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ASEAN BIOLOGICAL THREATS SURVEILLANCE CENTRE

DENGUE

In the ASEAN Region

FOCUS REPORT

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Acronyms and Abbreviations

ARDS	: Acute Respiratory Distress Syndrome
AKI	: Acute Kidney Injury
HUS	: Hemolytic Uremic Syndrome
ALT	: Alanine Transaminase
AMS	: ASEAN Member States
AST	: Aspartate Transferase
CFR	: Case Fatality Rate
CNS	: Central Nervous System
CSF	: Cerebrospinal Fluid
DEET	: Diethyltoluamide
DF	: Dengue Fever
DHF	: Dengue Hemorrhagic Fever
DSS	: Dengue Shock Syndrome
DENV	: Dengue Virus
EDS	: Expanded Dengue Syndrome
EIDs	: Emerging Infectious Diseases
ELISA	: Enzyme-Linked Immunosorbent Assay
HI	: Haemagglutination Inhibition
HEPR	: Health Emergency Prevention, Preparedness, Response and Resilience
IgG	: Immunoglobulin G
IgM	: Immunoglobulin M
IVM	: Integrated Vector Management
MoH	: Ministry of Health
NEA	: National Environment Agency
NIAID	: National Institute of Allergy and Infectious Diseases
NSP	: National Strategic Plan
NS1	: Non-Structural protein 1
NSAIDs	: Non-Steroidal Anti-Inflammatory Drugs
RT-PCR	: Reverse Transcription-Polymerase Chain Reaction
RNA	: Ribonucleic Acid
SAGE	: Strategic Advisory Group of Experts
SBCC	: Social and Behavioural Change Communication
SEA	: Southeast Asia
SEARO	: South-East Asia Regional Office
SPRP	: Strategic Preparedness and Response Plan
VCUs	: Vector Control Units
WHO	: World Health Organization
WPRO	: Western Pacific Regional Office

DENGUE

Introduction & Methods

Introduction

Dengue has emerged as the most prevalent and rapidly expanding vector-borne disease worldwide. The global burden has increased dramatically in recent decades, with reported cases rising from 505,430 in 2000 to 14.6 million in 2024 (WHO, n.d). The disease is now endemic in more than 100 countries, placing billions of people at risk of infection. Recent estimates suggest that approximately 390 million dengue infections occur annually, of which about 96 million manifest clinically, while up to 5.6 billion people may be at risk globally.

In 2024, dengue reached a historic high, with over 14.6 million cases and more than 12,000 deaths reported worldwide. The Region of the Americas accounted for a substantial proportion of this burden, contributing more than 13 million cases. From January to July 2025 alone, over 4 million cases and more than 3,000 deaths were reported from 97 countries, highlighting the continued global spread of the disease (WHO, n.d).

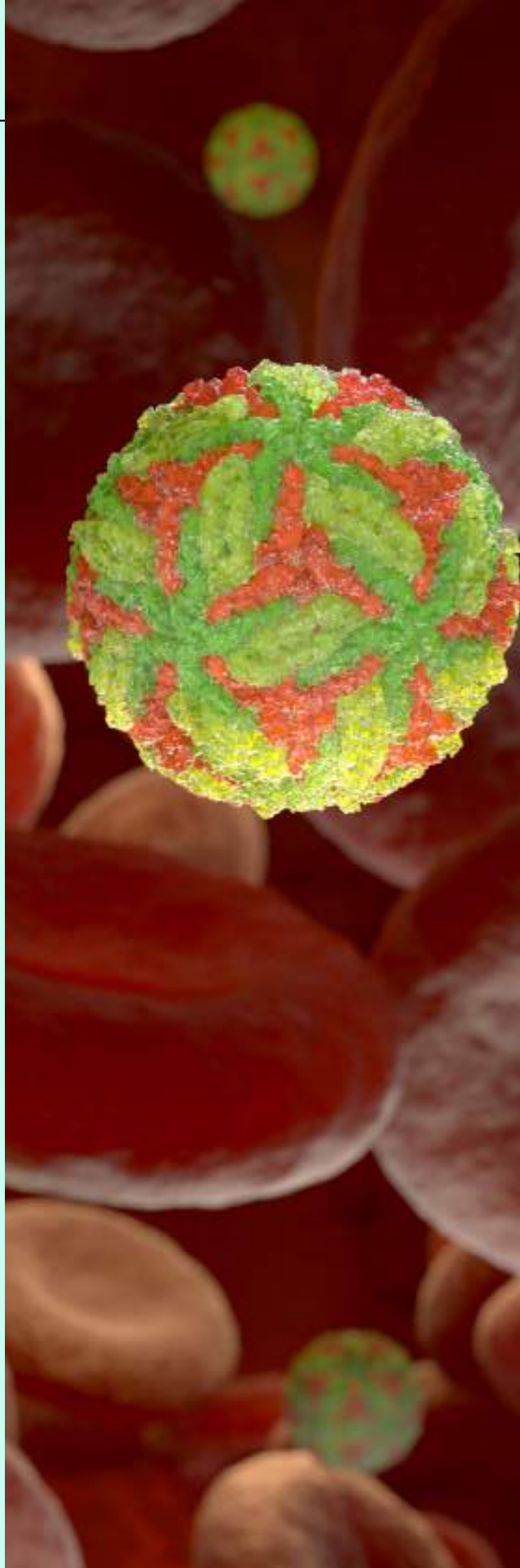
Several factors have contributed to the expansion of dengue transmission globally. These include the changing distribution of *Aedes* mosquito vectors (particularly *Aedes aegypti* and *Aedes albopictus*), rapid population growth, unplanned urbanization, inadequate water storage and sanitation systems, increased international travel and trade, and climate change—particularly rising temperatures, increased rainfall, and humidity. Additional challenges such as fragile health systems, gaps in surveillance and reporting, and political and financial instability in some regions have further exacerbated the spread of dengue (WHO, n.d).

ASEAN Member States (AMS) launched a regional initiative against dengue through ASEAN Dengue Day, observed annually on June 15 and endorsed at the 10th ASEAN Health Ministers Meeting in 2010 to reflect their shared commitment. This year's theme, "ASEAN United: Zero Dengue Deaths – A Future We Build Together by 2030," aims to raise awareness, strengthen collaboration, and facilitate knowledge exchange across public, private, and civil society sectors (ASEAN, 2026). The campaign promotes a sustainable, integrated approach to dengue control, including proactive surveillance, integrated vector management, rapid response, timely diagnosis and treatment, and targeted risk communication for vulnerable groups. It also emphasizes the use of innovations and new evidence to enhance effective and sustainable dengue management across AMS.

Methods

This report employs a comprehensive literature review to investigate the global landscape of dengue, with a particular focus on the ASEAN region. Data were retrieved from established databases, including PubMed, Embase, and Scopus. Furthermore, information on disease incidence sourced from publications by the WHO, AMS, and other official reports as well as diagnostic criteria, preventive measures, and policy strategies, was gathered from authoritative sources and credible news outlets. This integrated approach enabled a detailed analysis of current trends, epidemiological patterns, and the major challenges associated with dengue management within the ASEAN region.

In addition, a descriptive analytical approach was applied to assess the relationship between dengue incidence and climatic factors, particularly precipitation. This analysis examined observed dengue cases and rainfall intensity across selected ASEAN countries using data from January 1, 2022, to June 6, 2026. Country-level visualizations were used to explore temporal patterns and potential associations between seasonal rainfall and dengue transmission.



Case Definition and Clinical Features

Case Definition

Dengue is a mosquito-borne viral disease that typically presents with flu-like symptoms but can, in some cases, progress to a severe and potentially fatal condition known as severe dengue (WHO, 2024a). It is currently recognized as the fastest-growing mosquito-borne disease globally and represents an increasing public health concern (WHO, 2011a). The causative agent comprises four serotypes—DENV-1, DENV-2, DENV-3, and DENV-4—belonging to the Flaviviridae family and Flavivirus genus.

Following ingestion of the virus from an infected individual, the mosquito undergoes an incubation period of approximately 12 days, after which it remains infectious for the duration of its lifespan, typically 15 to 65 days. Female *Aedes aegypti* mosquitoes frequently feed on multiple hosts during a single gonotrophic cycle, thereby facilitating efficient viral transmission. In addition, these mosquitoes can transmit the virus vertically to their offspring. Their eggs are highly resilient, with the ability to withstand desiccation and remain viable in dry conditions for up to one year (WHO, 2011b).

Accurate dengue case classification is essential for clinical decision-making, including patient triage and determining the appropriate level of care, whether outpatient, inpatient, or hospital-based management. This becomes particularly critical during outbreaks, when surges in case numbers can place significant strain on healthcare systems. For diagnostic purposes, dengue cases are typically classified as either probable or confirmed, based on established criteria (WHO, 2009, WHO, 2011b).

Table 1. Case definitions of dengue (WHO, 2009, WHO, 2011b)

Diagnosis	Criteria
Probable Dengue	Acute febrile illness with at least two of the following: headache, retro-orbital pain, myalgia, arthralgia or bone pain, rash, hemorrhagic manifestations, leukopenia (≤5,000 cells/mm³), thrombocytopenia (<150,000 cells/mm³), or rising hematocrit (5–10%) together with at least one of the following: a. supportive serology on a single sample (HI titre ≥1:1280, comparable IgG by ELISA, or positive IgM), or b. occurrence at the same time and place as confirmed dengue cases.
Confirmed Dengue	**Probable case with at least one** of the following laboratory criteria: a. isolation of dengue virus from serum, CSF, or autopsy samples b. fourfold or greater increase in serum IgG (by haemagglutination inhibition test) or a rise in dengue virus–specific IgM antibodies c. detection of dengue virus or its antigen in tissue, serum, or CSF d. detection of dengue virus genomic sequences by RT-PCR

Dengue presents with a broad spectrum of clinical manifestations, and its progression can be unpredictable (WHO, 2009). While most cases are mild and self-limiting, a small proportion may progress to severe dengue, characterized by plasma leakage and, in some instances, hemorrhagic complications. In such cases, timely intravenous fluid management is critical and can reduce mortality to below 1%.

Historically, symptomatic dengue infections were categorized into three groups: undifferentiated fever, dengue fever (DF), and dengue hemorrhagic fever (DHF), with DHF further subdivided into four severity grades. The most severe forms (grades III and IV) were classified as dengue shock syndrome (DSS) (WHO, 1997). However, subsequent evidence indicated that this classification system was difficult to apply in routine clinical practice, as many severe cases did not meet the strict criteria for DHF (Deen, et al, 2006; Rigau-Perez, 2006). As a result, a more practical and clinically relevant classification framework was needed, although the DF/DHF/DSS system remains in use in some settings.

To address these limitations, WHO introduced revised dengue case definitions in 2009 to improve disease management and surveillance. The updated framework classifies dengue based on severity into three categories: dengue without warning signs, dengue with warning signs, and severe dengue (WHO, 2009, WHO, 2025a. The criteria for these categories are outlined in Table 2 and illustrated in Figure 1.

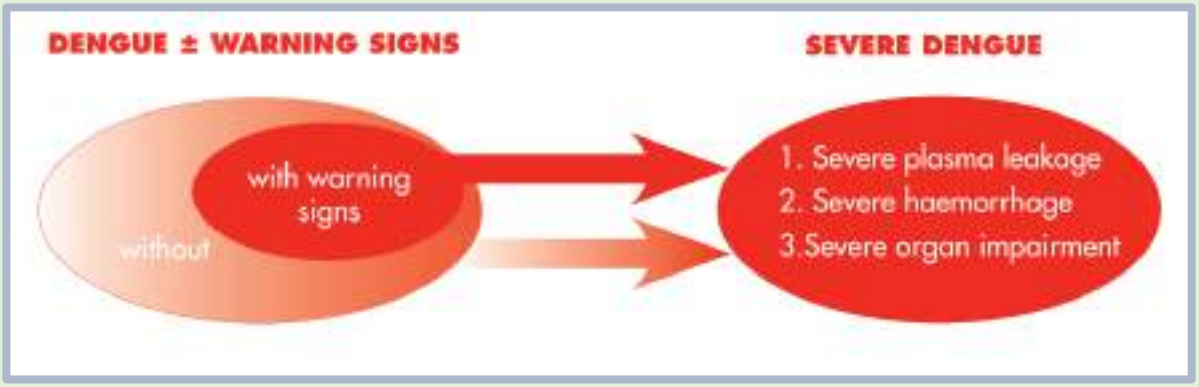


Figure 1. Suggested dengue case classification and levels of severity (source: WHO (https://iris.who.int/handle/10665/44188)

Table 2. Criteria for dengue and severe dengue

Dengue with or without warning signs	Severe dengue
Probable dengue, with or without the following warning signs: 1. Abdominal pain or tenderness 2. Persistent vomiting 3. Clinical fluid accumulation 4. Mucosal bleed 5. Lethargy and restlessness 6. liver enlargement > 2 cm laboratory: increase in hematocrit concurrent with rapid drop of platelet count	**Severe plasma leakage** leading to 1. Shock (DSS) 2. Fluid accumulation with respiratory distress **Severe Bleeding** as evaluated by a clinician **Severe organ involvement** 1. Liver: AST or ≥ 1,000 2. Central nervous system (CNS: impaired consciousness Heart and other organs

Transmission

Dengue virus (DENV) is primarily transmitted through the bite of infected *Aedes* mosquitoes, particularly *Aedes aegypti*. This species is well adapted to urban environments, where it commonly breeds in artificial water-holding containers such as buckets, flowerpots, and discarded tyres. It typically resides near human populations, where it feeds, rests, and lays its eggs. Unlike many other mosquito species, Aedes aegypti is active during the daytime, with peak biting periods in the early morning and late afternoon (Santos, 2023, WHO, 2024b).

