacity of a Health Region due to several factors, this difference in the capacity indicates that more investments are required in the Health Region.

Regarding health problems that should be prioritized, premature mortality from chronic diseases is highlighted in the South Region of the country. Despite studies reporting reduction of some chronic diseases in Brazil in recent years [32,33,34] and good perspectives regarding the achievement of the global target of 25% reduction by 2025, as established in the Global Action Plan for Chronic Noncommunicable Diseases [34], this is still an important challenge for the country.

Addressing chronic noncommunicable diseases (CNCDs) involves the development of policies and programs, especially in primary health care, for health promotion strategies, reduction of risk factors (smoking, inadequate diet, obesity, physical inactivity, and excessive alcohol use) and support for disease treatment [35]. For Ribeiro et al. [36], successful strategies that have led to reduced mortality from CNCDs include expansion of primary care, improvements in the provision of health services, and distribution of medication to the population at risk (such as cardiovascular diseases). Then, resource allocation to this area is essential in Health Regions with poor performance indicator in this theme.

Mortality from traffic accidents was the main health problem found in the Central-West Region. In addition to leading to the death of a significant part of the economically active population, traffic accidents have a significant impact on the economy due to the high costs of patient care and hospitalization [37]. Such impacts emphasize the importance of allocating resources to intersectoral actions involving traffic education, as well as inspection of the drink-driving law in force in Brazil since 2008, which has promoted a significant reduction in mortality from traffic accidents, as reported in studies conducted in the state of Santa Catarina and the Federal District [38].

Reducing maternal mortality has been a UN commitment since the Millennium Development Goals (MDGs) and is an old challenge for Brazil, particularly in the most vulnerable regions. Understanding the dynamics of this indicator involves complex aspects, such as social and economic inequalities in the country's regions; quality of information available; development of policies, programs, and actions to address this issue; care related to the pregnancy-puerperal cycle and illegal abortion [39].

Then, the results suggest more investments should be made in Health Regions presenting lower performance in this indicator, focusing on qualification and evaluation of prenatal services, with emphasis on the prevention of hypertensive complications, better adequacy of prenatal care in women between 10 and 29 years old, policy adaptation to prevent deaths among young mothers, legalization of abortion, reduction of the cesarean section rate, reduction of the gestational risk associated with late pregnancy, and improvements in the quality of information about maternal deaths [39]. The prevalence of malnutrition among children under 5 years of age is also a concern in the North and Northeast regions, which reinforces the fact that investments are required in interventions for maternal and child health.

The fifth and most important health problem, according to the ranking of this study, is the suicide mortality rate, particularly in Health Regions in the South Region of the country. Suicide is one of

the major causes of preventable violent death in modern society. The state of Rio Grande do Sul has historically been among the Brazilian states with the highest suicide rates [40]. Addressing this problem involves investments in public health strategies and specific social policies [41].

The synthetic prioritization index proposed in our study is a tool with high potential to help Brazilian municipalities in the process of fulfilling the targets of the 2030 Agenda and its commitment to leaving no one behind. Many national initiatives have been identified, from governments and the private sector, that support municipalities in the implementation and monitoring of SDGs. These initiatives present important indicators for that purpose at the local level, using tools that include interactive maps, panels, infographics, among others.

Some of these initiatives propose indices comprised of different indicators from the 2030 Agenda, such as the Atlas of Human Development in Brazil [42], an initiative that collects information about the Municipal Human Development Index (M-HDI) of all Brazilian municipalities; the Sustainable Cities Project [43], which presents the City Sustainable Development Index and the Social Progress Index (SPI), a direct measurement of human development based on indicators selected from three dimensions: basic human needs, foundations of human wellbeing, and opportunities [44]. However, experiences like these are rarely reported in the scientific literature, which justifies the development of studies that assess the situation and evolution of health in the national territory and support decisions about resource allocation, promoting reflection on possible ways to support municipalities in the implementation of the SDGs, especially considering the perspective that Brazil may not fulfill any of the 17 goals proposed in the 2030 Agenda [45,46].

This study has limitations which are inherent to ecological studies, particularly regarding the use of secondary data in comparisons between HRs, which does not take into account the weaknesses of information systems. Studies indicate significant underreporting differences in information systems regarding the structure of health networks when comparing the regions of the country [47,48,49]. This is particularly relevant in the North Region, with the highest number of underreported diseases, for example, diabetes mellitus and tuberculosis [47]. Small municipalities also have higher numbers of underreported diseases. Then, the synthetic prioritization index results, especially in Health Regions with a higher number of small municipalities and which are distant from large national centers, may marginally reflect this pattern of Brazilian health information systems. However, this reality is different for the various indicators, so that its effects are quite diluted in the partial and general indices. Also, the results obtained in this study reflect the best picture of the Health Region based on available data (without adjustments that require deep knowledge of local reporting dynamics), and using such health information for planning purposes can even be a good strategy to reduce underreporting.

