

Rocky Mountain Spotted Fever

Rocky Mountain Spotted Fever (RMSF) is a Class C disease. It must be reported to the state within five business days.

As of January 1, 2010, cases of RMSF are reported under a new category called Spotted Fever Rickettsiosis (including Rocky Mountain spotted fever). This change was made to better reflect the scope of cases being reported under the previous heading of RMSF, as many of those cases were not identified as being specifically caused by *R. rickettsii*.

Epidemiology

Rickettsia rickettsii, a bacterial organism spread to humans by the bite of ixodid (hard) ticks, is the etiologic agent of RMSF. The two major vectors of RMSF in the U.S. are the American dog tick, *Dermacentor variabilis* and the Rocky Mountain wood tick, *Dermacentor andersoni*. Other domestic tick species have been shown to be infected with *Rickettsia rickettsii* or have been identified as experimental vectors in laboratory studies. Some domestic ticks have no role in transmission in the U.S. but are considered important vectors in Central and South America. Although the vector of RMSF is the tick, exposure to ticks or tick-infested habitats is only reported in 60% of the cases.

The rickettsial organism is maintained in nature in a complex life cycle involving ticks and mammals. The tick acts as both vector and reservoir of the disease. Humans are accidental hosts and do not play a role in the natural transmission cycle. Even in areas from which most human cases are reported, only about 1% to 3% of the tick population carries the organism, therefore the risk of exposure is relatively low.

The disease is endemic in areas of North, Central and South America. Other closely related organisms cause different types of spotted fevers worldwide. Over half of the U.S. cases are reported from the south Atlantic region (which extends from Delaware south to Florida). Infection also occurs in the Pacific coastal region and the west south-central region, (which includes Arkansas, Louisiana, Oklahoma and Texas). Although initially identified in the Rocky Mountain states in 1896, a very small percentage of cases has recently been reported from this area.

Laboratory confirmation is usually done by serology. Several well validated serologic assays are available, but the reference standard is indirect immuno-fluorescence (IFA). PCR and isolation of the organism from tissues are other means of diagnosis. Early infections, which are often difficult to diagnose, are characterized by sudden onset of fever, headache and myalgia, followed by rash. Early diagnosis can be difficult. Without prompt, appropriate antibiotic therapy, the disease can be fatal. If epidemiological and clinical clues lead to a high degree of suspicion, therapy should never be delayed while waiting for laboratory confirmation. While the number of reported cases has increased, the case fatality rate in persons who become ill from RMSF has declined to a low of less than 0.5%.

No licensed vaccine providing immunity to RMSF is available. Limiting exposure to ticks is an important method of prevention. Since elimination of all activities resulting in tick exposure

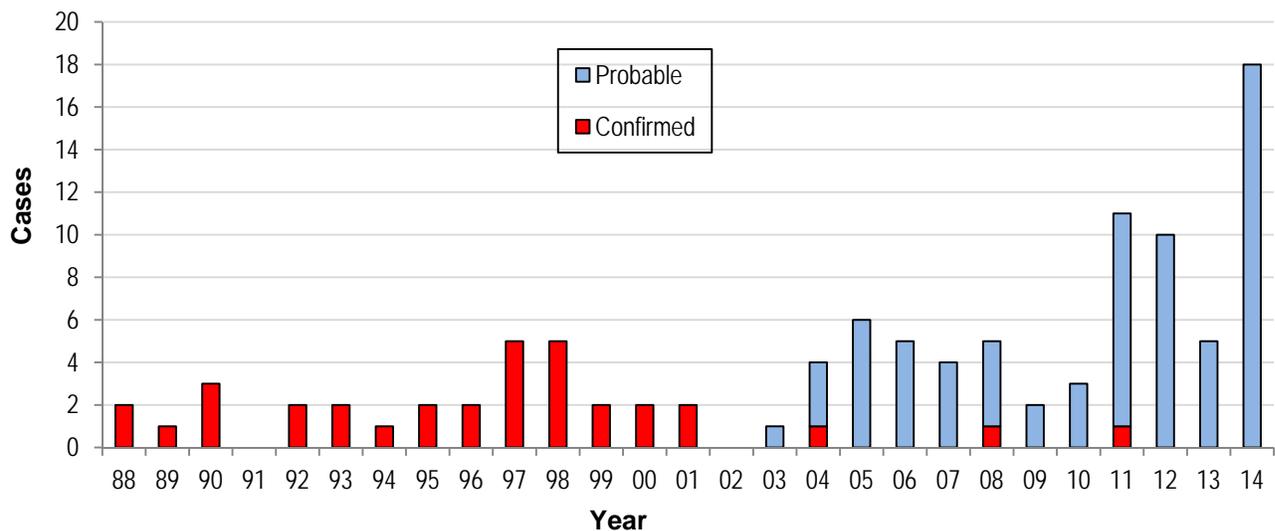
is impossible, protective measures such as wearing light colored clothing, tucking pant legs into socks and applying appropriate repellents to clothing and skin should be employed. Prompt inspection and removal of ticks are also very important. As in many tick-transmitted diseases, the tick must be attached for several hours before transmission takes place, thus the importance of tick removal.

