

Report to Maine Legislature

Lyme Disease

February 2, 2015

Prepared by:

Sara Robinson, MPH, Epidemiologist, Division of Infectious Disease
Public Health Corps, Division of Infectious Disease

Submitted by

Maine Department of Health and Human Services, Maine Center for
Disease Control and Prevention (CDC), Division of Infectious Disease

Report to Maine Legislature – Lyme Disease

During the first special session of the 123rd Legislature in 2008, hearings and discussion over proposed legislation regarding the reporting of Lyme disease led to Chapter 561 of the Session Laws. This law, An Act to Implement the Recommendations of the Joint Standing Committee on Insurance and Financial Services Regarding Reporting on Lyme Disease and Other Tick-Borne Illnesses, directed Maine Center for Disease Control and Prevention to submit an annual report to the joint standing committee of the Legislature having jurisdiction over health and human services matters and the joint standing committee of the Legislature having jurisdiction over health insurance matters. This report was to include recommendations for legislation to address public health programs for the prevention and treatment of Lyme disease and other tick-borne illnesses in the state, as well as to address a review and evaluation of Lyme disease and other tick-borne illnesses in Maine.

A bill in the second session of the 124th Legislature in 2010 amended these laws to include information on diagnosis of Lyme disease.

Title 22, Chapter 266-B, Subsection 1645 in Maine statutes, directs Maine CDC to report on:

- I. The incidence of Lyme disease and other tick-borne illness in Maine
- II. The Diagnosis and Treatment Guidelines for Lyme disease recommended by Maine Center for Disease Control and Prevention and the United States Department of Health and Human Services, Centers for Disease Control and Prevention
- III. A summary or bibliography of peer-reviewed medical literature and studies related to the diagnosis, medical management, and treatment of Lyme disease and other tick-borne illnesses, including, but not limited to, the recognition of chronic Lyme disease and the use of long-term antibiotic treatment
- IV. The education, training, and guidance provided by Maine Center for Disease Control and Prevention to health care professionals on the current methods of diagnosing and treating Lyme disease and other tick-borne illnesses
- V. The education and public awareness activities conducted by Maine Center for Disease Control and Prevention for the prevention of Lyme disease and other tick-borne illnesses; and
- VI. A summary of the laws of other states enacted during the last year related to the diagnosis, treatment, and insurance coverage for Lyme disease and other tick-borne illnesses based on resources made available by the federal Centers for Disease Control and Prevention or other organizations.

This is the seventh annual report to the Legislature and includes an update on activities conducted during 2014.

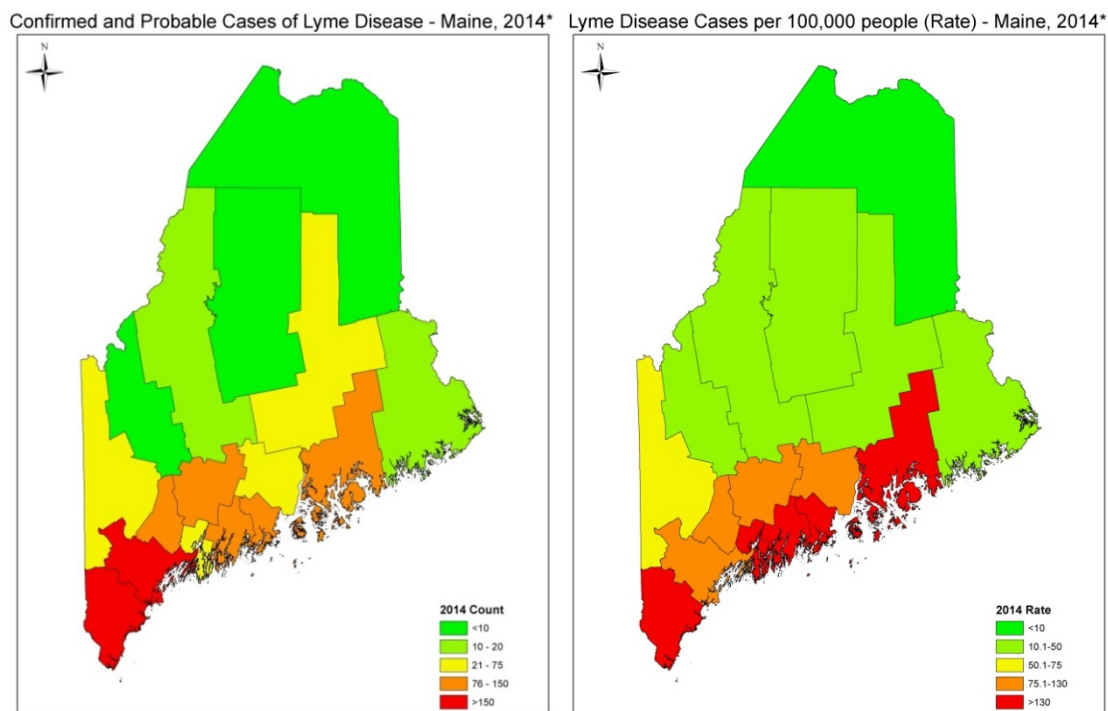
Executive Summary

Lyme disease is a notifiable condition in the State of Maine. The goal of Lyme disease surveillance is to help define demographic, geographic, and seasonal distribution; monitor disease trends; identify risk factors for transmission; and promote prevention and education efforts among the public and medical communities. Reported cases are classified as confirmed, probable, and suspect based on clinical symptoms and laboratory testing interpreted using criteria established by federal CDC. The surveillance case definition is not intended to be used in clinical diagnosis. Lyme disease surveillance is passive, dependent upon reporting, and therefore likely to be an under-representation of the true burden of Lyme disease in Maine. Federal CDC released a statement in 2013 that the true burden of Lyme disease may be up to ten times the number of reported cases.

Maine Lyme Disease Summary, 2014 (Preliminary data as of January 29, 2015)

- 1,381 confirmed and probable cases
- Symptoms of reported cases* of Lyme disease in Maine included:
 - Erythema Migrans (characteristic expanding rash): 773 cases (56%)
 - Arthritis (joint swelling): 425 cases (31%)
 - Neurological (Bell's Palsy or other cranial neuritis): 159 cases (12%)

* Cases could report more than one symptom
- Hospitalization occurred in 58 cases (4%).
- Among case patients with a reported date of symptom onset, 72% began experiencing symptoms during June, July, or August. Date of symptom onset is missing for 23% of cases.



* 2014 data are preliminary as of 01/29/2015

I. The Incidence of Lyme disease and other tick-borne illness in Maine

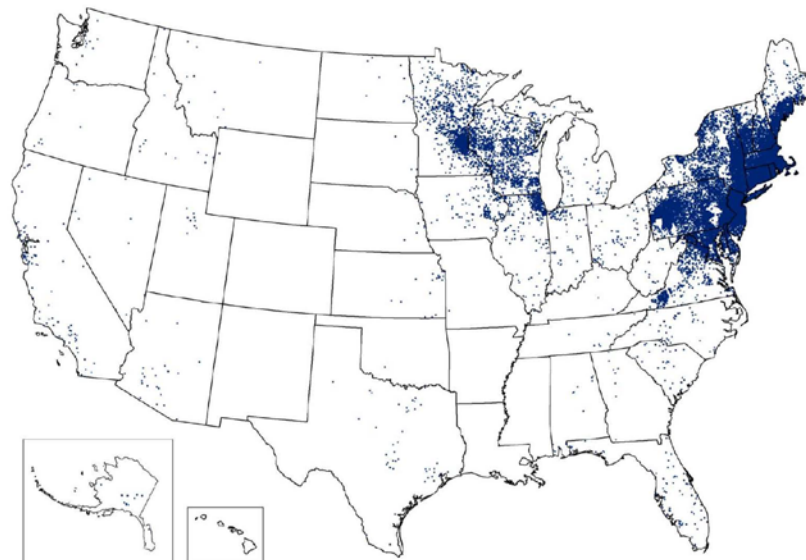
A. Lyme disease

Lyme disease is caused by the bacteria *Borrelia burgdorferi* which is transmitted to a person through the bite of an infected deer tick (*Ixodes scapularis*). Symptoms of Lyme disease include the formation of a characteristic expanding rash (erythema migrans) at the site of a tick bite 3-30 days after exposure. Fever, headache, joint and muscle pains, and fatigue are also common during the first several weeks. Later features of Lyme disease can include arthritis in one or more joints (often the knee), Bell's palsy and other cranial nerve palsies, meningitis, and carditis (AV block). Lyme disease is rarely fatal. The great majority of Lyme disease cases can be treated very effectively with oral antibiotics for ten days to a few weeks. IV antibiotics for up to 28 days may be needed for some cases of Lyme disease which affect the nervous system, joints, or heart.

