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Evolution of the provision of speech therapists in the Brazilian public healthcare system: study on correlations with social indictors in the last decade

Evolução da oferta de Fonoaudiólogos no SUS: um estudo sobre a correlação com os indicadores sociais no Brasil na última década

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Keywords

Availability
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ABSTRACT

Purpose: Investigate the correlation between the provision of speech therapists in the Brazilian public healthcare system and social indicators between 2007 and 2016. **Methods:** An ecological study was conducted. The units of analysis were the 27 federative units of Brazil. Indicators of the provision of speech therapists in public healthcare and the relative evolution of this provision in the period as well as the Human Development Index and Gini Index related to the year 2010 were analyzed. Correlations were investigated using Spearman's test ($\alpha = 5\%$). **Results:** In 2007, the provision of speech therapists in the public healthcare system was $3.55/10^5$ residents, with the lowest indicator in the state of Amazonas and the highest in the state of Mato Grosso do Sul. In 2016, this indicator nearly doubled in the country; the lowest indicator was again in the state of Amazonas and the highest was in the state of Piauí. An important relative evolution occurred in the provision of speech therapists in Brazil in the period analyzed, with significant variation among the federative units. A negative correlation was found between the relative evolution in the last decade and the Human Development Index and a positive correlation was found with the Gini Index. **Conclusion:** The increase in the provision of speech therapists in the Brazilian public healthcare system was greater in federative units with lower human development and a greater concentration of income. Despite this, the results from 2016 showed the maintenance of the *status quo,* with a greater provision in federative units with greater human development.

Descritores

Oferta
Fonoaudiologia
Acesso aos Serviços de Saúde
Sistema Único de Saúde
Indicadores Sociais

RESUMO

Objetivo: investigar a correlação entre a oferta de fonoaudiólogos no Sistema Único de Saúde e os indicadores sociais no Brasil, entre 2007 e 2016. **Método:** trata-se de um estudo ecológico, cujas unidades de análise foram as 27 Unidades Federativas do país. Foram calculados os indicadores da oferta de fonoaudiólogos no Sistema Único de Saúde e a evolução relativa dessa oferta no período, bem como o índice de Desenvolvimento Humano e o Índice de Gini, ambos referentes ao ano 2010. A correlação foi investigada utilizando o teste de Spearman, com $\alpha = 5\%$. **Resultados:** Em 2007, a oferta de fonoaudiólogos no SUS foi de $3,55/10^5$ habitantes, com o menor indicador no Amazonas e o maior no Mato Grosso do Sul. Em 2016, esse indicador quase dobrou no país, com permanência do menor valor encontrado no Amazonas, e o maior no Piauí. Ocorreu uma importante evolução relativa da oferta de fonoaudiólogos no Brasil, nesse período, com significativas variações entre as unidades federativas. Houve correlação negativa entre a evolução relativa na última década e o IDH, e positiva com o índice de Gini. **Conclusão:** A evolução da oferta de fonoaudiólogos no Sistema Único de Saúde foi maior nas unidades federativas com menor desenvolvimento humano e maior concentração de renda. No entanto, a despeito disso, os resultados referentes a 2016, mostraram a manutenção do *status quo,* com a maior oferta naquelas unidades federativas com maior desenvolvimento humano.

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INTRODUCTION

Speech therapy is found on difference levels of health care, such as outpatient clinics, hospitals, and primary care services[1]. The implantation of the 'Extended Family Health Centers' in primary care in 2008 increased the provision of speech therapy in the Brazilian public healthcare system[2,3], favoring the access of the population to this specialty[4].

Among the studies that have addressed the distribution and provision of speech therapists in Brazil, three concluded that speech therapy in public health occurs in an unequal manner among the different regions and states of the country[2,3,5].

Social, regional, and ethnic inequalities are striking characteristics in Brazilian society that have marked the entire history of the country[6]. When considered unfair, avoidable, and unnecessary, inequalities take on a connotation related to the principle of social justice and are denominated inequities[7], the socioeconomic and environmental aspects are at the forefront of this scenario.

The indicators used to evaluate social inequities include the Human Development Index (HDI), which has increased in recent years and varies among the different states of Brazil[8], and the Gini Index, which is an indicator of inequality based on household income per capita and is strongly associated with social and health-related conditions[9]. Scientific evidence indicates associations between social indicators, such as the HDI and Gini Index, and general health indicators of the population[10-12].

