

Review Article

Epidemiology of Respiratory Diseases in Indonesia: A Narrative Review

Nur Huriyah Balqis^a, Dahlia^{b,*}

^a Universitas Muslim Indonesia, Makassar, Indonesia, nurhuriyahbalqis2121@gmail.com

^b Universitas Muslim Indonesia, Makassar, Indonesia, dahliahaz@umi.ac.id

Correspondence should be addressed to Dahlia; dahliahaz@umi.ac.id

Received 17 November 2025; Accepted 25 November 2025; Published 31 December 2025

Copyright © 2025 Shihhah Wal Afiyah Journal. This scholarly piece is accessible under the Creative Commons Attribution Non-commercial License, permitting dissemination and modification, conditional upon non-commercial use and due citation.

Abstract:

Respiratory diseases remain a major public health problem worldwide and in Indonesia. They encompass a wide spectrum of acute and chronic conditions, including acute respiratory infections (ARI), pneumonia, tuberculosis (TB), asthma, and chronic obstructive pulmonary disease (COPD). Globally, respiratory diseases contribute to hundreds of millions of new cases and millions of deaths every year, with lower respiratory tract infections and COPD among the leading causes of mortality. In Indonesia, ARI consistently ranks among the most frequent diagnoses in primary health care, while the country is still listed as one of the highest TB-burden countries. Urban air pollution, household air pollution, high smoking prevalence, and crowded living conditions further aggravate the burden of respiratory morbidity and mortality. This narrative review summarizes current evidence on the definition and classification of respiratory diseases, their distribution and burden in Indonesia, key epidemiological determinants (person, place, and time), and major risk factors specific to the Indonesian context. The health, social, and economic impacts are discussed, as well as existing prevention and control strategies, including national TB control, childhood pneumonia programs, and smoke-free policies. A better understanding of these epidemiological aspects is essential to guide more targeted public health policies and integrated interventions to reduce the burden of respiratory diseases in Indonesia.

Keywords: Respiratory Diseases; Epidemiology; ARI; COPD; Tuberculosis.

1. Introduction

Respiratory diseases are among the most important contributors to global morbidity and mortality. They involve disorders of the respiratory tract, ranging from the upper airways to the lungs, and can severely impair gas exchange and overall functional capacity. Disturbances in respiratory function negatively affect quality of life, work productivity, and life expectancy (1). Common respiratory diseases include acute respiratory infections (ARI), pneumonia, tuberculosis (TB), asthma, chronic obstructive pulmonary disease (COPD), and more recently, respiratory illnesses caused by emerging viruses such as coronavirus disease 2019 (COVID-19) (2),(3).

According to the World Health Organization (WHO), respiratory diseases account for a substantial proportion of the global disease burden and remain among the top causes of death worldwide, driven largely by lower respiratory tract infections and COPD (4). In Indonesia, respiratory diseases consistently feature among the leading causes of outpatient visits and hospitalization, with ARI contributing to nearly one-fifth of primary care consultations and TB placing Indonesia among the three countries with the highest TB burden globally (5).

The epidemiology of respiratory diseases is shaped by a complex interaction between host characteristics (such as age, sex, nutritional status, and behavior), environmental exposures (including air pollution and housing

conditions), and broader social determinants such as poverty and access to health services. Rapid urbanization, persistent indoor and outdoor air pollution, as well as climate change further modify the temporal and spatial patterns of disease occurrence (6),(7).

Despite the large burden and extensive programmatic efforts, respiratory diseases remain a major challenge for the Indonesian health system. A structured overview of their epidemiology is therefore needed to inform more effective prevention and control measures. This narrative review aims to summarize the definition and classification of respiratory diseases, describe their distribution and burden in Indonesia, outline key epidemiological determinants and risk factors, and highlight current prevention and control strategies, with a focus on the Indonesian context.

