Enteric Disease Surveillance Report 2018-2021

WEST VIRGINIA Department of Health & Human Resources
BUREAU FOR PUBLIC HEALTH

Office of Epidemiology and Prevention Services
Division of Infectious Disease Epidemiology
350 Capitol Street, Room 125
Charleston, West Virginia 25301

Katie Guinther, MPH

Paige Hilbert, MPH

Table of Contents

Introduction

Twelve enteric diseases are reportable in West Virginia as per the West Virginia Reportable Disease Rule, 64 CSR 7 including Botulism, Campylobacteriosis, Cyclosporiasis, Cryptosporidiosis, Giardiasis, Shiga Toxin-producing *Escherichia coli* (STEC), Legionellosis, Listeriosis, Salmonellosis (including Typhoid and Paratyphoid Fever), Shigellosis, Vibriosis (including Cholera), and *Yersinia pestis* (Plague). Cases of these reportable conditions are investigated by local health department (LHD) staff and reported to the West Virginia Department of Health and Human Resources, Bureau for Public Health, Office of Epidemiology and Prevention Services, Division of Infectious Disease Epidemiology (DIDE), and subsequently the Centers for Disease Control and Prevention (CDC) via the West Virginia Electronic Disease Surveillance System (WVEDSS).

Between 2018 to 2021, the average incidence of all enteric illnesses by county ranged from 16.96 per 100,000 to 175.02 per 100,000 population (Figure 1).

For this report, the top four most commonly reported enteric pathogens (Campylobacteriosis, Giardiasis, Salmonellosis, and Shiga toxin-producing *E. coli*) were selected for analysis and presented in alphabetical order.

Methods

Cases were ascertained according to the CDC National Notifiable Disease Surveillance System (NNDSS) case definitions as proposed by the Council of State and Territorial Epidemiologists (CSTE). Current case definitions can be found at https://ndc.services.cdc.gov/.

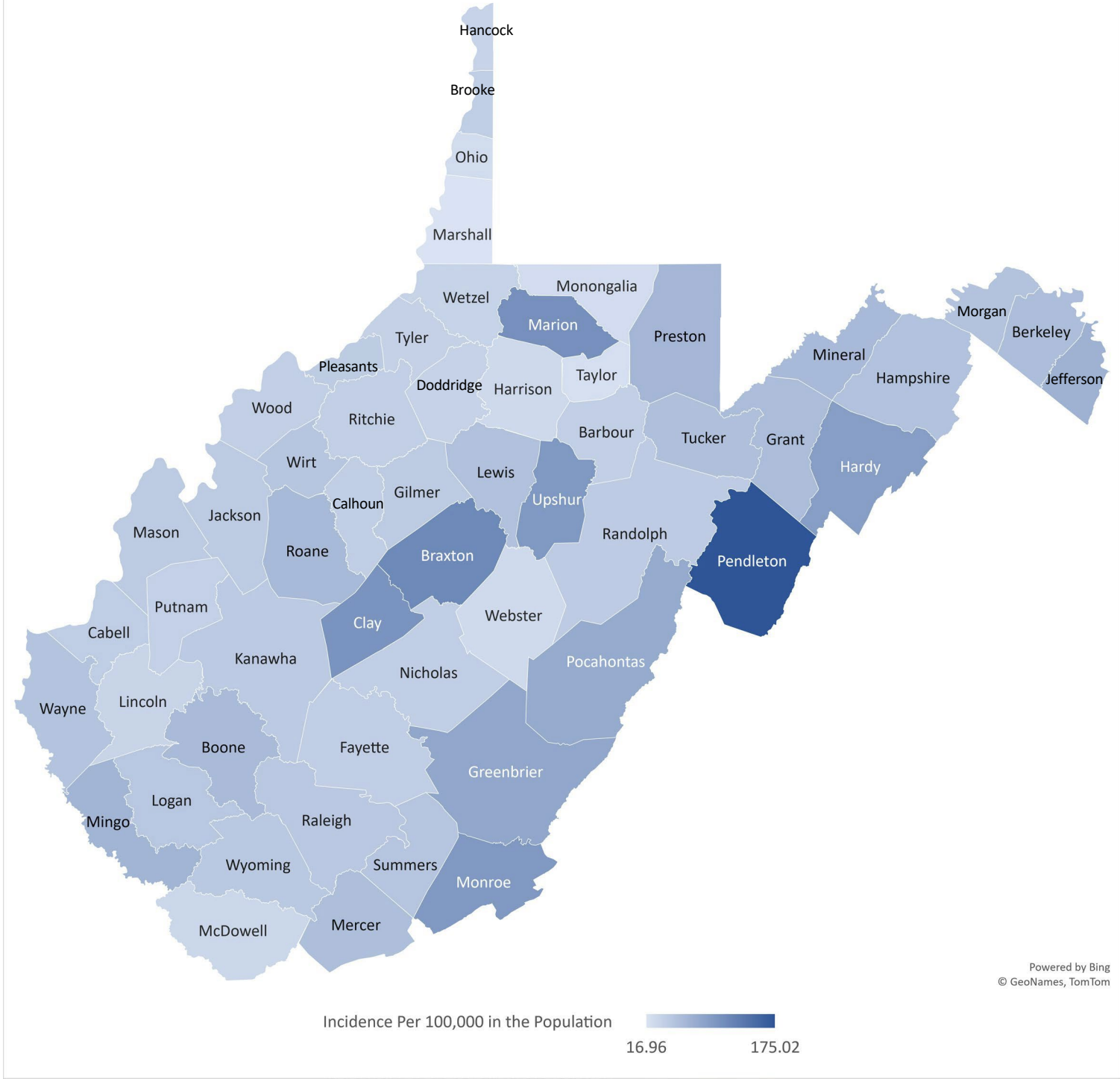
Data was extracted from WVEDSS then analyzed and summarized using Microsoft Excel. Data included case information for all cases of the four selected pathogens reported from 2018 through 2021 in West Virginia. The case investigation start date is used to determine year of report.

Age-specific population data was taken from 2020 census information: www.census.gov.

National enteric disease rates and incidences for 2021 were taken from the 2021 FoodNet Fast Pathogen Surveillance Data Visualization tool: https://wwwn.cdc.gov/foodnetfast/.

Below is a statewide map of enteric disease illness average incidence per 100,000 in the population by county. This was an average illness incidence over four years from 2018-2021. The darker the shade of the county, the higher incidence of illnesses reported for that county over those years. The reasoning for this increased incidence could be multi-factorial, including true higher incidence, higher incidence of testing in that county, or outbreaks occurring in that county over the years included in this report.

Figure 1. Enteric Illness Average Incidence by County, West Virginia, 2018-2021 (N=3349)



Campylobacteriosis

Campylobacteriosis is one of the most common enteric bacterial infections in the United States and is the most common enteric infection reported in West Virginia. Caused by the bacterium *Campylobacter*, the illness is characterized by acute onset of diarrhea, vomiting, abdominal pain, fever, and malaise. Symptoms are generally short-lived, occurring within two to five days of infection and lasting around one week; however, some infected individuals may be asymptomatic and go without detection while still transmitting the bacteria.
Campylobacteriosis is of worldwide epidemiologic importance due to the fecal-oral route of infection and the extensive reservoir of the organism in both wild and domestic animals. The feces of wild animals, livestock, and domesticated animals infected with Campylobacteriosis can subsequently contaminate local waterways and fruits and vegetables grown in, or watered with, feces-contaminated soil or water. Many cases result from eating raw or undercooked poultry meat or through cross-contamination of uncooked or ready-to-eat foods.

Campylobacteriosis was not made a nationally notifiable condition until 2015 but has been reportable for many years in West Virginia. From 2018 to 2021, the number of cases has remained relatively consistent with an average of 433.5 reported Campylobacteriosis cases per year (Figure 2). In 2021, a total of 449 cases were reported: 197 confirmed and 248 probable cases (*Figure 2, Table 1*). From 2018 to 2021, the year with the most reported cases was 2021, and the year with the least reported cases was 2020, with 411 cases. The lower number of cases in 2020 could be attributed to a combination of quarantine and travel restrictions as well as increased public education on hand hygiene due to COVID-19. Due to evolving laboratory testing, namely culture-independent diagnostic tests (CIDT) practices, the Campylobacteriosis case definition has changed over time. The current case definition, last updated in 2015, classifies cases as either confirmed or probable. A case is considered confirmed if *Campylobacter* is cultured from a clinical specimen. Cases are considered probable if the pathogen is detected by a CIDT method.

In 2021, West Virginia's Campylobacteriosis rate was 25.15 cases per 100,000 population, which was higher than the national rate of 17.8 (Figure 3). In the same year over 51% of cases were aged 45 years or older, with over 20% of total cases being 65 years or older (Figure 5). Of the 449 total cases of Campylobacteriosis in 2021, investigation efforts were able to collect exposure source information on 283 of those cases, finding the most commonly reported exposure to be restaurants, at 38% of exposures reported (Figure 6). Each year infections occurred year-round, with the peak incidence consistently occurring in the summer months (Figure 4).

