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Department of Public Health

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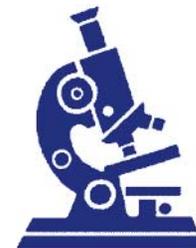
The Zika Virus: An Emerging Arbovirus in the Americas



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State Public Health Veterinarian

**Bureau of Infectious Disease and
Laboratory Sciences**



Presenter Disclosure Information

Catherine M Brown, DVM, MSc, MPH

Consultant	No relevant conflicts of interest to declare
Grant Research/Support	No relevant conflicts of interest to declare
Speaker's Bureau	No relevant conflicts of interest to declare
Major Stockholder	No relevant conflicts of interest to declare
Other Financial or Material Interest	No relevant conflicts of interest to declare

Objectives

- Explain the ecology and epidemiology of Zika virus
- Describe clinical characteristics and risk to pregnant women
- Highlight current clinical, diagnostic and prevention recommendations as well as where more information is needed
- Describe Massachusetts response to Zika virus

Origins of the Zika Virus

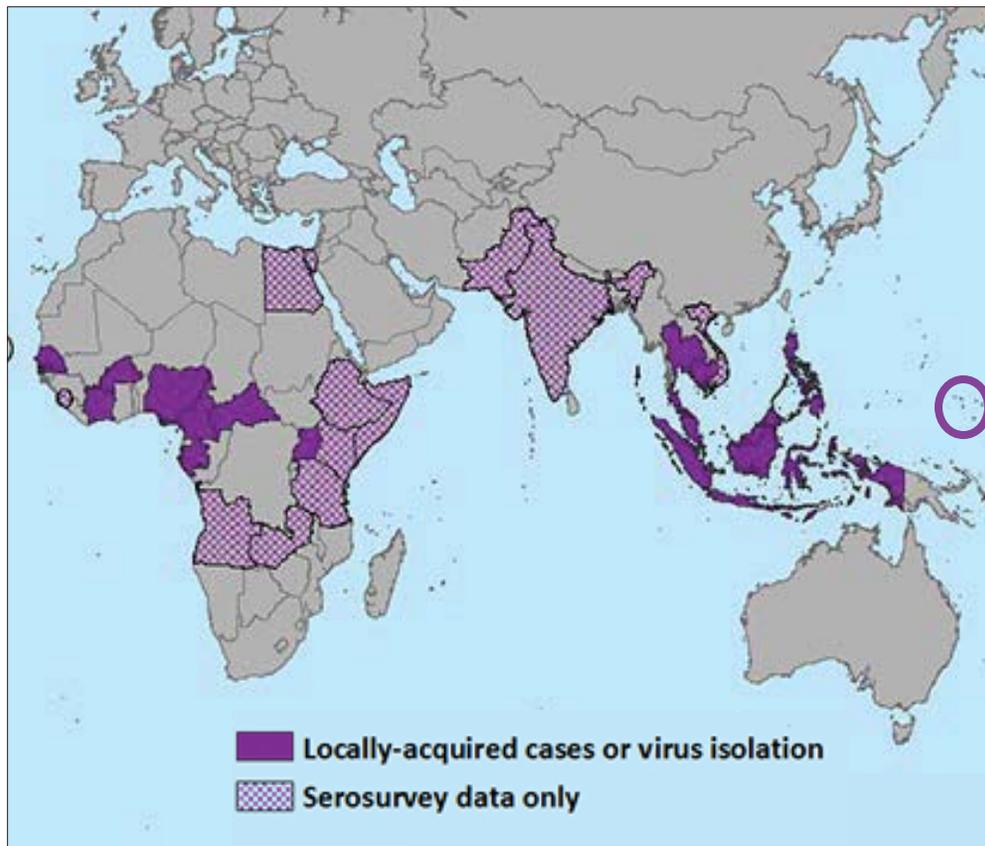
- 1947, Zika Forest Uganda
 - Isolated from rhesus monkey
- 1954, Nigeria Africa
 - First human case
 - Testing demonstrated human exposure in Africa and Southeast Asia
- Spread over time resulted in 2 distinct lineages, African and Asian

Geographic Range, 1947-2006



The mosquito species implicated as predominant Zika vectors in both Africa and Asia are:
Aedes aegypti
Aedes albopictus.

Spread to the Pacific Islands

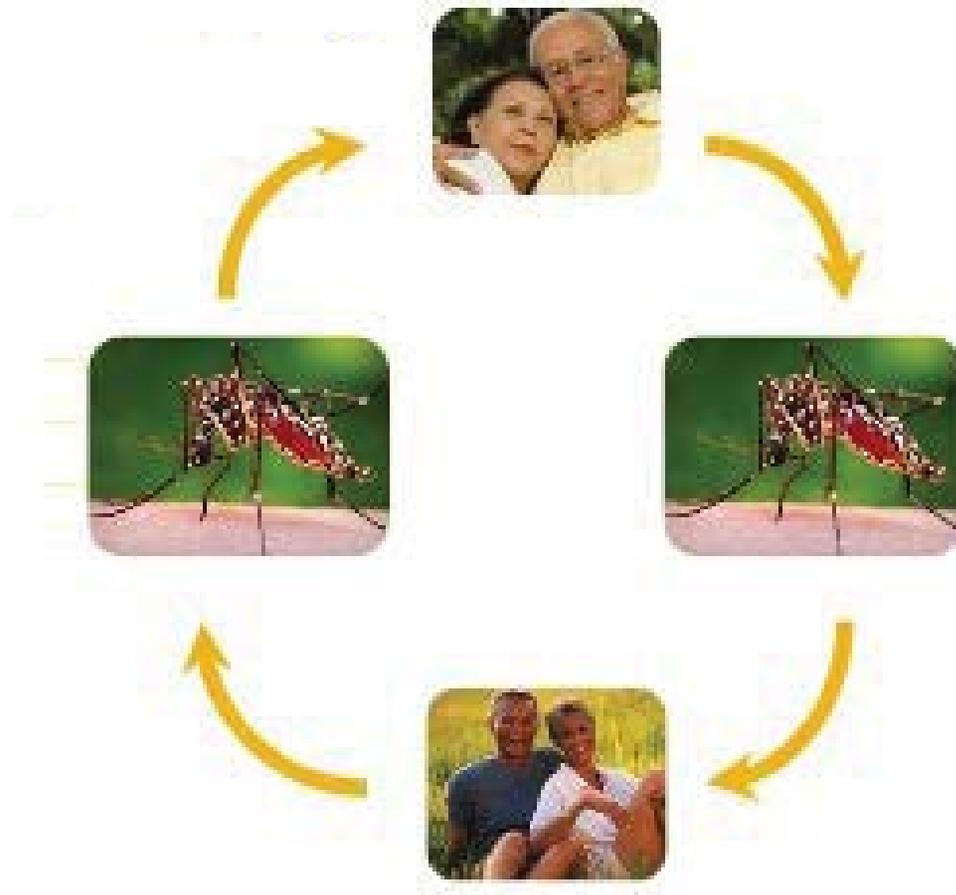


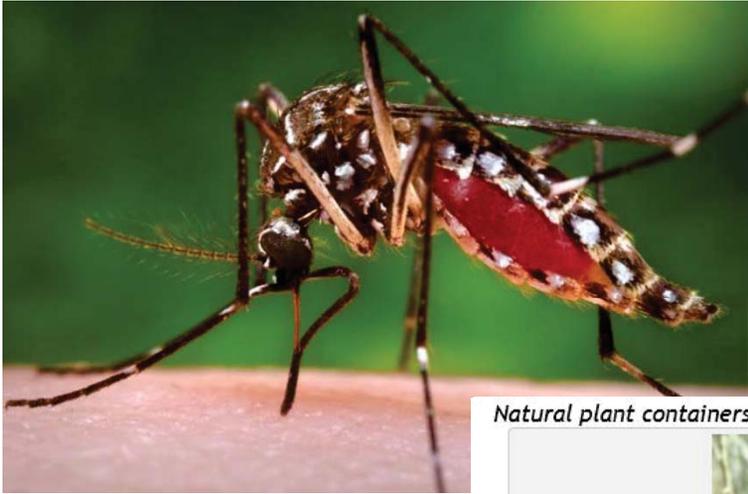
The first large documented Zika outbreak occurred on Yap Island in 2007

Yap Island is in the Micronesian Island chain of the western Pacific Ocean.

