

Foodborne Diseases Active Surveillance Network

FoodNet

2014 Surveillance Report



National Center for Emerging and Zoonotic Infectious Diseases
Division of Foodborne, Waterborne, and Environmental Diseases



ACKNOWLEDGEMENTS

We would like to thank all of our site and federal partners for their participation in the FoodNet program.

- California Emerging Infections Program
- Colorado Department of Public Health and Environment
- Connecticut Emerging Infections Program
- Georgia Department of Public Health and Emerging Infections Program
- Maryland Department of Health and Mental Hygiene
- Minnesota Department of Health
- New Mexico Emerging Infections Program
- New York State Department of Health
- Oregon Public Health Division
- Tennessee Department of Health
- U.S. Department of Agriculture Food Safety and Inspection Service
- U.S. Food and Drug Administration
- Centers for Disease Control's Emerging Infections Program
- Centers for Disease Control's Division of Foodborne, Waterborne, and Environmental Diseases

The following persons from CDC contributed substantially to compiling this report:

- Kelly Barrett
- Allison Spinelli
- Mary Patrick
- Olga Henao
- Patricia Griffin
- Staci Dixon

Suggested Citation:

CDC. Foodborne Diseases Active Surveillance Network (FoodNet): FoodNet Surveillance Report for 2014 (Final Report). Atlanta, Georgia: U.S. Department of Health and Human Services, CDC. 2014.

FoodNet 2014 Annual Report

This report summarizes FoodNet surveillance data for bacterial and parasitic pathogens for 2014, changes in incidence since 1996-1998, 2006-08, and 2011-13, and other FoodNet activities in 2014.

What is FoodNet?

The Foodborne Diseases Active Surveillance Network (FoodNet) is a collaborative program of the Centers for Disease Control and Prevention (CDC), 10 state health departments, the U.S. Department of Agriculture's Food Safety and Inspection Service (USDA-FSIS), and the Food and Drug Administration (FDA).

FoodNet determines the number of laboratory-confirmed infections caused by selected pathogens transmitted commonly by food, monitors changes in their incidence, collects information about the sources of infection, and disseminates information to provide a foundation for food safety policy and prevention efforts.

Cases of infection and incidence

In 2014, FoodNet identified 19,507 laboratory-confirmed cases of infection, 4,476 hospitalizations, and 75 deaths.

Number of cases of bacterial and parasitic infection, hospitalization, and death, by pathogen—FoodNet, 2014

Pathogen	Cases		Hospitalizations		Deaths	
	n	Incidence*	n	(%)	n	(%)
<i>Campylobacter</i>	6,465	13.29	1,088	(17)	9	(0.1)
<i>Listeria</i>	116	0.24	106	(91)	17	(15)
<i>Salmonella</i>	7,439	15.29	2,144	(29)	32	(0.4)
<i>Shigella</i>	2,774	5.70	575	(21)	4	(0.1)
STEC [†] O157	444	0.91	155	(35)	3	(0.7)
STEC non-O157	697	1.43	106	(15)	2	(0.3)
<i>Vibrio</i>	221	0.45	44	(20)	3	(1)
<i>Yersinia</i>	136	0.28	30	(22)	1	(1)
<i>Cryptosporidium</i>	1,189	2.44	226	(19)	4	(0.3)
<i>Cyclospora</i>	26	0.05	2	(8)	0	(0.0)
Total	19,507		4,476		75	

*Rate per 100,000 people

†Shiga toxin-producing *Escherichia coli*

- The incidence of infection and the number of hospitalizations and deaths was highest for *Salmonella*.
- Percentages of hospitalizations and deaths were highest for *Listeria*.
- Incidences of all infections were highest among children <5 years except for *Listeria*, *Vibrio*, and *Cyclospora*, which were highest among people >65 years.
- Overall, the highest percentages of hospitalizations and deaths were among people ≥65 years.

Changes in incidence

Percentage change and in incidence of bacterial and parasitic infections in 2014 compared with average annual incidence for 1996–1998*, 2006–2008 and 2011–2013 by pathogen—FoodNet, 2014

Pathogen	Percentage change in 2014 compared with		
	1996-1998 [*]	2006-2008 [*]	2011-2013 [*]
<i>Campylobacter</i>	24%↓	11%↑	1%↓
<i>Listeria</i>	45%↓	12%↓	11%↓
<i>Salmonella</i>	5%↓	1%↑	0%
<i>Shigella</i>	46%↓	12%↓	19%↑
STEC [†] O157	47%↓	33%↓	19%↓
STEC non-O157	- [‡]	-	22%↑
<i>Vibrio</i>	141%↑	54%↑	7%↑
<i>Yersinia</i>	60%↓	21%↓	19%↓
<i>Cryptosporidium</i>	8%↑	13%↑	3%↓
<i>Cyclospora</i>	-	-	-
2014 Overall[§]	29%↓	3%↓	8%↓

*Percentage change reported as increase (↑) or as decrease (↓) and shading denotes statistical significance n at $p < 0.05$ level.

[†]Shiga toxin-producing *Escherichia coli*.

[‡]Changes over time not evaluated.

[§]The measure of overall change in incidence combines data for *Campylobacter*, *Listeria*, *Salmonella*, STEC O157, *Vibrio*, and *Yersinia*, the six key bacterial pathogens for which >50% of illnesses are estimated to be transmitted by food.

The model weights by incidence of infection for each pathogen.

Compared with 2011–2013, the 2014 incidence was significantly:

- Lower for STEC O157
- Higher for STEC Non-O157

Compared with 2006–2008, the 2014 incidence was significantly:

- Lower for STEC O157
- Higher for *Campylobacter* and *Vibrio*

Other FoodNet activities

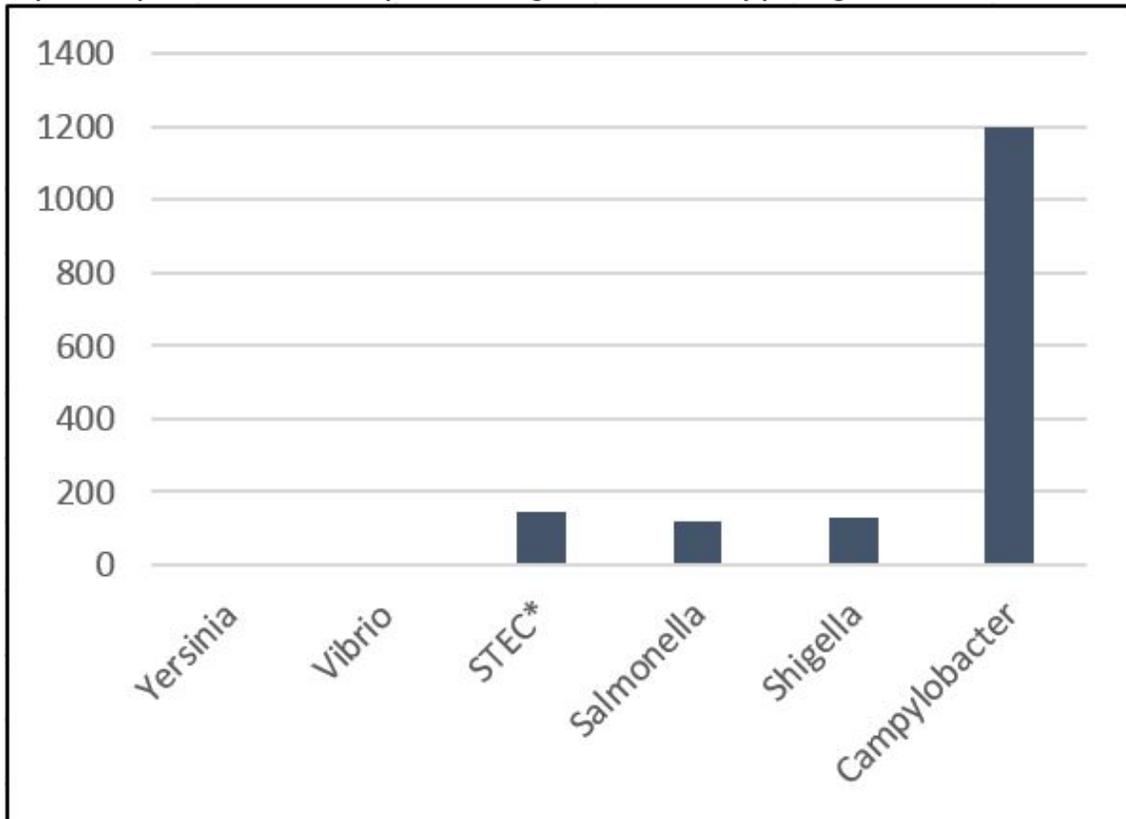
Surveillance for reports of positive culture-independent diagnostic tests (CIDTs)

In 2014, FoodNet collected 1,593 reports of positive CIDTs that were not confirmed by culture.

Clinical laboratories increasingly use CIDTs to diagnose bacterial enteric infections, a trend that will challenge the ability of surveillance systems to identify cases, characterize pathogens, monitor trends, and detect outbreaks.

FoodNet began routine, ongoing surveillance of all reports of positive CIDTs without culture confirmation (either because a culture did not yield a pathogen or because the specimen was not cultured) for STEC in 2008, *Campylobacter* in 2009, and all other FoodNet pathogens in 2011.

Reports of positive culture independent diagnostic tests**, by pathogen—FoodNet, 2014



* Shiga toxin-producing *Escherichia coli*

**Positive CIDT reports are defined as the detection of the enteric pathogen, or for STEC, Shiga toxin or the genes that encode a Shiga toxin, in a stool specimen or enrichment broth using a culture-independent diagnostic test. Any positive CIDT report that was confirmed by culture is counted only among the confirmed infections. For STEC, only positive CIDT reports that were confirmed at the state public health laboratory.

Special studies

In 2014, FoodNet completed data collection for a study of risk factors for infection with STEC serogroups other than O157. Since 1996, FoodNet has conducted more than 20 research studies to expand knowledge about risk factors for, and clinical characteristics of, intestinal pathogens.

Publications

In 2014, CDC summarized and used FoodNet data to:

- Publish seven peer-reviewed journal articles and present two abstracts at scientific conferences,
- Monitor progress toward CDC's Healthy People 2020 national health objectives,
- Describe the preliminary 2014 data in the *Morbidity and Mortality Weekly Report*, and
- Provide incidence data for a Health and Human Services high priority goal to decrease *Salmonella* serotype Enteritidis infections.

See all Foodnet publications at <http://www.cdc.gov/foodnet/publications>

Most foodborne illnesses can be prevented.

Since FoodNet began in 1996, some progress has been made in decreasing food contamination and reducing illness caused by foodborne pathogens. More work is needed. Surveillance data provides information for food safety policy and prevention efforts.

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CAMPYLOBACTER

Campylobacter causes an estimated 1.3 million illnesses and 120 deaths in the United States every year. Most of these infections are not laboratory-confirmed.

