



Paul R. LePage, Governor

Mary C. Mayhew, Commissioner

Department of Health and Human Services
Maine Center for Disease Control and Prevention
286 Water Street
11 State House Station
Augusta, Maine 04333-0011
Tel.: (207) 287-8016; Fax: (207) 287-9058
TTY Users: Dial 711 (Maine Relay)

Report to Maine Legislature

Lyme Disease

February 1, 2013

Sheila Pinette, DO, Director Maine CDC

Stephen D. Sears, MD, MPH, State Epidemiologist

Lori Wolanski, MPH, Director, Division of Infectious Disease

Anne Sites, MPH MCHES, Program Manager, Division of Infectious Disease

Sara Robinson, MPH, Epidemiologist, Division of Infectious Disease

Megan Saunders, MSPH, Epidemiologist, 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 fifth annual report to the Legislature and includes an update on activities conducted during 2012.

Executive Summary

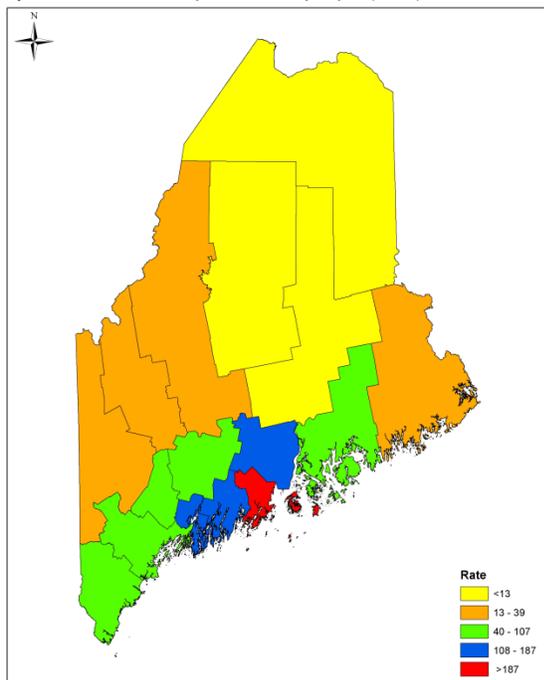
Lyme disease is a reportable condition in the state of Maine. The goal of Lyme disease surveillance is to help define demographic, geographic and seasonal distribution; monitor disease trends; identify risk factors for transmission; and promote prevention and education efforts among the public and medical 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 is likely to be an under-representation of the true burden of Lyme disease in Maine.

Maine Lyme Disease Summary, 2012 (Preliminary data as of January 15, 2013)

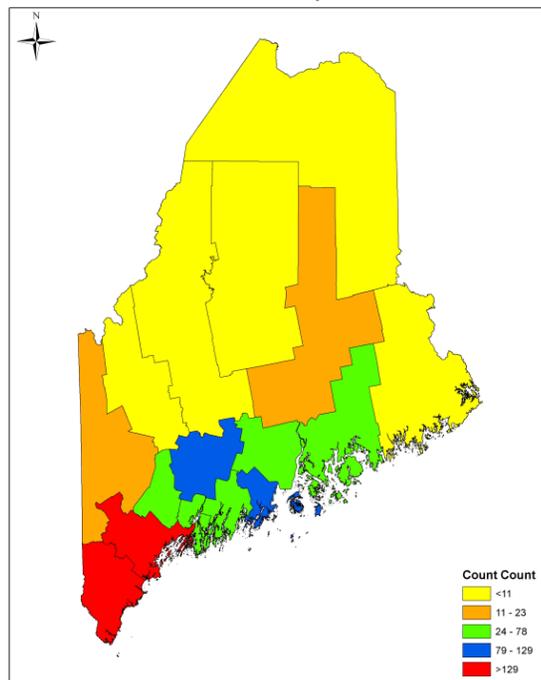
- 1095 confirmed and probable cases
- Symptoms of reported cases* of Lyme disease in Maine included:
 - Erythema Migrans (characteristic expanding rash): 562 cases (51%)
 - Arthritis (joint swelling): 360 cases (33%)
 - Neurological (Bells Palsy or other cranial neuritis): 115 cases (11%)

* Cases could report more than one symptom
- Hospitalization occurred in 47 cases (4%).
- Among case patients with a reported date of symptom onset, 64% began experiencing symptoms during June, July, or August. Date of symptom onset is missing for 23% of cases.
- Middle aged adults (45-64) represent the highest number of cases.

Lyme Disease Cases per 100,000 people (Rate) - Maine, 2012*



Confirmed and Probable Cases of Lyme Disease - Maine, 2012*



* 2012 data are preliminary as of 01/15/2013

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, if ever, fatal. The great majority of Lyme disease cases can be treated very effectively with oral antibiotics for 10 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, 2011

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.



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_2011.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 through 2012 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. In recent years, however, disease incidence has increased steadily in the northern parts of the state including increases in 2012 in Androscoggin, Hancock, Knox, Lincoln, Penobscot, Sagadahoc, Somerset, and Waldo counties.

In 2012 (preliminary data as of January 15, 2013) 1,095 confirmed and probable cases of Lyme disease were reported among Maine residents, which is a rate of 82.4 cases of Lyme disease per 100,000 persons in Maine. Forty-four percent of the reported cases were from Cumberland and York Counties (44%).

Fifty-six percent of cases were male and 44% were female. The median age of cases in 2012 was 48 years of age (average age of 43), which is slightly higher than the median age for the previous 5 years. The age at diagnosis ranges from 1-93 years. Sixty-four percent of the cases had onset during June, July, or August (date of onset is missing for 23% of cases). Forty-seven persons (4% of all cases) were reported to have been 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 15, 2013 showed 52 cases (36 confirmed and 16 probable) of anaplasmosis reported in 2012. This is double the number of confirmed and probable cases that occurred in 2011. Cases occurred in Androscoggin, Cumberland, Hancock, Kennebec, Knox, Lincoln, Penobscot, Somerset, Washington, and York counties. Anaplasma is considered an emerging disease in Maine as more cases are being found farther north than in previous years.

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 15, 2013 showed 10 cases (8 confirmed and 2 probable) of babesiosis reported in 2012. Cases occurred in Cumberland, Kennebec, Knox, Penobscot, and York counties. Babesiosis is also an emerging disease in Maine, and became a nationally notifiable disease on January 1, 2011.

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 15, 2013 showed 3 cases (1 confirmed and 2 probable) of ehrlichiosis reported in 2012. The cases occurred in Lincoln, Sagadahoc, and York counties.

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 15, 2013 showed 3 probable cases of RMSF reported in 2012. Cases were reported from Hancock, Knox, and Penobscot counties.

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 2012 as related to these clinical guidelines and other topics of interest is included in [Appendix 2](#). 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 continues to partner with Maine Medical Center Research Institute to monitor the identification of deer ticks in Maine. A map of deer ticks by town of submitter is included in [Appendix 3](#).

During 2012, a spatial analysis of Lyme disease surveillance data was performed at the county level, showing the disease progressing north through the state ([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 implemented a trial of a reporting method for early Lyme disease (*erythema migrans*) in four practices in the mid-coast region of Maine. The trial of the reporting option, known as the “EM Reporting Registry” ([Appendix 5](#)) ran from June 1st through September 30th of 2012. The registry resembled a line list and was designed to reduce the reporting burden of early Lyme disease on clinicians. Clinicians completed the registry with the minimum amount of information required for a clinical diagnosis of Lyme disease and faxed the document to Maine CDC on a weekly basis where Maine CDC epidemiologists documented the reports. Following the 17 weeks of the trial, a follow-up questionnaire was distributed to participants to evaluate the trial. Overall, the initial trial went well and a larger scale trial is being planned for 2013.

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 2012, a **clinical management guide**, “Physician’s Reference Manual: Tick-borne Diseases in Maine, December 2012” was available to providers in Maine upon request. 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. A copy of this guide is included in [Appendix 6](#).

- ~1,000 copies of this guide were distributed to health care facilities in 2012.

Maine CDC continues to contribute to **national surveillance and prevention activities**. During 2012, Maine CDC epidemiologists represented the State at both local and national meetings including:

- Council of State and Territorial Epidemiologist (CSTE) annual conference held in Omaha, Nebraska in June 2012
- American Society of Tropical Medicine and Hygiene (ASTMH) annual conference held in Atlanta, Georgia in November 2012
- Northeast Epidemiology Conference held in Meredith, New Hampshire in October 2012

Maine CDC epidemiologists also presented a poster ([Appendix 7](#)) on Lyme disease at the Maine Infectious Disease annual conference held in Augusta, Maine in November 2012, and at the Northeastern Mosquito Control Association annual conference in Mystic, Connecticut in December 2012.

