Rev. CFFAC, 2018 Majo-Jun; 20(3):353-362

Artigos originais

Fonoaudiologia na Atenção Básica no Brasil: análise da oferta e estimativa do déficit, 2005-2015

Speech, Language and Hearing services in Primary Health Care in Brazil: an analysis of provision and an estimate of shortage, 2005-2015

> Larissa Hellen Teixeira Viégas⁽¹⁾ Tatiane Costa Meira⁽²⁾ Brenda Sousa Santos(1) Yukari Figueroa Mise(2) Vladimir Andrei Rodrigues Arce(1) Silvia Ferrite^(1,2)

- (1) Instituto de Ciências da Saúde da Universidade Federal da Bahia, Salvador, Bahia, Brasil.
- (2) Instituto de Saúde Coletiva da Universidade Federal da Bahia, Salvador, Bahia, Brasil.

Research support source: Scientific Initiation Grant - Pibic/CNPg. Process no.: 122275/2016-0.

Study (partial) presented and awarded at the XXV Brazilian Congress of Speech, Language and Hearing Sciences, 2017.

Conflict of interests: Nonexistent



Received on: February 10, 2018 Accepted on: May 2, 2018

Mailing address:

Silvia Ferrite Instituto de Ciências da Saúde, Departamento de Fonoaudiologia, UFBA Avenida Reitor Miguel Calmon, s/n, Vale do Canela CEP: 40.110-902, Salvador, Bahia, Brasil

E-mail: ferrite@ufba.br

ABSTRACT

Objective: to investigate the evolution and estimate the shortage of Speech, Language and Hearing professionals in Primary Health Care between 2005 and 2015.

Methods: a mixed ecological study using data from the National Registry of Health Facilities and the Primary Health Care Information System. A descriptive analysis regarding the evolution of the number of professionals working in Primary Health Care over this period, in Brazilian states and regions, was conducted. The ratio of professionals per 100,000 inhabitants for the years 2005, 2010 and 2015, and the shortages in 2015, were estimated.

Results: in 2005, there were 1,717 professionals working in Primary Health Care, that is, one per 100,000 inhabitants. In 2015, there were 4,124, increasing to 2.1/100,000. In 2015, the shortage in supply was 55.1%, varying widely across the states.

Conclusion: the shortage in supply is equivalent to an absence of Speech, Language and Hearing service coverage within Primary Health Care for more than half of the Brazilian population. It is worth noting that a conservative parameter was adopted to conduct this estimate. The results suggest a process of consolidation for the inclusion of Speech, Language and Hearing professionals within Primary Health Care, however, still characterized by insufficient and unequal supply across the nation.

Keywords: Speech, Language and Hearing Sciences; Health Service Accessibility; Unified Health System; Primary Health Care

INTRODUCTION

The establishment of the Unified Health System (Sistema Único de Saúde: SUS) in 1988 promoted reflection about and changes to the work performed by a range of professionals. Speech, Language and Hearing (SLH) professionals, whose practices were historically defined by a health care model, have since expanded their activities towards a collective, social and preventative approach1.

In Brazil, the work of SLH professionals in health centres began in the 1970s². However, the first public examinations to contract SLH professionals for primary health care only took place in 1989, following the creation of SUS3. During this period, a lack of knowledge about the new health system and the new possibilities for professional operations beyond clinical intervention hindered their inclusion in Primary Health Care activities, resulting in a certain isolation from other professionals^{3,4}. At the time of a growth in professional inclusion in Primary Health Care, the necessary review of graduate course curriculums in Brazil received a boost in 2002, in the form of the new National Curricular Guidelines⁵.

Of all the strategies aimed at the organization of Primary Health Care⁶, the creation of the Family Health Support Centers (Núcleos de Apoio à Saúde da Família: NASF) in 20087 included SLH professionals as part of the minimum team composition; this was not compulsory, however. In this arena the professional must prioritize activities that focus on the collective and on community integration⁸ and should organize their practices according to defined territorial bases and knowledge of the population's health needs9. The need for SLH services is also recognized in a number of national policies which cover Primary Health Care activities.