Female mosquitoes frequently feed on multiple individuals within a single gonotrophic cycle, increasing the efficiency of virus transmission (Santos, 2023, WHO, 2024b). After ingesting the virus from an infected host, the mosquito undergoes an extrinsic incubation period, during which the virus replicates and disseminates within its body. This process generally takes between 8 and 12 days, after which the mosquito becomes capable of transmitting the virus for the remainder of its lifespan (WHO, 2024a).

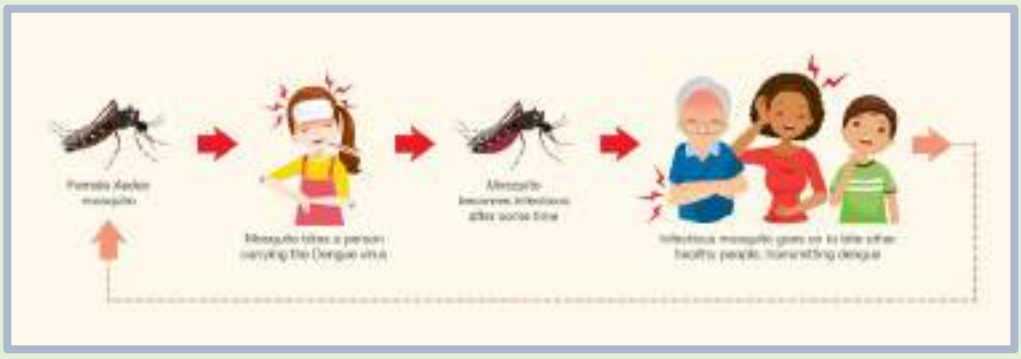


Figure 2. Dengue transmission cycle
(source: NEA (https://www.nea.gov.sg/dengue-zika/stop-dengue-now))

In addition to vector-borne transmission, other routes have been documented, although they are relatively uncommon. Maternal transmission from an infected pregnant woman to her infant may occur, with the risk influenced by the timing of infection during pregnancy. Such transmission has been associated with adverse neonatal outcomes, including preterm birth, low birth weight, and fetal distress (WHO, 2024b).

Rare cases of dengue transmission have also been reported through blood transfusion, organ transplantation, and other blood products. Furthermore, the virus can be passed from infected female mosquitoes to their offspring through transovarial transmission, contributing to the persistence of the virus in mosquito populations (WHO, 2024b).

Risk Factors and Risk Groups

Dengue transmission is strongly influenced by environmental and socio-demographic factors, particularly in settings undergoing rapid and unplanned urbanization. High population density increased human mobility, and limited access to reliable water supplies often lead to water storage practices that create favorable breeding conditions for Aedes mosquitoes (WHO, 2024a).

Community-level risk is also shaped by knowledge, attitudes, and practices related to dengue prevention. Behaviors such as improper water storage, maintenance of plants that collect standing water, and inadequate use of personal protective measures can increase exposure to mosquito bites. Active community participation in vector surveillance and control is therefore essential to strengthen resilience and reduce transmission. (WHO, 2024a)

Several key factors contribute to the spread and persistence of dengue (WHO, 2024a):

1. ***Demographic and societal changes:*** Rapid, unplanned urban growth places pressure on essential services, particularly water supply and solid waste management, creating environments conducive to mosquito breeding.
2. ***Inadequate water supply systems:*** Irregular access to clean water encourages water storage practices that provide breeding sites for mosquitoes.
3. ***Poor waste management:*** Insufficient waste collection and disposal allow accumulation of containers that can hold water and support mosquito larval development.
4. ***Weak vector control infrastructure:*** Limited capacity for sustained mosquito surveillance and control reduces the effectiveness of prevention efforts.

5. ***Consumer and environmental patterns:*** Increased use of non-biodegradable materials—such as plastics, disposable containers, and used tyres—facilitates the spread of passive transport of mosquito eggs across regions.
6. ***Globalization and mobility:*** Expanding international travel and trade have accelerated the global spread of dengue viruses and contributed to the circulation of multiple serotypes in many regions.
7. ***Viral evolution:*** Genetic diversification within dengue virus serotypes has led to the emergence of more virulent strains, with evidence suggesting that these may replace less virulent variants. Historical observations, such as the introduction of Asian DENV-2 into Cuba in 1981, illustrate the association between viral evolution and increased disease severity.

Clinical Presentation

Dengue infection ranges from asymptomatic cases to a wide spectrum of clinical illness. When symptomatic, dengue is a systemic and dynamic disease with varying levels of severity (WHO, 2012, WHO, 2025a). Following an incubation period, the disease typically progresses through three phases: febrile, critical, and recovery. The transition from the febrile to the afebrile state (defervescence) often marks the onset of the critical phase, during which disease severity becomes more apparent (Figure 3).

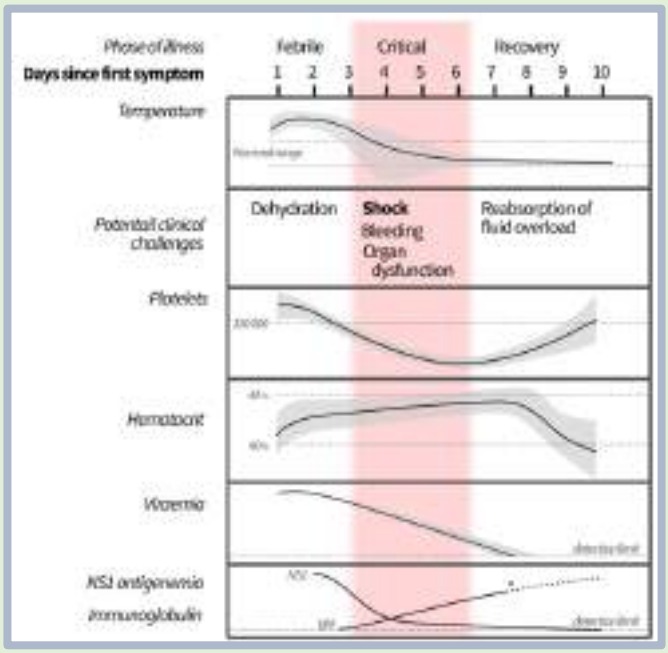


Figure 3. Course of dengue illness
Source: WHO (https://www.who.int/publications/i/item/9789240111110)

The febrile phase is characterized by the sudden onset of high fever, often reaching approximately 40°C and lasting between 2 and 7 days. A small proportion of patients (around 6%) may experience a biphasic or "saddleback" fever pattern, particularly in more severe forms of the disease (Schaefer, et al, 2024, WHO, 2025a). Common symptoms during this phase include facial flushing, erythematous skin rash, myalgia, arthralgia, headache, sore throat, conjunctival injection, anorexia, nausea, and vomiting. The rash typically appears within the first few days of illness and may recur toward the end of the febrile period.

The critical phase, typically occurring between days 3 and 7 of illness and coinciding with defervescence (temperature decreasing to 37.5-38 °C or lower), lasts approximately 24 to 48 hours. involves increased capillary permeability (WHO, 2025a). This stage is marked by increased capillary permeability, which may result in plasma leakage. Laboratory changes often include rising hematocrit levels, a rapid decline in platelet count, and leukopenia. Clinical warning signs commonly emerge during this phase, and without timely management, patients may progress to shock, severe bleeding, organ dysfunction, or disseminated intravascular coagulation.

The recovery phase follows the critical stage and generally begins within 24 to 48 hours. During this period, extravascular fluid is gradually reabsorbed over 48 to 72 hours (WHO, 2012, WHO, 2025a). Clinical improvement is evident, including stabilization of vital signs, return of appetite, resolution of gastrointestinal symptoms, and increased urine output. A transient rash may appear, and hematocrit levels typically normalize or decrease as fluid balance improves. White blood cell counts usually recover earlier, while platelet counts normalize more gradually.

In recent years, expanded dengue syndrome (EDS) has been increasingly recognized, involving severe dysfunction of organs such as the liver, kidneys, brain, and heart. These atypical presentations may occur in both severe and non-severe dengue and are often linked to co-infections, underlying comorbidities, or complications from prolonged shock (Araiza-Garaygordobil et al, 2021, Guzman, et al, 2024, WHO, 2011b). Clinical manifestations may include neurological complications (e.g., seizures, encephalitis, meningitis), gastrointestinal involvement (e.g., hepatitis, acute liver failure, pancreatitis), and other systemic complications such as myocarditis, acute respiratory distress syndrome (ARDS), acute kidney injury (AKI), and hemolytic uremic syndrome (HUS) (Schaefer, et al, 2024).

Infection with one dengue virus serotype confers lifelong immunity to that specific serotype. However, cross-protection against other serotypes is temporary, typically lasting only a few months after

the initial infection (WHO, 2009). Secondary infections with different serotypes, or simultaneous infection with multiple serotypes, are associated with an increased risk of severe disease outcomes (Wang, 2020, CDC, 2025).

Clinical Diagnostic

Accurate diagnosis of dengue cannot rely solely on clinical features, as presentations are often non-specific (WHO, 2012). Early laboratory confirmation is therefore essential, particularly because some patients may rapidly progress to severe disease. Prompt diagnosis and timely clinical management are critical to improving outcomes and can be lifesaving (WHO, 2012, WHO, 2025a).

During the early febrile phase, typically within the first five days of illness, dengue can be confirmed using several laboratory methods. These include virus isolation in cell culture, detection of viral RNA through nucleic acid amplification tests (NAAT), and identification of viral antigens using ELISA or rapid diagnostic tests (RDTs) (WHO, 2009b).

Virus isolation remains a definitive diagnostic method but requires advanced laboratory infrastructure, specialized expertise, and strict cold chain maintenance during sample transport to preserve viral viability. In addition, the process is time-consuming, often taking several days to yield results (WHO, 2009b). By contrast, nucleic acid detection methods such as NAAT offer higher sensitivity and specificity, with results typically available within 24–48 hours. However, these techniques are resource-intensive, requiring costly equipment, rigorous quality control, and trained personnel.

NS1 antigen detection assays can provide results within a few hours and are suitable for use in settings with limited laboratory capacity (WHO, 2009b). Rapid antigen tests further improve accessibility, producing results in under an hour and enabling use in field conditions. However, most antigen-based tests are not serotype-specific, can be relatively costly, and their diagnostic performance and cost-effectiveness vary across settings. As infection progresses beyond the first five days of illness, circulating virus and antigen levels generally decline to undetectable levels, although NS1 may persist briefly after fever resolution in some patients.

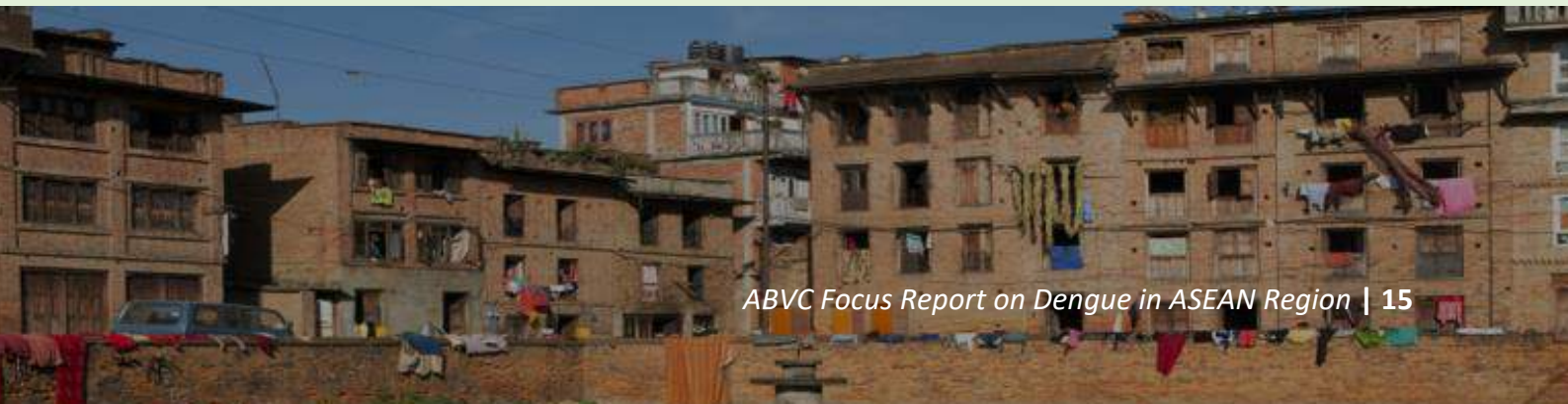
Compared with virological methods, serological assays are more widely available in dengue-endemic regions and are logistically easier to implement, as antibodies remain stable at room temperature under tropical conditions. These tests also allow flexibility in sampling, including the use of paired acute and convalescent sera collected

weeks or months apart. However, their sensitivity may be reduced in secondary infections, where IgM responses are often low or absent. While rapid serological tests can provide results within an hour, their accuracy varies, and many commercial assays have not been fully validated by reference laboratories (WHO, 2009b).

