

# 2020 Lyme and Other Tickborne Diseases Surveillance Report

Division of  
Infectious Disease  
Epidemiology

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**pennsylvania**  
DEPARTMENT OF HEALTH

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## Introduction

Lyme disease (LD) is a tickborne disease caused by the bacterium *Borrelia burgdorferi*. It may be transmitted by the bite of *Ixodes scapularis* ticks, also known as blacklegged ticks or deer ticks, if the tick carries the bacteria.<sup>1</sup> Early symptoms, typically occurring in the first 3 to 30 days after a tick bite, include fever, headache, and a rash, sometimes with a distinctive bull's eye shape, known as erythema migrans (EM). The EM rash is not present in approximately 20–30% of cases. Disseminated symptoms, typically occurring days to months after the tick bite, include joint pain and swelling, several EM rashes anywhere on the body, heart palpitations or irregular heartbeat, dizziness, nerve pain, facial palsy, and short-term memory loss. Most cases of Lyme disease can be successfully treated, especially when identified early. Delaying treatment can lead to heart and nervous system-related symptoms.<sup>2</sup>

In the United States, LD is the most common tickborne disease. Transmission of LD occurs primarily in the Northeast and upper Midwest regions of the country. In 2019 (the most recent year for which data are available), only 14 states reported 93% of all LD cases. In 2019, Pennsylvania reported more LD cases than any other state. Pennsylvania has a large population, so the incidence of cases per 100,000 population was fifth following Maine, Vermont, New Hampshire, and Delaware in 2019.<sup>3,4</sup> However, states where LD is endemic use a variety of surveillance approaches, making it difficult to make direct comparisons among states.

Other tickborne diseases can occur in Pennsylvania. The most common of these are anaplasmosis, ehrlichiosis, and spotted fever rickettsiosis (SFR). Anaplasmosis is caused by *Anaplasma phagocytophilum* bacteria, while ehrlichiosis is caused by various species of *Ehrlichia* bacteria. Anaplasmosis is transmitted by the *Ixodes scapularis* tick, the same tick that transmits LD. Ehrlichiosis is transmitted by the lone star tick (*Amblyomma americanum*). SFR is caused by species of *Rickettsia* bacteria and is transmitted by the American dog tick (*Dermacentor variabilis*).<sup>5,6,7</sup>

Babesiosis is an emerging tickborne disease in Pennsylvania. Babesiosis is caused by the parasite *Babesia microti*. *B. microti* is transmitted by *I. scapularis* ticks, the same ticks which transmit LD.<sup>8</sup> Babesiosis is not currently reportable in Pennsylvania, so the Pennsylvania Department of Health (DOH) relies on labs and facilities to voluntarily report cases. Therefore, these data are estimates and may be an undercount of the true burden of disease.

## Overview

In 2020, 3,334 LD cases were reported in Pennsylvania, representing an incidence of 26.0 cases/100,000 persons. Most were reported between May and August, with 44% reported in June and July. Sixty-five of 67 counties in Pennsylvania reported LD, ranging from 0 cases in Juniata and Montour Counties to 310 cases in Chester County. Incidence ranged from 0 cases/100,000 persons in Juniata and Montour Counties to 269.8 cases/100,000 persons in Cameron County.

In 2020, Pennsylvania reported 216 anaplasmosis cases, <5 ehrlichiosis cases, <5 SFR cases, and 40 babesiosis cases.

It should be noted when viewing these data that the COVID-19 pandemic began in Pennsylvania in 2020 and significantly affected case counts of other diseases, especially tickborne disease. The reasons for this are twofold. One, evidence indicates that fewer persons had laboratory testing conducted for LD and other tickborne diseases in 2020. This may have been due to concerns about exposure to COVID-19 in healthcare facilities. Virtual visits with healthcare providers became more common in 2020 and persons may have been diagnosed based on symptoms without laboratory testing. These cases were generally not reported to DOH. Secondly, per the CDC case definition in use in 2020 (<https://ndc.services.cdc.gov/>), all tickborne diseases require a combination of positive laboratory results and positive symptom presentation to determine that they are cases. Due to the time public health staff devoted to the COVID-19 crisis in 2020, significantly fewer LD cases were able to be investigated in 2020 and could not be classified as true cases, although it is likely many would have been classified as such had PA DOH been able to obtain the symptom information. This means that 2020 Lyme and other tickborne disease case counts were significantly lower than expected and almost certainly do not represent the true burden of disease in Pennsylvania in 2020.

## Methods

Cases of LD, anaplasmosis, ehrlichiosis, and SFR, as well as positive laboratory test results for these diseases, are reportable by providers and laboratories to the DOH per Chapter 27 of the Pennsylvania Health and Safety code.<sup>9</sup> Upon receiving the report, state public health nurses or county/municipal health department staff attempt to collect more information about the case from the ordering physician. The investigator then determines if the reported case meets the Council of State and Territorial Epidemiologists (CSTE)/Centers for Disease Control and Prevention's (CDC) surveillance case definition. National case definitions, which are designed for standardization of national case counting and are not intended for diagnostic purposes, can be found at <https://ndc.services.cdc.gov/>.

Cases that were designated as confirmed or probable according to the CSTE/CDC case definition are included in the case counts described in this report. In addition to comparing case counts to those from previous years, seasonal trends, geographic location and characteristics of cases were analyzed. Population data were obtained from the Pennsylvania Department of Health Bureau of Vital Statistics.

DOH also conducts syndromic surveillance of visits to Pennsylvania emergency departments and collects these data via the EpiCenter application, hosted by Health Monitoring Systems. EpiCenter collects de-identified data from most hospitals in Pennsylvania to monitor trends in reason for visits. In 2020, data regarding date and reason for visit, home zip code, and other information were obtained from 97% of emergency departments in the state. This information was analyzed to determine seasonal trends in tick-related emergency department visits. Chief complaints were searched for the presence of terms and variant spellings that indicated the patient had found a tick on their body or was bitten by a tick.

# Lyme Disease Findings

## Annual Trends

In 2020, 3,334 LD cases were reported in Pennsylvania. This represented an incidence of 26.0 cases/100,000 persons in Pennsylvania and was a 63% decrease from the 2019 case count. In 2019, Pennsylvania reported 29% of all confirmed LD cases in the United States and ranked first in number of cases reported and fifth in incidence. Although there is an overall increase for LD reported cases and incidence nationally over the last decade, in 2020, LD cases decreased in many Lyme endemic states as all states were significantly affected by the COVID-19 pandemic.<sup>10</sup> The long-term national trend in increasing cases may be due to expanded habitat for *Ixodes scapularis* and white-footed mice, which also harbor the *Borrelia burgdorferi* bacteria.<sup>11</sup> Additionally, *Ixodes scapularis* ticks are more likely to survive winter as the climate warms. Humans are also spreading into rural areas to build homes and participate in leisure activities, making human and tick contact more frequent. Year to year variations are not unusual and may be related to changes in tick activity, white-footed mouse populations, and weather patterns. Table 1 shows the case counts by classification and total incidence by year for the last 10 years.

