PRELIMINARY FOODNET DATA ON THE INCIDENCE OF FOODBORNE INFECTION, 10 US SITES 2004

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Abstract
The 2004 data indicate declines in the incidence of infections caused by *Campylobacter*, *Cryptosporidium*, Shiga toxin–producing *Escherichia coli* (STEC) O157, *Listeria, Salmonella*, and *Yersinia*. Declines in *Campylobacter* and *Listeria* incidence are approaching national health objectives (objectives 10-1a through 1d); for the first time, the incidence of STEC O157 infections in FoodNet is below the 2010 target (U.S. Department of Health and Human Services 2000, U.S. Department of Agriculture 2003) (Table). However, further efforts are needed to sustain these declines and to improve prevention of foodborne infections; efforts should be enhanced to reduce pathogens in food animal reservoirs and to prevent contamination of produce.

Introduction
Foodborne illnesses are a substantial health burden in the United States (Allos *et al*. 2004). The Foodborne Diseases Active Surveillance Network (FoodNet) of CDC’s Emerging Infections Program collects data from 10 U.S. sites (Connecticut, Georgia, Maryland, Minnesota, New Mexico, Oregon, Tennessee, and selected counties in California, Colorado, and New York) on diseases caused by enteric pathogens transmitted commonly through food. FoodNet quantifies and monitors the incidence of these infections by conducting active, population-based surveillance for laboratory-diagnosed illness (Hardnett *et al*. 2004). This report describes preliminary surveillance data for 2004 and compares them with baseline data from the period 1996–1998.

Methods
In 1996, FoodNet began active, population-based surveillance for laboratory-diagnosed cases of *Campylobacter*, STEC O157, *Listeria, Salmonella, Shigella, Vibrio*, and *Yersinia*. In 1997, FoodNet added surveillance for cases of *Cryptosporidium, Cyclospora*, and hemolytic uremic syndrome (HUS). In 2000, FoodNet began collecting information on non-O157 STEC. In 2004, FoodNet began determining whether a case was part of a national foodborne disease outbreak reported to CDC via the electronic Foodborne Outbreak Reporting System (eFORS).

FoodNet personnel ascertain cases through contact with all clinical laboratories in their surveillance areas. HUS surveillance is conducted through a network of pediatric nephrologists and infection-control practitioners, and the review of records of hospitalized patients. Because of the time required for review of hospital records, this report contains preliminary 2003 HUS data.

During 1996–2004, the FoodNet surveillance population increased from 14.2 million persons in five sites to 44.1 million persons (15.2% of the U.S. population) in 10 sites. Preliminary incidence for 2004 was calculated by using the number of laboratory-confirmed infections and dividing by 2003 population estimates. Final incidence for 2004 will be reported (at http://www.cdc.gov/food-net) when 2004 population estimates are available from the U.S. Census Bureau.

Comparison of 2004 Data with 1996—1998
To account for the increase in the number of FoodNet sites and populations under surveillance since 1996 and for variation in the incidence of infections among sites, a main-effects, log-linear Poisson regression model (negative binomial) was used to estimate statistically significant changes in the incidence of pathogens (Hardnett *et al*. 2004). To create a baseline period, an average annual incidence for the first 3 years (2 years for Cryptosporidium) of FoodNet surveillance, 1996–1998, was calculated. Next, the estimated change in incidence (relative rate) between the baseline period and 2004 was calculated, along with a 95% confidence interval (CI). The 3-year baseline, which differs from the 1996 baseline used in previous reports, resulted in more stable and precise relative rate estimates.

