



Indiana State
Department of Health
Epidemiology Resource Center

**Annual Report of Infectious Diseases
2015**

Notes

All incidence rates throughout the report are per 100,000 population based on the 2015 U.S. Census Bureau's population data, gathered on July 6, 2016.

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

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

Reports on HIV/AIDS, sexually transmitted infections and tuberculosis are published separately.

Counts and rates for the 2015 annual report are not comparable to previous years, as changes were made to ensure case definitions match the National Notifiable Diseases list, which can be found at <https://www.cdc.gov/nndss/conditions/>.

Indiana's reporting rule became effective December 25, 2015. While the requirements for what needs to be reported and when were updated, this report follows the reporting requirements of the previous rule. More information on the reporting rule can be found at <http://www.in.gov/isdh/25366.htm>.

References

American Academy of Pediatrics. In: Pickering LK, Baker CJ, Long SS, McMillan JA, eds. *Red Book: 2012 Report of the Committee on Infectious Diseases*. 29th ed. Elk Grove Village, IL: American Academy of Pediatrics, 2012.

Centers for Disease Control and Prevention. *Manual for the Surveillance of Vaccine-Preventable Diseases*. Centers for Disease Control and Prevention, Atlanta, GA, 2008.

Centers for Disease Control and Prevention. *Epidemiology and Prevention of Vaccine-Preventable Diseases*. Hamborsky J, Kroger A, Wolfe S, eds. 13th ed. Washington DC: Public Health Foundation, 2015.

Heyman, D.L. *Control of Communicable Diseases Manual* 20th ed. American Public Health Association, 2015.

Websites

www.cdc.gov

www.fda.gov

www.who.int



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 electronically report infectious diseases to the state and local health departments. 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 99 percent of the local health agencies in the state and nearly 134 hospitals to report infectious diseases.

CONTENTS

[Animal Bites](#)

[Anthrax](#)

[Arboviral Encephalitis](#)

[Babesiosis](#)

[Botulism](#)

[Brucellosis](#)

[Campylobacteriosis](#)

[Chikungunya](#)

[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 Group A](#)

[Streptococcus Group B](#)

[Tetanus](#)

[Toxic Shock Syndrome](#)

[Trichinosis](#)

[Tularemia](#)

[Typhoid Fever](#)

[Typhus Fever \(Murine\)](#)

[Varicella](#)

[Vibriosis](#)

[West Nile Virus](#)

[Yellow Fever](#)

[Yersiniosis](#)

[Zika Virus](#)

ANIMAL BITES

Animal bites are preventable injuries that may also be associated with transmission of rabies. Animal bites are reportable to public health authorities to facilitate rabies risk assessment and enable appropriate recommendations for post-exposure prophylaxis. Animal bite reporting also helps local public health professionals assess the need for community-level interventions, including aggressive dog ordinances, spay-neuter services, rabies vaccination clinics, public education campaigns and allocation of resources to animal control agencies and shelters.

Public Health Significance

While rabies is rare in Indiana's domestic animals, animal bites remain a common and important public health problem. Animal bites are preventable injuries that cause pain, trauma and infection, loss of function, disfigurement and anxiety.

Once an animal bite is reported to public health officials, the biting animal will either be quarantined for 10 days to observe for signs of rabies or submitted to the Indiana State Department of Health (ISDH) Rabies Laboratory for diagnostic testing. Post-exposure prophylaxis to prevent rabies may be recommended for the exposed person based on the rabies risk assessment and the outcome of the quarantine or rabies testing.

While any animal has the potential to bite, most bites come from dogs. According to the Centers for Disease Control and Prevention (CDC), each year approximately 4.5 million Americans are bitten by dogs. Of those who are bitten, 885,000 will seek medical attention and 386,000 of these will require treatment in an emergency department. Half of all animal bites occur in children; the rate of dog bites is highest for children ages 5-9 years. (See the following website for a detailed report: <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5226a1.htm>.)

In general, dog bites can be prevented by adhering to the following guidelines:

- Do not approach an unfamiliar dog.
- Do not scream and/or run from a dog.
- Remain motionless (e.g., "be still like a tree") if approached by an unfamiliar dog.
- If knocked over by a dog, roll into a ball and lie still (e.g., "be still like a log").
- Children should not play with a dog unless supervised by an adult.
- Children should report stray dogs or dogs displaying unusual behavior to an adult.
- Avoid direct eye contact with a dog.
- Do not disturb a dog that is sleeping, eating, or caring for puppies.
- Do not pet any dog without allowing the dog to see and sniff you first.

Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3-52, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report animal bites within 24 hours to the local health department or the ISDH.

Healthy People 2020 Goal

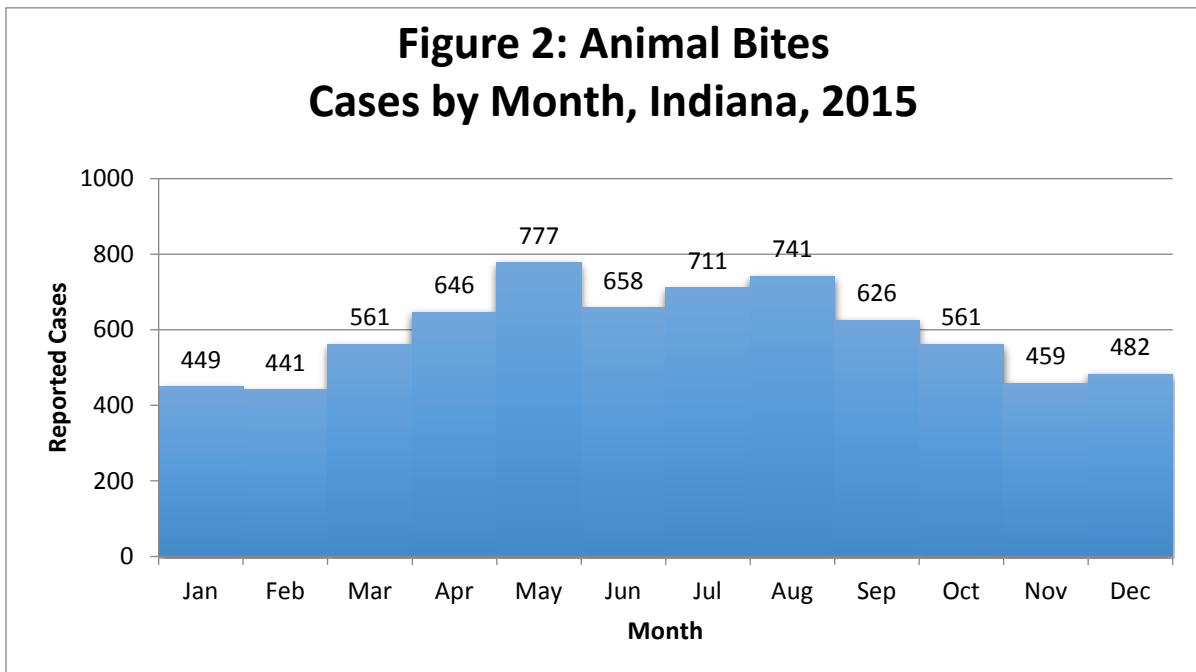
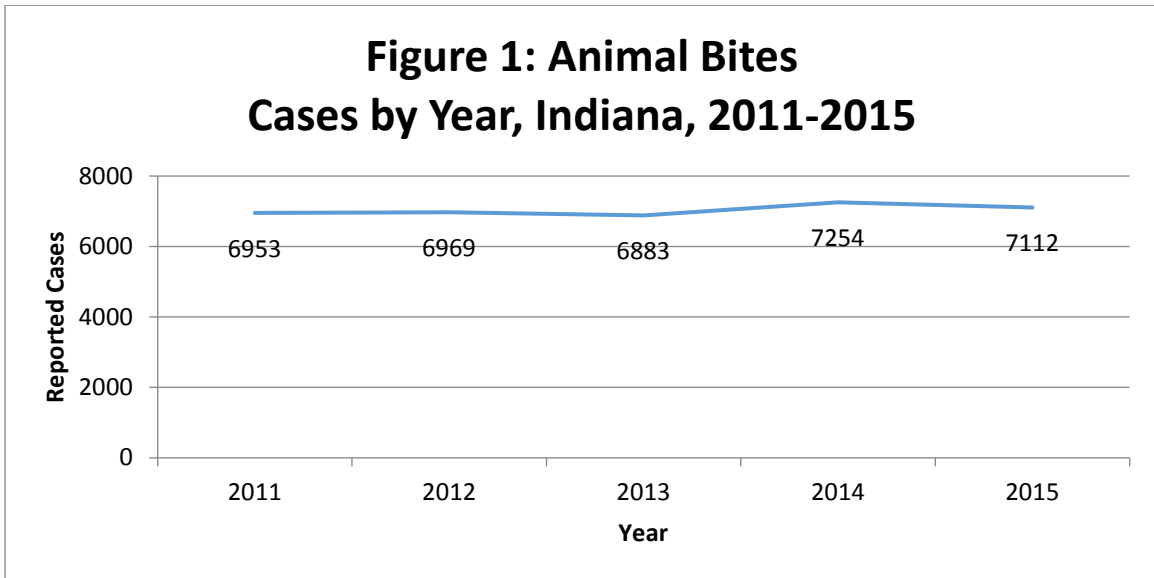
There is no Healthy People 2020 goal for animal bites.

Epidemiology and Trends

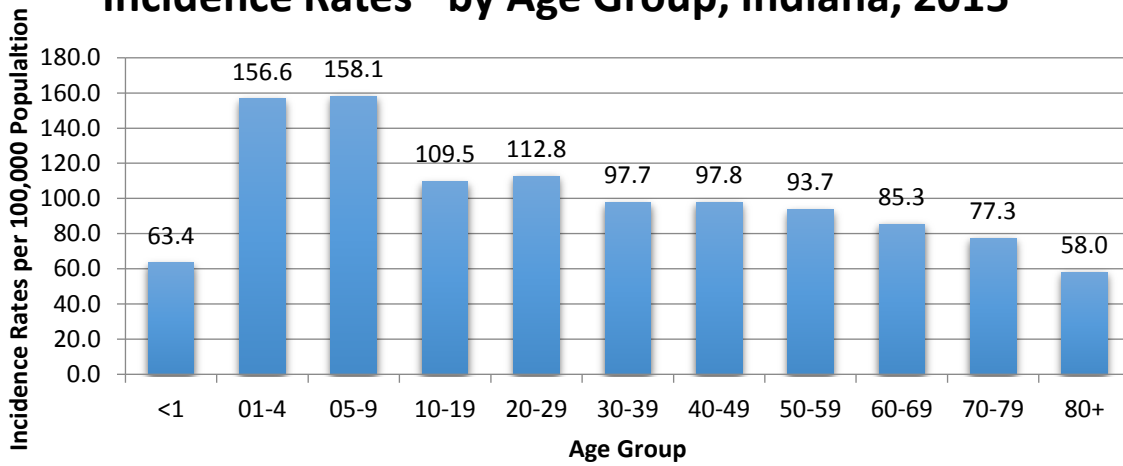
In the 2015 calendar year, 7,112 animal bite cases were reported in Indiana. This is similar to previous years when data were collected (Figure 1). Animal bites occurred at all times of the year, but were most common in the spring and summer months (Figure 2). The risk for animal bites was highest among

children ages 1–9 years (Figure 3), and there was a slightly higher proportion of female victims (Figure 4).

The majority of biting animals were domestic dogs and cats (Table 1). Substantial proportions of biting dogs and cats were sexually intact (Table 2) and unvaccinated against rabies (Table 3) or had unknown status for these risk factors.



**Figure 3: Animal Bites
Incidence Rates* by Age Group, Indiana, 2015+**



*Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

*Missing age group for 270 cases

**Figure 4: Animal Bites by Gender of Victim,
Indiana, 2015**

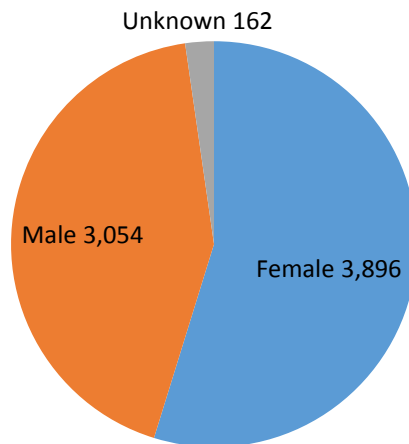


Table 1. Animal bites by species, Indiana, 2015

Type of Animal	Number	Percent
Dog	5,412	76%
Cat	1,347	19%
Bat	162	2%
Raccoon	49	<1%
Squirrel	20	<1%
Other	123	2%
Total	7,113	100

Table 2. Animal bites by spay or neuter status for dogs and cats, Indiana, 2015

	Dogs		Cats		Dogs and cats	
	Number	Percent	Number	Percent	Number	Percent
Spayed or neutered	1,618	24%	408	6%	2,026	30%
Not spayed or neutered	968	14%	183	3%	1,151	17%
Unknown	2,826	42%	756	11%	3,582	53%
Total	5,412	80%	1,347	20%	6,759	100%

Table 3. Animal bites by rabies vaccination status for dogs and cats, Indiana, 2015

	Dogs		Cats		Dogs and cats	
	Number	Percent	Number	Percent	Number	Percent
Vaccinated	2,294	34%	365	5%	2,659	39%
Not vaccinated	633	9%	248	4%	881	13%
Unknown	2,485	37%	734	11%	3,219	48%
Total	5,412	80%	1,347	20%	6,759	100%

You can learn more about animal bite prevention by visiting the following Web sites:

<http://www.cdc.gov/HomeandRecreationalSafety/Dog-Bites/index.html>

<https://www.avma.org/public/Health/Documents/dogbite.pdf>.

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:

- Cutaneous infections, the mildest form, occur when bacterial spores become embedded in the skin.
- The gastrointestinal form, which is extremely rare, occurs when animals ill with anthrax are consumed as food.
- 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 U.S. states and Canada. Animals, including livestock, can acquire the bacteria from contaminated soil. However, no cases of anthrax have been reported in Indiana livestock since before 1960.

Public Health Significance

Symptoms of anthrax can occur within seven 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 (eschar). Most anthrax infections are cutaneous.

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 stage 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 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.

Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report suspect cases of anthrax immediately to the local health department or the ISDH. Laboratories are also required to report positive results of *Bacillus anthracis* weekly to the ISDH.

Healthy People 2010 Goal

There is no Healthy People 2010 Goal for anthrax.

Epidemiology and Trends

No human or animal cases of anthrax were reported in Indiana in 2015 or during the five-year reporting period 2011-2015.

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 July through October, 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 WNV, 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. Most SLE infections are asymptomatic; clinical infections may range in severity from mild nonspecific febrile illness to meningitis or encephalitis (neuroinvasive disease). In the United States, the annual number of reported SLE neuroinvasive disease cases reported fluctuates widely as result of periodic epidemics. From 1964 through 2009, an average of 102 cases were reported annually, and as many as 2,000 cases were reported during epidemic years.

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 to 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 to 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.

Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report arboviral disease immediately (both neuroinvasive and non-neuroinvasive cases) to the local health department or the ISDH. Laboratories are also required to report positive results of arboviral testing weekly to the ISDH. Arboviral diseases include dengue, Eastern equine encephalitis (EEE), LaCrosse (California) encephalitis (LAC), Saint Louis encephalitis (SLE), Western equine encephalitis (WEE), West Nile Virus (WNV), Powassan encephalitis (POW), and yellow fever.

Healthy People 2020 Goal

There is no Healthy People 2020 Goal for arboviral disease.

Epidemiology and Trends

No human cases of EEE were reported in Indiana in 2015, nor were any reported during the five-year reporting cycle from 2011-2015.

No human cases of SLE were reported during 2015 in Indiana, nor were any reported during the five-year reporting period from 2011-2015.

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

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

<http://www.cdc.gov/EasternEquineEncephalitis/index.html>

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

BABESIOSIS

Babesiosis is caused by hemoprotozoan 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 other 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. Less common routes of *Babesia* infection include transfusion from an infected blood donor and from infected mother to her unborn child.

Public Health Significance

Symptoms of babesiosis usually occur one to four 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 have greater risk.

Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report babesiosis within 72 hours to the local health department or the ISDH. Laboratories are also required to report positive results of *Babesia* species weekly to the ISDH.

Healthy People 2020 Goal

There is no Healthy People 2020 Goal for babesiosis.

Epidemiology and Trends

No confirmed or probable cases of babesiosis were reported in Indiana in 2015. One case of babesiosis was reported during the five-year reporting period 2011-2015.

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 one or two years.

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

- Foodborne botulism results from eating foods, especially improperly home-canned foods that contain botulism toxin.
- Intestinal botulism (adults) and infant botulism result 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*.
- Iatrogenic botulism results from overdose of botulism toxin (e.g. Botox).

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 toward the feet. These symptoms are a result of the bacterial toxin paralyzing the muscles of the body. Botulism symptoms typically begin within 12 to 36 hours (range of six 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. 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. Infant botulism caused by *C. botulinum* type A or type B can be treated with Botulism Immune Globulin (BabyBIG). BabyBIG may significantly decrease the days of medical ventilation, intensive care unit stay and overall hospital stays.

Outbreaks have occurred following the consumption of unviscerated 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).
 - 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.

Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report botulism immediately to the local health department or the ISDH.

Healthy People 2020 Goal

There is no Healthy People 2020 Goal for botulism.

Epidemiology and Trends

No confirmed cases of botulism were reported in Indiana in 2015, and two cases were reported during the five-year reporting period 2011-2015.

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

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

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 but is rare.

Public Health Significance

In humans, symptoms of brucellosis usually appear within 6 to 12 weeks after exposure 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, such as soft cheese, that was made with unpasteurized milk. Treatment requires the use of multiple antibiotics for six weeks or longer, and recovery may take a few weeks to several months.

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

Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report brucellosis within 72 hours to the local health department or the ISDH. Laboratories are also required to report positive results of *Brucella* species weekly to the ISDH.

Healthy People 2020 Goal

There is no Healthy People 2020 Goal for brucellosis.

Epidemiology and Trends

Brucellosis cases in humans rarely occur in Indiana and are sporadic 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 to 70 years. Two cases of brucellosis were reported in Indiana in 2015. Six cases were reported during the five-year reporting period 2011-2015. Recent cases in the United States have 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/brucellosis/>.

*Bioterrorism Agent List:

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

CAMPYLOBACTERIOSIS

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

People can become infected with *Campylobacter* in many ways. The most common exposures are foodborne (e.g., consuming undercooked poultry, unpasteurized dairy products), waterborne (e.g., swallowing untreated water 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 two to five days after exposure, with a range of 1 to 10 days. For most people, *Campylobacter* causes symptoms that usually last no longer than one week, and they recover within five to seven 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 two hours) and chilling (chill immediately and separate into smaller containers if needed).
 - Thoroughly cook all food items to the U.S. Department of Agriculture (USDA) recommended safe minimum internal temperatures:
 - 145°F – beef, pork, veal and lamb (steaks, chops, or roasts); ham (fresh or smoked); fish; and shellfish
 - 160°F – ground meats and eggs
 - 165°F – all poultry, leftovers and casseroles
 - Reheat cooked hams packaged in USDA-inspected plants to 140°F and all others to 165°F.
 - 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.
- Exclusions:
 - 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.

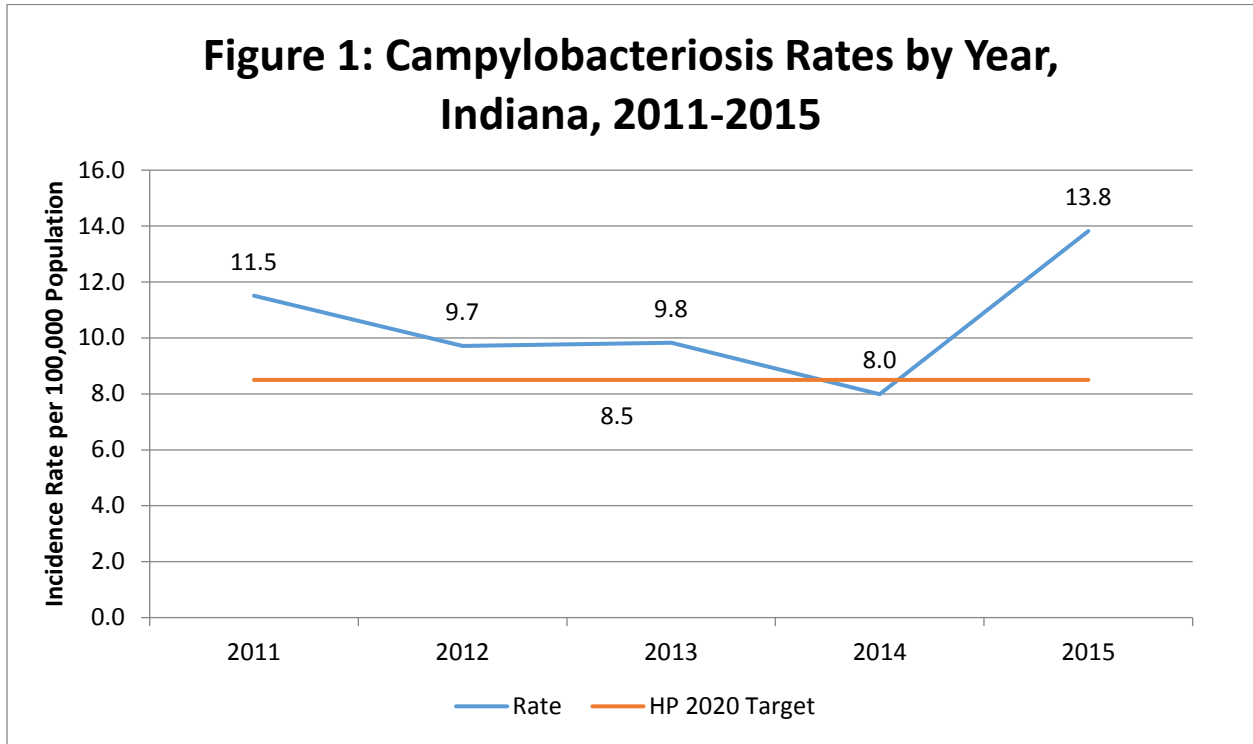
Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report campylobacteriosis within 72 hours to the local health department or the ISDH. Laboratories are also required to report positive results of campylobacteriosis weekly to the ISDH.

