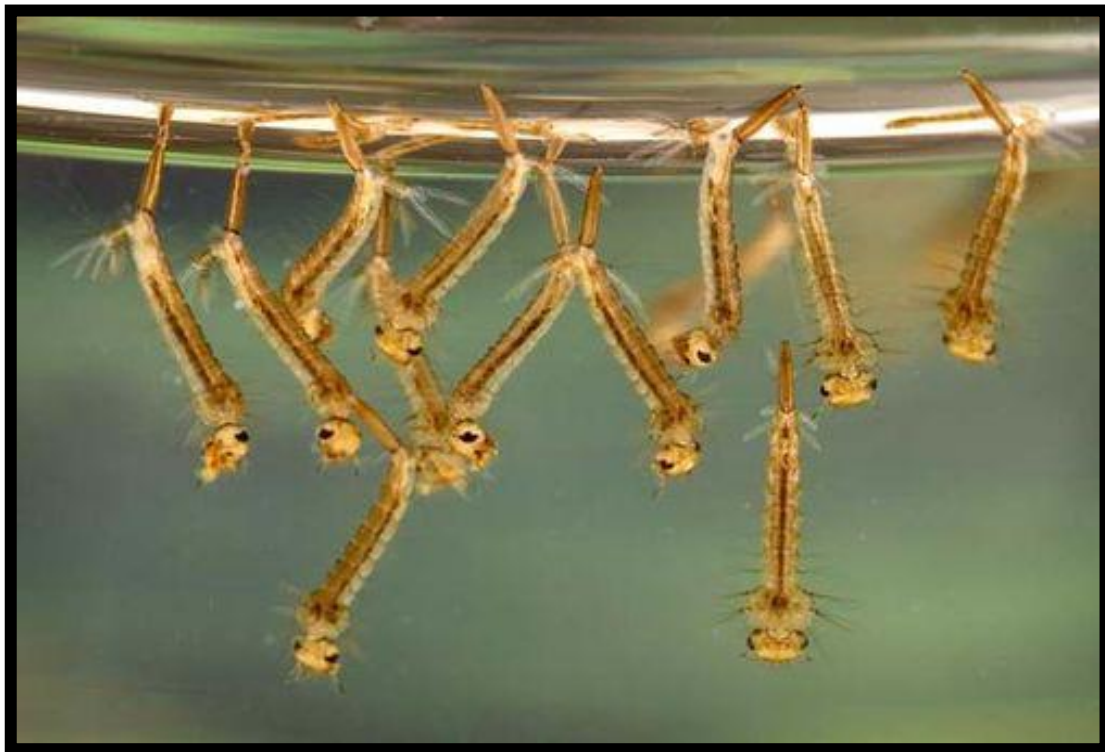


West Nile Virus in Maricopa County



Culex larvae found collecting in standing water

Image by CDC/James Gathany - License: Public Domain.



Maricopa County Department of Public Health
Office of Epidemiology
June 2011

January 1, 2010—December 31, 2010

Commentary

West Nile virus (WNV) is a mosquito-borne virus that causes a non-specific, self-limited, febrile illness. Mosquitoes become infected when they feed on infected birds that have migrated into an area. The mosquitoes then bite people who may or may not become infected. The cycle of WNV occurs at an unusually high intensity when there is both a large number of infected birds and a high concentration of infected mosquitoes in a relatively small geographic area. Mosquitoes are the known carriers (vectors) of the virus from the host birds to humans. Humans and animals (i.e., horses) are incidental hosts in this bird-mosquito cycle, and thus cannot pass the virus to others. Because WNV causes death in birds, we expect dead birds to be the first warning of WNV activity in an area.

WNV is widespread in Africa, North America, Europe, the Middle East, India, Southeast Asia, Australia, the Caribbean and Central and South America. Although it is now widespread in the United States, WNV was not present in Arizona until 2003. WNV is now endemic in Maricopa County and is expected to be a public health concern indefinitely. WNV surveillance season begins April 1st and ends November 30th, however, in Arizona the majority of cases occur between the months of June and October, with cases as early as January and as late as November. All residents and visitors are urged to continue to take precautions against WNV infection every year.

The Maricopa County Department of Public Health (MCDPH) and the Maricopa County Department of Environmental Services (MCDES) work closely to educate and protect the residents of Maricopa County against WNV. MCDES has an extensive mosquito-trapping program that enables staff to identify areas where there is a lot of mosquito activity and to detect mosquito-borne diseases. Various types of mosquito traps are set up throughout the county to collect mosquitoes for testing. These mosquitoes are pooled together, by species, into groups of 1-50 mosquitoes. This collection of mosquitoes is called a mosquito pool. The mosquitoes are then ground up and tested for WNV and other mosquito-borne diseases. MCDES responds to complaints regarding green (unattended) swimming pools, stagnant water, dead birds, and mosquitoes.

MCDPH is responsible for the interaction of the virus with humans. Working with hospitals and medical providers throughout the county, Public Health conducts disease surveillance to find “hot spots” in the Valley where there are a particularly high number of people with WNV. MCDPH nurses and epidemiologists monitor patients with potential WNV symptoms who seek medical care, monitor disease patterns in order to stop

transmission of the virus, and assist the public by giving recommendations for controlling the spread of or exposure to WNV in many different settings.

The majority (~80%) of people infected with WNV will show no symptoms at all. For those that are symptomatic (~20%), symptoms will appear 2-14 days after receiving the mosquito bite. Symptomatic cases are characterized by the acute onset of fever, headache, arthralgias, myalgias, and sometimes accompanied by a maculopapular rash or lymphadenopathy. Rarely do symptoms get more severe; however, 1-3% of symptomatic infections will develop into a neuroinvasive form of the disease. In neuroinvasive West Nile virus, the central nervous system (CNS) is involved and clinical syndromes ranging from meningitis (inflammation of the lining of the brain and spinal cord) to encephalitis (inflammation of the brain), or acute paralysis can occur. There is no treatment for WNV; only supportive care can be given.

Between January 1, 2010 and December 31, 2010, the MCDPH received reports of 126 residents infected with WNV, 115 of whom developed symptoms, and 12 of whom died from the disease. This was the second highest year for West Nile cases in Maricopa County ever recorded, but was still substantially lower than the 355 cases reported in 2004.

This represents a substantial increase in cases from the 19 cases reported in 2009. It should be noted that the 2009 season coincided with the increase in summer influenza cases during the H1N1 influenza pandemic, and therefore fewer WNV cases may have been detected and/or reported.

