



Centers for Disease Control and Prevention



# CDC Zika IMS Jurisdiction and Partner Sustainment Strategy

Wednesday, March 23, 2017

## Epidemiology and Surveillance Task Force

Carolyn Gould, MD, MSCR  
CAPT, USPHS

Michael Johansson

Clinical/Epidemiology Team Lead CDC Zika  
Response

Zika Modeling Team Lead and Biologist, Dengue  
Branch

# OVERVIEW

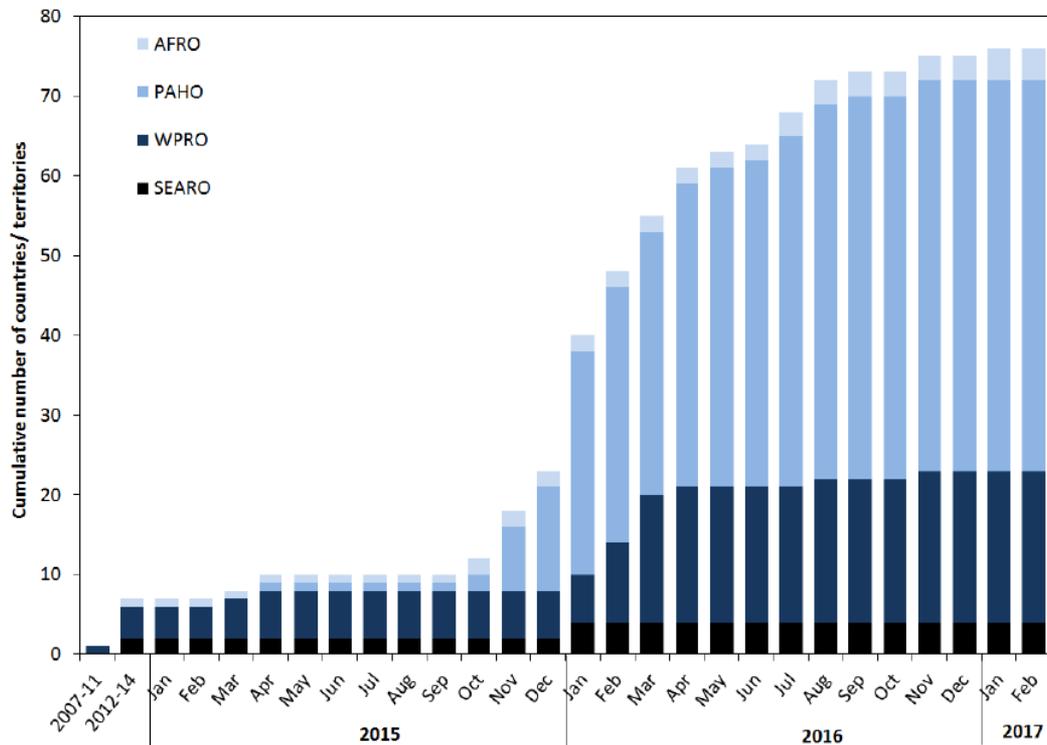
- Update on the epidemiology of Zika virus
- Modeling to inform surveillance strategies to identify local transmission
- What we might expect in 2017?
- Q&As

# Update on the epidemiology of Zika virus

# 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
- From 2013–2015, >30,000 suspected cases reported from French Polynesia and other Pacific islands

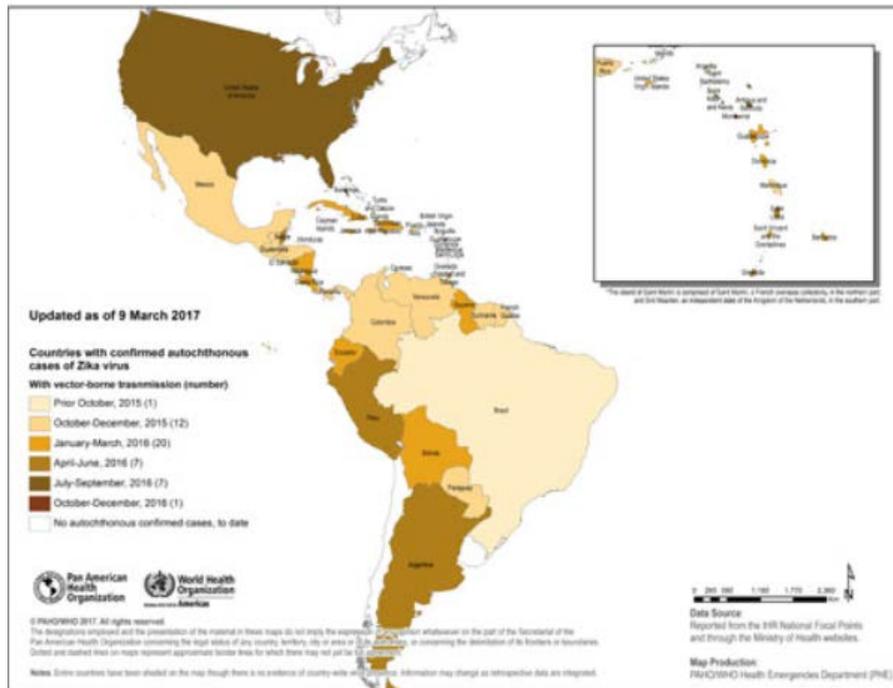
# Cumulative number of countries reporting mosquito-borne Zika virus transmission since 2007 by WHO region (as of Feb 1, 2017)



# Zika virus in the Americas

- In May 2015, the first locally acquired cases in the Americas were reported in Brazil
- As of March 10, 2017, local transmission reported in 49 countries and territories in the Americas
- Only countries without reported local transmission are Bermuda, Canada, and Uruguay
  - Chile (Easter Island) reported Zika virus transmission before 2015

