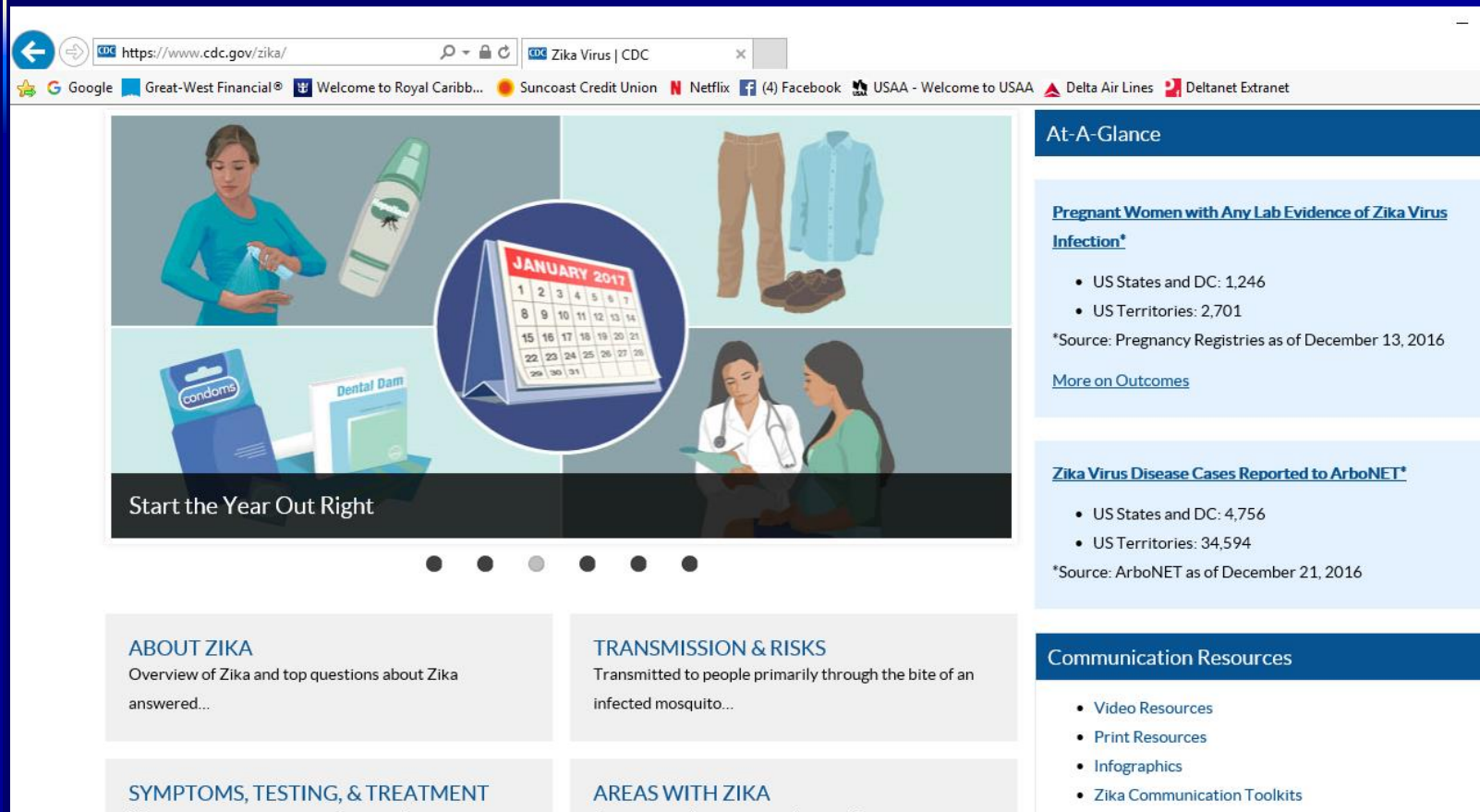


Zika Virus
and *Aedes aegypti* &
***Aedes albopictus*;**
History and Current
Situation in the U.S.

Tom R. Wilmot

OVCA: March 27, 2017

Disclaimer: Opinions expressed here are my own and do not represent official policy of US CDC



The screenshot shows the CDC Zika Virus website. The browser address bar displays <https://www.cdc.gov/zika/>. The page features a large banner with illustrations of a woman using mosquito repellent, a calendar for January 2017, a doctor consulting with a pregnant woman, and boxes of condoms and dental dams. The text "Start the Year Out Right" is visible. On the right, the "At-A-Glance" section provides statistics for pregnant women with lab evidence of Zika virus infection as of December 13, 2016. Below this, the "Zika Virus Disease Cases Reported to ArboNET*" section shows statistics as of December 21, 2016. The bottom of the page includes sections for "ABOUT ZIKA", "TRANSMISSION & RISKS", "SYMPTOMS, TESTING, & TREATMENT", and "AREAS WITH ZIKA".

At-A-Glance

[Pregnant Women with Any Lab Evidence of Zika Virus Infection*](#)

- US States and DC: 1,246
- US Territories: 2,701

*Source: Pregnancy Registries as of December 13, 2016

[More on Outcomes](#)

[Zika Virus Disease Cases Reported to ArboNET*](#)

- US States and DC: 4,756
- US Territories: 34,594

*Source: ArboNET as of December 21, 2016

Communication Resources

- Video Resources
- Print Resources
- Infographics
- Zika Communication Toolkits

ABOUT ZIKA
Overview of Zika and top questions about Zika answered...

TRANSMISSION & RISKS
Transmitted to people primarily through the bite of an infected mosquito...

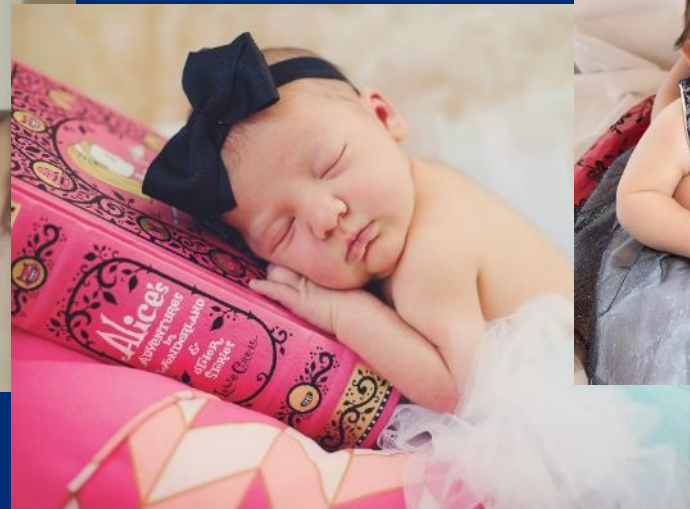
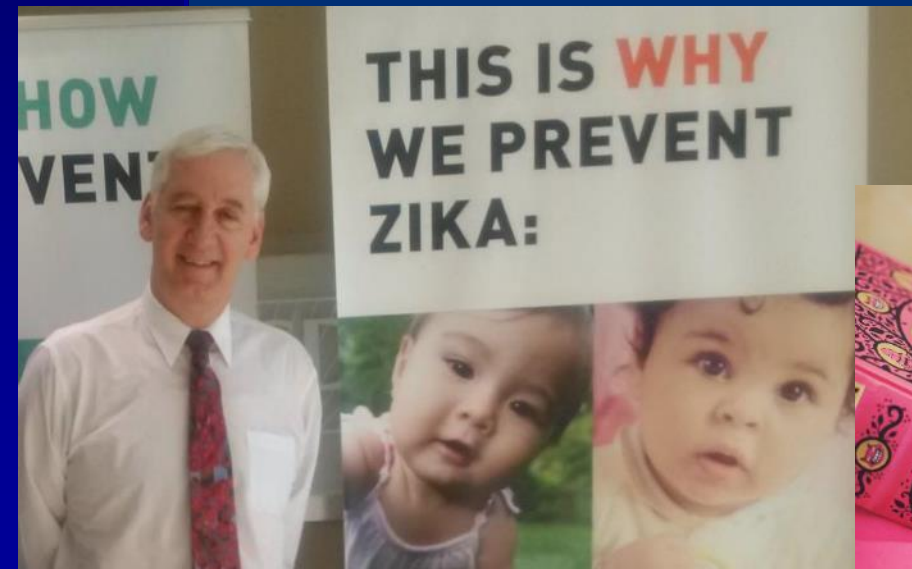
SYMPTOMS, TESTING, & TREATMENT