The 2010 WNV season was unusual as there were a high number of cases and mosquito positives reported early in the summer (mostly in July) from residents and mosquito pools in the East Valley. This intense, localized transmission of WNV was unlike transmission patterns seen from 2005 to 2009, which typically showed the peak number of cases and positives being reported in late August to September throughout Maricopa County (Figure 1). This focus of transmission occurred while there was minimal WNV activity throughout the rest of the United States. MCDPH and ADHS requested assistance from the Centers for Disease Control & Prevention (CDC) to define the size and scope of the outbreak, identify modifiable risk factors for WNV infection, and determine prevention techniques and messages to help curtail the outbreak. Reports on the findings from the CDC's investigation are forthcoming.

The following pages summarize the incidence of WNV cases in humans by age, gender, case classification and by city of residence. In addition, WNV surveillance indicators and data on mosquito pools are also summarized.

Figure 1. WNV Cases in Humans in Maricopa County by Month of Onset, 2005 - 2010

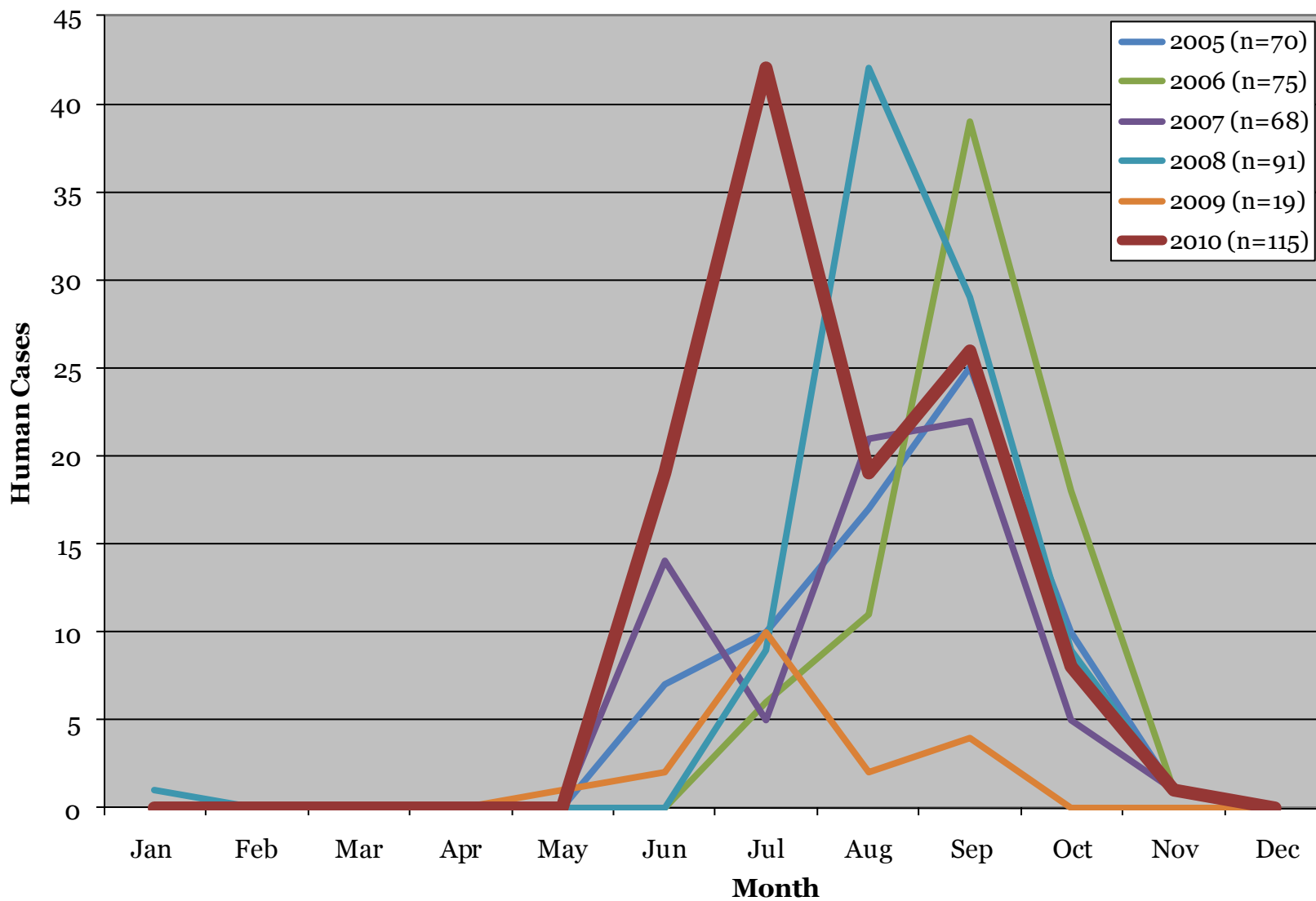
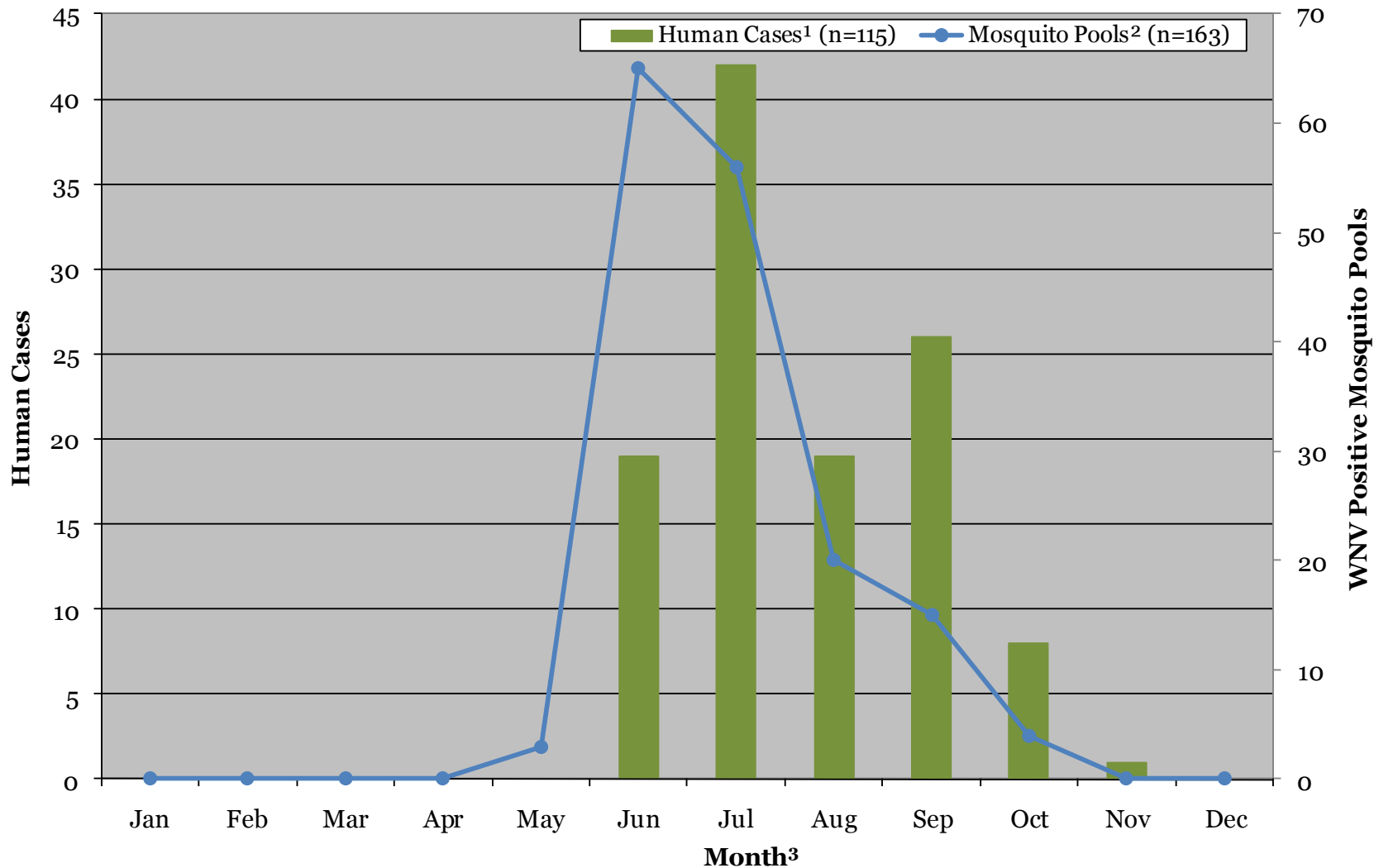


