

Estimate of Burden and Direct Healthcare Cost of Infectious Waterborne Disease in the United States

Appendix 3

Additional Tables

Appendix 3 Table 1. Total annual cost to commercial insurers (sum of insurer payments, in 2014 US dollars) of emergency department visits and hospitalizations from waterborne transmission of selected infections, 2014, United States

| Disease | Treat-and-release ED visit | | | Hospitalization | | | Total |
|--|--|--|---|---|---|---|--|
| | Mean insurer payment per visit (95% CrI) | Annual number of commercial visits paid due to waterborne transmission (95% CrI) | Total insurer cost of treat-and-release ED visits because of waterborne disease (95% CrI) | Mean insurer payment per stay (95% CrI) | Total annual number of stays because of waterborne transmission (95% CrI) | Total insurer cost of hospitalizations for waterborne disease (95% CrI) | Total annual insurer cost for waterborne disease (95% CrI) |
| Campylobacteriosis | 2,120 (21–8,730) | 190 (19–577) | 402,000 (2,190–2,200,000) | 14,100 (1,250–47,100) | 944 (84–3,030) | 13,000,000 (354,000–57,400,000) | 13,400,000 (589,000–57,800,000) |
| Cryptosporidiosis | 1,910 (16–9,280) | 310 (105–603) | 593,000 (5,050–2,800,000) | 16,900 (1,560–82,700) | 522 (48–1,650) | 8,830,000 (217,000–47,000,000) | 9,420,000 (588,000–47,500,000) |
| Giardiasis | 1,800 (43–9,280) | 365 (119–722) | 656,000 (10,100–3,210,000) | 24,100 (1,320–167,000) | 503 (167–999) | 12,100,000 (553,000–81,000,000) | 12,800,000 (979,000–81,300,000) |
| Legionnaires' disease | 1,230 (79–2,960) | 275 (120–495) | 338,000 (20,700–991,000) | 44,900 (1,500–293,000) | 4,610 (3,110–5,590) | 207,000,000 (7,280,000–1,340,000,000) | 208,000,000 (7,640,000–1,340,000,000) |
| Nontuberculous mycobacterial (NTM) infection | 1,480 (34–6,460) | 1,460 (739–2,240) | 2,170,000 (40,600–9,380,000) | 43,600 (1,320–243,000) | 13,500 (7,030–19,400) | 587,000,000 (16,400,000–3,340,000,000) | 589,000,000 (18,900,000–3,340,000,000) |
| Otitis externa | 517 (12–2,030) | 324,000 (193,000–470,000) | 167,000,000 (3,660,000–682,000,000) | 13,100 (1,300–57,600) | 8,750 (5,230–12,700) | 114,000,000 (9,700,000–522,000,000) | 282,000,000 (44,500,000–994,000,000) |
| <i>Pseudomonas</i> pneumonia | 1,710 (34–8,890) | 81 (21–153) | 138,000 (2,240–819,000) | 44,400 (1,300–192,000) | 2,980 (795–5,420) | 132,000,000 (2,750,000–640,000,000) | 132,000,000 (2,870,000–640,000,000) |
| <i>Pseudomonas</i> septicemia | 2,590 (161–11,800) | 9 (1–26) | 23,300 (228–169,000) | 62,900 (1,330–385,000) | 1,020 (131–2,540) | 64,000,000 (732,000–397,000,000) | 64,000,000 (742,000–397,000,000) |
| Salmonellosis, nontyphoidal | 1,520 (56–7,900) | 107 (8–372) | 165,000 (1,540–977,000) | 16,200 (1,360–74,100) | 661 (44–2,470) | 10,600,000 (173,000–59,100,000) | 10,700,000 (276,000–59,300,000) |
| Shiga toxin-producing <i>E. coli</i> infection, O157 | 1,570 (3–5,390)* | 5 (1–14) | 7,870 (15–37,300) | 24,800 (1,700–148,000) | 69 (7–250) | 1,720,000 (36,600–11,400,000) | 1,730,000 (43,500–11,400,000) |