2. Main Body / Subheadings

Definition and Classification of Respiratory Diseases

Respiratory diseases are broadly defined as disorders affecting the respiratory system, including the upper airways (nose, sinuses, pharynx, larynx) and lower airways (trachea, bronchi, and lungs). Etiologies include infectious agents such as viruses, bacteria, and fungi, as well as non-infectious factors such as air pollution, tobacco smoke, and allergens (8).

In clinical and public health practice, respiratory diseases are commonly categorized into two major groups:

a. Acute respiratory diseases

These are conditions with a relatively short onset and course, dominated by infectious etiologies:

- Acute Respiratory Infections (ARI): infections of the upper and/or lower respiratory tract caused by viruses or bacteria, often presenting with cough, sore throat, and fever (9).
- Influenza: acute viral infection characterized by fever, myalgia, and respiratory symptoms, with potential for seasonal epidemics (10).
- Pneumonia: inflammation of the lung parenchyma, typically involving the alveoli, caused by bacteria such as *Streptococcus pneumoniae* or respiratory viruses (11).
- COVID-19: a viral respiratory disease caused by SARS-CoV-2, with clinical manifestations ranging from mild upper respiratory symptoms to severe pneumonia and acute respiratory distress (12).

b. Chronic respiratory diseases

These are long-term conditions associated with persistent airway or lung pathology:

- Tuberculosis (TB) of the lungs: a chronic infectious disease caused by *Mycobacterium tuberculosis*, associated with prolonged cough, weight loss, and radiographic lung lesions; highly relevant in Indonesia due to its high disease burden (13).
- Chronic Obstructive Pulmonary Disease (COPD): a progressive disease characterized by airflow limitation that is not fully reversible, commonly associated with long-term exposure to tobacco smoke and air pollutants (14).
- Asthma: a chronic inflammatory disorder of the airways characterized by variable airflow obstruction and bronchial hyperresponsiveness, leading to symptoms such as wheezing, dyspnea, and cough (15).

This classification into acute and chronic conditions is useful for understanding the different epidemiological patterns, risk factors, and prevention strategies required for effective control.

Burden and Distribution of Respiratory Diseases in Indonesia

Acute Respiratory Infection (ARI)

ARI remains one of the most frequent diagnoses in primary health care settings in Indonesia. Data from the Indonesia Health Profile 2023 indicate that ARI accounts for approximately 18–20% of all patient visits to community health centers (puskesmas) nationwide. Incidence tends to increase during the rainy season, particularly in densely populated urban and peri-urban areas with poor ventilation and overcrowded housing.

Children under five years of age represent the most vulnerable group, with a higher risk of complications such as pneumonia and hospitalization.

Pneumonia

Pneumonia is a leading cause of mortality among children under five years of age in Indonesia. WHO and UNICEF estimates suggest more than 400,000 childhood pneumonia cases annually, with approximately 20,000 deaths per year (16). In response, the government has implemented the National Movement for the Control of Childhood Pneumonia (Gerakan Nasional Penanggulangan Pneumonia Balita), focusing on immunization, promotion of exclusive breastfeeding, and nutritional improvement (17).

Pulmonary Tuberculosis (TB)

Indonesia continues to rank among the countries with the highest TB burden worldwide, following India and China. The WHO Global Tuberculosis Report 2024 estimates about one million new TB cases annually in Indonesia, with around 140,000 TB-related deaths. High TB incidence is closely linked to low socioeconomic status, overcrowded housing, and suboptimal treatment adherence (18),(19). The national “End TB 2030” strategy emphasizes early case detection, treatment completion, and infection control in health facilities.

Chronic Obstructive Pulmonary Disease (COPD)

COPD is an important chronic respiratory disease in Indonesia, largely driven by high smoking prevalence and chronic exposure to air pollutants (20). Data from the Indonesia Basic Health Research (Riskesdas) 2023 report a COPD prevalence of around 3.5% in the population aged 30 years and older (20). With more than 60 million active smokers, Indonesia is considered one of the countries with the highest smoking rates globally, contributing significantly to COPD incidence and progression (21).