Prior to this, only 14 documented human cases

Zika Epidemic Transmission Cycle





Aedes aegypti



Aedes albopictus

Natural plant containers



Rain-filled cavities in trees, bamboo internodes, leaf-axils of plants

[Top of Page](#)

Artificial containers

Containers that are filled with rain water



Large discarded containers (tires, damaged appliances) and small discarded containers (paint cans)

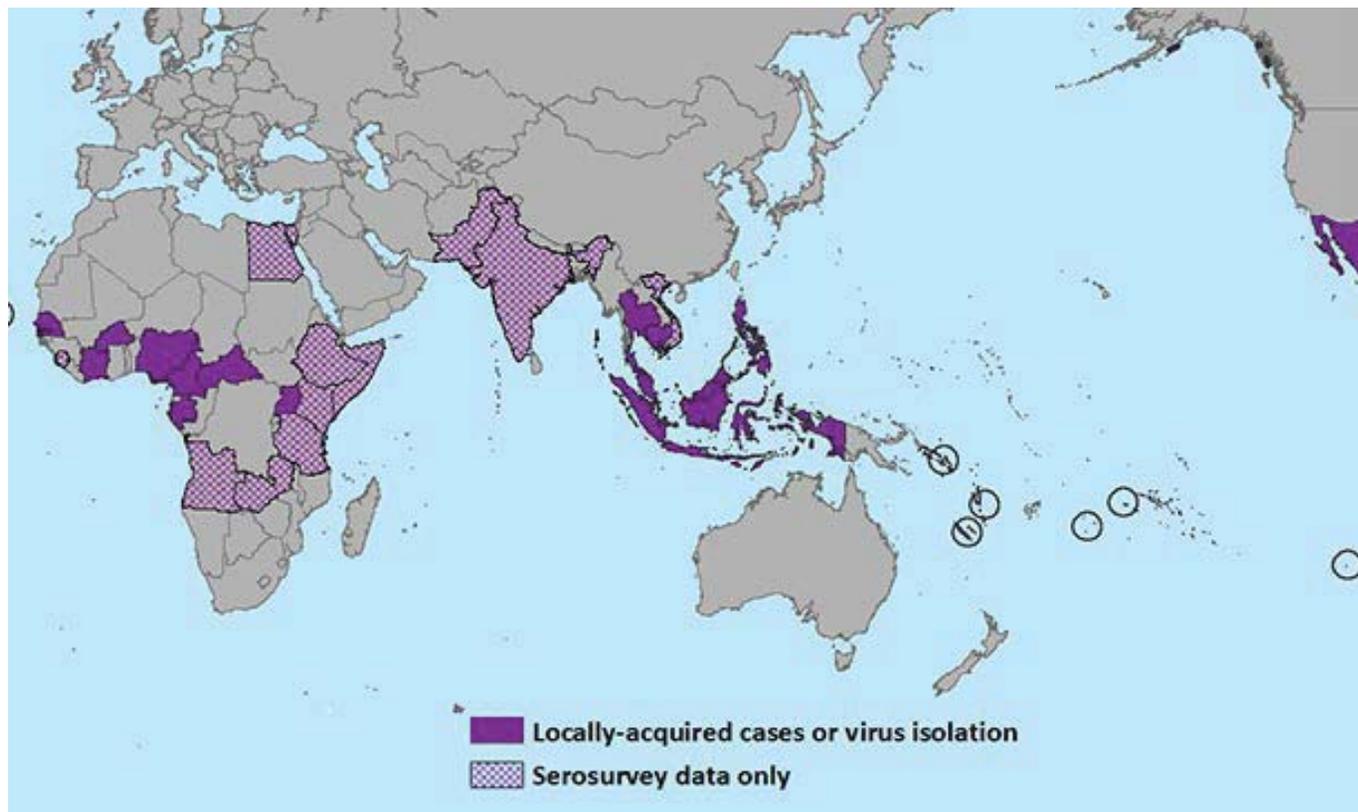
[Top of Page](#)



Trash cans, pails or buckets, painting trays, toys

Zika Spreads to More Pacific Islands

From 2013 through 2014, there was a large outbreak of Zika on the Islands of French Polynesia; this outbreak then spread to other Island groups including: New Caledonia, the Cook Islands, Vanuatu, Fiji, the Solomon Islands, and Easter Island.



Ae. aegypti
Ae. albopictus
Ae. polynesiensis

The French Polynesian Zika Outbreak

- Largest Zika outbreak ever recorded (at that time)
 - Approx. 170,000 people infected >50% of pop.
 - 80% of persons infected with Zika asymptomatic, ~140,000 persons
 - estimated 28,000 persons sought medical care (i.e. were symptomatic)

Zika Symptoms

20% symptomatic - generally mild, self-limiting, 2-7 day duration

- Fever
- Maculopapular rash, may be pruritic
- Arthralgia with swelling, often extremities
- Conjunctivitis



Zika Rashes



**Joint
pain and
Swelling**

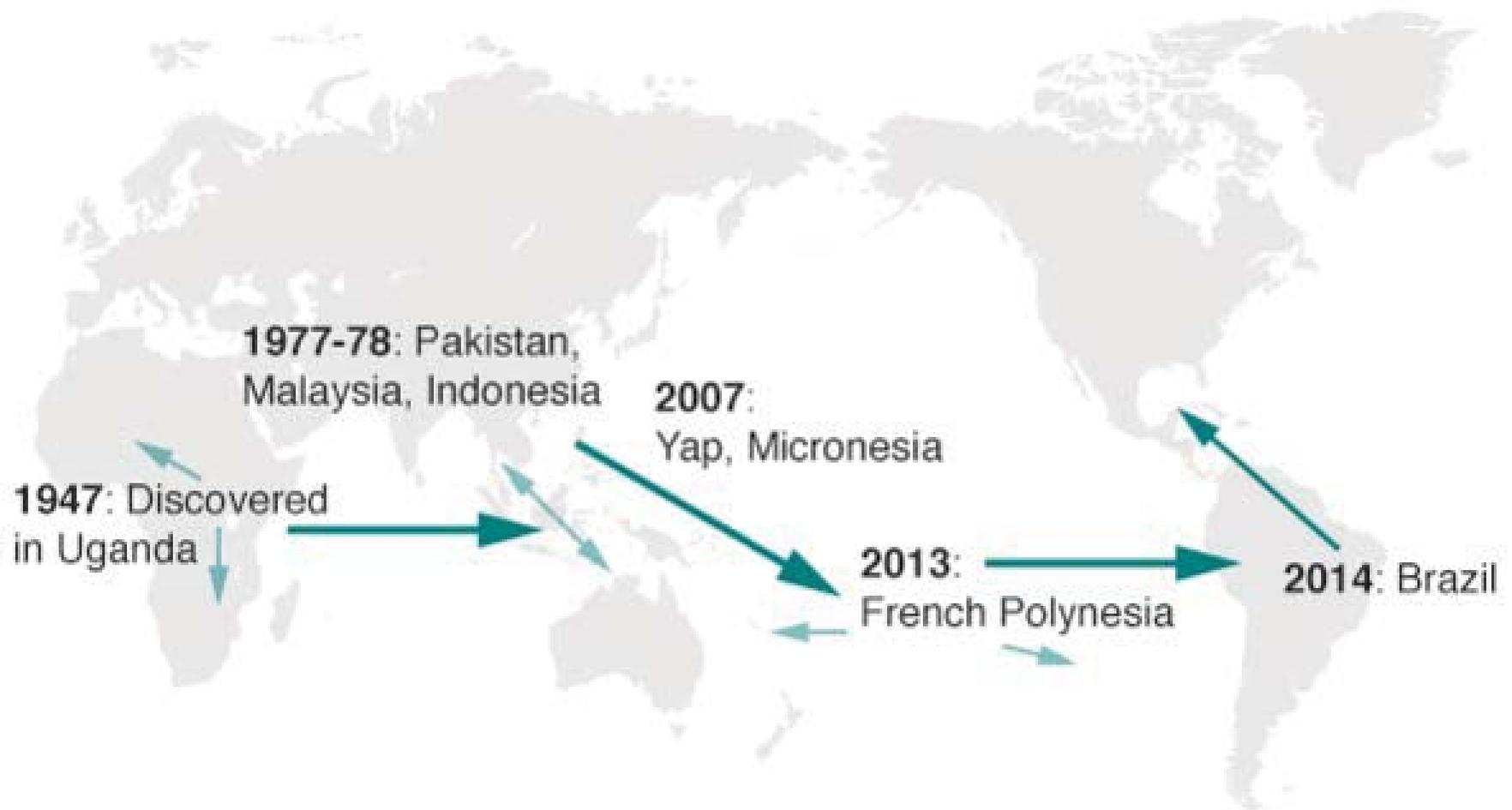


Conjunctivitis

Zika Symptoms – French Polynesia

- 70 hospitalized (.25% of symptomatic people)
 - 38 with Guillain-Barré syndrome
 - 32 other neurologic
 - Encephalitis, paresthesias, facial paralysis

How Zika virus spread from Africa



Zika Arrives in the Americas, 2013 - 2015?

- May, 2015
 - Outbreak in northeastern states of Brazil
 - Spread to 18 states by December
 - Serosurvey confirms infections as early as February
 - Genetic analysis of virus shows may have arrived as early as 2013
- May have arrived during an athletic event?
- *Ae. aegypti* and *Ae. albopictus* contributing

