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## Children and Foodborne Illness

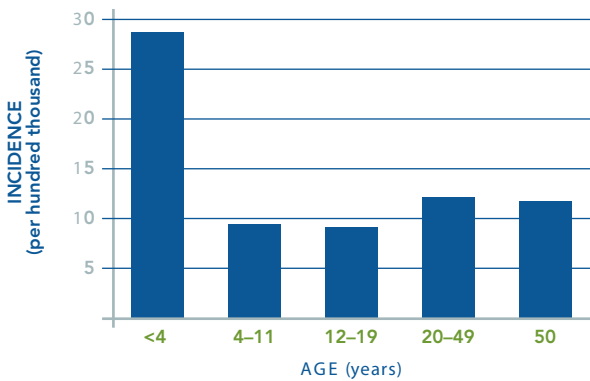
Children are disproportionately affected by foodborne illness, a serious public health problem. Approximately half of the reported foodborne illnesses\* occur in children, with the majority of these cases occurring in children under 15 years of age.<sup>1</sup> These diseases can lead to short- and long-term health consequences and, sometimes, can result in death. Every year, the Centers for Disease Control and Prevention (CDC) estimates that tens of millions of Americans fall ill, hundreds of thousands are hospitalized, and thousands die from foodborne illnesses.<sup>2</sup>

### Children are at high risk for foodborne illness for many reasons:<sup>3</sup>

- Still-developing immune systems, impeding their ability to fight infection;
- Lower body weight, reducing the dose of a pathogen needed to sicken them;
- Limited control over their diet and related food safety risks; and
- Reduced stomach acid production, decreasing their capacity to kill harmful bacteria.<sup>4</sup>

Recent CDC data reveals that the incidence of many foodborne infections has not changed significantly in recent years.<sup>5</sup> The pathogens listed below are those that disproportionately affect children and can be largely attributed to foodborne sources.

Incidence of Campylobacter Infections by Age, 2008



Source: CDC. Preliminary FoodNet Data, 2008. See also Roberts et al. The Long-Term Health Outcomes of Selected Foodborne Pathogens, 2009.\*\*\*\*

### Campylobacter<sup>6</sup>

- Children\*\* are disproportionately affected. The incidence of Campylobacter infection is 28.54 per 100,000 persons under four years of age, more than twice the Healthy People 2010 objective\*\*\* (12.30 per 100,000 persons).<sup>7,8</sup>
- Possible foodborne sources: raw or undercooked poultry; other foods cross-contaminated by these items; unpasteurized milk; contaminated water.
- Possible short-term effects: diarrhea (sometimes bloody); cramping; abdominal pain; urinary tract infections; fever; meningitis; infection in bloodstream; death.
- Possible long-term effects: Guillain-Barré syndrome; reactive arthritis (ReA); chronic arthritis.

\* CDC's 2008 Preliminary FoodNet data serves as the basis for incidence rates included throughout this document. CDC's FoodNet surveillance population was approximately 45.9 million persons in 2008 [15% of the U.S. population]. It was generally racially and ethnically representative of the entire U.S. population, with only a slight under-representation of Hispanics. Ten states, including Connecticut, Georgia, Maryland, Minnesota, New Mexico, Oregon, Tennessee, and selected counties in California, Colorado, and New York participate in FoodNet. (<http://www.cdc.gov/foodnet/news/2009/Summer2009FoodNetNews.pdf>) Although the FoodNet population is similar demographically to the U.S. population, the findings might not be generalizable. (<http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5813a2.htm>)

\*\* Children comprise infants and toddlers (ages 0-3), children (ages 4-11), and adolescents (ages 12-19). ([www.cdc.gov/osi/goals/people/index.html](http://www.cdc.gov/osi/goals/people/index.html))

\*\*\* Healthy People 2010 provides a framework for disease prevention for the Nation. It is a statement of national health objectives designed to identify the most significant preventable threats to health and to establish national goals to reduce these threats. ([www.healthypeople.gov](http://www.healthypeople.gov)) Although Healthy People 2010 foodborne illness objectives are not specifically targeted to children, they are the generally accepted national targets for reducing foodborne illness.

