

# Foodborne Illnesses

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**Definition:** A **foodborne illness** is an infection or poisoning caused by a bacterium, virus, parasite, or chemical transmitted by food. A foodborne **outbreak** is an illness event that typically includes two or more people infected from a common food source.

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## Summary

According to a 2011 report, 47.8 million Americans are affected by foodborne illnesses annually. Approximately 40 foodborne outbreaks and 500 outbreak-associated illnesses have been reported per year in Washington State over the past five years. In Washington and across the U.S., reported foodborne outbreaks represent only a small proportion of the total outbreaks that occur. Common pathogens causing foodborne illness outbreaks in Washington are *Salmonella*, *E. coli* O157:H7, *Campylobacter* and norovirus.

Public health challenges in monitoring foodborne illness include a rising number of multistate foodborne outbreaks and new types of contaminated foods.

In Washington, most foodborne outbreaks involve improper food handling or preparation. Interventions to prevent foodborne illness and outbreaks include training restaurant inspectors and food handlers about risk factors related to food safety, issuing permits and inspecting food establishments, and maintaining effective communication between public health agencies and the public in the event of food emergencies.

## Introduction

Although the U.S. food supply is among the safest in the world, foodborne illnesses and large foodborne outbreaks still occur. Many of these illnesses result in [hospitalizations](#) and deaths. A 2011 report on burden of foodborne illnesses estimated that 47.8 million Americans are affected by foodborne illnesses annually.<sup>1</sup> Most foodborne illnesses nationally and in Washington are part of small clusters or single cases that are

either undiagnosed or are reported to local public health authorities based on lab results identifying the organism causing the illness. These single cases are not reported as foodborne outbreaks unless a common food source is identified.

In Washington, as elsewhere in the United States, healthcare providers and hospitals are required to report clusters of diseases of suspected foodborne origin to local public health agencies, but affected people can also report their illnesses directly. Local public health agencies typically investigate outbreaks to establish a food source and organism. Laboratory analysis of food and patient samples is most often used to confirm the presence of foodborne illness, but not all foodborne illnesses are laboratory-confirmed. Local public health agencies report results of investigations to the Washington State Department of Health, which reports cases and outbreaks to the U.S. Centers for Disease Control and Prevention (CDC).

## Description of Indicators

***Incidence and numbers of reported foodborne illnesses and outbreaks.*** Both the number of outbreaks and the number of people who become ill over some period of time are indicators of risk of foodborne illness.

Foodborne outbreaks reported to health agencies represent only a small proportion of the actual number of events. Several factors affect the number of reported foodborne illnesses and outbreaks. People with mild symptoms may not seek medical care. Healthcare providers may not always report suspected cases to public health officials.<sup>2</sup> The number of reported outbreaks can also vary year to year due to variations in levels of reporting. Large, well-publicized foodborne illness outbreaks result in increased awareness of foodborne illness among healthcare providers and the public. Reporting often increases after such outbreaks.

In addition, sometimes it is difficult to establish whether an outbreak is foodborne since some pathogens can also be transmitted by other means, such as through person-to-person contact or by drinking contaminated water. While pathogens such as *Salmonella*, *Campylobacter* and norovirus can be contracted by other means, the most common exposure route is through contaminated food.

**Food screening results.** Screening foods for the presence of pathogens can identify foods that are likely to cause illness. Federal agencies periodically conduct large-scale sampling studies to assess the presence of *E. coli* and *Salmonella* in our food supply.<sup>3</sup> These agencies also determine the relative risk for other pathogens such as *Listeria monocytogenes*.<sup>4</sup>

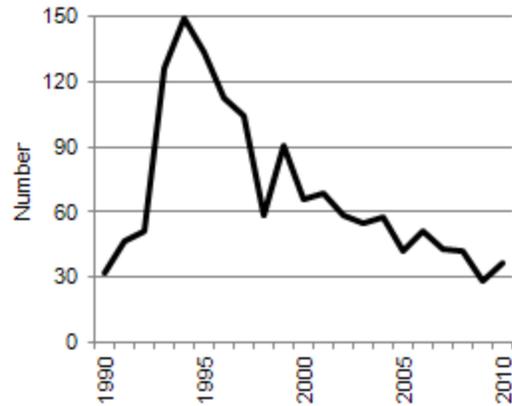
The Washington State Department of Agriculture (WSDA) routinely screens foods frequently involved in foodborne illness outbreaks such as raw milk and fresh produce. Samples testing positive for pathogens often result in product recalls or other actions such as closing processors or destroying stored product.

