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National Policy on Health Care Hearing: an evaluative study from covering services and diagnostic procedures

Política Nacional de Atenção à Saúde Auditiva: um estudo avaliativo a partir da cobertura de serviços e procedimentos diagnósticos

ABSTRACT

Purpose: To evaluate the National Policy on Hearing Health Care (PNASA) based on the coverage of specialized services and diagnostic procedures in hearing health care in Brazil. **Methods:** This is an evaluation study focused on the coverage of specialized services that offer moderate- and high-complexity diagnostic procedures by region and in Brazil as a whole. We analyzed the data for the period of 2004–2011 collected from the Unified Health System's Informatics Department database (DATASUS), under the link "Information on health" and tabulated using the software Tabwin. While collecting data from this platform, we selected "procedures for diagnostic purposes", and the selected way of organization was "diagnoses in otorhinolaryngology/audiology" of moderate and high complexity. We estimated coverage and evolution of the number of procedures according to the country's five geographic macroregions. **Results:** We identified an increase of 113% in service coverage and of 61% in the quantity of moderate- and high-complexity hearing health diagnostic procedures throughout the country. The northern region had an increase of 78% in the number of procedures, higher than all other regions. However, a proportionally larger number of procedures were performed in the southeast. We identified a significant increase in the number of examinations of otoacoustic emissions (OAE) for hearing triage, transient-evoked OAE and distortion product, as well as of diagnostic reassessments of hearing loss in patients older than 3 years. **Conclusion:** There has been an increase in services and actions in hearing health care in Brazil since PNASAs was implemented, but regional inequalities in the distribution of these services still persist.

RESUMO

Objetivo: Avaliar a Política Nacional de Atenção à Saúde Auditiva (PNASA) a partir da cobertura de serviços especializados e procedimentos diagnósticos em saúde auditiva no Brasil. **Método:** Estudo avaliativo com enfoque na cobertura de serviços especializados que oferecem procedimentos diagnósticos de média e alta complexidade por Região e no Brasil. Foram analisados dados do período 2004 a 2011 levantados a partir do Departamento de Informática do Sistema Único de Saúde (DATASUS), no ícone "Informações em saúde" e tabulados via *software* Tabwin. A seleção nesta plataforma foi direcionada a "procedimentos com finalidade diagnóstica", e a forma de organização selecionada foi "diagnóstico em otorrinolaringologia/fonoaudiologia" em média e alta complexidade. Foram realizados cálculos das estimativas de cobertura e evolução do número de procedimentos segundo as cinco macrorregiões brasileiras. **Resultados:** Identificou-se aumento de 113% na cobertura de serviços e 61% no quantitativo de procedimentos de diagnóstico em saúde auditiva de média e alta complexidade em todo o país. A região Norte apresentou 78% de aumento no número de procedimentos, superior às demais regiões. No entanto, o Sudeste realiza proporcionalmente maior quantidade de procedimentos. Identificou-se aumento expressivo dos exames de emissões otoacústicas (EOA) para triagem auditiva, de estudos de EOA transitórias e produto de distorção, como também dos exames de reavaliação diagnóstico de deficiência auditiva em pacientes maiores de três anos. **Conclusão:** Houve incremento dos serviços e ações em atenção à saúde auditiva no Brasil desde a implantação da PNASAs, porém persistem importantes desigualdades regionais na oferta de serviços.

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INTRODUCTION

Hearing loss is one of the most frequent sensory problems in the general population. It is estimated that there are 278 million people with moderate or profound bilateral hearing loss worldwide⁽¹⁾. In the United States, approximately 17% of the North-American adults (36 million people) report having some degree of hearing loss⁽²⁾.

In Brazil, the 2010 census identified 9.8 million individuals with hearing loss, which represents 5.1% of the population. Among them, 1.3% were between zero and 14 years of age, 4.2% were between 15 and 65 years of age, and 25.6% were 65 years or older⁽³⁾.

