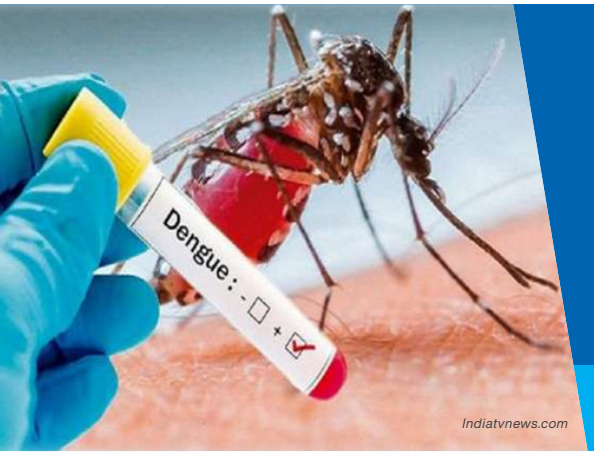
World Health Organization
REGIONAL OFFICE FOR Africa

WHO African Region Health Emergency Situation Report



Multi-country Outbreak of DENGUE

Burkina Faso, Cabo Verde, Chad, Côte d'Ivoire, Ethiopia, Guinea, Mali, Mauritius, São Tomé and Príncipe, Senegal, Benin, Nigeria, Ghana and Togo

Consolidated Regional Situation
Report # 001 – As of 19 December, 2023

171 991
Cumulative Suspected cases

70 223
Cumulative Confirmed cases

753
Deaths

15
Countries

HIGHLIGHTS

- **Since the start of 2023, over 5 million cases and 5 000 deaths have been reported worldwide from over 80 countries in all six WHO regions.** The global risk level was determined to be high due to the high number of people at risk (40% of the worldwide population), the number and magnitude of outbreaks, climate change consequences, including the ongoing El Niño phenomenon and complex humanitarian crises, the escalation in dengue-related deaths, and the lack of an integrated approach to prevent and control dengue outbreaks.
- **In the WHO African region, as of 19 December 2023, a total of 171 991 suspected cases of dengue, including 70 223 confirmed and probable cases and 753 deaths have been reported from 15 countries** (Benin, Burkina Faso, Cabo Verde, Chad, Côte d'Ivoire, Ethiopia, Ghana, Guinea, Mali, Mauritius, Niger, Nigeria, São Tomé and Príncipe, Senegal, and Togo). In 2023, the number of dengue infections in the region has risen nine-fold compared to 2019.
- **Burkina Faso continues to be the country that has been most impacted, accounting for 85% of reported cases and 91% of recorded fatalities.**
- Senegal and Mali have experienced simultaneous outbreaks of dengue, Zika, and chikungunya, highlighting **the issue of under-reporting of cases** due to limited capacity for early detection, and confirmatory diagnostics in most countries and the **need for an integrated arboviral response.**
- As per the WHO Emergency Response Framework (ERF), a regional Incident Management Support Team (IMST) has been established in each affected country and regional levels to coordinate the response.
- **A dengue criticality risk mapping has been created for 47 countries of the WHO African region,** categorizing them into tiers based on the risk of dengue outbreaks (Tier 1 for emergency response, Tier 2 for enhanced readiness interventions, and Tier 3 for preparedness interventions).
- **An updated comprehensive guideline for preparedness and response to dengue outbreaks** in the WHO African region is being developed.

Figure 1: Female Aedes Aegypti mosquitoes transmit dengue fever when enjoying blood meals. James Gathany

- **Dengue (break-bone fever) is a viral infection caused by the dengue virus (DENV), transmitted to humans through the bite of infected female mosquitoes mainly of the species Aedes aegypti and, to a lesser extent, Ae. albopictus. This mosquito also transmits chikungunya, yellow fever and Zika infection. It's found in tropical and sub-tropical climates, mostly in urban areas.**
- **While many DENV infections are asymptomatic or produce only mild flu-like illness, DENV can occasionally cause more severe cases, and even death.**
- **Prevention and control of dengue depend on effective vector control. There is no specific treatment for dengue/severe dengue, and early detection and access to proper medical care greatly lower fatality rates of severe dengue.**

EPIDEMIOLOGICAL UPDATE

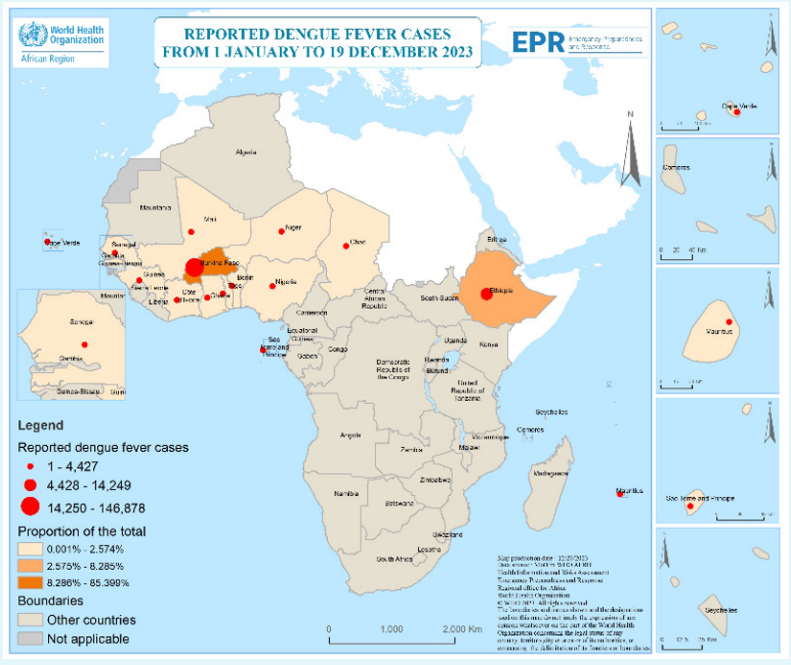
- As of **19 December, 2023,** a total of **171 991** cases of dengue, including **70 223** confirmed and probable cases and **753** deaths (case fatality rate: 0.4%) have been reported from Burkina Faso, Cabo Verde, Chad, Côte d'Ivoire, Ethiopia, Guinea, Mali, Mauritius, São Tomé and Príncipe, Senegal, Nigeria, Ghana, Benin and Togo.
- **Burkina Faso accounts for 85% of the total cases** (n = 146 878), followed by Ethiopia (8.2%) (n = 14 249), Mali (2.5%) (n = 4427), and Cote d'Ivoire with 2.2% (n = 3895) of all reported cases. In terms of deaths, **Burkina Faso accounts for 91% of fatalities** (n = 688), followed by Mali at 3.8% (n = 29) and Cote d'Ivoire at 3.5% (n = 27)
- **Table 1.** Total suspected and confirmed dengue cases and deaths reported within WHO Africa countries as of 19 December, 2023.

