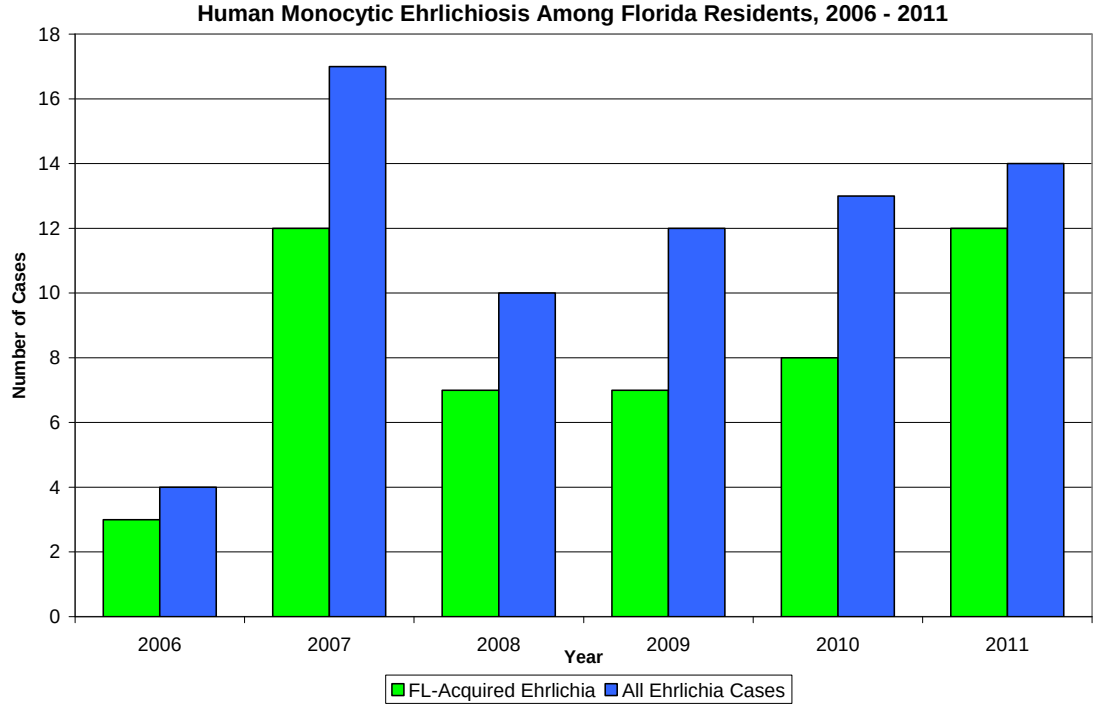
Florida Tick-Borne Disease Surveillance
2011 End of Year Summary

Tick-borne disease surveillance in Florida includes confirmed and probable cases of human monocytic ehrlichiosis, human granulocytic anaplasmosis, Rocky Mountain spotted fever or spotted fever rickettsiosis, and Lyme disease cases using the surveillance case definitions for Florida.

Human Monocytic Ehrlichiosis 2011

Ehrlichia chaffeensis, discovered in 1987, causes human monocytic ehrlichiosis (HME), which is nationally notifiable. The principal vector is the lone star tick, *Amblyomma americanum*. In Florida, the number of reported HME cases is typically greater than that of human granulocytic anaplasmosis (HGA). Increased educational efforts and awareness may have contributed to increases in reported cases since 2007. However, there is no standardized tick surveillance program in Florida so gaps in knowledge of tick ecology makes it difficult to ascertain any potential environmental contribution to changes in case numbers.

Figure 1. Confirmed and Probable Cases of Human Monocytic Ehrlichiosis Among Florida Residents, 2006 - 2011



The number of HME cases rose from 2008-2011 (Figure 1). The total number of cases rose 8% from 2010 to 2011, and the number of Florida-acquired cases was 50% higher in 2011 than in 2010. Florida-acquired HME infections accounted for 86% of all the cases in 2011, which is higher than the five year average (66%). Overall, there were 25% more cases in 2011 than seen on average in the previous 5 years. Twelve HME cases were reported as Florida acquired in 2011 including from: Alachua (2), Flagler (1), Gilchrist (1), Lake (1), Leon (3), Miami-Dade (1),

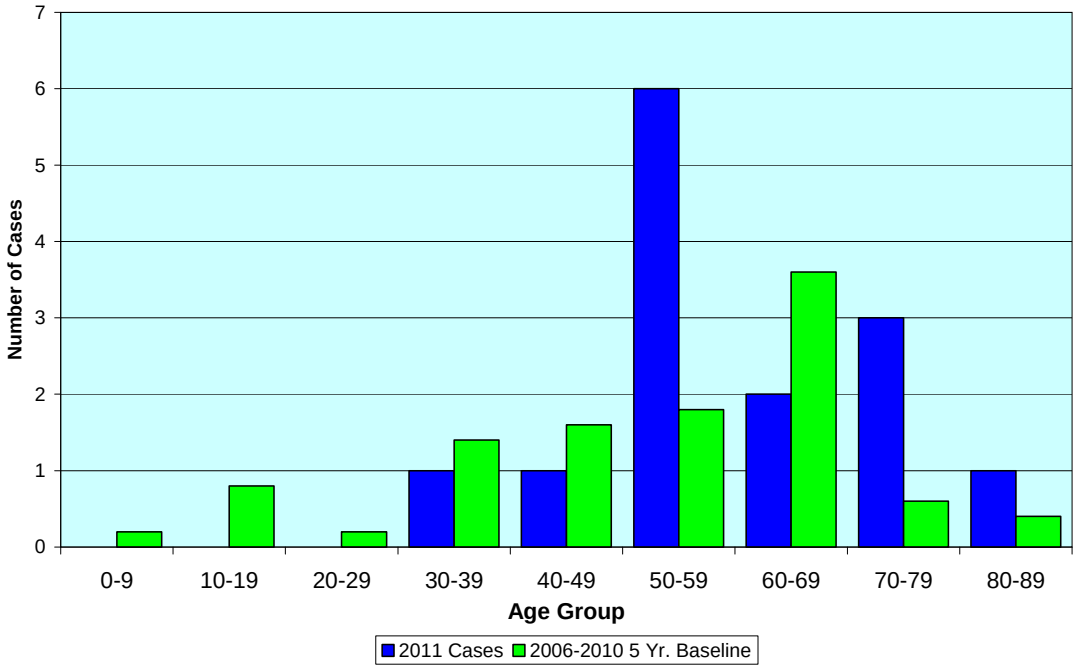
Orange (1), St. Johns (1), and Volusia (1) counties (Figure 5). Two cases with disease onset in 2011 were reported as acquired outside the state of Florida or of an unknown origin. Alachua and Leon Counties reported 42% of all Florida-acquired cases and 50% of all cases for 2011.

Cases were reported more frequently in older age groups, which is typical for *E. chaffeensis* infections. Case numbers were higher than the previous five year average in the 50-59, 70-79, and 80-89 year old age groups (Figure 2). Case numbers were lower than the 2006-2010 average in the 60-69 year old age group. The percentage of cases among females and males were even at 50%, which for females is slightly higher than the 43% reported in the previous 5 years. White, non-Hispanic individuals accounted for 86% of all cases, similar to the previous 5 year average (81%). Although transmission of HME can occur year round, the peak transmission occurs during later spring or early summer months. The first half of 2011 accounted for 86% of all HME cases; 71% had disease onset in April and May (Figure 3). For Florida-acquired cases, 75% of the cases occurred in April and May (Figure 4).

Transfusion associated *Ehrlichia ewingii* infections

A novel mode of ehrlichiosis transmission was observed as a case of leukoreduced platelet transfusion associated ehrlichiosis (*E. ewingii)* was identified in an immunocompromised patient. This highlights a potential risk of transmission through transfusion or organ transplant utilizing current preventative measures. *Ehrlichia chaffeensis* and *Ehrlichia ewingii* are known to cross-react in serological assays. Therefore, DNA based testing methods like PCR are currently the only way to differentiate the two *Ehrlichia* species.

Figure 2. All Human Monocytic Ehrlichiosis Cases by Age Group Among Florida Residents for 2011



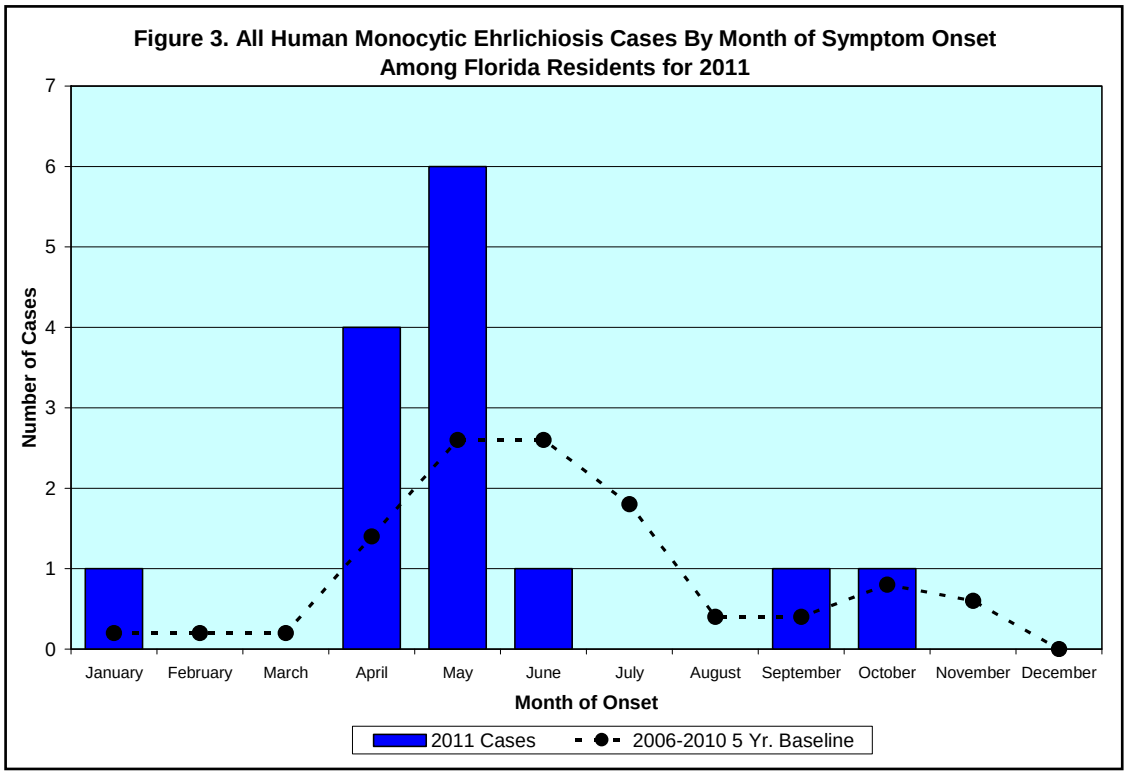


Figure 3. All Human Monocytic Ehrlichiosis Cases By Month of Symptom Onset Among Florida Residents for 2011
Number of Cases
0
1
2
3
4
5
6
7
January
February
March
April
May
June
July
August
September
October
November
December
Month of Onset
2011 Cases
2006-2010 5 Yr. Baseline