In 2004, the Ministry of Health implemented the National Policy on Hearing Health Care — PNASA (Ordinance MH 2073, year 2004) to improve actions related to hearing health within the Unified Health System (SUS). It proposed the organization of a hierarchized, regionalized, and integrated network between moderate- and high-complexity basic care, with the purpose of guaranteeing not only hearing diagnoses and rehabilitation but also promotion and protection, as well as audiology and speech therapy for adults and children⁽⁴⁾.

Drawing on this policy, specific actions in basic, moderate-, and high-complexity care were defined, to be organized and implemented by the State Health Departments (Ordinance SHD/MH 587, year 2004). The minimum technical criteria for service operation, and reorganization and classification of the procedures used in the UHS were also established (Ordinance SHD/MH 589, year 2004)⁽⁴⁾.

To expand service coverage, a minimum number of health centers specialized in hearing health was defined, based on the necessity of care coverage, the level of complexity of the services rendered, and their operation and technical capacity. The recommended parameter of Hearing Health Care centers for cases of moderate and high complexity (Ordinance SHD/MH 587, year 2004) is one service per 1.5 million inhabitants. To ensure care to people with hearing loss living in states whose population was below 1.5 million inhabitants, one care center was stipulated. In states with 2–3 million inhabitants, the parameter was two centers.

On the basis of the population estimated for Brazil in 2004, namely 169,872,856 inhabitants, 116 hearing health care units for moderate- and high-complexity cases were to be established across the country, distributed as follows: 16 in the south, 47 in the southeast, 9 in the midwest, 33 in the northeast, and 11 in the north^(4,5).

The implantation of the PNASA policy was an important step toward providing fair hearing health care in the country. Between 2002 and 2005, the offer of services of diagnosis, dispensation, and follow-up of individuals who use hearing aids through UHS increased by 200%⁽⁵⁾. An increase was also recorded in the number of services offered by the specialized hearing health network, as more procedures related to the fitting of hearing aids were conducted between 2004 and 2011⁽⁶⁾.

Considering that the diagnostic procedures used in hearing health care are essential for the treatment of patients with

hearing loss, as they minimize the social and health-related consequences of hearing loss, evaluating the specialized services offered in this sphere can improve the policy in question by optimizing the public funding used to offer qualified care to a larger number of individuals with hearing loss⁽⁷⁾.

The analysis of health actions can provide relevant information to be used in the process of decision-making, planning and management of health practices, as well as setting a focus on the analysis of programs/policies, services, or technologies. Studies that have the purpose of verifying health services and actions can contribute in reorganizing and re-dimensioning them to contemplate public needs and to use financial resources more rationally⁽⁸⁻¹¹⁾.

The main purpose of a management-focused evaluation is to produce information that contributes to the improvement of the object evaluated. It does not seek the fundamentals, justifications, or re-direction for a given condition, but its improvement. The priority is the characterization of a condition and its translation into measures that can be quantified and replicated^(12,13).

In international studies, authors indicate evaluative processes aimed at (re)structuring health policies that improve funding usage and service distribution, considering a territorial dimension through a “social and spatial justice” perspective that contributes to the integrality and equality of the services offered^(14,15).

It is worth highlighting the scarcity of studies that have the purpose of evaluating coverage and accessibility in the area of hearing health care based on secondary data (information systems). This paucity makes these studies relevant, as they can provide material for reflecting upon this topic at the national and international levels^(16,17).

In light of these considerations, the aim of the present study was to evaluate the coverage of specialized services and diagnostic procedures in hearing health care based on the PNASA policy in Brazil.

METHODS

This is an evaluation study about the degree of implementation of hearing health care services in Brazil based on the implementation of the PNASA policy with a focus on the coverage of specialized services in which procedures of moderate and high complexity are offered by region and in the country as a whole.

The evaluation of coverage concerns the availability as well as the social and spatial distribution of resources. These are the main components used to evaluate health care services, defined by the proportion of the target population that benefits from a given intervention⁽¹⁸⁾. This intervention can be differentiated as potential coverage, which corresponds to the capacity and possibility of offer, and as real coverage, an estimate of the proportion of the population that actually used the services⁽¹⁸⁾. The usefulness of coverage analyses has been little explored in the area of speech-language pathology and audiology⁽¹⁹⁾.

