# Foodborne Illness Acquired
# in the United States—Major Pathogens

**Technical Appendix 3**

**Estimation and Uncertainty Model Inputs for 31 Major Known Pathogens Transmitted Through Food**

| Pathogen: Astrovirus | | | |
|---|---|---|---|
| **Model input** | **Data source(s)** | **Distribution** | **Parameters** |
| Person-time at risk | The person-time at risk for 2006 was estimated as the 0-4 year population (20,417,636) divided by 5 and rounded (1). | Constant | 4,123,000 |
| Proportion ill | 75% of children assumed to experience an episode of clinical illness due to astrovirus by 5 years of age based on studies of rotavirus (2). Uncertainty with this proportion was based on a 50% relative increase/decrease from 0.75 on an odds scale. | Uniform | Low, high values: 0.55, 0.95 |
| Proportion hospitalized | Hospitalization rate estimated as 25% of rotavirus using data from a published study (3). | PERT | Low, modal, high values: 0.003, 0.004, 0.006 |
| Proportion who died | Very low: <10 deaths per year. | Uniform | Low, high values: 0.000, 0.0000024 |
| Proportion travel-related | Assumed to be 100% domestically acquired. | PERT | Low, modal, high values: 0.000, 0.000, 0.001 |
| Proportion foodborne | Very low (<1%) based on published review (4). | PERT | Low, modal, high values: 0.000, 0.005, 0.010 |

| Pathogen: *Bacillus cereus* | | | |
|---|---|---|---|
| **Model input** | **Data source(s)** | **Distribution** | **Parameters** |
| Reported illnesses | Number of *Bacillus cereus* outbreak-associated illnesses reported to CDC's Foodborne Disease Outbreak Surveillance System (2000-2007) (5). | Empirical | By year (2000-2007): 64, 76, 104, 85, 131, 69, 35, 100 |
| Population adjustment (year) | Population ratios applied to each year from 2000-2007 based on US Census population estimates (1). | Degenerate | Ratio by year (2000-2007): 1.058, 1.047, 1.038, 1.029, 1.019, 1.010, 1.000, 0.990 |
| Underreporting | Outbreak surveillance multiplier used to adjust for underreporting (see online Technical Appendix 4, www.cdc.gov/EID/content/17/1/7-Techapp4.pdf). | PERT | Low, modal, high, [precision] values: 5,16, 237, [20] |
| Proportion severe | | | |
| Medical care seeking (severe) | | | |
| Medical care seeking (mild) | Non-typhoidal *Salmonella* under-diagnosis multiplier used because of a lack of data on under-diagnosis factors. See Table 3.5 in this online Technical Appendix. | | |
| Specimen submission (severe) | | | |
| Specimen submission (mild) | | | |
| Laboratory testing | | | |
| Test sensitivity | | | |
| Proportion hospitalized | Proportion of cases hospitalized in *Bacillus cereus* outbreaks reported to the Foodborne Disease Outbreak Surveillance System (2000-2007). | Empirical | By year (2000-2007): 0.016, 0.000, 0.000, 0.000, 0.080, 0.000, 0.000, 0.010 |
| Proportion who died | Proportion of cases who died in *Bacillus cereus* outbreaks reported to the Foodborne Disease Outbreak Surveillance System (2000-2007). | Empirical | By year (2000-2007): 0.000, 0.000, 0.000, 0.000, 0.000, 0.000, 0.000, 0.000 |
| Under-diagnosis (hospitalizations, deaths) | Number of hospitalizations and deaths doubled to account for under-diagnosis. | PERT | Low, modal, high values: 1, 2, 3 |

| Proportion travel-related | Because of the rapid onset and short duration of *Bacillus cereus* illnesses, we assumed that almost 100% of *Bacillus cereus* illnesses occurring in the United States are domestically acquired. | PERT | Low, modal, high values: 0.00, 0.00, 0.02 |
|---|---|---|---|
| Proportion foodborne | Estimates based on outbreak-associated illnesses from foodborne outbreaks reported to the Foodborne Disease Outbreak Surveillance System, therefore, estimated illnesses assumed to be 100% foodborne. | PERT | Low, modal, high values: 0.999, 1.000, 1.000 |

| Pathogen: *Brucella* spp. | | | |
|---|---|---|---|
| **Model input** | **Data source(s)** | **Distribution** | **Parameters** |
| Reported illnesses | Number of illnesses caused by *Brucella* spp. reported to CDC's National Notifiable Disease Surveillance System (NNDSS) (2000-2007) (6). | Empirical | By year (2000-2007): 87, 136, 125, 104, 114, 120, 121, 131 |
| Population adjustment (year) | Population ratios applied to each year from 2000-2007 based on US Census population estimates (1). | Degenerate | Ratio by year (2000-2007): 1.058, 1.047, 1.038, 1.029, 1.019, 1.010, 1.000, 0.990 |
| Underreporting | Passive surveillance multiplier used to adjust for underreporting (see online Technical Appendix 4). | PERT | Low, modal, high values: 0.9, 1.1, 1.3 |
| Proportion severe | Assumed to be 80% severe. Uncertainty with this proportion was based on a 50% relative increase/decrease from 0.80 on an odds scale. | PERT | Low, modal, high values: 0.73, 0.80, 0.86 |
| Medical care seeking (severe) | Proportion (and 95% confidence interval (CI)) of survey respondents with bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) used as a proxy for severe illness (CDC, unpublished data). | PERT | Low, modal, high values: 0.19, 0.35, 0.51 |
| Medical care seeking (mild) | Proportion (and 95% CI) of survey respondents with a non-bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) used as proxy for mild illness (CDC, unpublished data). | PERT | Low, modal, high values: 0.15, 0.18, 0.20 |

| | | | |
|---|---|---|---|
| Specimen submission (severe) | Proportion (and 95% CI) of survey respondents who submitted a stool specimen among persons with bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) used as proxy for severe illness (CDC, unpublished data). | PERT | Low, modal, high values: 0.11, 0.36, 0.62 |
| Specimen submission (mild) | Proportion (and 95% CI) of survey respondents who submitted a stool specimen among persons with a non-bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) used as a proxy for mild illness (CDC, unpublished data). | PERT | Low, modal, high values: 0.12, 0.19, 0.25 |
| Laboratory testing | We assumed that most persons with brucellosis who submitted a specimen for testing would be tested for brucellosis. | PERT | Low, modal, high values: 0.94, 0.97, 1 |
| Test sensitivity | Laboratory test sensitivity estimated to be between 85-95% based on blood culture (7). | PERT | Low, modal, high values: 0.85, 0.90, 0.95 |
| Proportion hospitalized | 55% of cases hospitalized in outbreaks reported to the CDC (CDC, unpublished data). Uncertainty with this proportion was based on a 50% relative increase/decrease from 0.55 on an odds scale. | PERT | Low, modal, high values: 0.45, 0.55, 0.65 |
| Proportion who died | 0.9% based on studies in Texas and California (8, 9). Uncertainty with this proportion was based on a 50% relative increase/decrease from 0.009 on an odds scale. | PERT | Low, modal, high values: , 0.006, 0.009, 0.013 |
| Under-diagnosis (hospitalizations, deaths) | Number of hospitalizations and deaths doubled to account for under-diagnosis. | PERT | Low, modal, high values: 1, 2, 3 |
| Proportion travel-related | 16% of cases estimated to have acquired their infection outside the United States from NNDSS (2000-2007). Uncertainty with this proportion was based on a 50% relative increase/decrease from 0.16 on an odds scale. | PERT | Low, modal, high values: 0.11, 0.16, 0.22 |
| Proportion foodborne | 50% estimated based on published studies (9). Uncertainty with this proportion was based on a 50% relative increase/decrease from 0.50 on an odds scale. | PERT | Low, modal, high values: 0.40, 0.50, 0.60 |

| Pathogen: *Campylobacter* spp. | | | |
|---|---|---|---|
| **Model input** | **Data source(s)** | **Distribution** | **Parameters** |
| Reported/projected US illnesses | Number of illnesses caused by *Campylobacter* spp. infection reported to CDC's Foodborne Diseases Active Surveillance Network (FoodNet) by FoodNet site (n=10) and year (2005-2008) (10). | Empirical | By site and year (2005-2008) see Tables 3.1 and 3.2 in this online Technical Appendix |
| Population adjustment (year) | Incidence of *Campylobacter* infection in each FoodNet site by year applied to 2006 US Census population estimates (1). | Degenerate | Adjustment by year (2005-2008): 1.010, 1.000, 0.990, 0.981 |
| Underreporting | No underreporting multiplier; we assumed that all laboratory-confirmed *Campylobacter* illnesses were enumerated by FoodNet active surveillance. | - | - |
| Proportion severe | Proportion of cases by site reporting bloody diarrhea from FoodNet case-control study of sporadic laboratory-confirmed *Campylobacter* infections (11). We used uniform minimum variance unbiased (UMVU) estimators for lower and upper endpoints. | PERT | Low, modal, high values 0.36, 0.45, 0.52 |
| Medical care seeking (severe) | Proportion (and 95% confidence interval (CI)) of survey respondents with bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) (CDC, unpublished data). | PERT | Low, modal, high values: 0.19, 0.35, 0.51 |
| Medical care seeking (mild) | Proportion (and 95% CI) of survey respondents with a non-bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) (CDC, unpublished data). | PERT | Low, modal, high values: 0.15, 0.18, 0.20 |
| Specimen submission (severe) | Proportion (and 95% CI) of survey respondents who submitted a stool specimen among persons with bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) (CDC, unpublished data). | PERT | Low, modal, high values: 0.11, 0.36, 0.62 |
| Specimen submission (mild) | Proportion (and 95% CI) of survey respondents who submitted a stool specimen among persons with a non-bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) (CDC, unpublished data). | PERT | Low, modal, high values: 0.12, 0.19, 0.25 |

| Laboratory testing | Proportion of clinical laboratories routinely testing stool samples for *Campylobacter* from the FoodNet Laboratory Survey (12). Uncertainty with this proportion (97%) was based on a 50% relative increase/decrease from 0.97 on an odds scale. | PERT | Low, modal, high values: 0.94, 0.97, 1.00 |
|---|---|---|---|
| Test sensitivity | We used a laboratory test sensitivity rate of 70% based on studies of *Salmonella* (13, 14). We assumed a lower bound of 60% and an upper bound of 90%. | PERT | Low, modal, high values: 0.60, 0.70, 0.90 |
| Proportion hospitalized | Proportion of FoodNet cases of *Campylobacter* infection who were hospitalized (2005-2008). | Empirical | By site and year (2005-2008) see Table 3.3 in this online Technical Appendix |
| Proportion who died | Proportion of FoodNet cases of *Campylobacter* infection who died (2005-2008). | Empirical | By site and year (2005-2008) see Table 3.4 in this online Technical Appendix |
| Under-diagnosis (hospitalizations, deaths) | Number of hospitalizations and deaths doubled to account for under-diagnosis. | PERT | Low, modal, high values: 1, 2, 3 |
| Proportion travel-related | Proportion of FoodNet cases of *Campylobacter* infection who reported travel outside the United States within 7 days of illness onset (2005-2008). Uncertainty with this proportion (20%) was based on a 50% relative increase/decrease from 0.20 on an odds scale. | PERT | Low, modal, high values: 0.14, 0.20, 0.27 |
| Proportion foodborne | 1 – total non-foodborne population attributable fractions from FoodNet case-control study (11). Uncertainty with this proportion (80%) was based on a 50% relative increase/decrease from 0.80 on an odds scale. | PERT | Low, modal, high values: 0.73, 0.80, 0.86 |

| Pathogen: *Clostridium botulinum* | | | | |
|---|---|---|---|---|
| **Model input** | **Data source(s)** | **Distribution** | **Parameters** | |
| Reported illnesses | Number of foodborne botulism illnesses reported to CDC's National Notifiable Diseases Surveillance System (NNDSS) (2000-2007) (6). | Empirical | By year (2000-2007): 23, 39, 28, 20, 16, 19, 20, 32 | |
| Population adjustment (year) | Population ratios applied to each year from 2000-2007 based on US Census population estimates (1). | Degenerate | Ratios by year (2000-2007): 1.058, 1.047, 1.038, 1.029, 1.019, 1.010, 1.000, 0.990 | |
| Underreporting | Passive surveillance multiplier used to adjust for underreporting (see online Technical Appendix 4). | PERT | Low, modal, high values: 0.9, 1.1, 1.3 | |
| Proportion severe | Almost all cases of foodborne botulism assumed to be severe. Most cases of foodborne botulism reported to CDC's botulism surveillance are persons hospitalized for life-threatening manifestations. | PERT | Low, modal, high values: 0.95, 1.00, 1.00 | |
| Medical care seeking (severe) | Assumed to have a high rate of medical care seeking. | PERT | Low, modal, high values: 0.80, 0.90, 1.00 | |
| Medical care seeking (mild) | Assumed to have a high rate of medical care seeking. | PERT | Low, modal, high values: 0.80, 0.90, 1.00 | |
| Specimen submission (severe) | Assumed to have a high rate of specimen submission. | PERT | Low, modal, high values: 0.70, 0.80, 0.90 | |
| Specimen submission (mild) | Assumed to have a high rate of specimen submission. | PERT | Low, modal, high values: 0.70, 0.80, 0.90 | |
| Laboratory testing | Because persons hospitalized with botulism are often misdiagnosed with other serious illnesses, including Guillain-Barre syndrome and stroke, we assumed that only 70% would be tested appropriately for botulism (15). | PERT | Low, modal, high values: 0.61, 0.70, 0.78 | |
| Test sensitivity | Test sensitivity is 67% based on a published study (16); however, our estimates are based on counts that include epidemiologically linked cases that were not confirmed by a laboratory test but were part of recognized outbreaks. | PERT | Low, modal, high values: 0.999, 1.000, 1.000 | |
| Proportion hospitalized | Proportion of cases hospitalized in foodborne botulism outbreaks reported to the Foodborne Disease Outbreak Surveillance System (2000-2007) (5). | Empirical | By year (2000-2007): 1.000, 0.591, 0.643, 1.000, 1.000, 0.600, 0.769, 1.000 | |

| Proportion who died | Proportion of cases who died in foodborne botulism outbreaks reported to the Foodborne Disease Outbreak Surveillance System (2000-2007). | Empirical | By year (2000-2007): 0.200, 0.000, 0.000, 1.000, 0.000, 0.100, 0.077, 0.000 |
|---|---|---|---|
| Under-diagnosis (hospitalizations, deaths) | Number of hospitalizations and deaths doubled to account for under-diagnosis. | PERT | Low, modal, high values: 1, 2, 3 |
| Proportion travel-related | Almost all cases reported to CDC's botulism surveillance were domestically acquired, proportion of travel-related cases assumed to be very low. | PERT | Low, modal, high values: 0.00, 0.00, 0.02 |
| Proportion foodborne | Illnesses reported to NNDSS as foodborne botulism, therefore, assumed to be 100% foodborne. | PERT | Low, modal, high values: 0.999, 1.000, 1.000 |

| Pathogen: *Clostridium perfingens* | | | |
|---|---|---|---|
| **Model input** | **Data source(s)** | **Distribution** | **Parameters** |
| Reported illnesses | Number of *Clostridium perfingens* outbreak-associated illnesses reported to CDC's Foodborne Disease Outbreak Surveillance System (2000-2007) (5). | Empirical | By year (2000-2007): 802, 1235, 2243, 2070, 1276, 416, 732, 1334 |
| Population adjustment (year) | Population ratios applied to each year from 2000-2007 based on US Census population estimates (1). | Degenerate | Ratios by year (2000-2007): 1.058, 1.047, 1.038, 1.029, 1.019, 1.010, 1.000, 0.990 |
| Underreporting | Outbreak surveillance multiplier used to adjust for underreporting (see online Technical Appendix 4) | PERT | Low, modal, high, [precision] values: 5,16, 237, [20] |

