

MOSQUITO-BORNE DISEASES OF ARIZONA



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MOSQUITO-BORNE DISEASE OF ARIZONA

Culex spp. mosquitoes

- **Locally endemic diseases**
 - West Nile virus
 - St. Louis encephalitis



Aedes spp. mosquitoes

- **Diseases imported only, but could become endemic**
 - Chikungunya
 - Dengue



CULEX SPP.

WEST NILE VIRUS
&
ST. LOUIS ENCEPHALITIS



CULEX MOSQUITOES: EGGS AND LARVAE

Eggs laid in aquatic habitats, larvae prefer ground collections of water this is polluted with organic debris

- Associated with urbanization
 - Areas with poor drainage and sanitation
- Ex. Pools, puddles, ditches, rice fields, etc.



CULEX MOSQUITOES: ADULTS

Found throughout AZ

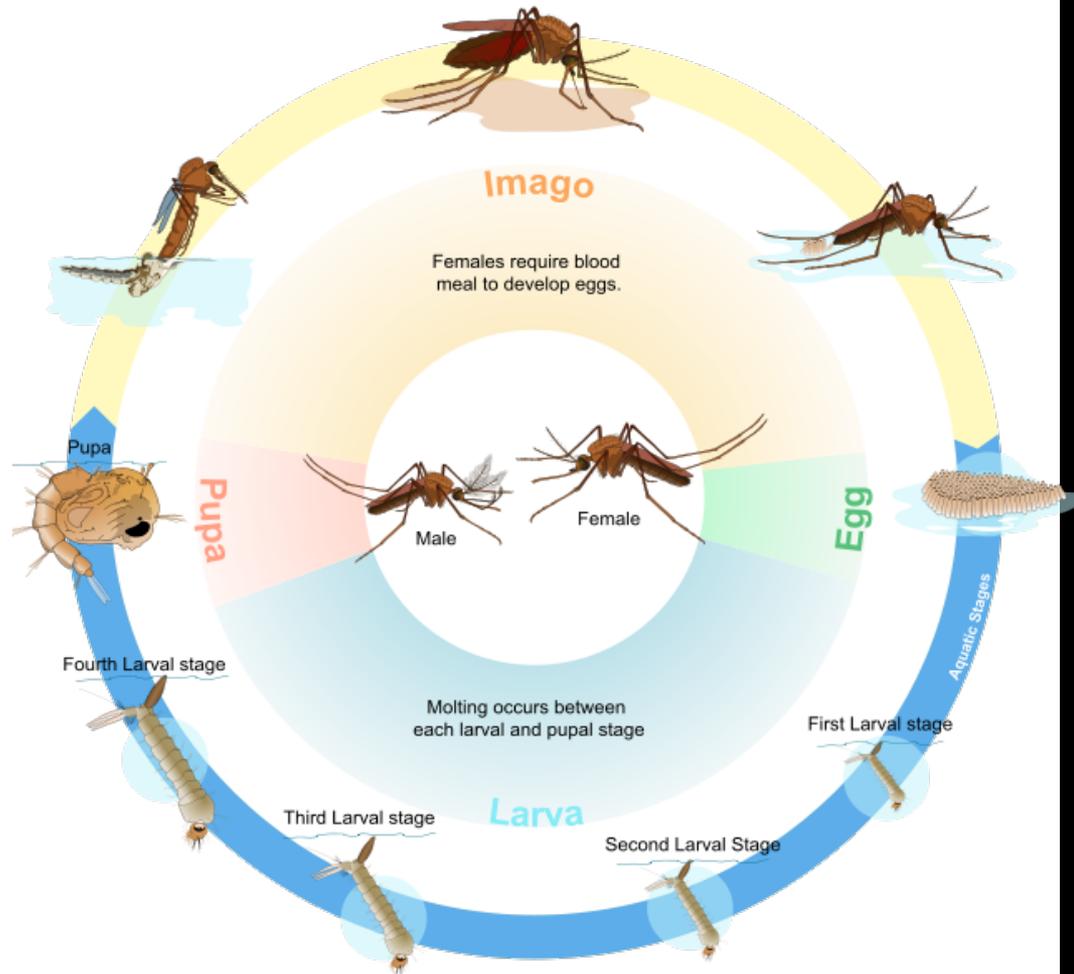
- *Culex tarsalis*
- *Culex quinquefasciatus*

Typically dusk/dawn biters

Will shelter either indoors or outdoors

Will feed on a variety of species

- Ex. Birds, horses, humans, etc.
 - Makes them good for zoonotic disease transmission