To measure the degree of implementation of these establishments, we estimated the number of services of moderate and

high complexity according to the criteria stated in the 2004 Ordinance SHD/MH 587 and compared them to the services offered/registered in the UHS in 2010. For this purpose, first we estimated the number of hearing health care services/centers necessary for Brazil and its regions according to the number of inhabitants in the 2010 census and obtained the number of establishments accredited by the UHS in the same year to measure the coverage of the services in question in Brazil.

In the analysis of the evolution of the quantity of hearing health diagnostic procedures offered by region, we considered 2004 as the base year, when the PNASAs policy was implemented, but also took into consideration the data pertaining to 2011 (the last year available in the Informatics Department of the Unified Health System — DATASUS). We also analyzed the quantity of hearing health diagnostic procedures from 2008 to 2011, when the new classification codes for the procedures were defined in the UHS⁽⁶⁾.

Moreover, we analyzed 12 moderate-complexity and 2 high-complexity procedures financed by the UHS in the same period (2008–2011) in Brazil.

The analysis of coverage evolution was conducted by assessing the central tendency of the number of procedures and calculating the percentage difference between the first and last years of the series. We also used the percentage differences between the real and the estimated coverage.

According to PNASAs, moderate-complexity services have the purpose of offering specialized assistance to people with otologic disorders and, especially, hearing loss. The care includes auditory triage and monitoring but does not cover diagnoses and hearing aid fitting for children up to 3 years of age; people with neurological and psychological conditions, people with genetic syndromes and associated subnormal vision; and individuals with unilateral hearing loss.

Chart 1 displays the moderate-complexity examinations included in this study and their respective codes.

Chart 1. Audiology codes and moderate-complexity diagnostic procedures

Code	Procedure
0211070025	Visual reinforcement audiometry
0211070041	Tone threshold audiometry
0211070149	Otoacoustic emissions for triage purposes
0211070092	Hearing loss diagnostic assessment
0211070157	Transient-evoked otoacoustic emissions and distortion product
0211070203	Immittance audiometry
0211070211	Logoaudiometry
0211070270	Brainstem auditory-evoked potentials (BAEP) for triage purposes
0211070262	Short-, middle-, and long-latency auditory-evoked potentials
021107029	Hearing loss diagnostic reassessment for patients older than 3 years
0211070319	Selection and verification of benefits of personal sound amplification devices (PSAD)
0211070360	Hearing triage of school-aged patients

On the other hand, high-complexity services, according to the PNASAs, provide hearing loss diagnoses and rehabilitation for children of up to 3 years of age, patients with associated conditions (neurological, psychological, genetic syndromes, blindness, subnormal vision) and unilateral loss, and for those who have difficulty in undergoing audiological assessments in services of moderate complexity. In this sense, the staff must rely on equipment to carry out differential diagnoses of hearing loss.

The high-complexity examinations included in this study and their respective codes in the UHS can be seen in Chart 2.

Chart 2. Audiology codes and high-complexity diagnostic procedures

Code	Procedure
0211070106	Assessment for differential diagnosis of hearing loss
0211070300	Hearing loss diagnostic reassessment for patients younger than 3 years

The data were obtained from the DATASUS database⁽²⁰⁾, under the link “Information on health”. The search was narrowed to “ambulatorial procedure by location” and the geographic coverage was displayed by region.

Therefore, our search was redirected from a group of procedures to “diagnostic procedures”. We then selected “diagnoses in otorhinolaryngology/speech-language pathology and audiology” of moderate and high complexity.

We analyzed the data on the Information Notes on Health of the Information Systems in Health — DATASUS, composed of an information database of public domain available online.

The data were tabulated using the software Tabwin, available through the Informatics Department of the Ministry of Health. After this step, we calculated the estimates of coverage and evolution of the number of procedures according to the five Brazilian geographical macroregions (north, northeast, midwest, southeast, and south).

