Machine Translated by Google

Brazilian Scientific Journal of Health and Medicine (RBMED)
(Brazilian Scientific Journal of Health and Medicine) ISSN-e 3086-2477
Vol. 1, No. 1 | 2026

Analysis of Morbidity and Mortality from Pneumonia in Brasília: An Ecological Study on Age and Racial Determinants

Analysis of Morbidity and Mortality from Pneumonia in Brasília: An Ecological Study on Age and Racial Determinants

Ramiro Dourado-Maranhão - Pulmonologist from UFG, Master's degree from Albert Einstein Hospital, Assistant Physician at Allergo Clinica and Gama Regional Hospital, Preceptor of the Medical Residency Program at HRG FEPECS/SES-DF. President of the Brasilia Society of Thoracic Diseases, Coordinator of the Infections Committee of SBPT. - https://orcid.org/0000-0001-8785-6669

Felipe Barros Blanco - Medical Resident in the Medical Residency Program at HRG FEPECS/SES-DF - https://orcid.org/0009-0004-8241-000X

Benedito Francisco Cabral Junior – Pulmonologist, Head of the Tuberculosis and Pneumology Department at the Gama Regional Hospital. Preceptor of the Medical Residency Program at HRG FEPECS/SES-DF. https://orcid.org/0000-0001-5657-7878

Gabriela Dourado-Maranhão – Pediatric Allergist and Immunologist, Assistant Physician and Technical Director of Allergo Clínica - https://orcid.org/0009-0004-1945-0471

Summary

Objective: To analyze the epidemiological profile, morbidity, and mortality rate from pneumonia in the Federal District between 2022 and 2024, identifying age and racial disparities. **Methods:** Cross-sectional ecological study using secondary data from the Hospital Information System (SIH/SUS). Hospitalizations and deaths under the descriptor "Pneumonia and Influenza" in Brasília were analyzed. **Results:** A progressive increase in the mortality rate was observed, evolving from 6.37 in 2022 to 7.7 in 2024. Mortality showed a strong correlation with advanced age and significant disparities between racial groups, with high rates in vulnerable populations. Seasonal peaks coincided with the dry season in the Cerrado. **Conclusion:** Pneumonia remains a critical public health challenge in Brasília, exacerbated by social inequalities and climatic factors. Vaccination strategies and early intervention protocols should be prioritized for higher-risk groups.

Keywords: Pneumonia, Bacterial Pneumonia; Influenza; Public Health.

Abstract

Objective: To analyze the epidemiological profile, morbidity, and mortality rate from pneumonia in the Federal District between 2022 and 2024, identifying age and racial disparities. Methods: Cross-sectional ecological study using secondary data from the Hospital Information System (SIH/SUS). Hospitalizations and deaths under the descriptor "Pneumonia and Influenza" in Brasília were analyzed. Results: A progressive increase in the mortality rate was observed, evolving from 6.37 in 2022 to 7.7 in 2024.

Seasonal peaks coincide with the dry season in the Cerrado. Conclusion: Pneumonia remains a critical public health challenge in Brasília, aggravated by social inequalities and climatic factors. Vaccination strategies and early intervention protocols should be prioritized for higher-risk groups.

Key-words: Pneumonia; Pneumonia, Bacterial; Influenza, Human; Public Health.

Machine Translated by Google

Brazilian Scientific Journal of Health and Medicine (RBMED)
(Brazilian Scientific Journal of Health and Medicine) ISSN-e 3086-2477
Vol. 1, No. 1 | 2026

1. Introduction

Community-acquired pneumonia (CAP) is one of the leading causes of
Hospitalization and death worldwide represent a persistent challenge.
for public health systems, they are [1] In Brazil, lower respiratory tract infections
among the leading causes of hospitalization in the Unified Health System (SUS).
exerting significant pressure on hospital infrastructure and resources.
financial. [2] Although advances in antibiotic therapy and supportive measures have been made
While ventilatory support has improved the prognosis for many patients, mortality has also decreased.
The incidence of pneumonia remains high, especially in vulnerable groups. [3]

The epidemiological landscape of respiratory diseases has undergone profound transformations.
following the COVID-19 pandemic. In Brasília, the period between 2022 and 2024 marks a phase
transitional phase where post-viral pulmonary sequelae, changes in the profile of
Bacterial resistance and fluctuations in vaccination coverage interact with the
The Central Plateau has unique geographical and climatic characteristics. The federal capital is...
characterized by a marked seasonality, with a period of extreme drought that
It compromises the defense mechanisms of the respiratory epithelium, facilitating colonization.
and infection by pathogens such as *Streptococcus pneumoniae.* [ÿ]

