



Centers for Disease Control and Prevention



Zika Virus

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Zika virus

- Single stranded RNA Virus
- Genus *Flavivirus*, Family *Flaviviridae*
- Closely related to dengue, yellow fever, Japanese encephalitis, and West Nile viruses
- Transmitted to humans primarily by *Aedes (Stegomyia)* species mosquitoes

Zika virus vectors: *Aedes* mosquitoes

- *Aedes* species mosquitoes
 - *Ae. aegypti* more efficient vectors for humans
 - *Ae. albopictus*
- Also transmit dengue and chikungunya viruses
- Lay eggs in domestic water-holding containers
- Live in and around households
- Aggressive daytime biters, but they can also bite at night



Aedes aegypti



Aedes albopictus

Approximate geographic range of *Aedes aegypti* and *Aedes albopictus* mosquitoes in the United States

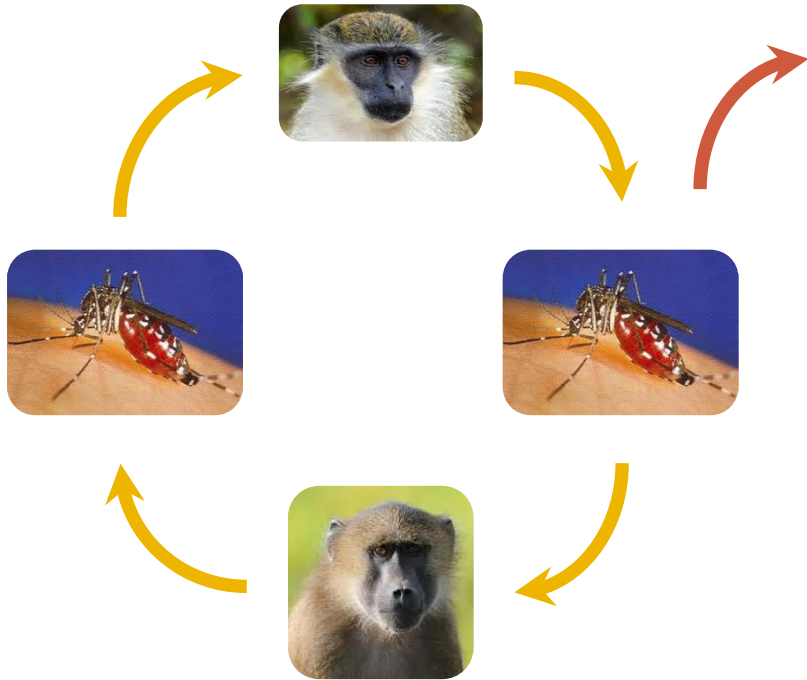


 *Ae albopictus*

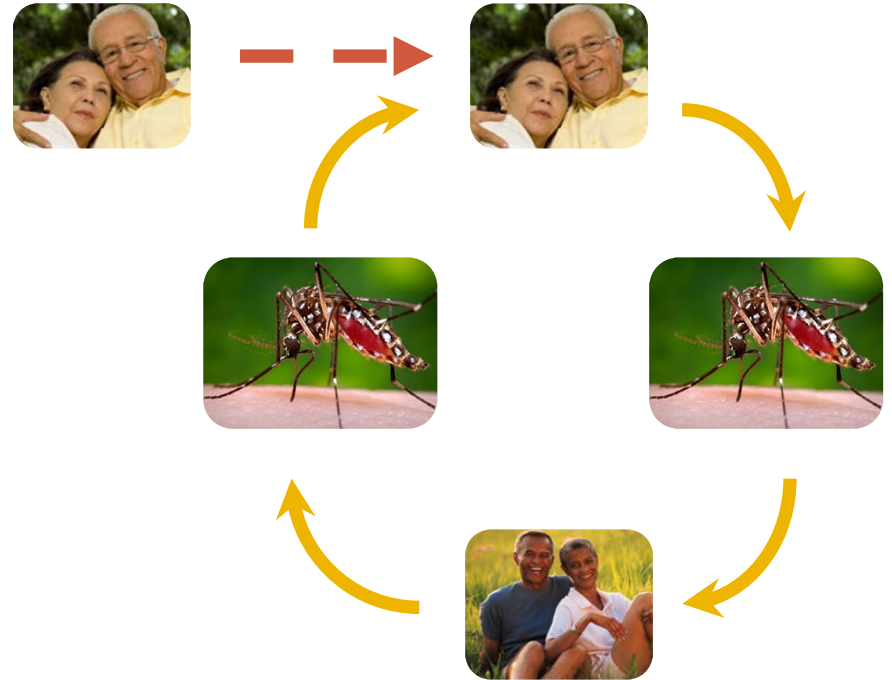
 *Ae aegypti*

 *Ae aegypti* and *Ae albopictus*

Zika virus transmission cycles



Sylvatic (jungle) cycle



Epidemic (urban) cycle

Non mosquito-borne modes of transmission

- Documented
 - Intrauterine resulting in congenital infection
 - Intrapartum from viremic mother to newborn
 - Sexual
 - Laboratory exposure
 - Blood transfusion
- Possible
 - Organ or tissue transplantation
 - Breast milk

