

Surveillance for Babesiosis —

United States, 2017

Annual Summary

Acknowledgments

The findings in this U.S. surveillance summary were based, in part, on contributions by state and local health departments.

Suggested citation

Centers for Disease Control and Prevention (CDC). Surveillance for babesiosis — United States, 2017 Annual Summary. Atlanta, Georgia: U.S. Department of Health and Human Services, CDC, 2019.

Data current as of:

June 26, 2018

Additional data, updates, or corrections received after that date are not reflected in this summary.

Summary compiled by:

Elizabeth B. Gray, Arman M. Niknafs, and Barbara L. Herwaldt

Centers for Disease Control and Prevention

Division of Parasitic Diseases and Malaria

1600 Clifton Road, Mailstop H24-3

Atlanta, GA 30329-4027

Telephone: 404-718-4745

E-mail: parasites@cdc.gov

Web: <http://www.cdc.gov/parasites/babesiosis/data-statistics/>

Contents

Main Findings for 2017	4
Background	4
Babesiosis	4
Surveillance	4
Babesiosis national surveillance case definition (Table 1).....	6
2017 babesiosis surveillance summary.....	8
Surveillance data, 2011–2017	9
Table 2. Number and incidence of reported cases of babesiosis, by state and year, 2011–2017.....	9
Figure 1. Number of reported cases of babesiosis, by year, 2011–2017.....	11
Figure 2. Number of reported cases of babesiosis, by county of residence — 37 states, 2017	12
Figure 3. Number of reported cases of babesiosis, by age group and year, 2011–2017	13
Figure 4. Number of reported cases of babesiosis, by month of symptom onset and year, 2011–2017 ...	14
References.....	155
Appendix.....	166

Main Findings for 2017

- For 2017, CDC was notified of a total of 2,358 U.S. cases of babesiosis, a 24% increase from the total of 1,909 cases for 2016.
- Babesiosis was a reportable disease in 37 states in 2017 (compared with 35 states in 2016); 26 (70%) of the 37 states notified CDC of at least 1 case.
- Most of the reported cases (86%; n = 2,020/2,358) were in residents of 7 states in the Northeast and upper Midwest (Connecticut, Massachusetts, Minnesota, New Jersey, New York, Rhode Island, and Wisconsin). Tickborne transmission of *Babesia* parasites is well established in these states.

Background

Babesiosis

Babesiosis is caused by protozoan parasites of the genus *Babesia*, which infect red blood cells. *Babesia* parasites usually are tickborne but also can be transmitted via blood transfusion or congenitally (1–3).

Most human cases of *Babesia* infection in the United States are caused by the parasite *Babesia microti*. Occasional U.S. cases caused by other species (types) of *Babesia* have been detected (4, 5). *Babesia microti* is spread in nature by *Ixodes scapularis* ticks (also called blacklegged ticks or deer ticks)—primarily in the Northeast and upper Midwest, especially in parts of New England, New York State, New Jersey, Wisconsin, and Minnesota (1, 6–8). The parasite *B. microti* typically is spread by the young nymph stage of the tick, which is found mostly during warm months (spring and summer), in areas with woods, brush, or grass. Infected people might not recall a tick bite because *I. scapularis* nymphs are very small (about the size of a poppy seed).

Many people who are infected with *Babesia microti* are asymptomatic. Some people develop flu-like symptoms, such as fever, chills, sweats, headache, body aches, loss of appetite, nausea, or fatigue. Because *Babesia* parasites infect and destroy red blood cells, babesiosis causes hemolytic anemia, which may range from mild to marked (7).

Babesiosis can be a severe, life-threatening disease (1, 7), particularly in people who:

- do not have a spleen;
- have a weak immune system for other reasons (such as cancer, lymphoma, or AIDS);
- have other serious health conditions (such as liver or kidney disease); or
- are elderly.

Surveillance

CDC has conducted surveillance for babesiosis in the United States since January 2011, when babesiosis became a nationally notifiable condition. The babesiosis case definition used for surveillance purposes is available online (<http://wwwn.cdc.gov/nndss/conditions/babesiosis/case-definition/2011/>) and is summarized in **Table 1**. Health departments in states where babesiosis is reportable notify CDC of cases that meet the definition via the **National Notifiable Diseases Surveillance System (NNDSS)**.

Health departments submit additional information about reported cases using the CDC Case Report Form (CRF) **Babesiosis CRF**  [PDF, 2 pages, 650 KB]; data are requested about risk factors for infection, clinical manifestations, and laboratory results. Of note, for some cases, requested data elements may be incomplete or missing. For example, data regarding clinical manifestations are collected as distinct questions, resulting in differences in the denominator across each sign/symptom. For more information, visit

babesiosis surveillance and case reporting. Health care providers, laboratories, and the general public should contact their state health department for information about reporting cases of babesiosis.

The number of states in which babesiosis is a reportable condition may change from year to year as additional states begin conducting surveillance. Cases are reported by state and county of residence, which is not necessarily where the exposure occurred. Changes in the number of reported cases do not necessarily represent true changes in disease incidence; ascertainment, reporting, and investigation of cases are subject to clinician awareness and public health agency resources, which may vary from year to year in and among states.

This summary focuses on babesiosis cases reported for surveillance year 2017; some data from previous years (2011–2016) are included to show differences from year to year. Babesiosis surveillance data also are presented in CDC's [Morbidity and Mortality Weekly Report \(MMWR\)](#) weekly and annual summaries of nationally notifiable diseases. In addition, national surveillance data for 2011 and a 5-year summary (2011–2015) were published previously (8, 9). Because of differences in the timeline for finalizing data in the annual surveillance datasets, data provided in this summary may differ slightly from those previously published. Of note, the year in which a case is counted in national surveillance summaries is assigned by the health department and might reflect the year of symptom onset, diagnosis, or of reporting to or by the health department.

