

# The Commonwealth's Response to Lyme and Other Tickborne Diseases

*A Report from the Lyme and Other Tickborne Diseases Interagency Workgroup*

**Office of the  
Secretary of Health**

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**pennsylvania**  
DEPARTMENT OF HEALTH

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# Lyme and Other Tickborne Diseases

## Interagency Workgroup

Thank you to the members of the Lyme and Other Tickborne Diseases Interagency Workgroup (Lyme Workgroup) for their time and efforts to address Lyme and other tickborne diseases (TBDs) and for their continued contributions to the commonwealth's coordinated response.

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## Lyme and Other Tickborne Diseases

Lyme disease (LD) is a tickborne disease caused by the bacterium *Borrelia burgdorferi*. It may be transmitted by the bite of *Ixodes scapularis* ticks, also known as blacklegged ticks or deer ticks, if the tick carries the bacteria. Early symptoms, typically occurring in the first three to 30 days after a tick bite, include fever, headache, and a rash, sometimes with a distinctive bull's eye shape, known as erythema migrans (EM). The EM rash is not present in approximately 20–30% of cases. Disseminated symptoms, typically occurring days to months after the tick bite, include joint pain and swelling, several EM rashes anywhere on the body, heart palpitations or irregular heartbeat, dizziness, nerve pain, facial palsy, and short-term memory loss. Most cases of LD can be successfully treated, especially when identified early. Delaying treatment can lead to heart and nervous system-related symptoms.

In the United States, LD is the most common tickborne disease. Transmission of LD occurs primarily in the Northeast and upper Midwest regions of the country. In 2019, only 14 states reported 93% of all LD cases. In 2019, Pennsylvania reported more LD cases than any other state. Pennsylvania has a large population, so the incidence of cases per 100,000 population was fifth following Maine, Vermont, New Hampshire, and Delaware in 2019. However, states where LD is endemic use a variety of surveillance approaches. Thus, it is difficult to make direct comparisons between states.

Other tickborne diseases (TBDs) can occur in Pennsylvania. The most common of these are anaplasmosis, ehrlichiosis, and spotted fever rickettsiosis (SFR). Anaplasmosis is caused by *Anaplasma phagocytophilum* bacteria, while ehrlichiosis is caused by various species of *Ehrlichia* bacteria. Anaplasmosis is transmitted by the *Ixodes scapularis* tick, the same tick that transmits LD. Ehrlichiosis is transmitted by the lone star tick (*Amblyomma americanum*). SFR is caused by species of *Rickettsia* bacteria and is transmitted by the American dog tick (*Dermacentor variabilis*). Babesiosis is an emerging tickborne disease in Pennsylvania.

Babesiosis is caused by the parasite *Babesia microti*. *B. microti* is transmitted by *I. scapularis* ticks, the same ticks which transmit LD. Babesiosis is not currently reportable in Pennsylvania, so we rely on labs and facilities to voluntarily report cases to us. Therefore, the data we have are estimates and may be an undercount of the true burden of disease.

In 2019, 8,998 LD cases were reported in Pennsylvania, representing an incidence of 70.3 cases/100,000 persons. Most were reported between May and August, with 45% reported in June and July. All 67 counties in Pennsylvania reported LD, ranging from ranging from <5 cases in Mifflin County to 470 cases in Chester County. Incidence ranged from 8.7 cases/100,000 persons in Mifflin County to 424.3 cases/100,000 persons in Venango County. In 2019, Pennsylvania reported 214 anaplasmosis cases, 23 ehrlichiosis cases, 29 SFR cases, and 68 babesiosis cases.<sup>1</sup>

# Background

Act 83 of 2014 established the Lyme and Related Tick-Borne Diseases Taskforce (the taskforce).<sup>2</sup> The taskforce was charged with making recommendations on prevention, education, awareness, and surveillance of Lyme and related tickborne diseases (TBDs) and presenting those recommendations to the Secretary of Health and the General Assembly. Coordination between the Departments of Health (DOH), Environmental Protection (DEP), Education (PDE), Conservation and Natural Resources (DCNR), and the Game Commission (PGC) was outlined in the Act, along with membership of the taskforce to include two physician members of the International Lyme and Associated Diseases Society, two physician members of the Infectious Diseases Society of America, an epidemiologist, two representatives of LD patient groups, a LD patient or a family member of a LD patient, an entomologist from The Pennsylvania State University, a registered school nurse, two veterinarians, and a representative from the Northeast DNA Laboratory of East Stroudsburg University. The taskforce met and developed recommendations to improve the commonwealth's response to Lyme and other TBDs. On October 15, 2015, the Lyme Disease Taskforce issued their report. The taskforce proposed 16 recommendations in 4 categories: prevention, education and awareness, surveillance, and other.

Since the publishing of the taskforce's report many recommendations have been implemented. In September 2021, the Physician General for the Commonwealth, Dr. Denise Johnson, now Acting Secretary of Health, convened the Lyme and Other Tick Borne Diseases Interagency Workgroup (the workgroup). Members from the DOH, DEP, PDE, DCNR, PGC, PDA, FBC and DOT met and continue to meet monthly to coordinate and collaborate on their work to address Lyme and other TBDs. Additionally, every three months external stakeholders are invited to join the workgroup's meetings to bolster collaboration with Pennsylvania organizations working to combat TBDs.

The mission of the workgroup is to develop and implement a state-wide comprehensive approach to Lyme and other TBDs, including surveillance, prevention, education, identification, and treatment. In an effort to fulfill this mission, the workgroup has followed up on the recommendations from the taskforce. This report summarizes the taskforce's recommendations and provides an update on the status of their implementation. In addition to those recommendations, this report provides information on ongoing commonwealth activities to address Lyme and other TBDs.

By implementing this comprehensive approach, the workgroup envisions a Pennsylvania where the health and well-being of all people and wildlife is enhanced by reducing incidences of Lyme and other TBDs.

