Zika Virus

Jen Brown, DVM, MPH

State Public Health Veterinarian

Indiana State Department of Health

Indiana State Department of Health

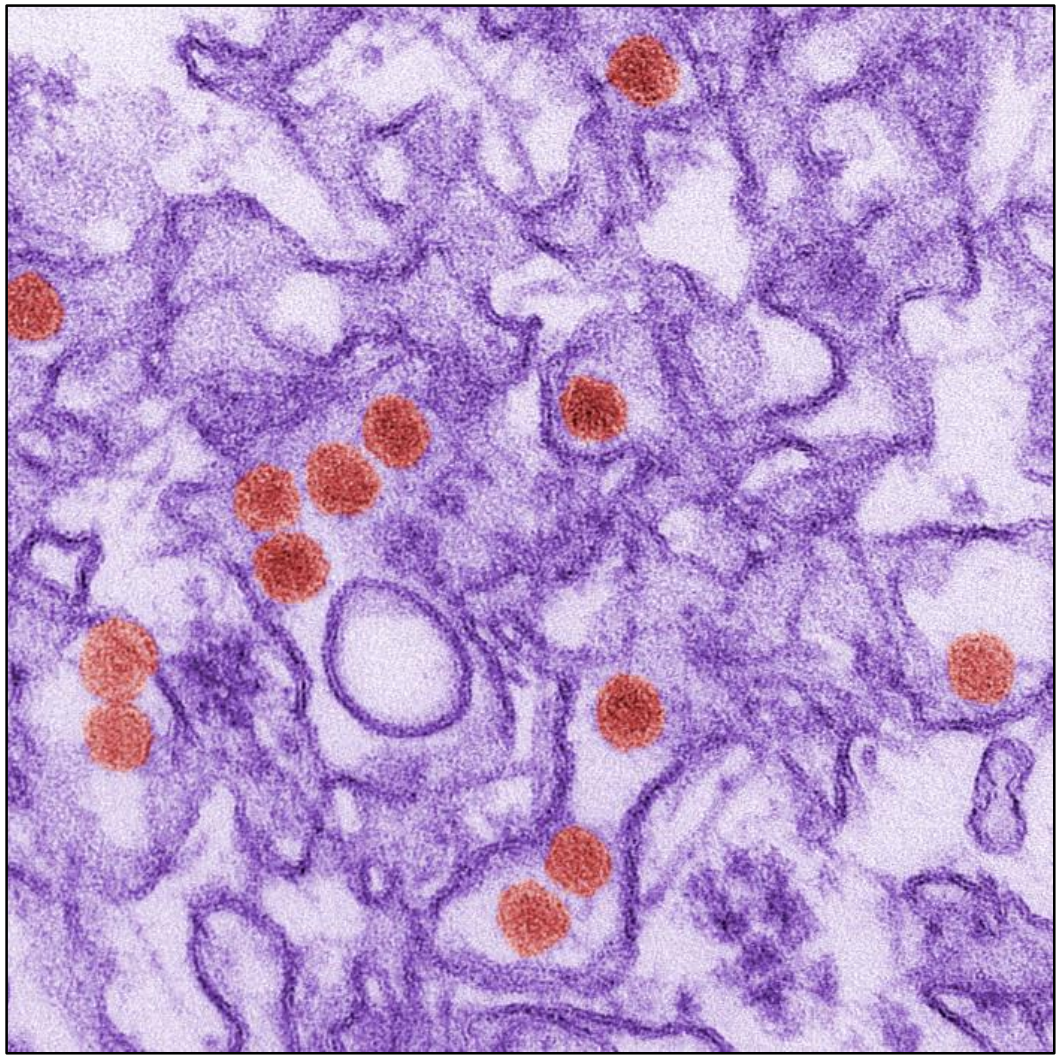
Today's Presentation

- Zika Basics
  - Overview
  - Transmission
  - Clinical Presentation
  - Zika and Pregnancy
  - Prevention
- Indiana Response

Overview

Zika virus

- Single-stranded RNA virus
- Genus *Flavivirus,* Family *Flaviviridae*
- Primarily transmitted by two Aedes species mosquitoes
  - *Aedes aegypti* and *Aedes albopictus*
- Additional modes of transmission
  - Intrauterine and perinatal
  - Sexual
  - Blood transfusion
  - Laboratory exposure



Zika virus. Photo: CDC.

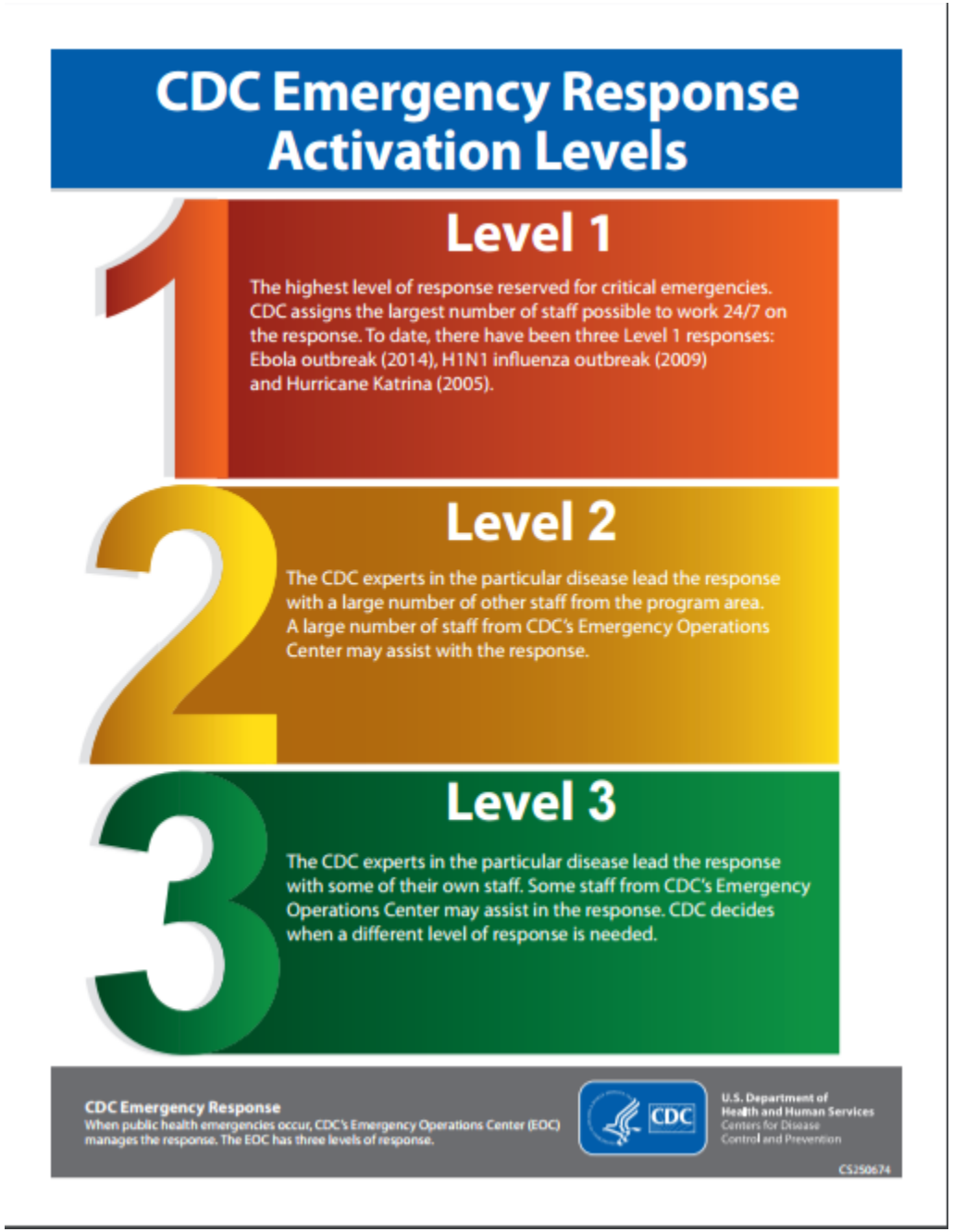
Zika virus epidemiology

- First isolated from a monkey in Uganda in 1947
- Sporadic human disease cases in Africa, Southeast Asia, and the Pacific Islands
- 2007: outbreak in Yap Islands, Federated States of Micronesia
- 2013–2014: >28,000 suspected cases in French Polynesia
- May 2015: first locally acquired cases in the Americas in Brazil