In the United States, the highest rates of Lyme disease occur across the eastern seaboard (Maryland to Maine) and in the upper Midwest (northern Wisconsin and southern Minnesota), with the onset of most cases occurring during the summer months. In endemic areas, deer ticks are most abundant in wooded, grassy, and brushy areas ("tick habitat"), especially where deer populations are large.

Reported Cases of Lyme Disease—United States, 2013

One dot is placed randomly within the county of residence for each confirmed case. Though Lyme disease cases have been reported in nearly every state, cases are reported based on the county of residence, not necessarily the county of infection.



1 dot placed randomly within county of residence for each confirmed case

National Center for Emerging and Zoonotic Infectious Diseases
Division of Vector borne Diseases | Bacterial Diseases Branch



Source: federal CDC (http://www.cdc.gov/lyme/resources/ReportedCasesofLymeDisease_2013.pdf)

The first documented case of Maine-acquired Lyme disease was diagnosed in 1986. Since 2003, when 175 cases were confirmed, the numbers of reported cases have increased each year with the exception of 2010. In 2010 there was a slight decrease in cases both in Maine, New England, and the United States, the reasons for which are unknown, but could be attributed to multiple factors including fewer ticks due to weather conditions, and prevention education. In the 1990's the great majority of

Lyme disease cases occurred among residents of south coastal Maine, principally in York County. Disease incidence remains high in the southern and the Mid-Coast areas but is starting to increase in the northern and western counties as well, making the problem statewide. Androscoggin, Aroostook, Hancock, Knox, Lincoln, Penobscot, Piscataquis, Sagadahoc, Washington, and York counties rates increased from 2013 to 2014. Eight counties have rates of Lyme disease higher than the State rate (Cumberland, Hancock, Kennebec, Knox, Lincoln, Sagadahoc, Waldo, and York).

In 2014 (preliminary data as of January 29, 2015) 1,381 confirmed and probable cases of Lyme disease were reported among Maine residents, which is a rate of 104.0 cases of Lyme disease per 100,000 persons in Maine. Forty-three (43%) percent of reported cases were from Cumberland and York County.

Forty-three (43%) percent of cases were female and fifty-seven (57%) percent of cases were male. The median age of cases in 2014 was 49 years of age (average age of 44). The age at diagnosis ranged from 1-95 years. Seventy-two (72%) percent of the cases with a known onset date had onset during June, July, or August (date of onset is missing for 23% of cases). Fifty-eight persons (4% of all cases) were reported as hospitalized with Lyme disease. For further Lyme disease statistics in Maine please see [Appendix 1](#).

B. Other Tick-Borne Diseases in Maine

Anaplasmosis:

Anaplasmosis is a disease caused by the bacteria *Anaplasma phagocytophilum* which infects white blood cells (neutrophils). Anaplasma was previously known as human granulocytic ehrlichiosis (HGE) or human granulocytic anaplasmosis (HGA) but was renamed in 2003 to differentiate between two different organisms that cause similar diseases (Anaplasmosis and Ehrlichiosis). Signs and symptoms of anaplasmosis include: fever, headache, malaise, and body aches. Encephalitis/ meningitis may occur but is rare. Anaplasmosis is transmitted to a person through the bite of an infected deer tick (*Ixodes scapularis*). Preliminary data as of January 29, 2015 showed 191 cases of anaplasmosis reported in 2014. This is double the number of cases that occurred in 2013, the third consecutive year the number has jumped dramatically. Cases occurred in Androscoggin, Aroostook, Cumberland, Hancock, Kennebec, Knox, Lincoln, Oxford, Penobscot, Piscataquis, Sagadahoc, Somerset, and York counties. For further Anaplasmosis disease statistics in Maine please see [Appendix 2](#).

Babesiosis:

Babesiosis is a rare and potentially severe tick-borne disease. Signs of babesiosis usually range from no symptoms at all (asymptomatic) to serious disease. Common symptoms include extreme fatigue, aches, fever, chills, sweating, dark urine, and possibly anemia. People who are infected generally make a full recovery as long as they have a healthy spleen and do not have other diseases that prevent them from fighting off infections. Preliminary data as of January 29, 2015 showed 42 cases of babesiosis reported in 2014 which is a slight increase from 2013. Cases occurred in Androscoggin, Cumberland, Knox, Lincoln, Sagadahoc, and York counties. For further Babesiosis disease statistics in Maine please see [Appendix 2](#).

Ehrlichiosis:

Ehrlichiosis is a disease caused by the bacteria *Ehrlichia chaffeensis* which infects white blood cells (monocytes). Ehrlichia was previously known as human monocytic ehrlichiosis (HME). Signs and

symptoms of ehrlichiosis include: fever, headache, nausea, and body aches. Encephalitis/ meningitis may occur. Ehrlichiosis is transmitted to a person through the bite of an infected lone star tick (*Amblyomma americanum*). Ehrlichiosis is uncommon in Maine as the tick is not commonly found here. However, this may be a disease to watch as the tick appears to be moving north. Preliminary data as of January 29, 2015 showed eight cases (one confirmed, seven probable) of *Ehrlichia chaffensis* reported in 2014 from Androscoggin, Cumberland, Hancock, and Oxford counties. Maine had six probable cases of Ehrlichia/Anaplasma Undetermined, which occurs when serologies are done, but titers are the same for both Ehrlichia and Anaplasma so we cannot tell which organism was present. For further Ehrlichiosis disease statistics in Maine please see [Appendix 2](#).

Powassan:

Powassan is a virus transmitted to humans through the bite of an infected tick. It is the only tick-borne arbovirus occurring the United States and Canada. Approximately 50 cases of Powassan were reported in the United States in the last decade. Signs and symptoms of Powassan include fever, headache, vomiting, weakness, confusion, seizures, and memory loss. Long-term neurologic problems may occur. No cases were reported in Maine in 2014.

Spotted Fever Rickettsiosis:

Spotted Fever Rickettsioses are a group of bacterial illnesses, the most common of which is Rocky Mountain Spotted Fever (RMSF). Signs and symptoms of RMSF include fever, chills, headache, gastrointestinal symptoms, and a maculopapular rash often on the palms and the soles. RMSF is transmitted to a person through the bite of an infected dog tick (*Dermacentor variabilis*). RMSF is not known to be endemic in Maine, but could become an emerging disease. Preliminary data as of January 29, 2015 showed three probable cases of RMSF reported in 2014. Cases were reported from Knox, Sagadahoc, and Waldo counties. For further RMSF disease statistics in Maine please see [Appendix 2](#).

II. The Diagnosis and Treatment Guidelines for Lyme disease recommended by Maine Center for Disease Control and Prevention and the United States Department of Health and Human Services, Centers for Disease Control and Prevention

Maine Center for Disease Control and Prevention continues to adhere to the strongest science-based source of information for the diagnosis and treatment of any infectious disease of public health significance. Nationally, the Infectious Disease Society of America (IDSA) is the leader in setting the standard for clinical practice guidelines on Lyme disease and other tick-borne illnesses:

<http://www.idsociety.org/Index.aspx>.

Lyme disease is diagnosed clinically with the aid of laboratory testing. An erythema migrans in an endemic area is sufficiently distinctive to allow clinical diagnosis in the absence of laboratory confirmation. Patients should be treated on the basis of clinical findings. A two tier testing algorithm is recommended for laboratory testing. First-tier testing is most often an enzyme-linked immunosorbant assay (ELISA) test which, if positive or equivocal, should be followed by an IgM and IgG Immunoblot. IgM is only considered reliable if tested within the first 30 days after symptom onset. Acute and convalescent testing is useful to determine final diagnosis. Untreated patients who remain seronegative despite having symptoms for 6-8 weeks are unlikely to have Lyme disease, and other potential diagnoses should be actively pursued. A diagnosis of Lyme disease made by a clinician may or may not meet the federal surveillance case definition, and therefore may not always be

counted as a case. Maine CDC refers physicians with questions about diagnosis to the IDSA guidelines <http://www.idsociety.org/Index.aspx>.

During 2009 and 2010, IDSA convened a special review of the clinical practice guidelines on Lyme disease to determine whether the 2006 guidelines should be revised and updated. A central question explored at the Review Panel hearing held during July 2009 was whether Lyme disease can persist as a chronic infection that can be successfully treated with an extended course of antibiotics.