**Table 1 – Lyme Disease Cases by Classification and Total Incidence per 100,000 Population, Pennsylvania, 2011–2020**

Year	Lyme Disease Case Count			Population	Lyme Disease Incidence per 100,000
	Confirmed	Probable	Total		
2011	4739	623	5362	12,742,886	42.08
2012	4146	887	5033	12,763,536	39.43
2013	5126	778	5904	12,773,801	46.22
2014	6470	1017	7487	12,787,209	58.55
2015	7655	1772	9427	12,802,503	73.63
2016	8988	2455	11443	12,784,227	89.51
2017	9250	2650	11900	12,805,537	92.93
2018	7920	2288	10208	12,807,060	79.71
2019	6763	2235	8998	12,801,989	70.29
2020	2641	693	3334	12,801,989	26.00

Source: PA-NEDSS; DOH, Bureau of Vital Statistics

## Seasonality

LD can be acquired year-round in Pennsylvania, however, most LD cases occur in the late spring and summer months. In 2020, 48.6% of cases with known onset dates reported that their onset of LD symptoms was in June or July. More people spend time outdoors and are more likely to come in contact with ticks in these months. In addition, *Ixodes scapularis* nymphs are most active in the late spring and early summer. Most cases of Lyme disease are attributed to nymphal ticks. Their small size makes them very hard to detect and remove in order to prevent Lyme bacteria transmission. Table 2 shows the months of onset of symptoms of LD by classification status. A higher proportion of confirmed cases were reported in June and July than probable cases. This is likely because acute cases of LD presenting with EM, a symptom which is diagnostic for LD, are more likely to be quickly diagnosed. Probable cases, which are defined by laboratory criteria and later-stage signs and symptoms, are more likely to be diagnosed after some time has passed.

**Table 2 – Lyme Disease by Onset Month\*, Pennsylvania, 2019**

Month	Confirmed Cases	Probable Cases	Total
January	76	43	119
February	64	21	85
March	41	16	57
April	61	18	79
May	155	42	197
June	507	100	607
July	306	48	354
August	114	22	136
September	78	20	98
October	66	20	86
November	50	18	68
December	68	25	93
Total	1586	393	1979

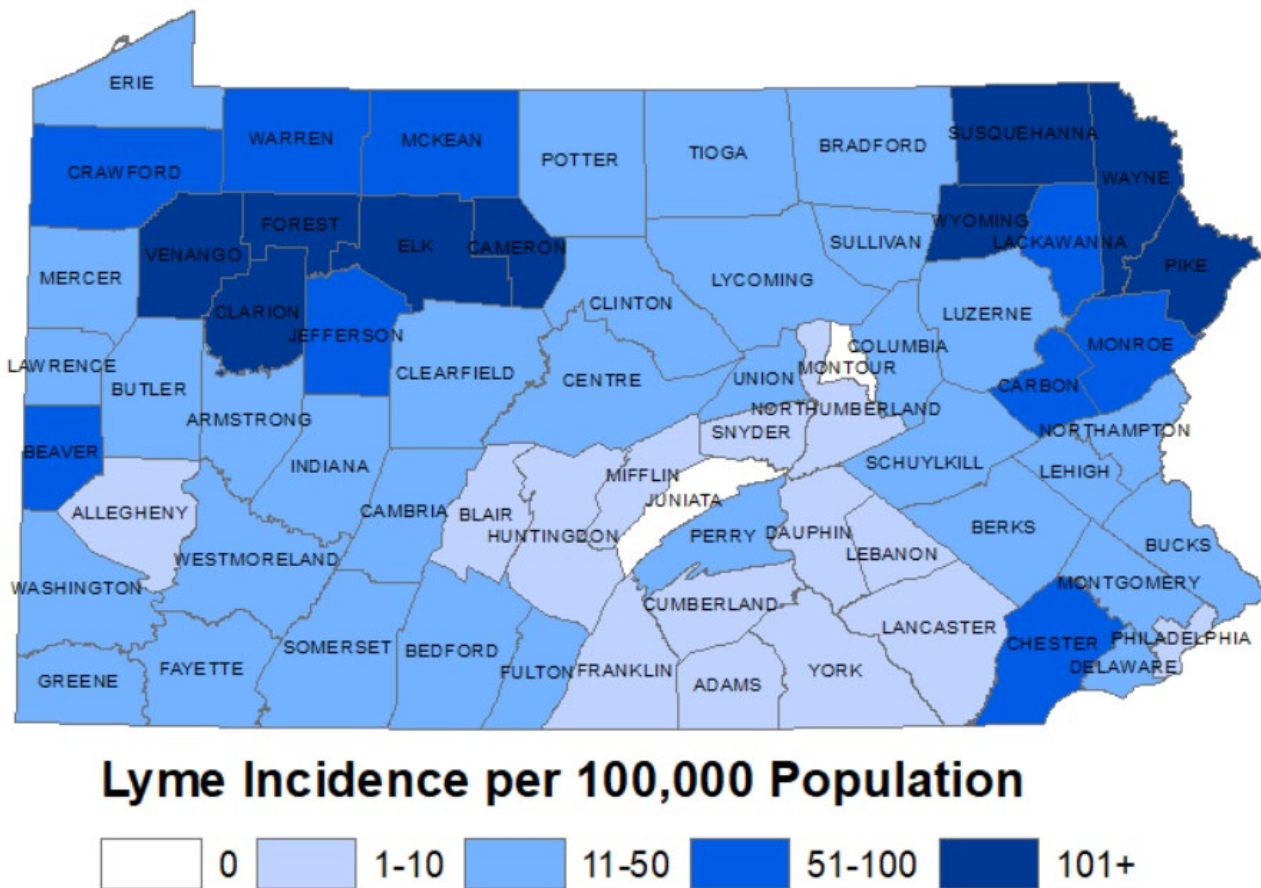
Source: PA-NEDSS

\* Onset date is unknown for 41% of cases.

## Geographic Distribution

*Ixodes scapularis* ticks infected with *Borrelia burgdorferi* have been found in all 67 counties in Pennsylvania. Persons have also been diagnosed with LD in all counties in Pennsylvania. LD incidence varies by county. Urban areas like Philadelphia tend to have a lower incidence than more rural counties. In addition, because classifying cases of LD requires data from providers to be reported to public health nurses in Pennsylvania's health departments, case counts could appear lower in counties with lower staffing levels or in areas in which providers are less likely to respond. Due to these surveillance complexities, the counties reporting the most cases may not actually have the greatest burden of LD. In 2020, counties in the northwest area of the state reported the highest incidence of LD. Map 1 shows the county incidence of LD cases in 2020. Table 3 shows the case counts by county in 2020.