Cases

In 2014, 19 cases were reported in Louisiana. Reported occurrence of RMSF in the state ranges from zero to ten cases per year from 1988 to 2013. Since 2000, cases have been classified as confirmed or probable based on the level of diagnosis determined in each circumstance. In 2010, changes were made to the case definition to include 'suspect' category for those who were not classified as confirmed or probable. The incidence rate in the state during 2014 is 0.41 cases per 100,000 persons with case fatality rate of 1.7% compared to nationwide rates of less than 0.5%.

The number of cases over the past ten years (2005-2014) increased 3-fold compared to the previous ten-year period (1995-2004) to 73 cases. This increase reflects the national trend that is particularly influenced by increased numbers of cases reported from suburban areas, presumably due to human migration into naturally pristine or forested areas and a combination of new diagnostic tests and changes in RMSF surveillance case definition in 2004. (Figure 1).

Figure 1: RMSF reported cases, (including both confirmed and probable)
Louisiana, 1988-2014

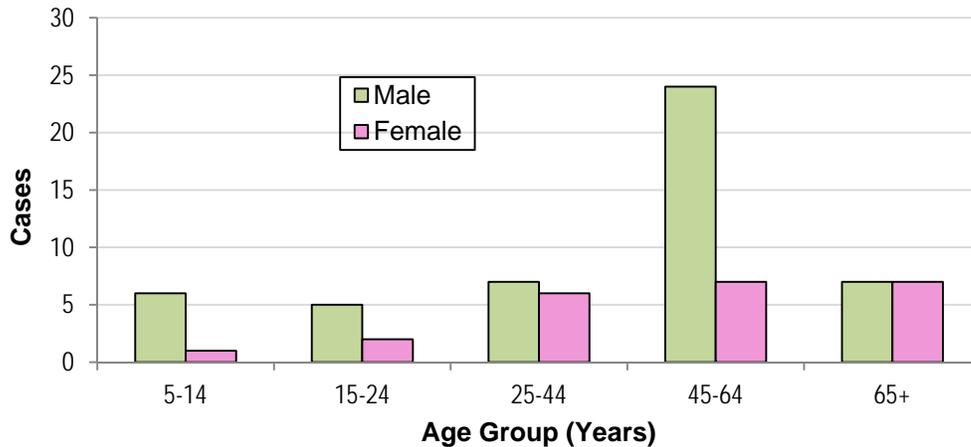


Gender and Age

Overall, more cases were reported among males (66%) than females. Data also indicated a huge preponderance among males in the age group of 45 to 64 years old. However, males and

females had almost the same number of cases in the 25 to 44 year old age group. Cases were also equally distributed among males and females in the 65+ age category (Figure 2).

Figure 2: RMSF cases by age and gender, (including both confirmed and probable) Louisiana, 2005-2014