Healthy People 2020 Goal

The Healthy People 2020 Goal for campylobacteriosis is 8.5 cases per 100,000 population per year. During the five-year period, 2011-2015, Indiana met this goal in 2014 ([Figure 1](#)).

Figure 1.



Epidemiology and Trends

In 2015, 915 cases of campylobacteriosis were reported in Indiana, for a rate of 13.82 cases per 100,000 population (Table 1). Males (14.87) were more likely to be reported than females (12.78). The rate of cases in whites (11.49) was greater than in blacks (3.46) or other races (5.97); however, 222 cases did not report racial data.

Table 1: Campylobacteriosis case rate by race and sex, Indiana, 2015

	Cases	Rate*	2011 - 2015 Total
Indiana	915	13.82	3,473
Race			
Black	22	3.46	78
White	653	11.49	2,382
Other	18	5.97	93
Not Reported	222	-	920
Sex			
Female	429	12.78	1,663
Male	485	14.87	1,808
Unknown	1	-	2

*Rate per 100,000 population based on U.S. Census Bureau's population data as of July 6, 2016.

*Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

Figure 2 shows reported cases by year for 2011-2015.

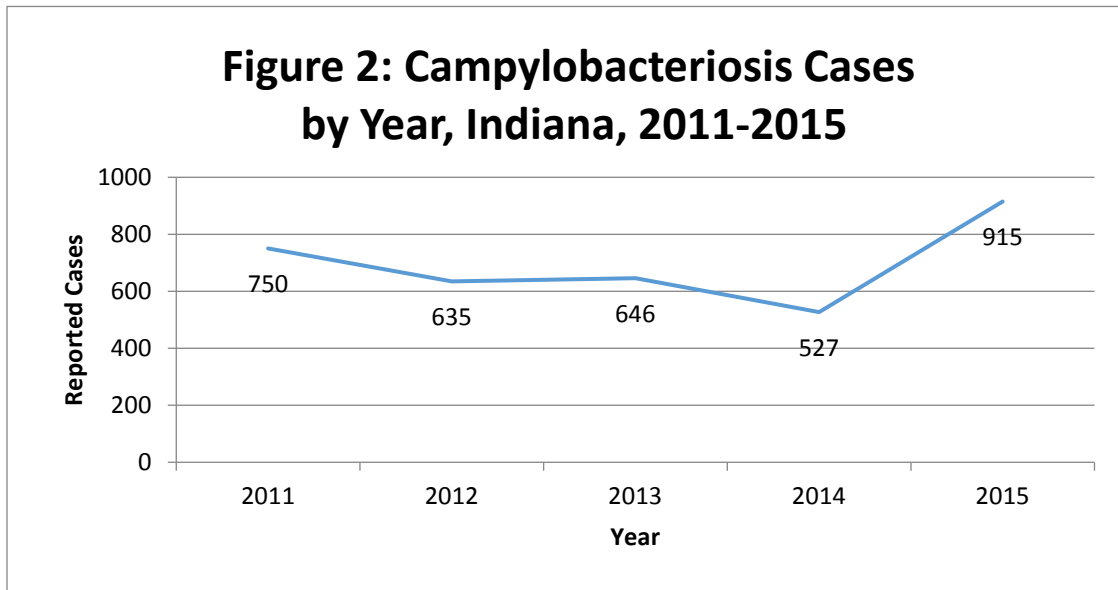
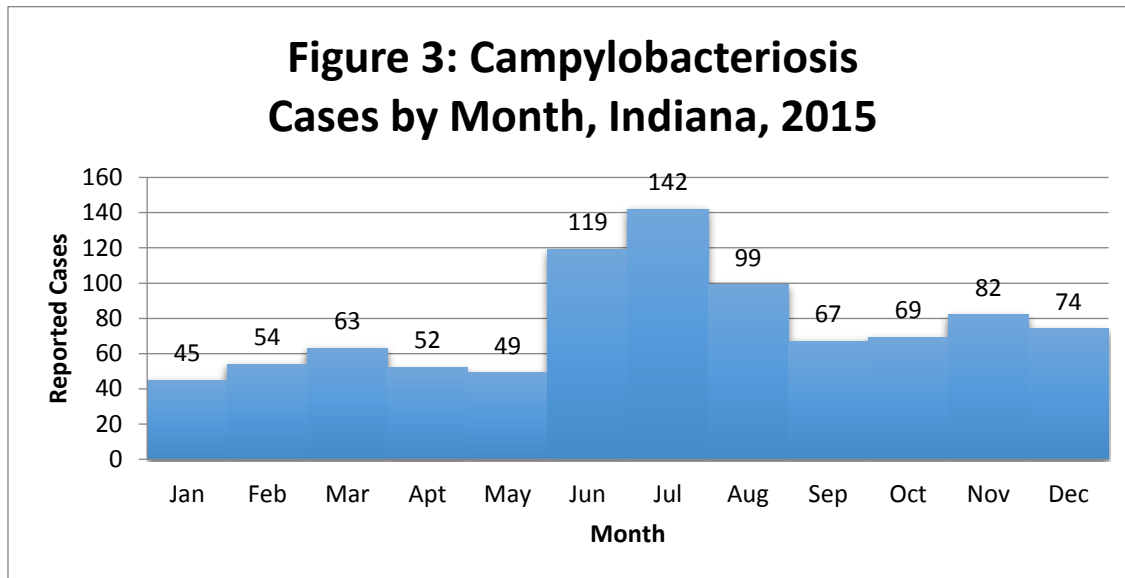
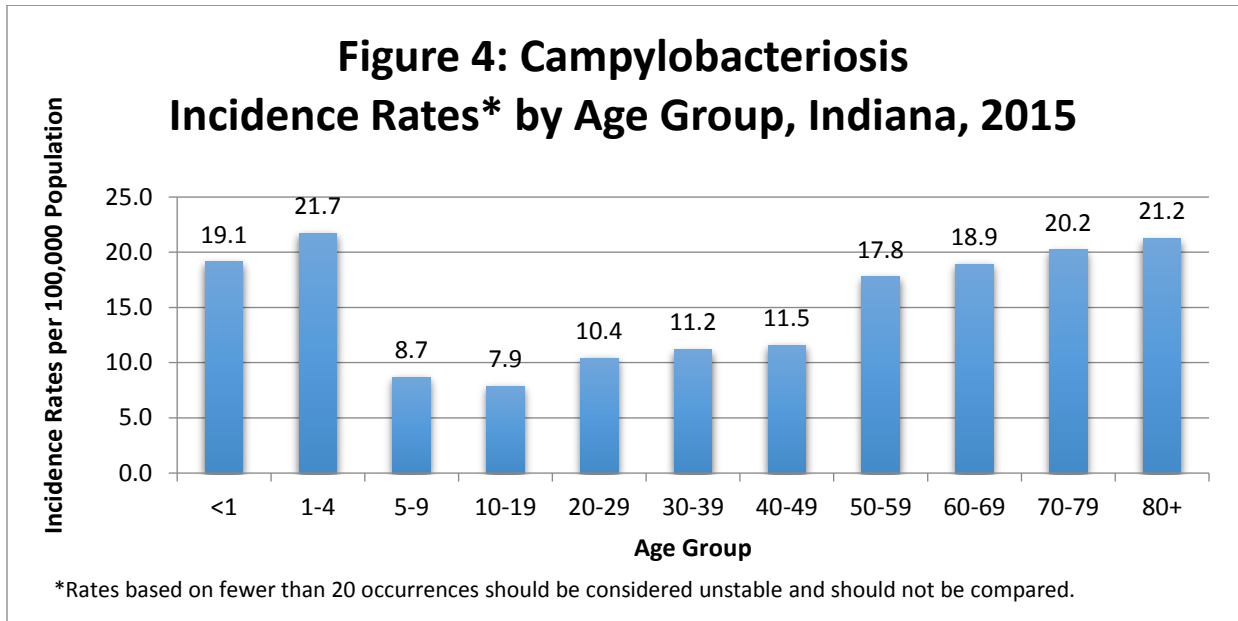


Figure 3 shows cases per month for 2015. Incidence of disease was greatest during the summer months.

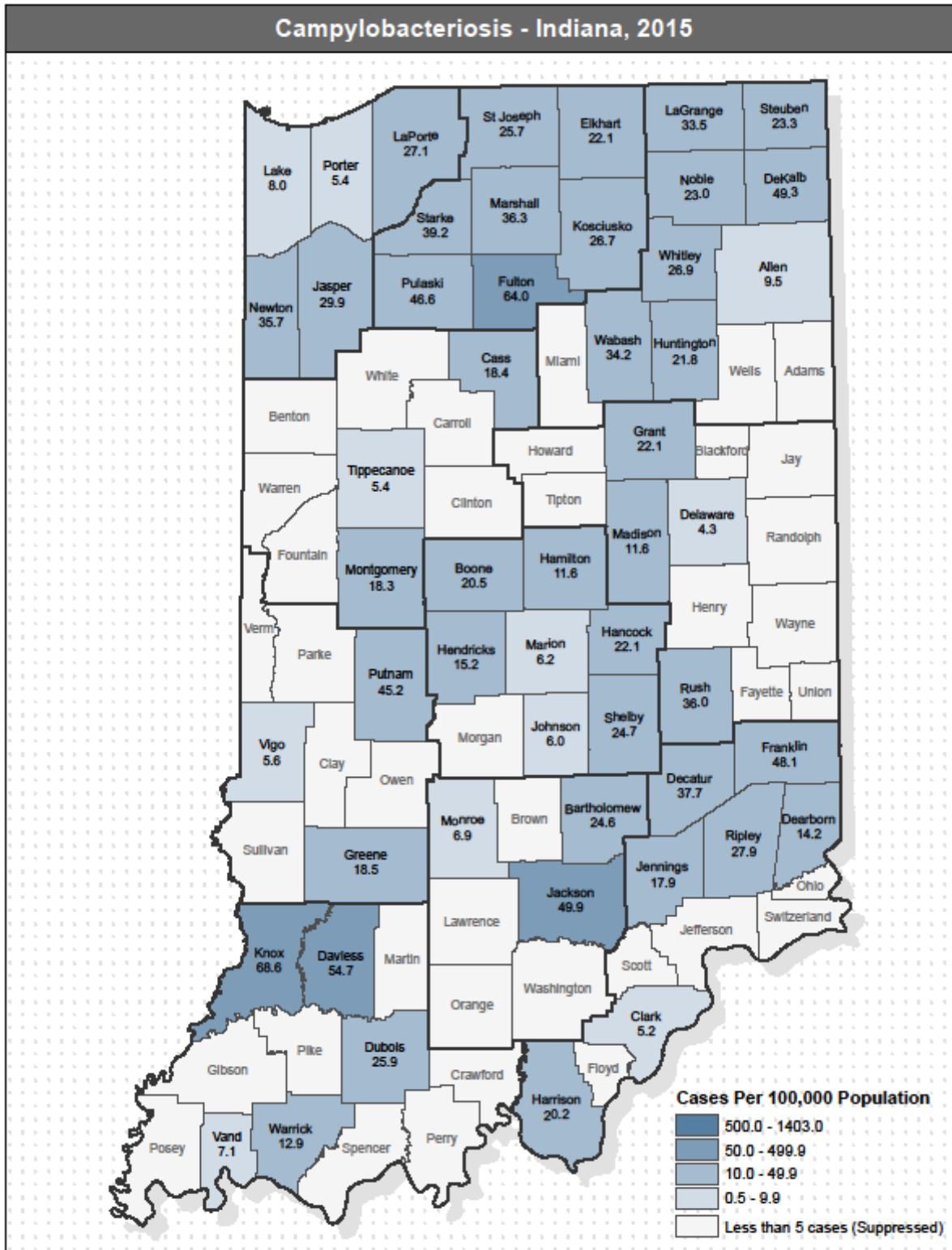


As shown in [Figure 4](#), age-specific rates in 2015 were greatest for preschoolers aged 1-4 years (21.7), closely followed by elderly adults over the age of 80 and elderly adults between the age of 70-79.



[Figure 5](#) shows counties reporting five or more cases of campylobacteriosis in 2015. The incidence rate was highest among the following counties reporting five or more cases: Knox (68.6), Fulton (64.0), and Daviess (61.1). Some of the rates are based on fewer than 20 counts and should be considered unstable.

Figure 5.



You can learn more about campylobacteriosis by visiting the following Web site:
<http://www.cdc.gov/nczved/divisions/dfbmd/diseases/campylobacter/>

CHIKUNGUNYA VIRUS

Chikungunya virus (CHIKV) is caused by an alphavirus in the family *Togaviridae*. The virus occurs in tropical and subtropical areas of the world. The primary vector, the *Aedes aegypti* mosquito, is rarely seen in Indiana. However, another competent vector, *Aedes albopictus*, is present in several of Indiana's counties, most predominantly in the southern part of the state. CHIKV is found in the same parts of the world, is transmitted by the same mosquito species, and has some clinical similarities to dengue virus and Zika virus. Distinguishing CHIKV infection from dengue infection is important to ensure proper treatment.

Public Health Significance

Symptoms of CHIKV usually occur within three to seven days after the infective bite. Symptoms include fever, pain in multiple joints, headache, muscle aches, nausea and vomiting and rash. There is no vaccine or specific antiviral medication for CHIKV. CHIKV may be introduced into areas by travelers who become infected while visiting tropical areas where the virus is endemic.

While CHIKV has not been transmitted in Indiana, recent cases have been acquired locally in Florida. Starting in late 2013, an outbreak began in the Caribbean that has since spread to 45 countries and territories throughout the Americas, with more than 1.7 million suspected cases reported to the Pan American Health Organization from affected areas. CHIKV outbreaks have also occurred in Africa, Asia, Europe and the Indian and Pacific Oceans.

Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), health care providers are required to report arboviral encephalitis immediately to the local health department or the Indiana State Department of Health. Laboratories are also required to report positive results of arboviral testing weekly to the ISDH. Chikungunya virus was added to the national notifiable disease list by the Council of State and Territorial Epidemiologists in 2014. A revision to the Communicable Disease Reporting Rule 410 IAC 1-2.3 was adopted in December 2015 to explicitly require mandatory reporting of chikungunya virus disease by health care providers and laboratories.

Healthy People 2020 Goal

There is no Healthy People 2020 Goal for chikungunya virus.

Epidemiology and Trends

In 2015, 7 cases of CHIKV infection were reported in Indiana residents. Forty cases of CHIKV were reported during the five-year reporting period 2011-2015. During the five-year reporting period, infectious were acquired during foreign travel to tropical and subtropical areas, including Aruba (1), the Bahamas (1), Dominica (1), the Dominican Republic (4), El Salvador (1), Haiti (15), Honduras (1), Jamaica (3), Mexico (1), Nicaragua (2), Puerto Rico (3), Saint Kitts and Nevis (1), Saint Maarten (1), Saint Lucia (1), the US Virgin Islands (1), Venezuela (1) and unknown destinations (2).

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

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

<http://wwwnc.cdc.gov/travel/yellowbook/2016/infectious-diseases-related-to-travel/chikungunya>

CHOLERA

Cholera is a contagious diarrheal disease caused by toxins produced by *Vibrio cholerae* bacteria (O1 and O139 serogroups). Humans are the only reservoir, although free living *Vibrio cholerae* can survive in aquatic environments such as 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 associated with international 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 with feces or vomitus of infected persons (e.g., via sewage). Water contaminated with *V. cholerae* can 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 bacteria, 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 two to three days (range of a few hours to five days) after exposure. Fever is usually absent. Infection with *V. cholerae* often results in asymptomatic or mild illness involving only diarrhea.

Approximately one 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 fluid and salts lost through diarrhea with an oral rehydration solution. Severe cases may also require intravenous fluid replacement. Antibiotics shorten the course and diminish the severity of illness, but 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 ill individuals; 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:
 - Do not eat uncooked shellfish or fish, including ceviche.
 - Use treated water for washing, cooking and drinking.
 - Wash all produce before eating raw or cooking.
- 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 two 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.

Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report cholera immediately to the local health department or the Indiana State Department of Health.

Healthy People 2020 Goal

There is no Healthy People 2020 Goal for cholera.

Epidemiology and Trends

In 2015, no cases of cholera were reported in Indiana, and no cases were reported in the five-year period from 2011-2015.

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

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

CRYPTOSPORIDIOSIS

Cryptosporidiosis is a contagious disease caused by the microscopic parasites, *Cryptosporidium hominis* and *Cryptosporidium parvum*, which can live in the intestine of humans, cattle and other mammals, poultry, fish and reptiles. Healthy people recover without medical intervention, but cryptosporidiosis can be very serious or life-threatening to people with weakened immune systems, especially those with HIV. The parasite is protected by an outer shell (cyst) which allows it to 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. From 2011-2015, an average of 188 cases of cryptosporidiosis were 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:

- Swallowing contaminated water from natural bodies of water such as lakes, rivers or streams.
- Swallowing treated, but unfiltered, contaminated drinking or recreational water (such as pools or hot tubs).
- Eating food (most commonly produce) contaminated with stool from infected animals or humans.
- Consuming unpasteurized dairy products or unpasteurized juices.
- Not washing hands after contact with farm animals, particularly at petting zoo or fair venues.
- Not washing hands after contact with stool from a contaminated surface such as diaper/linens or toys.
- 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 two to three weeks. 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 which can lead to prolonged disease and even death without proper medical intervention. A previous infection with *Cryptosporidium* does not provide immunity against re-infection.

Antiparasitic drugs are available for treatment and over-the-counter medications can ease 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.
 - 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 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 (contaminated foods may look and smell normal):
 - 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 and 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 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.
 - 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 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 5 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.

Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3 [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report cryptosporidiosis within 72 hours to the local health department or the ISDH. Laboratories are also required to report positive results of cryptosporidiosis weekly to the ISDH.

Healthy People 2020 Goal

There is no Healthy People 2020 Goal for cryptosporidiosis.

Epidemiology and Trends

In 2015, 188 cases of cryptosporidiosis were reported in Indiana, for a rate of 2.84 cases per 100,000 population (Table 1). In 2015, males (2.82) and females (2.86) had a similar risk of *Cryptosporidium*, and whites (2.55) were at greater risk than blacks (1.41).

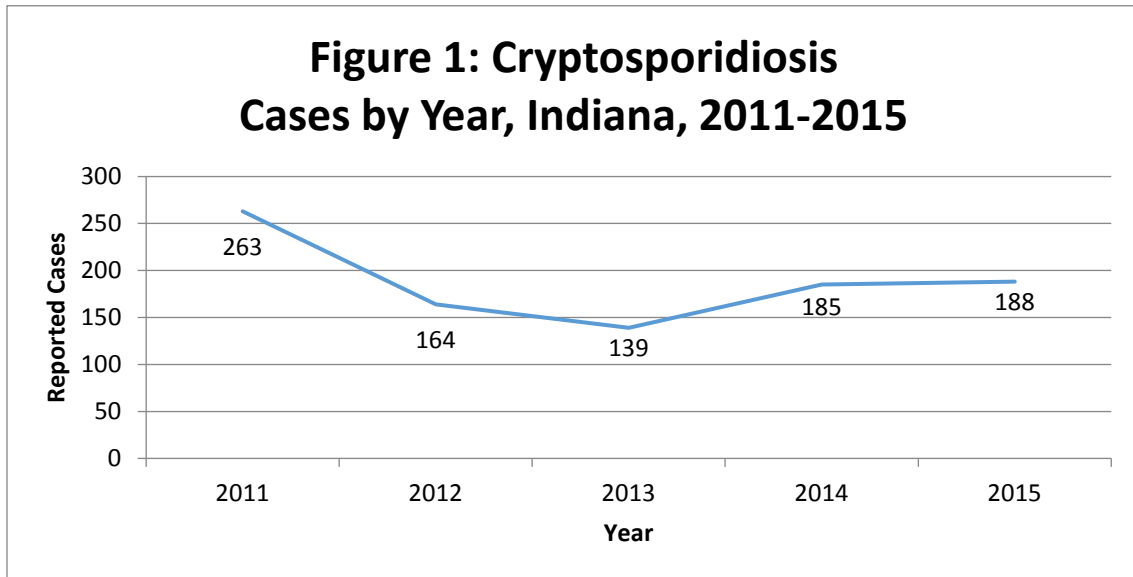
Table 1: Cryptosporidiosis case rate by race and sex, Indiana, 2015

	Cases	Rate*	2011- 2015 Total
Indiana	188	2.84	939
Race			
Black	9	1.41	47
White	145	2.55	670
Other	7	2.32	18
Not Reported	27	-	204
Sex			
Female	96	2.86	503
Male	92	2.82	435
Unknown	-	-	1

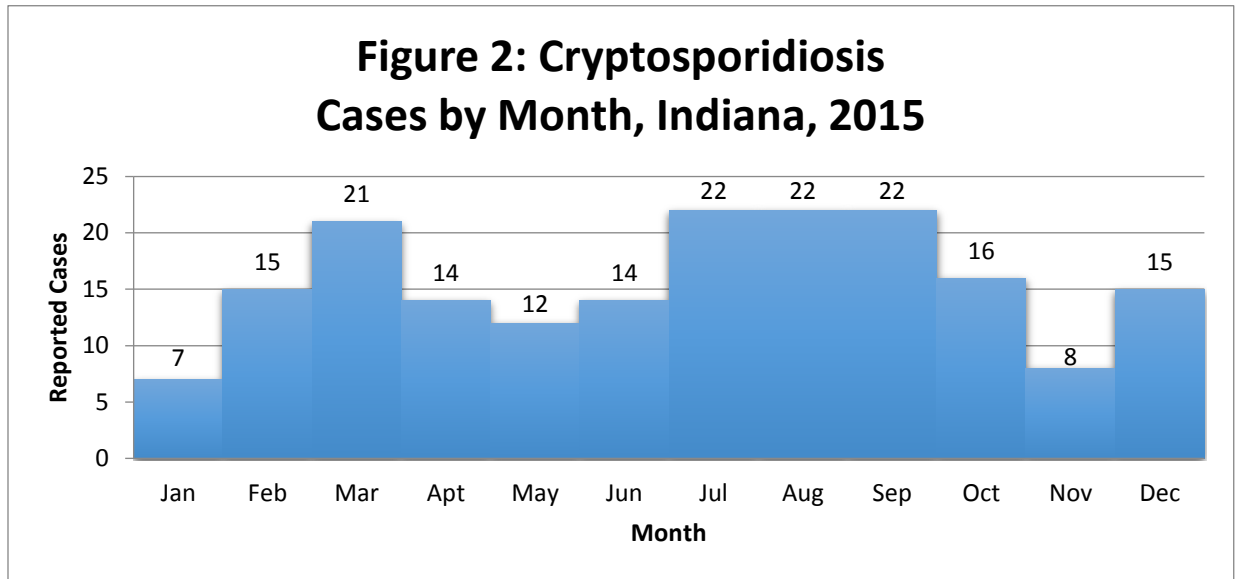
*Rate per 100,000 population based on U.S. Census Bureau's population data as of July 6, 2016.

*Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

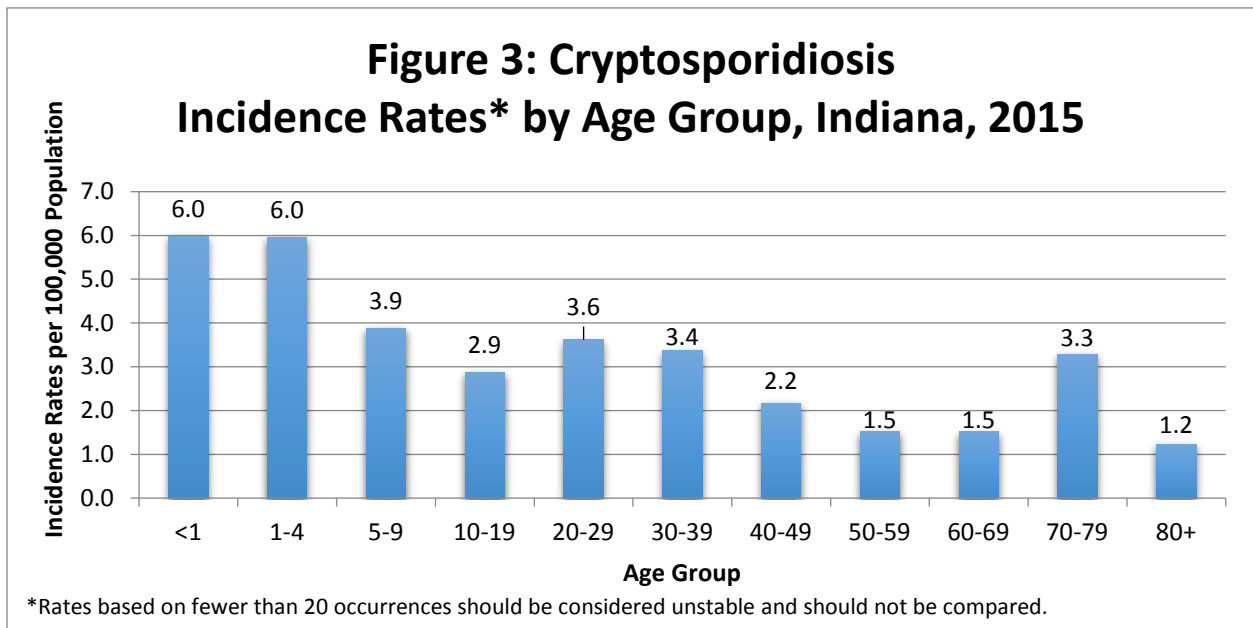
Figure 1 shows the number of reported cases each year for 2011-2015.



Disease incidence was greatest in the summer (Figure 2).



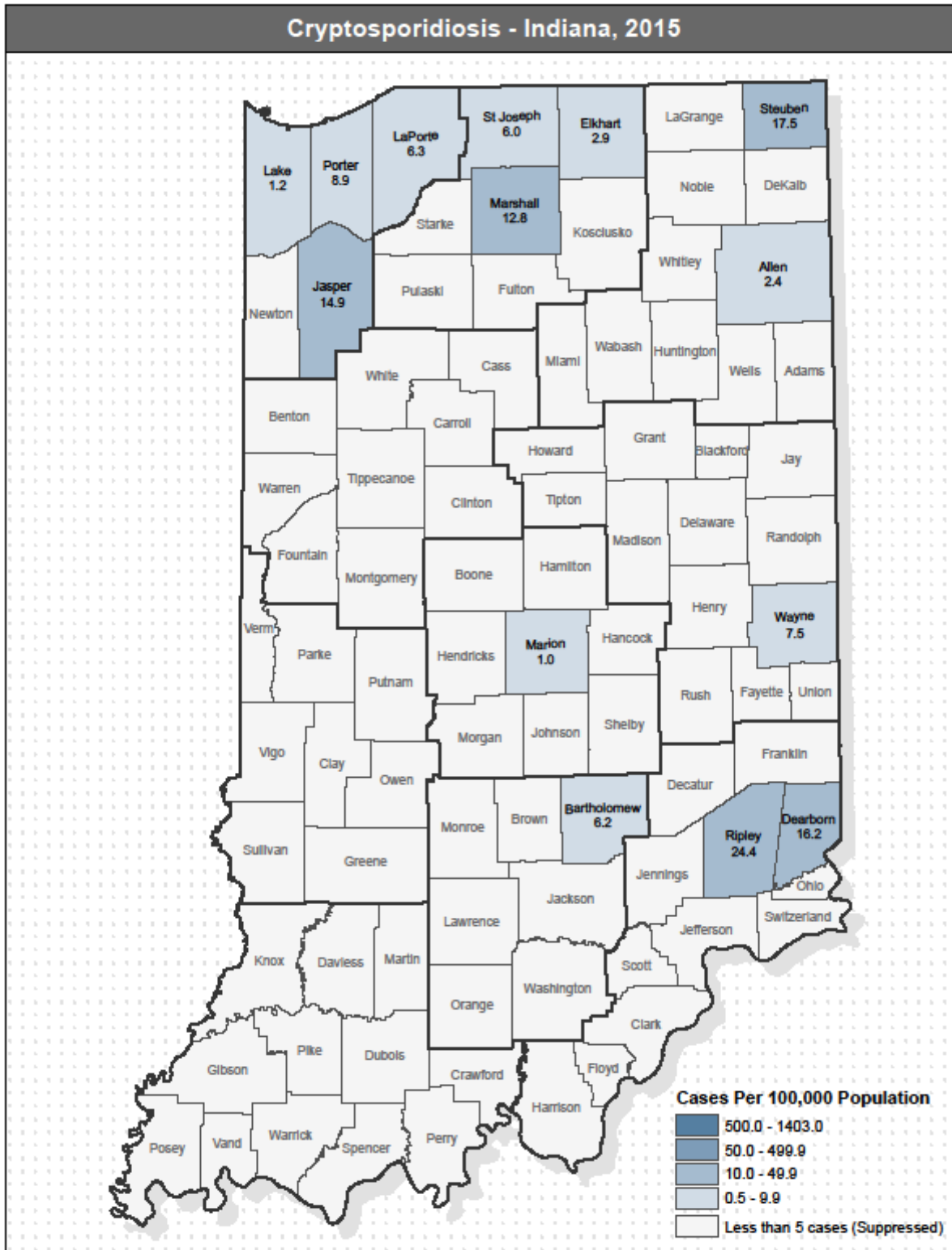
As shown in Figure 3, age-specific rates were greatest for children less than one year (6.0) and aged 1-4 years (6.0).



The incidence rates were highest among the following counties reporting five or more cases: Ripley (24.4), Steuben (17.5), Dearborn (16.2), Jasper (14.9) and Marshall (12.8).

Figure 4 shows counties reporting five or more cases of cryptosporidiosis in 2015. Some of the rates are based on fewer than 20 counts and should be considered unstable.

Figure 4.



You can learn more about cryptosporidiosis by visiting the following Web site:
<http://www.cdc.gov/crypto/>.

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. and are associated with imported fresh produce. 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.

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 an anti-parasitic, 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:
 - Wash all produce before cooking or eating raw.
 - 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 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.
- 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.

Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report cyclosporiasis within 72 hours to the local health department or the ISDH. Laboratories are also required to report positive results of cyclosporiasis weekly to the ISDH.

Healthy People 2020 Goal

There is no Healthy People 2020 Goal for cyclosporiasis.

Epidemiology and Trends

No cases of cyclosporiasis were reported in Indiana in 2015 and only three cases were reported during the five-year reporting period 2011-2015.

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

<http://www.cdc.gov/parasites/cyclosporiasis/index.html>.

DENGUE and SEVERE DENGUE

Dengue is a potentially fatal acute febrile illness that occurs in most tropical areas of the world. The disease is caused by infection with any of four virus serotypes (DEN-1 through DEN-4) of the genus *Flavivirus*. Dengue is a major public health problem worldwide and is one of the most important mosquito-borne viral illnesses of humans. In 2010, an estimated 400 million DENV infections and 100 million clinically apparent dengue cases occurred worldwide. The primary vector, the *Aedes aegypti* mosquito, is rarely seen in Indiana. However, another competent vector, *Aedes albopictus*, is present in several of Indiana's counties, most predominantly in the southern part of the state.

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. Approximately 5% of individuals that develop clinically apparent dengue will progress to severe dengue, an illness characterized by plasma leakage leading to hypovolemic shock, hemorrhage, and potentially death. The case-fatality rate for individuals with severe dengue can be as high as 10% if untreated, or 0.1% with appropriate clinical management. Distinguishing dengue infection from infection with other arboviruses is important to ensure proper treatment. 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.

While dengue has not been transmitted in Indiana, recent cases have been acquired locally in Florida and Texas. Starting in September 2009, an outbreak occurred in Key West, Florida, that affected more than 65 individuals by the end of 2010; this represents the first outbreak acquired in the continental United States outside of Texas since 1945. Since 1980, seven localized outbreaks have occurred along the Texas-Mexico border. Dengue is the leading cause of acute febrile illness in U.S. travelers returning from the Caribbean, South America, and Asia.

Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report arboviral disease, including dengue and severe dengue, immediately to the local health department or the ISDH. Laboratories are also required to report positive results of dengue virus weekly to the ISDH.

Healthy People 2020 Goal

There is no Healthy People 2020 Goal for dengue.

Epidemiology and Trends

In 2015, no cases of dengue or severe dengue were reported in residents of Indiana. For the five-year period 2011-2015, 22 cases of dengue and one case of severe dengue were reported in Indiana. All cases were acquired during foreign travel to tropical and subtropical areas.

You can learn more about dengue and severe dengue 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. Cutaneous diphtheria is not a reportable disease.

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 percent to 10 percent.

The typical series of vaccinations (for children 7 years old and younger) is five doses given at 2, 4, 6 and 15-18 months of age, and 4-6 years of age. Unvaccinated adults and children age 7 years and older require three vaccinations. Both adults and children should receive boosters (Td vaccine) every 10 years following completion of the primary series. It is recommended that one dose of Td be replaced with Tdap vaccine to protect against pertussis. 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. Diphtheria is still endemic in parts of Africa, the South Pacific, the Middle East, and Haiti. Although rare in the U.S. due to vaccination, diphtheria can infect unimmunized or partially immunized travelers visiting endemic countries.

Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report diphtheria immediately to the local health department or the ISDH. Laboratories are also required to report positive results of *Corynebacterium diphtheriae* weekly to ISDH.

Healthy People 2020 Goal

There is no Healthy People 2020 Goal for diphtheria. No cases of diphtheria have been reported in the United States since 2003.

Epidemiology and Trends

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

You can learn more about diphtheria by visiting the following website:

<http://www.cdc.gov/diphtheria/index.html>

<http://wwwnc.cdc.gov/travel/yellowbook/2014/chapter-3-infectious-diseases-related-to-travel/diphtheria>.

EHRlichiosis

Ehrlichiosis is a tick-borne disease that has been recognized in the U.S. since the mid-1980s. At least three species of *Ehrlichia* can cause human illness: *Ehrlichia chaffeensis*, *Ehrlichia ewingii*, and a third species provisionally called *Ehrlichia muris*-like (EML). 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) or anaplasmosis (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*. Anaplasmosis is currently classified with ehrlichiosis for reporting purposes.

Public Health Significance

Symptoms of ehrlichiosis are similar to Rocky Mountain spotted fever and include sudden high fever, muscle aches, headache and tiredness. Some individuals may experience a rash, but this is not a common feature in all cases. Symptoms can range from mild to serious and usually appear 3-16 days after a tick bite. If patients are not treated promptly and appropriately, some individuals may die. 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.

Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report ehrlichiosis within 72 hours to the local health department or ISDH. Laboratories are also required to report positive results of *Ehrlichia chaffeensis*, *Ehrlichia phagocytophila*, and *Anaplasma* weekly to the ISDH.

Healthy People 2020 Goal

There is no Healthy People 2020 Goal for ehrlichiosis.

Epidemiology and Trends

Twenty confirmed cases of ehrlichiosis were reported in 2015 in Indiana. From 2011-2015, 170 cases of ehrlichiosis were reported in Indiana. The number of reported cases of ehrlichiosis in Indiana has increased steadily in recent years, but dropped in 2015 (Figure 1). While the disease is most common in the spring and summer months when ticks are active, ehrlichiosis can occur any time during the year. Ehrlichiosis can occur in all areas of Indiana, but most cases occur in the southern portion of the state.

Table 1: Ehrlichiosis case rate by race and sex, Indiana, 2015

	Cases	Rate*	2011 - 2015 Total
Indiana	20	0.30	170
Race			
Black	-	-	3
White	14	0.25	132
Other	-	-	1
Not Reported	6	-	34
Sex			
Female	10	0.30	66
Male	10	0.31	104
Unknown	-	-	-

*Rate per 100,000 population based on U.S. Census Bureau's population data as of July 6, 2016.

*Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

Figure 1.

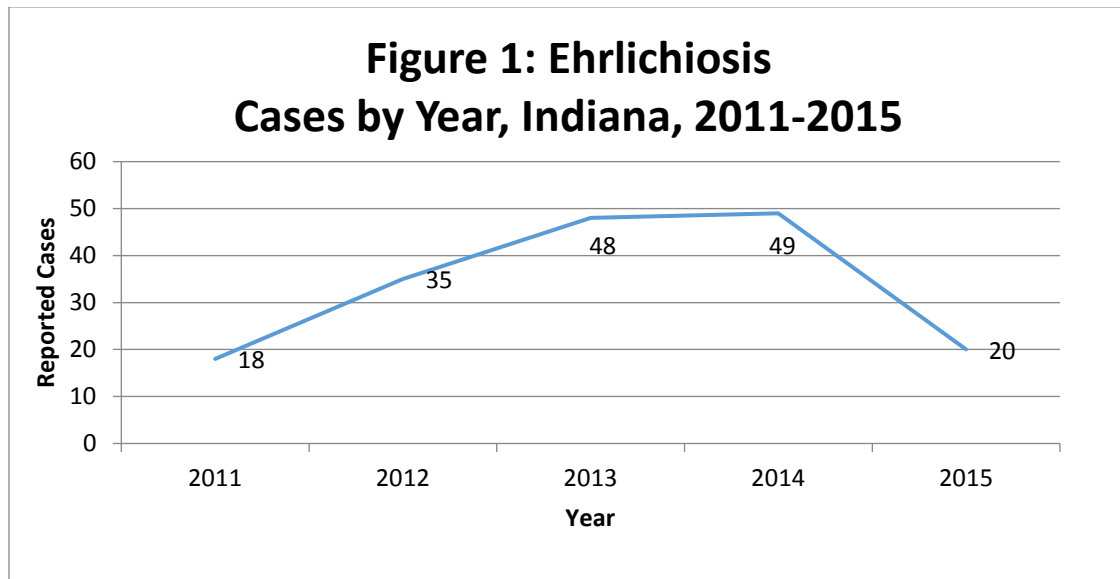
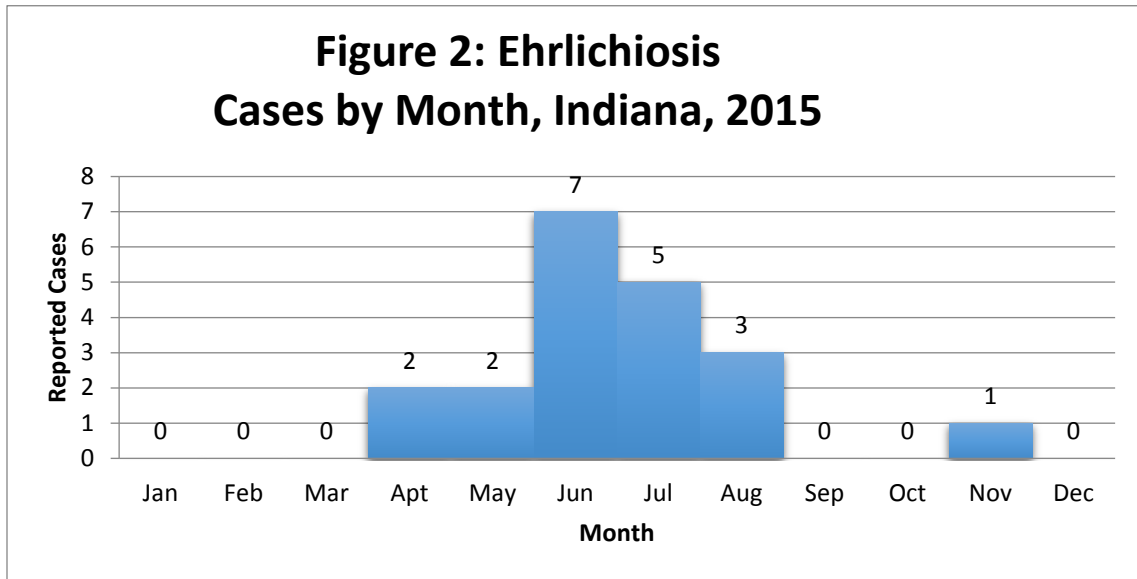


Figure 2.



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

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

***ESCHERICHIA COLI*, SHIGA TOXIN-PRODUCING**

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 toxins that damage body cells and tissues. The most severe clinical manifestation of Shiga toxin-producing *E. coli* (STEC) infection is hemolytic uremic syndrome (HUS).

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

- 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 STEC 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 STEC infection 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 6 percent of people infected with STEC (O157 and other Shiga toxin-producing strains) develop 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. HUS requires hospitalization and extensive medical care.

In general, STEC 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 barbecue 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 two 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 – beef, pork, veal and lamb (steaks, chops or roasts); ham (fresh or smoked); fish; and shellfish
 - 160°F – ground meats and eggs
 - 165°F – all poultry, leftovers and casseroles
 - Reheat cooked hams packaged in USDA-inspected plants to 140°F and all others to 165°F.
- 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.
- Exclusions:
 - 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.
 - Persons employed in retail food establishments with diarrhea and/or vomiting should be excluded from the establishment.

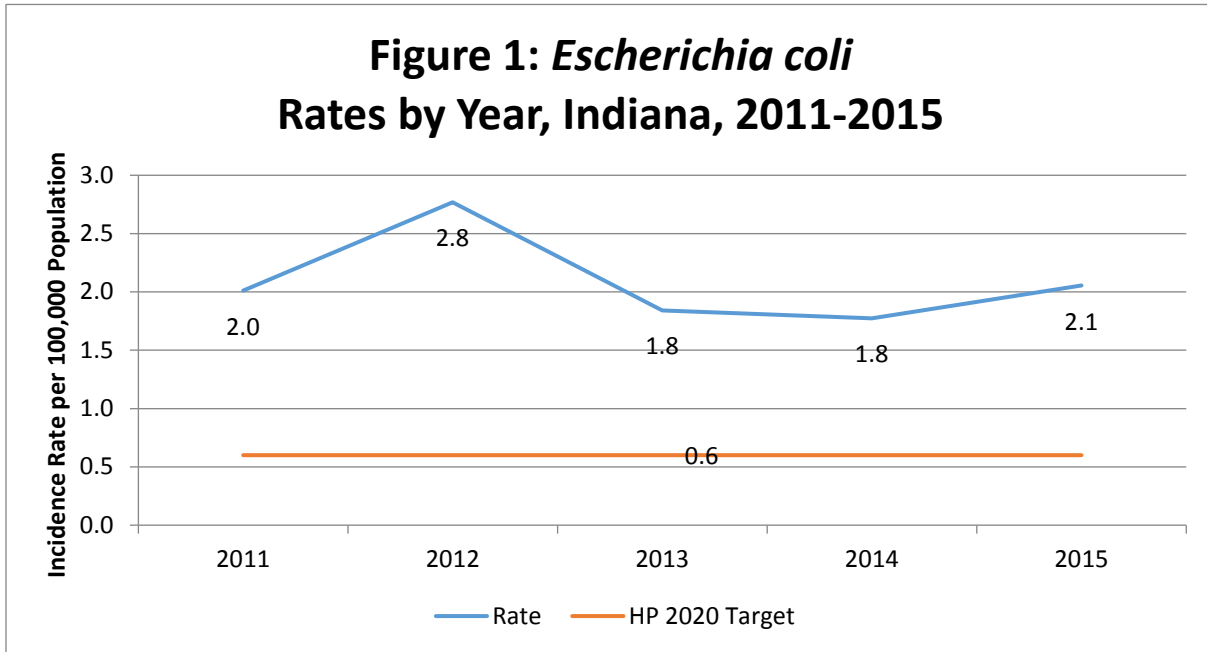
Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3 [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report infections with *Escherichia coli* O157:H7; Shiga toxin-producing; or sorbitol negative *E. coli* immediately to the ISDH. Laboratories are also required to report positive results of *Escherichia coli* O157:H7; Shiga toxin-producing; or sorbitol negative *E. coli* isolates weekly to the ISDH. In addition, for *Escherichia coli* O157; Shiga toxin-producing; or sorbitol negative *E. coli* isolates, laboratories are required to submit isolates received to the ISDH Laboratory for further confirmation and subtyping.

