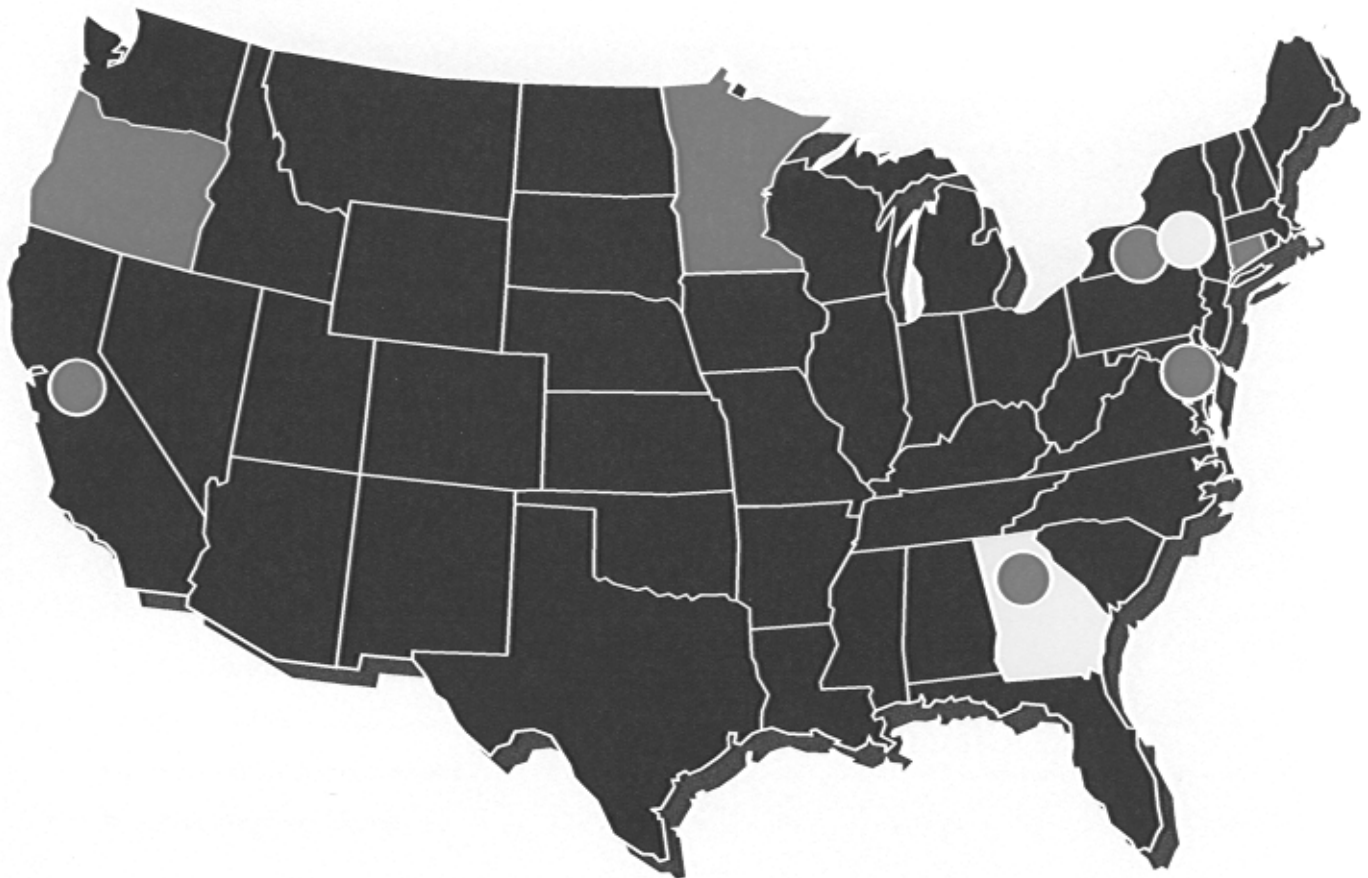


# FoodNet Surveillance Report for 1998 (Final Report)



## FoodNet

Foodborne Diseases Active Surveillance Network  
CDC's Emerging Infections Program

Centers for Disease Control and Prevention  
Division of Bacterial and Mycotic Diseases  
Foodborne and Diarrheal Diseases Branch  
March 2000



U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES  
Public Health Service  
Centers for Disease Control and Prevention

# CDC

CENTERS FOR DISEASE CONTROL  
AND PREVENTION

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## *Prologue*

The FoodNet Surveillance Report for 1998 consists of two parts: Part I, the Narrative Report, and Part II, the summary tables and graphs. The Narrative Report is based on the report "1998 Surveillance Results, Preliminary Report," written for the Department of Health and Human Services in March 1999. This new document has two revisions. First, this report uses as the denominator the 1998 postcensus population estimates, which became available in August 1999. Second, the new report includes additional cases reported since the publication of the initial report. Therefore, Tables 1A and 1B have been updated and incidence rates recalculated.