<http://www.cdc.gov/foodsafety/diseases/campylobacter/index.html>

Cases of infection reported to FoodNet*: 6,465

Hospitalizations: 1,088

Deaths: 9

Incidence rate: 13.3 per 100,000 people

Groups with highest incidence

- Age: <5 years
- Sex: male
- Race: white
- Ethnicity: Hispanic

Isolates with species information: 2,825 (44%)

- *C. jejuni*: 2,484 (88%)
- *C. coli*: 259 (9%)
- *C. upsaliensis*: 47 (2%)
- All other: 35 (1%)

Significant changes in incidence rate

- 11% higher than in 2006–2008
- 24% lower than in 1996–1998

International travel

- Cases with infection likely acquired abroad: 16% (767 of 4,964 cases with travel information)

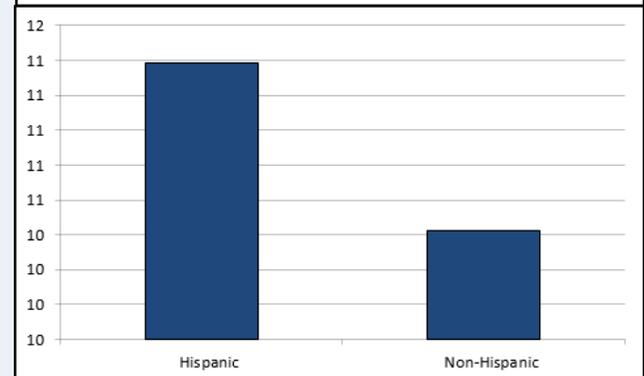
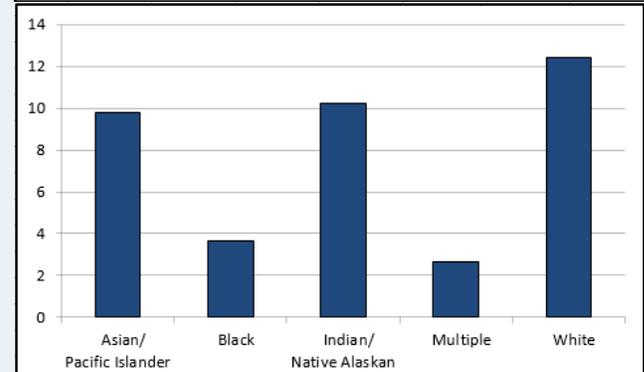
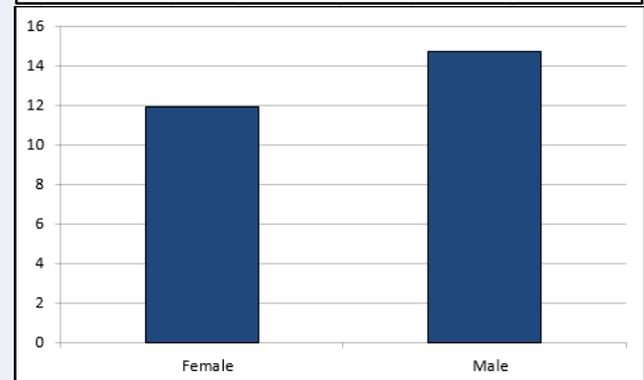
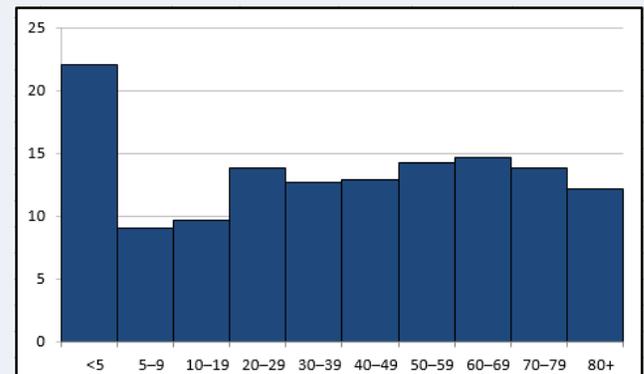
Outbreaks

- Cases associated with an outbreak: <1%

Seasonality

- Month with most cases: July

Incidence* of *Campylobacter* infections by age, sex, race, and ethnicity—FoodNet, 2014



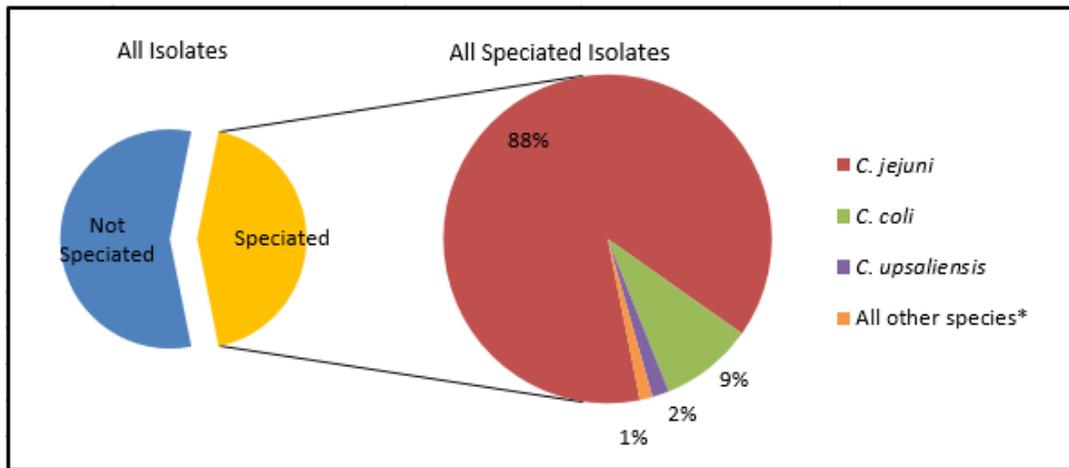
*per 100,000 people

*FoodNet determined the number of laboratory-confirmed infections caused by selected pathogens transmitted commonly by food. FoodNet collected data from 15% of the US population. For more information: www.cdc.gov/foodnet/surveillance.html.

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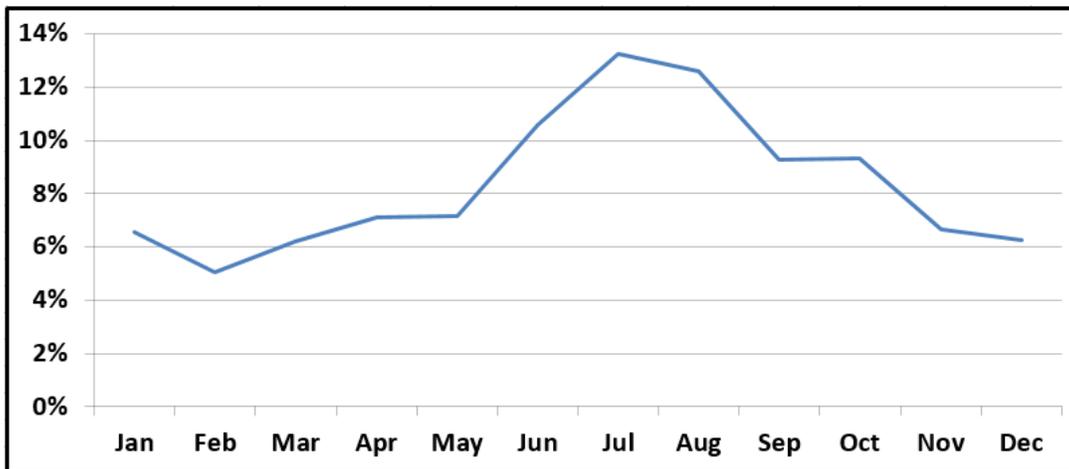
CAMPYLOBACTER

Percentage of *Campylobacter* infections by species—FoodNet, 2014

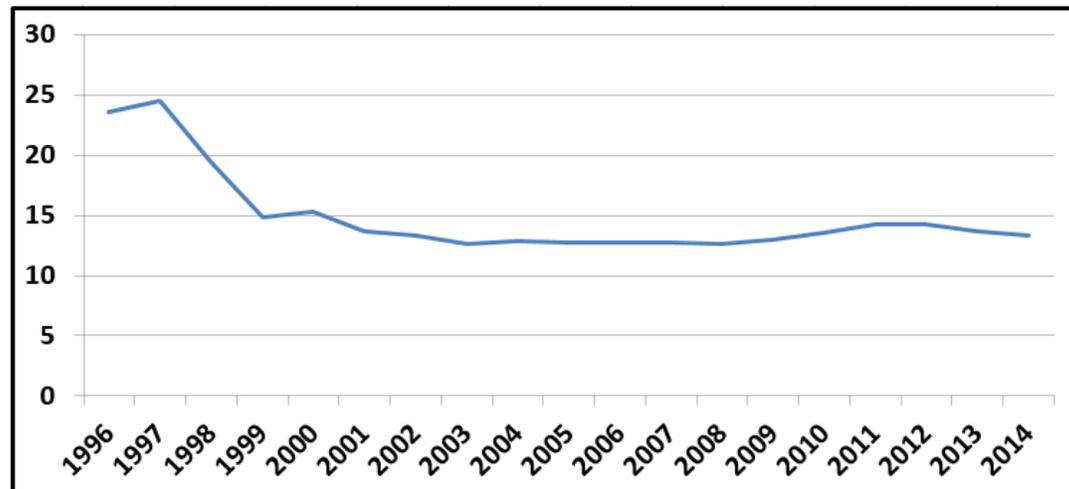


* *C. lari*, *C. fetus*, *C. helveticus*, *C. gracilis*, *C. hyointestinalis*, *C. muscosalis*, and *C. showae*

Percentage of *Campylobacter* infections by month—FoodNet, 2014



Incidence* of *Campylobacter* infections—FoodNet, 1996 through 2014



*per 100,000 people

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LISTERIA

Listeria monocytogenes causes an estimated 1,600 illnesses and 260 deaths in the United States every year. Some of these infections are not laboratory-confirmed.

www.cdc.gov/listeria

Cases of infection reported to FoodNet*: 116

Hospitalizations: 106

Deaths: 17

Incidence rate: 0.24 per 100,000 people

Pregnancy-associated cases (women and infants): 21

Fetal outcome: 2 abortions or stillbirths

Cases aged ≥ 65 years: 61

Groups with highest incidence

- Age: 80+ years
- Sex: similar in female and male
- Race: Indian/Native American
- Ethnicity: Hispanic

Significant changes in incidence rate

- 45% lower than in 1996–1998

International travel

- Cases with infection likely acquired abroad: <1% (1 of 110 cases with travel information)

Outbreaks

- Cases associated with an outbreak: 4.3%

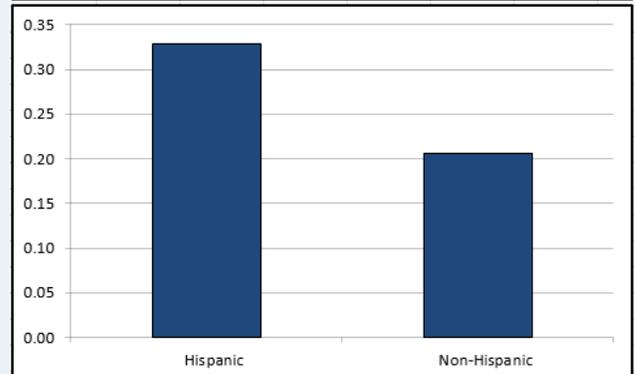
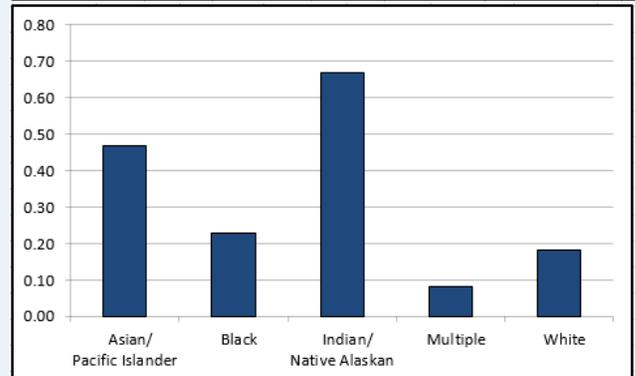
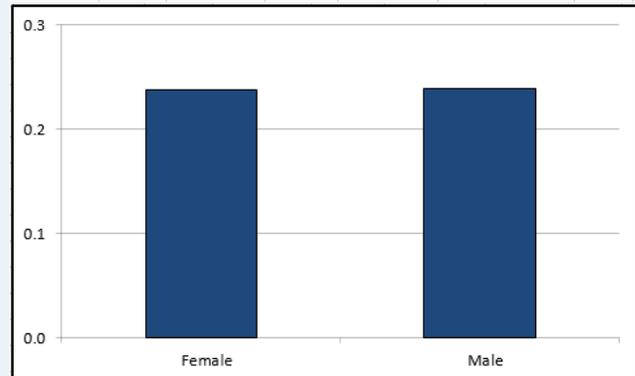
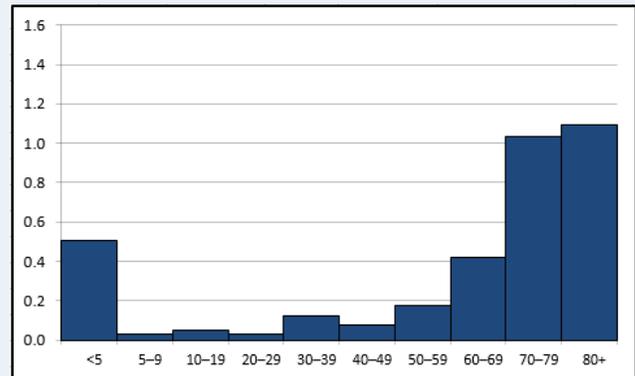
Seasonality

- Month with most cases: July

*FoodNet determined the number of laboratory-confirmed infections caused by selected pathogens transmitted commonly by food. FoodNet collected data from 15% of the US population. For more information:

www.cdc.gov/foodnet/surveillance.html.