AREAS WITH ZIKA

<https://www.cdc.gov/zika/>

Zika: The “First” Virus

- First virus since CMV associated with birth defects
- First arbovirus associated with birth defects



Zika: The “First” Virus

- **First arbovirus with documented sexual transmission**



Zika: The “First” Virus

- First vectorborne disease response to feature condom distribution



Zika Virus/Vectors

- Flavivirus
- Transmitted to man by *Aedes (Stegomyia)*
- *most likely not by Culex*



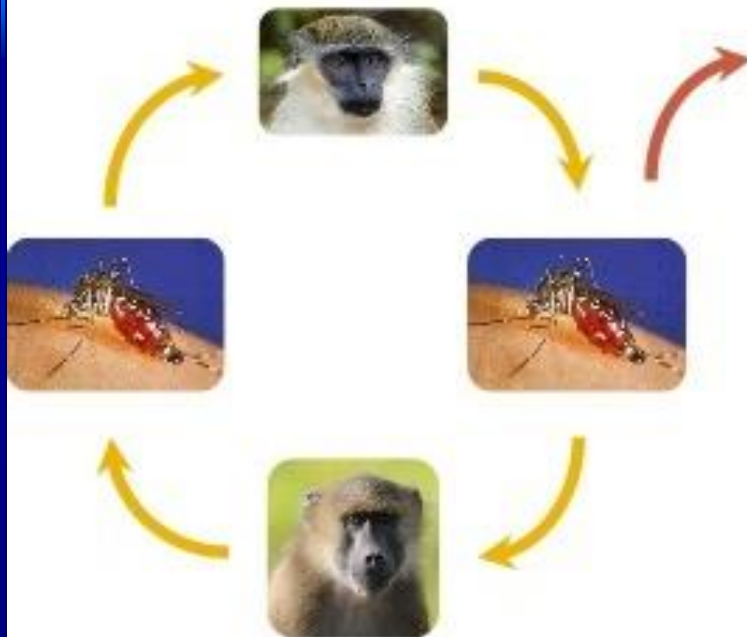
Zika Virus/Vectors

- **Vertical transmission probably not significant**



Zika Transmission cycle

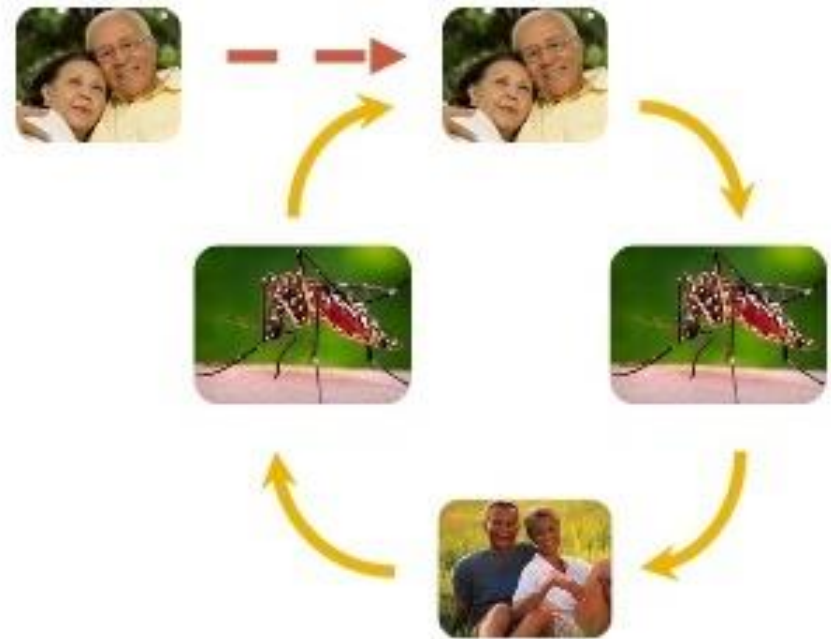
Zoonosis



Sylvatic (jungle) cycle

Aedes (Stegomyia)
Aedes (Diceromyia)

Anthroponosis



Epidemic (urban) cycle

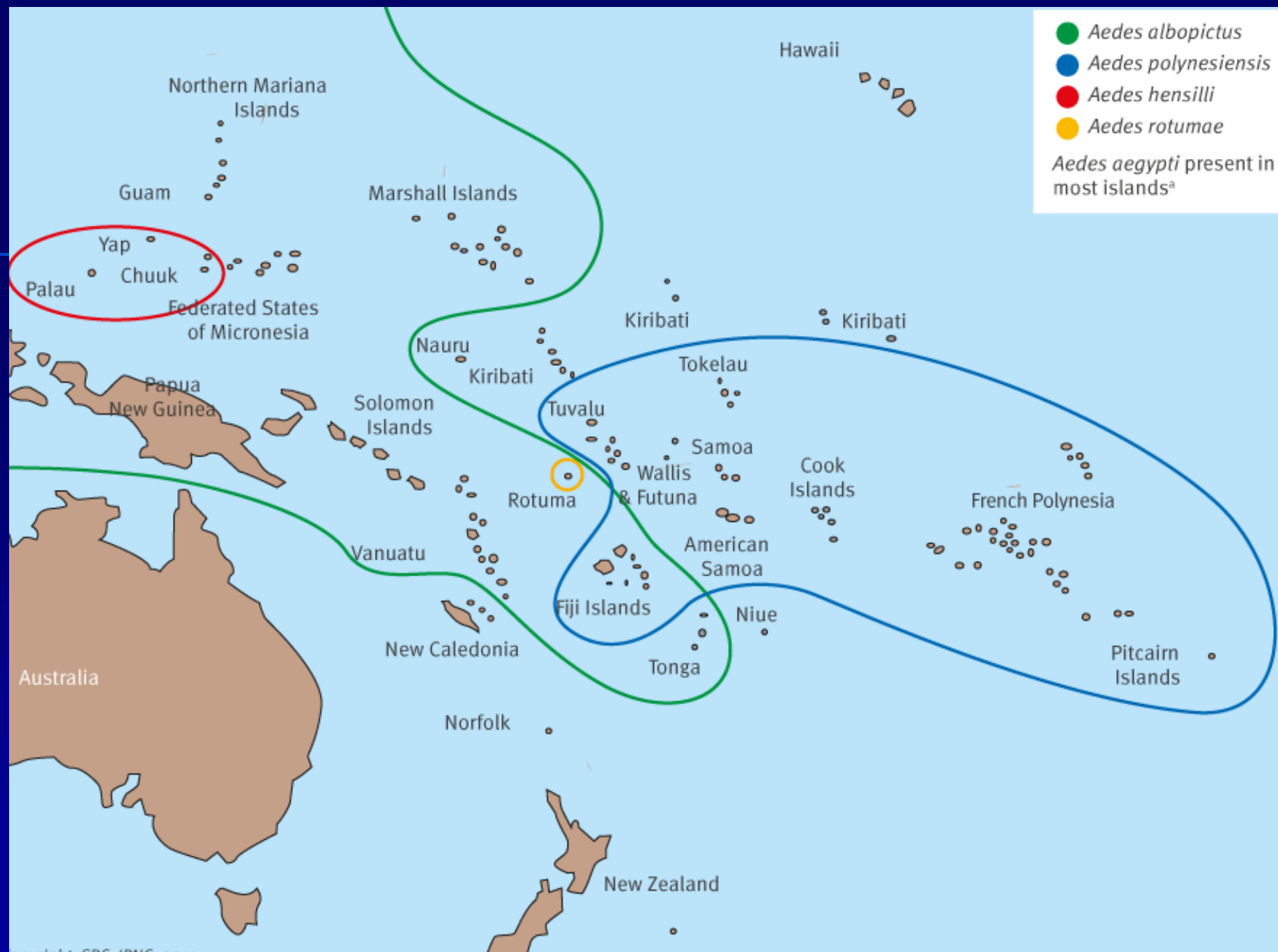
Aedes (Stegomyia)

Zika Vectors

- “Cockroach of the Culicidae”
 - Closely associated with man
 - exploits cryptic larval habitat
 - Peak feeding during daytime
 - interrupted feeding
 - multiple feeding in blood meal
 - low FIR can still transmit



