

West Nile Virus in Maricopa County



Maricopa County Department of Public Health
Office of Epidemiology
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January 1, 2007—December 31, 2007

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. 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.

Maricopa County Departments of Public Health and Environmental Services work closely to educate and protect the residents of Maricopa County against WNV. Environmental Services 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 that 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. Environmental Services responds to complaints regarding green (unattended) swimming pools, stagnant water, dead birds and mosquitoes.

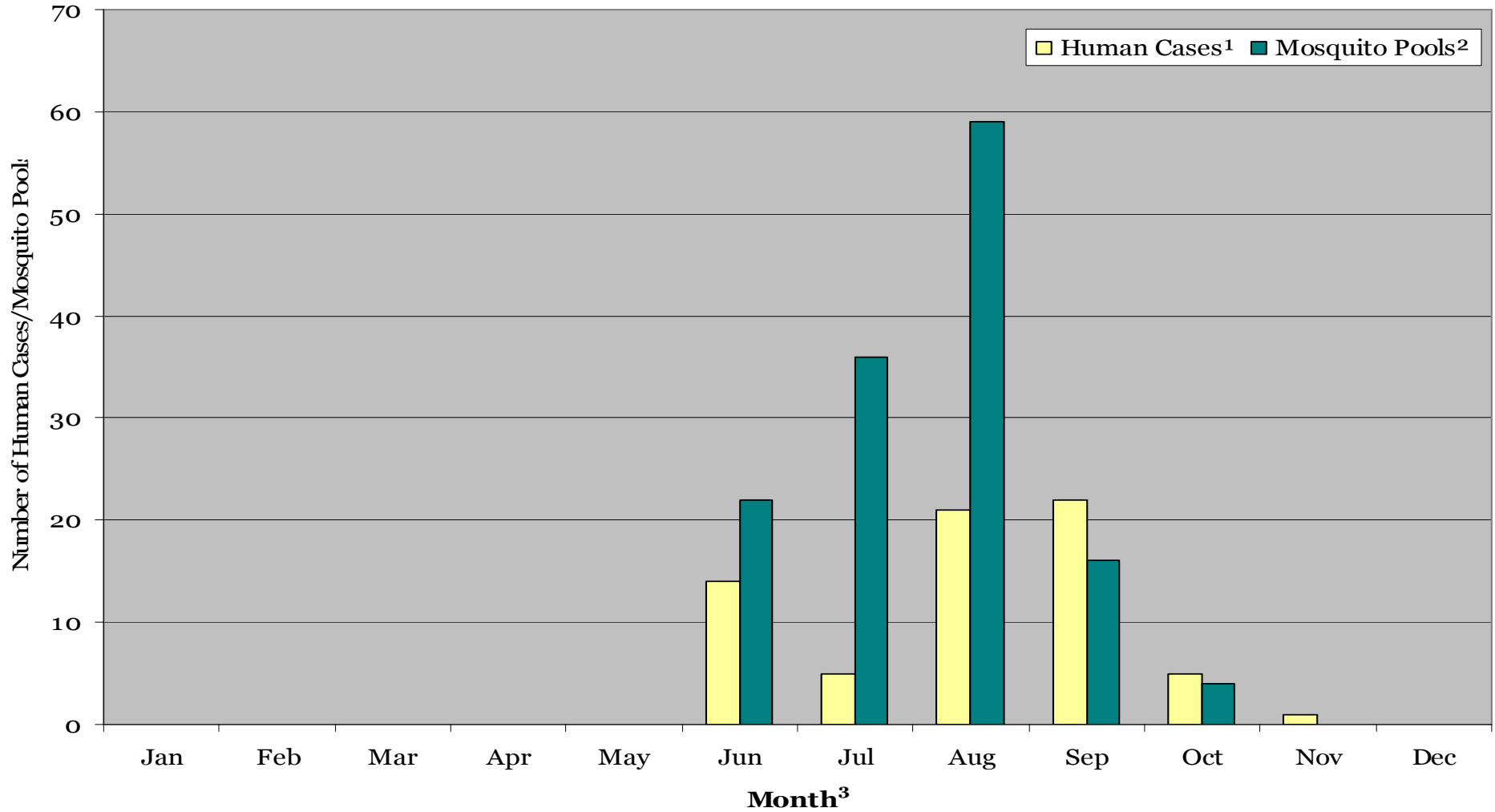
The Department of Public Health is responsible for the interaction of the virus with humans. Working with hospitals and doctors throughout the county, Public Health conducts disease surveillance to find “hot spots” in the Valley where there are a

particularly high number of people with WNV. Our 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, 2007 and December 31, 2007, there were 68 residents of Maricopa County infected with WNV, four of whom died from the disease. The following pages summarize the incidence of WNV cases and deaths in humans by age, gender, case classification and by city of residence. In addition, WNV surveillance indicators and mosquito pools are also summarized.