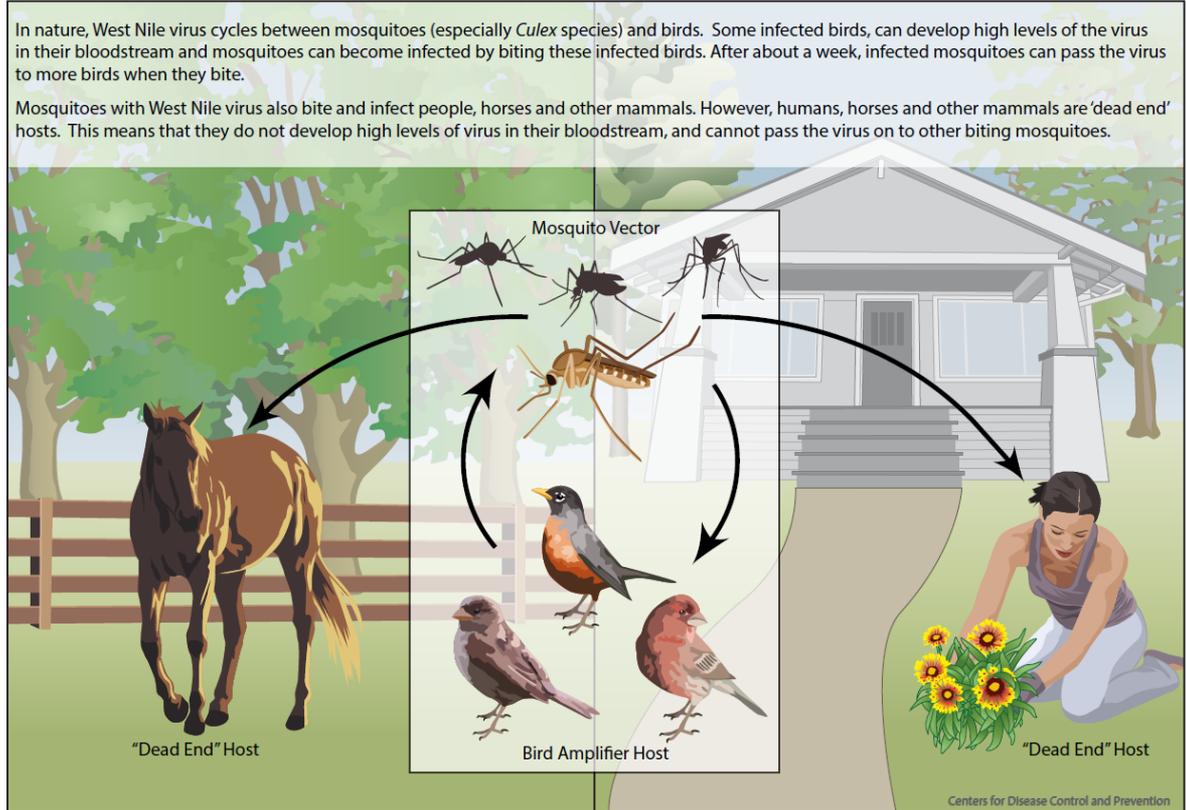
WEST NILE VIRUS

Most common arboviral disease of Arizona

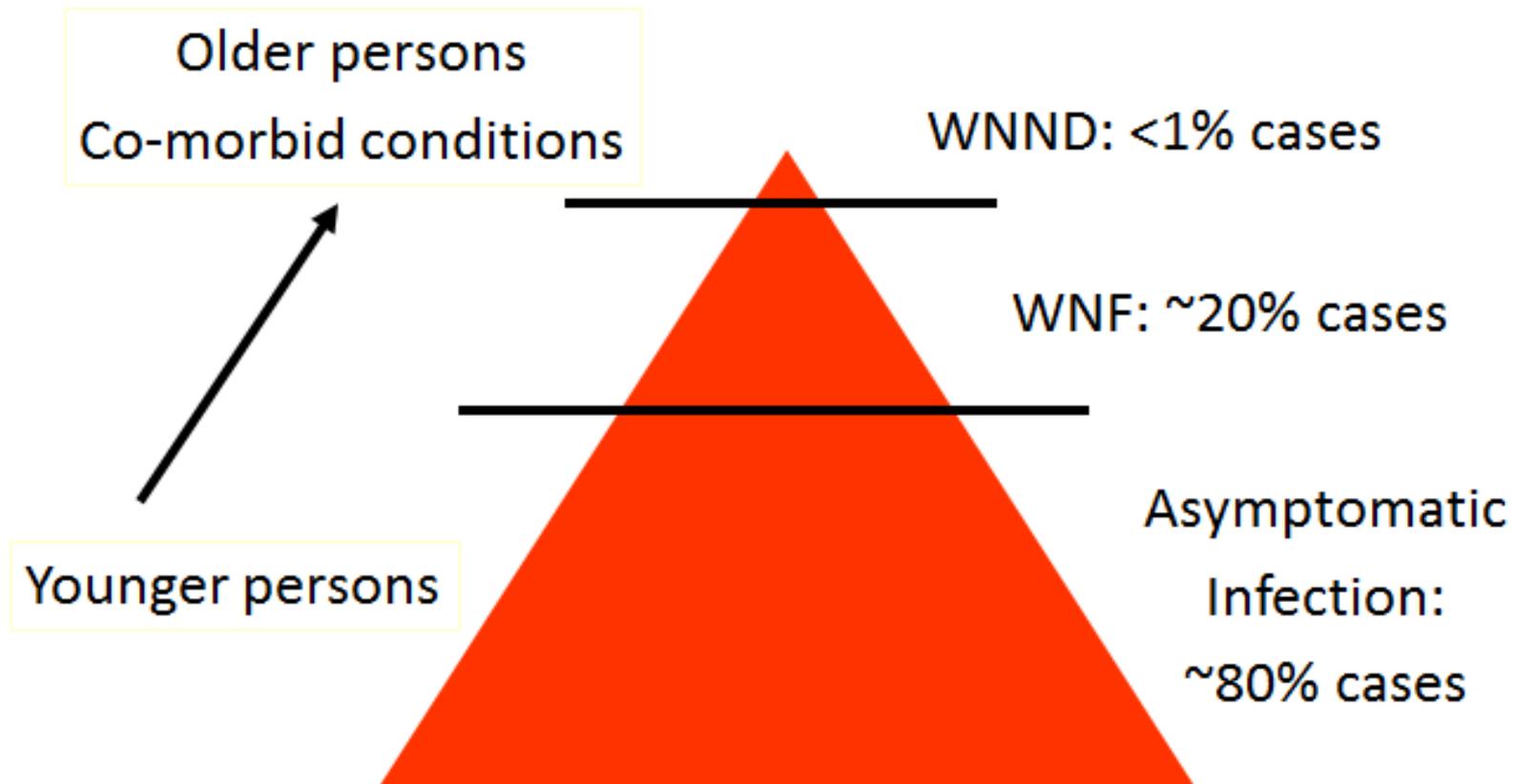
Only 10-20% of infections lead to disease