The special panel reviewed the medical and scientific literature as well as material submitted by the 18 individuals who testified at the hearing and about 150 other comments submitted by the public. The panel also heard from several representatives of the International Lyme and Associated Diseases Society (ILADS), who argued for more extensive treatment for what ILADS identifies as chronic Lyme disease. The panel met 16 times and the review took more than a year to complete. On April 22, 2010 the special Review Panel “unanimously agreed that no changes need be made to the 2006 Lyme disease treatment guidelines developed by the Infectious Diseases Society of America (IDSA)” (<http://www.idsociety.org/Index.aspx>).

“The Review Panel concurred that all of the recommendations from the 2006 guidelines are medically and scientifically justified in light of the evidence and information provided, including the recommendations that are most contentious: that there is no convincing evidence for the existence of chronic Lyme infection; and that long-term antibiotic treatment of “chronic Lyme disease” is unproven and unwarranted. This recommendation is also supported by federal CDC. Inappropriate use of antibiotics (especially given intravenously) has been shown to lead to deadly blood infections, serious drug reactions and *C. difficile* diarrhea, as well as the creation of antibiotic-resistant bacteria or ‘superbugs.’” (<http://www.idsociety.org/Index.aspx>).

III. A Summary or bibliography of peer reviewed medical literature and studies related to the diagnosis, medical management and the treatment of Lyme disease and other tick-borne illnesses, including, but not limited to, the recognition of chronic Lyme disease and the use of long term antibiotic treatment.

The Infectious Disease Society of America (IDSA) continues to provide leadership in setting the standard for clinical practice guidelines on Lyme disease. <http://www.idsociety.org/Index.aspx>. A bibliography of peer reviewed journal articles published in 2014 as related to these clinical guidelines and other topics of interest is included in [Appendix 3](#). Maine CDC reviews these journal articles to maintain an understanding of the current research and literature available on Lyme disease clinical management and treatment.

IV. The education, training, and guidance provided by Maine Center for Disease Control and Prevention to health care professionals on the current methods of diagnosing and treating Lyme disease and other tick-borne illnesses

Maine CDC continues to emphasize prevention and control of Lyme disease. Surveillance for tick-borne diseases, including Lyme disease, is performed by the Division of Infectious Disease, as Lyme disease is a notifiable disease entity by both medical practitioners and clinical laboratories. Reporting clinicians must submit subsequent clinical and laboratory information following the initial report.

Maine CDC also monitors tick-borne diseases through syndromic surveillance. By querying of participating hospital emergency department (ED) patient visit data, patients that complain of a tick bite are identified. An increase in ED visits for tick bites is usually a precursor for the typical seasonal increase in Lyme disease incidence. Maine CDC newly partnered with the University of Maine Cooperative Extension Office to monitor the identification of deer ticks in Maine through a passive submission system.

During 2014, a spatial analysis of Lyme disease surveillance data was performed at the county level, showing the continual disease progression ([Appendix 4](#)). Outreach and education to clinicians and other healthcare providers to increase provider response to required supplemental clinical and laboratory information is ongoing.

Maine CDC epidemiologists provide consultation to the medical community on tick-borne diseases, offering educational and preventive information as needed. Maine CDC epidemiologists present educational outreach activities and seminars on tick-borne disease prevention targeting the medical community at statewide meetings of school nurses and others. Ongoing educational initiatives are featured on the Maine CDC web site: <http://www.maine.gov/dhhs/mecdc/infectious-disease/epi/vector-borne/lyme/index.shtml>.

During 2014, a **clinical management guide**, "Physician's Reference Manual: Tick-borne Diseases in Maine" was mailed to all emergency rooms, urgent care facilities, infectious disease providers, and pediatricians. This guide includes information on ticks found in Maine and signs/symptoms, laboratory services, diagnosis, and treatment of six tick-borne diseases, including Lyme disease. The cover of this guide is viewable in [Appendix 5](#).

- ~500 copies of this guide were distributed to health care facilities in 2014.

Maine CDC continues to contribute to **national surveillance and prevention activities**. During 2014, Maine CDC epidemiologists represented the State at both local and national meetings including:

- Council of State and Territorial Epidemiologist (CSTE) annual conference held in Memphis Tennessee in June 2014
- Northeast Epidemiology annual conference held in Philadelphia, Pennsylvania in October 2014

V. The education and public awareness activities conducted by Maine Center for Disease Control and Prevention for the prevention of Lyme disease and other tick-borne illnesses

Maine CDC promotes ongoing **educational outreach activities** targeting the public and Maine municipalities. Maine CDC epidemiologists provided consultation to the public on tick-borne diseases, offering educational and preventive information as needed. Maine CDC epidemiologists present educational outreach activities and seminars on tick-borne disease prevention to the general public including:

- 30 presentations or displays held for: providers, hospitals, universities, State employees, health officers, schools, health fairs, private companies, sportsman shows and other events throughout the year.
- Numerous media interviews given by the Director of Maine CDC.
- Numerous talks and grand rounds given by the Director of Maine CDC.

Maine CDC's Vectorborne Epidemiologist chairs the State **Vector-borne Disease Work Group**; a group comprised of both State agencies and private entities, which meets on a bimonthly basis to proactively address surveillance, prevention and control strategies. Members of this group include: Maine Department of Human Services, Maine Department of Conservation, Maine Department of Agriculture, Conservation, and Forestry, Maine Department of Inland Fisheries and Wildlife, Maine Department of Education and Cultural Services, Maine Veterinary Association, Maine Municipal Association, University of Maine Cooperative Extension Services, United States Department of Agriculture, and Maine Department of Public Safety. A full list of members can be found in [Appendix 6](#).

6. Educational efforts by the Vector-borne Work Group included:

- Presentations given on ticks and Lyme disease.
- Presence at vendor shows, television and radio interviews.
- Distribution of educational materials including Lyme brochures, tick spoons, fact sheets, etc.

The Vectorborne Work Group educational sub-committee maintains **educational materials for fifth graders** on Lyme disease prevention. Developed materials are available on the website for use by all schools. A "Ticks: Know Your Enemy" PowerPoint presentation recorded and narrated by Doug Rafferty is also available online.

- The web resource for educators on the subject of Lyme disease was visited 683 times in 2014.

The education subcommittee continues to review and update the materials. This endeavor is being undertaken in close partnership with the Maine Department of Education. The educational materials are available online at: <http://www.maine.gov/dhhs/mecdc/infectious-disease/epi/vector-borne/lyme/lyme-resource-educators.shtml>.

In 2014, Maine CDC began a pilot project with fifth graders to teach the students about tick biology and ecology, as well as present information on tick-borne diseases and prevention. This program was piloted in two schools. The pilot project consisted of a pre-test to gauge knowledge prior to the intervention; a twenty minute PowerPoint presentation on tick biology and ecology as well as disease information; four ten-minute interactive activities; a take-home packet with games, activities, and information for parents; and a post-test to determine changes in knowledge and practices. This was undertaken with the Maine Public Health Corps students who designed the curriculum and assisted with the activities. A biologist presented the biology/ecology information and an epidemiologist presented the disease information. The program was evaluated very highly in both schools, and Maine CDC is currently working on mapping the curriculum to Maine educational objectives in order to expand this project statewide. An example of one of the take-home activities can be found in [Appendix 7](#).

Maine CDC presented a poster ([Appendix 8](#)) entitled "School intervention for vector-borne disease in Maine: Educating fifth graders on tick and mosquito-borne disease and prevention methods," summarizing the results of the pilot project at the Maine Infectious Disease Annual Conference held in Augusta, Maine in November 2014.

Maine CDC's Lyme disease website is continually updated to provide information to the public and to health professionals about Lyme disease in Maine.

- In 2014, the Lyme disease homepage was visited over 12,480 times.
- The tick identification page was visited over 7,300 times
- The FAQ section was visited over 35,400 times

Ongoing educational initiatives featured on the Maine CDC website

(<http://www.maine.gov/dhhs/mecdc/infectious-disease/epi/vector-borne/lyme/index.shtml>) include:

- Lyme disease fact sheet and Q&As
- Tick Identification
- Distribution of Deer Ticks in Maine
- Prevention of Tick-borne Diseases
- Lyme Disease Surveillance Reports from 2006-2013
- Lyme disease awareness and prevention movie

Links are also provided for the educational materials for educators and the fifth grade curriculum, and for other tick-borne diseases including: anaplasmosis, babesiosis, ehrlichiosis, Powassan, and RMSF.

During 2014, **Lyme disease educational materials** were distributed to partners and members of the public. Approximate numbers of materials distributed include:

- ~3,400 Wallet-sized laminated tick identification cards
- ~2,600 Tick remover spoons
- ~1,000 Lyme disease brochures
- ~1,000 Tick ID posters

Members of the Vector-borne Disease Working Group assist Maine CDC in distributing educational materials as widely as possible throughout the State.

