Due to the seasonal pattern of dengue, which implies greater transmission during the second half of the year in Central America and the Caribbean, the Pan American Health Organization/ World Health Organization (PAHO/WHO) presents updated Epidemiological Information in the Central American Subregion. It also emphasizes the importance of Member States reviewing and adjusting their preparedness and response plans to deal with outbreaks of dengue and other arboviruses. The goal is to prevent complications and deaths associated with these diseases.

Situation Summary in the Region

Dengue is the arbovirus with the highest number of cases reported in the Region of the Americas, with outbreaks occurring cyclically every 3 to 5 years. The highest number of dengue cases ever recorded was reported in 2019, with more than 3.1 million cases, including 28,203 severe cases and 1,823 deaths.

In 2022, between epidemiological week (EW) 1 and EW 52, 2,811,433 cases[1] of dengue were reported and it was considered to be the third year with the highest registration in the number of dengue cases, only surpassed by the years 2016 and 2019.

In 2023, between EW 1 and EW 28, a total of 3,034,889 cases of dengue were reported, with a cumulative incidence rate of 305 cases per 100,000 population. The highest cumulative incidence rates were observed in the following subregions[1]: The Southern Cone with 863 cases per 100,000 inhabitants, the Andean Subregion with 279 cases per 100,000 inhabitants, and the Central American Isthmus and Mexico with 70 cases per 100,000 inhabitants. This year, of the 3,034,889 reported cases of dengue, 1,367,802 (45%) were laboratory confirmed and 3,709 (0.12%) were classified as severe dengue. The highest number of dengue cases was observed in Brazil with 2,376,522 cases, followed by Peru with 215,786[2] cases (EW 29) and Bolivia with 133,779 cases[1].

Regarding the number of cases of severe dengue reported in 2023, the highest number of cases was observed in the following countries: Brazil with 1,249 cases, Colombia with 822, Peru with 821[2] (to EW 29), Bolivia with 591 and Mexico with 186 cases. Additionally, in the same period, a total of 1,328 deaths were reported in the Region (case fatality rate [CF]: 0.044%).

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[1] Note: the subregions and the corresponding countries and territories follow the divisions described in the Health Information Platform for the Americas (PLISA). Washington, DC: PAHO; 2023 [cited 26 July 2023]. Available from: https://bit.ly/3lGwSwc.

Maintaining the dengue case fatality rate below 0.05% is one of the impact goals in our Region, therefore the timely clinical diagnosis, early identification of warning signs and proper management and treatment of patients is important to avoid serious cases and deaths.

