

Foodborne Illness Surveillance Systems

Many surveillance systems are used in the United States to provide information about the occurrence of foodborne disease. Most of CDC's surveillance systems rely on data from state and local health agencies. Some focus on specific pathogens likely to be transmitted through food and have been used extensively for decades. More recently, new surveillance methods have emerged which improve the quality, quantity, and timeliness of data (e.g., sentinel surveillance systems and national laboratory networks).

Each surveillance system plays a role in detecting and preventing foodborne disease and outbreaks. CDC provides leadership for the following surveillance systems:

Foodborne Disease Active Surveillance Network (FoodNet)

FoodNet is a sentinel surveillance system that includes 10 participating state health departments in the United States working in collaboration with CDC, USDA, and FDA. The FoodNet surveillance area includes 46 million persons, which is 15% of the US population.

FoodNet is an active surveillance system (i.e., investigators regularly contact laboratories to enhance reporting). FoodNet conducts population-based surveillance for seven bacterial and two parasitic infections transmitted commonly through food, and it conducts analyses and epidemiologic studies designed to help public health officials better understand the epidemiology of foodborne diseases in the United States. FoodNet data provides insights into the incidence of and trends in foodborne and diarrheal diseases. **Data:** FoodNet annual reports are summaries of information collected through active population-based surveillance for infections caused by any of nine pathogens transmitted commonly through food. A preliminary version of this report is published annually in CDC's *MMWR*. The FoodNet final report becomes available after current census information becomes available. FoodNet reports and studies are available online.

"Good surveillance does not necessarily ensure the making of the right decisions, but it reduces the chances of wrong ones."

Dr. Alexander D. Langmuir, 1963

Founder of the Epidemic Intelligence Service

Surveillance statistics reflect a fraction of cases that occur in the community. Under-diagnosis and underreporting of foodborne illnesses present challenges for surveillance and the detection of outbreaks.

National Antimicrobial Resistance Monitoring System—enteric bacteria (NARMS)

NARMS conducts surveillance for antimicrobial resistance among foodborne bacteria in humans, retail meat, and animals. NARMS enhances collaboration among public health and agricultural agencies to detect, respond, and prevent antimicrobial resistance among foodborne bacteria. It is a joint effort between CDC, Center for Veterinary Medicine in the FDA, and USDA. **Data:** Annual reports are published and can be found online.

National Electronic Norovirus Outbreak Network (CaliciNet)

Caliciviruses, of which the noroviruses are the most important group of viruses, are responsible for the majority of foodborne outbreaks in the United States. To increase the quality of national norovirus surveillance, CDC has developed and implemented an electronic norovirus outbreak surveillance network (CaliciNet) with state and local public health laboratories. This network compares norovirus sequences to be able to rapidly link norovirus outbreaks with a common food source as well as to identify emerging norovirus strains. CaliciNet went live in March 2009, and currently has 15 states certified for participation. CaliciNet aims to provide a better understanding of noroviruses and to help control their spread.

Data: Periodic outbreak investigation reports are published in CDC's weekly publication, the *MMWR* and posted online. Since 2009, norovirus outbreaks, regardless of mode of transmission (i.e., foodborne or person-to-person), are reported to the National Outbreak Reporting System (NORS), which is linked to CaliciNet.

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National Molecular Subtyping Network for Foodborne Disease Surveillance (PulseNet)

PulseNet is a national network of local, state, territorial, agricultural, and federal laboratories coordinated by CDC and the Association of Public Health Laboratories (APHL) that uses standardized methods to perform pulsed-field gel electrophoresis (PFGE) on foodborne bacterial pathogens. PulseNet allows investigators from participating sites to upload PFGE patterns to an electronic database and compare them with patterns of other pathogens isolated from humans, animals, and foods to identify matches and possible linkages between pathogens (e.g., outbreaks). PulseNet has revolutionized the detection and investigation of foodborne disease outbreaks, especially those occurring in multiple sites across the country which before PulseNet went undetected or were not detected before they grew very large. **Data:** Publications and presentations of PulseNet studies are posted on-line.

National Notifiable Diseases Surveillance System (NNDSS)

In notifiable disease surveillance, health care providers and laboratory professionals are required by law to report individual cases of disease when selected pathogens are identified in patient specimens or specific clinical syndromes are recognized. Local public health agencies report these diseases to the state or territorial public health agency, which in turn voluntarily submits the information to the National Notifiable Diseases Surveillance System, which CDC oversees. Notifiable disease surveillance is "passive" (i.e., the investigator waits for disease reports from those required to report) and is susceptible to under-recognition and underreporting. Foodborne diseases that are reportable include botulism, hemolytic uremic syndrome (HUS), listeriosis, salmonellosis, shiga toxin-producing *Escherichia coli* (STEC) infections, and vibriosis. **Data:** Annual reports of nationally notifiable infectious diseases are published in the *MMWR* Summary of Notifiable Diseases, United States, with early release of state/territory counts published in CDC's weekly publication, the *MMWR*. More information about NNDSS can be found online.

National Outbreak Reporting System (NORS)

CDC collects reports of foodborne outbreaks due to enteric bacterial, viral, parasitic, and chemical agents. State, local, and territorial public health agencies report these outbreaks through the National Outbreak Reporting System (NORS). The NORS surveillance team conducts analyses of these data to improve understanding of the human health impact of foodborne outbreaks and the pathogens, foods, settings, and contributing factors involved in these outbreaks. Starting in 2009, the system has included modules for reporting enteric disease outbreaks transmitted through water, person-to-person contact, or direct contact with animals. The system that preceded NORS was called the electronic Foodborne Outbreak Reporting System (eFORS). <http://www.cdc.gov/outbreaknet/nors/>
Data: Outbreak surveillance data are published in the *MMWR* and are available on-line. State-specific information about outbreaks, a Foodborne Outbreak Online Database (FOOD) is available online.

Contributing factor surveillance (Environmental Health Specialists Network, or EHS-Net)

Investigators from state and local public health agencies gather information about contributing factors in foodborne outbreaks through environmental assessments conducted by food control officials and report the results to CDC. Contributing factors cannot be identified through general inspections of operating procedures or sanitary conditions, such as those used for licensing or routine inspection of a restaurant, but require a systematic description of what happened and how events most likely unfolded in an outbreak. CDC's EHS-Net was established in 2000 to address the environmental causes of foodborne disease.

Participants include environmental health specialists and epidemiologists from nine states, the US Food and Drug Administration (FDA), the Food Safety Inspection Service in the US Department of Agriculture (FSIS/USDA), and CDC. CDC has developed through EHS-Net an electronic reporting system for contributing factors and other root causes of foodborne outbreaks. In 2011, this EHS-Net activity will be launched nationally through the Conference for Food Protection as the National Voluntary Environmental Assessment Information System (NVEAIS) and participation will be open to any food regulatory program in the United States. **Data:** Publications and presentations of EHS-Net studies are posted on-line. Periodic reports from the NVEAIS system will be posted and made available through appropriate publications.

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The Laboratory-based Enteric Disease Surveillance (LEDS) system collects reports of isolates from laboratory-confirmed human infections of *Salmonella*, *Shigella*, and Shiga toxin-producing *Escherichia coli* (STEC).

Data: Annual reports are published and can be found online.