

Attribution of Foodborne Illnesses, Hospitalizations, and Deaths to Food Commodities Using Outbreak Data, United States, 1998–2008

Technical Appendix 1

Technical Appendix 1 Table 1. Foodborne disease outbreaks reported to CDC, 1998–2008. Shaded area indicates the categories of outbreaks (N=4,887) included in this analysis. Of these, 298 outbreaks were not included in analysis because information about the vehicle was insufficient to categorize the ingredient commodities.

Etiologic Agent	Confirmed		Suspected		Food vehicle		Unidentified		TOTAL							
	Outbreaks		Illnesses		Outbreaks		Illnesses		Outbreaks		Illnesses					
	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)				
Single, confirmed	1,811	(57)	73,103	(68)	1,285	(28)	27,145	(49)	1,908	(34)	54,869	(50)	5,004	(37)	155,117	(57)
Single, suspected	560	(18)	14,914	(14)	1,231	(27)	13,107	(24)	962	(17)	16,247	(15)	2,753	(21)	44,268	(16)
Multiple	120	(4)	4,998	(5)	121	(3)	1,805	(3)	126	(2)	1,490	(1)	367	(3)	8,293	(3)
Unidentified	698	(22)	14,676	(14)	1,884	(42)	13,251	(24)	2,646	(47)	36,369	(33)	5,228	(39)	64,296	(24)
TOTAL	3,189	(100)	107,691	(100)	4,521	(100)	55,308	(100)	5,642	(100)	108,975	(100)	13,352	(100)	271,974	(100)

Technical Appendix 1 Table 2. The number of foodborne disease outbreaks, with simple or complex implicated food vehicles, 1998–2008, and the estimated annual number of illnesses, hospitalizations, and deaths, by etiology

Etiologic Agent	Reported Outbreaks			Reported outbreak-associated Illnesses			Estimated Annual Numbers*		
	Total	Simple food	Complex food	Total	Simple food	Complex food	Illnesses	Hosp. †	Deaths
Bacterial	2,469	1,301	1,168	72,890	40,107	32,783	3,645,773	35,797	862
<i>Bacillus cereus</i>	197	74	123	1,647	699	948	63,400	20	0
<i>Brucella</i> spp.	4	4	.	14	14	.	839	55	1
<i>Campylobacter</i> spp.	138	105	33	4,395	3,911	484	845,024	8,463	76
<i>Clostridium botulinum</i>	30	20	10	111	62	49	55	42	9
<i>Clostridium perfringens</i>	461	234	227	18,710	9,470	9,240	965,958	438	26
<i>Escherichia</i>	206	138	68	6,778	4,382	2,396	205,781	2,429	21
<i>E. coli</i> , ETEC†	11	3	8	1,878	466	1,412	17,894	12	0
<i>E. coli</i> , O157 STEC†	186	128	58	4,844	3,867	977	63,153	2,138	20
<i>E. coli</i> , non-O157 STEC†	6	6	.	37	37	.	112,752	271	1
<i>E. coli</i> , other†	3	1	2	19	12	7	11,982	8	0
<i>Listeria monocytogenes</i>	21	15	6	336	217	119	1,591	1,455	255
<i>Mycobacterium bovis</i>	.	.	.	.	.	.	60	31	3
<i>Salmonella enterica</i>	877	482	395	29,685	16,000	13,685	1,029,382	19,533	378
Ser. Enteritidis	284	149	135	8,627	4,629	3,998	168,041	3,162	62
Ser. Heidelberg	66	23	43	3,151	456	2,695	49,478	931	18
Ser. Javiana	17	11	6	1,279	916	363	40,337	759	15
Ser. Newport	58	40	18	2,280	1,903	377	95,119	1,790	35
Ser. Typhimurium	106	59	47	4,113	1,767	2,346	202,497	3,810	74
S. spp., other non-typhoidal	344	199	145	10,213	6,323	3,890	472,089	8,883	174
Ser. Typhi	2	1	1	22	6	16	1,821	197	0
<i>Shigella</i> spp.	63	25	38	3,875	1,808	2,067	131,254	1,456	10
<i>Staphylococcus aureus</i>	384	135	249	6,032	2,356	3,676	241,148	1,063	6
<i>Streptococcus</i> spp. group A	1	1	.	4	4	.	11,217	1	0
<i>Vibrio</i>	80	62	18	1,238	1,128	110	52,408	278	48
<i>V. cholerae</i> , toxigenic	3	3	.	12	12	.	84	2	0
<i>V. parahaemolyticus</i>	68	51	17	1,208	1,100	108	34,664	100	4
<i>V. vulnificus</i>	.	.	.	.	.	.	96	93	36
<i>V. spp.</i> , other	9	8	1	18	16	2	17,564	83	8
<i>Yersinia enterocolitica</i>	7	6	1	65	56	9	97,656	533	29
Chemical	632	573	59	3,235	2,746	489	249,273	1,496	100
Marine biotoxins	527	513	14	2,170	2,129	41	147,955	888	59
Mycotoxins	16	15	1	128	121	7	8,727	52	3
Other chemicals	89	45	44	937	496	441	92,591	556	37
Parasitic	33	22	11	1,449	1,156	293	233,660	4,886	333
<i>Anisakis simplex</i>	1	1	.	14	14	.	955	6	0
<i>Cryptosporidium</i> spp.	3	1	2	157	144	13	57,616	210	4
<i>Cyclospora cayetanensis</i>	16	12	4	1,164	965	199	11,407	11	0
<i>Giardia intestinalis</i>	4	1	3	74	3	71	76,840	225	2
<i>Toxoplasma gondii</i>	.	.	.	.	.	.	86,686	4,428	327
<i>Trichinella</i> spp.	9	7	2	40	30	10	156	6	0
Viral	1,455	448	1,007	42,747	13,113	29,634	5,509,596	15,284	156
Astrovirus	.	.	.	.	.	.	15,433	87	0
Hepatitis A virus	29	13	16	1,303	1,145	158	1,566	99	7

