

Epidemiological Alert

Dengue

21 November 2018

Following a period of low dengue transmission in the Region of the Americas, an increase in cases has been reported in some countries. With the start of high transmission season for dengue in the Southern Hemisphere, the Pan American Health Organization / World Health Organization (PAHO/WHO) recommends Member States implement preparedness and response actions in order to prevent transmission of dengue as well as deaths due to this disease.

Situation summary in the Americas

In the Region of the Americas, between epidemiological week (EW) 1 and EW 44 of 2018, a total of 446,150 cases of dengue were reported (incidence of 45.9 cases per 100,000 population), including 240 deaths. Of the total cases, 171,123 were laboratory-confirmed and 2,164 (0.49%) were classified as severe dengue.

As of EW 44 of 2018, 13 countries in the Americas reported an increase in cases nationally or in parts of the country (compared to the same period in 2017): Antigua and Barbuda, Argentina, Brazil, Chile, Colombia, El Salvador, Guatemala, Guyana, Honduras, Jamaica, Mexico, Paraguay, and Venezuela. In Peru, though there was a decrease in the number of cases reported at the national level, an increase was observed (compared to 2017) in the departments of Loreto and Madre de Dios.

In 2018, the number of cases reported to date is similar to the total registered in 2017, and if this trend continues, it could exceed the total reported in that year (**Figure 1**).

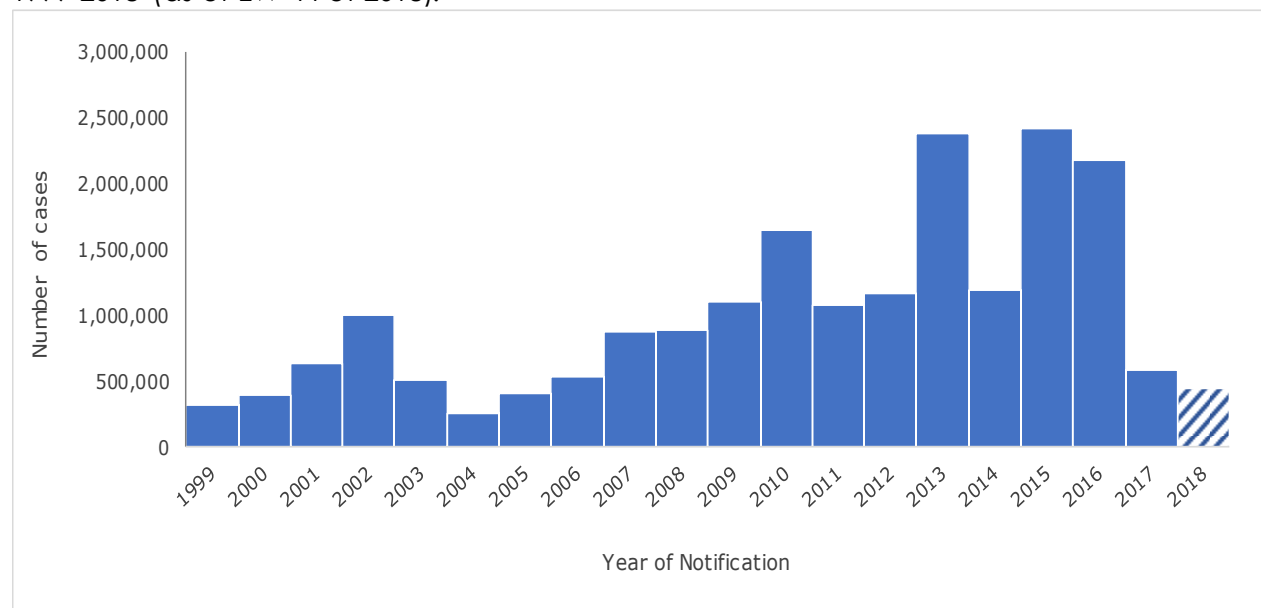
Compared to previous years, the total number of cases reported by the end of 2017 (581,207) was less than that reported in 2016 (2,178,929) and the lowest in the past ten years. However, the proportion of cases of severe dengue reported in 2017 was higher than the two previous years.

The four dengue virus serotypes (DENV 1, DENV 2, DENV 3, and DENV 4) are circulating simultaneously in some countries of the Region, which increases the risk of severe dengue, and therefore, could cause an additional burden on health services.

If timely interventions are not applied to control the vector, *Aedes aegypti*, an increase in cases could be expected in 2019—the magnitude of which will depend on the intensity and effectiveness of the control and prevention measures implemented.

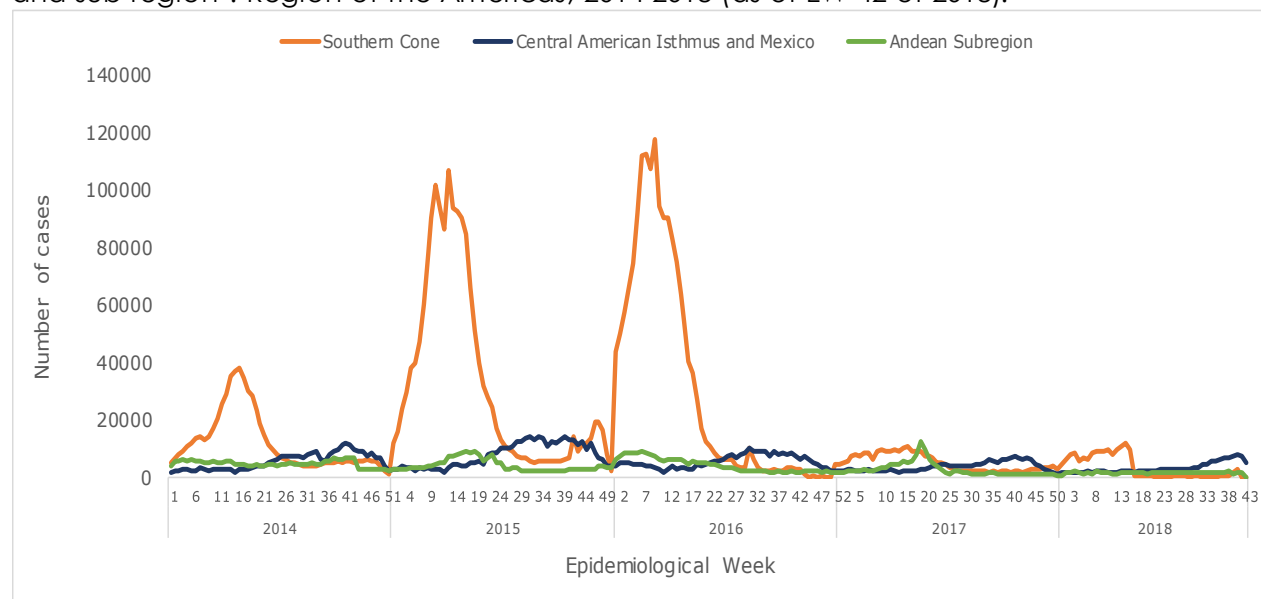
Suggested citation: Pan American Health Organization / World Health Organization. Epidemiological Alert: Dengue. 21 November 2018, Washington, D.C.: PAHO/WHO; 2018

Figure 1. Distribution of reported cases of dengue by year of report. Region of the Americas, 1999-2018 (as of EW 44 of 2018).