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 tickborne disease prevention to the general public including:

- Over 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.
- Over 15 television or newspaper interviews given by the State Epidemiologist.

The Maine CDC State 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 8](#).

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

- Over 30 presentations given on ticks and Lyme disease.
- Presence at vendor shows, television and radio interviews.
- Distribution of educational materials including:
 - ~2,000 Ticks in Maine brochures
 - ~2,000 Protecting Yourself from Lyme Disease brochures
 - ~8,000 tick identification cards
 - ~4,000 tick removal spoons
 - ~2,000 federal CDC Lyme Disease Public Information Guides

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 educational portion of the Lyme disease website was visited 560 times in 2012.

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>.

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 2012, the Lyme disease homepage was visited over 6,400 times.
- The teacher’s version of the “Ticks: Know Your Enemy” PowerPoint was visited 2,440 times in 2012.

Ongoing educational initiatives featured on the Maine CDC web

site(<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
- Proper Use of Insect Repellents (Q & A)
- Prevention of Tick-borne Diseases
- Lyme Disease Surveillance Reports from 2006-2011
- Lyme disease awareness and prevention movie

- Tick Identification game

Links are also provided for the educational materials for educators and the 5th grade curriculum, and for other tick-borne diseases including: powassan, babesiosis, anaplasmosis, and ehrlichiosis.

During 2012, **Lyme disease educational materials** were distributed to partners and members of the public. Total materials distributed include:

- 13,411 wallet-sized laminated tick identification cards
- 2,512 Lyme disease brochures
- 502 Lyme disease fact sheets
- 252 Lyme disease DVDs
- 5,093 Tick remover spoons
- 658 Tick removal kits
- 413 Tick-borne diseases informational cards

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

In partnership with Maine Medical Center Research Institute, Maine CDC provides Lyme disease education and prevention materials to members of the public that submit ticks to the Research Institute for identification. Copies of these materials are included in [Appendix 9](#).

Maine CDC releases **Health Alerts** 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 2012 included:

- Information for Providers on Lyme Disease HAN issued May 1, 2012
- “May is Lyme Disease Awareness Month” Press Release issued May 24, 2012
- “Maine CDC Announces Lyme Disease Poster Winners” Press Release issued June 26, 2012
- Increase in Anaplasmosis HAN issued August 9, 2012

Pursuant to Legislation enacted in the second regular session of the 125th Legislature, May 2012 was declared to be **Lyme Disease Awareness month** (PL 494). Educational activities took place the entire month including:

- Press release/ HAN
- Governor’s Re proclamation of Lyme Disease Awareness Month ([Appendix 10](#))
- Information distributed through social media (Facebook, Twitter, Blog)
- Information distributed through newsletters including:
 - Federally Qualified Health Centers
 - Maine Air National Guard
 - Maine Catholic Diocese
 - Maine Department of Environmental Protection
 - Maine Guard
 - Maine Guides Association
 - Maine Medical Association
 - Maine Osteopathic Association
 - Maine Summer Camps
 - Maine Veterinary Medical Association

- Medical Professionals Health Program at Maine Medical Association
- School Nurses Association
- University of Maine Cooperative Extension
- USDA-APHIS Veterinary Services Area Office – New England
- Wellness Works ME
- Lyme Disease Public Awareness Events in Bangor, Freeport, and Scarborough
- Presentations throughout the state
- Maine CDC presence at multiple health fairs and conferences
- Distribution of education materials including a newly created Lyme Disease Awareness Bracelet ([Appendix 11](#)).

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 “**Know Ticks, No Lyme**” 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). Over 60 posters were received and winners chosen in four age categories. All winning posters 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 12](#)). This poster was distributed to schools, state parks, board of tourism, and historical sites.

A new Lyme Disease Awareness month activity in 2012 was a **statewide public service announcement contest**. Students were invited to create a brief audio clip that focused on 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). The winner was recorded by 92 Moose and is available on Maine CDC’s Lyme disease website at <http://www.maine.gov/dhhs/mecdc/infectious-disease/epi/vector-borne/lyme/>.

In 2012 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 2001-2011. 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 2012, and was accessed 79 times during December. The Maine Tracking Network Lyme Data are available on Maine CDC’s website at <http://www.maine.gov/dhhs/mecdc/infectious-disease/epi/vector-borne/index.shtml>.

Our 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 13](#).

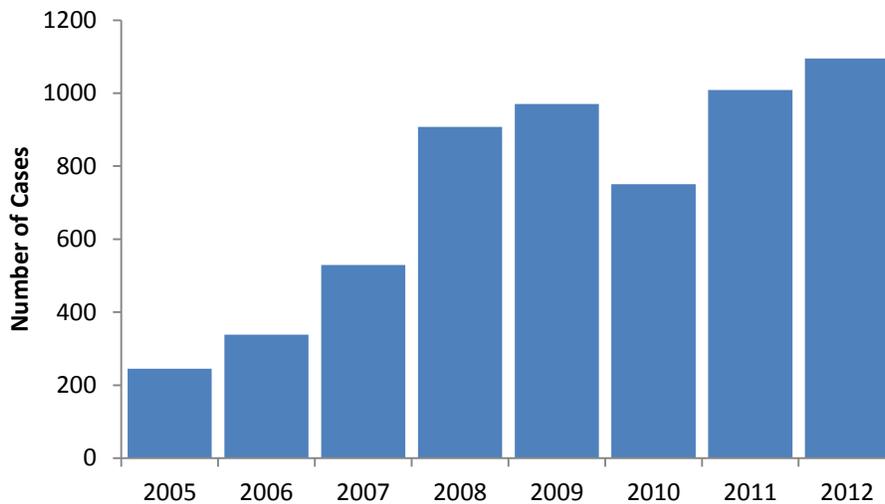
Appendix 1

Number and Rate per 100,000 persons of Lyme Disease Cases by County of Residence – Maine, 2008-2012*

| County | 2008 | | 2009 | | 2010 | | 2011 | | 2012 | |
|--------------|------------|-----------|------------|-------------|------------|-------------|-------------|-------------|-------------|-------------|
| | Count | Rate | Count | Rate | Count | Rate | Count | Rate | Count | Rate |
| Androscoggin | 36 | 33.7 | 56 | 52.4 | 38 | 35.7 | 58 | 54.6 | 78 | 72.6 |
| Aroostook | 4 | 5.6 | 7 | 9.8 | 4 | 5.6 | 3 | 4.2 | 1 | 1.4 |
| Cumberland | 228 | 82.6 | 276 | 100.0 | 180 | 65.1 | 276 | 99.8 | 266 | 94.2 |
| Franklin | 4 | 13.4 | 15 | 50.2 | 19 | 64.1 | 5 | 20.2 | 6 | 19.5 |
| Hancock | 13 | 24.5 | 34 | 64.0 | 28 | 52.6 | 43 | 80.7 | 58 | 106.3 |
| Kennebec | 114 | 94.2 | 99 | 81.8 | 89 | 73.6 | 130 | 107.5 | 129 | 105.8 |
| Knox | 72 | 177 | 69 | 169.6 | 65 | 160.3 | 103 | 254.0 | 107 | 269.5 |
| Lincoln | 40 | 115.5 | 45 | 130.0 | 38 | 110.5 | 53 | 154.2 | 64 | 187.0 |
| Oxford | 21 | 37 | 15 | 26.4 | 15 | 26.8 | 28 | 50.1 | 23 | 39.9 |
| Penobscot | 13 | 8.7 | 8 | 5.4 | 11 | 7.4 | 11 | 7.4 | 20 | 13.0 |
| Piscataquis | 1 | 5.9 | 2 | 11.8 | 1 | 5.9 | 6 | 35.6 | 2 | 11.5 |
| Sagadahoc | 40 | 110.1 | 51 | 140.4 | 45 | 124.9 | 47 | 130.4 | 57 | 161.9 |
| Somerset | 9 | 17.5 | 6 | 11.7 | 7 | 13.8 | 9 | 17.7 | 11 | 21.1 |
| Waldo | 19 | 49.6 | 19 | 49.6 | 26 | 67.8 | 25 | 65.2 | 54 | 139.4 |
| Washington | 3 | 9.2 | 4 | 12.3 | 8 | 25.1 | 13 | 40.7 | 7 | 21.5 |
| York | 291 | 144.3 | 264 | 130.9 | 177 | 28.8 | 198 | 98.2 | 212 | 107.0 |
| Maine | 908 | 69 | 970 | 73.7 | 751 | 57.0 | 1009 | 76.9 | 1095 | 82.4 |