Maine CDC releases **Health Alerts, press releases**, and other information on disease concerns of public health significance, including tick-borne diseases. Maine CDC also responds to numerous press inquiries and releases press statements as appropriate (www.mainepublichealth.gov). Official releases in 2014 included:

- 2014 Lyme disease information (HAN) - released May 1st, 2014.
- Winners of Lyme Disease Awareness Contest (PR) – released July 9th, 2014
- Tick-Borne Diseases Update (HAN) – released August 7th, 2014.
- Public Health Update – information on tick-borne diseases included from May 1st, 2014 through December 11, 2014

Pursuant to Legislation enacted in the second regular session of the 126th Legislature, May 2014 was declared to be **Lyme Disease Awareness Month** (PL 494). Educational activities took place the entire month including:

- Press release/ HAN
- Governor's Proclamation of Lyme Disease Awareness Month ([Appendix 9](#))
- Information distributed through social media (Facebook, Twitter, Blog)
- Information distributed through multiple newsletters throughout the state
- Lyme Disease Public Awareness Events held in Augusta, Freeport, and Scarborough
- Presentations throughout the state
- Maine CDC presence at multiple health fairs and conferences

Another major Lyme Disease Awareness month activity was a **statewide poster contest** for students in grades K-8. Students were asked to create a poster with the theme "**Tick Tock**" demonstrating at least one of the four Lyme disease prevention methods (wear protective clothing, use repellent, use

caution in tick infested areas, and perform daily tick checks). Three winning posters were chosen and are available for viewing at the Lyme disease website <http://www.maine.gov/dhhs/mecdc/infectious-disease/epi/vector-borne/lyme/>. One of the winning posters was chosen and turned into a Maine CDC poster ([Appendix 10](#)). This poster was distributed to schools, state parks, board of tourism, and historical sites.

In 2011 Maine CDC launched Lyme disease data on the **Maine Tracking Network Portal**. The data portal allows users to customize their data inquiries and includes data from 2001-2013. Data are broken down by public health district, county, gender, and age group where possible. Data can be viewed as tables, charts, trend charts, or maps. The portal was launched in December 2011, and was accessed 2,440 times during 2014. The Maine Tracking Network Lyme Data are available on Maine CDC's website at www.maine.gov/idepi.

Maine CDC's main **prevention message** is encouraging Maine residents and visitors to use personal protective measures to prevent tick exposures. Personal protective measures include avoiding tick habitat, use of EPA approved repellents, wearing long sleeves and pants, and daily tick checks and tick removal after being in tick habitats (ticks must be attached >24 hours to transmit Lyme disease). Persons who have been in tick habitats should consult a medical provider if they have unexplained rashes, fever, or other unusual illnesses during the first several months after exposure. Possible community approaches to prevent Lyme disease include landscape management and control of deer herd populations.

VI. A summary of laws of other states enacted during the past year related to the diagnosis, treatment, and insurance coverage for Lyme disease and other tick-borne illnesses based on resources made available by federal Centers for Disease Control and Prevention or Other Organizations

Maine CDC performed a search of state and federal legislation and a state by state listing of legislation relating to Lyme disease can be found in [Appendix 11](#).

