Work-Related Noise-induced Hearing Loss (NIHL) in the Southeast Region of Brazil (2006-2023)

Perda Auditiva Induzida por Ruído (PAIR) Relacionada ao Trabalho na Região Sudeste do Brasil (2006-2023)

Pérdida Auditiva Inducida por Ruido (PAIR) Relacionada al Trabajo en la Región Sudeste de Brasil (2006–2023)

RESUMO

Objetivo: Este estudo examinou as notificações de PAIR na Região Sudeste do Brasil, entre 2006 e 2023, avaliando o impacto da Política Nacional de Saúde do Trabalhador e da Trabalhadora (PNSTT), implementada em 2012. **Método:** Utilizando dados do Sistema de Informação de Agravos de Notificação (SINAN), foram analisadas variáveis demográficas, condutas adotadas e taxas de incidência ajustadas por populações interpoladas. **Resultados:** Os resultados evidenciaram aumento nas notificações após a implementação da PNSTT, com pico em 2016 e redução até 2023. São Paulo e Minas Gerais apresentaram os maiores números, enquanto o Espírito Santo registrou os menores índices. A maioria dos casos notificados foi de trabalhadores homens, com predominância dos registros classificados como "incapacidade permanente parcial". **Conclusão:** A análise evidencia fragilidades na vigilância em saúde, como subnotificação e registros incompletos, além dos desafios na implementação de medidas preventivas e educativas, reforçando a necessidade de ampliar a vigilância.

DESCRITORES: Perda Auditiva Provocada por Ruído; Ruído Ocupacional; Sistema de Vigilância em Saúde; Vigilância em Saúde do Trabalhador.

ABSTRACT

Objective: This study examined NIHL notifications in the Southeast Region of Brazil between 2006 and 2023, evaluating the impact of the National Worker Health Policy (PNSTT), implemented in 2012. **Method:** Using data from the Notifiable Diseases Information System (SINAN), demographic variables, case evolution, measures taken, and incidence rates adjusted for interpolated populations were analyzed. **Results:** The results evidenced an increase in notifications after the implementation of the PNSTT, with a peak in 2016 and a reduction until 2023. São Paulo and Minas Gerais presented the highest numbers, while Espírito Santo registered the lowest indices. The majority of reported cases were male workers, with a predominance of records classified as "partial permanent disability." **Conclusion:** The analysis reveals weaknesses in health surveillance, such as underreporting and incomplete records, as well as challenges in implementing preventive and educational measures, reinforcing the need to expand surveillance.

DESCRIPTORS: Noise-Induced Hearing Loss; Occupational Noise; Health Surveillance System; Occupational Health Surveillance.

RESUMEN

Objetivo: Este estudio examinó las notificaciones de PAIN en la Región Sudeste de Brasil entre 2006 y 2023, evaluando el impacto de la Política Nacional de Salud del Trabajador (PNSTT), implementada en 2012. **Método:** Utilizando datos del Sistema Nacional de Información de Enfermedades de Notificación Obligatoria (SINAN), se analizaron variables demográficas, comportamientos adoptados y tasas de incidencia ajustadas a poblaciones interpoladas. **Resultados:** Los resultados mostraron un aumento en las notificaciones tras la implementación de la PNSTT, alcanzando un máximo en 2016 y disminuyendo hasta 2023. São Paulo y Minas Gerais presentaron las cifras más altas, mientras que Espírito Santo registró las tasas más bajas. La mayoría de los casos notificados fueron trabajadores varones, con un predominio de registros clasificados como "incapacidad permanente parcial". **Conclusión:** El análisis destaca debilidades en la vigilancia de la salud, como el subregistro y los registros incompletos, así como desafíos en la implementación de medidas preventivas y educativas, lo que refuerza la necesidad de ampliar la vigilancia.

DESCRIPTORES: Pérdida Auditiva Inducida por Ruido; Ruido Ocupacional; Sistema de Vigilancia en Salud; Vigilancia de la Salud del Trabajador.