| | | | |
|---|---|---|---|
| Proportion severe | Non-typhoidal *Salmonella* under-diagnosis multiplier used because of a lack of data on under-diagnosis factors. See Table 3.5 in this online Technical Appendix. | | |
| Medical care seeking (severe) | | | |
| Medical care seeking (mild) | | | |
| Specimen submission (severe) | | | |
| Specimen submission (mild) | | | |
| Laboratory testing | | | |
| Test sensitivity | | | |
| Proportion hospitalized | Proportion of cases hospitalized in *Clostridium perfingens* outbreaks reported to the Foodborne Disease Outbreak Surveillance System (2000-2007). | PERT | By year (2000-2007): 0.002, 0.006, 0.001, 0.018, 0.004, 0.007, 0.003, 0.005 |
| Proportion who died | Proportion of cases who died in foodborne *Clostridium perfingens* outbreaks reported to the Foodborne Disease Outbreak Surveillance System (2000-2007). | PERT | By year (2000-2007): 0.000, 0.002, 0.000, 0.000, 0.001, 0.000, 0.000, 0.000 |
| Under-diagnosis (hospitalizations, deaths) | Number of hospitalizations and deaths doubled to account for under-diagnosis. | PERT | Low, modal, high values: 1, 2, 3 |
| Proportion travel-related | Because of the rapid onset and short duration of illness caused by *Clostridium perfingens*, we assumed that almost 100% of illnesses occurring in the United States are domestically acquired. | PERT | Low, modal, high values: 0.00, 0.00, 0.02 |
| Proportion foodborne | Estimates based on outbreak-associated illnesses from foodborne outbreaks reported to the Foodborne Disease Outbreak Surveillance System, therefore, estimated illnesses assumed to be 100% foodborne. | PERT | Low, modal, high values: 0.999, 1.000, 1.000 |

| Pathogen: *Cryptosporidium* spp. | | | |
|---|---|---|---|
| **Model input** | **Data source(s)** | **Distribution** | **Parameters** |
| Reported illnesses | Incidence of illnesses due to *Cryptosporidium* spp. infection reported to CDC's Foodborne Diseases Active Surveillance Network (FoodNet) by FoodNet site (n=10) and year (2005-2008) (10). | Empirical | By site and year (2005-2008) see Tables 3.1 and 3.2 in this online Technical Appendix |
| Population adjustment (year) | Incidence of *Cryptosporidium* spp. in each FoodNet site by year applied to 2006 US Census population estimates (1). | Degenerate | Adjustment by year (2005-2008): 1.010, 1.000, 0.990, 0.981 |
| Underreporting | No underreporting multiplier, we assumed that all laboratory-confirmed *Cryptosporidium* spp. illnesses were enumerated by FoodNet active surveillance. | - | - |
| Percent severe | Assumed to be mostly mild (17). | PERT | Low, modal, high values: 0.0, 0.0, 0.05 |
| Medical care seeking (severe) | Proportion (and 95% confidence interval (CI)) of survey respondents with bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) (CDC, unpublished data). | PERT | Low, modal, high values: 0.19, 0.35, 0.51 |
| Medical care seeking (mild) | Proportion (and 95% CI) of survey respondents with a non-bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) (CDC, unpublished data). | PERT | Low, modal, high values: 0.15, 0.18, 0.20 |
| Specimen submission (severe) | Proportion (and 95% CI) of survey respondents who submitted a stool specimen among persons with bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) (CDC, unpublished data). | PERT | Low, modal, high values: 0.11, 0.36, 0.62 |
| Specimen submission (mild) | Proportion (and 95% CI) of survey respondents who submitted a stool specimen among persons with a non-bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) (CDC, unpublished data). | PERT | Low, modal, high values: 0.12, 0.19, 0.25 |
| Laboratory testing | Proportion of clinical laboratories routinely testing stool samples for *Cryptosporidium* spp. from the FoodNet Laboratory Survey (18). Uncertainty with this proportion (36%) was based on a 50% relative increase/decrease from 0.36 on an odds scale. | PERT | Low, modal, high values: 0.27, 0.36, 0.46 |

| Test sensitivity | Average from published studies (18-22). Uncertainty with this proportion (87%) was based on a 50% relative increase/decrease from 0.87 on an odds scale. | PERT | Low, modal, high values: 0.81, 0.87, 0.91 |
|---|---|---|---|
| Proportion hospitalized | Proportion of FoodNet cases of *Cryptosporidium* spp. infection who were hospitalized (2005-2008). | Empirical | By site and year (2005-2008) see Table 3.3 in this online Technical Appendix |
| Proportion who died | Proportion of FoodNet cases of *Cryptosporidium* spp. infection who died (2005-2008). | Empirical | By site and year (2005-2008) see Table 3.4 in this online Technical Appendix |
| Under-diagnosis (hospitalizations, deaths) | Number of hospitalizations and deaths doubled to account for under-diagnosis. | PERT | Low, modal, high values: 1, 2, 3 |
| Proportion travel-related | Proportion of FoodNet cases of *Cryptosporidium* spp. infection who reported travel outside the United States within 15 days of illness onset (2005-2008). Uncertainty with this proportion (9%) was based on a 50% relative increase/decrease from 0.09 on an odds scale. | PERT | Low, modal, high values: 0.06, 0.09, 0.13 |
| Proportion foodborne | Estimated based on data from a Canadian study (23). Uncertainty with this proportion (8%) was based on a 50% relative increase/decrease from 0.08 on an odds scale. | PERT | Low, modal, high values: 0.06, 0.08, 0.12 |


| Pathogen: *Cyclospora cayetanensis* | | | |
|---|---|---|---|
| **Model input** | **Data source(s)** | **Distribution** | **Parameters** |
| Reported illnesses | Incidence of *Cyclospora cayetanensis* infection reported to CDC's Foodborne Diseases Active Surveillance Network (FoodNet) by FoodNet site (n=10) and year (2005-2008) (10). | Empirical | By site and year (2005-2008) see Tables 3.1 and 3.2 in this online Technical Appendix |
| Population adjustment (year) | Incidence of *Cyclospora cayetanensis* in each FoodNet site by year applied to 2006 US Census population estimates (1). | Degenerate | Adjustment by year (2005-2008): 1.010, 1.000, 0.990, 0.981 |
| Underreporting | No underreporting multiplier, we assumed all laboratory-confirmed *Cyclospora cayetanensis* illnesses were enumerated by FoodNet active surveillance. | - | - |
| Proportion severe | *Cyclospora cayetanensis* can cause severe diarrhea, though bloody diarrhea is rare. Proportion severe assumed to be 65% severe. | PERT | Low, modal, high values: 0.55, 0.65, 0.75 |

| | | | |
|---|---|---|---|
| Medical care seeking (severe) | Proportion (and 95% confidence interval (CI)) of survey respondents with bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) as a proxy for severe illness (CDC, unpublished data). | PERT | Low, modal, high values: 0.19, 0.35, 0.51 |
| Medical care seeking (mild) | Proportion (and 95% CI) of survey respondents with a non-bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) (CDC, unpublished data). | PERT | Low, modal, high values: 0.15, 0.18, 0.20 |
| Specimen submission (severe) | Proportion (and 95% CI) of survey respondents who submitted a stool specimen among persons with bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) as a proxy for severe illness (CDC, unpublished data). | PERT | Low, modal, high values: 0.11, 0.36, 0.62 |
| Specimen submission (mild) | Proportion (and 95% CI) of survey respondents who submitted a stool specimen among persons with a non-bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) (CDC, unpublished data). | PERT | Low, modal, high values: 0.12, 0.19, 0.25 |
| Laboratory testing | Published studies (18, 24-28). | PERT | Low, modal, high values: 0.18, 0.25, 0.33 |
| Test sensitivity | Published studies (18, 24-28). | PERT | Low, modal, high values: 0.73, 0.80, 0.86 |
| Proportion hospitalized | Proportion of FoodNet cases of *Cyclospora cayetanensis* infection hospitalized (2005-2008). | Empirical | By site and year (2005-2008) see Table 3.3 in this online Technical Appendix |
| Proportion who died | Proportion of FoodNet cases of *Cyclospora cayetanensis* infection who died (2005-2008). | Empirical | By site and year (2005-2008) see Table 3.4 in this online Technical Appendix |
| Under-diagnosis (hospitalizations, deaths) | Number of hospitalizations and deaths doubled to account for under-diagnosis. | PERT | Low, modal, high values: 1, 2, 3 |
| Proportion travel-related | Proportion of FoodNet cases of *Cyclospora cayetanensis* infection who reported travel outside the United States within 15 days of illness onset (2005-2008). Uncertainty with this proportion (42%) based on 50% relative increase/decrease from 0.42 on odds scale. | PERT | Low, modal, high values ; 0.32, 0.42, 0.52 |
| Proportion foodborne | Based on outbreaks reported to CDC (29, 30) | PERT | Low, modal, high values: 0.98, 0.99, 1.00 |

| Pathogen: *Escherichia coli*, enterotoxigenic (ETEC) | | | |
|---|---|---|---|
| **Model input** | **Data source(s)** | **Distribution** | **Parameters** |
| Reported illnesses | Number of ETEC outbreak-associated illnesses reported to CDC's Foodborne Disease Outbreak Surveillance System (2000-2007) (5). | Empirical | By year (2000-2007): 100, 42, 49, 55, 62, 39, 0, 66 |
| Population adjustment (year) | Population ratios applied to each year from 2000-2007 based on US Census population estimates (1). | Degenerate | Ratios by year (2000-2007): 1.058, 1.047, 1.038, 1.029, 1.019, 1.010, 1.000, 0.990 |
| Underreporting | Outbreak surveillance multiplier used to adjust for underreporting (see online Technical Appendix 4). | PERT | Low, modal, high, [precision] values: 5,16, 237, [20] |
| Proportion severe | Non-typhoidal *Salmonella* under-diagnosis multiplier used because of a lack of data on under-diagnosis factors. See Table 3.5 in this online Technical Appendix. | | |
| Medical care seeking (severe) | | | |
| Medical care seeking (mild) | | | |
| Specimen submission (severe) | | | |
| Specimen submission (mild) | | | |
| Laboratory testing | | | |
| Test sensitivity | | | |
| Proportion hospitalized | Proportion of cases hospitalized in ETEC outbreaks reported to the Foodborne Disease Outbreak Surveillance System (2000-2007). | Empirical | By year (2000-2007): 0.000, 0.000, 0.000, 0.036, 0.016, 0.000, 0.000, 0.015 |
| Proportion who died | Proportion of cases who died in foodborne ETEC outbreaks reported to the Foodborne Disease Outbreak Surveillance System (2000-2007). | Empirical | By year (2000-2007): 0.000, 0.000, 0.000, 0.000, 0.000, 0.000, 0.000, 0.000 |
| Under-diagnosis (hospitalizations, deaths) | Number of hospitalizations and deaths doubled to account for under-diagnosis. | PERT | Low, modal, high values: 1, 2, 3 |

| Proportion travel-related | 55% based on surveillance data from MN FoodNet site (Minnesota Department of Health, unpublished data). Uncertainty with this proportion was based on a 50% relative increase/decrease from 0.55 on an odds scale. | PERT | Low, modal, high values: 0.45, 0.55, 0.65 |
|---|---|---|---|
| Proportion foodborne | Estimates based on outbreak-associated illnesses from foodborne outbreaks reported to the Foodborne Disease Outbreak Surveillance System, therefore, estimated illnesses assumed to be 100% foodborne. | PERT | Low, modal, high values: 0.999, 1.000, 1.000 |

| Pathogen: *Escherichia coli*, Shiga toxin–producing (STEC) O157 | | | |
|---|---|---|---|
| **Model input** | **Data source(s)** | **Distribution** | **Paramters** |
| Reported illnesses | Incidence of STEC O157 infection reported to CDC's Foodborne Diseases Active Surveillance Network (FoodNet) by FoodNet site (n=10) and year (2005-2008) (10). | Empirical | By site and year (2005-2008) see Tables 3.1 and 3.2 in this online Technical Appendix |
| Population adjustment (year) | Incidence of STEC O157 in each FoodNet site by year applied to 2006 US Census population estimates (1). | Degenerate | Adjustment by year (2005-2008): 1.010, 1.000, 0.990, 0.981 |
| Underreporting | No underreporting multiplier; we assumed that all laboratory-confirmed STEC O157 illnesses were enumerated by FoodNet active surveillance. | - | - |
| Percent severe | Proportion of cases by site reporting bloody diarrhea from FoodNet case-control study of sporadic laboratory-confirmed STEC O157 infections (31). We used uniform minimum variance unbiased (UMVU) estimators for lower and upper endpoints. | PERT | Low, modal, high values: 0.85, 0.90, 1.00 |
| Medical care seeking (severe) | Proportion (and 95% confidence interval (CI)) of survey respondents with bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) (CDC, unpublished data). | PERT | Low, modal, high values: 0.19, 0.35, 0.51 |

| Medical care seeking (mild) | Proportion (and 95% CI) of survey respondents with a non-bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) (CDC, unpublished data) | PERT | Low, modal, high values: 0.15, 0.18, 0.20 |
|---|---|---|---|
| Specimen submission (severe) | Proportion (and 95% CI) of survey respondents who submitted a stool specimen among persons with bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) (CDC, unpublished data). | PERT | Low, modal, high values: 0.11, 0.36, 0.62 |
| Specimen submission (mild) | Proportion (and 95% CI) of survey respondents who submitted a stool specimen among persons with a non-bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-7) (CDC, unpublished data). | PERT | Low, modal, high values: 0.12, 0.19, 0.25 |
| Laboratory testing | Proportion of clinical laboratories routinely testing stool samples for STEC O157 from the FoodNet Laboratory Survey (12). | PERT | Low, modal, high values: 0.48, 0.58, 0.67 |
| Test sensitivity | We used a laboratory test sensitivity rate of 70% based on studies of *Salmonella* (13, 14). We assumed a lower bound of 60% and an upper bound of 90%. | PERT | Low, modal, high values: 0.60, 0.70, 0.90 |
| Proportion hospitalized | Proportion of FoodNet cases of STEC O157 infection who were hospitalized (2005-2008). | Empirical | By site and year (2005-2008) see Table 3.3 in this online Technical Appendix |
| Proportion who died | Proportion of FoodNet cases of STEC O157 infection who died (2005-2008) | Empirical | By site and year (2005-2008) see Table 3.4 in this online Technical Appendix |
| Under-diagnosis (hospitalizations, deaths) | Number of hospitalizations and deaths doubled to account for under-diagnosis. | PERT | Low, modal, high values: 1, 2, 3 |
| Proportion travel-related | Proportion of FoodNet cases of STEC O157 infection who reported travel outside the United States within 7 days of illness onset (2005-2008). Uncertainty with this proportion (3.5%) was based on a 50% relative increase/decrease from 0.035 on an odds scale. | PERT | Low, modal, high values: 0.02, 0.035, 0.05 |

| Proportion foodborne | Proportion of STEC O157 outbreak-associated illnesses due to foodborne transmission from outbreaks reported to CDC (32). Uncertainty with this proportion (68%) was based on a 50% relative increase/decrease from 0.68 on an odds scale. | PERT | Low, modal, high values: 0.59, 0.68, 0.76 |
|---|---|---|---|

| Pathogen: *Escherichia coli*, Shiga-toxin-producing (STEC), non-O157 | | | |
|---|---|---|---|
| **Model input** | **Data source(s)** | **Distribution** | **Parameters** |
| Reported illnesses | Incidence of non-O157 STEC infection reported to CDC's Foodborne Diseases Active Surveillance Network (FoodNet) by FoodNet site (n=10) and year (2005-2008) (10). | Empirical | By site and year (2005-2008) see Tables 3.1 and 3.2 in this online Technical Appendix |
| Population adjustment (year) | Incidence of non-O157 STEC in each FoodNet site by year applied to 2006 US Census population estimates (1). | Degenerate | Adjustment by year (2005-2008): 1.010, 1.000, 0.990, 0.981 |
| Underreporting | No underreporting multiplier; we assumed that all laboratory-confirmed non-O157 STEC illnesses were enumerated by FoodNet active surveillance. | - | - |
| Percent severe | Proportion of non-O157 STEC cases of infection with bloody diarrhea from study published study in Minnesota FoodNet site (33). Uncertainty with this proportion (54%) was based on a 50% relative increase/decrease from 0.54 on an odds scale. | PERT | Low, modal, high values: 0.44, 0.54, 0.64 |
| Medical care seeking (severe) | Proportion (and 95% confidence interval (CI)) of survey respondents with bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) (CDC, unpublished data). | PERT | Low, modal, high values: 0.19, 0.35, 0.51 |
| Medical care seeking (mild) | Proportion (and 95% CI) of survey respondents with a non-bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) (CDC, unpublished data). | PERT | Low, modal, high values: 0.15, 0.18, 0.20 |

