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Foodborne Illness in Connecticut, 2004-2012

Foodborne diseases are an important public health problem in the United States and Connecticut. The Centers for Disease Control and Prevention (CDC) estimates that food transmission is associated with approximately 48 million illnesses, 128,000 hospitalizations, and 3,000 deaths each year (*1*). To better understand the epidemiology of foodborne infections, the CDC established the Foodborne Diseases Active Surveillance Network (FoodNet). FoodNet currently collects data in 10 sites in the United States on select pathogens commonly transmitted through food. In Connecticut, FoodNet is a collaborative effort between the Connecticut Department of Public Health (DPH) and the Yale School of Public Health. This report summarizes 2012 surveillance data and describes trends and outbreaks in Connecticut since 2004.

In Connecticut, FoodNet enhances routine public health surveillance for enteric diseases, and allows for better identification, monitoring, and response to new and emerging foodborne diseases. Active population based surveillance is conducted for laboratory–confirmed reportable infections caused by *Campylobacter*, *Cryptosporidium*, *Cyclospora, Listeria*, *Salmonella*, Shiga toxin-producing *Escherichia coli* O157 (STEC) and non-O157 STEC, *Shigella*, *Vibrio*, and *Yersinia*. Hospitalizations occurring within 7 days of specimen collection date are recorded as well as outcome at hospital discharge, or at 7 days after specimen collection date if no hospitalization is documented (*2*). Demographic and clinical information are also recorded.

In 2012, a total of 1,266 laboratory-confirmed infections associated with foodborne diseases were reported, of which there were 289 (23%) hospitalizations, and 6 (0.5%) deaths. The incidence per 100,000 population by pathogen, were as follows: *Campylobacter* (16.8), *Salmonella* (12.7), *Shigella* (1.2), *Cryptosporidium* (1.2), non-O157 STEC (0.9), *Vibrio* (0.7), *Listeria* (0.6), *Yersinia* (0.6), O157 STEC (0.5) and *Cyclospora* (0.2) (Table 1). The percentage of patients hospitalized ranged from 12.2% for *Cryptosporidium* to 100% for *Listeria*. The case fatality ratio was highest among those infected with *Listeria* (8.7) and *Vibrio* (4.2.) (Table1). Children < 5 years of age were reported with the highest incidence of infection with *Salmonella* (28.2), STEC non–O157 (3.0), and *Yersinia* (2.0). Adults aged ≥ 65 years had the highest rate of infection with *Campylobacter* (22.9), *Listeria* (2.6), and *Vibrio* (2.2) (Table 2, page 10).

Of the 455 reported cases of *Salmonella* infection, the 3 most common serotypes identified were Enteritidis 127 (28%), Typhimurium 65 (14%), and Newport 34 (7%). Of the 24 cases of *Vibrio*, 18 (75%) were identified as *V. parahaemolyticus*. Of the 32 STEC non

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Table 1. Number of cases of bacterial and parasitic infection, hospitalization and deaths by pathogen—Connecticut FoodNet data 2012

	Cases		Hospitalization		Deaths	
Bacteria	**Number**	**Incidence***	**Number**	**Percent**	**Number**	**CFR^**
Campylobacter	599	16.8	103	17.2%	0	0.0
Salmonella	455	12.7	115	25.3%	3	0.7
Shigella	44	1.2	12	27.3%	0	0.0
STEC O157	19	0.5	6	31.6%	0	0.0
STEC non-O157	32	0.9	8	25.0%	0	0.0
Listeria	23	0.6	23	100.0%	2	8.7
Vibrio	24	0.7	7	29.2%	1	4.2
Yersinia	23	0.6	9	39.1%	0	0.0
Parasites						
Cryptosporidium	41	1.2	5	12.2%	0	0.0
Cyclospora	6	0.2	1	16.7%	0	0.0
Total	1266	35.4	289	22.8%	6	0.5

* Incidence per 100,000 population CT 2010 census.

