

Epidemiological Alerts and Updates

Annual Report 2016



Pan American
Health
Organization



World Health
Organization

REGIONAL OFFICE FOR THE Americas

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Table of Contents

Page

Acronyms and abbreviations	5
Introduction	7
Zika virus infection	9
Incidence and trends	9
Zika virus sexual transmission	20
Zika virus infection in pregnant women	21
Congenital syndrome associated with Zika virus infection	24
Guillain-Barré syndrome and other neurological manifestations	29
Surveillance of acute flaccid paralysis	35
Dissemination of new findings	36
Recommendations to Public Health Authorities	40
· Surveillance guide for Zika virus disease and complications	40
· Serological diagnosis of Zika virus infection guidelines	40
Influenza activity in the 2015-2016 season	43
Cholera	45
Yellow fever	49
Enterobacteria with transferable resistance to colistin	59
<i>Candida auris</i> outbreaks in health care services	63
Diphtheria	63
Annexes	69
Annex 1. Epidemiological alerts and updates published in 2016	
Annex 2. Epidemiological calendar 2016	
Annex 3. Cumulative cases of Zika virus infection and congenital syndrome associated with Zika virus, through 29 December 2016*	



Acronyms and abbreviations

AFP	acute flaccid paralysis
ARI	acute respiratory infection
CDC	Centers for Disease Control and Prevention of the United States
CHIKV	chikungunya virus
CNS	central nervous system
ELISA	enzymatic immunoabsorption test
EW	epidemiological week
FIOCRUZ	Foundation Oswaldo Cruz
IHR	International Health Regulations (2005)
ILI	influenza-like illness
IMS	Integrated Management Strategy
INVS	French Institute for Public Health Surveillance
IVM	Integrated Vector Management
PAHO	Pan American Health Organization
PRNT	plaque reduction neutralization test
RT-PCR	reverse transcription polymerase chain reaction
SD	standard deviation
WHO	World Health Organization
ZIKV	Zika virus



Introduction

The Annual Report on Epidemiological Alerts and Updates is a compendium of alerts issued during the year on events relevant to international public health in the Region of the Americas.

In 2016, the spread of Zika virus (ZIKV) in the Americas was the public health event that demanded the greatest amount of surveillance and control resources from the Pan American Health Organization / World Health Organization (PAHO/WHO), given its function as the Americas Regional Contact Point under the International Health Regulations (IHR).

Between January and December 2016, PAHO/WHO published 35 epidemiological updates on the autochthonous transmission of ZIKV and its complications in countries and territories of the Region. Between 17 February and 14 July, updates on Zika were issued weekly (21 updates). Since then and up to 29 December, 12 biweekly updates were published.

In addition to providing data on incidence and trends, up-to-date information was provided on Zika congenital syndrome, Guillain-Barré syndrome (GBS), and other neurological manifestations associated with ZIKV infection.

Based on the International Health Regulations (IHR) (2005), countries continued to report these and other public health emergencies of potential international concern. In total, 238 public health events were evaluated and monitored. Following a risk assessment, 143 of those were deemed of potential international concern. Those events occurred in 43 Member States and territories.

In 2016, a total of 51 alerts and epidemiological updates (Annex 1) were published. In addition to those related to ZIKV infection, PAHO/WHO monitored a cholera outbreak in Haiti, and reported cases of yellow fever. Recommendations were issued to Member States on seasonal influenza outbreaks; cases of infection with enterobacteria with transferable resistance to colistin; infection by strains of *Candida auris* in health care services, and diphtheria. This annual report summarizes the alerts and epidemiological updates of 2016. Annex 2 presents the epidemiological calendar, while the table in Annex 3 provides the number of reported cases of ZIKV infection and associated syndromes.

PAHO/WHO acknowledges and appreciates the contributions of all Member States to regional and global surveillance, and reiterates its request that all events that can endanger international public health be timely reported.

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Zika virus infection

Incidence and trends

Between January and December 2016, PAHO/WHO published 35 epidemiological updates on the transmission of Zika virus (ZIKV) in countries and territories of the Americas. Between 17 February and 14 July, updates were issued weekly (21 updates). Since then and up to 29 December, 12 biweekly updates were published. The following is a summary of their contents, by date of publication.

17 January 2016

In light of the increase in the number of cases of birth defects, Guillain-Barré syndrome (GBS), and other neurological manifestations in areas of ZIKV circulation, PAHO/WHO recommended that Member States establish and maintain the capacity to detect and confirm cases of ZIKV infection; prepare health services to respond to a potential increase in demand for specialized care services for patients with neurological syndromes; and strengthen outpatient and prenatal services. The Organization urged countries to maintain interventions to reduce the presence of the mosquito vector, through effective vector control activities, and communication strategies.

The first autochthonous circulation of ZIKV in the Americas was confirmed in February 2014, in Easter Island, Chile. Cases were reported on the island through June 2014. From February 2014 to 17 January 2016, 18 countries and territories of the Region confirmed indigenous circulation of ZIKV. Table 1 provides the distribution of countries reporting cases, by week of report.

Table 1. Countries reporting ZIKV infection cases, by week of epidemiological report.

Date of notification to PAHO/WHO	Countries with autochthonous vector-borne ZIKV transmission	Cumulative number of countries to date
March 2014	Chile: first autochthonous case detected in Easter Island	1
April 2014 to 16 February 2016	Aruba, Barbados, Bolivia (Plurinational State of), Bonaire, Sint Eustatius and Saba, Brazil, Colombia, Costa Rica, Curaçao, the Dominican Republic, Ecuador, El Salvador, Guadeloupe, Guatemala, French Guiana, Guyana, Haiti, Honduras, Jamaica, Martinique, Mexico, Nicaragua, Panama, Paraguay, Puerto Rico, San Martin (France), Suriname, Venezuela (Bolivarian Republic of), the United States Virgin Islands	28

Date of notification to PAHO/WHO	Countries with autochthonous vector-borne ZIKV transmission	Cumulative number of countries to date
18 February 2016	Trinidad and Tobago	29
25 February 2016	Saint Vincent and the Grenadines, Sint Maarten (the Netherlands)	31
15 March 2016	Dominica	32
16 March 2016	Cuba	33
7 April 2016	Saint Lucia	34
29 April 2016	Peru, Saint Barthélemy	36
5 May 2016	Grenada	37
16 May 2016	Belize	38
18 May 2016	Argentina	39
20 June 2016	Anguilla	40
7 July 2016*	Canada, the United States of America	*
25 July 2016	Antigua and Barbuda	41
26 July 2016	Turks and Caicos Islands	42
29 July 2016	the United States	43
10 August 2016	the Bahamas, the Cayman Islands	45
26 August 2016	the British Virgin Islands	46
15 September 2016	Saint Kitts and Nevis	47
4 November 2016	Montserrat	48

* First reports of sexually transmitted cases.

17 and 24 February 2016

As of this date, 29 countries and territories had reported local transmission of ZIKV. In the epidemiological update published on 24 February 2016, the evolution of the ZIKV outbreak in 2015-2016 and that of chikungunya in 2014-2015 were compared. The analysis showed that, following the detection of the ZIKV outbreak in Brazil, notifications regarding transmission of the virus had increased in the Region's continental platform, while only a few countries or island territories in the Caribbean had detected autochthonous ZIKV cases. This was the opposite of what had been observed during the chikungunya outbreak in 2014-2015.

In Colombia, there was an upward trend in the number of cases reported through epidemiological week (EW) 5 of 2016. In EW 6 of 2016, 3,765 new ZIKV cases (suspected and confirmed) were reported. Most of the cases occurred in the departments of Barranquilla, Cundinamarca, Huila, Norte de Santander, and Tolima. Of the 37,011 cases reported cumulatively (1,612 laboratory-confirmed), 6,356 corresponded to pregnant women (522 laboratory-confirmed).

24 February to 10 March 2016

During this period, no new countries reported cases of autochthonous transmission of ZIKV. Nevertheless, available data indicated that some countries (such as Panama and Venezuela) were experiencing an increase in incidence, while others (such as El Salvador and Honduras) were on a downward trend. However, given the geographical spread of the virus into new areas of countries, the epidemic in its entirety was seemingly increasing in the Region of the Americas.

As of 5 March 2016, a total of 241 suspected cases of ZIKV infection had been reported in pregnant women in El Salvador (63 in 2015 and 178 in 2016). Of the 225 pregnant women

being monitored, 18% were infected in the first trimester of pregnancy, 46% in the second trimester, and 36% in the third trimester. Sonography was performed in 63% of pregnant women, all of which had normal results. Newborns from 35 women who had already given birth did not present complications.

On 9 March 2016, the Venezuela Ministry of People's Power for Health updated its epidemiological information on the ZIKV situation in the country. Between EW 41 of 2015 and EW 6 of 2016, 23 federal entities reported a total of 16,942 suspected cases. Of the 801 samples analyzed for ZIKV by RT-PCR, 352 (44%) were positive. Of the total number of suspected cases, 941 were pregnant women (5.5%). Between EW 1 and EW 6 of 2016, a total of 226 samples from pregnant women with suspected ZIKV infection were analyzed by RT-PCR; of those, 153 (67.7%) were positive.

17 March 2016

The number of ZIKV cases appeared to be declining in the Region. However, in certain countries and territories (such as the Dominican Republic, French Guiana, Haiti, and Venezuela), the number of cases were increasing. Due to delayed reporting, and to the geographical spread of ZIKV in areas where the vector is present, the decreasing trend observed in the epidemiological curve was subject to changes.

An analysis of ZIKV data for Colombia and El Salvador showed that the incidence rate was higher among those aged 20 to 39 years in Colombia and 20 to 49-year-olds in El Salvador.

24 March 2016

The number of ZIKV cases reported in the Americas declined, coinciding with the observed trend of other circulating arboviruses (such as dengue and chikungunya).

Laboratory-confirmed cases represented only 2% of the total number of ZIKV cases reported by Member States; the remaining 98% of the cases were classified as suspected. The low number of laboratory-confirmed cases could be attributed to a range of factors, including differences in national surveillance systems; difficulties related to the detection of viral RNA in patients' sera during the short viremia phase, and the lack of serological diagnostic tests available for the convalescence phase of the disease.

8 April 2016

Regional and national trends revealed significant changes in viral circulation in different areas of countries. This was illustrated by data from Colombia showing that in some areas of the country the number of ZIKV cases increased, while in others it decreased.

14 April 2016

A case reported by the United States but originating from Belize was investigated by Belizean authorities as it was suspected of being an autochthonous case (See table 1).

Cases of ZIKV infection, as well as those of other mosquito-borne diseases (such as dengue and chikungunya), presented a downward trend in many countries; this was consistent with observations from the same period of the previous year. However, within countries, there were variations in ZIKV infection trends.

21 April 2016

In most countries and territories, the number of ZIKV cases was decreasing, similarly to other mosquito-borne diseases in previous years.

In Martinique, ZIKV cases increased from EW 52 of 2015 to EW 7 of 2016. This increase was followed by a stable trend between EW 8 and EW 11 of 2016, with a weekly average of 1,650 reported cases. In EW 12, a decline in the number of cases was observed, mainly due to the Easter holidays and the consequent closure of schools and reduction in health service delivery. Compared with the previous week, the number of cases increased slightly in EW 14.

In French Guiana, an increase in the number of cases occurred from EW 1 to EW 8 of 2016, followed by a stable trend, with a weekly average of 454 cases up to EW 11. Subsequently, between EW 12 and EW 13, the number of cases decreased for the first time since the beginning of the outbreak. This was possibly related, as in Martinique, to the closure of schools and reduction in health service delivery during the Easter holidays. Compared with the previous week, a slight increase in the number of cases was observed in EW 14.

28 April 2016

In some countries and territories of the Americas, the number of new ZIKV cases (suspected and confirmed) continued to decrease. However, in others where the outbreak had a later onset (such as the Dominican Republic and Guadeloupe), the number of cases tended to increase.

Brazil. Since the notification of ZIKV cases became mandatory in February 2016 up to EW 13 of the same year, a total of 91,387 probable cases were reported throughout the country (incidence rate of 44.7 cases per 100,000 population). The southeastern region recorded the greatest number of probable cases (35,505), possibly due to a relatively late onset of the outbreak in that region. The second region with the highest number of probable cases was the northeast (30,286). The highest incidence rate was reported in the center-west region (113.4 per 100,000 population), followed by the northeast (53.5 cases per 100,000 population). Brazil also reported three deaths related to ZIKV in San Luis (Maranhão), Benevides (Pará), and Serrinha (Rio Grande do Norte).

El Salvador. From the beginning of the outbreak in November 2015 until the end of that year, a growing trend was observed in the number of suspected cases of ZIKV infection, followed by a decline up to EW 12 of 2016. Between EW 12 and 13 of 2016, a slight increase was observed, which might be attributed to underreporting during Easter vacations (EW 12).

Dominican Republic. From the beginning of the outbreak in EW 49 of 2015 up to EW 15 of 2016, the Dominican Republic showed an increasing trend in the number of suspected and confirmed cases of ZIKV infection. During EW 12, the number of cases declined; as in other countries, this decrease could be attributed to underreporting during Easter vacations. During EW 15 of 2016, the greatest number of suspected cases of the disease was recorded. That growing trend related to reported cases of exanthematic febrile disease in the period between EW 1 and EW 15 of 2016.

Jamaica. A decrease in the number of suspected cases of ZIKV infection was reported, following an increase observed from the beginning of the outbreak in EW 39 of 2015. The greatest number of suspected cases was recorded in EW 5 of 2016, followed by a downward trend up to EW 14.

Guadeloupe. Since the detection of the first cases of ZIKV infection in EW 2 of 2016, the number of cases continually increased. The temporary decline of the number of cases observed between EW 10 and EW 12 of 2016 was similar to the trend observed in El Salvador and the Dominican Republic.

5 May 2016

In some countries and territories, the number of suspected and confirmed cases was decreasing. This was consistent with the seasonal trends of other mosquito-borne diseases in previous years. For example, in Suriname, the first cases of ZIKV infection were confirmed in EW 37 of 2015. A bimodal distribution of the cases was observed, with the highest number of cases being reported in EW 49 of 2015 ($n = 93$), and EW 4 of 2016 ($n = 406$). These peaks were followed by a gradual decline.

19 May 2016

Trends of ZIKV infection cases varied by country and territory, depending on the date of onset of the epidemic, and the seasonal distribution of mosquito-borne diseases.

Colombia. A downward trend was observed. This was the second country, after Brazil, reporting ZIKV circulation in 2015. The outbreak started in the department of Bolivar, from where it spread to the rest of the country. By EW 18 of 2016, cases had been reported in 747 municipalities. In the period between EW 32 of 2015 and EW 18 of 2016, a bimodal distribution of suspected and confirmed cases was observed, with a first peak occurring in EW 5 of 2016 (6,309 cases), followed by a second peak in EW 13 of the same year (3,609 cases).

26 May 2016

In Central and South America, the number of new suspected and confirmed cases of ZIKV infection continued to decrease. Nevertheless, in most countries and territories of the Caribbean, the trend was the opposite.

Panama. The first cases of autochthonous Zika transmission were confirmed in EW 47 of 2015, on the island of Ustupu, Alligandi district, Guna Yala region. Since then and up to EW 18 of 2016, a total of 846 suspected cases of ZIKV infection were reported, of which 272 were laboratory-confirmed. Most cases were reported in the region of Guna Yala. In the same period, 14 cases of laboratory-confirmed chikungunya virus infection, and 1,400 confirmed cases of dengue were reported.

2 June 2016

The trend in Central America and South America continued to decline, while the trend was upward in most countries and territories of the Caribbean.

Dominica. The first cases of autochthonous transmission of ZIKV infection were confirmed in EW 11 of 2016. Based on the date of onset of symptoms, the epidemiological curve of suspected and confirmed cases presented a maximum of 18 cases on 5 May 2016. The Zika epidemic affected the entire country, although most cases were concentrated in the Roseau parish. As for age and sex distribution, the number of cases among women was twice as high as among men: 230 and 107 cases, respectively. Except for the 61 and over year age group, cases among women were two- to three-fold those among men in all age groups.

9 June 2016

Brazil. The first autochthonous cases of the disease were confirmed in April 2015. From EW 1 up to EW 20 of 2016, a total of 148,905 suspected cases of ZIKV infection were reported throughout the country, as well as 3 deaths (2 in Minas Gerais and 1 in Rio de Janeiro). In 2015, three additional deaths were reported: one each in the states of Maranhão, Pará, and Rio Grande do Norte. The median age of death for ZIKV cases was 20 years. As for the

geographical distribution, 1,605 municipalities reported suspected cases. The center-west region had the highest incidence rate, with 130.2 cases per 100,000 population, followed by the northeast region, where the incidence was 76 per 100,000 population. Both regions surpassed the national rate of 58.8 cases per 100,000 population

Dominican Republic. Since the report of the first case until EW 19 of 2016, 2,987 suspected cases of ZIKV infection and 123 cases of Guillain-Barré syndrome (GBS) related to ZIKV infection were reported. On average, in the four weeks prior to 9 June 2016, 274 suspected cases of ZIKV infection were reported, as well as 13 weekly GBS cases associated with ZIKV. The number of cases continued to rise. The highest incidence rates were reported in Independencia, the National District, Santo Domingo, Azua, and Valverde.

16 June 2016

Colombia. From the onset of the epidemic up to EW 22 of 2016, a total of 91,156 suspected cases of ZIKV infection were reported, of which 8,221 (9%) were laboratory-confirmed.

While the country as a whole showed a downward trend, an increase in the number of cases was observed in 20 of 930 municipalities at risk. The departments of Huila, Norte de Santander, Santander, Tolima, and Valle del Cauca accounted for 58% of the total number of suspected cases, as well as 53% of the total number of confirmed cases. Those same departments had higher incidence rates than the country as a whole (277.29 per 100,000 population at risk).

El Salvador. Since the report of the first case up to EW 22 of 2016, a total of 10,476 suspected and confirmed cases of ZIKV infection were reported. The highest number of cases was reported in EW 49 of 2015 and EW 1 of 2016 (914 and 1,140 cases respectively). By mid-June 2016, the trend was declining.

7 July 2016

Five countries in the Region reported for the first time sexually transmitted cases of ZIKV infection: Argentina, Canada, Chile, the United States, and Peru (see also next section on sexual transmission). The number of countries and territories reporting autochthonous vector-borne transmission cases remained the same, but there was an upward trend in the number of cases in Costa Rica, Guadeloupe, Guatemala, French Guiana, Jamaica, Mexico, Puerto Rico, Saint Martin, and Saint Barthélemy in the four week period prior to 7 July 2016.

14 July 2016

During this week, Canada updated its number of imported cases of ZIKV infection associated with international travel. As of 6 July 2016, there had been a total of 143 cases reported throughout the country, of which 142 acquired the infection in the Region of the Americas. In the United States, the first death from ZIKV infection (imported case) was reported in the contiguous continental territory. In Costa Rica, Ecuador, Guadeloupe, Guatemala, Jamaica, Mexico, Nicaragua, Puerto Rico, Saint Barthélemy, Saint Martin, and Venezuela, the rising trend in the number of cases observed during the four preceding weeks continued.