**Map 1 – Lyme Disease Incidence per 100,000 by County, Pennsylvania, 2020**



Source: PA-NEDSS; DOH, Bureau of Vital Statistics

**Table 3 – Lyme Disease Case Counts by County, Pennsylvania, 2020**

County	Lyme Disease Case Count	County	Lyme Disease Case Count
Adams	*	Lackawanna	105
Allegheny	98	Lancaster	25
Armstrong	18	Lawrence	17
Beaver	131	Lebanon	12
Bedford	19	Lehigh	121
Berks	66	Luzerne	68
Blair	*	Lycoming	13
Bradford	13	McKean	30
Bucks	295	Mercer	28
Butler	78	Mifflin	*
Cambria	26	Monroe	113
Cameron	12	Montgomery	291
Carbon	54	Montour	0
Centre	45	Northampton	71
Chester	310	Northumberland	6
Clarion	60	Perry	9
Clearfield	39	Philadelphia	142
Clinton	7	Pike	69
Columbia	7	Potter	*
Crawford	46	Schuylkill	31
Cumberland	9	Snyder	*
Dauphin	20	Somerset	16
Delaware	78	Sullivan	*
Elk	36	Susquhanna	52
Erie	130	Tioga	15
Fayette	35	Union	17
Forest	8	Venango	59
Franklin	*	Warren	23
Fulton	5	Washington	36
Greene	13	Wayne	80
Huntingdon	*	Westmoreland	66
Indiana	33	Wyoming	37
Jefferson	32	York	37
Juniata	0	<b>Total</b>	<b>3334</b>

Source: PA-NEDSS

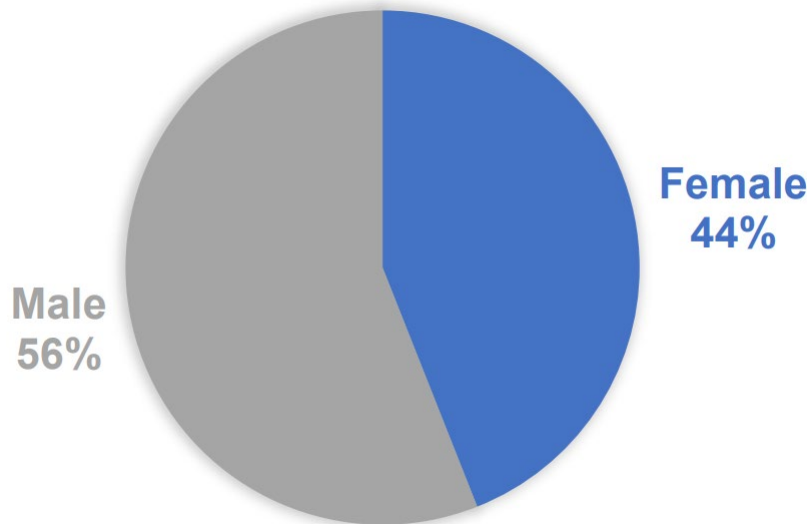
\*Case counts <5 have been redacted to help protect patient confidentiality, in accordance with DOH policy.



## LD Case Characteristics

Nationally, LD is more commonly diagnosed in males. This pattern was seen in the 2020 Pennsylvania LD data as well, with males comprising 56% of reported cases. Males may spend more time engaging in outdoor activities, such as camping and hunting, may be more likely to do yard work, and may be more likely to have jobs that require work outdoors. Figure 1 shows the sex distribution of LD cases in 2020.

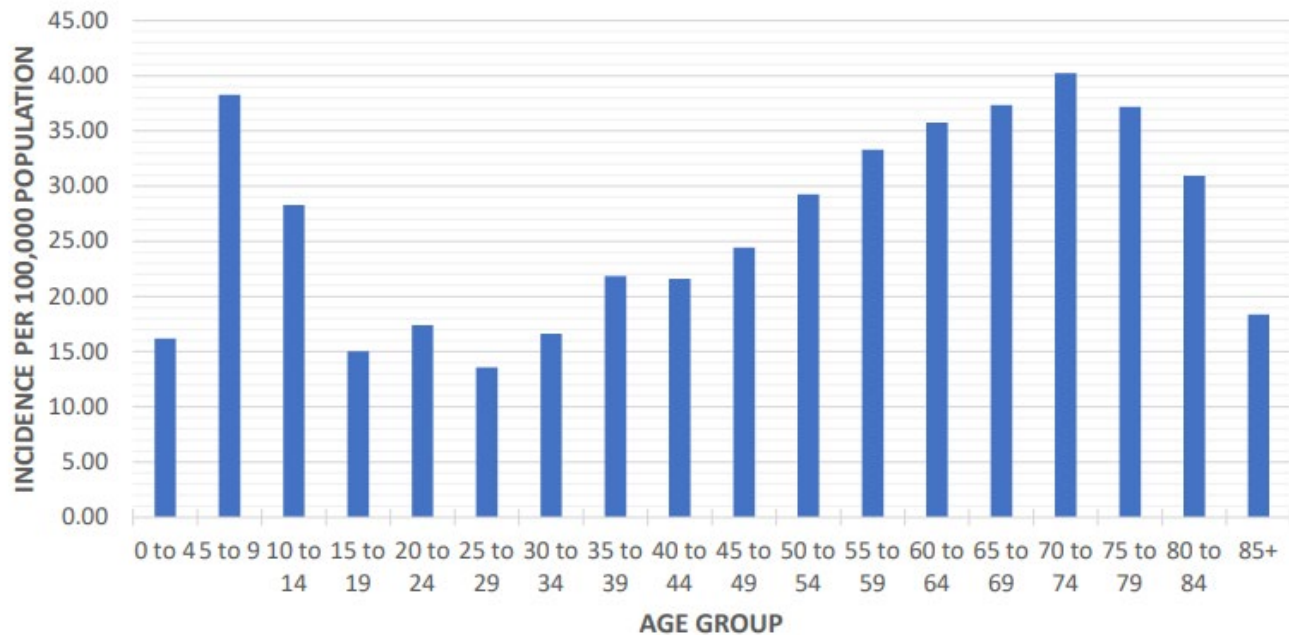
**Figure 1 – Lyme Disease by Sex, Pennsylvania, 2020**



Source: PA-NEDSS

LD incidence was highest in children ages 5–9 and in older adults. This is consistent with national trends. Hypotheses for this trend include that children in the 5–9 year age group are more likely to play outside, are lower to the ground, may cuddle more with pets who might have ticks, and are more likely to play in leaves and tall grass. There is also a high incidence in older adults. The reason for this is not clear but may be due to more severe symptoms resulting in an increased likelihood to seek care for LD-related symptoms, or increased time post-retirement to participate in outdoor leisure activities, such as dog walking, gardening, bird watching, and nature walks. The age-adjusted LD incidence for 2020 is 26.4 cases per 100,000 persons. Figure 2 displays the incidence of LD by age groups in 2020.