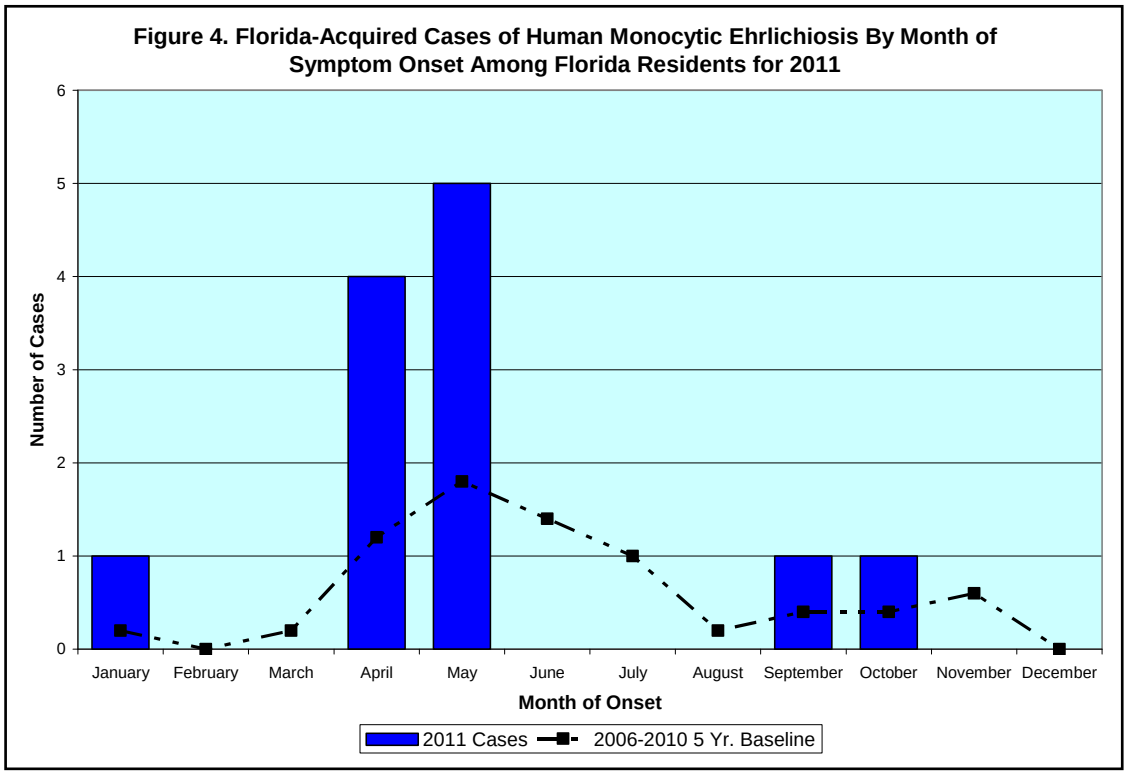
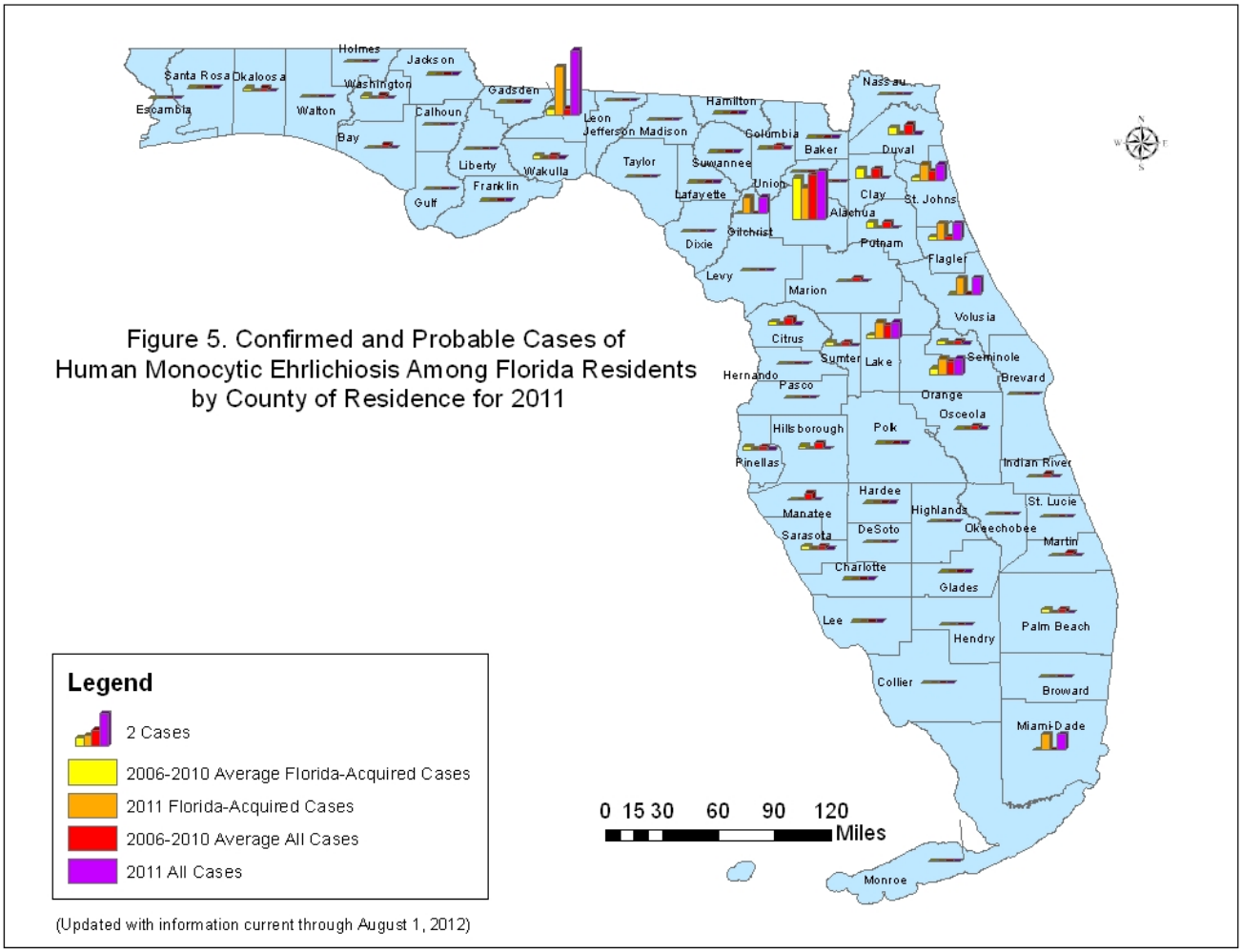
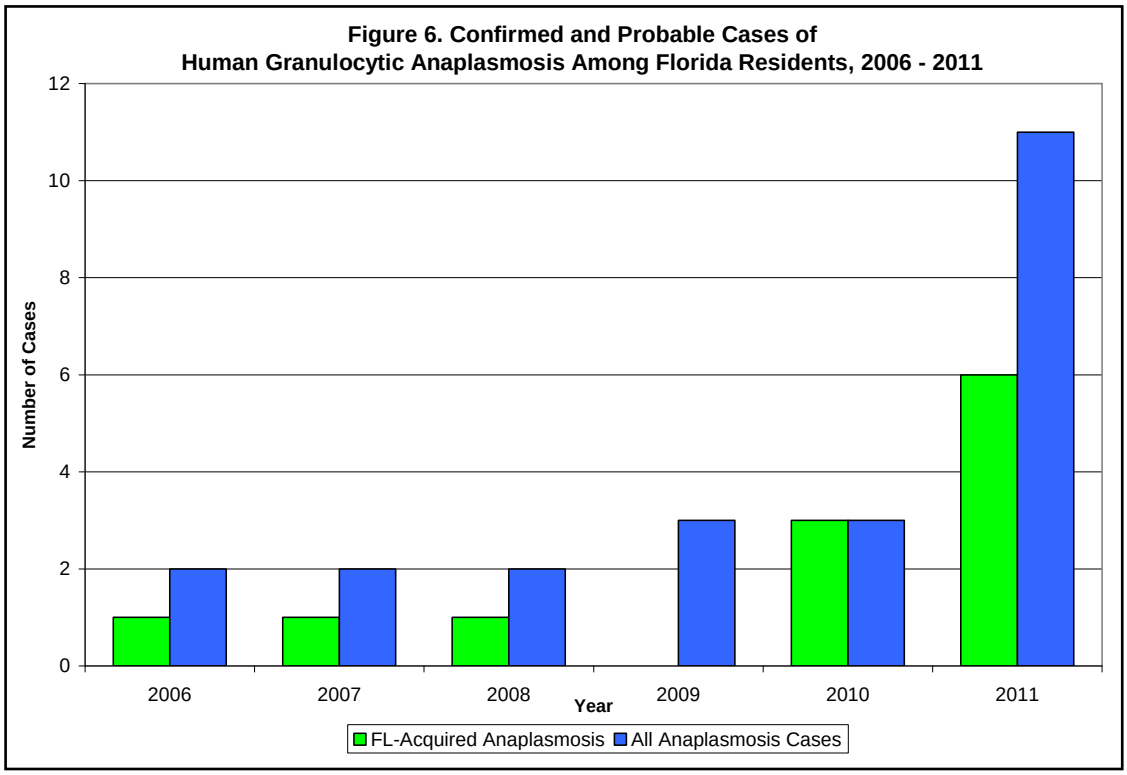


Figure 4. Florida-Acquired Cases of Human Monocytic Ehrlichiosis By Month of Symptom Onset Among Florida Residents for 2011
Number of Cases
0
1
2
3
4
5
6
January
February
March
April
May
June
July
August
September
October
November
December
Month of Onset
2011 Cases
2006-2010 5 Yr. Baseline



Human Granulocytic Anaplasmosis, 2011

Anaplasma phagocytophilum was originally thought to be another species of *Ehrlichia* but was later reclassified. The associated illness was renamed human granulocytic anaplasmosis (HGA). HGA became nationally notifiable in 1999. The principal vector for *A. phagocytophilum* is *Ixodes scapularis* and most cases are reported from the Northeast and Midwestern United States. The bacteria that cause Lyme disease, babesiosis, and anaplasmosis share the same principal vector making it possible for co-infections with these pathogens. Additionally, *A. phagocytophilum* can cross-react with *Ehrlichia* species on serological exams. Therefore, laboratory tests should be performed for both pathogens, and when possible, DNA based testing such as PCR that can differentiate these organisms should be done.