Figure 1. Incidence of West Nile Virus in Humans and WNV+ Mosquito Pools in Maricopa County by Month, 2007

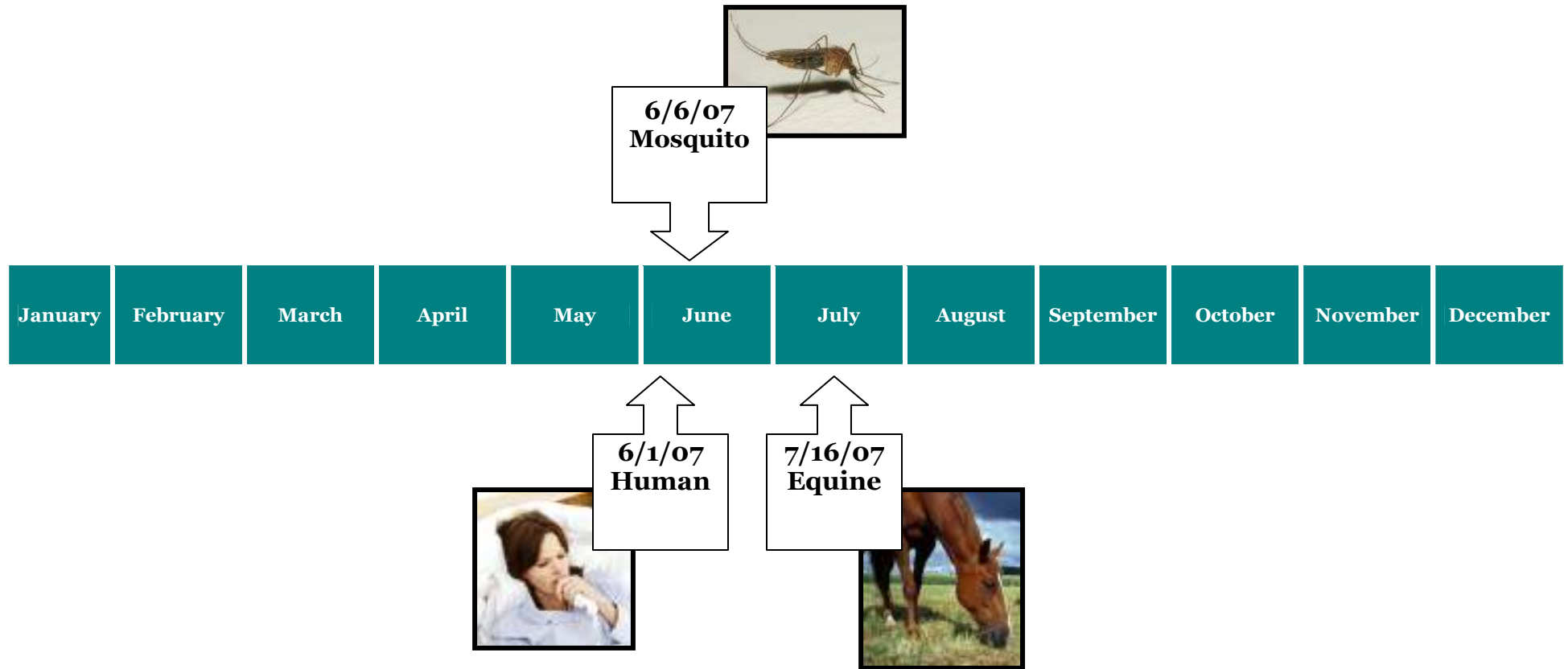


¹ A human case is one individual infected with any classification of WNV.

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 and other mosquito-borne diseases.

³ Human data are based on the date of symptom onset; if onset date is missing, date used is earliest available: date of diagnosis, date of lab specimen or date of report to public health. Mosquito data are based on date specimen was collected.

Figure 2. West Nile Virus Surveillance Indicators: Dates of First Positive Findings in a Mosquito Pool, Human, and Equine, Maricopa County*, 2007



* In 2007 Maricopa County quit testing sentinel chicken flocks for WNV.

Table 1. Incidence of West Nile Virus Cases and Deaths in Humans in Maricopa County by Gender and Case Classification, 2007

Case Classification ¹	WNV Cases		WNV Deaths		Total	%
	Male	Female	Male	Female		
Meningitis	6	5	-	-	11	16%
Encephalitis	11	10	4	-	25	37%
Paralysis Syndrome	-	2	-	-	2	3%
Neuroinvasive Disease-Total	17	17	4	-	38	56%
Fever	7	19	-	-	26	38%
Fever in a viremic donor ²	3	1	-	-	4	6%
Fever Total	10	20	-	-	30	44%
Total Number of Cases	27	37	4	-	68	100%
Viremic Donors Asymptomatic ³	3	2	-	-	5	-

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

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

³ Viremic donors who did not become symptomatic are not included in case numbers.