Figure 2. WNV Cases in Humans and WNV Positive Mosquito Pools in Maricopa County by Month, 2010

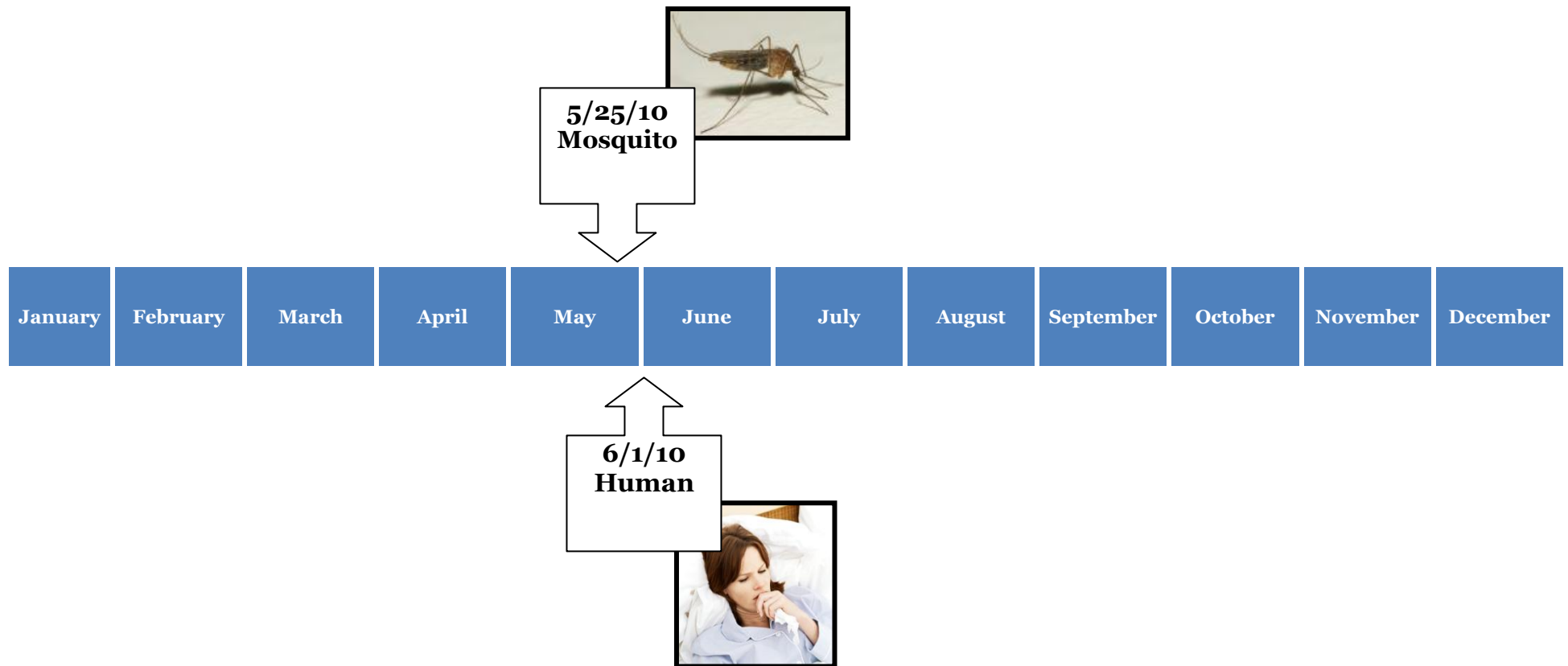


¹A human case is an individual infected with WNV and with a clinically compatible illness.

² Mosquito pools are a collection of mosquitoes that have been collected from a county trap that are pooled together, by species, into groups of 1-50 mosquitoes and then ground up and tested for WNV.

³ Human data are based on the date of symptom onset. Mosquito data are based on date specimen was collected. Since WNV has an incubation period ranging from 2-14 days, it is expected that there will be a lag between mosquito positives and human case onsets.

Figure 3. West Nile Virus Surveillance Indicators: Dates of First Positive Findings in a Mosquito Pool and Onset in a Human in Maricopa County, 2010*



*Reports from previous years have included the first positive equine. In 2010, no horses tested positive for WNV in Maricopa County.

Table 1. West Nile Virus Cases in Maricopa County by Gender and Case Classification, 2010

Case Classification ¹	WNV Cases		Total	% of Total Cases
	Male	Female		
Meningitis	17	18	35	30%
Encephalitis	20	10	30	26%
Paralysis Syndrome	3	1	4	3%
Neuroinvasive Disease Total	40	29	69	60%
Fever	19	8	27	23%
Fever in a viremic donor ²	4	2	6	5%
Unspecified ³	2	4	6	5%
Unspecified in a viremic donor ^{3,4}	2	5	7	6%
Non-Neuroinvasive Total	27	19	46	40%
Total Number of Cases	67	48	115	100%
Viremic Donors Asymptomatic ⁵	5	6	11	-

¹ Case Classification may differ from the numbers reported by Arizona Department of Health Services.