Healthy People 2020 Goal

The Healthy People 2020 Goal for Shiga toxin-producing *Escherichia coli* O157 is 0.6 cases per 100,000 population per year. Indiana has not met this goal from 2011-2015 (Figure 1). Nationally, STEC 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* O157 in ground beef. Since 2004, several

national outbreaks of STEC have occurred, validating the need for continuous education on effective control measures and enhanced food safety systems.



Epidemiology and Trends

In 2015, 136 cases of Shiga toxin-producing *E. coli* infection were reported in Indiana, for a rate of 2.05 cases per 100,000 population (Table 1). Females (2.11) were more likely to be reported than males (1.99). The rate of other races (1.66) was greater than the rate of white (1.64) or blacks (0.47); however, 35 cases did not report race data.

Table 1. Shiga toxin-producing *E. coli* cases by race and sex, Indiana, 2015.

	Cases	Rate*	2011- 2015 Total
Indiana	136	2.05	686
Race			
Black	3	0.47	20
White	93	1.64	464
Other	5	1.66	25
Not Reported	35	-	177
Sex			
Female	71	2.11	397
Male	65	1.99	289
Unknown	-	-	-

*Rate per 100,000 population based on U.S. Census Bureau's population data as of July 6, 2016.

*Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

Figure 2 shows the number of reported cases per year for 2011-2015.

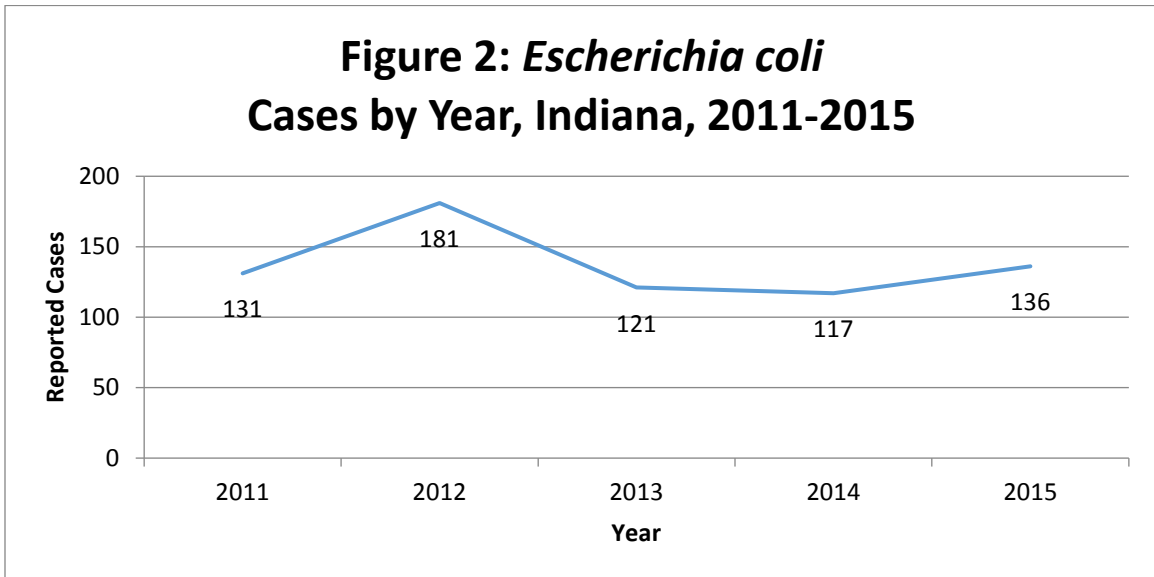
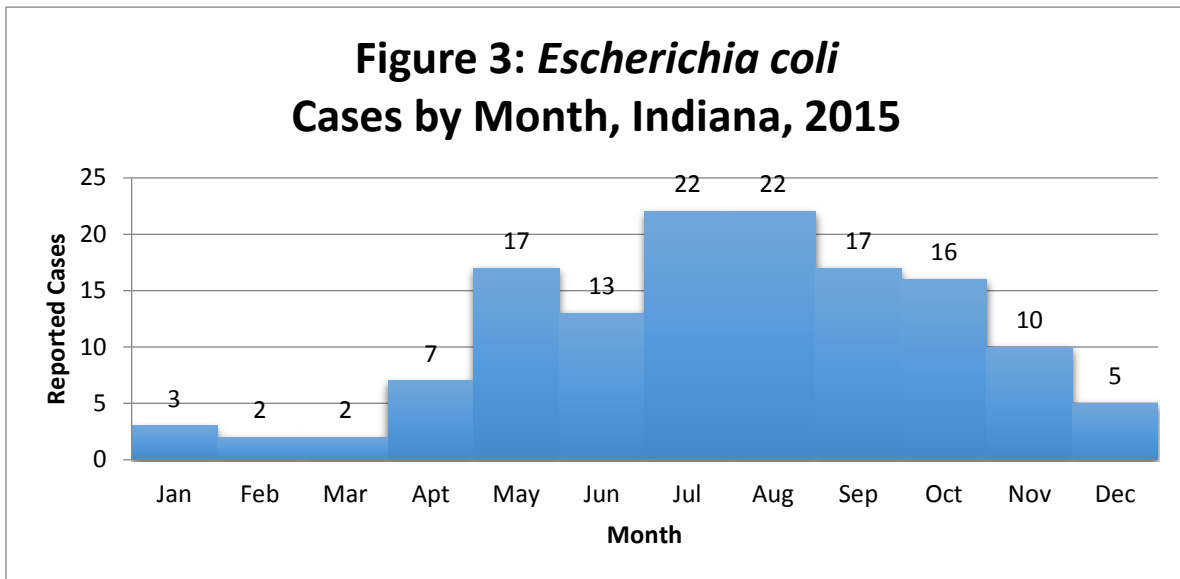
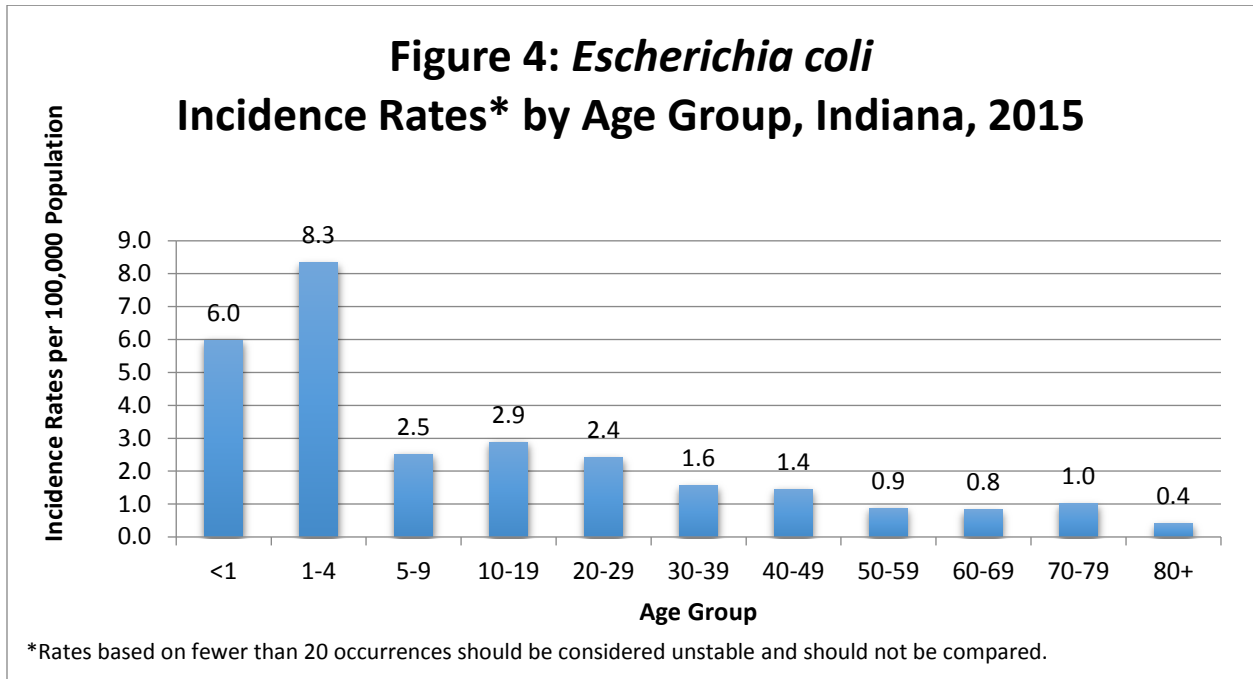


Figure 3 shows the number of cases per month in Indiana for 2015. Incidence of disease was greatest during the summer months, with July and August having the highest number of reported cases (22).



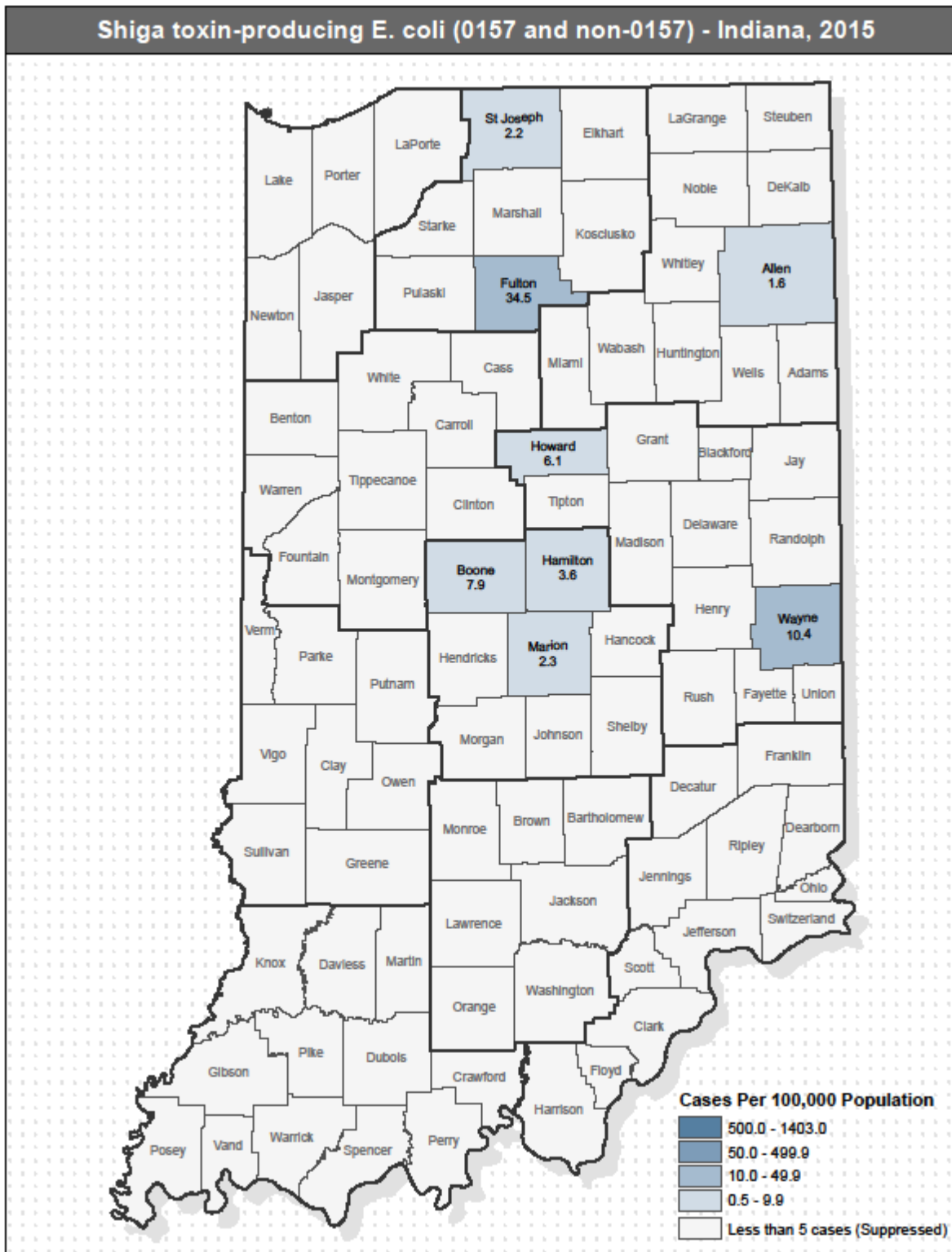
As shown in [Figure 4](#), age-specific rates in 2015 were highest among preschoolers ages 1-4 years (8.3), followed by infants less than 1 year (6.0), followed by children ages 5-9 years (2.5).



Ten cases of HUS were reported in 2015. One case resulted in a death.

[Figure 5](#) shows counties reporting five or more cases of Shiga toxin-producing *E. coli* in 2015. The incidence rates were highest among the following counties: Fulton (34.5), Wayne (10.4) and Boone (7.9). Some of the rates are based on fewer than 20 counts and should be considered unstable.

Figure 5.



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

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

GIARDIASIS

Giardiasis is a contagious disease caused by the *Giardia* parasite, most commonly *Giardia lamblia*, which is found in the intestines of many animals. *Giardia* is the most common intestinal parasite infection in the U.S. and is a leading cause of waterborne disease. The parasite is protected by an outer shell (cyst), which allows it to 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 2011-2015, an average of 221 cases of giardiasis were reported in Indiana each year.

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

- 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 daycare facilities and contaminated recreational waters.

Public Health Significance

Symptoms of giardiasis can include diarrhea, gas, greasy stools, bloating, stomach cramps, nausea and weight loss. Symptoms usually begin within 7-10 days (range of 3-25 days) after exposure and last 2-6 weeks. Infected people may carry *Giardia* in their bodies for weeks or months without symptoms and unknowingly infect others. While medications are available to treat 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 contact with animals and reptiles; 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 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 (contaminated foods may look and smell normal):
 - Do not consume unpasteurized dairy products or juices.
 - Wash all produce before cooking or eating raw.
 - While backpacking and camping, drink only bottled water or surface water that has been filtered and boiled.
 - Use treated water for washing, cooking and drinking.
 - Avoid swallowing untreated and 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 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.
 - 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 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.

Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report giardiasis within 72 hours to local health department or the ISDH. Laboratories are also required to report positive results of giardiasis weekly to the ISDH.

Healthy People 2020 Goal

There is no Healthy People 2020 Goal for giardiasis.

Epidemiology and Trends

In 2015, 178 cases of giardiasis were reported in Indiana, for a rate of 2.69 cases per 100,000 population (Table 1). Males (3.22) were at greater risk of giardiasis than females (2.17). The rate for other races (3.65) was higher than that for whites (1.99) or blacks (1.73); however, 43 cases (24.2%) did not report race data.

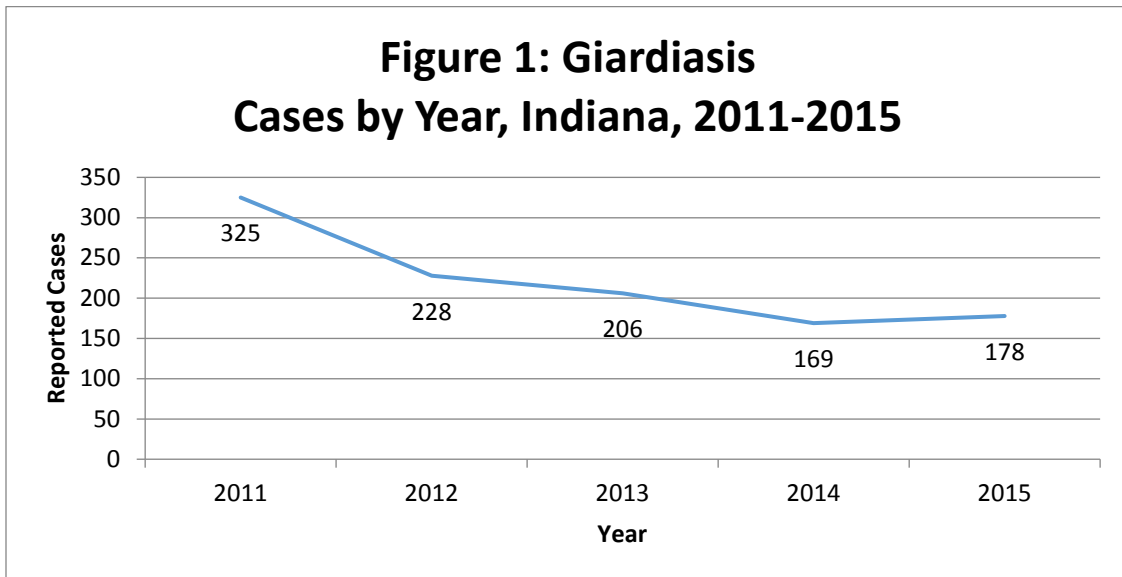
Table 1: Giardiasis case rate by race and sex, Indiana, 2015

	Cases	Rate*	2011 - 2015 Total
Indiana	178	2.69	1,106
Race			
Black	11	1.73	115
White	113	1.99	571
Other	11	3.65	143
Not Reported	43	-	277
Sex			
Female	73	2.17	486
Male	105	3.22	618
Unknown	-	-	2

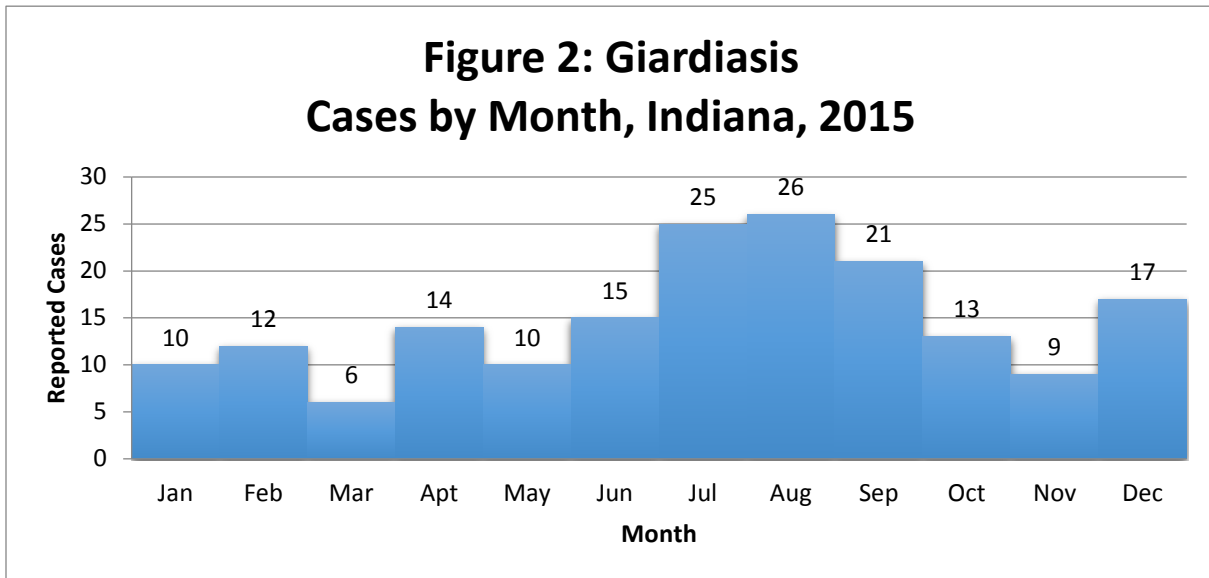
*Rate per 100,000 population based on U.S. Census Bureau's population data as of July 6, 2016.

*Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

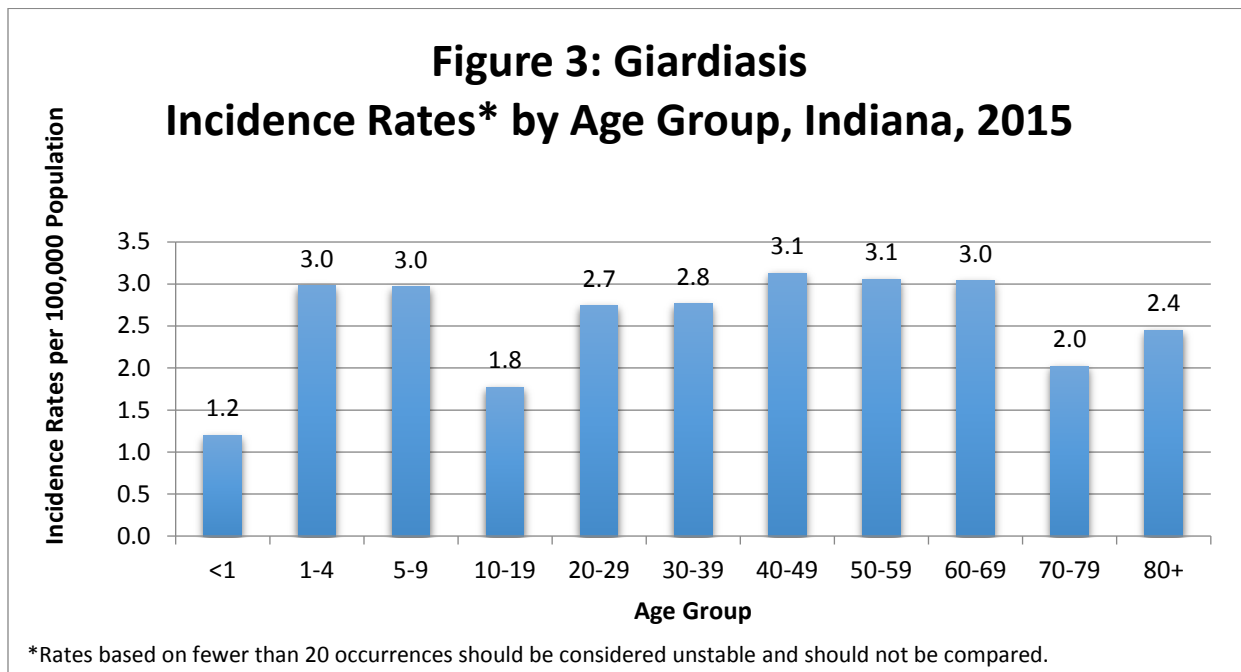
Figure 1 shows the number of reported cases each year for 2011-2015.