DOI: 10.36489/saudecoletiva.2025v17i106p19618-19633

RECEIVED: 01/09/2026 **APPROVED:** 02/01/2026

How to cite this article: Souza GS, Araújo PC, Mata GG, Mafort LS, Fontes CLU, Gualberto LES, Coelho KSC, Vieira UP, Work-Related Noise-induced Hearing Loss (NIHL) in the Southeast Region of Brazil (2006-2023). Saúde Coletiva (Brazilian Edition) [Internet]. 2026 [cited year month day];17(106):19618-19633 Available from: DOI: 10.36489/saudecoletiva.2026v17i106p19618-19633

Gabriel da Silva Souza
Graduando em Medicina, Universidade Federal do Rio de Janeiro
ORCID: https://orcid.org/0009-0005-4366-1655

Pedro Carvalho Araújo
Graduando em Medicina, Universidade Federal do Rio de Janeiro. Mestre em Produção Vegetal
ORCID: https://orcid.org/0009-0002-8918-8806

Gabriella Gonçalves da Mata
Graduanda em Medicina, Universidade Federal do Rio de Janeiro
ORCID: https://orcid.org/0009-0003-6850-1602

Luisa Sanglard Mafort
GRADUanda em Medicina, Universidade Federal do Rio de Janeiro
ORCID: https://orcid.org/0009-0005-0697-8514

Carolina Luz Utrini Fontes
Graduanda em Medicina, Universidade Federal do Rio de Janeiro
ORCID: https://orcid.org/0009-0003-3029-701X

Laiza Eduarda de Souza Gualberto
Graduanda em Medicina, Universidade Federal do Rio de Janeiro
ORCID: https://orcid.org/0009-0001-5969-4663

Karla Santa Cruz Coelho
Doutora em Saúde Coletiva, Docente da Universidade Federal do Rio de Janeiro
ORCID: https://orcid.org/0000-0003-4943-4814

Uliana Pontes Vieira
Doutora em Educação, Gestão e Difusão em Biociências, Docente da Universidade Federal do Rio de Janeiro
ORCID: https://orcid.org/0000-0001-8035-3831

INTRODUCTION

Noise-induced hearing loss (NIHL) is one of the main health problems faced by workers exposed to high noise levels in the workplace[1] . Once NIHL develops, it becomes an irreversible condition, directly compromising workers' hearing, quality of life, and productivity, in addition to generating significant economic and social impacts on the affected population[2] . Despite advances in legislation and prevention practices, NIHL remains one of the most common occupational health problems[3] . In Brazil, the field of occupational health surveillance has shown progress but still faces major obstacles, such as underreporting of cases, a lack of awareness among employers and workers, and a shortage of resources for prevention and enforcement actions[4] .

The creation of the National Policy on Workers' Health (PNSTT), through Ordinance No. 1,823 of August 23, 2012, represented a significant step forward in promoting surveillance and prevention of occupational diseases, including PAIR. This policy aims to integrate worker health into the Unified Health System (SUS), expanding access to health services and strengthening the surveillance of occupational diseases[5] . However, challenges remain for the full implementation of these policies, especially due to regional inequalities and insufficient infrastructure in some areas. These challenges have been exacerbated by the COVID-19 pandemic, which has overwhelmed the health system and resulted in a decline in case reports and the interruption of various initiatives related to worker health[4] .

PAIR is officially recognized by the Ministry of Health as an occupational disease, for which reporting to the Notifiable Diseases Information System (SINAN) is mandatory, and it must be monitored by the Occupational Health Surveillance (VISAT). These reports are essential for health professionals to understand the epidemiological landscape in municipalities regarding various diseases, aiding in action planning and strategic decision-making[6] .

In this context, the present study aims to analyze work-related PAIR notifications in Brazil between 2006 and 2023, with an emphasis on the Southeast Region, one of the country's most important areas in economic and industrial terms[7] . The analysis seeks to identify trends over time, regional variations, and the demographic characteristics of the most affected workers, providing an overview of the PAIR situation in Brazil. In addition, the study discusses the main challenges faced by occupational health surveillance and evaluates the impact of the PNSTT,

implemented during the period, with the aim of contributing to the improvement of strategies for the prevention and control of PAIR, as well as fostering discussions to improve practices for the protection of workers' health.

METHODOLOGY

This study adopted a quantitative and descriptive methodology to examine work-related reports of Noise-Induced Hearing Loss (NIHL) in both Brazil and the states of the Southeast Region from 2006 to 2023. Data were collected through the Notifiable Diseases Information System (SINAN), an official platform of the Ministry of Health that centralizes data on mandatory reports of diseases and health conditions nationwide.

