

# Malaria vs Dengue: what are the similarities and differences?

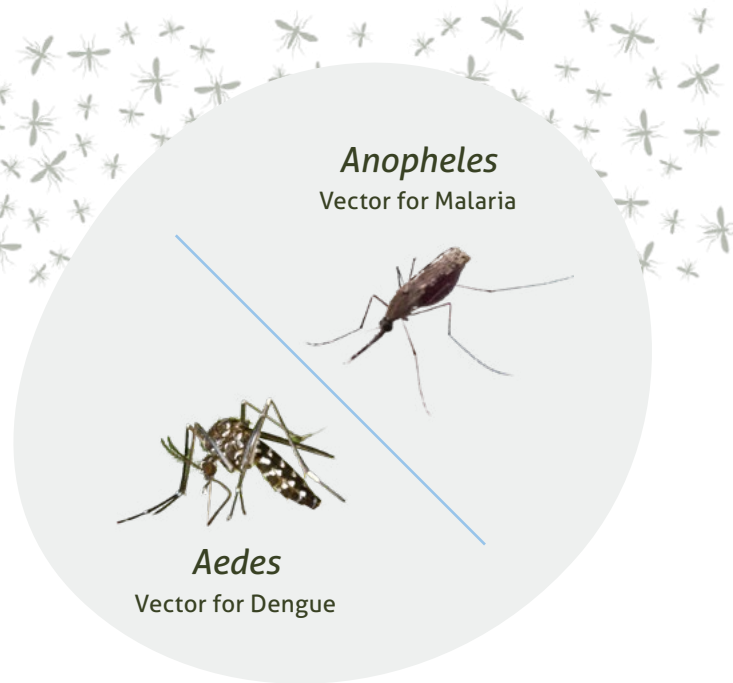
Malaria and dengue are two very common vector-borne and mosquito-borne diseases in certain parts of the world, meaning that they are both transmitted by mosquitoes. They are responsible for over 600,000 deaths and have been reported in over 80 countries.

These diseases can also be present in the same countries, which can be problematic if there is an outbreak of both diseases at the same time. Misdiagnosis between the two is common and contributes to the prevalence of co-infection.<sup>1</sup>

Both malaria and dengue are transmitted by female mosquitoes and cause severe fevers in humans. Because of this similarity, they can be confused by patients and medical personnel. However, **they are two very different diseases caused by different pathogens<sup>2</sup> and different mosquito species (*Aedes* and *Anopheles*) that do not mate.** There are around 150 million years of evolution separating *Aedes* and *Anopheles* mosquitoes.

In this factsheet, we aim to help clarify the similarities and differences between malaria and dengue.

At Target Malaria, our focus is on the development of new genetic tools to target the population of mosquitoes that transmit malaria. There are other teams working on solutions for dengue control.<sup>3</sup>



## Comparison

DENGUE	MALARIA
<b>Differences</b>	
Flavivirus <sup>4</sup>	Parasite
<i>Aedes</i> mosquitoes	<i>Anopheles</i> mosquitoes
No specific treatment	Anti-malaria drugs for prevention and treatment
Urban	Rural
Prefer to live indoors and outdoors	Prefer to shelter indoors
Day biting mosquitoes	Prefers to bite late evening and night
<b>Similarities</b>	
Symptoms: Fever	
Disease vector: Mosquito-borne	
Location: Tropical countries	
Measures Vector control methods	

## Vector-borne diseases

Vector-borne diseases are human illnesses caused by pathogens that are transmitted by vectors, which cause more than 700,000 deaths every year.<sup>5</sup> They include for example, malaria and dengue. Their vectors are living organisms that can transmit these infectious pathogens between humans, or from animals to humans, for example mosquitoes. In the case of mosquitoes, the pathogen is passed from the vector to the human or animal when it bites them.

1 [Increasing prevalence of malaria and acute dengue virus coinfection in Africa: a meta-analysis and meta-regression of cross-sectional studies | Malaria Journal | Full Text \(biomedcentral.com\)](#)

2 Pathogens are micro-organisms that can cause disease in their hosts, i.e. viruses, parasites, bacteria.

3 [World Mosquito Program – www.worldmosquitoprogram.org. and Oxitec – www.oxitec.com](#)

4 Flaviviruses are emerging arthropod-borne RNA viruses, causing a broad spectrum of life-threatening disease symptoms, such as encephalitis and haemorrhagic fever.