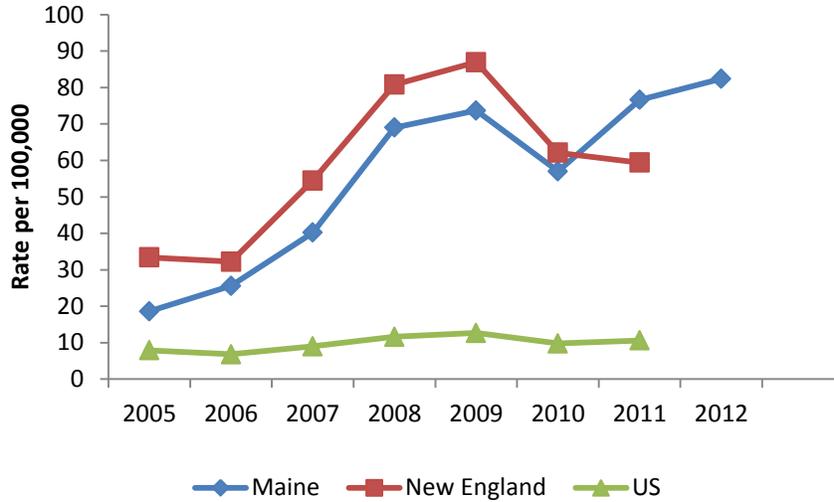
All data includes both confirmed and probable cases

Lyme Disease Cases - Maine, 2006-2012*

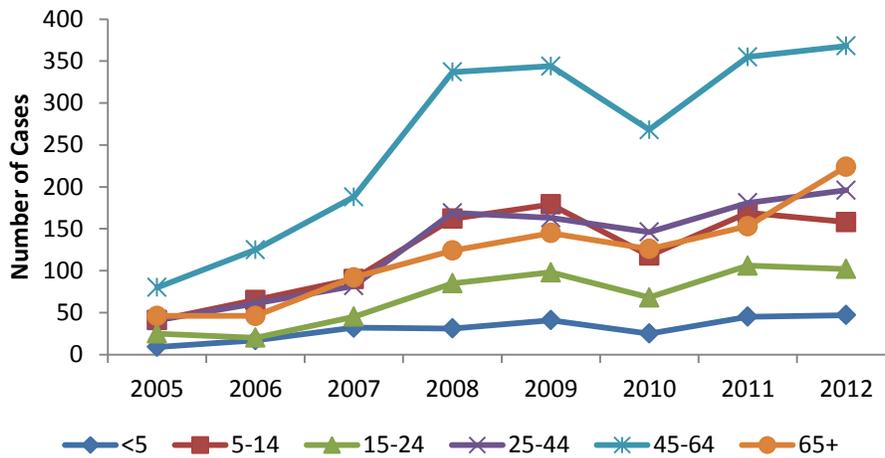


* 2012 data are preliminary as of 01/15/2012

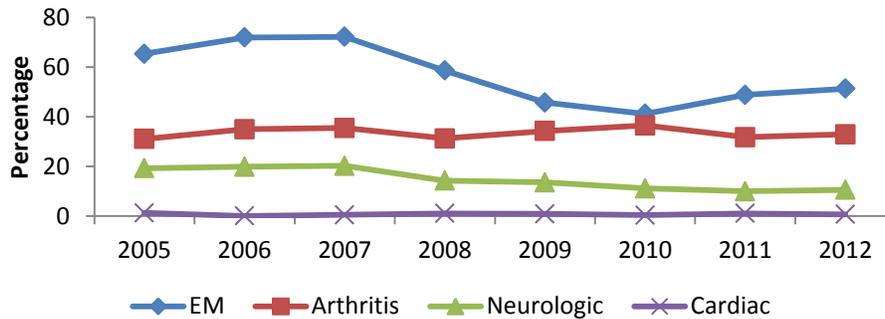
Lyme Disease Incidence - Maine and US, 2005-2012*



Number of Reported Lyme Disease Cases by Age Group - Maine, 2005-2012*



Percentage of Symptoms Reported Among Lyme Disease Cases - Maine, 2005-2012*



* 2012 data are preliminary as of 01/15/2012

Appendix 2

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

Reinfection versus relapse in Lyme disease.

Steere AC.

N Engl J Med. 2012 Nov 15;367(20):1950-1. doi: 10.1056/NEJMe1211361.

PMID: 23150963 [PubMed – indexed for MEDLINE]

Differentiation of reinfection from relapse in recurrent Lyme disease

Nadelman RB, Hanincova K, Mukherjee P, Liveris D, Nowkowski J, McKenna D, Brisson D, Cooper D, Bittker S, Madison G, Holmgren D, Schwartz I, Wormser GP.

N Engl J Med. 2012 Nov 15;367(20):1883-90. doi: 10.1056/NEJMeMoa1114362.

PMID: 23150958 [PubMed – indexed for MEDLINE]

In the clinic. Lyme disease.

Skogman BH, Glimaker K, Nordwall M, Vrethem M, Odkvist L, Forsberg P.

Ann Intern Med. 2012 Aug 7;157(3):ITC2-2 – ITC2-16. doi: 10.7326/0003-4819-157-3-20120807-01002.

PMID: 22868858 [PubMed – indexed for MEDLINE]

Lyme disease: knowledge, beliefs, and practices of physicians in a low-endemic area.

Henry B, Crabtree A, Roth D, Blackman D, Morshed.

Can Fam Physician. 2012 May;58(5):e289-95.

PMID: 22734172 [PubMed – indexed for MEDLINE]

Deer, predators, and the emergence of Lyme disease.

Levi T, Kilpatrick AM, Mangel M, Wilmers CC.

Proc Natl Acad Sci U S A. 2012 Jul 3;109(27):10942-7. doi: 10.1073/pnas.1204561109. Epub 2012 Jun 18.

PMID: 22711825 [PubMed – indexed for MEDLINE]

The rise and fall of the Lyme disease vaccines: a cautionary tale for risk interventions in American medicine and public health.

Aronowitz RA.

Milbank Quarterly Journal. 2012 Jun;90(2):250-77. doi: 10.1111/j.1468-0009.2012.00663.x.

PMID: 22709388 [PubMed – indexed for MEDLINE]

Prevention of tick-borne disease.

Piesman J, Beard CB.

J Environ Health. 2012 Jun;74(10):30-2.

PMID: 227080205 [PubMed – indexed for MEDLINE]

Images in health surveillance: tickborne disease vectors and Lyme disease clinical diagnosis.

Armed Forces Health Surveillance Center (AFHSC)

MSMR. 2012 May;19(5):14-5.

PMID: 22694589 [PubMed – indexed for MEDLINE]

Evaluation of commercial screening tests and blot assays for the diagnosis of Lyme borreliosis.

Busson L, Reynders M, Van den Wijngaert S, Dahma H, Decolcenaer M, Vasseur L, Vandenberg O. *Diagn Microbiol Infect Dis*. 2012 Jul;73(3):246-51. doi: 10.1016/j.diagmicrobio.2012.04.0001. Epub 2012 May 4.

PMID: 22560168 [PubMed – indexed for MEDLINE]

What do we need to know about disease ecology to prevent Lyme disease in the northeastern United States?

Eisen RJ, Piesman J, Zielinski-Gutierrez E, Eisen L. *J Med Entomol*. 2012 Jan;49(1):11-22.

PMID: 22308766 [PubMed – indexed for MEDLINE]

Effect of surveillance method on reported characteristics of Lyme disease, Connecticut, 1996-2007.

Ertel SH, Nelson RS, Cartter ML. *Emerg Infect Dis*. 2012 Feb;18(2):242-7. doi: 10.3201/eid1802.101219.

PMID: 22304872 [PubMed – indexed for MEDLINE]

Human risk of infection with *Borrelia burgdorferi*, the Lyme disease agent, in eastern United States.

