Surveillance for Babesiosis —

United States, 2015

Annual Summary

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Main Findings for 2015

- For 2015, CDC was notified of a total of 2,074 U.S. cases of babesiosis, a 19% increase from the total of 1,742 cases for 2014.
- Babesiosis was a reportable disease in 33 states in 2015 (compared with 31 states in 2014); 24 (73%) of the 33 states notified CDC of at least 1 case.
- Most of the reported cases (93%; n = 1,925/2,074) 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 2015; some data from previous years (2011–2014) 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 *Babesia* 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 *Babesia* organisms by light microscopy in a Giemsa, Wright, or Wright-Giemsa–stained blood smear; **or** Detection of *Babesia microti* DNA in a whole blood specimen by polymerase chain reaction (PCR); **or** Detection of *Babesia* spp. genomic sequences in a whole blood specimen by nucleic acid amplification; **or** Isolation of *Babesia* organisms from a whole blood specimen by animal inoculation. **Laboratory supportive** Demonstration of a *Babesia microti* indirect fluorescent antibody (IFA) total immunoglobulin (Ig) or IgG antibody titer of ≥1:256 (or ≥1:64 in epidemiologically linked blood donors or recipients); **or** Demonstration of a *Babesia microti* immunoblot IgG positive result; **or** Demonstration of a *Babesia divergens* IFA total Ig or IgG antibody titer of ≥1:256; **or** Demonstration of a *Babesia duncani* IFA total Ig or IgG antibody titer of ≥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://wwwn.cdc.gov/nndss/conditions/babesiosis/case-definition/2011/

2015 babesiosis surveillance summary

In 2015, babesiosis was a reportable condition in 33 states (compared with 31 states in 2014). CDC was notified of a total of 2,074 cases of babesiosis by 24 (73%) of the 33 states (**Table 2**), a 19% increase from the total of 1,742 cases for 2014 (**Figure 1**). For 2015, 93% (n = 1,925/2,074) 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 2015 (**Figure 2**) and the 4 prior years (2011–2014) in which national surveillance was conducted (**Appendix**). Among the 170 counties with at least 1 reported case of babesiosis for 2015, 107 counties (63%) reported 1–5 cases, 15 counties (9%) reported 6–10 cases, 16 counties (9%) reported 11–20 cases, and 32 (19%) had >20 reported cases for 2015. The 32 counties with >20 cases reported were in Connecticut (n=8), Massachusetts (n=7), New York (n=7), New Jersey (n=5), Rhode Island (n=4), and New Hampshire (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 2015—Arkansas and Kentucky—reported zero cases.

For 2015, the median age of the case-patients was 63 years (range: <1–99 years; n = 2,074). The age distributions for 2015 and the 4 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 2015, among the 2,074 case-patients, 67% (n = 1,379) were male, 33% were female, and the sex was unknown for <1%.

A majority of case-patients reported getting sick during the spring or summer months. Data on month of symptom onset were available for most case-patients (80%, n = 1,665/2,074). The proportion of case-patients with reported symptom onset during June–August has remained fairly consistent from year to year (**Figure 4**).

For 2015, among the case-patients for whom data were available, fever was the most frequently reported clinical manifestation (83%; n = 1,508/1,822 patients), followed by myalgia (69%; n = 973/1,416), chills (69%; n = 990/1,443), thrombocytopenia (68%; n = 730/1,070), and anemia (63%; n = 703/1,113); proportions are similar to previous years.

For 2015, hospitalization data were available for 1,834 case-patients, 835 (46%) of whom reportedly had been hospitalized for at least 1 day. These data are consistent with previous years; overall for 2011–2015, hospitalization data were available for 6,404 case-patients (84% of the total of 7,614), 3,004 of whom (47% of 6,404) reportedly had been hospitalized for at least 1 day.

For 2015, of the 874 case-patients for whom data were available, 399 (46%) recalled having a tick bite in the 8 weeks before symptom onset. Overall for 2015, 9 cases of babesiosis in blood recipients were classified by the reporting state as transfusion associated.

