

## ANALYSIS OF MORTALITY FROM PNEUMONIA IN ELDERLY INDIVIDUALS AGED 80 YEARS AND OVER IN BRAZIL BETWEEN 2014 AND 2024

## ANÁLISE DA MORTALIDADE POR PNEUMONIA EM IDOSOS ACIMA DE 80 ANOS NO BRASIL ENTRE OS ANOS DE 2014 A 2024

## ANÁLISIS DE LA MORTALIDAD POR NEUMONÍA EN PERSONAS MAYORES DE 80 AÑOS EN BRASIL ENTRE 2014 Y 2024



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### ABSTRACT

Pneumonia is one of the leading causes of mortality among older adults, especially those aged 80 years and over, due to immunological fragility and associated comorbidities; this study aimed to analyze the mortality profile from pneumonia in this age group in Brazil between 2014 and 2024, based on data from the Brazilian Unified Health System Hospital Information System (SIH/SUS); this is an ecological, quantitative, and descriptive analysis that included variables such as geographic region, sex, and race/color; the results revealed a higher number of deaths in the Southeast and Northeast regions, with predominance among White individuals in the South and Southeast and mixed-race individuals in the North and Northeast; the COVID-19 pandemic significantly contributed to the increase in deaths between 2020 and 2022; men presented higher lethality rates, and social vulnerability, low vaccination coverage, and regional inequalities were determining factors for negative outcomes; the findings highlight the need to strengthen public policies aimed at prevention, early diagnosis, and equity in healthcare access for the oldest-old population.

**Keywords:** Pneumonia. Older Adults. Mortality. Aging.

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## RESUMO

A pneumonia é uma das principais causas de mortalidade entre idosos, especialmente aqueles com 80 anos ou mais, devido à fragilidade imunológica e às comorbidades associadas. Este estudo objetivou analisar o perfil de mortalidade por pneumonia nessa faixa etária no Brasil entre 2014 e 2024, com base nos dados do Sistema de Informações Hospitalares do SUS (SIH/SUS). Trata-se de uma análise ecológica, quantitativa e descritiva, que incluiu variáveis como região geográfica, sexo e cor/raça. Os resultados revelaram maior número de óbitos nas regiões Sudeste e Nordeste, com predomínio entre indivíduos brancos nas regiões Sul e Sudeste, e pardos no Norte e Nordeste. A pandemia de COVID-19 contribuiu significativamente para o aumento de óbitos no período de 2020 a 2022. Homens apresentaram maior letalidade, e a vulnerabilidade social, baixa cobertura vacinal e desigualdades regionais foram determinantes para os desfechos negativos. Os achados destacam a necessidade de fortalecer políticas públicas voltadas à prevenção, diagnóstico precoce e equidade no acesso à saúde para idosos longevos.

**Palavras-chave:** Pneumonia. Idosos. Mortalidade. Envelhecimento.

## RESUMEN

La neumonía es una de las principales causas de mortalidad entre las personas mayores, especialmente aquellas de 80 años o más, debido a la fragilidad inmunológica y a las comorbilidades asociadas; este estudio tuvo como objetivo analizar el perfil de mortalidad por neumonía en este grupo etario en Brasil entre 2014 y 2024, con base en datos del Sistema de Información Hospitalaria del Sistema Único de Salud (SIH/SUS); se trata de un análisis ecológico, cuantitativo y descriptivo que incluyó variables como región geográfica, sexo y raza/color; los resultados revelaron un mayor número de muertes en las regiones Sudeste y Nordeste, con predominio de individuos blancos en las regiones Sur y Sudeste y de personas pardas en el Norte y Nordeste; la pandemia de COVID-19 contribuyó significativamente al aumento de muertes entre 2020 y 2022; los hombres presentaron mayor letalidad, y la vulnerabilidad social, la baja cobertura vacunal y las desigualdades regionales fueron factores determinantes para los desenlaces negativos; los hallazgos destacan la necesidad de fortalecer políticas públicas orientadas a la prevención, el diagnóstico precoz y la equidad en el acceso a la salud para las personas mayores longevas.

**Palabras clave:** Neumonía. Personas Mayores. Mortalidad. Envejecimiento.

## 1 INTRODUCTION

Pneumonia is one of the leading causes of mortality among the elderly, especially in the population over 80 years of age, whose immune fragility and the presence of comorbidities significantly increase the risk of fatal complications (Marrie et al., 2017). With the aging of the population in Brazil, understanding the pneumonia mortality profile in this age group has become an urgent need to guide public health strategies.

According to the World Health Organization (WHO), the elderly represent the portion of the population most vulnerable to respiratory infections, especially community-acquired pneumonia (World Health Organization, 2021). In Brazil, data from the SUS Hospital Information System (SIH/SUS) indicate that the

pneumonia remains among the leading causes of death in older adults over 80 years of age (Silva et al., 2020).

