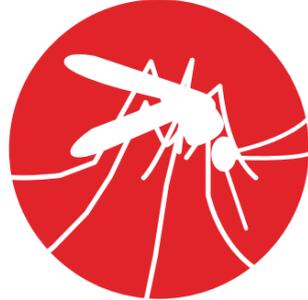


About Dengue



- Dengue fever is the **fastest-spreading vector-borne viral disease worldwide**.¹ Its incidence has risen 30-fold in the past 50 years, and more countries are reporting their first outbreaks of the disease.²
- Most dengue infections are asymptomatic or lead to mild illness with flu-like symptoms, but occasionally severe dengue can lead to potentially deadly complications.³
 - Most dengue cases are either asymptomatic or subclinical; approximately 25% lead to clinically apparent disease, and around 5% of these may be severe cases.^{4,5}
- Dengue is caused by four distinct, but closely related, dengue virus serotypes (DENV-1, 2, 3 and 4).³
 - Recovery from infection with one serotype is thought to provide long lasting, but not necessarily complete, protection against that serotype, and short-lived, partial protection against other serotypes. This means it is possible to be infected with dengue up to four times.³
- Dengue is found mostly in urban and semi-urban areas in tropical and sub-tropical climates where *Aedes aegypti* and *Aedes albopictus* mosquitoes are most common.⁶
 - Climate conditions, such as rainy season in endemic countries, can lead to increased mosquito breeding.⁷

Dengue is a top ten threat to global health and endemic in more than 100 countries⁸

- About 50% of the world's population lives under the threat of dengue, which is responsible for approximately **390 million infections** globally per year and **500,000 hospitalizations** annually.^{3,9}
- The global economic burden of dengue is substantial and has been estimated to cost **\$12 billion per year**.¹⁰
- Since 1970, dengue has spread from **nine countries to 100+ countries**.³
 - The Americas, South-East Asia and Western Pacific regions are the most seriously affected, with Asia representing ~70% of the global burden of disease.³
 - More than six billion people could be at risk for dengue by 2080 due to population growth in endemic areas.⁶
- A vast majority of dengue cases are asymptomatic or mild and self-managed, resulting in the actual numbers of dengue cases being under-reported and making it difficult to estimate the true extent of the disease and incidence rates.^{3,11}



Dengue can have a negative impact on endemic regions and put significant burdens on communities

Hospitals Struggle with High Numbers of Cases

- Severe dengue is a **leading cause of hospitalization and death** in children and adults in endemic regions.³
- Epidemics are unpredictable and are becoming increasingly frequent, with dengue now capable of spreading to previously unaffected areas due to global warming. During an outbreak, affected areas can see a massive spike in cases and admitted patients.^{12,13}
 - Healthcare facilities may face difficulties in finding the necessary space to care for the significant rapid influx of patients, resulting in ordinary hospital wards being converted into makeshift dengue wards.^{12,13}
 - Staff on call may not always be sufficient to meet patient demand, leading to stress, fatigue, and unexpected lack of attendance.¹²



The Economic Impact of Dengue is Broad



Individuals

The average cost range per hospitalized person in endemic countries can vary anywhere from **\$36-\$2,000**¹⁰ and families may spend **up to a quarter of monthly household income** for hospitalizations due to dengue fever, or more, depending on socioeconomic factors.^{15,16}



Local Governments

Local governments in dengue endemic regions face the expenses of additional personnel, equipment and supplies needed for vector control and surveillance; and monitoring and communication of information about cases, outbreaks and death.¹⁷



Countries

Countries experiencing dengue outbreaks may see loss in tourism, business travel and in foreign and local investment.¹⁷ Dengue can also significantly impact a region's productivity, with long-term fatigue effecting educational levels and labor supply.¹⁷

Controlling Dengue

- Current efforts for dengue control are directed at reducing infection rate through vector control methods, such as personal protection, biological control, chemical control and environmental management of mosquitoes³:
 - **Preventing breeding:** Removing or applying insecticide to outdoor water storage containers;
 - **Emergency control measures:** Space spraying of insecticide (i.e., fogging) during outbreaks;
 - **Personal protection measures:** Use of window screens, repellents, or wearing clothing that minimizes skin exposure.
- With limited options available to prevent dengue infection, there is a need for safe and effective dengue vaccines.



References

1. OutbreakObservatory. The global rise of dengue infections. Available at: <https://www.outbreakobservatory.org/outbreakthursday-1/3/21/2019/the-global-rise-of-dengue-infections>. Accessed March 2020.
2. WHO. Global Strategy for Dengue Prevention and Control 2012–2020. Available at: www.who.int/denguecontrol/9789241504034/en/. Accessed March 2021.
3. World Health Organization. Dengue and Severe Dengue. <https://www.who.int/en/news-room/fact-sheets/detail/dengue-and-severe-dengue>. Published June 23, 2020.
4. CDC. Travelers' Health- Yellow book. New York: Oxford University Press; 2020.
5. Wilder-Smith A. Current Infectious Disease Reports. 2018;20:50.
6. Messina, J.P., Brady, O.J., Golding, N. et al. The current and future global distribution and population at risk of dengue. Nat Microbiol 4, 1508–1515 (2019). <https://doi.org/10.1038/s41564-019-0476-8>.
7. World Health Organization (WHO). Dengue increase likely during rainy season: WHO warns. <https://www.who.int/westernpacific/news/detail/11-06-2019-dengue-increase-likely-during-rainy-season-who-warns>. 11 June 2019.
8. World Health Organization (WHO). Top ten threats to global health in 2019. <https://www.who.int/newsroom/spotlight/top-ten-threats-to-global-health-in-2019>.
9. Guzman MG, Halstead SB, Artsob H, et al. Dengue: a continuing global threat. Nat Rev Microbiol. 2010;8(12 Suppl):S7-S16. doi:10.1038/nrmicro2460.
10. Goldstein Research. Global Dengue Vaccine Market Outlook 2030: Market Segmentation By Technology, By End Users, By Region With COVID-19 Impact | Forecast Period 2017-2030. 2020
11. Shepard, et al. Lancet Infect Dis 2016;16:935–41.
12. PLOS. Neglected Tropical Disease. Societal impact of dengue outbreaks: Stakeholder perceptions and related implications. A qualitative study in Brazil, 2015.
13. World Health Organization (WHO). WHO Scales Up Response to Worldwide Surge in Dengue. <https://www.who.int/newsroom/feature-stories/detail/who-scales-up-response-to-worldwide-surge-in-dengue>.
14. Shepard, et al. Lancet Infect Dis 2016;16:935–41.
15. Tozan Y, Ratanawong P, Sewe MO, Wilder-Smith A, Kittayapong P. Household costs of hospitalized dengue illness in semi-rural Thailand. PLoS Negl Trop Dis. 2017;11(9):e0005961.
16. Sri Lanka Journal of Child Health, 2014; 43(4): 205-207 . Economic cost of hospitalized non-fatal paediatric dengue at the Lady Ridgeway Hospital for Children in Sri Lanka.
17. Castro MC, Wilson ME, Bloom DE. Disease and economic burdens of dengue. Lancet Infect Dis. (2017) 17:e70–8. doi: 10.1016/S1473-3099(16)30545-X.