^ Case Fatality Ratio

Table 2. Incidence* of laboratory-confirmed bacterial and parasitic infection cases by age group and pathogen—Connecticut FoodNet data 2012

	Incidence by age group (years)				
Bacteria	**<5**	**5-9**	**10-19**	**20-64**	**≥65**
Campylobacter	18.8	9.4	12.6	16.8	22.9
Salmonella	28.2	12.6	12.8	11.8	10.3
Shigella	2.5	3.2	1.4	1.2	0.0
STEC O157	0.5	1.8	0.6	0.5	0.2
STEC non-O157	3.0	1.8	1.2	0.4	1.4
Listeria	0.5	0.0	0.0	0.4	2.6
Vibrio	0.0	0.0	0.2	0.6	2.2
Yersinia	2.0	0.9	0.2	0.6	0.8
Parasites					
Cryptosporidium	1.0	0.9	1.0	1.3	1.0
Cyclospora	0.0	0.0	0.0	0.2	0.2

* Incidence per 100,000 population CT 2010 census.

O157, the most common serogroups were O26, 5(16%), and O103, O111, O121 with 4 (12%) each. Of the 599 *Campylobacter* isolates 295 (51%) were *C. jejuni*.

During 2004-2012, overall trends show statistically significant changes in incidence for infections caused by *Campylobacter* (35% increase, χ^2 for trend 8.6, p=0.003) *Vibrio* (212% increase, χ^2 for trend 15.8, p=0.000), *Shigella* (41% decrease, χ^2 for trend 6.8, p=0.009), STEC O157 (64% decrease, χ^2 for trend 12.9, p=0.000) and *Cyclospora* (92% decrease, χ^2 for trend 5.9, p=0.02). Infections caused by all other enteric pathogens under FoodNet surveillance have remained stable.

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Editorial

Foodborne illness affects approximately one in six persons in the United States every year. Infants and young children, pregnant women, the elderly and those who are immunocompromised are more likely to be affected and have poor outcomes. In Connecticut, the highest rates of foodborne infections were seen among children under 5 years of age and those who are 65 years of age and older. The ≥65 age group also experienced the highest proportion of hospitalization and death.

During 2004-2012, a significant increase in incidence was seen in infections caused by *Campylobacter* and *Vibrio*; was relatively unchanged for *Cryptosporidium*, *Listeria*, *Salmonella*, and *Yersinia*; and decreased significantly for *Shigella*, STEC O157, and *Cyclospora*. These findings highlight the need to continue active surveillance for these foodborne pathogens, and case-patient interviews to identify potential exposures and detect outbreaks.

In Connecticut, and nationally, the incidence of Campylobacteriosis has increased to its highest levels since 2000. Although most infections are self-limited, sequelae include reactive arthritis and Guillain-Barré syndrome (*3*). Associated exposures include consumption of poultry, raw milk, contaminated produce, untreated water, and animal contact (*3*). Infections are most common in children under the age of 5 and in adults 65 and older. Detailed patient exposure information could help in assessing the relative contribution of various sources of infection.

FoodNet surveillance relies on the isolation of bacterial pathogens by culture methods. The increasing use of culture independent diagnostic tests (CIDT) for various pathogens might have a significant impact on incidence rates in the future. Laboratory surveys conducted by FoodNet in Connecticut show a growing number of laboratories using shiga-toxin testing for determining infection caused by non O157 *E. coli*; currently no laboratories in Connecticut are using CIDT methods to test for *Campylobacter* in stool. However, with the availability of an increasing number of CIDT that can identify multiple pathogens, the paradigm will be shifting to one that highlights the importance of surveillance of testing methods to explain trends.

Although the number of *Vibrio* infections is low, the increase in Connecticut is significant over time. *Vibrios* live naturally in marine and estuarine waters, and infections are acquired by consuming raw or undercooked seafood, in particular oysters (*4*). *Vibrio spp.* may also cause wound and soft tissue infections among persons with open wounds through direct contact with seawater. Most *Vibrio* infections occur during the summer months when waters are warmer and contain more *Vibrio* organisms. Infections can be prevented by using postharvest treatment of oysters with heat-cool pasteurization, individual quick freezing, or high hydrostatic pressure methods. Thorough cooking will also prevent infection. Persons who are immunocompromised or have impaired liver function should be informed that consuming raw or undercooked seafood carries a risk for severe and potentially life-threatening infections.