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

Figure 2. Distribution of suspected and confirmed dengue cases by epidemiological week and sub-region¹. Region of the Americas, 2014-2018 (as of EW 42 of 2018).



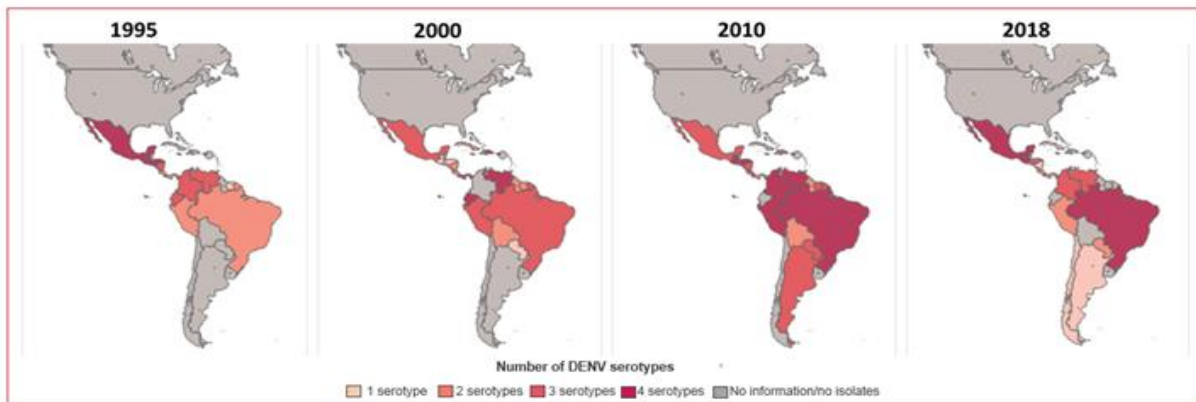
Source: Health Information Platform for the Americas (PLISA, PAHO/WHO) by the Ministries and Institutes of Health of the countries and territories of the Region.

¹ **Central American Isthmus and Mexico:** Belize, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, and Panama.

Andean Subregion: Bolivia, Colombia, Ecuador, Peru, and Venezuela (Bolivarian Republic of).

Southern Cone: Argentina, Brazil, Chile, Paraguay, and Uruguay.

Figure 3. Number of dengue serotypes circulating in countries and territories in the Region of the Americas, 1995-2018 (as of EW 41 of 2018).

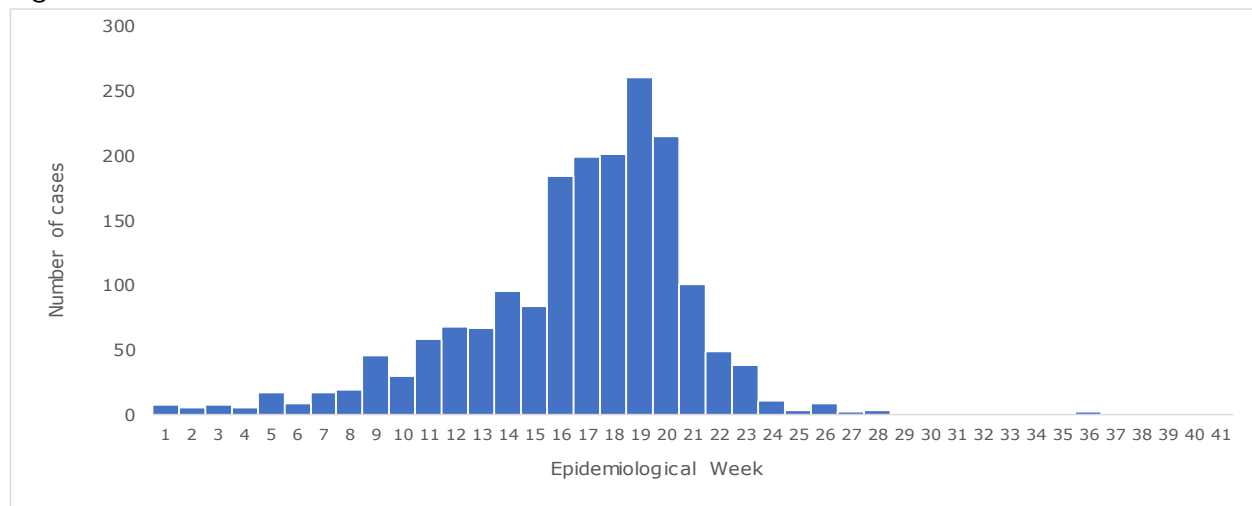


Source: Epidemiological reports sent by the countries to PAHO/WHO.

The following is a summary of the epidemiological situation in select countries. In addition, a summary of the dengue situation in Panama has also been included considering that the country will host a mass gathering event in January 2019, though no increase of dengue cases has been reported.

In **Argentina**, between EW 1 and EW 44 of 2018, a total of 1,808 cases of dengue were reported, of which 1,166 were confirmed. Of the total confirmed cases, 9 (0.8%) were classified as dengue with warning signs, and there were no cases of severe dengue. The epidemiological curve indicates higher incidence between EW 16 and EW 20 of 2018, particularly due to an increase in cases in the provinces of Chaco, Santiago del Estero, Buenos Aires, and the Autonomous City of Buenos Aires. In early 2018, the highest proportion of cases was reported by Formosa Province, and later on by Chaco, Corrientes, and Misiones provinces. By age group, the highest incidence rates were reported for 15 to 24-year-olds followed by 25 to 34-year-olds. No deaths were reported. Circulation of serotype DENV 1 was detected.