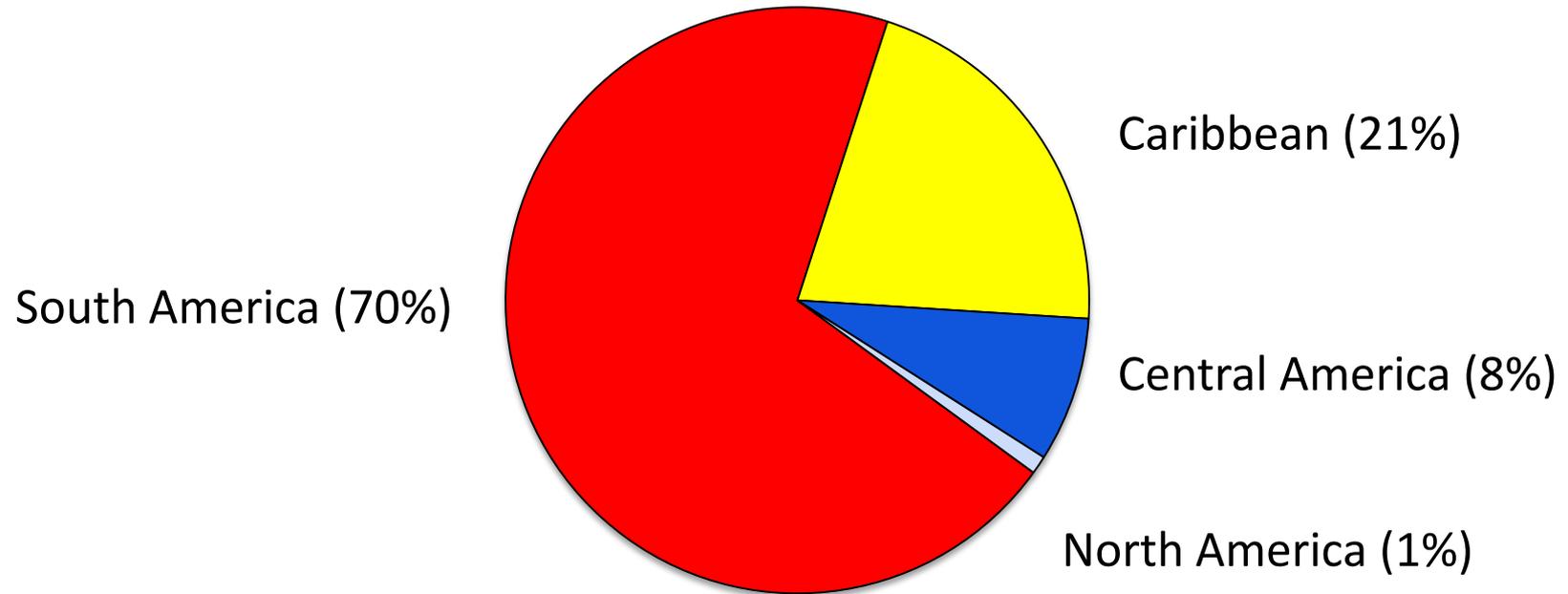
# Locally transmitted Zika virus disease cases reported by country/territory in the Americas, 2015–2017 (as of Mar 9, 2017)



<b>Country (N=50)</b>	<b>(N=754,460)*</b>	
Brazil	346,475	(46%)
Colombia	107,206	(14%)
Venezuela	62,200	(8%)
Puerto Rico	39,339	(5%)
Martinique	36,701	(5%)
Honduras	32,403	(4%)
Guadeloupe	31,227	(4%)

**\*27% of cases are lab-confirmed**

# Suspected and confirmed locally transmitted Zika virus disease cases reported in the Americas, 2015–2017 (as of Mar 9, 2017)



N=754,460 suspected and confirmed cases

# Zika virus in the United States

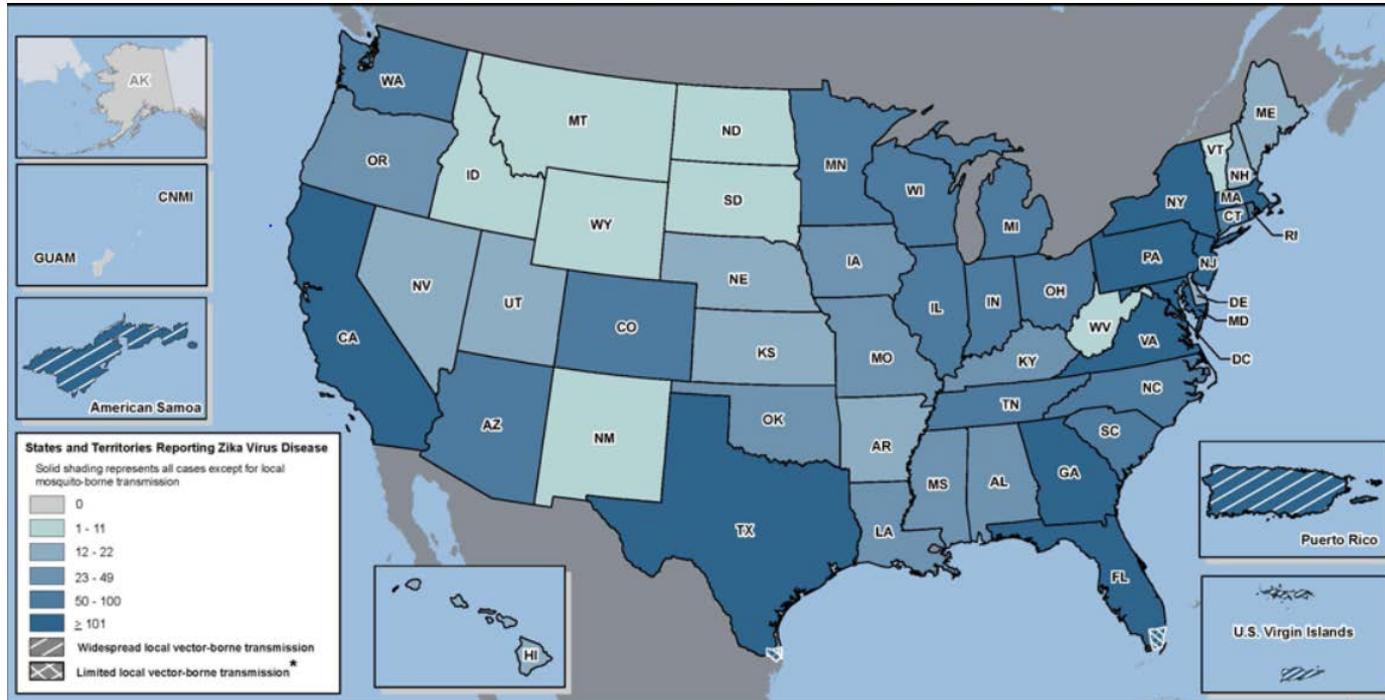
- From 2007–2014, 14 Zika virus disease cases identified in US travelers
- With recent outbreaks in the Americas, cases among US travelers increased substantially
- Limited local mosquito-borne transmission identified in Florida and Texas
- Outbreaks in three US territories (Puerto Rico, US Virgin Islands, and American Samoa)

# Laboratory-confirmed Zika virus disease cases reported to ArboNET by US states or territories, 2015–2017 (as of Mar 8, 2017)

	<b>States</b> <b>N=5,109</b>		<b>Territories</b> <b>N=38,099</b>	
Travel-associated	4,813	(94%)	147	(<1%)
Locally acquired	221	(4%)	37,952	(99%)
Other routes*	75	(1%)	0	(0%)

\*Includes sexual transmission (n=45), congenital infection (n=28), laboratory transmission (n=1), and person-to-person through an unknown route (n=1)

# State or territory of residence for reported Zika virus disease cases — United States, 2015–2017 (as of Mar 8, 2017)



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

# State of residence for reported Zika virus disease and presumptive viremic blood donor cases — US states, 2015–2017

(as of Mar 8, 2017)

State	Symptomatic disease cases (N=5,109)	Presumptive viremic blood donor† (N=39)
New York	1,007 (21%)	3 (8%)
Florida	1,095* (21%)	24 (62%)
California	431 (9%)	5 (13%)
Texas	317* (6%)	3 (8%)
New Jersey	180 (4%)	0 (0%)
Pennsylvania	175 (4%)	0 (0%)
Maryland	133 (3%)	0 (0%)

† People who reported no symptoms at the time of donating blood, but whose blood tested positive when screened for the presence of Zika virus RNA by the blood collection agency. Some presumptive viremic blood donors develop symptoms after their donation or may have had symptoms in the past. These individuals may be reported as both Zika virus disease cases and presumptive viremic blood donors.

