**Dengue Epidemic Worsens with Record 14 Million Cases and 9,000 Deaths Reported in 2024**

**Najmul Haider1, Mohammad Nayeem Hasan2, Joshua Onyango3, Masum Billah4, Sakirul Khan5, Danai Papakonstantinou 6, Priyamvada Paudyal 7, Md Asaduzzaman4**

1School of Life Sciences, Faculty of Natural Sciences, Keele University, Keele, Staffordshire, United Kingdom, ST5 5BG (NH: [n.haider@keele.ac.uk](mailto:n.haider@keele.ac.uk))

2Department of Statistics, Shahjalal University of Science and Technology, Sylhet 3114, Bangladesh (MNH: [nayeem5847@gmail.com](mailto:nayeem5847@gmail.com))

3The Harper and Keele Veterinary School, Keele University, Keele, Staffordshire, United Kingdom, ST5 5BG (JO: [j.o.onyango@hkvets.ac.uk](mailto:j.o.onyango@hkvets.ac.uk))

4Department of Engineering, Staffordshire University, Stoke-on-Trent ST4 2DE, UK (MB: [masum.billah@staffs.ac.uk](mailto:masum.billah@staffs.ac.uk)) (MA: [md.asaduzzaman@staffs.ac.uk](mailto:md.asaduzzaman@staffs.ac.uk))

5Research Center for Global and Local Infectious Diseases, Department of Microbiology, Faculty of Medicine, Oita University, Yufu, Oita, Japan (SK: sakirul@oita-u.ac.jp)

6School of Medicine, Keele University, Keele, Staffordshire, UK (DP: [d.papakonstantinou@keele.ac.uk](mailto:d.papakonstantinou@keele.ac.uk))

7Institute for Global Health and Wellbeing, School of Medicine, Keele University, Keele, Staffordshire, UK (PP: [p.paudyal@keele.ac.uk](mailto:p.paudyal@keele.ac.uk) )

**Correspondence:** Najmul Haider([n.haider@keele.ac.uk](mailto:n.haider@keele.ac.uk))

**Abstract**

Dengue virus (DENV) is the fastest-growing mosquito-borne disease worldwide. This article critically examines the global burden of dengue cases and fatalities in 2024 by analysing their distribution and identifying factors influencing dengue-related mortality.

We utilised monthly data on dengue cases and deaths reported through the World Health Organisation's (WHO) global surveillance system for dengue fever. We then performed a generalised linear regression model to understand country-level determinants of dengue-related mortality in 2024.

In 2024, 14.1 million dengue cases were reported globally, surpassing the historic milestone of 7 million observed in 2023. This figure represents a twofold increase compared to 2023 and a 12-fold rise compared to 2014 (*n*=1,206,644). In 2024, 9404 dengue-related deaths were recorded, resulting in a global case-fatality rate of 0.07%. In regression analysis, countries with a higher prevalence of obesity (Incidence Rate Ratio [IRR]: 1.03, 95% Confidence Interval [CI]: 1.01–1.06), Aged population (IRR 1.04, CI: 1.02-1.07), and those in the Southern hemisphere (IRR: 3.97, 95% CI: 2.90–5.42) were significantly associated with higher dengue-related mortality per million population.

The ongoing dengue outbreak underscores the urgent need for global investment in DENV research, vaccine development, vector control, and therapeutic strategies. We urge the inclusion of DENV in the WHO’s Research and Development Priority Disease list to address this growing global health threat.

**Background**

Dengue virus (DENV) is currently the world’s fastest-spreading mosquito-borne disease [1]. In 2023, the world witnessed its first landmark of 6.5 million cases and 7000 deaths due to DENV [2]. The record of cases and deaths by DENV is continuing to increase, with new records continuing to emerge each year since 2021. Since 2021, indigenous dengue cases have been recorded in mainland Europe and the USA [2]. DENV is a member of the Flaviviridae family transmitted by *Aedes aegypti* and *Aedes albopictus*, mosquitoes of the genus *Aedes*.

