

# PROFILES OF SELECTED NOTIFIABLE DISEASES

## CHOLERA

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<i>Number of cases in 2007:</i>	<i>1</i>	<i>Rate in 2007:</i>	<i>0.0</i>
<i>Number of cases in 2006:</i>	<i>0</i>	<i>Rate in 2006:</i>	<i>0.0</i>

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\* Rates are based on U.S. Census midpoint estimates for each year and are per 100,000 population.

Cholera is caused by a Gram-negative, rod-shaped bacterium, *Vibrio cholerae* serogroup O1 or O139, which produces potent toxins. These toxins cause acute, violent diarrhea and dehydration that can lead to death within two to three hours if untreated. Cholera is acquired from ingestion of food or water contaminated with toxigenic *V. cholerae*. The organism can be found in humans, coastal waters, fish and shellfish. Cholera occurs worldwide, but is rare in the United States. Most cases of cholera in the United States are attributed to travel to endemic areas or the consumption of raw/undercooked seafood.<sup>1</sup>

The single case of cholera that occurred in 2007 was the first case reported in Ohio since 1993. The causative agent was characterized as *V. cholerae* serogroup O1, biotype El Tor, serotype Ogawa. This case acquired cholera while in Pakistan.

## CRYPTOSPORIDIOSIS

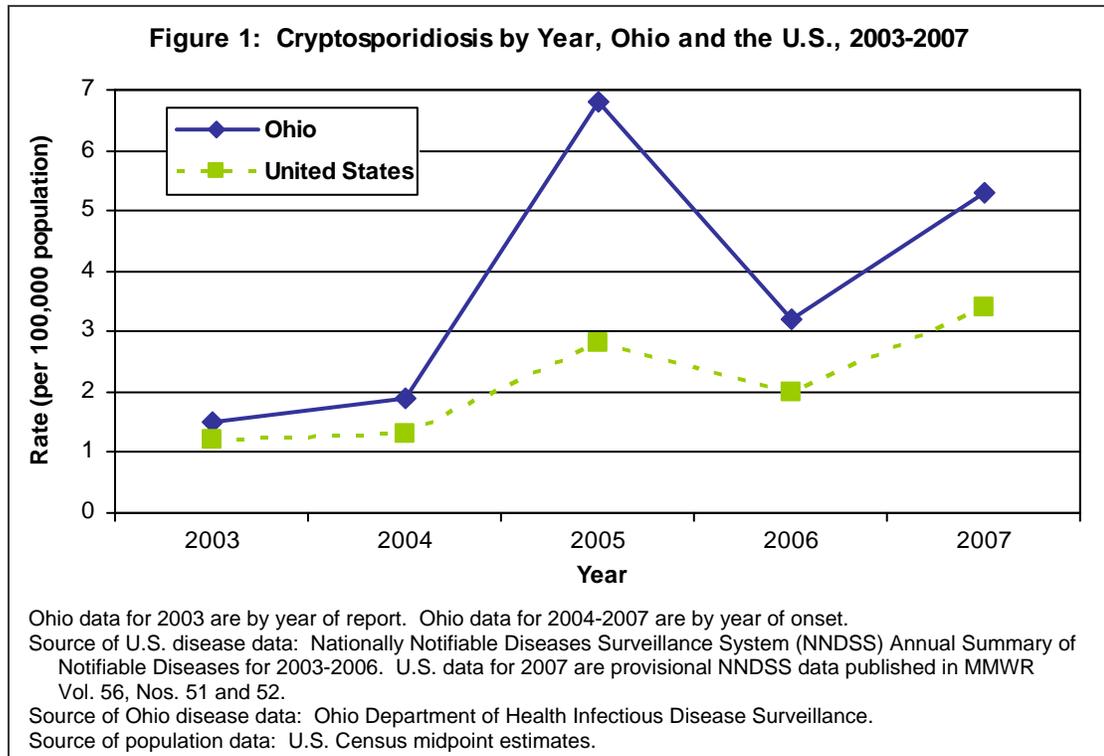
Number of cases in 2007:	611	Rate in 2007:	5.3
Number of cases in 2006:	366	Rate in 2006:	3.2

\* Rates are based on U.S. Census midpoint estimates for each year and are per 100,000 population.

Cryptosporidiosis is a diarrheal disease caused by microscopic parasites of the genus *Cryptosporidium*: *Cryptosporidium parvum*, *Cryptosporidium hominis*, *Cryptosporidium meleagridis*, *Cryptosporidium muris*, *Cryptosporidium felis* and *Cryptosporidium canis*.<sup>2</sup> Cryptosporidiosis is characterized by watery diarrhea, abdominal cramps, low-grade fever, weight loss, dehydration, loss of appetite, nausea and vomiting.<sup>3</sup> The parasite is transmitted via the fecal-oral route; a person becomes infected by swallowing the parasite. *Cryptosporidium* is shed in the stool from an infected person or animal. As a result, *Cryptosporidium* is found in water, soil, food or other surfaces contaminated with infected feces.

Over the past two decades, cryptosporidiosis has become known as one of the most widespread causes of waterborne disease in humans in the United States.<sup>4</sup> In 2005, southwest Ohio experienced a multi-county outbreak of cryptosporidiosis at a community swimming pool. This outbreak involved residents in Brown, Butler, Clermont, Clinton, Hamilton, Highland and Warren counties.

As seen in Figure 1, the incidence of cryptosporidiosis in Ohio and in the United States has increased over the past five years. Ohio's rate was above the national rate for cryptosporidiosis infection for the five years compared.



