

West Nile Virus, Orange County 2011 – 2018



Background

West Nile Virus (WNV) is spread through the bite from an infected *Culex* mosquito. Approximately 80% of infected persons experience no symptoms. Up to 20% of infected persons develop a condition known as West Nile Fever, which causes symptoms that last several days which include fever, headache, body aches, nausea, vomiting, swollen lymph glands, skin rash, and/or fatigue and weakness that persists for several months. Less than 1% of infected persons develop a serious condition known as West Nile Neuroinvasive Disease, which causes inflammation of the brain and surrounding tissue. Severe symptoms may include high fever, headache, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, vision loss, numbness and paralysis. These symptoms may last several weeks, and neurological effects may be permanent. Infection can result in death. Adults over 60 years of age and persons with immunodeficiencies are at higher risk for developing the disease and for experiencing more severe symptoms. Once a person has had WNV, it is understood that they are immune and cannot contract it a second time.

While asymptomatic cases are the most common, they are severely underreported because they are rarely identified. The reported asymptomatic cases are almost always found through routine screenings of blood donations, since the disease can be passed on through blood transfusion. West Nile fever is also underreported: persons with West Nile fever will often not see a medical provider for their illness, and providers seeing a case of West Nile fever will often not test for this disease. This results in surveillance methods which skew toward detection of neuroinvasive cases, though they are the least common form of the disease.

There is no treatment for WNV infection; only supportive care can be given. The best way to prevent WNV is to avoid mosquito bites. Draining and removing standing water sources such as empty containers, flowerpots, bird baths, and pet dishes deprives mosquitoes of breeding sites around your home. Installing or repairing tight fitting screens on windows and doors can keep the mosquitoes out of your home.

In settings with a high chance of mosquito exposure, repellants such as DEET and picaridin can be applied to the skin, and clothing can be treated with permethrin. More information on insect repellants can be found at <https://www.epa.gov/insect-repellents>.

Humans (and also horses) are “accidental hosts” for WNV; the transmission cycle is primarily between mosquitoes and wild birds. Testing dead birds for presence of WNV is one of the primary methods the county uses for surveilling WNV activity. If you find a dead bird, please report it to your local Vector Control district. Instructions for reporting dead birds in Orange County can be found at <https://www.ocvector.org/report-a-dead-bird>.

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**For more
information,
please
visit the
California
Department
of Public
Health
webpage on
[West Nile
Virus.](#)**

Orange County, California

WNV is endemic in Orange County. Most infections occur in the northern areas. Geographically, Santa Ana, Anaheim, Fullerton, and Tustin areas see the highest densities of infections (**Figure 1**).

Most WNV cases occur in the summer and early fall. From 2011 through 2018, the number of total reported WNV cases in Orange County per year ranged from 10 to 278, with a median of 37 (**Table 1**). Heavy WNV seasons tend to occur every 3-5 years. More than half of all infections from this time frame occurred in 2014. Overall, the cases were 65% male, 51% non-Hispanic White, and 41% in the age range 50-64.

County-wide incidence rates ranged from 0.33 infections per 100,000 people in 2011 to 8.85 infections per 100,000 people in 2014 (**Table 2**). Across all years, males experienced higher incidence rates than females, and Non-Hispanic White residents were the racial/ethnic group that experienced the highest incidence rate. While the age group 65+ generally experienced the highest incidence of WNV infection, the age group 50-64 experienced similar rates.

The high incidence in older adults is due to an increased susceptibility to severe disease in elderly populations. By contrast, the higher incidence in males is likely due to gender-based behavioral differences, as opposed to differences in susceptibility. High incidence in both non-Hispanic White and Hispanic groups is likely due to the demographic makeup