Venezuela. As of EW 26 of 2016, autochthonous cases had been confirmed in the 24 states of the country. The highest incidence rate in 2015 was reported in the state of Vargas, while in 2016, the highest incidence rate was detected in Apure, followed by Delta Amacuro, Miranda, and Merida. The highest number of cases occurred between EW 48 of 2015 and EW 8 of 2016. Since EW 9 of 2016, there had been a downward trend, which continued through EW 13 of 2016, when the trend showed a slight increase. With respect to dengue, during the last 12 EWs of 2015 and the first two of 2016, an average of 2,000 weekly cases were reported.

Since EW 4, coinciding with an increase in the number of cases of ZIKV, the number of cases of dengue had been decreasing.

29 July 2016

Brazil. On 21 July 2016, the Oswaldo Cruz Foundation (FIOCRUZ) reported the detection through quantitative RT-PCR of mosquitoes of the species *Culex quinquefasciatus* infected by ZIKV. The mosquitoes were collected from the homes of reported ZIKV cases in the cities of Recife and Arcoverde, Pernambuco state. Between EW 1 and EW 26 of 2016, a total of 165,907 suspected cases of ZIKV infection were reported in Brazil. Since EW 8 of 2016, a sustained downward trend had been observed.

Canada. As of 28 July 2016, 169 imported cases of ZIKV infection had been reported throughout the country.

Guatemala. As of EW 28 of 2016, a total of 2,133 suspected cases of ZIKV had been reported. In 2016, a bimodal distribution of cases was observed, with maximum peaks being reported in EW 6 and 25 of that year. As in other countries, women accounted for the majority of cases (68%). The most affected age groups was 25-39 year-olds.

Mexico. As of EW 28 of 2016, a total of 1,115 confirmed cases ZIKV infection had been reported. A marked increase in the number of cases was observed from EW 19 of 2016.

Puerto Rico. As of EW 27 of 2016, the total number of confirmed cases was 5,572. The trend in the number of cases appeared to be upward, with an average of 855 weekly cases being reported during the four preceding weeks.

Saint Martin. As of EW 28 of 2016, 1,580 suspected cases of ZIKV infection had been reported, 200 of which were confirmed. The trend seemed to be upward.

United States. The United States Centers for Disease Control and Prevention (CDC) reported the detection of four cases of ZIKV infection, probably transmitted by *Aedes aegypti* mosquitos in the state of Florida.

11 August 2016

Starting on this date, PAHO/WHO began to provide data by subregion of the Americas, and by country or territory, whenever data was available.

North America. In Mexico, a decrease in the number of confirmed cases during the previous four weeks was observed through 11 August 2016. In the United States, the first autochthonous outbreak of ZIKV infection was reported in Miami-Dade County, Florida.

Central America. All countries showed a downward trend for the number of cases of ZIKV infection. The largest increase in that number had occurred at the end of 2015 and at the beginning of 2016.

Caribbean. The trend in this subregion was downward, except for the territories of Saint Barthélemy and Saint Martin.

South America. As of this date, the number of cases was decreasing in all the countries of this subregion.

25 August 2016

North America. In Mexico, the number of confirmed cases continued its downward trend. In the United States, the area of transmission of ZIKV in Miami-Dade County continued to expand, and the Health Department of the state of Florida confirmed an autochthonous case in the county of Pinellas.

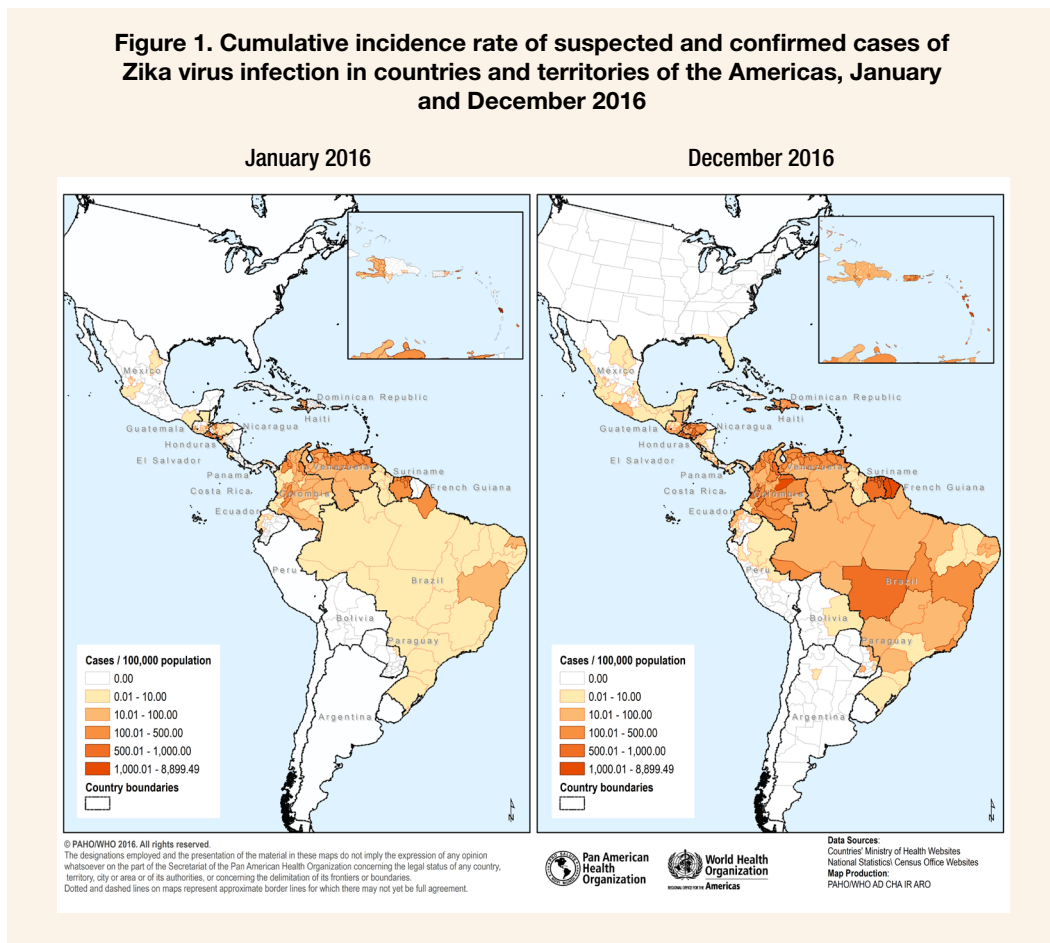
Central America. Except for Costa Rica and Nicaragua, the trend in the number of reported cases of ZIKV had been downward in the four previous weeks. The greatest increase in the number of cases in this subregion was observed between the end of 2015, and early 2016.

Caribbean. Puerto Rico and Saint Barthélemy continued to report a rising trend in the number of cases, while the other countries and territories of the subregion showed the opposite.

South America. A downward trend in the number of cases was evident in all countries of the subregion.

8 September 2016

The British Virgin Islands confirmed autochthonous vector-borne transmission of ZIKV. Figure 1 illustrates the number of countries and territories with autochthonous vector-borne transmission of the virus from the beginning of 2016 until December of the same year.



North America. During EW 30 to EW 33, the number of confirmed cases in Mexico presented a downward trend. In the United States, the area of transmission of ZIKV infection continued to expand, and three counties of the state of Florida reported autochthonous cases: Miami-Dade, Palm Beach, and Pinellas.

Central America. In Costa Rica, the number of reported cases of ZIKV grew steadily from the onset of the outbreak up to EW 31. In Guatemala, after a downward trend that began in EW 23, the number of cases increased again in EW 32. In Nicaragua, the number of reported cases continued a downward trend for the third consecutive week (EW 32 to EW 34).

Caribbean. Grenada, Puerto Rico, and Saint Barthélemy showed a decrease in the number of cases in EW 32 to EW 33, following an upward trend from the beginning of the outbreak until that date.

South America. The number of reported ZIKV infections continued to decrease in all the subregion.

22 September 2016

North America. In the United States, autochthonous cases were still being reported in the counties of Miami-Dade, Palm Beach, and Pinellas, Florida.

Central America. In Costa Rica, Guatemala, and Nicaragua the number of cases of ZIKV infection increased for a fourth consecutive week. In Panama, after a marked decrease in the number of cases that began in EW 23, in EW 30 that number increased again.

Caribbean. Saint Kitts and Nevis confirmed autochthonous vector-borne transmission of ZIKV for the first time. Saint Martin (French territory) reported an increase in the number of cases in the four preceding weeks, following a decrease in EW 32. In other countries and territories of the Caribbean, the number of cases continued to decline.

South America. The downward trend in the number of cases reported in all the countries of this subregion continued.

6 October 2016

North America. In Mexico, the number of confirmed cases continued to decrease, while in the United States, that number was increasing in the state of Florida.

Central America. In Panama, after the sustained increase in the incidence of ZIKV infection between EW 30 and EW 35, in EW 36 and 37 the curve began to decline. In the rest of countries of the subregion no changes were reported.

Caribbean. In Anguilla, after a decline in the number of cases between EW 32 and 36, there was an increase in EW 37 and 38. In the French territories of Saint Barthélemy and Saint Martin, an increase in the number of suspected cases of ZIKV was also observed between EW 35 and 37. In Sint Marteen, the Netherlands independent territory which borders the French territory of Saint Martin, the number of cases confirmed increased in EW 36 and 37, as well. In Puerto Rico, the number of cases began to decrease starting in EW 35.

South America. The downward trend continued.

20 October 2016

North America. In the United States, on 14 October, the state of Florida reported on a new area affected by ZIKV transmission in Miami-Dade County.

Central America. In Belize, the bimodal epidemic curve showed a maximum number of suspected cases in EW 34 and 38. In Guatemala, in the three weeks prior to 20 October, a new increase in the number of suspected cases was observed after a drop during EW 22. Similarly, in Panama, there was a sustained increase in cases between EW 30 and EW 36.

Caribbean. In Anguilla, new cases continued to be reported, with a growing trend. In the French territory of Saint Martin, after an increase in the number of suspected cases between EW 32 and EW 36, there was a decline between EW 37 and EW 39. In Saint Barthélemy, the circulation of the virus remained active, and in Sint Marteen, there was a rising trend in the number of confirmed cases in EW 37 and EW 38. In other countries and territories of the Caribbean, the number of reported cases continued to decrease.

South America. The number of reported cases continued to decrease.

3 November 2016

North America. In Mexico, from the onset of the outbreak up to EW 39 of 2016, the number of confirmed cases showed an upward trend. That number started to decrease in EW 40. In the United States, the area affected by transmission in Miami-Dade County continued to expand. On 19 October 2016, the state of Florida and the U.S. CDC reported an ongoing investigation of autochthonous cases in a new area of that county.

Central America. The number of cases reported in Guatemala remained stable between EW 37 and 40, while in Panama, that number continued to rise. The same was true for Belize, where there was an increase in the number of reported cases between EW 36 and EW 39. In other countries of the subregion, the number of reported cases continued to decline.

Caribbean. As of EW 40, an upward trend continued to be reported.

South America. All countries in this subregion continued to report a decrease in the number of cases.

17 November 2016

Caribbean. Montserrat confirmed autochthonous vector-borne transmission of ZIKV infection, taking the total number of countries and territories in the Americas with autochthonous vector-borne transmission to 48. The downward trend continued in all countries and territories of the subregion, with the exception of the Turks and Caicos Islands and Montserrat, where the number of reported cases was still on the rise.

North America. In Mexico, no changes had been reported since 3 November (see above). In the United States, cases of autochthonous transmission continued to be detected in areas of Miami Beach, and Miami-Dade County.

Central America. Panama continued to report a growing number of cases between EW 36 and EW 41. In other countries of the subregion, the number of cases followed a downward trend.

South America. The Peru Ministry of Health reported that, as of EW 21, a growing number of ZIKV were being reported in Iquitos, the only city in the country where cases had been detected in the 13 weeks preceding 17 November. The rest of the countries of the subregion continued to show a downward trend in the number of reported cases.

During the week of 17 November, the Brazil Ministry of Health provided the results of a descriptive observational study carried out in the country between EW 1 and EW 32 of 2016,

based on data from the Reported Events Information System (Sinam-NET). According to that study,¹ the greatest number of cases was recorded between EW 7 and EW 9 of 2016; the most affected geographical areas of the country were in the center-west and northeast, with rates of 270 and 172 per 100,000 population, respectively.

1 December 2016

North America. In Mexico, a slight downward trend was observed between EW 44 to EW 48. In the United States, cases of local transmission had not been detected during the previous 45 days in the northern area of Miami-Dade; however, active transmission continued to be reported in Miami Beach. In addition, the State Department of Health Services of the state of Texas, and the Department of Health and Human Services of Cameron County announced on 28 November the first autochthonous case of ZIKV infection in Texas – at the time, it was not known whether the case was mosquito-borne.

Central America. In Panama, after a growing number of cases being reported between EW 32 and EW 41, a decrease was observed between EW 42 to EW 45. In other countries of the subregion, the number of cases followed a downward trend.

Caribbean. In Saint Barthélemy and Saint Martin, there continued to be active circulation of the virus. In the other countries and territories of the Caribbean, the downward trend in the number of reported cases continued.

South America. Since EW 21, an active outbreak of ZIKV infection had been declared in the city of Iquitos, Peru, with the four districts of the city reporting an upward trend. In the rest of South America, the downward trend continued.

15 December 2016

North America. In Mexico, the number of cases reported during the six epidemiological weeks preceding 15 December 2016 was on a downward trend. In the United States, the Department of Health of the State of Florida had not reported new cases of ZIKV since 7 December. On 9 December, the area of Miami Beach was declared free from active transmission. On that same date, the State Department of Health Services of Texas and the Department of Health and Human Services of Cameron County announced the detection of four new cases of ZIKV infection; these cases were suspected of being of local transmission. Those cases were detected as a part of a follow-up of the first ZIKV infection case announced on 28 November.

Central America. With the exception of Panama, where the number of reported cases between EW 32 and 45 showed a rising trend, the subregion showed a downward trend.

Caribbean. In Anguilla, the number of ZIKV infection cases increased between EW 41 and EW 47. In Saint Martin, the epidemic showed an irregular trend, with a recent increase in the number of visits to emergency health services for suspected of ZIKV infection. In other countries and territories of the subregion the downward trend continued.

South America. In Paraguay, an increase in the number of ZIKV cases occurred between EW 42 and EW 46. In Peru, since EW 40 up to EW 45, there was an increase in the number of suspected cases, particularly in the city of Iquitos. In other countries and territories of this subregion, the downward trend continued.

¹ Brazil Epidemiological Bulletin. Secretaria de Vigilância em Saúde – Ministério da Saúde No 37, 2016. Available at: http://portal.arquivos.saude.gov.br/images/pdf/2016/novembro/15/2016_031-Mulheres_publicacao.pdf

29 December 2016

North America. In the United States, the Department of Health of the state of Florida reported that, in EW 52, Miami-Dade County had reported isolated cases of locally transmitted ZIKV infection. In addition, the State Department of Health Services of Texas and the Department of Health and Human Services of Cameron County announced the detection of a sixth autochthonous mosquito-borne case in that county.

Central America. In Panama, the number of suspected and confirmed cases continued to increase between EW 30 and EW 47. In the other countries of the subregion, the number of cases was decreasing.

Caribbean. In Anguilla, a rising trend in the number of cases was observed between EW 27 and EW 48. In the other countries and territories of the Caribbean the downward trend continued.

South America. In Bolivia, autochthonous cases were confirmed in the departments of Beni and Pando, in addition to the outbreak in progress in Santa Cruz. In Peru, from EW 40 to EW 45, an increase in suspected and confirmed cases was reported, particularly in the city of Iquitos. In the rest of the subregion the downward trend continued.

Zika virus sexual transmission

Three of the epidemiological updates on Zika issued by PAHO/WHO in 2016 focused on the sexual transmission of the virus. Five countries in the Americas reported Zika cases transmitted sexually.

3 March 2016

The epidemiological update of 3 March 2016 reported the official notification of sexually transmitted cases of ZIKV by the United States and Italy. In February 2016, 14 suspected cases of ZIKV sexual transmission were reported in the United States. Two of the cases were laboratory-confirmed, and four were classified as probable. All the cases were women whose only known risk factor was sexual contact with a symptomatic male partner who had a recent history of travel to an area of ZIKV transmission. Two cases were discarded based on additional information, and six more continued to be investigated. In Italy, one case was reported after being detected through retrospective analysis of serum samples stored since 2014. The infected sample came from a traveler to Thailand.

31 March 2016

Additional information was provided on the sexual transmission of ZIKV, including details of cases detected by surveillance systems of countries without autochthonous circulation of the virus, or where the vector is not present. In eight cases, transmission affected sexual partners of men with travel history to countries with circulation of ZIKV; all of them presented symptoms of ZIKV infection shortly before or at the time of sexual contact. As of this date, sexually transmitted cases had been reported in Argentina, Chile, and the United States.

Argentina. On 29 February, Argentina reported the first sexually transmitted ZIKV case in a woman from Cordoba who had not traveled abroad, but had had sexual contact with a partner with history of travel to Colombia. The male partner had had symptoms of ZIKV infection, which was laboratory-confirmed by MAC-ELISA. This was the first time that autochthonous vector-borne transmission of the virus had been detected in Argentina.

Chile. On 26 March, the Chile Ministry of Health reported a laboratory-confirmed sexually transmitted ZIKV case in continental Chile, where neither the vector nor autochthonous transmission of ZIKV had previously been detected. The male partner of the case presented symptoms at the time of (unprotected) sexual contact. It is believed that the male partner might have been infected with the virus during a trip to Haiti, shortly before the onset of symptoms.

United States. Between February and March 2016, six confirmed cases of sexually transmitted ZIKV infection were reported. In all the cases with documented sexual contact, sex had been unprotected, and occurred while the male partner experienced symptoms, or shortly after the end of symptoms. The average age of the cases was 22.5 years (19 to 55 years of age). In three cases with available information, transmission affected women who had had contact with their male sexual partner, who developed symptoms after travel to areas of viral transmission. Those women presented symptoms of ZIKV infection between 10 and 14 days after sexual contact.

Zika virus detection in semen

At the end of March 2016, at least three cases had been documented in which ZIKV was isolated from samples of semen obtained at least two weeks after the onset of symptoms, when ZIKV was undetectable in blood samples by RT-PCR. In one case, serum, urine, and semen samples were obtained from a 68 year-old man who developed ZIKV infection symptoms following a trip to the Cook Islands. After 27 and 62 days of the onset of symptoms, only semen remained positive for ZIKV infection by RT-PCR.

21 April 2016

As of this date, four countries in the Region of the Americas had reported sexually transmitted cases of ZIKV: Argentina, Chile, and Peru (one case each), and the United States (6 cases).

Zika virus infection in pregnant women

A total of nine epidemiological updates issued by PAHO/WHO in 2016 dealt with the subject of ZIKV infection in pregnant women.

10 March 2016

On this date, results of a follow-up study² of a cohort of pregnant women with exanthematic disease in Rio de Janeiro, Brazil, were analyzed. Preliminary results suggested an association between ZIKV infection during pregnancy and serious outcomes, including fetal death, placental insufficiency, fetal stunting, and fetal central nervous system (CNS) injuries. The detection of ZIKV infection in pregnant women intensified in the Region, due to the risk of what subsequently was described as congenital syndrome associated with ZIKV infection.