| Disease | Treat-and-release ED visit | | | Hospitalization | | Total | |
|--|--|--|---|---|---|---|--|
| | Mean insurer payment per visit (95% CrI) | Annual number of commercial visits paid due to waterborne transmission (95% CrI) | Total insurer cost of treat-and-release ED visits because of waterborne disease (95% CrI) | Mean insurer payment per stay (95% CrI) | Total annual number of stays because of waterborne transmission (95% CrI) | Total insurer cost of hospitalizations for waterborne disease (95% CrI) | Total annual insurer cost for waterborne disease (95% CrI) |
| Shiga toxin-producing <i>E. coli</i> infection, non-O157 | 1,570 (3–5,390)* | 2 (0–06) | 2,650 (00–15,600) | 22,900 (1,140–95,700) | 19 (0–77) | 431,000 (00–2,990,000) | 433,000 (644–3,000,000) |
| Shigellosis | 1,960 (09–12,400) | 24 (2–115) | 46,600 (124–289,000) | 17,700 (1,220–84,100) | 113 (6–524) | 1,920,000 (31,100–12,100,000) | 1,960,000 (50,900–12,100,000) |
| <i>Vibrio</i> spp. infection | 1,280 (300–4,440) | 51 (10–112) | 65,300 (4,150–262,000) | 16,400 (399–49,200) | 110 (67–158) | 1,790,000 (37,300–6,290,000) | 1,860,000 (134,000–6,380,000) |
| Total cost | | | 172,000,000 (7,840,000–686,000,000) | | | 1,160,000,000 (268,000,000–4,210,000,000) | 1,330,000,000 (361,000,000–4,440,000,000) |

*For emergency department (ED) visits only, costs for STEC O157 and STEC non-O157 were combined and payer proportion was derived from all ED visits instead of treat-and-release visits because of small sample size.

Appendix 3 Table 2. Total annual cost to Medicare (sum of Medicare payments, in 2014 US dollars) of emergency department visits and hospitalizations from waterborne transmission of selected infections, 2014, United States

| Disease | Treat-and-release ED visit | | | Hospitalization | | | Total |
|--|--|--|--|---|---|---|--|
| | Mean insurer payment per visit (95% CrI) | Annual number of commercial visits paid because of waterborne transmission (95% CrI) | Total insurer cost of treat-and-release ED visits for waterborne disease (95% CrI) | Mean insurer payment per stay (95% CrI) | Total annual number of stays because of waterborne transmission (95% CrI) | Total insurer cost of hospitalizations for waterborne disease (95% CrI) | Total annual insurer cost for waterborne disease (95% CrI) |
| Campylobacteriosis | 1,190 (92–9,290) | 51 (5–155) | 60,500 (959–519,000) | 13,700 (404–57,400) | 842 (75–2,700) | 11,500,000 (154,000–61,000,000) | 11,500,000 (212,000–61,000,000) |