www.cdc.gov/zika



Zika Identified as a Cause of Birth Defects and Guillain – Barré Syndrome



Centre Publications Countries Programmes Governance About WHO

Emergencies preparedness, response

Microcephaly – Brazil

Disease Outbreak News
20 November 2015

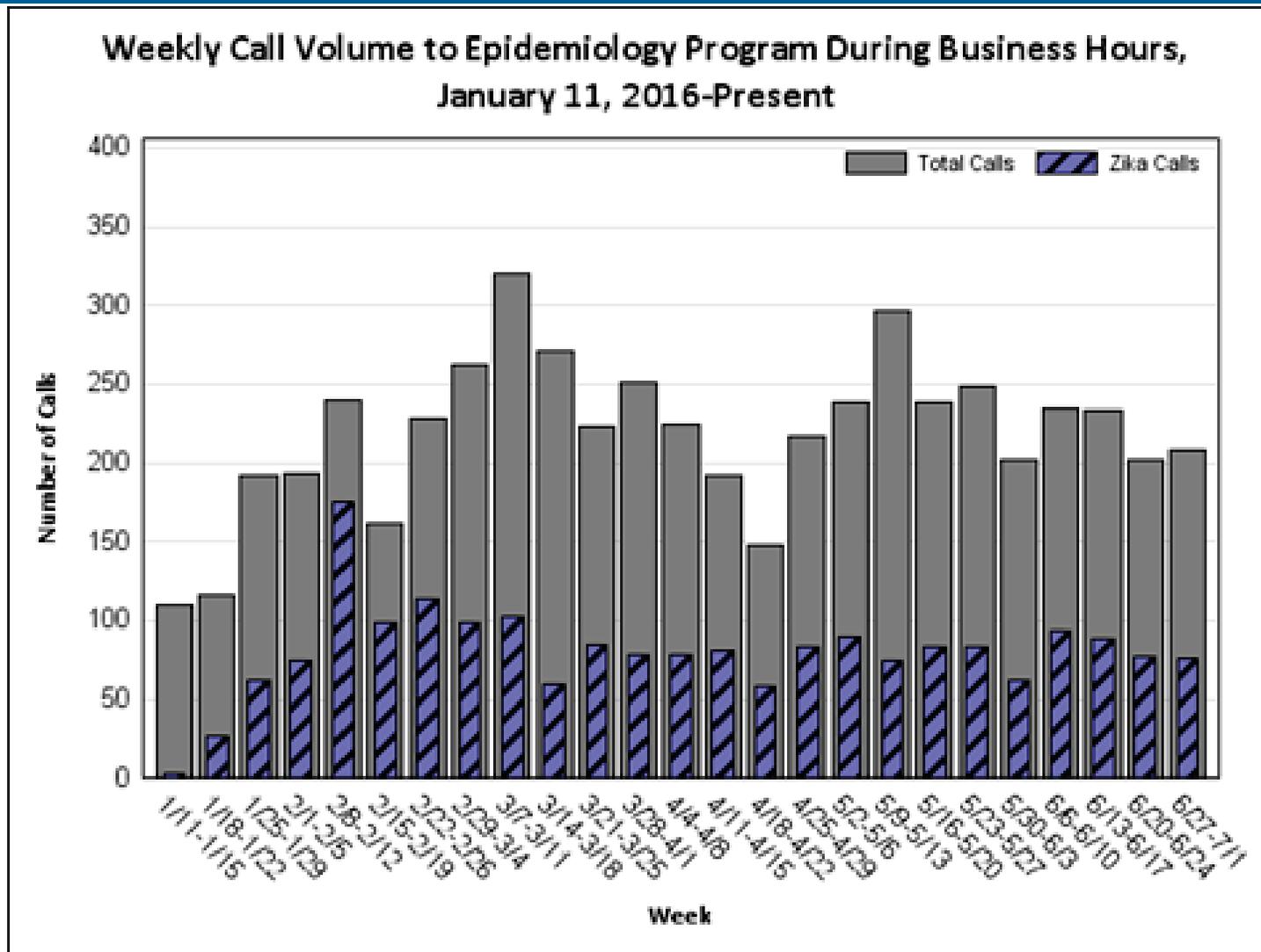
In October 2015, the Ministry of Health (MoH) of Brazil notified PAHO/WHO of an unusual increase in the number of cases of microcephaly among newborns in the state of Pernambuco, northeastern Brazil.

As of 17 November, a total of 399 cases of microcephaly were being investigated in seven states in the northeast of Brazil. Most of the cases were registered in Pernambuco state (268). Other states that reported microcephaly cases are Sergipe (44), Rio Grande do Norte (39), Paraíba (21), Piauí (10), Ceará (9) and Bahia (8).



AP Photo/Felipe Dana

Calls to 24/7 Epidemiology Number



Dallas reports case of Zika spread through sex; CDC urges condom use

A 89 Save for Later Reading List

By **Lena H. Sun, Brady Dennis and Ariana Eunjung Cha** February 3

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The Zika virus, explained

THE ZIKA VIRUS

Play Video 2:52

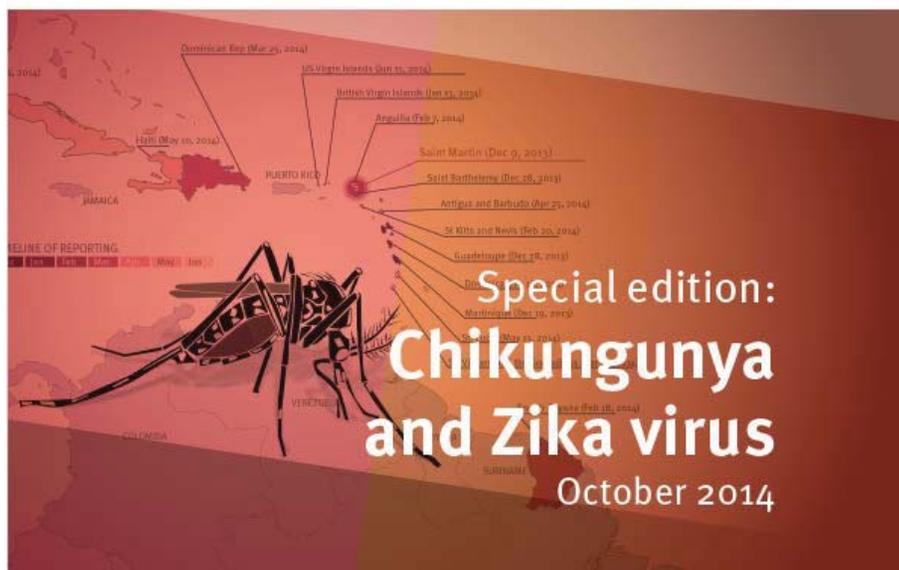
Everything you ever wanted to know about the Zika virus and its spread across North and South America. (Daron Taylor, Claritza Jimenez/The Washington Post)

Dallas health officials said Tuesday that a local resident was infected with the Zika virus by having sex with a person who had contracted the disease while traveling in Venezuela.

Most Read

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- 2 Scalia's death plunges court, national politics into turmoil
- 3 Supreme Court Justice Antonin Scalia dies at 79
- 4 He didn't report to work for six years, and no one noticed until he won an award
- 5 No running water and no solutions as California's driest county despairs

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- Spread of chikungunya and Zika virus in South America
- Aspects of Zika virus
- Cases of chikungunya in Spain from Haiti



RAPID COMMUNICATIONS

Potential for Zika virus transmission through blood transfusion demonstrated during an outbreak in French Polynesia, November 2013 to February 2014

D Musso (dmusso@ilm.pf)¹, T Nhan¹, E Robin¹, C Roche¹, D Bierlaire², K Zisou¹, A Shan Yan¹, V M Cao-Lormeau¹, J Broutt²

1. Unit of Emerging Infectious Diseases, Institut Louis Malardé, Tahiti, French Polynesia
2. Centre hospitalier du Taaone, Tahiti, French Polynesia

Citation style for this article:

Musso D, Nhan T, Robin E, Roche C, Bierlaire D, Zisou K, Shan Yan A, Cao-Lormeau VM, Broutt J. Potential for Zika virus transmission through blood transfusion demonstrated during an outbreak in French Polynesia, November 2013 to February 2014. Euro Surveill. 2014;19(14):pii=20761. Available online: <http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=20761>

Likelihood of severe disease

- Pregnant women are NOT more likely to develop symptomatic infection or severe disease
- Infants and children are NOT more likely to develop symptomatic infection or severe disease (from mosquito exposure)
- Individuals with HIV have not been shown to be more likely to develop severe disease (active AIDS may be different)
- Women infected during pregnancy have a higher risk for problems with the developing fetus

More New Developments

- Sexual transmission male to male and female to male, assumed female to female
- RNA (not necessarily live virus) shown in semen up to 6 months after infection
- Birth Defects: microcephaly; intracranial calcifications; ventriculomegaly; arthrogryposis; abnormalities of the corpus callosum, cerebrum or cerebellum; fetal loss; and abnormalities in both vision and hearing in the neonate.
- Significant testing limitations

