

Surveillance for Foodborne Disease Outbreaks United States, 2011: Annual Report



National Center for Emerging and Zoonotic Infectious Diseases
Division of Foodborne, Waterborne, and Environmental Diseases





**Surveillance for
Foodborne Disease Outbreaks
United States
2011 Annual Report**

Acknowledgements

The findings in this study are based, in part, on contributions by state, local, tribal, and territorial health departments.

Suggested Citation

Centers for Disease Control and Prevention (CDC).
Surveillance for Foodborne Disease Outbreaks, United States, 2011, Annual Report.
Atlanta, Georgia: US Department of Health and Human Services, CDC, 2014.

Report compiled by

Sarah D. Bennett, Karunya Manikonda, Elisabeth Mungai,
Daniel Dewey-Mattia, and L. Hannah Gould

Centers for Disease Control and Prevention

Division of Foodborne, Waterborne, and Environmental Diseases
1600 Clifton Road, Mail Stop C-09, Atlanta, GA 30333
Telephone: 404.639.2206
Email: NORS-Foodborne@cdc.gov
<http://www.cdc.gov/foodsafety/fdoss>

Contents

Introduction.....	1
Findings: Foodborne disease outbreaks, United States, 2011.....	1
Limitations.....	3
Main Findings and Comments.....	3
References.....	4
Figure: Rate of reported foodborne disease outbreaks per 1 million population and number of outbreaks, by state and major etiology group.....	5
Table 1: Number of reported foodborne disease outbreaks, outbreak-associated illnesses, and hospitalizations, by etiology.....	6
Table 2a: Number of reported foodborne disease outbreaks and outbreak-associated illnesses, by food category.....	7
Table 2b: Most common pathogen-food category pairs resulting in outbreaks, outbreaks-associated illnesses, hospitalizations, and deaths.....	8
Table 3a: Number of reported foodborne disease outbreaks and outbreak-associated illnesses, by location of food preparation.....	9
Table 3b: Number of reported foodborne disease outbreaks and outbreak-associated illnesses, by etiology and location of food preparation.....	10
Appendix: Number of reported foodborne disease outbreaks, by etiology and contributing factors.....	11

Introduction

Foodborne diseases cause an estimated 48 million illnesses each year in the United States, including 9.4 million caused by known pathogens (1–2). Though only a small proportion of these illnesses occur in the setting of an outbreak, data collected during outbreak investigations can provide valuable insight into the pathogens and foods that cause illness. Public health officials, regulatory agencies, and the food industry can use this information to create targeted control strategies along the farm-to-table continuum to address specific pathogens and foods.

A foodborne disease outbreak is defined as the occurrence of two or more cases of a similar illness resulting from ingestion of a common food. Foodborne disease outbreaks are a nationally notifiable condition (<http://cymcdn.com/sites/www.cste.org/resource/resmgr/CSTENotifiableConditionListA.pdf>). CDC conducts foodborne disease outbreak surveillance in the United States through the Foodborne Disease Outbreak Surveillance System. Public health agencies in all 50 states, the District of Columbia, U.S. territories, and Freely Associated States voluntarily submit reports of outbreaks investigated by their agencies using a web-based reporting platform, the National Outbreak Reporting System (NORS) (<http://www.cdc.gov/nors/>). NORS also collects reports of enteric disease outbreaks caused by other modes of transmission, including person-to-person contact, animal contact, water, environmental contamination, and unknown mode of transmission.

Investigating and reporting agencies use a standard outbreak reporting form (http://www.cdc.gov/nors/pdf/NORS_CDC_5213.pdf) to report foodborne disease outbreaks. Data requested for each outbreak include the reporting state; date of first illness onset; number of illnesses, hospitalizations and deaths; etiology; implicated food and ingredients; locations of food preparation; and factors contributing to food contamination (see appendix). Outbreaks that are excluded from the Foodborne Disease Outbreak Surveillance System include those that occurred on

cruise ships with both US and international ports and those in which the food was eaten outside the United States, even if the illness occurred in the United States.

This report includes foodborne disease outbreaks that were reported to the Foodborne Disease Outbreak Surveillance System by October 17, 2013, in which the first illness occurred during 2011. Etiologic agents were reported as confirmed if they met pre-defined confirmation criteria (3); otherwise, they were reported as suspected. For outbreaks caused by a single confirmed or suspected etiology, etiologies were grouped as bacterial, chemical and toxin, parasitic, or viral. Multistate outbreaks were defined as outbreaks in which exposure to the implicated food occurred in more than one state or territory. Population-based outbreak reporting rates were calculated for each state using United States Census estimates of the 2011 state populations (<http://www.census.gov/popest/>); multistate outbreaks were included in population-based outbreak reporting rates by assigning one outbreak to each state that reported cases in the outbreak. Implicated foods were classified into one of 24 single food categories if a single contaminated ingredient was identified or if all ingredients belonged to that category (4). Outbreaks attributed to foods that could not be assigned to one of these single food categories, or for which the report contained insufficient information for category assignment, were not attributed to any category.

Findings: Foodborne disease outbreaks, United States, 2011

During 2011, 801 foodborne disease outbreaks were reported (Table 1), resulting in 14,140 illnesses, 956 hospitalizations, and 45 deaths (Table 1). Outbreaks were reported by public health officials from all 50 states, the District of Columbia, and Puerto Rico (Figure 1). The median rate was 3.7 foodborne disease outbreaks per 1 million population; rates ranged from 1.1 outbreaks per 1 million population in North Carolina to 10.7 outbreaks per 1 million population in Minnesota.

A single confirmed or suspected etiologic agent was identified in 502 (63%) outbreaks (370 confirmed and 132 suspected) (Table 1). Among the 370 outbreaks with a single confirmed etiologic agent, bacteria caused the most outbreaks (192 outbreaks, 52%), followed by viruses (144, 39%), chemicals and toxins (30, 8%), and parasites (4, 1%). Norovirus was the most common cause of confirmed, single-etiology outbreaks and illnesses, accounting for 143 (39%) outbreaks and 3,978 (46%) illnesses. *Salmonella* was next, accounting for 108 (29%) outbreaks and 2,966 (35%) illnesses. Among the 107 confirmed *Salmonella* outbreaks with a serotype reported, Enteritidis was the most common (28 outbreaks, 26%), followed by Typhimurium (20, 19%), Heidelberg (13, 12%), and Newport (8, 7%). Shiga toxin-producing *Escherichia coli* (STEC) caused 23 confirmed, single-etiology outbreaks, of which 17 (74%) were caused by serogroup O157; 5 outbreaks were caused by serogroup O26 and 1 outbreak by serogroup O121.