| Cryptosporidiosis | 4,110 (129–18,000) | 58 (20–113) | 238,000 (4,250–1,270,000) | 16,900 (00–155,000) | 339 (31–1,080) | 5,750,000 (9–39,400,000) | 5,990,000 (142,000–39,500,000) |
| Giardiasis | 1,040 (51–2,640) | 76 (25–150) | 78,800 (2,390–274,000) | 22,900 (388–118,000) | 341 (113–677) | 7,790,000 (186,000–38,600,000) | 7,870,000 (286,000–38,600,000) |
| Legionnaires' disease | 626 (135–2,160) | 43 (19–78) | 27,200 (3,160–131,000) | 32,800 (1,080–181,000) | 4,930 (3,330–5,980) | 162,000,000 (5,750,000–908,000,000) | 162,000,000 (5,770,000–908,000,000) |
| Nontuberculous mycobacterial (NTM) infection | 1,960 (47–10,000) | 2,800 (1,420–4,280) | 5,490,000 (81,200–33,400,000) | 26,800 (647–159,000) | 28,700 (15,000–41,400) | 771,000,000 (17,200,000–4,440,000,000) | 777,000,000 (19,500,000–4,440,000,000) |
| Otitis externa | 421 (34–2,500) | 43,600 (25,900–63,300) | 18,400,000 (1,330,000–111,000,000) | 13,500 (632–63,800) | 8,740 (5,230–12,700) | 118,000,000 (5,130,000–605,000,000) | 136,000,000 (13,700,000–644,000,000) |
| <i>Pseudomonas</i> pneumonia | 411 (54–1,970) | 166 (43–315) | 68,200 (4,490–393,000) | 26,500 (572–145,000) | 10,500 (2,790–19,000) | 278,000,000 (3,880,000–1,530,000,000) | 278,000,000 (3,940,000–1,530,000,000) |
| <i>Pseudomonas</i> septicemia | 213 (67–529) | 23 (1–68) | 4,920 (188–20,100) | 32,800 (768–179,000) | 4,000 (516–9,990) | 131,000,000 (1,410,000–783,000,000) | 131,000,000 (1,410,000–783,000,000) |
| Salmonellosis, nontyphoidal | 1,470 (79–8,960) | 24 (2–82) | 34,700 (391–257,000) | 17,100 (474–80,900) | 515 (34–1,920) | 8,870,000 (64,400–50,300,000) | 8,900,000 (84,500–50,300,000) |
| Shiga toxin-producing <i>E. coli</i> infection, O157 | 555 (84–1,510)* | 5 (1–14) | 2,790 (124–13,500) | 16,600 (291–88,200) | 42 (4–153) | 700,000 (866–4,320,000) | 702,000 (2,760–4,320,000) |
| Shiga toxin-producing <i>E. coli</i> infection, non-O157 | 555 (84–1,510)* | 2 (0–06) | 940 (0–5,710) | 33,200 (1,040–243,000) | 40 (0–167) | 1,320,000 (0–11,000,000) | 1,320,000 (274–11,000,000) |
| Shigellosis | 297 (139–570) | 3 (0–15) | 892 (49–3,900) | 10,200 (194–38,200) | 54 (3–252) | 546,000 (2,690–3,320,000) | 547,000 (3,380–3,320,000) |
| <i>Vibrio</i> spp. infection | 374 (269–479) | 8 (2–18) | 3,090 (528–7,690) | 21,600 (5,280–76,300) | 106 (65–153) | 2,290,000 (457,000–8,750,000) | 2,290,000 (461,000–8,750,000) |
| Total cost | | | 24,400,000 (2,710,000–121,000,000) | | | 1,500,000,000 (319,000,000–5,820,000,000) | 1,520,000,000 (338,000,000–5,840,000,000) |

