WEST VIRGINIA 2016 ENTERIC DISEASE SURVEILLANCE REPORT

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

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Introduction

Eleven enteric pathogens are reportable in West Virginia as per the West Virginia Reportable Disease Rule, 64 CSR 7. 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, 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).

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

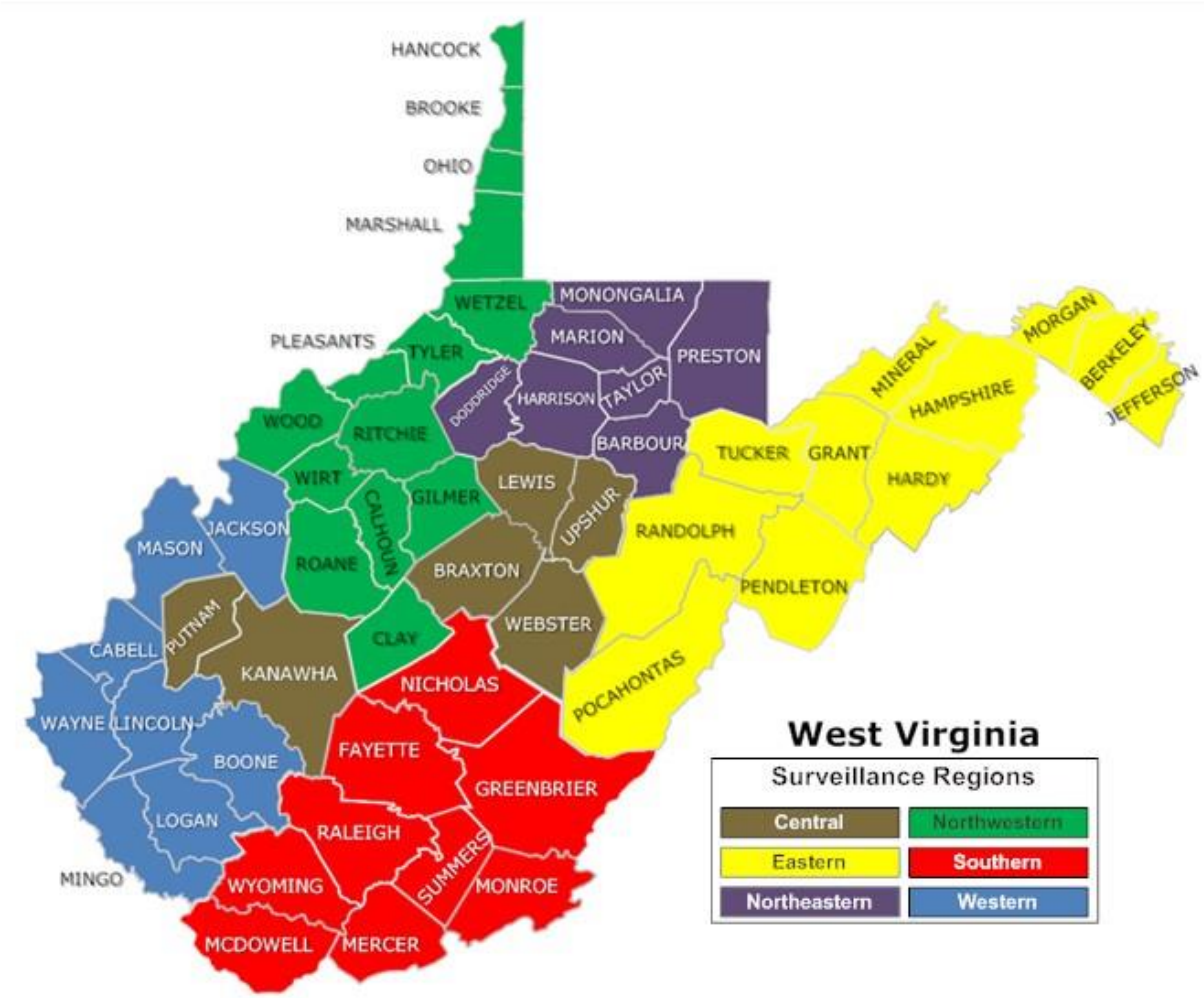
Cases were ascertained according to the CDC National Notifiable Disease Surveillance System (NNDSS) case definitions in effect for 2015 as proposed by the Council of State and Territorial Epidemiologists (CSTE). Current case definitions can be found at: www.cdc.gov/nndss/conditions/search/.

Data were extracted from WVEDSS, then analyzed and summarized using Microsoft Excel. Data included case information for all cases of the four selected pathogens reported from 2011 through 2015 in West Virginia. The date the case investigation was started is used to determine year of report.

Age-specific population data was taken from 2010 census information: www.census.gov/popest/data/state/asrh/2013/files/SC-EST2013-AGESEX-CIV.csv.

National enteric disease rates and incidences for 2016 were taken from the 2016 Annual Tables of Infectious Disease Data: wonder.cdc.gov/nndss/nndss_annual_tables_menu.asp.

West Virginia Surveillance Regions



Campylobacteriosis

Campylobacteriosis is one of the most common enteric bacterial infections in the United States and is most common enteric infection reported in West Virginia. It is caused by the bacterium *Campylobacter*. The illness is characterized by acute onset of diarrhea, vomiting, abdominal pain, fever, and malaise. Symptoms generally occur within two to five days of infection; although, some infected individuals may be asymptomatic and go undetected, but still transmit 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. Many cases are thought to 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. In 2016, West Virginia had a total 396 reported Campylobacteriosis cases: 157 confirmed and 239 probable cases (Figure 1, Table 1). The number of cases has nearly tripled between 2011 and 2016 (Figure 1). This steady increase in reporting is likely attributed to the increase of culture-independent diagnostic tests (CIDT) in clinical laboratories. Due to evolving laboratory testing practices, the Campylobacteriosis case definition has changed several times over the past five years. The current case definition classifies cases as either confirmed or probable. A case is considered confirmed if *Campylobacteria* is cultured from a clinical specimen. Cases are considered probable if the pathogen is detected by a CIDT method. The suspect classification (clinically compatible cases with an epidemiological link to a confirmed case) was considered for case classification from 2012–2014. However, this category was incorporated into the probable classification in 2015.

In 2016, West Virginia's Campylobacteriosis rate of 21.4 cases per 100,000 population was higher than the national rate of 18.6 (Figure 2). Children under one year of age had the highest incidence of Campylobacteriosis (Figure 4). Infections occurred year-round, with the peak incidence occurring in the summer (Figure 3). The Eastern region had the highest incidence of reported Campylobacteriosis cases in West Virginia at 34.9 cases per 100,000 (Figure 5). The most frequently reported risk factors among West Virginia cases in 2016 were: live poultry and/or reptile contact, consumption of untreated water and recreational water contact (Table 2).