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

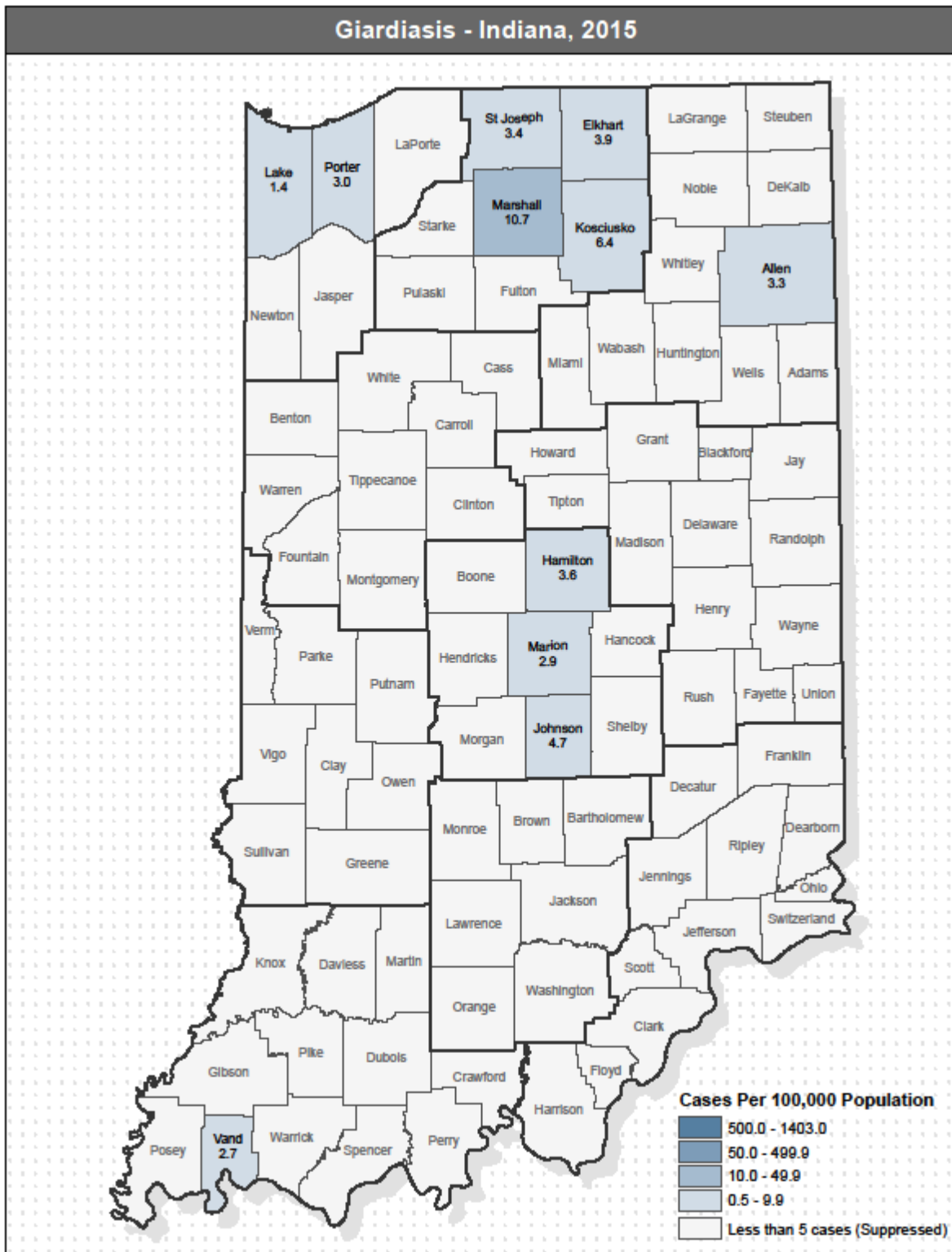


As shown in Figure 3, age specific rates were greatest for adults aged 40-49 (3.1) and 50-59 (3.1).



The incidence rates were highest among the following counties reporting five or more cases: Marshall (10.7), Kosciusko (6.4), Johnson (4.7), Elkhart (3.9) and Hamilton (3.6). Figure 4 shows counties reporting five or more cases of giardiasis in 2015. Some of the rates are based on fewer than 20 counts and should be considered unstable.

Figure 4.



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

<http://www.cdc.gov/parasites/giardia/index.html> .

HAEMOPHILUS INFLUENZAE, INVASIVE

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 percent 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 to the state laboratory 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. Hib vaccine is recommended for all infants at 2, 4, 6, and 12-15 months of age. Hib vaccine is often combined with other routine vaccinations, which may require adjusted dosing. 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 toward 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.

Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report invasive *Haemophilus influenzae* infection immediately to the local health department or the ISDH. Laboratories are also required to report positive results of invasive *Haemophilus influenzae* weekly to the ISDH. In addition, laboratories are required to submit isolates of invasive *Haemophilus influenzae* to the ISDH Laboratory within five days of isolation for further confirmation and serotyping.

Healthy People 2020 Goal

The Healthy People 2020 Goal for Hib disease is 0.27 cases of *H. influenzae* type B disease per 100,000 children under 5 years of age. In 2015, four 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. In 2015, Indiana did not meet the Healthy People 2020 goal, with 0.95 cases of Hib per 100,000 children under five years of age.

Epidemiology and Trends

In 2015, 119 cases of invasive *H. influenzae* (all types) disease were reported in Indiana. Females (2.11 per 100,000) ([Table 1](#)) were more likely than males (1.47 per 100,000) to acquire *H. influenzae*. Vaccination of young children against Hib is critical to reducing incidence of Hib in Indiana.

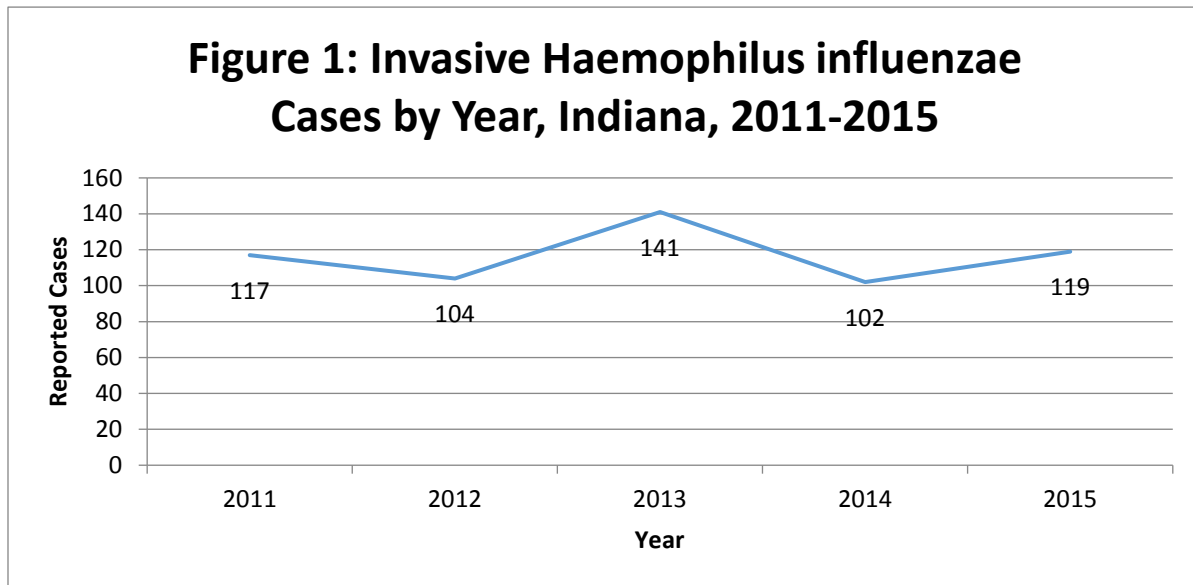
Table 1: *Haemophilus influenzae* case rate by race and sex, Indiana, 2015

	Cases	Rate*	2011 - 2015 Total
Indiana	119	1.80	583
Race			
Black	6	0.94	42
White	99	1.74	449
Other	3	1.00	13
Not Reported	11	-	79
Sex			
Female	71	2.11	326
Male	48	1.47	257
Unknown	-	-	0

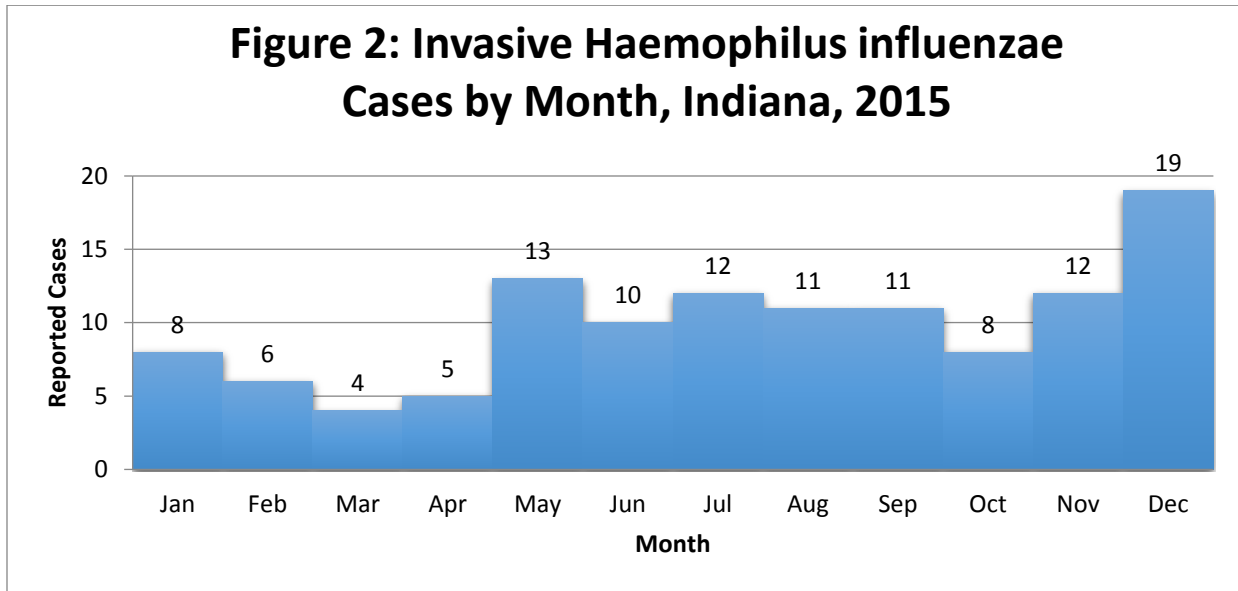
*Rate per 100,000 population based on U.S. Census Bureau's population data as of July 6, 2016.

*Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

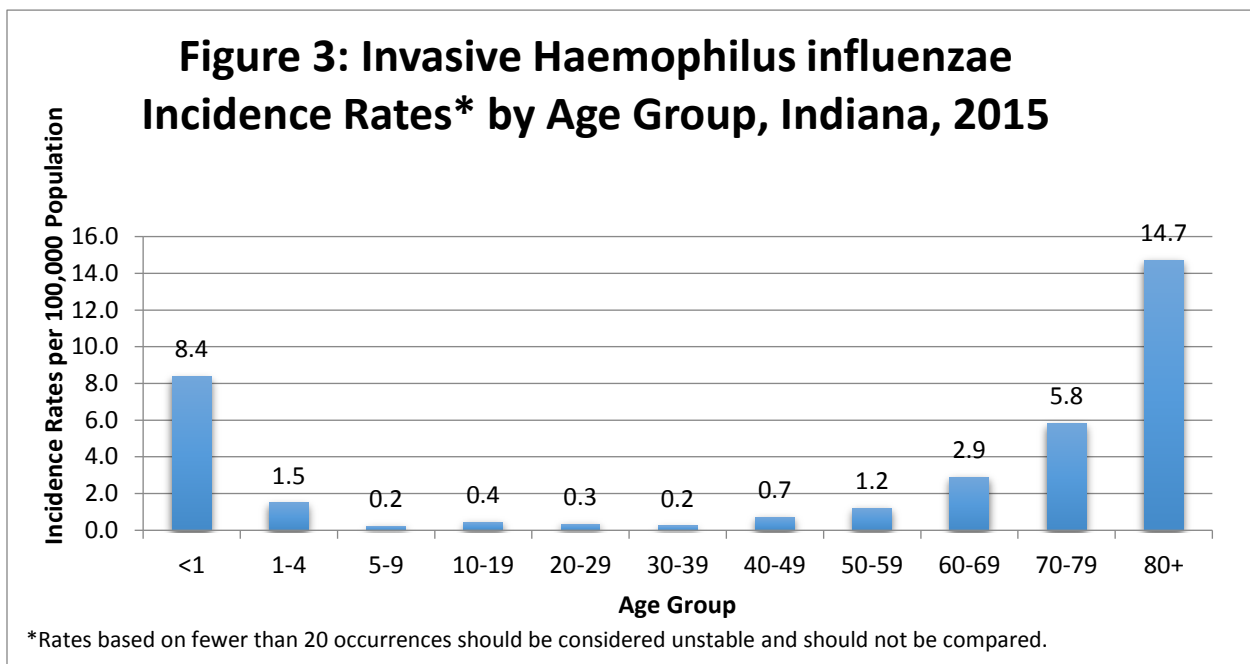
Figure 1 shows reported cases of *H. influenzae* for the five-year period 2011-2015.



H. influenzae occurred throughout the year in 2015, with the highest number of cases occurring in December and May (Figure 2).



Age-specific rates were greatest for infants less than 1 year (8.4) and adults age 80 years and older (14.7). Figure 3 shows *H. influenzae* incidence by age group.

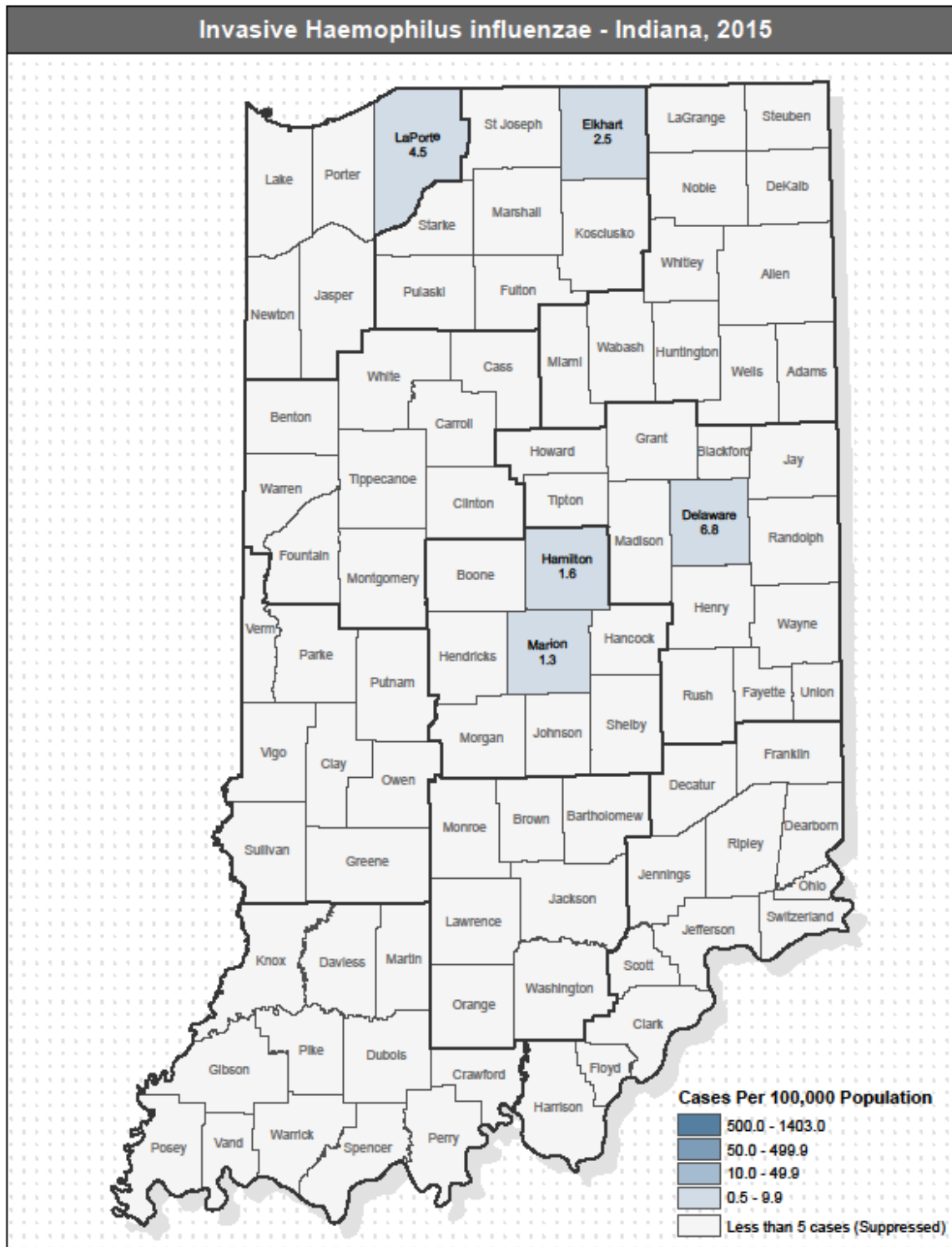


Although 50 counties reported cases of *H. influenzae*, only four counties (Marion, Delaware, Elkhart, and Hamilton) had five or more cases. Of the 119 cases reported in 2015, 106 (89.1%) were serotyped. [Table 2](#) provides a breakdown of *H. influenzae* cases by serotype.

Table 2: Percent of reported *Haemophilus influenzae* cases by serotype, 2015

Type	Number	Percent
a	7	5.9%
b	4	3.4%
e	5	4.2%
f	14	11.8%
Nontypeable	75	63.0%
Not Tested/Unknown	14	11.8%
Total	119	100.0%

Figure 4.



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

<http://www.cdc.gov/hi-disease/index.html>

<http://www.cdc.gov/vaccines/vpd-vac/hib/>

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 and 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 or specific antiviral treatment 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, hikers, and those who work or play outdoors. In addition, housecleaning activities such as sweeping or vacuuming areas that rodents inhabit can release contaminated particles into the air.

Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report hantavirus pulmonary syndrome (HPS) immediately to the local health department or the ISDH. Laboratories are also required to report positive results of hantavirus weekly to the ISDH.

Healthy People 2020 Goal

There is no Healthy People 2020 Goal for hantavirus.

Epidemiology and Trends

One hantavirus case was reported in Indiana in 2015 and one during the five-year reporting period 2011-2015.

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

<http://www.cdc.gov/hantavirus/index.html>.

HEPATITIS A

Hepatitis A is an inflammation of the liver caused by the hepatitis A virus (HAV). Humans are the normal reservoir for HAV, and 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

An acute hepatitis A case is characterized by: positive immunoglobulin M (IgM) antibody to hepatitis A virus (anti-HAV), an acute illness with a) discrete onset of symptoms (e.g., fever, malaise, anorexia, nausea) b) jaundice or elevated serum aminotransferase levels. Symptoms of hepatitis A usually occur suddenly and may include diarrhea, nausea, vomiting, tiredness, stomach pain, fever, dark urine, pale or clay-colored stool, loss of appetite and sometimes jaundice. 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 days (range of 15-50 days) after exposure and usually last less than two months. About 10 percent to 15 percent of symptomatic people can recover and become ill again (relapse) for as long as six months. However, people will eventually recover, and hepatitis A infection has no long-term carrier. Death from hepatitis A is rare and 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. Beginning with the 2014-2015 school year, two doses of hepatitis A vaccine were required for all incoming kindergarten students. Candidates for vaccination also 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

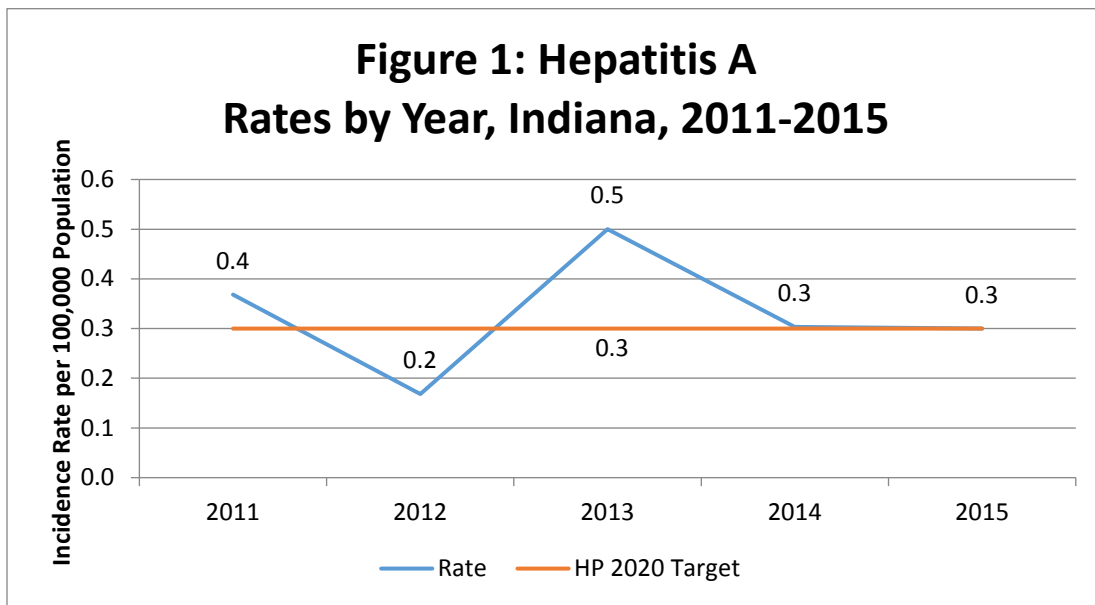
Post-exposure prophylaxis with hepatitis A vaccine or hepatitis A immune globulin is effective if received within two weeks of exposure. Indications for prophylaxis may include: people who consumed food or beverages contaminated with HAV, household or sexual contacts of someone infected with HAV, children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

Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report hepatitis A infection immediately to the local health department or the ISDH. Laboratories are also required to report positive results of disease weekly to the ISDH.