Further information concerning FoodNet, including current and previous surveillance reports, MMWR articles, and other FoodNet publications, can be obtained by contacting the Foodborne and Diarrheal Diseases Branch at telephone number 404.371.5465 or via the Internet at <http://www.cdc.gov/ncidod/dbmd/foodnet>.

***Part I***

***Narrative Report***

## ***Executive summary***

Foodborne infections are an important public health challenge. The Centers for Disease Control and Prevention (CDC) is actively involved in preventing foodborne disease. CDC's principal role in the interagency national Food Safety Initiative has been to enhance surveillance for and investigation of infections that are foodborne. These efforts will provide crucial data to identify control points, focus future prevention strategies and decision making within food safety regulatory agencies, measure changes in the burden of disease, and improve the national early warning system for food safety emergencies.

The Foodborne Diseases Active Surveillance Network (FoodNet) is the principal foodborne-disease component of the CDC's Emerging Infections Program (EIP). FoodNet is a collaborative project among CDC, the eight EIP state health department sites, the Food Safety and Inspection Service (FSIS) of the United States Department of Agriculture (USDA), and the Food and Drug Administration (FDA). As a sentinel network, FoodNet is designed to 1) produce national estimates of the burden and sources of specific foodborne diseases in the United States through active surveillance and epidemiologic studies, 2) track and interpret trends in these diseases over time and conduct studies of causes of emerging foodborne diseases, 3) document the effectiveness of new food safety control measures, such as the USDA Pathogen Reduction and Hazard Analysis and Critical Control Points (HACCP) Rule, in decreasing the number of cases of major foodborne diseases in the United States each year, and 4) respond rapidly to new and emerging foodborne pathogens. FoodNet and other efforts at CDC augment, but do not replace, longstanding activities at CDC, FSIS, FDA, and in states to identify, control, and prevent foodborne disease hazards. Enhanced surveillance and investigation are integral to the development and evaluation of new prevention and control strategies that improve the safety of our food and the public's health.

The following are key findings of FoodNet surveillance activities during 1998:

- Rates of *Campylobacter*, *Salmonella*, and *Cryptosporidium* infections declined. Although this decline might reflect simple annual fluctuations in foodborne illness, it may also reflect disease prevention efforts, particularly for campylobacteriosis and salmonellosis. These efforts include changes in meat and poultry processing in the United States mandated by the USDA HACCP Rule. The percentage of meat and poultry products sampled at processing plants that yielded *Salmonella* declined compared with baseline rates, also possibly due to the implementation of HACCP.
- The rate of *Salmonella* Enteritidis (SE) infections declined in all states except Georgia and Oregon. The possible reasons are being investigated. SE infections, particularly outbreaks, have been

commonly associated with eating undercooked eggs. An egg quality assurance program that calls for microbiologic testing and diverting eggs intended for retail stores to egg breaker plants when SE is found on a farm may have contributed to the decline in reported human illnesses.

- The large reduction in cyclosporiasis is due in part to increased public awareness of the risks associated with consuming imported raspberries and to restrictions on the importation of raspberries into the United States.
- The sustained increase in *Vibrio* rates is a reflection of multistate outbreaks of *Vibrio parahaemolyticus* in 1997 and 1998.
- The rate of *Escherichia coli* O157 infections increased in 1998 to slightly above 1996 levels, reversing a decline in 1997; the reasons for the fluctuations are unknown.
- FoodNet case-control studies of *Salmonella* infections found that eating chicken and undercooked eggs was associated with sporadic SE and sporadic *S. Heidelberg* infections. Antimicrobial use in the month before illness was associated with multi-resistant sporadic *Salmonella* Typhimurium DT104 infections. Breast-feeding was protective against infant salmonellosis. Salmonellosis was also associated with pet reptile contact.
- FoodNet surveillance contributed to the detection and investigation of a large, multistate outbreak of listeriosis. In FoodNet sites, *Listeria* infections resulted in higher rates of hospitalization than any other pathogen and caused nearly half of the reported deaths. FoodNet will conduct additional studies of *Listeria* infections to identify food sources and potential control points in 1999.

## ***Background***

Foodborne infections are an important public health challenge. The Centers for Disease Control and Prevention (CDC), the Food Safety and Inspection Service (FSIS) of the United States Department of Agriculture (USDA), the Food and Drug Administration (FDA), and the eight Emerging Infections Program (EIP) sites are actively involved in preventing foodborne diseases. Recently, the interagency national Food Safety Initiative was established to meet the public health challenge of foodborne diseases. CDC's principal role in the Food Safety Initiative has been to enhance surveillance and investigation of infections that are usually foodborne. FoodNet is one of the most important ways in which this mission is accomplished.

### ***Objectives***

The objectives of FoodNet are to determine the frequency and severity of foodborne diseases, determine the proportion of common foodborne diseases that result from eating specific foods, and describe the epidemiology of new and emerging bacterial, parasitic, and viral foodborne pathogens. To address these objectives, FoodNet uses active surveillance and conducts related epidemiologic studies. By monitoring the burden of foodborne diseases over time, FoodNet can document the effectiveness of new food safety initiatives, such as the USDA HACCP Rule, in decreasing the rate of foodborne diseases in the United States each year.