## ENTEROHEMORRHAGIC *ESCHERICHIA COLI*

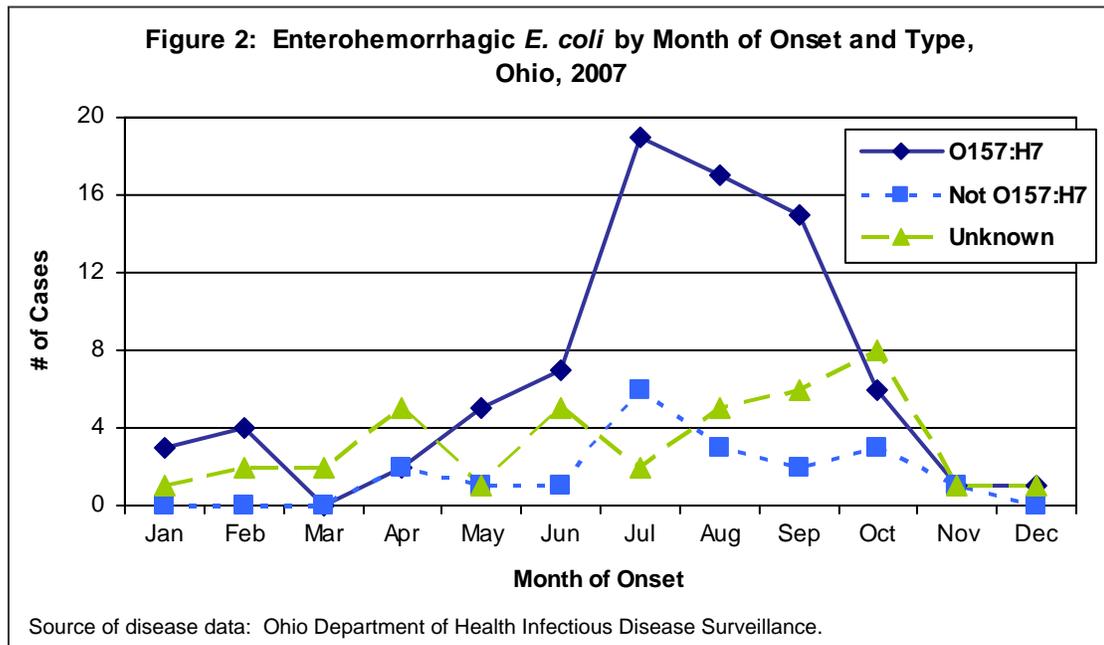
Number of cases in 2007:	138	Rate in 2007:	1.2
Number of cases in 2006:	211	Rate in 2006:	1.8

\* Rates are based on U.S. Census midpoint estimates for each year and are per 100,000 population.

This infection is caused by *Escherichia coli*, a Gram-negative, rod-shaped bacterium that produces shiga toxins. It is also known as shiga toxin-producing *E. coli*. Persons infected with enterohemorrhagic *E. coli* usually experience mild to severe diarrhea without fever. Humans and cattle are the primary sources for shiga toxin-producing *E. coli*, and disease is mainly transmitted by water and food contaminated with human or animal waste.<sup>5</sup> Enterohemorrhagic *E. coli* occurs worldwide, but is mostly recognized in developed countries.<sup>6</sup> More cases occur during the summer months and among children.<sup>5</sup>

In Ohio, enterohemorrhagic *E. coli* infections are characterized as one of three reportable conditions: *E. coli* O157:H7, *E. coli* not O157:H7 and *E. coli* of an unknown serotype. Infections caused by *E. coli* O157:H7 or *E. coli* O157:Non-motile (unflagellated) are classified as enterohemorrhagic *E. coli* O157:H7. Infections caused by shiga toxin-producing *E. coli* bacteria of a known serotype other than O157:H7 or O157:Non-motile are reported as enterohemorrhagic *E. coli* not O157:H7. Shiga toxin-producing *E. coli* bacteria that are isolated but not serotyped are reported as enterohemorrhagic *E. coli* unknown serotype.

The majority of enterohemorrhagic *E. coli* infections in 2007 were caused by O157:H7 (Figure 2). However, shiga toxin-producing serotypes other than O157:H7 and unknown serotypes were also reported. Like previous years, cases of disease due to *E. coli* O157:H7 increased beginning in May, peaked July through September and declined the remainder of the year. Infections attributed to *E. coli* not O157:H7 followed this same seasonal pattern; however, incidence of *E. coli* unknown serotype infections peaked later, in October.



## HAEMOPHILUS INFLUENZAE, INVASIVE DISEASE

Number of cases in 2007:	114	Rate in 2007:	1.0
Number of cases in 2006:	93	Rate in 2006:	0.8

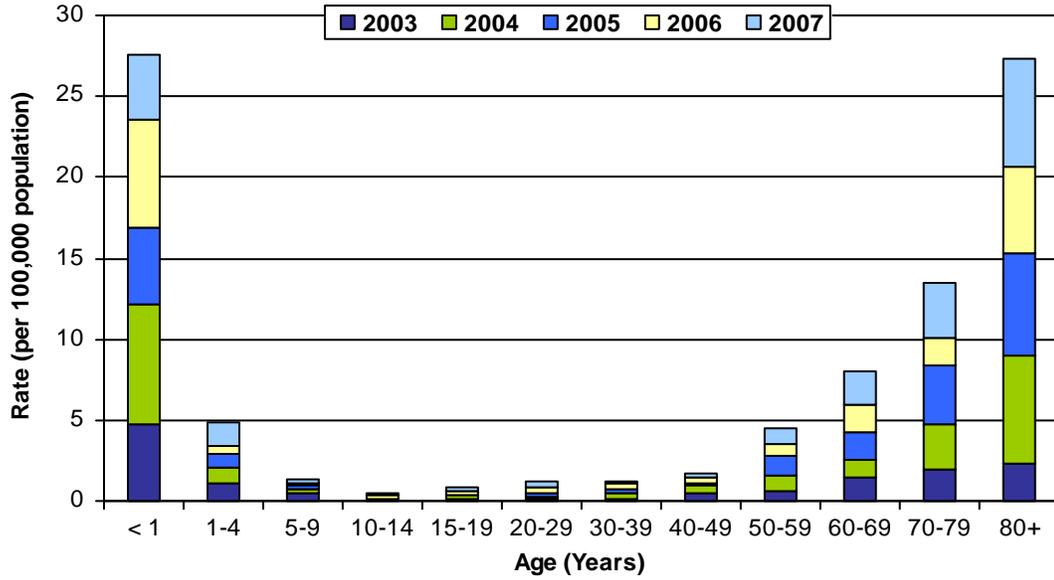
\* Rates are based on U.S. Census midpoint estimates for each year and are per 100,000 population.

*Haemophilus influenzae* (*H. influenzae*) is caused by a Gram-negative encapsulated coccobacillus bacterium that can cause a variety of infections and produce an assortment of clinical syndromes.<sup>7</sup> In Ohio, only invasive disease due to *H. influenzae* is reportable. Several types of invasive disease may be caused by *H. influenzae*, including meningitis, bacteremia, cellulitis, epiglottitis, osteomyelitis, pericarditis, pneumonia or septic arthritis. *H. influenzae* is spread from person to person by direct contact with respiratory secretions or through airborne respiratory droplets. *H. influenzae* can be part of the normal bacterial flora of the upper respiratory tract, and asymptomatic carriers are a source of infection.