Immunosenescence, characterized by the progressive decline in the function of the immune system, compromises the inflammatory and immunological response of the elderly, making them more prone to colonization by respiratory pathogens and progression to lethal conditions (Pera et al., 2015). In addition, the coexistence of chronic diseases such as diabetes, heart failure, and chronic obstructive pulmonary disease (COPD) worsens the clinical prognosis of pneumonia in this population (Prina et al., 2015).

Aging is also associated with anatomical and physiological changes in the respiratory tract, such as reduced respiratory muscle strength and mucociliary clearance, which facilitate the onset and worsening of pulmonary infections (Cilloniz et al., 2016). These factors contribute to higher lethality rates in the elderly over 80 years of age.

The literature points out that pneumonia mortality rates are markedly higher in the North and Northeast regions of Brazil, suggesting inequalities in access to primary care, vaccination, and early diagnosis (Bastos et al., 2021). Vaccination coverage against pneumococcus and influenza, despite being recommended by the National Immunization Program (PNI), still has important gaps among the oldest elderly (Domingues et al., 2020).

In addition, the impact of the COVID-19 pandemic between 2020 and 2022 significantly modified the profile of mortality from respiratory causes, including pneumonia, either by differential diagnosis or by co-infection (Booth et al., 2021). This reinforces the importance of evaluating the historical series of deaths, also considering the effects of the new coronavirus on mortality patterns among the elderly.

Studies indicate that factors such as low education, poverty, and institutionalization in long-term care institutions are associated with a higher risk of death from pneumonia (Loeb

et al., 1999; Andrade et al., 2018). These social conditions directly interfere with treatment adherence, home care, and access to health services.

Pneumonia also represents an important marker of functional frailty in the elderly, often associated with loss of autonomy, sarcopenia, and

increased dependence after severe conditions (Covinsky et al., 1994). Therefore, mortality from pneumonia in this age group has significant implications for quality of life and care costs.

In this context, the present study aimed to analyze the pneumonia mortality profile in the elderly aged 80 years or older in Brazil, from 2014 to 2024, considering sociodemographic variables such as geographic region, sex, and color/race.

## **2 METHODOLOGY**

This study is characterized as an ecological analysis of a quantitative nature, using secondary data from the database of the Hospital Information System of the SUS (SIH/SUS), available in DATASUS, of the Ministry of Health of Brazil.

Records of deaths from pneumonia (ICD-10: J12 to J18) that occurred between 2014 and 2024 in individuals aged 80 years or older were extracted. The variables selected for analysis were: year of death, geographic region, gender, and color/race of the patient.

The color/race categories used followed the DATASUS standardization: white, brown, black, yellow and indigenous. The regions considered were: North, Northeast, Southeast, South and Midwest. Deaths were analyzed descriptively, with data presented by bar graphs and frequency distribution tables.

The data were processed and organized with the aid of Microsoft Excel®, and the graphs were constructed to facilitate the visualization of trends and comparisons between the variables. It should be noted that, as these are secondary data, this study may have limitations related to the quality of the records, such as underreporting, inconsistency of completion, or absence of data.

## **3 RESULTS AND DISCUSSIONS**

The analysis of data obtained from the SIH/SUS for the period from 2014 to 2024 highlights important aspects of pneumonia mortality in the elderly aged 80 years or older, allowing us to understand how demographic, regional, and social factors influence the clinical outcomes of this population.

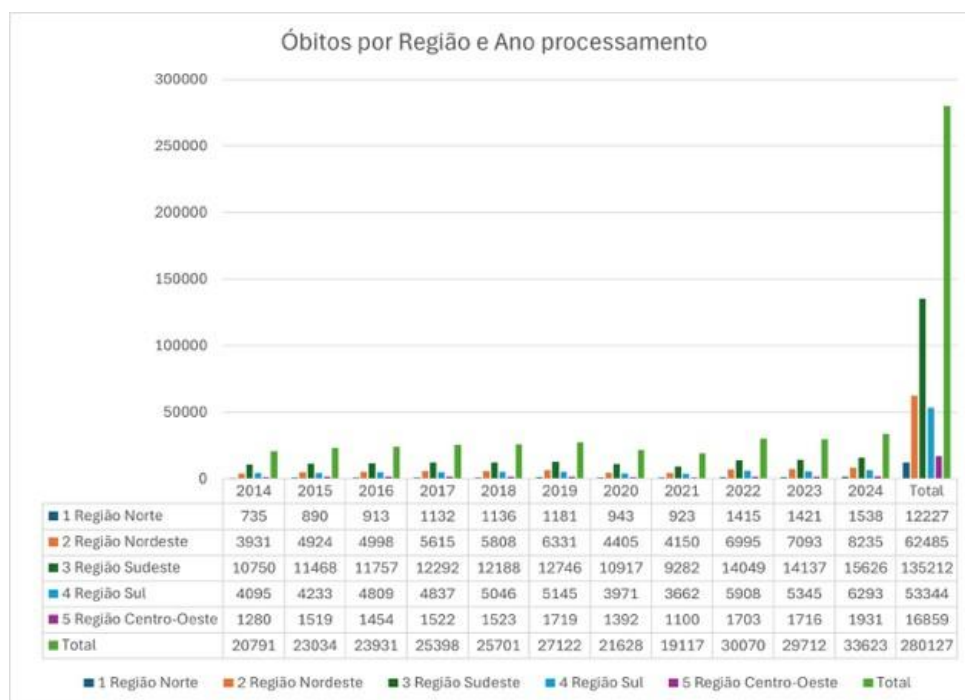
## 1. Distribution of Deaths by Region and Year