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. A confirmed case is a clinically compatible illness that is West Nile virus laboratory confirmed. WNV infection can be asymptomatic or result in a febrile illness of variable severity sometimes associated with CNS involvement. Cases of WNV are classified either as neuroinvasive or non-neuroinvasive, which are explained below:

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.

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)
 - 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: No CDC case definition exists at the present time; however, the CDC defines a viremic donor as a person whose blood tested positive 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 or Viremic donor fever. 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 or paralysis syndrome (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 3. Incidence of West Nile Virus Cases in Maricopa County by Gender and Case Classification, 2007

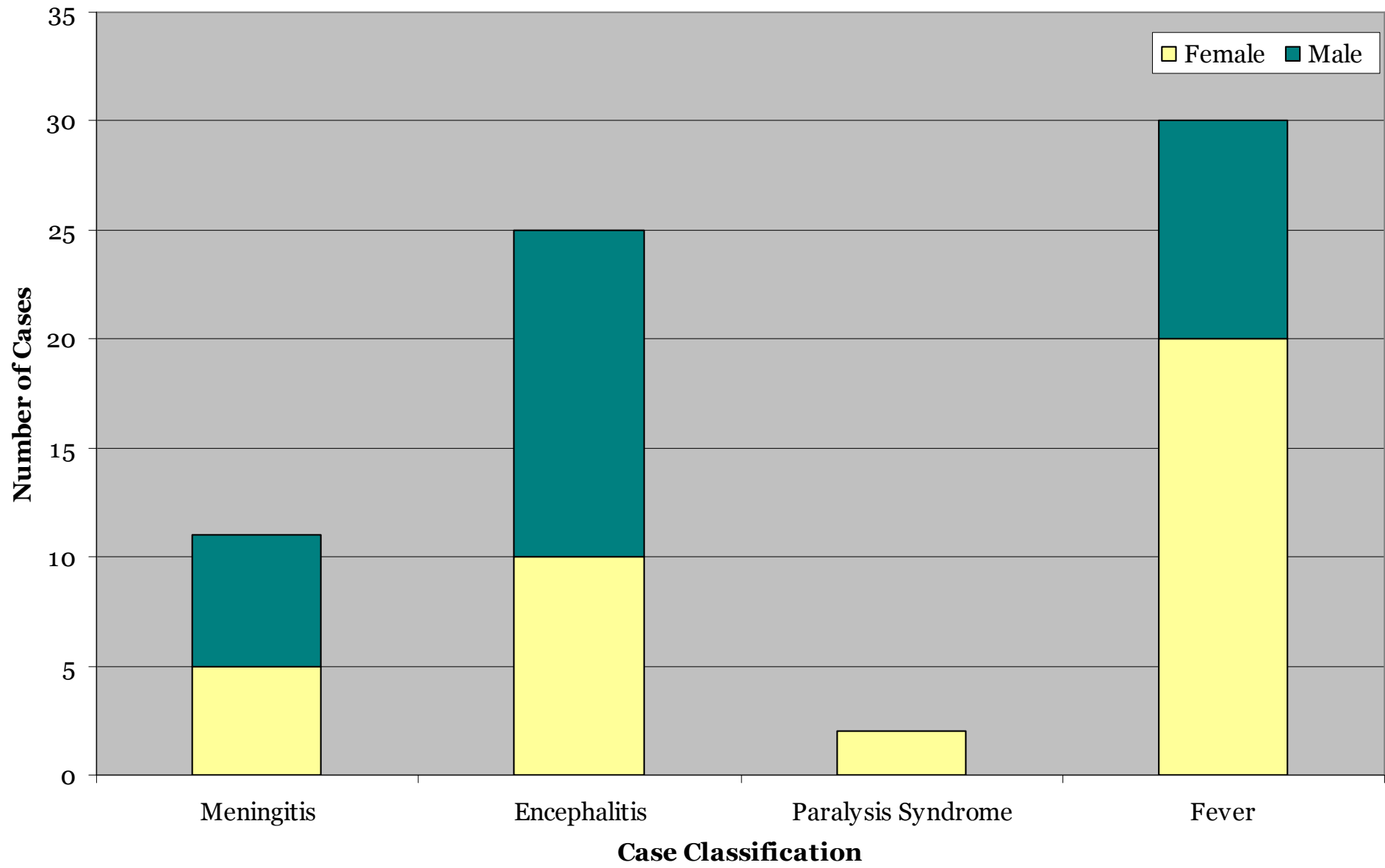


Figure 4. Incidence of West Nile Virus Cases in Maricopa County by Case Classification, 2006-2007