Etiologic Agent	Reported Outbreaks						Reported outbreak-associated Illnesses						Estimated Annual Numbers*					
	Total		Simple food		Complex food		Total		Simple food		Complex food		Illnesses		Hosp. †		Deaths	
Norovirus	1,419	431	988	41,257	11,922	29,335	5,461,731	14,663	149									
Rotavirus	5	2	3	148	7	141	15,433	348	0									
Sapovirus	2	2	.	39	39	.	15,433	87	0									
Total	4,589	2,344	2,245	120,321	57,122	63,199	9,638,301	57,462	1,451									

*The values not previously published¹ were estimated as described in methods.

[†]Hosp.=Hospitalizations, STEC=Shiga toxin-producing *Escherichia coli*, ETEC=Enterotoxigenic *Escherichia coli*, other= diarrheagenic other than STEC and ETEC

Technical Appendix 1 Table 3. Minimum and maximum percentages of annual U.S. foodborne illnesses caused by each agent that were attributed to each food commodity, by etiologic agent, using outbreak data from 1998 through 2008

Etiologic Agent	Fish		Crust.		Mollusks		Dairy		Eggs		Beef		Game		Pork		Poultry		Grains-Beans		Oils-Sugars		Fruits-Nuts		Fungi		Leafy		Root		Sprout		Vine-Stalk		
	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	
Bacterial	0.0	0.2	0.1	0.3	0.4	0.4	2.3	4.1	0.3	1.6	1.1	2.6	0.0	0.2	1.0	2.3	1.5	3.4	0.2	1.9	.	.	0.7	1.3	0.0	0.0	0.5	1.8	0.1	2.2	0.1	0.2	1.0	2.7	
<i>Bacillus cereus</i>	0.5	5.6	7.2	10.0	.	.	0.2	12.8	.	.	5.4	13.9	.	.	5.7	13.4	7.9	29.1	10.7	53.0	.	.	0.4	5.0	.	.	4.2	42.9	.	.	0.2	14.5			
<i>Brucella</i> spp.	.	.	.	.	.	.	100	100	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Campylobacter</i> spp.	0.1	0.2	.	.	6.2	6.3	61.8	65.2	.	.	.	.	0.0	0.6	0.6	6.3	5.3	10.3	.	.	.	.	0.7	5.4	.	.	8.4	10.4	3.1	9.1	.	.	2.8	6.2
<i>Clostridium botulinum</i>	35.1	40.5	.	.	.	.	.	.	.	.	3.6	7.2	.	.	.	.	1.8	12.6	.	.	.	.	1.8	1.8	.	.	5.4	35.1	.	.	8.1	29.7		
<i>Clostridium perfringens</i>	.	.	0.3	2.5	.	.	0.1	22.0	0.5	8.0	16.3	41.1	.	.	5.1	17.2	18.9	38.7	3.9	27.7	.	.	.	.	0.4	10.9	0.0	25.8	.	.	5.1	23.1		
<i>Escherichia</i>	.	.	4.1	5.8	.	.	2.1	3.0	.	.	26.4	29.0	0.2	0.2	0.2	1.2	0.2	0.8	0.0	3.2	.	.	40.5	42.4	.	.	11.0	18.8	.	.	0.4	0.5	2.7	3.4	
<i>Escherichia coli</i> , ETEC	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	10.4	16.8	.	.	6.9	53.3	.	.	31.2	38.7		