Invasive disease due to *H. influenzae* is primarily a disease of the elderly, those with compromised immune systems and under-vaccinated or unvaccinated children. Few cases of invasive *H. influenzae* type b (Hib) are reported in Ohio each year since the introduction of the Hib vaccine in the United States in 1990. Infants are recommended to receive three primary doses of the Hib vaccine at 2, 4 and 6 months of age.<sup>8</sup> A booster dose is also recommended between 12-15 months of age.

The greatest burden of invasive disease from *H. influenzae* in Ohio from 2003-2007 occurred among children less than 1 year of age and adults 80 years of age and older (Figure 3). Although less than 4 percent (three of 78) of all cases among children less than 5 years of age were reported with invasive Hib during the five-year period, the true morbidity that may have been preventable through vaccination is unknown. Sixty-four percent (50 of 78) of cases reported among children less than 5 years of age 2003-2007 did not report a serotype (i.e., were blank or unknown). Storing isolates for further serotyping is strongly encouraged for this high-risk age group so the true burden of disease among the very young is better understood.

Figure 3: Invasive *Haemophilus influenzae* Disease, Ohio, 2003-2007



Data for 2003 are by year of report. Data for 2004-2007 are by year of onset.  
Source of disease data: Ohio Department of Health Infectious Disease Surveillance.  
Source of population data: 2000 U.S. Census.

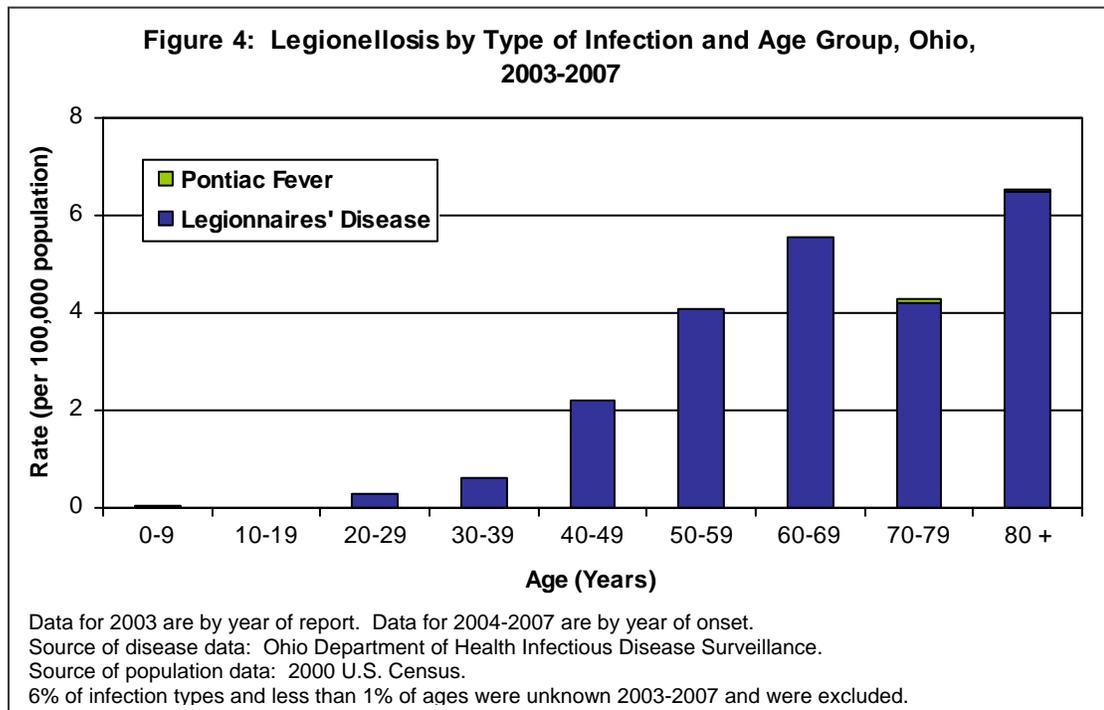
## LEGIONELLOSIS

Number of cases in 2007:	231	Rate in 2007:	2.0
Number of cases in 2006:	237	Rate in 2006:	2.1

\* Rates are based on U.S. Census midpoint estimates for each year and are per 100,000 population.

Legionellosis is a respiratory infection caused by *Legionella*, a Gram-negative, rod-shaped bacterium. Most infections are attributed to *Legionella pneumophila* serogroup 1, but any *Legionella* organism can cause disease. Two distinct illnesses are associated with legionellosis: Legionnaires' disease and Pontiac fever. Legionnaires' disease is characterized by fever, myalgia, cough and pneumonia. Pontiac fever is a milder respiratory illness without pneumonia. *Legionella* bacteria are ubiquitous in water and have been identified in ponds, lakes, creeks, cooling towers, air conditioners, hot and cold water taps, showers and hot tubs. Legionellosis is transmitted via the airborne route, mainly through inhalation of aerosolized water. Cases occur most frequently in the summer and fall. Persons at greatest risk for acquiring disease are over 50 years of age, smoke and are immunocompromised.<sup>9</sup>

As seen in Figure 4, nearly all cases of legionellosis reported in 2003-2007 were Legionnaires' disease (93 percent). The incidence of legionellosis increased with age and peaked in individuals 80 years and older. Few to no cases were reported in children, adolescents and young adults. The very few cases of Pontiac fever reported mostly occurred in 70-79-year-olds. More cases were reported with an unknown type of infection as age increased; however, only 6 percent of cases were reported with an unknown type of infection over the past five years.