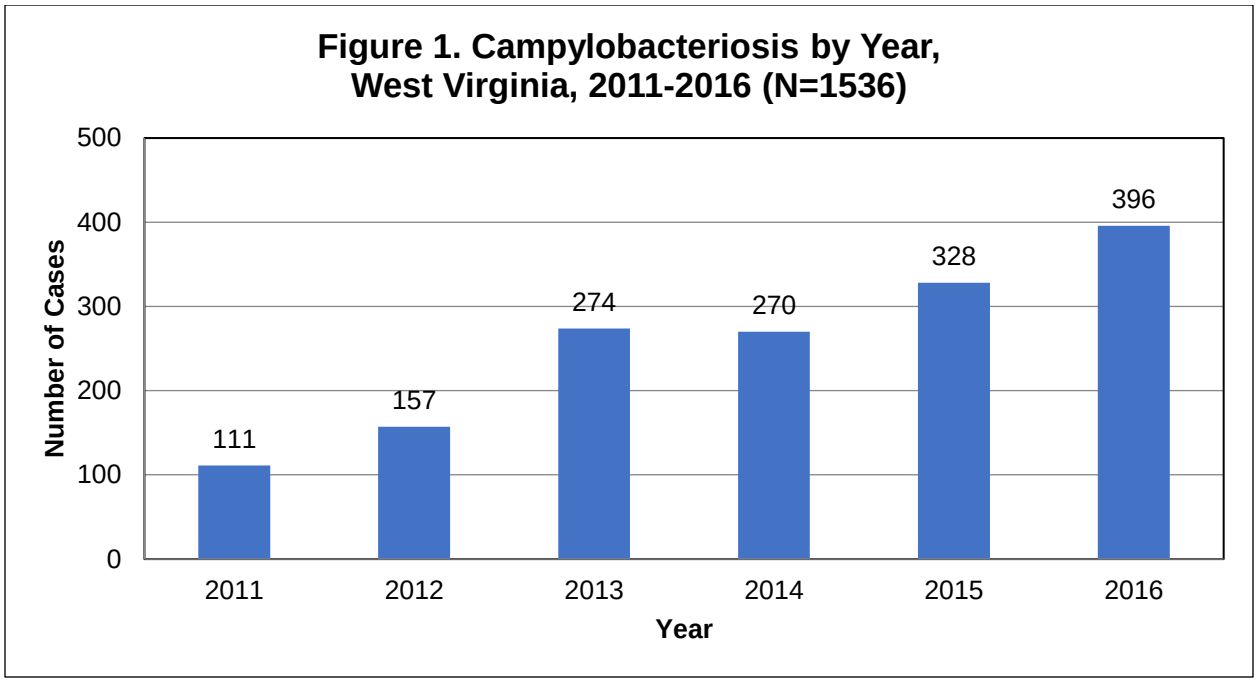


Table 1. Campylobacteriosis by Year and Case Status, West Virginia, 2011-2016 (N=1536)*

Case Status	2011	2012	2013	2014	2015	2016
Confirmed	110	147	143	140	135	157
Probable	1	10	1	5	193	239
Suspect	--	0	130	125	--	--
Total	**111**	**157**	**274**	**270**	**328**	**396**

*Case definition changed in 2012 and 2015.

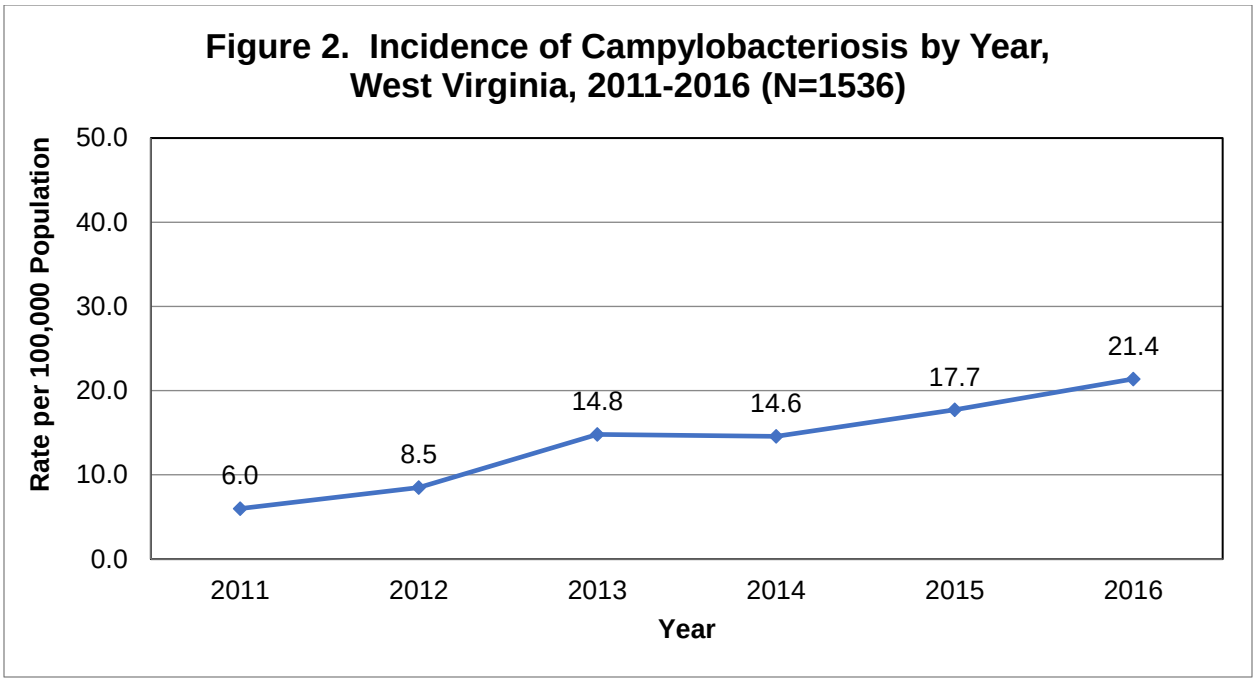


Figure 2. Incidence of Campylobacteriosis by Year, West Virginia, 2011-2016 (N=1536)
Rate per 100,000 Population
50.0
40.0
30.0
20.0
10.0
0.0
6.0
8.5
14.8
14.6
17.7
21.4
2011
2012
2013
2014
2015
2016
Year

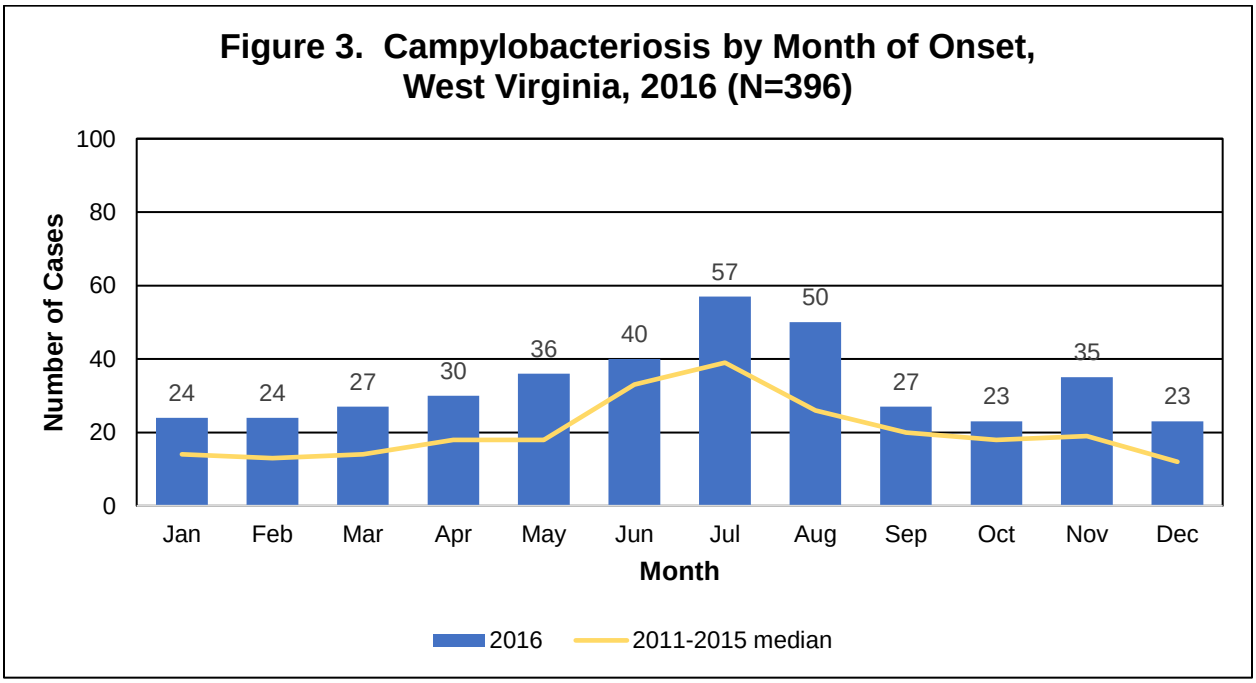


Figure 3. Campylobacteriosis by Month of Onset, West Virginia, 2016 (N=396)
Number of Cases
100
80
60
40
20
0
24
24
27
30
36
40
57
50
27
23
35
23
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Month
2016
2011-2015 median

