

Master of Public Health Field Experience Report

**Redesigning and Updating the Indiana State Department of Health Zoonotic
and Vector-Borne Disease Website**

by

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submitted in partial fulfillment of the requirements for the degree

MASTER OF PUBLIC HEALTH

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SUMMARY

In August 2017, I met with Dr. Jennifer Brown, the state public health veterinarian for Indiana, about completing a project that would fulfill the requirements for my MPH field experience. We collaborated on a project to redesign and provide up-to-date information on the Epidemiology Resource Center website of the Indiana State Department of Health (ISDH), specifically the Zoonotic and Vector-Borne Epidemiology/ Entomology pages. The entire website was redesigned. My responsibility included providing updated datasheets for the tick-borne and mosquito-borne disease pages. Once these sheets are completed, they would be reviewed by ISDH staff members also working on these webpages, and then be officially published on the website to be accessed by the public. The details of my involvement in this project for my field experience are detailed in this report.

Subject keywords: zoonoses, Indiana State Department of Health (ISDH), vector-borne diseases, tick-borne diseases, mosquito-borne diseases, webpage, epidemiology.

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Chapter 1 - Introduction

People interact with animals in many ways in the United States. Domesticated animals offer many benefits in our daily lives, including companionship, food, and scientific research. Contact with some animals, however, can lead to human sickness. Zoonotic diseases or zoonoses are infections that are spread between animals and humans (CDC, 2018). These diseases can be caused by bacteria, fungi, parasites, and viruses (CDC, 2018). Every year, thousands of Americans are affected by zoonotic diseases (CITE). There are several ways that diseases can spread between animals and humans. These include: direct contact, indirect contact, food-borne, and vector-borne (CDC, 2018).

Zoonotic diseases can be mild to serious, potentially leading to death (ISDH, 2017c). Access to and dissemination of information about possible prevention and symptoms of these diseases are very important to improve overall public health in the state of Indiana and surrounding areas. Several information platforms are available to the public to access this information. The Centers for Disease Control and Prevention (CDC) offers this information to the public in a manner that applies to the entire United States. The Indiana State Department of Health (ISDH) Epidemiology Resource Center is a portal that houses the ISDH Vector-Borne Disease website (ISDH, 2017a). The ISDH Vector-Borne Disease website contains a list of mosquito-borne diseases, tick-borne diseases, and other zoonotic diseases, the organisms that cause these illnesses, tips for prevention, guidance for international travelers, and a list of other pests of public health significance (ISDH, 2017b). The website is designed to be easily accessible and comprehensible to the public, specifically Indiana residents.

There have been several user complaints about the ease of use and the functioning of the ISDH Vector-Borne Disease website. One example of this was voiced at a meeting between

members of the ISDH and Indiana Lyme Connect, a Lyme disease advocacy group, in June 2017. Indiana Lyme Connect found the website carried outdated data, made some elements of Lyme disease and its main vector, the black-legged tick, seem irrelevant, and that information could be better organized. They also would appreciate appropriate pictures to be placed on the website. The lack of current information could lead to reduced use of the website, less access to relevant information, reduced reporting rates, and potentially suboptimal health outcomes in Indiana and surrounding areas. Work needed to be done to improve the functioning of the ISDH Vector-Borne Disease website. As a result, the overall goal of this study was to identify issues that reduce the usefulness of the website and to map existing pages for updating and reorganization.

The specific goals of the MPH field experience included:

- To determine the content deficiencies in the Epidemiology Resource Center website of the Indiana State Department of Health (ISDH), specifically the Zoonotic and Vector-borne Epidemiology/ Entomology pages
- To develop a universal datasheet template for tick- and mosquito-borne diseases
- To compile a datasheet for each tick- and mosquito-borne disease of concern as identified by the Epidemiology committee of ISDH
- To develop user-friendly webpages for each tick- and mosquito-borne diseases of concern for publication on the ISDH website.

Inbox

On June 21, 2017, ISDH met with Indiana Lyme Connect, a Lyme advocacy group, to discuss several concerns. One concern they had was that the website was outdated. Here is their feedback:

- o The website map identifies the counties where blacklegged ticks are found doesn't impart a sense of risk. It's also unclear how recent the data is.