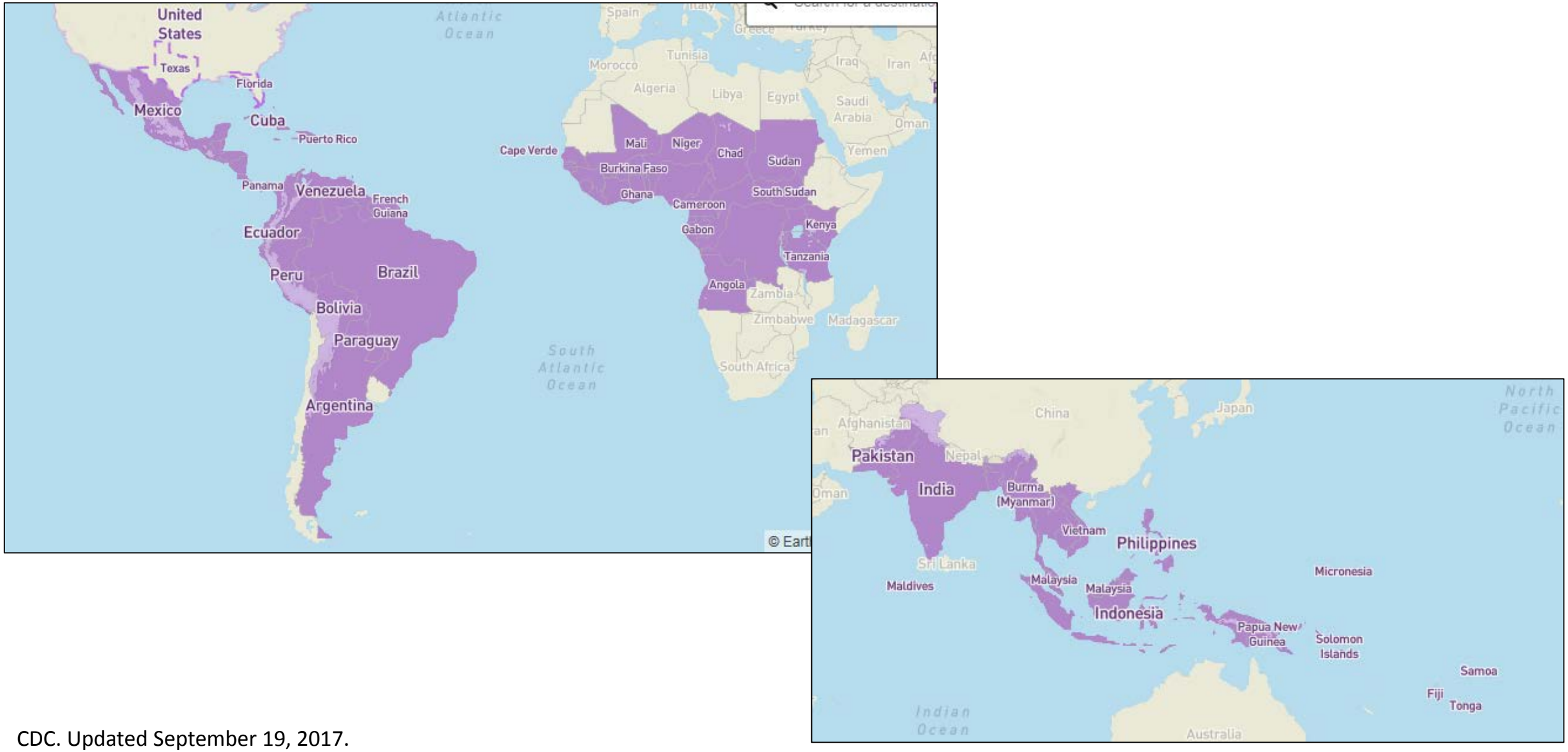
http://www.cnn.com/2016/02/02/health/zika-forest-viral-birthplace/

International concern

- January 22, 2016 - CDC Emergency Response Activation Level 1
- February 1, 2016 – WHO and PAHO declare Zika a Public Health Emergency of International Concern