Incidence* of *Listeria* infections by age, sex, race, and ethnicity—FoodNet, 2014

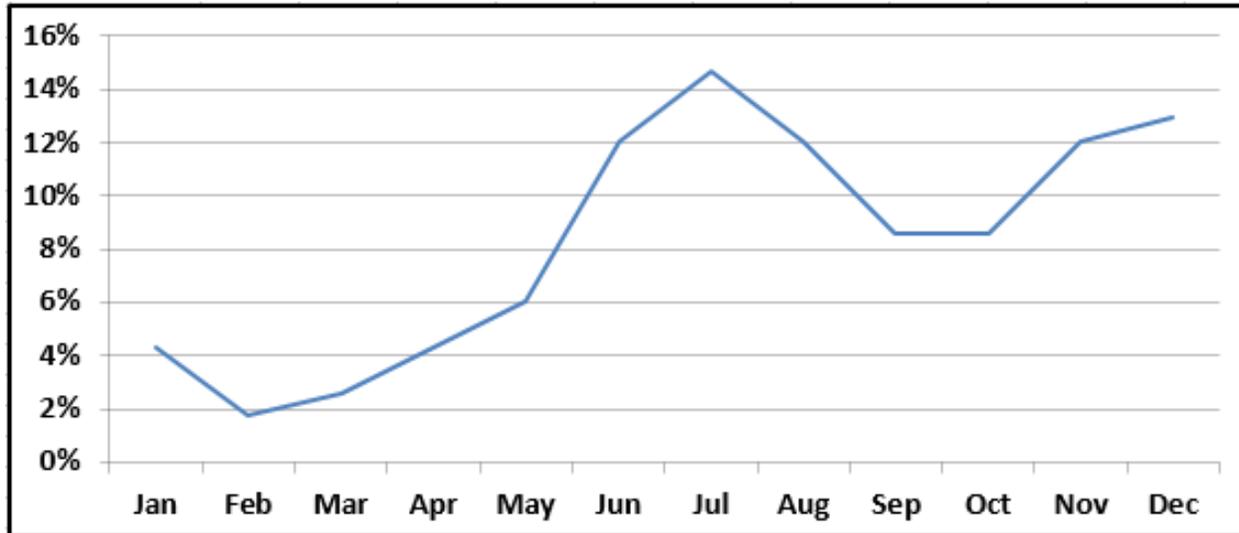


*per 100,000 people

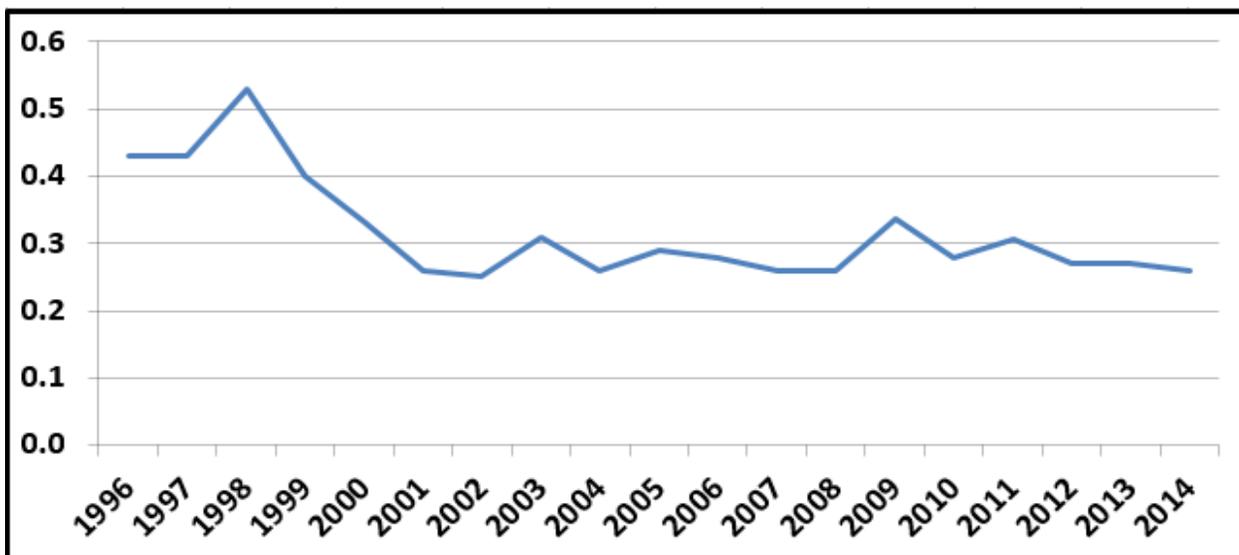
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LISTERIA

Percentage of *Listeria* infections by month—FoodNet, 2014



Incidence* of *Listeria* infections—FoodNet, 1996 through 2014



*per 100,000 people

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SALMONELLA

Salmonella causes an estimated 1.2 illnesses and 450 deaths in the United States every year.

Most of these infections are not laboratory-confirmed.

Over 2,000 *Salmonella* serotypes cause human disease.

www.cdc.gov/salmonella

Cases of infection reported to FoodNet*: 7,439

Hospitalizations: 2,144

Deaths: 32

Incidence rate: 15.3 per 100,000 people

Groups with highest incidence

- Age: <5 years
- Sex: female
- Race: Asian/Pacific Islander
- Ethnicity: similar in Hispanic and non-Hispanic

Isolates with serotype information: 6,805 (91%)

- Enteritidis: 1,426 (19%)
- Typhimurium: 836 (11%)
- Newport: 768 (10%)
- Javiana: 685 (9%)
- I 4,[5],12,i-: 392 (5%)
- Heidelberg: 194 (3%)
- All other: 2,504 (34%)

International travel

- Cases with infection likely acquired abroad: 9% (525 of 5,734 cases with travel information)

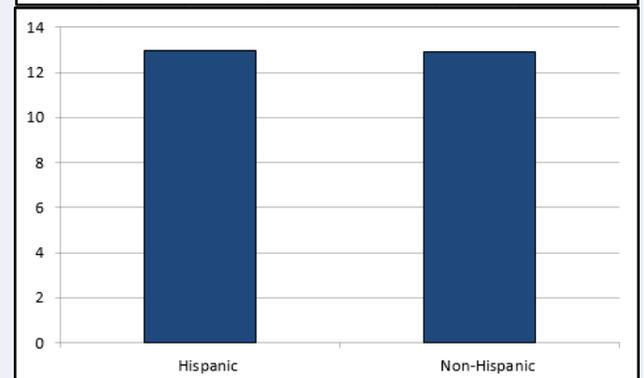
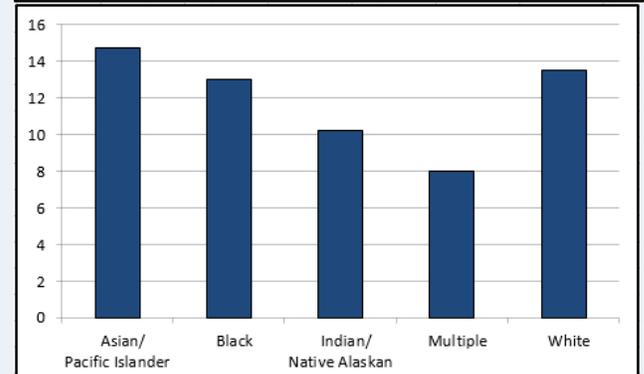
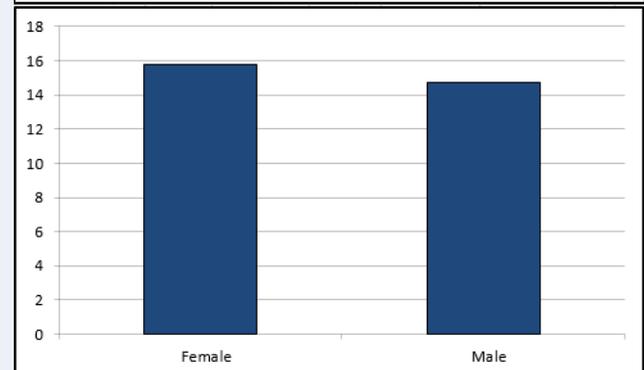
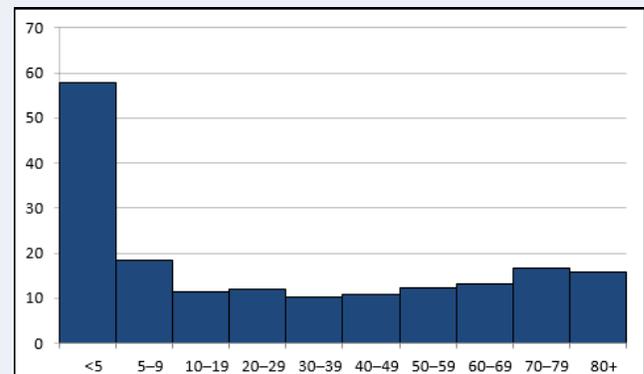
Outbreaks

- Cases associated with an outbreak: 6%

Seasonality

- Month with most cases: August

Incidence* of *Salmonella* infections by age, sex, race, and ethnicity—FoodNet, 2014



*per 100,000 people

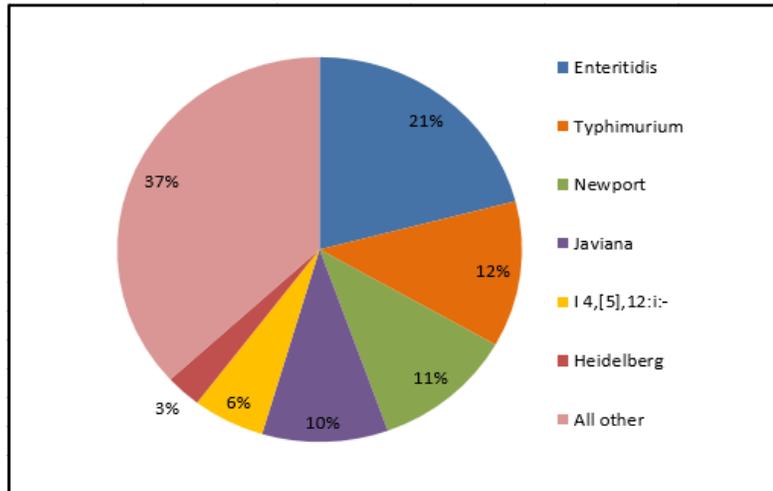
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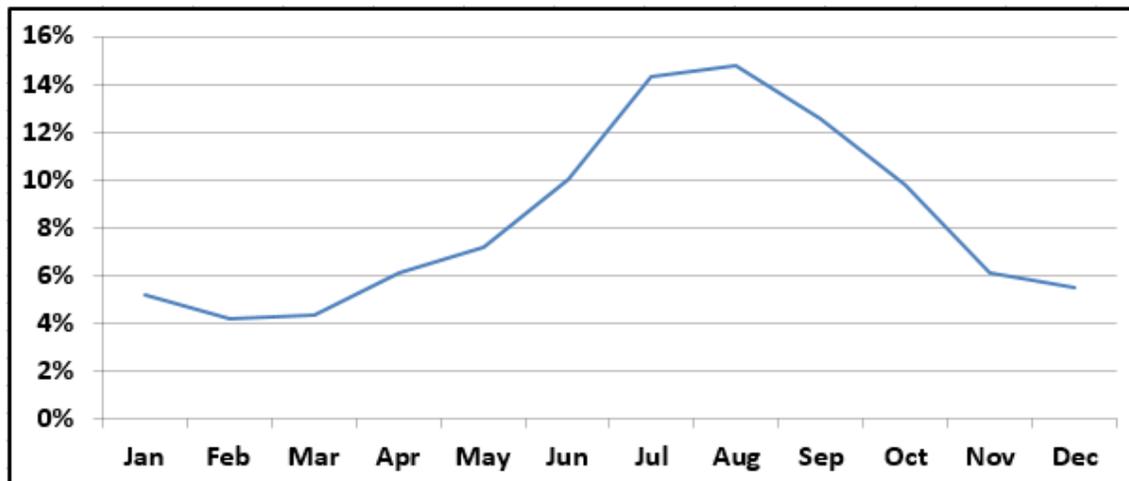
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SALMONELLA