Sousa et al. (2017)¹⁰ recently analyzed the provision of SLH professionals in Primary Health Care, confirming an evolution of 62.1% between 2008 and 2013, but with geographical inequalities across the nation. Despite this evolution, the process of reframing conceptions and the adoption of intervention methodologies in the field of health promotion and prevention in SLH services, difficulties in accessing services remain common, based on evidence that indicates insufficient SLH provision in SUS1,10-13.

Within health, supply is related to the availability of services, human resources and other products in public establishments. It may also be understood as an aspect that intervenes in the relationship between individuals and services¹⁴. Access may be viewed as the timely use of services sufficient to achieve results. Thus, the discussion of supply necessarily involves the guarantee of timely access¹⁵.

Finding out about the supply of professionals via the main gateway to the health system may contribute to an understanding of the population's access to SLH services. The aim of this study, therefore, is to investigate the evolution and estimate the shortage of the provision of SLH services in Primary Health Care, in SUS, between 2005 and 2015.

METHODS

The study was approved by the Research Ethics Committee of the Institute of Collective Health at the Federal University of Bahia (Protocol no.: 027-16, report no.: 1.659.113).

This is a mixed ecological study in which the units of observation were geographical locations: all the federal states and the large regions of Brazil, for which we ascertained the evolution of the number SLH professionals working in Primary Health Care between 2005 and 2015, and the shortage of SLH professionals in Primary Health Care in 2015.

We utilized secondary data from the public domain, generated by three sources for each state and each calendar year under analysis. Data relating to professionals was collected from the National Registry of Health Facilities (Cadastro Nacional de Estabelecimentos de Saúde: CNES) according to the occupation 'Speech, Language and Hearing professional' and occupancy within Primary Health Care. We collected data regarding the population from the Brazilian Institute of Geography and Statistics (Instituto Brasileiro de Geografia e Estatística: IBGE) via the Primary Health Care Information System (Sistema de Informação da Atenção Básica: SIAB).

Data collection from the CNES was conducted via TABNET for the months between August 2005 and November 2015, through a record search for "Human Resources" selected from the option "occupation". We selected the following parameters to obtain data for the period from 2005 to 2015: Line – regions/unit; Column – year/month operation; Content - works at SUS; Period (month/year) - August (2005) and July (2006-2015); Type of Establishment - Health Fitness Academy; Health Centre/Primary Health Care Unit; Family Health Support Centre; Health Unit; Family Health Unit and Indigenous Health Care Unit; Occupation at higher education level and in general - Speech, Language

and Hearing professional. For 2005, we selected the month of August, since it was the first month data was available.

The selection of type of establishment was defined by a clear link to Primary Health Care; we therefore did not consider mixed units or speciality health centres. The main variable investigated in this study was the number of SLH professionals in Primary Health Care by state, region and calendar year. We considered all the SLH professionals occupied in any of the health establishments within the Primary Health Care network.

Following data collection, we first conducted a descriptive analysis of the evolution of the number of SLH professionals who worked in Primary Health Care by state and region for each annual period from 2005 to 2015. We estimated the relative percentage variation (RPV) of the number of SLH professionals in Primary Health Care in Brazil between 2005 and 2015 using the following calculation: $(nfono_{2015}-nfono_{2005})/nfono_{2005}$ x 100, where "nfono" represents the number of SLH professionals in Primary Health Care in that particular year. As a relative measurement, we estimated the ratio of SLH professionals in Primary Health Care per 100,000 inhabitants, using the calculation: (nfono/pop) x 100,000, where "pop" represents the population of the state or geographic region in 2005, 2010 and 2015. We also estimated the variation in this ratio over the period 2005-2015 using the calculation: (rfono₂₀₁₅-rfono₂₀₀₅)/ rfono₂₀₀₅ x 100, where "rfono" represents the ratio of SLH professionals in Primary Health Care in relation to the resident population in that year.