### ***Methods***

In 1998, FoodNet conducted population-based active surveillance for confirmed cases of *Campylobacter*, *Cryptosporidium*, *Cyclospora*, Shiga toxin-producing *Escherichia coli* O157, *Listeria*, *Salmonella*, *Shigella*, *Vibrio*, and *Yersinia* infections in Connecticut, Minnesota, and Oregon and selected counties in California, Georgia, Maryland, and New York (total population in bacterial catchment areas is 20.7 million, total population in parasitic catchment areas is 25 million). To identify cases, FoodNet personnel contact each of the more than 300 clinical laboratories within the catchment areas, either weekly or monthly, depending on the size of the clinical laboratory. FoodNet also conducts surveillance for hemolytic uremic syndrome through pediatric nephrologists, and surveillance for foodborne disease outbreaks.

## Results

### Cases reported

In 1998, a total of 9762 confirmed infections caused by the pathogens under surveillance were identified in the seven sites. Of these, 9187 were bacterial, including 4025 *Campylobacter* infections, 2839 *Salmonella* infections, 1480 *Shigella* infections, 500 *E. coli* O157 infections, 181 *Yersinia* infections, 112 *Listeria* infections, and 50 *Vibrio* infections (Table 1A). Among the 2525 serotyped *Salmonella* isolates, the most commonly identified serotypes were Typhimurium (827 cases), Enteritidis (403), Heidelberg (168), Newport (90), and Braenderup (61). In addition, 575 cases of parasitic diseases were reported, including 566 cases of *Cryptosporidium* infection and 9 cases of *Cyclospora* infection (Table 1B).

**Table 1A. Cases of infections caused by specific bacterial pathogens, reported by FoodNet sites, 1998**

Pathogen	CA	CT	GA	MD	MN	NY	OR	Total
<i>Campylobacter</i>	789	603	468	246	1004	222	693	4025
<i>E. coli</i> O157	35	58	51	24	209	22	101	500
<i>Listeria</i>	11	29	19	11	18	8	16	112
<i>Salmonella</i>	329	486	505	438	581	201	299	2839
<i>Shigella</i>	236	72	585	56	327	48	156	1480
<i>Vibrio</i>	10	6	17	6	2	0	9	50
<i>Yersinia</i>	33	22	57	14	35	5	15	181
<b>Total</b>	<b>1443</b>	<b>1276</b>	<b>1702</b>	<b>795</b>	<b>2176</b>	<b>506</b>	<b>1289</b>	<b>9187</b>

**Table 1B. Cases of infections caused by specific parasitic pathogens, reported by FoodNet sites, 1998**

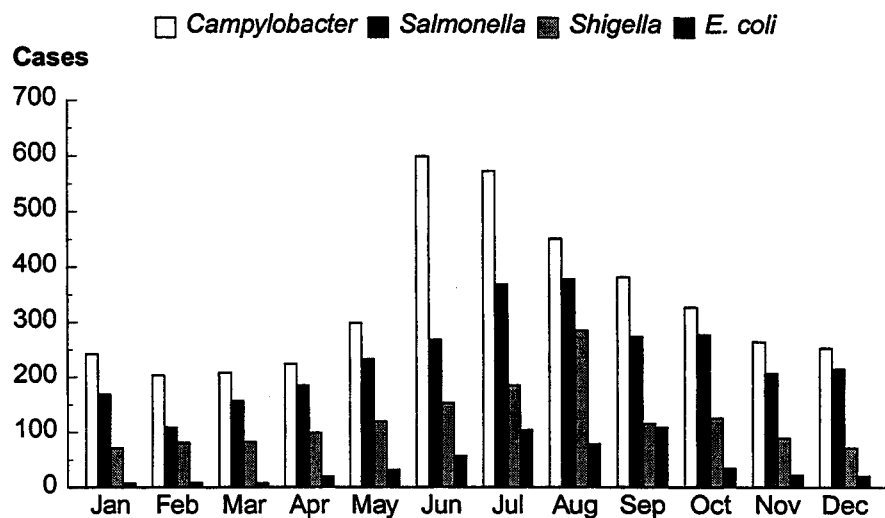
Pathogen	CA	CT	GA	MD	MN	NY	OR	Total
<i>Cryptosporidium</i>	153	43	93	13	173	22	69	566
<i>Cyclospora</i>	1	6	0	1	0	0	1	9
<b>Total</b>	<b>154</b>	<b>49</b>	<b>93</b>	<b>14</b>	<b>173</b>	<b>22</b>	<b>70</b>	<b>575</b>



### Seasonality

Isolation rates for several pathogens showed wide seasonal variation; 68% of *Vibrio*, 47% of *E. coli* O157, 40% of *Campylobacter*, and 36% of *Salmonella* were isolated during June through August (Figure 1). Forty-four percent of cyclosporiasis cases and 33% of cryptosporidiosis cases were identified during the summer months. *Yersinia* infections were more likely to have occurred in winter months with 40% of cases being reported during January, February, or December.