Case numbers of anaplasmosis have been relatively steady from 2006 to 2010, but in 2011, case numbers increased more than 3-fold compared to both 2010 and the previous five year average (Figure 6). The number of reported Florida-acquired HGA cases doubled from 2010 to 2011. Six cases with an onset date in 2011 were reported as being acquired in Florida. Counties reporting Florida-acquired HGA cases include: Alachua (1), Escambia (1), Jackson (1), Ocala (1), Orange (1), and Wakulla (1) (Figure 10). The majority of cases occurred in the North and Central parts of Florida with Alachua and Leon Counties reporting 42% of all Florida-acquired cases and 50% of all cases for 2011. Five cases with an onset in 2011 were reported as being acquired outside the state of Florida or of unknown origin. Identified locations of exposure included: Michigan (1), Minnesota (1), New Jersey (1), and Washington (1). The case acquired in Washington was unusual because anaplasmosis is exceedingly rare there.

Anaplasmosis was most frequently observed in 30-39 year olds followed by infections among 20-29 year olds and 60-69 year olds (Figure 7). This is fairly unusual as both state and national data suggest that anaplasmosis most frequently occurs in the older age groups. Males accounted for 64% of 2011 cases compared to 50% on average from 2006-2010. White, non-Hispanic individuals accounted for 73% of all cases, similar to the previous 5 year average of 75%. Cases of Hispanic descent accounted for 18% of 2011 cases. Although transmission of HGA can occur year round, peak transmission occurs during spring and summer months. More than 80% of all cases were reported from April through August (Figure 8), (Figure 9).

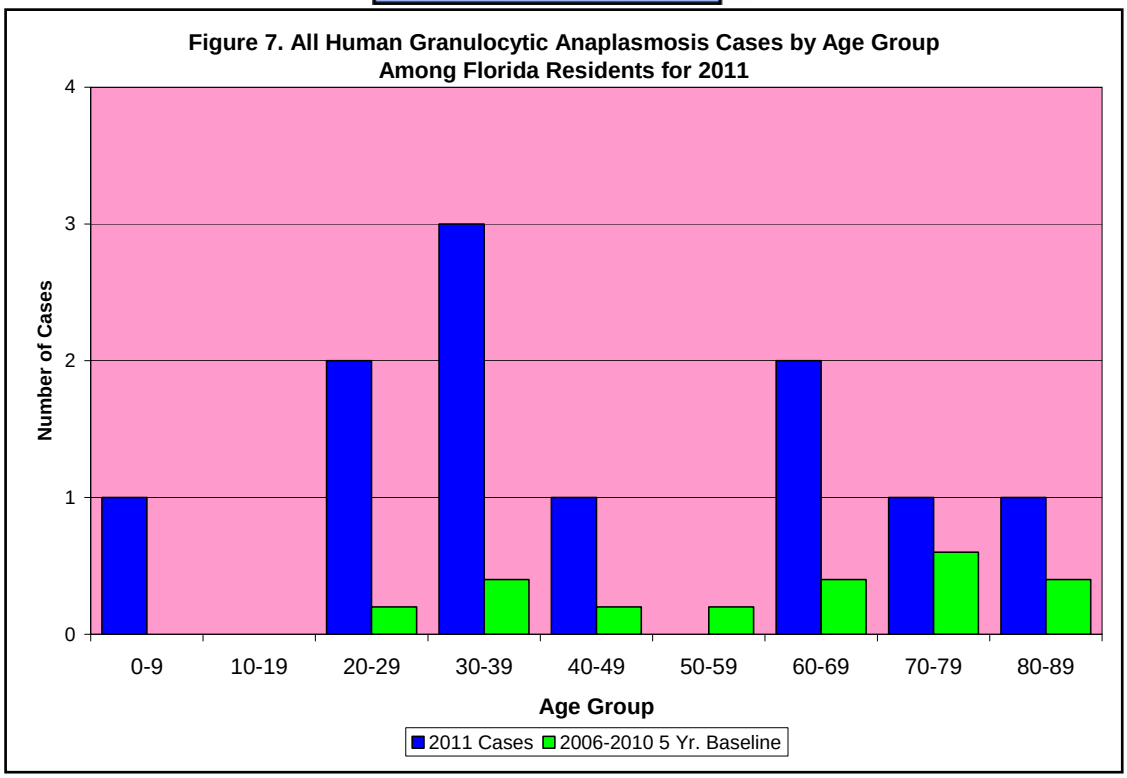


Figure 7. All Human Granulocytic Anaplasmosis Cases by Age Group
Among Florida Residents for 2011
Number of Cases
0
1
2
3
4
0-9
10-19
20-29
30-39
40-49
50-59
60-69
70-79
80-89
Age Group
2011 Cases
2006-2010 5 Yr. Baseline

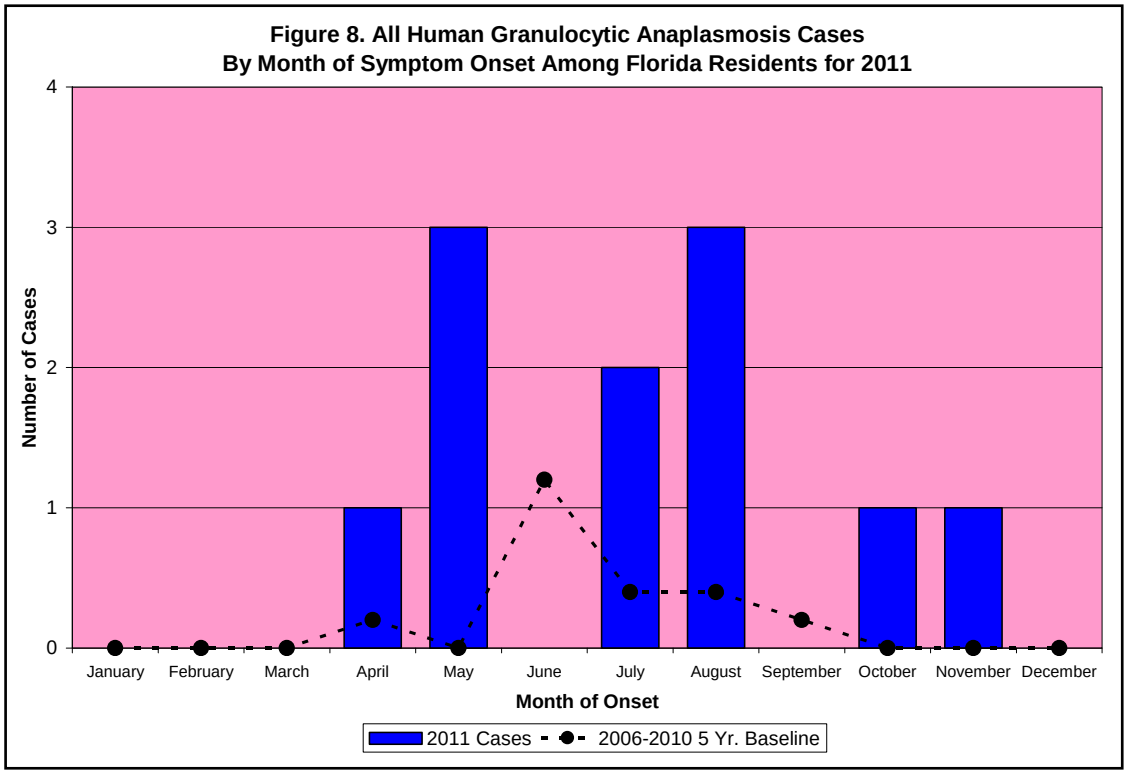


Figure 8. All Human Granulocytic Anaplasmosis Cases
By Month of Symptom Onset Among Florida Residents for 2011
Number of Cases
0
1
2
3
4
January
February
March
April
May
June
July
August
September
October
November
December
Month of Onset
2011 Cases
2006-2010 5 Yr. Baseline

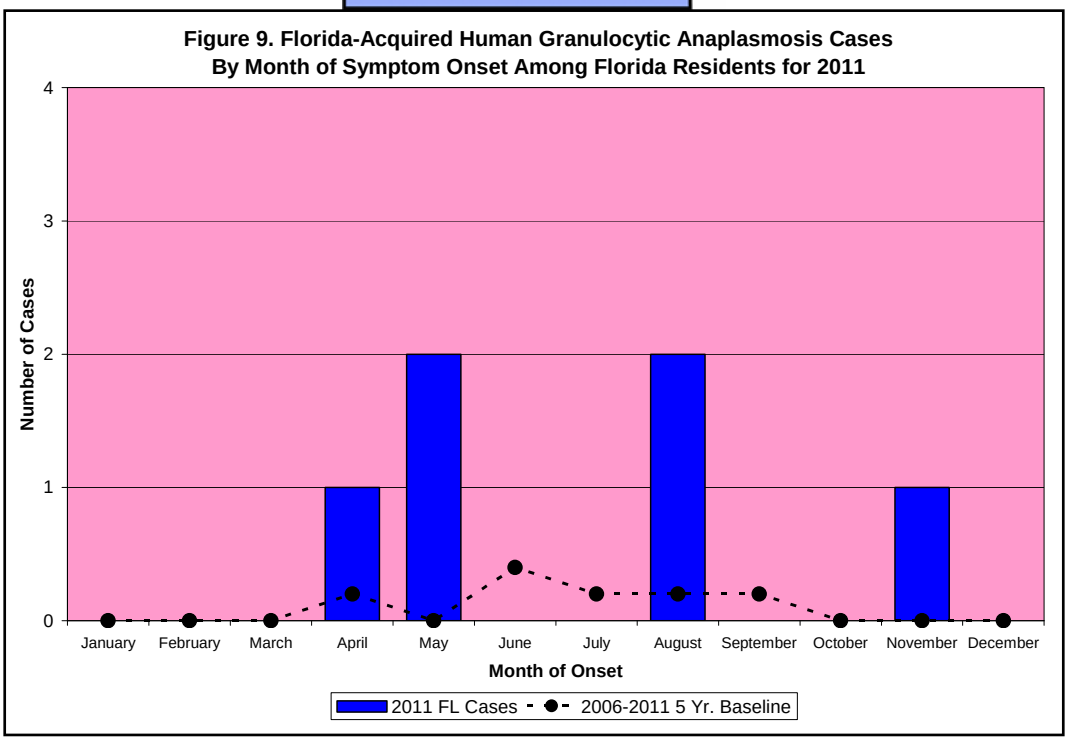


Figure 9. Florida-Acquired Human Granulocytic Anaplasmosis Cases
By Month of Symptom Onset Among Florida Residents for 2011
Number of Cases
0
1
2
3
4
January
February
March
April
May
June
July
August
September
October
November
December
Month of Onset
2011 FL Cases
2006-2011 5 Yr. Baseline