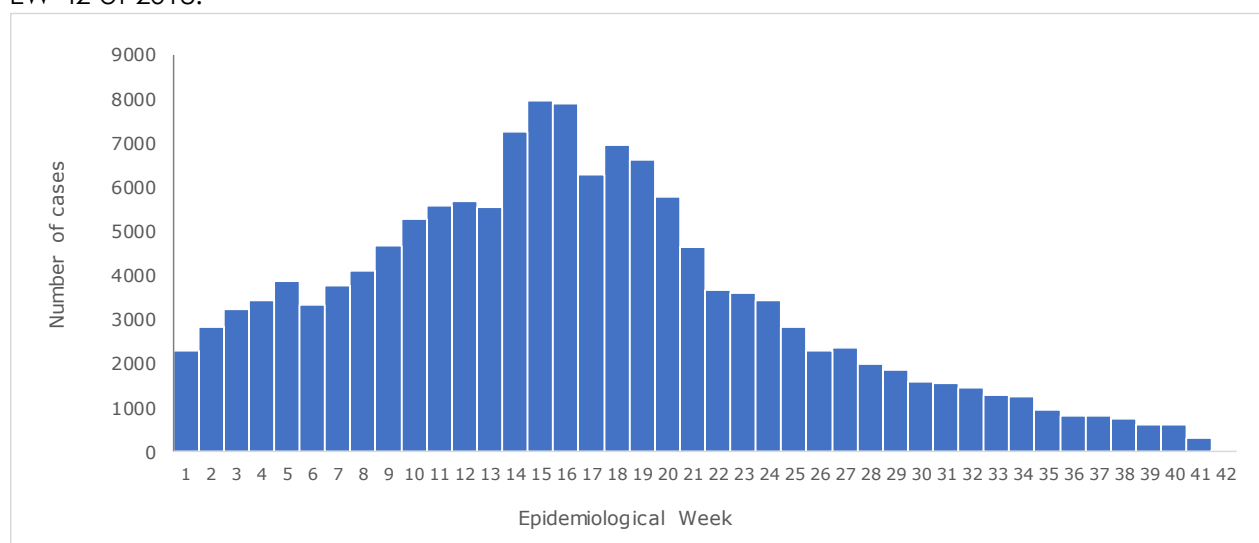
Figure 4. Distribution of confirmed and probable cases of dengue by epidemiological week. Argentina, EW 1 to EW 41 of 2018.



Source: Argentina Ministry of Health and Social Development Weekly Epidemiological Bulletin and reproduced by PAHO/WHO

In **Brazil**, between EW 1 and EW 42 of 2018, a total of 218,337 probable cases of dengue were reported, of which 261 (0.1%) were severe dengue and 2,744 (1.2%) dengue cases with warning signs. A total of 128 dengue deaths were confirmed. Compared to the same period in 2017, there was no increase in the incidence rate of dengue at the national level, though a slight increase was reported at the sub-regional level, in 3 of the 5 sub-regions in the country: Southeast (53.6 cases per 100,000 population in 2017 versus 69.8 cases per 100,000 population in 2018); South (6.9 cases per 100,000 population in 2017 versus 7.8 cases per 100,000 population in 2018); and West Central (453.5 cases per 100,000 population in 2017 versus 492.5 cases per 100,000 population in 2018). By age group, the highest incidence rates were reported among 15 to 19-year-olds (130.5 cases per 100,000 population) and 20 to 29-year-olds (129.7 cases per 100,000 population). The circulating serotypes are DENV 1, DENV 2, DENV 3, and DENV 4.

Figure 5. Distribution of reported cases of dengue by epidemiological week. Brazil, EW 1 to EW 42 of 2018.



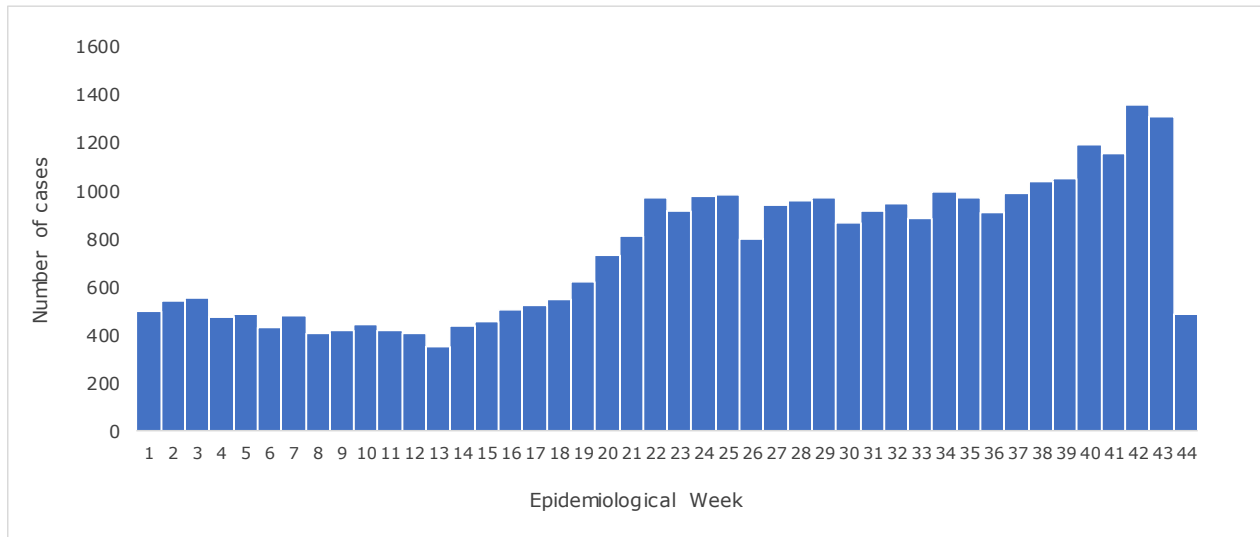
Source: Notification of Injury Information System (SINAN), Brazil Ministry of Health, and reproduced by PAHO/WHO

In **Chile**, an outbreak was reported between EW 14 and EW 18 of 2018 on Easter Island, with a total of 18 laboratory-confirmed cases. There were no cases of severe dengue and no deaths. Circulation of serotype DENV 1 was detected.

In **Colombia**, between EW 1 and EW 44 of 2018, a total of 33,134 cases of dengue were reported through the Public Health Surveillance System (SIVIGILA, per its acronym in Spanish). Of these, 404 (1.2%) were severe dengue cases and 16,547 (49.9%) dengue cases with warning signs. As of EW 44 of 2018, 138 probable deaths due to dengue have been reported, of which 20 have been confirmed for dengue.

Although the epidemiological curve at the national level was below the lowest threshold or within the historical endemic dengue limits (2009-2017), the situation at the sub-national level was different. Of the total 37 territorial entities with risk of transmission, 10 were in the alarm zone and 9 were above expected levels (Norte de Santander, Córdoba, Santa Marta, Magdalena, Arauca, Meta, Putumayo, La Guajira, and Guaviare). Co-circulation of serotypes DENV 1, DENV 2, and DENV 3 has been detected.