Figure 1. Density of WNV Infections Across Orange County

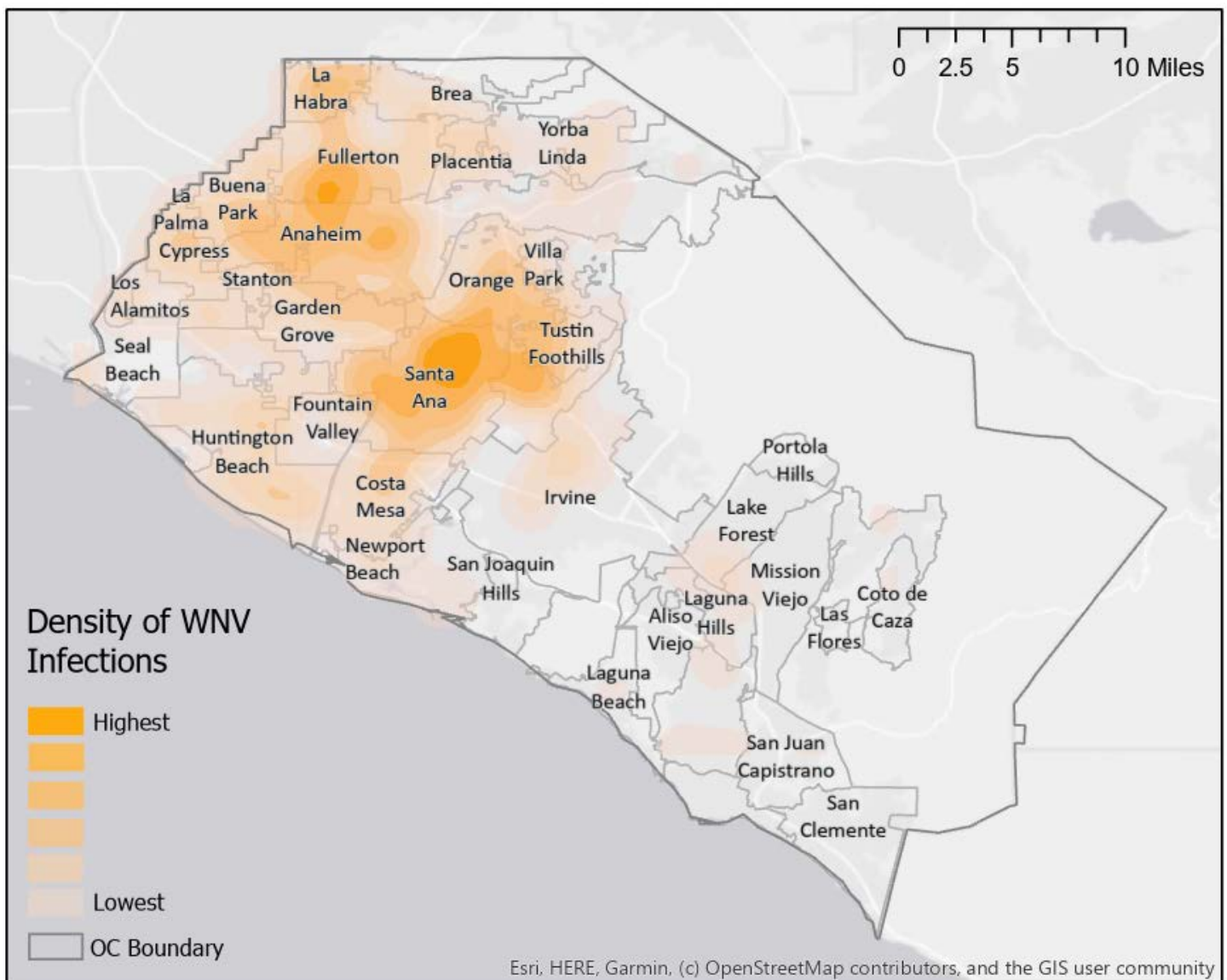


Table 1. Orange County West Nile Virus Infections by Number of Deaths, Disease Type, Sex, Race/Ethnicity, and Age Group, 2011 – 2018.

	2011	2012	2013	2014	2015	2016	2017	2018
Total Cases	10	48	12	278	97	36	38	12
# of Deaths								
Died	0	2	0	8	8	1	4	1
Disease Type								
Asymptomatic	0	6	2	14	5	4	5	3
Fever	0	16	1	66	21	6	9	1
Neuroinvasive	10	26	9	198	71	26	24	8
Sex								
Male	6	30	9	185	63	20	23	11
Female	4	18	3	93	34	16	15	1
Race/Ethnicity								
White	5	25	10	134	59	18	17	4
Hispanic	1	13	1	101	26	14	12	6
Asian	1	3	0	10	5	1	2	2
Black	0	0	0	2	0	0	0	0
NHOP ¹	0	0	0	1	0	0	0	0
Multiracial	0	0	0	3	0	0	1	0
Other / Unknown	3	7	1	27	7	3	6	0
Age Group								
<18	0	2	1	9	1	1	0	1
18 - 49	2	18	3	85	15	10	11	4
50 - 64	3	15	5	108	47	19	15	4
≥ 65	5	13	3	76	34	6	12	3

Note: Case counts are subject to change as additional information becomes available. Cases are grouped into calendar years based on the earliest of the following dates: onset, specimen collection, diagnosis, report received, or death. Confirmed and probable cases are included in this analysis.

¹ Native Hawaiian or Other Pacific Islander

Table 2. Orange County West Nile Virus Infection Incidence Rates by Disease Type, Sex, Race/Ethnicity, and Age Group, per 100,000 people, 2011 – 2018.