Table 1. National surveillance case definition for babesiosis*

Clinical evidence	Objective One or more of the following: fever, anemia, or thrombocytopenia. Subjective One or more of the following: chills, sweats, headache, myalgia, or arthralgia.
Epidemiologic evidence for transfusion transmission	For the purposes of surveillance, epidemiologic linkage between a transfusion recipient and a blood donor is demonstrated if all of the following criteria are met: In the transfusion recipient Received one or more red blood cell (RBC) or platelet transfusions within 1 year before the collection date of a specimen with laboratory evidence of <i>Babesia</i> infection; and At least one of these transfused blood components was donated by the donor described below; and Transfusion-associated infection is considered at least as plausible as tickborne transmission; and In the blood donor Donated at least one of the RBC or platelet components that was transfused into the above recipient; and The plausibility that this blood component was the source of infection in the recipient is considered equal to or greater than that of blood from other involved donors. (More than one plausible donor can be linked to the same recipient.)
Laboratory criteria for diagnosis	Laboratory confirmatory Identification of intraerythrocytic <i>Babesia</i> organisms by light microscopy in a Giemsa, Wright, or Wright-Giemsa–stained blood smear; or Detection of <i>Babesia microti</i> DNA in a whole blood specimen by polymerase chain reaction (PCR); or Detection of <i>Babesia</i> spp. genomic sequences in a whole blood specimen by nucleic acid amplification; or Isolation of <i>Babesia</i> organisms from a whole blood specimen by animal inoculation. Laboratory supportive Demonstration of a <i>Babesia microti</i> indirect fluorescent antibody (IFA) total immunoglobulin (Ig) or IgG antibody titer of $\geq 1:256$ (or $\geq 1:64$ in epidemiologically linked blood donors or recipients); or Demonstration of a <i>Babesia microti</i> immunoblot IgG positive result; or Demonstration of a <i>Babesia divergens</i> IFA total Ig or IgG antibody titer of $\geq 1:256$; or Demonstration of a <i>Babesia duncani</i> IFA total Ig or IgG antibody titer of $\geq 1:512$.

Case classification	
Confirmed	A case that has confirmatory laboratory results and meets at least one of the objective or subjective clinical evidence criteria, regardless of the mode of transmission (can include clinically manifest cases in transfusion recipients or blood donors).
Probable	A case that has supportive laboratory results and meets at least one of the objective clinical evidence criteria (subjective criteria alone are not sufficient); or A case that is in a blood donor or recipient epidemiologically linked to a confirmed or probable babesiosis case (as defined above) and Has confirmatory laboratory evidence but does not meet any objective or subjective clinical evidence criteria; or Has supportive laboratory evidence and might or might not meet any subjective clinical evidence criteria but does not meet any objective clinical evidence criteria.

* Available at <http://www.cdc.gov/nndss/conditions/babesiosis/case-definition/2011/>

2017 babesiosis surveillance summary

In 2017, babesiosis was a reportable condition in 37 states (compared with 35 states in 2016). CDC was notified of a total of 2,358 cases of babesiosis by 26 (70%) of the 37 states (**Table 2**), a 24% increase from the total of 1,909 cases for 2016 (**Figure 1**). For 2017, 86% (n = 2,020/2,358) of the reported cases were in residents of 7 states (Connecticut, Massachusetts, Minnesota, New Jersey, New York, Rhode Island, and Wisconsin). Tickborne transmission of *Babesia* parasites is well established in parts of these states. Differences within and among states in the distributions of reported cases by place of residence are evident in the county-level maps for 2017 (**Figure 2**) and the 6 prior years (2011–2016) in which national surveillance was conducted (**Appendix**). Among the 232 counties with at least 1 reported case of babesiosis for 2017, 161 counties (69%) reported 1–5 cases, 18 counties (8%) reported 6–10 cases, 20 counties (9%) reported 11–20 cases, and 33 (14%) had >20 reported cases for 2017. The 33 counties with >20 cases reported were in Connecticut (n=9), New York (n=9), Massachusetts (n=7), Rhode Island (n=4), Maine (n=2), New Hampshire (n=1), and New Jersey (n=1). Changes in the number of states conducting surveillance for babesiosis had minimal impact on the fluctuations in the yearly totals of cases; the two states that began surveillance for babesiosis in 2017—Florida and Virginia—reported nine cases and zero cases, respectively.

For 2017, the median age of the case-patients was 61 years (range: <1–104 years; n = 2,347). The age distributions for 2017 and the 6 previous years were similar (**Figure 3**), with the largest number of cases reported in persons aged 60–69 years. Similar to the data for previous years, for 2017, among the 2,358 case-patients, 65% (n = 1,536) were male and 35% were female.

A majority of case-patients have reported getting sick during the spring or summer months. Data on month of symptom onset were available for most case-patients (75%, n = 1,772/2,358). The proportion of case-patients with reported symptom onset during June–August has remained fairly consistent from year to year (**Figure 4**).

For 2017, among the case-patients for whom data were available, fever was the most frequently reported clinical manifestation (81%; n = 1,593/1,968 patients), followed by chills (68%; n = 1,138/1,681), myalgia (66%; n = 1,132/1,711), anemia (66%; n = 588/890), thrombocytopenia (65%; n = 761/1,167), and headache (59%; n = 978/1,670); proportions are similar to previous years.

For 2017, hospitalization data were available for 1,554 case-patients, 749 (48%) of whom reportedly had been hospitalized for at least 1 day. These data are consistent with previous years; overall for 2011–2017, hospitalization data were available for 9,624 case-patients (81% of the total of 11,881), 4,477 of whom (47% of 9,624) reportedly had been hospitalized for at least 1 day.

For 2017, of the 860 case-patients for whom data were available, 407 (47%) recalled having a tick bite in the 8 weeks before symptom onset. Overall for 2017, 3 cases of babesiosis in blood recipients were classified by the reporting state as transfusion associated.

Table 2. Number and incidence of reported cases of babesiosis, by state and year, 2011–2017*