Healthy People 2020 Goal

The Healthy People 2020 Goal for hepatitis A is 0.3 cases per 100,000 population per year. This goal was met in Indiana in 2011, 2012 and 2015 for the five-year reporting period 2011-2015 (Figure 1).



Epidemiology and Trends

In 2015, 19 cases of hepatitis A were reported in Indiana for a rate of 0.29 cases per 100,000 population (Table 1). Males (0.21) and females (0.36) were evenly dispersed. The rate for other races (1.0) was greater than whites (0.16) or blacks (0.31); however, five cases did not report race data.

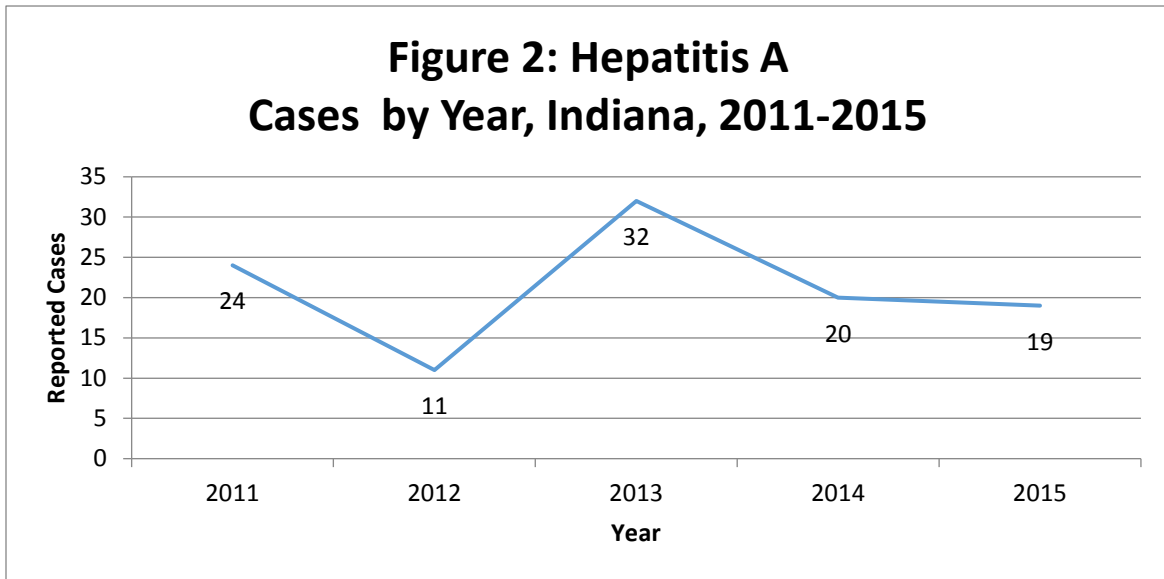
Table 1: Hepatitis A case rate by race and sex, Indiana, 2015

	Cases	Rate*	2011- 2015 Total
Indiana	19	0.29	106
Race			
Black	2	0.31	7
White	9	0.16	57
Other	3	1.00	12
Not Reported	5	-	30
Sex			
Female	12	0.36	52
Male	7	0.21	53
Unknown	-	-	1

*Rate per 100,000 population based on U.S. Census Bureau's population data as of July 6, 2016.

*Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

Figure 2 shows the number of reported cases per year for 2011-2015.



Incidence of disease was greatest in October and December (Figure 3).

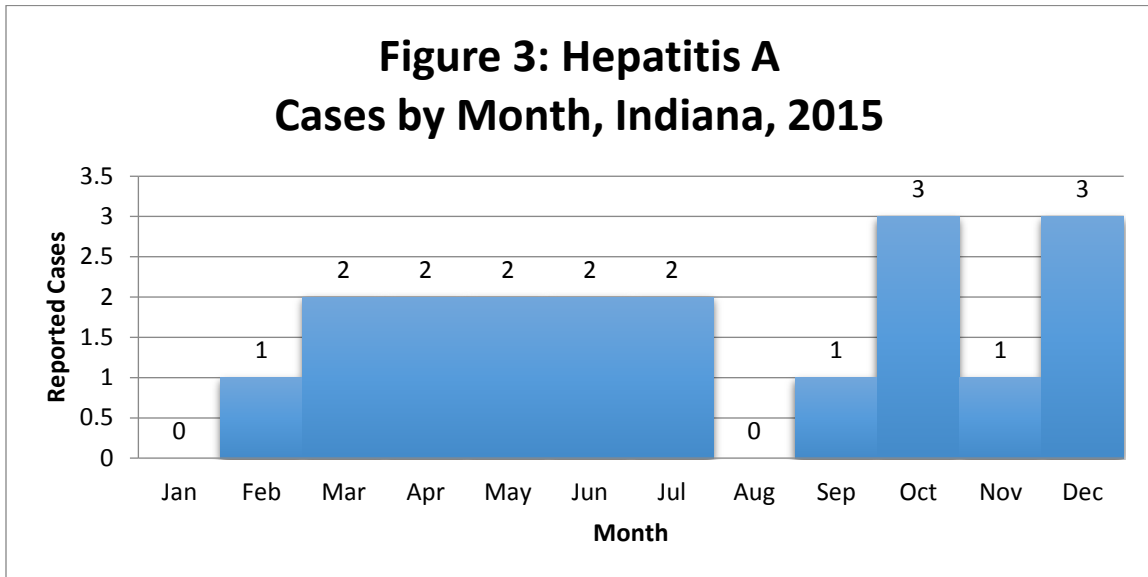
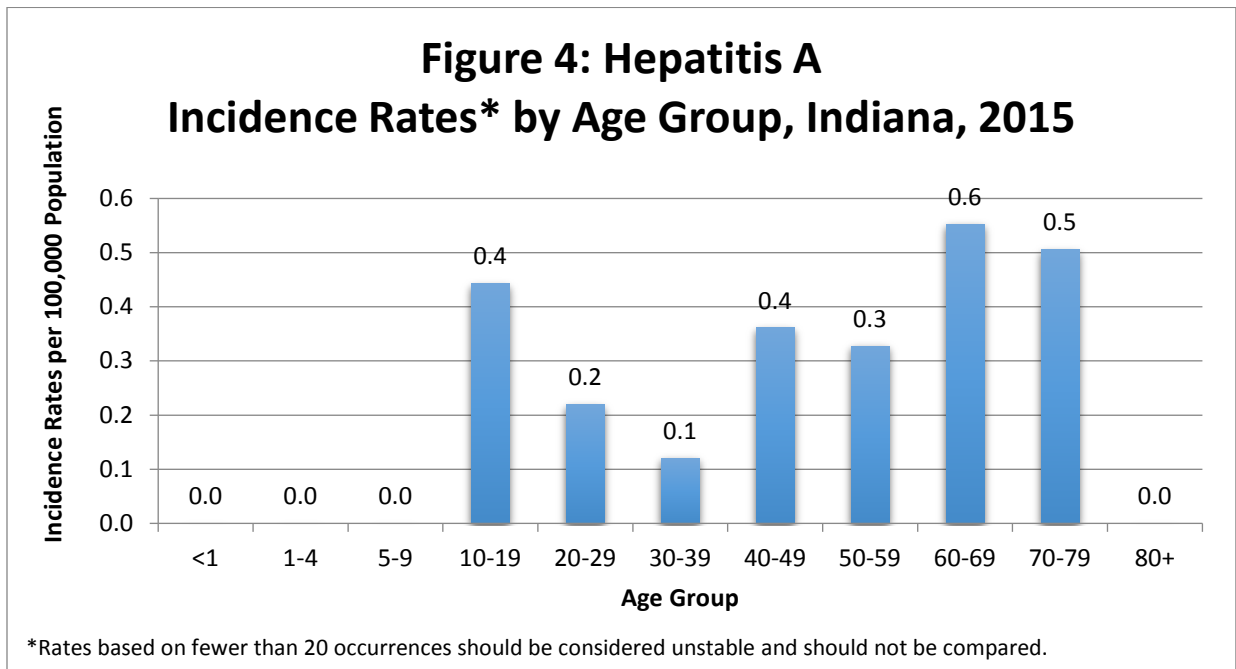


Figure 4 shows age-specific rates were greatest for adults aged 60-69 years (0.6) and adults aged 70-79 years (0.5).



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

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

HEPATITIS B

Hepatitis B is a disease 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. Mechanisms for transmission include sexual or household contact with an infected person, injection drug use (IDU), perinatal transmission from mother to infant, and nosocomial exposure.

Hepatitis B can be either acute or chronic. Acute hepatitis B virus infection is a short-term illness that occurs within the first six months after someone is exposed to the hepatitis B virus. An acute hepatitis B illness can range in severity from a very mild illness with few or no symptoms, to a serious condition requiring hospitalization, characterized by multiple symptoms such as nausea, anorexia, fever, malaise, headache, myalgia, right upper quadrant abdominal pain, dark urine, skin rash and jaundice.

Approximately 50 percent of adults with an acute infection are asymptomatic. The incubation period of HBV ranges from six weeks to six 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 infections result in complete recovery and immunity from future infection.

An acute infection can – but does not always – lead to a chronic, or lifelong, infection. Many individuals with chronic hepatitis B do not have symptoms and do not know they are infected. However, they are still capable of transmitting the virus and infecting others. A chronic infection of HBV is also associated with an increased risk for chronic liver disease, cirrhosis, liver failure and liver cancer.

Public Health Significance

The Centers for Disease Control and Prevention (CDC) requires states to conduct surveillance and reporting of acute hepatitis B cases within their states. Clinical and laboratory definitions must be met to classify a case of hepatitis B. On an annual basis, the CDC evaluates the case definitions that are used for this classification of cases. Although changes were made to the definition in 2012, no changes were made in 2015.

Risk for hepatitis B infection varies with occupation, lifestyle or the environment where there is contact with blood from infected persons. Populations at high risk for hepatitis B infection include: people from areas with endemic rates, infants born to infected mothers, sex partners of infected persons, injection drug users, tattoo recipients, men who have sex with men (MSM), and household contacts of infected persons. Populations at intermediate risk include: prisoners, health care workers, staff caring for developmentally disabled individuals, heterosexuals with multiple partners, persons with a sexually transmitted disease(s) (including hepatitis C virus and/or HIV) and travelers to regions with intermediate or high rates of hepatitis B (HBsAg+ prevalence of >2%).

Safe and effective vaccines have been available for hepatitis B since 1981. After three intramuscular doses of hepatitis B vaccine, more than 90 percent of healthy adults and more than 95 percent 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 addressing each of these priorities will ultimately eliminate domestic hepatitis B transmission.

Control measures used to prevent exposures to blood and body fluids, another mechanism for the transmission of hepatitis B, include the use of universal precautions and disinfection of contaminated equipment. Contacts that have been exposed to blood and body fluids of individuals infected with the hepatitis B virus should be immunized, and when appropriate, given hepatitis B immune globulin (HBIG).

Reporting Requirements

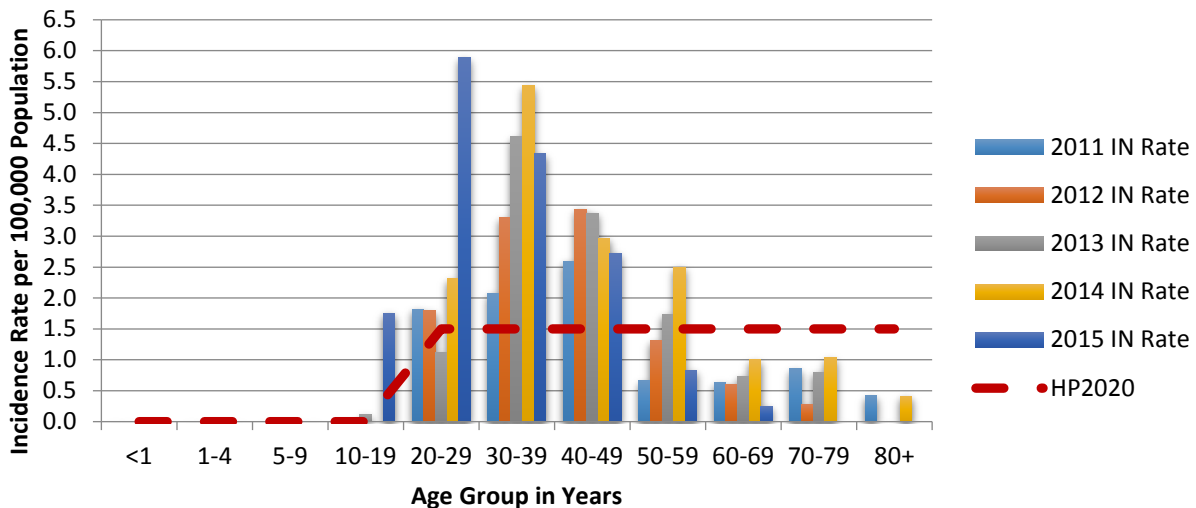
As detailed in the Communicable Disease Reporting Rule, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), the Indiana State Department of Health (ISDH) requires hospitals, healthcare providers and laboratories to provide prompt reporting of positive hepatitis B serologic results to the local health department or the ISDH. Hospitals and healthcare providers must report their findings within 72 hours, and positive laboratory results must be reported at least weekly. Laboratory reporting enables identification of asymptomatic persons infected with the virus, as well as those displaying symptoms. The ISDH uses standardized case definitions to classify the appropriate diagnosis for each individual.

Healthy People 2020 Goal

The Healthy People 2020 objective for hepatitis B is reduction of both new and chronic infections in a variety of populations, including: reducing new infections in adults age 19 years and older to 1.5 cases per 100,000; reducing new infections among injection drug users (IDU) to 215 cases; and reducing new hepatitis B infections among men who have sex with men (MSM) to 45 cases.

[Figure 1](#) shows Indiana's incidence rates of hepatitis B per 100,000 population, per age group. Also included in [Figure 1](#) is the reference level for the Healthy People 2020 goal for reducing new infections in adults ages 19 and older. MSM and IDU rates in Indiana can be found in [Table 2](#). As evidenced in the [Figure 1](#), Indiana met the Healthy People 2020 goal for the 50-59, 60-69, and 70-79 year age groups during 2015. Overall, an increase in the incidence rate of infection was noted in the 30-39 age group (5.5 to 6.0). The rate of acute infection dropped from 2.3 to 1.8 in the 20-29 age group. The 40-49 age group had the biggest gain, 3.0 to 4.4, compared with the 2014 rate. Since 2011, the overall number of acute hepatitis B cases has increased. Although improved reporting and surveillance can be a reason for an increase in the incidence of disease, additional effort is needed to accomplish each of the goal areas in Healthy People 2020 objective for hepatitis B, particularly for rates among IDU, contacts with those who are HBV+ and co-infections with HIV, hepatitis C, and sexually transmitted infections.

Figure 1: Acute Hepatitis B Incidence By Age Group, Indiana, 2011-2015



Epidemiology and Trends

In 2015, 133 confirmed cases of acute hepatitis B disease were reported in Indiana (Table 1). One confirmed case resulted in death. An overall increase in acute cases of hepatitis B was reported in 2015. It should be noted that the data presented in this report does not include the burden of disease caused by chronic infection with HBV, which certainly remains a substantial public health problem, both nationally and in Indiana especially with foreign-born individuals.

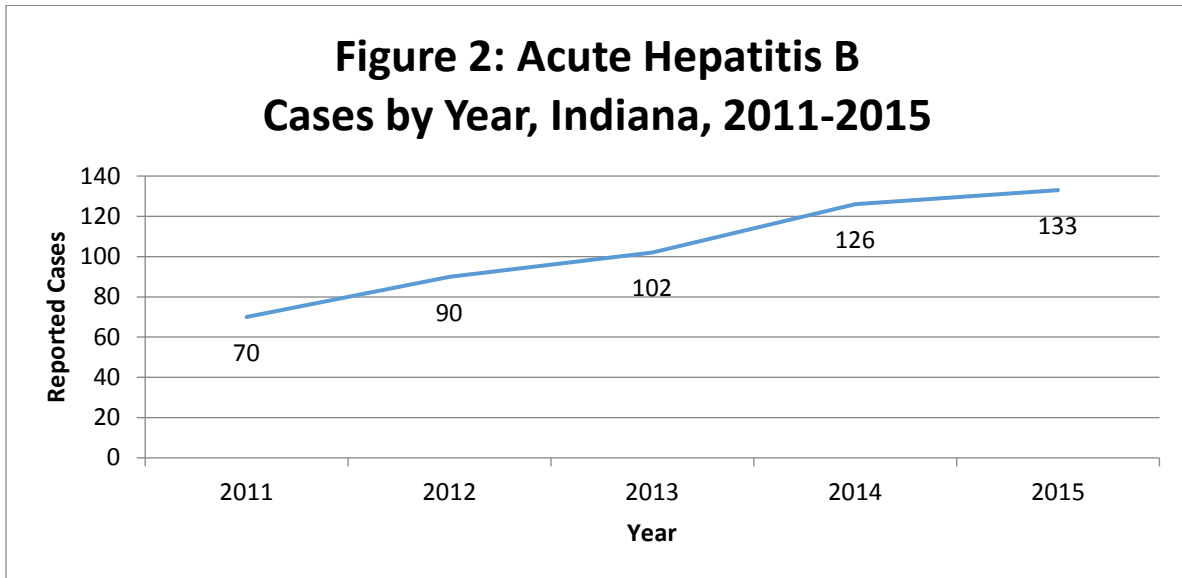
Table 1: Acute Hepatitis B case rate by race and sex, Indiana, 2015

	Cases	Rate*	2011-2015 Total
Indiana	133	2.01	521
Race			
Black	10	1.57	32
White	90	1.58	371
Other	2	0.66	7
Not Reported	31	-	111
Sex			
Female	62	1.85	200
Male	71	2.18	320
Unknown	-	-	1

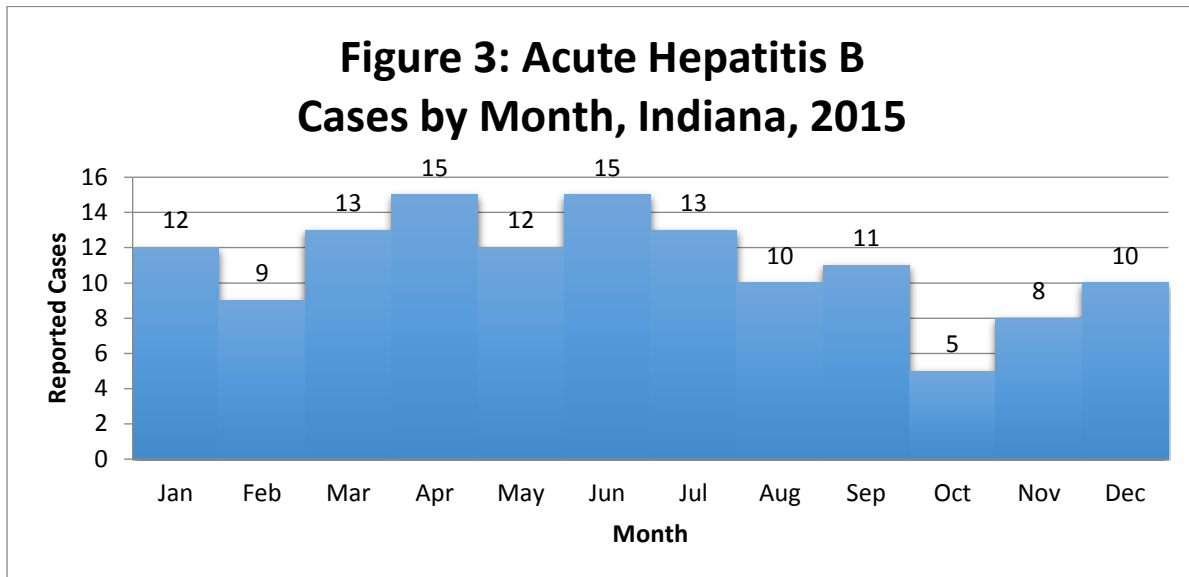
*Rate per 100,000 population based on U.S. Census Bureau’s population data as of July 6, 2016.

*Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

Figure 2 shows reported cases of acute hepatitis B for the five-year period 2011-2015. In 2015, the number of reported cases of acute hepatitis B increased compared to 2014 (126). This increase can be attributed to the rise in awareness of the public of the need for testing and an increase in IDU in Indiana and nationwide¹.

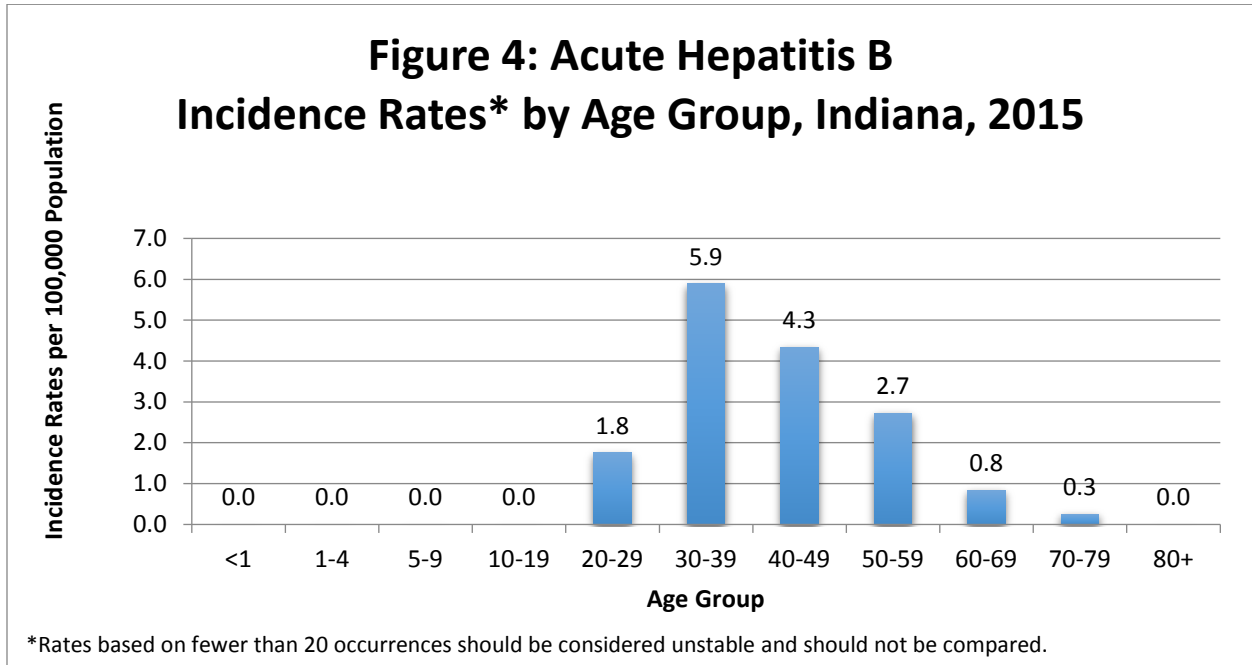


Acute hepatitis B cases occurred and were reported during each month in 2015 without specific seasonality (Figure 3).