In addition to biological and environmental factors, contemporary literature highlights the influence
determinant of socioeconomic and racial factors in the clinical outcomes of diseases
respiratory. [ÿ] In Brazil, structural racism manifests itself in barriers to access to
early diagnosis and appropriate treatment, resulting in glaring disparities in
case fatality rate among different ethnic and racial groups. [ÿ] Understanding how these
Variables operating within the specific context of Brasília are fundamental to the formulation of
equitable and effective public policies.

This study aims to analyze the trend of morbidity and mortality from pneumonia in Brasília in
three-year period 2022-2024, investigating the impact of age and race as determinants of
risk. The analysis aims to provide input for the optimization of care protocols and
to strengthen secondary prevention strategies in the region.

Machine Translated by Google

Brazilian Scientific Journal of Health and Medicine (RBMED)
(Brazilian Scientific Journal of Health and Medicine) ISSN-e 3086-2477
Vol. 1, No. 1 | 2026

2. Methods

This is an ecological, time-series, cross-sectional study focused on
Analysis of aggregated data on hospitalizations and deaths due to pneumonia in the Federal District.
Public domain data, without individual identification, was used, originating from
from the Department of Informatics of the Unified Health System (DATASUS), which dispensed with
the submission and approval by a Research Ethics Committee, in accordance with the
current resolutions of the National Health Council. Even so, all procedures
The adopted methods strictly adhered to ethical principles and scientific integrity.

The data was obtained from the SUS Hospital Information System.
(SIH/SUS), through the TABNET tool, covering the period from January 2022 to
December 2024. For the geographic delimitation, the descriptor "Brasília" was used, and the
The selected procedure was "Treatment of Pneumonia and Influenza," which includes codes.
from the International Classification of Diseases (ICD-10) relating to bacterial pneumonias,
viral and unspecified. Information was collected regarding the total number of
Hospitalizations, deaths, mortality rate, patient age range, and race/ethnicity.
self-declared.

The main dependent variable was the mortality rate, defined as the ratio between the
The number of deaths and the number of hospitalizations in the same period, multiplied by 100.
The independent variables considered included the year of service (2022, 2023 and
2024), the age range, categorized into decennial groups or major life cycles.
(pediatric, adult and geriatric), and self-declared race/color (white, black, brown,
(yellow and indigenous). Additionally, the distribution of outcomes was analyzed by
hospital unit, with the aim of identifying possible heterogeneities in the network
assistance.

Machine Translated by Google

Brazilian Scientific Journal of Health and Medicine (RBMED)
(Brazilian Scientific Journal of Health and Medicine) ISSN-e 3086-2477
Vol. 1, No. 1 | 2026

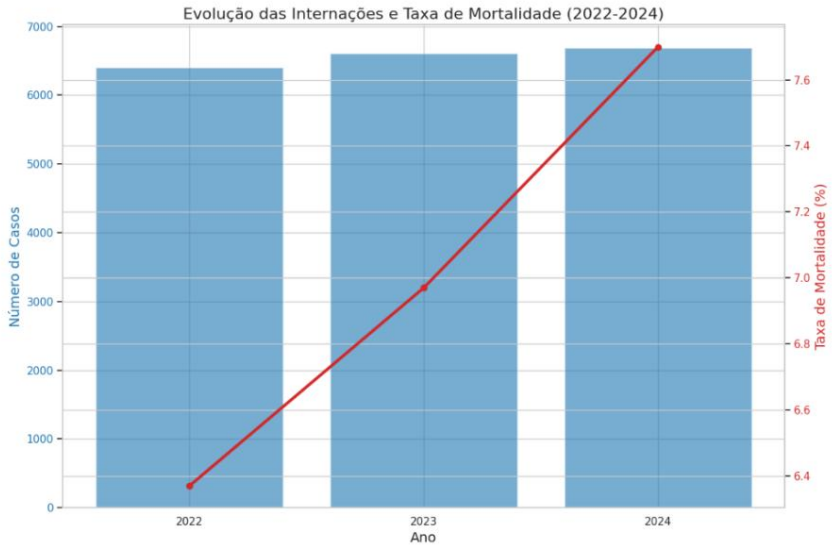
The data were organized into spreadsheets and subjected to statistical analysis.
descriptive, with calculation of absolute and relative frequencies. The temporal trend of
Mortality was assessed by identifying percentage variations over the
years studied. For the investigation of racial disparities, ratios were calculated of
The rate allows for comparison of risk between different groups. The presentation and the
The reporting of results followed the STROBE (Strengthening the Reporting of...) guidelines.
Observational Studies in Epidemiology), aiming to ensure transparency and consistency.
methodological and scientific quality.

