*International Journal Of Health, Engineering And Technology (IJHET)* *E-ISSN 2829 - 8683*
Volume 4, Number 6, March 2026, *Page. 2055 - 2061*
Email : editorijhess@gmail.com

# Epidemiological And Etiological Profile Of Severe Acute Respiratory Infection Syndrome In Indonesia 2025: A Retrospective Descriptive Study

**Darmawali Handoko[1)], Hana Apsari Pawestri[2)], Yulia Arum Sekarini[3)], Kambang Sariadji[4)], Catharina Yekti Praptiningsih[5)] , Subangkit[6)], Budiyanto[7)], Arie Ardiansyah Nugraha[8)], Markus Evan Anggia[9)]**
[1,2,4,6,7,8,9)] National Center for Public Health Biological Laboratory Indonesia,
[3,5)] Centers for Disease Control (CDC) Indonesia

*Corresponding Author
Email : kambang_sar@yahoo.com

***Abstract***

*Severe acute respiratory infection syndrome is a major cause of hospitalization and mortality worldwide and remains a critical public health concern in Indonesia. Laboratory-based syndromic surveillance plays an essential role in monitoring circulating respiratory pathogens and detecting emerging threats. To describe the demographic characteristics and temporal distribution of severe acute respiratory infection syndrome cases identified through laboratory-based syndromic surveillance in Indonesia during 2025. We conducted a retrospective descriptive study using routinely collected laboratory surveillance data from the National Biological Public Health Laboratory, Indonesia, during January-December 2025. The cases were defined according to World Health Organization criteria. Specimens submitted through passive syndromic surveillance were tested using polymerase chain reaction-based assays following national protocols. Descriptive analyses were performed to summarize demographic characteristics, laboratory results, and temporal and geographic distribution of the cases. A total of 194 severe acute respiratory infection syndrome cases were identified in 2025. Children under five years of age accounted for 43.8% of cases, and males represented 59.3%. Most specimens were respiratory (94.3%). Overall, 75.2% of cases tested negative for pathogens included in the testing panel. Among laboratory-confirmed cases, Legionella pneumophila (19.1%) and influenza A (8.2%) were the most frequently detected pathogens, while SARS-CoV-2 was detected in one case (0.5%). Severe acute respiratory infection disease cases were reported throughout the year, with fluctuations in weekly case counts and wide geographic distribution across provinces. Severe acute respiratory infection syndrome occurred year-round in Indonesia during 2025, with young children and older adults disproportionately affected. Despite limitations inherent to passive laboratory-based surveillance, these findings demonstrate the value of integrated severe acute respiratory infection disease surveillance for monitoring severe respiratory infections and informing public health preparedness in tropical settings.*

***Keywords: Severe Acute Respiratory Infection Syndrome; Laboratory-Based Syndromic Surveillance; Respiratory Pathogens; Polymerase Chain Reaction (Pcr); Epidemiology; Indonesia; Public Health Surveillance; Temporal Distribution.***

## INTRODUCTION

Severe acute respiratory infection syndrome is caused by a range of viral and bacterial pathogens and represents a major global public health threat due to its high transmissibility, potential for rapid spread, and association with severe morbidity and mortality [1]. Historically, emerging and re-emerging respiratory pathogens have caused devastating pandemics, including the 1918 H1N1 influenza pandemic ("Spanish flu") [2], the 1957 H2N2 ("Asian flu") [3], and the 1968 H3N2 ("Hong Kong flu"), collectively resulting in an estimated 40–50 million deaths worldwide [1,4]. More recent events, such as the Severe Acute Respiratory Syndrome (SARS) outbreak in 2003 [5], the 2009 H1N1 influenza pandemic, and ongoing threats from avian influenza viruses (H5N1, H7N9)[6], and Middle East Respiratory Syndrome coronavirus (MERS-CoV) [7], further underscore the continuing global risk posed by severe acute respiratory illness-causing pathogens.

The emergence of coronavirus disease 2019 (COVID-19), caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), reaffirmed the critical importance of Severe acute respiratory infection syndrome surveillance. As of early 2023, more than 755 million confirmed cases and over 6.8 million deaths had been reported globally [8]. In Indonesia, COVID-19 resulted in substantial morbidity and mortality and placed extraordinary pressure on health systems, highlighting vulnerabilities in respiratory disease detection and response mechanisms.

