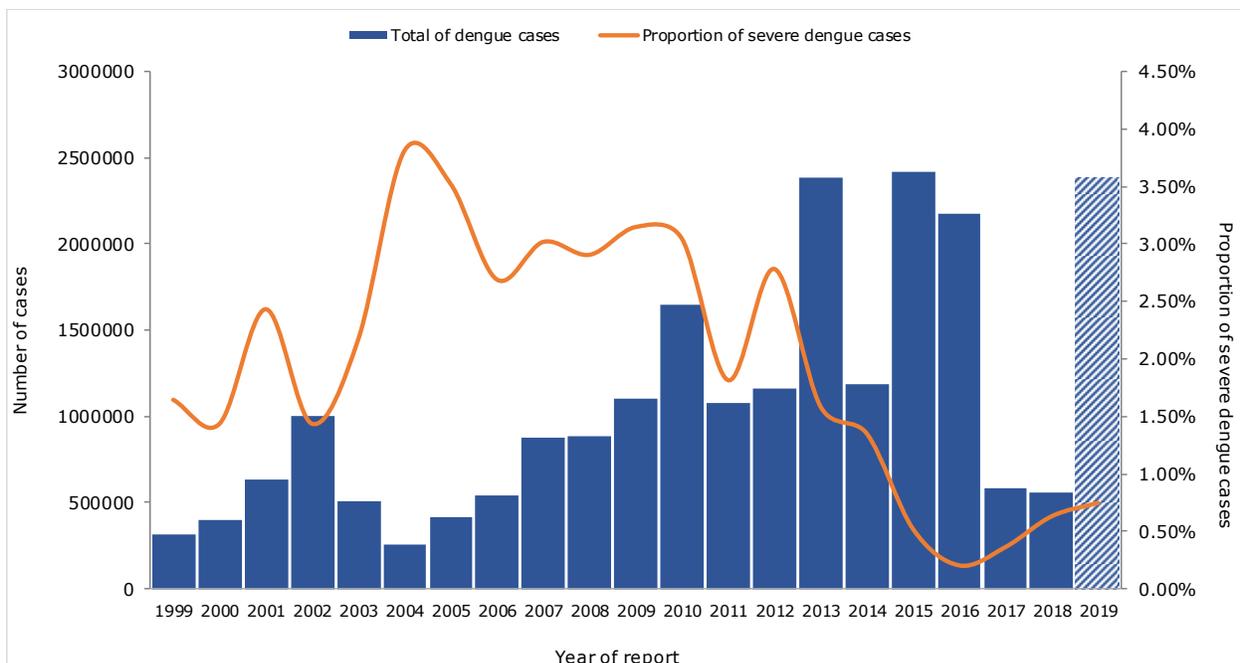


Situation summary

In the Region of the Americas, between epidemiological week (EW) 1 and EW 35¹ of 2019, a total of 2,384,029 cases of dengue (244.1 cases per 100,000 population) have been reported, including 949 deaths. Of the total cases, 1,065,701 (44.7%) were laboratory-confirmed and 17,794 (0.7%) were classified as severe dengue. The reported case-fatality rate was 0.04%.

The number of cases reported in 2019 as of EW 35 (2,384,029) is higher than the annual totals reported in 2016, 2017, and 2018, and the total by the end of the year will likely exceed the total reported in the epidemic year of 2015 (**Figure 1**). In 2019, the proportion of severe dengue (0.7%) has exceeded that observed in the previous four years.

Figure 1. Distribution of reported dengue cases and proportion of severe dengue cases, by year of report. Region of the Americas, 1999-2019 (up to EW 35 of 2019).