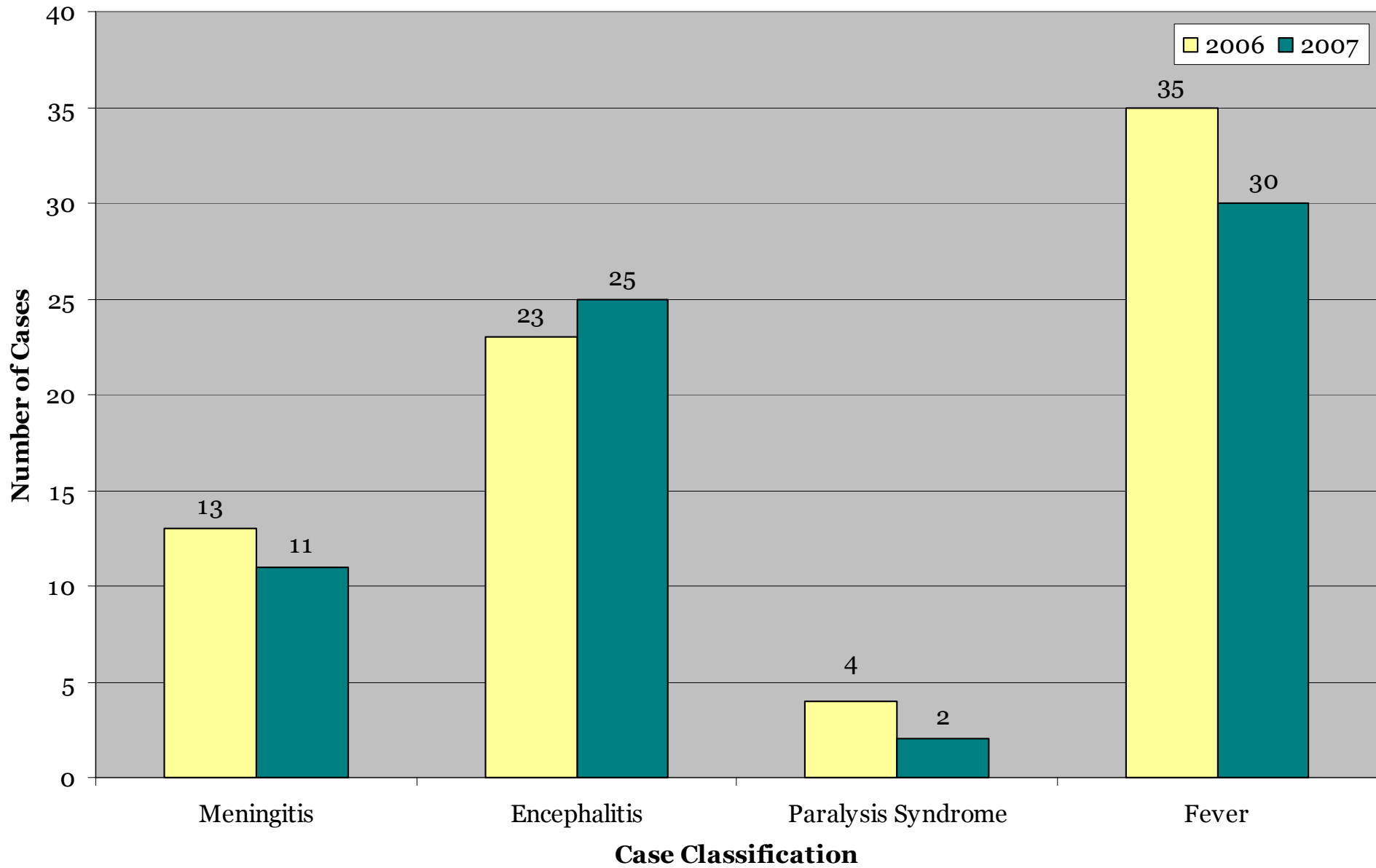


Figure 5. Incidence of West Nile Virus Deaths in Maricopa County by Gender, 2006-2007