Asthma and Allergic Respiratory Diseases

Asthma is a common chronic respiratory condition in Indonesia. The Global Initiative for Asthma (GINA) and Riskesdas 2023 estimate asthma prevalence at approximately 4.0–5.2% of the total population. Asthma is frequently diagnosed in children and adolescents and can be exacerbated by urban air pollution, household allergens such as dust mites, and climate variability. Poor disease control leads to recurrent emergency visits, missed school or work days, and reduced quality of life.

Taken together, these conditions illustrate the substantial contribution of respiratory diseases to outpatient visits, hospital admissions, and premature mortality in Indonesia. To provide an integrated overview, the main characteristics and relative burden of each major respiratory disease are summarized in Table 1.

Table 1. Major respiratory diseases in Indonesia

Disease / Condition	Type	Main affected group	Burden in Indonesia	Main Health Impact	Key Risk Factors	Program/Response
Acute Respiratory Infection (ARI)	Acute	All ages, esp. children <5 years	~20% of primary care visits	Recurrent cough, fever, risk of pneumonia	Overcrowded housing, poor ventilation, indoor pollution	IMCI, early care-seeking education
Pneumonia (childhood)	Acute	Children <5 years	>400,000 cases, 20,000 deaths/year	Respiratory distress, mortality	Incomplete immunization, malnutrition	Pneumonia Control Program
Tuberculosis (TB)	Chronic	Adults 15-49 years	1 million new cases, 140,000 deaths/year	Cough \geq 2 weeks, weight loss, fatigue	Smoking, poor nutrition, HIV	End TB Strategy 2030
Chronic Obstructive Pulmonary Disease (COPD)	Chronic	Adults \geq 30 years (mostly male)	~3–4% prevalence	Reduced lung function, disability	Smoking, occupational dust, air pollution	Tobacco control, pulmonary rehab
Asthma	Chronic	All ages	4–5% prevalence	Recurrent wheezing, dyspnea	Allergens, smoking, pollution	Asthma management via PHC

As shown in Table 1, acute respiratory infections and pulmonary tuberculosis stand out as the conditions with the highest overall burden, particularly in terms of frequency and mortality. To further illustrate the relative magnitude of these conditions, Figure 1 presents a qualitative comparison of the burden of major respiratory diseases in Indonesia.

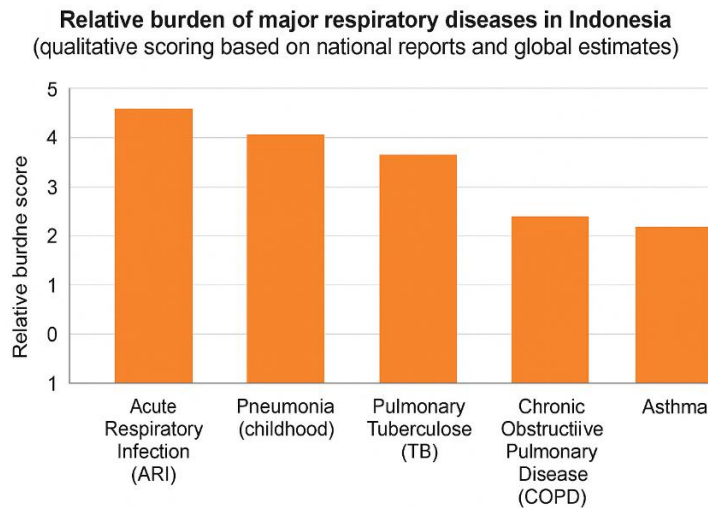


Figure 1. Relative burden of major respiratory diseases in Indonesia

Epidemiological Determinants: Person, Place, and Time

Person (Individual Factors)

Individual-level characteristics play a central role in determining susceptibility to respiratory diseases:

- **Age:** Children under five and older adults have weaker immune defenses, making them more prone to ARI and pneumonia, as well as severe disease outcomes (21).
- **Sex:** Men are at higher risk for COPD and lung cancer, largely due to higher smoking prevalence compared with women (22).
- **Nutritional status:** Undernutrition compromises immune function, increasing vulnerability to respiratory infections, especially among children.
- **Behavioral factors:** Active smoking, exposure to second-hand smoke, and alcohol use are associated with increased risk of chronic lung diseases and recurrent infections (23).