A confirmed diagnosis of recent dengue infection can be established by demonstrating a fourfold or greater rise in antibody titers between paired serum samples, typically using IgG ELISA or haemagglutination inhibition tests. However, because this approach requires convalescent samples, it is primarily useful for retrospective confirmation rather than immediate clinical decision-making. Diagnostic methods are summarized in Table 3 (WHO, 2009b).

Table 3. Summary of operating characteristics and comparative costs of dengue diagnostic methods (WHO, 2009b)

Diagnostic Methods	Diagnosis of Acute Infection	Time to Result	Specimen	Time of Collection After Onset of Symptoms	Facilities
Viral isolation and serotype identification	Confirmed	1 - 2 weeks	Whole blood, serum, tissues	1 - 5 days	Mosquito or cell culture facilities, BSL-2/BSL-3⁰ laboratory, fluorescence microscope or molecular biology equipment
Nucleic acid detection	Confirmed	1 or 2 days	Tissues, whole blood, serum, plasma	1 - 5 days	BSL-2 laboratory, equipment for molecular biology
IgG (paired sera) by ELISA, HI or neutralization test	Confirmed	7 days or more	Serum, plasma, whole blood	Acute sera, 1 - 5 days; convalescent after 15 days	ELISA facilities BSL-2 laboratory for neutralization assay
IgM ELISA	Probable	1 - 2 days	Serum, plasma, whole blood	After 5 days	ELISA facilities
IgM rapid test	Probable	30 minutes	Serum, plasma, whole blood	After 5 days	No additional supplies
Antigen detection	Not yet determined	1 day	Serum	1 - 6 days	ELISA facilities
	Confirmed	> 1 day	Tissue for immuno-chemistry	NA	Facilities for histology



Epidemiology

Global Situation

Dengue has a long history, with the earliest recorded outbreak of a dengue-like illness documented in the French West Indies in 1635. Subsequent reports emerged from Batavia (present-day Jakarta, Indonesia) and Cairo, Egypt, in 1779, followed by outbreaks in Philadelphia in 1780 and across the Caribbean and southern United States in the early 19th century (Gubler, et al, 1998). Since the 1950s, dengue incidence has increased dramatically—by approximately thirty-fold—with around 40% of the global population now living in areas at risk and an estimated 400 million infections occurring annually (WHO, 2024a, Phillips, 2008, PAHO, 2017).

Over recent decades, the global burden of dengue has continued to rise. Reported cases increased from 26.45 million in 1990 to 58.96 million in 2021, while dengue-related deaths nearly doubled from 14,315 to 29,075. Similarly, disability-adjusted life years (DALYs) rose from 1.25 million to 2.08 million over the same period (Zhang, et al., 2025). Dengue transmission typically follows cyclical patterns, with large outbreaks occurring every three to four years (WHO, 2023).

During the COVID-19 pandemic, dengue transmission patterns varied widely across regions. In 2023, dengue reached historically high levels, with more than 6.5 million reported cases and over 7,300 deaths worldwide. The Americas accounted for nearly 80% of all reported cases, exceeding 4 million, while local transmission was also documented in parts of the WHO European Region (WHO, 2024a).

The global burden continued to rise in 2024, with approximately 14.4 million dengue cases reported, including over 7.6 million confirmed cases, 52,441 severe cases, and 11,070 deaths. In 2025, reported cases declined to 5.4 million, including about 2.2 million confirmed cases and 4,071 deaths worldwide (WHO, 2026a) (Figure 4).

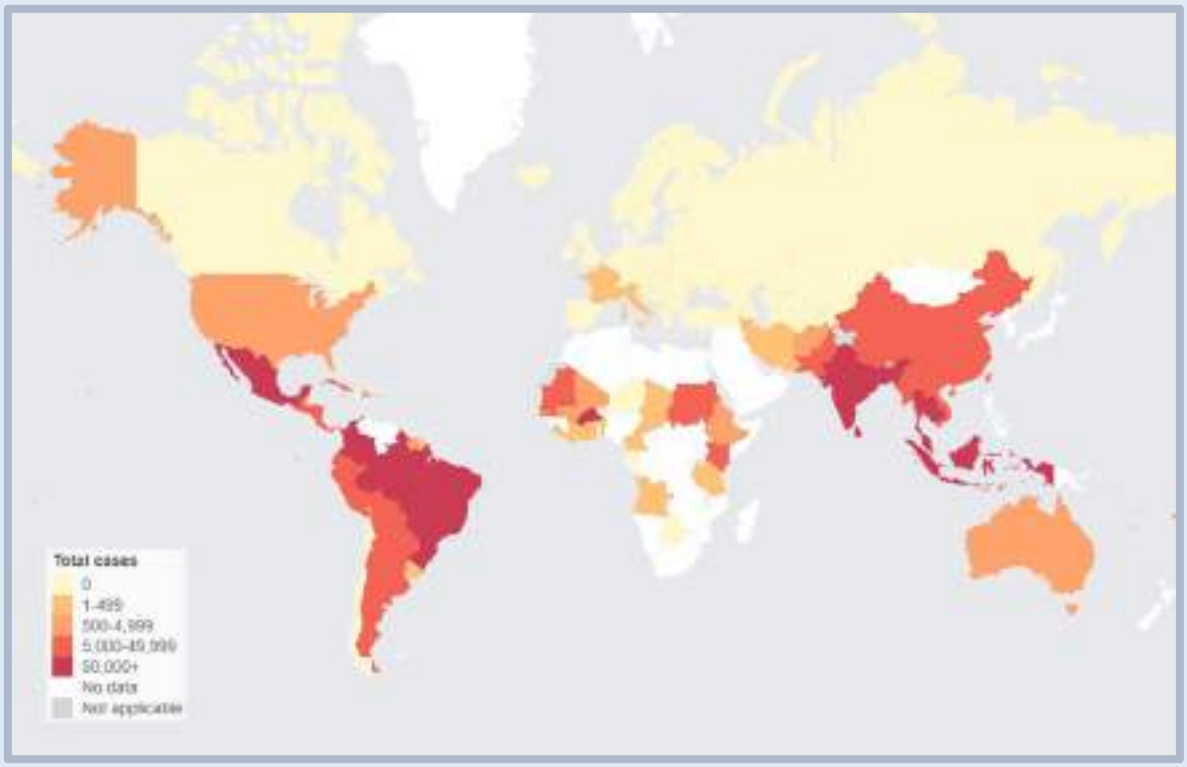


Figure 4. Global dengue situation, 2025
(Source: WHO Global Dengue Surveillance (https://worldhealthorg.shinyapps.io/dengue_global/)

The global expansion of dengue is driven by multiple interrelated factors. The geographic spread of *Aedes aegypti* and *Aedes albopictus* mosquitoes, particularly into previously non-endemic regions, has significantly contributed to increased transmission (WHO, 2023). Climate-related factors, including rising temperatures, increased rainfall, and higher humidity associated with events such as the 2023 El Niño, have further created favourable conditions for mosquito breeding and survival. In addition, weakened health systems during and following the COVID-19 pandemic, alongside political and economic instability in countries affected by complex humanitarian crises, have undermined effective disease control efforts. High levels of population mobility also facilitate the spread of the virus across regions.

In many settings, limited surveillance capacity has led to delayed detection and response, increasing the risk of severe outbreaks. Underreporting remains a major challenge, as a large proportion of infections are asymptomatic or mild, and many febrile illnesses may be misdiagnosed as dengue (WHO, 2024a).

Burden of Dengue in the ASEAN Region

Dengue remains a significant public health challenge across the ASEAN region, with high endemicity reported in countries such as Cambodia, Lao PDR, the Philippines, Viet Nam, Indonesia, Thailand, and Myanmar (WHO, 2023b, WHO, 2026b). The Western Pacific and South-East Asia regions together account for over half of the global dengue burden. WHO regional offices (WPRO and SEARO) conduct both indicator- and event-based surveillance to monitor trends, detect unusual patterns, assess risks, and support timely responses (WHO, 2023b).

The ASEAN Biological Threats Surveillance Centre (ABVC) has been compiling dengue data since 2022 using available official sources; however, these data should be interpreted with caution due to reporting delays of approximately 2–8 weeks. Differences in reporting criteria across countries should also be considered. In Indonesia, notified cases include only severe forms (DHF and DSS, whereas in Singapore, reported cases include DF and DHF. Based on these data, the distribution of dengue cases across ASEAN for the first half of 2026 is presented in Figure 5 below.

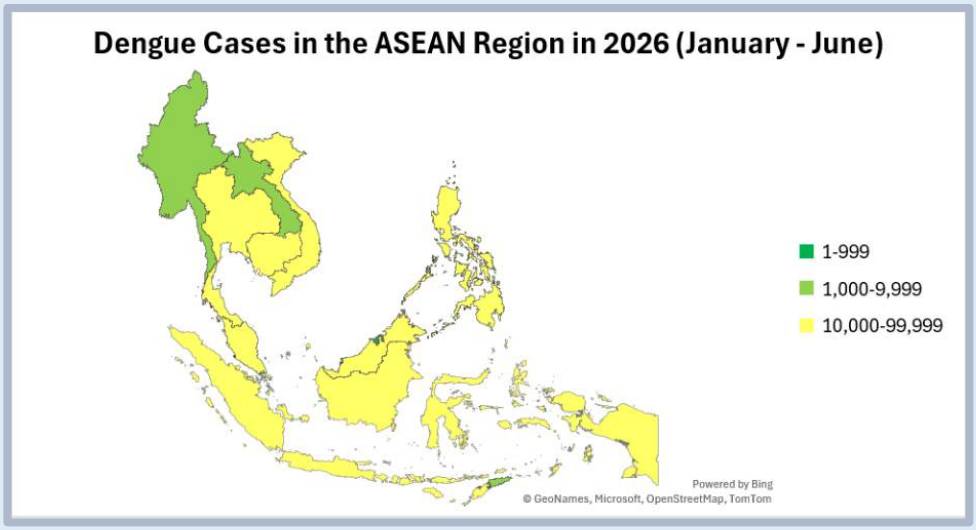


Figure 5. Dengue cases in the ASEAN Region in 2026 (January – June)
(Source: Ministry of Health, Brunei Darussalam; WHO WPRO; Ministry of Health, Republic of Indonesia; Portal Rasmi iDengue untuk Komuniti; Ministry of Health, Myanmar; Ministry of Health. Singapore; Ministry of Public Health Thailand; Ministry of Health, Timor-Leste; WHO Global Dengue Surveillance)

The following section examines dengue trends across ASEAN Member States (AMS) from 2016 to 2025, utilizing official data from the WHO, ASEAN, and respective national health authorities. It should be noted that disparities may exist between these data and those compiled by the ASEAN Biological Threats Surveillance Centre (ABVC), due to differences in data sources, reporting timelines, and case definitions across countries. In addition, evidence from relevant epidemiological and operational studies is incorporated to complement the existing official statistics.

Brunei Darussalam

Dengue cases in Brunei Darussalam have shown variability over time. In 2013, the WHO Western Pacific Region recorded 2,025 cases in the country (Togami et al, 2023). According to the ASEAN e-Health Bulletin, reported cases declined to 436 in 2014 and further to 84 in 2016 (ASEAN, 2017). Over the past decade, the average annual number of dengue cases has remained relatively low at approximately 54 cases per year. The highest number of cases was recorded in 2019, with 119 cases, followed by a secondary peak of 100 cases in 2024 and 41 in 2025 (Ministry of Health Brunei Darussalam, 2026).