Most foodborne illness can be prevented by following food storage, handling and preparation guidelines. Increased resources for regulatory practices, controls and inspections along the food chain can help decrease foodborne illness. Continued efforts to maintain comprehensive active surveillance is essential to monitor trends, identify at risk populations, and attribute the infections to various commodities and sources. Focused educational campaigns are necessary. The CDC offers information for both the consumer and health care providers on their website (*5*). This information highlights general safety measures and disease summaries, as well as risks and specific information for vulnerable populations.

References

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Foodborne Disease Outbreaks, Connecticut, 2004-2012

In Connecticut, suspected foodborne disease outbreaks are physician reportable to both the state Department of Public Health (DPH) and local health departments by telephone on the day of recognition or strong suspicion. Outbreaks are also identified through monitoring of surveillance and laboratory data, and public notification. A foodborne disease outbreak is defined as the occurrence of two or more similar illnesses resulting from the ingestion of a common food. During foodborne outbreak investigations, local and state public health officials work closely together to identify the etiology, vehicle of transmission, and contributing factors that help determine control measures. The information acquired from these outbreaks can potentially help develop effective methods for preventing future outbreaks. In 2012, Connecticut became the seventh site in the country to join the Foodborne Diseases Centers for Outbreak Response Enhancement (FoodCORE) (*1*). FoodCORE sites collaborate to develop novel methods to detect, investigate, and control foodborne disease outbreaks. In Connecticut, FoodCORE is a joint effort between the DPH and the Yale School of Public Health. This report summarizes foodborne disease outbreaks reported in Connecticut during 2004-2012.

During 2004–2012, a total of 156 foodborne disease outbreaks were identified (median 18 per year, range 13-24); of these, 26 (17%) were multistate outbreaks (Figure 1). Of the 156 outbreaks, 91 (58%) were reported from the public. Other outbreaks were most commonly detected through the following methods: pulsed-field gel electrophoresis (PFGE) 22 (14%), pathogen-specific surveillance 17 (11%), and reporting from healthcare providers 16 (10%) (Figure 2).

Figure 1. Number of reported foodborne outbreaks, Connecticut, 2004-2012 (N=156)

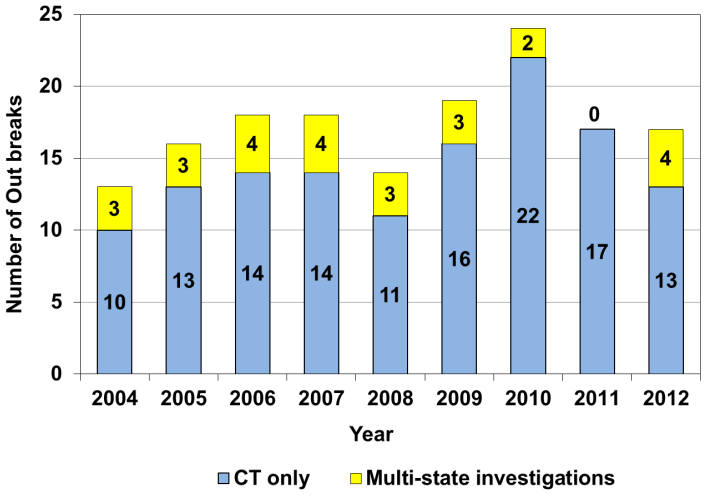
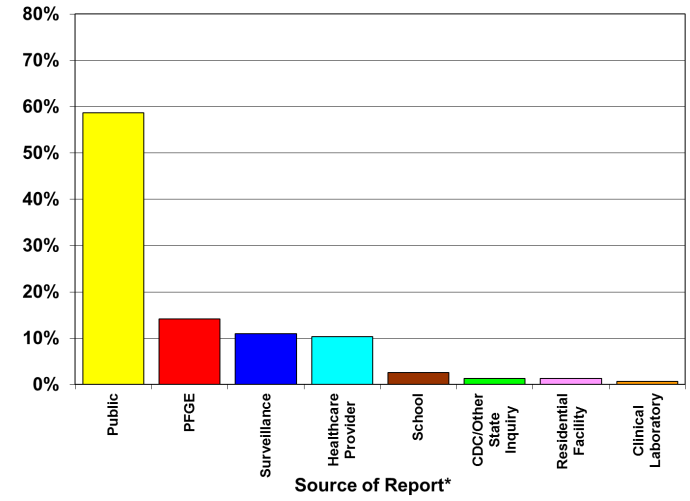