¹ National Institute on Drug Abuse. Drug facts: HIV/AIDS and drug abuse: intertwined epidemics. Available at <http://www.drugabuse.gov/publications/drugfacts/hivaids-drug-abuse-intertwined-epidemics>. Accessed September 18, 2012.

The number of reported cases of hepatitis B 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 ages 30-39 and 40-49, and persons with identified risk factors (e.g. IDU, contacts with those diagnosed with HBV, MSM and persons with multiple sex partners) ([Table 2](#)). All of this data also emphasizes the need for continued vaccination of adults and young people, and the provision of preventative counseling, especially for those who are at higher risk for acquiring hepatitis B infection. Testing for viral hepatitis must continue in the perinatal, sexually transmitted diseases and co-infected populations.



[Table 2](#) highlights the identified risk factors in 2015 for the acute hepatitis B cases in Indiana. Completeness of the reporting of risk factor information varies. The most common risk factor identified is IDU, with the largest increase in case numbers over those documented for 2014. Other common risk factors identified include: individuals who have contact with a case, those who receive a tattoo; those who have multiple sex partners; individuals self-identified as MSM; and those who have a recent history of dental work.

Table 2: Acute Hepatitis B risk factors – Indiana, 2015

Risk Factors	Number of Cases (Percent of Cases)
Injection drug use	37 (27.8%)
Application of a tattoo	14 (10.5%)
Contact of a case	13 (9.8%)
Multiple sex partners	13 (9.8%)
History of dental work	11 (8.3%)
History of surgery	5 (3.8%)
MSM	4 (3.0%)
Medical employment	2 (1.5%)

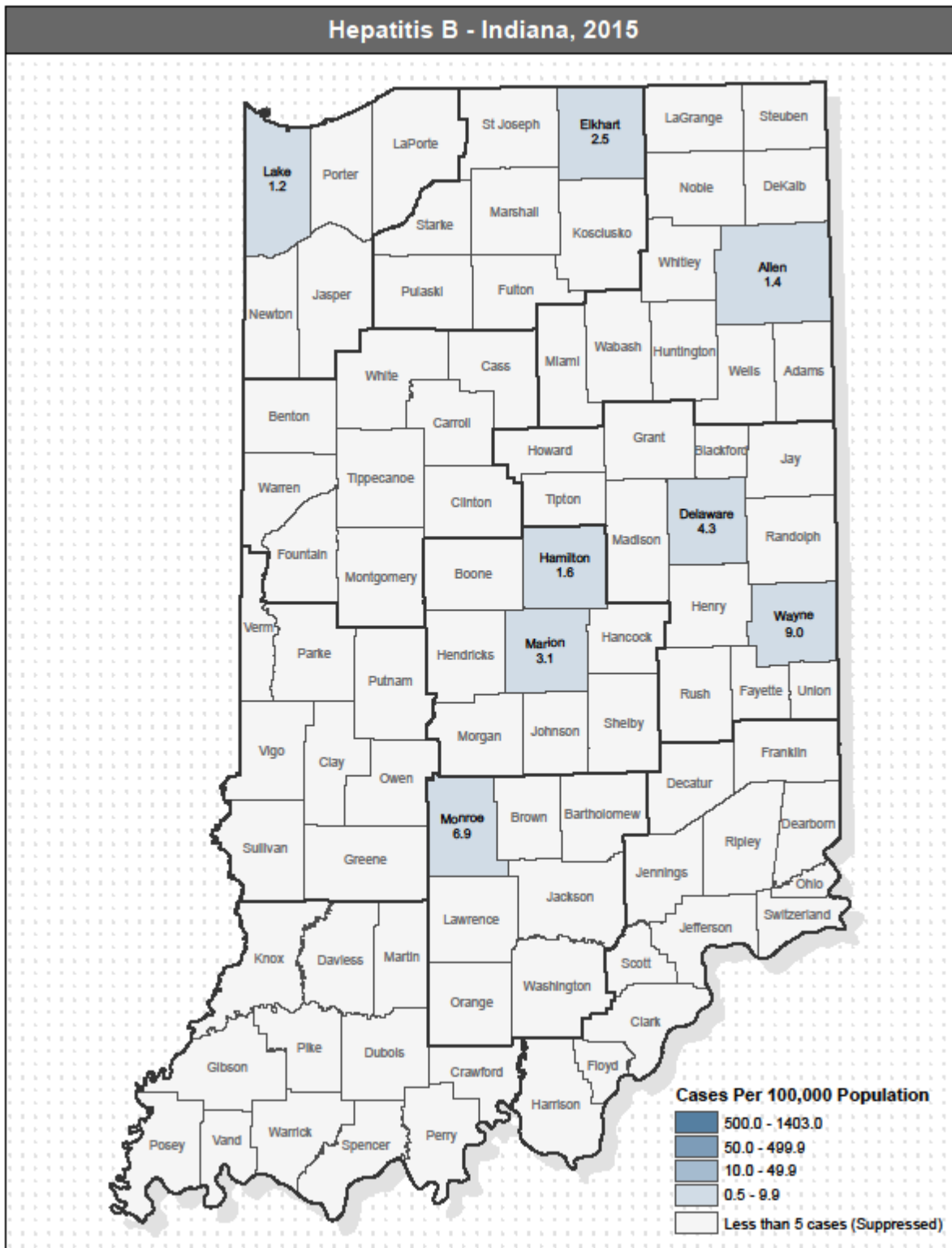
Note: Cases may report more than one risk factor resulting in a total percentage greater than 100.

In 2015, 38 Indiana counties reported at least one case of acute hepatitis B. This is almost the same number of counties reporting acute cases in 2014 (37 counties). The incidence rates, per 100,000 population, were highest among the following counties reporting five or more cases: Wayne (9.0), Monroe (6.9), Delaware (4.3) and Marion (3.1), and Hamilton (1.6). [Figure 5](#) shows acute hepatitis B incidence rates by county per 100,000 population. Some of the rates are based on fewer than 20 counts and should be considered unstable.

Individuals with chronic hepatitis B infection may be asymptomatic and unaware of their infection for many years before developing clinical evidence of illness. Serologic testing identifies infected persons, allowing for treatment and the identification and vaccination of their contacts. These actions contribute significantly to the prevention of secondary infections. 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 percent or greater. In 2015, the testing and reporting of the hepatitis B status of refugees residing in Indiana continued, especially in Marion and Allen counties, where refugee centers are located.

Indiana law requires the reporting of perinatal HBV infection. In 2015, zero perinatal cases were reported to the CDC. This represents a decrease from cases identified in 2014 (1). The goal of the ISDH perinatal hepatitis B program is to prevent future infections in newborns by ensuring appropriate prophylactic treatment of infants born to HBV-infected mothers. The provision of education and counseling regarding the testing and vaccination for household contacts is also a part of the perinatal program.

Figure 5.



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

ISDH Hepatitis B Quick Facts: http://www.in.gov/isdh/files/HBV_QF2010.pdf

CDC Viral Hepatitis Home Page: <http://www.cdc.gov/hepatitis/ChooseB.htm>

Hepatitis B Foundation: <http://www.hepb.org>

Hepatitis Foundation International: www.hepfi.org.

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 asymptomatic or mild illness lasting several weeks to serious, lifelong illness. Hepatitis C is the leading chronic blood-borne disease in the United States. The burden of HCV in the United States is approximately 3.5 million cases, with 75% of those infected being baby boomers. A significant number of new cases of HCV was reported among younger populations largely due to an increase in injection drug use (IDU).

The number of reported cases is determined by the number of positive HCV 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 Centers for Disease Control and Prevention (CDC). Acute cases were reportable in 2015, but data were also collected and reported on chronic cases to assess risk factors when feasible. Investigation of chronic hepatitis C cases contributes to the reduction in the spread of disease by increasing the percentage of persons aware they have HCV infection and educating infected individuals. Case definitions for both acute and chronic HCV are available on the CDC website at the National Notifiable Diseases Surveillance System (NNDSS) page: <http://wwwn.cdc.gov/nndss/>.

Symptoms, if present, during acute infection may include abdominal pain, fatigue, fever, joint pain, loss of appetite, dark urine, jaundice, light stool, nausea and/or vomiting. Approximately 15%-20% of these acute cases will spontaneously clear the virus, and individuals will no longer be considered infected. The remaining infected individuals may be asymptomatic for years or even

Public Health Significance

Prior to the implementation of universal antibody screening of blood donors in 1992, most hepatitis C (HCV) infections were acquired through medical procedures, blood transfusions, poor infection control practices, and tissue/organ transplants. Today, the predominant route of exposure is the sharing of syringes or other equipment used to inject drugs. Other high-risk groups include health care workers, children (via perinatal exposure), people who get tattoos and body piercings, and, in rarer instances, those who have sexual contact with someone who is already infected. While there is no vaccination currently available for HCV, treatments are available that can eliminate infection.

In 2015, the number of acute hepatitis C cases in Indiana increased by 13.1% from 122 cases in 2014 to 138 cases. This increase was tied largely to injection drug use that was the primary risk factor in an outbreak of human immunodeficiency virus (HIV) in Scott County.

Indiana Partnership Efforts

In 2015, the ISDH continues to partner with behavioral health organizations that conduct surveillance and provide testing, consultation and recovery services in a variety of locations (e.g., correctional facilities, drug treatment centers, homeless shelters, etc.). These efforts extend throughout various regions of the state. In 2013, the ISDH began participating in a pilot project designed to assess the feasibility of using rapid hepatitis C testing in an effort to improve testing among a subpopulation in Indiana. Use of this rapid test, along with the counseling and education of those infected with the disease, will reduce the spread of hepatitis C. Aspire Indiana, a non-profit comprehensive community mental health center, is assisting with these efforts. ISDH partners also include Corizon, the Aliveness Project of Northwest Indiana, Heartland and Positive Link.

Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians and hospital administrators, 410 IAC 1-2.3-47, hospitals and healthcare providers must report acute hepatitis C within five business days to the local health department or the ISDH. Laboratory reporting enables identification of asymptomatic persons infected with the virus as well as those displaying symptoms, and positive results must be reported at least weekly.

Although acute HCV infection is reportable, chronic cases, which account for the greatest burden of disease, are not. Reporting risk factors for chronic viral hepatitis C is voluntary at the state and local levels, and data may not be complete to fully characterize the burden of hepatitis C in Indiana. The ISDH uses standardized case definitions from the Council of State and Territorial Epidemiologists (CSTE), in conjunction with the CDC.

To see the most current national statistical summary of data, which includes Indiana, go to:

<http://www.cdc.gov/hepatitis/statistics/2013surveillance/index.htm>.

Epidemiology and Trends

In 2015, 138 cases of acute hepatitis C infection were reported, for an incidence rate of 2.08 cases per 100,000 population. The incidence rate for acute hepatitis C infection among males was 2.24 cases per 100,000 males, while the rate among females was 1.94 per 100,000 females.

For chronic hepatitis C infection, 6,990 cases were reported during 2015 for an incidence rate 105.59 cases per 100,000 population (Table 1); however, incidence may be higher because reporting of chronic cases is not required. During 2015, males had an incidence rate of 130.5 per 100,000 males and females had an incidence rate of 81.4 per 100,000 females (Table 1). In 2015, race was not reported for more than 30 percent of all hepatitis C cases.

Table 1: Hepatitis C cases by race and sex, Indiana 2015

	Acute		Chronic		2011-2015
	Cases	Rate	Cases	Rate	Total Cases
Indiana	138	2.08	6,990	105.59	30,417
Race					
Black	1	0.16	405	63.61	2,366
White	108	1.90	4,279	75.31	18,243
Other	3	1.00	171	56.73	582
Unknown	26	-	2,134	-	9,226
Sex					
Female	65	1.94	2,733	81.39	11,475
Male	73	2.24	4,256	130.48	18,861
Unknown	-	-	-	-	81

*Rate per 100,000 population based on U.S. Census Bureau's population data as of July 6, 2016.

*Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

Figure 1. The number of total reported cases of hepatitis C infection for the five-year period 2011-2015.

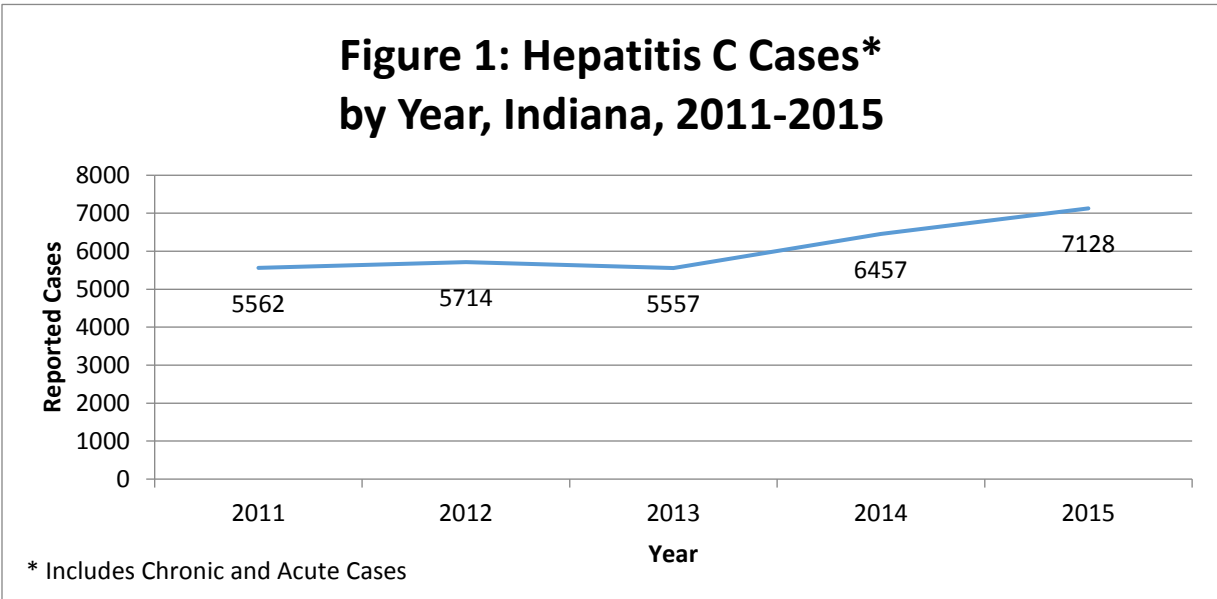


Figure 2. Age-specific incidence rates for total acute and chronic reported cases of hepatitis C infection during 2015. Rates were highest among adults age 20-29 (246.0 per 100,000), followed by the 30-39 (202.8 per 100,000) age group.

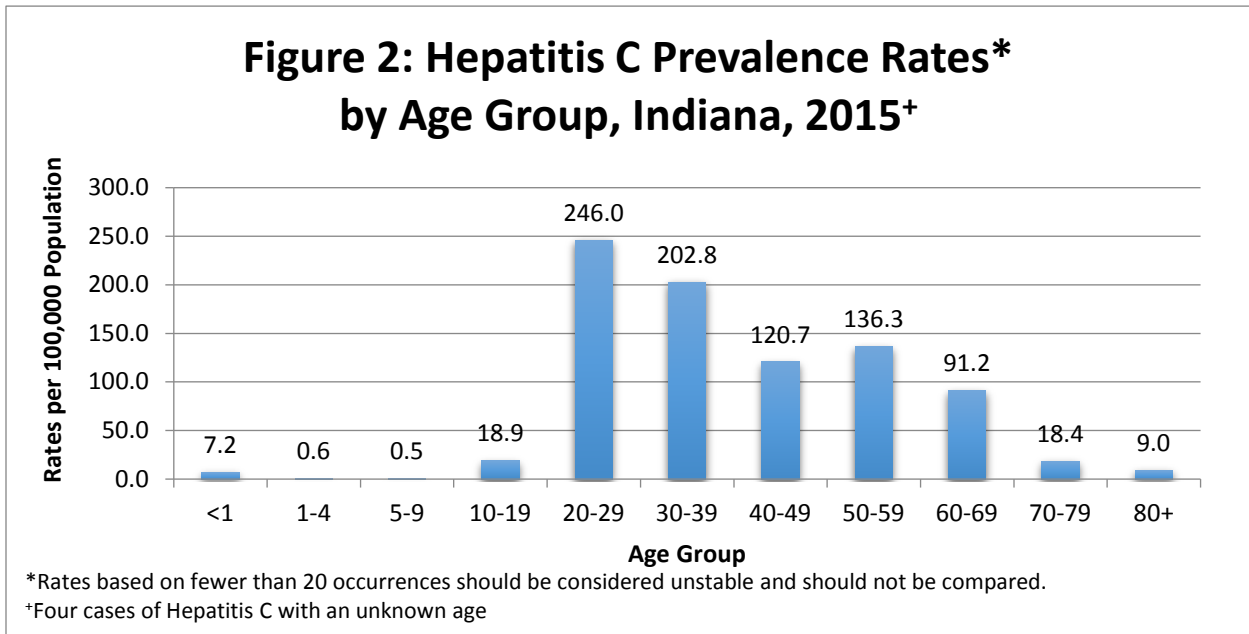


Table 2 highlights the most common risk factors identified in 2015 for acute hepatitis C cases in Indiana. Completeness of reporting risk factor information varies.

Table 2: Acute Hepatitis C risk factors, Indiana, 2015

Risk Factor	Number of Cases (%)
Injected drugs not prescribed by doctor	76 (55.1%)
Use street drugs but do not inject	58 (42.0%)
Contact with a person with confirmed or suspected hepatitis C infection	27 (19.6%)

Note: Cases may report more than one risk factor resulting in a total percentage greater than 100.

Table 3 shows the number of total reported cases of hepatitis C infection within the Indiana Department of Corrections (IDOC). These cases were first differentiated from general cases in 2009. IDOC cases were not separated out in previous years because the data point was not captured prior to the use of INEDSS. The larger number of cases seen for Hendricks and Parke counties is due mostly to the locations of Regional Diagnostic Centers for male and female offenders within the IDOC facilities in those counties. Offenders are tested for bloodborne diseases, such as hepatitis C, at these facilities, but likely reside in other Indiana counties.

Table 3: Total reported cases of Hepatitis C infection in the IDOC - Indiana, 2015

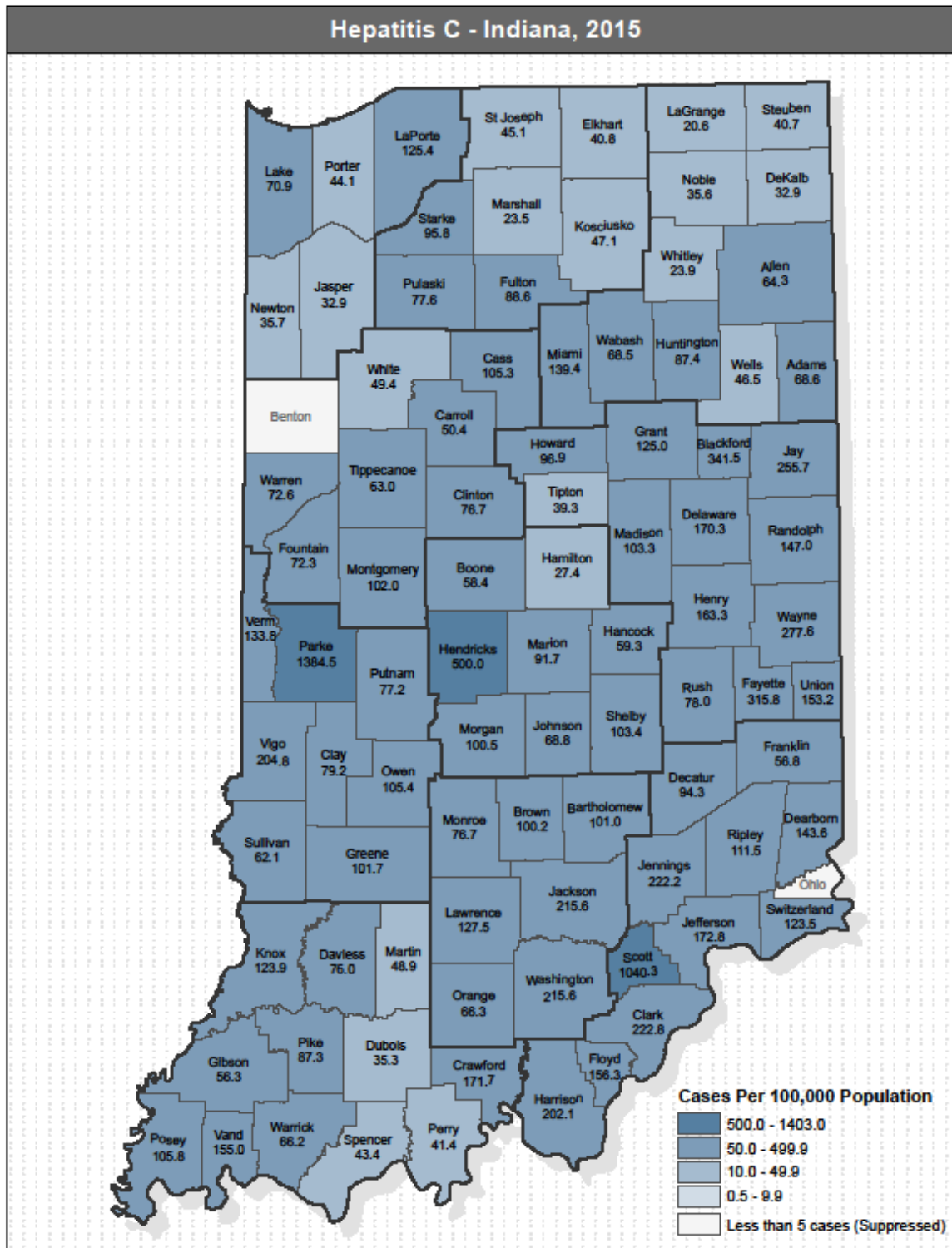
County of Facility	Cases*
ALLEN	< 5
CASS	6
CLARK	< 5
HENDRICKS	740
HENRY	8
JEFFERSON	< 5
JOHNSON	< 5
LAPORTE	54
MADISON	< 5
MARION	22
MIAMI	18
NOBLE	< 5
PARKE	216
PERRY	< 5
PUTNAM	8
ST. JOSEPH	< 5
WABASH	< 5
Total	1,245

**Actual cases in DOC counties totaling less than 5 will not be listed in an effort to protect patient confidentiality.

In 2015, at least one case of hepatitis C infection was reported in each of the 92 counties. Figure 3 is a state map displaying the prevalence of hepatitis C infections by county for individuals, including the IDOC.