3. Results

3.1 Overview of Hospitalizations and Demographic Profile

Between the years 2022 and 2024, the Federal District recorded a substantial volume of
Hospitalizations for pneumonia. The demographic profile of hospitalized patients revealed a
Bimodal distribution, with peaks in hospitalization at the extremes of life: children
Children under 5 years old and seniors over 60 years old. However, the severity of the cases and the
The need for complex interventions increased progressively in the group.
geriatric.

Table 1: Evolution of Hospitalizations and Mortality Rate (2022 – 2024). Brasília, 2025.



Machine Translated by Google

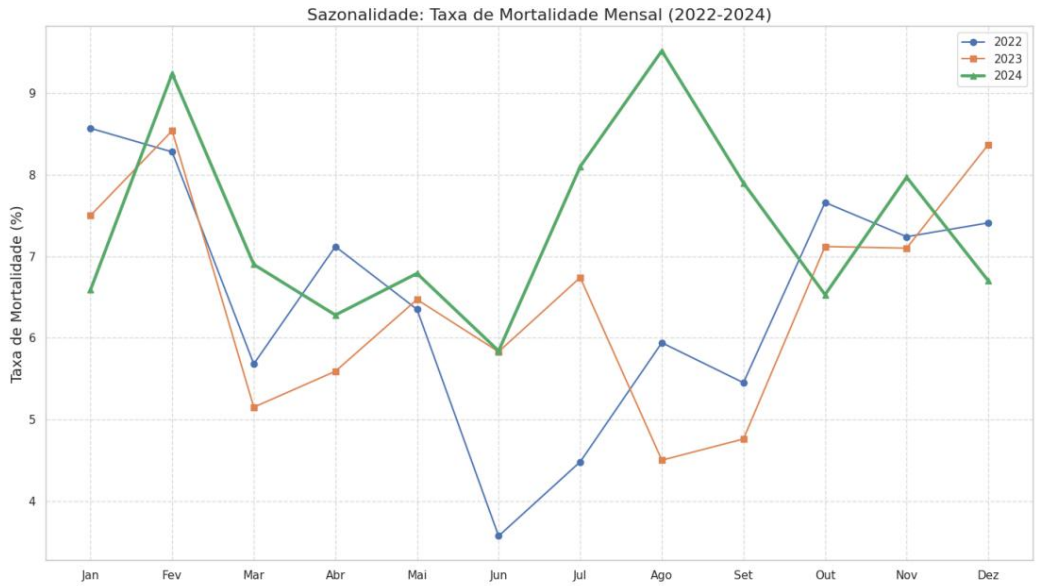
Brazilian Scientific Journal of Health and Medicine (RBMED)
(Brazilian Scientific Journal of Health and Medicine) ISSN-e 3086-2477
Vol. 1, No. 1 | 2026

3.2 Temporal Evolution and Seasonality of Mortality

A critical finding of this study is the progressive and sustained increase in the rate of mortality from pneumonia in Brasília over the three-year period analyzed. In 2022, the rate The mortality rate was 6.37. This figure rose to 6.97 in 2023 and reached 7.7. at the close of the period in 2024. This growth represents an increase a relative increase of approximately 20.8% in hospital mortality in just three years.

The monthly analysis demonstrated a clear influence of climatic seasonality. It was observed- if there is a systematic increase in hospitalizations and, subsequently, in mortality. During the winter and dry months (June to September). During these months, the low humidity The relative humidity in Brasília, often reaching critical levels below 20%, coincided with the highest rates of hospital deaths due to respiratory causes.

Table 2: Seasonality: Monthly Mortality Rate (2022 – 2024)



3.3 Analysis of Mortality Rate by Age Groups

Age was confirmed as the strongest individual predictor of death. While in the age ranges In pediatric age groups, mortality remained low, despite the high volume of

Hospitalizations have increased, but the mortality rate has skyrocketed among the elderly population. In 2024, the mortality rate...