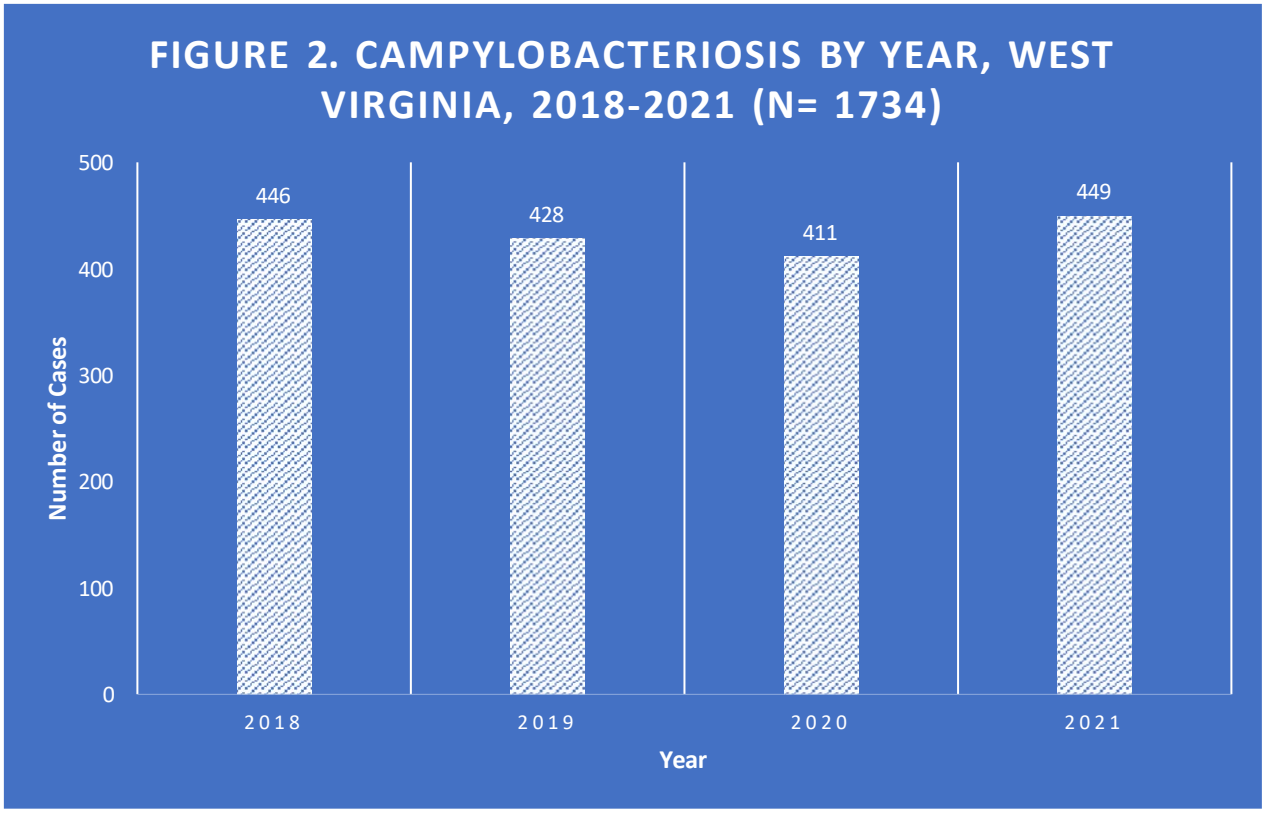


Table 1. Campylobacteriosis Case Status by Year, West Virginia, 2018-2021 (N= 1734)

Case Status	**2018**	**2019**	**2020**	**2021**
Probable	240	252	230	248
Confirmed	203	173	173	197
Total	443	425	403	445

FIGURE 3. INCIDENCE OF CAMPYLOBACTERIOSIS BY YEAR, WEST VIRGINIA, 2018-2021 (N=1734)

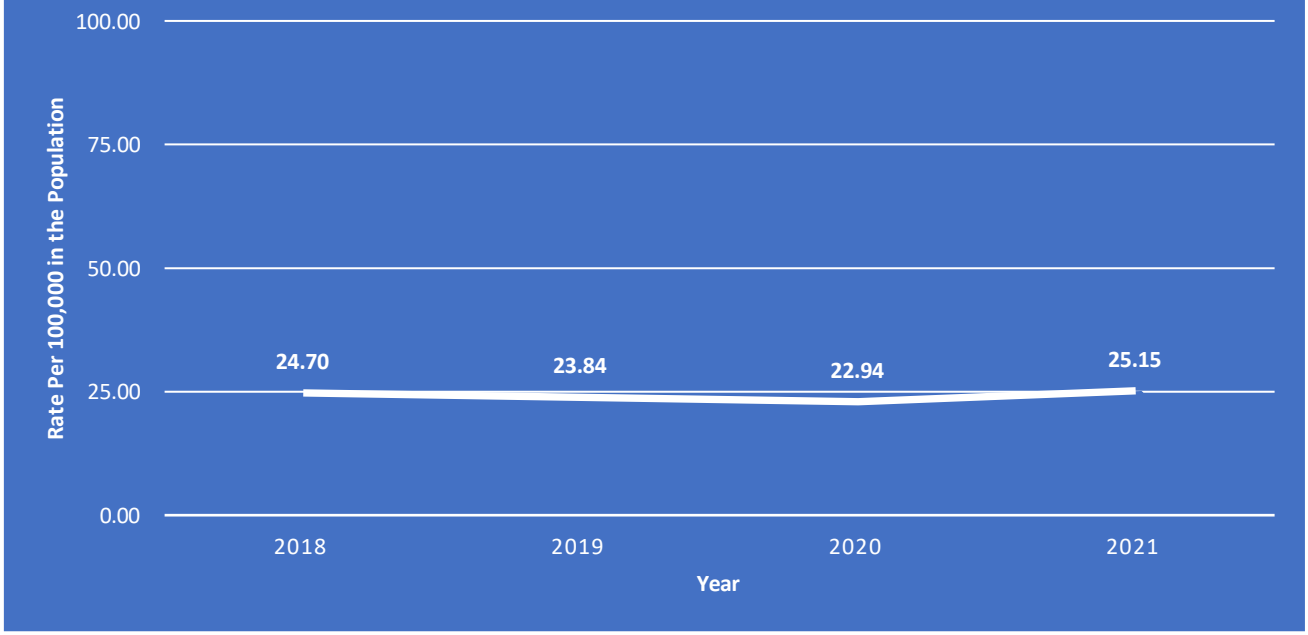
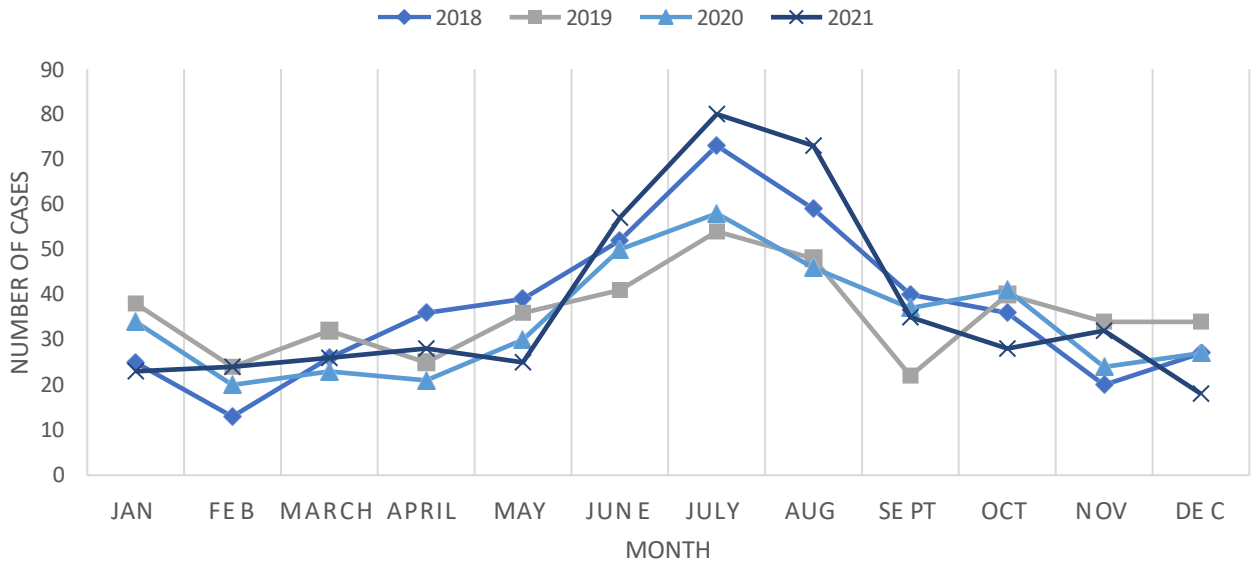


FIGURE 4. CAMPYLOBACTER BY MONTH INVESTIGATION OPENED, WEST VIRGINIA, 2018-2021 (N= 1734)



