

SURVEILLANCE BRIEF

Wisconsin Environmental Public Health Tracking Program

SEPTEMBER 2020

LYME DISEASE TRENDS IN WISCONSIN

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SUMMARY - Lyme disease is acquired through the bite of a blacklegged tick (commonly known as the deer tick) infected with the bacterium *Borrelia burgdorferi*. A rare, new emerging species, *Borrelia mayonii*, has been detected among Wisconsin residents.

Wisconsin is among the top 25% of states reporting high incidence of Lyme disease cases. Lyme disease has been reported in every county in Wisconsin, with the highest incidence in the northwestern region.

The risk of tick exposure occurs when it is warm enough for ticks to be active, usually from spring to autumn. Lyme disease surveillance in Wisconsin is conducted year round. The majority of reported Lyme disease cases occur between May and August.

Lyme disease can be prevented through personal behaviors such as using tick repellent, wearing long-sleeved shirts and pants, tucking pants into socks or boots, checking for ticks after being in wooded areas, and promptly showering to wash off any crawling ticks.

BACKGROUND

Scientists first recognized Lyme disease in the U.S. in 1975 after an outbreak in Lyme, Connecticut.¹ Most cases reported in the U.S. are caused by the bacterium *Borrelia burgdorferi*. A rare, emerging species, *Borrelia mayonii*, was identified in 2012 and is currently

present only in the Midwest.² Lyme disease can be transmitted to humans by the bite of an infected *Ixodes scapularis* tick, commonly called the blacklegged or deer tick.¹

Lyme disease is increasing in Wisconsin and was the state's fifth highest

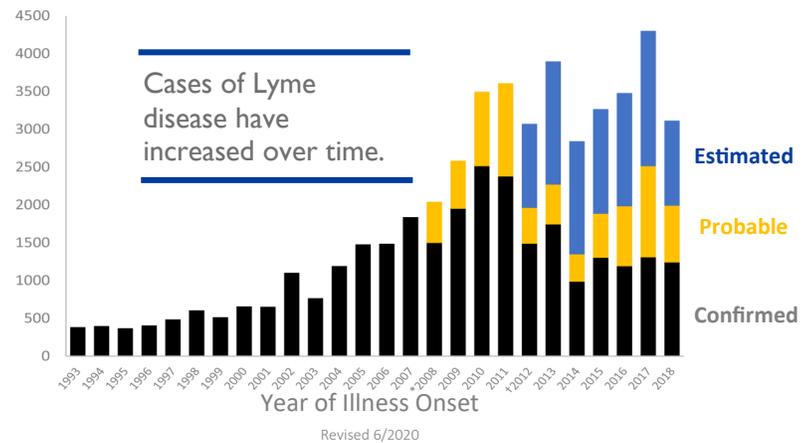
reported notifiable communicable disease in 2017.³ The highest number of cases has traditionally been reported in the northwestern region of Wisconsin, but in recent years cases have increased in the central and eastern regions (Figure 1). Between

1993 and 2018, 48,053 cases of Lyme disease were reported in Wisconsin (Figure 2).¹ Lyme disease is the most commonly reported vectorborne illness in the U.S., with 33,666 cases reported in 2018.⁴ Nationally, 96% of cases in 2018 were observed in 14 states, including Wisconsin.⁵

Many factors contribute to the increase in Lyme disease infections, including the abundance and distribution of ticks, the prevalence of infection in ticks, and the frequency of ticks and human contact.⁶ *B. burgdorferi* can infect a wide range of animal hosts, including deer, small mammals, lizards, and birds. Climate conditions can play a role in the tick life cycle, which impacts Lyme disease.⁷

Wisconsin has experienced a warmer and wetter climate in recent decades and this increased humidity and temperature creates a hospitable environment for ticks.^{7,8} Climatic shifts allow for extended geographic distribution of ticks, as well as earlier seasonal activity. Increased

FIGURE 2. Lyme Disease Cases in Wisconsin, 1993-2018¹

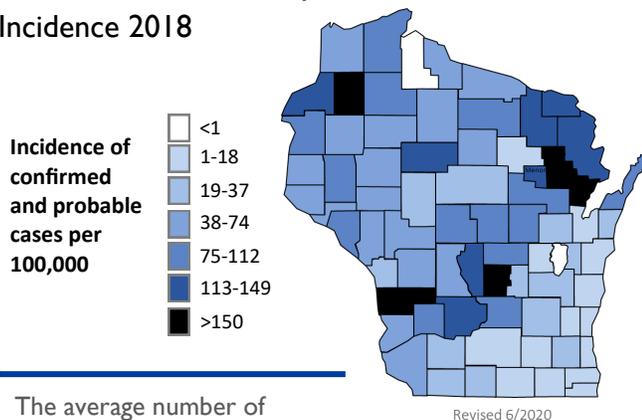


*Surveillance case definition changed to include probable cases.