Data collection involved extracting NNI records from SINAN, taking into account variables such as the year of notification, state of occurrence, age group, sex, race/ethnicity, and the measures taken. These data were organized by state in the Southeast Region (Espírito Santo, Minas Gerais, Rio de Janeiro, and São Paulo), with the aim of identifying trends over time and differences among states regarding the occurrence of PAIR.

To assess the impact of the National Policy on Occupational Health (PNSTT), implemented in 2012, the study compared different periods: the period prior to the implementation of the PNSTT (2006 to 2011) and the corresponding period following its implementation (2012 to 2017).

Population data were obtained from the demographic censuses conducted by the Brazilian Institute of Geography and Statistics (IBGE) for the years 2010 and 2022[8] . Since censuses in Brazil occur only every 10 years, it was necessary to estimate the population for the intervening years to ensure the accuracy of the incidence rates of the disease under study. For this purpose, the linear interpolation technique was used, which allows for the estimation of approximate values between two known points[9] . The formula used for interpolation was:

Estimated Population in year t = Population in 2010 + [(Population in 2022 - Population in 2010) / (2022 - 2010)] × (t - 2010).

In this formula, t represents the year for which we wish to estimate the population, distributing the difference between the 2010 and 2022 populations linearly over the years.

After estimating the populations for the necessary years, PAIR incidence rates were calculated using the following formula:

Incidence Rate = (Number of PAIR Notifications / State Population) × 100,000

In this way, it was possible to compare incidence rates before and after the implementation of the PNSTT, identifying trends and variations over time.

In addition, to obtain an overview of the entire analyzed period, an additional analysis was conducted that considered the cumulative incidence of PAIR from 2006 to 2023, using the most recent population as a basis, according to the 2022 census[8] . With this approach, it became possible to calculate an average incidence rate for the entire period, using a single population reference point, which facilitates long-term comparisons and analyses.

For the general analysis of the data, descriptive statistical techniques were applied, along with an assessment of trends over the years. The information was presented in tables and graphs, facilitating the understanding of variations in notifications during the analysis period. Microsoft Excel® *software* was used to collect and process the data.

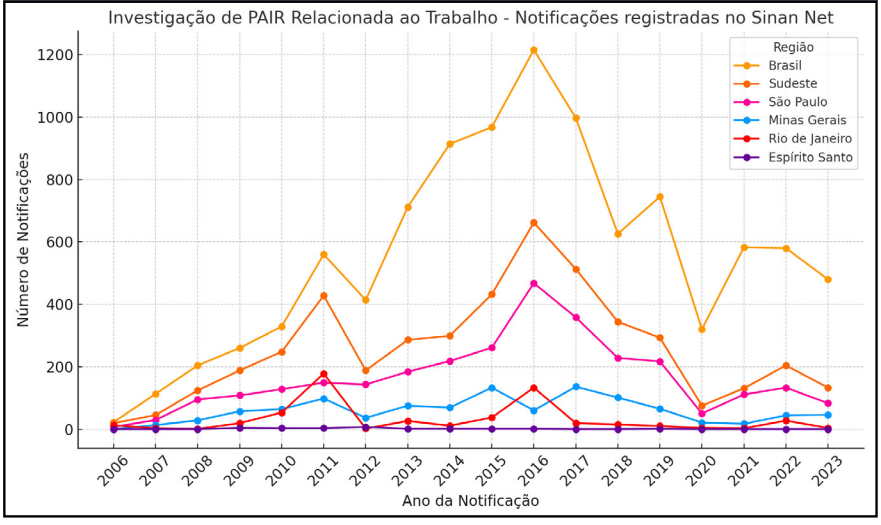
All data were collected by the authors in September 2024.

RESULTS

The results of this study provide an overview of work-related Noise-Induced Hearing Loss (NIHL) reports in Brazil and the Southeast Region from 2006 to 2023

Figure 1 illustrates the work-related Noise-Induced Hearing Loss (NIHL) reports recorded in the Notifiable Diseases Information System (SINAN Net) in Brazil and in the states of the Southeast Region during the analyzed period.

Figure 1: Investigation of Work-Related PAIR - Notifications recorded in SINAN



Source: Author's own. Data extracted from the Ministry of Health/SVS - Notifiable Diseases Information System (2024).

DOI: 10.36489/saudecoletiva.2025v17i106p19618-19633

Notifications of work-related PAIR in Brazil increased progressively until 2016, when they peaked at 1,216 cases, followed by a gradual decline until 2023 (480 cases).