| Specimen submission (severe) | Proportion (and 95% CI) of survey respondents who submitted a stool specimen among persons with bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) (CDC, unpublished data). | PERT | Low, modal, high values: 0.11, 0.36, 0.62 |
|---|---|---|---|
| Specimen submission (mild) | Proportion (and 95% CI) of survey respondents who submitted a stool specimen among persons with a non-bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-7) (CDC, unpublished data). | PERT | Low, modal, high values: 0.12, 0.19, 0.25 |
| Laboratory testing | Laboratory-confirmed non-O157 STEC illnesses assumed to be at least as common as STEC O157 (34, 35). Laboratory testing proportion estimated based on this assumption. | PERT | Low, modal, high values: 0.18, 0.25, 0.33 |
| Test sensitivity | We used a laboratory test sensitivity rate of 70% based on studies of *Salmonella* (13, 14). We assumed a lower bound of 60% and an upper bound of 90%. | PERT | Low, modal, high values: 0.60, 0.70, 0.90 |
| Proportion hospitalized | Proportion of FoodNet cases of non-O157 STEC infection hospitalized (2005-2008). | Empirical | By site and year (2005-2008): see Table 3.3 in this online Technical Appendix |
| Proportion who died | Proportion of FoodNet cases of non-O157 STEC infection who died (2005-2008). | Empirical | By site and year (2005-2008): see Table 3.4 in this online Technical Appendix |
| Under-diagnosis (hospitalizations, deaths) | Number of hospitalizations and deaths doubled to account for under-diagnosis. | PERT | Low, modal, high values: 1, 2, 3 |
| Proportion travel-related | Proportion of FoodNet cases of non-O157 STEC infection who reported travel outside the United States within 7 days of illness onset (2005-2008). Uncertainty with this proportion (18%) was based on a 50% relative increase/decrease from 0.18 on an odds scale. | PERT | Low, modal, high values: 0.13, 0.18, 0.25 |
| Proportion foodborne | Proportion of non-O157 STEC outbreak-associated illnesses due to foodborne transmission from outbreaks reported to CDC (1990-2008) (36). Uncertainty with this proportion (82%) was based on a 50% relative increase/decrease from 0.82 on an odds scale. | PERT | Low, modal, high values: 0.75, 0.82, 0.87 |

| Pathogen: *Escherichia coli*, diarrheagenic other than STEC and ETEC | | | |
|---|---|---|---|
| **Model input** | **Data source(s)** | **Distribution** | **Parameters** |
| Reported illnesses | Assumed to be as common as enterotoxigenic *E. coli* because of a lack of available surveillance data or data on under-diagnosis factors. | | |
| Population adjustment (year) | | | |
| Underreporting | | | |
| Percent severe | | | |
| Medical care seeking (severe) | | | |
| Medical care seeking (mild) | | | |
| Specimen submission (severe) | | | |
| Specimen submission (mild) | | | |
| Laboratory testing | | | |
| Laboratory test sensitivity | | | |
| Proportion hospitalized | Assumed to be the same as ETEC | Empirical | By year (2000-2007): 0.000, 0.000, 0.000, 0.036, 0.016, 0.000, 0.000, 0.015 |
| Proportion who died | Assumed to be the same as ETEC | Empirical | By year (2000-2007): 0.000, 0.000, 0.000, 0.000, 0.000, 0.000, 0.000, 0.000 |
| Under-diagnosis (hospitalizations, deaths) | Number of hospitalizations and deaths doubled to account for under-diagnosis. | PERT | Low, modal, high values: 1, 2, 3 |
| Proportion travel-related | Assumed to be almost 100% domestically acquired. | PERT | Low, modal, high values: 0, 0, 0.02 |
| Proportion foodborne | Very little data available, a few foodborne outbreaks have been reported. Assumed to be 30% foodborne (37). Uncertainty with this proportion was based on a 50% relative increase/decrease from 0.30 on an odds scale. | PERT | Low, modal, high values: 0.22, 0.30, 0.39 |

| Pathogen: *Giardia intestinalis* | | | |
|---|---|---|---|
| **Model input** | **Data source(s)** | **Distribution** | **Parameters** |
| Reported illnesses | Number of illnesses due to *Giardia intestinalis* reported to CDC's National Notifiable Diseases Surveillance System (NNDSS) (2002-2007) (6). | Empirical | By year (2002-2007): 21300, 19709, 20965, 19733, 18953, 19417 |
| Population adjustment (year) | Population ratios applied to each year from 2002-2007 based on US Census population estimates (1). | Degenerate | Ratios by year (2002-2007): 1.038, 1.029, 1.019, 1.010, 1.000, 0.990 |
| Underreporting | Passive surveillance multiplier used to adjust for underreporting (see online Technical Appendix 4). | PERT | Low, modal, high values: 1.0, 1.3, 1.6 |
| Percent severe | Assumed to be mostly mild (17). | PERT | Low, modal, high values: 0.0, 0.0, 0.05 |
| Medical care seeking (severe) | Proportion (and 95% confidence interval (CI)) of survey respondents with bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) (CDC, unpublished data). | PERT | Low, modal, high values: 0.19, 0.35, 0.51 |
| Medical care seeking (mild) | Proportion (and 95% CI) of survey respondents with a non-bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) (CDC, unpublished data) | PERT | Low, modal, high values: 0.15, 0.18, 0.20 |
| Specimen submission (severe) | Proportion (and 95% CI) of survey respondents who submitted a stool specimen among persons with bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) (CDC, unpublished data). | PERT | Low, modal, high values: 0.11, 0.36, 0.62 |
| Specimen submission (mild) | Proportion (and 95% CI) of survey respondents who submitted a stool specimen among persons with a non-bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-7) (CDC, unpublished data). | PERT | Low, modal, high values: 0.12, 0.19, 0.25 |
| Laboratory testing | Based on consultations with clinical and billing code experts at CDC, in academia, and laboratories across the United States. Uncertainty with this proportion (80%) was based on a 50% relative increase/decrease from 0.80 on an odds scale. | PERT | Low, modal, high values: 0.73, 0.80, 0.86 |

| Test sensitivity | Average from 10 published studies (19, 21, 38-45). We used uniform minimum variance unbiased (UMVU) estimators for lower and upper endpoints. | PERT | Low, modal, high values: 0.72, 0.83, 0.93 |
|---|---|---|---|
| Proportion hospitalized | Proportion of cases hospitalized estimated using annual national estimates from the Nationwide Inpatient Sample (NIS) (2002-2006) using ICD-9-CM code 007.1 (Giardiasis) (46). | Empirical | By year (2002-2006): 0.085, 0.092, 0.083, 0.086, 0.095 |
| Proportion who died | Proportion of cases who died estimated using annual national estimates from the NIS (2002-2006) using ICD-9-CM code 007.1 (Giardiasis). | Empirical | By year (2002-2006): 0.010, 0.0005, 0.0010, 0.0008, 0.0010 |
| Under-diagnosis (hospitalizations, deaths) | Number of hospitalizations and deaths doubled to account for under-diagnosis. | PERT | Low, modal, high values: 1, 2, 3 |
| Proportion travel-related | 8% based on a published study (47). Uncertainty with this proportion was based on a 50% relative increase/decrease from 0.08 on an odds scale. | PERT | Low, modal, high values: 0.06, 0.08, 0.12 |
| Proportion foodborne | 7% based on outbreaks reported to CDC (CDC, unpublished data). Uncertainty with this proportion was based on a 50% relative increase/decrease from 0.07 on an odds scale. | PERT | Low, modal, high values: 0.05, 0.07, 0.10 |


| Pathogen: Hepatitis A | | | |
|---|---|---|---|
| **Model input** | **Data source(s)** | **Distribution** | **Parameters** |
| Reported illnesses | Number of illnesses due to hepatitis A reported to CDC's National Notifiable Diseases Surveillance System (NNDSS) (2000-2007) (6, 48). Because of an apparent trend over time, the empirical distribution was based on the predicted count for 2006 plus empirical residuals derived from a linear regression of the number of illnesses on year (online Technical Appendix 2, www.cdc.gov/EID/content/17/1/7-Techapp2.pdf). | Empirical | By year (2000-2007): 13397, 10616, 8795, 7653, 5683, 4488, 3579, 2979 |

| | | | |
|---|---|---|---|
| Population adjustment (year) | Population ratios applied to each year from 2000-2007 based on US Census population estimates (1). | Degenerate | Ratios by year (2000-2007): 1.058, 1.047, 1.038, 1.029, 1.019, 1.010, 1.000, 0.990 |
| Underreporting | Passive surveillance multiplier used to adjust for underreporting (see online Technical Appendix 4) | PERT | Low, modal, high values: 0.9, 1.1, 1.3 |
| Proportion severe | Approximately 70% of infected persons have jaundice. Therefore, assumed to be 70% severe (48). | PERT | 0.61, 0.70, 0.78 |
| Medical care seeking (severe) | Assumed to have a high rate of medical care seeking. | PERT | Low, modal, high values: 0.80, 0.90, 1.00 |
| Medical care seeking (mild) | Proportion (and 95% CI) of survey respondents with a non-bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) used as proxy for mild illness (CDC, unpublished data). | PERT | Low, modal, high values: 0.15, 0.18, 0.20 |
| Specimen submission (severe) | Assumed to be 100%. | PERT | Low, modal, high values: 0.99, 1.00, 1.00 |
| Specimen submission (mild) | Proportion (and 95% CI) of survey respondents who submitted a stool specimen among persons with a non-bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) used as a proxy for mild illness (CDC, unpublished data). | PERT | Low, modal, high values: 0.12, 0.19, 0.25 |
| Laboratory testing | We assumed that most persons with hepatitis A who submitted a specimen for testing would be tested for hepatitis A. | PERT | Low, modal, high values: 0.94, 0.97, 1 |
| Laboratory test sensitivity | Assumed to be almost 100%. | PERT | Low, modal, high values: 0.94, 0.97, 1 |
| Proportion hospitalized | NNDSS data on proportion of cases of hepatitis A infection hospitalized (2001-2007). Data from 2001 were used because of hospitalizations were more carefully evaluated since 2001. | Empirical | By year (2001-2007): 0.288, 0.261, 0.318, 0.328, 0.330, 0.330, 0.350 |
| Proportion who died | Estimated using multiple cause-of-death mortality data from the national vital statistics system (49, 50) and doubled to adjust for under-diagnosis. | Empirical | By year (2004-2007): 0.023, 0.022, 0.022, 0.029 |
| Under-diagnosis (hospitalizations) | Number of hospitalizations doubled to account for under-diagnosis. | PERT | Low, modal, high values: 1, 2, 3 |

| Proportion travel-related | 41% based on enhanced surveillance in 6 US states (2005-2007) (51). Uncertainty with this proportion was based on a 50% relative increase/decrease from 0.41 on an odds scale. | PERT | Low, modal, high values: 0.32, 0.41, 0.51 |
|---|---|---|---|
| Proportion foodborne | 6% based on exposure data from NNDSS (2000-2007). | PERT | Low, modal, high values: 0.035, 0.063, 0.16 |

| Pathogen: *Listeria monocytogenes* | | | |
|---|---|---|---|
| **Model input** | **Data source(s)** | **Distribution** | **Distribution values** |
| Reported illnesses | Incidence of invasive *Listeria monocytogenes* infection reported to CDC's Foodborne Diseases Active Surveillance Network (FoodNet) by FoodNet site (n=10) and year (2005-2008) (10). | Empirical | By site and year (2005-2008) see Table 3.1 and 3.2 in this online Technical Appendix |
| Population adjustment (year) | Incidence of *Listeria monocytogenes* infection in each FoodNet site by year applied to 2006 US Census population estimates (1). | Degenerate | Adjustment by year (2005-2008): 1.010, 1.000, 0.990, 0.981 |
| Underreporting | No underreporting multiplier, we assumed that all laboratory-confirmed *Listeria monocytogenes* illnesses were enumerated by FoodNet active surveillance. | - | - |
| Percent severe | Almost all cases of infection assumed to be severe. Only invasive infections included here. | PERT | Low, modal, high values: 0.95, 1.00, 1.00 |
| Medical care seeking (severe) | Assumed to have a high rate of medical care seeking. | PERT | Low, modal, high values: 0.80, 0.90, 1.00 |
| Medical care seeking (mild) | Assumed to have a high rate of medical care seeking. | PERT | Low, modal, high values: 0.80, 0.90, 1.00 |
| Specimen submission (severe) | Assumed to have a high rate of specimen submission. | PERT | Low, modal, high values: 0.70, 0.80, 0.90 |
| Specimen submission (mild) | Assumed to have a high rate of specimen submission. | PERT | Low, modal, high values: 0.70, 0.80, 0.90 |
| Laboratory testing | We assumed that most persons with listeriosis who submitted a specimen for testing would be tested for listeriosis. | PERT | Low, modal, high values: 0.94, 0.97, 1.00 |
| Laboratory test sensitivity | 71% based on published study of blood culture sensitivity (52). | PERT | Low, modal, high values: 0.55, 0.71, 0.83 |

| Proportion hospitalized | Proportion of FoodNet cases of *Listeria monocytogenes* infection who were hospitalized (2005-2008). | Empirical | By site and year (2005-2008) see Table 3.3 in this online Technical Appendix |
|---|---|---|---|
| Proportion who died | Proportion of FoodNet cases of *Listeria monocytogenes* infection who died (2005-2008). | Empirical | By site and year (2005-2008) see Table 3.4 in this online Technical Appendix |
| Under-diagnosis (hospitalizations, deaths) | Number of hospitalizations and deaths doubled to account for under-diagnosis. | PERT | Low, modal, high values: 1, 2, 3 |
| Proportion travel-related | Proportion of FoodNet cases of *Listeria monocytogenes* infection who reported travel outside the United States within 30 days of illness onset (2005-2008). Uncertainty with this proportion (3%) was based on a 50% relative increase/decrease from 0.03 on an odds scale. | PERT | Low, modal, high values: 0.02, 0.03, 0.05 |
| Proportion foodborne | Assumed to be almost 100% foodborne (53-57). | PERT | Low, modal, high values: 0.999, 1.000, 1.000 |

| Pathogen: *Mycobacterium bovis* | | | |
|---|---|---|---|
| **Model input** | **Data source(s)** | **Distribution** | **Parameters** |
| Reported TB illnesses | Number of tuberculosis (58) illnesses reported to CDC's National Tuberculosis Surveillance System (NTSS) (2004-2007) (59). | Empirical | By year (2004-2007): 14500, 14067, 13727, 13288 |
| *M. bovis* fraction | Fraction of TB attributed to *Mycobacterium bovis* (60). Uncertainty with this proportion was based on a 50% relative increase/decrease from 0.014 on an odds scale. | PERT | Low, modal, high values: 0.011, 0.014, 0.017 |
| Population adjustment (year) | Population ratios applied to each year from 2004-2007 based on US Census population estimates (1). | Degenerate | Ratio by year (2004-2007): 1.019, 1.010, 1.000, 0.990 |
| Underreporting | No underreporting multiplier. We assumed that all cases of *Mycobacterium bovis* infection were reported to NTSS. | - | - |
| Proportion severe | Almost all cases assumed to be severe. | PERT | Low, modal, high values: 95, 1.00, 1.00 |

