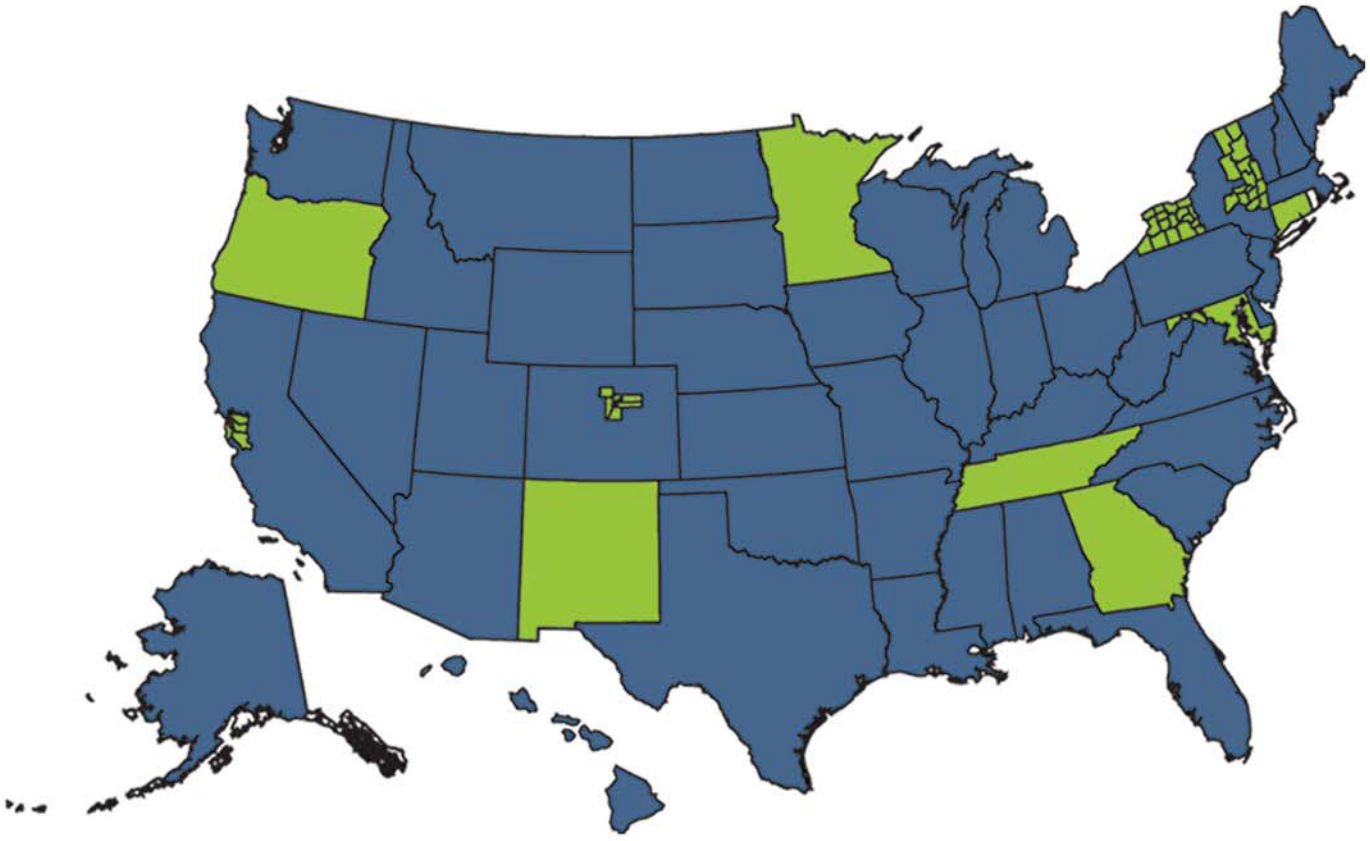
Foodborne Active Disease Surveillance Network (FoodNet)

2009 Surveillance Report



U.S. Department of Health & Human Services
Centers for Disease Control and Prevention

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Background

The Foodborne Diseases Active Surveillance Network (FoodNet) is the principal foodborne-disease component of the Centers for Disease Control and Prevention's (CDC's) Emerging Infections Program (EIP). FoodNet is a collaborative project involving CDC, 10 state health departments, the Food Safety and Inspection Service (FSIS) of the United States Department of Agriculture (USDA), and the Center for Food Safety and Applied Nutrition (CFSAN) and the Center for Veterinary Medicine (CVM) of the United States Food and Drug Administration (FDA). This report describes final surveillance data for *Campylobacter*, *Cryptosporidium*, *Cyclospora*, *Listeria*, *Salmonella*, *Shigella*, Shiga toxin-producing *Escherichia coli* (STEC) O157, STEC non-O157, *Vibrio*, *Yersinia* for 2009, HUS for 2008, and trends in incidence since 1996.

FoodNet was established in 1996 to conduct population-based active surveillance in five sites; Minnesota, Oregon, and selected counties in California, Connecticut, and Georgia. By 2004, the FoodNet surveillance area had expanded to include 10 sites: Connecticut, Georgia, Maryland, Minnesota, New Mexico, Oregon, and Tennessee, and selected counties in California, Colorado, and New York (Figure 1). The FoodNet surveillance area in 2009 included 46.8 million persons, representing 15.3% of the United States population (Table 2). The sex, race, and ethnic distribution of the 2009 FoodNet surveillance population was similar to that of the United States population as whole, with the exception of the Hispanic population, which was under-represented (Table 3).

The objectives of FoodNet are to determine the burden of foodborne illness in the United States, monitor trends in the burden of specific foodborne illness over time, attribute the burden of foodborne illness to specific foods and settings, and disseminate information that can lead to improvements in public health practice and the development of interventions to reduce the burden of foodborne illness. By meeting these objectives, FoodNet provides the information needed to assess the effectiveness of new food safety initiatives in decreasing the burden of foodborne illness in the United States. Data obtained through the network also can be used to target educational messages and other interventions for prevention and treatment of populations disproportionately affected by foodborne illness.

Methods

Active Surveillance

FoodNet has conducted active, population-based surveillance for laboratory-confirmed cases of infection caused by *Campylobacter*, *Listeria*, *Salmonella*, STEC O157, *Shigella*, *Vibrio*, and *Yersinia* since 1996; *Cryptosporidium* and *Cyclospora* since 1997; and STEC non–O157 since 2000. A case is defined as isolation (for bacteria) or identification (for parasites) of an organism

from a clinical specimen. To identify cases, FoodNet personnel regularly communicate with >650 clinical laboratories serving the surveillance area. Once a case is identified, FoodNet personnel at each site complete a set of core variables and enter this information into an electronic database. Hospitalizations occurring within 7 days of the specimen collection date are recorded, as is the patient's outcome (dead or alive) at hospital discharge (or at 7 days after the specimen collection date if the patient is not hospitalized). International travel within 7 days of illness onset is captured routinely for all *Salmonella* and STEC O157 cases.

Surveillance for Hemolytic Uremic Syndrome (HUS)

FoodNet also conducts surveillance for cases of hemolytic uremic syndrome (HUS). Active surveillance is conducted for cases of pediatric HUS (i.e., HUS in persons <18 years of age at time of diagnosis) through a network of pediatric nephrologists and infection-control practitioners who report all illnesses suspected to be HUS on the basis of clinical findings. Reported cases of HUS are not required to meet case definitions used by the National Notifiable Disease Surveillance System (NNDSS). FoodNet also conducts passive surveillance for cases of adult HUS (i.e., HUS in persons aged ≥18 years of age). Data from HUS surveillance are reported 1 year later than data from FoodNet Active Surveillance because of the additional time required for review of medical records and hospital discharge data for HUS cases.

In 2000, FoodNet sites began reviewing hospital discharge data for pediatric HUS cases to validate existing HUS surveillance activities and identify additional HUS cases among persons <18 years of age; with the exception of New Mexico, all FoodNet sites continue to conduct this review on a yearly basis. HUS cases are identified using ICD-9 codes specifying HUS, acute renal failure with the hemolytic anemia and thrombocytopenia, or thrombotic thrombocytopenic purpura with diarrhea caused by STEC (or another unknown pathogen). Because reviewing discharge data and validating HUS diagnosis through medical-record reviews are time-intensive, complete HUS surveillance results are reported later than those obtained through FoodNet's active surveillance activities.

Analysis

Incidence rates were calculated by dividing the number of laboratory-confirmed infections by U.S. Census Bureau population estimates for 2009. Case fatality ratios (CFRs) were calculated by dividing the number of deaths by the number of laboratory-confirmed infections and multiplying by 100. Age groups were defined as <1 years, 1-4 years, 5-9 years, 10-19 years, 20–29 years, 30-39 years, 40-49 years, 50-59 years, 60-69 years, 70-79 years and ≥80 years of age.

A main effects, log-linear Poisson regression model was used to estimate changes in incidence of infections in 2009 compared with previous years. This model accounts for site-to-site variation and changes in the size of the population under surveillance in FoodNet over time (Figure *1*). The 2009 illness incidence was compared with annual average incidence data from two distinct 3-year periods: the first 3 years of FoodNet surveillance (i.e., 1996–1998) and the 3 years preceding

2009 (2006-2008); the estimated change in incidence between 2009 and the comparison periods was calculated with 95% confidence intervals (95% CIs). For HUS surveillance, the average annual incidence for 2005–2007 was used as the comparison period. Due to the small number of cases, changes over time were not evaluated for STEC non-O157 and *Cyclospora*.

Summary of Results

In 2009, a total of 17,528 laboratory-confirmed cases of infection were identified (Table 4). Compared with the first 3 years of surveillance (1996–1998), declines in the incidence of infections caused by *Campylobacter, Listeria, Salmonella,* Shiga toxin-producing *Escherichia coli* (STEC) O157, *Shigella,* and *Yersinia* were observed (Figures 9-10). Compared with the 3 years preceding 2009 (2006-2008), significant decreases were observed for *Shigella and* STEC O157 (Figure 11). All other pathogens showed no significant change when compared with 2006-2008. For most infections, the reported incidence was highest among children aged <5 years, whereas the percentage of persons hospitalized and the case fatality rates (CFRs) were highest among persons aged ≥50 years (Tables 6, 6a, 12, 12a, 15, 15a).

In 2008, FoodNet ascertained 98 HUS cases, including 90(92%) post-diarrheal cases. Among post-diarrheal HUS cases, 7 (8%) person died. Seventy-seven (85%) pediatric post-diarrheal HUS cases were reported; among these, 49 (64%) cases were in children aged <5 years. Of all post-diarrheal HUS cases, 57% were diagnosed during June through September.

Detailed information about active surveillance and HUS data can be found in Tables 19-21 and Figure 12.

Publications and Abstracts, 2009
Below is a list of manuscripts and abstracts published in 2009 that utilized FoodNet data.

Publications

1. DeBess EE, Pippert E, Angulo FJ, Cieslak PR. Food handler assessment in Oregon. Foodborne Pathog Dis. 2009 Apr; 6(3):329-35.

2. Centers for Disease Control and Prevention (CDC). Preliminary FoodNet Data on the incidence of infection with pathogens transmitted commonly through food--10 States, 2008. MMWR Morb Mortal Wkly Rep. 2009 Apr 10; 58(13):333-7.

3. Pires SM, Evers EG, van Pelt W, Ayers T, Scallan E, Angulo FJ, Havelaar A, Hald T; Med-Vet-Net Workpackage 28 Working Group. Attributing the human disease burden of foodborne infections to specific sources. Foodborne Pathog Dis. 2009 May; 6(4):417-24. Review.

4. Lathrop S, Edge K, Bareta J. 2009 Aug; 15(8):1289-91. Shiga toxin-producing Escherichia coli, New Mexico, USA, 2004-2007. Emerg Infect Dis 2009 Aug; 15(8):1289-91.

5. Hedican EB, Medus C, Besser JM, Juni BA, Koziol B, Taylor C, Smith KE. Characteristics of O157 versus non-O157 Shiga toxin-producing Escherichia coli infections in Minnesota, 2000-2006. Clin Infect Dis. 2009 Aug 1; 49(3):358-64.

6. Clarkston L, Tobin-D'Angelo M, Shuler C, Hanna S, Benson J, Voestch AC. Sporadic Salmonella enteric serotype Javiana Infections in Georgia and Tennessee: A Hypothesis-Generating Study. Epidemiol Infect 2009 Sep 2:1-7.

7. Limbago BM, Long CM, Thompson AD, Killgore GE, Hannett GE, Havill NL, Mickelson S, Lathrop S, Jones TF, Park MM, Harriman KH, Gould LH, McDonald LC, Angulo FJ. Clostridium difficile strains from community-associated infections. J Clin Microbiol. 2009 Sep; 47(9):3004-7. Epub 2009 Jul 1.

