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**Dengue Epidemic Worsens: Record 13 Million Cases and 9,000 Deaths Reported in 2024, Surpassing 2023**

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**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, analyzing their distribution and identifying factors influencing dengue-related mortality.

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

In 2024, a total of 13.86 million dengue cases were reported globally, marking the first instance of cases surpassing the historic milestone of 7 million observed in 2023. This figure represents a twofold increase compared to 2023 and a staggering 27-fold rise compared to the year 2000 (n ~ 500,000). In 2024, over 9,900 dengue-related deaths were recorded, resulting in a global case-fatality rate of 0.07% with South America accounting for more than 6,800 deaths. In regression analysis, countries with higher temperatures (Incidence Rate Ratio [IRR]: 1.14, 95% Confidence Interval [CI]: 1.10–1.19), greater population density (IRR: 1.01, 95% CI: 1.01–1.02), and larger urban populations (IRR: 1.01, 95% CI: 1.01–1.02) 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 advocate for the inclusion of DENV in the WHO's Research and Development (R&D) Priority Disease list to address the escalating global health threat posed by dengue.

**Introduction**

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 dengue virus (DENV). The record of cases and deaths by DENV is continuing to break and new records are created each year since 2021. While the number of cases and deaths is increasing, more geographical areas or countries are reporting dengue cases. Since 2021, 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 are likely contributing to the global expansion of dengue cases, including globalisation, rapid urbanisation, and climate change (1). In 1950, approximately 31 million passengers travelled by air; however, in the post-Covid period, nearly 4.5 billion passengers are travelling globally each year (1). Rapid urbanisation 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, *Aedes 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 countries across Europe (4). The spread and adaptability of *A. albopictus* is an increasing concern for dengue and other arboviruses, including Zika and chikungunya viruses.

We hypothesized that countries with higher urbanization rates, population density, higher temperatures, and rainfall might experience a higher burden of dengue cases and a higher prevalence of co-morbidities (diabetes, hypertension, obesity, and elderly population) might experience a higher fatality rate (5). This article aimed to examine the global burden of dengue cases and fatalities in 2024, analyzing their distribution and identifying factors influencing dengue-related mortality.

**Methods**

**Data sources:** We collected daily reports of new dengue cases and deaths, monthly reported cases and deaths, and cases and deaths per million inhabitants from the WHO Global Dengue Surveillance system for the period from January 1, 2024, to December 31, 2024 (6). We also wanted to understand the nation-level factors affecting dengue-related deaths.

We considered cases and deaths per million population as the outcome variable, while predictor variables included population density (7), the percentage of the population aged 65 years or older (8), the percentage of the urban population (9), the prevalence of obesity (10), Diabetes (11), and hypertension (12), as well as environmental factors such as average temperature and total rainfall (13). These data were gathered from the World Bank, other United Nations sources, and ‘Our World in Data’.

**Statistical analysis**

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. We used line graphs for monthly cases and death records for the northern and southern hemispheres in 2024. To identify factors associated with dengue cases and deaths, a generalized linear regression model with a Poisson distribution was employed. Statistical analyses were performed using R Version 3.5.2.2 (14).

**Results**

Between 1 January and 31 December 2024, a staggering 14,284,310 dengue cases were recorded worldwide. This is the highest-ever recorded dengue cases since the global dengue recording system started. This figure is compared with the previous record in 2023 when 6.8 million cases were recorded by WHO. Compared to the cases recorded in 2014 (n=1206644), global dengue fever has increased by 12 times in 2024 **(Fig 1)**.

The year 2024 also recorded higher highest number of deaths since the recording system was available with 10,554 fatalities resulting in a case-fatality ratio of 0.07%. The death toll in 2024 is 15 times higher than the recorded deaths in 2014 (n=683) **(Fig 1)**.