In Southeast Asia, severe acute respiratory illness remains a leading cause of hospitalization and death, particularly among young children, older adults, and individuals with underlying medical conditions [9]. Acute respiratory infections account for a large proportion of infectious disease morbidity in the region, and in Indonesia, the prevalence of acute respiratory infection among children under five years has been estimated at approximately 5.7% [10]. Despite this burden, reliable and recent population-based estimates of laboratory-confirmed severe acute respiratory illness incidence, severity, and etiology in Indonesia remain limited [11].

To address these gaps, Indonesia has adopted a syndromic surveillance approach for severe acute respiratory illness. Syndromic severe acute respiratory illness surveillance focuses on the systematic identification and reporting of hospitalized patients meeting a standardized clinical case definition, combined with laboratory-based pathogen detection [12]. Given the ongoing circulation of multiple respiratory pathogens and the continued risk of emerging infectious diseases, robust analysis of severe acute respiratory illness surveillance data is essential. Therefore, this retrospective descriptive study aims to describe the burden and temporal patterns of Severe Acute Respiratory Infection cases identified through laboratory-based syndromic surveillance in Indonesia during 2025.

## RESEARCH METHODS

### Study Design and Setting

This retrospective descriptive study used routinely collected laboratory surveillance data from the National Biological Public Health Laboratory, a national reference laboratory under the Ministry of Health of Indonesia. The study included specimens received between January and December 2025 as part of routine public health diagnostic and surveillance activities.

### Surveillance System

Indonesia implements a passive, laboratory-based syndromic surveillance system for priority infectious diseases, including severe acute respiratory infection syndrome [12]. Health facilities submit clinical specimens to the national reference laboratory based on predefined clinical syndromes. The laboratory's role is limited to specimen receipt and diagnostic testing; it does not actively identify cases or conduct clinical follow-up.

### Case Definition

Severe acute respiratory illness was defined according to WHO surveillance standards as an acute respiratory illness with fever (≥38°C), cough, symptom onset within the previous 10 days, and requiring hospitalization [13]. Syndromic classification was based on clinical information provided on laboratory request forms. This analysis included only records meeting the severe acute respiratory illness definition.

### Laboratory Testing

Testing was performed as part of routine services, and not all specimens were tested for all pathogens. Specimens were analyzed using PCR-based assays, including real-time RT-PCR, following national standard operating procedures [12]. Pathogens tested among cases included influenza viruses, avian influenza A(H5N1), SARS-CoV-2, MERS-CoV, enteroviruses, and Legionella spp. Laboratory confirmation was defined as pathogen-specific nucleic acid detection.

### Data Analysis

Descriptive analyses were conducted to summarize demographic characteristics, laboratory results, specimen types, and temporal distribution of severe acute respiratory infection syndrome. Frequencies and proportions were calculated, and temporal trends were assessed using weekly aggregation. Analyses were performed using R software (version 4.5.2).

### Ethical Considerations

This study used anonymized secondary surveillance data and was approved by the Head of the National Biological Public Health Laboratory. Data use complied with Indonesian Health Law No. 17 of 2023, governing public health surveillance and secondary data analysis [14].

## RESULTS AND DISCUSSION

**Table 1.** Demographic and Clinical Characteristics of Severe Acute Respiratory Infection Syndrome Cases.

| Variable | Frequency, n (%) |
|---|---|
| **Total, n** | 194 |
| **Age** | |
| <5 years | 85 (43.8) |
| 5 – 14 years | 40 (20.6) |
| 15 – 30 years | 6 (3.1) |
| 31 – 60 years | 24 (12.4) |
| >60 years | 19 (20.1) |
| **Sex** | |
| Male | 115 (59.3) |
| Female | 79 (40.7) |
| **Type of specimen** | |
| Respiratory | 183 (94.3%) |
| Blood and Urine | 11 (5.7%) |
| **PCR result** | |
| Negative | 185 (75.2) |
| Positive Influenza A | 16 (8.2) |
| Positive Legionella pneumophila | 37 (19.1) |
| Positive SARS-COV 2 | 1 (0.5) |

A total of 194 severe acute respiratory infection syndrome cases were identified through laboratory-based surveillance during 2025 (Table 1). Nearly half of the cases occurred among children aged <5 years (43.8%), followed by those aged 5–14 years (20.6%). Adults aged 31–60 years accounted for 12.4% of cases, while individuals aged >60 years represented 20.1%. Only a small proportion of cases were observed among those aged 15–30 years (3.1%).