<i>Escherichia coli</i> , O157 STEC	.	.	.	.	.	.	6.7	9.8	.	.	33.0	41.3	0.5	0.8	0.7	4.0	0.8	2.5	0.1	10.4	.	.	18.0	22.5	.	.	19.3	31.5	.	.	1.1	1.7	.	.
<i>Escherichia coli</i> , non-O157 STEC	.	.	.	.	.	.	.	.	.	.	29.7	29.7	.	.	.	.	.	.	.	.	.	.	62.2	62.2	.	.	8.1	8.1	.	.	.	.	.	.
<i>Escherichia coli</i> , other	.	.	70.6	100	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Listeria monocytogenes</i>	.	.	.	.	.	.	15.7	16.3	.	.	1.2	35.6	.	.	4.2	38.1	38.4	72.8	.	.	.	.	.	.	.	.	.	.	.	.	6.0	6.0	.	.
<i>Mycobacterium bovis</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Salmonella enterica</i>	0.6	3.6	0.1	0.7	0.3	0.3	6.0	18.6	11.6	29.0	3.5	14.9	0.3	2.5	3.6	11.4	10.1	29.2	.	.	.	.	6.0	11.5	0.1	1.4	1.9	18.5	0.8	14.8	1.8	2.1	9.6	22.9
Ser [†] . Enteritidis	0.2	9.1	0.3	2.2	.	.	0.5	16.7	35.2	61.8	0.8	11.1	.	.	0.5	7.3	10.6	20.9	.	.	.	.	2.6	8.1	.	.	0.2	25.2	.	.	1.3	1.9	1.7	19.9
Ser [†] . Heidelberg	.	.	.	.	.	.	.	.	6.7	48.6	0.6	19.6	.	.	.	.	7.5	34.3	.	.	.	.	0.1	29.8	.	.	.	.	.	.	.	.	.
Ser [†] . Javiana	.	.	.	.	.	.	.	.	.	.	.	.	.	6.9	10.3	0.5	22.1	.	.	.	.	48.1	48.5	.	.	3.1	22.2	0.3	24.9	.	.	12.7	32.9	
Ser [†] . Newport	.	.	.	.	.	.	7.4	12.8	.	.	9.6	15.4	.	.	5.7	8.0	8.1	13.0	.	.	.	.	10.0	17.1	.	.	4.8	13.9	4.2	13.4	.	.	33.6	40.8
Ser [†] . Typhi	.	.	.	.	100	100	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ser [†] . Typhimurium	1.5	2.3	.	.	.	.	12.5	31.4	1.0	16.6	4.2	19.8	0.7	6.8	5.5	19.4	13.3	44.2	.	.	.	.	.	.	0.3	3.9	2.2	18.9	0.2	29.6	4.0	4.2	6.6	20.8
Other non-typhoidal	0.6	1.8	0.1	1.1	.	.	0.9	14.7	1.4	15.5	6.7	13.2	0.4	3.9	5.9	11.5	10.3	19.6	2.5	12.7	.	.	9.3	21.5	.	.	0.7	13.7	0.2	14.8	4.2	7.0	18.9	29.9	
<i>Shigella</i> spp.	1.4	1.4	.	.	0.2	0.2	0.2	22.6	0.1	16.6	2.1	7.4	.	.	0.1	1.8	1.4	12.2	0.3	23.5	.	.	1.7	11.2	.	.	16.0	44.6	.	.	.	.	23.2	57.5
<i>Staphylococcus aureus</i>	0.2	1.9	0.5	2.6	0.3	1.7	0.9	24.9	0.3	29.9	3.9	18.9	0.0	4.9	22.9	51.5	9.4	40.6	0.1	28.3	.	.	.	.	.	.	0.6	23.9	.	.	0.0	12.9		
<i>Streptococcus</i> spp. group A	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	100	100	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Vibrio</i>	3.7	7.5	13.5	18.9	70.8	73.6	.	.	.	.	.	.	.	.	.	.	2.6	2.8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>V. cholerae</i> , toxigenic	.	.	50.0	50.0	50.0	50.