31 March 2016

Eighteen countries and territories of the Americas had reported cases of ZIKV infection in pregnant women: Barbados, Bolivia, Brazil, Colombia, Costa Rica, the Dominican Republic, Ecuador, El Salvador, French Guiana, Guadeloupe, Guatemala, Martinique, Mexico, Nicaragua,

² Zika Virus Infection in Pregnant Women in Rio de Janeiro. *New England Journal of Medicine*. 375:24 (2321-2334). DOI: 10.1056/NEJMoa1602412

Panama, Paraguay, Puerto Rico, and Saint Martin. By 21 April 2016, the number of countries and territories of the Americas with suspected or confirmed cases of ZIKV infection in pregnant women had increased to 20. By 28 April 2016, that number had risen to 21. Below is a summary of the situation by country, throughout 2016.

Brazil. In the epidemiological update of 10 March 2016 (see previous paragraphs), a study carried out in Rio de Janeiro was analyzed. A total of 88 pregnant women were recruited between September 2015 and February 2016 to participate in the study. Of the total, 72 (82%) had positive results for ZIKV in blood, urine, or both. Acute viral infection due to ZIKV occurred between the 5th and 38th week of gestation. A fetal ultrasonography was performed in 12 of 42 women positive for ZIKV (58%), and in all the women with ZIKV negative results. Fetal anomalies were detected by sonography in 12 of the 42 ZIKV positive women (29%), and in none of the 16 women with negative results. Adverse results included: 2 fetal deaths, at 36 and 38 weeks of gestation; 5 intrauterine stunted fetuses, with or without microcephaly; 7 fetuses with ventricular calcifications or other CNS injuries; and 7, with abnormal amniotic fluid volume or abnormal cerebral or umbilical artery flow. As of 21 April 2016, 8 of the 42 women with fetal sonography had given birth, and the results of their tests had been confirmed. Published results of that study identified the possibility of neurological alterations, without microcephaly, associated with ZIKV infection during pregnancy, regardless of gestational age at time of infection. These findings were consistent with clinical observations reported by Brazilian pediatricians, and had implications with regard to the spectrum of neurological abnormalities caused by ZIKV infection during pregnancy.

Between February and 2 April 2016, a total of 7,584 probable cases of ZIKV infection were reported in pregnant women throughout the country. Of those cases, 2,844 were laboratory-confirmed. Up to this date, the highest number of cases of microcephaly associated with ZIKV infection had been reported among women who had suffered from the disease in the first trimester of pregnancy.

Based on data published by the Brazil Ministry of Health, between 22 October 2015 and 21 May 2016, 7,623 cases of suspected newborns with microcephaly or other CNS malformations had been reported throughout the country. Of the total, 1,434 had evidence of congenital infection, determined by the country's surveillance and response protocol (208 cases were confirmed by laboratory criteria). On the other hand, 2,932 cases were discarded (due to association with other noninfectious causes, or for not meeting the case definition); 3,257 continued to be under investigation. Confirmed cases occurred in 517 municipalities, located in 26 of the 27 states. Between EW 3 and EW 20 of 2016, the largest number of cases ($n = 134$) was confirmed during EW 4. In the same period, the number of cases being investigated (confirmed and discarded) was between 80 (EW 12) and 381 (EW 4).

During the week of 26 May 2016 (EW 21), reported cases of microcephaly and other congenital malformations in the state of Pernambuco were analyzed together with reported cases of the three circulating arbovirus (chikungunya, dengue, and Zika). From the beginning of 2015 up to EW 20 of 2016, Pernambuco presented a bimodal curve for dengue cases, with peaks between EW 13 and 15 of 2015, and in EW 7 of 2016. Around those same epidemiological weeks, the maximum number of cases of ZIKV was reported. The first confirmed cases of microcephaly associated with ZIKV appeared from 7 to 8 months after the first cases of ZIKV infection were identified; the largest number of cases was reported during EW 46 of 2015.

Between EW 1 and EW 20 of 2016, 12,612 cases of pregnant women with suspected ZIKV infection were reported; of those, 1,454 were laboratory-confirmed. As of EW 20, 1,551 cases of congenital syndrome associated with ZIKV infection had been confirmed in Brazil.

United States. On 26 February, U.S. CDC published information on ZIKV infection among pregnant women who had traveled abroad between August 2015 and February 2016.³ The article reported on nine pregnant women in which ZIKV infection was laboratory confirmed after their return from countries with autochthonous ZIKV circulation at the time of their visit. Of those 9 women, 6 acquired the infection during the first trimester of pregnancy, 2 during the second trimester, and 1 during the third. Pregnancy outcomes among the 6 women who contracted the infection during the first trimester of pregnancy included 2 early miscarriages, 2 elective pregnancy interruptions, and 1 live newborn with microcephaly. A sixth pregnancy followed its course. Viral RNA was detected in both miscarried fetuses. In one of the cases of elective termination, amniocentesis was performed, and ZIKV RNA was detected by RT-PCR. A fetal sonography performed before the pregnancy's termination indicated the absence of callous body, ventriculomegaly, and cerebral atrophy. In the newborn with microcephaly, ZIKV RNA was detected in the placenta, both by RT-PCR, and by immunohistochemical staining.

Of the two women who became infected during the second trimester of pregnancy, one gave birth to an apparently healthy newborn, and the other continued her pregnancy. The mother who contracted the infection in the third trimester of pregnancy gave birth to a healthy newborn.

Colombia. From the onset of the outbreak up to EW 11 of 2016 (Table 2), 10,812 cases of pregnant women with ZIKV infection had been reported. Of those, 997 were laboratory-confirmed cases; the remaining 9,815 presented symptoms of ZIKV infection without laboratory confirmation. Table 2 presents the evolution of the number of cases reported between EW 11 and EW 22 of 2016.

Table 2. Cumulative number of cases of ZIKV infection in pregnant women, by laboratory confirmation, and epidemiological week of reporting

Epidemiological week	Number of cases		
	Total	With symptoms, without laboratory confirmation	With symptoms, without laboratory confirmation
11/2016	10,812	9,815	997
14/2016	12,380	10,674	1,706
15/2016	12,802	11,099	1,703
16/2016	13,314	11,306	2,008
22/2016	16,323	10,903	5,420

On 16 June 2016, it was reported that, of the total number of pregnant women with confirmed ZIKV infection, 1,203 (19%) lived in the department of Norte de Santander. As of EW 17, of the total of 13,728 pregnant women with suspected or confirmed ZIKV infection, 5,287 had completed their pregnancy, and 8,442 were still pregnant. Of the 5,287 that delivered, 4,971 gave birth to live newborns, and 316 resulted in fetal or perinatal death (68.3% abortions; 29.4% perinatal deaths, and 2.2% unknown outcome). Of the women whose pregnancy culminated in fetal or perinatal death, 58.2% had acquired the infection during the first trimester of pregnancy.

Honduras. By 31 March 2016, 68 pregnant women infected by ZIKV had been reported; 41 of them presented symptoms during the first and second trimester of pregnancy.

Puerto Rico. As of 31 March 2016, 40 cases of pregnant women had had laboratory-confirmed ZIKV infection. Of that total, 27 developed symptoms.

³ Meaney-Delman D, Hills SL, Williams C, et al. Zika Virus Infection Among U.S. Pregnant Travelers — August 2015–February 2016. *MMWR Morb Mortal Wkly Rep* 2016;65:211–214. DOI: <http://dx.doi.org/10.15585/mmwr.mm6508e1>

Martinique. By 14 April 2016, and after the first ZIKV infection was detected, there had been 142 cases of the disease among pregnant women. There was not information on pregnancy outcomes for those women who had already given birth.

Ecuador. On 19 May 2016, it was reported that between EW 52 of 2015 and EW 17 of 2016, there had been eight laboratory-confirmed ZIKV cases among pregnant women. Up to that date, there had been no cases of congenital syndrome associated with the infection.

Panama. By 19 May 2016, it was reported that from the onset of the outbreak (EW 48 of 2015) up to EW 18 of 2016, 31 suspected cases of ZIKV infection had been detected among pregnant women; of those, 16 were laboratory confirmed, and the 15 remaining tested negative. As of EW 18, three laboratory-confirmed cases of congenital syndrome associated with ZIKV infection had been reported in newborns of three asymptomatic women. In addition, one case of fetal death at 32 weeks of pregnancy tested positive for the virus.

El Salvador. On 2 June 2016, it was reported that between EW 47 of 2015 and EW 20 of 2016, a total of 275 pregnant women with suspected ZIKV infection had been reported, of which 3 were laboratory-confirmed. As of EW 20, cases of congenital syndrome associated with ZIKV infection had not been confirmed.

On 16 June 2016 the country reported the implementation of infection monitoring measures among pregnant women, implemented in EW 48 of 2015. Since then and up to EW 22 of 2016, there had been 287 pregnant women (63 in 2015 and 224 in 2016) with suspected ZIKV infection, of which 38 (13%) had been screened for the virus, as they met the criterion for sample collection. Of those 38, 3 (8%) tested positive for ZIKV, and gave birth to children without birth defects. As of EW 21, a total of 111 (39%) pregnant women with suspected ZIKV infection had given birth to apparently healthy children, without congenital anomalies at birth.

Dominican Republic. On 9 June 2016, it was reported that, from the beginning of the epidemic up to EW 19 of 2016, 348 suspected cases of ZIKV infection in pregnant women had been notified in the country. All had contracted the infection during the first 24 weeks of gestation.

Congenital syndrome⁴ associated with ZIKV infection

In October 2015, the Brazil IHR National Focal Point reported an unusual increase in the number of newborns with microcephaly; shortly afterwards, other alterations of the central nervous system and complications were confirmed.

Following the publication of Surveillance Guidelines for Zika Virus Disease and its Complications on 15 April 2016, the denomination congenital syndrome associated with Zika virus was adopted. As of 29 December 2016, 22 countries and territories of the Americas had reported cases of said syndrome, and had recorded a total 2,525 confirmed cases. Of that total, 90.6% occurred in Brazil (2,289 cases).

Since 1 September 2016, the number of confirmed cases of congenital syndrome is published weekly in PAHO/WHO's web page, and is available at: <http://bit.ly/2chh2aP>.

Brazil

In October 2015, the Brazil IHR National Focal Point reported an unusual increase in the number of newborns with microcephaly⁵ in private and public health facilities of the state of Pernambuco,

⁴ Case definition available at: http://www.paho.org/hq/index.php?option=com_content&view=article&id=11117&Itemid=41532&lang=en

⁵ Defined as a neurological disorder in which the occipitofrontal circumference is smaller than the size expected for age, race, and sex.

northeast Brazil.⁶ As of EW 1 of 2016, a total of 3,530 microcephaly cases, including 46 deaths, were reported in 20 states and the Federal District. Between 2010 and 2014, the annual average of microcephaly cases was 163 (or 16.9) for the country as a whole.⁷

In January 2016, the detection of ocular injuries in the macular region of three newborns with microcephaly and cerebral calcifications was reported; the infants were suspected of having intrauterine ZIKV infection. The three newborns presented pigmentation disorders in the macular region, and loss of unilateral foveal reflex. One of the newborns also presented macular neuroretinal atrophy.

On 17 February 2016, the Brazil Ministry of Health reported the detection of 201 new suspected cases of microcephaly related to ZIKV infection, which brought the total number of suspected cases to 6,280 by EW 6 of 2016. In addition, during that same week, 46 new cases of microcephaly were reported; the total number of cases with typical malformations indicative of congenital infection was 508. The confirmation was by clinical, radiological, laboratory methods or a combination of those methods. Of the total number of cases investigated, 837 were determined to be due to noninfectious causes, or did not meet case definition criteria. Furthermore, 17 deaths were reported, including miscarriages and stillbirths; the total number of deaths reached 108.

A week later, on 23 February 2016, the Brazil Ministry of Health reported that, during EW 7 of 2016, 360 new cases of microcephaly suspected of congenital infection were reported, bringing the total number of cases to 5,640 cases. Furthermore, during that same week, 75 new cases were confirmed (by the aforementioned methods), for a new cumulative total of 583 cases of microcephaly or malformations indicative of congenital infection. Of those cases, 67 were laboratory confirmed for ZIKV infection. Twelve new deaths were additionally confirmed among microcephaly cases (miscarriages and stillbirths), bringing the total number of deaths to 120. Although cases of microcephaly continued to be confirmed in new areas in the northeast region, where the first increase in microcephaly was detected, a decline was observed for two consecutive weeks.

On 3 March 2016, the Brazil Ministry of Health reported that, between 22 October 2015 and 27 February 2016, a total of 5,909 cumulative cases of microcephaly and other CNS malformations were detected among newborns in the country, that is 269 cases more than had previously been reported.

Brazilian health authorities had investigated 1,687 cases (29% of the total reported); among them, there had been 641 confirmed cases of microcephaly or other CNS malformations, with signs suggesting congenital infection; 1,046 cases had been discarded. Another 4,222 reported microcephaly cases continued to be the subject of investigation. The 641 confirmed microcephaly cases occurred in 250 municipalities of 15 Brazilian states: Alagoas, Bahia, Ceara, Espirito Santo, Goiás, Maranhão, Mato Grosso do Sul, Pará, Paraíba, Pernambuco, Piauí, Rio de Janeiro, Rio Grande do Norte, Rio Grande do Sul, and Rondônia.

As of 17 March 2016, Brazil was the only country or territory of the Region that had officially reported an increase in the number of cases of congenital microcephaly. In the United States, microcephaly associated with ZIKV infection had been detected in one pregnant woman who had lived in an area of ZIKV transmission during her pregnancy.

The epidemiological update of 24 March 2016, illustrated that the increase in the number of cases of microcephaly had occurred seven months after the first ZIKV infection cases had been detected. The dengue surveillance system registered a large number of cases at the

⁶ PAHO/WHO. 17 November 2015 Epidemiological Alert. Available at: http://www.paho.org/hq/index.php?option=com_docman&task=doc_view&Itemid=270&gid=32636&lang=en

⁷ SINAC is a national system capturing information about births in the country as a whole. Available at: <http://www2.aids.gov.br/cgi/tabcgi.exe?caumul/anoma.def>

time of the first detection of Zika virus in Pernambuco. The reported number of microcephaly cases began to decrease in EW 48 of 2015. As of EW 51 of that year up to EW 8 of 2016, an average of 44 weekly cases was reported.

The update of 31 March 2016, reported on a study conducted in the state of Pernambuco on the clinical characterization of 104 children born with microcephaly in 2015. In that study, 100 mothers were interviewed (59 retrospectively) to investigate the history of exanthema during pregnancy. Of the total, 70 newborns were found to have severe microcephaly (defined in the study as a head circumference < 30 cm). Between EW 5 and EW 11 of 2016, an average of 39 weekly cases of microcephaly were reported in Pernambuco.

Cases of microcephaly detected in Brazil during 2015

A study of microcephaly cases detected through December 2015 included an analysis of 574 cases of the condition detected by a recently created ad hoc surveillance system. The study identified temporal and geospatial relationships between onset of febrile exanthematic disease consistent with ZIKV during the first trimester of pregnancy, and the increase in prevalence of microcephaly at birth. The prevalence of microcephaly in 15 geographical units of Brazil where laboratory-confirmed ZIKV transmission had been detected (2.8 cases per 10,000 live births) was much higher than that of four states without confirmed ZIKV transmission (0.6 cases per 10,000 live births). The relationship between exposure to maternal ZIKV infection during the first trimester of pregnancy and higher prevalence of newborns with microcephaly provided additional evidence of ZIKV congenital infection.

First trimester of pregnancy: probably greater risk for pregnant women

Preliminary results of a case and control study in Paraiba, conducted by the Brazil Ministry of Health, the Government of Paraiba, and the U.S. CDC, revealed that mothers who acquired ZIKV infection in the first trimester of pregnancy had a higher probability of giving birth to children with microcephaly. The study was the work of eight teams who researched the proportion of newborns with microcephaly associated with Zika virus infection, and the risk of ZIKV infection in 56 municipalities in Paraiba. The study included 165 mothers with newborns with microcephaly, and 446 controls (mothers with newborns without microcephaly in the same areas). No association was found between microcephaly and chemical products, such as insecticides.⁸

9 June 2016. To this date, 556 cases had been confirmed in 26 of Brazil's 27 federal entities. Between EW 3 and EW 22 of 2016, the median number of cases investigated (confirmed and discarded) reached 209, with a minimum of 80 (EW 12), and a maximum of 381 (EW 4). The trend in the number of newborns with microcephaly or CNS malformations was upward from the beginning of 2015 up to EW 47 of the same year. Since then, there had been a constant decline through EW 17 of 2016.

29 July 2016. According to data published by the Ministry of Health, from 22 October 2015 through 23 July 2016, 8,703 suspected cases of microcephaly or other CNS malformations were reported in newborns in the country. Of those, a total of 1,749 cases had with evidence of congenital infection (272 were laboratory-confirmed), as established in the country's surveillance and response protocol. Of the total number of reported cases, 3,892 were discarded (due to association with noninfectious causes, or because they did not meet the case definition criteria). A total of 3,062 cases were still being investigated.

In total, up to that date, 371 deaths, between abortions and stillbirths, had been reported among suspected cases (4.3% of the total). In 106 of them, a relation to ZIKV infection was confirmed.

⁸ Full report available at: <http://portalsaude.saude.gov.br/index.php/cidadao/principal/agencia-saude/22994-microcefalia-estudo-aponta-que-1-trimestre-pode-ser-de-maior-risco-para-gravidas>

Panama

19 March 2016. The Panama Ministry of Health confirmed a case of ZIKV infection in an infant born at 31 weeks of gestation, who was diagnosed with microcephaly and occipital encephalocele. The newborn died on 17 March, a few hours after birth. The umbilical cord sample was analyzed by RT-PCR, and tested positive for ZIKV. An analysis of maternal samples gave negative results for ZIKV, and there was nothing indicating that she could have acquired ZIKV infection during her pregnancy. The ultrasound conducted at 19 weeks of gestation indicated fetal neural tube development deficiency, and microcephaly. These findings suggested that the virus had the capability to cross the placental barrier, and strengthened a vertical transmission hypothesis.

7 April 2016. Two confirmed cases of congenital syndrome associated with ZIKV infection were reported. The first case was a fetal death with additional fetal malformations. The second case was a live birth, without other malformations. Both cases were laboratory-confirmed by the Gorgas Commemorative Institute.

28 April 2016. Two new cases of congenital syndrome associated with ZIKV infection were reported. One of the cases was a newborn with microcephaly, whose mother had RT-PCR confirmed ZIKV infection in urine. The other case was 36-week gestational-age fetus with congenital malformations, whose diagnosis was confirmed by ultrasound.

Colombia

30 March 2016. Fifty cases of suspected microcephaly in live births were reported, after being detected between 4 January and 20 March 2016. That number represented an increase when compared to the expected annual historical average (140 cases per year). Of the 50 recorded cases, microcephaly was ruled out in 16. Of the remaining 34, 2 did not meet the national criteria for ZIKV infection associated with microcephaly, and the other 32 were under investigation to establish a possible association with ZIKV infection. At the time of reporting, in 8 of the 32 cases of microcephaly, ZIKV infection had been detected by RT-PCR.

2 April 2016. Between EW 1 and EW 12 of 2016, 34 cases of microcephaly from all causes had been reported in the country. Of those, 8 were tested for Zika virus: 1 was discarded; 7 were still being studied (4 in Santander, and 1 each in Cauca, Guaviare and Norte de Santander); of the remaining 26, 20 were under preliminary testing, and 6 were awaiting the necessary biological samples.