**Figure 1. Cases of foodborne disease caused by specific pathogens, by month, FoodNet sites, 1998**



### 1998 Rates

Annual incidence rates were calculated to compare the number of cases among sites with different populations. Incidence is the number of cases divided by the population. All 1998 rates reported here were calculated with 1998 population estimates. Overall incidence rates were highest for infections with *Campylobacter* (19.4/100,000 population), *Salmonella* (13.7/100,000), and *Shigella* (7.1/100,000). Lower overall incidence rates were reported for *E. coli* O157 (2.4/100,000), *Cryptosporidium* (2.3/100,000), *Yersinia* (0.9/100,000), *Listeria* (0.5/100,000), *Vibrio* (0.2/100,000), and *Cyclospora* (0.0/100,000).

### 1996-1998 Rates

Overall incidence rates of illness caused by pathogens under surveillance declined in the five original sites from 1996 to 1998 (Table 2). Infections caused by *Salmonella* decreased from 14.5/100,000 in 1996 to 12.3/100,000 in 1998. This decrease was particularly pronounced for serotype Enteritidis, which dropped from 2.5/100,000 to 1.4/100,000. Although *Campylobacter* rates increased slightly from 1996 to 1997 (23.5/100,000 to 25.2/100,000), 1998 rates experienced a substantial decline (21.4/100,000). After showing a decline from 1996 to 1997, *E. coli* O157 infections increased in 1998 to 2.8/100,000. The incidence of *Vibrio* infections, which had increased substantially from 1996 to 1997, remained elevated in 1998. Incidence rates for *Listeria* and *Yersinia* infections were similar for the 3 years. The incidence of illness caused by *Cryptosporidium* dropped from 2.8/100,000 in 1997 to 2.3/100,000 in 1998, and *Cyclospora* incidence decreased from 0.3/100,000 in 1997 to 0.0/100,000 in 1998. Compared with 1997, Georgia reported an overall increase in the incidence of illnesses caused by the pathogens under surveillance while California, Connecticut, Minnesota, and Oregon reported decreases.

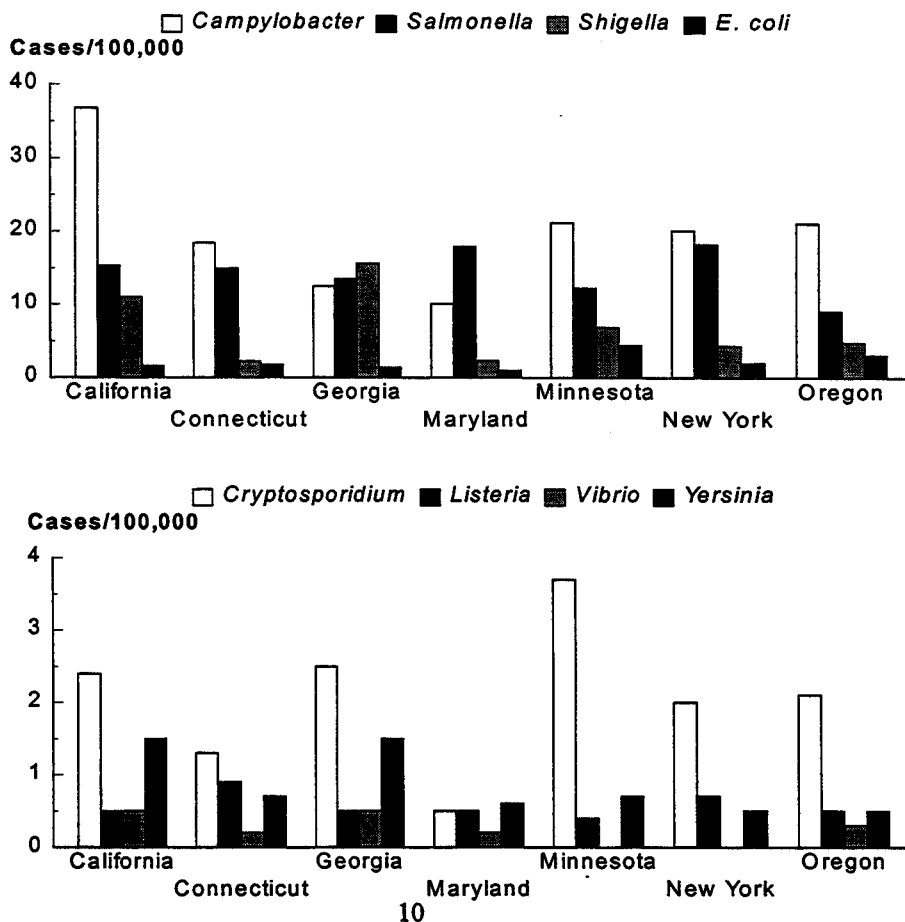
**Table 2. Cases per 100,000 of specific bacterial foodborne pathogens for the five original FoodNet sites, 1996-1998**

