Q&As about the 2012 FoodNet MMWR

Questions about this report

1. What is the *MMWR* article "Incidence and Trends of Infection with Pathogens Transmitted Commonly Through Food — Foodborne Diseases Active Surveillance Network, 10 U.S. Sites, 1996–2012" about?

Foodborne illnesses are an important public health problem in the United States. This *MMWR* article, entitled "Incidence and Trends of Infection with Pathogens Transmitted Commonly Through Food — Foodborne Diseases Active Surveillance Network, 10 U.S. Sites, 1996–2012," is an annual summary of data collected through the Foodborne Diseases Active Surveillance Network (FoodNet). FoodNet collects information to track rates and determine trends for *Campylobacter, Cryptosporidium, Cyclospora, Listeria, Salmonella,* Shiga toxin-producing *Escherichia coli* (STEC) O157 and non-O157, *Shigella, Vibrio*, and *Yersinia* infections diagnosed by laboratory testing of samples from patients, and for physician-diagnosed hemolytic uremic syndrome (HUS). It is a collaborative program among CDC, 10 state health departments, the US Department of Agriculture's Food Safety and Inspection Service (USDA-FSIS), and the Food and Drug Administration (FDA). This report summarizes 2012 preliminary surveillance data and describes trends since 1996; the information contributes to our understanding of the human health impact of foodborne diseases.

2. What are the main take-home points of the report?

- **FoodNet provides accurate counts of the frequency of diagnosed infections.** In 2012, FoodNet identified 19,531 laboratory-confirmed cases of infection, 4,563 hospitalizations, and 68 deaths among 48 million residents of 10 states (15% of the US population).
  - The most frequent infection was caused by *Salmonella* accounting for 40% of reported infections, and the second by *Campylobacter* (35%).
  - The incidence of infection caused by nearly all pathogens tracked were highest among either children aged <5 years or among older adults aged ≥65 years.
  - Persons aged ≥65 years are at greater risk than younger persons for hospitalization and death related to most of the infections under FoodNet surveillance.
- **FoodNet provides the best information we have on trends in specific foodborne illnesses.** Comparison of incidence rates in 2012 with incidence rates in 2006–2008 shows some clear **short-term changes**:
  - Incidence of *Campylobacter* infection was 14% higher. *Campylobacter* was the second most common infection reported in FoodNet (14.3 cases reported per 100,000 population).
  - Incidence of *Vibrio* infection was 43% higher. *Vibrio* infections are rare (0.41 cases reported per 100,000 population).
  - But most rates in 2012 did not change in comparison with rates in 2006–2008:
    - The incidence of laboratory-confirmed *Listeria*, *Salmonella*, Shiga toxin-producing *Escherichia coli* (STEC) O157, and *Yersinia* infections did not change significantly.
    - As a group, the incidence of infection with six key pathogens transmitted commonly through food (*Campylobacter*, *E. coli* O157, *Listeria*, *Salmonella*, *Vibrio*, and *Yersinia*) was unchanged.
  - In 2011, the incidence of HUS was 44% lower among children aged <5 years and 29% lower among children aged <18 years compared with rates from 2006–2008 (complete HUS case detection lags behind the rest of FoodNet surveillance).
- In comparison with the first three years of FoodNet surveillance (1996–1998), **long-term changes** were observed:
  - Declines in the incidence of infections caused by *Campylobacter*, *Listeria*, STEC O157, *Shigella*, and *Yersinia* in the early part of the decade were sustained.
  - The incidence of *Vibrio* infection was 116% higher.
  - As a group, the incidence of infection with six key foodborne pathogens (*Campylobacter*, *Listeria*, *Salmonella*, STEC O157, *Vibrio*, and *Yersinia*) was 22% lower. However, the incidence of *Salmonella* was unchanged.

3. According to FoodNet data, how did the incidence in 2012 compare with the Healthy People 2020 national targets for reducing foodborne illness?

Healthy People 2020 set national targets for reducing the rates of infection caused by *Campylobacter*, *Listeria, Salmonella,* Shiga toxin-producing *Escherichia coli* (STEC) O157, *Vibrio*, and *Yersinia*. FoodNet provides the data to track progress. None of the 2020 targets have yet been met. The 2012 incidence rates based on FoodNet data and the Healthy People 2020 objective targets are listed in the table.

