

2009 Indiana Report of Infectious Diseases

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All incidence rates throughout the report are per 100,000 population based on the U.S. Census Bureau's population data as of July 1, 2009.

Data for counties reporting fewer than five disease cases are not included to protect the confidentiality of the cases.

Data for fewer than 20 reported disease cases are considered statistically unstable.

References

American Academy of Pediatrics. In: Pickering LK, Baker CJ, Long SS, McMillan JA, eds. *Red Book: 2006 Report of the Committee on Infectious Diseases*. 27th ed. Elk Grove Village, IL: American Academy of Pediatrics; 2006.

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Heyman, D.L. (2008). *Control of Communicable Diseases Manual (19th ed.)*. American Public Health Association.

Websites

www.cdc.gov

Notes

As of 2009, meningitis (aseptic) is no longer reportable.



The **Indiana National Electronic Disease Surveillance System** (I-NEDSS) is a web based application that promotes the collection, integration and sharing of data at federal, state and local levels. The purpose of I-NEDSS is to automate the current process for reporting infectious diseases to the state and local health departments. Eventually, I-NEDSS will replace the paper based reporting and case investigation system currently in use. Benefits of I-NEDSS include an increase of speed, accuracy, and accountability in our disease surveillance. This will be accomplished by having all reporting and investigation forms accessed, completed, and submitted electronically through I-NEDSS. I-NEDSS is part of a national electronic disease reporting system that not only links healthcare providers and state and local public health agencies within Indiana, but also provides data to the U.S. Centers for Disease Control and Prevention. This system is currently in use by 85% of the local health agencies in the state and nearly 40 hospitals use it to electronically report infectious diseases to the state and local health departments.

Anthrax

Arboviral Encephalitis

Babesiosis

Botulism

Brucellosis

Campylobacteriosis

Cholera

Cryptosporidiosis

Cyclosporiasis

Dengue Fever and Dengue Hemorrhagic Fever

Diphtheria

Ehrlichiosis

Escherichia coli O157:H7

Giardiasis

Haemophilus influenzae (invasive disease)

Hantavirus

Hepatitis A

Hepatitis B

Hepatitis C

Hepatitis D

Hepatitis E

Histoplasmosis

La Crosse Encephalitis

Legionellosis

Leprosy

Leptospirosis

Listeriosis

Lyme Disease

Malaria

Measles

Meningococcal Disease

Mumps

Pertussis

Plague

Pneumococcal Disease

Poliomyelitis

Psittacosis

Q Fever

Rabies

Rocky Mountain Spotted Fever

Rubella

Salmonellosis

Shigellosis

Smallpox

Streptococcus A

Streptococcus B

Tetanus

Toxic Shock Syndrome

Trichinosis

Tularemia

Typhoid Fever

Typhus Fever (Murine)

Varicella (associated with hospitalizations and/or deaths)

Vibriosis

West Nile Virus

Yellow Fever

Yersiniosis

ANTHRAX

Anthrax is a bacterial disease of humans and animals caused by the bacterium *Bacillus anthracis*. Anthrax bacteria form spores, which are extremely stable in the environment. There are three clinical presentations of the disease: 1) Cutaneous infections, the mildest form, occur when bacterial spores become embedded in the skin. 2) The gastrointestinal form, which is extremely rare, occurs when animals ill with anthrax are consumed as food. 3) Inhalation anthrax occurs when the spores are inhaled. Both the inhalation and gastrointestinal forms have high mortality rates. The reservoir of the bacteria is soil, where the spores can remain viable for years. The spores can be found worldwide and are found naturally in some western states in the U.S. and Canada. Animals, including livestock, can acquire the bacteria from contaminated soil. However, there have been no reported cases of anthrax in Indiana livestock since before 1960.

Public Health Significance

Symptoms of anthrax can occur within 7 days of becoming infected except for symptoms of inhalation anthrax, which can take up to 62 days to appear. The symptoms are different depending on how the disease is acquired.

Cutaneous: Skin infection starts with a small sore that resembles an insect bite or blister. The sore develops into a skin ulcer with a black area in the center. Most anthrax infections are cutaneous (eschar).

Gastrointestinal: Symptoms start with nausea, vomiting, fever, and loss of appetite and progress to more severe symptoms such as vomiting blood, stomach pain, and severe diarrhea.

Inhalation: In the beginning of the illness, symptoms are similar to a common cold and include sore throat, mild fever, and muscle aches. As disease progresses, breathing problems, tiredness, and chest discomfort can occur and become progressively severe

Antibiotics are used to treat all three types of anthrax. However, treatment success will depend on the type of anthrax infection and how soon treatment can begin.

An anthrax vaccine has been licensed for use in humans. However the vaccine is only recommended for individuals considered to be at high risk for exposure. The vaccine is recommended for the following groups:

- Laboratory personnel working directly with the organism.
- Persons who handle potentially infected animal products, e.g., imported hides.
- Veterinarians or other animal handlers who work in high-risk areas, especially outside the U.S.
- Military personnel.

The vaccine protects against cutaneous anthrax and is believed to be effective against inhaled spores in a biowarfare situation.

Anthrax is a Category A bioterrorism agent*. Anthrax spores could be released into the air and used as a weapon. As an agent of biological warfare, it is expected that a cloud of anthrax spores would be released at a strategic location to be inhaled by the individuals under attack. Spores of *B. anthracis* can be produced and stored in a dry form and remain viable for decades in storage or after release.

Healthy People 2010 Goal

There is no Healthy People 2010 Goal for anthrax.

Epidemiology and Trends

There were no reported human or animal cases of anthrax in Indiana in 2008 or during the five-year reporting period 2005-2009.

You can learn more about anthrax by visiting the following Web sites:

<http://emergency.cdc.gov/agent/anthrax/index.asp>

*Bioterrorism Agent List:

<http://www.bt.cdc.gov/agent/agentlist-category.asp>

ARBOVIRAL ENCEPHALITIS

Arboviral encephalitis viruses are transmitted by blood-feeding arthropods, the most common being mosquitoes and ticks. Indiana residents are at risk for four arboviral encephalitis viruses: 1) eastern equine encephalitis (EEE), 2) St. Louis encephalitis (SLE), 3) LaCrosse encephalitis (LAC), and 4) West Nile virus (WNV), all of which are transmitted by mosquitoes. [LAC](#) encephalitis and [WNV](#) are addressed in separate sections of this report. Most cases of arboviral encephalitis occur from June through September, when arthropods are most active. In warmer climates, cases may occur during the winter months because arthropods are active for longer periods of time.

EEE is caused by a virus transmitted to humans and equines (horses) by infected mosquitoes and is maintained in a bird-mosquito cycle in fresh water swamps. In Indiana, the ecological system that supports the transmitting mosquito, *Culiseta melanura*, occurs only in the north central counties. Horse and human cases occur sporadically. EEE has a high mortality rate and is considered one of the most serious mosquito-borne diseases in the U.S.

Prior to the emergence of West Nile Virus, SLE was the most common mosquito-transmitted human pathogen in the U.S. The SLE virus is maintained in a bird-mosquito cycle involving *Culex* species of mosquito.

Public Health Significance

People infected with EEE often have no symptoms or mild flu-like symptoms, headache, and fever. Symptoms can become severe, affecting the central nervous system and eventually leading to seizures and coma. Symptoms appear 4-10 days after the bite from an infected mosquito. People most at risk of contracting EEE are those who live or visit areas where EEE is common and engage in outdoor recreational activities or people who work outdoors. While no vaccine or specific treatment exists for humans infected with EEE, there is a vaccine for horses.

Symptoms of SLE are similar to EEE and range in severity from headache and fever to coma, tremors, and convulsions. Symptoms appear 5-15 days after becoming infected with SLE. People most at risk of becoming infected with SLE are those who visit or reside in areas where mosquitoes carry the infection and people who work outdoors or participate in outdoor recreational activities. As with EEE, there is no human vaccine for SLE.

Healthy People 2010 Goal

There is no Healthy People 2010 Goal for arboviral encephalitis.

Epidemiology and Trends

No human cases of EEE were reported in Indiana from 2005-2009.

One human case of SLE was reported during 2009 in Indiana. This was the only case reported during the five year reporting period, 2005-2009.

You can learn more about arboviral encephalitis by visiting the following Web sites:

<http://www.cdc.gov/ncidod/dvbid/arbtor/index.htm>

<http://www.cdc.gov/ncidod/dvbid/arbtor/eeefact.htm>

http://www.cdc.gov/ncidod/dvbid/sle/Sle_FactSheet.html

BABESIOSIS

Babesiosis is caused by hemoprotzoan parasites of the genus *Babesia*. The parasite attacks the red blood cells, causing their destruction and resulting in hemolytic anemia. Individuals with babesiosis often have enlarged livers and spleens. On the East Coast and in the Midwestern states, the disease is transmitted by the bite of deer ticks infected with the *Babesia* parasite. The deer tick, *Ixodes scapularis*, lives on deer, meadow voles, and small rodents such as deer mice. Deer ticks also transmit Lyme disease and human granulocytic ehrlichiosis in Indiana. Co-infections of Lyme disease and *Babesia* have been identified in the New England states.

Public Health Significance

Symptoms of babesiosis usually occur 1-4 weeks after a tick bite but can appear months later. Most cases have mild symptoms that begin with fatigue and body aches. More severe symptoms may resemble malaria and include headache, fever, chills, and vomiting. Treatment is available and usually includes a combination of antiparasitic medications.

Although anyone can become infected with babesiosis, elderly people, persons with weakened immune systems, and people whose spleens have been removed are more at risk.

Healthy People 2010 Goal

There is no Healthy People 2010 Goal for babesiosis.

Epidemiology and Trends

There were no reported cases of babesiosis in Indiana in 2009, and no reported cases during the five-year reporting period 2005-2009.

You can learn more about babesiosis by visiting the following Web site:

<http://www.cdc.gov/babesiosis/>

BOTULISM

Botulism is caused by a nerve toxin (poison) produced by the *Clostridium botulinum* bacterium, which lives in the soil and grows best with little oxygen. These bacteria form spores, which allows survival in harsh environments. The toxin can cause muscle paralysis, which can result in death if the breathing muscles become paralyzed. Botulism is considered a medical emergency. On average, one case of botulism is reported in Indiana every two years.

Botulism is not spread from person to person. There are three types of botulism:

- Foodborne botulism results from eating foods, especially improperly home-canned foods, that contain botulism toxin.
- Intestinal botulism (formerly infant botulism) results from eating certain foods, e.g., honey or natural syrups, that contain spores of botulism bacteria. These spores grow in the intestines and produce toxin in babies and people with gastrointestinal disorders.
- Wound botulism results from wounds becoming contaminated with *Clostridium botulinum*.

Public Health Significance

Symptoms of botulism can include diarrhea, vomiting, constipation, urinary retention, double or blurred vision, drooping eyelids, difficulty speaking or swallowing, dry mouth, muscle weakness, and muscle paralysis that begins in the upper body and progresses downward (“descending paralysis”). Muscle paralysis involves both sides of the body at the same time, starting at the head and moving towards the feet. These symptoms are a result of the bacterial toxin paralyzing the muscles of the body. Botulism symptoms typically begin within 12-36 hours (range of 6 hours to 10 days) after consuming contaminated food or after a wound has become infected with the bacteria. Babies with botulism appear tired, do not eat well, are constipated, and have a weak cry and limp muscles.

If discovered early, botulism caused by contaminated food or an infected wound can be treated with an antitoxin. While the antitoxin keeps the illness from becoming worse, it does not speed recovery. Antitoxin is rarely used to treat babies with botulism. Because the antitoxin can cause severe allergic reactions in some patients, the health care provider must rule out other possibilities for the illness before giving antitoxin.

Outbreaks have occurred following the consumption of uneviscerated fish (guts left inside the fish), fermented fish, and improperly processed foods (e.g., sautéed onions, chili peppers, and canned chili).

Measures that would decrease the likelihood of transmission of botulism include:

- Foodborne:
 - Properly process and prepare all home-canned foods. Instructions for safe home canning are available from county extension services or from the United States Department of Agriculture (USDA) at http://www.uga.edu/nchfp/publications/publications_usda.html.
 - Boil home-canned foods for 10 minutes before eating. The bacterial toxin is destroyed by heat.
 - Never eat foods from cans or jars that are bulging, discolored, have a bad taste or smell, or have swollen lids or caps.
 - If stored overnight, remove aluminum foil from leftover potatoes before refrigerating. Potatoes that have been baked while wrapped in aluminum foil should be kept hot until they are eaten or refrigerated.
 - Refrigerate oils that contain garlic or herbs.

- Intestinal (including infants):
 - Honey should not be fed to babies less than 12 months of age. Honey can contain spores of the bacteria, which can easily grow in infants.
- Wound care:
 - Carefully clean and disinfect all cuts and wounds.

Healthy People 2010 Goal

There is no Healthy People 2010 Goal for botulism.

Epidemiology and Trends

There were no reported cases of botulism in Indiana in 2009 and only four reported during the five-year reporting period 2005-2009.

You can learn more about botulism by visiting the following Web sites:

<http://www.cdc.gov/nczved/divisions/dfbmd/diseases/botulism/>

<http://www.fda.gov/Food/FoodSafety/FoodborneIllness/FoodborneIllnessFoodbornePathogensNaturalToxins/BadBugBook/ucm070000.htm>

BRUCELLOSIS

Brucellosis is a systemic bacterial disease of animals caused by one of several *Brucella* species (*abortus*, *melitensis*, *suis*, *canis*) that can be transmitted to humans through one of three methods: 1) consumption of contaminated milk or meat; 2) handling of infected animal fetuses, vaginal fluid, or products of birth; or 3) inhalation of the organism in laboratories or slaughterhouses. Person-to-person transmission (from sexual activity and breast-feeding mothers) has been documented.

Public Health Significance

In humans, symptoms of brucellosis usually appear within 5-30 days of becoming infected but may take as long as six months. Symptoms may include fever, sweats (often at night), headaches, weakness, chills, and body aches. Groups at risk for brucellosis include meat inspectors, animal handlers, laboratory workers, veterinarians, and anyone who consumes unpasteurized milk and dairy products made with unpasteurized milk such as cheese. Treatment is available for brucellosis and recovery may take a few weeks to several months. Treatment requires the use of multiple antibiotics for six weeks or longer.

Since *Brucella* can be transmitted by inhalation, it is considered a Category B bioterrorism agent*.

Healthy People 2010 Goal

There is no Healthy People 2010 Goal for brucellosis.

Epidemiology and Trends

Brucella cases in humans rarely occur in Indiana or elsewhere in the U.S. due to the efforts of the United States Department of Agriculture and state animal health agencies to eliminate *Brucella* from livestock herds over the last 60-70 years. There were five cases of brucellosis reported in Indiana in 2009 and these were the only cases reported during the five-year reporting period 2005-2009. Recent cases in the United States have been attributed to the consumption of unpasteurized milk products acquired through foreign travel.

Brucella cases in humans rarely occur in Indiana or elsewhere in the U.S. due to the efforts of the United States Department of Agriculture and state animal health agencies to eliminate *Brucella* from livestock herds over the last 60-70 years. There were five cases of brucellosis reported in Indiana in 2009, and these were the only cases reported during the five-year reporting period 2005-2009. These five cases were one outbreak associated with imported cheese made from unpasteurized milk. Recent cases in other parts of the United States have also been attributed to the consumption of unpasteurized milk products acquired through foreign travel.

You can learn more about brucellosis by visiting the following Web sites:

http://www.cdc.gov/ncidod/dbmd/diseaseinfo/brucellosis_g.htm

*Bioterrorism Agent List:

<http://www.bt.cdc.gov/agent/brucellosis/>

CAMPYLOBACTERIOSIS

Campylobacteriosis is a contagious disease caused by *Campylobacter* bacteria, which live in the intestines of many animals, including birds, farm animals, dogs, and cats. There are over 20 types of *Campylobacter* bacteria. Campylobacteriosis is one of the most commonly reported causes of diarrheal illness in humans.

There are many ways a person can become infected with *Campylobacter*. The most common exposures are foodborne (consuming undercooked poultry, unpasteurized dairy products), waterborne (swallowing untreated water, e.g., from lakes or streams), person-to-person contact, and contact with infected animals, primarily puppies, kittens, and livestock.

Public Health Significance

Typical symptoms include diarrhea, stomach cramps, fever, nausea, and vomiting. Symptoms usually appear 2-5 days after exposure, with a range of 1-10 days. For most people, *Campylobacter* causes symptoms that usually last no longer than one week, and they recover within 5-7 days without medical treatment. Since diarrhea can cause dehydration, an infected person should drink plenty of fluids. No specific treatment is generally recommended; however, antibiotics may be used to treat persons with severe cases.

In general, campylobacteriosis can be prevented by strictly adhering to the following guidelines:

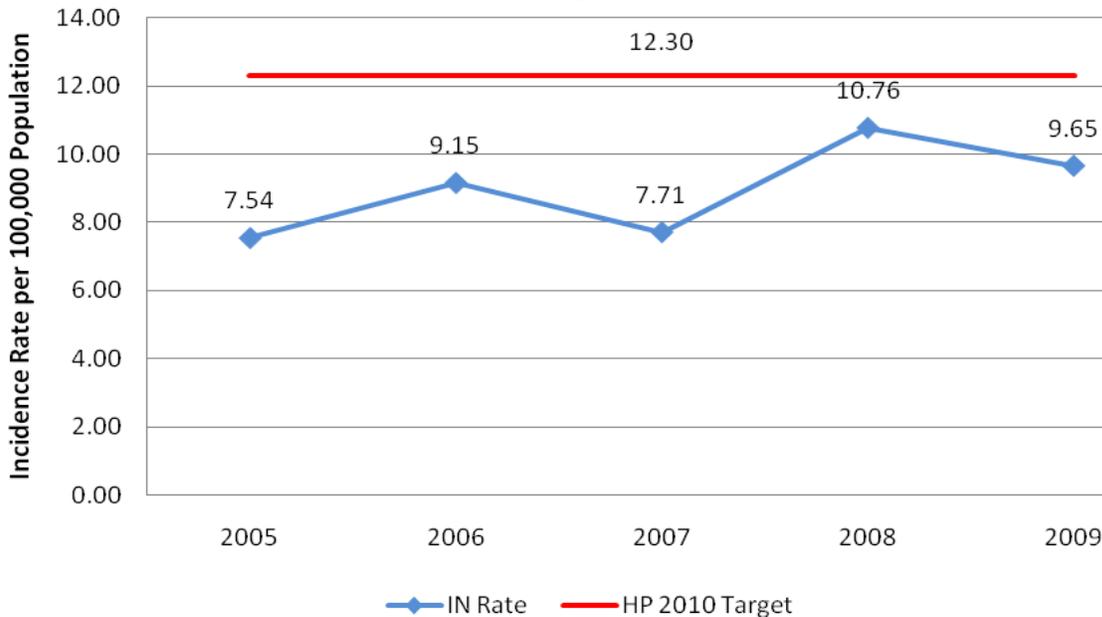
- Practice good hygiene:
 - Thoroughly wash hands with soap and water after using the restroom; after assisting someone with diarrhea and/or vomiting; after contact with animals and reptiles; after swimming; before, during, and after food preparation; and after exposure to raw meat products.
 - Clean food preparation work surfaces, equipment, and utensils with soap and water before, during, and after food preparation, especially after contamination with raw meat products.
- Separate raw and cooked foods:
 - Avoid cross-contamination by keeping uncooked meat products and marinades separate from produce, ready-to-eat foods, and cooked foods.
 - Use separate equipment and utensils for handling raw foods.
 - Clean food-preparation work surfaces, equipment, and utensils with soap and water before, during, and after food preparation, especially after contact with raw meat products.
- Maintain safe temperatures:
 - Maintain proper temperatures during refrigeration (<40°F), freezing (<2°F), holding (keep food hot or at room temperature for no longer than 2 hours), and chilling (chill immediately and separate into smaller containers if needed).
 - Thoroughly cook all food items to USDA recommended safe minimum internal temperatures:
 - 145°F – steaks, roasts, and fish
 - 160°F – pork, ground beef, and egg dishes
 - 165°F – chicken breasts and whole poultry
 - If the temperature cannot be checked, cook poultry until juices run clear and the meat is no longer pink.
- Eat safe foods:
 - Do not eat undercooked meat, poultry, eggs, expired foods, or unpasteurized dairy products or juice.
 - Wash all produce before eating raw or cooking.

- Use treated water for washing, cooking, and drinking.
- Avoid swallowing untreated water.
- Protect others:
 - Persons with diarrhea and/or vomiting should not prepare food or provide health care services for others and should limit direct contact with others as much as possible.
 - Persons with diarrhea and/or vomiting should not attend a daycare facility or school.
 - Do not change diapers near recreational water.
 - Do not go swimming or use hot tubs if you have diarrhea and for at least two weeks after diarrhea stops.
- Handle animals safely:
 - Wash hands after contact with farm animals, petting zoos, pets (including reptiles and amphibians), especially if they are suffering from diarrhea, and after contact with pet food/treats (including live or frozen rodents).
 - Keep pets out of food-preparation areas.
 - Do not clean pet or reptile cages in the kitchen sink or in the bathtub.
- Travel safely outside of the U.S.:
 - Drink bottled beverages and water, even when brushing teeth.
 - Do not eat uncooked fruits or vegetables unless you peel them yourself.
 - Do not eat foods or beverages from street vendors.
 - Do not consume local water or ice.

Healthy People 2010 Goal

The Healthy People 2010 Goal for campylobacteriosis is 12.3 cases per 100,000 population per year. Indiana met that goal for the five-year period 2005-2009 (Figure 1).

**Figure 1: Campylobacteriosis Rates by Year
Indiana, 2005-2009**



Epidemiology and Trends

In 2009, there were 620 reported cases of campylobacteriosis in Indiana, for a rate of 9.65 cases per 100,000 population (Table 1). This represents a decrease in reported cases compared to 2008 (686). Males (10.11) were more likely to be reported than females (9.05). The rate for other races (7.10) was higher than that for whites (5.34), or blacks (2.55); however, 290 cases (46.8%) did not report race data.

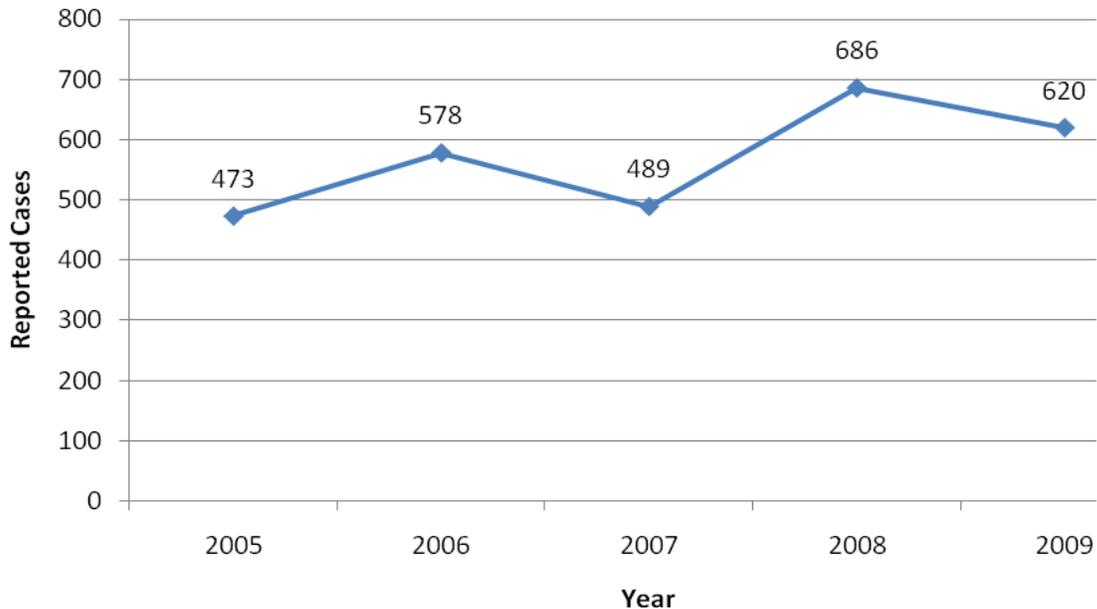
Table 1: Campylobacteriosis Case Rate by Race and Sex, Indiana, 2009

	Cases	Rate*	2005 - 2009 Total
Indiana	620	9.65	2846
Race			
Black	15	2.55	88
White	301	5.34	1872
Other	14	7.10	60
Not Reported	290		826
Sex			
Female	295	9.05	1301
Male	320	10.11	1525
Unknown	0		20

*Rate per 100,000 population based on U.S. Census Bureau's population data as of July 1, 2009

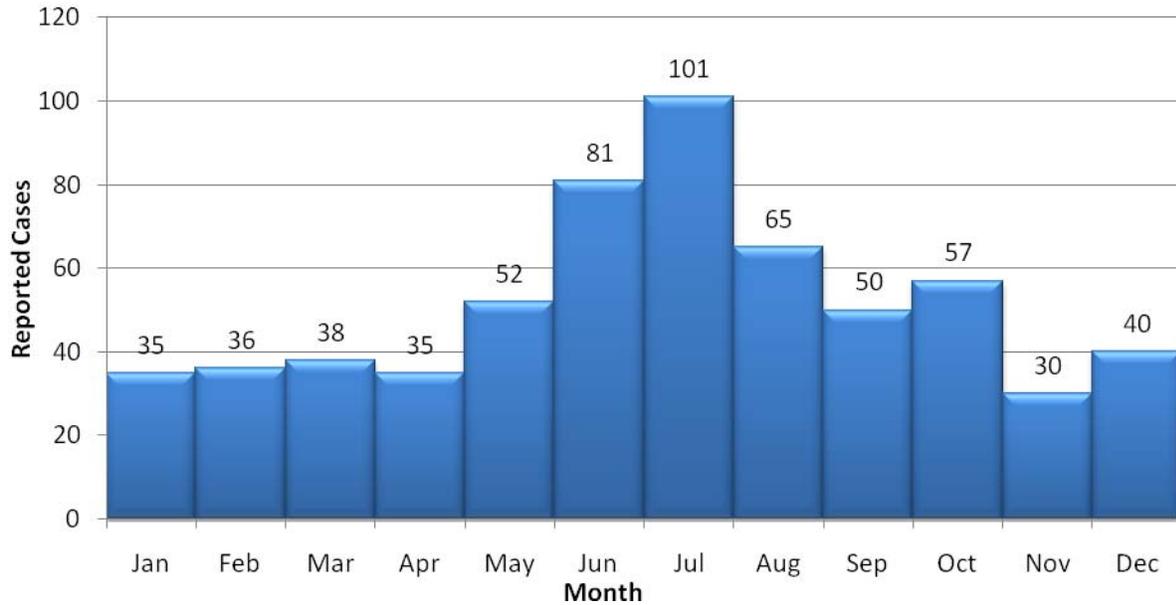
Figure 2 shows reported cases by year for 2005-2009.

Figure 2: Campylobacteriosis Cases by Year Indiana, 2005-2009



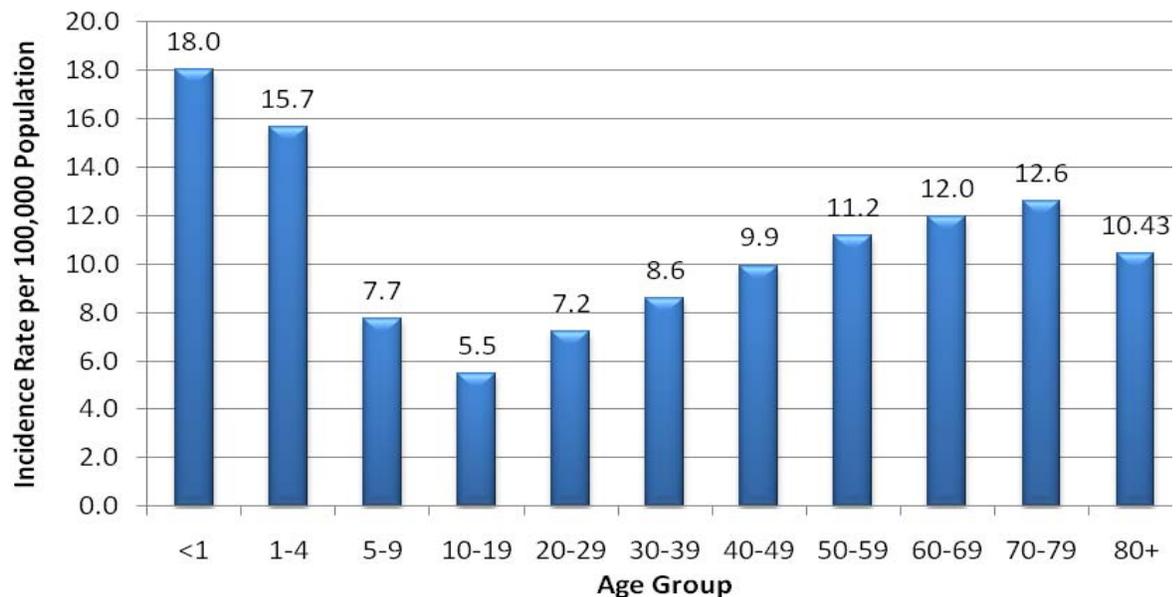
Incidence of disease was greatest during the summer months. [Figure 3](#) shows cases per month for 2009.

**Figure 3: Campylobacteriosis Cases by Month
Indiana, 2009**



As shown in [Figure 4](#), age specific rates were greatest for infants under the age of 1 year (18.0), followed by preschoolers aged 1-4 years (15.7), and adults aged 70-79 years (12.6).

**Figure 4: Campylobacteriosis Incidence
Rates by Age Group Indiana, 2009**



The incidence rates were highest among the following counties reporting five or more cases: Boone (30.2), Decatur (23.9), St. Joseph (23.9), and Steuben (23.8). [Figure 5](#) shows counties reporting five or more cases of campylobacteriosis in 2009.

You can learn more about campylobacteriosis by visiting the following Web site:

<http://www.cdc.gov/nczved/divisions/dfbmd/diseases/campylobacter/>

CHOLERA

Cholera is a contagious diarrheal disease caused by toxins produced by *Vibrio cholera* bacteria (O1 and O139 serogroups). Humans are the primary reservoir, although environmental reservoirs may exist in brackish water (a mixture of saltwater and fresh water) and estuaries (places where freshwater rivers and streams flow into the ocean). Shellfish found in the U.S. coastal waters may be contaminated with *V. cholerae*. Cholera is extremely rare in the U.S. and is usually related to travel to areas where cholera is common, such as Africa, Asia, and Latin America.

V. cholerae is passed in the stool, and people become infected by ingesting feces from an infected person (fecal-oral route). *V. cholerae* is typically transmitted via the ingestion of food or water contaminated (directly or indirectly) with feces or vomitus of infected persons (e.g., via sewage). Water contaminated with *V. cholerae* can thus contaminate shellfish and raw produce.

Although direct person-to-person spread is unlikely, cholera may be transmitted as long as stools test positive for the bacterium, most likely until a few days after recovery from symptoms. Shedding of bacteria may occasionally persist for several months.

Public Health Significance

Symptoms of cholera can include diarrhea, vomiting, and dehydration and usually begin within 2-3 days (range of a few hours to 5 days) after exposure. Fever is usually absent. Infection with *V. cholerae* often results in asymptomatic or mild illness involving only diarrhea.

Approximately 1 out of 20 infected people will develop more severe illness characterized by profuse watery stools, nausea, some vomiting, and leg cramps. Because of rapid loss of body fluids, dehydration and shock can occur in the most severe cases. Without rehydration therapy, death can result within hours. The case fatality rate is high and in untreated cases may exceed 50 percent; with prompt rehydration, the fatality rate is less than 1 percent.

Cholera can be treated by immediate replacement of the fluid and salts lost through diarrhea. Patients can be treated with oral rehydration solution, a prepackaged mixture of sugar and salts to be mixed with water and drunk in large amounts. This solution is used throughout the world to treat diarrhea. Severe cases also require intravenous fluid replacement. Antibiotics shorten the course and diminish the severity of the illness, but they are not as important as rehydration.

In general, cholera can be prevented by strictly adhering to the following guidelines:

- Practice good hygiene:
 - Thoroughly wash hands with soap and water after using the restroom; after assisting someone with diarrhea and/or vomiting; after contact with animals and reptiles; after swimming; before, during, and after food preparation; and after exposure to raw meat products.
 - Clean food preparation work surfaces, equipment, and utensils with soap and water before, during, and after food preparation, especially after contamination with raw meat products.
- Eat safe foods and drink safe water:
 - Use treated water for washing, cooking, and drinking.
 - Wash all produce before eating raw or cooking.
 - Do not eat uncooked shellfish or fish, including ceviche.
- Protect others:
 - Persons with diarrhea and/or vomiting should not prepare food or provide health care for others and should limit direct contact with others as much as possible.

- Persons with diarrhea and/or vomiting should not attend a daycare facility or school.
- Do not change diapers near recreational water.
- Do not go swimming or use hot tubs if you have diarrhea and for at least 2 weeks after diarrhea stops.
- Safe travel outside of the U.S.:
 - Drink bottled beverages and water, even when brushing teeth.
 - Do not consume local water or ice.
 - Do not eat uncooked fruits or vegetables unless you peel them yourself.
 - Do not eat foods or beverages from street vendors.
 - Do not bring raw produce or shellfish back into the U.S.

Healthy People 2010 Goal

There is no Healthy People 2010 Goal for cholera.

Epidemiology and Trends

In 2009, there was one reported case of cholera in Indiana which was the only case reported from 2006-2009.

You can learn more about cholera by visiting the following Web sites:

<http://www.cdc.gov/cholera/>

<http://www.fda.gov/Food/FoodSafety/FoodborneIllness/FoodborneIllnessFoodbornePathogensNaturalToxins/BadBugBook/ucm070071.htm>

CRYPTOSPORIDIOSIS

Cryptosporidiosis is a contagious disease caused by a one-celled parasite, *Cryptosporidium parvum*, which can live in the intestine of humans, cattle and other mammals, poultry, fish, and reptiles. Healthy people recover on their own, but cryptosporidiosis can be very serious and even cause death in people with weakened immune systems. Because the parasite is protected by an outer shell (cyst), it can survive outside the body and in the environment for long periods of time. Concentrations of chlorine used in routine water treatment do not kill *Cryptosporidium* cysts. On average, 80 cases of cryptosporidiosis are reported in Indiana each year.

People become infected with *Cryptosporidium* by ingesting feces from an infected animal or person (fecal-oral route). Risk factors associated with cryptosporidiosis include:

- Eating food, most commonly produce, contaminated with stool from infected animals or contaminated water.
- Swallowing contaminated water from lakes, rivers, streams, swimming pools, or hot tubs.
- Swallowing treated but unfiltered drinking or recreational water.
- Having contact with an infected person's stool:
 - Not washing hands after contact with stool from a contaminated surface or diaper/linen and ingesting the bacteria.
 - Engaging in sexual activity that involves contact with stool.

The most common sources of *Cryptosporidium* outbreaks are contaminated drinking water, recreational water parks, pools, lakes, and contaminated beverages.

Public Health Significance

Symptoms of cryptosporidiosis can include watery diarrhea, stomach cramps, upset stomach, slight fever, weight loss, and vomiting (more common in children). Symptoms usually begin seven days (range of 1-12 days) after a person becomes infected. In healthy people, symptoms usually last about two weeks or less. However, it is common for symptoms to fade and then return. This relapse of illness can continue for up to 30 days.

Some people with cryptosporidiosis may not have any symptoms, but they can still pass the disease to others. After infection, people can shed *Cryptosporidium* in their stool for months. People with weakened immune systems may not be able to clear the infection. This may lead to prolonged disease and even death. Being infected with *Cryptosporidium* and recovering from the infection does not provide any immunity against reinfection.

Antiparasitic drugs are available for treatment. Also, there are over-the-counter medications that can ease the symptoms. Since diarrhea can cause dehydration, an infected person should drink plenty of fluids.

In general, cryptosporidiosis can be prevented by strictly adhering to the following guidelines:

- Practice good hygiene:
 - Thoroughly wash hands with soap and water after using the restroom; after assisting someone with diarrhea and/or vomiting; after contact with animals and reptiles; after swimming; before, during, and after food preparation; and after exposure to raw meat products.
 - Clean food preparation work surfaces, equipment, and utensils with soap and water before, during, and after food preparation, especially after contamination with raw meat products.

- Separate raw and cooked foods:
 - Avoid cross-contamination by keeping uncooked meat products and marinades separate from produce, ready-to-eat foods, and cooked foods.
 - Use separate equipment and utensils to handle raw foods.
- Eat safe foods and drink safe water:
 - Do not consume unpasteurized dairy products or juices.
 - Wash all produce before cooking or eating raw.
 - Use treated chlorinated water for washing, cooking, and drinking.
 - Avoid swallowing recreational water.
 - Test your well if:
 - Members of your family or others who use the same water are becoming ill,
 - The well is located at the bottom of a hill or it is considered shallow, or
 - The well is located in a rural area where animals graze.
- Protect others:
 - Persons with diarrhea and/or vomiting should not prepare food or provide health care services for others and should limit direct contact with others as much as possible.
 - Persons with diarrhea and/or vomiting should not attend a daycare facility or school.
 - Do not change diapers near recreational water.
 - Do not go swimming or use hot tubs if you have diarrhea and for at least two weeks after diarrhea stops.
- Handle animals safely:
 - Wash hands after contact with livestock, petting zoos, pets (including reptiles and amphibians), especially if they are suffering from diarrhea, and after contact with pet food/treats (including live or frozen rodents).
 - Keep pets out of food-preparation areas.
 - Have pets checked for parasites by your veterinarian, especially if they have diarrhea.
 - Do not clean pet or reptile cages in the kitchen sink or in the bathtub.
 - Reptiles should not be allowed to roam the house.
 - Reptiles should not be kept in daycare facilities or classrooms.
 - Children less than five years of age, pregnant women, and persons with weakened immune systems should not handle reptiles.
- Travel safely outside of the U.S.:
 - Drink bottled beverages and water, even when brushing teeth.
 - Do not eat uncooked fruits or vegetables unless you peel them yourself.
 - Do not eat foods or beverages from street vendors.
 - Do not consume local water or ice.

Healthy People 2010 Goal

There is no Healthy People 2010 Goal for cryptosporidiosis.

Epidemiology and Trends

In 2009, 280 cases of cryptosporidiosis were reported in Indiana, for a rate of 4.36 cases per 100,000 population ([Table 1](#)). This represents a 36 percent increase from 2008 (3.18). Females (5.31) were more likely to be reported than males (3.35). The rate for whites (2.77) was higher than that for blacks (2.38) and other races (2.03); however, 106 cases (37.9%) did not report race data. A steady increase in cryptosporidiosis has been observed in the last five years.

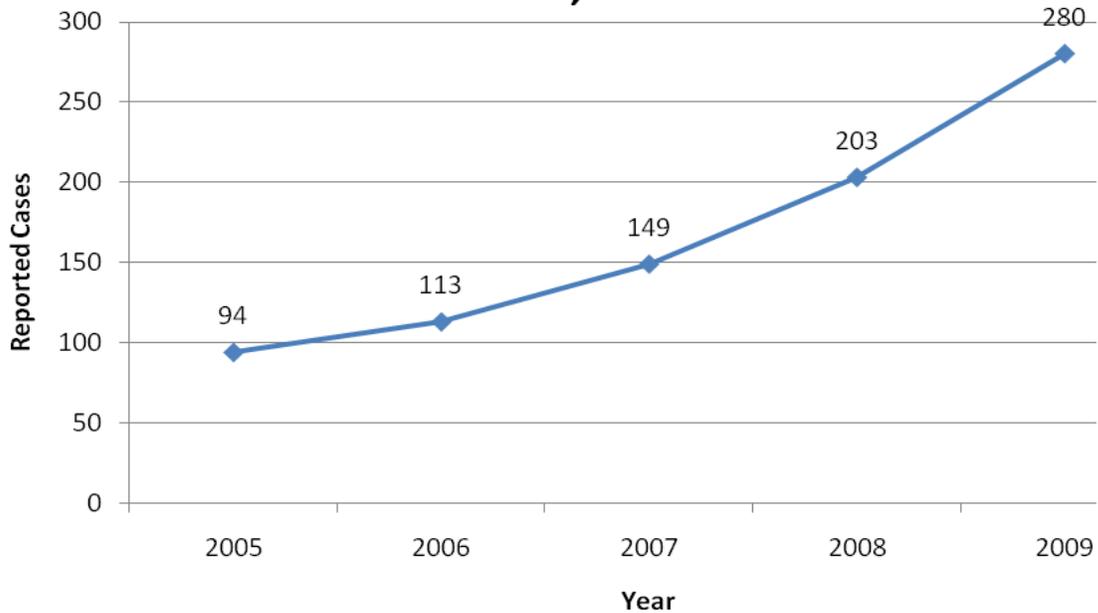
Table 1: Cryptosporidiosis Case Rate by Race and Sex, Indiana, 2009

	Cases	Rate*	2005 - 2009 Total
Indiana	280	4.36	839
Race			
Black	14	2.38	40
White	156	2.77	569
Other	4	2.03	21
Not Reported	106		209
Sex			
Female	173	5.31	479
Male	106	3.35	355
Unknown	0		5

*Rate per 100,000 population based on U.S. Census Bureau's population data as of July 1, 2009

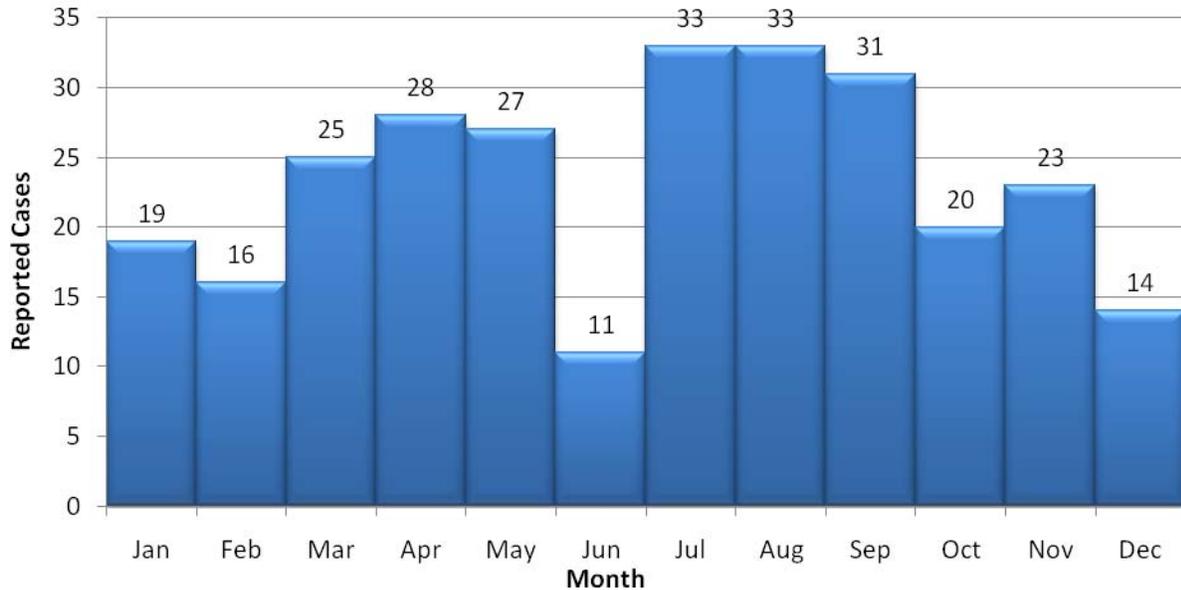
Figure 1 shows the number of reported cases each year for 2005-2009.

