



Westchester County Department of Health



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Community Health Assessment Data Update

2018.02

Tickborne Diseases, 1999-2017

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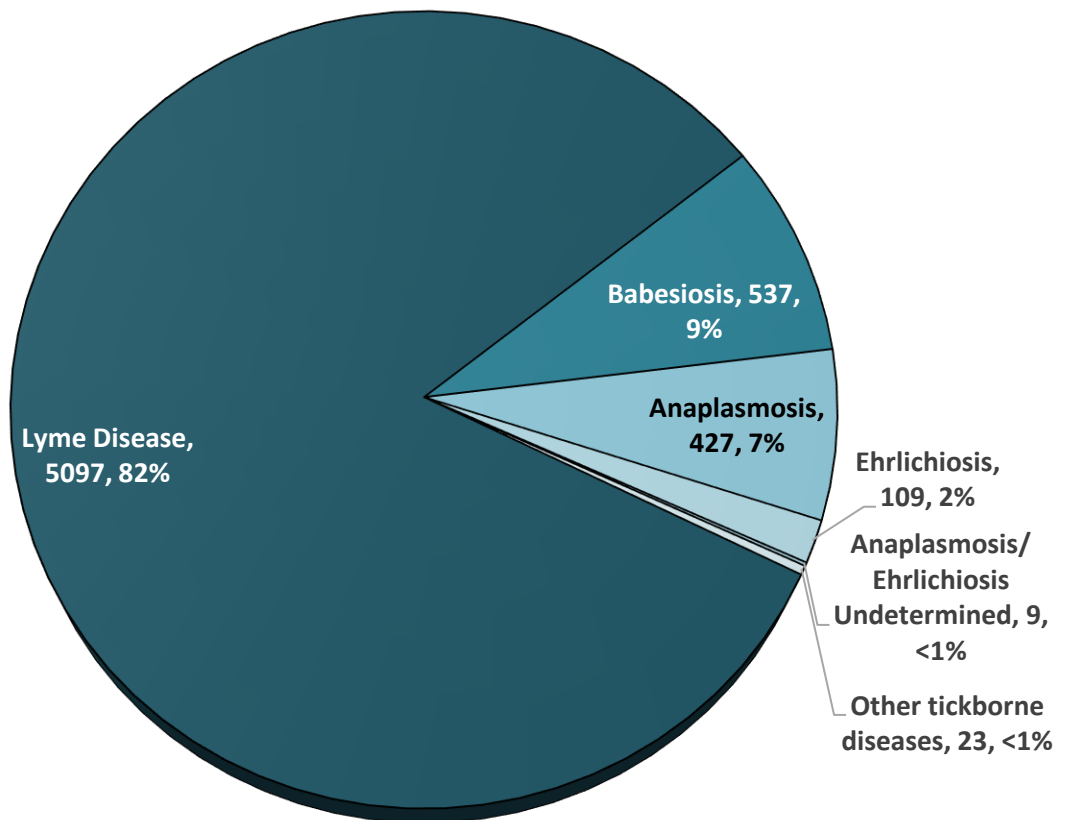
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Reported Tickborne Disease Cases, Westchester County, 1999-2017



More than 80% of all tickborne diseases reported in Westchester County between 1999 and 2017 were Lyme disease cases.

Ticks and Disease Transmission

Ticks are tiny parasites that feed on the blood of warm-blooded mammals, birds, reptiles, and amphibians. Most ticks go through four stages of life (egg, six-legged larva, eight-legged nymph, and adult) and must eat blood at each stage after hatching from eggs to survive. Some will feed on the same host animal or person during all life stages but most ticks will have a different host at each stage.

Ticks cannot jump or fly; instead, they climb tall grasses, brushes, or shrubs and wait for a potential host to brush against them. The tick will then climb onto the host and feed on the host's blood by inserting their mouths into the skin and slowly taking in blood. After feeding, the tick will drop off and prepare for the next life stage. If a tick feeds on a host infected with an infectious pathogen, it will ingest the host's blood *and* the pathogen. The infected tick is then capable of transmitting disease to a new host (including people) at its next blood meal through a bite. Ticks generally need to be attached to your skin for at least 48-72 hours to transmit infection but some diseases can be transmitted after 12-24 hours of attachment.

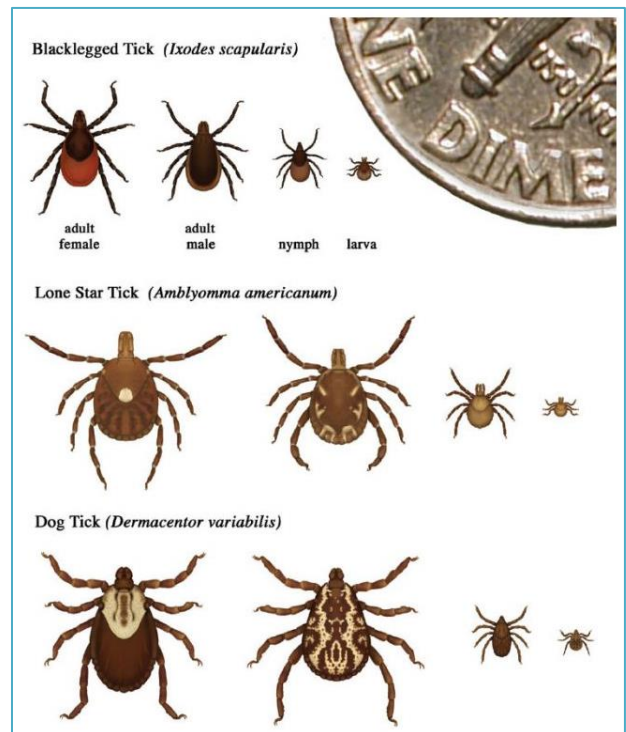
In Westchester County, the three most common ticks that cause disease among people are the blacklegged tick (*Ixodes scapularis*), lone star tick (*Amblyomma americanum*), and American dog tick (*Dermacentor variabilis*). Both the blacklegged and lone star ticks are widely distributed in the eastern United States while the American dog tick is widely distributed east of the Rocky Mountains.