\*\*\*\* Roberts, T., B. Kowalczyk, P. Buck, M. Blaser, J. Frenkel, B. Lorber, J. Smith, P. Tarr. *The Long-Term Health Outcomes of Selected Foodborne Pathogens*. Center for Foodborne Illness Research & Prevention. November 12, 2009.

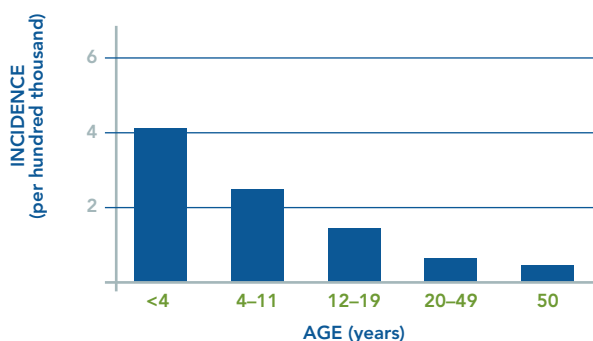
### *E. coli* O157:H7<sup>9</sup>

- Children are disproportionately affected.
  - The incidence of *E. coli* O157:H7 infection is 4.24 per 100,000 persons under four years of age, more than four times the Healthy People 2010 objective (1.00 per 100,000 persons).
  - The incidence of *E. coli* O157:H7 infection is 2.57 per 100,000 persons between four and eleven years of age, more than two and a half times the Healthy People 2010 objective (1.00 per 100,000 persons).<sup>10,11</sup>
- Possible foodborne sources: food items contaminated with animal feces, or other foods cross-contaminated by these items; contaminated water. Common foods associated with *E. coli*

O157:H7 infection include ground beef and other meats; green leafy vegetables; unpasteurized juices; unpasteurized (raw) milk and soft cheeses made from raw milk.

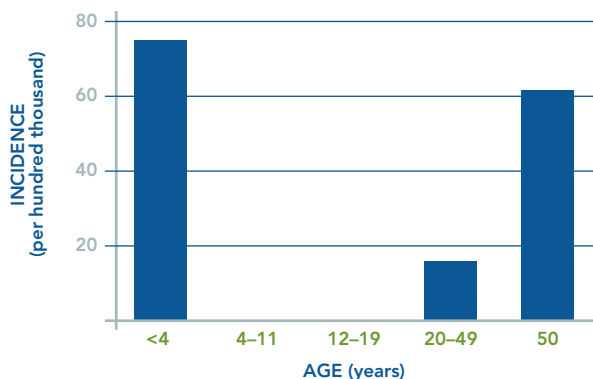
- Possible short-term effects: severe stomach cramps; diarrhea (often bloody); vomiting; hospitalization; hemolytic uremic syndrome (HUS); death.
  - While HUS is rare in adults, it occurs in about 15% of children with positive *E. coli* O157:H7 test results.<sup>12</sup>
- Possible long-term effects: kidney failure; chronic kidney problems; diabetes; hypertension; gallstones; irritable bowel syndrome; strictures; neurological disorders.<sup>13</sup>

Incidence of *E. coli* O157:H7 Infections by Age, 2008



Source: CDC. Preliminary FoodNet Data, 2008. See also Roberts et al. *The Long-Term Health Outcomes of Selected Foodborne Pathogens*, 2009.\*\*\*\*

Incidence of *Listeria monocytogenes* Infections by Age, 2008



Source: CDC. Preliminary FoodNet Data, 2008. See also Roberts et al. *The Long-Term Health Outcomes of Selected Foodborne Pathogens*, 2009.\*\*\*\*