Equity is one of the doctrinal principles of the Brazilian public healthcare system. Based on this principle, researchers highlight relations between access to health care and factors that permeate the social dynamics of the country[13-16].

Access is a term with a complex definition that has motivated numerous scientific productions[14-17]. Some authors state that access can be understood from the viewpoint of entry into healthcare services and is related to characteristics of the provision of services, referring to the possibility of using healthcare services when necessary[17,18]. The effective use of healthcare services can be measured by an evaluation of access, which results from a multiplicity of predisposing individual and contextual factors as well as those related to the quality of care, exerting an influence on the use and effectiveness of the care offered[17].

Studies have shown advances made by the Brazilian public healthcare system in ensuring universal access[19,20]. Despite progress with regards to the offer of services, there continue to be reports of disparities in terms of access[14,15] as well as inequalities in the distribution of healthcare providers and services among the different regions of the country[5,6,14,15], which are recognized as important challenges to overcome[6].

In this scenario, there are questions regarding the relationship between access to speech therapy in the public healthcare system and social indicators in Brazil. Therefore, the aim of the present study was to investigate correlations between the provision of speech therapists in the public healthcare system and correlations with social indicators in Brazil in the period between 2007 and 2016.

METHODS

This study was conducted in accordance with the ethical precepts stipulated in Resolution n°466/2012 of the National Board of Health. As the data analyzed are in the public domain, approval from an ethics committee was not required. All sources of data are duly cited throughout the article.

An ecological study was conducted. The units of analysis were the 27 federative units of Brazil. The period analyzed was 2007 to 2016, which was the most recent decade with data available in information systems during the data collection period.

The dependent variables were indicators of the provision of speech therapists in the public healthcare system in 2016 and the relative evolution of this provision during the period studied (2007-2016). These indicators were calculated using the formulas below:

$$\text{Availability of speech therapy in public health} = \frac{\text{Nº of speech therapists in public health in year}_x \text{ in federative unit}_x}{\text{Total number of residents in year}_x \text{ in federative unit}_x} \times 10^5 \quad (1)$$

$$\text{Relative evolution of provision} = \frac{\left[\left(\frac{\text{provision of speech therapy in public health in 2016}}{\text{Availability of speech therapy in public health in 2007}}\right) - 1\right]}{} \times 100 \quad (2)$$

The number of speech therapists in public healthcare was collected from the databank of the National Registry of Health Establishments using files with the *.dbc extension from the month of December of each year available on the website of the Informatics Department of the Health Ministry and processed using the Tabwin software, version 3.2. Census estimates from 2007 and 2016 were used for the number of residents in each federative unit. Data on the HDI and Gini Index refer to the year 2010 published in the 2013 Atlas of Human Development[9]. The 2010 base-year was selected because it was a census year in Brazil.

Both social indicators have a scale ranging from zero to one, but with opposite interpretations. For the HDI, a higher value indicates a higher level of human development. For the Gini Index, values closer to one indicate a greater concentration of income and, therefore, greater inequality.

The data were analyzed using descriptive statistics (measures of central tendency and dispersion). The Shapiro-Wilk test was used to determine the distribution (normal or non-normal) of the dependent variables ($\alpha = 5\%$). As non-normal distribution was demonstrated, Spearman's test was used to investigate correlations between the dependent and independent variables ($\alpha = 5\%$).

Thematic maps were created with the distribution of the independent variables and social indicators using distribution by quartiles with the aid of the Terraview program, version 4.2.1, developed by the *Instituto Nacional de Pesquisas Espaciais* (INPE [National Space Research Institute]).

RESULTS

The number of speech therapists in the Brazilian public healthcare system was $3.55/10^5$ residents in 2007, ranging from $0.68/10^5$ in the state of Amazonas to $5.64/10^5$ in the state of Paraná ($\delta = 1.38$; Md = 2.79). In 2016, number of speech therapists was $6.18/10^5$ residents, ranging from $2.57/10^5$ also in Amazonas to $7.69/10^5$ in Amapá ($\delta = 1.61$; Md = 6.13) (Table 1, Figure 1A and 1B).

The relative evolution in the provision of speech therapists in public health care increased by 74.26% in the period analyzed, with increases in all federative units. The increase ranged from 36.11% in the state of Paraná to 505.29% in the state of Sergipe ($\delta = 115.6$; Md = 91.4) (Table 1 and Figure 1C).