	2011	2012	2013	2014	2015	2016	2017	2018
Total Rate	0.33	1.56	0.39	8.85	3.07	1.13	1.19	0.37
# of Deaths								
Died	-	-	-	0.25	0.25	-	-	-
Disease Type								
Asymptomatic	-	0.19	-	0.45	-	-	-	-
Fever	-	0.52	-	2.10	0.66	0.19	0.28	-
Neuroinvasive	0.33	0.84	0.29	6.31	2.24	0.82	0.75	0.25
Sex								
Male	0.40	1.96	0.58	11.88	4.02	1.27	1.45	0.69
Female	-	1.16	-	5.88	2.13	1.00	0.93	-
Race/Ethnicity								
White	0.37	1.86	0.74	9.93	4.37	1.33	1.26	-
Hispanic	-	1.23	-	9.28	2.36	1.26	1.06	0.53
Asian	-	-	-	1.77	0.88	-	-	-
Black	-	-	-	-	-	-	-	-
NHOPI	-	-	-	-	-	-	-	-
Multiracial	-	-	-	-	-	-	-	-
Age Group								
<18	-	-	-	1.23	-	-	-	-
18 - 49	-	1.29	-	6.11	1.08	0.72	0.80	-
50 - 64	-	2.63	0.86	18.11	7.71	3.07	2.38	-
≥ 65	1.37	3.38	-	18.21	7.84	1.34	2.57	-

Table 3. WNV Incidence Rates per 100,000 people in California, Los Angeles County, and Orange County, 2011-2018.

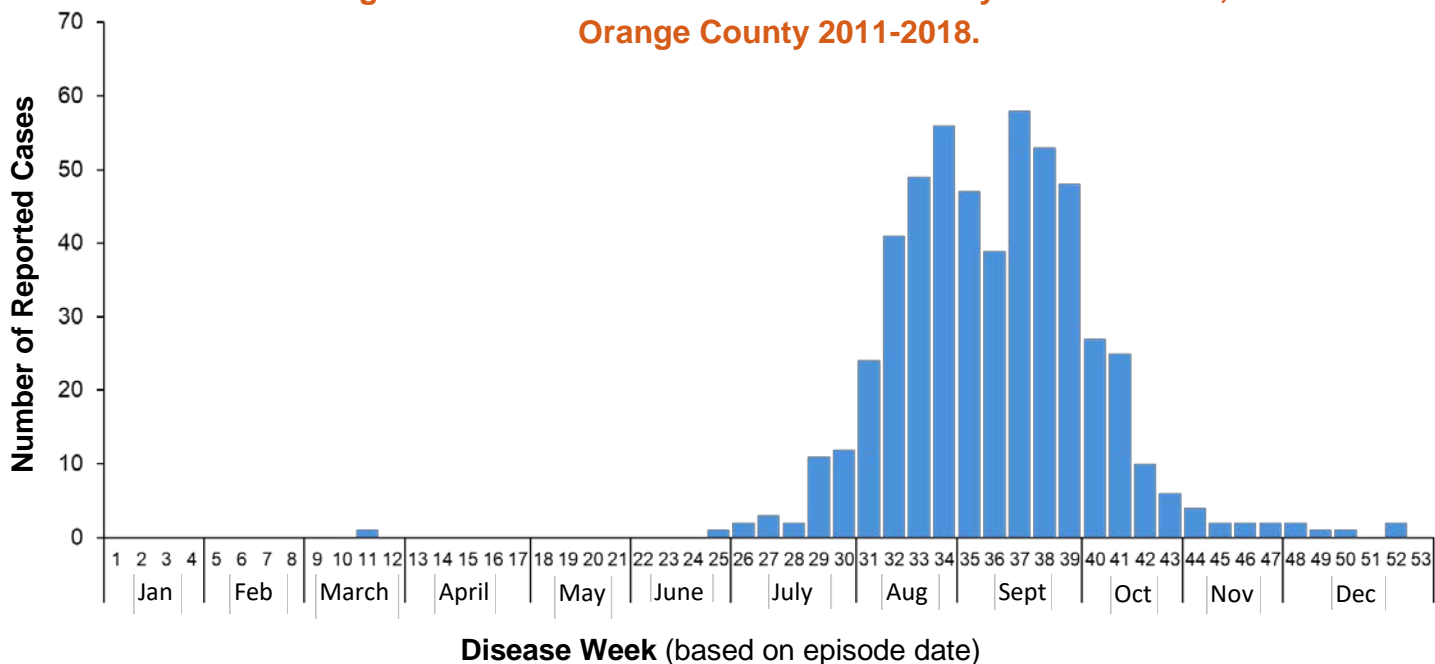
	2011	2012	2013	2014	2015	2016	2017	2018
California ²	0.42	1.26	0.99	2.07	2.01	1.13	1.40	0.55
LA County ³	0.59	1.64	1.58	2.52	2.83	1.49	2.74	0.43
Orange County	0.33	1.56	0.39	8.85	3.07	1.13	1.19	0.37

Note: Incidence rates are only calculated for categories in which there are 5 or more cases (Table 2 and Table 3). Darker orange indicates a higher incidence rate.