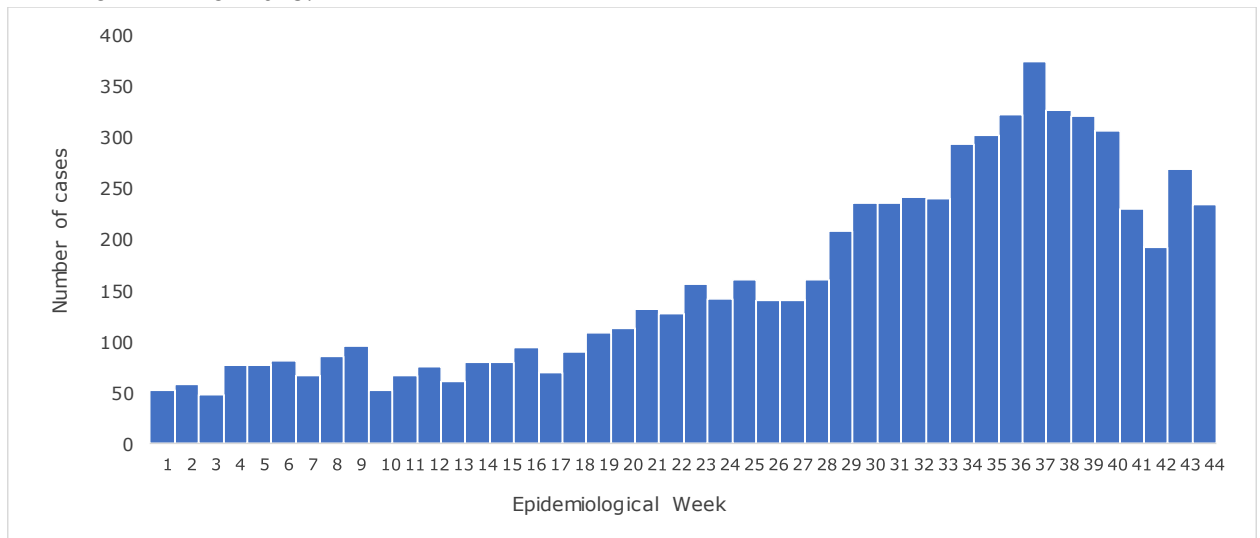
Figure 6. Distribution of reported cases of dengue by epidemiological week. Colombia, EW 1 to EW 44 of 2018.



Source: Colombia National Institute of Health (INS-SIVIGILA), Vector-borne and Zoonosis Disease Team and updated by the Ministry of Health and Social Protection, Directorate of Epidemiology and Demography, and reproduced by PAHO/WHO

In **El Salvador**, between EW 1 and EW 44 of 2018, a total of 377 probable cases of dengue were reported, of which 307 were confirmed; this is higher than that reported during the same period the previous year (140 probable cases and 56 confirmed). Of the total confirmed cases in 2018, 118 (38.4%) were severe dengue cases. By age group, the highest rates among confirmed cases were 5 to 9-year-olds (22 cases per 100,000 population) followed by 1 to 4-year-olds (15 cases per 100,000 population) and <1-year-olds (12.6 cases per 100,000 population). The circulating serotype is DENV 2.

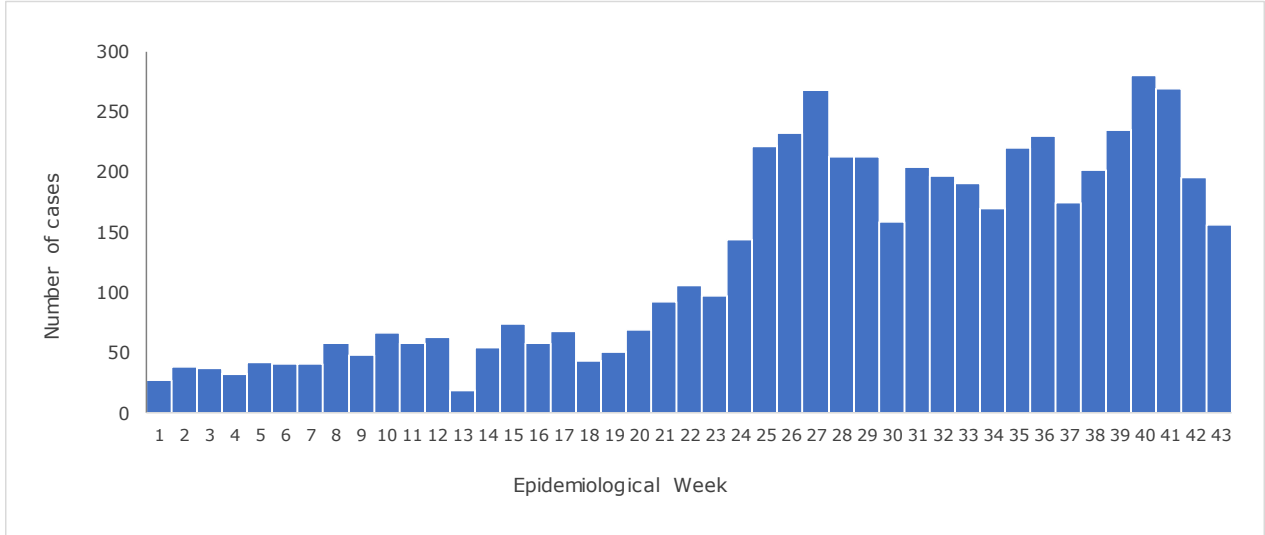
Figure 7. Distribution of suspected cases of dengue by epidemiological week. El Salvador, EW 1 to EW 44 of 2018.



Source: El Salvador Ministry of Health Directorate of Health Surveillance Epidemiological Bulletin EW 44 of 2018 and reproduced by PAHO/WHO

In **Guatemala**, between EW 1 and EW 43 of 2018, a total of 5,449 cases of dengue have been reported, which is an increase compared to the same period in 2017 (3,754 cases). Of the total cases in 2018, 49 (0.9%) were classified as severe dengue. Sixteen dengue deaths were confirmed. The departments which have reported an increase in cases are: Quetzaltenango, Izabal, Escuintla, Retalhuleu, San Marcos, and Suchitupéquez. The highest incidence rates were reported in Quetzaltenango (222 cases per 100,000 population), followed by Izabal (122.6 cases per 100,000 population), Zacapa (107.8 cases per 100,000 population), Escuintla (58.1 cases per 100,000 population), El Progreso (52.5 cases per 100,000 population), and Chiquimula (42.1 cases per 100,000 population). By age group, the highest incidence rates were reported among <10-year-olds (27.3 per 100,000 population), followed by 15 to 19-year-olds (24.1 cases per 100,000 population). The circulation of all four serotypes was detected, with a predominance of serotype DENV 2.