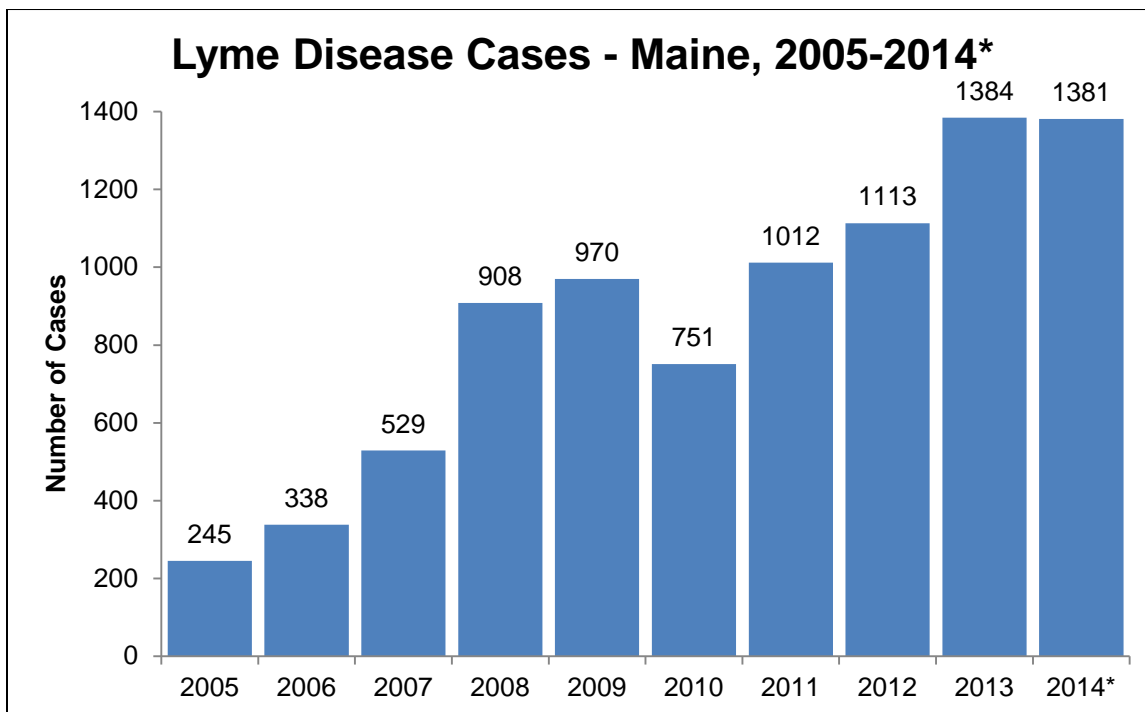
Appendix 1

Maine Lyme disease statistics

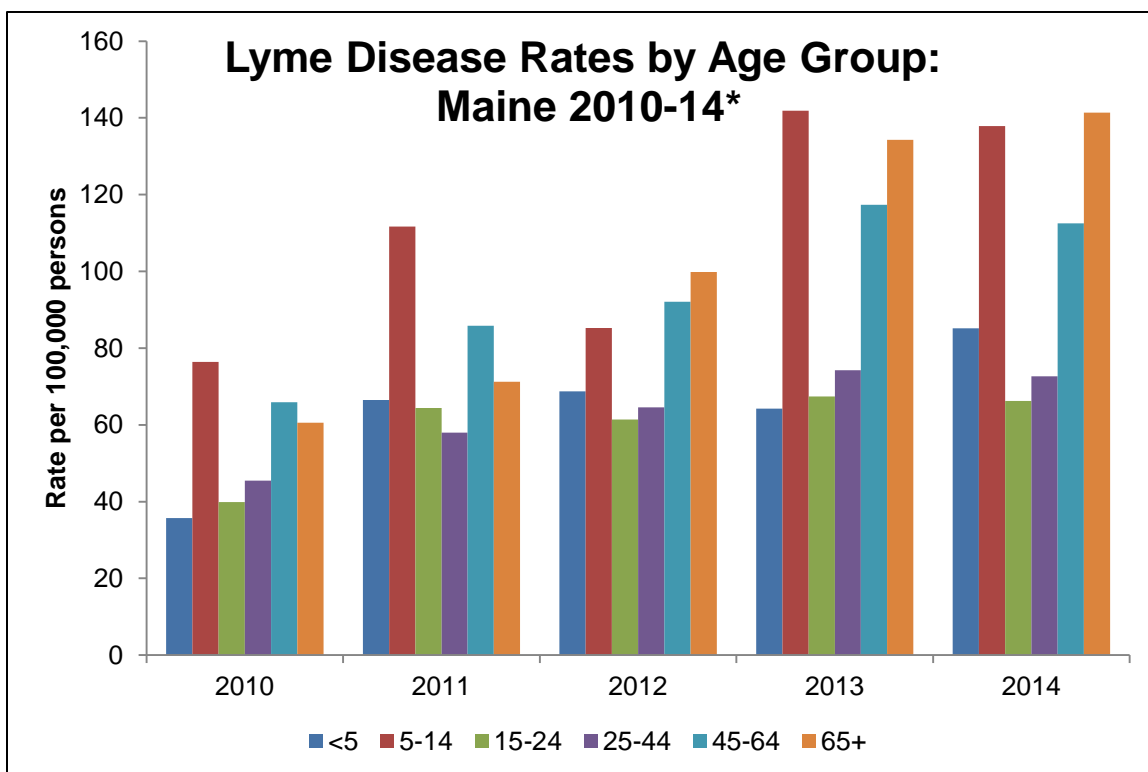
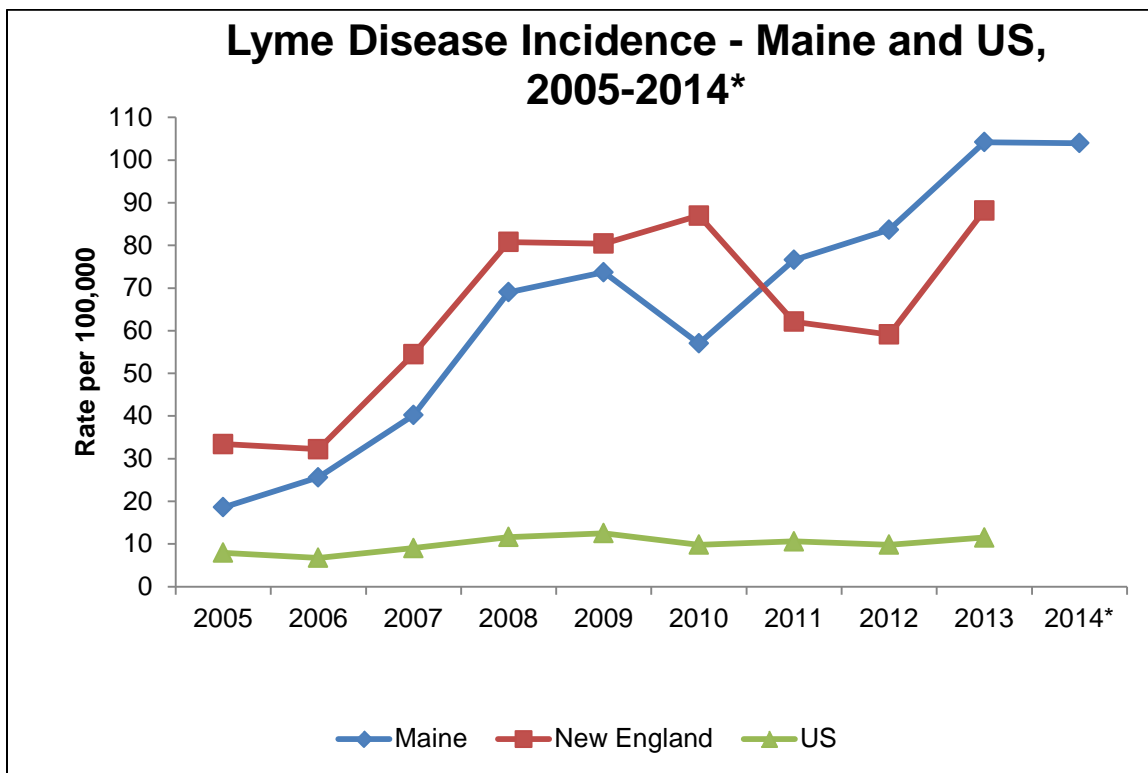
Number and Rate per 100,000 persons of Lyme Disease Cases by County of Residence – Maine, 2010-2014*

County	2010 Count	2010 Rate	2011 Count	2011 Rate	2012 Count	2012 Rate	2013 Count	2013 Rate	2014 Count	2014 Rate
Androscoggin	38	35.7	58	54.6	80	74.3	72	66.9	93	86.4
Aroostook	4	5.6	3	4.2	1	1.4	3	4.3	5	7.1
Cumberland	182	65.1	276	99.8	267	94.0	351	123.0	337	118.1
Franklin	19	64.1	6	20.2	6	19.6	11	36.1	9	29.5
Hancock	28	52.6	43	80.7	59	108.1	100	182.3	119	217.0
Kennebec	88	73.6	132	109.1	128	105.0	183	151.0	136	112.2
Knox	65	160.3	103	254.0	109	274.8	95	240.2	106	268.0
Lincoln	38	110.5	53	154.2	65	190.2	71	208.3	79	231.8
Oxford	15	26.8	28	50.1	25	43.5	50	87.3	42	73.3
Penobscot	12	7.4	11	7.4	21	13.7	38	24.8	50	32.6
Piscataquis	1	5.9	6	35.6	2	11.6	0	0.0	2	11.7
Sagadahoc	45	124.9	47	130.4	59	167.7	55	157.1	63	179.9
Somerset	7	13.8	9	17.7	11	21.2	32	61.9	17	32.9
Waldo	25	67.8	25	65.2	55	141.7	89	228.6	47	120.7
Washington	8	25.1	13	40.7	7	21.6	13	40.4	14	43.5
York	176	28.8	199	98.7	218	109.5	221	110.8	262	131.4
State	751	57.0	1012	77.1	1113	83.7	1384	104.2	1381	104.0

All data includes both confirmed and probable cases.

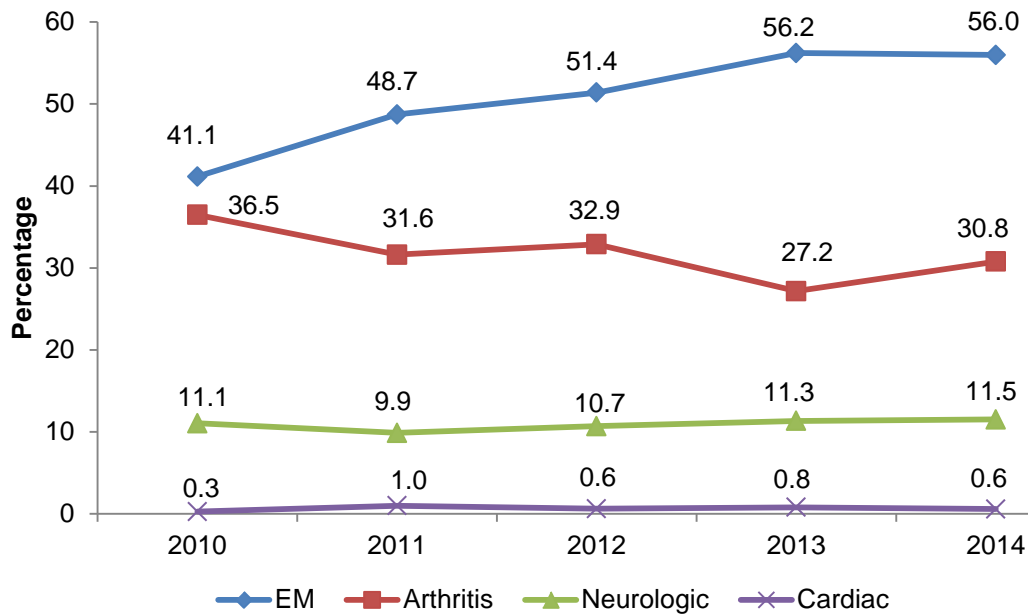


* 2014 data are preliminary as of 01/29/2015



* 2014 data are preliminary as of 01/29/2015

Percentage of Symptoms Reported Among Lyme Disease Cases - Maine, 2010-2014*



* 2014 data are preliminary as of 01/29/2015

Appendix 2 Maine tick-borne disease statistics

Number of Selected Tick-borne Disease Cases by County of Residence – Maine, 2014*