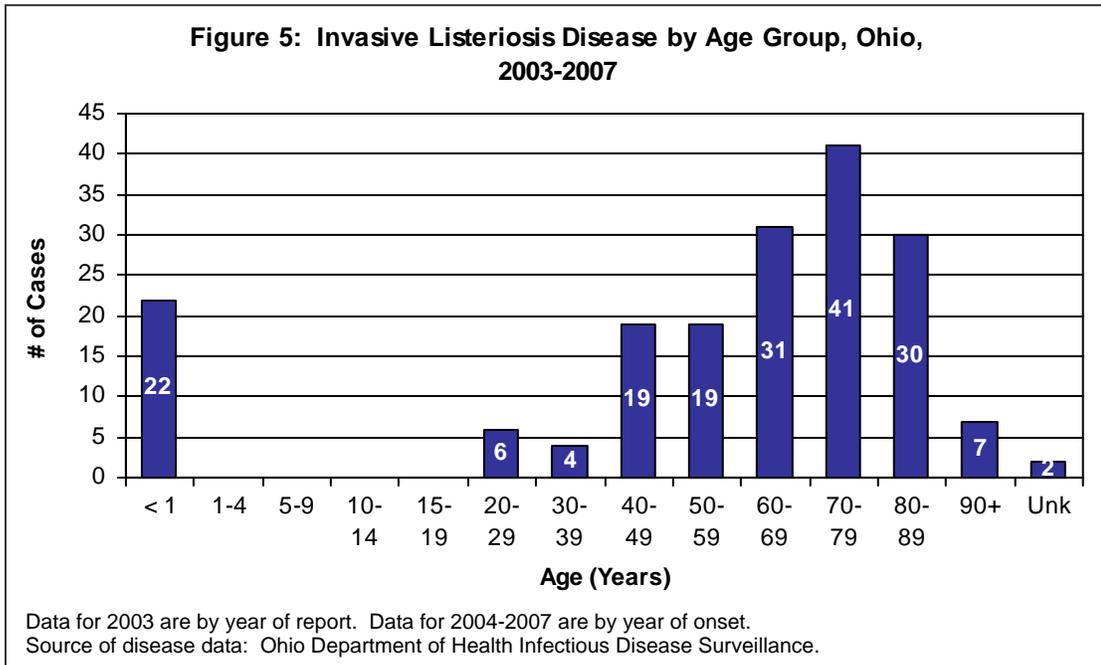
## LISTERIOSIS

Number of cases in 2007:	33	Rate in 2007:	0.3
Number of cases in 2006:	43	Rate in 2006:	0.4

\* Rates are based on U.S. Census midpoint estimates for each year and are per 100,000 population.

Listeriosis is an infection caused by consuming food contaminated with the bacterium *Listeria monocytogenes*. Symptoms of listeriosis include fever, muscle aches and sometimes gastrointestinal symptoms such as nausea or diarrhea.<sup>10</sup> If the infection spreads to the nervous system, symptoms can include headache, stiff neck, confusion and/or convulsions. Those at greatest risk for complications from listeriosis include pregnant women, newborns and adults with weakened immune systems.<sup>10</sup> Only invasive disease due to *L. monocytogenes* is reportable in Ohio.

Figure 5 demonstrates the age distribution of invasive listeriosis disease over the past five years. The majority of cases occurred in individuals over 59 years of age (111 cases, 61 percent). Neonatal cases accounted for 12 percent of invasive listeriosis disease during this same time period.



## MENINGITIS, ASEPTIC

<i>Number of cases in 2007:</i>	816	<i>Rate in 2007:</i>	7.1
<i>Number of cases in 2006:</i>	905	<i>Rate in 2006:</i>	7.9

\* Rates are based on U.S. Census midpoint estimates for each year and are per 100,000 population.

Aseptic meningitis refers to meningitis for which a cause is unapparent after initial evaluation. The majority of cases are caused by viruses, most often involving enteroviruses such as coxsackie virus and echovirus, but can also be caused by herpes simplex virus, mumps virus, measles virus, varicella zoster virus, lymphocytic choriomeningitis virus and adenovirus. Other causes of meningitis include invasive infection by bacteria, protozoans, rickettsiae, helminths or fungi; cases of meningitis with these etiologies are not reported as aseptic meningitis.<sup>11</sup>

Symptoms of aseptic meningitis include headache, fever, malaise and anorexia followed by stiff neck and irritability. Abdominal pain, nausea and vomiting also commonly occur. Humans are the primary source for most viral etiologies, and transmission depends on the viral agent. For enteroviruses, infection is transmitted through direct contact with the respiratory secretions or feces of an infected person; airborne transmission through respiratory droplets also occurs. The incidence of aseptic meningitis peaks in the late summer and early fall, and most cases occur among infants and children.<sup>11</sup>

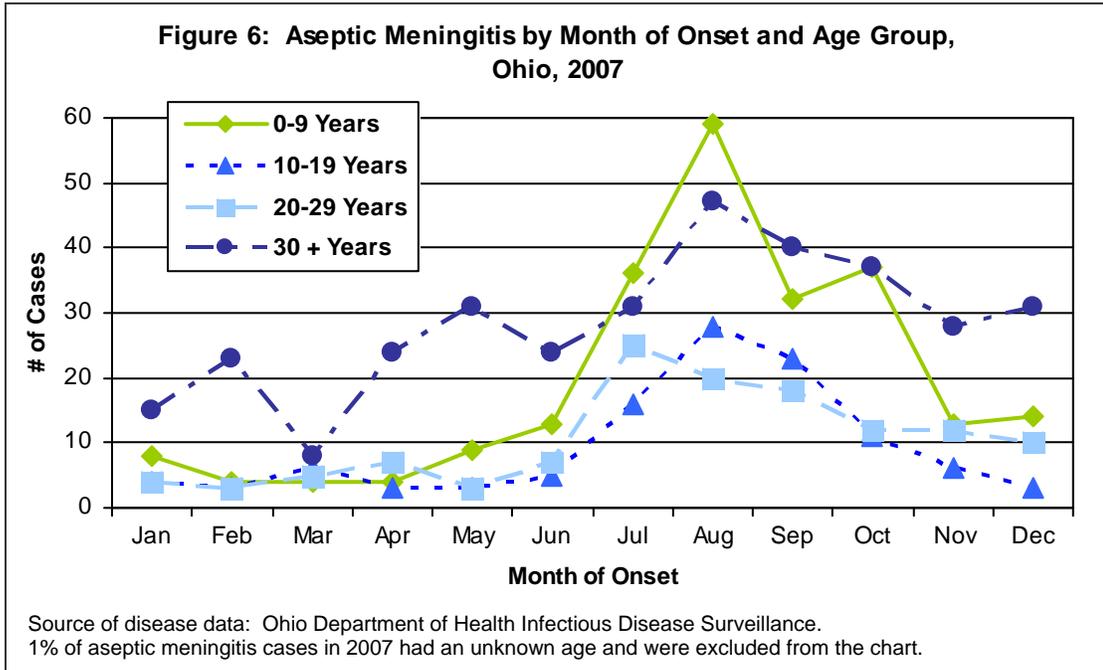
The majority of aseptic meningitis cases in Ohio 2006-2007 were of an unknown etiology (Table 1). Among cases where an agent was specified, an enterovirus was most often identified over the past two years (26 percent) followed by herpes simplex virus (6 percent). Less common viral etiologies included JC virus, varicella zoster virus, coxsackie B virus, Epstein-Barr virus, adenovirus, echovirus and cytomegalovirus.