Number	Country	Suspected Cases	Probable & Confirmed cases	Deaths	CFR (%)	End of reporting period
1	**Burkina Faso**	**146 878**	**68 346**	**688**	**0.5**	**18/12/2023**
2	**Ethiopia**	**14 249**	**127**	**7**	**0.0**	**02/11/2023**
3	**Mali**	**4 427**	**629**	**29**	**0.6**	**19/12/2023**
4	**Côte d'Ivoire**	**3 895**	**321**	**27**	**0.7**	**03/12/2023**
5	**Chad**	**1 342**	**41**	**1**	**0.1**	**01/10/2023**
6	**Cabo Verde**	**410**	**193**	**0**	**0.0**	**19/12/2023**
7	**Mauritius**	**265**	**265**	**0**	**0.0**	**01/10/2023**
8	**Senegal**	**203**	**203**	**0**	**0.0**	**03/12/2023**
9	**Niger**	**148**	**0**	**0**	**0.0**	**10/12/2023**
10	**Nigeria**	**72**	**14**	**0**	**0.0**	**19/12/2023**
11	**Sao Tome and Principe**	**69**	**69**	**0**	**0.0**	**03/10/2023**
12	**Ghana**	**18**	**9**	**0**	**0.0**	**10/12/2023**
13	**Togo**	**8**	**2**	**0**	**0.0**	**16/11/2023**
14	**Benin**	**6**	**3**	**1**	**0.2**	**18/12/2023**
15	**Guinea**	**1**	**1**	**0**	**0.0**	**31/08/2023**
	TOTAL	**171 991**	**70 223**	**753**	**0.4**	

*This category includes PCR and/or RDT positive cases

- The dengue outbreak is no longer active in four of the eleven affected countries: Chad, Guinea, Mauritius, and Sao Tome and Principe.

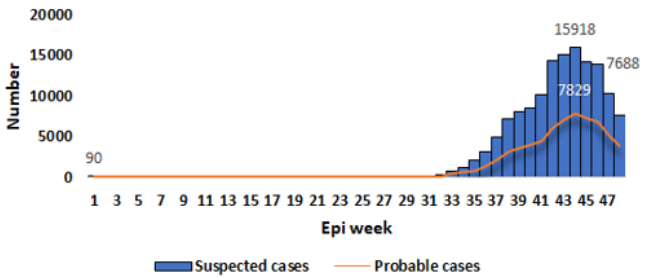
Figure 2. Reported dengue fever cases in the WHO African Region from 1 January to 19 December, 2023



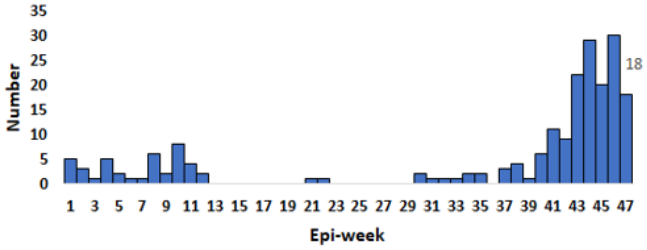
EPIDEMIOLOGICAL UPDATE (2)

Figure 3. Dengue incidence trends in the most afflicted West and Central African countries between Week 1 and Week 48, 2023

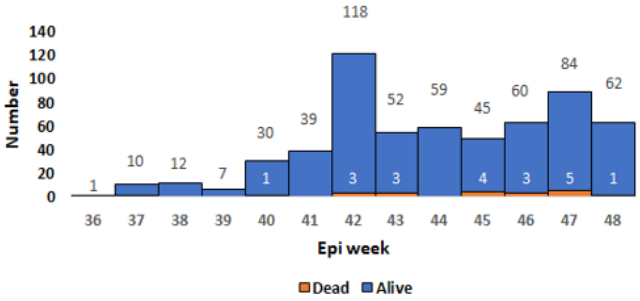
3a) Suspected & probable cases of dengue as of week 48, 2023, Burkina Faso



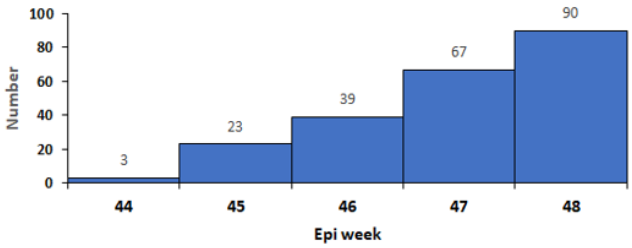
3b) Confirmed cases of dengue as of week 48, 2023, Senegal