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>V. parahaemolyticus</i>	.	.	20.3	28.4	67.4	71.6	.	.	.	.	.	.	.	.	.	.	3.9	4.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>V. spp.</i> , other	11.1	22.2	.	.	77.8	77.8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>V. vulnificus</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Etiologic Agent	Fish		Crust.		Mollusks		Dairy		Eggs		Beef		Game		Pork		Poultry		Grains-Beans		Oils-Sugars		Fruits-Nuts		Fungi		Leafy		Root		Sprout		Vine-Stalk			
	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max				
<i>Yersinia enterocolitica</i>	.	.	.	.	.	.	0	0	.	.	.	.	.	.	86.2	100	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.1	0.8	
Chemical	8.4	8.5	0.1	0.1	0.2	0.2	0.0	1.1	0.1	0.9	0.0	0.1	0.1	0.1	0.0	0.1	0.6	1.4	0.2	1.8	0.0	0.9	1.5	1.7	0.2	0.4	0.1	1.4	0.0	1.4	.	.	0.1	0.8		
Marine biotoxins	95.4	97.3	0.5	0.9	2.2	2.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	58.6	58.6	35.9	41.4	.	.	.	.	.	.	.	.
Mycotoxins	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	22.0	27.4	0.2	3.0	2.1	26.8	0.2	26.4	.	.	.	.
Other chemicals	5.4	5.4	0.5	0.5	.	.	0.7	20.8	2.8	17.0	0.6	2.8	1.6	2.8	0.2	1.4	12.2	25.5	2.9	33.5	0.4	16.6	.	.	.	.	.	.	.	.	1.0	14.9		
Parasitic	0.1	0.1	.	.	9.4	9.4	.	.	.	.	.	.	0.0	0.0	.	.	.	.	.	.	.	.	7.8	8.3	.	.	0.0	0.1	.	.	.	.	0.0	0.2
<i>Anisakis simplex</i>	100	100	
<i>Cryptosporidium</i> spp.	94.7	100	
<i>Cyclospora cayetanensis</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	82.9	88.9	.	.	0.7	5.6	.	.	.	.	0.3	15.3
<i>Giardia intestinalis</i>	100	100	
<i>Toxoplasma gondii</i>	
<i>Trichinella</i> spp.	90.9	100
Viral	0.2	0.5	0.0	0.3	0.3	0.4	0.3	5.1	0.1	5.4	0.2	2.2	0.0	0.8	0.2	2.2	0.2	2.8	0.1	4.9	0.0	4.7	1.0	3.5	.	.	1.3	7.3	0.1	5.7	.	.	0.2	5.4		
Astrovirus
Hepatitis A virus	.	.	0.5	1.0	3.1	3.1	0.6	6.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2.9	8.2	.	.	57.7	65.6	23.3	31.5	.	.	1.8	7.9
Norovirus	1.2	3.4	0.2	2.0	1.8	2.5	2.2	36.0	0.9	37.9	1.2	15.3	0.0	5.7	1.2	15.3	1.6	19.7	0.7	34.1	0.2	33.1	7.0	24.9	.	.	8.9	51.3	0.7	39.8	.	.	1.3	38.3		
Rotavirus	4.3	98.3	.	.	1.7	1.7
Sapovirus	53.8	53.8
TOTAL	2.3	4.1	0.4	1.9	2.8	3.3	7.2	31.7	1.3	26.1	3.6	15.8	0.1	3.8	3.2	14.8	5.0	20.6	1.1	24.8	0.1	19.1	6.7	18.6	0.0	0.2	6.6	34.5	0.8	29.0	0.3	0.5	3.4	29.1		