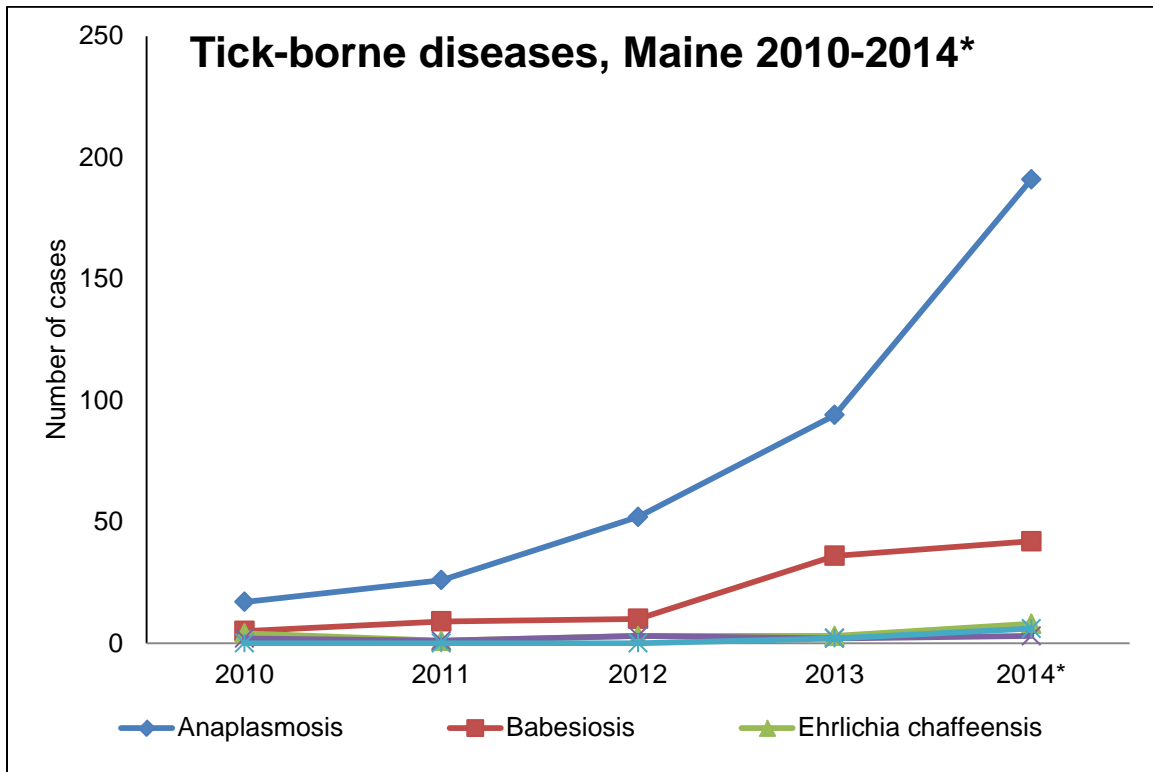
County	Anaplasmosis	Babesiosis	Ehrlichiosis	Ehrlichiosis/ Anaplasmosis Undetermined	RMSF
Androscoggin	11	3	1	1	0
Aroostook	1	0	0	0	0
Cumberland	34	11	5	2	0
Franklin	0	0	0	0	0
Hancock	3	0	1	0	0
Kennebec	7	0	0	0	0
Knox	32	7	0	1	1
Lincoln	27	3	0	1	0
Oxford	5	0	1	0	0
Penobscot	3	0	0	0	0
Piscataquis	1	0	0	0	0
Sagadahoc	22	3	0	0	1
Somerset	1	0	0	0	0
Waldo	0	0	0	0	1
Washington	0	0	0	0	0
York	44	15	0	1	0
Total	191	42	8	6	3

* 2014 data are preliminary as of 01/29/2015

Number of Selected Tick-borne Disease Cases– Maine, 2005 - 2014*

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014*
Anaplasmosis	4	10	9	17	15	17	26	52	94	191
Babesiosis	11	9	11	11	3	5	9	10	36	42
Ehrlichia chaffeensis	1	4	3	1	1	4	1	3	3	8
Ehr/Ana undetermined	0	0	0	0	0	0	0	0	2	6
RMSF	NR	NR	NR	1	5	2	1	3	2	3
Powassan	0	0	0	0	0	0	0	0	1	0

* 2014 data are preliminary as of 01/29/2015



* 2014 data are preliminary as of 01/29/2015

Appendix 3

Peer-reviewed medical literature related to medical management and treatment of Lyme disease - bibliography

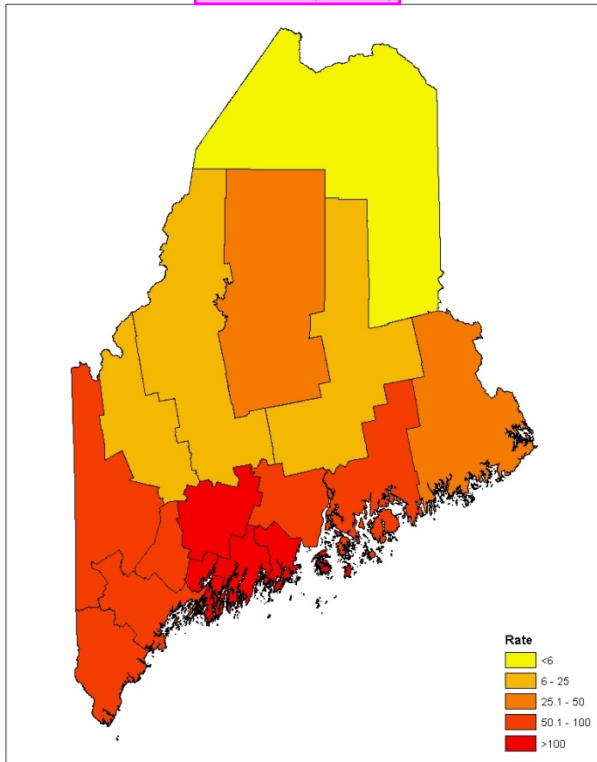
- Agüero-Rosenfeld ME, Wormser GP. (2014). Lyme disease: diagnostic issues and controversies. *Expert Rev Mol Diagn.* (1;15). PMID: 25482091
- Ali A, Vitulano L, Lee R, Weiss TR, Colson ER. (2014). Experiences of patients identifying with chronic Lyme disease in the healthcare system: a qualitative study. *BMC Fam Pract.* (1;15). PMID: 24885888
- Berende A, Ter Hofstede H, Donders A, van Middendorp H, Kessels R, Adang et al. (2014). Persistent Lyme Empiric Antibiotic Study Europe (PLEASE) - design of a randomized controlled trial of prolonged antibiotic treatment in patients with persistent symptoms attributed to Lyme borreliosis. *BMC Infect Dis.* (16;14). PMID: 25318999
- Borchers AT, Keen CL, Huntley AC, Gershwin ME. (2014). Lyme disease: A rigorous review of diagnostic criteria and treatment. *J Autoimmun.* (10;16). PMID: 25451629
- Borgermans L, Goderis G, Vandevoorde J, Devroey D. (2014). Relevance of chronic Lyme disease to family medicine as a complex multidimensional chronic disease construct: a systematic review. *Int J Family Med.* Epub (11;24). PMID: 25506429
- Brett ME, Hinckley AF, Zielinski-Gutierrez EC, Mead PS. (2014). U.S. healthcare providers' experience with Lyme and other tick-borne diseases. *Tick Borne Dis.* (5;4). PMID: 24713280
- Crowder LA, Yedlin VA, Weinstein ER, Kortte KB, Aucott JN. (2014). Lyme disease and post-treatment Lyme disease syndrome: the neglected disease in our own backyard. *Public Health.* (128;9). PMID: 25213101
- DeBiasi RL. (2014). A concise critical analysis of serologic testing for the diagnosis of Lyme disease. *Curr Infect Dis Rep.* (12;16). PMID: 25351855
- Fallon BA, Pavlicova M, Coffino SW, Brenner C. (2014). A comparison of Lyme disease serologic test results from 4 laboratories in patients with persistent symptoms after antibiotic treatment. *Clin Infect Dis.* (12;59). PMID: 25182244
- Hinckley AF, Connally NP, Meek JI, Johnson BJ, Kemperman MM, Feldman KA et al. (2014). Lyme disease testing by large commercial laboratories in the United States. *Clin Infect Dis.* Sep 1;59(5):676-81. PMID: 24879782
- Johnson L, Wilcox S, Mankoff J, Stricker RB. (2014). Severity of chronic Lyme disease compared to other chronic conditions: a quality of life survey. *PeerJ.* (27;2). PMID: 24749006
- Lantos PM, Auwaerter PG, Wormser GP. (2014). A systematic review of *Borrelia burgdorferi* morphologic variants does not support a role in chronic Lyme disease. *Clin Infect Dis.* (3;5). PMID: 24336823