Of the 8,561 outbreak-related illnesses caused by a single confirmed etiologic agent, 800 (9%) resulted in hospitalization (Table 1). Among confirmed, single-etiology outbreaks, *Salmonella* caused the most outbreak-related hospitalizations (461 hospitalizations, 58%), followed by *Listeria monocytogenes* (149, 19%) and STEC (96, 12%). Outbreaks caused by *Listeria* resulted in the highest proportion of ill persons hospitalized (97%). Among the 45 deaths reported, 43 (96%) were attributed to bacterial etiologies (*Listeria* [35], *Salmonella* [5], STEC serogroup O157 [2], and *Yersinia enterocolitica* [1]); 2 deaths were reported in outbreaks caused by unknown etiologies.

A food vehicle was reported for 326 (41%) outbreaks. In 191 (59%) of these outbreaks, the food vehicle could be classified into one of the 24 single food categories (Table 2a); the categories most commonly implicated were fish (30 outbreaks, 16%), fruits (24, 13%), and dairy (23, 12%). Among the 23 dairy-associated outbreaks for which pasteurization information was reported, 20 (87%) involved unpasteurized products. The categories associated with the most

outbreak-related illnesses were fruits (842 illnesses, 21%), chicken (669, 17%), and turkey (492, 12%).

The pathogen-food category pairs responsible for the most outbreaks were *Campylobacter* in unpasteurized dairy (15 outbreaks), ciguatoxin in fish (13), and norovirus in fruits (11) (Table 2b). The pathogen-food category pairs responsible for the most outbreak-related illnesses were *Salmonella* in chicken (545 illnesses), norovirus in fruits (444), and *Salmonella* in pork (227). The pathogen-food category pairs responsible for the most hospitalizations were *Listeria* in fruits (143 hospitalizations), *Salmonella* in turkey (58), and STEC in vegetable row crops (44). Deaths were reported for the following pathogen-food category pairs: *Listeria* in fruits (33 deaths) and dairy (2), STEC in fruits (2), *Salmonella* in turkey (1), *Yersinia enterocolitica* in dairy (1).

Nineteen multistate outbreaks (2% of all outbreaks) were reported. They involved a median of 10 states (range: 4–37). Twelve outbreaks were caused by *Salmonella*. Reported *Salmonella* serotypes were Enteritidis (3 outbreaks); Heidelberg and Newport (2 each); Agona, Bovismorbificans, Panama, Typhimurium, and Uganda (1 each). The remaining 7 outbreaks were caused by STEC (4 outbreaks; serogroups O157 [3] and O26 [1]), *Listeria* (2), and toxigenic *Vibrio cholerae* serogroup O75 (1). Ten (83%) of 12 multistate outbreaks caused by *Salmonella* implicated a food vehicle; the foods were cantaloupes (2 outbreaks); alfalfa sprouts, broiled chicken liver, ground beef, ground turkey, papayas, tahini, tomatoes, and Turkish pine nuts (1 each). Four multistate outbreaks were caused by STEC; it was transmitted in Lebanon beef bologna (serogroup O157 [1 outbreak]), clover sprouts (O26 [1]), romaine lettuce (O157 [1]), and mixed romaine and iceberg lettuce (O157 [1]). Two multistate outbreaks were caused by *Listeria* in cantaloupes and blue-veined cheese made from unpasteurized milk (1 outbreak each).

Among the 587 outbreaks and 9,856 illnesses with a reported single location where food was prepared, 348 outbreaks (59%) and 4,536 illnesses (46%) were associated with foods prepared in a restaurant (Table 3a). Among these outbreaks, sit-down dining-style was the type of restaurant most

commonly reported as the location where food was prepared (268 outbreaks, 77%). The most commonly reported location of food preparation varied by outbreak etiology. For example, among the 23 outbreaks caused by *Campylobacter* with a reported single location of food preparation, foods were most commonly prepared at commercial locations other than a restaurant, catering, or banquet facility (11 outbreaks, 48%), including on a farm or dairy (10 outbreaks) and at a fair, festival or other temporary location (1) (Table 3b). Among outbreaks caused by STEC with a reported single location of food preparation (16 outbreaks), 9 (56%) were attributed to foods prepared in a private home.

Twenty-seven outbreaks resulted in product recalls; the foods recalled were ground beef (3 outbreaks); frozen oysters, multiple cheeses, unpasteurized milk, and ground turkey (2 each); mussels, live oysters, ground tuna, intact tuna, pasteurized Mexican-style queso fresco, Lebanon beef bologna, pork sausage, broiled chicken liver, alfalfa sprouts, clover sprouts and seeds, cantaloupes, papayas, strawberries, organic grape tomatoes, canned fruits and vegetables, and Turkish pine nuts (1 each).

Limitations

The findings in this report are subject to at least four limitations. First, only a small proportion of foodborne illnesses reported each year are identified as being associated with outbreaks. The extent to which the distribution of food vehicles and locations of preparation implicated in foodborne disease outbreaks reflect the same vehicles and locations as sporadic foodborne illnesses is unknown. Similarly, not all outbreaks are identified, investigated, or reported. Second, many outbreaks had an unknown etiology, an unknown food vehicle, or both, and conclusions drawn from outbreaks with a confirmed or suspected etiology or food vehicle might not apply to outbreaks with an unknown etiology or food vehicle. Third, CDC's outbreak surveillance system is dynamic; agencies can submit new reports and can change or delete previous reports as new information becomes

available. Therefore, the results of this analysis might differ from those published earlier or from future reports. Finally, because of changes in the surveillance system implemented in 2009 and the use of a new food categorization scheme in 2011, comparisons with preceding years should be made with caution.