²Fever in a viremic donor cases are included in fever cases throughout the rest of this report.

³In 2010, MCDPH expanded the interpretation of the WNV case definition to include mild cases of illness without fever, captured in the “Unspecified” category.

⁴Unspecified in a viremic donor cases are included in fever cases throughout the rest of this report.

⁵Fever, fever in a viremic donor, unspecified, unspecified in a viremic donor are included in non-neuroinvasive cases throughout the rest of this report.

Case Classifications:

The Maricopa County Department of Public Health uses the Centers for Disease Control and Prevention’s (CDC) case definition to confirm a case of West Nile virus. CDC case definitions are reviewed and modified as more information is learned about the disease. Since WNV is a relatively new disease, changes to the WNV case definition are common. A case of WNV is a clinically compatible illness with supporting laboratory evidence. Cases of WNV are classified either as neuroinvasive or non-neuroinvasive, which are explained below. WNV infection can also be asymptomatic or result in a febrile illness of variable severity sometimes associated with CNS involvement.

Non-Neuroinvasive West Nile Virus: Requires, at minimum, the presence of documented fever, as measured by the patient or clinician, the absence of neuroinvasive disease, and the absence of a more likely clinical explanation for the illness.

- Fever: A non-localized, self-limited febrile illness characterized by the acute onset of fever, headache, arthralgias, myalgias, and sometimes accompanied by a maculopapular rash or lymphadenopathy.
- Unspecified: A non-localized, self-limited illness with the same symptoms as listed (above) for fever, but in the absence of a fever. (This was a new classification category for the 2010 season).

Neuroinvasive West Nile Virus: Requires the presence of fever, the absence of a more likely clinical explanation for the illness, and at least one of the following documented by a physician:

1. Acutely altered mental status (e.g., disorientation, obtundation, stupor, or coma)
2. Acute signs of central or peripheral neurologic dysfunction (e.g., paresis or paralysis, nerve palsies, sensory deficits, abnormal reflexes, generalized convulsions, or abnormal movements)
3. Pleocytosis (increased white blood cell concentration in cerebrospinal fluid [CSF]) associated with illness clinically compatible with meningitis (e.g., headache or stiff neck)

Neuroinvasive cases are classified using the following categories:

- Meningitis: WNV meningitis is characterized by fever, headache, stiff neck, and pleocytosis.
- Encephalitis: WNV encephalitis is characterized by fever, headache, and altered mental status ranging from confusion to coma with or without additional signs of brain dysfunction (e.g., paresis or paralysis, cranial nerve palsies, sensory deficits, abnormal reflexes, generalized convulsions, and abnormal movements).
- Paralysis syndrome: No CDC case definition for this syndrome exists at the present time. The criteria applied to Maricopa County cases are:
 - Laboratory confirmed acute WNV-infection; AND
 - Physician documented acute paralysis.

Viremic Donor: The CDC defines a WNV positive viremic donor as a person who donated blood and had a positive test when screened for the presence of West Nile

virus. Viremic donors are followed up by the blood agency to verify their infection with additional tests. Some viremic donors will remain asymptomatic, but others will go on to develop symptoms.

- Asymptomatic Viremic Donor: Viremic donors who do not become symptomatic are not included in case numbers. The criteria applied to Maricopa County cases are:
 - Laboratory confirmed acute WNV-infection; AND
 - No report of symptoms.
- Symptomatic Viremic Donor: Once the symptoms are reviewed, the case will be classified as a confirmed case of viremic donor encephalitis, Viremic donor meningitis, Viremic donor paralysis syndrome, Viremic donor fever, or Viremic donor unspecified. The criteria applied to Maricopa County cases are:
 - Laboratory confirmed acute WNV-infection; AND
 - A report of symptoms compatible with West Nile Fever, meningitis, encephalitis, paralysis syndrome, or unspecified (see above definitions).

For more information visit:

<http://www.cdc.gov/ncidod/dvbid/westnile/clinicians/surveillance.htm#casedef>

<http://www.azdhs.gov/phs/oids/pdf/casedefinitions.pdf>

Figure 4. West Nile Virus Human Cases in Maricopa County by Gender and Case Classification, 2010 (n=115)