Counties with *Ixodes scapularis*
(Deer Tick) Identified



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<https://outlook.office.com/owa/projection.aspx>

- The prevention information on the website, while useful, might benefit from reorganization.
 - o Specifically, discuss permethrin ahead of information on repellents.
 - o With regard to repellents it's important to offer alternatives to DEET. Picaridin is equally safe and effective as is lemon eucalyptus oil, which is preferred by people who want to avoid chemicals by using natural products.
 - o A link to the Tick Management Handbook Dr. Kirby Stafford of the Connecticut Agricultural Experiment Station, New Haven would be helpful.
<http://www.ct.gov/caes/lib/caes/document/publications/bulletins/b1010.pdf>
 - o Appropriate pictures might be nice.

1/2

Figure 1: Email from Dr. Jennifer Brown, State Public Health Veterinarian, showing the feedback from Indiana Lyme Connect, outlining the group's concerns about the outdated Lyme disease website.

Chapter 2 - Methods

Study Location:

The study was conducted at the Indiana State Department of Health located on 2N Meridian Street, Indianapolis, Indiana.

Research Tasks:

Introduction to this project began with a series of orientation classes on procedures due to the need to work with State Government information. The State Public Health Veterinarian, Dr. Jennifer Brown, served as a local research mentor for the project. One of the first tasks for the project was to gain familiarity with existing ISDH Zoonotic and Vector-Borne Epidemiology webpages. The main tabs included the Infectious Disease Epidemiology Diseases and Conditions menu and the Zoonotic and Vector Borne Epidemiology/Entomology menu. General web searches were performed to gain a general understanding of the webpage search results that would be generated by searching behavior consistent with a member of the public. Google searches were used including the terms “ISDH” and “Indiana State Department of Health” and results were noted.

A specific list of diseases was then specified to bring the research into focus. Tick-Borne diseases (including information on tick species) and Mosquito-Borne diseases were the topics chosen.

List of Tick-Borne Diseases:

- Anaplasmosis
- Babesiosis

- Ehrlichiosis
- Heartland virus
- Lyme disease
- Powassan virus
- Rocky Mountain Spotted Fever
- Tularemia

List of Tick Species:

- *Amblyomma americanum* (Lone Star tick)
- *Dermacentor variabilis* (American Dog tick)
- *Ixodes scapularis* (Black legged tick)
- *Rhipicephalus sanguineus* (Brown Dog tick)

List of Mosquito-Borne Diseases:

- California serogroup viruses
- Chikungunya virus
- Dengue virus
- Eastern equine encephalitis virus
- La Crosse virus
- Malaria
- St. Louis encephalitis virus
- West Nile virus
- Yellow fever virus

- Zika virus

Next, another stage of ISDH webpage search and Google search were conducted to identify the main Uniform Resource Locator (URL), also known as a web address, that is most closely linked to the disease topics. If more than one URL existed, the most appropriate URL based on its location on the website was designated the “main” URL. Other URLs covering the same topics were noted and recorded.

Standardized templates for the disease pages were developed. These included a brief description of the diseases, transmission information, signs and symptoms, and any data and statistics that were considered relevant. These templates were used to complete the necessary information that would be eventually placed on the website. These pages were then reviewed by ISDH staff members including epidemiologists, entomologists, and clinical coordinators. These members included:

- Jennifer Brown: State Public Health Veterinarian
- Emily Potts: Zika Clinical Coordinator
- Taryn Stevens: Zoonotic/Vector Borne Epidemiologist
- Bryan Price: Senior Medical Entomologist
- Lee Green: Medical Entomologist
- Doug Ginder: Medical Entomologist
- Jeanette McCanc: Medical Entomologist

The staff helped to develop a presentation style that could be applied to all the disease pages. The entomologists also provided pictures of parasites for use on the web pages. After preliminary editing, the pages were revised to include the suggestions made by the staff. These

pages were then reviewed and edited by Dr. Jennifer Brown and Dr. Taryn Stevens before submitting to state epidemiologist, Pam Pontones, and deputy state epidemiologist, Dr. Eric Hawkins. Their final review was performed to ensure that the information was accurate and relevant to the websites. The completed pages were then finally submitted to the ISDH Office of Public Affairs for approval. Once approved, Dr. Taryn Stevens will post the pages to the websites where they will be available to public within minutes.