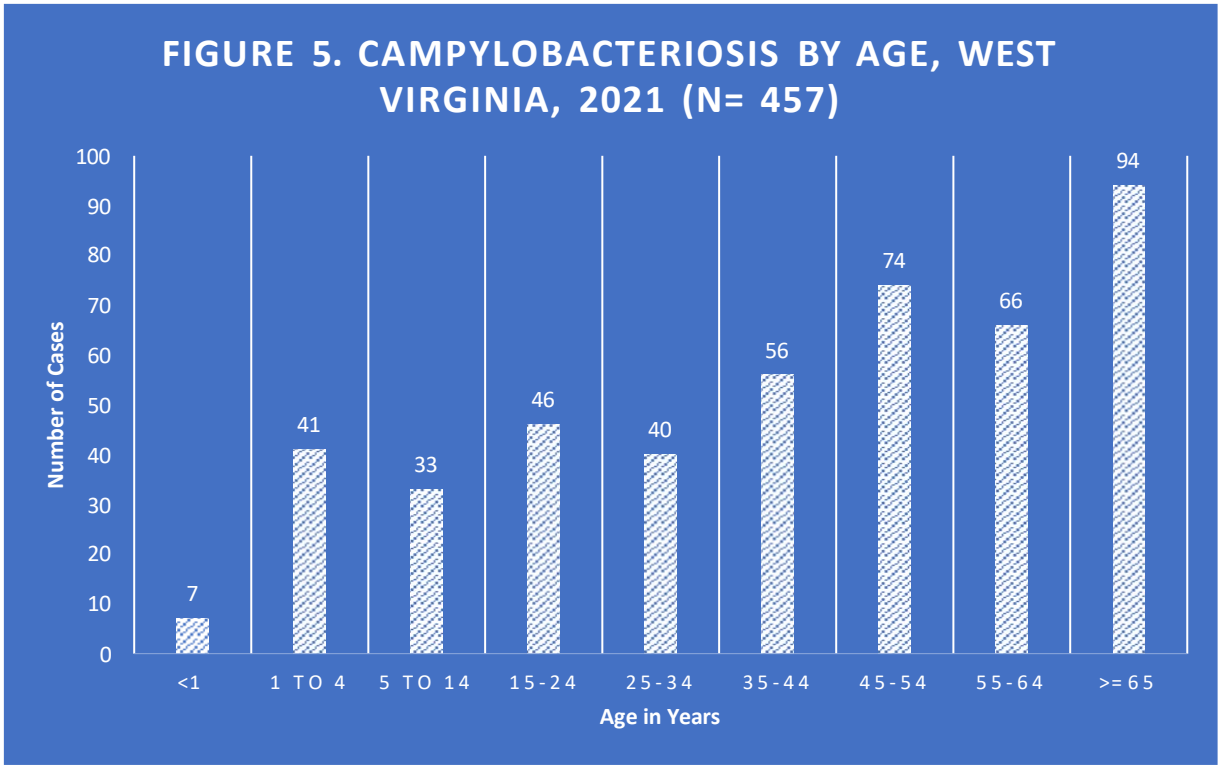
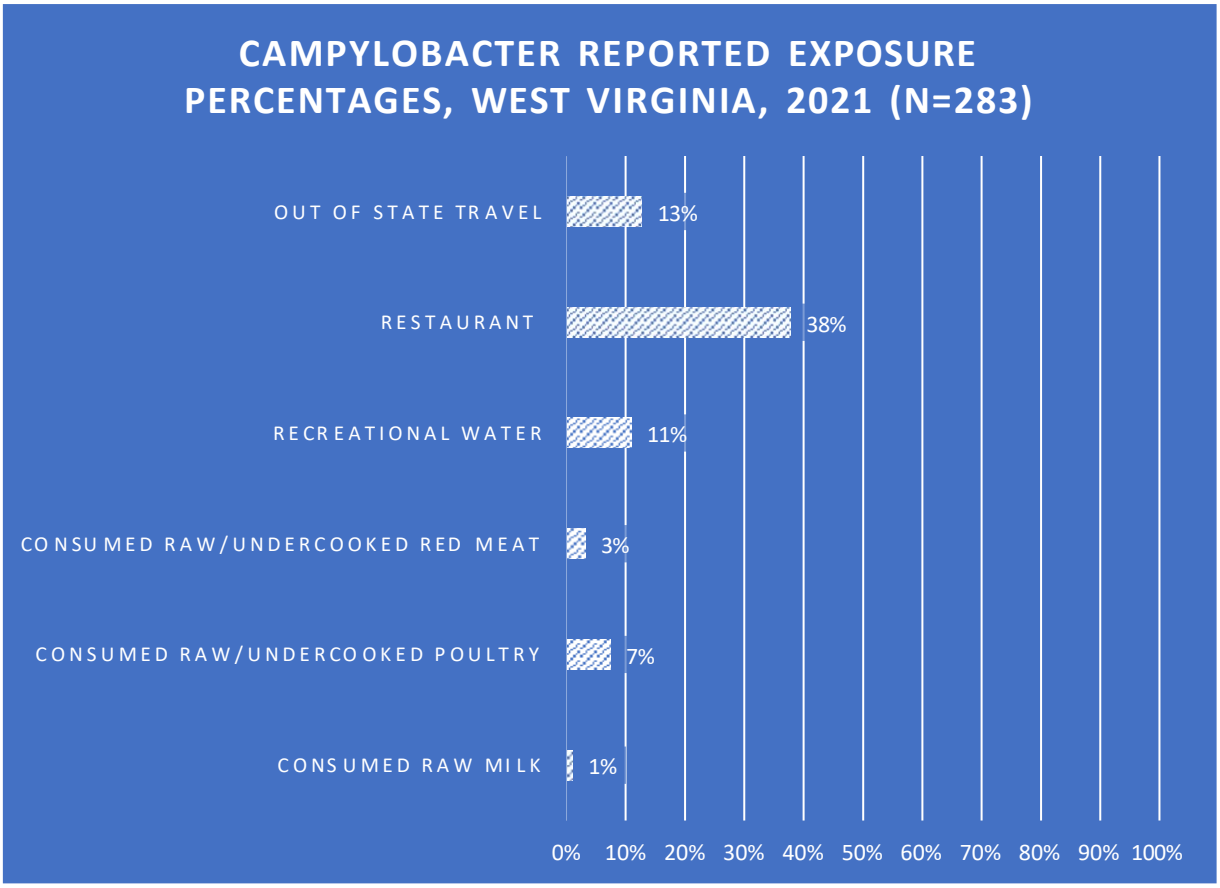


FIGURE 5. CAMPYLOBACTERIOSIS BY AGE, WEST VIRGINIA, 2021 (N= 457)
Number of Cases
100
90
80
70
60
50
40
30
20
10
0
7
41
33
46
40
56
74
66
94
<1
1 TO 4
5 TO 14
15-24
25-34
35-44
45-54
55-64
>=65
Age in Years


CAMPYLOBACTER REPORTED EXPOSURE PERCENTAGES, WEST VIRGINIA, 2021 (N=283)
OUT OF STATE TRAVEL
13%
RESTAURANT
38%
RECREATIONAL WATER
11%
CONSUMED RAW/UNDERCOOKED RED MEAT
3%
CONSUMED RAW/UNDERCOOKED POULTRY
7%
CONSUMED RAW MILK
1%
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%

Salmonellosis

Salmonellosis is caused by the bacterium *Salmonella*. The illness is characterized by acute abdominal pain, diarrhea, and often fever, which usually begins 6 hours to 6 days after exposure. Excretion of *Salmonella* may persist for several days or even months beyond the acute phase of the illness. Some infected individuals can become asymptomatic carriers and shed the bacteria for prolonged periods in their stool. There are more than 2,500 serotypes (serovars) of *Salmonella*. Some serotypes may be associated more with certain types of animals, foods, or geographic locations, while other serotypes can be associated with varying degrees of virulence. The serotype *Salmonella Typhi* may cause typhoid fever—a potentially life-threatening illness that develops seven to 14 days after the initial onset of Salmonellosis. Symptoms can include bacteremia, fever, headaches, rash, and altered mental status.

A wide range of domestic and wild animals are carriers of *Salmonella*. These include poultry, swine, cattle, rodents, reptiles, dogs and cats. Ingestion of contaminated food (mostly of animal origin) is the predominant mode of transmission. Raw or undercooked food items – such as eggs, milk, meat and poultry – have been implicated as common sources in salmonellosis outbreaks, along with produce and other processed food items. In recent years, numerous large outbreaks have also been linked to contact with high-risk animals including live poultry in backyard flocks, reptiles (especially small turtles), and amphibians.

The salmonellosis case definition used to classify cases through 2016 defined a confirmed case as one identified by laboratory culture-confirmation; a probable case was identified by CIDT methods; and a suspect case was a clinically compatible case that lacks laboratory testing but is epidemiologically linked to a confirmed case. However, the suspect category was eliminated in the 2017 case definition, and suspect cases were incorporated into the probable case classification.

West Virginia had 233 reported cases of Salmonellosis in 2021 (Table 2). There were 196 confirmed cases and 37 probable cases (Table 2). The 2021 salmonellosis incidence in West Virginia was 13.05 per 100,000 population, and is lower than the national incidence of 14.18 per 100,000 population for that year (Figure 8). In the same year over 63% of cases were aged 45 years or older, with over 33% of total cases being 65 years or older (Figure 10). Cases were reported throughout the year, with peak incidence occurring in August (Figure 9). Of the 233 total cases of Salmonellosis in 2021, investigation efforts were able to collect exposure source information on 145 of those cases, finding the most commonly reported exposure to be fresh produce consumption, at 54% of exposures reported (Figure 11).