8. Lathrop S, Edge K, Bareta J. Shiga toxin-producing Escherichia coli, New Mexico, USA, 2004-2007. Emerging Infectious Diseases 2009 Aug; 15(8):1289-91.

9. Gould LH, Bopp C, Strockbine N, Atkinson R, Baselski V, Body B, Carey R, Crandall C, Hurd S, Kaplan R, Neill M, Shea S, Somsel P, Tobin-D'Angelo M, Griffin PM, Gerner-Smidt P; Centers for Disease Control and Prevention (CDC). Recommendations for diagnosis of Shiga toxin-producing Escherichia coli infections by clinical laboratories. MMWR Recomm Rep. 2009 Oct 16; 58(RR-12):1-14.

10. Gould LH, Demma L, Jones TF, Hurd S, Vugia DJ, Smith K, Shiferaw B, Segler S, Palmer A, Zansky S, Griffin PM. Hemolytic uremic syndrome and death in persons with Escherichia coli O157:H7 infection, foodborne diseases active surveillance network sites, 2000-2006. Clin Infect Dis. 2009 Nov 15; 49(10):1480-5.

11. Hurd S., Clogher P., Marcus R, Phan Q. Shiga toxin-producing Escherichia coli (STEC), Connecticut, 2000-2008. Connecticut Epidemiologist. 2009; 29(7).

Conference Abstracts

1. Cavallaro, E, Viray, Melissa, Hyytia-Trees, Eija, Lafon, Patricia, Kludt, Patricia, Sheline, Katie, Pogostin, Lindsey, Sotir, Mark. "M-L-V-A": It's fun to use the M-L-V-A (for differentiating outbreak-associated and sporadic E. coli infections) — United States, 2008. EIS, 2009. Poster.

2. Gould, Hannah. Hemolytic uremic syndrome and death due to Escherichia coli O157:H7 infection in FoodNet sites, United States, 2000—2006. VTEC, 2009. Oral.

3. Gould, Hannah. Norton, Dawn M., Everstine, Karen, Ripley, Danny, Reimann, David, Dreyfuss, Moshe, Chen, Wu San, Seys, Scott, Selman, Carol. Beef Grinding and Record Keeping Practices: A Survey of Retail Establishments in Three States, 2008. IAFP, 2009. Oral.

4. Kwan, Patrick S. L. Rosenblum, Ida E., Patrick, Mary, Smith, Jacinta, Jones, Timothy F., Marcus, Ruthanne, Fields, Patricia, Fitzgerald, Collette. Source attribution of C. jejuni infections using MLST in the United States. CHRO, 2009. Poster.

5. Larson, Kirsten, FoodNet Outbreak Working Group. Overview of the FoodNet PFGE Cluster Project. PulseNet/OutbreakNet Annual Meeting, 2009. Oral.

6. Lathrop, Sarah. Bareta, Joseph, Angeles, K, Ewers, C. Salmonellosis in New Mexico, 2004-2007. APHA, 2009. Oral.

7. Nicholson, Cyndy. Butler, L, Lathrop, Sarah. Shigellosis in New Mexico, 2004-2008. APHA, 2009. Poster.

8. Palekar, Rakhee. Raw shellfish and oyster consumption in FoodNet. EIS, 2009.

9. MacFarquhar JK, Dunn J, Copeland S, Schaffner W, Jones TF. Escherichia coli O157:H7 Infections
   Associated with a Youth Hunting Event — Tennessee, 2008. EIS, 2009.

10. Patrick, Mary. Kadam P, Ghoneim R, Maguire H, Larson, Kirsten, McDonald T, Braymen C, Solghan SM, Hardin HD, Gould, Hannah, Angulo, Fredrick J., Rodgers J. Enumeration of Campylobacter on Chickens at Processing and Retail: An Explanation of Regional Differences in Incidence of Campylobacter Observed in FoodNet Sites? IAFP, 2009. Oral.

11. Racz, SE. Khanlian S, Lathrop, Sarah. Trends in New Mexico FoodNet Surveillance 2004-2008.APHA, 2009. Oral.

12. Boothe E, Garman KN, Dunn JR. Tennessee Department of Health—Statewide FoodNet Incidence, demographic features, clinical outcomes, and reported exposures among Listeria cases, Tennessee, 2004-2008. Tennessee EIP Scientific Presentation Day, 2009.

13. Date KA, Jones TF, Vugia D, Hurd S, Zansky S, Cronquist A, Farley M, Shiferaw B, Henao O.
Trends in Incidence of Listeriosis among Persons 65 Years and Older, Foodborne Diseases Active Surveillance Network (FoodNet), United States, 1996-2007. IDSA, 2009.

14. Dunn J, Sashti N, Jones TF. Assessment of Molecular Diversity of Salmonella Serotypes Using Simpsons Index of Diversity, United States, 1993-2008. IDSA, 2009.

Further information concerning FoodNet, including previous surveillance reports, *MMWR* articles, and other FoodNet publications, can be obtained by contacting the Enteric Diseases Epidemiology Branch at (404) 639-2206.

FoodNet Working Group, 2009

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TABLE 1. Foodborne Diseases Active Surveillance Network (FoodNet) Surveillance Area, by State and County — 1996–2009

State	County	Year														2009 Total Catchment Population
		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	
California	Original counties (Alameda and San Francisco)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	3,348,114
	Added county (Contra Costa)					●	●	●	●	●	●	●	●	●	●	
Colorado	Original counties (Adams, Arapahoe, Denver, Douglas and Jefferson)						●	●	●	●	●	●	●	●	●	2,801,318
	Added counties (Boulder and Broomfield)							●	●	●	●	●	●	●	●	
Connecticut	Original counties (Hartford and New Haven)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	3,518,288
	Rest of state			●	●	●	●	●	●	●	●	●	●	●	●	
Georgia	Original counties (Clayton, Cobb, Dekalb, Douglas, Fulton, Gwinnett, Newton, and Rockdale)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	9,829,211
	Added counties (Barrow, Bartow, Carroll, Cherokee, Coweta, Fayette, Forsyth, Henry, Paulding, Pickens, Spalding, and Walton)		●	●	●	●	●	●	●	●	●	●	●	●	●	
	Rest of state				●	●	●	●	●	●	●	●	●	●	●	
Maryland	Original counties (Anne Arundel, Baltimore, Baltimore City, Carroll, Harford, and Howard)			●	●	●	●	●	●	●	●	●	●	●	●	5,699,478
	Added counties (Montgomery and Prince George's)						●	●	●	●	●	●	●	●	●	
	Rest of state							●	●	●	●	●	●	●	●	
Minnesota	All counties	●	●	●	●	●	●	●	●	●	●	●	●	●	●	5,266,214
New Mexico	All counties									●	●	●	●	●	●	2,009,671
New York	Original sites (Genesee, Livingston, Monroe, Ontario, Orleans, Wayne, and Yates)			●	●	●	●	●	●	●	●	●	●	●	●	4,265,336
	Added counties (Albany, Columbia, Greene, Montgomery, Rensselaer, Saratoga, Schenectady, and Schoharie)				●	●	●	●	●	●	●	●	●	●	●	
	Added counties (Erie, Niagara, Wyoming)							●	●	●	●	●	●	●	●	
	Added counties (Allegany, Cattaraugus, Chautauqua, Chemung, Schuyler, Seneca, Steuben, Warren, and Washington)								●	●	●	●	●	●	●	
	Added counties (Clinton, Delaware, Essex, Franklin, Fulton, Hamilton, and Otsego)									●	●	●	●	●	●	
Oregon	All counties	●	●	●	●	●	●	●	●	●	●	●	●	●	●	3,825,657
Tennessee	Original counties (Cheatham, Davidson, Dickson, Hamilton, Knox, Robertson, Rutherford, Shelby, Sumner, Williamson, and Wilson)					●	●	●	●	●	●	●	●	●	●	6,296,254
	Rest of state								●	●	●	●	●	●	●	

TABLE 2. Population under Surveillance, by Site — FoodNet, 1996–2009

FoodNet Site	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
California	2,087,032	2,113,195	2,142,806	2,162,359	3,180,772	3,225,036	3,220,303	3,213,676	3,207,812	3,213,384	3,225,645	3,258,747	3,303,791	3,348,114
Colorado	-	-	-	-	-	2,154,603	2,506,142	2,527,170	2,554,059	2,587,179	2,637,862	2,691,516	2,746,753	2,801,318
Connecticut	1,622,809	2,453,483	**3,272,563**	**3,282,031**	**3,411,726**	**3,428,433**	**3,448,382**	**3,467,673**	**3,474,610**	**3,477,416**	**3,485,162**	**3,488,633**	**3,502,932**	**3,518,288**
Georgia	2,720,443	3,632,206	3,744,022	**7,788,240**	**8,230,161**	**8,419,594**	**8,585,535**	**8,735,259**	**8,913,676**	**9,097,428**	**9,330,086**	**9,533,761**	**9,697,838**	**9,829,211**
Maryland	-	-	2,441,279	2,450,566	2,516,736	4,244,912	5,439,913	5,496,708	5,542,659	5,582,520	5,612,196	5,634,242	5,658,655	5,699,478
Minnesota	**4,647,723**	**4,687,726**	**4,726,411**	**4,775,508**	4,933,958	4,982,813	**5,017,458**	**5,047,862**	**5,079,344**	**5,106,560**	**5,148,346**	**5,191,206**	**5,230,567**	**5,266,214**
New Mexico	-	-	-	-	-	-	-	-	**1,891,829**	**1,916,538**	**1,942,608**	**1,968,731**	**1,986,763**	**2,009,671**
New York	-	-	1,105,062	2,084,453	2,114,742	2,115,307	3,320,262	3,958,449	4,293,658	4,277,300	4,267,358	4,262,357	4,261,717	4,265,336
Oregon	**3,195,087**	**3,243,254**	**3,282,055**	**3,316,154**	**3,430,891**	**3,470,382**	**3,517,111**	**3,550,180**	**3,573,505**	**3,617,869**	**3,677,545**	**3,732,957**	**3,782,991**	**3,825,657**
Tennessee	-	-	-	-	2,826,135	2,860,502	2,891,733	5,856,522	5,916,762	5,995,748	6,089,453	6,172,862	6,240,456	6,296,254
Total	14,273,094	16,129,864	20,714,198	25,859,311	30,645,121	34,901,582	37,946,839	41,853,499	44,447,914	44,871,942	45,416,261	45,935,012	46,412,463	46,859,541
FoodNet population as % of U.S. population	5.4	6.0	7.7	9.5	10.9	12.2	13.2	14.4	15.2	15.2	15.2	15.2	15.2	15.3

Bold indicates active surveillance was conducted statewide, including all counties within a state; otherwise surveillance was conducted in select counties.
"-" Indicates state was not a FoodNet site during indicated year.