**Figure 2 – Lyme Disease Incidence by Age Group, Pennsylvania, 2020**



Source: PA-NEDSS; DOH, Bureau of Vital Statistics

### Clinical Manifestations of LD

The EM rash is the most distinctive sign of LD; 44.6% of Pennsylvania cases in which the data were available were reported as having this classic rash. It should be noted that, according to CDC, EM is diagnostic for LD, and treatment should be initiated. Lab testing is not required in this circumstance, as serologic tests may be negative if done too soon after the onset of illness. Since most LD cases are reported to DOH by laboratories, it is likely many cases diagnosed on the basis of EM alone are not reported to the department at all. Therefore, the proportion of cases with EM seen in our data are likely an underrepresentation of the true incidence of EM in LD cases. As noted earlier, there are several other signs and symptoms associated with different stages of LD. More serious complications of LD, like meningitis, encephalitis, and atrioventricular block, are rare. Table 4 shows the frequency with which the most common signs and symptoms of LD were reported in 2020. In cases in which the onset date of symptoms was reported, the median number of days between symptom onset and diagnosis of LD was eight days. However, onset date is not always reported and may be less likely to be reported in cases that have been experiencing LD symptoms for a longer period of time, since these cases may not remember when their LD symptoms began.

**Table 4 – Signs and Symptoms of Lyme Disease Reported by Providers Among Lyme Disease Cases, Pennsylvania, 2020**

Symptom	Percent (%) Who Reported	
	Experiencing this Symptom	Total Number of Cases
Erythema migrans (EM)	44.6	1426
Joint swelling	37.8	1208
Bell's palsy	5.3	169
Radiculoneuropathy	3.5	112
Lymphocytic meningitis	0.3	11
Encephalitis/encephalomyelitis	0.7	21
Second or third degree atrioventricular block	0.9	29

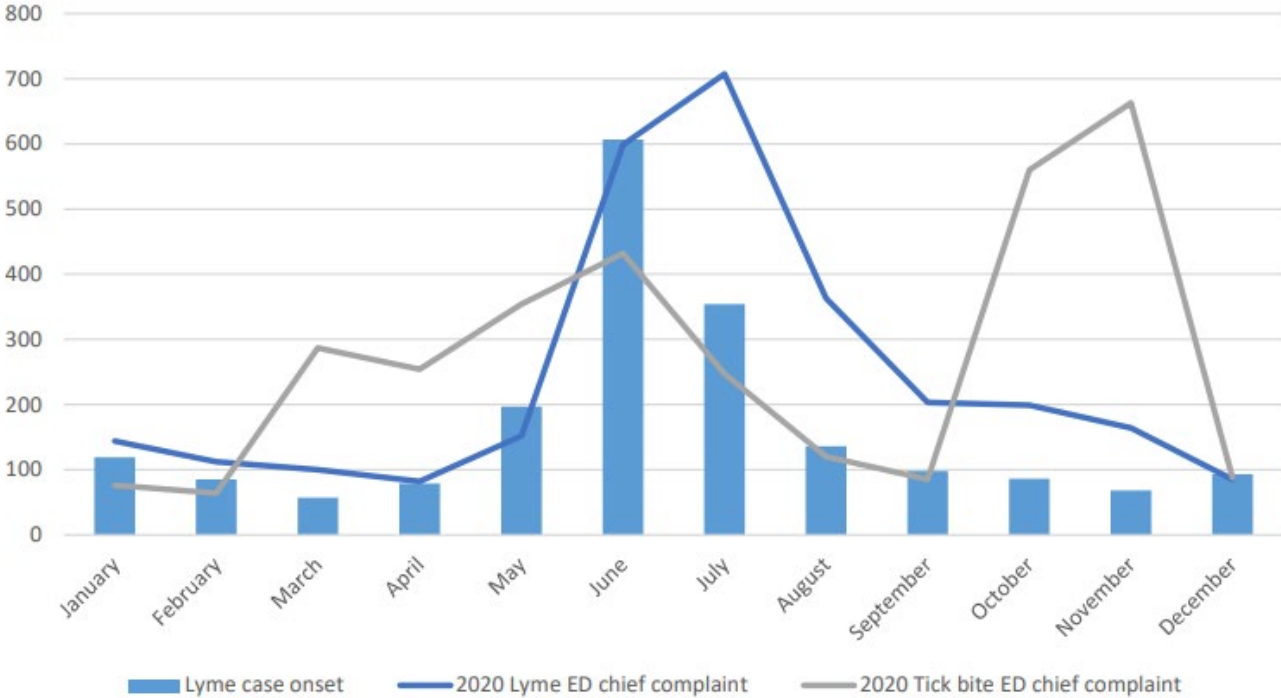
Source: PA-NEDSS

### Emergency Department Surveillance Data

A review of syndromic emergency department (ED) surveillance data typically shows an increase in visits attributed to tick bites occurring in April each year when weather warms and people were more likely to spend time outdoors. However, this pattern was not evident in 2020, likely due to the COVID-19 pandemic. April was at the peak of widespread closures and avoidance of healthcare facilities due to fears of being exposed to COVID-19 in those settings. All non-COVID-19 related ED visits dropped off during this time. In 2020, ED visits due to tick bites did not begin to increase until May and June 2020 and then dropped off again until the fall. Spring tick bites are typically attributed to adult *Ixodes scapularis* and adult *Dermacentor variabilis* (dog ticks). *Ixodes scapularis* nymphs emerge in late spring and early summer. Tick bite complaints, which are inclusive of several species of ticks, are elevated during late spring and early summer despite *I. scapularis* adult activity decreasing. *I. scapularis* nymphs, however, are active from late May to mid-July, which corresponds with the spike in LD reports with onset date in June and July. These cases do not appear to be associated with visits to the emergency department (ED) for tick bites; it is possible that nymphal activity is less noticeable and results in fewer ED visits, although these bites still contribute to LD incidence. There is a second peak in tick-related emergency department complaints in the fall, which is consistent with the fact that adult *I. scapularis* ticks feed during October and November. Since tick bite-related emergency department visits peak prior to the peak of Lyme incidence, this indicates persons may be more likely to present to the emergency department with an adult tick bite than a nymphal tick bite.

Emergency department visits specifically related to LD increased in May 2020 reaching a peak in June and July, corresponding to the onset dates of reported LD cases. LD related emergency department visits are highly correlated to the timing of LD onset month and can be an early indicator of an increase in LD cases. Figure 3 shows the timing of tick-related and LD complaints reported in Pennsylvania emergency departments in 2020.