3c) Confirmed dengue cases of dengue as of week 48, 2023, Mali



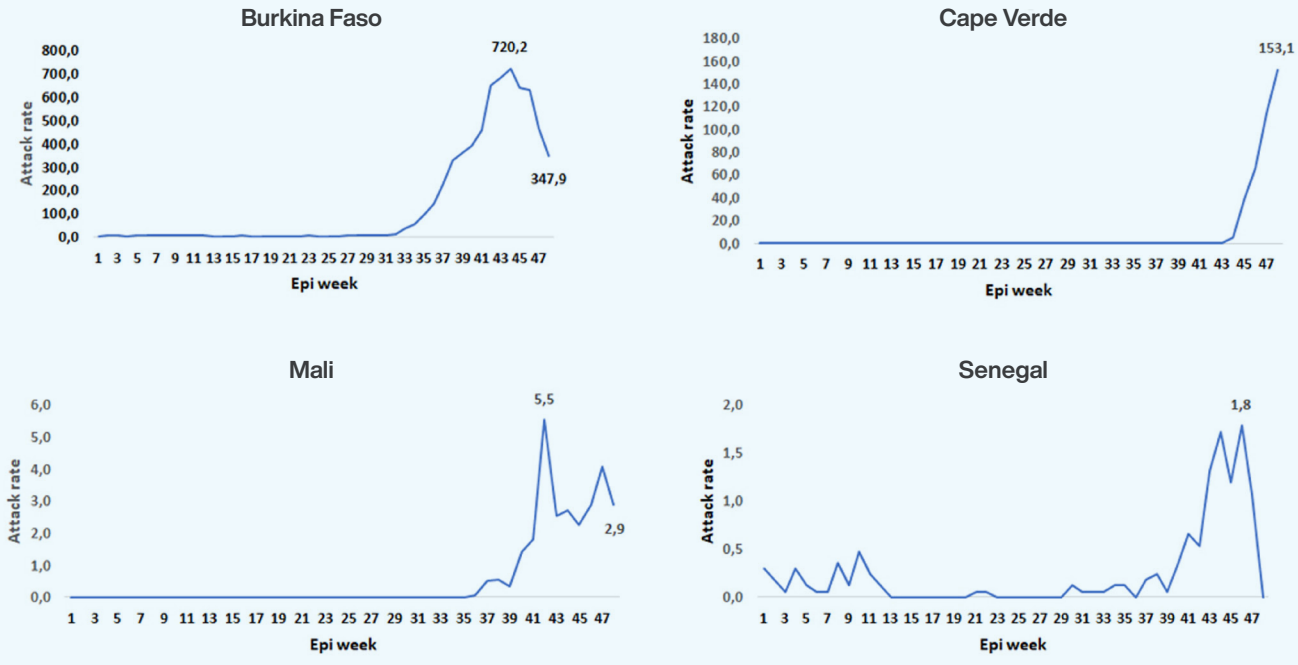
3d) Suspected cases of dengue as of week 48, 2023, Cape Verde



- There has been an increase in the number of reported cases in Burkina Faso; however, the overall trend is declining.
- There has been a consistent increase in suspected cases in Cabo Verde.
- The transmission of the virus in Mali and Senegal has plateaued.

Figure 4. Evolution of dengue weekly attack rates per 1 000 000 inhabitants in the most affected West and Central African countries.

Dengue weekly attack rate per country and 1,000,000 inhabitants



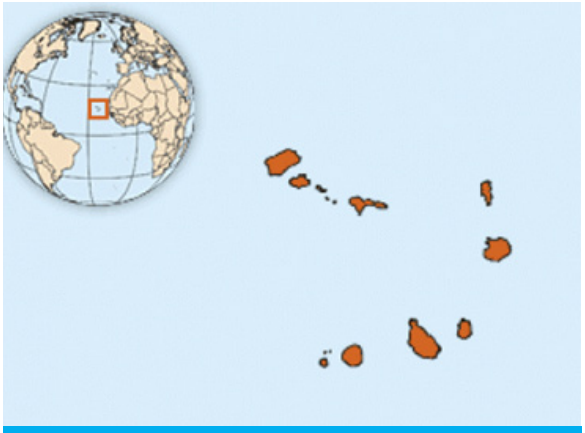
- Considering the progression of the attack rate (AR) per 1 000 000 inhabitants: Burkina Faso has been the most impacted country in recent weeks, with Cabo Verde following closely after. Cabo Verde is experiencing an increasing trend, whereas Burkina Faso is experiencing a decreasing trend.

DENGUE RESPONSE ACTIVITIES WITHIN THE MOST AFFECTED COUNTRIES

BURKINA FASO

- From epidemiological week 32 of 2023 onwards, Burkina Faso has been facing an unprecedented dengue outbreak, mostly concentrated in the country's two major cities: Bobo Dioulasso and Ouagadougou. In Burkina Faso, the coordination structure for the dengue outbreak is the National Committee for Epidemic Management (CNGE) at the central level. Additionally, Incident Management Support Teams (IMSTs) were activated at regional levels in the Centre and Hauts Bassins regions. A strategic response plan for arboviral diseases is being finalized, and advocacy is being conducted to mobilize financial resources.
- **Surveillance and active search for cases and contacts** have been strengthened, with MoH-approved dengue case definitions and guidelines being disseminated in health regions. Investigations of suspected dengue cases and Chikungunya cases have also been conducted. Free dengue testing has been declared in hospitals and health centers, and the national viral hemorrhagic fever reference laboratory is conducting genomic surveillance. Laboratory confirmation of cases has been conducted, and sometimes we stock laboratory reagents and consumables for confirmatory diagnosis of dengue fever and arboviruses. A cumulative total of 173 600 tests were procured with the support of partners (including USG Agencies and WHO) since the beginning of the outbreak. Over 120 000 tests were already deployed in the field, and 51 265 tests were in stock at the central store of the Ministry of Health as of 10 December 2023.
- **Clinical case management** has been implemented according to revised guidelines, with briefings of health providers and the provision of medications and supplies for clinical case management at the hospital level. Tents have been set up at several institutions (CHUYO, CMA de Pissy, CMA de Kossodo, CM de Saaba, and CHR de Koudougou) to expand hospital capacity, and monitoring visits have been carried out. Death audits have been conducted in hospitals in the cities of Ouagadougou and Bobo Dioulasso.
- **Vector control and entomology** have been implemented, with household spraying in Bobo Dioulasso and Ouagadougou. This includes the application of insecticide to households (2812 houses of patients and nearby homes of patients). Targeted spatial spraying in high vector density areas and the use of drones to spray gutters and canals (76 treated in total). The Ministry of Environment, Water, and Sanitation has launched a national campaign of larval nest destruction in Ouagadougou, and the Ministry of Agriculture and Animal Resources has deployed sprayers to support spraying operations.
- **Risk communication and community engagement** have been crucial, with the call center (3535) operating 24/7 and awareness-raising messages being disseminated through microprograms in both French and national languages. Media professionals, bloggers, and influencers have been briefed, and interactive programs have been hosted.
- **Challenges** encompass the limited mobilization of financial resources, expansion of spraying to additional areas, inadequate availability of emergency drugs for severe cases in targeted university and referral hospitals (CHU and CHR), inadequate documentation of cases on the STELab platform, which restricts analysis possibilities, dissemination of false rumors about dengue and chikungunya, including through social media, insufficient vehicles for field deployment, inadequate research activities, scarcity of dengue RDTs (Rapid diagnostic test) and laboratory reagents for confirmation and surveillance of arboviral diseases, and absence of cross-border meetings for sharing experiences in enhancing surveillance and controlling outbreaks in the sub-region.
- The response plan aims to reduce morbidity and mortality and prevent new cases in priority areas. Financial resources are needed, and the WHO in-country team estimated the response needs at about US$ 1.5 million.