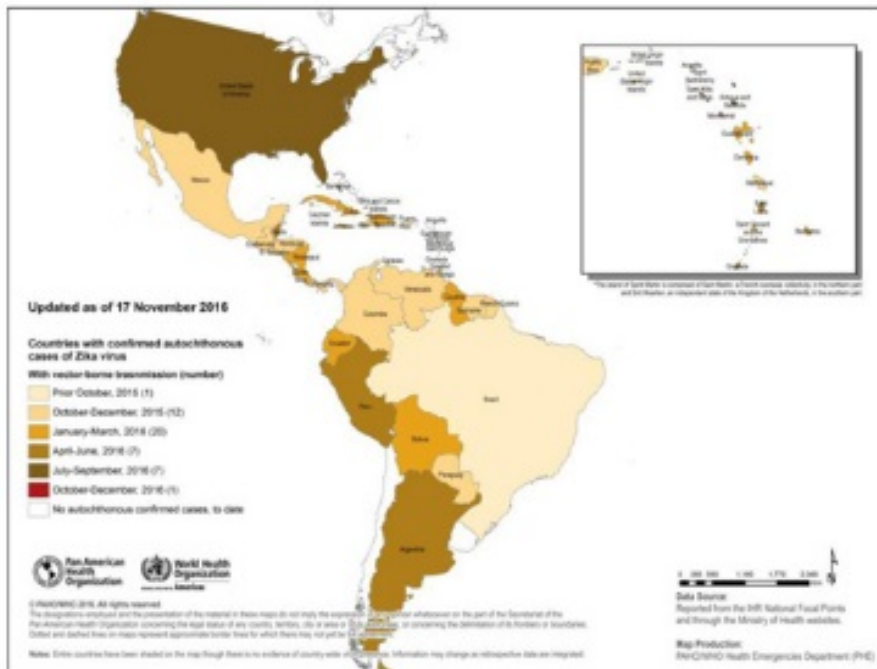
Zika virus epidemiology

- First isolated from a monkey in Uganda in 1947
- Before 2007, only sporadic human disease cases reported from Africa and Southeast Asia
- In 2007, first outbreak reported on Yap Island, Federated States of Micronesia
- In 2013–2015, >30,000 suspected cases reported from French Polynesia and other Pacific islands

Zika virus in the Americas

- In May 2015, the first locally-acquired cases in the Americas were reported in Brazil
- Currently, outbreaks are occurring in most countries or territories in the Americas, including US states and territories

Locally transmitted Zika virus disease cases reported to PAHO by country in the Americas, 2015–2016 (as of Nov 17)



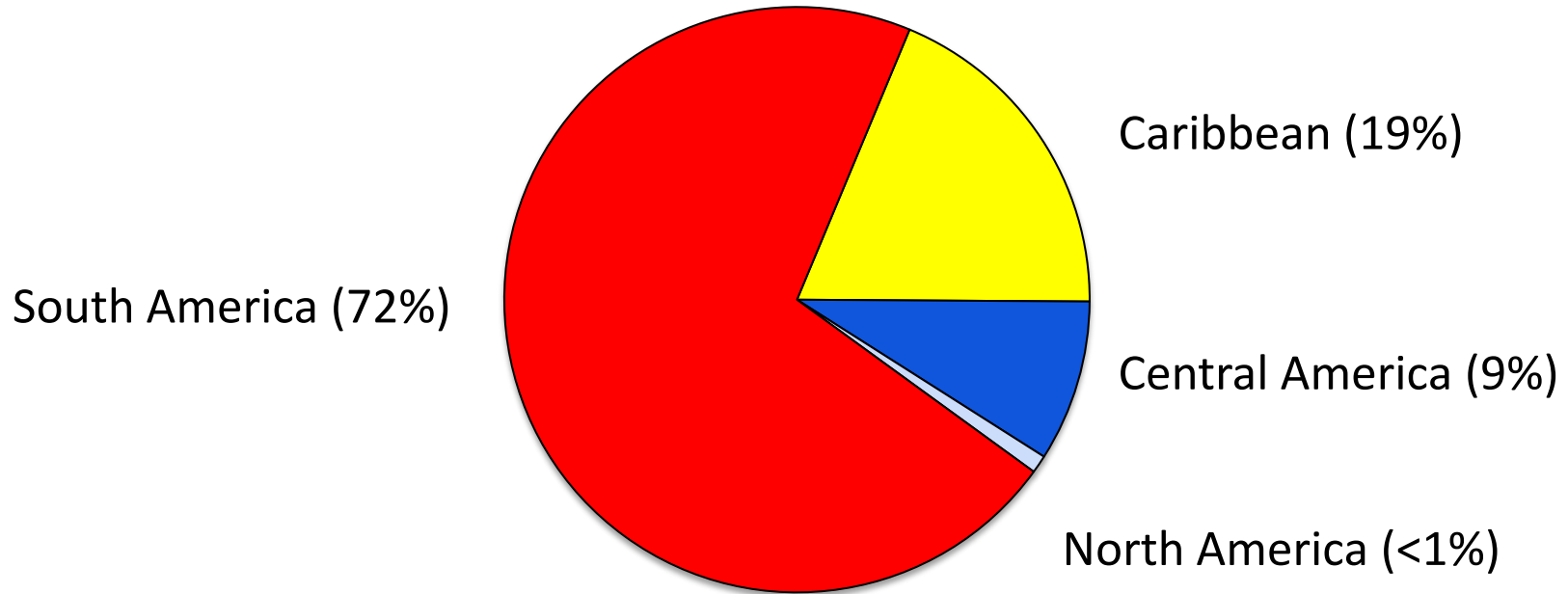
Country/Territory
(N=47)

(N=688,040)*

Brazil	310,061	(45%)
Colombia	105,247	(15%)
Venezuela	61,002	(9%)
Martinique	36,692	(5%)
Honduras	32,004	(5%)
Guadeloupe	31,224	(5%)
Puerto Rico	33,455	(5%)
El Salvador	11,384	(2%)
Other	66,971	(10%)