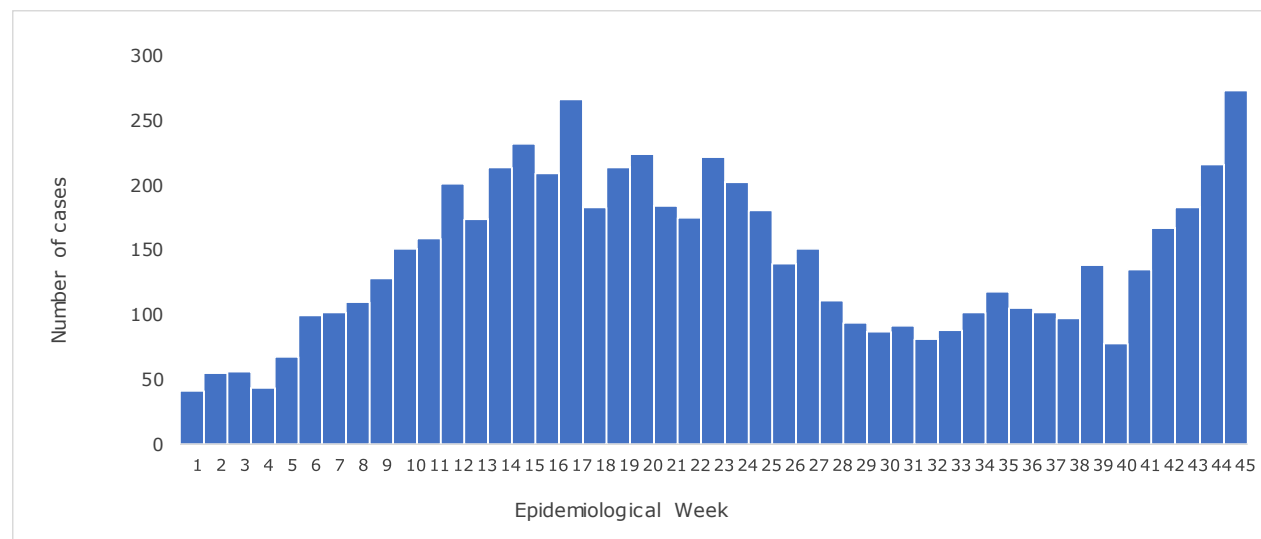
Figure 8. Distribution of reported dengue cases by epidemiological week. Guatemala, EW 1 to EW 43 of 2018.



Source: Guatemala Ministry of Public Health and Social Assistance and reproduced by PAHO/WHO

In **Honduras**, between EW 1 and EW 45 of 2018, a total of 6,442 suspected cases of dengue were reported, including 594 cases of severe dengue (9.2%) and 3 deaths in the Cortes Region. Of the total cases, only 405 cases (6%) underwent laboratory testing, of which 80 (20%) were positive. Between EW 12 and EW 20 of 2018, the epidemiological curve of cases at the national level was in the alarm zone of the endemic dengue limits. At the regional level, there were fluctuations between the alarm and epidemic zones in Colón, Comayagua, Cortes, and Valle, with Comayagua remaining in the epidemic zone for 6 consecutive weeks (between EW 15 and EW 20). More recently, Cortes has been in the epidemic zone (since EW 43). Co-circulation of serotypes DENV 1, DENV 2, and DENV 3 was detected, with a predominance of DENV 2.

Figure 9. Distribution of suspected dengue cases by epidemiological week. Honduras, EW 1 to EW 45 of 2018.



Source: Daily Alert-Response Bulletin–Weekly Epidemiological Telegram, Health Surveillance Unit, Honduras Secretary of Health, and reproduced by PAHO/WHO

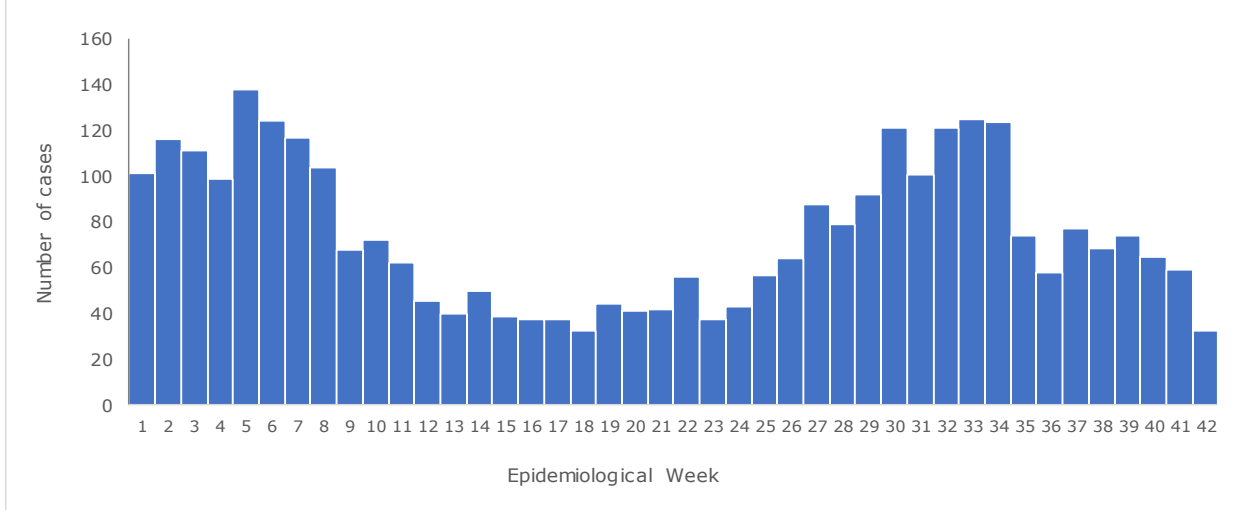
In **Jamaica**, between EW 1 and EW 42 of 2018, a total of 296 suspected cases of dengue were reported, compared to 119 reported by the end of 2017. Of the total cases in 2018, 4 have been laboratory-confirmed compared to only one laboratory-confirmed case in 2017. Two of the 4 confirmed cases in 2018 were severe dengue, and DENV 3 was identified for all 4 cases. Though there has been an increase in cases compared to 2017, the number of suspected cases in 2018 has been below the monthly average as well as the alert and epidemic thresholds.