DENGUE RESPONSE ACTIVITIES WITHIN THE MOST AFFECTED COUNTRIES (2)



CABO VERDE

- Cabo Verde is facing economic challenges due to limited resources, a small market, limited economic diversification, and a dispersed population. The country's economy contracted by 15% during the COVID-19 pandemic, primarily due to decreased tourism. In addition to these economic challenges, Cabo Verde is now dealing with an outbreak of dengue fever. The outbreak has primarily affected the municipalities of Praia, Santa Cruz, São Filipe, and Mosteiros, with a total of 222 cases, of which 58 confirmed reported.
- The country is facing challenges in controlling the outbreak, including insufficient vector control measures, limited human resources for surveillance, and a lack of diagnostic testing supplies. To address these challenges, a response plan has been developed, which aims to strengthen the country's capacity to control the outbreak and mitigate its impact. The plan includes measures such as strengthening surveillance and vector surveillance and control, improving risk communication, and acquiring necessary laboratory supplies. Technical and financial support from the WHO African Regional Office is needed to implement the plan, with an estimated budget of US$ 500 000.
- Urgent needs: ▪ financial support; ▪ operationalization of the Public Health Emergency Operating Center (PHEOC); ▪ strengthen epidemiological and entomological surveillance; ▪ build the capacity of laboratory technicians on PCR (Polymerase Chain Reaction) and genomic sequencing for dengue fever; ▪ acquire reagents and consumables to establish dengue virus PCR and genomic sequencing in the country. Resources needed: ▪ Technical support from AFRO (African Region Office) to deploy one expert in entomology (for 15 days) and one expert in the laboratory (for 10 days).

MALI

- Mail has developed a response plan to combat the dengue outbreak that has been spreading in the country. The plan aims to reduce morbidity and mortality associated with dengue fever and prevents its spread to other regions. The specific objectives of the plan include strengthening the surveillance system for early case detection, organizing an immediate response to cases, ensuring appropriate case management, identifying entomological and environmental factors, organizing vector control measures, and developing and disseminating prevention messages.
- The Ministry of Health is responsible for coordinating the outbreak response at the national level, while regional and district levels are coordinated by the Permanent Intersectoral Committees for the Management of Epidemics and Disasters. Surveillance, laboratory testing, case management, vector control, public communication, and community engagement are key components of the response plan.
- The initial budget of the dengue response plan in Mali is US$ 1 000 000.
- The Ministry of Health and Social Development in Bamako has implemented vector control measures, fumigating residences and surrounding areas of confirmed cases in 36 health zones, and spraying 1503 households. The measures aim to isolate confirmed cases and eliminate breeding habitats. However, immediate assistance is needed to aid the response to the dengue outbreak in Mali, including laboratory diagnostics, epidemiological and entomological investigative efforts, vector control, staff skill enhancement, cross-border workshops, and infrastructure improvements at designated points of entry.

DENGUE RESPONSE ACTIVITIES WITHIN MOST AFFECTED COUNTRIES (3)

COTE D'IVOIRE

- Côte d'Ivoire is currently facing a dengue epidemic, with over 3500 suspected cases including over 300 confirmed cases and 27 deaths in the Autonomous District of Abidjan. This is the sixth dengue outbreak in the country since 2009. The presence of Aedes albopictus, a secondary dengue vector, has been detected in certain areas, along with Zika and chikungunya viruses the epidemiological situation shows that the Cocody-Bingerville health district has the highest number of confirmed dengue cases, followed by Treichville-Marcory and Yopougon-Est. The Abidjan Health Districts account for 94.56% of the confirmed cases.
- The response to the epidemic includes the use of rapid diagnostic tests for dengue and malaria, with a high number of cases diagnosed in Abidjan. Efforts are being made to control mosquito populations through various measures such as awareness-raising, managing breeding sites (including the destruction of used tires), and spraying insecticides.
- The response plan will be implemented in the Autonomous District of Abidjan for one month, followed by mosquito control activities in other regions. The aim is to minimize transmission, morbidity, and mortality, support the healthcare system, and involve the public in the response efforts. The initial budget for the dengue response plan in Cote d'Ivoire is US$ 1 million.

ETHIOPIA

- Ethiopia is currently facing multiple health crises, including cholera, measles, malaria, dengue fever, and internal displacement of people due to conflicts and natural disasters. These crises are particularly affecting vulnerable populations, especially children. Malaria and dengue fever outbreaks are a major concern during the rainy season, while the internal displacement of people worsens the public health crisis due to crowded and unsanitary living conditions.
- To address these challenges, a multi-outbreak response incident management system (IMS) has been activated, establishing coordination platforms at the national level. As of 2 November 2023, there have been 14 249 cases of dengue fever and seven deaths reported, with most cases in the Afar Region. Response activities for dengue fever include coordination, capacity-building, active case-finding, vector control, case management, and social mobilization.
- However, there are challenges in the response efforts, such as inconsistent surveillance, limited partner engagement, weak collaboration between sectors, and a lack of commitment from private clinics. Efforts are needed to strengthen coordination, surveillance, and community engagement to effectively respond to these outbreaks and provide necessary healthcare services to those affected, especially vulnerable groups.