†Criteria in Wisconsin for reporting Lyme disease were revised so that only cases with an erythema migrans (EM) rash required follow-up. A statistical method was implemented to estimate cases based on the number of total laboratory reports for each year since 2012.

temperatures with higher humidity can enhance tick survival, while colder temperatures may lead to a decrease in tick population.⁶ Other factors such as host populations (e.g., deer and mice) and changes in land use can also influence Lyme disease incidence.⁷

FIGURE 1. Wisconsin Lyme Disease Annual Incidence 2018



The average number of reported cases of Lyme disease has more than doubled over the past 10 years.

Statewide incidence = 32.4/100,000

This map is based on the county of residence of confirmed cases. Some infections may have been acquired during travel to other areas.

Data source: Wisconsin Division of Public Health

LYME DISEASE IN WISCONSIN

Geographically, Lyme disease incidence varies within the state of Wisconsin (Figure 1). The average number of reported cases of Lyme disease has more than doubled over the past 10 years.

Figure 2 displays statewide cases (confirmed, probable, and estimated) from 1993 to 2018. Case estimation began in 2012 due to the Wisconsin Department of Health Services' (WI DHS) change in Lyme disease reporting which modified follow-up requirements. WI DHS provided a method to calculate estimated Lyme disease cases based on the number of reported Lyme disease laboratory results.

Nationally, the Centers for Disease Control and Prevention estimates the total number of cases is approximately 10 times higher than what is reported through surveillance.⁹ Similar to the national number, the actual number of Lyme disease cases in

Wisconsin is likely much greater because of incomplete testing, misdiagnoses, and underreporting. Lyme disease may not be recognized or diagnosed because the public or medical providers are not aware of the risk of infection and proper testing is not performed, especially in areas where Lyme disease is emerging. Surveillance capabilities, including investigation and follow-up of reports, are determined by budget and personnel constraints.¹⁰

WISCONSIN EFFORTS AND TICK SURVEILLANCE

In Wisconsin, several programs collaborate to monitor Lyme disease. The Vectorborne Disease Program (VDP) compiles and disseminates data and resources on a range of vectorborne diseases in Wisconsin (such as the data in Figures 1 and 2). In 2015, the Wisconsin Environmental Public Health Tracking (WI EPHT) Program partnered with the VDP to enhance accessibility and availability of Lyme disease data and highlight the role of environmental factors in Lyme disease. One outcome of this partnership is the inclusion of Lyme disease data on the WI EPHT program’s public data portal in fall 2016.

The Wisconsin Climate and Health Program seeks to build statewide capacity to respond to health issues related to weather and climate. To better understand tick activity patterns, the WI Climate and Health program partnered with the Eau Claire City-County Health Department to conduct tick surveillance.

The goal was to provide baseline trends of seasonal tick activity, tick population numbers, and *B. burgdorferi* infectivity rates. Staff conducted weekly tick drags in 2014 and 2015 at two popular county parks in the Eau Claire area (Big Falls and Lowes Creek), with drags conducted in alternating fashion between the two parks each week (Figure 3). Figure 4 shows the monthly number of blacklegged ticks collected by tick drags. In both years, tick collections were notably low in July through September but higher in the months of April, May, and October. Data from Figures 3 and 4 came from the Eau Claire City-County Health Department.

PREVENTING LYME DISEASE

Prevention of Lyme disease is possible, and vector and disease surveillance can direct and drive prevention activities. The collection and dissemination of these data provide public health partners with the means to understand the scope of this problem within their communities. This allows for the appropriate prioritization of resources and funds to improve the health of community members.

The following three videos provide more information about Lyme disease and its prevention: [Tips for Preventing Lyme Disease](#), [Lyme Disease Data and Resources for Health Departments](#), [Lyme Disease Trends in Wisconsin](#).