- Initially nonspecific
 - Fever, headache, nausea, vomiting, fatigue, etc.
- In severe cases, can become neuroinvasive
 - 1-2% of those may be fatal

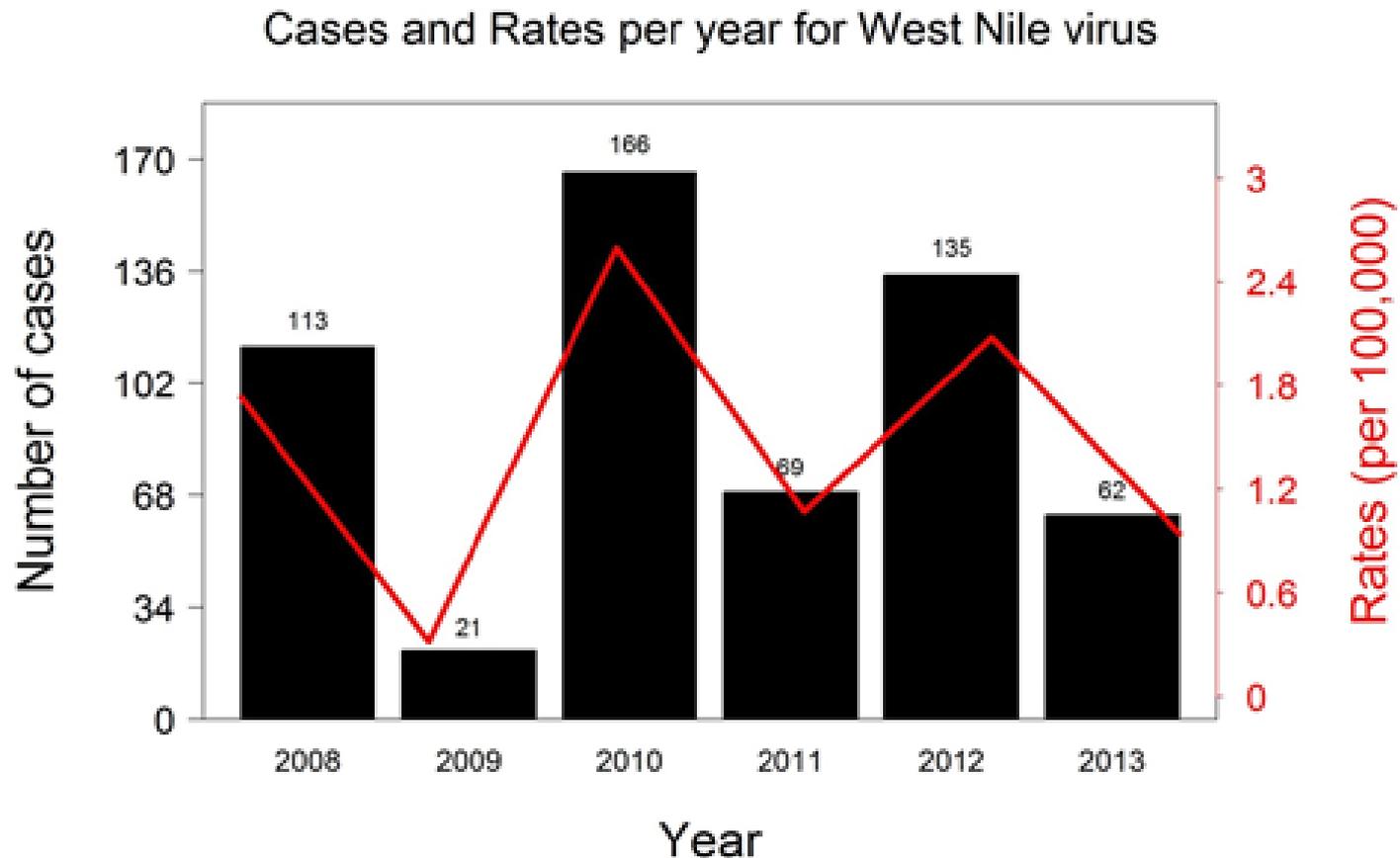
West Nile Virus Transmission Cycle



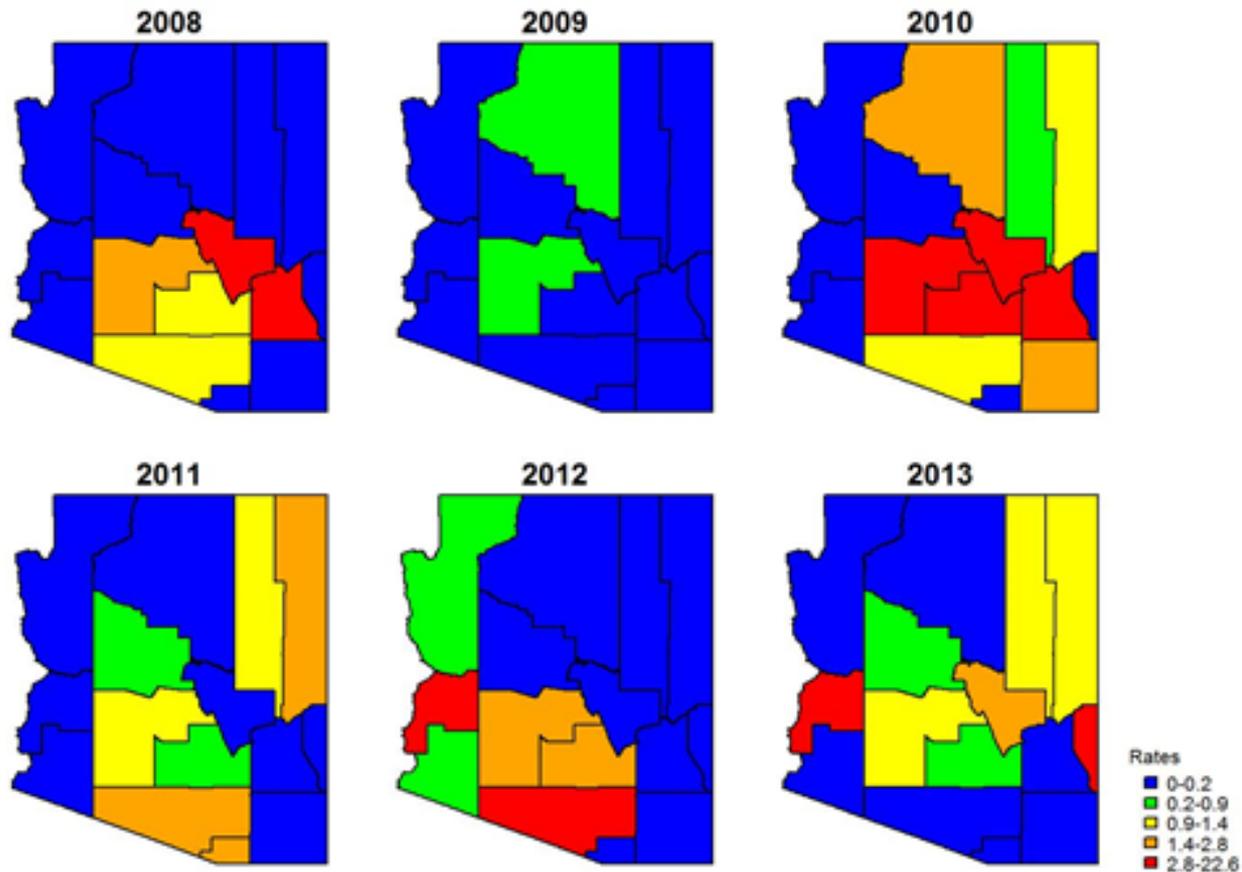
WNV CLINICAL "ICEBERG"