SENEGAL

- Senegal is currently experiencing simultaneous outbreaks of dengue, Zika, chikungunya, and measles across fifteen health districts. The first confirmed case of dengue was reported on 1 February 2023, and the national attack rate for dengue fever is 13.6 per 1 million inhabitants. Pikine has the highest number of dengue cases, followed by Thilogne, Yeumbeul, and Dakar-Centre.
- There have been five cases with hemorrhagic signs indicating severe dengue and one related death. Overall, the situation in Senegal regarding the simultaneous occurrence of arbovirus outbreaks is concerning. The number of cases and the presence of hemorrhagic signs highlight the severity of the outbreaks.

The WHO African Region has classified its 47 countries according to the risk of dengue outbreak, considering likelihood and impact (consequences) as an overall criticality score. Eight key indicators were used to estimate the overall criticality score for each country:

1. **The INFORM Risk Index,** which is a global, open-source risk assessment for humanitarian crises and disasters. Each country in the world is assigned a composite score of 0-10, indicating risk across three dimensions: hazard and exposure; vulnerability; and lack of coping capacity. This indicator contributes to the 'consequences' dimension of the dengue risk classification by identifying countries with competing disease priorities, socio-economic vulnerabilities, lack of access to healthcare, and other components that contribute to increasing the consequences of dengue infections.

   Source : https://drmkc.jrc.ec.europa.eu/inform-index/INFORM-Risk

2. **The dengue U.S. CDC (Center for Disease Control and Prevention) Level of Risk,** which categorizes countries based on their level of dengue risk. This indicator contributes to the 'likelihood' dimension of the dengue risk classification. The indicator classifies countries into three categories: countries with a frequent or continuous risk of dengue, those with sporadic or uncertain risk of dengue, and those with no evidence of dengue; these are scaled to a 10-point scale by assigning a score of 10, 5, or 0, respectively.

   Source : https://www.cdc.gov/dengue/areaswithrisk/around-the-world.html

3. **Outbreaks of dengue in Africa in the past decade (2011–2021).** This indicator contributes to the 'likelihood' dimension of the dengue risk classification. Countries with outbreaks in the past five years are given a score of 10, those with outbreaks in the preceding five years are given a score of 5, and others are given a score of 0.

   Source: Gainor, E.M.; Harris, E.; LaBeaud, A.D. Uncovering the Burden of Dengue in Africa: Considerations on Magnitude, Misdiagnosis, and Ancestry. Viruses 2022, 14, 233. https://doi.org/ 10.3390/v14020233. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8877195/

4. **Outbreaks of dengue recorded in 2022–2023.** This indicator contributes to the 'likelihood' dimension of the dengue risk classification. Countries with active outbreaks in 2023 are given a score of 10, those with outbreaks during this period that are no longer active are given a score of 5, and those with no outbreaks in this period are given a score of 0. **Source:** WHO AFRO, 2023, Unpublished data.

5. **Total DALYs (disability adjusted life years) due to dengue.** This indicator contributes to the 'consequences' dimension of the dengue risk classification. The total burden of disease from dengue is calculated using the disability-adjusted life years (DALYs), where each DALY represents the loss of the equivalent of one year of full health due to prevalent cases of the disease or health condition. Using total DALYs allows for reflecting a larger overall burden of dengue in large countries with many cases. The total DALY score is scaled from 0 to 10 by taking the total DALYs from dengue from all countries in the world for the year 2017 (last year with data) and breaking them down into percentiles, then assigning a country total DALY score as follows: 0=0, <25th percentile (0 DALYs) = 2, <median (88.75 DALYs) =4, <75th percentile (1190.84 DALYs) = 6, <90 percentile (5623.93 DALYs) = 8, 90+ percentile = 10.

   Source: Zeng Z, Zhan J, Chen L, Chen H, Cheng S. Global, regional, and national dengue burden from 1990 to 2017: A systematic analysis based on the global burden of disease study 2017. EClinicalMedicine. 2021 Jan 6; 32:100712. doi: 10.1016/j.eclinm.2020.100712. PMID: 33681736; PMCID: PMC7910667. https://www.thelancet.com/pdfs/journals/eclinm/PIIS2589-5370(20)30456-9.pdf

6. **DALY rate per 100 000 population.** This indicator contributes to the 'consequences' dimension of the dengue risk classification. The DALY rate per 100 000 population for dengue is calculated using the disability-adjusted life years (DALYs) but dividing by the country's population. Using the DALY rate per population allows for reflecting a larger per-capita burden in some smaller countries. The DALY rate score is scaled from 0-10 by taking the global DALY rate from dengue from all countries in the world for the year 2017 (last year with data) and breaking them down into percentiles, then assigning a country total DALY score as follows: 0=0, <25th percentile (0 DALYs) = 2, <median (4.57 DALYs) = 4, <75th percentile (18.44 DALYs) = 6, <90 percentile (40.61 DALYs) = 8, 90+ percentile = 10.

   Source: Zeng Z, Zhan J, Chen L, Chen H, Cheng S. Global, regional, and national dengue burden from 1990 to 2017: A systematic analysis based on the global burden of disease study 2017. EClinicalMedicine. 2021 Jan 6; 32:100712. doi: 10.1016/j.eclinm.2020.100712. PMID: 33681736; PMCID: PMC7910667. https://www.thelancet.com/pdfs/journals/eclinm/PIIS2589-5370(20)30456-9.pdf

The actual distribution of dengue DALYs globally results in the 25th percentile also being 0; so in practice, no country is assigned a score of 2.