Results
2004 Surveillance
In 2004, a total of 15,806 laboratory-diagnosed cases of infections in FoodNet surveillance areas were identified, as follows: *Salmonella, 6,464; Campylobacter, 5,665; Shigella, 2,231; Cryptosporidium, 613; STEC O157, 401; Yersinia, 173; Vibrio, 124; Listeria, 120; and Cyclospora, 15. Overall incidence per 100,000 persons was 14.7 for *Salmonella, 12.9 for*
Campylobacter, 5.1 for Shigella, and 0.9 for STEC O157. The overall incidence per 1 million persons was 13.2 for Cryptosporidium, 3.9 for Yersinia, 2.8 for Vibrio, 2.7 for Listeria, and 0.3 for Cyclospora. However, substantial variation occurred across surveillance sites (Table).

Of the 5,942 (92%) Salmonella isolates serotyped, five serotypes accounted for 56% of infections, as follows: Typhimurium, 1,170 (20%); Enteritidis, 865 (15%); Newport, 585 (10%); Javiana, 406 (7%); and Heidelberg, 304 (6%). Among 112 (90%) Vibrio isolates identified to species, 58 (52%) were V. parahaemolyticus, and 16 (14%) were V. vulnificus. FoodNet also collected data on 106 non-O157 STEC infections. An O antigen was determined for 80 (75%) of the non-O157 STEC isolates, including O111, 40 (50%); O103, 14 (18%); and O26, 10 (13%). In 2003, FoodNet collected data on 52 HUS cases in persons aged <15 years (rate: 0.6 per 100,000 persons aged <15 years); 36 (69%) of the 52 HUS cases occurred in children aged <5 years (rate: 1.3 per 100,000 children aged <5 years).

In 2004, FoodNet cases were part of 239 nationally reported foodborne disease outbreaks (defined as two or more illnesses from a common source); 138 (58%) of these outbreaks were associated with restaurants. An etiology was reported in 152 (64%) outbreaks. The most common etiologies were norovirus (57%) and Salmonella (18%). Cases associated with outbreaks influenced the incidence of laboratory-diagnosed infections. For example, the incidence of S. Javiana cases increased substantially in 2004, in part because of a multistate outbreak associated with Roma tomatoes (CDC 2005) that included 42 laboratory-diagnosed cases in Maryland (CDC, unpublished data, 2005).

Comparing 1996–1998 with 2004, the estimated incidence of several infections declined significantly, as illustrated by the relative rates (Figure 1). The estimated incidence of infection with Campylobacter decreased 31% (95% CI = 25%–36%), Cryptosporidium decreased 40% (CI = 26%–52%), STEC O157 decreased 42% (CI = 28%–54%), Listeria decreased 40% (CI = 25%–52%), Yersinia decreased 45% (CI = 32%–55%), and overall Salmonella infections decreased 8% (CI = 1%–15%). The estimated incidence of Shigella infections did not change significantly in 2004 compared with the baseline period. Overall Vibrio infections increased 47% (CI = 7%–102%) (Figure 1); this increase was less than that reported previously because of the increased stability of the baseline rate estimate.

Although Salmonella incidence decreased overall, of the five most common Salmonella serotypes, only the incidence of S. Typhimurium decreased significantly (41% [CI = 34%–48%]), as illustrated by the relative rates comparing 2004 with the 1996–1998 baseline period (Figure 2). Estimated incidence of S. Enteritidis and S. Heidelberg did not change significantly; incidence of S. Newport and S. Javiana increased 41% (CI = 5%–89%) and 167% (CI = 75%–306%), respectively.