Figure 1. Number of dengue cases in 2022, 2023 (up to EW 28) and average of the last 5 years - Region of the Americas.
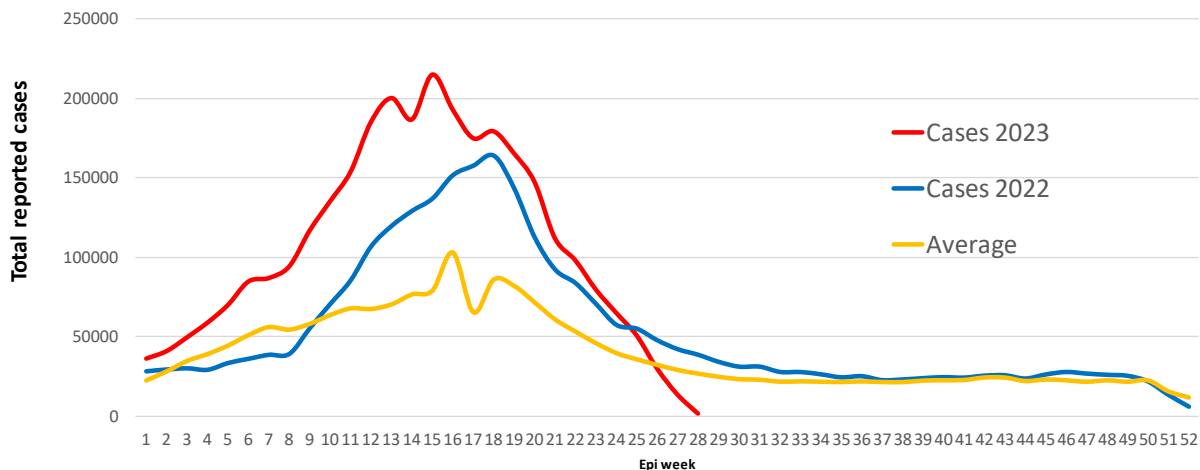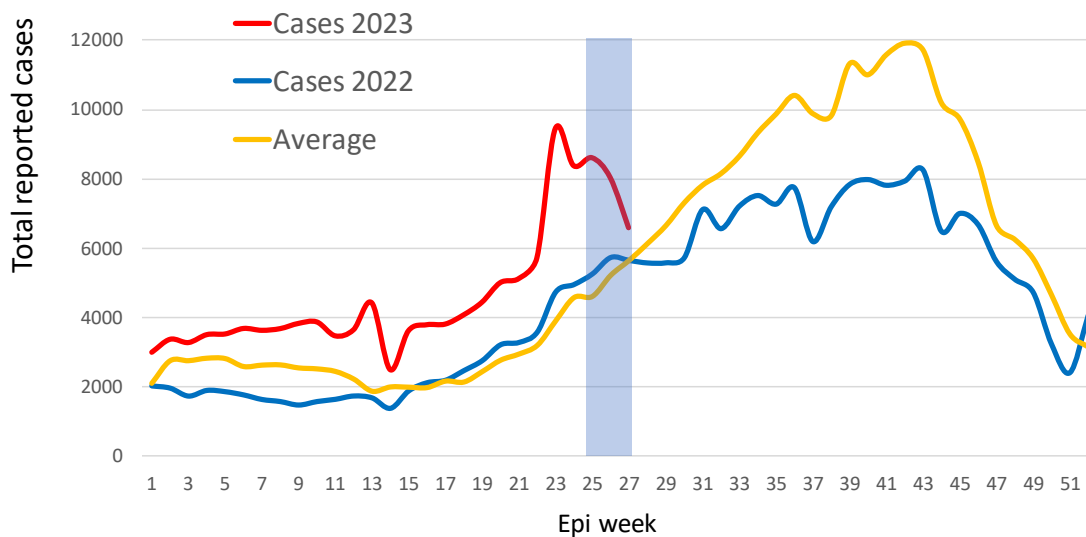

Source: Adapted from Pan American Health Organization. PLISA Health Information Platform for the Americas, Core Indicators Portal. Washington, DC: PAHO; 2023 [cited 26 July 2023]. Available from: https://opendata.paho.org/en

Situation Summary in the Central American Isthmus Subregion and Mexico

In 2023, between EW 1 and EW 28, a total of 127,631 cases of dengue were reported, with a cumulative incidence rate in the sub-region of 69.7 cases per 100,000 inhabitants. The highest cumulative incidence rates were observed in the following countries (1): Nicaragua with 943 cases per 100,000 population, Belize with 79.8 cases per 100,000 population, Panama with 71.2 cases per 100,000 population, and Honduras with 70.9 cases per 100,000 population. This year, of the 127,631 reported dengue cases, 10,861 (8.5%) were laboratory confirmed and 269 (0.21%) were classified as severe dengue. The highest number of dengue cases was observed in Nicaragua with 63,200 cases, followed by Mexico with 41,287 cases and Honduras with 7,138 cases.

Regarding the number of cases of severe dengue reported in 2023, the highest number of cases was observed in the following countries: Mexico with 186 cases, Honduras with 57 cases, Nicaragua with 10 cases, Guatemala with 9 cases and Panama with 7 cases. Additionally, in the same period, a total of 26 deaths were reported in the Region (case fatality rate [CF]: 0.020%).

Figure 2. Dengue cases in 2022, 2023 (up to EW 27) and average of the last 5 years – Central American Isthmus and Mexico.

The four dengue virus serotypes (DENV1, DENV2, DENV3 and DENV4) are present in the Central American and Mexico subregion. In 2023, until EW 28, the simultaneous circulation of all of them has been detected in Costa Rica, Guatemala, Honduras and Mexico; however, in Panama, the serotypes DENV1, DENV2 and DENV3 circulate, and in Nicaragua the serotypes DENV1, DENV3 and DENV4.

During the second semester of 2023, an increase in arboviruses has been observed in some Central American countries due to seasonality and increased rainfall. Consequently, it is important to consider the potential impact on dengue-endemic areas as there has been evidence of an increase in the incidence of this disease which could generate an additional burden of arbovirus-borne diseases for health systems in affected areas. Therefore, it is crucial to take preventive measures and strengthen the preparedness and response of health systems to deal with this epidemiological situation.

