2020 Zoonotic Disease Surveillance Report

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BUREAU FOR PUBLIC HEALTH

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Methods

Surveillance and Case Ascertainment Methods

During the study period [2020 Morbidity and Mortality Weekly Report (MMWR) Year], passive surveillance was conducted for mosquito-borne diseases (MBDs), tickborne diseases (TBDs) and zoonotic diseases in West Virginia. W. Va. Code 16-3-1 and 64CSR7 establish infectious disease reporting requirements for healthcare providers and laboratories. Local health departments (LHDs) conducted initial case investigations after receiving case reports or positive laboratory results for reportable MBDs, TBDs and zoonotic diseases. Cases were reported from LHDs to the West Virginia Department of Health and Human Resources, Bureau for Public Health using the West Virginia Electronic Disease Surveillance System (WVEDSS).

Cases were reviewed by the Zoonotic Disease Program in the Bureau for Public Health's Division of Infectious Disease Epidemiology before a final case classification status was assigned. All case classifications were determined using the most current Council of State and Territorial Epidemiologists (CSTE) case definition for each disease or condition. Once a final case status was made, cases were reported by the Bureau for Public Health to the Centers for Disease Control and Prevention (CDC) via the National Electronic Disease Surveillance System (NEDSS).

Surveillance was also conducted using syndromic surveillance. Syndromic surveillance tracks the number of patients seeking care in emergency departments (ED) and urgent care centers (UC) with specific symptoms or concerns—before a diagnosis is confirmed. By utilizing the National Syndromic Surveillance Program's cloud based BioSense platform, a secure integrated electronic health information system with standardized analytic tools and processes, the program can view ED and UC visits due to "tick bite exposure."

Data Extraction and Analyses

Surveillance data for confirmed and probable cases of each MBD, TBD and zoonotic disease for MMWR Year 2020 were exported from WVEDSS to an Excel database for analyses. County- and state-level census data for 2020 were obtained from the U.S. Census Bureau.

2020 Mosquito-Borne Disease Surveillance Summary

Introduction

Mosquito-borne diseases (MBDs), most of which are viruses, are transmitted through the bite of infected mosquitoes. Surveillance for these diseases in West Virginia focuses on four endemic mosquito-transmitted diseases—La Crosse encephalitis virus (LAC), West Nile virus (WNV), St. Louis encephalitis virus (SLE), and eastern equine encephalitis virus (EEE)—and travel-associated, or imported diseases, such as chikungunya, dengue fever, malaria, and Zika virus (ZIKV). Historically, LAC has been the MBD of most concern in West Virginia.

Most people who become infected with endemic MBDs have no clinical symptoms; however, encephalitis (inflammation of the brain) is a potentially life-threatening complication that is often reported among infected persons who develop symptoms. Symptoms generally begin one to two weeks after a mosquito bite and include fever, headache, myalgia, meningitis, and neurologic dysfunction. There is no specific treatment available for arboviral infections.

Mosquito surveillance is important to understanding the geographic and temporal distribution of these vectors, the diseases they might transmit to humans, and when and where human cases of MBD might occur. Mosquito surveillance is conducted in selected counties across the State from

late spring through fall. Environmental surveillance for MBDs monitors local disease activity in non-human species. Horses can become infected with WNV and EEE. Birds can be infected with SLE, WNV and EEE. Mosquitoes, dead birds, and horses have all been used to help identify WNV and other arboviral disease activity in West Virginia. Additional information on ecological assessments of MBDs and TBDs is available in the West Virginia Mosquito and Tick Surveillance Reports. This surveillance summary describes human cases of MBDs in West Virginia during 2020

Results

Human Surveillance

Table 1 provides a comparison of human cases of MBDs reported in West Virginia from 2015 to 2020. In 2020, seven probable cases of MBDs were reported. All seven cases were LAC.

Seven probable cases of LAC were reported from five counties: Kanawha, Logan, Nicholas, Raleigh, and Wyoming (Figure 1). Six were neuroinvasive cases with one non-neuroinvasive; most of these cases (n=5, 71%) were male. The median age was seven years (average=7.1 years; range=-2-12 years). Illness onset month for these LAC cases was June (n=1), July (n=1), August (n=4), and September (n=1). All cases were febrile and hospitalized because of illness. Five of the neuroinvasive cases presented with encephalitis including meningoencephalitis and one presented with meningitis only. One of these cases presented with abnormal movements and convulsions. One case reported symptoms including myalgia, paresis, and stupor.

Table 1. Human cases of mosquito-borne disease in West Virginia from 2015 to 2020.

Disease	# (%) of Cases† (2015)	# (%) of Cases† (2016)	# (%) of Cases† (2017)	# (%) of Cases† (2018)	# (%) of Cases† (2019)	# (%) of Cases† (2020)
LAC	4 (57.1)	8 (38.1)	4(50)	6 (50)	3 (30)	7 (100)
WNV	0 (0)	1 (4.8)	1 (12.5)	2 (16.7)	0 (0)	0 (0)
Malaria	2 (28.6)	1 (4.8)	2 (25)	3 (25)	2 (20)	0 (0)
Dengue	1 (14.3)	0 (0)	0 (0)	1 (8.3)	5 (50)	0 (0)
EEE	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
SLE	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Chikungunya	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Zika	-	11(52.4)	1* (12.5)	0 (0)	0 (0)	0 (0)
Total	7 (100)	21 (100)	8 (100)	12 (100)	10 (100)	7 (100)

*Positive viremic blood donor. †Includes only cases classified as confirmed or probable.