16 June 2016. From EW 1 to EW 20 of 2016, the birth defects surveillance system had recorded 88 cases of microcephaly throughout the country. The historical average had been, approximately, 12 cases per month. When compared to reported cases (n=45) for the same period of 2015, the number of cases in 2016 represented a 96% increase.

29 July 2016. As of EW 28 of 2016, the number of microcephaly cases had increased to 297, of which 21 cases had been confirmed as associated with ZIKV infection; 80 cases were discarded; and 196 continued to be under investigation.

Martinique

24 March 2016. The France Ministry of Health confirmed the first case of microcephaly related to ZIKV infection in Martinique. The diagnosis was performed by ultrasound at 22 weeks of gestation. ZIKV infection was detected by PCR analysis of blood samples, and fetal amniotic fluid. The mother's blood sample tested positive for ZIKV.

31 March 2016. The French Institute for Public Health Surveillance (INVS, per its acronym in French) reported that Zika virus infection had been laboratory-confirmed in 106 pregnant women, in whom two cases of microcephaly and other fetal malformations were detected by ultrasound.

El Salvador

16 June 2016. El Salvador was added to the list of countries and territories that reported cases of congenital syndrome associated with ZIKV infection in the Americas, alongside Brazil (1,581 cases), Colombia (7), Martinique (3), Panama (5), Puerto Rico (1), and the United States (2).

From EW 1 to EW 22 of 2016, 47 cases of newborns with microcephaly were recorded in the country. The annual average number of cases of microcephaly between 2012 and 2016 in El Salvador had been 24, which means the number for 2016 reflected a significant increase with respect to previous years. During 2015, 20 cases of microcephaly were recorded in 8 of the 14 departments, while in 2016 as of 16 June, there had been cases in 12 departments. In 1 of the 47 cases of microcephaly ZIKV infection was detected.

Jamaica

23 June 2016. Jamaican health authorities reported one of the four pregnancies with positive ZIKV diagnosis had resulted in fetal death at 20 weeks of gestation.

Canada

25 July 2016. Canada reported a case of vertical transmission of Zika virus. The mother presented symptoms in the 10th week of pregnancy. The newborn's cerebrospinal fluid tested positive for Zika by PCR. No visible congenital anomalies were detected in the newborn. As of EW 35, two cases of maternal transmission of ZIKV had been confirmed; one of them with severe neurological anomalies.

Guatemala

29 July 2016. In late July, the Guatemala Ministry of Health reported 16 probable cases of congenital syndrome associated with ZIKV infection (15 cases of microcephaly, and 1 of other birth defects). All the mothers were in the first two trimesters of pregnancy when they presented symptoms consistent with ZIKV infection. Later, on 22 September 2016, Guatemala was added to the list of countries that reported confirmed cases of congenital syndrome; 17 cases were confirmed by the National Reference Laboratory, and the U.S. CDC.⁹

Argentina

17 November 2016. During EW 42, a case of a child born in the province of Tucuman in its 34th week of gestation was reported; the newborn presented a head circumference of 31 cm, arthrogryposis of the four limbs, amniotic bands in the hands and left leg, and intracranial malformations (ventriculomegaly and posterior fossa malformation). The newborn died 10 days later.

⁹ Information summarized from data provided by the Ministry of Public Health and Social Assistance. Available at: <http://www.mspas.gob.gt/index.php/en/mspas/noticias/1239-comunicado-ante-la-epidemia-del-viruszika.html?tmpl=component&print=1&layout=default&page>

Slovenia (ex Brazil)

17 February 2016. A case of fetal congenital malformation (microcephaly) was reported in a pregnant woman who presented eruptive febrile disease at the end of the first trimester of pregnancy, while living in Brazil. An ultrasound performed at 29 weeks of gestation revealed microcalcifications, both in the brain of the fetus and the placenta. After the pregnancy was terminated at the mother's request, a fetal autopsy was performed. Through microbiological examination, the full ZIKV genome was recovered from the fetal brain. Viral RNA and ZIKV antigens were also detected in brain tissue of two infants with microcephaly who died within the first 20 hours of life, and in placenta tissue in two miscarriages. All four mothers had had clinical signs of ZIKV infection, including fever and skin rash, during the first trimester of pregnancy, but did not have clinical signs of active infection at the time of childbirth or miscarriage. The viral sequence analysis provided additional proof of ZIKV infection in tissues, and revealed a sequence that was very similar to that of Zika virus strains isolated in Brazil during 2015.

Guillain-Barré syndrome (GBS) and other neurological manifestations

In 2016, a total of 18 epidemiological PAHO/WHO updates dealt with topics related to Guillain-Barré syndrome (GBS), and other neurological manifestations associated with Zika virus infection. The increase in the number of cases of neurological syndromes associated with ZIKV, the detection of ZIKV in cerebrospinal fluid of cases of GBS and other neurological syndromes, and the observed increase in the number of GBS cases in countries with ZIKV transmission highlighted the need to expand the spectrum of neurological manifestations to be monitored in the context of the ZIKV epidemic in the Region.

17 January 2016. An increase in the number of GBS cases and other neurological manifestations was reported for the first time. During the ZIKV outbreak in French Polynesia (2013–2014),¹⁰ 74 patients had presented neurological or auto-immune syndrome after suffering symptoms consistent with Zika virus infection. Of those patients, 42 were classified as GBS; of the 42, 24 (57%) were men, and 37 (88%) presented signs and symptoms compatible with ZIKV infection.

July 2015. Brazil reported the detection of patients with neurological syndromes and recent history of ZIKV infection in the state of Bahia. A total of 76 patients with neurological syndromes had been detected, of whom 42 (55%) were confirmed as GBS. Among the confirmed GBS cases, 26 (62%) had a history of symptoms compatible with ZIKV infection.

25 November 2015. The Aggeu Magalhães Research Center of the Oswaldo Cruz Foundation reported that ZIKV infection had been confirmed in 10 of 224 samples from patients with suspected dengue infection. Seven of the 10 samples corresponded to patients with neurological syndromes.

January 2016. In El Salvador, an unusual increase in the number of GBS cases had been observed since early December 2015. In El Salvador, on average, 14 GBS cases were reported monthly (169 annual cases) in previous years. However, between 1 December 2015 and 6 January 2016, 46 GBS cases were reported, of which 2 died. Of the total, 25 (54%) were men, and 35 (76%) were over 30 years of age. All of the cases were hospitalized and received treatment with plasmapheresis or immunoglobulin. Of the deaths, one had a history of multiple underlying chronic conditions. Of a total of the 22 patients whose information was available, 12 (54%) presented exanthematic febrile disease between 7 and 15 days before the onset of GBS.

¹⁰ Reported suspected cases 8,750; estimated number of persons infected, 32,000.

A similar situation was investigated in other countries of the Region. The findings were compatible with a spatiotemporal association between ZIKV circulation and the increase in the number of GBS cases. Although neither the pathogenesis nor the risk factors for GBS had been clearly established yet, PAHO/WHO recommended that Member States implement surveillance systems to detect unusual increases in cases, and prepare their health services to provide care to patients with neurological signs and symptoms.

Other neurological syndromes

ZIKV can produce other neurological syndromes (meningitis, meningoencephalitis, and myelitis), also described in the French Polynesian outbreak (2013-2014). In the Region, a similar situation had not yet been reported at the time; nonetheless, health services were alerted to the potential occurrence of said syndromes, so they could prepare to detect cases and provide appropriate care.

31 March 2016. Eight countries and territories of the Region had reported an increase in GBS cases (Brazil, Colombia, the Dominican Republic, El Salvador, Honduras, Martinique, Suriname, and Venezuela); five more countries and territories had reported at least one case of GBS with laboratory-confirmed ZIKV infection, but no increase in the expected incidence (French Guiana, Haiti, Martinique, Panama, and Puerto Rico). In Guadeloupe, a case of myelitis had been detected, in which ZIKV infection was confirmed in cerebrospinal fluid. Honduras reported a case of GBS in a pregnant woman who miscarried at nine-week pregnancy, and in whom ZIKV infection was also detected.

14 April to 26 May 2016. Paraguay reported an increase in GBS cases, although ZIKV infection was confirmed in none of the cases. Five more countries and territories reported GBS cases associated with ZIKV infection, without an increase in the number of GBS cases.

16 June 2016. Overall, nine countries and territories of the Region had reported increases in the number of GBS cases, with at least one of those cases being confirmed for ZIKV infection. As of 23 June 2016, that number had risen to 11.

7 July to 29 July 2016. Eleven countries and territories of the Region had reported increases in the number of GBS cases. Four of these countries reported GBS cases associated with ZIKV infection without an increase in this type of cases.

11 August 2016. Saint Vincent and the Grenadines was added to the list of countries and territories with an increase in the number of GBS cases, bringing the total to 12. Costa Rica and Grenada joined the list of countries and territories reporting GBS cases associated with ZIKV infection but without an increase in the number of expected GBS cases.

6 October 2016. In Guadeloupe, an increase in the number of GBS cases had been observed, and in Mexico, the confirmation of ZIKV infection was reported in five GBS cases.

6 November 2016. Guatemala reported an increase in the number of GBS cases; previously, there had been at least one GBS case with laboratory-confirmed ZIKV infection.

Table 3 shows the countries and territories in the Americas that reported GBS cases in 2016.

Table 3. Countries and territories of the Americas that reported GBS cases, in the context of Zika virus circulation (updated to 29 December 2016)

Increase of GBS cases, and laboratory confirmation of Zika virus in at least one case of GBS	Laboratory confirmation of Zika virus infection in at least one case of GBS	Increase of GBS cases, without laboratory-confirmed Zika virus infection
Brazil	Bolivia	Paraguay
Colombia	Costa Rica	Saint Vincent and the Grenadines
El Salvador	Grenada	
Guadeloupe	Haiti	
Guatemala	Mexico	
French Guiana	Panama	
Honduras	Saint Martin	
Jamaica		
Martinique		
Puerto Rico		
Dominican Republic		
Suriname		
Venezuela		

Brazil

24 March 2016. Between EW 13 and 20 of 2015, the Pernambuco Secretariat for Health of reported an increase in the number of GBS cases. On average, in the past, the state had reported 94 GBS cases per year. However, in 2015, a total of 130 cases of that syndrome had been recorded. An analysis of age-specific GBS incidence rates in the state showed that 50-59 year-olds were the most affected, followed by the age group 60 years and over.

9 June 2016. Information on the geographic distribution of hospitalized GBS cases between 2008 and 2015 (through November) in Brazil was published. The southeast and northeast regions presented an increasing trend between 2014 and 2015, with the greatest number of cases reported since 2010. Furthermore, in the southern region, the epidemiological curve presented a downward trend between 2008 and 2012, with a slight increase starting in 2012. In other regions (north and center-west), epidemiological curves were stable, although a mild increase was observed in 2014 in the northern region.

Colombia

February 2016. Colombian authorities reported an increase of GBS cases. On average, 242 GBS cases had been reported annually in the past; however, on 23 February 2016, it was reported that, from EW 51 of 2015 through EW 6 of 2016, 201 GBS cases had been reported, all of which had a history of suspected ZIKV infection. The majority of the cases came from Norte de Santander and Barranquilla, departments in which most ZIKV cases had been reported. There were more male than female cases, and the most affected age group was 30 to 49 years. The increase in the number of GBS cases was detected five weeks after the initial detection of autochthonous ZIKV circulation.

17 March 2016. Since the implementation of intensified neurological syndrome surveillance in December 2015 up to EW 9 of 2016, 327 cases of neurological syndromes with history of ZIKV

infection were detected in Colombia, including 220 GBS cases, and other similar neurological disorders, such as ascending polyneuropathy. Of the total number of neurological syndrome cases, 58.1% (190 cases) were men. The highest number of cases occurred among people aged 69 years and over (40 cases), followed by the age groups 35 to 39, and 45 to 49 years (35 cases each). The highest number of neurological syndrome cases was reported in Norte de Santander (69 cases), where the highest number of ZIKV infection cases was also recorded. There were several cases of neurological syndromes in Barranquilla (57 cases) and Atlantic (29 cases) in the Caribbean region, where the first outbreaks of ZIKV in the country were detected. The geographical distribution of neurological syndrome cases indicates a spatial association with the departments that reported a high number of ZIKV infections.

24 March 2016. Since the implementation of surveillance up to EW 10 of 2016, 352 cases of neurological syndromes were reported, including 248 GBS cases and other similar neurological conditions, such as ascending polyneuropathy. All of the cases of neurological syndromes had a history of ZIKV infection.

8 April 2016. An analysis of the simultaneous circulation of different arboviruses in Colombia was conducted, as dengue and chikungunya viruses had been circulating in the country prior to the introduction of ZIKV in the Americas. The three viruses share a common vector. Colombia experienced a large dengue outbreak that began in August 2014 and peaked in April 2015. In 2014, there was also a chikungunya outbreak (55,000 cases), whose epidemic curve mirrored that of the dengue epidemic (65,000 cases). With the introduction of ZIKV in August 2015, a simultaneous upward trend began to be observed for both arboviruses (dengue and chikungunya).

Upon comparing the dynamic of dengue, chikungunya, and ZIKV with the incidence of GBS cases, which reached its peak in January and February of 2016, a temporal correlation was observed between GBS and ZIKV cases.

8 April 2016. In Norte de Santander, a high number of neurological syndrome cases were reported, including 78 GBS cases; this department also registered the greatest number of ZIKV cases, followed by the departments of Barranquilla, Atlantic, and Antioquia. The geographical distribution of neurological syndrome cases, by department, suggests a spatial association with the incidence of suspected and confirmed ZIKV cases.

14 April 2016. Between December 2015 and EW 13 of 2016, 416 cases of neurological syndromes with history of ZIKV infection were detected, including 277 GBS cases (66.6%), and other similar neurological disorders, such as ascending polyneuropathy. The epidemiological curve began its decline following an increase in the number of cases during EW 3 of 2016. Of the cases of neurological syndromes, 56.3% (234) were men; with regard to age, the highest number of cases was reported in the age group 65 years and over (49 cases), followed by 45 to 49 year-olds (41 cases).

16 June 2016. Between 15 December 2015 (EW 50 of 2015) and EW 22 of 2016, in the country as a whole, 567 cases of neurological syndromes with suspected association to ZIKV infection were reported; of those, 373 cases corresponded to GBS. There was a total of 48 probable deaths by Zika under investigation.

Dominican Republic

Prior to the introduction of ZIKV in the Region of the Americas, the Dominican Republic had registered dengue and chikungunya outbreaks. The first cases of chikungunya were recorded in March 2014. After a decrease in the number of cases of dengue reported in the country at the beginning of 2015, an increase was observed in October 2015. Upon comparing the dynamic of dengue, chikungunya, and ZIKV with the incidence of cases of GBS, which peaked in February 2016, a temporal correlation was observed between GBS and ZIKV infection cases.

14 April 2016. The Ministry of Public Health issued a resolution that made reporting of GBS, microcephaly, and other birth defects related to the ZIKV epidemic mandatory.

28 April 2016. As of EW 15, a total of nine new cases of SGB had been recorded, all with history of suspected ZIKV infection. In total, between EW 1 and EW 15 of 2016, 48 cases of GBS were recorded, 67% of them in the four most recent weeks. This was temporally associated with an increase in the number of cases of ZIKV infection reported for EW 15.

26 May 2016. Between EW 1 and EW 17 of 2016, 100 GBS cases with suspected ZIKV infection had been reported throughout the country, 42% of them in Santo Domingo, 25% in the National District, 10% in Barahona, and 7% in Azua.

9 and 23 June 2016. GBS surveillance data in the Dominican Republic indicated that, between EW 1 and EW 20 of 2016, 139 GBS cases had been reported, including 15 deaths. Of the total number of reported cases, 38% occurred between EW 17 and EW 20, and 62% affected residents of the province of Santo Domingo, and the National District (56 and 30 cases, respectively).

El Salvador

17 March 2016. Between EW 48 of 2015 and EW 9 of 2016, 136 GBS cases had been reported from all of the country's 14 departments; on average, 169 GBS cases are recorded yearly. Those cases affected patients from 3 to 88 years of age; the highest number of cases occurred among 30 to 39 year-olds. Of the 22 patients whose information was available, 12 (54%) had had exanthematic febrile disease between 7 and 15 days before the onset of GBS symptoms. Three patients died, including one affected by multiple underlying chronic diseases, although none had a history of exanthematic febrile disease.

24 March 2016. Upon comparing the dynamic of dengue, chikungunya, and ZIKV with the incidence of GBS, which peaked in the first weeks of 2016, a similar time correlation as in Colombia was observed, with the greatest number of ZIKV cases being detected between December 2015 and January 2016.

21 April 2016. Between EW 48 of 2015 and EW 14 of 2016, 141 GBS cases, including five deaths, were reported in the country. More than 45% of ZIKV reported cases and 58% of GBS cases were registered between EW 51 of 2015 and EW 3 of 2016.

Guadeloupe

ZIKV infection was confirmed in 8 GBS patients, while 9 more cases were under investigation. Furthermore, ZIKV infection was confirmed in 5 other patients who presented other neurological disorders.

Honduras

According to hospital discharge data published in the epidemiological update of 17 March 2016, between 2010 and 2015, an average of 112 GBS cases had been reported in the country. However, from the beginning of 2016 to EW 9 of the same year, 57 GBS cases were reported in the departments of San Pedro Sula (21), Tegucigalpa (10), and Cortés (5). Among these cases, there was one death; ZIKV infection was not laboratory-confirmed.

31 March 2016. In July 2015, dengue and chikungunya outbreaks were reported in the country. Towards the end of 2015, dengue and chikungunya epidemiological trends were descending; however, a slight increase starting in December was reported, which coincided with the

detection of the first autochthonous ZIKV cases. As in other places, a temporal correlation was observed between the increase in ZIKV infection and the highest GBS incidence in January and February 2016.

EW 14 of 2016. A total of 74 GBS cases had been reported. Most cases of ZIKV infection (82%) and GBS (62%) were registered between EW 2 and EW 9 of 2016. Both diseases have showed a constant downward trend from EW 7 of 2016, although a sporadic fluctuation in the number of cases was observed, which could be associated with delays in reporting.

Martinique

31 March 2016. Among the French territories in the Americas (Guadeloupe, French Guiana, Martinique, Saint Barthélemy, and Saint Martin), Martinique had reported the highest number of suspected cases of ZIKV infection, with a total of 14,320 cases. Martinique also reported the highest number of GBS cases, including five cases with confirmed ZIKV infection, and four more GBS cases with pending laboratory results. Historical data on the incidence of GBS are not available to estimate the baseline number of GBS cases, so no expected threshold could be defined. However, an increase in the number of GBS cases was clear when compared with the number of cases reported in previous weeks. Also, three cases of severe neurological syndromes were detected among confirmed cases of ZIKV infection.

Panama

17 March 2016. A case of GBS was reported in a 13-year-old girl who presented fever on 19 February and, 10 later days, developed weakness in the lower limbs. The spine tap showed protein elevation in the CSF, and ZIKV infection was detected in CSF and urine samples. This was the second case of GBS with history of ZIKV infection reported.