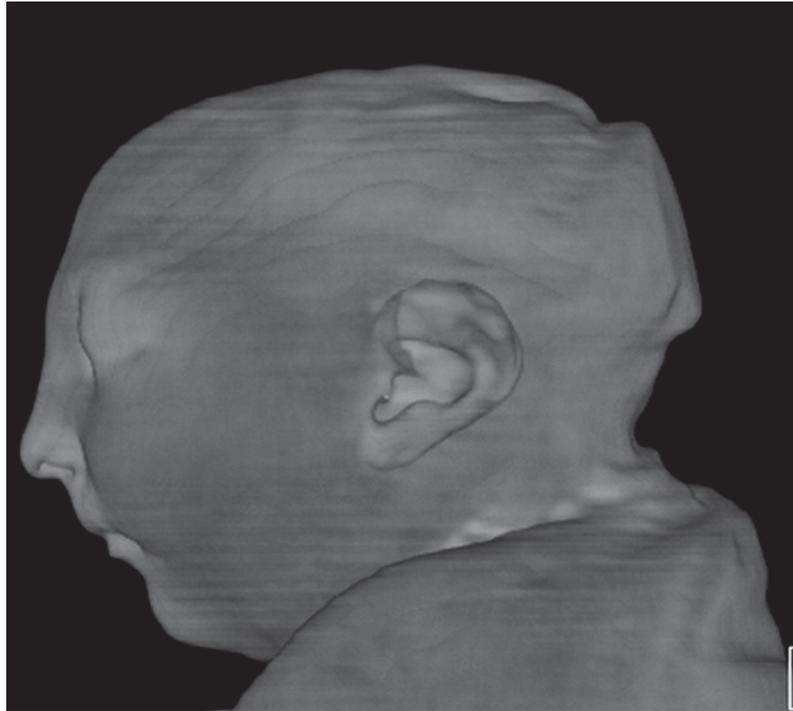


Figure 6g: Images in the case of a 24-year-old woman pregnant with twins, with characteristic rash at 9 weeks of pregnancy and confirmed Zika virus infection. (For each pair of images, the first image is of twin A, and the second image is of twin B.) At 14 weeks of gestational age, the fetal head size of both twins was normal. The head size never went below the 3rd percentile for either fetus in examinations at 19–28 weeks. **(a, b)** Sagittal and **(c, d)** axial fetal MR images were obtained at 36 weeks. **(e, f)** Axial and **(g, h)** surface reconstruction postnatal CT images and **(i, j)** axial T2-weighted and **(k, l)** coronal MR images were obtained 1 week after delivery at 38 weeks of gestational age. There is severe microcephaly with profound frontal lobe hypoplasia. Calcifications in the subcortical white matter at the gray matter–white matter junction are visualized. Both twins have a flattened appearance of the pons. The spinal cord is atrophic (best seen on **a**). Redundant skin is seen in the occipital region. There is polymicrogyria involving the frontal and parietal regions and atrophic cortex and white matter in the occipital regions. Each twin has hypoplasia of the corpus callosum, with prominent fornices. There is abnormal myelination in the occipital region that, in twin A (**i**), has the appearance of a cyst or septation within the ventricle. The cerebellum is somewhat small and nodular. There is lack of rotation of the hippocampi.

Radiology,
<http://pubs.rsna.org/doi/abs/10.1148/radiol.2016161584>

Published in: Patricia Soares de Oliveira-Szejnfeld; Deborah Levine; Adriana Suely de Oliveira Melo; Melania Maria Ramos Amorim; Alba Gean M. Batista; Leila Chimelli; Amilcar Tanuri; Renato Santana Aguiar; Gustavo Malinger; Renato Ximenes; Richard Robertson; Jacob Szejnfeld; Fernanda Tovar-Moll; *Radiology* Ahead of Print

DOI: 10.1148/radiol.2016161584

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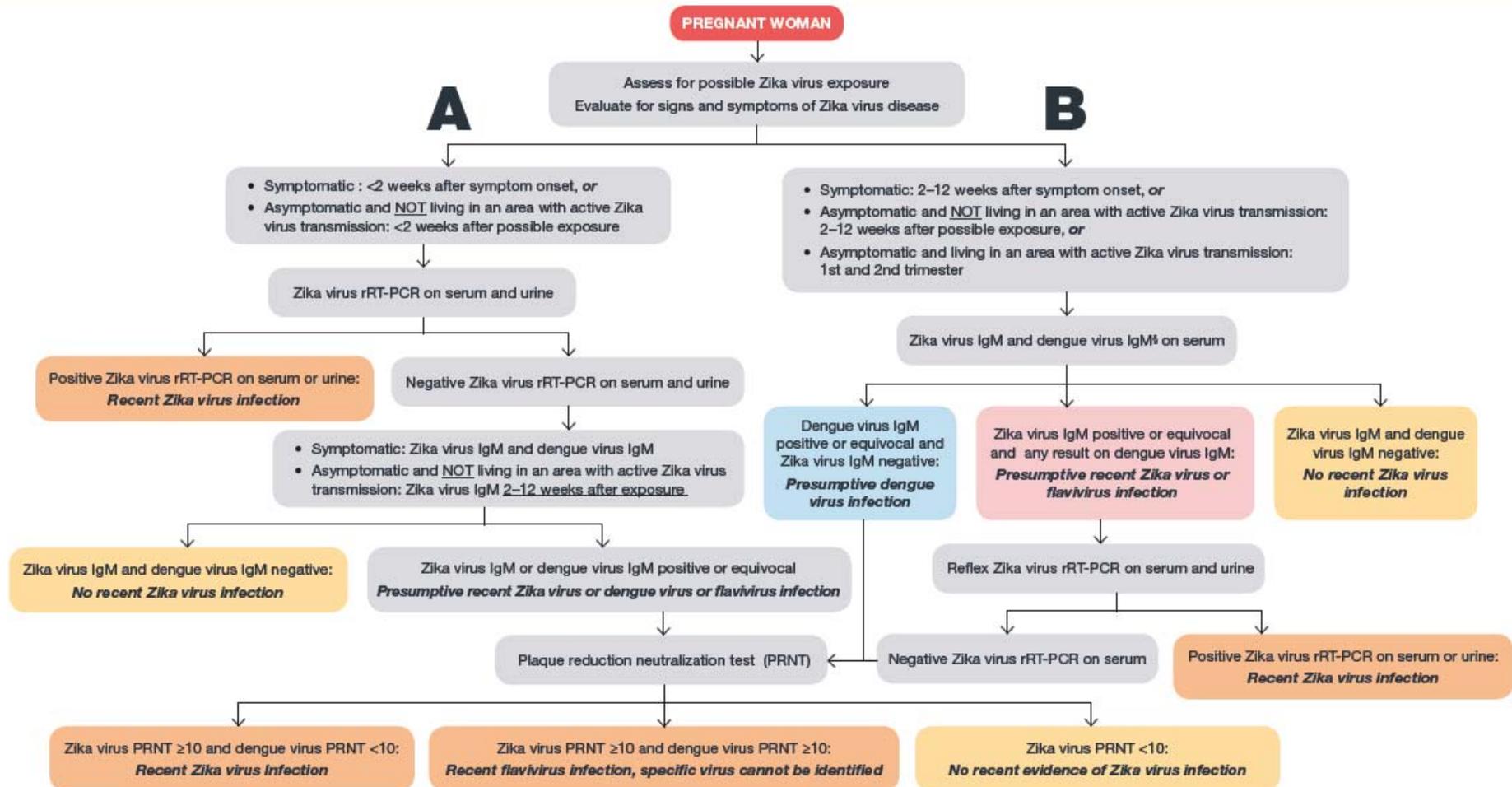
Current Recommendations for Pregnant Women

- **Women that are pregnant should avoid travel to areas with known Zika virus transmission**
- Women that are pregnant that DO travel to an area with known Zika virus transmission should be tested whether or not they reported symptoms

UPDATED INTERIM PREGNANCY GUIDANCE:



Testing and interpretation recommendations^{†, §¶} for a pregnant woman with possible exposure to Zika virus^{**} — United States (including U.S. territories)



Clinical management of a pregnant woman with suspected Zika virus infection

Interpretation of Laboratory Results*	Prenatal Management	Postnatal Management
<u>Recent Zika virus infection</u>	<ul style="list-style-type: none"> Consider serial ultrasounds every 3–4 weeks to assess fetal anatomy and growth[†] Decisions regarding amniocentesis should be individualized for each clinical circumstance[§] 	<p>LIVE BIRTHS:</p> <ul style="list-style-type: none"> Cord blood and infant serum should be tested for Zika virus rRT-PCR, Zika IgM, and dengue virus IgM antibodies. If CSF is obtained for other reasons, it can also be tested. Zika virus rRT-PCR and IHC staining of umbilical cord and placenta is recommended.[‡] <p>FETAL LOSSES:</p> <ul style="list-style-type: none"> Zika virus rRT-PCR and IHC staining of fetal tissues is recommended.[‡]
<u>Recent flavivirus infection; specific virus cannot be identified</u>		
<u>Presumptive recent Zika virus infection**</u>	<ul style="list-style-type: none"> Consider serial ultrasounds every 3–4 weeks to assess fetal anatomy and growth[†] Amniocentesis might be considered; decision should be individualized for each clinical circumstance[§] 	<p>LIVE BIRTHS:</p> <ul style="list-style-type: none"> Cord blood and infant serum should be tested for Zika virus rRT-PCR, Zika IgM, and dengue virus IgM antibodies. If CSF is obtained for other reasons, it can also be tested. Zika virus rRT-PCR and IHC staining of umbilical cord and placenta should be considered.[‡] <p>FETAL LOSSES:</p> <ul style="list-style-type: none"> Zika virus rRT-PCR and IHC staining of fetal tissues should be considered.[‡]
<u>Presumptive recent flavivirus infection**</u>		
<u>Recent dengue virus infection</u>	<ul style="list-style-type: none"> Clinical management in accordance with existing guidelines (http://apps.who.int/iris/bitstream/10665/44188/1/9789241547871_eng.pdf). 	
<u>No evidence of Zika virus or dengue virus infection</u>	<ul style="list-style-type: none"> Prenatal ultrasound to evaluate for fetal abnormalities consistent with congenital Zika virus syndrome.[†] Fetal abnormalities present: repeat Zika virus rRT-PCR and IgM test; base clinical management on corresponding laboratory results. Fetal abnormalities absent: base obstetric care on the ongoing risk of Zika virus exposure to the pregnant woman. 	