*STEC=Shiga toxin-producing *Escherichia coli*; ETEC=Enterotoxigenic *Escherichia coli*; other= diarrheagenic *E. coli* other than STEC and ETEC; ser.=serotype.

Technical Appendix 1 Table 4. Number of foodborne disease outbreaks that were attributed to each food commodity, by etiologic agent, using outbreak data from 1998 through 2008

Etiologic agent	TOTAL	Aquatic animals				Land animals						Plants									
		Shellfish				Dairy	Eggs	Meat-Poultry				Grains-Beans	Oils-Sugars	Produce							
		Fish	Crustacean	Mollusk	Meat			Game	Pork	Poultry	Fruits-Nuts			Fungi	Leafy	Root	Sprout	Vine-Stalk			
Bacterial	2,469	81	97	85	596	586	593	120	413	713	742	361	207	29	501	554	45	492			
<i>Bacillus cereus</i>	197	5	8	3	35	59	27	8	21	52	131	64	17	5	54	80	3	37			
<i>Brucella</i> spp.	4	.	.	.	4	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Campylobacter</i> spp.	138	2	1	4	78	11	10	3	10	37	12	8	8	1	20	14	1	17			
<i>Clostridium botulinum</i>	30	15	2	2	.	1	3	2	1	2	3	1	1	4	8	.	6				
<i>Clostridium perfringens</i>	461	6	9	4	93	44	199	22	98	173	157	55	21	6	64	111	1	102			
<i>Escherichia</i>	206	2	3	1	28	23	109	7	12	11	43	15	22	1	67	26	8	39			
<i>E. coli</i> , ETEC	11	1	.	.	4	5	2	.	1	2	5	3	2	.	7	5	.	4			
<i>E. coli</i> , O157 STEC	186	1	1	1	23	17	103	6	10	8	36	11	18	1	59	20	8	34			
<i>E. coli</i> , non-O157 STEC	6	.	.	.	.	.	3	.	.	.	.	.	2	.	1	.	.	.
<i>E. coli</i> , other	3	.	2	.	1	1	1	1	1	1	2	1	.	.	.	1	.	1			
<i>Listeria monocytogenes</i>	21	1	.	.	7	1	6	.	6	10	1	.	.	.	2	1	1	1			
<i>Salmonella</i>	877	28	26	9	210	324	128	38	115	271	211	114	103	11	160	169	29	160			
Ser [†] . Enteritidis	284	12	13	4	78	192	32	7	24	61	81	45	23	2	50	51	7	42			
Ser [†] . Heidelberg	66	1	.	.	29	36	9	4	7	22	25	21	10	1	8	9	.	10			