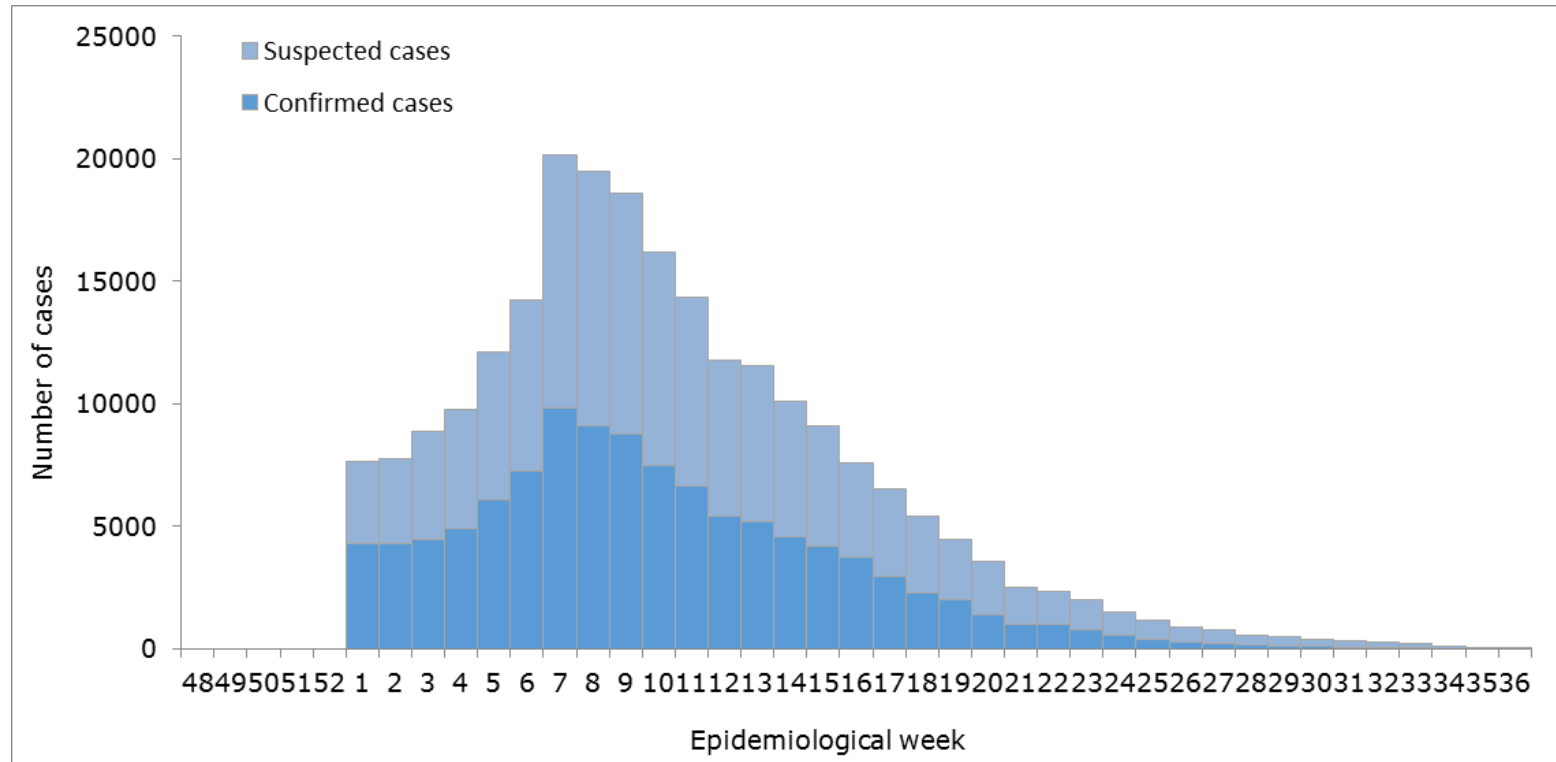
*25% of cases are lab-confirmed

Suspected and confirmed locally transmitted Zika virus disease cases reported to PAHO by region in the Americas, 2015–2016