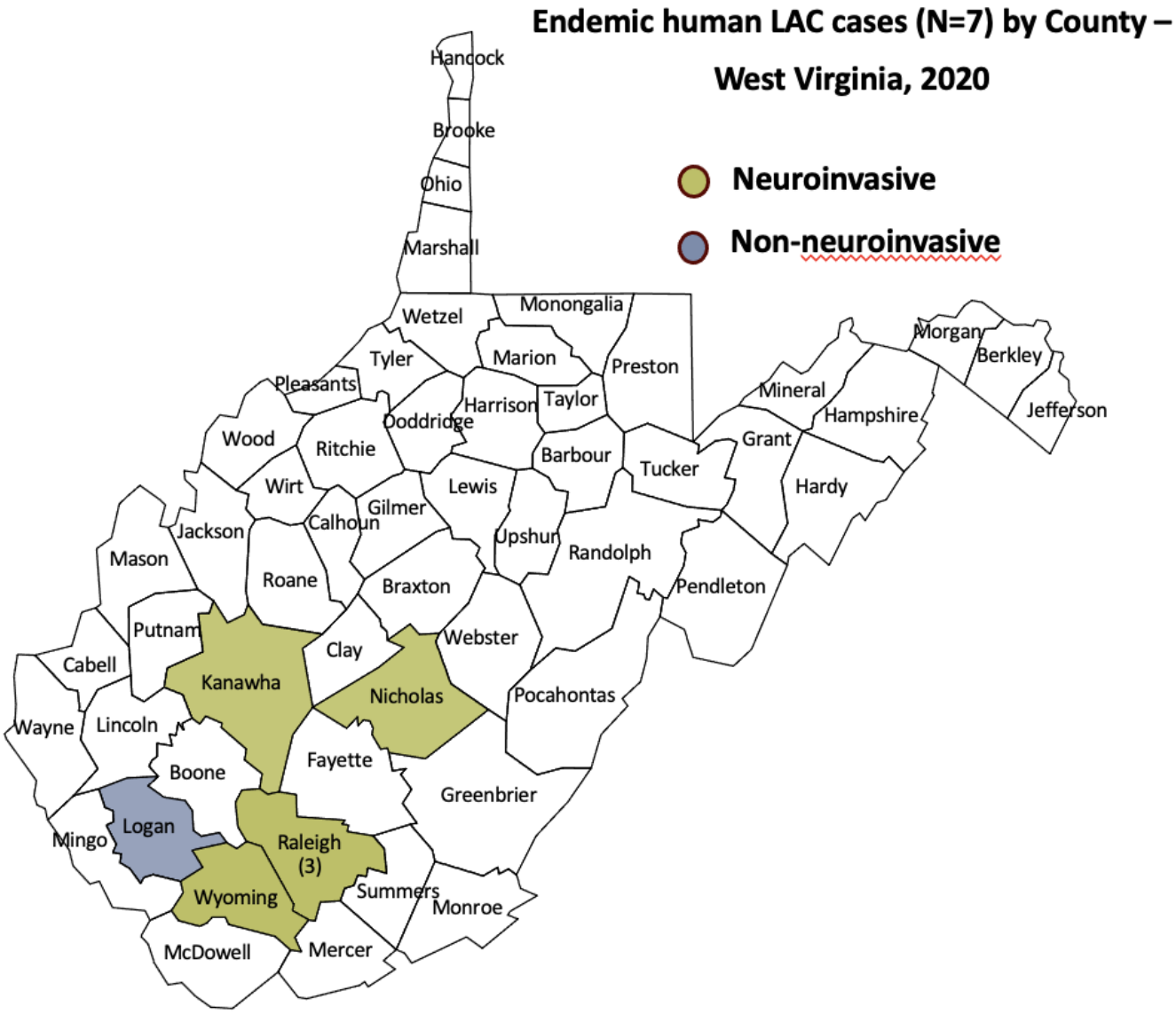

Figure 1. Distribution of human endemic mosquito-borne cases reported in West Virginia in 2020.

Discussion

The incidence of local MBDs was higher for West Virginia in 2020 than in 2019. LAC cases followed the epidemiologic trends previously seen in West Virginia with cases in children under 15 years of age and reported from southern counties.

No imported MBD cases occurred in 2020. This could be perhaps because of COVID-19 related travel restrictions. However, it is important that residents from West Virginia who travel internationally be mindful of MBDs endemic in their destination country. CDC's Traveler's Health website is a good resource for this information and is available at wwwnc.cdc.gov/travel. Links to CDC pages as well as to public health literature on MBDs can be found on the Office of Epidemiology and Prevention Services (OEPS) Mosquito-borne Disease's webpage at: oeps.wv.gov/arboviral/Pages/mbd.aspx.