Regarding social indicators in Brazil, the Gini Index was 0.59, ranging from 0.49 in the state of Santa Catarina to 0.65 in Amazonas ($\delta = 0.039$; Md = 0.6) (Table 2 and Figure 2B). The HDI for Brazil was 0.7, ranging from 0.63 in the state of Alagoas to 0.82 in the Federal District ($\delta = 0.05$; Md = 0.7) (Table 2 and Figure 2A). The HDI-E (education) was 0.6 for the country, ranging from 0.52 in Alagoas to 0.74 in the Federal District ($\delta = 0.06$; Md = 0.6). The HDI-L (longevity) was 0.8, ranging from 0.75 in Alagoas to 0.87 in the Federal District ($\delta = 0.03$; Md = 0.8). The HDI-I (income) was 0.7, ranging from 0.61 in the state of Maranhão to 0.86 in the Federal District ($\delta = 0.05$; Md = 0.7) (Table 2).

A positive correlation was found between the provision of speech therapy in 2016 and the HDI among the federative units ($rs = 0.37$; $p = 0.05$) and a negative correlation was found between this provision and the Gini Index ($rs = -0.49$; $p = 0.01$) (Table 3).

The analysis of the relative evolution in the last decade among the federative units revealed a negative correlation with the HDI ($rs = -0.54$; $p = 0.004$) and a positive correlation with the Gini Index ($rs = 0.62$; $p = 0.0006$) (Table 3).

Correlations between the different HDI components (income, longevity, and education) and the dependent variables followed the same pattern as that found for the overall HDI, with statistical significance only for HDI-E (Table 3).

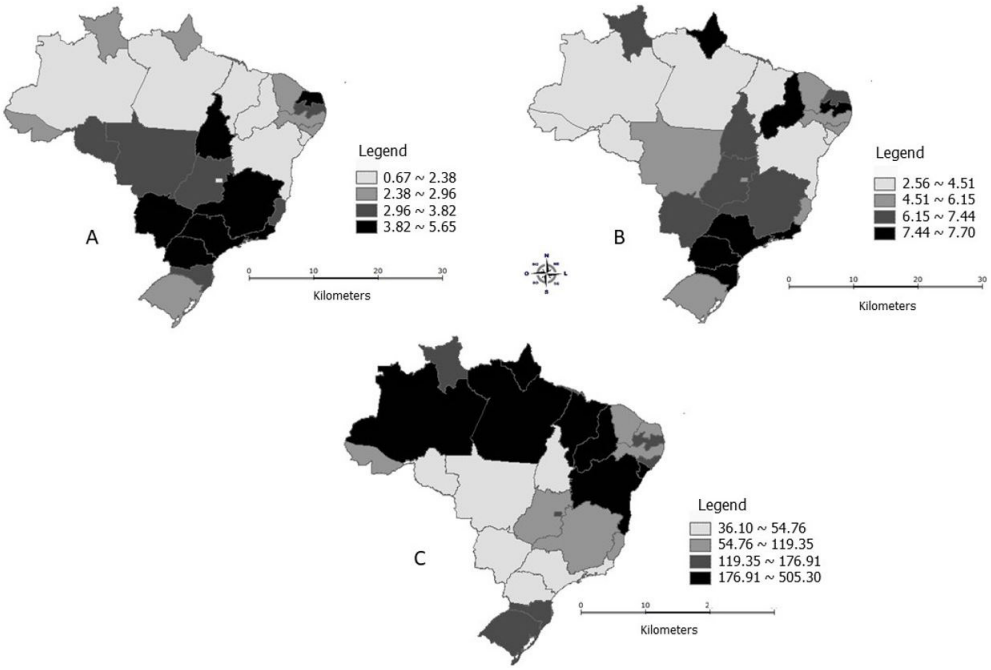
The spatial distribution of the indicators of the provision of speech therapy in public healthcare in 2007 and 2016 revealed a concentration of higher indicators among the states located in the southeastern region of the country. Different behavior was found regarding the distribution of the evolution of provision, with greater expansion in states located in the northern and northeastern regions (Figure 1A and Figure 1B).