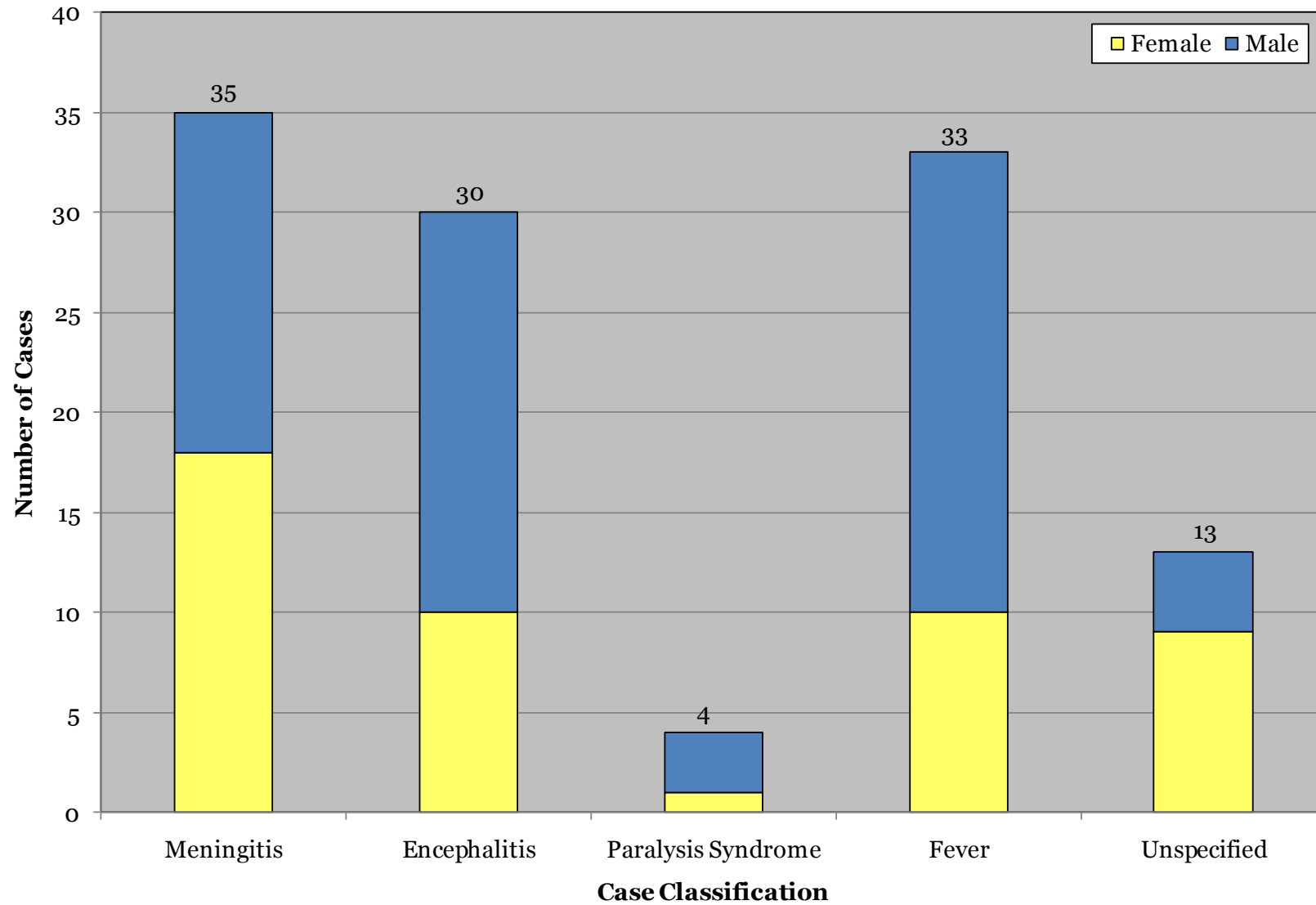


Figure 5. West Nile Virus Cases in Maricopa County by Case Classification, 2006-2010

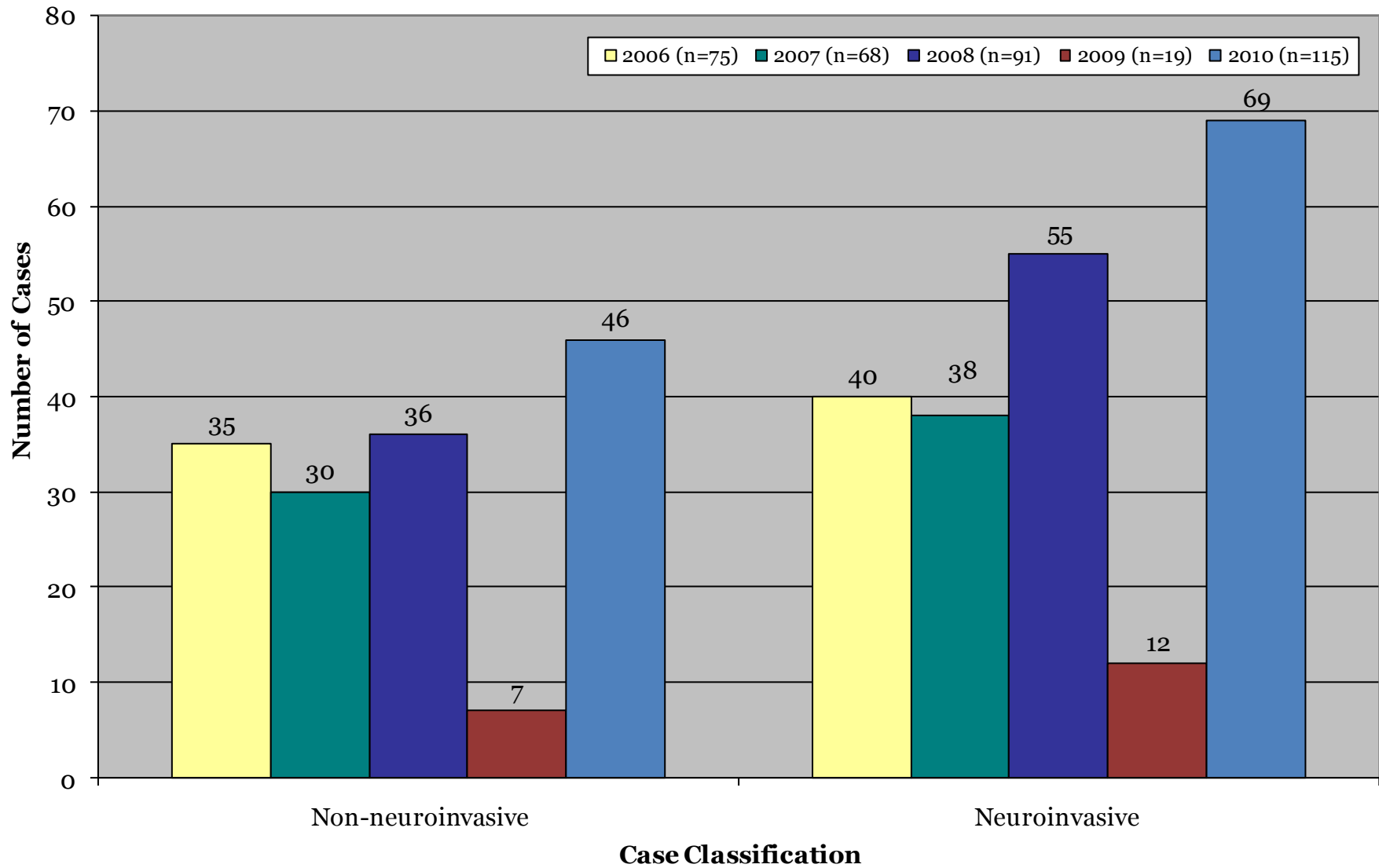


Table 2. Mean, Median, and Range of Ages of West Nile Virus Deaths and Survivors in Maricopa County, 2010 (n=115)

	Mean Age	Median Age	Age Range
Died (n=12)	66.3	67.5	32-89
Survived (n=103)	51.0	50.0	10-85
Total	52.6	51.0	10-89

Figure 6. West Nile Virus Deaths in Maricopa County by Gender, 2006-2010 (n=28)