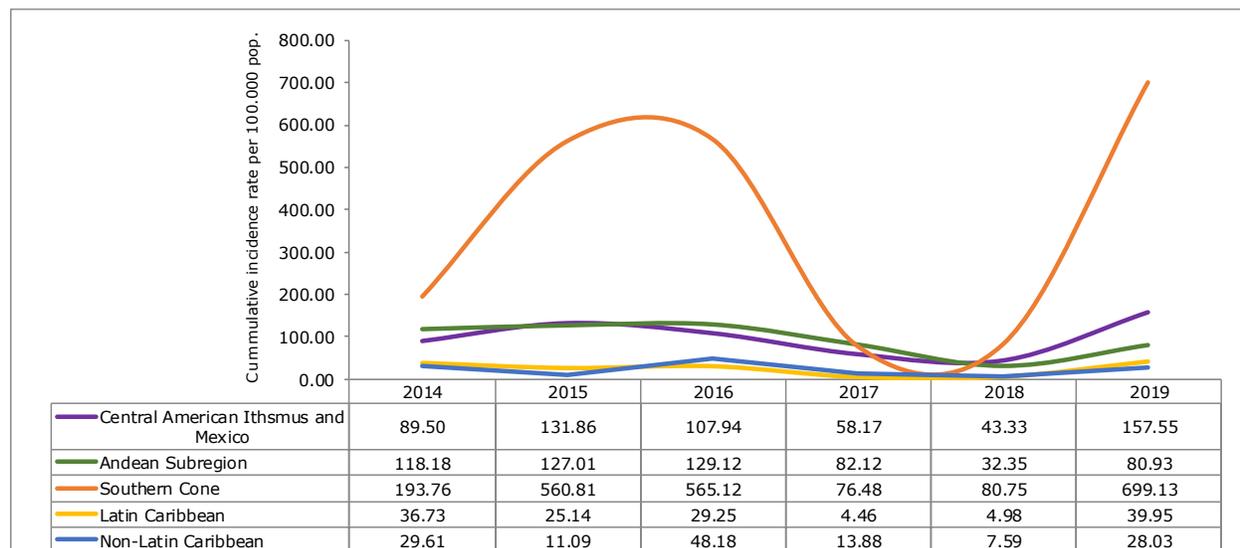
Source: Data entered into the Health Information Platform for the Americas (PLISA, PAHO / WHO) by the Ministries and Institutes of Health of the countries and territories of the Region.

¹ Data available in the Health Information Platform for the Americas (PLISA, PAHO / WHO), accessed 10 September 2019. Available at: <https://bit.ly/314Snw4>

Suggested citation: Pan American Health Organization / World Health Organization. Epidemiological Update: Dengue. 13 September 2019, Washington, D.C. PAHO / WHO. 2019

When comparing the cumulative incidence rates by sub-region in 2019 (as of EW 35) with the previous epidemic period (2015-2016, as of EW 35), with the exception of the Andean and non-Latin Caribbean sub-regions, the incidence rates exceeded those during the previous epidemic cycle for the remaining sub-regions (**Figure 2**).

Figure 2. Incidence rates of reported dengue cases as of EW 35 by year and sub-region. Region of the Americas, 2014-2019.



Source: Data entered into the Health Information Platform for the Americas (PLISA, PAHO / WHO) by the Ministries and Institutes of Health of the countries and territories of the Region.

The four dengue virus serotypes (DENV 1, DENV 2, DENV 3, and DENV 4) are present in the Americas and co-circulation of all four has been detected in Brazil, Guatemala, and Mexico in 2019; in Colombia, Guadeloupe, Martinique, Panama, and Venezuela, serotypes DENV 1, DENV 2, and DENV 3 have been co-circulating; and in Paraguay and Peru, DENV 1, DENV 2, and DENV 4 have been co-circulating.

Of the five countries in the Americas with the highest incidence rates (**Table 1**), four are located in the Central American Isthmus: Belize (387 cases per 100,000 population), El Salvador (258 cases per 100,000 population), Honduras (778 cases per 100,000 population), and Nicaragua (1,504 cases per 100,000 population). The fifth country with highest incidence rate in the Americas is Brazil (939 cases per 100,000 population).

Table 1. Incidence rates and number of dengue cases, proportion of severe dengue cases, case-fatality rates, and serotypes, in 10 selected countries of the Region. EW 1 to EW 35 of 2019.