Pathogen	1996	1997	1998
<i>Campylobacter</i>	23.5	25.2	21.4
<i>E. coli</i> O157	2.7	2.3	2.8
<i>Listeria</i>	0.5	0.5	0.6
<i>Salmonella</i>	14.5	13.6	12.3
<i>Shigella</i>	8.9	7.5	8.5
<i>Vibrio</i>	0.1	0.3	0.3
<i>Yersinia</i>	1.0	0.9	1.0
<b>Total</b>	<b>51.2</b>	<b>50.3</b>	<b>46.9</b>

**Rates by site**

Incidence rates for many of these pathogens varied substantially among the sites (Figure 2). The incidence rates for *Campylobacter* infection varied from 10.1/100,000 in Maryland to 36.8/100,000 in California, and for *Shigella* infections, from 2.2/100,000 in Connecticut to 15.6/100,000 in Georgia. Although incidence rates for *Salmonella* infection were similar among the sites, the rates for *Salmonella* serotype Enteritidis infection varied dramatically, from 0.6/100,000 in Georgia to 5.0/100,000 in Maryland. Rates of infection with *Salmonella* Typhimurium varied from 3.0/100,000 in California to 5.2/100,000 in Minnesota. Incidence rates for *E. coli* O157 infection varied from 1.0/100,000 in Maryland to 4.4/100,000 in Minnesota. Infections caused by *Yersinia* varied from 0.5/100,000 in New York to 1.5/100,000 in California and Georgia. Incidence rates of *Cryptosporidium* cases ranged from 0.5/100,000 in Maryland to 3.7/100,000 in Minnesota. Reasons for these regional differences in incidence rates are being investigated; many of these differences may be due to variations in testing practices, for example, since most laboratories do not test specimens routinely for all pathogens.

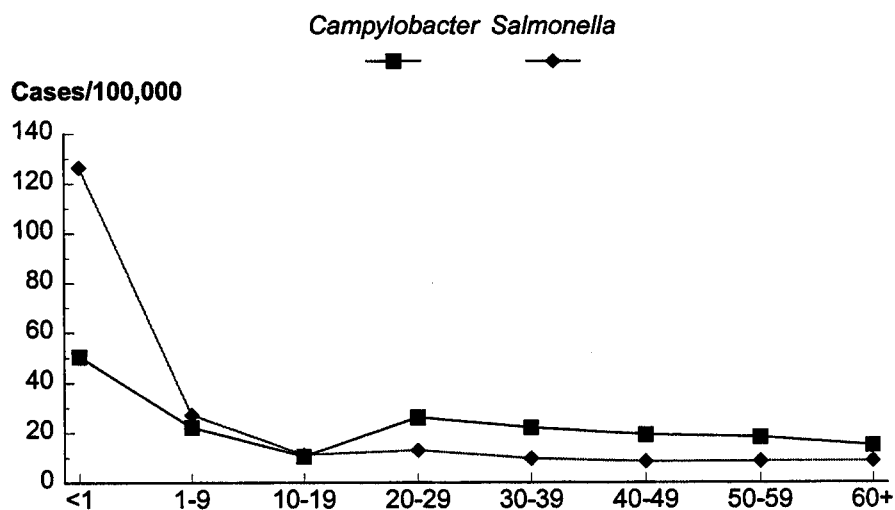
**Figure 2. Cases per 100,000 population of foodborne disease caused by specific pathogens, FoodNet sites, 1998**



**Rates by age**

Annual incidence rates of foodborne illness varied by age, especially for *Campylobacter* and *Salmonella* infections (Figure 3). For children <1 year of age, the rate of *Salmonella* infection was 126.4/100,000, and the rate of *Campylobacter* infection was 50.4/100,000, both substantially higher than for other age groups.

**Figure 3. Incidence of *Campylobacter* and *Salmonella* infections by age group, FoodNet sites, 1998**



### **Rates by gender**

Incidence rates varied by sex (Table 3). Overall, males were more likely than females to be infected with one of these pathogens. In particular, rates of *Campylobacter* infection were 30% higher among males than among females.

**Table 3. Sex-specific incidence rates per 100,000 population, by pathogen, FoodNet sites, 1998**

<b>Pathogen</b>	<b>Male</b>	<b>Female</b>	<b>Overall</b>
<i>Campylobacter</i>	22.0	16.9	19.4
<i>Cryptosporidium</i>	2.7	1.8	2.3
<i>Cyclospora</i>	0.04	0.03	0.0
<i>E. coli</i> O157	2.4	2.4	2.4
<i>Listeria</i>	0.6	0.5	0.5
<i>Salmonella</i>	13.8	13.6	13.7
<i>Shigella</i>	7.3	7.1	7.1
<i>Vibrio</i>	0.3	0.2	0.2
<i>Yersinia</i>	1.0	0.8	0.9
<b>Total</b>	<b>47.4*</b>	<b>41.5*</b>	<b>44.2*</b>

