**Dengue Epidemic Escalates: 2024 Surpasses 2023 with Record 12 million Cases**

**Methods**

**Data sources**

The dengue data, including daily reports of new cases and deaths, total reported cases and deaths, and total cases and deaths per million inhabitants, were sourced from the WHO Global Dengue Surveillance system. The data spanned the period from January 1, 2024, to December 31, 2024 (1). This study also included population density(2), the percentage of the population aged 65 years or older(3), the percentage of urban population (4), the prevalence of obesity (5), diabetes (6), and hypertension (7), as well as environmental factors such as average temperature and total rainfall(8). Data were gathered from the World Bank, other United Nations sources, and "Our World in Data."

**Outcome and predictor variables**

In this study, dengue deaths per million population were used as the outcome variable, while predictor variables included population density, the percentage of the population aged 65 years or older, the prevalence of obesity, diabetes, and hypertension, along with environmental factors such as average temperature and total rainfall.

**Statistical analysis**

Summary statistics for dengue cases and deaths were calculated by continent, and for the northern and southern hemispheres, using monthly and yearly data. Trends in dengue cases over time were visualized using bar charts, while monthly changes in cases for each hemisphere in 2024 were represented using line graphs. However, descriptive statistics and trend analysis alone were insufficient to fully explain the dengue situation in 2024. To identify factors associated with dengue cases and deaths, a linear regression model with a Poisson distribution was employed. All statistical analyses were performed using R Version 3.5.2.2 (9).

**Results**



**Figure 1. Bar chart of global dengue cases and deaths by year (2000-2024)**

Among the years recorded, **2024** witnessed the highest number of dengue cases, a staggering **13,291,975**, marking it as a critical year for dengue incidence. This was followed by **2023**, which saw **5,624,842 cases**, indicating a significant surge from the previous years. **2019** ranked third with **3,756,512 cases**, reflecting a troubling upward trend. The years **2016** and **2015** followed closely, with **3,134,652** and **2,643,619 cases**, respectively (Figure 1).

Regarding deaths, **2024** also topped the list with **8,606 fatalities**, underscoring the severe impact of the disease during this year. **2023** recorded **5,422 deaths**, a significant rise compared to prior years. **2019** stood third in fatalities, with **2,560 deaths**, aligning with its high case numbers. In fourth place was **2022**, with **2,120 deaths**, followed by **2015**, which experienced **1,653 deaths** (Figure 1).



Figure 2: Monthly Global dengue cases by hemisphere (0verall, northern, and southern) for

2024

In the **Northern Hemisphere**, the highest number of dengue cases occurred in **October**, with **1,235,208 cases**. The lowest number of cases was recorded in **April**, with **363,035 cases**. In the **Southern Hemisphere**, **March** experienced the highest number of dengue cases, with a staggering **6,036,731 cases**. Conversely, the lowest number of cases occurred in **September**, with **479,734 cases**.



**Figure 3: Global map by cases and deaths of dengue in 2024 by country: (Per million**

**population)**

Brazil reported the highest burden of dengue cases and fatalities among the analyzed countries. With an astonishing **45,707.30 cases per million**, Brazil experienced a severe outbreak, accompanied by a death rate of **26.76 deaths per million**, indicating significant public health challenges. Paraguay followed closely in terms of case incidence, recording **42,048.97 cases per million**, although its death rate was not detailed in this dataset. Argentina ranked third in cases, with **12,668.73 cases per million**, and reported a death rate of **8.91 deaths per million**, highlighting a substantial impact on its population. In contrast, Colombia and Mexico had lower case burdens, reporting **5,636.19** and **3,676.28 cases per million**, respectively. However, Mexico stood out with the lowest death rate of **1.99 deaths per million**, suggesting effective healthcare interventions or outbreak management strategies. Outside the Americas, Bangladesh exhibited a relatively low fatality rate of **1.71 deaths per million**, while Peru recorded **7.36 deaths per million.**

