

## West Nile Virus – Connecticut, 2000-2013

The Connecticut Department of Public Health (DPH) monitors human cases of arboviral infections. West Nile virus (WNV) is the mosquito-borne arbovirus that most frequently results in serious illness in Connecticut residents.

During 2000-2013, a total of 114 WNV-associated illnesses were reported to the DPH. Of these, 107 (94%) infections were acquired in-state. In Connecticut, the number of annually acquired infections ranged from zero in 2004 and 2009, to 21 in 2012 (median = 6.5).

Case-patients ranged in age from 6-89 years (median = 58.5 years); 62 (54%) were male. Of the 114 case-patients, 73 (64%) had meningitis or encephalitis, 37 (32%) had WNV fever, 3 had muscle weakness of one or more extremities, and 1 was characterized by non-specific flu-like symptoms; 75 (66%) were hospitalized. There were 3 deaths associated with meningitis or encephalitis in patients >80 years of age; 2 were female (2).

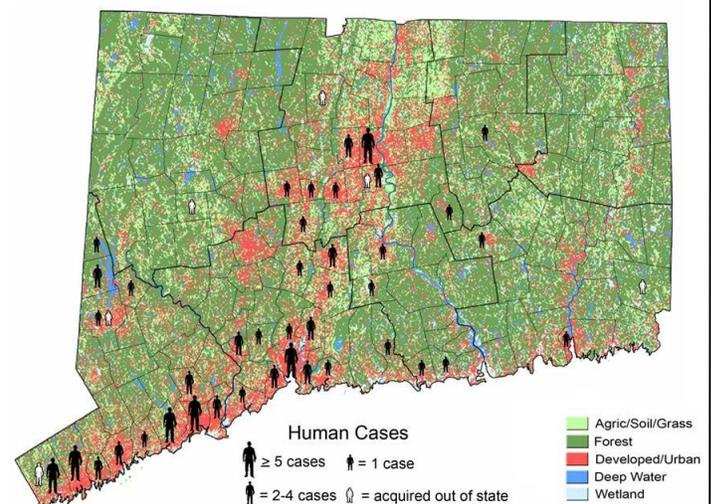
Among the 107 case-patients with in-state acquired infections, 60 (56%) were from Fairfield County, 23 (21%) from New Haven County, 17 (16%) from Hartford County, 4 (4%) from Middlesex County, 2 (2%) from New London County, and 1 (1%) from Tolland County; no cases were reported from Litchfield or Windham counties. Geographic case-patient distribution reflected land use characteristics with increased risk for human infections in areas designated as developed/urban (Figure 1). Cumulatively, onset of illness peaked during the second week of August through the third week of September (Figure 2, see page 6).

To identify areas where arboviruses are circulating, and help assess the threat to public health, the Connecticut Agricultural Experiment Station (CAES) conducts annual mosquito trapping and testing from June through October (1). Two types of traps were used at each of the 91 mosquito

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Figure 1. Human cases of WNV-associated illnesses—Connecticut, 2000-2013



trapping locations to assure attracting a variety of mosquito species including those that are most likely to carry eastern equine encephalitis virus (EEE) or WNV. Similarly, locations were chosen with habitat that supports the mosquito species of particular concern.

West Nile virus has been identified in 21 of the 50 mosquito species identified in Connecticut. Of the virus isolates, 72% were from *Culex pipiens*, a species that lays eggs in small containers of water and are commonly found peridomestically in urban and suburban settings. Traps at sites in southwestern (Fairfield and New Haven counties) and in central (greater Hartford area) Connecticut are responsible for collecting the majority (1,414 pools, 95%) of WNV infected mosquitoes (Figure 3, see page 6). Cumulatively, isolates increased rapidly during July, peaking in mid-July to mid-August and declining during September (Figure 2).

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**Editorial Note**

Since 1999, when WNV was first identified in Connecticut, New Jersey, New York and Maryland, it rapidly spread across the United States and has re-emerged annually in many states (3). Due to its complex life cycle, which includes wild bird hosts and mosquito vectors, it is difficult to predict where and how many people will become infected and develop illness each year. Many factors including the weather, numbers of birds that are infected, numbers of mosquitoes that spread the virus, and human behavior can influence the risk of transmission to people. Ongoing surveillance nationally and in Connecticut is needed each mosquito season to guide the public health response.