Discussion During 1996–2004, substantial declines occurred in the estimated incidence of infections with Campylobacter, Cryptosporidium, STEC O157, Listeria, S. Typhimurium, and Yersinia. The 2004 incidence of STEC O157 infections declined below the 2010 national target of 1.0 case per 100,000 persons in FoodNet overall and in seven of the 10 surveillance sites. In addition, the decline in Campylobacter incidence represents progress toward the national health objective of 12.3 cases per 100,000 persons (U.S. Department of Health and Human Services 2000); the renewed decline in Listeria incidence, to 2.7 cases per 1 million population in 2004, suggests that the revised national objective to reduce foodborne listeriosis to 2.5 cases per 1 million population by 2005 might be achievable with continued efforts (U.S. Department of Health and Human Services 2000; U.S. Department of Agriculture 2001).
The declines described in this report have occurred concurrently with several important food safety initiatives and education efforts (Allos et al. 2004). The substantial decline of STEC O157 infections first noted in 2003 and sustained in 2004 is consistent with declines in STEC O157 contamination of ground beef reported by the U.S. Department of Agriculture Food Safety and Inspection Service (FSIS) for 2003 (Naugle et al. 2005) and 2004 (http://www.fsis.usda.gov/news_&_events/NR_022805_01/index.asp). Multiple interventions might have contributed to this decline, including industry response to the FSIS 2002 notice to manufacturers to reassess control strategies for STEC O157 in the production of ground beef and enhanced strategies for reduction of pathogens in live cattle and during slaughter (Naugle et al. 2005). The overall decline in Campylobacter incidence from the baseline period to 2004, the majority of which occurred before 2001, might reflect efforts to reduce contamination of poultry and educate consumers about safe food-handling practices. Although the incidence of Listeria infections decreased from the period 1996–1998 through 2004, the incidence in 2004 was comparable to 2002, after an increase in 2003 (Figure 1); efforts must continue to prevent foodborne listeriosis.

The decline in Salmonella incidence was modest compared with those of other foodborne bacterial pathogens. Only one of the five most common Salmonella serotypes, S. Typhimurium, declined significantly. To achieve the national health objective of reducing the number of cases to 6.8 per 100,000 persons, greater efforts are needed to understand the complex epidemiology of Salmonella and to identify effective pathogen-reduction strategies. The multistate tomato-associated S. Javiana outbreak that occurred in the summer of 2004 emphasizes the need to better understand Salmonella reservoirs and contamination of produce during production and harvest (CDC 2003). The Food and Drug Administration recently developed a plan to decrease foodborne illness associated with fresh produce (FDA 2004). Moreover, multidrug resistance is an emerging problem among Salmonella serotypes, particularly S. Newport; large multistate outbreaks associated with ground beef are cause for increased concern (CDC 2002).

The findings in this report are subject to at least five limitations. First, FoodNet relies on laboratory diagnoses, and many foodborne illnesses are not laboratory diagnosed. For example, infections such as norovirus are not identified routinely in clinical laboratories. Second, protocols for isolation of enteric pathogens (e.g., non-O157 STEC) in clinical laboratories vary and are not implemented uniformly within FoodNet sites (Voetsch et al. 2004). Third, reported illnesses might have been acquired through nonfoodborne sources; reported incidence rates do not represent foodborne sources exclusively. Fourth, although the FoodNet population is similar to the U.S. population (Hardnett et al. 2004), the findings might not be generalizable to the entire population of the United States. Finally, year-to-year changes in incidence might reflect either annual variations or sustained trends.

**Conclusions** Enhanced efforts are needed across the farm-to-table continuum to understand and control pathogens in animals and plants, to reduce or prevent contamination during processing, and to educate consumers about risks and prevention measures. Such efforts can be particularly focused when an animal reservoir species and transmission route for a pathogen are known. For example, many Vibrio infections are related to consumption of raw molluscan shellfish harvested from waters where Vibrio are present; ultra-high hydrostatic pressure treatment of oysters will likely prevent Vibrio infections. Other effective prevention measures, such as pasteurization of in-
shell eggs and irradiation of ground meat and raw poultry, should be used more widely, particularly for foods eaten by persons at high risk. Consumers should follow safe food-handling recommendations and not consume raw or undercooked shellfish, eggs, ground beef, or poultry. In addition, efforts are needed to prevent transmission by nonfoodborne routes (e.g., via water, person-to-person, and exposure to animals or their environments). Guidelines to prevent disease associated with direct contact with animals or their environments in public settings (e.g., fairs and petting zoos) have recently been published (CDC 2005).

References