The blacklegged tick, also known as the deer tick, causes the majority of tickborne diseases in Westchester. These ticks spread Lyme disease, anaplasmosis, babesiosis, and Powassan virus disease to humans and pose the greatest risk of biting people in the spring, summer, and fall. While all life stages of the blacklegged tick bite humans, the nymphs and adult females are most commonly found on people.

The lone star tick is an aggressive tick that can spread human ehrlichiosis and tularemia. Humans are most frequently bitten by the nymph and adult females, the latter of which is distinguished by a white dot on its back. The greatest risk of being bitten by this tick exists from early spring through late fall.

The American dog tick can spread tularemia (like the lone star tick) and Rocky Mountain spotted fever to humans who are most likely to be bitten by adult females during the spring and summer.

In July 2018, the longhorned tick was found in Westchester County. This tick has transmitted disease to humans in other countries but additional research is needed to determine the threat it poses to humans in the United States.



Source: [Centers for Disease Control and Prevention Tickborne Diseases Tick ID](#)

Anaplasmosis

Anaplasmosis, or human granulocytic anaplasmosis (HGA), is primarily spread to humans by a blacklegged deer tick infected with the bacterium *Anaplasma phagocytophilum*.

Symptoms of anaplasmosis will typically begin within 1 to 2 weeks of the tick bite. The number and combination of symptoms will vary from person to person, and very few people will develop all of the symptoms. Less than 1% of anaplasmosis cases will die as a result of their infection.

Individuals with weakened immune systems (due to HIV infection, prior organ transplant, removed spleen, or immunosuppressive therapies such as cancer chemotherapy) may experience more severe outcomes including a higher chance of death.

The prescription antibiotic doxycycline is the first line of treatment for adults and children with suspected anaplasmosis and prevents the development of severe disease complications. Delaying treatment may result in severe illness or death, and use of antibiotics other than doxycycline may increase the risk of death. Successful treatment of anaplasmosis does not grant immunity to the individual since it is a bacterial infection.

Symptoms of Anaplasmosis

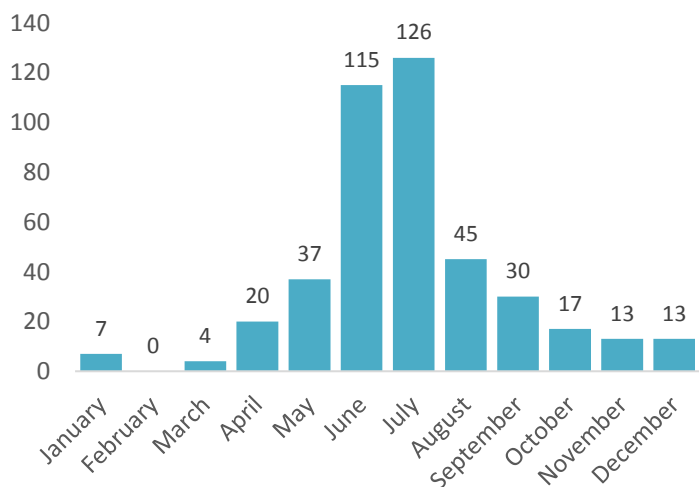
Common symptoms:

- Fever
- Headache
- Muscle pain
- Malaise
- Chills
- Nausea
- Abdominal pain
- Cough
- Confusion
- Rash (rare)

Serious disease symptoms:

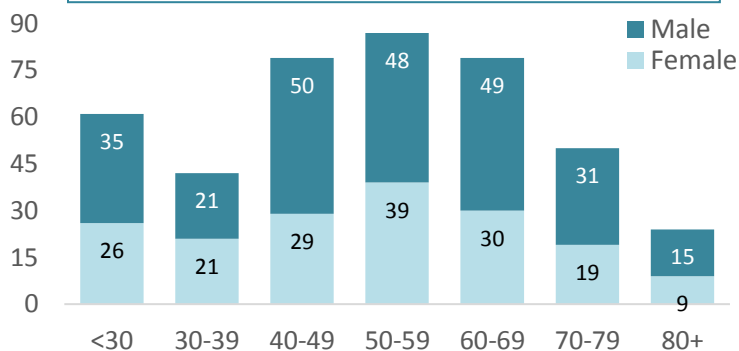
- Difficulty breathing
- Hemorrhage
- Renal failure
- Neurological problems

Number of Anaplasmosis Cases by Month of Disease Incidence*, 1999-2017



*Disease incidence is reported by the date of diagnosis; if unavailable, incidence is reported by the available dates according to the following hierarchy: symptom onset date, date reported to Health Department, date received by Health Department, or date when supplemental file was created

Age & Sex of Anaplasmosis Cases, 1999-2017



Note: Age is unknown for five of 427 cases

Since 1999, 427 cases of anaplasmosis were reported amongst Westchester County residents with incidence peaking in June and July.

Of these 427, 251 (58.8%) were men and 176 (41.2%) were women. Approximately 20.4% of cases were between 50 and 59 years of age.