INCIDENCE RATE OF WNV IN ARIZONA

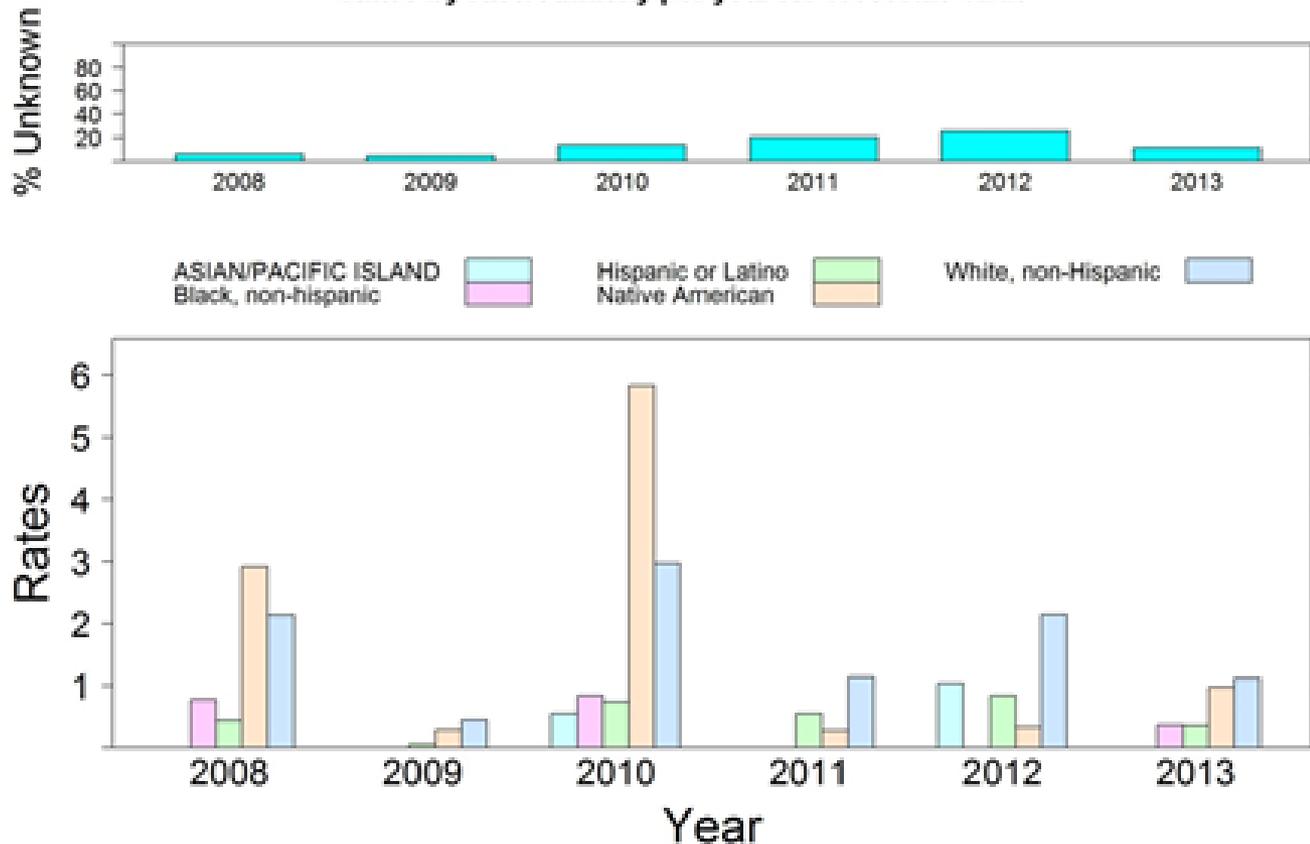


Spatial Distribution of WNV Cases by Incidence Rate



WNV Case Rates by Race & Ethnicity

Rates by race/ethnicity per year for West Nile virus



WNV SURVEILLANCE

Surveillance of human WNV cases

Mosquito pool surveillance

Surveillance of WNV in other animals

- Typically birds or horses



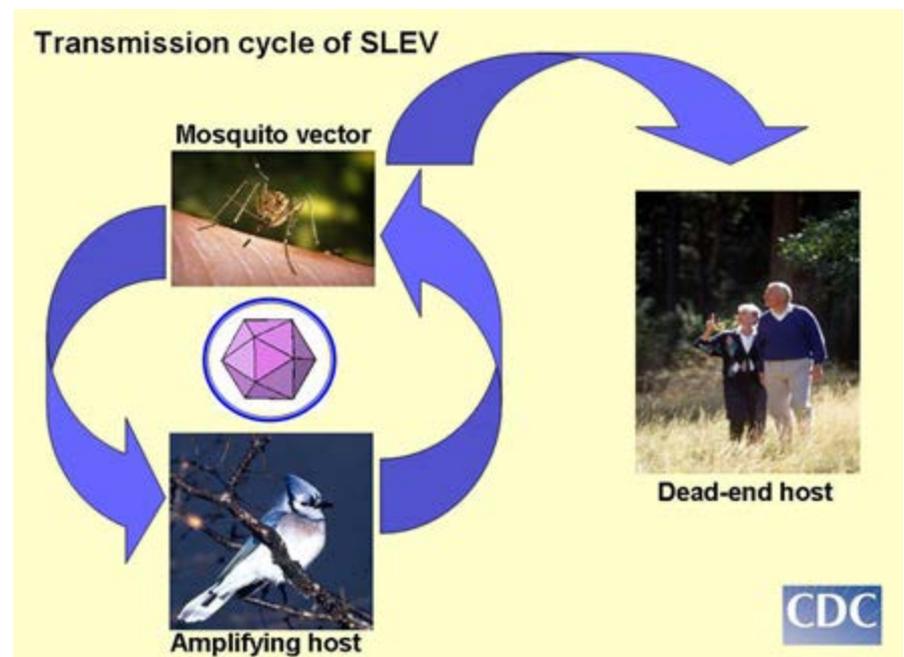
ST. LOUIS ENCEPHALITIS

Only one case in Arizona in the past five years, in 2014

We know that the mosquitoes are infected

Less than 1% of infections are apparent

- Will be either non-neuroinvasive or neuroinvasive
- 5-15% of cases are fatal



AEDES AEGYPTI

DENGUE
&
CHIKUNGUNYA



Aedes Aegypti MOSQUITOES: EGGS & LARVAE

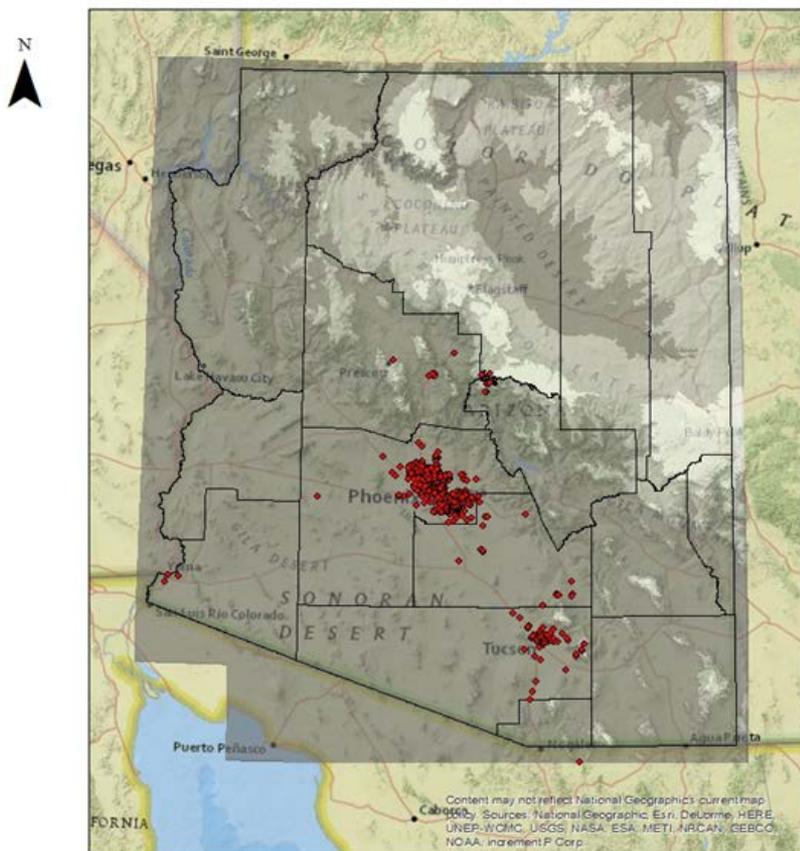
Eggs are black and laid singly just above the water line, they can withstand desiccation for over a year

Larvae prefer artificial water-holding containers

- Ex. Tires, buckets, etc.
- Usually found in or around human homes



AEDES MOSQUITOES: ADULTS



***Aedes aegypti* found dispersed throughout Arizona**

Daytime biting adults

Prefer to bite humans in and around their homes

Known sightings are just the tip of the iceberg

- Using *Culex spp.* surveillance data

CHIKUNGUNYA VIRUS

An RNA virus spread by mosquitos

- *Aedes spp.*
- Mosquito-human-mosquito-human cycle

First appeared in western hemisphere in December, 2013