Place (Environmental and Contextual Factors)

Geographical and environmental conditions shape the spatial distribution of respiratory diseases:

- **Urban air pollution:** Large cities such as Jakarta, Surabaya, and Medan frequently report fine particulate matter (PM_{2.5}) levels exceeding WHO safety thresholds, contributing to exacerbations of asthma and COPD (24).
- **Housing conditions:** Overcrowded dwellings with poor ventilation and high humidity facilitate the transmission of respiratory pathogens and worsen chronic symptoms.
- **Rural and remote areas:** Limited access to health facilities, diagnostic services, and essential medicines leads to delayed diagnosis and treatment, increasing the risk of complications and mortality.

Time (Temporal Patterns)

Temporal variations reflect seasonal and long-term trends in respiratory disease occurrence:

- **Seasonality:** ARI and influenza typically peak during the rainy season or cooler months, when high humidity and closer indoor contact favor viral transmission.
- **Endemicity:** TB and COPD display relatively stable incidence throughout the year, consistent with their chronic nature and long-term risk exposures.

- Pandemic events: The COVID-19 pandemic (2020–2023) illustrated how novel respiratory pathogens can rapidly spread globally, causing surges in morbidity, mortality, and health system strain.

Major Risk Factors for Respiratory Diseases in Indonesia

Multiple risk factors contribute to the high burden of respiratory diseases in Indonesia. Key determinants include:

1. Tobacco Use

The Global Adult Tobacco Survey (GATS) 2023 reports that approximately 33.5% of Indonesian adults are active smokers, with around 70% of them being male. Tobacco smoke exposure both active and passive is a major risk factor for COPD, lung cancer, cardiovascular disease, and increased susceptibility to respiratory infections.

2. Outdoor and Indoor Air Pollution

According to the IQAir World Air Quality Report 2024, PM_{2.5} levels in several Indonesian cities often exceed WHO recommended limits. Sources include traffic emissions, industrial activities, burning of biomass, and transboundary haze from forest and land fires. Indoor air pollution from biomass cooking fuels further elevates risk, particularly among women and children in rural households.

3. Housing and Living Conditions

Overcrowded living environments with inadequate ventilation and poor sanitation promote the transmission of respiratory infections such as TB and ARI. Many low-income families reside in densely populated neighborhoods with limited space, increasing contact rates and shared air exposures.

4. Socioeconomic Status and Nutrition

Low-income households often face barriers to accessing timely and quality health care, clean energy, and adequate nutrition. Undernutrition in children and micronutrient deficiencies impair immune competence, leading to more severe respiratory infections and slower recovery.

5. Climate Change and Extreme Weather

Climate variability, including changes in temperature, rainfall patterns, and extreme weather events, can influence respiratory disease patterns. Increased particulate matter during dry seasons and higher humidity during rainy seasons may trigger exacerbations of asthma and ARI.

Health, Social, and Economic Impact

Respiratory diseases impose substantial health, social, and economic burdens. At the individual level, recurrent infections and chronic respiratory conditions lead to reduced physical capacity, chronic disability, and diminished quality of life. Children with recurrent ARI or poorly controlled asthma may experience growth impairment and impaired school performance, while adults with COPD or TB often face reduced work productivity and income loss.

From a societal perspective, high rates of hospitalization, long treatment durations (particularly for TB), and the need for intensive care in severe pneumonia or COPD exacerbations place a heavy strain on the health system. WHO estimates that chronic lung diseases and lower respiratory tract infections contribute to global economic losses exceeding USD 1 trillion annually due to health care costs and productivity losses (21). In low- and middle-income countries such as Indonesia, these impacts are magnified by limited health system resources and social protection mechanisms.