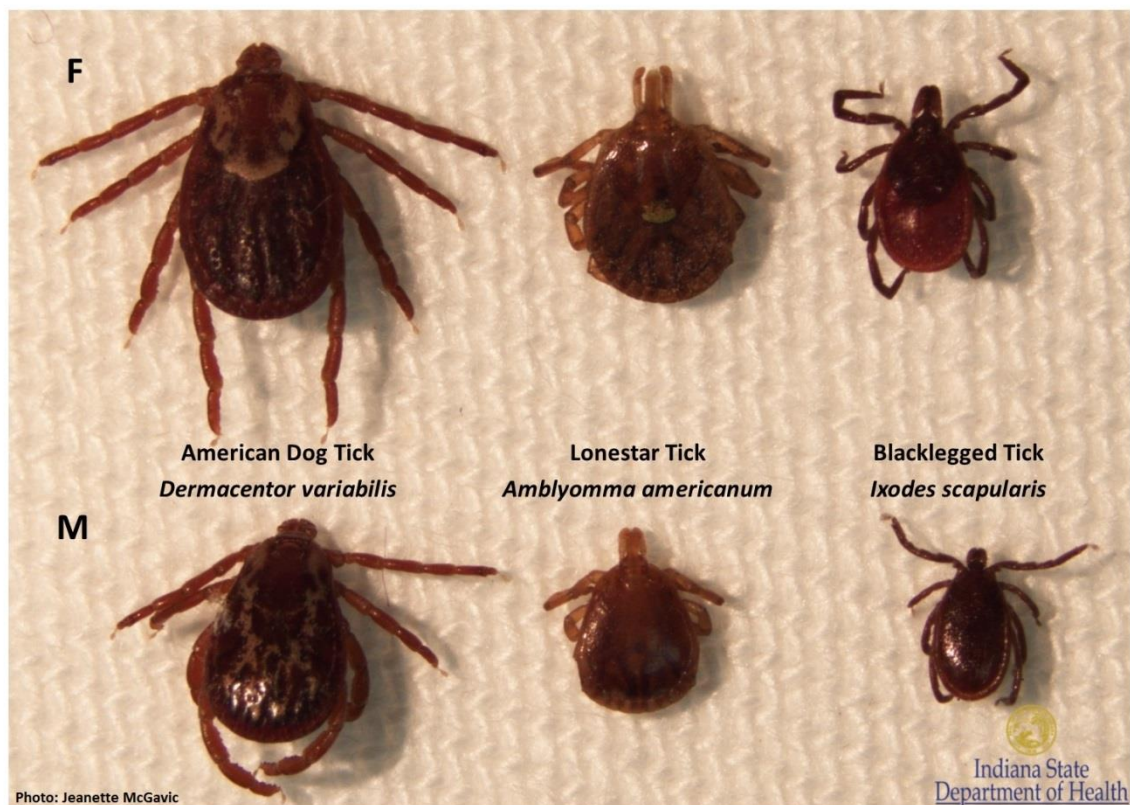


Figure 2: Tick species that can be found in the state of Indiana. Image provided by the Indiana State Department of Health.



Figure 3: *Ixodes scapularis* ticks collected in the field. Image provided by the Indiana State Department of Health.

Chapter 3 - Results

The internet is one of the primary avenues that the public uses for seeking information. The ISDH Vector-Borne Disease website is located on the ISDH Epidemiology Resource Center <https://www.in.gov/isdh/25154.htm>. Conceptually speaking, when operating optimally, the website inhabits a space where it functions as a repository of information on pests and diseases, and integrates the interests of multiple stakeholders including the ISDH, related agencies, and public and private stakeholders. This provides a direction for the revision of the website to better meet the needs of future users.

Preliminary user testing of the webpages made it clear that navigating these webpages for information could be challenging. Several pages were duplicated, had outdated information, or were simply blank. One example was the Lyme disease page. The Lyme disease page had no information available, with a disclaimer displayed instead: “We are working hard to update the content on this page. Please check back soon for more current information.” A link to a quick fact sheet was available, but this had not been updated since 2015. This was common for other disease pages; some were simply blank or had outdated quick fact sheets. These broken links were identified to be repaired once the website information was ready to be uploaded.

Using the standardized templates developed, pages for the Tick-borne and Mosquito-borne disease were drafted. These pages included information on how the disease is transmitted, the symptoms of the disease, how it is diagnosed, and its treatment and prevention. The new templates also provided links to pertinent information on the Centers for Disease Control and Prevention (CDC) and other government websites for information for medical providers. Related data and statistics were also provided where available. For the Lyme disease page, more detailed statistical information was provided by Alex Bowland, MPH. In a separate project, he detailed

Lyme Disease Surveillance data from 2009-2015. This information was presented on the page specifically for Indiana residents.