**Time Trends**

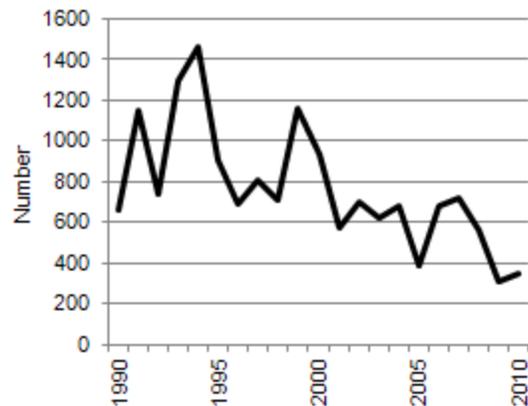
**Reported outbreaks and related illnesses.** Before 1993, 30 to 60 foodborne outbreaks were reported each year in Washington. Following a major *E. coli* O157:H7 outbreak in January 1993, reporting by the public and healthcare providers increased to nearly 150 outbreaks. Since 1995, the number of reported outbreaks has steadily declined.

Current numbers are consistent with reporting levels prior to 1993. From 2005–2010, Washington State reported an average of 40 foodborne outbreaks. These outbreaks involved an average of almost 500 sick people a year. It is not clear the extent to which the decrease represents a return to prior levels of reporting (that is, the heightened awareness has faded) or results from improved food safety. Given that Washington’s population increased by almost 40% from 1990 to 2010, a return to reporting levels before 1993 represents a drop in the rates of outbreaks and cases of foodborne illness.

**Reported Foodborne Outbreaks Washington State Notifiable Conditions, 1990–2010**



**Foodborne Illness Cases Related to Reported Outbreaks Washington State Notifiable Conditions, 1990–2010**



**2020 Goals**

*Healthy People 2020* goals include food safety objectives for four pathogens that are usually transmitted through food: *Campylobacter*, Shiga toxin-producing *E. coli*, *Listeria* and *Salmonella*. Based on data from 2006–2010, Washington has nearly achieved the 2020 food safety objective for *Salmonella*; illness rates for the remaining three pathogens range from two to five times higher than the 2020 objectives.

Although Washington is not yet meeting the *Healthy People 2020* food safety objectives, efforts are underway to achieve these objectives over the coming years. (See [Intervention Strategies](#).)

**Foodborne Illnesses by Pathogen  
(Rate per 100,000)  
Washington State Department of Health  
Food Safety Program**

Pathogen	WA State Avg (2006–2010)	2020 Objective
Campylobacter	16.5	8.5
Salmonella	11.6	11.4
*STEC	2.8	0.6
Listeria	0.4	0.2

\*STEC =Shiga-toxin producing *E. coli*

### Sources of Illness

Foodborne illness can occur from using contaminated ingredients and from introducing contamination through food handling, such as contamination by an infected food handler, contamination of foods from raw animal products, improper temperature maintenance after cooking resulting in microbial growth, and insufficient cooking or cooling.

Based on investigation of reported outbreaks by state and local public health agencies, improper food handling causes most foodborne illnesses. The table below shows the principal causes of foodborne illness outbreaks related to improper handling in Washington.