\* Excludes *Cryptosporidium* and *Cyclospora*

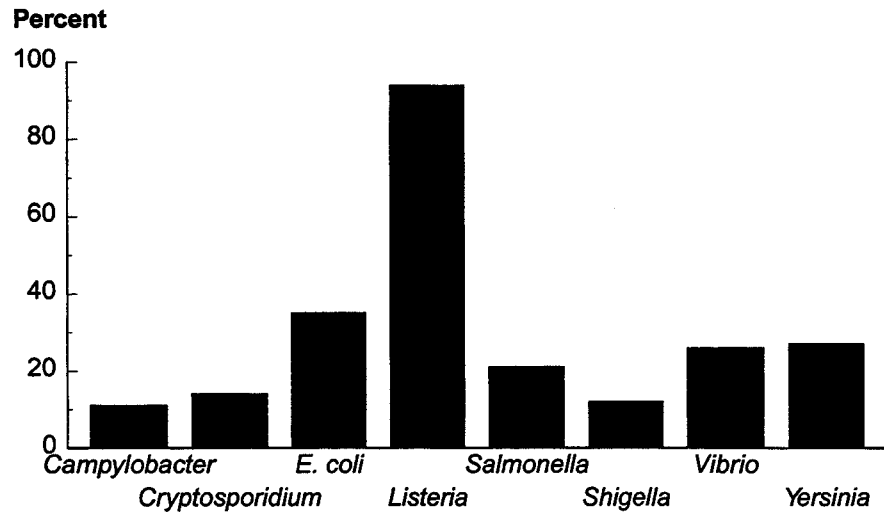
### **Rates by age and gender**

The incidence rate of *Campylobacter* infection was higher for males than for females in all age groups. In contrast, although rates of *Salmonella* infection were higher for male infants and persons aged 1-19 years compared with females, rates were higher among females for all other age groups.

### **Hospitalizations**

Data on hospitalization show that overall, seventeen percent of persons with culture-confirmed illness were hospitalized; hospitalization rates differed markedly by pathogen (Figure 4). The rate of hospitalization was highest for persons infected with *Listeria* (95%) followed by those infected with *E. coli* O157 (35%), *Yersinia* (27%), *Vibrio* (26%), *Salmonella* (21%), *Shigella* (12%), and *Campylobacter* (11%).

**Figure 4. Percentage of persons hospitalized with infections caused by specific pathogens, FoodNet sites, 1998**



### **Deaths**

Thirty-three persons died; of those, 13 were infected with *Listeria*, 11 with *Salmonella*, two with *E. coli* O157, two with *Campylobacter*, three with *Cryptosporidium*, one with *Vibrio*, and one with *Yersinia*. The pathogen with the highest case-fatality rate was *Listeria*; 12% of persons infected with *Listeria* died.

### **HUS**

Hemolytic uremic syndrome (HUS) is a life-threatening illness characterized by hemolytic anemia, thrombocytopenia, and acute renal failure. Approximately 90% of HUS cases in the United States are caused by infection with Shiga toxin-producing *Escherichia coli* (STEC). Although *E. coli* O157:H7 (O157) is the most easily and most frequently isolated, many other STEC serotypes can also cause HUS.

HUS surveillance in FoodNet sites began in 1997. In 1998, a total of 52 cases were reported from FoodNet sites (Table 4A). Twenty-five (48.1%) of these reported cases were diagnosed in the summer months of June, July, and August (Figure 5). For both years combined, the overall annual rate of post-diarrheal HUS among residents in the FoodNet sites was 7.2 cases per million for children under 16 years of age and 18.1 cases per million for children under 5 years of age (Table 4B). *E. coli* O157:H7 was identified in approximately half (52.2%) of stools cultured for this organism (Table 4C). There was 1 death in 1997 and 4 deaths in 1998.

**Table 4A. 1997-1998 HUS Surveillance: Total cases by site and year\***

State	1997	1998
California	10	9
Connecticut	1	0
Georgia	8	14
Maryland	n/a	2
Minnesota	12	21
New York	n/a	0
Oregon	10	6
<b>Total</b>	<b>41</b>	<b>52</b>

\*Includes cases among persons who live outside the formal catchment area.

**Table 4B. 1997-1998 HUS Surveillance: Post-diarrheal HUS among children, by site and year**

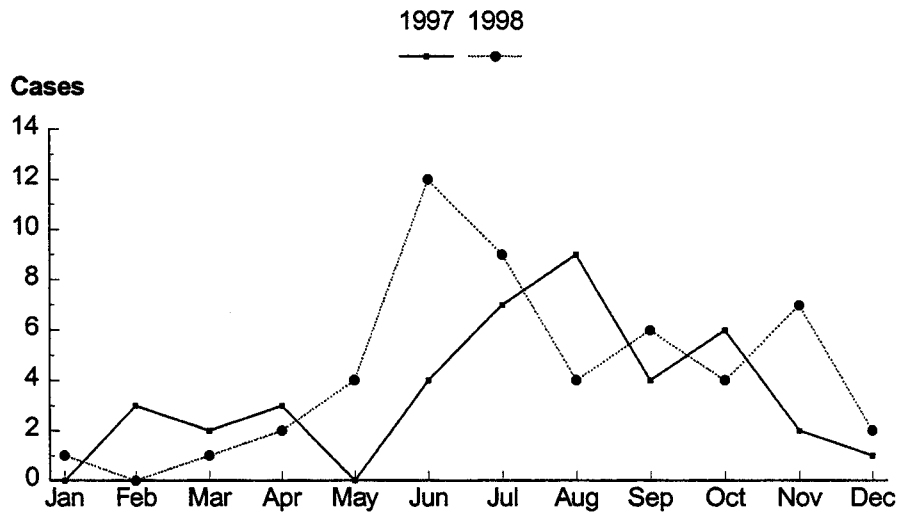
State	Children under 16 years old		Children under 5 years old	
	Cases	Rate per 1,000,000	Cases	Rate per 1,000,000
California	9	10.7	6	22.2
Connecticut	1	0.7	1	2.3
Georgia	11	6.4	8	14.2
Maryland*	2	3.7	2	12.3
Minnesota	27	12.2	20	31.6
New York*	0	0	0	0
Oregon	12	8.3	10	23.3
<b>Total</b>	<b>62</b>	<b>7.2</b>	<b>47</b>	<b>18.1</b>