26 May 2016. The discharge rate for patients with GBS had presented an upward trend since 2010, from 0.08 to 0.43 per 100,000 population. During this period of 2016, 6 cases of neurological syndrome had been recorded, 5 clinically compatible with GBS, and 1 with cerebellitis. In three cases (2 GBS, and one encephalo-cerebellitis) previous ZIKV infection was confirmed by RT-PCR.

Paraguay

12 April 2016. An increase in the number of GBS cases was observed in the first three months of 2016. Between 2005 and 2011, Paraguay registered an annual average of 32 GBS cases, versus 21 GBS cases reported during the first three months of 2016. At the time of reporting, none of the cases had laboratory-confirmed ZIKV infection.

Suriname

31 March 2016. A 54-year-old healthy Dutch woman developed thrombocytopenia and hemorrhage, following a visit to Suriname; the case was confirmed as ZIKV infection. The onset of symptoms occurred 11 days after her return from Suriname, when she presented fatigue, loss of appetite, generalized weakness, and inflammation and pain in hands, wrists, and ankles. After 10 days, she developed vomiting and watery diarrhea, with subcutaneous hematomas in all limbs. Blood samples from the patient were obtained on the second day after the onset of symptoms. The sample was analyzed by PCR at the Academic Hospital of Paramaribo, and yielded positive results for ZIKV.

28 April 2016. Between EW 39 of 2015 and EW 15 of 2016, 14 GBS cases were reported, 9 of which occurred between EW 1 and EW 15 of 2016. Between 2010 and 2014, an average

of five annual GBS cases were reported, i.e., a two-fold increase in the number of cases registered in the first four months of 2016.

23 June 2016. From EW 1 to EW 20 of 2016, 10 GBS cases were reported, the same as the total number of cases registered in 2015. Of the total cases reported in 2016, two had confirmed ZIKV infection.

United States

17 March 2016. Two GBS cases with laboratory-confirmed ZIKV infection were reported in travelers who returned to the United States from countries with autochthonous ZIKV transmission. The first case was an adult male who resided in the United States, with a history of recent travel to Central America. He developed an acute febrile disease shortly after returning, and was subsequently hospitalized in January 2016, with clinical symptoms that included progressive ascending weakness of the limbs and decreased reflexes. Biological samples from this patient tested positive for ZIKV infection by PCR. The patient evolved favorably, and was about to be discharged when he developed sudden subarachnoid hemorrhage due to a ruptured aneurism, and died.

The second case was a Haitian resident, who, at the beginning of January 2016, developed facial weakness, difficulty in swallowing, and numbness of the fingers. The patient traveled to the United States for medical care, after numbness had spread to his lower limbs, and his spinal tap showed increased serum proteins and leukocytes in cerebrospinal fluid. Serum and CSF analysis determined the presence of IgM and neutralizing ZIKV antibodies.

Venezuela

12 December 2015 to 13 February 2016. A total of 578 GBS cases were reported, of which 235 had had ZIKV infection symptoms. The first GBS case with laboratory-confirmed ZIKV (by RT-PCR) infection was reported in November 2015. In 2016 (between EW 1 and EW 6), 27 samples of patients with GBS were analyzed, with 6 (22.2%) yielding positive results. GBS cases presented an upward trend starting on EW 1 of 2016; it followed the rising epidemic curve for ZIKV infection. Furthermore, 1 case of facial paralysis and 10 cases of nonspecific neurological disorders were reported with positive ZIKV RT-PCR test.

Surveillance of acute flaccid paralysis

The epidemiological updates on ZIKV infection of 2016 emphasized the importance of an integrated analysis of the findings of various surveillance systems, in order to better understand the emergence of ZIKV, and other arboviruses. The importance of analyzing the epidemiology of acute flaccid paralysis (AFP), a neurological complication manifested in many diseases, and of investigating any unusual increase in the number of cases in areas of ZIKV circulation was also underlined. In some countries of the Region of the Americas with autochthonous circulation of ZIKV an increase in AFP case reporting in children under 15 years of age was observed.

Honduras

21 April 2016. In 2015, there was an increase in the number of cases of acute flaccid paralysis (AFP), when compared with the number recorded in the two previous years; that increase coincided with the introduction of ZIKV. The number of AFP cases reported in the first 14 epidemiological weeks of 2016 was similar to the total annual number reported in 2013 and 2014.

Colombia

During 2016, an increase in the number of AFP cases was observed. As of EW 9 of 2016, the AFP rate was 0.33 per 100,000 children under 15 years of age, while the expected rate was 0.17 per 100,000. During the ZIKV epidemic, between EW 38 of 2015 and 9 of 2016, 26 cases of AFP were reported in children; those were consistent with ZIKV infection prior to the paralysis.

Upon comparing the dynamic of dengue, chikungunya, and Zika with the monthly incidence of acute flaccid paralysis reported among children under 15 years of age, there was a correlation between the time of the increase of AFP cases and the beginning of the ZIKV epidemic.

Bolivia

19 May 2016. When compared with the rates reported through EW 18 of 2015, there had been a slight increase in the incidence rate of AFP in 2016. Nevertheless, since AFP is a clinical sign of a wide range of diseases, it is important that countries with ZIKV circulation consider that an increase in AFP rates could be related to neurological complication of ZIKV disease. As of 19 May 2016, Bolivia had not reported increased numbers of GBS cases.

Brazil

2 June 2016. Between 2010 and 2012, the reported incidence rate of AFP in children under 15 of years of age ranged between 0.78 and 0.84 per 100,000 population; later, between 2013 and 2014, a downward trend was observed. Subsequently, in 2015 and 2016, an upward trend reemerged. Similarly to countries with reported increases in the number of GBS cases associated with ZIKV infection, it was thought that the increase in AFP cases in Brazil could have been related to ZIKV infection in children.

Dissemination of new findings

PAHO/WHO epidemiological alerts and updates were also used to share the results of studies that helped to better understand the ongoing ZIKV epidemic. The conclusions of various scientific studies and reports that were shared with Member States through their IHR National Focal Points are summarized below.

Evidence of vertical transmission of ZIKV

13 January 2016. The Brazil Ministry of Health reported the detection of ZIKV genome by RT-PCR in four cases of congenital malformations in the state of Rio Grande do Norte. The cases corresponded to two abortions, and two newborns (one born at 37 weeks and the other at 42 weeks of pregnancy) who died within 24 hours of birth. Tissue samples of both newborns were positive for ZIKV by immunohistochemistry.¹¹ A previous report included in the Epidemiological Alert of 1 December 2015 described the detection of ZIKV genome by RT-PCR in the amniotic fluid of two pregnant women from Paraiba, whose fetuses' ultrasound detected microcephaly.

¹¹ Public Health Emergency Operations Center on microcephaly. EW 1, 2016. Brazilian Ministry of Health. Available at: <http://portalsaude.saude.gov.br/images/pdf/2016/janeiro/13/COES-Microcefalias---InformeEpidemiol--gico-08---EW-01-2016---Valida----o-12jan2016---VALIDADO-PELO-CLAUDIO--e-com-osestados-por-webconfer--n.pdf>

Fatal cases with atypical presentation

Brazil

11 February 2016. The Brazil IHR National Focal Point reported that, on 22 January 2016, the Evandro Chagas Institute had reported the findings of a retrospective investigation of a ZIKV infection related death. This was a 20 year-old woman, from the municipality of Serrinha, Rio Grande do Norte, without history of prior disease. She developed symptoms (dry cough, high fever, myalgia, fatigue, and dyspnea) on 11 April 2015. The patient was admitted into intensive care due to worsening of her symptoms, abundant bleeding, and decompensation, which later caused her death. Blood samples obtained on 17 April 2015 were negative for dengue. However, fragments of ZIKV were detected by RT-PCR in several organs (liver, kidneys, and lungs). Necropsy results revealed diffuse pulmonary infiltrate, and bilateral pulmonary abscesses.

Suriname

Suriname reported the death of four men related to ZIKV infection within a period of two weeks. The ages of the affected cases were 58, 61, 64, and 75 years. All had presented acute symptoms, including diarrhea or vomiting, and dehydration. Shortly after their conditions had worsened, they died. All the cases had underlying diseases or risk factors. The possibility that those deaths had been caused by concomitant diseases was not ruled out.

ZIKV detection in urine and saliva samples

17 February 2016. Oswaldo Cruz Foundation (Fiocruz) scientists reported the detection of ZIKV in samples of urine and saliva.¹²

ZIKV Neurotropism

10 March 2016. A recent study showed that strains of ZIKV can effectively infect human neural stem cells. The study provided a model to investigate the effect and mechanism through which ZIKV affects human brain development, as well as a platform to select therapeutic compounds.¹³

Relationship between ZIKV and GBS

3 March 2016. Readers were informed of the publication of the first case-control study on the relationship between ZIKV infection and GBS. The subjects of the study were 42 GBS cases with laboratory-confirmed ZIKV infection recorded during the 2013-2014 ZIKV outbreak in French Polynesia. On average, the onset of neurological symptoms occurred six days after the exanthematic febrile disease. There were no fatalities among these cases, and patients' recovery was faster than usually observed among GBS patients.

All cases had neutralizing antibodies against ZIKV, in comparison with 56% of the 98 patients in the control group ($p < 0.0001$). Most cases (93%) also were IgM positive for ZIKV. Previous infection with dengue was not significantly different in cases and controls. This was the first study to show that ZIKV infection could cause GBS. The authors indicated that, due to the rapid spread of ZIKV in the Americas, it was necessary for countries with risk of ZIKV infection

¹² Full report available at: <https://agencia.fiocruz.br/fiocruz-detecta-presenca-de-virus-zika-com-potencial-de-infeccao-em-saliva-e-urina>

¹³ Full report available at: [http://www.cell.com/cell-stem-cell/fulltext/S1934-5909\(16\)00106-5](http://www.cell.com/cell-stem-cell/fulltext/S1934-5909(16)00106-5)

to implement measures to treat potential GBS patients, among others, ensuring that sufficient ICU beds were available.¹⁴

Epidemiological and genetic findings on the introduction of ZIKV in the Americas

24 March 2016. A study based on phylogenetic and molecular analyses of the ZIKV revealed that it had been introduced in the Americas on a single event, believed to have occurred between May and November 2013, that is, more than 12 months before the detection of the first cases of ZIKV infection in Brazil. The study revealed that the ZIKV strain detected in Brazil shared a common ancestor with the ZIKV strain circulating in French Polynesia in November 2013.

In order to determine the evolution of ZIKV, and explore its introduction in the Americas, phylogenetic mobility data, as well as epidemiological, and demographic data were analyzed. Seven complete ZIKV genomes identified in Brazil were sequenced, through new generation sequencing of samples obtained during the outbreak. The samples corresponded to 4 cases of ZIKV infection, 1 to a blood donor, 1 adult death in the state of Maranhão, and 1 newborn with microcephaly and congenital malformations in the state of Ceará.¹⁵

Genetic analysis in twins

3 March 2016. Researchers at the University of São Paulo, Brazil, reported on an ongoing study in discordant twins, where only one newborn had microcephaly. The study sought to investigate whether some fetuses carried genes that protect from or facilitate congenital malformations related to ZIKV infection. At the time of the report, three pairs of twins, in which only one had microcephaly, had been identified. The research aimed to compare the twins' genome with that of the parents, to determine the existence of microcephaly related genes.¹⁶

ZIKV infection--prolonged maternal viremia and fetal brain anomalies

31 March 2016. A report was published on the case of a 33-year-old pregnant woman who developed symptoms of ZIKV infection at 11 weeks of gestation, after her return from a trip to Belize, Guatemala, and Mexico at the end of November 2015. IgG and IgM antibodies against ZIKV were detected in samples from the case. At the time, recommendations regarding sampling for laboratory testing of ZIKV infection indicated that viremia lasted less than a week after the onset of symptoms. However, ZIKV RNA was detected in the serum of the pregnant woman up to 4 and 10 weeks after the onset of symptoms, but not at time of delivery.

The patient decided to terminate the pregnancy at 21 weeks of gestation. Upon studying fetal and maternal viral loads by quantitative RT-PCR, the highest viral load was detected in fetal brain, with substantial viral loads in the placenta, fetal membranes, and umbilical cord. ZIKV RNA was found in smaller quantities in fetal muscle, liver, lung, and spleen, as well as in amniotic fluid. Researchers suspected that that persistent Zika viremia in the mother resulted from fetal or placental viral replication. No other TORCH (toxoplasmosis, rubella, cytomegalovirus, herpes simplex and syphilis) agents were detected in the amniotic fluid. The study also presented postmortem histopathological findings indicating the loss, by apoptosis, of postmigration neurons of intermediate differentiation. However, the preservation of differentiated neurons in the basal nodes, the limbic region, and the dorsal spinal cord was observed.¹⁷

¹⁴ Full report available at: [http://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(16\)00562-6/abstract](http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(16)00562-6/abstract)

¹⁵ Full report available at: <http://science.sciencemag.org/content/351/6280/1377.full>

¹⁶ Full report available at: <http://www.genoma.ib.usp.br/pt-br/noticias/pesquisa-sobre-virus-zika-e-microcefalia>

¹⁷ Full report available at: http://www.nejm.org/doi/full/10.1056/NEJMoa1601824?query=featured_home#t=abstract

Clinical manifestations of ZIKV infection

8 April 2016. A study published by the U.S. CDC analyzed signs and symptoms of ZIKV infection in a sample of confirmed cases from an emergency clinic in Rio de Janeiro, Brazil. The authors found that skin rash was, by far, the most common symptom leading patients to seek care (98%). Only 67% of patients had fever (at least at the time of consultation). The authors compared their results with those from a series of similar cases in Puerto Rico, where fever was almost as frequent as skin rash (77% skin rash, versus 73% fever).¹⁸

Congenital malformations and cerebral dysfunction in fetuses and newborns after a Zika epidemic in French Polynesia, 2013-2014

A report was published on the investigation of an unusual increase in cerebral congenital malformations and fetal dysfunction in newborns in French Polynesia following the ZIKV epidemic that occurred between October 2013 and March 2014. A retrospective analysis identified 19 cases, of which 8 had serious cerebral lesions, and severe microcephaly; 6 had serious cerebral injuries without microcephaly; and 5, brain stem dysfunction without visible malformations. The authors emphasized the need for clarifying the potential teratogenic function of ZIKV regarding birth defects different from microcephaly, extracerebral malformations, and dysfunction of the brain stem.¹⁹

Nonhuman primates infected with Zika virus

9 March 2016. Ecuador reported the detection of ZIKV infection in a howler monkey. Samples of heart and spleen tissues from the dead monkey tested positive for ZIKV by RT-PCR. The samples were obtained as part of an epizootic investigation (39 dead monkeys). The outbreak occurred between 1 and 10 February, in a national park in the province of Manabi. Samples were also tested for influenza, dengue, leptospirosis, and yellow fever, all of which yielded negative results. This was the first detection of ZIKV infection in nonhuman primates reported in Ecuador, as well as the first in the Americas. On 14 April 2016, a second case of a howler monkey infected with ZIKV in Ecuador was reported.

Shortly afterwards, Brazilian researchers published the findings of a study of nonhuman primates infected with ZIKV in the state of Rio Grande do Norte. The detection occurred in samples of 4/15 titi monkeys (*Callithrix jacchus*) and 3/9 capuchin monkeys (*Sapajus libidinosus*) captured between July and November 2015, in the state of Ceará, an area of ZIKV circulation. Viral sequencing showed a 100% similarity to other Zika viruses detected in South America.²⁰

These nonhuman primates were captured in various environmentally different areas, distant from one another. ZIKV was isolated for the first time in a Rhesus monkey in the Zika forest in Uganda in the 1940s. The prevalence of ZIKV is unknown in monkeys and other nonhuman primates.

Zika virus damages the growth of neurospheres and cerebral organoids in humans

10 April 2016. Researchers at the D'Or Institute for Research and Education showed, using immunocytochemistry and electron microscopy, that ZIKV targets human brain cells, reducing

¹⁸ Full report available at: https://wwwnc.cdc.gov/eid/article/22/7/16-0375_article

¹⁹ Full report available at: <http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=21429>

²⁰ Full report available at: <http://biorxiv.org/content/biorxiv/early/2016/04/20/049395.full.pdf>

their viability and growth as brain neurospheres and organoids. The virus infects human pluripotent neural stem cells, brain neurospheres and organoids, leading to cellular death, malformations, and a 40% growth reduction. In similar experiments with dengue virus, the cells were infected, but neither neural cells nor neuroespheres or organoids were damaged. These results suggest that ZIKV prevents neurogenesis during the human brain development phase.²¹

Detection of Zika virus in *Aedes albopictus* mosquito in Mexico

12 April 2016. The Arbovirus and Hemorrhagic Viruses Laboratory of the Institute for Epidemiological Diagnosis and Reference (InDRE, per its Spanish acronym) confirmed the detection of ZIKV in mosquitoes of the species *Aedes albopictus* captured in the environment. Mosquitoes were analyzed by RT-PCR. This was the first time ZIKV was documented in *Ae. albopictus* mosquitoes in Mexico and in the Americas. The mosquitoes were provided to the InDRE by the State Public Health Laboratory of San Luis Potosí.

Recommendations to Public Health Authorities

Surveillance guide for Zika virus disease and complications

In April 2016, PAHO/WHO published *Guidelines for surveillance of Zika virus disease and complications*, based on the experience of the ongoing epidemic in the Region of the Americas. The Guide includes a brief clinical description of ZIKV disease, its neurological manifestations, and congenital Zika syndrome. It also includes a proposed case definitions, and laboratory procedures for case detection and diagnosis.

PAHO/WHO urged Member States to adopt the case definitions proposed in the Guide, and to document its use for the purpose of revising and updating it, if needed, based on the experience and in light of newly acquired knowledge. The guide is available on PAHO's website through the following link: <http://iris.paho.org/xmlui/handle/123456789/28234?locale-attribute=en>.

Serological diagnosis of Zika virus infection guidelines

Considering that detecting antibodies against ZIKV constitutes an effective method for confirming infection by this virus associated with complications, such as neurological and congenital syndromes; that serological diagnosis can be made by ZIKV ELISA IgM from day 6 after the onset of symptoms and for several months after the infection, Member States were urged to implement and use PAHO/WHO's Guidelines for serological diagnosis of ZIKV infection published in October 2016, which is available at: http://www2.paho.org/hq/index.php?option=com_docman&task=doc_view&Itemid=270&gid=36616&lang=en.

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Influenza Activity in the 2015-2016 Season

PAHO/WHO recommended that Member States adopt measures to ensure appropriate clinical management, strict compliance with infection control measures in health care services, and adequate provision of antiviral medication. In addition, PAHO/WHO urged Member States to continue vaccinating against seasonal influenza, to prevent severe cases and deaths from influenza.

9 February 2016

Epidemiological context

During 2015, most of the Member States of the Caribbean reported little influenza and other respiratory viruses' activity. However, Barbados reported an increase of influenza A(H1N1)pdm09 activity at the end of that year, and Cuba registered high activity of severe acute respiratory infection (SARI) associated with influenza A(H1N1)pdm09 between EW 26 and EW 40 of 2015. Furthermore, in Puerto Rico, a growing trend of influenza-like illness was reported (ILI) between EW 51 of 2015 and EW 3 of 2016. In Dominica and Saint Lucia, the incidence of acute respiratory infection (ARI) remained high and rising.