The following is a summary of the epidemiological situation of dengue in selected Central American countries and in alphabetical order:

Costa Rica[3]

In 2023, up to EW 27, of the 3,627 reported dengue cases, 483 (13.3%) were laboratory confirmed and there were no cases of severe dengue. The cases registered to EW 27 of 2023 are 23% higher than those in the same period of 2022 (**Figure 3**). In the same period, no deaths were reported.

Figure 3. Dengue cases in 2022, 2023 (up to EW 27) and average of the last 5 years – Costa Rica.
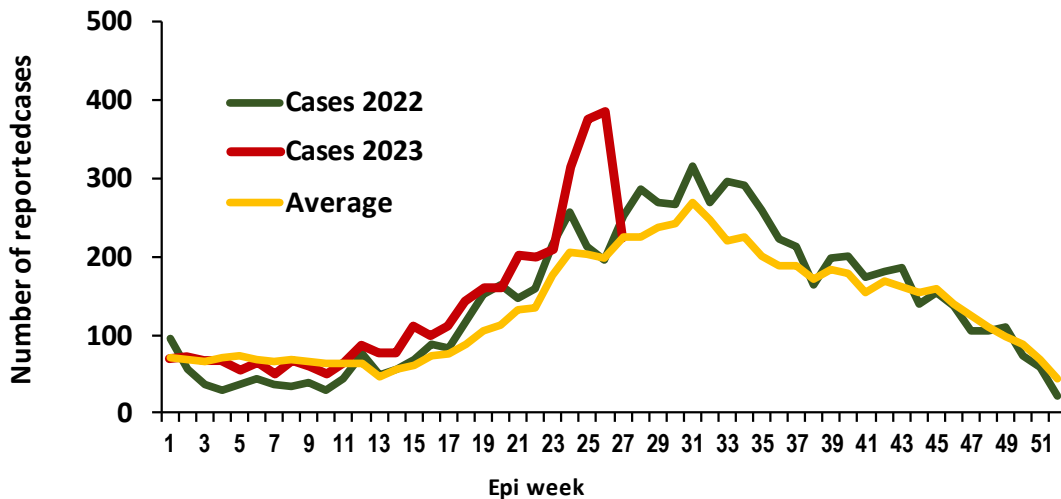
Guatemala[4]

In 2023, up to EW 27, of the 6,013 reported dengue cases, 1,065 (17.7%) were laboratory confirmed and 9 (0.15%) were classified as severe dengue. The cases registered at EW 27 of 2023 are 82% higher than the those in the same period of 2022 and 52% higher compared to the average of the last 5 years (**Figure 4**). In the same period, a total of 8 deaths were reported (case fatality rate: 0.13%).

Figure 4. Dengue cases in 2022, 2023 (up to EW 27) and average of the last 5 years – Guatemala.
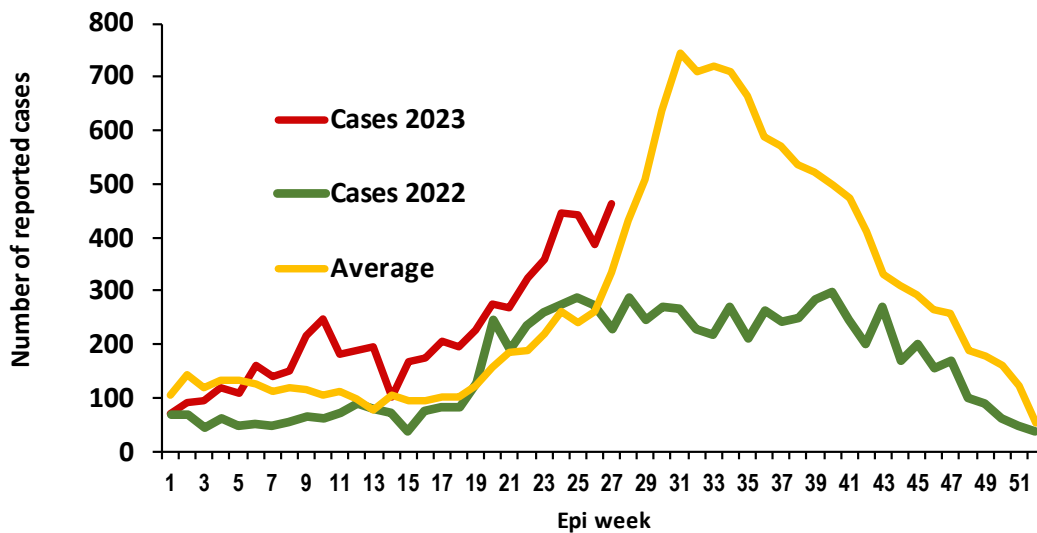
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Mexico[1]

In 2023, up to EW 28, of the 41,287 dengue cases reported, 5,958 (14.4%) were laboratory confirmed and 186 (0.45%) were classified as severe dengue. The cases registered to EW 28 of 2023 are 1.7 times higher than those in the same period of 2022 and 79% higher compared to the average of the last 5 years (**Figure 5**). In the same period, a total of 13 deaths were reported (case fatality rate: 0.033%).