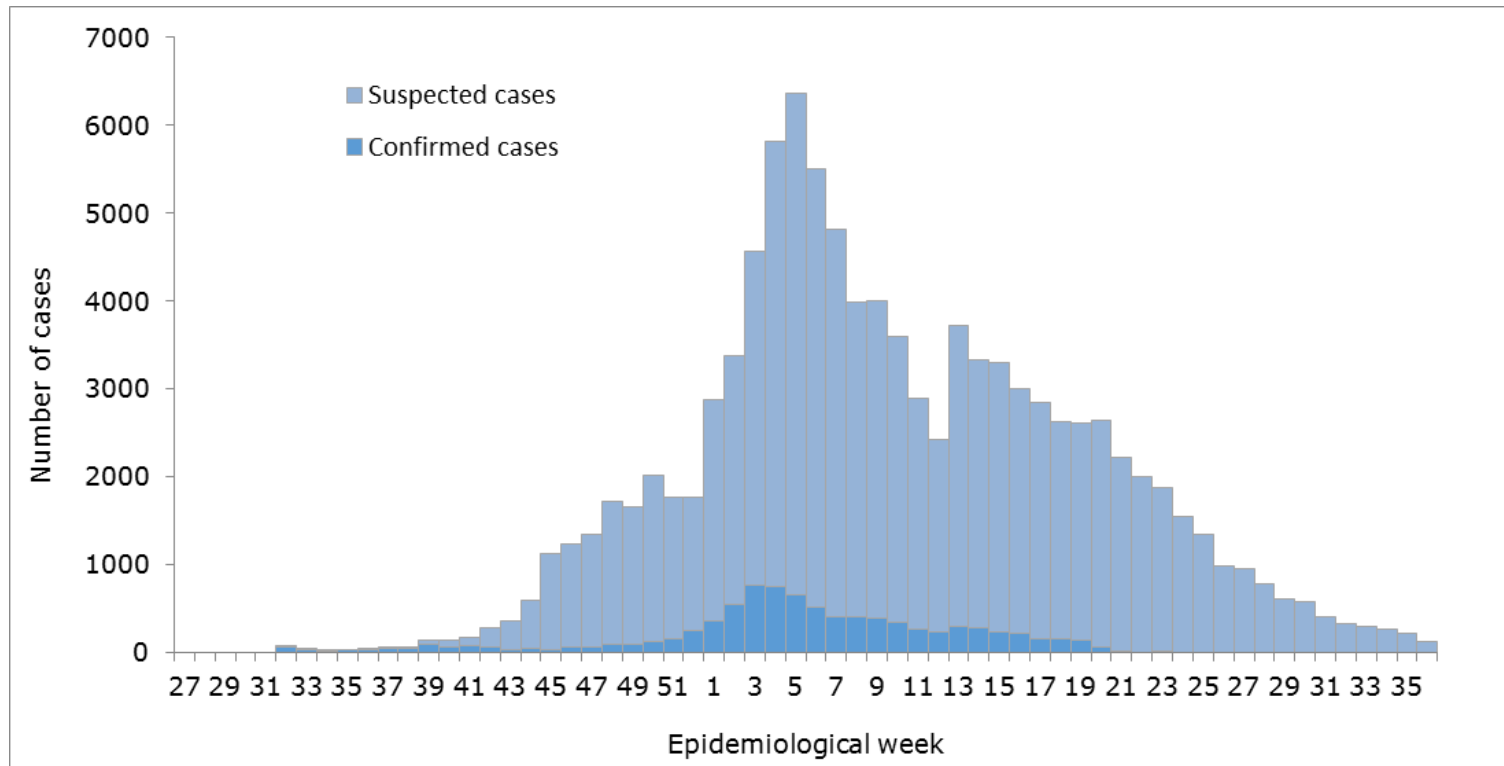
N=688,040 suspected and confirmed cases

Suspected and confirmed Zika virus disease cases reported to PAHO from Brazil, Jan–Oct 3, 2016

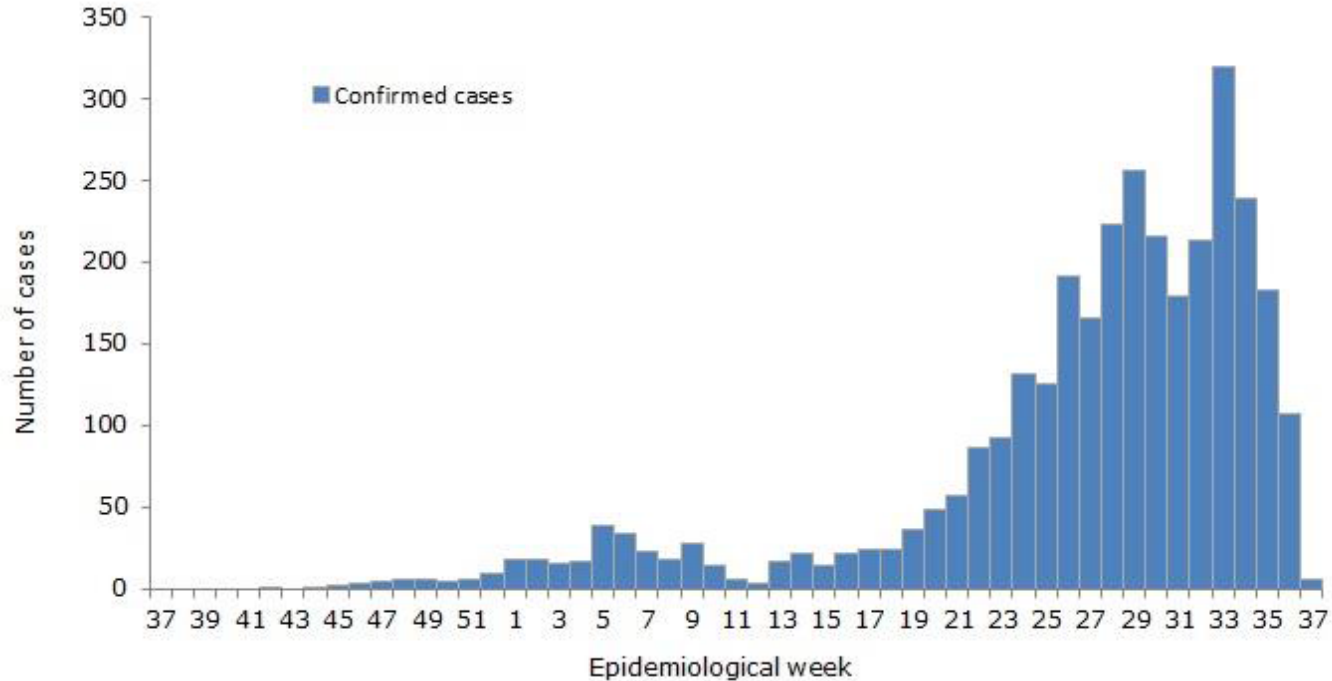


http://www.paho.org/hq/index.php?option=com_docman&task=doc_view&gid=35221&Itemid=270&lang=en

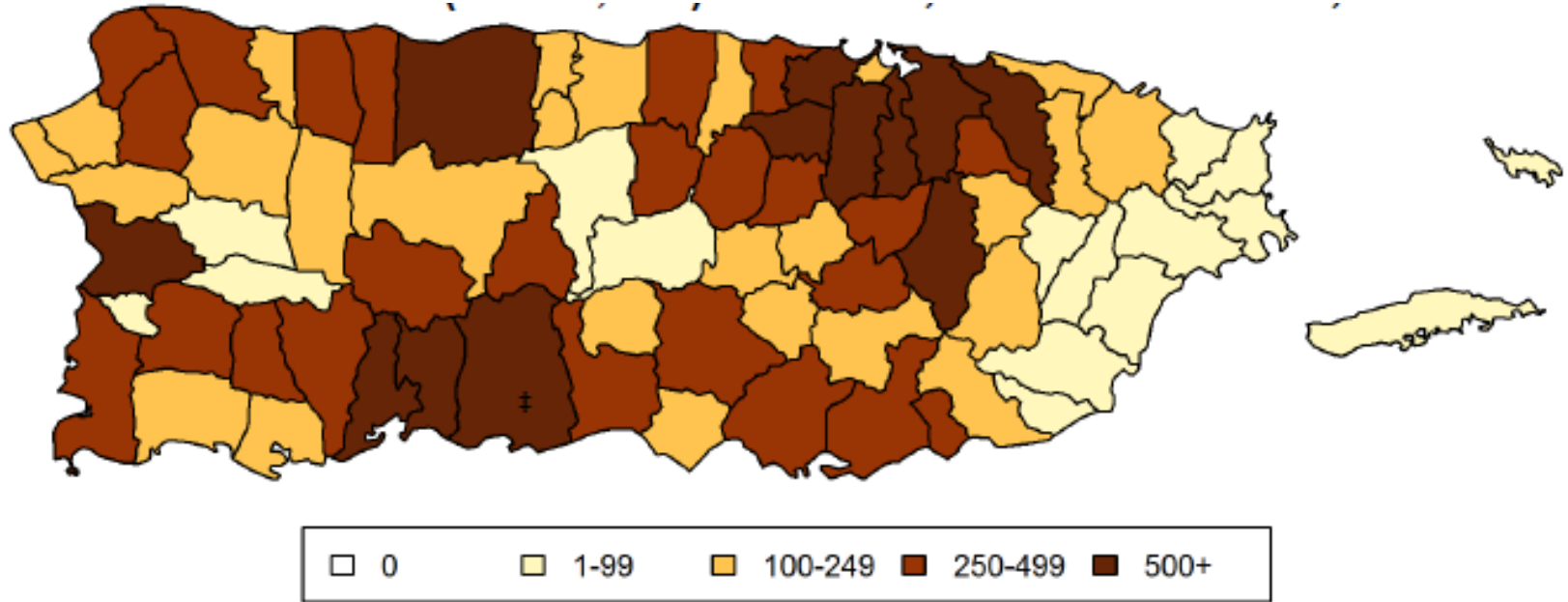
Suspected and confirmed Zika virus disease cases reported to PAHO from Colombia, Jul 2015–Oct 3, 2016