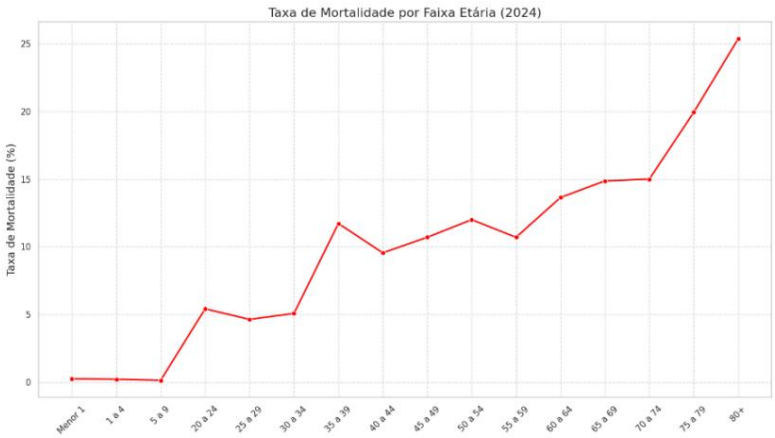
in patients over 80 years of age, it significantly exceeded the overall average, highlighting the The vulnerability of this group to acute respiratory infections. ÿ The increase in

Machine Translated by Google

Brazilian Scientific Journal of Health and Medicine (RBMED)
(Brazilian Scientific Journal of Health and Medicine) ISSN-e 3086-2477
Vol. 1, No. 1 | 2026

The overall mortality rate observed between 2022 and 2024 was driven primarily by...
Worsening outcomes in patients over 65 years of age.

Table 3: Mortality Rate by Age Group (2024)



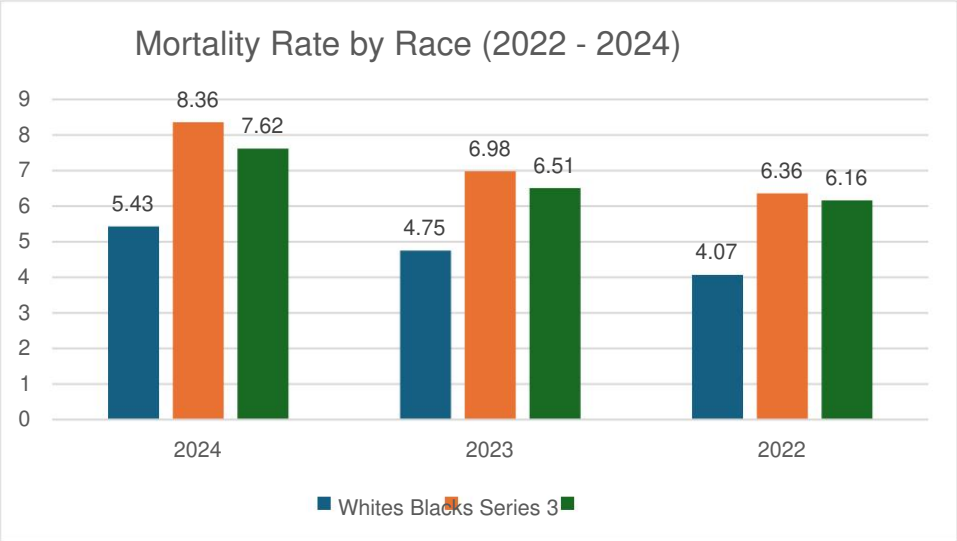
3.4 Disparities in Mortality by Race and Hospital Distribution

The data revealed significant inequalities when stratified by race/color.
The population that self-identified as brown and black presented higher mortality rates than
White population in various hospital units. In 2024, the analysis by hospital.
indicated that units located in administrative regions with lower per capita income
They presented higher mortality rates for Black and mixed-race patients in
comparison with hospitals in central areas.