Main Findings and Comments

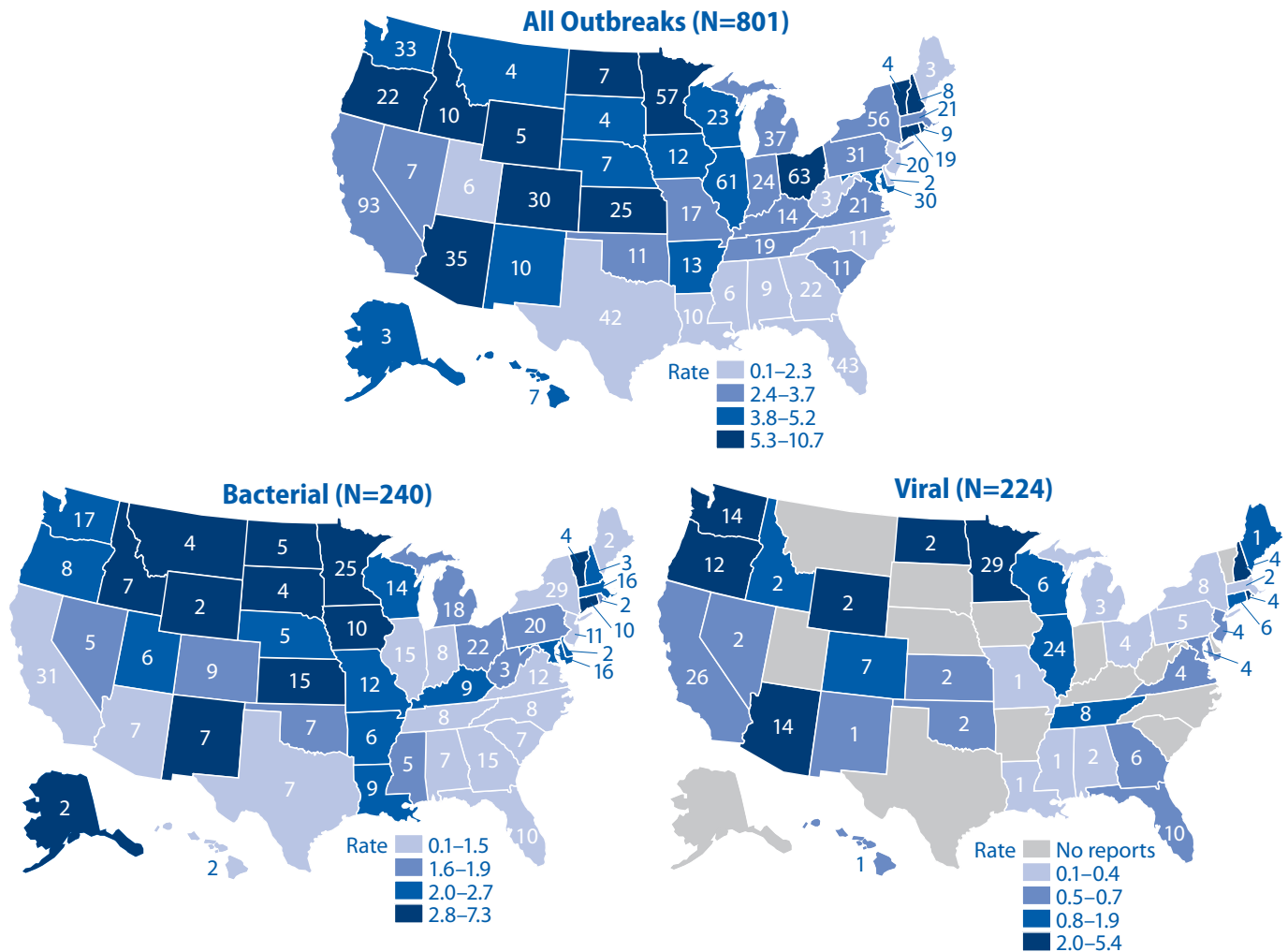
- In 2011, 801 foodborne disease outbreaks were reported, resulting in 14,140 illnesses, 956 hospitalizations, 45 deaths, and 27 food recalls. The number of reported deaths in 2011 was greater than the number of deaths reported in 2009 and 2010; this increase is attributed to a single multistate outbreak caused by *Listeria* in cantaloupes.
- The number of outbreaks caused by *Campylobacter* increased from 15 in 2009 to 25 in 2010 and 30 outbreaks in 2011. Among the 18 *Campylobacter* outbreaks with a known food vehicle in 2011, 15 (83%) were attributed to unpasteurized dairy products.
- Fish, fruits, and dairy were the most commonly implicated food categories in outbreaks in which a single food category could be implicated. The food category classification scheme used for this annual summary differs from the classification scheme used in previous years (5–7). Therefore, direct comparisons with previous years cannot be made.
- Overall, restaurants, specifically sit-down dining-style restaurants, were most commonly reported as the location of food preparation; however, the most common locations of preparation varied by outbreak etiology.

Public health, regulatory, and food industry professionals use foodborne disease outbreak surveillance data to target prevention efforts related to pathogens and foods that cause foodborne disease outbreaks. Additional information on outbreaks and the Foodborne Disease Outbreak Online Database are available at <http://www.cdc.gov/foodsafety/fdoss/>.

References

1. Scallan E, Hoekstra RM, Angulo FJ, et al. Foodborne illness acquired in the United States—major pathogens. *Emerging Infectious Diseases* 2011; 17(1): 7-15.
2. Scallan E, Griffin PM, Angulo FJ, Tauxe RV, Hoekstra RM. Foodborne illness acquired in the United States—unspecified agents. *Emerging Infectious Diseases* 2011; 17(1): 16-22.
3. CDC. Guide to confirming a diagnosis in foodborne disease. Available at: http://www.cdc.gov/foodsafety/outbreaks/investigating-outbreaks/confirming_diagnosis.html. Accessed January 23, 2014.
3. Interagency Food Safety Collaboration (IFSAC). The Interagency Food Safety Analytics Collaboration (IFSAC): Completed Projects. <http://www.cdc.gov/foodsafety/ifsac/projects/completed.html>. Accessed May 30, 2014.
4. CDC. Surveillance for foodborne disease outbreaks — United States, 2009–2010. *Morbidity and Mortality Weekly Report* 2013; 62(3): 41-7.
5. CDC. Surveillance for foodborne disease outbreaks — United States, 1998–2008. *Morbidity and Mortality Weekly Report* 2013; 62(SS02): 1-34.
6. Painter JA, Ayers T, Woodruff R, et al. Recipes for foodborne outbreaks: a scheme for categorizing and grouping implicated foods. *Foodborne Pathogens and Disease* 2009; 6(10): 1259-64.