	Incidence Rate (number of infections per 100,000 persons)	
Pathogen	**2012 FoodNet data**	**Healthy People 2020 objective target**
Campylobacter spp.	14.30	8.5
Listeria monocytogenes	0.25	0.2
Salmonella spp.	16.42	11.4
STEC O157	1.12	0.6
Vibrio spp.	0.41	0.2
Yersinia spp. (other than *Y. pestis*)	0.33	0.3

4. How is the incidence of infections in FoodNet influenced by outbreaks?

In 2004, FoodNet began routinely tracking which of the laboratory-confirmed infections reported were associated with outbreaks; most are not. From 2004–2012, 9–26% of cases of STEC O157 infection and 4–8% of cases of *Salmonella* infection were associated with outbreaks each year. In 2012, none of the trends described in the *MMWR* report would be substantially different if outbreak-associated cases were excluded from the totals.

5. How is the "overall incidence" calculated for groups of pathogens?

To calculate the "overall incidence," data were combined for *Campylobacter*, *Listeria*, *Salmonella*, Shiga toxin-producing *Escherichia coli* O157, *Vibrio*, and *Yersinia*, the six key bacterial pathogens tracked by FoodNet for which >50% of illnesses are estimated to be transmitted by food. The data were weighted by the incidence of infection of each pathogen. The measure of overall incidence includes all reports of the six component infections. These pathogens can all be transmitted by modes other than food (e.g., water, person-to-person contact). Because FoodNet reports all infections and does not collect information on the mode of transmission for an individual infection, this measure of overall incidence is not a measure of foodborne illness exclusively.

6. Are the data from FoodNet representative of the entire United States?

FoodNet provides valid and reliable information about incidence and trends of foodborne illness in the United States; it does not include the entire country. The population of the FoodNet surveillance area resembles the entire US population demographically. The only notable difference is a slightly lower percentage of persons of Hispanic ethnicity in the population of FoodNet sites.

7. What are some limitations of the FoodNet surveillance data?

- Increasing use by clinical laboratories of culture-independent tests for diagnosis of *Campylobacter* and Shiga toxin-producing *Escherichia coli* (STEC) might affect the reported incidence of *Campylobacter* and STEC infections.
- FoodNet relies on diagnoses made in clinical laboratories. Some infectious agents, such as norovirus, that are transmitted commonly through food are not under surveillance in FoodNet, because these pathogens are usually not tested for in clinical laboratories.
- Many illnesses are acquired from non-food sources, so incidence rates do not reflect foodborne transmission exclusively.
- Differences in health-care–seeking behaviors may contribute to observed differences in incidence.
- Hospitalizations and deaths reported to FoodNet may or may not be due to the specific infection reported, since any hospitalization and death is reported if it occurs in the 7 days before or after the diagnosis of infection.

8. What is FoodNet doing to examine the impact of the increasing use of culture-independent tests in clinical laboratories on observed trends?

FoodNet is actively conducting surveillance for infections diagnosed through culture-independent methods, with a focus on *Campylobacter* and Shiga toxin-producing *Escherichia coli* (STEC). Our current report includes only those cases that are confirmed at the laboratory through culture so the incidence we report for *Campylobacter* and STEC might be an underestimate of the true incidence. As more clinical labs begin using culture-independent tests, the potential exists for the incidence of infections to appear to decrease as fewer cases are diagnosed through traditional methods. We are developing methods to assess incidence and trends using both culture-confirmed cases and those identified through culture-independent methods.

Questions about specific infections

1. How do people get *Campylobacter* infections? What are the symptoms? How can they be prevented?

- *Campylobacter* transmission occurs through consumption of the organism in undercooked poultry and meat, unpasteurized dairy products, or other contaminated food or water. One can also be infected by direct contact with animals such as puppies, kittens, and farm animals, or their environments.
- Most people who become ill with campylobacteriosis get diarrhea, cramping, abdominal pain, and fever within two to five days after exposure to the organism. The diarrhea may be bloody and can be accompanied by nausea and vomiting. The illness typically lasts one week. Although most infections are self-limited, sequelae include arthritis and Guillain-Barré syndrome (a type of paralysis).
- To learn more about *Campylobacter* infections and how they can be prevented, visit the *Campylobacter* webpage.