In Central America, El Salvador reported an increase of influenza A activity (H3N2) at the end of 2015, and, in that same period, Nicaragua reported an increase in the number of cases of influenza A(H1N1)pdm09. The circulation of this virus also increased in Panama between EW 1 and EW 3 of 2016.

In Costa Rica, there was an increase in the number of cases of influenza starting in EW 43 of 2015, which then diminished as of EW 52 of that year. The predominant virus, as in Nicaragua and Panama, was influenza A(H1N1)pdm09, followed by influenza A(H3N2). The highest number of cases of influenza was recorded between EW 49 and EW 52 of 2015. In those last weeks, the incidence of cases of SARI also increased among patients in intensive care units; the trend began to decline starting in EW 52.

In North America, the number of cases of influenza and other respiratory viruses remained low, although in the last weeks of 2015, an increasing trend was observed in Canada, Mexico, and the United States. In response to this situation, on 1 February 2016, the U.S. CDC, through its health alerts network, reported the detection of severe cases of influenza in the United States.

Additional information on influenza and other respiratory viruses can be obtained in the Regional Influenza Update, published weekly on PAHO's website, available at: http://www2.paho.org/hq/index.php?option=com_content&view=article&id=3352&Itemid=2469&to=2246&lang=en.

Recommendations

At the onset of the season of greater circulation of influenza viruses in the northern hemisphere, PAHO/WHO reiterated its recommendations on surveillance; adequate clinical patient management; implementation of control measures for health care associated infections; and communication with the population regarding preventive measures. For more information on the specific recommendations, refer to:

http://www.paho.org/hq/index.php?option=com_docman&task=doc_view&Itemid=270&gid=33167&lang=en.



Cholera

In 2016, PAHO/WHO published six epidemiological updates on cholera in the Region of the Americas. From EW 1 to EW 43 of 2016, a total of 35,755 cases of cholera had been reported in four countries of the Americas: the Dominican Republic (1,097), Ecuador (1), Haiti (34,656), and Mexico (1). In comparison, in 2015, a total of 36,654 cases of cholera had been reported in three countries of the Region: Cuba (65), the Dominican Republic (546), and Haiti (36,045).

9 March 2016

Cuba. As of EW 7, no new cases had been reported.

Haiti. As of EW 7, 7,040 suspected cholera cases, and 88 deaths had been reported. The number of cases reported during the first four EW of 2016, was greater than the number of cases reported for the same period in 2014 and 2015.

Dominican Republic: 68 suspected cases, and zero deaths had been reported.

27 May 2016

Ecuador. On 25 May 2016, the Ecuador IHR National Focal Point reported a confirmed cholera case in a 57 year-old individual with an underlying clinical condition in the city of Machala, El Oro province. The case was confirmed by the National Public Health and Research Institute (INSPI), where the strain was identified as *Vibrio cholerae* serogroup O1, serotype Ogawa, biotype El Tor. The strain was sensitive to ampicillin, ceftriaxone, ciprofloxacin, chloramphenicol, tetracycline, and trimethoprim-sulfamethoxazole. No additional suspected cases were identified by epidemiological investigation. Furthermore, no increase in the number of cases of acute diarrheal disease (ADD) was reported in Machala, or at the provincial or national levels. The last autochthonous case of cholera had been reported in Ecuador in 2004.

Haiti. The number of recorded cases in the first 17 EWs of 2016 was higher than the number of reported cases during the same period in 2014 and 2015.

Dominican Republic. In the same 17 EWs as above, 714 suspected cholera cases and 16 deaths had been reported, which were also higher than those registered throughout 2014 (603 cases, and 11 deaths) and 2015 (546 cases, and 15 deaths).

21 July 2016

Haiti. As of EW 25 of 2016, a total of 21,661 suspected cholera cases and 200 deaths had been reported. The number of cases during the first four weeks of 2016 exceeded the total number of cases reported in the same period, both for 2014 and 2015. Between EW 19 and EW 27 of 2016, the epidemic was similar to that of 2013, with more cases and deaths than in 2014 and 2015.

Dominican Republic. As of EW 25 of 2016, 894 suspected cholera cases and 17 deaths had been reported.

12 September 2016

Haiti. As of EW 34 of 2016, a total of 26,799 cholera suspected cases and 242 deaths (case fatality rate, 0.90%) had been reported. The number of reported cases and deaths remained higher than in the same period of 2014 and 2015, although the case fatality rate for the country as a whole was lower than that of 2014 (1.05%), and similar to that of 2015 (0.89%).

Dominican Republic. Between EW 1 and EW 32, a total of 1,039 suspected cholera cases and 18 deaths (case fatality rate, 1.7%) had been reported. That number is almost twice the total number of cases reported in 2014; however, the case fatality rate was lower than in 2014 (1.82%), and 2015 (2.74%).

18 October 2016

Haiti. As of EW 37 of 2016, a total of 28,559 suspected cholera cases and 267 deaths (case fatality rate, 0.9%) were reported. The total number of reported cases and deaths remained high.

Dominican Republic. As of EW 38 of 2016, a total of 1,069 suspected cholera cases and 18 deaths (case fatality rate, 1.7%) were reported. This figure was almost double the total number of cases reported in 2014 (603 cases and 11 deaths) and 2015 (546 cases and 15 deaths), but the case fatality rate was lower than in 2014 (1.8%) and 2015 (2.7%).

Mexico. On 23 September 2016, the confirmation of a cholera case of in the state of Nayarit was reported. The case was confirmed by laboratory testing as *V. cholerae* O:1 Ogawa toxigenic. An active search of cases was conducted in the blocks of houses near the domicile of the case and 59 suspected cases were found. Samples of all of them were taken, analyzed, and found to be negative for *V. cholerae*. State and local health authorities carried out prevention and control activities, such as coordination with the departments of the Protection Against Sanitary Risks for measuring chlorine in the white water network, obtaining food samples, and planting Moore swabs; as well as the development of health promotion measures.

29 November 2016

Haiti. As of EW 43 of 2016, a total of 34,656 suspected cholera cases and 339 deaths (case fatality rate, 1%) had been reported. On 4 October (EW 40), hurricane Matthew ravaged the commune of Les Anglais, Sud department. The hurricane critically affected the departments of Grand'Anse and Sud, and generated propitious environmental and social conditions for increasing cholera transmission. Intensified surveillance of the disease, implemented following hurricane Matthew, revealed the impact of the event on the country: increased number of suspected cholera cases; the daily number of cases was two- to three-fold the number reported prior to the hurricane. Between EW 40 and EW 45, the departments of Grand'Anse and Sud contributed, respectively, 23% and 26% of the total number of cholera cases reported in the country. Those two departments accounted for 4% and 7% of the total population of Haiti, respectively. Additional information on the cholera situation, and the impact of hurricane Mathew is available at: <http://mspp.gouv.ht/newsite/documentation.php?page=1¶m1=valu1¶m2=value2>.

Dominican Republic. From the beginning of 2016 up to EW 42, a total of 1,097 suspected cases of cholera and 20 deaths (case fatality rate, 1.8%) had been reported, twice the number of the two previous years (Table 4).

Mexico. A single case of cholera was reported in the state of Nayarit. Laboratory testing confirmed the strain as *V. cholerae* O:1 Ogawa toxigenic. Additional cases were not reported.

Table 4. Number of cases of cholera in selected countries of the Americas, 2010-2016

Year	Cuba		Dominican Republic		Haiti	
	Cases	Deaths	Cases	Deaths	Cases	Deaths
2010‡	0	0	191	0	179,379	3,990
2011‡	0	0	20,851	336	340,311	2,869
2012‡	417	3	7,919	68	112,076	894
2013‡	181	0	1,954	42	58,809	593
2014‡	76	0	603	11	27,753	296
2015	65	0	546	15	36,045	322
2016	0	0	1,097*	20*	34,656 †	339 †

‡ Source: WHO Weekly Epidemiological Bulletin. Available at: <http://www.who.int/wer/en/>.

* As of EW 42 of 2016.

† As of EW 43 of 2016.

Guidelines for Member States

Considering that drinking water supplies and environmental sanitation are key measures to reduce the impact of cholera and other water-borne diseases, PAHO/WHO recommended that Member States maintained their effort to ensure that both drinking water supply, and environmental sanitation were adequate.

PAHO/WHO urged Member States to maintain active surveillance systems to detect suspected cases on a timely basis, rapidly confirm cases by laboratory, provide adequate treatment, and contain the spread of the disease.

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Other sources of information

- WHO Cholera information. Available at: <http://www.who.int/mediacentre/factsheets/fs107/en/>
- PAHO Health Topics: Cholera. Available at: www.paho.org/cholera
- Information on the WHO declaration regarding international travel and trade in countries that are registering cholera. Available at: http://new.paho.org/hq/images/Atlas_IHR/CholeraHispaniola/atlas.html
- PAHO Atlas of Cholera Outbreak in Hispaniola. Available at: http://new.paho.org/hq/images/Atlas_IHR/CholeraHispaniola/atlas.html

- Cholera Outbreak: response assessment and preparedness. Available in Spanish only at: http://www.who.int/topics/cholera/publications/cholera_outbreak/es/
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Yellow fever

In 2016, due to a yellow fever outbreak in countries outside the Region of the Americas, and considering that yellow fever virus circulation was reported in several areas of the Region, PAHO/WHO issued one epidemiological alert and six updates during the year on the subject.

Those recommendations to Member States urged countries to maintain the capacity to detect and confirm yellow fever cases; to provide up-to-date information; and to train health care professionals in the detection and adequate treatment of the disease, especially in areas of known circulation of the virus. Maintaining high vaccination coverages among populations at risk was also recommended.

22 April 2016

Summary of the situation in the Americas

During the last decade, human yellow fever cases in the Region of the Americas were confirmed in Argentina, Bolivia, Brazil, Colombia, Ecuador, Paraguay, Peru, and Venezuela. In 2015, three countries confirmed circulation of the virus (Bolivia, Brazil and Peru).

Bolivia. in December 2015, Bolivia reported the detection of a yellow fever epizootic (epidemic outbreak of disease in an animal population) with deaths in nonhuman primates in the municipality of Monteagudo, department of Chuquisaca. Human cases associated with that epizootic were not detected.

Brazil. in July 2014, Brazil announced the reemergence of the yellow fever virus in the country, resulting from epizootics in nonhuman primates, in which the virus was confirmed. Between July 2014 and June 2015, seven cases of yellow fever and four deaths were confirmed. None of the cases had been vaccinated against yellow fever. The case distribution, by place of exposure was: Goiás (5 cases), Mato Grosso do Sul (1 case) and Pará (1 case). All the cases were male, unvaccinated, and aged between 7 and 59 years. Of the total, 4 cases had been exposed to the virus while working in tourism; 2 in rural tasks; and 1 was a resident of a rural area.

The Secretariat of Health of the state of Rio Grande do Norte reported a fatal case that was under investigation. The case was a female patient who died in July 2015 in Natal, whose initial tests were positive for yellow fever. She did not have history of travel to endemic areas. No other cases were reported in the municipality. The last case of yellow fever in Natal had been reported in 1930.

In addition, yellow fever epizootics were confirmed in the states of Tocantins (1 municipality in 2014 and 4 in 2015); Goiás (3 municipalities in 2015); Minas Gerais (1 municipality in 2015); Pará (1 municipality in 2015); and in the Federal District (1 municipality in 2015). Cases and yellow fever epizootics are an indicator of viral activity in the area, which was limited to the center-east region of the country.

Peru. Prior to 22 April 2016, Peru had only confirmed cases of jungle yellow fever. Until EW 14 of said year, 25 suspected cases of the disease had been reported, including 2 deaths. Of the total cases, 9 were confirmed, 11 classified as probable, and 5 were discarded. The departments with the highest number of confirmed and probable cases reported were Junín and San Martín, with 8 and 6 cases, respectively. The number of reported cases as of EW 14 of 2016 exceeded the total number of cases reported in the two preceding years, i.e., 2014 (15 cases), and 2015 (17 cases). During 2005 and 2006, 102 confirmed cases and 88 probable cases were reported; these years were characterized by the occurrence of El Niño phenomenon in the central Pacific during 2004-2005 and 2006-2007.

Situation in other regions

Outside the Region of the Americas, Angola, the Democratic Republic of the Congo and Uganda reported yellow fever outbreaks during 2016. Furthermore, because of the exposure of unvaccinated individuals to the virus in Angola, cases were exported to China (9 cases) and Kenya (2 cases). The largest outbreak occurred in Angola, where, since December 2015 and up to 19 April 2016, a total of 1,908 suspected cases were recorded, including 250 deaths (case fatality rate, 13%). The highest proportion of cases occurred in the provinces of Huambo, Huíla, and Luanda.

In the Democratic Republic of the Congo, between January 2016 and 22 March 2016, a total of 151 suspected cases (9 confirmed) and 21 deaths (case fatality rate, 14%) had been recorded.

Vaccine supply

For years, the world supply of yellow fever vaccine has been insufficient. Through PAHO/WHO's Revolving Fund, some 50% of the Regional demand is met. The Revolving Fund allocates the vaccine supply to countries based on epidemiological risk. Together with WHO and UNICEF, the Revolving Fund participates in joint activities to face vaccine supply challenges.

The outbreak in Angola reduced the yellow fever vaccine supply. Outbreaks have priority in the distribution of available vaccines, to respond to the emergency. At the end of March 2016, thanks to the collaboration of partners, such as the International Coordination Group and UNICEF, the world reserve of yellow fever vaccines for emergencies was replenished.

25 May 2016

Summary of the situation in the Americas

Brazil. Between 2015 and 2016, the IHR National Focal Point reported two fatal yellow fever cases. The first case was a woman of the city of Natal (see summary in previous paragraphs). The second case was a 38 year-old unvaccinated male, exposed to the virus in an endemic area. His normal location of residence was Bady Bassit, São Paulo. Thirty-six epizootics were also reported in nonhuman primates in the state of Minas Gerais. Of the total number of epizootics, one was confirmed as yellow fever, in the municipality of Natalândia.

Peru. As of EW 18 of 2016, a total of 43 suspected yellow fever cases had been reported, including 4 deaths. Of the total number of cases reported, 14 were confirmed; 18, classified as probable; and 11, discarded. The cases were reported in six departments, of which the most affected was Junín, where the highest number of confirmed and probable was reported ($n=21$). The number of confirmed and probable cases ($n=32$) notified in Peru as of EW 18 of 2016 was twice the total number of cases reported annually in the two previous years.

Situation in other regions

Angola continued to have the largest yellow fever outbreak; from December 2015 to 15 May 2016, a total of 2,420 suspected cases (736 confirmed), including 258 deaths (96 confirmed) had been reported. Preliminary analysis by the Institute Pasteur of Dakar of samples obtained during the ongoing epidemic indicated that the circulating strain of yellow fever virus was genetically close to the strain that circulated in the Angola outbreak of 1971.

In the Democratic Republic of the Congo, as of 19 May 2016, a total of 44 confirmed and probable yellow fever cases had been reported (42 imported from Angola, and 2 autochthonous).

In Uganda, through 30 April 2016, a total of 60 suspected yellow fever cases had been reported, seven with laboratory confirmation. This outbreak was, apparently, not related to the one in Angola.

On 19 May 2016, the Director-General of WHO summoned the Organization's Emergency Committee, to evaluate the yellow fever situation. Based on the recommendations of said Committee, the Director-General determined that urban yellow fever outbreaks in Angola and the Democratic Republic of the Congo were serious public health events that required a better national response and more international support. Up to that time, these events did not constitute a public health emergency of international concern, as per the IHR. See further details at: <http://www.who.int/mediacentre/news/statements/2016/ec-yellow-fever/en>.

On this date, an epidemiological alert indicated that unvaccinated travelers to areas with active yellow fever outbreaks created a potential risk of introducing the virus in areas where yellow fever risk factors are present (human susceptibility, vector, and animal reservoirs).

6 July 2016

Summary of the situation in the Americas

Brazil. As of May 2016, no new yellow fever cases or epizootics had been reported.

Colombia. In June 2016, the IHR National Focal Point reported a fatal case of jungle yellow fever in the municipality of La Macarena, department of Meta, a yellow fever endemic area. As a result of field epidemiological investigations, epizootics were detected in nonhuman primates in three municipalities of the Meta department, i.e., La Macarena, Puerto Concordia, and Puerto Rico.

Peru. Through EW 24 of 2016, a total of 106 suspected yellow fever cases had been reported, including 9 deaths. Of the reported cases, 37 were confirmed, 42 were classified as probable, and 27 were discarded. Reported yellow fever cases affected 7 of the 25 departments of Peru. The department of Junín reported the highest number of confirmed and probable cases (58 cases).

Situation in other regions

Angola continued to have the largest outbreak, with a cumulative total of 3,464 suspected cases by 24 June 2016. Of the total number of cases, 868 were laboratory-confirmed, with a case fatality rate of 13.4%.

As of 23 June 2016, the Democratic Republic of the Congo had reported 1,307 suspected cases of yellow fever, of which 68 had been confirmed (59 imported cases of Angola). Because of the exposure of unvaccinated people to yellow fever virus in Angola, there were now 13 exported cases: 11 to China and 2 to Kenya. Furthermore, Chad, Ghana, Guinea, and Uganda had reported outbreaks or sporadic cases not linked to the Angolan outbreak.

26 July 2016

Summary of the situation in the Americas

Brazil. On 19 July 2016, the Brazil IHR National Focal Point reported another fatal case of yellow fever detected in the city of Niteroi, state of Rio de Janeiro. This was a 58-year-old male, whose symptoms began on 29 March. He sought medical care on 31 March, was hospitalized with a diagnosis of suspected typhoid fever, and died on 2 April 2016. Laboratory tests for typhoid fever and dengue yielded negative results, and were positive for yellow fever (MAC-ELISA: non-reactive; RT-qPCR: positive). Available information at the time indicated the patient had been to Angola eight days before the onset of symptoms.

On 22 July, the Brazil IHR National Focal Point reported a new fatal case of laboratory-confirmed yellow fever in the city of Goiânia, state of Goiás. The date of onset of symptoms was 9 April. Confirmation was by immunohistochemistry. Epidemiological investigations were ongoing to determine the probable place of infection.

Colombia. On 20 July 2016, the Colombia IHR National Focal Point reported a new fatal case of yellow fever detected in the municipality of Carurú, department of Vaupés, which shares borders to the east with Brazil. This was the first case of yellow fever documented in that department. The case was an 18-year-old man, whose symptoms began on 22 June 2016. He died on 7 July 2016. The case was confirmed as yellow fever by RT-PCR in liver tissue.

Peru. As of EW 28 of 2016, a total of 126 suspected jungle yellow fever cases had been reported, including 17 deaths. Of the total number of reported cases, 50 were confirmed, 28 classified as probable, and 48 were discarded. Eight of the 25 departments of Peru had reported yellow fever cases; the highest number of confirmed and probable cases (60 cases) was reported in Junín.

Situation in other regions

Angola, the Democratic Republic of the Congo, and Uganda continued to experience yellow fever outbreaks. The most significant outbreak affected Angola, where a cumulative total of 3,682 suspected cases were reported between December 2015 and 15 July 2016. Of the total number of cases, 877 were laboratory-confirmed, and the case fatality rate was 13.3% (117 laboratory-confirmed deaths).

Through 11 July 2016, the Democratic Republic of the Congo had reported 1,798 suspected cases, of which 68 had been confirmed (59 cases imported from Angola).