Figure: Rate of reported foodborne disease outbreaks per 1 million population* and number of outbreaks,† by state‡ and major etiology group§—Foodborne Disease Outbreak Surveillance System, United States, 2011.



* Cutpoints for outbreak rate categories determined using quartiles. Legend differs for each map.

† Number of reported outbreaks in each state. In addition to the 50 states, Puerto Rico reported 9 outbreaks and the District of Columbia reported 1 outbreak.

‡ Includes 19 multistate outbreaks (i.e., outbreaks in which exposure occurred in more than one state) assigned as an outbreak to each state involved. Multistate outbreaks involved a median of 10 states (range: 4–37).

§ Includes outbreaks caused by both confirmed and suspected etiologies.

Table 1: Number of reported foodborne disease outbreaks, outbreak-associated illnesses, and hospitalizations, by etiology (confirmed or suspected)*—Foodborne Disease Outbreak Surveillance System, United States, 2011.

Etiology	No. Outbreaks				No. Illnesses				No. Hospitalizations			
	CE	SE	Total	%	CE	SE	Total	%	CE	SE	Total	%
Bacterial												
<i>Salmonella</i> [†]	108	6	114	23	2,966	81	3,047	29	461	7	468	56
<i>Campylobacter</i> [‡]	23	7	30	6	241	50	291	3	22	3	25	3
<i>Escherichia coli</i> , Shiga toxin-producing (STEC) [§]	23	0	23	5	237	0	237	2	96	0	96	11
<i>Clostridium perfringens</i>	12	8	20	4	392	275	667	6	0	1	1	0
<i>Bacillus cereus</i>	2	7	9	2	48	52	100	1	0	1	1	0
<i>Staphylococcus aureus</i> , enterotoxin	3	6	9	2	20	93	113	1	3	11	14	2
<i>Vibrio parahaemolyticus</i>	4	2	6	1	20	5	25	0	3	0	3	0
<i>Listeria monocytogenes</i>	4	1	5	1	153	15	168	2	149	1	150	18
<i>Shigella</i> [¶]	4	0	4	1	40	0	40	0	3	0	3	0
<i>Escherichia coli</i> , Enterotoxigenic	3	0	3	1	162	0	162	2	1	0	1	0
<i>Clostridium botulinum</i>	2	0	2	0	11	0	11	0	2	0	2	0
<i>Vibrio cholerae</i>	1	1	2	0	10	12	22	0	0	0	0	0
<i>Clostridium</i> other	1	0	1	0	12	0	12	0	0	0	0	0
<i>Escherichia coli</i> , Enteroaggregative	1	0	1	0	12	0	12	0	0	0	0	0
<i>Yersinia enterocolitica</i>	1	0	1	0	16	0	16	0	7	0	7	1
Other	0	10	10	2	0	66	66	1	0	1	1	0
Subtotal	192	48	240	48	4,340	649	4,989	48	747	25	772	92
Chemical and toxin												
Ciguatoxin	15	0	15	3	62	0	62	1	1	0	1	0
Scombroid toxin/Histamine	10	0	10	2	27	0	27	0	1	0	1	0
Mycotoxins	2	0	2	0	4	0	4	0	1	0	1	0
Paralytic shellfish poison	1	0	1	0	21	0	21	0	4	0	4	0
Other	2	3	5	1	5	16	21	0	2	0	2	0
Subtotal	30	3	33	7	119	16	135	1	9	0	9	1
Parasitic												
<i>Cryptosporidium</i>	1	1	2	0	4	16	20	0	0	1	1	0
<i>Cyclospora</i>	2	0	2	0	111	0	111	1	3	0	3	0
<i>Trichinella</i>	1	0	1	0	2	0	2	0	1	0	1	0
Subtotal	4	1	5	1	117	16	133	1	4	1	5	1
Viral												
Norovirus	143	80	223	44	3,978	1,157	5,135	49	38	12	50	6
Hepatitis A	1	0	1	0	7	0	7	0	2	0	2	0
Subtotal	144	80	224	45	3,985	1,157	5,142	49	40	12	52	6
Single etiology**	370	132	502	63	8,561	1,838	10,399	74	800	38	838	88
Multiple etiologies	9	3	12	1	211	66	277	2	8	0	8	1
Unknown etiology††	0	287	287	36	0	3,464	3,464	24	0	110	110	12
Total**	379	422	801	100	8,772	5,368	14,140	100	808	148	956	100

Abbreviations: No. = Number; CE = confirmed etiology; SE = suspected etiology.

* If at least one etiology was laboratory-confirmed, the outbreak was considered to have a confirmed etiology. If no etiology was laboratory-confirmed, but an etiology was reported based on clinical or epidemiologic features, the outbreak was considered to have a suspected etiology.

[†] *Salmonella* serotypes causing more than five outbreaks were Enteritidis (29 outbreaks), Typhimurium (22), Heidelberg (13), Newport (9), and Muenchen (6).

[‡] *Campylobacter jejuni* (23 outbreaks), *Campylobacter coli* (2), and *Campylobacter* unknown species (5).

[§] STEC serogroups O157 (17 outbreaks; 16 were H7 and 1 was nonmotile), O26 (5; 1 was nonmotile), O121:H19 (1).

[¶] *Shigella sonnei* (3 outbreaks) and *Shigella flexneri* (1).

** The denominator for the etiology percentages is the single etiology total. The denominator for the single etiology, multiple etiologies, and unknown etiology is the total. Because of rounding, numbers might not add up to the single etiology total or the total.

†† An etiological agent was not confirmed or suspected based on clinical, laboratory, or epidemiologic information.