FIGURE 3. Maps of Tick Drag Locations in Eau Claire County

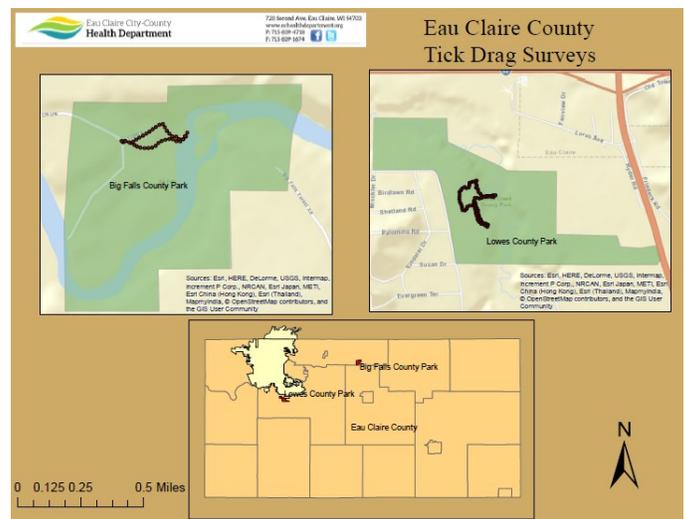
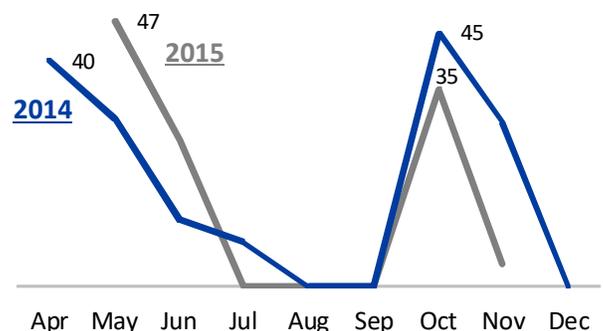


FIGURE 4. Number of Blacklegged Deer Ticks Collected at Lowes Creek Park and Big Falls Park in Eau Claire County, 2014 and 2015



Prevention can also be taken at the individual level:

Avoid wooded areas with high grass and leaf litter. If venturing in these areas, avoid overgrown grass and brush.^{11,12}

Wear light-colored clothing so ticks can be easily spotted. Long-sleeved shirts and pants should be tucked into waistbands and socks or shoes to minimize skin contact.¹¹

Use repellents. Repellents with 20 to 30% DEET may be applied to skin and clothing to provide protection for several hours.^{11,12}

Treat clothing with permethrin. Clothing may also be treated with 0.5% permethrin, an insecticide that kills ticks on contact. As such, it should not be applied directly on the skin. Clothing and gear treated with permethrin remain protective after several washings.^{11,12} Clothing treated with permethrin should be removed soon after leaving grassy or wooded areas to reduce insecticide exposure.

Check for ticks soon after visiting wooded areas. Examine the body, clothing, gear, and pets. Shower to wash off any crawling ticks.^{11,12} Inspect the armpits, scalp, and groin area, using a handheld or full-length mirror as necessary.^{11,12}

Heat clothing and gear. Place dry items in the dryer on high heat for six minutes, or one hour for wet items, to kill any blacklegged ticks present.^{12,13}

Remove attached ticks promptly with tweezers. Pull the tick up and out from the body then disinfect the site and wash

hands.^{11,14} If tick is attached for ≥ 24 hours, WI DHS recommends consulting a doctor for a single dose of doxycycline to prevent Lyme disease.

CONCLUSIONS

Lyme disease is passed to humans through the bite of the blacklegged tick, a common vector found in Wisconsin. It is the most frequently reported tickborne disease in the state. Infection is most likely in warmer months, but Wisconsin is experiencing expanded seasonal tick activity due to climate change. People spending time outdoors can prevent Lyme disease with the following activities: avoidance of areas prone to tick activity, use of repellents, selection of light-colored clothing with long sleeves and full pant legs tucked into waistbands and socks, and completion of tick checks and shower after being in grassy or wooded areas.

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ACKNOWLEDGEMENTS

The authors would like to thank Paul Creswell, Jenny Camponeschi, Colleen Moran, Christy Vogt, Connie Bell, Angela Ablaberdieva, Rachel Meyer, and Mark Werner for their contributions to this surveillance brief. We thank Theoren Loo and Christopher Steward, Wisconsin Division of Public Health, for their assistance in Lyme disease surveillance.

ABOUT TRACKING

The Wisconsin Environmental Public Health Tracking Program is your source for environmental public health data on Wisconsin communities.

FUNDING

The Wisconsin Environmental Public Health Tracking Program is funded by the Centers for Disease Control and Prevention.

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