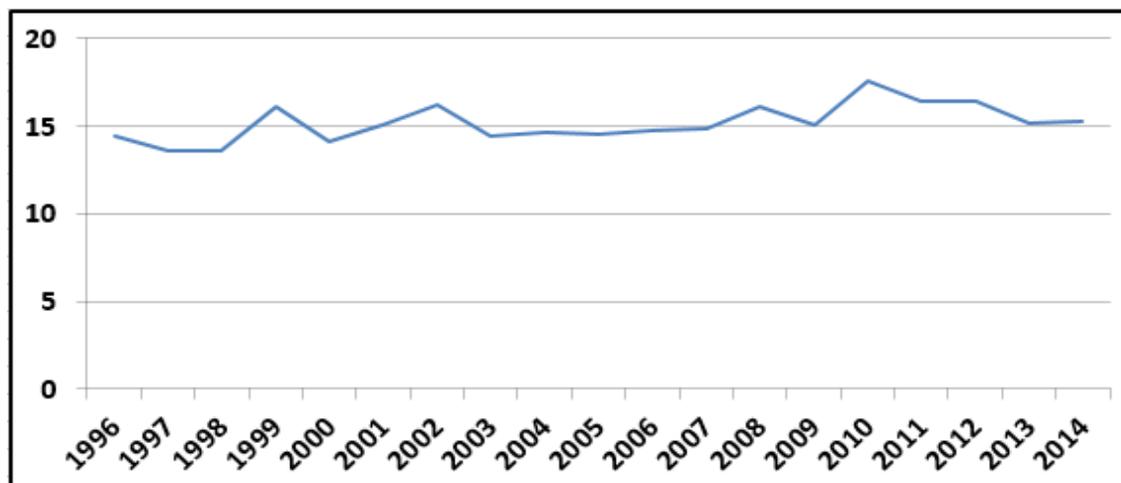
Percentage of serotyped *Salmonella* infections by serotype—FoodNet, 2014



Percentage of *Salmonella* infections by month—FoodNet, 2014



Incidence* of *Salmonella* infections—FoodNet, 1996 through 2014



*per 100,000 people

SHIGA TOXIN-PRODUCING *ESCHERICHIA COLI* (STEC)

STEC causes an estimated 265,000 total infections in the United States each year. Most of these infections are not laboratory-confirmed. About 8% of people who are diagnosed with STEC O157 infection develop hemolytic uremic syndrome.

www.cdc.gov/ecoli

STEC O157

Cases of infection reported to FoodNet*: 444

Hospitalizations: 155

Deaths: 3

Incidence rate: 0.91 per 100,000 people

Groups with highest incidence

- Age: <5 years
- Sex: female
- Race: white
- Ethnicity: non-Hispanic

Significant changes in incidence rate

- 47% lower than in 1996–1998
- 33% lower than in 2006–2008
- 19% lower than in 2011–2013

International travel

- Cases with infection likely acquired abroad: 5% (21 of 422 of cases with travel information)

Outbreaks

- Cases associated with an outbreak: 16%

Seasonality

- Month with most cases: July

STEC non-O157

Cases of infection reported to FoodNet*: 697

Hospitalizations: 106

Deaths: 2

Incidence rate: 1.43 per 100,000 people

Groups with highest incidence

- Age: <5 years
- Sex: female
- Race: white
- Ethnicity: Hispanic

Significant changes in incidence rate

- 22% higher than in 2011–2013

International travel

- Cases with infection likely acquired abroad: 15% (95 of 634 cases with travel information)

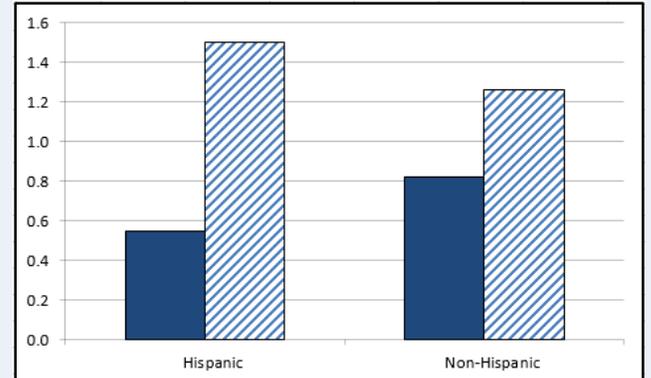
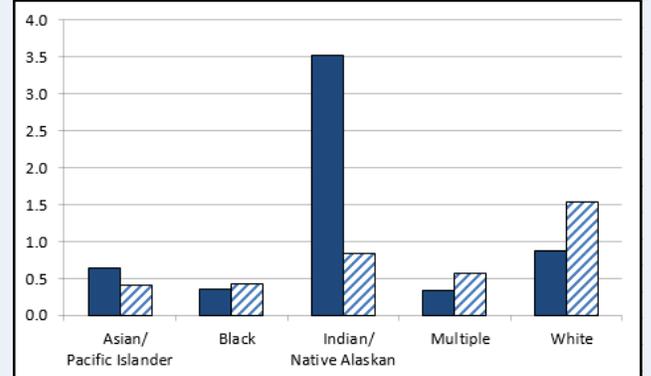
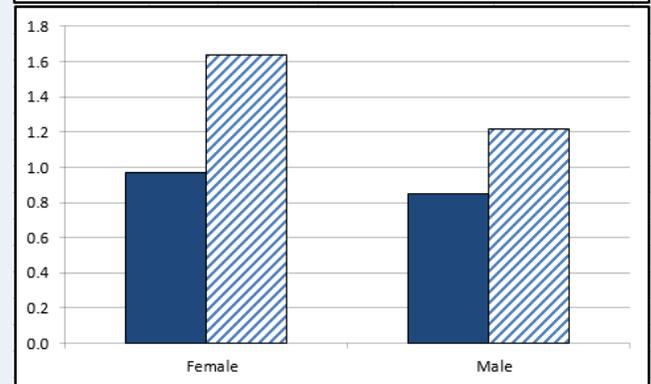
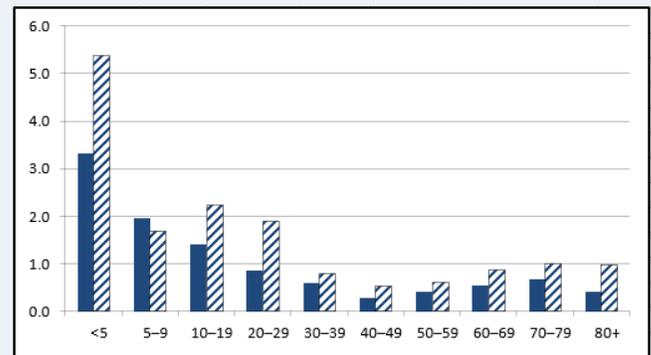
Outbreaks

- Cases associated with an outbreak: 6%

Seasonality

- Month with most cases: July

Incidence* of STEC O157 (solid) and non-O157 (patterned) infections by age, sex, race, and ethnicity—FoodNet, 2014



*per 100,000 people

*FoodNet determined the number of laboratory-confirmed infections caused by selected pathogens transmitted commonly by food. FoodNet collected data from 15% of the US population. For more information: www.cdc.gov/foodnet/surveillance.html.

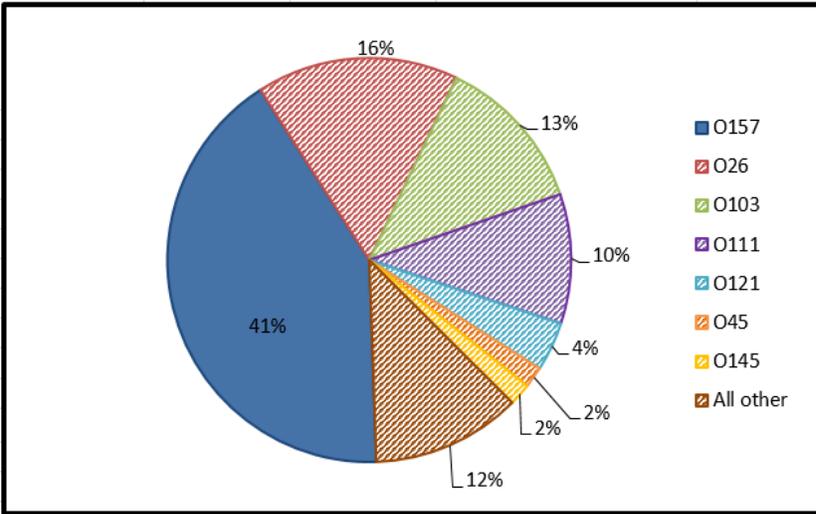
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SHIGA TOXIN-PRODUCING *ESCHERICHIA COLI* (STEC)

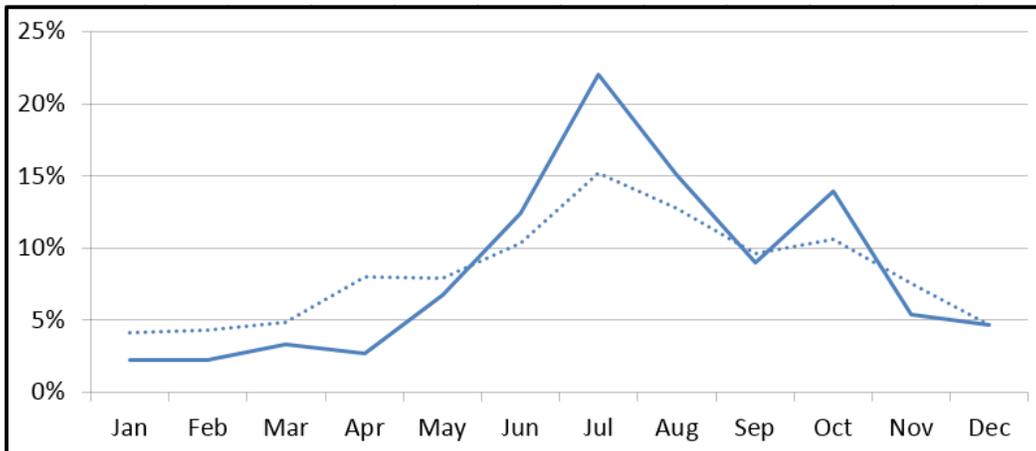
Isolates with O Antigen information:
1,070 (88%)

- O157: 444 (41%)
- O26: 173 (16%)
- O103: 135 (13%)
- O111: 111 (10%)
- O121: 42 (4%)
- O45: 18 (2%)
- O145: 19 (2%)
- All other: 128 (12%)