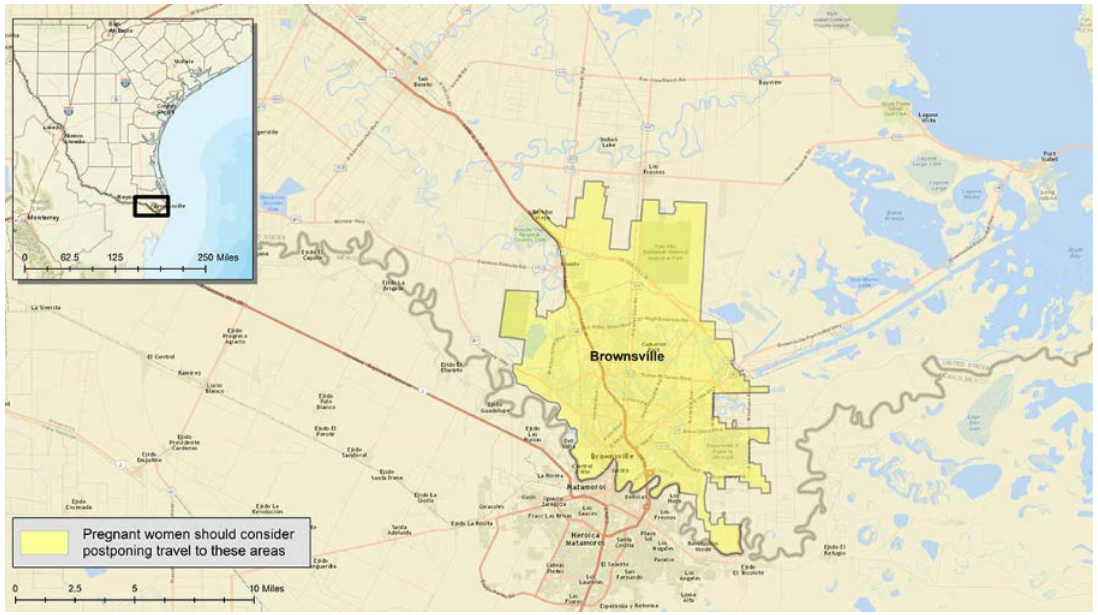
Current Zika virus transmission

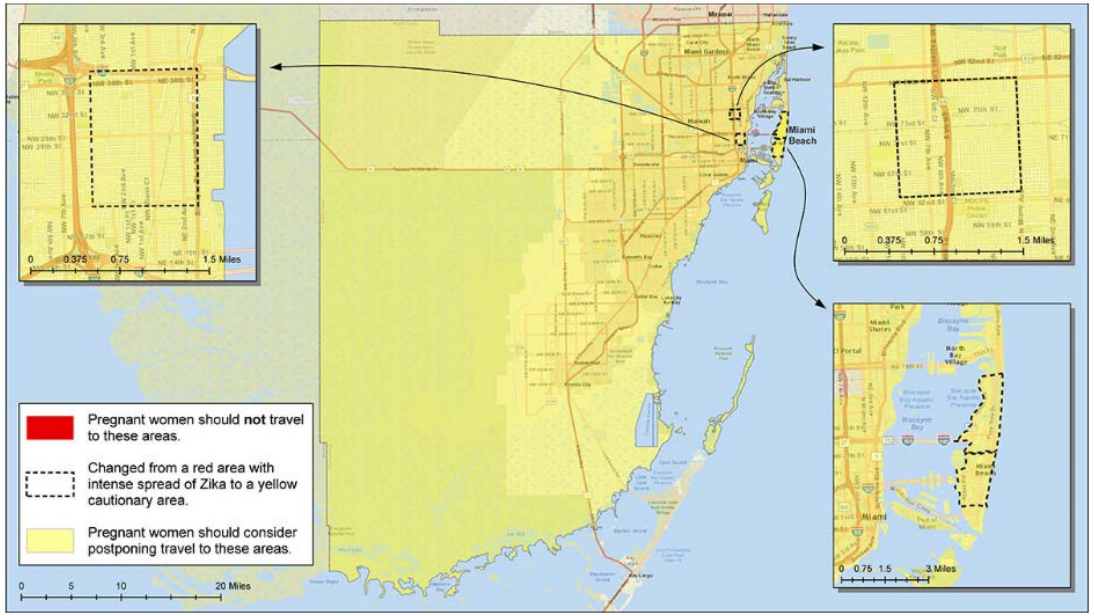


CDC. Updated September 19, 2017.

Zika in the U.S.

- Local mosquito-borne spread of Zika virus was reported in 2016 in Miami-Dade County, Florida, and Brownsville, Texas.
- Pregnant women should consider postponing travel to these areas.



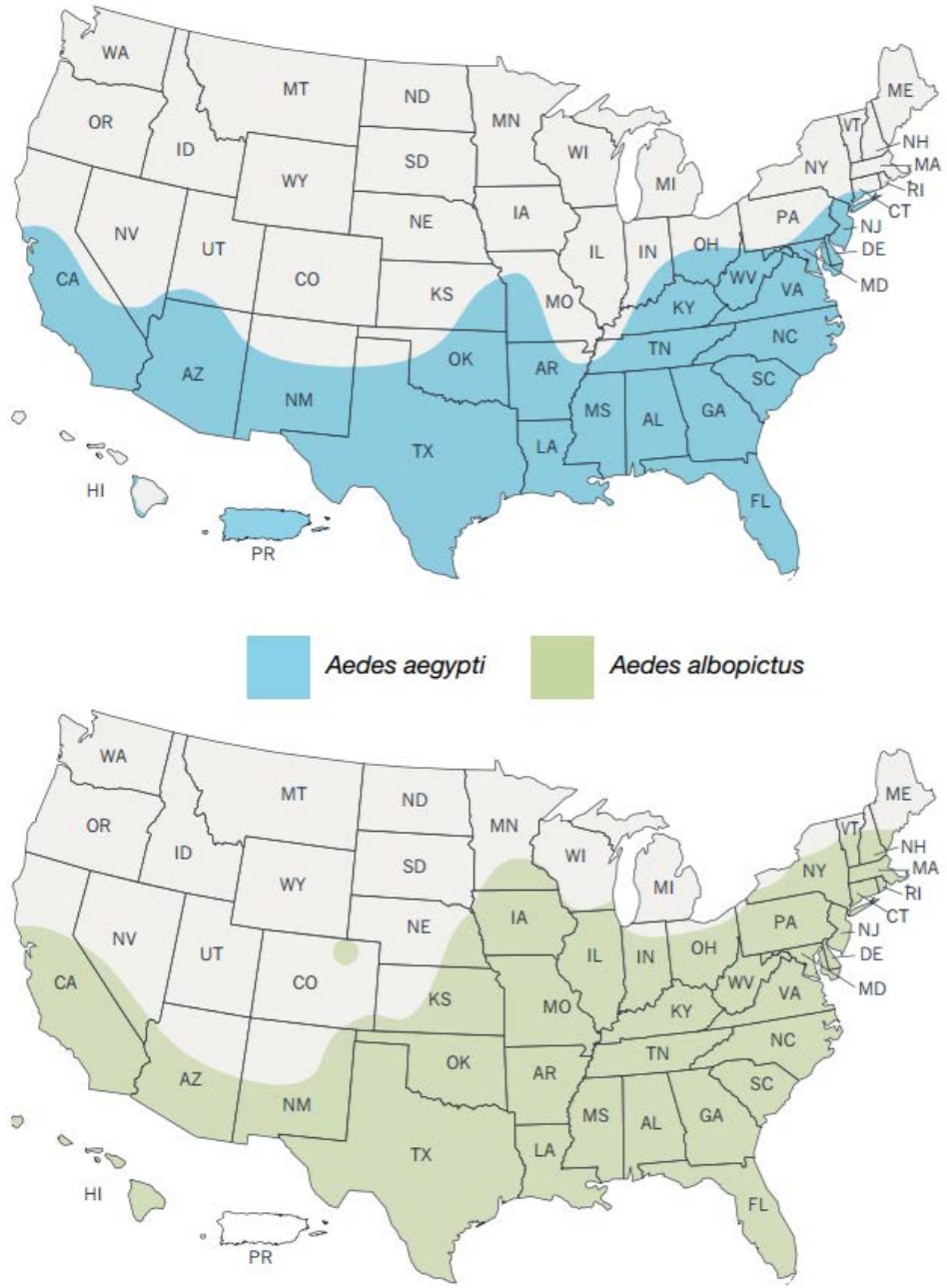


Transmission

Mosquito Transmission

- *Aedes aegypti* and *Aedes albopictus*
  - Aggressive daytime biters, also bite at night
  - Prefer to bite people
  - Live indoors and outdoors, near people
  - Lay eggs in standing water

https://www.cdc.gov/chikungunya/transmission/


WA
OR
CA
ID
NV
MT
WY
UT
AZ
CO
NM
ND
SD
NE
KS
OK
TX
MN
IA
MO
AR
LA
WI
IL
MS
MI
IN
AL
OH
KY
TN
GA
WV
VA
NC
SC
PA
NY
FL
ME
VT
NH
MA
RI
CT
NJ
DE
MD
HI
PR
Aedes aegypti
Aedes albopictus