2. Why has the incidence of *Campylobacter* infection been increasing recently? What can be done?

- We are not sure why the incidence of infection is increasing. Many *Campylobacter* infections are the result of eating contaminated poultry. Declines in campylobacteriosis observed in the United States in the early 2000s are thought to be related to efforts by industry and regulators to control bacterial contamination of meat and poultry products in the mid-1990s. Recent measures include the establishment of performance standards in 2011 for allowable *Campylobacter* contamination of whole broiler chickens at processing plants. Some *Campylobacter* infections come from drinking raw milk. Those can be easily prevented by pasteurizing milk.
- Other countries—including New Zealand, Norway, Sweden, Iceland, and Denmark—have observed reductions in the incidence of human *Campylobacter* infection after implementing food safety and regulatory strategies focused on poultry. Belgian authorities noted decreases following withdrawal of poultry from the market after detection of dioxin-contaminated products. In the Netherlands, decreases were observed following drops in poultry sales and culling of flocks during an avian influenza outbreak.
- Reducing the number of *Campylobacter* infections requires:
  - Development and implementation of measures known to reduce food contamination.
  - Collection of comprehensive surveillance information that supports efforts to attribute infections to sources and prioritize prevention efforts to those that may have the largest impact.

3. How do people get *Vibrio* infections? How can they be prevented? Why have they increased in frequency?

- *Vibrio* infections are rare but often serious. *Vibrio* is a naturally occurring organism commonly found in marine and estuarine waters, including the Gulf of Mexico and the Atlantic and Pacific Oceans. Many *Vibrio* infections are due to eating raw oysters. The *Vibrio* bacteria multiply when the seawater where oysters grow is warm. As a result, these infections are most common during the warm months, when waters and oysters naturally contain high numbers of *Vibrio* organisms.

- Infections can be prevented by treating oysters at processing plants with heat, freezing, or high pressure. The risk of infection can be reduced by rapidly refrigerating oysters after harvest and by thorough cooking, especially when they come from warm growing waters. Continued *Vibrio* infections highlight the lack of implementation of these control measures.
- Not all *Vibrio* infections are due to oyster consumption. Some species, such as *Vibrio alginolyticus*, cause ear or wound infections after contact with marine or estuarine water. *Vibrio vulnificus*, which is usually transmitted through food, can also cause wound infections after contact with warm seawater.
- The incidence of *Vibrio* infection has increased in recent years. It is possible that global climate change resulting in warmer waters plays a role. To learn more about *Vibrio* infections and how they can be prevented, visit the *Vibrio* web pages.

4. The incidence of Shiga toxin-producing *Escherichia coli* (STEC) O157 infection has not decreased recently. Why?

- We are not sure why the incidence of STEC O157 infection has not decreased recently.
- Past declines in STEC O157 infection correlate closely with regulatory changes and improvements in the food industry, including reducing the risk of ground beef contaminated with STEC O157 from being sold, improvements in slaughter plants that result in less cattle fecal matter contaminating beef, better inspections in ground beef processing plants (including testing beef for STEC O157), improvements in the FDA Model Food Code, and increased awareness in food service establishments of the risk of consumption of undercooked ground beef. These interventions and awareness should be maintained. Further declines in incidence might require identification of additional ways to reduce contamination of foods and heightened awareness among consumers about the importance of thoroughly cooking and safely handling ground beef in their own homes.
- FoodNet only counts illnesses that are confirmed by finding *E. coli* bacteria in a culture of patient's specimen. There are newly developed tests that do not rely on culture, but are more like the dipsticks that are used to diagnose strep throat in doctor's offices. We ask that laboratories that use these new tests then go on to culture for *E. coli* if they get a positive test. The increasing use of these culture-independent tests for Shiga toxin by clinical laboratories might affect the reported incidence of laboratory-confirmed STEC O157 infection. These tests might increase the number of cases diagnosed, if they mean more patients get tested. They might also decrease reported incidence if the laboratories do not follow up by culturing the patient. FoodNet is starting to track the actual practices as they change, and the impact these changes may have.
- Like most foodborne pathogens, not all STEC O157 infections are acquired through food. The infections can occur because of animal contact at petting zoos, or spread in child day care centers and swimming pools. Food safety efforts alone will not eliminate these infections.