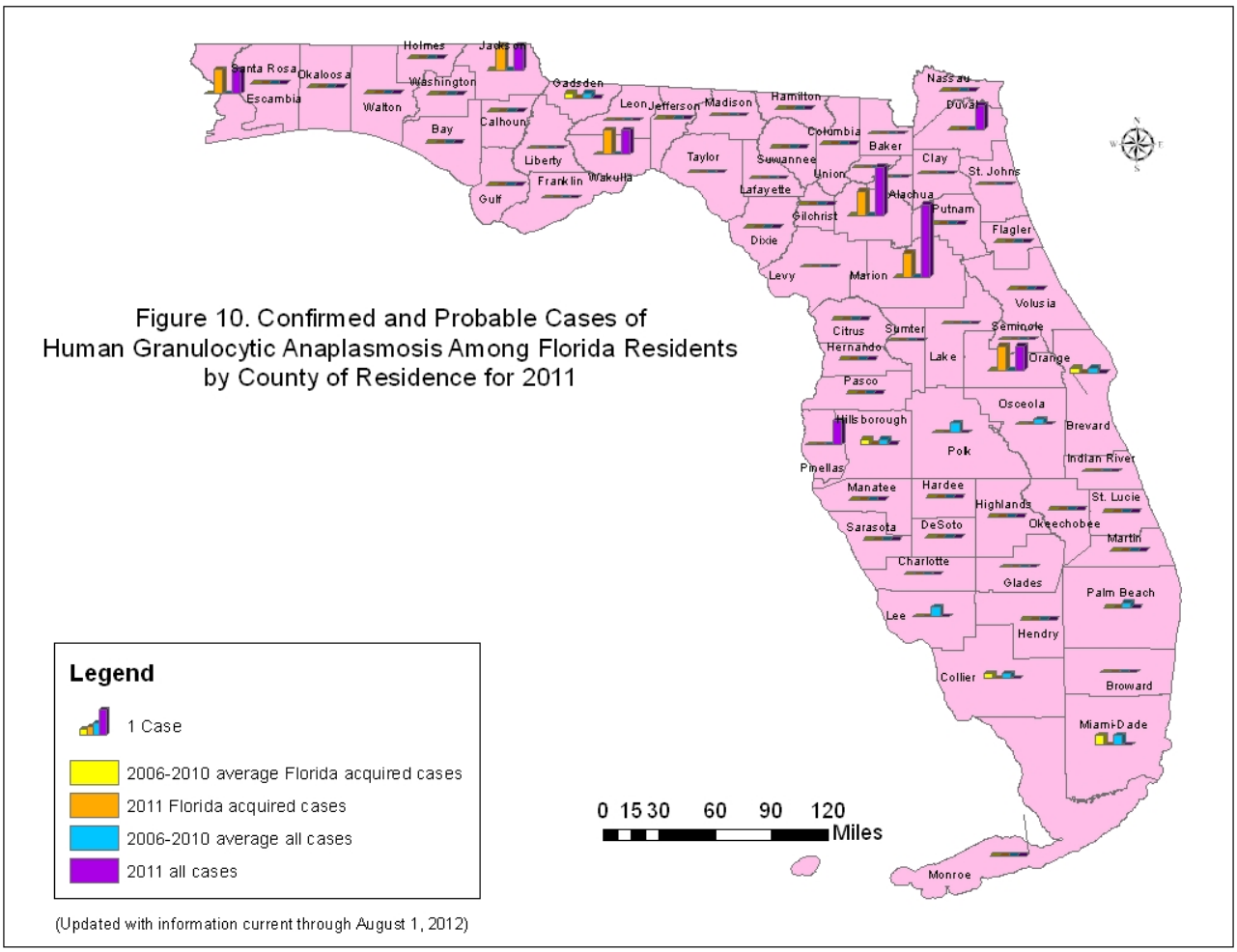
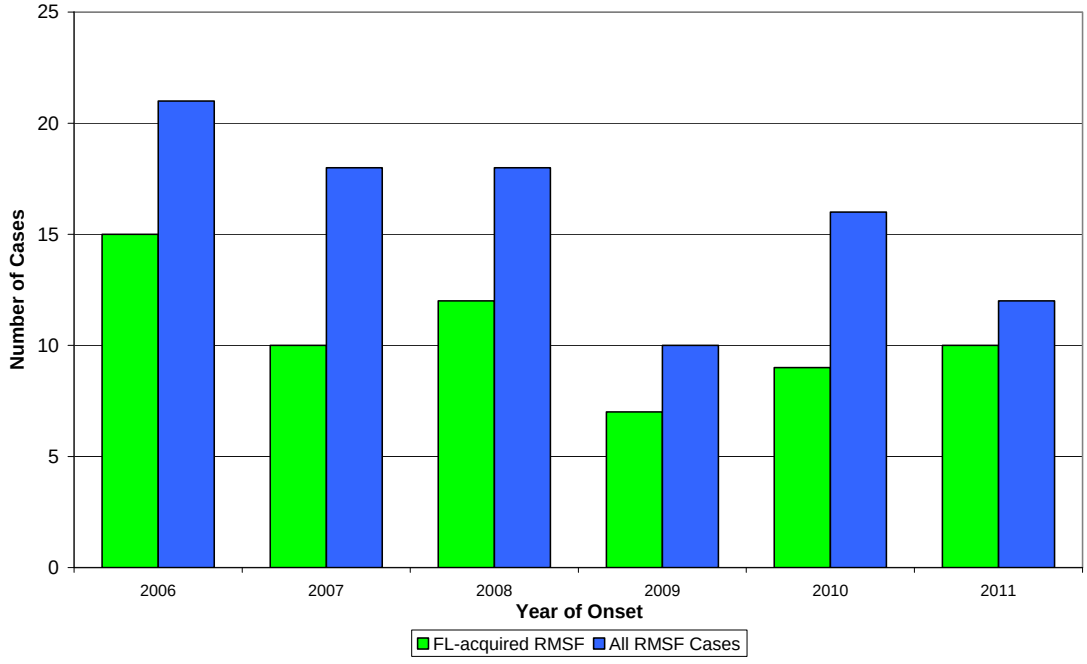


Figure 10. Confirmed and Probable Cases of
Human Granulocytic Anaplasmosis Among Florida Residents
by County of Residence for 2011
Legend
1 Case
2006-2010 average Florida acquired cases
2011 Florida acquired cases
2006-2010 average all cases
2011 all cases
0 15 30 60 90 120
Miles
Santa Rosa
Okaloosa
Escambia
Holmes
Washington
Walton
Bay
Calhoun
Gadsden
Leon
Jefferson
Madison
Hamilton
Liberty
Franklin
Gulf
Wakulla
Taylor
Suwannee
Lafayette
Columbia
Baker
Union
Nassau
Duval
Clay
St. Johns
Alachua
Gilchrist
Dixie
Levy
Putnam
Flagler
Marion
Volusia
Seminole
Orange
Lake
Citrus
Sumter
Hernando
Pasco
Osceola
Hillsborough
Brevard
Polk
Indian River
Pinellas
Manatee
Hardee
Highlands
St. Lucie
Okeechobee
Sarasota
DeSoto
Martin
Charlotte
Glades
Palm Beach
Lee
Hendry
Collier
Broward
Miami-Dade
Monroe
(Updated with information current through August 1, 2012)

Rocky Mountain Spotted Fever/ Spotted Fever Rickettsiosis 2011

Nationally, RMSF is the only tick-borne disease that has been reportable since the 1920s. RMSF is a tick-borne infection caused by the intracellular coccobacillialliary bacteria, *Rickettsia rickettsii.* Across the U.S., an estimated 90% of the rickettsial disease cases are from RMSF. Human antibodies to spotted fever rickettsial species such as *Rickettsia parkeri*, *R. amblyommii, R. africae,* and *R. conorii* cross-react with serologic tests for the RMSF agent *R. rickettsii*. In addition, commercial antibody testing to differentiate other SFR from RMSF is currently limited. This may be one explanation for apparent changes in RMSF incidence, disease severity, and geographic distribution over time. For example, RMSF antibody positive cases with the presence of eschar type lesions at the site of the tick bite is suggestive of infection from a SFR other than *R. rickettsii*. National reporting criteria for Rocky Mountain spotted fever (RMSF) were expanded to include all spotted fever rickettsiosis (SFR) in 2010. Florida is in the process of revising state regulations to align with updated SFR national reporting criteria.

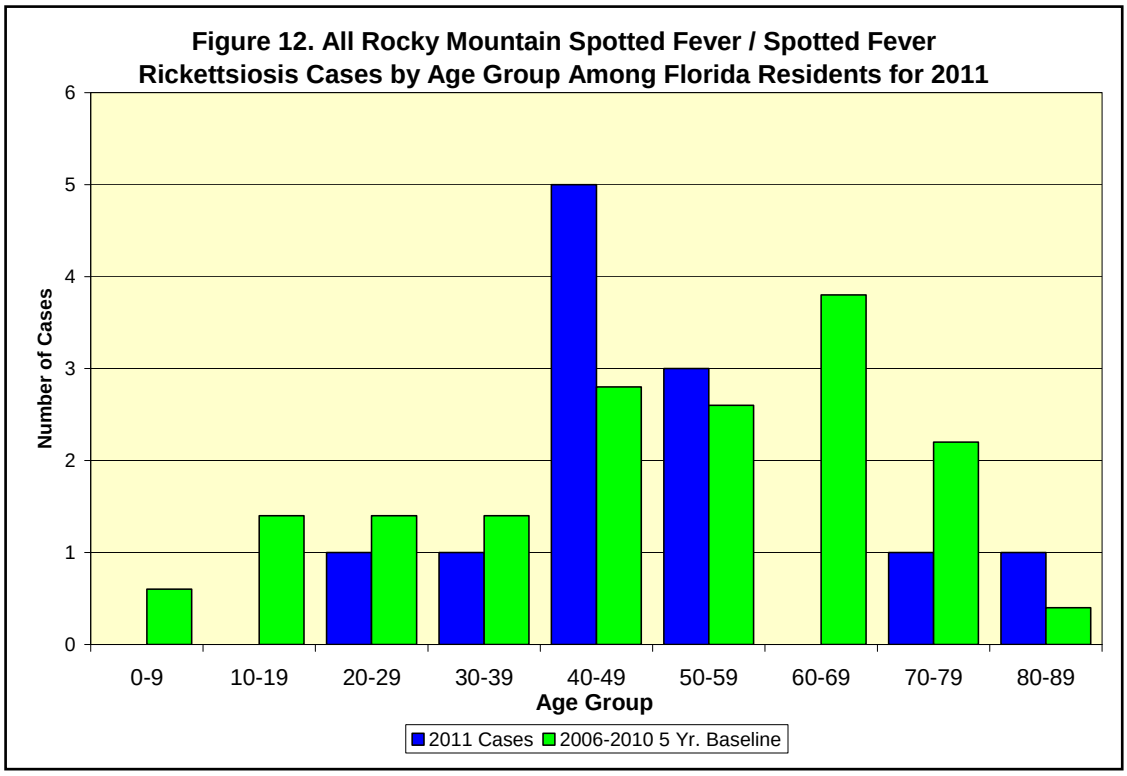
Figure 11. Confirmed and Probable Cases of Rocky Mountain Spotted Fever / Spotted Fever Rickettsiosis Among Florida Residents, 2006 - 2011



Surveillance data from 2011 showed a continued decrease in the number of RMSF/SFR cases since the peak year of 2004 (Figure 11). Florida-acquired case numbers have remained fairly stable since 2007, ranging from 7 to 12 cases per year. There were 2 confirmed and 10 probable cases in 2011. In total, 28% fewer cases were reported in 2011 than the previous 5 year average. However, the number of Florida-acquired cases in 2011 (n=10) were similar to the previous 5 year average. Florida counties reporting RMSF cases include: Bradford (1), Escambia (1), Hernando (1), Lee (1), Leon (1), Levy (2), Miami-Dade (1), and Volusia (2). Volusia and Levy Counties reported 40% of Florida-acquired cases of RMSF/SFR in 2011. Two cases were acquired outside the state of Florida (Georgia (1) and Tennessee (1)).