7. **Estimated Mean Index P,** a climate-driven suitability measure for mosquito-borne viruses derived from a mechanistic model previously developed to study the transmission dynamics of Zika and dengue, was used to estimate the monthly Index P time series for each spatial pixel in 186 countries and territories from 1981 to 2019. This indicator contributes to the 'likelihood' dimension of the dengue risk classification. The estimated mean Index P per country was visually estimated by an expert from AFRO (African Region Office) from the distribution of shading in each country. The mean index of 0, 0.5, 1.0, 1.5, 2.0, or 2.5 was scaled from 0 to 10 by multiplying by 4.

   Source: Nakase, T., Giovanetti, M., Obolski, U. et al. Global transmission suitability maps for dengue virus transmitted by Aedes aegypti from 1981 to 2019. Sci Data 10, 275 (2023). https://www.nature.com/articles/s41597-023-02170-7

8. **AFRO Arbovirus Country Capacity score.** This score is derived from the WHO/TDR publication titled "Surveillance and control of arboviral diseases in the WHO African Region: assessment of country capacities." This indicator contributes to the 'consequences' dimension of the dengue risk classification. It aims to assess the ability of a country to mitigate the effects of dengue transmission across seven dimensions: disease surveillance system; diagnosis and case notification; management of cases and severe cases; virological surveillance; routine vector surveillance and control; community sensitization and participation in non-epidemic periods; and preparedness for arboviral disease outbreaks and epidemics. These seven dimensions add up to a score per country of 0 to 100, with 100 being the best. In order to scale this indicator from 0 to 10 and give it the proper direction (where 10 is the worst), the total national score out of 100 was divided by 10 and rounded to the nearest integer, then subtracted from 10 to invert the direction (e.g., a score of 73.1 becomes 7.31, which is rounded to 7, and when subtracted from 10 yields a final score of 3).

   Source: WHO/TDR. "Surveillance and control of arboviral diseases in the WHO African Region: assessment of country capacities." https://www.who.int/publications/i/item/9789240052918

The overall dengue criticality score is calculated from the sum of the above eight indicators, with equal weight given to 'likelihood' and 'consequences'. The highest the score, the higher the risk.

Three tiers were defined to classify the dengue risk in the WHO African Region, with a subsequent package of activities and strategies.

- **Tier 1 was defined as countries with ongoing active outbreaks for emergency response.** Regardless of the overall criticality scores.
- **Tier 2 was defined as countries with a high overall criticality rating for readiness activities.** This includes the countries above the median criticality score (36.3). Countries with ongoing outbreaks (Tier 1) are repeated here, to emphasize the need for durable system strengthening even after the outbreak is over. Countries on the edge of Tier 2 versus Tier 3 should be assessed on a case-by-case basis for appropriate activities.
- **Tier 3 was defined as countries with a medium overall criticality rating for preparedness activities.** This includes the countries equal to or below the median criticality score. Countries with ongoing outbreaks (Tier 1) are repeated here, to emphasize the need for durable system strengthening even after the outbreak is over. Countries on the edge of Tier 2 versus Tier 3 should be assessed on a case-by-case basis for appropriate activities.

These classifications aim to support decisions about emergency response, readiness, and preparedness activities against dengue in the 47 countries of the WHO African Region.

Table 2: Dengue Risk Mapping Indicators and Overall Criticality Scores for Each Country of the WHO African Region. (14 December 2023)

#	Country	INFORM Risk (0-10)	Weighted CDC Dengue Risk Level Score (0,5,10)	Historical outbreaks score (Last 5 years=10 / 5 previous years=5, none = 0)	Recent outbreaks score (2023 Outbreak Yes-active=10 / Yes-not active=5/ No=0	Dengue Total DALYs class (0=0, <25th percentile = 2, <median = 4, <75th percentile = 6, <90th percentile = 8, 90+ percentile = 10)	Dengue DALYs rate per 100,000 class (0=0, <25th percentile = 2, <median = 4, <75th percentile = 6, <90 percentile = 8, 90+ percentile = 10)	Weighted P Index score (0,2,4,6,8,10)	AFRO Arbovirus Country Capacity score (rounded on 0-10 scale - inverted to make high scores bad)	Overall Criticality Score
1	Burkina Faso	7	10	10	10	8,00	6,00	10	5,00	66,0
2	Ethiopia	7	10	10	10	8,00	4,00	8	5,00	62,0
3	Kenya	6,6	10	10	5	8,00	6,00	10	4,00	59,6
4	Côte d'Ivoire	4,6	5	10	10	8,00	6,00	8	3,00	54,6
5	Nigeria	6,6	5	0	10	10,00	6,00	8	8,00	53,6
6	Senegal	4,1	5	10	5	8,00	6,00	10	3,00	51,1
7	Tanzania	5,1	10	10	5	8,00	6,00	2	5,00	51,1
8	Mozambique	6,7	5	5	5	8,00	6,00	6	8,00	49,7
9	Cameroon	6,6	5	10	0	8,00	6,00	6	7,00	48,6
10	Niger	6,6	5	0	10	6,00	4,00	10	5,00	46,6
11	Ghana	3,5	5	0	10	8,00	6,00	8	4,00	44,5
12	Seychelles	1,5	5	10	5	4,00	10,00	4	5,00	44,5
13	Uganda	7	5	0	5	8,00	6,00	4	8,00	43,0
14	Guinea-Bissau	3,9	5	0	5	6,00	6,00	8	9,00	42,9
15	Chad	7,8	5	0	5	6,00	4,00	8	5,00	40,8
16	Mali	6,8	5	0	5	6,00	6,00	8	4,00	40,8
17	Madagascar	5,5	5	0	5	8,00	6,00	6	4,00	39,5
18	Central African Republic	8,7	5	0	0	6,00	6,00	6	7,00	38,7
19	Mauritius	2,1	5	10	5	6,00	6,00	2	2,00	38,1
20	South Sudan	8,5	5	0	5	6,00	4,00	6	3,00	37,5
21	Malawi	4,4	5	0	5	6,00	6,00	2	9,00	37,4
22	Cabo Verde	2,4	5	0	10	6,00	6,00	6	1,00	36,4
23	Togo	4,3	5	0	5	6,00	6,00	4	6,00	36,3
24	Gambia	3,6	5	0	0	6,00	6,00	8	7,00	35,6
25	Sierra Leone	4,2	5	0	5	6,00	6,00	4	5,00	35,2
26	Zambia	3,9	5	0	5	6,00	6,00	2	7,00	34,9
27	Guinea	4,5	5	0	5	6,00	6,00	4	4,00	34,5
28	Liberia	4,5	5	0	5	6,00	6,00	2	6,00	34,5
29	Angola	5,2	5	5	0	8,00	4,00	4	3,00	34,2
30	Congo	5	5	0	0	8,00	6,00	4	6,00	34,0
31	Benin	4,3	5	0	0	8,00	6,00	6	4,00	33,3
32	Zimbabwe	4,1	5	0	5	6,00	4,00	2	7,00	33,1
33	Namibia	3,8	5	0	5	4,00	4,00	4	7,00	32,8
34	Eritrea	6	10	5	0	0,00	4,00	2	5,00	32,0
35	Mauritania	4,3	0	0	5	6,00	4,00	8	4,00	31,3
36	Rwanda	4,2	5	0	5	6,00	4,00	2	5,00	31,2
37	Congo DR	7,7	5	0	0	6,00	6,00	4	2,00	30,7
38	Equatorial Guinea	3,1	5	0	0	6,00	6,00	2	6,00	28,1
39	Burundi	5,6	5	0	0	4,00	6,00	0	7,00	27,6
40	Comoros	3,3	5	0	0	4,00	6,00	4	5,00	27,3
41	Gabon	3,2	5	0	0	6,00	6,00	2	5,00	27,2
42	South Africa	4,5	0	0	5	4,00	4,00	2	4,00	23,5
43	Sao Tome and Principe	2,6	5	0	5	0,00	0,00	2	8,00	22,6
44	Eswatini	3,3	0	0	0	6,00	0,00	2	8,00	19,3
45	Botswana	2,6	0	0	0	0,00	0,00	4	10,00	16,6
46	Lesotho	3,6	0	0	5	0,00	0,00	0	6,00	14,6
47	Algeria	3,6	0	0	0	0,00	0,00	2	0,00	5,6