In the Southeast Region, the trend was similar, peaking in 2016 (665 cases). São Paulo accounted for the highest number of reports, reaching 468 cases in 2016 and declining steadily through 2023. In Rio de Janeiro, the numbers remained relatively stable, with the exception of a spike between 2010 and 2011, when they reached 178 cases. Minas Gerais peaked in 2017 (136 cases), followed by a decline. Espírito Santo, on the other hand, maintained the lowest numbers, never exceeding 7 cases per year, which may reflect regional particularities discussed below.

The data presented in Table 1 show population variations across the years analyzed, allowing for a more precise adjustment of PAIR incidence rates throughout the pre- and post-implementation periods of the PNSTT. The use of the interpolated population for 2017 allows for a more accurate analysis of PAIR notifications between the periods from 2006 to 2011 and 2012 to 2017, while the 2022 population will be used to calculate the cumulative incidence rate for the full period from 2006 to 2023.

Table 1: Population of the States in the Southeast Region in 2010, 2017 (Interpolation), and 2022

State	Population (2010 Census)	Estimated Population (2011)	Estimated Population (2017)	Population (2022 Census)
Rio de Janeiro	15,989,929	15,995,366	16,027,990	16,055,174
São Paulo	41,262,199	41,524,619	43,099,140	44,411,238
Minas Gerais	19,597,330	19,675,885	20,147,210	20,539,989
Espírito Santo	3,514,952	3,541,515	3,700,895	3,833,712

Source: IBGE (2010 and 2022 Censuses); Calculations by the authors (2024).

To assess the impact of the implementation of the National Policy on Occupational Health (PNSTT) in 2012, PAIR incidence rates were calculated before and after the policy, using data from SINAN and IBGE population estimates. Table 2 presents the incidence rates for the periods 2006–2011, 2012–2017, and the cumulative total for 2006–2023.

Table 2: PAIR Incidence Rates by State (per 100,000 inhabitants)

State	Rate (2006–2011)	Rate (2012–2017)	Rate (2006–2023)
Rio de Janeiro	1.66	1.43	3.50
São Paulo	1.24	3.79	6.69
Minas Gerais	1.32	2.53	5.17
Espírito Santo	0.28	0.30	0.57

Source: SINAN and IBGE; Calculations by the authors (2024).

It is also possible to relate variables such as sex, race, and age group to unemployment rates among people aged 14 and older, according to IBGE data. This comparison deepens the analysis of labor market inequalities and their possible connections to noise exposure and access to reporting[10] . Table 3 presents the 2023 unemployment rates in the states of Rio de Janeiro, São Paulo, Minas Gerais, and Espírito Santo, organized by sex, race, and age group.

DOI: 10.36489/saudecoletiva.2026v17i106p19618-19633

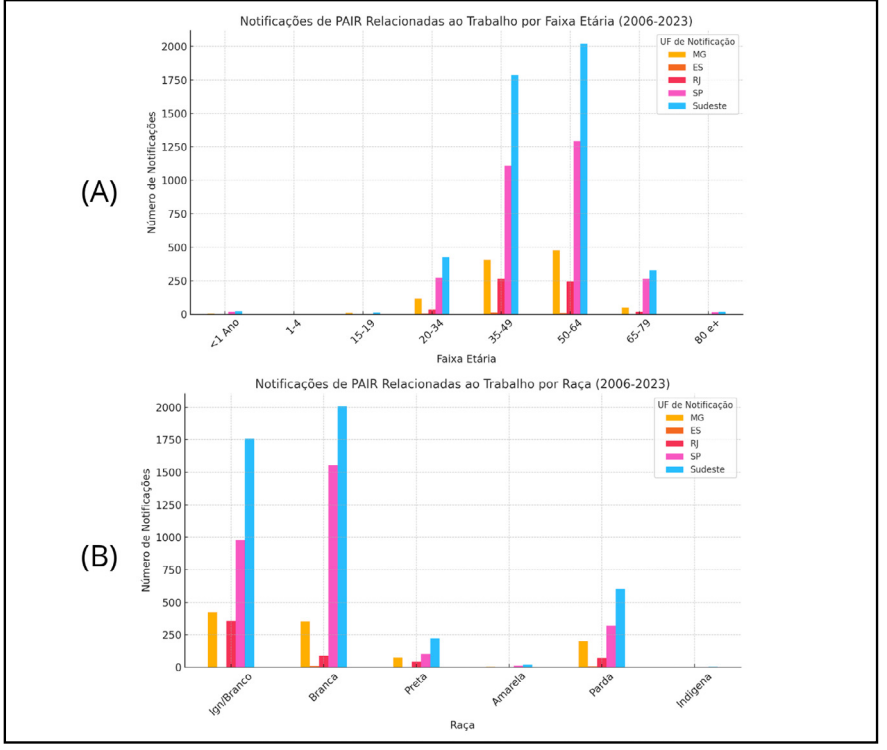
Table 3: Unemployment Rate by Sex, Color or Race, and Age Group in the States (2023)