Figure 4. Incidence of Campylobacteriosis by Age, West Virginia, 2016 (N=396)

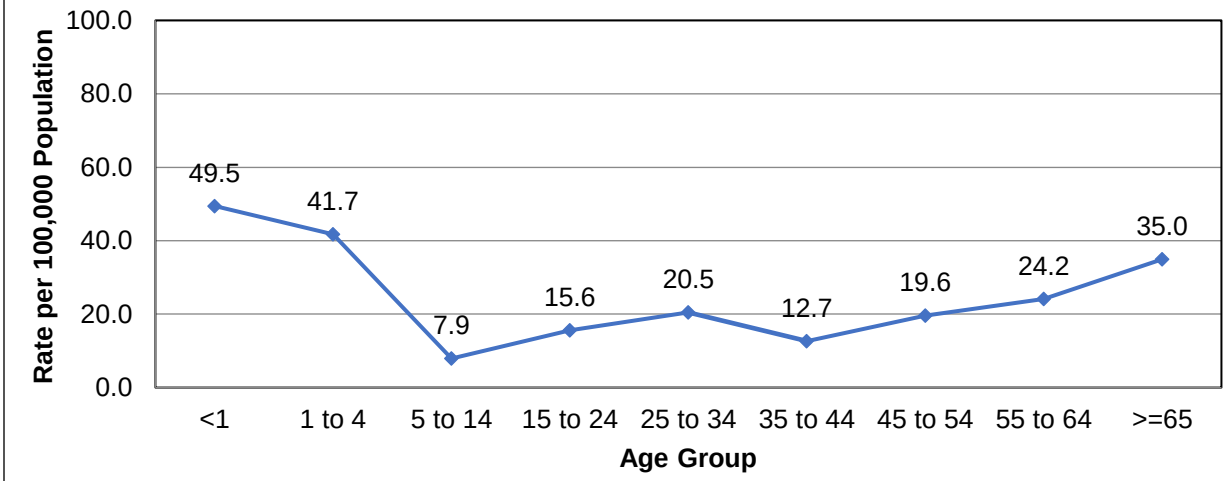


Figure 5. Incidence of Campylobacteriosis by Surveillance Region, West Virginia, 2016 (N=396)

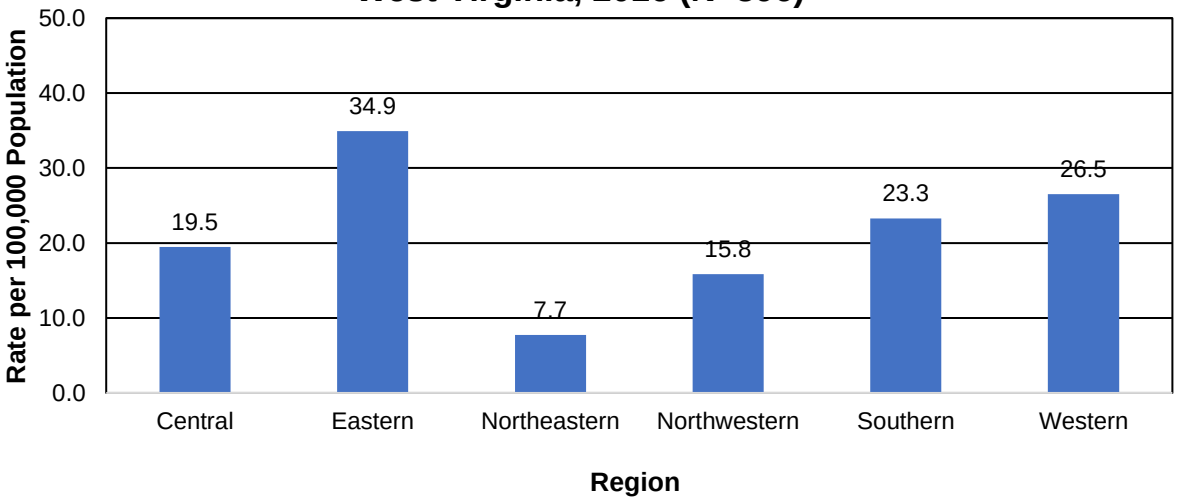


Table 2. Most Common Risk Factors Reported by Campylobacteriosis Cases, West Virginia, 2016 (N=396)

Exposure/Risk Factor	Number of Cases*	Percent of Cases
Live poultry/reptile contact	61	15.4
Consumed untreated water	52	13.1
Recreational water contact	42	10.6

*Multiple exposures/risk factors could be reported per case. Risk factor information was not obtained for all cases, including cases lost to follow-up.

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 fecally contaminated food or water. 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 child care 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. 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 2016, the incidence of giardiasis in West Virginia was 5.2 cases per 100,000 population (Figure 7). This is below the United States rate of 6.4 cases per 100,000 population for the same year. The number of confirmed cases in West Virginia was 97 (Figure 6, Table 3). Cases occurred throughout the year with peak incidence during the summer (Figure 8). In January, there was an increase in the expected number of cases for the month. Further investigation into the increase did not determine a cause. West Virginians age 35-44 had the highest incidence of giardiasis at 7.6 cases per 100,000 population (Figure 9). The Northeastern region had the highest incidence of reported cases in West Virginia at 11.1 cases per 100,000 (Figure 10). Pet contact was the most commonly reported risk factor for the disease (Table 4).

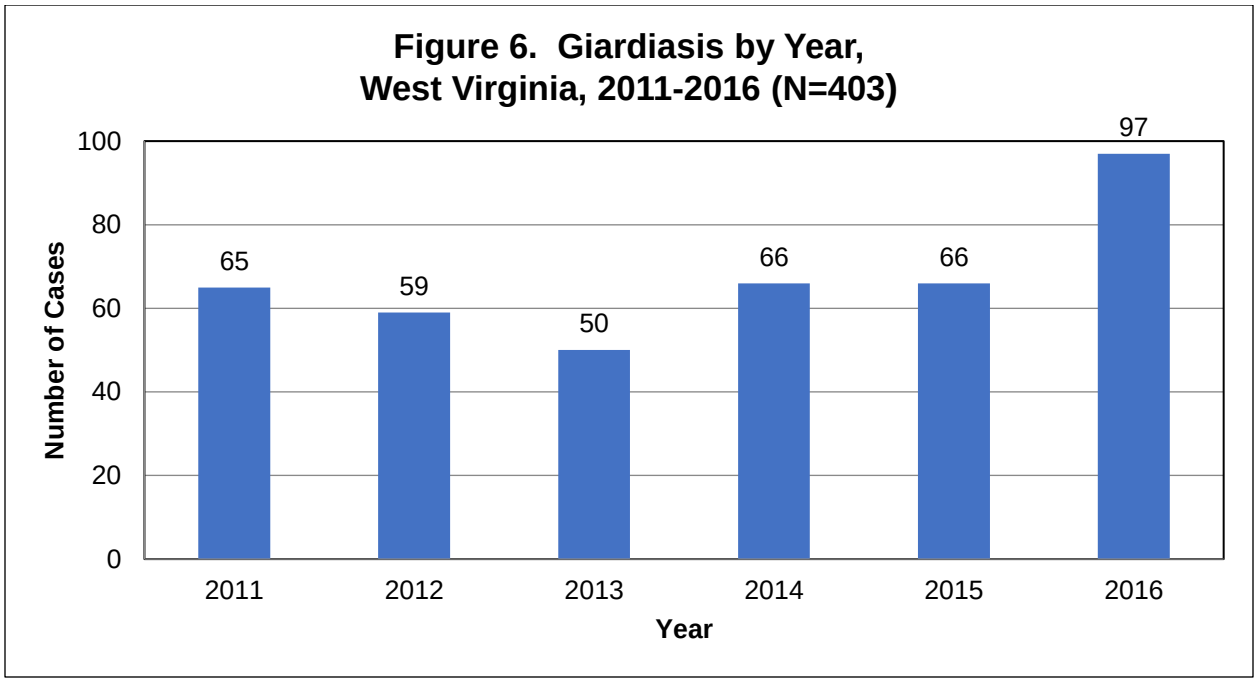


Table 3. Number of Giardiasis Cases by Year of Report and Case Status, West Virginia, 2011-2016 (N=403)