Some limitations of databases must be highlighted. They are updated by health professionals and are, therefore, subject to errors such as duplication and lack or substitution of information, which can compromise data quality. These facts do not invalidate this research, because these specificities are present in studies of this type.

This study was approved by the human research ethics committee of the Clinics Hospital of Universidade Federal do Paraná on December 05, 2011 (report number 410ext043/2011-10).

RESULTS

As stated in the PNASAs policy⁽⁴⁾, the distribution of hearing health care services must allocate one center for each 1.5 million inhabitants. On the basis of data of the 2010 census, Brazil had a population of 190,732,694 inhabitants at that time⁽³⁾; therefore, the number of care centers estimated to assist this

population was 127. Data available on DATASUS show that 143 centers were registered by the Ministry of Health in that year for the entire territory, that is, a coverage of 112.6%.

However, on analyzing the distribution of services registered per region, we observed that the south had a number of centers and coverage much larger than what was estimated as necessary (189.0%), whereas the north had half of the necessary coverage (54.5%) to assist the local population (Table 1).

Table 2 shows the evolution of all moderate-complexity hearing health procedures in the national territory and by region between 2008 and 2011. It is observable that there was an overall increase of 21.4% of these procedures in Brazil, whereas high-complexity procedures had an increase of only 1.5%.

When evaluation was conducted by Brazilian region, we verified that the southeast concentrated the majority of moderate-complexity procedures in all years studied, followed by the northeast region. However, the south had the highest proportional increase (65%) in that period. In the north, the number of procedures performed over the 4 years was the smallest in the country, but the region presented the second highest growth rate (58% in that period).

Concerning high-complexity procedures by region, the southeast presented the largest quantity of procedures performed from 2008 to 2011 in comparison to the other regions, followed by the northeast. However, they had a

negative growth rate if the first and the last years investigated are considered, as the number of examinations decreased 2%. Although a much smaller number of high-complexity procedures was registered in the north region in relation to the others, it presented an increase of 53.5% in that period, as seen in Table 2.

With the purpose of evaluating the implantation of PNASA, we estimated the coverage of diagnostic procedures (Charts 1 and 2) in hearing health care based on the number of examinations conducted in 2004 compared to the more recent data of 2011.

Table 3 shows the increase in the number and coverage of procedures (given by the average of examinations per 1,000 inhabitants) in all regions between the two years analyzed. The north region had a growth rate higher than other regions (78.68%). However, a proportionally larger number of procedures were performed in the southeast in comparison to the other regions (46.5% in 2011).

Table 4 details the evolution of some specific hearing health diagnostic procedures of moderate and high complexity between 2008 and 2011.

Over the 4 years evaluated in this study, there was an increase in the majority of procedures analyzed, namely 473% in examinations and otoacoustic emissions (OAE) for triage, 129% in examinations of transient-evoked OAE and distortion

Table 1. Estimate of hearing health care centers covered by the Unified Health System by region (Brazil, 2010)

Region	Population in 2010	Estimated necessary services* (number)	Accredited services (number)	Estimated service coverage (%)
South	27,384,815	18	34	189.0
Southeast	80,353,724	54	59	109.3
Midwest	14,050,340	9	9	100.0
Northeast	53,078,137	35	35	100.0
North	15,865,678	11	6	54.5
Total	190,732,694	127	143	112.6

*One center for every 1.5 million inhabitants

Table 2. Evolution of the number of moderate- and high-complexity hearing health procedures in the Unified Health System by region (Brazil, 2008–2011)

Procedures	South	Southeast	Midwest	Northeast	North	Brazil
Moderate complexity						
2008	348,888	1,658,499	421,753	937,753	221,323	3,588,216
2009	359,592	1,667,662	457,313	853,374	264,306	3,602,247
2010	508,359	1,864,787	428,831	917,443	297,163	4,016,583
2011	576,018	2,018,884	376,060	1,034,224	349,671	4,354,857
Increase from 2008 to 2011 (%)	65.1	21.7	-10.8	10.3	58.0	21.4
High complexity						
2008	16,524	57,295	6,545	28,876	2,773	112,013
2009	14,983	52,263	7,916	22,235	3,195	100,592
2010	18,851	57,043	7,046	23,812	3,059	109,811
2011	17,093	55,818	8,193	28,306	4,257	113,667
Increase from 2008 to 2011(%)	3.4	-2.6	25.2	-2.0	53.5	1.5
Total	1,860,308	7,432,251	1,713,657	3,846,023	1,145,747	15,997,986

product, and 121% in diagnostic reassessments of hearing loss in patients older than 3 years.