RMSF/SFR was most frequently observed in 40-49 year olds followed by 50-59 year olds (Figure 12). The average case count was highest in the 60-69 year old age group from 2006-2010, however, no cases were observed in this age group in 2011. Males accounted for 67% of the 2011 cases, which is similar to the 70% average recorded in the previous 5 years. White, non-Hispanic individuals accounted for 67% of all cases, a slightly lower proportion than the previous 5 year average (80%).

The impact of ecological factors such as rainfall, ambient temperature, fluctuations in tick and tick host densities, and other factors on incidence of disease in humans in Florida is unknown. In Florida, cases of RMSF/SFR are reported year-round without distinct seasonality, though peak transmission typically occurs during the summer months (Figure 13). In 2011, Florida-acquired case numbers peaked in April (Figure 14). Yet, November and December accounted for 40% of all Florida-acquired cases.



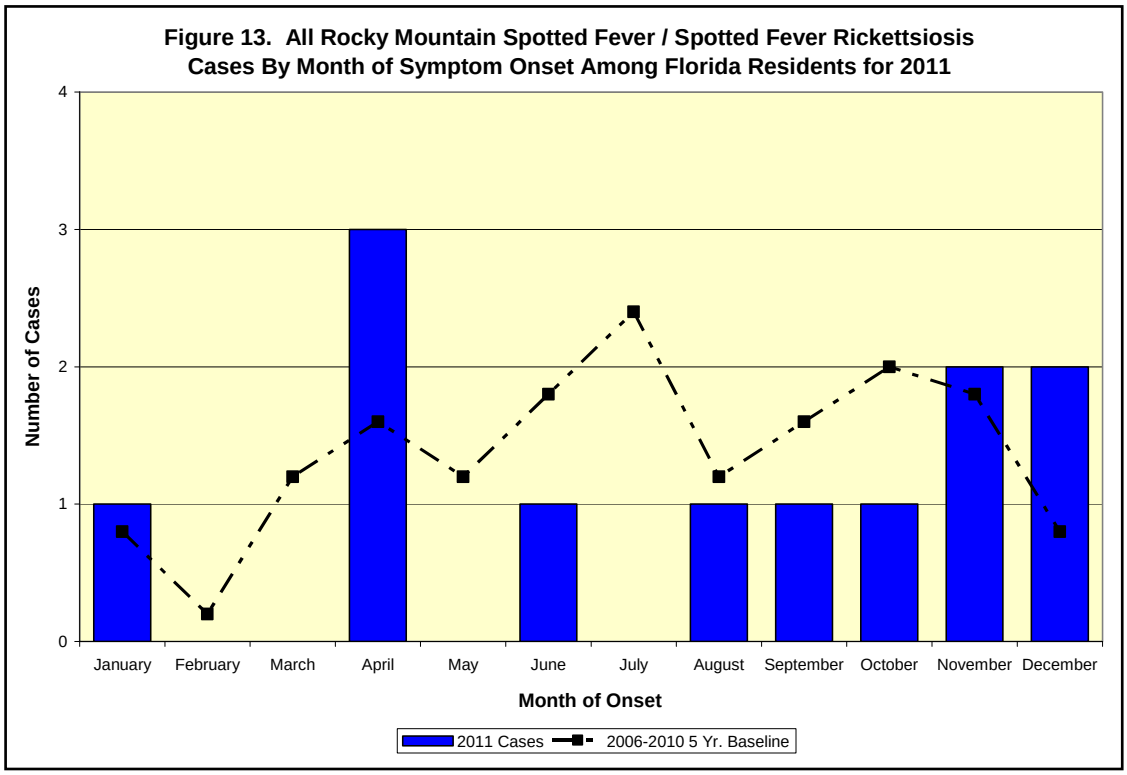


Figure 13. All Rocky Mountain Spotted Fever / Spotted Fever Rickettsiosis Cases By Month of Symptom Onset Among Florida Residents for 2011
Number of Cases
0
1
2
3
4
January
February
March
April
May
June
July
August
September
October
November
December
Month of Onset
2011 Cases
2006-2010 5 Yr. Baseline

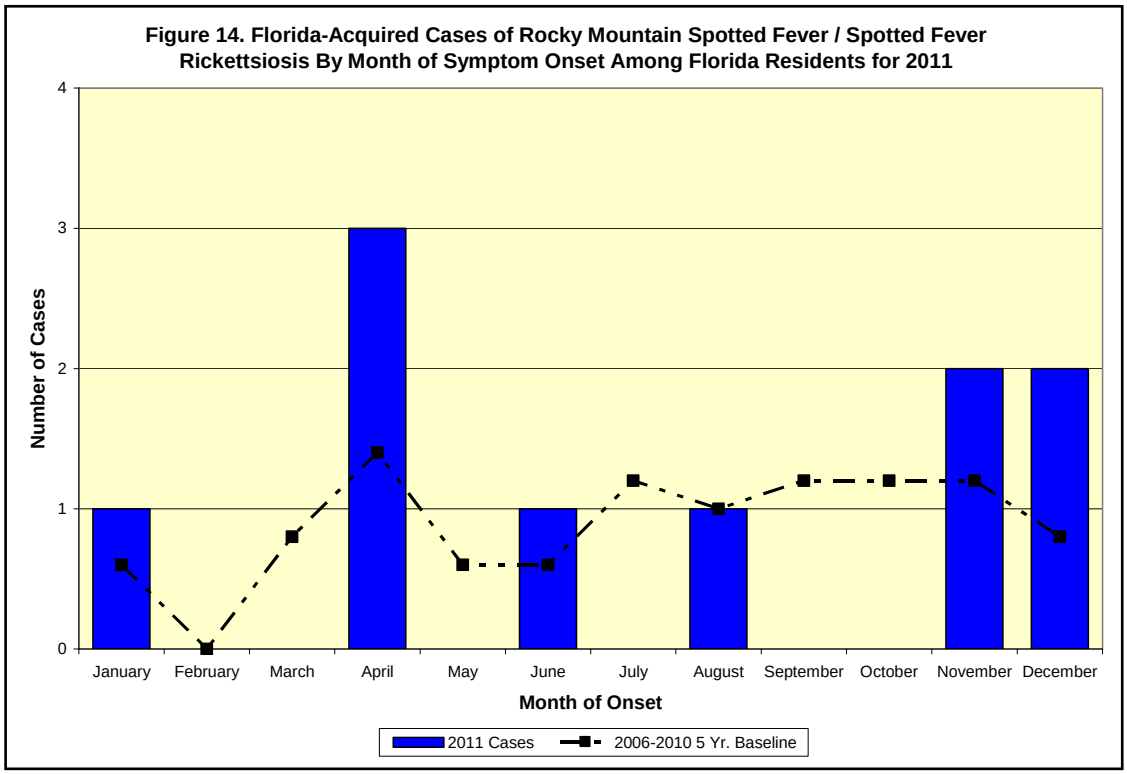


Figure 14. Florida-Acquired Cases of Rocky Mountain Spotted Fever / Spotted Fever Rickettsiosis By Month of Symptom Onset Among Florida Residents for 2011
Number of Cases
0
1
2
3
4
January
February
March
April
May
June
July
August
September
October
November
December
Month of Onset
2011 Cases
2006-2010 5 Yr. Baseline

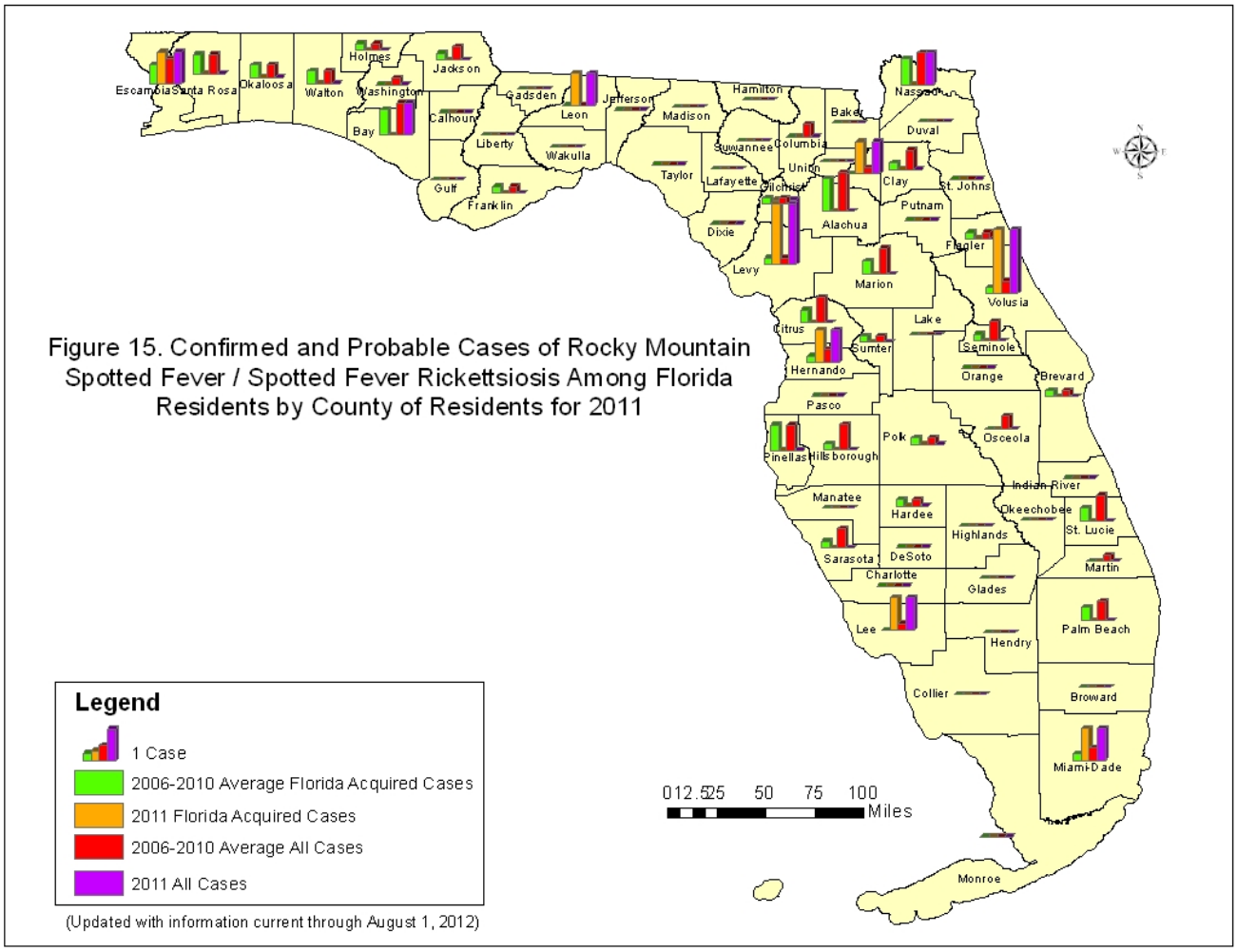


Figure 15. Confirmed and Probable Cases of Rocky Mountain Spotted Fever / Spotted Fever Rickettsiosis Among Florida Residents by County of Residents for 2011