Etiologic agent	TOTAL	Aquatic animals			Land animals						Plants								
		Shellfish			Dairy	Eggs	Meat-Poultry				Grains-Beans	Oils-Sugars		Produce					
		Fish	Crustacean	Mollusk			Beef	Game	Pork	Poultry		Fruits-Nuts	Vegetables						
													Meat	Leafy	Root	Sprout	Vine-Stalk		
<i>Ser.</i> [†] Javiana	17	.	.	.	3	1	1	.	3	4	4	1	4	.	4	5	.	6	
<i>Ser.</i> [†] Newport	58	.	.	.	11	4	12	3	6	15	9	3	13	.	11	10	.	15	
<i>Ser.</i> [†] Typhimurium	106	3	2	1	29	21	15	5	15	39	28	18	14	4	22	25	3	20	
<i>Ser.</i> [†] spp., other non-typhoidal	344	12	11	3	59	70	59	19	60	130	64	26	38	4	65	69	19	67	
<i>Ser.</i> [†] Typhi	2	.	.	1	1	.	.	.	.	.	.	.	1	.	.	.	.	.
<i>Shigella</i> spp.	63	2	2	2	17	20	11	2	5	12	16	12	8	1	27	25	3	20	
<i>Staphylococcus aureus</i>	384	14	15	10	118	97	98	37	137	141	161	87	24	3	98	117	1	107	
<i>Streptococcus</i> spp. group A	1	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.
<i>Vibrio</i>	80	6	31	50	5	6	1	1	1	2	7	5	.	.	6	3	.	1	
<i>V. cholerae</i> , toxigenic	3	.	1	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>V. parahaemolyticus</i>	68	4	30	41	5	6	1	1	1	2	6	5	.	.	5	3	.	1	
<i>V. spp.</i> , other	9	2	.	7	.	.	.	.	.	.	1	.	.	.	1	.	.	.
<i>Yersinia enterocolitica</i>	7	.	.	.	1	.	1	.	7	1	.	.	.	.	.	.	.	.
Chemical	632	526	8	14	32	21	7	5	5	10	32	29	22	18	31	34	3	19	
Marine biotoxins	527	514	6	14	7	6	.	.	.	.	5	2	.	.	9	12	.	1
Mycotoxins	16	.	.	.	1	.	.	.	.	.	.	.	3	13	1	1	.	.
Other chemicals	89	12	2	.	24	15	7	5	5	10	27	27	19	5	21	21	3	18	
Parasitic	33	2	.	1	.	4	2	8	3	4	6	6	11	1	9	8	1	7	
<i>Anisakis simplex</i>	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Cryptosporidium</i> spp.	3	.	.	.	.	1	.	.	.	.	1	1	1	.	1	2	.	1
<i>Cyclospora cayetanensis</i>	16	1	.	.	.	2	1	.	1	1	4	4	9	.	5	3	.	4	
<i>Giardia intestinalis</i>	4	.	.	1	.	1	.	.	.	2	1	1	.	1	3	3	1	2	
<i>Trichinella</i> spp.	9	.	.	.	.	.	1	8	2	1	.	.	1	.	.	.	.	.
Viral	1,455	49	43	69	552	518	250	104	221	326	527	491	286	83	741	540	69	536	
Hepatitis A virus	29	1	2	1	7	6	2	.	1	2	2	6	8	5	16	11	5	9	
Norovirus	1419	46	41	67	545	510	247	104	219	321	522	483	278	78	722	528	64	525	
Rotavirus	5	2	.	1	.	2	1	.	1	3	2	2	.	.	2	1	.	2	
Sapovirus	2	.	.	.	.	.	.	.	.	.	1	.	.	.	1	.	.	.
Total	4,589	658	148	169	1,180	1,129	852	237	642	1,053	1,309	889	477	131	1,286	1,138	118	1,057	

[†]STEC=Shiga toxin-producing *Escherichia coli*; ETEC=Enterotoxigenic *Escherichia coli*; other= diarrheagenic *E. coli* other than STEC and ETEC; ser.=serotype.

Technical Appendix 1 Table 5. Comparison of rank order of illnesses, hospitalizations, and deaths attributed to food commodities when adjusting the attribution algorithm to account for variation among the number of outbreak illnesses.

A) Comparison of rank order and percentage of **illnesses** attributed to food commodities when adjusting the attribution algorithm to account for variation among the number of outbreak illnesses.