14 September 2016

Summary of the situation in the Americas

Brazil. No new cases were reported.

Colombia. From EW 1 to EW 35 of 2016, five cases of jungle yellow fever were laboratory-confirmed; another 12 cases were classified as probable. Of the five confirmed cases, four died (case fatality rate, 80%). Confirmed cases in Vichada (border with Venezuela) and Chocó (border with Panama) posed the risk of circulation of the virus toward those two bordering countries, especially in areas where a single ecosystem was shared. Furthermore, between April and May, epizootics were detected in three municipalities of the department of Meta (La Macarena, Puerto Concordia, and Puerto Rico). La Macarena is a tourist area with a large

influx of foreign and national tourists. The following is a summary of the yellow fever situation in Colombia in the last 11 years.

In 2005, simultaneously with the occurrence of El Niño phenomenon, 20 cases of jungle yellow fever were confirmed: 10 in the department of Caquetá, 8 in Putumayo, 1 in Santander, and 1 in Guaviare. Between 2006 and 2008, 15 cases of jungle yellow fever were reported (100% case fatality rate) in the departments of Caquetá, Casanare, Guaviare, Meta, Norte de Santander, Putumayo, and Vichada. In 2009, a total of 5 cases were reported in the department of Meta. Following the absence of cases between 2010 and 2012, in 2013, one case was confirmed in the department of Caquetá. Cases of yellow fever were not reported in 2014 or 2015.

Peru. As of EW 34 of 2016, there had been 62 confirmed cases of jungle yellow fever. They affected mainly young and economically active individuals. The 29 to 49 year-age group was the most affected (52 of 85 cases), and the cases were, for the most part, farmers, informal miners, and individuals who entered jungle areas.

Situation in other regions

In Angola, as of 23 June, no new cases had been confirmed. The vaccination campaign was still ongoing for the population at risk. The total number of cases recorded between 5 December 2015 and 1 September 2016 was 4,949, of which 884 were laboratory-confirmed.

In the Democratic Republic of the Congo, no new cases had been confirmed between 12 July and 8 September 2016. The number of cumulative cases for the year was 2,678, of which 75 were laboratory-confirmed. Preliminary results of the vaccination campaign indicated the achievement of high coverage rates.

In Uganda, on 6 September 2016, the end of the yellow fever outbreak was declared. This outbreak was not related to the epidemic in Angola.

On 31 August 2016, the Director-General of WHO again summoned the Emergency Committee to reevaluate the yellow fever situation. Based on the Committee's recommendations, WHO's Director-General considered that the yellow fever situation in Angola and the Democratic Republic of the Congo no longer represented a public health emergency of international concern (PHEIC). The full announcement is available at: <http://www.who.int/emergencies/yellow-fever/mediacentre/webcast-31-8-2016/en/>.

9 November 2016

Summary of the situation in the Americas

Brazil. No change.

Colombia. From EW 1 to EW 43 of 2016, six cases of jungle yellow fever were laboratory-confirmed and 6 were classified as probable. Confirmed cases were reported in the departments of Antioquia, Amazon, Meta, Vaupés, and Vichada. The last three accounted for 75% of all reported cases. The case detected in the Amazon department originated in the municipality of Cabalococha, in Peru. All confirmed cases were male, and the majority (66.6%) were aged 20 to 29 years. Five of the six confirmed cases died (case fatality rate of 83.3%).

Peru. As of EW 42 of 2016, a total of 75 jungle yellow fever cases had been reported, of which 62 were confirmed and 13 were classified as probable cases. Of the 25 departments of Peru, 9 reported cases. Junín was the department that reported the highest number of confirmed and probable cases (n=50).

Situation in other regions

In Angola, no new cases had been confirmed as of 23 June 2016. The vaccination campaign of at risk populations (phase II) was still ongoing.

In the Democratic Republic of the Congo, the last confirmed yellow fever case developed symptoms on 12 July. On 26 October 2016, a new jungle yellow fever case was confirmed, and 14 probable cases remained under investigation.

14 December 2016

Summary of the situation in the Americas

Brazil. In the month prior to this date, two epizootics were confirmed in nonhuman primates in the state of São Paulo, one in the municipality of Severinia, and another in Cajobi. Between EW 1 and EW 47 of 2016, five human jungle yellow fever cases were confirmed in the country.

Colombia. From EW 1 and EW 47 of 2016, seven cases of laboratory-confirmed jungle yellow fever were reported; there were also five probable cases. Confirmed cases were reported in the departments of Antioquia, Amazonas, Guainía, Meta, Vaupés, and Vichada. All were male, and the majority were aged 20 to 29 years (57%). Six of the seven confirmed cases died (case fatality rate, 85.7%).

Peru. As of EW 46 of 2016, a total of 82 jungle yellow fever cases had been reported, of which 66 were confirmed and 16 were classified as probable. Nine departments were still affected, with Junín reporting the highest number of confirmed and probable cases (n = 54). As of EW 46 of 2016, the number of confirmed and probable cases reported in the country was higher than in the nine previous years. Deaths from the disease in 2016 also were higher (n = 26) than in the five previous years.

Situation in other Regions

In Angola and the Democratic Republic of the Congo, no changes were reported.

Recommendations

The detection of cases of yellow fever among unvaccinated individuals who enter areas of viral circulation reaffirm the importance of adopting measures by Member States to keep travelers informed of the risks, and ensure their vaccination when travel includes areas where the vaccination certificate against yellow fever is compulsory.

PAHO/WHO does not recommend any type of restriction to travel or trade in cases of active outbreaks of yellow fever. Recommendations can be found in the yellow fever Epidemiological Alert of 31 December 2015. Below, the recommendations related to surveillance, clinical management, and prevention and control measures are detailed.

Surveillance

Epidemiological surveillance of yellow fever should be aimed at: (i) early detection of the virus, in order to adopt appropriate, timely, and adequate control measures to prevent new cases; (ii) to prevent outbreak progression; and (iii) to prevent the re-urbanization of the disease. The approach to surveillance should be a combination of:

- surveillance of clinical cases compatible with the disease, according to WHO's case definition;
- surveillance of febrile icteric syndrome;
- surveillance of epizootics; and
- surveillance of post-vaccination events presumably attributable to vaccination against yellow fever.

Surveillance of febrile icteric syndrome is usually conducted in sentinel sites; the case definition is more sensitive, and a laboratory test is required to exclude negative cases.

Laboratory diagnosis

Yellow fever diagnosis is done by detection of genetic viral material in blood or tissue, using polymerase chain reaction, and serological tests for the detection of IgM antibodies.

Viral diagnosis

During the first five days after the onset of clinical symptoms (acute phase, viremic period), detection of viral RNA in serum is possible, through molecular techniques, such as conventional or real-time RT-PCR. A positive result (in the presence of adequate controls) confirms the diagnosis. Viral isolation can be done by intracerebral inoculation in mice or in cell culture, but, because of its complexity, it is not frequently used as a diagnostic method, and it is only recommended for research studies complementary to public health surveillance.

Serological diagnosis

Serology (detection of specific antibodies) is useful for the diagnosis of yellow fever during the acute and convalescence stages of the disease (i.e., after the sixth day from the onset of symptoms). A positive result of IgM by ELISA (MAC-ELISA or any other immunoassay) in a sample obtained after the sixth day of onset of the symptoms is presumptive of recent yellow fever infection. Confirmation can only be achieved by demonstrating an increase in antibody titers (four-fold or higher) in paired samples, and using quantitative techniques.

It is important to consider that serological tests can generate cross-reactions, especially in places endemic for diverse flaviviruses. For that reason, where there is simultaneous circulation of several flaviviruses, it is recommended that serological confirmation be done by more specific methods, such as PRNT, once other infection agents have been ruled out by differential diagnosis. In any case, serological test results should be cautiously interpreted, and considered alongside the patient's vaccination history.

Postmortem Diagnosis

The histopathological study of liver tissue is the ideal method for diagnosing fatal yellow fever cases. The analysis includes typical microscopic description of injuries due to yellow fever (midzonal necrosis, fatty changes, among others), detection of Councilman's bodies (pathognomonic), and immunohistochemistry that reveals viral proteins within hepatocytes.

Although yellow fever immunohistochemistry has good specificity, because of the possibility of cross-reaction with other antigenically related flaviviruses, it is recommended that confirmation be performed by molecular PCR detection in fresh or paraffin-conserved tissue samples.

Biosafety

Patient serum samples from the acute phase of the disease are considered potentially infectious. All laboratory personnel handling this type of sample should be vaccinated against yellow fever. Furthermore, it is recommended that certified biosafety cabinets class II be used for sample, maximizing precautions to prevent puncture accidents. Considering that differential diagnosis of yellow fever includes arenaviral hemorrhagic fevers, samples should be handled in BSL3 containment conditions. The risk and clinical history of the patient should be rigorously evaluated prior to any sample manipulation in the laboratory.

Clinical management

There is no specific antiviral treatment for yellow fever. However, support measures are crucial. Patients in serious condition must be treated in intensive care units. General support treatment consists of oxygen administration, intravenous fluids, and vasopressors, for hypotension and metabolic acidosis. Gastric protection should be included to reduce the risk of digestive tract bleeding.

In severe cases, patient care should include mechanical ventilation, treatment of disseminated intravascular coagulation, frozen fresh plasma for hemorrhage, antibiotics to treat possible secondary infections, and treatment for liver and renal failure. Other support measures include nasogastric tube to provide nutritional support or prevent gastric distention, and dialysis for patients with renal failure or refractory acidosis.

In mild cases, the treatment is symptomatic. Salicylates should not be used, so as to prevent bleeding risks.

Differential diagnosis

The various clinical forms of yellow fever must be differentiated from other febrile diseases that present with jaundice, bleeding, or both. In the Region of the Americas, the main diseases to be considered in the differential diagnosis of yellow fever are leptospirosis; severe malaria; viral hepatitis, especially fulminating form of hepatitis B and D; viral hemorrhagic fevers; dengue; typhoid fever, typhus, and hepatic toxicity or hepatitis secondary to toxic medicines.

Patient isolation

Contact between yellow fever patients and *Aedes* mosquitos must be prevented, at least during the first five days of the disease (viremic phase). Mosquito nets are recommended, whether impregnated with insecticide or not; otherwise, patients should remain in a place protected with anti-mosquito screens. Health workers taking care of patients with yellow fever should protect themselves from mosquito bites, by using repellents and long sleeves and trousers.

Prevention and control measures

Vaccination

The most important yellow fever prevention measure is vaccination. Preventive vaccination can be through systematic immunization in infancy, or by single mass campaigns, to increase coverage in risk areas; vaccination of those who travel to risk areas is also stressed.

The yellow fever vaccine is safe and accessible, and its effectiveness ranges from 80 to 100% after 10 days, and 99% after 30 days. A single dose confers immunity and protection for life, without a need for boosters. Severe side effects are extremely rare. Given the shortage of the vaccine, it is recommended that national authorities evaluate vaccination coverages against yellow fever in risk areas, to program vaccine distribution.

Vaccine contraindications:

- people with acute febrile diseases, and compromised general health conditions;
- people with history of hypersensitivity to eggs, and derivatives;
- pregnant women, except in epidemiological emergencies, and following specific recommendations from health authorities;
- individuals with critical immunosuppression from other diseases (such as, cancer, leukemia, AIDS, etc.) or drugs;
- children aged 6 months or younger (check the manufacturer's leaflet); and
- people of any age affected by thymus-related diseases.

The epidemiological risk of contracting yellow fever vis-à-vis the risk of adverse events in persons 60 years of age or older who have not been previously vaccinated needs to be assessed on a case by case basis.

Vector Control

The risk of yellow fever transmission in urban areas can be reduced through the application of an effective vector control strategy. Together with emergency vaccination campaigns, insecticide fumigation to eliminate adult mosquitoes can reduce or halt yellow fever transmission while vaccinated populations acquire immunity. Mosquito control programs in jungle areas are not feasible.

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Enterobacteria with transferable resistance to colistin

Implications for Public Health in the Americas

Given the detection in several countries of the Region of the Americas of microorganisms with colistin resistance mechanisms mediated by mcr-1 plasmids in both human and animal isolates, PAHO/WHO urged Member States to implement and maintain the capacity to detect, prevent and control the transmission of microorganisms with transferable resistance to colistin.

PAHO/WHO also called on Member States to adopt measures to prohibit the use of colistin for prophylaxis and growth promotion in animals for human consumption.

10 June 2016

Background

In November 2015, the detection of a plasmid-mediated colistin-resistant mechanism related to the mcr-1 gene that generates enzyme resistance to colistin was reported. Colistin is a last line antibiotic used for treating multidrug resistant infections. Because the mcr-1 gene is in a plasmid, bacteria can easily spread resistance to other bacteria.

As of 10 June 2016, resistance to polymyxins (including colistin) by chromosomal mutation was well known, but horizontal transfer of genes conferring resistance had not been reported. The mcr-1 gene was detected in a retrospective prevalence study of that gene in strains of *Escherichia coli* and *Klebsiella pneumoniae* collected between April 2011 and November 2014, in China.

The study identified mcr-1 carriage in *E. coli* strains collected from 78 (15%) out of 523 samples of raw meat; 166 (21%) out of 804 animal samples, and 16 (1%) out of 1,322 samples of hospitalized patients with infection. Subsequently, other countries reported similar retrospective findings.

The mcr-1 gene was detected in databases and bacterial strains collections in all continents. Samples of bacterial strains, such as *E. coli* and *Salmonella* carrying this gene, were isolated from various sources, both human (isolates from the community), pigs, and poultry meat.

Situation in the Americas

A prospective study conducted between November 2012 and November 2013 in samples collected from Dutch travelers within one and two weeks after their return to the Netherlands, the mcr-1 gene was detected in colistin-resistant *E. coli* isolates producers of extended spectrum betalactamase (ESBL), collected from six of nine travelers. Of the 6 travelers, 2 had visited Colombia, Bolivia and Peru; another 2 had visited China; 1, Tunisia; and, 1 had traveled to several Southeast Asian countries (Cambodia, the Lao People's Democratic Republic,

Thailand, and Viet Nam). The duration of the trips was from 8 to 40 days, with an average of 21.3 days.

In December 2015, the Public Health Agency of Canada reported colistin-resistant *mcr-1* in isolates of *E. coli*, in samples previously collected for special research projects. A sample was isolated from a 62-year-old patient, and two samples, from retail ground beef collected in 2010. At the time of reporting, those findings had not yet been published in peer-reviewed journals.

In April 2016, Brazilian investigators reported the detection of *E. coli* strains carrying the *mcr-1* gene in food and animal samples. The same report indicated the isolation of *mcr-1* carrying *E. coli* in a sample of human origin from Ecuador. That sequence is deposited in the GeneBank® (access number: KU886144.1).

In May 2016, the Latin American Antimicrobial Resistance Surveillance Network's (ReLAVRA) Regional Reference Laboratory (Antimicrobial Service, INEI ANLIS "Dr. Carlos G. Malbrán" of Argentina), confirmed the detection of *E. coli* clinical strains carriers of the *mcr-1* gene. The strains came from nine patients admitted to six different hospitals, whose samples were collected between January 2008 and January 2016.

Various isolates carrying the *mcr-1* gene were not genetically related to each other, and the resistance detected was of the transferable type, which shows that the mechanism can be spread from one to another microorganism. Furthermore, the fact that the *mcr-1* gene was detected in invasive infections demonstrates adaptation to hospital environments.

In May 2016, Colombia reported the detection of the *mcr-1* gene in three isolates of *Salmonella enterica* serovar Typhimurium in patients from Antioquia, Bogotá, and Boyacá, as well as an *E. coli* isolate from a patient from Santander. The findings were part of a retrospective study of isolates collected from 2014 to May 2016.

In June 2016, the U.S. CDC reported the detection of the first isolate carrying the *mcr-1* gene in strains of *E. coli* from a human sample in the United States. The isolate was detected by the Multidrug-resistant Organism Repository and Surveillance Network (MRSN) of the Walter Reed Army Institute of Research. Furthermore, the departments of Agriculture and Health and Human Services of the United States detected strains of colistin-resistant *E. coli* in a sample of pig intestine. This isolate was also resistant to ampicillin, streptomycin, sulfisoxazole, and tetracycline.

At the time of reporting, there had been no reports of outbreaks or deaths caused by colistin-resistance *mcr-1* microorganisms. Nevertheless, asymptomatic bacterium transfer is possible with this gene, meaning there is a risk of spread to other more virulent strains or hyperepidemic clones.

Recommendations

In light of these findings, PAHO/WHO advised Member States to set up, and strengthen surveillance and epidemiological research to detect microorganisms with this type of resistance, aimed at adopting appropriate prevention and control measures.

Given the use of colistin in veterinary medicine, the need to integrate human and animal antibiotic resistance surveillance was emphasized, as was the need to implement coordinated measures between both sectors, to prevent and control the dissemination of microorganisms with transferable resistance to colistin.

Surveillance and epidemiological research

The following are the main measures recommended on this subject:

- Increase the participation of national public health laboratories in surveillance activities for early detection of outbreaks, in order to provide adequate early antimicrobial treatment of patients, and implement prevention and control measures.
- In isolates of Enterobacteriaceae collected from patients with suspected multidrug resistance or decreased sensitivity to colistin, testing for colistin antimicrobial susceptibility is advised.
- Ensure analysis and molecular characterization of microorganisms with phenotypic resistance to colistin, to determine the presence of the *mcr-1* gene. In cases of suspected *mcr-1* mediated polymyxin resistance, it is recommended that strains be sent to a national or regional reference laboratory for confirmation and molecular typing.
- Use the regional protocol for detecting *mcr-1*.
- Detection of microorganisms with resistance mechanisms due to the *mcr-1* gene should be immediately reported to local infection control authorities, as well as to relevant national public health authorities.
- Disseminate information, and provide recommendations to alert health care workers and decision makers at all levels.
- Strengthen monitoring of polymyxin use and resistance in food production for human consumption.

Laboratory Detection

Laboratories participating in ReLAVRA have the capacity to detect colistin resistance phenotypically. Molecular typing can be performed in national reference laboratories; otherwise, samples can be sent to the Regional Reference Laboratory (ReLABRA) for analysis, and molecular characterization.

The role of the laboratory is key, both for detection as well as containment of resistant pathogens. Following the detection of resistance mechanisms, it is important to rapidly notify health facility and national health authorities, so that other hospitals may be alerted to the situation.

Use of colistin in veterinary medicine

Due to its toxicity, colistin has not been frequently used to treat human infections. In recent years, it has remained as a reserve antibiotic, to treat carbapenem-resistant infections. However, polymyxins are indeed used to prevent infections and promote growth in farm animals. Thus, it is important to monitor the spread of the *mcr-1* gene, not only in human medicine, but also in veterinary medicine.

The use of polymyxins in animal husbandry has favored the appearance of the colistin-resistant plasmid. Accordingly, it is important to limit the use of this antibiotic in the treatment of clinically affected animals, and to ban its use in prophylaxis, under the principle of responsible use of antimicrobial drugs.

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Candida auris outbreaks in services of health care of the health

After the first Candida auris outbreaks associated to health care in Latin America, PAHO/WHO recommended that Member States implement the capacity to detect and report said infections early on, so that adequate measures may be adopted to prevent and control local spread, and to avoid dissemination to health services of other countries of the Region of the Americas.