**Figure 1: Cryptosporidiosis Cases by Year
Indiana, 2005-2009**



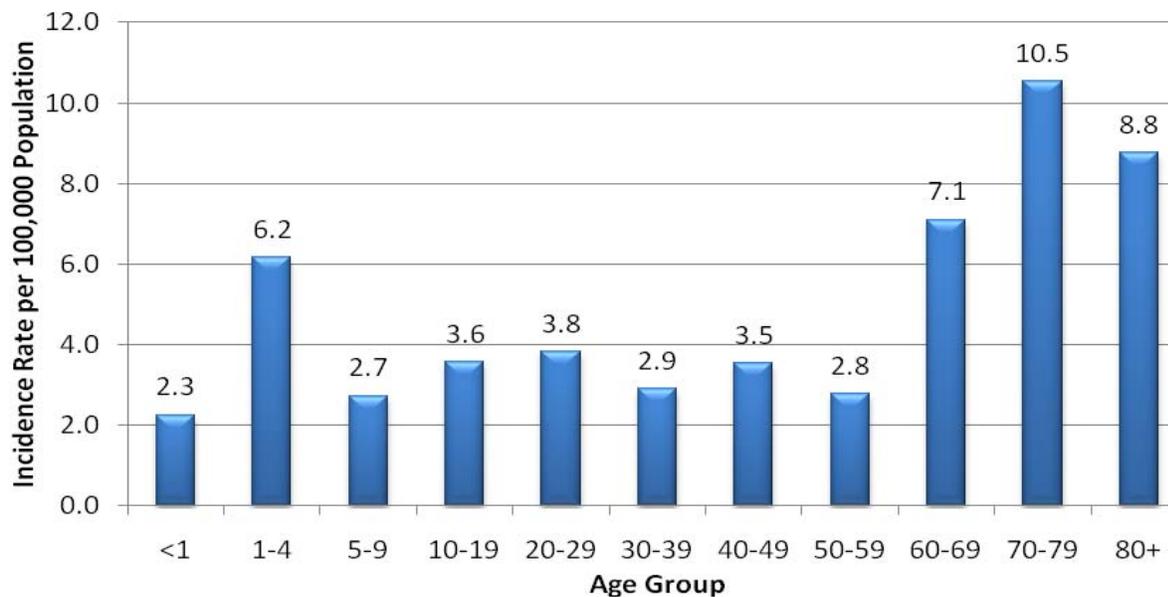
Disease incidence was greatest during the late summer months (Figure 2).

**Figure 2: Cryptosporidiosis Cases by Month
Indiana, 2009**



As shown in Figure 3, age specific rates were greatest for adults aged 70 – 79 (10.5), adults over 80 years of age (8.8), adults aged 60-69 (7.1), and preschoolers aged 1-4 years (6.2).

**Figure 3: Cryptosporidiosis Incidence Rates
by Age Group - Indiana, 2009**



The incidence rates were highest among the following counties reporting five or more cases: Steuben (32.8), Jay (23.7), and Johnson (21.9). [Figure 4](#) shows counties reporting five or more cases of cryptosporidiosis in 2009.

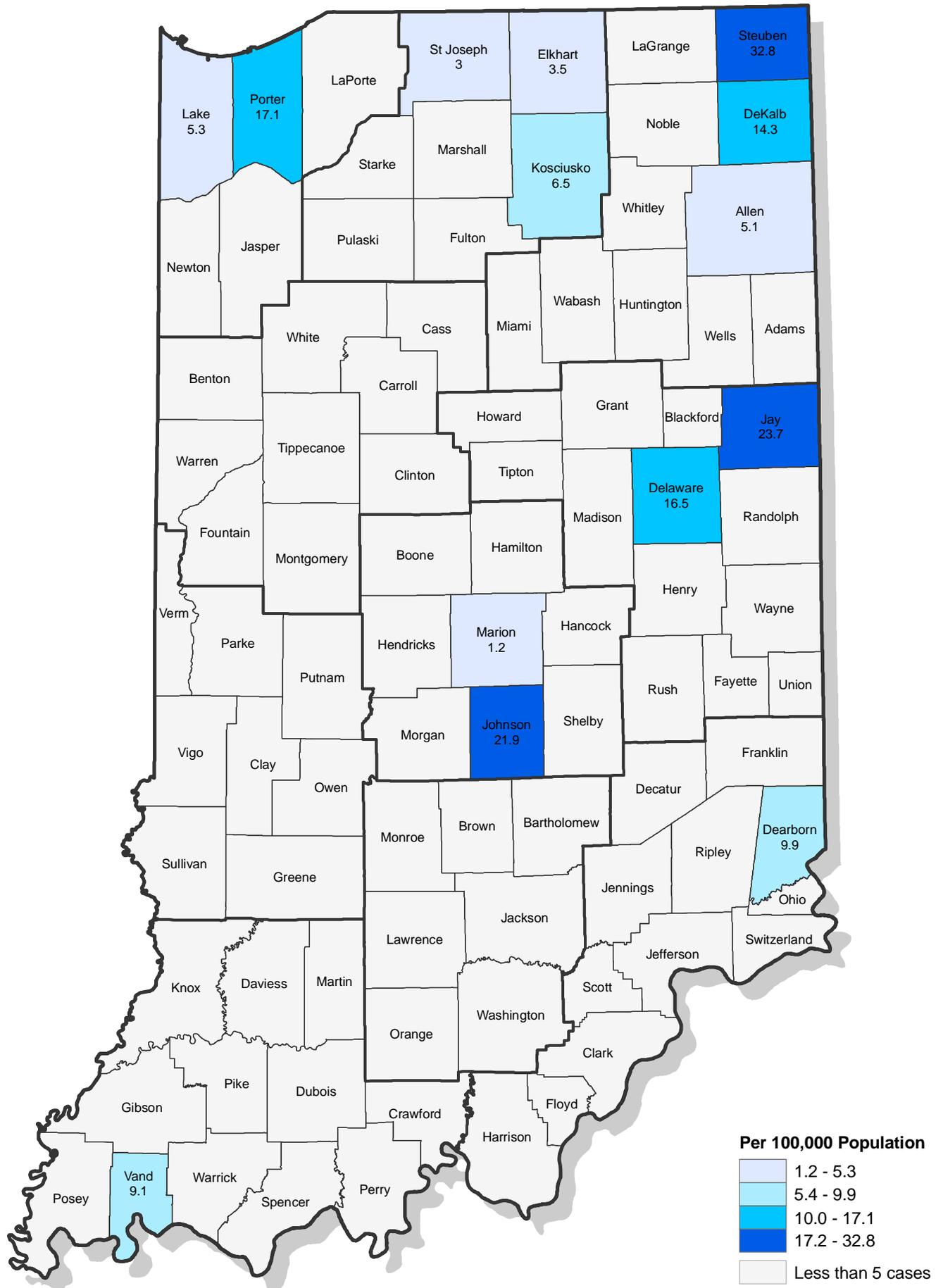
There were no outbreaks of cryptosporidiosis reported in Indiana in 2009.

You can learn more about cryptosporidiosis by visiting the following Web sites:

<http://www.cdc.gov/crypto/>

<http://www.fda.gov/Food/FoodSafety/FoodborneIllness/FoodborneIllnessFoodbornePathogensNaturalToxins/BadBugBook/ucm070753.htm>

Figure 5: Cryptosporidiosis Cases by County – Indiana, 2009



CYCLOSPORIASIS

Cyclosporiasis is an infection caused by a one-celled parasite, *Cyclospora cayetanensis*.

Cyclosporiasis is usually found in developing countries, but in the last several years, infection rates have increased in the U.S. Cyclosporiasis remains a common cause of “traveler’s diarrhea”. Because the parasite is protected by an outer shell (cyst), it can survive outside the body and in the environment for long periods of time. Concentrations of chlorine used in routine water treatment do not kill *Cyclospora* cysts.

People become infected with *Cyclospora* by ingesting feces from an infected animal or person (fecal-oral route). *Cyclospora* needs time (days or weeks) after being passed in a bowel movement to become infectious. Therefore, it is unlikely that *Cyclospora* is passed directly from one person to another. It is not known if animals can be infected and pass the infection to humans.

There are two main ways to become infected with *Cyclospora*:

- Eating contaminated food, such as fresh produce, or drinking water, usually while traveling to countries where the parasite is common.
- Swallowing contaminated water from lakes, rivers, or streams.

The most common sources of *Cyclospora* outbreaks have been linked to various types of imported fresh produce and recreational water.

Public Health Significance

Symptoms of cyclosporiasis can include watery diarrhea (sometimes explosive), loss of appetite, increased gas, stomach cramps, nausea, vomiting, fatigue, and weight loss. Symptoms usually begin one week after exposure and last from a few days to a month or longer. If not treated with anti-parasitics, symptoms can be prolonged and can fade and then return (relapse). Some people infected with *Cyclospora* may not have any symptoms. Being infected with *Cyclospora* and recovering from the infection does not provide any immunity against reinfection.

A health care provider can prescribe medication to treat cyclosporiasis. Since diarrhea can cause dehydration, an infected person should also drink plenty of fluids.

In general, cyclosporiasis can be prevented by strictly adhering to the following guidelines:

- Practice good hygiene:
 - Thoroughly wash hands with soap and water after using the restroom; after assisting someone with diarrhea and/or vomiting; after swimming; before, during, and after food preparation.
 - Clean food preparation work surfaces, equipment, and utensils with soap and water before, during, and after food preparation.
- Separate raw and cooked foods:
 - Avoid cross-contamination by separating produce, ready-to-eat foods, and cooked foods.
 - Use separate equipment and utensils to handle raw foods.
- Eat safe foods and drink safe water:
 - Do not consume unpasteurized dairy products or juices.
 - Wash all produce before cooking or eating raw.
 - Use treated water for washing, cooking, and drinking.
 - Avoid swallowing untreated water.
 - Test your well if:
 - Members of your family or others who use the same water are becoming ill,
 - The well is located at the bottom of a hill or it is considered shallow, or

- The well is in a rural area where animals graze.
- Protect others:
 - Persons with diarrhea and/or vomiting should not prepare food or provide health care for others and should limit direct contact with others as much as possible.
 - Persons with diarrhea and/or vomiting should not attend a daycare facility or school.
 - Do not change diapers near recreational water.
 - Do not go swimming or use hot tubs if you have diarrhea and for at least 2 weeks after diarrhea stops.
- Travel safely outside of the U.S.:
 - Drink bottled beverages and water, even when brushing teeth.
 - Do not eat uncooked fruits or vegetables unless you peel them yourself.
 - Do not eat foods or beverages from street vendors.
 - Do not consume local water or ice.

Healthy People 2010 Goal

There is no Healthy People 2010 Goal for cyclosporiasis.

Epidemiology and Trends

There was one reported case of cyclosporiasis in Indiana in 2009 and only seven during the five-year reporting period 2005 - 2009.

You can learn more about cyclosporiasis by visiting the following Web sites:

www.cdc.gov/ncidod/dpd/parasites/cyclospora/default.htm

<http://www.fda.gov/Food/FoodSafety/FoodborneIllness/FoodborneIllnessFoodbornePathogensNaturalToxins/BadBugBook/ucm122216.htm>

DENGUE FEVER AND DENGUE HEMORRHAGIC FEVER (DHF)

Dengue fever and dengue hemorrhagic fever (DHF), two of the most important mosquito-borne viral diseases of humans, occur in most tropical areas of the world. The disease is caused by one of four virus serotypes (DEN-1 through DEN-4) of the genus *Flavivirus*. The primary vector, the *Aedes aegypti* mosquito, is rarely seen in Indiana. However, another competent vector, *Aedes albopictus*, has been seen in at least 37 Indiana counties. DHF is a more severe form of dengue and can be fatal if not properly treated.

Public Health Significance

Symptoms of dengue occur 3-14 days after the infective bite. Symptoms include fever, headache, muscle aches, nausea and vomiting, and rash. Symptoms of DHF are similar to dengue but manifest into hemorrhagic symptoms, bleeding nose or gums, and possibly internal bleeding. There is no vaccine or specific antiviral medication for dengue. Dengue viruses may be introduced into areas by travelers who become infected while visiting tropical areas where dengue is endemic.

Symptoms of dengue occur 3-14 days after the infective bite. Symptoms include fever, headache, muscle aches, nausea and vomiting, and rash. Symptoms of DHF are similar to dengue but manifest into hemorrhagic symptoms, bleeding nose or gums, and possibly internal bleeding. There is no vaccine or specific antiviral medication for dengue. Dengue viruses may be introduced into areas by travelers who become infected while visiting subtropical and tropical areas where dengue is endemic. While dengue has not been transmitted in Indiana there has been recent cases acquired locally in Florida and Texas. From September 2009 to April 2010 there was an outbreak in Key West, Florida that affected 28 individuals; this represents the first outbreak acquired in the continental United States outside of Texas since 1945. Since 1980, there have been seven localized outbreaks along the Texas-Mexico border. Dengue is the leading cause of acute febrile illness in US travelers returning from the Caribbean, South America, and Asia.

Healthy People 2010 Goal

There is no Healthy People 2010 Goal for dengue or dengue hemorrhagic fever.

Epidemiology and Trends

In 2009 there were four cases of dengue in residents of Indiana. For the five-year period 2005-2009, four cases of dengue were reported in Indiana. All cases were acquired during foreign travel to tropical and subtropical areas. There were no reported cases of dengue hemorrhagic fever during the five-year reporting period 2005-2009.

You can learn more about dengue and dengue hemorrhagic fever by visiting the following Web sites:

<http://www.cdc.gov/dengue/>

<http://wwwn.cdc.gov/travel/yellowBookCh4-denguefever.aspx>

DIPHTHERIA

Diphtheria is caused by the bacterium *Corynebacterium diphtheriae*. Diphtheria may occur in any mucous membrane and is classified based on the site of the infection: anterior nasal, pharyngeal, tonsillar, and laryngeal are all respiratory forms of the disease, while cutaneous (skin) infections also may occur. Humans are the reservoir of the organism. The more severe respiratory forms are caused by toxin-producing strains, while the cutaneous form may be caused by either toxin- or non-toxin producing strains.

The respiratory form of diphtheria is characterized by the formation of a membrane in the throat and/or on the tonsils which can obstruct the respiratory tract and interfere with respiratory function. Medical treatment is dependent on the administration of diphtheria antitoxin, available only from the Centers for Disease Control and Prevention (CDC). Antibiotics are used along with antitoxin to treat diphtheria.

Public Health Significance

Symptoms of diphtheria include sore throat, fever, and enlarged lymph nodes located in the neck. Symptoms usually begin 2-5 days after infection but may take as long as 10 days to appear. Most complications, including death, can be attributed to the toxin being absorbed into organs and tissues of the body. Myocarditis and neuritis are the most frequent complications from the infection. The overall case-fatality rate is 5-10 percent.

Diphtheria is prevented through administration of a primary series of diphtheria toxoid injections. Adults and children 7 years of age and older require three injections. Infants and children less than 7 years of age require five injections. Both adults and children should receive boosters every 10 years following completion of the primary series. Prior to routine vaccination, as many as 200,000 cases of diphtheria, responsible for as many as 15,000 deaths, occurred each year in the United States.

Due to global travel, exposure to diphtheria is still possible. Although rare in the U.S. due to vaccination, diphtheria can infect unimmunized or partially immunized travelers visiting endemic countries.

Healthy People 2010 Goal

The Healthy People 2010 Goal for diphtheria is total elimination. Indiana has met that goal since 1996.

Epidemiology and Trends

No cases of diphtheria have been reported in Indiana since 1996.

You can learn more about diphtheria by visiting the following Web site:

<http://wwwnc.cdc.gov/travel/yellowbook/2010/chapter-2/diphtheria.aspx>

EHRlichiosis

Ehrlichiosis is a tick-borne disease that has been recognized in the U.S. since the mid-1980s. Human monocytic ehrlichiosis (HME) is caused by the bacterium *Ehrlichia chaffeensis* and is transmitted to humans by the lone star tick, *Amblyomma americanum*. The disease occurs mostly in the southeastern and south central parts of the U.S. Human granulocytic anaplasmosis (HGA), previously known as human granulocytic ehrlichiosis (HGE), is caused by the bacterium *Anaplasma phagocytophilum* and is transmitted to humans by the deer tick, *Ixodes scapularis*.

Public Health Significance

Symptoms of ehrlichiosis are similar to Rocky Mountain spotted fever and include sudden high fever, muscle aches, headache, and tiredness. Symptoms are generally mild and usually appear 3-16 days after a tick bite. People at highest risk of getting ehrlichiosis are those who spend time outdoors in tick-infested areas from April until October when ticks are most active.

There is no vaccine for ehrlichiosis, but the disease can be treated with antibiotics.

Healthy People 2010 Goal

There is no Healthy People 2010 Goal for ehrlichiosis.

Epidemiology and Trends

There were seven reported cases of ehrlichiosis in 2009 in Indiana. From 2005-2009, 12 cases of ehrlichiosis were reported in Indiana.

You can learn more about ehrlichiosis by visiting the following Web site:

<http://www.cdc.gov/ticks/diseases/ehrlichiosis/>.

ESCHERICHIA COLI

Escherichia coli is a bacterium that lives in the intestines of most healthy warm-blooded animals, including humans. There are hundreds of strains of *E. coli*, and most are harmless. However, several types of *E. coli*, such as O157 and other shiga toxin-producing strains, can cause severe and contagious illness in humans. Shiga-toxins are potent cytotoxins produced by some *E. coli*. The most severe clinical manifestation of shiga-toxin producing *E. coli* (STEC) infection is hemolytic uremic syndrome (HUS).

People become infected with *E. coli* by ingesting feces from an infected animal or person (fecal-oral route). There are many ways to become infected with *E. coli*:

- Eating contaminated foods:
 - Undercooked beef products, particularly ground beef.
 - Unpasteurized milk and fruit juices, including apple cider.
 - Unwashed raw fruits, vegetables, or herbs that have been contaminated by feces, raw meats, fertilizers, or untreated water.
 - Untreated water, e.g., from lakes or streams.
- Having direct contact with the stool of infected cattle, livestock, and animals at petting zoos
- Having contact with an infected person's stool:
 - Not washing hands after contact with stool from a contaminated surface or diaper/linen and ingesting the bacteria.
 - Engaging in sexual activity that involves contact with stool.

The most common sources of *E. coli* outbreaks are inadequately cooked hamburgers, contaminated produce (such as melons, lettuce, spinach, coleslaw, apple cider, and alfalfa sprouts), and unpasteurized milk. Persons who work in certain occupations, such as food handlers, daycare providers, and health care providers, have a greater risk of transmitting infection to others.

Public Health Significance

Symptoms of *E. coli* include diarrhea (bloody or non-bloody), abdominal cramps, and little to no fever. Symptoms usually begin 3-4 days (range of 2-10 days) after exposure and last for approximately 5-10 days. Some people may have only mild diarrhea or no symptoms at all. The bacteria can be passed in the stool for up to three weeks after symptoms have stopped. Most people recover from infection without medical treatment. The use of antibiotics or over-the-counter antidiarrheal agents is not recommended, as the use of these can lead to greater likelihood of developing HUS.

Approximately 8 percent of people infected with *E. coli* (O157 and other Shiga toxin-producing strains) develop a condition called hemolytic uremic syndrome (HUS). This condition is very serious and can lead to kidney failure and death. Children less than 5 years of age and the elderly are more likely to develop HUS. Serious infections that affect the kidneys will require hospitalization and extensive medical care.

In general, *E. coli* infection can be prevented by strictly adhering to the following guidelines:

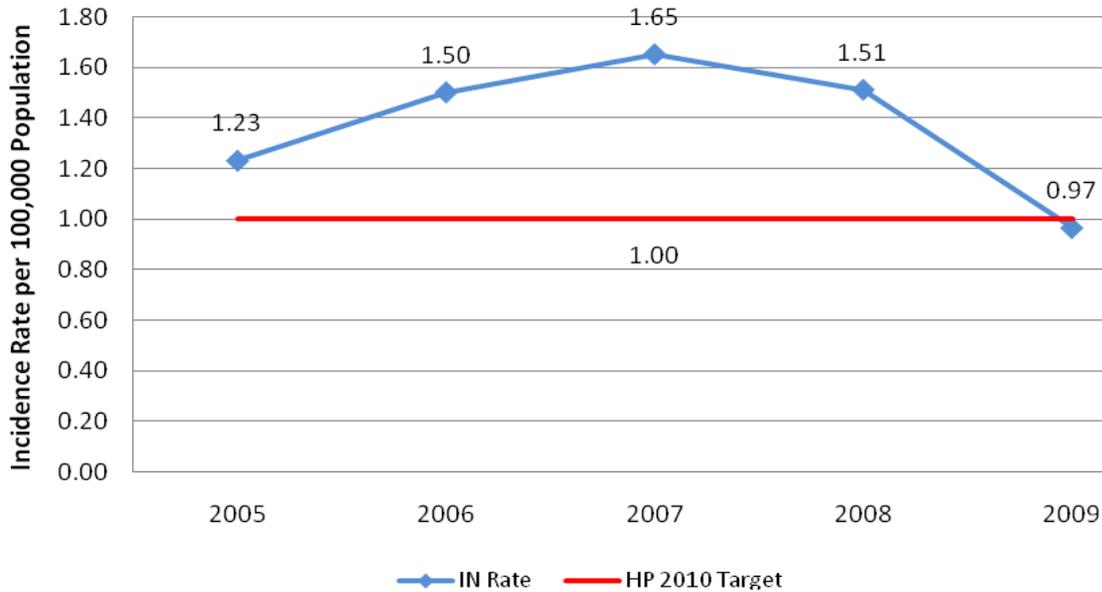
- Practice good hygiene:
 - Thoroughly wash hands with soap and water after using the restroom; after assisting someone with diarrhea and/or vomiting; after contact with animals; after swimming; before, during, and after food preparation; and after exposure to raw meat products.
 - Clean food preparation work surfaces, equipment, and utensils with soap and water before, during, and after food preparation, especially after contamination with raw meat products.
- Separate raw and cooked foods:

- Avoid cross-contamination by keeping uncooked meat products separate from produce, ready-to-eat foods, and cooked foods.
- Use separate equipment and utensils for handling raw foods, especially for marinades or barbeque sauce.
- Clean food-preparation work surfaces and utensils with soap and water before, during, and after food preparation, especially after contact with raw meat products.
- Maintain safe food temperatures:
 - Ensure proper temperatures are maintained during refrigeration (<40°F), freezing (<2°F), holding (keep food hot or at room temperature for no longer than 2 hours), and chilling (chill immediately and separate into smaller containers if needed).
 - Thoroughly cook all food items to USDA-recommended safe minimum internal temperatures:
 - 145°F – steaks and roasts
 - 160°F – pork and ground beef (should not be eaten pink)
- Eat safe foods:
 - Do not eat undercooked meat.
 - Do not eat foods past the expiration date.
 - Do not eat unpasteurized dairy products and fruit juices, including apple cider; it is illegal to sell unpasteurized dairy products in Indiana.
 - Wash all produce before eating raw or cooking.
 - Use treated water for washing, cooking, and drinking.
- Handle animals safely:
 - Wash hands after contact with livestock, petting zoos, and pets, especially if they are suffering from diarrhea.
- Protect others:
 - Persons with diarrhea and/or vomiting should not prepare food or provide health care for others and should limit direct contact with others as much as possible.
 - Persons with diarrhea and/or vomiting should not attend a daycare facility or school.

Healthy People 2010 Goal

The Healthy People 2010 Goal for *Escherichia coli* is 1.0 case per 100,000 population per year. Indiana did not meet this goal in 2005-2008, but did in 2009 (Figure 1). Nationally, *E. coli* cases decreased in 2004. The decrease is likely due to the USDA's Food Safety and Inspection Service implementing new safety recommendations to combat *E. coli* 0157 in ground beef. Since 2004, several national outbreaks of *E. coli* have occurred which validate the need for continuous education on effective control measures and enhanced food safety systems.

**Figure 1: *Escherichia coli* Rates by Year
Indiana, 2005-2009**



Epidemiology and Trends

In 2009, 62 cases of *E. coli* O157:H7 infection were reported in Indiana, for a rate of 0.97 cases per 100,000 population (Table 1). Females (1.04) were slightly more likely to be reported than males (0.88). The rate for other races was higher (1.01) than that for whites (0.62) or blacks (0); however, 25 cases (40.3%) did not report race data.

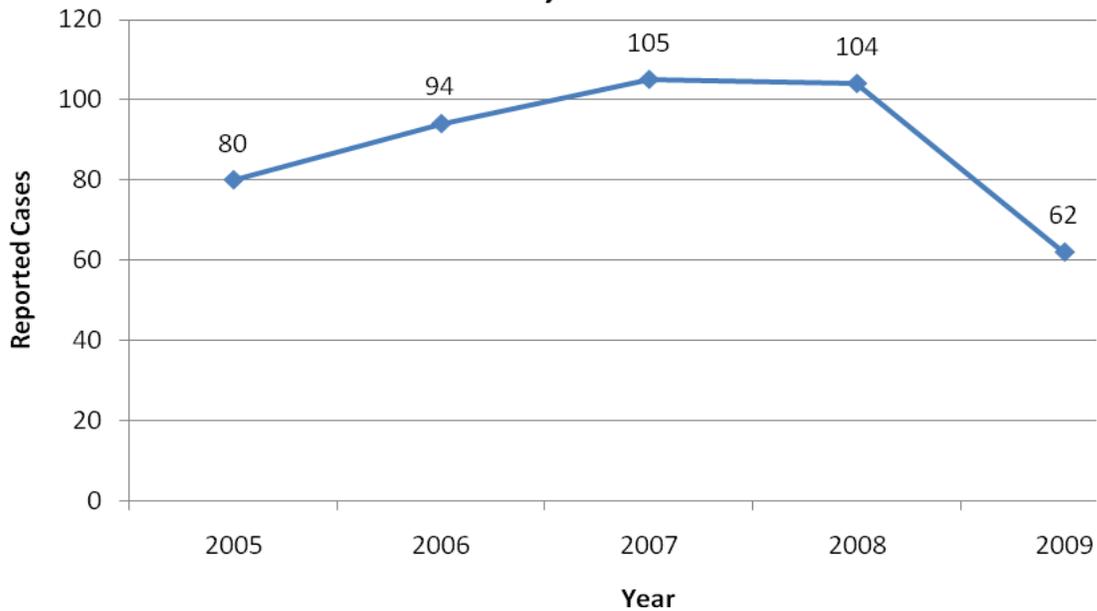
Table 1. *E. coli* O157:H7 Cases by Race and Sex, Indiana, 2009.

	Cases	Rate*	2005- 2009 Total
Indiana	62	0.97	445
Race			
Black	0	0	14
White	35	0.62	320
Other	2	1.01	6
Not Reported	25		105
Sex			
Female	34	1.04	238
Male	28	0.88	207
Unknown	0	0	0

*Rate per 100,000 population based on U.S. Census Bureau's population data as of July 1, 2009

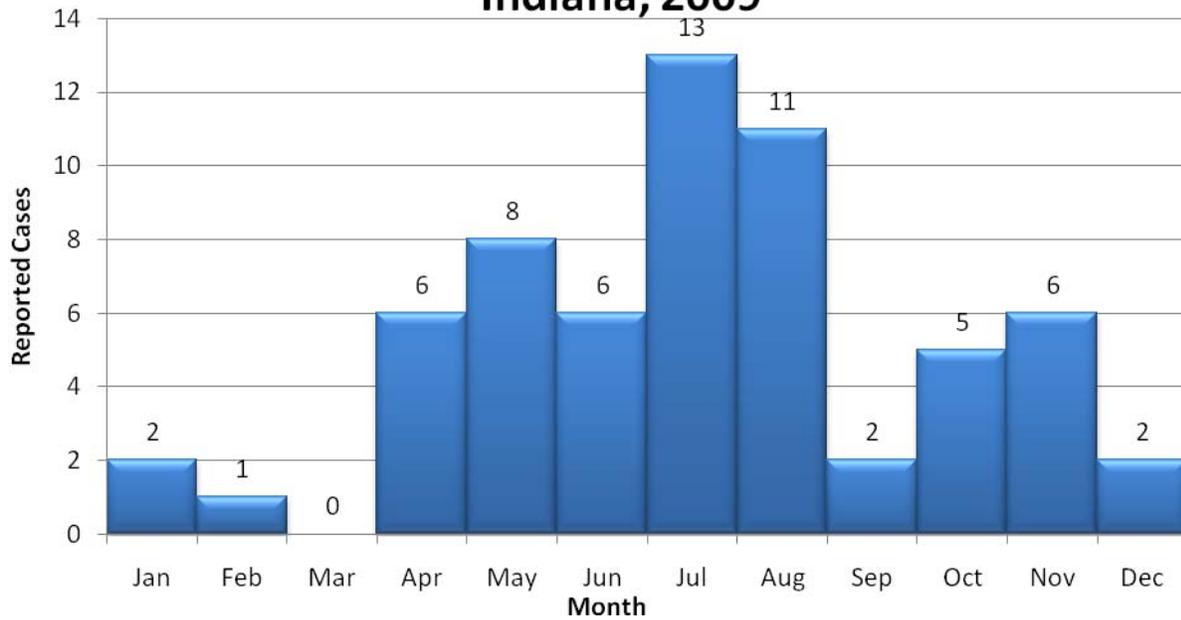
Figure 2 shows the number of reported cases per year for 2005-2009.

**Figure 2: *Escherichia coli* Cases by Year
Indiana, 2005-2009**



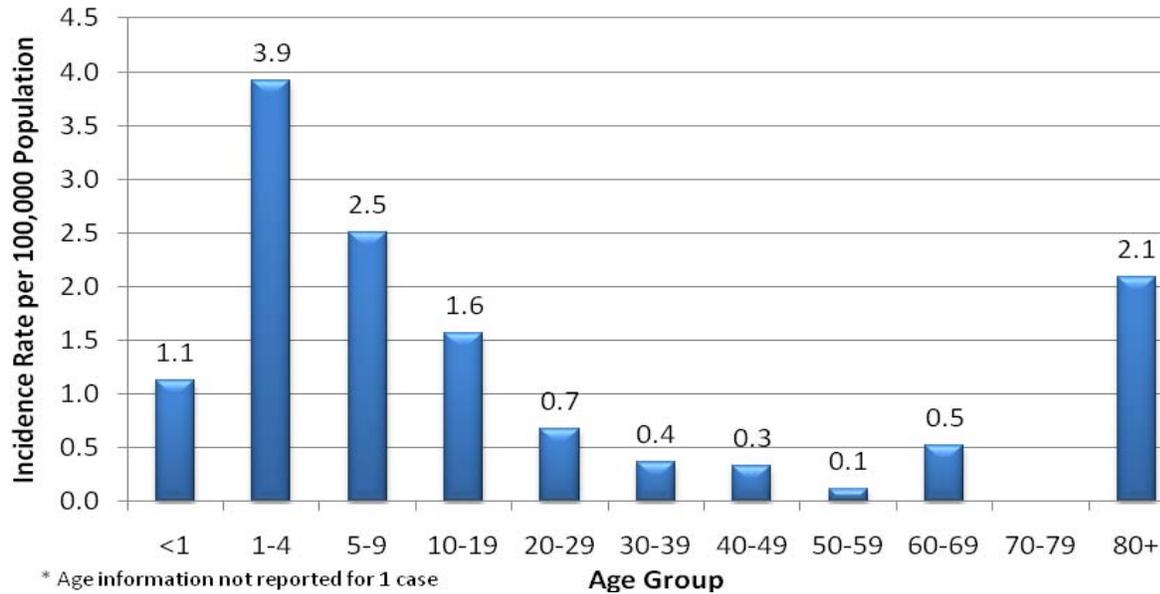
Incidence of disease was greatest during the summer months. Figure 3 shows the number of cases per month in Indiana for 2009.

**Figure 3: *Escherichia coli* Cases by Month
Indiana, 2009**



As shown in [Figure 4](#), age-specific rates were highest among preschoolers aged 1-4 years (3.9), followed by children aged 5-9 years (2.5), and adults 80 years and older (2.1).

Figure 4: *Escherichia coli* Incidence Rates by Age Group - Indiana, 2009



Although 32 counties reported cases of *E. coli* O157:H7, only two counties had five or more cases (Figure 5).

Seven cases of HUS was reported in 2009.

Clinical laboratories should routinely screen all stool specimens for sorbitol-negative *E. coli* strains. Lack of sorbitol fermentation in *E. coli* bacteria is a biochemical marker for the O157:H7 serotype and other shiga toxin-producing strains.

You can learn more about *Escherichia coli* by visiting the following Web sites:

<http://www.cdc.gov/ecoli/>

<http://www.fda.gov/Food/FoodSafety/FoodborneIllness/FoodborneIllnessFoodbornePathogensNaturalToxins/BadBugBook/ucm071284.htm>

Figure 5: *Escherichia Coli* O157:H7 Cases by County – Indiana, 2009



GIARDIASIS

Giardiasis is a contagious disease caused by a one-celled parasite, *Giardia lamblia*, which is found in the intestines of many animals. During the past two decades, *Giardia* infection has become recognized as one of the most common causes of waterborne disease (found in both drinking and recreational water) in the United States. Because the parasite is protected by an outer shell (cyst), it can survive outside the body and in the environment for long periods of time. Concentrations of chlorine used in routine water treatment do not kill *Giardia* cysts. From 1997-2000, there was an average of 665 cases of giardiasis reported in Indiana every year.

Giardia is passed in the stool, and people become infected by ingesting feces from an infected animal or person (fecal-oral route).

There are several ways to become infected with *Giardia*:

- Having contact with an infected person's stool:
 - Not washing hands after contact with stool from a contaminated surface or diaper/linen and ingesting the bacteria.
 - Having sex that involves contact with stool.
- Swallowing untreated water from lakes or streams.
- Swallowing treated but unfiltered drinking or recreational water.
- Direct contact with the stool of infected cattle, livestock, and animals from petting zoos.

Giardiasis is more common in children than adults. Large community outbreaks have occurred from drinking treated but unfiltered water. Smaller outbreaks have resulted from contaminated food, person-to-person transmission in day care facilities, and contaminated recreational waters.

Public Health Significance

Symptoms of giardiasis can include diarrhea, gas, greasy stools that tend to float, bloating, stomach cramps, nausea, and constipation. Symptoms usually begin within 7-10 days (range of 3-25 days) after exposure and last 2-6 weeks. These symptoms may lead to weight loss and dehydration, but some persons infected may have no symptoms. Infected people may carry *Giardia* in their bodies for weeks or months without symptoms and unknowingly infect others.

While medications are available for giardiasis, they are not needed if the person does not have diarrhea. Over-the-counter drugs may relieve symptoms but will not get rid of the parasite.

In general, giardiasis can be prevented by strictly adhering to the following guidelines:

- Practice good hygiene:
 - Thoroughly wash hands with soap and water after using the restroom; after assisting someone with diarrhea and/or vomiting; after swimming; before, during, and after food preparation.
 - Clean food preparation work surfaces, equipment, and utensils with soap and water before, during, and after food preparation.
- Separate raw and cooked foods:
 - Avoid cross-contamination by separating produce, ready-to-eat foods, and cooked foods.
 - Use separate equipment and utensils for handling raw foods.
- Eat safe foods and drink safe water (Remember: Contaminated foods may look and smell normal):
 - Do not consume unpasteurized dairy products or juices.
 - Wash all produce before eating raw or cooking.
 - Use treated water for washing, cooking, and drinking.

- Avoid swallowing untreated water.
- Test your well if:
 - Members of your family or others who use the same water are becoming ill,
 - The well is located at the bottom of a hill or it is considered shallow, or
 - The well is in a rural area where animals graze.
- Protect others:
 - Persons with diarrhea and/or vomiting should not prepare food or provide health care for others and should limit direct contact with others as much as possible.
 - Persons with diarrhea and/or vomiting should not attend a day care facility or school.
 - Persons with diarrhea and/or vomiting shall be excluded from employment involving food handling (Indiana Retail Food Establishment Sanitation Requirements, 410 IAC 7-24-122).
 - Do not change diapers near recreational water.
 - Do not go swimming or use hot tubs if you have diarrhea and for at least 2 weeks after diarrhea stops.
- Handle animals safely:
 - Wash hands after contact with livestock, petting zoos, pets, especially if they are suffering from diarrhea.
 - Have pets checked for parasites by your veterinarian, especially if they have diarrhea.
- Safe travel outside of the United States:
 - Drink bottled beverages and water, even when brushing teeth.
 - Do not eat uncooked fruits or vegetables unless you peel them yourself.
 - Do not eat foods or beverages from street vendors.
 - Do not consume local water or ice.

Healthy People 2010 Goal

There is no Healthy People 2010 Goal for giardiasis.

Epidemiology and Trends

In 2009, 310 cases of giardiasis were reported in Indiana, for a rate of 4.83 cases per 100,000 population (Table 1). Males (5.02) were more likely to be reported than females (4.51). The rate for other races (14.71) was higher than that for blacks (4.42) or whites (2.54); however, 112 cases (36.1%) did not report race data. Giardiasis was newly reportable in 2009.

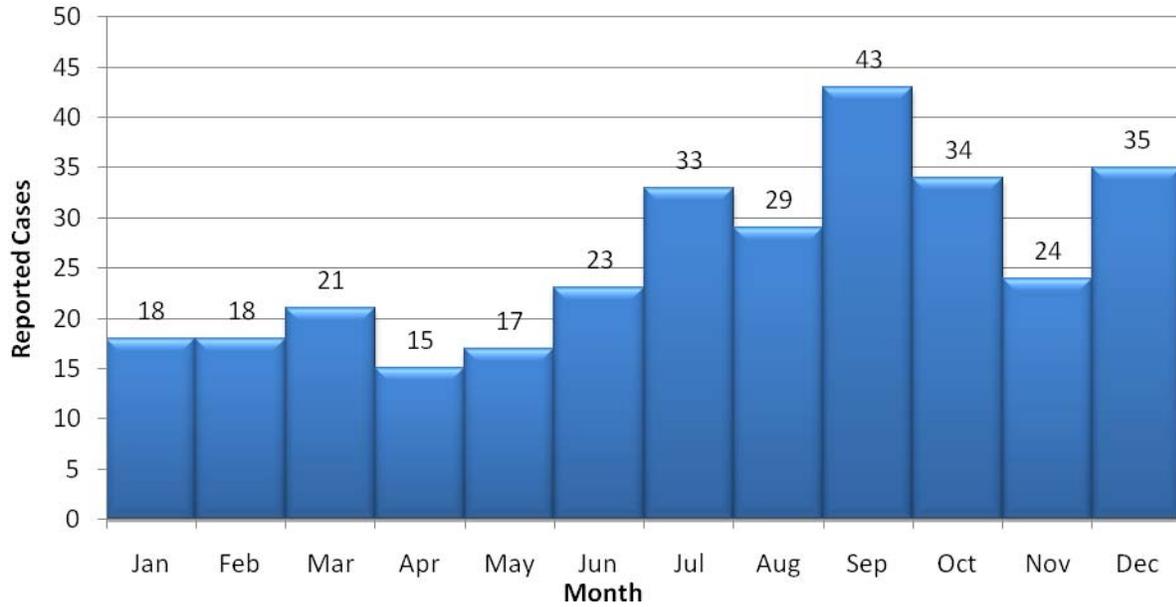
Table 1: Giardiasis Case Rate by Race and Sex, Indiana, 2009

	Cases	Rate*
Indiana	310	4.83
Race		
Black	26	4.42
White	143	2.54
Other	29	14.71
Not Reported	112	
Sex		
Female	147	4.51
Male	159	5.02
Unknown	0	

*Rate per 100,000 population based on U.S. Census Bureau's population data as of July 1, 2009

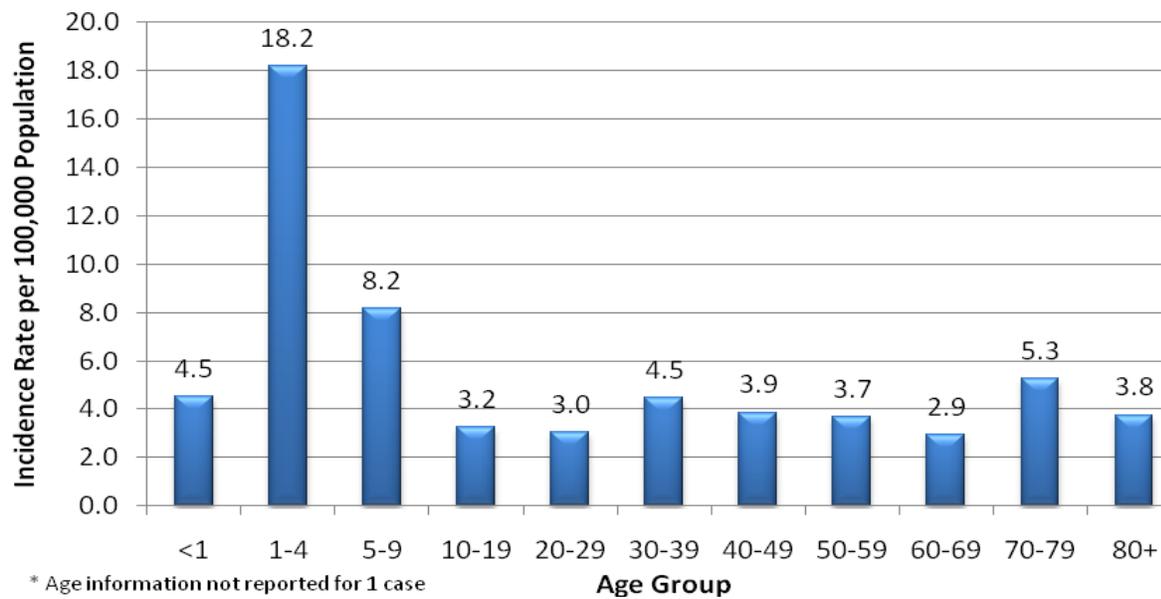
Disease incidence was greatest during the latter half of the year (Figure 1).

**Figure 1: Giardiasis Cases by Month
Indiana, 2009**



As shown in Figure 2, age specific rates were greatest for preschoolers aged 1-4 (18.2), children aged 5-9 (8.2) and adults aged 70-79 years (5.3).

**Figure 2: Giardiasis Incidence Rates by
Age Group - Indiana, 2009**



The incidence rates were highest among the following counties reporting five or more cases: Decatur (19.9), Steuben (17.9), and Knox (15.8). [Figure 3](#) shows counties reporting five or more cases of giardiasis in 2009.

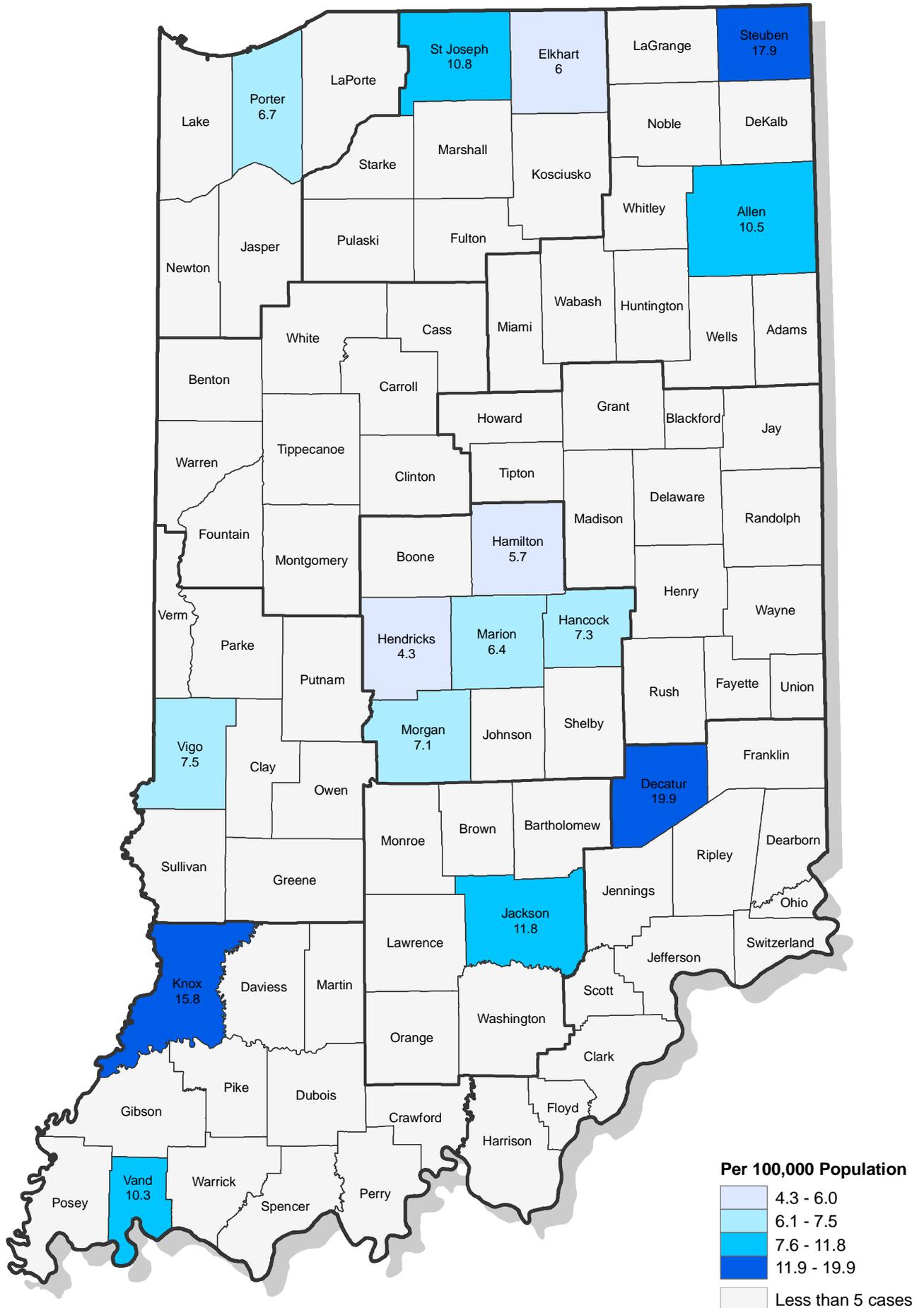
There were no outbreaks of giardiasis reported in Indiana in 2009.