2020 Tickborne Disease Surveillance Summary

Introduction

Tickborne diseases (TBDs) are transmitted by the bite of an infected tick vector. In West Virginia, tick vectors responsible for disease transmission have been identified for at least seven TBDs (Table 2). Diagnosing TBDs can be challenging as some of these infections can initially produce similar, non-specific clinical symptoms (as with rickettsial diseases), while other TBDs produce highly variable symptoms (as with Lyme disease). Early recognition and treatment of TBDs by healthcare providers can prevent complications from these diseases and decrease morbidity and mortality. Most TBDs, including those listed in Table 2, are reportable to the Bureau for Public Health from healthcare providers and laboratories. The purpose of this summary is to describe the epidemiology of TBDs reported in West Virginia during 2020.

Table 2. Possible TBD by causative agent based on vectors found in West Virginia.

Tickborne Disease[a]	Agent	Tick Vector(s) in West Virginia
Anaplasmosis	*Anaplasma phagocytophilum*	Blacklegged tick (*Ixodes scapularis*) [b]
Babesiosis	*Babesia microti* and other *Babesia* spp.	Blacklegged tick (*Ixodes scapularis*)
Ehrlichiosis	*Ehrlichia chaffeensis* and *Ehrlichia ewingii*	Lone star tick (*Amblyomma americanum)*
Lyme disease	*Borrelia burgdorferi*	Blacklegged tick (*Ixodes scapularis*)
Powassan encephalitis	Powassan virus	Groundhog tick (*Ixodes cookei*)[c] Blacklegged tick (*Ixodes scapularis*)
Rocky Mountain Spotted Fever and other spotted fever rickettsioses	*Rickettsia rickettsii* (and other spotted fever group *Rickettsia* spp.)	American dog tick (*Dermacentor variabilis*) Brown dog tick (*Rhipicephalus sanguineus)* Lone star tick (*Amblyomma americanum*) Gulf Coast tick (*Amblyomma maculatum*) Asian longhorned tick (Haemaphysalis longicornis)
Tularemia[d]	*Francisella tularensis*	American dog tick (*Dermacentor variabilis*) Lone star tick (*Amblyomma americanum*)

[a] Other TBD, including but not limited to Colorado tick fever, tickborne encephalitis, and Crimean-Congo hemorrhagic fever, may result from travel to regions where these illnesses are endemic.
[b] *I. scapularis* is also commonly referred to as the deer tick.
[c] *I. cookei* does not have an official common name. Names that have been used include the groundhog tick, woodchuck tick, and the American castor bean tick.
[d] Tularemia cases are included in the "Other ZD Surveillance Summary" since other animal species more commonly transmit tularemia to humans.

Results

Human Surveillance

In 2020, 1,075 confirmed and probable TBD cases were reported from 53 counties in West Virginia. Diseases reported included anaplasmosis, ehrlichiosis, Lyme disease, and spotted fever group rickettsioses (SFGR) (Figure 2, Table 3). No Powassan virus, tularemia or babesiosis cases were reported.