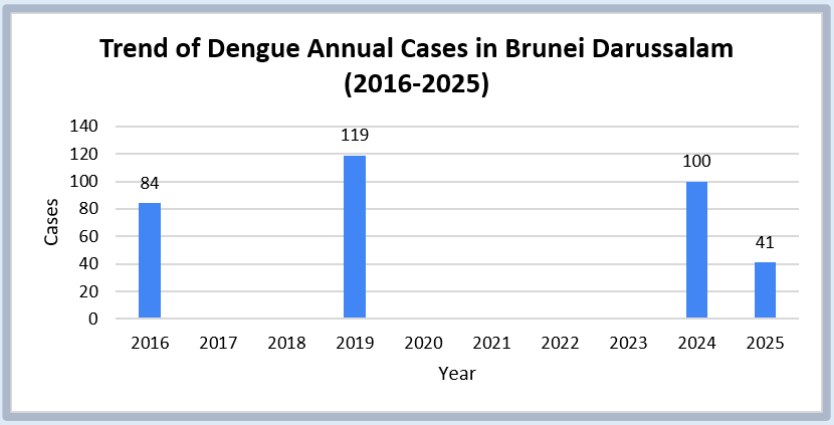


Figure 6. Trend of reported cases of dengue in Brunei Darussalam, 2016-2025 (Source: ASEAN, Ministry of Health)

Cambodia

Figure 7 shows the number of dengue cases in Cambodia from 2016 to 2025 (ASEAN, 2017, WHO, n.d). The trend shows significant fluctuations in dengue cases over the decade. Reported cases increased from 12,843 in 2016 to a peak of 18,983 in 2019, followed by a decline to 11,977 in 2020. A sharp drop was then observed in 2021, with only 1,523 cases—the lowest level during the period. Subsequently, cases rebounded, rising substantially to 35,390 in 2023. Although cases fell to 18,983 in 2024, a dramatic surge occurred in 2025, reaching 63,016 cases.

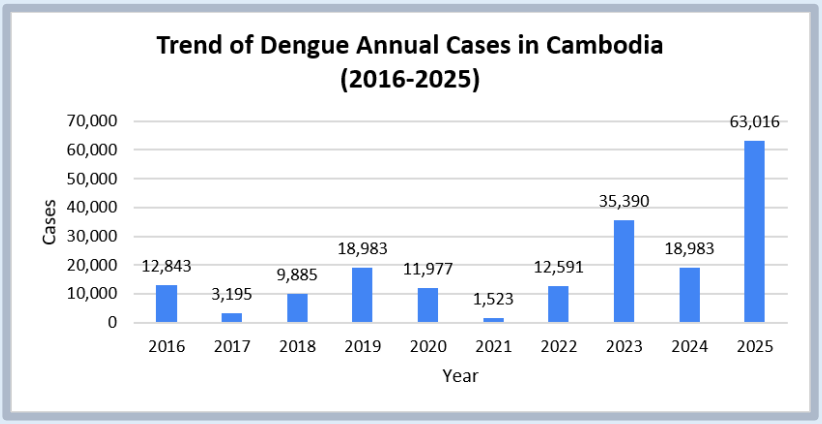


Figure 7. Trend of reported cases of dengue in Cambodia, 2016-2025 (Source: ASEAN, WHO)

Indonesia

From 2016 to 2025, the trend of dengue cases in Indonesia revealed considerable year-to-year variability, with several notable peaks and declines (Figure 8). In 2016, reported cases reached 204,172, followed by a sharp decline to 68,364 in 2017 and 65,591 in 2018 (WHO, 2026a). Cases rebounded to 138,131 in 2019, then gradually decreased to 73,518 in 2021. An upward trend resumed in 2022, with cases rising to 143,266, before slightly declining to 114,720 in 2023. In 2024, cases surged dramatically to 257,271—the highest level in a decade—before decreasing to 170,798 in 2025.

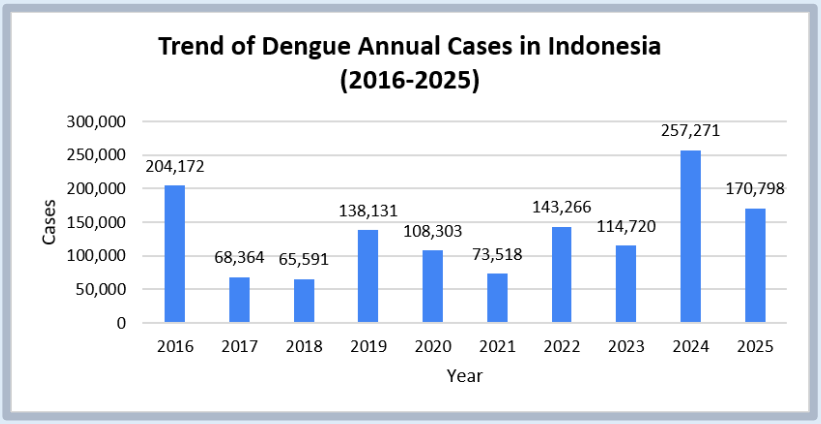


Figure 8. Trend of reported cases of dengue in Indonesia, 2016-2025 (Source: WHO)

Lao People's Democratic Republic

Figure 9 illustrates the number of dengue cases in Lao PDR from 2016 to 2025, highlighting substantial fluctuations over the decade (WHO, n.d). Reported cases rose from 5,372 in 2016 to 11,039 in 2017, before declining to 6,204 in 2018. A sharp increase followed, with cases peaking at 38,753 in 2019. This was followed by a steady decline to 1,328 cases in 2021, the lowest level during the period. Subsequently, cases surged again, reaching 29,138 in 2022 and peaking at 31,997 in 2023. However, the trend reversed in the following years, with cases declining to 19,486 in 2024 and further to 12,245 in 2025.

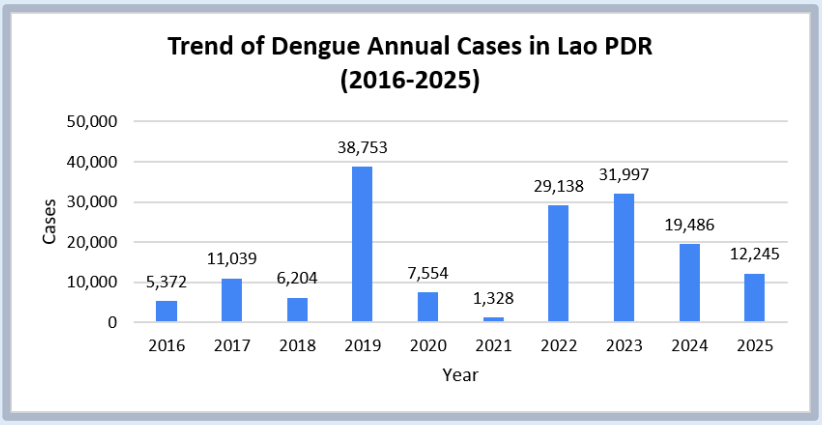


Figure 9. Trend of reported cases of dengue in Lao PDR, 2016-2025 (Source: WHO)

Malaysia

From 2015 to 2025, dengue cases in Malaysia exhibited considerable year-to-year variability, with several notable peaks and declines (Figure 10). Cases decreased from over 100,000 in 2016 to around 80,000 in both 2017 and 2018 (WHO, n.d IFRC, 2025). This was followed by a sharp increase to 129,578 cases in 2019, the highest level observed during the period. Subsequently, cases declined steadily, reaching a low of 26,365 in 2022. However, this downward trend reversed, with cases rising again to over 122,000 in both 2023 and 2024, before dropping to 55,399 in 2025.

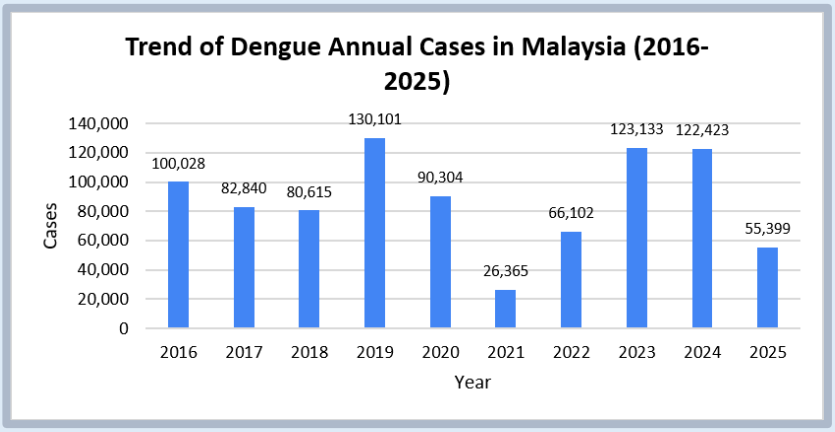


Figure 10. Trend of reported cases of Dengue in Malaysia, 2015-2024 (Source: WHO, IFRC)

Myanmar

Figure 11 illustrates the number of dengue cases in Myanmar from 2019 to 2025. The trend shows notable fluctuations over the period, with alternating peaks and declines. Reported cases were 23,203 in 2019, before decreasing to 15,131 in 2020 and further to 5,446 in 2021, the lowest level during the period. A sharp increase followed in 2022, with cases peaking at 24,971, the highest recorded value (Ministry of Information, Republic of the Union of Myanmar, 2024). Subsequently, cases declined to 16,130 in 2023 and dropped further to 6,388 in 2024. In 2025, however, the trend reversed, with cases rising again to 12,040 (WHO, 2026a).

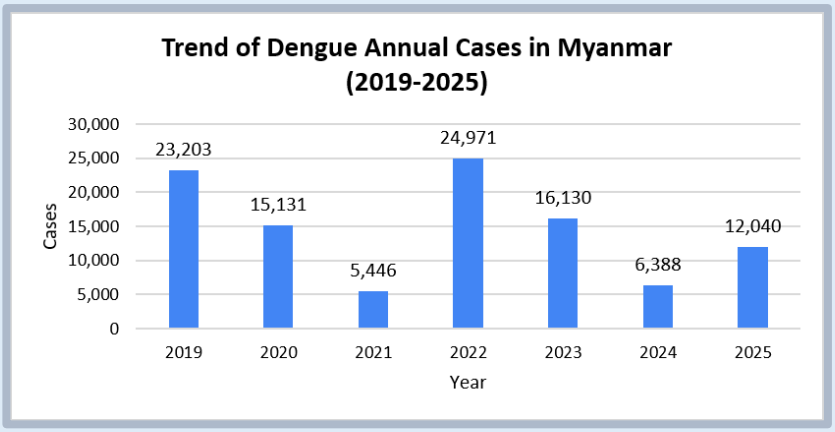


Figure 11. Trend of reported cases of dengue in Myanmar, 2019-2025 (Source: Ministry of Information, WHO)

Philippines

Figure 12 illustrates the number of dengue cases in the Philippines from 2015 to 2024, showing substantial fluctuations over the period. Reported cases were 169,435 in 2015, increasing to 218,278 in 2016, before declining to 146,309 in 2017. Cases rose again to 216,190 in 2018, followed by a sharp surge to 437,563 in 2019, the highest level during the period (Department of Health Philippines, n.d.). This peak was followed by a significant decline, with cases falling to 91,108 in 2020 and further to 79,872 in 2021, the lowest level in the series. Subsequently, dengue incidence rebounded, rising to 226,497 in 2022, before declining slightly to 195,603 in 2023. In 2024, however, cases increased sharply again to 413,960, representing a second major peak (Olana, et al, 2025).

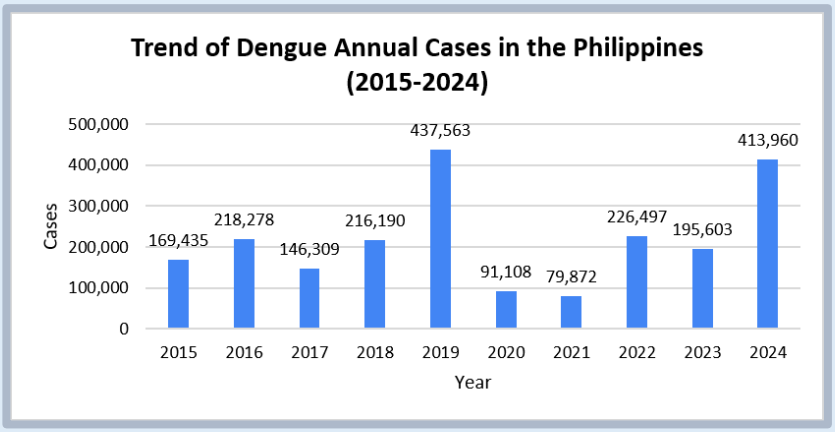


Figure 12. Trend of reported cases of dengue in the Philippines, 2015-2024 (Source: WHO, Olana et al)

Singapore

From 2016 to 2025, dengue cases in Singapore fluctuated markedly, with several pronounced peaks and declines (Figure 13). Reported cases were 13,115 in 2016, before dropping to 2,767 in 2017 and slightly increasing to 3,285 in 2018 (Ministry of Health Singapore, n.d). A sharp surge followed, with cases peaking at 35,315 in 2020, the highest level during the period. Cases then declined significantly to 5,258 in 2021, rebounded to 32,137 in 2022, and fell again to 9,949 in 2023. In 2024, cases rose moderately to 13,655 before decreasing to 4,036 in 2025 (WHO, 2026a).