TABLE 3. Comparison of FoodNet Surveillance Population to U.S. Population, Overall and by Site — 2009

	Total FoodNet surveillance population		U.S. Population	CA[§]	CO[§]	CT	GA	MD	MN	NM	NY[§]	OR	TN
	#	%	#	#	#	#	#	#	#	#	#	#	#
Total population	46,859,541		307,006,550	3,348,114	2,801,318	3,518,288	9,829,211	5,699,478	5,266,214	2,009,671	4,265,336	3,825,657	6,296,254
Age													
<1	636,484	14.9%	4,261,494	43,042	42,120	41,216	147,740	76,511	73,019	30,381	47,663	49,701	85,091
1-4	2,553,600	15.0%	17,038,162	172,384	167,752	169,254	603,475	304,095	290,956	121,607	185,395	198,208	340,474
5-9	3,105,247	15.1%	20,609,634	204,107	200,076	219,783	733,376	370,292	344,094	142,378	241,040	239,157	410,944
10-19	6,254,422	15.1%	41,511,401	378,523	353,870	484,695	1,385,815	766,548	705,677	274,501	590,500	488,961	825,332
20-29	6,511,282	15.1%	43,217,278	471,117	412,528	443,810	1,411,822	775,650	744,339	292,935	569,931	534,012	855,138
30-39	6,284,790	15.5%	40,426,954	539,867	430,338	428,303	1,398,487	744,736	663,184	251,200	480,745	507,694	840,236
40-49	6,883,929	15.7%	43,822,697	514,077	413,054	549,474	1,441,023	877,993	776,458	263,059	631,610	519,140	898,041
50-59	6,361,737	15.6%	40,736,417	450,317	369,961	501,959	1,220,954	789,380	733,378	265,200	631,393	548,914	850,281
60-69	4,242,786	15.4%	27,596,243	287,322	221,289	333,802	808,786	517,484	460,743	185,630	430,828	382,508	614,394
70-79	2,388,984	14.6%	16,333,275	163,095	114,728	194,457	424,523	289,050	269,727	110,827	258,853	207,970	355,754
80+	1,636,280	14.3%	11,452,995	124,263	75,602	151,535	253,210	187,739	204,639	71,953	197,378	149,392	220,569
Sex													
Male	23,064,774	15.2%	151,449,490	1,665,987	1,405,918	1,717,636	4,835,262	2,763,806	2,620,570	994,635	2,094,663	1,897,054	3,069,243
Female	23,794,767	15.3%	155,557,060	1,682,127	1,395,400	1,800,652	4,993,949	2,935,672	2,645,644	1,015,036	2,170,673	1,928,603	3,227,011
Ethnicity													
Hispanic	4,955,890	10.2%	48,419,324	686,122	608,260	434,471	819,887	411,133	226,384	915,738	163,633	428,469	261,793
Non-Hispanic	41,903,651	16.2%	258,587,226	2,661,992	2,193,058	3,083,817	9,009,324	5,288,345	5,039,830	1,093,933	4,101,703	3,397,188	6,034,461
Race													
White	36,014,495	14.7%	244,298,393	2,050,633	2,456,425	2,956,387	6,391,950	3,588,912	4,664,703	1,680,251	3,740,827	3,435,729	5,048,678
Black	7,348,498	18.5%	39,641,060	352,748	154,061	366,375	2,970,607	1,691,143	249,909	62,773	362,274	78,348	1,060,260
Asian/Pacific Islander	2,201,622	15.1%	14,592,307	803,387	106,395	129,868	298,837	302,775	202,143	33,236	79,249	154,098	91,634
Indian/Native Alaskan	492,872	15.6%	3,151,284	23,804	28,887	13,586	37,427	21,134	66,640	195,403	24,589	59,665	21,737
Multiple	802,054	15.1%	5,323,506	117,542	55,550	52,072	130,390	95,514	82,819	38,008	58,397	97,817	73,945

[§]This FoodNet site includes only selected counties. California: Alameda, San Francisco, and Contra Costa; Colorado: Adams, Arapahoe, Denver, Douglas, Jefferson, Boulder, and Broomfield; New York: Albany, Allegany, Cattaraugus, Chautauqua, Chemung, Clinton, Columbia, Delaware, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Livingston, Monroe, Montgomery, Niagara, Ontario, Orleans, Otsego, Rensselaer, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, Steuben, Warren, Washington, Wayne, Wyoming, Yates

FIGURE 1. Foodborne Disease Active Surveillance (FoodNet) Sites — 2009

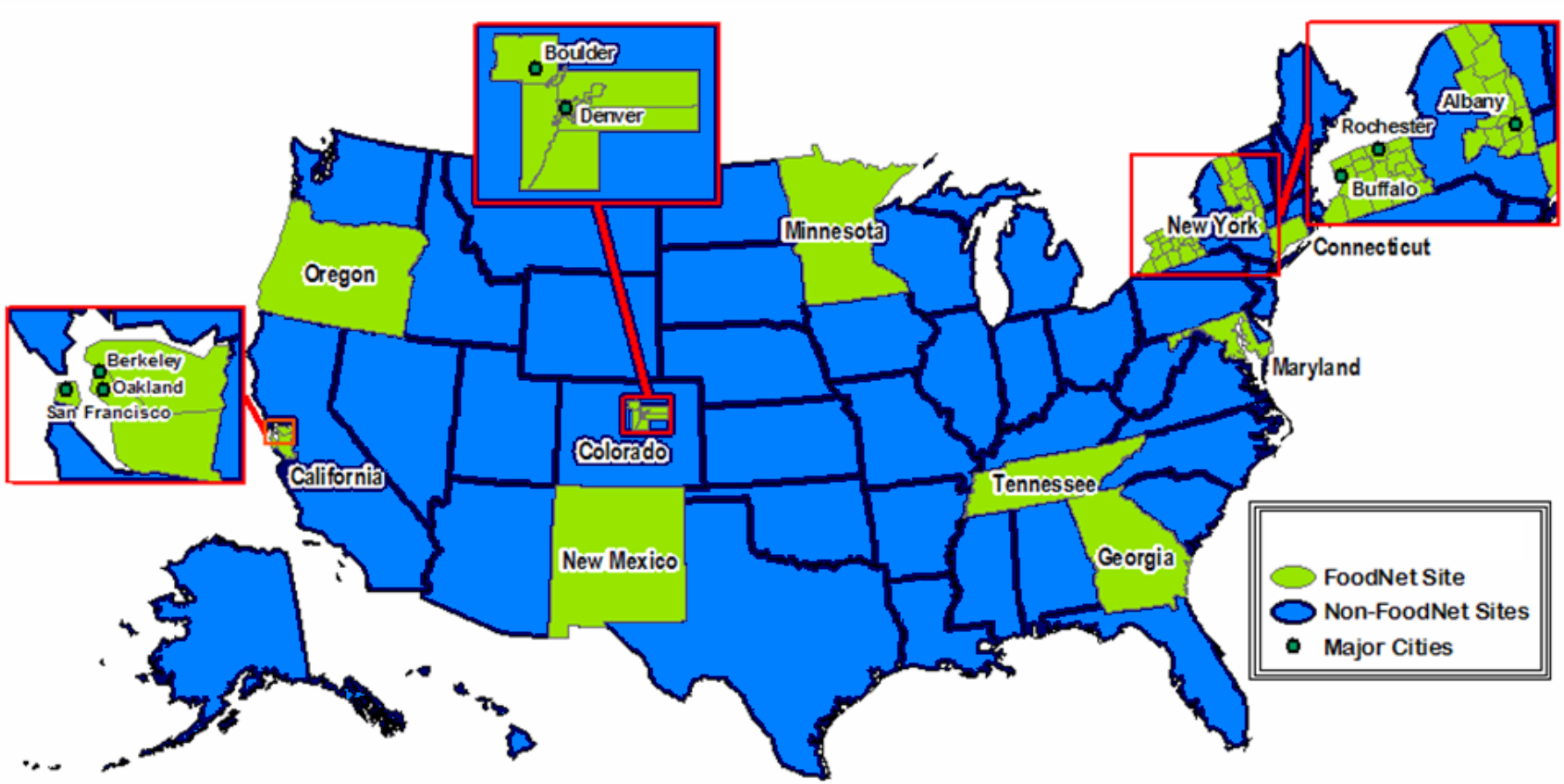


TABLE 4. Number of Laboratory-Confirmed Bacterial and Parasitic Infections, by Site and Pathogen — FoodNet, 2009

	CA[§]	CO[§]	CT	GA	MD	MN	NM	NY[§]	OR	TN	Total
Bacterial											
Campylobacter	967	386	535	740	479	899	331	490	718	513	6,058
Listeria	15	7	26	31	14	3	3	24	19	15	157
Salmonella	587	324	432	2,375	756	578	334	425	415	797	7,023
Shigella	183	65	43	653	275	79	92	46	43	375	1,854
STEC[†] O157	38	63	44	20	24	130	9	29	66	38	461
STEC non-O157	5	42	22	30	33	78	26	17	11	22	286
Vibrio	20	9	27	27	30	9	1	11	18	8	160
Yersinia	10	4	22	37	11	13	2	13	17	23	152
Parasitic											
Cryptosporidium	55	45	38	324	44	348	146	69	198	78	1,345
Cyclospora	0	0	18	6	3	1	1	1	0	2	32
Total	1,880	945	1,207	4,243	1,669	2,138	945	1,125	1,505	1,871	17,528

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

[§]This FoodNet site includes only selected counties. California: Alameda, San Francisco, and Contra Costa; Colorado: Adams, Arapahoe, Denver, Douglas, Jefferson, Boulder, and Broomfield; New York: Albany, Allegany, Cattaraugus, Chautauqua, Chemung, Clinton, Columbia, Delaware, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Livingston, Monroe, Montgomery, Niagara, Ontario, Orleans, Otsego, Rensselaer, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, Steuben, Warren, Washington, Wayne, Wyoming, Yates

TABLE 5. Incidence* of Cases of Bacterial and Parasitic Infections, by Site and Pathogen, Compared with National Health Objectives[†]— FoodNet, 2009

	California	Colorado	Connecticut	Georgia	Maryland	Minnesota	New Mexico	New York	Oregon	Tennessee	Overall 2009	National 2010 health objective[¶]
Bacteria												
Campylobacter	28.88	13.78	15.21	7.53	8.40	17.07	16.47	11.49	18.77	8.15	12.93	12.30
Listeria	0.45	0.25	0.74	0.32	0.25	0.06	0.15	0.56	0.50	0.24	0.34	0.24
Salmonella	17.53	11.57	12.28	24.16	13.26	10.98	16.62	9.96	10.85	12.66	14.99	6.28
Shigella	5.47	2.32	1.22	6.64	4.83	1.50	4.58	1.08	1.12	5.96	3.96	N/A[§]
STEC[†]O157	1.13	2.25	1.25	0.20	0.42	2.47	0.45	0.68	1.73	0.60	0.98	1.00
STEC non-O157	0.15	1.50	0.63	0.31	0.58	1.48	1.29	0.40	0.29	0.35	0.61	N/A
Vibrio	0.60	0.32	0.77	0.27	0.53	0.17	0.05	0.26	0.47	0.13	0.34	N/A
Yersinia	0.30	0.14	0.63	0.38	0.19	0.25	0.10	0.30	0.44	0.37	0.32	N/A
Parasites												
Cryptosporidium	1.64	1.61	1.08	3.30	0.77	6.61	7.26	1.62	5.18	1.24	2.87	N/A
Cyclospora	0.00	0.00	0.51	0.06	0.05	0.02	0.05	0.02	0.00	0.03	0.07	N/A
Surveillance population (millions)	**3.35**	**2.80**	**3.52**	**9.83**	**5.70**	**5.27**	**2.01**	**4.27**	**3.83**	**6.30**	**46.86**	

*Per 100,000 population

¶Healthy People 2010 objectives for incidence of *Campylobacter, Salmonell* a, and Shiga toxin-producing *Escherichia col* i O157 infections for year 2010 and for incidence of *Listeria* infections for year 2010

[§]Not applicable because no national health objective exists regarding infection with this pathogen

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

TABLE 6. Number and Incidence* of FoodNet Pathogens, by Age, Sex, Race and Ethnicity — 2009

	Campylobacter		*Listeria*		*Salmonella*		*Shigella*		STEC O157		STEC non O157	
	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate
Age												
<1	185	29.07	17	2.67	761	119.56	30	4.71	6	0.94	9	1.41
1-4	639	25.02	0	0.00	1,232	48.25	502	19.66	104	4.07	70	2.74
5-9	345	11.11	0	0.00	610	19.64	426	13.72	75	2.42	28	0.90
10-19	530	8.47	4	0.06	663	10.60	166	2.65	101	1.61	51	0.82
20-29	869	13.35	8	0.12	690	10.60	223	3.42	60	0.92	38	0.58
30-39	752	11.97	6	0.10	609	9.69	168	2.67	26	0.41	21	0.33
40-49	846	12.29	7	0.10	688	9.99	151	2.19	20	0.29	24	0.35
50-59	843	13.25	14	0.22	683	10.74	89	1.40	30	0.47	13	0.20
60-69	568	13.39	31	0.73	492	11.60	58	1.37	22	0.52	16	0.38
70-79	288	12.06	29	1.21	347	14.53	24	1.00	14	0.59	11	0.46
80+	191	11.67	41	2.51	245	14.97	17	1.04	3	0.18	5	0.31
Unknown	2	-	-	-	3	-	-	-	-	-		-
Sex												
Male	3,336	14.46	68	0.29	3,318	14.39	983	4.26	208	0.90	142	0.62
Female	2,721	11.44	89	0.37	3,701	15.55	870	3.66	253	1.06	143	0.60
Unknown	1	-	0	-	4	-	1	-	0	-	1	-
Ethnicity												
Hispanic	506	10.21	22	0.44	641	12.93	280	5.65	35	0.71	44	0.89
Non-Hispanic	3,462	8.26	118	0.28	4,901	11.70	1,046	2.50	395	0.94	207	0.49
Unknown	2,090	-	17	-	1,481	-	528	-	31	-	35	-
Race												
White	3,649	10.13	120	0.33	4,338	12.05	814	2.26	376	1.04	215	0.60
Black	243	3.31	19	0.26	984	13.39	511	6.95	27	0.37	10	0.14
Asian/Pacific Islander	204	9.27	3	0.14	329	14.94	43	1.95	14	0.64	5	0.23
Indian/Native Alaskan	65	13.19	0	0.00	62	12.58	19	3.85	3	0.61	3	0.61
Multiple	31	3.87	0	0.00	62	7.73	10	1.25	1	0.12	3	0.37
Other	144	-	2	-	171	-	62	-	10	-	14	-
Unknown	1,722	-	13	-	1,077	-	395	-	30	-	36	-
Total	**6,058**	**12.93**	**157**	**0.34**	**7,023**	**14.99**	**1,854**	**3.96**	**461**	**0.98**	**286**	**0.61**