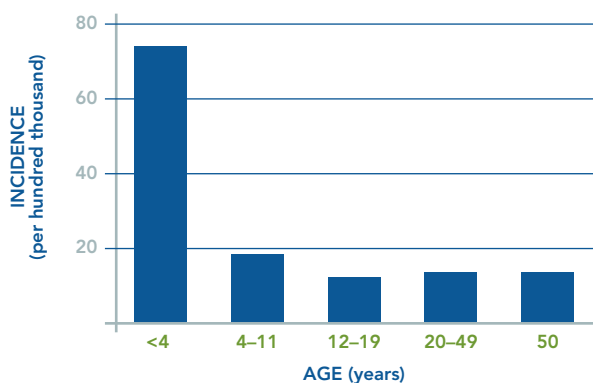
### *Listeria monocytogenes* (Lm)<sup>14</sup>

- Children under four years of age are disproportionately affected. The incidence of *Lm* infections is 0.76 per 100,000 persons under four years of age, more than three times the Healthy People 2010 objective (0.24 per 100,000 persons).<sup>15,16</sup>
- About one third of all cases of *Lm* infections involve pregnant women.<sup>17</sup>
- Possible foodborne sources: vegetables grown in contaminated soil or fertilizer; contaminated meat or poultry products. Common foods associated with *Lm* infection include uncooked meats and vegetables; cold cuts; hot dogs; smoked seafood; raw milk; soft cheeses made from raw milk.<sup>18</sup>
- Possible short-term effects: fever; muscle aches; nausea; diarrhea. If infection spreads to the nervous system, headaches; stiff neck; confusion; loss of balance; convulsions/seizures; death.
- Infections during pregnancy can lead to miscarriage or stillbirth, premature delivery, or infection/death of the newborn.
- Possible long-term effects: neurological dysfunctions or an impaired ability to see, hear, swallow or speak.

### Salmonella<sup>19</sup>

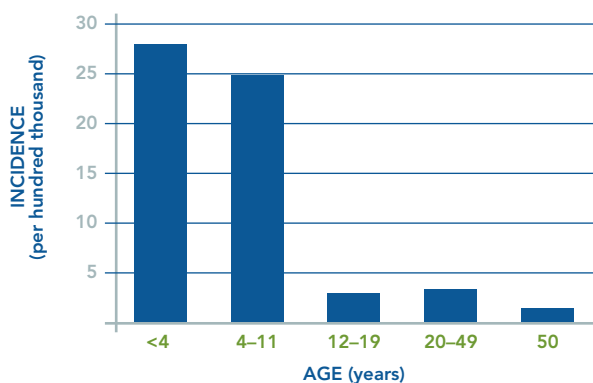
- Children are disproportionately affected. The incidence of *Salmonella* infections is 74.65 per 100,000 persons under four years of age, more than eleven times the Healthy People 2010 objective (6.8 per 100,000 persons).<sup>20</sup>
- Possible foodborne sources: meat and plant-based foods contaminated with animal feces. Common foods associated with *Salmonella* infection include those of animal origin, such as beef, poultry, milk, and eggs; or from cross-contamination of other foods by these items.
- Possible short-term effects: diarrhea; fever; abdominal cramps; colitis; meningitis; blood infections; heart infections; death.

Incidence of *Salmonella* Infections by Age, 2008



Source: CDC. Preliminary FoodNet Data, 2008. See also Roberts et al. *The Long-Term Health Outcomes of Selected Foodborne Pathogens*, 2009.\*\*\*\*

Incidence of *Shigella* Infections by Age, 2008



Source: CDC. Preliminary FoodNet Data, 2008. See also Roberts et al. *The Long-Term Health Outcomes of Selected Foodborne Pathogens*, 2009.\*\*\*\*

- Possible long-term effects: reactive arthritis (ReA); chronic arthritis; eye irritation; painful urination.