5 Vector-borne diseases include malaria, dengue, schistosomiasis, human African trypanosomiasis, leishmaniasis, Chagas disease, yellow fever, Japanese encephalitis and onchocerciasis. <https://www.who.int/news-room/fact-sheets/detail/vector-borne-diseases>

## Mosquito-borne diseases

Mosquitoes are vectors for a number of pathogens that transmit a number of diseases that are called “mosquito-borne diseases”. Some include (non-exhaustive list):

VECTOR		DISEASE CAUSED	TYPE OF PATHOGEN
Mosquito	<i>Aedes</i>	Chikungunya	Virus
		Dengue	Virus
		Lymphatic filariasis	Parasite <sup>6</sup>
		Rift Valley fever	Virus <sup>7</sup>
		Yellow Fever	Virus
		Zika	Virus
	<i>Anopheles</i>	Lymphatic filariasis	Parasite
		Malaria	Parasite
	<i>Culex</i>	Japanese encephalitis	Virus
		Lymphatic filariasis	Parasite
		West Nile fever	Virus

## Dengue

Dengue is a mosquito-borne disease.

### Cause: Flavivirus

Dengue infections are caused by four closely related viruses named DEN-1, DEN-2, DEN-3, and DEN-4. These four viruses are called serotypes because each has different interactions with the antibodies in human blood serum.

Recovery from infection by one provides lifelong immunity against that particular serotype. However, cross-immunity to the other serotypes after recovery is only partial and temporary. Subsequent infections by other serotypes increase the risk of developing severe dengue.

### Disease: Dengue fever

Severe Dengue including Dengue haemorrhagic fever (DHF) and Dengue Shock Syndrome (DSS) are potentially deadly complications that have become a leading cause of hospitalization and death among children/adults in Asia and Latin America. There is good evidence that sequential infection with the different serotypes of dengue virus increases the risk of more severe disease that can result in shock syndrome and death.

### Symptoms

High fever, headache, body aches, nausea, and rash that affects infants, young children and adults. Recovery normally takes 1-2 weeks, in some cases, hospitalization is required, and in severe cases dengue can be fatal. It is also referred to as bone break fever because of the symptoms.

### Vector

Female mosquitoes of the *Aedes* mosquitoes (mainly *Ae. aegypti* and, to a lesser extent, *Ae. albopictus*) species. This mosquito also transmits chikungunya, yellow fever and zika infection

### Transmission

The virus is transmitted to humans through the bites of infected female mosquitoes. After virus incubation for 4–10 days, an infected mosquito can transmit the virus for the rest of its life.

### Geography

Dengue is found in tropical and sub-tropical climates worldwide, mostly in urban and semi-urban areas. Local variations in risk are influenced by rainfall, temperature, relative humidity and unplanned rapid urbanization.

### Global burden

The global incidence of dengue has grown dramatically in recent decades. Cases reported to WHO increased from 505,430 cases in 2000 to 6.5 million in 2023. About half of the world's population is now at risk.

The disease is now endemic in more than 100 countries in the WHO Regions of Africa, the Americas, the Eastern Mediterranean, South-East Asia and the Western Pacific. The Americas, South-East Asia and Western Pacific regions are the most seriously affected, with Asia representing around 70% of the global disease burden.

Dengue is spreading to new areas worldwide, and multiple outbreaks are occurring.<sup>6</sup> The transmission is cyclic and large outbreaks every 3-4 years can be expected in those affected regions.

### Treatment

There is no specific treatment for dengue, but appropriate medical care frequently saves the lives of patients with Severe Dengue. Early detection of warning signs and access to proper medical care lowers fatality rates below 1%.

### Vector control

At present, the main method of controlling or preventing dengue virus transmission is to combat the vector mosquitoes using environmental management, source reduction, and chemical methods.<sup>7</sup> Community support is essential to sustain control measures

### Vaccine development

At present, one vaccine (QDenga) has been approved and licensed in some countries. However, it is recommended only for children aged 6 to 16 in high-transmission settings. Several additional vaccines are under evaluation.

<sup>6</sup> A parasite is a eukaryotic organism

<sup>7</sup> A virus is an infectious agent that can only replicate within a host organism.

<sup>8</sup> <https://www.who.int/emergencies/disease-outbreak-news/item/2023-DON498>

<sup>9</sup> <https://www.afro.who.int/health-topics/dengue>

## Malaria

Malaria is a mosquito-borne disease.

### Cause:

There are 5 *Plasmodium* parasite species that cause malaria in humans and 2 of these species – *P. falciparum* and *P. vivax* – pose the greatest threat. *P. falciparum* is the deadliest malaria parasite and the most prevalent on the African continent. *P. vivax* is the dominant malaria parasite in most countries outside of sub-Saharan Africa. The other malaria species which can infect humans are *P. malariae*, *P. ovale* and *P. knowlesi*.