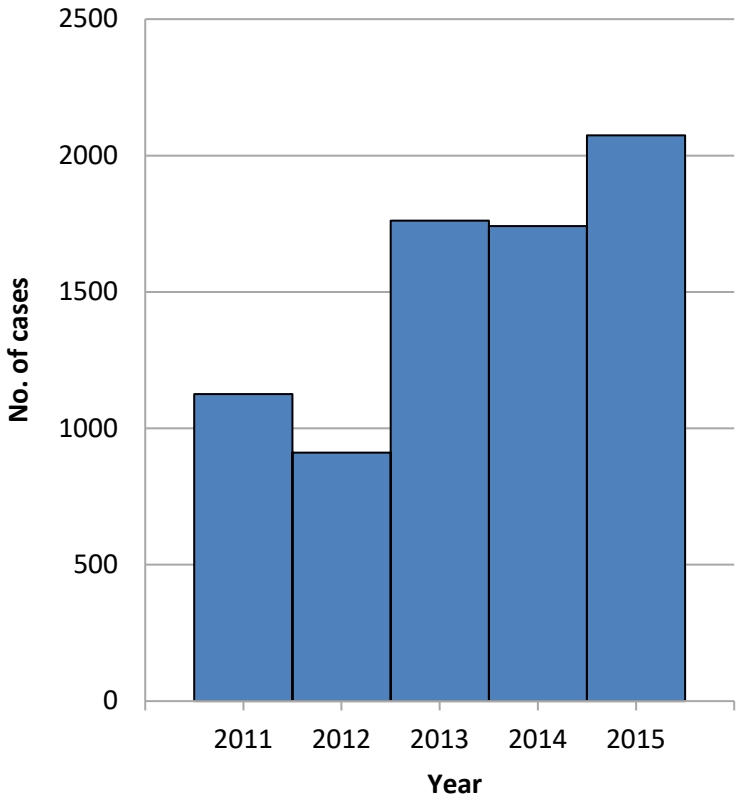
Table 2. Number and incidence of reported cases of babesiosis, by state and year, 2011–2015*

State†	2011		2012		2013		2014		2015	
	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
Alaska	—§	—	—	—	—	—	—	—	—	—
Arizona	—	—	—	—	—	—	—	—	—	—
Arkansas	—	—	—	—	—	—	—	—	0	0.0
California	1	<0.1	4	<0.1	3	<0.1	3	<0.1	5	<0.1
Colorado	—	—	—	—	—	—	—	—	—	—
Connecticut	74	2.1	123	3.4	268	7.5	205	5.7	328	9.1
Delaware	1	0.1	0	0.0	2	0.2	1	0.1	1	0.1
District of Columbia	—	—	—	—	—	—	—	—	—	—
Florida	—	—	—	—	—	—	—	—	—	—
Georgia	—	—	—	—	—	—	—	—	—	—
Hawaii	—	—	—	—	—	—	—	—	—	—
Idaho	—	—	—	—	—	—	—	—	—	—
Illinois	—	—	—	—	—	—	1	<0.1	3	<0.1
Indiana	0	0.0	1	<0.1	1	<0.1	0	0.0	0	0.0
Iowa	—	—	—	—	—	—	—	—	—	—
Kansas	—	—	—	—	—	—	—	—	—	—
Kentucky	—	—	—	—	—	—	—	—	0	0.0
Louisiana	—	—	—	—	2	<0.1	0	0.0	1	<0.1
Maine	9	0.7	10	0.8	36	2.7	42	3.2	55	4.1
Maryland	4	0.1	3	0.1	9	0.2	2	<0.1	4	0.1
Massachusetts	208	3.1	261	3.9	417	6.2	535	7.9	444	6.5
Michigan	0	0.0	0	0.0	2	<0.1	2	<0.1	3	<0.1
Minnesota	73	1.4	41	0.8	64	1.2	49	0.9	45	0.8
Mississippi	—	—	—	—	—	—	—	—	—	—
Missouri	—	—	—	—	—	—	—	—	—	—
Montana	—	—	—	—	—	—	0	0.0	0	0.0
Nebraska	0	0.0	1	0.1	1	0.1	0	0.0	0	0.0
Nevada	—	—	—	—	—	—	—	—	—	—
New Hampshire	13	1.0	19	1.4	22	1.7	42	3.2	53	4.0
New Jersey	166	1.9	92	1.0	171	1.9	159	1.8	281	3.1
New Mexico	—	—	—	—	—	—	—	—	—	—
New York	418	2.1	253	1.3	534	2.7	471	2.4	581	2.9
North Carolina	—	—	—	—	—	—	—	—	—	—
North Dakota	1	0.1	0	0.0	1	0.1	0	0.0	3	0.4
Ohio	—	—	—	—	—	—	1	<0.1	2	<0.1
Oklahoma	—	—	—	—	—	—	—	—	—	—
Oregon	1	<0.1	0	0.0	0	0.0	1	<0.1	2	<0.1
Pennsylvania	—	—	—	—	—	—	—	—	—	—
Rhode Island	73	6.9	56	5.3	142	13.5	172	16.3	190	18.0
South Carolina	—	—	—	—	1	<0.1	3	0.1	2	<0.1
South Dakota	—	—	—	—	1	0.1	1	0.1	0	0.0
Tennessee	1	<0.1	0	0.0	0	0.0	0	0.0	1	<0.1