Babesiosis

Babesiosis is a rare, sometimes severe, disease primarily caused by the bite of a blacklegged tick infected with the parasite *Babesia microti*. The parasite is typically spread by the young nymph stage of the tick. Babesiosis can also be transmitted (less commonly) from a contaminated blood transfusion or (rarely) from an infected mother to child during pregnancy or delivery.

Most people infected with *Babesia microti* will not have any symptoms but some may develop flu-like symptoms one to nine weeks (and sometimes longer) after exposure. Because *Babesia* parasites infect and destroy red blood cells, babesiosis can cause hemolytic anemia which may lead to jaundice (yellowing of the skin) and dark urine.

Babesiosis can be life-threatening to individuals who have had their spleen removed, have a weak immune system (due to, for example, cancer, HIV/AIDS, or an organ transplant), have serious health conditions (such as liver or kidney disease), or are elderly.

Individuals who are infected with *Babesia microti* but do not have symptoms do not need to be treated. For those that do experience symptoms, treatments are available and recommended by a health care provider upon diagnosis.

Symptoms and Complications of Babesiosis

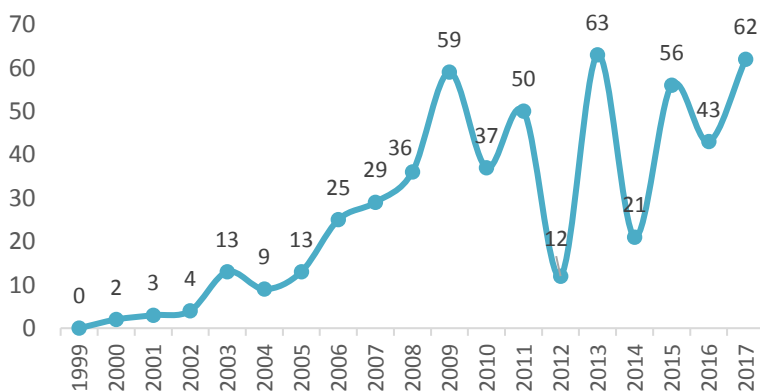
Mild symptoms:

- Fever
- Chills
- Sweats
- Headache
- Body aches
- Loss of appetite
- Nausea
- Fatigue

Complications:

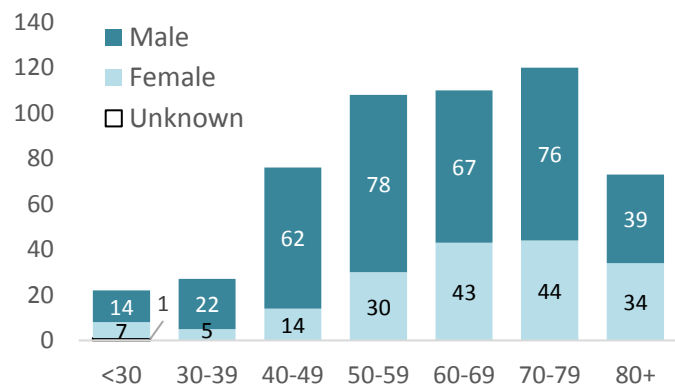
- Low and unstable blood pressure
- Severe hemolytic anemia (hemolysis)
- Very low platelet count (thrombocytopenia)
- Consumptive coagulopathy (can lead to blood clots and bleeding)
- Malfunction of vital organs (such as kidneys, lungs, and liver)
- Death

Number of Babesiosis Cases*, 1999-2017



*Includes confirmed and probable cases

Age & Sex of Babesiosis Cases, 1999-2017



Note: Age is unknown for one of 537 cases

Between 1999 and 2017, 537 cases and three deaths (one in 2010, 2012, and 2015) were reported amongst Westchester County residents with incidence peaking in July (45.8%).

Of the 537 cases, roughly two-thirds were men and 76.5% were at least 50 years of age.

Ehrlichiosis

Individuals bitten by a lone star tick infected with *Ehrlichia chaffeensis* or *Ehrlichia ewingii* may develop ehrlichiosis, a disease closely related to anaplasmosis.

Symptoms of ehrlichiosis will usually develop 1 to 2 weeks after the tick bite and the number and combination of symptoms will vary from person to person with very few people developing all of the symptoms. A skin rash is not commonly reported in persons infected with *Ehrlichia ewingii* but could occur in up to 60% of children and less than 30% of adults infected with *Ehrlichia chaffeensis*.

Symptoms of Ehrlichiosis

Common symptoms:

- Fever
- Headache
- Muscle pain
- Malaise
- Chills
- Nausea
- Vomiting
- Diarrhea
- Confusion
- Conjunctival injection (red eyes)
- Rash (more commonly reported in children)

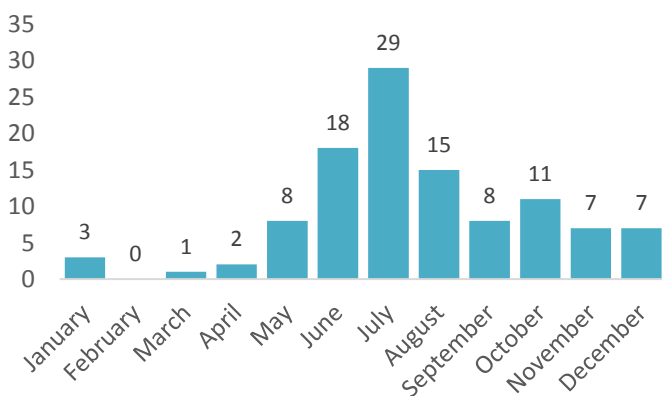
Serious disease symptoms:

- Difficulty breathing
- Bleeding disorders

An estimated 1.8% of ehrlichiosis cases die as a result of their infection. Similar to anaplasmosis cases, individuals with weakened immune systems (due to HIV infection, prior organ transplant, removed spleen, or immunosuppressive therapies such as cancer chemotherapy) may experience more severe outcomes of ehrlichiosis including a higher chance of death.

