



Westchester County Department of Health



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Community Health Assessment Data Update

2018.01

Arbovirus/Mosquito Control and Surveillance, 1999-2017

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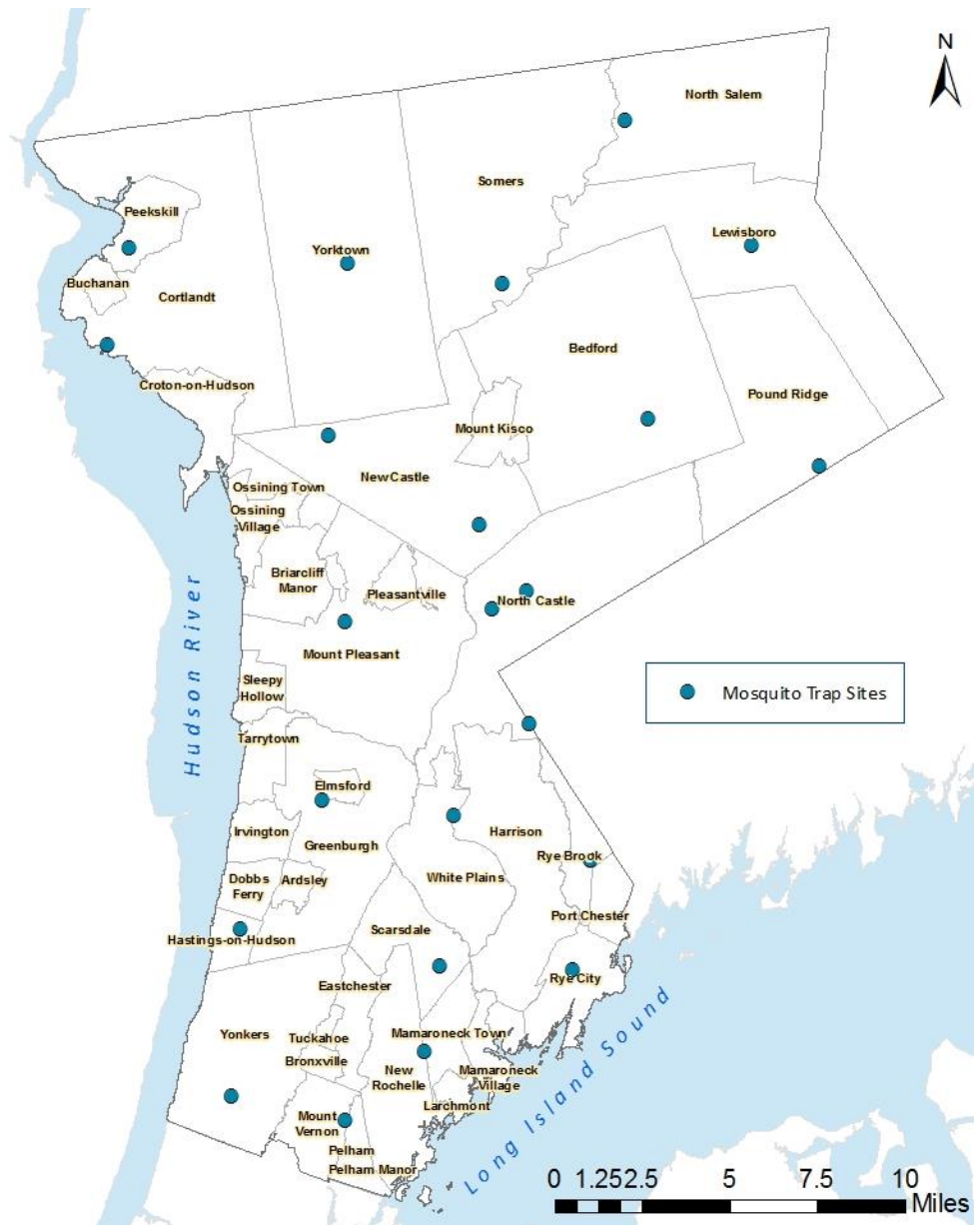
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Mosquito Surveillance Trap Sites, 2017



Mosquito Control and Surveillance

The Westchester County Department of Health (WCDH) has worked since 1999 to prevent the spread of arboviruses which cause mosquito-borne disease. This has been done through mosquito control and education efforts.

Mosquito Control

Eliminating Breeding Sites

Each spring and throughout the mosquito breeding season, WCDH collaborates with municipalities, community stakeholders, and the public to identify and eliminate standing water in places such as empty lots and backyards. These intensive efforts reduce potential mosquito breeding sites. The health department also investigates any complaints of standing water from residents.

Minnow Distribution

Fathead minnows help provide control by eating mosquito larvae and pupae before they emerge into adult mosquitoes. Since 2013, WCDH has distributed minnows to County residents and municipalities. Approximately 410 pounds and 450 pounds were distributed in 2016 and 2017, respectively.

Larvicide

Catch basins are municipal drainage systems used to move excess rainwater from streets and other urban surfaces into the storm drain system. Catch basins may hold standing water for a long period of time, making them ideal for mosquito breeding. Up to 2017, WCDH evaluated thousands of catch basins throughout the County and applied larvicide when necessary in each May. Starting in 2018, WCDH will larvicide as needed.

Adulticide

If disease-bearing mosquitoes ever become a serious threat to public health, the county will consider applying pesticides. To date, this has only occurred in 2000.

Mosquito Surveillance

Trapping

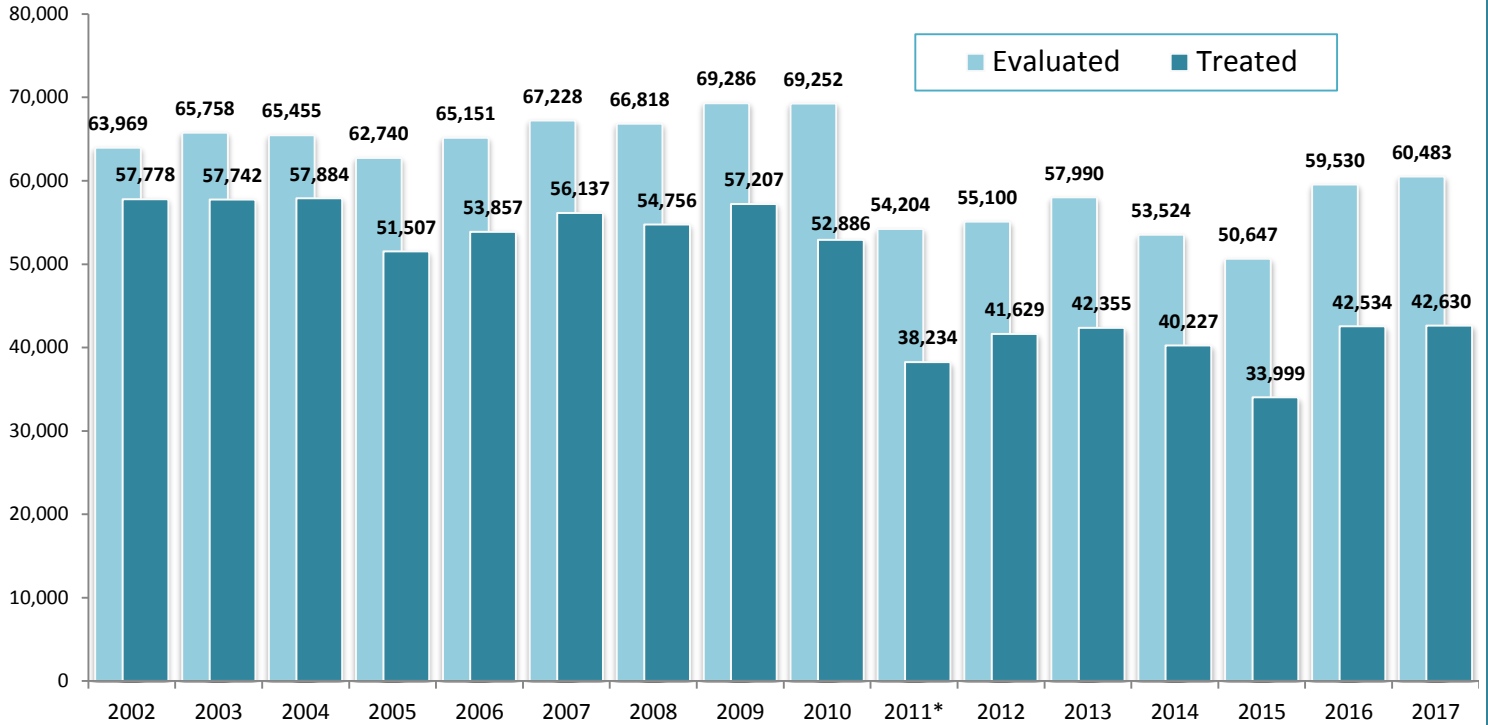
Each year, WCDH sets up multiple trap sites throughout the County from May to October. The trapping of mosquitoes allows for surveillance and testing for the presence of mosquito-borne diseases. Trap sites are selected based on population density, where positive mosquitoes have been identified in the past, and locations of past human West Nile virus (WNV) cases, as well as site availability or the need for additional surveillance in response to heavy mosquito infestation. In 2016, WCDH expanded the number and type of traps due to the new threat of potential spread of Zika.