Several factors likely contributing to the global increase in dengue cases, including globalisation, rapid urbanisation, and climate change [1]. In 1950, approximately 31 million passengers travelled by air; however, in the post-COVID-19 period, nearly 4.5 billion passengers are traveling globally each year [1]. The rapid urbanisation worldwide since the 1980s has created ideal breeding sites for *Aedes* mosquitoes. Warmer temperatures enable mosquitoes to grow and spread more rapidly, bite humans more frequently, and shorten the extrinsic incubation period of the virus [3]. Additionally, changes in rainfall patterns have extended vector seasons. In recent years, *A. albopictus* has spread to every continent except Antarctica. While the exact number of countries where *A. albopictus* is endemic remains uncertain, the mosquito has been identified in at least 20 European countries [4]. The spread and adaptability of *A. albopictus* is an increasing concern for dengue and other arboviruses, including Zika and chikungunya viruses.

Individuals infected for the second time with a different dengue serotype can develop severe secondary dengue infection. In addition, previous studies have demonstrated that individuals who are suffering from chronic diseases, such as diabetes, obesity, and hypertension, are at greater risk of progressing to severe disease [5]. In this study, we hypothesised that countries with higher urbanisation rates and population density, poor air quality index, higher temperatures, and rainfall might experience a higher burden of dengue cases while those with a higher prevalence of co-morbidities (diabetes, hypertension, obesity, and elderly population) might experience a higher fatality rate [6]. To explore these hypotheses, this article examines the global burden of dengue cases and fatalities in 2024 by analysing their distribution and identifying factors influencing dengue-related mortality.

**Data sources, study design and Statistical analysis**

We collected and analysed data from daily reports of new dengue cases and deaths, monthly reported cases and deaths, and cases and deaths per million inhabitants worldwide from the WHO Global Dengue Surveillance system from January 01, 2014, to December 01, 2024 [7]. We also explored the nation-level factors affecting dengue-related cases and deaths per million population.

We considered cases and deaths per million population as the outcome variable, while predictor variables included population density, the percentage of the population aged 65 years or older, the percentage of the urban population, the prevalence of obesity, diabetes and hypertension, and environmental factors such as average temperature, total rainfall and Air Quality Index (AQI). These data were gathered from the World Bank, other United Nations sources, and ‘Our World in Data’ [8–14].

We performed summary statistics for dengue cases and deaths and calculated the incidence by continent and for the northern and southern hemispheres, using monthly and yearly data. A generalised linear regression model with Poisson distribution was employed to identify independent predictors of dengue cases and deaths. Statistical analyses were performed using R Version 3.5.2.2 [15].

**Global dengue cases and deaths in 2024**

Between 1 January and 1 December 2024, a staggering 14,098,279 dengue cases were recorded worldwide. This is the highest-ever recorded number of dengue cases since the global dengue recording system was introduced in 2010. This figure is more than double compared to the previous record of 6.8 million reported by the WHO in 2023. Compared to the cases recorded in 2014 (*n*=1,206,644), global dengue fever increased 12-fold in 2024 **(Figure S1)**. The year 2024 also recorded the highest number of deaths since the recording system was available, with 9,404 fatalities resulting in a case-fatality rate of 0.07%. The death toll in 2024 was 15 times higher compared to the deaths recorded in 2014 (*n*=683) **(Figure S2)**.

Dengue seasonality varied in the Southern and Northern hemispheres due to the variation in weather patterns in the two opposite hemispheres. The highest number of cases in the Northern Hemisphere occurred in October, with 410,157 cases (Figure S1). In the Southern Hemisphere, the highest number of cases was recorded in March, with 2,661,833 **(Figure S3)**.

Country-wise, Brazil reported the highest burden of dengue cases and fatalities, with a total of 10,239,883 cases—equating to 47,777.09 cases per million. The country also recorded the highest number of dengue-related deaths, with 6,161 fatalities, resulting in the highest death rate per million (28.75 deaths/M), followed closely by French Guiana (26.90 deaths/M) **(Figure S2)**. In Europe, in 2024, 213 dengue cases were reported in Italy, 85 cases in France, and 10 cases in Spain. In Africa, Niger reported a very high case fatality rate (20.70%, 12 deaths out of 58 dengue cases) **(Table S1)**.