Table 2a: Number of reported foodborne disease outbreaks and outbreak-associated illnesses, by food category*—Foodborne Disease Outbreak Surveillance System, United States, 2011.

Food Category*	No. Outbreaks		No. Illnesses	
	Total	%	Total	%
Aquatic animals				
Crustaceans	2	1	16	0
Mollusks†	17	9	115	3
Fish	30	16	106	3
Other aquatic animals	0	0	0	0
Subtotal	49	26	237	6
Land animals				
Dairy‡	23	12	210	5
Eggs	3	2	34	1
Beef	11	6	118	3
Pork	15	8	344	9
Other meat (sheep, goat, etc.)	0	0	0	0
Chicken	15	8	669	17
Turkey	10	5	492	12
Other poultry	0	0	0	0
Game	3	2	6	0
Subtotal	80	42	1,873	47
Plants				
Oils and sugars	0	0	0	0
Fungi	3	2	8	0
Sprouts	5	3	72	2
Root and other underground vegetables§	1	1	8	0
Seeded vegetables¶	5	3	246	6
Herbs	1	1	27	1
Vegetable row crops**	9	5	349	9
Fruits††	24	13	842	21
Grains and beans††	11	6	221	6
Nuts and seeds§§	1	1	53	1
Subtotal	60	31	1,826	46
Other	2	1	45	1
Food reported, attributed to a single food category**	191	24	3,981	28
Food reported, not attributed to a single food category	135	17	2,737	19
No food reported	475	59	7,422	52
Total**	801	100	14,140	100

Abbreviations: No. = Number.

*Interagency Food Safety Analytics Collaboration (IFSAC) food categorization scheme: <http://www.cdc.gov/foodsafety/ifsac/projects/completed.html>.

†Bi-valve mollusks (15 outbreaks) and mollusks not further classified (2).

‡Unpasteurized dairy products (20 outbreaks) and pasteurized dairy products (3).

§Tubers (1 outbreak).

¶Solanaceous seeded vegetables (3 outbreaks), legumes (1), and vine-grown seeded vegetables (1).

** Leafy vegetables (8 outbreaks) and stem vegetables (1).

†† Melons (4 outbreaks), pome fruits (3), small fruits (1), sub-tropical fruits (1), and fruits not further classified (14).

‡‡ Grains (5 outbreaks), beans (2), and grains-beans not further classified (4).

§§ Nuts (1 outbreak).

** The denominator for the food category percentages is the “food reported, attributed to a single food category” total. The denominator for the “food reported, attributed to a single food category,” “food reported, not attributed to a single food category,” and “No food reported” is the total. Because of rounding, numbers might not add up to the “food reported, attributed to a single food category” total or the total.

Table 2b: Most common pathogen-food category pairs resulting in outbreaks, outbreaks-associated illnesses, hospitalizations, and deaths—Foodborne Disease Outbreak Surveillance System, United States, 2011.

Top 5 pathogen-food category pairs resulting in outbreaks					
Etiology	Food Category*	No. Outbreaks	No. Illnesses	No. Hospitalizations	No. Deaths
<i>Campylobacter</i>	Dairy	15	125	6	0
Ciguatoxin	Fish	13	55	1	0
Norovirus	Fruits	11	444	5	0
<i>Salmonella</i>	Pork	10	227	30	0
Scombroid toxin/Histamine	Fish	9	25	1	0

Top 5 pathogen-food category pairs resulting in outbreak-associated illnesses					
Etiology	Food Category*	No. Outbreaks	No. Illnesses	No. Hospitalizations	No. Deaths
<i>Salmonella</i>	Chicken	7	545	36	0
Norovirus	Fruits	11	444	5	0
<i>Salmonella</i>	Pork	10	227	30	0
<i>Clostridium perfringens</i>	Turkey	3	226	0	0
<i>Salmonella</i>	Turkey	4	222	58	1

Top 5 pathogen-food category pairs resulting in outbreak-associated hospitalizations					
Etiology	Food Category*	No. Outbreaks	No. Illnesses	No. Hospitalizations	No. Deaths
<i>Listeria monocytogenes</i>	Fruits	1	147	143	33
<i>Salmonella</i>	Turkey	4	222	58	1
<i>Escherichia coli</i> , Shiga toxin-producing (STEC)	Vegetable row crops	3	108	44	0
<i>Salmonella</i>	Chicken	7	545	36	0
<i>Salmonella</i>	Pork	10	227	30	0

Pathogen-food category pairs resulting in outbreak-associated deaths					
Etiology	Food Category*	No. Outbreaks	No. Illnesses	No. Hospitalizations	No. Deaths
<i>Listeria monocytogenes</i>	Fruits	1	147	143	33
<i>Escherichia coli</i> , Shiga toxin-producing (STEC)	Fruits	1	15	7	2
<i>Listeria monocytogenes</i>	Dairy	3	19	5	2
<i>Salmonella</i>	Turkey	4	222	58	1
<i>Yersinia enterocolitica</i>	Dairy	1	16	7	1

Abbreviations: No. = Number.

* Interagency Food Safety Analytics Collaboration (IFSAC) food categorization scheme: <http://www.cdc.gov/foodsafety/ifsac/projects/completed.html>.

Table 3a: Number of reported foodborne disease outbreaks and outbreak-associated illnesses, by location of food preparation—Foodborne Disease Outbreak Surveillance System, United States, 2011.

Location of food preparation	No. Outbreaks		No. Illnesses	
	Total	%	Total	%
Restaurant	348	59	4,536	46
Sit-down dining	268	46	3,329	34
Fast-food	46	8	620	6
Other or unknown type	32	5	376	4
Multiple types	2	0	211	2
Private home	83	14	1,196	12
Catering or banquet facility	75	13	2,306	23
Other commercial location	32	5	400	4
Farm or dairy	15	3	152	2
Grocery store	13	2	161	2
Fair, festival, or temporary mobile service	4	1	87	1
Other institutional location	18	3	762	8
Prison or jail	9	2	444	5
School	3	1	42	0
Workplace cafeteria	3	1	219	2
Camp	2	0	41	0
Workplace, not cafeteria	1	0	16	0
Other location	14	2	116	1
Hospital or nursing home	12	2	330	3
Nursing home	10	2	322	3
Hospital	2	0	8	0
Other private location	5	1	210	2
Place of worship	4	1	185	2
Picnic	1	0	25	0
Single location*	587	73	9,856	70
Multiple locations	50	6	1,627	12
Unknown location	164	20	2,657	19
Total*	801	100	14,140	100

Abbreviations: No. = Number.