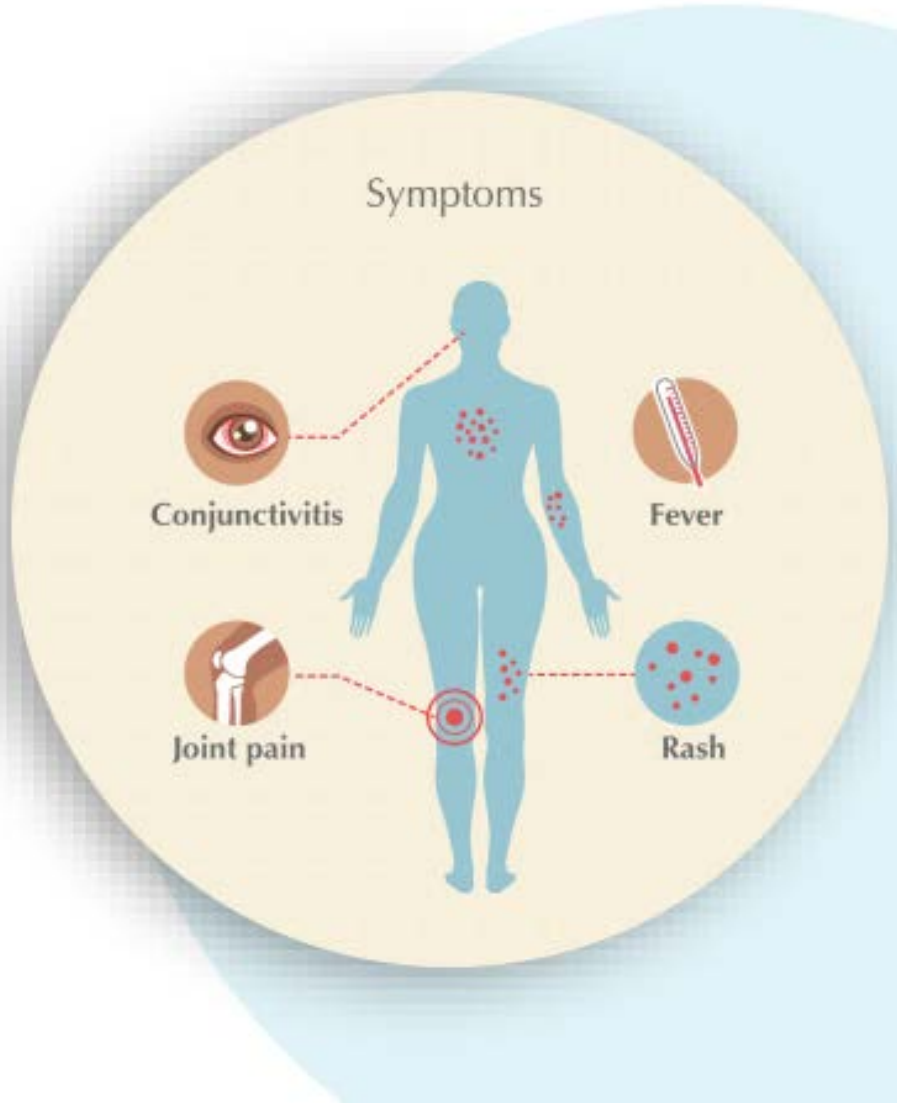
Sexual Transmission

- Zika can be passed through sex from a person who has Zika to his or her sex partners, even if the person does not have symptoms
- Travelers to an area with Zika should abstain from sex or use condoms to avoid sexual transmission
  - 8 weeks for women
  - 6 months for men

Clinical Presentation

Clinical Presentation

- Most common symptoms
  - Fever
  - Rash
  - Joint pain
  - Conjunctivitis
- Symptoms last several days to a week
- Severe disease uncommon and fatalities are rare
- Once infected, a person is likely to be protected from future infections

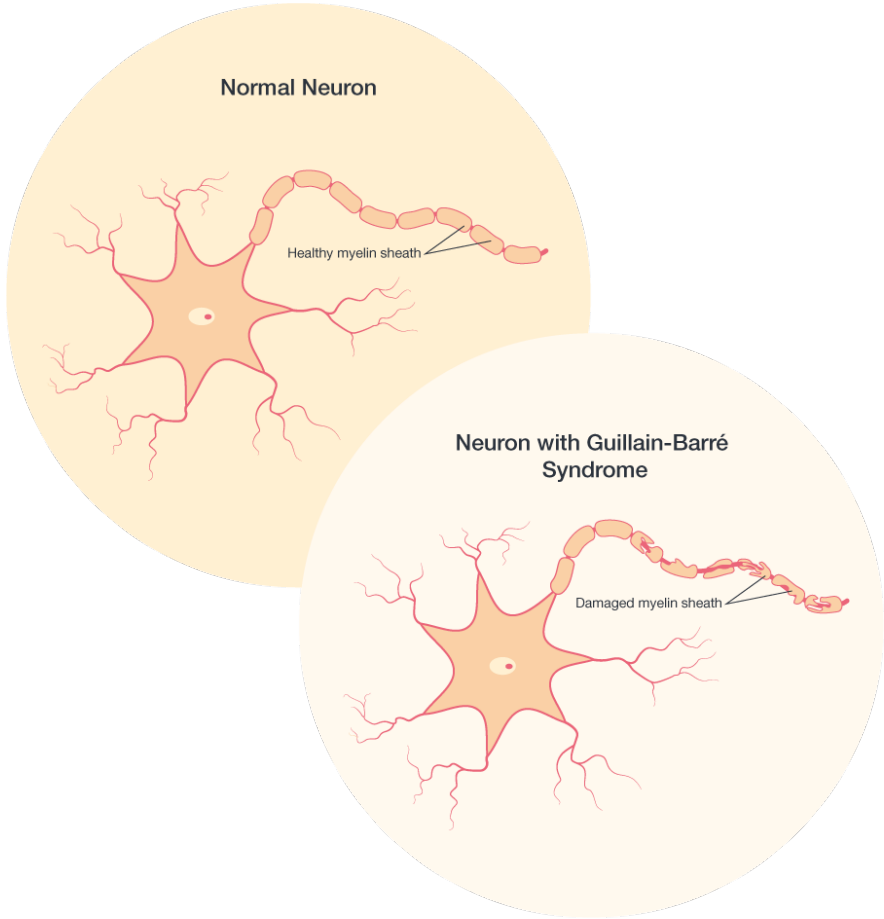


Why is Zika risky for some people?

- Zika infection during pregnancy is linked to:
  - Microcephaly and other severe birth defects
  - Miscarriage
  - Stillbirth
- Certain areas affected by Zika have reported increased cases of Guillain-Barre Syndrome (GBS)

Guillain-Barre Syndrome (GBS)

- Autoimmune disorder of the peripheral nervous system
- Muscle weakness and paralysis
- Most people recover fully, death is rare
- Rare in the U.S. (1-2 per 100,000 people)
- Associated with bacterial or viral infections
- Causation is difficult to establish



Zika and Pregnancy

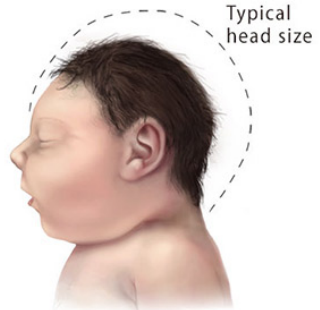
“We have never before identified a situation where a mosquito bite could result in an infection that causes a devastating birth defect. ”

-Dr. Tom Frieden, former Director, Centers for Disease Control and Prevention

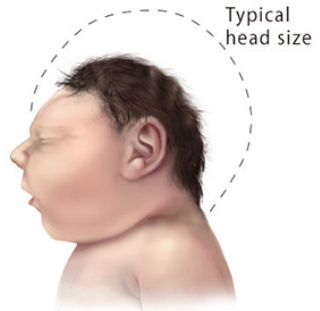
Microcephaly

- Birth defect where the head is smaller than expected when compared to babies of the same sex and age
- Head circumference measurement less than 3rd percentile
- Can range from mild to severe
- Not common in the U.S.
  - Estimated ranges from 2 to 12 babies per 10,000 live births