The Lyme disease, Tick-borne and Mosquito-borne disease pages were forwarded to the content review committee. Members of the team commented on the pages and made suggestions about the content. Some of the comments corrected scientific details about the disease or the disease pests, offered suggestions on more data as it pertains to Indiana, or offered ways to make the pages more relatable to the public. Pictures of the pests or examples of human signs were also included.

At present, all the pages have been reviewed by the Content Review Committee and have been submitted to Dr. Jennifer Brown and Dr. Taryn Stevens for review. The main Lyme disease page was approved by Pam Pontones, state epidemiologist, as well as by Dr. Eric Hawkins, the deputy state epidemiologist. They also reviewed and approved the Ixodes scapularis tick page. They decided that the data collected for Lyme disease in Indiana was so detailed, that a separate page needed to be designed. They have finished editing the Lyme Statistics and Tick prevention pages. Once all the pages are approved by the ISDH Office of Public Affairs, they will be posted by Dr. Stevens and be available to the public. Since the webpages are similar in architecture, they will be easy to update yearly in future. Data can also be added that is relevant to Indiana.

As of May 2, 2019, all of the tick-borne disease web pages and tick species web pages have been updated and can be reached through the Zoonotic and Vector-Borne Epidemiology/Entomology menu <https://www.in.gov/isdh/25521.htm>. Several corrections still have to be made to correct broken links and redundant pages for the mosquito-borne disease web pages, but these pages are expected to function within the next few months.

Future work on the website includes organizing surveys to ensure that the website is user-friendly and the information is easily accessible. A proposed method would be to send surveys to public health clinics where employees may need to access the website more frequently and are more dependent on the veracity of the information provided there. We would also like to generate a survey for the public. This survey may be offered to clients at public health clinics, or can be distributed at county and state fairs, where at least one ISDH representative is present. This would also help the public realize the existence and value in having access to the ISDH Vector-Borne Disease website.

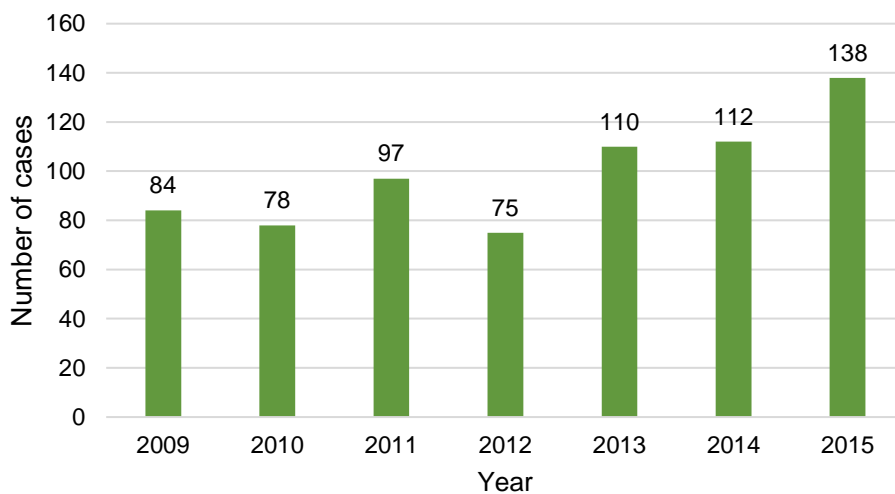


Figure 4: Lyme disease cases reported in Indiana by year (n=694), 2009-2015. Information collected by Alex Boland, MPH candidate, and provided by ISDH

Chapter 4 - Study Limitations and Strengths

There were some limitations to this project. One issue was detecting and preventing information redundancy, as some of the same information could be found at various CDC or public health webpages. This was overcome by ensuring that the information remained relevant to Indiana residents. When possible, data and statistics on disease incidence in Indiana were put directly on the webpage of the disease incidence in Indiana. This is most relevant to the Lyme disease page, where the data collected was in depth and extensive. Links to more information on the diseases were also placed on the pages, especially those provided by the CDC, as they related to medical providers and health department workers.

Another challenge was coordinating with the group about making changes to the disease and pest pages. At first, copies of the pages were emailed to each member for review. Due to conflicting work schedules, several weeks would pass before the reviewed pages would be received. Also, since pages were being reviewed individually, edits had to be read over and unified from each reviewer to get the relevant changes. This problem was resolved simply by placing a separate save drive on the ISDH network. This K-drive would be utilized to download the pages for review, and all the members could access and make corrections on the same page. As a result, the members could now comment with each other and come to a consensus on what changes should be made before the next stage of review. Deadlines were set for when these revisions were to be completed, to keep the work process going forward.