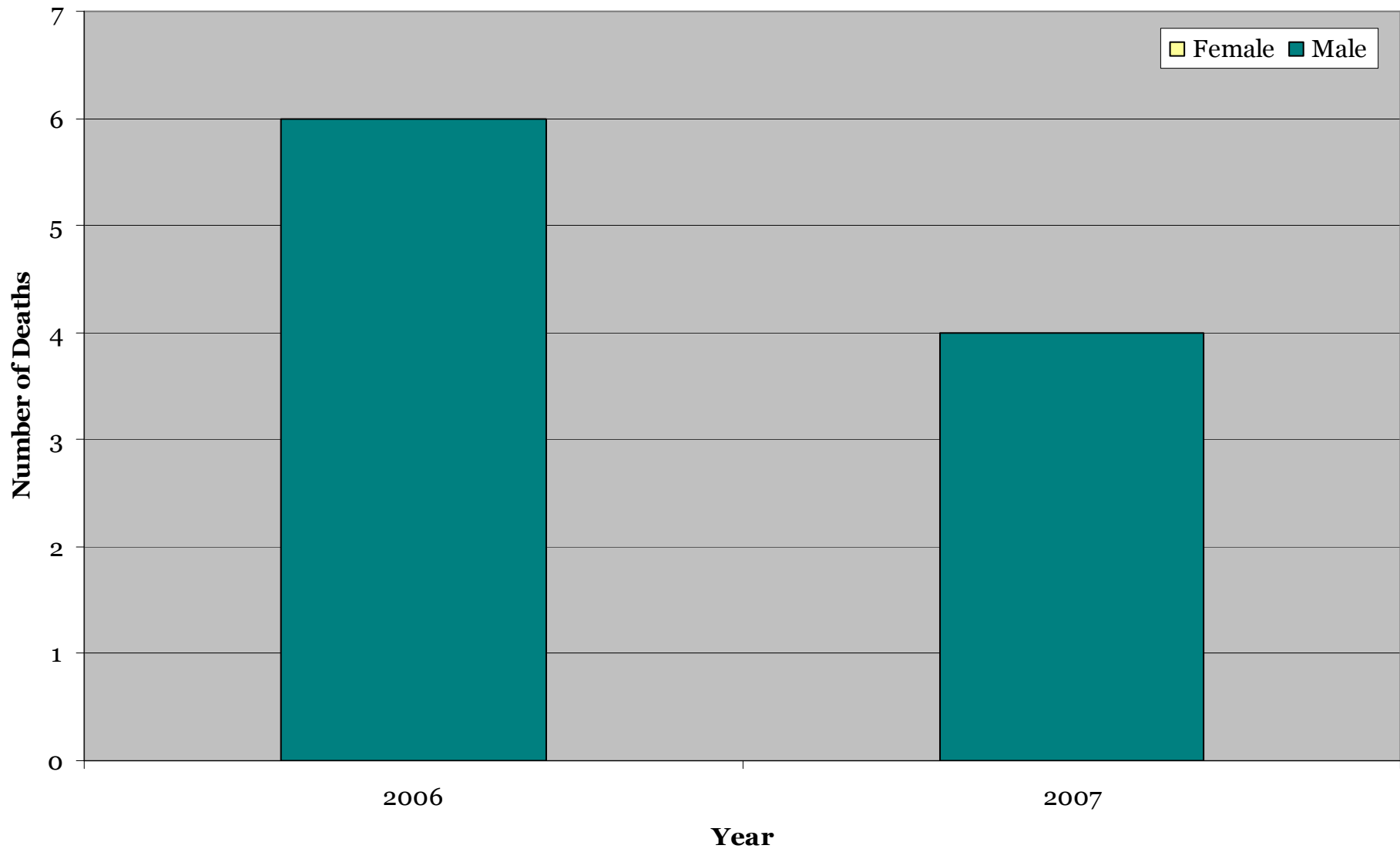


Table 2. Age Distribution of West Nile Virus Cases in Maricopa County, 2007

	Mean Age	Median Age	Age Range
Fever	48.0	50.5	(2-77)
Neuroinvasive	56.4 ¹	59.5	(3-93)
Total	52.7	53	(2-93)

¹ Mean age of West Nile Virus cases with fever vs. neuroinvasive was *not* significantly different, $p < .05$

Figure 6. West Nile Virus Cases in Maricopa County by Age and Case Classification, 2007