State†	2011		2012		2013		2014		2015		2016		2017	
	No.	Rate‡	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate
Alabama	1	<0.1	0	0.0	0	0.0	1	<0.1	2	<0.1	0	0.0	1	<0.1
Alaska	—§	—	—	—	—	—	—	—	—	—	—	—	—	—
Arizona	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Arkansas	—	—	—	—	—	—	—	—	0	0.0	1	<0.1	0	0.0
California	1	<0.1	4	<0.1	3	<0.1	3	<0.1	5	<0.1	3	<0.1	4	<0.1
Colorado	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Connecticut	74	2.1	123	3.4	268	7.5	205	5.7	328	9.1	322	9.0	309	8.6
Delaware	1	0.1	0	0.0	2	0.2	1	0.1	1	0.1	2	0.2	4	0.4
District of Columbia	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Florida	—	—	—	—	—	—	—	—	—	—	—	—	9	<0.1
Georgia	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Hawaii	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Idaho	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Illinois	—	—	—	—	—	—	1	<0.1	3	<0.1	2	<0.1	0	0.0
Indiana	0	0.0	1	<0.1	1	<0.1	0	0.0	0	0.0	0	0.0	1	<0.1
Iowa	—	—	—	—	—	—	—	—	—	—	—	—	2	0.1
Kansas	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Kentucky	—	—	—	—	—	—	—	—	0	0.0	0	0.0	0	0.0
Louisiana	—	—	—	—	2	<0.1	0	0.0	1	<0.1	0	0.0	1	<0.1
Maine	9	0.7	10	0.8	36	2.7	42	3.2	55	4.1	82	6.2	118	8.8
Maryland	4	0.1	3	0.1	9	0.2	2	<0.1	4	0.1	6	0.1	5	<0.1
Massachusetts	208	3.1	261	3.9	417	6.2	535	7.9	444	6.5	517	7.6	591	8.6
Michigan	0	0.0	0	0.0	2	<0.1	2	<0.1	3	<0.1	2	<0.1	3	<0.1
Minnesota	73	1.4	41	0.8	64	1.2	49	0.9	45	0.8	50	0.9	60	1.1
Mississippi	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Missouri	—	—	—	—	—	—	—	—	—	—	1	<0.1	0	0.0
Montana	—	—	—	—	—	—	0	0.0	0	0.0	1	0.1	0	0.0
Nebraska	0	0.0	1	0.1	1	0.1	0	0.0	0	0.0	1	0.1	0	0.0
Nevada	—	—	—	—	—	—	—	—	—	—	—	—	—	—
New Hampshire	13	1.0	19	1.4	22	1.7	42	3.2	53	4.0	13	1.0	78	5.8
New Jersey	166	1.9	92	1.0	171	1.9	159	1.8	281	3.1	174	1.9	193	2.1

New Mexico	—	—	—	—	—	—	—	—	—	—	—	—	—	
New York	418	2.1	253	1.3	534	2.7	471	2.4	581	2.9	430	2.2	696	3.5
North Carolina	—	—	—	—	—	—	—	—	—	—	—	—	—	
North Dakota	1	0.1	0	0.0	1	0.1	0	0.0	3	0.4	1	0.1	0	0.0
Ohio	—	—	—	—	—	—	1	<0.1	2	<0.1	—	—	1	<0.1
Oklahoma	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Oregon	1	<0.1	0	0.0	0	0.0	1	<0.1	2	<0.1	2	<0.1	5	0.1
Pennsylvania	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Rhode Island	73	6.9	56	5.3	142	13.5	172	16.3	190	18.0	155	14.7	161	15.2
South Carolina	—	—	—	—	1	<0.1	3	0.1	2	<0.1	2	<0.1	2	<0.1
South Dakota	—	—	—	—	1	0.1	1	0.1	0	0.0	0	0.0	0	0.0
Tennessee	1	<0.1	0	0.0	0	0.0	0	0.0	1	<0.1	1	<0.1	1	<0.1
Texas	—	—	—	—	1	<0.1	1	<0.1	1	<0.1	1	<0.1	0	0.0
Utah	—	—	—	—	—	—	0	0.0	0	0.0	0	0.0	1	<0.1
Vermont	2	0.3	2	0.3	6	1.0	3	0.5	9	1.4	15	2.4	22	3.5
Virginia	—	—	—	—	—	—	—	—	—	—	—	—	0	0.0
Washington	0	0.0	0	0.0	1	<0.1	4	0.1	2	<0.1	0	0.0	1	<0.1
West Virginia	—	—	—	—	0	0.0	0	0.0	0	0.0	0	0.0	1	0.1
Wisconsin	80	1.4	45	0.8	76	1.3	43	0.7	56	1.0	68	1.2	88	1.5
Wyoming	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00
Total¶	1,126	0.8	911	0.6	1,761	1.0	1,742	0.8	2,074	0.9	1,909	0.8	2,358	0.9

* Year as reported by the health department

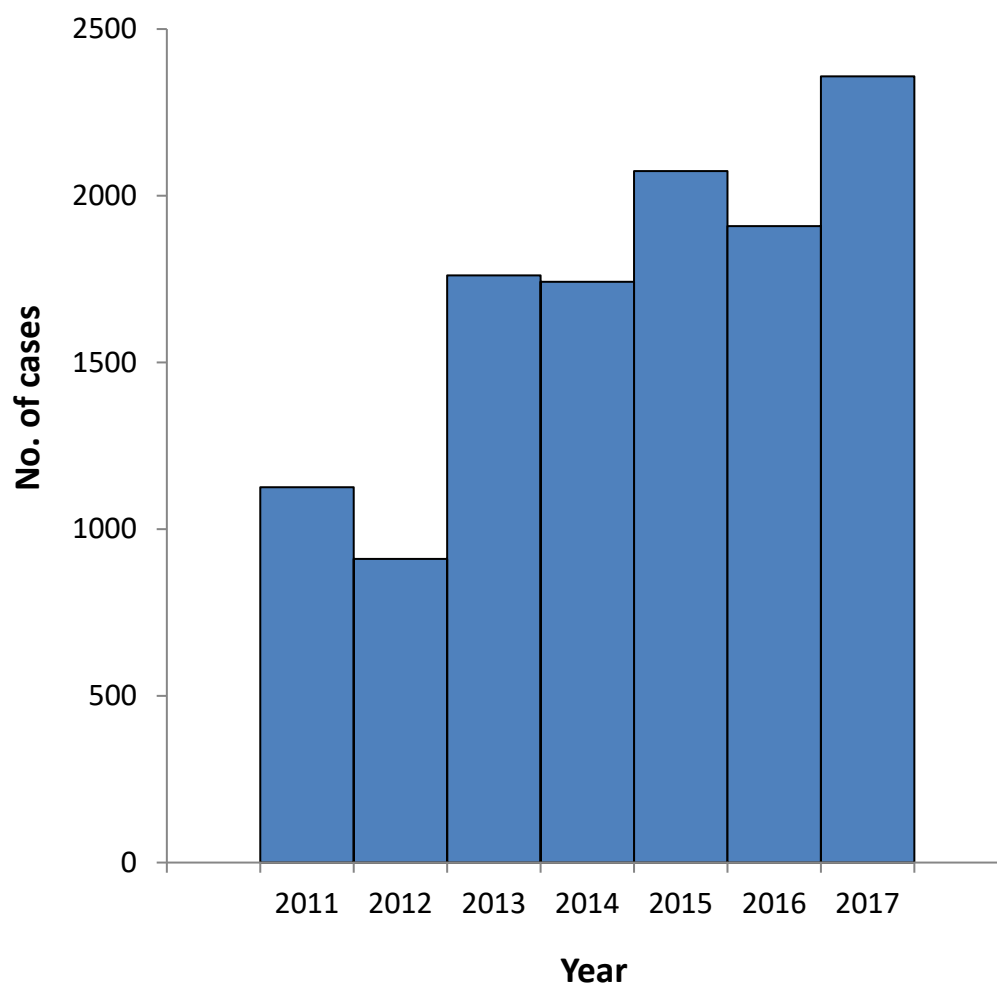
† Cases were reported by state of residence, which was not necessarily the state of exposure.