Most cases occurred among males (59.3%), with females accounting for 40.7% of cases. The majority of specimens collected were respiratory specimens (94.3%), while blood and urine specimens accounted for 5.7% of submissions.

Overall, 75.2% of severe acute respiratory infection cases tested negative for the pathogens included in the testing panel. Among laboratory-confirmed infections, Legionella pneumophila was the most frequently detected pathogen, identified in 19.1% of cases, followed by Influenza A in 8.2% of cases. SARS-CoV-2 was detected in one case (0.5%).

**Figure 1.** Provincial Distribution of All Diagnosed Severe Acute Respiratory Infection Syndrome in 2025.

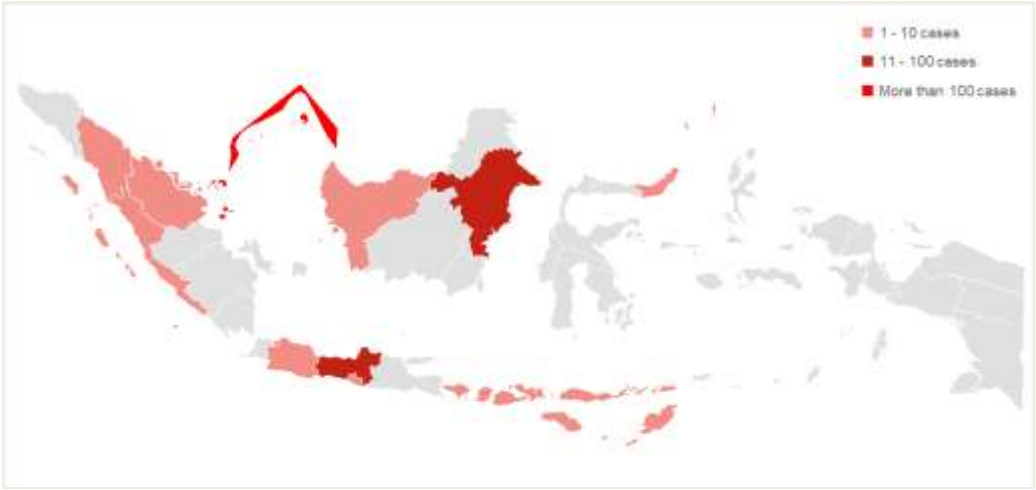
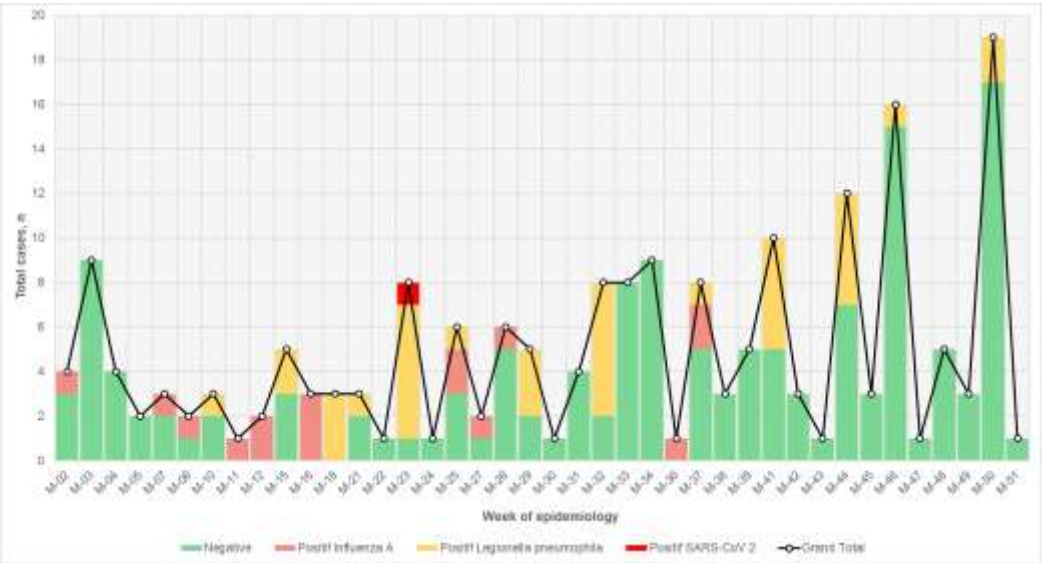