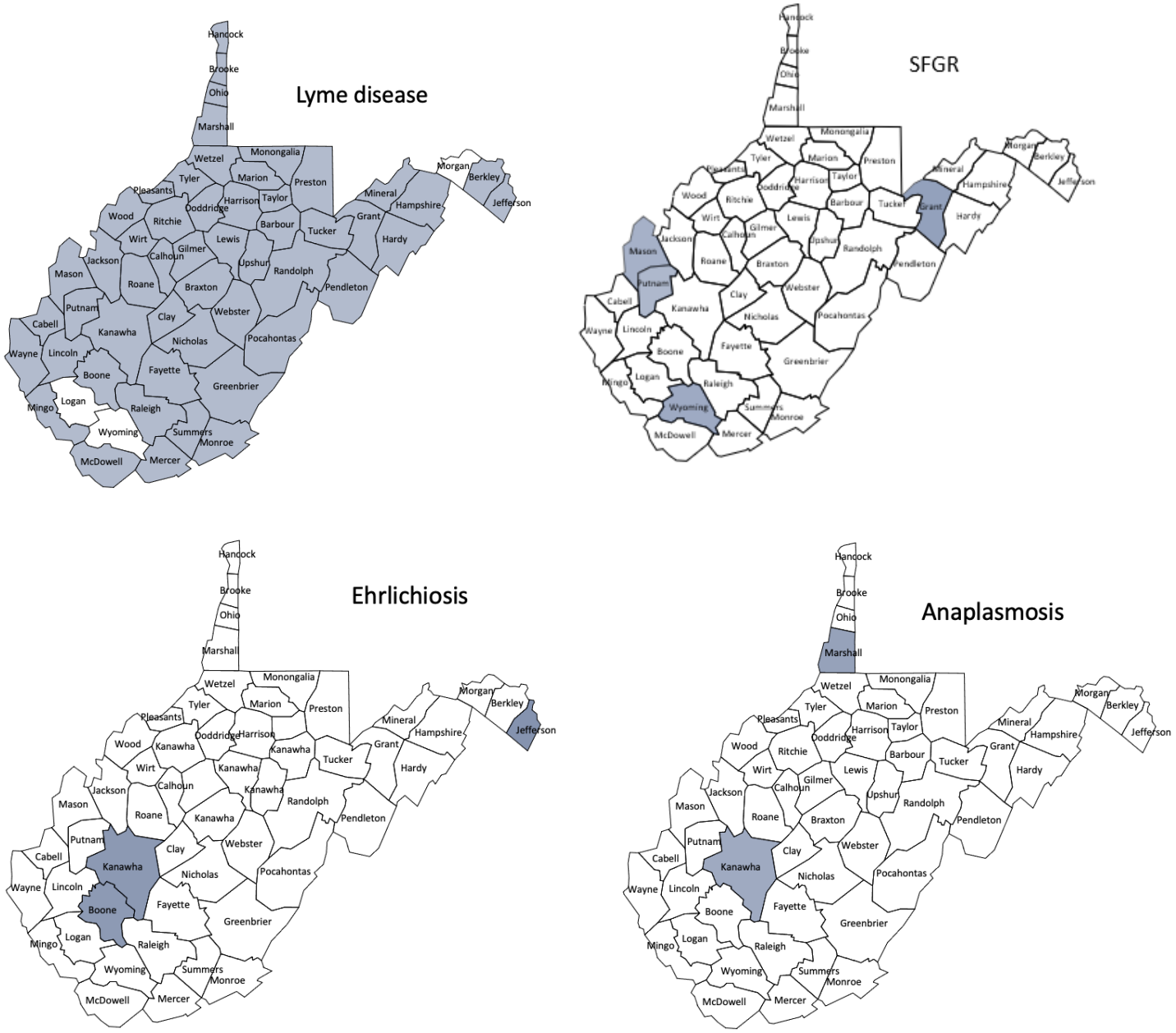

Figure 2. County-level distribution of Lyme disease, anaplasmosis, ehrlichiosis, and SFGR cases – West Virginia, 2020.

Table 3. Frequency of TBDs reported in West Virginia from 2015–2020.

Disease Name	# of 2015 cases	# of 2016 cases	# of 2017 cases	# of 2018 cases	# of 2019 cases	# of 2020 cases
Anaplasmosis	0	0	2	0	3	2
Babesiosis	0	0	1	1	0	0
Ehrlichiosis	5	6	6	4	10	3
RMSF/SFGR	9	14	17	20	26	5
Lyme disease	289	368	648	671	898	1065
TOTAL CASES	**304**	**388**	**675**	**697**	**937**	**1075**

Table 4. Frequency of counties reporting TBDs in West Virginia from 2015–2020.

Disease Name	Counties with cases (2015)	Counties with cases (2016)	Counties with cases (2017)	Counties with cases (2018)	Counties with cases (2019)	Counties with cases (2020)
Anaplasmosis	0	0	2	0	3	2
Babesiosis	0	0	1	1	0	0
Ehrlichiosis	4	5	6	4	8	3
RMSF/SFGR	7	10	14	12	13	4
Lyme disease	37	42	45	49	52	52
***TOTAL COUNTIES**	**38**	**43**	**47**	**55**	**53**	**53**

*Note: Counties are mutually exclusive and are not double counted in the total.

Three ehrlichiosis cases (two confirmed and one probable) were reported from Boone, Kanawha, and Jefferson counties during MMWR Year 2020. Two of the three cases reported hospitalization. Their ages ranged from 41-61 years of age. All cases (n=3) presented with fever, malaise, headache, and myalgia. Of the three cases, two also presented with rash, nausea, and vomiting.

Two anaplasmosis cases (both probable) were reported in MMWR year 2020 from Kanawha and Marshall counties. Neither were hospitalized. Both reported symptoms of fever and malaise, with one also reporting myalgia, headache, and rash. Cases ranged in age from 34-41 years.

Five SFGR cases (all probable) were reported during MMWR Year 2020 from four counties: Grant, Mason, Putnam, and Wyoming (2). The majority of cases (n=4, 80%) were female. Cases ranged in age from 26-61 years; no cases reported hospitalization. The symptoms that commonly presented were fever (n=5, 100%), headache (n=5, 100%), myalgia (n=5, 100%), rash (n=4, 80%), nausea (n=4, 80%), vomiting (n=4, 80), and malaise (n=3, 60%).

Lyme disease cases increased during MMWR Year 2020 with 1,065 cases reported in 2020 (889 confirmed and 176 probable) compared to 898 cases (713 confirmed and 185 probable) reported in the previous year. Lyme disease cases accounted for 99% of all TBD cases reported (1,065 of 1,075 cases) which is consistent with the past couple of years. The number of counties reporting at least one case increased slightly from MMWR year 2019, from 52 to 53 counties. Thirteen counties reported greater than 30 cases; Kanawha (n=99), Marshall (n=66), Preston (n=62), Hancock (n=59), and Monongalia (n=58) reported the most cases (Figure 3).