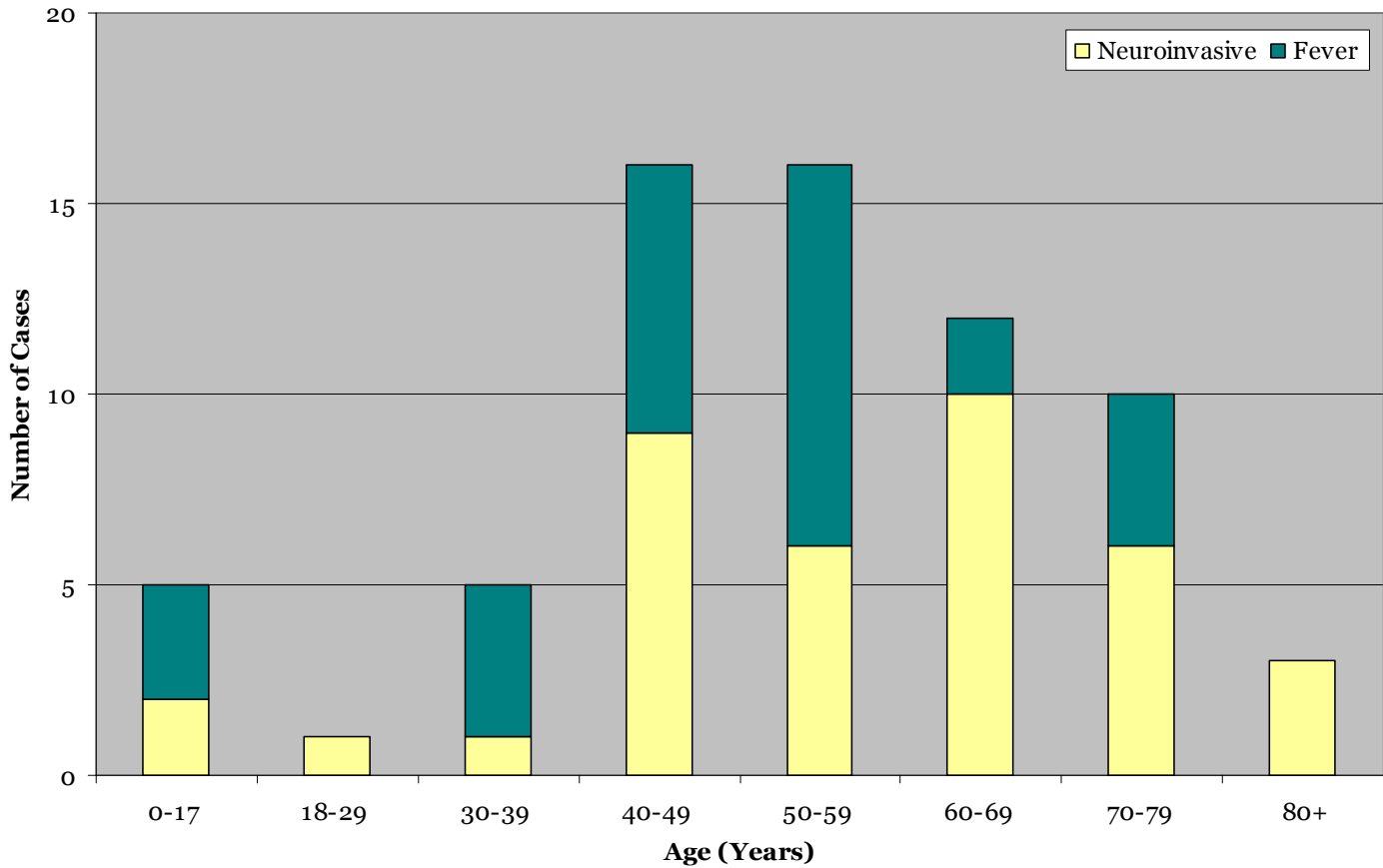


Figure 7. Mean Age in Years of West Nile Virus Cases in Maricopa County by Case Classification, 2006-2007