Figure 5. Dengue cases in 2022, 2023 (up to EW 28) and average of the last 5 years – Mexico.
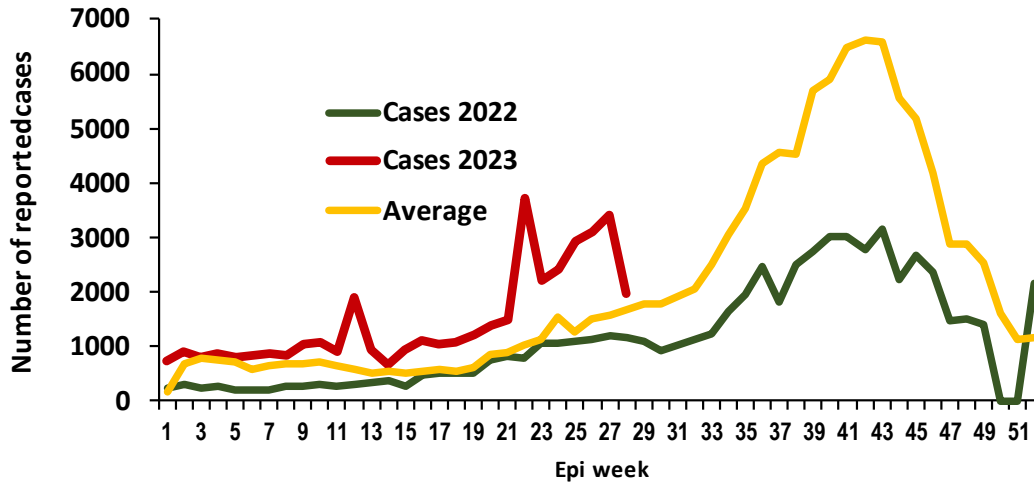

Source: Adapted from Pan American Health Organization. PLISA Health Information Platform for the Americas, Core Indicators Portal. Washington, DC: PAHO; 2023 [cited 26 July 2023]. Available from: https://opendata.paho.org/en

Nicaragua[5]

In 2023, up to EW 29, of the 68,541 dengue cases reported, 1,321 (1.9 3%) were laboratory confirmed and 10 (0.01%) were classified as severe dengue. The cases registered to EW 29 of 2023 are 1.4 times higher than those in the same period of 2022 and 1.2 times higher compared to the average of the last 5 years (**Figure 6**). In the same period, one death was reported (case fatality rate: 0.002%).

Figure 6. Dengue cases in 2022, 2023 (up to EW 27) and average of the last 5 years – Nicaragua.

Source: Adapted from Pan American Health Organization. PLISA Health Information Platform for the Americas, Core Indicators Portal. Washington, DC: PAHO; 2023 [cited 26 July 2023]. Available from: https://opendata.paho.org/en

Panama[6]

In 2023, up to EW 24, of the 3,176 reported dengue cases, 1,338 (42%) were laboratory confirmed, 823 (26%) by epidemiological link, and 7 (0.22%) were classified as severe dengue. The cases registered at EW 24 of 2023 are 54% higher than those in the same period of 2022 and 63% higher compared to the average of the last 5 years (**Figure 7**). In the same period, no deaths were reported.