State	Rio de Janeiro	São Paulo	Minas Gerais	Espírito Santo
Total Unemployment Rate (%)	13.3	9.1	7.7	8.5
Gender				
Male (%)	11.2	7.3	6.7	6.5
Women (%)	15.7	11.1	9.1	11.1
Race or Ethnicity				
White (%)	10.7	8.0	5.3	7.5
Black or Brown (%)	15.2	10.7	9.3	9.1
Age group				
14 to 29 years old (%)	24.5	16.3	14.1	15.3
30 to 49 years old (%)	9.6	6.7	5.3	6.4
50 years or older (%)	8.5	5.4	4.3	4.9

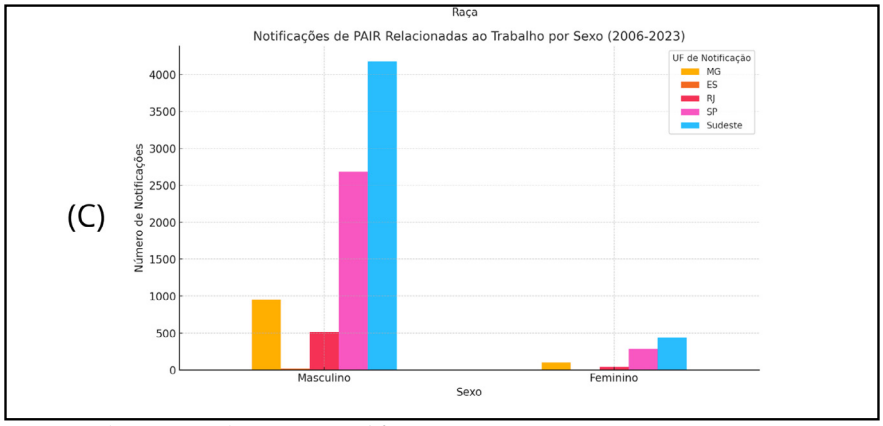
Source: IBGE 2023. Unemployment rate for people aged 14 and older by sex, race, and age group in the states of the Southeast Region.

Figure 2 (A) shows the distribution of the 4,615 PAIR reports in the Southeast Region between 2006 and 2023: São Paulo recorded 2,969 cases, Minas Gerais 1,062, Rio de Janeiro 562, and Espírito Santo 22. The most affected age groups were 35–49 years (1,788 cases) and 50–64 years (2,021). Age groups such as 20–34 and 65–79 years had fewer cases, with only 11 reports among those aged 15–19. Figure 2 (B) shows a predominance of the white race (2,007 cases), followed by "Unknown/White" (1,760), brown (602), and black (222). The Asian (19) and Indigenous (5) races had the lowest numbers. Figure 2 (C) reveals a predominance of males (4,179 cases) over females (436). São Paulo leads with 2,686 male cases and 283 female cases, followed by Minas Gerais with 957 and 105, respectively.

Figure 2: (A) Work-Related PAIR Notifications by Age Group (2006–2023), (B) Work-Related PAIR Notifications by Race (2006–2023) and (C) Work-Related PAIR Notifications by Sex (2006–2023).