# Prevention

## 2015 Recommendations

<b>Recommendation 1*</b>	<b>Protocol and Funding Strategy for Schools in High-Risk Areas</b>
<b>Description*</b>	Develop and implement a protocol and funding strategy for schools located in high-risk areas to implement personal protection and property actions (Integrated Tick Management strategies like spraying, various deer management methods, landscape modifications, based on a review of the available evidence on tick reduction approaches) to reduce the risk of tick exposure on school properties and during school activities.
<b>Suggested Lead Organizations*</b>	DOH and PDE
<b>Status</b>	Implemented and ongoing

\*Source: LYME DISEASE IN PENNSYLVANIA, A Report Issued by the Task Force on Lyme Disease and Related Tick-Borne Disease, September 2015

The DOH collaborated with the PDE to develop a toolkit for elementary school instructors. Elementary aged children are one of the highest risk groups for Lyme and other TBDs. The toolkit was first distributed during the 2019-2020 school year and was updated and released to schools in January 2022.<sup>3</sup> Because LD is found in all counties in Pennsylvania, the toolkit is not targeted at specific areas. It is distributed to all public and some private schools in the commonwealth. The updated toolkit includes a slide presentation for educators to use in their lessons for students. The toolkit aligns with PA Academic Standards for lessons on Environment and Ecology, Science and Technology, and Health, Safety & Physical Education. Additionally, school nurses provide information on tick awareness to students and parents to prevent tick bites.

Additionally, PDE and DOH collaborated to create the Lyme Disease Art Contest.<sup>4</sup> The contest is designed to educate elementary age children and was first launched during the 2019-2020 school year. This year's contest was announced in January 2022, and winners were announced in May 2022 during Lyme Disease Awareness Month.

<b>Recommendation 2*</b>	<b>Park Staff Protocols</b>
<b>Description*</b>	Develop and implement a protocol for federal, state and local park staff and properties to include communicating risk awareness (tick presence, tips for personal protection), and taking property actions (Integrated Tick Management strategies like spraying, use of deer management methods, landscape modifications, vehicle spraying, protective clothing and other methods based on a review of the available evidence on tick reduction approaches) to reduce risk to the staff and the public.
<b>Suggested Lead Organizations*</b>	DCNR, County Health Departments, District Offices, and other Community level organizations



**Status** Implemented and ongoing

\*Source: LYME DISEASE IN PENNSYLVANIA, A Report Issued by the Task Force on Lyme Disease and Related Tick-Borne Disease, September 2015

Throughout state parks and state forests the DCNR posts CDC signs at trail heads to communicate how to prevent LD. Educational materials are also available at all visitor centers for public taking. For decades the DCNR has provided their field staff with access to treated clothing, Picardian tick and insect spray and Permethrin spray, to prevent tick bites. Some State Parks have also purchased gaiters so staff can cover the tops of their shoes and lower pant legs to protect themselves from ticks and other insects. Ahead of tick season, the DCNR held an all staff meeting on Lyme and TBDs prevention in April 2022. Presenters included representatives from DEP, DOH, and OA-HR.



Image 1. Sign at a Pennsylvania state park

While DCNR provides staff with the means to prevent tick bites, the department issued an official protocol for State Park staff regarding tick bites on January 3, 2022. The protocol requires employees to report an incident of a tick bite, and for supervisors and managers to investigate all incidents to determine if the employee was wearing repellent, proper clothing, and performing tick checks. This investigation is important to reduce these types of incidents. The protocol also directs employees to prevention education to keep themselves safe while performing their duties. Educational materials on Lyme and TBDs prevention are also shared with local and community park managers. It is a future goal to disseminate information on property actions and management strategies that will reduce risk. The National Park Service (NPS) has its own protocols for staff regarding tick bites. The NPS’s Office of Public Health/Office of Risk Management/Wildlife Health Branch issued “Tickborne Disease Prevention in the NPS” to provide park staff with information on ticks and TBDs, as well as what to do if they are bitten by a tick.<sup>5</sup>

In addition to the worker safety measures recommended for the DCNR staff, the DOT provides LD and tick safety information to their employees through the PennDOT Daily Safety Talk Book.<sup>6</sup> The FBC also provide their field staff with tick removal kits and keychains, tick repellants, and permethrin infused socks. They provide trainings to law enforcement and hatchery and fisheries personnel on tick bite prevention and post signage at boating access areas and throughout properties owned by the commission.

**Recommendation 3\*** **Standard Brochures for Physician Distribution**

**Description\*** Develop and implement a standard brochure (based on the Virginia model) that physicians ideally should provide to patients when they are evaluated, either by clinical exam or lab testing, for potential Lyme and related tick-borne infections.

**Suggested Lead Organizations\*** Task Force, DOH, and health systems

<b>Status</b>	Implemented and ongoing
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\*Source: LYME DISEASE IN PENNSYLVANIA, A Report Issued by the Task Force on Lyme Disease and Related Tick-Borne Disease, September 2015

Note: This recommendation and Education Recommendation 2: Health Care Provider Prevention Education, have overlapping implementation strategies.

The DOH created a brochure to educate physicians and patients. The brochure was first published in February 2020, and was recently updated in March 2022. Information in the brochure covers transmission, signs and symptoms, treatment, and prevention of Lyme and other TBDs. The brochure is also available in Spanish to reach more Pennsylvanians. This brochure, in both English and Spanish, can be found in the education section of the Tickborne Diseases page on the DOH website (health.pa.gov).<sup>7</sup> In addition to the brochure, the website now includes a specific section for provider resources.

Ahead of the 2022 Lyme season, Acting Secretary of Health and Physician General Denise Johnson, MD, sent a letter to healthcare provider associations, health systems, county and municipal health departments, and school nurses. The letter encouraged their staff and membership to review the brochure and take the web-based training offered by the DOH to familiarize themselves with Lyme and TBDs. Providers were also encouraged to register to receive alerts from the Pennsylvania Health Alert Network (HAN).<sup>8</sup> The HAN is a communication network for state and local health agencies, health care providers, hospitals, and emergency management officials. Each year when the DOH sees an increase in emergency room visits for Lyme or other TBDs an advisory is sent to all who have registered for the HAN. This notifies providers of the increase and to have “a heightened clinical suspicion for tickborne diseases in persons with clinically compatible symptoms.”<sup>9</sup>

In addition to the recommended brochure, the DOH provides a multitude of education materials for the public and healthcare providers, which can be found in the education section of the Tickborne Diseases page on the DOH website (health.pa.gov).<sup>7</sup>

<b>Recommendation 4*</b>	<b>Strategy for Reducing Transfusion Transmitted Babesiosis (TTB)</b>
<b>Description*</b>	Develop and implement strategy to reduce risk of transfusion transmitted Babesiosis (TTB) resulting from donors with tick-borne infection.
<b>Suggested Lead Organizations*</b>	DOH
<b>Status</b>	Implemented and ongoing