Country	Incidence rate (cases per 100,000 pop.)	Number of cases	Proportion of severe dengue (%)	Case-fatality rate (%)	Serotypes reported
Nicaragua	1,503.79	91,269	0.64	0.016	2
Brazil	690.4	1,439,471	0.07	0.041	1-2-3-4
Honduras	777.64	71,215	20.19	0.180	1-2
Belize	386.65	1,477	3.59	0.000	N/A
El Salvador	258.47	16,573	0.59	0.030	2
Colombia	171.12	84,644	1.09	0.057	1-2-3
Paraguay	124.81	8,608	N/A	0.105	1-2-4
Guatemala	128.63	22,755	0.23	0.18	1-2-3-4
Mexico	56.80	74,277	1.07	0.038	1-2-3-4
Venezuela	26.68	8,638	0.51	0.162	1-2-3

Note: To calculate the incidence rates, proportion of severe dengue cases, and case-fatality rates, discarded cases were excluded.

Source: Data entered into the Health Information Platform for the Americas (PLISA, PAHO / WHO) by the Ministries and Institutes of Health of the countries and territories of the Region. For Brazil (EW 34), Guatemala (EW 34), Honduras (EW 35), and Nicaragua (EW 35), the data was shared by the International Health Regulations (IHR) National Focal Points (NFPs).

The following is a summary of the epidemiological situation for dengue in select countries.

In **Brazil**, between EW 1 and EW 34 of 2019, a total of 1,439,471 probable cases of dengue have been reported, of which 1,015,124 cases were confirmed². Of the confirmed cases, 15,179 were classified as dengue with warning signs, and 1,111 as severe dengue. A total of 2,486 cases of dengue with warning signs and severe dengue remain under investigation. Among the confirmed cases, there were 591 deaths, and 486 deaths remain under investigation.

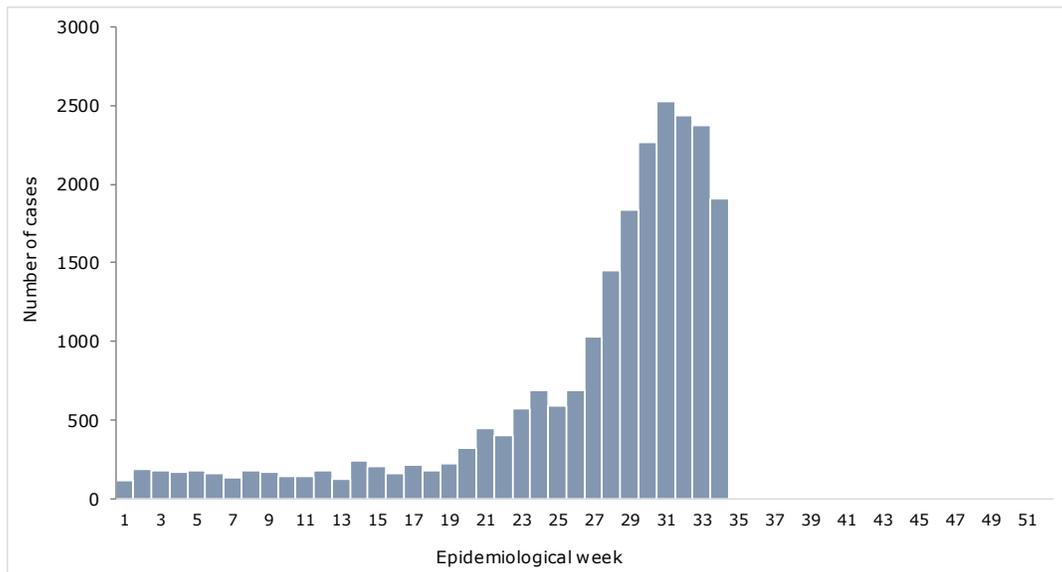
The cumulative national incidence rate is 690.4 cases per 100,000 population, representing a 599.5% increase compared to the same period of 2018. By geographical region, the highest incidence rate has been reported in the Central-West (1,196.1 cases per 100,000 population, with a 131.8% increase compared to 2018), followed by the Southeast (1,139.2 cases per 100,000 population, with a 1,713.2% increase). The federal units with the highest incidence rates are Minas Gerais (2,239.3 cases per 100,000 population), Goiás (1,561.6 cases per 100,000 population), Espírito Santo (1,493.3 cases per 100,000 population), Mato Grosso do Sul (1,466.1 cases per 100,000 population), and the Federal District (1,194.4 cases per 100,000 population).