Case Status	2011	2012	2013	2014	2015	2016
Confirmed	61	57	50	66	66	97
Probable	4	2	0	0	0	0
Total	**65**	**59**	**50**	**66**	**66**	**97**

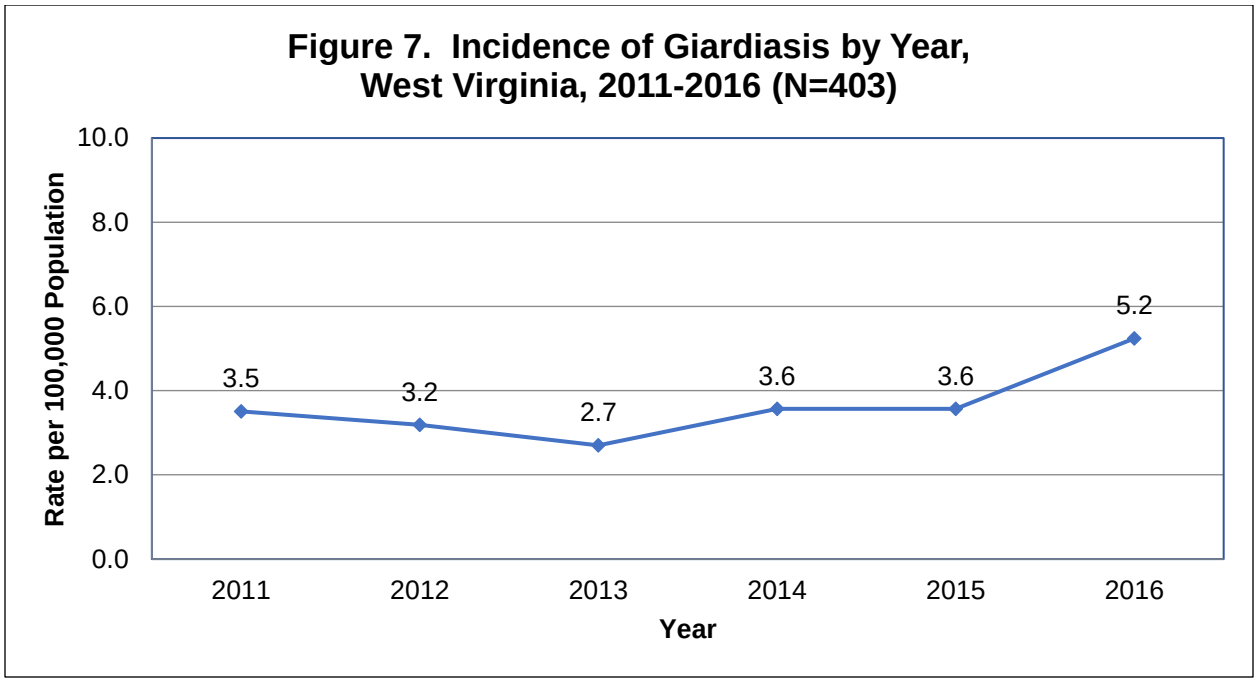


Figure 7. Incidence of Giardiasis by Year,
West Virginia, 2011-2016 (N=403)
Rate per 100,000 Population
10.0
8.0
6.0
4.0
2.0
0.0
3.5
3.2
2.7
3.6
3.6
5.2
2011
2012
2013
2014
2015
2016
Year

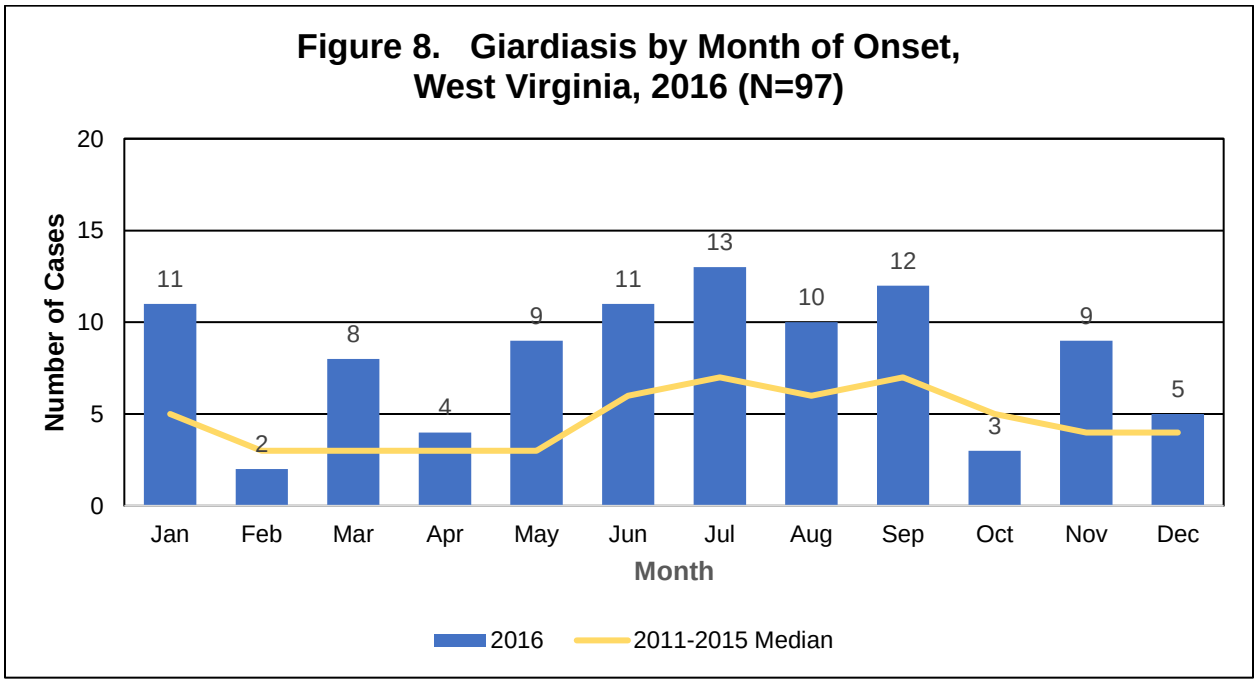


Figure 8. Giardiasis by Month of Onset,
West Virginia, 2016 (N=97)
Number of Cases
20
15
10
5
0
11
2
8
4
9
11
13
10
12
3
9
5
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Month
2016
2011-2015 Median

Figure 9. Age-Specific Incidence of Giardiasis, West Virginia, 2016 (N=97)

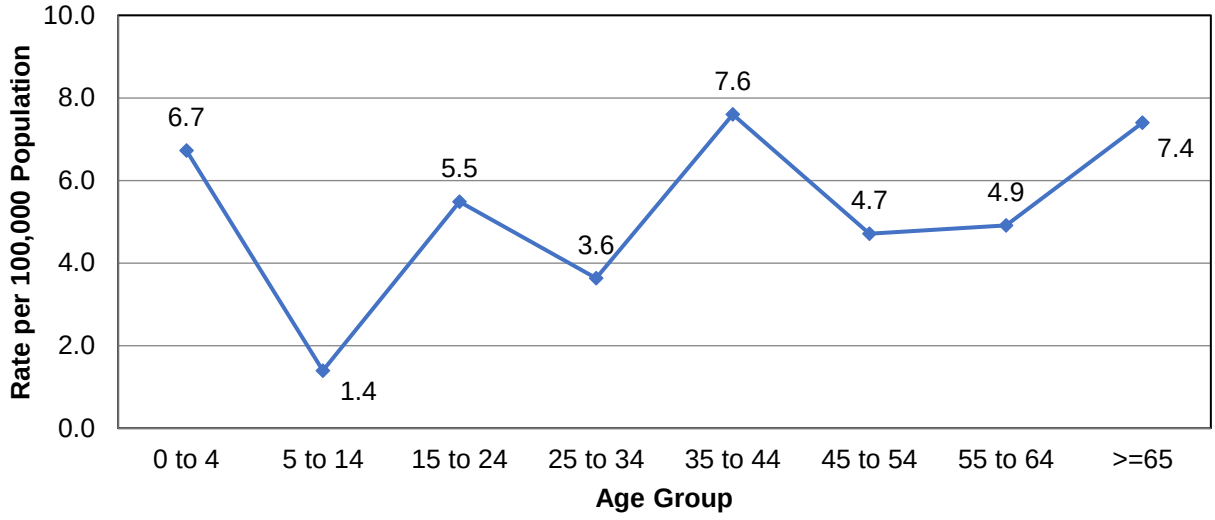


Figure 10. Incidence of Giardiasis by Surveillance Region, West Virginia, 2016 (N=97)