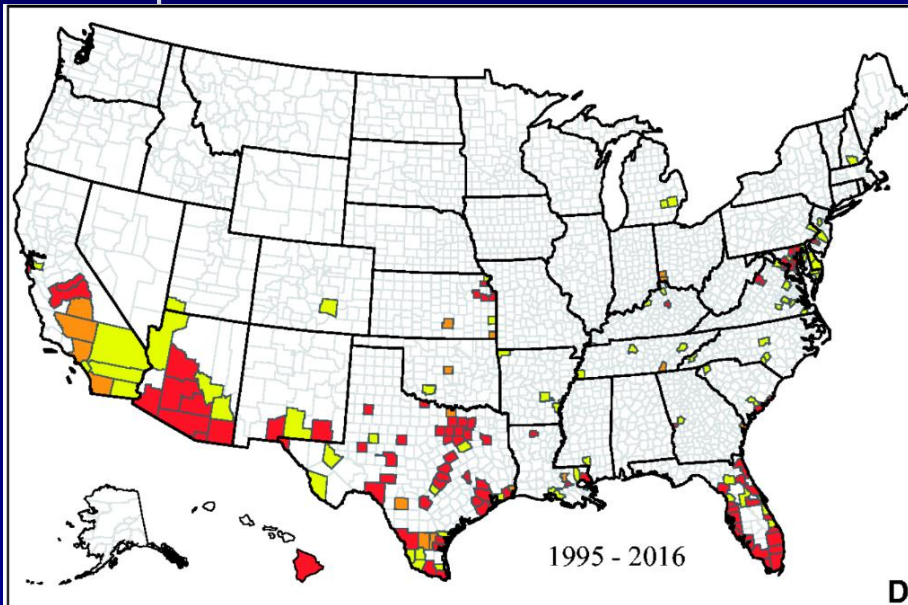
Photo by Carolyn McBride



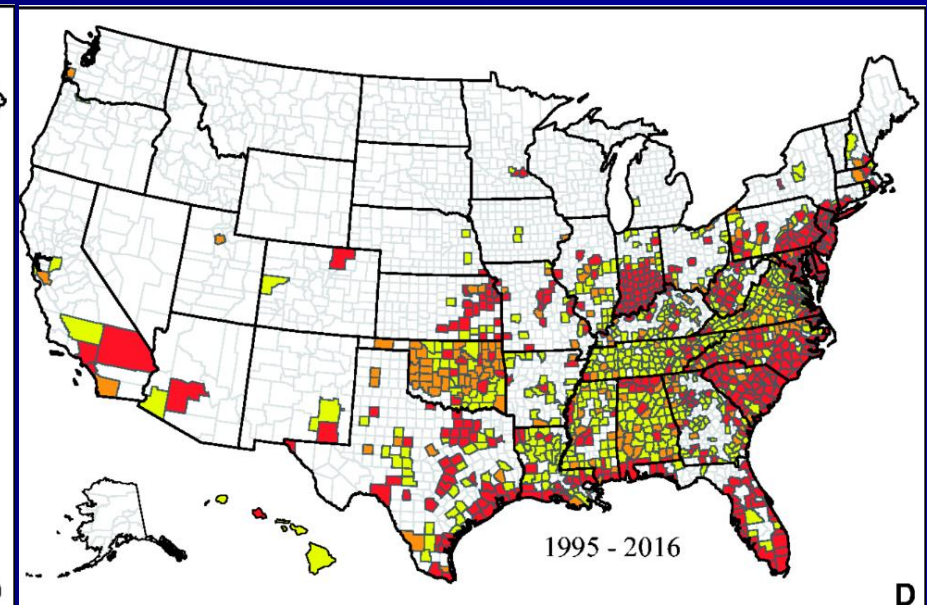
Reported Distribution of *Aedes* (*Stegomyia*) *aegypti* and *Aedes* (*Stegomyia*) *albopictus* in the United States, 1995-2016 (Diptera: Culicidae)

Hahn, et al.

J Med Entomol. 2016;53(5):1169-1175.