The spatial distribution of the social indicators revealed the mirrored behavior between the HDI and Gini Index. Federative

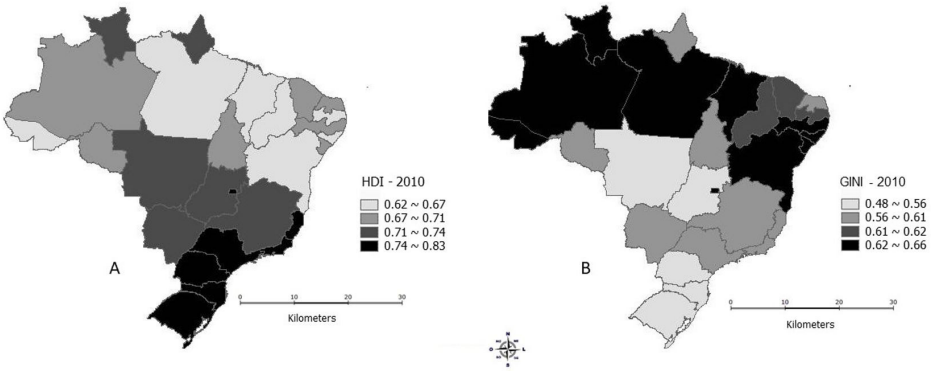
Table 1. Provision of speech therapy in public health care and evolution of provision in federative units, Brazil, 2007 and 2016

Federative Unit	Provision of speech therapy in 2007	Provision of speech therapy in 2016	Relative evolution
Rondônia	2.96	4.03	36.20
Acre	2.59	4.04	55.78
Amazonas	0.68	2.57	276.96
Roraima	2.78	6.42	130.87
Pará	1.10	3.05	176.91
Amapá	2.38	7.67	221.75
Tocantins	4.34	6.59	51.74
Maranhão	0.93	4.10	339.96
Piauí	1.68	7.69	357.21
Ceará	2.39	4.51	88.22
Rio Grande do Norte	3.82	7.05	84.76
Paraíba	3.32	7.58	128.00
Pernambuco	2.79	5.35	91.40
Alagoas	2.60	6.13	135.78
Sergipe	0.72	4.37	505.29
Bahia	1.26	3.50	178.60
Minas Gerais	4.56	7.34	60.92
Espírito Santo	3.25	5.03	54.76
Rio de Janeiro	4.87	7.44	52.68
São Paulo	5.00	7.49	49.68
Paraná	5.64	7.68	36.11
Santa Catarina	3.34	7.48	123.92
Rio Grande do Sul	2.65	5.80	119.35
Mato Grosso do Sul	4.94	6.86	38.77
Mato Grosso	3.33	5.05	51.81
Goiás	3.68	6.15	67.05
Federal District	1.67	4.57	173.63
Total	**3.55**	**6.18**	**74.26**

Caption: Provision of speech therapy = number of therapists per 100 thousand residents. Relative evolution expressed as percentage
Source: National Registry of Health Establishments of Health Ministry[21]



Caption: (A) Coefficient of provision of speech therapy in public health in 2007; (B) Coefficient of provision of speech therapy in public health in 2016; (C) Coefficient of relative evolution of provision of speech therapy in public health 2007-2016.
Figure 1. Spatial distribution of provision of speech therapy in public health care and relative evolution of provision among federative units, Brazil, 2007 and 2016



Caption: (A) Human Development Index 2010; (B) Gini Index 2010
Figure 2. Spatial distribution of Human Development Index and Gini Index among federative units, Brazil, 2010

units with an HDI indicating greater human development (darker on the map) were those with the lowest Gini Index values, indicating a lower concentration of income (Figure 2A and Figure 2B).

DISCUSSION

The present findings indicate correlations between social indicators and the provision of speech therapy in the Brazilian public healthcare system. For a better understanding of these findings, it is important to bear in mind the inversely proportional relation between the HDI and Gini Index – one increases as the other diminishes, demonstrating that the concentration of income has direct repercussions on human development[22].

In both 2007 and 2016, the highest indicators of the provision of speech therapy were found in states located in the southern and southeastern regions of Brazil. These regions also had the highest HDI and lowest Gini Index values, revealing that the federative units that offer speech therapy more have a higher level of human development and, therefore, a lower concentration of income. Likewise, the lowest indicators of the provision of speech therapy in both years were found in states located in the northern and northeastern regions, which had the lowest HDI and highest Gini Index values, revealing greater difficulty in gaining access to speech therapy in the public healthcare system in states and regions with a greater concentration of income and, therefore, lower level of human development. These findings

Table 2. Gini Index, HDI, HDI-E, HDI-L, and HDI-I according to federative unit, Brazil, 2010