Testing

WCDH staff collects the trapped mosquitoes three to four times a week. The trapped mosquitoes are sorted by species and submitted in batches for WNV, Zika virus (beginning in 2016), and other arbovirus testing at the NYS Wadsworth Laboratory following the NYSDOH guidelines.

Catch Basin Evaluation and Treatment

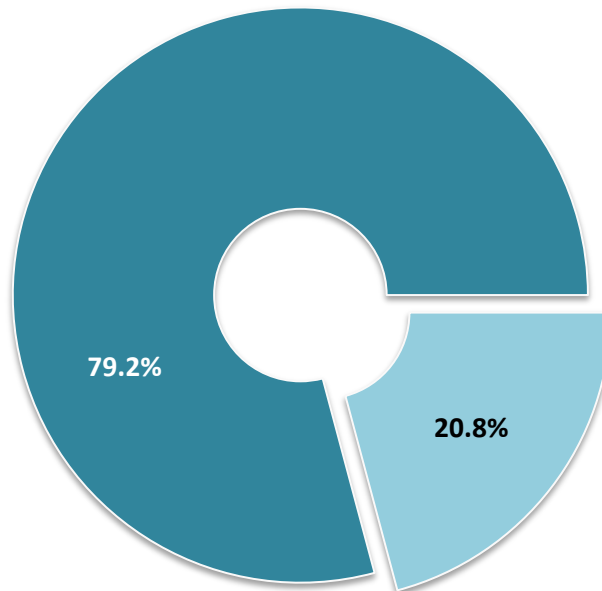
Number of Catch Basins Evaluated and Treated with Larvicide, 2002-2017



*From 2011 on, WCDH no longer carried out larvicide activities on NYSDOT roads.

Average Percentage of Evaluated Catch Basins Treated with Larvicide, 2002-2017

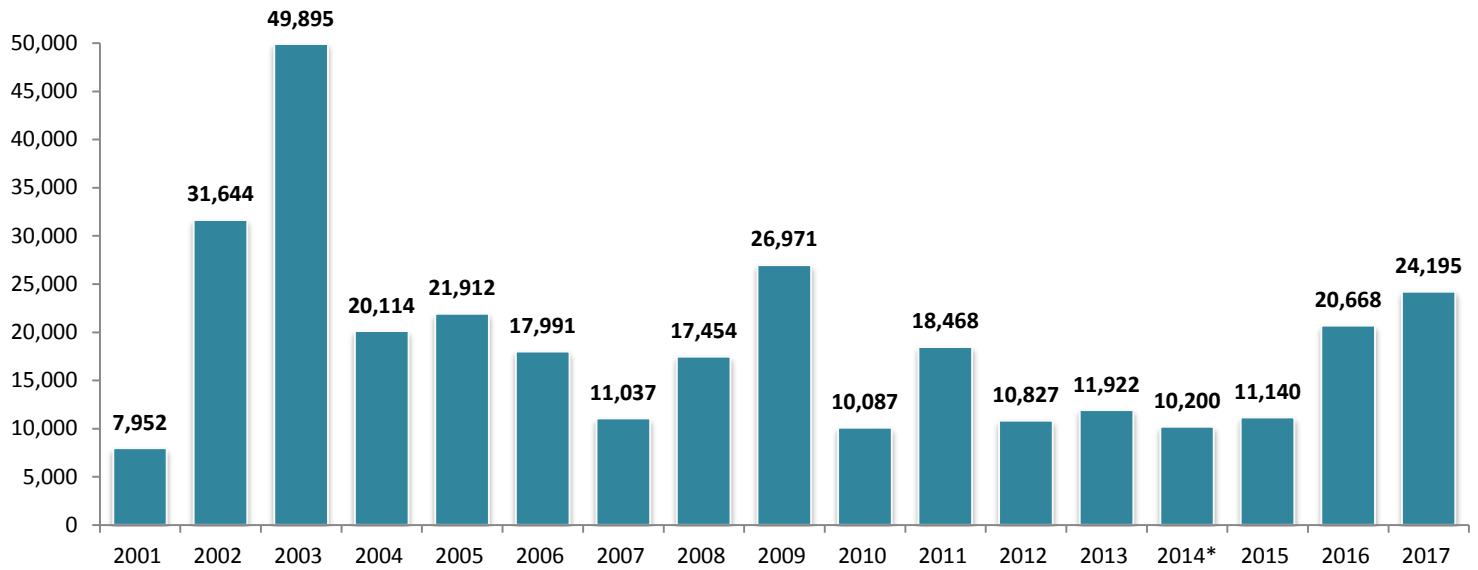
On average, approximately 4 out of 5 catch basins evaluated in Westchester County were treated with larvicide between 2002 and 2017.



Some catch basins were not treated either due to the absence of standing-water or inaccessibility.