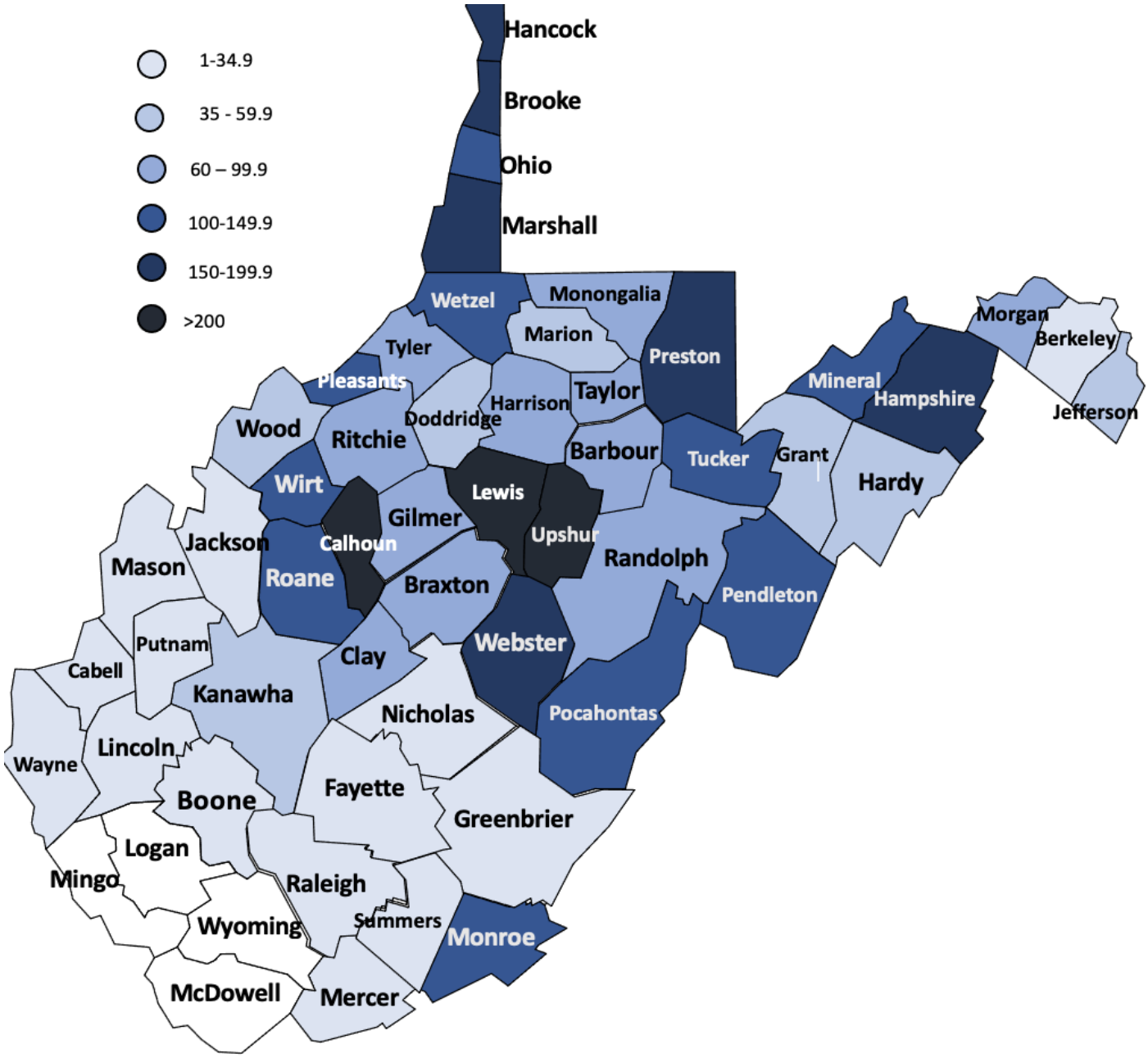

Figure 3. Incidence rate of Lyme disease cases per 100,000 - West Virginia, 2020.

Confirmed and probable Lyme disease cases ranged in age from 1–93 years; the highest proportion of cases were reported in the 1–10 age range (n=223) with the age range of 61–70 years old (n=191) following closely (Figure 4). When looking at the relative frequency of reported symptoms, erythema migrans was the most reported (56%) while arthritis was the second most reported symptom (35%) (Figure 5).