| | | | |
|---|---|---|---|
| Medical care seeking (severe) | Assumed to be 100% | PERT | Low, modal, high values: 0.999, 1.00, 1.00 |
| Medical care seeking (mild) | Assumed to be 100% | PERT | Low, modal, high values: 0.999, 1.00, 1.00 |
| Specimen submission (severe) | Assumed to be 100% | PERT | Low, modal, high values: 0.999, 1.00, 1.00 |
| Specimen submission (mild) | Assumed to be 100% | PERT | Low, modal, high values: 0.999, 1.00, 1.00 |
| Laboratory testing | Assumed to be almost 100% | PERT | Low, modal, high values: 0.94, 0.97, 1.00 |
| Test sensitivity | Assumed to be almost 100% | PERT | Low, modal, high values: 0.94, 0.97, 1.00 |
| Proportion hospitalized | Limited data available on *Mycobacterium bovis* . Assumed to be 55% based on a study of hospitalizations among persons with TB (61). Uncertainty with this proportion was based on a 50% relative increase/decrease from 0.55 on an odds scale. | Empirical | Values: 0.45, 0.55, 0.65 |
| Proportion who died | Limited data available on *Mycobacterium bovis*. Assumed to be equal to the proportion of TB cases who died in NTSS (2004-2007). | Empirical | By year (2004-2007): 0.050, 0.048, 0.046, 0.044 |
| Proportion travel-related | 70% of cases assumed to be travel-related. Uncertainty with this proportion (70%) was based on a 50% relative increase/decrease from 0.70 on an odds scale. | PERT | Low, modal, high values: 0.61, 0.70, 0.78 |
| Proportion foodborne | Assumed to be 95% based on published study (62) Uncertainty with this proportion was based on a 50% relative increase/decrease from 0.95 on an odds scale. | PERT | Low, modal, high values: 0.93, 0.95, 0.97 |

| Pathogen: Norovirus | | | |
|---|---|---|---|
| **Model input** | **Data source(s)** | **Distribution** | **Parameters** |
| Population at risk | Estimated using 2006 US Census population estimate. | Constant | 299,000,000 |
| Norovirus fraction | The proportion of all acute gastroenteritis illnesses, hospitalizations, and deaths was estimated from published studies of the proportion of acute gastroenteritis illnesses due to norovirus in the Netherlands (58), England and Wales (63, 64), and Australia (65). The proportions from these studies, .06, .11, .11, .20, were used to define low (0.06), modal (0.11) and high (0.20) values. The decision to apply this distribution to estimates of the number of acute gastroenteritis hospitalizations and deaths was supported by published studies of hospitalizations (66, 67). | PERT | Low, modal, high values: 0.06, 0.11, 0.2 |
| Norovirus illnesses | Norovirus fraction (above) applied to estimated number of acute gastroenteritis illness (below) | | |
| Acute gastroenteritis illnesses | Estimated rate per person per year by site using combined data from FoodNet Population Surveys in 2000–2001 (0.49 per person per year), 2002–2003 (0.54 per person per year), and 2006–2007 (0.73 per person per year) (CDC, unpublished data). Uncertainty from the site-specific survey estimates was added by assuming that site estimates were normally distributed with standard deviations equal to survey standard errors. | Mixture of Normals | By FoodNet site: 0.61, 0.63, 0.51, 0.68, 0.51, 0.56, 0.63, 0.63, 0.56, 0.65 |
| Norovirus hospitalizations | Norovirus fraction (above) applied to estimated number of acute gastroenteritis hospitalizations (below). | | |
| Proportion hospitalized | Estimated rate per 100,000 using annual national estimates from the 2000-2006 National Hospital Discharge System (186.3, 205.0, 211.1, 203.8, 203.0, 204.0, and 206.6 per 100,000) (68), the 2000-2006 Nationwide Inpatient Sample (177.1, 181.4, 183.4, 189.3, 183.9, 190.6, and 203.9 per 100,000) (46), and combined data from the 2000-2006 National Ambulatory Medical Care and National Hospital Ambulatory Medical Care Surveys (92.1, 94.7, 138.8, 110.1, 111.7, 90.4, and 126.3 per 100,000) (69). Low, modal, and high values were determined using the lowest (90), mean (166), and highest (211) annual rate per 100,000. | PERT | Low, modal, high values: 0.0015, 0.0028, 0.0035 |
| Norovirus deaths | Norovirus fraction (above) applied to estimated number of acute gastroenteritis deaths (below). | | |

| | | | |
|---|---|---|---|
| Proportion who died | Estimated annual rate per 100,000 persons using data from 2000–2006 multiple cause-of-death data from the national vital statistics system (49, 50) (2.4, 1.2, 1.3, 1.3, 1.3, 1.6, and 1.7 per 100,000) (50). Low, modal, and high values were determined using the lowest (1.2), mean (1.5), and highest (2.4) annual rate per 100,000. | PERT | Low, modal, high values: 0.00002, 0.000026, 0.00004 |
| Proportion travel-related | Assumed to be low. | PERT | Low, modal, high values: 0.00, 0.00, 0.02 |
| Proportion foodborne | Based on 179 norovirus outbreaks examined by CDC from 2000-2005. Of 13,944 persons ill, 3,628 (26%) were in foodborne outbreaks (CDC, unpublished data). | PERT | Low, modal, high values: 0.19, 0.26, 0.35 |

| Pathogen: Rotavirus | | | |
|---|---|---|---|
| **Model input** | **Data source(s)** | **Distribution** | **Parameters** |
| Person-time at risk | The person-time at risk for 2006 was estimated as the 0-4 year population (20,417,636) divided by 5 and rounded (1). | Constant | 4,123,000 |
| Proportion ill | 75% of children assumed to experience an episode of clinical illness due to rotavirus by 5 years of age based on published studies (2). Uncertainty with this proportion was based on a 50% relative increase/decrease from 0.75 on an odds scale. | Uniform | Low, high values: 0.55, 0.95 |
| Proportion hospitalized | Based on published study (2). | PERT | Low, modal, high values: 0.012, 0.017, 0.023 |
| Proportion who died | Very low: 20 to 40 deaths per year (2). | Uniform | Low, high values: 0.0000054, 0.00001 |
| Proportion travel-related | Assumed to be 100% domestically acquired. | PERT | Low, modal, high values: 0.000, 0.000, 0.001 |
| Proportion foodborne | Very few foodborne outbreaks reported (0.5% of illnesses). | PERT | Low, modal, high values: 0.000, 0.005, 0.010 |

| Pathogen: *Salmonella enterica,* non-typhoidal serotypes | | | |
|---|---|---|---|
| **Model input** | **Data source(s)** | **Distribution** | **Distribution values** |
| Reported illnesses | Incidence of *Salmonella enterica* infections excluding serotype Typhi reported to CDC's Foodborne Diseases Active Surveillance Network (FoodNet) by FoodNet site (n=10) and year (2005-2008) (10). | Empirical | By site and year (2005-2008): See Table 3.1 and 3.2 in this online Technical Appendix |
| Population adjustment (year) | Incidence of non-typhoidal *Salmonella* in each FoodNet site by year applied to 2006 US Census population estimates (1). | Degenerate | Adjustment by year (2005-2008): 1.010, 1.000, 0.990, 0.981 |
| Underreporting | No underreporting multiplier, we assumed that all laboratory-confirmed non-typhoidal *Salmonella* illnesses were enumerated by FoodNet active surveillance. | - | - |
| Percent severe | Proportion of cases reporting bloody diarrhea in FoodNet case-control studies of sporadic laboratory-confirmed *Salmonella* infections (70-73). We used uniform minimum variance unbiased (UMVU) estimators for lower and upper endpoints. | PERT | Low, modal, high values: 0.35, 0.45, 0.71 |
| Medical care seeking (severe) | Proportion (and 95% confidence interval (CI)) of survey respondents with bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) (CDC, unpublished data). | PERT | Low, modal, high values: 0.19, 0.35, 0.51 |
| Medical care seeking (mild) | Proportion (and 95% CI) of survey respondents with a non-bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) (CDC, unpublished data) | PERT | Low, modal, high values: 0.15, 0.18, 0.20 |
| Specimen submission (severe) | Proportion (and 95% CI) of survey respondents who submitted a stool specimen among persons with bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) (CDC, unpublished data). | PERT | Low, modal, high values: 0.11, 0.36, 0.62 |
| Specimen submission (mild) | Proportion (and 95% CI) of survey respondents who submitted a stool specimen among persons with a non-bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) (CDC, unpublished data). | PERT | Low, modal, high values: 0.12, 0.19, 0.25 |

| | | | |
|---|---|---|---|
| Laboratory testing | 100% of clinical laboratories reported routinely testing stool samples for *Salmonella* in the FoodNet Laboratory Survey (12).We assumed a slightly lower rate of 97%; uncertainty with this proportion was based on a 50% relative increase/decrease from 0.97 on an odds scale. | PERT | Low, modal, high values: 0.94, 0.97, 1.00 |
| Laboratory test sensitivity | We assumed a laboratory test sensitivity rate of 70% based on studies of *Salmonella*. (13, 14). We assumed a lower bound of 60% and an upper bound of 90%. | PERT | Low, modal, high values: 0.60, 0.70, 0.90 |
| Proportion hospitalized | Proportion of FoodNet cases of non-typhoidal *Salmonella* infection who were hospitalized (2005-2008). | Empirical | By site and year (2005-2008): See Table 3.3 in this online Technical Appendix |
| Proportion who died | Proportion of FoodNet cases of non-typhoidal *Salmonella* infection who died (2005-2008). | Empirical | By site and year (2005-2008): See Table 3.4 in this online Technical Appendix |
| Under-diagnosis (hospitalizations, deaths) | Number of hospitalizations and deaths doubled to account for under-diagnosis. | PERT | Low, modal, high values: 1, 2, 3 |
| Proportion travel-related | Proportion of FoodNet cases of non-typhoidal *Salmonella* infection who reported travel outside the United States within 7 days of illness onset (2005-2008). Uncertainty with this proportion (11%) was based on a 50% relative increase/decrease from 0.11 on an odds scale. | PERT | Low, modal, high values: 0.07, 0.11, 0.15 |
| Proportion foodborne | 94% based on FoodNet case-control study of sporadic illness (72) and on outbreaks reported to the CDC from 1996-2006 (CDC, unpublished data) (see online Technical Appendix 1). Uncertainty with this proportion was based on a 50% relative increase/decrease from 0.94 on an odds scale. | PERT | Low, modal, high values: 0.91, 0.94, 0.96 |

| Pathogen: *Salmonella* enterica, serotype Typhi | | | |
|---|---|---|---|
| **Model input** | **Data source(s)** | **Distribution** | **Distribution values** |
| Reported illnesses | Incidence of *Salmonella* serotype Typhi infection reported to CDC's Foodborne Diseases Active Surveillance Network (FoodNet) by FoodNet site (n=10) and year (2005-2008) (10). | Empirical | By site and year (2005-2008): See Table 3.1 and 3.2 in this online Technical Appendix |
| Population adjustment (year) | Incidence of serotype Typhi in each FoodNet site by year applied to 2006 US Census population estimates (1). | Degenerate | Adjustment by year (2005-2008): 1.010, 1.000, 0.990, 0.981 |
| Underreporting multiplier | No underreporting multiplier; we assumed that all laboratory-confirmed serotype *Typhi* illnesses were enumerated by FoodNet active surveillance. | - | - |
| Percent severe | Almost all cases of serotype Typhi infections assumed to be severe. | PERT | Low, modal, high values: 0.95, 1.00, 1.00 |
| Medical care seeking (severe) | Proportion (and 95% confidence interval (CI)) of survey respondents with bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) used as a proxy for severe illness (CDC, unpublished data). | PERT | Low, modal, high values: 0.19, 0.35, 0.51 |
| Medical care seeking (mild) | Proportion (and 95% CI) of survey respondents with a non-bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) used as proxy for mild illness (CDC, unpublished data). | PERT | Low, modal, high values: 0.15, 0.18, 0.20 |
| Specimen submission (severe) | Proportion (and 95% CI) of survey respondents who submitted a stool specimen among persons with bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) used as proxy for severe illness (CDC, unpublished data). | PERT | Low, modal, high values: 0.11, 0.36, 0.62 |
| Specimen submission (mild) | Proportion (and 95% CI) of survey respondents who submitted a stool specimen among persons with a non-bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) used as a proxy for mild illness (CDC, unpublished data). | PERT | Low, modal, high values: 0.12, 0.19, 0.25 |
| Laboratory testing | We assumed that almost all persons with serotype Typhi would be tested for serotype Typhi. | PERT | Low, modal, high values: 0.94, 0.97, 1.00 |
| Test sensitivity | 60-80% based on published review (74). | PERT | Low, modal, high values: 0.60, 0.70, 0.80 |

| Proportion hospitalized | Proportion of FoodNet cases of serotype Typhi infection who were hospitalized (2005-2008). | Empirical | By site and year (2005-2008): See Table 3.3 in this online Technical Appendix |
|---|---|---|---|
| Proportion who died | Proportion of Foodnet cases of serotype Typhi infection who died (2005-2008). | Empirical | By site and year (2005-2008): See Table 3.4 in this online Technical Appendix |
| Under-diagnosis (hospitalizations, deaths) | Number of hospitalizations and deaths double to account for under-diagnosis. | PERT | Low, modal, high values: 1, 2, 3 |
| Proportion travel-related | Proportion of FoodNet cases of serotype Typhi infection who reported travel outside the United States within 30 days of illness onset (2005-2008). Uncertainty with this proportion (67%) was based on a 50% relative increase/decrease from 0.67 on an odds scale. | PERT | Low, modal, high values: 0.58, 0.67, 0.76 |
| Proportion foodborne | 100% of domestically acquired outbreaks reported to the CDC between 1980 and 1999 were foodborne (100% of 13 [out of 17] outbreaks with a known route of transmission) (75). Lower bound set at 76% (13 of 17 outbreaks). | PERT | Low, modal, high values: 0.76, 1, 1 |

| Pathogen: Sapovirus | | | |
|---|---|---|---|
| **Model input** | **Data source(s)** | **Distribution** | **Parameters** |
| Person-time at risk | The person-time at risk for 2006 was estimated as the 0-4 year population (20,417,636) divided by 5 and rounded (1). | Constant | 4,123,000 |
| Proportion ill | 75% of children assumed to experience an episode of clinical illness due to sapovirus by five years of age based on studies of rotavirus (2). Uncertainty with this proportion was based on a 50% relative increase/decrease from 0.75 on an odds scale. | Uniform | Low, high values: 0.55, 0.95 |
| Proportion hospitalized | Hospitalization rate derived as 25% of rotavirus. | PERT | Low, modal, high values: 0.003, 0.004, 0.006 |
| Proportion who died | Assumed to be very low: 0–10 deaths per year | Uniform | Low, high values: 0.000, 0.0000024 |
| Proportion travel-related | Assumed to be 100% domestically acquired. | PERT | Low, modal, high values: 0.000, 0.000, 0.001 |

| Proportion foodborne | Very few foodborne outbreaks reported (<1% of all sapovirus illnesses) | PERT | Low, modal, high values: 0.000, 0.005, 0.010 |
|---|---|---|---|

| Pathogen: *Shigella* spp. | | | |
|---|---|---|---|
| **Model input** | **Data source(s)** | **Distribution** | **Distribution values** |
| Reported illnesses | Incidence of *Shigella* infection reported to CDC's Foodborne Diseases Active Surveillance Network (FoodNet) by FoodNet site (n=10) and year (2005-2008) (10) | Empirical | By site and year (2005-2008): See Table 3.1 and 3.2 in this online Technical Appendix |
| Population adjustment (year) | Incidence of *Shigella* spp. in each FoodNet site by year applied to 2006 US Census population estimates (1). | Degenerate | Adjustment by year (2005-2008): 1.010, 1.000, 0.990, 0.981 |
| Underreporting | No underreporting multiplier; we assumed that all laboratory-confirmed *Shigella* spp. illnesses were enumerated by FoodNet active surveillance. | - | - |
| Percent severe | Percent of laboratory-confirmed cases of *Shigella* spp. infection with bloody diarrhea reported to FoodNet surveillance in Minnesota and New York (Minnesota Department of Health and New York Department of Health, unpublished data). We used uniform minimum variance unbiased (UMVU) estimators for lower and upper endpoints. | PERT | Low, modal, high values: 0.17, 0.35, 0.53 |
| Medical care seeking (severe) | Proportion (and 95% confidence interval (CI)) of survey respondents with bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) (CDC, unpublished data). | PERT | Low, modal, high values: 0.19, 0.35, 0.51 |
| Medical care seeking (mild) | Proportion (and 95% CI) of survey respondents with a non-bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) (CDC, unpublished data) | PERT | Low, modal, high values: 0.15, 0.18, 0.20 |