### Disease:

Malaria

### Symptoms

Symptoms usually start within 10 – 15 days of getting bitten by an infected mosquito. Symptoms can be mild or life-threatening. Mild symptoms are fever, chills and headache. Severe symptoms include fatigue, confusion, seizures, and difficulty breathing. The first symptoms may be mild, similar to many febrile illnesses, and difficult to recognize as malaria. Left untreated, *P. falciparum* malaria can progress to severe illness and death within 24 hours.

### Vector

*Anopheles* mosquitoes

### Transmission

Malaria spreads to people through the bites of infected female *Anopheles* mosquitoes.

The incubation period in most cases of malaria ranges from 7 – 30 days. Different species of parasites that cause malaria in humans can cause shorter or longer incubation periods.<sup>10</sup> Just like *Aedes*, once infected the mosquito is able to spread the parasite for life.

### Geography

Although malaria is present in many countries of the tropical belt around the world, the WHO African Region continues to carry a disproportionately high share of the global malaria burden. In 2022 the Region was home to about 94% of all malaria cases and 95% of deaths.

Children under 5 years of age accounted for about 78% of all malaria deaths in the Region.

Four African countries accounted for just over half of all malaria deaths worldwide: Nigeria (26.8%), the Democratic Republic of the Congo (12.3%), Uganda (5.1%) and Mozambique (4.2%).<sup>11</sup>

### Global burden

In 2022, the global tally of malaria deaths reached 608,000, and cases reached 249 million – well above the estimated number of cases before the COVID-19 pandemic, and an increase of five million over 2021.<sup>12</sup>

### Treatment

Early diagnosis and treatment of malaria with anti-malaria drugs reduces disease, prevents deaths and contributes to reducing transmission. WHO recommends that all suspected cases of malaria be confirmed using parasite-based diagnostic testing (through either microscopy or a rapid diagnostic test).

Malaria is a serious infection and always requires treatment with medicine.

### Vector control

Vector control is a vital component of malaria control and elimination strategies as it is highly effective in preventing infection and reducing disease transmission. The 2 core interventions are insecticide-treated nets (ITNs) and indoor residual spraying (IRS).

### Vaccine development

Since October 2021, WHO has recommended broad use of the RTS,S/AS01 malaria vaccine among children living in regions with moderate to high *P. falciparum* malaria transmission. The vaccine has been shown to significantly reduce malaria, and deadly severe malaria, among young children.

In October 2023, WHO recommended a second safe and effective malaria vaccine, R21/Matrix-M. The availability of two malaria vaccines is expected to make broad-scale deployment across Africa possible.

<sup>10</sup> <https://www.cdc.gov/malaria/symptoms/index.html>

<sup>11</sup> World Malaria Report 2023

<sup>12</sup> World Malaria Report 2023

## Global upsurge in dengue

After a slight decline of cases between the year 2020-2022 due to the COVID-19 pandemic and lower reporting rate, the global incidence of dengue has markedly increased over the past two decades, posing a substantial public health challenge. From 2000 to 2023, the World Health Organization (WHO) documented a **ten-fold surge in reported cases worldwide** increasing from 500,000 to 6.5 million<sup>13</sup>, characterized by a significant increase in the number, scale, and simultaneous occurrence of multiple outbreaks, spreading into regions previously unaffected by dengue.<sup>14</sup> Urbanization, international travel, climate change, and socioeconomic factors have fueled these recent dengue upsurges.<sup>15</sup>

Since the beginning of 2024, **over 9 million dengue cases** and **over 4500 dengue-related deaths** have been reported globally. Most cases were reported in the WHO Pan-American region with a cumulative number of over 7 million suspected cases reported until June of 2024. According to the Pan-American Health Organization report of 7 March 2024, this is an increase of 249% compared to the same period in 2023.<sup>16</sup>

In comparison malaria cases and deaths have not seen an upsurge of this magnitude although the prevalence is higher now than it was pre-COVID.