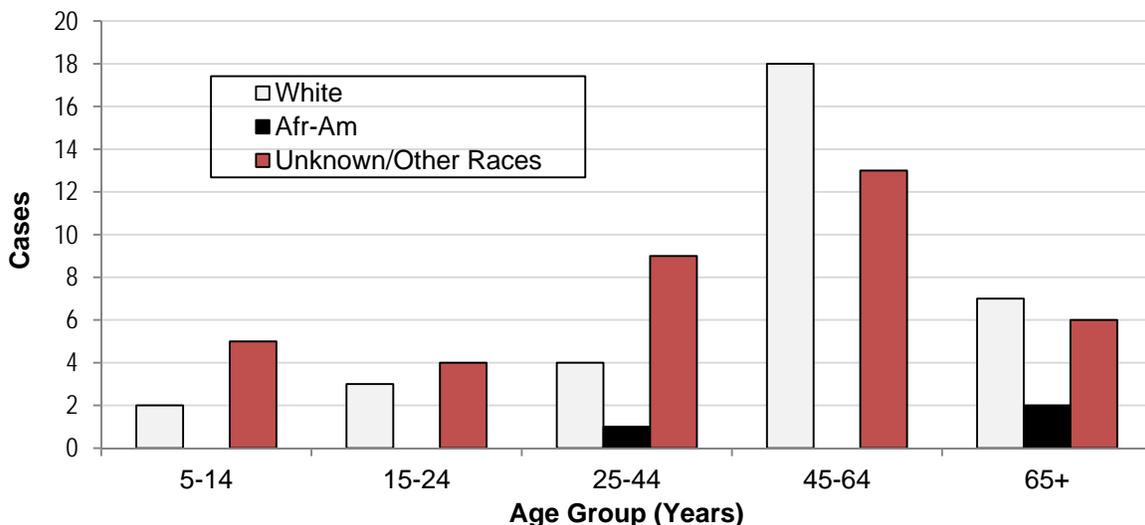


A large number of RMSF cases was reported in the age groups of 45 to 64 years and 65+ years with incidence of 2.5 and 2.6 cases per 100,000 populations respectively.

Race and Age

Nationally the frequency of RMSF is highest in males, American Indians, and people at least 40 years-old. In Louisiana, no cases were reported among American Indians. Whites comprised 46% of all reported cases, and 4% were black. All other cases were reported as other races or unknown from 2005 to 2014 (Figure 3).

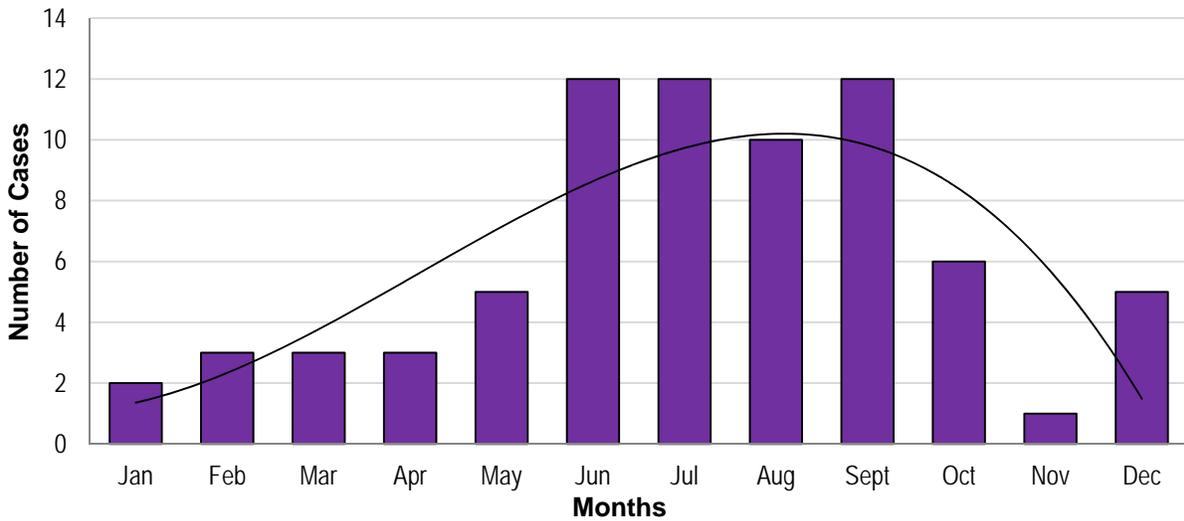
Figure 3: RMSF cases by age and race, (including both confirmed and probable) Louisiana, 2005-2014



Seasonality

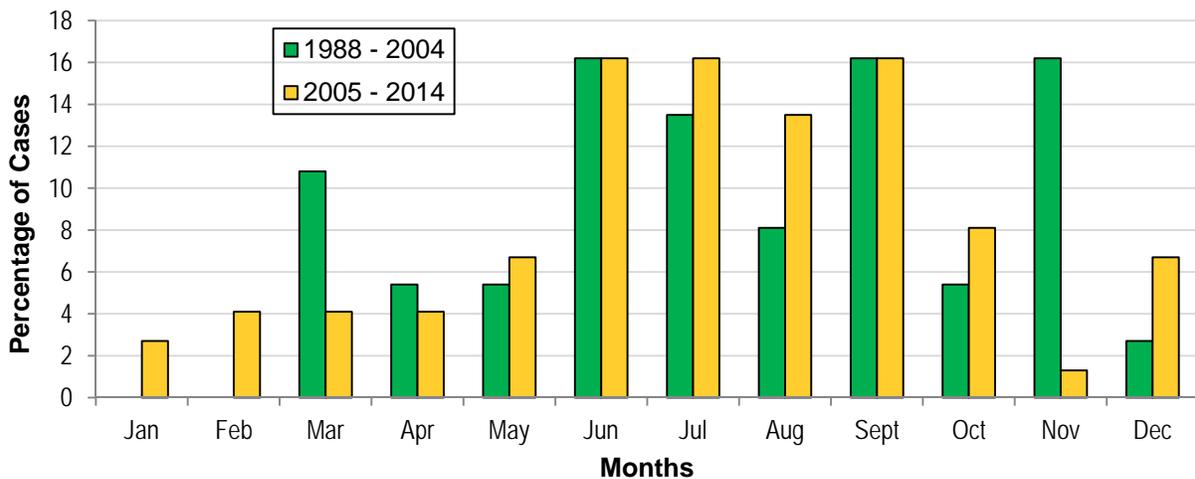
In the United States majority of cases are infected during summer months. In Louisiana, 73% of the cases occur between April and September (Figure 4). Louisiana’s sub-tropical climate likely fosters a longer period of tick activity.