Current Recommendations for Pregnant Women and Couples

- Because of the risk of sexual transmission, if a pregnant woman's sex partner traveled to an area with known Zika virus transmission, there are recommendations to prevent transmission between sex partners
- Couples that are planning on attempting conception should talk to their healthcare provider about their plans prior to travel

Guidance on Timing of Pregnancy and Prevention of Sexual Transmission

Updated interim guidance for women of reproductive age and sexually active men	
Symptomatic women diagnosed with Zika virus or experiencing symptoms of possible exposure	8 weeks after symptom onset before trying to get pregnant
Symptomatic men diagnosed with Zika virus or experiencing symptoms of possible exposure	6 months after symptom onset before having unprotected sex
Asymptomatic men and women with possible exposure to Zika virus from recent travel or sexual contact	8 weeks after possible exposure before trying to get pregnant, men should wear a condom during all sexual contact
Asymptomatic men and women who live in an area with active Zika transmission	CDC recommends healthcare providers talk with their patients about pregnancy plans

Some of the Questions Still Being Investigated

- Why has microcephaly been reported more from some places than other?
- When is maternal infection most risky?
- How often does infection of the fetus occur?
- Are there co-factors that precipitate the birth defects/fetal losses?
- How often is Zika virus found in semen or vaginal fluids?
 - How long can it be found there?
 - How common is sexual transmission?

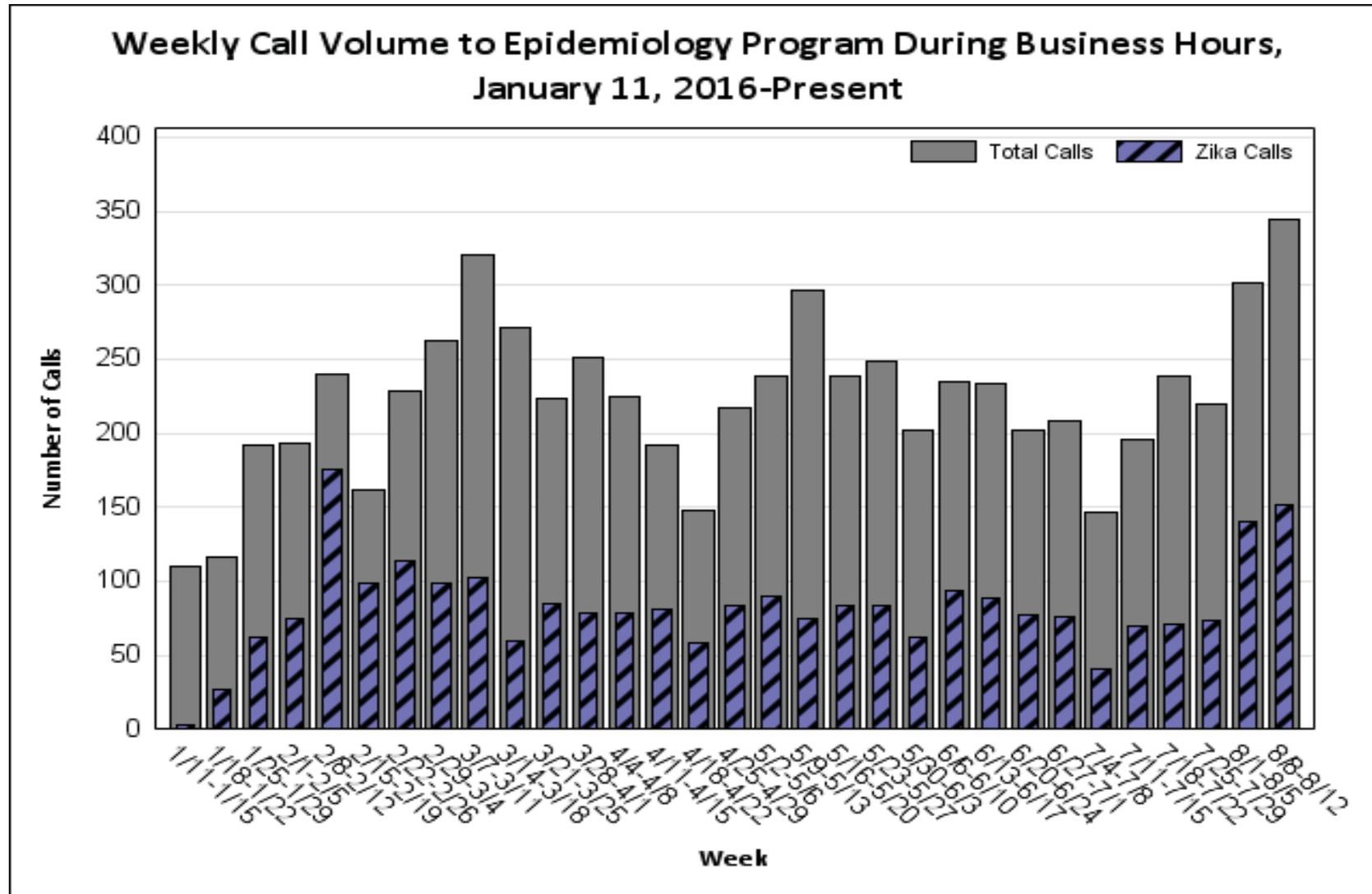


Response to Zika virus in Massachusetts

DPH Coordination with Providers

- Working with Providers and Hospitals
 - to identify pregnant women with possible Zika virus exposure and test them in order to either rule out infection or to provide the information about the evidence of infection to the healthcare provider so they can make monitoring and management decisions with their patient
 - to test samples any time a woman with potential exposure to Zika virus has an unexpected or poor birth outcomes

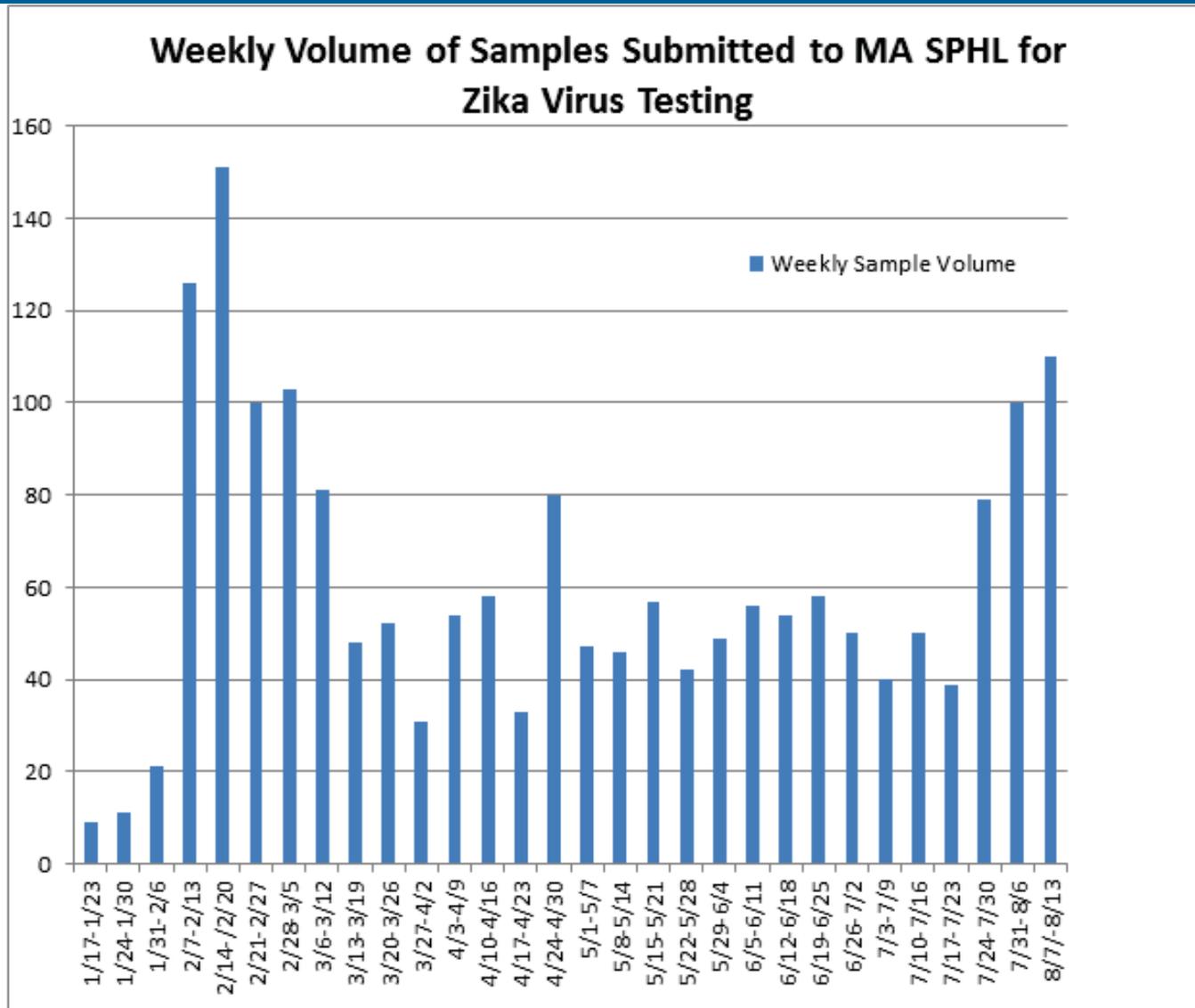
Calls to 24/7 Epidemiology Number



Testing Capacity at MDPH

- MA State Public Health Laboratory rapidly implemented Zika virus testing
- Zika virus testing issues
 - Significant cross-reactivity with other flaviviruses (dengue, WNV, yellow fever)
 - Antibody testing is complex and difficult to interpret, confirmation required at CDC
 - Utilizing testing to protect the most vulnerable population

Samples Submitted to MSPHL



MDPH Birth Defects Surveillance

- Coordinating with Birth Defects surveillance
 - Microcephaly from all causes occurs in ~1.5 births per every 10,000. (Expectation of 10-15 babies born per year in MA).
 - Other causes of microcephaly include genetic abnormalities, infection with certain pathogens such as cytomegalovirus, rubella, toxoplasmosis, and varicella, severe malnutrition, and exposure to alcohol or drugs.
 - Assisting with medical chart review for mothers and infants with evidence of Zika virus exposure

U.S. Zika Pregnancy Registry

- Working with other states and CDC to get data to more accurately assess risk
 - Follow-up of all pregnant women with inconclusive or positive tests for Zika virus
 - Through pregnancy
 - Neonatal assessment
 - Infant assessment
 - 2, 6, and 12 months



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Zika Virus



Information about Zika Virus

What is Zika Virus?