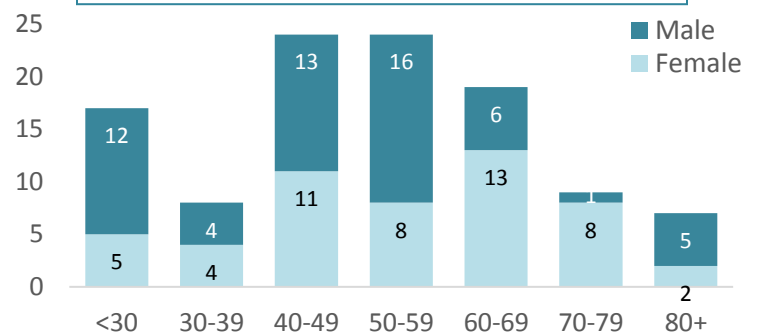
Doxycycline is the first line of antibiotic treatment for adults and children with suspected ehrlichiosis and prevents the development of severe disease complications. Delaying treatment may result in severe illness or death, and use of antibiotics other than doxycycline may increase the risk of death. Like anaplasmosis, successful treatment of ehrlichiosis does not grant immunity to the disease because it is a bacterial infection.

Number of Ehrlichiosis Cases by Month of Disease Incidence*, 1999-2017



*Disease incidence is reported by the date of diagnosis; if unavailable, incidence is reported by the available dates according to the following hierarchy: symptom onset date, date reported to Health Department, date received by Health Department, or date when supplemental file was created

Age & Sex of Ehrlichiosis Cases, 1999-2017

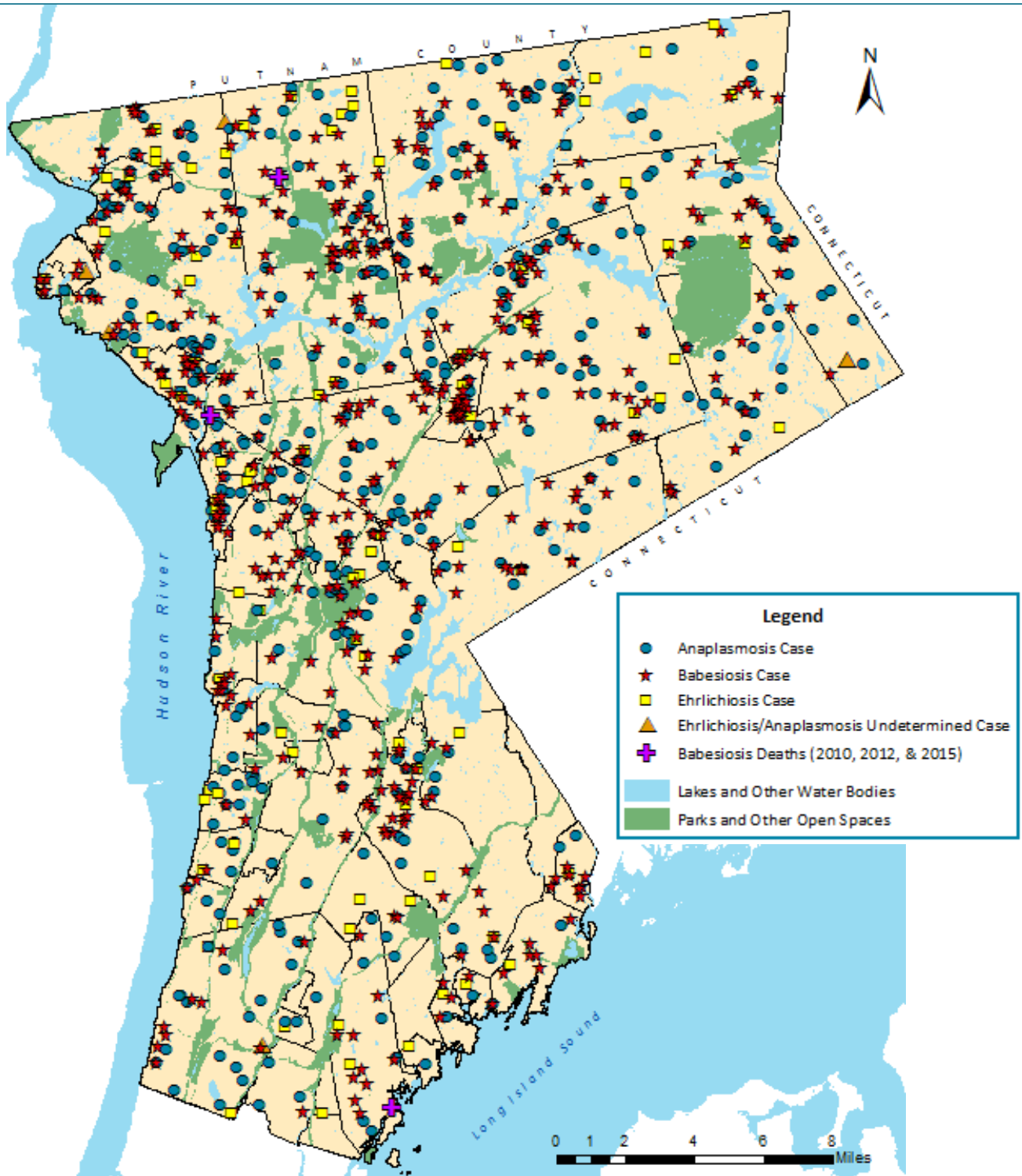


Note: Age is unknown for one of 109 cases

Since 1999, 109 cases of ehrlichiosis were reported amongst Westchester County residents with incidence peaking in July. Of these 109 cases, 57 were men and 52 were women. Approximately 44.0% of cases were between 40 and 59 years of age.