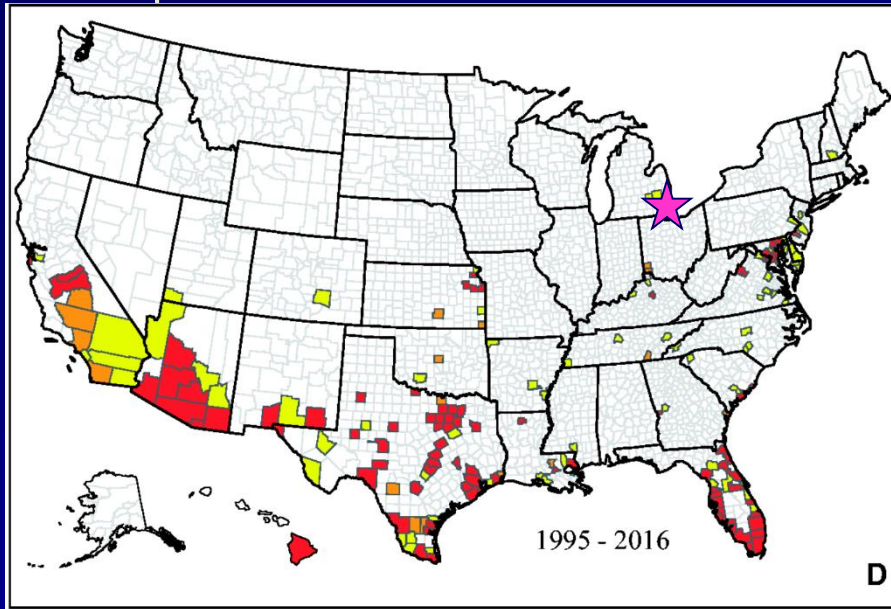


Aedes aegypti

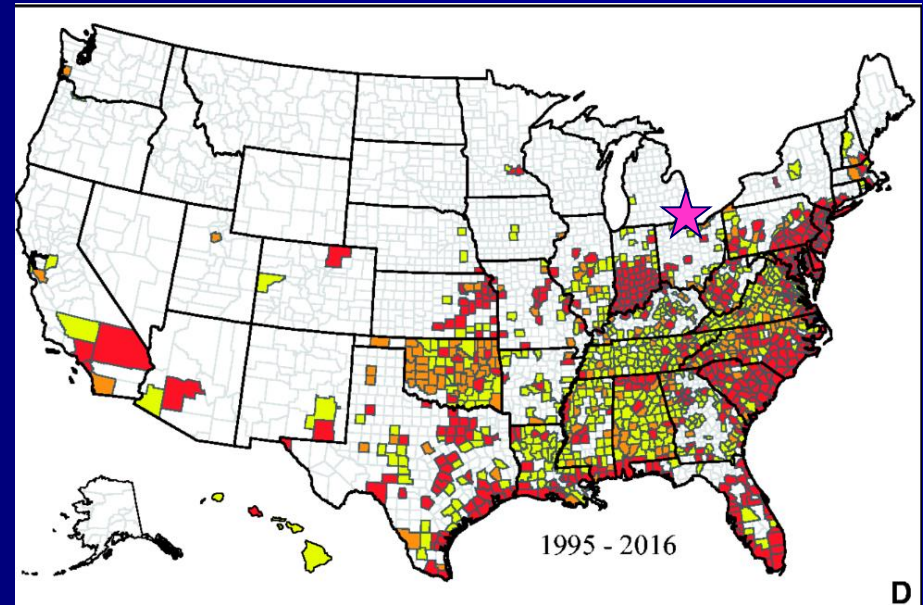


Aedes albopictus

★ Reported Occurrence in Windsor, 2016



Aedes aegypti



Aedes albopictus

Aedes surveillance



Aedes surveillance

House Index
Container Index
Breteau Index

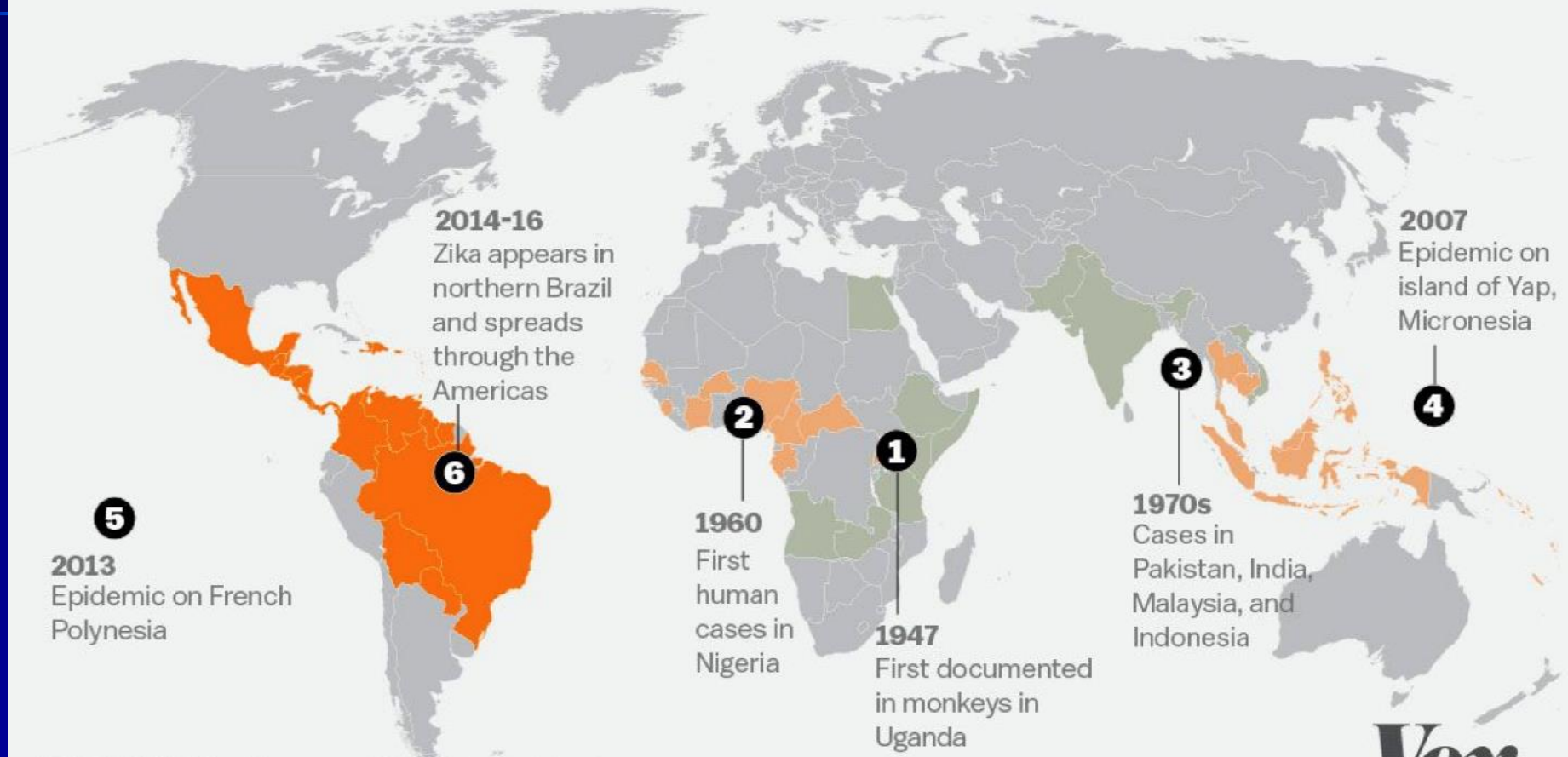


Zika Virus/Disease



How the Zika virus spread

Active transmission Known previous transmission Antibodies also detected

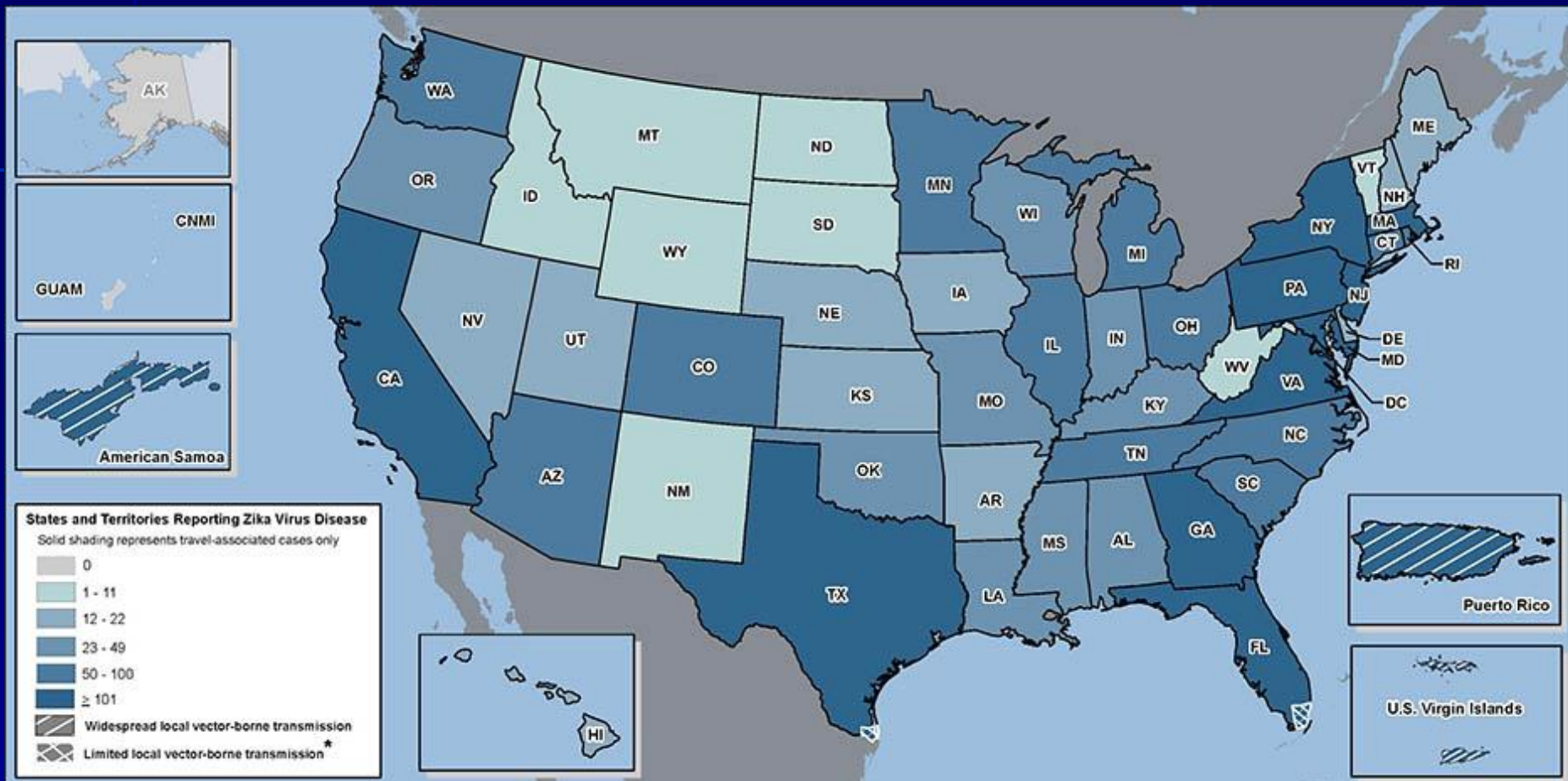


SOURCE: WHO and Lancaster University , Feb.1

Vox



<https://www.cdc.gov/zika/geo/active-countries.html>



<https://www.cdc.gov/zika/intheus/maps-zika-us.html#zika-cases-us>

Laboratory-confirmed Zika virus disease cases reported to ArboNET by states or territories — United States, 2015–2017 (as of March 08, 2017)

	States (N = 5,109)	Territories (N = 38,099)
Travel-Associated	4813 (94%)	147 (<1%)
Locally-acquired mosquito	221 (4%)	37,952 (99%)
Locally-acquired other	75 (1%)	0

<http://www.cdc.gov/zika/geo/united-states.html>

State of residence for reported Zika virus disease cases — U.S. states, 2015–2017 (as of March 08, 2017)

State	Travel Associated (N = 4,813)	Locally Acquired (N = 221)
New York	1007 (21%)	0
Florida	880 (18%)	215 (97%)
California	431 (9%)	0
Texas	311 (6%)	6 (3%)
New Jersey	180 (4%)	0
Pennsylvania	175 (4%)	0
Maryland	133 (3%)	0

<http://www.cdc.gov/zika/geo/united-states.html>

Zika virus disease cases — Canada (as of March 09, 2017)