The need for and absolute and relative shortage of SLH professionals in Primary Health Care were estimated according to the parameter suggested by Santos et al (2017)11, based on Decree no. 3214 of 20127 which redefined as "9" the maximum number of Family Health Teams linked to NASFs, which, in turn, include SLH professionals as part of their teams. In this way, need was estimated according to the calculation: (N EqSF/9) where N EqSF refers to the projected number of Family Health teams required for total coverage of the municipality's resident population, and "9" is the maximum number of Family Health teams linked to each NASF. In order to carry out this projection, we adopted the ratio of one Family Health team for every 3,450 inhabitants, a standard calculation used by the Ministry of Health's Department of Primary Health Care¹⁶. This projection was applied to each of the 5,570 Brazilian municipalities, given that Primary Health Care services fall under municipal administration. It took into consideration the expectation of one SLH professional per NASF and then estimated the shortage of professionals in 2015. For municipalities with up to 31,050 inhabitants (3,450 x 9) we recorded the need for one SLH professional.

We used the SAS programme 9.4 to analyse our data and the TabWin programme to construct the maps.

RESULTS

Number of Speech, Language and Hearing professionals in Primary Health Care

In Brazil, in 2005, there were 1,717 SLH professionals registered on the CNES in Primary Health Care establishments, with a rise to 4,124 in 2015 and an estimated RPV of 140.2%. Between 2005 and 2015, we observed the highest number of professionals in the Southeast region and the lowest in the North, while confirming that the Northeast region presented the greatest variation over this period (+800%).

In 2005, there were no records of SLH professionals in Primary Health Care in either Sergipe or the Federal District, while there was only one recorded in Amazonas and one in Maranhão. For their part, São Paulo (n=708), Rio de Janeiro (n=233) and Minas Gerais (n=209) had the highest number of such professionals within Primary Health Care (Table 1).

Table 1. Speech, Language and Hearing professionals (SLHs) per 100,000 inhabitants within Primary Health Care, per Brazilian geographical region and state, 2005-2015

	2005			2010			2015		
Geographical Location	NSLHs	Population	SLHs in Primary Health Care/ 100,000 inhab.	NSLHs	Population	SLHs in Primary Health Care/ 100,000 inhab.	NSLHs	Population	SLHs in Primary Health Care/ 100,000 inhab.
Brazil	1,717	177,243,280	1.0	2,871	189,701,259	1.5	4,124	193,976,530	2.1
North	25	13,880,240	0.2	103	15,195,860	0.7	164	16,347,807	1.0
Rondônia	3	1,474,453	0.2	5	1,493,566	0.3	12	1,590,011	0.8
Acre	4	607,839	0.7	11	680,073	1.6	10	758,786	1.3
Amazonas	1	3,034,159	0.0	19	3,341,096	0.6	24	3,590,985	0.7
Roraima	2	360,529	0.6	2	412,783	0.5	9	469,524	1.9
Para	11	6,615,158	0.2	43	7,374,669	0.6	80	7,822,205	1.0
Amapá	2	537,247	0.4	18	613,164	2.9	21	698,602	3.0
Tocantins	2	1,250,855	0.2	5	1,280,509	0.4	8	1,417,694	0.6
Northeast	122	49,651,734	0.2	473	53,115,026	0.9	1,053	53,907,144	2.0
Maranhão	1	5,926,408	0.0	54	6,305,539	0.9	125	6,714,314	1.9
Piauí	3	2,945,444	0.1	40	3,119,697	1.3	127	3,160,748	4.0
Ceara	33	7,764,638	0.4	105	8,451,359	1.2	170	8,606,005	2.0
Rio Grande do Norte	12	2,904,932	0.4	41	3,106,430	1.3	97	3,228,198	3.0
Paraíba	9	3,532,620	0.3	78	3,742,606	2.1	151	3,815,171	4.0
Pernambuco	44	8,182,842	0.5	91	8,757,198	1.0	181	8,931,028	2.0
Alagoas	2	2,923,524	0.1	15	3,127,557	0.5	33	3,165,472	1.0
Sergipe ¹	5	2,012,710	0.2	3	1,999,374	0.2	26	2,110,867	1.2
Bahia	13	13,458,616	0.1	46	14,505,266	0.3	143	14,175,341	1.0
Southeast	1,184	75,410,800	1.6	1,689	80,193,204	2.1	2,101	81,565,983	2.6
Minas Gerais	209	18,565,096	1.1	427	19,852,798	2.2	689	19,855,332	3.5
Espírito Santo	34	3,251,862	1.0	66	3,453,648	1.9	76	3,578,067	2.1
Rio de Janeiro	233	14,880,236	1.6	260	15,873,973	1.6	276	16,231,365	1.7
São Paulo	708	38,713,606	1.8	936	41,012,785	2.3	1,060	41,901,219	2.5
South	306	26,054,247	1.2	442	27,499,861	1.6	567	27,731,644	2.0
Paraná	119	9,923,007	1.2	155	10,591,436	1.5	231	10,577,755	2.2
Santa Catarina	85	5,610,207	1.5	100	6,052,587	1.7	151	6,383,286	2.4
Rio Grande do Sul	102	10,521,033	1.0	187	10,855,838	1.7	185	10,770,603	1.7
Central West	86	12,571,352	0.7	164	13,697,308	1.2	239	14,423,952	1.7
Mato Grosso do Sul	39	2,184,269	1.8	60	2,336,058	2.6	70	2,505,088	2.8
Mato Grosso	10	2,682,553	0.4	20	2,957,732	0.7	28	3,115,336	0.9
Goiás	36	5,319,532	0.7	81	5,845,146	1.4	131	6,154,996	2.1
Distrito Federal ¹	1	2,384,998	0.0	3	2,558,372	0.1	10	2,648,532	0.4