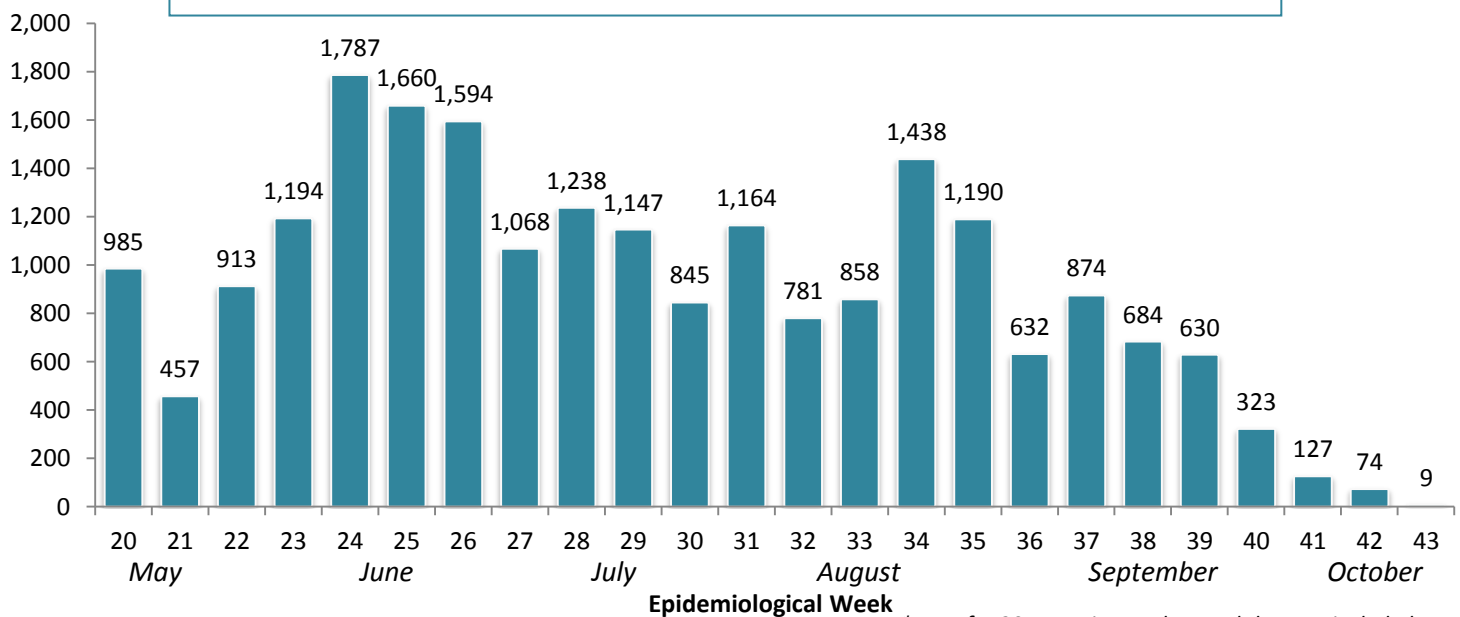
Mosquito Surveillance

Total Number of Mosquitoes Trapped, 2001-2017



*2014 data for number of mosquitoes trapped is an estimate

Average Number of Mosquitoes Trapped per Epidemiological Week, 2001-2017*

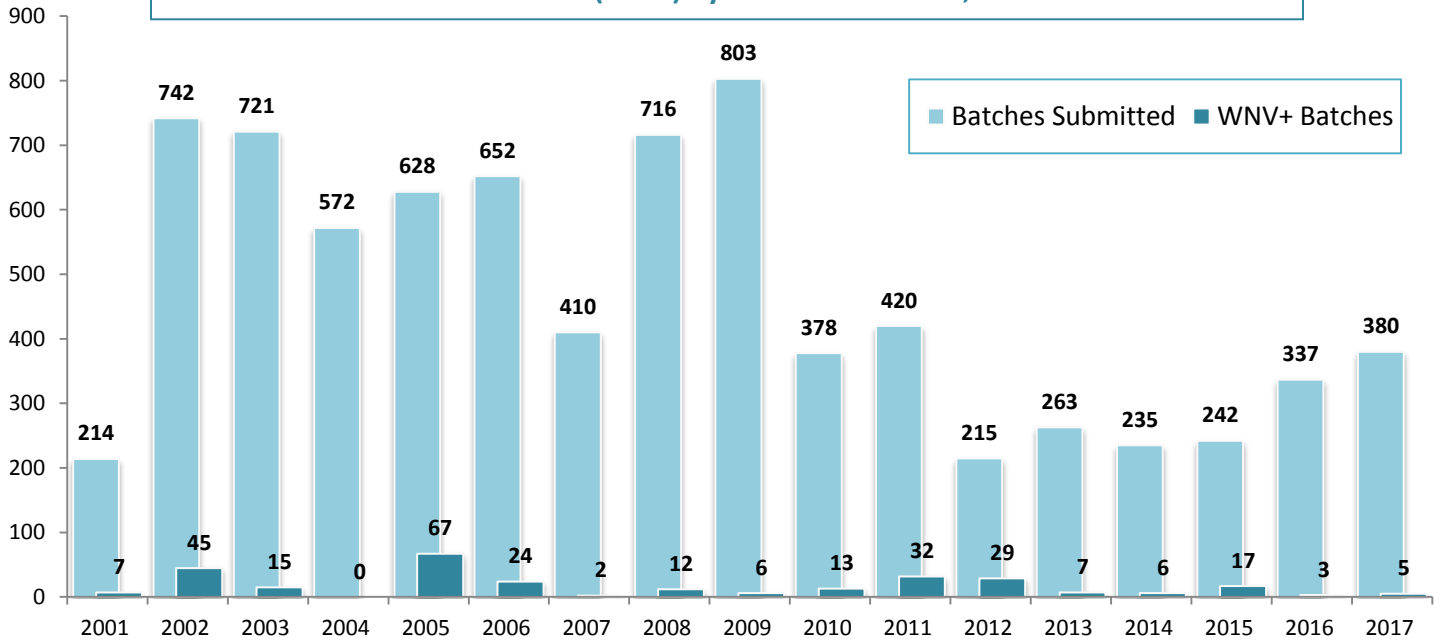


*Data for 2014 are incomplete and thus not included

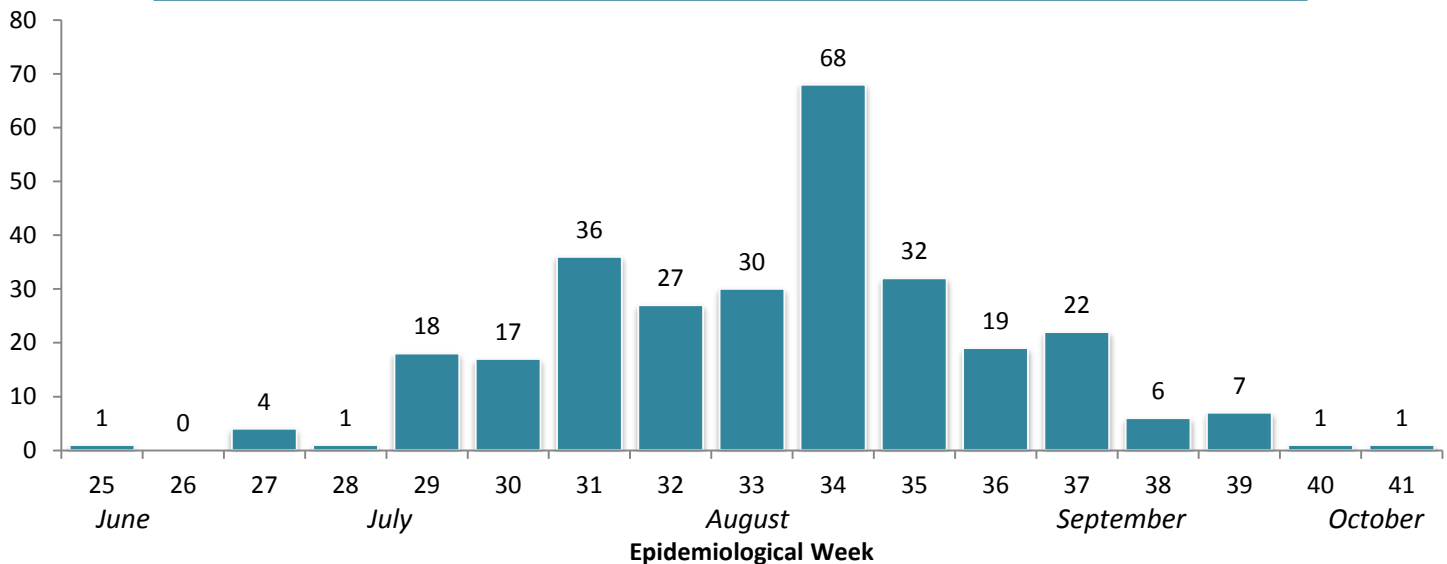
An epidemiological week (also known as epi week, CDC week, or MMWR week) is a standardized method of counting weeks that allows comparison of data by year. Each epidemiological week starts on a Sunday with the first one being the first week with at least four days in the calendar year. Therefore, the starting date of each epidemiological week may fall on a different date each year. For example, the first epidemiological weeks started on 12/31/2000 for 2001 and started on 1/2/2017 for 2017. The start of the 20th epidemiological week ranges from 5/11 to 5/17 in any given year and the start of the 43rd epidemiological week ranges from 10/19 to 10/26.