**Figure 3 – Tick and Lyme Related Emergency Department Chief Complaints, Pennsylvania, 2020**



Source: Health Monitoring Systems; PA-NEDSS

# Tickborne Rickettsial Infections (TBRI) Findings (Anaplasmosis, Ehrlichiosis, Spotted Fever Rickettsiosis)

## Annual Trends

Ehrlichiosis and SFR case counts have been steady in Pennsylvania over the last 10 years, with counts typically ranging between 10–30 cases per year. Anaplasmosis, on the other hand, was infrequently reported a decade ago but has increased steadily to a high of 216 cases in 2020. Ehrlichiosis and SFR are transmitted by *Amblyomma americanum* (the lone star tick) and *Dermacentor variabilis* (the American dog tick), respectively. Anaplasmosis is transmitted by the *Ixodes scapularis* (deer tick), the same tick which transmits LD. Tick surveys have shown that the geographic range of *I. scapularis* has increased in Pennsylvania and the density of *I. scapularis* ticks has increased as well.<sup>8</sup> This likely accounts for the increase in *I. scapularis* transmitted infections like anaplasmosis. In 2020, Pennsylvania reported 216 anaplasmosis cases, <5 ehrlichiosis cases and <5 SFR cases. Table 5 shows the case counts of these 3 tickborne diseases over the last 10 years.

**Table 5 – Anaplasmosis, Ehrlichiosis and SFR Case Counts, Pennsylvania, 2011-2020**

Year	Anaplasmosis	Ehrlichiosis	Spotted Fever Rickettsiosis
2011	6	10	19
2012	8	23	41
2013	34	28	16
2014	25	10	7
2015	21	14	16
2016	58	23	22
2017	94	19	28
2018	108	18	25
2019	214	33	29
2020	216	*	*

Source: PA-NEDSS

\*Case counts <5 have been redacted to help protect patient confidentiality, in accordance with DOH policy.

## Seasonality

Onset months of TBRI cases differ slightly from typical onset months of LD. Most cases occur in warm months, as ticks are most active in the warmer months and people are more likely to be outdoors and exposed to ticks during these months. However, compared to LD, anaplasmosis cases are more likely to report onset dates in the warm months of May-July. There is also another smaller peak in anaplasmosis in the cooler fall months of October and November when adult *I. scapularis* are feeding. This trend may indicate that adult *I. scapularis* ticks are as likely to transmit anaplasmosis as nymphs are, given that nymphs are most active in June and July. Most ehrlichiosis cases report onset in May through August. However, SFR cases report most commonly report onset in July through August. Table 6 shows the 2020 cases of other tickborne diseases by month of report. Ehrlichiosis and SFR are transmitted by *A. americanum* and *D. variabilis*, respectively, which have different life cycles than *I. scapularis*.

**Table 6 – Anaplasmosis Case Counts by Month of Onset, Pennsylvania, 2020**

Month of Onset Date	Anaplasmosis
January	*
February	*
March	*
April	9
May	24
June	26
July	39
August	9
September	6
October	11
November	12
December	*

Source: PA-NEDSS

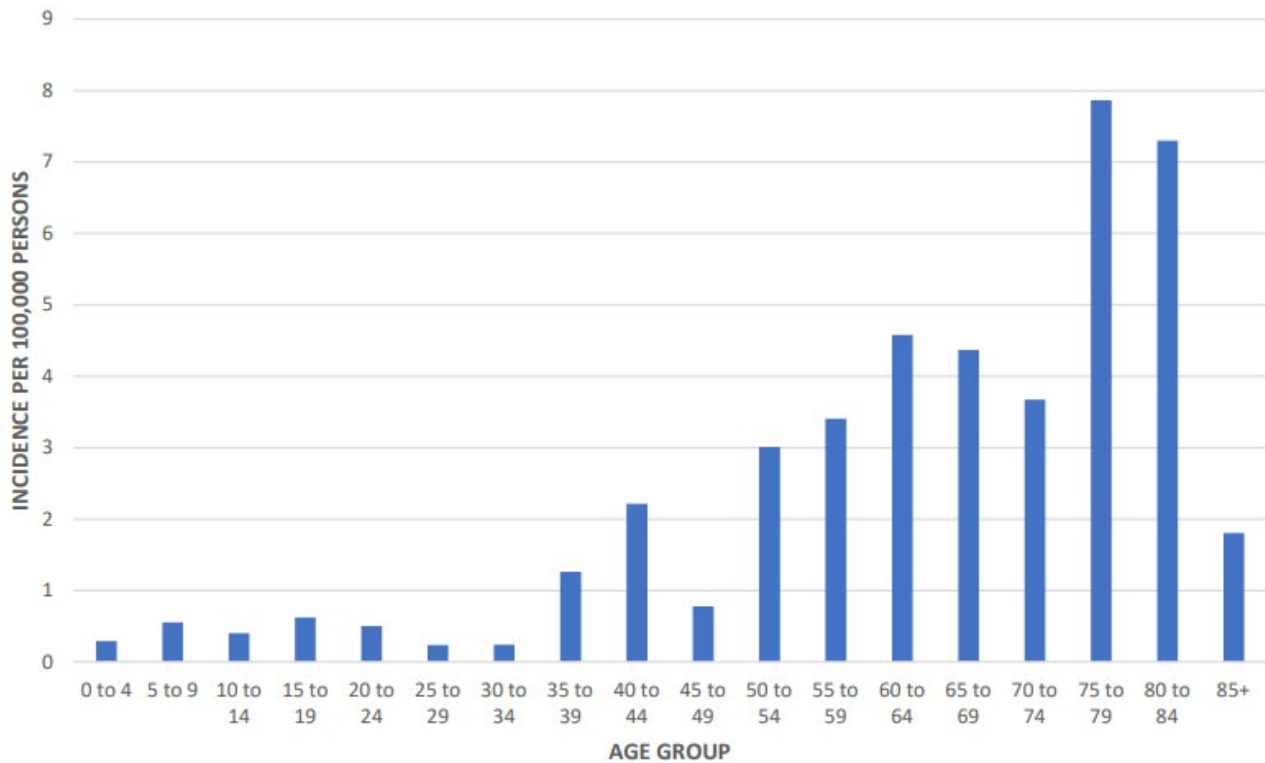
\*Case counts <5 have been redacted to help protect patient confidentiality, in accordance with DOH policy.

## Case Characteristics

Similar to LD, males are more likely than females to report these other tickborne diseases, with 61.3% of cases occurring in males. In both anaplasmosis and spotted fever rickettsiosis, we see more males than females affected, 61.6% and 66.7%, respectively. However, for ehrlichiosis, we see a slightly lower proportion in males, 33.3%.

In LD, we see a high incidence in children and older adults. However, in TBRI cases, the incidence in young children was low, and there was a higher incidence in older adults and the elderly. The reason for this pattern is not clear. Figure 4 shows the number of cases per 100,000 in each age category.