- Lantos PM, Wormser GP. (2014). Chronic coinfections in patients diagnosed with chronic Lyme disease: a systematic review. *Am J Med.* (11;127). PMID: 24929022
- Lobraico J, Butler A, Petrini J, Ahmadi R. (2014). New insights into stages of Lyme disease symptoms from a novel hospital-based registry. *J Prim Care Community Health.* (10;5). PMID: 24970880
- Molins CR, Sexton C, Young JW, Ashton LV, Pappert R, Beard CB, Schriefer ME. (2014). Collection and characterization of samples for establishment of a serum repository for Lyme disease diagnostic test development and evaluation. *J Clin Microbiol.* (52;10). PMID: 25122862
- Nelson C, Hojvat S, Johnson B, Petersen J, Schriefer M, Beard CB, Petersen L, Mead P. (2014). Concerns regarding a new culture method for *Borrelia burgdorferi* not approved for the diagnosis of Lyme disease. *MMWR.* Apr;18;63(15):333. PMID: 24739342
- Pearson S. (2014). Recognising and understanding Lyme disease. *Nurs Stand.* (9;29). PMID: 25182921
- Perea AE, Hinckley AF, Mead PS. (2014). Tick Bite Prophylaxis: Results from a 2012 Survey of Healthcare Providers. *Zoonoses Public Health* (8;22). PMID: 25244410
- Rebman AW, Crowder LA, Kirkpatrick A, Aucott JN.(2014). Characteristics of seroconversion and implications for diagnosis of post-treatment Lyme disease syndrome: acute and convalescent serology among a prospective cohort of early Lyme disease patients. *Clin Rheumatol.* (4;13). PMID: 24924604
- Robinson S. (2014). Lyme Disease in Maine: a Comparison of NEDSS Surveillance Data and Maine Health Data Organization Hospital Discharge data. *Online J Public Health Inform.* (5;3). PMID: 24678383
- Smith RP Jr, Elias SP, Borelli TJ, Missaghi B, York BJ, Kessler RA, et al. (2014). Human babesiosis, Maine, USA, 1995-2011. *Emerg Infect Dis.* (10;30). PMID: 25272145

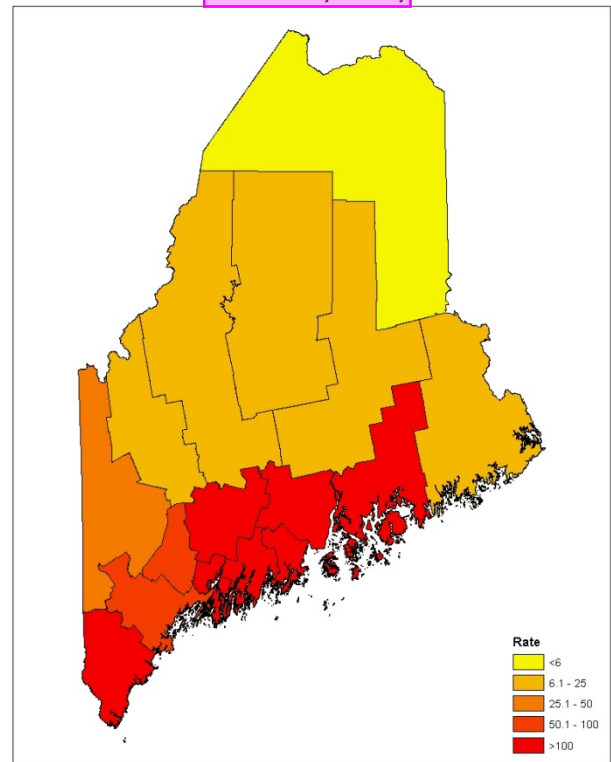
Appendix 4

Lyme Disease Cases per 100,000 people (Rate) – Maine, 2011-2014

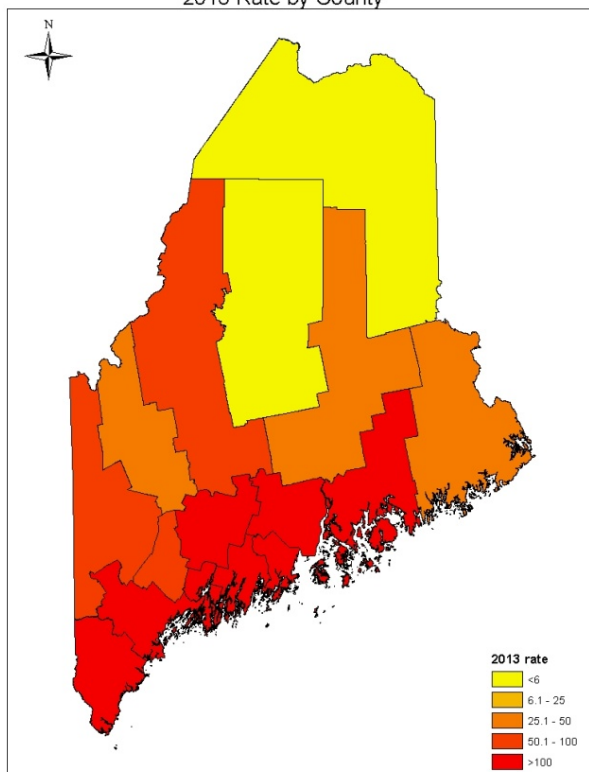
2011 Rate by County



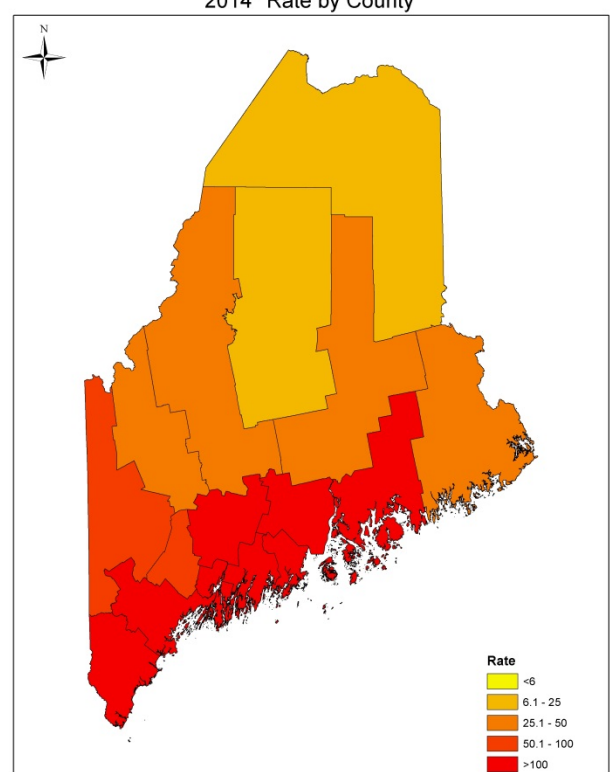
2012 Rate by County



2013 Rate by County



2014* Rate by County



Preliminary data as of 1/29/2015

Appendix 5

Physician's Reference Guide



Appendix 6

2014 Maine Vector-borne Work Group

Chair: Sara Robinson, Maine Center for Disease Control and Prevention (Maine CDC)

Adams, Justin	Municipal Pest Management
Andrews, Wayne	Atlantic Pest Control
Bills, Anne	Maine Board of Pesticides Control
DiFedele, Lisa	Maine CDC
Dill, Jim	Maine Cooperative Extension
Donahue, Charlene	Maine Forest Service
Dube, Nancy	Maine Department of Education
Elias, Susan	Maine Medical Center Research Institute
Fish, Gary	Maine Board of Pesticides Control
Foss, Kimberly	Municipal Pest Management
Green, Katy	MOFGA
Groden, Ellie	University of Maine Orono
Hicks, Lebelles	Maine Board of Pesticides Control
Jennings, Henry	Maine Board of Pesticides Control
Kantar, Lee	Maine Department of Inland Fisheries and Wildlife
Keenan, Patrick	Biodiversity Research Institute
Kirby, Clay	Maine Cooperative Extension
Lacombe, Eleanor	Maine Medical Center Research Institute
Lichtenwalner, Anne	University of Maine, Animal Health Laboratory
Lubelczyk, Charles	Maine Medical Center Research Institute
McCutchan, Thomas	Maine Insectary Services
McEvoy, Elizabeth O.	Maine Department of Agriculture, Conservation, and Forestry
Morrison, Mike	Municipal Pest Management
Murray, Kathy	Maine Department of Agriculture, Conservation, and Forestry
Rand, Peter	Maine Medical Center Research Institute
Ravana, Kyle	Maine Department of Inland Fisheries and Wildlife
Ridky, Chip	United States Department of Agriculture
Robinson, Sara	Maine CDC
Spaulding, Heather	MOFGA
St. Amand, Ted	Atlantic Pest Solutions
Smith, Rob	Maine Medical Center Research Institute
Storch, Dick	University of Maine, Environmental Services
Stratton, Robert D.	Maine Department of Inland Fisheries and Wildlife
Struble, Dave	Maine Forest Service
Sullivan, Kelsey	Maine Department of Inland Fisheries and Wildlife
Szantyr, Beatrice	Physician, Lincoln, Maine
Tsomides, Leon	Maine Department of Environmental Protection
Walsh, Michele	Maine Department of Agriculture, Conservation, and Forestry
Webber, Lori	Maine CDC

Appendix 7 Sample 5th Grade Activity

Tick Word Search

Can you find the tick related words hidden in the puzzle?



