



# Young Children and Foodborne Illness

Each year, an estimated 1 in 6 Americans—48 million people—contracts a foodborne illness, resulting in 128,000 hospitalizations and 3,000 deaths.<sup>1</sup> Many pathogens commonly transmitted through food have a disproportionate impact on children younger than 5.<sup>2</sup> Some die from these preventable illnesses, and many others suffer lasting, even lifelong, health problems.

Children face higher risks when exposed to foodborne pathogens because their less-developed immune systems have a limited ability to fight infections. Also, their lower body weight reduces the amount of a pathogen needed to cause illness.<sup>3</sup>

## By the numbers: Young children and foodborne pathogens<sup>\*</sup>

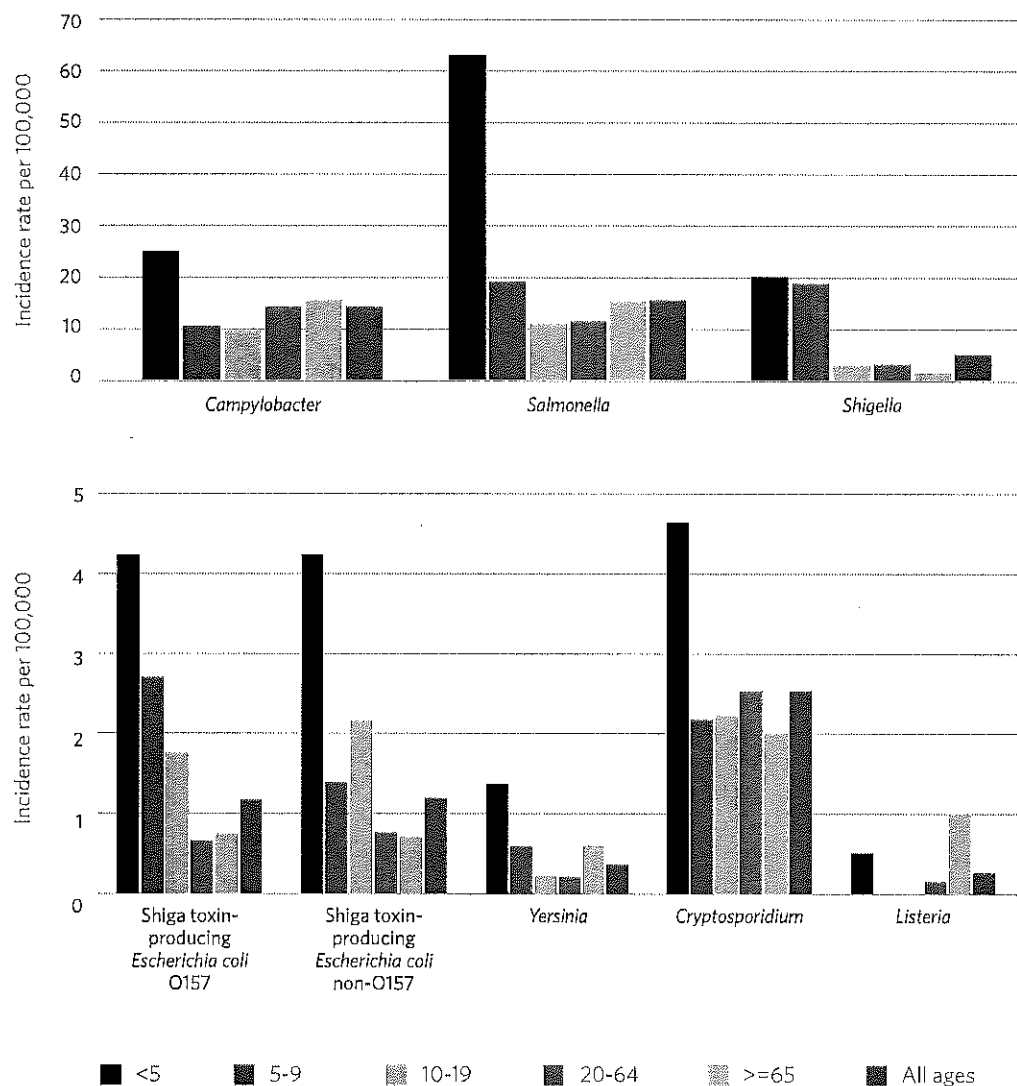
- Children under 5 experience higher rates of laboratory-confirmed infections from eight of the 10 major foodborne pathogens, both bacteria and parasites, tracked by the public health system.<sup>4</sup> (See Figure 1.)