Texas	—	—	—	—	1	<0.1	1	<0.1	1	<0.1
Utah	—	—	—	—	—	—	0	0.0	0	0.0
Vermont	2	0.3	2	0.3	6	1.0	3	0.5	9	1.4
Virginia	—	—	—	—	—	—	—	—	—	—
Washington	0	0.0	0	0.0	1	<0.1	4	0.1	2	<0.1
West Virginia	—	—	—	—	0	0.0	0	0.0	0	0.0
Wisconsin	80	1.4	45	0.8	76	1.3	43	0.7	56	1.0
Wyoming	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Total¶	1,126	0.8	911	0.6	1,761	1.0	1,742	0.8	2,074	0.9

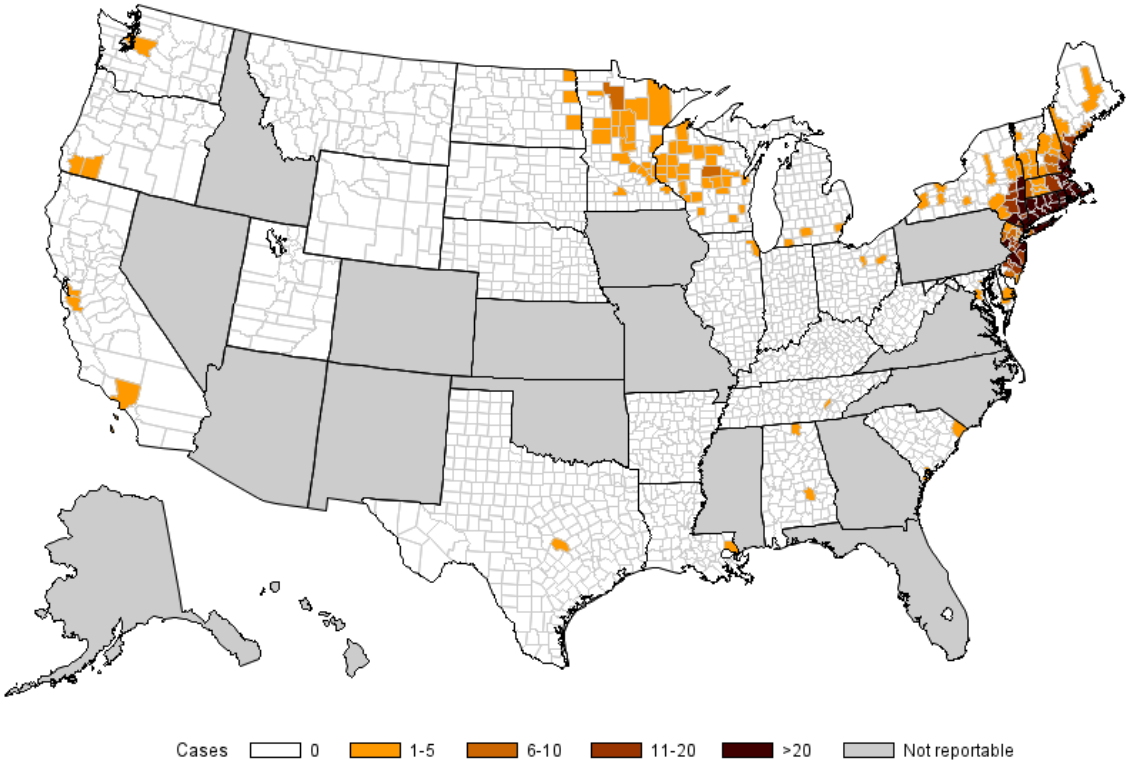
* Year as reported by the health department
† Cases were reported by state of residence, which was not necessarily the state of exposure.
‡ Rate per 100,000 population (10)
§ Not reportable
¶ The denominators for calculations of total incidence rates included only the populations of states in which babesiosis was a reportable condition during the pertinent year