*Rate per 100,000

TABLE 6a. Number and Incidence* of FoodNet Pathogens, by Age, Sex, Race and Ethnicity — 2009

	Vibrio		*Yersinia*		*Cryptosporidium*		*Cyclospora*	
	#	Rate	#	Rate	#	Rate	#	Rate
Age								
<1	0	0.00	40	6.28	17	2.67	0	0.00
1-4	3	0.12	21	0.12	135	0.12	1	0.12
5-9	2	0.06	11	0.35	90	2.90	0	0.00
10-19	8	0.13	7	0.11	128	2.05	2	0.03
20-29	16	0.25	9	0.14	197	3.03	2	0.03
30-39	16	0.25	12	0.19	191	3.04	5	0.08
40-49	29	0.42	14	0.20	197	2.86	6	0.09
50-59	29	0.46	8	0.13	155	2.44	8	0.13
60-69	28	0.66	10	0.24	104	2.45	6	0.14
70-79	20	0.84	8	0.33	78	3.26	2	0.08
80+	9	0.55	12	0.73	52	3.18	0	0.00
Unknown	-	-	-	-	1	-	-	-
Sex								
Male	113	0.49	70	0.30	616	2.67	15	0.07
Female	47	0.20	82	0.34	728	3.06	17	0.07
Unknown	0	-	0	-	1	-	0	-
Ethnicity								
Hispanic	8	0.16	14	0.28	103	2.08	1	0.02
Non-Hispanic	126	0.30	101	0.24	998	2.38	27	0.06
Unknown	26	-	37	-	244	-	4	-
Race								
White	114	0.32	76	0.21	982	2.73	25	0.07
Black	19	0.26	27	0.37	138	1.88	3	0.04
Asian/Pacific Islander	10	0.45	16	0.73	19	0.86	1	0.05
Indian/Native Alaskan	0	0.00	0	0.00	12	2.43	0	0.00
Multiple	1	0.12	1	0.12	11	1.37	0	0.00
Other	2	-	5	-	18	-	0	-
Unknown	14	-	27	-	165	-	3	-
Total	**160**	**0.34**	**152**	**0.32**	**1,345**	**2.87**	**32**	**0.07**

*Rate per 100,000

TABLE 7. Number and Incidence* of Laboratory-Confirmed *Salmonella* Infections Caused by the Top 20 *Salmonella* Serotypes — FoodNet, 2009

Rank 2004-2008	Rank 2009	*Salmonella* serotype	Number of cases	% of total *Salmonella*	Incidence per 100,000 persons
2	1	Enteritidis	1,233	17.6	2.6
1	2	Typhimuirum**	1,029	14.7	2.2
3	3	Newport	775	11.0	1.7
4	4	Javiana	550	7.8	1.2
5	5	Heidelberg	232	3.3	0.5
7	6	Montevideo	216	3.1	0.5
6	7	I 4,[5],12:i:-***	210	3.0	0.4
9	8	Muenchen	172	2.4	0.4
8	9	Saintpaul	158	2.2	0.3
11	10	Braenderup	133	1.9	0.3
12	11	Oranienburg	132	1.9	0.3
27	12	I 13,23:b:-	91	1.3	0.2
13	13	Infantis	79	1.1	0.2
16	14	Thompson	71	1.0	0.2
19	15	Bareilly	67	1.0	0.1
10	15	Mississippi	67	1.0	0.1
17	17	Typhi	65	0.9	0.1
14	18	Agona	57	0.8	0.1
24	19	Mbandaka	48	0.7	0.1
21	20	Hadar	47	0.7	0.1
		Sub total	**5,432**	77.3	11.6
		All other serotyped	1,059	15.1	2.3
		Not serotyped isolates	303	4.3	0.6
		Partially serotyped	196	2.8	0.4
		Rough or nonmotile	33	0.5	0.1
		Total	**7,023**	**100**	**15.0**

*Per 100,000 persons

** Typhimurium includes var.5- (Formerly var. Copenhagen)

***Includes I 4,[5],12:i:- and I 4,5,12:i:-

TABLE 8. Number and Incidence* of Laboratory-Confirmed *Shigella* Infections, by Species — FoodNet, 2009

Shigella species	Number of cases	% of total *Shigella* cases	Incidence per 100,000 persons
S. sonnei	1,403	75.7	2.99
S. flexneri	327	17.6	0.70
S. boydii	13	0.7	0.03
S. dysenteriae	11	0.6	0.02
Unknown	100	5.4	0.21
Total	**1,854**	**100**	**3.96**

*Rate per 100,000 persons

TABLE 9. Number and Incidence* of Laboratory-Confirmed *Vibrio* Infections, by Species, FoodNet 2009

Vibrio species	Number of cases	% of total *Vibrio* cases	Incidence per 100,000 persons
V. parahaemolyticus	82	51.3	0.17
V. alginolyticus	22	13.8	0.05
V. vulnificus	22	13.8	0.05
V. fluvialis	14	8.8	0.03
V. cholerae non-01, non-0139	5	3.1	0.01
V. mimicus	4	2.5	0.01
V. cholerae non-01	3	1.9	0.01
V. cholerae 01	2	1.3	0.00
V. hollisae	1	0.6	0.00
Unknown	5	3.1	0.01
Total	**160**	**100**	**0.34**

*Rate per 100,000 persons

TABLE 10. Number and Incidence* of Laboratory-Confirmed STEC non-O157 Infections Caused by the Ten Most Common Serogroups of STEC — FoodNet, 2009

Rank	STEC Serogroups	Number of cases	% total STEC non O157 cases	Incidence per 100,000 persons
1	O26	71	24.8	0.15
2	O103	55	19.2	0.12
3	O111	42	14.7	0.09
4	O121	14	4.9	0.03
5	O45	12	4.2	0.03
6	O118	9	3.1	0.02
7	O145	7	2.4	0.01
8	O124	5	1.7	0.01
9	O156	4	1.4	0.01
9	O69	4	1.4	0.01
	Undetermined	28	9.8	0.06
	Unknown	8	2.8	0.02
	All other	27	9.4	0.06
	Total	**286**	**100**	**0.61**

*Rate per 100,000 persons

FIGURE 2. Incidence of *Campylobacter*, *Salmonella* and *Shigella* Infections, by Age Group, FoodNet 2009

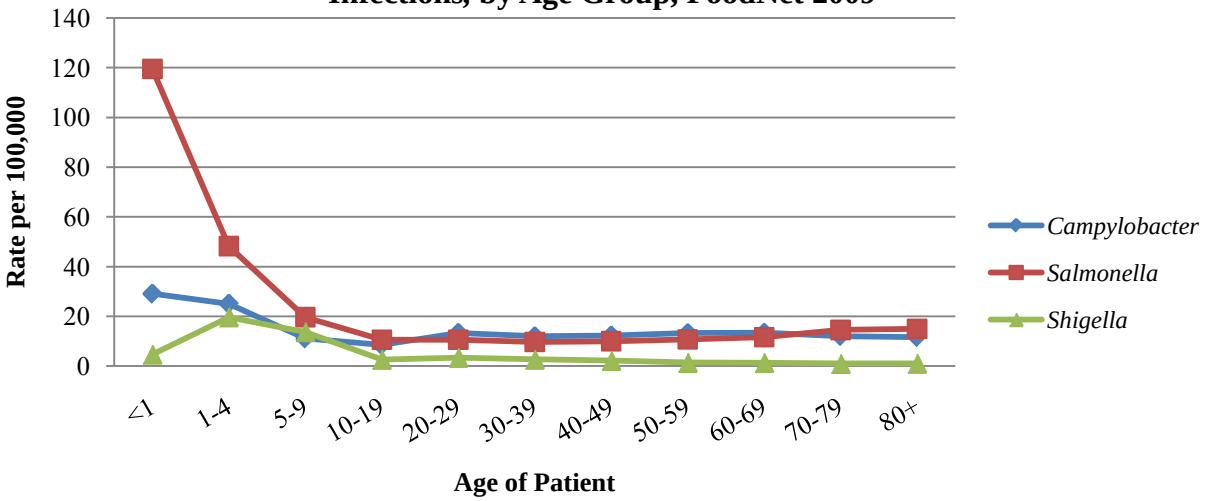


FIGURE 3. Incidence of *Cryptosporidium*, *Listeria*, and *Yersinia* Infections, by Age Group — FoodNet, 2009

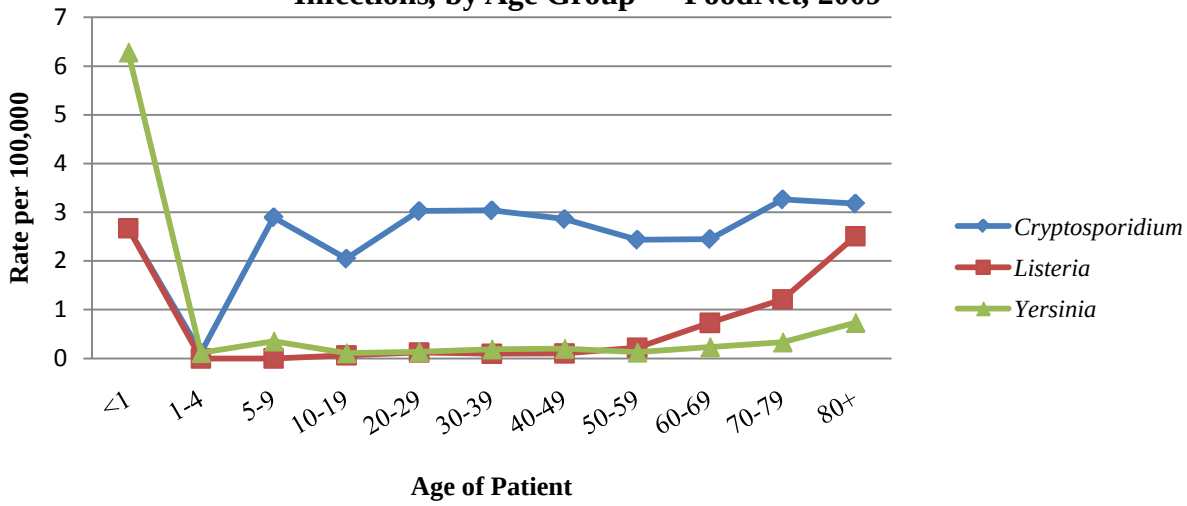


FIGURE 4. Incidence of STEC O157 and STEC non-O157 Infections, by Age Group — FoodNet, 2009

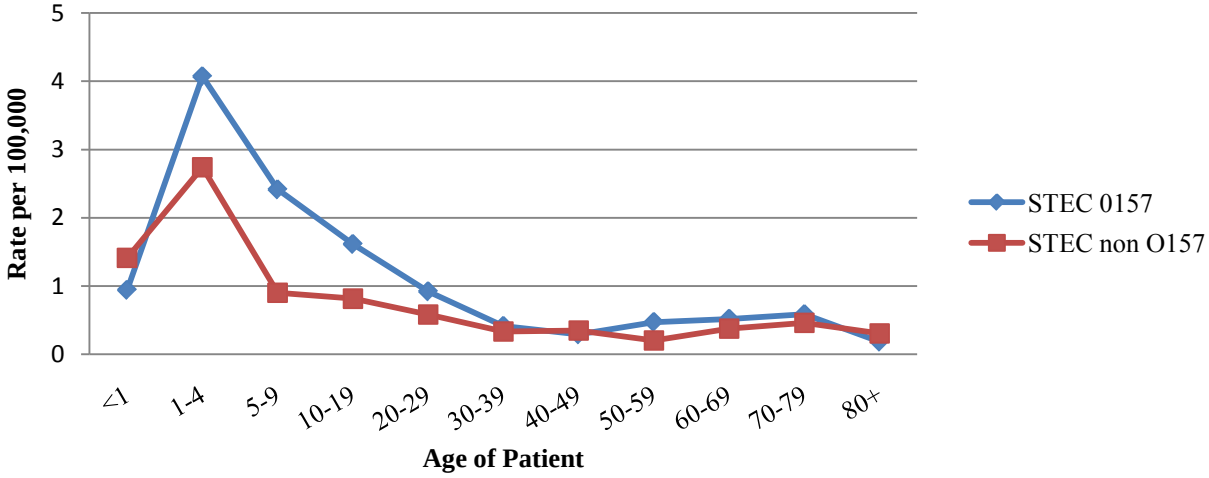


TABLE 11. Number and Percentage* of Hospitalizations, by Pathogen — FoodNet, 2009

	# Hospitalized	# Outpatient	# Unknown	Total # of Cases	% Hospitalized
Bacteria					
Campylobacter	909	4,638	511	6,058	15.0
Listeria	148	9	0	157	94.3
Salmonella	1,994	4,854	175	7,023	28.4
Shigella	366	1,421	67	1,854	19.7
STEC† O157	196	262	3	461	42.5
STEC non-O157	45	238	3	286	15.7
Vibrio	48	110	2	160	30.0
Yersinia	41	108	3	152	27.0
Parasites				0	
Cryptosporidium	284	1,016	45	1,345	21.1
Cyclospora	4	28	0	32	12.5
Total	4,035	12,684	809	17,528	23.0

†Shiga toxin-producing *Escherichia coli* .