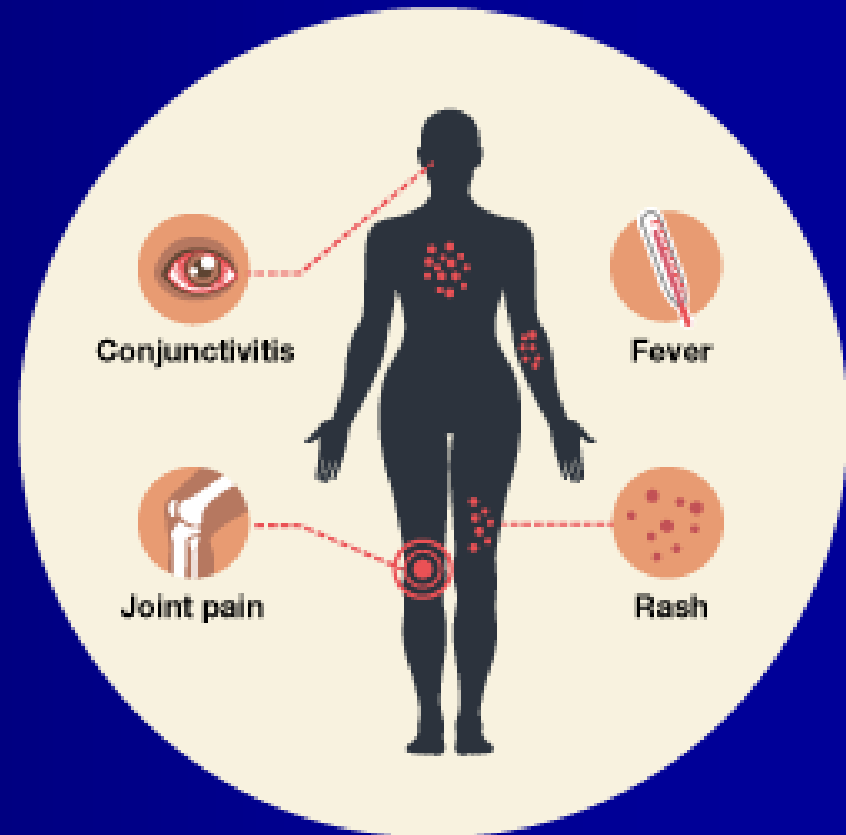
Travel-Associated	478 (99%)
Sexual Transmission	3 (<1%)

<https://www.canada.ca/en/public-health/services/diseases/zika-virus/surveillance-zika-virus.html#s1>

Zika Disease - Symptoms

Many people infected with Zika virus won't have symptoms or will only have mild symptoms. The most common symptoms of Zika are:

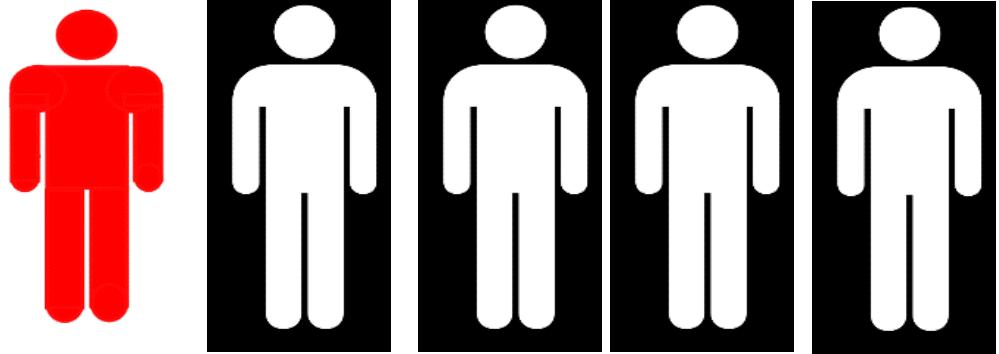
- Fever
- Rash
- Joint pain
- Conjunctivitis (red eyes)



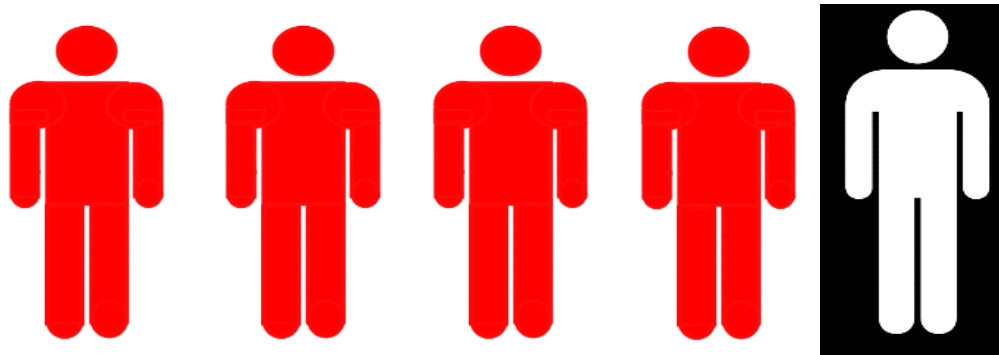
<https://www.cdc.gov/zika/symptoms/symptoms.html>

Zika Disease – Silent Epidemic

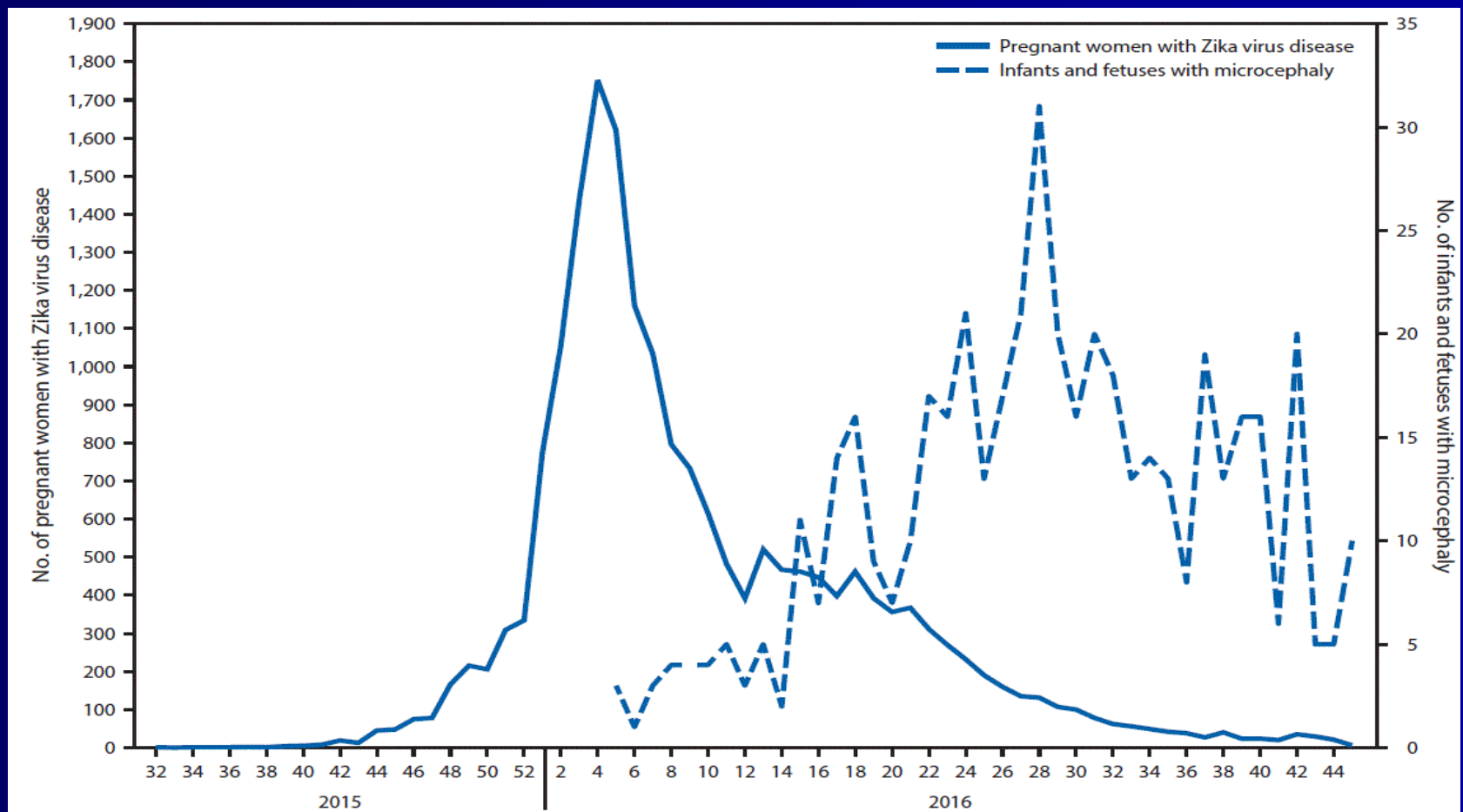
Zika
1 of 5



Chikungunya
4 of 5



Zika Disease – Relationship to Microcephaly



Cuevas et al. MMWR 2016

March 28, 2016

Zika Virus and Microcephaly in French Polynesia

Mary E. Wilson, MD reviewing Cauchemez S et al. *Lancet* 2016 Mar 15. Rodrigues LC. *Lancet* 2016 Mar 15.