In **Guatemala**, between EW 1 and EW 34 of 2019, a total of 22,755 suspected cases of dengue have been reported, of which 7,623 were classified as dengue with warning signs and 127 as severe dengue, including 69 deaths.

² Cases of severe dengue, dengue with warning signs, and deaths from dengue were confirmed by laboratory or clinical-epidemiological criteria.

During the current dengue epidemic cycle, the trend of suspected cases increased between EW 20 and EW 31 of 2019, where it reached a peak of cases and has since started to decline. However, it remains too early to determine if a declining trend will continue, especially given that the rainy season has not ended (**Figure 3**).

Figure 3. Distribution of suspected dengue cases by epidemiological week of report. Guatemala, EW 1 to EW 34 of 2019.



Source: Data published by the Guatemala Ministry of Public Health and Social Assistance and reproduced by PAHO / WHO.

Of the total number of cases of severe dengue (127 cases), 54 were confirmed (including 42 deaths) and 73 remain under investigation (including 27 deaths). Among cases of severe dengue, children aged less than 15 years represent 67% of the cases and females represent 69% of the cases.

Among the 29 health areas in the country, since EW 34 of 2019, 13 have reported incidence rates above the national incidence rate (128.6 cases per 100,000 population), as follows: Baja Verapaz (251.5 cases per 100,000 population), Chiquimula (175.7 cases per 100,000 population), Central Guatemala (135.3 cases per 100,000 population), Huehuetenango (230.3 cases per 100,000 population), Ixcán (298.2 cases per 100,000 population), Izabal (237.2 cases per 100,000 population), Petén Norte (155.1 cases per 100,000 population), Petén Sur Occidental (317.1 cases per 100,000 population), Petén Sur Oriental (664.9 cases per 100,000 population), Quetzaltenango (253.3 cases per 100,000 population), Retalhuleu (160.8 per 100,000 population), Santa Rosa (321.9 cases per 100,000 population), and Zacapa (298.2 cases per 100,000 population).

By age group and sex, children aged 5 to 9-years for both sexes have the highest incidence rates, followed by 10 to 14-year-olds.

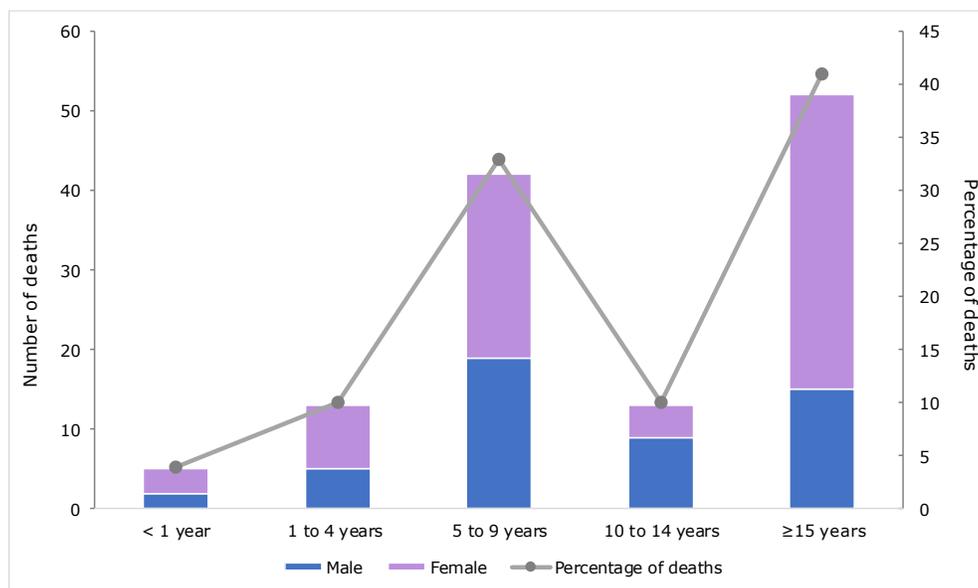
In **Honduras**, between EW 1 and EW 35 of 2019, a total of 71,215 suspected cases of dengue, including 227 deaths, have been reported. Of the total number of suspected cases, 20% (14,381 cases) were classified as severe dengue.