TABLE 12. Number and Percentage of Hospitalizations, by Age Group and Pathogen — FoodNet, 2009

	<1 year				1-4 years				5-9 years			
Bacteria	**# Hospitalized**	**# Unknown**	**Total # of Cases**	**% Hospitalized**	**# Hospitalized**	**# Unknown**	**Total # of Cases**	**% Hospitalized**	**# Hospitalized**	**# Unknown**	**Total # of Cases**	**% Hospitalized**
Campylobacter	26	10	185	14.1	51	59	639	8.0	42	31	345	12.2
Listeria	17	0	17	100.0	0	0	0	-	0	0	0	-
Salmonella	216	15	761	28.4	228	31	1,232	18.5	122	17	610	20.0
Shigella	4	0	30	13.3	59	23	502	11.8	63	14	426	14.8
STEC†O157	1	1	6	16.7	33	1	104	31.7	30	0	75	40.0
STEC non-O157	0	0	9	-	3	0	70	4.3	1	1	28	3.6
Vibrio	0	0	0	-	0	0	3	-	0	0	2	0.0
Yersinia	12	0	40	30.0	2	0	21	9.5	3	0	11	27.3
Parasites												
Cryptosporidium	6	0	17	35.3	27	2	135	20.0	12	0	90	13.3
Cyclospora	0	0	0	-	0	0	1	0.0	0	0	0	-
Total	282	26	1,065	27.1	403	116	2,707	15.6	273	63	1,587	17.2

	10-19 years				20-29 years				30-39 years			
Bacteria	**# Hospitalized**	**# Unknown**	**Total # of Cases**	**% Hospitalized**	**# Hospitalized**	**# Unknown**	**Total # of Cases**	**% Hospitalized**	**# Hospitalized**	**# Unknown**	**Total # of Cases**	**% Hospitalized**
Campylobacter	71	44	530	13.4	92	70	869	10.6	106	79	752	14.1
Listeria	3	0	4	-	7	0	8	87.5	6	0	6	100.0
Salmonella	131	20	663	19.8	143	27	690	20.7	138	11	609	22.7
Shigella	40	3	166	24.1	65	4	223	29.1	41	10	168	24.4
STEC†O157	51	0	101	50.5	21	1	60	35.0	9	0	26	34.6
STEC non-O157	5	1	51	9.8	9	0	38	23.7	5	0	21	23.8
Vibrio	1	0	8	12.5	3	0	16	18.8	2	1	16	12.5
Yersinia	1	1	7	14.3	1	1	9	11.1	3	0	12	25.0
Parasites												
Cryptosporidium	16	2	128	12.5	34	8	197	17.3	36	12	191	18.8
Cyclospora	0	0	2	-	0	0	2	-	0	0	5	-
Total	319	71	1,660	19.2	375	111	2,112	18.7	346	113	1,806	19.2

†Shiga toxin-producing *Escherichia coli* .

TABLE 12a. Number and Percentage of Hospitalizations, by Age Group and Pathogen —FoodNet, 2009

	40-49 years				50-59 years				60-69 years			
Bacteria	# Hospitalized	# Unknown	Total # of Cases	% Hospitalized	# Hospitalized	# Unknown	Total # of Cases	% Hospitalized	# Hospitalized	# Unknown	Total # of Cases	% Hospitalized
Campylobacter	104	73	846	12.3	123	75	843	14.6	102	43	568	18.0
Listeria	7	0	7	100.0	13	0	14	92.9	29	0	31	93.5
Salmonella	188	13	688	27.3	262	20	683	38.4	216	5	492	43.9
Shigella	38	6	151	25.2	21	3	89	23.6	12	1	58	20.7
STEC†O157	8	0	20	40.0	16	0	30	53.3	13	0	22	59.1
STEC non-O157	5	0	24	20.8	2	0	13	15.4	4	0	16	25.0
Vibrio	7	0	29	24.1	12	0	29	41.4	13	1	28	46.4
Yersinia	3	1	14	21.4	3	0	8	37.5	3	0	10	30.0
Parasites												
Cryptosporidium	53	11	197	26.9	30	4	155	19.4	24	3	104	23.1
Cyclospora	0	0	6	0.0	2	0	8	25.0	2	0	6	33.3
Total	413	104	1,982	20.8	484	102	1,872	25.9	418	53	1,335	31.3

	70-79 years				80+ years			
Bacteria	# Hospitalized	# Unknown	Total # of Cases	% Hospitalized	# Hospitalized	# Unknown	Total # of Cases	% Hospitalized
Campylobacter	101	17	288	35.1	91	8	191	47.6
Listeria	28	0	29	96.6	38	0	41	92.7
Salmonella	192	7	347	55.3	157	7	245	64.1
Shigella	12	2	24	50.0	11	1	17	64.7
STEC†O157	12	0	14	85.7	2	0	3	66.7
STEC non-O157	8	0	11	72.7	2	0	5	40.0
Vibrio	7	0	20	35.0	3	0	9	33.3
Yersinia	3	0	8	37.5	7	0	12	58.3
Parasites								
Cryptosporidium	28	1	78	35.9	17	2	52	32.7
Cyclospora	0	0	2		0	0	0	
Total	391	27	821	49.2	328	18	575	57.0

†Shiga toxin-producing *Escherichia coli* .

TABLE 13. Number and Percentage* of Hospitalizations, by Site and Pathogen — FoodNet, 2009

	California[§]					Colorado[§]					Connecticut				
Bacteria	**# Hospitalized**	**# Outpatient**	**# Unknown**	**Total # of Cases**	**% Hospitalized**	**# Hospitalized**	**# Outpatient**	**# Unknown**	**Total # of Cases**	**% Hospitalized**	**# Hospitalized**	**# Outpatient**	**# Unknown**	**Total # of Cases**	**% Hospitalized**
Campylobacter	86	605	276	967	8.9	47	336	3	386	12.2	72	456	7	535	13.5
Listeria	14	1	0	15	93.3	7	0	0	7	100.0	24	2	0	26	92.3
Salmonella	169	392	26	587	28.8	83	234	7	324	25.6	83	347	2	432	19.2
Shigella	25	144	14	183	13.7	16	49	0	65	24.6	4	39	0	43	9.3
STEC[†] O157	16	22	0	38	42.1	19	44	0	63	30.2	21	23	0	44	47.7
STEC non-O157	0	4	1	5	0.0	4	38	0	42	9.5	5	17	0	22	22.7
Vibrio	3	17	0	20	15.0	1	8	0	9	11.1	5	17	0	22	22.7
Yersinia	1	9	0	10	10.0	2	2	0	4	50.0	6	16	0	22	27.3
Parasites				0					0					0	
Cryptosporidium	9	20	26	55	16.4	14	30	1	45	31.1	5	33	0	38	13.2
Cyclospora	0	0	0	0	-	0	0	0	0	-	1	17	0	18	5.6
Total	323	1,214	343	1,880	17.2	193	741	11	945	20.4	226	967	9	1,202	18.8

	Georgia					Maryland				
Bacteria	**# Hospitalized**	**# Outpatient**	**# Unknown**	**Total # of Cases**	**% Hospitalized**	**# Hospitalized**	**# Outpatient**	**# Unknown**	**Total # of Cases**	**% Hospitalized**
Campylobacter	150	580	10	740	20.3	83	372	24	479	17.3
Listeria	30	1	0	31	96.8	14	0	0	14	100.0
Salmonella	695	1,620	60	2,375	29.3	232	494	30	756	30.7
Shigella	134	506	13	653	20.5	53	208	14	275	19.3
STEC[†] O157	9	10	1	20	45.0	17	6	1	24	70.8
STEC non-O157	3	26	1	30	10.0	3	30	0	33	9.1
Vibrio	14	13	0	27	51.9	17	13	0	30	56.7
Yersinia	10	27	0	37	27.0	1	8	2	11	9.1
Parasites				0					0	
Cryptosporidium	105	218	1	324	32.4	23	17	4	44	52.3
Cyclospora	2	4	0	6	33.3	1	2	0	3	33.3
Total	1,152	3,005	86	4,243	27.2	444	1,150	75	1,669	26.6

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

[§]This FoodNet site includes only selected counties. California: Alameda, San Francisco, and Contra Costa; Colorado: Adams, Arapahoe, Denver, Douglas, Jefferson, Boulder, and Broomfield; New York: Albany, Allegany, Cattaraugus, Chautauqua, Chemung, Clinton, Columbia, Delaware, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Livingston, Monroe, Montgomery, Niagara, Ontario, Orleans, Otsego, Rensselaer, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, Steuben, Warren, Washington, Wayne, Wyoming, Yates

TABLE 13a. Number and Percentage* of Hospitalizations, by Site and Pathogen — FoodNet, 2009

	Minnesota					New Mexico					New York[§]				
Bacteria	**# Hospitalized**	**# Outpatient**	**# Unknown**	**Total # of Cases**	**% Hospitalized**	**# Hospitalized**	**# Outpatient**	**# Unknown**	**Total # of Cases**	**% Hospitalized**	**# Hospitalized**	**# Outpatient**	**# Unknown**	**Total # of Cases**	**% Hospitalized**
Campylobacter	144	751	4	899	16.0	69	255	7	331	20.8	77	404	9	490	15.7
Listeria	3	0	0	3	100.0	3	0	0	3	100.0	22	2	0	24	91.7
Salmonella	149	426	3	578	25.8	84	246	4	334	25.1	133	289	3	425	31.3
Shigella	19	58	2	79	24.1	30	59	3	92	32.6	9	37	0	46	19.6
STEC[†] O157	47	82	1	130	36.2	6	3	0	9	66.7	16	13	0	29	55.2
STEC non-O157	14	63	1	78	17.9	6	20	0	26	23.1	2	15	0	17	11.8
Vibrio	2	7	0	9	22.2	0	1	0	1	0.0	1	8	2	11	9.1
Yersinia	3	10	0	13	23.1	2	0	0	2	100.0	3	10	0	13	23.1
Parasites				0					0					0	
Cryptosporidium	55	291	2	348	15.8	23	120	3	146	15.8	11	57	1	69	15.9
Cyclospora	0	1	0	1	0.0	0	1	0	1	0.0	0	1	0	1	
Total	436	1,689	13	2,138	20.4	223	705	17	945	23.6	274	836	15	1,125	24.4

	Oregon					Tennessee				
Bacteria	**# Hospitalized**	**# Outpatient**	**# Unknown**	**Total # of Cases**	**% Hospitalized**	**# Hospitalized**	**# Outpatient**	**# Unknown**	**Total # of Cases**	**% Hospitalized**
Campylobacter	54	506	158	718	7.5	127	373	13	513	24.8
Listeria	17	2	0	19	89.5	14	1	0	15	93.3
Salmonella	98	313	4	415	23.6	268	493	36	797	33.6
Shigella	8	34	1	43	18.6	68	287	20	375	18.1
STEC[†] O157	20	46	0	66	30.3	25	13	0	38	65.8
STEC non-O157	0	11	0	11	0.0	8	14	0	22	36.4
Vibrio	1	17	0	18	5.6	4	4	0	8	50.0
Yersinia	2	14	1	17	11.8	11	12	0	23	47.8
Parasites				0					0	
Cryptosporidium	12	180	6	198	6.1	27	50	1	78	34.6
Cyclospora	0	0	0	0	-	0	2	0	2	0.0
Total	212	1,123	170	1,505	14.1	552	1,249	70	1,871	29.5

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

[§]This FoodNet site includes only selected counties. California: Alameda, San Francisco, and Contra Costa; Colorado: Adams, Arapahoe, Denver, Douglas, Jefferson, Boulder, and Broomfield; New York: Albany, Allegany, Cattaraugus, Chautauqua, Chemung, Clinton, Columbia, Delaware, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Livingston, Monroe, Montgomery, Niagara, Ontario, Orleans, Otsego, Rensselaer, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, Steuben, Warren, Washington, Wayne, Wyoming, Yates