Diuk-Wasser MA, Hoen AG, Cislo P, Brinkerhoff R, Hamer SA, Rowland M, Cortinas R, Vourc'h G, Melton F, Hickling GJ, Tsao JI, Bunikis J, Barbour AG, Kitron U, Piesman J, Fish D. *Am J Trop Med Hyg*. 2012 Feb;86(2):320-7. doi: 10.4269/ajtmh.2012.11-0395.

PMID: 22302869 [PubMed – indexed for MEDLINE]

Of ticks, mice and men: understanding the dual-host lifestyle of Lyme disease spirochaetes.

Radolf JD, Caimano MJ, Stevenson B, Hu LT. *Nat Rev Microbiol*. 2012 Jan 9;10(2):87-99. doi: 10.1038/nrmicro2714.

PMID: 22230951 [PubMed – indexed for MEDLINE]

Validation of a clinical prediction rule to distinguish Lyme meningitis from aseptic meningitis.

Cohn KA, Thompson AD, Shah SS, Hines EM, Lyons TW, Welsh EJ, Nigrovic LE. *Pediatrics*. 2012 Jan;129(1):e46-53. doi: 10.1542/peds.2011-1215. Epub 2011 Dec 19.

PMID: 22184651 [PubMed – indexed for MEDLINE]

Clinical evidence for rapid transmission of Lyme disease following a tick bite.

Hynote ED, Mervine PC, Stricker RB. *Diagn Microbiol Infect Dis*. 2012 Feb;72(2):188-92. doi: 10.1016/j.diagmicrobio.2011.10.003 Epub 2011 Nov 21.

PMID: 22104184 [PubMed – indexed for MEDLINE]

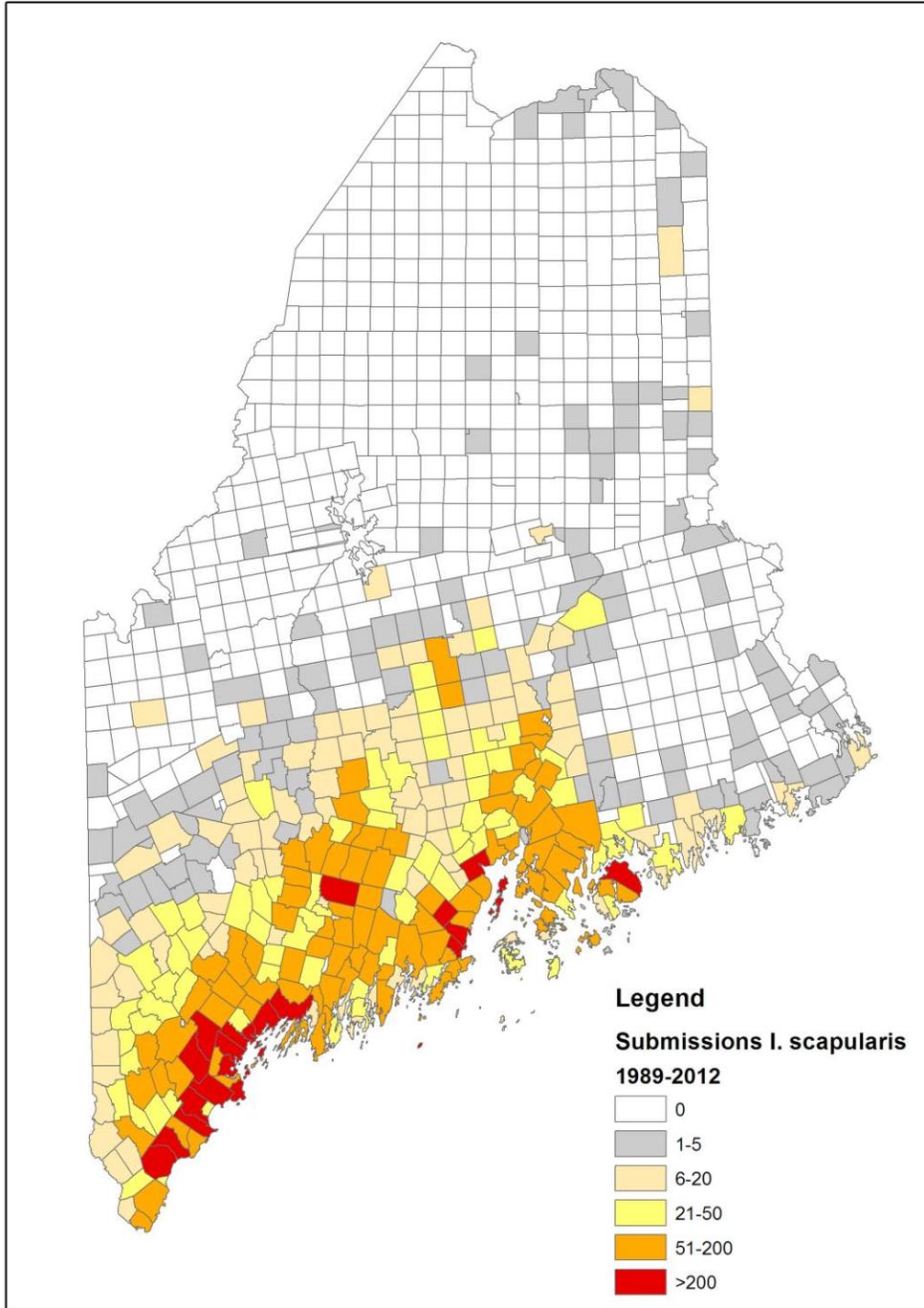
Application of medical and analytical methods in Lyme borreliosis monitoring.

Ligor M, Olszowy P, Buszewski B. *Anal Bioanal Chem*. 2012 Mar;402(7):2233-48. doi: 10.1007/s00216-011-5451-z. Epub 2011 Oct 21.

PMID: 22015476 [PubMed – indexed for MEDLINE]