**Figure 4 – Anaplasmosis, Ehrlichiosis and SFR Incidence by Age Group, Pennsylvania, 2020**



Source: PA-NEDSS and DOH Bureau of Vital Statistics

## Geographic Distribution

In 2020, 48 of 67 counties reported at least one case of anaplasmosis, ehrlichiosis, or SFR. The highest number of cases are reported in the eastern counties of the state. This is primarily driven by anaplasmosis, which has had high numbers of cases in the northeastern counties. Case counts have begun increasing in central and western counties, following the same pattern exhibited by LD, which first appeared in eastern counties and then spread westward throughout the state. Ehrlichiosis cases do not show a geographic pattern and can be found in counties in all areas of Pennsylvania. Most SFR cases are reported in eastern counties, especially southeastern counties. Table 8 shows the number of anaplasmosis cases by county in 2020.

**Table 8 – Anaplasmosis Case Counts by County, Pennsylvania, 2020\***

County	Anaplasmosis	County	Anaplasmosis
Allegheny	6	Lancaster	*
Armstrong	*	Lebanon	0
Beaver	*	Lehigh	*
Berks	*	Luzerne	9
Blair	0	Lycoming	10
Bucks	6	McKean	*
Camrbia	*	Mercer	0
Carbon	*	Monroe	19
Centre	10	Montgomery	*
Chester	11	Montour	5
Clarion	*	Northampton	*
Clearfield	*	Northumberland	5
Clinton	*	Perry	*
Columbia	11	Philadelphia	5
Cumberland	*	Pike	17
Dauphin	*	Potter	*
Delaware	*	Schuylkill	*
Elk	5	Snyder	*
Erie	*	Somerset	*
Huntingdon	*	Susquehanna	*
Indiana	*	Tioga	*
Jefferson	7	Warren	*
Juniata	0	Wayne	18
Lackawanna	10	Westmoreland	0

Source: PA-NEDSS

\*Case counts <5 have been redacted to help protect patient confidentiality, in accordance with Pa. DOH policy.



# Babesiosis Findings

## Annual Trends

Babesiosis is not a reportable condition in Pennsylvania, therefore, reporting is voluntary rather than mandatory. As a result, it is not clear how well the data represent the true burden of babesiosis cases in Pennsylvania. Babesiosis is an emerging tickborne disease in Pennsylvania. Case counts appear to be increasing, although the increase in case counts may be due to labs and facilities opting to report more cases. In 2020, 40 babesiosis cases were reported in the state.

**Table 9 – Babesiosis Case Counts, Pennsylvania, 2011–2020**

<b>Year</b>	<b>Babesiosis</b>
2011	35
2012	11
2013	25
2014	11
2015	45
2016	36
2017	81
2018	72
2019	68
2020	40

Source: PA-NEDSS

## Seasonality

Since babesiosis is transmitted by the *I. scapularis* tick, the seasonality of babesiosis is similar to that of LD, with most cases reporting onset in June and July. There are also high case numbers in August which may be due to the four-week incubation period.

**Table 10 – Babesiosis Case Counts by Month of Onset, Pennsylvania, 2020**

Month of Onset Date	Babesiosis
January	0
February	0
March	0
April	*
May	*
June	6
July	13
August	*
September	*
October	*
November	0
December	0

Source: PA-NEDSS

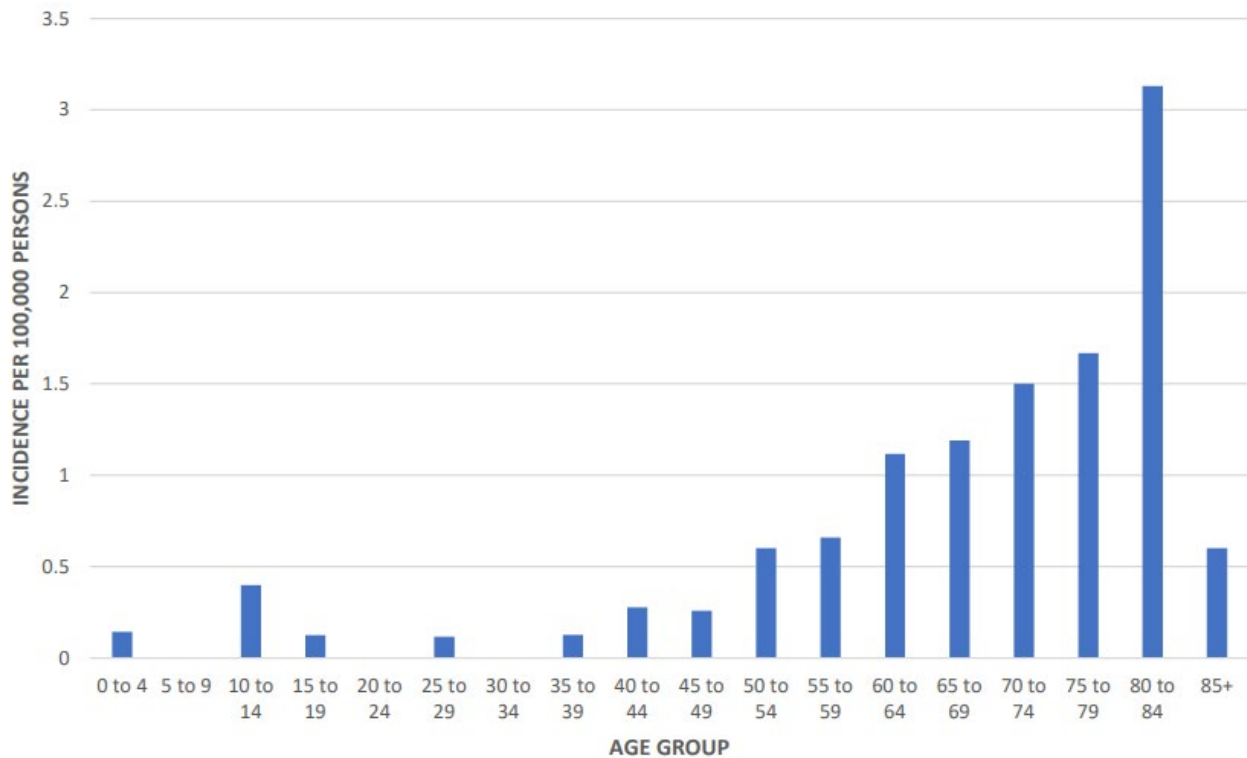
\*Case counts <5 have been redacted to help protect patient confidentiality, in accordance with Pa. DOH policy.

## Case Characteristics

Similar to LD, males are more likely than females to report babesiosis, with 80.0% of cases occurring in males.

However, in contrast with LD but consistent with TBRI, the incidence in young children was low, and there was a higher incidence in older adults and the elderly. The reason for this pattern is not clear. Figure 5 shows the number of cases per 100,000 in each age category.