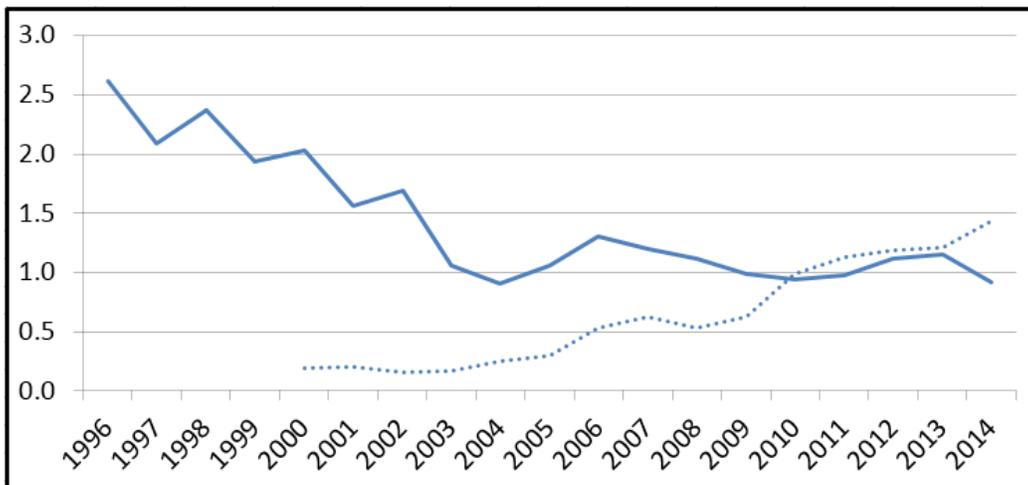
Percentage of STEC Infections by O Antigen—FoodNet, 2014



Percentage of STEC O157 (solid) and non-O157 (dotted) infections by month—FoodNet, 2014



Incidence* of STEC O157 (solid) and non-O157† (dotted) infections—FoodNet, 1996 through 2014



*per 100,000 people; †Non-O157 data not collected until 2000

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SHIGELLA

Shigella causes an estimated 500,000 illnesses and 40 deaths in the United States every year.

Most of these infections are not laboratory-confirmed.

www.cdc.gov/shigella

Cases of infection reported to FoodNet*: 2,774

Hospitalizations: 575

Deaths: 4

Incidence rate: 5.7 per 100,000 people

Groups with highest incidence

- Age: <5 years
- Sex: male
- Race: black
- Ethnicity: Hispanic

Isolates with species information: 2,603 (94%)

- *S. sonnei*: 2,215 (85%)
- *S. flexneri*: 374 (14%)
- *S. boydii*: 11 (<1%)
- *S. dysenteriae*: 3 (<1%)

Significant changes in incidence rate

- 46% lower than in 1996–1998

International travel

- Cases with infection likely acquired abroad: 7% (150 of 2,051 cases with travel information)

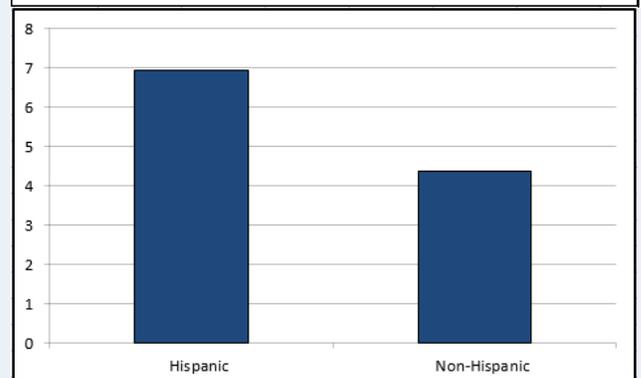
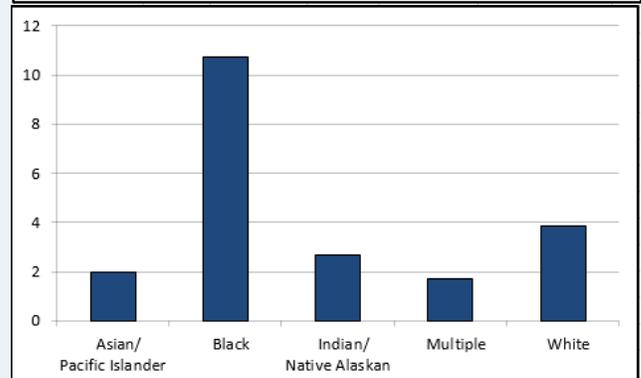
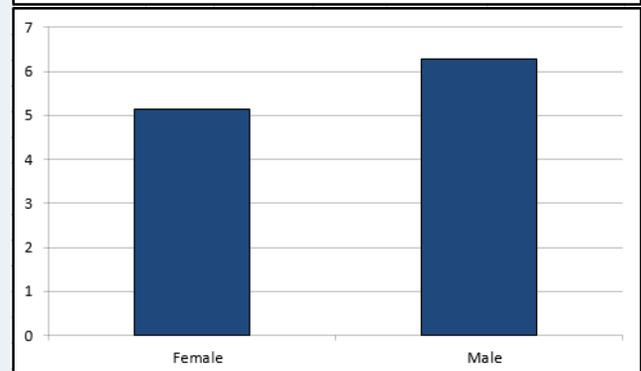
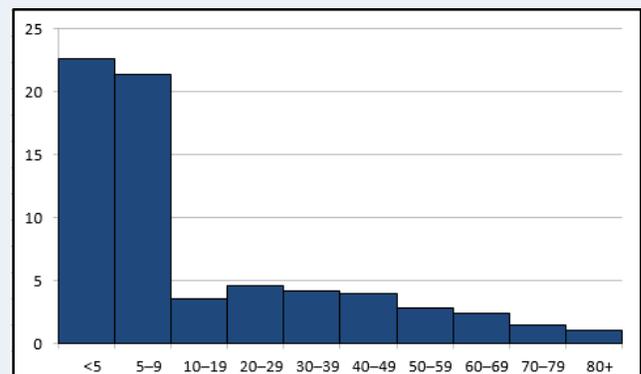
Outbreaks

- Cases associated with an outbreak: 7%

Seasonality

- Month with most cases: December

Incidence* of *Shigella* infections by age, sex, race, and ethnicity—FoodNet, 2014



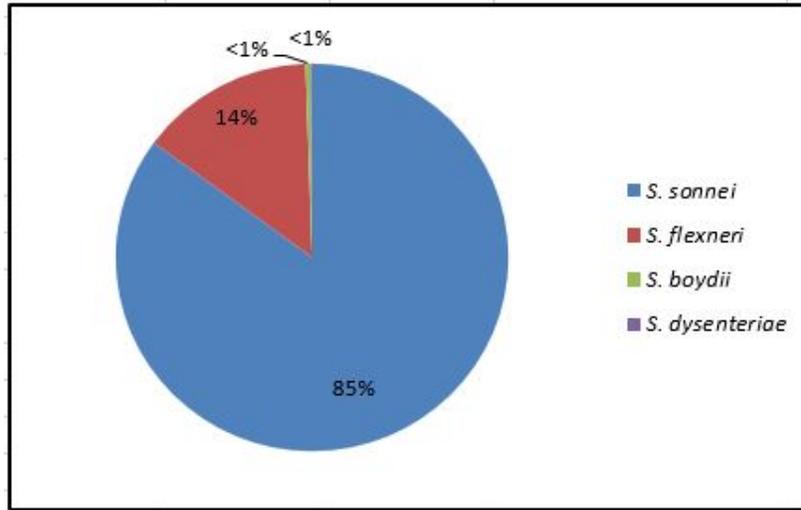
*per 100,000 people

*FoodNet determined the number of laboratory-confirmed infections caused by selected pathogens transmitted commonly by food. FoodNet collected data from 15% of the US population. For more information: www.cdc.gov/foodnet/surveillance.html.

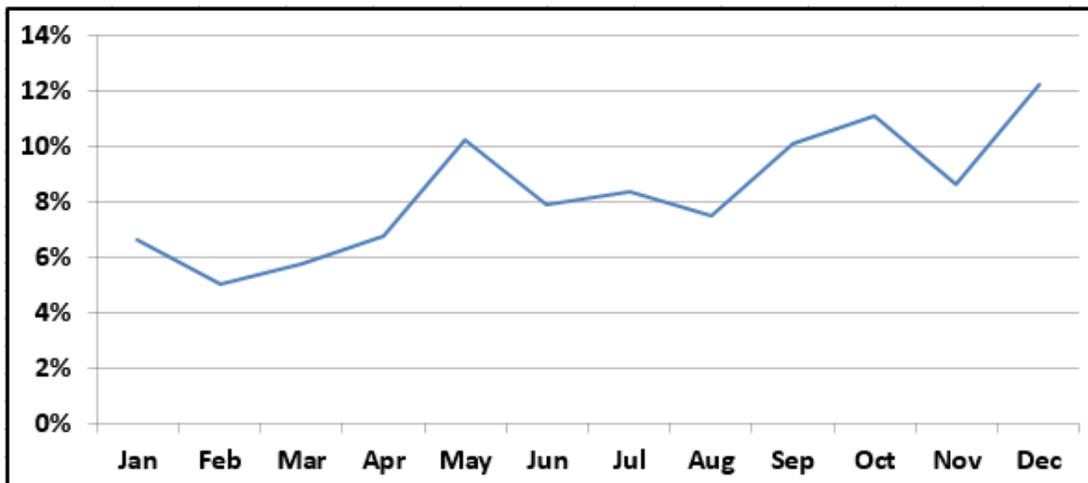
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SHIGELLA

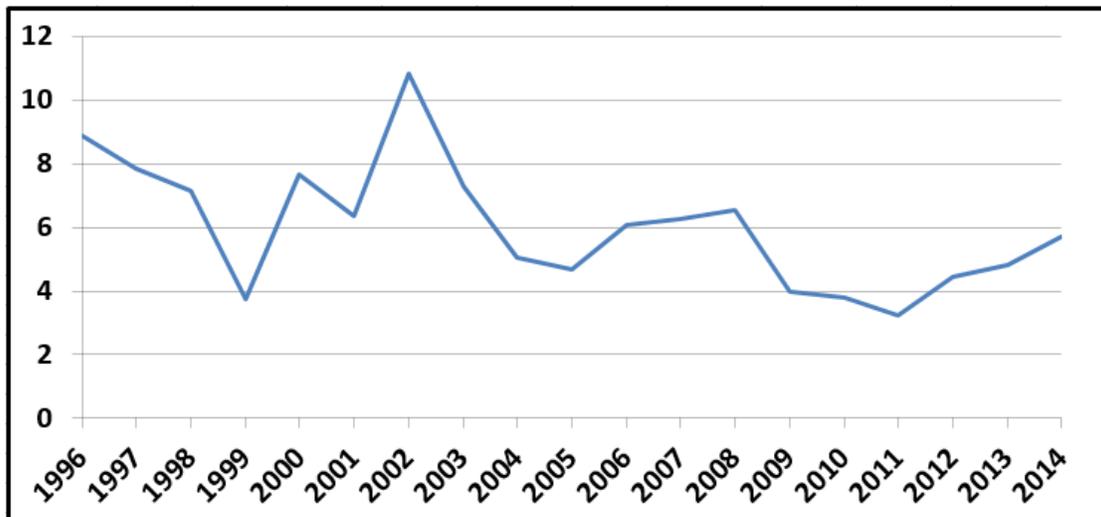
Percentage of speciated *Shigella* infection by species—FoodNet, 2014



Percentage of *Shigella* infections by month—FoodNet, 2014



Incidence* of *Shigella* infections—FoodNet, 1996 through 2014



*per 100,000 people

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VIBRIO

Vibrio causes an estimated 80,000 illnesses and 100 deaths in the United States every year. Most of these infections are not laboratory-confirmed.