The denominator for the location percentages is the single location total. The denominator for the single location, multiple locations, and unknown location is the total. Because of rounding, numbers might not add up to the single location total or the total.

Table 3b: Number of reported foodborne disease outbreaks and outbreak-associated illnesses, by etiology (confirmed and suspected)* and location of food preparation†—Foodborne Disease Outbreak Surveillance System, United States, 2011.

Etiology	Catering or banquet facility		Restaurant		Other commercial location		Hospital or nursing home		Other institutional location		Private home		Other private location		Other location	
	NO	NI	NO	NI	NO	NI	NO	NI	NO	NI	NO	NI	NO	NI	NO	NI
Bacterial																
<i>Salmonella</i>	3	49	34	981	4	61	— [‡]	—	2	99	20	414	2	43	1	13
<i>Campylobacter</i>	1	3	5	44	11	138	—	—	—	—	5	28	—	—	1	3
<i>Escherichia coli</i> , Shiga toxin-producing (STEC)	—	—	4	57	2	17	—	—	—	—	9	68	—	—	1	5
<i>Clostridium perfringens</i>	4	94	6	97	—	—	—	—	3	235	3	49	—	—	—	—
<i>Bacillus cereus</i>	1	45	6	29	—	—	—	—	—	—	—	—	—	—	—	—
<i>Staphylococcus aureus</i> , enterotoxin	—	—	1	7	1	7	—	—	—	—	4	62	—	—	1	6
<i>Vibrio parahaemolyticus</i>	—	—	4	13	—	—	—	—	—	—	2	12	—	—	—	—
<i>Listeria monocytogenes</i>	1	15	—	—	—	—	—	—	—	—	2	149	—	—	—	—
<i>Shigella</i>	—	—	1	7	—	—	—	—	—	—	2	25	—	—	—	—
<i>Escherichia coli</i> , Enterotoxigenic	—	—	2	109	—	—	—	—	—	—	—	—	—	—	—	—
<i>Clostridium botulinum</i>	—	—	—	—	—	—	—	—	1	8	1	3	—	—	—	—
<i>Vibrio cholerae</i>	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Clostridium</i> other	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Escherichia coli</i> , Enteroaggregative	—	—	1	12	—	—	—	—	—	—	—	—	—	—	—	—
<i>Yersinia enterocolitica</i>	—	—	—	—	1	16	—	—	—	—	—	—	—	—	—	—
Other	1	12	8	49	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	11	218	72	1,405	19	239	—	—	6	342	48	810	2	43	4	27
Chemical and toxin																
Ciguatoxin	—	—	6	20	—	—	—	—	—	—	5	29	—	—	2	6
Scombroid toxin/Histamine	—	—	8	22	—	—	—	—	1	3	—	—	—	—	1	2
Mycotoxins	—	—	—	—	—	—	—	—	—	—	2	4	—	—	—	—
Paralytic shellfish poison	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Other	—	—	1	8	—	—	—	—	—	—	3	10	—	—	1	3
Subtotal	—	—	15	50	—	—	—	—	1	3	10	43	—	—	4	11
Parasitic																
<i>Cryptosporidium</i>	—	—	—	—	1	4	—	—	—	—	1	16	—	—	—	—
<i>Cyclospora</i>	—	—	1	12	—	—	—	—	—	—	—	—	—	—	—	—
<i>Trichinella</i>	—	—	—	—	—	—	—	—	—	—	1	2	—	—	—	—
Subtotal	—	—	1	12	1	4	—	—	—	—	2	18	—	—	—	—
Viral																
Norovirus	38	1,489	121	2,042	8	90	7	235	5	268	7	134	2	99	3	45
Hepatitis A	—	—	1	7	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	38	1,489	122	2,049	8	90	7	235	5	268	7	134	2	99	3	45
Single etiology	49	1,707	210	3,516	28	333	7	235	12	613	67	1,005	4	142	11	83
Multiple etiologies	—	—	4	108	1	14	1	33	—	—	2	35	1	68	—	—
Unknown etiology[§]	26	599	134	912	3	53	4	62	6	149	14	156	—	—	3	33
Total	75	2,306	348	4,536	32	400	12	330	18	762	83	1,196	5	210	14	116

Abbreviations: NO = number of outbreaks; NI = number of illnesses.

* If at least one etiology was laboratory-confirmed, the outbreak was considered to have a confirmed etiology. If no etiology was laboratory-confirmed, but an etiology was reported based on clinical or epidemiologic features, the outbreak was considered to have a suspected etiology.

† Reported locations were grouped as follows: catering or banquet facility, restaurant, other commercial location, hospital or nursing home, other institutional location, private home, other private location, and other location (see Table 3a).

‡ No outbreaks in the data reported fall into this category.

§ An etiologic agent was not confirmed or suspected based on clinical, laboratory, or epidemiologic information.

Appendix: Number of reported foodborne disease outbreaks, by etiology (confirmed and suspected)* and contributing factors[†]—Foodborne Disease Outbreak Surveillance System, United States, 2011.