| Specimen submission (severe) | Proportion (and 95% CI) of survey respondents who submitted a stool specimen among persons with bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) (CDC, unpublished data). | PERT | Low, modal, high values: 0.11 0.36, 0.62 |
|---|---|---|---|
| Specimen submission (mild) | Proportion (and 95% CI) of survey respondents who submitted a stool specimen among persons with a non-bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) (CDC, unpublished data). | PERT | Low, modal, high values: 0.12, 0.19, 0.25 |
| Laboratory testing | Proportion of clinical laboratories routinely testing stool samples for *Shigella spp.* from the FoodNet Laboratory Survey (12). We assumed a slightly lower rate of 97%, uncertainty with this proportion was based on a 50% relative increase/decrease from 0.97 on an odds scale. | PERT | Low, modal, high values: 0.94, 0.97, 1.00 |
| Test sensitivity | We used a laboratory test sensitivity rate of 70% based on studies of *Salmonella* (13, 14). We assumed a lower bound of 60% and an upper bound of 90%. | PERT | Low, modal, high values: 0.60, 0.70, 0.90 |
| Proportion hospitalized | Proportion of FoodNet cases of *Shigella* spp. infection who were hospitalized (2005-2008). | Empirical | By site and year (2005-2008): See Table 3.3 in this online Technical Appendix |
| Proportion who died | Proportion of FoodNet cases of *Shigella* spp. infection who died (2005-2008). | Empirical | By site and year (2005-2008): See Table 3.4 in this online Technical Appendix |
| Under-diagnosis (hospitalizations, deaths) | Number of hospitalizations and deaths doubled to account for under-diagnosis. | PERT | Low, modal, high values: 1, 2, 3 |
| Proportion travel-related | Proportion of FoodNet cases of *Shigella* spp. infection who reported travel outside the United States within 7 days of illness onset (2005-2008). Uncertainty with this proportion (15%) was based on a 50% relative increase/decrease from 0.15 on an odds scale. | PERT | Low, modal, high values: 0.10, 0.15, 0.21 |
| Proportion foodborne | 31% based on FoodNet enhanced surveillance (76) with this proportion was based on a 50% relative increase/decrease from 0.31 on an odds scale. | PERT | Low, modal, high values: 0.23, 0.31, 0.40 |

| Pathogen: *Staphylococcus aureus* | | | |
|---|---|---|---|
| **Model input** | **Data source(s)** | **Distribution** | **Distribution values** |
| Reported illnesses | Number of *Staphylococcus aureus* outbreak-associated illnesses reported to CDC's Foodborne Disease Outbreak Surveillance System (2000-2007) (5). Because of an apparent trend over time, the empirical distribution was based on the predicted count for 2006 plus empirical residuals derived from a linear regression of the number of illnesses on year (see online Technical Appendix 2). | Empirical | By year (2000-2007): 650, 679, 551, 393, 450, 376, 380, 245 |
| Population adjustment (year) | Population ratios applied to each year from 1998-2006 based on US Census population estimates (1). | Degenerate | Ratios by year (2000-2007): 1.058, 1.047, 1.038, 1.029, 1.019, 1.010, 1.000, 0.990 |
| Underreporting multiplier | Outbreak surveillance multiplier used to adjust for underreporting (see online Technical Appendix 4) | PERT | Low, modal, high, [precision] values: 5,16, 237, [20] |
| Proportion severe | Non-typhoidal *Salmonella* under-diagnosis multiplier used because of a lack of data on under-diagnosis factors. See Table 3.5 in this online Technical Appendix. | | |
| Medical care seeking (severe) | | | |
| Medical care seeking (mild) | | | |
| Specimen submission (severe) | | | |
| Specimen submission (mild) | | | |
| Laboratory testing | | | |
| Test sensitivity | | | |
| Proportion hospitalized | Proportion of cases hospitalized in *Staphylococcus aureus* outbreaks from the Foodborne Disease Outbreak Surveillance System (2000-2007). | Empirical | By year (2000-2007): 0.087, 0.115, 0.080, 0.059, 0.044, 0.082, 0.021, 0.020 |
| Proportion who died | Proportion of cases who died in *Staphylococcus aureus* outbreaks from the Foodborne Disease Outbreak Surveillance System (2000-2007). | Empirical | By year (2000-2007): 0.003, 0.000, 0.000, 0.000, 0.000, 0.000, 0.000, 0.000 |

| Under-diagnosis (hospitalizations, deaths) | Number of hospitalizations and deaths doubled to account for under-diagnosis. | PERT | Low, modal, high values: 1, 2, 3 |
|---|---|---|---|
| Proportion travel-related | Because of the rapid onset and short duration of *Staphylococcus aureus* illnesses, we assumed that almost 100% of *Staphylococcus aureus* illnesses occurring in the United States would be domestically acquired. | PERT | Low, modal, high values: 0.00, 0.00, 0.02 |
| Proportion foodborne | Estimates based on outbreak-associated illnesses from foodborne outbreaks reported to the Foodborne Disease Outbreak Surveillance System, therefore, assumed to be 100% foodborne. | PERT | Low, modal, high values: 0.999, 1.000, 1.000 |

| Pathogen: *Streptococcus* spp., Group A | | | |
|---|---|---|---|
| **Model input** | **Data source(s)** | **Distribution** | **Distribution values** |
| Reported illnesses | Number of *Streptococcus* spp.,Group A outbreak-associated illnesses reported to CDC's Foodborne Disease Outbreak Surveillance System (1996-2007) (5). | Empirical | By year (1996-2007): 0, 122, 4, 0, 0, 0, 0, 0, 37, 0, 0, 0 |
| Population adjustment (year) | Population ratios applied to each year from 1996-2007 based on US Census population estimates (1). | Degenerate | Ratios by year (1996-2007): 1.126, 1.115, 1.105, 1.095, 1.058, 1.047, 1.038, 1.029, 1.019, 1.010, 1.000, 0.990 |
| Underreporting | Outbreak surveillance multiplier used to adjust for underreporting (see online Technical Appendix 4) | PERT | Low, modal, high, [precision] values: 5,16, 237, [20] |

| | | | |
|---|---|---|---|
| Proportion severe | | | |
| Medical care seeking (severe) | | | |
| Medical care seeking (mild) | Non-typhoidal *Salmonella* under-diagnosis multiplier used because of a lack of data on under-diagnosis factors. See Table 3.5 in this online Technical Appendix. | | |
| Specimen submission (severe) | | | |
| Specimen submission (mild) | | | |
| Laboratory testing | | | |
| Test sensitivity | | | |
| Proportion hospitalized | Proportion of *Streptococcus* spp.*,* Group A cases hospitalized from the Foodborne Disease Outbreak Surveillance System (1981-2007, 12 years when outbreaks occurred). Note, the outlier value of 4/4=100 hospitalization in 1998 was shrunk to 0.012, the next highest value in the ordered list of 12 rates. | Empirical | Outbreak  years (1981-2007): 0.000, 0.000, 0.012, 0.000, 0.000, 0.000, 0.000, 0.000, 0.004, 0.000, 1.000, 0.000 |
| Proportion who died | Proportion of *Streptococcus* spp.*,* Group A cases who died from the Foodborne Disease Outbreak Surveillance System (1981-2007, 12 years when outbreaks occurred). | Empirical | Outbreak years (1981-2007): 0.000, 0.000, 0.000, 0.000, 0.000, 0.000, 0.000, 0.000, 0.000, 0.000, 0.000, 0.000 |
| Under-diagnosis (hospitalizations, deaths) | Number of hospitalizations and deaths doubled to account for under-diagnosis. | PERT | Low, modal, high values: 1, 2, 3 |
| Proportion travel-related | Because of the rapid onset and short duration of *Streptococcus* spp.*,* Group A illnesses, we assumed that almost 100% of *Streptococcus* spp.*,* Group A illnesses occurring in the United States are domestically acquired. | PERT | Low, modal, high values: 0.00, 0.00, 0.02 |
| Proportion foodborne | Estimates based on outbreak-associated illnesses from foodborne outbreaks reported to CDC, therefore, assumed to be 100% foodborne. | PERT | Low, modal, high values: 0.999, 1.00, 1.00 |

| Pathogen: *Toxoplasma gondii* | | | |
|---|---|---|---|
| **Model input** | **Data source(s)** | **Distribution** | **Parameters** |
| Prevalence | Prevalence of *Toxoplasma gondii* infection estimated using nationally representative serologic data from the National Health and Nutrition Examination Survey (NHANES) (1999-2004). Specifically, the estimated prevalence for persons aged 40-49 years reported in Jones *et al.* (77) was assumed to be the cumulative result of 45 years of constant incidence. Upper and lower limits were based on the published 95% confidence interval. | Constant | Low, modal, high values: 0.137, 0.157, 0.177 |
| Incidence | Prevalence for persons aged 40-49 years reported in Jones *et al.* (77) was converted to annual incidences using the following formula: 1-(1-Prev%/100)^(1/45). Incidence was applied to 2006 US Census population estimates (299 million persons). Upper and lower limits of the incidence distribution were obtained by direct conversion of the 95% confidence interval. | Degenerate | 0.00327, 0.00379, 0.00432 |
| Seroconverison rate | The symptomatic fraction was estimated to be 15% (78). Uncertainty with this proportion was based on a 50% relative increase/decrease from 0.15 on an odds scale. | PERT | Low, modal, high values: 0.11, 0.15, 0.21 |
| Proportion hospitalized | Low, modal, and high values estimated from the annual national estimates of the number of toxoplasmosis hospitalizations from the 2000-2006 Nationwide Inpatient Sample (NIS) (46) using ICD-9-CM code 130 (Toxoplasmosis). | PERT | Low, modal, high values: 0.017, 0.026, 0.033 |
| Proportion who died | Low, modal, and high values estimated from the annual national estimates of the number of toxoplasmosis inpatient deaths from the 2000-2006 NIS using ICD-9-CM code 130 (Toxoplasmosis). | PERT | Low, modal, high values 0.0014, 0.0019 , 0.0022 |
| Under-diagnosis (hospitalizations, deaths) | Number of hospitalizations and deaths doubled to account for under-diagnosis. | PERT | Low, modal, high values: 1, 2, 3 |
| Proportion travel-related | Assumed to be very low. | PERT | Low, modal, high values: 0, 0, 0.2 |
| Proportion foodborne | 50% based on published studies (79, 80). Uncertainty with this proportion was based on a 50% relative increase/decrease from 0.50 on an odds scale. | PERT | Low, modal, high values: 0.40, 0.50, .060 |

| Pathogen: *Trichinella* spp. | | | |
|---|---|---|---|
| **Model input** | **Data source(s)** | **Distribution** | **Parameters** |
| Reported illnesses | Number of illnesses due to *Trichinella* spp. reported to CDC's National Notifiable Diseases Surveillance System (NNDSS) (2000-2007) (6, 81). | Empirical | By year (2000-2007): 16, 22, 14, 6, 5, 16, 15, 5 |
| Population adjustment (year) | Population ratios applied to each year from 2000-2007 based on US Census population estimates (1). | Degenerate | Ratios by year (2000-2007): 1.058, 1.047, 1.038, 1.029, 1.019, 1.010, 1.000, 0.990 |
| Underreporting | Passive surveillance multiplier used to adjust for underreporting (see online Technical Appendix 4). | PERT | Low, modal, high values: 1.0, 1.3, 1.6 |
| Percent severe | Assumed to be severe (82). | PERT | 0.95, 1.00, 1.00 |
| Medical care seeking (severe) | Proportion (and 95% confidence interval (CI)) of survey respondents with bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) used as a proxy for severe illness (CDC, unpublished data). | PERT | Low, modal, high values: 0.19, 0.35, 0.51 |
| Medical care seeking (mild) | Proportion (and 95% CI) of survey respondents with a non-bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) used as proxy for mild illness (CDC, unpublished data). | PERT | Low, modal, high values: 0.15, 0.18, 0.20 |
| Specimen submission (severe) | Proportion (and 95% CI) of survey respondents who submitted a stool specimen among persons with bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) used as proxy for severe illness (CDC, unpublished data). | PERT | Low, modal, high values: 0.11, 0.36, 0.62 |
| Specimen submission (mild) | Proportion (and 95% CI) of survey respondents who submitted a stool specimen among persons with a non-bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) used as a proxy for mild illness (CDC, unpublished data). | PERT | Low, modal, high values: 0.12, 0.19, 0.25 |
| Laboratory testing | We assumed that most persons with *Trichinella* who submitted a specimen for testing would be tested for *Trichinella*. | PERT | Low, modal, high values: 0.95, 0.97, 1 |
| Test sensitivity | Assumed to be 95% based on discussion with CDC experts. | PERT | Low, modal, high values: 0.93, 0.95, 0.97 |

| Proportion hospitalized | Proportion from the CDC's Foodborne Disease Outbreak Surveillance System (2000–2007) (5). ¶No outbreaks reported in 2004 and 2007. | Empirical | Available years (2000-2007): 0.333, 0.286, 0.000, 0.000, ¶, 0.333, 0.500, ¶ |
|---|---|---|---|
| Proportion who died | 0.2% based on published study (83). Uncertainty with this proportion was based on a 50% relative increase/decrease from 0.0020 on an odds scale. | PERT | Low, modal, high values: 0.0013, 0.0020, 0.0030 |
| Under-diagnosis (hospitalizations, deaths) | Number of hospitalizations and deaths doubled to account for under-diagnosis. | PERT | Low, modal, high values: 1, 2, 3 |
| Proportion travel-related | 3.7% based on surveillance data (81). Uncertainty with this proportion was based on a 50% relative increase/decrease from 0.037 on an odds scale. | PERT | Low, modal, high values: 0.025, 0.037, 0.054 |
| Proportion foodborne | 100% foodborne (84). | PERT | Low, modal, high values: 0.999, 1.000, 1.000 |


| Pathogen: *Vibrio cholerae,* toxigenic | | | |
|---|---|---|---|
| **Model input** | **Data source(s)** | **Distribution** | **Distribution values** |
| Reported illnesses | Number of illnesses due to toxigenic *Vibrio cholerae* infection reported to CDC's Cholera and Other Vibrio Illness Surveillance (COVIS) System (2000-2007) (85). Because of an apparent trend over time, the empirical distribution was based on the predicted count for 2006 plus empirical residuals derived from a linear regression of the number of illnesses on year (see online Technical Appendix 2). | Empirical | By year (2000-2007): 7, 3, 2, 2, 5, 12, 8, 7 |
| Population adjustment (year) | Population ratios applied to each year from 2000-2007 based on US Census population estimates (1). | Degenerate | Ratios by year (2000-2007): 1.058, 1.047, 1.038, 1.029, 1.019, 1.010, 1.000, 0.990 |
| Underreporting | Passive surveillance multiplier used to adjust for underreporting (see online Technical Appendix 4). | PERT | Low, modal, high values: 0.9, 1.1, 1.3 |
| Percent severe | Almost all cases assumed to be severe. | PERT | Low, modal, high values: 0.95, 1.00, 1.00 |
| Medical care seeking (severe) | Proportion (and 95% confidence interval (CI)) of survey respondents with bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) used as a proxy for severe illness (CDC, unpublished data) | PERT | Low, modal, high values: 0.19, 0.35, 0.51 |