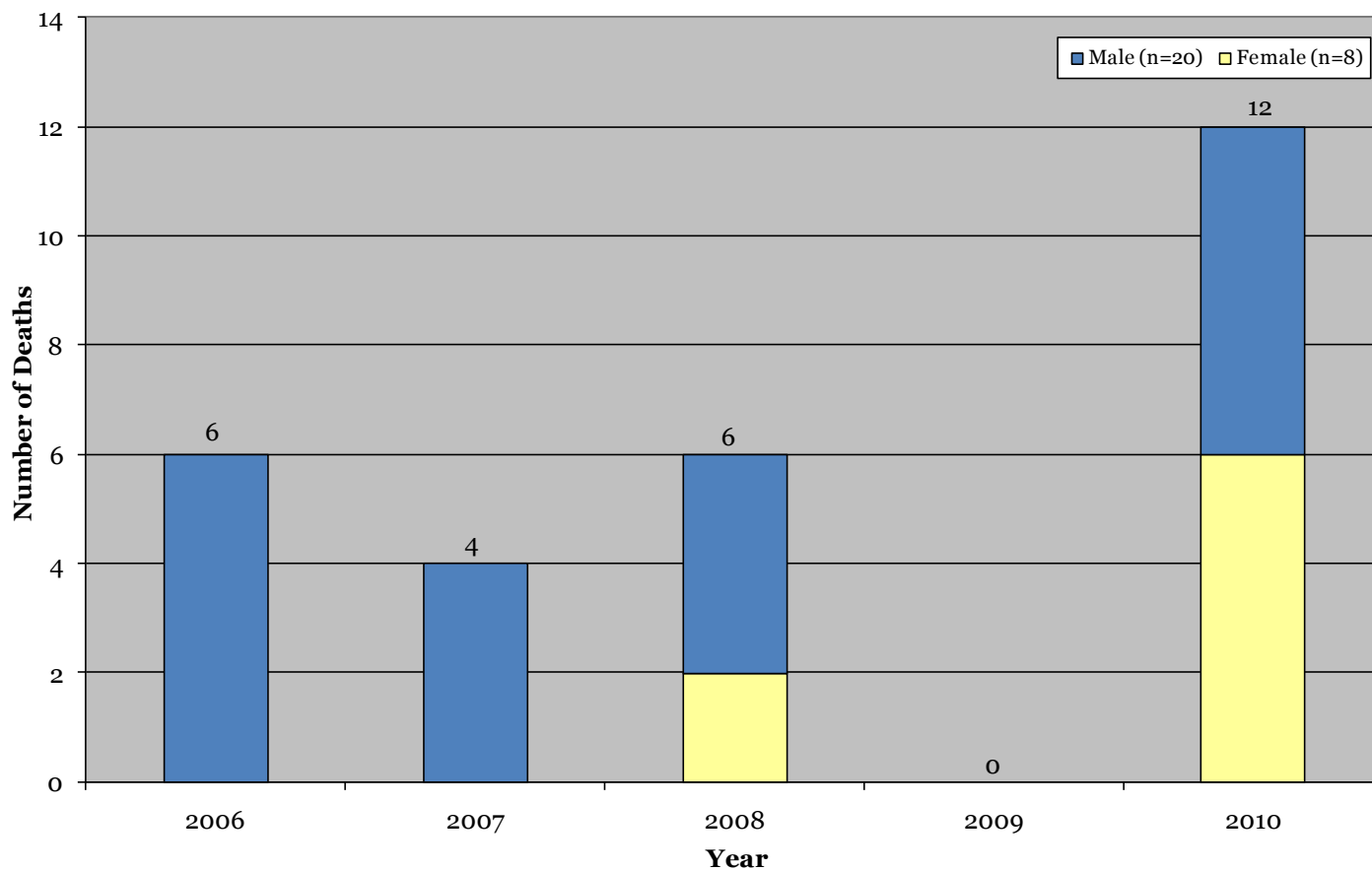


Table 3. Mean, Median, and Range of Ages of West Nile Virus Cases in Maricopa County, 2010 (n=115)

	Mean Age	Median Age	Age Range
Non-neuroinvasive	49.9	49.0	10-80
Neuroinvasive	54.4 ¹	54.0	14-89
Total	52.6	51.0	10-89

¹ Mean age of West Nile virus non-neuroinvasive cases vs. neuroinvasive cases was not significantly different, $p < .05$

Figure 7. West Nile Virus Cases in Maricopa County by Age and Case Classification, 2010 (n=115)