Confirmed Zika virus disease cases reported to PAHO from Mexico, Sep 2015–Oct 3, 2016

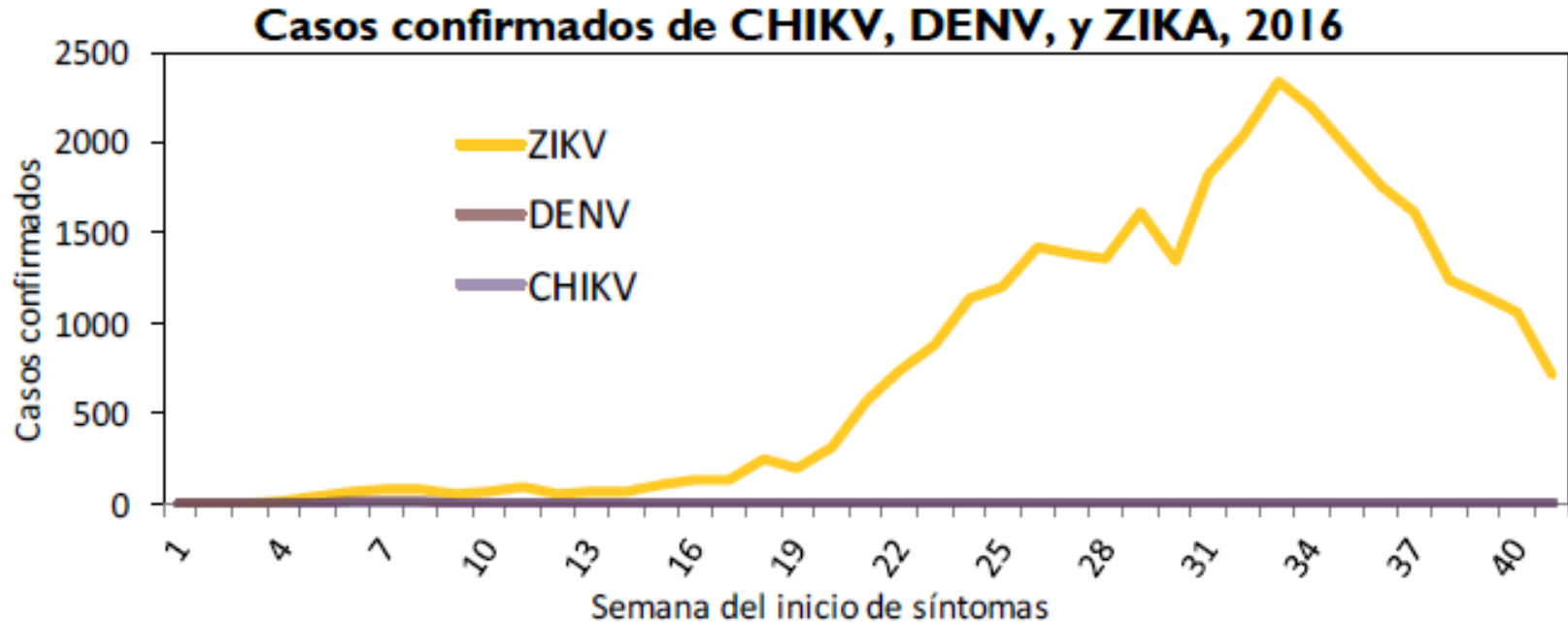


Confirmed Zika virus disease cases reported from Puerto Rico by municipality, week 41, 2015–2016 (n=31,245)



<http://www.salud.gov.pr/Estadisticas-Registros-y-Publicaciones/Pages/VigilanciadeZika.aspx#arbov>

Confirmed Zika, dengue, and chikungunya virus disease cases reported from Puerto Rico by week of illness onset, 2015–2016