+

Am I At Risk for Zika Virus?

+

Preventing Zika Virus

+

More Information for the Public

+

Information for Healthcare and Public Health Partners

+

CDC Guidance for Healthcare Providers

+

This information is provided by [Epidemiology Program](#) within the [Department of Public Health](#).

Educational Materials

Mass.gov

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Human Services

Department of
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Mass in
Motion

WIC
Nutrition Program

Public Health
Council



Mass Public Health Blog

Promoting public health & wellness in Massachusetts

Zika Virus and Travel: Advice for Women

[Home](#) / [Ask Mass WIC](#) / [Zika Virus and Travel: Advice for Women](#)

Translations available:

- Spanish
- Portuguese
- Haitian-Creole
- French

PUBLIC HEALTH FACT SHEET

Zika Virus

[What is Zika virus?](#)

Fact sheets

Enjoy your vacation

What you need to know:

- Public health is best left to the professionals.
- Public health is best left to the professionals.
- Public health is best left to the professionals.

What you should do:

- Wash your hands often.
- Use hand sanitizer.
- Use insect repellent.
- Use sunscreen.
- Use a first aid kit.
- Use a travel kit.
- Use a travel kit.

What you should avoid:

- Drinking tap water.
- Eating street food.
- Swimming in open water.
- Swimming in open water.

Enjoy Your Vacation

- English [PDF - 1 page]
- Spanish [PDF - 1 page]

Spring Break on your mind?

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College Spring Break

- English [PDF - 1 page]
- Spanish [PDF - 1 page]

Have a happy and healthy Spring Break

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Family Spring Break

- English [PDF - 1 page]
- Spanish [PDF - 1 page]

PREGNANT? Read this before you travel

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Pregnant? Read this before you travel

- English [PDF - 2 pages]
- Spanish [PDF - 2 pages]

Mosquito Bite Prevention for Travelers

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Mosquito Bite Prevention for Travelers

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- Spanish [PDF - 2 pages]
- Portuguese [PDF - 2 pages]
- Danish [PDF - 2 pages]

Zika and Sex: Information for men with pregnant partners living in areas with Zika

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Zika and Sex: Information for men with pregnant partners living in areas with Zika

- English [PDF - 1 page]
- Spanish [PDF - 1 page]

Zika and Sex: Information for pregnant women living in areas with Zika

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Zika and Sex: Information for pregnant women living in areas with Zika

Pregnant and living in an area with Zika?

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Pregnant and living in an area with Zika?

- English [PDF - 1 page]
- Spanish [PDF - 1 page]

For pregnant women in areas with Zika: Protect your pregnancy

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For pregnant women in areas with Zika: Protect your pregnancy

www.cdc.gov/zika

Personal Prevention for Travelers

Take steps to prevent mosquito bites.

- Be aware that these mosquito vectors are active during the day
- Wear long-sleeved shirts and long pants.
- Stay in places with air conditioning and window and door screens to keep mosquitoes outside.
- Use Environmental Protection Agency (EPA)-registered insect repellents. When used as directed, these insect repellents are proven safe and effective even for pregnant and breastfeeding women.
- Remove or stay away from mosquito breeding sites, like containers with standing water.

Mosquito Surveillance

- In Massachusetts, surveillance for invasive mosquito species such as *Aedes aegypti* and *Aedes albopictus* has been performed since 2008
- *Ae. aegypti* does not survive this far north
- Limited *Ae. albopictus* is found but it does not exist in the large or widespread populations that would be necessary for Zika virus spread in Massachusetts

Continuing Mosquito Surveillance

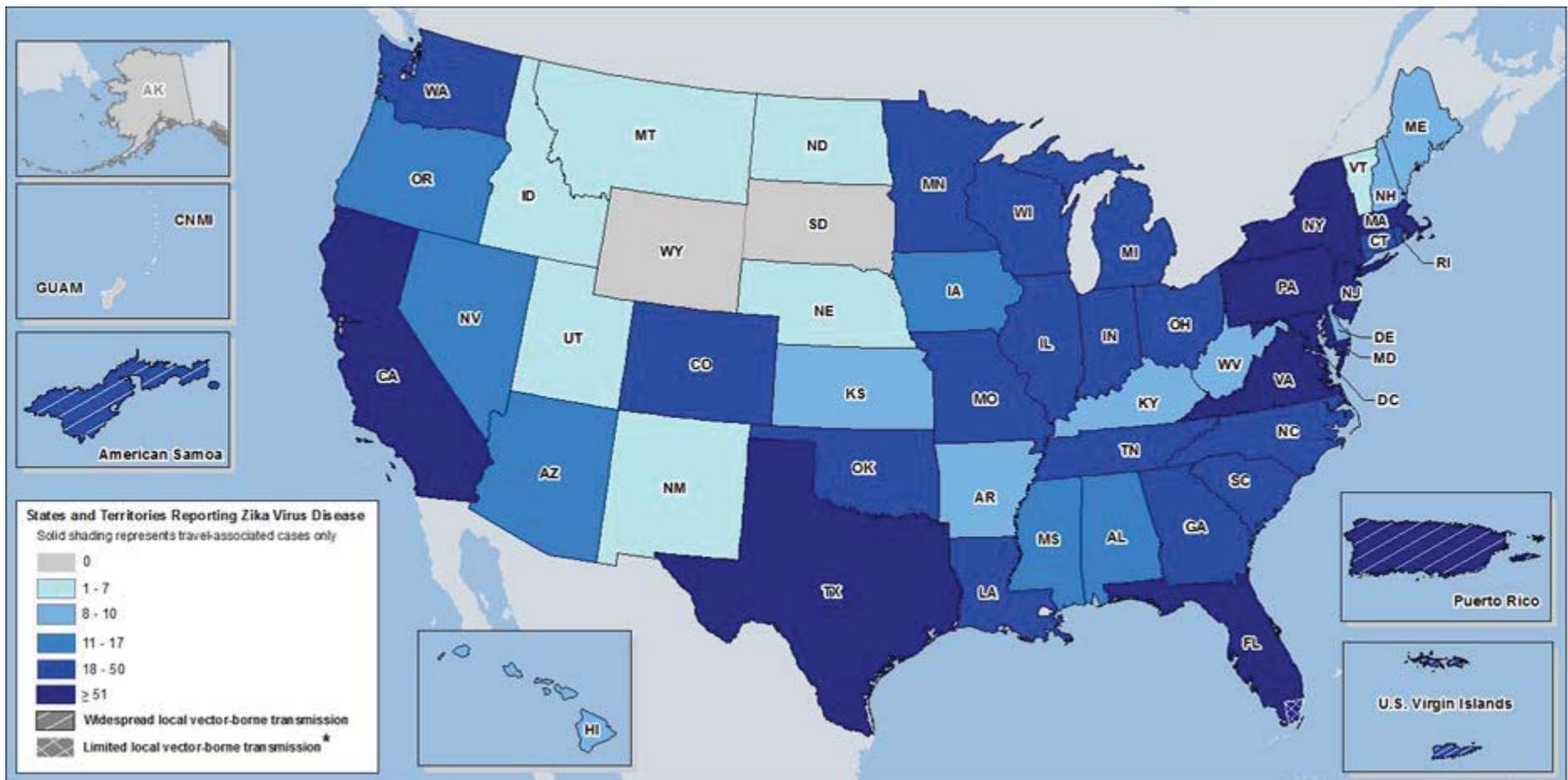
- Coordinating with local Mosquito Control Projects to identify areas that may be at risk for *Aedes albopictus* introduction
 - Surveillance in those areas
- Incorporating public health recommendations for response to identifications of *Aedes albopictus* into DPH's Arbovirus Surveillance and Response Plan
- Communicating with LHDs