**Factors Contributing To Foodborne Outbreaks  
Washington State, 2006–2010  
Washington State Department of Health  
Food Safety Program**

Contributing Factor	Ranking
Bare hand contact with food	1
Inadequate hand washing	2
Food handler working while ill	3
Improper cooling of food	4
Inadequate cold holding of refrigerated food	5
Contamination from gloved hand	6
Cross contamination of foods	7
Room temperature storage of food that requires cold holding	8
Inadequate hot holding of food	9
Inadequate cleaning	10

Food served in restaurants accounted for about two-thirds of outbreaks that occurred from 2006–2010. Only a small portion of those outbreaks resulted from restaurants using contaminated commercial products. Most resulted from improper handling practices. From 2006–2010,

about two-thirds of reported outbreaks were from restaurants and about one in seven resulted from contaminated commercial products. Catered meals accounted for about 6% of the outbreaks.

**Foodborne Outbreaks by Source  
Washington State, 2006–2010  
Washington State Department of Health  
Food Safety Program**

Food Contamination Source	Percent of Outbreaks
Restaurant	67%
Commercial product	14%
Catered meals	6%
Institution	5%
Market	3%
Private Residence	3%
Concession	2%

### Other Measures of Burden

**Illness reporting.** Foodborne illness complaints from the public are the primary source of information for outbreak detection. However, due to developments in laboratory identification of pathogen subtypes, the proportion of outbreaks identified through public health surveillance is steadily increasing. Data from the 2010 Washington Communicable Disease Report shows that 43% of reported outbreaks were detected through linking patient specimen pathogen subtypes, while 57% were detected through patient complaints.

The Department of Health tracks the annual number of laboratory-confirmed cases of disease related to pathogens that are primarily transmitted by food, such as *Salmonella* and *Campylobacter*. According to the department's data, campylobacteriosis is the most commonly reported intestinal illness with 900 to 1100 cases in Washington each year. Salmonellosis is the second most common with 600 to 850 cases each year.

According to CDC, norovirus is the most common cause of foodborne illness nationally.<sup>5</sup> This is likely also true in Washington. In addition to the 16 outbreaks reported from 2006–2010 (see table on following page), most viral foodborne outbreaks that are not laboratory confirmed are also likely from norovirus.

Sharing pathogen subtype information between laboratories and public health agencies contributes significantly to identifying outbreaks. This information sharing allows for the linking of seemingly unrelated individual illness cases and facilitates public health

surveillance, notification and investigation of suspected cases to identify causes of the outbreak.

**Agents Associated with Foodborne Outbreaks  
Washington State 2006–2010  
Communicable Disease Annual Reports**

	Number of Outbreaks
<b>Bacterial Agent</b>	
<i>Salmonella</i>	30
STEC*	9
<i>Campylobacter jejuni</i>	4
<i>Bacillus cereus</i>	2
<i>Vibrio parahaemolyticus</i>	2
<i>Vibrio mimicus</i>	1
<i>Listeria monocytogenes</i>	1
<b>Viral Agent</b>	
Virus (not lab confirmed)	59
Norovirus	16
Hepatitis A	2
<b>Toxin Agent</b>	
Bacterial (not lab confirmed)	15
<i>Clostridium perfringens</i>	9
Scombrototoxin	3
Chemical ingestion	1
Mushroom toxin	1
<b>Unknown Agent</b>	11

\*STEC = Shiga-toxin producing *E. coli*

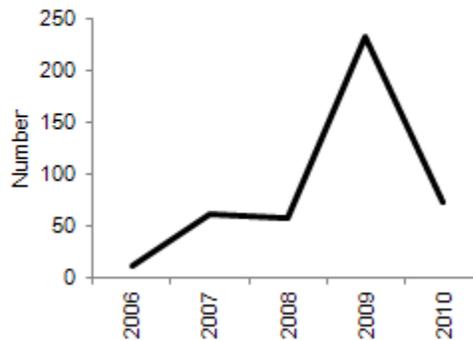
**Restaurant inspections.** Generally, food service establishments with many inspection violations pose a greater risk of foodborne disease outbreaks than those with fewer violations.<sup>6</sup> Since 2009, local public health agencies have reported the total number of permanent food service establishments receiving inspections and the number of inspected establishments with more than 35 critical item violation points during an inspection. Enforcement action usually takes place when critical violations exceed 35 points during an inspection. In 2010, in seven of Washington’s 39 counties, 5% or more of inspected establishments had a critical violation score in excess of 35 points.<sup>7</sup>

Caution is needed when interpreting this indicator because inspection practices, inspector training and workloads can influence inspection scores. These factors vary between public health agencies. A greater number of violations might result from recent inspector training, standardization of inspection methods or

increased focus on identification and documentation of critical violations.