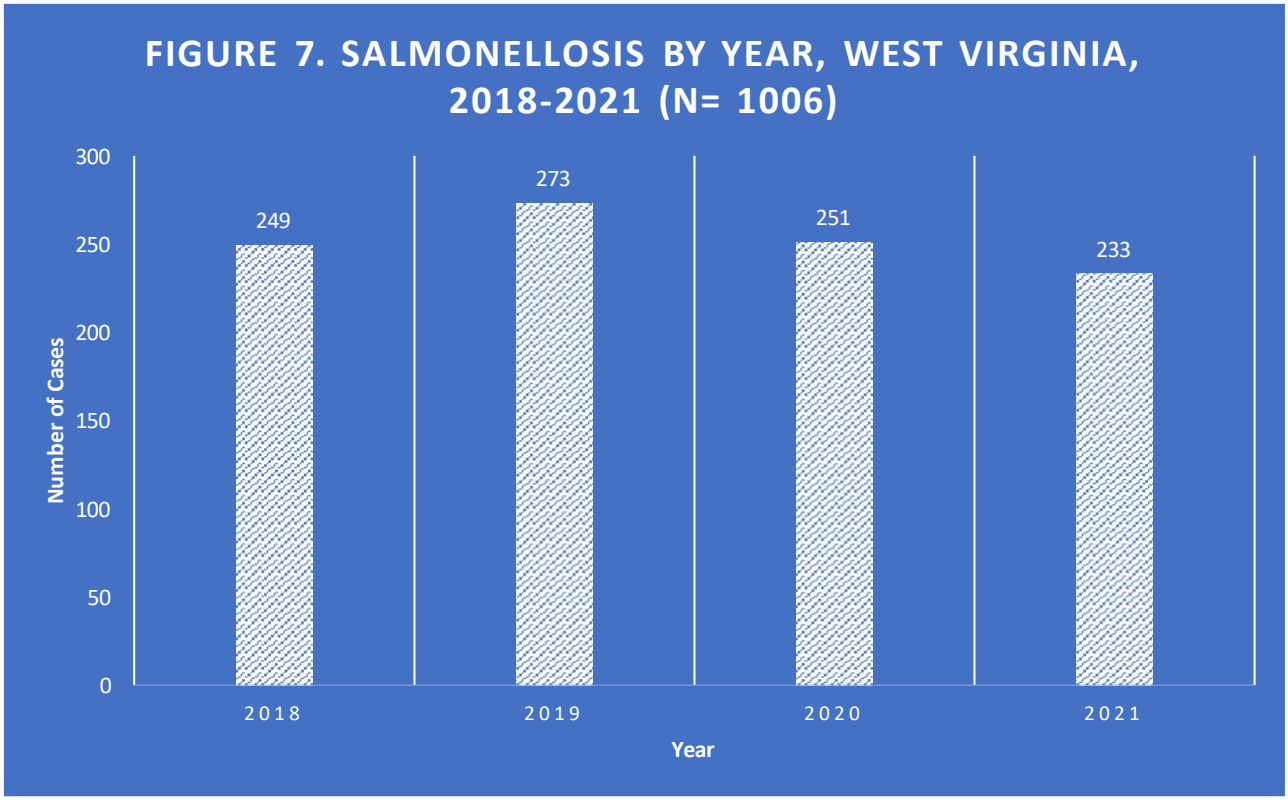


Table 2. Salmonellosis Case Status by Year, West Virginia, 2018-2021 (N= 1006)

Case Status	**2018**	**2019**	**2020**	**2021**
Probable	38	32	35	37
Confirmed	211	241	216	196
Total	249	273	251	233

FIGURE 8. INCIDENCE OF SALMONELLOSIS BY YEAR, WEST VIRGINIA, 2018-2021 (N=1006)

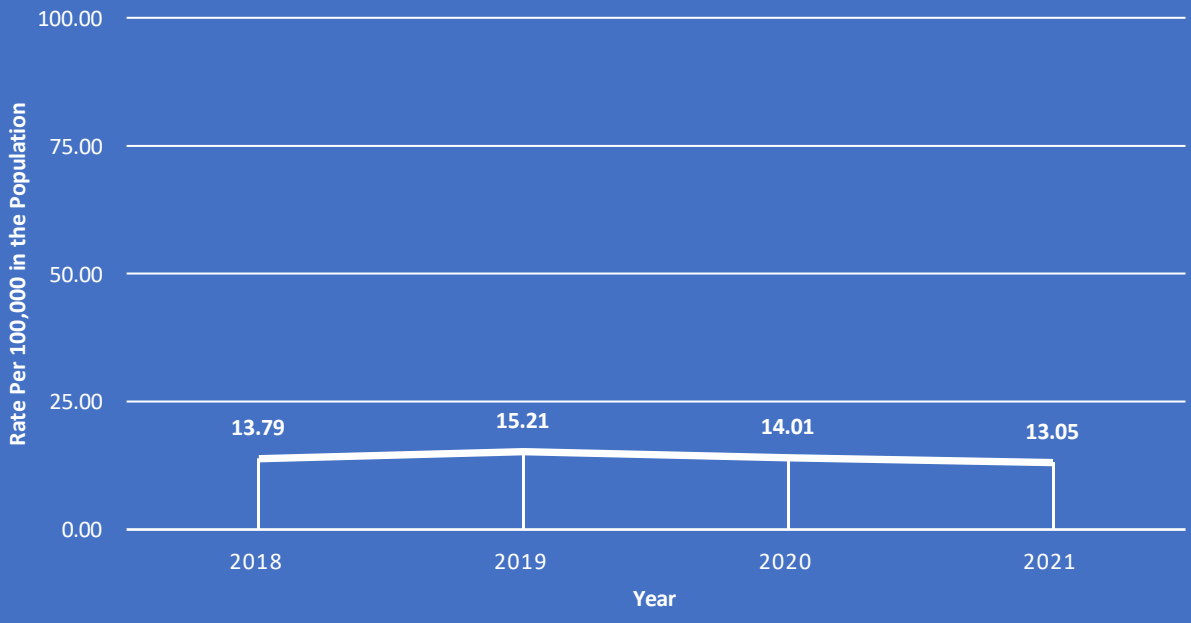


FIGURE 9. SALMONELLOSIS BY MONTH INVESTIGATION OPENED, WEST VIRGINIA, 2018-2021 (N= 1006)

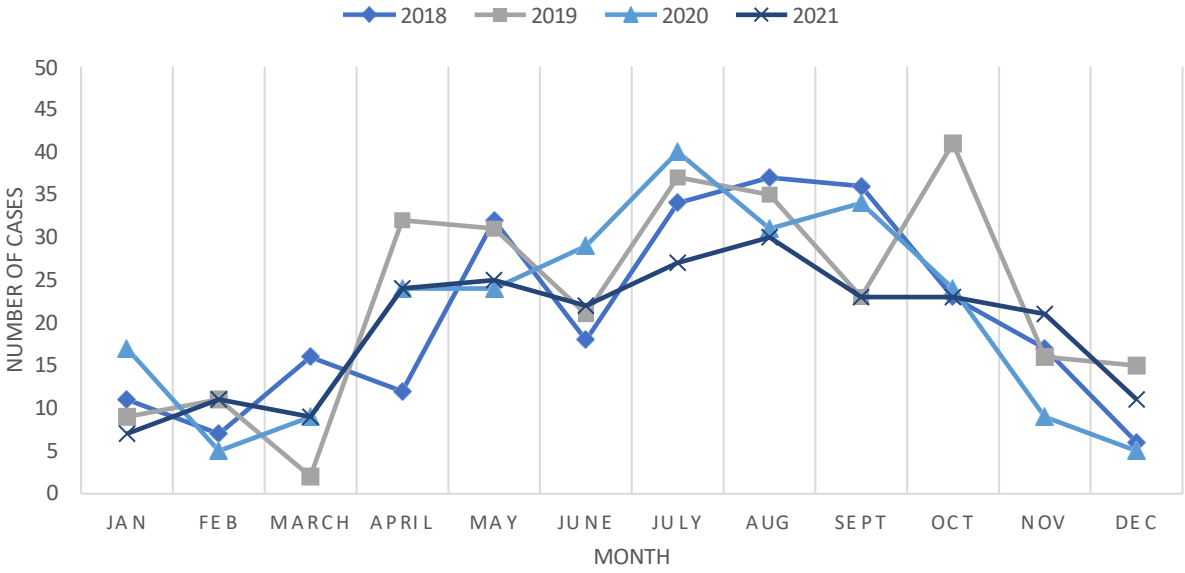
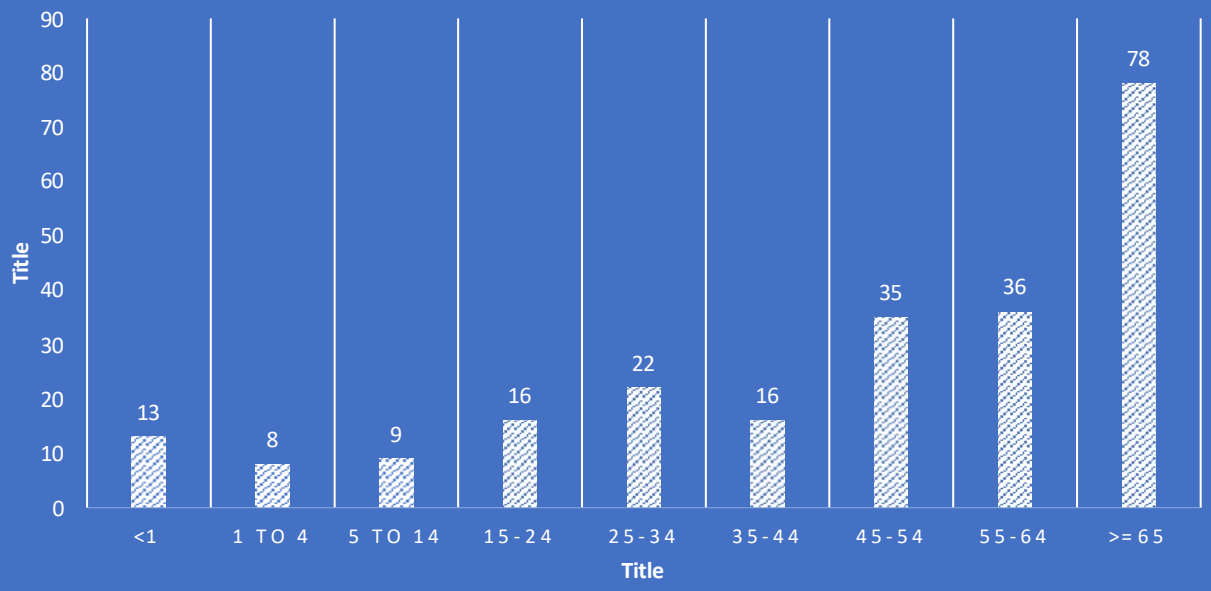
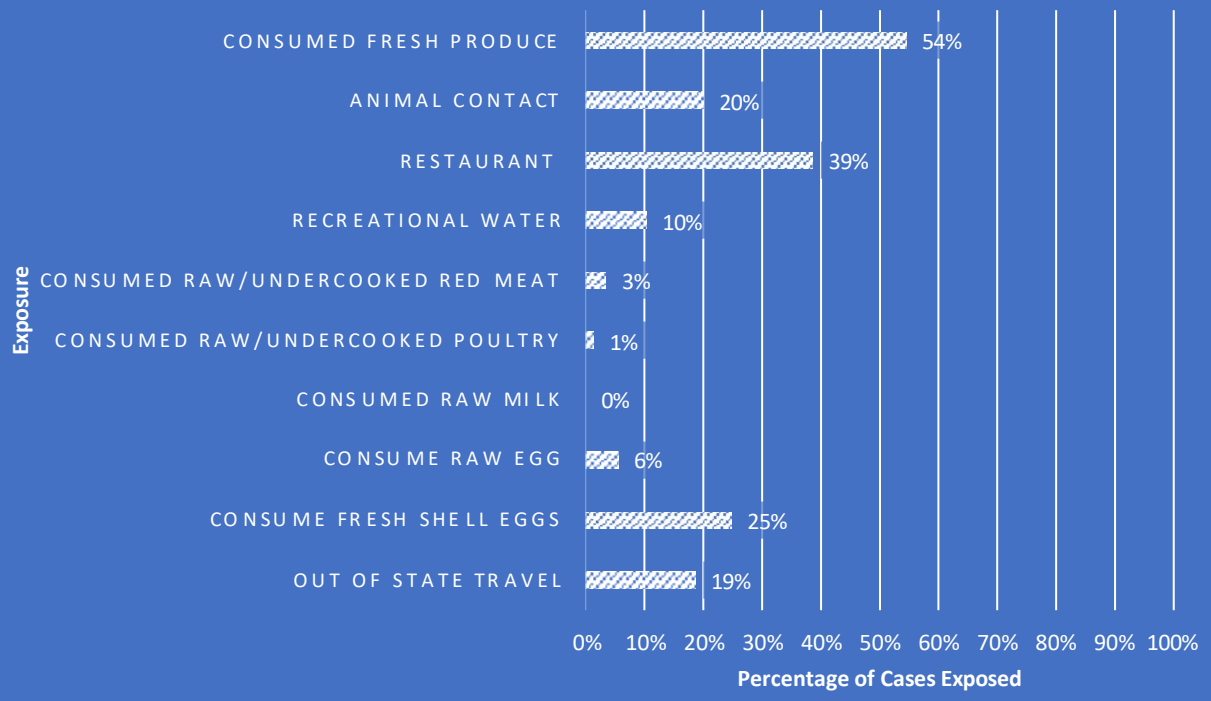