Prevention and Control Strategies in Indonesia

The Indonesian government, supported by international partners, has implemented a range of interventions to prevent and control respiratory diseases:

1. National Tuberculosis Control Program (P2TB)

The national TB program adopts a comprehensive strategy of Find–Treat–Prevent–Build, focused on early case detection, standardized treatment regimens, prevention of transmission, and health system strengthening. The long-term objective is to achieve TB elimination by 2030.

2. Programs Targeting ARI and Childhood Pneumonia

Control of ARI and pneumonia among children is pursued through the provision of complete basic immunization (including Haemophilus influenzae type b and pneumococcal vaccines), promotion of exclusive breastfeeding, improved nutrition, and counseling on early care-seeking behavior.

3. Tobacco Control and Smoke-Free Policies

Smoke-free area (Kawasan Tanpa Rokok, KTR) regulations have been introduced in many provinces and districts, especially in public facilities, schools, hospitals, and public transport. These regulations aim to reduce exposure to second-hand smoke and support broader tobacco control efforts (25).

4. Air Quality and Environmental Management

Measures to reduce air pollution include emission controls on industry and vehicles, urban greening initiatives, and efforts to prevent and mitigate forest and land fires. While progress remains uneven, these environmental policies are important components of long-term respiratory health protection (26).

5. Early Detection and Pulmonary Rehabilitation

Health facilities increasingly provide early detection services for COPD and other chronic respiratory diseases, as well as pulmonary rehabilitation programs that focus on exercise training, education, and self-management support for patients with chronic symptoms.

Continued integration of these strategies, coupled with health promotion, community engagement, and stronger surveillance, is crucial for reducing the respiratory disease burden in Indonesia.

3. Conclusion

Respiratory diseases constitute a major public health challenge in Indonesia, contributing substantially to morbidity, mortality, and economic losses. The spectrum of conditions ranges from acute infections such as ARI and pneumonia to chronic diseases like TB, asthma, and COPD. Their epidemiology is shaped by individual characteristics (age, sex, nutritional and behavioral factors), environmental exposures (air pollution, housing conditions), and broader social determinants, with climate change adding further complexity. High smoking prevalence, persistent indoor and outdoor air pollution, overcrowded living conditions, and socioeconomic disparities remain key drivers of respiratory disease burden. Although Indonesia has implemented multiple national programs including TB control, childhood pneumonia initiatives, smoke-free policies, and environmental regulations significant gaps persist in awareness, access to care, and risk factor reduction. A comprehensive understanding of the epidemiology of respiratory diseases, as outlined in this review, can serve as an evidence base for refining public health policies and multi-sectoral interventions. Strengthening prevention, early detection, and long-term management together with efforts to address environmental and social determinants will be essential to reduce the burden of respiratory diseases and improve the respiratory health and quality of life of the Indonesian population.

References:

1. Purnama TB. Prevalence and risk factors of acute respiratory infection and diarrhea among children under 5 years old in low-middle wealth household, Indonesia. *Infect Dis Poverty* [Internet]. 2025;14(1). Available from: <https://www.scopus.com/inward/record.uri?partnerID=HzOxMe3b&scp=85219587319&origin=inward>
2. Lutpiatina L. Multilevel Analysis of Lifestyle and Household Environment for Toddlers With Symptoms of Acute Respiratory Infection (ARI) in Indonesia in 2007, 2012, and 2017. *Glob Pediatr Heal* [Internet]. 2022;9. Available from: <https://www.scopus.com/inward/record.uri?partnerID=HzOxMe3b&scp=85127116491&origin=inward>
3. Farida H. Epidemiologic, clinical, and serum markers may improve discrimination between bacterial and