\* Includes 215 cases in FL and 6 cases in TX acquired through presumed local mosquito-borne transmission

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



# Mosquito-borne Zika virus transmission in Florida

- Beginning in July 2016, sporadic, locally acquired cases identified in multiple counties in South Florida
- Active transmission identified in three small areas of Miami-Dade County
  - Recommendations for pregnant women to avoid travel to those areas and pregnant residents to be tested and followed
  - Intensive public health response, including aerial adulticide and larvicide applications, helped control the outbreaks
  - No evidence of ongoing, sustained local transmission

Likos et al. MMWR 2016;

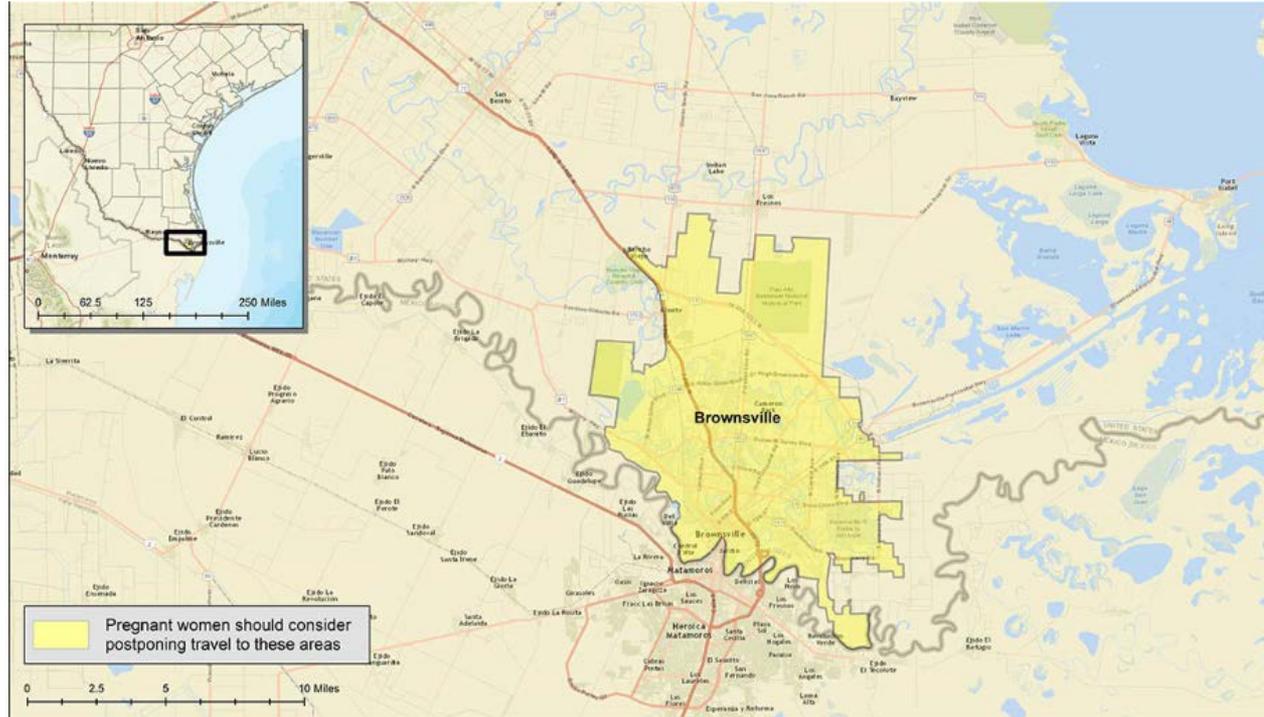
<http://www.floridahealth.gov/newsroom/2016/10/101116-zika-update.html>



# Mosquito-borne Zika virus transmission in Texas

- In November 2016, first case of local mosquito-borne Zika virus infection reported in Brownsville, Texas
- Area borders Mexico with frequent border crossings
- Active Zika virus transmission reported in Mexico near the US-Mexico border
- In December, CDC designated Brownsville a Zika cautionary (yellow) area
  - Recommendations for pregnant women to avoid travel to that area and pregnant residents to be tested and followed
- As of March 8, 2017, 6 cases of local mosquito-borne transmission reported from the Brownsville area

# Zika cautionary area in Brownsville, Texas



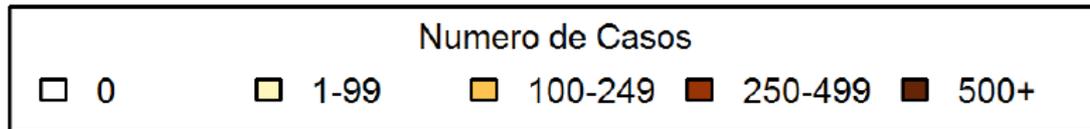
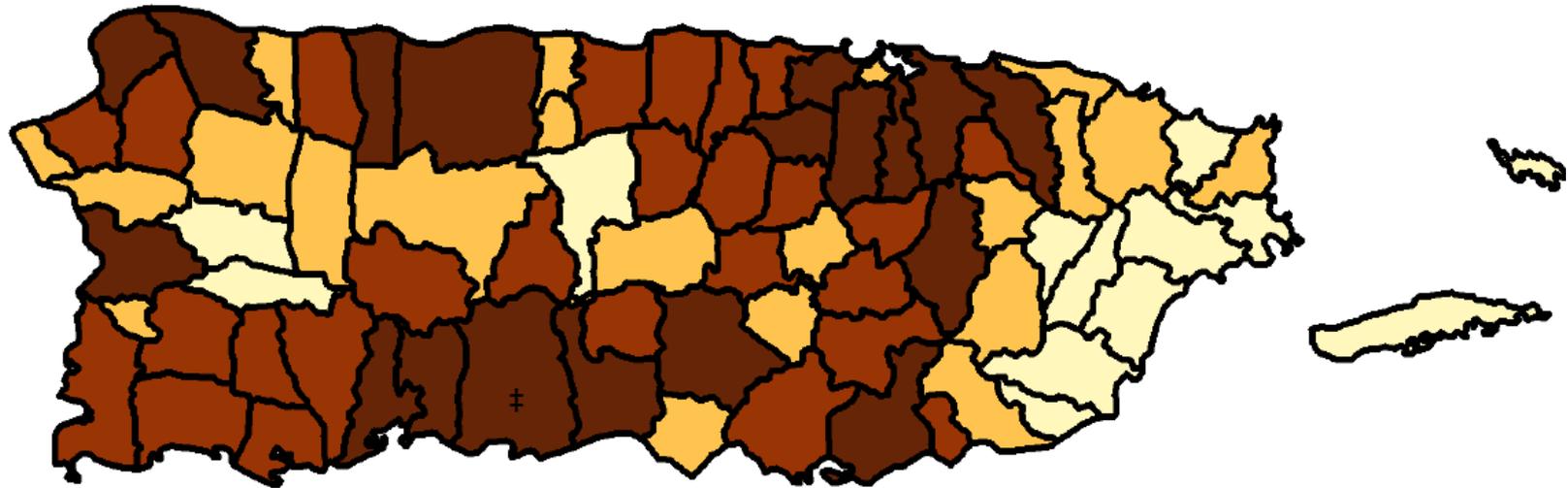
Brownsville, TX. Yellow shows areas where pregnant women should consider postponing travel.