\*Source: LYME DISEASE IN PENNSYLVANIA, A Report Issued by the Task Force on Lyme Disease and Related Tick-Borne Disease, September 2015

The five blood banks in Pennsylvania are the American Red Cross of Greater Pennsylvania, Central Pennsylvania Blood Bank, Community Blood Bank of Northwest PA and western NY, Miller-Keystone Blood Center, and Vitalant Blood Bank. In December 2021, the DOH met with all five blood banks to review the recommendation as well as FDA’s 2019 guidance on the issue.<sup>10</sup> Since 2020, all five blood banks have implemented processes to test donor blood for babesiosis and prevent TTB. Since implementing the guidance, a few cases of Babesiosis have been identified in donor blood. In



these cases, the donor blood is discarded and no cases of TTB have occurred. For more information on the blood banks and how to donate visit the Blood Donation page on the DOH website.<sup>11</sup>

## Additional Prevention Efforts

In addition to the prevention efforts described above, the PDA is working to decrease tick habitats. On October 8, 2021, the Japanese Barberry, or *Berberis thunbergii*, was added to a list of noxious weeds. This list indicates plants that cannot be legally sold or cultivated in Pennsylvania. Enforcement of the ban will be phased in over the course of two years. The ornamental shrub was brought to the United States in the 1800s and is popular in landscaping, but disrupts the native ecosystem.<sup>12</sup> A study in Connecticut found that the larger the number of barberry in the area, the higher the incidence of LD carrying ticks.<sup>13</sup> Removal of barberry from landscaping can help reduce Pennsylvanian's exposure to ticks.

The timeline for the two-year rollout of the ban is as follows:

- November 2021 – Nursery and landscape businesses will receive notice from the department, advising them to immediately begin adjusting propagation, ordering and planting of Japanese barberry to decrease inventory.
- Fall 2022 – The department will issue letters of warning to any plant merchant still selling Japanese barberry, providing a date in Fall 2023 after which remaining inventory will be subject to a destruction order.
- Fall 2023 – The department will issue Stop Sale and destruction orders to plant merchants selling or distributing Japanese barberry.

# Education and Awareness

## 2015 Recommendations

<b>Recommendation 1*</b>	<b>Public Awareness Campaign</b>
<b>Description*</b>	Develop and implement comprehensive multimedia public awareness campaign targeting the general public and at-risk population to improve awareness and understanding of TBDs in Pennsylvania and establish working relationships with partners that represent key stakeholders.
<b>Suggested Lead Organizations*</b>	DOH, PDE, DCNR, PGC, and PDA
<b>Status</b>	Implemented and ongoing

\*Source: LYME DISEASE IN PENNSYLVANIA, A Report Issued by the Task Force on Lyme Disease and Related Tick-Borne Disease, September 2015

The DOH, DEP, PDE, DCNR, PDA, and PGC participate in public awareness initiatives. These agencies share information on tick bite prevention and Lyme and other TBDs through their social media accounts, TV and radio interviews, and press events.

The DOH Communications Office has multiple social media campaigns to alert the public about tick safety and LD when tick related emergency department complaints increase and throughout LD season in the summer. The DOH promotes and connects to other organizations education efforts on social media with #TickTalkPA. The DOH created several educational materials that are available on the department’s website, including toolkits, posters and brochures. Videos on tick safety and signs and symptoms of LD are in development by the DOH and Commonwealth Media Services with an expected completion date of Spring 2023. These will be shared with the public once complete. The DOH’s Bureau of Community Health Systems traditionally conducts hundreds of in person educational sessions throughout the state and distributes educational materials. During the initial response to COVID-19, these trainings were put on hold. The DOH’s Bureau of Epidemiology created Bite Labs that consist of tri-fold boards with 25 interchangeable posters to tailor the education to the audience, hands on items to learn what ticks look like, educational handouts and giveaways, such as bookmarks, tick remover tools, and tick ID cards. The Bite Labs were piloted in 2021 and are now being distributed to all of the DOH’s district offices in 2022 to assist with vector awareness and education. These Bite Labs are used at schools, summer camps, and other community events to educate children and the general public.



**Image 2. Tick Bite Lab**

As outlined in Prevention Recommendation 1, the PDE partners with the DOH to disseminate toolkits to teachers and oversee a statewide art contest for students. These activities are aimed at engaging students across the commonwealth to learn about tick bite prevention and LD.

The FBC, PGC, and DCNR post signage at the entrances to water access points, parking for State Game Lands, and trail heads respectively. In addition to posting tick awareness signs, DCNR provides tick "rack cards" for the public at all State Park and State Forest Offices. The rack cards are available in both English and Spanish. During the state park public programs, the State Park Environmental Educators integrate messages related to tick bite and LD prevention.

<b>Recommendation 2*</b>	<b>Health Care Provider Prevention Education</b>
<b>Description*</b>	Develop and implement an initial and ongoing education program for healthcare providers to include prevention of tick bites, and prevention of disease progression from acute to later stages of infection.
<b>Suggested Lead Organizations*</b>	DOH, PA Medical Society, PA County or Municipal Health Departments, PA State Nurses Association or PA State Board of Nursing
<b>Status</b>	Implemented and ongoing

\*Source: LYME DISEASE IN PENNSYLVANIA, A Report Issued by the Task Force on Lyme Disease and Related Tick-Borne Disease, September 2015

Note: This recommendation and Prevention Recommendation 3: Standard Brochures for Physician Distribution, have overlapping implementation strategies.

The DOH released a Lyme and Other Tickborne Diseases webinar for healthcare providers on TRAIN PA, the department’s training website, in 2019 and plans to publish an updated version in June 2022. The webinar covers signs and symptoms, testing, diagnosis, and treatment for LD as well as other TBDs. The DOH supports the Infectious Disease Society of America’s Clinical Practice Guidelines for the Prevention, Diagnosis and Treatment of Lyme Disease, which are presented in the webinar.<sup>14</sup> To access the webinar, go to [WWW.TRAIN.ORG/PA](http://WWW.TRAIN.ORG/PA). Continuing education credits for physicians and nurses are available upon completion of the webinar.

Acting Secretary of Health and Physician General Denise Johnson, MD, sent a letter to healthcare provider associations, health systems, county and municipal health departments, and school nurses in March 2022. The letter encouraged their staff and membership to take the web-based training offered by the DOH to familiarize themselves with Lyme and TBDs ahead of the peak season for tick bites in Pennsylvania.