Appendix 3

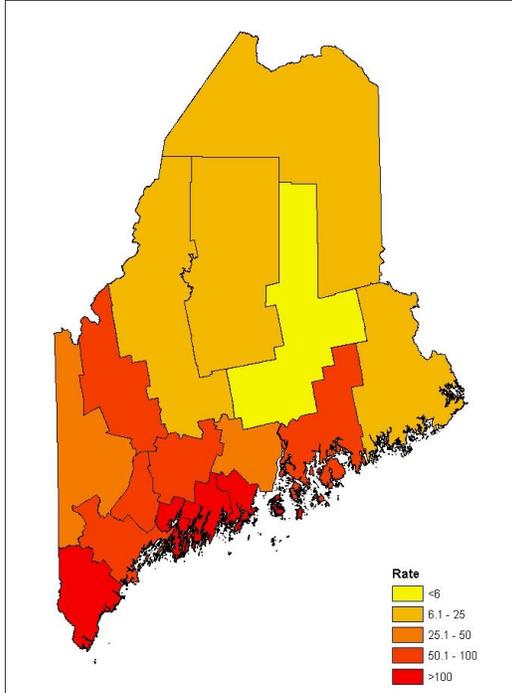
I. scapularis submissions, 1989-2012



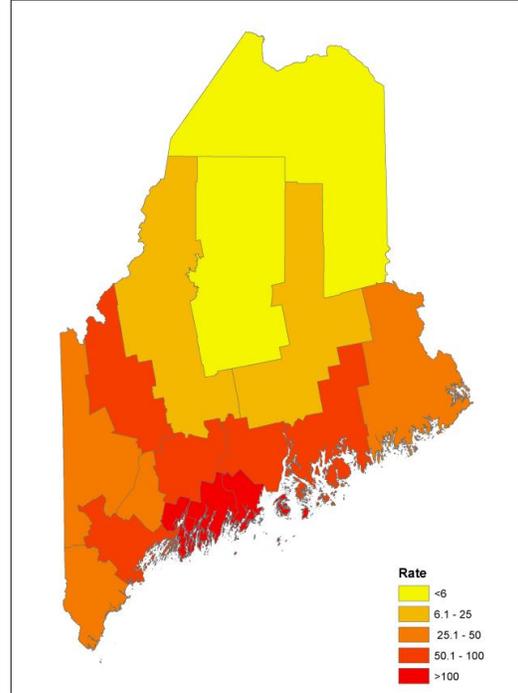
Appendix 4

Lyme Disease Cases per 100,000 people (Rate) – Maine, 2008-2011

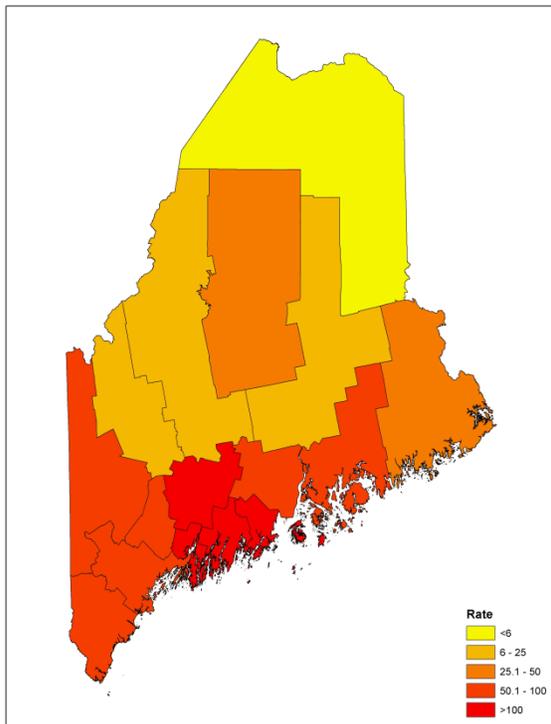
2009 Rate by County



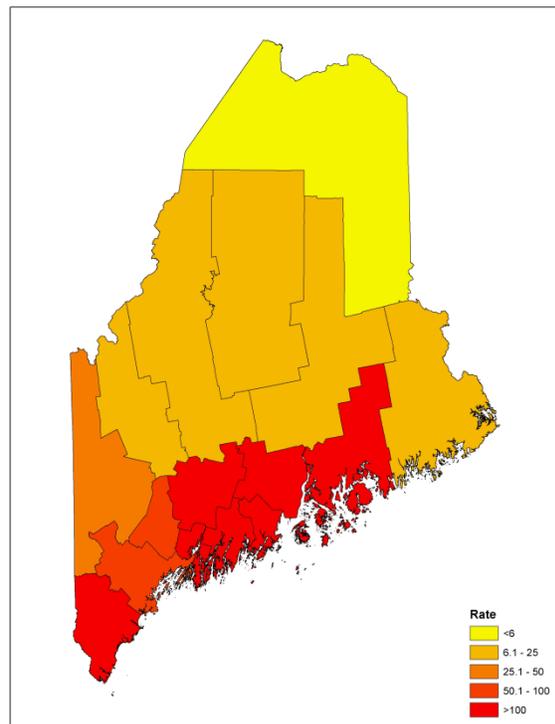
2010 Rate by County



2011 Rate by County



2012 Rate by County



* Preliminary data as of 1/15/2012

Appendix 5

Lyme Disease EM Reporting Registry

| Lyme Disease EM Reporting - For Use ONLY for presence of <i>Erythema migrans</i> | | | | | | | | |
|--|------|---------|-----|-----|------------------|------------|---------------|-----------------|
| Physician Information: | | | | | | | | |
| Name: | | | | | | | | |
| Address: | | | | | | | | |
| Telephone: | | | | | | | | |
| Date | Name | Address | DOB | M/F | Race & Ethnicity | Occupation | Date of Onset | Tick Bite (Y/N) |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

If you have additional comments, please submit on additional pages. Please Fax Weekly to 1-800-293-7534

Appendix 6

Physician's Reference Guide



Appendix 7

Human Lyme Disease Surveillance System Evaluation Poster



Evaluation of Human Lyme Disease Surveillance in Maine, 2008 – 2010

Megan Saunders^{1,2} MSPH, Sara Robinson² MPH, Anne Sites² MPH MCHES

¹University of Southern Maine
²Maine Center for Disease Control and Prevention



BACKGROUND

Lyme disease is the most commonly reported vector-borne disease in the United States and the third most commonly reported infectious disease in Maine.

Lyme disease is caused by the bacterium *Borrelia burgdorferi* and is transmitted through the bite of an infected deer tick (*Ixodes scapularis*). The deer tick is considered endemic throughout Maine, although Lyme disease is still considered an emerging disease in Maine's northernmost counties.





Lyme disease has a wide range of clinical manifestations, the most common being the presence of erythema migrans (EM), the initial skin lesion that occurs in 70% to 80% of patients nationwide¹. With treatment, many patients will not progress beyond the early phase of Lyme disease; however some may develop systemic disorders related to *B. burgdorferi* infection. These manifestations (known as late manifestations of Lyme disease) include dermatologic, rheumatologic, neurologic, and cardiac abnormalities. From 2008 to 2010 Maine had a total of 2,657 confirmed and probable cases of Lyme disease with rates approximately six times higher than the United States² incidence rate.

The human Lyme disease surveillance system evaluation sought to assess the overall usefulness of Maine's Lyme disease surveillance system, to identify aspects of the system that can be improved, and to determine areas for interventions to reduce Lyme disease related morbidity and mortality in Maine.

METHODS

This evaluation was conducted using the Centers for Disease Control and Prevention's 2001 Updated Guidelines for Evaluating Public Health Surveillance Systems³. These guidelines identify the essential attributes of a public health surveillance system. Data was obtained from the National Electronic Disease Surveillance System (NEDSS) and included all reports of Lyme disease from 2008 through 2010. Statistical analysis of data was performed using statistical analysis (SAS 9.3) software.

2008 CSTE Case Definition⁴

- **Confirmed:** A case of EM with a known exposure⁵, OR a case of EM with laboratory evidence of infection and without a known exposure, OR a case with at least one late manifestation that has laboratory evidence of infection.
- **Probable:** Any other case of physician-diagnosed Lyme disease that has laboratory evidence of infection.

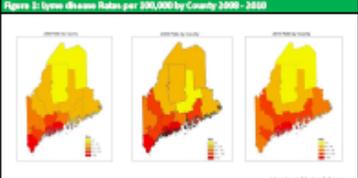
¹All counties in Maine are considered endemic for Lyme disease, therefore living in Maine is considered to be an exposure.

EVALUATION RESULTS

Usefulness

- System is useful – allows Maine CDC to identify demographic, geographic, and seasonal patterns of Lyme disease distribution
- Monitors changes in Lyme disease incidence in Maine

Figure 1: Lyme Disease Rates per 100,000 by County 2008 – 2010



Acceptability

- Maine CDC: Good
 - 79.7% of case report forms sent out within 5 days
- Provider: Fair
 - Overall return rate of case report forms = 84.7%
 - Under-reporting of EM
 - 57.1% of investigations took longer than 30 days

Sensitivity

- No "gold standard" for true cases in a population
- Low sensitivity due to under-reporting of EM
- Shows ability to monitor changes over time

Predictive Value Positive (PVP)

- Confirmed PVP: 46.2%
- Confirmed + Probable PVP: 59.9%

Representativeness

- All reports investigated
- Shows Northward expansion of cases over time
- Case information corresponds with information on the Northward expansion of the vector

Timeliness

- Overall Investigation Time: Fair
 - Average: 122 days, Median: 37 days
 - 42.9% completed in 30 days or less
- Maine CDC Initial Response: Good
 - Average: 4.04 days, Median: 2 days
 - 79.7% of investigations have this step completed in 5 days or less

CONCLUSIONS

- Maine's Human Lyme Disease Surveillance System is Useful, Sustainable, and Functions Well
- Overall system quality will improve if Maine CDC:
 - Streamlines the Lyme disease reporting process to avoid duplication of efforts
 - Spreadsheet removed from reporting process in 2011
 - Creates a standard operating procedure (SOP) for the surveillance system
 - Ensures continuity of clerical staff
- Data quality will improve if:
 - Healthcare providers are educated on case report form completion
 - Maine CDC ensures proper training of clerical staff
- Representativeness will improve if:
 - Exposure information is captured on the case report form
 - Occupation information field added to case report form
 - Tick exposure information added to case report form
- Predictive Value Positive and Sensitivity will improve if:
 - Under-reporting of EMs is reduced
 - Small scale trial of a weekly registry style report form occurred from June through September 2012
 - Efficacy of trial is currently being evaluated

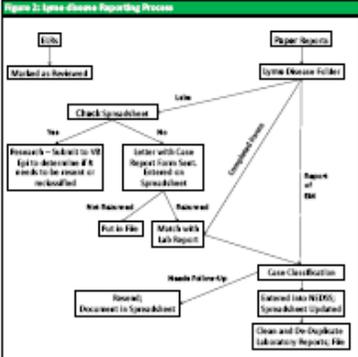
REFERENCES

1. CDC. Signs and symptoms of Lyme disease. <http://www.cdc.gov/nczod/diseases/zoonotic/d006304a.htm>
2. CDC. Updated guidelines for evaluating public health surveillance systems: recommendations from the guidelines working group. MMWR 2001; 50(RR11):1-15. <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr1101a01.htm>
3. CDC. 2008 Case Definition: Lyme disease. <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm3501a08.htm>