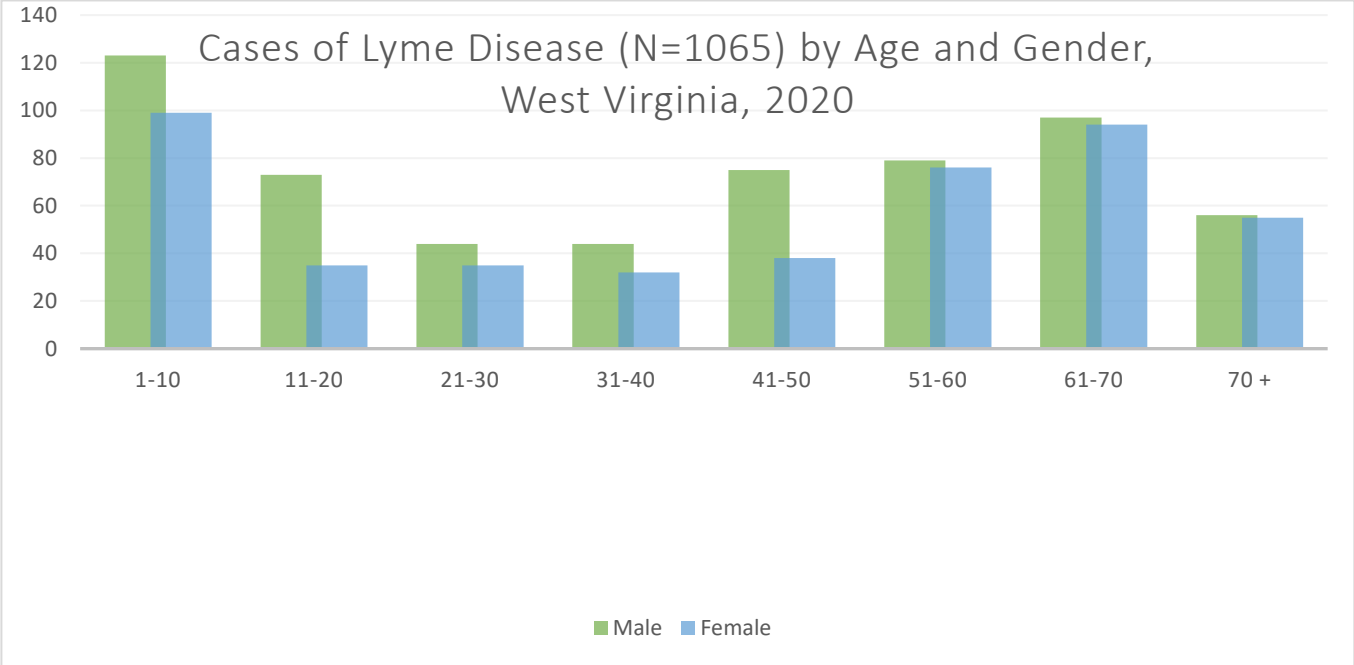

Figure 4. Frequency of Lyme disease cases by age and gender – West Virginia, MMWR Year 2020.

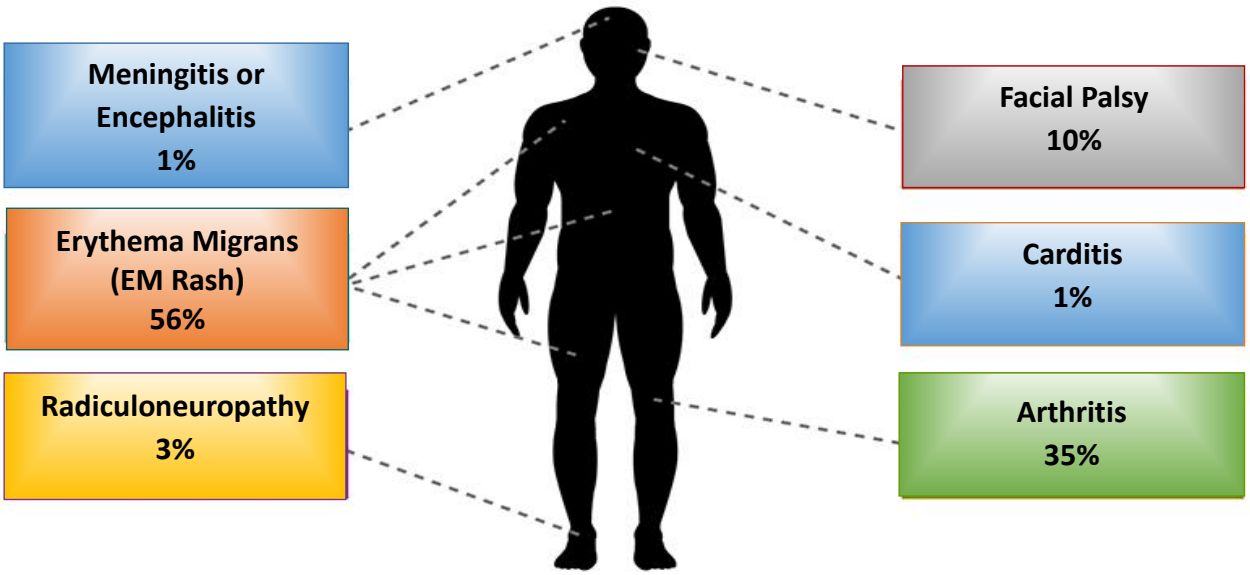

Figure 5. Frequency of clinical features of Lyme Disease among confirmed cases – West Virginia, MMWR Year 2020.