## Dengue outbreak in Burkina Faso in 2023

In Burkina Faso, dengue has been endemic since 2013, a consequence of the increase in *Aedes aegypti* and *Aedes albopictus* species in the country. In 2023, Burkina Faso grappled with an epidemic of dengue fever, marked by a cumulative total of 154,867 suspected cases (diagnosed through syndromic diagnosis). Among these, 70,433 cases were probable (confirmed by rapid detection test), resulting in 709 recorded deaths. All thirteen regions of the country reported at least one dengue-related death (with the highest number of deaths being in the Central region (Ouagadougou; 318 deaths) and in the Hauts-Bassins region (Bobo-Dioulasso; 228 deaths)<sup>17</sup>, marking this as the **largest dengue epidemic ever witnessed in Africa**.<sup>18</sup> As a comparison, in Burkina Faso, there were 8 million malaria infections and 16,669 deaths in 2022.<sup>19</sup>

The transmission is cyclic and large outbreaks are expected to occur every 3-5 years. During the 2016-2017 outbreak in Burkina Faso, the predominant circulating serotype was DEN-2. Recent analysis by Prof. Armel Poda (CHU Sourô Sanou, Bobo-Dioulasso, Burkina Faso) indicates that during the 2023 outbreak, serotype DEN-3 was circulating (abstract submission at ICID conference). The difference in serotypes could explain the increased severity of dengue cases (hospitalisations and deaths) last year in Burkina Faso due to the higher number of secondary infections, several years after the end of serotype cross-protection. However, other factors such as climate change, urbanisation and socioeconomic factors that are responsible for the global surge could also apply here.

13 <https://www.who.int/emergencies/disease-outbreak-news/item/2023-DON498>

14 <https://www.who.int/news-room/fact-sheets/detail/dengue-and-severe-dengue>

15 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC11035754/>

16 <https://www.ecdc.europa.eu/en/dengue-monthly>

17 Ministry of Health, Weekly epidemiological bulletin 52, epidemiological surveillance. Ministry of Health, Burkina Faso, 2023

18 [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(23\)02803-9/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(23)02803-9/fulltext)

19 WHO, World Malaria Report 2023

## Conclusion

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While malaria and dengue present similarities, in particular in the symptoms and the fact that they are both transmitted both by mosquitoes, it is fundamental to consider these two diseases very differently.

**The mosquitoes that transmit those two diseases belong to distinct species that do not mate and the pathogens that they transmit are also very different: a virus, in the case of dengue; and a parasite, in the case of malaria.** *Aedes* mosquitoes occur in more urban areas, whilst *Anopheles* mosquitoes stay in more rural areas.

In the case of dengue, increased urbanisation and climate change may have contributed to a change in the vectors distribution and spread.<sup>20</sup> Further, difficulties in the timely detection (crucial for the reporting of cases and prevention of spread) and adequate surveillance may have emphasized the increase of dengue in affected countries.<sup>21</sup>

The increase in dengue cases is happening globally and is not limited to Burkina Faso. In fact, from 2000 to 2023, the World Health Organization (WHO) documented over ten-fold surge in reported dengue cases worldwide, 2023 and 2024 are showing record case numbers globally. These numbers are likely to be an underestimate of the true burden as most of the primary infections are asymptomatic. Dengue reporting is also not mandatory in many countries.

Efforts are ongoing to better understand the transmission dynamics of dengue and other arboviruses in the African region. The WHO Regional Office for Africa has endorsed the Framework for the integrated control, elimination and eradication of tropical and vector-borne diseases in the African Region 2022-2030.<sup>22</sup> Equally, the Regional Office has also drafted the Framework for implementation of the Global Arbovirus Initiative by targeted Member States in the WHO African Region.<sup>23</sup>

## Références

- [Dengue and severe dengue \(who.int\)](https://www.who.int/health-topics/dengue)
- <https://www.afro.who.int/health-topics/dengue>
- [Malaria \(who.int\)](https://www.who.int/health-topics/malaria)
- <https://www.afro.who.int/health-topics/malaria>
- [Dengue fever explained: from disease spread to prevention | News | Wellcome](https://www.who.int/emergencies/disease-outbreak-news/item/2023-DON498)
- <https://www.who.int/emergencies/disease-outbreak-news/item/2023-DON498>
- [Setting Dengue Fever Epidemic Thresholds Between 2016 and 2021 in the Central Health Region, Burkina Faso: An Ecological Study](https://www.who.int/initiatives/global-arbovirus-initiative)

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<sup>20</sup> <https://www.who.int/emergencies/disease-outbreak-news/item/2023-DON498>

<sup>21</sup> [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(23\)02803-9/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(23)02803-9/fulltext)

<sup>22</sup> Regional Committee for Africa, 72. (2022). Framework for the integrated control, elimination and eradication of tropical and vector-borne diseases in the African Region 2022–2030: report of the Secretariat. World Health Organization. Regional Office for Africa. <https://iris.who.int/handle/10665/361856>

<sup>23</sup> <https://www.who.int/initiatives/global-arbovirus-initiative>