Mosquito Batches Submitted for Testing and Results

Number of Mosquito Batches Submitted for Testing and Batches Testing Positive for West Nile Virus (WNV) by Year of Collection, 2001-2017



Cumulative Number of Batches Testing Positive for West Nile Virus by Epidemiological Week of Collection, 2001-2017



Since 2001, 7,928 mosquito batches have been submitted for testing. Each batch contained a minimum of 10 mosquitoes. Overall, 290 batches were tested positive for WNV, with the positive rate of 3.7%. During the past 17 years of surveillance, the greatest number of WNV positive mosquitoes was found in the 34th week of the year (typically mid- to late-August). No positive batches were identified before week 25 or after week 41. No Zika virus has been identified in any mosquito batches to date.

West Nile Virus

WNV can cause serious illnesses.

Approximately 3 out of 4 people who are infected do not show any symptoms, but about 1 in 4 will develop mild symptoms 3-14 days after being bitten by an infected mosquito.

Even though the chance of serious disease is less than 1%, there is no treatment or vaccine. Serious symptoms may last for several weeks and can be life-threatening among people with a vulnerable immune system. The neurological effects of a WNV infection may be permanent.

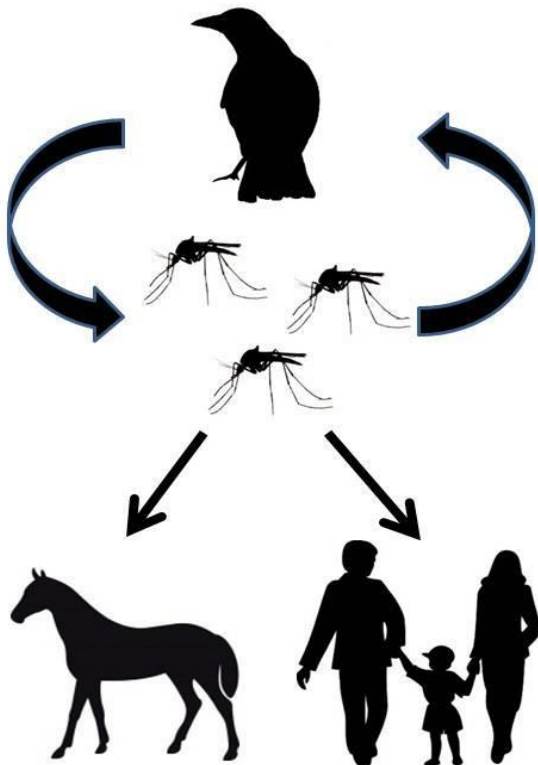
Symptoms of West Nile Virus

Mild symptoms:

- Body aches
- Fever
- Fatigue
- Headache
- Mild rash
- Swollen lymph glands

Serious disease symptoms:

- High fever with rapid onset
- Headache and neck stiffness
- Disorientation
- Convulsions
- Encephalitis
- Paralysis
- Coma
- Death



The West Nile Virus Life Cycle

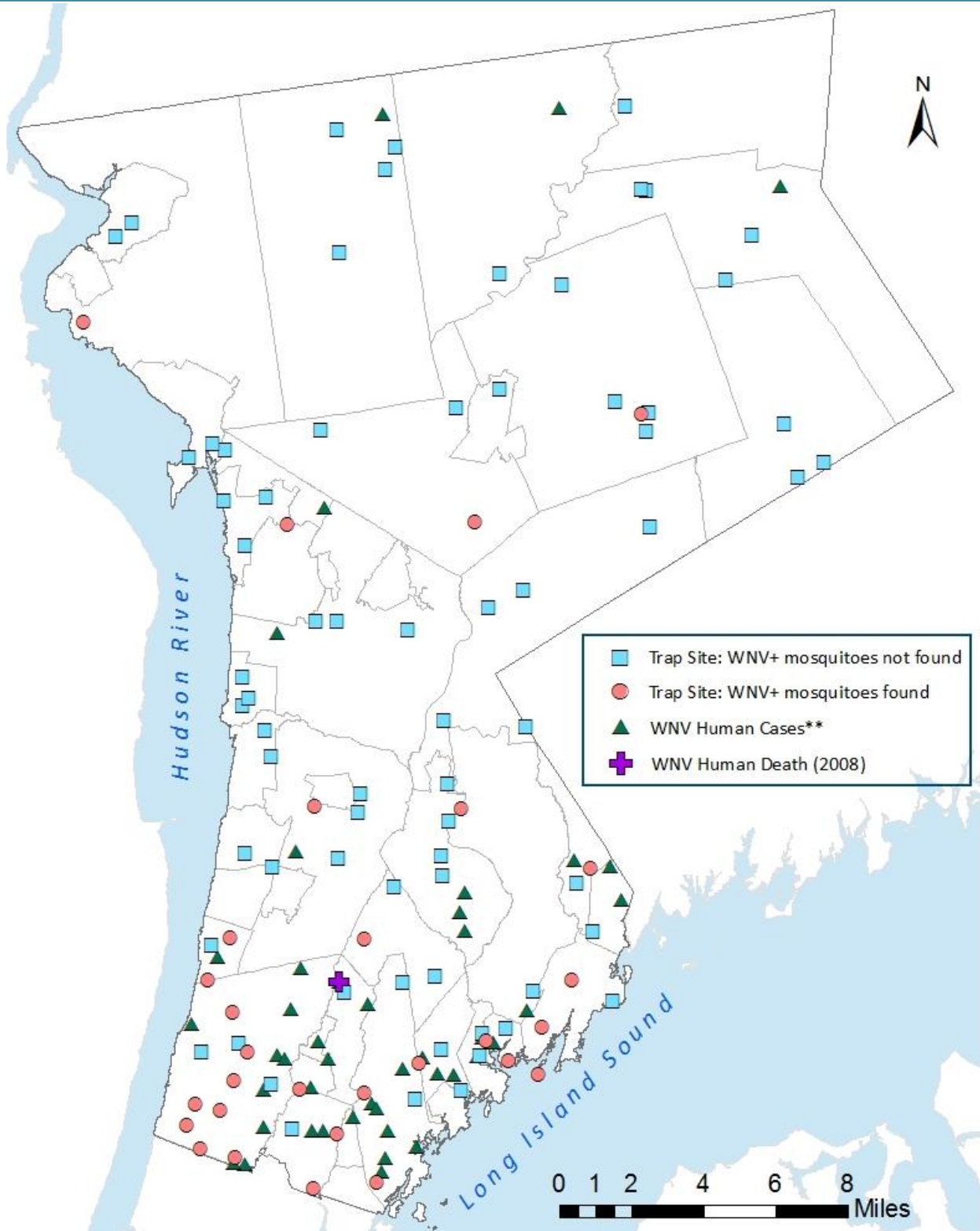
West Nile virus is reproduced by a cycle of transmission between adult blood-feeding mosquitoes and birds, which are the main reservoir hosts for the virus.

Certain species of mosquitoes feed on both birds and mammals, and are the bridge vector for WNV transmission to humans.

In Westchester County, the *Culex*, *Ochlerotatus*, and *Aedes* genera are the most common mosquito types. The species *Culex pipiens-restuans* is the major mosquito vector for WNV transmission between animal reservoirs and humans in New York State.