| | | | |
|---|---|---|---|
| Medical care seeking (mild) | Proportion (and 95% CI) of survey respondents with a non-bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) used as proxy for mild illness (CDC, unpublished data). | PERT | Low, modal, high values: 0.15, 0.18, 0.20 |
| Specimen submission (severe) | Proportion (and 95% CI) of survey respondents who submitted a stool specimen among persons with bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) used as proxy for severe illness (CDC, unpublished data). | PERT | Low, modal, high values: 0.11, 0.36, 0.62 |
| Specimen submission (mild) | Proportion (and 95% CI) of survey respondents who submitted a stool specimen among persons with a non-bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) used as a proxy for mild illness (CDC, unpublished data). | PERT | Low, modal, high values: 0.12, 0.19, 0.25 |
| Laboratory testing | We assumed that most persons with toxigenic *Vibrio cholerae* who submitted a specimen for testing would be tested. | PERT | Low, modal, high values: 0.95, 0.97, 1 |
| Test sensitivity | Proportion of clinical laboratories using appropriate diagnostic tests to test stool samples for *Vibrio* spp. the FoodNet Laboratory Survey (12). | PERT | Low, modal, high values: 0.21, 0.28, 0.37 |
| Proportion hospitalized | Proportion of cases of toxigenic *Vibrio cholerae* infection reported to COVIS who were hospitalized (2000-2007). | Empirical | By year (2000-2007): 0.571, 0.333, 0.000, 0.500, 0.400, 0.417, 0.500, 0.714 |
| Proportion who died | Proportion of cases of toxigenic *Vibrio cholerae* infection reported to COVIS who died (2000-2007). | Empirical | By year (2000-2007): 0.000, 0.000, 0.000, 0.000, 0.000, 0.000, 0.000, 0.000 |
| Under-diagnosis (hospitalizations, deaths) | Number of hospitalizations and deaths doubled to account for under-diagnosis. | PERT | Low, modal, high values: 1, 2, 3 |
| Proportion travel-related | Based on proportion of cases of toxigenic *Vibrio cholerae* infection reported to COVIS who acquired the infection while traveling outside the United States (2000-2007). | PERT | Low, modal, high values: 0.42, 0.69, 1.00 |
| Proportion foodborne | Based on proportion of cases of toxigenic *Vibrio cholerae* infection reported to COVIS that were classified as foodborne (2000-2007). | PERT | Low, modal, high values: 0.999, 1.000, 1.000 |

| Pathogen: *Vibrio vulnificus* | | | |
|---|---|---|---|
| **Model input** | **Data source(s)** | **Distribution** | **Distribution values** |
| Reported illnesses | Number of illnesses due to *Vibrio vulnificus* infection reported to CDC's Cholera and Other Vibrio Illness Surveillance (COVIS) System (2000-2007) (85). Because of an apparent trend over time, the empirical distribution was based on the predicted count for 2006 plus empirical residuals derived from a linear regression of the number of illnesses on year (see online Technical Appendix 2). | Empirical | By year (2000-2007): 67, 89, 89, 119, 125 123, 100, 98 |
| Population adjustment (year) | Population ratios applied to each year from 2000-2007 based on US Census population estimates (1). | Degenerate | Ratios by year (2000-2007): 1.058, 1.047, 1.038, 1.029, 1.019, 1.010, 1.000, 0.990 |
| Underreporting | Passive surveillance multiplier used to adjust for underreporting (see online Technical Appendix 4). | PERT | Low, modal, high values: 0.9, 1.1, 1.3 |
| Percent severe | Almost all cases assumed to be severe. | PERT | Low, modal, high values: 0.95, 1, 1 |
| Medical care seeking (severe) | Assumed to have a high rate of medical care seeking. | PERT | Low, modal, high values: 0.80, 0.90, 1.00 |
| Medical care seeking (mild) | Assumed to have a high rate of medical care seeking. | PERT | Low, modal, high values: 0.80, 0.90, 1.00 |
| Specimen submission (severe) | Assumed to have a high rate of specimen submission. | PERT | Low, modal, high values: 0.70, 0.80, 0.90 |
| Specimen submission (mild) | Assumed to have a high rate of specimen submission. | PERT | Low, modal, high values: 0.70, 0.80, 0.90 |
| Laboratory testing | We assumed that most persons with *Vibrio vulnificus* who submitted a specimen for testing would be tested. | PERT | Low, modal, high values: 0.94, 0.97, 1.00 |
| Test sensitivity | Based on sensitivity of blood cultures (86, 87). | PERT | Low, modal, high values: 0.70, 0.85, 1.00 |
| Proportion hospitalized | Proportion of cases of *Vibrio vulnificus* infection reported to COVIS who were hospitalized (2000-2007). | Empirical | By year (2000-2007): 0.983, 0.905, 0.907, 0.936, 0.886, 0.895, 0.862, 0.926 |
| Proportion who died | Proportion of cases of *Vibrio vulnificus* infection reported to COVIS who died (2000-2007). | Empirical | By year (2000-2007): 0.377, 0.360, 0.402, 0.308, 0.360, 0.253, 0.360, 0.369 |

| Under-diagnosis (hospitalizations, deaths) | Number of hospitalizations and deaths double to account for under-diagnosis. | PERT | Low, modal, high values: 1, 2, 3 |
|---|---|---|---|
| Proportion travel-related | Based on proportion of cases of *Vibrio vulnificus* infection reported to COVIS who acquired the infection while traveling outside the United States (2000-2007). | PERT | Low, modal, high values: 0, 0.02, 0.03 |
| Proportion foodborne | Based on proportion of cases of *Vibrio vulnificus* infection reported to COVIS that were classified as foodborne (2000-2007). | PERT | Low, modal, high values: 0.31, 0.48, 0.60 |

| Pathogen: *Vibrio parahaemolyticus* | | | |
|---|---|---|---|
| **Model input** | **Data source(s)** | **Distribution** | **Distribution values** |
| Reported illnesses | Number of illnesses due to *Vibrio parahaemolyticus* infection reported to CDC's Cholera and Other Vibrio Illness Surveillance (COVIS) System (2000-2007) (85). Because of an apparent trend over time, the empirical distribution was based on the predicted count for 2006 plus empirical residuals derived from a linear regression of the number of illnesses on year (see online Technical Appendix 2). | Empirical | By year (2000-2007): 139, 155, 156, 170, 276, 219, 408, 239 |
| Population adjustment (year) | Population ratios applied to each year from 2000-2007 based on US Census population estimates (1). | Degenerate | Ratios by year (2000-2007): 1.058, 1.047, 1.038, 1.029, 1.019, 1.010, 1.000, 0.990 |
| Underreporting | Passive surveillance multiplier used to adjust for underreporting (see online Technical Appendix 4). | PERT | Low, modal, high values: 0.9, 1.1, 1.3 |
| Percent severe | Assumed to be a similar illness to non-typhoidal *Salmonella* infection. | PERT | Low, modal, high values: 0.35, 0.45, 0.71 |
| Medical care seeking (severe) | Proportion (and 95% confidence interval (CI)) of survey respondents with bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) used as a proxy for severe illness (CDC, unpublished data). | PERT | Low, modal, high values: 0.19, 0.35, 0.51 |
| Medical care seeking (mild) | Proportion (and 95% CI) of survey respondents with a non-bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) used as proxy for mild illness (CDC, unpublished data). | PERT | Low, modal, high values: 0.15, 0.18, 0.20 |

| | | | |
|---|---|---|---|
| Specimen submission (severe) | Proportion (and 95% CI) of survey respondents who submitted a stool specimen among persons with bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) used as proxy for severe illness (CDC, unpublished data). | PERT | Low, modal, high values: 0.11, 0.36, 0.62 |
| Specimen submission (mild) | Proportion (and 95% CI) of survey respondents who submitted a stool specimen among persons with a non-bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) used as a proxy for mild illness (CDC, unpublished data). | PERT | Low, modal, high values: 0.12, 0.19, 0.25 |
| Laboratory testing | Proportion of clinical laboratories routinely testing stool samples for *Vibrio* spp. from the FoodNet Laboratory Survey (12). | PERT | Low, modal, high values: 0.41, 0.51, 0.61 |
| Test sensitivity | Proportion of clinical laboratories using appropriate diagnostic tests to test stool samples for *Vibrio* spp. the FoodNet Laboratory Survey (12). | PERT | Low, modal, high values: 0.21, 0.28, 0.37 |
| Proportion hospitalized | Proportion of cases of *Vibrio parahaemolyticus* infection reported to COVIS who were hospitalized (2000-2007). | Empirical | By year (2000-2007): 0.205, 0.254, 0.275, 0.182, 0.241, 0.230, 0.178, 0.238 |
| Proportion who died | Proportion of cases of *Vibrio parahaemolyticus* infection reported to COVIS who died (2000-2007). | Empirical | By year (2000-2007): 0.007, 0.000, 0.037, 0.007, 0.012, 0.010, 0.003, 0.000 |
| Under-diagnosis (hospitalizations, deaths) | Number of hospitalizations and deaths double to account for under-diagnosis. | PERT | Low, modal, high values: 1, 2, 3 |
| Proportion travel-related | Based on proportion of cases of *Vibrio. parahaemolyticus* infection reported to COVIS who acquired the infection while traveling outside the United States (2000-2007). | PERT | Low, modal, high values: 0.08, 0.10, 0.14 |
| Proportion foodborne | Based on proportion of cases of *Vibrio parahaemolyticus* infection reported to COVIS that were classified as foodborne (2000-2007). | PERT | Low, modal, high values: 0.76, 0.87, 0.92 |

| Pathogen: *Vibrio* spp., other | | | |
|---|---|---|---|
| **Model input** | **Data source(s)** | **Distribution** | **Distribution values** |
| Reported illnesses | Number of illnesses due to *Vibrio spp.* other than toxigenic *V. cholerae, V. vulnificus*, and *V. parahaemolyticus* reported to CDC's Cholera and Other Vibrio Illness Surveillance (COVIS) System (2000-2007) (85). Because of an apparent trend over time, the empirical distribution was based on the predicted count for 2006 plus empirical residuals derived from a linear regression of the number of illnesses on year (see online Technical Appendix 2). | Empirical | By year (2000-2007): 98, 132, 208, 201, 179, 209, 227, 218 |
| Population adjustment (year) | Population ratios applied to each year from 2000-2007 based on US Census population estimates (1). | Degenerate | Ratios by year (2000-2007): 1.058, 1.047, 1.038, 1.029, 1.019, 1.010, 1.000, 0.990 |
| Underreporting | Passive surveillance multiplier used to adjust for underreporting (see online Technical Appendix 4). | PERT | Low, modal, high values: 0.9, 1.1, 1.3 |
| Percent severe | Assumed to be a similar illness to non-typhoidal *Salmonella* infection. | PERT | Low, modal, high values: 0.35, 0.45, 0.71 |
| Medical care seeking (severe) | Proportion (and 95% confidence interval (CI)) of survey respondents with bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) used as a proxy for severe illness (CDC, unpublished data). | PERT | Low, modal, high values: 0.19, 0.35, 0.51 |
| Medical care seeking (mild) | Proportion (and 95% CI) of survey respondents with a non-bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) used as proxy for mild illness (CDC, unpublished data). | PERT | Low, modal, high values: 0.15, 0.18, 0.20 |
| Specimen submission (severe) | Proportion (and 95% CI) of survey respondents who submitted a stool specimen among persons with bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) used as proxy for severe illness (CDC, unpublished data). | PERT | Low, modal, high values: 0.10, 0.36, 0.62 |

| Specimen submission (mild) | Proportion (and 95% CI) of survey respondents who submitted a stool specimen among persons with a non-bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) used as a proxy for mild illness (CDC, unpublished data). | PERT | Low, modal, high values: 0.12, 0.19, 0.25 |
|---|---|---|---|
| Laboratory testing | Proportion of clinical laboratories routinely testing stool samples for *Vibrio spp.* from the FoodNet Laboratory Survey (12). | PERT | Low, modal, high values: 0.41, 0.51, 0.61 |
| Test sensitivity | Proportion of clinical laboratories using appropriate diagnostic tests to test stool samples for *Vibrio* spp. the FoodNet Laboratory Survey (12). | PERT | Low, modal, high values: 0.21, 0.28, 0.37 |
| Proportion hospitalized | Proportion of cases of *Vibrio,* other infection reported to COVIS who were hospitalized (2000-2007). | Empirical | By year (2000-2007): 0.375, 0.359, 0.369, 0.396, 0.353, 0.437, 0.361, 0.317 |
| Proportion who died | Proportion of cases of *Vibrio,* other infection reported to COVIS who died (2000-2007). | Empirical | By year (2000-2007): 0.021, 0.015, 0.037, 0.068, 0.035, 0.069, 0.020, 0.032 |
| Under-diagnosis (hospitalizations, deaths) | Number of hospitalizations and deaths double to account for under-diagnosis. | PERT | Low, modal, high values: 1, 2, 3 |
| Proportion travel-related | Based on proportion of cases of *Vibrio,* other infection reported to COVIS who acquired the infection while traveling outside the United States (2000-2007). | PERT | Low, modal, high values: 0.06, 0.11, 0.17 |
| Proportion foodborne | Based on proportion of cases of *Vibrio,* other infection reported to COVIS that were classified as foodborne (2000-2007). | PERT | Low, modal, high values: 0.48, 0.57, 0.67 |

| Pathogen: *Yersinia enterocolitica* | | | |
|---|---|---|---|
| **Model input** | **Data source(s)** | **Distribution** | **Parameters** |
| Reported illnesses | Incidence of *Yersinia enterocolitica* infection reported to CDC's Foodborne Diseases Active Surveillance Network (FoodNet) by FoodNet site (n=10) and year (2005-2008) (10). | Empirical | By site and year (2005-2008) see Tables 3.1 and 3.2 in this online Technical Appendix |
| Population adjustment (year) | Incidence of *Yersinia enterocolitica* in each FoodNet site by year applied to 2006 US Census population estimates (1). | Degenerate | Adjustment by year (2005-2008): 1.010, 1.000, 0.990, 0.981 |
| Underreporting | No underreporting multiplier, we assumed all laboratory-confirmed *Yersinia enterocolitica* illnesses were enumerated by FoodNet active surveillance. | - | - |
| Proportion severe | Proportion of cases of *Yersinia enterocolitica* infection with bloody diarrhea from FoodNet study in two sites (88). Uncertainty with this proportion (9%) was based on a 50% relative increase/decrease from 0.09 on an odds scale. | PERT | Low, modal, high values: 0.062, 0.09, 0.129 |
| Medical care seeking (severe) | Proportion (and 95% confidence interval (CI)) of survey respondents with bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) (CDC, unpublished data). | PERT | Low, modal, high values: 0.19, 0.35, 0.51 |
| Medical care seeking (mild) | Proportion (and 95% CI) of survey respondents with a non-bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) (CDC, unpublished data) | PERT | Low, modal, high values: 0.15, 0.18, 0.20 |
| Specimen submission (severe) | Proportion (and 95% CI) of survey respondents who submitted a stool specimen among persons with bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-2001, 2002-2003, 2006-2007) (CDC, unpublished data). | PERT | Low, modal, high values: 0.11, 0.36, 0.62 |
| Specimen submission (mild) | Proportion (and 95% CI) of survey respondents who submitted a stool specimen among persons with a non-bloody diarrhea who sought medical care from FoodNet Population Surveys (2000-1, 2002-3, 2006-7) (CDC, unpublished data). | PERT | Low, modal, high values: 0.12, 0.19, 0.25 |
| Laboratory testing | Proportion of clinical laboratories routinely testing stool samples for *Yersinia enterocolitica* from the FoodNet Laboratory Survey (12). | PERT | Low, modal, high values: 0.31, 0.40, 0.50 |

| Test sensitivity | Proportion of clinical laboratories using appropriate diagnostic tests to test stool samples for *Yersinia enterocolitica* the FoodNet Laboratory Survey (12). | PERT | Low, modal, high values: 0.49, 0.59, 0.68 |
|---|---|---|---|
| Proportion hospitalized | Proportion of FoodNet cases of *Yersinia enterocolitica* infection hospitalized (2005-2008). | Empirical | By site and year (2005-2008) see Table 3.3 in this online Technical Appendix |
| Proportion who died | Proportion of FoodNet cases of *Yersinia enterocolitica* infection who died (2005-2008). | Empirical | By site and year (2005-2008) see Table 3.4 in this online Technical Appendix |
| Under-diagnosis (hospitalizations, deaths) | Number of hospitalizations and deaths doubled to account for under-diagnosis. | PERT | Low, modal, high values: 1, 2, 3 |
| Proportion travel-related | Proportion of FoodNet cases of *Yersinia enterocolitica* infection who reported travel outside the United States within 7 days of illness onset (2005-2008). Uncertainty with this proportion (7%) was based on a 50% relative increase/decrease from 0.07 on an odds scale. | PERT | Low, modal, high values: 0.05, 0.07, 0.10 |
| Proportion foodborne | From a published review (89). Uncertainty with this proportion (90%) was based on a 50% relative increase/decrease from 0.90 on an odds scale. | PERT | Low, modal, high values: 0.80, 0.90, 1.00 |

