

Key Findings and Public Health Messages

- The California Department of Public Health (CDPH) received reports of 2,765 cases of West Nile virus illness with estimated onset dates from 2003 through 2008.
- In 2002, one human case of West Nile virus was identified in southern California. However, further epidemiologic investigation determined that the individual likely acquired the infection in another state.
- Of the 2,765 cases reported during the surveillance period, 1,137 (41.1 percent) had a neuroinvasive form of illness (e.g., meningitis or encephalitis).
- Incidence rates of West Nile virus illness increased from the lowest of <0.1 per 100,000 in 2003 to the highest of 2.4 per 100,000 in 2005. Incidence rates have since fluctuated but have remained around 1 case per 100,000.
- Average annual incidence rates were highest among cases 65 to 84 years of age (3.0 per 100,000).
- West Nile virus cases with complete race/ethnicity data were reported to be White non-Hispanic (68.7 percent) more frequently than would be expected based on the overall demographic profile of Californians (44.2 percent).
- During the surveillance period, 48 (82.8 percent) of 58 counties reported at least 1 case.
- The best way to prevent West Nile virus infection is to avoid mosquito bites.

Background

West Nile virus is a mosquito-borne arbovirus occurring in Africa, Europe, west and central Asia, the Middle East, and most recently, North America. The virus was first detected in the United States in New York in 1999,

and has since spread to 47 states including California. West Nile virus is typically transmitted through the bite of an infected mosquito. Mosquitoes become infected when they feed on infected birds.

Most persons infected with West Nile virus do not develop clinical illness or symptoms. However, approximately 20 percent of people develop symptoms compatible with what is known as West Nile fever. The West Nile fever syndrome can be variable, but common symptoms include fever, headache, muscle weakness, fatigue, or rash. About one in 150 people infected with West Nile virus develop severe neuroinvasive illness, e.g. meningitis, encephalitis, or acute flaccid paralysis. The incubation period for West Nile virus is commonly 3 to 14 days. There is no specific treatment. Though milder illness often improves without treatment, those cases with severe West Nile virus illness may require hospitalization and supportive care.

We describe here the epidemiology of human West Nile virus in California from 2003, when the first three locally acquired human cases were detected, through 2008. For a complete discussion of the definitions, methods, and limitations associated with this report, please refer to Technical Notes¹.

California reporting requirements and surveillance case definition

California Code of Regulations, Title 17, requires health care providers and laboratories to report cases of West Nile virus infection to their local health department via electronic transmission (including FAX), telephone, or mail within one working day of identification.

Local health officers are required by regulation to investigate provider or laboratory reports of West Nile virus infection and report any new cases of infection to CDPH. Asymptomatic infections, such as those detected in blood donors, are reportable but do not meet the surveillance case definition as defined by the Center for Disease Control and Prevention (CDC).

During the surveillance period, CDC defined a case of West Nile virus illness as meeting at least one of the clinical criteria for either neuroinvasive or non-neuroinvasive disease, and at least one of the laboratory criteria for diagnosis.

Cases of neuroinvasive disease had fever and at least one of the following: acutely altered mental status, other acute signs of central or peripheral neurologic

dysfunction, or pleocytosis associated with an illness clinically compatible with meningitis. Cases of non-neuroinvasive disease had fever, the absence of neuroinvasive disease, and the absence of a more likely clinical explanation for the illness.

CDC classified cases as confirmed if they met at least one of the following four laboratory criteria: (1) four-fold or greater change in virus-specific serum antibody titer; (2) isolation of virus from or demonstration of specific viral antigen or genomic sequences in tissue, blood, CSF, or other body fluid; (3) virus-specific immunoglobulin M (IgM) antibodies demonstrated in CSF by antibody capture enzyme immunoassay (EIA); or (4) virus-specific IgM antibodies demonstrated in serum by antibody-capture EIA and confirmed by demonstration of virus-specific serum immunoglobulin G (IgG) antibodies in the same or later specimen by another serologic assay (e.g. neutralization or hemagglutination inhibition).

CDC classified cases as probable if they had either (1) stable (less than or equal to a two-fold change) but elevated titer of virus-specific serum antibodies; or (2) virus-specific serum IgM antibodies detected by antibody-capture EIA but with no available results of a confirmatory test for virus-specific serum IgG antibodies in the same or a later specimen.