Trap Site Locations and West Nile Virus Human Cases Over Time

Cumulative Distribution of Mosquito Trap Sites and West Nile Virus (WNV) Human Cases, 1999-2017*

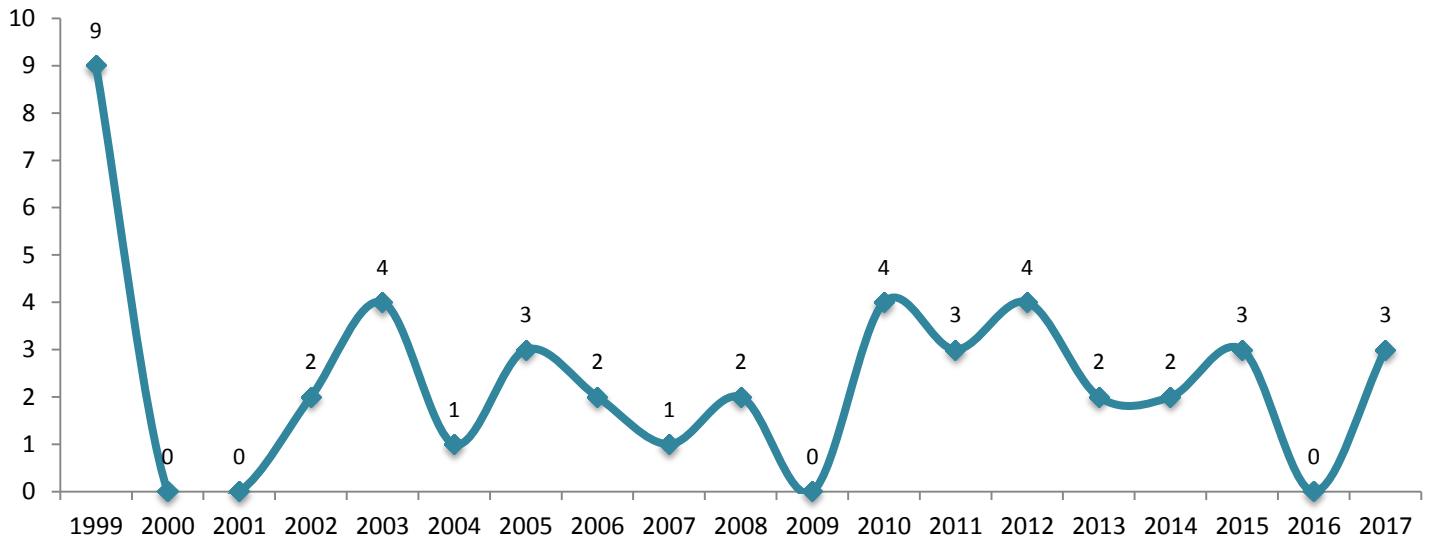


*Mosquito trap site data presented for 2001-2017 only.

**Human cases include both confirmed and probable cases.

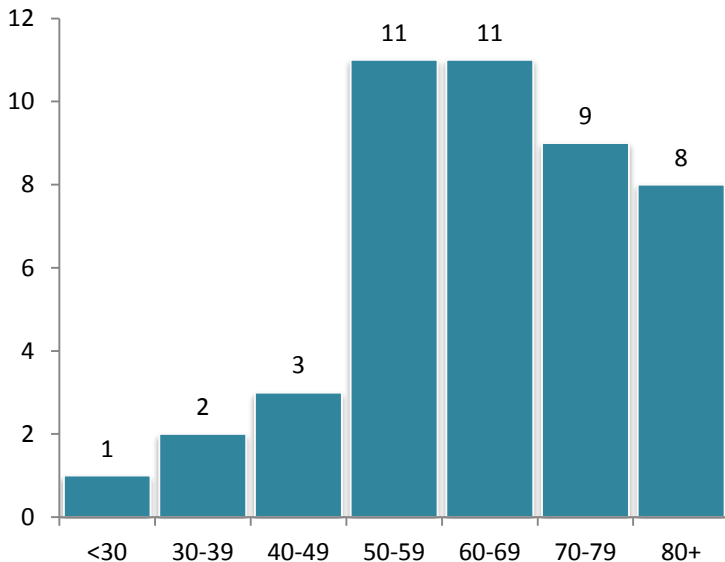
West Nile Virus Human Cases

Number of Confirmed West Nile Virus Human Cases, 1999-2017



The health department monitors West Nile virus encephalitis among other mosquito-borne diseases. From May to October, the health department provides all county hospitals and infectious disease specialists with educational materials, reminders on criteria for case reporting and submission of laboratory specimens, and updates on arbovirus activity. Health department staff visit the homes and surrounding neighborhood of every person who is confirmed to have West Nile virus to identify and eliminate any mosquito breeding areas. When appropriate, the health department provides targeted mosquito control measures in these areas to prevent further transmission.

Age Distribution of Human West Nile Virus Cases, 1999-2017



Since 1999, 45 Westchester residents had West Nile virus and one death was reported in Westchester County.

Of the 45, 20 were women and 25 were men. Approximately 62.2% of cases were among people aged 60 or older.

With the exception of five, all Westchester residents with West Nile virus resided in the southern half of the county.

Zika Virus

Zika is a virus spread to people primarily through the bite of an infected mosquito.

Many people infected with Zika virus won't have symptoms or will only have mild symptoms, which can last several days to a week.

However, a pregnant woman can pass Zika to her fetus during pregnancy or around the time of birth. Zika infection during pregnancy can cause a serious birth defect called microcephaly and other severe fetal brain defects. A person with Zika can also pass it to his or her sex partners.

Symptoms and Effects of Zika Virus

Mild symptoms:

- Fever
- Rash
- Joint pain
- Conjunctivitis (red eyes)
- Muscle Pain
- Headache

Potential serious effects around pregnancy:

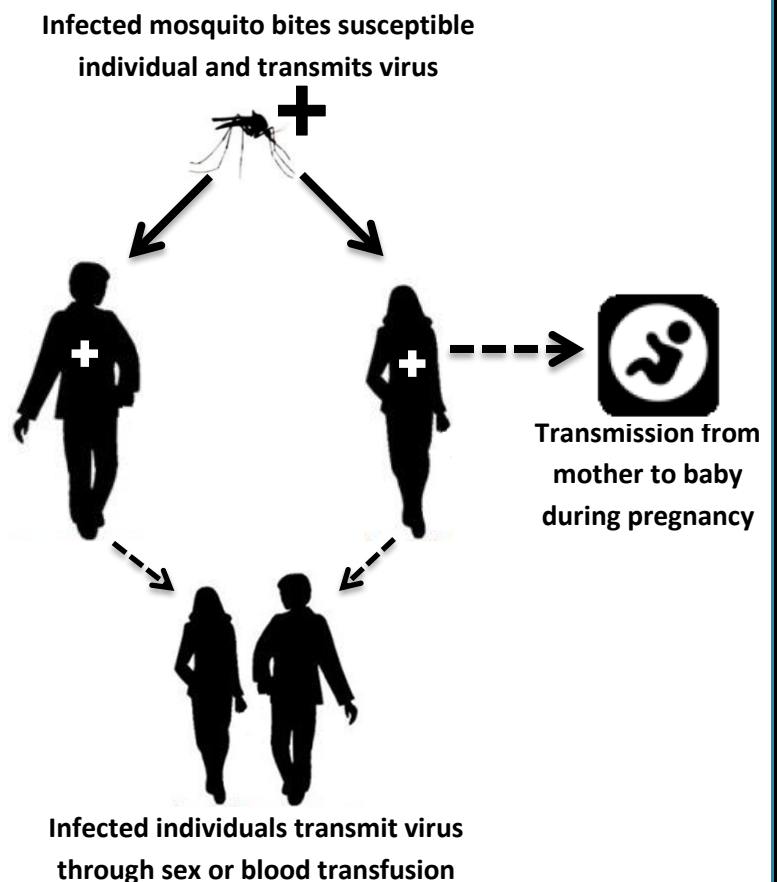
- Microcephaly - where a baby's head is much smaller than expected, due to improper development
- Other severe fetal brain defects

Infected *Aedes aegypti* mosquitoes are the primary spreaders of Zika in the United States. At this time, New York State is not a known habitat for the *Aedes aegypti* mosquito. There is laboratory evidence that a related mosquito (*Aedes albopictus*) found in Westchester County may carry and spread the Zika virus.

Pregnant women should not travel to any area with Zika. People who have traveled to or live in places with Zika are encouraged to protect themselves by preventing mosquito bites, and sexual transmission of Zika through barrier methods.