In the last five epidemiological weeks (EW 31 to EW 35 of 2019), a decreasing trend in the number of reported cases has been observed, with a 31% decrease in the number of severe dengue cases and a 34% decrease in the number of dengue cases with warning signs; however, it remains too early to determine if a declining trend will continue, especially given that the rainy season has not ended.

Of the total deaths (227), 127 were laboratory-confirmed, 37 were discarded following laboratory testing, and 63 remain under investigation. By age group and sex, children aged less than 15 years represent 57% of the confirmed deaths and females represent 59% of the confirmed deaths (**Figure 4**).

All 20 health regions in the country have reported dengue cases, with the regions of Cortés, Yoro, and Santa Barbara accounting for 55% of the total deaths reported.

Figure 4. Number and proportion of deaths due to confirmed dengue, by age group and sex. Honduras, EW 1 to EW 35 of 2019.



Source: Data shared by the Honduras International Health Regulations (IHR) National Focal Point and reproduced by PAHO / WHO.

In **Nicaragua**, between EW 1 and EW 35 of 2019, a total of 91,269 suspected cases of dengue have been reported (a 209% increase compared to 2018), of which 4,543 were confirmed (a 380% increase compared to 2018), including 15 deaths, and 587 were severe dengue.

The highest incidence rates have been reported in the departments of León (177 cases per 100,000 population), Carazo (128 cases per 100,000 population), Estelí (124 cases per 100,000 population), Chinandega (119 cases per 100,000 population), Masaya (102 cases per 100,000 population), and Managua (81 cases per 100,000 population).

By age group, the highest incidence rates are among children aged 10 to 14-years-old (171 cases per 100,000 population), 5 to 9-years-old (161 cases per 100,000 population), less than

1-year-old (124 cases per 100,000 population), and 15 to 19-years-old (91 cases per 100,000 population).

Advice to Member States

Given the increase in cases of dengue and severe dengue in several countries and territories in the Region of the Americas, the Pan American Health Organization / World Health Organization (PAHO/WHO) emphasizes the need for Member States to implement inter-sectoral preparedness and response measures for these outbreaks. PAHO/WHO reiterates the recommendations provided to Member States in the 21 November 2018 Epidemiological Alert³ and the 22 February 2019 Epidemiological Update⁴.

The following is a summary of the key recommendations regarding outbreak preparedness and response, case management, laboratory diagnosis, risk communication, and integrated vector management.

Outbreak preparedness and response

As part of outbreak preparedness and response, it is recommended that Member States:

- strengthen disease surveillance, including laboratory diagnosis;
- review emergency plans;
- strengthen and intensify vector surveillance and control;
- ensure that healthcare professionals are properly trained for appropriate clinical diagnosis and clinical management of patients with dengue or other arboviruses, **with a special focus on age groups and at-risk groups with the highest case-fatality rates;**
- involve the community in prevention and control activities;
- ensure performance of the outbreak response is monitored and systematized, including the establishment of a situation room; and
- adapt risk communication according to the epidemiological scenario.

In countries with presence of the vectors but without dengue virus circulation, preparedness and response plans should focus on strategies to reduce the risk of transmission. Rapid investigation of all clinically suspected cases should be carried out as well as laboratory testing to confirm the presence of the dengue virus.

³ Pan American Health Organization / World Health Organization. Epidemiological Update: Dengue. 21 November 2018, Washington, D.C. PAHO / WHO. 2018. Available at: <https://bit.ly/2U13MtX>

⁴ Pan American Health Organization / World Health Organization. Epidemiological Update: Dengue. 22 February 2019, Washington, D.C. PAHO / WHO. 2019. Available at: <https://bit.ly/2VUSX1C>

Situation Room

The situation room is a key tool for informed decision making, wherein information is analyzed through multi-disciplinary teams to support health management. It has a key role in the response to outbreaks and emergencies situations. In the case of dengue, the situation room is typically where key aspects of the inter-sectoral response are tracked, bringing together information from all involved sectors. The activities carried out in the situation room include, but are not limited to:

- Analysis and continuous systematic assessment of the current and prospective situation.
- Integration of epidemiological information, including laboratory diagnosis, vector control, and case management, aimed at:
 - Early detection of cases and outbreaks.
 - Monitoring trends and incidence.
 - Understanding the dynamics of viral circulation.
- Guide and maintain data collection, including data quality control.
- Monitor actions and impact of intervention measures.
- Produce periodic concise, operationally focused situation reports to support coordination of the emergency or outbreak response. The situation report should:
 - Provide a snapshot of the current needs, response, and gaps during outbreaks or emergency situations.
 - Be a tool for mobilizing resources.
- Manage key aspects of logistics for the ongoing prevention and control response.