5. Why did FoodNet observe a decrease in incidence in HUS, but no decrease in incidence of STEC?

Because HUS surveillance involves review of hospital discharge records that are not immediately available, complete data collection is less rapid, lagging one year behind data collection for STEC O157 infection. The observed decline in HUS cases in 2011 relative to 2006–2008 is consistent with the decline in STEC O157 infection observed in 2011 relative to 2006–2008.

6. Why doesn't the report include information about changes in incidence of non-O157 STEC?

Diagnostic practices for non-O157 STEC have been changing, making it difficult to tell whether there has been a true change in the incidence of infection. The slightly higher incidence of non-O157 STEC infection in 2012 compared with previous years might be a result of increased testing in clinical laboratories.

7. Why hasn't there been any decrease in the incidence of *Salmonella* infection?

- *Salmonella* infection is a complicated problem that is not likely to be controlled by any one measure. There are many different types of *Salmonella*. They are carried in the intestines of many different kinds of food animals and wild animals, and transmission of *Salmonella* to humans can occur in several ways. Most often, *Salmonella* is spread through contaminated food, including foods of animal origin, raw produce contaminated with animal or human fecal matter, and processed foods with contaminated ingredients. It can also be spread by contact with animals that carry *Salmonella* in their intestines and through contaminated water.
- Although the incidence of *Salmonella* infection has not decreased overall, some types have decreased, while others have been increasing. Incidence of the second most common type of *Salmonella,* serotype Typhimurium, has decreased since 1996, while incidence of the most common type, serotype Enteritidis, has shown little change in recent years. *Salmonella* serotype Typhimurium can come from a variety of meats and other foods. This decrease may reflect the ongoing efforts to make meat and poultry safer. Other types of *Salmonella* have been increasing, for reasons that are not well understood.
- Foodborne *Salmonella* infections can be prevented by decreasing carriage among food animals with pathogens that cause human illness, reducing contamination in slaughterhouses and factories, improving the safety of produce items consumed raw, monitoring the safety of ingredients of processed foods, and keeping foods refrigerated during transport.
- Regulatory agencies are developing and implementing measures to make food safer. USDA-FSIS has implemented tighter standards for *Salmonella* on poultry. FDA has recently proposed regulations to make produce safer, and to increase preventive controls in many food processing factories. Training restaurant managers in food safety and educating consumers about preparing foods safely at home can also help. Investigating illnesses and outbreaks is important, so that contaminated products are removed before more persons become ill, and so we learn what measures are needed to prevent more illnesses. Farmers, the food industry, regulatory agencies, food service, consumers, and public health authorities all have a role.

8. *Shigella* and *Yersinia* have both decreased over the past 10–15 years. How can I learn more about these infections?

For more information about *Shigella* and *Yersinia* visit their web pages.

9. What happened in 2012 for the parasitic pathogens, *Cryptosporidium* and *Cyclospora*?

We did not observe any change in incidence of *Cryptosporidium* infection compared with either 1996–1998 or 2006–2008. Incidence of *Cyclospora* infection was very low in 2012, and was similar to previous years.

Questions about specific groups of people

1. Why is the incidence of so many of these infections higher in young children, and what are some risk factors for these infections in young children?

The incidence of *Campylobacter*, *Cryptosporidium*, *Salmonella*, *Shigella*, STEC O157, STEC non-O157, and *Yersinia* infection were highest among children aged <5 years. Young children are more likely than persons in other age groups to be brought to medical attention for diarrheal illness, and this is part of the explanation. However, the immune system in young children is not fully developed, which is another reason why they are at highest risk for many infections. Studies in young children have identified various food and non-food exposures—including visiting a farm, riding in a shopping cart near raw meat or poultry, and contact with turtles, water frogs, and baby chicks —that can increase the risk of infection with these pathogens. Breastfeeding provides important protection to infants and should continue to be encouraged.

2. Why are the hospitalization and death rates for so many of these infections higher in older adults?

For infections with most pathogens under FoodNet surveillance, persons aged ≥65 years are at greater risk than are other persons for hospitalization and death, probably reflecting the fact that many older adults have other health issues that put them at higher risk for severe illness if they get one of these infections. These data highlight the need for prompt diagnosis and treatment in this age group as well as for careful attention to food safety.