By continent, South America reported the highest dengue case count, with 11,892,175 cases and 7,310 deaths, translating to 238,479.58 cases per million (Cases/M) and 118.00 deaths per million (Deaths/M). North America recorded 1,142,666 cases and 934 deaths, corresponding to 203,129.99 cases and 60.93 deaths per million population with a relatively lower CFR of 0.08%, while in Asia, 884,639 cases and 1,008 deaths, with a CFR of 0.11% were recorded. A lower number of cases and deaths was reported in Africa, although it recorded the second highest case-fatality rate at 0.09%, after Asia (0.11%) **(Table 1).**

**Table 1: Comparing the dengue cases, deaths, and case fatality ratio (CFR) of dengue in 2024 by continent. Data were collected from WHO’s global dengue surveillance system. (**[**https://worldhealthorg.shinyapps.io/dengue\_global/**](https://worldhealthorg.shinyapps.io/dengue_global/) **)**

In the generalized linear regression, several factors were associated with dengue's increased case and death rate. The countries located in the Southern Hemisphere (Incidence Rate Ratio [IRR]: 2.64, 95% Confidence Interval [CI]: 2.54-2.74), a high mean annual temperature (IRR: 1.20, 95% CI: 1.19-1.20), high rainfall (IRR: 1.01, 95% CI: 1.01-1.02) demonstrated a significant association for country’s dengue cases/M **(Table 2)**. For dengue-related deaths/M population by country, countries located in the Southern hemisphere (IRR: 4.91, 95% CI: 3.48–6.91) were significantly associated with higher dengue-related mortality per million population **(Table 2).**

**Table 2: Country-level factors associated with dengue cases, deaths, and case–fatality rate, with national-level explanatory variables using a multiple linear regression model between 1 January 2024 and 31 December 2024. Data were collected from the WHO’s global dengue surveillance system (**[**https://worldhealthorg.shinyapps.io/dengue\_global/**](https://worldhealthorg.shinyapps.io/dengue_global/) **)**

**Discussion**

The unprecedented global burden of dengue in 2024 highlights the alarming growth trajectory of this mosquito-borne disease. With over 14.1 million reported cases worldwide, dengue has exceeded the historic milestone of 7 million cases reported in 2023 [2]. This twofold increase within a year and a staggering 12-fold rise since 2014 highlight the escalating public health crisis. The significant mortality toll of over 9,000 deaths, with South America alone accounting for nearly 70% of these fatalities, emphasises the disproportionate regional impact of dengue. Such figures reveal the pressing need to address the multifactorial challenges driving the outbreak, including climate change, urbanisation, and resource disparities in healthcare and vector control.

Dengue patients in the Southern Hemisphere experience five times higher deaths compared to their northern counterparts, primarily because of higher recorded deaths in Brazil and other South American countries [2,16]. Countries with a higher aged population and obesity had a higher death rate due to DENV. Our findings confirm previous studies that have shown a higher fatality rate of severe dengue in older people [16]. The reasons behind that are not well established, but older individuals also have multiple co-morbidities, which may independently increase the risk of severe disease. Earlier studies showed that obesity increases the intrinsic permeability of the endothelial surface of hosts who have been previously infected by another serotype, thus permitting the occurrence of fluid shift [17].

Our analysis shows a remarkable increase in dengue cases and deaths and underscores the critical importance of robust global data-sharing mechanisms. Surveillance systems such as the WHO’s global dengue surveillance could be pivotal in identifying trends, tracking outbreaks, and informing timely interventions[18]. Comprehensive, real-time data collection enables accurate analysis of determinants such as temperature, population density, and urbanization, as demonstrated in this study. However, gaps in reporting persist, with a current delay of nearly two months on the WHO dashboard. The COVID-19 pandemic highlighted the importance of real-time data sharing, a practice that must be replicated for other diseases, including dengue. Countries not currently reporting dengue cases to the WHO platform, including European countries, should be encouraged and supported to participate in this global effort to enhance data transparency and collaboration. Addressing these challenges through investments in digital health infrastructure, standardised reporting protocols, and international collaboration is essential to improving the global response to dengue. Transparent and accessible data sharing will be vital for forecasting outbreaks, tailoring interventions, and evaluating the effectiveness of existing control measures.