You can learn more about giardiasis by visiting the following Web sites:

<http://www.cdc.gov/ncidod/dpd/parasites/giardiasis/default.htm>

<http://www.fda.gov/Food/FoodSafety/FoodborneIllness/FoodborneIllnessFoodbornePathogensNaturalToxins/BadBugBook/ucm070716.htm>

Figure 5: Giardiasis Cases by County – Indiana, 2009



INVASIVE *HAEMOPHILUS INFLUENZAE*

Invasive *Haemophilus influenzae* (*H. influenzae*) is a disease caused by a bacterium of the same name. It can be typeable (encapsulated) or nontypeable (non-encapsulated). The encapsulated form has been classified into serotypes A through F. Humans are the natural host, with up to 80 percent of healthy individuals colonized with the nontypeable form.

Public Health Significance

H. influenzae can cause a number of invasive infections, including bacteremia/sepsis, meningitis, pneumonia, epiglottitis, arthritis, and cellulitis. Symptoms of *H. influenzae* usually begin suddenly and can include fever, vomiting, lethargy, and meningeal irritation with bulging fontanelle (soft spot) in infants or stiff neck and back in older children. As the infection progresses, stupor or coma can occur.

Infections caused by the bacterium are commonly treated with antibiotics. Susceptibility tests can assist in the selection of appropriate treatment. Prevention of infection through immunization is the most effective way to reduce transmission of *H. influenzae* serotype b (Hib), which prior to routine immunization, accounted for 95% of all cases of invasive *H. influenzae*. All cases of invasive *H. influenzae* disease, regardless of age or serotype, are reportable in Indiana. Indiana requires laboratories to submit *H. influenzae* isolates for serotype analysis.

Before the widespread use of vaccines, Hib was the leading cause of bacterial meningitis in children. Since the introduction of the conjugate Hib vaccine in 1990, the incidence of Hib disease in children has decreased dramatically in both the U.S. and Indiana. Since vaccine is available to protect only against Hib, serotyping all *H. influenzae* isolates from patients (especially from children less than 5 years of age) with invasive disease is necessary to monitor the effectiveness of the vaccination program and national progress towards Hib elimination. Serotype information also is needed to measure the sensitivity of the surveillance system and to detect the emergence of invasive disease caused by types of *H. influenzae* other than type b.

A Hib vaccine recall in December 2007 and resulting interim recommendations to defer the booster dose of Hib vaccine in healthy children highlights the importance of ongoing surveillance and serotyping for invasive *Haemophilus influenzae*.

Healthy People 2010 Goal

The Healthy People 2010 Goal for *H. influenzae* type b disease is to eliminate all *H. influenzae* type b disease in children less than 5 years of age. This task will require aggressive immunization education and campaigning, especially for populations that decline vaccinations. In 2009, two cases of *Haemophilus influenzae* type b disease occurred in Indiana in children less than 5 years of age for whom isolates were submitted for testing.

Epidemiology and Trends

Indiana had 86 reported cases of invasive *H. influenzae* (all serotypes) disease in 2009. Females (1.50 per 100,000) were slightly more likely than males (1.17 per 100,000) to acquire *H. influenzae*. The rate of illness for whites (1.10 per 100,000) was lower than that for blacks (1.19 per 100,000).

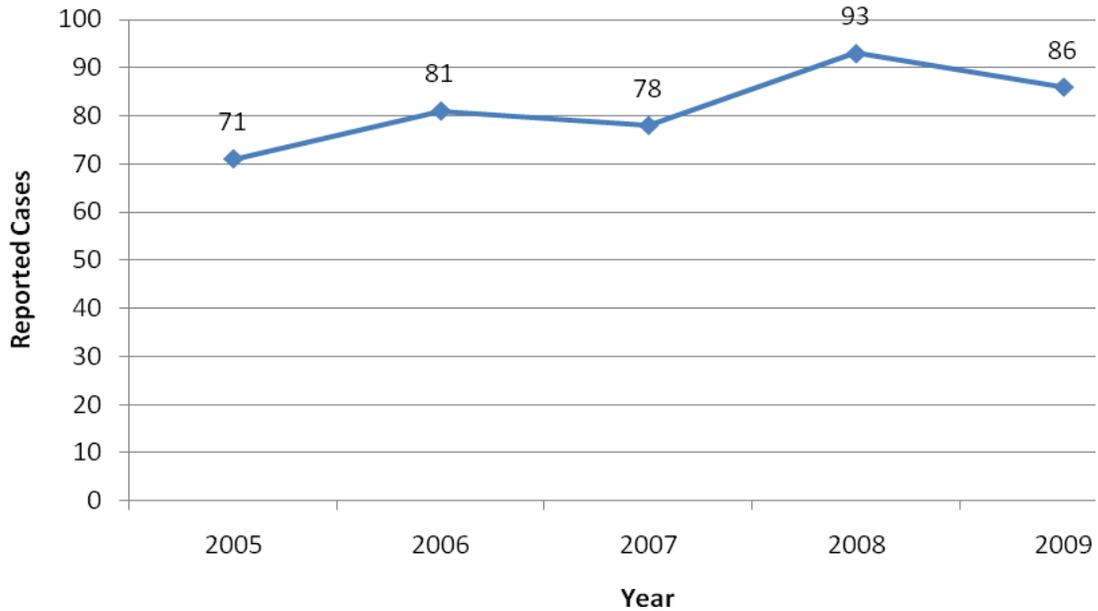
Table 1: *H. Influenzae* Case Rate by Race and Sex, Indiana, 2009

	Cases	Rate*	2005 - 2009 Total
Indiana	86	1.34	409
Race			
Black	7	1.19	32
White	62	1.10	324
Other	0	0.00	2
Not Reported	17	-	51
Sex			
Female	49	1.50	223
Male	37	1.17	186
Unknown	0	-	0

*Rate per 100,000 population based on U.S. Census Bureau's population data as of July 1, 2009

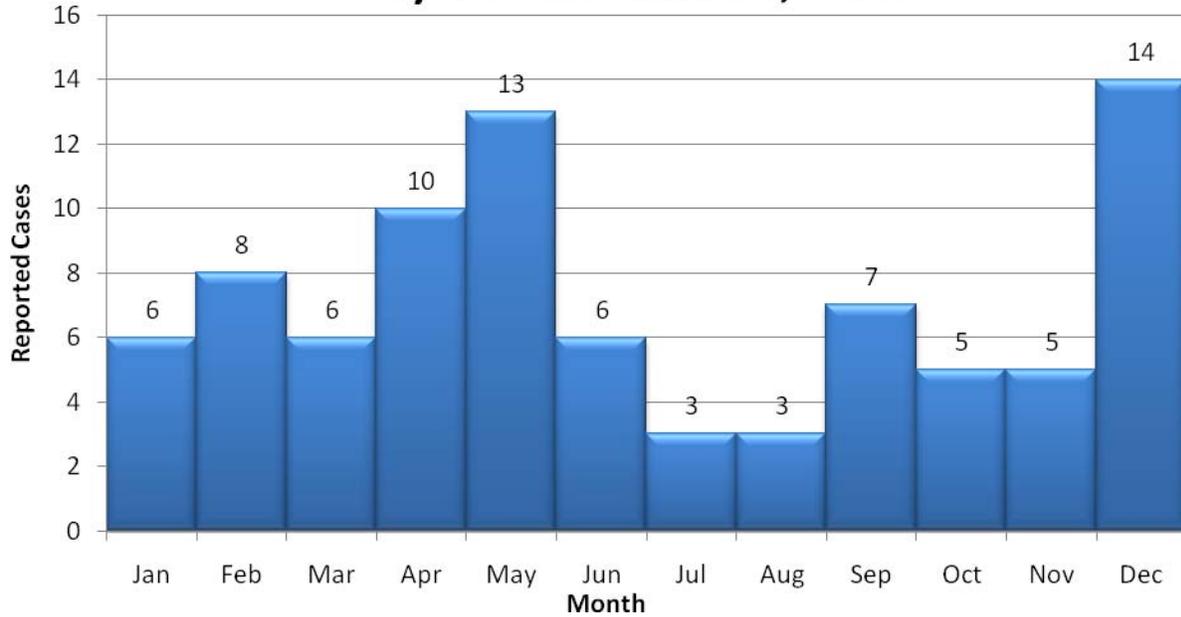
Figure 1 shows reported cases of *H. influenzae* for the five-year period 2005-2009.

**Figure 1: *Haemophilus Influenzae* Cases by Year
Indiana, 2005-2009**



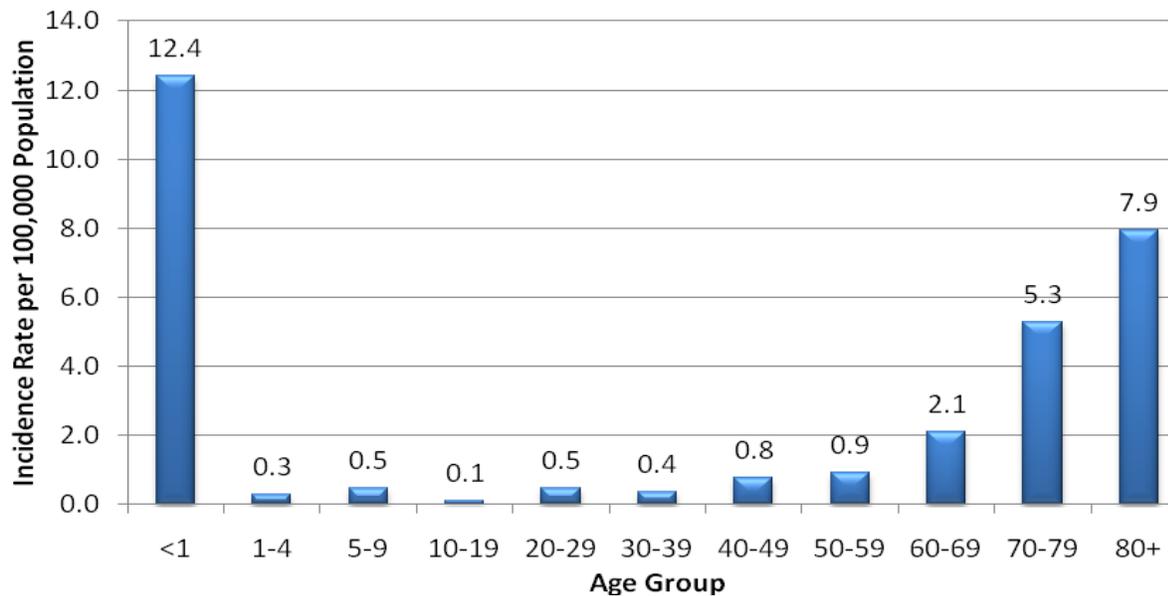
H. influenzae occurred throughout the year in 2009, with the highest number of cases occurring in April, May, and December (Figure 2).

Figure 2: *Haemophilus Influenzae* Cases by Month - Indiana, 2009



Age-specific rates were greatest for infants less than 1 year of age (12.4), followed by adults ages 80 years and older (7.9) and adults ages 70 to 79 (5.3). Figure 3 shows *H. influenzae* incidence by age group.

Figure 3: *Haemophilus Influenzae* Incidence Rates by Age Group - Indiana, 2009



Although 35 counties reported cases of *H. influenzae*, only three counties had 5 or more cases. The highest incidence rate among counties reporting 5 or more cases was in Allen County (2.3).

Of the 86 cases reported in 2009, 77 (89.5%) were serotyped. [Table 2](#) provides a breakdown of *H. influenzae* cases by serotype.

Table 3: Percent of Reported *Haemophilus influenzae* Cases by Serotype, 2009

Type	Number	Percent
a	1	1.2
b	5	5.8
c	0	-
d	0	-
e	5	5.8
f	15	17.4
Nontypeable	51	59.3
Not Tested/Unknown	9	10.5
Total	86	100.0

You can learn more about *H. influenzae* by visiting the following Web site:

http://www.cdc.gov/ncidod/dbmd/diseaseinfo/haeminfluserob_t.htm

Figure 5: Haemophilus Influenzae Cases by County – Indiana, 2009



HANTAVIRUS

Hantavirus pulmonary syndrome (HPS) is an acute respiratory disease caused by the Sin Nombre virus. Deer mice are the most common carriers of the virus. Rodents shed the virus in their urine, droppings, and saliva. The main route of transmission for humans is breathing air contaminated with the virus. The disease was first described as a clinical syndrome, and the causative agent was identified as the Sin Nombre virus in the Four Corners area (Utah, New Mexico, Colorado, Arizona) in 1993. Most cases have been reported from states west of the Mississippi River. However, 12 states east of the Mississippi have reported cases, including Indiana. Since 1993, two hantavirus cases have been reported in Indiana, resulting in one death.

Public Health Significance

The initial symptoms of hantavirus include fever, tiredness, headache, and fatigue. As the disease progresses, symptoms may include shortness of breath and coughing due to lungs filling with fluid (pneumonia). Symptoms occur 1-6 weeks after exposure to the virus. There is no vaccine for hantavirus.

People most at risk for becoming infected with hantavirus include those who visit or reside in closed spaces where infected rodents live, including campers and hikers and those who work or play outdoors. In addition, housecleaning activities such as sweeping or vacuuming can release contaminated particles into the air.

Healthy People 2010 Goal

There is no Healthy People 2010 Goal for hantavirus.

Epidemiology and Trends

No hantavirus cases were reported in Indiana in 2009 or during the five-year reporting period 2005-2009.

You can learn more about hantavirus by visiting the following Web site:

<http://www.cdc.gov/ncidod/diseases/hanta/hps/index.htm>

HEPATITIS A

Hepatitis A is an inflammation of the liver caused by the hepatitis A virus (HAV). HAV is not normally found in animals. People become infected with HAV by coming in contact with the stool of an infected person (fecal-oral route). For this reason, the virus is easily spread in areas where there are poor sanitary conditions or where good personal hygiene is not practiced. Persons are at risk for hepatitis A infection if they have:

- Exposure to contaminated food or water, such as:
 - Consuming untreated water.
 - Consuming food prepared by an infected person.
 - Consuming raw produce or raw shellfish (e.g., oysters).
 - Traveling to countries where hepatitis A is common and where there is limited clean water or proper sewage disposal.
- Exposure to the stool or blood of an infected person who is a(n):
 - Household member or sexual partner (men who have sex with men are at higher risk).
 - Child or staff member of a daycare center (including centers for the disabled).
 - Resident or staff member of a health care center.
 - Injection drug user.

Public Health Significance

Hepatitis A illness is characterized by : immunoglobulin M (IgM) antibody to hepatitis A virus (anti-HAV) positive, an acute illness with a) discrete onset of symptoms (enteric symptoms e.g., nausea, vomiting, diarrhea) and b) jaundice or elevated serum aminotransferase levels. Symptoms of hepatitis A include diarrhea, nausea, vomiting, tiredness, stomach pain, fever, dark urine, pale or clay-colored stool, loss of appetite, and sometimes jaundice. Symptoms usually occur suddenly. People are most contagious from about two weeks before symptoms begin until two weeks after. Some people, especially children, may have no symptoms but can still spread the virus to others.

Symptoms usually begin 28-30 days (range of 15-50 days) after exposure and usually last less than two months. Sometimes a person can recover and become ill again (relapse) for as long as 12 months. However, people will eventually recover, and there is no long-term carrier state with hepatitis A infection. Death from hepatitis A is rare, 0.1-0.3 percent, and is more common in adults over 50.

There is no specific treatment for hepatitis A other than treating symptoms. People who have had hepatitis A develop lifelong immunity and cannot get hepatitis A again.

Hepatitis A can be prevented by a two-dose vaccination series. Candidates for vaccination include persons at increased risk for hepatitis A infection or its consequences including:

- Persons with chronic liver disease or clotting factor disorders
- Men who have sex with men
- Injecting drug users
- Persons traveling to or working in countries where hepatitis A infection is endemic
- Persons who work with hepatitis A virus in a research setting
- Children who live in communities with consistently elevated rates of infection

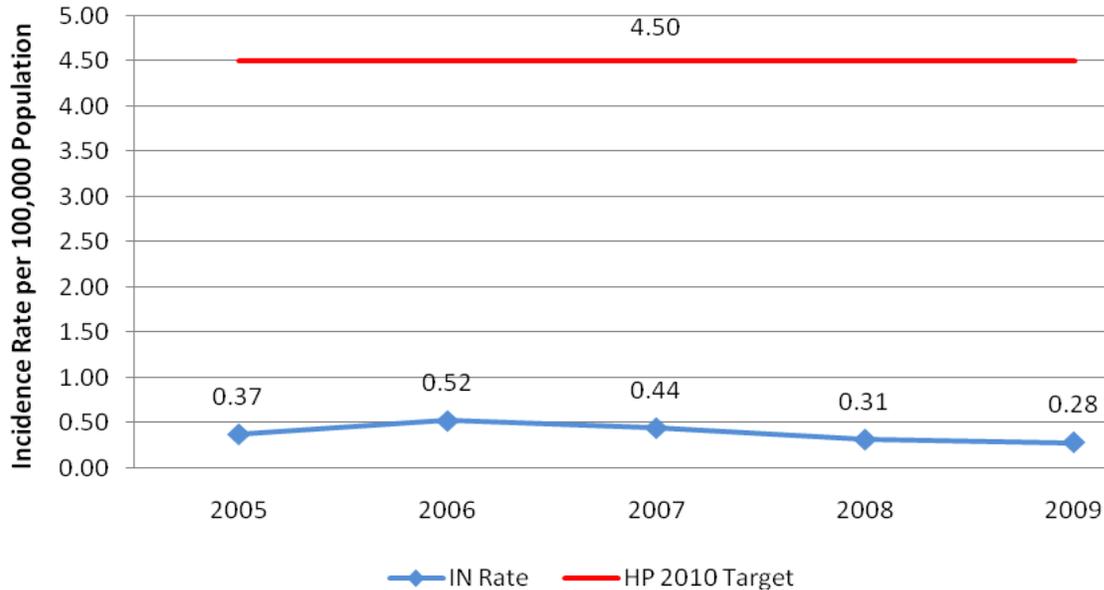
Post-exposure prophylaxis with hepatitis A vaccine or hepatitis A immune globulin is effective if received within two weeks of exposure. Indications for prophylaxis may include: people who consumed food or beverages contaminated with HAV, household or sexual contacts of someone infected with HAV,

children and staff members in the same daycare room as an infected case, and residents and staff members in a health care center who have direct contact with someone infected.

Healthy People 2010 Goal

The Healthy People 2010 Goal for hepatitis A is 4.5 cases per 100,000 population per year. Indiana met this goal for the five-year reporting period 2005-2009 (Figure 1).

**Figure 1: Hepatitis A Rates by Year
Indiana, 2005-2009**



Epidemiology and Trends

In 2009, 18 cases of hepatitis A were reported in Indiana for a rate of less than 1 case per 100,000 population (Table 1). Males (0.38) were more likely to be reported than females (0.18). The rate for other races (0.51) was higher than that for whites (0.18) or blacks (0); however, 7 cases (33.3%) did not report race data.

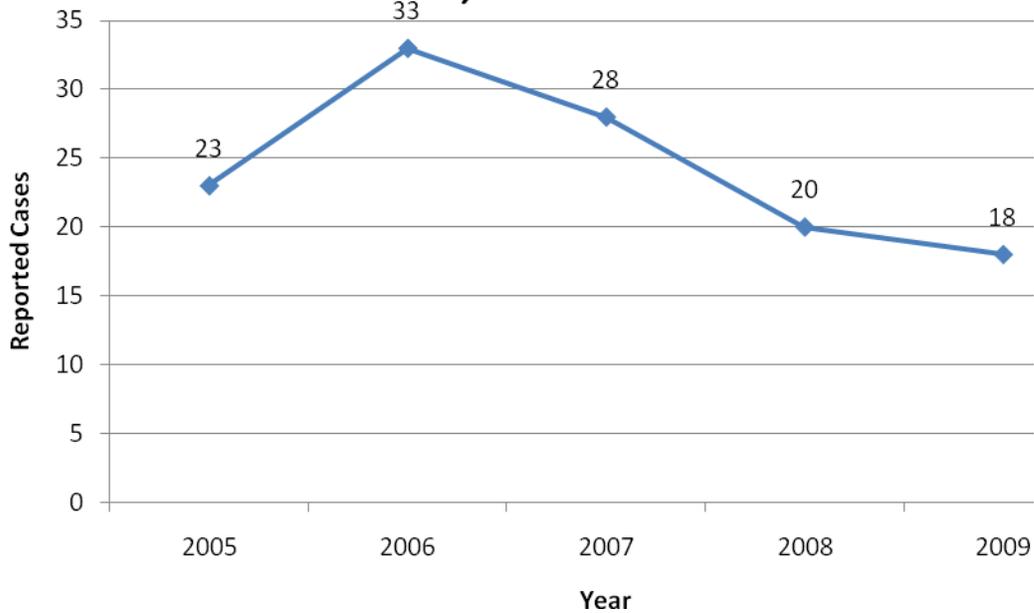
Table 1: Hepatitis A Case Rate by Race and Sex, Indiana, 2009

	Cases	Rate*	2005 - 2009 Total
Indiana	18	0.28	122
Race			
Black	0	0	5
White	10	0.18	84
Other	1	0.51	10
Not Reported	7		23
Sex			
Female	6	0.18	65
Male	12	0.38	56
Unknown	0	0	1

*Rate per 100,000 population based on U.S. Census Bureau's population data as of July 1, 2009

Figure 2 shows the number of reported cases per year for 2005-2009.

**Figure 2: Hepatitis A Cases by Year
Indiana, 2005-2009**



Incidence of disease was greatest in January (Figure 3).

**Figure 3: Hepatitis A Cases by Month
Indiana, 2009**

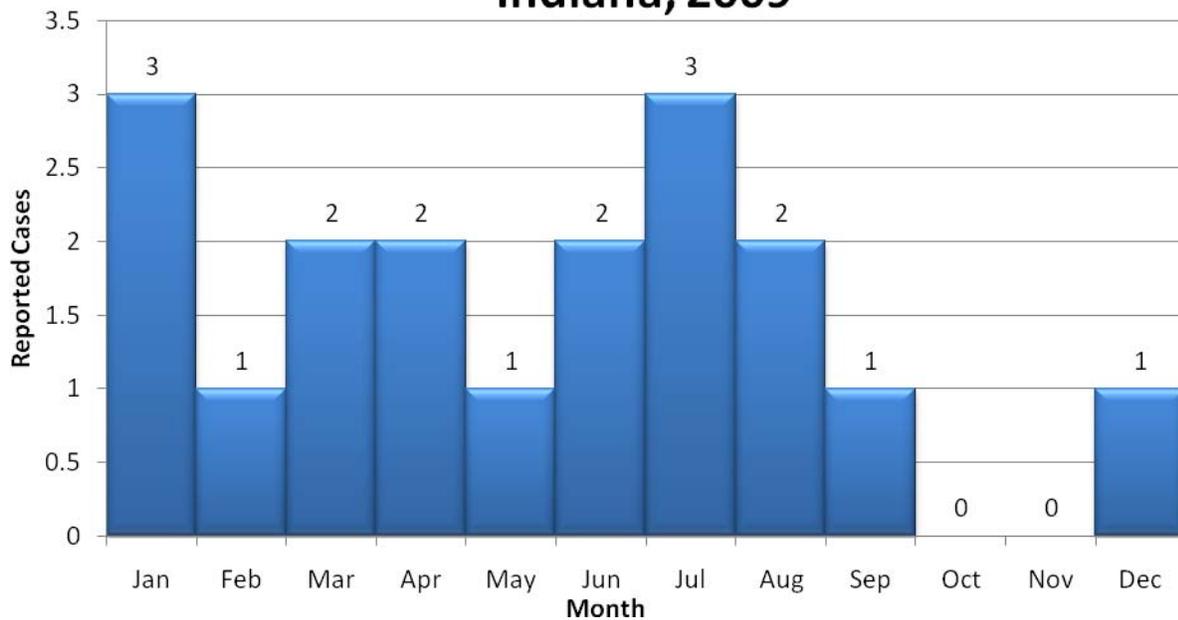
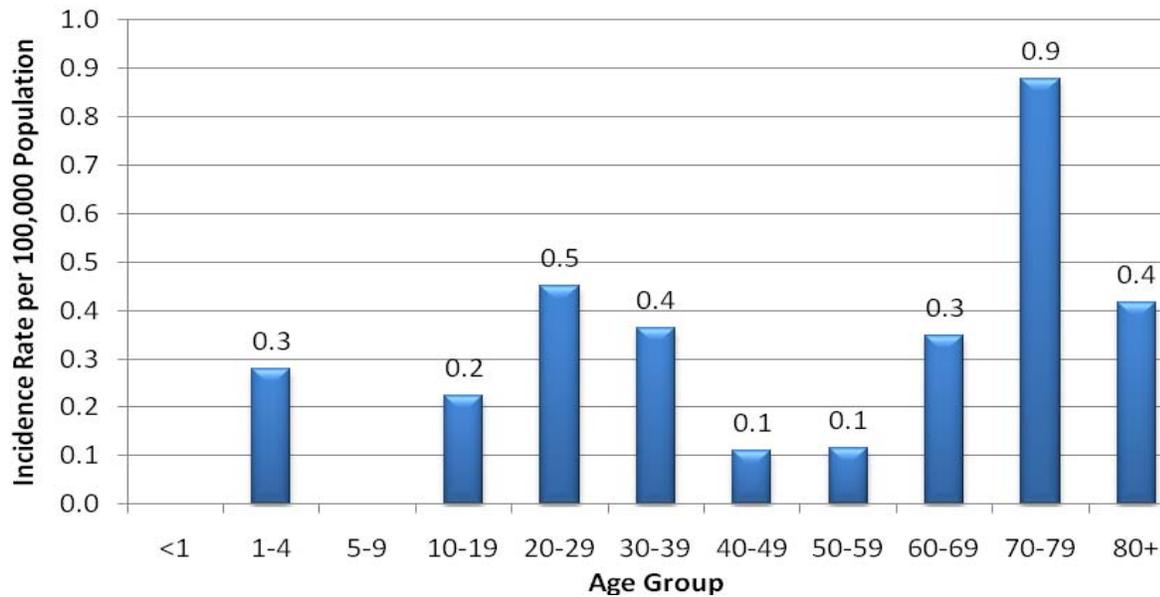


Figure 4 shows age-specific rates were greatest for adults 70-79 years (0.9), followed by adults aged 20–29 years (0.5).

**Figure 4: Hepatitis A Incidence Rates by Age Group
Indiana, 2008**



In 2009, 11 Indiana counties reported cases of hepatitis A, but no county reported 5 or more cases.

You can learn more about hepatitis A by visiting the following Web sites:

<http://www.cdc.gov/hepatitis/index.htm>

<http://www.fda.gov/Food/FoodSafety/FoodborneIllness/FoodborneIllnessFoodbornePathogensNaturalToxins/BadBugBook/ucm071294.htm>

HEPATITIS B

Hepatitis B is caused by infection with the hepatitis B virus (HBV). This serious viral disease of the liver is transmitted through parenteral or mucosal exposure to blood or body fluids of an infected person, such as sexual or household contact with an infected person, injection drug use (IDU), perinatal transmission from mother to infant, and nosocomial exposure. Acute hepatitis B illness is characterized by nausea, anorexia, fever, malaise, headache, myalgia, right upper quadrant abdominal pain, dark urine, skin rash and jaundice. Clinical and laboratory definitions must be met to classify a case as acute hepatitis B. The clinical case definition includes: discrete onset of symptoms (eg. nausea, anorexia, fever, malaise, or abdominal pain) and jaundice or elevated serum aminotransferase levels. Laboratory criteria for confirmation of acute HBV includes: positive IgM antibody to hepatitis B core antigen (anti-HBc) or HBsAg positive and a negative IgM to hepatitis A (if performed).

Public Health Significance

Approximately 50% of adults with acute infection are asymptomatic. The incubation period of HBV ranges from 6 weeks to 6 months, with an average of 120 days. The time variation is related to the amount of virus transmitted, the mode of transmission, and host factors. All persons who are hepatitis B surface antigen (HBsAg) positive are potentially infectious. Most adult acute hepatitis B infection results in complete recovery and immunity from future infection. However, HBV can also produce a chronic infection that is associated with an increased risk for chronic liver disease, cirrhosis, liver failure, and liver cancer. Persons with chronic infection are often asymptomatic but capable of infecting others.

Risk for hepatitis B infection varies with occupation, lifestyle, or environment where there is contact with blood from infected persons. Populations at high risk for hepatitis B infection include: immigrants from areas with endemic rates, institutionalized developmentally disabled individuals, IDU, men who have sex with men (MSM), hemodialysis patients, and household contacts of infected persons. Intermediate risk includes: prisoners, health care workers, staff for developmentally disabled, and heterosexuals with multiple partners.

Safe and effective vaccines have been available for hepatitis B since 1981. After three intramuscular doses of hepatitis B vaccine, more than 90% of healthy adults and more than 95% of infants, children, and adolescents will develop adequate immunity. The dosage of vaccine varies with the age of the recipient and type of vaccine.

Since 1991, a comprehensive strategy for the elimination of HBV transmission in the United States has included: universal vaccination of infants beginning at birth; routine screening of all pregnant women for hepatitis B infection and immunoprophylaxis to infants born to infected women or women of unknown status; routine vaccination of previously unvaccinated children and adolescents; and the vaccination of high risk adults. Hepatitis B vaccination programs will ultimately eliminate domestic hepatitis B transmission, and increased vaccination of adults who have risk factors will accelerate progress toward elimination.

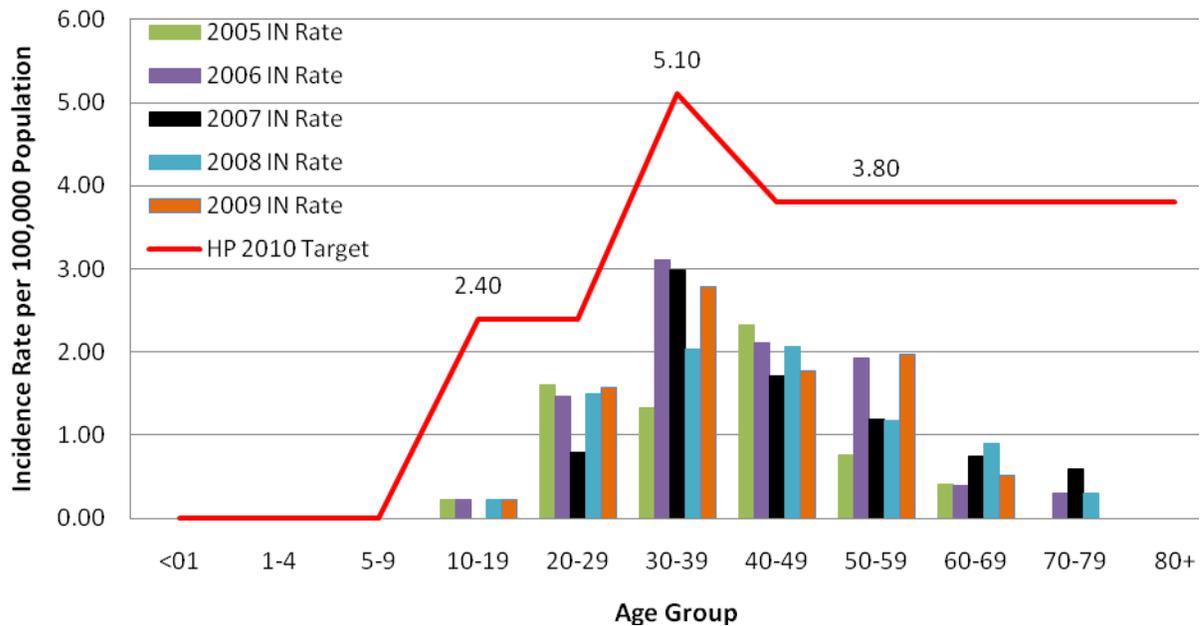
Control measures used to prevent exposures to blood and body fluids include use of universal precautions and disinfection of contaminated equipment. Contacts should be immunized, and when appropriate, given hepatitis B immune globulin (HBIG).

The Indiana State Department of Health (ISDH) requires reporting of a positive HBsAg laboratory result including the prompt reporting and case management of acute hepatitis B as detailed in the Communicable Disease Reporting Rule [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf).

Healthy People 2010 Goal

The Healthy People 2010 Goal for hepatitis B is to reduce cases of vaccine-preventable hepatitis B disease in persons aged 2-18 years to nine cases nationally (99% decrease) and to reduce cases per 100,000 population in the following age groups: people aged 19- 24 years to 2.4 cases, people aged 25 - 39 years to 5.1 cases, and people aged 40 years and older to 3.8 cases. Indiana met this goal during the five-year reporting period 2004-2008. [Figure 1](#) shows incidence rates per 100,000 population per age group and the Healthy People 2010 Goal.

**Figure 1: Hepatitis B Incidence by Age Group
Indiana, 2005-2009**



Epidemiology and Trends

In 2009, there were 75 confirmed cases of acute hepatitis B disease reported in Indiana ([Table 1](#)). No cases resulted in death.

The data presented in this report does not include the burden of disease caused by chronic infection with HBV, which is a substantial public health problem.

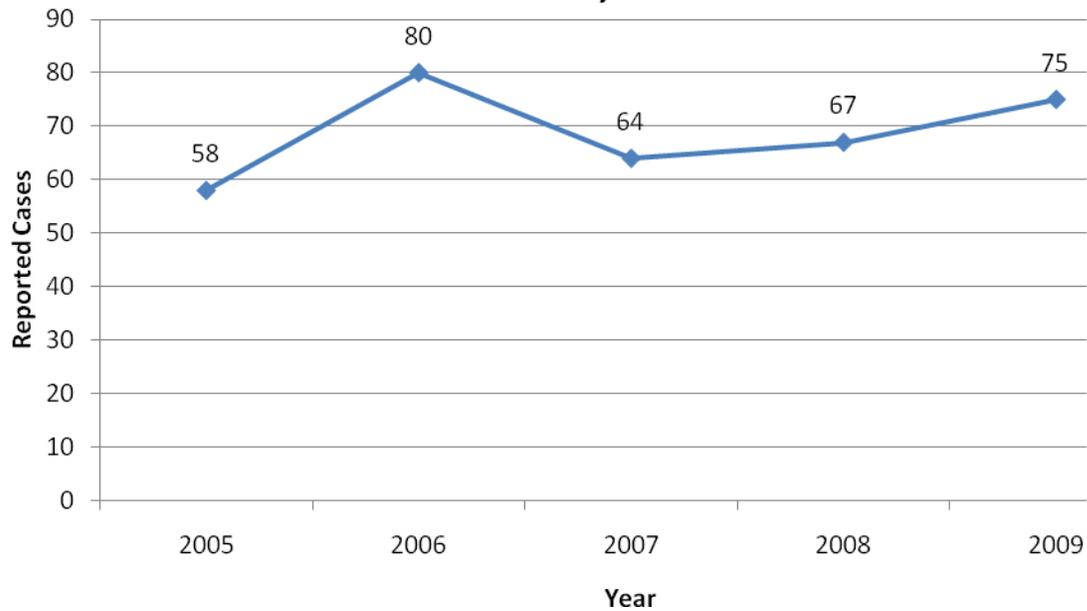
Table 1: Case Rate by Race and Sex, Indiana, 2009

	Cases	Rate*	2005- 2009 Total
Indiana	75	1.17	344
Race			
Black	15	2.55	61
White	47	0.83	230
Other	1	0.51	11
Not Reported	12	-	42
Sex			
Female	24	0.74	101
Male	51	1.61	243
Unknown	0	-	0

*Rate per 100,000 population based on U.S. Census Bureau's population data as of July 1, 2009

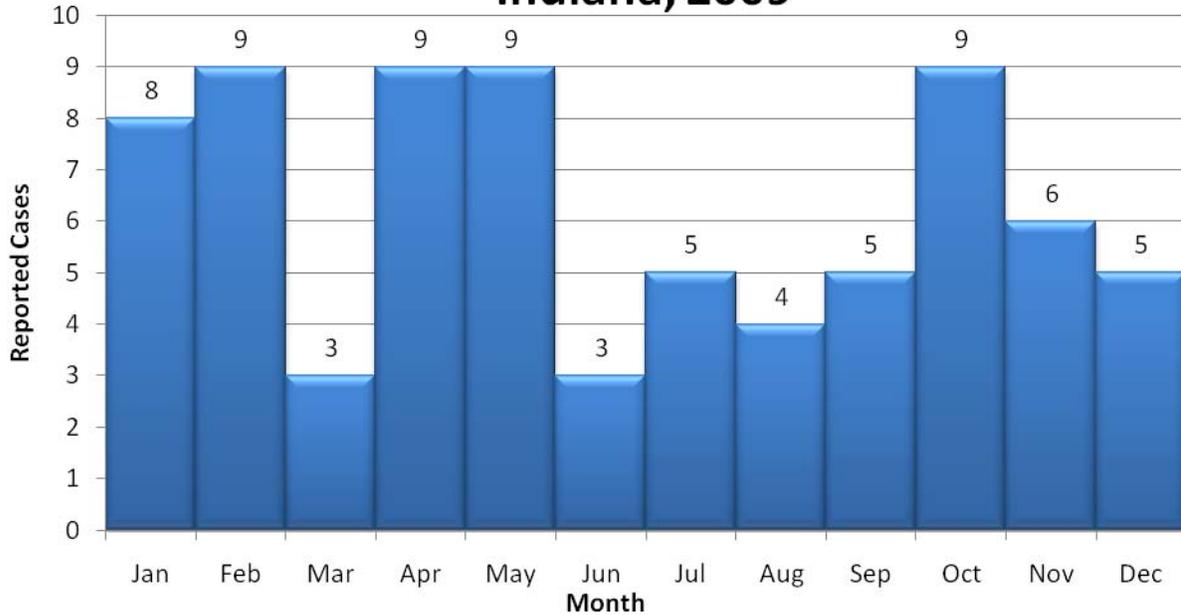
Figure 2 shows reported cases of acute hepatitis B for the five-year period 2005-2009. Eighty cases in both 2004 and 2006 remain the highest number of annual acute hepatitis B reports. In 2009 there was an increase in reported cases as compared to 2008 (67). Hepatitis B lab results are being assigned and investigated earlier in the disease process than previous years due to electronic reporting. Also, significant staffing changes within local health departments could account for an increase in hepatitis B identification and reporting.

Figure 2: Hepatitis B Cases by Year
Indiana, 2005-2009



Acute hepatitis B cases occurred during each month in 2009 without specific seasonality (Figure 3).

**Figure 3: Hepatitis B Cases by Month
Indiana, 2009**



Reported cases varied with age. Figure 4 shows acute hepatitis B incidence rates by age group per 100,000 population. In Indiana, as well as nationally, higher rates of hepatitis B disease continue among adults, particularly males 25-44 years of age and persons with identified risk factors (ie. IDU, MSM, and persons with multiple sex partners). This data emphasizes the need to vaccinate adults at risk for hepatitis B infection.

**Figure 4: Hepatitis B Incidence Rates by Age Group
Indiana, 2009**

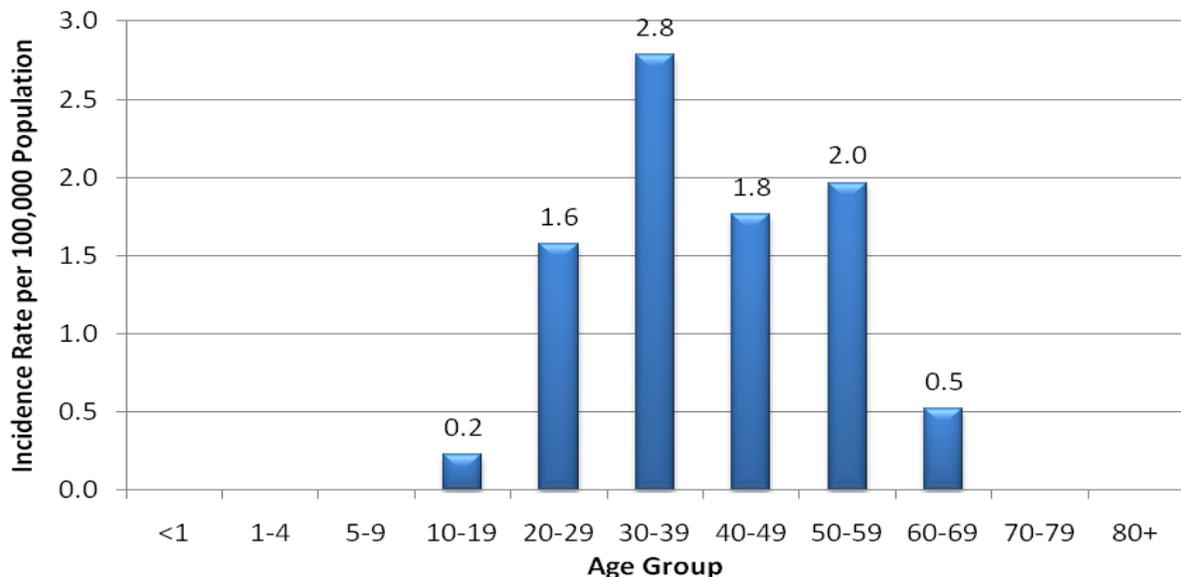


Table 2 highlights the risk factors identified in 2009 for acute hepatitis B cases in Indiana. Completeness of reporting risk factor information prior to infection varies. The proportion of heterosexuals reporting multiple sex partners, IDU, and self-identified MSM continue to be the most common risk factors.

Table 2. Hepatitis B Risk Factors – Indiana, 2009

Risk Factor	Number of Cases (Percent of Cases)
Multiple Sex Partners	14 (18.67%)
Application of a Tattoo	8 (10.67%)
Injection Drug Use	9 (12.00%)
Homosexual/Bisexual	10 (13.33%)
Medical Employment	1 (1.33%)
History of Dental Work	8 (10.67%)
History of Surgery	3 (4.0%)
Contact of a Case	7 (9.33%)

In 2009, twenty-six Indiana counties reported at least one case of acute hepatitis B. The incidence rates were highest among the following counties reporting five or more cases: Scott (25.4) and Marion (2.8) (Figure 5).

The CDC recommends HBsAg testing to identify chronic hepatitis B infection for all foreign-born persons from countries or regions with an HBV prevalence of 2.0% or greater. In 2009, sixteen Indiana counties reported at least one case of chronic hepatitis B occurring in a refugee. The incidence rates were highest among the following counties reporting five or more cases: Allen (33.68) and Marion (44.21). These two counties are Refugee Centers receiving refugees from Eritrea, Liberia, and Myanmar.

Indiana law requires the reporting of perinatal HBV infection. In 2009, no perinatal cases were reported. The goal of the ISDH perinatal hepatitis B program is to ensure appropriate prophylactic treatment of infants born to HBV infected mothers.

You can learn more about hepatitis B by visiting the following Web sites

http://www.in.gov/isdh/files/HBV_QF2010.pdf

<http://www.cdc.gov/hepatitis/ChooseB.htm>

<http://www.hepb.org>

Figure 5: Hepatitis B Cases by County – Indiana, 2009



HEPATITIS C

Hepatitis C is an infectious blood-borne disease caused by the hepatitis C virus (HCV). The virus infects the liver, causing inflammation. Infections may range from mild illness lasting several weeks to serious, lifelong illness. Hepatitis C is the leading chronic blood-borne disease in the United States. The number of reported cases is determined by the number of positive hepatitis C tests reported for the first time during a given year. Cases are defined as either acute or chronic and are classified using case definitions published by the CDC. Only acute cases were reportable in 2009, but data is collected on chronic cases in order to assess risk factors.