**Recalls of contaminated products.** Food safety challenges include a rising number of multistate foodborne illness outbreaks with contaminated products causing illness. In 2009, the number of recalled products surged nationwide, with Washington being impacted by more than 200 recalls. The 2009 increase was largely due to one contaminated ingredient being added to numerous products. One such incident, which affected many products, was contaminated peanuts. This resulted in scores of separate recalls affecting over 2,800 different peanut-containing products.

**Food Recalls  
Washington State, 2006–2010  
Washington State Department of  
Health, Food Safety Program**



**High-Risk Populations**

Young children, the elderly, pregnant women, and people who are immune-compromised are among those at a higher risk for developing more severe symptoms of foodborne illness. Safe food handling practices are critically important at facilities and institutions serving these groups.

**Intervention Strategies**

Preventing foodborne illness is the responsibility of public health, the food service industry, various regulatory agencies and the general public. Activities include:

- Training inspectors and food workers about safe food handling practices and risk factors related to food safety.
- Educating the public about food safety.
- Inspecting and permitting food establishments.
- Notifying the public of food safety alerts.

- Supporting communication among food safety agencies for a prompt coordinated response to food emergencies.

**Outreach training for inspectors and food workers.** The Department of Health provides training to local public health inspectors to help them identify food safety risk factors. In addition, the department conducts training workshops for inspectors and workers in the food industry. Proper food handling practices will have the greatest impact on reducing foodborne illnesses.

Washington is one of a few states that requires food workers to maintain a valid food handler card. The department oversees updates and revisions to the training manual and exam. Local public health administers the exam and issues the card.

In a recent study of kitchen managers and food workers, 12% of surveyed workers reported that they had worked two or more shifts in the last year while experiencing vomiting or diarrhea. Male workers were more likely to work while experiencing these symptoms. The findings also indicated that workers who were entitled to paid sick leave were two times less likely to come to work with vomiting and diarrhea. Interventions suggested by the research include policies that encourage workers to tell managers when they are ill and policies to lessen pressure to work while ill.<sup>8</sup>

**Educating the public about food safety.** Food safety education is available through various campaigns such as “Fight Bac!” and “Clean, Separate, Cook, Chill.” The “Fight Bac!” campaign promotes the reduction of foodborne illness through outreach materials for people of different ages. The four simple steps to preserve food safety presented by the “Clean, Separate, Cook, Chill” program may protect families from foodborne illness. Other campaigns include seasonal and holiday food safety messages.

**Inspecting and permitting food establishments.** In Washington, retail food service rules are adopted by the State Board of Health and supported by the department. Local public health agencies regulate the retail food industry by permitting and conducting routine inspections of food establishments. The state Departments of Health, Social and Health Services, and Early Learning similarly regulate food service in specialized facilities such as daycare and nursing homes.

**Notifying the public of food recalls and safety alerts.** The department issues press releases to inform the public of food safety alerts. This often occurs when there are associated illnesses within the state. The department also maintains a website that lists and provides details about recalled products affecting the state. To get updated food recall and safety alerts visit [www.doh.wa.gov/foodrecalls](http://www.doh.wa.gov/foodrecalls).

**Communicating during food emergencies.** Ensuring food safety involves monitoring from “farm to table.” WSDA works with the U.S. Food & Drug Administration and the U.S. Department of Agriculture to monitor food production safety. The department is working closely with these agencies through the Washington Food Protection Task Force (FPTF). The FPTF provides a framework for multi-agency cooperation and coordination during food emergencies impacting Washington State.