Baby with Typical Head Size



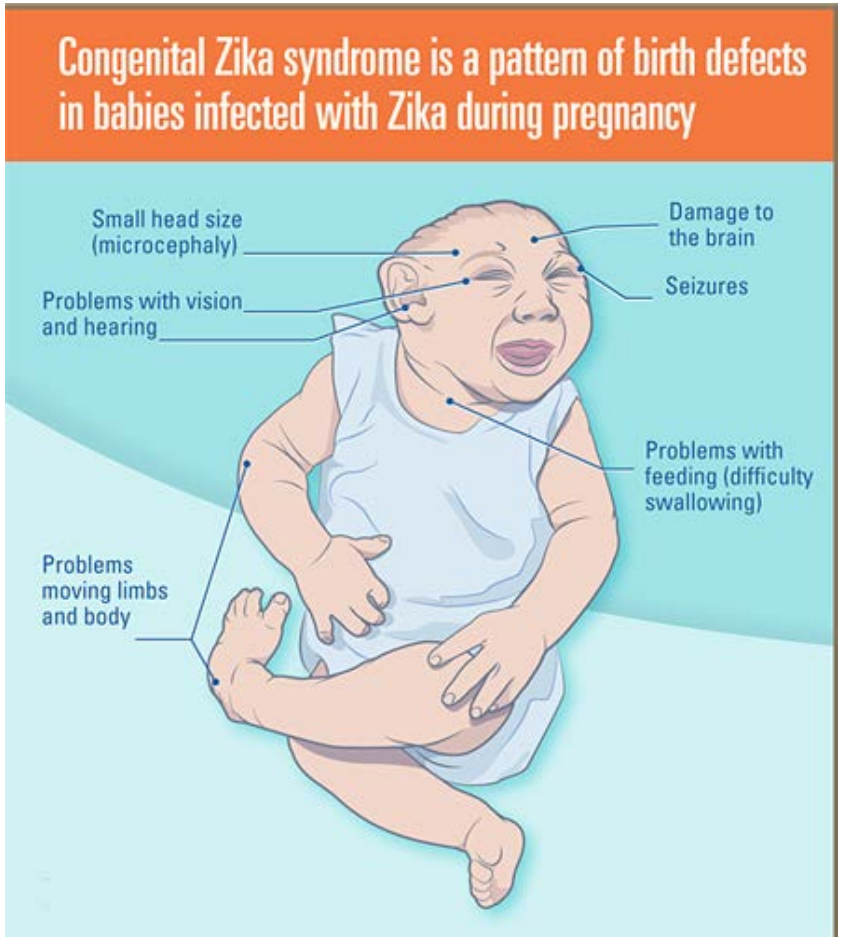
Baby with Microcephaly



Baby with
Severe Microcephaly

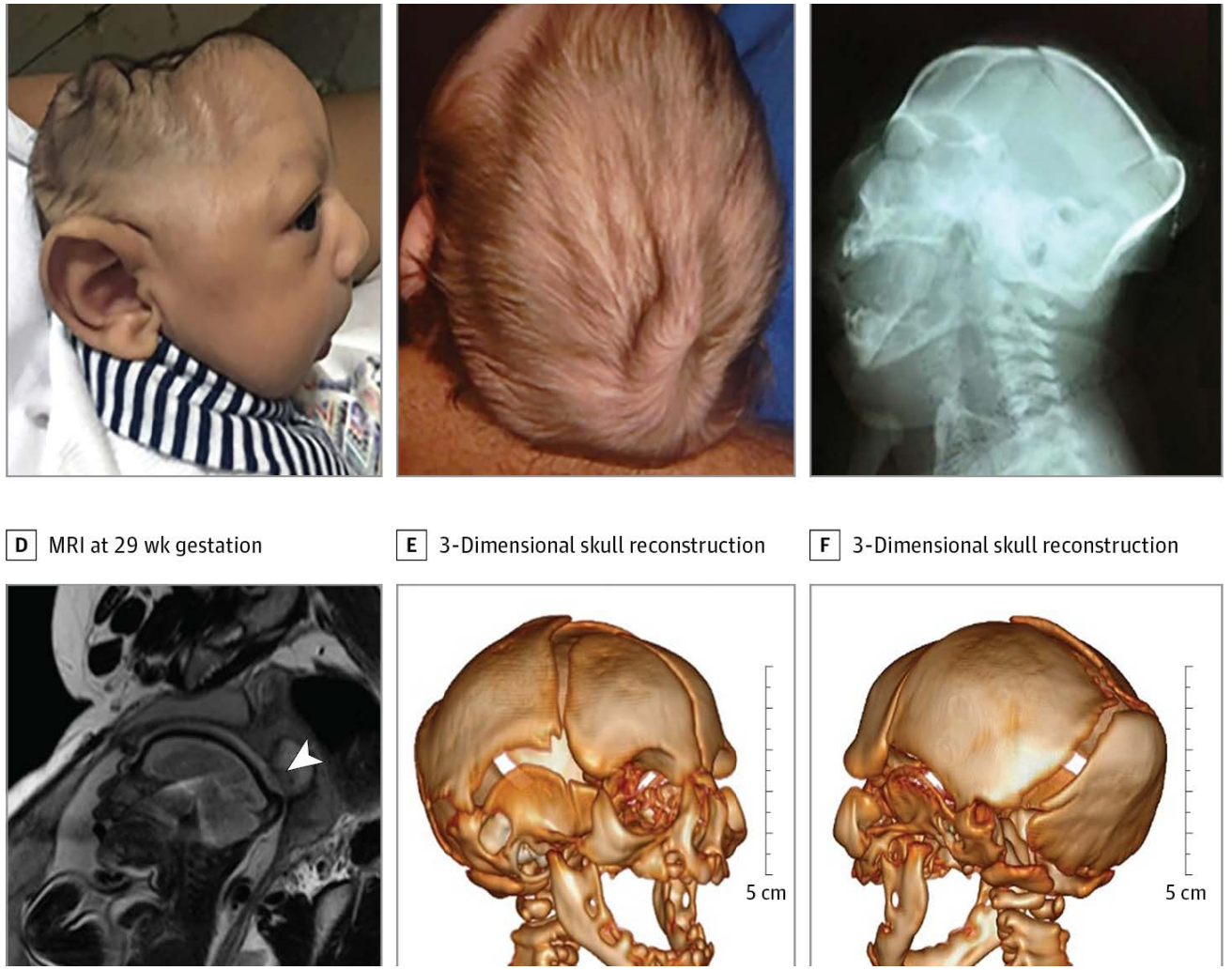
Congenital Zika Syndrome

- Pattern of congenital anomalies associated with Zika virus infection during pregnancy that includes:
  - Severe microcephaly resulting in a partially collapsed skull
  - 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