Since West Nile virus antibodies can cross-react with other flavivirus antibodies and since IgM antibodies can persist for up to one year, laboratory diagnosis of acute West Nile virus infection can often involve a multi-step process with multiple test assays. Caution should be used when interpreting laboratory reports.

Epidemiology of West Nile virus in California

CDPH received reports of 2,765 cases of locally acquired West Nile virus illness with estimated onset dates from 2003 through 2008². This corresponds to an average annual incidence rate of 1.2 per 100,000 California residents. Incidence rates were highest in 2004 and 2005, when California was the epicenter of national West Nile virus activity. The incidence rates were 2.1 and 2.4 per 100,000 in 2004 and 2005, respectively. From 2006-2008, annual incidence rates decreased to an average of 1 case per 100,000 [Figure 1].

Of the 2,765 cases reported to CDPH, 1,137 (41.1 percent) were neuroinvasive disease. The ratio of male to female cases was 1.5:1.0. The median age of all cases was 52 years (range: 2-96 years). Average incidence rates for the combined years 2003-2004, 2005-2006, and 2007-2008 were highest

Figure 1. California West Nile virus case counts and incidence rates, 2003-2008*

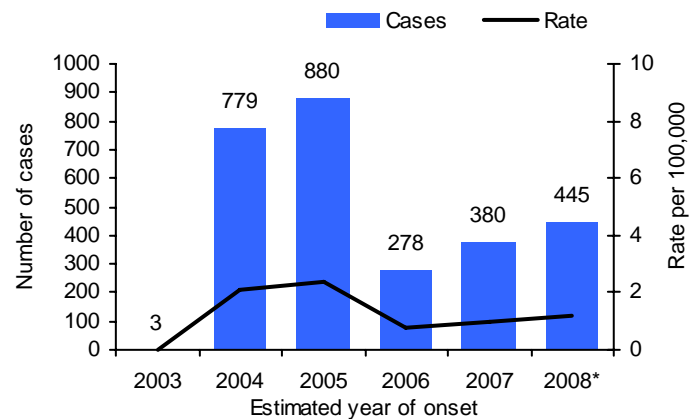


Figure 2. California West Nile virus incidence rates by age, 2003 - 2008*

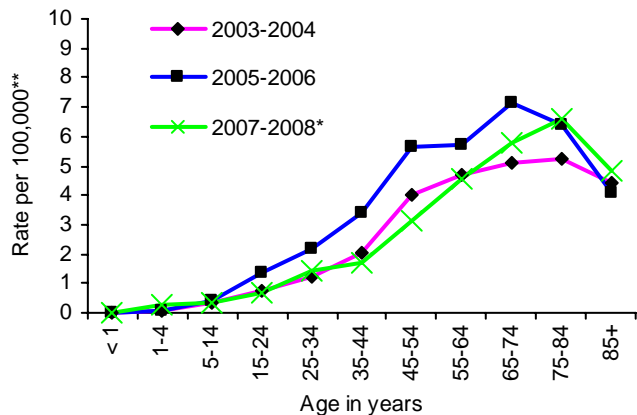
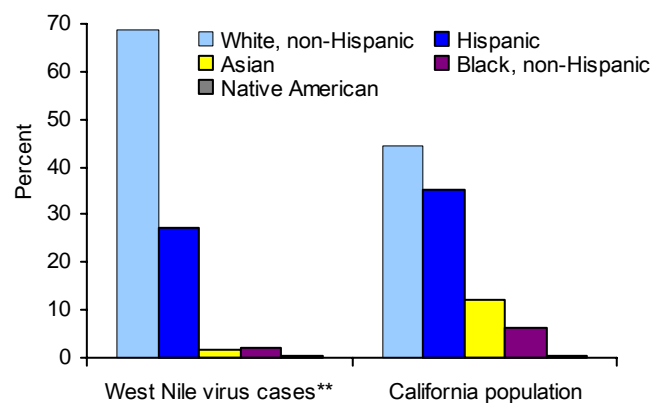


Figure 3. California West Nile virus cases and population by Race/ethnicity, 2003 - 2008*