Hi there,

It's the time of year when many of us are reviewing our sections of the ISDH website. If you are just updating data in your section of the website, then you do NOT need to get approval. However, if you are adding new content, you will need to get approval from Pam and OPA. Some of us (like the zoonotic/vector team) will have a whole lot of new content requiring review, so Emily set up a tracking system for us. Here's what you need to do:

1. Get your new content approved by your supervisor as well as the program manager (me, Eric, or Chris).
2. Save your content in the "For Review" folder at
\\state.in.us\file1\ISDH\Shared\ISDH6\ITS\Outbreak\Website Development ERC.
3. Enter the information for your content in the tracking spreadsheet "Website_Dev_Tracking_Sheet2018" in the same folder.
4. Send an email to Pam and Jeni simultaneously with a link to your content that needs approval.
5. As you get your approvals, enter the info in the tracking spreadsheet. OPA approval may come from either Jeni or Greta Sanderson.
6. When the content is approved, move it into the "Review Complete" folder.
7. Put in a request to post your content to the current ERC Web editor on the SharePoint site (<http://intranet.isdh.in.gov/sites/erc/Lists/ERC%20Web%20Requests/SIDERC%20View.aspx>).

Let me know if you have any questions!

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Figure 5: Email from Dr. Jennifer Brown, State Public Health Veterinarian, to the Content Review Committee outlining how content would be stored and reviewed on the ISDH shared drives.

Despite these limitations, the project did have its strengths. The project team members possessed excellent and current knowledge on entomology and epidemiology, especially as it related to diseases in Indiana. As a result, this project can contribute to promoting public health to Indiana residents, especially related to tick-borne and mosquito-borne diseases. The webpages were designed with similar structure and information, making information more readily available, and easily changed for reviews. This allows for greater ease of future work to build upon the architecture. This project also provides a protocol for how to identify knowledge available to the ISDH and to incorporate it for communication with the general public in a timely manner.

Chapter 5 - MPH Foundational Competencies

For this project, I was able to demonstrate and utilize the skills learned as part of my MPH Infectious Disease and Zoonoses Program.

- 1) **Pathogens and Pathogenic Mechanisms: Understand and be able to describe the ecology and modes of disease causation and infectious agents such as bacteria, viruses, parasites and fungi:** I relied heavily on my courses on Pathogenic mechanisms and Immunology as I researched the material and designed and wrote the format of the tick-borne and mosquito-borne diseases' webpages. Many of the tick-borne diseases were caused by bacteria such as Lyme disease and Babesiosis, while many of the mosquito-borne diseases were caused by viruses. At least one, Malaria, is caused by a parasite. The information then had to be translated into a more comprehensible form for the general public.
- 2) **Host response to pathogens and immunology: Describe the current understanding of host immune response to infection and understand the role of vaccination in infectious disease control:** All the reviewed webpages now include information on the disease signs and symptoms, diagnosis, and treatment. The information is made comprehensible for the general public, but there are links for more in-depth information for medical professionals.
- 3) **Environmental and ecological influences: Understand the influence of space/geography, insect vectors, toxic plants and other toxin sources as well as infectious diseases and food safety:** A good knowledge of environmental and ecological influences was needed as some of the diseases were considered emerging and new information had to be made to the public via the webpages. Geographical influences were

particularly significant for tick-borne diseases as tick exposure was elevated in various counties, and therefore higher numbers of people tested positive for these diseases in these areas. However, increased levels of positive results could be related to accessibility of medical facilities (higher numbers in urban areas because more medical facilities test for the diseases), higher positive results in men compared to women (due to larger number of men doing outdoor activities such as hunting or camping), etc.

- 4) **Disease surveillance and quantitative methods: Understand how disease events and risk factors for disease are quantified and compared:** I did not have much responsibility regarding statistics and quantitative methods, but I did have to work on using this information as needed on the websites. Most statistical information had already been compiled but needed to be organized on the webpages so they could be easily accessed.
- 5) **Effective communication: Develop and demonstrate effective strategies to communicate public health/ infectious disease issues to a variety of audiences:** Effective communication in the form of written context had to be employed for the creation of the webpages, especially because it will be seen by the public. The hope is that the material provided on the ISDH Vector-Borne Disease website will provide up-to-date information to the public that is easily accessed and understood by people of various education levels and can continue to be a source of information for years to come.