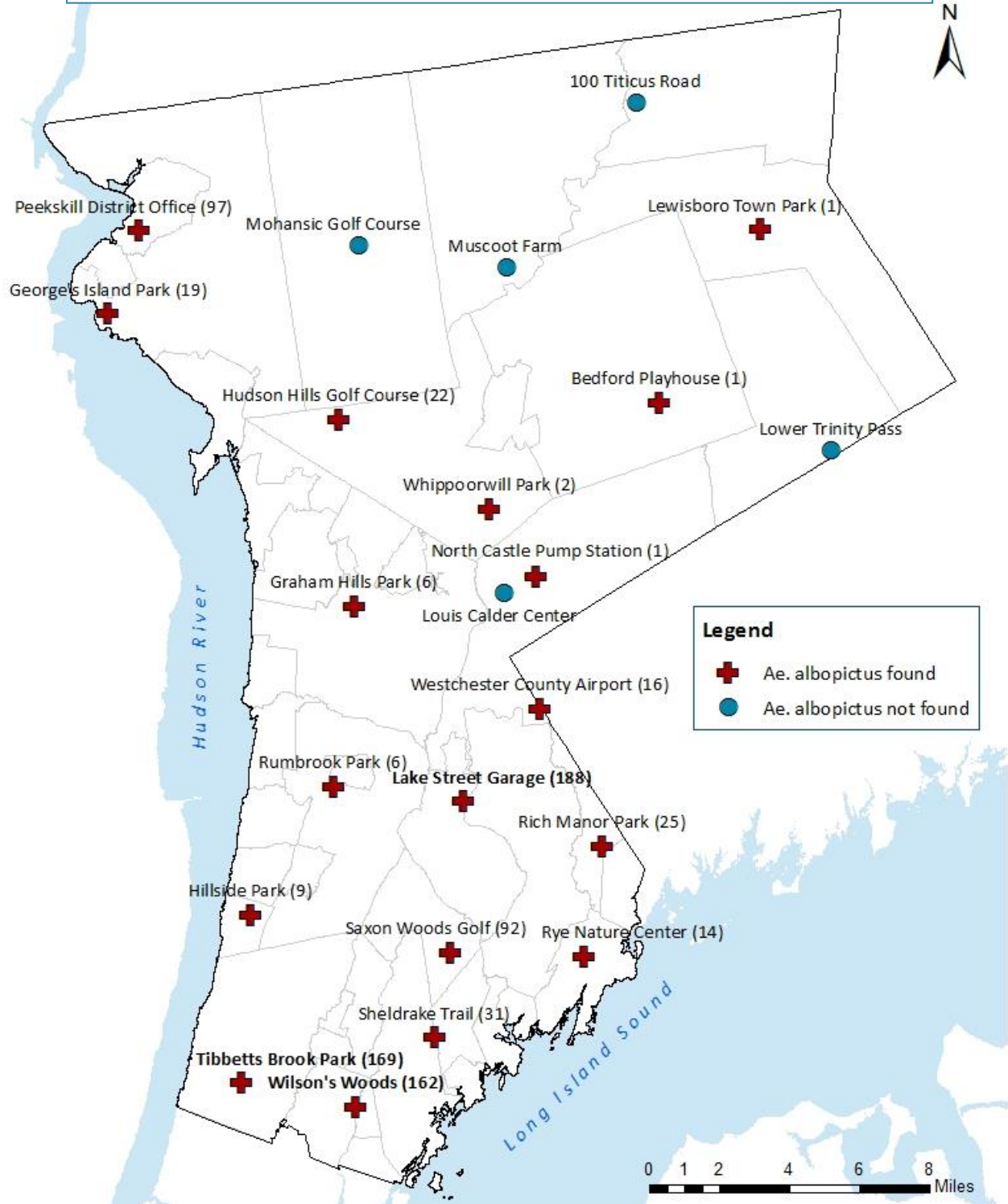
More information about Zika can found at: health.westchestergov.com/zika-virus-facts

The Zika Virus Transmission Cycle



Trap Site Locations and *Aedes Albopictus* Habitat

Identified *Aedes Albopictus* Habitat and Average Number of *Aedes Albopictus* Collected Per Trap Set by Mosquito Trap Site, 2017



There is laboratory evidence that the *Aedes albopictus* mosquito, also known as the Asian Tiger Mosquito, can carry and spread the Zika virus. This mosquito species was found across 18 (78%) of the 23 trap sites used across Westchester County in 2017.

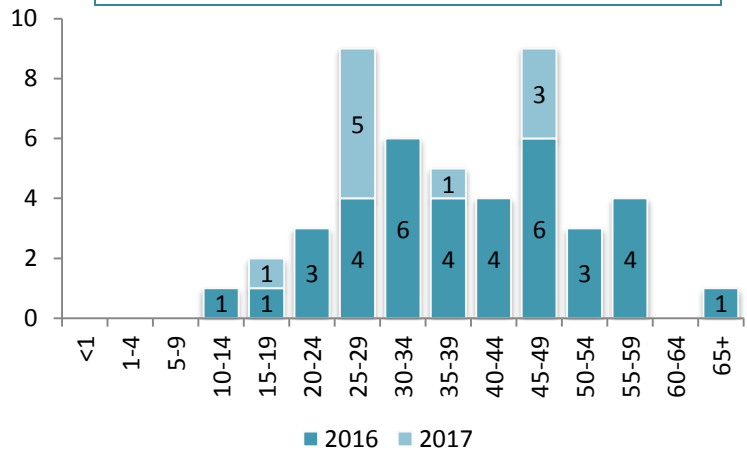
Zika Human Cases and Investigations

To identify cases and monitor disease spread, the health department processed a large volume of reports for Zika in 2016 and 2017. In these two years, 1,819 tests or authorizations for test were processed in Westchester County (795 in 2016 and 1,024 in 2017). Approximately 38% (683) of the total tests or authorization for tests were for pregnant women, a prioritized group due to the possible negative effects of Zika to an unborn baby.

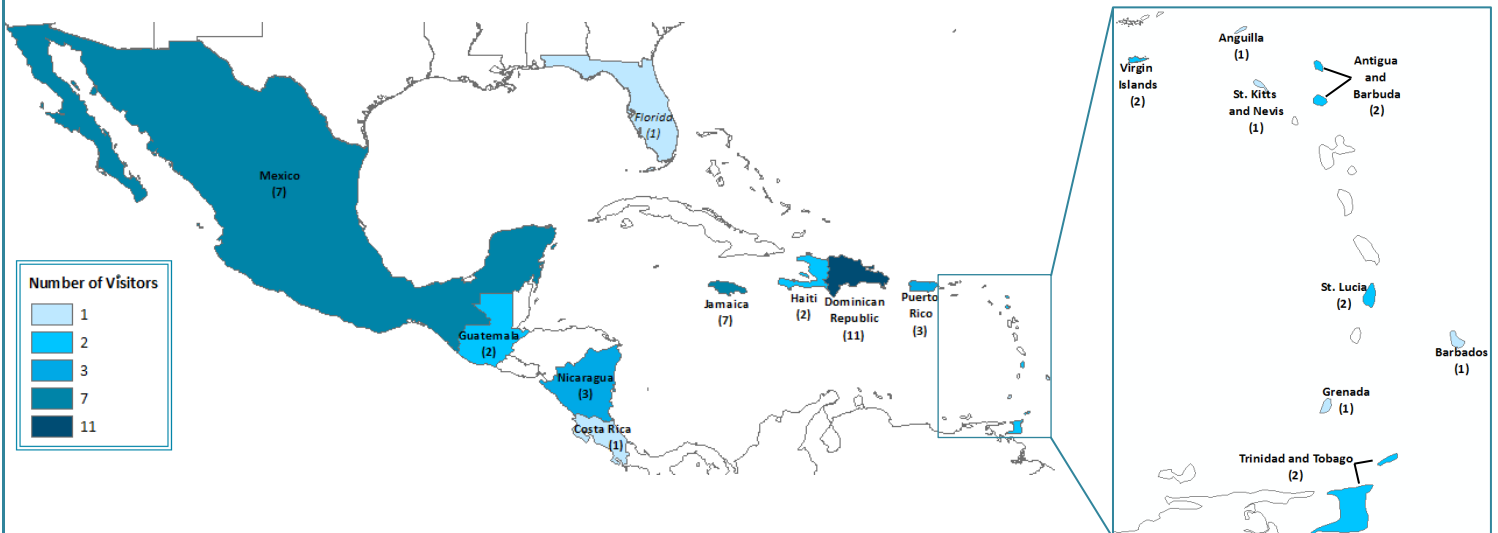
	2016	2017	TOTAL
# Tested/Authorized for Testing	795	1,024	1,819
Male	134	183	317
Female	661	840	1,501
<i>Pregnant</i>	<i>387</i>	<i>296</i>	<i>683</i>
Unknown	0	1	1
# Cases	37	10	47
Male	13	1	14
Female	24	9	33
<i>Pregnant</i>	<i>5</i>	<i>3</i>	<i>8</i>