FIGURE 10. SALMONELLOSIS BY AGE, WEST VIRGINIA, 2021 (N= 233)



SALMONELLOSIS REPORTED EXPOSURE PERCENTAGES, WEST VIRGINIA, 2021 (N=145)



Shiga Toxin-producing *Escherichia coli*

Shiga toxin-producing *E. coli* (STEC), the most notorious being *E. coli* O157, are among the most dreaded causes of infectious gastroenteritis. Bloody diarrhea is a hallmark of this pathogen, but the real danger is post-diarrheal hemolytic uremic syndrome (HUS). Spread by the fecal-oral route, STEC has many animal reservoirs, the most important of which are ruminants: cattle, goats, sheep, deer, etc. Transmission often occurs from the consumption of contaminated food or water, as well as direct person-to-person spread and environmental exposures. Public health actions to monitor, prevent, and control STEC infections are based on serogroup characterization. HUS is mostly associated with O157. Non-O157 STEC, a diverse group that varies in virulence, comprises approximately 50 other serogroups. Increased use of CIDT diagnostic tests in recent years has led to increased detection and reporting STEC infection.

There are two types of Shiga toxins (Stx) produced by STEC: Stx1 andStx2. In general, strains that produce certain types of Stx2 are the most virulent. Confirmed cases were determined by bacterial culture of *E. coli* or detection of Shiga toxin production or Stx genes. Probable cases were classified by one of the following: (1) STEC detected by CIDT in a clinical specimen; (2) isolation of O157 without the detection of Stx; and (3) individuals who were symptomatic but have no laboratory evidence and have an epidemiological link to a confirmed or probable case of STEC. Suspect cases were those cases where Stx genes were detected by CIDT without detection of STEC or cases having the laboratory criteria of a case, but lacking clinical symptoms, or individuals having a diagnosis or HUS. The current STEC case definition was adopted in 2018. Prior to 2018, there was one stipulation for the qualification of a confirmed case, three stipulations for a qualified classification as probable, and two stipulations for qualified classification as a suspected case. With the current definition there are now four stipulations to qualify for suspected case classification, and there are six stipulations to qualify for a probable case.

In 2021, there were 76 reported STEC cases in West Virginia: 16 confirmed, 55 probable and 5 suspect (Figure 12, Table 3). The incidence of STEC cases was 4.26 per 100,000 population and was lower than the national incidence of 5.04 per 100,000 population in 2021 (Figure 13). In the same year 50% of cases were aged 45 years or older, with over 27% of total cases being 65 years or older (Figure 15). More cases were reported in summer and early fall (Figure 14). Of the 76 total reported cases in 2021, investigation efforts were able to collect reported exposure to 51 of those cases in which it was found 57% of cases cited exposure to consuming raw fruits and vegetables (Figure 16).

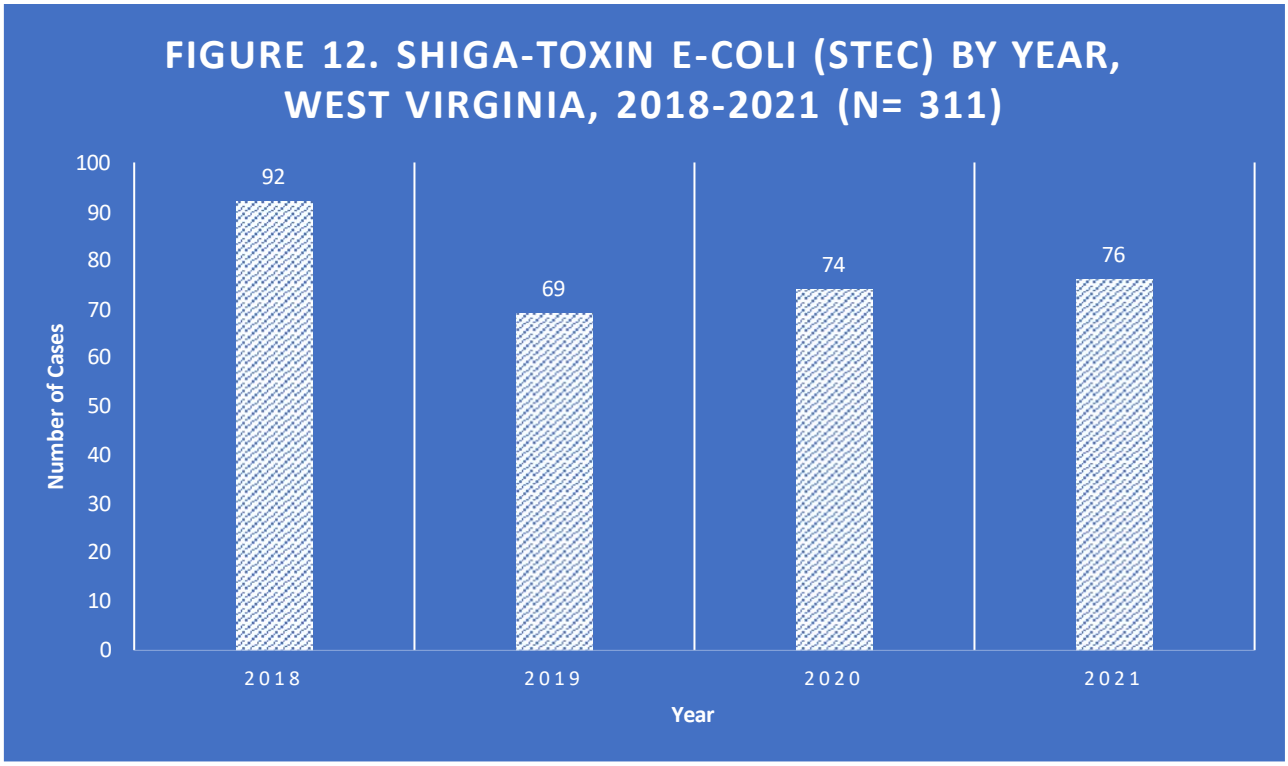


Table 3. Shiga-Toxin E. Coli (STEC) Case Status by Year, West Virginia, 2018-2021 (N= 311)