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Appendix A: Information available on the Indiana State Department of Health Zoonotic and Vector-Borne Epidemiology/Entomology webpages before updates

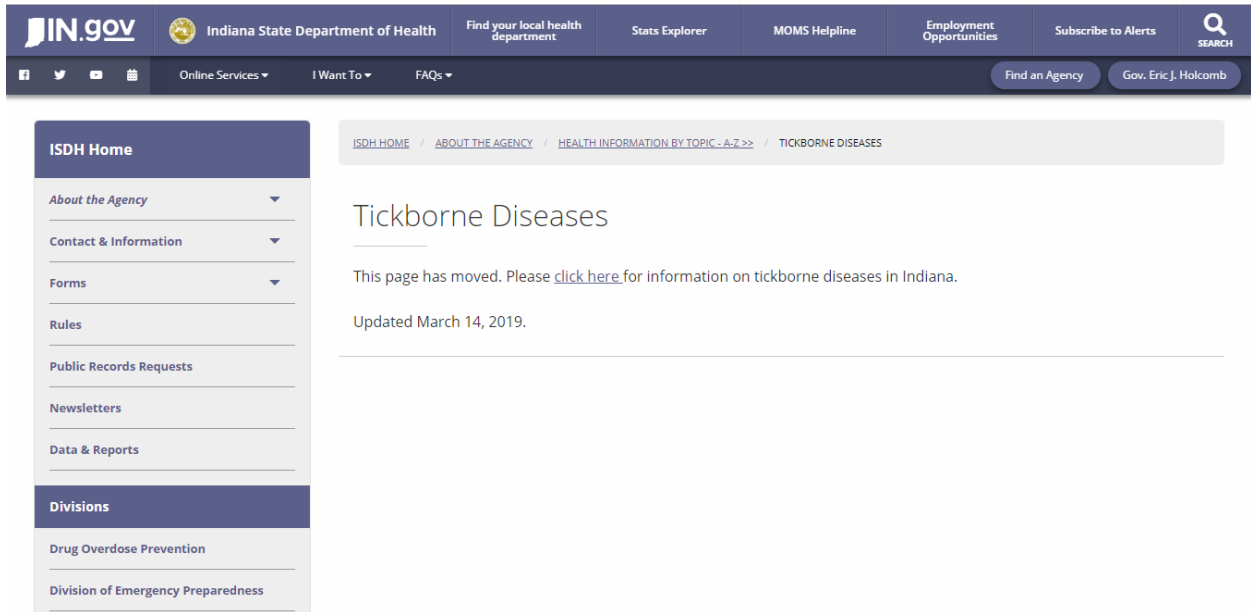


Figure 6: Appearance of Tick-Borne disease website while updates were being made.



Figure 7: Zika Virus Webpage available on Indiana State Department of Health website; last updated 2016. The website is currently not functional as updates are being made.



Figure 8: Zoonotic and Vector-Borne Disease page from the Indiana State Department of Health website.