Aedes albopictus Surveillance

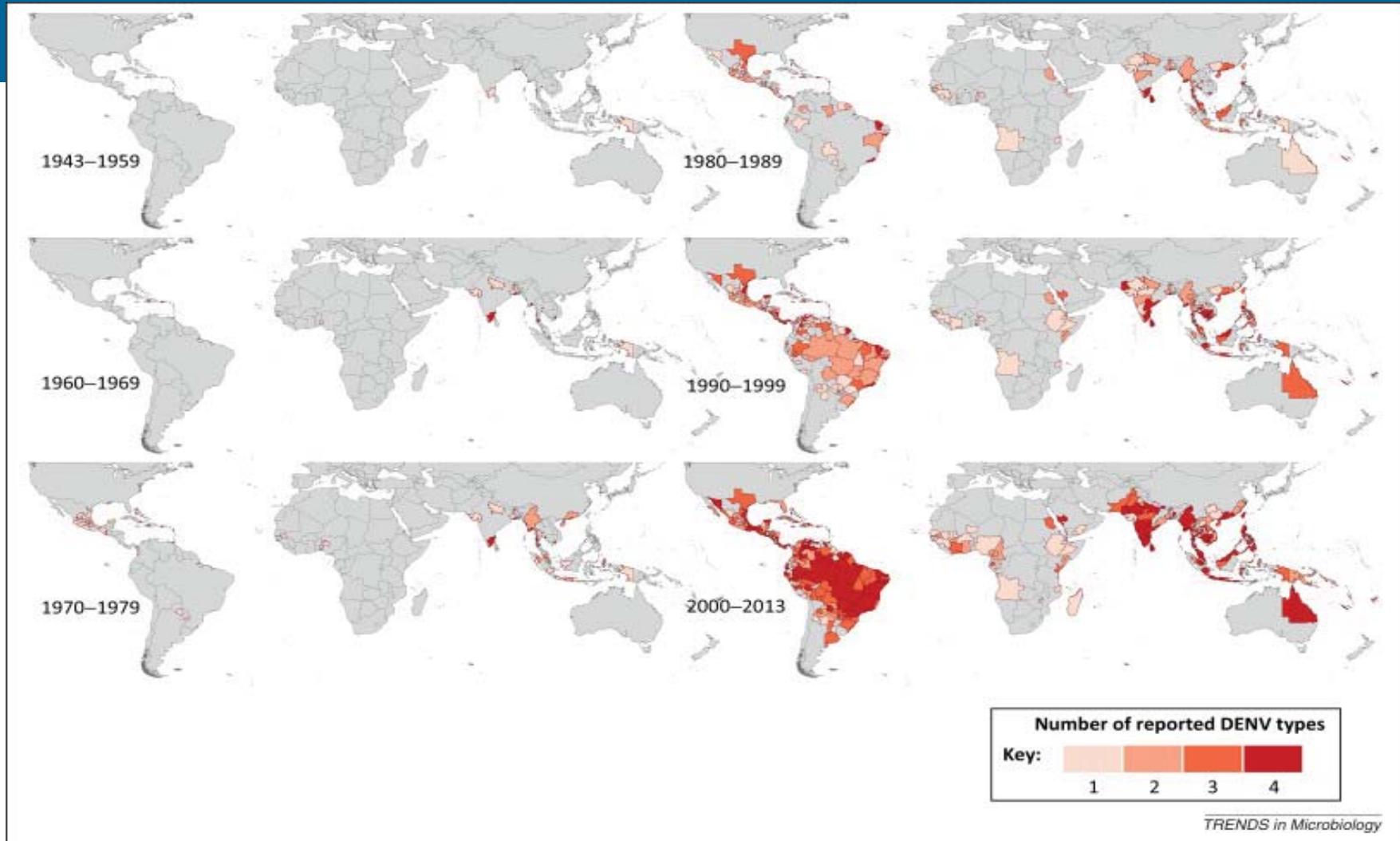


Stadium Cup Ovitrap

Local Transmission and Imported Cases in US and Territories

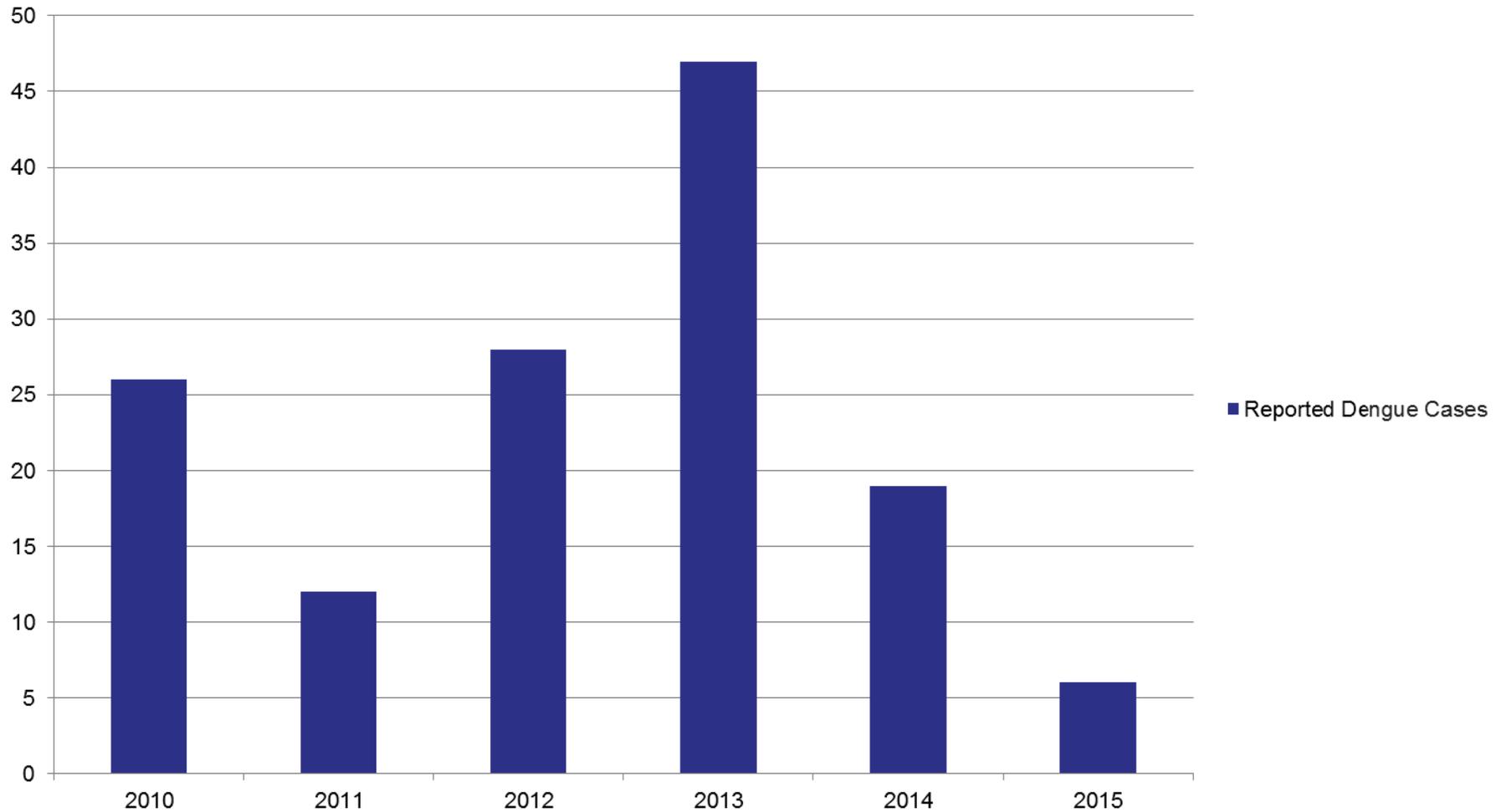


DENV 1-4

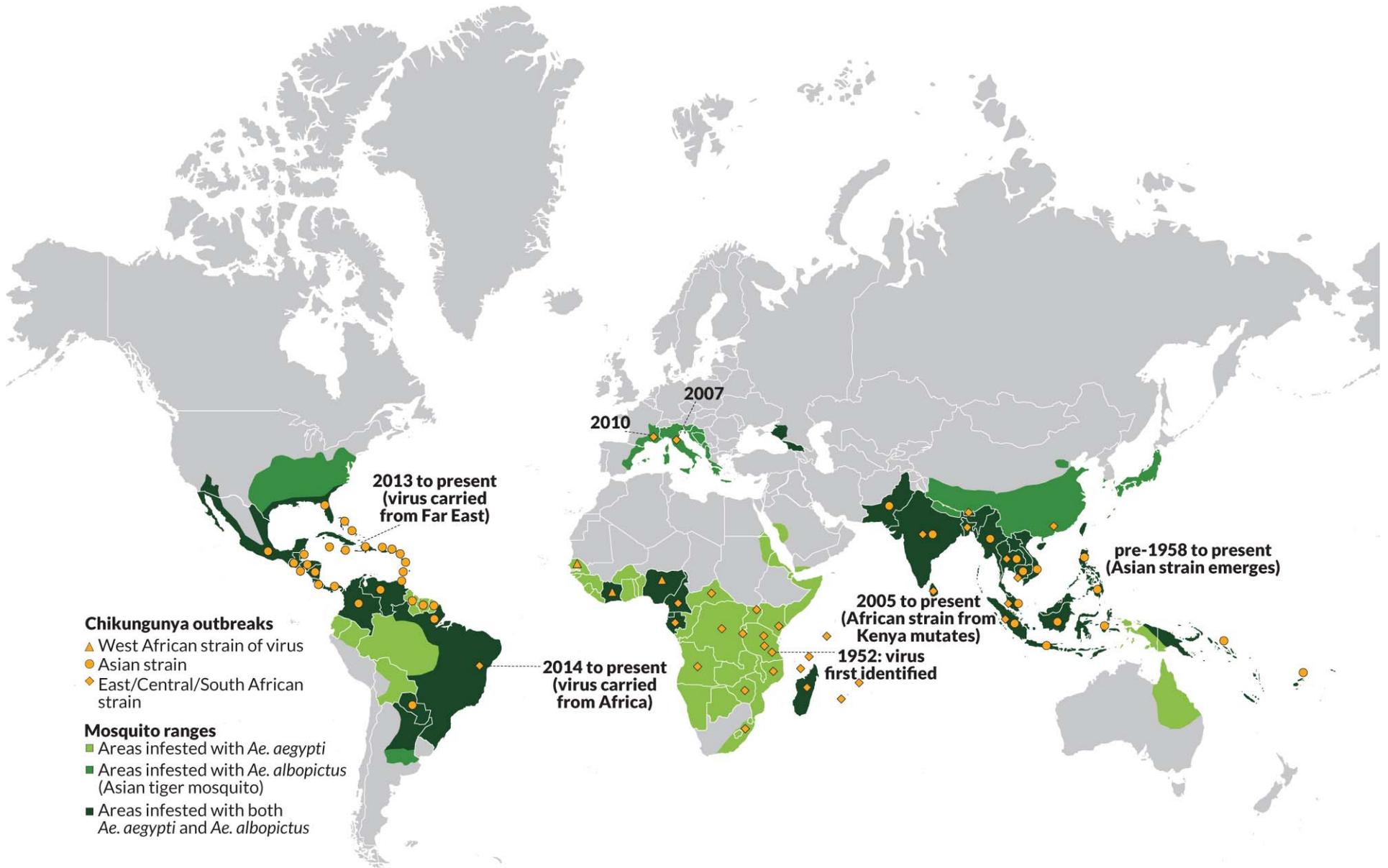


Messina et al. 2014

Reported Confirmed and Probable Imported Dengue Cases in Massachusetts, 2010-2015