In addition to the webinar for physicians and nurses, the DOH is partnering with the Pennsylvania Veterinary Medical Association to create a web-based training for veterinarians. This training will provide information and instruction on diagnosis, treatment and prevention for Lyme and other TBDs of concern to pets and other animals.

## **Additional Education and Awareness Efforts**

In addition to the education efforts already described, the DOH conducts in person vector-borne disease education at Boy Scout camps, schools, community centers, senior centers, and workplaces.

# Surveillance

## 2015 Recommendations

<b>Recommendation 1*</b>	<b>Disease List Updating and Reporting</b>
<b>Description*</b>	(A): Adjust and periodically review the Pennsylvania notifiable disease list. Add Babesiosis and specifically include Powassan virus as an arboviral infection to the state’s notifiable disease list and conduct periodic reviews of the list for TBDs.  (B): Report TBDs not included on the Pennsylvania notifiable disease list. Encourage providers to report new and emerging TBDs (i.e., <i>B. miyamotoi</i> ) not included on the list regardless of whether or not they were acquired in the state using the unusual disease occurrence reporting mandate.
<b>Suggested Lead Organizations*</b>	DOH and County and Municipal Health Departments
<b>Status</b>	In progress

\*Source: LYME DISEASE IN PENNSYLVANIA, A Report Issued by the Task Force on Lyme Disease and Related Tick-Borne Disease, September 2015

The DOH supports updating and periodically reviewing the list of reportable diseases.<sup>15</sup> Babesiosis has not been added to the list of reportable diseases in Pennsylvania. The DOH supports adding babesiosis as a reportable condition. Additionally, the DOH has received reports of *B. miyamotoi* cases in Pennsylvania residents and supports adding it to the list of reportable diseases. Powassan virus is a reportable disease as it is an arbovirus, and all arboviruses have been reportable diseases in Pennsylvania for decades.

The DOH issues health alerts regarding TBDs and requests that providers and labs report all TBDs to capture new and emerging TBDs.

The DOH is in the process of updating the regulations found in Chapter 27 of Title 28 related to communicable and noncommunicable diseases. Because of the scope and complexity of this chapter, revision is a lengthy process. In addition, the regulatory process in Pennsylvania, once the regulations receive internal approval and approval from the Advisory Health Board, can take up to two years.

County and Municipal Health Departments (CMHDs) in Pennsylvania follow the DOH’s list of reportable diseases, except for the Philadelphia Department of Public Health. Their list of reportable diseases can be found on their website: [HIP.PHILA.GOV](http://HIP.PHILA.GOV).<sup>16</sup>

<b>Recommendation 2*</b>	<b>Statewide Environmental Survey</b>
<b>Description*</b>	Increase the public, medical, and scientific community’s awareness of tick populations, and the diseases they carry through a broad and comprehensive statewide environmental survey.

Suggested Lead Organizations*	DEP
Status	Implemented and ongoing

\*Source: LYME DISEASE IN PENNSYLVANIA, A Report Issued by the Task Force on Lyme Disease and Related Tick-Borne Disease, September 2015

An active statewide survey of tick populations was initiated by the DEP in the fall of 2018 and have continued annually since that time. Tick surveys target *Ixodes scapularis* (Blacklegged tick or Deer tick) at all life stages, however, additional tick species are surveyed, including *Dermacentor variabilis* (American Dog tick). In addition, emerging tick populations are being surveyed to track their prevalence and expansion in the Commonwealth such as *Haemaphysalis longicornis* (Asian Longhorned tick), *Amblyomma americanum* (Lonestar tick), and *Amblyomma maculatum* (Gulf Coast tick).

The DEP collects and tests a minimum of 50 adult *Ixodes scapularis* ticks from all 67 counties during the fall and winter survey (October-March). Adult Blacklegged ticks were initially tested for three primary pathogens including *Borrelia burgdorferi*, *Anaplasma phagocytophilum*, and *Babesia microti*. Since the inception of DEP’s Tick Surveillance and Testing Program, their molecular laboratory has developed the capacity to test for emerging or rarer pathogens such as *Borrelia mayonii*, *Borrelia miyamotoi*, and Deer Tick Virus.

The nymphal stage of *Ixodes scapularis* is the second life stage that the DEP targets. That survey begins in April and ends in August. Nymphs are collected from two locations in each of Pennsylvania’s 67 counties and tested for *B. burgdorferi*, *A. phagocytophilum*, and *Ba. microti*. During this time the above referenced tick species are collected and stored for additional testing or future studies.

As detailed below, DEP has partnered with a number of federal, state, and academic agencies to produce peer-reviewed manuscripts published in scientific journals in fulfillment of Implementation Ideas and Performance/ Evaluation Metrics in the taskforce report. Additional studies on ticks and tickborne pathogens are ongoing to support continued achievement of the taskforce’s recommendations.

- Price, K. J., Witmier, B. J., Eckert, R. A., Boyer, C. N., Helwig, M. W., & Kyle, A. D. (2021). Distribution and density of *Haemaphysalis longicornis* (Acari: Ixodidae) on public lands in Pennsylvania, United States. *Journal of Medical Entomology*, 58(3), 1433-1438.
- Price, K. J., Graham, C. B., Witmier, B. J., Chapman, H. A., Coder, B. L., Boyer, C. N., ... & Kyle, A. D. (2021). *Borrelia burgdorferi* sensu stricto DNA in field-collected *Haemaphysalis longicornis* ticks, Pennsylvania, United States. *Emerging Infectious Diseases*, 27(2), 608.
- Price, K. J., Tewari, D., Witmier, B. J., Long, J., Chroscinski, M. S., Livengood, J. L., ... & Lind, L. (2021). Prevalence and distribution of Powassan/deer tick virus in Pennsylvania. *International Journal of Acarology*, 47(8), 726-729.
- Price, K. J., Ayres, B. N., Maes, S. E., Witmier, B. J., Chapman, H. A., Coder, B. L., ... & Nicholson, W. L. (2021). First detection of human pathogenic variant of *Anaplasma*

*phagocytophilum* in field-collected *Haemaphysalis longicornis*, Pennsylvania, USA. Zoonoses and Public Health.

In addition to the DEP’s tick surveys, the DOH has created a community of practice (CoP) for tick researchers in the commonwealth. The CoP brings together all tick surveillance entities in the state to streamline processes, collaborate and share best practices. Members of the CoP include the DOH, DEP, PDA, East Stroudsburg University, Indiana University of Pennsylvania, Grove City College, Muhlenberg College, Penn State, Shippensburg University, University of Pittsburgh, and Westminster College.