**Table 3.1:** Number of cases of illness reported to CDC's Foodborne Diseases Active Surveillance Network (FoodNet) by pathogen, year, and FoodNet site

| Pathogen | Year | FoodNet site | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CA | CO | CT | GA | MD | MN | NM | NY | OR | TN |
| *Campylobacter* spp. | 2005 | 920 | 495 | 543 | 585 | 403 | 843 | 352 | 507 | 641 | 403 |
| *Campylobacter* spp. | 2006 | 866 | 479 | 532 | 581 | 432 | 899 | 383 | 522 | 634 | 443 |
| *Campylobacter* spp. | 2007 | 923 | 421 | 493 | 689 | 414 | 907 | 350 | 522 | 705 | 448 |
| *Campylobacter* spp. | 2008 | 985 | 388 | 530 | 683 | 378 | 884 | 357 | 479 | 690 | 480 |
| *Cryptosporidium* spp. | 2005 | 48 | 25 | 84 | 154 | 32 | 166 | 17 | 708 | 48 | 45 |
| *Cryptosporidium* spp. | 2006 | 47 | 37 | 38 | 276 | 20 | 242 | 41 | 54 | 77 | 47 |
| *Cryptosporidium* spp. | 2007 | 40 | 102 | 42 | 231 | 33 | 302 | 120 | 89 | 129 | 137 |
| *Cryptosporidium* spp. | 2008 | 43 | 27 | 41 | 258 | 55 | 235 | 174 | 114 | 58 | 47 |
| *Cyclospora cayetanensis* | 2005 | 2 | 0 | 35 | 13 | 3 | 0 | 4 | 1 | 4 | 3 |
| *Cyclospora cayetanensis* | 2006 | 0 | 0 | 11 | 19 | 2 | 4 | 1 | 0 | 2 | 4 |
| *Cyclospora cayetanensis* | 2007 | 1 | 0 | 3 | 3 | 1 | 0 | 2 | 2 | 0 | 1 |
| *Cyclospora cayetanensis* | 2008 | 0 | 0 | 4 | 2 | 3 | 3 | 2 | 0 | 0 | 3 |
| *E. coli* O157 STEC | 2005 | 28 | 26 | 43 | 33 | 27 | 121 | 10 | 74 | 66 | 45 |
| *E. coli* O157 STEC | 2006 | 42 | 35 | 41 | 41 | 40 | 147 | 20 | 53 | 83 | 88 |
| *E. coli* O157 STEC | 2007 | 39 | 32 | 45 | 47 | 22 | 165 | 10 | 58 | 73 | 56 |
| *E. coli* O157 STEC | 2008 | 37 | 82 | 26 | 44 | 33 | 120 | 15 | 51 | 56 | 54 |
| *E. coli* non-O157 STEC | 2005 | 5 | 4 | 20 | 8 | 24 | 35 | 11 | 11 | 8 | 2 |
| *E. coli* non-O157 STEC | 2006 | 6 | 16 | 34 | 18 | 47 | 44 | 23 | 19 | 9 | 11 |
| *E. coli* non-O157 STEC | 2007 | 9 | 55 | 26 | 40 | 35 | 41 | 23 | 12 | 5 | 24 |
| *E. coli* non-O157 STEC | 2008 | 1 | 23 | 17 | 27 | 49 | 53 | 27 | 16 | 5 | 10 |
| *Listeria monocytogenes* | 2005 | 10 | 2 | 20 | 22 | 19 | 15 | 4 | 17 | 11 | 10 |
| *Listeria monocytogenes* | 2006 | 8 | 5 | 18 | 17 | 28 | 5 | 5 | 19 | 11 | 9 |
| *Listeria monocytogenes* | 2007 | 7 | 9 | 11 | 31 | 14 | 6 | 4 | 10 | 8 | 14 |
| *Listeria monocytogenes* | 2008 | 19 | 4 | 14 | 21 | 14 | 5 | 5 | 16 | 5 | 12 |
| *Salmonella*, non-typhoidal* | 2005 | 453 | 336 | 460 | 1920 | 779 | 573 | 251 | 488 | 372 | 813 |
| *Salmonella*, non-typhoidal* | 2006 | 469 | 353 | 502 | 1836 | 768 | 720 | 258 | 493 | 397 | 841 |
| *Salmonella*, non-typhoidal* | 2007 | 469 | 311 | 423 | 2030 | 854 | 702 | 283 | 520 | 317 | 850 |
| *Salmonella*, non-typhoidal* | 2008 | 460 | 335 | 491 | 2276 | 836 | 748 | 516 | 431 | 395 | 905 |

| | | CA | CO | CT | GA | MD | MN | NM | NY | OR | TN |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Salmonella* serotype Typhi | 2005 | 14 | 5 | 8 | 8 | 12 | 6 | 1 | 0 | 4 | 3 |
| *Salmonella* serotype Typhi | 2006 | 17 | 6 | 4 | 5 | 8 | 5 | 1 | 2 | 4 | 1 |
| *Salmonella* serotype Typhi | 2007 | 9 | 6 | 8 | 17 | 16 | 9 | 0 | 1 | 3 | 1 |
| *Salmonella* serotype Typhi | 2008 | 17 | 2 | 3 | 9 | 17 | 7 | 2 | 2 | 2 | 4 |
| *Shigella* spp. | 2005 | 283 | 101 | 58 | 668 | 99 | 96 | 133 | 66 | 85 | 506 |
| *Shigella* spp. | 2006 | 244 | 180 | 67 | 1375 | 128 | 259 | 172 | 48 | 94 | 198 |
| *Shigella* spp. | 2007 | 188 | 79 | 44 | 1638 | 109 | 237 | 107 | 38 | 66 | 363 |
| *Shigella* spp. | 2008 | 159 | 85 | 40 | 1103 | 117 | 311 | 154 | 33 | 74 | 968 |
| *Yersinia enterocolitica* | 2005 | 28 | 7 | 15 | 28 | 4 | 17 | 2 | 20 | 9 | 18 |
| *Yersinia enterocolitica* | 2006 | 10 | 5 | 16 | 32 | 9 | 22 | 5 | 12 | 12 | 29 |
| *Yersinia enterocolitica* | 2007 | 14 | 4 | 17 | 42 | 8 | 19 | 3 | 14 | 16 | 13 |
| *Yersinia enterocolitica* | 2008 | 10 | 7 | 14 | 42 | 14 | 14 | 2 | 15 | 12 | 21 |

*In all analyses in this paper, serotype Paratyphi is grouped with non-typhoidal S*almonella.*

**Table 3.2:** US cases of illness projected from CDC's Foodborne Diseases Active Surveillance Network (FoodNet) by pathogen, year, and FoodNet site

| Pathogen | Year | FoodNet site | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CA | CO | CT | GA | MD | MN | NM | NY | OR | TN |
| *Campylobacter* spp. | 2005 | 85289 | 57079 | 46572 | 19193 | 21566 | 49270 | 54903 | 35342 | 52803 | 20096 |
| *Campylobacter* spp. | 2006 | 79857 | 54239 | 45509 | 18602 | 23007 | 52153 | 58967 | 36470 | 51389 | 21781 |
| *Campylobacter* spp. | 2007 | 84281 | 46720 | 42149 | 21586 | 21983 | 52219 | 53160 | 36526 | 56309 | 21738 |
| *Campylobacter* spp. | 2008 | 88706 | 42161 | 45250 | 21039 | 20019 | 50581 | 53678 | 33519 | 54319 | 23092 |
| *Cryptosporidium* spp. | 2005 | 4450 | 2883 | 7205 | 5053 | 1712 | 9702 | 2652 | 49353 | 3954 | 2244 |
| *Cryptosporidium* spp. | 2006 | 4334 | 4190 | 3251 | 8837 | 1065 | 14039 | 6312 | 3773 | 6241 | 2311 |
| *Cryptosporidium* spp. | 2007 | 3652 | 11319 | 3591 | 7237 | 1752 | 17387 | 18226 | 6228 | 10303 | 6647 |
| *Cryptosporidium* spp. | 2008 | 3872 | 2934 | 3494 | 7948 | 2913 | 13431 | 26162 | 7977 | 4566 | 2256 |
| *Cyclospora cayetanensis* | 2005 | 185 | 0 | 3002 | 427 | 161 | 0 | 624 | 70 | 330 | 150 |
| *Cyclospora cayetanensis* | 2006 | 0 | 0 | 941 | 608 | 107 | 232 | 154 | 0 | 162 | 197 |
| *Cyclospora cayetanensis* | 2007 | 91 | 0 | 256 | 94 | 53 | 0 | 304 | 140 | 0 | 49 |
| *Cyclospora cayetanensis* | 2008 | 0 | 0 | 341 | 62 | 159 | 171 | 301 | 0 | 0 | 144 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| *E. coli* O157 STEC | 2005 | 2596 | 2998 | 3688 | 1083 | 1445 | 7072 | 1560 | 5158 | 5437 | 2244 |
| *E. coli* O157 STEC | 2006 | 3873 | 3963 | 3507 | 1313 | 2130 | 8528 | 3079 | 3703 | 6728 | 4327 |
| *E. coli* O157 STEC | 2007 | 3561 | 3551 | 3847 | 1473 | 1168 | 9500 | 1519 | 4058 | 5831 | 2717 |
| *E. coli* O157 STEC | 2008 | 3332 | 8910 | 2216 | 1355 | 1748 | 6858 | 2255 | 3569 | 4408 | 2592 |
| *E. coli* non-O157 STEC | 2005 | 464 | 461 | 1715 | 262 | 1284 | 2046 | 1716 | 767 | 659 | 100 |
| *E. coli* non-O157 STEC | 2006 | 553 | 1812 | 2908 | 576 | 2503 | 2553 | 3541 | 1327 | 730 | 541 |
| *E. coli* non-O157 STEC | 2007 | 822 | 6104 | 2223 | 1253 | 1858 | 2360 | 3493 | 840 | 399 | 1165 |
| *E. coli* non-O157 STEC | 2008 | 90 | 2499 | 1449 | 832 | 2595 | 3029 | 4060 | 1120 | 394 | 480 |
| *Listeria monocytogenes* | 2005 | 927 | 231 | 1715 | 722 | 1017 | 877 | 624 | 1185 | 906 | 499 |
| *Listeria monocytogenes* | 2006 | 738 | 566 | 1540 | 544 | 1491 | 290 | 770 | 1327 | 892 | 443 |
| *Listeria monocytogenes* | 2007 | 639 | 999 | 940 | 971 | 743 | 345 | 608 | 700 | 639 | 679 |
| *Listeria monocytogenes* | 2008 | 1711 | 435 | 1193 | 647 | 741 | 286 | 752 | 1120 | 394 | 576 |
| *Salmonella*, non-typhoidal | 2005 | 41995 | 38744 | 39453 | 62993 | 41686 | 33490 | 39150 | 34017 | 30644 | 40542 |
| *Salmonella*, non-typhoidal | 2006 | 43248 | 39972 | 42942 | 58784 | 40902 | 41769 | 39722 | 34444 | 32179 | 41350 |
| *Salmonella*, non-typhoidal | 2007 | 42825 | 34513 | 36164 | 63599 | 45347 | 40416 | 42983 | 36386 | 25319 | 41243 |
| *Salmonella*, non-typhoidal | 2008 | 41426 | 36402 | 41841 | 70111 | 44276 | 42751 | 77585 | 30160 | 31095 | 43447 |
| *Salmonella* serotype Typhi | 2005 | 1298 | 577 | 686 | 262 | 642 | 351 | 156 | 0 | 330 | 150 |
| *Salmonella* serotype Typhi | 2006 | 1568 | 679 | 342 | 160 | 426 | 290 | 154 | 140 | 324 | 49 |
| *Salmonella* serotype Typhi | 2007 | 822 | 666 | 684 | 533 | 850 | 518 | 0 | 70 | 240 | 49 |
| *Salmonella* serotype Typhi | 2008 | 1531 | 217 | 256 | 277 | 900 | 400 | 301 | 140 | 157 | 192 |
| *Shigella* spp. | 2005 | 26236 | 11646 | 4975 | 21916 | 5298 | 5611 | 20745 | 4601 | 7002 | 25233 |
| *Shigella* spp. | 2006 | 22500 | 20382 | 5731 | 44024 | 6817 | 15025 | 26481 | 3354 | 7619 | 9735 |
| *Shigella* spp. | 2007 | 17167 | 8767 | 3762 | 51318 | 5788 | 13645 | 16252 | 2659 | 5272 | 17613 |
| *Shigella* spp. | 2008 | 14319 | 9236 | 3409 | 33977 | 6196 | 17775 | 23155 | 2309 | 5825 | 46472 |
| *Yersinia enterocolitica* | 2005 | 2596 | 807 | 1287 | 919 | 214 | 994 | 312 | 1394 | 741 | 898 |
| *Yersinia enterocolitica* | 2006 | 922 | 566 | 1369 | 1025 | 479 | 1276 | 770 | 838 | 973 | 1426 |
| *Yersinia enterocolitica* | 2007 | 1278 | 444 | 1453 | 1316 | 425 | 1094 | 456 | 980 | 1278 | 631 |
| *Yersinia enterocolitica* | 2008 | 901 | 761 | 1193 | 1294 | 741 | 800 | 301 | 1050 | 945 | 1008 |