- Since then has caused a huge outbreak in the Caribbean and Latin America

Naïve population + *Aedes* vectors = large outbreak potential

Probable locally acquired case in Sonora, Mexico → moving northward



- Current outbreak:
 - As of 1/22/15
 - 1,133,561 cases
 - 172 deaths



CHIKUNGUNYA: What is local transmission?

A person with no recent history of travel to an area with the virus who gets bitten by a mosquito infected with chikungunya virus where they live, work or play.



A mosquito bites a person who is sick with chikungunya and picks up the virus from the infected person's blood.

Infected mosquitoes can then spread the virus to other people through bites.



U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

CHIKUNGUNYA, CLINICAL

Most common symptoms: severe joint pain, fever, rash, nausea, vomiting, diarrhea

- Joint pain so severe can't leave bed
- 80-90% of all infections lead to disease

Mortality typically very low, <1%

BUT morbidity may be very high

- Chronic infection can cause months or years of rheumatic symptoms, fatigue, and depression

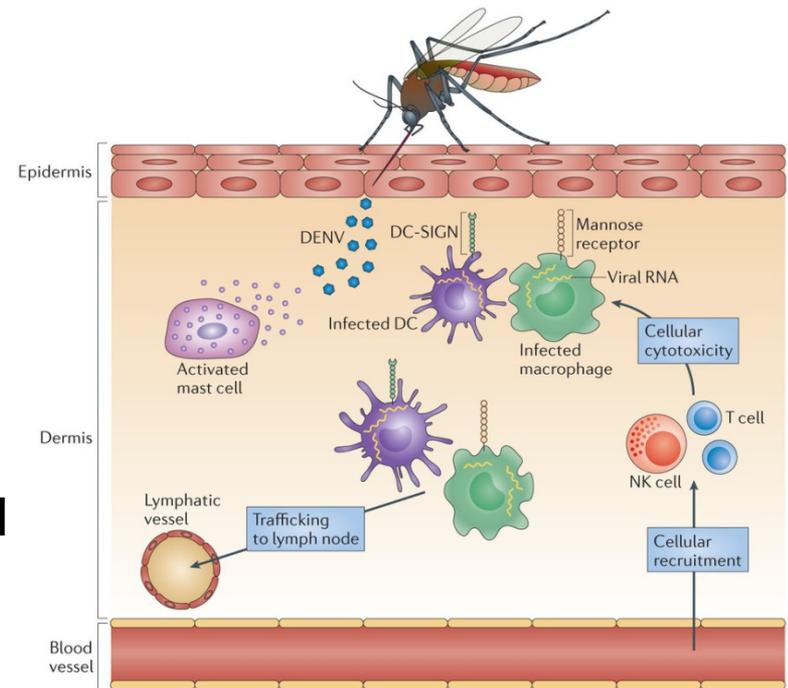
DENGUE BACKGROUND

RNA virus transmitted by *Aedes* mosquito vectors

Found globally throughout tropics and subtropics

Serotypes I, II, III, IV

- No cross-immunity
- Second infection (with different strain) much worse than the first.
 - Antibody dependent enhancement