² <http://www.westnile.ca.gov>

The summer months see the highest number of WNV infections. Mosquito activity starts in the spring season and increases with temperature through the summer. **Figure 2** below shows the total case counts by CDC disease week for the time period 2011-2018 (the month labels are only approximate). The most infections occurred in August (189 infections), followed closely by September (164 infections). October and July also had a substantial number of infections with 59 and 34, respectively. While most infections are acquired locally, some infections are acquired while traveling internationally and may occur outside the expected season.

Figure 2. Total West Nile Virus Infections by Disease Week, Orange County 2011-2018.



2014 Outbreak

Orange County experienced a large number of cases in 2014 and reached an incidence rate of 8.85 cases per 100,000 residents. This was more than 3.5 times the incidence rate experienced by Los Angeles county (where WNV is also endemic), and more than four times the incidence rate experienced by California as a whole (**Table 3**). A comparison of the number of reported cases by year and type of infection is shown in **Figure 3** on the following page.

Persons grouped into the age ranges 50-64 and ≥65 experienced similar incidence rates of WNV infection during the outbreak (**Figure 4**). Older age is known to be a predictor of more virulent WNV disease, so it is notable that there seemed to be little difference between these two age groupings.

The precise factors that caused the 2014 outbreak are unknown, but it is thought to be connected to weather and rainfall patterns. Mosquitoes tend to like intermittent rains, but wetter years seem to have lower mosquito counts. Large amounts of rain likely flush out the drainage systems where many mosquitoes breed. California was in the midst of a drought in 2014.

Figure 3. Reported Orange County West Nile Virus Infections By Type and Year, 2011-2018.

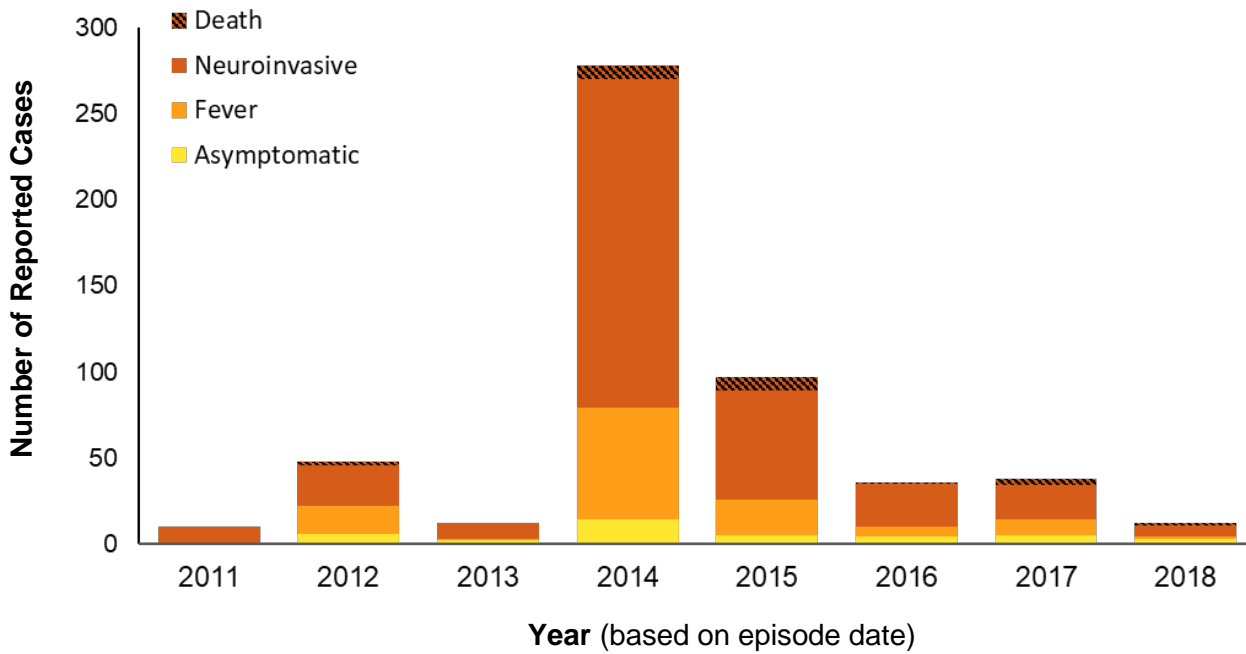


Figure 4. Comparison of West Nile Virus Infection Incidence Rates by Age Group, Orange County 2011-2018.