<b>Recommendation 3*</b>	<b>Funding for Research and Information Sharing</b>
<b>Description*</b>	Earmark state budgeted appropriations to conduct research and share information for tick distribution, control, infectivity rates, and pathogen load
<b>Suggested Lead Organizations*</b>	DEP (tick surveillance) and PDA (other animal surveillance)
<b>Status</b>	In progress

\*Source: LYME DISEASE IN PENNSYLVANIA, A Report Issued by the Task Force on Lyme Disease and Related Tick-Borne Disease, September 2015

Efforts have been made to achieve this recommendation; however, resource limitations have hindered the agencies’ abilities to fully realize this work. The DOH provided DEP with funds from the state appropriation for LD to conduct tick surveys. The results of these surveys are included in the 2019 Annual Lyme and Other Tickborne Disease Report.<sup>1</sup>

Additionally, a state appropriation of \$750,000 provides East Stroudsburg University with funding to conduct tick testing and public outreach.

Information on tick testing and how to access testing is included on the DOH website. While testing ticks can provide useful information about which pathogens the tick may carry, there are some issues that should be considered:

- Positive results from a tick or ticks attached to a person does not necessarily mean that the person bitten was exposed to the pathogen, likewise negative results from a tick does not mean the person was not exposed to any tickborne pathogen.
- Studies have shown that very few people with tickborne illnesses recall being bitten by a tick indicating people may not see the tick that bit them and caused an illness.
- It is possible to be bitten by a tick carrying a disease and not be infected with that disease, depending on many factors, including how long the tick was attached to you.<sup>17</sup>

<b>Recommendation 4*</b>	<b>Funding for Observational Epidemiological Studies</b>
<b>Description*</b>	Obtain funding to support observational epidemiologic studies to provide more detailed data on the burden and cost of TBDs among Pennsylvania residents. Observation studies may include: 1) use of prevention practices and risk factors for tick-borne disease; 2) self-reported tick-borne disease illness; and



	3) long-term patient outcomes
<b>Suggested Lead Organizations*</b>	PA Institutions of Higher Education (IHEs) with Masters programs in Public Health or similar programs, PA academic medical institutions, and DOH Bureau of Epidemiology
<b>Status</b>	In progress

\*Source: LYME DISEASE IN PENNSYLVANIA, A Report Issued by the Task Force on Lyme Disease and Related Tick-Borne Disease, September 2015

The DOH added the Vectorborne Diseases module to the statewide 2022 Behavioral Risk Factor Surveillance System (BRFSS).<sup>18</sup> This phone survey is conducted across Pennsylvania to better understand the population’s behavioral risk factors. The questions included in the Vectorborne Disease module can be found in Appendix A of this report.

In addition to the BRFSS, the DOH conducted enhanced interviews with a subset of LD cases in 2019. A total of 660 in depth interviews were conducted with LD cases to understand demographic factors, attitudes about tick safety and LD, outdoor activities, pet ownership, occupation, and LD related healthcare experiences.

<b>Recommendation 5*</b>	<b>Diagnostic Testing – Annual Updates</b>
<b>Description*</b>	Provide annual updates for, and enhance availability of, a broad array of diagnostic tests for tick-borne disease, as well as encourage the development of innovative and more accurate diagnostic tests.
<b>Suggested Lead Organizations*</b>	DOH Bureau of Laboratories, DOH Bureau of Epidemiology, Local and District Health Departments, and other state health departments
<b>Status</b>	Implemented and ongoing

\*Source: LYME DISEASE IN PENNSYLVANIA, A Report Issued by the Task Force on Lyme Disease and Related Tick-Borne Disease, September 2015

Three tests exist to detect LD, 1) the standard two-tier test (STTT), 2) the modified two-tier test (MTTT), and 3) the PCR test. The MTTT was approved by the FDA for LD diagnosis in 2019, although it is unknown how widely it is being used and may not be more available than the standard two tier test.<sup>19</sup> The PCR test for LD diagnosis was added to the Council for State and Territorial Epidemiologists case definition for LD in 2021.<sup>20</sup> No other diagnostic tests for LD have been developed.

The DOH Bureau of Laboratories (BOL) currently has capacity to provide the STTT test for LD.<sup>21</sup> The two-tier test refers to a screening test and a confirmatory test, both of which can be completed using the same blood sample. The screening test and the confirmatory test must be positive in order for the overall result to be positive for LD. In addition to the to the STTT, the BOL will soon offer the MTTT. The BOL is currently conducting validation tests and access to MTTT is expected in the summer of 2022. The BOL ensures access to testing for all uninsured and underinsured residents of the Commonwealth. All other requests for testing are considered on a case-by-case basis. To access these resources, providers should contact the BOL at 484-870-6416.<sup>22</sup>

Annually, a HAN is sent to healthcare providers regarding ticks and LD that includes links to CDC resources outlining approved tests for LD, as well as the services provided by the BOL. The most recent HANs were issued on May 13, 2022.<sup>23</sup>

<b>Recommendation 6*</b>	<b>Expand Surveillance Network</b>
<b>Description*</b>	Improve healthcare provider and veterinarian participation in tick-borne disease surveillance by disseminating annual advisories on the recognition, diagnosis and reporting of TBDs in PA and by utilizing technology to streamline and enable electronic tick-borne disease case reporting.
<b>Suggested Lead Organizations*</b>	DOH (humans) and Department of Agriculture (domestic animals)
<b>Status</b>	In progress

\*Source: LYME DISEASE IN PENNSYLVANIA, A Report Issued by the Task Force on Lyme Disease and Related Tick-Borne Disease, September 2015

In 2013, the DOH expanded its surveillance by using its emergency department surveillance system to identify increases in tick related complaints. These complaints indicate that people are having more tick encounters. This information helps the DOH identify the start of the summer LD season. This system allows the DOH to identify increases in tick and LD cases more quickly than traditional case reporting. When this increase is identified, an advisory is sent to all providers registered in the HAN, described earlier in this report, and a press release is issued to notify the public.

LD and other TBDs in animals are not reportable to the PDA and therefore this surveillance data does not currently exist. The Pennsylvania Animal Diagnostic Laboratory System offers PCR testing for LD for dogs, horses, and other animals. There are fees associated with this testing. Private labs also offer other diagnostic tests. The PDA does not have plans to create an expanded surveillance network. In order to do so, the PDA would first need to make LD and other TBDs a reportable disease in domestic animals. The funding for this type of passive surveillance is limited to samples from the DEP that are submitted to the PDA, and no active surveillance is conducted. If active surveillance were to occur funding would be necessary.