Table 4: Mortality Rate by Race (2022-2024)

Machine Translated by Google

Brazilian Scientific Journal of Health and Medicine (RBMED)
(Brazilian Scientific Journal of Health and Medicine) ISSN-e 3086-2477
Vol. 1, No. 1 | 2026



This disparity was not limited to the frequency of deaths, but also extended to the earliness of the onset of symptoms. fatal outcome after admission, suggesting that patients from ethnic minorities may be arriving at health units in more advanced stages of the disease or facing Barriers to accessing advanced support therapies, such as mechanical ventilation and hospital beds. ICU. [ÿ]

4. Discussion

The progressive increase in the pneumonia mortality rate in Brasília, from 6.37 to The increase of 7.7% between 2022 and 2024 is a phenomenon that requires a multifactorial analysis. The "post-pandemic paradox" suggests that, although the acute threat of COVID-19 has been mitigated by mass vaccination, the dynamics of community pathogens have undergone lasting changes, including for those who survived severe infections by Covid-19. [10] One of the most alarming aspects of this study is the confirmation of race as a determinant of survival in pneumonia. High mortality in populations The high percentage of Black and mixed-race people in Brasília cannot be attributed to intrinsic biological factors, but Yes to the structural racism that permeates the healthcare system. [13] Inequality in The geographical distribution of health resources in the Federal District can be represented by that peripheral populations have a longer "door-to-antibiotic time". The delay in The start of pharmacological treatment is one of the main predictors of multiple organ failure. organ failure and septic shock in patients with severe pneumonia. [14] In this context, the

Machine Translated by Google

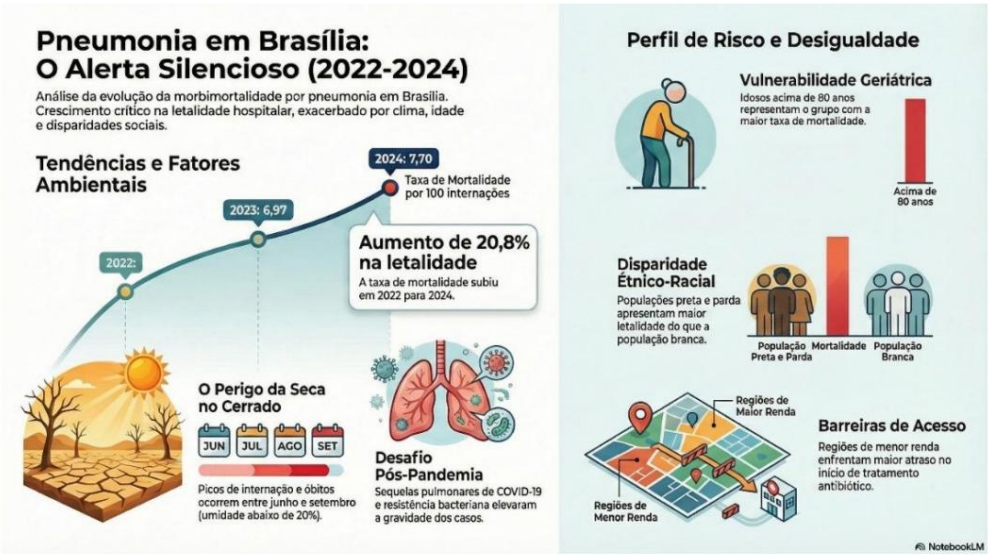
Brazilian Scientific Journal of Health and Medicine (RBMED)
(Brazilian Scientific Journal of Health and Medicine) ISSN-e 3086-2477
Vol. 1, No. 1 | 2026

Disparities in mortality rates among racialized individuals transcend physiological factors.
isolated. As discussed in the literature, the differences in critical outcomes at the end of the
Life is accompanied by markers of residential segregation, economic marginalization, and...
systematic denial of highly complex care. [19] Such evidence reinforces that the
The observed excess mortality does not stem from postulated biological differences, but rather
due to systemic and structural causes that limit the quality of support offered to these
groups. Furthermore, the correlation between race and social determinants of health, such as
Housing and educational conditions influence the ability to recognize children early.
of the symptoms and adherence to vaccination campaigns. [16] Literature shows that...
Income inequality, as measured by the Gini index, has a direct positive correlation.
with mortality from respiratory diseases in Brazil. [ÿ] In Brasília, this social fracture
This is evident when comparing the Plano Piloto (the planned city center) with the surrounding administrative regions.
Analysis of geriatric mortality also reveals gaps in the care network.
Pneumonia is often the final event in patients with multiple comorbidities.
chronic conditions such as COPD, heart failure, and diabetes. [ÿ] The increase in mortality in
The last three years may reflect accelerated population aging or a
decompensation of these chronic diseases in the post-pandemic period, where the
Outpatient follow-up was compromised. The elderly person's weakened immune system, or
Immunosenescence requires preventive strategies, such as vaccines.
Pneumococcal conjugate vaccines (P13, P15 and P20) and the influenza vaccine, reach
vaccination coverage rates higher than current levels in the Federal District. [17]

Machine Translated by Google

As limitations, this study shares the restrictions inherent in ecological studies.
such as the impossibility of establishing individual causal links (ecological fallacy) and the
dependence on the quality of completion of Hospital Admission Authorizations
(AIH). Underreporting or misdiagnosis between pneumonia and other
Severe acute respiratory syndromes can influence the results. However, the
SIH/SUS is a robust tool for monitoring population trends and
for guiding large-scale public policies.