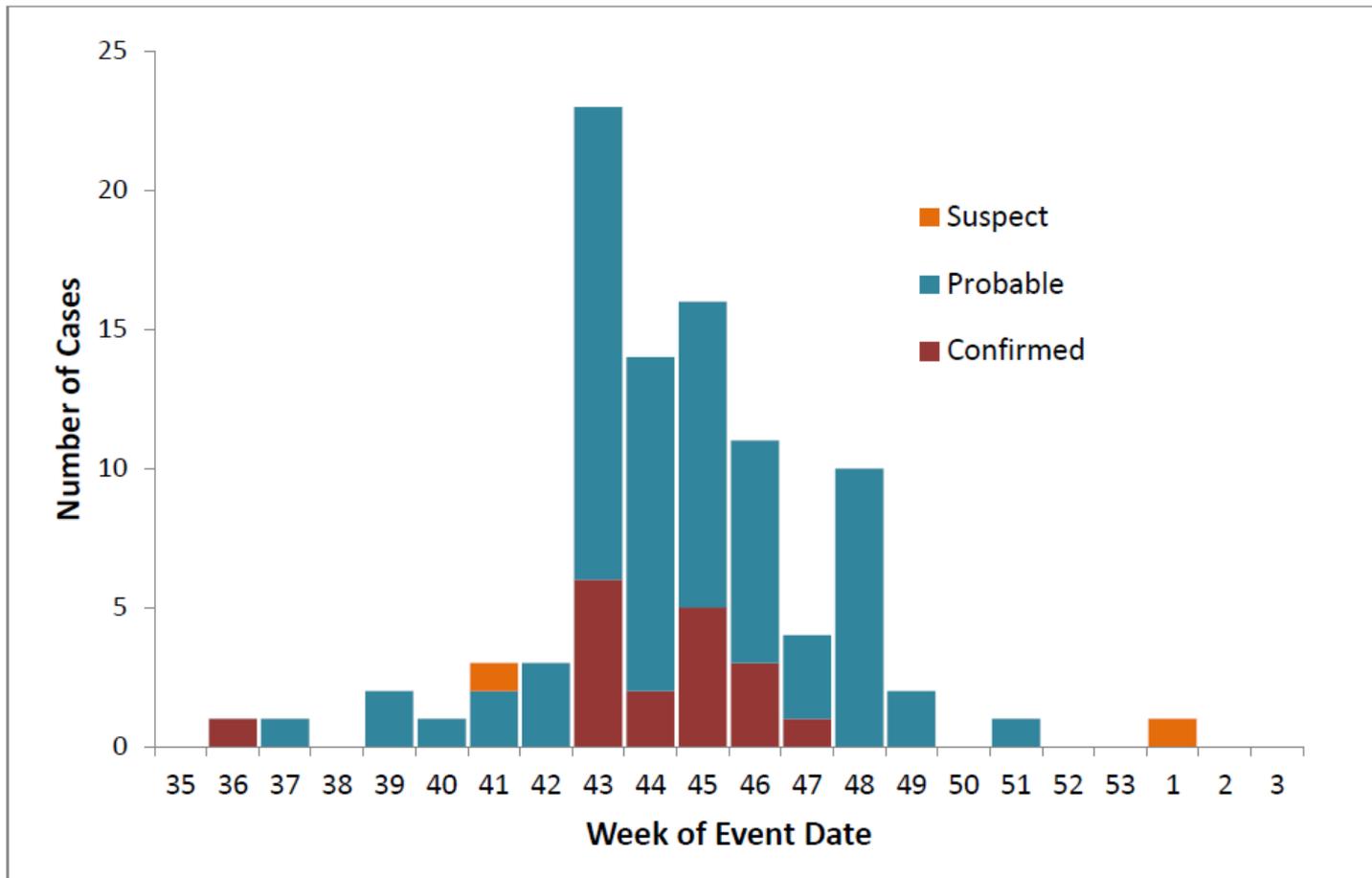
DENGUE, THE OUTBREAK

Dengue outbreak in Sonora, Mexico