Each country's overall dengue criticality score is a sum of the weighted scores of the following indicators: INFORM score; CDC dengue risk score; historical outbreaks; recent outbreaks; dengue total DALYs; dengue DALY rates per 100 000 persons; AFRO dengue preparedness score (inverted),), estimated mean Index P and the AFRO Arbovirus Country Capacity score.

- Tier 1 for emergency response
- Tier 2 for readiness interventions
- Tier 3 for preparedness interventions

Adjusted Preliminary Dengue Risk Mapping in the WHO African Region.

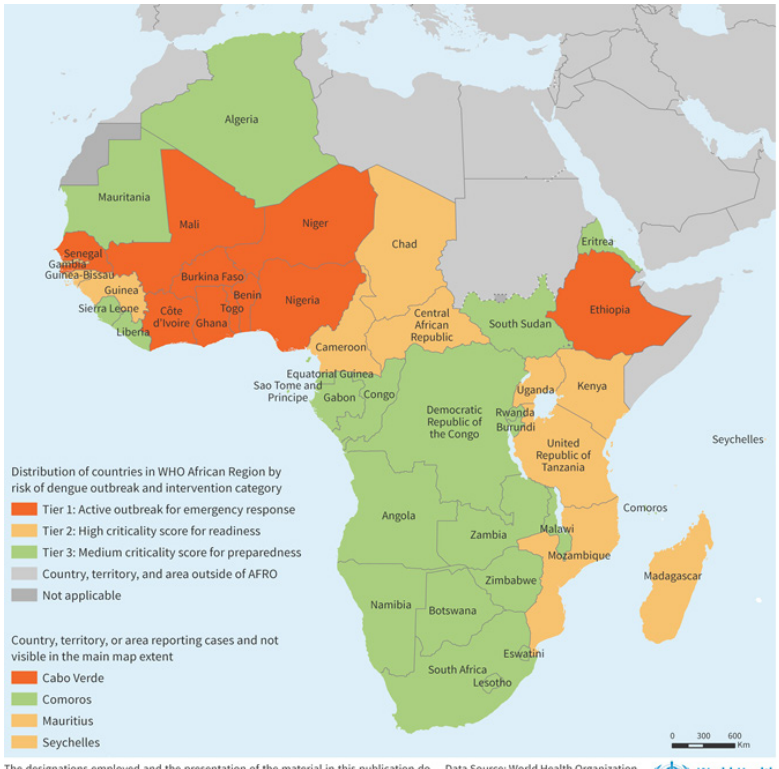
- **Tier 1 was defined as countries with ongoing active outbreaks requiring emergency response.** This includes countries with active dengue outbreaks, regardless of the criticality score: Burkina Faso, Ethiopia, Côte d'Ivoire, Nigeria, Senegal, Niger, Ghana, Mali, Cabo Verde, Togo, and Benin (11 countries).

- **Tier 2 was defined as countries with a high overall criticality rating requiring the implementation of the defined minimum package of readiness interventions.** This includes countries above the median criticality score (36.3) and countries that reported dengue outbreaks in 2023 but are no longer active: Kenya, Tanzania, Mozambique, Cameroon, Seychelles, Uganda, Guinea-Bissau, Chad, Madagascar, Central African Republic, Mauritius, Guinea, and São Tomé and Príncipe (13 countries).

- **Tier 3 was defined as countries with a medium overall criticality rating requiring the implementation of the defined package of preparedness core activities.** This includes countries that are equal to or below the median criticality score and are not experiencing an active outbreak: South Sudan, Malawi, Gambia, Sierra Leone , Zambia, Liberia, Angola, Congo, Zimbabwe, Namibia, Eritrea, Mauritania, Rwanda, Congo DR, Equatorial Guinea, Burundi, Comoros, Gabon, South Africa, Eswatini , Botswana, Lesotho, and Algeria (23 countries).

This categorization is subject to change and adaptation all over time. It is important to acknowledge that a country might transition from one tier to another owing to several reasons or a predictable or unpredictable change in the circumstances.