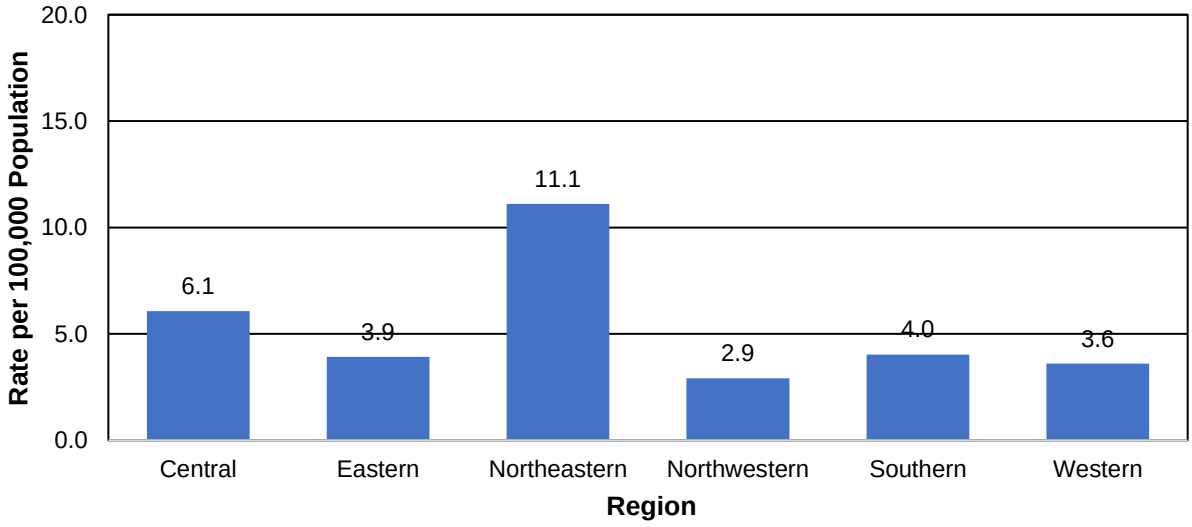


Table 6. Most Common Factors Reported by Giardiasis Cases West Virginia, 2016 (N=97)

Exposure/Risk Factor	Number of Cases*	Percent of Cases
Pet contact	47	48.4
Out-of-state travel	28	28.9
Recreational water use	27	27.8
Consumed untreated water	15	15.5

*Multiple exposures/risk factors could be reported per case. Risk factor information was not obtained for all cases, including cases lost to follow-up.

Salmonellosis

Salmonellosis is caused by bacterium *Salmonella entererica*. The illness is characterized by acute abdominal pain, diarrhea, and often fever, which usually begins 12 to 36 hours 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. 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-threating 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 defines a confirmed case as one identified through culture-dependent laboratory methods, a suspect case is identified by using CIDT methods and a probable case is a clinically compatible case that lacks laboratory testing, but is epidemiologically linked to a confirmed case.

West Virginia had 261 reported cases of salmonellosis in 2016 (Figure 11). There were 236 confirmed cases, three probable cases and 22 suspect cases (Table 5). The 2016 salmonellosis incidence in West Virginia was 14.1 per 100,000 population and is lower than the national incidence of 16.7 per 100,000 population for that year (Figure 12). Cases were reported throughout the year, with yearly peak incidence occurring in June (Figure 13). Incidence of infection was highest among children <1 year of age (74.2 cases per 100,000 population) (Figure 14). The Western region of West Virginia had the highest incidence at 20.0 cases per 100,000 population. The most commonly (47.0%) reported risk factor for West Virginia was “consumed fresh produce” (Table 6).

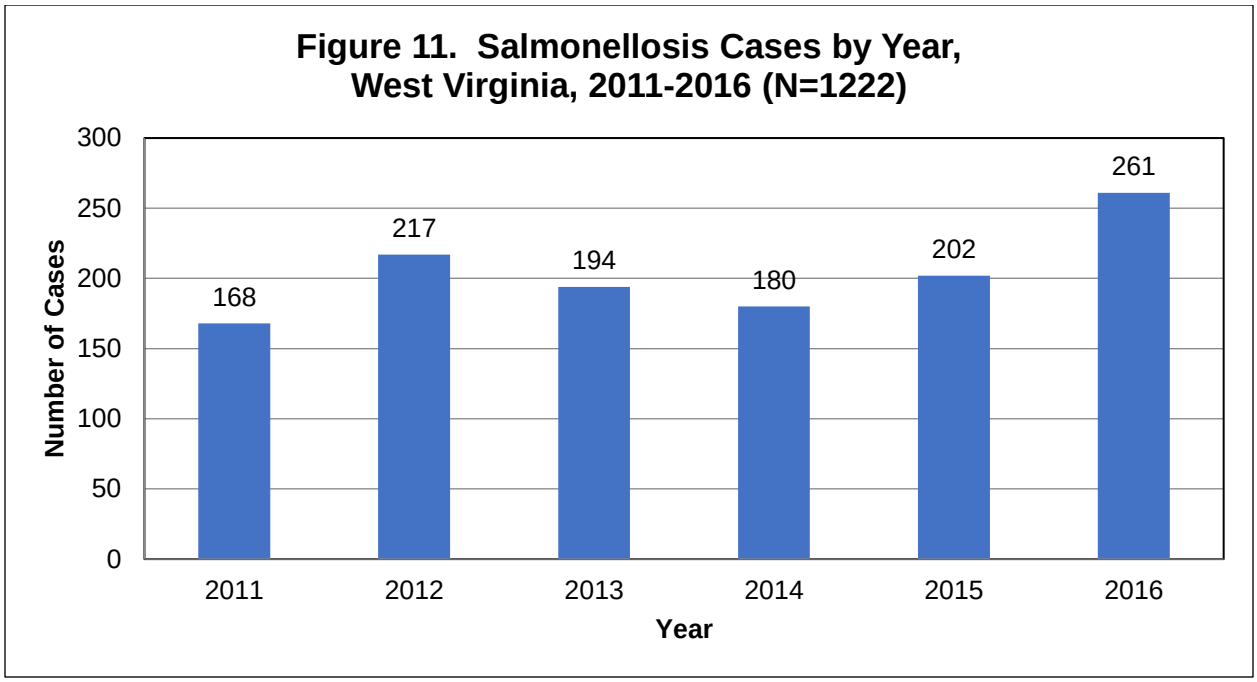


Table 5. Number of Salmonellosis Cases by Year of Report and Case Status, West Virginia, 2011-2016 (N=1222)

Case Status	2011	2012	2013	2014	2015	2016
Confirmed	164	213	188	172	195	236
Probable	4	4	6	8	7	3
Suspect	0	0	0	0	0	22
Total	**168**	**217**	**194**	**180**	**202**	**261**