\* Rates adjusted to reflect that MD and NY were not FoodNet participants in 1997.

**Table 4C. 1997-1998 HUS Surveillance: Results of microbiologic testing**

Patient had diarrhea in the 3 weeks before HUS diagnosis	86/93 (92.5%)
Stool culture obtained	80/86 (93.0%)
Stool cultured for O157	69/80 (86.3%)
O157 isolated from stool	36/69 (52.2%)
Stool tested for Shiga toxin by EIA	6/80 (7.5%)
Non-O157 STEC isolated from stool	0/6 (0%)

**Figure 5. 1997-1998 HUS Surveillance: Total Cases of Post-diarrheal HUS, by Year and Month**





## ***Outbreaks***

A foodborne disease outbreak is defined as an incident with two or more persons ill caused by ingestion of a common food. The overall rate of foodborne disease outbreaks in which 10 or more persons become ill reported in FoodNet sites was 3.7 outbreaks per million population, ranging from 0.8 outbreaks per million in Georgia to 8.1 outbreaks per million in New York (Table 5).

**Table 5: Outbreaks reported with 10 or more persons ill, FoodNet sites, 1998**

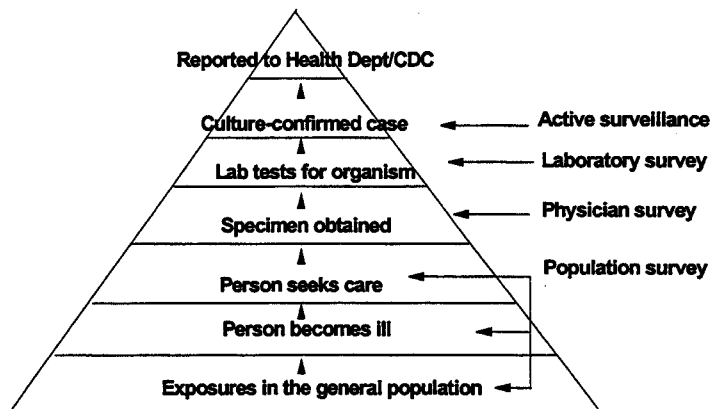
<b>Site</b>	<b>Number</b>	<b>Rate/1,000,000</b>
<b>California</b>	12	5.7
<b>Connecticut</b>	7	2.1
<b>Georgia</b>	3	0.8
<b>Maryland</b>	9	3.7
<b>Minnesota</b>	24	5.1
<b>New York</b>	9	8.1
<b>Oregon</b>	12	3.6
<b>Total</b>	<b>76</b>	<b>3.7</b>

## *Additional Studies*

### ***Burden of illness***

Cases reported through active surveillance represent a fraction of the number of cases in the community. To better estimate the number of cases of foodborne disease in the community, we have conducted surveys of laboratories, physicians, and the general population in the FoodNet sites (Figure 5). Using these data, we can determine the proportion of people in the general population with a diarrheal illness and from among those, the number who seek medical care for the illness. We can estimate the proportion of physicians who ordered a bacterial stool culture for patients with diarrhea, and we can evaluate how variations in testing for bacterial pathogens influence the number of culture-confirmed cases. Using FoodNet and other data, CDC estimates that there were 76 million illnesses, 325,000 hospitalizations, and 5,000 deaths in 1997 in the United States.

**Figure 5. Burden of Illness Pyramid**



This model, which indicates for each culture-confirmed person there are 38 ill persons who do not seek care, can be used for developing estimates of the burden of illness caused by each foodborne pathogen. For example, data from this model suggest that in 1997 there were 1,400,000 *Salmonella* infections, resulting in 113,000 physician office visits, and 37,200 culture-confirmed cases in this country. Culture-confirmed cases alone resulted in an estimated 8500 hospitalizations and 300 deaths; additional hospitalizations and deaths occur among persons whose illness is not culture-confirmed.

***Causes of foodborne diseases***

As part of FoodNet, case-control studies are conducted to determine the proportion of foodborne diseases that are caused by specific foods or food preparation and handling practices. By determining this proportion, health officials can make their prevention efforts more specific and document their effectiveness.