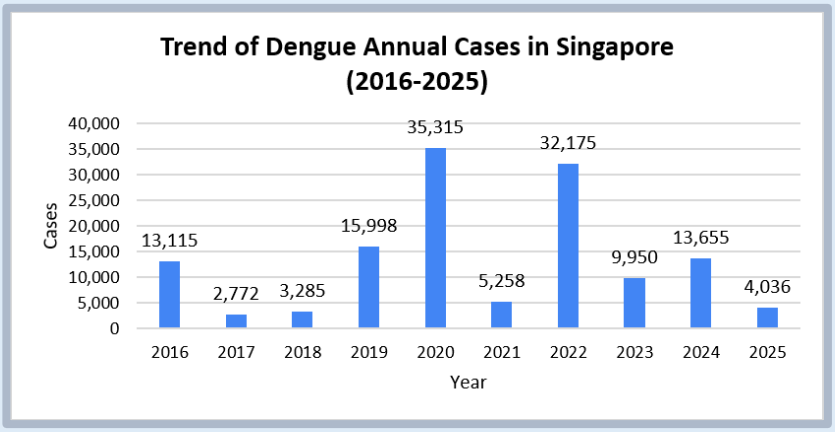


Figure 13. Trend of reported cases of Dengue in Singapore, 2015-2024 (Source: Ministry of Health Singapore, WHO)

Thailand

Figure 14 illustrates the number of dengue cases in Thailand from 2016 to 2025. Cases increased steadily from 38,466 in 2016 to 131,157 in 2019, before declining sharply to a low of 10,617 cases in 2021 (WHO, 2026a). This was followed by a rapid resurgence, with cases peaking at 159,219 in 2023. Subsequently, the trend reversed, with cases gradually decreasing to 57,440 in 2025.

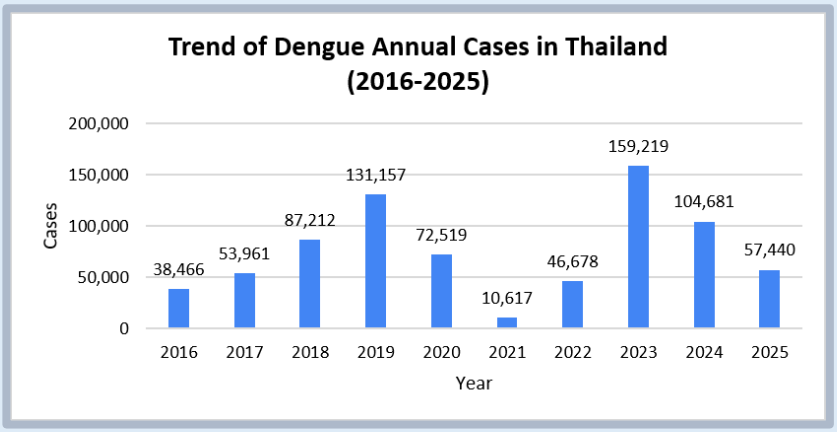


Figure 14. Trend of reported cases of dengue in Thailand, 2016-2025 (Source: WHO)

Timor-Leste

Figure 15 illustrates the number of dengue cases in Timor-Leste from 2016 to 2025. Cases increased from 251 in 2016 to 550 in 2017, before declining to 330 in 2018. A steady upward trend followed, with cases rising to 976 in 2019 and 1,451 in 2020. This was followed by a decrease to 901 cases in 2021 (Ministry of Health Democratic Republic of Timor-Leste, 2023a). A sharp increase was then observed in 2022, when cases peaked at 5,658, the highest level during the period. Subsequently, cases declined significantly to 1,953 in 2023 and remained relatively stable, with a slight increase to 1,510 in 2025 (WHO, 2026a).

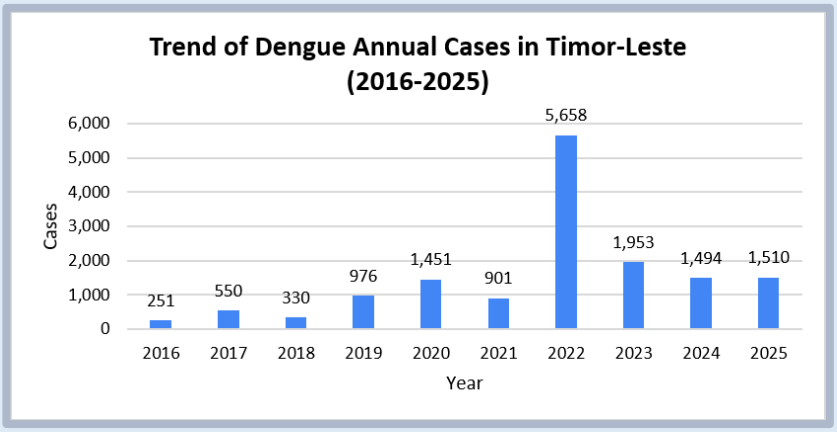


Figure 15. Trend of reported cases of Dengue in Timor-Leste, 2016-2025 (Source: Ministry of Health Timor-Leste, WHO)

Viet Nam

Figure 16 illustrates the number of dengue cases in Viet Nam from 2016 to 2025. Reported cases increased from 110,854 in 2016 to 183,287 in 2017, before slightly declining to 113,850 in 2018 (WHO, n.d). Cases rose to 320,702 in 2019, followed by a gradual decrease to 70,944 in 2021. In 2022, cases peaked at 367,729, the highest level recorded. Subsequently, cases declined steadily to 166,619 in 2023 and 108,433 in 2024. By 2025, cases had dropped sharply to 28,787, marking a substantial reduction following the 2022 peak.

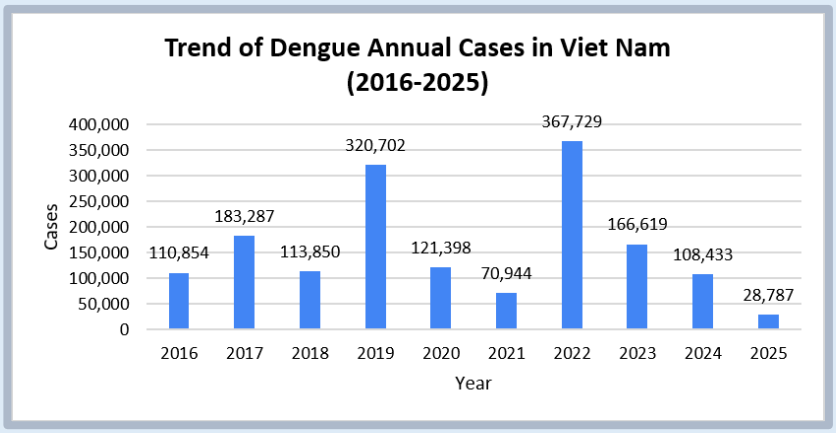


Figure 16. Trend of reported cases of dengue in Viet Nam, 2016-2025 (Source: WHO)

Comparison between Precipitation (Rainfall) and Dengue Cases in the ASEAN region

Understanding the relationship between climatic factors and dengue transmission is critical for strengthening early warning systems and enhancing targeted control measures. Climatic factors, particularly rainfall, play an important role in shaping dengue transmission dynamics by influencing mosquito breeding environments and seasonal disease patterns (Garnida and Kasetyaningsih, 2026). However, the effects of rainfall are complex and can vary depending on its timing, intensity, and baseline environmental conditions, often exhibiting lagged impacts on dengue incidence (Cheng, et al, 2023). In addition, low temperature has been shown to significantly increase dengue risk, while precipitation can have either positive or negative effects depending on local ecological conditions and extreme weather patterns such as heatwaves (Lorenz, et al, 2025).

This section describes the dengue fever and precipitation patterns shown in the country visualization. It focuses on observed dengue fever cases and rainfall intensity (precipitation) based on data from January 1, 2022, to June 6, 2026.

Across these countries, rainfall patterns and dengue fever cases often appear to follow seasonal trends. Cambodia, Laos, Myanmar, Thailand, and Vietnam show the clearest connection between periods of heavier rainfall and increased dengue activity, with dengue cases generally reaching their highest levels during or close to the rainy season. In Vietnam, this pattern was evident when both rainfall and dengue cases peaked in October 2024. Lao PDR and Myanmar also recorded increases in rainfall and dengue cases around the middle of the year, while Cambodia's dengue cases peaked in July 2025, just before rainfall reached its highest point in August 2025 (Figure 17).

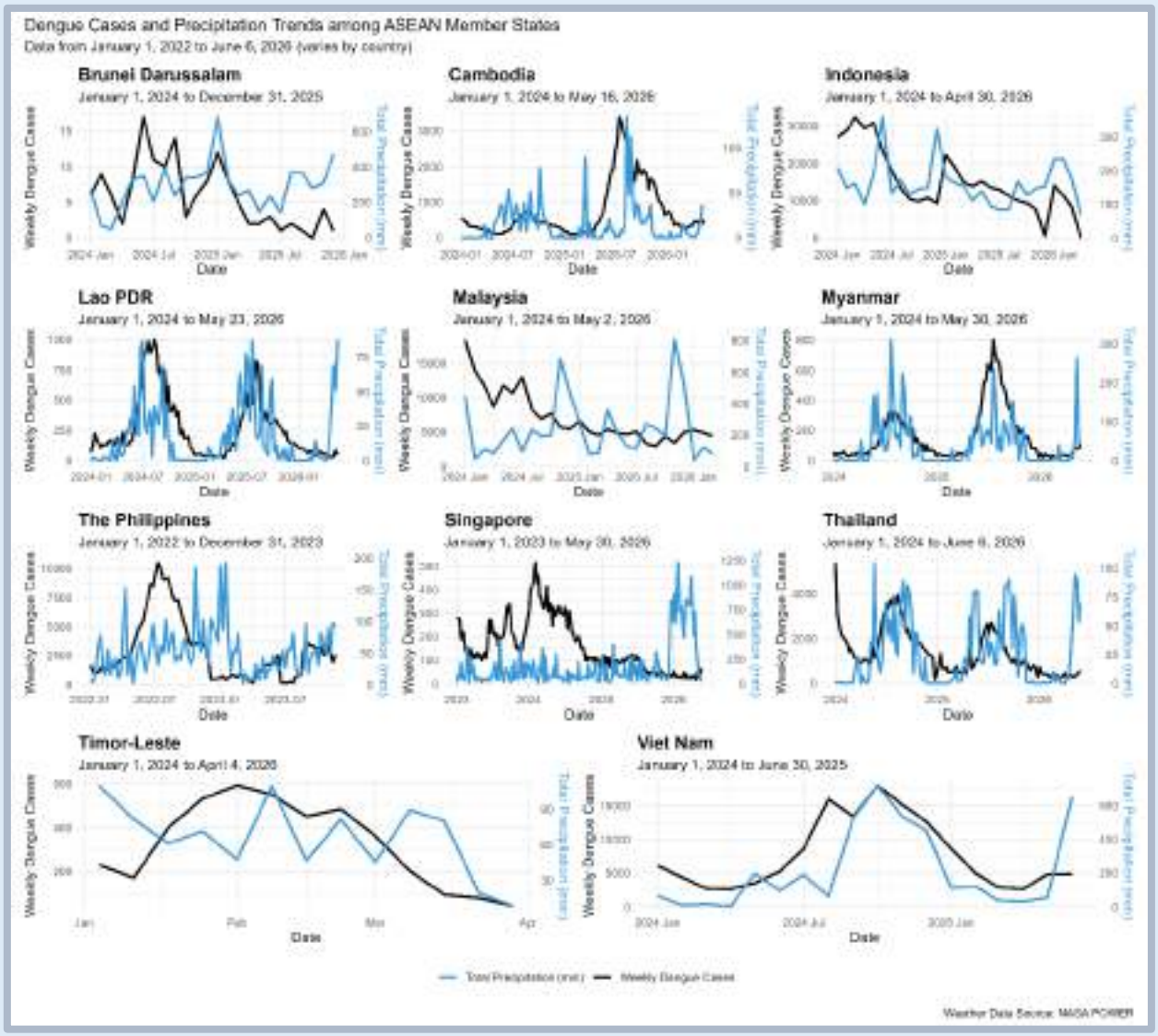
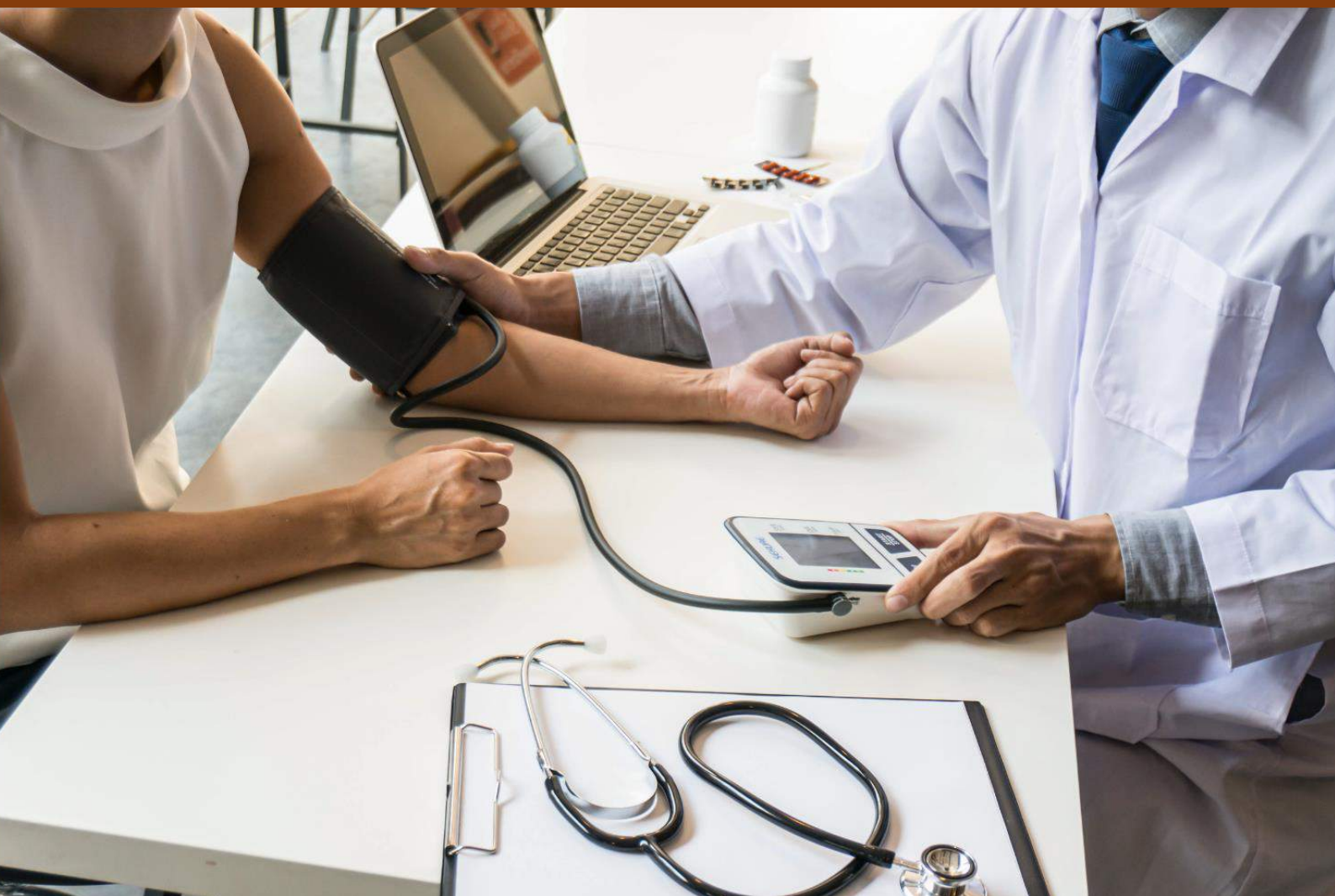