Case Status	**2018**	**2019**	**2020**	**2021**
Suspect	0	2	0	5
Probable	72	43	56	55
Confirmed	20	24	18	16
Total	92	69	74	76

FIGURE 13. INCIDENCE OF SHIGA-TOXIN E-COLI (STEC) BY YEAR, WEST VIRGINIA, 2018-2021 (N=311)

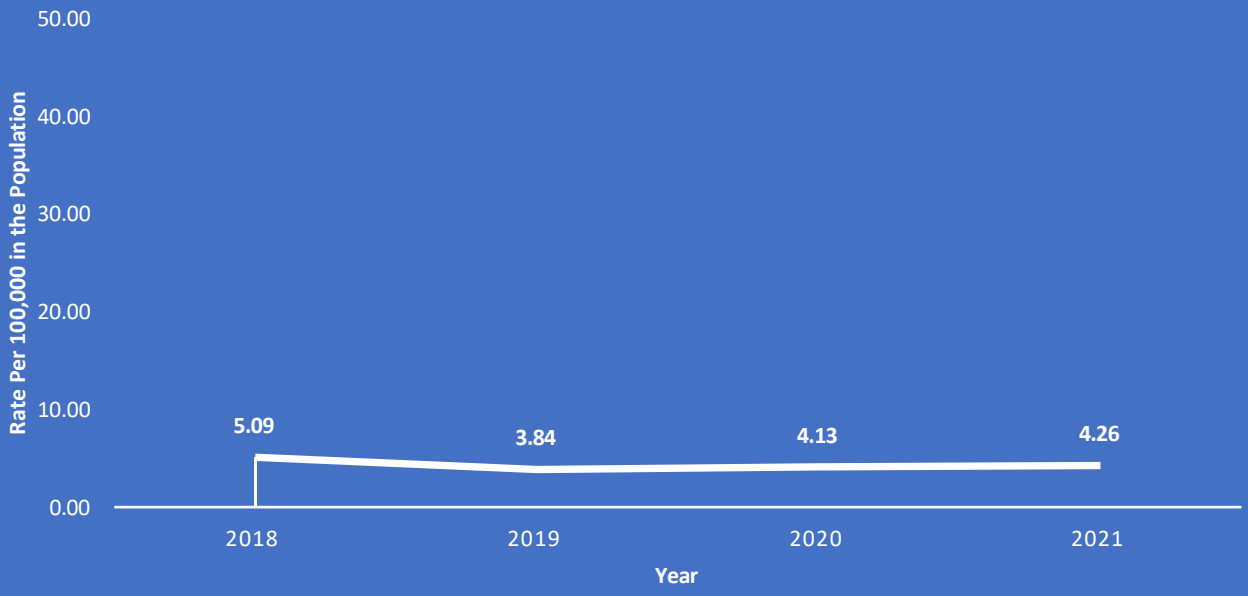


FIGURE 14. SHIGA-TOXIN E. COLI (STEC) BY MONTH INVESTIGATION OPENED, WEST VIRGINIA, 2018-2021 (N= 311)

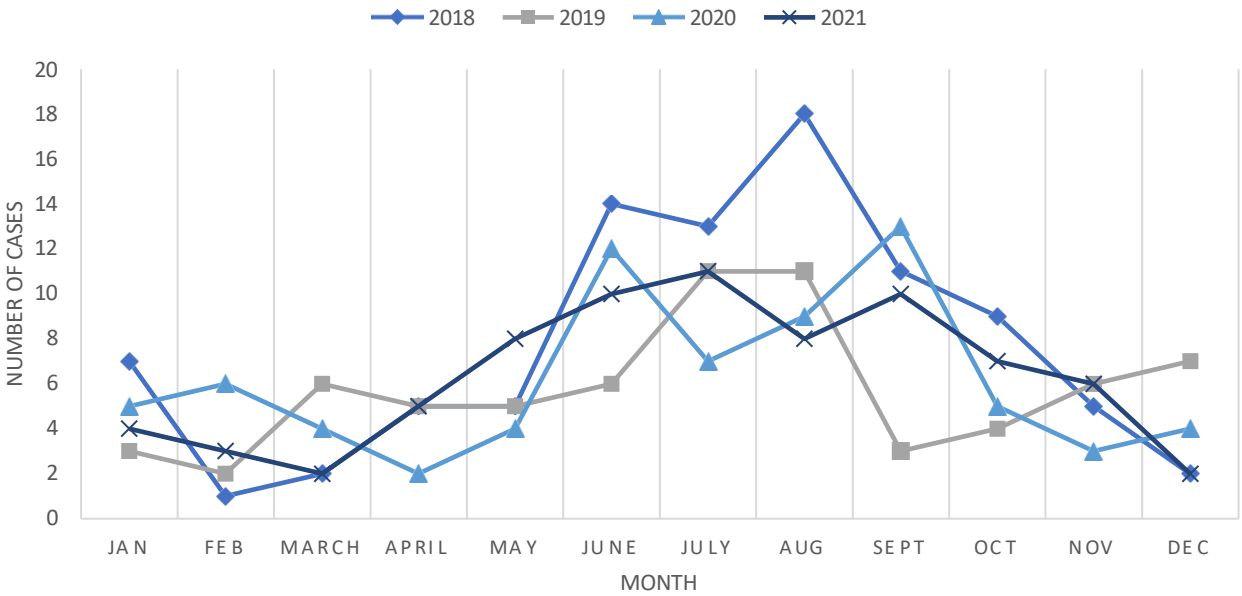
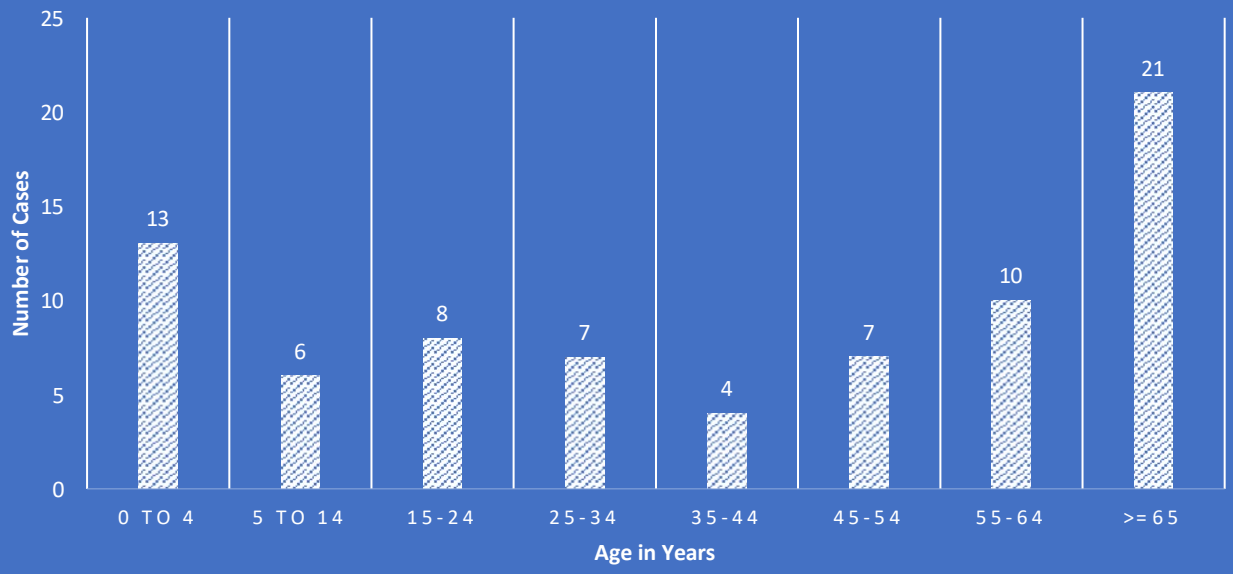
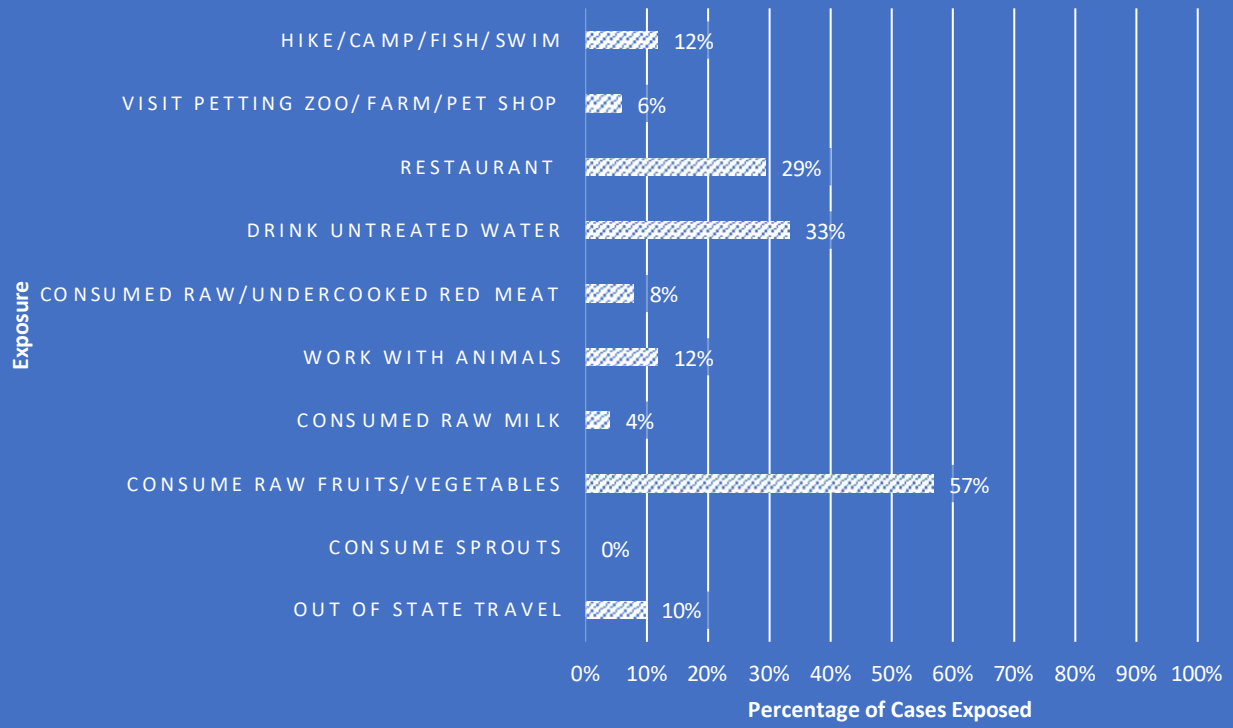