<sup>\*</sup> The Foodborne Diseases Active Surveillance Network (FoodNet) collects and monitors information on laboratory-confirmed illnesses for about 48 million people, or about 15 percent of Americans. Because many illnesses are acquired from nonfood sources, the incidence rates do not reflect foodborne transmission exclusively. FoodNet data continue to provide the best measure of trends in foodborne disease in the United States.

Figure 1

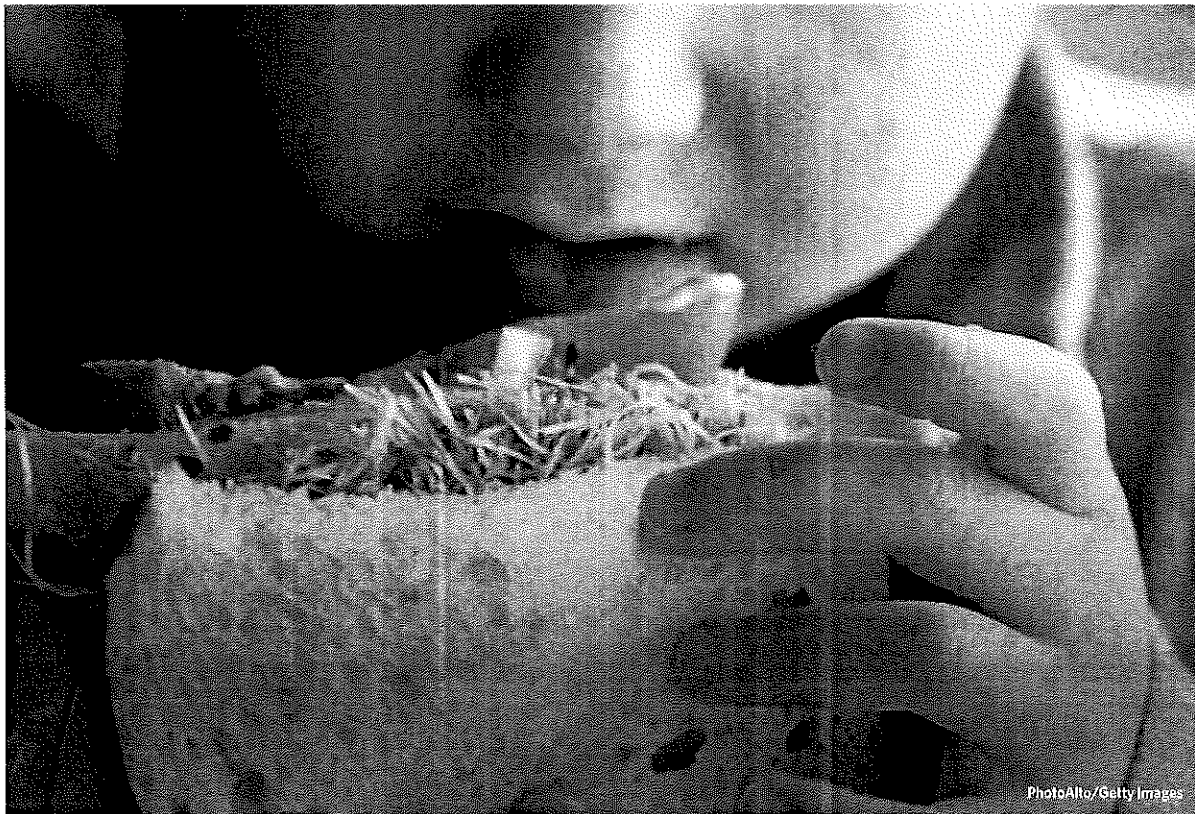
# Incidence of Culture-Confirmed Bacterial and Lab-Confirmed Parasitic Infections

By selected pathogen and age group, 2013



Source: Centers for Disease Control and Prevention Foodborne Diseases Active Surveillance Network, "Table 4b FoodNet-Incidence of Laboratory-Confirmed Infections by Age Group 2013," accessed June 23, 2014, <http://www.cdc.gov/foodnet/data/trends/tables/2013/table4a-b.html#table-4b>.

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Significant reductions in foodborne infections among young children are likely to be necessary to achieve the Healthy People 2020 objectives for several of its targeted pathogens.

- Even though young children are more likely than the general population to get a diagnosis of foodborne illness, the incidence of many pathogens remains higher for the young than for all other ages combined.<sup>5</sup> Significant reductions in foodborne infections among young children are likely to be necessary to achieve the Healthy People 2020 objectives for several of its targeted pathogens. (See Table 1.)
- A recent study by the U.S. Centers for Disease Control and Prevention looked at five foodborne pathogens and found that *Salmonella* was the leading cause of bacterial illnesses in children under 5, accounting for more than 40 percent of the estimated illnesses and doctor visits and approximately 60 percent of estimated hospitalizations and deaths.<sup>6</sup>

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\* Healthy People 2020 is an initiative of the U.S. Department of Health and Human Services. It is intended to support the agency's 10-year national objectives to improve the health of all Americans by encouraging collaborations across communities and sectors, empowering individuals to making informed health decisions, and measuring the impact of prevention activities. (Source: <http://www.healthypeople.gov/2020/default.aspx>, accessed Aug. 13, 2014.)