Anaplasmosis, Babesiosis, and Ehrlichiosis Cases Over Time

Cumulative Distribution of Anaplasmosis, Babesiosis, and Ehrlichiosis Cases by Reported Residence, 1999-2017^{1,2}



¹Human cases include both confirmed and probable cases.

²Of the 1,082 anaplasmosis, babesiosis, ehrlichiosis, and anaplasmosis/ehrlichiosis undetermined cases reported between 1999 and 2017, 62 (5.7%) are not represented in the map due to missing addresses, post office box addresses, or incorrect addresses.

Lyme Disease

The Lyme disease bacterium *Borrelia burgdorferi* can be spread to humans through the bite of an infected blacklegged tick, the same tick that can spread anaplasmosis and babesiosis. The infected tick must be attached to a person for at least 36 to 48 hours before the bacterium can be transmitted. Lyme disease cannot be spread from person to person, and transmission from an infected pregnant woman to her fetus is extremely rare.

Persons with Lyme disease will start to see symptoms within 3 to 30 days after the tick bite. Approximately 70-80% of infected persons will develop a circular bull's eye rash about two inches in diameter (called erythema migrans) around or near the location of the bite. This rash is rarely itchy or painful but may gradually expand up to 12 inches or more over a period of days.



"Classic" erythema migrans rash

Source: [Centers for Disease Control and Prevention Signs and Symptoms of Untreated Lyme Disease](#)

Symptoms of Lyme Disease

Early symptoms (3-30 days after tick bite):

- Fever and chills
- Headache
- Fatigue
- Muscle and/or joint aches
- Swollen lymph nodes
- Erythema migrans (EM) rash

Symptoms of disease progression (days to months after tick bite):

- Additional EM rashes on other body areas
- Severe headaches and neck stiffness
- Dizziness or shortness of breath
- Arthritis with severe joint pain and swelling
- Intermittent pain in tendons, muscles, joints, and bones
- Shooting pains, numbness, or tingling in the hands or feet
- Facial palsy (loss of muscle tone or droop on one or both sides of the face)
- Inflammation of the brain and spinal cord
- Lyme carditis (irregular heart beat)
- Nerve pain
- Problems with short-term memory

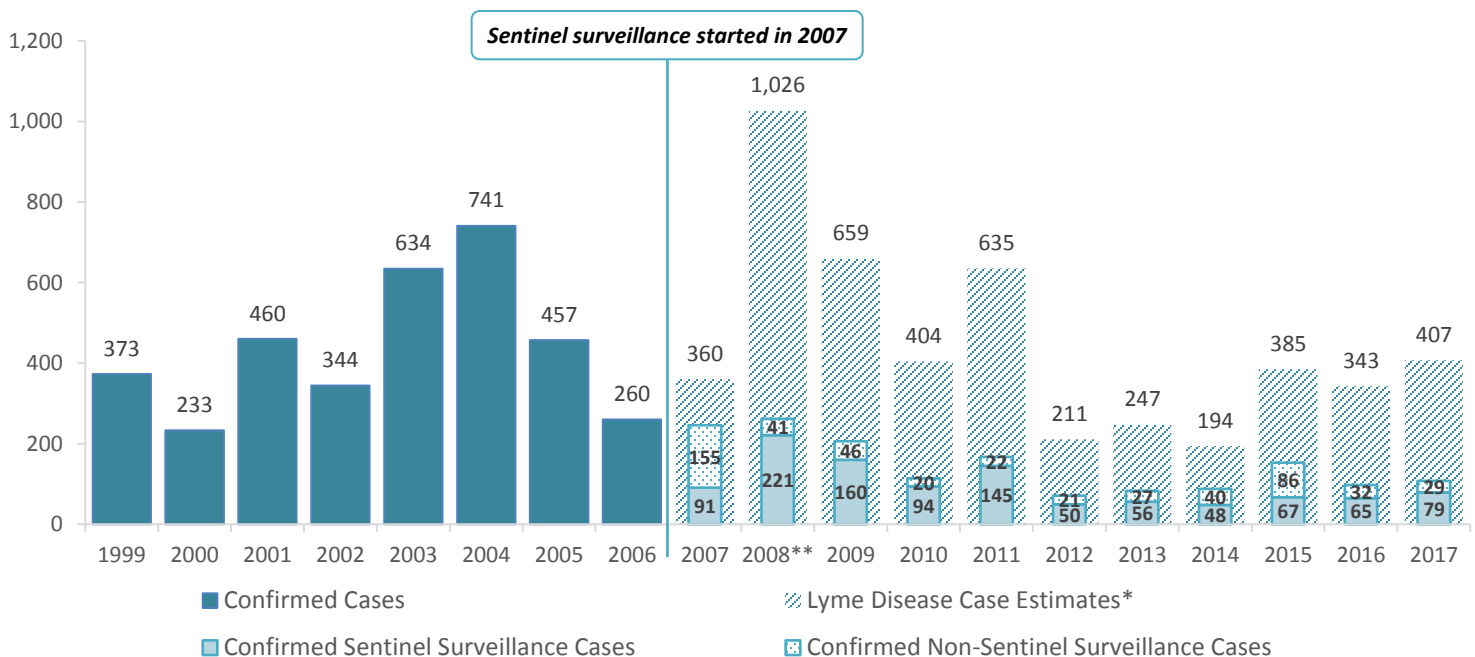
If Lyme disease is not recognized or treated in the early stage, more severe symptoms may occur. The most severe symptoms may appear until weeks, months, or years after the tick bite.