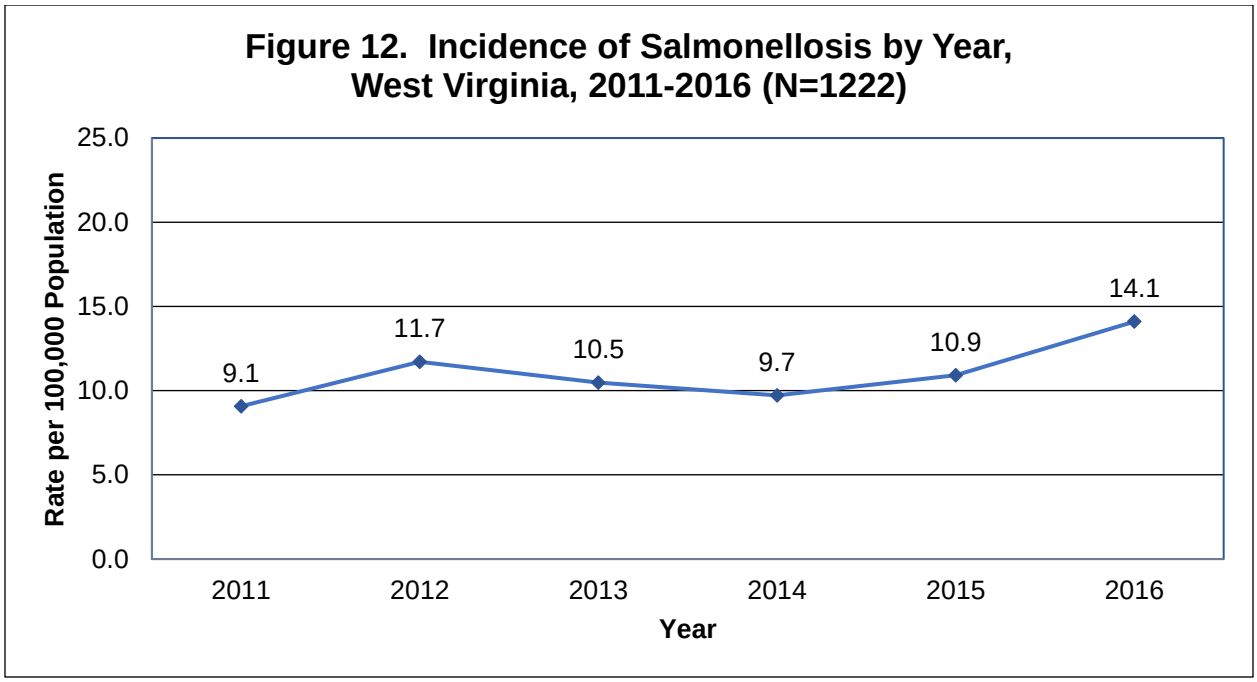


Figure 12. Incidence of Salmonellosis by Year,
West Virginia, 2011-2016 (N=1222)
Rate per 100,000 Population
25.0
20.0
15.0
10.0
5.0
0.0
9.1
11.7
10.5
9.7
10.9
14.1
2011
2012
2013
2014
2015
2016
Year

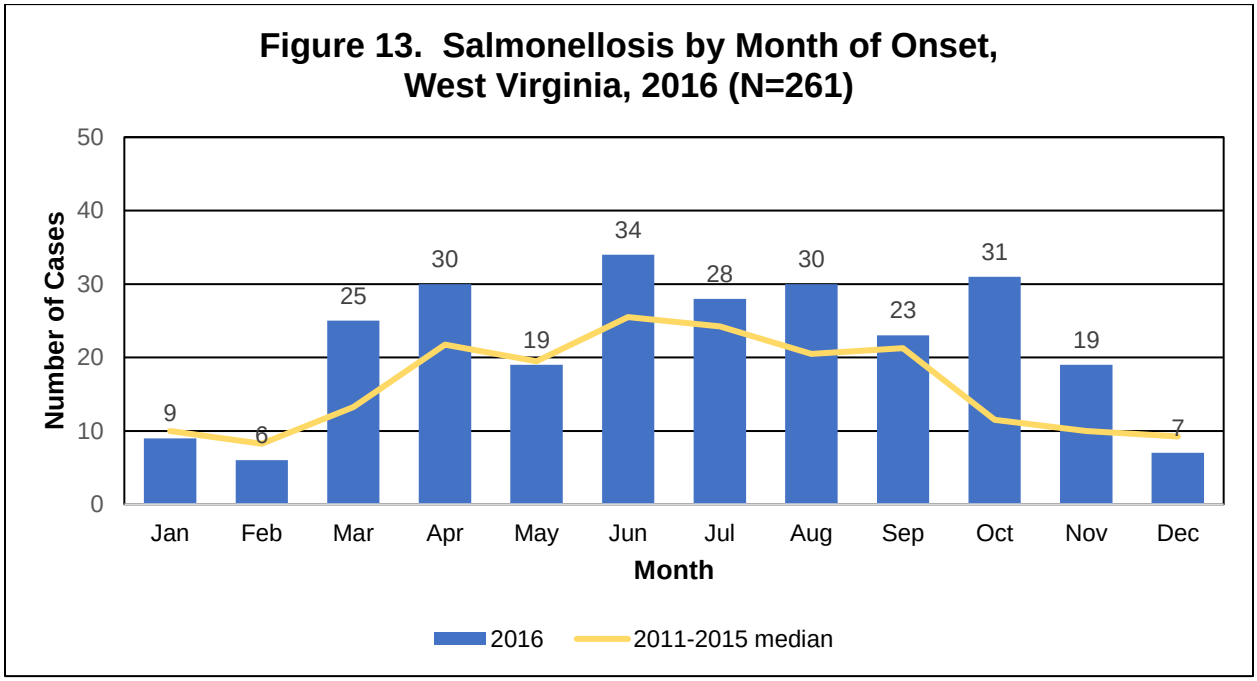


Figure 13. Salmonellosis by Month of Onset,
West Virginia, 2016 (N=261)
Number of Cases
50
40
30
20
10
0
9
6
25
30
19
34
28
30
23
31
19
7
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Month
2016
2011-2015 median

Figure 14. Age-Specific Incidence of Salmonelosis, West Virginia, 2016 (N=261)

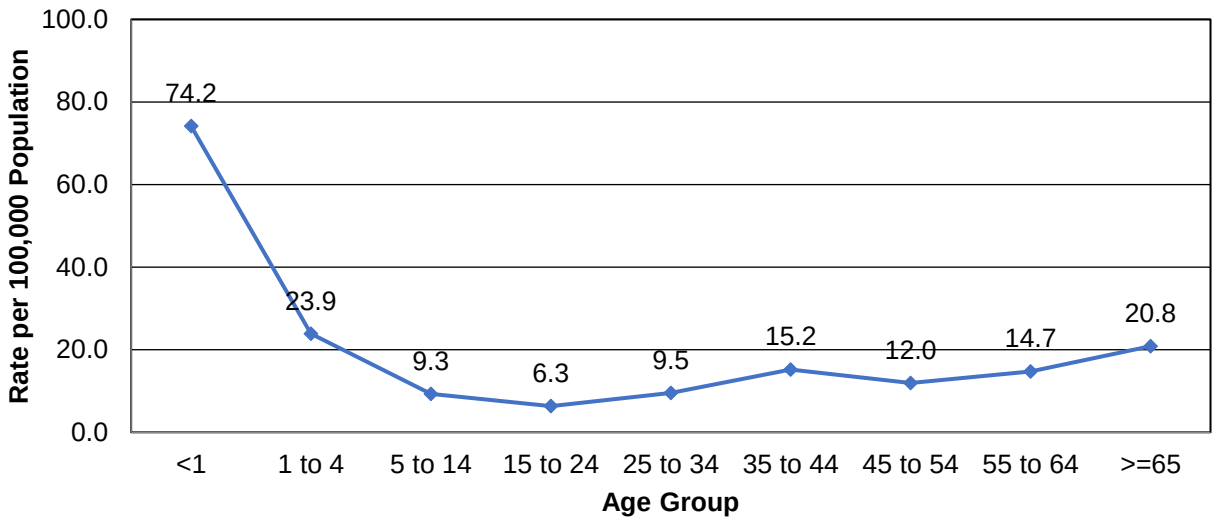


Figure 15. Incidence of Salmonella by Surveillance Region West Virginia, 2016 (N=261)