¹Calculation initiated in different years, due to the absence of records for the number of SLHs in 2005. NSLHs – number of Speech, Language and Hearing professionals; inhab.- inhabitants

Data source: National Registry of Health Facilities; Department of Primary Health Care, 2005-2015.

In 2015, the smallest contingents of SLH professionals were observed in Tocantins (n=8), Roraima (n=9), Acre and the Federal District (n=10), while the largest were in São Paulo (n=1,060), Minas Gerais (n=689) and Rio de Janeiro (n=276).

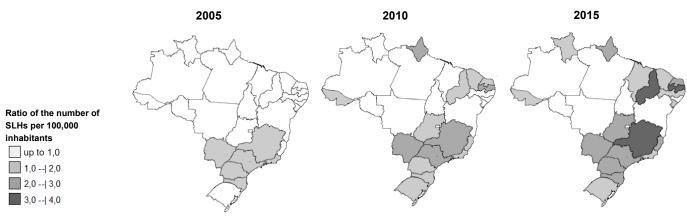
Supply of Speech, Language and Hearing professionals in Primary Health Care per 100,000 inhabitants

In our analysis of the number of SLH professionals in relation to the population for the entire country, we estimated a ratio of 1/100,000 inhabitants within Primary Health Care in 2005 and one of 2.1/100,000 in 2015, representing a RPV of 119.5%

In 2005, the per-region analysis revealed the lowest estimate for the North and Northeast regions

(0.2/100,000) and the highest for the Southeast (1.6/100,000) (Table 1). Among the states, São Paulo and Mato Grosso do Sul (1.8/100,000), Rio de Janeiro (1.6/100,000), Santa Catarina (1.5/100,000), Paraná (1.2/100,000) and Rio Grande do Sul (1.0/100,000) recorded the highest values, while the other states only obtained a ratio below 1.0 (Table 1).