Etiology	Contamination Factors [‡]															No. outbreaks with reported contributing factors	Total No. outbreaks	
	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15			≥1 factor reported
Bacterial																		
<i>Salmonella</i>	1	— [§]	—	—	—	11	4	—	7	6	3	5	1	4	3	34	40	114
<i>Campylobacter</i>	—	—	—	—	—	4	9	1	2	—	—	—	1	—	1	16	17	30
<i>Escherichia coli</i> , Shiga toxin-producing (STEC)	—	—	—	—	—	5	6	1	—	1	1	—	—	1	—	11	11	23
<i>Clostridium perfringens</i>	—	—	—	—	—	2	—	—	1	—	—	—	—	1	3	6	15	20
<i>Bacillus cereus</i>	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5	9
<i>Staphylococcus aureus</i> , enterotoxin	—	—	—	—	—	—	—	—	—	1	—	—	—	—	2	3	6	9
<i>Vibrio parahaemolyticus</i>	1	—	—	—	—	1	5	—	—	—	—	—	—	—	—	6	6	6
<i>Listeria monocytogenes</i>	—	—	—	—	—	—	2	1	—	—	—	—	—	—	2	3	3	5
<i>Shigella</i>	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1	1	4
<i>Escherichia coli</i> , Enterotoxigenic	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3
<i>Clostridium botulinum</i>	2	—	—	—	—	—	1	—	—	—	—	—	—	—	—	2	2	2
<i>Vibrio cholerae</i>	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1	2	2
<i>Clostridium</i> other	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
<i>Escherichia coli</i> , Enteroaggregative	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
<i>Yersinia enterocolitica</i>	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Other	—	—	—	—	—	—	1	—	3	—	—	—	—	1	—	4	10	10
Subtotal	4	—	—	—	—	23	29	3	13	8	4	5	3	7	11	87	118	240
Chemical and toxin																		
Ciguatoxin	13	—	—	—	—	—	—	—	—	—	—	—	—	—	—	13	13	15
Scombroid toxin/Histamine	5	—	—	—	—	1	2	—	—	—	—	—	—	—	1	8	8	10
Mycotoxins	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2	2
Paralytic shellfish poison	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	1
Other	4	—	—	—	—	—	—	—	—	1	—	—	—	—	—	5	5	5
Subtotal	25	—	—	—	—	1	2	—	—	1	—	—	—	—	1	29	29	33
Parasitic																		
<i>Cryptosporidium</i>	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	2	2	2
<i>Cyclospora</i>	—	—	—	—	—	1	1	—	—	—	—	—	—	—	—	1	1	2
<i>Trichinella</i>	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	1
Subtotal	1	—	—	—	—	1	1	—	—	—	—	—	—	1	1	4	4	5
Viral																		
Norovirus	—	—	—	—	—	4	—	3	46	26	22	6	—	4	—	83	87	223
Hepatitis A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Subtotal	—	—	—	—	—	4	—	3	46	26	22	6	—	4	—	83	87	224
Single etiology	30	—	—	—	—	25	36	3	16	54	31	27	9	8	17	203	238	502
Multiple etiologies	—	—	—	—	—	1	—	1	2	1	—	—	—	—	—	4	6	12
Unknown etiology[§]	6	—	2	—	—	2	4	1	6	8	4	4	3	6	11	44	64	287
Total	36	—	2	—	—	27	41	4	23	64	36	31	12	14	28	251	308	801

Appendices' footnotes are on page 14.

Appendix: Number of reported foodborne disease outbreaks, by etiology (confirmed and suspected)* and contributing factors[†]—Foodborne Disease Outbreak Surveillance System, United States, 2011.

Etiology	Proliferation / Amplification Factors [‡]													No. outbreaks with reported contributing factors	Total No. outbreaks
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	≥1 factor reported		
Bacterial															
<i>Salmonella</i>	7	7	2	3	3	1	3	2	— [§]	—	—	4	18	40	114
<i>Campylobacter</i>	2	—	1	—	1	—	1	—	—	—	1	1	5	17	30
<i>Escherichia coli</i> , Shiga toxin-producing (STEC)	2	1	1	1	1	—	—	—	—	—	—	1	3	11	23
<i>Clostridium perfringens</i>	4	5	1	1	2	3	7	4	—	—	—	1	14	15	20
<i>Bacillus cereus</i>	—	—	—	1	1	—	2	2	—	—	—	—	5	5	9
<i>Staphylococcus aureus</i> , enterotoxin	—	3	—	—	1	—	1	3	—	—	—	1	6	6	9
<i>Vibrio parahaemolyticus</i>	—	1	—	—	—	—	—	—	—	—	—	—	1	6	6
<i>Listeria monocytogenes</i>	—	—	—	—	—	—	—	—	—	—	—	1	1	3	5
<i>Shigella</i>	—	—	—	—	—	—	—	—	—	—	—	—	—	1	4
<i>Escherichia coli</i> , Enterotoxigenic	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3
<i>Clostridium botulinum</i>	2	—	—	—	—	—	—	—	—	—	—	—	2	2	2
<i>Vibrio cholerae</i>	—	—	—	—	—	—	—	—	—	—	—	1	1	2	2
<i>Clostridium</i> other	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
<i>Escherichia coli</i> , Enteroaggregative	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
<i>Yersinia enterocolitica</i>	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Other	2	5	—	1	—	2	4	3	—	—	—	1	8	10	10
Subtotal	19	22	5	7	9	6	18	14	—	—	1	11	64	118	240
Chemical and toxin															
Ciguatoxin	—	—	—	—	—	—	—	—	—	—	—	—	—	13	15
Scombroid toxin/Histamine	—	—	1	—	2	—	—	—	—	—	—	—	3	8	10
Mycotoxins	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2
Paralytic shellfish poison	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1
Other	—	—	—	—	—	—	—	—	—	—	—	—	—	5	5
Subtotal	—	—	1	—	2	—	—	—	—	—	—	—	3	29	33
Parasitic															
<i>Cryptosporidium</i>	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2
<i>Cyclospora</i>	—	—	—	—	—	—	—	—	—	—	—	—	—	1	2
<i>Trichinella</i>	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	4	5
Viral															
Norovirus	5	1	—	—	1	—	—	—	—	—	—	1	8	87	223
Hepatitis A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Subtotal	5	1	—	—	1	—	—	—	—	—	—	1	8	87	224
Single etiology	24	23	6	7	12	6	18	14	—	—	1	12	75	238	502
Multiple etiologies	3	4	1	—	1	1	—	—	—	—	—	—	4	6	12
Unknown etiology[§]	13	5	1	7	8	3	4	8	—	—	—	4	33	64	287
Total	40	32	8	14	21	10	22	22	—	—	1	16	112	308	801

Appendices' footnotes are on page 14.

Appendix: Number of reported foodborne disease outbreaks, by etiology (confirmed and suspected)* and contributing factors[†]—Foodborne Disease Outbreak Surveillance System, United States, 2011.