Figure 7. Dengue cases in 2022, 2023 (up to EW 24) and average of the last 5 years – Panama.
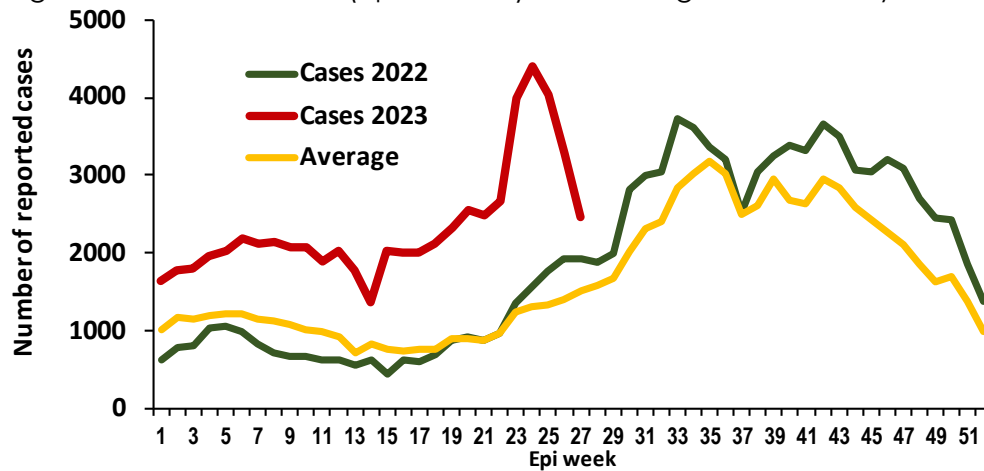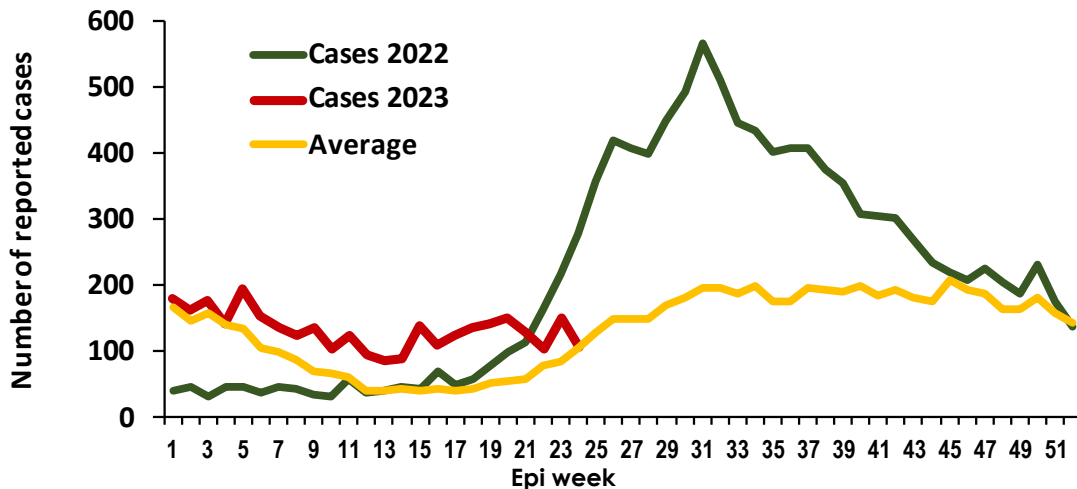

Source: Adapted from Pan American Health Organization. PLISA Health Information Platform for the Americas, Core Indicators Portal. Washington, DC: PAHO; 2023 [cited 26 July 2023]. Available from: https://opendata.paho.org/en

Guidance for national authorities

Given the increase in the number of cases and deaths from dengue and chikungunya registered in countries of the Southern Hemisphere during the seasonal period in the first half of 2023, and given the start of the season of greatest transmission of dengue and other mosquito-borne diseases in the Northern Hemisphere, the Pan American Health Organization/World Health Organization (PAHO/WHO) urges Member States to continue strengthening surveillance, triage, diagnosis, and timely and adequate treatment of cases of dengue, chikungunya, and other arboviruses. Simultaneously, it calls for intensified preparedness actions of health care services to facilitate access and proper management of patients with these diseases.

PAHO/WHO reminds Member States that the same guidance published in the Epidemiological Update of 10 June 2023 on Dengue and Other Arboviruses, is available in Spanish from: https://bit.ly/3dRrUZR.

Adequacy of health-care services

Due to the recent increases in the incidence of dengue in some areas of the Region, Member States are urged to adapt their health care services to provide timely and adequate response to the population at all levels of care.

- Organize in each institution, by levels of care, the screening, patient flow and clinical surveillance and hospitalization areas,

- Reorganize healthcare services in outbreak/epidemic situations at different levels of patient care.

- Strengthen patient care networks in diagnosis, management and follow-up of patients with suspected chikungunya (including the chronic phase of the disease) or dengue.

Integrated Surveillance

PAHO/WHO encourages continued epidemiological surveillance and sharing reports of suspected and confirmed cases of dengue, chikungunya, and Zika.

Given that the clustering of cases is common in both diseases (dengue, chikungunya), efforts should be made to analyze the spatial distribution of cases to allow rapid response at the local level of the most affected areas. Information from dengue and chikungunya hotspots should be directed towards intensive vector control.