Table 3: Adjusted Preliminary Dengue Risk Mapping of the 47 Countries of the WHO African Region. (19 December 2023)



REVISED AND ADAPTED DENGUE CASE DEFINITIONS

1. Suspected case

Suspected case WITHOUT warning signs

- Any person who lives in or has traveled to areas with dengue transmission in the last 14 days (about two weeks) and presents acute fever, usually from two to seven days' duration, and two or more of the following manifestations: nausea/vomiting, abdominal pain, chills, rash, headache/retro-orbital pain, myalgia and arthralgia, petechial or positive tourniquet test (+ >10 pinpoint-sized spots of bleeding under the skin (petechiae) per square inch), low platelet count (thrombocytopenia), low white blood cell count (leukopenia) even without any warning sign or sign of severity.
- Any child who resides or has traveled in the last 14 days (about two weeks) to an area with dengue transmission that presents acute fever, usually from two to seven days duration, with no apparent focus of infection, is also considered a probable case.

Suspected case WITH warning signs

- Any person who presents one or more of the following signs:
  - Abdominal pain: progressive until it is continuous or sustained and intense
  - Persistent vomiting: three or more episodes in one hour or four episodes in six hours
  - Sensory disorder: irritability, drowsiness, and lethargy
  - Mucosal bleeding: bleeding from gums (gingivorrhagia), nose (epistaxis), or vaginal not associated with menstruation or more menstrual bleeding than usual, and blood in urine (hematuria)
  - Feeling of faintness (lipothymia due to postural hypotension)
  - Fluid accumulation: clinical, on imaging, or both
  - Liver enlargement (hepatomegaly): more than 2 cm below the costal margin and abrupt onset
  - Progressive increase in hematocrit (proportion of red blood cells): on at least two consecutive measurements during patient monitoring
- All suspected cases with warning signs are patients with increased risk of progression to severe dengue and should be immediately evacuated to the emergency room or intensive care unit of the nearest hospital without any further action.

2. Probable or highly suggestive dengue case (Some countries consider this to be part of a confirmed case.)

- A suspected case with highly suggested laboratory confirmation
  - Immunoglobulin M (IgM) positive in a single serum sample
  - Immunoglobulin G (IgG) positive in a single serum sample with a house index (HI) titre of 1280 or greater
  - detection of viral antigen (Non-Structural protein 1 or NS1+) in a single serum sample (by enzyme-linked immunosorbent assay (ELISA) or rapid tests)

3. Confirmed case

- A suspected case with laboratory confirmation through following methods
  - polymerase chain reaction (PCR) positive
  - virus culture positive
  - IgM seroconversion in paired sera
  - IgG seroconversion in paired sera or fourfold IgG titre increased in paired sera

4. Severe dengue

- Suspected/probable/confirmed dengue case with one or more of the following:
  - severe plasma leakage, leading to dengue shock syndrome,
  - fluid accumulation with respiratory distress;
  - severe bleeding, as evaluated by clinician;
  - severe organ involvement, such as
    - » liver (aspartate aminotransferase (ASAT) or alanine aminotransferase (ALT) elevation ≥ 1000),
    - » central nervous system (impaired consciousness) or
    - » heart or other organs.

Adapted from the primary source of definition: Chapter 3: Outbreak alert and outbreak detection Technical handbook for dengue surveillance, outbreak prediction/detection and outbreak response (Geneva: World Health Organization; 2016) Pg 19 – 26

Main source of evidence used: PAHO/WHO. Guidelines for the Clinical Diagnosis and Treatment of Dengue, Chikungunya, and Zika. Washington, D.C.: Pan American Health Organization; 2022. License: CC BY-NC-SA 3.0 IGO. https://doi.org/10.37774/9789275124871.

NEXT STEPS

1. Develop a regional dengue strategic preparedness and response plan (SPRP), including funding needs; mobilize resources and deploy needed expertise to countries;
2. Finalize the preliminary regional risk mapping to prioritize countries (countries on preparedness or response mode) as well as the comprehensive guideline for preparedness and response to dengue outbreaks;
3. Develop and publish regular multi-country reports on the regional dengue situation and response;
4. Support essential emergency medical supplies, including rapid diagnostic kits and intravenous fluids;
5. Strengthen human resource capacities in vector control in priority countries;
6. Adopt a multisectoral and one-health approach to prevent and control dengue and other arboviral diseases.
7. Ensure an integrated approach for the prevention and control of all arboviral events and not focus only on dengue, including real-time monitoring of arboviral events (dengue, Zika, and chikungunya);
8. Provide and maintain vector control equipment and insecticides, and strengthen vector surveillance and insecticide resistance management.
9. Move ahead on the adaptation and country implementation of the Global Arbovirus Initiative.
10. WHO AFRO, in-country teams, and partners should continue to provide technical support to countries to:
    - k) Conduct national reviews, situation analyses, surveillance assessments, laboratory and clinical analyses including sustainable support for lab reagents and kits; and develop additional tools for an integrated public health care approach;
    - l) Strengthen surveillance, including strengthening diagnostic algorithms, using RDTs, collecting and transporting samples, and strengthening laboratory capacity to test for dengue virus;
    - m) Reinforce or build the capacities of healthcare workers to improve early diagnosis and management of dengue with warning signs and severe dengue;
    - n) Strengthen case management capacity and improve access to care for patients to decrease mortality;
    - o) Strengthen risk communication and community engagement (RCCE) to improve awareness in the population, strengthening partner coordination based on stakeholder mapping, collecting behavioral sciences studies to contextualize the situation, ensuring effective community feedback mechanisms, developing RCCE interventions, and working closely with other technical teams (clinical, vector control, coordination).
    - p) To develop key messages for community action in local languages.
    - q) Strengthen country-level supply management to ensure continuity of response services;
    - r) Strengthen vector surveillance and control capacity for targeted risk categorization-based action;
    - s) Support appropriate urban environmental building construction, water supply, and waste management policies and legislation;
    - t) Ensure effective use and implementation of existing operational research findings for prevention and control.

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