# Reported Zika virus disease and presumptive viremic blood donor cases — US territories, 2015–2017 (as of Mar 8, 2017)

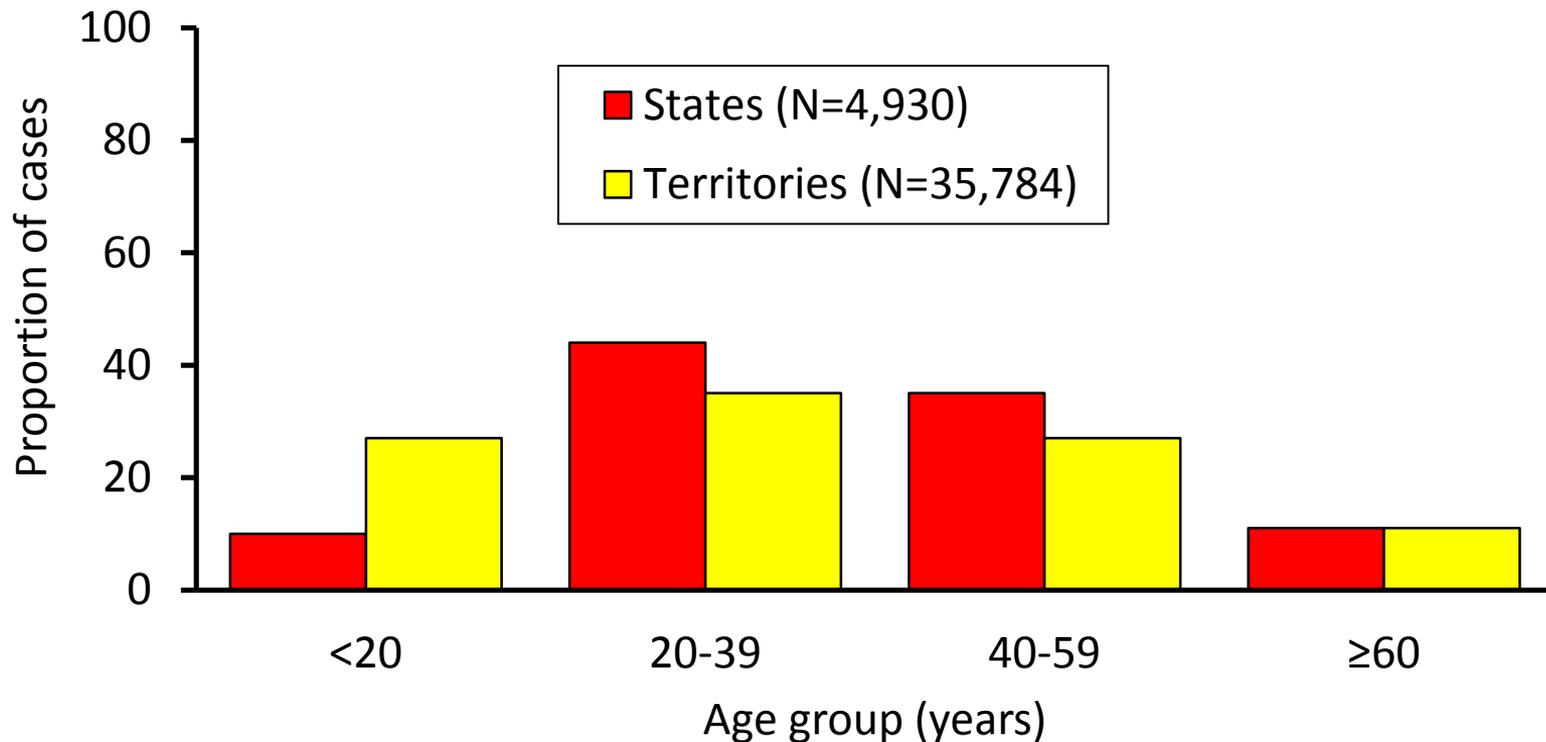
<b>Territory</b>	<b>Symptomatic disease cases (N=38,099)</b>	<b>Presumptive viremic blood donor† (N=318)</b>
Puerto Rico	36,967 (97%)	318 (100%)
US Virgin Islands	993 (3%)	0 (0%)
American Samoa	139 (<1%)	0 (0%)

† People who reported no symptoms at the time of donating blood, but whose blood tested positive when screened for the presence of Zika virus RNA by the blood collection agency. Some presumptive viremic blood donors develop symptoms after their donation or may have had symptoms in the past. These individuals may be reported as both Zika virus disease cases and presumptive viremic blood donors.