**See Related Chapters:** [Shellfish Safety](#), [Emerging Infectious Diseases](#)

#### **Data Sources**

[Washington State Department of Health, Communicable Disease Annual Reports 1990–2010](#)

[Washington State Department of Health, Food Safety Program](#)

#### **For More Information**

Washington State Department of Health, Food Safety Program (360) 236-3385

<http://www.doh.wa.gov/YouandYourFamily/FoodSafety.aspx>

Partnership for Food Safety and Education, Fight Bac!:

<http://www.fightbac.org/>

U.S. Centers for Disease Control and Prevention (CDC), Foodborne Illness:

<http://www.cdc.gov/foodsafety/facts.html>

CDC Food Safety Office: <http://www.cdc.gov/foodsafety/>

U.S. Department of Agriculture, Food Safety:

<http://www.fsis.usda.gov/Home/index.asp>

U.S. Food and Drug Administration, Food Safety:

<http://www.fda.gov/Food/FoodSafety/default.htm>

Washington State Department of Agriculture:

<http://agr.wa.gov/Portals/Food/>

Washington State University Cooperative Extension-Food Safety: <http://www.foodsafety.wsu.edu/>

#### **Acknowledgments**

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## Endnotes

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<sup>1</sup> Scallan E, Hoekstra RM, Angulo FJ, et al. Foodborne Illnesses Acquired in the United States-Major Pathogens. *Emerg Infect Dis.* 2011;17(1):1. [http://wwwnc.cdc.gov/eid/article/17/1/P2-1101\\_article.htm](http://wwwnc.cdc.gov/eid/article/17/1/P2-1101_article.htm). Accessed September 26, 2011.

<sup>2</sup> U.S. Centers for Disease Control and Prevention. *Outbreaks and Surveillance (tracking) – How do public health departments track foodborne diseases?* Atlanta, GA: U.S. Centers for Disease Control and Prevention; 2012. <http://www.cdc.gov/foodsafety/facts.html>. Accessed January 9, 2013.

<sup>3</sup> U.S. Department of Agriculture, Food Safety and Inspection Service. *Salmonella enteritidis risk assessment, shell eggs and egg products.* Washington, DC: U.S. Department of Agriculture; 1998. <http://www.fsis.usda.gov/OPHS/risk/index.htm>. Accessed March 19, 2008.

<sup>4</sup> U.S. Food and Drug Administration, Center for Food Safety and Applied Nutrition. *Quantitative assessment of relative risk to public health from foodborne Listeria monocytogenes among selected categories of ready-to-eat foods.* Washington, DC: U.S. Food and Drug Administration; 2003. <http://www.fda.gov/downloads/food/scienceresearch/researchareas/riskassessmentsafetyassessment/ucm197330.pdf>. Accessed March 19, 2008.

<sup>5</sup> U.S. Centers for Disease Control and Prevention. *What are the most common foodborne diseases?* Atlanta, GA: U.S. Centers for Disease Control and Prevention; 2012. <http://www.cdc.gov/foodsafety/facts.html#mostcommon>. Accessed March 11, 2013.

<sup>6</sup> Irwin K, Ballard J, Grendon J, Kobayashi J. Results of routine restaurant inspections can predict outbreaks of foodborne illness: the Seattle-King County experience. *Am J Public Health.* 1989;79(5):586-590.

<sup>7</sup> Public Health Improvement Partnership. *Local Public Health Indicators – Food Service Safety.* Olympia, WA: Washington State Department of Health; 2011. <http://www.doh.wa.gov/Portals/1/Documents/1200/LPHI-list.pdf>. Accessed February 20, 2013.

<sup>8</sup> Sumner S, Brown L, Frick R, et.al. Factors associated with food workers working while experiencing vomiting and diarrhea. *J Food Protect.* 2011;74(2):215-220. [http://www.cdc.gov/nceh/ehs/EHSNet/Docs/JFP\\_ill\\_food\\_workers.pdf](http://www.cdc.gov/nceh/ehs/EHSNet/Docs/JFP_ill_food_workers.pdf). Accessed November 14, 2011.