Lyme disease cases are treated with antibiotics such as doxycycline, amoxicillin, and cefuroxime axetil. Individuals with certain neurologic or cardiac forms of illness may require additional treatment but cases treated in the early stages of disease will usually recover completely and quickly. There is no approved vaccine for Lyme disease.

Lyme Disease

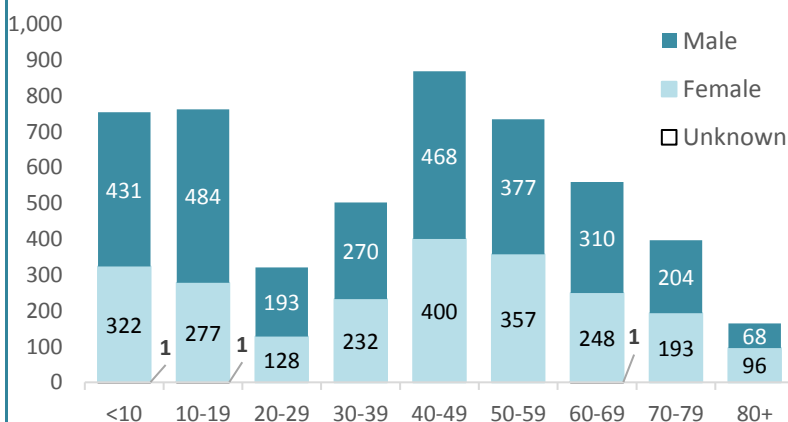
The Westchester County Department of Health annually investigated all potential Lyme disease cases until 2007 when it started conducting Lyme disease sentinel surveillance using a sampling methodology developed by the New York State Department of Health. This methodology randomly extracts 20% of the county's positive Lyme disease reports from the New York State Electronic Clinical Laboratory Reporting System (ECLRS) for investigation. In any given year, the total number of Lyme disease cases reported in Westchester County includes the confirmed and probable cases from sentinel surveillance and from non-sentinel surveillance (provider reports with a diagnosis of an EM rash).

Confirmed and Estimated* Number of Lyme Disease Cases by Incidence Year, Westchester County, 1999-2017



*Estimates calculated by New York State Department of Health $([5 \times \text{number of confirmed and probable cases from sentinel surveillance}] + \text{number of laboratory reports with a positive Lyme disease result accompanying a positive laboratory result for another tickborne disease} + \text{physician-reported erythema migrans [EM] rash})$
 **Electronic laboratory reporting was mandated by state law in 2008, resulting in a greater number of laboratories reporting positive Lyme disease laboratory results

Age & Sex of Lyme Disease Cases, 1999-2017



Note: Age is unknown for 36 of 5,097 cases

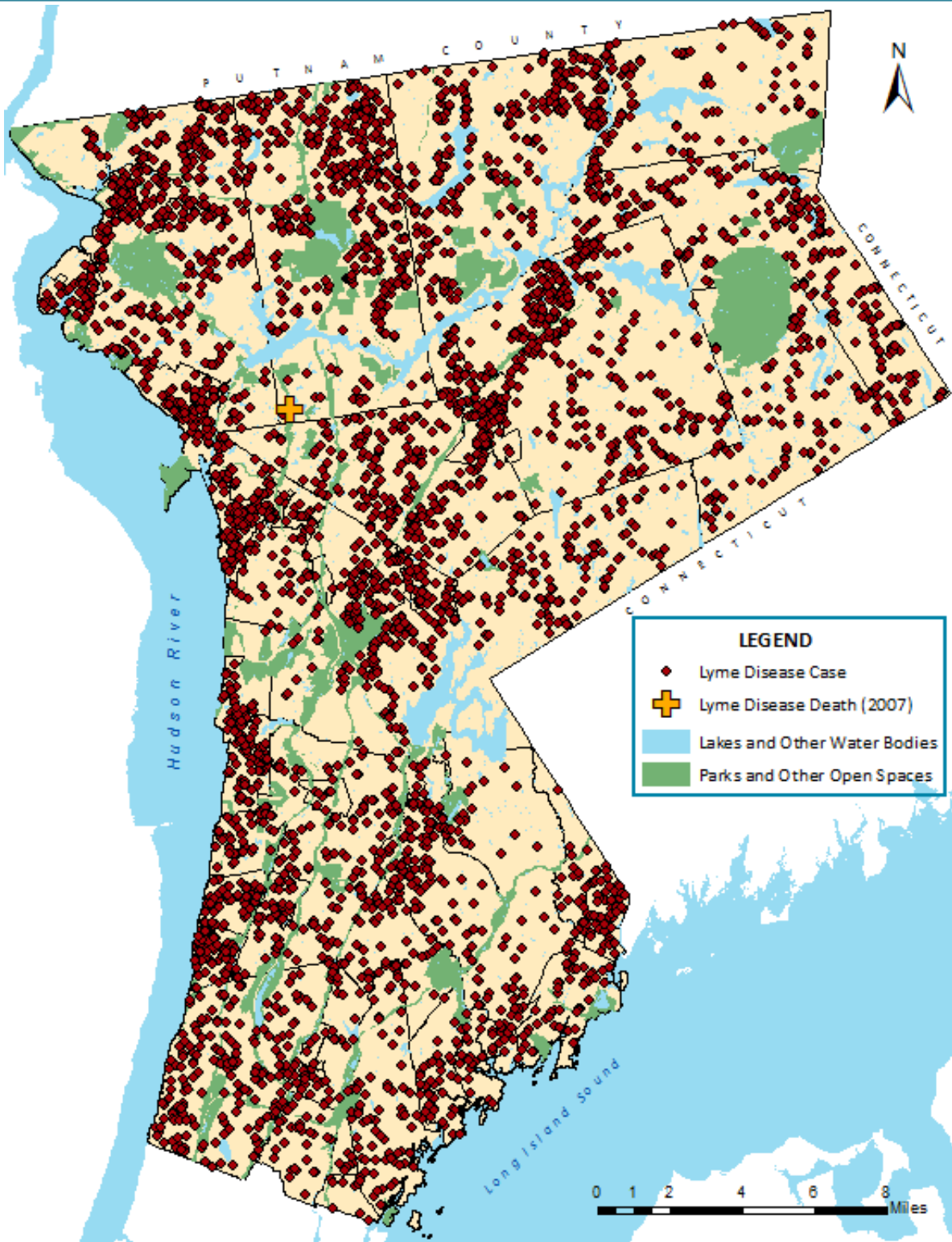
Between 1999 and 2017, a total of 5,097 confirmed or probable Lyme disease cases and one death was reported in Westchester County.