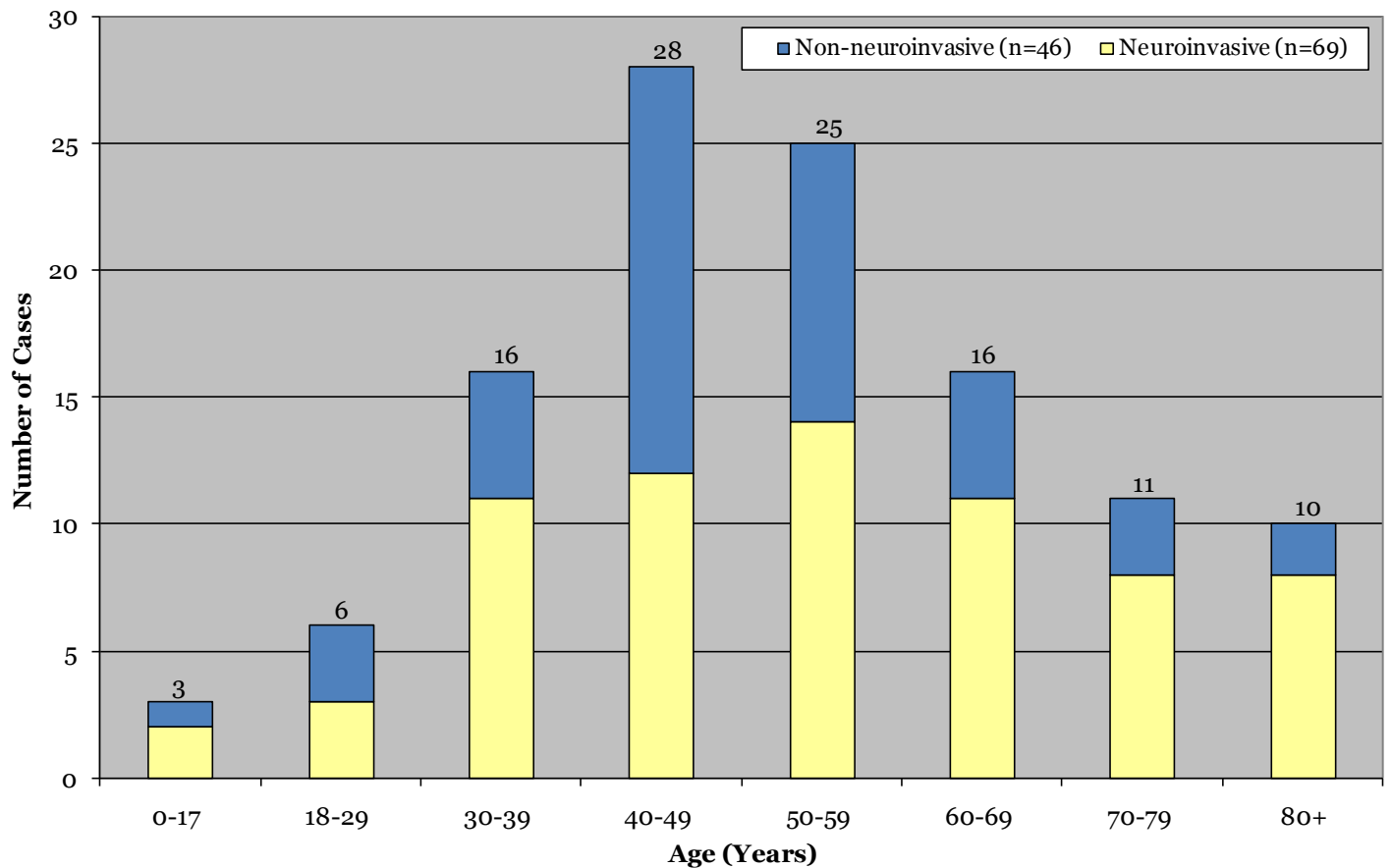


Figure 8. Mean Ages in Years of West Nile Virus Cases in Maricopa County by Case Classification, 2006-2010

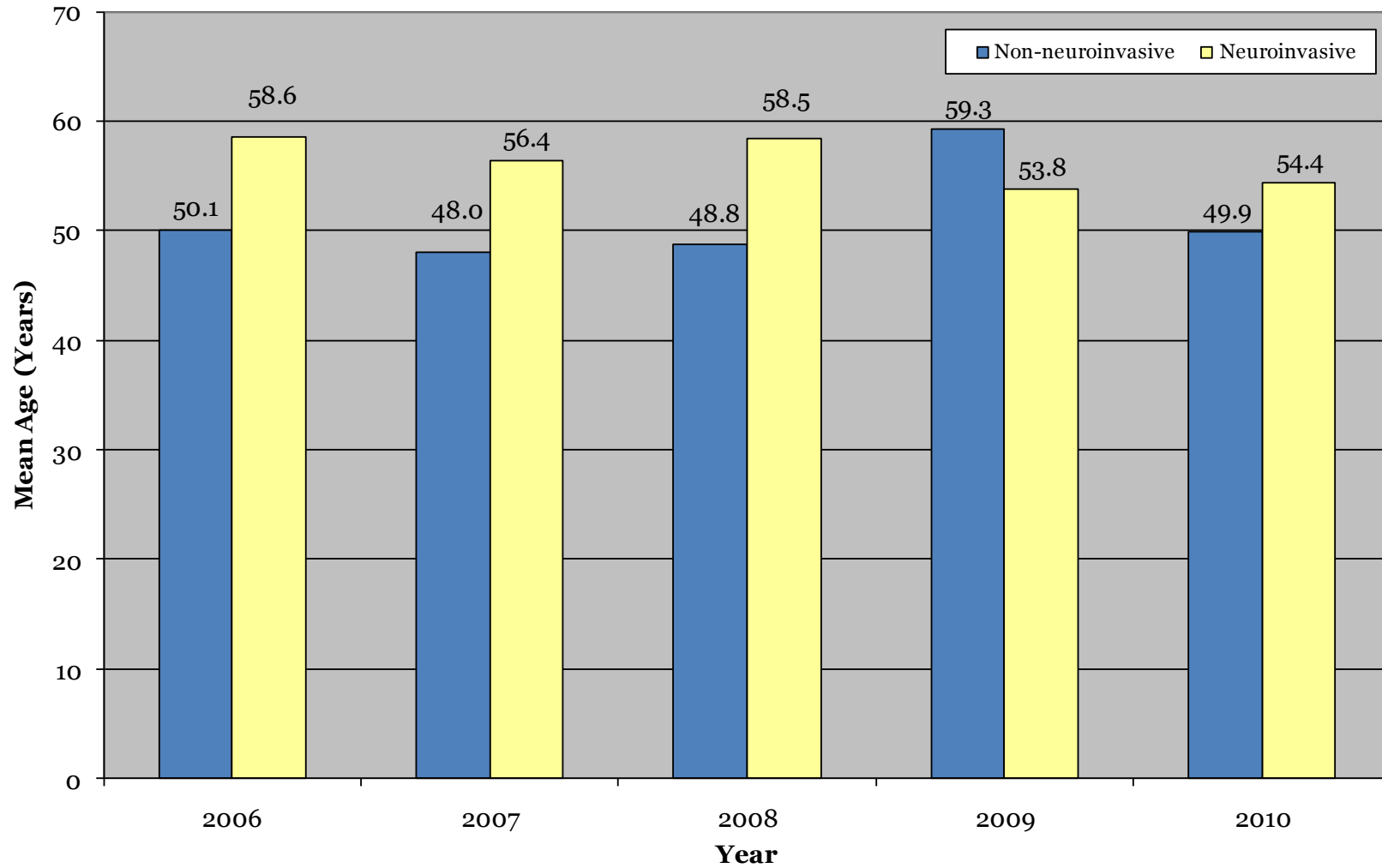
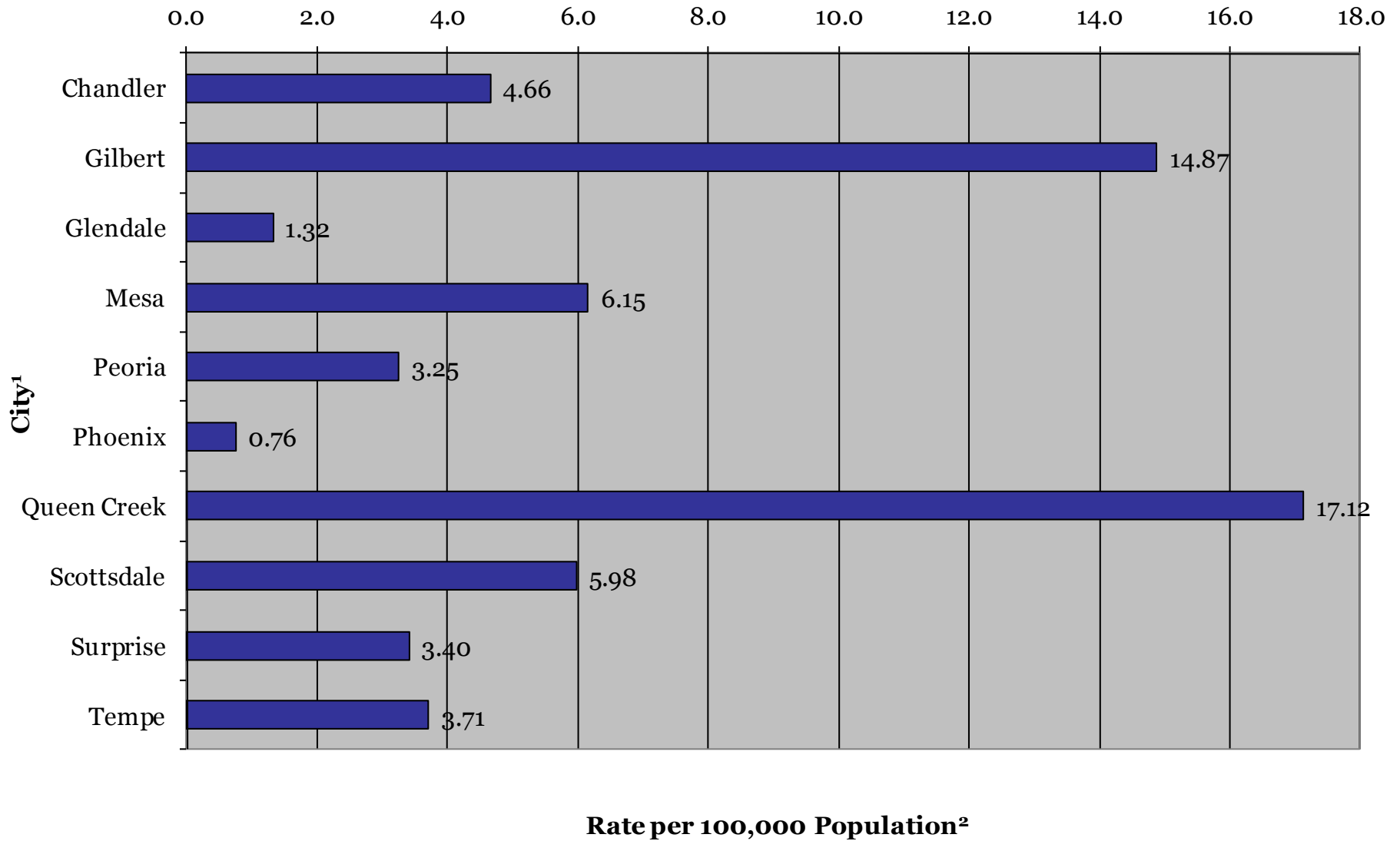