**Figure 5 – Babesiosis Incidence by Age Group, Pennsylvania, 2020**



Source: PA-NEDSS and DOH Bureau of Vital Statistics

## Geographic Distribution

In 2020, 18 of 67 counties reported at least one case of babesiosis. The highest number of cases are reported in the southeastern counties of the state. Table 11 shows the number of babesiosis cases by county in 2020.

**Table 11 – Babesiosis Case Counts by County, Pennsylvania, 2020\***

<b>County</b>	<b>Babesiosis</b>
Allegheny	*
Berks	7
Bucks	11
Chester	21
Cumberland	*
Dauphin	*
Delaware	*
Elk	*
Fayette	*
Lebanon	*
Lehigh	*
Lycoming	*
Montgomery	6
Northampton	*
Philadelphia	*
Pike	6
Potter	*
Venango	*

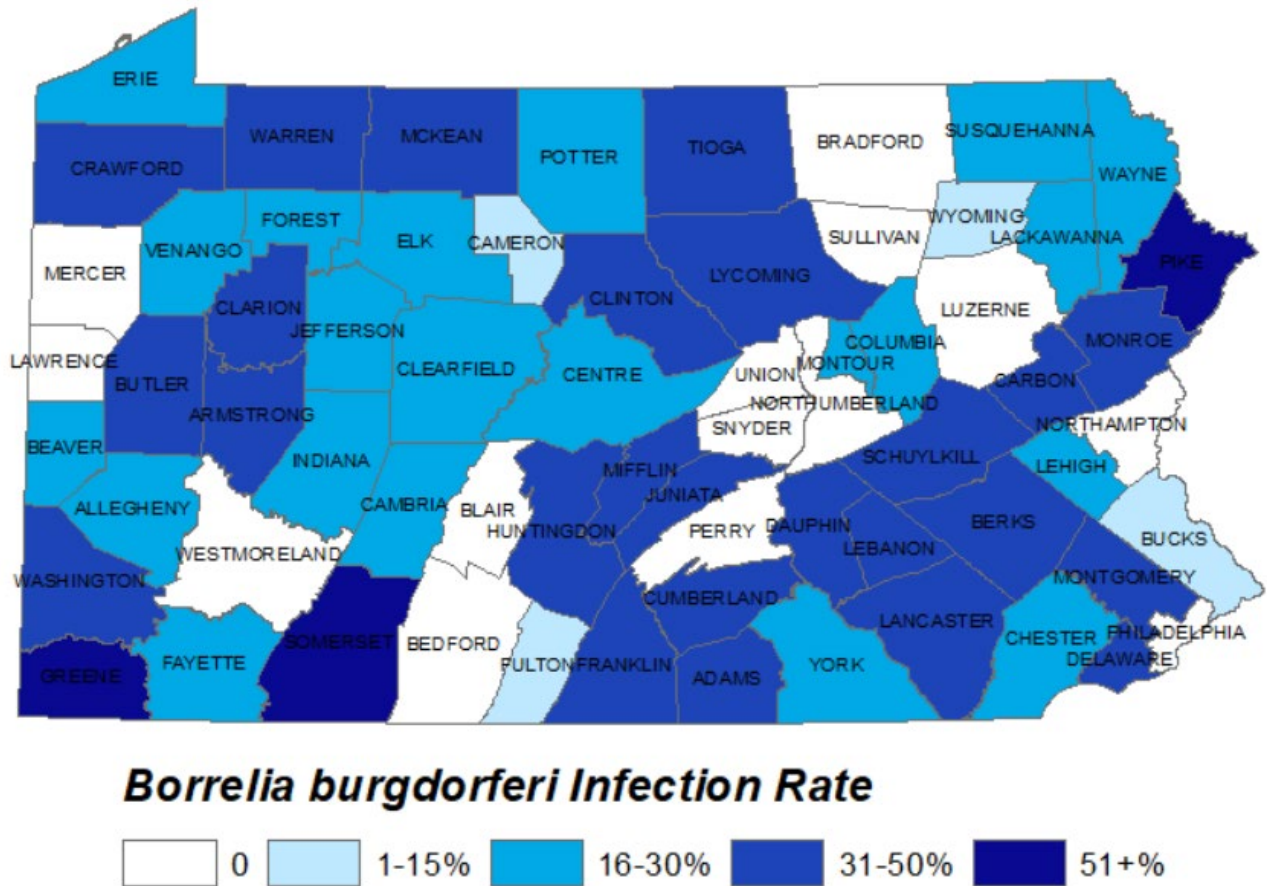
Source: PA-NEDSS

\*Case counts <5 have been redacted to help protect patient confidentiality, in accordance with Pa. DOH policy.