**Table 1: Reported Etiologic Agents for Aseptic Meningitis, Ohio, 2006-2007**

Etiologic Agents	2006		2007		Total	
	N	%	N	%	N	%
Unknown	626	69%	502	62%	1,128	66%
Enterovirus	213	24%	231	28%	444	26%
Herpes Simplex virus	43	5%	56	7%	99	6%
JC virus	6	1%	10	1%	16	1%
Varicella Zoster virus	4	0%	6	1%	10	1%
Coxsackie B virus	4	0%	5	1%	9	1%
Epstein-Barr virus	3	0%	3	0%	6	0%
Adenovirus	4	0%	0	0%	4	0%
Echovirus	0	0%	3	0%	3	0%
Cytomegalovirus	2	0%	0	0%	2	0%
<b>Total</b>	<b>905</b>	<b>100%</b>	<b>816</b>	<b>100%</b>	<b>1,721</b>	<b>100%</b>

Source of disease data: Ohio Department of Health Infectious Disease Surveillance.

Like previous years, aseptic meningitis followed a seasonal pattern in Ohio during 2007 (Figure 6). Cases increased beginning in June and peaked in August. The most dramatic increase in incidence occurred among infants and children aged 0-9 years, which increased fourfold from 13 cases in June to 59 cases in August. Adults 30 years and over demonstrated a higher burden of disease throughout the year except in July and August; however, the incidence among this age group experienced a longer and more gradual increase from March to August as compared to other age groups.



## MENINGOCOCCAL DISEASE

<i>Number of cases in 2007:</i>	32	<i>Rate in 2007:</i>	0.3
<i>Number of cases in 2006:</i>	50	<i>Rate in 2006:</i>	0.4

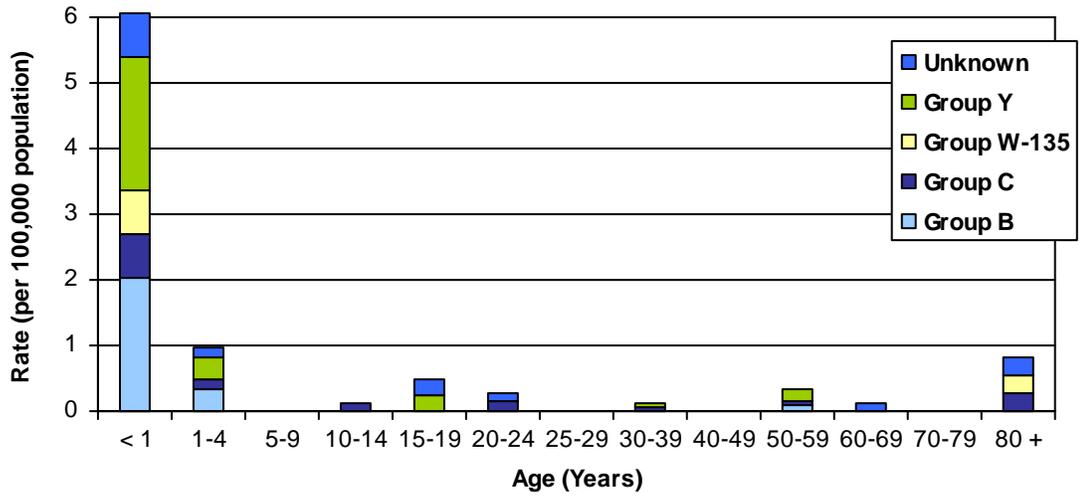
\* Rates are based on U.S. Census midpoint estimates for each year and are per 100,000 population.

Meningococcal disease is an invasive infection of *Neisseria meningitidis*, a Gram-negative, sphere-shaped bacterium usually found grouped in pairs. There are 13 serogroups of *N. meningitidis*; the most common in the United States are groups B, C and Y.<sup>12</sup> Individuals infected with *N. meningitidis* most commonly experience meningitis and/or meningococemia. Meningococemia is characterized by fever, chills, malaise, prostration and a rash. Other complications such as bacteremia, pneumonia, septic arthritis, conjunctivitis and pericarditis can also occur. Meningococcal disease is spread person to person through infected respiratory droplets. An estimated 5 percent to 25 percent of the population is asymptotically colonized with the bacteria; these carriers play a major role in transmission of disease. Incidence in the United States is greatest among children less than 5 years of age, especially infants 3 to 5 months of age.<sup>13</sup>

Two vaccines are available in the United States for individuals aged 2 years and older that protect against meningococcal disease caused by groups A, C, Y and W-135. The Advisory Committee on Immunization Practices recommends the meningococcal vaccine for all adolescents and persons at risk, including college freshmen living in dormitories, microbiologists routinely exposed to *N. meningitidis*, military recruits, persons traveling to countries where meningococcal disease is endemic and persons with certain immune system disorders.<sup>14</sup>

As seen in Figure 7, the highest incidence of meningococcal disease in Ohio occurred among infants when compared to all other age groups combined during 2007 (six cases per 100,000). Meningococcal disease among children aged 1-4 years was lower, at one case per 100,000. No cases occurred in children 5-9 years, but there was a slight increase in the rate of disease for teenagers and young adults aged 15-24 years. Most adults had a low incidence of disease, but the burden of disease among adults 80 years and older was approximately one case per 100,000. The majority of group B meningococcal serogroups, which are not included in current vaccines, occurred in infants and young children, while the incidence of invasive disease among the remaining serogroups was distributed fairly evenly across age groups. Serogroup information was not reported for 22 percent of cases. Although the greatest burden of disease in Ohio is found among infants, preventing disease in this vulnerable population remains a challenge because current vaccines are not approved for use in infants.

**Figure 7: Meningococcal Disease by Age Group and Serogroup, Ohio, 2007**



Source of disease data: Ohio Department of Health Infectious Disease Surveillance.  
Source of population data: 2000 U.S. Census.