Reporting positive test results for HCV was not required in Indiana until October, 2000. Starting in May, 2006, the ISDH requests that local health departments voluntarily investigate chronic cases of hepatitis C infection in order to reduce the spread of disease and educate infected individuals.

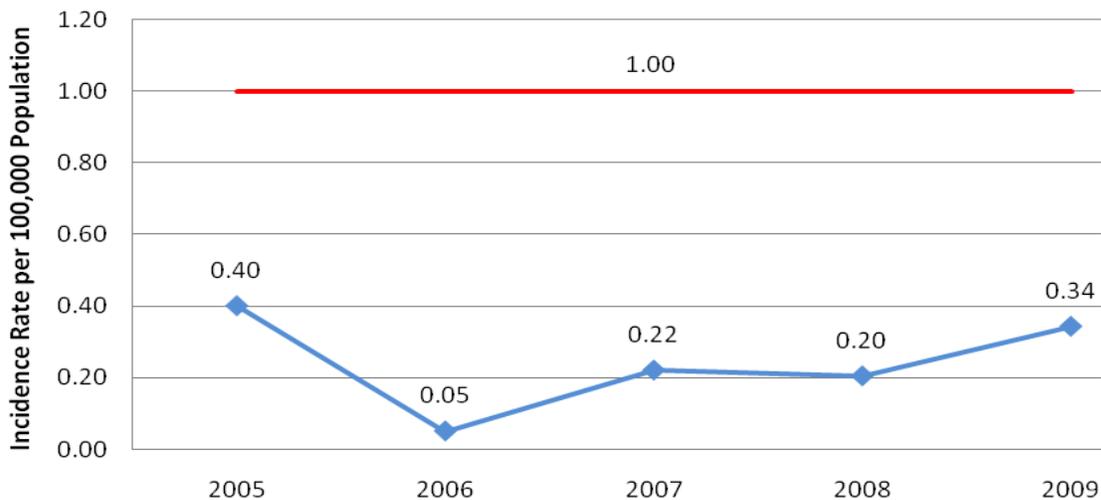
Public Health Significance

Clinically defined cases of acute hepatitis C do not occur often, making it difficult to identify these cases. Approximately 15 to 20 percent of these cases will spontaneously clear the virus and are no longer considered infected. The remaining infected individuals may be asymptomatic for years or even decades, becoming chronic cases. Symptoms that may be present during infection include abdominal pain, fatigue, fever, joint pain, jaundice, loss of appetite, dark urine, light stool, nausea, and/or vomiting. Twenty percent of cases will develop serious liver damage from hepatitis C, and 25 percent of those will need a liver transplant, develop liver cancer, or die. Antibodies can be found in 7 out of 10 persons when symptoms begin and in 9 out of 10 people within 3 months after symptoms begin. There is no vaccine for hepatitis C. Treatment for hepatitis C is available, but treatment is very rigorous and should be discussed thoroughly with a health care provider to determine candidacy. Populations most at risk include injection drug users and recipients of blood transfusions and organ transplants prior to 1992.

Healthy People 2010 Goal

The Healthy People 2010 Goal for hepatitis C is 1 new acute case per 100,000 population per year. Indiana met this goal for the last five-year reporting period 2005-2009 (Figure 1).

**Figure 1: Acute Hepatitis C Rates by Year
Indiana, 2005-2009**



* Upon review the rate for 2006 is 0.05 (previously reported as 0.73) ◆ IN Rate — HP 2010 Target

Epidemiology and Trends

In 2009, 22 cases of acute hepatitis C infection were reported for an incidence rate of 0.34 cases per 100,000 population while 6,049 cases of chronic hepatitis C infection were reported for a prevalence rate of 94.18 cases per 100,000 population (Table 1). The most commonly reported risk factors for acute cases were non-injection street drug use (59%), having been in contact with someone known to be infected with HCV (50%), and injection drug use (41%). Of cases reporting non-injection drug use, 62% reported having used both non-injection and injection drugs. Sexual contact was the most common type reported among those having contact with someone known to be infected with HCV (55%). The incidence rate for acute hepatitis C infection among males was 0.32 cases per 100,000 males while the rate among females was 0.37 per 100,000 females. For chronic cases of hepatitis C infection, males had a prevalence rate of 120.16 per 100,000 males and females had a prevalence rate of 64.79 per 100,000 females (Table 1). In 2009, race was not reported for 42% of hepatitis C cases; consequently, an accurate comparison is not possible.

Table 1: Hepatitis C Cases by Race and Sex, Indiana 2009

	Acute		Chronic		2005-2009 Total Cases
	Cases	Rate*	Cases	Rate*	
Indiana	22	0.34	6,049	94.18	27,471
Race					
African American	1	0.17	683	**	2,961
Caucasian	11	0.20	2,693	**	10,677
Other/Multiracial	0	0.00	108	**	324
Unknown	10	-	2,565	-	13,509
Sex					
Female	12	0.37	2,110	64.79	9,853
Male	10	0.32	3,805	120.16	17,057
Unknown	0	-	134	-	561

*Rate per 100,000 population based on the U.S. Census Bureau's population data as of July 1, 2009

**Over 40% of cases did not have a race reported. Rates not calculated.

Figure 2 shows the number of total reported cases of hepatitis C infection for the five-year period 2005-2009.

**Figure 2: Hepatitis C Cases* by Year
Indiana, 2005-2009**

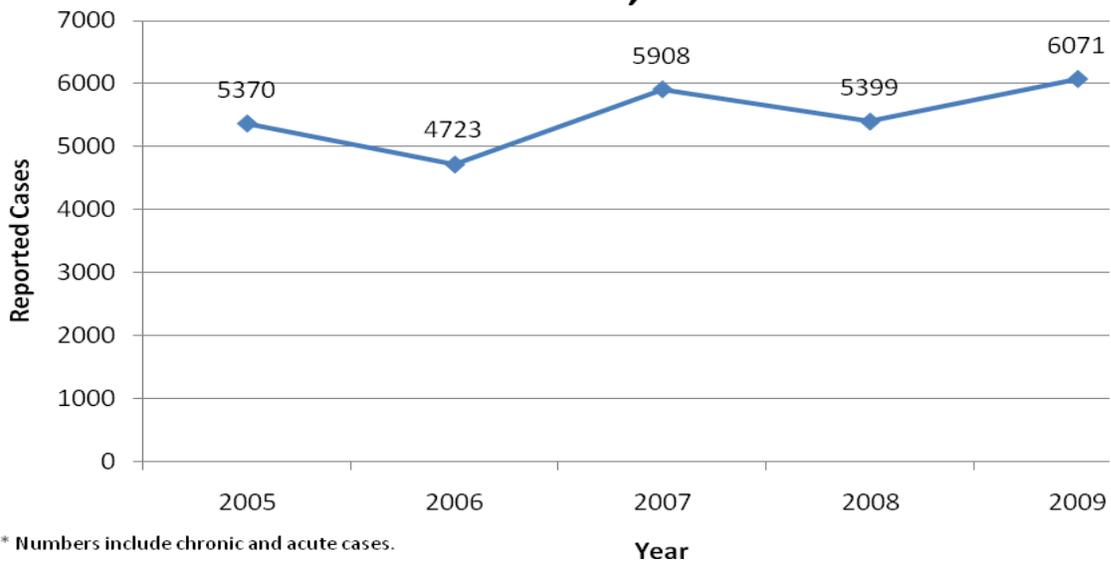


Figure 3 shows age-specific incidence rates for acute cases of hepatitis C infection. Rates were highest among adults age 20-29 (1.01) followed by the 30-39 (0.73) year age group.

**Figure 3: Acute Hepatitis C Incidence Rates
by Age Group Indiana, 2009**

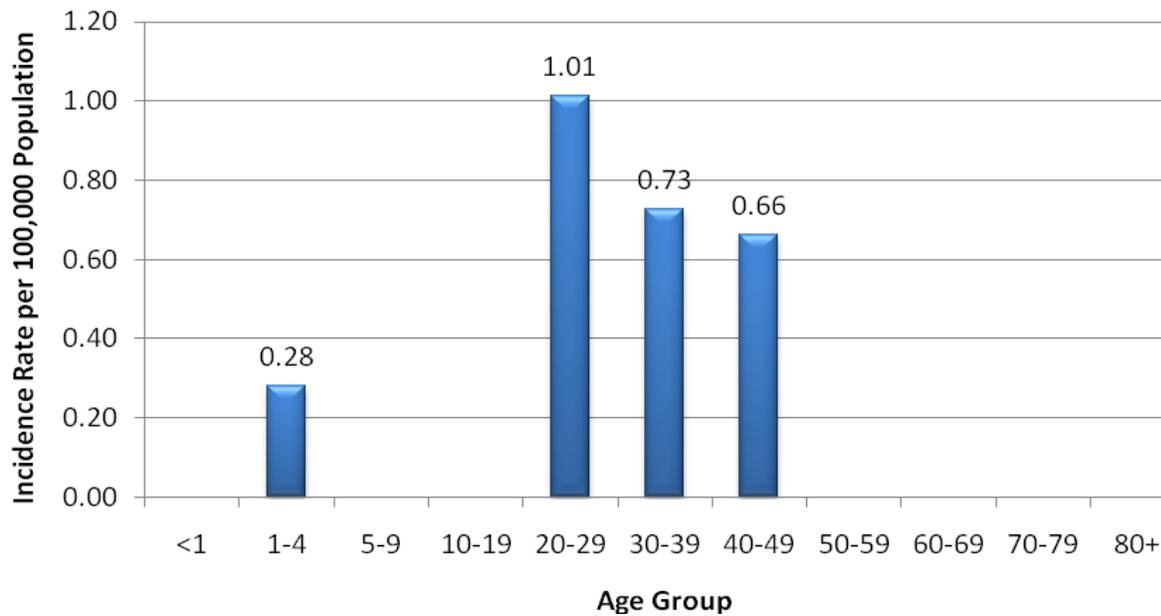


Figure 4 shows age-specific prevalence rates for all cases of hepatitis C infection. Rates were highest among adults age 50-59 followed by the 40-49 year age group.

**Figure 4: Hepatitis C Incidence Rates*
by Age Group Indiana, 2009**

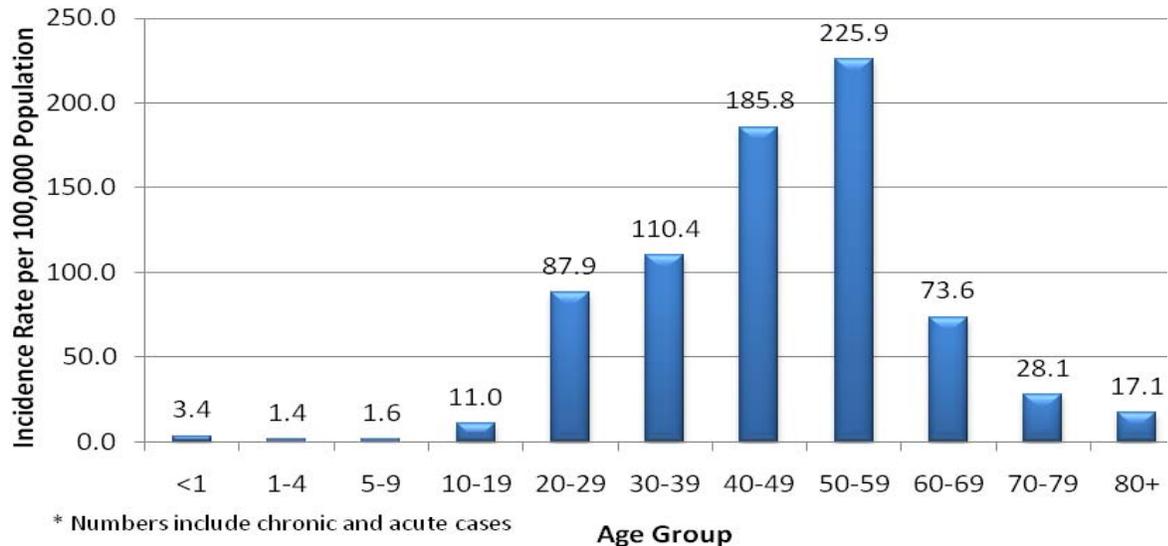


Table 2 shows the number of newly reported cases of hepatitis C infection within the Indiana Department of Corrections (IDOC). This is the first year that these cases have been differentiated from the general public. IDOC cases were not separated out in previous years because the data point was not captured prior to the use of INEDSS.

Table 2: Newly Reported Cases of Hepatitis C Infection in the IDOC - Indiana, 2009

County of Facility	Cases*
Allen	11
Cass	12
Clark	2
Hendricks	693
Henry	3
Jefferson	0
Johnson	2
LaPorte	35
Madison	35
Marion	40
Miami	42
Noble	0
Parke	237
Perry	5
Putnam	12
St. Joseph	4
Wabash	0
Total	1,133

*These cases will no longer be included in the state map displaying county rates.

In 2009, cases of hepatitis C infection were reported in all counties. [Figure 5](#) is a state map displaying the prevalence of hepatitis C infections by county for individuals excluding the IDOC.

You can learn more about hepatitis C by visiting the following Web site:

<http://www.cdc.gov/hepatitis/ChooseC.htm>

HEPATITIS D

Hepatitis D, also known as delta hepatitis, is a liver disease caused by the hepatitis D virus (HDV). HDV is a defective virus that requires the helper function of the hepatitis B virus (HBV) to replicate. People may become infected with HDV at the same time they acquire HBV (co-infection), or people may acquire the virus after infection with HBV (superinfection). The modes of transmission are similar to those for HBV. HDV is transmitted by percutaneous exposure or sexually through contact with infected blood. Most cases are acquired by exposure to contaminated needles. Symptoms of HDV infection resemble those of HBV infection and usually occur 2-8 weeks after exposure.

Public Health Significance

Superinfection with HDV is usually more severe than HBV infection alone and more likely to result in severe disease. Since HDV is transmitted by similar methods as HBV (e.g., exposure to infected blood and contaminated needles), those most at risk of becoming infected with HDV are chronic HBV carriers and those who have not been immunized against HBV.

Although there is a vaccine for HBV, there is no vaccine for HDV. Since HDV is dependent on HBV infection, preventing HBV infections will prevent HDV infections. There is currently no treatment for HDV.

Healthy People 2010 Goal

There is no Healthy People 2010 Goal for hepatitis D.

Epidemiology and Trends

In 2009 there were no reported cases of hepatitis D in Indiana. One hepatitis D case was reported during the 5-year reporting period 2005-2009.

You can learn more about hepatitis D by visiting the following Web sites:

http://www.in.gov/isdh/files/HDV_QF2010.pdf

<http://www.cdc.gov/ncidod/diseases/hepatitis/d/index.htm>

HEPATITIS E

Hepatitis E is an inflammation of the liver caused by the hepatitis E virus (HEV). HEV rarely causes long-term liver damage or death but can cause very serious infection in pregnant women, especially during the last three months of pregnancy. Hepatitis E is rare in the U.S. and is almost always related to travel to a country where hepatitis E is common, such as Mexico, Africa, the Middle East, India, and China.

People become infected with HEV by coming in contact with the stool of an infected person (fecal-oral route). Most outbreaks have been associated with contaminated drinking water. For this reason, the virus is easily spread in areas where there are poor sanitary conditions or where good personal hygiene is not practiced.

Public Health Significance

Symptoms of hepatitis E include diarrhea, nausea, vomiting, tiredness, stomach pain, fever, dark urine, pale/clay-colored stool, loss of appetite, and jaundice. Symptoms usually occur suddenly. Some people, especially children, may have no symptoms but can still spread the virus to others. Symptoms usually begin 26-42 days (range of 15-64 days) after exposure. Death from hepatitis E is rare, but mortality may be as high as 20 percent among pregnant women in their third trimester. Premature deliveries due to infection have a 33 percent infant mortality rate. People are most contagious from about two weeks before symptoms begin until two weeks after symptoms begin.

There is no cure for hepatitis E. However, people infected with the virus develop lifelong immunity. Unlike hepatitis A, there is no vaccine or immune globulin (IG) to prevent infection.

Persons are at risk for hepatitis E infection if they have:

- Exposure to contaminated food or water:
 - Consuming untreated water.
 - Consuming food prepared by an infected person.
 - Consuming raw produce or raw shellfish (e.g., oysters).
 - Traveling to countries where hepatitis E is common and where there is little clean water or proper sewage disposal.
- Exposure to the stool or blood of an infected person who is a:
 - Household member or sexual partner (men who have sex with men are at higher risk).
 - Child or staff member of a daycare center (including centers for the disabled).
 - Resident or staff member of a health care center.

Casual contact, as in the usual workplace or school setting, does not spread the HEV virus. However, most cases of hepatitis E have an unknown exposure, due to the length of time from exposure to the time symptoms begin (range of 15-64 days).

Healthy People 2010 Goal

There is no Healthy People 2010 Goal for hepatitis E.

Epidemiology and Trends

There were two reported case of hepatitis E in Indiana in 2009 and only six reported cases during the five-year period 2005-2009.

You can learn more about hepatitis E by visiting the following Web sites:

<http://www.cdc.gov/hepatitis/index.htm>

<http://www.fda.gov/Food/FoodSafety/FoodborneIllness/FoodborneIllnessFoodbornePathogensNaturalToxins/BadBugBook/ucm071311.htm>

HISTOPLASMOSIS

Histoplasmosis is caused by *Histoplasma capsulatum*, a saprophytic soil fungus. The primary route of transmission is inhalation of infectious spores made airborne by the disturbance of contaminated soil. The presence of *Histoplasma capsulatum* has been associated with soil enriched with bird feces, especially from blackbirds, starlings, chickens, and pigeons. Birds are not carriers of histoplasmosis, but accumulation of bird feces provide the organic enrichment needed for *Histoplasma* growth. Bat guano may also contain the organism.

Public Health Significance:

Approximately 90 percent of *Histoplasma capsulatum* infections are asymptomatic. Clinically recognized histoplasmosis can be characterized into one of three forms: 1) acute, pulmonary histoplasmosis; 2) disseminated histoplasmosis; and 3) chronic, cavitary histoplasmosis. Symptoms of histoplasmosis cases are flu-like with nonproductive cough, chest pains, and difficult breathing (acute, pulmonary histoplasmosis). More severe disease may result in fever, night sweats, weight loss, and bloody sputum. Severe cases may result in *Histoplasma* organisms being disseminated to many body organs (disseminated histoplasmosis). Symptoms occur within 3-17 days after exposure to the fungus. Antifungal medication is available for histoplasmosis, although mild infections usually resolve without medication.

People most at risk for developing histoplasmosis include poultry workers, farmers, landscapers and gardeners, and those who have contact with bats or bat caves.

Healthy People 2010 Goal

There is no Healthy People 2010 Goal for histoplasmosis.

Epidemiology and Trends

In 2009, 136 confirmed cases of histoplasmosis were reported in Indiana for an incidence rate of 2.12 cases per 100,000 population (Table 1). Males (2.50) were more likely to be reported with histoplasmosis infection than females (1.75).

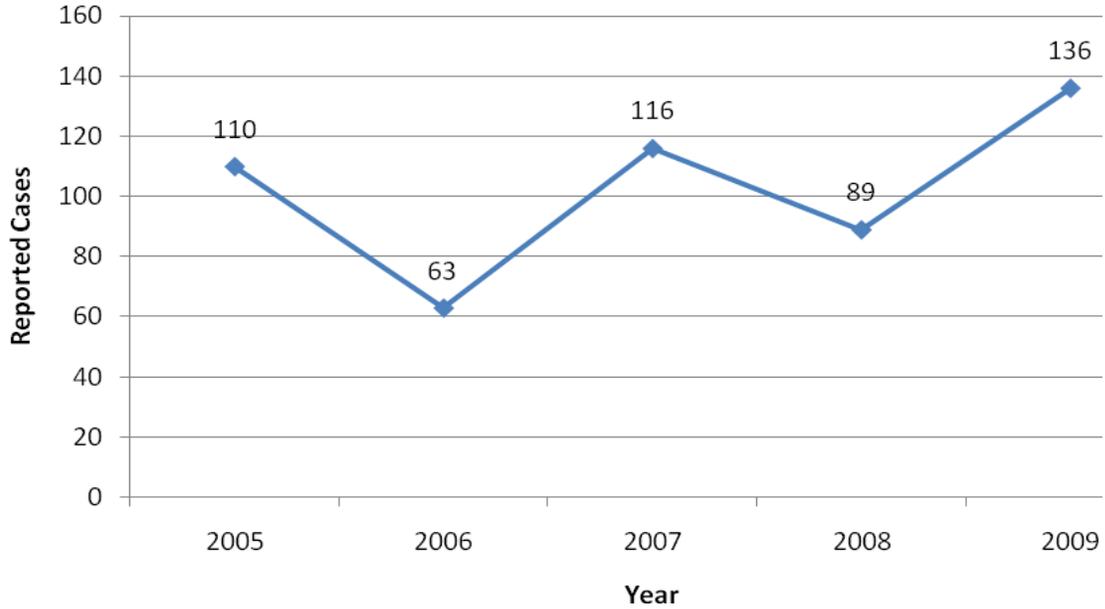
Table 1: Histoplasmosis Case Rate by Race and Sex, Indiana, 2009

	Cases	Rate*	2004 - 2009 Total
Indiana	136	2.12	569
Race			
Black	10	1.70	49
White	77	1.37	315
Other	1	0.51	14
Not Reported	48	-	136
Sex			
Female	57	1.75	228
Male	79	2.50	285
Unknown	0	-	1

*Rate per 100,000 population based on U.S. Census Bureau's population data as of July 1, 2009

Figure 1 illustrates the number of cases by year for 2005-2009.

**Figure 1: Histoplasmosis Cases by Year
Indiana, 2005-2009**



Histoplasmosis occurred throughout the year in 2009, with the largest number of cases occurring in the winter and spring months (Figure 2).

**Figure 2: Histoplasmosis Cases by Month
Indiana, 2009**

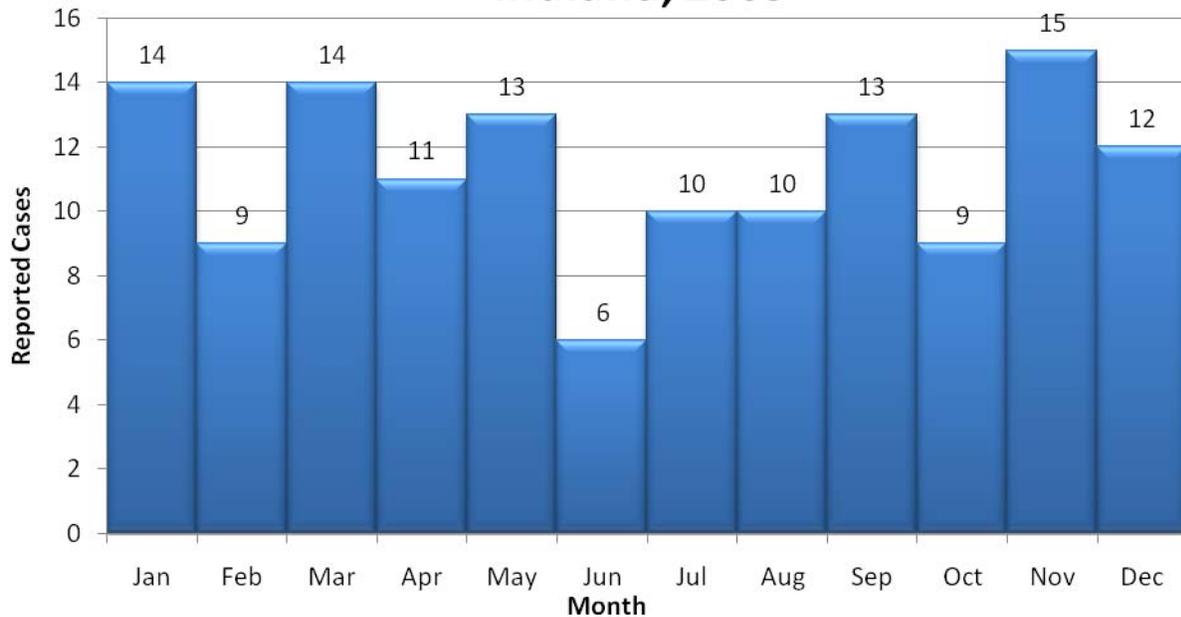
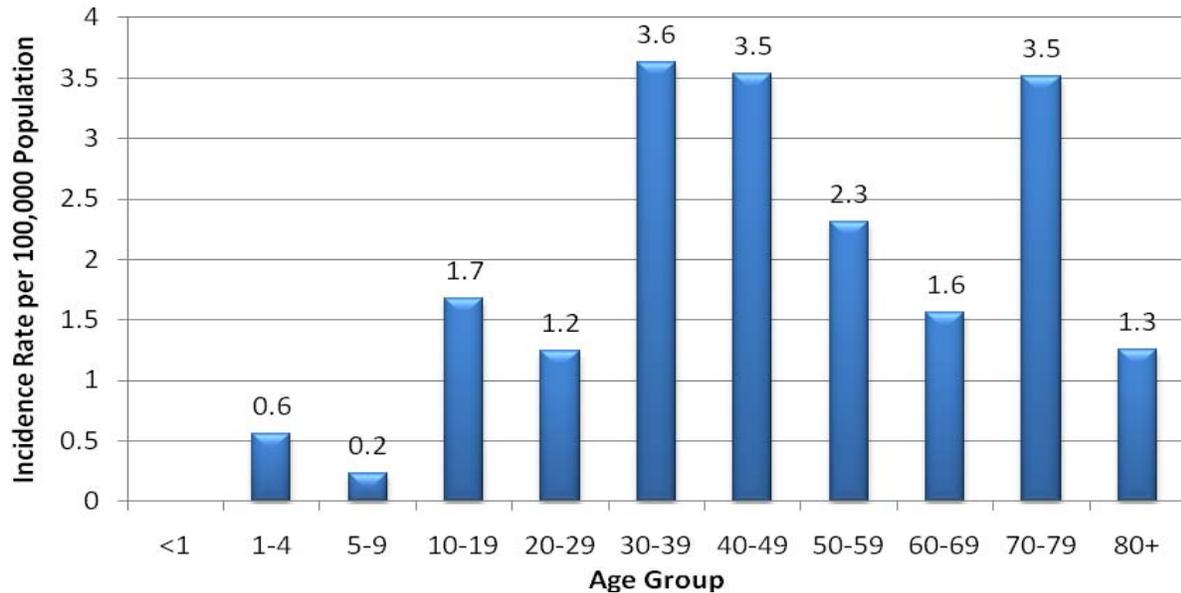


Figure 3 shows the distribution of cases by age group. Age-specific rates were greatest among adults aged 30-39 years of age (3.6).

**Figure 3: Histoplasmosis Incidence Rates by Age Group
Indiana, 2009**



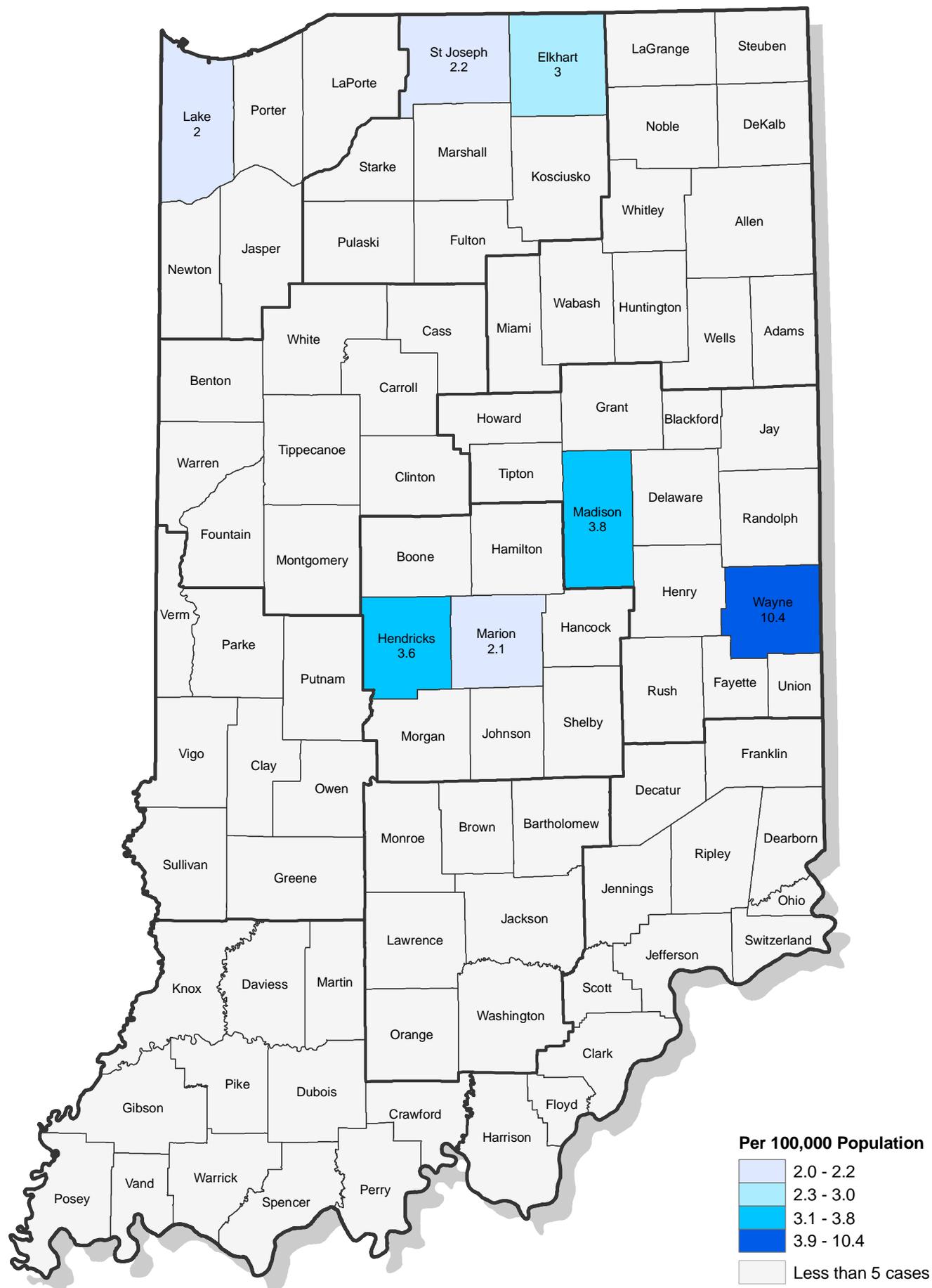
In 2009, 52 counties reported at least one case of histoplasmosis in Indiana. Elkhart, Hendricks, Lake, Madison, Marion, St. Joseph, and Wayne counties reported 5 or more cases (Figure 4).

There were no documented outbreaks of histoplasmosis in Indiana in 2009.

You can learn more about histoplasmosis by visiting the following Web site:

http://www.cdc.gov/nczved/dfbmd/disease_listing/histoplasmosis_gi.html

Figure 5: Histoplasmosis Cases by County – Indiana, 2009



LA CROSSE ENCEPHALITIS

La Crosse encephalitis is a mosquito-borne viral infection found primarily in the eastern United States where hardwood forests exist. The disease is maintained in nature in a cycle between the tree-hole mosquito, *Aedes triseriatus*, and small woodland mammals such as squirrels and chipmunks. Although La Crosse virus is endemic in Indiana, the disease is relatively rare because humans are not an essential component of the viral life cycle.

Public Health Significance

Symptoms of La Crosse encephalitis include headache, fever, nausea, vomiting, drowsiness, and disorientation. Severe cases may result in seizures or coma. Symptoms appear 5-15 days after a bite from an infected mosquito. Cases are rarely fatal but may result in learning disabilities in recovered individuals. For every symptomatic case, there are approximately 1,500 asymptomatic cases. Clinically recognized infections occur mainly in children under 16 years of age. No specific treatment exists for La Crosse encephalitis. People most at risk for developing La Crosse encephalitis include children younger than 16 years of age, those residing in or near woodlands where tree-hole mosquitoes reside, and those involved in outdoor water activities.

Healthy People 2010 Goal

There is no Healthy People 2010 Goal for La Crosse encephalitis.

Epidemiology and Trends

In 2009 there was one case of La Crosse encephalitis reported in Indiana. During the five-year period 2005-2009, two cases of La Crosse encephalitis were reported in Indiana.

You can learn more about La Crosse encephalitis by visiting the following Web site:

<http://www.cdc.gov/ncidod/dvbid/arbor/lacfact.htm>

LEGIONELLOSIS

Legionellosis is a respiratory infection caused by *Legionella* bacteria, most commonly *Legionella pneumophila*. These bacteria are transmitted by contaminated water aerosols, which are then inhaled. *Legionella* can be found in any type of water system. They have been found in the environment in creeks and ponds and potting soil. The bacteria are prevalent in warm stagnant water such as those found in most plumbing systems, hot water tanks, water in cooling towers and evaporative condensers.

Public Health Significance

Legionnaires' disease is a severe infection, most commonly characterized by pneumonia. Other symptoms include high fever, cough, chills, muscle aches, and headache. Symptoms usually begin about 2-14 days after exposure. Chest X-rays are needed to confirm the presence of pneumonia, and other tests can be performed on sputum (phlegm), as well as blood and urine to find evidence of the bacteria in the body.

People most at risk of getting sick from the bacteria are:

- older people (usually 65 years of age or older)
- smokers
- people with chronic lung disease (like emphysema)
- people with weakened immune systems from diseases like cancer, diabetes, or kidney failure
- people who take drugs that suppress (weaken) the immune system (such as organ transplants or chemotherapy)

A milder infection caused by the same type of *Legionella* bacteria is Pontiac Fever. The symptoms of Pontiac Fever usually last for 2 to 5 days and may also include fever, headaches, and muscle aches; however, there is no pneumonia. Symptoms resolve on their own without treatment and without causing further problems. Neither infection is transmissible person-to-person. Pontiac Fever and Legionnaires' disease may both be called "legionellosis."

Outbreaks occur when two or more people become ill in the same place at about the same time, such as hospitalized patients. Hospitals or large buildings have complex water systems, and many people in hospitals already have illnesses that increase their risk for *Legionella* infection. Other outbreaks have been linked to aerosol sources in the community, cruise ships, and hotels, with the most likely sources being whirlpool spas, cooling towers (air-conditioning units from large buildings), and water used for drinking and bathing.

Legionnaires' disease can be treated with antibiotics. Supportive therapy may be needed to aid breathing function. There is no vaccine for legionellosis.

Healthy People 2010 Goal

There is no Healthy People 2010 Goal for legionellosis.

Surveillance Case Definitions

Legionellosis cases must meet clinical definition and one of the following laboratory requirements.

Confirmed:

- Culture: isolation of any *Legionella* organism from respiratory secretions, lung tissue, pleural fluid, or other normally sterile fluid.
- Urinary antigen: detection of specific *Legionella pneumophila* serogroup 1 antigen in urine using validated reagents. This is the fastest way to confirm the diagnosis.
- Seroconversion: fourfold or greater rise in specific serum antibody titer to *Legionella pneumophila* using validated reagents. This is not recommended due to the time required to obtain both acute and convalescent sera.

Epidemiology and Trends

In 2009, there were 62 confirmed cases of legionellosis in Indiana (Table 1). The legionellosis disease case rate for 2009 was 0.97 per 100,000. In 2009, blacks (2.04) were at higher risk for legionellosis than whites (0.57). Additionally, males (1.23) are at higher risk than females (0.71).

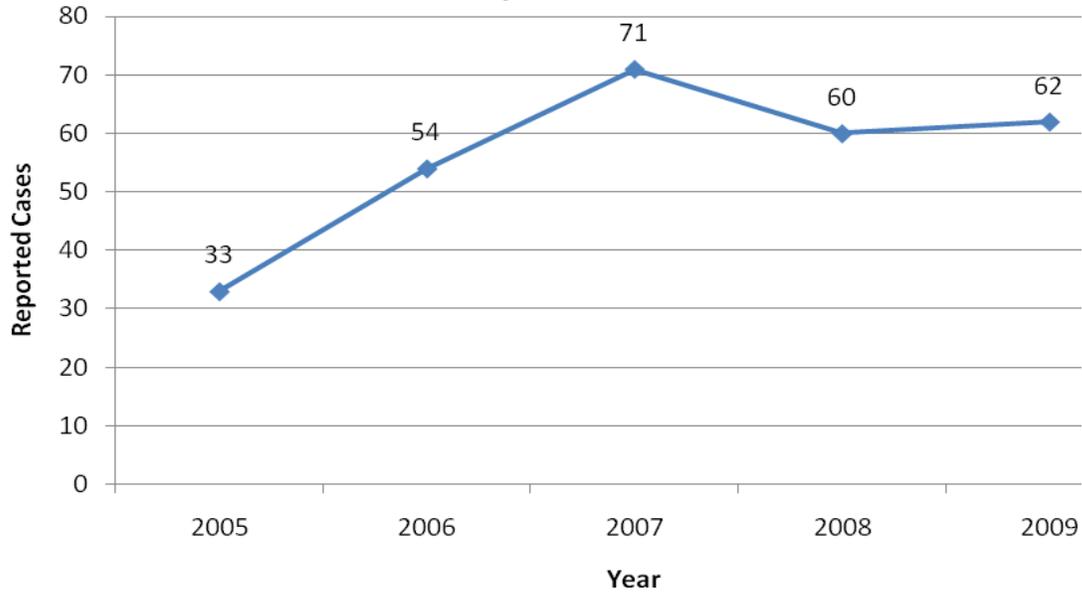
Table 1: Legionellosis Case Rate by Race and Sex, Indiana, 2009

	Cases	Rate*	2005 - 2009 Total
Indiana	62	0.97	280
Race			
Black	12	2.04	39
White	32	0.57	191
Other	0		2
Not Reported	18	-	48
Sex			
Female	23	0.71	100
Male	39	1.23	180
Unknown	0	-	0

*Rate per 100,000 population based on U.S. Census Bureau's population data as of July 1, 2009

Figure 1 shows the number of cases by year for 2005-2009.

**Figure 1: Legionellosis Cases by Year
Indiana, 2005-2009**



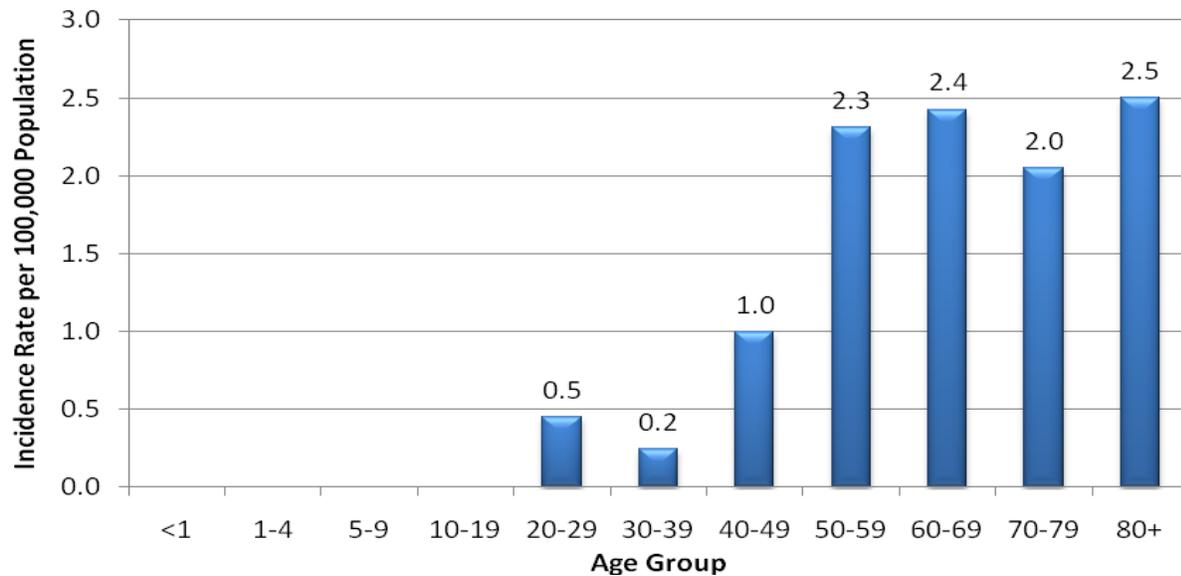
Incidence of legionellosis usually climbs in the summer. Figure 2 indicates an increase of incidence in the late summer of 2009.

**Figure 2: Legionellosis Cases by Month
Indiana, 2009**



Cases of legionellosis disease tend to occur more frequently in adults 80 and over, followed by the 60-69 and 50-59 year age groups respectively, seen in Figure 3.

**Figure 3: Legionellosis Incidence Rates by Age Group
Indiana, 2009**



Of the 24 counties reporting cases in 2008, only Marion County had 5 or more cases.

You can learn more about legionellosis by visiting the following Web sites

<http://www.in.gov/isdh/22111.htm>

http://www.cdc.gov/legionella/patient_facts.htm

LEPROSY (HANSEN'S DISEASE)

Leprosy, or Hansen's Disease, is a chronic disease caused by the bacterium *Mycobacterium leprae*, which affects the skin, mucous membranes, and peripheral nerves. The World Health Organization (WHO) classifies the disease based upon the presence of bacteria and the appearance of cells during a skin biopsy. Cases with less than five lesions are typically considered paucibacillary and cases with more than five skin lesions are multibacillary. This classification system is used in the determination of the appropriate duration and type of antibiotic drug therapy used in treatment. Symptoms of leprosy include hypopigmented or reddish skin lesions that may appear as plaques or nodules that are not painful, as well as loss of sensation in the extremities and nose from peripheral nerve involvement and nasal congestion. Symptoms of the disease do not typically appear for several years after contact with an infected person. The mode of transmission is uncertain, but the bacteria are thought to be spread through the contact with nasal mucosa of infected persons. It is estimated that 95% of the world's population is naturally immune to the bacteria, as leprosy is not a highly transmissible disease.

Public Health Significance

Persons at greatest risk for the disease include household contacts of a case. Most cases in the United States occur in immigrants and refugees who acquired the disease in their native country. Leprosy is more common in temperate, tropical, and subtropical climates.

Early diagnosis and treatment of the disease is critical in curing the disease and in preventing permanent damage to the skin and nerves. A multi-drug regimen taken over an extended period is used to treat the disease, and it is recommended that direct observation therapy be utilized to ensure compliance with the medication regimen. While prophylaxis of close contacts is not recommended, current household contacts should be examined immediately by a health care provider and then annually for five years following last contact with the infectious patient. The average incubation period for the disease is about three years.

Healthy People 2010 Goal

There is no Healthy People 2010 Goal for leprosy.

Epidemiology and Trends

There were no cases of leprosy reported in Indiana during 2009. Only one case was reported during the five year reporting period 2005 – 2009. National data for 2009 was not available at the time of publication; however, there were 80 cases reported in the United States during 2008. Most cases occurred in the Southwestern regions of the country.

You can learn more about leprosy by visiting the following Web sites:

http://www.cdc.gov/nczved/dfbmd/disease_listing/leprosy_ti.html

LEPTOSPIROSIS

Leptospirosis is a bacterial disease of animals and humans caused by *Leptospira* bacteria, most commonly *Leptospira interrogans*. The primary reservoir of the bacteria is rodents. However, infected domestic animals such as cattle, sheep, goats, pigs, dogs, and cats can pose an additional threat to humans. Humans generally become infected by direct contact with infected animals or from exposure to water contaminated with urine from infected animals.

Public Health Significance

Symptoms of leptospirosis may appear abruptly and include fever, chills, severe headache, body aches, and vomiting. If leptospirosis is left untreated, kidney damage, liver failure, and respiratory distress can occur. Symptoms occur 2-28 days after exposure to the bacteria. Antibiotics are used to treat the infection.

Leptospirosis can be an occupational disease risk for individuals who work with animals or who have exposure to contaminated soil or water. Groups at increased risk include farmers, veterinarians, coal miners, meat handlers, and sewer workers. At least one large leptospirosis outbreak in the U.S. has been linked to the recreational use of a lake.

Healthy People 2010 Goal

There is no Healthy People 2010 Goal for leptospirosis.

Epidemiology and Trends

There were no cases of leptospirosis reported in Indiana in 2009. One case reported during five year reporting period, 2005-2009.