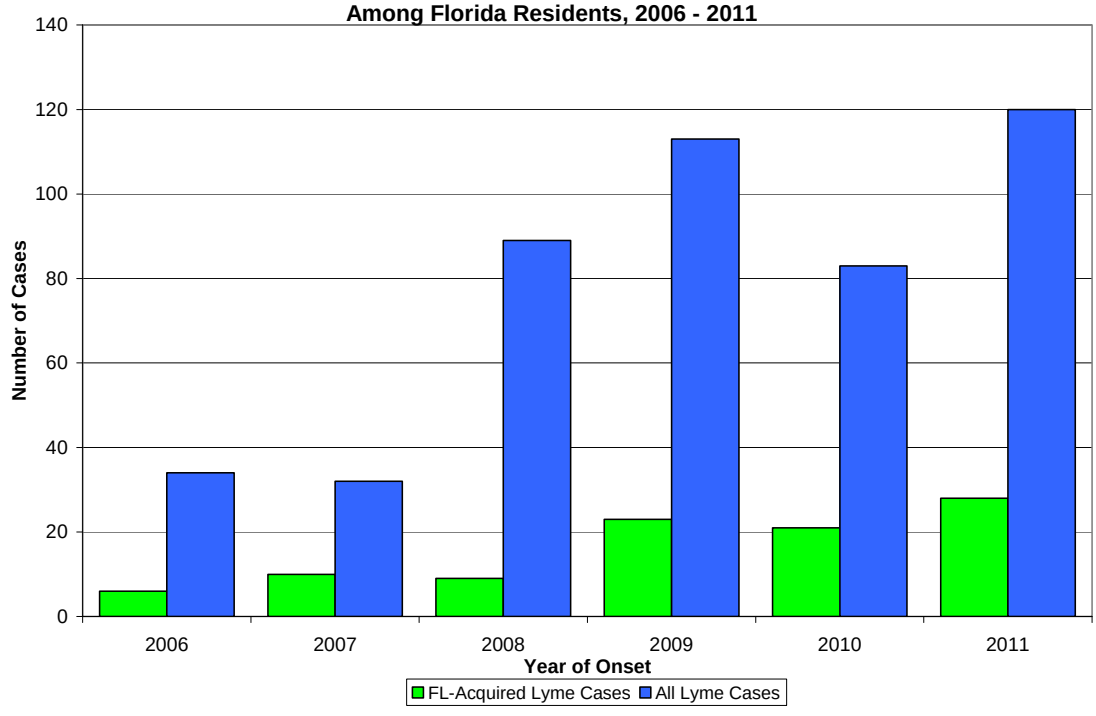
Lyme Disease, 2011

The reported number of Florida cases of *Borrelia burgdorferi* infections, more commonly known as Lyme disease, has changed dramatically since 2007. Although there is likely a true increase in cases, some of the increase can be partly attributed to a change in the Lyme disease case definition in 2008. The 2008 case definition incorporated the probable case designation based on compatible symptoms and a single IgG western blot result.

The number of Lyme disease cases reported in 2011 was the highest since Lyme disease was first made reportable in Florida in 1991. The number of reported Florida-acquired cases was also the highest since at least 2006. Among the120 Lyme disease cases reported with disease onset during 2011, 28 (23%) were Florida-acquired (Figure 16), 79 were acute Lyme disease cases and 31 cases had late-manifestations. An additional 15 cases of Lyme disease with late-manifestations were reported in 2011 but had disease onsets in 2010 or earlier. Acute Lyme disease cases include patients with symptoms of less than 30 days duration, without late clinical signs such as intermittent arthritis. Late-manifestation Lyme disease cases include patients with symptoms greater than 30 days duration or those with late clinical signs such as intermittent arthritis, cardiac disease, or other neurological symptoms.

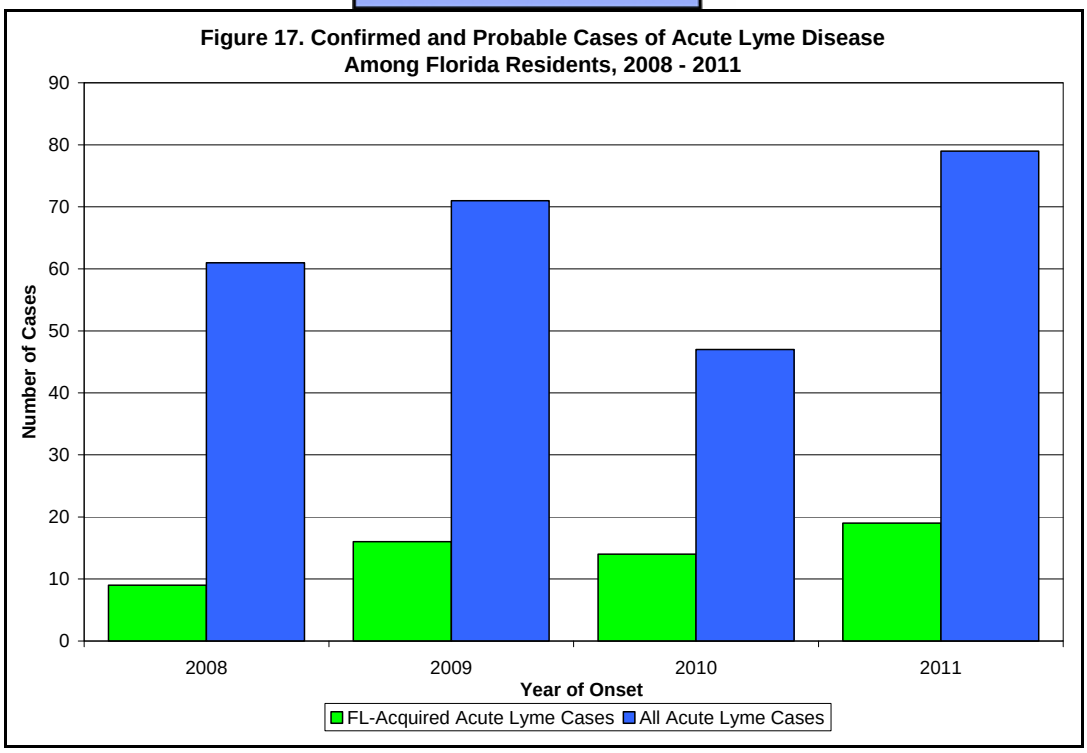
The total number of Lyme disease cases rose 45% from 2010 to 2011, while the number of reported acute cases rose 68% from the previous year. The number of Florida-acquired cases of Lyme disease was 33% higher in 2011 than in 2010, and the acute case count of Florida-acquired Lyme disease increased 36% compared to 2010. In total, 18.3 (31%) more acute cases were reported in 2011 when compared to the previous 3 year average (Figure 17). The number of reported Florida-acquired cases was 46% greater than the previous 3 year average.

Figure 16. Confirmed and Probable Lyme Disease Cases Among Florida Residents, 2006 - 2011

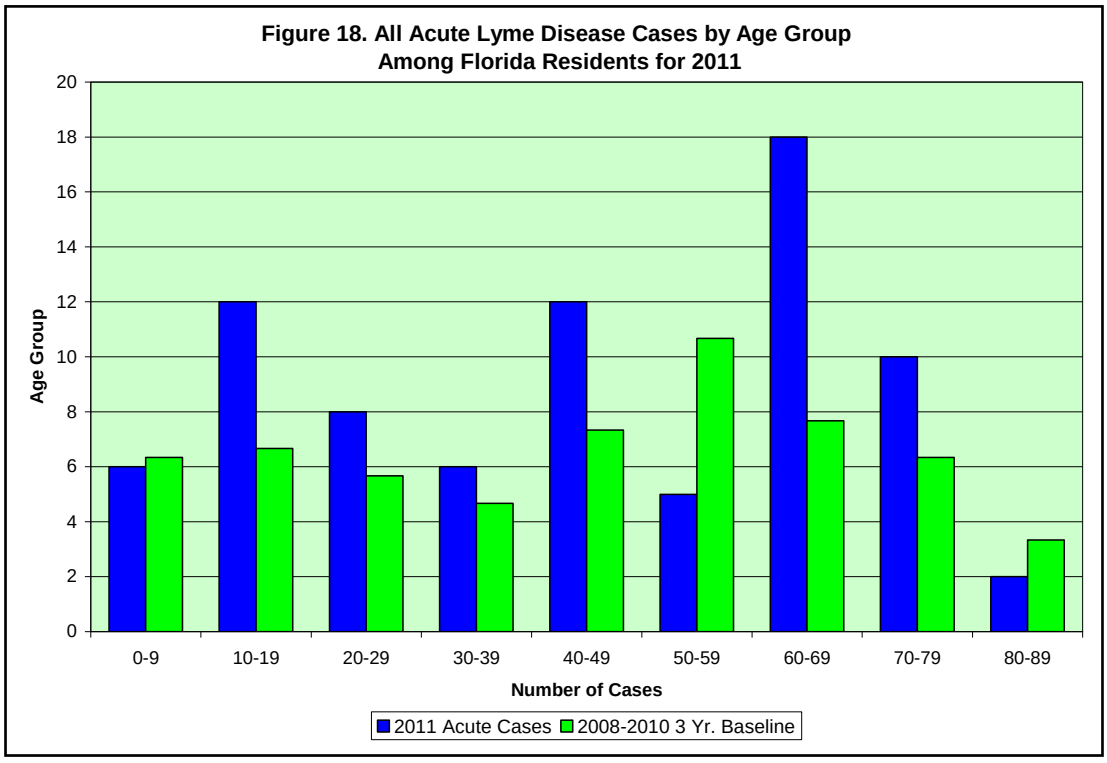


Acute Lyme disease cases were reported in 29 of 67 Florida counties (Figure 21). Most cases were reported from central and south Florida. Palm Beach reported 10 acute Lyme disease cases, 9 of which were acquired out of state. Nineteen acute cases acquired in Florida were reported from the following counties: Calhoun (1), Flagler (1), Hillsborough (3), Lee (1), Leon (3), Manatee (1), Marion (1), Palm Beach (1), Pinellas (1), Seminole (1), St. Johns (2), Sumter (2), and Volusia (1). Sixty acute cases were acquired outside the state of Florida or of an unknown origin. Identified locations of exposure include: Alabama, Belgium, Connecticut (4), East Coast, Maine (4), Maryland (2), Massachusetts (5), Minnesota (3), Missouri, New Hampshire, New Jersey (5), New York (7), Pennsylvania (13), Rhode Island, Sweden, Switzerland, Vermont, Virginia (3), Washington D.C (1), and Wisconsin (2).