Figure 17. Dengue cases and precipitation trends among ASEAN Member States, 2022-2025

Nevertheless, the comparison indicates that higher rainfall does not always lead to more dengue cases. Brunei and Singapore receive frequent or substantial rainfall, yet their dengue case numbers remain comparatively low. Malaysia experienced high and fluctuating rainfall, including a major rainfall peak in November 2025, but dengue cases decreased during that same period. Similarly, Indonesia recorded a sharp rise in dengue cases in March 2024, although this did not coincide with the month of highest rainfall. Overall, rainfall seems to play an important seasonal role in dengue patterns in some countries, but it is not the only factor influencing dengue activity.

Case Management and Prevention



Case Management

There is currently no specific antiviral treatment for dengue. Instead, treatment focuses on supporting the patient and relieving symptoms (WHO, 2024b). Most cases can be treated at home with rest, drinking plenty of fluids, and taking acetaminophen for fever and pain. Aspirin and NSAIDs like ibuprofen are not recommended because they can cause bleeding (WHO, 2024a). Severe cases require prompt hospitalization to prevent complications and reduce mortality. With timely diagnosis and appropriate care, case-fatality rates can be kept below 1%.

Recommendations for Clinical Management

Cases of suspected, probable, and confirmed dengue should be notified early so that appropriate public-health measures can be initiated. Laboratory confirmation is not necessary before notification, but it should be obtained. In non-endemic countries, usually only confirmed cases will be notified (WHO, 2012). Depending on the clinical manifestations and other circumstances, patients may either be sent home (Group A); be referred for in-hospital management (Group B); or require emergency treatment and urgent referral (Group C) (Figure 18).

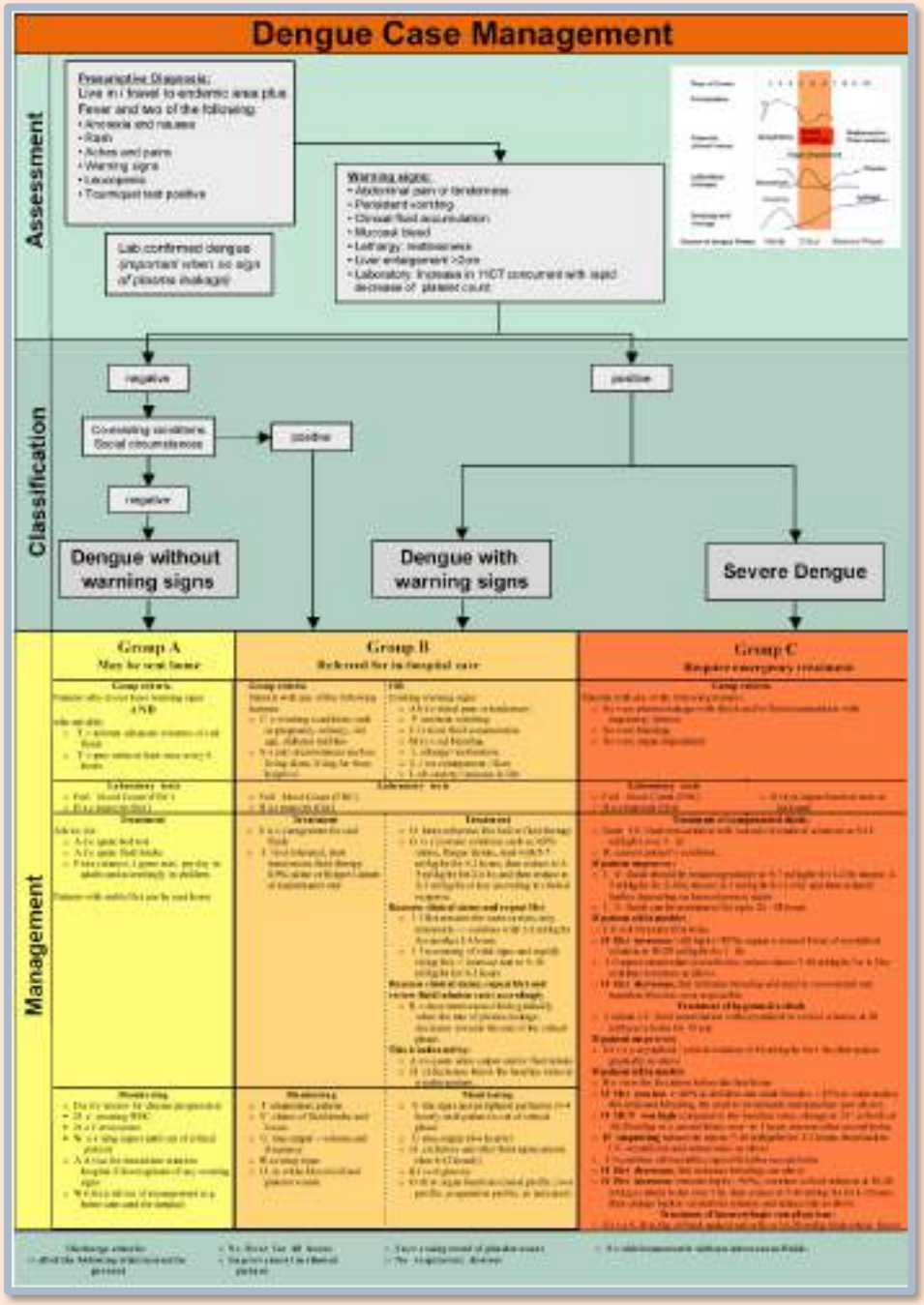


Figure 18. Dengue Case Management
(Source: WHO (https://www.who.int/publications/i/item/9789241504713))

Outpatient Management for Group A Dengue Patients

Group A includes patients without warning signs, coexisting conditions, or social risks. During the febrile phase (lasting 2–7 days), daily evaluation is essential to monitor for warning signs, dehydration, and defervescence, which may indicate progression to the critical phase. Patients and families should be advised on the following (WHO, 2012):

1. **Fever Control**: Give paracetamol for high fever if the patient is

uncomfortable. The recommended dose is 10 mg/kg/dose, not more than 3−4 times in 24 hours in children and not more than 3 g/day in adults). Sponge with tepid water if the patient still has a high fever. Do not give acetylsalicylic acid (aspirin), ibuprofen or other NSAIDs or intramuscular injections, as these aggravate gastritis or bleeding.

2. **Prevent Dehydration:** Ensure adequate fluid intake (oral rehydration solutions, water, soups, juice). Monitor for signs of dehydration, including reduced urination, dry mouth or tongue, absence of tears (in children), sunken eyes, lethargy, or agitation. Aim for urination at least 4–6 times per day. In outpatient settings, daily records of oral fluid intake and urine output are recommended for monitoring.
3. **Recognize Warning Signs:** Advise caregivers to seek immediate hospital care if any of the following occur: no improvement or worsening of symptoms around the time fever subsides, severe abdominal pain, persistent vomiting, cold extremities, lethargy, irritability, or restlessness, bleeding (e.g. black stools, coffee-ground vomitus), shortness of breath, and no urination for more than 4–6 hours.
4. **Prevent Dengue Spread at Home:** All household members should sleep under mosquito nets and use EPA-registered insect repellent. Remove mosquito breeding sites by scrubbing water containers and covering or emptying standing water.

Inpatient Management for Group B Dengue Patients

Group B includes patients with dengue warning signs, comorbidities (e.g., pregnancy, infancy, elderly, obesity, diabetes, hypertension, heart failure, renal failure, haemolytic disorders like sickle-cell disease, autoimmune diseases), or social risks (e.g. living alone or far from a health facility without reliable transport). Management begins by assessing for warning signs and ability to tolerate oral intake (WHO, 2012).

1. Patients with warning signs

   If the patient tolerates oral fluids, encourage intake and monitor. If not, administer isotonic solutions (0.9% saline, Ringer's lactate, or Hartmann's), starting at 5–7 ml/kg/hour for 1–2 hours, then tapered based on clinical response. Haematocrit should be checked before fluid initiation and monitored regularly to guide infusion rates. Continuous monitoring of vital signs, haematocrit, urine output, and

organ function is essential until the critical phase has passed.

2. Patients with comorbid conditions but no warning signs

   For dengue patients with comorbid conditions but no warning signs, the focus of management is on adequate hydration, preferably through oral fluids. If oral intake is insufficient, intravenous fluids should be administered at maintenance rates adjusted based on ideal body weight, particularly for overweight individuals. Patients should be closely monitored for temperature patterns, fluid balance, urine output, warning signs, hematocrit, and blood counts. Additional tests (e.g., liver, and renal function) should be performed as clinically indicated.

Inpatient Management for Group C Dengue Patients

Patients with severe dengue, characterized by severe plasma leakage leading to shock or respiratory distress, severe bleeding, or severe organ impairment, require emergency treatment and urgent referral to hospitals with blood transfusion capability (WHO, 2012). Immediate intravenous fluid resuscitation with isotonic crystalloids constitutes the basis of effective management. In cases of hypotensive shock, the utilization of colloids is recommended. Ideally, hematocrit levels should be assessed prior to and following resuscitation. The process of resuscitation involves the administration of large fluid boluses, typically ranging from 10 to 20 milliliters per kilogram of body weight, under closely monitored conditions.