<b>Recommendation 7*</b>	<b>Expand and Standardize Data Collection in Case Investigations</b>
<b>Description*</b>	Enhance and ensure tick-borne disease surveillance case investigations used by local health department and health district staff to include questions that can identify potential coinfections with other tick-borne pathogens and help identify potential risk factors for infection.
<b>Suggested Lead Organizations*</b>	DOH and Local and District Health Departments
<b>Status</b>	Implemented and ongoing

\*Source: LYME DISEASE IN PENNSYLVANIA, A Report Issued by the Task Force on Lyme Disease and Related Tick-Borne Disease, September 2015

Investigations are completed on TBD cases, with the exception of LD, to identify risk factors, symptoms and treatment. LD cases are no longer interviewed or investigated as robust case counting in

high incidence states does not provide much value when those resources may be better directed at prevention. Every county in Pennsylvania is considered to be high incidence for LD. Therefore, trends from lab report case counts and syndromic surveillance systems can be gleaned while resources are directed at public education and prevention. The diseases for which DOH conducts investigations include: anaplasmosis, ehrlichiosis, spotted fever rickettsiosis, babesiosis, Powassan virus, and tularemia.

<b>Recommendation 8*</b>	<b>Surveillance Data Website</b>
<b>Description*</b>	Use a centralized, publicly accessible website to disseminate summaries of human, other animal, and ecologic tick-borne disease surveillance data at a statewide and county level.
<b>Suggested Lead Organizations*</b>	DOH (Humans), DEP (Ticks), and Department of Agriculture (Other animals)
<b>Status</b>	Implemented and ongoing

\*Source: LYME DISEASE IN PENNSYLVANIA, A Report Issued by the Task Force on Lyme Disease and Related Tick-Borne Disease, September 2015

The DEP worked in conjunction with DOH to develop a website. The website includes information on general tick biology, surveillance methodology, tick species, tick pathogens, personal protection, habitat management around the home, and tick distribution in the Commonwealth. The DEP intends to update the website monthly to include currently active tick species and life stages and testing results on a county basis. The DEP website includes a section for citizens to find their local tick surveillance coordinator under the County Contacts section.<sup>24</sup> Links are also included to the CDC and DOH websites for information on Lyme and other TBDs in humans, including surveillance data. The website, DEP.PA.GOV/TICKS, was launched in April 2022. See Surveillance Recommendation 6 on page 16 for information regarding PDA’s surveillance.

## Additional Surveillance Efforts

The DOH has conducted surveillance of LD and other TBDs for decades. Annually, a surveillance report is produced, most recently in October 2021.<sup>1</sup> The report provides the methodology used to conduct the surveillance efforts along with data and visualizations on the prevalence of LD and other TBDs in Pennsylvania.

The DOH actively collaborates with other state agencies, other states, and the CDC on monitoring new trends in TBDs. Part of this collaboration is providing funding to DEP to conduct active tick surveillance, as described in Surveillance Recommendation 2. The results of the most recent tick surveillance can be found on the DEP’s website, DEP.PA.GOV.

## Other

### 2015 Recommendations

<b>Recommendation 1*</b>	<b>Convene an Advisory Body</b>
<b>Description*</b>	Convene a task force that reports to the Secretary of Health and operates as an independent advisory group on Lyme disease and other TBDs.
<b>Suggested Lead Organizations*</b>	All participating agencies in Act 83
<b>Status</b>	In progress

\*Source: LYME DISEASE IN PENNSYLVANIA, A Report Issued by the Task Force on Lyme Disease and Related Tick-Borne Disease, September 2015

The recommendation encourages the formation of an advisory body to track the implementation of the taskforce’s recommendations, update programs, and provide diverse perspectives, including government agencies, scientists, healthcare providers, scientists, and patient advocates. This is currently being achieved through two groups, the workgroup and the CoP. The workgroup is monitoring progress toward implementing the recommendations and includes all participating agencies in Act 83. To hear from diverse perspectives, the workgroup meets quarterly with LD stakeholders and is actively recruiting more stakeholders, including patient advocates, to participate in these meetings. To gather the perspective of scientists, the CoP meets every other month, including scientists from eight universities in Pennsylvania researching tick borne diseases. Starting in June 2022, each university participating in the CoP will be invited on a rotating basis to present their work at the quarterly stakeholder meeting of the workgroup. This effort will connect the research community with organizations throughout Pennsylvania working to combat Lyme and other TBDs. For more information on the CoP see Surveillance Recommendation 2: Statewide Environmental Survey on page 13 of this report.

<b>Recommendation 2*</b>	<b>Obtain Independent Implementation Cost Analysis</b>
<b>Description*</b>	The Task Force recommends that the independent and bi-cameral Legislative Budget and Finance Committee provide a useful estimate of costs for key recommendations contained in this report and identify any potential sources of public or private grant funding.
<b>Suggested Lead Organizations*</b>	Legislative Budget and Finance Committee
<b>Status</b>	Completed

\*Source: LYME DISEASE IN PENNSYLVANIA, A Report Issued by the Task Force on Lyme Disease and Related Tick-Borne Disease, September 2015

In October 2016, the Pennsylvania Legislative Budget and Finance Committee published *Cost Estimates to Implement the Recommendations of the Task Force on Lyme Disease and Related Tick-borne Diseases*.<sup>25</sup> Their analysis stated that at minimum it would cost \$23.7 million, and at maximum \$115.7 million, to implement the recommendations from the taskforce over five years, or between \$4.7

and \$23.4 million annually. This estimate did not include the recommendations in the Other category and assumed that four of the recommendations would cost zero dollars to implement. Table 1 details the cost estimates from the Pennsylvania Legislative Budget and Finance Committee for each recommendation from the taskforce.

The workgroup determined that the four recommendations identified as requiring no funds by the Pennsylvania Legislative Budget and Finance Committee, would in fact require funding to implement.