TABLE 14. Number of Deaths and Case Fatality Ratio (CFR), by Pathogen — FoodNet, 2009

	Overall 2009			
Bacteria	**# Deaths**	**# Unknown**	**Total # of Cases**	**CFR**
Campylobacter	9	720	6,058	0.15
Listeria	21	0	157	13.38
Salmonella	24	344	7,023	0.34
Shigella	1	128	1,854	0.05
STEC[†]O157	2	6	461	0.43
STEC non-O157	1	2	286	0.35
Vibrio	7	6	160	4.38
Yersinia	2	14	152	1.32
Parasites				
Cryptosporidium	8	62	1,345	0.59
Cyclospora	0	0	32	0.00
Total	75	1,282	17,528	0.43

[†]Shiga toxin-producing *Escherichia coli*

TABLE 15. Number of Deaths and Case Fatality Ratio (CFR), by Age Group and Pathogen — FoodNet, 2009

	<1 years				1-4 years				5-9 years			
Bacteria	**# Deaths**	**# Unknown**	**Total # of Cases**	**CFR**	**# Deaths**	**# Unknown**	**Total # of Cases**	**CFR**	**# Deaths**	**# Unknown**	**Total # of Cases**	**CFR**
Campylobacter	0	13	185	0.00	0	85	639	0.00	0	49	345	0.00
Listeria	0	0	17	0.00	0	0	0	-	0	0	0	-
Salmonella	1	37	761	0.13	0	82	1232	0.00	0	35	610	0.00
Shigella	0	2	30	0.00	0	35	502	0.00	0	23	426	0.00
STEC[†] O157	0	1	6	0.00	0	1	104	0.00	1	1	75	1.33
STEC non-O157	0	0	9	0.00	0	0	70	0.00	0	0	28	0.00
Vibrio	0	0	0	-	0	0	3	0.00	0	0	2	0.00
Yersinia	0	4	40	0.00	0	5	21	0.00	0	1	11	0.00
Parasites												
Cryptosporidium	0	0	17	0.00	0	0	135	0.00	0	2	90	0.00
Cyclospora	0	0	0	-	0	0	1	-	0	0	0	-
Total	1	57	1,065	0.09	0	208	2,707	0.00	1	111	1,587	0.06

	10-19 years				20-29 years				30-39 years			
Bacteria	**# Deaths**	**# Unknown**	**Total # of Cases**	**CFR**	**# Deaths**	**# Unknown**	**Total # of Cases**	**CFR**	**# Deaths**	**# Unknown**	**Total # of Cases**	**CFR**
Campylobacter	0	61	530	0.00	0	106	869	0.00	0	130	752	0.00
Listeria	0	0	4	-	0	0	8	0.00	0	0	6	0.00
Salmonella	0	34	663	0.00	0	28	690	0.00	1	21	609	0.16
Shigella	1	8	166	0.60	0	17	223	0.00	0	20	168	0.00
STEC[†] O157	0	0	101	0.00	0	2	60	0.00	0	0	26	0.00
STEC non-O157	0	1	51	0.00	0	0	38	0.00	0	1	21	0.00
Vibrio	0	1	8	0.00	0	2	16	0.00	0	1	16	0.00
Yersinia	0	1	7	0.00	0	0	9	0.00	0	2	12	0.00
Parasites	0				0							
Cryptosporidium	0	5	128	0.00	2	12	197	1.02	2	16	191	1.05
Cyclospora	0	0	2	-	0	0	2	0.00	0	0	5	0.00
Total	1	111	1,660	0.06	2	167	2,112	0.09	3	191	1,806	0.17

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

TABLE 15a. Number of Deaths and Case Fatality Ratio, by Age Group and Pathogen — FoodNet, 2009

	40-49 years				50-59 years				60-69 years			
Bacteria	# Death	# Unknown	Total # of Cases	CFR	# Deaths	# Unknown	Total # of Cases	CFR	# Deaths	# Unknown	Total # of Cases	CFR
Campylobacter	0	94	846	0.00	4	90	843	0.47	1	53	568	0.18
Listeria	0	0	7	0.00	3	0	14	21.43	3	0	31	9.68
Salmonella	1	27	688	0.15	4	38	683	0.59	4	17	492	0.81
Shigella	0	13	151	0.00	0	2	89	0.00	0	6	58	0.00
STEC† O157	0	1	20	0.00	0	0	30	0.00	1	0	22	4.55
STEC non-O157	0	0	24	0.00	0	0	13	0.00	1	0	16	6.25
Vibrio	0	2	29	0.00	5	0	29	17.24	1	0	28	3.57
Yersinia	0	1	14	0.00	1	0	8	12.50	0	0	10	0.00
Parasites												
Cryptosporidium	0	12	197	0.00	0	6	155	0.00	2	4	104	1.92
Cyclospora	0	0	6	0.00	0	0	8	0.00	0	0	6	0.00
Total	1	150	1,982	0.05	17	136	1,872	0.91	13	80	1,335	0.97

	70-79 years				80+ years			
Bacteria	# Death	# Unknown	Total # of Cases	CFR	# Deaths	# Unknown	Total # of Cases	CFR
Campylobacter	2	18	288	0.69	2	20	191	1.05
Listeria	7	0	29	24.14	8	0	41	19.51
Salmonella	8	12	347	2.31	5	11	245	2.04
Shigella	0	0	24	0.00	0	2	17	0.00
STEC† O157	0	0	14	0.00	0	0	3	0.00
STEC non-O157	0	0	11	0.00	0	0	5	0.00
Vibrio	1	0	20	5.00	0	0	9	0.00
Yersinia	0	0	8	0.00	1	0	12	8.33
Parasites								
Cryptosporidium	1	4	78	1.28	1	0	52	1.92
Cyclospora	0	0	2	-	0	0	0	-
Total	19	34	821	2.31	17	33	575	2.96

†Shiga toxin-producing *Escherichia coli* .

TABLE 16. Number of Deaths and Case Fatality Ratio (CFR), by Site and Pathogen — FoodNet, 2009

	California[§]				Colorado[§]				Connecticut				Georgia				Maryland			
Bacteria	**# Deaths**	**# Unknown**	**Total # of Cases**	**CFR**	**# Deaths**	**# Unknown**	**Total # of Cases**	**CFR**	**# Deaths**	**# Unknown**	**Total # of Cases**	**CFR**	**# Deaths**	**# Unknown**	**Total # of Cases**	**CFR**	**# Deaths**	**# Unknown**	**Total # of Cases**	**CFR**
Campylobacter	1	594	967	0.10	1	0	386	0.26	0	7	535	0.00	1	76	740	0.14	1	12	479	0.21
Listeria	3	0	15	20.00	0	0	7	0	7	0	26	26.92	3	0	31	1.23	0	0	14	0
Salmonella	2	67	587	0.34	0	1	324	0	1	3	432	0.23	8	219	2,375	0	2	21	756	0.26
Shigella	0	29	183	0	0	0	65	0	0	0	43	0	1	82	653	0.15	0	3	275	0
STEC[†]O157	0	0	38	0	0	0	63	0	0	1	44	0	0	3	20	0	0	1	24	0
STEC non-O157	0	1	5	0	0	0	42	0	0	0	22	0	0	1	30	0	0	0	33	0
Vibrio	0	2	20	0	0	0	9	0	0	0	27	0	4	4	27	14.81	3	0	30	10.00
Yersinia	0	2	10	0	0	0	4	0	0	0	22	0	1	9	37	2.70	0	2	11	0
Parasites																				
Cryptosporidium	0	28	55	0	0	0	45	0	0	0	38	0	4	22	324	1.23	1	6	44	2.27
Cyclospora	0	0	0	0	0	0	0	-	0	0	18	0	0	0	6	0	0	0	3	0
Total	6	723	1,880	0.32	1	1	945	0.11	8	11	1,207	0.66	22	416	4,243	0.52	7	45	1,669	0.42

	Minnesota				New Mexico				New York[§]				Oregon				Tennessee			
Bacteria	**# Deaths**	**# Unknown**	**Total # of Cases**	**CFR**	**# Deaths**	**# Unknown**	**Total # of Cases**	**CFR**	**# Deaths**	**# Unknown**	**Total # of Cases**	**CFR**	**# Deaths**	**# Unknown**	**Total # of Cases**	**CFR**	**# Deaths**	**# Unknown**	**Total # of Cases**	**CFR**
Campylobacter	2	1	899	0.22	1	21	331	0.30	1	1	490	0.20	1	0	718	0.14	0	8	513	0
Listeria	0	0	3	0	1	0	3	33.33	3	0	24	12.50	3	0	19	15.79	1	0	15	6.67
Salmonella	3	0	578	0.52	2	11	334	0.60	1	0	425	0.24	0	0	415	0	5	22	797	0.63
Shigella	0	0	79	0	0	3	92	0	0	0	46	0	0	0	43	0	0	11	375	0
STEC[†]O157	0	0	130	0	0	0	9	0	1	1	29	3.45	0	0	66	0	1	0	38	2.63
STEC non-O157	0	0	78	0	1	0	26	3.85	0	0	17	0	0	0	11	0	0	0	22	0
Vibrio	0	0	9	0	0	0	1	0	0	0	11	0	0	0	18	0	0	0	8	0
Yersinia	1	0	13	7.69	0	0	2	0	0	0	13	0	0	0	17	0	0	1	23	0
Parasites																				
Cryptosporidium	1	0	348	0.29	0	4	146	0	0	0	69	0	2	0	198	1.01	0	2	78	0
Cyclospora	0	0	1	0	0	0	1	0	0	0	1	-	0	0	0	-	0	0	2	0
Total	7	1	2,138	0.33	5	39	945	0.53	6	2	1,125	0.53	6	0	1,505	0.40	7	44	1,871	0.37

[§]This FoodNet site includes only selected counties. California: Alameda, San Francisco, and Contra Costa; Colorado: Adams, Arapahoe, Denver, Douglas, Jefferson, Boulder, and Broomfield; New York: Albany, Allegany, Cattaraugus, Chautauqua, Chemung, Clinton, Columbia, Delaware, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Livingston, Monroe, Montgomery, Niagara, Ontario, Orleans, Otsego, Rensselaer, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, Steuben, Warren, Washington, Wayne, Wyoming, Yates

[†]Shiga toxin-producing *Escherichia coli*

TABLE 17. Outbreak-Related Cases, by Pathogen — FoodNet, 2008

	Total number of cases reported	Outbreak-related cases		Foodborne		Waterborne		Animal contact		Person-to-person		Indeterminent		Unknown	
		#	%	#	%	#	%	#	%	#	%	#	%	#	%
Bacteria															
Campylobacter	6,058	16	0.3	16	100.0	0	0	0	0.0	0	0	0	0	0	0
Listeria	157	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0
Salmonella	7,023	376	5.4	288	76.6	0	0	14	3.7	0	0	53	14.1	21	5.6
Shigella	1,854	75	4.0	0	0	6	8.0	0	0.0	52	69.3	3	4.0	14	18.7
STEC[†] O157	461	121	26.2	76	62.8	0	0	32	26.4	5	4.1	8	6.6	0	0
STEC non-O157	286	1	0.3	1	0	0	0	0	0.0	0	0	0	0	0	0
Vibrio	160	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0
Yersinia	152	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0
Parasites															
Cryptosporidium	1,345	33	2.5	0	0	21	63.6	2	6.1	10	30.3	0	0	0	0
Cyclospora	32	8	25.0	0	0	0	0	0	0.0	0	0	0	0	8	100
Total	17,528	630	3.6	381	60.5	27	4.3	48	7.6	67	10.6	64	10.2	43	6.8

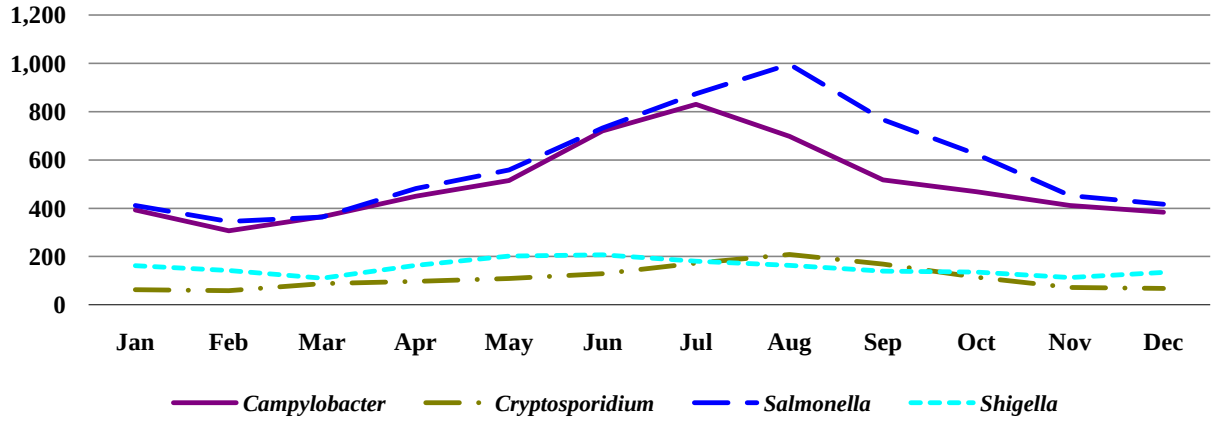
[†]Shiga toxin-producing *Escherichia coli* .