**Table 3.3:** Proportion of case-patients hospitalized from CDC's Foodborne Diseases Active Surveillance Network (FoodNet) by pathogen, year, and FoodNet site

| Pathogen | Year | FoodNet site | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CA | CO | CT | GA | MD | MN | NM | NY | OR | TN |
| *Campylobacter* spp. | 2005 | 0.1060 | 0.1087 | 0.2016 | 0.2363 | 0.2141 | 0.1295 | 0.1502 | 0.1584 | 0.0939 | 0.2575 |
| *Campylobacter* spp. | 2006 | 0.1256 | 0.1006 | 0.1909 | 0.2226 | 0.5370 | 0.1316 | 0.1485 | 0.1862 | 0.0738 | 0.2126 |
| *Campylobacter* spp. | 2007 | 0.1292 | 0.1041 | 0.2056 | 0.1872 | 0.1959 | 0.1287 | 0.2060 | 0.1437 | 0.0893 | 0.2426 |
| *Campylobacter* spp. | 2008 | 0.1196 | 0.1111 | 0.1589 | 0.1969 | 0.2235 | 0.1357 | 0.1813 | 0.1809 | 0.0762 | 0.2500 |
| *Cryptosporidium* spp. | 2005 | 0.2444 | 0.1600 | 0.1449 | 0.3650 | 0.5667 | 0.2108 | 0.1875 | 0.0395 | 0.1042 | 0.2750 |
| *Cryptosporidium* spp. | 2006 | 0.3810 | 0.1081 | 0.2143 | 0.2918 | 0.8462 | 0.1777 | 0.2500 | 0.1667 | 0.1739 | 0.3721 |
| *Cryptosporidium* spp. | 2007 | 0.2105 | 0.1237 | 0.2059 | 0.3258 | 0.5161 | 0.1739 | 0.1875 | 0.1591 | 0.0569 | 0.1308 |
| *Cryptosporidium* spp. | 2008 | 0.3030 | 0.4231 | 0.1622 | 0.3347 | 0.6038 | 0.1923 | 0.1557 | 0.1150 | 0.0714 | 0.2750 |
| *Cyclospora cayetanensis* | 2005 | 0.5000 | | 0.0286 | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| *Cyclospora cayetanensis* | 2006 | | | 0.1000 | 0.0000 | 1.0000 | 0.0000 | 0.0000 | | 0.0000 | 0.0000 |
| *Cyclospora cayetanensis* | 2007 | 0.0000 | | 0.0000 | 0.0000 | | | 0.0000 | 0.0000 | | 0.0000 |
| *Cyclospora cayetanensis* | 2008 | | | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | | | 0.0000 |
| *E. coli* O157 STEC | 2005 | 0.4444 | 0.3846 | 0.4419 | 0.4848 | 0.2800 | 0.3802 | 0.1000 | 0.4384 | 0.3636 | 0.6364 |
| *E. coli* O157 STEC | 2006 | 0.4524 | 0.4000 | 0.4390 | 0.5610 | 0.9500 | 0.4150 | 0.5500 | 0.4717 | 0.5060 | 0.6023 |
| *E. coli* O157 STEC | 2007 | 0.4872 | 0.3438 | 0.3778 | 0.6170 | 0.5909 | 0.4242 | 0.3333 | 0.5000 | 0.3836 | 0.5636 |
| *E. coli* O157 STEC | 2008 | 0.3784 | 0.3537 | 0.4231 | 0.6364 | 0.4545 | 0.2750 | 0.5333 | 0.5400 | 0.4107 | 0.5660 |
| *E. coli* non-O157 STEC | 2005 | 0.0000 | 0.0000 | 0.0500 | 0.2500 | 0.1818 | 0.0286 | 0.5000 | 0.2727 | 0.0000 | 0.0000 |
| *E. coli* non-O157 STEC | 2006 | 0.0000 | 0.0000 | 0.2941 | 0.1111 | 0.2000 | 0.0909 | 0.1667 | 0.2105 | 0.0000 | 0.2727 |
| *E. coli* non-O157 STEC | 2007 | 0.0000 | 0.0727 | 0.1667 | 0.0256 | 0.1176 | 0.2500 | 0.1364 | 0.3333 | 0.2000 | 0.1739 |
| *E. coli* non-O157 STEC | 2008 | 0.0000 | 0.0000 | 0.1176 | 0.0417 | 0.0208 | 0.2075 | 0.0000 | 0.1250 | 0.2000 | 0.3000 |
| *Listeria monocytogenes* | 2005 | 1.0000 | 1.0000 | 0.9500 | 0.9091 | 1.0000 | 1.0000 | 0.7500 | 0.8824 | 0.9091 | 0.8000 |
| *Listeria monocytogenes* | 2006 | 0.8750 | 1.0000 | 1.0000 | 0.8824 | 1.0000 | 1.0000 | 1.0000 | 0.9474 | 0.7273 | 0.8889 |
| *Listeria monocytogenes* | 2007 | 1.0000 | 0.8889 | 1.0000 | 0.9355 | 0.8571 | 1.0000 | 1.0000 | 1.0000 | 0.8750 | 0.8571 |
| *Listeria monocytogenes* | 2008 | 0.8947 | 1.0000 | 0.9286 | 0.9048 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 0.9167 |
| *Salmonella*, non-typhoidal | 2005 | 0.2151 | 0.1918 | 0.2857 | 0.3440 | 0.2993 | 0.2483 | 0.2712 | 0.2531 | 0.1425 | 0.3980 |
| *Salmonella*, non-typhoidal | 2006 | 0.2299 | 0.2087 | 0.2612 | 0.3037 | 0.8221 | 0.1986 | 0.2705 | 0.3063 | 0.1924 | 0.3729 |
| *Salmonella*, non-typhoidal | 2007 | 0.2153 | 0.1836 | 0.2597 | 0.2877 | 0.2973 | 0.2325 | 0.2481 | 0.2521 | 0.2050 | 0.3297 |
| *Salmonella*, non-typhoidal | 2008 | 0.2342 | 0.2018 | 0.2112 | 0.2797 | 0.3125 | 0.2735 | 0.2414 | 0.2430 | 0.2127 | 0.3360 |

| Pathogen | Year | CA | CO | CT | GA | MD | MN | NM | NY | OR | TN |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Salmonella* serotype Typhi | 2005 | 0.7692 | 0.8000 | 0.7143 | 0.5000 | 0.8182 | 0.8333 | 0.0000 |  | 0.5000 | 1.0000 |
| *Salmonella* serotype Typhi | 2006 | 0.6875 | 0.6667 | 0.7500 | 1.0000 | 0.8750 | 1.0000 | 1.0000 | 1.0000 | 0.5000 | 1.0000 |
| *Salmonella* serotype Typhi | 2007 | 0.6250 | 0.6667 | 0.7500 | 0.3529 | 0.7500 | 0.6667 |  |  | 0.6667 | 1.0000 |
| *Salmonella* serotype Typhi | 2008 | 0.6429 | 1.0000 | 0.3333 | 1.0000 | 0.7647 | 1.0000 | 0.5000 | 1.0000 | 1.0000 | 1.0000 |
| *Shigella* spp. | 2005 | 0.1526 | 0.2222 | 0.1429 | 0.2496 | 0.2143 | 0.1771 | 0.2177 | 0.1667 | 0.1882 | 0.1982 |
| *Shigella* spp. | 2006 | 0.1391 | 0.1173 | 0.3019 | 0.1883 | 0.6042 | 0.1550 | 0.2160 | 0.2292 | 0.1915 | 0.2515 |
| *Shigella* spp. | 2007 | 0.1453 | 0.1429 | 0.2069 | 0.1214 | 0.2233 | 0.1838 | 0.1837 | 0.1842 | 0.1667 | 0.1753 |
| *Shigella* spp. | 2008 | 0.1644 | 0.1786 | 0.2105 | 0.1668 | 0.2818 | 0.2058 | 0.2414 | 0.2121 | 0.1918 | 0.1448 |
| *Yersinia enterocolitica* | 2005 | 0.2500 | 0.4286 | 0.4615 | 0.4074 | 0.6667 | 0.2941 | 0.5000 | 0.4500 | 0.2222 | 0.5625 |
| *Yersinia enterocolitica* | 2006 | 0.5556 | 0.4000 | 0.3077 | 0.6250 | 0.4000 | 0.1818 | 0.5000 | 0.3333 | 0.1667 | 0.5185 |
| *Yersinia enterocolitica* | 2007 | 0.1667 | 0.0000 | 0.1667 | 0.4048 | 0.5000 | 0.2105 | 0.5000 | 0.1429 | 0.2667 | 0.3077 |
| *Yersinia enterocolitica* | 2008 | 0.6000 | 0.1429 | 0.4286 | 0.3846 | 0.3846 | 0.2143 | 0.0000 | 0.2667 | 0.2727 | 0.1500 |

**Table 3.4:** Proportion of case-patients who died from CDC's Foodborne Diseases Active Surveillance Network (FoodNet) by pathogen, year, and FoodNet site

| Pathogen | Year | FoodNet site | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CA | CO | CT | GA | MD | MN | NM | NY | OR | TN |
| *Campylobacter* spp. | 2005 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| *Campylobacter* spp. | 2006 | 0.0000 | 0.0000 | 0.0027 | 0.0046 | 0.0000 | 0.0011 | 0.0028 | 0.0000 | 0.0000 | 0.0000 |
| *Campylobacter* spp. | 2007 | 0.0041 | 0.0000 | 0.0026 | 0.0035 | 0.0000 | 0.0011 | 0.0000 | 0.0000 | 0.0014 | 0.0022 |
| *Campylobacter* spp. | 2008 | 0.0065 | 0.0000 | 0.0038 | 0.0018 | 0.0027 | 0.0011 | 0.0000 | 0.0063 | 0.0014 | 0.0021 |
| *Cryptosporidium* spp. | 2005 | 0.0000 | 0.0000 | 0.0000 | 0.0088 | 0.0000 | 0.0060 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| *Cryptosporidium* spp. | 2006 | 0.0250 | 0.0000 | 0.0000 | 0.0093 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0238 |
| *Cryptosporidium* spp. | 2007 | 0.0000 | 0.0000 | 0.0000 | 0.0152 | 0.0000 | 0.0066 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| *Cryptosporidium* spp. | 2008 | 0.0000 | 0.0000 | 0.0000 | 0.0372 | 0.0000 | 0.0043 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| *Cyclospora cayetanensis* | 2005 | 0.0000 |  | 0.0000 | 0.0000 | 0.0000 |  | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| *Cyclospora cayetanensis* | 2006 |  |  | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |  | 0.0000 | 0.0000 |
| *Cyclospora cayetanensis* | 2007 | 0.0000 |  | 0.0000 | 0.0000 |  |  | 0.0000 | 0.0000 |  | 0.0000 |
| *Cyclospora cayetanensis* | 2008 |  |  | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |  |  | 0.0000 |

| Organism | Year | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *E. coli* O157 STEC | 2005 | 0.0370 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0270 |
| *E. coli* O157 STEC | 2006 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0250 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| *E. coli* O157 STEC | 2007 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0172 | 0.0000 | 0.0000 |
| *E. coli* O157 STEC | 2008 | 0.0000 | 0.0122 | 0.0000 | 0.0256 | 0.0000 | 0.0000 | 0.0000 | 0.0196 | 0.0179 | 0.0189 |
| *E. coli* non-O157 STEC | 2005 | 0.0000 | 0.0000 | 0.0000 | 0.1250 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| *E. coli* non-O157 STEC | 2006 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| *E. coli* non-O157 STEC | 2007 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| *E. coli* non-O157 STEC | 2008 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| *Listeria monocytogenes* | 2005 | 0.4000 | 0.0000 | 0.1500 | 0.0000 | 0.1111 | 0.1333 | 0.0000 | 0.1765 | 0.1818 | 0.0000 |
| *Listeria monocytogenes* | 2006 | 0.0000 | 0.0000 | 0.0556 | 0.0588 | 0.0741 | 0.2000 | 0.4000 | 0.1579 | 0.3636 | 0.0000 |
| *Listeria monocytogenes* | 2007 | 0.1429 | 0.0000 | 0.3636 | 0.0968 | 0.1538 | 0.3333 | 0.2500 | 0.1000 | 0.1250 | 0.2857 |
| *Listeria monocytogenes* | 2008 | 0.1579 | 0.0000 | 0.4286 | 0.1429 | 0.1429 | 0.2000 | 0.4000 | 0.1875 | 0.2000 | 0.1818 |
| *Salmonella*, non-typhoidal | 2005 | 0.0074 | 0.0030 | 0.0055 | 0.0053 | 0.0039 | 0.0017 | 0.0130 | 0.0061 | 0.0000 | 0.0081 |
| *Salmonella*, non-typhoidal | 2006 | 0.0024 | 0.0028 | 0.0071 | 0.0092 | 0.0028 | 0.0014 | 0.0285 | 0.0061 | 0.0000 | 0.0026 |
| *Salmonella*, non-typhoidal | 2007 | 0.0141 | 0.0000 | 0.0116 | 0.0041 | 0.0024 | 0.0014 | 0.0074 | 0.0038 | 0.0032 | 0.0012 |
| *Salmonella*, non-typhoidal | 2008 | 0.0026 | 0.0030 | 0.0021 | 0.0050 | 0.0086 | 0.0107 | 0.0040 | 0.0000 | 0.0076 | 0.0011 |
| *Salmonella* serotype Typhi | 2005 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |  | 0.0000 | 0.0000 |
| *Salmonella* serotype Typhi | 2006 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| *Salmonella* serotype Typhi | 2007 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |  | 0.0000 | 0.0000 | 0.0000 |
| *Salmonella* serotype Typhi | 2008 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| *Shigella* spp. | 2005 | 0.0000 | 0.0000 | 0.0000 | 0.0024 | 0.0103 | 0.0000 | 0.0085 | 0.0000 | 0.0000 | 0.0000 |
| *Shigella* spp. | 2006 | 0.0067 | 0.0056 | 0.0000 | 0.0011 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| *Shigella* spp. | 2007 | 0.0000 | 0.0000 | 0.0000 | 0.0008 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0152 | 0.0000 |
| *Shigella* spp. | 2008 | 0.0000 | 0.0000 | 0.0000 | 0.0011 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| *Yersinia enterocolitica* | 2005 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0714 |
| *Yersinia enterocolitica* | 2006 | 0.1111 | 0.0000 | 0.0000 | 0.0870 | 0.0000 | 0.0000 | 0.2500 | 0.0833 | 0.0833 | 0.0000 |
| *Yersinia enterocolitica* | 2007 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| *Yersinia enterocolitica* | 2008 | 0.1000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

**Table 3.5 Underreporting and under-diagnosis multipliers for the 25 known pathogens with surveillance data available**

| Pathogen | Underreporting multiplier† Mean (90% credible interval [CrI]) | Under-diagnosis multiplier‡ Mean (90% CrI) |
|---|---|---|
| *Bacillus cereus* | 25.5 (8.7-52.3) | 29.3 (21.8-38.5) |
| *Brucella* spp. | 1.1 (1.0-1.2) | 15.1 (10.7-21.4) |
| *Campylobacter* spp. | - | 30.3 (23.2-39.0) |
| *Clostridium botulinum,* foodborne | 1.1 (1.0-1.2) | 2.0 (1.8-2.3) |
| *Clostridium perfringens* | 25.5 (8.7-52.3) | 29.3 (21.8-38.5) |
| *Cryptosporidium spp.* | - | 98.6 (73.5-130.3) |
| *Cyclospora cayetanensis* | - | 83.1 (59.1-114.5) |
| *E. coli,* enterotoxigenic (ETEC) | 25.5 (8.7-52.3) | 29.3 (21.8-38.4) |
| *E. coli*, Shiga toxin–producing (STEC) non-O157 | - | 106.8 (75.4-146.3) |
| *E. coli*, Shiga toxin–producing (STEC) O157 | - | 26.1 (16.1-41.3) |
| *Giardia intestinalis* | 1.3 (1.1-1.5) | 46.3 (36.0-59.3) |
| Hepatitis A | 1.1 (1.0-1.2) | 9.1 (6.9-11.8) |
| *Listeria monocytogenes* | - | 2.3 (2.0-2.6) |
| *Mycobacterium bovis* | - | 1.1 (1.0-1.1) |
| *Salmonella* serotype Typhi | - | 13.3 (7.6-22.8) |
| *Salmonella,* non-typhoidal | - | 29.3 (21.8-38.4) |
| *Shigella* spp. | - | 33.3 (25.1-43.4) |
| *Staphylococcus aureus,* foodborne | 25.5 (8.7-52.3) | 29.3 (21.8-38.5) |
| *Streptococcus* spp.*,* Group A, foodborne | 25.5 (8.7-52.3) | 29.3 (21.8-38.5) |
| *Trichinella spp.* | 1.3 (1.1-1.5) | 9.8 (5.6-16.7) |
| *Vibrio cholerae,* toxigenic | 1.1 (1.0-1.2) | 33.1 (18.4-57.5) |
| *Vibrio parahaemolyticus* | 1.1 (1.0-1.2) | 142.4 (100.1-195.1) |
| *Vibrio* spp., other | 1.1 (1.0-1.2) | 142.7 (100.4-195.2) |
| *Vibrio vulnificus* | 1.1 (1.0-1.2) | 1.7 (1.5-2.0) |
| *Yersinia enterocolitica* | - | 122.8 (91.2-163.0) |

†Adjustment for underreporting due to surveillance method; underreporting multiplier for passive surveillance systems (COVIS and NNDSS) derived by comparing the incidence of laboratory-confirmed illnesses for *Listeria,* non-typhoidal *Salmonella*, *Shigella,* and STEC O157 (for bacteria) and *Cryptosporidium* spp. and *Cyclospora cayetanensis* (for parasites) ascertained in FoodNet to the incidence of laboratory-confirmed illnesses for the same pathogens reportable to NNDSS; underreporting multiplier for outbreak-associated illness reported through the Foodborne Disease Outbreak Surveillance System derived by comparing the incidence of laboratory-confirmed illnesses caused by *Listeria*, non-typhoidal *Salmonella, Shigella*, and STEC O157 ascertained in FoodNet to the incidence of laboratory-confirmed illnesses of these bacterial infections reported to FDOSS. More detail on the data used to estimate underreporting multipliers is given in online Technical Appendix 4.

‡ Adjustment for under-diagnosis due to variations in medical care seeking, specimen submission, laboratory testing, and test sensitivity.

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