Figure 1. Number* of reported cases of babesiosis, by year, 2011–2015†



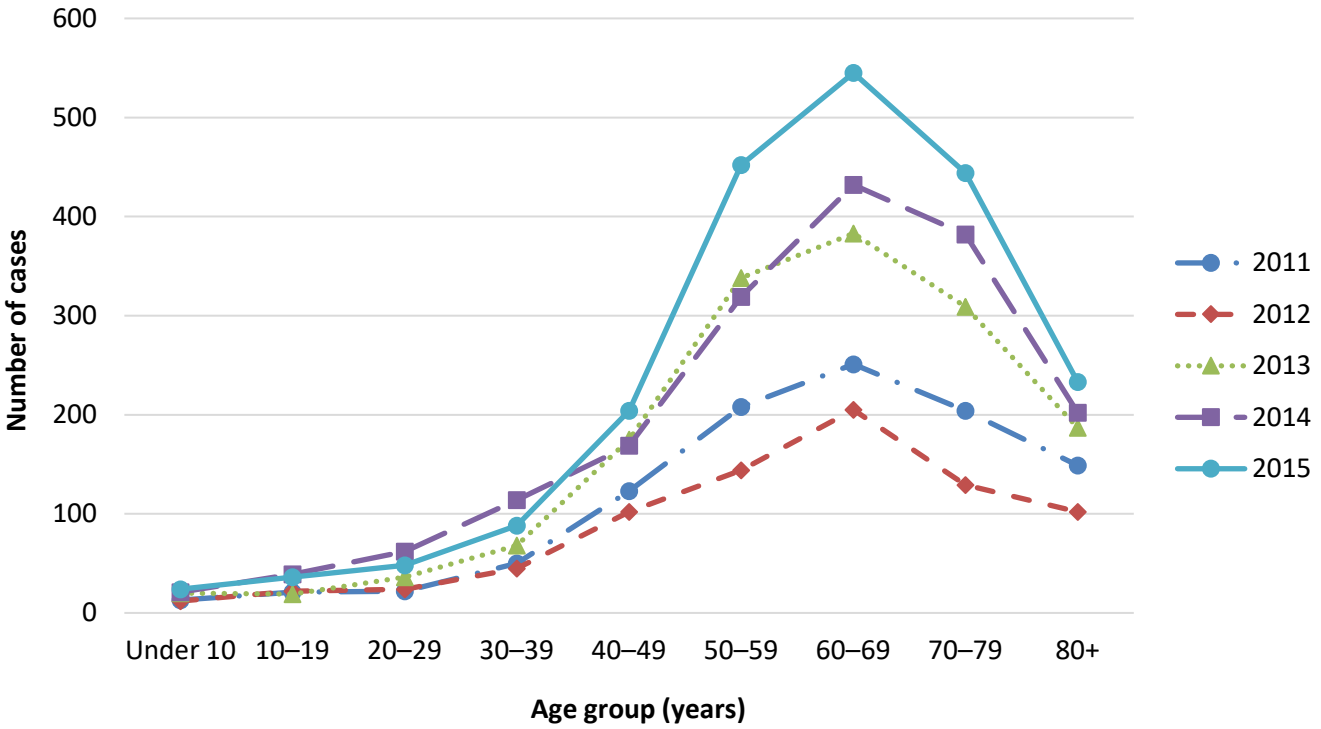
* A total of 7,614 cases of babesiosis were reported (2011, n = 1,126; 2012, n = 911; 2013, n = 1,761; 2014, n = 1,742; 2015, n = 2,074).
† Year as reported by the health department.