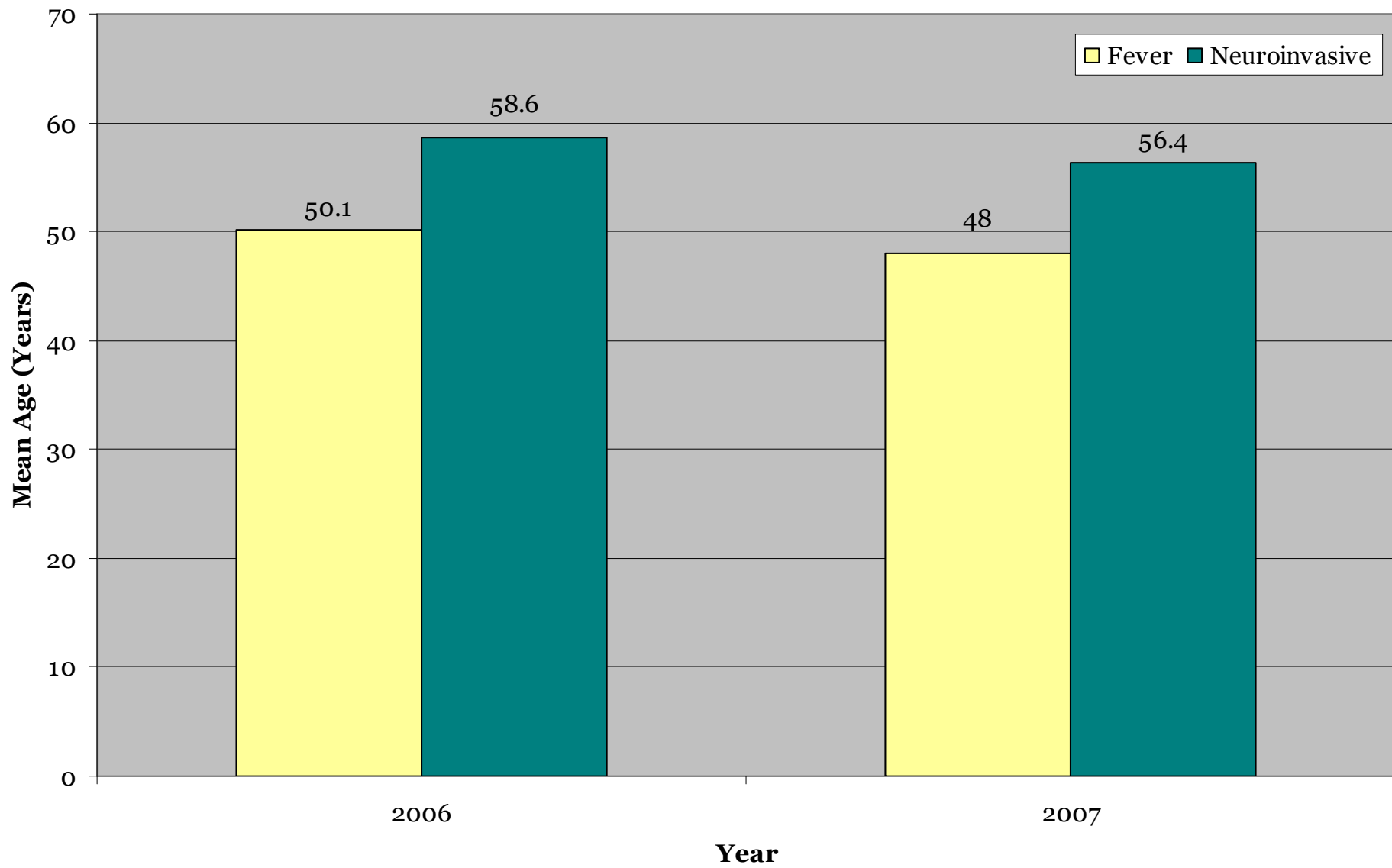
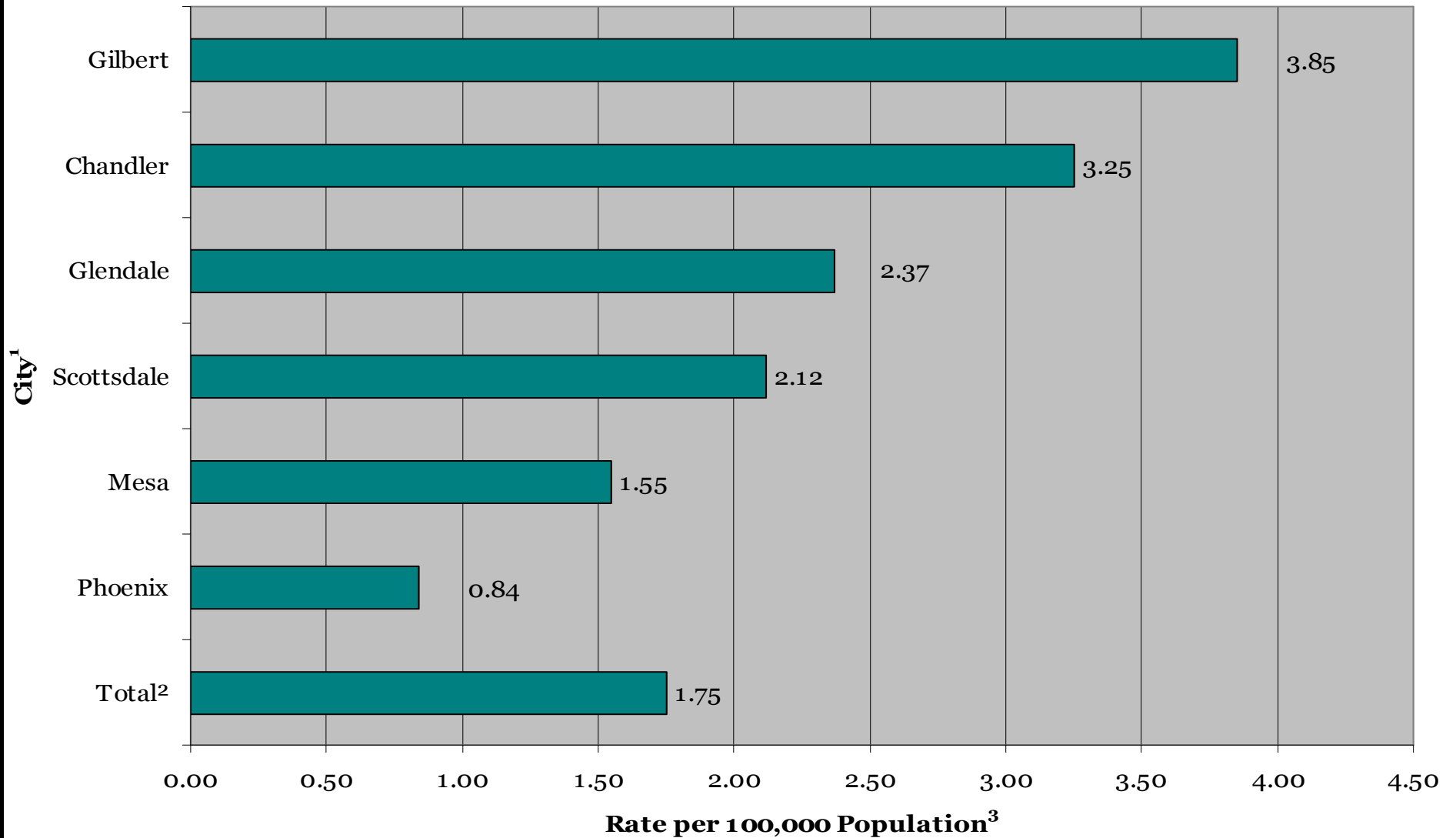