Simpleity

- Passive system of case investigation improves simplicity
 - Provider completes case report form
 - No follow-up calls by epidemiologist
- Multiple reviews of reports reduce simplicity

Figure 2: Lyme Disease Reporting Process



Flexibility

- Absorbed case definition changes
- National Electronic Disease Surveillance System (NEDSS) supports multiple data sources

Data Quality

- Majority of case report forms completed with enough clinical information to classify the case

Stability

- System is stable with 24 hour availability and minimal downtime

Appendix 8

Maine Vector-borne Work Group

Chair: Stephen Sears, Maine Center for Disease Control and Prevention (Maine CDC)

| | |
|----------------------|---|
| Adams, Justin | Municipal Pest Management |
| Aherne, Jim | Maine Organic Farmers and Gardeners Association |
| Campbell, Polly | Nurse, Augusta, Maine |
| Camuso, Judy | Maine Department of Inland Fisheries and Wildlife |
| 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 |
| Forbes, John | United States Department of Agriculture Wildlife Services |
| Foss, Kimberly | Municipal Pest Management |
| Hicks, Lebelle | Maine Board of Pesticides Control |
| Jennings, Henry | Maine Board of Pesticides Control |
| Juris, Sherrie | Atlantic Pest Solutions |
| 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 |
| Pote, Ken | Maine CDC |
| Rand, Peter | Maine Medical Center Research Institute |
| Ridky, Chip | United States Department of Agriculture |
| Robinson, Sara | Maine CDC |
| Saunders, Megan | Maine CDC |
| St. Amand, Ted | Atlantic Pest Solutions |
| Shively, Kirk | United States Department of Agriculture Wildlife Services |
| Sites, Anne | Maine CDC |
| 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, Michelle | Maine Department of Agriculture, Conservation, and Forestry |
| Webber, Lori | Maine CDC |

Appendix 9

| |
|--------------------|
| Acc. # _____ |
| Date Rec: _____ |
| Report Sent: _____ |
| Date Enter: _____ |

TICK SUBMISSION Form
 Maine Medical Center Research Institute
 Center for Vector-borne Disease
 75 John Roberts Road—Suite 9B
 South Portland, ME 04106
www.mmcri.org/lyme/
ticklab@mmc.org

Feb 2010

As part of a program to monitor the distribution of the deer tick, *Ixodes scapularis*, the vector for the Lyme disease bacteria and other human pathogens, our research laboratory offers free identification of ticks. Ticks will **not be tested** to see if they contain the Lyme disease spirochete because the clinical value of this information is uncertain. Unless other arrangements have been made, ticks should be preserved in small bottles of 70% alcohol and mailed in a crush-proof container with this completed form to the above address. Please be sure to note the town where the tick was acquired and date tick found.

In the late spring and summer, many areas are infested with dog ticks, *Dermacentor variabilis*. This tick does not transmit Lyme disease. Because our laboratory can become overwhelmed by submissions of this tick, we ask that you not submit ticks on which you can distinguish the characteristic faint white markings unique to the dog tick.

To remove ticks, grasp them with fine forceps as near to the skin as possible and pull directly out firmly and steadily. The barbed mouth parts may not let go easily, so a minute or more may be required. Do not handle ticks with your bare hands.

Because we are interested in tick distribution, we may attempt to contact the person who originally collected the tick. If the tick is submitted by a clinic or other organization, please include the original collector's name and address. Please include name of guardian if under 18 years of age.

| | |
|---|--|
| A. Individual, physician, clinic, or organization submitting tick: | B. Person (or owner's name if pet) acquiring tick: |
| Name: _____ | Name: _____ |
| Address: _____ | Address: _____ |
| _____ Zip: _____ | _____ Zip: _____ |
| Phone: _____ | Phone: _____ |
| E-mail: _____ | E-mail: _____ |
| Date tick found: ___ / ___ / ___ | Town where acquired: _____ State: _____ |
| Was the tick attached when found? <input type="checkbox"/> Yes <input type="checkbox"/> No Body part attached to: _____ | |
| Tick found on: <input type="checkbox"/> Person (Age of person: _____) <input type="checkbox"/> Animal <input type="checkbox"/> Other: _____ | |
| If found on animal, what species? <input type="checkbox"/> Dog (Breed: _____) <input type="checkbox"/> Cat <input type="checkbox"/> Other: _____ | |
| Animal's name: _____ Has animal been vaccinated for Lyme disease? <input type="checkbox"/> Yes <input type="checkbox"/> No | |
| Do you use any tick control products on your animal <input type="checkbox"/> Yes <input type="checkbox"/> No | |
| If yes, what product was used: <input type="checkbox"/> Frontline <input type="checkbox"/> Advantix <input type="checkbox"/> Other _____ | |
| Were there any associated symptoms? _____ | |
| Patients or Physicians, please note any other pertinent information here: | |

Lab use only:
 (do NOT write below line)

Tick Identification:

Ticks in Maine – 2011

(Hard ticks – Family Ixodidae)

Ixodes scapularis (previously Ixodes dammini), the “deer tick”, also called the “black-legged tick”, is the principal vector of the Lyme disease spirochete in the northeastern United States. At some sites in Maine, particularly in southern areas, over half of the adult ticks contain spirochetes, although infection rates vary considerably, even in adjacent areas. Infection rates of questing nymphs are typically somewhat lower. Immature stages feed on small mammals such as mice, while adult ticks prefer deer, but all stages may feed on humans and domestic animals. Less common in Maine, the agents of two other infectious diseases, human granulocytic anaplasmosis, & babesiosis, may also be found in this species of tick. Although male deer ticks can be infected, they do not engorge with blood and are therefore not thought to be vectors of Lyme disease.

Ixodes cookei, the “woodchuck tick” is widely distributed in Maine and is the second most common species of Ixodes found. It has not been associated with Lyme disease transmission. Ixodes cookei usually feeds on wild animals, such as woodchucks and raccoons, but will also feed readily on humans and domestic animals. This tick is known to be a vector of Powassan virus. Rare cases of encephalitis have occurred in Maine in people infected with Powassan virus.

Ixodes marxi, the “squirrel tick”, has not been associated with Lyme disease. It is commonly found on squirrels but will occasionally bite humans.

Ixodes muris is occasionally found in Maine. Usually it is found only on voles and mice, but it may bite humans, cats, dogs, and birds. A recent report indicates that I. muris is a weak vector of Lyme disease. We have associated its bite with a reaction in dogs, cats and other domestic animals characterized by pain, swelling, fever, lethargy and loss of appetite. If this reaction is observed we are very interested in receiving the tick alive and with relevant information.

Ixodes angustus is usually found only on voles and mice and is common in many parts of Maine, but it is very rarely found on humans or domestic animals

Dermacentor variabilis, the “American dog tick”, is not a vector of Lyme disease. This tick is particularly abundant in southern Maine but its range has been expanding in recent years. Immature stages feed on voles and other small rodents, but adults are often found on humans, dogs, and other domestic animals. The adults, found from May through July and rarely later in the season, are larger than Ixodes ticks and can be distinguished by characteristic white markings (see back). This tick is the vector of Rocky Mountain spotted fever in the eastern United States. Recently, some cases of RMSF were reported in Maine but these have not been confirmed as Maine-acquired cases.

Dermacentor albipictus, the “winter tick” or “moose tick”, is found on moose and deer and occasionally on horses, cows, dogs and humans, particularly in central and northern Maine. Large numbers of the tiny larvae may be encountered in the fall, particularly in habitat where moose are found. This tick has not been associated with Lyme disease but has been shown to be responsible for moose mortality in northern New England in the winter.

Haemaphysalis leporispalustris, the “rabbit tick”, is usually found only on rabbits and birds. Although it has rarely been reported to be infected with the Lyme disease bacteria, it has not been associated with Lyme disease in humans.

Amblyomma americanum, the “Lone Star tick”, is most often found on people traveling from states to the south where it is very common, but is becoming more frequently acquired in Maine. It has been shown to carry pathogens including Ehrlichia chaffeensis and a different spirochete (Borrelia lonestari), which in humans may produce a rash and some symptoms similar to Lyme disease.