## PERTUSSIS

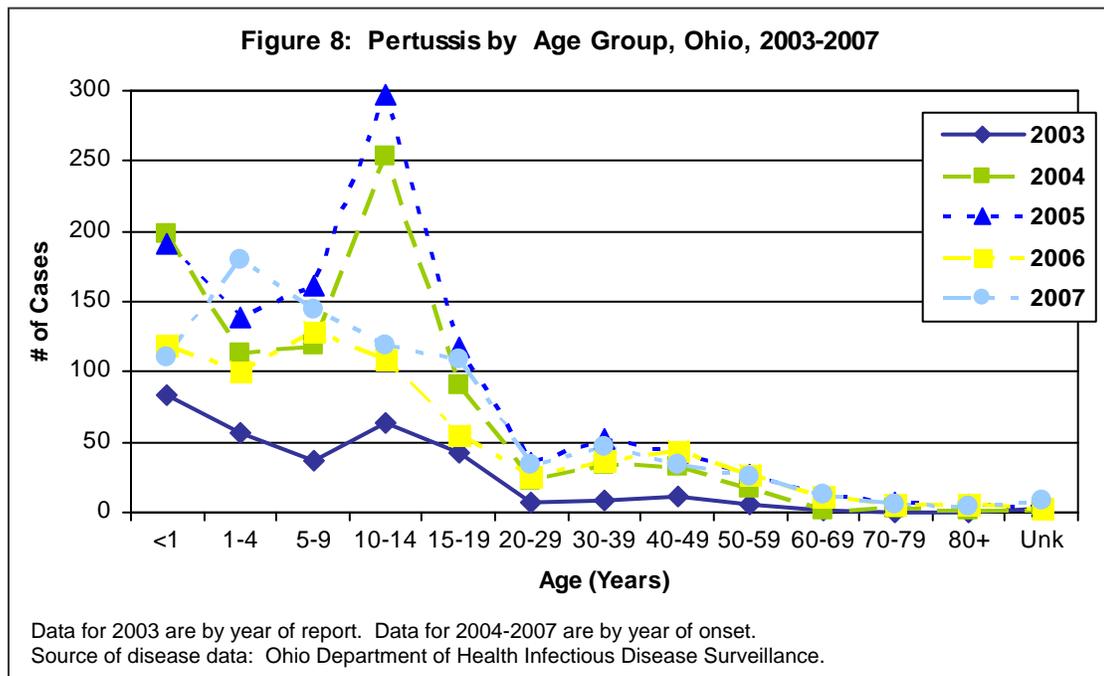
Number of cases in 2007:	837	Rate in 2007:	7.3
Number of cases in 2006:	594	Rate in 2006:	5.2

\* Rates are based on U.S. Census midpoint estimates for each year and are per 100,000 population.

Pertussis, otherwise known as whooping cough, is an acute, infectious disease caused by the bacterium *Bordetella pertussis* (*B. pertussis*).<sup>15</sup> Symptoms initially include a mild upper respiratory infection, resembling the common cold. Episodes of a more severe, rapid cough and high-pitched “whoop” generally follow and may last for several weeks. Coughing attacks may occur more frequently at night and result in a discharge of thick, clear mucus. Pertussis is spread by direct contact with the discharges from the nose and/or throat of infected persons. An infected person can transmit pertussis from the onset of symptoms to three weeks after the initial coughing episode. Pertussis can occur at any age, with infants being at the greatest risk for complications and death. Adolescents and adults do not usually exhibit the classic inspiratory whoop often seen in the very young with *B. pertussis*. This can lead to the misdiagnosis and underreporting of cases and transmission to susceptible infants.

The DTaP (diphtheria, tetanus toxoids and acellular pertussis) vaccine is recommended for all infants at 2, 4 and 6 months of age.<sup>15</sup> An additional dose of DTaP vaccine is recommended at 15-18 months of age and 4-6 years of age.

The majority of pertussis cases in Ohio are reported among children less than 5 years of age (Figure 8). However, there is an increasing number of adolescent and adult cases. This could possibly be due to waning of vaccine immunity. In 2005, Tdap (tetanus, diphtheria and pertussis) vaccine was introduced for older children, adolescents and adults.<sup>16</sup> Tdap is currently recommended as a once-only booster for adolescents and adults.



## SALMONELLOSIS

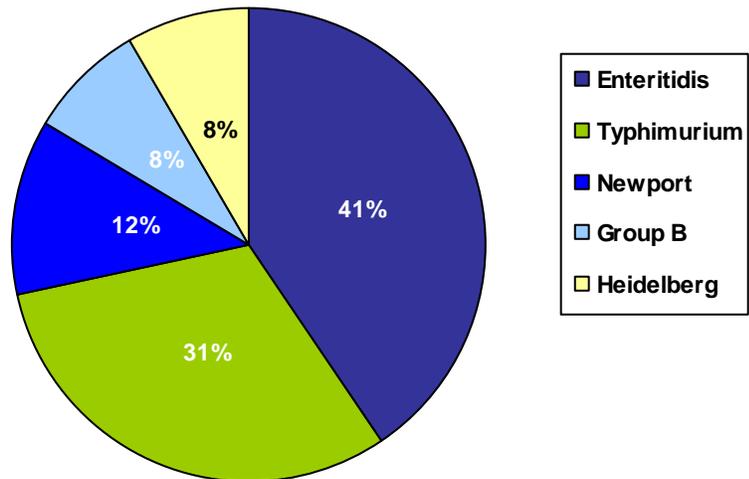
Number of cases in 2007:	1,323	Rate in 2007:	11.5
Number of cases in 2006:	1,299	Rate in 2006:	11.3

\* Rates are based on U.S. Census midpoint estimates for each year and are per 100,000 population.

Salmonellosis is an infectious disease caused by a group of bacteria known as *Salmonella*.<sup>17</sup> Salmonellosis is an acute gastrointestinal illness characterized by fever, headache, abdominal cramps, diarrhea and vomiting. Humans may acquire *Salmonella* directly via the fecal-oral route, from animals or from ingestion of contaminated food or water. Salmonellosis occurs worldwide with children less than 5 years of age, the elderly and the immunocompromised the most likely to develop severe infections.<sup>18</sup>

More than 1,000 cases of salmonellosis have been reported in each of the past five years in Ohio. There are more than 2,000 known serotypes of *Salmonella* bacteria, with serotypes Typhimurium and Enteritidis accounting for more than half of all human *Salmonella* isolates. Figure 9 displays the incidence of the most common *Salmonella* serotypes reported in Ohio from 2003-2007. *Salmonella* Enteritidis and Typhimurium were the most commonly isolated serotypes among Ohio's salmonellosis cases.