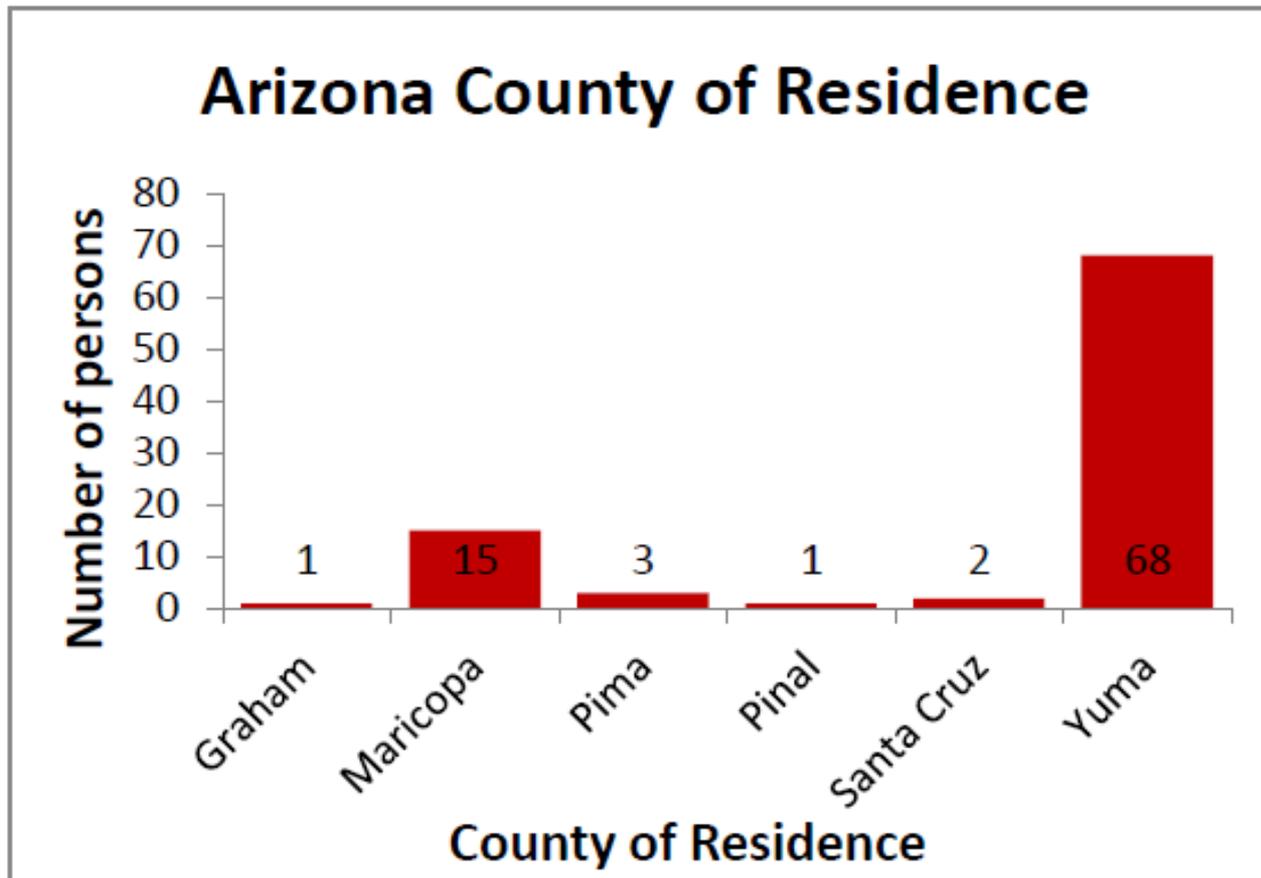
93 imported cases into AZ between Sept. 2014 and Feb. 2015