Of the 5,097 cases, approximately 55% (2,822) were men and 29% (1,516) were under 20 years of age.

Cases of Lyme disease were found and reported throughout the county as seen on the map on the following page, demonstrating that anyone can be bitten by a tick.

Lyme Disease Cases Over Time

Cumulative Distribution of Lyme Disease Human Cases by Reported Residence, 1999-2017^{1,2}



¹Human cases include both confirmed and probable cases.

²Of the 5,097 cases between 1999 and 2017, 495 (9.7%) are not represented in the map due to missing addresses, post office box addresses, or incorrect addresses.

Other Tickborne Diseases

Other tickborne diseases less commonly reported in Westchester County include Powassan virus disease, Rocky Mountain spotted fever, and tularemia.

Powassan Virus Disease

Powassan virus disease is a rare and often serious disease primarily spread by a blacklegged tick infected with the Powassan virus. This virus could also be transmitted to humans by the squirrel tick (*Ixodes marxi*) and the woodchuck/groundhog tick (*Ixodes cookie*), but these ticks rarely bite people.

Most people with Powassan disease will show no signs of infection but some may develop symptoms 1 to 4 weeks after the bite.

Approximately 10% of Powassan disease cases are fatal and half of the survivors will have permanent neurological symptoms such as recurrent headaches, muscle wasting, and memory problems.

There is no cure or treatment for Powassan disease but health care providers will attempt to relieve disease symptoms. Hospitalization and supportive care such as respiratory support, intravenous fluids, and medications to reduce brain swelling may be required for some cases.

The first case of Powassan disease in Westchester County was reported in 2005. Between 2005 and 2017, a total of seven cases of Powassan disease were reported with two deaths in 2007.

Of the seven cases, six (85.7%) were over 60 years of age.

With the exception of one, all Westchester residents with Powassan disease resided in the northern half of the county.

Symptoms of Powassan Virus Disease

Symptoms:

- Fever
- Headache
- Vomiting
- Weakness
- Confusion
- Loss of coordination
- Speech difficulties
- Seizures

Powassan virus can infect the central nervous system and cause:

- Meningitis (inflammation of the membranes surrounding the brain and spinal cord)
- Encephalitis (inflammation of the brain)

Other Tickborne Diseases

Rocky Mountain Spotted Fever

American dog ticks infected with the bacterium *Rickettsia rickettsia* can transmit Rocky Mountain spotted fever (RMSF), a serious illness that can lead to death if it is not treated early.

Symptoms of RMSF will usually appear 2 to 14 days after the bite and can rapidly progress to a serious, life-threatening illness. Most RMSF cases will develop a rash 2 to 5 days after a fever. The rash will start on the wrists, forearms, and ankles and spread to the trunk or the rest of the body.

Some survivors of severe RMSF may have permanent damage such as amputation of arms, legs, fingers, or toes due to damage to blood vessels; hearing loss; paralysis; and mental disability.

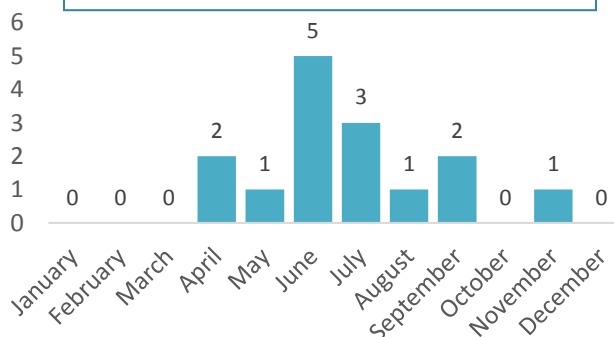
RMSF is treated with the same antibiotic used for anaplasmosis and ehrlichiosis (doxycycline) and is most effective when started within five days of when symptoms first develop.

Between 1999 and 2017, 15 cases were reported in Westchester with one death in 2015. Nine (60%) cases were female, and 6 (40%) were between 40-49 years old.