TABLE 18. Frequency of International Travel, by Pathogen — FoodNet, 2009

	Total cases reported	Total cases with travel		Traveled		Did not travel		Unknown travel	
	#	#	%	#	%*	#	%*	#	%
Bacteria									
Campylobacter	6,058	3,660	60.4	639	17.5	3,021	82.5	2,398	39.6
Listeria	157	136	86.6	3	2.2	133	97.8	21	13.4
Salmonella	7,023	5,147	73.3	453	8.8	4,694	91.2	1,876	26.7
Shigella	1,854	1,256	67.7	161	12.8	1,095	87.2	598	32.3
STEC O157	461	432	93.7	8	1.9	424	98.1	29	6.3
STEC non-O157	286	261	91.3	34	13.0	227	87.0	25	8.7
Vibrio	160	141	88.1	7	5.0	134	95.0	19	11.9
Yersinia	152	103	67.8	8	7.8	95	92.2	49	32.2
Parasites									
Cryptosporidium	1,345	1,021	75.9	91	8.9	930	91.1	324	24.1
Cyclospora	32	30	93.8	14	46.7	16	53.3	2	6.3
Total	**17,528**	**12,187**	**69.5**	**1,418**	**11.6**	**10,769**	**88.4**	**5,341**	**30.5**

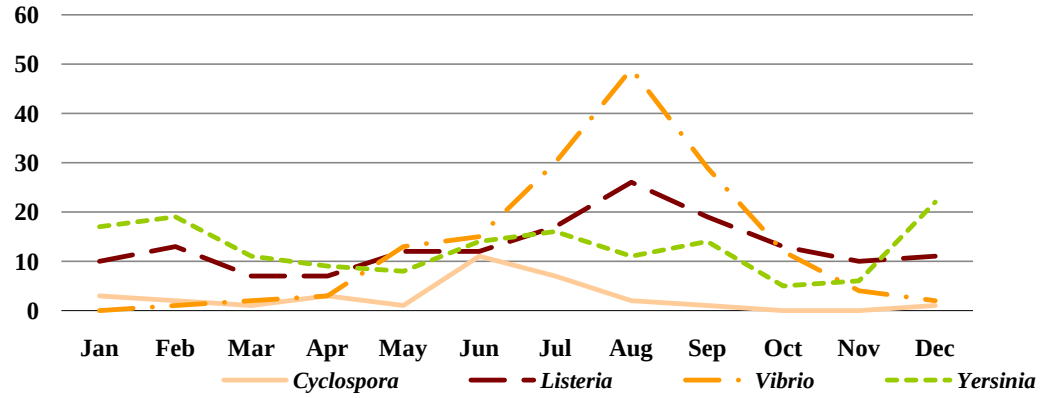
*Among cases with known travel status

FIGURE 5. Seasonality of *Campylobacter*, *Cryptosporidium*, *Salmonella* and *Shigella* cases, FoodNet, 2009



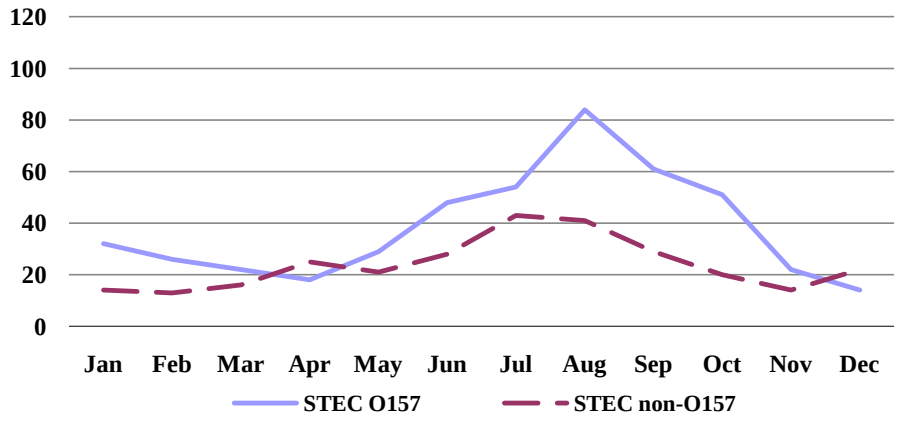
Pathogen	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Campylobacter	393	306	365	450	515	721	860	698	514	468	412	383
Cryptosporidium	62	58	88	97	109	129	172	208	168	114	72	68
Salmonella	412	345	363	481	559	733	874	996	767	624	452	417
Shigella	162	142	110	164	202	207	181	163	140	136	113	134

FIGURE 6. Seasonality of *Cycvlospora*, *Listeria*, *Vibrio*, and *Yersinia*, FoodNet, 2009



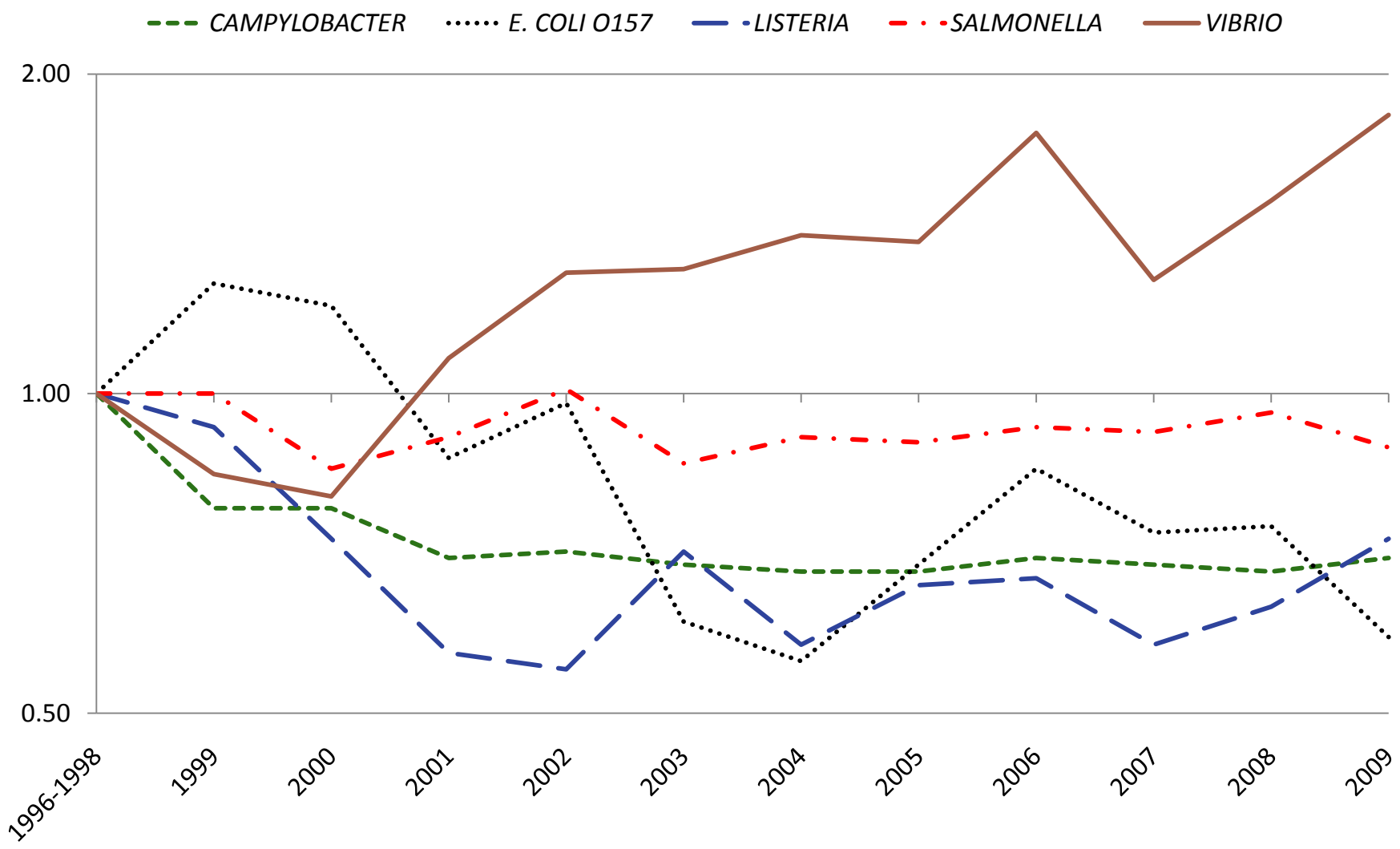
Pathogen	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Cyclospora	3	2	1	3	1	11	7	2	1	0	0	1
Listeria	10	13	7	7	12	12	17	26	19	13	10	11
Vibrio	0	1	2	3	13	15	30	49	29	12	4	2
Yersinia	17	19	11	9	8	14	16	11	14	5	6	22

FIGURE 7. Seasonality of STEC O157 and non-O157 cases, 2009



Pathogen	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
STEC O157	32	26	22	18	29	48	54	84	61	51	22	14
STEC non-O157	14	13	16	25	21	28	43	41	29	20	14	22

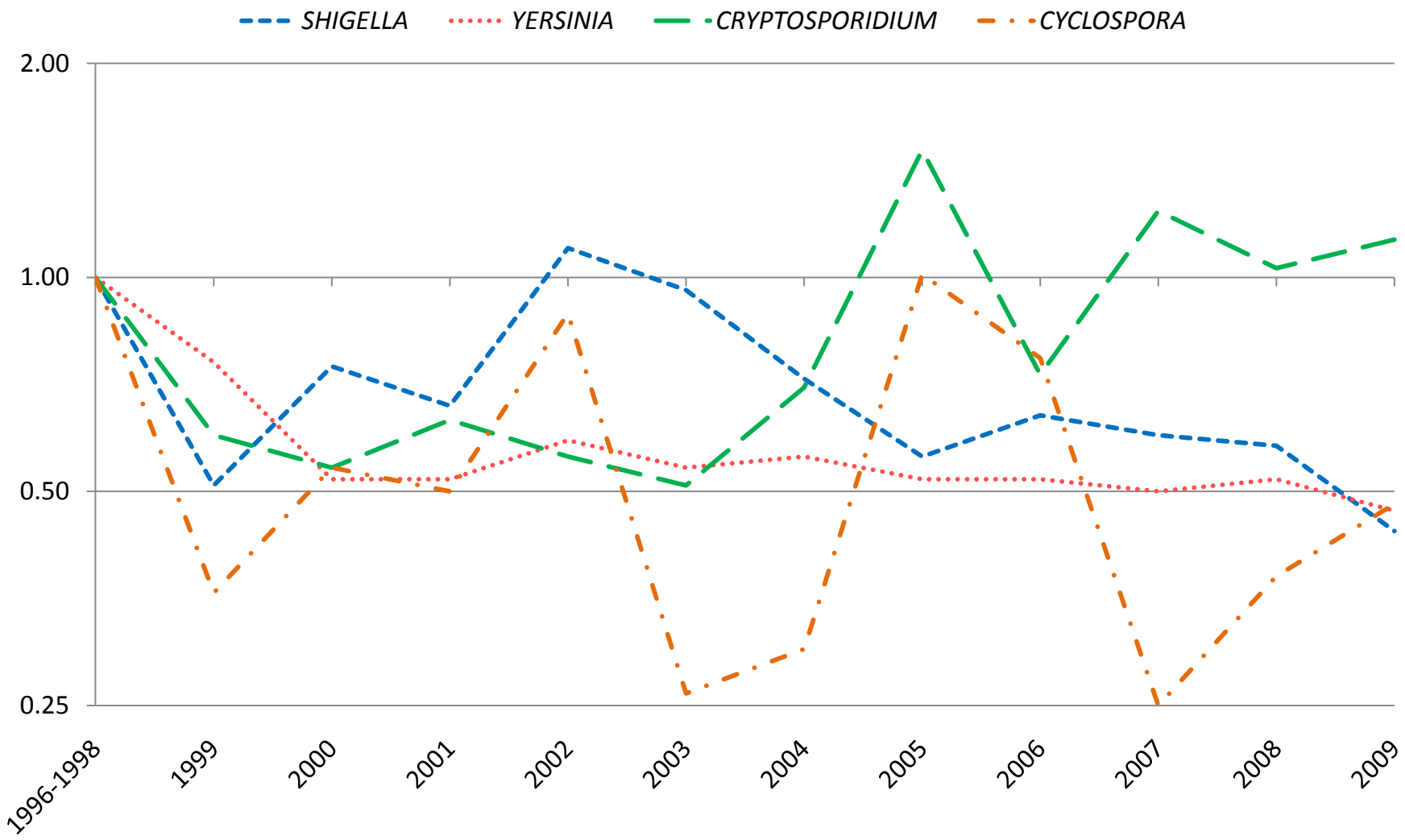
FIGURE 8. Relative Rates of Laboratory-confirmed Infections with *Campylobacter*, STEC* O157, *Listeria*, *Salmonella*, and *Vibrio* Compared with 1996–1998 Rates, by Year — FoodNet 1996–2009†



* Shiga toxin-producing *Escherichia coli*.