Case management

While the clinical manifestations of the disease are complex, treatment is relatively simple, inexpensive, and very effective in saving lives if timely and adequate management is provided. Early recognition of warning signs at different stages of the disease is critical in order to provide the necessary health care, and therefore prevent progression to severe disease.

When the clinical diagnosis is suggestive of dengue, chikungunya, or Zika, patients (particularly children), should be managed as a case of dengue and

WARNING SIGNS OF DENGUE

1. Intense abdominal pain or tenderness.
2. Persistent vomiting.
3. Clinical accumulation of liquids.
4. Bleeding from mucous membranes.
5. Lethargy or irritability.
6. Postural hypotension (lipothymia).
7. Hepatomegaly greater than 2 centimeters.
8. Progressive increase in hematocrit.

monitored daily to detect warning signs of severe illness, especially during the critical phase of the disease⁵.

In cases of dengue without warning signs, patients⁶ should receive information about these signs for timely identification of warning signs and for seeking medical assistance.

Clinical management and treatment of patients suspected with dengue should be initiated without waiting for laboratory confirmation of dengue. Initial clinical diagnosis is sufficient to offer timely and adequate medical care and treatment.

Organization of healthcare services and referral of patients

The main objective of the prevention and control measures during dengue outbreaks is to prevent deaths. Consequently, timely and adequate care of patients, as well as strengthening coordination between different health areas and services, should be promoted. If dengue cases increase, the healthcare network should consider expanding healthcare services and ensuring sufficient supplies, equipment, medication, access to clinical tests, and hospital beds; adequate patient monitoring and the use of patient tracking forms should also be ensured.

The **primary level of healthcare** is key in the management of dengue cases, as this is the level in which the first contact with patients occurs and where most cases receive medical attention. Therefore, it is recommended that the primary level of healthcare:

- Have sensitized and trained personnel for the triage of cases upon arrival at the healthcare service. These personnel should provide instructions and guidance to patients and/or family members on how to identify warning signs of dengue and seek the nearest healthcare service as soon as these signs occur.
- Have healthcare personnel trained to observe and detect patients who present with warning or severe signs in waiting, in order to ensure immediate care and reduce waiting time.
- Establish *dengue units* for the management of dengue cases with warning signs.
- Ensure continuous clinical monitoring of patients with specialized medical needs, co-morbidities, pregnant women, concomitant conditions, or persons whose social situation makes it difficult to access the necessary care (such as persons living in remote places, refugees, displaced persons, among others).
- Establish referral and counter-referral systems for severe dengue cases between different healthcare levels. Severe cases of dengue should be referred to a higher-level unit (secondary or tertiary level), after stabilization of the patient and coordination between healthcare units.

⁵ PAHO / WHO. Dengue: Guidelines for patient care in the Region of the Americas, 2nd Edition 2016. Available at: <https://bit.ly/2U1Pp8t>

⁶ Or parents or guardians, in the case of children.

- All units of this level should have flowcharts and guidelines for the clinical management of dengue, available to all medical and paramedical personnel, for any necessary consultation during medical attention of patients.

The **secondary and tertiary levels of healthcare** should be designed for the management of severe cases of dengue. Thus, overwhelming these units is avoided and specific clinical care can be provided to patients requiring highly specialized care.

As part of the organization of the healthcare systems in emergency situations or outbreaks, the following is necessary:

- A group of highly specialized physicians should be established to provide medical guidance on diagnosis and management of dengue cases, mainly to support physicians in remote areas (peripheral areas).
- A hotline for consultation with a trained physician, particularly for healthcare personnel in peripheral areas.
- The healthcare personnel in healthcare units should have access to clinical guidelines and flowcharts for the care of dengue cases.
- Continuous education should be maintained in healthcare units, particularly regarding the management of severe and difficult-to-treat cases as well as the analysis of dengue deaths.