‡ Rate per 100,000 population (10)

§ Not reportable

¶ The denominators for calculations of total incidence rates included only the populations of states in which babesiosis was a reportable condition during the pertinent year

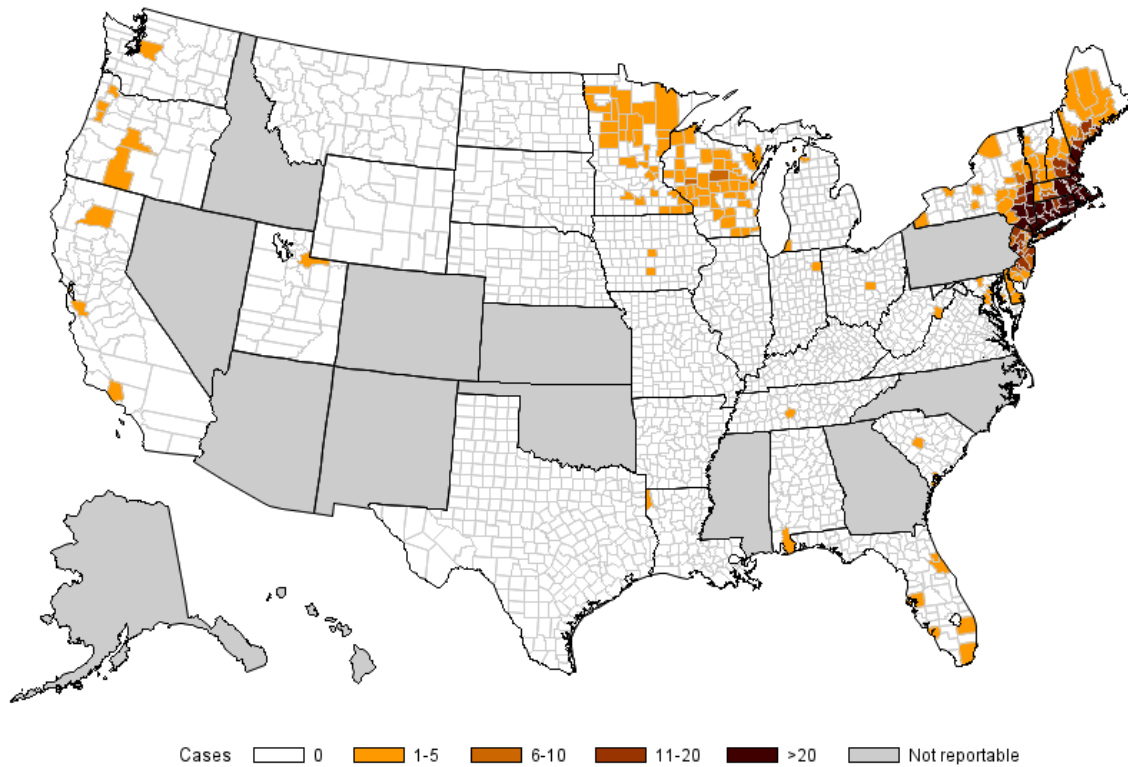
Figure 1. Number* of reported cases of babesiosis, by year, 2011–2017†



* A total of 11,881 cases of babesiosis were reported (2011, n = 1,126; 2012, n = 911; 2013, n = 1,761; 2014, n = 1,742; 2015, n = 2,074; 2016, n = 1,909; 2017, n = 2,358).

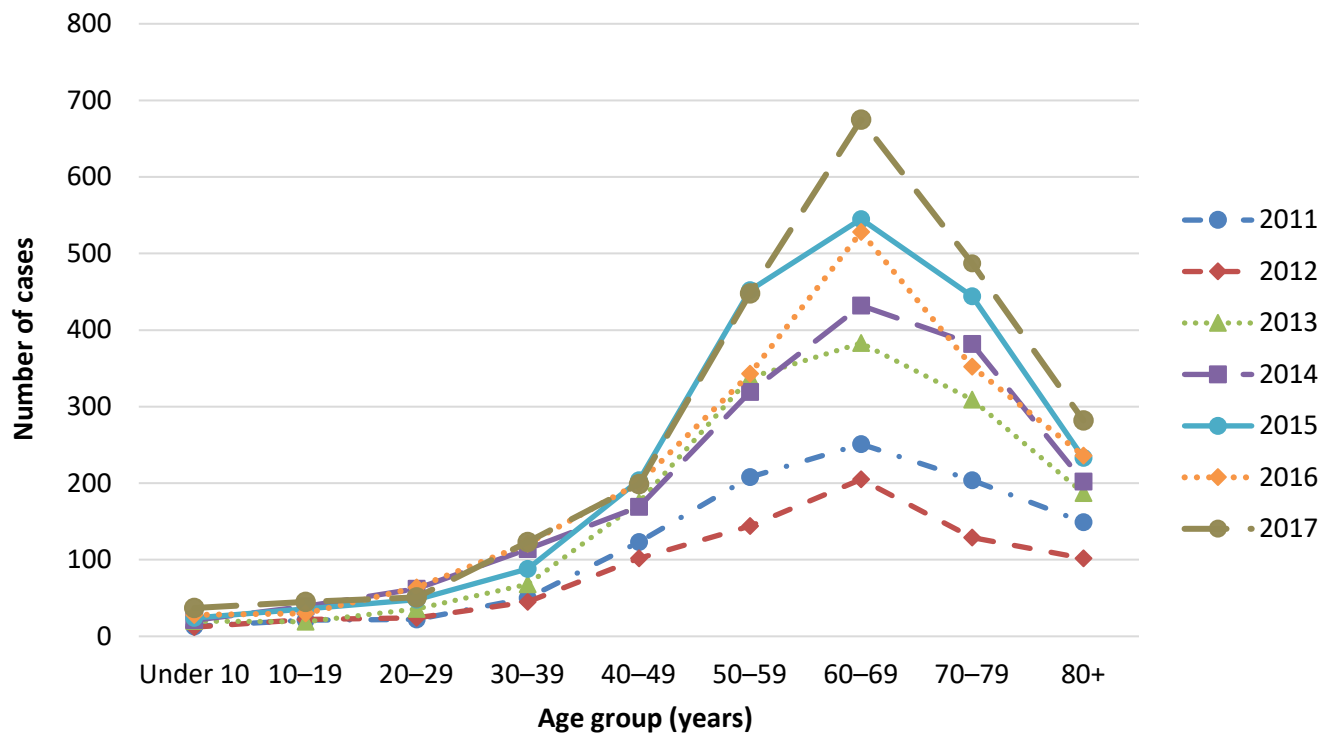
† Year as reported by the health department.