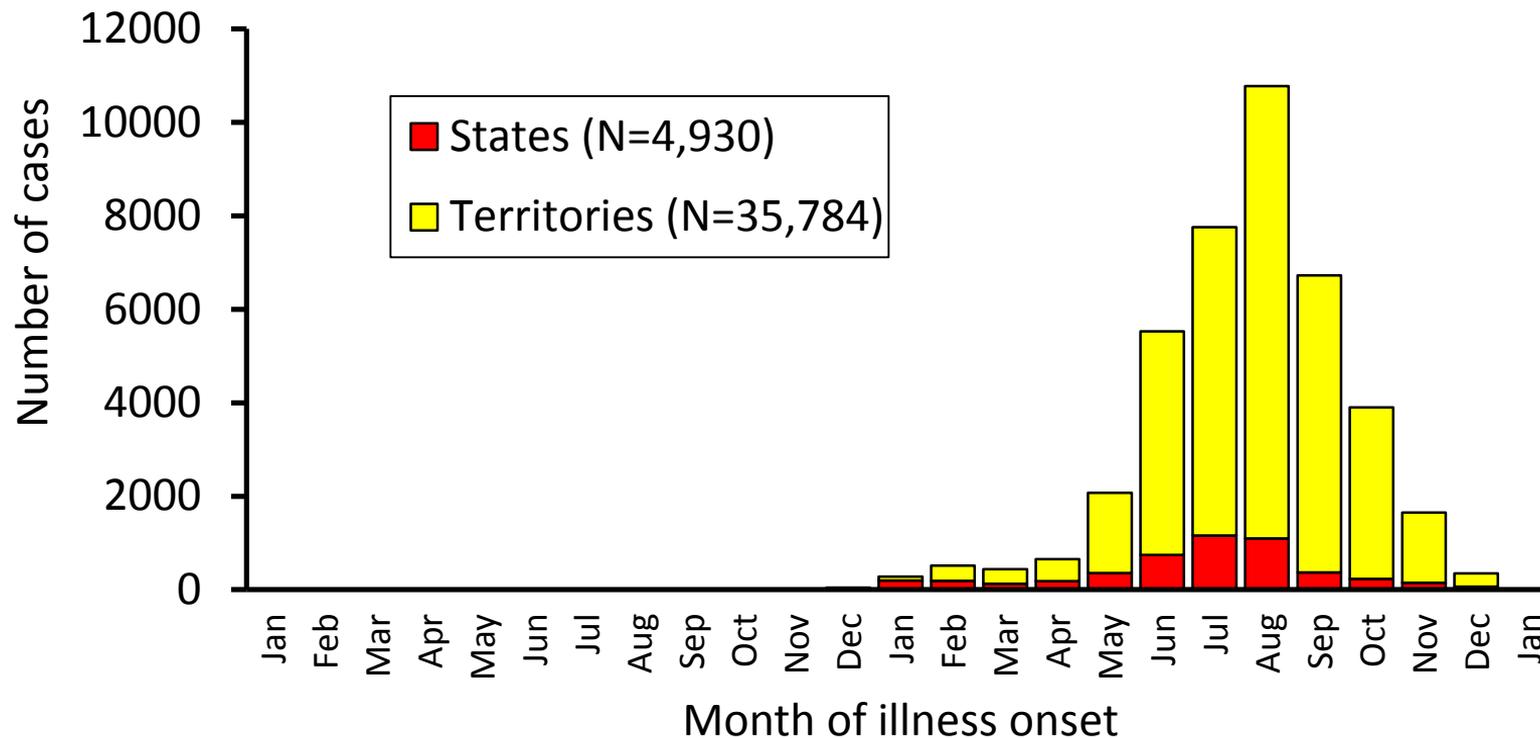
# Municipality of residence for reported Zika virus disease cases — Puerto Rico, 2015–2017 (as of Jan 26, 2017)