**Figure 2.** Weekly distribution of all diagnosed Severe Acute Respiratory Infection Syndrome cases in 2025.




The weekly distribution of severe acute respiratory infection syndrome cases throughout 2025 is shown in Figure 1. Cases were reported consistently across epidemiological weeks, with notable fluctuations and several peaks observed toward the latter part of the year. Both laboratory-confirmed and negative cases contributed to these peaks, indicating sustained severe acute respiratory infection syndrome activity throughout the surveillance period.

The geographic distribution of severe acute respiratory infection syndrome cases by province is presented in Figure 2. Cases were reported from multiple provinces across Indonesia, with higher numbers observed in selected provinces. This distribution reflects the national coverage of the laboratory-based severe acute respiratory infection syndrome surveillance system and the referral pattern of specimens to the national reference laboratory.

## DISCUSSION

This study describes the demographic characteristics, laboratory findings, and temporal and geographic patterns of severe acute respiratory infection syndrome cases identified through laboratory-based syndromic surveillance in Indonesia during 2025. Children under five years of age and older adults accounted for the largest proportion of the cases, consistent with previous studies demonstrating increased susceptibility to severe respiratory infections among these age groups due to immature or declining immune function and a higher prevalence of comorbidities [15]. The observed male predominance is also consistent with findings from other respiratory surveillance studies and

may reflect differences in exposure risk, disease severity, or healthcare utilization rather than healthcare-seeking behavior alone [16,17].

Severe acute respiratory infection syndrome represented the predominant syndrome captured by the surveillance system, highlighting its central role in monitoring respiratory pathogens with epidemic and pandemic potential. This finding is consistent with reports from laboratory-based surveillance platforms globally, where severe acute respiratory illness serves as a key entry point for detecting severe respiratory disease and emerging pathogens [18]. The integration of severe acute respiratory infection syndrome surveillance within strengthened post-COVID-19 respiratory surveillance frameworks has improved the detection of both SARS-CoV-2 and co-circulating respiratory pathogens, including influenza viruses [19].

Among laboratory-confirmed severe acute respiratory illness cases, *Legionella pneumophila* and influenza A were the most frequently detected pathogens. This pattern is consistent with previous studies from diverse settings, which have identified influenza viruses and atypical bacterial pathogens as important contributors to severe respiratory illness requiring hospitalization [20,21]. The low detection of SARS-CoV-2 during the study period likely reflects reduced community transmission and widespread population immunity following successive pandemic waves [22].

The temporal distribution of severe acute respiratory illness cases demonstrated continuous occurrence throughout the year, consistent with the known epidemiology of respiratory infections in tropical climates [23,24]. In Indonesia, influenza viruses circulate year-round without a well-defined seasonal peak, unlike temperate regions [25]. The observed increase in *Legionella pneumophila* detections during the latter part of the year may suggest environmental or climatic influences, such as increased humidity or water system contamination, as reported in previous studies [26]. These findings underscore the importance of sustained, year-round severe acute respiratory infection syndrome surveillance in tropical settings.

Several limitations should be considered when interpreting these findings. First, this study relied on a passive, laboratory-based syndromic surveillance system, which depends on clinician recognition, testing practices, and specimen submission [12]. As a result, not all severe acute respiratory illness cases in the community or healthcare facilities may have been captured, and the data likely underestimate the true burden of disease. Second, testing was not uniform across all cases, as diagnostic algorithms varied by clinical suspicion, specimen type, and resource availability, which may have influenced pathogen detection rates. Third, the surveillance data were derived from specimens referred to a national reference laboratory and may not fully represent the geographic distribution of severe acute respiratory illness across Indonesia. Despite these limitations, the findings demonstrate the value of laboratory-supported syndromic surveillance in describing severe acute respiratory illness epidemiology, identifying circulating pathogens, and monitoring temporal trends.