Figure 2. Number* of reported cases of babesiosis, by county of residence — 37 states, 2017†



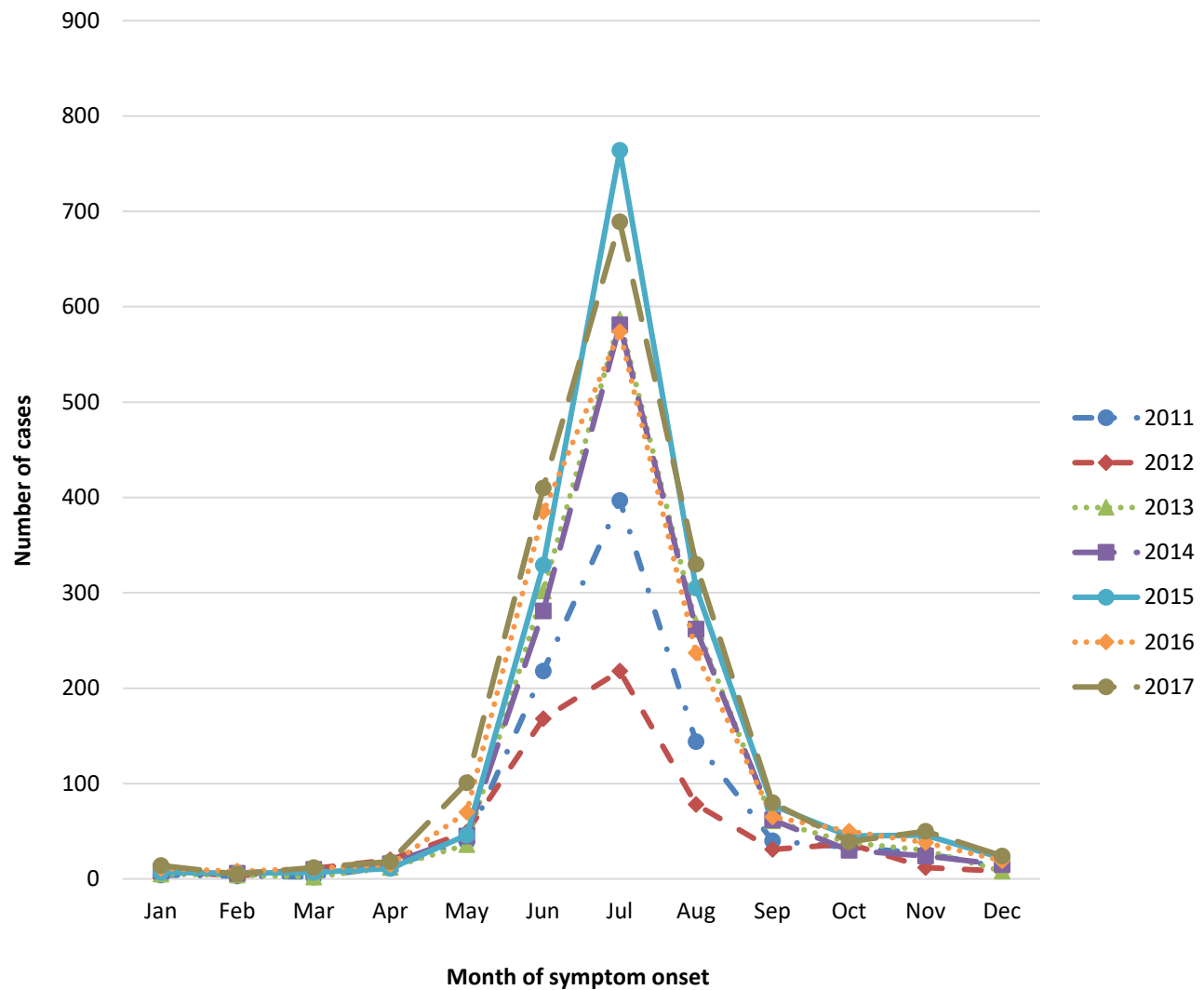
* N = 2,324; county of residence was known for all but 34 (1%) of the 2,358 total case-patients. See the Appendix for the maps for surveillance years 2011–2016.

† Year as reported by the health department.

Figure 3. Number of reported cases of babesiosis, by age group* and year, 2011–2017†

* Data on age were available for most case-patients (2011, n = 1,041/1,126; 2012, n = 785/911; 2013, n = 1,523/1,761; 2014, n = 1,740/1,742; 2015, n = 2,074/2,074; 2016, n = 1,902/1,909; 2017, n = 2,347/2,358).

† Year as reported by the health department.

Figure 4. Number of reported cases of babesiosis, by month of symptom onset* and year, 2011–2017†

* Data on month of symptom onset were available for most case-patients (2011, n = 932/1,126; 2012, n = 644/911; 2013, n = 1,352/1,761; 2014, n = 1,340/1,742; 2015, n = 1,665/2,074; 2016, n = 1,483/1,909; 2017, n = 1,772/2,358).