Final considerations

The synthetic prioritization index proposed in our study was considered a powerful method to support health management decisions. Its results helped identify that Health Regions with less favorable social characteristics, particularly in the North Region of the country, are the most vulnerable and, therefore, should be priority regions for resource allocation. In addition, the analysis of subindices highlighted local health bottlenecks, reinforcing that municipalities in each region should establish their own priorities in health resource decisions.

The findings of this study, when identifying Health Regions and priority themes for more investments, show paths that can support the implementation of the 2030 Agenda at local or national levels, and provide elements through which policy makers can minimize the effects of social inequalities on health, prioritizing territories with lower indices.

The synthetic prioritization index proposed in this study is a step forward in supporting decisions based on care and epidemiological characteristics, particularly for highlighting major inequalities in the country and the themes and regions with stronger demands. However, the notion of prioritization indicated by the index must be limited to understanding the different realities found in the country and should not be used as a notion of inter-regional competition for scarce resources. The index does consider the existence of sufficient resources for public health policy. In this sense, SUS underfunding is the most pressing issue in the current Brazilian context.

Contributors

W. D. Miranda developed the study project, performed data analysis and interpretation and article writing, approved the final version to be published, and is responsible for all aspects of the study, also ensuring its accuracy and integrity. G. D. M. Silva performed data analysis and interpretation and article writing, approved the final version to be published, and is responsible for all aspects of the study, also ensuring its accuracy and integrity. L. M. M. Fernandes performed data analysis and interpretation and article writing, approved the final version to be published, and is responsible for all aspects of the study, ensuring its accuracy and integrity. F. Silveira performed data analysis and interpretation and article writing, approved the final version to be published, and is responsible for all aspects of the study, ensuring its accuracy and integrity. R. P. Sousa performed data analysis and interpretation and article revision, approved the final version to be published, and is responsible for all aspects of the study, ensuring its accuracy and integrity.

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Resumo

O objetivo deste artigo é desenvolver um índice de priorização para aceleração do cumprimento das metas nacionais de saúde propostas pela Agenda 2030. Trata-se de estudo ecológico que abordou as Regiões de Saúde do Brasil. O índice incorporou 25 indicadores com proximidade analítica aos indicadores oficiais da Agenda 2030, para os quais existem dados de fontes públicas no nível municipal para o período de 2015 a 2019. O índice apresentou-se como potente método para apoiar a decisão da gestão em saúde. Os resultados permitiram identificar que a Região Norte do país apresenta os territórios mais vulneráveis e, portanto, prioritários para a alocação de recursos. Além disso, a análise dos subíndices permitiu destacar os gargalos locais de saúde, reforçando a necessidade de os municípios de cada região estabelecerem suas próprias prioridades na decisão de alocação dos recursos da saúde. Ao indicar as Regiões de Saúde e os temas prioritários para maiores investimentos, esta investigação aponta caminhos que podem apoiar a implementação da Agenda 2030 do nível local ao nacional, além de fornecer elementos por meio dos quais os formuladores de políticas podem minimizar os efeitos das iniquidades sociais sobre a saúde, priorizando os territórios com piores índices.

Desenvolvimento Sustentável; Gestão em Saúde; Planejamento em Saúde; Prioridades em Saúde

Resumen

El objetivo fue desarrollar un índice de priorización para acelerar el cumplimiento de las metas nacionales de salud propuestas por la Agenda 2030. Se trata de un estudio ecológico que abordó las Regiones de Salud de Brasil. El índice incorporó 25 indicadores con proximidad analítica a los indicadores oficiales de la Agenda 2030 para los cuales existen datos de fuentes públicas a nivel municipal para el período 2015-2019. El índice se presentó como potente método para apoyar la decisión de la gestión en salud. Los resultados permitieron identificar que la Región Norte del país cuenta con los territorios más vulnerables y, por tanto, áreas prioritarias para la asignación de recursos. Además, el análisis de los subíndices permitió resaltar cuellos de botella locales en salud, reforzando la necesidad de que los municipios de cada región establezcan sus propias prioridades en la decisión de asignación de recursos en salud. Al indicar las Regiones de Salud y los temas prioritarios para mayores inversiones, esta investigación apunta caminos que pueden apoyar la implementación de la Agenda 2030 desde el nivel local al nacional, además de proporcionar elementos a través de los cuales los formuladores de políticas pueden minimizar los efectos de las inequidades sociales sobre la salud, priorizando los territorios con peores índices.

Desarrollo Sostenible; Gestión en Salud; Planificación en Salud; Prioridades en Salud

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