**Table 1: Comparing the cases and CFR of dengue in 2024 by continent or WHO regions**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Continents** | **Cases** | **Deaths** | **Cases/M** | **Deaths/M** | **CFR** |
| Africa | 129664 | 132 | 52673.27 | 12.60 | 3.19 |
| Antarctica | 0 | 0 | 0 | 0 | 0 |
| Asia | 705528 | 931 | 18871.38 | 41.00 | 0.24 |
| Europe | 308 | 0 | 5.14 | 0 | 0 |
| North America | 972361 | 667 | 161305.51 | 52.76 | 0.20 |
| Oceania | 9269 | 0 | 19427.80 | 0 | 0 |
| South America | 11474844 | 6875 | 213265.45 | 108.20 | 0.37 |
| **Grand Total** | **13291974** | **8605** | **465548.5512** | **214.5653014** | **0.87** |

Table 1 provides a comprehensive comparison of dengue cases, deaths, and related metrics in 2024 across continents or WHO regions. **South America** reported the highest dengue case count, with an overwhelming **11,474,844 cases** and **6,875 deaths**, translating to **213,265.45 cases per million (Cases/M)** and **108.20 deaths per million (Deaths/M)**. The continent also exhibited a case fatality rate (CFR) of **0.37%**. **North America** followed with **972,361 cases** and **667 deaths**, corresponding to **161,305.51 Cases/M** and **52.76 Deaths/M**. Despite a relatively lower CFR of **0.20%**. **Asia** recorded **705,528 cases** and **931 deaths**, with a CFR of **0.24%**. Its case incidence was **18,871.38 Cases/M**, and its death rate stood at **41.00 Deaths/M**. **Africa** reported **129,664 cases** and **132 deaths**, with a CFR of **3.19%**, the highest among all regions. The **52,673.27 Cases/M** and **12.60 Deaths/M**. **Oceania** had a modest **9,269 cases** and no reported deaths, with a CFR of **0%**. Its incidence rate of **19,427.80 Cases/M**. **Europe** experienced minimal dengue activity, with just **308 cases** and no deaths. Globally, the grand total of **13,291,974 cases** and **8,605 deaths** corresponds to a **CFR of 0.87%**.

**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.**

|  |  |  |
| --- | --- | --- |
|  | Deaths/M | |
|  | IRR (95% CI) | P-value |
| Aged 65 and above (%) | 1.02 (0.99 - 1.05) | 0.097 |
| Urban population (%) | 1.01 (1.01 - 1.02) | **0.023** |
| Population density | 1.01 (1.01 - 1.02) | **0.007** |
| Obesity (%) | 1.01 (0.97 - 1.02) | 0.783 |
| Diabetes (%) | 1.01 (0.97 - 1.04) | 0.740 |
| Hypertension (%) | 0.99 (0.96 - 1.02) | 0.448 |
| Average temperature | 1.14 (1.10 - 1.19) | **<0.001** |
| Total Rainfall | 1.01 (0.99 - 1.01) | 0.180 |

From Table 2, the percentage of the population aged 65 and above showed a positive association with dengue deaths (IRR: 1.02, 95% CI: 0.99–1.05, p = 0.097). The proportion of the urban population and Population density demonstrated a significant association (IRR: 1.01, 95% CI: 1.01–1.02, p = 0.023) and (IRR: 1.01, 95% CI: 1.01–1.02, p = 0.007), indicating that urbanization and higher population density may contribute to higher dengue mortality, respectively. Regarding health-related factors, obesity (IRR: 1.01, 95% CI: 0.97–1.02, p = 0.783) and diabetes (IRR: 1.01, 95% CI: 0.97–1.04, p = 0.740) contribute to higher dengue mortality, in contrast, hypertension (IRR: 0.99, 95% CI: 0.96–1.02, p = 0.448) contribute to lower dengue mortality, however, they did not exhibit significant associations with dengue deaths. Average temperature emerged as a strong and statistically significant predictor of dengue mortality (IRR: 1.14, 95% CI: 1.10–1.19, p < 0.001), which explained that higher temperature may reason of higher dengue mortality. Total rainfall, however, did not show a significant relationship with dengue deaths (IRR: 1.01, 95% CI: 0.99–1.01, p = 0.180), however, it shows positive association with dengue deaths.

References  
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<https://worldhealthorg.shinyapps.io/dengue_global/> (Dengue Global)