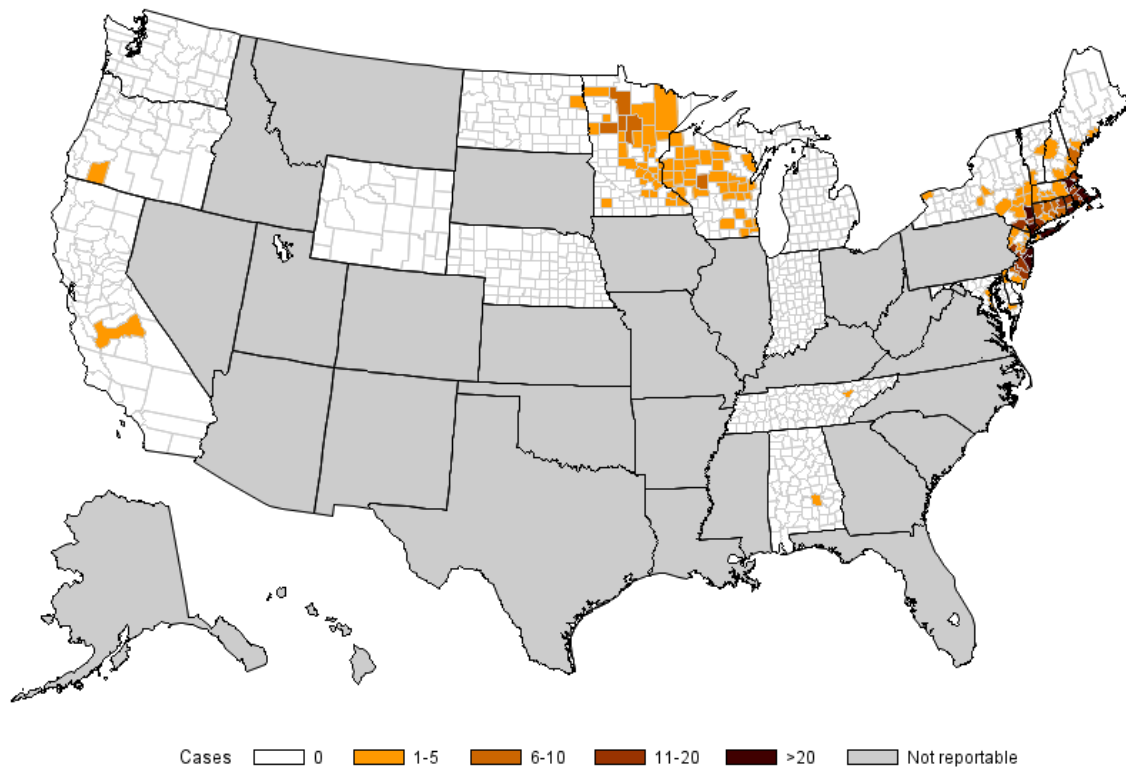
† Year as reported by the health department.

References

1. Herwaldt BL, Linden JV, Bosserman E, Young C, Olkowska D, Wilson M. Transfusion-associated babesiosis in the United States: a description of cases. *Ann Intern Med* 2011;155:509–19.
2. Joseph JT, Purtill K, Wong SJ, et al. Vertical transmission of *Babesia microti*, United States. *Emerg Infect Dis* 2012;18:1318–21.
3. Fox LM, Wingerter S, Ahmed A, et al. Neonatal babesiosis: case report and review of the literature. *Pediatr Infect Dis J* 2006;25:169–73.
4. Conrad PA, Kjemtrup AM, Carreno RA, et al. Description of *Babesia duncani* n.sp. (Apicomplexa: Babesiidae) from humans and its differentiation from other piroplasms. *Int J Parasitol* 2006;36:779–89.
5. Herwaldt BL, de Bruyn G, Pieniazek NJ, et al. *Babesia divergens*-like infection, Washington State. *Emerg Infect Dis* 2004;10:622–9.
6. Herwaldt BL, McGovern PC, Gerwel MP, Easton RM, MacGregor RR. Endemic babesiosis in another eastern state: New Jersey. *Emerg Infect Dis* 2003;9:184–8.
7. Wormser GP, Dattwyler RJ, Shapiro ED, et al. The clinical assessment, treatment, and prevention of Lyme disease, human granulocytic anaplasmosis, and babesiosis: clinical practice guidelines by the Infectious Diseases Society of America. *Clin Infect Dis* 2006;43:1089–134. Erratum in: *Clin Infect Dis* 2007;45:941.
8. Centers for Disease Control and Prevention. Babesiosis surveillance — 18 states, 2011. *Morb Mortal Wkly Rep* 2012;61:505–9.
9. Gray EB, Herwaldt BL. Babesiosis surveillance — United States, 2011–2015. *MMWR Surveill Summ* 2019;68(No. SS-6):1–11. DOI: <http://dx.doi.org/10.15585/mmwr.ss6806a1>
10. US Census Bureau. Annual estimates of the resident population: April 1, 2010 to July 1, 2017. Washington, DC: US Census Bureau; 2018. https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=PEP_2017_PEPANNRES&src=pt. Accessed on 6 May 2019.

Appendix. Maps for surveillance years 2011–2016

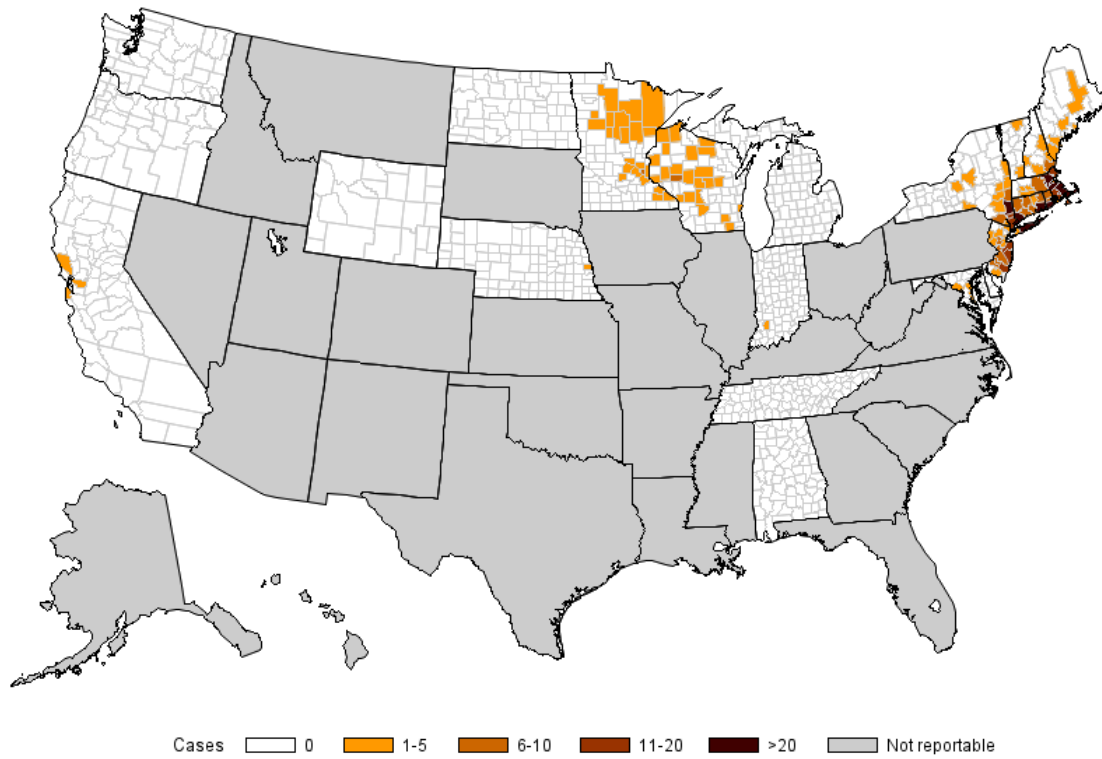
2011: Number* of reported cases of babesiosis, by county of residence — 22 states†



* N = 1,117; county of residence was known for all but 9 (1%) of the 1,126 total case-patients.