DENGUE OUTBREAK EPI CURVE



DENGUE OUTBREAK CASES BY COUNTY



MULTIPLE CLINICAL MANIFESTATIONS

Dengue-like illness

- Fever and travel to dengue-endemic area

Dengue

- Fever and at least one of the following:
 - Nausea/vomiting, rash, aches/pains, tourniquet test positive, leukopenia, abdominal pain/tenderness, extravascular fluid accumulation, mucosal bleeding, liver enlargement, increasing hematocrit with platelet count decrease

Severe dengue

- Dengue with any of the following:
- Severe plasma leakage, severe bleeding, severe organ involvement

PREVENTION

AND



CONTROL

VECTOR CONTROL

Public education

- Source reduction
- Personal and property protection

Conduct Surveillance

- Evidence based control efforts

Source Reduction

- Eliminate egg laying sites

Larviciding

- Apply larvicides to larval habitats

Adulticiding/Fogging

- Prioritize fogging based on surveillance



SOURCE REDUCTION

Eliminating larval habitats

- Tires, bird baths, containers, rain gutters, unused swimming pools
- Education component is very important
- Most useful for *Aedes spp.*



PERSONAL PROTECTION

Reduce time outdoors

Long pants and sleeves

Use mosquito repellent

- Apply according to instructions
- Reapply according to instructions
- Apply after sunscreen



HOME PROTECTION

Keep window screens intact, or use AC

Source reduction, source reduction, source reduction

Treat non-removable standing water with insecticide

Remove water collecting debris from the yard



TARGET BY SPECIES

CULEX SPP.

Focus on larvicides, adulticides, etc. in the high risk areas

- At community level
- Standing ground water areas
- Agricultural areas
- Education for personal protection
- Etc.

AEDES SPP.

Education for homeowners

- Household level
- *Aedes aegypti* live in and around human homes, so focus on education
- Source reduction near homes
- Home protection
- Personal protection

Protect yourself from West Nile Virus

- Use Insect repellents that contain **DEET**.
- **Drain** any standing water.
- **Dress** in long, loose, light-colored clothing.
- Use repellent & protective clothing from **Dusk** to **Dawn**.

ADHS'S ROLES

ARIZONA
PREPAREDNESS &
RESPONSE
HANDBOOK FOR
CHIKUNGUNYA &
DENGUE



Classify, track, and analyze human disease cases

Database management and analysis of vector data

Provide support to county and tribal partners, when requested

Disease and vector surveillance reporting to federal partners

Educational campaigns and assessments for the public, clinicians, and local partners

1/23/2015

Arizona Department of Health Services

PREVENTION EDUCATION CAMPAIGN

ADHS WNV website: www.westnileaz.com

ADHS staff available for presentations

Brochures in English & Spanish

WNV poster – backyard prevention



QUESTIONS?



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Vectorborne and Zoonotic Disease Program
Office of Infectious Disease Services, ADHS

SOURCES/ADDITIONAL RESOURCES

Center for Disease Control and Prevention SLE webpage:

- <http://www.cdc.gov/sle>

Center for Disease Control and Prevention Chikungunya webpage:

- <http://www.cdc.gov/chikungunya/>

Center for Disease Control and Prevention Dengue webpage:

- <http://www.cdc.gov/Dengue/>

Center for Disease Control and Prevention (CDC) WNV webpage:

- http://www.cdc.gov/ncidod/dvbid/westnile/surv&control_archive.htm

Arizona Dept. of Health Services WNV page:

- <http://azdhs.gov/phs/oids/westnile/>