A total of 47 confirmed or probable cases of Zika virus were identified in 2016 (37) and 2017 (10). None of the 47 cases were locally acquired in Westchester County. The median age of the Zika cases in 2016 and 2017 were 38 years (range 12 – 72 years) and 29 years (range 19 – 49 years), respectively. Eight (24.2%) of the 33 female cases were pregnant, and early identification allowed these women to be closely monitored by their health providers. There have been no reports to date of Zika-related effects in any newborns.

Age Distribution of Zika Virus Cases, 2016-2017



Of the 37 cases in 2016, 33 had mild symptoms and 4 did not experience symptoms. Of the 10 cases in 2017, 4 had mild symptoms and 6 did not experience symptoms. All 47 Westchester County cases of Zika virus in 2016 and 2017 have been associated with travel to a Zika-affected country. Approximately 53% of the cases traveled to the Dominican Republic (11), Mexico (7), or Jamaica (7).



Other Mosquito-borne Diseases

In addition to West Nile virus and Zika virus, human cases of chikungunya, dengue fever, and malaria have also been reported in Westchester County.

Chikungunya

Reported cases of chikungunya in the United States have historically been acquired from travel to countries in Africa, Asia, Europe, and the Indian and Pacific Oceans until late 2013 when a large outbreak began in the Caribbean. Chikungunya virus disease is spread to people through the bite of an *Aedes* mosquito infected with chikungunya virus. The most common species that transmit this virus are *Aedes aegypti* and *Aedes albopictus*. These species also transmit Zika virus and, as stated earlier, only *Aedes albopictus* mosquitoes are found in Westchester County. To date, there are no reports of chikungunya virus being transmitted in New York State.

Most people with chikungunya virus will develop some symptoms starting 3 to 7 days after being bitten by an infected mosquito. Death is a rare outcome for chikungunya but the symptoms can be severe and disabling for some. Most people experiencing symptoms will feel better within a week but some may experience joint pain for months.

There is no treatment or vaccine available for chikungunya, but symptoms can be relieved by getting plenty of rest, drinking fluids to prevent dehydration, and taking medication to reduce fever and pain.

It is likely that people who have already been infected with chikungunya virus will be protected from future infections.

Between 2014 and 2017, 50 Westchester residents had chikungunya virus disease of which 40 (80%) were diagnosed in 2014.

Of the 50 cases, 33 were women, 17 were men, 16 were between 50 to 59.

Symptoms of Chikungunya Virus

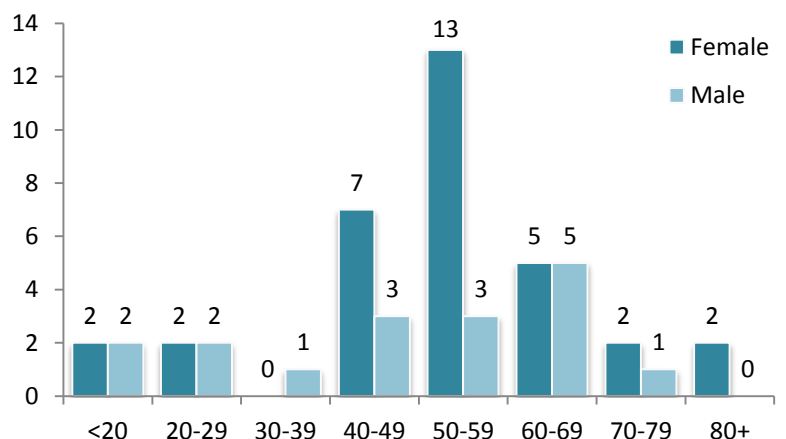
Symptoms:

- Fever
- Joint pain
- Headache
- Muscle Pain
- Joint Swelling
- Rash

Population at risk for more severe disease:

- Newborns infected around time of birth
- Adults 65 years of age or older
- People with medical conditions such as high blood pressure, diabetes, and heart disease

Age & Sex of Chikungunya Cases, 2014-2017



Other Mosquito-borne Diseases

Dengue Fever

The same mosquito genus that transmits Zika virus and chikungunya virus can also transmit dengue fever. This disease is primarily spread to people through the bite of an *Aedes* mosquito infected with one of four closely related dengue viruses, with the most common mosquito vector being the *Aedes aegypti*. Most cases in the U.S. are associated with travel to areas where dengue is endemic such as tropical Asia and the Caribbean but outbreaks of local transmission are occasionally reported.

Most people infected with dengue fever will have mild or no symptoms and will recover after a week. Symptoms may begin from 3 to 14 days after being bitten but typically manifest within 4 to 7 days. Dengue fever causes flu-like symptoms that last for 2 to 7 days but some people may develop a severe form known as dengue hemorrhagic fever (DHF) around 3 to 7 days after the first sign of illness. Dengue fever leads to DHF when the case's fever declines and warning signs are exhibited that can lead to circulatory failure and shock which can result in death if untreated.

Symptoms of Dengue Fever and Warning Signs for Dengue Hemorrhagic Fever

Symptoms of dengue fever include high fever and at least two of the following:

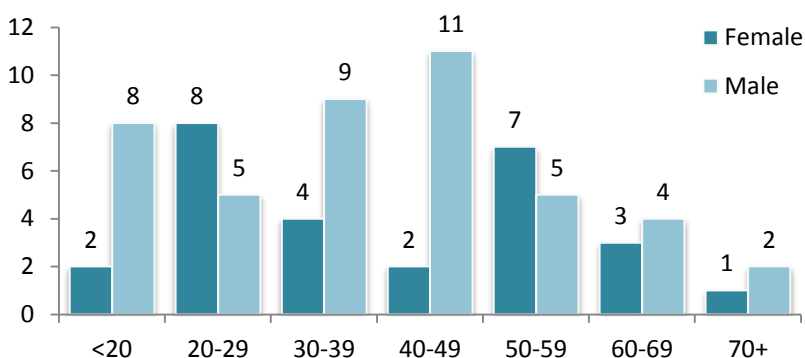
- Headache
- Pain behind the eyes
- Nausea
- Vomiting
- Joint, muscle, or bone pains
- Swollen glands
- Rash

Warning signs for Dengue Hemorrhagic Fever:

- Severe abdominal pain
- Persistent vomiting
- Bleeding nose or gums
- Vomiting blood
- Rapid breathing
- Fatigue/restlessness

Approved vaccines to prevent infection and specific treatment for dengue fever or DHF are not available. Persons with dengue fever should get plenty of rest, drink fluids, take acetaminophen to control fever and relieve pain, and seek medical advice. Ibuprofen and aspirin, which can increase the risk of bleeding, should be avoided. Upon recovery, persons gain immunity to the specific dengue virus that caused infection but can be infected by any of the other three dengue viruses.

Age & Sex of Dengue Fever Cases, 2005-2017



Dengue fever was first diagnosed in a Westchester resident in 2005. Between 2005 and 2017, 71 cases of dengue fever were reported.

Of these 71 cases, 44 were men and 27 were women. Most of the cases were under 50 years of age.