- Prevention Recommendation 4 requires the blood banks in Pennsylvania to test their blood donations in order to reduce the risk of transfusion transmitted babesiosis. While this would not be a cost for the commonwealth, this comes at a cost to the blood banks.
- Surveillance Recommendation 1 says that the DOH should periodically review the Pennsylvania notifiable disease list and report TBDs not included on the Pennsylvania notifiable disease list. Updating the notifiable disease list is a change in regulation of Chapter 27. This requires a significant amount of staff time, including those at the DOH, and other reviewing entities.
- Surveillance Recommendation 3 says that state funds should be earmarked for research. This would come at a cost to the commonwealth depending on the level of funding desired and the scope of the research.
- Surveillance Recommendation 7 instructs the DOH to increase tickborne disease case investigation. This is currently accomplished for TBDs other than LD. If there are increases in other TBDs or LD cases were to be investigated, additional funding would be needed.

The DOH annually receives state funding to address LD. Of the \$3 million dollars received for FY 2021 -2022, \$800,000 for surveillance activities, \$868,000 for education and awareness, \$130,000 for testing capabilities, \$381,000 for planning and prevention, \$71,000 for administrative needs, and \$750,000 to East Stroudsburg University for tick-testing and public outreach.

The DOH also applies for federal funding to address vector borne diseases. In FFY 2021-2022, the DOH was awarded nearly \$430,000 from the federal government through the Epidemiology and Laboratory Capacity for Infectious Diseases (ELC) Cooperative Agreement to address mosquito and tickborne surveillance and prevention. These ELC funds support arbovirus (including West Nile Virus) surveillance and laboratory personnel, laboratory supplies, a mosquito surveillance subgrant to the DEP and funding for a part time coordinator for tickborne surveillance (both Lyme and non-Lyme diseases). The DOH will continue to apply for this funding.

## Conclusions

The workgroup will continue to meet monthly to implement and enhance the commonwealth's response to LD and other TBDs. An additional update to the public, stakeholders, and General Assembly will be published in late 2022 on the workgroup's progress towards achieving its mission.



Table 1. Costs Associated with Recommendations Over Five Years

Recommendation	Associated Costs	
	Minimum	Maximum
<u>Prevention 1</u> : Develop and implement a protocol and funding strategy for schools located in high-risk areas to implement personal protection and property actions.	\$15,000	\$2,639,500
<u>Prevention 2</u> : Develop and implement a protocol for federal, state, and local park staff and properties to include communicating risk awareness (tick presence, tips for personal protection) and taking property actions.	\$85,350	\$25,217,550
<u>Prevention 3</u> : Develop and implement a standard brochure (based on the Virginia model) that physicians ideally would provide to patients.	\$772,000	\$2,197,000
<u>Prevention 4</u> : Develop and implement strategy to reduce risk of transfusion transmitted babesiosis (TTB) resulting from donors with tick-borne infection. The CDC and FDA have responsibility for the safety of the blood supply.	\$0	\$0
<b>Subtotal for Prevention Recommendations</b>	<b>\$872,350</b>	<b>\$30,054,050</b>
<u>Education &amp; Awareness (E&amp;A) 1</u> : Develop and implement comprehensive multimedia public awareness campaign targeting the general public and at-risk population.	\$0	\$11,525,000
<u>E&amp;A 2</u> : Develop and implement an initial and ongoing education program for healthcare providers.	\$7,500	\$7,500
<b>Subtotal for E&amp;A Recommendations</b>	<b>\$7,500</b>	<b>\$11,532,500</b>
<u>Surveillance 1</u> : (A): Adjust and periodically review the Pennsylvania notifiable disease list. (B): Report TBDs not included on the Pennsylvania notifiable disease list.	\$0	\$0
<u>Surveillance 2</u> : Increase the public, medical, and scientific community's awareness of tick populations and the diseases they carry through a broad and comprehensive statewide environmental survey.	\$1,822,000	\$5,093,000
<u>Surveillance 3</u> : Earmark state budgeted appropriations to conduct research and share information for tick distribution, control, infectivity, rates, and pathogen load.	\$0	\$0
<u>Surveillance 4</u> : Obtain funding to support observational epidemiologic studies to provide more detailed data on the burden and cost of TBDs among Pennsylvania residents.	\$8,751,500	\$8,751,500
<u>Surveillance 5</u> : Provide annual updates for, and enhance availability of, a broad array of diagnostic tests for tick-borne disease, as well as encourage the development of innovative and more accurate diagnostic tests.	\$15,000	\$37,500
<u>Surveillance 6</u> : Improve healthcare provider and veterinarian participation in tick-borne disease surveillance.	\$12,000,000	\$60,000,000
<u>Surveillance 7</u> : Enhance and ensure tick-borne disease surveillance case investigations used by local health department and health district staff.	\$0	\$0
<u>Surveillance 8</u> : Use a centralized, publicly accessible website to disseminate summaries of human, other animal, and ecologic tick-borne disease surveillance data at a statewide and county level.	\$200,000	\$225,000
<b>Subtotal for Surveillance Recommendations</b>	<b>\$22,788,500</b>	<b>\$74,107,000</b>
<b>TOTAL</b>	<b>\$23,668,350</b>	<b>\$115,693,550</b>