In **Mexico**, between EW 1 and 44 of 2018, a total of 62,404 probable dengue cases were reported, which is lower than that reported during the same period in 2017 (72,756 cases). However, the number of probable cases reported in Chiapas, Veracruz, Jalisco, San Luis Potosi, Oaxaca, Baja California Sur, Quintana Roo, Sinaloa, and Mexico City exceeds the number of cases reported in those states during the same period in 2017. Chiapas has reported the highest incidence rate (54.80 cases per 100,000 population); as of EW 44 of 2018, a total of 9,461 probable cases of dengue have been reported, of which 2,984 were laboratory-confirmed including 409 severe dengue cases and 28 deaths. Moreover, the incidence rate in Chiapas 7.4 times the national rate (7.4 cases per 100,000 population). In Chiapas and Veracruz states, the co-circulation of all four serotypes DENV 1, DENV 2, DENV 3, and DENV 4 has been reported, though DENV 2 is the predominant serotype in Chiapas while DENV 1 is predominant in Veracruz. In Chiapas, the highest proportion of cases is among pre-school and school-aged children, with the highest incidence rate being among 5 to 9-year-olds.

In **Panama**, between EW 1 and EW 42 of 2018, a total of 3,110 cases of dengue were reported, of which 5 (0.2%) were severe dengue and 227 were cases with warning signs. Three deaths due to dengue were confirmed. The epidemiological curve indicates a continued increase in cases from EW 24 to EW 34, with fluctuations between the alert and baseline zones. Compared with the previous three years (2015-2017), there was a slight decrease in the total number of cases; however, there was an increase in cases between EW 4 and EW 18. By age group, the highest incidence rates were reported among 15 to 19-

year-olds (101 cases per 100,000 population), followed by 20 to 24-year-olds (88.8 per 100,000 population). Circulation of DENV 1 was detected in 13 of the 15 health regions and DENV 2 was detected in 5 of the 15 health regions.

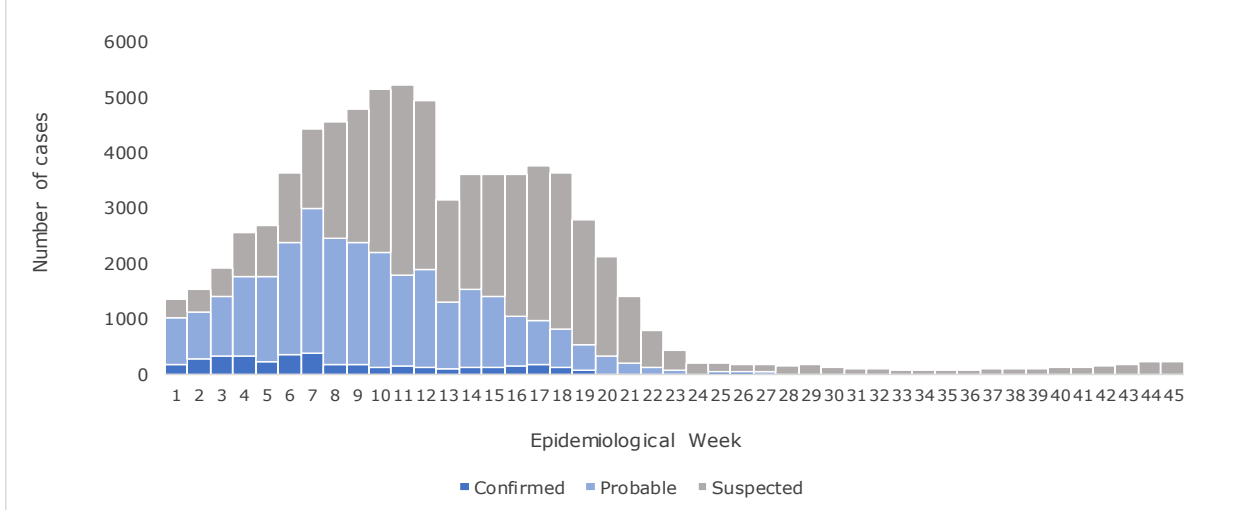
Figure 10. Distribution of confirmed dengue cases by epidemiological week. Panama, EW 1 to EW 42 of 2018.



Source: Dengue Epidemiological Bulletin No. 42, Panama Ministry of Health, and reproduced by PAHO/WHO

In **Paraguay**, between EW 1 and EW 45 of 2018, a total of 31,163 suspected cases of dengue were reported, of which 3,414 were laboratory-confirmed and 27,749 were probable; this is higher than that reported during the same period in 2017 (345 confirmed and 1,612 probable). During 2018, 31 cases were admitted to the intensive care unit (ICU), and there have been 15 deaths. Between EW 6 and 18 of 2018, there was an increase in cases. By age group, the highest cumulative incidence rates were reported among 20 to 39-year-olds, followed by 5 to 14-year-olds. Circulation of DENV 1 was detected in all departments, with co-circulation of DENV 1 and DENV 4 detected in Alto Paraná, Central, and Guairá departments.

Figure 11. Distribution of confirmed, probable, and suspected cases of dengue by epidemiological week. Paraguay, EW 1 to EW 45 of 2018.

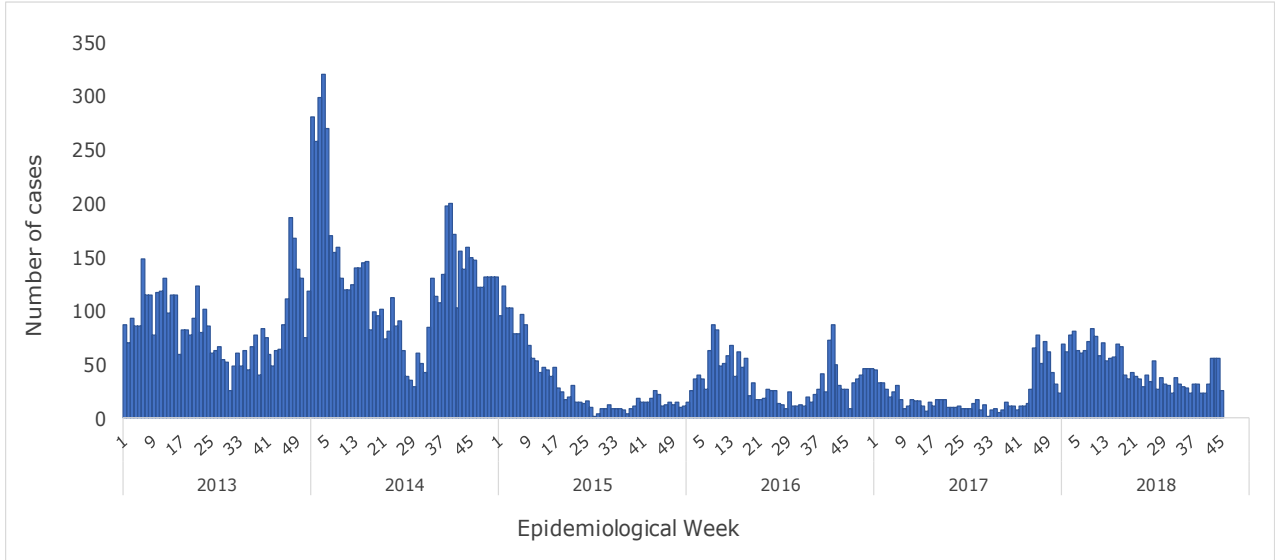


Source: Paraguay Ministry of Public Health and Social Welfare and reproduced by PAHO/WHO

In **Peru**, between EW 1 and EW 44 of 2018, a total of 6,404 cases of dengue were reported, of which 63 (1%) were severe dengue cases, 1,089 (17%) were classified as cases with warning signs, and 16 were fatal (14 laboratory-confirmed for dengue and 2 classified as probable). Although the number of cases at the national level is much lower than that reported during the same period in 2017 (68,171 cases), an increase in cases was observed in two departments, Loreto and Madre de Dios, compared to the same period in 2017. In Loreto, the number of cases exceeds that reported in the previous three years (2015-2017), and in Madre de Dios, the number of cases exceeds that reported in the previous four years (2014-2017).