The estimated risk for microcephaly in the fetus was approximately 1% for women infected in the first trimester of pregnancy.

Zika virus (ZIKV) caused a large outbreak in 2013–14 in French Polynesia, where it was estimated to

~ 5/10,000 pre-outbreak ---> 95/10,000 (~ 1%)

The mathematical models with satisfactory fit all included ZIKV infection in the first trimester of pregnancy as a period of risk for microcephaly. The model with the best fit overall included only the first trimester.

Zika Disease

[CDC](#) > [Zika Virus Home](#) > [Health Effects & Risks](#)

Microcephaly & Other Birth Defects

~1% - 10%



Language: English ▼

Zika and microcephaly

[Microcephaly](#) is a birth defect where a baby's head is smaller than expected when compared to babies of the same sex and age. Babies with microcephaly often have smaller brains that might not have developed properly.

Zika virus infection during pregnancy is a cause of [microcephaly](#). During pregnancy, a baby's head grows because the baby's brain grows. Microcephaly can occur because a baby's brain has not developed properly during pregnancy or has stopped growing after birth.

Congenital Zika Syndrome

Congenital Zika syndrome is a pattern of birth defects found among fetuses and babies infected with Zika virus during pregnancy. Congenital Zika syndrome is described by the following five features:

- Severe microcephaly where the skull has partially collapsed
- Decreased brain tissue with a specific pattern of brain damage
- Damage to the back of the eye
- Joints with limited range of motion, such as clubfoot
- Too much muscle tone restricting body movement soon after birth

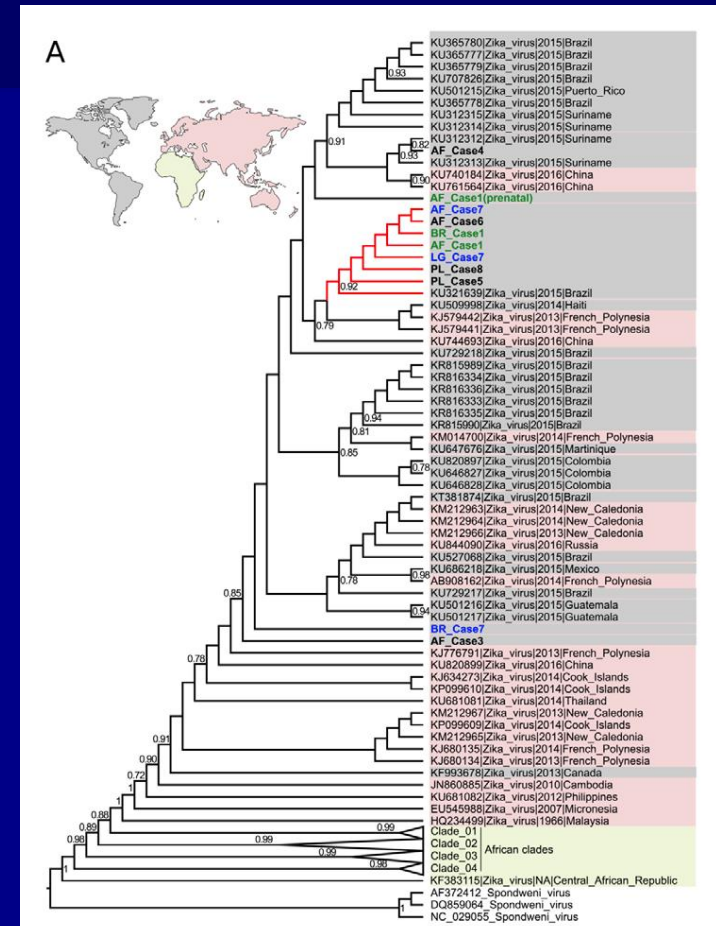


https://www.cdc.gov/zika/healtheffects/birth_defects.html

Genotypic analysis of Zika virus

2 distinct genotypes
(African and
Asian/American)

- No significant genetic changes between Asian and American outbreaks



Emergence of Microcephaly

- Simply not recognized?
- Still to be identified genetic basis?
- Females in endemic regions immune before child-bearing age?

Sexual Transmission and Microcephaly?

- Higher virus load in semen than in serum
- May be higher risk of microcephaly from sexual transmission than from mosquito bite?

Evolving Epidemiology in US

- Zika in Central America/Caribbean
- Tourism down
- Ticket prices down
- Immigrants return home for a visit

VFR

- Visiting Family & Relatives
- Relatively low situational awareness
- Preponderance of cases shifts from random / middle America to migrant communities
- New York PSA
 - “We love you, but don’t come for a visit.”

What to do about Zika?



Centers for Disease Control and Prevention
CDC 24/7: Saving Lives, Protecting People™

SEARCH



CDC A-Z INDEX ▾

Zika Virus

Zika Virus Home

About Zika +

Prevention +

Transmission +

Symptoms, Testing, & Treatment +

Areas with Zika +

Mosquito Control +

Health Effects & Risks +

Pregnancy +

Information for Specific Groups -

State & Local Health Departments -

[CDC](#) > [Zika Virus Home](#) > [Information for Specific Groups](#) > [State & Local Health Departments](#)

CDC Zika Interim Response Plan

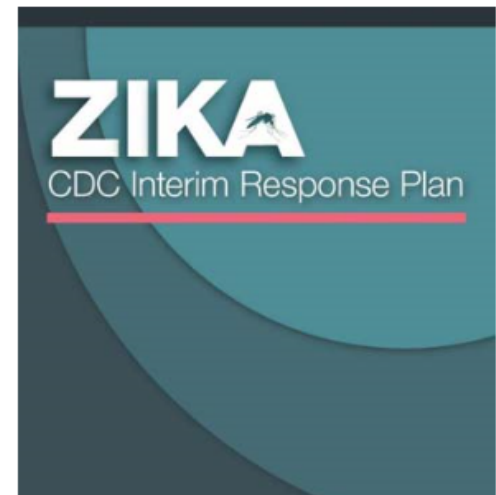


Language: English ▾

Summary

The purpose of this document is to describe the Centers for Disease Control and Prevention (CDC) response plan for locally acquired cases of Zika virus infection in the continental United States and Hawaii. Zika virus is spread to people primarily through the bite of an infected *Aedes aegypti* or *Aedes albopictus* mosquito. The response activities outlined in this plan are based on currently available knowledge about Zika virus and its transmission, and these activities may change as more is learned about Zika virus infection. Most of the plan focuses on response activities that would occur after locally acquired Zika virus transmission has been identified. CDC also is committed to responding to travel- associated and sexually transmitted Zika virus infections reported in the United States (US) before detection of locally transmitted cases of Zika virus infection.

Latest Changes



<https://www.cdc.gov/zika/public-health-partners/cdc-zika-interim-response-plan.html>

Have a Plan



POLICY #2015-03 MOSQUITO-BORNE DISEASE RESPONSE PLAN

A number of mosquito-borne disease agents have been, are, or may become active in Florida. Evaluation of the potential for mosquito-borne disease transmission to humans and proper response to that risk is dependent upon a large number of factors including (but not limited to): detection of disease agents (locally to internationally), the abundance of suspected mosquito vectors, time of year, and weather. The presence of mosquito-borne pathogens in the state is likely to increase public interest in mosquito control efforts.

CMCD will provide the following responses, based on the potential for human infection in this area, in accordance with provisions of Chapter 388, Florida Statutes.