Figure 4: RMSF reported cases, (including both confirmed and probable) by month of onset Louisiana, 2005-2014



The peak in U.S. cases of RMSF occurs in June and July, but in Louisiana the peak months are June, July, August and September. There was a significant four-month peak from June to September ($p=0.024$), in past years (Figure 5).

Figure 5: RMSF reported cases, (including both confirmed and probable) by month of onset Louisiana, 1988-2004 and 2005-2014



Hospitalization

Healthcare settings are required to report all patients with RMSF to the Office of Public Health using case report forms, indicating the timing and nature of illness, with laboratory diagnosis. Data indicated that, in majority of the RMSF cases (66%), a confirmatory test for RMSF was not performed. Patients were treated based on index of suspicion and IgM or IgG antibody titers that were obtained only during an acute phase. Most suspected cases of RMSF are treated empirically with doxycycline leading to early recovery from illness and shorter duration of in-patient stay. Hence, obtaining titers using convalescent sera two to four weeks following illness, for a confirmatory diagnosis may not always be possible, which may explain the large number of ‘probable’ cases diagnosed in the state. Although IFA has found to be the most sensitive and specific of all serologic tests, it is usually not positive in acute illness.

Diagnosing and confirming RMSF infections accurately is important in national surveillance efforts to estimate the true burden of the disease and to take necessary timely actions following case identification. Consistent use of single rapid confirmatory test like real-time PCR assay on clinical specimens that is shown to be highly sensitive and specific to diagnose RMSF when compared to the traditional PCR techniques used by the Centers for Disease Control and Prevention should be encouraged. This reduces the need for a second titer sample for antibodies to RMSF by IFA to make a confirmed diagnosis.

Since 1999, 66% of the total RMSF cases that required hospital admission were males and approximately 38% were in the 45 to 64-years age group. In-patient data shows that 18.75% of all cases suffered at least one life threatening complication with meningitis and encephalitis adding up to 46% of those cases (Table 1).

Table 1: RMSF-associated hospitalizations, Louisiana 2005 – 2014

RMSF- Hospitalizations		
Age group	Hospitalized	%
< 5 years	1	1.7
5 - 14 years	10	17.5
15 - 24 years	4	7.0
25 - 44 years	8	14.0
45 - 64 years	22	38.5
65 +	12	21.0
Total	57	

The most frequently listed accompanying diagnoses with RMSF diagnosis included rash and other nonspecific skin eruptions (17.2%), hypertension (15.5%), hyponatremia and/or hypo-osmolality (12%), headache (10%), and other concurrent bacterial/viral infections (10%). Lyme disease (3.4%) was the most common tick borne illness diagnosed along with RMSF.

The impact of RMSF can be estimated by duration of hospitalization and the cost of treatment incurred. The median number of days and cost of treatment for people who were hospitalized

with RMSF and associated complications or other accompanying diagnoses was three, (minimum three days, maximum 16 days) and \$11,809.65 respectively (Table 2).

Table 2: RMSF-associated life threatening complications, Louisiana 2005 - 2014

Hospitalization		Life Threatening Complications			
Years	Cases	ARF/CRF	DIC/Sepsis	E/M/ME	ARDS
2005	5	0	1	0	0
06	3	0	0	1	0
07	5	0	0	1	0
08	4	0	0	0	0
09	5	0	0	0	0
2010	5	1	0	0	0
11	13	0	1	1	0
12	5	1	0	0	0
13	2	0	0	0	0
14	10	1	0	1	0
Total	57	3	2	4	0

During the period from 2005 to 2014, the number of reported cases (confirmed and probable) to The Infectious Disease Reporting Information System (IDRIS) was 74 with estimated hospitalization rates of 310 per 1000 RMSF cases.

Geography

A higher percentage of cases was reported from parishes that lie along the state border - Caddo, Bossier, Calcasieu, St. Tammany and Washington (Figure 6).

Figure 6: RMSF reported cases by parish, (including both confirmed and probable) Louisiana, 2005-2014