Symptoms of Rocky Mountain Spotted Fever

- Fever
- Headache
- Rash
- Muscle pain
- Malaise (general discomfort)
- Gastrointestinal symptoms (abdominal pain, nausea, vomiting)

Number of RMSF Cases by Month of Disease Incidence*, 1999-2017



*Disease incidence is reported by the date of diagnosis; if unavailable, incidence is reported by the available dates according to the following hierarchy: symptom onset date, date reported to Health Department, date received by Health Department, or date when supplemental file was created

Tularemia

American dog ticks or lone star ticks infected with the bacterium *Francisella tularensis* can transmit the rare disease tularemia. This disease can also be acquired from inhaling dust or aerosols contaminated with *F. tularensis*, drinking water contaminated with *F. tularensis*, skin contact with infected animals, deer fly bites, and laboratory exposure.

Symptoms will start to appear 3 to 5 days after exposure but can take as long as 21 days to start. Signs of tularemia include fever, headache, diarrhea, muscle aches, joint pain, dry cough, and progressive weakness. Other signs of disease depend on how the infection was acquired. Individuals bitten by an infected tick may develop an ulcer at the site of infection and swollen lymph glands. Treatment is available for tularemia and can be prescribed by a health care provider.

Between 1999 and 2017, only one case of tularemia was reported in Westchester County in 2003.

Summary of Tickborne Disease Human Surveillance

Reported Tickborne Disease Cases and Deaths in Westchester County, 1999-2017

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Number of Human Cases^a																			
Anaplasmosis	35	34	40	51	0	0	0	34	31	29	31	15	1	24	21	8	14	26	33
Babesiosis	0	2	3	4	13	9	13	25	29	36	59	37	50	12	63	21	56	43	62
Ehrlichiosis	2	0	10	2	1	0	0	26	13	7	5	0	1	2	8	3	3	11	15
Anaplasmosis/Ehrlichiosis Undetermined	0	0	0	0	0	0	0	1	0	0	0	2	0	0	1	0	0	3	2
Lyme Disease ^b	373	233	460	344	634	741	457	260	246	262	206	114	167	71	83	88	153	97	108
<i>Sentinel Surveillance Cases</i>	--	--	--	--	--	--	--	--	91	221	160	94	145	50	56	48	67	65	79
<i>Non-Sentinel Surveillance Cases</i>	--	--	--	--	--	--	--	--	155	41	46	20	22	21	27	40	86	32	29
<i>NYSDOH Calculated Incidence</i>	--	--	--	--	--	--	--	--	360	1,026	659	404	635	211	247	194	385	343	407
Powassan Disease	0	0	0	0	0	0	1	0	3	1	0	0	0	0	0	0	1	1	0
Rocky Mountain Spotted Fever	3	2	0	0	0	0	0	0	0	1	0	0	0	1	0	0	6	1	1
Tularemia	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of Human Deaths																			
Babesiosis	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	0	0
Lyme Disease	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Powassan Disease	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
Rocky Mountain Spotted Fever	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0

^aIncludes confirmed and probable cases

^bStarting in 2007, Lyme disease totals includes number of confirmed cases from sentinel surveillance, erythema migrans (EM) rash and provider reporting. Cases from the sentinel surveillance are based on the 20% of cases randomly extracted from those reported to WCDH through New York State's Electronic Clinical Laboratory Reporting System (ECLRS).

Data sources: NYSDOH Communicable Disease Electronic Surveillance System (CDESS)

Tickborne Disease Prevention & Tick Removal Tips

How to Minimize Your Risk for Tickborne Diseases

The best way to avoid infection with tickborne diseases is to prevent tick bites:

✓ **Protect yourself and your family**

- Avoid wooded or grassy areas especially during the spring and summer months
- Wear light-colored clothes to spot ticks more easily
- Tuck your pants into your socks and your shirt into your pants to create a barrier between ticks and your skin
- Use an Environmental Protection Agency (EPA)-registered insect repellents containing DEET and permethrin products when outdoors
- Do tick checks after outdoor activities such as gardening, hiking, or picnicking
 - Inspect the entire body (parents should check their children) and remove ticks promptly

✓ **Protect your property**

- Keep grass cut short
- Remove leaf litter and debris
- Create a barrier of wood chips between your lawn and busy vegetation or wooded areas
- Select plantings that do not attract deer

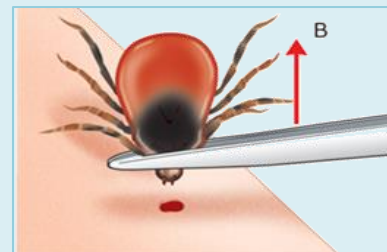
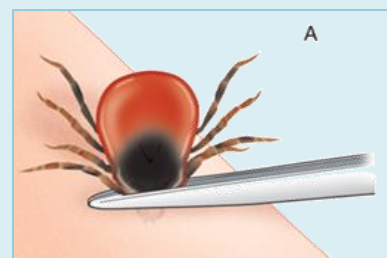
Tick Removal Tips

✓ **To properly remove a tick:**

- Use a pair of clean, fine-point tweezers to grasp the tick as close to the skin as possible at the site of attachment (by the head or mouthparts – see image A to the right)
- Firmly and steadily pull the tick away from the skin (see image B)
- Clean the bite area and your hands with soap and water, rubbing alcohol, or hydrogen peroxide
- Monitor the site and report early signs of disease to your health care provider

✓ **DO NOT:**

- Grasp the tick by the body
- Twist the tick to remove it from your skin
- Put petroleum jelly, a hot match, or any other irritant on the tick before removing it



Source: Reichman EF: *Emergency Medicine Procedures, Second Edition*:
www.accessemergencymedicine.com
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For additional prevention information and tips, call the Westchester County Department of Health at (914) 813-5000 or visit <http://health.westchestergov.com/tick-borne-diseases>.