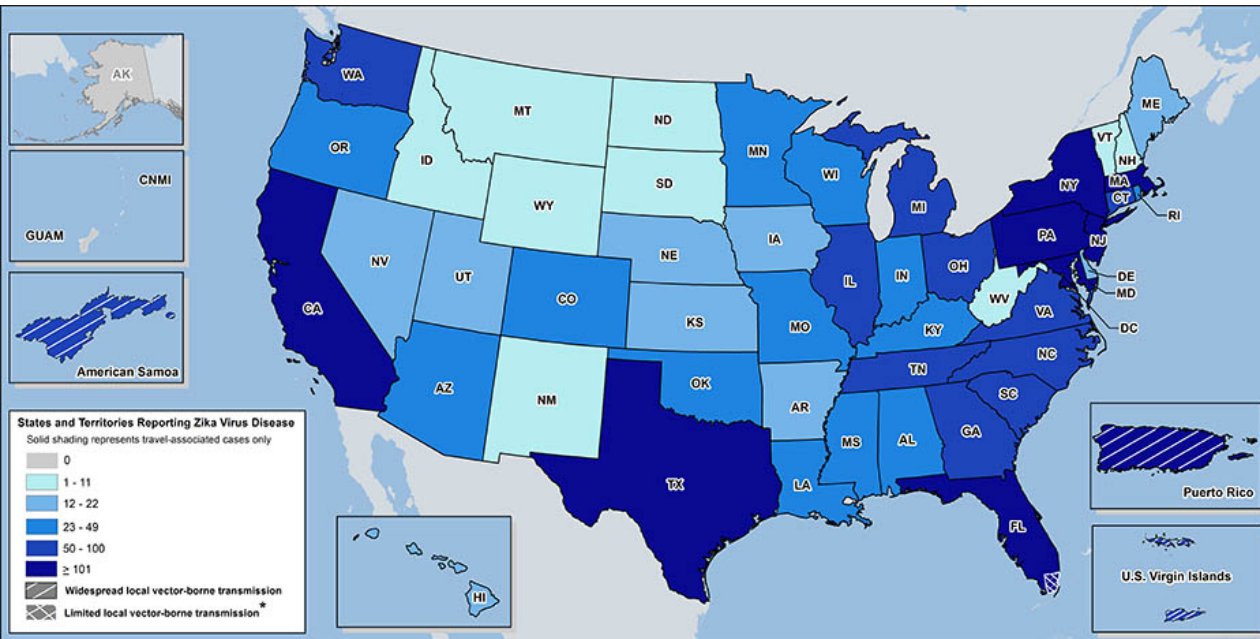
Laboratory-confirmed Zika virus disease cases reported to ArboNET by states or territories — United States (as of Nov 16, 2016)

	Travel-associated cases* (N=4,232)		Locally acquired cases† (N=32,090)	
States	4,115	(97%)	139	(<1%)
Territories				
Puerto Rico	115	(3%)	31,294	(98%)
U.S. Virgin Islands	2	(<1%)	603	(2%)
American Samoa	0	(0%)	54	(<1%)

*Includes cases in travelers and their contacts with presumed sexual or in utero transmission, one case with unknown route of person-to-person transmission, and one lab acquired case

†Presumed local mosquito-borne transmission

State of residence for reported Zika virus disease cases — US states (as of Nov 16, 2016)

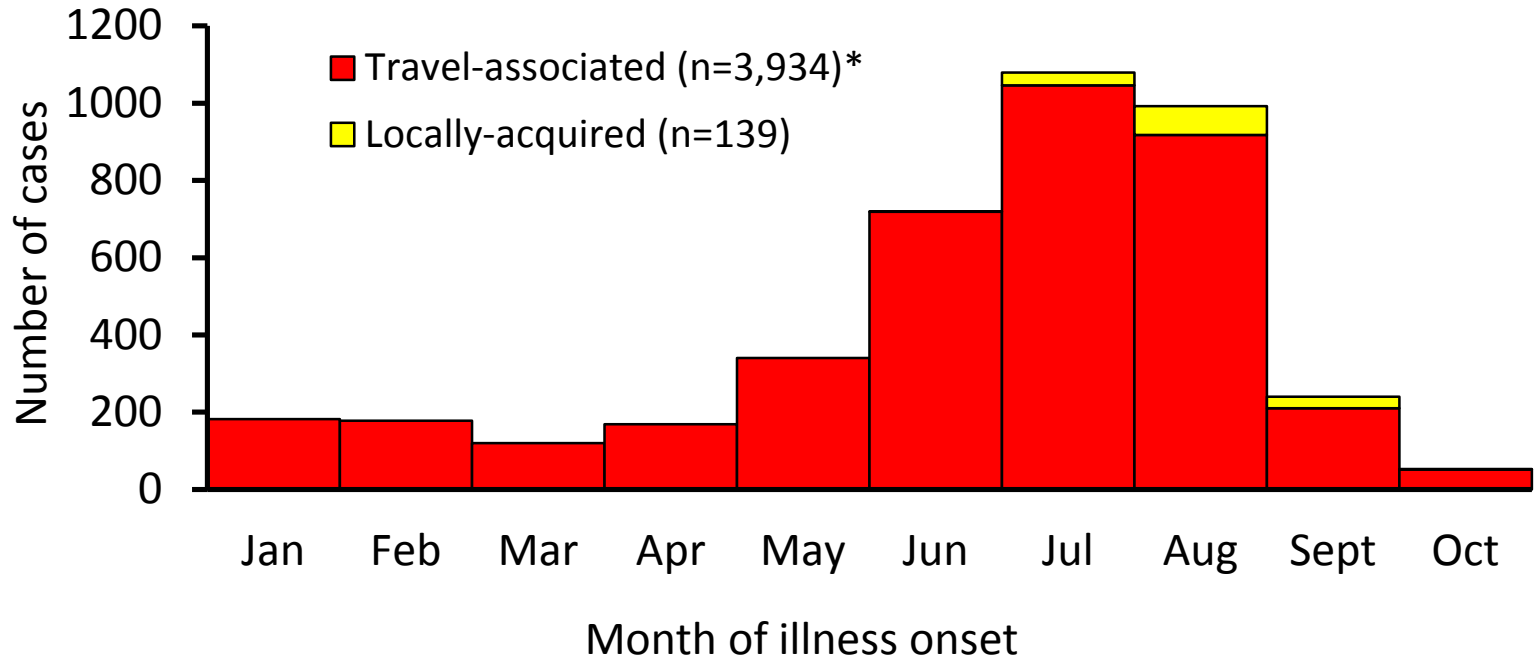


<u>State</u>	<u>(N=4,255)</u>
<u>NY</u>	905 (21%)
<u>FL</u>	847 (20%)
<u>CA</u>	340 (8%)
<u>TX</u>	237 (6%)
<u>NJ</u>	157 (4%)
<u>PA</u>	154 (4%)