## CONCLUSION

Severe acute respiratory infection syndrome remains an important public health concern in Indonesia, with a substantial burden observed in 2025, particularly among children under five years of age and older adults. Laboratory-based syndromic surveillance at the national reference laboratory demonstrated continuous severe acute respiratory illness activity throughout the year, with *Legionella pneumophila* and influenza A identified as the most frequently detected pathogens, reflecting ongoing circulation of severe respiratory infections in a tropical setting. Although interpretation is limited by the passive nature of the surveillance system and variability in testing practices, these findings highlight the critical role of integrated laboratory-supported severe acute respiratory infection syndrome surveillance in monitoring severe respiratory disease, guiding public health preparedness, and strengthening early detection of emerging respiratory threats.

## REFERENCES

Al Amad M, Almoayed K. Influenza circulating viruses, positivity rate and risk factors for influenza associated severe acute respiratory infection during 2018/2019 winter season, Yemen. BMC Infect Dis [Internet]. 2022 Feb 1 [cited 2025 Dec 21];22:111. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC8804082/

Asian Influenza - an overview | ScienceDirect Topics [Internet]. [cited 2026 Jan 19]. Available from: https://www.sciencedirect.com/topics/medicine-and-dentistry/asian-influenza

Auderset D, Riou J, Clair C, Perreau M, Mueller Y, Schwarz J. Why gender and sex matter in infectious disease modelling: A conceptual framework. SSM - Population Health [Internet]. 2025 June 1 [cited 2025 Dec 21];30:101775. Available from: https://www.sciencedirect.com/science/article/pii/S2352827325000291

Bausch DG. West Africa 2013 Ebola: From Virus Outbreak to Humanitarian Crisis. In: Mühlberger E, Hensley LL, Towner JS, editors. Marburg- and Ebolaviruses: From Ecosystems to Molecules [Internet]. Cham: Springer International Publishing; 2017 [cited 2025 Dec 21]. p. 63–92. Available from: https://doi.org/10.1007/82_2017_69

Beach B, Clay K, Saavedra MH. The 1918 Influenza Pandemic and its Lessons for COVID-19 [Internet]. National Bureau of Economic Research; 2020 [cited 2025 Dec 21]. (Working Paper Series). Available from: https://www.nber.org/papers/w27673

Denayer S, Dufrasne FE, Monsieurs B, van Eycken R, Houben S, Seyler L, et al. Genomic monitoring of SARS-CoV-2 variants using sentinel SARI hospital surveillance. Influenza Other Respir Viruses [Internet]. 2023 Oct 13 [cited 2025 Dec 21];17(10):e13202. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC10570899/

De Schrijver S, Vanhulle E, Ingenbleek A, Alexakis L, Johannesen CK, Broberg EK, et al. Epidemiological and Clinical Insights into Enterovirus Circulation in Europe, 2018–2023: A Multicenter Retrospective Surveillance Study. J Infect Dis [Internet]. 2025 July 15 [cited 2025 Dec 22];232(1):e104–15. Available from: https://doi.org/10.1093/infdis/jiaf179

Farley MM. 2009 H1N1 Influenza: A Twenty-First Century Pandemic With Roots in the Early Twentieth Century. The American Journal of the Medical Sciences [Internet]. 2010 Sept 1 [cited 2026 Jan 19];340(3):202–8. Available from: https://www.sciencedirect.com/science/article/pii/S0002962915314993

Gleason JA, Cohn PD. A review of legionnaires' disease and public water systems – Scientific considerations, uncertainties and recommendations. International Journal of Hygiene and Environmental Health [Internet]. 2022 Mar 1 [cited 2025 Dec 22];240:113906. Available from: https://www.sciencedirect.com/science/article/pii/S1438463921002212

Kemenkes RI. Petunjuk Teknis Surveilans SARI (Severe Acute respiratory infection) [Internet]. Google Drive. Jakarta: Kementerian Kesehatan RI; 2023 [cited 2026 Jan 19]. Available from: https://drive.google.com/drive/u/1/folders/1eMr7uC9xFspPB8YN7yC4LTWJjLZL88-4

Kosasih H, Roselinda, Nurhayati, Klimov A, Xiyan X, Lindstrom S, et al. Surveillance of Influenza in Indonesia, 2003–2007. Influenza and Other Respiratory Viruses [Internet]. 2013 [cited 2025 Dec 22];7(3):312–20. Available from: https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1750-2659.2012.00403.x