In 2015, the North region attained a ratio of 1.0 SLH professional for every 100,000 inhabitants, while the Southeast region obtained 2.5/100,000, corresponding to the lowest and highest estimates for all the regions. In terms of the states, the highest ratios were identified in Piauí and Paraíba (4.0/100,000), and in Minas Gerais (3.5/100,000). On the other hand, the lowest values were found in Amazonas (0.7/100,000), Tocantins (0.6/100,000) and the Federal District (0.4/100,000) (Figure 1).



Data source: National Registry of Health Facilities; Department of Primary Health Care, 2005-2015.

Figure 1. Map of ratio of the number of Speech, Language and Hearing professionals within Primary Health Care per 100,000 inhabitants by federal state, 2005-2015

Absolute and relative shortage of Speech, **Language and Hearing professionals within Primary Health Care**

We estimated a need for 9,195 SLH professionals in Brazil in 2015, which, when compared to the supply of professionals, resulted in an absolute shortage of 5,071 professionals. This corresponds to a relative shortage of 55.1% of the total SLH professionals who should be incorporated into Primary Health Care around the country. The North region is noticeable for presenting the greatest shortage (77.7%) and the Southeast region the smallest (42.3%). Of the 27 states, 19 presented with a shortage above or equal to 50.0%. The greatest shortages were identified in Tocantins (94.8%), the Federal District (88.2%), Mato Grosso (84.7%) and Rondônia (84.2%), while the least were found in Amapá (30.0%), Mato Grosso do Sul (40.2%), Minas Gerais (40.9%) and São Paulo (43.3%) (Table 2).

Table 2. Shortage of Speech, Language and Hearing professionals (SLHs) within Primary Health Care by geographical region and federal state in 2015

Local	Population	SLHs required	Existing SLHs	Absolute shortage	Relative shortage (%)
Brazil	193,976,530	9,195	4,124	5,071	55.1
North	16,347,807	734	164	570	77.7
Rondônia	1,590,011	76	12	64	84.2
Acre	758,786	34	10	24	70.6
Amazonas	3,590,985	133	24	109	82.0
Roraima	469,524	25	9	16	64.0
Pará	7,822,205	283	80	203	71.7
Amapá	698,602	30	21	9	30.0
Tocantins	1,417,694	153	8	145	94.8
Northeast	53,907,144	2,565	1,053	1,512	58.9
Maranhão	6,714,314	299	125	174	58.2
Piauí	3,160,748	257	127	130	50.6
Ceará	8,606,005	331	170	161	48.6
Rio Grande do Norte	3,228,198	212	97	115	54.2
Paraíba	3,815,171	270	151	119	44.1
Pernambuco	8,931,028	344	181	163	47.4
Alagoas	3,165,472	125	33	92	73.6
Sergipe	2,110,867	105	26	79	75.2
Bahia	14,175,341	622	143	479	77.0
Southeast	81,565,983	3,732	2,153	1,579	42.3
Minas Gerais	19,855,332	1,165	689	476	40.9
Espírito Santo	3,578,067	144	76	68	47.2
Rio de Janeiro	16,231,365	552	276	276	50.0
São Paulo	41,901,219	1,871	1,060	811	43.3
South	27,731,644	1,637	567	1,070	65.4
Paraná	10,577,755	575	231	344	59.8
Santa Catarina	6,383,286	390	151	239	61.3
Rio Grande do Sul	10,770,603	672	185	487	72.5
Central West	14,423,952	737	239	498	67.6
Mato Grosso do Sul	2,505,088	117	70	47	40.2
Mato Grosso	3,115,336	183	28	155	84.7
Goiás	6,154,996	352	131	221	62.8
Distrito Federal	2,648,532	85	10	75	88.2

Data source: National Registry of Health Facilities; Department of Primary Health Care, 2005-2015.