*For emergency department (ED) visits only, costs for STEC O157 and STEC non-O157 were combined and payer proportion was derived from all ED visits instead of treat-and-release visits because of small sample size.

Appendix 3 Table 3. Total annual cost to Medicaid (sum of Medicaid payments, in 2014 US dollars) of emergency department visits and hospitalizations from waterborne transmission of selected infections, 2014, United States

| Disease | Treat-and-release ED visit | | | Hospitalization | | | Total |
|--|--|--|--|---|---|---|--|
| | Mean insurer payment per visit (95% CrI) | Annual number of commercial visits paid because of waterborne transmission (95% CrI) | Total insurer cost of treat-and-release ED visits for waterborne disease (95% CrI) | Mean insurer payment per stay (95% CrI) | Total annual number of stays because of waterborne transmission (95% CrI) | Total insurer cost of hospitalizations for waterborne disease (95% CrI) | Total annual insurer cost for waterborne disease (95% CrI) |
| Campylobacteriosis | 436 (13–1,480) | 77 (08–234) | 33,600 (383–170,000) | 5,710 (43–29,000) | 363 (32–1,160) | 2,050,000 (4,870–11,600,000) | 2,080,000 (16,100–11,700,000) |
| Cryptosporidiosis | 511 (1–3,420) | 124 (42–241) | 63,200 (161–405,000) | 10,700 (16–64,200) | 258 (24–817) | 2,730,000 (3,300–15,300,000) | 2,790,000 (29,200–15,400,000) |
| Giardiasis | 555 (1–2,000) | 126 (41–249) | 69,600 (146–278,000) | 14,300 (79–88,000) | 254 (84–506) | 3,630,000 (22,100–21,500,000) | 3,700,000 (75,900–21,600,000) |
| Legionnaires' disease | * | 111 (48–199) | 65,600 (16,600–174,000) | 18,600 (17–99,300) | 1,260 (846–1,520) | 23,300,000 (21,000–130,000,000) | 23,400,000 (78,600–130,000,000) |
| Nontuberculous mycobacterial (NTM) infection | 699 (4–3,130) | 807 (407–1,230) | 565,000 (3,520–2,490,000) | 14,900 (45–70,300) | 9,250 (4,830–13,300) | 138,000,000 (361,000–687,000,000) | 138,000,000 (811,000–689,000,000) |
| Otitis externa | 194 (24–545) | 200,000 (119,000–290,000) | 38,700,000 (4,440,000–115,000,000) | 6,530 (25–36,900) | 5,740 (3,430–8,310) | 37,400,000 (143,000–203,000,000) | 76,200,000 (11,400,000–270,000,000) |
| <i>Pseudomonas</i> pneumonia | 301 (20–1,710) | 44 (11–84) | 13,300 (556–77,400) | 11,500 (18–53,500) | 2,020 (540–3,680) | 23,200,000 (26,800–115,000,000) | 23,200,000 (40,200–115,000,000) |
| <i>Pseudomonas</i> septicemia | 535 (51–2,470) | 4 (0–12) | 2,210 (25–17,100) | 19,600 (46–113,000) | 576 (74–1,440) | 11,300,000 (12,900–72,200,000) | 11,300,000 (14,300–72,200,000) |
| Salmonellosis, nontyphoidal | 415 (17–2,090) | 63 (5–218) | 26,100 (302–173,000) | 6,820 (32–26,300) | 340 (23–1,270) | 2,360,000 (4,580–13,500,000) | 2,380,000 (13,300–13,500,000) |
| Shiga toxin-producing <i>E. coli</i> infection, O157 | 165 (10–672) † | 2 (0–6) | 368 (8–2,110) | 4,270 (03–30,200) | 27 (3–100) | 116,000 (46–773,000) | 116,000 (210–774,000) |
| Shiga toxin-producing <i>E. coli</i> infection, non-O157 | 165 (10–672) † | 1 (0–3) | 125 (0–832) | 4,660 (41–32,000) | 16 (0–64) | 73,200 (0–524,000) | 73,300 (28–524,000) |
| Shigellosis | 294 (15–1,480) | 37 (3–181) | 10,900 (221–57,400) | 7,620 (37–51,300) | 78 (4–362) | 611,000 (1,370–3,510,000) | 622,000 (7,360–3,520,000) |
| <i>Vibrio</i> spp. infection | 260 (30–1,010) | 16 (3–36) | 4,230 (361–15,400) | 4,600 (13–46,000) | 35 (22–51) | 162,000 (445–1,350,000) | 167,000 (1,550–1,360,000) |
| Total cost | | | 39,600,000 (5,200,000–116,000,000) | | | 245,000,000 (35,100,000–860,000,000) | 284,000,000 (62,700,000–906,000,000) |

*N<5, costs not reported.

†For emergency department (ED) visits only, costs for STEC O157 and STEC non-O157 were combined and payer proportion was derived from all ED visits instead of treat-and-release visits because of small sample size.

Appendix 3 Table 4. Total annual cost (in 2014 US dollars) of emergency department visits and hospitalizations from all transmission routes of selected diseases, 2014, United States