The administration of blood transfusions is reserved for cases of confirmed or suspected severe bleeding accompanied by hypotension. The primary objectives of this treatment are to restore effective circulation, as indicated by the normalization of heart rate, blood pressure, and capillary refill time, which should be less than two seconds, and to improve end-organ perfusion, as demonstrated by enhanced mental status, urine output of at least 0.5 milliliters per kilogram of body weight per hour, and a reduction in acidosis.

Figure 19. Blood transfusions

Prevention

Effective dengue prevention primarily relies on robust vector control strategies and individual protective behaviors. Key vector control strategies include (WHO, 2024b):

1. Elimination of mosquito breeding sites
2. Use of insecticides or insecticide-treated materials
3. Proper waste management
4. Space spraying of insecticides during outbreaks as an emergency intervention

Figure 20. Spraying insect repellent

Protective Behaviours

Community and individual behavior change is essential to control mosquito populations and reduce dengue transmission. Key actions within and around households include (WHO, 2024b):

Figure 21. Household container

1. Regular cleaning of flower vases to eliminate eggs and larvae.
2. Covering water storage containers to prevent mosquito access.
3. Removing or recycling used tyres, which often collect rainwater.
4. Cleaning water-holding containers weekly to disrupt mosquito breeding.
5. Eliminating standing water in and around the home and garden.

However, integrated vector control strategies should (WHO, 2024b):

1. Involve inter-sectoral collaboration to eliminate potential mosquito habitats.
2. Promote safe water storage and environmental management practices.

Aedes sp. mosquitoes are primarily daytime feeders, insecticide-treated bed nets have limited effectiveness. It is therefore recommended to avoid outdoor activities during peak mosquito biting hours, typically early morning, and late afternoon, to further reduce the risk of dengue virus transmission. Personal protective measures include (WHO, 2024b):

1. Wearing long-sleeved shirts and trousers to reduce skin exposure.
2. Using insect repellents containing DEET to prevent bites.
3. Limiting outdoor activity during peak mosquito biting times (early morning and late afternoon).
4. Recognizing that insecticide-treated bed nets have limited effectiveness against *Aedes* mosquitoes due to their daytime biting behavior.

Vaccines

In May 2024, WHO released an updated position paper reflecting the recommendations of the SAGE on Immunization (WHO, 2024c). The 2024 update highlights TAK-003 and outlines its recommended use. WHO endorses TAK-003 for children aged 6–16 years in areas with high dengue transmission. Dengue vaccination should be implemented as part of a comprehensive disease control strategy that includes sustained vector control, effective clinical management, and active community engagement. Currently, two dengue vaccines have received licensure, namely CYD-TDV (Dengvaxia, developed by Sanofi) and TAK-003 (Qdenga, developed by Takeda). Both are live-attenuated tetravalent vaccines; however, they differ in terms of chimeric design, genomic backbone, as well as their respective efficacy and safety profiles. In addition, a third tetravalent live-attenuated dengue vaccine, developed by the Laboratory of Infectious Diseases at the U.S. NIAID, is presently in the advanced stages of clinical development.

1. CYD-TDV

CYD-TDV is a tetravalent live-attenuated dengue vaccine composed of recombinant viruses for all four DENV serotypes, using an attenuated yellow fever 17D virus backbone with substituted prM and E genes. It is administered in a three-dose schedule at six-month intervals and approved for individuals aged 9–45 or 9–60 years in dengue-endemic regions, depending on national regulations. Clinical trials have shown it to be effective and safe in seropositive individuals but associated with an increased risk of severe dengue in those who are seronegative. To

mitigate this risk, pre-vaccination screening is recommended to identify individuals with prior dengue infection. In settings where screening is not feasible, vaccination is advised only in areas with high seroprevalence (≥80% by age 9) (WHO, 2024c).

2. TAK-003

TAK-003 is a live-attenuated dengue vaccine based on a DENV2 strain (TDV-2), which serves as the genomic backbone (WHO, 2024c). The other three vaccine strains (TDV-1, TDV-3, and TDV-4) were created by replacing the E and prM genes of TDV-2 with those from wild-type DENV1, DENV3, and DENV4, respectively. It is administered in two subcutaneous doses three months apart and is approved in various countries with differing age indications. WHO recommends its use in children aged 6–16 years in areas with high dengue transmission, ideally initiating vaccination 1–2 years before the age-specific peak in dengue hospitalizations. Subnational, targeted introduction may be appropriate in regions with heterogeneous transmission intensity. However, WHO does not recommend its use in children under 6 years or in areas with low to moderate transmission due to lower efficacy and limited data on DENV-3 and DENV-4 protection in seronegative individuals.

Control Measures Strategy

Control Measures in Global

The World Health Organization (WHO) developed the Strategic Preparedness, Response and Resilience Plan (SPRP) for dengue and other Aedes-borne arboviruses to strengthen global preparedness, prevention, and response capacities (WHO, 2024d). The plan is aligned with the Global Vector Control Response (GVCR) 2017–2030, the Global Arbovirus Initiative (GLAI), and the roadmap for neglected tropical diseases, incorporating lessons learned from previous dengue, chikungunya, Zika, and COVID-19 responses.

The SPRP aims to reduce the burden of disease and mortality associated with dengue and other Aedes-borne arbovirus diseases and to accelerate prevention and control efforts through coordinated, multisectoral action (WHO, 2024d). Key interventions include surveillance strengthening, epidemiological and entomological investigations, laboratory capacity, outbreak detection and response, integrated vector management, risk communication, community engagement, and health system preparedness.

Recent implementation efforts have included the expansion of Early Warning, Alert and Response Systems (EWARS), improved integration of climate information into outbreak forecasting, and the application of innovative vector control approaches, including Wolbachia-based interventions (WHO, 2025b). WHO also supports the implementation of dengue vaccination strategies where appropriate and promotes research and evidence generation to improve future prevention and response measures.

The SPRP is aligned with the WHO Health Emergency Prevention, Preparedness, Response and Resilience (HEPR) framework. The alignment between the HEPR core components and the SPRP pillars for dengue and other arboviruses is presented in Table 4 (WHO, 2024d).

The primary goal of this SPRP is to reduce the burden of disease and mortality caused by dengue and other Aedes-borne viruses worldwide. Its strategic objective is to accelerate global efforts in preventing and controlling outbreaks through coordinated, multisectoral action. Specific objectives include strengthening international collaboration and coordination, enhancing the capacity of countries to detect, report, and respond to outbreaks, and supporting the implementation of effective vaccination programs and integrated vector management strategies (WHO, 2024d).

Aligned with the WHO's 2023 HEPR Framework, this plan adopts an ecosystem-based approach that strengthens collaborative surveillance, community protection, scalable healthcare, access to countermeasures, and emergency coordination. Through

sustained commitment and a multidisciplinary strategy, the global health community can work together to confront the complex challenges of dengue and protect public health.

Table 4. Alignment of the pillars of the global SPRP 2024–2025 for dengue and other arboviruses with the core components of the proposed global health architecture

Core components of the WHO global architecture for HEPR	Pillars of the global SPRP for dengue and other arboviruses
C1. Emergency coordination	Pillar 1. Leadership and coordination, prevention of sexual misconduct culture bottle)
C2. Collaborative surveillance	Pillar 3. Surveillance, epidemiological and entomological investigation Pillar 5. Laboratory surveillance and diagnostics
C3. Community protection	Pillar 2. Risk communication, community engagement and infodemic management Pillar 4. Travel, trade, and points of entry surveillance and control Pillar 6. Integrated vector management and WASH & IPC
C4. Safe and scalable care	Pillar 7. Clinical management and therapeutics Pillar 9. Essential health systems and services
C5. Access to countermeasures	Pillar 8. Operational support and logistics Pillar 10. Vaccination Pillar 11. Research, innovation and evidence

The alignment of the SPRP pillars with the HEPR framework provides a structured approach to strengthening capacities for dengue prevention, preparedness, and response, while supporting coordinated implementation of public health interventions.

Regional Control Measures

Dengue control measures in the ASEAN region are implemented through regional strategies under the WHO South-East Asia Region (SEARO) and Western Pacific Region (WPRO). Although ASEAN Member States are distributed across two WHO regions, both regional approaches prioritize strengthening surveillance, outbreak preparedness, integrated vector management, laboratory capacity, and health system resilience.

In the WHO South-East Asia Region (SEARO), dengue is endemic in 10 of the 11 Member States, with increasing geographic expansion and recurrent outbreaks requiring strengthened regional prevention and control strategies (WHO SEARO, 2024). Dengue control

activities in SEARO are implemented under the Regional Strategic Framework for sustaining, accelerating, and innovating to end neglected tropical diseases in the South-East Asia Region 2024–2030, which supports integrated approaches for dengue and other arboviral diseases.

To strengthen regional coordination and technical support, WHO SEARO re-established the Regional Technical Advisory Group (RTAG) on dengue and other arboviruses in 2021 (WHO SEARO, 2024). The RTAG provides technical guidance on epidemiological trends, regional priorities, and evidence-based interventions, while supporting Member States in improving preparedness and response capacities under the Global Arbovirus Initiative (GLAI).

SEARO dengue control activities include epidemiological, entomological, and laboratory surveillance to support early detection and outbreak response. Member States strengthen Early Warning, Alert and Response Systems (EWARS), data sharing mechanisms, and diagnostic capacity through regional laboratory networks. Prevention activities include vector surveillance, source reduction, insecticide resistance monitoring, and community-based interventions. Clinical management, risk communication, and community engagement are also included as components of dengue prevention and control activities.

In the WHO Western Pacific Region (WPRO), dengue prevention and control activities are implemented through the Western Pacific Regional Action Plan for Dengue Prevention and Control 2016, which was developed through consultations with dengue experts, country programme managers, and Member States (WHO WPRO, 2016). The Action Plan aims to reduce the health impact of dengue by reducing case fatality rates and strengthening evidence for action on dengue. The regional approach promotes a shift from outbreak containment towards reducing the impact of dengue on communities. WPRO prioritizes strengthening dengue surveillance, laboratory capacity, clinical management, and vector control to support dengue prevention and control activities.

Dengue control strategies in WPRO emphasize the proactive and sustainable implementation of Aedes mosquito-control measures in collaboration with sectors beyond the health sector (WHO WPRO, 2016). The Region also supports the early implementation of new technologies to strengthen dengue prevention and control. Through strengthened surveillance, laboratory systems, clinical management, vector control, and evidence-based approaches, WPRO aims to improve preparedness and reduce the burden of dengue across Member States.

Control Measures in ASEAN Member States

Dengue control activities in ASEAN are implemented through regional health cooperation mechanisms involving ASEAN Member States. Public health, as part of the ASEAN Socio-Cultural Community, has been identified as an important area of cooperation, including addressing emerging infectious diseases such as dengue. The ASEAN Expert Group on Communicable Diseases developed the ASEAN Medium Term Plan on Emerging Infectious Diseases (2011–2015), which identified dengue as a priority area (WHO, 2011a). ASEAN also collaborated with WHO through the 2009–2013 Memorandum of Understanding to strengthen regional health cooperation and support alignment of dengue prevention and control activities with international technical guidance.

A key outcome of ASEAN–WHO collaboration was the establishment of ASEAN Dengue Day, observed annually on 15 June. The initiative was endorsed at the 10th ASEAN Health Ministers Meeting in Singapore in 2010, with the first observance launched in Jakarta, Indonesia, in 2011 (ASEAN, 2017). ASEAN Dengue Day was established to increase public awareness of dengue, mobilize resources for dengue prevention and control, and reaffirm ASEAN's commitment to addressing dengue as a regional public health concern. Since its establishment, ASEAN Dengue Day has been commemorated through synchronized activities at regional, national, and sub-national levels across ASEAN Member States, with support from WHO and international and local partners.

Following the regional launch in 2011, ASEAN Member States hosted a series of regional dengue conferences and observances, including Myanmar (2012), Viet Nam (2013), the Philippines (2014), Lao PDR (2015), and Thailand (2016) (ASEAN, 2017). These activities involved ASEAN governments, the ASEAN Secretariat, development partners, private sector entities, civil society organizations, and community groups to strengthen coordinated dengue prevention and control efforts. Given the multifactorial nature of dengue transmission, ASEAN highlights collaboration among stakeholders as an important component of regional dengue prevention and control activities.