www.cdc.gov/vibrio

Cases of infection reported to FoodNet*: 221

Hospitalizations: 44

Deaths: 3

Incidence rate: 0.45 per 100,000 people

Groups with highest incidence

- Age: 40 years and older
- Sex: male
- Race: white
- Ethnicity: non-Hispanic

Isolates with species information: 210 (95%)

- *V. parahaemolyticus*: 131 (62%)
- *V. alginolyticus*: 28 (13%)
- *V. vulnificus*: 20 (10%)
- *V. fluvialis*: 10 (5%)
- *V. cholerae* non-O1, non-O139: 7 (3%)
- All other: 14 (7%)

Significant changes in incidence rate

- 54% higher than in 2006–2008
- 141% higher than in 1996–1998

International travel

- Cases with infection likely acquired abroad: 9% (18 of 201 cases with travel information)

Outbreaks

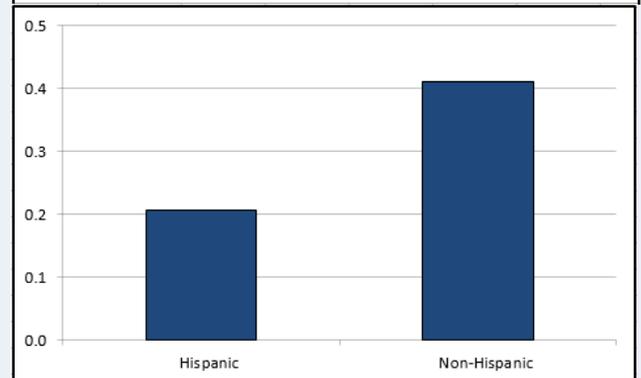
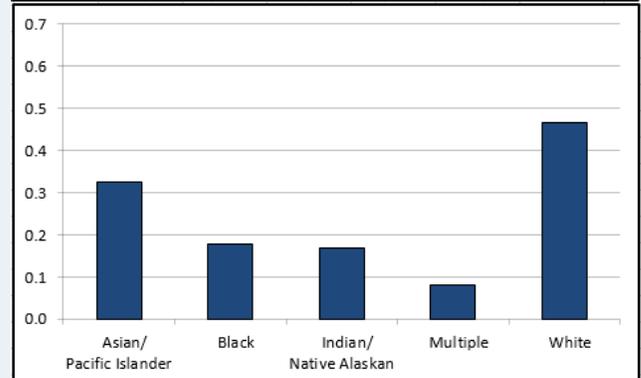
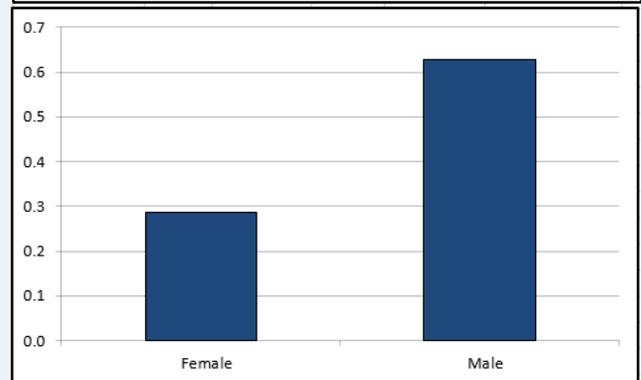
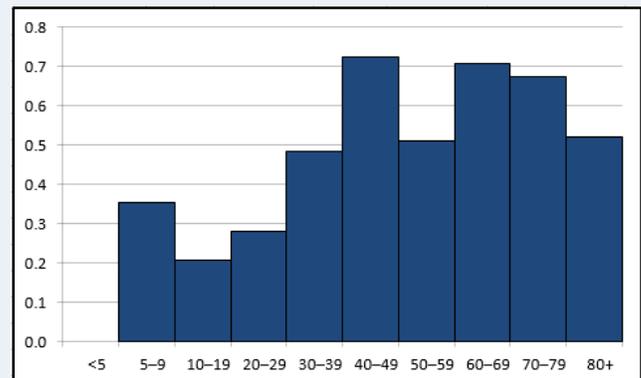
- Cases associated with an outbreak: 6%

Seasonality

- Month with most cases: August

*FoodNet determined the number of laboratory-confirmed infections caused by selected pathogens transmitted commonly by food. FoodNet collected data from 15% of the US population. For more information: www.cdc.gov/foodnet/surveillance.html.

Incidence* of *Vibrio* infections by age, sex, race, and ethnicity—FoodNet, 2014

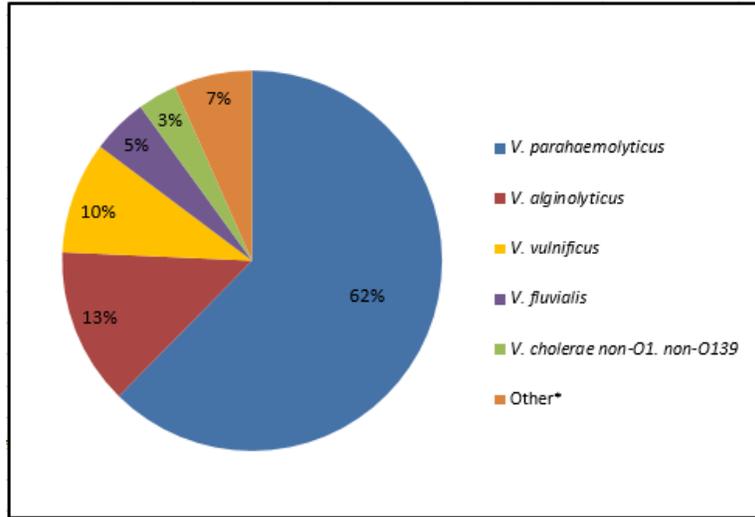


*per 100,000 people

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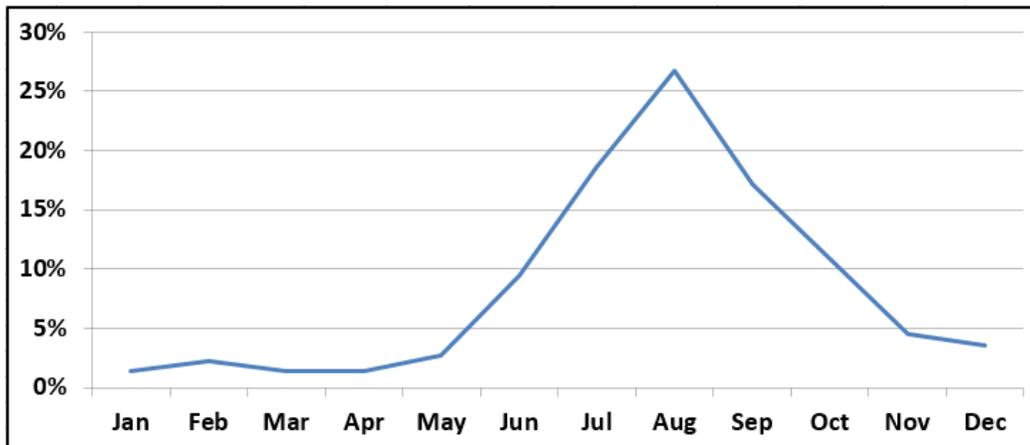
VIBRIO

Percentage of speciated *Vibrio* infections by species—FoodNet, 2014

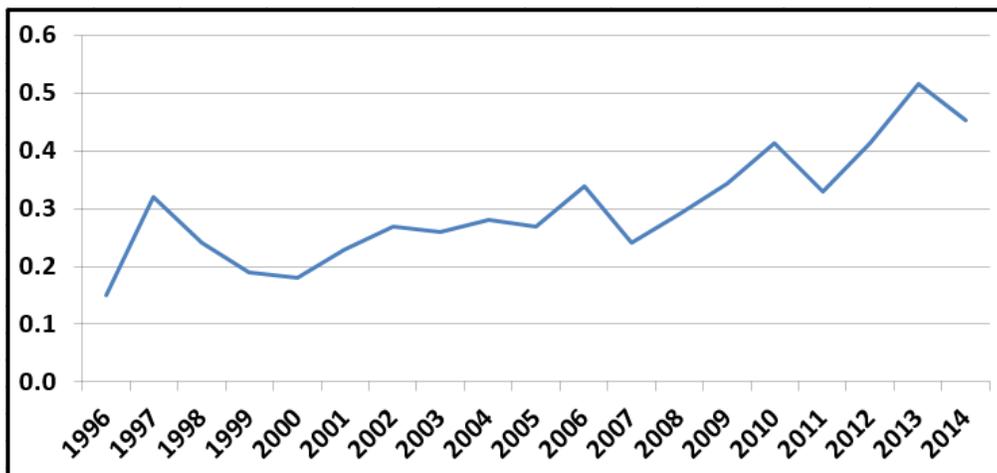


**V. mimicus*, *Grimontia hollisae*, *V. cholerae non-O1*, *Photobacterium damsela*, *V. metschnikovii*, *V. cholerae O1*, *V. cholerae unspecified*.

Percentage of *Vibrio* infections by month—FoodNet, 2014



Incidence* of *Vibrio* infections—FoodNet, 1996 through 2014



*per 100,000 people

FoodNet 2014 Annual Report

YERSINIA

Yersinia causes an estimated 115,000 illnesses and 29 deaths in the United States every year. Most of these infections are not laboratory-confirmed.

www.cdc.gov/nczved/divisions/dfbmd/diseases/yersinia

Cases of infection reported to FoodNet*: 136

Hospitalizations: 30

Deaths: 1

Incidence rate: 0.28 per 100,000 people

Groups with highest incidence

- Age: <5
- Sex: male
- Race: Asian/Pacific Islander
- Ethnicity: non-Hispanic

Significant changes in incidence rate

- 60% lower than in 1996–1998

International travel

- Cases with infection likely acquired abroad: 4% (4 of 103 cases with travel information)

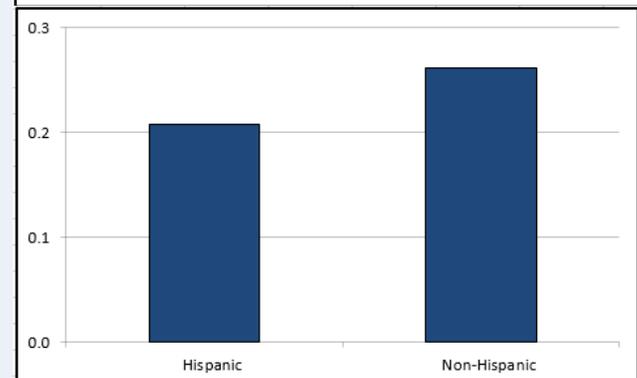
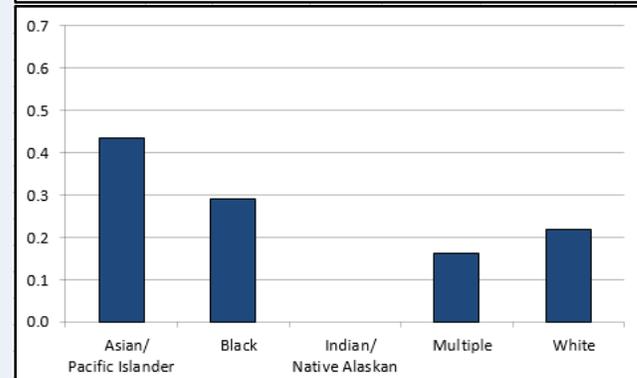
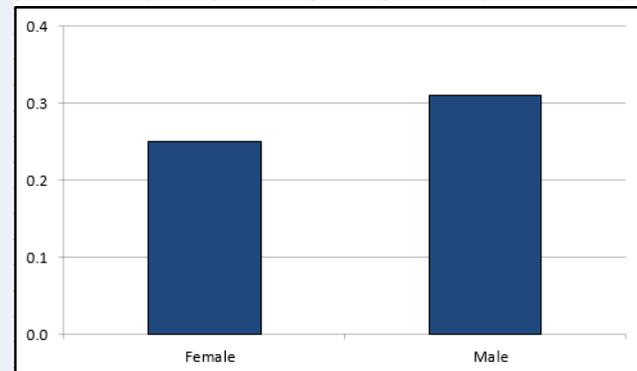
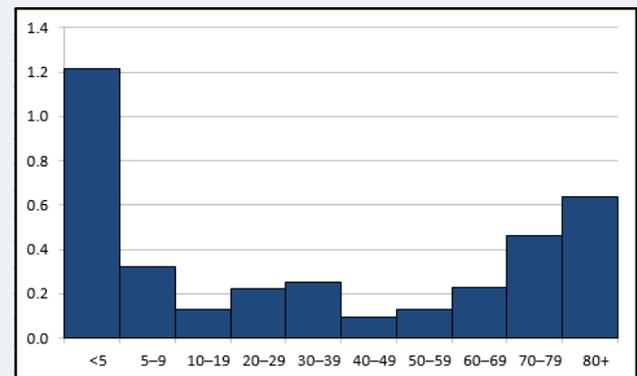
Outbreaks