| Disease or syndrome | Treat-and-release ED visit | | | Hospitalization | | Total | |
|---|----------------------------|---|---|-------------------------|---|--|--|
| | Cost per visit (95% CrI) | Total annual number of treat-and-release ED visits because of all transmission routes (95% CrI) | Total cost of treat-and-release ED visits for selected diseases (95% CrI) | Cost per stay (95% CrI) | Total annual number of stays because of all transmission routes (95% CrI) | Total cost of hospitalizations for selected diseases (95% CrI) | Total annual direct healthcare cost of selected diseases (95% CrI) |
| Campylobacteriosis | 1,710 (137–5,810) | 2900 (1620–4630) | 4,950,000 (398,000–18,700,000) | 13,600 (3,850–35,800) | 19,300 (8790–34,900) | 261,000,000 (56,800,000–790,000,000) | 266,000,000 (61,500,000–794,000,000) |
| Cryptosporidiosis | 1,960 (238–6,270) | 1260 (742–1880) | 2,460,000 (257,000–8,150,000) | 16,100 (4,360–55,400) | 2,860 (439–8,060) | 45,900,000 (3,710,000–195,000,000) | 48,400,000 (5,670,000–197,000,000) |
| Giardiasis | 1,620 (196–7,510) | 1460 (902–2,090) | 2,360,000 (284,000–9,880,000) | 21,800 (6,160–99,200) | 2,830 (1760–4,070) | 61,800,000 (14,300,000–265,000,000) | 64,200,000 (16,200,000–267,000,000) |
| Legionnaires' disease | 691 (288–1,390) | 691 (316–1,220) | 477,000 (137,000–1,160,000) | 37,100 (7,950–149,000) | 11,200 (8,750–13,300) | 416,000,000 (84,800,000–1,740,000,000) | 416,000,000 (85,400,000–1,740,000,000) |
| Nontuberculous mycobacterial (NTM) infection | 1,610 (129–6,430) | 7,150 (5110–9,620) | 11,500,000 (892,000–46,100,000) | 29,600 (6,350–120,000) | 72,400 (57,300–89,700) | 2,140,000,000 (436,000,000–8,720,000,000) | 2,160,000,000 (448,000,000–8,730,000,000) |
| Norovirus* | 1,140 | 429,000 | 491,000,000 | 6,080 | 78,100 | 475,000,000 | 966,000,000 |
| Otitis externa | 494 (120–1,430) | 726,000 (466,000–994,000) | 358,000,000 (79,600,000–1,070,000,000) | 12,200 (3,320–42,400) | 29,700 (19,200–40,600) | 365,000,000 (89,900,000–1,330,000,000) | 723,000,000 (250,000,000–1,990,000,000) |
| <i>Pseudomonas</i> pneumonia | 856 (89–4,190) | 580 (321–902) | 496,000 (45,500–2,440,000) | 29,300 (5,910–114,000) | 30,800 (18,700–44,700) | 901,000,000 (164,000,000–3,710,000,000) | 901,000,000 (165,000,000–3,710,000,000) |
| <i>Pseudomonas</i> septicemia | 923 (95–3,190) | 164 (36–326) | 151,000 (9140–731,000) | 38,200 (6,340–172,000) | 25,300 (16300–34,800) | 968,000,000 (149,000,000–4,240,000,000) | 968,000,000 (149,000,000–4,240,000,000) |
| Salmonellosis, nontyphoidal | 1,230 (161–4,500) | 3400 (2100–4900) | 4,200,000 (510,000–16,000,000) | 14,900 (4,300–46,900) | 26,600 (11400–52,800) | 395,000,000 (79,500,000–1,410,000,000) | 400,000,000 (83,300,000–1,420,000,000) |
| Shiga toxin-producing <i>E. coli</i> infection, O157† | 1,070 (109–2,350) | 252 (92–465) | 269,000 (16600–794,000) | 19,000 (3,790–85,000) | 2640 (487–7630) | 50,400,000 (4,270,000–244,000,000) | 50,700,000 (4,530,000–244,000,000) |
| Shiga toxin-producing <i>E. coli</i> infection, non-O157† | 1,070 (109–2,350) | 75 (12–171) | 79,600 (3090–274,000) | 24,200 (4,780–138,000) | 1420 (264–3810) | 34,500,000 (2490000–223,000,000) | 34,600,000 (2,570,000–223,000,000) |
| Shigellosis | 952 (115–3,980) | 1650 (540–2860) | 1,570,000 (123,000–7,420,000) | 14,200 (4,130–48,000) | 6380 (929–20,300) | 90,700,000 (8,170,000–398,000,000) | 92,300,000 (9,280,000–400,000,000) |
| <i>Vibrio</i> spp. infection | 1,030 (293–3,330) | 366 (122–700) | 376,000 (53,700–1,270,000) | 16,000 (3,780–39,900) | 782 (567–1030) | 12,500,000 (2,620,000–32,300,000) | 12,900,000 (3,010,000–32,800,000) |
| Total cost | | | 878,000,000 (596,000,000–1,590,000,000) | | | 6,220,000,000 (2,980,000,000–15,400,000,000) | 7,100,000,000 (3,770,000,000–16,300,000,000) |

*For norovirus only, costs were derived from previously published estimates that did not include uncertainty intervals. In addition, the number of emergency department visits includes visits in which the patient was admitted to the hospital.

†For emergency department (ED) visits only, costs for STEC O157 and STEC non-O157 were combined and payer proportion was derived from all ED visits instead of treat-and-release visits because of small sample size.