Rhipicephalus sanguineus, the “brown dog tick” or “kennel tick”, is widely distributed over the world, but only rarely found in Maine. Dogs are the principal host. It has not been associated with Lyme disease transmission, but is the vector of canine ehrlichiosis (Ehrlichia canis).

Other species of Ixodes, I. brunneus, (found on migratory birds), I. dentatus, (found on rabbits and hares), I. uriae, (found on marine birds) and I. gregsoni (found on mink, weasel and fisher) have occurred in Maine. The “bird tick” Haemaphysalis chordeilis and Ixodes banksi (found on beaver and muskrat) have not yet been found in Maine but may occur here. There is no record of soft ticks, Family Argasidae, in Maine.

Elsewhere in the country, ticks may carry other diseases such as Rocky Mountain spotted fever, tularemia, Q-fever, and deer tick virus (DTV). As yet, these have not been reported or are rare in Maine.

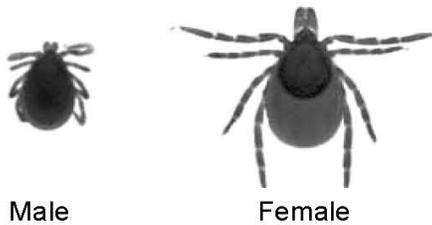
*Maine Medical Center Research Institute ~ Center for Vector-borne Disease 75 John Roberts Road, Suite 9B
South Portland ME 04106 ~ticklab@mmc.org*

THE DEER TICK

Ixodes scapularis



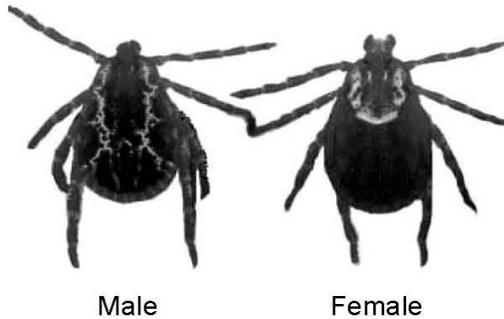
Enlarged adult deer ticks



THE DOG TICK

Dermacentor variabilis, the American dog tick, **which does not transmit Lyme disease**, is commonly found in spring and early summer. Adult stages have **characteristic whitish markings** that can usually be seen in bright light even on engorged females.

Enlarged adult dog ticks



Actual size



If bitten by a deer tick...

If you remove a deer tick that has become engorged while feeding, you should consult your physician right away, since a single dose of antibiotic given within 72 hours of the bite has been shown to prevent Lyme disease. Remember to save the tick for later identification (see following page).

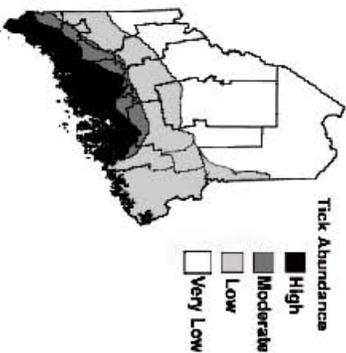
The first symptom of Lyme disease in humans is usually an expanding red rash greater than 2 inches in diameter at the site of the tick bite which may occur within a few days or several weeks later. The rash may be preceded or accompanied by flu-like symptoms such as fever, headache, chills, nausea, facial paralysis, or pain in the muscles and joints. If Lyme disease is suspected, call your doctor immediately. Early antibiotic treatment is very effective and can prevent later, more serious, complications. Not all patients develop the rash, however, and many do not recall a tick bite. The bites of ticks, mosquitoes, and black flies can produce a red, itchy, swollen area that may persist for a week or so but is usually less than 2 inches in diameter.

Lyme disease in pets. Although cats rarely show symptoms of Lyme disease, dogs may be seriously affected. The first indications include lameness, loss of appetite, fever, and lethargy. Dogs usually respond well to prompt antibiotic treatment. If deer ticks are abundant, dog owners should consult with veterinarians about canine Lyme vaccines available. Tick collars or other anti-tick treatments should also be used.

Other tick-borne pathogens. Two other deer tick-transmitted diseases, human granulocytic anaplasmosis and babesiosis, occur in Maine. These infections may start with headaches, fever and other flu-like symptoms, but without the characteristic bulls-eye rash of Lyme disease. Cats, dogs, and horses may suffer clinically from anaplasmosis. We suggest contacting your veterinarian if you find a tick on your pet. Powassan encephalitis virus has also been found in Maine and to date has resulted in four human cases. It is spread by the woodchuck tick *Ixodes cookei*.

The deer tick in Maine

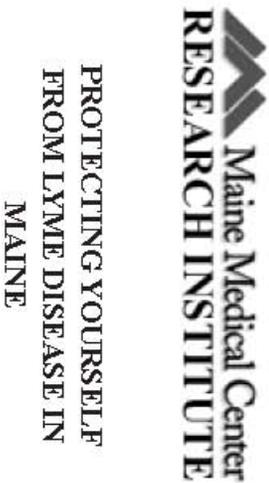
This map shows a very generalized picture of the location and abundance of deer ticks in Maine through 2008. Although most often found in coastal areas, increasing numbers of ticks have been found inland. Continuing research will update this range and study the ecological variables which influence the spread.



Tick identification. If you find ticks you think may be deer ticks and would like to have them identified, send them in a small vial of alcohol in a crushproof container to the laboratory listed below. Include the name and age, if from a person, type of animal or source, the location where acquired, and the date found. **Submitted ticks are not tested for the Lyme disease spirochete.**

Submitted ticks are not tested for the Lyme disease spirochete.

Maine Medical Center Research Institute
Center for Vector-borne Disease
75 John Roberts Rd. - Suite 9B
South Portland, ME 04106
<http://www.mmcri.org/lyme/>
email: ticklab@mmc.org



Lyme disease is an illness caused by a corkscrew-shaped bacterium (a spirochete) that is transmitted to humans and domestic animals by the bite of a tick. Frequently starting with a rash and flu-like symptoms, Lyme disease, if untreated, may progress to cause arthritis and neurological problems. Over 3000 cases of Maine-acquired Lyme disease have now been officially recognized.

The tick that transmits Lyme disease is the deer tick, *Ixodes scapularis*. This tick is well established in southern areas, particularly in coastal counties, but is increasingly found in interior Maine as well.

The risk to humans of contracting Lyme disease is greatest from the bite of the inconspicuous nymphs, which are most active in June and July. Adult ticks are found most often in the fall and in early spring as they search for larger hosts, primarily deer. The larger, reddish females can also transmit the Lyme bacteria, but the smaller, black males do not attach long enough to do so.



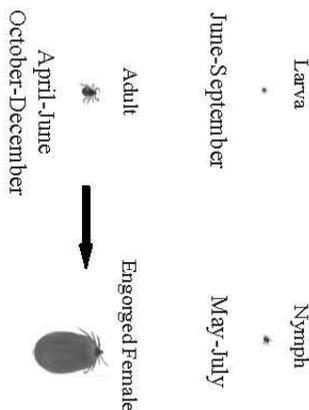
Male Female
Adult Deer Ticks (*Ixodes scapularis*)



Male Female
Adult Dog Ticks (*Dermacentor variabilis*)

The deer tick, which transmits Lyme disease (left), and the common dog tick (right), enlarged for comparison. The dog tick is not thought to transmit Lyme disease. Photos by Kevin Byron.

THE ACTUAL SIZE OF DEER TICKS



Not all deer ticks contain the spirochete. Field studies in Maine have shown that although in some sites more than half the adult ticks sampled were infected, infection rates may vary considerably, even between adjacent areas at the same location.

Thirteen other species of ticks have been found in Maine, some of which look very much like deer ticks. They may bite humans and domestic animals but are not thought to transmit Lyme disease.

Ixodes cookei, the 'woodchuck tick,' which cannot be reliably distinguished from the deer tick without a microscope, is widely distributed in Maine. It usually feeds on wild animals such as woodchucks and skunks, but will also feed readily on humans and domestic animals.



Dermacentor variabilis (shown), the American 'dog' tick, is commonly found in late spring and early summer. It is larger than the *Ixodes* ticks and can be distinguished by its characteristic white markings. It is not found October-December in Maine.