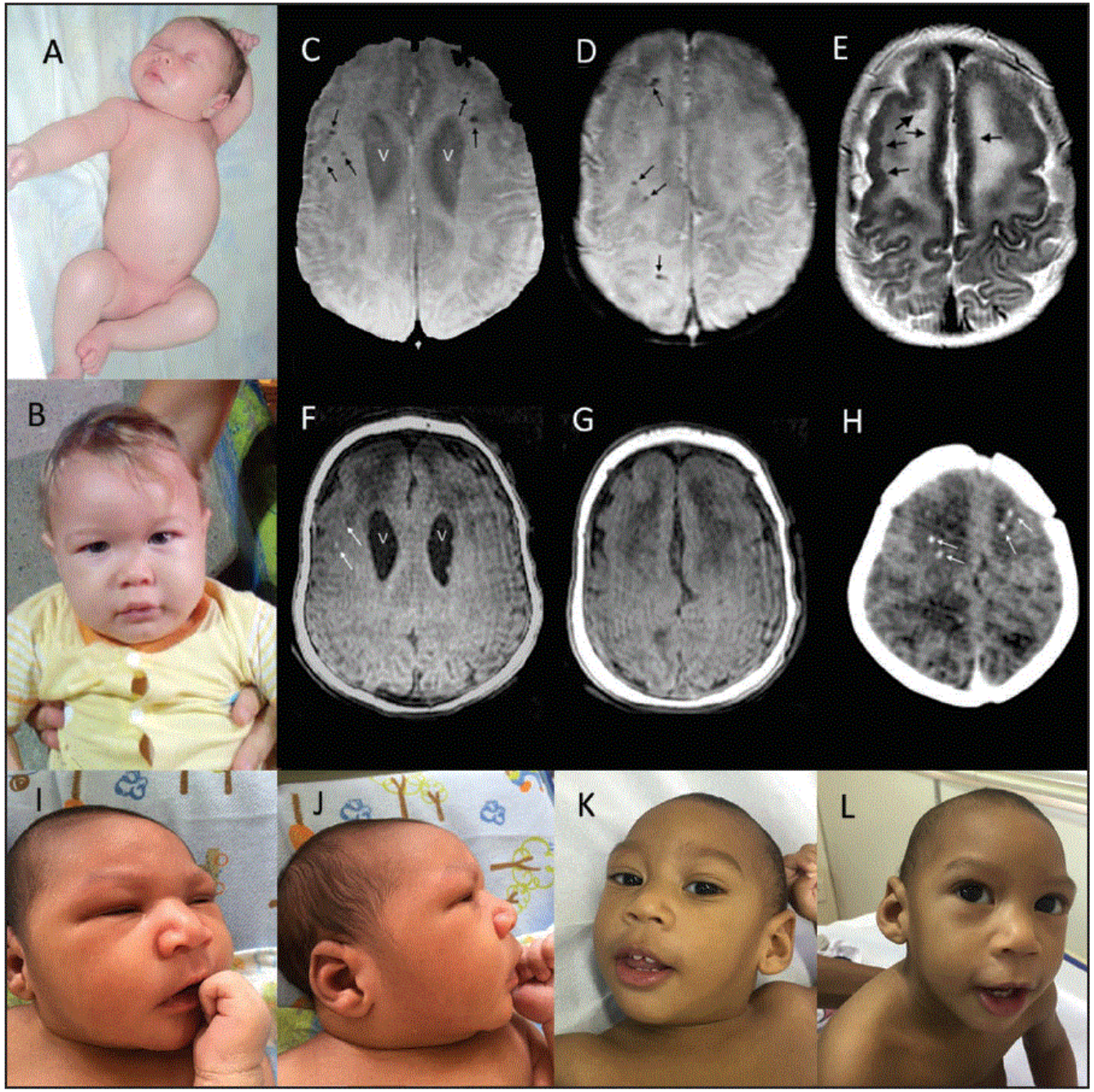


Fetal brain disruption sequence

- Severe microcephaly
- Cranial bone collapse
- Redundant skin on scalp
- Loss of brain volume
- Decrease in cranial pressure

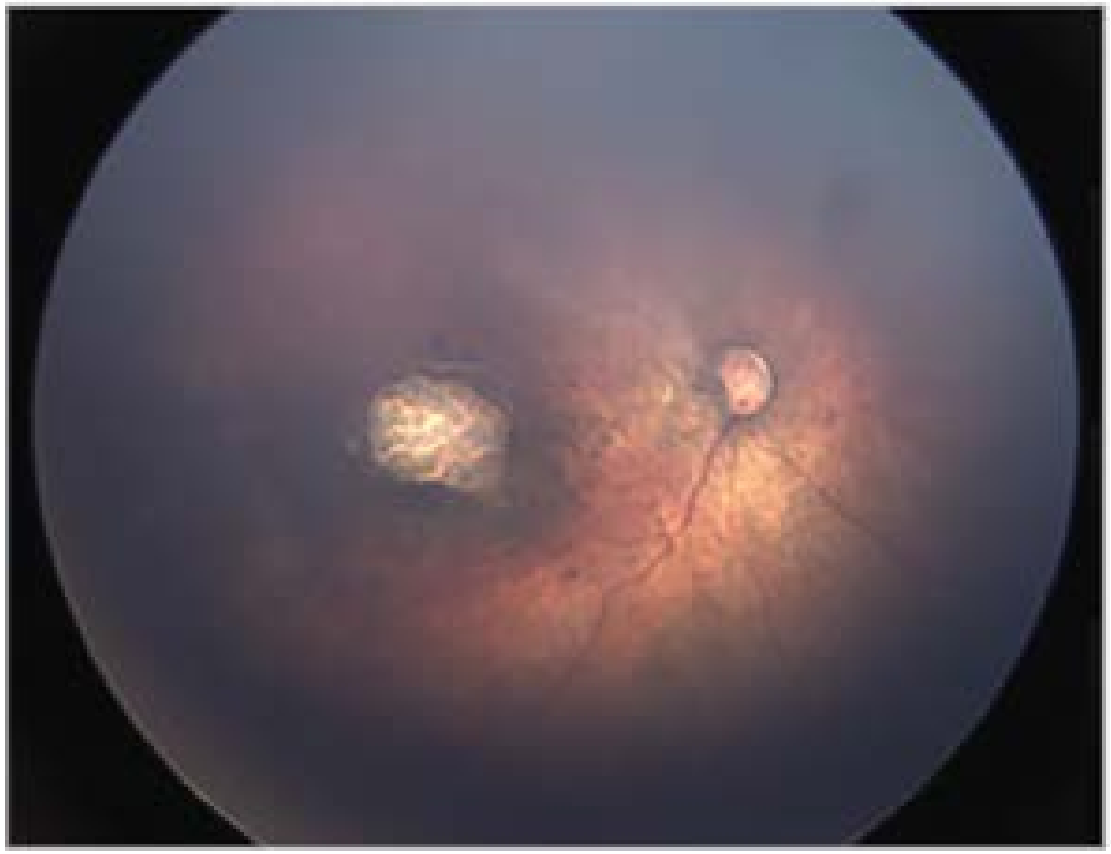


JAMA Pediatr. 2017;171(3):288-295. doi:10.1001/jamapediatrics.2016.3982

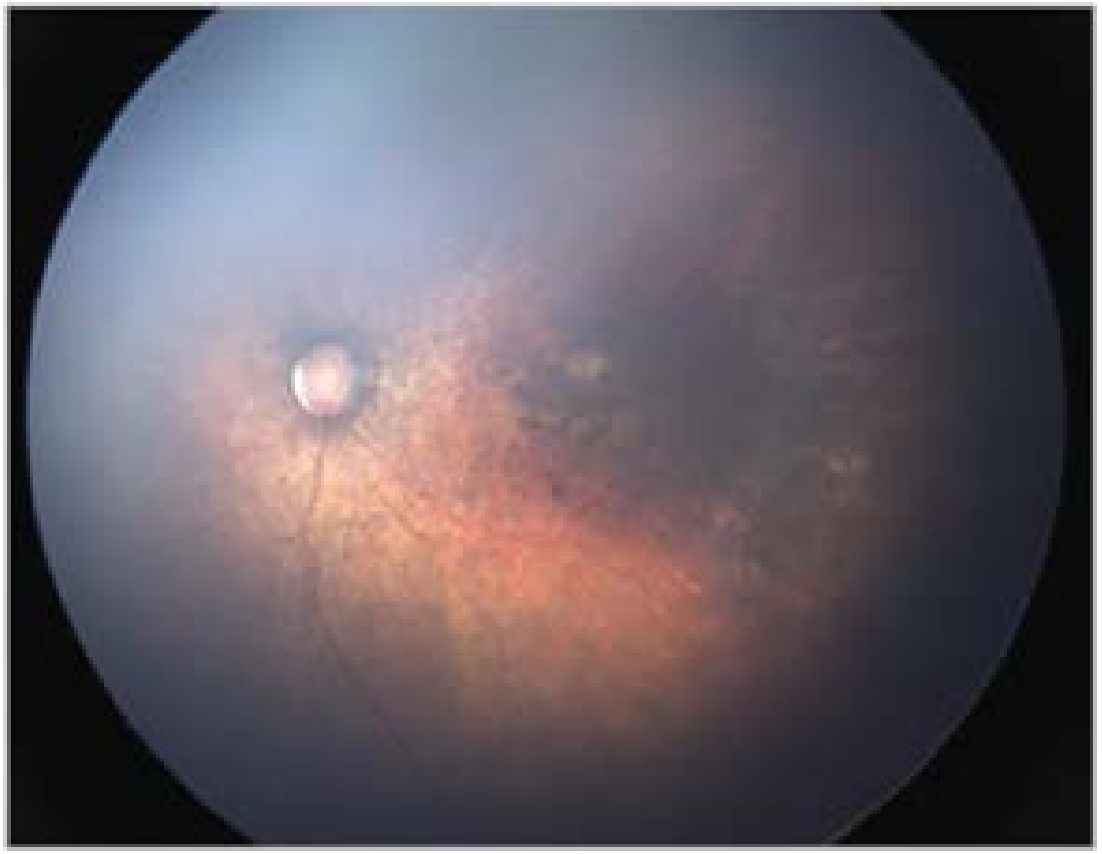


van der Linden V, Pessoa A, Dobyns W, et al. Description of 13 Infants Born During October 2015–January 2016 With Congenital Zika Virus Infection Without Microcephaly at Birth — Brazil. MMWR Morb Mortal Wkly Rep 2016;65:1343–1348. DOI: http://dx.doi.org/10.15585/mmwr.mm6547e2.