Figure 2. Number* of reported cases of babesiosis, by county of residence — 33 states, 2015†



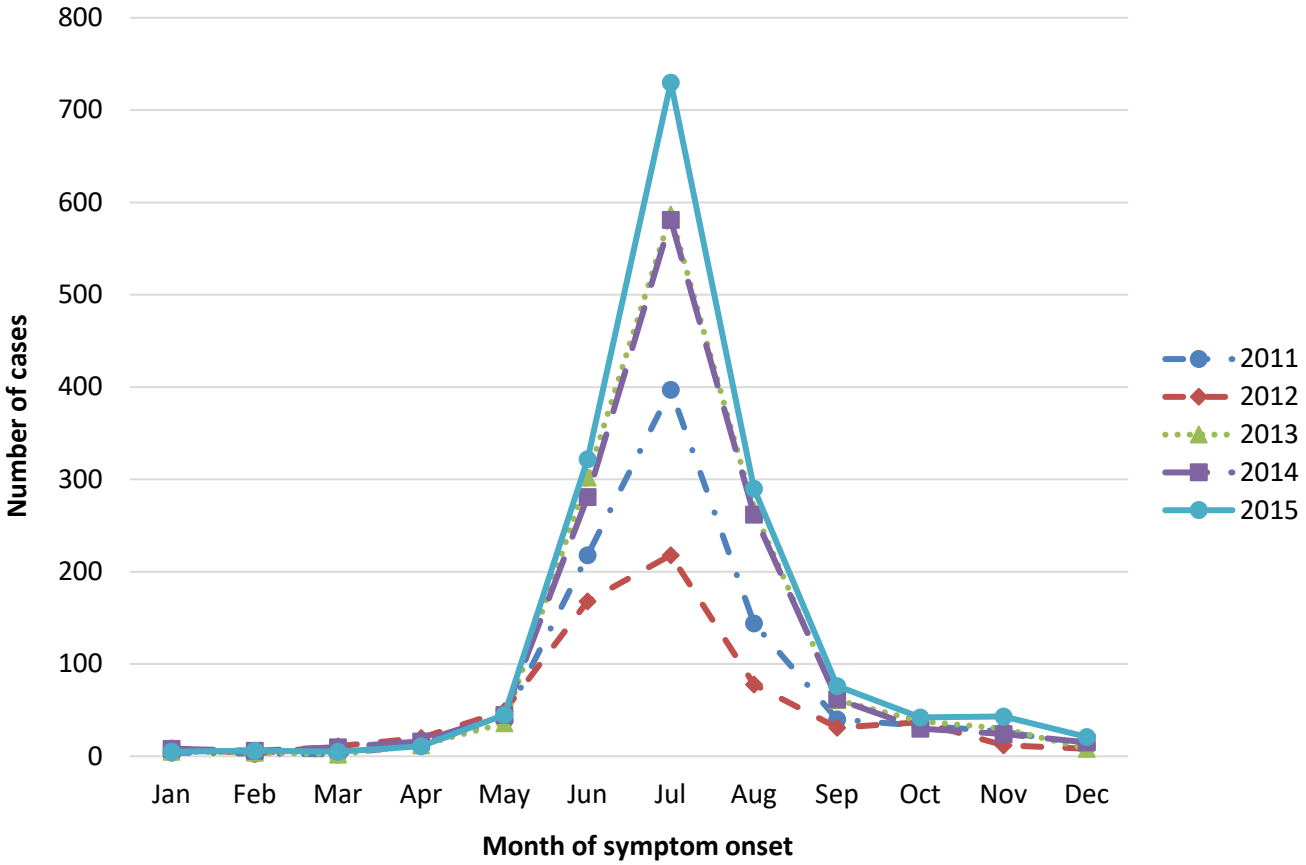
* N = 2,070; county of residence was known for all but 4 (<1%) of the 2,074 total case-patients. See the Appendix for the maps for surveillance years 2011–2014.
† Year as reported by the health department.

Figure 3. Number of reported cases of babesiosis, by age group* and year, 2011–2015†



* Data on age were available for most case-patients (2011, n = 1,041/1,126; 2012, n = 785/911; 2013, n = 1,535/1,761; 2014, n = 1,740/1,742; 2015, n = 2,074/2,074).
† Year as reported by the health department.