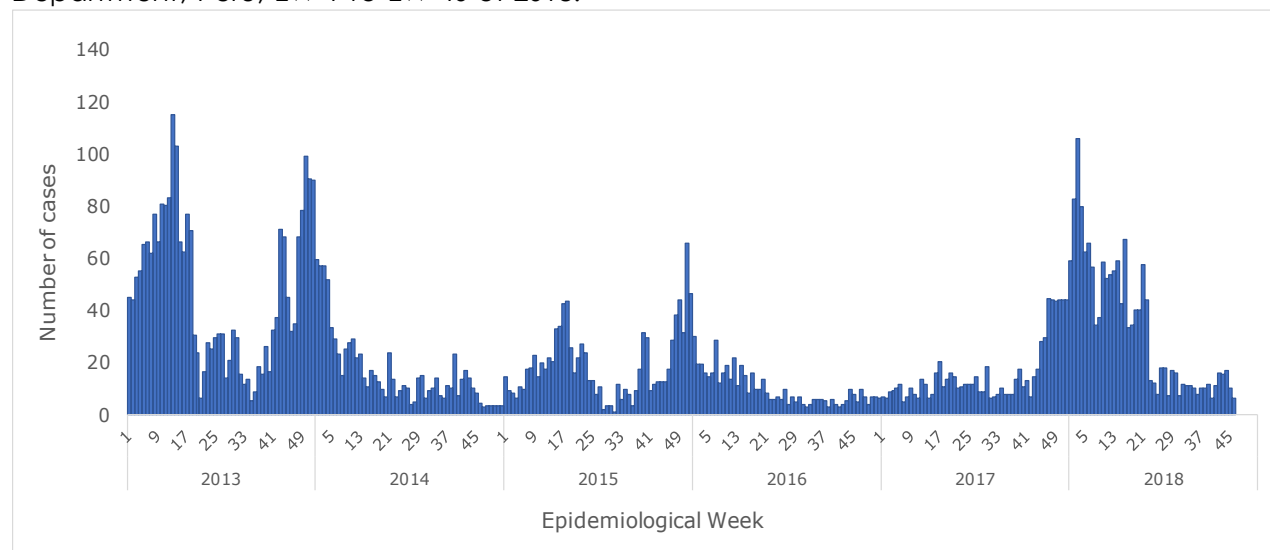
In 2018, the highest incidence rates (cases per 100,000 population) have been reported in Loreto (172.5), Madre de Dios (843), Piura (59.9), Tumbes (299.1), and Ucayali (63) departments. By age, 35.7% of the cases were reported among 30 to 59-year-olds and 24.48% among 18 to 29-year-olds, though the cumulative incidence rates were higher among 12 to 17-year-olds (14.5) and 18 to 29-year-olds (23.3). Serotypes DENV 2 and DENV 3 (predominantly DENV 2) were detected on the northern coast, and serotypes DENV 2 and DENV 4 were detected in the jungle (serotype DENV 4 in Madre de Dios).

Figure 12.a. Distribution of notified dengue cases by epidemiological week. Loreto Department, Peru, EW 1 to EW 40 of 2018.



Source: Situation Room for the analysis of the health situation, EW 40 of 2018, National Center for Epidemiology, Prevention and Control of Diseases, Peru Ministry of Health, and reproduced by PAHO/WHO

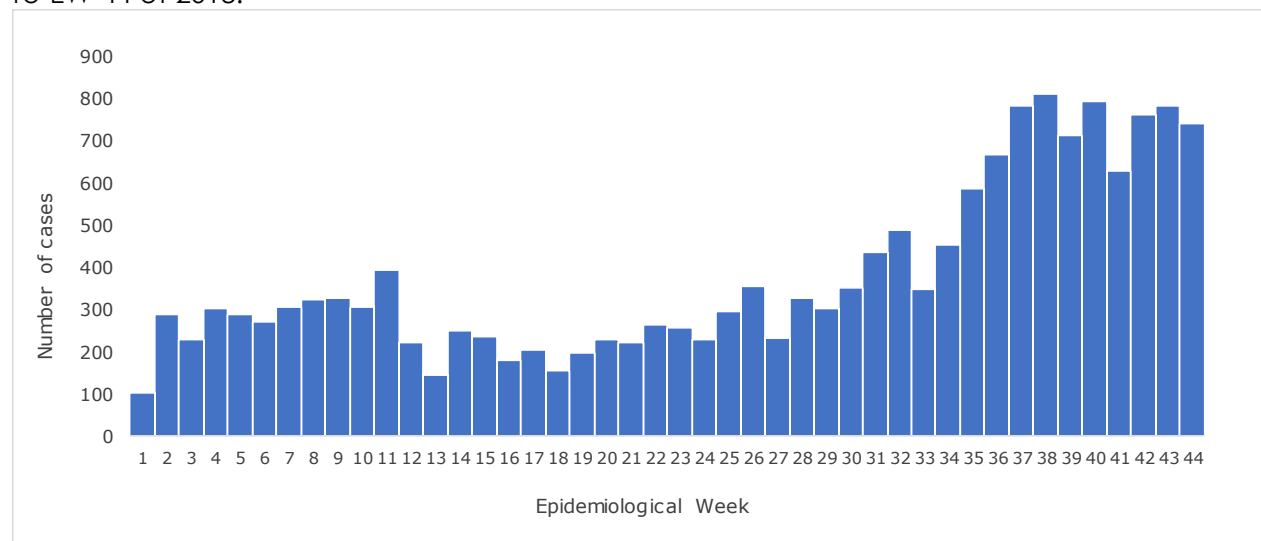
Figure 12.b. Distribution of notified dengue cases by epidemiological week. Madre de Dios Department, Peru, EW 1 to EW 40 of 2018.