DISCUSSION

Between 2005 and 2015 the supply of SLH services in SUS more than doubled in terms of the number of professionals within the Primary Health Care network in Brazil, and the same occurred when we analysed supply relative to the country's population. We also confirmed that the supply of SLH services in SUS within Primary Health Care is unequally distributed across the country's regions, with the greatest supply in the Southeast region and the least in the North region,

over the entire period. In 2015, while Piauí, Paraíba and Minas Gerais had more than three SLH professionals per 100,000 inhabitants in their Primary Health Care networks, Amazonas, Tocantins and the Federal District had less than one. The estimated shortage for the country is equivalent to an absence of SLH service coverage in Primary Health Care for more than half of the Brazilian population, noting, once again, that we adopted a conservative parameter as the premise of our estimate.

Supply of Speech, Language and Hearing professionals in Primary Health Care

The growth in the supply of SLH services in SUS was also assessed by Miranda et al. (2015)12, who investigated an evaluation of SLH health care in SUS over five-year periods between 2000 and 2010, through an analysis of the number of procedures, the amount paid and the number of professionals, independent of level of care. During that period, a growth of 118.8% was seen in the number of SLH professionals in the country. In our study, we confirmed a more significant growth in the number of SLH professionals in Primary Health Care from 2005 to 2015 - 140.2%.

Specifically, in relation to the number of SLH professionals in Primary Health Care per 100,000 inhabitants. taking account of the resident population in each federal state, this study identified significant growth in the supply of SLH services in the country, which was more evident in the Northeast and North - the regions with the least provision at the beginning of the period (2005). In the meantime, we also observed an intense concentration of these professionals in the Southeast region. The same pattern was seen in a study conducted by Buarque et al. (2009)¹³, which described the supply of SLH professionals in SUS by Brazilian region and found a greater shortage of professionals in the North (60.89%) and Northeast (50.65%) regions according to the parameters established by Lessa and Miranda (2005)17.

Absolute and relative shortage of Speech. Language and Hearing professionals in Primary Health Care

The alternative parameter adopted in our study to estimate the shortage of SLH professionals in Primary Health Care was initially proposed by Santos et al. (2017)¹¹, when analysing the provision of SLH services specifically in the capitals in Northeast Brazil. Together, the shortage of SLH professionals in Primary Health Care in these capitals was 83.9%. We note that this only took account of the supply within the municipal public health network (directly administered). In the same way, the estimated shortage in our study revealed that the growth in supply still did not attain a level sufficient to guarantee universal access, taking as its reference parameter one SLH professional for every 100,000 inhabitants in Primary Health Care¹⁷, or the alternative parameter of the need for SLH professionals in Primary Health Care, providing 100% coverage of the Family

Health Strategy (Estratégia Saúde da Família: ESF) and the expectation of one SLH professional per NASF team11. We should also note that the adopted parameter is conservative, since it considers the maximum number of teams per type 1 NASF, which may range from five to nine. Furthermore, the number of teams in type 2 and 3 NASFs may vary from three to four and from one to two teams respectively7.

We observed that the greatest provision of SLH services per 100,000 inhabitants did not necessarily correspond to the lowest estimated shortages. This is because of the difference between methodological procedures, since relative supply was estimated taking the total population of each federal state as a reference, while shortage was calculated taking as a reference each one of their municipalities.

Regional inequalities

Regional inequalities in the supply of SLH professionals confirmed in this study should be considered in the light of the heterogeneity of living and health conditions across Brazil. Inequality in access to health services appears to be historically explained by disparities in the regions' socio-economic development, principally occasioned by the unequal distribution of financial resources between the country's geographical areas. Despite an increase in federal resources allocated to health, specifically to the North and Northeast regions, health access in these regions does not obtain the same level seen in the South and Southeast regions^{18,19}.

A recent study described five types of health regions in Brazil based on the Human Development Index (HDI), with type "1" representing the health regions with the best indices and type "5" those with the worst. The Southeast contained the greatest concentration of health regions between types "1" and "2", while the North and Northeast presented the greatest concentration of type "4" and "5" health regions²⁰. Thus, the distribution of the supply of SLH professionals appears to mirror the social inequalities observed in this territorial analysis. It is worth noting the importance of discussions about the provision of and access to SLH services, taking account of a contextual analysis of social, political and economic indicators, while also bearing in mind that meeting SUS's equity health principle may influence changes in access to health.