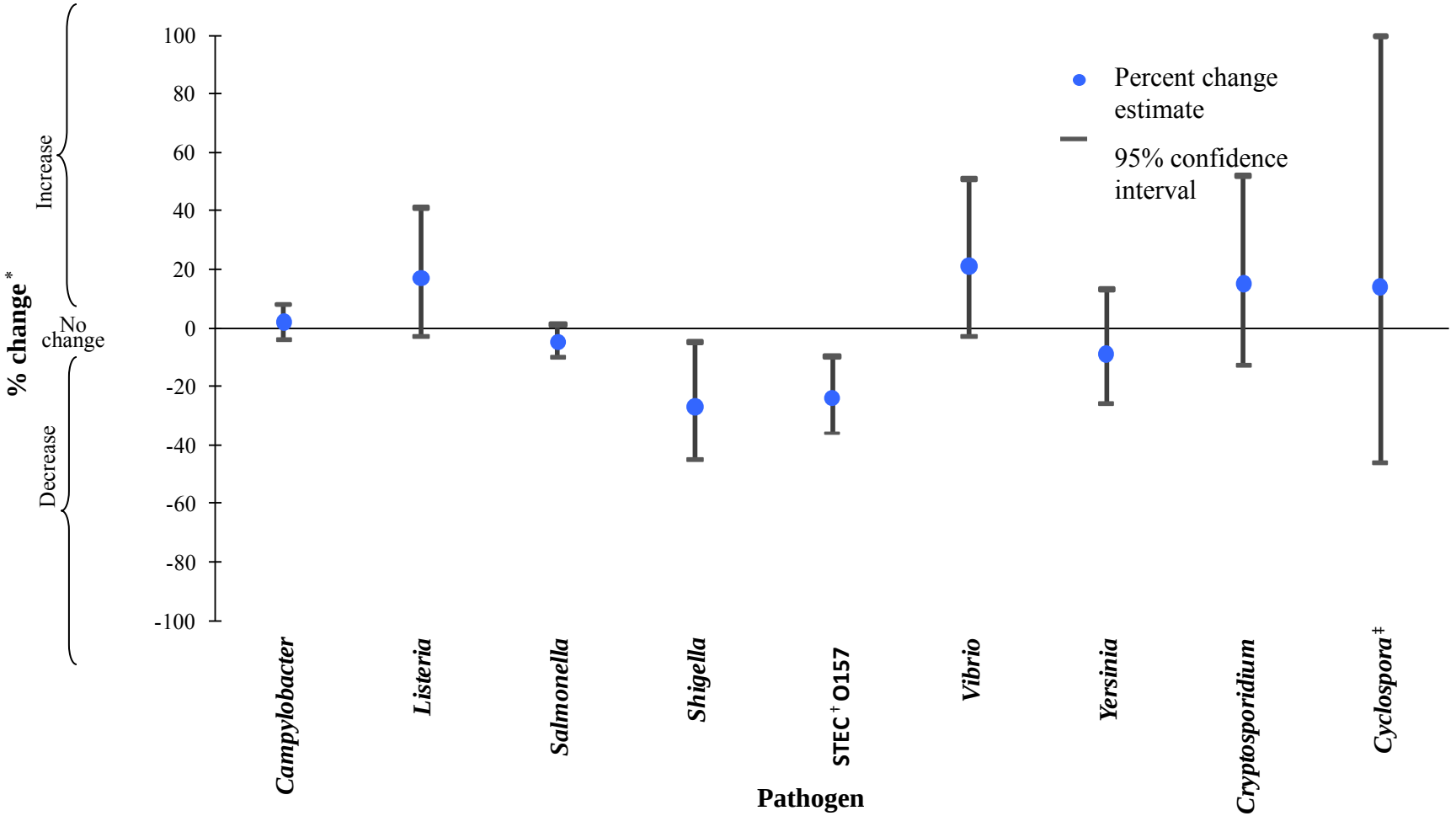
† The position of each line indicates the relative change in the incidence of that pathogen compared with 1996-1998. The actual incidences of these infections cannot be determined from this graph.

FIGURE 9. Relative Rates of Laboratory-Confirmed Infections with *Shigella*, *Yersinia*, *Cryptosporidium*, and *Cyclospora* Compared with 1996-1998 Rates, by Year —FoodNet, 1996–2009*



*The position of each line indicates the relative change in the incidence of that pathogen compared with 1996-1998. The actual incidences of these infections cannot be determined from this graph.

FIGURE 10. Percent Change in Incidence of Laboratory-Confirmed Bacterial and Parasitic Infections in 2009 Compared with Average Annual Incidence during 2006-2008, by Pathogen— FoodNet



**No significant change* = 95% confidence interval is both above and below the no change line; *significant increase* = estimate and entire 95% confidence interval are above the no change line; *significant decrease* = estimate and entire 95% confidence interval are below the no change line.

† Shiga toxin-producing *Escherichia coli*.

‡ 95% confidence interval upper limit exceeds 100%

Table 19. Summary of Post-diarrheal Hemolytic Uremic Syndrome (HUS) Cases, All Ages — FoodNet, 1997–2008

	Number of Post-diarrheal HUS Cases	Median Age (range)	Number (%) Female	Median Days (range) of Hospitalization	Number (%) of Deaths	Number (%) of Cases occurring June-September
1997-2007	795	4.4 (0–89)	465 (58%)	12.0 (0–152)	43 (5%)	467 (59%)
2008	90	4.5 (0–81)	48 (53%)	13.0 (2–116)	7 (8%)	51 (57%)

Table 20. Results of Microbiologic Testing for Shiga Toxin-producing *Escherichia coli* (STEC) Infection among Post-diarrheal HUS Case-patients — FoodNet, 1997–2008

	1997–2007		2008	
	No. (%)	**Total**	**No. (%)**	**Total**
Diarrhea in 3 weeks before HUS diagnosis / Total patients	795 (88%)	905	90 (92%)	98
Stool specimen obtained/ Total patients with diarrhea	758 (95%)	795	89 (99%)	90
Stool tested for Shiga toxin/ Patients with stool specimen obtained	341 (45%)	758	54 (61%)	89
Stool positive for Shiga toxin/ Patients with stool tested for Shiga toxin	234 (69%)	341	30 (56%)	54
Stool cultured for *E. coli* O157/ Patients with stool specimens obtained	719 (95%)	758	83 (93%)	89
E. coli O157 isolated from stool/ Patients with stool cultured for *E. coli* O157	413 (57%)	719	42 (51%)	83
Isolation of non-O157 STEC/ Patients with stool culture evaluated for non-O157 STEC and no evidence of *E. coli* O157	14 (5%)	306	1 (2%)	41
Serum positive for antibodies against *E. coli* / Patients with serum tested for antibodies against *E. coli*†	80* (64%)	125	21‡ (84%)	25

†Information on serum specimens was not collected before 2000

*Of the 80 positive serum samples, 71 had antibodies against *E. coli* O157 lipopolysacchride (LPS); four had antibodies against *E. coli* O111 LPS; 5 Unknown

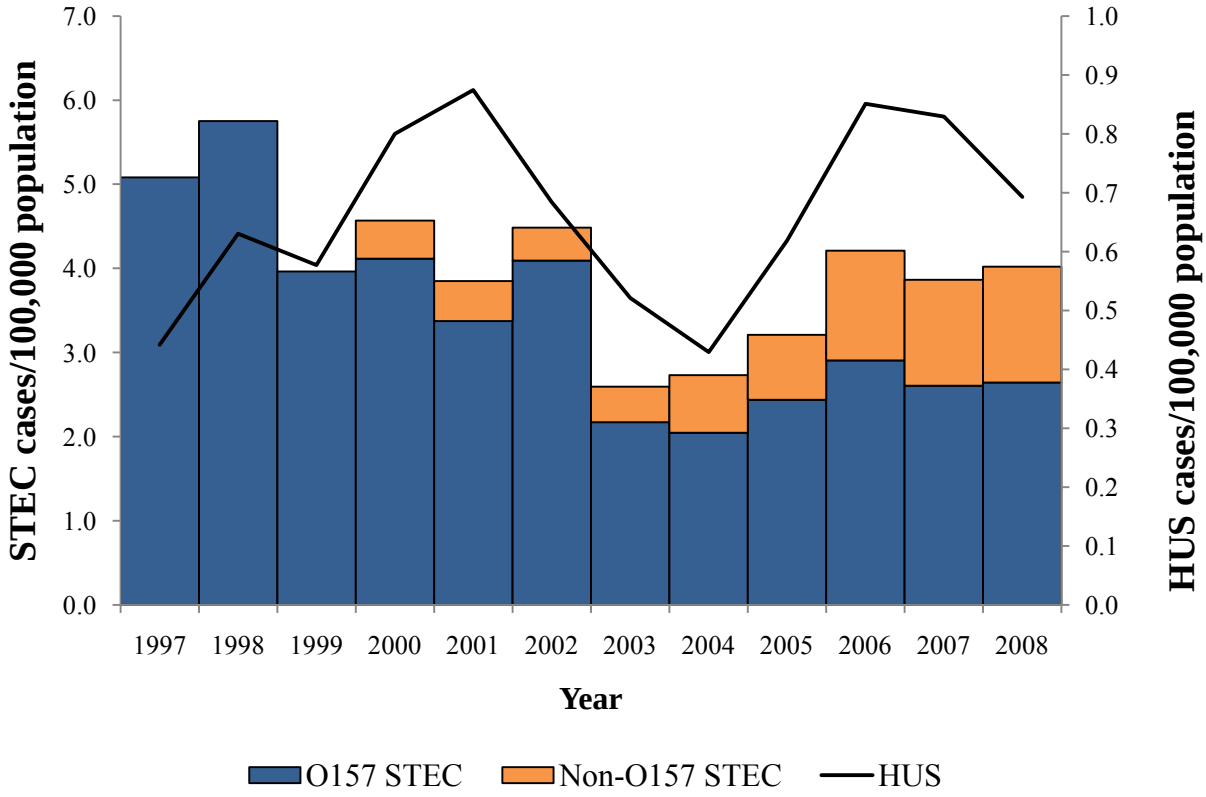
‡All 21 positive serum samples had antiobodies against *E. coli* O157 LPS

Table 21. Number and Incidence Rate* of Post-diarrheal Pediatric HUS cases†, by Site and Age Group — FoodNet, 1997–2008

State	Age <5 years		Age 5–14 years		Age 15–17 years		Age <18 years	
	#	Rate	#	Rate	#	Rate	#	Rate
CA	32	1.43	16	0.37	0	0.00	48	0.61
CO	25	1.64	13	0.47	1	0.12	39	0.76
CT	31	1.22	28	0.51	2	0.12	61	0.63
GA	69	0.96	23	0.13	4	0.10	96	0.38
MD	25	0.75	15	0.21	1	0.05	41	0.33
MN	94	2.33	51	0.60	2	0.07	147	0.97
NM	7	0.98	3	0.22	0	0.00	10	0.40
NY	37	1.81	15	0.32	4	0.16	56	0.67
OR	78	3.15	22	0.39	5	0.28	105	1.04
TN	85	2.84	35	0.58	2	0.11	122	1.12
Total	483	1.64	221	0.37	21	0.11	725	0.67

*Cases per 100,000 population.
†Includes cases among persons residing within catchment area only.
§HUS surveillance started in CO in 2001; MD in 1999; NM in 204; NY in 1998, and TN in 2000.

Figure 11. Comparison of Post-diarrheal Incidence Rates of Shiga Toxin-producing *E. coli* (STEC) and Pediatric Hemolytic Uremic Syndrome (HUS) — FoodNet, 1997–2008*



*Non-O157 STEC became a nationally notifiable disease in 2000.