Sentinel entomological surveillance assists with assessing changes in the risk of vector-borne diseases and the impact of vector control measures.

Laboratory confirmation

It is important to note that the initial diagnosis of DENV infection is clinical, and proper suspicion may guide the confirmation protocol. However, laboratory results should always be analyzed in conjunction with demographic information and according to epidemiological context, for surveillance purposes and not for clinical decision making.

Laboratory confirmation of dengue infection is based on virological (RT-PCR, NS1 antigen detection, and in some cases viral isolation in culture for further characterization) and serological (IgM and/or IgG detection) tests. However, for the confirmation of cases, virological assays that demonstrate the presence of the complete virus, its genetic material or its proteins should be prioritized. In general, virological assays for dengue are performed on serum samples taken during the first 5 days after symptom onset (acute phase), although highly sensitive molecular methodologies can detect viral RNA for up to 7 days depending on viremia (**Figure 8**).

On the other hand, serological assays based on the detection of IgM (or IgG) should be analyzed carefully, taking into account the time that antibodies circulate in the blood after an infection, as well as the possibility of cross-reaction with other flaviviruses (including Zika, yellow fever and others) and nonspecific detection. Thus, a single IgM result in a patient only indicates a possible recent contact with the virus, but it may have occurred up to 6 months ago. A second

sample taken at least one week apart, processed in parallel with the first and with a quantitative serological assay (PRNT, for example) to demonstrate seroconversion or increase in antibody titer, may be useful to clarify the diagnosis (**Figure 9**).

It is important to have a clear laboratory algorithm that allows early detection. Although multiple molecular methodologies (*multiplex* PCR) are useful when there is no clear clinical suspicion, in a case of dengue that meets the established definitions and where the clinic is compatible, it is suggested to prioritize protocols for specific detection (*singleplex*) of the virus[7].

In fatal cases, tissue samples (liver, spleen, kidney) should be considered both for detection of genetic material (RT-PCR) and for histopathological and immunohistochemical study. Taking biopsies from a patient with suspected dengue is completely contraindicated.

On the other hand, the use of rapid tests (NS1 and/or antibodies) is not recommended since their low sensitivity can lead to false negative results. Its use should be limited to community studies under established protocols, but in no case to rule out infection or to implement medical behaviors.

Since laboratory services are a key component of dengue epidemiological and virological surveillance, timely detection and characterization in appropriate samples should be maintained. Where possible and depending on the capacities of each laboratory, confirmation of all severe and fatal cases of dengue is recommended, while only a proportion (10-20% or a limited number of samples depending on installed capacity) of those cases without warning signs will be necessary for surveillance.

Figure 8. Algorithm for virological testing in suspected cases of dengue, chikungunya and Zika
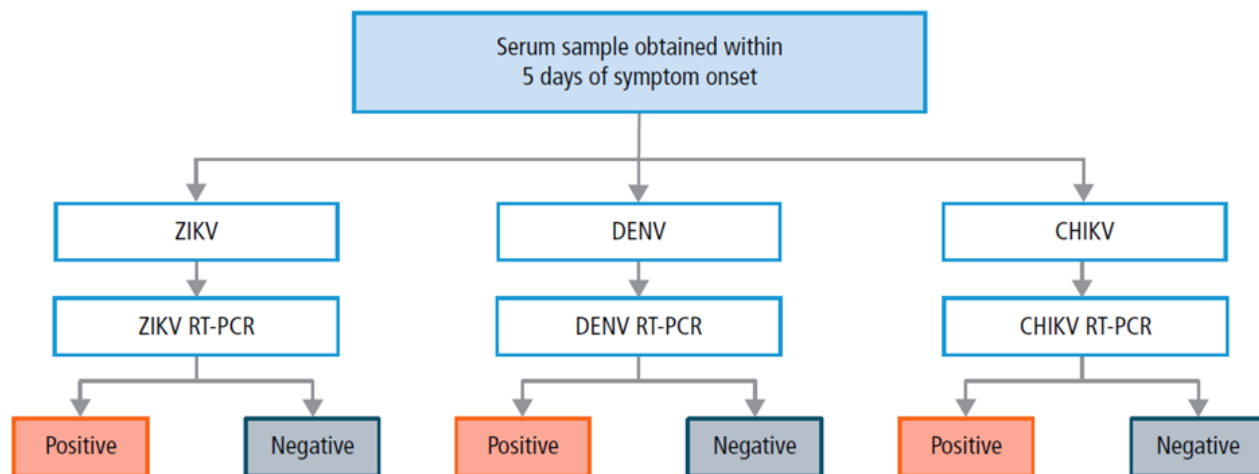
Source: Pan American Health Organization. Recommendations for Laboratory Detection and Diagnosis of Arbovirus Infections in the Region of the Americas. Washington, DC: PAHO; 2023. Available from: https://iris.paho.org/handle/10665.2/57555