Mosquito-borne transmission in Florida

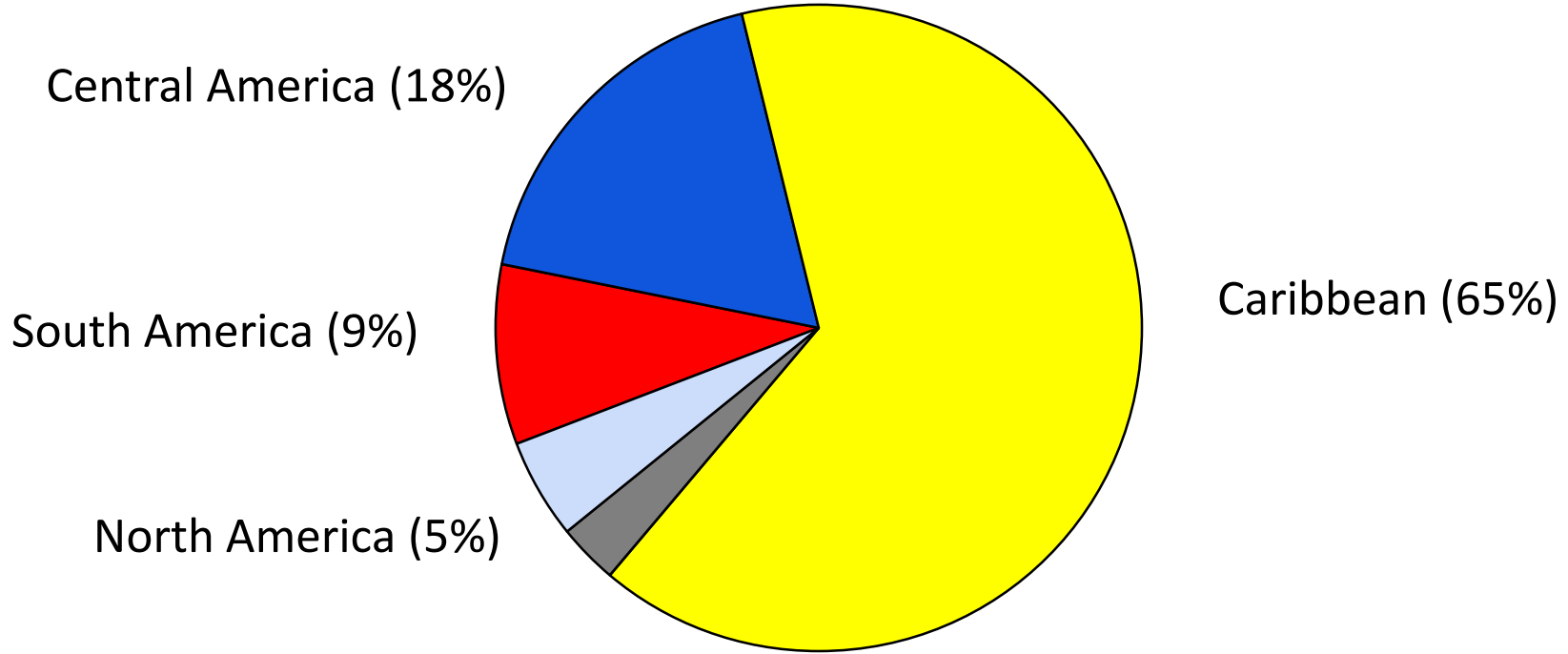
- Sporadic, locally acquired cases identified in multiple counties in south Florida
- Multi-person transmission identified in three areas of Miami-Dade County
 - Resulted in recommendations for pregnant women to avoid travel to those areas
- No evidence of ongoing, active local transmission in one of the three areas after aerial spraying and other mosquito control efforts
- As of Nov 17 there were 139 locally acquired cases reported by Florida DOH
- Florida DOH continues to report active investigations in several counties in south Florida
- Pregnant women and their sex partners who are concerned about potential exposure to Zika may consider postponing nonessential travel to all parts of Miami-Dade County

Month of illness onset for reported Zika virus disease cases — US states, Jan-Oct 2016 (as of Nov 2)



*Travelers returning from affected areas or their sexual contacts

Region where reported US travel-associated Zika virus disease cases were acquired, Jan–Jul 2016

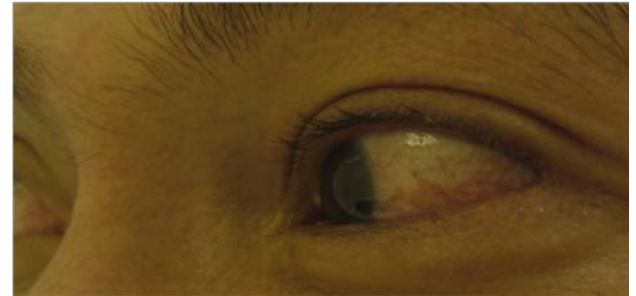


N=2,382



Zika virus disease clinical course and outcomes

- Most infections asymptomatic*
- Clinical illness usually mild
- Characterized by rash, fever, arthralgia, and/or conjunctivitis
- Symptoms last several days to a week
- Severe disease requiring hospitalization uncommon
- Fatalities rare



*Asymptomatic infection rate in Yap, Micronesia was estimated at 82% (95%CI 73-90)

Clinical signs/symptoms of reported US travel-associated Zika virus disease cases — United States, 2015–2016 (as of July 13)

<u>Sign/symptom</u>	<u>Yes</u>	
Rash	243	(76%)
Fever	192	(60%)
Arthralgia	151	(47%)
Conjunctivitis	97	(31%)

Differential diagnosis for Zika virus disease

- **Dengue**
- **Chikungunya**
- Leptospirosis
- Malaria
- Rickettsia
- Parvovirus
- Group A streptococcus
- Rubella
- Measles
- Adenovirus
- Enterovirus

* **Very similar clinical features**

Distinguishing Zika from dengue and chikungunya

- Dengue and chikungunya viruses transmitted by same mosquitoes with similar ecology
- Dengue and chikungunya can circulate in same area and rarely cause co-infections
- Diseases have similar clinical features
- Important to rule out dengue, as proper clinical management can improve outcome*

*WHO dengue clinical management guidelines:
http://whqlibdoc.who.int/publications/2009/9789241547871_eng.pdf