On the other hand, we verified a decrease in the number of visual reinforcement audiometry examinations, and short-, middle- and long-latency auditory-evoked potentials, as well as of hearing triage examinations performed in school-aged patients (Table 4).

DISCUSSION

In this study we aimed at evaluating the degree of implementation of the PNASA policy based on the quantitative evolution of moderate- and high-complexity services and diagnostic procedures in hearing health care in the entire national territory.

The results obtained point to advancements in service coverage and, consequently, in hearing health diagnostic procedures in the country.

In a study about hearing health programs in countries in Latin America and the Caribbean, the authors concluded that hearing loss is not prioritized in health care services, and that investments in technology and human material are as limited as the services offered⁽¹⁶⁾. In several Latin American countries, such as Argentina, Chile and Mexico, these interventions were incipient before 2000 and did not include audiology diagnostic services⁽¹⁷⁾. In Brazil, these actions were intensified with the implementation of PNASA in 2004.

Few studies on the quantitative evaluation of procedures as a resource to improve service and accessibility coverage and

Table 3. Evolution of coverage for moderate- and high-complexity hearing health diagnostic procedures by region (Brazil, 2004 and 2011)

Region	Total of moderate- and high-complexity procedures in 2004			Total of moderate- and high-complexity procedures in 2011			Increase in the number of diagnostic procedures, 2004–2011 (%)
	n	% by region	Coverage (average of examinations/ 1,000 inhabitants)	n	% by region	Coverage (average of examinations/ 1,000 inhabitants)	
South	221,674	12.6	8.3	593,111	13.3	21.5	62.6
Southeast	947,457	54.0	12.2	2,074,702	46.5	25.6	54.3
Midwest	131,165	7.5	10.3	384,253	8.6	27.0	65.9
Northeast	380,437	21.7	7.5	1,062,530	23.8	19.9	64.2
North	74,823	4.3	5.2	350,928	7.9	21.8	78.7
Total	1,755,556	100.0	9.7	4,465,524	100.0	23.2	60.7

Table 4. Evolution of the number of specific hearing health diagnostic procedures (Brazil, 2008–2011)

Procedures	2008	2009	2010	2011	Increase (%)
Moderate complexity					
Visual reinforcement audiometry	39,705	41,174	36,052	31,641	-20.3
Tone threshold audiometry	382,376	486,034	553,807	612,654	60.2
Otoacoustic emissions for triage purposes	89,224	250,081	361,324	511,274	473.0
Hearing loss diagnostic assessment	34,381	38,542	41,294	37,965	10.4
Transient-evoked otoacoustic emissions and distortion product	67,966	87,856	119,157	155,807	129.2
Immittance audiometry	367,458	425,845	460,623	506,597	37.9
Logaudiometry	435,766	484,631	525,424	562,843	29.2
Brainstem auditory-evoked potentials (BAEP) for triage purposes	36,447	37,036	39,523	42,733	17.2
Short-, middle-, and long-latency auditory-evoked potentials	31,341	17,234	17,442	21,223	-32.3
Hearing loss diagnostic reassessment for patients older than 3 years	10,962	16,049	21,795	24,209	120.8
Selection and verification of benefits of personal sound amplification devices (PSAD)	71,186	88,428	102,292	114,367	60.7
Hearing triage of school-aged patients	51,426	44,847	33,108	26,250	-49.0
Subtotal	1,618,238	2,017,757	2,311,841	2,647,563	8,595,399
High complexity					
Assessment for differential diagnosis of hearing loss	89,224	94,318	102,979	107,853	20.9
Hearing loss diagnostic reassessment for patients younger than 3 years	5,198	6,274	6,832	5,814	11.9
Subtotal	94,422	100,592	109,811	113,667	418,492
Total	1,712,660	2,118,349	2,421,652	2,761,230	9,013,891

organization have been carried out in the country^(5,8,21). In one of them, the authors analyzed the users' level of satisfaction pertaining to the difficulty to keep track of the services offered in hearing health⁽⁷⁾.