Under the ASEAN Health Cluster 2 framework, ASEAN Member States implement dengue prevention and control activities through strengthened disease and vector surveillance, integrated vector management, and rapid response capacities to support early detection and outbreak control (ASEAN, 2026). Dengue prevention activities include vector surveillance, community-based prevention activities, and coordinated interventions addressing mosquito breeding sites. ASEAN also

highlights the importance of diagnostic capacity, timely case detection, effective treatment, and clinical management to reduce dengue-related morbidity and mortality. ASEAN dengue prevention and control activities also include risk communication, community engagement, collaboration among stakeholders, and knowledge sharing. The application of innovation and technology, together with evidence generation, is included in regional efforts to strengthen dengue prevention and control approaches across ASEAN Member States

Brunei Darussalam

In Brunei Darussalam, vector-borne disease control—including dengue—is carried out through coordinated efforts between the MoH, the Environmental Health Division, and District Health Offices (ASEAN, 2017). Guided by the principles of Integrated Vector Management (IVM), the national strategy emphasizes multisectoral coordination, community engagement, and evidence-based interventions.

In responding to vector-borne diseases including dengue incidences in Brunei Darussalam, several activities to prevent and reduce the spread of vector borne diseases have been implemented (Prime Minister's Office Brunei Darussalam, 2016). These include the following:

1. Implement vector borne diseases control consisting of various strategic plans and organized programs for the vigilance, elimination, control and prevention of diseases.
2. Application of an IVM and to get more effective, cost effective, ecologically sound, and sustainable vector control; and
3. Combatting vector-borne diseases through Malaria Vigilance Programme; Entomology Programme, Vector Control Programme which entails mosquito, virus and human surveillance' public education and awareness; law enforcement and research.

The Ministry of Health also collaborates with the WHO to strengthen public health resilience against vector-borne diseases and the impacts of climate change.

Cambodia

The dengue strategy in Cambodia aims to reduce the incidence and mortality of dengue fever through an integrated approach that strengthens prevention, control, and community resilience. The main approach combines health education, risk communication, and community engagement to raise awareness and promote behavior change. The implementation strategy involves coordination between the Ministry of Health, local authorities, schools, and health centers, using tools like the 4P framework (purpose, process, product, and presentation) to guide communication. Key activities include public education campaigns, training health workers and community volunteers, promoting environmental management to eliminate mosquito breeding sites, and using media and mobile platforms to disseminate timely and accurate information during outbreaks (Ministry of Health Cambodia, 2020).

Indonesia

In February 2026, Indonesia's Ministry of Health convened the Regional Dengue Forum, "Advancing Collaboration on Dengue Prevention and Control," bringing together senior representatives from ASEAN health ministries, the ASEAN Secretariat, WHO, local governments, the private sector, and experts. The forum agreed to develop integrated policy recommendations to safeguard approximately 670 million people across ASEAN from dengue (Ministry of Health Indonesia, 2026). Following the event, the Indonesian Ministry of Health began finalizing the 2026–2029 National Action Plan for Dengue Control in response to increasing challenges from urbanization and climate change, and as part of efforts to achieve the global target of "Zero Dengue Deaths by 2030" (Ministry of Health Indonesia, 2026).The 2026–2029 National Action Plan focuses on four main pillars:

1. Strengthening early detection and diagnosis to enable timely treatment.
2. Improving clinical management and referral systems to reduce mortality.
3. Advancing integrated prevention, including vector control, innovations such as *Wolbachia*, vaccination strategies, and effective risk communication.
4. Enhancing integrated surveillance and early warning systems to ensure rapid outbreak response.

Implementation is supported by strong governance, sustainable financing, partnerships, and continuous research

and innovation. The approach integrates environmental management, mosquito control, and human protection, ensuring these components are addressed simultaneously.

The plan also prioritizes expansion of Wolbachia programs, encourages local governments to adopt dengue vaccination, and highlights the critical role of community participation and regional collaboration, particularly within ASEAN, to reduce dengue burden effectively.

Lao People's Democratic Republic

Laos PDR's dengue strategy incorporates multiple integrated approaches (WMP, 2025). Vector control is achieved through the release of *Wolbachia*-infected mosquitoes to reduce disease transmission. Youth education is promoted in schools to build early awareness of mosquito-borne diseases. Climate-resilient planning addresses rising risks from floods and droughts, which create breeding grounds for mosquitoes. Lastly, community engagement includes empowering local volunteers and educating families to host mosquito containers and maintain clean environments. These combined efforts aim to strengthen the public health system and reduce the national dengue burden.

Malaysia

To ensure the continuity of the dengue control program, the Ministry of Health Malaysia has developed The National Dengue Prevention and Control Strategic Plan 2022-2026 (Ministry of Health Malaysia, 2022). The Strategic Plan contains 22 strategies, 41 initiatives and 54 indicators with three (3) main cores, and two supporting elements.

Main cores of dengue strategic plan

1. Strengthening the Dengue Surveillance System
2. Ensuring Access to Dengue Detection, Diagnosis and Treatment
3. Strengthening Efforts Towards Dengue Prevention and Control

Supporting elements of dengue strategic plans

1. Supporting Element 1: Strengthening the health system and catalytic factors
2. Supporting Element 2: Strengthening dengue-related research and innovation

Myanmar

In 2016, the Ministry of Health and Sports the Union of the Republic of Myanmar Developed a NSP for Dengue Prevention and Control 2016 - 2020. The NSP has a vision to minimize the health, economic, and social impact of the disease by reversing the rising trend of dengue. Guided by this vision, the program aims to reduce the overall burden of dengue and dengue hemorrhagic fever. To achieve this goal, the program has set clear and measurable objectives: to reduce dengue morbidity by at least 25% by 2020 and 50% by 2025, compared to the 2015 baseline; to reduce dengue mortality by at least 50% by 2020 and 90% by 2025; and to maintain a CFR of less than 1%. These targets reflect a strong commitment to improving public health outcomes and strengthening the response to dengue at all levels. The following are seven strategic interventions of the national strategic plan (Ministry of Health and Sports The Union of the Republic of Myanmar, 2016) :

1. Increase capacity of the National Programme to strengthen dengue surveillance.
2. Strengthen the capacity of the National Programme to implement effective integrated vector management.
3. Increase the capacity of clinicians, nurses, BHS, laboratory technicians and laboratories to diagnose, treat and refer dengue patients.
4. Increase capacity to predict, detect early and respond to outbreaks in a timely manner
5. Promote collaboration among affected communities, national health and non-health departments and other stakeholders to implement communication for behavioral impact (COMBI) for dengue.
6. Promote and conduct dengue researches to address programmatic issues and gaps that require new or improved tools for effective dengue prevention and control.
7. Strengthen dengue programme management and promote inter-sectoral collaboration for effective Dengue prevention and control.

Philippines

The National Dengue Prevention and Control Program of the Philippines envisions "a dengue-free Philippines", with a mission to ensure healthy lives and promote well-being for all at all ages (Department of Health Republic of the Philippines, 2016). Its overarching goal is to reduce the burden of dengue disease nationwide. The program has set clear objectives and indicators: first, to reduce dengue morbidity by at least 25% by 2022; second, to reduce dengue mortality by at least 50% by 2022; and third, to maintain a CFR below 1% annually.

The program consists of six core components: (1) Surveillance, (2) Case Management and Diagnosis; (3) Integrated Vector Management (IVM); (4) Outbreak Response; (5) Health Promotion and Advocacy; and (6) Research. These efforts are reinforced by the Enhanced 4S Strategy, namely (1) search and destroy, (2) seek early consultation, (3) self-protection measures, and (4) say yes to fogging only during outbreaks.

To support implementation of the national program, the Department of Health (DOH) has promoted community-based dengue prevention activities through the Anti-Dengue Advocacy Campaign (Department of Health Republic of the Philippines, n.d). The campaign encourages households, schools, local government units, and communities to participate in dengue prevention activities and reduce mosquito breeding sites. The DOH further implements the 4S Strategy through community actions, including the "4 o'clock habit" to regularly search and destroy potential mosquito breeding sites and the Aksyon Barangay Kontra Dengue (ABKD), which supports routine clean-up activities at the barangay level.

The DOH also promotes timely consultation, access to dengue testing at the community level, and dissemination of dengue hotspot information to support early detection and response (Department of Health Republic of the Philippines, n.d). These activities involve collaboration among local communities, schools, government units, and other stakeholders in dengue prevention and control efforts

Singapore

Singapore's dengue prevention and control strategy focuses on integrated surveillance and control measures aligned with WHO recommendations (NEA, 2025). The key approach is source reduction through the detection and elimination of Aedes mosquito breeding sites. Preventive risk-based inspections are

conducted in high-risk areas, including areas without reported dengue cases, to identify and remove potential breeding sites. These measures support suppression of mosquito populations and reduction of dengue transmission risk.

The National Environment Agency (NEA) works with other agencies, including PUB, NParks, and Town Councils, to implement dengue control measures. Key vector control activities include monitoring mosquito populations using Gravitraps, conducting intensive search-and-destroy operations, applying targeted larvicide, and implementing insecticidal fogging during outbreaks (NEA, 2025). Community engagement is supported through communication activities, mobilisation efforts, and legislation under the Control of Vectors and Pesticides Act.

Public awareness activities focus on preventing Aedes mosquito breeding through regular inspection and removal of stagnant water sources (NEA, n.d). The Dengue Campaign Poster 2021 highlights that dengue is transmitted through the bite of Aedes mosquitoes and emphasizes the importance of preventing mosquito breeding. The campaign introduces the B-L-O-C-K approach, which includes breaking up hardened soil, lifting and emptying flowerpot plates, overturning pails, and wiping their rims, changing water in vases, and keeping roof gutters clear with the placement of BTI insecticide. These activities encourage households to remove potential mosquito breeding sites as part of dengue prevention efforts.

Singapore also continues to implement innovation-based vector control through Project Wolbachia (NEA, 2024). As of October 2024, the project was expanded to five additional sites, increasing coverage from 480,000 to 580,000 households. Field trials reported a 75% reduction in dengue cases and an 80–90% reduction in Aedes aegypti populations in areas covered by the programme.

Thailand

Under the Vector-borne Disease Management Strategy (2023–2032), Thailand aims to address the ongoing public health challenges posed by diseases including dengue. reduce the health burden from diseases like dengue amid environmental changes, urbanization, and increased mobility. By 2032, the strategy envisions a comprehensive national system for surveillance, prevention, and control aligned with global standards and the Sustainable Development Goals (SDGs). Its core objectives include reducing morbidity and mortality from vector-borne diseases, fulfilling Thailand's international commitments, and strengthening global health security (DDC Thailand, 2022). The strategy is built upon five strategic pillars:

1. Developing effective policies and programs.
2. Enhancing surveillance systems and emergency preparedness.
3. Strengthening infrastructure and operational capacity at local and regional levels.
4. Fostering active engagement from communities and stakeholders; and
5. Investing in workforce development, particularly in epidemiology and entomology.

Implementation is supported by a five-year action plan (2023–2027), legal frameworks like the Communicable Disease Act (B.E. 2558), and initiatives such as the formation of VCUs and Centers of Excellence. Ultimately, the strategy emphasizes intersectoral collaboration and localized ownership to ensure effective and sustainable vector-borne disease management across the country (DDC Thailand, 2022).

Timor-Leste

Timor-Leste is strengthening dengue prevention and control through the proposed establishment of an Integrated Vector-Borne Disease Control Unit (IVBDCU) under the Ministry of Health, integrating dengue and malaria programmes to improve coordination, surveillance, vector control, and resource utilization (Ministry of Health Democratic Republic of Timor-Leste, 2023b). Dengue control follows the WHO Bi-regional Dengue Strategy and focuses on a multi-sectoral approach combining surveillance, case management, vector control, health education, and community engagement. Given the highly seasonal pattern of dengue transmission, particularly during the wet season (December–February), proactive monitoring of vector density and mosquito breeding sites is prioritized to enable early intervention and outbreak prevention.

Key dengue control measures include source reduction, larviciding, fogging (space spraying), integrated vector management (IVM), entomological surveillance, mandatory case notification, and strengthened outbreak preparedness and response systems (Ministry of Health Democratic Republic of Timor-Leste, 2023b). Efforts are underway to improve data sharing between surveillance and environmental health units, expand the use of rapid diagnostic tests (RDTs), update clinical management guidelines, and strengthen referral systems for severe dengue cases. Community-based interventions, including Information, Education and Communication (IEC) and Behaviour Change Communication (BCC) activities, promote public participation in

eliminating breeding sites and adopting personal protective measures. Capacity building for surveillance, laboratory, and vector control personnel, together with regular technical coordination through a national technical working group, supports the long-term sustainability of dengue control efforts in the country.

Viet Nam

Viet Nam's dengue prevention and control strategy aligns with the Western Pacific Region's Dengue Action Plan adopted in 2016, focusing on reducing the disease's impact on communities and health systems (WHO, 2019). Guided by the 2014 National Guidelines for Dengue Surveillance and Control, the country emphasizes integrated surveillance, timely response, and strong community engagement. Viet Nam has also actively participated in ASEAN Dengue Day for ten consecutive years, reinforcing public awareness and regional collaboration. With WHO support, Viet Nam continues to enhance its efforts to minimize the scale, frequency, and consequences of dengue outbreaks.

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