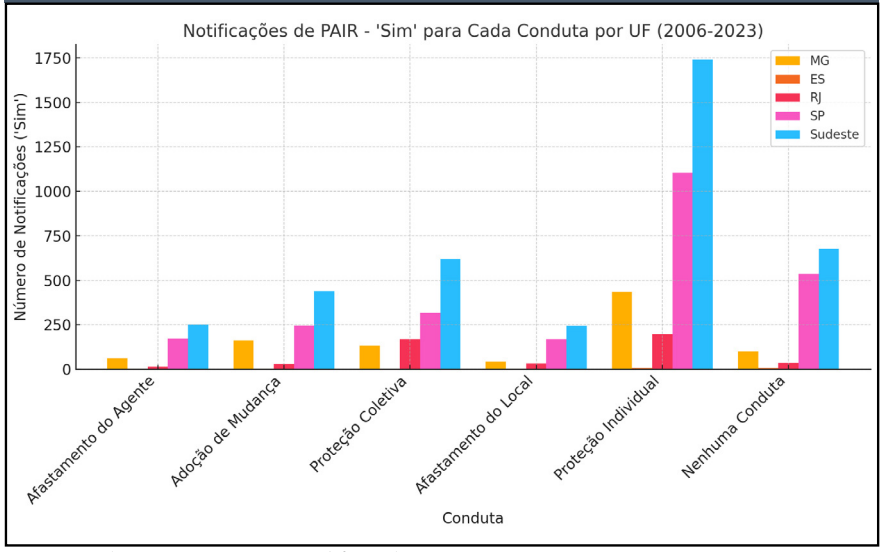
DOI: 10.36489/saudecoletiva.2025v17i106p19618-19633



Source: Author's own work. Data extracted from the Ministry of Health/SVS - Notifiable Diseases Information System (2024).

Figure 3 presents the measures taken in response to PAIR notifications. The use of personal protective equipment was the most frequent (1,741 records), followed by collective protection (621) and changes to the work environment (439). Removal of the agent and from the workplace had 251 and 244 records, respectively. "No action" was the least adopted, with 677 cases. São Paulo led in all measures, followed by Minas Gerais, Rio de Janeiro, and Espírito Santo.

Figure 3: PAIR Notifications - 'Yes' for Each Response by State (2006-2023)



Source: Author's own. Data extracted from the Ministry of Health/SVS - Notifiable Diseases Information System (2024).

DISCUSSION

Analysis of this study's results reveals important trends regarding notifications of Noise-Induced Hearing Loss (NIHL), highlighting challenges in implementing public policies and structural issues affecting occupational health surveillance in Brazil, with an emphasis on the Southeast Region. The data allow for reflection on the influence of the PNSTT, working conditions, and reporting capacity over time.

The implementation of the PNSTT and the creation of the Occupational Health Reference Centers (CEREST) led to a significant increase in reports of conditions such as NIIH, especially following greater awareness of hearing health and the strengthening of surveillance, culminating in a peak in reports in 2016.

Between 2016 and 2023, reports dropped significantly, a phenomenon attributed to the suspension of inspections, political and economic changes, and the COVID-19 pandemic. In 2020, the decline was more pronounced, possibly due to the temporary closure of occupational health services and the reduction in in-person activities[4] . This decline contributed to a scenario of underreporting, particularly in states with fragile infrastructure[11] .

In the Southeast Region, disparities among states were evident. São Paulo led in notifications, reflecting its industrial density and robust network of CERESTs. Minas Gerais saw growth until 2017, followed by a decline. Rio de Janeiro remained stable. Espírito Santo, on the other hand, reported the lowest numbers, attributed to the lack of adequate Reference Centers and weak coordination among municipalities[11] .

The situation in Espírito Santo illustrates inequalities in the implementation of the PNSTT. The lack of CERESTs hinders the reporting of cases, revealing structural limitations that do not reflect the actual occurrence of cases. An analysis of PAIR incidence rates between 2006 and 2023 reinforces this picture. Minas Gerais rose from 1.32 to 2.53 notifications per 100,000 inhabitants following the PNSTT, reaching a cumulative total of 5.17, suggesting improvements in reporting[5] . Espírito Santo maintained low rates: 0.28 before the policy, 0.30 after, and 0.57 in total, indicating underreporting or low exposure[11,12] . In Rio de Janeiro, the rate fell slightly from 1.66 to 1.43, totaling 3.50 for the

DOI: 10.36489/saudecoletiva.2026v17i106p19618-19633

entire period, which may reflect preventive measures or changes in industrial processes[13] . São Paulo showed the largest increase: from 1.24 to 3.79, totaling 6.69, possibly due to its extensive industrial activity[14] .

The PNSTT sought to expand surveillance and control of conditions such as PAIR, and the data indicate that in some states there were advances, driven by greater awareness and the adoption of preventive measures[13] . However, the policy's effectiveness varied according to the structure of services, local surveillance, and workers' level of information[12] .