Source: Pennsylvania Legislative Budget and Finance Committee



## Citations

1. 2019 Lyme and Other Tickborne Diseases Surveillance Report. Department of Health. Published October 1, 2021. Accessed January 2022. <https://www.health.pa.gov/topics/Documents/Diseases%20and%20Conditions/Lyme/Lyme%20Disease%20Annual%20Report%202019.pdf>
2. 2014 Act 83. Pennsylvania General Assembly. Published June 29, 2014. Accessed January 2022. <https://www.legis.state.pa.us/cfdocs/legis/li/uconsCheck.cfm?yr=2014&sessInd=0&act=83>
3. Vectorborne Diseases Schools and Educators. Pennsylvania Department of Health. Accessed January 2022. <https://www.health.pa.gov/topics/disease/Vectorborne%20Diseases/Pages/Schools-Educators.aspx>
4. Lyme Art. Department of Health. Accessed January 2022. <https://www.health.pa.gov/topics/disease/Pages/Lyme-Art.aspx>
5. Tickborne Disease Prevention in the NPS. Public Health/Office of Risk Management/Wildlife Health Branch. Published May 2, 2019. Accessed January 2022. <https://santacruz.nrs.ucsb.edu/sites/default/files/docs/Tickborne%20Disease%20Info%202019-1.pdf>
6. *PennDOT Daily Safety Talk Book*. Pennsylvania Department of Transportation Accessed April 2022. <https://www.dot.state.pa.us/public/PubsForms/Publications/PUB%20247.pdf>
7. LYME DISEASE: WHAT YOU NEED TO KNOW. Pennsylvania Department of Health. Accessed May 2022. <https://www.health.pa.gov/topics/Documents/Diseases%20and%20Conditions/Vectorborne/Lyme%20brochure%20PA.pdf>
8. Health Alert Network (HAN). Department of Health. Accessed January 2022. <https://www.health.pa.gov/topics/prep/PA-HAN/Pages/HAN.aspx>
9. *PENNSYLVANIA DEPARTMENT of HEALTH 2021 -PAHAN-571-5-13-ADV Lyme Disease and Other Tickborne Diseases in Pennsylvania SUBJECT: Lyme Disease and Other Tickborne Diseases in Pennsylvania*. Pennsylvania Department of Health; 2021. Accessed May 2022. <https://www.health.pa.gov/topics/Documents/HAN/2021-571-5-13-ADV-Lyme.pdf>
10. *Recommendations for Reducing the Risk of Transfusion-Transmitted Babesiosis Guidance for Industry.*; 2019. Accessed January 2022. <https://www.fda.gov/media/114847/download>
11. Blood Donation. Department of Health. Accessed May 2022. <https://www.health.pa.gov/topics/programs/Pages/Blood-Donation.aspx>
12. News from PA Dept. of Agriculture. Pennsylvania Pressroom. Published November 12, 2021. Accessed January 2022. [https://www.media.pa.gov/Pages/Agriculture\\_details.aspx?newsid=1160](https://www.media.pa.gov/Pages/Agriculture_details.aspx?newsid=1160)
13. Williams SC, Ward JS. Effects of Japanese Barberry (*Ranunculales: Berberidaceae*) Removal and Resulting Microclimatic Changes on *Ixodes scapularis* (Acari: Ixodidae) Abundances in Connecticut, USA. *Environmental Entomology*. 2010;39(6):1911-1921. doi:10.1603/en10131
14. Clinical Practice Guidelines by the Infectious Diseases Society of America (IDSA), American Academy of Neurology (AAN), and American College of Rheumatology (ACR): 2020 Guidelines for the Prevention, Diagnosis and Treatment of Lyme Disease. Infectious Disease Society of America. Published November 30, 2020. Accessed January 2022. <https://www.idsociety.org/practice-guideline/lyme-disease/>
15. List of Reportable Diseases. Pennsylvania Department of Health. Accessed January 2022. <https://www.health.pa.gov/topics/Reporting-Registries/Pages/Reportable-Diseases.aspx>
16. Philadelphia Department of Public Health - Report A Disease - PDPH Health Information Portal. [hip.phila.gov](http://hip.phila.gov). Accessed May 2022. <https://hip.phila.gov/report-a-disease/>

17. Tick Identification and Testing Services. Pennsylvania Department of Health. Accessed May 2022. <https://www.health.pa.gov/topics/disease/Vectorborne%20Diseases/Pages/Tick-Testing.aspx>
18. Behavioral Health Risks of Pennsylvania Adults. Department of Health. Accessed January 2022. <https://www.health.pa.gov/topics/HealthStatistics/BehavioralStatistics/BehavioralRiskPAAadults/Pages/BehavioralRisksPAAadults.aspx>
19. Mead P, Petersen J, Hinckley A. Updated CDC Recommendation for Serologic Diagnosis of Lyme Disease. *MMWR Morbidity and Mortality Weekly Report*. 2019;68(32):703. doi:10.15585/mmwr.mm6832a4
20. *Title: Modification of Lyme Disease Case Definition*. Council for State and Territorial Epidemiologists; 2021. Accessed April 2022. [https://cdn.ymaws.com/www.cste.org/resource/resmgr/ps/ps2021/21-ID-05\\_Lyme\\_Disease.pdf](https://cdn.ymaws.com/www.cste.org/resource/resmgr/ps/ps2021/21-ID-05_Lyme_Disease.pdf)
21. *Bureau of Laboratories Directory of Services*. Pennsylvania Department of Health; 2021. Accessed April 2022. <https://www.health.pa.gov/topics/Documents/Laboratories/BOL-1-V11.pdf>
22. 2019– PAHAN –443– 04-12 - ADV Lyme Disease and Other Tickborne Diseases in Pennsylvania. Pennsylvania Department of Health. Published April 12, 2019. Accessed January 2022. <https://www.health.pa.gov/topics/Documents/HAN/2019-PAHAN-443-04-12-ADV-Lyme%20Disease.pdf>
23. *2022-PAHAN-640-05-13-ADV Lyme Disease and Other Tickborne Diseases in Pennsylvania*. PENNSYLVANIA DEPARTMENT OF HEALTH; 2022. Accessed May 2022. [https://www.health.pa.gov/topics/Documents/HAN/2022-640-05-13-ADV-Lyme\\_Tickborne.pdf](https://www.health.pa.gov/topics/Documents/HAN/2022-640-05-13-ADV-Lyme_Tickborne.pdf)
24. Vector Management: Mosquitoes, Ticks, and Black Flies. Department of Environmental Protection. Published April 2022. Accessed May 2022. <https://www.dep.pa.gov/Business/ProgramIntegration/Vector-Management/Pages/default.aspx>
25. Brewster J, Brooks M, McGarrigle T, et al. *Cost Estimates to Implement the Recommendations of the Task Force on Lyme Disease and Related Tick-Borne Diseases Legislative Budget and Finance Committee a JOINT COMMITTEE of the PENNSYLVANIA GENERAL ASSEMBLY*.; 2016. Accessed May 24, 2022. <http://lbfc.legis.state.pa.us/Resources/Documents/Reports/565.pdf>

## Appendix A: 2022 BRFSS PA State Added Section 6: Vectorborne Diseases

Question Number	Question text	Variable names	Responses (DO NOT READ UNLESS OTHERWISE NOTED)	Interviewer Note (s)	Column(s)
PA06.01	How often do you use insect repellent before participating in outdoor activities such as hiking, camping, fishing, golfing, gardening, yard work, etc.? Would you say...		1 Always 2 Usually 3 Sometimes 4 Rarely 5 Never 7 Don't know / Not sure 9 Refused		913
PA06.02	After participating in such outdoor activities, how often do you inspect yourself for ticks? Would you say...		1 Always 2 Usually 3 Sometimes 4 Rarely 5 Never 7 Don't know / Not sure 9 Refused		914
PA06.03	In the past 12 months, have you found one or more ticks on yourself?		1 Yes 2 No 7 Don't know / Not sure 9 Refused		915