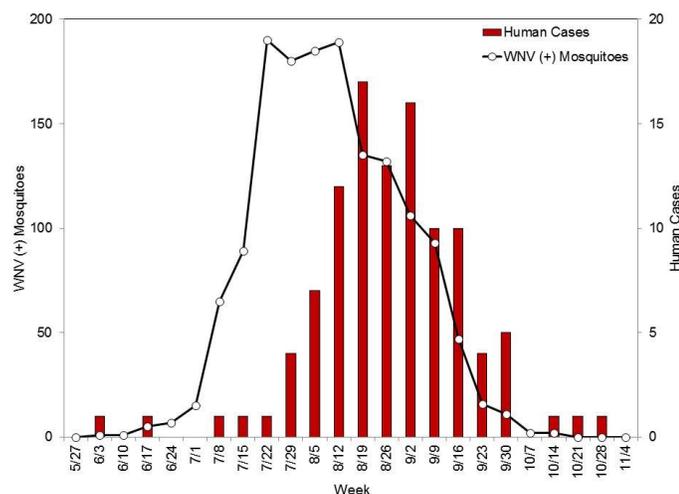
In Connecticut, WNV surveillance focuses on identification of human cases, and identification of the virus in mosquitoes captured at trapping sites throughout the state. While WNV activity varies annually, some regional and temporal patterns of human illness and virus isolations from mosquitoes have emerged that can help focus the public health response. From 2000-2013, 93% of people with WNV infections acquired in-state were residents of urban and suburban towns with dense human population in three of Connecticut's eight counties

(Fairfield, New Haven, and Hartford counties). Based on the dates of onset of illness and typical incubation period, risk for acquiring WNV infection is generally highest from early-August to early-September. These findings are also supported by mosquito surveillance data that provides early warning of regional presence of WNV infected mosquitoes, and detailed information for risk assessment. Mosquitoes collected from each trap site provide information on the abundance, distribution, and infection of potential mosquito vectors.

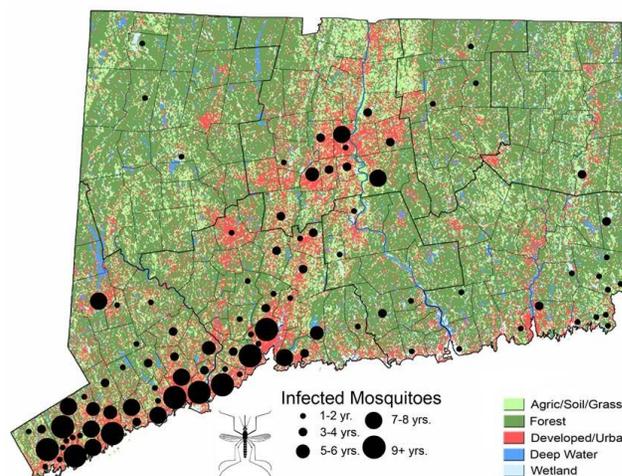
The majority of people with WNV infections do not develop illness, and <1% develop serious neurologic illness. In the U.S. however, WNV has the potential to cause large outbreaks and serious illness. In 2012, an outbreak of WNV resulted in 5,674 cases reported nationally, an increase of 697% over the previous year. Of these cases, 3,491(62%) case-patients were hospitalized, and of these 286 (8%) died (4). In Connecticut in 2012, 21 cases were reported representing a 133% increase over the previous year. Of these cases, 12 (57%) patients were hospitalized; no deaths were reported.

To raise awareness and encourage adoption of prevention measures, surveillance data are shared with local health departments, health care providers and the public through press releases. Information and data are also available online at: <http://www.ct.gov/mosquito/site/default.asp>. Homeowners and other property owners are reminded to reduce standing water on their properties. Persons who live in areas with WNV activity should take precautions

**Figure 2. Human cases of WNV-associated illnesses and mosquito isolations– Connecticut, 2000-2013.**



**Figure 3. Frequency of WNV mosquito isolations by location – Connecticut, 1999-2013.**



to avoid mosquito bites; this is particularly important for older people who are at the highest risk for developing severe WNV-associated illnesses. Surveillance data also serve to help guide diagnostic testing of patients who present with neuroinvasive disease that may be due to arboviral infections.

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## Dengue Among Connecticut Residents, 2011-2013

Dengue is a mosquito-borne disease caused by any of four closely related single-stranded RNA viruses (DENV-1-4). Dengue virus is a leading cause of illness and death in the tropics and subtropics, and has the potential to cause outbreaks in the United States (1). Because of concerns regarding travel-associated dengue infections, potential for the establishment of domestic local transmission cycles, and transfusion-associated infections, dengue virus infections were added to the list of nationally notifiable diseases in 2010 (2). In Connecticut, dengue has been a reportable laboratory finding and physician reportable disease since 2011 (3).