Adequate reporting is essential for effective public policies. Underreporting compromises diagnoses and preventive actions, making it imperative to strengthen surveillance, train health teams, and encourage reporting[13,14] .

The distribution by age group indicates that workers aged 35 to 64 were the most affected, due to prolonged exposure to noise, particularly in sectors such as construction and industry[15,16] . This reinforces the need for specific preventive policies, focusing on source control and the use of PPE[17] .

Between 2006 and 2023, 23 cases of PAIR were recorded in children under one year of age, raising questions about reporting gaps[18] . Possible causes include reporting errors, exposure to occupational environments via breastfeeding mothers (Decree-Law No. 5,452, Art. 396), or living near sources of noise pollution such as airports or factories[19] . These factors point to the need for more accurate records and policies to protect children in noisy environments.

The predominance of cases among men reflects their greater presence in high-risk sectors, while the white majority in the reports may indicate racial inequalities in access to occupational health systems[20-22] .

Unequal access to the formal labor market reinforces disparities in reported cases. Women and Black or Brown individuals face higher unemployment rates[23] , which limits their access to formal jobs and occupational health services. Workers aged 50 or older, due to their greater job stability, may be more exposed to PAIR due to prolonged noise exposure.

Individual protection was the main measure adopted, but it remains insufficient. Source control and collective protection were rarely used strategies, despite being recommended by the PNSTT.

PAIR can progress to permanent hearing loss if noise exposure exceeds 85 dB(A) for eight hours a day[24] . Progressive hearing loss impairs sound perception, speech, and quality of life, and may cause tinnitus and depression[25] . This highlights the urgency of prevention policies and the inclusion of people with disabilities. The pandemic has exacerbated underreporting, with a drop in records between 2019 and 2023[4] . This scenario undermines effective public policies, especially in states such as Espírito Santo.

CONCLUSION

The implementation of the PNSTT in 2012 initially led to an increase in reported cases, peaking by 2016, followed by a sharp decline in subsequent years, particularly during the COVID-19 pandemic. The states of São Paulo and Minas Gerais accounted for the highest number of reports, reflecting their industrial density and greater surveillance capacity, while Espírito Santo had the lowest rates, highlighting regional inequalities. Most cases involved men of working age, reinforcing the importance of targeted preventive strategies. The analysis also revealed weaknesses in record-keeping, underreporting, and low representation of minorities, pointing to the need for greater training of health teams, strengthening of CERESTs, and expansion of educational initiatives. The expansion of these centers and the adoption of intersectoral strategies are fundamental to reducing inequalities, improving surveillance, ensuring safer work environments, and promoting equity in occupational health in Brazil.

REFERENCES

1. GUSMÃO, A. C. et al. Fatores associados à notificação de perda auditiva induzida por ruído no Brasil, 2013-2015: estudo ecológico. Epidemiologia e Serviços de Saúde, Brasília, 2021.

2. NATARAJAN, N.; BATTS, S.; STANKOVIC, K. M. Noise-Induced Hearing Loss. Journal of Clinical Medicine, v. 12, n. 6, p. 2347, 17 mar. 2023.

3. WHO. Determination of Risk of Noise-Induced Hearing Loss Due to Recreational Sound. Geneva: World Health Organization, 2017.

4. METTIFOGO, C. B. G. et al. Subnotificação dos casos de PAIR na pandemia. Brazilian Medical Students Journal, 2024.

5. BRASIL. Portaria nº 1.823, de 23 de agosto de 2012. Institui a Política Nacional de Saúde do Trabalhador e da Trabalhadora. Brasília, 2012.

6. NAKAMURA, H. Y.; GONÇALVES, C. G. O. Notificação

DOI: 10.36489/saudecoletiva.2025v17i106p19618-19633

da perda auditiva induzida por ruído: instrumento de vigilância da saúde dos trabalhadores. São Paulo, SP: Sintropia Traduções, 2022.

7. CASTRO, C. A.; PLÁCIDO, R. L.; SCHENKEL, C. A. História socioespacial do trabalho no Brasil, educação profissional tecnológica e a questão regional. 2020.

8. INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA (IBGE). O IBGE. Disponível em: https://www.ibge.gov.br/acesso-informacao/institucional/o-ibge.html. Acesso em: 16 nov. 2024.

9. ETHERINGTON, T. R. Discrete natural neighbour interpolation with uncertainty using cross-validation error-distance fields. PeerJ. Computer Science, v. 6, p. e282, 2020.

10. INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA (IBGE). Taxa de desocupação de pessoas com 14 anos ou mais por sexo, raça e faixa etária nos estados da Região Sudeste. 2023. Disponível em: https://www.ibge.gov.br. Acesso em: 28 nov. 2024.

11. Boletim VISAT. Vigilância em Saúde do Trabalhador. Espírito Santo, 2020.

12. DOTRAS BRAVO, A.; SILVA, E. M. Prática de ensino supervisionada: obstáculos sociais e educativos. In: XIV CONGRESO INTERNACIONAL DE LA SOCIEDAD ESPANOLA DE DIDÁCTICA DE LA LENGUA Y LA LITERATURA, 14., Braga. Anais... Braga: Universidade do Minho, 2013. p. 46.

13. HURTADO, S. L. B. et al. Políticas de saúde do trabalhador no Brasil: contradições históricas e possibilidades de desenvolvimento. Ciencia & Saúde Coletiva, v. 27, n. 8, p. 3091–3102, 2022.

14. TORRES, M. et al. Saúde e bem-estar em meio urbano: das políticas à prática = Health and well-being in urban environment: from policies to practice. Revista Portuguesa de Saúde Pública, Lisboa, v. 31, n. 1, p. 9, 2013.

15. BRASIL. Ministério da Saúde. Secretaria de Vigilância em Saúde. Departamento de Vigilância Epidemiológica. Guia de Vigilância Epidemiológica. 7. ed. Brasília: Ministério da Saúde, 2009. 816 p. (Série A. Normas e Manuais Técnicos).

16. ABRAHAM, Z. et al. Prevalence of Noise-Induced Hearing Loss among Textile Industry Workers in Dar es Salaam, Tanzania. Annals of Global Health, v. 85, n. 1, 2019.

17. HENNINGTON, É. A. et al. Dez anos da Política Nacional de Saúde do Trabalhador e da Trabalhadora e os desafios da formação para (trans)formação do trabalho. Revista Brasileira de Saúde Ocupacional, 2024.

18. HILLESHEIM, D. et al. Perda auditiva induzida por ruído no Brasil: descrição de 14 anos de notificação. Audiology - Communication Research [online], v. 27, e2585, 2022. Disponível em: https://doi.org/10.1590/2317-6431-2021-25851. Acesso em: 13 out. 2024.

19. MUNIR, S. et al. Temporal and seasonal variations of noise pollution in urban zones: a case study in Pakistan. Environmental Science and Pollution Research, 9 fev. 2021.

20. LIEBERMAN, A. G. et al. Intersectional discrimination from black women, white women, black men, or white men impacts young adult black women's affective states and risky health cognitions. Psychology & Health, p. 1–17, 27 jun. 2021.

21. RAFAGNIN, M. S. S.; RAFAGNIN, T. R. Políticas de saúde do trabalhador no Brasil: contradições históricas e possibilidades de desenvolvimento. 2021.

22. PANDAY, S. et al. Perceived barriers to accessing Female Community Health Volunteers' (FCHV) services among ethnic minority women in Nepal: A qualitative study. PLOS ONE, v. 14, n. 6, p. e0217070, 10 jun. 2019.

23. SILVEIRA, L. S.; SIQUEIRA, N. L. Segregação ocupacional e diferenciais de renda por gênero e raça no Brasil: uma análise de grupos etários. Revista Brasileira de Estudos de População, v. 38, 2021. DOI: https://doi.org/10.20947/S0102-3098a0151.

24. BRASIL. Ministério da Saúde. Secretaria de Atenção à Saúde. Departamento de Ações Programáticas Estratégicas. Perda auditiva induzida por ruído (PAIR). Brasília, DF: Ministério da Saúde, 2006. 40 p. (Saúde do Trabalhador: Protocolos de Complexidade Diferenciada, n. 5; Série A. Normas e Manuais Técnicos). ISBN 85-334-1144-8. Disponível em: https://bvsms.saude.gov.br/bvs/publicacoes/protocolo_perda_auditiva.pdf. Acesso em: 19 out. 2024.

25. DING, T.; YAN, A.; LIU, K. What is noise-induced hearing loss? Br J Hosp Med (Lond). 2019 Sep 2. DOI: 10.12968/hmed.2019.80.9.525.

DOI: 10.36489/saudecoletiva.2026v17i106p19618-19633