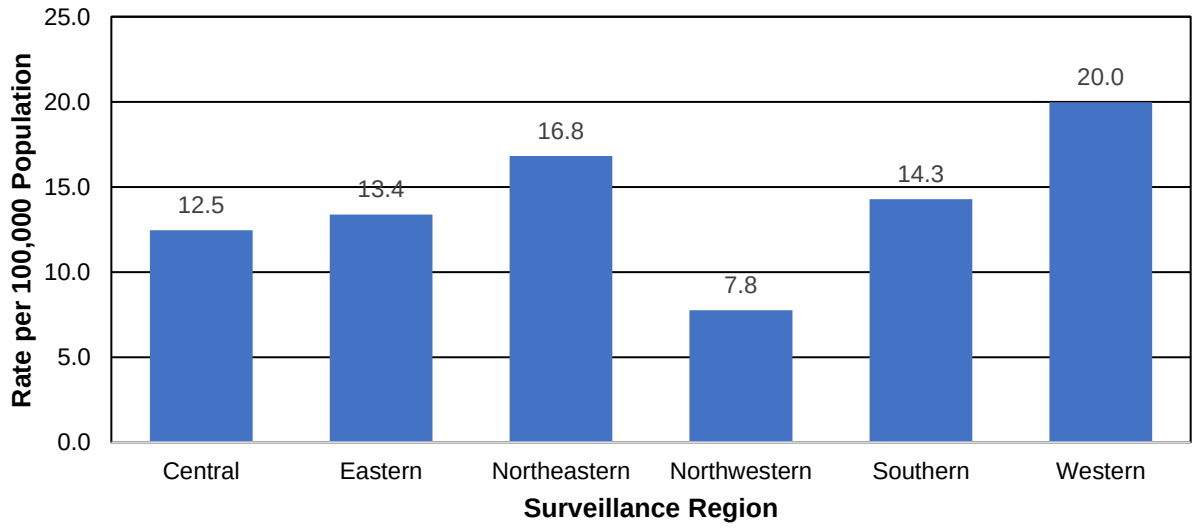


Table 6. Most Common Risk Factors Reported by Salmonellosis Cases, West Virginia, 2016 (N=261) *

Exposure/Risk Factor	Number of Cases	Percent of Cases
Consumed fresh produce	123	47.1
Contact with farm animals	68	26.0
Consumed fresh shelled eggs	40	15.3

*Multiple exposures/risk factors could be reported per case. Risk factor information was not obtained for all cases, including cases lost to follow-up.

Shiga toxin-producing *Escherichia coli* infections including *E. coli* O157

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 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: *Stx*1 and*Stx*2. In general, strains that produce certain types of *Stx*2 are the most virulent.

Confirmed cases are determined by bacterial culture of *E. coli* and detection of Shiga toxin production or *Stx* genes. Probable cases are classified by one of the following criteria: (1) STEC detected by CIDT in a clinical specimen; (2) isolation of O157 without the detection of *Stx*; (3) individuals who are symptomatic but have no laboratory evidence and have an epidemiological link to a confirmed or probable case of STEC. Suspect cases where *Stx* genes are detected by CIDT without detection of STEC or cases having the laboratory criteria of a case but lack clinical symptoms, or individuals having a diagnosis or HUS.

In 2016, there were 79 reported STEC cases in West Virginia: 23 confirmed, and 56 suspect (Figure 21, Table 7). The incidence of STEC cases was 4.3 per 100,000 population and was higher than the national incidence of 2.5 per 100,000 population in 2016 (Figure 22). Children less than five years had the highest incidence (8.3 per 100,000 population) of STEC (Figure 23). More cases were reported in summer and early fall, with peak occurrence in August (Figure 24). The southern region of West Virginia had the highest incidence at 5.6 cases per 100,000 population (Figure 25). The most commonly (44.3%) reported risk factor for STEC in West Virginia was “consumed fresh fruits and vegetables” (Table 8).

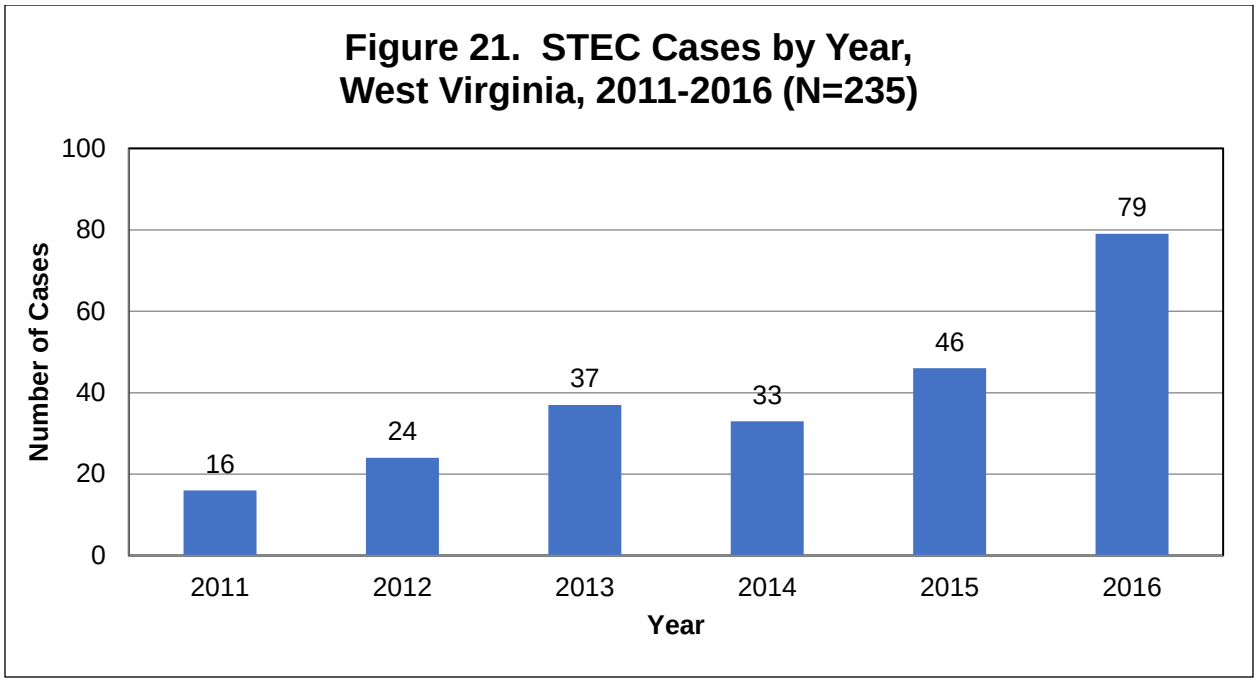


Table 7. Number of STEC Cases by Year of Report and Case Status, West Virginia, 2011-2016 (N=235)

Case Status	2011	2012	2013	2014		2015	2016
Confirmed	8	17	31	19		18	23
Probable	3	1	4	1		5	--
Suspect	5	6	2	13		23	56
Total	**16**	**24**	**37**	**33**		**46**	**79**

*Case definition changed in 2016

Figure 22. Incidence of STEC Cases by Year, West Virginia, 2011-2016 (N=235)