- Cases associated with an outbreak: <1%

Seasonality

- Month with most cases: January

Incidence* of *Yersinia* infections by age, sex, race, and ethnicity—FoodNet, 2014



*per 100,000 people

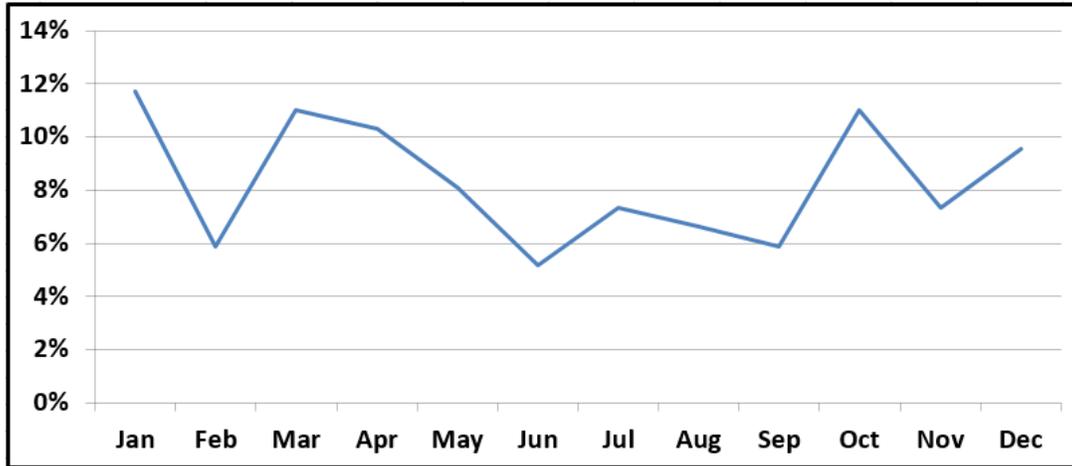
*FoodNet determined the number of laboratory-confirmed infections caused by selected pathogens transmitted commonly by food. FoodNet collected data from 15% of the US population. For more information:

www.cdc.gov/foodnet/surveillance.html.

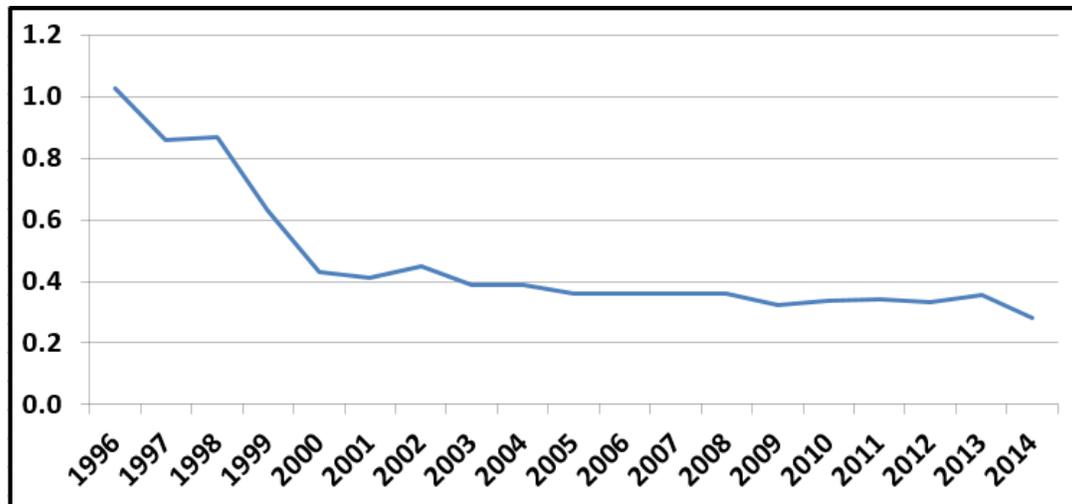
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YERSINIA

Percentage of *Yersinia* infections by month—FoodNet, 2014



Incidence* of *Yersinia* infections—FoodNet, 1996 through 2014



*per 100,000 people

FoodNet 2014 Annual Report

CRYPTOSPORIDIUM

Cryptosporidium causes an estimated 750,000 illnesses and 46 deaths in the United States every year. Most of these infections are not laboratory-confirmed.

www.cdc.gov/parasites/crypto

Cases of infection reported to FoodNet*: 1,189
Hospitalizations: 226
Deaths: 4
Incidence rate: 2.4 per 100,000 people

Groups with highest incidence

- Age: <5 years
- Sex: male
- Race: white
- Ethnicity: non-Hispanic

International travel

- Cases with infection likely acquired abroad: 10% (91 of 925 cases with travel information)

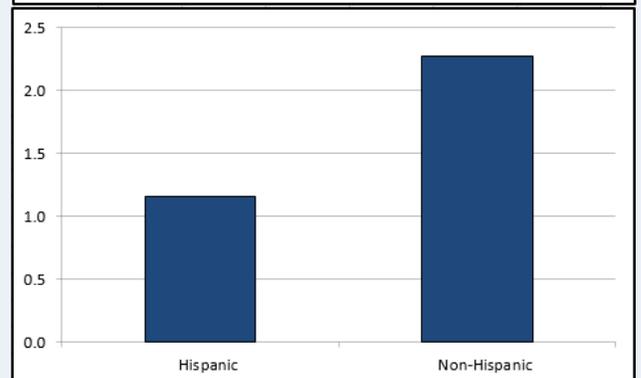
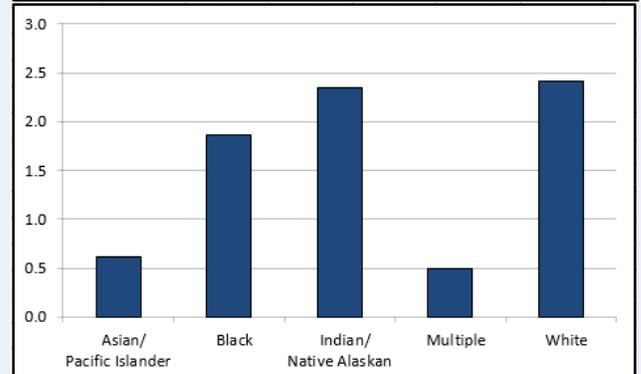
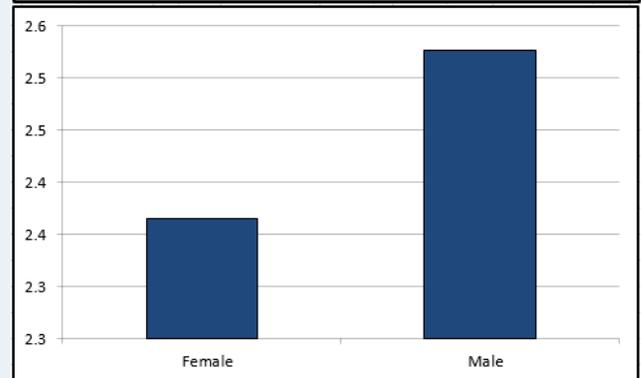
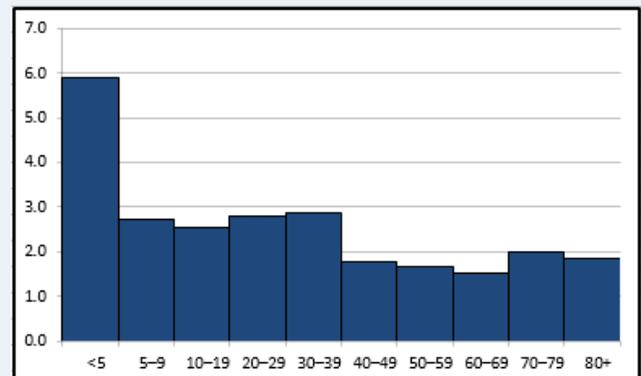
Outbreaks

- Cases associated with an outbreak: 5%

Seasonality

- Month with most cases: August

Incidence* of *Cryptosporidium* infections by age, sex, race, and ethnicity—FoodNet, 2014



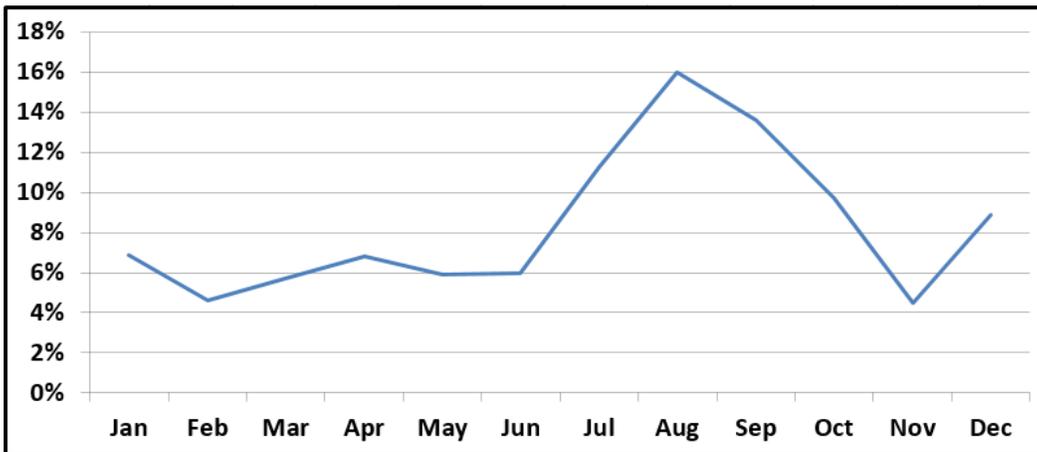
*per 100,000 people

*FoodNet determined the number of laboratory-confirmed infections caused by selected pathogens transmitted commonly by food. FoodNet collected data from 15% of the US population. For more information: www.cdc.gov/foodnet/surveillance.html.