A timely approach, the correct classification of cases, and proper case management are key elements of healthcare to prevent patient deaths due to dengue. A delay in medical care for these cases is often related to the cause of death.

Laboratory diagnosis

Diagnosis and etiological confirmation of dengue infection can be performed through virological assays (viral isolation, detection of genetic material, detection of NS1 protein, or immunohistochemistry) or by serological tests for the detection of IgM antibodies.

Virological diagnosis

- *Molecular detection*: During the first 5 days from the onset of symptoms (acute phase, viremic period), viral RNA from a serum sample can be detected using molecular techniques such as conventional or real-time reverse transcription polymerase chain reaction (RT-PCR). A positive PCR result (with appropriate controls) confirms the diagnosis.
- *Viral isolation*: Can be performed by intracerebral inoculation in mice or in cell culture. However, due to its complexity, this is rarely used as a routine diagnostic test and is recommended only for research or characterization to complement public health surveillance.

- *NS1 Protein*: The nonstructural protein 1 (NS1) of the dengue virus can be detected by ELISA up to 9 days after the onset of symptoms. However, since it is a protein produced at an early stage of infection, it is most likely detected between the first 3 to 5 days after the onset of symptoms.
- *Post-mortem diagnosis*: In fatal cases, it is recommended to take tissue samples (preferably liver, followed by spleen and kidney) in buffered formalin for histopathological and immunohistochemical assay. Additionally, molecular methods (RT-PCR) from fresh tissue samples (taken in dry tube and maintained in refrigeration), or preserved in paraffin, can also be used for the confirmation of fatal cases associated with dengue or to conduct differential diagnosis.

Serological diagnosis

A positive IgM result using the ELISA technique (MAC-ELISA or any other immunoassay) in a sample taken after the fifth day of symptom onset is presumptive of recent dengue infection. A single serum in the acute phase is considered presumptive, so it is recommended that a second sample be taken between one and two weeks after the first sample to demonstrate seroconversion (negative to positive) or an increase up to four times the antibody titer (with one quantitative assay).

Cross-reactivity with other flaviviruses (mainly in secondary infections) should be considered in areas where co-circulation with other flaviviruses (e.g., Zika, yellow fever, St. Louis Encephalitis, etc.) is documented and where there is a likelihood that the population has been previously infected.

Therefore, the detection of antibodies for other flaviviruses (e.g., IgM for Zika) by ELISA should be conducted in parallel. A positive result for dengue IgM in the absence of IgM for Zika (negative) is presumptive of dengue infection, while a negative IgM result for dengue with Zika-positive IgM will be presumptive of infection by the latter. However, a positive result for the two assays only indicates a recent flavivirus infection, and therefore, it will not be possible to confirm an etiologic agent. For this reason, results should be analyzed while also considering the clinical characteristics and the epidemiological history of the case.

Rapid tests

Immunochromatography-based rapid tests have been widely used for the diagnosis of dengue. However, in addition to the challenges observed by cross-reactivity, these types of tests have shown low sensitivity so the negative predictive value is very low, and a negative result will not rule out a case. Due to this, implementation and use of these types of tests for public health purposes should be carefully assessed.

Risk Communication

Risk communication and information to the public is essential during outbreaks to reduce adverse impact, decrease domestic breeding sites, and for affected persons to seek timely medical assistance, and therefore prevent severe cases and deaths from dengue. Communication messages should focus on the identification of warning signs and obtaining timely medical assistance.

In addition, communication campaigns should raise public awareness on the importance of vector control interventions at home, identification of febrile cases, and special measures for vector control, specifically the control of intra- and peri-domiciliary breeding sites, and personal protection.

Integrated vector management

The objective of integrated vector management is to improve efficiency and achieve sustainability in vector prevention and control actions, and includes the following:

- Selection of control methods based on knowledge of the biology of the vector, disease transmission, and morbidity.
- Use of multiple interventions, often in combination and in a synergistic and synchronized manner.
- Collaboration of the health sector with other public and private sectors linked to the management of the environment that have work which impacts or could impact reduction of the vector.
- Integration of individuals, families, and other key partners (education, finance, tourism, water and sanitation, and others).
- Establishment of a legal framework that permits an integrated and intersectoral approach.