It is known that in order to achieve good-quality health care several mechanisms for evaluation and control are used. Evaluating its structure is fundamental to planning and managing health care services. It also evidences the real situation in a given territory, region, and country, which facilitates the proper use of resources, investments, and service extension⁽²²⁾.

Regional or state evaluation studies on PNASA are still scarce. Specific studies were carried out in the northeastern region, Pernambuco⁽⁵⁾, and in the southeast, Rio de Janeiro⁽²¹⁾. Both studies showed the necessity of improvements concerning the hearing health care procedures, early diagnoses, and access to hearing aids and rehabilitation.

On analyzing the quantity of moderate- and high-complexity services offered by macroregion (Table 1), we identified that the south and the southeast regions surpassed the number of estimated necessary services according to the parameters of PNASA. However, in the northern region the number of services was still below 50% of expectations.

From 2008 to 2011 (Table 2), the southern region had a significant increase in moderate-complexity interventions, followed by the north, which maintained this growth also in regards to moderate and high complexity, compared to the other macroregions.

In a study conducted based on secondary data from the Ambulatorial Information System (AIS) of the UHS, with a focus on personal sound amplification devices (PSAD) fitting from 2004 to 2010, the researchers identified an improvement in the national coverage of hearing health care services, with 86% of network implementation across the national territory, and that the midwest and the north were below the expectations compared to the other regions⁽⁶⁾.

These differences can be justified by Brazil's immense demographic and socioeconomic heterogeneity. The UHS' proposal to decentralize health care services contributes to health care accessibility throughout the national territory. However, equality and integrality become a challenge, as care-related aspects spring from local initiatives, in tune with a given population's financial particularities and necessities, proposed by state and municipal management personnel^(14,15,23-25).

In regards to the north, data from the 2002 Municipal System Management Survey revealed an increase in the region's resources, even though they still remained below the other regions. According to the study, advancements and increases were observable following the implementation of the UHS⁽²⁶⁾.

The increase in the number of moderate-complexity procedures related to hearing health can be justified by technological advancements along with investments by the Ministry of Health, the organization of care in network mode in several municipalities, policies geared toward the promotion of equality, and to the implementation of the Little Ear Test law (*Teste da Orelhinha*), which mandates the conduction of OAE examinations in children born in the country^(27,28).

Concerning the procedures considered of moderate complexity in the AIS, we verified a significant decrease in audiometry examinations with visual reinforcement (Table 4). This can be attributed to technological advancements and to the acquisition of equipment to be used in hearing health services with the purpose of performing objective examinations due to their easy use and practicality.

The databases made available by the Ministry of Health are a way to democratize information and also a tool for social management and control, but these resources are underused by all levels of health management. We highlight, however, that analyses based on the data available on DATASUS, among others, must be judicious, as typing errors and inconsistencies might be present^(8,9).

Finally, we highlight the need for new quantitative evaluation studies that detail the distribution of hearing health care services in each state and region. Studies carried out to create protocols for assessing the PNASA policy in Brazil are also necessary, considering the expansion of the procedures shown in this study, with the purpose of evaluating its effectiveness.

CONCLUSION

We verified a relative increase in the number of moderate-complexity examinations in the periods studied here. It was also evident that the north region presented a significant increase in the number and coverage of procedures in the period analyzed, although it still has insufficient coverage for specialized services, which shows that regional inequalities in the distribution of hearing health care services still persist.

**LGS was responsible for data collection, tabulation and analysis, and also for manuscript elaboration; CGOG and VMNS were responsible for the study project and outline, as well as overall supervision of the stages of manuscript writing and elaboration.*

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