## Tick Surveillance Findings

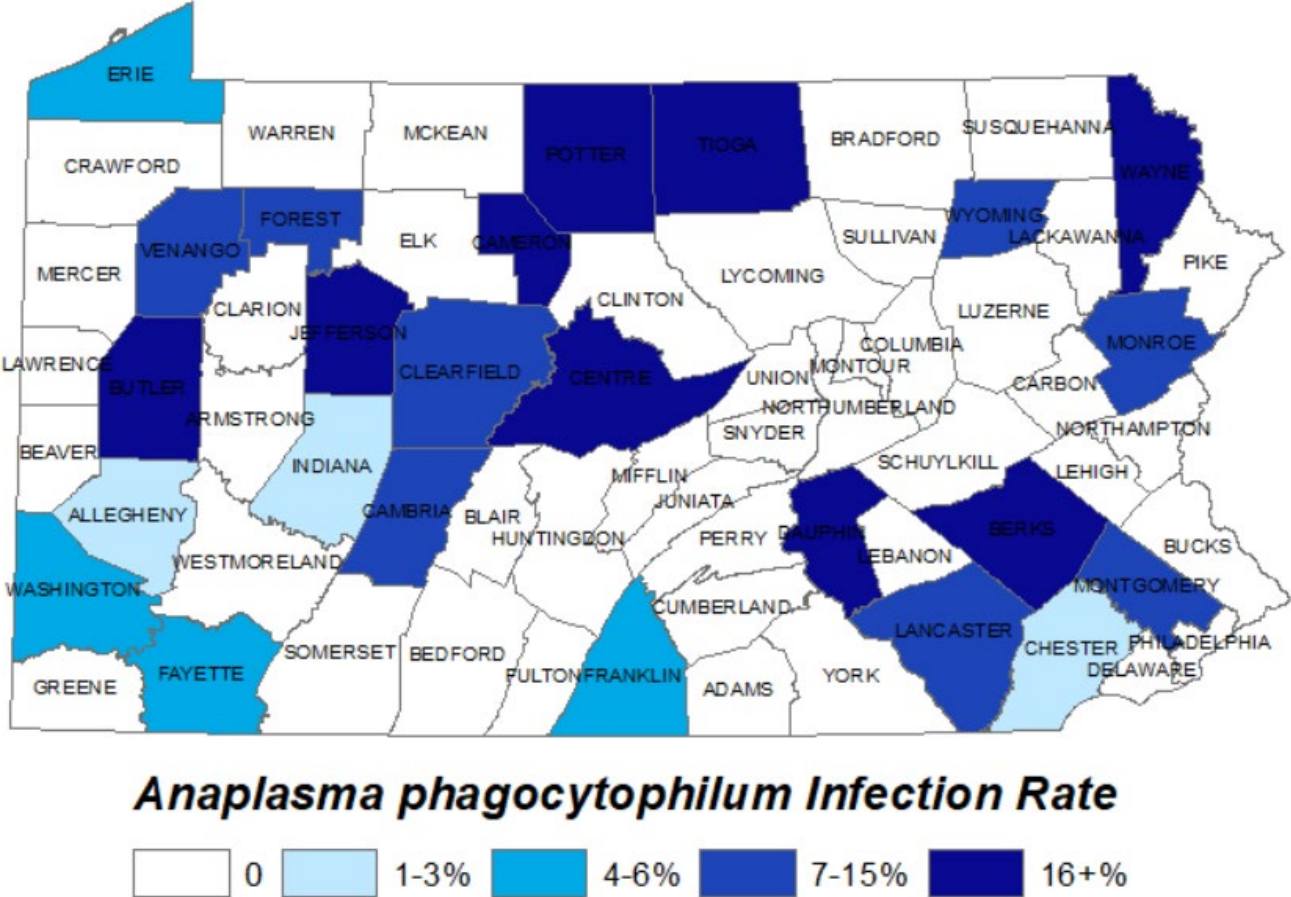
Beginning in the fall of 2018, the Pennsylvania Department of Environmental Protection (DEP) began a robust tick surveillance program. This program involved collecting a minimum of 50 *Ixodes scapularis* ticks from each county and testing these ticks for the primary *I. scapularis* pathogens to understand the infection rate of the disease vector. During the 2020 nymphal *I. scapularis* season (late April through late July), 1191 nymphal *Ixodes scapularis* ticks were collected from all 67 Pennsylvania counties. Of these, 1180 were tested for the primary *I. scapularis* pathogens including *Borrelia burgdorferi* (the bacteria that causes LD), *Anaplasma phagocytophilum* (the bacteria that causes anaplasmosis) and *Babesia microti* (the parasite that causes babesiosis). Statewide *B. burgdorferi* infection rates were 26.1%, *A. phagocytophilum* infection rates were 5.9%, and *B. microti* infection rates were 1.4%. Figures 6–8 show the county infection rates of the nymph *I. scapularis* ticks collected in 2020.

**Figure 6 – *Borrelia burgdorferi* Infection Rates in Nymph *Ixodes scapularis* by County, Pennsylvania, 2020**



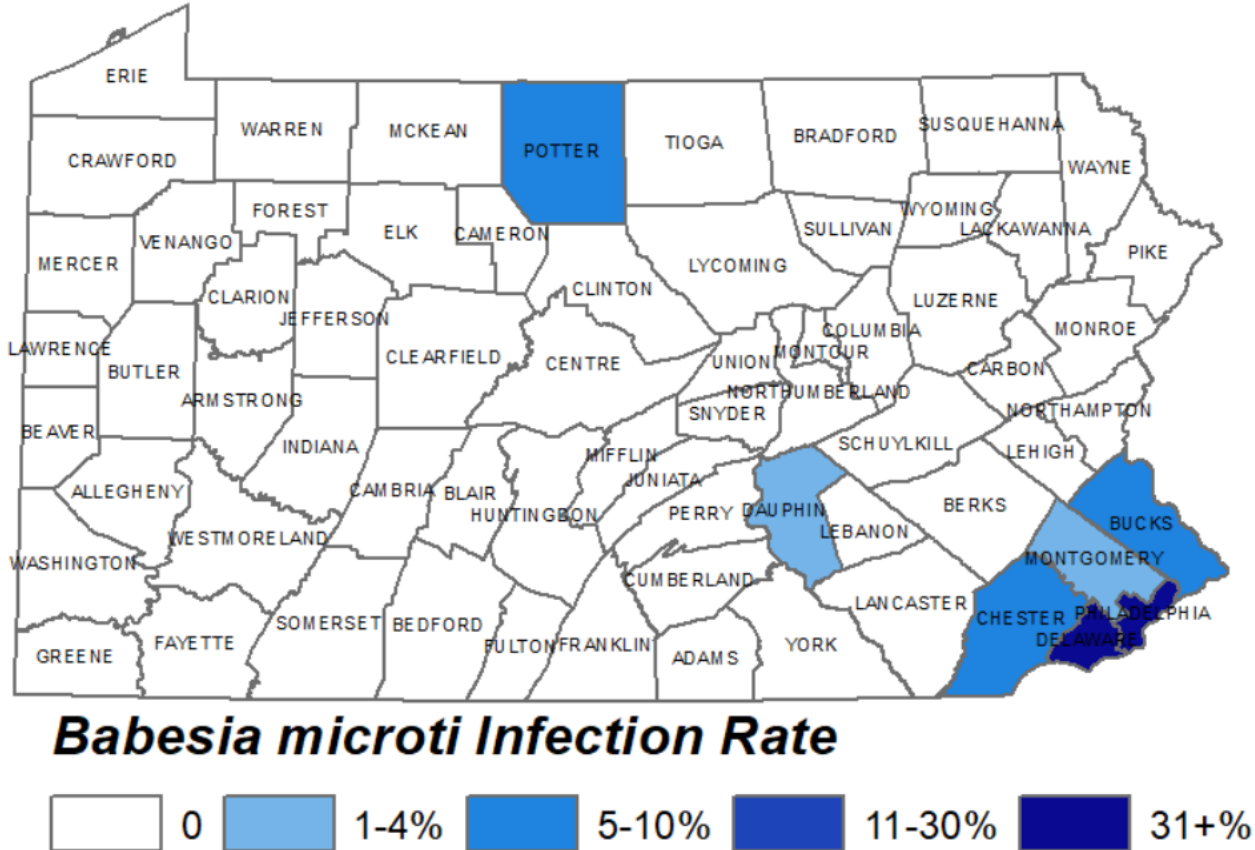
Source: Department of Environmental Protection

**Figure 7 – *Anaplasma phagocytophilum* Infection Rates in Nymph *Ixodes scapularis* by County, Pennsylvania, 2020**



Source: Department of Environmental Protection

**Figure 8 – *Babesia microti* Infection Rates in Nymph *Ixodes scapularis* by County, Pennsylvania, 2020**



Source: Department of Environmental Protection

## Citations

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