Given the high infestation by *Aedes aegypti* and the presence of *Aedes albopictus* in the Region, prevention and control measures should be aimed at reducing the density of the vector, with local community acceptance and collaboration in adopting such measures.

Prevention and control measures to be implemented by national authorities should include the following:

- Strengthen environmental management actions, mainly by eliminating vector breeding sites in every home and in common areas of neighborhoods and cities (parks, schools, cemeteries, etc.).
- Organize intensive environmental sanitation campaigns for the elimination of breeding sites in specific areas where routine garbage collection has been interrupted.
- Implement breeding site control measures through the use of physical, biological, and/or chemical methods, with the active involvement of individuals, family members and the community.
- Identify the areas at high-risk of transmission (risk stratification) and prioritize those where there are larger concentrations of people (schools, transportation terminals, hospitals, health centers, etc.). In these areas, the presence of mosquitoes must be removed within a diameter of at least 400 meters. Special attention should be given

to health units, so that these are free of the presence of the vector and its breeding sites so that they do not become points of exposure for the virus.

- In areas where active transmission is detected, it is suggested to use adulticide treatment (mainly through spraying) to remove infected adult mosquitoes in order to stop and interrupt transmission. It is important to take into account that this action is of exceptional nature and only effective when executed by properly trained personnel following internationally accepted technical guidelines and when performed concomitantly to other proposed actions. Spraying and elimination and/or control of vector breeding sites within households is the main action to interrupt transmission when it intensely occurs. The greatest impact for the elimination of infected adult mosquitoes (active transmission) is achieved with intra-domiciliary spraying, using individual equipment.
- Select appropriate insecticides (in accordance with PAHO/WHO recommendations), verify the product formula, and consider the susceptibility of mosquito populations to that insecticide.
- Maintain and use spraying equipment in an appropriate manner and maintain insecticide reserves.
- Ensure intensified monitoring actions (quality control) of field work operators both during larval control and during adulticide treatment (spraying).
- Emphasize integrated (simultaneous or coordinated) actions for vector control, in space and time (adulticidal and larval control by trained personnel, coupled with sanitation and the promotion of community actions), is essential to achieve a greater impact in the shortest time possible.

Personal Prevention Measures

Patients infected with the dengue virus are the reservoir of infection for other people both at home and in the community. Therefore, public health measures to minimize the exposure of patients to mosquitoes are critical in preventing the spread of the virus and, consequently, of the disease.

Patients, other household members, and the affected community must be informed about the risk of transmission to others and ways to minimize this risk by reducing the vector population and human-vector contact.

The following actions are recommended to minimize patient-vector contact:

- The patient must rest under mosquito nets, impregnated, or not, with insecticide.
- The patient, as well as other members of the household, must wear long sleeves (when ill persons are in the house) to cover extremities.
- Repellents containing DEET, IR3535, or Icaridine can be applied to exposed skin or clothing and its use must be in strict accordance with the instructions on the product label.

- Use wire-mesh/mosquito nets on doors and windows.

These personal prevention measures are also effective in preventing the transmission of the virus to healthy people.

Sources of information

1. PAHO / WHO Health Information Platform for the Americas (PLISA). Available at: <https://bit.ly/314Snw4>
2. **Brazil** International Health Regulations (IHR) National Focal Point (NFP) report to PAHO/WHO received by email.
3. **Colombia** International Health Regulations (IHR) National Focal Point (NFP) report to PAHO/WHO received by email.
4. **Guatemala** International Health Regulations (IHR) National Focal Point (NFP) report to PAHO/WHO received by email.
5. **Honduras** International Health Regulations (IHR) National Focal Point (NFP) report to PAHO/WHO received by email.
6. **Nicaragua** International Health Regulations (IHR) National Focal Point (NFP) report to PAHO/WHO received by email.

Bibliography

1. Integrated Management Strategy for Dengue Prevention and Control in Region of the Americas. Washington DC, 2017. Pan American Health Organization – World Health Organization. Available at: <https://bit.ly/2INL7gB>
2. Dengue Guidelines for Patient Care in the Region of the Americas. Second Edition PAHO / WHO. Available at: <https://bit.ly/2U1Pp8t>