Given the escalating global health threat posed by dengue, we advocate that WHO should include the DENV in its ‘Prioritising diseases for research and development (R&D) in emergency contexts’ list [19]. This designation would catalyse investment in critical areas such as vaccine development, therapeutic innovations, and enhanced vector control strategies. The lack of a universally accessible and effective dengue vaccine leaves millions vulnerable to severe disease outcomes [20]. Furthermore, this study highlights how climate and demographic factors exacerbate dengue-related mortality, underlining the need for tailored, multidisciplinary approaches to prevention and treatment. Prioritising DENV on the global R&D agenda would ensure coordinated efforts to address the growing burden of dengue and prevent future outbreaks of this magnitude. Including dengue as a priority disease is not just a scientific necessity—it is a moral imperative to protect global health and reduce the inequities associated with this preventable and treatable disease.

We collected data from the WHO’s global dengue surveillance platform, which is relatively new and updated from 1st January to 1st December 2024. As a result, our dataset does not fully cover the year 2024. Additionally, the WHO relies on dengue reports from various countries, each of which may use different definitions for dengue cases and dengue-related deaths. These variations between countries necessitate caution when interpreting and generalising the data. We also identified factors influencing national-level dengue cases, deaths, and CFR. However, these findings should not be interpreted at the individual level, and the associations should not be considered causal.

The current dengue control programme is heavily reliant on vector control strategies [21]. While vector control remains essential in managing mosquito-borne diseases, its limited success has raised concerns about whether additional alternative approaches should be prioritized for controlling dengue and other arboviruses [21]. Greater emphasis must be placed on developing effective vaccines, novel therapeutics, improved patient management strategies, and early detection systems for secondary/severe dengue cases [20]. A coordinated global priority-setting effort is urgently required to tackle dengue more effectively, with the WHO taking a leading role in these initiatives [22]. The Inclusion of dengue on the WHO priority disease list would facilitate action and drive investment and innovation in research and public health interventions. Dengue was previously identified as an important disease by the WHO’s nominated expert member for listing Priority Diseases, such as in 2017 [23]. Strengthening international collaboration and resource allocation is critical to address the rising global dengue burden.

**Conclusion**

In 2024, dengue cases (14 million) and deaths (>9,000) reached record highs. Urgent focus is needed on vaccine development, novel therapies, improved patient management, vector control, and early detection of secondary and severe dengue cases. Prioritizing dengue in the WHO's research agenda, alongside global collaboration and investment, is crucial for reducing its burden and preventing future outbreaks.

**Declarations of competing interest**

The authors declare no conflict of interest.

**Acknowledgments**

We acknowledge the WHO and its regional offices for sharing dengue cases and death data on a portal accessible by the public.

**Funding statement**

There was no funding for this study.

**Author´s Contribution Statement**

Conceptualization: NH, Data curation: MNH, writing original draft: NH, MNH, JO, Writing, review, and editing: MA, MNH, JO, MB, SK, DP, PP

**Ethics statement**

There is no identifiable individual-level data, and ethical approval is not required.

**Data availability**

Dengue data was obtained from the WHO Global Dengue Surveillance system, with additional information sourced from the World Bank, various United Nations agencies, and ‘Our World in Data.’

**References**

[1] Wellcome Trust. Millions of engineered mosquitoes are helping to fight dengue – here’s how . London: 2025.

[2] Haider N, Hasan MN, Onyango J, Asaduzzaman M. Global Landmark: 2023 Marks the Worst Year for Dengue Cases with Millions Infected and Thousands of Deaths Reported. IJID Regions 2024:100459. https://doi.org/10.1016/j.ijregi.2024.100459.