Response Level 1:

No Significant Vector or Disease Activity:

- Expected during the dryer, cooler winter months

Vector Control and Surveillance

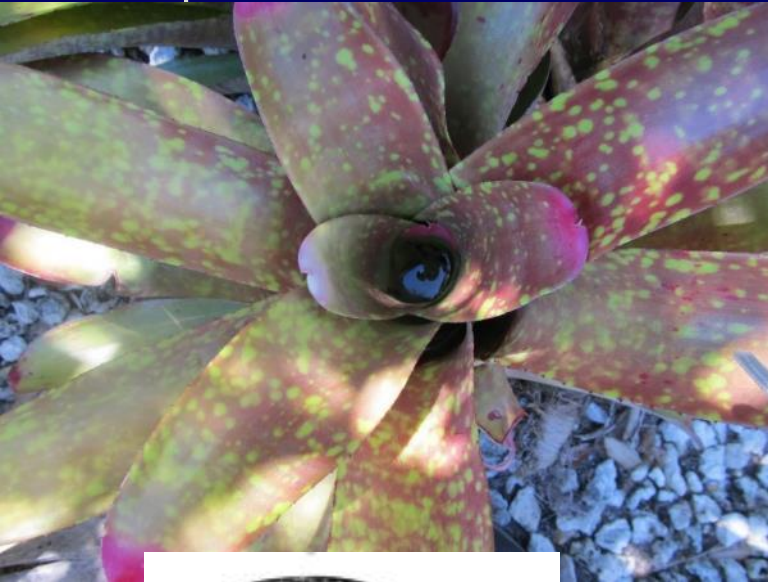
- Maintain basic surveillance activities as appropriate for season and/or conditions
- Engage in control efforts as appropriate
- Maintain source reduction projects
- Review and update response plans as conditions dictate

Public Education/Media

- Review and update community outreach and public education programs as necessary

Interagency Coordination

Preparing for Zika



Work with your local Health Department


- Epidemiological investigation
- Emergency Response
- Address HIPPA issues

Resistance testing is key

Alpha-cypermethrin



What to do about Zika? - Travel



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Travel Advice and Advisories


Our Travel Advice and Advisories pages provide Canadians travelling and living abroad with official Government information that may affect their safety and well-being. Select your destination from the list below to view regularly updated requirements, health conditions, local laws and culture, natural disasters and climate, and how to find help while abroad.

No matter where in the world you intend to travel, make sure you check your destination country's travel advice before you leave. If the region or the country you will be visiting become affected by a health emergency, your trip cancellation insurance may be affected.

You are solely responsible for your travel decisions.

▾

ADVICE TO TRAVELLERS TO ZIKA-AFFECTED COUNTRIES



PROTECT YOURSELF AGAINST ZIKA VIRUS BY PREVENTING MOSQUITO BITES

PREGNANT WOMEN & THOSE PLANNING A PREGNANCY

- Avoid travel to areas of ongoing Zika virus outbreaks.
- If travel cannot be avoided or postponed, strict mosquito bite prevention measures should be followed.

MOSQUITOES BITE IN DAYLIGHT AND EVENING HOURS

Prevent mosquito bites:

- Use insect repellent
- Cover up: wear light-coloured long-sleeved shirts and long pants
- Use bed nets: they can also cover playpens, cribs or strollers
- Stay in rooms with air conditioning
- Keep windows/door screens in good repair

MONITOR YOUR HEALTH AND WATCH FOR THESE SYMPTOMS:

- low-grade fever
- rash
- red eyes
- muscle or joint pain
- lack of energy
- headaches

Brazil - Exercise a high degree of caution

There is no nationwide advisory in effect for Brazil. However, you should exercise a high degree of caution due to high crime rates and regular incidents of gang-related and other violence in urban areas.

Travel Health Notice - Zika virus

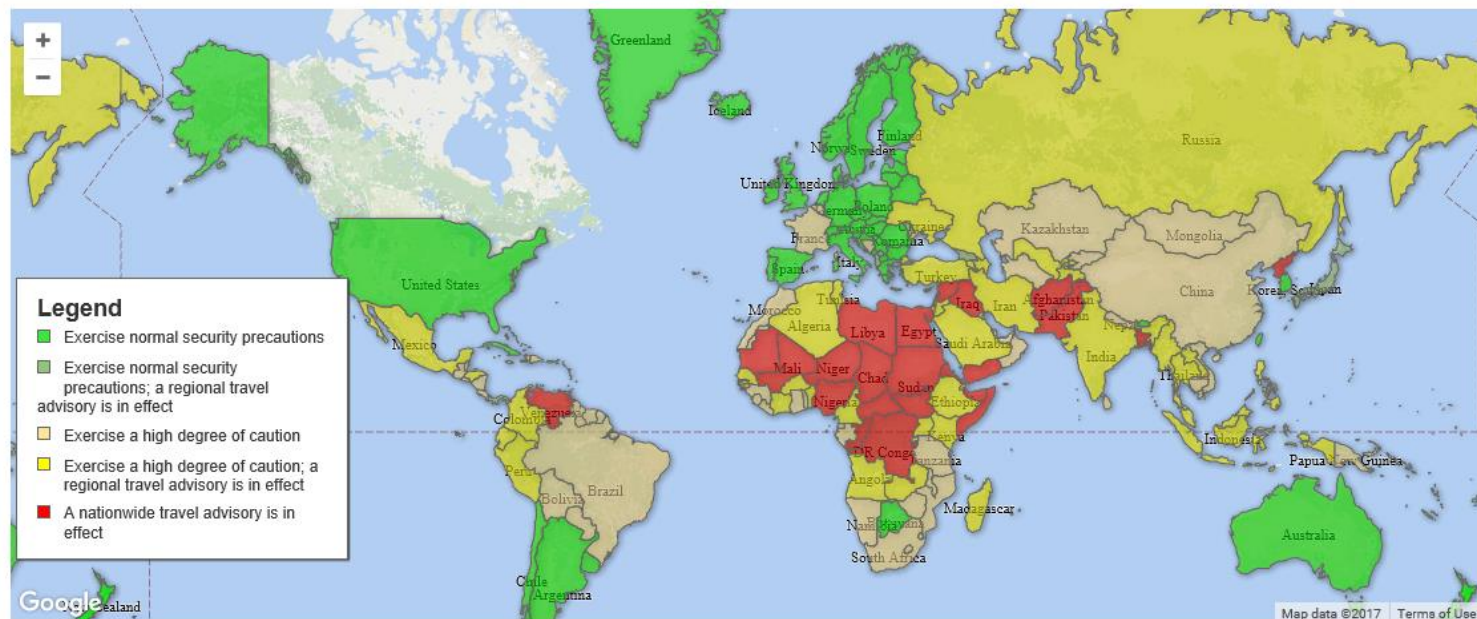
The Public Health Agency of Canada has issued a Travel Health Notice for the [Global Update: Zika virus infection](#) recommending that Canadians practice special health precautions while travelling in affected countries. Pregnant women and those considering becoming pregnant should avoid travel to Brazil. See [Health](#) for more information.