Questions about food safety

1. What is CDC doing to control and prevent foodborne disease?

- CDC is part of the US Public Health Service, and has as a mission to use the best scientific methods and information available to monitor, investigate, control, and prevent public health problems. Using the tools of epidemiology and laboratory science, CDC provides scientific assessment of public health threats. CDC works closely with state health departments to monitor the frequency of specific diseases and conducts national surveillance for them. CDC provides expert epidemiologic and microbiologic consultation to health departments and other federal agencies on a variety of public health issues, including foodborne diseases. At the invitation of state public health officials, CDC can also send a team into the field to help conduct emergency field investigations of large or unusual outbreaks. CDC researchers develop new methods for identifying and characterizing the microbes that cause disease and translate laboratory research into practical field methods that can be used by public health authorities in States and counties.
- CDC is not a regulatory agency. Government regulation related to food safety is the responsibility of the Food and Drug Administration (FDA), the Food Safety and Inspection Service of the US Department of Agriculture (USDA-FSIS), the National Marine Fisheries Service, and other regulatory agencies. CDC maintains regular contact with the regulatory agencies.
- When new food safety threats appear, CDC, in collaboration with its public health partners, conducts epidemiologic and laboratory investigations to determine the causes of these threats and how they can be controlled. Although CDC does not regulate the safety of food, CDC assesses the effectiveness of current prevention efforts. CDC provides scientific assessment of what the problems are, how they can be controlled, and where gaps exist in our knowledge.
- An example of a collaborative effort to address foodborne illness is the Interagency Food Safety Analytics Collaboration (IFSAC), a partnership between CDC, USDA-FSIS, and FDA. IFSAC conducts analytic projects to estimate the attribution of illnesses to foodborne and non-foodborne sources, using data from surveillance, outbreak investigations, and special studies.
- Much of CDC's effort related to foodborne illness focuses on detecting outbreaks and tracking foodborne illnesses in the United States, but CDC also works to make the information it gathers available when, where, and how people throughout the world need it in order to make decisions that can protect their health.

2. What other efforts are underway to reduce foodborne illness?

- There are many partners in prevention of foodborne illness, including state and federal public health authorities, the federal food regulatory authorities, the food industry, consumer and patient advocacy groups, and consumers themselves. Enhanced measures are needed to 1) control or eliminate pathogens in domestic and imported food; 2) reduce or prevent contamination of food during growing, harvesting, and processing; and 3) continue the education of all food-handlers, including restaurant workers and consumers about risks and prevention measures. In particular, continued efforts are needed to understand how contamination of fresh produce and processed foods occurs and to develop and implement measures that reduce it.
- Our federal regulatory partners have taken new measures, including tighter standards for *Salmonella* in poultry (USDA-FSIS) and new regulations that FDA has proposed to improve produce safety and processed foods. Industry can play an important role by requiring safety measures in their purchase contracts, and preventing contamination in their own processes. Consumers can choose foods that have been made safer (like pasteurized milk and shell eggs), and can know how to prepare food safely.

- CDC is working with state health departments to develop and implement ways to detect and investigate outbreaks more quickly, so that the foods that cause outbreaks are identified quickly, and illnesses can be prevented. CDC is also working closely with state health departments to ensure that effective surveillance can be maintained as diagnostic practices in clinical laboratories change.

More Information

Where can I go for more information on foodborne illness?

- To view the article, 'Incidence and Trends of Infection with Pathogens Transmitted Commonly Through Food — Foodborne Diseases Active Surveillance Network, 10 U.S. Sites, 1996–2012' in its entirety along with supplemental tables, visit the FoodNet website.

- For information on past reports, visit the Reports page of the FoodNet website.

- For information on foodborne disease prevention and current activities, visit the CDC's Food Safety and the Food Safety.gov websites.

- For information on the new Food Safety Modernization Act and CDC's role, visit the Food Safety Modernization Act web page.

- For information on what consumers can do to reduce the risk for foodborne illness, visit the CDC's Food Safety, the Food Safety.gov, and the Fight Bac websites.