You can learn more about leptospirosis by visiting the following Web site:

http://www.cdc.gov/ncidod/dbmd/diseaseinfo/leptospirosis_g.htm

LISTERIOSIS

Listeriosis is a contagious disease caused by *Listeria monocytogenes* bacteria. These bacteria are found in soil, untreated water, and the intestines of some animals. These animals are not sick but can pass the bacteria into the soil through manure. Most often, people get listeriosis by eating food contaminated with *Listeria* bacteria. *Listeria* is killed by pasteurization and cooking. However, in certain ready-to-eat foods, such as luncheon meats, contamination may occur after cooking but before packaging. Raw produce may become contaminated by contact with soil or manure. Unlike other bacteria found in food, *Listeria* can multiply in food even while refrigerated. Foods at high risk for listeriosis include: raw vegetables, uncooked meats and seafood, ready-to-eat meats, soft cheeses, and unpasteurized dairy products. The only way listeriosis can be spread from person to person is from mother to baby during pregnancy. It cannot be spread by other person-to-person contact.

Outbreaks of listeriosis have been attributed to unpasteurized dairy products, soft cheeses, raw vegetables, and ready-to-eat meats.

Public Health Significance

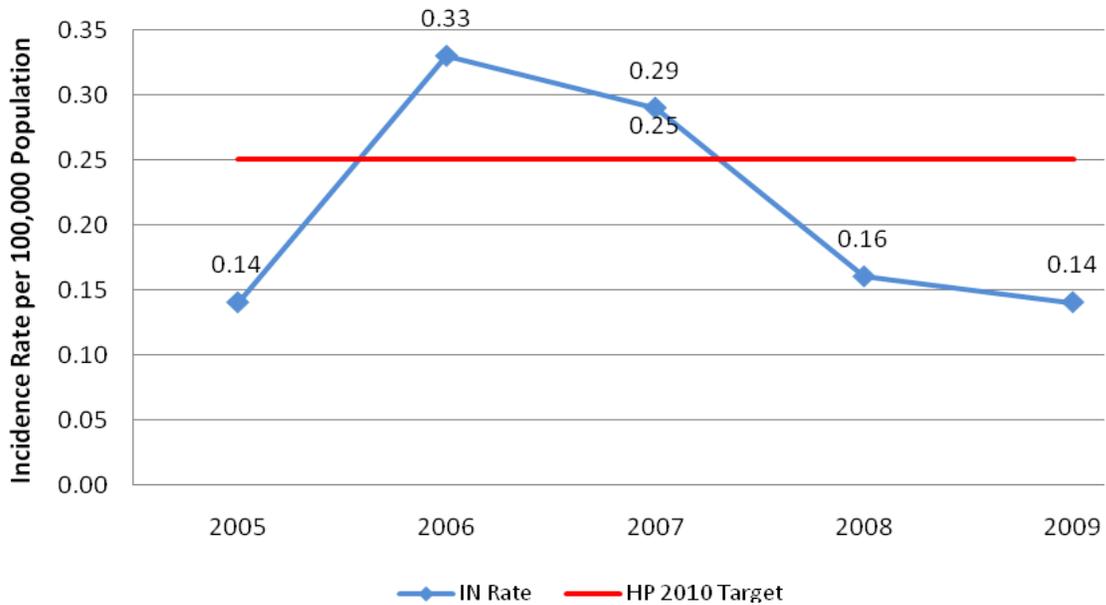
Symptoms of listeriosis include fever, headache, muscle aches, nausea, vomiting, abdominal cramps, and diarrhea. Symptoms usually begin 21 days (range of 3-70 days) after exposure. Duration of symptoms depends on the health of the infected person; symptoms can last several days or several weeks. Healthy people usually do not have any symptoms, while others may have a mild illness. Pregnant women are about 20 times more likely than other healthy adults to get listeriosis. About one-third of listeriosis cases occur during pregnancy. If infection occurs when a woman is pregnant, antibiotics given promptly can often prevent infection of her baby. Otherwise, infected pregnant women may experience only a mild, flu-like illness; however, infections during pregnancy can lead to miscarriage or stillbirth, premature delivery, or infection of the newborn. Illness can be very serious in pregnant women, newborns, elderly persons, and persons with weakened immune systems.

Antibiotics are available to treat the infection in all persons, regardless of age.

Healthy People 2010 Goal

The Healthy People 2010 Goal for listeriosis is 0.25 cases per 100,000 population. During the five-year reporting period, Indiana met the Healthy People 2010 goal in 2005, 2008, and 2009 ([Figure 1](#)). The increase in cases for 2006 and 2007 is unknown.

**Figure 1: Listeriosis Rates by Year
Indiana, 2005-2009**



Epidemiology and Trends

In 2009, nine cases of listeriosis were reported in Indiana, for a rate of less than 1 case per 100,000 population (Table 1).

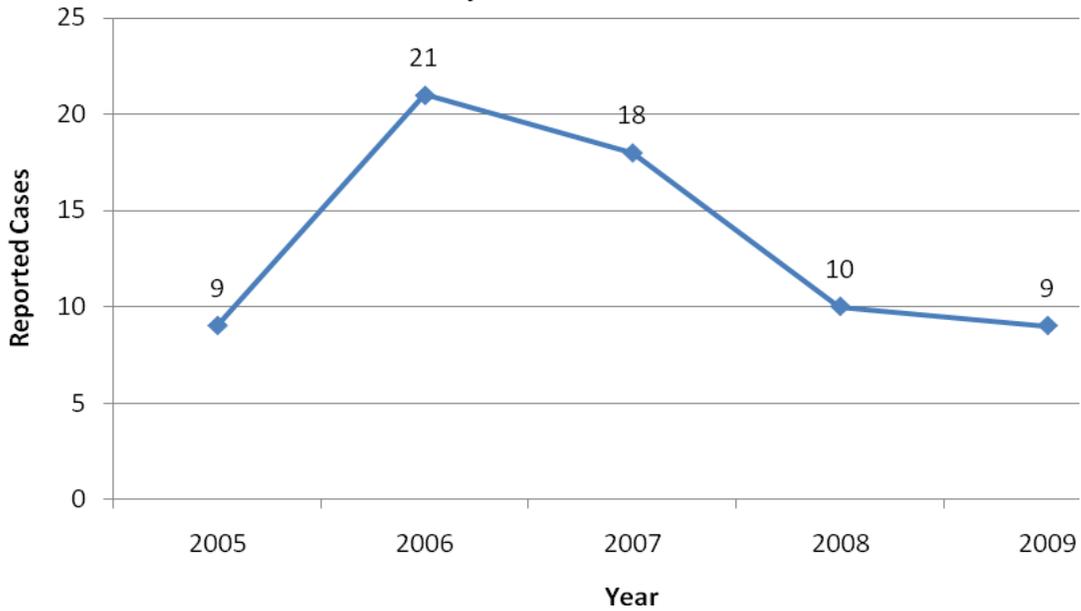
Table 1: Listeriosis Case Rate by Race and Sex, Indiana, 2009

	Cases	Rate*	2005 - 2009 Total
Indiana	9	0.14	67
Race			
Black	0	0	4
White	6	0.11	46
Other	0	0	1
Not Reported	3		16
Sex			
Female	2	0.06	27
Male	7	0.22	40
Unknown	0	0	

*Rate per 100,000 population based on U.S. Census Bureau’s population data as of July 1, 2009

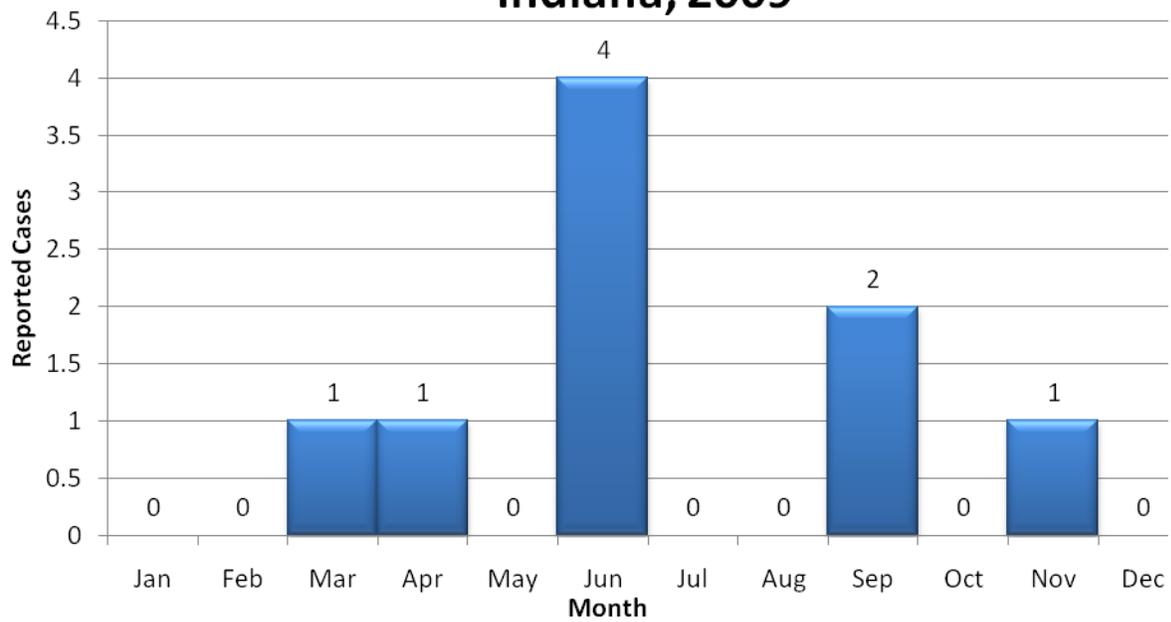
Figure 2 shows reported listeriosis cases by year for 2005-2009.

**Figure 2: Listeriosis Cases by Year
Indiana, 2005-2009**



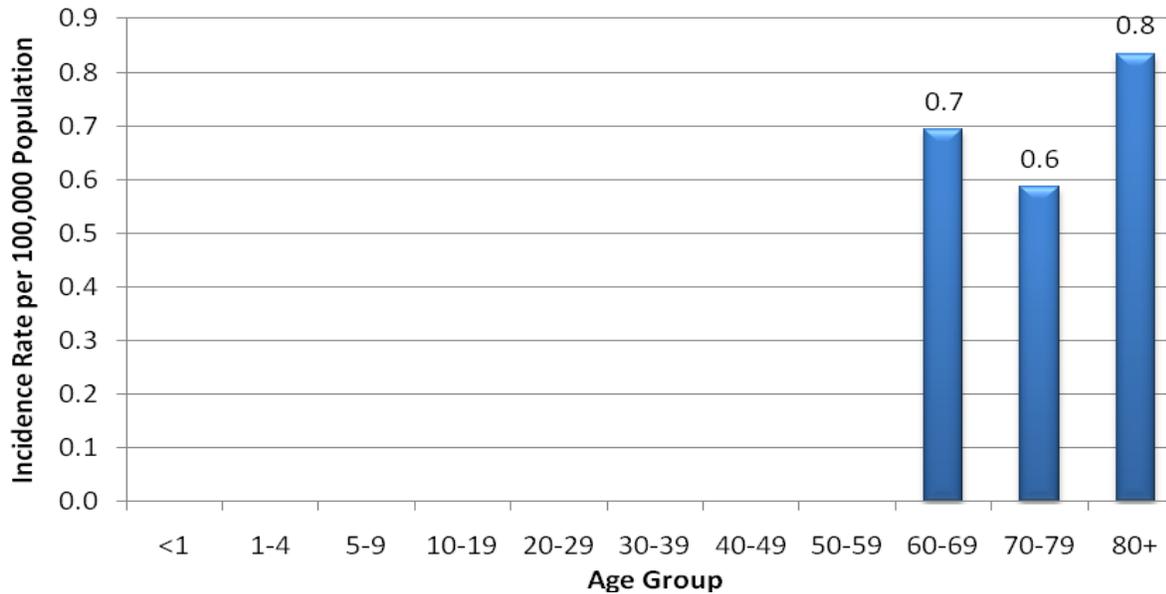
Incidence of disease was highest in June (Figure 3).

**Figure 3: Listeriosis Cases by Month
Indiana, 2009**



As shown in [Figure 4](#), age specific rates were greatest for adults 80 years of age and older (0.8), followed by adults ages 60-69 (0.7), and adults 70-79 years of age (0.6).

**Figure 4: Listeriosis Incidence Rates by Age Group
Indiana, 2009**



Eight counties reported having at least one listeriosis case in 2009, and no county reported 5 or more cases.

There were no outbreaks of listeriosis reported in Indiana in 2009.

You can learn more about listeriosis by visiting the following Web sites:

<http://www.cdc.gov/nczved/divisions/dfbmd/diseases/listeriosis/>

<http://www.fda.gov/Food/FoodSafety/FoodborneIllness/FoodborneIllnessFoodbornePathogensNaturalToxins/BadBugBook/ucm070064.htm>

LYME DISEASE

Lyme disease is caused by the bacterium *Borrelia burgdorferi* and is the most commonly diagnosed tick-borne disease in Indiana. It is transmitted by the deer tick (*Ixodes scapularis*), using small wild rodents as its reservoir. Transmission can occur after the tick has been attached and feeding for approximately 36 hours.

Public Health Significance

Symptoms of Lyme disease appear 3-30 days after exposure to the infected tick but generally occur 7-14 days after exposure. Symptoms often include a “bullseye” skin rash known as erythema migrans. In some cases, more severe symptoms of joint pain, arthritis, and insomnia can last from months to years. Lyme disease can be successfully treated with antibiotics, especially if treatment is started early. Untreated infections of *Borrelia burgdorferi* can lead to various health problems including arthritis, neurologic disease, meningitis, loss of muscle tone (Bell’s palsy) and/or dermatological (skin) conditions.

Healthy People 2010 Goal

There is no Healthy People 2010 Goal for Lyme disease.

Epidemiology and Trends

In 2009, 62 cases of Lyme disease were reported in Indiana, for a rate of less than 1 case per 100,000 population ([Table 1](#)).

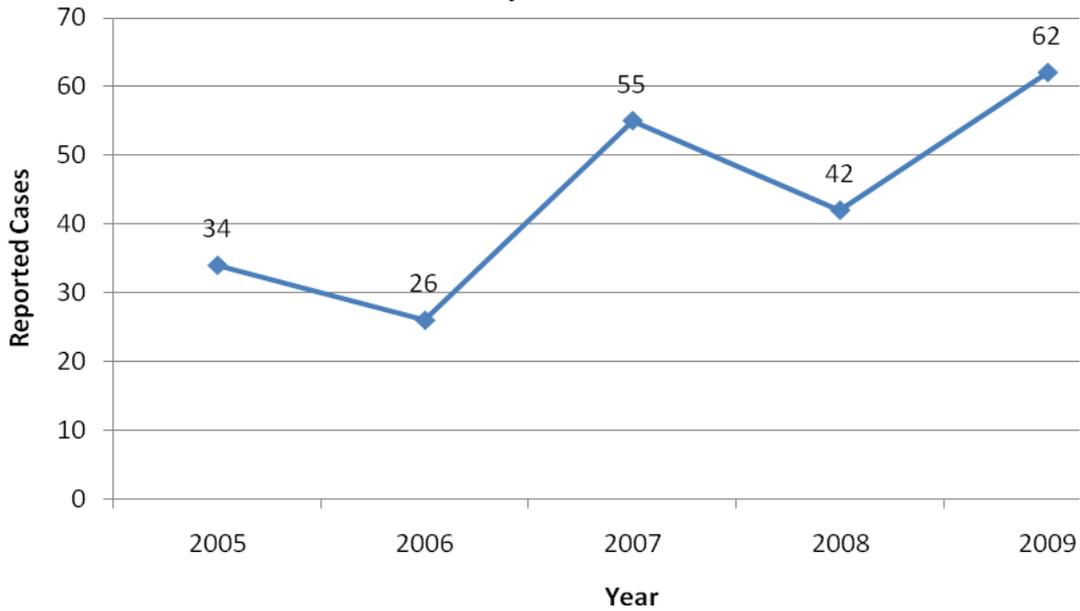
Table 1. Lyme Disease Cases by Race and Sex, Indiana, 2009

	Cases	Rate*	2004 - 2008 Total
Indiana	62	0.97	189
Race			
Black	0	0.00	4
White	31	0.55	149
Other	1	0.51	4
Not Reported	30	-	64
Sex			
Female	26	0.80	96
Male	36	1.14	121
Unknown	0	-	2

*Rate per 100,000 population based on the U.S. Census Bureau’s population data as of July 1, 2009

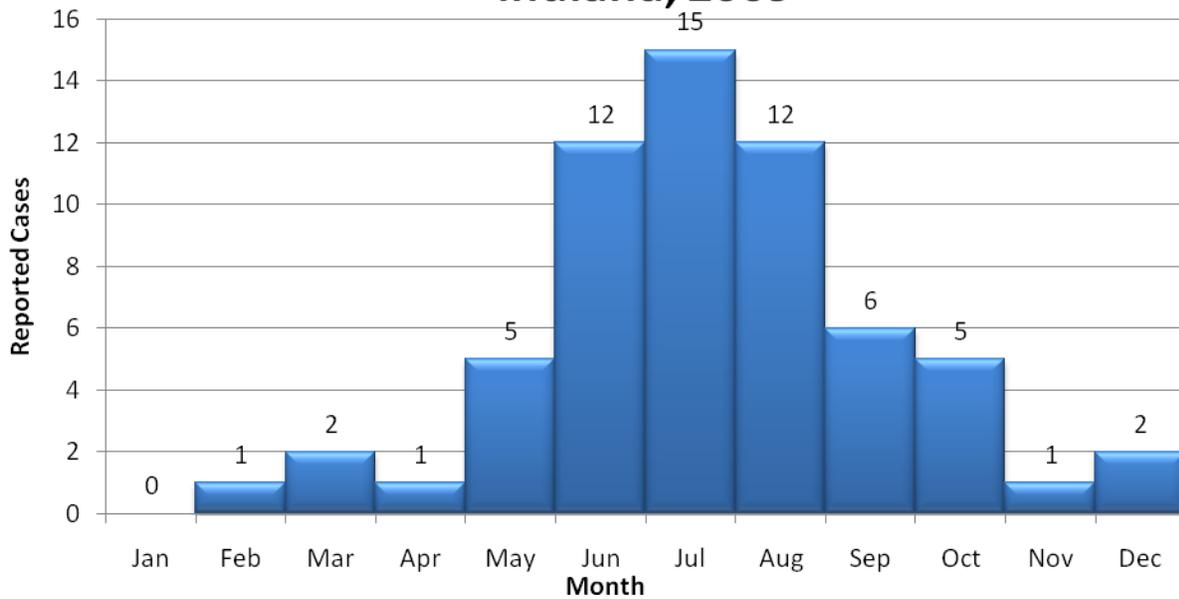
Figure 1 shows the number of reported cases per year for 2005-2009.

**Figure 1: Lyme Disease Cases by Year
Indiana, 2005-2009**



Incidence of disease was greatest during the summer months (Figure 2). Eighty-three percent of reported cases occurred from May through September when ticks are most active.

**Figure 2: Lyme Disease Cases by Month
Indiana, 2009**



Twenty-five counties reported Lyme disease cases in 2009; however, in past years most counties throughout the state have reported at least one case. No counties reported five or more cases.

You can learn more about Lyme disease by visiting the following Web site:

<http://www.cdc.gov/ncidod/dvbid/lyme/index.htm>

MALARIA

Malaria is a serious, sometimes fatal, blood disease caused by one of four *Plasmodium* parasite species (*falciparum*, *vivax*, *ovale*, *malariae*) and transmitted by the bite of an infected female *Anopheles* mosquito. In the U.S., cases of malaria are acquired by international travel to malaria risk areas. Malaria risk in specific countries is dependent on various factors that can change rapidly and from year to year, such as local weather conditions, mosquito vector density, and prevalence of infection, which can markedly affect local malaria transmission patterns. In general, malaria transmission occurs in large areas of Central and South America, the island of Hispaniola (the Dominican Republic and Haiti), Africa, Asia (including South Asia, Southeast Asia, and the Middle East), Eastern Europe, and the South Pacific.

Public Health Significance

Malaria symptoms are similar to influenza and may include chills, headache, muscle aches, and tiredness. The indicative symptoms of malaria are cyclic fevers and chills. Symptoms develop 7-30 days after the infective bite. However, antimalarial drugs taken for prophylaxis can delay malaria symptoms. Delays between exposure and development of symptoms can result in misdiagnosis or delayed diagnosis because of reduced clinical suspicion by the health care provider.

Prior to traveling to malaria risk areas, travelers should always see a health care provider to obtain anti-malarial medications to prevent malaria infection. The type of anti-malarial medication will vary depending on travel destination due to resistance to anti-malarial medication in many parts of the world. No vaccine is currently available.

Healthy People 2010 Goal

The Healthy People 2010 Goal for malaria is to increase the proportion of international travelers who receive recommended preventive services when traveling in areas of risk for select infectious diseases. The number of international travelers from the U.S. has increased by an average of 3 percent each year for the past decade. Malaria is one of three diseases that accounts for a large proportion of illness and disability for international travelers.

Epidemiology and Trends

In 2009 there were 23 cases of malaria reported in Indiana. All were acquired outside of the United States. During the five-year period from 2005-2009, malaria cases were reported in Indiana following international travel to Sub-Saharan Africa, tropical (northern) South America, Central America, the Caribbean (Haiti and Dominican Republic), and parts of South and Southeast Asia.

You can learn more about malaria by visiting the following Web sites:

<http://www.cdc.gov/malaria/> <http://wwwn.cdc.gov/travel/default.aspx>

MEASLES

Measles is a highly contagious viral illness. Measles is transmitted through the air when an infected person coughs or sneezes. It also may spread through contact with nose or throat drainage of an infected person or articles contaminated by an infected person.

Public Health Significance

Symptoms of measles usually begin to appear 10-12 days after exposure to the virus. Symptoms of measles begin with tiredness, fever, cough, coryza (runny nose), and conjunctivitis. A maculopapular rash begins 3-4 days later, typically beginning on the hairline of the forehead and gradually proceeding downward over the entire body. The rash lasts a minimum of 3 days, but on average lasts 4-7 days. Persons with measles usually appear to be very ill at least 2 days before to 2 days after rash onset. Though historically considered a mild childhood disease, it can lead to serious complications. Measles infection may cause ear infections, pneumonia, encephalitis, vision damage, and even death. Fever may last 2-4 days and can peak as high as 103-105 degrees Fahrenheit.

Measles virus is communicable prior to the appearance of the classical rash, thus following infection control guidelines and exclusion rules are important when exposed to an infected person.

No medications are currently used to treat measles. Vaccination is the most effective measure to prevent measles. Measles can spread quickly in unimmunized populations. Two doses of measles, mumps, and rubella (MMR) vaccine typically prevent infection. Children receive the first dose of MMR at 12 months of age and the second dose of MMR at 4-6 years of age following the routine schedule. All adults should receive at least one dose of MMR vaccine, but two doses are recommended for health care workers, international travelers, and adults enrolled in secondary education.

Prior to routine measles vaccination, more than 500,000 measles cases and 500 associated deaths were reported annually in the United States. The actual number of measles cases per year was estimated to be 3-4 million. Measles incidence in the United States decreased more than 98% following the vaccine's licensure in 1963, but outbreaks still occur when the measles virus is introduced to unimmunized pockets of the population. According to the World Health Organization, more than 10 million people worldwide are infected each year. Measles outbreaks are still common in many areas, including Europe.

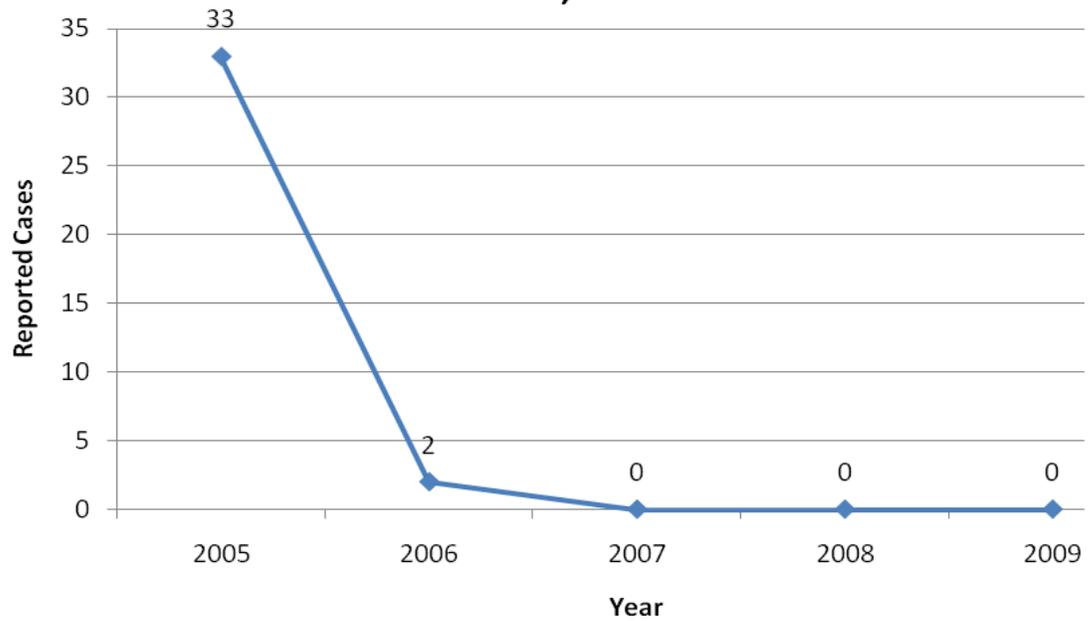
Healthy People 2010 Goal

The Healthy People 2010 Goal for measles is total elimination of the disease. Indiana has not met this goal. Achieving and maintaining high levels of vaccination coverage in Indiana is an effective way to accomplish this goal. The risk of importation of measles virus through international travel remains, thus prevention through vaccination is necessary until the virus is globally eradicated.

Epidemiology and Trends

No cases of measles were reported in 2009. There were 35 cases of measles reported in Indiana during the five-year period 2005-2009. Of those 35 cases, 33 occurred in 2005 among a community that had low vaccination coverage. [Figure 1](#) shows reported cases of measles for the five-year period 2005-2009.

**Figure 1: Measles Cases by Year
Indiana, 2005-2009**



You can learn more about measles by visiting the following Web site:
<http://wwwnc.cdc.gov/travel/yellowbook/2010/chapter-2/measles.aspx>

MENINGOCOCCAL DISEASE

Meningococcal disease is a life-threatening illness which occurs when *Neisseria meningitidis* bacteria invade a site in the body that is normally sterile, such as the blood or fluid surrounding the brain and spinal cord. The bacteria are transmitted from person-to-person through direct contact with nose and throat secretions of an infected person. It is estimated that at least 10% of U.S. residents may be colonized with the bacteria in the nasopharynx but have no symptoms of infection. Invasive disease is most commonly manifested as meningitis, bacteremia, meningococemia (meningococcal sepsis), or septic arthritis, although the disease can also cause pneumonia in older adults. Meningococcal infections often begin with a sudden onset of fever, headache, stiff neck, rash, photophobia, nausea and vomiting. Prompt antibiotic therapy can reduce the risk of long-term effects and improve survival, although case fatality rates range from 10-14%. Meningococemia is the most severe form of the infection and is fatal in up to 40% of cases. Only cases of invasive disease are reportable in Indiana.

Public Health Significance

Certain segments of the population are at increased risk for the disease due to risk factors within the host or in the environment. These groups include:

- College freshmen living in dormitories
- Persons working in or attending child-care facilities
- Microbiologists
- U.S. military recruits
- Persons who travel to or reside in countries where *N. meningitidis* is epidemic, especially if there will be prolonged contact with the local population
- Persons who have certain immune system disorders
- Persons who do not have a functional spleen

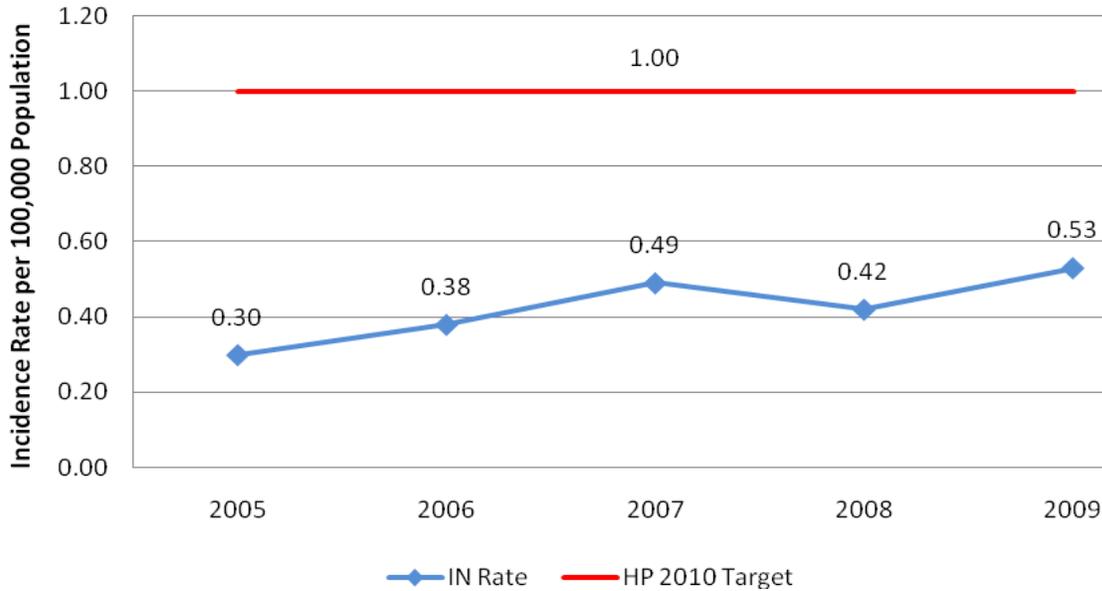
Routine vaccination for children 11-18 years of age is recommended by the American Council on Immunization Practices (ACIP) and became a requirement for school attendance in Indiana during the 2010–2011 school year. Vaccination is also recommended for other at-risk populations, and education on the importance of receiving the vaccine is a primary strategy for reducing incidence of the disease. Revaccination for individuals who remain at high risk is recommended. Three vaccines are currently available to protect against meningococcal disease, with the vaccine Menveo licensed in 2010. All vaccines protect against four of the five encapsulated serogroups of the bacteria which cause invasive disease (A, B, C, Y, W-135). No vaccine is available to protect against serogroup B or serogroup Z disease.

Increased hospital, provider, and laboratory awareness of the condition may improve clinical outcomes. Immediate recognition and treatment of suspected cases is crucial. Suspected cases should be treated prior to lab confirmation. Health care providers and local health departments must immediately report suspected and confirmed cases to ensure proper control measures can be implemented to prevent secondary cases. The Indiana State Department of Health should be immediately involved with each case investigation. Individuals with direct exposure to the respiratory droplets of a case are at greater risk for contracting the disease within the few days following symptom onset. Antibiotic prophylaxis is recommended for all high-risk close contacts and should be administered as soon as possible. Due to effective prophylaxis, secondary cases and outbreaks of meningococcal disease are rare, and as a result almost all cases in the U.S. are sporadic.

Healthy People 2010 Goal

The Healthy People 2010 Goal for meningococcal disease is an incidence of 1.0 case per 100,000 population per year. Indiana met the Healthy People 2010 Goal for the 5-year reporting period of 2005 - 2009 (see Figure 1).

**Figure 1: Meningococcal Disease Rates by Year
Indiana, 2005-2009**



Epidemiology and Trends

In 2009, there were 34 confirmed and probable cases (Table 1) including four reported deaths (11.7%) from invasive meningococcal disease in Indiana. Figure 2 displays the number of confirmed cases by year for the previous 5 years.

Table 1: Meningococcal Cases Rate by Race and Sex, Indiana, 2009

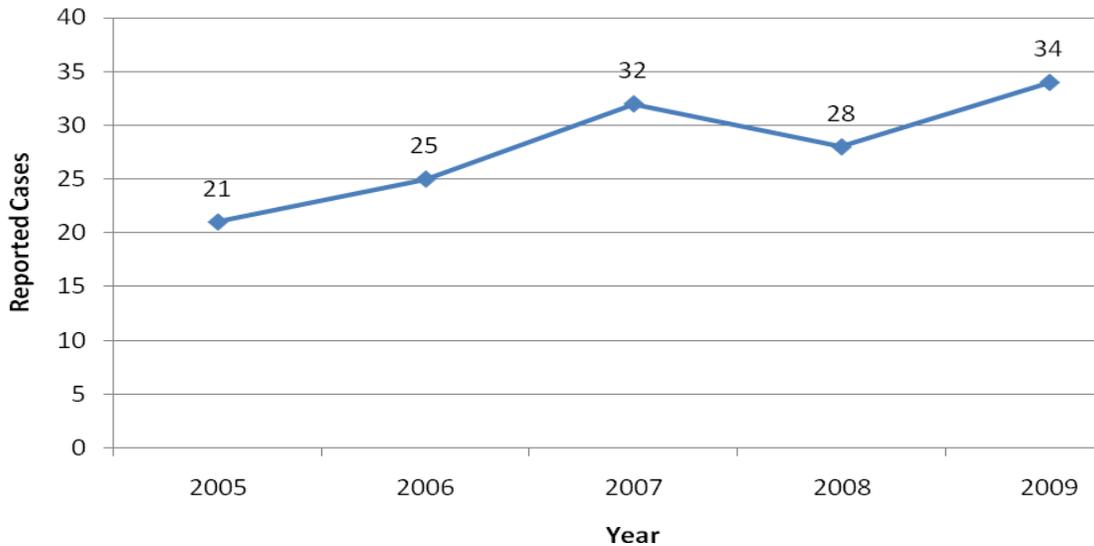
	Cases	Rate*	2005 - 2009 Total
Indiana	34	0.53	140
Race			
Black	3	0.51	20
White	29	0.51	106
Other	0	-	4
Not Reported	2	-	10
Sex			
Female	19	0.58	77
Male	15	0.47	62
Unknown	-	-	1

*Rate per 100,000 population based on U.S. Census Bureau's population data as of July 1, 2009

The rate for blacks (0.51) was the same for whites (0.51), which is a trend that differs from previous years. Females (0.58) had higher rates of disease than males (0.47), and women accounted for 56% of cases during 2009.

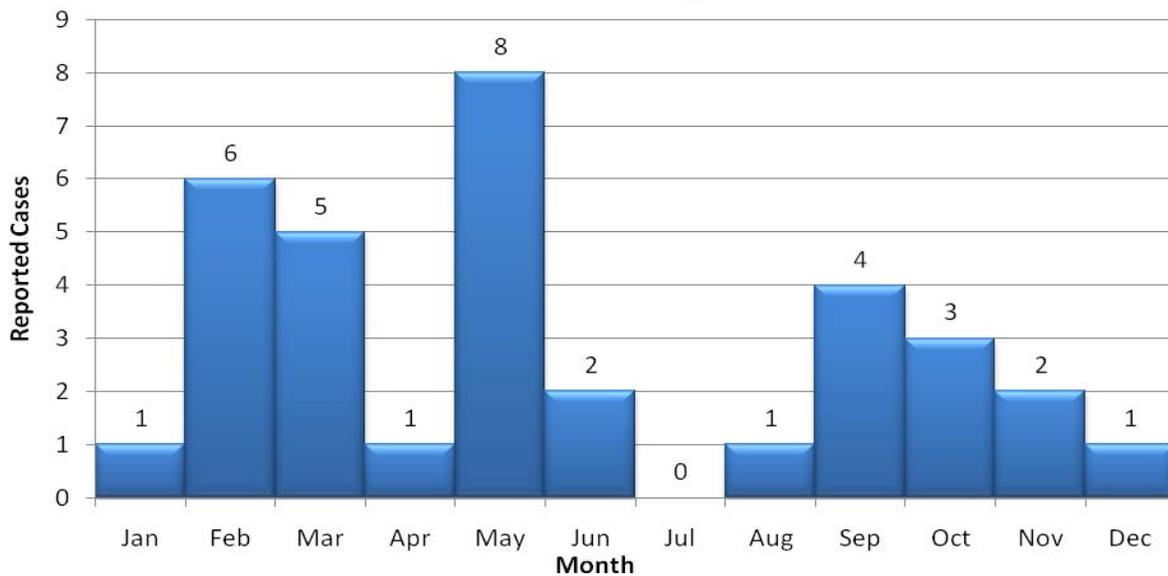
The 2009 meningococcal incidence rate (0.53) was the highest rate from the 5-year reporting period and was a 21% increase from the 2008 incidence rate (see [Figure 2](#)).

**Figure 2: Meningococcal Disease Cases by Year
Indiana, 2005-2009**



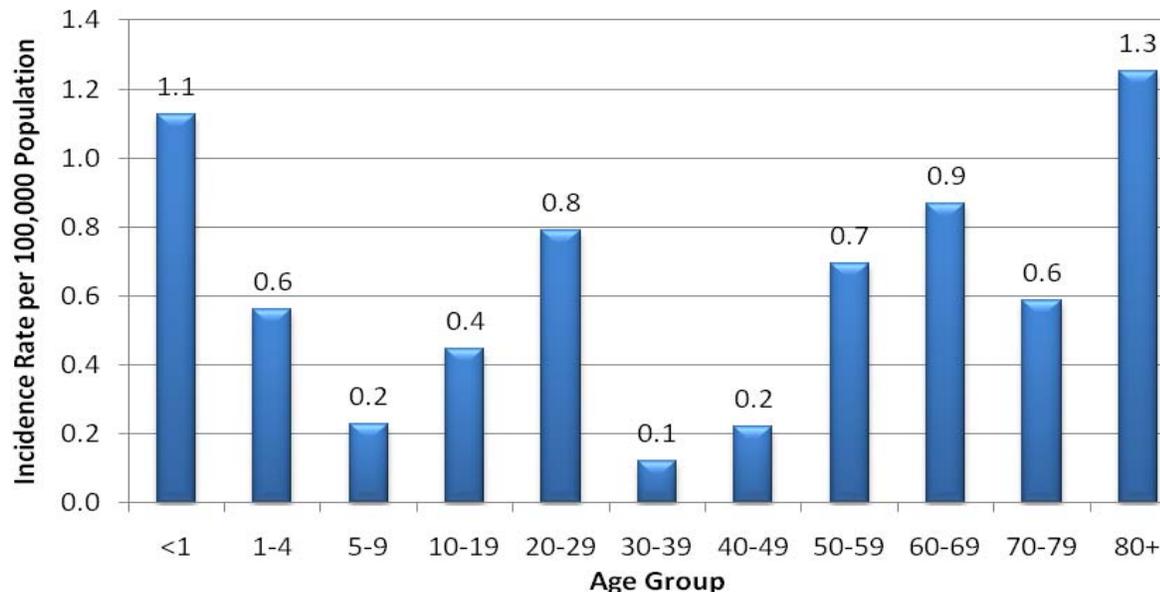
There is some seasonality to meningococcal disease. Case rates in the U.S. are highest during the late winter and early spring. [Figure 3](#) demonstrates this trend with the number of cases by month. The highest number of cases occurred in May 2009.

**Figure 3: Meningococcal Disease Cases by Month
Indiana, 2009**



The highest incidence of meningococcal disease occurs in infants, young adults and the elderly. During 2009, incidence rates were the highest among adults over the age of 80 (1.25) followed by infants < 1 year of age (1.13) and adults 60-69 years of age (0.87). Adults aged 30 -39 years of age had a rate of 0.12 cases per 100,000 persons. Figure 4 shows meningococcal incidence rates for all age groups in the state of Indiana.

Figure 4: Meningococcal Disease Incidence Rates by Age Group Indiana, 2009



Fourteen counties reported confirmed cases during 2009. Allen and Marion counties reported more than 5 cases and accounted for 41% of all cases.

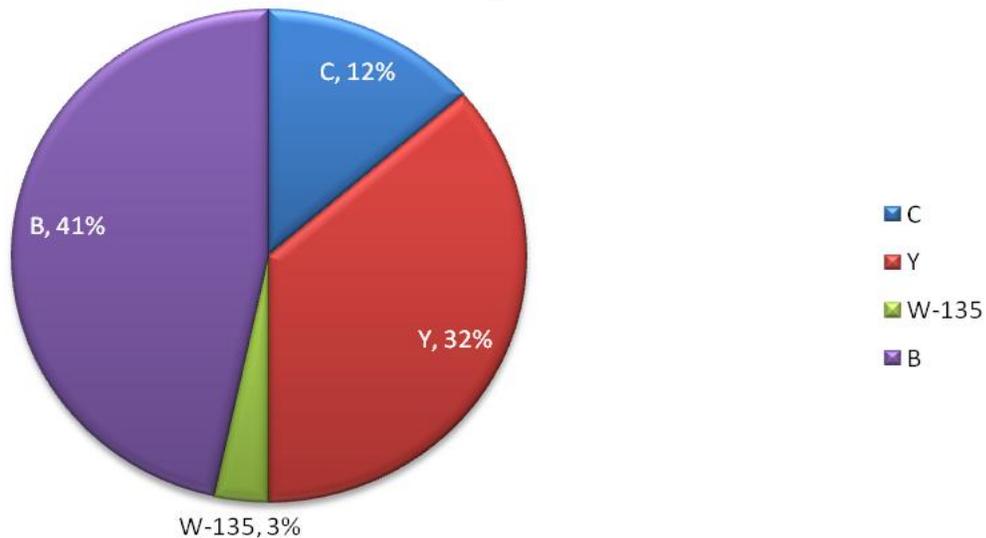
In the U.S., *Neisseria meningitidis* serogroups B, C, and Y are most frequently associated with invasive disease. The Indiana *Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories*, 410 IAC 1-2.3, requires laboratories to submit isolates from invasive sites to the ISDH Laboratory for confirmation, serogrouping followed by susceptibility testing and molecular typing at the CDC meningitis laboratory. Polymerase chain reaction testing (PCR) can be also performed on specimens of suspected cases to provide serogrouping results at the CDC.

Thirty-one of the 34 cases in 2009 had isolates that were viable for confirmation and serogroup testing; 3 specimens were sent to the CDC for PCR testing. In 2009, serogroup B accounted for 47 % (16/34) of all cases compared to 11 % (4/34) for serogroup C and 32.3% (11/34) for serogroup Y. Serogroup B had the highest proportion of cases from 2005 – 2009 (39%). These findings are relatively consistent with previous years as shown in Table 2. Figure 5 displays the total percentage of serogroup results from 2009.

Table 2: Meningococcal Disease Serogroups (Number and % of Isolates), 2005 - 2009

Serogroup	2005	2006	2007	2008	2009	Total
A	-	-	-	-	-	-
B	4 (21%)	12 (50%)	13 (42%)	8 (30%)	16 (41%)	53
C	6 (32%)	5 (21%)	8 (26%)	6 (22%)	4 (12%)	29
Y	1 (5%)	2 (8%)	10 (32%)	11 (44%)	11 (32%)	35
W-135	-	-	-	1 (0.8%)	1 (3%)	2
Z	-	-	-	-	-	-
Nonviable	1 (5%)	-	-	1 (0.8%)	2 (6%)	4
Unknown	7 (37%)	5 (21%)	-	-	-	12

**Figure 5: Meningococcal Disease Serogroups
Indiana, 2009**



The proportion of cases attributed to each serogroup varies with age. All cases in individuals < 5 years of age tested positive for serogroup B, whereas serogroup C accounted for 75% cases in adults 65 years of age and older.

No unusual trends were seen during analysis of 2009 cases of meningococcal disease, although the emergence of serogroup W-135 is notable. Small case rates make yearly comparisons problematic. It is best practice to observe trends over a 5-year reporting period.

You can learn more information on Meningococcal disease, by visiting the following Web sites:

<http://www.in.gov/isdh/22121.htm>

<http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5407a1.htm>

<http://www.cdc.gov/ncidod/dbmd/abcs/publications-neis.htm>

MUMPS

Mumps is an acute illness caused by the mumps virus. Transmission of mumps occurs through airborne transmission or direct contact with infected droplet nuclei or saliva.

Public Health Significance

Mumps illness causes parotitis in approximately 30-40 percent of infected individuals. Swelling of the parotid glands can be unilateral or bilateral when it is present. Common symptoms of mumps include muscle pain, loss of appetite, malaise, headache, and low-grade fever. Up to 20 percent of mumps infections may be asymptomatic. Although mumps may present as a mild disease, it may also lead to severe complications. More severe complications that have been documented include hearing loss, encephalitis, pancreatitis, sterility, permanent sequelae, and death.