- viral etiologies of childhood pneumonia. *Front Med* [Internet]. 2023;10. Available from: <https://api.elsevier.com/content/article/eid/1-s2.0-S2296858X23005967>
4. Santri IN. Associations between indoor air pollutants and risk factors for acute respiratory infection symptoms in children under 5: An analysis of data from the indonesia demographic health survey. *J Prev Med Public Heal* [Internet]. 2023;56(3):255–63. Available from: <https://www.scopus.com/inward/record.uri?partnerID=HzOxMe3b&scp=85161238599&origin=inward>
 5. Purnama TB. Effects of the Local Environment and Nutritional Status on the Incidence of Acute Respiratory Infections Among Children Under 5 Years Old in Indonesia. *J Prev Med Public Heal* [Internet]. 2024;57(5):461–70. Available from: <https://www.scopus.com/inward/record.uri?partnerID=HzOxMe3b&scp=85205972802&origin=inward>
 6. Lutpiatina L. Prediction of Toddlers Acute Respiratory Infection (ARI) to Become Pneumonia in Martapura Catchment Area, Banjar District, Indonesia. *Glob Pediatr Heal* [Internet]. 2024;11. Available from: <https://www.scopus.com/inward/record.uri?partnerID=HzOxMe3b&scp=85185922657&origin=inward>
 7. Haryanto B. Associations Between Ambient PM2.5 Levels and Children’s Pneumonia and Asthma During the COVID-19 Pandemic in Greater Jakarta (Jabodetabek). *Ann Glob Heal* [Internet]. 2025;91(1). Available from: <https://www.scopus.com/inward/record.uri?partnerID=HzOxMe3b&scp=86000217750&origin=inward>
 8. Aditama TY. Air Pollution [Internet]. *Social Consequences of Climate Change Debates in Research and Policy*. 2024. p. 3–10. Available from: <https://www.scopus.com/inward/record.uri?partnerID=HzOxMe3b&scp=105018441108&origin=inward>
 9. Wulandari RA. Investigations on the risk factors of Acute Respiratory Infections (ARIs) among under-five children in Depok City, Indonesia. *Ann Di Ig Med Prev E Di Comunita* [Internet]. 2024;36(1):15–25. Available from: <https://www.scopus.com/inward/record.uri?partnerID=HzOxMe3b&scp=85178497950&origin=inward>
 10. Krasselt M. Influenza, Pneumococcal and Herpes Zoster Vaccination Rates in Patients with Autoimmune Inflammatory Rheumatic Diseases. *Vaccines* [Internet]. 2023;11(4). Available from: <https://www.scopus.com/inward/record.uri?partnerID=HzOxMe3b&scp=85153792461&origin=inward>
 11. Ayan E. Diagnosis of Pediatric Pneumonia with Ensemble of Deep Convolutional Neural Networks in Chest X-Ray Images. *Arab J Sci Eng* [Internet]. 2022;47(2):2123–39. Available from: https://api.elsevier.com/content/abstract/scopus_id/85114800863
 12. Zaini J. Tuberculosis and COVID-19 coinfection: A report of two cases at a tertiary referral in Indonesia. *J Infect Dev Ctries* [Internet]. 2022;16(3):478–83. Available from: <https://www.scopus.com/inward/record.uri?partnerID=HzOxMe3b&scp=85127979493&origin=inward>
 13. Ramadhan MD. Profile of Pulmonary Tuberculosis Patients in Dr. Soetomo General Academic Hospital. *Indones J Clin Pathol Med Lab* [Internet]. 2023;29(3):272–6. Available from: <https://www.scopus.com/inward/record.uri?partnerID=HzOxMe3b&scp=85188605821&origin=inward>
 14. Sebayang RRB. Comparative analysis between PUMA and CAPTURE questionnaires for chronic obstructive pulmonary disease (COPD) screening in smokers. *Narra J* [Internet]. 2024;4(1). Available from: <https://www.scopus.com/inward/record.uri?partnerID=HzOxMe3b&scp=85193719236&origin=inward>
 15. Sandoval-Gutiérrez JL. Asthma and pregnancy: simplified approach [Internet]. Vol. 38, *Medicina Interna De Mexico*. 2022. p. 642–8. Available from: <https://www.scopus.com/inward/record.uri?partnerID=HzOxMe3b&scp=85158168166&origin=inward>
 16. Mesina F, Julian J, Relos J, Torres R, Comia MVM, Ongkingco JMP, et al. Use of Convalescent Plasma Therapy with Best Available Treatment (BAT) among Hospitalized COVID-19 Patients: A Multi-Center Study. *medRxiv* [Internet]. 2022;1–27. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9211424/>
 17. Echeverría-Esnal D, Martín-Ontiyuelo C, Navarrete-Rouco ME, De-Antonio Cuscó M, Ferrández O, Horcajada JP, et al. Azithromycin in the treatment of COVID-19: a review [Internet]. Vol. 19, *Expert Review of Anti-Infective Therapy*. Taylor & Francis; 2021. 147–163 p. Available from: <https://doi.org/10.1080/14787210.2020.1813024>
 18. Yusransyah Y. Cost-effectiveness analysis of TB-R (Tuberculosis Reminder) application implementation