Commodity	Attributed Illnesses As a Function of Outbreak-associated Illnesses Included in Model									
	All Outbreaks, all illnesses [*]		Small Outbreaks, 2–19 Illnesses per outbreak [†]		Medium Outbreaks, 10–100 Illnesses per outbreak [‡]		Large Outbreaks, ≥20 illnesses per outbreak [§]		All Outbreaks, 1 illness per outbreak [¶]	
	Rank	%	Rank	%	Rank	%	Rank	%	Rank	%
Leafy	1	22.3	1	20.5	1	23.4	1	22.7	1	22.3
Dairy	2	13.8	3	11.5	4	9.4	2	14.2	3	11.2
Fruits-Nuts	3	11.7	6	7.0	2	12.3	3	11.9	4	8.6
Poultry	4	9.8	2	14.4	3	11.1	4	9.1	2	13.3
Vine	5	7.9	9	5.3	8	6.2	5	8.1	10	4.9
Beef	6	6.6	4	8.3	5	7.2	7	6.0	5	8.5
Eggs	7	6.0	8	5.5	6	6.9	6	6.1	8	5.3
Pork	8	5.4	7	6.6	7	6.7	8	5.5	7	6.3
Grains-Beans	9	4.5	5	7.9	9	4.7	11	3.6	6	6.6
Root	10	3.6	11	3.2	10	4.5	10	3.6	11	3.4
Mollusk	11	3.0	10	3.5	13	1.3	13	1.9	9	4.0
Fish	12	2.7	12	2.3	12	1.9	12	2.5	12	2.5
Undetermined	13	1.1	13	1.8	11	2.4	9	3.7	13	1.1
Oils-Sugars	14	0.7	14	0.8	14	0.9	14	0.6	15	0.7
Crustacean	15	0.5	15	0.7	15	0.6	16	0.4	14	0.7
Sprout	16	0.3	17	0.2	16	0.5	15	0.4	16	0.3
Game	17	0.1	16	0.5	17	0.1	17	0.0	17	0.3
Fungi	18	0.1	18	0.2	18	0.0	18	0.0	18	0.1

*4,589 Outbreaks; 120,321 illnesses

†3,126 Outbreaks; 21,701 illnesses

‡2,244 Outbreaks; 80,368 illnesses

§1,463 Outbreaks; 98,620 illnesses

¶4,589 Outbreaks

#Each outbreak adjusted to count only one illness per outbreak, which is equivalent to modeling attribution based on outbreak counts. Further discussion of attribution models based on outbreak counts versus outbreak illnesses can be found in Technical Appendix 2 (wwwnc.cdc.gov/EID/article/19/3/11-1866-Techapp2.pdf).

B) Comparison of rank order of **hospitalizations** attributed to food commodities when adjusting the attribution algorithm to account for variation among the number of outbreak illnesses.

Commodity	Attributed Hospitalizations As a Function of Outbreak Illnesses Included in Model									
	All Outbreaks, all illnesses		Small Outbreaks, 2–19 Illnesses per outbreak [†]		Medium Outbreaks, 10–100 Illnesses per outbreak [‡]		Large Outbreaks, ≥20 illnesses per outbreak [§]		All Outbreaks, 1 illness per outbreak [¶]	
	Rank	%	Rank	%	Rank	%	Rank	%	Rank	%
Dairy	1	16.2	2	15.3	3	13.0	1	16.1	2	14.6
Leafy	2	13.5	3	13.0	1	14.2	2	13.7	3	13.4
Poultry	3	11.5	1	17.8	2	13.5	3	11.4	1	17.0
Vine	4	10.5	8	5.3	5	7.5	5	11.2	7	4.8
Fruits-Nuts	5	10.1	9	5.3	9	8.6	4	10.3	9	6.4
Undetermined	6	8.1	5	8.5	4	9.7	6	10.2	5	8.1
Eggs	7	7.1	4	8.5	6	7.9	7	7.0	4	8.3
Beef	8	5.4	6	6.6	7	6.9	9	4.8	6	7.1
Pork	9	5.1	7	6.1	8	6.9	8	5.0	8	6.2
Fish	10	2.9	11	2.7	12	2.0	11	2.2	11	3.0
Root	11	2.6	12	2.5	10	4.0	10	2.5	12	2.7
Grains-Beans	12	2.5	10	3.4	11	2.6	12	2.1	10	3.0
Mollusk	13	2.5	13	2.3	14	0.6	13	1.7	13	2.8
Sprout	14	1.2	15	0.7	13	1.7	14	1.4	14	1.2
Oils-Sugars	15	0.3	17	0.4	15	0.4	15	0.3	17	0.4
Crustacean	16	0.2	14	0.5	16	0.2	17	0.1	15	0.5
Game	17	0.2	16	0.9	17	0.2	16	0.1	16	0.6
Fungi	18	0.1	18	0.3	18	0.0	18	0.0	18	0.2