† Year as reported by the health department.

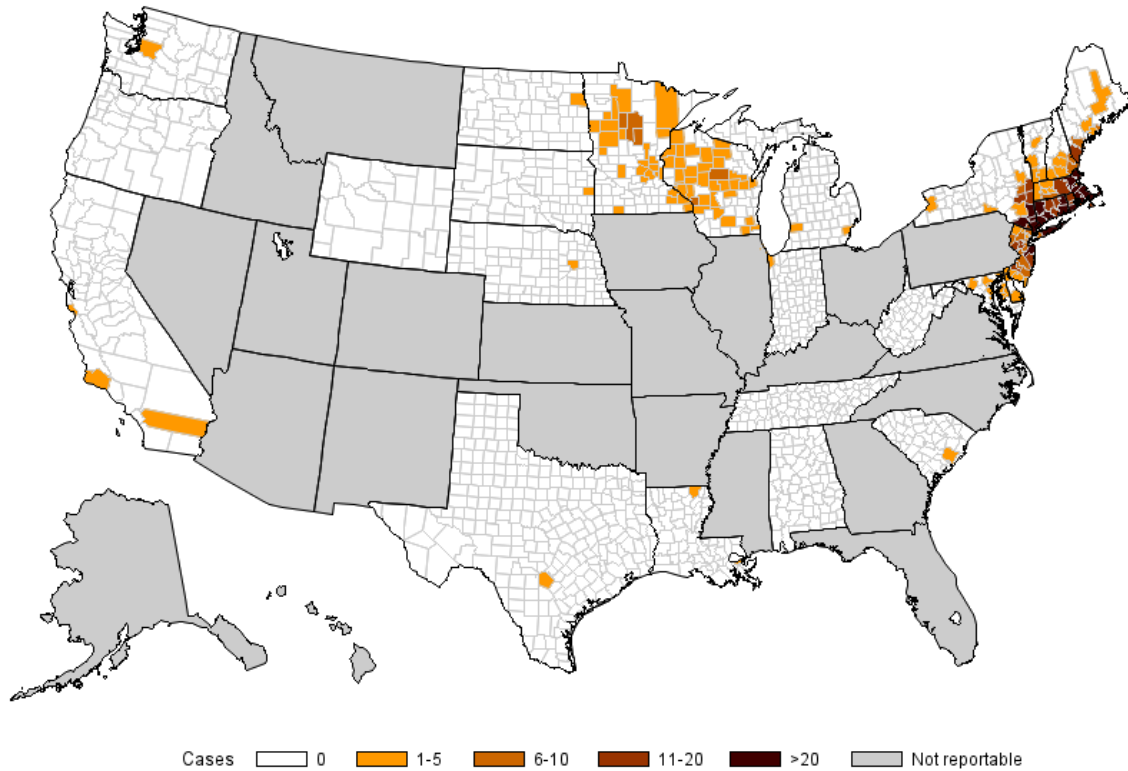
2012: Number* of reported cases of babesiosis, by county of residence — 22 states†



* N = 904; county of residence was known for all but 7 (1%) of the 911 total case-patients.

† Year as reported by the health department.

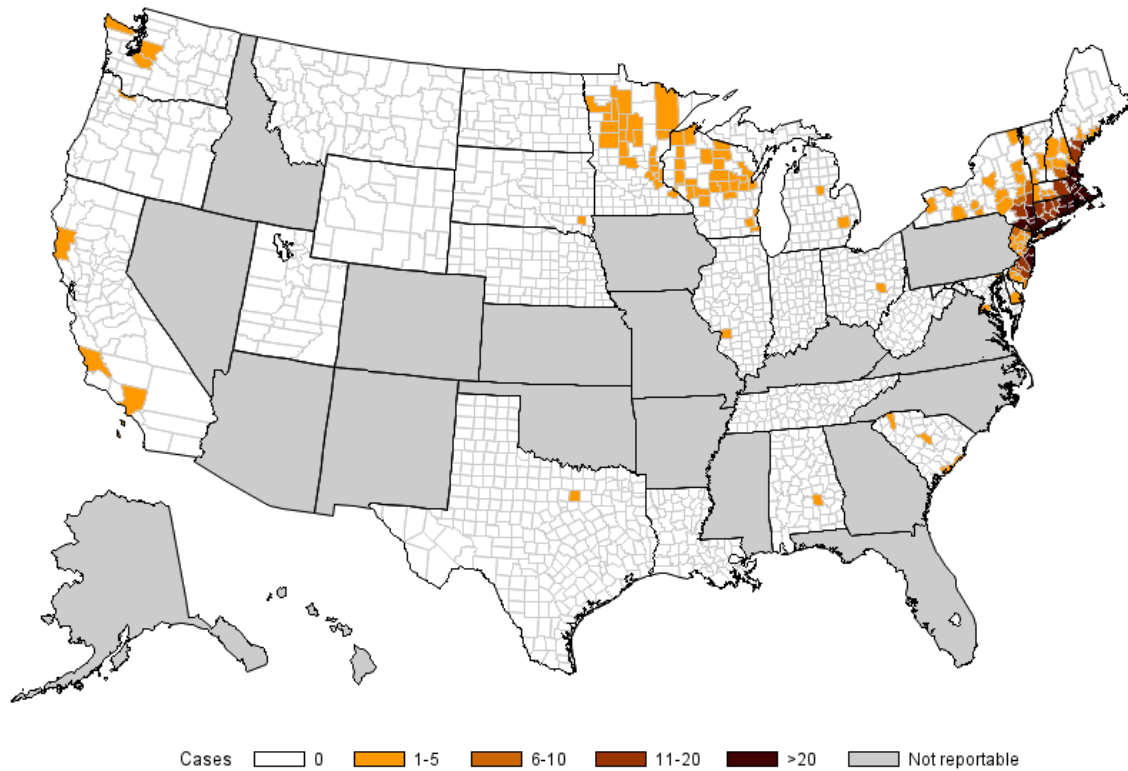
2013: Number* of reported cases of babesiosis, by county of residence — 27 states†



* N = 1,749; county of residence was known for all but 12 (1%) of the 1,761 total case-patients.