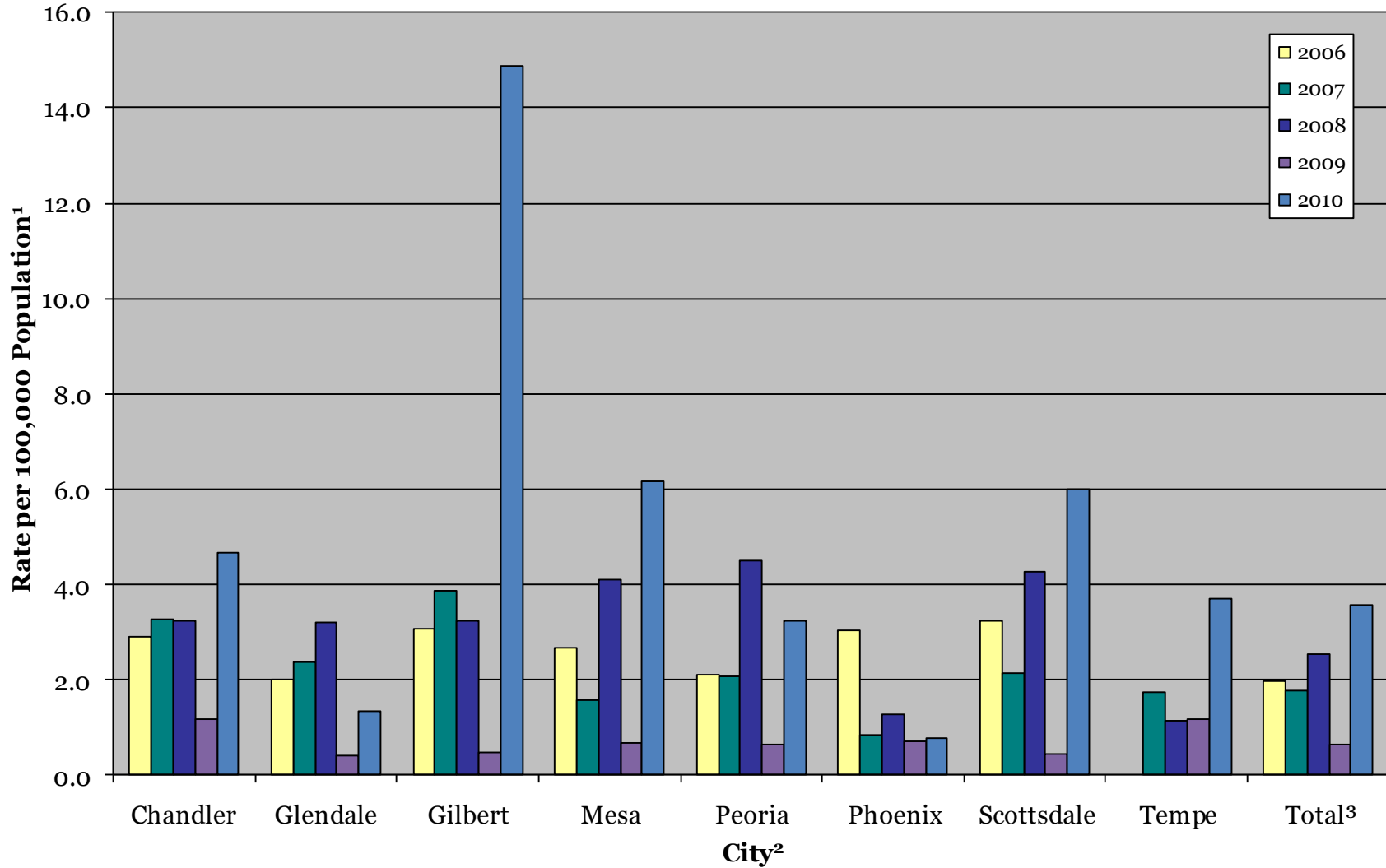
Figure 9. Rates of West Nile Virus in Maricopa County by City, 2010



¹ Population statistics for each city were obtained from United States Census Bureau 2010 Census.

² Rate per 100,000 population = (N/population) * 100,000.

Figure 10. Rates of West Nile Virus in Maricopa County by City¹, 2006-2010



¹ Rates shown for the top 8 cities by population in Maricopa County.

² Rate per 100,000 population = $(N/\text{population}) * 100,000$.

³ Cities population statistics for each city were obtained from United States Census Bureau 2006, 2007, 2008, and 2009 estimates and from the 2010 Census.

⁴ Total includes cities displayed in figure, as well as other cities and unincorporated areas with <5 cases.