Speech, Language and Hearing Health Care in **Primary Health Care**

When we discuss the supply of SLH Health Care within Primary Health Care, we should consider the historical perspective of the construction of the professional identity of the SLH professional, mediated by training and operational pathways in Brazil. Changes in 2002 to curricular guidelines for SLH graduation courses and the implementation of public health policies that cover the range of SLH activities, for example the National Hearing Healthcare Policy, the School Health Programme, the National Policy for the Integration of Disabled People and the National Policy for Child Health, have represented important movements towards incorporating these professionals within Primary Health Care. However, inequality in supply, still evident in 2015, suggests that this process has differed across the country's federal states.

Furthermore, the increase in the number of SLH professionals in Primary Health Care appears to be connected to the Ministry of Health's 2008 creation of NASFs, whose main objective is to support the consolidation of Primary Health Care in Brazil, expanding the supply of health professionals within the network of services and promoting resolutive and comprehensive health activities7.

The NASF is the main arena for the incorporation of the SLH professional within Primary Health Care, where the professional shares their health practices and knowledge and is able to organize them into defined territorial areas according to knowledge of the population's health needs and specific epidemiological profiles9. Although practice itself and the healthcare model are not the object of this study, we note that a number of studies have indicated that there remains a certain emphasis on practices centred on disease, on the individual and on rehabilitation/treatment in the NASF context, despite these being carried out within a broader perspective and in detriment to collective practices^{21,22}.

The importance of activities involving the SLH professional in Primary Health Care has been recognized at global level. For example, in Australia, some SLH procedures for triage and the continuous care of children in the first years of life occur within Primary Health Care, which enhances both the potential development of children within the community and early identification of and intervention in the disorders they may suffer²³. In the meantime, in the United Kingdom, the SLH professional is one of the health professionals

who may be freed from their routine activities within primary health in order to provide intensive education and social support to those who most require it²⁴.

The shortage of SLH service coverage within Primary Health Care observed in this study has a negative impact on the comprehensiveness of health care. This is particularly true when we consider that Primary Health Care is the gateway to SUS, the regulator of the networks of care and the arena in which activities that guarantee longitudinal healthcare for the population should take place.

This study has certain limitations, such as potential problems with data records, which include an absence of information or incorrect recording of data regarding We note as an advantage that the professionals. estimate of shortages in Primary Health Care provision around the country was based on a parameter which utilizes the premises of the National Primary Health Care Policy.

Although the results demonstrate significant growth in the number of SLH professionals in Primary Health Care, this still appears to be insufficient to the guarantee of coverage and timely access for the population. Furthermore, the mere availability of human resources, services and equipment does not guarantee individual access to health services, due to the geographical, financial, cultural and informational barriers which may facilitate or hinder the users' capacity to utilize this service²⁵.

Due to the lack of studies regarding the supply and practices of SLH professionals in Primary Health Care, it is necessary to examine in greater depth the health needs of the population. This could involve investment in the training of Primary Health Care SLH professionals in how to develop health situation analyses within the territory, in order to investigate the extent of problems, associated factors and the determinants of the health process.

In any event, we observed in this study that the Primary Health Care arena is constituted as a real field of practice for the SLH professional. We expect that the knowledge produced here will support the implementation of public policies aimed at reflections on the work of the professional within the network, resulting in the expansion of the availability of SLH professionals in Primary Health Care, thereby promoting comprehensiveness of care and enhancing access to health.

CONCLUSION

We note the trend for the increased inclusion of SLH professionals in Primary Health Care, but also that this is characterized by insufficient and unequal supply across the nation. This shortage of supply is equivalent to the absence of SLH coverage within Primary Health Care for more than half of the Brazilian population, bearing in mind that the estimate adopted a conservative parameter as its premise.

ACKNOWLEDGMENTS

We would like to thank Dr. Stela Maris Aguiar Lemos for her valuable reflections regarding the results of this study.

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