Precautions to avoid tick bites:

- Wear light-colored clothing and tuck your pants into your socks and your shirt into your pants when walking in the woods, brush, or tall grass. Deer ticks attach to clothing and move upwards.
 - Use a repellent containing DEET according to label instructions - particularly on shoes, socks, and pant legs. (Use caution in applying high-concentration products to the skin, especially on children.)
 - People may pretreat clothing with a permethrin-containing product, which both repels and kills ticks. **Caution:** This is not for use on skin; use only as directed on the label.
 - To prevent engorged ticks from reproducing near your home and to protect your pets, consult your veterinarian about tick repellents and acaricides.
 - **Inspect yourself, your clothing, your children, and your pets for ticks when you come in from the field and then again in a few hours.** Ticks often attach at body folds, behind the ears, and in the hair. If possible, shower and wash clothes immediately. Heat drying is effective in killing ticks.
 - Mowing grass and cutting brush may reduce tick habitats in problem areas.
 - When transporting pets or game, caution should be taken to avoid bringing ticks to new areas.
- Prompt removal of attached ticks is extremely important. Lyme disease is rarely transmitted before the tick has been attached for 36 hours.** Using tweezers, grasp the tick as close to the skin as possible and pull until the tick lets go. Do not handle ticks with bare hands. Do not squeeze the tick. Apply antiseptic to the bite. Save the tick in a small vial of 70% alcohol. Tick removal methods, such as applying vaseline, nail polish or scorching with a match, are not recommended.



Drawing by K. Wolfe

Appendix 10

Governor's Proclamation

State of Maine



WHEREAS, the Maine Center for Disease Control and Prevention reports that in 2011, more than 1,000 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 Twenty Sixth day of April Two-Thousand Twelve


Paul R. LePage
Governor





Charles E. Summers, Jr.
Secretary of State
TRUE ATTESTED COPY

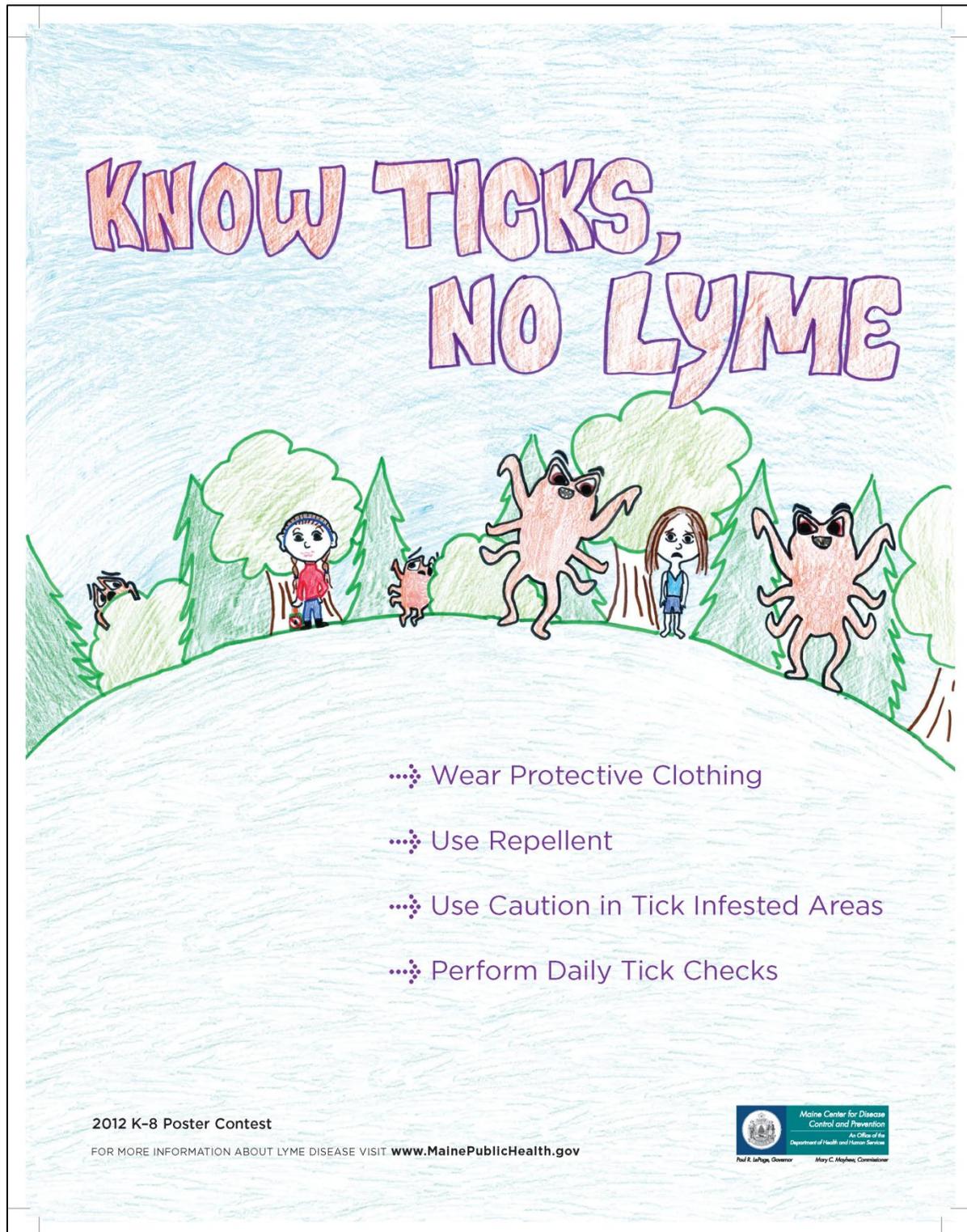
Appendix 11

Lyme Disease Awareness Month 2012 Bracelet: Know Ticks. No Lyme.



Appendix 12

Maine CDC Lyme Disease Awareness Month Poster 2012



Appendix 13

Recent Lyme Legislation

Massachusetts:

Title: An Act relative to Lyme Disease treatment coverage (MA HB 329)

Status: Did not pass

Title: An Act establishing a public health Lyme disease research institute at the University of Massachusetts Medical School at Worcester (MA HB 349)

Status: Did not pass

Title: An Act relative to the research and treatment of Lyme Disease (MA HB 3261)

Status: Passed

Title: An Act relative to the research and treatment of Lyme Disease (MA HB 3261)

Status: Did not pass

Title: An Act relative to the control of low lands and swamps to control of tick-borne illness (MA HB 3269)

Status: Did not pass

Title: Printed as amended version of the Bill making appropriations for the fiscal year 2012 for the maintenance of departments, boards, commissions, institutions and certain activities of the Commonwealth, for interest, sinking fund and serial bond requirements and for certain permanent improvements (MA HB 3401)

Status: Did not pass

Title: The committee of conference on the disagreeing votes of the two branches with reference to the Senate amendments of the House Bill making appropriations for the fiscal year 2012 for the maintenance of the departments, boards commissions, institutions and certain activities of the Commonwealth, for interest, sinking fund and serial bond requirements and for certain permanent imp. (MA HB 3535)

Status: Passed

Title: An Act relative to Lyme disease and associated co-infections. (Ma SB 1129)

Status: Did not pass

Title: Printed as amended version of the Bill making appropriations for the fiscal year 2012 for the maintenance of departments, boards, commissions, institutions and certain activities of the Commonwealth, for interest, sinking fund and serial bond requirements and for certain permanent improvements. (MA SB 1920)

Status: Passed

New York:

Title: An Act to amend the agriculture and markets law, in relation to the establishment of the Hudson valley white-tail deer mitigation task force and providing for the repeal of such provisions upon expiration thereof. (NY AB 2876)

Status: Did not pass

Title: An Act to amend the workers' compensation law, in relation to enacting the "Lyme disease compensation act". (NY AB 5159)

Status: Did not pass

Title: An Act to amend the education law, in relation to requiring course work and training in tick-borne diseases. (NY AB 7167)

Status: Did not pass

Title: An Act to amend the insurance law and the workers' compensation law, in relation to coverage of long term medical care for Lyme disease and other tick-borne related pathogens. (NY AB 7696)

Status: Passed

Title: An Act to amend the agriculture and markets law, in relation to the establishment of the Hudson valley white-tail deer mitigation task force and providing for the repeal of such provisions upon expiration thereof. (NY SB 5122)

Status: Did not pass

Title: An Act to amend the insurance law and the workers' compensation law, in relation to coverage of long term medical care for Lyme disease and other tick-borne related pathogens.

Status: Passed