A Right eye



B Left eye



JAMA Pediatr. 2017;171(3):288-295. doi:10.1001/jamapediatrics.2016.3982

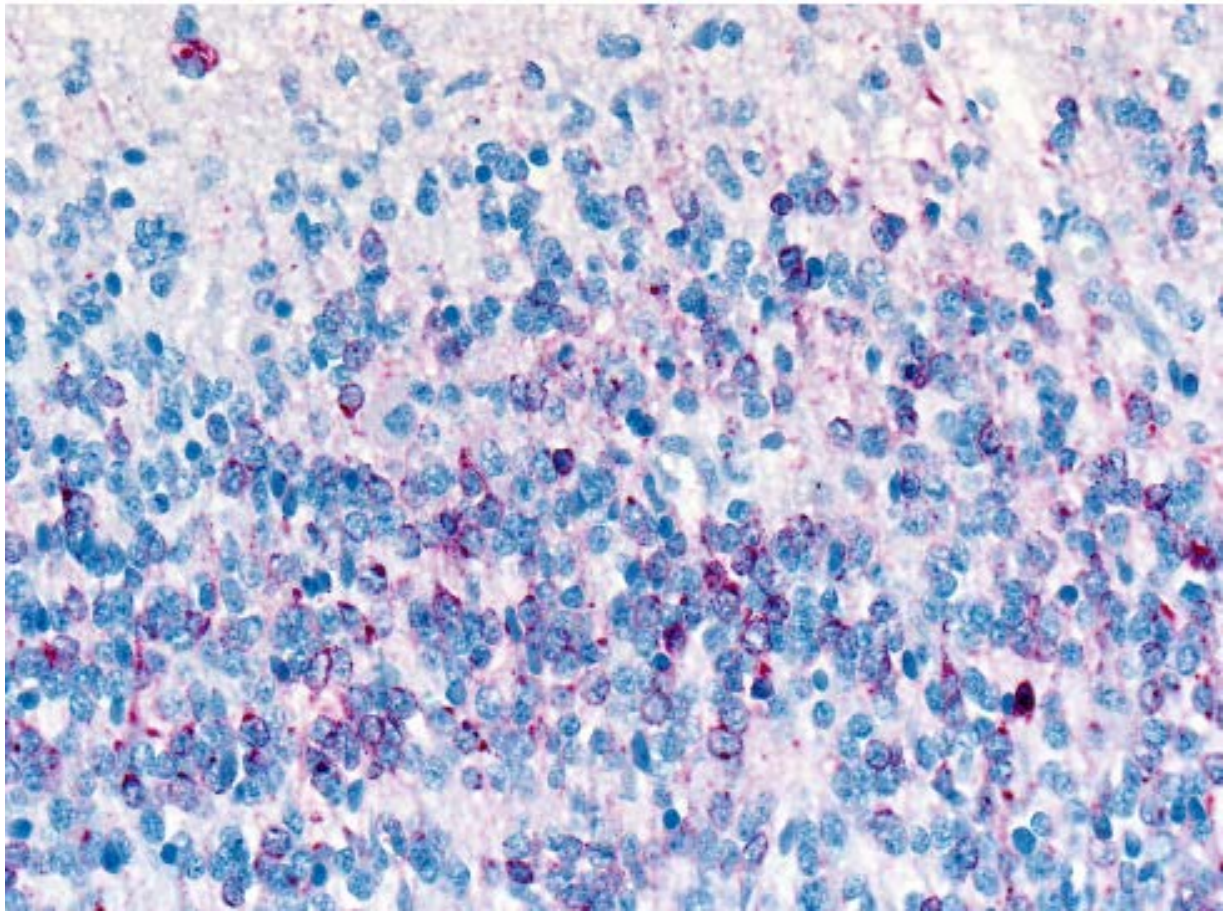
A Multiple contractures with knee dislocation

B Multiple contractures including right talipes equinovarus

JAMA Pediatr. 2017;171(3):288-295. doi:10.1001/jamapediatrics.2016.3982

Zika in Fetal Tissues

- Zika virus has been shown to be present in fetal tissue
- Evidence of Zika virus has been detected in
  - Amniotic fluid
  - Placenta
  - Fetal brain tissue
  - Products of conception
- Zika virus has been found to continue to replicate in infants' brains after birth (Bhatnagar et.al., 2017)



Immunohistochemical staining of Zika virus antigen (red stain) in fetal brain tissue. This staining is present in the same areas where neuronal cell death/necrosis was identified by microscopic review of tissue morphology.

Bhatnagar J, Rabeneck DB, Martines RB,Reagan-Steiner S, Ermias Y, Estetter LBC, et al. Zika virus RNA replication and persistence in brain and placental tissue. Emerg Infect Dis. 2017 Mar [Epub ahead of print].
Reference/attribution for image: Ritter JM, Martines RB, Zaki SR. Zika Virus: Pathology From the Pandemic. Arch Pathol Lab Med. 2016 Oct 5. [Epub ahead of print]

Neurologic Sequelae

- Motor disabilities
- Cognitive disabilities
- Irritability with excess crying
- Tremors
- Swallowing dysfunction and trouble eating
- Vision and hearing impairment
- Epilepsy

JAMA Pediatr. 2017;171(3):288-295. doi:10.1001/jamapediatrics.2016.3982

US Zika Pregnancy Registry

- Established to collect information and learn more about pregnant women in the US with Zika and their infants
- Data will be used to
  - Update recommendations for clinical care
  - Plan for services for pregnant women and families affected by Zika
  - Improve prevention of Zika infection during pregnancy

US Zika Pregnancy Registry

Zika Active Pregnancy Surveillance System (Puerto Rico)

Potential Risk of Birth Defects Related to Zika

- Among pregnant women in the United States with laboratory evidence of possible Zika virus infection:
  - Overall about 6% of fetuses or infants had birth defects potentially related to Zika virus
  - The proportion of pregnancies with birth defects was similar (around 6%) among symptomatic and asymptomatic pregnant women
  - Among women with infection in the 1st trimester of pregnancy, birth defects were reported in 11% of fetuses or infants

Honein MA, Dawson AL, Petersen EE et al. Birth Defects Among Fetuses and Infants of US Women With Evidence of Possible Zika Virus Infection During Pregnancy. JAMA. 2016 Dec 15 [Epub ahead of print]

Johansson MA, Mier-Y-Teran-Romero L, Reefhuis J, Gilboa SM, Hills SL. Zika and the Risk of Microcephaly. N Engl J Med. 2016 May 25 [Epub ahead of print].