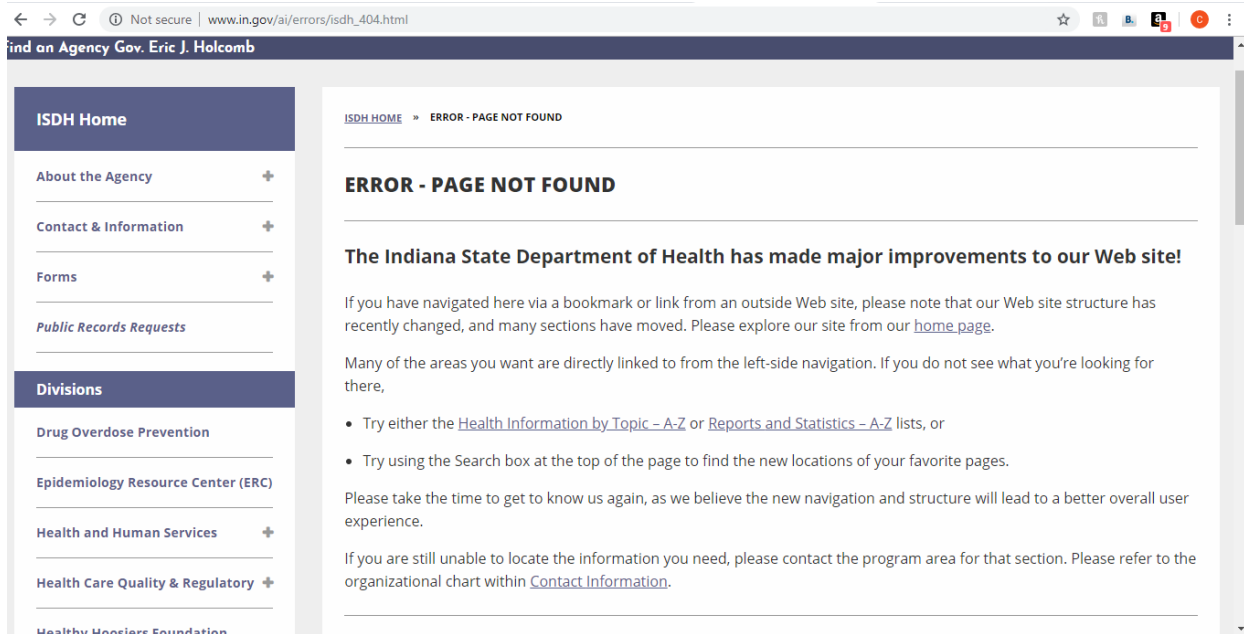


Figure 9: Error page found on vector-borne disease pages while the information is being updated.



Figure 10: Current Eastern Equine Encephalitis page. There were a few disease pages like this, where no information was available before the website redesigning was started.

IN.gov Indiana State Department of Health Find your local health department Stats Explorer MOMS Helpline Employment Opportunities Subscribe to Alerts SEARCH

Online Services I Want To FAQs Find an Agency Gov. Eric J. Holcomb

Epidemiology Resource Center (ERC)

- Data Analysis and Risk Factors
- Surveillance Systems and Informatics
- Public Health Geographics
- Infectious Disease Epidemiology
- Zoonotic and Vectorborne Epidemiology / Entomology
- TB/Refugee Health
- International Travel

Malaria

Information

[Malaria Quick Fact](#)

Other Websites

- [CDC Malaria Website](#)
- [World Health Organization Malaria Website](#)

Page last updated: August 1, 2016

Page last reviewed: August 1, 2016

Figure 11: Current Malaria webpage. Only the factsheet is available currently, which was last updated in August 2016.

Appendix B: Examples of Information available on the Indiana State Department of Health Zoonotic and Vector-Borne Epidemiology/Entomology webpages after updates

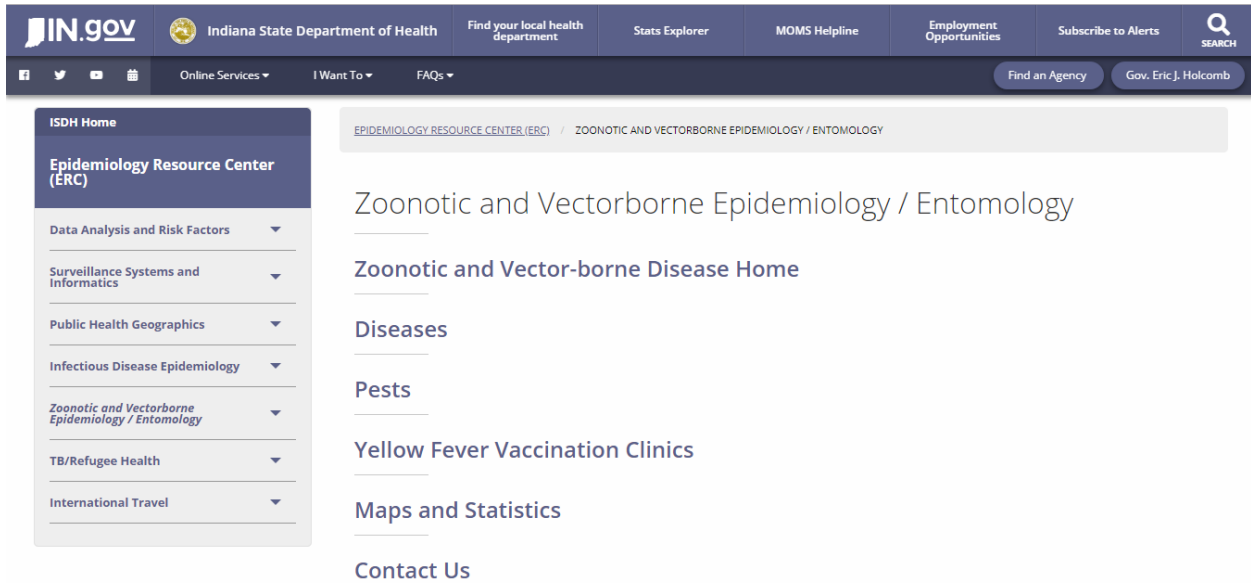


Figure 12: Current Zoonotic and Vector-Borne Epidemiology/Entomology page.