The most effective means of preventing mumps virus is vaccination. Children should receive one dose of measles, mumps, rubella (MMR) vaccine at 12 months of age and a second dose at 4-6 years of age according to the routine immunization schedule. All adults should have at least one dose of MMR vaccine; healthcare workers, international travelers, and students enrolled in secondary education should receive two doses of MMR vaccine at least 28 days apart.

It is difficult to distinguish mumps from other forms of parotitis. Therefore, appropriate laboratory testing is strongly recommended on all sporadically reported cases. Appropriate testing includes a serum specimen and a viral specimen (buccal, throat, or nasopharyngeal swab) collected as early as possible following onset of parotitis. Another serum specimen should be collected two weeks later. Although Indiana has a relatively low incidence of mumps cases, health care providers should consider mumps diagnosis and testing when parotitis of two days or longer has occurred.

Healthy People 2010 Goal

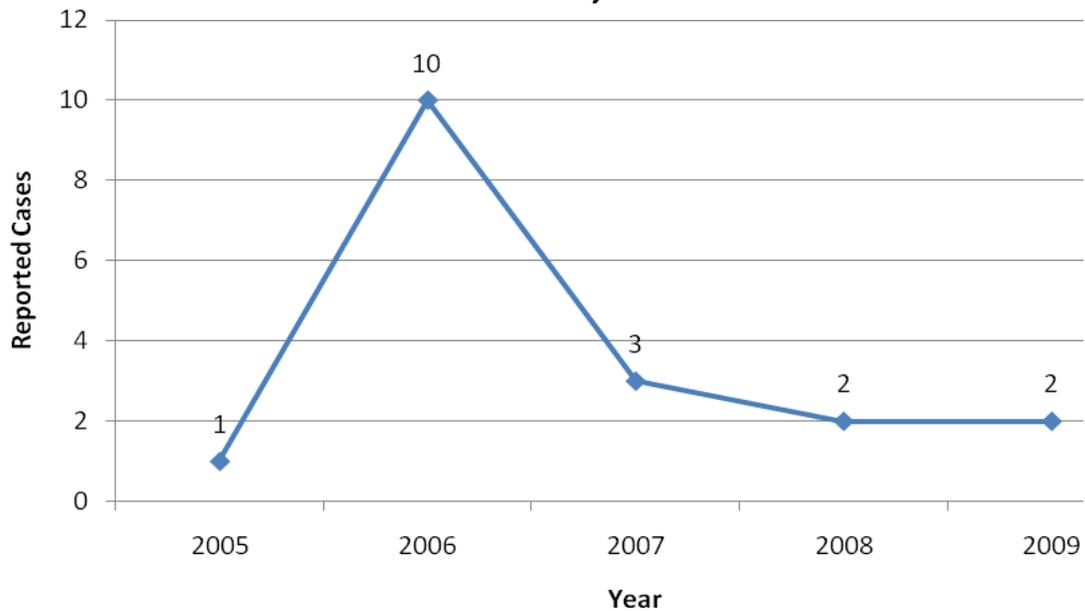
The Healthy People 2010 Goal for mumps is total elimination of the disease in people of all ages. Achieving and maintaining high levels of vaccination coverage is an effective way to accomplish this goal. International travel poses a risk of imported cases exposing travelers as well as residents; therefore, prevention through vaccination is necessary until the virus is globally eradicated. Indiana did not meet the Healthy People 2010 Goal during the five-year reporting period 2005-2009.

Epidemiology and Trends

In 2009, two cases of mumps were reported in Indiana. Eighteen cases were reported during the 5-year period 2005-2009.

[Figure 1](#) shows reported cases by year for 2005-2009. Two reported cases in 2009 is comparable to case reports in recent years other than 2006, when 10 cases were reported that may have been associated with a mumps outbreak in Iowa (the largest outbreak of mumps in the U.S. since 1988).

**Figure 1: Mumps Cases by Year
Indiana, 2005-2009**



In 2009, one case was reported in March and the other case was reported in September. The source of the virus was unknown for both cases.

You can learn more about mumps by visiting the following Web site:

<http://www.cdc.gov/vaccines/vpd-vac/mumps/default.htm>

PERTUSSIS

Pertussis (whooping cough) is an acute respiratory disease caused by the toxin-producing bacterium *Bordetella pertussis*. Transmission most commonly occurs through contact with respiratory droplets or airborne droplets of respiratory secretions. Pertussis is highly communicable with a secondary household attack rate of 80% among susceptible persons.

Public Health Significance

The illness is characterized by the onset of coryza (runny nose), sneezing, low-grade fever, and a mild cough. The cough usually becomes more severe during the second week of illness as the patient experiences bursts, or paroxysms, of numerous, rapid coughs. During these attacks, the patient may become cyanotic and inspiratory “whoop” sound may be heard. Vomiting and exhaustion commonly follow such an episode. Following this paroxysmal phase, which may last 1-10 weeks, a convalescent stage occurs where the coughing spells become less severe and less frequent.

Prior to routine vaccination, more than 200,000 cases of pertussis were reported in the United States each year. Pertussis incidence has decreased more than 80% since the prevaccine era. However, pertussis incidence, unlike other vaccine-preventable diseases, has increased in recent years. Infants are at increased risk for severe complications, including pneumonia, seizures, encephalopathy, and death. The vaccines currently available that provide protection from pertussis are DTaP and Tdap. The DTaP vaccine is licensed to be administered at 2, 4, 6, and 15-18 months of age with an additional dose administered between 4 and 6 years of age. The DTaP vaccine should not be administered to persons over 7 years of age. However, there are two Tdap vaccines currently available for adolescents and adults from ages 10 through 64. The introduction of the Tdap vaccine may help to reduce the rate of pertussis in adult and adolescent populations, who tend to be responsible for infecting most infants.

While antibiotics are used to reduce the transmission of pertussis, they often have little impact on reducing the intensity of the coughing symptoms.

Serious complications of pertussis can include pneumonia, seizures, encephalopathy and death.

Healthy People 2010 Goal

The Healthy People 2010 Goal for pertussis is fewer than 2,000 cases of pertussis nationwide in children under 7 years of age. Current data are not available to assess progress toward this goal.

Epidemiology and Trends

Indiana had 392 reported cases of pertussis in 2009, for a rate of 6.10 cases per 100,000 population ([Table 1](#)). Females (6.57) had a higher incidence rate than males (5.62). The rate for whites (5.57) was higher than for blacks (4.08), but lower than for other races (8.12).

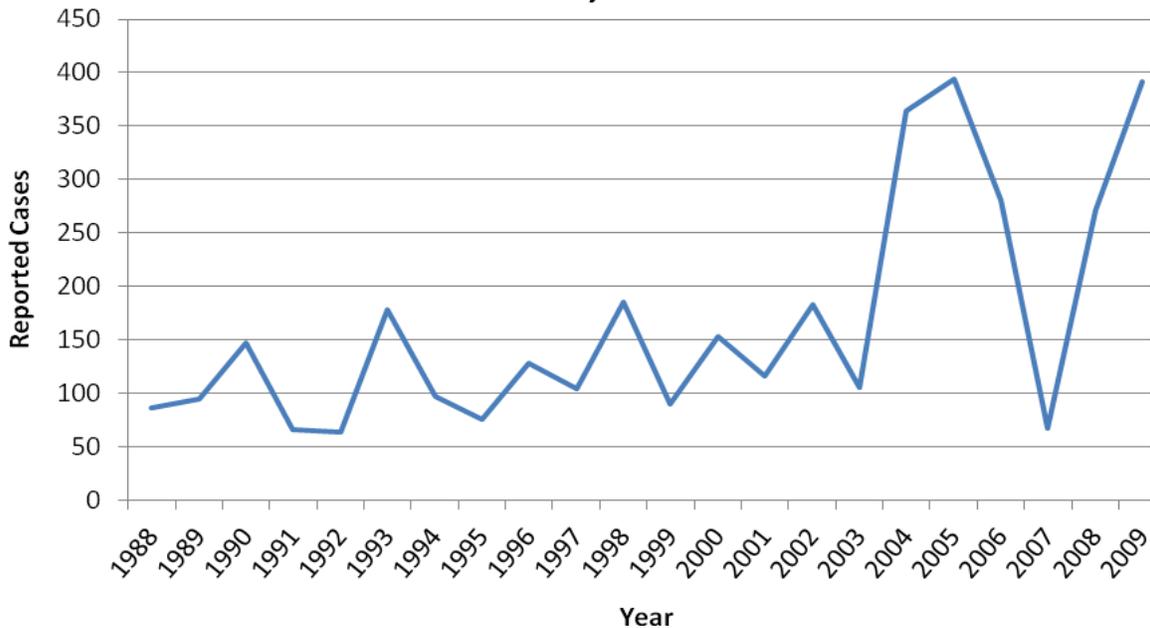
Table 1: Case Rate by Race and Sex, Indiana, 2009

	Cases	Rate*	2005 - 2009 Total
Indiana	392	6.10	1406
Race			
Black	24	4.08	60
White	314	5.57	1231
Other	16	8.12	38
Not Reported	38	-	77
Sex			
Female	214	6.57	782
Male	178	5.62	624
Unknown	0	0.00	0

*Rate per 100,000 population based on U.S. Census Bureau's population data as of July 1, 2009

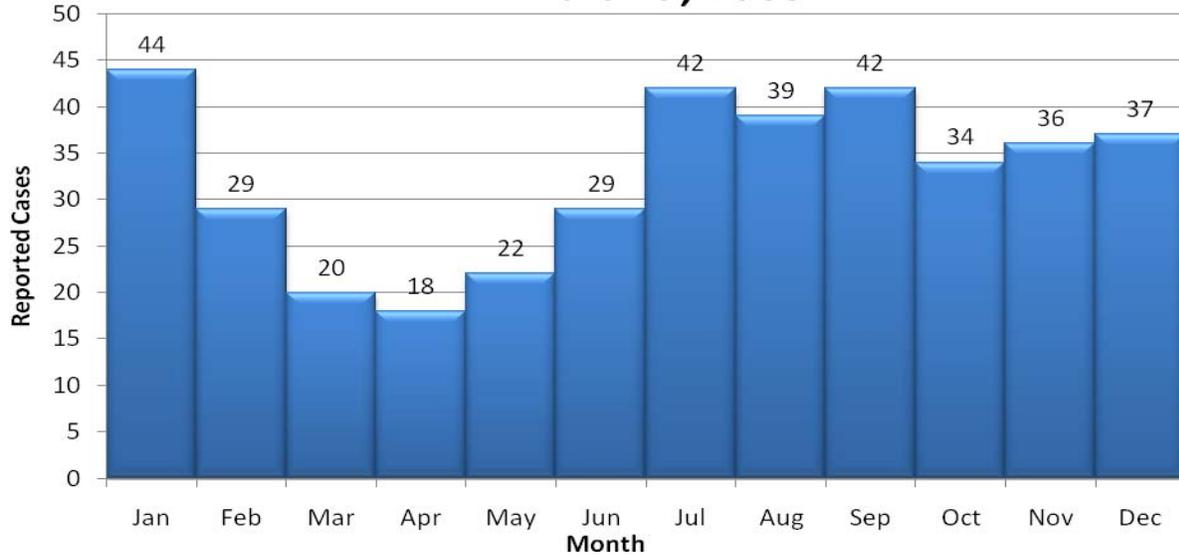
As stated earlier, pertussis incidence, unlike other vaccine-preventable diseases, has increased overall since the 1980s. Pertussis incidence occurs in a cycle, with increases and decreases every 3-5 years. [Figure 1](#) illustrates this cycle. The increased incidence in Indiana in 2009 is similar to incidence trends observed throughout the U.S. and is believed to be part of the natural cycle of pertussis.

**Figure 1: Pertussis Cases by Year
Indiana, 1988-2009**



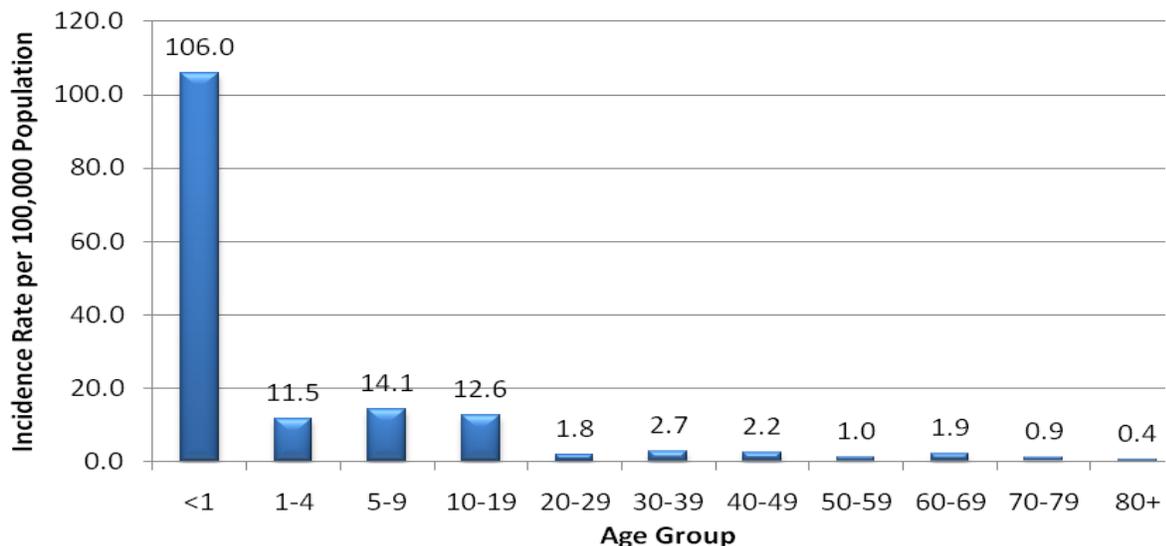
In 2009, disease incidence was highest during January, followed by July and September, but pertussis can occur anytime during the year (Figure 2).

**Figure 2: Pertussis Cases by Month
Indiana, 2009**



Pertussis is the most frequently reported vaccine-preventable disease among children under age 5 years. In 2009, 34% of all cases occurred in children less than 5 years of age. Incidence rates were highest for infants less than 1 year of age (106.0), followed by children ages 5-9 years (14.1) and children ages 10-19 years (12.6). School aged-children, 5-19 years of age, accounted for 44.6% of cases in 2009. The proportion of pertussis cases reported in school-age children in 2009 is related to community-wide pertussis outbreaks and with ongoing transmission within schools and households as well as self-limited school outbreaks. Figure 3 shows incidence rates for all age groups.

**Figure 3: Pertussis Incidence Rates by Age Group
Indiana, 2009**



The incidence rates were highest among the following counties reporting five or more cases (Figure 4): Ripley (29.2), Washington (28.9), and Fulton (24.7). Sixty-two counties reported at least one case during 2009.

In 2009, 75 of the 392 (19.1%) reported cases in Indiana were hospitalized. In 2009, 61 of the 90 cases (67.8%) in infants less than 1 year of age were hospitalized. Infants less than 1 year of age are at greatest risk for severe disease as evidenced by the proportion of cases hospitalized and smaller airways.

Unvaccinated children are at highest risk for severe disease, but appropriately immunized children may also develop illness. Table 2 reflects the number and percent of cases that were not up-to-date for pertussis vaccination at time of illness for selected age groups.

Table 2: Vaccination History of Selected Age Groups and Number (Percent) of Incomplete Vaccinations, Indiana, 2009

Age Group	Number of Cases	Number (Percent) Not Appropriately Immunized	Unknown Vaccine History
7-11 Months	10	7 (70%)	0
1 Year	16	11 (69%)	0
2-4 Years	29	12 (41%)	0
5-9 Years	58	13 (22%)	0
10-19 Years (Including Tdap)	116	103 (89%)	3

Laboratory confirmation was obtained through culture and/or PCR for 246 (63%) of the reported pertussis cases. Since other illness have similar symptoms, it is important for physicians to test potential cases. PCR and culture are the preferred testing methods. However, physicians should not wait for test results before treating a suspected case of pertussis.

No deaths were reported in Indiana in 2009 due to pertussis.

You can learn more about pertussis by visiting the following Web site:

<http://www.cdc.gov/vaccines/vpd-vac/pertussis/default.htm>

PLAGUE

Plague is caused by *Yersinia pestis* bacteria. Bacteria are present in the fleas of wild rodents (ground squirrels, prairie dogs, and other burrowing rodents) of the western U.S., where 10-15 cases of human plague occur annually. Plague does not occur naturally in Indiana.

Plague is transmitted by an infected flea bite, direct contact with a sick or dead animal, or from respiratory droplets from a sick animal. There are three forms of the disease: 1) bubonic plague, an infection of lymph nodes; 2) septicemic plague, a systemic bloodstream infection; or 3) pneumonic plague, an infection of the lungs. If not treated rapidly, bubonic or pneumonic plague can develop into septicemic plague. Mortality rates can be as high as 100% for both pneumonic and septicemic plague. Early treatment with appropriate antibiotics prevents the high mortality associated with plague.

Public Health Significance

Each form of plague has different symptoms. The incubation period is 2-5 days after exposure to bacteria. Bubonic plague symptoms appear suddenly and include swollen lymph nodes (called “buboes”), high fever, chills, malaise, muscle pain, and headache. The bacteria can invade the bloodstream if not treated. Septicemic plague is a more severe form of plague and results when infection spreads directly to the bloodstream. Symptoms include nausea, vomiting, diarrhea, abdominal pain, and organ failure. Death may result before symptoms occur. Pneumonic plague is the most dangerous and the least common. Symptoms appear suddenly and include severe cough, bloody sputum, and difficulty breathing. Populations at increased risk for infection include veterinarians, pet owners, hunters, and campers or hikers in areas with outbreaks of animal plague. Most cases of the plague occur in the southwestern U.S.

Plague is classified as a Category A potential bioterrorism agent* because of its ability to be transmitted via aerosolization as a weapon and secondarily by respiratory droplets from infected individuals. Plague was used as a weapon of mass destruction during WWII.

Healthy People 2010 Goal

There is no Healthy People 2010 Goal for plague.

Epidemiology and Trends

There have been no reported cases of plague in Indiana to date.

You can learn more about plague by visiting the following Web sites:

<http://www.cdc.gov/ncidod/dvbid/plague/index.htm>

*Bioterrorism Agent List:

<http://www.bt.cdc.gov/agent/agentlist-category.asp>

PNEUMOCOCCAL DISEASE

Pneumococcal disease is caused by the bacterium *Streptococcus pneumoniae* and causes significant illness and death in the U.S. The major clinical syndromes of pneumococcal disease include pneumonia and otitis media; however, more serious life-threatening illnesses such as bacteremia and meningitis can occur when the bacteria invade a site in the body where bacteria are not normally found. Pneumococcal bacteria, of which there are over 90 serotypes are found in the nose and throat of healthy people and are rarely spread through contact with respiratory droplets of an infected person. Only cases of invasive disease are reportable in Indiana.

Public Health Significance

Symptoms of pneumococcal pneumonia generally include an abrupt onset of fever, chills or rigors, pleuritic chest pain, a productive cough, rusty sputum, difficulty breathing, rapid heart rate, and fatigue. The treatment for pneumococcal disease is the administration of appropriate antibiotics. Treatment for invasive pneumococcal infections is based on empiric therapy followed by the specific susceptibility of the strain acquired. Strains have been identified that are not susceptible to penicillin G, cefotaxime, ceftriaxone, and other antimicrobial agents. In some areas the rates of resistance are as high as 30%.

Since the licensure of a 7-valent pneumococcal conjugate vaccine for children under 5 years of age in 2000, Indiana has seen a decrease in cases in this age group. However, the highest rate of invasive pneumococcal disease still occurs among young children, especially those younger than 2 years of age, and the most common serotypes are not included in the 7-valent vaccine. The current pneumococcal conjugate vaccine recommended for administration to children under 5 years of age is 13-valent pneumococcal conjugate vaccine (PCV13), which was licensed in 2010. The vaccine contains capsular polysaccharides from thirteen *S. pneumoniae* serotypes which are known to cause the majority of bacteremia, meningitis, and otitis media associated with invasive pneumococcal infections. The 23-valent polysaccharide vaccine (PPSV23) is licensed for routine use in adults age 65 and older and may be used in other individuals with certain risk factors.

Pneumococcal disease is not easily spread from person to person; therefore, the control measures for contacts of a known case of invasive pneumococcal disease are minimal under most circumstances. On rare occasions, outbreaks have occurred in settings where close contact is common, such as daycare centers and correctional facilities. Proper hygiene habits when coughing, sneezing, and hand washing will help prevent the spread of infection.

Healthy People 2010 Goal

The Healthy People 2010 Goal for pneumococcal disease is 46 cases per 100,000 population for children under 5 years and 42 cases per 100,000 population for adults aged 65 years and older. Indiana met the Healthy People 2010 Goal for children under 5 years of age in 2009 with an incidence rate of 18.40 per 100,000 population. Indiana also met the Healthy People 2010 Goal for adults aged 65 years and older; the incidence rate for this population was 23.2 per 100,000 population in 2009.

Epidemiology and Trends

Surveillance of invasive pneumococcal disease has been ongoing in Indiana since the summer of 1998. In 2009, 819 cases of pneumococcal disease were reported in Indiana for a case rate of 12.75 per 100,000 population, a decrease from 2008. In 2009, the incidence rate among the black population (14.45) was higher than that of the white population (10.09). The rates of disease in females (13.41) were higher than males (12.07) in 2009.

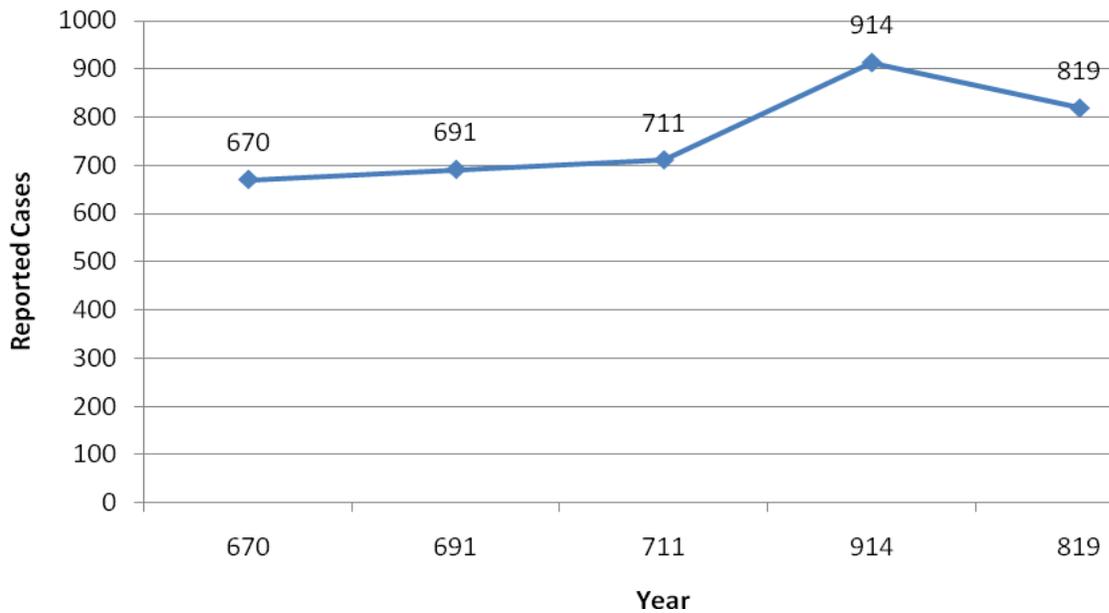
Table 1: Pneumococcal Disease Case Rate by Race and Sex, Indiana, 2009

	Cases	Rate*	2005 - 2009 Total
Indiana	819	12.75	3805
Race			
Black	85	14.45	427
White	569	10.09	2609
Other	8	4.06	32
Not Reported	157	-	737
Sex			
Female	437	13.41	1949
Male	382	12.07	1846
Unknown	0	-	10

*Rate per 100,000 population based on U.S. Census Bureau's population data as of July 1, 2009

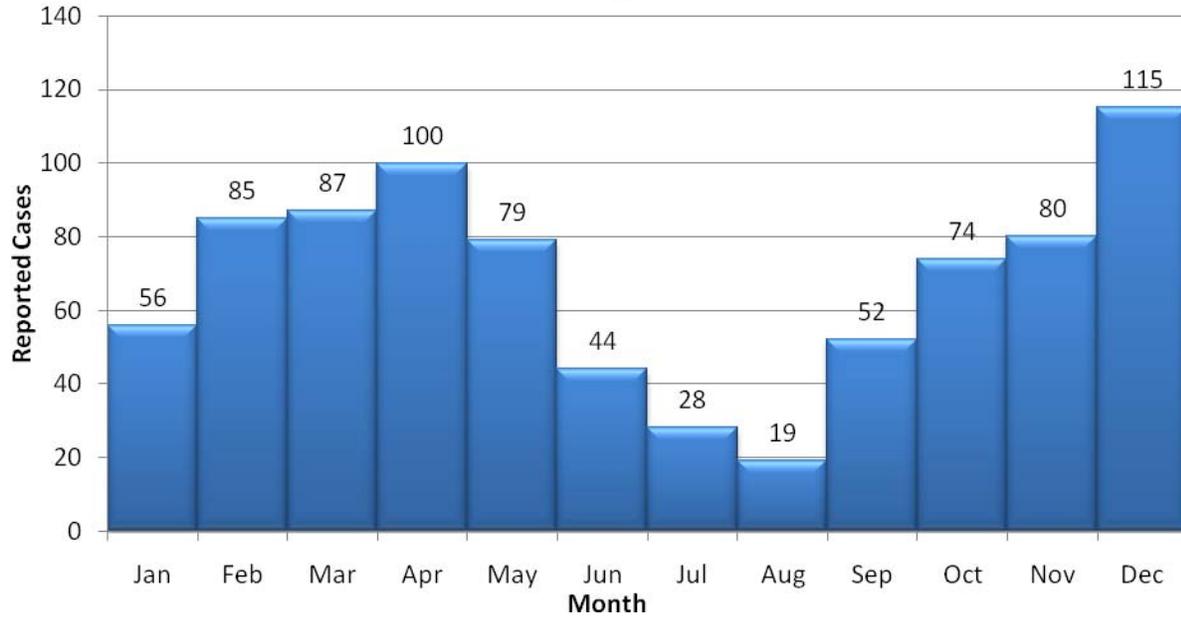
Figure 1 shows the number of reported cases per year for 2005-2009.

**Figure 1: Pneumococcal Disease Cases by Year
Indiana, 2005-2009**



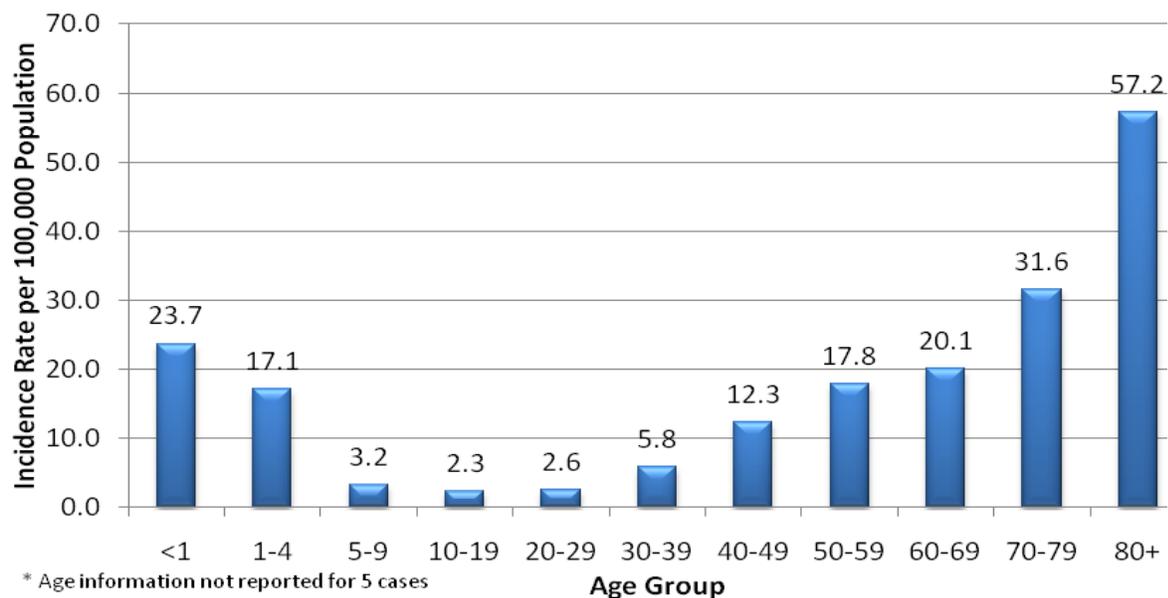
Disease incidence was greatest during the spring and winter months (Figure 2).

**Figure 2: Pneumococcal Disease Cases by Month
Indiana, 2009**



Incidence of invasive pneumococcal disease varies considerably with age. Pneumococcal disease is a significant burden on adults aged 80 years and older. In 2009, the incidence rate for adults aged 80 years and older was 57.2 per 100,000 population, followed by adults aged 70-79 years (31.6), and infants less than 1 year of age (23.7) (Figure 3).

**Figure 3: Pneumococcal Disease Incidence
Rates by Age Group Indiana, 2009**



In 2009, 26 counties reported 5 or more cases of invasive pneumococcal disease (Figure 4). The incidence rates were highest among the following counties reporting five or more cases: Decatur (31.9), Grant (30.5) and Sullivan (28.4).

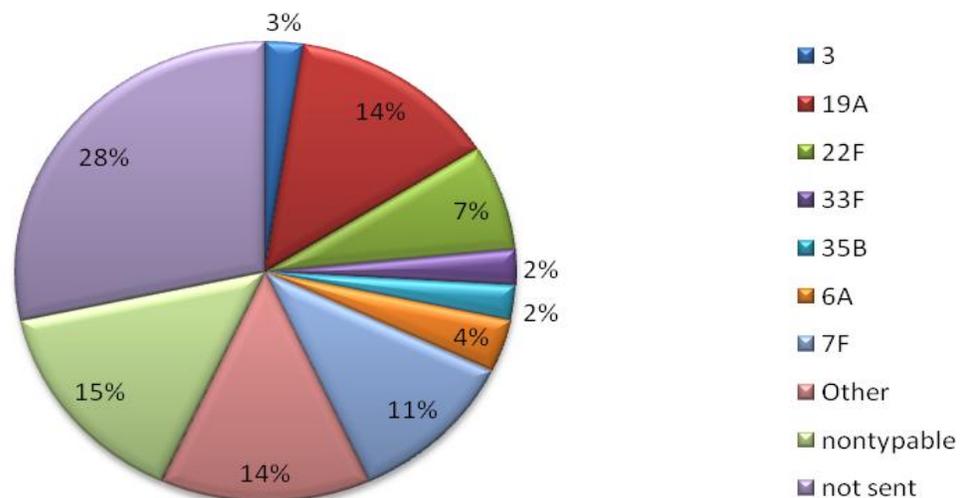
Susceptibilities were reported for all but 5 cases of invasive pneumococcal disease in 2009. Of the 819 cases, 252 demonstrated intermediate resistance or resistance to at least one commonly prescribed antibiotic. Table 2 lists susceptibility testing results for cases reported in Indiana.

Table 2: Antimicrobial Resistance Rates, Indiana, 2009

Antimicrobial Agent	Susceptible (%)	Intermediate (%)	Resistant (%)
Penicillin	81.3	12.1	6.6
Ceftriaxone	96.2	2.8	1.0
Erythromycin	70	N/A	30
TMP/Sulfa	76.8	6.0	17.2
Tetracycline	88.1	1.9	10.0
Levofloxacin	99.5	N/A	0.5
Vancomycin	100		

Ten percent of all reported invasive pneumococcal cases occurred in individuals less than five years of age in 2009 (82 cases). The Indiana Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3, requires laboratories to submit isolates from invasive sites for all cases under the age of 5 years for serotyping. Of the 82 cases under the age of 5 years, 57 had viable isolates that were sent to the Indiana State Department of Health for serotyping. Of the 57 cases, 46 cases were successfully serotyped. Predominant serotypes were 19A (14%), 7F (11%) and 22F. Both 19A and 7F serotypes are included in the 13-valent conjugate vaccine (Figure 5).

Figure 5: Pneumococcal Serotypes, Children Under 5 Years, Indiana 2009



You can learn more about pneumococcal infections by visiting the following Web site:
<http://www.cdc.gov/vaccines/vpd-vac/pneumo/default.htm>

POLIOMYELITIS

Poliomyelitis (polio) is a viral disease that infects the intestinal tract. Cases can be asymptomatic, experience mild gastrointestinal infection, meningitis, or in the most severe cases, exhibit acute flaccid paralysis. Death may result if respiratory muscles are affected. While transmission of wild poliovirus has been interrupted in most of the world, cases of polio still occur in Afghanistan, India, Nigeria, and Pakistan. Further spread of the illness into other unvaccinated groups is possible due to international travel.

Poliovirus is mainly transmitted by fecal-oral and respiratory routes. The virus enters the environment through feces and throat secretions of infected people and then is passed to others, especially in environments where hygiene is poor.

Public Health Significance

Approximately 95 percent of polio infections are asymptomatic, resulting in the ability to spread undetected unless confirmed by laboratory analysis. Once it is introduced into largely unvaccinated populations, polio spreads easily.

Poliomyelitis reporting serves to: 1) detect importation of wild poliovirus into the U.S. and 2) detect the presence of vaccine-derived poliovirus in the U.S. Due to the severity of this potentially paralytic disease, timely reporting of suspected cases is extremely important, especially among unvaccinated groups. Disease reporting by clinicians is often delayed because it is only after other differential diagnoses are ruled out that the diagnosis of poliomyelitis is considered. Efforts should be made to promote physicians' awareness of the importance of prompt reporting of suspected cases to the state and local health departments, as well as the need to obtain stool and serum specimens early in the course of the disease.

Healthy People 2010 Goal

The Healthy People 2010 Goal for polio is to eliminate all wild-type polio from persons of all ages. Indiana has met this goal since the late 1950s.

Epidemiology and Trends

Polio incidence fell rapidly following the introduction of the inactivated polio vaccine (IPV) in 1955 and the live polio vaccine (OPV) in the 1960s. Due to successful vaccination efforts, the world is almost polio free today. The last indigenous case of wild poliovirus in the U.S. occurred in 1979. The Americas were declared polio free in 1994.

You can learn more about polio by visiting the following Web sites:

<http://www.cdc.gov/travel/yellowbook/2010/chapter-2/poliomyelitis.aspx>

<http://www.cdc.gov/vaccines/pubs/pinkbook/downloads/polio.pdf>

<http://www.who.int/topics/poliomyelitis/en/>

PSITTACOSIS

Psittacosis, often called parrot fever, is caused by the bacteria *Chlamydophila psittaci* (formerly *Chlamydia psittaci*). Humans acquire the disease through inhalation of dried secretions from infected birds. Wild and domestic birds are the natural reservoirs of this agent and are most often involved in transmission to humans. Cattle, sheep, goats, and cats can also become infected with a mammalian strain and develop severe debilitating disease. Large outbreaks of psittacosis in humans have been associated with infected feces and respiratory excretions from domestic poultry flocks.

Public Health Significance

Human symptoms of psittacosis include fever, nonproductive cough, headache, and malaise. More severe illness may result in heart inflammation, hepatitis, and encephalopathy. The incubation period is 5-19 days with symptoms persisting for 7-10 days. Bird symptoms include ruffled appearance, diarrhea, and poor appetite. Some birds may be asymptomatic. Groups most at risk for contracting psittacosis are bird owners, pet shop employees, and veterinarians. It may also be found in farmers and slaughterhouse workers who process turkeys. Psittacosis can be diagnosed with serum antibody tests and treated with antibiotics.

Healthy People 2010 Goal

There is no Healthy People 2010 Goal for psittacosis.

Epidemiology and Trends

There were no reported cases of psittacosis in Indiana during the five-year period 2005-2009.

You can learn more about psittacosis by visiting the following Web site:

http://www.cdc.gov/ncidod/dbmd/diseaseinfo/psittacosis_t.htm

Q FEVER

Q fever is caused by the bacterium *Coxiella burnetii* and is a zoonotic disease affecting several species of animals, including humans. Ticks are the primary reservoir and maintain disease cycles in rodents, other mammals, and birds. Cattle, sheep, and goats can carry the infection without signs or symptoms and shed high levels of bacteria when birthing. Birth products (placenta and fluids) are often highly contaminated. The bacteria are highly resistant to natural degradation and can persist in the environment for weeks to months. Q fever may result from infection by a single organism, and the low infectious dose enhances transmission efficiency.

Human infections generally occur through inhalation of aerosols from contaminated barnyard dust, handling of birthing products from shedding animals, or drinking unpasteurized milk. Humans may have an asymptomatic, acute, mild, or severe disease that can be highly fatal or result in chronic infection that can cause significant morbidity if untreated.

Public Health Significance

Symptoms of Q fever usually appear 2-3 weeks after exposure and can include high fever, severe headache, muscle aches, chills, nausea and vomiting, and a non-productive cough. Fifty percent of those infected may not have any symptoms. Antibiotics are available for the treatment of Q fever. Treatment is most effective when initiated within the first three days of illness. People most at risk of becoming infected with Q fever are veterinarians, meat processing plant workers, livestock handlers, and dairy farmers. While there is a vaccine for Q fever, it is not available in the U.S.

Q fever is classified as a Category B potential bioterrorism agent* because of its ability to cause infection with a low number of organisms, resistance to environmental degradation, and the ability to cause infection via aerosolization.

Healthy People 2010 Goal

There is no Healthy People 2010 Goal for Q fever.

Epidemiology and Trends

In 2009, no cases of Q fever were reported in Indiana. Five cases of Q fever were reported during the five-year period 2005-2009.

You can learn more about Q fever by visiting the following Web sites:

<http://www.cdc.gov/ncidod/dvrd/qfever/index.htm>

*Bioterrorism Agent List:

<http://www.bt.cdc.gov/agent/agentlist-category.asp>

RABIES

Clinical rabies is caused by a virus from the genus *Lyssavirus*. Within the *Lyssavirus* genus, a number of other viruses have been identified that infect mammalian hosts (animal and human) causing fatal encephalitis. Rabies virus is the *Lyssavirus* associated with rabies in bats and terrestrial mammals around the world. The other *Lyssaviruses* have been identified in bats in Europe, Africa, Asia, and Australia. Rabies is transmitted from animal to animal through transfer of virus-contaminated saliva by bites or mucous-membrane exposures. In the U.S., rabies virus subtypes have become associated with the mammalian species in which the subtype is generally found. In Indiana, the North Central Skunk virus and numerous bat subtypes of rabies virus have been identified. In 2009, there were 1,163 animals of various species tested for rabies in Indiana. Thirty-nine of those animals were found to be positive; all were bats.

In 2009, 49 states, the District of Columbia, and Puerto Rico reported 6,690 cases of animal rabies and four human cases to the Centers for Disease Control and Prevention (Hawaii is the only state that is rabies free). The total number of reported cases decreased by 2.2 percent from those reported in 2008 (6,841 animal cases and two human cases).

Public Health Significance

In humans, early symptoms of rabies infection are similar to influenza (the flu) and may include headache, fever, and malaise. As the disease progresses, symptoms include anxiety, confusion, hallucinations, excessive salivation, and difficulty swallowing. The virus infects the central nervous system resulting in death, often within days of symptom onset. Symptoms usually occur 1-3 months after exposure.

Vaccine and postexposure prophylaxis for rabies are available. Treatment has not been shown to be effective after the development of clinical signs; the vaccine must be given before clinical signs develop.

Although anyone can be at risk for rabies, people who work with rabies virus in research laboratories and vaccine production facilities are at the highest risk. Other groups at risk include veterinarians, animal control and wildlife officers, rehabilitation specialists, and bat handlers.

Healthy People 2010 Goal

There is no Healthy People 2010 Goal for rabies.

Epidemiology and Trends

While rabies is rare disease of humans in the United States, one case was reported in an Indiana resident in 2009. In the five-year reporting period from 2005-2009, two human cases of rabies were reported in Indiana.

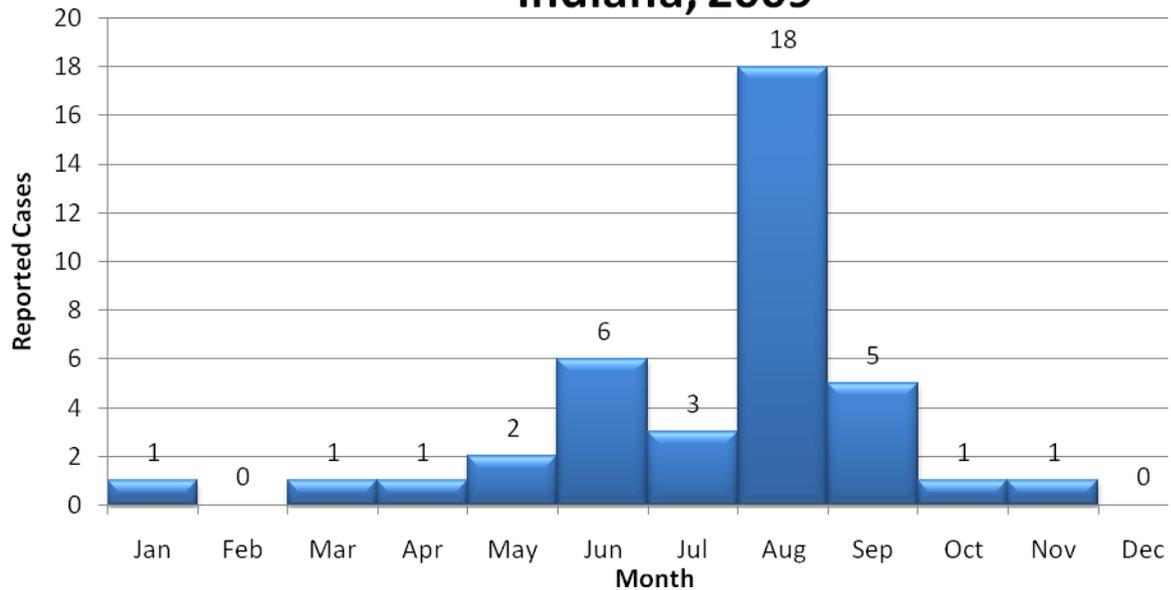
Since 1990, bats have been the predominate species diagnosed with rabies at the Indiana State Department of Health Laboratory (the only Indiana laboratory that performs rabies testing). Bats continued that trend in 2009, being the only animal species found positive that year: a total of 39 bats tested positive (Table 1). A horse diagnosed with rabies in 2002 was infected with a bat strain of rabies virus, and both human rabies cases in 2006 and 2009 were also infected with a bat strain of the virus.

Table 1. Rabies Cases by Species, Indiana, 2008

	2009	2005 - 2009 Total
Cases	40	91
Species		
Bat	39	89
Skunk	0	0
Horse	0	0
Human	1	2

Incidence of disease was greatest during the summer months (Figure 1).

**Figure 1: Rabies Cases by Month
Indiana, 2009**



You can learn more about rabies by visiting the following Web sites:

<http://www.cdc.gov/ncidod/dvrd/rabies/>

<http://www.in.gov/isdh/20518.htm>

<http://avmajournals.avma.org/doi/full/10.2460/javma.233.6.884>

ROCKY MOUNTAIN SPOTTED FEVER

Rocky Mountain spotted fever (RMSF) is caused by the bacterium *Rickettsia rickettsii*. RMSF is transmitted in Indiana by the dog tick (*Dermacentor variabilis*), which lives in wooded areas and tall, grassy fields.

Public Health Significance

RMSF occurs 5-10 days after a bite from an infected tick. Symptoms of RMSF include high fever, severe headache, nausea, vomiting, muscle and joint pain, and lack of appetite, followed by a rash. Early treatment with antibiotics ensures recovery.

Healthy People 2010 Goal

There is no Healthy People 2010 Goal for RMSF.

Epidemiology and Trends

During the five-year period 2005-2009, 20 cases of RMSF were reported in Indiana, including 1 case in 2009. While the disease is most common in the spring and summer months when ticks are active, RMSF can occur anytime during the year. RMSF can occur in all areas of Indiana, but most cases occur in the southern portion of the state. Cases are reported by county of residence and may not always reflect the site of tick exposure.