# Age group for reported Zika virus disease cases — US states and territories, 2015–2017 (as of Jan 25, 2017)



# Month of illness onset for Zika virus disease cases — US states and territories, 2015–2017 (as of Jan 25, 2017)

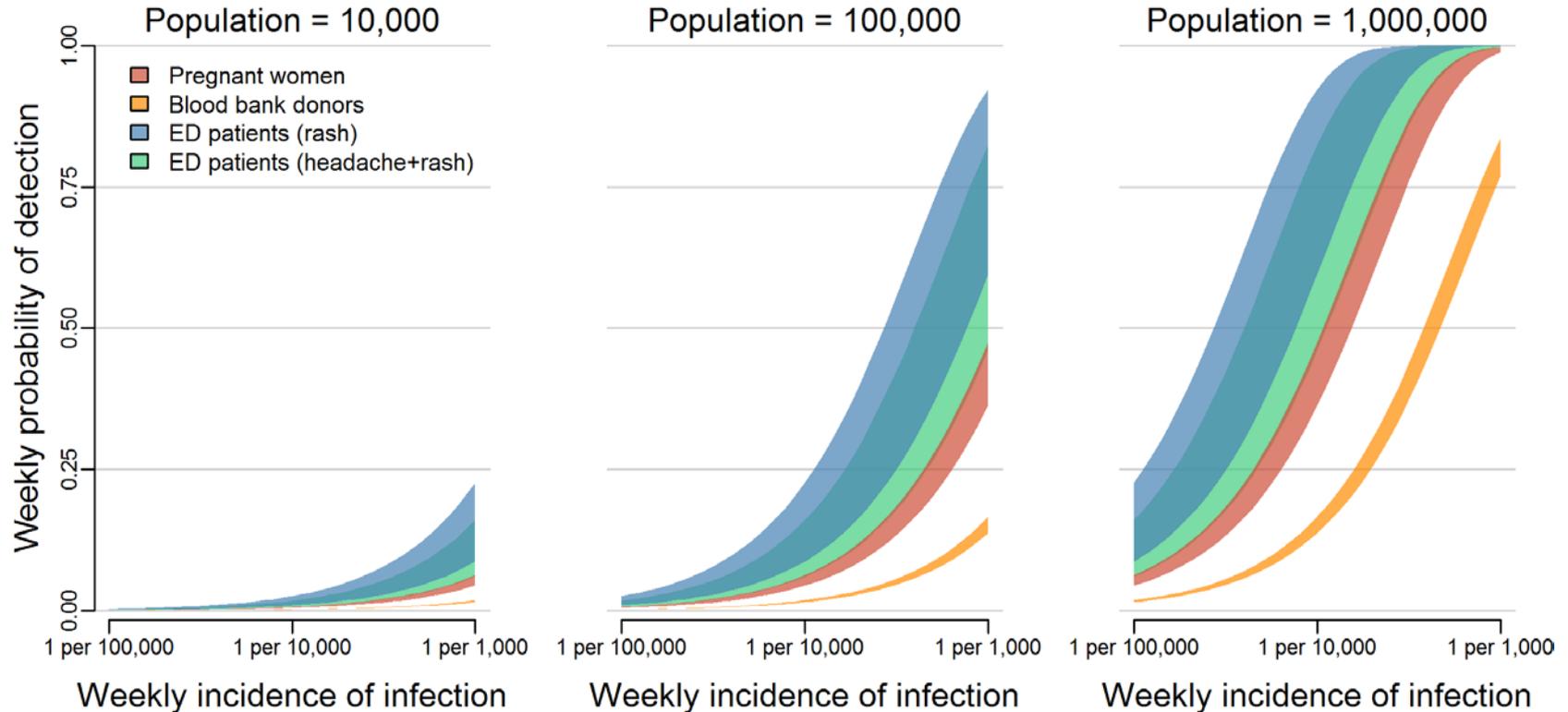


**Modeling to inform surveillance strategies  
to identify local transmission**

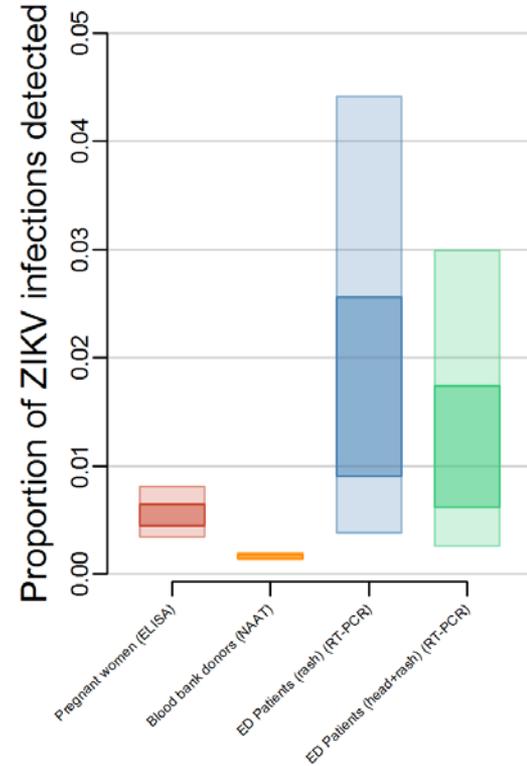
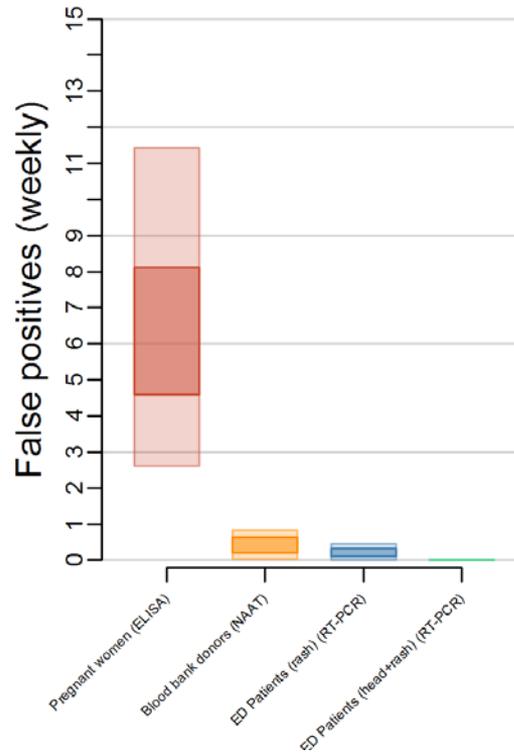
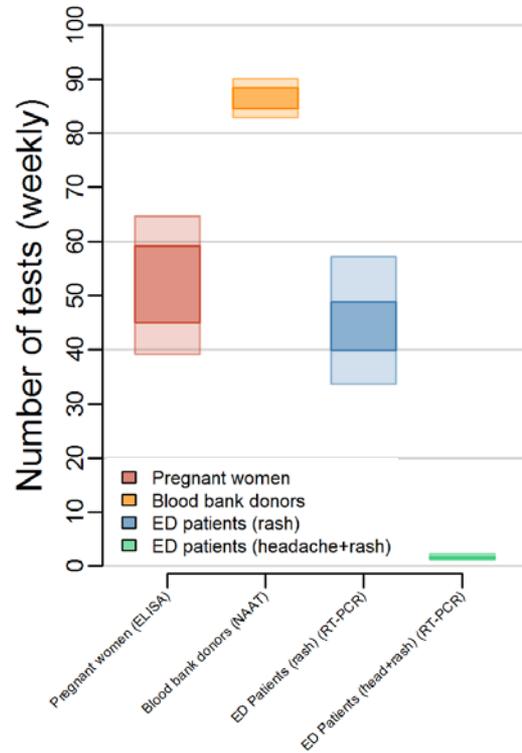
# Research Question

- In areas at risk for local Zika virus transmission that have no documented local transmission, what is the most effective way to detect transmission?
- General strategies
  - Pregnant women
    - Test all pregnant women twice during pregnancy (IgM MAC-ELISA)
  - Blood donors
    - Test all blood bank donors (NAAT)
  - Emergency department patients
    - Test symptomatic people visiting the ED with specific symptoms (rRT-PCR on serum)

# Probability of detecting ZIKV transmission with different strategies



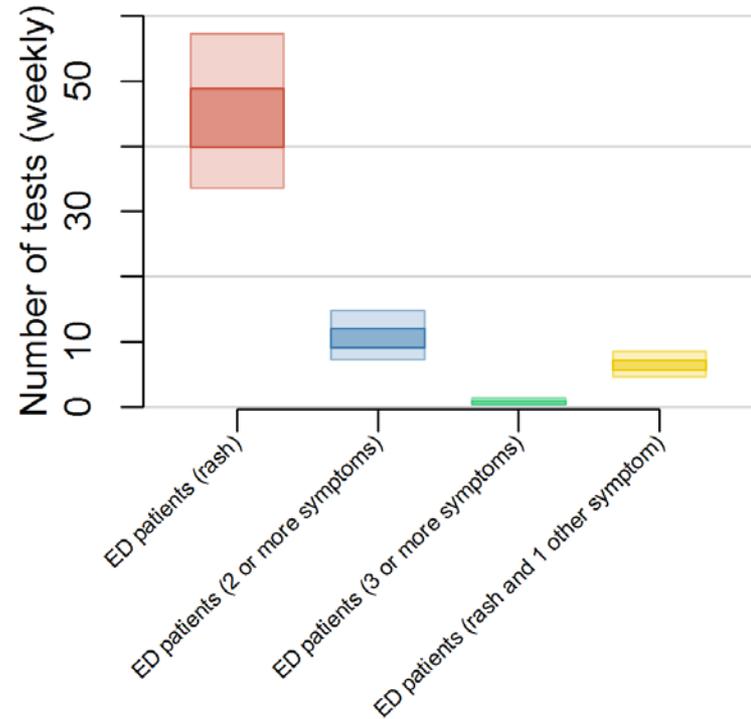
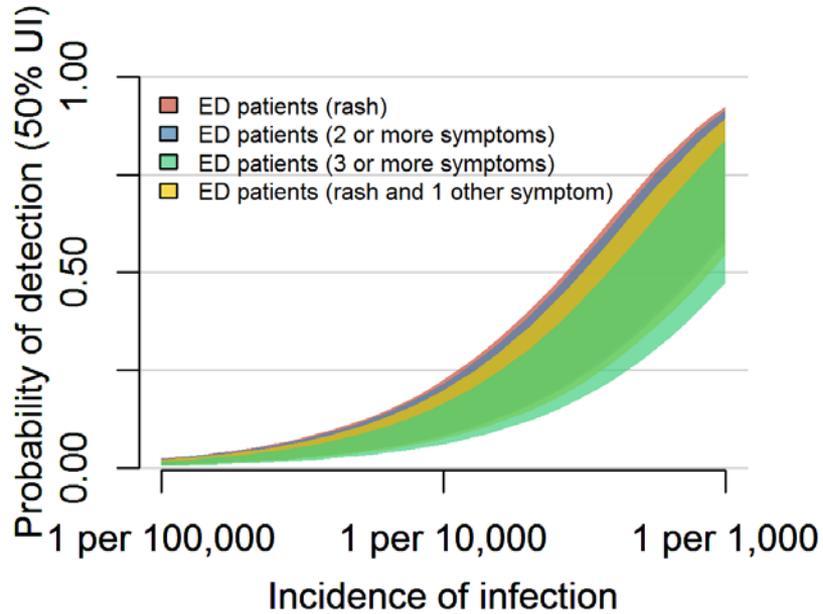
# Expected number of tests\*, false positive results\*, and proportion of infections detected