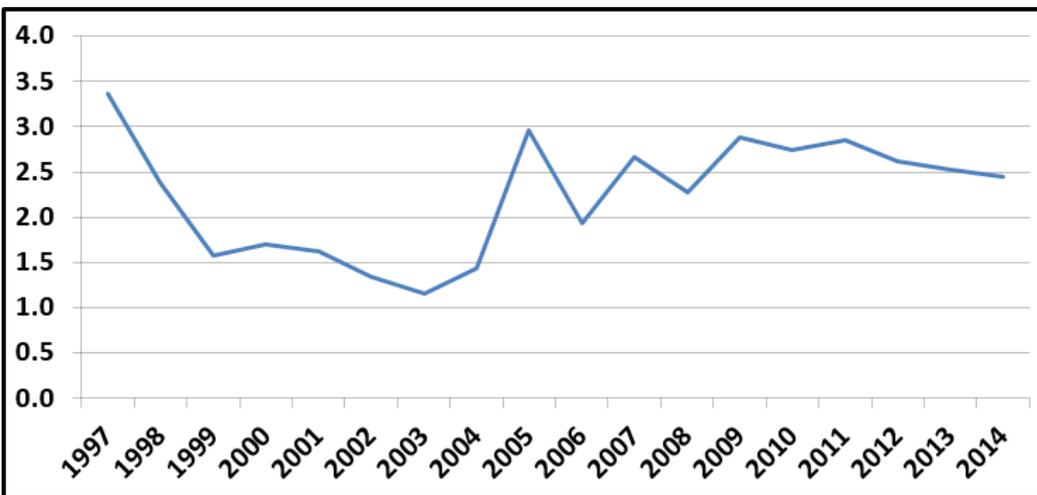
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CRYPTOSPORIDIUM

Percentage of *Cryptosporidium* infections by month—FoodNet, 2014



Incidence* of *Cryptosporidium* infections—FoodNet, 1997 through 2014



*per 100,000 people

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CYCLOSPORA

Cyclospora cayetanensis causes an estimated 20,000 illnesses in the United States every year.
Most of these infections are not laboratory-confirmed.

www.cdc.gov/parasites/cyclosporiasis

Cases of infection reported to FoodNet*: 26

Hospitalizations: 2

Deaths: 0

Incidence rate: 0.05 per 100,000 people

Groups with highest incidence

- Age: 70-79 years
- Sex: female
- Race: white
- Ethnicity: non-Hispanic

International travel

- Cases with infection likely acquired abroad: 48%
(11 of 23 cases with travel information)

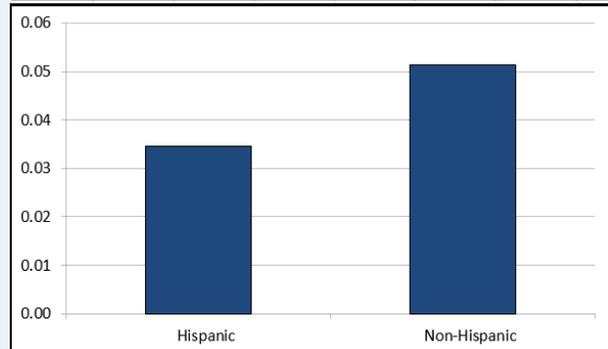
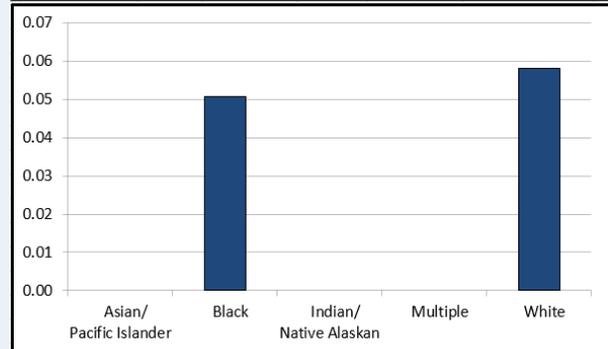
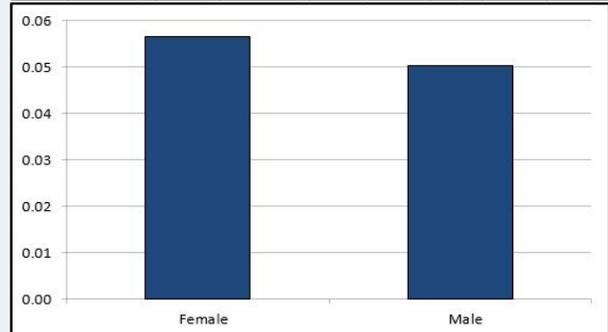
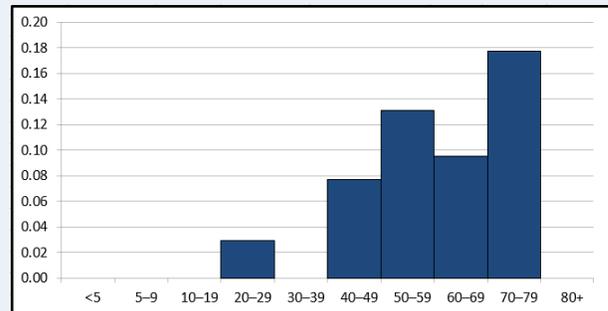
Outbreaks

- Cases associated with an outbreak: 0

Seasonality

- Month with most cases: July

Incidence* of *Cyclospora* infections by age, sex, race, and ethnicity—FoodNet, 2014



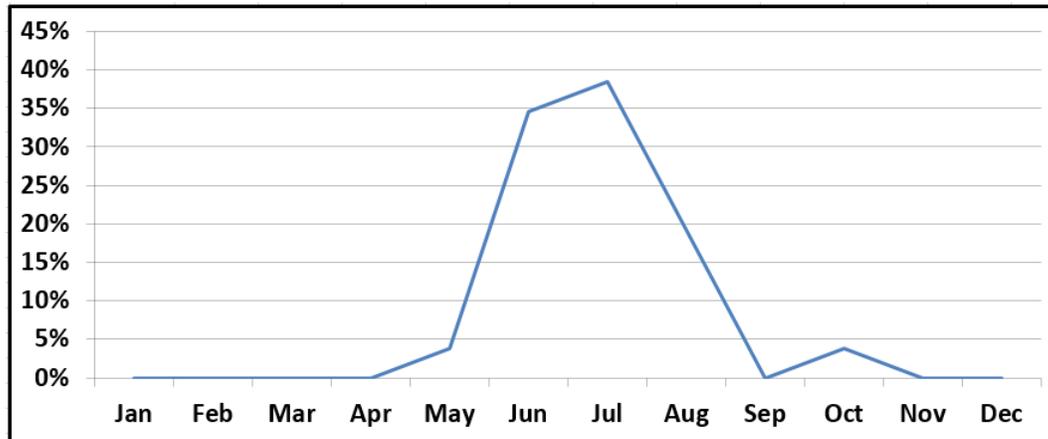
*per 100,000 people

*FoodNet determined the number of laboratory-confirmed infections caused by selected pathogens transmitted commonly by food. FoodNet collected data from 15% of the US population. For more information: www.cdc.gov/foodnet/surveillance.html.

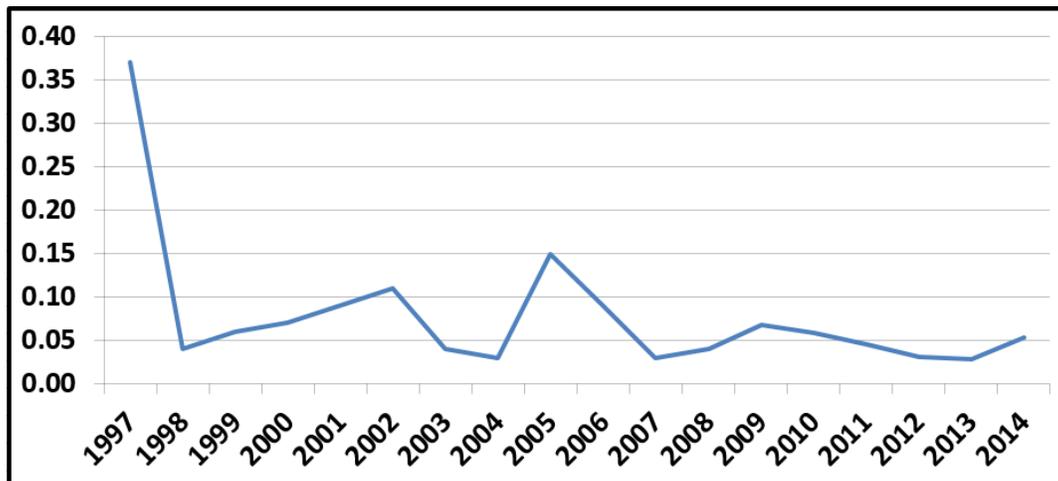
FoodNet 2014 Annual Report

CYCLOSPORA

Percentage of *Cyclospora* infections by month—FoodNet, 2014



Incidence* of *Cyclospora* infections—FoodNet, 1997 through 2014



*per 100,000 people

HUS 2013 Annual Report (FoodNet)

PEDIATRIC POST-DIARRHEAL HEMOLYTIC UREMIC SYNDROME (HUS)

HUS is a life-threatening condition characterized by anemia, low platelet count, and kidney failure.

2013 is the most recent year for which complete data are available

Cases reported to FoodNet*: 88

Cases <5 years: 46

Deaths: 0

Median age (range): 4.3 years (1 year–17 years)

Female: 53 (60%)

Median days hospitalized (range): 11 (2–372)

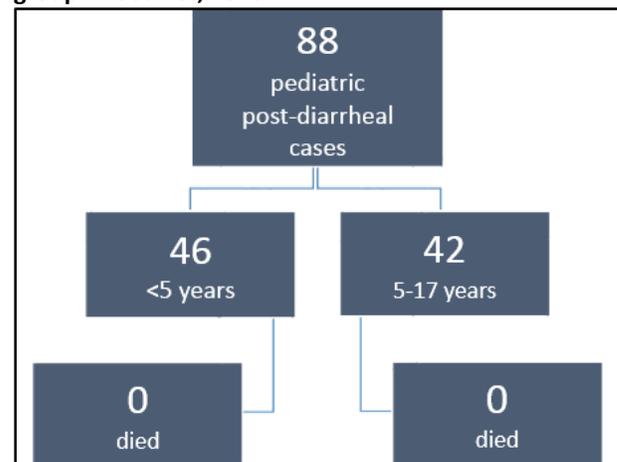
Seasonality

- 76% of cases occurred May through October

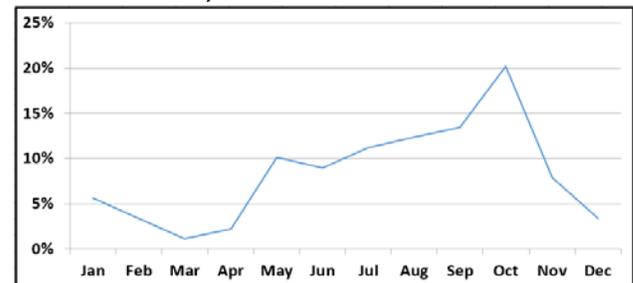
HUS Etiology

- 67 (76% of 88) cases had evidence of Shiga toxin-producing *Escherichia coli* (STEC) infection
 - 54 (81% of 67) cases had STEC isolated, of the following serogroups
 - O157 (53 cases)
 - O127 (1 case)
 - 9 (13% of 67) cases had O157 antibodies detected by serology
- Percentage of children <5 years old with STEC O157 isolated who developed HUS: 27% (33/124)

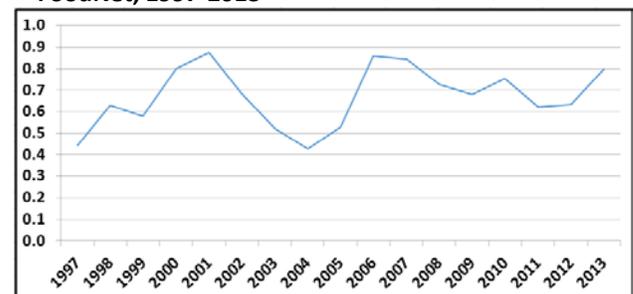
Pediatric post-diarrheal HUS cases and deaths, by age group—FoodNet, 2013



Percentage of pediatric post-diarrheal HUS cases by month—FoodNet, 2013



Incidence* of pediatric post-diarrheal HUS—FoodNet, 1997-2013



*per 100,000 people

*FoodNet staff conducted active surveillance for physician-diagnosed post-diarrheal HUS through a network of nephrologists and infection preventionists and reviewed hospital discharge data for children <18 years old. FoodNet collected data from 15% of the US population. For more information: www.cdc.gov/foodnet/surveillance.html.