Figure 4. Number of reported cases of babesiosis, by month of symptom onset* and year, 2011–2015†



* 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).
† Year as reported by the health department.

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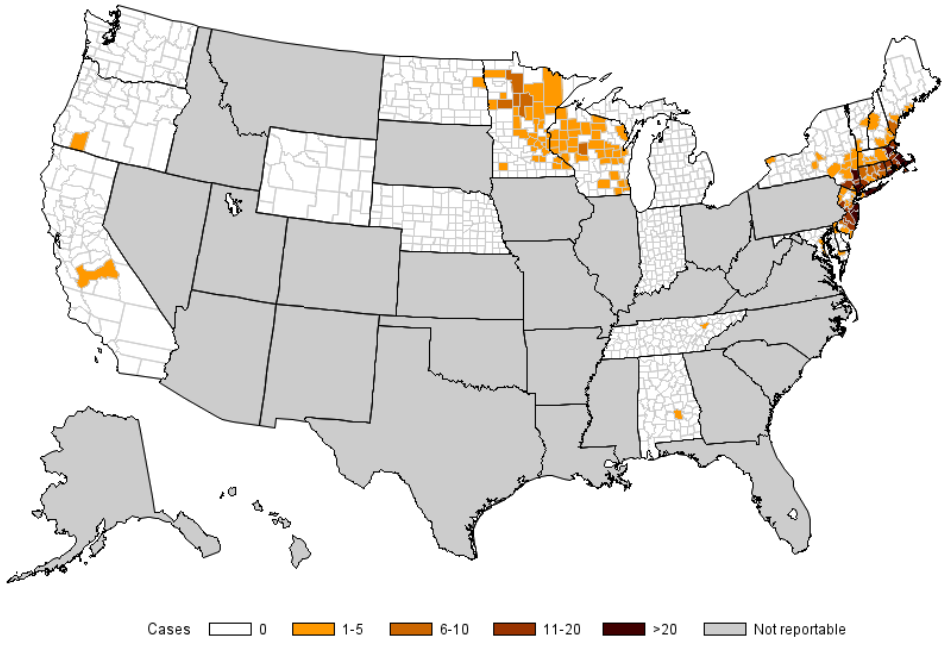
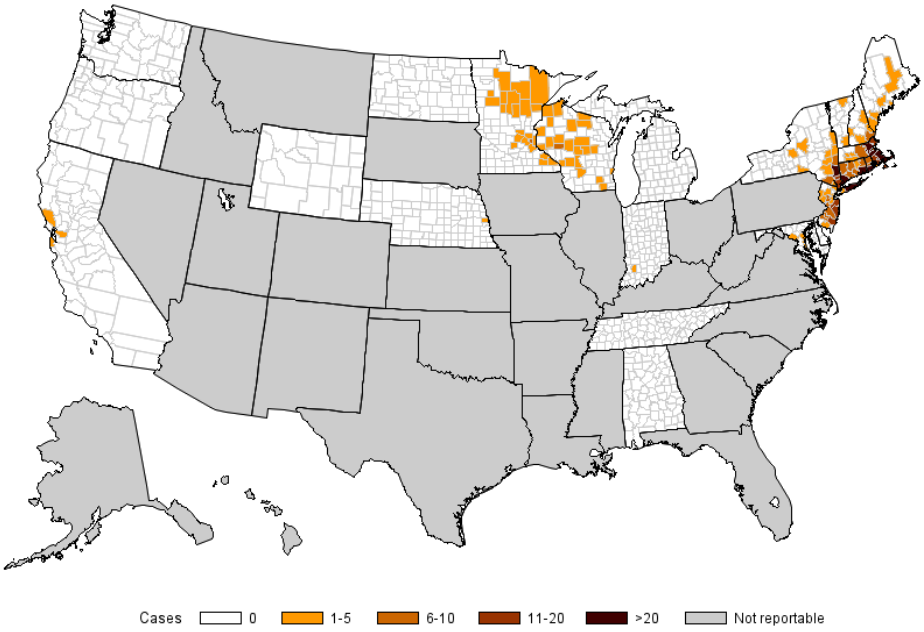
Appendix. Maps for surveillance years 2011–2014