**Figure 1. Bar chart of global monthly dengue cases by year (2014-2024). Data were collected from WHO’s global dengue surveillance system (**[**https://worldhealthorg.shinyapps.io/dengue\_global/**](https://worldhealthorg.shinyapps.io/dengue_global/) **)**

The dengue seasonality varies in the southern and northern hemispheres as the weather also varies in these two opposite hemispheres of the globe. In the Northern Hemisphere, the highest number of dengue cases occurred in October, with 1,350,467 cases **(Fig 2)** despite the temperature peaking in July-August. In the Southern Hemisphere, the highest number of cases was recorded in April with 6,127,208 dengue cases **(Fig 2)**. The temperature reaches a peak in January in the Southern Hemisphere. The country with the highest number of dengue cases in the Southern Hemisphere includes Brazil (n=10,223,107), Argentina (n=581,559), and Paraguay (n=295,785).



**Figure 2: Monthly Global dengue cases by hemisphere (northern as red, southern as green, and total as blue) for 2024. Data were collected from WHO’s global dengue surveillance system (**[**https://worldhealthorg.shinyapps.io/dengue\_global/**](https://worldhealthorg.shinyapps.io/dengue_global/) **)**

Country-wise, Brazil reported the highest burden of dengue cases and fatalities. Brazil recorded a total of 10,223,107 cases resulting in 47,698.82 cases per million which is a global record of dengue cases for any country. Brazil also recorded the highest number of deaths for DENV with 6,068 deaths resulting in 28.31 deaths per million population **(Fig 3)**. Brazil reported the highest deaths per million population with French Guiana as second (26.90 deaths/M). In Europe in 2024, 213 dengue cases were reported in Italy, 85 cases in France, and 10 cases in Spain. Niger reported a very high case fatality rate (20.70%, 12 deaths of 58 Dengue cases), indicating a substantial under reporting of the cases.



**Figure 3: Global map of dengue cases and deaths in 2024 by country: (Per million population) Data were collected from WHO’s global dengue surveillance system (**[**https://worldhealthorg.shinyapps.io/dengue\_global/**](https://worldhealthorg.shinyapps.io/dengue_global/) **)**

By continent, South America reported the highest dengue case count, with 11,875,396 cases and 7,217 deaths, translating to 238,373.15 cases per million (Cases/M) and 117.57 deaths per million (Deaths/M). The continent also exhibited a case fatality rate (CFR) of 0.06%. North America followed with 1,141,716 cases and 934 deaths, corresponding to 201,087.36 cases and 60.93 Deaths/M. Despite a relatively lower CFR of 0.08%. Asia recorded 877,704 cases and 1,006 deaths, with a CFR of 0.11%. Also, Africa recorded a lower number of cases and deaths, the continent recorded the second highest case-fatality rate at 0.09%, after Asia (Table 1). Globally, in 2024, there were a record **14,073,666** cases and **9,316** deaths resulting to a CFR of 0.07%.

The WHO region for Pan American Health Organization (PAHO) reported a total of 13,017,112 cases and 8,151 deaths while the South-East Asian region reported 505,487 cases and 854 deaths, the African region reported 156,966 cases and 140 deaths, the Eastern Mediterranean region reported 81375 cases and 17 deaths and the Western Pacific region reported 311093 cases and 150 deaths.

**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/) **)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Continents** | **Cases** | **Deaths** | **Cases/M** | **Deaths/M** | **CFR (%)** |
| Africa | 168,962 | 159 | 85,884.45 | 16.12 | 0.09 |
| Antarctica | 0 | 0 |  |  |  |
| Asia | 877,704 | 1,006 | 22,946.79 | 15.71 | 0.11 |
| Europe | 308 | 0 | 5.12 | 0.00 | 0.00 |
| North America | 1,141,716 | 934 | 201,087.36 | 60.93 | 0.08 |
| Oceania | 9,580 | 0 | 19,860.92 | 0.00 | 0.00 |
| South America | 11,875,396 | 7,217 | 238,373.15 | 117.57 | 0.06 |
| **Grand Total** | **14,073,666** | **9,316** | **568,157.79** | **210.33** | 0.07 |

In the Generalized linear regression, we identified associations of several factors for the increased case and death rate for dengue. The proportion of the urban population (IRR: 1.01, 95% CI: 0.98–1.01, p = 0.132) and Population density (IRR: 1.01, 95% CI: 0.99–1.02, p = 0.098) demonstrated a significant association, indicating that urbanization and higher population density may contribute to higher dengue mortality. The high average temperature was also associated with high dengue mortality (IRR: 1.19, 95% CI: 1.15–1.24, p < 0.001) (Table 2).