Federative Unit	GINI	HDI	HDI-E	HDI-L	HDI-I
Rondônia	0.56	0.690	0.577	0.800	0.712
Acre	0.63	0.663	0.559	0.777	0.671
Amazonas	0.65	0.674	0.561	0.805	0.677
Roraima	0.63	0.707	0.628	0.809	0.695
Pará	0.62	0.646	0.528	0.789	0.646
Amapá	0.60	0.708	0.629	0.813	0.694
Tocantins	0.60	0.699	0.624	0.793	0.690
Maranhão	0.62	0.639	0.562	0.757	0.612
Piauí	0.61	0.646	0.547	0.777	0.635
Ceará	0.61	0.682	0.615	0.793	0.651
Rio Grande do Norte	0.60	0.684	0.597	0.792	0.678
Paraíba	0.61	0.658	0.555	0.783	0.656
Pernambuco	0.62	0.673	0.574	0.789	0.673
Alagoas	0.63	0.631	0.520	0.755	0.641
Sergipe	0.62	0.665	0.560	0.781	0.672
Bahia	0.62	0.660	0.555	0.783	0.663
Minas Gerais	0.56	0.731	0.638	0.838	0.730
Espírito Santo	0.56	0.740	0.653	0.835	0.743
Rio de Janeiro	0.59	0.761	0.675	0.835	0.782
São Paulo	0.56	0.783	0.719	0.845	0.789
Paraná	0.53	0.749	0.668	0.830	0.757
Santa Catarina	0.49	0.774	0.697	0.860	0.773
Rio Grande do Sul	0.54	0.746	0.642	0.840	0.769
Mato Grosso do Sul	0.56	0.729	0.629	0.833	0.740
Mato Grosso	0.55	0.725	0.635	0.821	0.732
Goiás	0.55	0.735	0.646	0.827	0.742
Federal District	0.63	0.824	0.742	0.873	0.863
Total	**0.59**	**0.705**	**0.612**	**0.809**	**0.707**

Caption: HDI (Human Development Index), HDI-E (Human Development Index - Education), HDI-L (Human Development Index - Longevity), HDI-I (Human Development Index - Income)
Source: Atlas of Human Development[9]

Table 3. Correlations between social indicators and dependent variables

Social indicators	Provision of speech therapy in public health in 2016		Relative evolution 2007-2016	
	Spearman's coefficient	*p-value*	*Spearman's coefficient*	*p-value*
HDI	rs = 0.37	p = 0.056	rs = -0.54	p = 0.004
HDI-E	rs = 0.38	p = 0.051	rs = -0.51	p = 0.007
HDI-L	rs = 0.31	p = 0.122	rs = -0.45	p = 0.018
HDI-I	rs = 0.32	p = 0.110	rs = -0.55	p = 0.003
Gini Index	rs = - 0.49	p = 0.01	rs = 0.62	p = 0.0006

Caption: HDI (Human Development Index), HDI-E (Human Development Index - Education), HDI-L (Human Development Index - Longevity), HDI-I (Human Development Index - Income)

point to persistent inequality, as studies conducted in previous periods also report unequal provision[2,3,5,23,24].

The studies cited showed that higher percentages of speech therapy procedures and therapists in the public healthcare system were also concentrated in areas with a more favorable socioeconomic status, such as the southeastern and southern regions of the country, and lower percentages were concentrated in areas with a poorer socioeconomic status, such as the northern and northeastern regions[2,5,23,24].

A study addressing speech therapy in the Brazilian public healthcare system found that more than half of the procedures recorded in the country in 2010 were concentrated in the southeastern region, which is the wealthiest region of Brazil, and this same region had the highest percentage of speech therapists in the period analyzed. The authors also found disparity between the quantity and need for speech therapists in public health care in the northern and northeastern regions, revealing a deficit in these regions in the period analyzed[5].

Likewise, studies analyzing the evolution of the provision of speech therapists in the public healthcare system and primary care in Brazil from 2008 to 2013[2] and from 2005 to 2015[3] found a greater concentration of provision in the southeastern region and lower concentration in the northern region, demonstrating that the distribution of the provision of speech therapists seems to maintain an association with social inequalities.

Regarding intra-regional inequalities, a previous study found an insufficient, unequal distribution in the provision of speech therapists at municipal public healthcare services among state capitals in the northeastern region of Brazil, exerting a negative impact on access of the population to this type of therapy[24].