You can learn more about Rocky Mountain spotted fever by visiting the following Web site:

http://www.cdc.gov/ticks/diseases/rocky_mountain_spotted_fever/

RUBELLA

Rubella, also known as German Measles, is an infectious viral disease caused by the rubella virus. Rubella is spread from person to person via airborne transmission or droplets shed from respiratory secretions of infected persons.

Public Health Significance

Symptoms of rubella include rash, low-grade fever, malaise, lymphadenopathy, and upper respiratory symptoms. Symptoms of rubella typically appear 12-23 days after exposure, and as many as 50 percent of infections may be subclinical or inapparent. In children and adults, rubella generally is a mild illness.

Congenital rubella syndrome (CRS), however, can lead to severe, long-term outcomes. CRS can occur when a woman becomes infected with rubella during pregnancy. CRS can affect virtually all organ systems, with severity and long term sequelae largely dependent on the time of gestation at which infection occurs. Fetal death, spontaneous abortion, premature delivery, deafness, eye defects, cardiac defects, and neurologic abnormalities can occur. Prevention of CRS is the primary objective of rubella vaccination programs.

At least one dose of rubella-containing vaccine is recommended for all children 12 months of age or older. The first dose of measles-mumps-rubella (MMR) vaccine is administered after 12 months of age, while a second dose is routinely administered at 4 to 6 years of age to improve immunity. Children and adults who have not received two doses of MMR vaccine should receive two doses 28 days apart.

Prior to routine vaccination, the United States experienced the greatest number of rubella cases in 1969 with 57,686 cases reported (58 cases per 100,000 population). The largest annual total of reported cases of CRS occurred in 1970 with 67 cases.

Healthy People 2010 Goal

The Healthy People 2010 Goal for rubella disease is to eliminate all cases of CRS from children less than one year of age. Indiana met this goal during the five-year reporting period 2005-2009.

Epidemiology and Trends

No cases of rubella were reported in Indiana in 2009 or during the five-year reporting period 2005-2009.

You can learn more about rubella by visiting the following Web site:

<http://www.vaccineinformation.org/rubella/qandadis.asp>

SALMONELLOSIS

Salmonellosis is a contagious disease caused by *Salmonella* bacteria, which are found in the intestines of many healthy animals, including poultry, farm animals (cattle, pigs, chicks, and ducklings), domestic animals (dogs, cats, and birds), wild birds, reptiles, and amphibians. There are thousands of types of *Salmonella* bacteria, most of which can infect humans. People become infected with *Salmonella* by ingesting feces from an infected animal or person (fecal-oral route).

The most common sources of *Salmonella* outbreaks are raw or undercooked eggs and poultry, unpasteurized dairy products, untreated water, and contaminated raw fruits, vegetables, or herbs. Pet food and treats have also been implicated in outbreaks. Persons who work in certain occupations, such as food handlers, daycare providers, and health care providers, have a greater risk of transmitting infection to others.

Public Health Significance:

Symptoms of *Salmonella* can include diarrhea, stomach cramps, fever, nausea, or vomiting. Symptoms usually begin 12-36 hours (range of 6-72 hours) after exposure and last 4-7 days. Infected people may carry *Salmonella* in their bodies for weeks or months without symptoms and unknowingly infect others. Rarely, *Salmonella* can get into the blood and infect organs such as the heart, lungs, and bones. Death from salmonellosis is rare. Children less than 5 years of age, the elderly, and people with weakened immune systems are at the greatest risk for severe complications. Most people recover within 5-7 days without medical treatment, but antibiotics are available if indicated. Since diarrhea can cause dehydration, an infected person should drink plenty of fluids. There is no vaccine for salmonellosis.

In general, salmonellosis can be prevented by strictly adhering to the following guidelines:

- Practice good hygiene:
 - Thoroughly wash hands with soap and water after using the restroom; after assisting someone with diarrhea and/or vomiting; after contact with animals, amphibians, and reptiles; after swimming; before, during, and after food preparation; and after exposure to raw meat products.
 - Clean food preparation work surfaces, equipment, and utensils with soap and water before, during, and after food preparation, especially after contamination with raw meat products.
- Separate raw and cooked foods:
 - Avoid cross-contamination by keeping uncooked meat products separate from produce, ready-to-eat foods, and cooked foods.
 - Use separate equipment and utensils for handling raw foods.
 - Clean food-preparation work surfaces and utensils with soap and water before, during, and after food preparation, especially after contact with raw meat products.
- Maintain safe food temperatures:
 - Ensure proper temperatures are maintained during refrigeration (<40°F), freezing (<2°F), holding (keep food hot or at room temperature for no longer than 2 hours), and chilling (chill immediately and separate into smaller containers if needed).
 - Thoroughly cook all food items to USDA recommended safe minimum internal temperatures:
 - 145°F – steaks, roasts, and fish
 - 160°F – pork, ground beef, and egg dishes
 - 165°F – chicken breasts and whole poultry

- Eat safe foods and drink safe water:
 - Do not eat undercooked meat, poultry, or eggs.
 - Do not eat foods past the expiration date.
 - Do not eat unpasteurized dairy products; it is illegal to sell unpasteurized dairy products in Indiana.
 - Wash all produce before eating raw or cooking.
 - Use treated water for washing, cooking, and drinking.

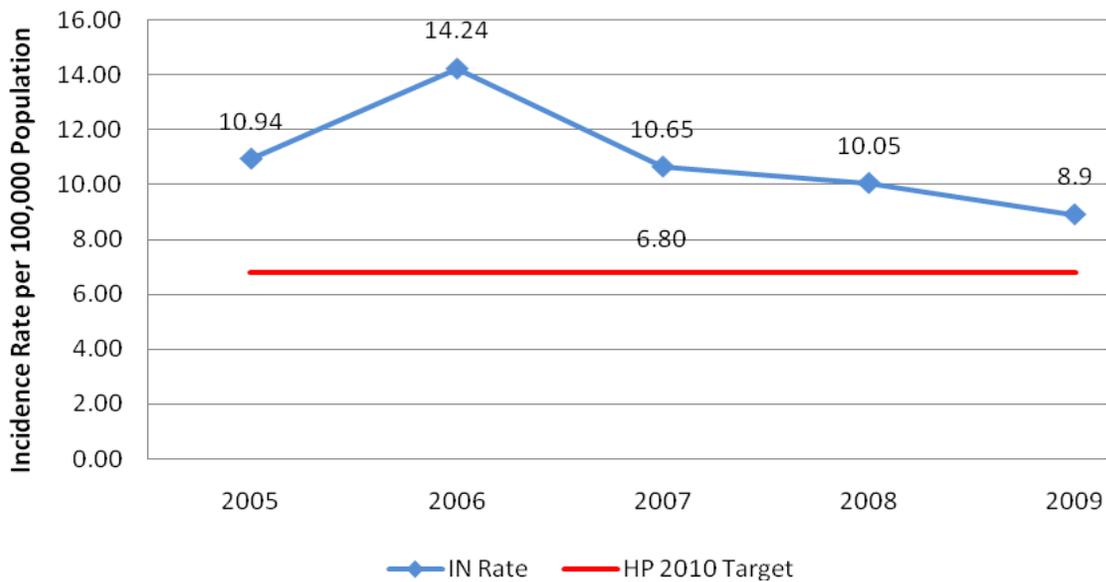
- Handle animals safely:
 - Wash hands after contact with livestock, petting zoos, pets (including reptiles and amphibians), especially if they are suffering from diarrhea, and after contact with pet food/treats (including live or frozen rodents).
 - Keep pets out of food-preparation areas.
 - Do not clean pet or reptile cages in the kitchen sink or in the bathtub.
 - Reptiles should not be allowed to roam the house.
 - Reptiles should not be kept in daycare facilities or classrooms.
 - Children less than 5 years of age, pregnant women, and persons with weakened immune systems should not handle reptiles.

- Protect others:
 - Persons with diarrhea and/or vomiting should not prepare food or provide health care for others and should limit direct contact with others as much as possible.
 - Persons with diarrhea and/or vomiting should not attend a daycare facility or school.

Healthy People 2010 Goal

The Healthy People 2010 Goal for salmonellosis is 6.8 cases per 100,000 population per year. Indiana did not meet this goal during the five-year reporting period 2005-2009 (Figure 1).

**Figure 1: Salmonellosis Rates by Year
Indiana, 2005-2009**



Epidemiology and Trends

In 2009, there were 572 cases of salmonellosis reported in Indiana, for a rate of 8.91 cases per 100,000 population (Table 1). This represents a 12 percent decrease in the incidence rate from 2008 (10.05). Females (9.30) were more likely to be reported with salmonellosis than males (8.44). Other races (7.10) were more likely to be reported than whites (4.77) or blacks (3.74); however, 267 cases (46.6%) did not report race data.

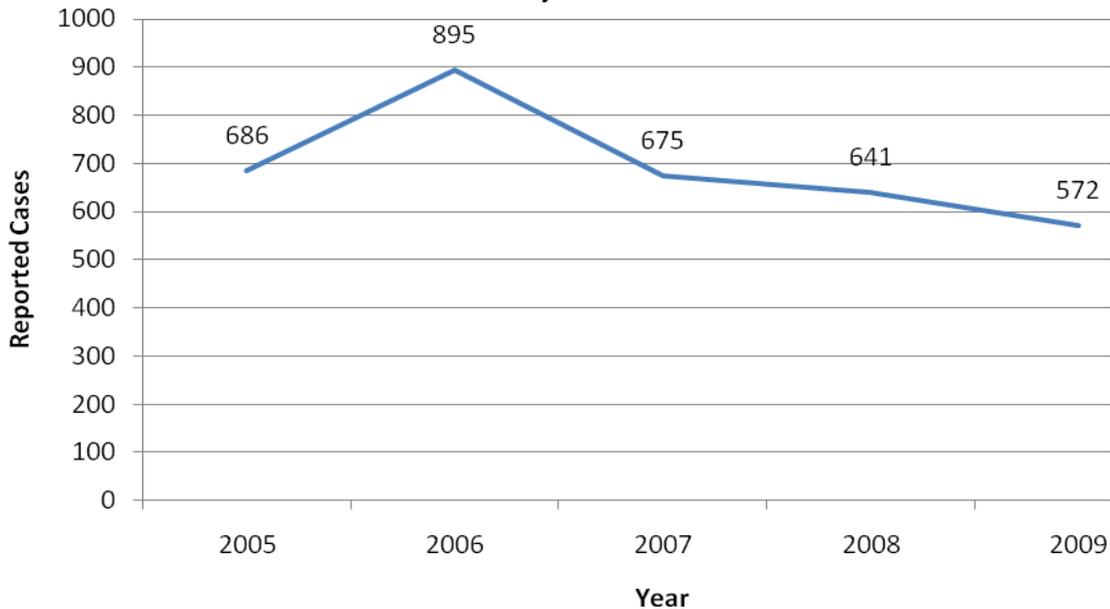
Table 1: Salmonellosis Case Rate by Race and Sex, Indiana, 2009

	Cases	Rate*	2005 - 2009 Total
Indiana	572	8.91	3469
Race			
Black	22	3.74	177
White	269	4.77	2169
Other	14	7.10	85
Not Reported	267		1038
Sex			
Female	303	9.30	1873
Male	267	8.44	1584
Unknown	0		12

*Rate per 100,000 population based on U.S. Census Bureau's population data as of July 1, 2009

Figure 2 shows the number of reported cases for 2005-2009.

**Figure 2: Salmonellosis Cases by Year
Indiana, 2005-2009**



The incidence was greatest during the summer months (Figure 3).

**Figure 3: Salmonellosis Cases by Month
Indiana, 2005-2009**

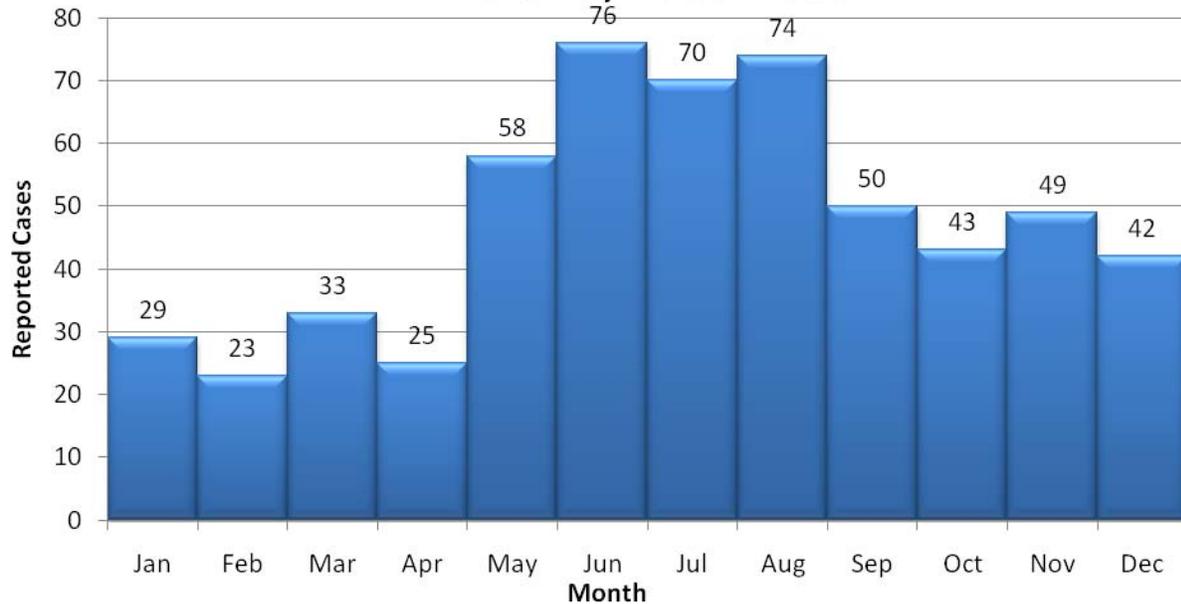
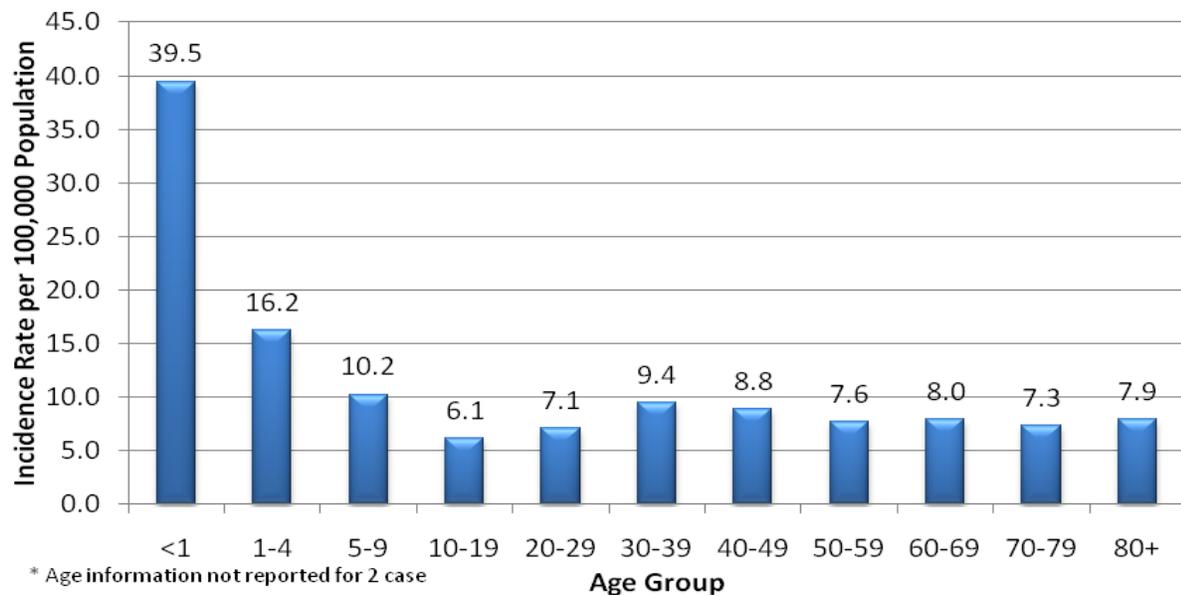


Figure 4 shows age-specific rates were greatest among infants less than 1 year of age (39.5), followed by preschoolers aged 1-4 years (16.2), and children aged 5-9 (10.2).

**Figure 4: Salmonellosis Incidence Rates by Age Group
Indiana, 2009**



There are over 2,500 different *Salmonella* serotypes that differ in somatic and flagellar antigens. Communicable Disease Reporting Rule (410 IAC 1-2.3) requires clinical laboratories to submit all

positive *Salmonella* isolates to the ISDH Laboratories for free confirmation and serotyping. During 2009, serotypes were determined for 523 (91.4%) of the 572 cases. [Table 2](#) shows the top three *Salmonella* serotypes in Indiana for 2009.

Table 2: Top Three Reported Serotypes for Salmonellosis Cases, Indiana, 2009

Serotype	Number	Percent
Enteritidis	119	22.7%
Typhimurium	87	16.6%
Newport	44	8.4%

[Figure 5](#) shows the incidence rates were highest among the following counties reporting five or more cases: LaGrange (18.8) and Noble (18.7). [Figure 5](#) shows Indiana counties reporting five or more cases.

You can learn more about salmonellosis by visiting the following Web sites:

<http://www.cdc.gov/salmonella/>

<http://www.fda.gov/Food/FoodSafety/FoodborneIllness/FoodborneIllnessFoodbornePathogensNaturalToxins/BadBugBook/ucm069966.htm>

SHIGELLOSIS

Shigellosis is a contagious diarrheal illness caused by *Shigella* bacteria. There are four types of *Shigella* bacteria: *sonnei*, *flexneri*, *boydii*, and *dysenteriae*. *Shigella* bacteria are found mainly in humans, and the infection is very easily passed from person to person. Shigellosis is very serious in babies, the elderly, and people with weakened immune systems.

People become infected with *Shigella* by having contact with stool from an infected person (fecal-oral route). Infection may be transmitted in several ways:

- Consuming food or beverages prepared by an infected person.
- Hand-to-mouth exposure to the stool or vomit of an infected person, such as:
 - Handling or cleaning up stool or vomit.
 - Touching a contaminated surface or object.
 - Having close contact with an ill household member.
 - Engaging in sexual activity that involves contact with stool.

Public Health Significance

Symptoms of shigellosis include diarrhea, sudden stomach pain, cramps, fever, and vomiting. Symptoms usually begin 24-72 hours (range of 12 hours to 5 days) after exposure and last about 4-7 days. Some people may have no symptoms but can still spread the infection to others. Antibiotics are usually used to treat shigellosis. However, some strains of *Shigella* bacteria are resistant to certain antibiotics.

Persons who work in certain occupations, such as food handlers, daycare providers, and health care providers, have a greater risk of transmitting infection to others. *Shigella* bacteria are not naturally found in foods of animal origin.

In general, shigellosis can be prevented by strictly adhering to the following guidelines:

- Practice good hygiene:
 - Thoroughly wash hands with soap and water after using the restroom; after assisting someone with diarrhea and/or vomiting; after swimming; and before, during, and after food preparation.
 - Clean food preparation work surfaces, equipment, and utensils with soap and water before, during, and after food preparation.
- Eat safe foods and drink safe water:
 - Wash all produce before eating raw or cooking.
 - Use treated water for washing, cooking, and drinking.
- Protect others:
 - Persons with diarrhea and/or vomiting should not prepare food or provide health care for others and should limit direct contact with others as much as possible.
 - Persons with diarrhea and/or vomiting should not attend a daycare facility or school.

Healthy People 2010 Goal

There is no Healthy People 2010 Goal for shigellosis.

Epidemiology and Trends

In 2009, 76 cases of shigellosis were reported in Indiana, for a case rate of 1.18 per 100,000 population (Table 1). This represents over an 800% decrease from the incidence rate in 2008 (9.52). Males (1.23) were slightly more likely to be reported than females (1.14). The rate of illness among blacks (1.70) was higher than the rate for whites (0.64) and other races (2.03); however, 26 cases (34.2%) did not report race data.

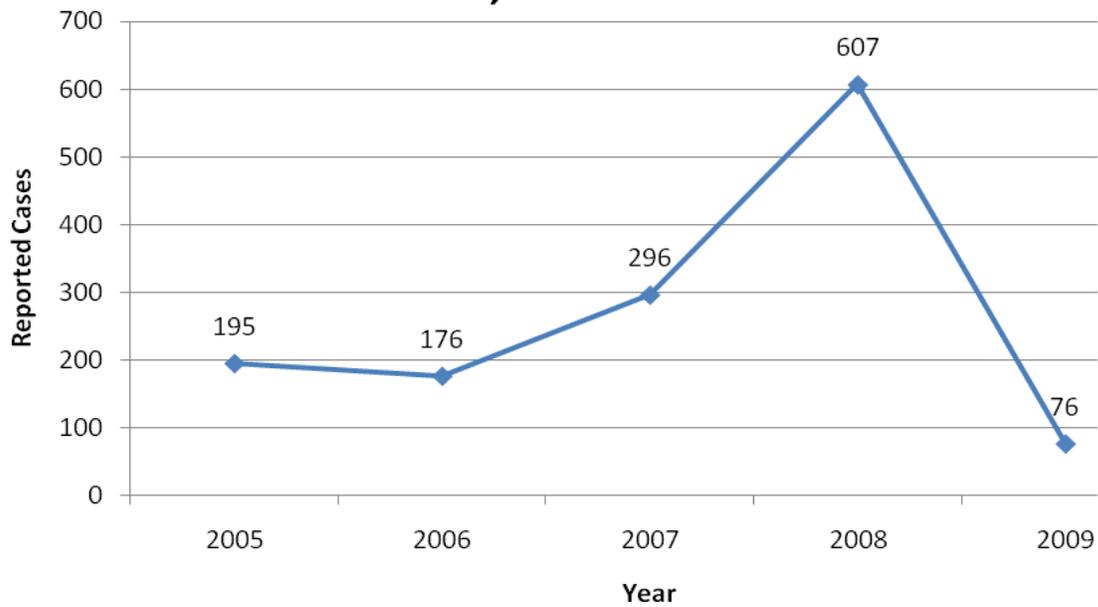
Table 1: Shigellosis Case Rate by Race and Sex, Indiana, 2009

	Cases	Rate*	2005 - 2009 Total
Indiana	76	1.18	1350
Race			
Black	10	1.70	588
White	36	0.64	438
Other	4	2.03	65
Not Reported	26		259
Sex			
Female	37	1.14	761
Male	39	1.23	586
Unknown	0	0	3

*Rate per 100,000 population based on U.S. Census Bureau's population data as of July 1, 2009

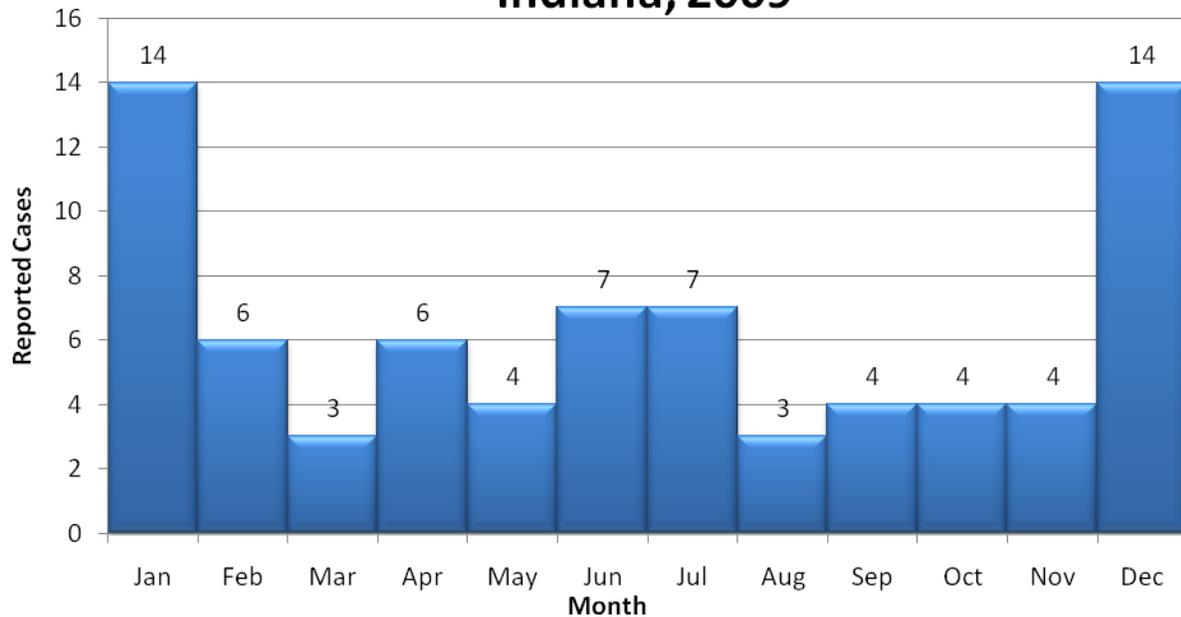
Figure 1 shows the number of reported cases per year for 2005-2009.

**Figure 1: Shigellosis Cases by Year
Indiana, 2005-2009**



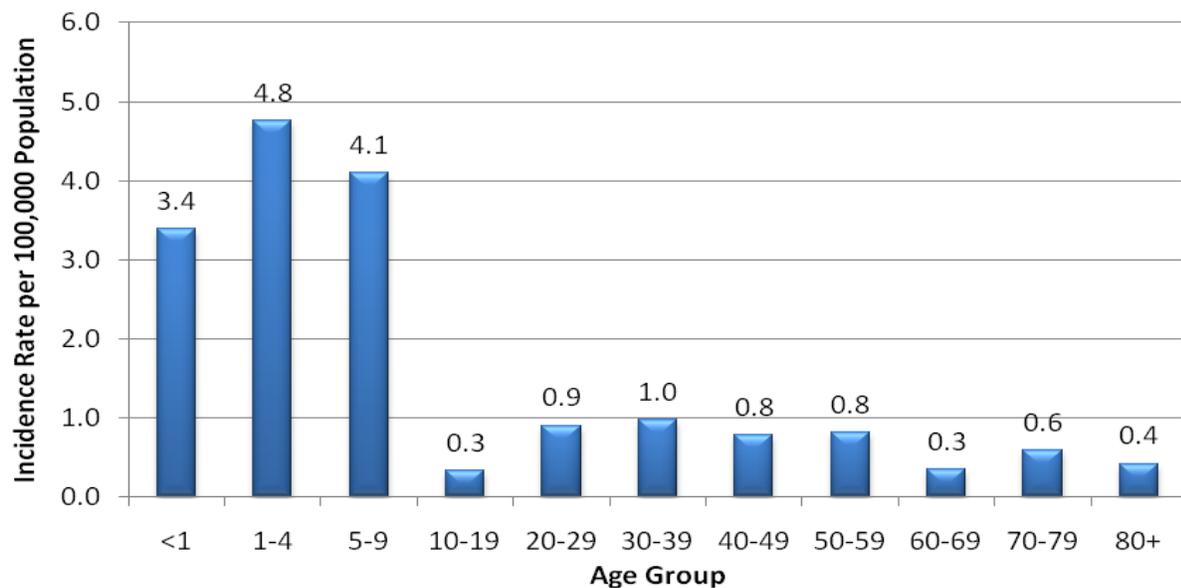
The incidence of shigellosis was highest in the winter months (Figure 2).

**Figure 2: Shigellosis Cases by Month
Indiana, 2009**



As shown in Figure 3, age-specific rates were highest among preschoolers ages 1-4 years (4.8), followed by children ages 5-9 years (4.1), and infants less than one year old (3.4).

**Figure 3: Shigellosis Incidence Rates by Age Group
Indiana, 2009**



The incidence rate was highest in Lake (3.8) among counties reporting five or more cases. [Figure 4](#) shows Indiana counties reporting five or more cases.

You can learn more about shigellosis by visiting the following Web sites:

<http://www.cdc.gov/nczved/divisions/dfbmd/diseases/shigellosis/>

<http://www.fda.gov/Food/FoodSafety/FoodborneIllness/FoodborneIllnessFoodbornePathogensNaturalToxins/BadBugBook/ucm070563.htm>

Figure 5: Shigellosis Cases by County – Indiana, 2009



SMALLPOX

Smallpox is an acute infectious disease caused by the variola virus, which infects the oropharyngeal or respiratory mucosa. The virus localizes in the blood vessels of the dermis and oral and pharyngeal mucosa, resulting in the characteristic maculopapular rash, which evolves into vesicles, then pustules. The overall fatality rate for ordinary-type smallpox is about 30 percent. Other more severe types of smallpox have 90 percent and higher fatality rates.

Public Health Significance

Past use of smallpox in bioweapons programs and recent political instability in some areas of the world have led political and scientific leaders to consider the possibility that smallpox virus could be utilized as a Category A biological weapon.* Therefore, extensive national and state plans have been adopted in the event that variola virus is released. In 2003, a national effort was made to vaccinate a corps of medical responders to provide care for initial cases in the event of a smallpox virus release. Routine vaccination of the public was discontinued in 1972 after smallpox was declared eradicated in the United States.

Healthy People 2010 Goal

There is no Healthy People 2010 Goal for smallpox.

Epidemiology and Trends

The last case of smallpox in the U.S. was reported in 1949. In Indiana, there have been no reported cases of smallpox in over 50 years. Smallpox disease was declared to be eradicated worldwide in 1980.

You can learn more about smallpox by visiting the following Web sites:

<http://www.bt.cdc.gov/agent/smallpox/disease/>

*Bioterrorism Agent List:

<http://www.bt.cdc.gov/agent/agentlist-category.asp#a>

GROUP A STREPTOCOCCUS

Group A streptococcal (GAS) disease is caused by the bacterium *Streptococcus pyogenes* and is manifested as many types of illness including strep throat, scarlet fever, wound infections and impetigo. More serious and life-threatening illnesses such as streptococcal bacteremia/sepsis, streptococcal toxic shock syndrome, and necrotizing fasciitis can occur when the bacteria invade a site in the body where bacteria are not normally found, such as the blood or muscle tissue. Necrotizing fasciitis ("the flesh-eating bacteria") is a rapidly progressive disease which destroys muscle, fat and skin tissue. Streptococcal toxic shock syndrome (STSS) is septic shock, resulting in a rapid drop in blood pressure and multi-organ failure. The bacteria are transmitted through direct contact with nose and throat secretions of persons who are infected or by touching infected hands. Spread may also occur by contact with infected wounds or sores on the skin, such as when a person has chickenpox lesions. Antibiotics are used to treat GAS disease. Only cases of invasive disease are reportable in Indiana.

Public Health Significance

Symptoms of GAS disease vary depending on the manifestation of the illness. Bacteria spread more easily in crowded settings, such as dormitories, barracks, child-care centers or correctional facilities.

Persons at greatest risk for the disease include:

- Children with chickenpox
- People with suppressed immune systems
- Burn victims
- Elderly people with cellulitis, blood vessel disease or cancer
- People taking steroid treatments or chemotherapy
- Intravenous drug users

The risk of GAS infection can be reduced by good personal hygiene. Proper hand cleaning is one of the best ways to prevent GAS infections. All wounds should be kept clean and watched for signs of redness, swelling, drainage and pain at the site. A person with signs of an infected wound, especially if fever is present, should seek medical attention immediately. Health care providers may recommend that people who are exposed to someone with invasive disease or those who are identified as carriers in outbreak situations take antibiotics to prevent the spread of infection.

Provisional data from the Centers for Disease Control and Prevention (CDC) Active Bacterial Core Surveillance (ABC) Program, estimate national rates of group A streptococcus invasive disease at 3.8 cases per 100,000 population.

Healthy People 2010 Goal

There is no Healthy People 2010 Goal for invasive group A streptococcus infections.

Epidemiology and Trends

In 2009, there were 190 cases of invasive GAS disease reported in Indiana for a rate of 2.96 cases per 100,000 persons (Table 1). Incidence rates for males (3.19) and females (2.70) were similar. Whites (2.48) had had lower rates than blacks (3.40), although low case numbers among minorities make rates comparisons problematic from year to year. Of these cases, 12% (23/190) had manifestations of streptococcal toxic shock syndrome (STSS) and/or necrotizing fasciitis. Prior to 2007, confirmed cases of STSS and necrotizing fasciitis were not included in the annual report; however, these most severe cases of GAS have been incorporated in the data and are included in the five-year reporting totals.

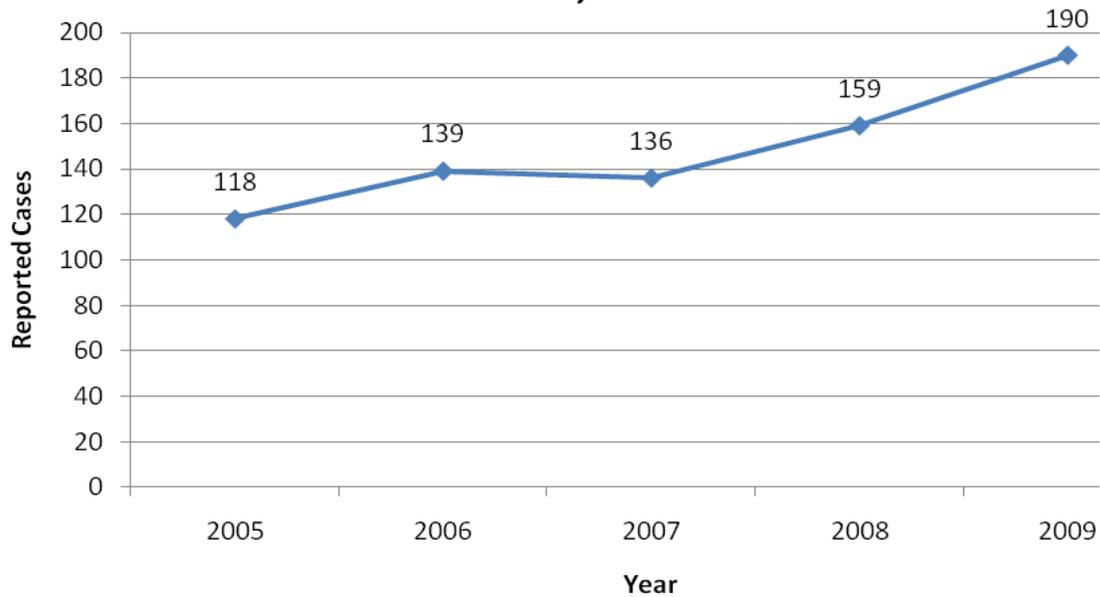
Table 1: Group A Streptococcus Case Rate by Race and Sex, Indiana, 2009

	Cases	Rate*	2005 - 2009 Total
Indiana	190	2.96	742
Race			
Black	20	3.40	85
White	140	2.48	521
Other	8	4.06	14
Not Reported	22	-	122
Sex			
Female	88	2.70	350
Male	101	3.19	389
Unknown	0	-	3

*Rate per 100,000 population based on U.S. Census Bureau's population data as of July 1, 2008

Figure 1 shows reported cases by year for the five-year reporting period 2005-2009. Reported cases were highest in 2009 (190 cases).

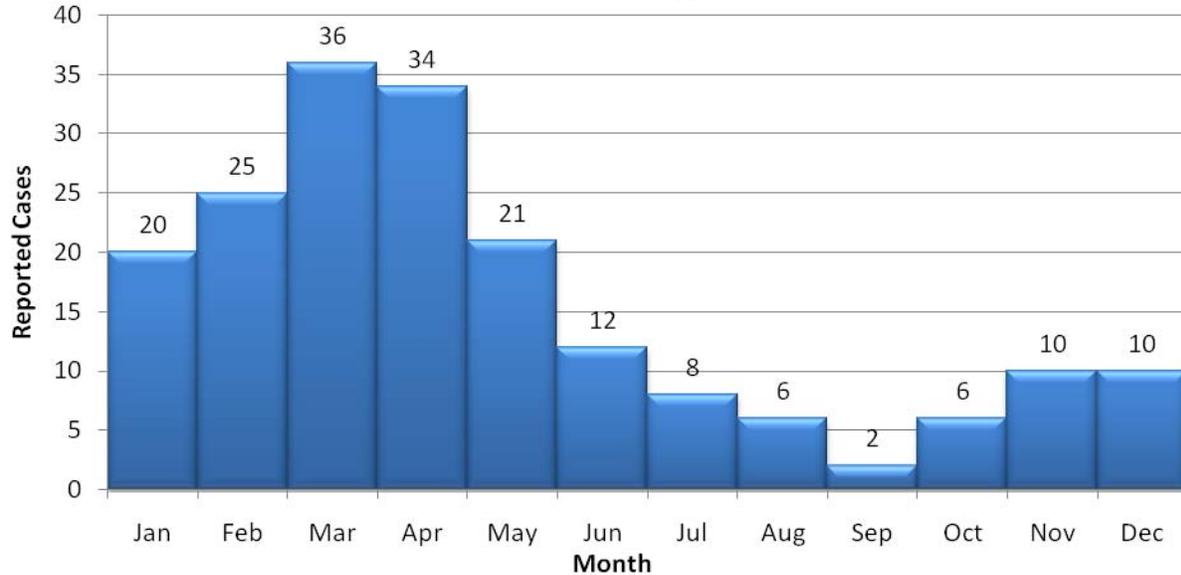
**Figure 1: Group A Streptococcus Cases* by Year
Indiana, 2005-2009**



*Case numbers include Group A Streptococcus and Streptococcal Toxic Shock Syndrome (STSS)

In 2009, incidence of invasive GAS peaked in the late winter and early spring as shown in [Figure 2](#). Fifty-one percent (81/190) cases occurred between January and March.

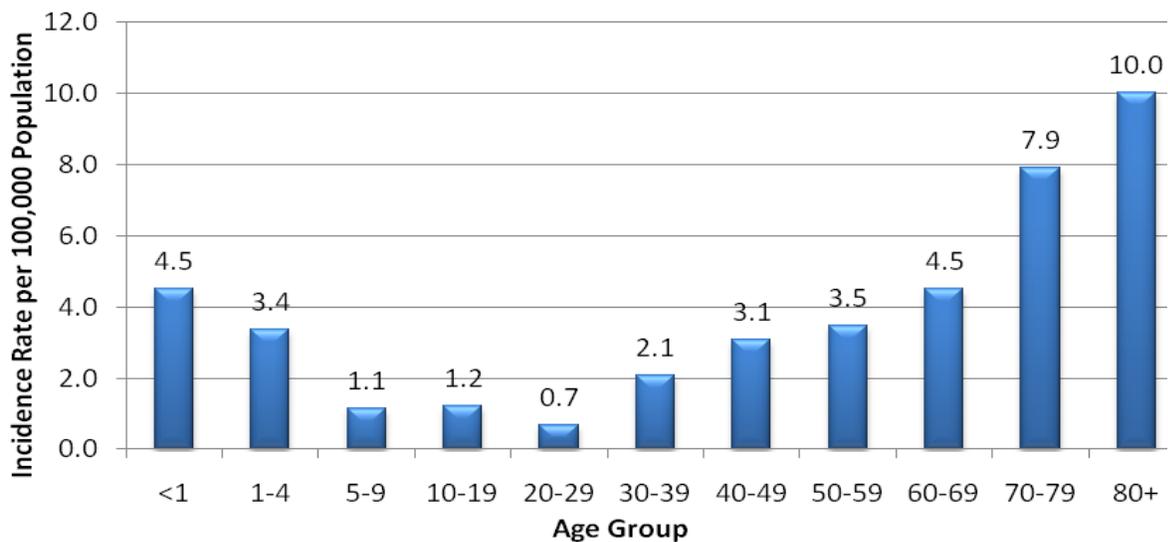
**Figure 2: Group A Streptococcus Cases by Month
Indiana, 2009**



*Case numbers include Group A Streptococcus and Streptococcal Toxic Shock Syndrome (STSS)

Very young infants and older adults are more likely to suffer from a compromised immune system or have underlying chronic medical conditions such as diabetes or cancer that predisposes them to GAS disease. As shown in [Figure 3](#), age-specific incidence rates were greatest for adults over the age of 80 (10.0) followed by adults 70-79 years of age (7.9).

**Figure 3: Group A Streptococcus Incidence*
Rates by Age Group Indiana, 2009**



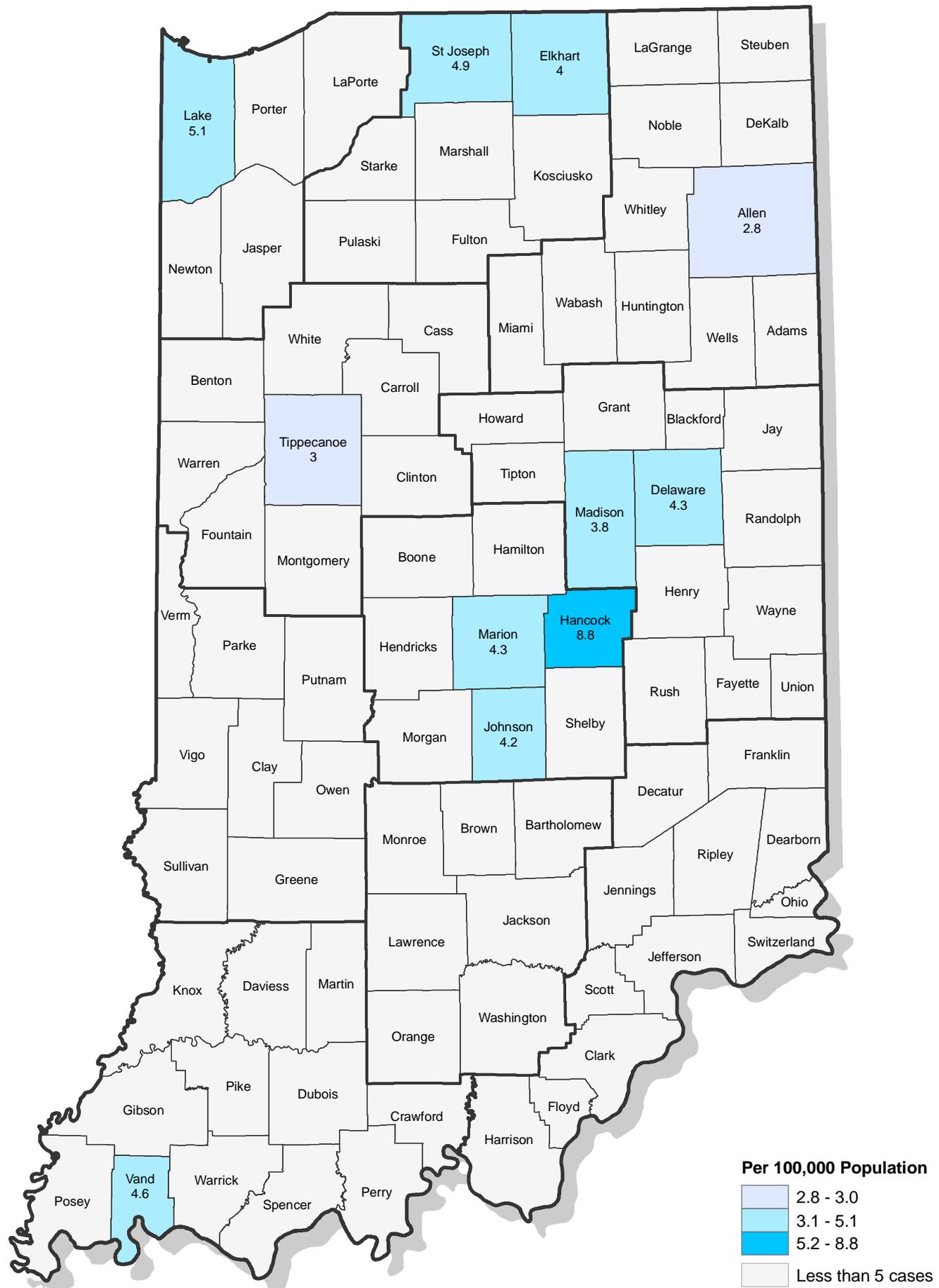
* Incidence based on Group A Streptococcus and Streptococcal Toxic Shock Syndrome (STSS) cases

Incidence rates were highest among the following counties reporting 5 or more cases during the year: Hancock (8.8), Lake (5.1) and St Joseph (4.9) counties (see [Figure 4](#)).