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



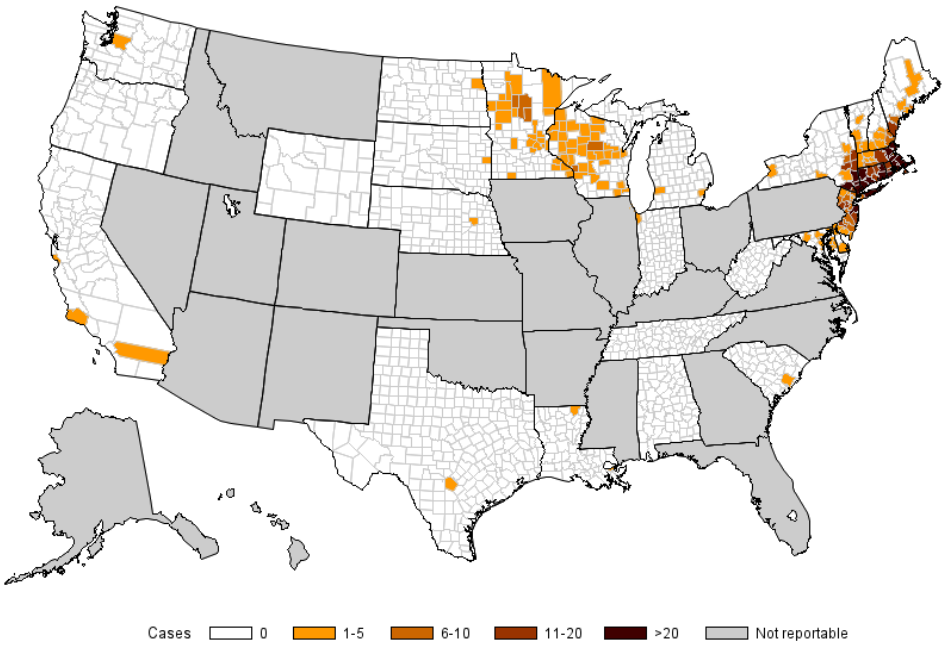
* N = 1,117; county of residence was known for all but 9 (1%) of the 1,126 total case-patients.
† Year as reported by the health department.

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



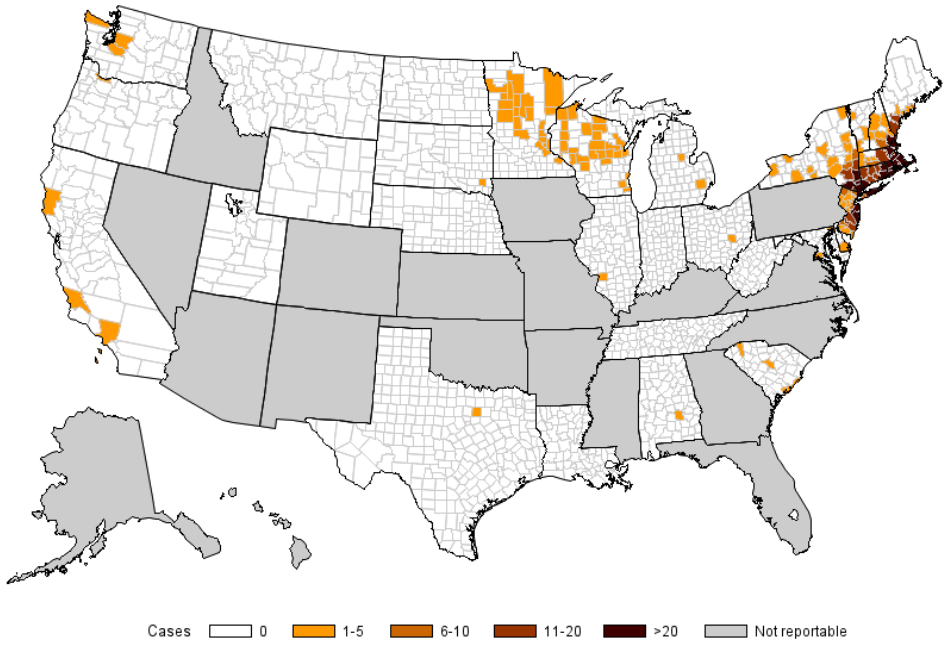
* N = 904; county of residence was known for all but 7 (1%) of the 911 total case-patients.
† Year as reported by the health department.

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.