[3] Najmul Haider. Modeling the vector-borne disease transmission potential in northern Europe with a special emphasis on microclimatic temperature: PhD Thesis. Technical University of Denmark, 2018.

[4] ECDC. Aedes albopictus—current known distribution: September 2020. Mosquito maps. https://ecdc.europa.eu/en/disease-vectors/surveillance-and-disease-data/mosquito-maps. Brussels: 2020.

[5] Wei H-Y, Shu P-Y, Hung M-N. Characteristics and Risk Factors for Fatality in Patients with Dengue Hemorrhagic Fever, Taiwan, 2014. Am J Trop Med Hyg 2016;95:322–7. https://doi.org/10.4269/ajtmh.15-0905.

[6] The Guardian. Dengue fever: with a record 12.4m cases in 2024 so far, what is driving the world’s largest outbreak? London: 2024.

[7] WHO. Global dengue surveillance 2024. https://worldhealthorg.shinyapps.io/dengue\_global/ (accessed January 3, 2025).

[8] The World Bank. Population density (people per sq. km of land area). The World Bank 2018. https://data.worldbank.org/indicator/EN.POP.DNST (accessed June 2, 2020).

[9] The World Bank. Population ages 65 and above, total. World Bank Data 2018. https://data.worldbank.org/indicator/SP.POP.65UP.TO.ZS (accessed June 2, 2020).

[10] OWID. Urbanization - Our World in Data 2024. https://ourworldindata.org/urbanization (accessed January 4, 2025).

[11] WHO. Global health services data, obesity and overweight. 2020.

[12] OWID. Diabetes prevalence, 2021 2024. https://ourworldindata.org/grapher/diabetes-prevalence (accessed January 4, 2025).

[13] WHO. Global report on hypertension: the race against a silent killer. Geneva: World Health Organization; 2023. Licence: CC BY-NC-SA 3.0 IGO. Https://WwwWhoInt/Publications/i/Item/9789240081062 2023:1–291.

[14] NASA. POWER | Data Access Viewer 2022. https://power.larc.nasa.gov/data-access-viewer/ (accessed January 30, 2022).

[15] R Core Team. R: A Language and Environment for Statistical Computing, 2020.

[16] Queiroga AS, Barbosa DAM, Campos T de L, Schwarzbold AV, Siqueira AM, Salvato RS, et al. Severe dengue–related deaths in the elderly population soared in Southern Brazil in 2024. IJID Regions 2025;14:100577. https://doi.org/10.1016/j.ijregi.2025.100577.

[17] Sekaran SD, Liew ZM, Yam HC, Raju CS. The association between diabetes and obesity with Dengue infections. Diabetol Metab Syndr 2022;14:101. https://doi.org/10.1186/s13098-022-00870-5.

[18] WHO. Global dengue surveillance : https://worldhealthorg.shinyapps.io/dengue\_global/. WHO 2024.

[19] WHO. Prioritizing diseases for research and development in emergency contexts: https://www.who.int/activities/prioritizing-diseases-for-research-and-development-in-emergency-contexts. WHO 2014.

[20] Petersen E, Elton L, Haider N, McHugh TD, Dar O, Sharma A, et al. The role of new dengue vaccines in curtailing the emerging global threat of dengue outbreaks arising from mass gathering sporting and religious events. International Journal of Infectious Diseases 2024;148:107216. https://doi.org/10.1016/j.ijid.2024.107216.

[21] Achee NL, Grieco JP, Vatandoost H, Seixas G, Pinto J, Ching-NG L, et al. Alternative strategies for mosquito-borne arbovirus control. PLoS Negl Trop Dis 2019;13:e0006822. https://doi.org/10.1371/journal.pntd.0006822.

[22] Ukoaka BM, Okesanya OJ, Daniel FM, Ahmed MM, Udam NG, Wagwula PM, et al. Updated WHO list of emerging pathogens for a potential future pandemic: Implications for public health and global preparedness. Infez Med 2024;32:463–77. https://doi.org/10.53854/liim-3204-5.

[23] WHO. 2017 Annual review of diseases prioritized under the Research and Development Blueprint . Geneva: 2017.