Figure 2. Foodborne outbreaks by reporting source, Connecticut, 2004-2012 (N=156)



* Reporting source missing for one outbreak

A total of 80 (51%) outbreaks were caused by viruses, 57 (37%) by bacteria, 5 (3%) by toxins, and 2 (1%) by parasites. The etiologic agent was undetermined in 12 (8%) outbreaks. All viral outbreaks were caused by norovirus (70 laboratory-confirmed, 10 suspected). Among bacterial outbreaks, 37 (65%) were caused by *Salmonella* spp., 11 (19%) by *E. coli* O157, 4 (7%) *Clostridium perfringens*, 2 (4%) *Staphylococcus aureus*, 1 (2%) *Campylobacter*, 1 (2%) *Shigella*, and 1 (2%) *Vibrio*. The most common settings for outbreaks were food service establishments (FSE) 100 (64%) and private homes 38 (24%). Overall, 92 (59%) outbreaks were associated with contamination or mishandling of foods at FSE, and 32 (21%) with commercially distributed contaminated food items.

In total, an estimated 2,147 illnesses (mean 14 cases/outbreak) were identified as part of these investigations. Epidemiologic analytic studies were conducted in 106 (68%) outbreak investigations. Overall, suspected food item(s) were identified in 104 (67%) outbreaks through statistical evidence, compelling supportive information, and/or identification of the pathogen in the food item.

A subset of outbreaks from 2009 – 2012 were analyzed to examine contributing factors. Among the 77 outbreaks that occurred during this time period, 42 (55%) had contributing factors identified. Of those with contributing factors, 22 (52%) were caused by norovirus, 19 (45%) by bacteria, and 1 (2%) was toxin-mediated. Bare-handed contact by a food worker suspected to be infectious was reported in 18 (82%) norovirus outbreaks. Among the bacterial outbreaks with contributing factors identified, the most commonly reported included improper/slow cooling 7 (37%), insufficient time and/or temperature during reheating 7 (37%), other process failures that permit pathogen survival 6 (32%), bare-handed contact by a food worker suspected to be infectious 5 (26%), and cross-contamination of ingredients 4 (21%). There could be more than one contributing factor determined for each outbreak. Of the 77 outbreaks, 35 were caused by norovirus, 41 bacteria, and 1 was toxin-mediated. Overall, a food worker was implicated as the source of contamination in 23 (66%) viral and 6 (15%) bacterial outbreaks.

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Editorial

Foodborne disease outbreaks can be detected through a variety of methods. The majority of those identified in Connecticut were reported to the DPH by private citizens. Most outbreaks in Connecticut were caused by norovirus and occurred in FSE. Contamination of food by an infectious food worker was the primary mechanism of transmission for norovirus outbreaks. Causes of bacterial outbreaks were related to a variety of contributing environmental factors ranging from time and temperature abuse, cross-contamination, and other process failures. Infected food workers may also be a source of bacterial outbreaks, although this method of transmission occurs less frequently.

Routine pathogen-specific surveillance and subtyping of foodborne disease isolates using PFGE play important roles in outbreak detection. Connecticut participates in PulseNet, a national network of public health laboratories that conduct "DNA fingerprinting" of bacterial foodborne pathogens (*2*). PulseNet is the primary mechanism through which multistate bacterial outbreaks are detected, and subsequently investigated by public health and regulatory agencies. Most multistate outbreaks are associated with widely commercially-distributed products and therefore have a far reaching impact on a national level. Rapid identification of cases, and prompt local investigations, can contribute to the national investigation effort leading to the removal of implicated products from commerce and prevention of additional illness. Physicians play a crucial role to these public health efforts through diagnosing and reporting of foodborne or enteric disease cases.

References

1. http://www.cdc.gov/foodcore/
2. http://www.cdc.gov/pulsenet/index.html