Circle the words you find in each category:

Transmission

DEER TICK
 SUMMER
 BITE
 LYME
 GRASS

Symptoms

RASH
 WEAK
 JOINTS
 SKIN

Prevention

SOCKS
 PANTS
 SPRAY
 CHECK

Removal

PARENT
 NURSE
 TWEEZERS
 PULL

Appendix 8



School intervention for vector-borne diseases in Maine: Educating fifth graders on tick- and mosquito-borne diseases and prevention methods

Jacey Keller, MPH Candidate^{1,2}; Nikki Busmanis, MPH Candidate^{1,2}; Carissa Parent, MPH Candidate^{1,2};

Sara Robinson, MPH¹; Judy Tupper, DHed, CHES, CPPS²

¹ Maine Center for Disease Control and Prevention; ² Muskie School of Public Service



Background:

Maine is experiencing a statewide increase in tick- and mosquito-borne illnesses. Children ages 5-14 years are a high-risk cohort for these vector-borne illnesses. The Public Health Education Corps (PHEC), a collaboration between Maine Center for Disease Control and Prevention (Maine CDC) and the Muskie School of Public Service, prepared an educational pilot program for fifth grade students on tick- and mosquito-borne diseases and prevention methods. PHEC hypothesized that students at the school in the high-incidence area would have a larger knowledge-base about ticks and mosquitoes.

Methods:

- Gathered and developed program materials, including:
 - Pre- and post-tests
 - PowerPoint presentations of tick and mosquito biology, tick- and mosquito-borne diseases, and prevention methods
 - Hands-on activities to identify habitats of ticks and mosquitoes, disease prevention methods, and disease symptom identification
 - Activity booklets reinforcing information from presentations
 - Take-home fact sheets
- Selected a school located in a high-incidence area and a school located in a low-incidence area of vector-borne activity to participate
- Students completed pre-tests prior to presentations
- PHEC, Maine CDC epidemiologist, and biologists presented and led hands-on activities at the schools
- Students completed post-tests after presentations; instructors completed feedback forms identifying opportunities of improvement
- PHEC compared pre- and post-tests to find which learning objectives had been met
- PHEC revised the program based on results and feedback to ensure the presentation and materials aligned with the learning objectives

Learning Objectives:

Learning objectives for the program were designed to increase students' ability to:

- Identify symptoms of mosquito-borne diseases
- Demonstrate knowledge of methods of preventing mosquito bites
- Identify mosquito reduction opportunities around their homes
- Identify deer ticks and dog ticks
- Identify symptoms of tick-borne diseases
- Demonstrate knowledge of methods of preventing tick bites

Results:

- Tick and mosquito pre- and post-test scores revealed an improvement in content knowledge at both schools.
- Most significant improvements were in knowledge of tick identification, diseases carried by mosquitoes, and bite prevention methods.
- Participants from both schools demonstrated an improvement in their ability to identify the symptoms of tick- and mosquito-borne diseases, recognize recommended prevention methods, identify a deer tick, and recommend tick and mosquito reduction opportunities around their homes.

Pre- and Post-test Results:

Figure 1: Mosquito Pre- and Post-Test Results of Correct Answers

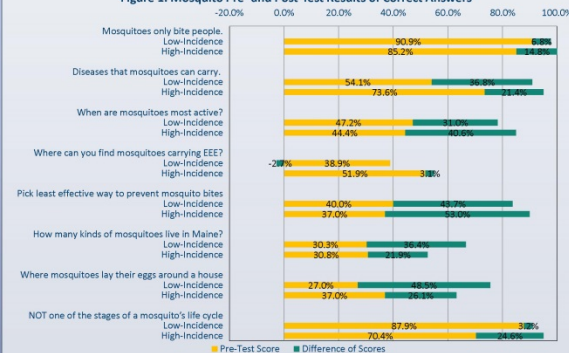
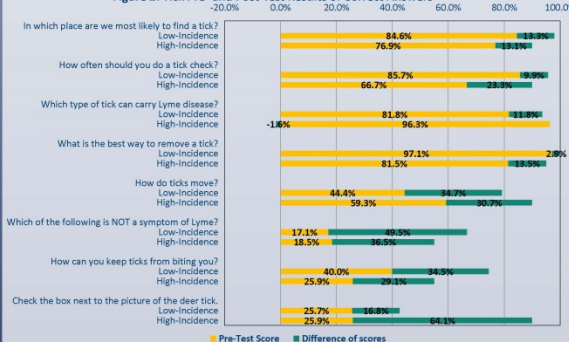
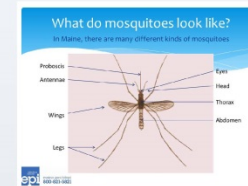


Figure 2: Tick Pre- and Post-Test Results of Correct Answers

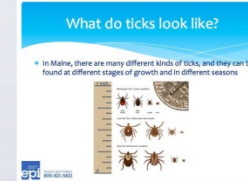


Sample Materials:

Mosquitoes:



Ticks:



Conclusion:

- Pre- and post-test scores did not indicate a significantly higher knowledge-base of ticks and mosquitoes for students in the higher-incidence area for vector-borne activity.
- Some variation in post-test improvement may be related to situational differences such as length and location of educational presentations and number of participants.
- PHEC is now working to package the program to release to Maine schools via the Maine CDC website to encourage tick- and mosquito-borne disease education.

For More Information:

Maine Center for Disease Control and Prevention
1-800-821-5821
www.maine.gov/idepi

Appendix 9

Governor's Proclamation



WHEREAS, the Maine Center for Disease Control and Prevention reports that in 2013, more than 1,350 cases of Lyme Disease have been reported; and

WHEREAS, the actual incidence of Lyme disease is far more than reported; and

WHEREAS, public awareness and education are necessary to educate and promote awareness of Lyme disease and other tick-borne illnesses; and

WHEREAS, the 124th Maine Legislature enacted Public Law Chapter 494, L.D. 1709, Item 1, *An Act to Enhance Public Awareness of Lyme Disease*

NOW, THEREFORE, I, PAUL R. LEPAGE, Governor of the State of Maine, do hereby proclaim the month of May as


LYME DISEASE AWARENESS MONTH

throughout the State of Maine, and urge the public to become aware of the steps that can be taken to reduce the risk of tick-borne illnesses.

In testimony whereof, I have caused the Great Seal of the State to be hereunto affixed GIVEN under my hand at Augusta this eighth day of May Two Thousand Fourteen


Paul R. LePage
Governor




Matthew Dunlap
Secretary of State

TRUE ATTESTED COPY

Appendix 10

Maine CDC Lyme Disease Awareness Month Poster 2013



Appendix 11

Recent Lyme Legislation

Federal

Title: Tick-borne Disease Research Transparency and Accountability Act of 2014 (H.R. 4701)
Status: Passed House; received in the Senate

Delaware

Title: Establishing A Joint Executive and Legislative Task Force to Study and Make Findings and Recommendations Regarding the Need for a Unified Strategy to Combat Lyme Disease (SJR10)
Status: Passed

Maryland

Title: Maryland-National Capital Park and Planning Commission Park Police - Workers' Compensation - Lyme Disease Presumption - Repeal of Termination Date PG/MC 110-14 (HB977)
Status: Passed

New York

Title: An act to amend the public health law, in relation to the identification, charging, reporting and investigation of charges of professional misconduct by health care professionals (S7854/A7558B)
Status: Passed

Title: Relates to creating the 21st century workgroup for disease elimination and reduction (A00829)
Status: Passed

Ohio

Title: Notice required for test for Lyme disease (4730, 4731)
Status: Passed (repealed effective 03/19/15)

Pennsylvania

Title: Urging the Pennsylvania Game Commission to include Lyme disease education in the Hunter-Trapper Education training courses that are offered to hunters each year. (SR338)
Status: Passed

Title: An Act establishing a task force on Lyme disease and related maladies; and providing for powers and duties of the task force, the Department of Health, the Department of Conservation and Natural Resources and the Pennsylvania Game Commission to execute surveillance, prevention and education strategies (SB177; Act 83)
Status: Passed

Rhode Island

Title: House Resolution Respectfully Requesting the Department Of Health to Develop a Lyme Disease Awareness Program (H7641)

Status: Passed

Title: Lyme Disease Diagnosis And Treatment (S2924, H7123)

Status: Passed

Vermont

Title: An act relating to Lyme disease and other tick-borne illnesses. (H123, S112)

Status: Passed

Wisconsin

Title: Required notices by a health care provider who orders a test for the presence of Lyme disease (AB751)

Status: Did not pass