\*Population = 100,000, numbers scale directly with population size



# Probability of detection and test numbers by case definition



# Model limitations

- There are many variables, each one with substantial uncertainty and variability.
- The analysis was limited to three surveillance strategies, though many are possible.
- Syndromic surveillance was limited to ED visits.  
(We were only able to obtain detailed symptom data for ED patients.)
- The costs of implementing any of these systems should also be considered but was not analyzed here.

# Conclusions

- The probability of detection for a given surveillance strategy depends on the incidence of infection and the population size.
- The expected proportion of infections detected by any system is low.
- Assay specificity is important, as testing will largely occur on non-ZIKV infected individuals, requiring follow-up on all positive results.
- Testing ED patients with Zika symptoms is likely more effective than testing pregnant women or blood donors.  
(increased probability of detection and fewer false positive results)
- For surveillance among ED patients, case definitions should capture symptoms that are common in ZIKV infections and uncommon in ED patients (increased probability of detection and fewer false positive results).

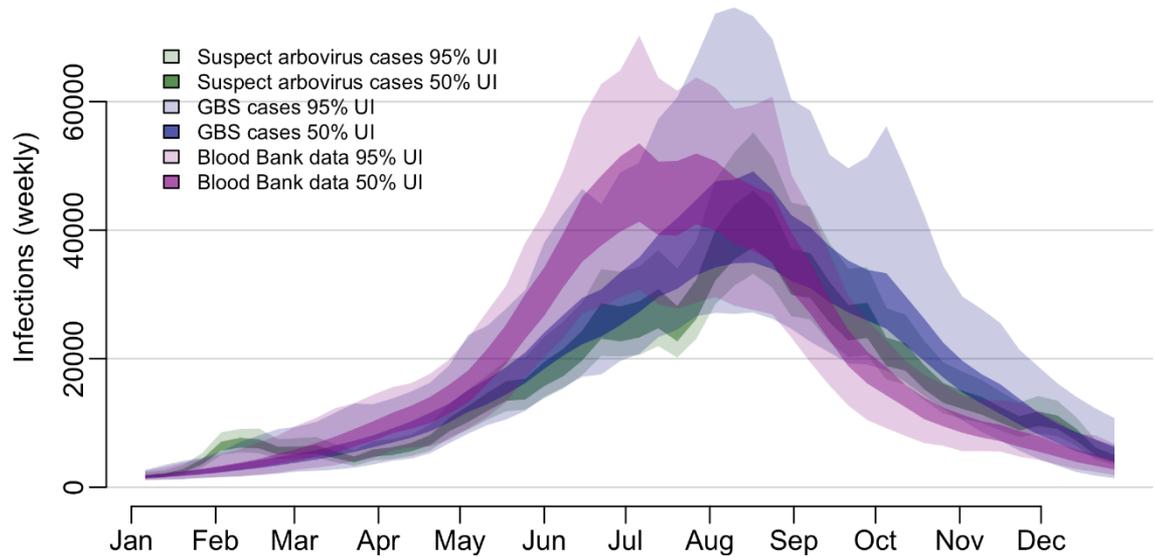
**What might we expect in 2017?**

# Zika dynamics in 2017

- Three tiers of risk
  1. Epidemics in tropical areas
  2. Infected travelers
  3. Local transmission in the continental US and Hawaii
- Evidence from Zika, chikungunya, and dengue

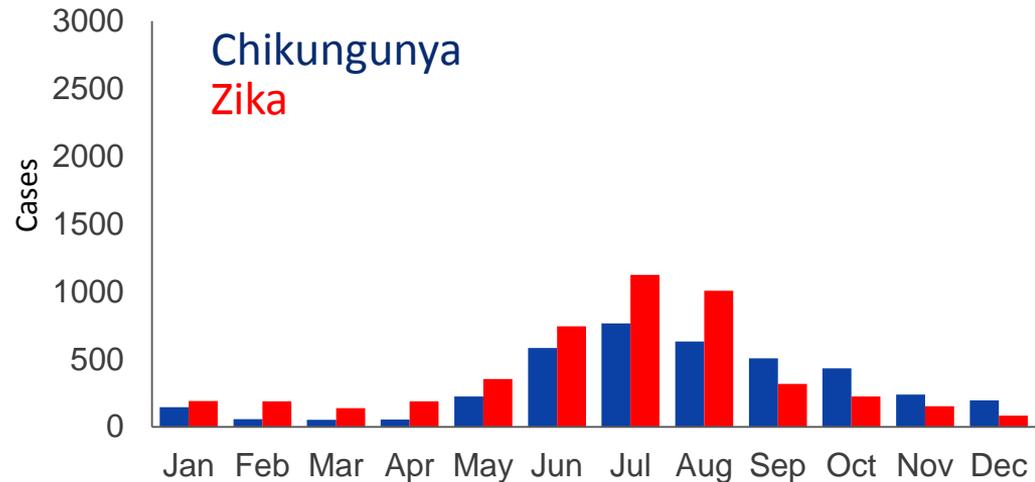
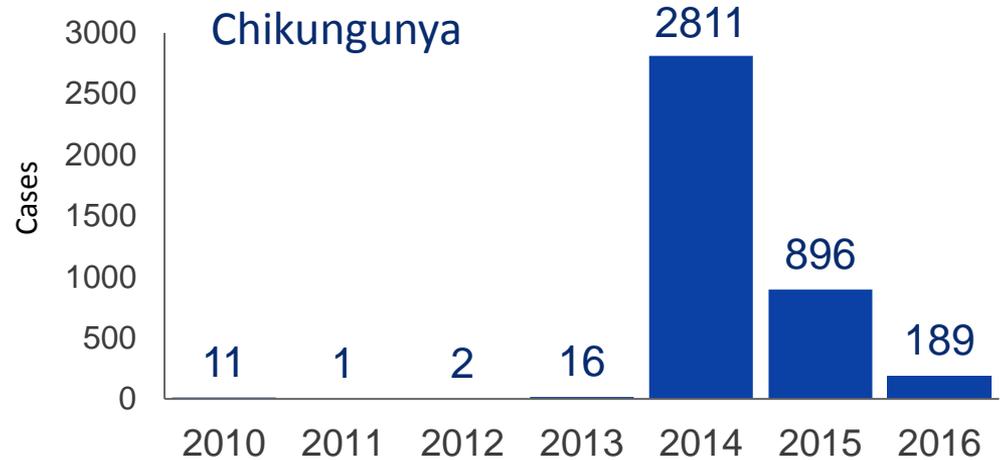
# Puerto Rico and other tropical areas