Figure 13: New Zoonotic and Vector-Borne Epidemiology/Entomology Diseases home webpage as it is today. The information pages on the Tick-Borne Diseases seen in Indiana are completed; to date, most of the Mosquito-Borne Disease pages still need to be updated.

Indiana State Department of Health

A State that Works

ISDH

ISDH Home

Epidemiology Resource Center (ERC)

- Data Analysis and Risk Factors +
- Surveillance Systems and Informatics +
- Public Health Geographics +
- Infectious Disease Epidemiology +
- Zoonotic and Vectorborne Epidemiology / Entomology +
- TB/Refugee Health +
- International Travel +

EPIDEMIOLOGY RESOURCE CENTER (ERC) » ZOOBOTIC AND VECTORBORNE EPIDEMIOLOGY / ENTOMOLOGY » DISEASES » LYME DISEASE

LYME DISEASE

Lyme disease is an infection caused by the bacterium *Borrelia burgdorferi*, which is transmitted in Indiana by the bite of an infected blacklegged tick (*Ixodes scapularis*). Lyme disease is the most commonly reported tick-borne disease in Indiana and in the United States. Typical symptoms include fever, headache, fatigue, and a skin rash with a characteristic “bull’s-eye” appearance. If left untreated, infection can spread to joints, the heart, and the nervous system.



Borrelia burgdorferi. Photo: Janice Haney Carr, Centers for Disease Control and Prevention.

<https://www.in.gov/isdh/25154.htm>

Figure 14: Current appearance of the Lyme Disease page today.

IN.gov

Indiana State Department of Health

Find your local health department

Stats Explorer

MOMS Helpline

Employment Opportunities

Subscribe to Alerts

SEARCH

For more information about Lyme disease, please visit the [CDC Lyme Disease webpage](#).

Statistics

For Lyme disease statistics in Indiana, please visit our [Lyme Disease Statistics page](#).

National statistics for Lyme disease can be found at the [CDC Lyme Disease Data and Statistics webpage](#).

Resources

- [Indiana Tick Trail Sign](#)
- [CDC Educational Materials](#)
- [Lyme Disease Quick Facts](#)

Information for Providers

- For Lyme disease diagnosis, treatment, and testing information, [click here](#).
- [Health advisory from ISDH on RMSF and other tick-borne diseases](#).
- [Tickborne Diseases of the United States](#).

Page Last Updated: March 29, 2019

Page Last Reviewed: September 4, 2018

Figure 15: Current appearance of the Lyme Disease page today- statistics, resources and information to providers.



ROCKY MOUNTAIN SPOTTED FEVER QUICK FACTS

Rocky Mountain spotted fever (RMSF) is an infection caused by the bacterium *Rickettsia rickettsii*, which is transmitted in Indiana by the bite of an infected American dog tick (*Dermacentor variabilis*). RMSF is one of several diseases caused by a group of bacteria in the spotted fever family. These diseases have similar signs and symptoms, but RMSF is the most severe disease of the group. RMSF can be deadly if not treated early, especially in children. Please visit the ISDH RMSF page for more information (<https://www.in.gov/isdh/28012.htm>).

TRANSMISSION

The RMSF bacterium is transmitted in Indiana by the American dog tick (*Dermacentor variabilis*).

SIGNS AND SYMPTOMS

Signs and symptoms of RMSF usually appear within 3–12 days of a bite from an infected tick. People in the early stages of illness can experience flu-like symptoms, such as:

- Fever
- Headache
- Nausea
- Vomiting
- Stomach pain
- Muscle aches
- Loss of appetite

Rash is a common sign in people who are sick with RMSF. Rash usually develops 2–4 days after fever begins. The look of the rash can vary widely over the course of illness. Some rashes can look like red splotches and some look like pinpoint dots. While almost all patients with RMSF will develop a rash, it often does not appear early in illness, which can make RMSF difficult to diagnose.

Untreated RMSF can rapidly progress to a serious and life-threatening illness.

Figure 16: Rocky Mountain Spotted Fever quick fact sheet available on the Indiana State Department of Health website. Other disease factsheets that were updated recently follow this structure.