FIGURE 15. SHIGA-TOXIN E.COLI (STEC) BY AGE, WEST VIRGINIA, 2021 (N= 76)



SHIGA-TOXIN E. COLI (STEC) REPORTED EXPOSURE PERCENTAGES, WEST VIRGINIA, 2021 (N=51)



Giardiasis

Giardia intestinalis is a flagellated protozoan that can be found throughout the world. The pathogen exists in two forms during its lifecycle: an extremely hardy cyst that can survive in the environment for months and a trophozoite form that can only survive while inside the host. Infection can occur in humans, pets, domesticated livestock, rodents and other wild animals. Giardiasis is the most common intestinal parasitic infection in humans in the United States.

Human infections occur primarily through person-to-person contact or through ingestion of food or water contaminated by feces. As little as ten or fewer *Giardia* cysts can cause infection. Cysts can be excreted in stool intermittently for weeks or months, resulting in a prolonged period of communicability. Symptomatic Giardiasis patients report chronic diarrhea, abdominal cramps, bloating, frequent loose pale greasy stools, fatigue, and weight loss. However, asymptomatic cases are common.

Children in childcare settings, their close contacts, and men who have sex with men are at greatest risk of infection and are commonly involved in Giardiasis outbreaks. Because many human cases follow person-to-person transmission, rapid detection and treatment of disease, as well as good contact management practices, are necessary to prevent further spread of disease.

A confirmed Giardiasis case is identified by the detection of the protozoan using direct microscopic observation or by CIDT in a clinical specimen in a patient with clinical symptoms. Cases are considered probable when no laboratory testing has been completed, but a patient is symptomatic and has an epidemiological link to a confirmed case.

In 2021, the incidence of Giardiasis in West Virginia was 5.21 cases per 100,000 population (Figure 18). This is below the United States rate of incidence for 2019 (most recent national data) of 5.9 cases per 100,000 population. The number of confirmed cases in 2021 was 93 (Figure 17, Table 4). Cases occurred throughout the year with the most consistency during the Summer, although peak incidence occurred during the month of November (Figure 19). West Virginians aged 35-44 had the highest incidence of Giardiasis in 2021 (Figure 20). Of the 93 total cases in 2021, investigation efforts were able to collect reported exposure to 61 of those cases, in which it was found 51% of cases cited exposure to pets (Figure 21).

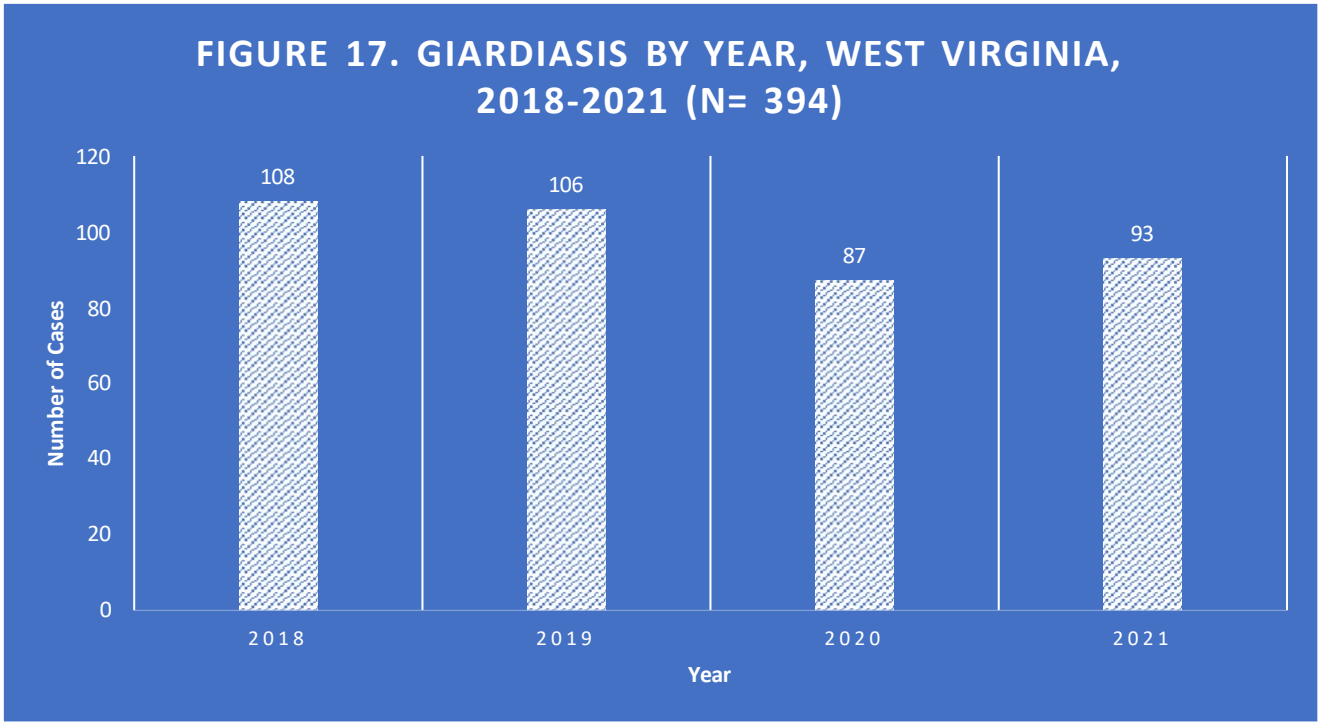


Table 4. Giardiasis Case Status by Year, West Virginia, 2018-2021 (N= 394)

Case Status	**2018**	**2019**	**2020**	**2021**
Not a Case	3	2	3	5
Confirmed	105	104	84	88
Total	108	106	87	93

FIGURE 18. INCIDENCE OF GIARDIASIS BY YEAR, WEST VIRGINIA, 2018-2021 (N=394)

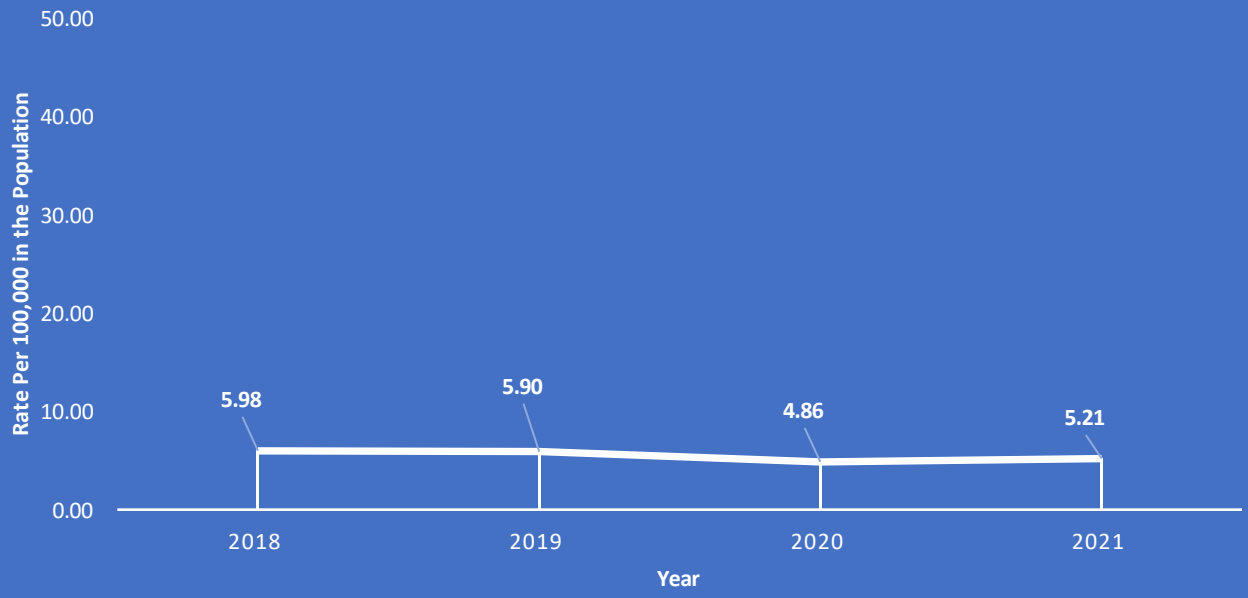


FIGURE 19. GIARDIASIS BY MONTH INVESTIGATION OPENED, WEST VIRGINIA, 2018-2021 (N= 394)