3 October 2016

Background

Candida auris was first detected as a cause of human disease in 2009, after being isolated from the secretion of the external auditory channel of a Japanese patient. Since then, cases of infection by *C. auris* have been reported in different continents and countries, especially India, Kuwait, South Africa, and South Korea. Most of those cases were associated with health care services.

In 2012, a hospital outbreak of *C. auris* infection was reported in Venezuela, a first in the Region of the Americas. The outbreak occurred in the intensive care unit of a tertiary hospital. The real incidence and prevalence of the pathogen had not been well established, because the methods in use at the time detected all strains of the *Candida haemulonii* complex, including *C. auris*; both species are phylogenetically related. It is also possible that strains of *C. auris* were being identified as other frequently isolated yeasts. As a result, it is conceivable that *C. auris* strains were a more frequent cause of candidemia than was originally thought.

Cases of *C. auris* infection had been reported in patients with prolonged hospital stays, particularly in neonatal and adult intensive care units. Most of those patients had received wide-spectrum antibiotic therapy, bore intravenous catheters, and had been submitted to mechanical ventilation. Most isolates had been obtained from blood samples, although detection in other biological samples (i.e., urine and bronchoalveolar lavage) had been reported. At the time of reporting, it had not been determined whether findings in those locations were proof of infection or of colonization. The transmission mechanism was unknown.

Due to difficulties associated with the detection of *C. auris* strains with commercial methods, its characterization was done by sequencing. The protein profile method by MALDI-TOF was also reliable for that purpose.

Summary of the situation in the Americas

As previously indicated, the first outbreak of *C. auris* in the Region of the Americas was reported in Venezuela. The outbreak occurred between March 2012 and July 2013, in the intensive care unit of a tertiary hospital in Maracaibo. It affected 18 patients, including 13 children. The case fatality rate was 28%. Initially, all isolates were identified as *Candida haemulonii*.

Subsequently, ITS sequencing and AFLP analysis conducted to study the potential cloning capacity of the isolates identified the strains as *C. auris*. All the isolates were resistant to fluconazole, and voriconazole. Half the isolates had high minimum inhibitory concentration (MIC) to amphotericin B.

In Colombia, isolated cases of infection by *C. auris* had been reported in various cities (Santa Marta, Bogota, and Valledupar) since 2013. Between 2015 and 2016, the city of Barranquilla reported 27 isolates. In August 2016, an outbreak was reported in a pediatric intensive care unit in the district of Cartagena. Five cases of disseminated infection of *C. auris* were identified. Initially the five isolates were identified as *C. albicans*, *C. guilliermondii*, and *Rhodotorula rubra*, but after performing MALDI-TOF, they were confirmed as *C. auris*. Central venous catheter, mechanical ventilation, and urinary catheter were risk factors in all confirmed cases. As to antifungal susceptibility testing, only the results of two out of the five isolates were available, both of which were sensitive to fluconazole, and resistant to amphotericin B.

In the United States, in 2013, *C. auris* isolation was reported as part of a surveillance program.

Given these findings, PAHO/WHO recommended the following measures.

Surveillance and epidemiological research

- Increase the participation of national laboratories in hospital-based surveillance to facilitate the timely detection of this organism.
- Disseminate information obtained from surveillance for the implementation of adequate treatment and infection control measures in health care service.
- Sampling is recommended for all patients from hospitals where cases of *C. auris* colonization / infection have been reported.
- Urge health care professionals to contact the relevant public health authorities, either local or national, if they suspect that a patient may have a *C. auris* infection in a health care service.

Laboratory diagnosis

- All laboratories with *C. auris* detection methods (MALDI-TOF or molecular methods) are advised to notify any positive isolation of this organism.
- Faced with the isolation of any of the following microorganisms, whether by conventional or commercial methods, relevant public health authorities should be contacted to assess the need for specific tests for the detection of *C. auris* or *C. haemulonii*, regardless of the type of sample, or other species of the genus *Candida*, such as *C. guilliermondii*, *C. famata*, *C. sake* or other yeasts, such as *Rodothorula glutinis* and *Saccharomyces cerevisiae*; or the identification of *C. albicans* without germ tube production, and with high MIC to azoles and/or amphotericin.
- If any of the aforementioned *Candida* species is detected, sensitivity tests, mainly to azoles and amphotericin B, must be performed by commercial methods, and must be confirmed by the microdilution reference method.
- Currently, values of specific MICs for *C. auris* strains are not available; as a result, cut-off points of other species of *Candida* are being used as reference, as indicated in document M27-S4 of the Clinical Standards and Laboratories Institute (CLSI) -colonized/infected.

Infection Prevention and Control

Upon detection of *C. auris* isolates in a patient, the recommendations were to:

- Maintain the patient in isolation, if possible, and use gloves and gown for any patient contact. The use of masks and facial shield is only indicated when there is risk of exposure to bodily fluids.
- Maintain a clean environment. Cleaning with water and soap should be followed by disinfection with 0.1% bleach. Once the patient is discharged, cleaning of surfaces, floor, and wall with water and soap must be ensured, followed by disinfection 0.1% bleach.
- Clean, disinfect, or sterilize equipment and appliances, according to the type of material, after having their use in patient care.
- Isolate patients coming from centers with documented *C. auris* presence, until screening results are available.
- Obtain a series of three negative samples, preferably urine, blood, or respiratory secretions, separated by 24 h or more, before removing the patient from isolation.
- When a patient requires a test or services that cannot be performed in the patient's room, that test or service should be scheduled at the end of the day, and thorough cleaning of the area should follow the test's performance.
- Special care must be taken for waste manipulation, following the same recommendations used for multidrug resistant pathogens. In pediatric units, diaper elimination should be especially attended to.
- Careful manipulation of the patient's laundry in the room is recommended, to minimize environmental spread of microorganisms.
- Avoid washing patients' linens and clothes by hand. Machine-washing is recommended.
- Products of these patients should not be discarded in sinks.

Treatment

- Currently, the first line of treatment is provided by echinocandins, which are administered until results of susceptibility testing become available. There is evidence suggesting the rapid development of resistance to the treatment with this family of antifungals.
- Currently, there is insufficient evidence on appropriate treatment. Initiating treatment with antifungal combination therapy is not advised, although clinicians should make the most appropriate decision on a case by case basis.

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Diphtheria

During 2015, five countries reported cases of diphtheria: Brazil (12 cases), Canada (3 cases), the Dominican Republic (1 case), Guatemala (1 case), and Haiti (32 cases).

From EW 1 to EW 47 of 2016, three countries in the Americas had reported cases of diphtheria: Haiti, the Dominican Republic, and Venezuela.

PAHO/WHO urged Member States to continue their efforts to guarantee high vaccination coverage rates, through appropriate strategies in the entire national territory. In addition, the Organization recommended strengthening surveillance systems, to allow early detection of suspected cases, and to initiate timely treatment for both patients and their contacts, and to ensure the provision of diphtheria antitoxin.

16 December 2016

Haiti. As of EW 48 of 2016, 76 probable diphtheria cases, including 16 deaths, had been reported. Seventy-two samples were collected from affected patients, with 33 yielding positive results to *Corynebacterium diphtheriae*. The cases were recorded in the country's 10 departments, but almost half occurred in the departments of Artibonite, Center, and West. Of the total number of cases, 38% were between 5 and 10 years old; in 66% of cases the vaccination status was unknown, or they had not been vaccinated. Differences by sex were not observed.

Dominican Republic. In EW 43, two children under 3 years of age, residents of Santo Domingo, presented early symptoms of diphtheria. One of them died. In samples of both cases, gram-positive bacilli consistent with *C. diphtheriae* were isolated. Additional cases were not reported. The vaccination status of the child who died was unknown; the second child had received a single dose of the vaccine.

Venezuela. Between September 2016 and 24 November 2016, suspected or probable cases of diphtheria had been reported. Of a total of 183 samples processed by the National Institute of Hygiene "Rafael Rangel", 20 were positive (isolation of toxin producing *C. diphtheriae* or by PCR). The 20 positive cases were recorded in six states, but the greatest number of cases occurred in the state of Bolivar (60%), followed by the state of Monagas (20%). Among confirmed cases, five died (3 in the state of Bolivar, and 2 in Monagas). One of the minors had lived in Haiti during the two months prior to the onset of symptoms.

References

PAHO/WHO. Number of cases of vaccine-preventable EPI diseases in the Americas. Available at: http://ais.paho.org/hiph/viz/im_vaccinepreventablediseases.asp.

Annexes

Annex 1. Alerts and Updates Published in 2016

17 January	Neurological syndromes, birth defects, and Zika virus infection	Epidemiological update
9 February	Influenza activity in the season 2015/2016	Epidemiological Alert
17 February	Zika virus infection	Epidemiological Update
24 February	Zika virus infection	Epidemiological Update
3 March	Zika virus infection	Epidemiological Update
9 March	Cholera—situation in the Americas	Epidemiological Update
10 March	Zika virus infection	Epidemiological Update
17 March	Zika virus infection	Epidemiological Update
24 March	Zika virus infection	Epidemiological Update
31 March	Zika virus infection	Epidemiological Update
8 April	Zika virus infection	Epidemiological Update
14 April	Zika virus infection	Epidemiological Update
21 April	Zika virus infection	Epidemiological Update
22 April	Yellow fever	Epidemiological Alert
28 April	Zika virus infection	Epidemiological Update
5 May	Zika virus infection	Epidemiological Update
12 May	Zika virus infection	Epidemiological Update
19 May	Zika virus infection	Epidemiological Update
25 May	Yellow fever	Epidemiological Update
26 May	Zika virus infection	Epidemiological Update
27 May	Cholera—situation in the Americas	Epidemiological Update
2 June	Zika virus infection	Epidemiological Update
9 June	Zika virus infection	Epidemiological Update
10 June	Enterobacteria with transferable resistance to `colistin`	Epidemiological Alert
16 June	Zika virus infection	Epidemiological Update
23 June	Zika virus infection	Epidemiological Update
6 July	Yellow fever	Epidemiological Update
7 July	Zika virus infection	Epidemiological Update
14 July	Zika virus infection	Epidemiological Update
21 July	Cholera—situation in the Americas	Epidemiological Update
26 July	Yellow fever	Epidemiological Update
29 July	Zika virus infection	Epidemiological Update

11 August	Zika virus infection	Epidemiological Update
25 August	Zika virus infection	Epidemiological Update
8 September	Zika virus infection	Epidemiological Update
12 September	Cholera—situation in the Americas	Epidemiological Update
14 September	Yellow fever	Epidemiological Update
22 September	Zika virus infection	Epidemiological Update
3 October	<i>Candida auris</i> outbreaks in services of health care to the health	Epidemiological Alert
6 October	Zika virus infection	Epidemiological Update
18 October	Cholera—situation in the Americas	Epidemiological Update
20 October	Zika virus infection	Epidemiological Update
3 November	Zika virus infection	Epidemiological Update
9 November	Yellow fever	Epidemiological Update
17 November	Zika virus infection	Epidemiological Update
29 November	Cholera—situation in the Americas	Epidemiological Update
1 December	Zika virus infection	Epidemiological Update
14 December	Yellow fever	Epidemiological Update
15 December	Zika virus infection	Epidemiological Update
16 December	Diphtheria	Epidemiological Alert
29 December	Zika virus infection	Epidemiological Update

Summary

Zika	34 updates
Cholera	6 updates
Yellow fever	1 alert and 6 updates
Others	4 alerts

Annex 2. Epidemiological calendar 2016

Epidemiological Week		Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
January 2016	1	3	4	5	6	7	8	9
	2	10	11	12	13	14	15	16
	3	17	18	19	20	21	22	23
	4	24	25	26	27	28	29	30
	5	31	1	2	3	4	5	6
February 2016	6	7	8	9	10	11	12	13
	7	14	15	16	17	18	19	20
	8	21	22	23	24	25	26	27
	9	28	29	1	2	3	4	5
March 2016	10	6	7	8	9	10	11	12
	11	13	14	15	16	17	18	19
	12	20	21	22	23	24	25	26
	13	27	28	29	30	31	1	2
April 2016	14	3	4	5	6	7	8	9
	15	10	11	12	13	14	15	16
	16	17	18	19	20	21	22	23
	17	24	25	26	27	28	29	30
May 2016	18	1	2	3	4	5	6	7
	19	8	9	10	11	12	13	14
	20	15	16	17	18	19	20	21
	21	22	23	24	25	26	27	28
	22	29	30	31	1	2	3	4
June 2016	23	5	6	7	8	9	10	11
	24	12	13	14	15	16	17	18
	25	19	20	21	22	23	24	25
	26	26	27	28	29	30	1	2

Epidemiological Week		Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
July 2016	27	3	4	5	6	7	8	9
	28	10	11	12	13	14	15	16
	29	17	18	19	20	21	22	23
	30	24	25	26	27	28	29	30
	31	31	1	2	3	4	5	6
August 2016	32	7	8	9	10	11	12	13
	33	14	15	16	17	18	19	20
	34	21	22	23	24	25	26	27
	35	28	29	30	31	1	2	3
September 2016	36	4	5	6	7	8	9	10
	37	11	12	13	14	15	16	17
	38	18	19	20	21	22	23	24
	39	25	26	27	28	29	30	1
October 2016	40	2	3	4	5	6	7	8
	41	9	10	11	12	13	14	15
	42	16	17	18	19	20	21	22
	43	23	24	25	26	27	28	29
	44	30	31	1	2	3	4	5
November 2016	45	6	7	8	9	10	11	12
	46	13	14	15	16	17	18	19
	47	20	21	22	23	24	25	26
	48	27	28	29	30	1	2	3
December 2016	49	4	5	6	7	8	9	10
	50	11	12	13	14	15	16	17
	51	18	19	20	21	22	23	24
	52	25	26	27	28	29	30	31

Annex 3. Cumulative cases of Zika virus infection and congenital syndrome associated with Zika virus, through 29 December 2016*

Cumulative cases of Zika and associated congenital syndrome reported by countries and territories in the Americas, 2015–2016, through 29 December 2016 2:00 PM EST							
Country/Territory	Autochthonous cases ^a		Imported cases	Incidence rate ^b	Deaths from Zika ^c	Congenital syndrome associated with Zika virus infection, confirmed cases ^d	Population (1,000) ^e
	Suspected	Confirmed					
North America							
Bermuda	0	0	5	0.00	0	0	71
Canada	0	0	421	0.00	0	1	36,286
United States of América ¹	0	217	4,592	0.07	0	39	324,119
Subtotal	0	217	5,018	0.06	0	40	360,476
Latin America and the Caribbean							
Latin America							
Mexico	0	7,335	15	5.70	0	0	128,632
Central America							
Belize	756	68	0	224.52	0	0	367
Costa Rica	3,840	1,581	32	111.61	0	2	4,857
El Salvador ²	11,413	51	0	186.53	0	4	6,146
Guatemala ³	3,343	788	0	24.78	0	15	16,673
Honduras	31,936	298	0	393.58	0	2	8,190
Nicaragua	0	2,053	3	33.38	0	2	6,150
Panama ⁴	2,570	652	42	80.75	0	5	3,990
Subtotal	53,858	5,491	77	127.98	0	30	46,373
Latin Caribbean							
Cuba	0	3	30	0.03	0	0	11,393
Dominican Republic	4,903	331	0	49.15	0	22	10,649
French Guiana ⁶	9,700	483	10	3689.49	0	16	276
Guadeloupe ⁶	30,845	379	0	6629.30	0	6	471
Haiti	2,955	5	0	27.29	0	1	10,848
Martinica ⁶	36,680	12	0	9265.66	0	18	396
Puerto Rico	0	35,870	1	974.46	5	10	3,681
Saint Barthélemy ⁶	975	61	0	11511.11	0	0	9
Saint Martin ⁶	3,115	200	0	9208.33	0	0	36
Subtotal	89,173	37,344	41	335.06	5	73	37,759

Source: report of the IHR National Focal Point to the regional point of contact of WHO for the Americas, and official websites of the ministries of health of the countries of the Americas, 2016.

Annex 3 (cont.)

Country/Territory	Autochthonous cases ^a		Imported cases	Incidence rate ^b	Deaths from Zika ^c	Congenital syndrome associated with Zika virus infection, confirmed cases ^d	Population (1,000) ^e
	Suspected	Confirmed					
Andean Region							
Bolivia	741	156	4	8.24	0	14	10,888
Colombia ⁷	96,649	9,799	0	218.79	0	72	48,654
Ecuador ⁸	2,678	853	15	21.55	0	0	16,385
Peru	1,395	382	18	5.66	0	0	31,374
Venezuela ⁹	59,235	2,380	0	195.49	0	0	31,519
Subtotal	160,698	13,570	37	125.54	0	86	138,820
Brasil ¹⁰	211,770	109,596	0	153.35	9	2,289	209,568
Southern Cone							
Argentina ¹¹	1,821	26	29	4.21	0	1	43,847
Chile	0	0	33	0.00	0	0	18,132
Paraguay ¹²	555	14	0	8.46	0	2	6,725
Uruguay	0	0	1	0.00	0	0	344
Subtotal	2,376	40	63	3.50	0	3	69,048
Non-Latin Caribbean							
Anguila ¹³	23	18	1	241.18	0	0	17
Antigua and Barbuda	465	14	2	509.57	0	0	94
Aruba	676	28	7	617.54	0	0	114
Bahamas	0	22	3	5.60	0	0	393
Barbados	699	46	0	256.01	0	0	291
Bonaire ¹⁴	0	85	0	340.00	0	0	25
Cayman Islands	211	30	10	422.81	0	0	57
Curaçao	0	820	0	550.34	0	0	149
Dominica	1,150	79	0	1660.81	0	0	74
Granada ¹⁵	314	111	0	382.88	0	1	111
Guyana	0	37	0	4.80	0	0	771
Jamaica	7,052	186	0	258.22	0	0	2,803
Montserrat	2	5	0	140.00	0	0	5
Saint Kitts and Nevis	549	33	0	1119.23	0	0	52
Saint Lucia	822	50	0	531.71	0	0	164

Suggested citation: Pan American Health Organization/World Health Organization. Zika suspected and confirmed cases reported by countries and territories in the Americas, cumulative cases, 2015-2016. As of 29 December 2016. Washington, D.C.: PAHO/WHO; 2016; Pan American Health Organization • www.paho.org • © PAHO/WHO, 2016

Annex 3 (cont.)

Country/Territory	Autochthonous cases ^a		Imported cases	Incidence rate ^b	Deaths from Zika ^c	Congenital syndrome associated with Zika virus infection, confirmed cases ^d	Population (1,000) ^e
	Suspected	Confirmed					
Non-Latin Caribbean							
Saint Vincent and the Grenadines	508	83	0	579.41	0	0	102
Sint Maarten (the Netherlands) ¹⁶	168	62	0	560.98	0	0	41
Suriname	2,758	723	0	635.22	4	2	548
Trinidad and Tobago	0	643	1	47.11	0	1	1,365
Turks and Caicos Islands	179	17	3	384.31	0	0	51
British Virgin Islands	74	52	0	370.59	0	0	34
United States Virgin Islands	1,028	877	0	1849.51	0	0	103
Subtotal	16,678	4,021	27	281.08	4	4	7,364
TOTAL	534,553	177,614	5,278	71.36	18	2,525	998,040

*To access the table's reference notes, please see the original table, available at: <http://bit.ly/2chh2aP>.

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