- for pulmonary tuberculosis patient management in hospitals across underdeveloped regions of Indonesia. *Pharm Sci Asia* [Internet]. 2026;53(1):102–11. Available from: <https://www.scopus.com/inward/record.uri?partnerID=HzOxMe3b&scp=105032125671&origin=inward>
19. Zahra DAA. Factors Affecting the Quality of Life Among Pulmonary Tuberculosis Patients at the TB-DOTS Outpatient Clinic of Public Hospital. *Public Heal Indones* [Internet]. 2024;10(1):43–51. Available from: <https://www.scopus.com/inward/record.uri?partnerID=HzOxMe3b&scp=85189010939&origin=inward>
 20. Sari DM. Prevalence and Predictors of COPD in Indonesian Smokers Attending Posbindu Community Health Centers: A Cross-Sectional Analysis. *Media Publ Promosi Kesehat Indones* [Internet]. 2026;9(2):284–95. Available from: <https://www.scopus.com/inward/record.uri?partnerID=HzOxMe3b&scp=105030604993&origin=inward>
 21. Adeloye D. Global, regional, and national prevalence of, and risk factors for, chronic obstructive pulmonary disease (COPD) in 2019: a systematic review and modelling analysis. *Lancet Respir Med* [Internet]. 2022;10(5):447–58. Available from: <https://api.elsevier.com/content/article/eid/1-s2.0-S2213260021005117>
 22. Broese JMC. Implementation of a palliative care intervention for patients with COPD – a mixed methods process evaluation of the COMPASSION study. *BMC Palliat Care* [Internet]. 2022;21(1). Available from: <https://www.scopus.com/inward/record.uri?partnerID=HzOxMe3b&scp=85143500726&origin=inward>
 23. Sambodo NP. When the smoke gets in your lungs: short-term effects of Indonesia’s 2015 forest fires on health care use. *Environ Heal A Glob Access Sci Source* [Internet]. 2024;23(1). Available from: <https://api.elsevier.com/content/article/eid/1-s2.0-S1476069X2400037X>
 24. Mamola R. Enhancing urban awareness for respiratory disease prevention: a socio-environmental approach to air pollution in Indonesia. *Manag Environ Qual* [Internet]. 2025; Available from: <https://www.scopus.com/inward/record.uri?partnerID=HzOxMe3b&scp=105004363453&origin=inward>
 25. Bhatt G. Feasibility of tobacco cessation intervention at non-communicable diseases clinics: A qualitative study from a North Indian State. *PLoS One* [Internet]. 2023;18(5). Available from: <https://api.elsevier.com/content/article/eid/1-s2.0-S1932620323023970>
 26. He T, Jin L, Li X. On the triad of air PM pollution, pathogenic bioaerosols, and lower respiratory infection. *Environ Geochem Health* [Internet]. 2023; Available from: <https://link.springer.com/article/10.1007/s10653-021-01025-7>