*4,589 Outbreaks; 120,321 illnesses

†3,126 Outbreaks; 21,701 illnesses

‡2,244 Outbreaks; 80,368 illnesses

§1,463 Outbreaks; 98,620 illnesses

¶4,589 Outbreaks

#Each outbreak adjusted to count only one illness per outbreak, which is equivalent to modeling attribution based on outbreak counts. Further discussion of attribution models based on outbreak counts versus outbreak illnesses can be found in Technical Appendix 2 (wwwnc.cdc.gov/EID/article/19/3/11-1866-Techapp2.pdf).

C) Comparison of rank order of **deaths** attributed to food commodities when adjusting the attribution algorithm to account for variation among the number of outbreak illnesses.

Commodity	Attributed Deaths As a Function of Outbreak Illnesses Included in Model									
	All Outbreaks, all illnesses		Small Outbreaks, 2–19 Illnesses per outbreak [†]		Medium Outbreaks, 10–100 Illnesses per outbreak [‡]		Large Outbreaks, ≥20 illnesses per outbreak [§]		All Outbreaks, 1 illness per outbreak [¶]	
	Rank	%	Rank	%	Rank	%	Rank	%	Rank	%
Undetermined	1	25.2	1	25.5	1	26.6	1	27	1	25.2
Poultry	2	19.1	3	14.6	2	21.3	2	24	2	17.2
Dairy	3	9.7	2	15.9	3	8.0	5	7	3	11.9
Vine	4	7.0	10	3.2	10	4.6	4	7	10	3.0
Fruits-Nuts	5	6.4	9	3.0	7	5.2	3	7	9	3.9
Leafy	6	6.0	5	6.3	4	6.6	6	6	5	6.1
Pork	7	5.7	4	8.4	5	6.7	9	4	4	7.8
Fish	8	4.9	7	5.0	9	4.4	8	4	8	5.2
Eggs	9	4.9	6	6.1	6	5.5	7	5	6	6.0
Beef	10	3.8	8	4.9	8	4.5	10	3	7	5.6
Sprout	11	1.9	15	0.5	11	2.4	11	2	13	1.7
Grains-Beans	12	1.9	11	2.0	12	1.8	12	1	11	1.9
Root	13	1.4	12	1.6	13	1.7	13	1	12	1.7
Mollusk	14	1.4	13	1.3	14	0.5	14	1	14	1.4
Game	15	0.2	14	0.7	15	0.2	17	0	16	0.4
Oils-Sugars	16	0.2	18	0.3	17	0.2	15	0	17	0.4
Crustacean	17	0.2	16	0.4	16	0.2	16	0	15	0.4
Fungi	18	0.1	17	0.4	18	0.0	18	0	18	0.3

[†] Scallan E, Hoekstra RM, Angulo FJ, Tauxe RV, Widdowson MA, Roy SL, et al. Foodborne illness acquired in the United States--major pathogens. Emerg Infect Dis. 2011 Jan;17(1):7-15.

*4,589 Outbreaks; 120,321 illnesses

[†]3,126 Outbreaks; 21,701 illnesses

[‡]2,244 Outbreaks; 80,368 illnesses

[§]1,463 Outbreaks; 98,620 illnesses

[¶]4,589 Outbreaks

#Each outbreak adjusted to count only one illness per outbreak, which is equivalent to modeling attribution based on outbreak counts. Further discussion of attribution models based on outbreak counts versus outbreak illnesses can be found in Technical Appendix 2 (wwwnc.cdc.gov/EID/article/19/3/11-1866-Techapp2.pdf).