<https://travel.gc.ca/destinations/brazil>

What to do about Zika? Travel

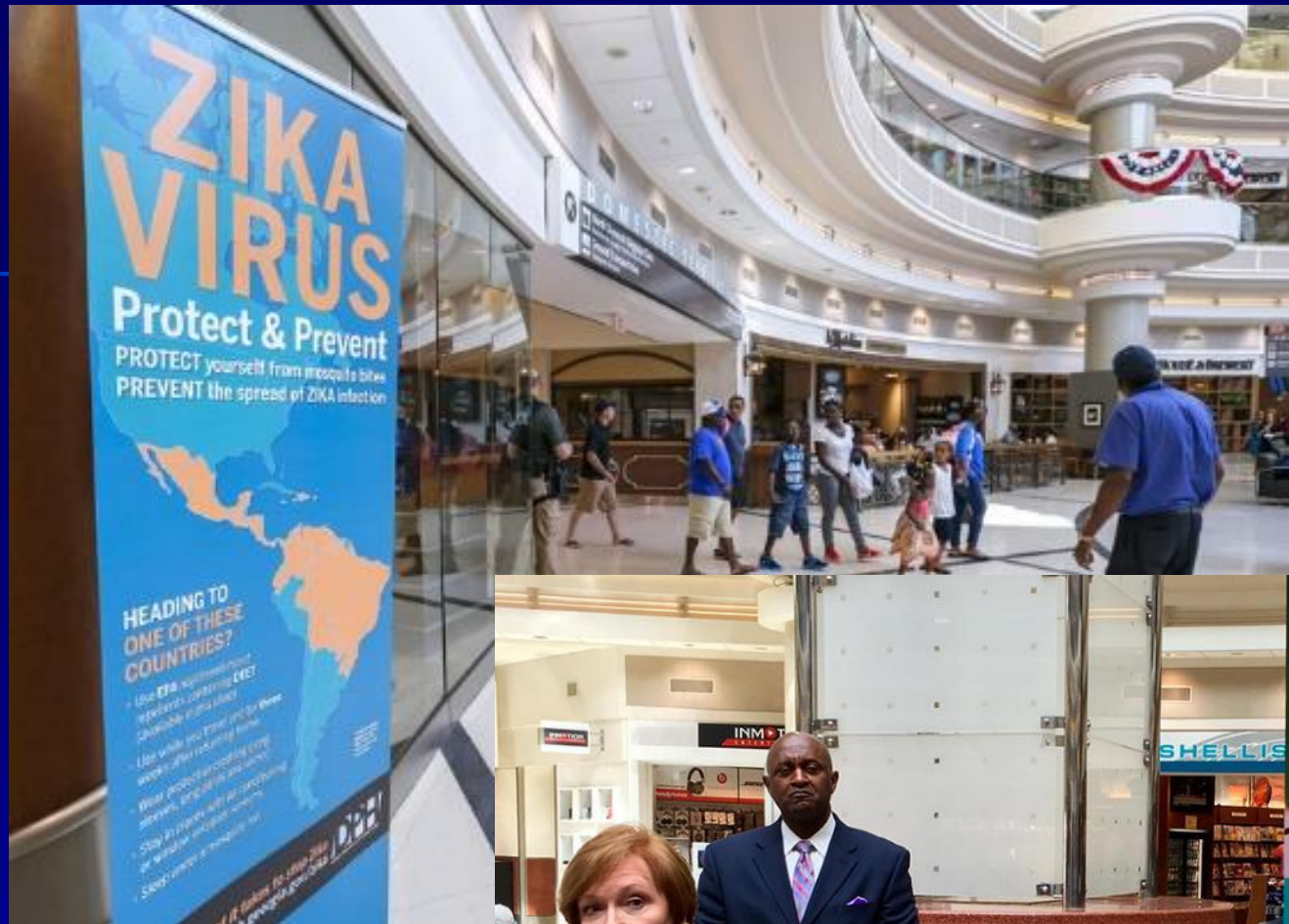
Travel advice and advisories map

[Hide map](#)



Report inaccurate or missing information: webmaster.consular@international.gc.ca. Apart from the Canadian Country-specific Travel Advisories shown, the information in the map above is from external sources. As such, it is provided only as a convenience and is available only in the language provided; it does not necessarily reflect the views of the Government of Canada and is not subject to the *Official Languages Act*.

https://travel.gc.ca/travelling/advisories?_ga=1.58151722.1890306674.1489515900



What to do about Zika?

Prevent Infections in Pregnancy

Prevent Transmission to Females

PREGNANT? READ THIS BEFORE YOU TRAVEL

What we know about Zika

- Zika can be passed from a pregnant woman to her fetus.
- Zika infection during pregnancy can cause certain birth defects.
- Zika is spread mostly by the bite of an infected *Aedes aegypti* or *Aedes albopictus* mosquito.
 - » These mosquitoes bite during the day and night.
- There is no vaccine to prevent or medicine to treat Zika.
- Zika can be passed through sex from a person who has Zika to his or her sex partners.



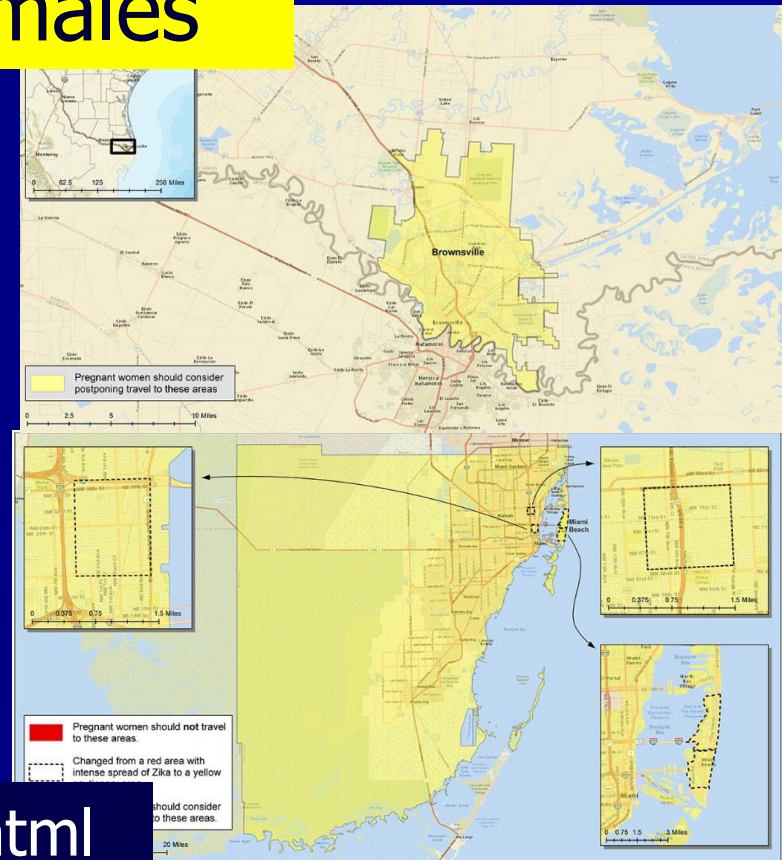
What we don't know about Zika

- If there's a safe time during your pregnancy to travel to an area with Zika.
- If you do travel and are infected, how likely it is that the virus will infect your fetus and if your baby will have birth defects from the infection.

Travel Notice

CDC has issued a travel notice (Level 2-Practice Enhanced Precautions) for people traveling to areas where Zika virus is spreading.

- For a current list of places with Zika outbreaks, see CDC's Travel Health Notices: <http://wwwnc.cdc.gov/travel/page/zika-travel-information>
- This notice follows reports in Brazil



<https://www.cdc.gov/zika/geo/index.html>

<https://www.cdc.gov/zika/prevention/plan-for-travel.html>

What to do about Zika?

Preventing Sexual Transmission

Morbidity and Mortality Weekly Report (MMWR)

[CDC](#) > [MMWR](#)

Update: Interim Guidance for Preconception Counseling and Prevention of Sexual Transmission of Zika Virus for Persons with Possible Zika Virus Exposure — United States, September 2016

Weekly / October 7, 2016 / 65(39);1077-1081



Format:

On September 30, 2016, this report was posted online as an MMWR Early Release.

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Wikipedia (1) [↗](#)
Reddit (1) [↗](#)

<https://www.cdc.gov/zika/pregnancy/women-and-their-partners.html>



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Zika Virus: Pregnant or planning a pregnancy?

Learn about Zika virus before you or your partner travel

Zika virus can be passed from a pregnant woman to her fetus and infection during pregnancy may cause birth defects.

There is no vaccine to prevent, or medicine to treat Zika virus infection.

- **Avoid travel** to countries, or areas in the United States, with reported mosquito-borne Zika virus transmission. See our [Travel Health Notice on Travel.gc.ca](#) for details.
- **If travel cannot be avoided** follow strict [mosquito bite prevention measures](#).
- Discuss your travel plans with a health care professional for specific advice.

Zika virus can also be sexually transmitted.

If you are pregnant:

- If your partner has travelled to an area with local mosquito-borne transmission of Zika virus, **ALWAYS** use condoms correctly and consistently, or avoid having sex, **for the duration of your pregnancy.**



http://healthycanadians.gc.ca/publications/diseases-conditions-maladies-affections/zika-virus-pregnancy-virus-zika-grossesse/index-eng.php?_ga=1.217986582.1890306674.1489515900

Zika virus vaccine

U.S. government interagency working group

Evaluate promising candidate vaccines for safety, immunogenicity, and efficacy

Have one or more candidate vaccines available in 2018 for emergency use in U.S. populations at high risk of exposure or disease

Work with partners to commercialize vaccines for broad distribution by 2020

Current status

Many vaccine candidates in preclinical development

Four vaccines in phase 1 clinical trials by end of 2016

Phase 2 studies scheduled to begin in 2017