Infection with dengue virus can produce a wide spectrum of illness, although most infections are asymptomatic or subclinical (4). Severe disease occurs in a small proportion of cases and is mostly characterized by plasma leakage with or without hemorrhage. Symptoms generally develop after an incubation period of 4-10 days. Susceptibility is universal, with infants and young children usually having milder illness. Recovery from infection from one of the four serotypes provides lifelong homologous immunity but only short-term protection against other serotypes.

For surveillance purposes, dengue fever (DF) is defined as an acute febrile illness that includes at

least two of the following: headache, myalgia, arthralgia, retro-orbital or ocular pain, rash, leukopenia, or hemorrhagic manifestations (2). Dengue hemorrhagic fever (DHF) is characterized by all of the following: fever lasting 2-7 days, thrombocytopenia, a hemorrhagic manifestation or positive tourniquet test, evidence of plasma leakage shown by hemoconcentration or pleural effusion, or ascites, or hypoproteinemia. Dengue shock syndrome (DSS) includes all criteria for DHF plus circulatory failure.

Laboratory confirmation requires: identification of virus antigen (by virus isolation, polymerase chain reaction, immunofluorescence or immunohistochemistry) or serology (by seroconversion from negative to positive for the presence of Immunoglobulin M antibodies, IgM antibodies in cerebrospinal fluid, or four-fold rise in Immunoglobulin G antibody titer, Hemagglutination inhibition titer, or plaque reduction neutralization test end point titer). Dengue IgM antibodies in serum based on a single titer are supportive but not confirmatory.

During 2011-2013, 41 cases of dengue were reported to the DPH, which included 40 DF and 1 DHF. No cases of DSS were reported. Overall, dengue was reported among persons aged 8-71 years with a median age of 44.; 26 (63%) were female. Onset of illness peaked July through September.

All case-patients reported travel outside of the United States during their incubation period, with 10 (24%) reporting travel to Puerto Rico. Destination countries also included Bangladesh (1), Barbados (2), British Virgin Islands (4), Cambodia (1), China (1), Dominican Republic (2), El Salvador (1), Haiti (4), India (4), Jamaica (5), Nicaragua (3), Thailand (1), Trinidad and Tobago (1), and the US Virgin Islands (1). These countries all have areas of known risk for dengue virus transmission.

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### Editorial Comment

Dengue is the most common vector-borne disease in the world, causing an estimated 50-100 million infections and 22,000 deaths annually, and is

spreading geographically (1). Travelers to endemic areas may be viremic upon return to the U.S. and capable of introducing dengue virus into populations of competent mosquito vectors. Among Connecticut residents, peak illness onset occurs during July and August, when residents are most likely to travel on vacation.

Following a bite from an infected mosquito, humans are infective from shortly before, through the end of the febrile period, generally 2-7 days. The mosquito becomes infective 8-12 days after the viremic blood meal, and remains so for life (5). The most important dengue vector is *Aedes aegypti*, which is present in the southern and southeastern U.S. *Aedes albopictus* is also capable of transmitting dengue viruses although with less potential to cause large outbreaks. The Connecticut Agricultural Experiment Station found an increase in the number of *Ae. albopictus* trapped during 2012-2013 in southern Connecticut, and in 2013 identified a population overwintering in Fairfield County (6). With the climate changes projected, *Ae. albopictus* populations are expected to become increasingly established at more northern latitudes.

During 2009-2010, a total of 28 Key West, FL residents became the first dengue cases acquired in the continental U.S. outside of the Texas-Mexico border since 1945, and the first locally acquired cases in Florida since 1934 (7). In 2013, Suffolk County, NY saw its first case of dengue fever acquired locally (8). Prior to this, locally acquired dengue had only been documented in FL, TX, and HI. The NY patient did not travel outside of the local metropolitan area. The most likely cause of infection was a bite from a mosquito that had previously bitten an infected traveler.

The recent cases in Key West and New York, as well as trends in CT mosquito population data, illustrate the need for ongoing local surveillance and awareness among the medical community of the signs and symptoms of dengue virus infection. Expansion of dengue in the Americas has been

dramatic over the past 30 years (Figure 1). Timely detection and reporting of suspected cases to public health authorities can facilitate the identification of locally acquired cases, and may help to identify emerging areas of transmission.

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Figure 1. Laboratory-confirmed DHF in the Americas prior to 1981 vs. 1981-2003



Source: WHO PAHO CDC

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