CDC Zika Vital Signs

- In 2016, a total of 1,297 pregnancies with possible recent Zika virus infection were reported to the USZPR from 44 states
- Approximately 1 in 10 pregnancies with **laboratory-confirmed** Zika virus infection resulted in a fetus or infant with Zika virus-associated birth defects
- Birth defects were reported in a higher proportion of fetuses or infants whose mothers were infected during the first trimester of pregnancy
- The proportion of fetuses and infants with birth defects among pregnancies with confirmed Zika virus infection was more than 30 times higher than the baseline prevalence in the pre-Zika years
- Only 25% of infants from pregnancies with possible recent Zika virus infection reported receiving postnatal neuroimaging

Prevention

Prevention

- No vaccine
- Avoid mosquito bites
  - Wear long sleeves and pants
  - Wear EPA-registered insect repellant
  - Treat clothing and gear with permethrin
  - Stay in places with air conditioning and window/door screens
- Avoid sexual transmission
  - Abstain from sex or use condoms
- Reduce mosquito breeding sites

Photo: CDC 2016

Pregnancy Planning

- Testing is not available to “rule-out” Zika for family planning purposes
- CDC recommends couples wait to attempt pregnancy after a possible Zika virus exposure
  - 8 weeks for women
  - 6 months for men
- Decisions about pregnancy are personal and complex – women should speak with their healthcare provider about risks and benefits

Plan for travel

- Check CDC travel notices
- Check travel recommendations
  - Pregnant women should not travel to areas with risk of Zika
  - Couples trying to get pregnant should consider avoiding non-essential travel to areas with Zika
- During your trip
  - Protect against mosquito bites
- After your trip
  - Avoid mosquito bites
  - Protect your partners during sex
  - See a healthcare provider if you develop symptoms

http://www.health.harvard.edu/blog/zika-pregnancy-and-winter-travel-many-unknowns-and-a-cautious-message-201602229241

Zika Virus in Indiana

Overall risk in IN is low

- No *Aedes aegypti*
- Better infrastructure and sanitary conditions
- Lower volume of travelers
- Dengue virus example
  - Similar virus, transmitted by the same mosquito
  - Handful of travel-associated cases each year
  - No IN local transmission
- ISDH has a robust mosquito surveillance program throughout the state

Zika virus disease—United States, 2015–2017

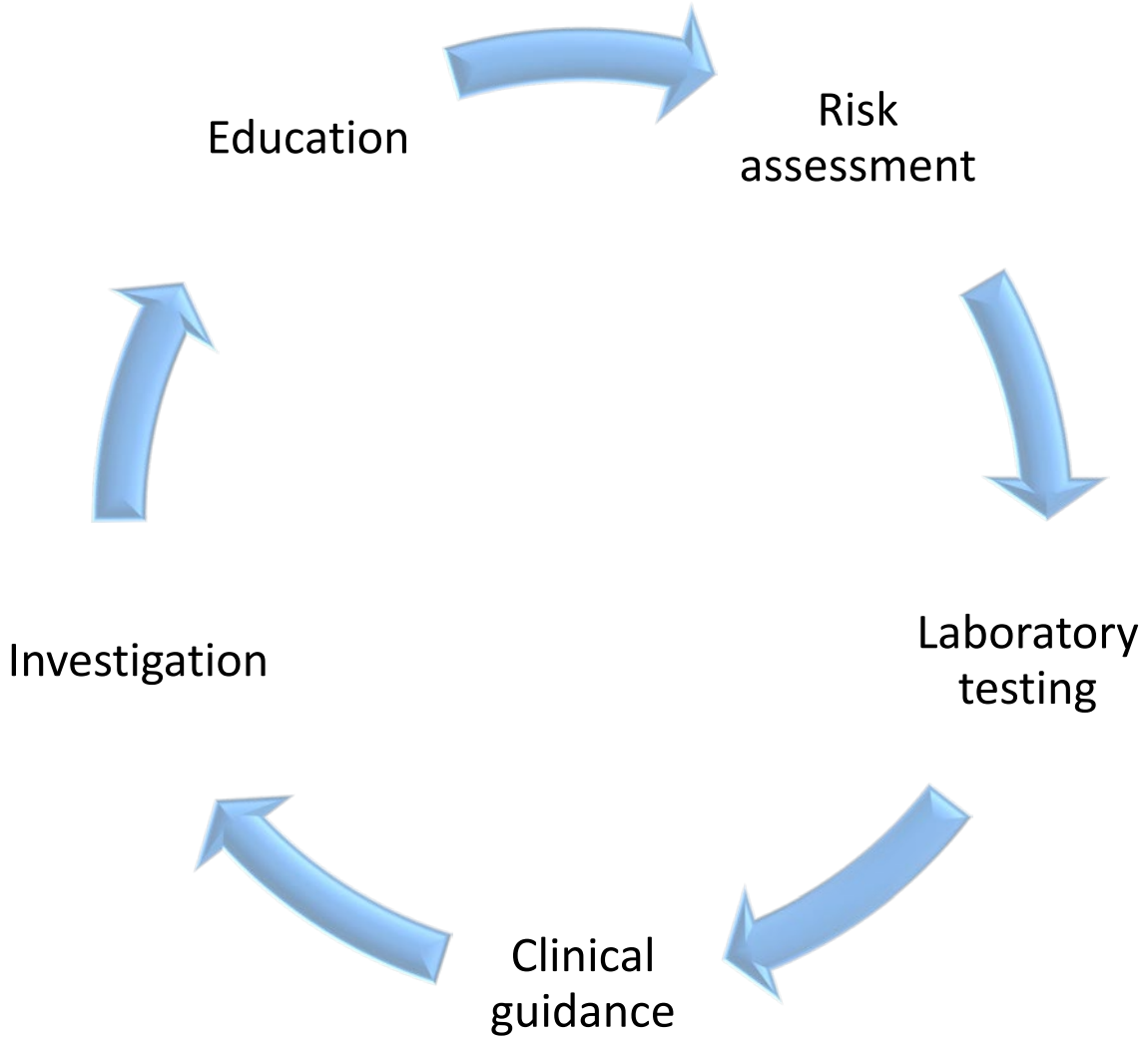
	Travel-associated cases			Locally acquired cases			Other routes*			Total cases
	2015	2016	2017	2015	2016	2017	2015	2016	2017	
US States	61	4,830	251	0	224	0	0	48	3	5,464
Indiana	3	49	1	0	0	0	0	0	0	53
US Territories	1	142	0	8	35,937	554	**	**	**	37,009

*Includes sexual transmission, congenital infection, laboratory transmission, and person-to-person through an unknown route.

**Sexually transmitted cases are not reported for US territories because with local transmission of Zika virus it is not possible to determine whether infection occurred due to mosquito-borne or sexual transmission.

CDC. Updated September 13, 2017.

ISDH Response



Colts Health Fair Survey, 2016

- 5 question survey
- Convenience sample
- Participants were asked to identify
  - Potential health outcomes
  - Transmission routes
  - Geographic areas of current transmission
  - Prevention measures

Photo: Taryn Stevens, 2016.

Survey Results

Less than half (38%) were aware that Zika is currently being transmitted in the Caribbean.

Survey Results

Less than half (38%) were aware that Zika is currently being transmitted in the Caribbean.

Less than half (44%) responded that Zika could be transmitted through sexual activity.

Survey Results

Less than half (38%) were aware that Zika is currently being transmitted in the Caribbean.

Less than half (44%) responded that Zika could be transmitted through sexual activity.

The most commonly reported sources of information regarding Zika virus were news media (64%) and social media (50%).

In Summary

- Zika is spread primarily through infected mosquitoes. It can also be spread through sex.
- The best way to prevent Zika is to prevent mosquito bites.
- Zika is linked to birth defects.
- Pregnant women should not travel to areas with Zika.
- Returning travelers should take precautions to prevent the spread of Zika through mosquito bites and sex.

Questions?

Thank you!

- Contact me!
  - Jen Brown
  - 317-233-7272
  - jenbrown@isdh.in.gov
- More information on Zika: www.cdc.gov/zika

Presentation adapted from "Zika Training for Healthcare Providers," National Center for Emerging and Zoonotic Infectious Diseases, Centers for Disease Control and Prevention (CDC)