**Figure 9: Top Five *Salmonella* Serotypes or Serogroups Reported, Ohio, 2003-2007**



Data for 2003 are by year of report. Data for 2004-2007 are by year of onset.  
 Source of disease data: Ohio Department of Health Infectious Disease Surveillance.  
 7% of *Salmonella* isolates had no known serotype or serogroup 2003-2007.

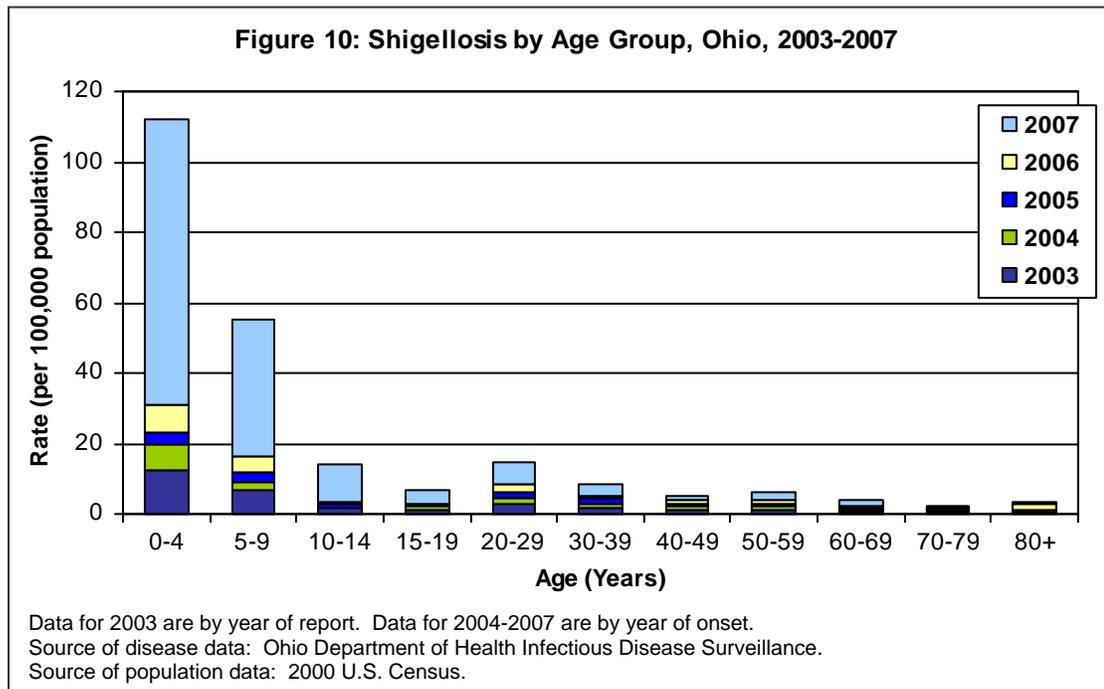
## SHIGELLOSIS

Number of cases in 2007:	1,277	Rate in 2007:	11.1
Number of cases in 2006:	200	Rate in 2006:	1.7

\* Rates are based on U.S. Census midpoint estimates for each year and are per 100,000 population.

Shigellosis is an infectious disease caused by a group of bacteria known as *Shigella*.<sup>19</sup> *Shigella* species are Gram-negative, non-spore forming, rod-shaped bacilli in the family Enterobacteriaceae.<sup>20</sup> There are four species of *Shigella*: *Shigella boydii*, *Shigella dysenteriae*, *Shigella flexneri* and *Shigella sonnei*. *Shigella* species primarily infect the large intestine, causing clinical manifestations that range from loose or watery stools to more severe symptoms including fever, abdominal tenderness or cramps and mucoid stools with or without blood.<sup>21</sup> *Shigella* is spread directly via person-to-person contact by the fecal-oral route.<sup>19</sup> Transmission by eating contaminated foods and/or swallowing contaminated water may also occur.

Figure 10 demonstrates the burden of shigellosis over the past five years in Ohio by age group. Although most recognized cases occur in children less than 10 years of age (1,296), persons of all ages are at risk for shigellosis. Among *Shigella* isolates reported in Ohio 2003-2007, 81 percent were *S. sonnei*, 6 percent were *S. flexneri* and less than 1 percent of cases were identified as either *S. boydii* or *S. dysenteriae*. In addition, approximately 13 percent of shigellosis cases did not have a species reported.



## STREPTOCOCCAL DISEASE, GROUP A, INVASIVE

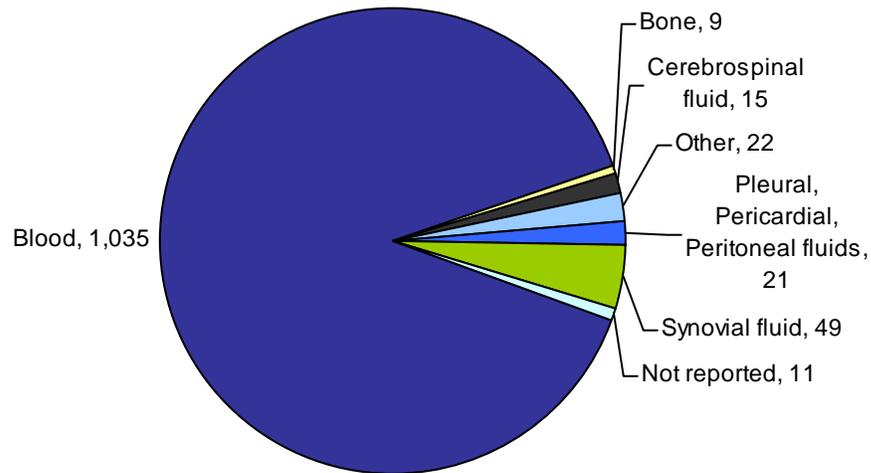
<i>Number of cases in 2007:</i>	226	<i>Rate in 2007:</i>	2.0
<i>Number of cases in 2006:</i>	245	<i>Rate in 2006:</i>	2.1

\* Rates are based on U.S. Census midpoint estimates for each year and are per 100,000 population.