Table 1

## Incidence of Several Pathogens in Total Population Is Above Target Goals

Comparison of rates with Healthy People 2020 food safety objectives

Pathogen	Incidence rate per 100,000 people, all ages, 2013	Healthy People 2020 objective for all ages
<i>Campylobacter</i>	13.82	8.5
<i>Listeria monocytogenes</i>	0.26	0.2
<i>Salmonella enterica</i> (nontyphoidal)	15.18	11.4
Shiga toxin-producing <i>Escherichia coli</i> O157:H7	1.15	0.6
<i>Yersinia enterocolitica</i>	0.36	0.3

Sources: Centers for Disease Control and Prevention Foodborne Diseases Active Surveillance Network, "Table 2b FoodNet-Incidence of Laboratory-Confirmed Infections by Year 2013," accessed June 23, 2014, <http://www.cdc.gov/foodnet/data/trends/tables/2013/table2a-b.html#table-2b>; and U.S. Department of Health and Human Services, "Healthy People 2020," accessed June 23, 2014, <http://www.healthypeople.gov/2020/topicsobjectives2020/objectiveslist.aspx?topicid=14>.

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- *Listeria monocytogenes* infections pose an increased risk for pregnant women and newborns. Pregnant women are about 10 times more likely than the general population to get a *Listeria* infection; about 1 in 7 cases occur during pregnancy.<sup>7</sup> Illness can lead to miscarriage or stillbirth, premature delivery, or illness/death of the newborn.<sup>8</sup> Many other severe complications and long-term effects can result.<sup>9</sup>
- Norovirus infections are the leading cause of medically attended acute gastroenteritis among children under 5 in the United States. A recent study estimated that in 2009 and 2010 the average numbers of annual hospitalizations (more than 14,000), emergency department visits (more than 281,000), and outpatient visits (more than 627,000) due to norovirus infection among young children in the United States resulted in more than \$273 million in treatment costs each year.<sup>10</sup>

### Effects of foodborne illness

- Foodborne illness can lead to severe short- and long-term health consequences, including bloodstream infections, reactive arthritis, seizures, kidney disease, and even death. (See Table 2.) A recent study revealed that children with *Salmonella*-induced gastroenteritis are more likely than adults to develop irritable bowel syndrome later in life.<sup>11</sup>

Table 2

## Select Severe Acute Complications and Long-Term Consequences for 7 Major Foodborne Pathogens in the United States

Pathogen	Severe acute complications	Long-term consequences
<i>Campylobacter</i>	Sepsis, meningitis, carditis, endocarditis, hepatitis, cholecystitis, pancreatitis	Chronic diarrhea, Guillain-Barré syndrome, irritable bowel syndrome, dyspepsia, inflammatory bowel disease, reactive arthritis, renal diseases
<i>Escherichia coli</i> O157:H7	Hemolytic uremic syndrome, renal failure, coma, seizures	Kidney dysfunction, hypertension, cardiovascular disease, stroke, endothelial injury, pancreatitis, diabetes, splenic abscesses, gallstones, seizures, hemiplegia, cortical blindness, psychomotor retardation, irritable bowel syndrome, dyspepsia, reactive arthritis
<i>Listeria monocytogenes</i>	Preterm birth, encephalitis, meningitis, seizures, bacteremia, sepsis, endocarditis, pulmonary infection, septic arthritis	Cerebral palsy, epilepsy, vision and hearing loss, cognitive and attention deficits, chronic lung disease
Norovirus		Irritable bowel syndrome
<i>Salmonella enterica</i> (nontyphoidal)	Bacteremia, sepsis, meningitis, septic arthritis, spondylitis, cholangitis, pneumonia, septic metastases, arterial infection, aortitis, aortic aneurysm, endocarditis, osteomyelitis and bone sequelae, splenic abscesses, pancreatitis, hemolytic uremic syndrome, renal failure, coma, seizures	Chronic diarrhea, irritable bowel syndrome, dyspepsia, inflammatory bowel disease, reactive arthritis
<i>Shigella</i>	Intestinal perforation, toxic megacolon, bacteremia, sepsis, hemolytic uremic syndrome, renal failure, coma, seizures	Kidney dysfunction, hypertension, cardiovascular disease, endothelial injury, pancreatitis, diabetes, splenic abscesses, gallstones, coma, seizures, hemiplegia, cortical blindness, psychomotor retardation, irritable bowel syndrome, dyspepsia, inflammatory bowel disease, reactive arthritis
<i>Yersinia enterocolitica</i>	Intestinal perforation; intussusception; toxic megacolon; mesenteric vein thrombosis; osteomyelitis; sinusitis; pneumonia; empyema; bacteremia; sepsis; endocarditis; meningitis; abscesses in kidney, lung, liver, or spleen	Chronic diarrhea, Graves' disease (autoimmune thyroid disease); reactive arthritis

Note: Not all of the included consequences are applicable to children under 5.