- ***E. coli* O157 case-control studies**

A case-control study of *E. coli* O157:H7 infections conducted at FoodNet sites in 1997 found that undercooked ground beef was the principal food source of these infections. A follow-up case-control study in 1999, which will include subtyping of isolates by pulsed-field gel electrophoresis (PFGE), will again evaluate the role of undercooked ground beef and examine risk and prevention factors for *E. coli* O157 infections.

- ***Salmonella* case-control studies**

Eating chicken and undercooked eggs was associated with sporadic *Salmonella* Enteritidis and *Salmonella* Heidelberg infections. Antimicrobial use in the month before illness was associated with multiresistant *Salmonella* Typhimurium DT104 infections. Breast-feeding was found to be protective against infant salmonellosis. Reptile contact was associated with salmonellosis.

- ***Campylobacter* case-control study**

In 1998, a FoodNet case-control study to determine risk and prevention factors for *Campylobacter* infection enrolled more than 1200 case-patients and 1200 controls. Analysis is ongoing. A pilot study in four FoodNet sites showed that domestically acquired fluoroquinolone-resistant *Campylobacter* has emerged in the United States.

- ***Listeria* case-control study**

To determine sources and risk factors for listeriosis, a FoodNet case-control study will begin in February 2000.

- ***Cryptosporidium* case-control study**

A FoodNet case-control study is being conducted to determine sources and risk factors for *Cryptosporidium* infection.

## *Future activities*

- Continue population-based surveillance for *Campylobacter*, *Cryptosporidium*, *Cyclospora*, *Salmonella*, *Shigella*, Shiga toxin-producing *Escherichia coli*, *Listeria*, *Yersinia*, and *Vibrio* infections and for hemolytic uremic syndrome (HUS).
- Conduct surveillance for all foodborne disease outbreaks of any cause that occur within the FoodNet sites and pilot electronic reporting of outbreaks.
- Expand the population under active surveillance to include the entire state of Georgia and additional counties in New York. In 1999, the population within the catchment areas will include 29.9 million persons or 11% of the U.S. population.
- Conduct an additional case-control study of *E. coli* O157 infections, which will include PFGE subtyping of isolates.
- Conduct a case-control study of *Cryptosporidium* infections.
- Conduct a case-control study of *Listeria* infections.
- Conduct a physician survey on food safety education practices.
- Repeat a survey of microbiology laboratories in FoodNet sites to determine changes in laboratory practices.
- Repeat the Population survey among residents in FoodNet sites.

**The following reports are available at the FoodNet web site:**

<http://www.cdc.gov/ncidod/dbmd/foodnet>

CDC. 1996 Final FoodNet Surveillance Report. Atlanta: Centers for Disease Control and Prevention; 1998.

CDC. 1997 Final FoodNet Surveillance Report. Atlanta: Centers for Disease Control and Prevention; 1998.

CDC. The Catchment. Atlanta: Centers for Disease Control and Prevention; Vol.1, No.1, Fall 1998.

**The following MMWR articles about FoodNet are available at this web site:**

<http://www.cdc.gov/epo/mmwr/mmwr.html>

CDC. The Foodborne Diseases Active Surveillance Network, 1996. Morbidity and Mortality Weekly Report. 1997; 46(12):258-61.

CDC. Incidence of foodborne illness-FoodNet, 1997. Morbidity and Mortality Weekly Report. 1998; 47(37):782-86.

## ***1998 FoodNet Publications***

The following is a list of FoodNet manuscripts and abstracts published in 1998. A complete listing of all FoodNet manuscripts and abstracts is available at the FoodNet website:

<http://www.cdc.gov/ncidod/dbmd/foodnet>

### ***Manuscripts***

Angulo FJ, Voetsch AC, Vugia D, et al. Determining the burden of human illness from foodborne diseases: CDC's Emerging Infectious Disease Program Foodborne Diseases Active Surveillance Network (FoodNet). *Microbial Foodborne Pathogens, Veterinary Clinics of North America* 14:165-72.

### ***Abstracts***

Angulo FJ, Voetsch AC, Swerdlow DL, et al. Determining the burden of foodborne illness: FoodNet 1996-97 [Abstract]. In: Program and Abstracts of the International Conference on Emerging Infectious Diseases, Atlanta, March 8-11, 1998. Washington, D.C.: American Society for Microbiology, 1998;84.

Baer JT, Vugia DJ, Reingold AL, Aragon T, Angulo FJ, Bradford WZ. Epidemiology of shigellosis in San Francisco during the HIV era. In: Program and Abstracts of the International Conference on Emerging Infectious Diseases, Atlanta, March 8-11, 1998. Washington, D.C.: American Society for Microbiology, 1998;114.

Bender J, Mead P, Voetsch D, et al. Hemolytic uremic syndrome (HUS) cases identified in the 1996 FoodNet *Escherichia coli* O157:H7 surveillance. [Abstract] In: Program and Abstracts of the International Conference on Emerging Infectious Diseases, Atlanta, March 8-11, 1998. Washington, D.C.: American Society for Microbiology, 1998;116.

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