Acute Lyme disease was most frequently reported among 60-69 year olds followed by the 10-19 and 40-49 year old age groups (Figure 18). During 2008-2010, the number of cases was highest in the 50-59 year old age group. Only 5 cases were reported among 50-59 year olds in 2011. Males accounted for 54% of the 2011 acute cases, compared with the 3 year average of 49%. White, non-Hispanic individuals accounted for 84% of all cases, similar to proportion (81%) of white, non-Hispanic individuals reported in the previous 3 year case average.



Peak transmission typically occurs in the summer months, particularly for Lyme disease acquired outside of the state. However, disease transmission can occur year round in Florida. The number of acute Lyme disease cases peaked in July 2011 which is consistent with the seasonal trend seen in 2008-2010 (Figure 19). However, 2011 Florida-acquired acute Lyme disease cases appeared to peak from March through May, compared to June through August, the peak transmission period observed in the previous 3 years (Figure 20).



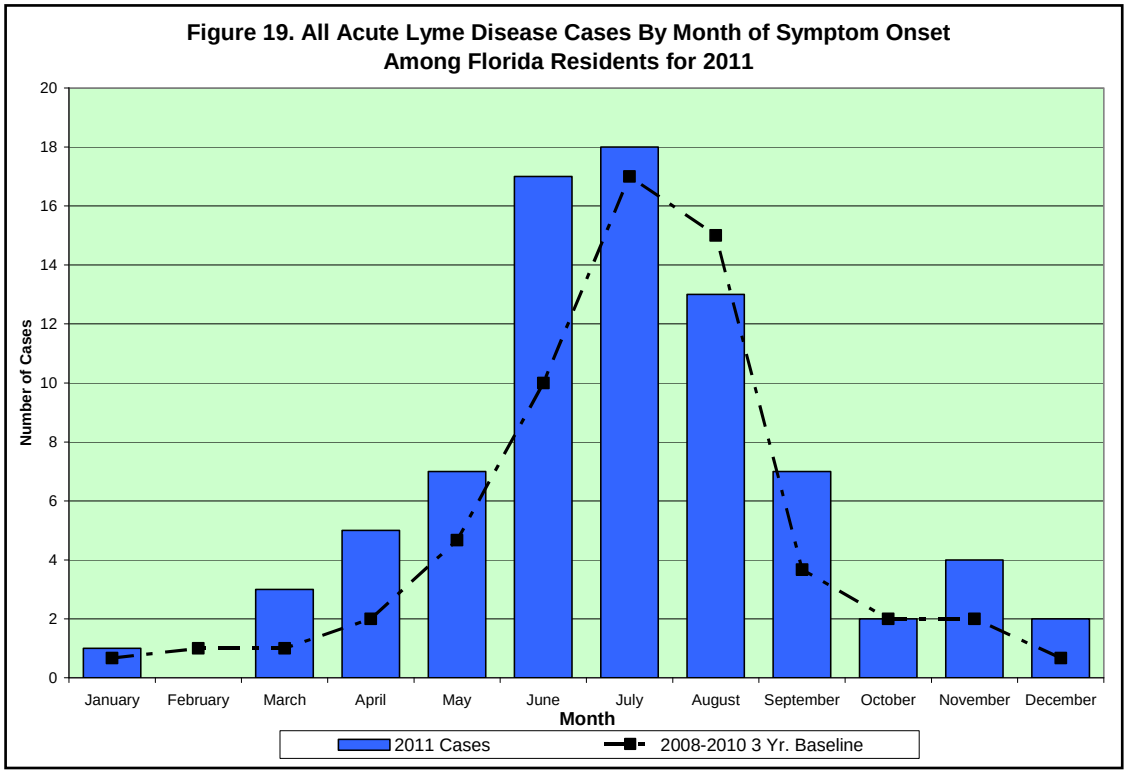


Figure 19. All Acute Lyme Disease Cases By Month of Symptom Onset
Among Florida Residents for 2011
Number of Cases
0
2
4
6
8
10
12
14
16
18
20
January
February
March
April
May
June
July
August
September
October
November
December
Month
2011 Cases
2008-2010 3 Yr. Baseline

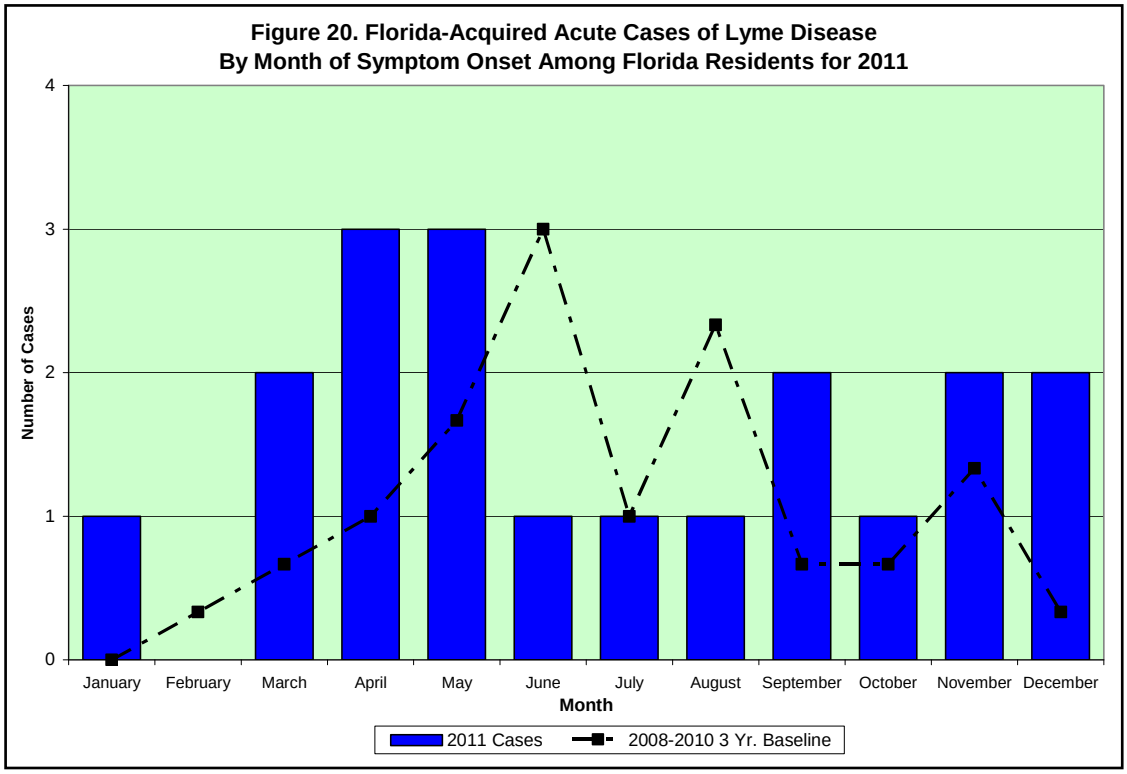


Figure 20. Florida-Acquired Acute Cases of Lyme Disease
By Month of Symptom Onset Among Florida Residents for 2011
Number of Cases
0
1
2
3
4
January
February
March
April
May
June
July
August
September
October
November
December
Month
2011 Cases
2008-2010 3 Yr. Baseline

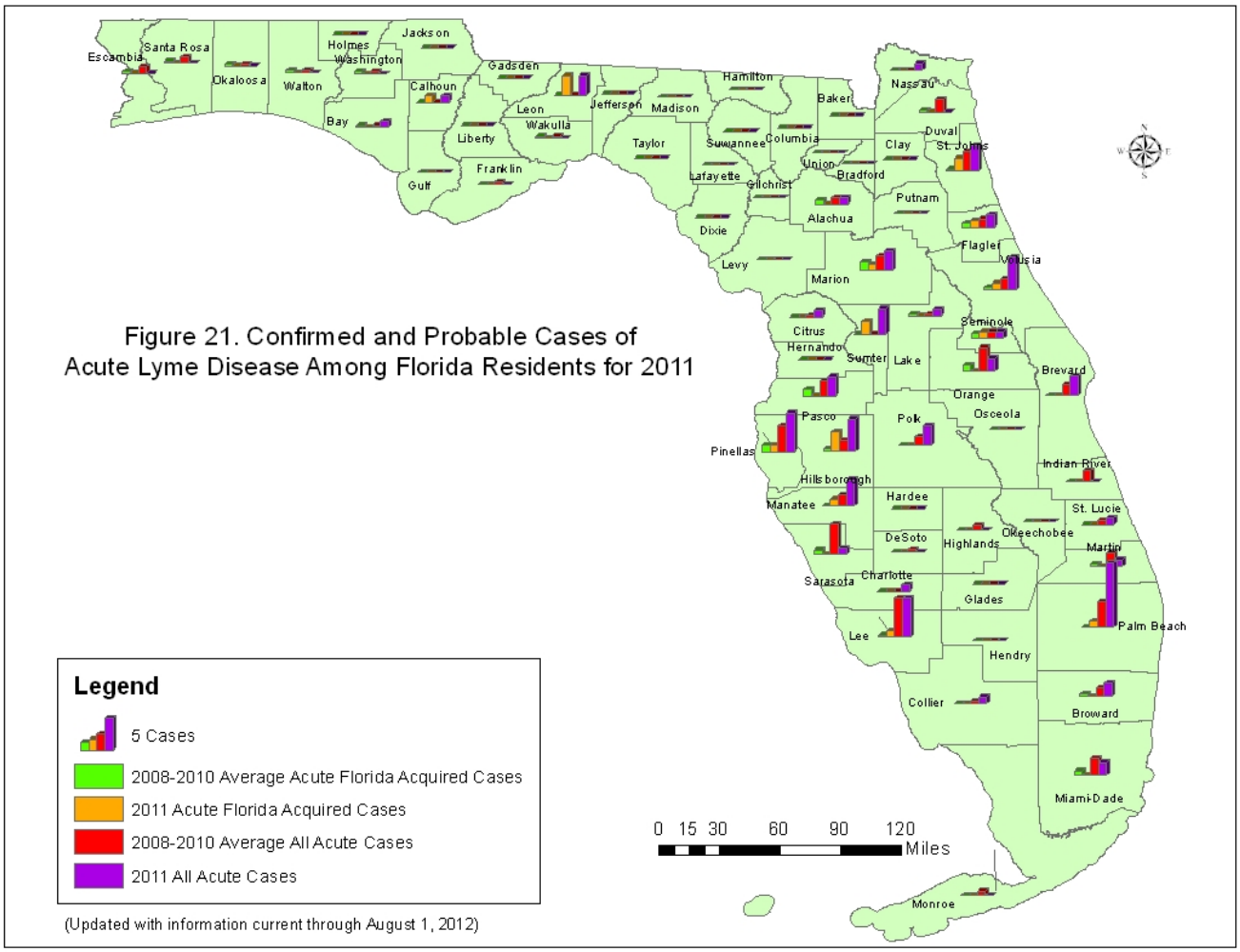


Figure 21. Confirmed and Probable Cases of Acute Lyme Disease Among Florida Residents for 2011

Total Tick-Borne Disease Summary

Reported tick-borne disease incidence increased in 2011 for all diseases except for RMSF/SFR. In 2011, there were 116 cases of acute tick-borne disease, and 31 late-manifestation Lyme disease cases. The tick-borne disease incidence in 2011 was 47% higher than in 2010 (n=79) for acute tick borne illnesses, and 28% higher than 2010 (n=115) if late-manifestation Lyme disease cases were included. Of the 67 counties in Florida, 37 reported at least one tick-borne disease case (Table 1). Twenty-four (36%) of the Florida counties reported at least one tick-borne disease as being acquired in Florida. Forty-seven (41%) of all cases of acute tick-borne disease were exposed in Florida. Incidence of Florida-acquired acute tick-borne diseases increased 31% from 2010 (n=36).