Figure 9. Algorithm for serological testing in suspected cases of dengue and Zika
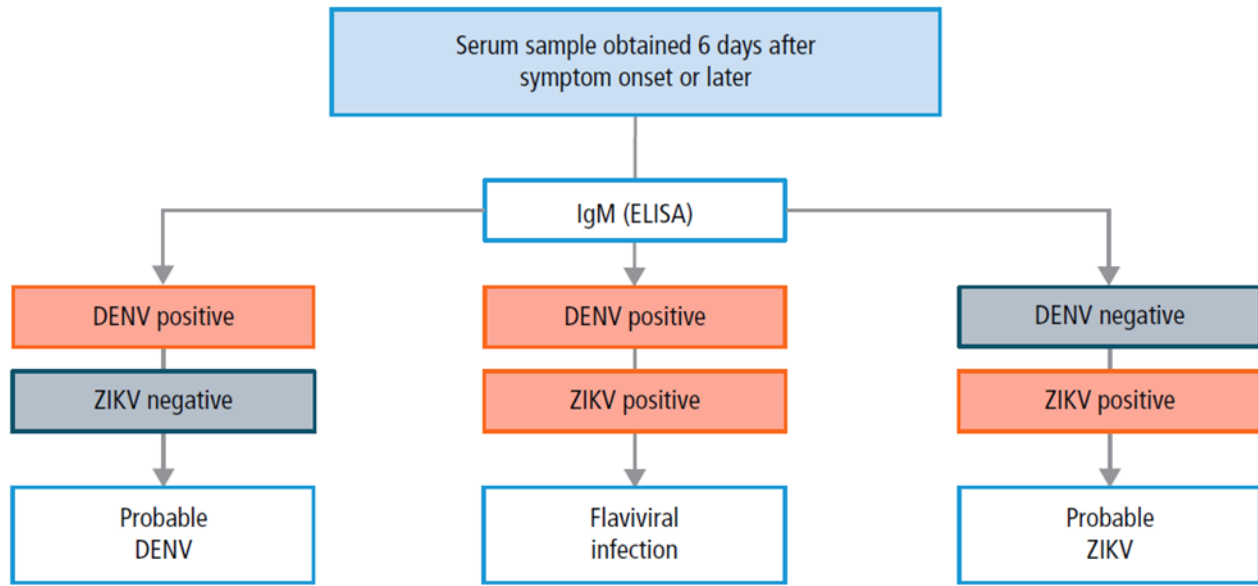
Source: Pan American Health Organization. Recommendations for Laboratory Detection and Diagnosis of Arbovirus Infections in the Region of the Americas. Washington, DC: PAHO; 2023. Available from: https://iris.paho.org/handle/10665.2/57555

Case Management

Measures to ensure proper clinical management of suspected dengue cases should be a priority.

Capacities must be strengthened at the level of primary health care and, from this level, avoid progression to severe forms and deaths from dengue. This requires early clinical diagnosis and recognition of warning signs in dengue (such as severe and sustained abdominal pain or tenderness of the abdomen, persistent vomiting, clinical fluid accumulation, mucosal bleeding, lethargy, restlessness, liver enlargement >2 cm below the costal ridge and enlargement progressive hematocrit) in order to initiate an adequate management according to the recommendations published in the PAHO clinical guidelines. In cases where dengue is suspected, healthcare workers should provide clear guidance to patients and/or families to monitor for warning signs and seek immediate medical attention should they occur. These measures will also help reduce the number of patients who must be referred to hospitals, thus avoiding the saturation of these facilities and intensive care units.

At the same time, all second and third level hospitals must be prepared to handle cases of dengue with warning signs and cases of severe dengue.

More information on the clinical management of dengue cases is available in the Guidelines for the Clinical Diagnosis and Treatment of Dengue, Chikungunya and Zika[8] and the Instrument for the Diagnosis and Care of Patients with Suspected Arbovirus[9], both published by PAHO.

PAHO reiterates the recommendations for technical teams in charge of malaria control, which also apply to personnel involved in arbovirus care, available at: https://bit.ly/3ZucrpK.