Figure 1: Pneumonia in Brasília – a silent warning (2022 – 2024)



5. References

SILVA, PGOE et al. *Community-acquired pneumonia: epidemiology, diagnosis, prognostic severity scales, and new therapeutic options.* Medwave, vol. 13, no. 1, e2719, 2023.

GOMES, M. *Community-acquired pneumonia: challenges of the situation in Brazil.* Jornal Brasileiro de Pneumologia, v. 44, n. 4, p. 255-256, 2018.

ESPINOZA, R. et al. *Factors associated with mortality in severe community-acquired pneumonia: a multicenter cohort study.* Journal of Critical Care, vol. 50, p. 148-154, 2019.

Machine Translated by Google

CORRÊA, RA et al. *2018 recommendations for the management of community-acquired pneumonia.* Jornal Brasileiro de Pneumologia, v. 44, n. 5, p. 383-405, 2018.

DIAS, NLC et al. *Respiratory infections in adults and inequality: an analysis of deaths and their socioeconomic determinants in Brazil.* Medical Sciences, vol. 13, no. 1, p. 34, 2025.

OLIVEIRA, FEG et al. *Racial inequalities in the development of multimorbidity of chronic conditions: results from a Brazilian prospective cohort.* International Journal for Equity in Health, vol. 23, p. 201, 2024.

KIM, KT et al. *Breath-to-breath respiratory mechanics variation: how much variation should we expect?* Critical Care, vol. 19, p. 14340, 2015.

DOS SANTOS, LL et al. *Mortality from pneumonia in elderly people over 80 years of age, Brazil (2014 to 2024).* Brazilian Journal of Implantology and Health Sciences, v. 7, n. 1, p. 6523, 2025.

CARDOSO, FS; GOMES, DCK; SILVA, AS *Racial inequality in health care of adults hospitalized with COVID-19.* Public Health Notebooks, v. 39, no. 2, e00123421, 2023.

RODRIGUES, W. et al. *Social, economic, and regional determinants of mortality in hospitalized patients with COVID-19 in Brazil.* Frontiers in Public Health, vol. 10, p. 856137, 2022.

GHAZI CHAKI, SS et al. *Global trends in the proportion of macrolide-resistant Mycobacterium species: a systematic review and meta-analysis.* PLOS ONE, vol. 20, no. 1, e0333521, 2025.

PESSOA, E.; BÁRBARA, C.; COSTA, A.; NOGUEIRA, P. *Host and environmental determinants of in-hospital mortality in community-acquired pneumonia: evidence of seasonality, socioeconomic factors, and hospital.* BMC Pulmonary Medicine, vol. 25, p. 3716, 2025.

REBOUÇAS, P. et al. *Ethnoracial inequalities and child mortality in Brazil: a nationwide longitudinal study of 19 million newborn babies.* The Lancet Global Health, vol. 10, no. 9, p. e1234-e1245, 2022.

VÄNSKÄ, M. *Biomarkers of sepsis in neutropenic hematological patients.* University of Eastern Finland, 2015.

Machine Translated by Google

WYNEKER, JJ et al. *Racial, ethnic, and socioeconomic differences in critical care near the end of life: a narrative review.* Chest, vol. 164, no. 2, p. 432-441, 2023.

DA SILVA JUNIOR, SV et al. *Social determinants of health and adult respiratory distress syndrome.* International Journal of Nursing Didactics, v. 14, no. 3, p. 3385, 2024.

KITSIOS, GD et al. *Community-acquired pneumonia in vulnerable populations across the Americas: ongoing barriers to prevention and management.* Annals of the American Thoracic Society, vol. 22, p. 652, 2025.

ARTIGAS, A. et al. *24th international symposium on infections in the critically ill patient.* Journal of Clinical Medicine, vol. 8, no. 2, p. 23, 2019.