† Year as reported by the health department.

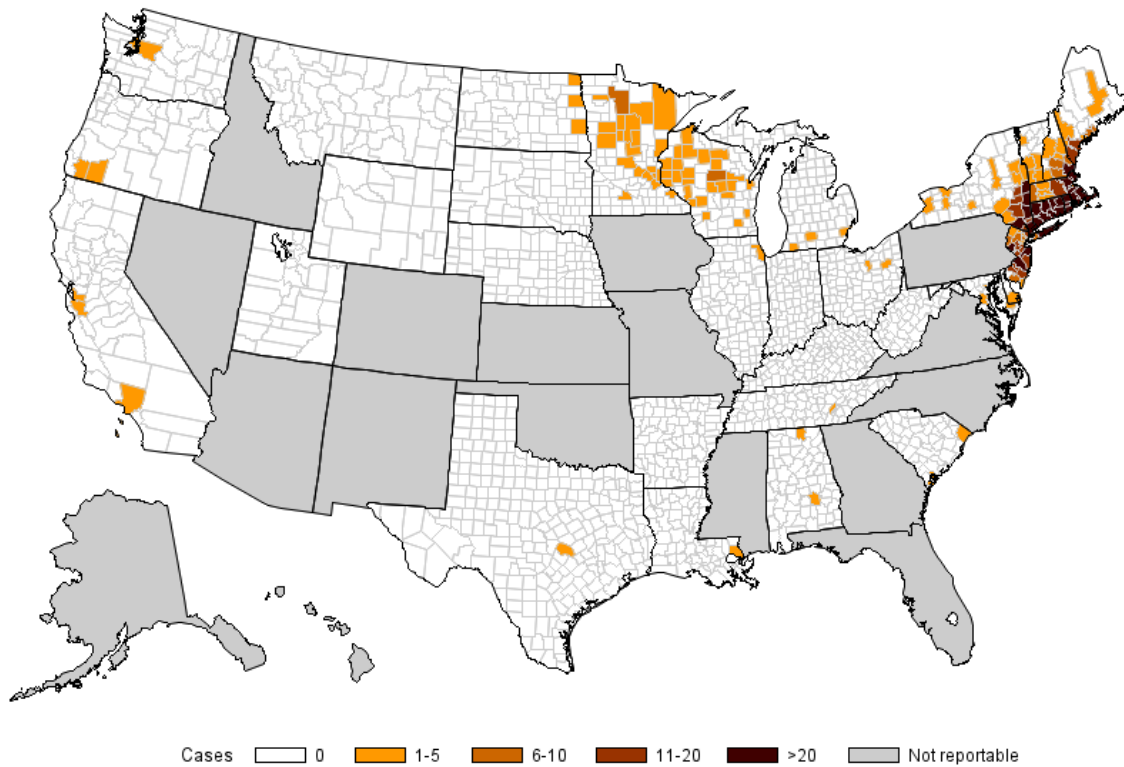
2014: Number* of reported cases of babesiosis, by county of residence — 31 states†



* N = 1,731; county of residence was known for all but 13 (1%) of the 1,742 total case-patients.

† Year as reported by the health department.

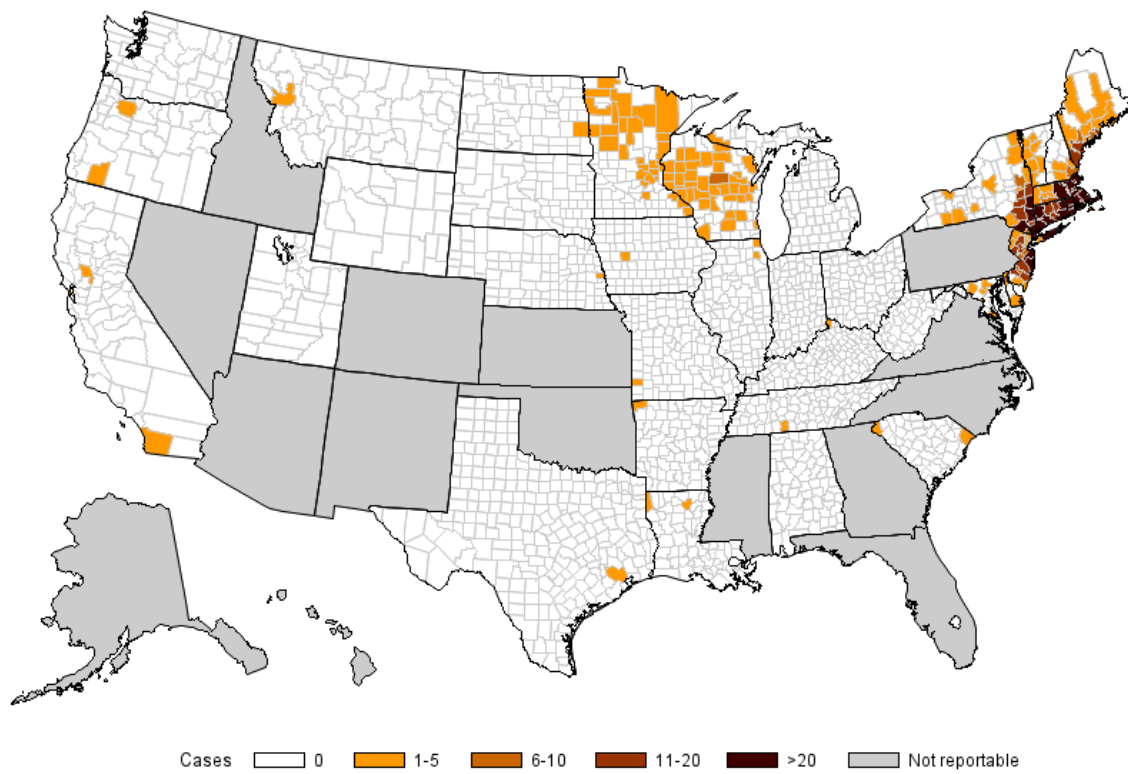
2015: Number* of reported cases of babesiosis, by county of residence — 33 states†



* N = 2,070; county of residence was known for all but 4 (<1%) of the 2,074 total case-patients.

† Year as reported by the health department.

2016: Number* of reported cases of babesiosis, by county of residence — 35 states†



* N = 1,889; county of residence was known for all but 20 (1%) of the 1,909 total case-patients.

† Year as reported by the health department.