### Shigella

- Children are disproportionately affected.<sup>21</sup>
  - The incidence of *Shigella* infections is 27.86 per 100,000 persons under four years of age.
  - The incidence of *Shigella* infections is 25.67 per 100,000 persons between four and eleven years of age.<sup>22</sup>
  - There are no national health objectives regarding *Shigella* infections.
- Possible foodborne sources: vegetables harvested in a field with sewage that contains *Shigella*; flies that breed in infected feces and contaminate food; drinking, swimming in, or playing with contaminated water.
- Possible short-term effects: diarrhea (often bloody); fever; stomach cramps; seizures in children less than 2 years old.
- Possible long-term effects: reactive arthritis (ReA); chronic arthritis; post-infectious arthritis; eye irritation; painful urination.

### *Toxoplasma gondii* (*T. gondii*)<sup>23</sup>

- The third leading cause of deaths from foodborne illness in the United States.<sup>24</sup>
- Approximately 50% of all reported cases are of foodborne origin.<sup>25</sup>
- Possible foodborne sources: undercooked, contaminated meat, especially pork, lamb, and venison; contaminated water.
- Possible short-term effects: flu-like symptoms; swollen lymph glands; muscle aches and pains; reduced vision; blurred vision; eye pain; redness of the eye; tearing. Possible miscarriage or stillbirth of fetus.
- Possible long-term effects: severe mental retardation; damage to the brain, eyes, or other organs.<sup>26</sup>

- Estimates for the number of newborns infected with *T. gondii* annually in the United States range between 400 to 4,000 cases, with the following consequences:<sup>27, 28, 29</sup>
  - Fetuses infected during the first trimester usually die and miscarriage results;
  - Fetuses infected during the second trimester may develop lesions in the eye or brain, and/or central nervous system disorders;
  - Fetuses infected in the third trimester usually survive, but may suffer residual infection in the brain and eyes.
- Pregnant women may have mild symptoms but once the acute infection begins, the *T. gondii* parasite may cross through the placenta and infect the fetus.
- FoodNet, the CDC's foodborne illness surveillance system, does not track this parasite, increasing the likelihood that it is grossly under-reported.

*This document was prepared by  
The Pew Health Group in collaboration  
with the Center for Foodborne Illness  
Research & Prevention.*

**Consumers can take steps to protect themselves from foodborne illness by cooking meat thoroughly, preventing cross-contamination, washing produce, purchasing pasteurized high-risk products and reporting any suspected foodborne illness to a local health department. However, national safeguards need to be modernized and strengthened to adequately prevent foodborne illness.**

<sup>1</sup> Centers for Disease Control and Prevention (CDC). Summary of notifiable diseases—United States, 2007. *MMWR*, July 9, 2009; 56(No. 53): 1-94. Accessed at <<http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5813a2.htm>> on November 2, 2009.

<sup>2</sup> Mead, P., L. Slutsker, V. Dietz et al. Food-related illness and death in the United States. *Emerg Infect Dis*, Sept-Oct 1999; 5(5):607-625. Accessed at <<http://www.cdc.gov/ncidod/eid/vol5no5/mead.htm>> on November 2, 2009.

<sup>3</sup> Buzby, J. C. Children and microbial foodborne illness. *Food Review*, 2001; 24(2):32-7.

<sup>4</sup> Haffee I. E. The epidemiology of rotavirus infections: a global perspective. *J Pediatr Gastroenterol Nutr*, 1995; 20:275-286.

<sup>5</sup> Centers for Disease Control and Prevention (CDC). Preliminary FoodNet data on the incidence of infection with pathogens transmitted commonly through food—10 States, 2008. *MMWR*, 2009; 58 (13):333-7. Accessed at <<http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5813a2.htm>> on November 2, 2009.

<sup>6</sup> Centers for Disease Control and Prevention (CDC). *Campylobacter*. 2008. Accessed at <[http://www.cdc.gov/nczved/dfbmd/disease\\_listing/campylobacter\\_gi.html](http://www.cdc.gov/nczved/dfbmd/disease_listing/campylobacter_gi.html)> on November 2, 2009.

<sup>7</sup> CDC. Preliminary FoodNet Data, 2008.

<sup>8</sup> U.S. Department of Health and Human Services. Healthy People 2010, Volume 1 (second edition), Part A: Focus Areas 1-14, "Food Safety." 2000. Accessed at <<http://healthypeople.gov/Publications/>> on November 2, 2009.