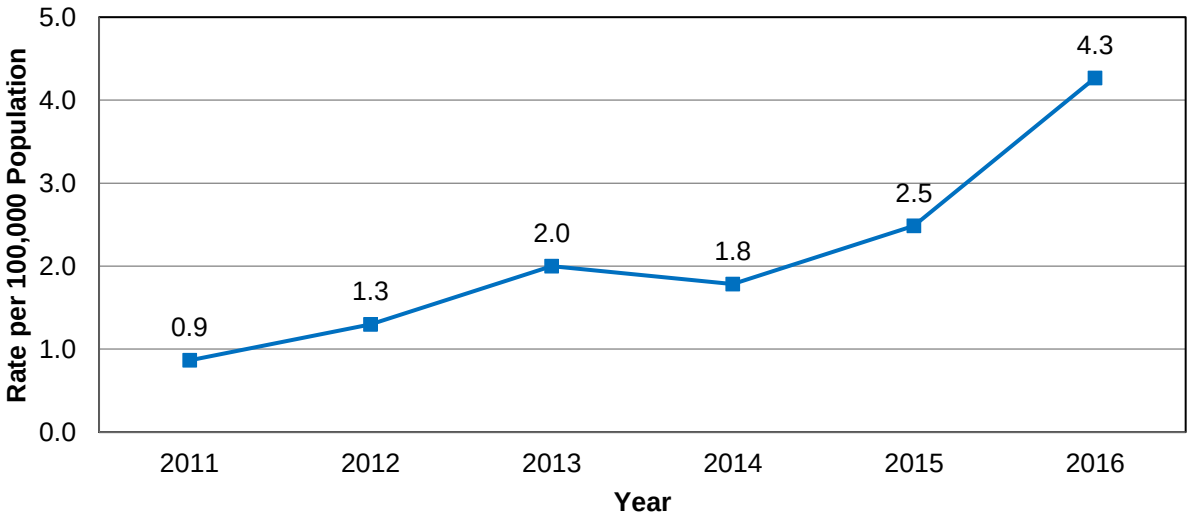


Figure 23. STEC Cases by Month of Onset, West Virginia, 2016 (N=79)

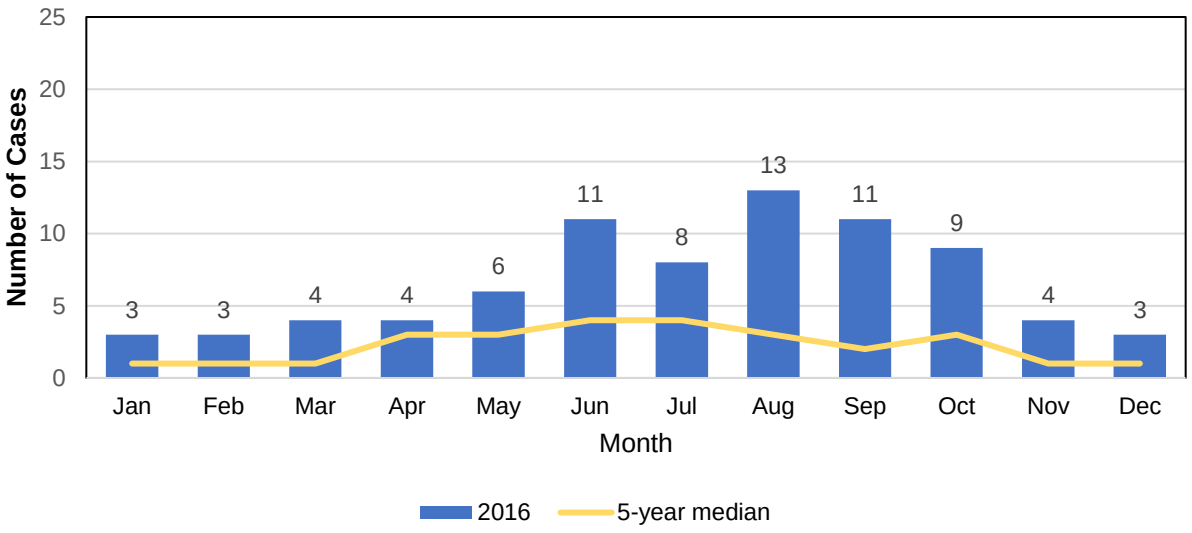


Figure 24. Age-Specific Incidence of STEC Cases, West Virginia, 2016 (N=79)

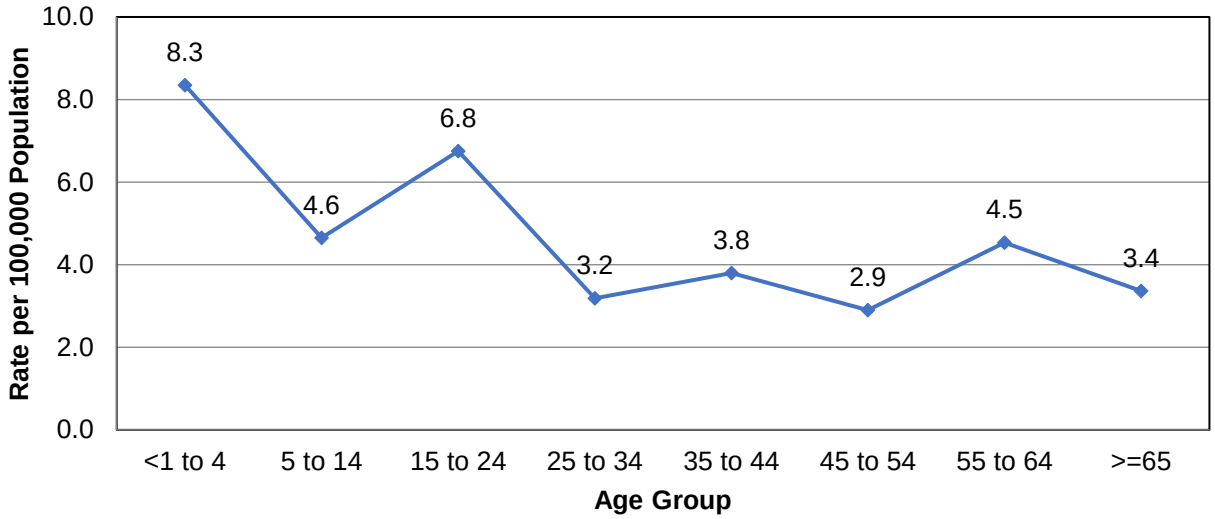


Figure 25. Incidence of STEC by Surveillance Region West Virginia, 2016 (N=79)

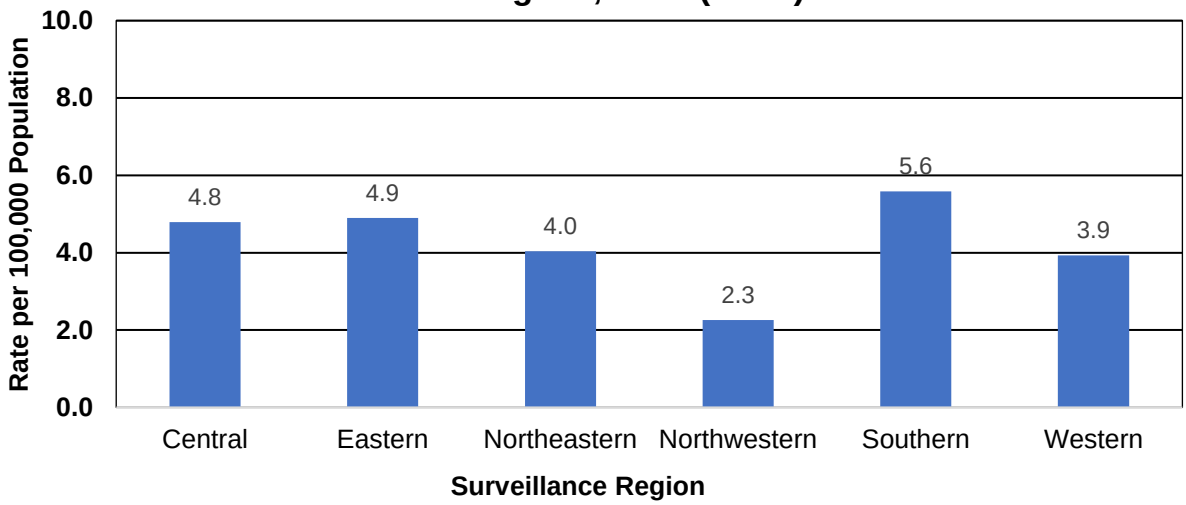


Table 8. Most Common Risk Factors Reported by STEC Cases, West Virginia, 2016 (N=79)

Exposure/Risk Factor	Number of Cases	Percent of Cases
Consumed fresh fruits or vegetables	35	44.3
Animal manure contact	11	13.9
Consumed untreated Water	10	1.0

*Multiple exposures/risk factors could be reported per case. Risk factor information was not obtained for all cases, including cases lost to follow-up.