Kugeler KJ, Mead PS, Schwartz AM, Hinckley AF. Changing Trends in Age and Sex Distributions of Lyme Disease—United States, 1992-2016. Public Health Rep [Internet]. 2022 July 1 [cited 2025 Dec 21];137(4):655–9. Available from: https://doi.org/10.1177/00333549211026777

Lestari FB, Vongpunsawad S, Wanlapakorn N, Poovorawan Y. Rotavirus infection in children in Southeast Asia 2008–2018: disease burden, genotype distribution, seasonality, and vaccination. J Biomed Sci [Internet]. 2020 May 21 [cited 2025 Dec 21];27:66. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC7239768/

Marques DF, Kovacs D, Sanchez-Ruiz MA, Rodrigues AP, Machado A, Mazagatos C, et al. Evaluation of European severe acute respiratory infection (SARI) surveillance, 27 European countries, 2022/23. Euro Surveill [Internet]. 2025 May 22 [cited 2025 Dec 21];30(20):2400655. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC12105088/

Middle East respiratory syndrome coronavirus (MERS-CoV) [Internet]. [cited 2026 Jan 19]. Available from: https://www.who.int/news-room/fact-sheets/detail/middle-east-respiratory-syndrome-coronavirus-(mers-cov)

Pariani E, Martinelli M, Canuti M, Jazaeri Farsani SM, Oude Munnink BB, Deijs M, et al. Influenza and other respiratory viruses involved in severe acute respiratory disease in northern Italy during the pandemic and postpandemic period (2009-2011). Biomed Res Int. 2014;2014:241298.

Pons-Salort M, Grassly NC. Serotype-specific immunity explains the incidence of diseases caused by human enteroviruses. Science. 2018 Aug 24;361(6404):800–3.

Purnama TB, Wagatsuma K, Saito R. 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 Feb 27 [cited 2025 Dec 21];14(1):13. Available from: https://doi.org/10.1186/s40249-025-01286-9

Severe Acute Respiratory Syndrome (SARS) [Internet]. [cited 2026 Jan 19]. Available from: https://www.who.int/health-topics/severe-acute-respiratory-syndrome

Surveillance case definitions for ILI and SARI [Internet]. [cited 2026 Jan 19]. Available from: https://www.who.int/teams/global-influenza-programme/surveillance-and-monitoring/case-definitions-for-ili-and-sari

Taubenberger JK, Morens DM. The 1918 Influenza Pandemic and Its Legacy. Cold Spring Harb Perspect Med [Internet]. 2020 Oct [cited 2026 Jan 19];10(10):a038695. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC7528857/

Twitchell DK, Christensen MB, Hackett G, Morgentaler A, Saad F, Pastuszak AW. Examining Male Predominance of Severe COVID-19 Outcomes: A Systematic Review. Androg Clin Res Ther [Internet]. 2022 July 15 [cited 2025 Dec 21];3(1):41–53. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC9527649/

UU No. 17 Tahun 2024 [Internet]. [cited 2026 Jan 19]. Available from: https://peraturan.bpk.go.id/Details/290677/uu-no-17-tahun-2024

Wahyono TYM, Nealon J, Beucher S, Prayitno A, Moureau A, Nawawi S, et al. Indonesian dengue burden estimates: review of evidence by an expert panel. Epidemiology & Infection [Internet]. 2017 Aug [cited 2025 Dec 21];145(11):2324–9. Available from: https://www.cambridge.org/core/journals/epidemiology-and-infection/article/indonesian-dengue-burden-estimates-review-of-evidence-by-an-expert-panel/38AE556E9984B62981F832EE7C405134

Weekly epidemiological update on COVID-19 - 15 February 2023 [Internet]. [cited 2026 Jan 19]. Available from: https://www.who.int/publications/m/item/weekly-epidemiological-update-on-covid-19---15-february-2023

Yu HW, Kuan CH, Tseng LW, Chen HY, Tsai MY, Chen YS. Investigation of the Correlation between Enterovirus Infection and the Climate Factor Complex Including the Ping-Year Factor and El Niño-Southern Oscillation in Taiwan. Viruses [Internet]. 2024 Mar 20 [cited 2025 Dec 22];16(3):471. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC10975746/