Invasive Group A *Streptococcus* (GAS) is caused when a normally sterile site is infected with the bacteria *Streptococcus pyogenes*. *S. pyogenes* is a bacteria commonly found in the throat and on the skin of healthy people with no symptoms of illness. Those with underlying chronic health conditions such as diabetes, cancer or HIV infection are at a greater risk to develop invasive GAS disease.<sup>23</sup>

As seen in Figure 11, over the past five years, the majority of GAS cases in Ohio were isolated from blood (1,035) followed by synovial fluid (49), peritoneal, pericardial and/or pleural fluids (21) and cerebrospinal fluid (15). The number of invasive GAS cases reported has been declining since 2003 (2003: 287, 2004: 199, 2005: 245 and 2007: 226), while the proportion of cases isolated from blood has increased during this same time period (2003: 85 percent, 2004: 91 percent, 2005: 93 percent, 2006: 89 percent and 2007: 91 percent).

**Figure 11: Invasive Group A *Streptococcus* Cases by Specimen Site, Ohio, 2003-2007**



Data for 2003 are by year of report. Data for 2004-2007 are by year of onset.  
Source of disease data: Ohio Department of Health Infectious Disease Surveillance.

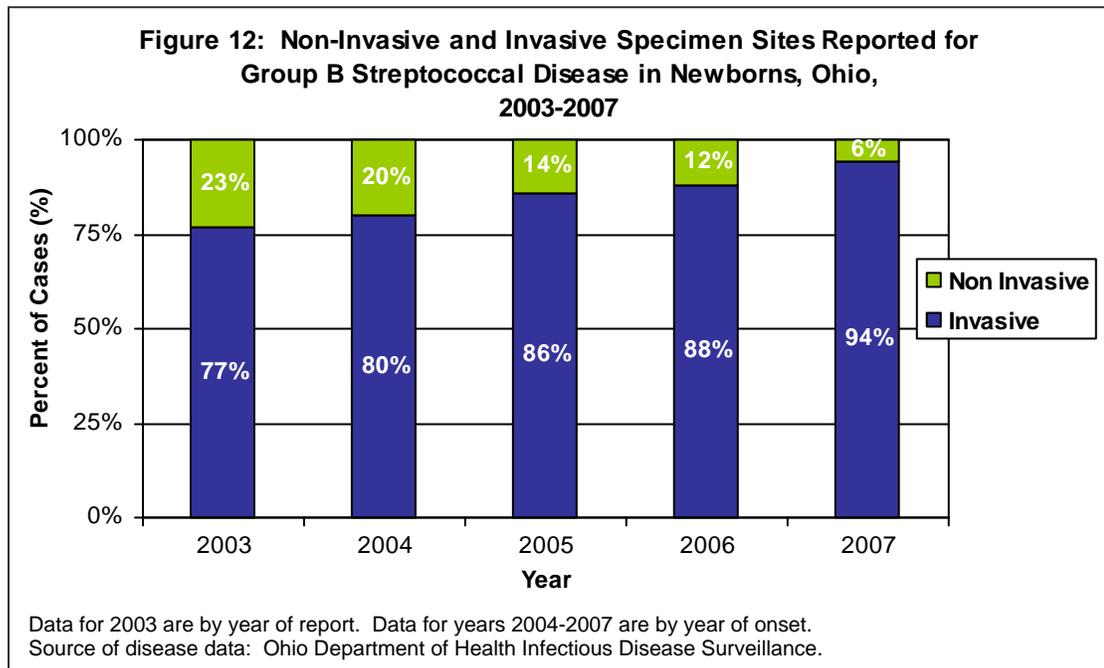
## STREPTOCOCCAL DISEASE, GROUP B, IN NEWBORN

<i>Number of cases in 2007:</i>	49	<i>Rate in 2007:</i>	0.4
<i>Number of cases in 2006:</i>	63	<i>Rate in 2006:</i>	0.5

\* Rates are based on U.S. Census midpoint estimates for each year and are per 100,000 population.

Group B *Streptococcus* (GBS) is a type of bacterium that causes illness in pregnant women, their newborn babies, the elderly and adults with chronic illnesses. GBS is the most common cause of life-threatening infections in newborns, including sepsis and meningitis. As such, routine prenatal screening of pregnant women for GBS colonization at 35-37 weeks gestation is recommended in the United States.<sup>24</sup> Newborn GBS is a reportable condition in Ohio for infants 3 months or less of age, and unlike several other reportable bacterial pathogens, it is reportable from both sterile and non-sterile specimen sites.

As seen in Figure 12, the majority of newborn infections in Ohio from Group B *Streptococcus* were reported from normally sterile specimen sites. Since 2003, the proportion of cases isolated from a normally sterile site continues to increase. The only sterile sites from which newborn GBS was isolated over the past five years were blood or serum (84 percent) and cerebrospinal fluid (16 percent).



## VARICELLA

<i>Number of cases in 2007:</i>	<i>4,364</i>	<i>Rate in 2007:</i>	<i>38.1</i>
<i>Number of cases in 2006:</i>	<i>8,859</i>	<i>Rate in 2006:</i>	<i>77.2</i>

\* Rates are based on U.S. Census midpoint estimates for each year and are per 100,000 population.

Varicella, also known as chickenpox, is caused by the varicella zoster virus, a member of the herpesvirus family.<sup>25</sup> The most common symptoms of chickenpox are fever, malaise and a generalized itchy rash first seen on the head and trunk. This is followed by rapid progression to macules, papules and vesicular lesions that produce blisters on other areas of the body. These blisters will dry, crust over and form scabs. Lesions that have scabbed over are not infectious. Varicella is spread by direct contact with the drainage from infectious lesions or airborne respiratory tract secretions. Varicella occurs worldwide and is common in the United States. The disease occurs most frequently in winter and early spring. Most people get chickenpox during their childhood years. Disease in adults is often severe and may result in complications (e.g., secondary bacterial infections).

The first varicella vaccine was licensed by the U.S. Food and Drug Administration in 1995. Routine vaccination is recommended for all healthy children 12 months through 15 months of age, with a second dose recommended between 4 and 6 years of age. In addition, those 13 years of age and older without a history of disease and susceptible adults are also targeted for vaccination.<sup>26</sup>

As seen in Figure 13, the majority of varicella cases reported in Ohio between 2006 and 2007 occurred in the 5-9-year age group. It is not known what proportion of this age group was unvaccinated. As of Jan. 1, 2006, varicella became a Class A(3) reportable disease in Ohio, reportable by individual case at the end of the work week. Prior to 2006, varicella was reportable as an aggregate (total number of cases) at the end of each work week. The reason for the sharp decline of cases between 2006 and 2007 is unknown.