<sup>9</sup> Centers for Disease Control and Prevention (CDC). Questions & Answers: Sickness caused by *E. coli*. 2006. Accessed at <[http://www.cdc.gov/ecoli/qa\\_ecoli\\_sickness.htm](http://www.cdc.gov/ecoli/qa_ecoli_sickness.htm)> on November 2, 2009.

<sup>10</sup> CDC. Preliminary FoodNet Data, 2008.

<sup>11</sup> Healthy People 2010, 2000.

<sup>12</sup> Council for Agricultural Science and Technology (CAST). Foodborne pathogens: risks and consequences. CAST: Ames, IA, 1994.

<sup>13</sup> Chandler, W., S. Jelacic, D. Boster, et al. Prothrombotic coagulation abnormalities preceding the hemolytic-uremic syndrome. *N Engl J Med*. 346 (2002): 23-32.

<sup>14</sup> Centers for Disease Control and Prevention (CDC). *Listeriosis*. 2008. Accessed at <[http://www.cdc.gov/nczved/dfbmd/disease\\_listing/listeriosis\\_gi.html](http://www.cdc.gov/nczved/dfbmd/disease_listing/listeriosis_gi.html)> on November 2, 2009.

<sup>15</sup> CDC. Preliminary FoodNet Data, 2008.

<sup>16</sup> Healthy People 2010, 2000.

<sup>17</sup> CDC. *Listeriosis*, 2008.

<sup>18</sup> Department of Health and Human Services (DHHS), National Toxicology Program. *Listeria* and Food Poisoning. 2008. Accessed at <<http://cerhr.niehs.nih.gov/common/listeria.html#Sources>> on November 2, 2009.

<sup>19</sup> Centers for Disease Control and Prevention (CDC). *Salmonellosis*. 2009. Accessed at <<http://www.cdc.gov/salmonella/>> on November 2, 2009.

<sup>20</sup> CDC. Preliminary FoodNet Data, 2008.

<sup>21</sup> CDC. Preliminary FoodNet Data, 2008.

<sup>22</sup> Centers for Disease Control and Prevention

(CDC). *Shigella*. 2008. Accessed at <[http://www.cdc.gov/nczved/dfbmd/disease\\_listing/shigellosis\\_gi.html](http://www.cdc.gov/nczved/dfbmd/disease_listing/shigellosis_gi.html)> on November 2, 2009.

<sup>23</sup> Centers for Disease Control and Prevention (CDC). *Toxoplasmosis*. 2008. Accessed at <<http://www.cdc.gov/toxoplasmosis/>> on November 2, 2009.

<sup>24</sup> Lopez, A., V.J. Dietz, M. Wilson et al. Preventing congenital toxoplasmosis. *MMWR Recomm Rep*, Mar 31, 2000; 49(RR-2):59-68. Review.

<sup>25</sup> Mead et al., 1999.

<sup>26</sup> Roberts, T., J.K. Frenkel. Estimating income losses and other preventable costs caused by congenital toxoplasmosis in people in the United States. *J Am Vet Med Assoc*, Jan 15 1990; 196(2):249-56.

<sup>27</sup> Jones, J.L., D. Kruszon-Moran, K. Sanders-Lewis and M. Wilson. *Toxoplasma gondii* infection in the United States, 1999-2004, decline from the prior decade. *Am J Trop Med Hyg*, Sep, 2007; 77(3):405-10.

<sup>28</sup> Commodaro, A.G., R.N. Belfort, L.V. Rizzo et al. Ocular toxoplasmosis: an update and review of the literature. *Mem Inst Oswaldo Cru*, Mar 2009; 104(2):345-50.

<sup>29</sup> Frenkel, J.K. and L. Jacobs. Ocular toxoplasmosis; pathogenesis, diagnosis and treatment. *AMA Arch Ophthalmol*, Feb 1958; 59(2):260-79.