- Estimated 20-30% of Puerto Ricans infected in 2016
- Local transmission is likely to continue
- Another large epidemic is not likely
- Large-scale geographical spread is likely to be more restricted



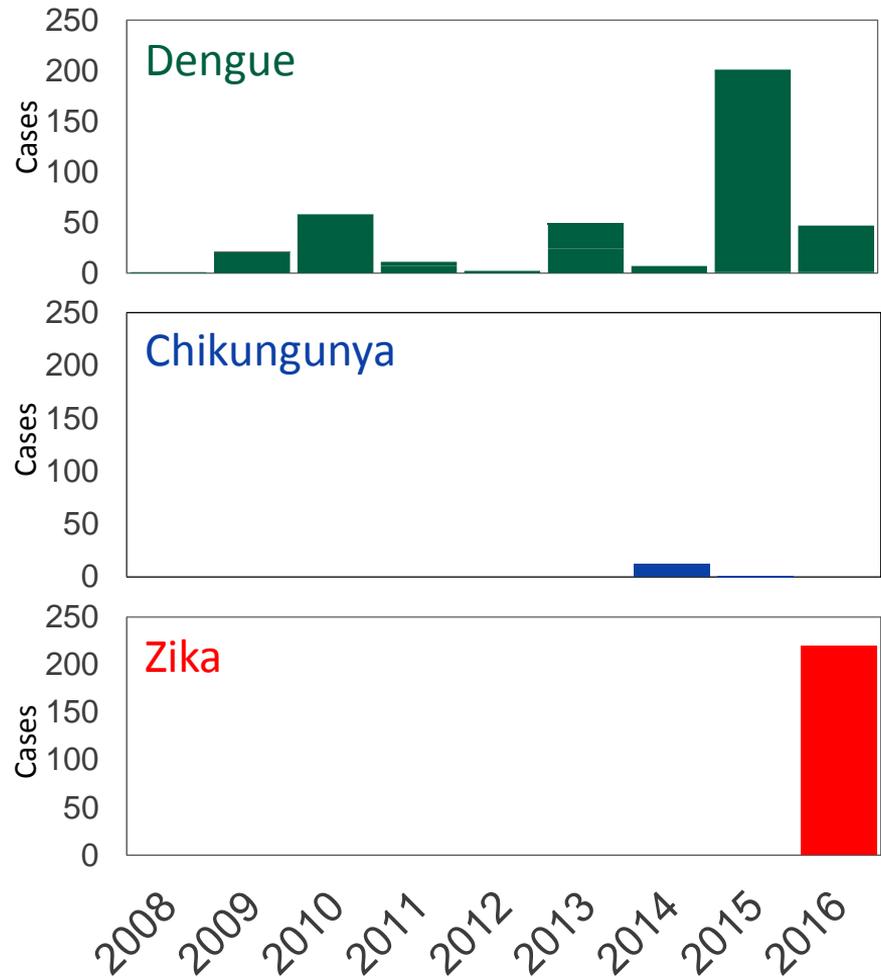
# Travel-associated cases

- After the initial chikungunya outbreaks, incidence among travelers declines.
- Travel-associated cases of chikungunya and Zika show seasonality.



# Autochthonous cases

- Although arbovirus introduction continues to happen, local transmission is limited.
- More awareness and increased surveillance activities likely increase case numbers.



# Conclusions

- In Puerto Rico and other dengue-endemic areas, herd immunity will likely reduce transmission of Zika virus in the near-future but not eliminate it.
- For US travelers, risk will continue but will likely decrease and show some seasonality (similar to chikungunya).
- In US states, limited local transmission may occur with sporadic cases or clusters.
- Improved surveillance and testing practices in the United States may lead to relatively higher case numbers compared to what we have seen with dengue and chikungunya.

**Questions/Discussion**

TELECONFERENCE OVERVIEW	DATE/TIME/LOCATION
<b>Laboratory Task Force</b> Eddie Ades, Robert Lanciotti, Christy Ottendorfer	<del>Wed 3/15/2017 / 2pm-3pm - Domestic</del> <del>Wed 3/15/2017 / 5 pm-6 pm - Islands</del> <del>Bridge Line: 1(888)972-6716/ Passcode: 6721430</del>
<b>Joint Information Center/Communications</b> Cathy Young, John O'Connor	<del>Wed 3/22/2017 / 2pm-3pm / Rm 5116</del> <del>Bridge Line: 1(888)972-6716/ Passcode: 6721430</del>
<b>Epidemiology Task Force</b> Stacey Martin, Carolyn Gould	Thurs 3/23/2017 / 2pm-3pm / Rm 5116 Bridge Line: 1(888)972-6716/ Passcode: 6721430
<b>Vector Issues Team</b> Janet McAllister, Audrey Lenhart	Tues 3/28/2017 / 2pm-3pm / Rm 5116 Bridge Line: 1(888)972-6716/ Passcode: 6721430
<b>Policy and Partnerships</b> Sue Visser, Melody Stevens	Wed 3/29/2017 / 1:30pm-2:30pm / Rm 5116 Bridge Line: 1(888)972-6716/ Passcode: 6721430
<b>Pregnancy and Birth Defects Task Force (including surveillance)</b> Peggy Honein, Dana Meaney-Delman, Suzanne Gilboa	Wed 3/29/2017 / 3pm-4pm / Rm 5116 Bridge Line: 1(888)972-6716/ Passcode: 6721430
<b>Blood Safety Task Force</b> <b>Sustainment Strategy Discussions</b> Koo Chung, Matt Kuhnert, Craig Hooper	Thurs 3/30/2017 / 2pm-3pm / Rm 5116 Bridge Line: 1(888)972-6716/ Passcode: 6721430
<b>Medical Investigations Team</b> <b>Sustainment Strategy Discussions</b> Maleeka Glover	Thurs 3/30/2017 / 3:30pm-4:30pm / Rm 5116 Bridge Line: 1(888)972-6716/ Passcode: 6721430

# Thank You!

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

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