**Table 2: Factors associated with dengue cases, deaths, case–fatality ratio and other explanatory variables in different counties using a multiple linear regression model between 1 January 2024 and 31 December 2024. Data were collected from WHO’s global dengue surveillance system (**[**https://worldhealthorg.shinyapps.io/dengue\_global/**](https://worldhealthorg.shinyapps.io/dengue_global/) **)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Cases/M |  | Deaths/M | |
|  | IRR (95% CI) | *p*-value | IRR (95% CI) | *p*-value |
| Aged 65 and above (%) | 1.06 (1.06 - 1.07) | **<0.001** | 1.04 (1.02 - 1.07) | <0.001 |
| Urban population (%) | 1.01 (1.01 - 1.02) | **<0.001** | 1.01 (0.98 - 1.01) | **0.132** |
| Population density | 1.01 (1.01 - 1.02) | **<0.001** | 1.01 (0.99 - 1.02) | **0.098** |
| Obesity (%) | 1.04 (1.04 - 1.05) | **<0.001** | 1.03 (1.01 - 1.06) | 0.003 |
| Average temperature | 1.25 (1.20 - 1.28) | **<0.001** | 1.19 (1.15 - 1.24) | **<0.001** |
| Total Rainfall | 1.01 (1.01 - 1.02) | **<0.001** | 1.01 (1.01 - 1.02) | **<0.001** |
| Hemisphere (Southern) | 4.11 (4.08 - 4.14) | **<0.001** | 3.97 (2.90 – 5.42) | **<0.001** |

**Discussion:**

The unprecedented global burden of dengue in 2024 underscores the alarming growth trajectory of this mosquito-borne disease. With over 13.86 million reported cases worldwide, dengue has exceeded all previous records, including the historic milestone of 7 million cases reported in 2023. This twofold increase within a year and a staggering 1,300-fold rise since 2000 highlight the escalating public health crisis. The significant mortality toll of over 9,900 deaths, with South America alone accounting for nearly 70% of these fatalities, emphasizes the disproportionate regional impact of dengue. Such figures reveal the pressing need to address the multifactorial challenges driving this outbreak, including climate change, urbanization, and resource disparities in healthcare and vector control. Without immediate action, the global trajectory of dengue may continue to worsen, further straining health systems and disproportionately affecting vulnerable populations.

The remarkable increase in dengue cases and deaths also underscores the critical importance of robust global data-sharing mechanisms. Surveillance systems such as the World Health Organization's global dengue fever monitoring network play a pivotal role in identifying trends, tracking outbreaks, and informing timely interventions(15). 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 that are not currently reporting dengue cases to the WHO platform 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, standardized 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, the WHO must include the DENV in its Research and Development (R&D) Priority Disease list. This designation would catalyse investment in critical areas such as vaccine development, therapeutic innovations, and enhanced vector control strategies. The current lack of a universally accessible and effective dengue vaccine leaves millions vulnerable to severe disease outcomes. Furthermore, the regression analysis presented in this study highlights how climate and demographic factors exacerbate dengue-related mortality, underlining the need for tailored, multidisciplinary approaches to prevention and treatment. Prioritizing 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. The inclusion of 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.

The current dengue control programme is heavily reliant on vector control strategies. While vector control remains an essential component in managing mosquito-borne diseases, its limited success has raised concerns about whether alternative approaches should be prioritised for controlling dengue and other arboviruses. Greater emphasis must be placed on the development of effective vaccines, novel therapeutics, improved patient management strategies, and early detection systems for severe dengue cases. A coordinated global priority-setting effort is urgently required to tackle dengue more effectively, with the WHO taking a leading role in these initiatives. The inclusion of dengue on the WHO priority disease list would not only facilitate action but also drive investment and innovation in research and public health interventions. Strengthening international collaboration and resource allocation is critical to address the rising global dengue burden.

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