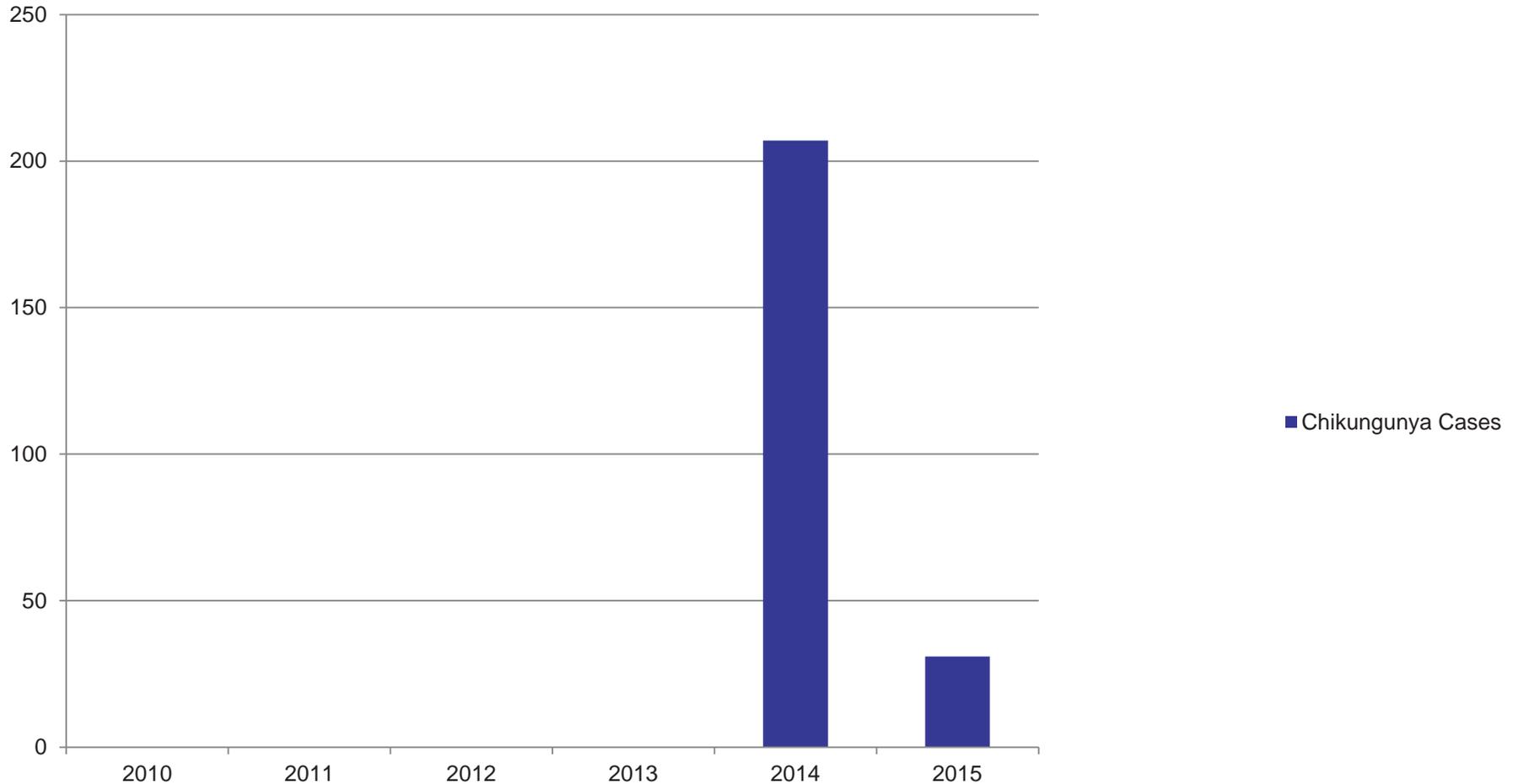


Data accurate as of February 14, 2016 and is subject to change



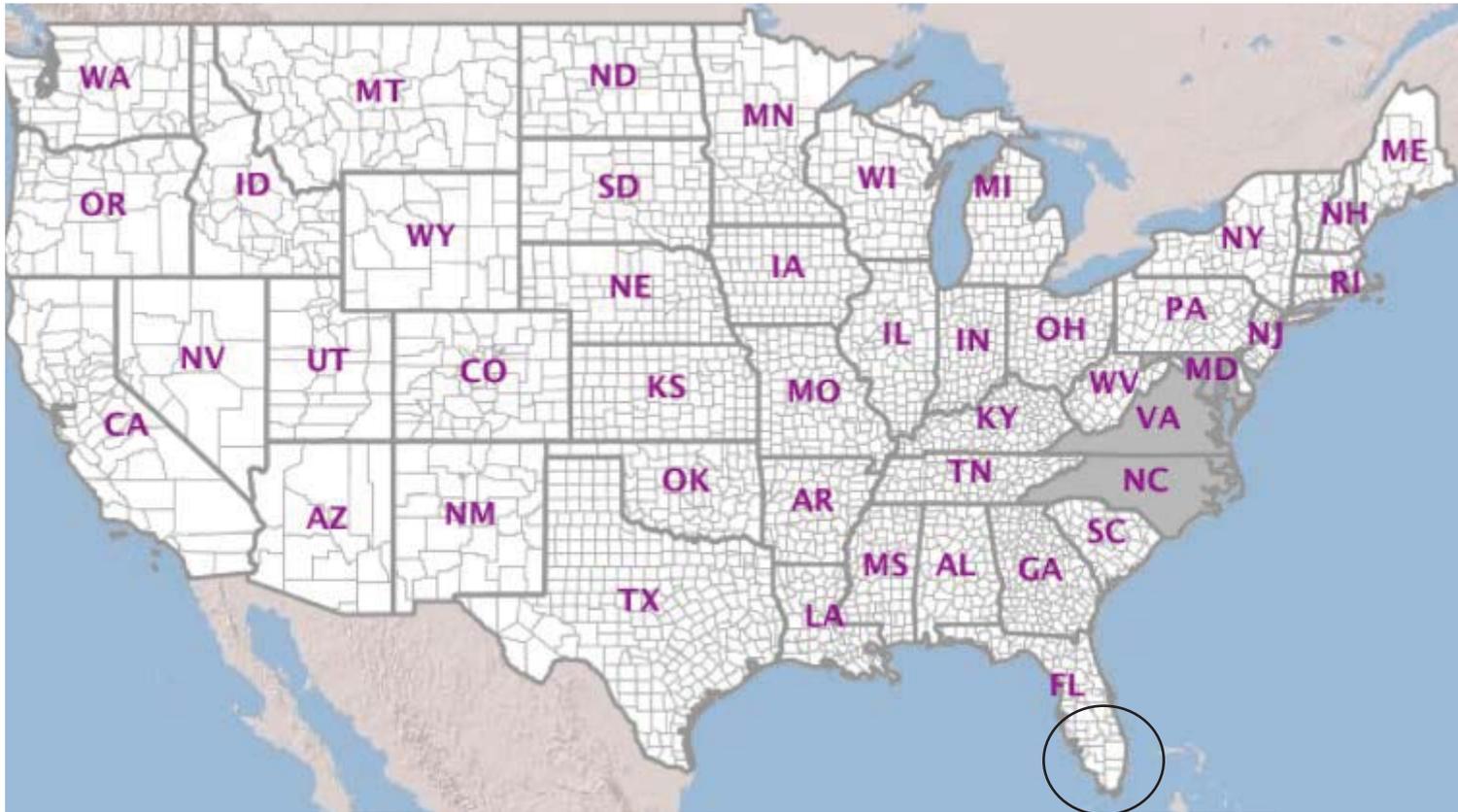
Sources: PAHO; M. Aubry et al/Emerg. Infect. Dis. 2015; A. Powers and C. Logue/J. Gen. Virol. 2007; S. Weaver and M. Lecuit/NEJM 2015; S. Weaver/PLoS Negl. Trop. Dis. 2014

Reported Confirmed and Probable Imported Chikungunya Cases Massachusetts, 2010-2015



Data accurate as of February 14, 2016 and is subject to change
Chikungunya first made reportable in 2014

Chikungunya locally acquired 2014



In 2014, 12 cases of locally acquired CHIKV infections were reported in Florida⁵⁰



www.mass.gov/dph/zika