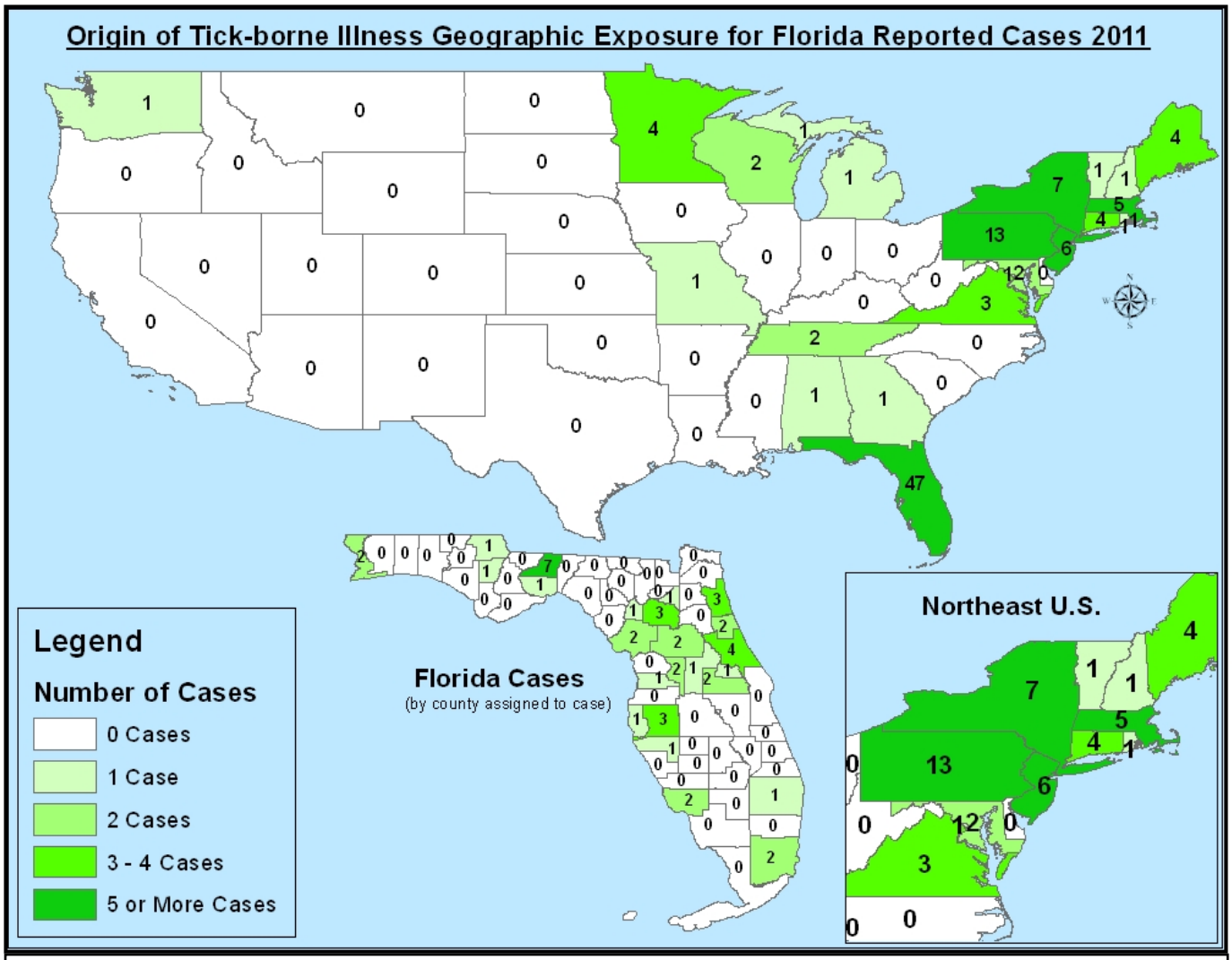


Figure 22. Geographic Location of Tick-borne Illness Exposure for Cases Reported in Florida Residents for 2011. Florida acquired cases are represented by county of residence rather than county of exposure. This figure highlights the risk of acquiring a tick-borne illness for Florida residents throughout the state and country. Different tick-borne organisms have different distributions throughout the state and the country. Therefore, not all organisms are present in all states or every county within Florida.

Leon County residents had the greatest number of tick-borne diseases acquired in Florida reported with 3 HME, 1 RMSF, and 3 acute Lyme disease cases. The 13 counties in north and central Florida surrounding the Ocala National Forest reported 61% of all the acute Florida acquired tick-borne disease cases. Florida residents contracted tick-borne diseases in 21 different states and 3 foreign countries. Tick-borne diseases acquired outside the state of Florida most frequently occurred in Pennsylvania (13 cases) and other states in the Northeast United States (Figure 22). Palm Beach County residents reported the greatest number of tick-borne disease cases acquired outside of Florida (9).

Table 1. Florida Tick-Borne Disease Activity by Reporting County for 2011							
Disease	**HME**		**RMSF/SFR**		**Acute Lyme**		**Totals**
Origin	FL	Non-FL	FL	Non-FL	FL	Non-FL	All
Alachua*	2	1 (U)	0	0	0	1 (I)	4
Bay	0	0	0	1 (I)	0	1 (U)	2
Bradford	0	0	1	0	0	0	1
Brevard	0	0	0	0	0	3 (I)	3
Broward	0	0	0	0	0	2 (I)	2
Calhoun	0	0	0	0	1	0	1
Charlotte	0	0	0	0	0	1 (I)	1
Citrus	0	0	0	0	0	1 (I)	1
Collier	0	0	0	0	0	1 (I)	1
Duval*	0	0	0	0	0	0	0
Escambia*	0	0	1	0	0	0	1
Flagler	1	0	0	0	1	1 (I)	3
Gilchrist	1	0	0	0	0	0	1
Hernando	0	0	1	0	0	0	1
Hillsborough	0	0	0	0	3	2 (I)	5
Jackson*	0	0	0	0	0	0	0
Lake	1	0	0	0	0	1 (I)	2
Lee	0	0	1	0	1	5 (I)	7
Leon	3	1 (I)	1	0	3	0	8
Levy	0	0	2	0	0	0	2
Manatee	0	0	0	0	1	3 (I)	4
Marion*	0	0	0	0	1	2 (I)	3
Martin	0	0	0	0	0	1 (I)	1
Miami-Dade	1	0	1	0	0	2 (I)	4
Nassau	0	0	0	1 (I)	0	1 (I)	2
Orange*	1	0	0	0	0	2 (I)	3
Palm Beach	0	0	0	0	1	9 (I)	10
Pasco	0	0	0	0	0	3 (I)	3
Pinellas*	0	0	0	0	1	5 (I)	6
Polk	0	0	0	0	0	3 (I)	3
Sarasota	0	0	0	0	0	1 (U)	1
Seminole	0	0	0	0	1	0	1
St. Johns	1	0	0	0	2	2 (I)	5
St. Lucie	0	0	0	0	0	1 (I)	1
Sumter	0	0	0	0	2	2 (I)	4
Volusia	1	0	2	0	1	4 (I)	8
Wakulla*	0	0	0	0	0	0	0
Totals	**12**	**2**	**10**	**2**	**19**	**60**	**105**

Legend: HME = human monocytic ehrlichiosis, RMFS = Rocky Mountain spotted fever FL = Florida acquired, Non-FL=Non-Florida or unknown origin, I=imported, U=Unknown

***** *A. phagocytophilum* / HGA cases were reported in Alachua, Duval, Escambia, Jackson, Marion, Orange, Pinellas, and Wakulla Counties.

Tick-Borne Disease Prevention

Most tick-borne illness can be prevented. The most effective prevention is avoiding human and pet exposure. Prevention strategies include:

- Avoid tick infested areas.
- Cover exposed skin as much as possible.
- Wear light-colored clothing to better see ticks.
- Tuck in pant legs and button sleeves.
- Apply permethrin to clothing and gear, and DEET to skin (per CDC recommendations).
- Inspect children, pets, and adults for ticks immediately following likely exposure.
- Promptly remove any ticks found attached to children, adults, or pets. Use fine tweezers or a tissue to protect fingers, grasp the tick close to the skin and gently pull straight out without twisting. Do not use bare fingers to crush ticks. Wash hands following tick removal.
- Bathe soon after being in tick habitats to decrease risk of infection in endemic areas.
- Use appropriate veterinary products as recommended by a veterinarian to prevent tick exposure to pets.
- Use landscaping measures around the home to reduce ground cover for ticks and use any type of fencing around a home.

Acknowledgements and Data Sources

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For more surveillance information, please see the DOH website at:
http://www.doh.state.fl.us/Environment/medicine/arboviral/Tick_Borne_Diseases/Tick_Index.htm

Data are provided by county health departments, Florida Department of Health, Bureau of Public Health Laboratories-Jacksonville, private health care providers and laboratories. Tallies are organized into those where exposure to the infected tick most likely occurred: in Florida or a total case count which includes cases with exposures in and outside Florida as well as for cases were exposure location was not definitively determined. This report is in large part designed to increase awareness of current tick disease transmission so the report focuses on cases acquired in 2011. Acute Lyme disease cases include patients with symptoms of less than 30 days duration at the time of diagnosis, without late clinical signs such as intermittent arthritis. Reporting is inherently delayed as most testing for tick-borne illness is based on antibodies which can take 2-4 weeks to form and generally requires an acute and convalescent serum sample to be definitive.