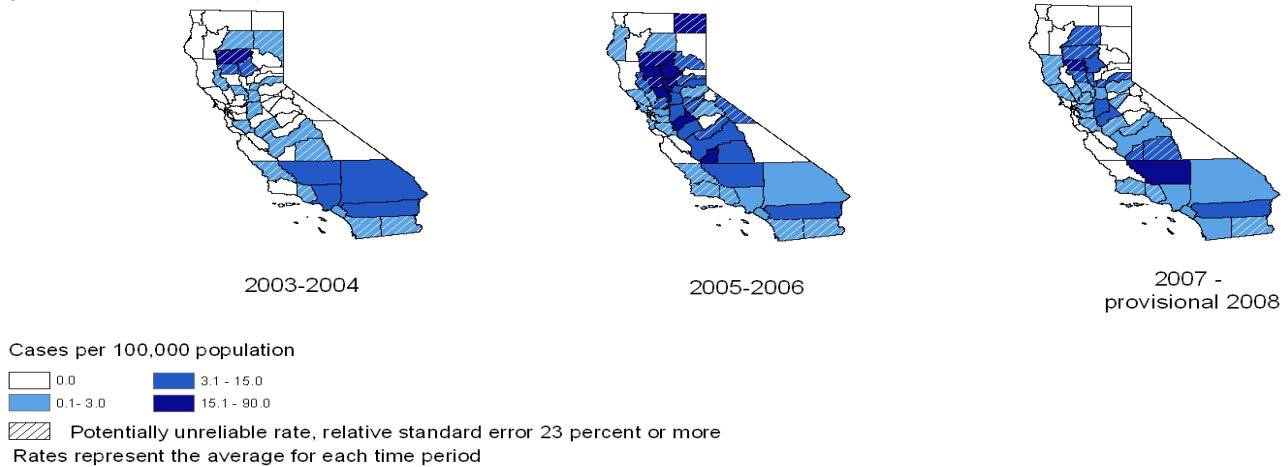


Notes for Figures 1-3

*2008 data are provisional

**Unknowns were excluded

Figure 4. California county-specific West Nile virus incidence rates, 2003 - 2008



among cases 75 to 84 years of age (6.1 per 100,000). Incidence rates among cases 75 to 84 years of age increased by 25.2 percent from the combined years 2003 and 2004 (5.3 per 100,000) to the combined years 2007 and 2008 (6.6 per 100,000) [Figure 2].

Incidence rates by race/ethnicity were not calculated due to the substantial portion of missing data (23.9 percent). Of the West Nile virus cases with complete data reported, 68.7 percent were non-Hispanic White, 27.2 percent were Hispanic, 2.2 percent were non-Hispanic Black, 1.5 percent were Asian, and 0.4 percent were Native American [Figure 3]. White, non-Hispanic cases were reported more frequently than would be expected based on the overall demographic profile of California, while Hispanic, Asian, non-Hispanic Black and Native American cases were reported less frequently than would be expected.

In California, cases of West Nile virus illness typically occur during the summer and fall seasons. During the surveillance period, 88.7 percent of all reported cases experienced onset of symptoms in the months of June through September. Forty-eight (82.8 percent) of 58 counties reported at least 1 case during the surveillance period [Figure 4].

Comment

Being outdoors increases the risk of being bitten by an infected mosquito for all individuals. The best way to prevent West Nile virus infection is to avoid mosquito bites. Some ways to do this

include using insect repellent, staying indoors during dawn and dusk (peak mosquito biting times), installing or fixing door and window screens, and draining standing water in and around the yard. Local and state public health and vector control agencies also work to prevent and control outbreaks of West Nile virus.

Some individuals appear to be at a greater risk for developing severe symptoms from West Nile virus infection. Among the cases reported in California, risk factors associated with developing neuroinvasive disease as compared to non-neuroinvasive disease included older age, male gender, and diabetes mellitus³.

References and resources

¹Epidemiologic Summaries of Selected General Communicable Diseases in California, 2001-2008: Technical Notes <http://www.cdph.ca.gov/data/statistics/Documents/technicalnotes-episummary-aug2409.pdf>

²California West Nile virus website <http://www.westnile.ca.gov>

³Jean CM, Honarmand S, Louie JK, Glaser CA. Risk factors for West Nile virus neuroinvasive disease, California, 2005. *Emerg Infect Dis.* 2007; 13(12):1918-20.

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