Other Mosquito-borne Diseases

Malaria

Malaria is a serious and sometimes fatal illness primarily spread through the bite of a female *Anopheles* mosquito infected with one of four blood parasites from the *Plasmodium* genus: *P. falciparum*, *P. vivax*, *P. ovale*, and *P. malariae*. The *P. falciparum* parasite is most likely to cause severe infection and lead to death if the infection is not treated promptly. Malaria can also be transmitted by transfusion of blood and/or organ transplant from an infected person, shared use of contaminated needles or syringes, or from a mother to her unborn infant before or during delivery (“congenital malaria”).

Malaria is common in tropical or subtropical areas of Asia, Africa, and Central & South America. Most malaria cases in the U.S. were due to travel to or living in an area where malaria is present. Local spread is rare but has occurred in Long Island and New York City but not in Westchester County.

Malaria symptoms will start to exhibit 10 days to 4 weeks after infection for most people depending on the type of *Plasmodia* involved, although a person may start to feel ill as early as 7 days or as late as 1 year after infection.

A cycle of chills, fever, and sweating occurring every one to three days is a good indicator of malaria. Individuals who fall ill after returning from an area where malaria is known to spread should visit their doctor immediately for testing, diagnosis, and prompt treatment before malaria becomes serious and life-threatening.

Antimalarial drugs that work against the parasite in the blood are available to treat malaria. Health care providers will review the geographic area the person was infected, specific parasite causing infection, whether or not the infection is drug resistant, and infected person’s health, pregnancy status, and drug allergies to determine the best drug or drug combinations to use for treatment.

Between 1999 and 2017, 186 cases of malaria among Westchester residents were reported with one death in 2013. Of these 186, 120 (65%) were men.

Approximately 20 of cases were under 20 years of age, and 23 were between 40 and 49 years of age.

Symptoms and Complications of Malaria

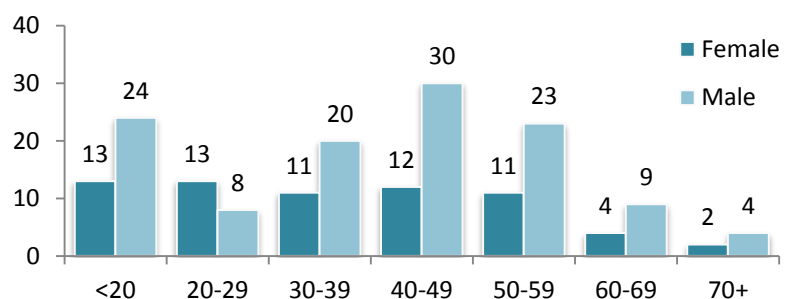
Symptoms:

- Fever
- Chills
- Sweats
- Headache
- Nausea
- Vomiting
- Body aches
- General malaise

Potential complications of malaria:

- Jaundice (yellowing of skin and eyes)
- Anemia
- Blood clotting defects
- Shock
- Kidney or liver failure
- Central nervous system disorders
- Coma
- Death

Age & Sex of Malaria Cases 1999-2017



Mosquito Control and Surveillance Activities

Summary of Mosquito Control and Surveillance Activities, 1999-2017

Program	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014 ^a	2015	2016 ^b	2017 ^b
Mosquito Control																			
Number of Catch Basins Evaluated	--	--	57,879	63,969	65,758	65,455	62,740	65,151	67,228	66,818	69,286	69,252	54,204	55,100	57,990	53,524	50,647	59,530	60,483
Number of Catch Basins Treated	--	--	54,640	57,778	57,742	57,884	51,507	53,857	56,137	54,756	57,207	52,886	38,234	41,629	42,355	40,227	33,999	42,534	42,630
Mosquito Vector Surveillance																			
Number of Nights Out for Trapping	--	--	51	71	78	60	67	55	52	62	63	56	52	46	37	51	48	58	100
Number of Trap Sites	--	--	37	31	11	11	15	12	10	13	11	12	10	10	10	10	10	24	23
Number of Trap Nights	--	--	1,075	2,545	1,299	1,061	1,426	1,147	802	1,200	1,121	1,134	622	329	557	550	582	1,474	1,898
Number of Mosquitoes Trapped	--	--	7,952	31,644	49,895	20,114	21,912	17,991	11,037	17,454	26,971	10,087	18,468	10,827	11,922	10,200	11,140	20,668	24,195
Number of Mosquitoes Submitted	--	--	4,070	16,406	24,664	13,258	14,949	12,237	7,584	12,904	19,400	6,898	12,046	6,628	6,724	5,933	6,043	9,211	10,815
Number of Batches Submitted ^c	--	--	214	742	721	572	628	652	410	716	803	378	420	215	263	235	242	337	380
Number of WNV+ Mosquito Batches ^c	--	--	7	45	15	0	67	24	2	12	6	13	32	29	7	6	17	3	5
Number of Zika+ Mosquito Batches	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0	0
Mosquito-borne Disease Human Surveillance^d																			
Number of Chikungunya Cases	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	40	5	5	0
Number of Dengue Fever Cases	--	--	--	--	--	--	1	3	7	6	0	14	1	6	8	6	4	15	0
Number of Malaria Cases	9	13	17	9	17	8	10	12	13	3	7	9	7	7	10	12	6	9	8
Number of West Nile virus Cases ^e	9	0	0	2	4	1	3	2	1	2	0	4	3	4	2	2	3	0	3
Number of Zika virus Cases	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	37	10

^a 2014 data entry was incomplete; Trap Nights and Number of Mosquitoes Trapped is estimated

^b Trapping completed by Westchester County Department of Health (WCDH) and New York State Department of Health (NYSDOH); data may not report all mosquito surveillance activity by NYSDOH

^c Six batches containing 106 mosquitoes were trapped by NYSDOH at Roberto Clemente Park (Bronx, NY) and submitted for testing by WCDH in 2017; these batches were excluded from the analysis

^d Human cases include both confirmed and probable cases

^e Includes confirmed and probable West Nile virus neuroinvasive and non-neuroinvasive cases

Data sources: WCDH internal database, NYSDOH Communicable Disease Surveillance System (CDESS), and Fordham University Vector Ecology Laboratory

Mosquito-borne Disease Prevention Tips

How to Minimize Your Risk for Mosquito-borne Diseases

The best way to avoid infection with mosquito-borne diseases is to prevent mosquito bites:

- ✓ **Protect yourself and your family**
 - **Use insect repellent** and insect-repellent clothing when outdoors. Mosquitoes are most active at dusk and dawn; consider wearing long sleeves and loose pants during these times. When outdoors, cover your baby stroller or playpen with netting.
 - Use an Environmental Protection Agency (EPA)-registered insect repellent with one of the following active ingredients. When used as directed, EPA-registered insect repellents are proven safe and effective, even for pregnant and breastfeeding women.
 - DEET
 - Picaridin, also known as KBR 3023, Bayrepel, and icaridin
 - Oil of lemon eucalyptus (OLE) or para-menthane-diol (PMD)
 - IR3535
- ✓ **Protect your home**
 - **Screens on windows and doors** should be kept in good repair to keep mosquitoes out.
- ✓ **Protect your yard**
 - **Get rid of standing water** around your home where mosquitoes can breed. Empty standing water from flower pots, buckets, rain barrels, child wading pools, old tires, tree holes, clogged gutters, or even something as small as a bottle cap.

To report large areas of standing water on public property, call the Westchester County Department of Health Complaint Bureau at (914) 813-5000.

Travel Considerations

- ✓ **Remember to pack insect repellent** and use it to prevent mosquito bites
- ✓ **Pregnant women should not travel to any area where Zika virus is spreading**
 - Women trying to become pregnant, and their male partners, should consult with their doctor before traveling to these areas and strictly follow steps to prevent mosquito bites during the trip.
- ✓ **After your trip**
 - Visit your healthcare provider right away if you develop a fever, headache, rash, muscle or joint pain. Be sure to tell your doctor about any recent international travel.

For more tips, visit health.westchestergov.com.