Source: Situation Room for the analysis of the health situation, EW 40 of 2018, National Center for Epidemiology, Prevention and Control of Diseases, Peru Ministry of Health, and reproduced by PAHO/WHO

In **Venezuela**, between EW 1 and EW 44 of 2018, a total of 14,166 probable cases of dengue were notified, of which 1,871 were confirmed and 77 (0.5%) were classified as severe dengue. These data demonstrate an increase compared to that reported during the same period in 2016 and 2017. Nationally, there were 13 deaths due to dengue. During 2018, all federal entities in the country have reported cases, with incidence rates ranging from 6 to 192 cases per 100,000 population (in Portuguesa and Delta Amacuro, respectively). Between EW 2 and EW 11 of 2018, an initial increase in cases was observed and, since EW 20, the increase in cases has been maintained, with an average of 612 cases reported weekly between EW 33 and EW 44. Circulation of serotypes DENV 1, DENV 2, and DENV 3 were detected. All age groups have been affected, particularly those <15-year-old.

Figure 13. Distribution of reported dengue cases by epidemiological week. Venezuela, EW 1 to EW 44 of 2018.



Source: Venezuela Ministry of the Popular Power for Health and reproduced by PAHO / WHO

Advice to national authorities

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

Outbreak preparedness and response

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

- intensify surveillance of the disease, 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;
- involve the community in prevention and control activities;
- ensure outbreak response performance is monitored and documented; and
- adapt risk communication according to the epidemiological scenario.

In countries with the presence of dengue vectors, but without dengue virus circulation, the preparation and response plans should focus on strategies to reduce transmission risks. Rapid investigation of any clinically compatible case should be made and laboratory confirmation for the presence of dengue virus should be conducted.

Case management

The disease caused by dengue virus is systemic and dynamic; infection can occur asymptotically or involve a broad spectrum of clinical manifestations, ranging from mild to severe forms that lead to death if the patient does not receive timely and appropriate treatment.

While the manifestations of the disease are complex, their treatment could be simple, inexpensive, and very effective in saving lives, if timely and adequate clinical management is provided. Early recognition of the warning signs in the different phases of the disease is critical to enable adequate clinical management and a positive outcome. This is particularly important in the treatment of plasma loss with oral or intravenous hydration.

When there is doubt about the clinical diagnosis among dengue, chikungunya, or Zika, patients (particularly children) should be managed as a case of dengue and monitored daily in order to detect warning signs of severe dengue, especially during the critical phase of the disease².

² PAHO/WHO Dengue Guidelines for Patient Care in the Region of the Americas, 2nd Edition, 2016. Available at: <http://iris.paho.org/xmlui/handle/123456789/31207>

As part of patient care, healthcare providers should complete the notification form for any suspected case and request a diagnostic test for dengue for epidemiological surveillance purposes, prioritizing cases with warning signs and severe dengue.

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

Organization of healthcare services and referral of patients

Referral and counter-referral systems between the different levels of healthcare services should be established. The healthcare network should consider expanding health services if there is an increase in cases.

Emergency services, at any level of care, must have qualified health personnel for triage of cases upon arrival to ensure that severe cases or cases with warning signs are addressed immediately. A delay in medical care for these cases is often the determining cause of death.

Healthcare services should be organized so that once patients with warning signs or severe dengue are stabilized, they can be transferred immediately to a higher level of care. In addition, it is recommended that patients with specialized medical care needs, co-morbidity, pregnant women, concomitant conditions, or persons whose social situation makes it difficult to access the necessary care (examples: people who live in remote places, refugees, displaced persons, among others) are admitted to an observation room to guarantee monitoring by health personnel.

Training is a key element for all aspects of dengue case management, but especially for all medical and non-medical personnel involved in the clinical management of dengue from primary to secondary and tertiary levels. When planning the frequency of such training, factors such as staff turnover and cohorts of newly graduated physicians should be considered (see PAHO/WHO Dengue Guidelines for Patient Care in the Region of the Americas, 2nd Edition, 2016).

Laboratory diagnosis

The diagnosis and etiological confirmation of dengue infections 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 could be detected by 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 done 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 additional characterization to complement public health surveillance.

- *Protein NS1*: The nonstructural protein 1 (NS1) of the dengue virus can be detected by the 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 likely to be 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, 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 preserved in refrigeration) or preserved in paraffin, can also be used for the confirmation of fatal case associated with dengue or to conduct the differential diagnosis.

Serological diagnosis

A positive IgM result using the ELISA technique (MAC-ELISA or any other immunoassay) in a sample taken after the sixth 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 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 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 for dengue infection, while a negative IgM result for dengue with Zika-positive IgM will be presumptive for infection by the latter. However, a positive result for the two viruses indicates a recent flavivirus infection, and therefore, it will not be possible to confirm an etiologic agent. For this reason, obtained results should be analyzed, taking into account the clinical characteristics and the epidemiological context 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 the 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; vector control measures, specifically 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 current knowledge of the biology of the vector, transmission of disease, 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, whose work impacts or could have an impact on the 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 and adopting such measures through community acceptance and collaboration.

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

- Strengthen environmental management by eliminating vector breeding sites in every home and in common areas of neighborhoods and cities (parks, schools, cemeteries, etc.).
- Organize mass 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 community involvement.
- Identify the areas of high risk of transmission (risk stratification) and prioritize those where there are concentrations of people (e.g., schools, transportation terminals, hospitals, health centers, etc.).
- The presence of the mosquitoes must be removed in a diameter of at least 400 meters around. Special attention should be given to health units, so that these are free of the presence of the vector and its breeding places so that they do not become irradiating points of 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 interrupt transmission. It is important to take into account that this action is exceptional and is only effective when executed by properly trained personnel following internationally accepted technical guidelines and when performed concomitantly to other proposed actions. Spraying is the main action to interrupt transmission when it intensely occurs and facilitates gaining time to consolidate the actions to eliminate physical breeding sites. The greatest impact is achieved with intra-domiciliary spraying, using individual equipment.
- Select appropriate insecticide (in accordance with PAHO/WHO recommendations), verify the product label and 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 (e.g., quality control) of field work operators both during larval control and during adulticide treatment (spraying).
- Integrated (simultaneous or coordinated) actions for vector control, in space and time, (e.g., adulticidal and larval control by trained personnel, coupled sanitation and the promotion of community actions), is essential to achieve a greater impact and in the shortest amount of time.

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 / disease.

Patients, their household members, and other affected community members 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 to cover extremities, while the patient is at home.
- Apply repellents containing DEET, IR3535, or Icaridine to exposed skin or clothing; 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/2Pes0li>
2. Argentina Ministry of Health and Social Development. Integrated Surveillance Bulletin Number 425, epidemiological week 44, November 2018. Available at: <https://bit.ly/2J9XALq>
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