Figure 1 shows that the highest absolute numbers of deaths from pneumonia in long-lived elderly patients occurred in the Southeast and Northeast regions. The Southeast, a region with higher population density and more developed hospital infrastructure, also had a higher number of records, which may indicate greater diagnostic and notification capacity. On the other hand, the persistence of high numbers in the Northeast suggests weaknesses in preventive and primary care care, as pointed out by Bastos et al. (2021), who highlight regional disparities in access to health and mortality from respiratory diseases.

The upward trend between 2020 and 2022 was striking in all regions, especially in 2021, a period that coincided with the peak of the COVID-19 pandemic in Brazil. This elevation may reflect both co-infection and underreporting of COVID-19 as the underlying cause of death, being erroneously classified as pneumonia (Booth et al., 2021).

**Figure 1**

*Deaths by Region and Year of Processing*



Source: Adapted from DATASUS.

### Distribution of Deaths by Color/Race

Figure 2 shows that white elderly people concentrated most of the deaths in the South and Southeast regions, while brown elderly people were predominant in the North and Northeast. This distribution reflects the demographic profile of the regions, but also suggests structural differences in access to health services and in the diagnosis of respiratory diseases.

According to Loeb et al. (1999), institutionalized populations or those in situations of greater social vulnerability tend to have a higher risk of complications from pneumonia. In addition, Andrade et al. (2018) reinforce that socioeconomic inequalities are directly associated with worse clinical outcomes in elderly Brazilians, including higher hospitalization rates and mortality from preventable causes.

**Figure 2**

*Deaths by region and color/race*



Source: Adapted from DATASUS.

### Deaths by Sex

Figure 3 indicates that deaths from pneumonia were more frequent in males in most Brazilian regions. This data is in line with evidence showing higher lethality from respiratory infections in men, possibly due to lower demand for health services, more pronounced presence of comorbidities, and lower adherence to preventive strategies, such as vaccination (Domingues et al., 2020; Silva et al., 2020).

In addition, Cillóniz et al. (2020) report that male patients with pneumonia tend to have more severe clinical conditions and a greater need for intensive support, which contributes to the increase in mortality in this population.

**Figure 3**

*Deaths by region and sex*



Source: Adapted from DATASUS.

### Impact of the COVID-19 Pandemic

The significant increase in deaths in the 2020–2022 triennium is also strongly associated with the COVID-19 pandemic. Pneumonia was often the clinical presentation of COVID-19 in the elderly, making it difficult to distinguish diagnostics between causes and enhancing the severity of cases (Booth et al., 2021).

The marked aging of the immune system (immunosenescence) in the elderly aged 80 years or older makes them particularly vulnerable to the rapid evolution of respiratory conditions, both of viral and bacterial origin (Pera et al., 2015). This aggravates the outcome of pneumonia even in previously vaccinated patients, especially when vaccination coverage is incomplete or outdated.

### Epidemiological and Social Considerations

The data analyzed reinforce pneumonia as a marker of functional frailty and high mortality risk in the long-lived elderly. Covinsky et al. (1994) warn that hospitalizations for pneumonia in this age group often result in irreversible functional loss, dependence for activities of daily living and increased institutionalization.

In addition, the increase in deaths in less developed regions suggests the importance of restructuring the primary care network, with a focus on prevention, early screening of infections, and expansion of vaccination coverage against pneumococcus and influenza —

aspects that are still insufficient in the population group over 80 years of age (Domingues et al., 2020).

#### 4 CONCLUSION

Pneumonia remains an important public health problem among the elderly aged 80 years or older in Brazil, reflecting the weaknesses of the health system in view of the specific needs of this population. The high mortality observed in regions such as the Southeast and Northeast, as well as among men and vulnerable populations from the socioeconomic and racial point of view, indicates structural inequalities in health care for the elderly. The COVID-19 pandemic has aggravated this scenario, revealing limitations in diagnosis and epidemiological surveillance. These results reinforce the urgency of expanding vaccination coverage, restructuring primary care, promoting health education, and ensuring equitable access to prevention and treatment services. Investing in comprehensive care for long-lived elderly patients is essential to reduce mortality from pneumonia and improve the clinical outcomes associated with this condition in Brazil.

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