Community Involvement

Every effort should be made to gain community support for the prevention of dengue.

Simple Information, Education, and Communication (IEC) materials can be disseminated through various media (including social media).

Household members should be encouraged to eliminate both residential and peri domiciliary. sources of mosquito breeding.

Highly productive mosquito breeding sites, such as water storage containers (drums, raised tanks, clay pots, etc.), must be subject to prevention measures to avoid vector reproduction. Other breeding sites, such as roof gutters and other water retention containers, should also be cleaned periodically.

Local teams often know how to convey this information more effectively, and in many cases national campaigns and messages are not as effective as local initiatives.

Aedes prevention and control measures

PAHO/WHO urges the effective use of available resources to prevent and/or control vector infestation in affected areas and in health services. This will be achieved through the implementation of integrated vector control strategies in emergencies, which include the following processes:

- Selection of control methods based on knowledge of vector biology, disease transmission and morbidity.

- Use of multiple interventions, often in combination and synergistically.

- Collaboration of the health sector with public and private sectors linked to environmental management whose work impacts the reduction of vectors.

- Integration of individuals, families and other key partners (education, finance, tourism, water and sanitation and others) into prevention and control activities.

- Strengthening of the legal framework that allows an integrated and intersectoral approach.

Given the high infestation by *Aedes aegypti* and the presence of *Aedes albopictus* in the Region, it is recommended that prevention and control measures aim to reduce the density of the vector and have the acceptance and collaboration of the local population. Prevention and control measures for implementation by national authorities should include the following:

- Strengthen environmental management actions, mainly the elimination of vector breeding sites in homes and common areas (parks, schools, cemeteries, etc.).

- Reorganize solid waste collection services to support breeding site disposal actions in areas of greatest transmission and, if necessary, plan intensive actions in specific areas where regular garbage collection has been interrupted.

- Apply measures for the control[10] of breeding sites through the use of physical, biological and / or chemical methods, while actively involving individuals, families, and the community.

- Define the high-risk transmission areas (risk stratification[11]) and prioritize those with high concentrations of people (schools, terminals, hospitals, health centers, etc.). In these facilities, the presence of mosquitoes must be eliminated in a diameter of at least 400 meters. It is important to pay special attention to health care units, and to ensure that these are free of the presence of the vector and its breeding sites so that they do not become spreading sources of the virus.

- In areas where active transmission is detected, implementing measures aimed at eliminating infected adult mosquitoes (mainly through the use of insecticides) is suggested in order to stop and cut transmission. This action is of an exceptional nature and is only effective when conducted by well-trained personnel under internationally accepted technical guidelines, and when it is carried out simultaneously with the other proposed actions. The main action to interrupt intensive transmission is the elimination of infested adult mosquitoes (active transmission) through indoor spraying, using individual equipment added to the destruction and/or control of vector breeding sites within households.

- An effective modality of adult control that can be used, considering the available operational capabilities, is indoor residual spraying, which should be applied selectively to the resting places of *Aedes aegypti*, avoiding the contamination of storage containers of water used for drinking or cooking. This intervention preformed in treated areas is effective for a period of up to 4 months; it can be used in shelters, homes, health services, schools and others. For more information, consult the PAHO Manual for applying indoor residual spraying in urban areas for the control of Aedes aegypti[12] and the document Control of *Aedes aegypti* in the scenario of simultaneous transmission of COVID19[13].

- Correctly choose the insecticide to be used (following PAHO/WHO recommendations), regarding its formulation and be aware of which mosquito populations are susceptible to this insecticide[14].

- Guarantee the proper functioning of fumigation equipment and its maintenance and ensure insecticide reserves.

- Intensify the actions of supervision of the operators' field work (quality control) during both the focal treatment and in the adulticide treatment (fumigation), ensuring compliance with personal protection measures.

Personal prevention measures

Patients infected with dengue, chikungunya, and/or Zika virus are the reservoir of infection for others both in their households and in the community. It is necessary to communicate to the sick, their families, and the affected community about the risk of transmission and ways to prevent contagion by decreasing the vector population and contact between the vector and people.

To minimize vector-patient contact it is recommended:

- Patients should rest under mosquito nets, impregnated, or otherwise, with insecticide.
- Patients, as well as other household members, must wear long sleeves (if there are sick people in the house) to cover the extremities.
- Repellents containing DEET, IR3535 or Icaridin, can be applied to exposed skin or clothing, and must be used in strict accordance with the instructions on the product label.
- Use wire-mesh/mosquito nets on doors and windows.

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