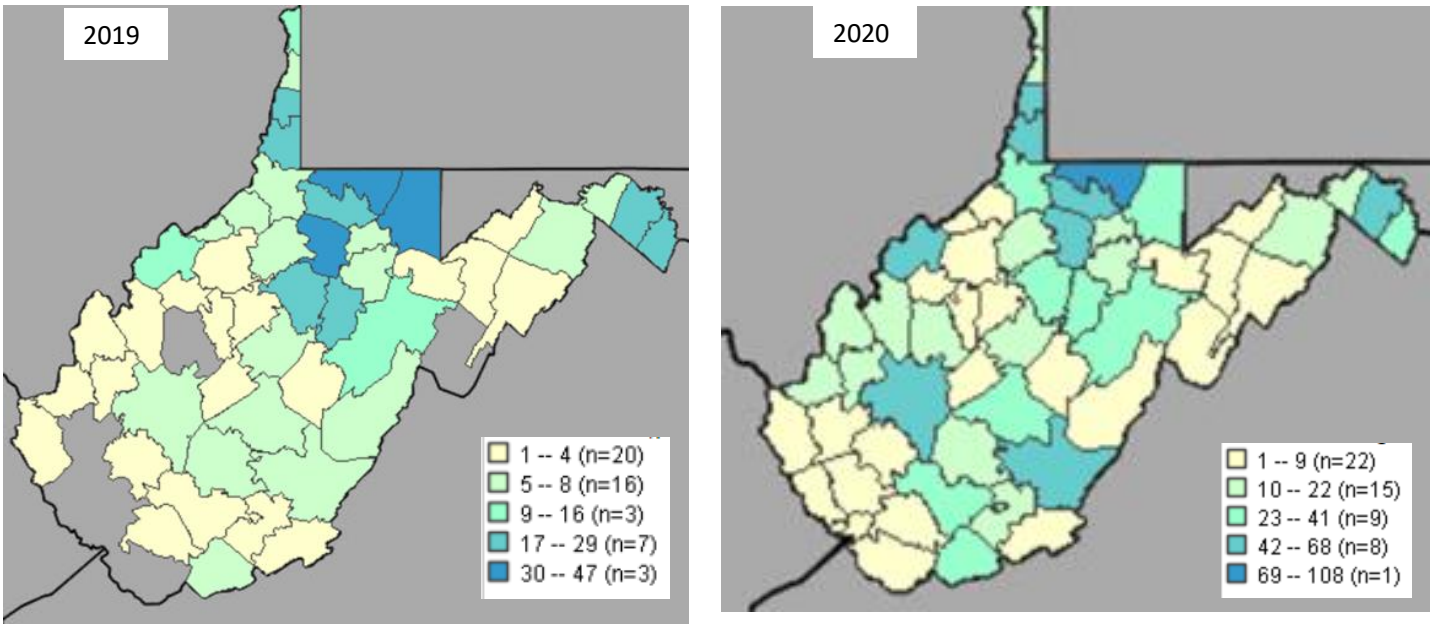

Figure 6. The distribution of tick bite exposure emergency departments and urgent care visits from October to November in both 2019 and 2020.
*Data based on the hospital location where a patient sought treatment.

Syndromic surveillance data, shown in Figure 6, demonstrates the increase in tick bite exposure visits by the population from 2019 to 2020. These late season maps show where people are being exposed to *Ixodes scapularis*, which is the only human blood feeding tick active in September, October, and November. The counties with high tick bite exposure are also the same counties with high densities of *Ixodes scapularis,* the tick vector for Lyme disease, and the high incidence of Lyme disease (Fig. 3). Conversely, the counties in southwestern West Virginia with low Lyme disease incidence also have low exposure to *Ixodes scapularis*. There are more encounters with the Lyme disease tick vector in regions where the tick is established. Exposure to *Ixodes scapularis* is also extending to new regions.

Discussion

Lyme disease accounted for most TBD cases (Table 3) as seen in previous years. Though the vectors of Powassan encephalitis (*I. cookei* and *I. scapularis*) have been identified in the State, there were no reports of Powassan encephalitis during the period or to date in West Virginia. The first human babesiosis case in West Virginia was reported in 2017, one case was reported in 2018 and no cases were reported in 2019 or 2020.

The overall reported number of TBDs increased from 937 in 2019 to 1,075 in 2020 (Table 2); the number of counties that reported at least one TBD remained the same at 53 counties in both 2019 and 2020. Reported Lyme disease cases have increased 254% during the past five MMWR years, from 304 in 2015 to 1,075 in 2020. West Virginia became a high incidence state in 2017 based on having a three-year average incidence of greater than 10 cases per 100,000 persons. In 2020, West Virginia's average incidence rate was 59.37 cases per 100,000 persons compared to 48.5 cases per 100,000 persons in 2019. West Virginia is seeing a steady increase in incidence of Lyme disease each year.

Tickborne rickettsial diseases (anaplasmosis, ehrlichiosis, and SFGR) often have high hospitalization rates among cases; 100% of anaplasmosis cases and 67% of ehrlichiosis cases

during MMWR Year 2020 were hospitalized. None of SFGR cases reported in 2020 required hospitalization.

West Virginia is in a unique geographical position for TBD exposure. It borders three states also classified as high incidence states for Lyme disease; Maryland, Pennsylvania, and Virginia rank in the top 14 states that account for about 95% of Lyme disease cases reported annually. West Virginia also borders Tennessee, Virginia, and North Carolina which contain hotspots for SFGR. The Asian longhorned tick (*Haemaphysalis longicornis*) was first collected in West Virginia in 2010 and originally misidentified as the rabbit tick *Haemaphysalis leporispalustris*. It is a new tick to the U.S. overall (2017) and is still being researched by scientists. While it has not been known to cause disease in humans in the U.S., studies have shown that it carries the potential to transmit *Rickettsia rickettsii*, the pathogen responsible for Rocky Mountain spotted fever. Quality surveillance allows for monitoring of changes in TBD incidence and identification of emerging TBDs at the local, state, and national level. Therefore, it is important to obtain timely and accurate data, including travel history, during TBD case investigations.