Source: This table was adapted from Michael Batz et al., "Long-Term Consequences of Foodborne Infections," *Infectious Disease Clinics North America* 27 (2013): 599-616.

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### Consumer Resources

To learn about steps that individuals can take to minimize the risk of contracting a foodborne illness, please see:

**"Food Safety and Vulnerable Populations"**

From the Center for Foodborne Illness Research and Prevention

**"Food-Borne Illnesses Prevention"**

From the American Academy of Pediatrics

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### Policy Recommendations

Infants and young children, pregnant women, older adults, and people with weakened immune systems are at highest risk for serious foodborne illnesses. Therefore:

- When setting food safety standards, policymakers and regulators should consider the greater impact of these illnesses on at-risk populations.
- Congress must ensure that the Food and Drug Administration receives adequate resources to fully implement the FDA Food Safety Modernization Act, which includes new requirements that food producers must adopt to reduce the incidence and spread of foodborne diseases.

Learn more at [www.pewtrusts.org/foodsafety](http://www.pewtrusts.org/foodsafety).

## Endnotes

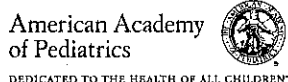
- 1 Elaine Scallan et al., "Foodborne illness acquired in the United States—major pathogens," *Emerging Infectious Diseases* 17 (2011): 7-15 and 16-22, [http://wwwnc.cdc.gov/eid/article/17/1/p1-1101\\_article](http://wwwnc.cdc.gov/eid/article/17/1/p1-1101_article).
- 2 Elaine Scallan et al., "Estimates of Illnesses, Hospitalizations and Deaths Caused by Major Bacterial Enteric Pathogens in Young Children in the United States," *The Pediatric Infectious Disease Journal* 32 (2013):217-221; and Kathleen M. Koehler, et al., "Population-Based Incidence of Infection With Selected Bacterial Enteric Pathogens in Children Younger Than Five Years of Age 1996-1998," *The Pediatric Infectious Disease Journal* 25 (2006):129-134.
- 3 Charles P. Gerba et al., "Sensitive Populations: Who Is at the Greatest Risk?" *International Journal of Food Microbiology* 30 (1996):113-123; Mitchell B. Cohen, "Etiology and Mechanisms of Acute Infectious Diarrhea in Infants in the United States," *Journal of Pediatrics* 118 (1991):S34-S39; and Barbara M. Lund and Sarah J. O'Brien, "The Occurrence and Prevention of Foodborne Disease in Vulnerable People," *Foodborne Pathogens and Diseases* 8 (2011):961-973.
- 4 Centers for Disease Control and Prevention, "Incidence and Trends of Infection with Pathogens Transmitted Commonly Through Food: Foodborne Diseases Active Surveillance Network, 10 U.S. Sites, 1996-2012," *Morbidity and Mortality Weekly Report*, April 2013; 62(15):283-287.
- 5 Scallan et al., "Estimates of Illnesses, Hospitalizations and Deaths."
- 6 Ibid.
- 7 Centers for Disease Control and Prevention, "Listeria (Listeriosis)," accessed June 23, 2014, <http://www.cdc.gov/listeria/risk.html>.
- 8 American Academy of Pediatrics, "Listeria monocytogenes Infections (Listeriosis)," *Red Book: 2012 Report of the Committee on Infectious Diseases, 29th Edition*, (Elk Grove Village, IL: American Academy of Pediatrics, 2012).
- 9 Michael Batz et al., "Long-Term Consequences of Foodborne Infections," *Infectious Diseases Clinics North America* 27 (2013): 599-616.
- 10 Daniel C. Payne et al., "Norovirus and Medically Attended Gastroenteritis in U.S. Children," *New England Journal of Medicine* 368 (2013):1121-1130.
- 11 Cesare Cremon et al., "Salmonellosis Gastroenteritis During Childhood Is a Risk Factor for Irritable Bowel Syndrome in Adulthood," *Gastroenterology* 147 (2014): 69-77.

## For further information, please visit:

[pewtrusts.org](http://pewtrusts.org)

[aap.org](http://aap.org)

[foodborneillness.org](http://foodborneillness.org)



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