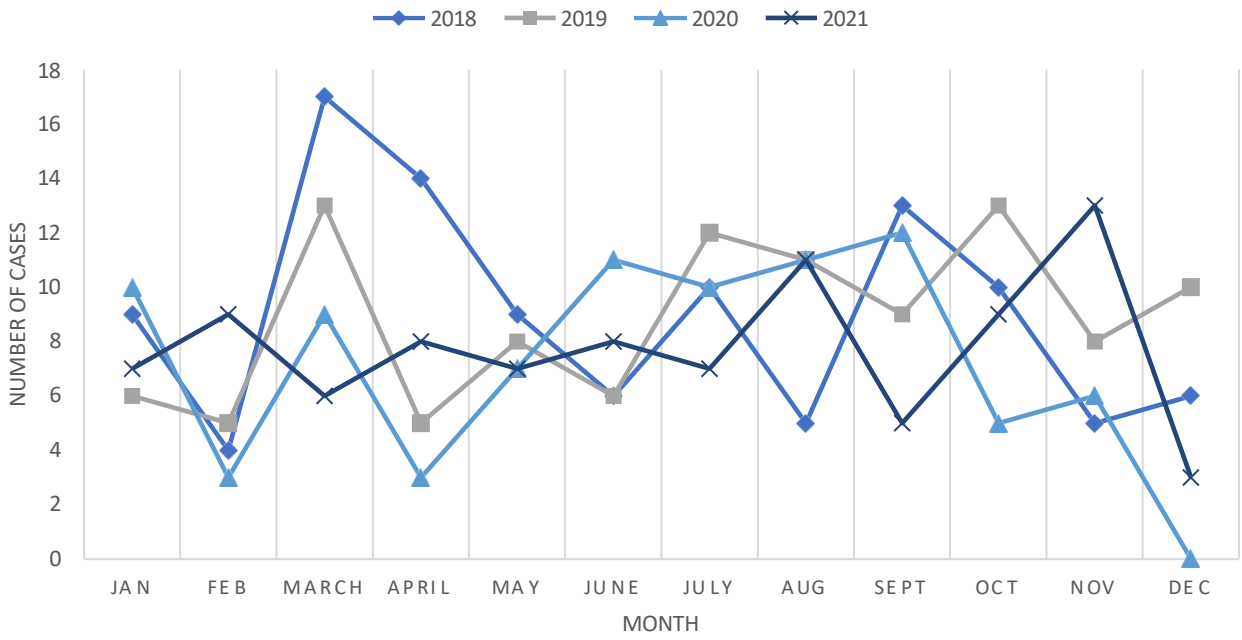


FIGURE 20. GIARDIASIS BY AGE, WEST VIRGINIA, 2021 (N= 93)

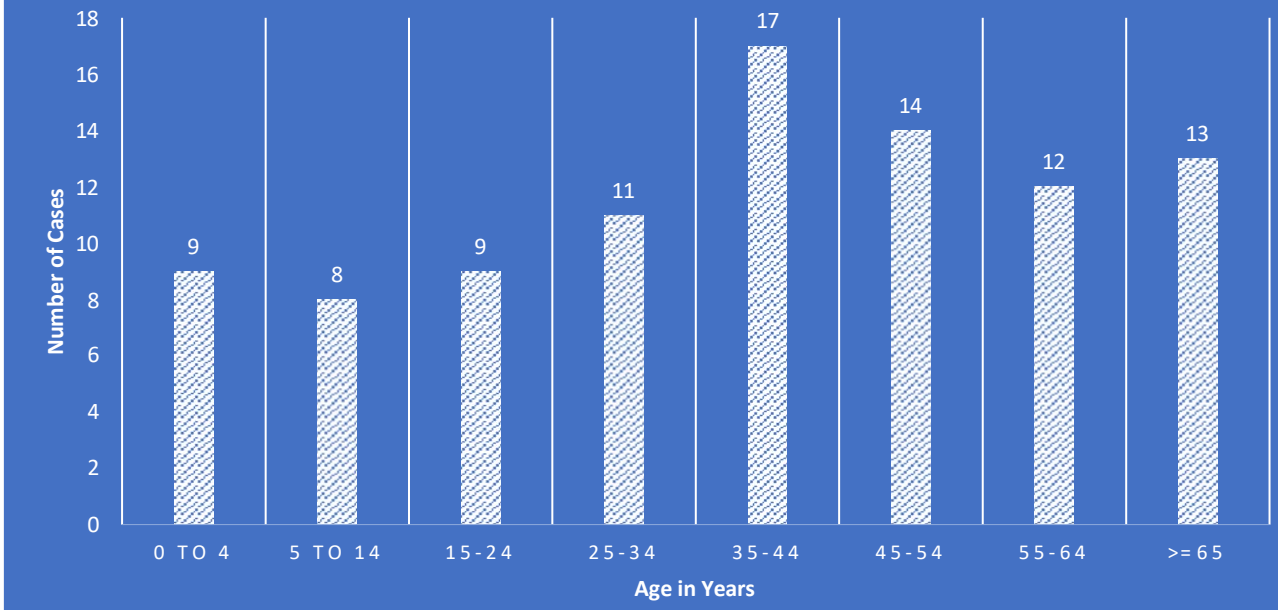
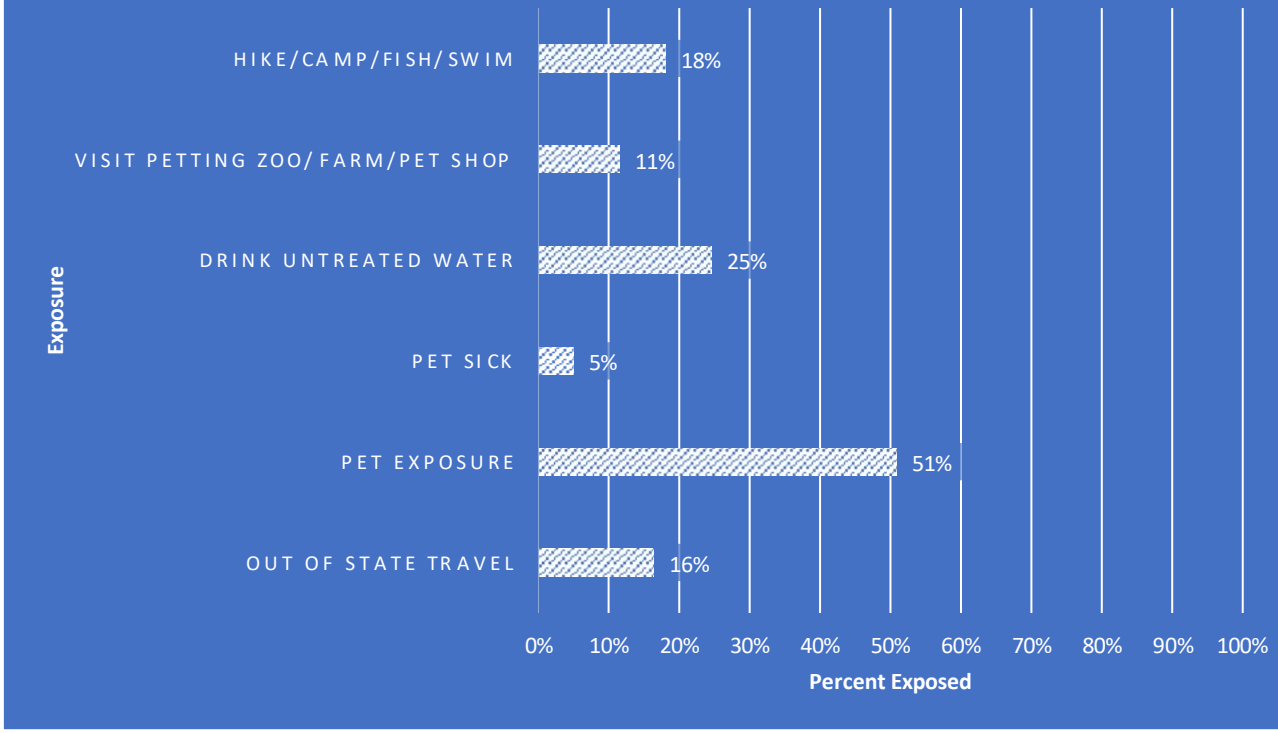


FIGURE 21. GIARDIASIS REPORTED EXPOSURE PERCENTAGES, WEST VIRGINIA, 2021 (N=61)



Conclusion

Enteric illness rates across the four illnesses in this report remained relatively steady across the years of 2018, 2019, and 2021, but there were notable decreases seen in 2020. This decrease was seen nationwide with a 26% decrease in the incidence of infections caused by pathogens transmitted through food for the year 2020. This was the largest single-year variation in incidence during the 25 years of FoodNet surveillance. There could be many contributing factors to this decrease in illnesses including pandemic-related travel restrictions, restaurant closures, changes in healthcare-seeking behaviors, and a broader use of telehealth limiting stool specimen testing.[1] For the four illnesses analyzed in this report, from the year 2019 to the year 2020, there was a 5.84% decrease in the incidence of these infections, which is significantly lower than the national decrease.

For further information regarding foodborne illnesses in West Virginia, please visit the Office of Epidemiology and Prevention Services website: https://oeps.wv.gov/enteric/

For more information on national food safety, please visit CDC's website: https://www.cdc.gov/foodsafety/index.html

1 https://www.cdc.gov/mmwr/volumes/70/wr/mm7038a4.htm