Moreover, this inequality is not restricted to the field of speech therapy. A study addressing indicators of oral health in primary care and its association with socioeconomic status concluded that municipalities with a higher HDI in Brazil were those with the highest proportions of first dental appointments[25], which may be explained by the greater provision of services that these municipalities offer to the population. The same study also found that the states of Rio Grande do Sul and Santa Catarina, both of which are located in the southern region of the country, had the highest proportions of dentists at public healthcare services[25].

Regarding the relative evolution of the provision of speech therapy in the period studied, expansion occurred in all federative units. However, the highest indices of this evolution were found in states located in the northern and northeastern regions, which had the lowest HDI and highest Gini Index values. Lower evolution indices were found in states located in the southeastern, southern, and central western regions, where the highest HDI and lowest Gini Index values were found.

Similar results were described in a previous study, which found expansion in the provision of speech therapy in public health care in all federative units of Brazil, especially the states of Sergipe, Piauí, and Bahia, which are located in the northeastern region[2]. The quantitative expansion of speech therapists also occurred in all regions of Brazil between 2000 and 2010, especially the northern region, and an increase in this provision was found among capital cities in the northeastern region of the country between 2007 and 2014[5,24]. In the period from 2005 to 2015, the number of speech therapists on the primary care level of the public healthcare system more than doubled, with a greater concentration in the southeastern region[3].

Although the relative evolution in the last decade shows greater expansion in access to speech therapy in public health care among states with lower human development and a greater concentration of income, the results found in 2016 reveal few changes in relation to the pattern found in 2007, demonstrating that there is still a long way to go to ensure an equanimous offer of speech therapy.

The evolution of the offer of speech therapy in the Brazilian healthcare system found in the present study was not enough to cover the existing demand in states with low levels of human development. Some authors agree that a reduction in inequalities has occurred, especially in recent years[2,5,23,24,26,27]. However, disparities in the provision of speech therapists and inequalities in their distribution among the federative units remain, as regions with a better socioeconomic status have better indicators of the provision of speech therapy, whereas those with the poorest indicators provide fewer services, which is in agreement with data described in previous studies[5,7,26,27].

The expansion in access to speech therapy in regions with a lower socioeconomic status (north and northeast) is certainly related to the expansion in the coverage of primary care in these regions, oriented mainly by one of the guiding principles of the Brazilian public healthcare system – equity. Regarding the southern and southeastern regions, despite concentrating states with better indictors of the provision of speech therapy in the present investigation, a previous study that analyzed this provision in primary care measured respective deficits of 65.4% and 42.3% regarding the number of therapists needed[3]. Therefore, despite important inequalities among the different regions, there is a need to broaden access to speech therapy in the entire country.

The authors recognize some methodological limitations of the present study, such as the use of secondary data, which are subject to underreporting and the quality of information, and the level of state aggregation, which is subject to fluctuations due to the use of the mean HDI and Gini Index values. However, these data from official information systems of the Health Ministry, such as those from the National Registry of Health Establishments, and official sites of the United Nations (social indicators) are important to the execution of academic studies and the production of evidence that can contribute to the planning, implantation, and improvement of services and actions inherent to public health. Another limitation was the non-investigation of the migration of speech therapists from one state to another. However, the authors believe that such migrations are isolated cases and would certainly not have a substantial effect on the results of this study.

This study with secondary data enabled raising hypotheses that could be confirmed in future studies that address this issue with the aim of producing and discussing information that contributes to the consolidation of speech therapy services in the Brazilian public healthcare system and ensuring access to health, respecting the principles of universality and equity.

CONCLUSION

The evolution of the offer of speech therapy was greater in federative units with lower human development and a greater concentration of income. This finding reveals how this expansion in the last decade was an attempt to minimize the effects of social inequality regarding access to human communication health in the Brazilian public healthcare system. Despite this, the results from 2016 revealed the maintenance of the *status quo*, with a greater provision of speech therapy in federative units with greater human development.

Efforts are needed to ensure that the path of change is not lost, as the advances achieved do not yet meet the demands for speech therapy in any part of the country. A country with such inequality that opted for universal access needs to ensure that care is within the reach of all those who need it. The same is true for speech therapy, which should be a right to all and a duty of the State.

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Author contributions

RPMS participated in the planning, data collection and analysis and final revision of the manuscript; CMBN, GMDM, VLM, and MLLTL participated in the analysis, writing and final revision of the manuscript; and MBRV served as the adviser and participated in the idealization of the study, data analysis, writing and final revision of the manuscript.