You can learn more about group A streptococcus disease by visiting the following Web site:

http://www.cdc.gov/ncidod/dbmd/diseaseinfo/groupastreptococcal_g.htm

Figure 4: Streptococcus A Cases by County – Indiana, 2009



GROUP B STREPTOCOCCUS

Group B streptococcal (GBS) disease is caused by the bacteria *Streptococcus agalactiae* and is manifested as many types of illness, such as urinary tract infections. More serious and life-threatening illness including meningitis, bacteremia, sepsis or joint infections, can occur when the bacteria invade a site in the body that is sterile, such as the blood, cerebrospinal fluid or joint fluid. Cases most often occur in young infants and adults with chronic medical conditions. Symptoms of GBS for the newborn include sudden fever, difficulty feeding, fussiness and fatigue. It is estimated that 25% of women carry GBS in their rectum or vagina but show no signs of illness. Newborns (< 7 days of age) acquire the bacteria from their mother just before or during birth, but the transmission of GBS in adults and infants one week or older is not clearly understood. Antibiotics are used to treat GBS disease. Only cases of invasive disease are reportable in Indiana.

Public Health Significance

Cases occurring in infants less than 7 days of age are considered “early-onset” disease; cases occurring in infants 7 – 89 days old are considered “late-onset” disease.

Persons at greatest risk for the disease include:

- Infants born to mothers who are GBS carriers
- Adults with chronic medical conditions including cancer, liver failure, and diabetes

In 2010, the American College of Obstetricians and Gynecologists (ACOG) and the American Academy of Pediatrics (AAP) issued revised guidelines for the prevention of early-onset GBS disease. These guidelines include universal screening (consisting of a urogenital swab) of all women at 35 – 37 weeks gestation for group B colonization and the administration of intrapartum antibiotics to women identified as carriers. Although case rates have decreased due to appropriate screening and therapy, GBS is still the most common cause of life-threatening infections in newborns.

Following standard infection control practices, especially for patients in hospitals and healthcare facilities, will reduce the risk of patients or residents acquiring GBS disease.

According to the Centers for Disease Control and Prevention (CDC) Active Bacterial Core Surveillance (ABC) Emerging Infections Programs Network for GBS in 2009, provisional findings estimate the disease rates at approximately 7.1 cases per 100,000 persons. This estimate includes all invasive cases of GBS. Live-birth data is used in the calculations of early-onset and late-onset disease. National estimates of early-onset disease were 0.26 cases per 1,000 live-births; estimates of late-onset disease were 0.30 cases per 1,000 live-births.

Healthy People 2010 Goal

The Healthy People 2010 Goal for early-onset (infants < 7 days of age) group B streptococcus disease is 0.5 cases per 1,000 live-births per year. Indiana met that Goal for 2009 with a rate of 0.20 cases of early-onset disease per 1,000 live-births (2007 IN State Natality Data). This finding should be interpreted with caution as 2007 Natality Data was used in the calculation.

Epidemiology and Trends

In 2009, there were 307 cases of GBS reported in Indiana, for a rate of 4.76 cases per 100,000 persons (Table 1). Rates of disease in blacks (6.80) were over twice that of whites (3.39). The rates of males (4.83) and females (4.73) were similar. Forty of the 307 cases occurred in newborns less than 3

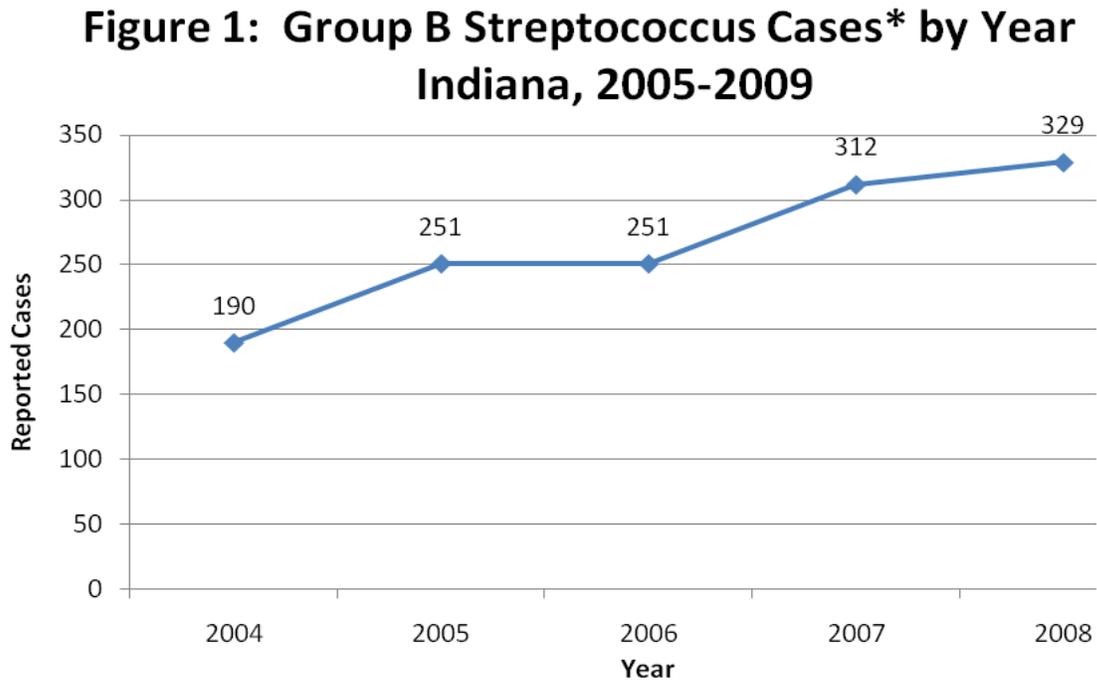
months of age, with 18 cases of early-onset disease. Almost 17 percent of early-onset cases occurred in black infants. Small numbers of early and late onset disease cases each year make rate comparisons problematic.

Table 1: Group B Streptococcus Case Rate by Race and Sex, Indiana, 2009

	Cases	Rate*	2005 - 2009 Total
Indiana	306	4.76	1444
Race			
Black	40	6.80	206
White	191	3.39	877
Other	8	4.06	24
Not Reported	67	-	337
Sex			
Female	153	4.70	719
Male	153	4.83	721
Unknown	0	-	4

*Rate per 100,000 population based on U.S. Census Bureau's population data as of July 1, 2009

Figure 1 shows reported cases by year for 2005 – 2009 with 2008 having the most cases during the five - year reporting period (328 cases).



*Case numbers include all cases of Group B Streptococcus including early onset disease.

GBS infections can occur anytime during the year as displayed in [Figure 2](#).

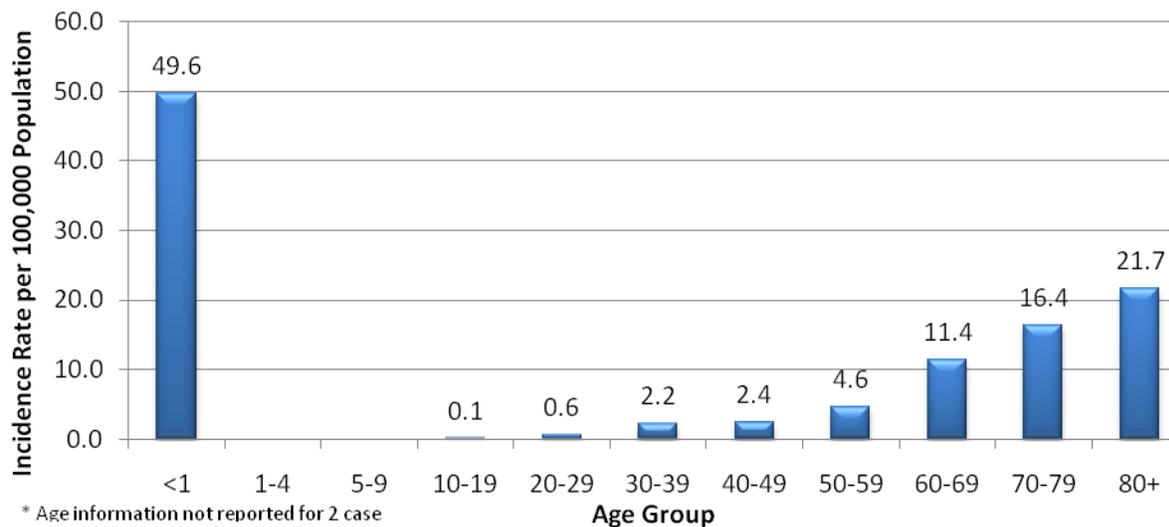
**Figure 2: Group B Streptococcus Cases* by Month
Indiana, 2009**



*Case numbers include all cases of Group B Streptococcus including early onset disease.

Rates of disease in 2009 were highest among at-risk groups and blacks. Age specific rates were highest for infants less than 1 year of age (50.75) followed by older adults aged at least 80 years (21.70) and adults 70-79 years (16.39) as demonstrated in [Figure 3](#).

**Figure 3: Group B Streptococcus Incidence
Rates*+ by Age Group Indiana, 2009**



* Age information not reported for 2 case

*+Incidence based on all cases of Group B Streptococcus including early onset disease.

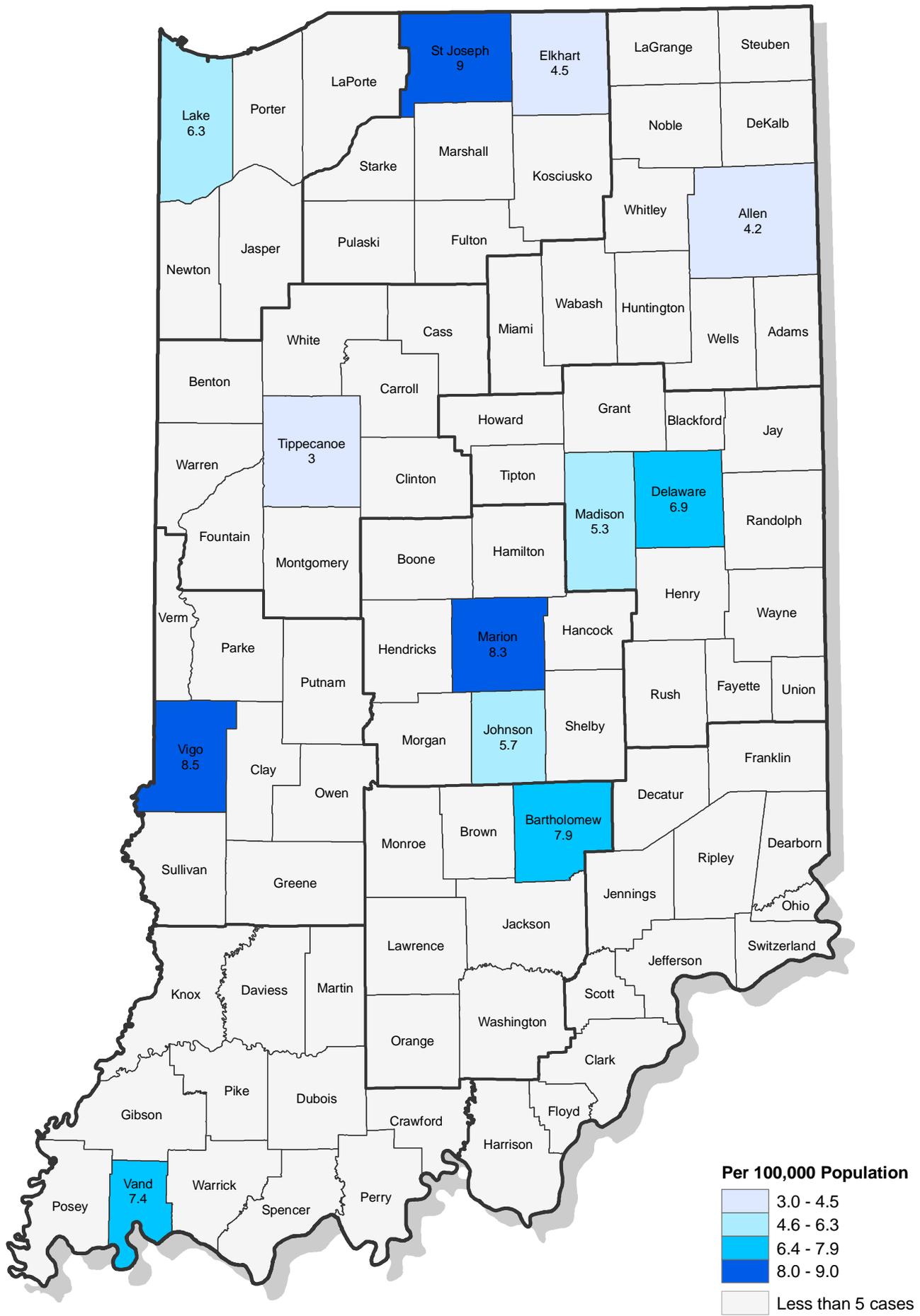
Incidence rates were highest among the following counties reporting 5 or more cases during the year: St. Joseph (9.0), Marion (8.3) and Bartholomew (7.9) counties (see [figure 4](#)).

You can learn more about group B Streptococcus by visiting the following Web sites:

<http://www.in.gov/isdh/22435.htm>

<http://www.cdc.gov/groupbstrep/>

Figure 5: Streptococcus B Cases by County – Indiana, 2009



Per 100,000 Population

- 3.0 - 4.5
- 4.6 - 6.3
- 6.4 - 7.9
- 8.0 - 9.0
- Less than 5 cases

TETANUS

Tetanus is an acute, often fatal disease caused by a toxin produced by the bacterium *Clostridium tetani*. It is characterized by generalized rigidity and convulsive spasms of skeletal muscles. The muscle contractions usually involve the jaw (lockjaw) and neck and then become generalized. Tetanus bacteria are found in the environment, primarily soil. Tetanus is not contagious from person to person; transmission is primarily through contaminated wounds, which can either be apparent or inapparent.

Public Health Significance

The initial symptoms of tetanus are lockjaw and facial spasms, followed by neck stiffness, difficulty swallowing, stiff abdominal muscles, fever, and elevated blood pressure. Symptoms appear 3-21 days after infection. Antibiotics are available for the treatment of tetanus.

Tetanus is prevented through administration of a primary series of tetanus toxoid injections. Adults and children 7 years of age and older require three injections. Infants and children less than 7 years of age require four injections. Both adults and children should receive boosters every 10 years following completion of the primary series. Prior to routine vaccination, 500-600 cases of tetanus were reported in the United States each year. In the US, an all-time low of 18 cases (0.01 cases per 100,000 population) were reported in 2009. In recent years, the case-fatality rate has decreased from 30 percent to approximately 10 percent.

Achieving high immunization rates for adults as well as infants and children will help to eliminate tetanus. Although the illness is rare in the U.S., it is still common in some countries.

Healthy People 2010 Goal

The Healthy People 2010 Goal for tetanus is total elimination of the disease in people less than 35 years of age. Indiana met that goal during the five-year reporting period 2005-2009 except in 2006 and 2009.

Epidemiology and Trends

Two cases of tetanus were reported in Indiana in 2009. One case was younger than 35 years of age. The vaccination status of one of the cases was unknown. The other case had been vaccinated with a tetanus containing vaccine approximately six years prior to the infection. During the five-year period 2005-2009, four cases of tetanus were reported in Indiana. Almost all cases of tetanus reported nationally occur in persons who have either never been vaccinated or have not had a booster in the 10 years preceding the illness.

One death was reported in Indiana in 2009 due to tetanus.

You can learn more about tetanus by visiting the following Web site:

<http://www.cdc.gov/vaccines/vpd-vac/tetanus/default.htm>

TOXIC SHOCK SYNDROME

Toxic shock syndrome (TSS) is caused by *Staphylococcal aureus* bacteria and occurs when the bacteria invade a sterile site in the body and produce a toxin. Symptoms of TSS include sudden onset of high fever, vomiting, profuse, watery diarrhea, and muscle pain followed by hypotension, and in severe cases, shock. A sun-burn like rash that peels may be present during the acute phase of illness. TSS is not spread from person to person; however, staphylococcal bacteria colonize the nasopharynx and skin of healthy people. The bacteria are spread through contact with respiratory secretions of an infected person carrying a pathogenic strain or through contact with drainage from an infected wound. Antibiotics are available for the treatment of TSS.

Public Health Significance

TSS most often occurs in women of child-bearing age and is associated with the use of vaginal tampons, barrier contraceptive devices, or infection following childbirth or abortion. Although rare, anyone can develop TSS in the course of a *Staphylococcus aureus* infection. The risk of menstrual TSS can be reduced by avoiding the use of highly absorbent vaginal tampons or using tampons intermittently. Drainage of wounds or removal of wound packing may also decrease the risk of infection.

Healthy People 2010 Goal

There is no Healthy People 2010 Goal for toxic shock syndrome.

Epidemiology and Trends

There was only one reported case of toxic shock syndrome in Indiana in 2009 with eight cases reported during the five-year period 2005-2009.

You can learn more about toxic shock syndrome by visiting the following Web sites:

<http://www.in.gov/isdh/22439.htm>

http://www.cdc.gov/ncidod/dbmd/diseaseinfo/toxicshock_t.htm

TRICHINOSIS

Trichinosis is caused by parasites from the genus *Trichinella*. There are several species in this genus, but the one with the most historical association with human illness is *T. spiralis*. *T. spiralis* is widely disseminated and has been reported in up to 150 animal species. Human infections have been traditionally related to consumption of undercooked pork products containing the cysts of infective larvae. The parasite larva matures in the small intestine, releasing larvae that penetrate the intestinal wall and migrate to muscle tissue where they encyst.

Public Health Significance

Symptoms of trichinosis in humans are nausea, vomiting, fatigue, fever, and abdominal discomfort. Symptoms of muscle infection include headache, fever, chills, cough, eye swelling, aching joints, muscle pain, and itchy skin. Antiparasitic medication can be used to treat the infection in the early stages; however once the parasite has invaded the muscles, treatment is limited to supportive care. Modern swine farming practices have reduced the presence of this parasite in pork, and with education on proper cooking and/or freezing of pork, the incidence of trichinosis has been greatly reduced.

Prevention can be accomplished by cooking meat products to an internal temperature of 170 degrees Fahrenheit or by freezing pork products less than six inches thick at 5 degrees Fahrenheit for 20 days. Cooking of garbage fed to swine, as well as preventing swine from consuming rat carcasses, are important practices in reducing the infection in swine. Salting, drying, smoking, and/or microwaving are not reliable methods of destroying infective cysts.

Healthy People 2010 Goal

There is no Healthy People 2010 Goal for trichinosis.

Epidemiology and Trends

No cases of trichinosis were reported in Indiana during the five-year period 2005-2009.

You can learn more about trichinosis by visiting the following Web site:

<http://www.cdc.gov/ncidod/dpd/parasites/trichinosis/default.htm>

TULAREMIA

Tularemia is caused by the bacterium *Francisella tularensis* and can be transmitted by ticks, biting flies, handling tissues of infected animals, contaminated water, soil, and vegetation, and by inhalation of aerosols. The normal reservoirs include a variety of small mammals such as rabbits, hares, squirrels, voles, mice, and rats. Although rare, tularemia is highly infectious, and as few as 10 organisms are thought to cause infection.

Public Health Significance

Tularemia can infect the skin, mucous membranes, gastrointestinal tract, lungs, or disseminate throughout the body. It is not transmissible from person to person. Symptoms of tularemia may include sudden fever, chills, headache, joint pain, diarrhea, and dry cough. Most people experience symptoms of tularemia within 2-10 days of exposure to the bacteria. Treatment with antibiotics is available for tularemia. No vaccine is currently available in the U.S.

Tularemia most often occurs in the rural western and south-central states. Although anyone can develop tularemia, people most at risk include hunters, wildlife management personnel, landscapers, and veterinarians. Tick season (usually April–September) and hunting season are peak times for infection. The best way to prevent tularemia infection is to wear rubber gloves when handling or skinning rodents, avoid ingesting uncooked wild game and untreated water sources, wear long-sleeved clothing, and use insect repellent when outdoors.

The tularemia bacterium is classified as a Category A potential bioterrorism agent,* since it is easily aerosolized and highly infective.

Healthy People 2010 Goal

There is no Healthy People 2010 Goal for tularemia.

Epidemiology and Trends

There was one case of tularemia in Indiana in 2009, and only four reported cases during the five-year reporting period 2005-2009.

You can learn more about tularemia by visiting the following Web sites:

<http://www.bt.cdc.gov/agent/tularemia/index.asp>

*Bioterrorism Agent List:

<http://www.bt.cdc.gov/agent/agentlist-category.asp#a>

TYPHOID FEVER

Typhoid fever is a life-threatening, highly contagious disease caused by *Salmonella* Typhi bacteria, which are found in the stool of infected persons. Unlike other *Salmonella* bacteria, *S. Typhi* is not found in animals. Typhoid fever is extremely rare in the U.S. and is almost always related to travel to an area where typhoid fever is common, such as Asia, Africa, and Latin America.

People become infected with *S. Typhi* by ingesting feces from an infected person (fecal-oral route), usually because of poor hand hygiene after using the restroom. Transmission can occur through person-to-person contact, handling food, and touching items such as soiled diapers or linens and then touching your mouth. Water can also be contaminated with *S. Typhi* by raw sewage and, thus, can contaminate raw produce.

Public Health Significance

Symptoms of typhoid fever include fever, chills, weakness, headache, abdominal pain, loss of appetite, nausea, vomiting, diarrhea or constipation, and flat, rose-colored rash. Symptoms usually begin within 8-14 days (range of 3-60 days) after exposure. The illness can be mild with a low-grade fever or severe with multiple complications. Persons given antibiotics usually begin to feel better within 2-3 days. Infected people may carry *S. Typhi* in their bodies for weeks or months without symptoms and unknowingly infect others.

Antibiotics are available to treat the illness. Most people who take medication recover completely.

Healthy People 2010 Goal

There is no Healthy People 2010 Goal for typhoid fever.

Epidemiology and Trends

In 2009, there was one case of typhoid fever in Indiana and only seven reported cases during the five-year period 2005-2009.

There were no outbreaks associated with typhoid fever in 2009.

You can learn more about typhoid fever by visiting the following Web sites:

http://www.cdc.gov/nczved/divisions/dfbmd/diseases/typhoid_fever/

www.cdc.gov/vaccines/vpd-vac/typhoid/default.htm

TYPHUS FEVER

The term typhus fever refers to three different bacterial diseases: epidemic, scrub, and murine typhus. Epidemic typhus fever is caused by *Rickettsia prowazekii* and is transmitted human to human by the human body louse, *Pediculus humanus corporis*. Scrub typhus, which occurs in Southeast Asia, is caused by *Rickettsia tsutsugamushi* and is transmitted to humans by certain mites that also serve as the reservoir. Murine typhus (also called “endemic typhus”) occurs in Indiana and is caused by *Rickettsia typhi*. Traditionally, murine typhus has been transmitted from the natural reservoir, rats, by the rat flea. Fleas from other animals such as opossums and cats may also be involved in the transmission of typhus. Prior to eliminating and controlling rats in the U.S., murine typhus was frequently reported. Now, fewer than 100 typhus cases are reported per year in the U.S.

Public Health Significance

Symptoms of murine typhus include headache, muscle pain, high fever, rash, and dry cough and usually last 2-3 weeks. People at greatest risk for murine typhus include those exposed to infected rat fleas and feces, or exposure to other infected animals such as cats, opossum, raccoons, and skunks. There is no available vaccine in the U.S. Murine typhus can be successfully treated with antibiotics.

Healthy People 2010 Goal

There is no Healthy People 2010 Goal for typhus.

Epidemiology and Trends

There was one reported case of typhus in Indiana in 2009. This is the only case reported during the five-year period 2005-2009.

You can learn more about typhus by visiting the following Web sites:

<http://wwwn.cdc.gov/travel/yellowBookCh4-Rickettsial.aspx>

VARICELLA

Primary varicella infection (also known as chickenpox) is caused by the varicella-zoster virus, a member of the herpesvirus family. The virus is transmitted from person-to-person through direct contact, droplet, or airborne spread of respiratory secretions or through contact with the fluid vesicular lesions. Varicella is commonly considered a childhood illness; however, anyone who does not have a history of varicella or received two valid doses of the vaccine can become infected. Varicella is typically a mild infection, but it can cause serious complications including pneumonia, encephalitis, viral meningitis, bacterial skin infections and even death in immune-suppressed individuals.

Public Health Significance

The varicella rash first appears as flat, red lesions, which become raised and blister-like (vesicles) and severely itch. The lesions are most evident on the trunk and present in several stages of development over several days. Other symptoms of varicella, including fever, abdominal pain, sore throat, and headache, may even occur before rash onset. Onset of symptoms usually occurs 10-21 days after initial exposure. Hospitalizations and deaths due to varicella still occur in Indiana.

Vaccines are available to protect individuals from acquiring varicella. Some children and adults who receive one or even two doses of the vaccine may have a mild case of illness “break-through” disease. Some individuals as well as health care providers view varicella as a mild childhood illness and choose not to vaccinate; thus the incidence of varicella infections has reached a plateau and outbreaks remain common in schools and other residential facilities.

Healthy People 2010 Goal

The Healthy People 2010 Goal for varicella is less than 400,000 cases nationally for persons less than 18 years of age. In 2009, individual cases of varicella were reportable for the first time in Indiana, making it difficult to determine progress towards meeting this national goal.

Epidemiology and Trends

In 2009, there were 463 reported cases of varicella for a rate of 7.21 cases per 100,000 population. Of the 463 cases, 12 cases were hospitalized with one reported death. Rates are reported only for hospitalized cases. The rate of hospitalizations was 0.19 per 100,000 population (Table 1). The rate of varicella hospitalizations for females (0.25) was higher than that of males (0.13). The hospitalization rate was no different between whites (0.16) than in blacks (0.17).

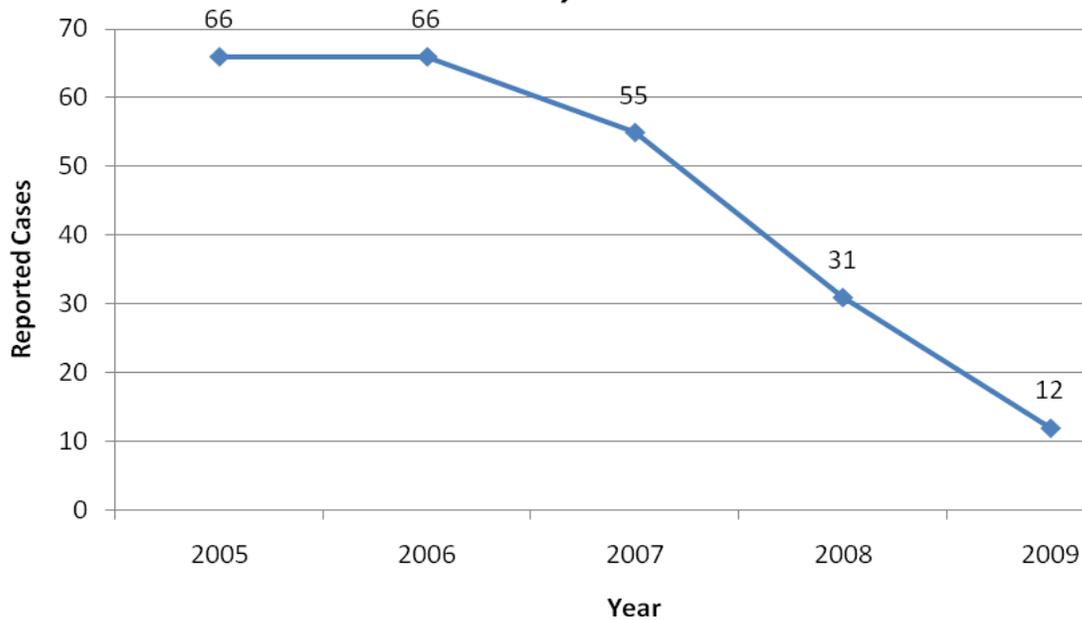
Table 1. Varicella Hospitalizations by Race and Sex, Indiana 2009

	Cases	Rate*
Indiana	12	0.19
Race		
Black	1	0.17
White	9	0.16
Other	2	1.01
Not Reported	0	-
Sex		
Female	8	0.25
Male	4	0.13
Unknown	0	-

*Rate per 100,000 population based on U.S. Census Bureau's population data as of July 1, 2009

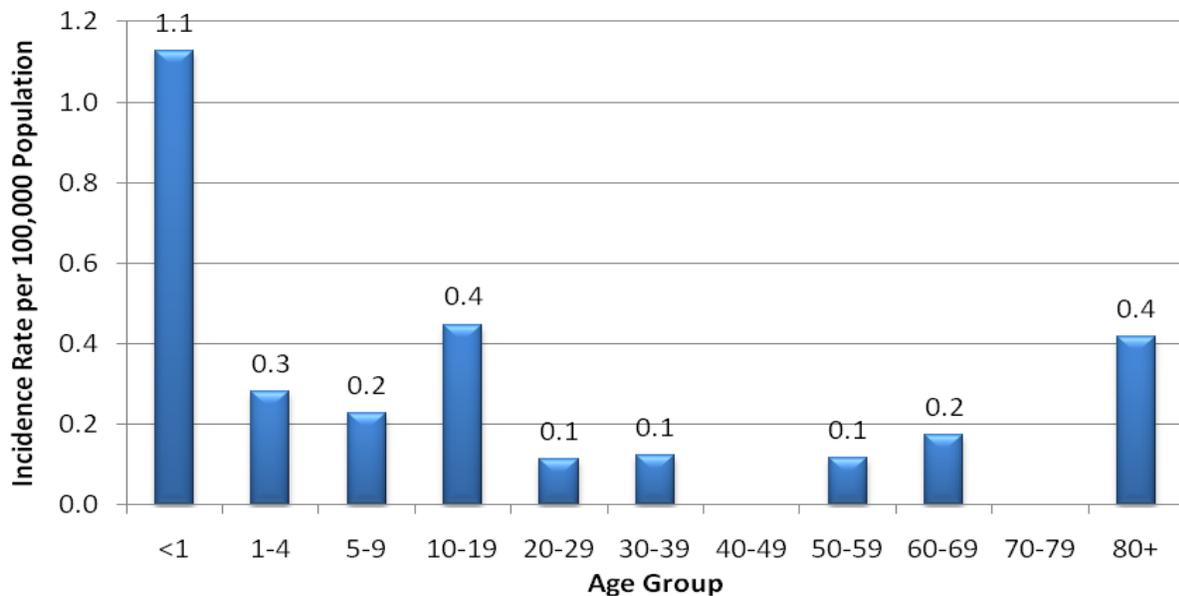
Figure 1 shows reported hospitalized cases by year from 2005-2009.

**Figure 1: Varicella Hospitalizations by Year
Indiana, 2005-2009**



As Figure 2 shows, age-specific rates were greatest for children less than 1 year old (1.1), followed by adolescents aged 10-19 years (0.4) and elderly over 80 years old (0.4).

**Figure 2: Varicella Hospitalization Rates by Age Group
Indiana, 2009**



You can learn more about varicella by visiting the following Web site:

<http://www.cdc.gov/vaccines/vpd-vac/varicella/default.htm>

VIBRIOSIS

Vibriosis is an illness caused by a variety of *Vibrio* bacteria, the most common being *Vibrio parahaemolyticus*. The bacteria normally live in warm seawater and cause disease in those who eat contaminated seafood or have an open wound exposed to seawater. The bacteria are more common in warmer months; thus, fish and shellfish are more likely to be contaminated in the summer.

Public Health Significance

Ingestion of *Vibrio parahaemolyticus* can cause vomiting, diarrhea, fever, and abdominal cramps. The illness is usually mild or moderate and runs its course in 2-3 days. In severe cases, hospitalization may be required. Symptoms usually occur 12-24 hours after eating contaminated food. Most cases of vibriosis are self-limited; however, antibiotics are available for severe cases. Although anyone can become infected with the bacterium, people who eat seafood, especially fish and shellfish, are at greatest risk for infection.

Healthy People 2010 Goal

There is no Healthy People 2010 Goal for vibriosis.

Epidemiology and Trends

In 2009, there were three reported cases of vibriosis in Indiana and only 13 reported cases during the five-year period 2005-2009.

You can learn more about vibriosis by visiting the following Web site:

<http://www.cdc.gov/nczved/divisions/dfbmd/diseases/vibriop/>

<http://www.cdc.gov/nczved/divisions/dfbmd/diseases/vibriov/>

WEST NILE VIRUS

West Nile virus (WNV) infection was first identified in Indiana in 2001, when WNV was confirmed in seven counties (47 birds and 1 horse). In 2009, Indiana was one of 38 states to report human WNV cases. Nationally in 2009, 720 human cases were reported, with 32 deaths. Indiana had four reported cases with one death. Most infections are contracted through the bite of an infected mosquito.

Public Health Significance

Symptoms of WNV include fever, headache, body aches, and skin rash. Although rare, WNV can enter the brain and cause inflammation either of the brain or the tissue that surrounds the brain. Most people infected with WNV usually have very mild or no symptoms. Symptoms of WNV usually appear 3-14 days after exposure. There is no specific treatment or vaccine for WNV.

According to the Centers for Disease Control and Prevention, the easiest and best way to avoid WNV is to prevent mosquito bites by adhering to the following practices:

- Use insect repellent.
- Wear long sleeves and long pants when mosquitoes are most active, usually at dusk and dawn, or consider staying indoors during these hours.
- Keep window and door screens free from tears and in good working condition.
- Eliminate mosquito-breeding sites by emptying standing water from flower pots, buckets, and barrels. Change the water in pet dishes and replace the water in birdbaths weekly. Drill holes in tire swings so water drains out. Keep children's wading pools empty and upright when not in use.

WNV is endemic in Indiana, and virus activity will continue to occur during the mosquito-breeding season in future years. The extent of activity will depend on the weather, presence of mosquito and bird populations for virus amplification, equine vaccination rates, and human activities to prevent transmission.

Healthy People 2010 Goal

There is no Healthy People 2010 Goal for WNV.

Epidemiology and Trends

In 2009 Indiana reported four cases of WNV with one death. In the five year reporting period from 2005-2009 there were 135 human cases including eight deaths.

You can learn more about West Nile virus by visiting the following Web site:

<http://www.cdc.gov/ncidod/dvbid/westnile/index.htm>

YELLOW FEVER

Yellow fever is a viral disease transmitted to humans by infected mosquitoes. The disease occurs in tropical and subtropical areas including West and Central Africa and in parts of South America. Yellow fever is a very rare cause of illness in U.S. travelers to endemic areas.

Public Health Significance

Symptoms of yellow fever may include influenza-like symptoms such as fever, headache, and vomiting to more severe symptoms such as shock, liver and kidney failure, and bleeding. Symptoms usually appear 3-6 days after becoming infected.

Yellow fever can be prevented by vaccination, and people traveling to countries where yellow fever infection occurs should be vaccinated. The vaccine for yellow fever is only administered in designated vaccination centers – and a list of designated Indiana travel clinics may be found at <http://www.in.gov/isdh/17199.htm> Many countries have regulations and vaccine requirements that must be met before travelers are allowed to enter.

Healthy People 2010 Goal

There is no Healthy People 2010 Goal for yellow fever.

Epidemiology and Trends

No cases of yellow fever were reported in Indiana during the five-year period 2005-2009.

You can learn more about yellow fever by visiting the following Web site:

<http://www.cdc.gov/ncidod/dvbid/yellowfever/index.htm>

YERSINIOSIS

Yersiniosis is a disease caused by *Yersinia enterocolitica* bacteria, which live in livestock and domestic animals and can be found in untreated water. The bacteria are also found in unpasteurized milk and raw or undercooked meat. People become infected with *Yersinia* by consuming water and raw produce contaminated with animal or human feces (fecal-oral route). Infection can also occur after contact with symptomatic, infected animals through person-to-person contact, handling food to be eaten by others, and touching items such as soiled diapers or linens and then touching the mouth. Infected persons can shed the bacteria in their stool for several months if untreated. Children are infected more often than adults.

Public Health Significance

Symptoms of yersiniosis include fever, abdominal pain, diarrhea, and vomiting. Symptoms usually begin 3-7 days (up to 10 days) after exposure and last 1-3 weeks. In older children and adults, pain in the lower right side and fever can be the main symptoms and may be confused with appendicitis. Some people may also have a sore throat. Most people recover within 5-7 days without medical treatment. A doctor may prescribe antibiotics for people with severe infection.

Healthy People 2010 Goal

There is no Healthy People 2010 Goal for yersiniosis.

Epidemiology and Trends

In 2009, there were eight cases of yersiniosis reported in Indiana, for a rate of less than 1 case per 100,000 population ([Table 1](#)).

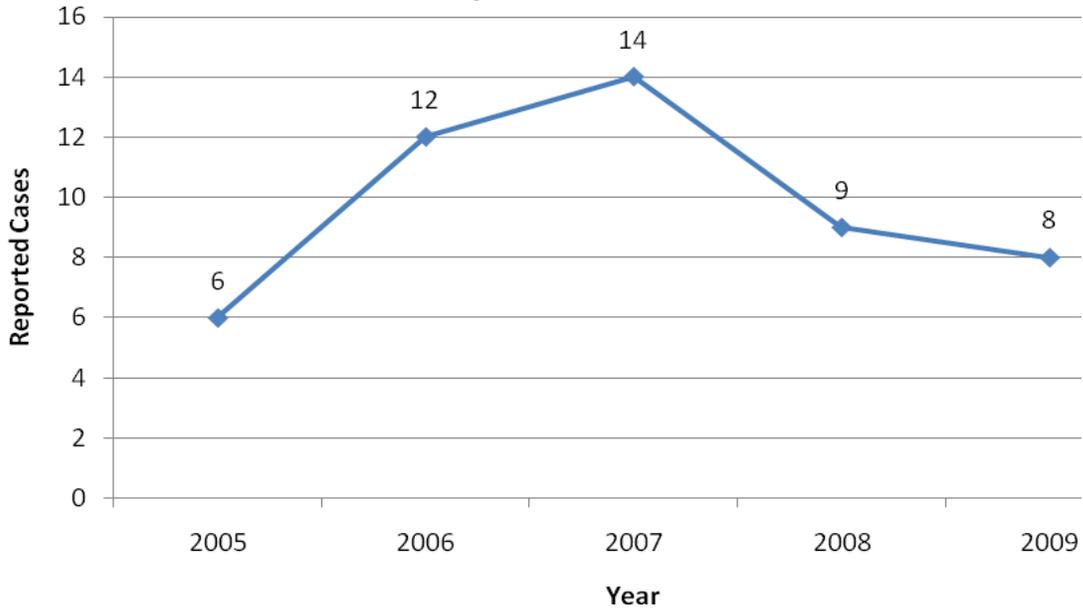
Table 1. Yersiniosis Cases by Race and Sex, Indiana, 2009

	Cases	Rate*	2005 - 2009 Total
Indiana	8	0.12	49
Race			
Black	2	0.34	5
White	0	0	24
Other	1	0.51	5
Not Reported	5		15
Sex			
Female	4	0.12	27
Male	4	0.13	22
Unknown	0	0	0

*Rate per 100,000 population based on U.S. Census Bureau's population data as of July 1, 2009

Figure 1 shows reported cases by year for 2005-2009.

**Figure 1: Yersiniosis Cases by Year
Indiana, 2005-2009**



Although yersiniosis has a winter seasonal pattern, incidence of disease can occur at any time (Figure 2).

**Figure 2: Yersiniosis Cases by Month
Indiana, 2009**

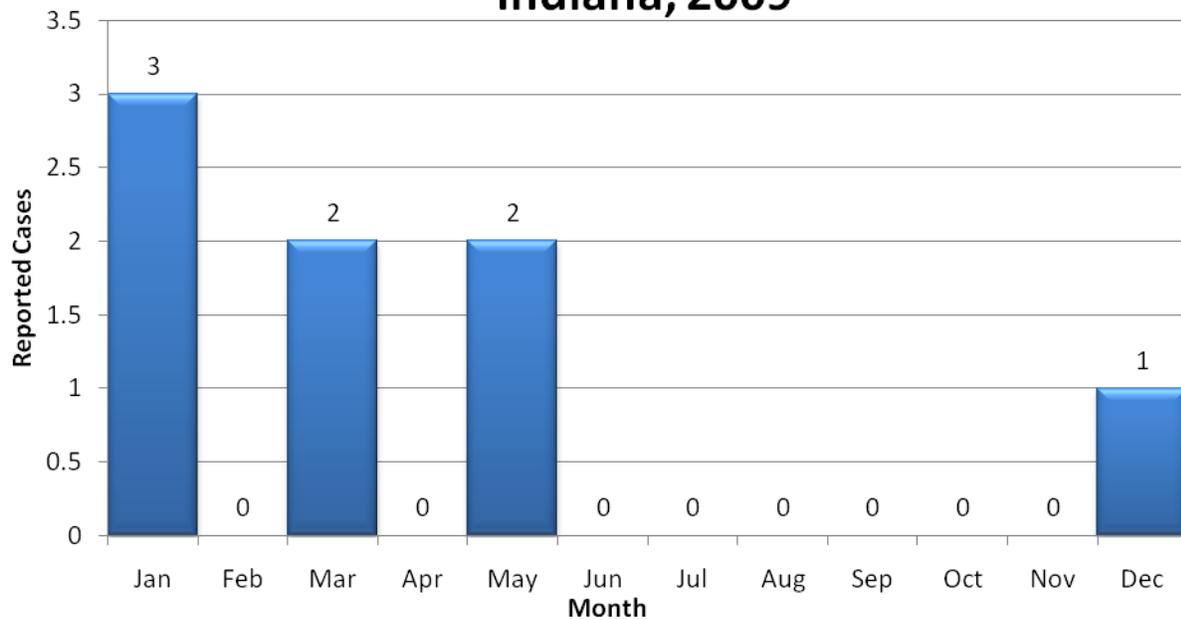
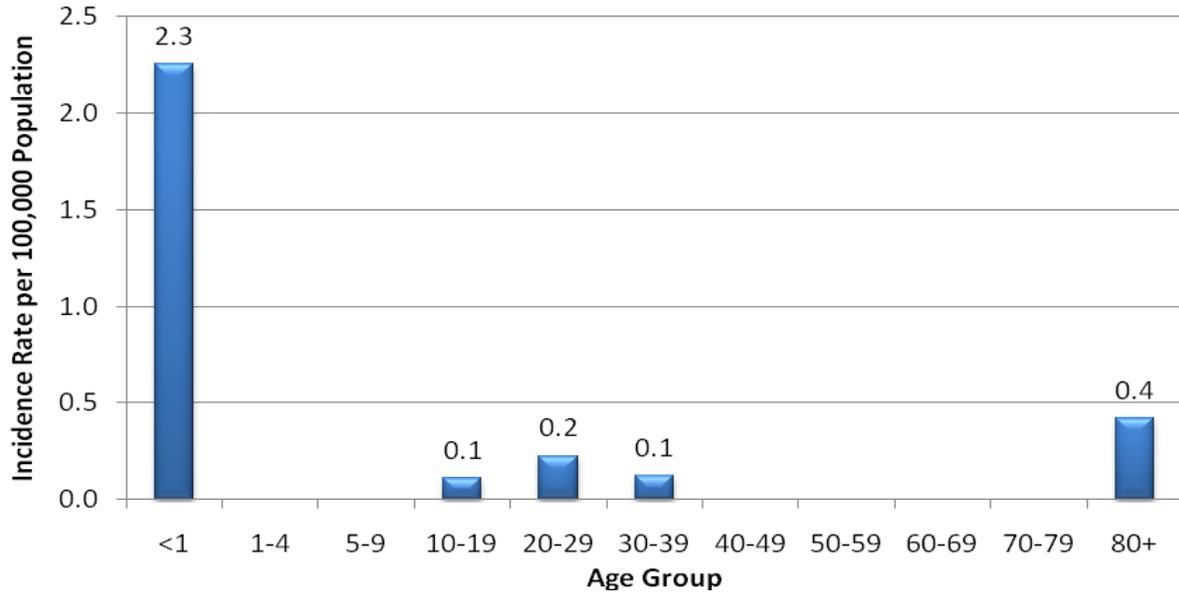


Figure 3 shows age-specific rates were greatest for infants less than 1 year of age (2.3), followed by those over 80 years old (0.4).

**Figure 3: Yersiniosis Incidence Rates by Age Group
Indiana, 2009**



Four Indiana counties reported yersiniosis cases in 2009. Only Lake County reported five or more cases.

There were no outbreaks of yersiniosis reported in Indiana in 2009.

You can learn more about yersiniosis by visiting the following Web sites:

http://www.cdc.gov/ncidod/dbmd/diseaseinfo/yersinia_g.htm

<http://www.fda.gov/Food/FoodSafety/FoodborneIllness/FoodborneIllnessFoodbornePathogensNaturalToxins/BadBugBook/ucm070040.htm>