Newly identified clinical manifestations of Zika virus infection

- Adverse outcomes of pregnancy including fetal loss, microcephaly, and other congenital anomalies
- Guillain-Barre syndrome and other neurologic syndromes
- Thrombocytopenia

Zika Virus and pregnancy



- Existing data show
 - No evidence of increased susceptibility
 - Infection can occur in any trimester
 - Incidence of Zika virus in this population is not known
 - No evidence of more severe disease

Zika virus and microcephaly in Brazil

- Reports of a substantial increase in number of babies born with microcephaly in 2015 in Brazil; true baseline unknown
 - Zika virus infection identified in several infants born with microcephaly (including deaths) and in early fetal losses
- Incidence of microcephaly among fetuses with congenital Zika infection is unknown

Risk of Microcephaly and Other Adverse Fetal Outcomes

- 1% - 13% estimated risk of microcephaly in first trimester
 - » Modeling based on outbreak in Bahia, Brazil
 - » Negligible risk in 2nd and 3rd trimesters
- 1% estimated risk of microcephaly in first trimester
 - » Modeling based on outbreak in French Polynesia
- 29% abnormalities detected including two intrauterine deaths in lab-confirmed Zika virus infection in women with prenatal ultrasound in Brazil



Johansson MA et al., *N Engl J Med.* 2016;375(1):1-4.
Cauchemez S et al., *Lancet* 2016 387(10033):2125-32.
Brasil P et al., *N Engl J Med.* 2016 Mar 4. [Epub ahead of print]

Many Questions Remain

- What is the level of risk from Zika virus infection during pregnancy?
- When during pregnancy Zika virus infection poses the highest risk to the fetus?
- What is the full range of potential health problems that Zika virus infection may cause?
- What is the risk for later health problems in an infant who is without abnormalities at birth?
- What are other factors (e.g., co-occurring infection) that might affect the risk for birth defects?



Zika virus diagnostic testing

- Testing methods
 - rRT-PCR for viral RNA in serum and urine
 - Evaluating RT-PCR for viral RNA in amniotic fluid and semen
 - Serology for anti-Zika virus IgM and neutralizing antibodies in serum and cerebrospinal fluid
 - Immunohistochemical staining (IHC) and RT-PCR for viral antigens and RNA in tissues
- Testing recommendations vary based on several factors*

Who should be tested for Zika virus infection

- Patient with fever, rash, arthralgia, and/or conjunctivitis
 - Onset during or within 2 weeks of travel to an area with ongoing transmission, OR
 - Epidemiologic link to laboratory-confirmed case through vertical transmission or sexual contact
- Pregnant women should be offered testing if they have a history of
 - Travel to or residence in an area with ongoing transmission during pregnancy, OR
 - Sexual contact without protection in a partner who had traveled to an area with ongoing transmission

Serology cross-reactions with other flaviviruses

- Zika virus serology (IgM) can be positive due to antibodies against related flaviviruses (e.g., dengue and yellow fever viruses)
- Neutralizing antibody testing may discriminate between cross-reacting antibodies in primary flavivirus infections
- Difficult to distinguish infecting virus in people previously infected with or vaccinated against a related flavivirus

Laboratories for diagnostic testing

- Several commercially-available molecular and serologic diagnostic tests
 - All under Emergency Use Authorizations (EUA) with FDA*
- Testing also performed at CDC and most state health departments
- Healthcare providers should contact state health departments to facilitate diagnostic testing and interpretation of results

*<http://www.fda.gov/MedicalDevices/Safety/EmergencySituations/ucm161496.htm#zika>

Initial assessment and treatment for non-congenital Zika virus disease

- No specific antiviral therapy
- Treatment is supportive (i.e., rest, fluids, analgesics, antipyretics)
- Suspected Zika virus infections should be evaluated and managed for possible dengue or chikungunya virus infections
- Aspirin and other NSAIDs should be avoided until dengue can be ruled out to reduce the risk of hemorrhage

Zika virus disease surveillance

- Consider in travelers with acute onset of fever, maculopapular rash, arthralgia, or conjunctivitis within 2 weeks after return
- Inform and evaluate women who traveled to areas with Zika virus transmission while they were pregnant
- Evaluate fetuses/infants of women infected during pregnancy for possible congenital infection and microcephaly
- Be aware of possible local transmission in areas where *Aedes* species mosquitoes are active

Reporting Zika virus diseases cases

- Zika virus disease and Zika virus infection, including congenital Zika virus infection, are nationally notifiable
 - CSTE approved interim case definitions in February 2016 and revised case definitions in June 2016*
- Healthcare providers encouraged to report suspected cases to their state or local health department
- Timely reporting allows health departments to assess and reduce the risk of local transmission or mitigate further spread

*http://c.ymcdn.com/sites/www.cste.org/resource/resmgr/2016PS/16_ID_01.pdf

Zika virus preventive measures

- No vaccine or medication to prevent infection or disease
- Primary prevention measure is to reduce mosquito exposure
 - Use EPA-registered insect repellent; considered safe to use in pregnant and lactating women
 - Wear long-sleeved shirts and long pants to cover exposed skin
 - Wear permethrin-treated clothes
 - Stay and sleep in screened-in or air-conditioned rooms
- Pregnant women should consider postponing travel to areas with ongoing Zika virus outbreaks
- Protect infected people from mosquito exposure during first week of illness to prevent further transmission

Resources

- CDC Zika virus information: <http://www.cdc.gov/zika/>
- PAHO Zika virus pages: http://www.paho.org/hq/index.php?option=com_topics&view=article&id=427&Itemid=41484&lang=en
- Zika virus information for clinicians: <http://www.cdc.gov/zika/hc-providers/index.html>
- Zika virus information for travelers and travel health providers: <http://wwwnc.cdc.gov/travel/yellowbook/2016/infectious-diseases-related-to-travel/zika>
- Travel notices: <http://wwwnc.cdc.gov/travel/notices>

For more information, contact CDC
1-800-CDC-INFO (232-4636)
TTY: 1-888-232-6348 www.cdc.gov

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