Figure 8. Rates of West Nile Virus in Maricopa County by City, 2007

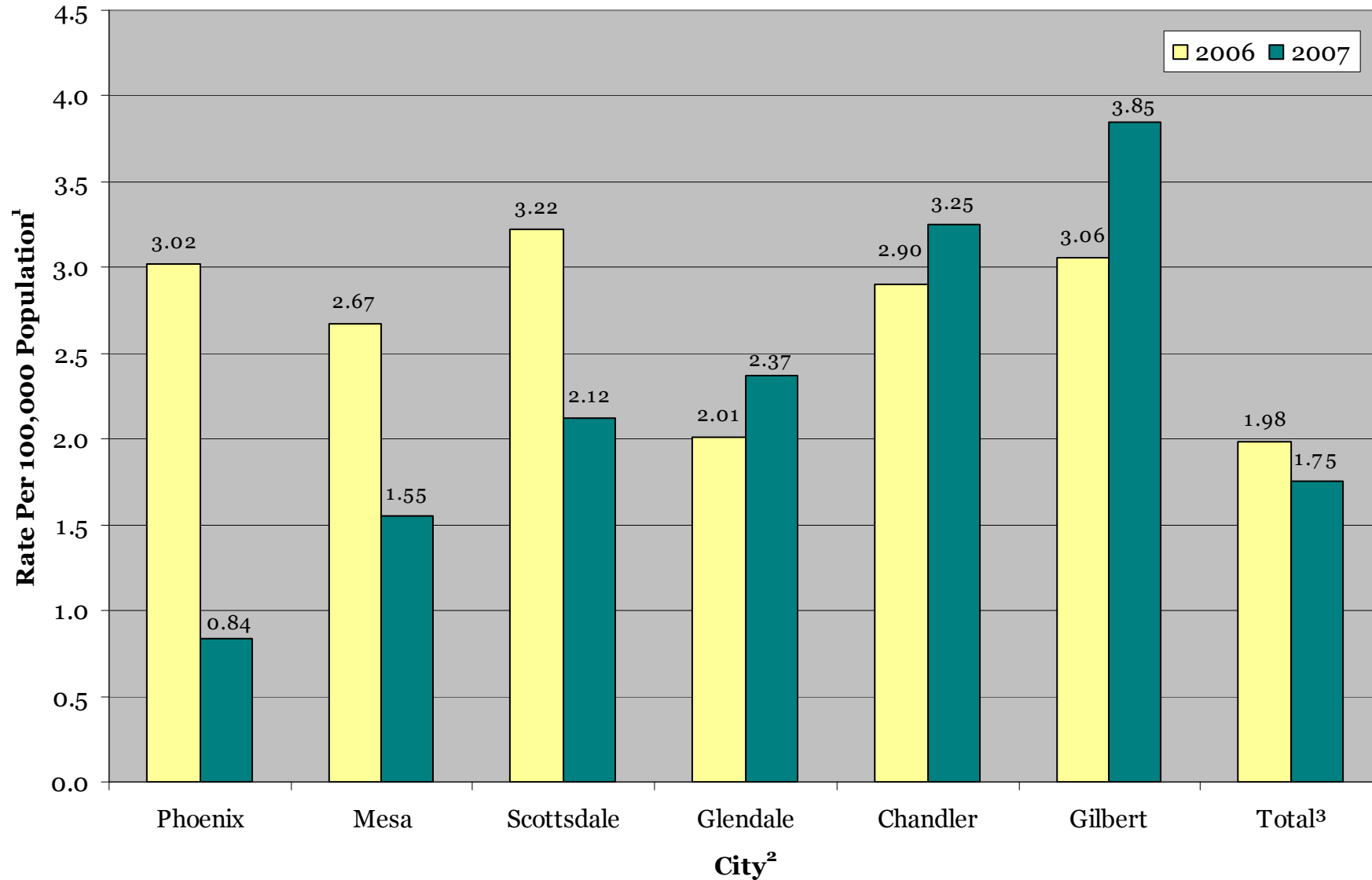


¹ Population statistics for each city were obtained from United States Census Bureau 2006 estimates. Individual cities listed in this figure had >5 cases of WNV in 2007.

² Total includes cities displayed in figure, as well as other cities and unincorporated areas with <5 cases.

³ Rate per 100,000 population = (N/population) * 100,000.

Figure 9. Rates of West Nile Virus in Maricopa County by City, 2006-2007



¹ Rate per 100,000 population = (N/population) * 100,000.

² Individual cities listed in this figure had >5 cases of WNV in 2007. Population statistics for each city were obtained from United States Census Bureau 2006 and 2007 estimates.

³ Total includes cities displayed in figure, as well as other cities and unincorporated areas with <5 cases.