Etiology	Survival Factors [‡]						No. outbreaks with reported contributing factors	Total No. outbreaks
	S1	S2	S3	S4	S5	≥1 factor reported		
Bacterial								
<i>Salmonella</i>	13	3	— [§]	—	4	18	40	114
<i>Campylobacter</i>	2	—	—	—	2	4	17	30
<i>Escherichia coli</i> , Shiga toxin-producing (STEC)	5	—	—	1	2	6	11	23
<i>Clostridium perfringens</i>	2	7	—	—	3	10	15	20
<i>Bacillus cereus</i>	—	—	—	—	1	1	5	9
<i>Staphylococcus aureus</i> , enterotoxin	—	1	—	—	2	2	6	9
<i>Vibrio parahaemolyticus</i>	1	—	—	—	—	1	6	6
<i>Listeria monocytogenes</i>	—	—	—	—	1	1	3	5
<i>Shigella</i>	—	—	—	—	—	—	1	4
<i>Escherichia coli</i> , Enterotoxigenic	—	—	—	—	—	—	—	3
<i>Clostridium botulinum</i>	—	—	—	—	—	—	2	2
<i>Vibrio cholerae</i>	—	1	—	—	1	2	2	2
<i>Clostridium</i> other	—	—	—	—	—	—	—	1
<i>Escherichia coli</i> , Enteroaggregative	—	—	—	—	—	—	—	1
<i>Yersinia enterocolitica</i>	—	—	—	—	—	—	—	1
Other	1	4	—	—	—	4	10	10
Subtotal	24	16	—	1	16	49	118	240
Chemical and toxin								
Ciguatoxin	—	—	—	—	—	—	13	15
Scombroid toxin/Histamine	—	—	—	—	1	1	8	10
Mycotoxins	—	—	—	—	—	—	2	2
Paralytic shellfish poison	—	—	—	—	—	—	1	1
Other	—	—	—	—	—	—	5	5
Subtotal	—	—	—	—	1	1	29	33
Parasitic								
<i>Cryptosporidium</i>	—	—	—	—	1	1	2	2
<i>Cyclospora</i>	—	—	—	—	—	—	1	2
<i>Trichinella</i>	—	—	—	—	—	—	1	1
Subtotal	—	—	—	—	1	1	4	5
Viral								
Norovirus	—	—	—	—	3	3	87	223
Hepatitis A	—	—	—	—	—	—	—	1
Subtotal	—	—	—	—	3	3	87	224
Single etiology	24	16	—	1	21	54	238	502
Multiple etiologies	1	1	—	—	1	1	6	12
Unknown etiology[§]	13	5	1	2	5	22	64	287
Total	38	22	1	3	27	77	308	801

Appendices' footnotes are on page 14.

Appendix footnotes:

* If at least one etiology was laboratory-confirmed, the outbreak was considered to have a confirmed etiology.

If no etiology was laboratory-confirmed, but an etiology was reported based on clinical or epidemiologic features, the outbreak was considered to have a suspected etiology.

† Contributing factors are defined as risk factors that either enable an outbreak to occur, or amplify an outbreak caused by other means. Contributing factors are classified into three categories: contamination factors (factors that introduce or otherwise permit contamination), proliferation / amplification factors (factors that allow proliferation or growth of the etiologic agent), and survival factors (factors that allow survival or fail to inactivate a contaminant) (Bryan FL, Guzewich JJ, Todd EC. Surveillance of Foodborne Diseases III. Summary and Presentation of Data on Vehicles and Contributory Factors: Their value and limitations. J Food Prot 1997;60(6):701–14). More than one contributing factor might be reported per outbreak.

‡ Contributing factors:

- C1: toxic substance part of the tissue
- C2: poisonous substance intentionally / deliberately added
- C3: poisonous substance accidentally / inadvertently added
- C4: addition of excessive quantities of ingredients that are toxic in large amounts
- C5: toxic container
- C6: contaminated raw product — food that was intended to be consumed after a kill step
- C7: contaminated raw product — food was intended to be consumed raw or undercooked / under-processed
- C8: foods originating from sources shown to be contaminated or polluted (such as a growing field or harvest area)
- C9: cross-contamination of ingredients (cross-contamination does not include ill food workers)
- C10: bare-handed contact by a food handler / worker / preparer who is suspected to be infectious
- C11: glove-handed contact by a food handler / worker / preparer who is suspected to be infectious
- C12: other mode of contamination (excluding cross-contamination) by a food handler / worker / preparer who is suspected to be infectious
- C13: foods contaminated by non-food handler / worker / preparer who is suspected to be infectious
- C14: storage in a contaminated environment
- C15: other source of contamination

- P1: food preparation practices that support proliferation of pathogens (during food preparation)
- P2: no attempt was made to control the temperature of implicated food or the length of time food was out of temperature control (during food service or display of food)
- P3: improper adherence of approved plan to use Time as a Public Health Control
- P4: improper cold holding due to malfunctioning refrigeration equipment
- P5: improper cold holding due to an improper procedure or protocol
- P6: improper hot holding due to malfunctioning equipment
- P7: improper hot holding due to improper procedure or protocol
- P8: improper / slow cooling
- P9: prolonged cold storage
- P10: inadequate modified atmospheric packaging
- P11: inadequate processing (acidification, water activity, fermentation)
- P12: other situations that promoted or allowed microbial growth or toxin production

- S1: insufficient time and / or temperature control during initial cooking / heat processing
- S2: insufficient time and / or temperature during reheating
- S3: insufficient time and / or temperature control during freezing
- S4: insufficient or improper use of chemical processes designed for pathogen destruction
- S5: other process failures that permit pathogen survival

§ No outbreaks in the data reported fall in this category.

¶ An etiologic agent was not confirmed or suspected based on clinical, laboratory, or epidemiologic information.



For more information, please contact

Centers for Disease Control and Prevention
1600 Clifton Road NE, Atlanta, GA 30333

Telephone: 1-800-CDC-INFO (232-4636) / TTY: 1-888-232-6348

E-mail: cdcinfo@cdc.gov

Web: <http://www.cdc.gov>