There are limitations to TBD surveillance. First, underreporting of TBDs in West Virginia and other high incidence states is likely. Cases may not seek medical attention unless symptoms or clinical manifestations of disease become severe and cannot be resolved without treatment. Misdiagnosis of disease is possible due to inaccurate laboratory test results and/or provider diagnostic error. There is also the possibility of case misclassification. For example, case ascertainment for Lyme disease requires clinical, laboratory, and, sometimes, epidemiologic evidence. If information is missing, a true case may be classified as either “suspect,” or “not a case.” In 2020, there were 172 suspect cases of Lyme disease, 15 suspect SFGR cases, 5 suspect ehrlichiosis cases and 1 suspect anaplasmosis case that were not included in the analyses of this summary. Also, surveillance data often captures only the county of residence or facility where treatment was sought, and not necessarily county of exposure. This highlights the importance of obtaining quality laboratory, clinical, and epidemiologic information to ensure that appropriate surveillance is being conducted. In regard to this report, 2020 was an especially challenging year, due to the strain COVID-19 placed on both the public health and healthcare systems and the decreased likelihood of individuals seeking care for tickborne disease.

Prevention of tickborne diseases focuses primarily on avoiding tick bites. CDC’s recommendations for the prevention of TBDs are located on the CDC website at www.cdc.gov/ticks/avoid/on_people.html. Because ticks are more active in warmer months, it is also important to make the public aware of the risk of becoming infected with any TBD from late spring to early fall.

2020 Other Zoonotic Diseases Surveillance Summary

Introduction

While mosquito-borne and tickborne diseases account for most zoonotic diseases reported in West Virginia, other diseases can be transmitted from animals to humans without arthropod vectors. Table 5 lists diseases and conditions transmitted by animals that are under surveillance in West Virginia. While Q fever and tularemia can be transmitted by ticks, they are more commonly transmitted by other animals.

Table 5. Lists of diseases, the associated pathogen(s), and host species.

Disease	Pathogen	Host(s)
Anthrax	*Bacillus anthracis*	Cattle, sheep, and goats
Brucellosis	*Brucella* spp.	Sheep, goats, cattle, deer, elk, pigs, and dogs
Hantavirus pulmonary syndrome	Hantavirus	Wild rodents (deer mice)
Leptospirosis	*Leptospira interrogans*	Cattle, pigs, horses, dogs, rodents, and wild animals
MERS (Middle East Respiratory Syndrome)	MERS coronavirus	Camels and bats
Monkeypox	Monkeypox virus	Rodents, prairie dogs, Gambian giant rat, and rabbits
Plague	*Yersinia pestis*	Fleas and rodents
Psittacosis	*Chlamydophila psittaci*	Parrots, parakeets, macaws, turkeys, and ducks
Q fever	*Coxiella burnetii*	Cattle, sheep, ticks, and goats
Rabies[1]	Rabies lyssavirus	Mammals
SARS (Sudden Acute Respiratory Syndrome)	SARS coronavirus	Bats (likely)
Tularemia	*Francisella tularenis*	Hard ticks, rabbits, hares, and rodents
Viral hemorrhagic fever	Marburg virus, Lassa virus, Ebola virus, Crimean-Congo virus, Rift Valley Fever, and Yellow Fever	Bats, primates, ticks, mosquitoes, and rodents

[1]The Bureau for Public Health has an annual rabies report that can be accessed at the OEPS website under data and surveillance: https://oeps.wv.gov/rabies/pages/default.aspx.

Results

No other zoonotic diseases were reported during MMWR year 2020.

Discussion

Zoonotic diseases in West Virginia can be transmitted by a variety of animals and by a variety of different routes. Some zoonotic diseases require travel to specific areas of the world for a person to become infected, while others may require exposure to bodily fluids or a bite from a specific animal host.

In West Virginia, most zoonotic diseases not arthropod-transmitted result from contact with domestic animals such as livestock and dogs. High-risk groups for both diseases include farm workers, veterinarians, and meat processing workers since their professions put them in close contact with animal products (e.g., unpasteurized milk) and animal body fluids (e.g., birth products, feces). Inhalation of the bacteria that cause brucellosis and Q fever may also lead to infection.

Most of the “other” zoonotic diseases listed on Table 5 are reportable within 24 hours or immediately since these diseases can result in severe morbidity and even mortality (e.g., rabies, hantavirus) and are considered bioterrorism agents (e.g., anthrax, Q fever). Some “other” reportable zoonotic diseases are considered travel associated. These zoonotic diseases are not endemic to West Virginia but occur when a person is infected during travel to an area where the disease is transmitted (e.g., viral hemorrhagic fever, MERS-CoV). For information about “other” zoonotic diseases reportable in West Virginia, visit oeps.wv.gov/zoonotic/pages/default.aspx.