Figure 3. Prevalence of both acute (confirmed) and chronic (confirmed and probable) hepatitis C cases in Indiana reported during 2015 (including IDOC sites). Some of the rates are based on fewer than 20 counts and should be considered unstable.

Figure 3.



You can learn more about hepatitis C by visiting the following Web site:
<http://www.in.gov/isdh/25474.htm>.

HEPATITIS D

Hepatitis D, also known as delta hepatitis, is a liver disease caused by the hepatitis D virus (HDV). HDV is an incomplete 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 for HDV are similar to those for HBV, by percutaneous or mucosal exposure through contact with infected blood or other body fluids. 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.

Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report hepatitis D within 72 hours to the local health department or the ISDH. Laboratories are also required to report positive results of hepatitis D at least weekly to the ISDH. Laboratory reporting enables identification of asymptomatic persons infected with the virus as well as those displaying symptoms. The ISDH uses standardized case definitions to classify the appropriate diagnosis for each individual.

Healthy People 2020 Goal

There is no Healthy People 2020 Goal for hepatitis D.

Epidemiology and Trends

Three cases of hepatitis D were reported in Indiana in 2015. Eleven hepatitis D cases were reported during the five-year reporting period 2011-2015.

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

ISDH Hepatitis D Quick Facts: http://www.in.gov/isdh/files/HDV_QF2010.pdf

CDC Viral Hepatitis: <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 fever, fatigue, loss of appetite, nausea, vomiting, abdominal pain, dark urine, clay-colored stool, joint pain and jaundice. Symptoms usually occur suddenly. Some people, especially children, may have no symptoms but can still spread the virus to others. Symptoms begin 15-60 days after exposure (mean of 40 days). Death from hepatitis E is rare, but mortality may be as high as 10 percent to 30 percent among pregnant women in their third trimester. People are most contagious from about two weeks before symptoms begin until two weeks after symptoms begin.

There is no specific treatment for hepatitis E other than treating symptoms. However, people infected with the virus develop lifelong immunity. Unlike hepatitis A, there is no vaccine or immune globulin (IG) to prevent infection approved in the US.

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

- Exposure to contaminated food or water by:
 - Consuming untreated water (most common source of infection in developing countries).
 - Consuming food prepared by an infected person.
 - Consuming uncooked/undercooked pork or deer meat.
 - Consuming 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.

Casual contact, as in the usual workplace or school setting, does not spread HEV. However, most cases of hepatitis E have an unknown exposure due to the variable incubation period (range of 15-60 days).

Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report hepatitis E immediately to the local health department or the ISDH. Laboratories are also required to report positive results of hepatitis E weekly to the ISDH.

Healthy People 2020 Goal

There is no Healthy People 2020 Goal for hepatitis E.

Epidemiology and Trends

Two cases of hepatitis E was reported in Indiana in 2015, and 13 cases were reported during the five-year period, 2011-2015.

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

<http://www.cdc.gov/hepatitis/index.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. Some studies have indicated that different clay minerals in soil may influence growth and activity of bacteria and fungi.

Public Health Significance:

Histoplasmosis is endemic in Indiana, and the Centers for Disease Control and Prevention (CDC) reports between 60 percent and 90 percent of people who live in areas where *Histoplasma capsulatum* is common in the environment will show evidence of having been exposed to the fungus at some point in their lifetime. In these areas, 10 percent to 25 percent of HIV-infected people will develop disseminated histoplasmosis. 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.

Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report histoplasmosis within 72 hours to the local health department or the ISDH. Laboratories are also required to report positive results of histoplasmosis weekly to the ISDH.

Healthy People 2020 Goal

There is no Healthy People 2010 Goal for histoplasmosis.

Epidemiology and Trends

In 2015, 151 confirmed cases of histoplasmosis were reported in Indiana, for an incidence rate of 2.28 cases per 100,000 population (Table 1). Males (2.58) were more likely to be reported with histoplasmosis infection than females (1.97).

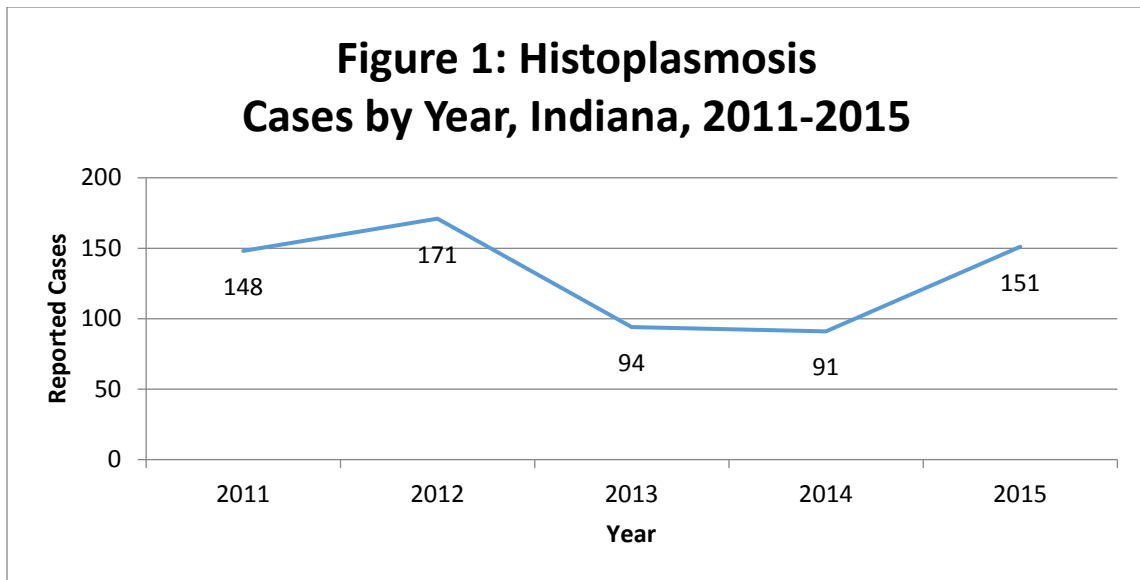
Table 1: Histoplasmosis case rate by race and sex, Indiana, 2015

	Cases	Rate*	2011 - 2015 Total
Indiana	151	2.28	655
Race			
Black	8	1.26	50
White	76	1.34	383
Other	5	1.66	20
Not Reported	62	-	202
Sex			
Female	66	1.97	277
Male	84	2.58	376
Unknown	1	-	2

*Rate per 100,000 population based on U.S. Census Bureau's population data as of July 6, 2016.

*Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

Figure 1 illustrates the number of cases by year for 2011-2015.



Histoplasmosis occurred throughout the year in 2015, with the largest number of cases occurring in the fall (Figure 2).

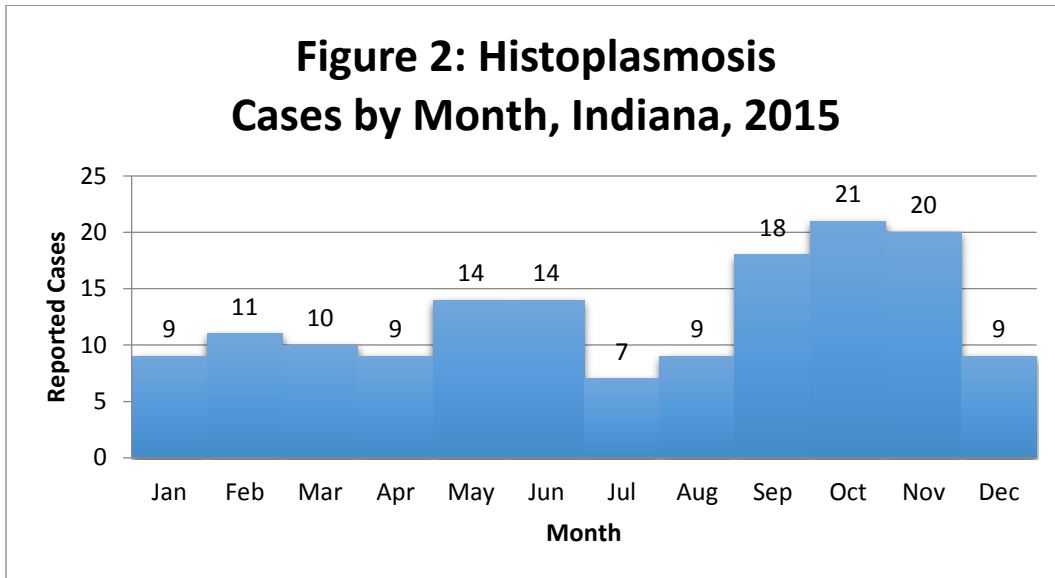
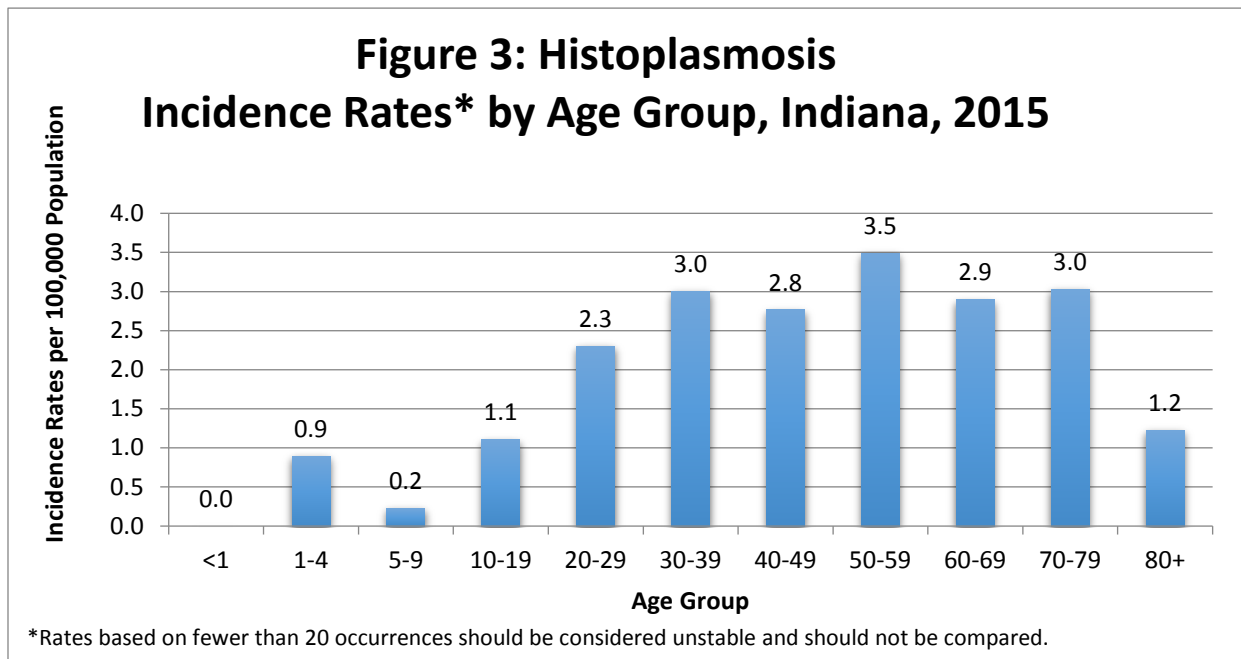
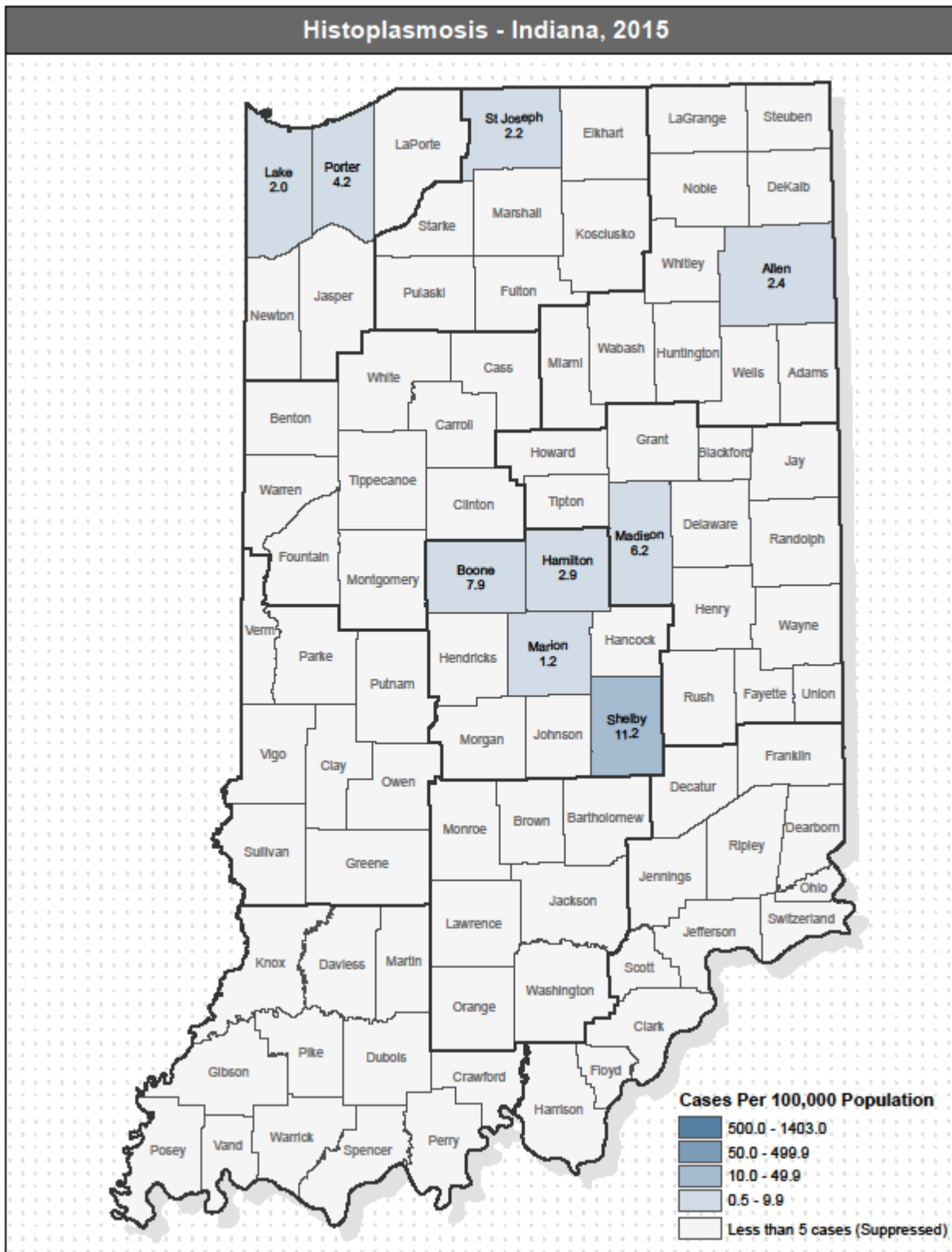


Figure 3 shows the distribution of cases by age group. Age-specific rates were greatest among adults aged 50 to 59 years (3.5).



In 2015, 55 counties reported at least one case of histoplasmosis in Indiana. Incidence rates were highest among the following counties reporting 5 or more cases: Shelby (11.2), Boone (7.9), Madison (6.2) and Porter (4.2) shown in Figure 4. Some of the rates are based on fewer than 20 counts and should be considered unstable.

Figure 4.



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

<http://www.cdc.gov/fungal/diseases/histoplasmosis/index.html>

<http://www.in.gov/isdh/23254.htm>

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 age 16 years. No specific treatment exists for La Crosse encephalitis. People most at risk for developing La Crosse encephalitis include children younger than 16, those residing in or near woodlands where tree-hole mosquitoes reside, and those involved in outdoor recreational water activities.

Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report arboviral disease, including La Crosse (California) encephalitis, immediately to the local health department or the ISDH. Laboratories are also required to report positive results of California serogroup (CAL) virus weekly to the ISDH.

Healthy People 2020 Goal

There is no Healthy People 2020 Goal for La Crosse encephalitis.

Epidemiology and Trends

In 2015, no cases of La Crosse encephalitis were reported in Indiana. During the five-year period 2011-2015, nine cases of La Crosse encephalitis were reported in Indiana (Table 1).

Table 1: La Crosse Encephalitis cases, 2011-2015

	Cases
2015	0
2014	2
2013	1
2012	3
2011	3
Five-year total	9

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

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

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 natural and building water system and the environment sources, such as creeks, ponds and potting soil. The bacteria are prevalent in warm, stagnant water, such as that 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:

- adults age 50 and older
- current or former 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 transplant recipients or those receiving chemotherapy)

A milder infection caused by the same type of *Legionella* bacteria is Pontiac Fever. The symptoms of Pontiac Fever usually last for two to five 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. *Legionella* bacteria are not spread from 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 or when one confirmed healthcare acquired (nosocomial) case is identified. Hospitals or large buildings have complex water systems, and many people in hospitals and long-term care facilities already have illnesses that increase their risk for *Legionella* infection. The specific control measures for legionellosis include:

- (1) An investigation by the local health officer shall be performed within 72 hours in the event that:
 - (A) A single nosocomial case is identified; or
 - (B) two (2) or more cases not associated with a health care facility are identified.

A definite nosocomial case is a laboratory confirmed case who has spent 10 days or more continuously in a health care facility. A possible nosocomial case is a laboratory case that occurs two (2) to nine (9) days after discharge from a health care facility. The investigation shall focus on environmental sources for the exposure in the health care facility for nosocomial cases or places of common exposure for those infections not associated with a health care facility. Active surveillance for additional cases shall be undertaken. 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.

Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report legionellosis within 72 hours to the local health department or the ISDH. Laboratories are also required to report positive results of legionellosis weekly to the ISDH.

Healthy People 2020 Goal

There is no Healthy People 2010 Goal for legionellosis.

Surveillance Case Definitions

Confirmed legionellosis cases must meet clinical definition and one of the following laboratory requirements:

- 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 2015, 177 confirmed cases of legionellosis were reported in Indiana (Table 1), for a case rate of 2.67 per 100,000. In 2015, blacks (5.65) were at higher risk for legionellosis than whites (2.20). Additionally, males (3.37) were at higher risk than females (2.00).

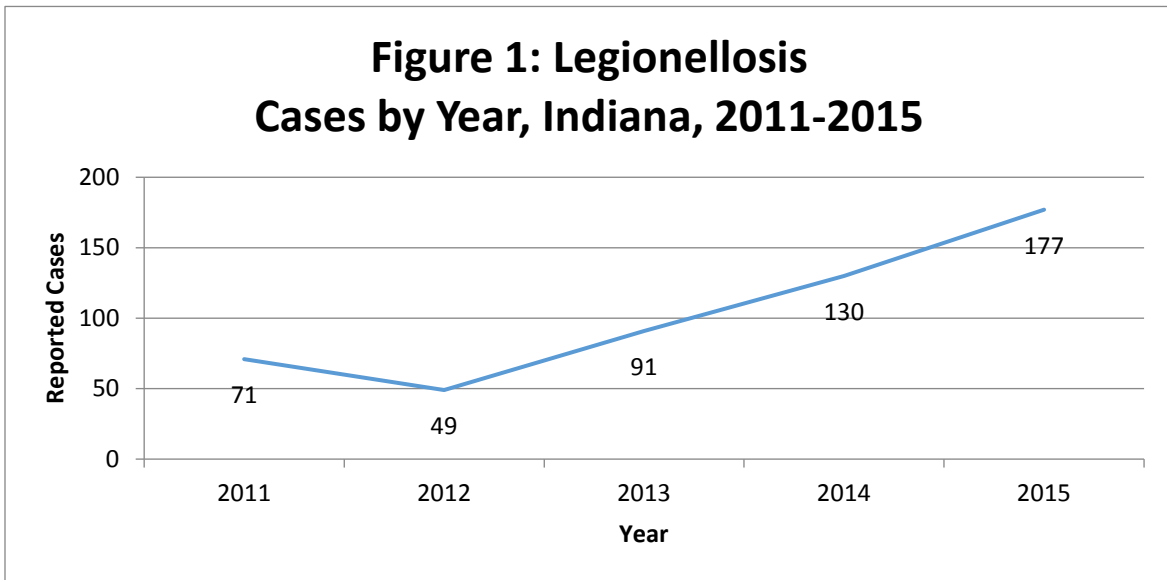
Table 1: Legionellosis case rate by race and sex, Indiana, 2015

	Cases	Rate*	2011 - 2015 Total
Indiana	177	2.67	518
Race			
Black	36	5.65	76
White	125	2.20	352
Other	2	0.66	6
Not Reported	14	-	84
Sex			
Female	67	2.00	193
Male	110	3.37	325
Unknown	0	-	0

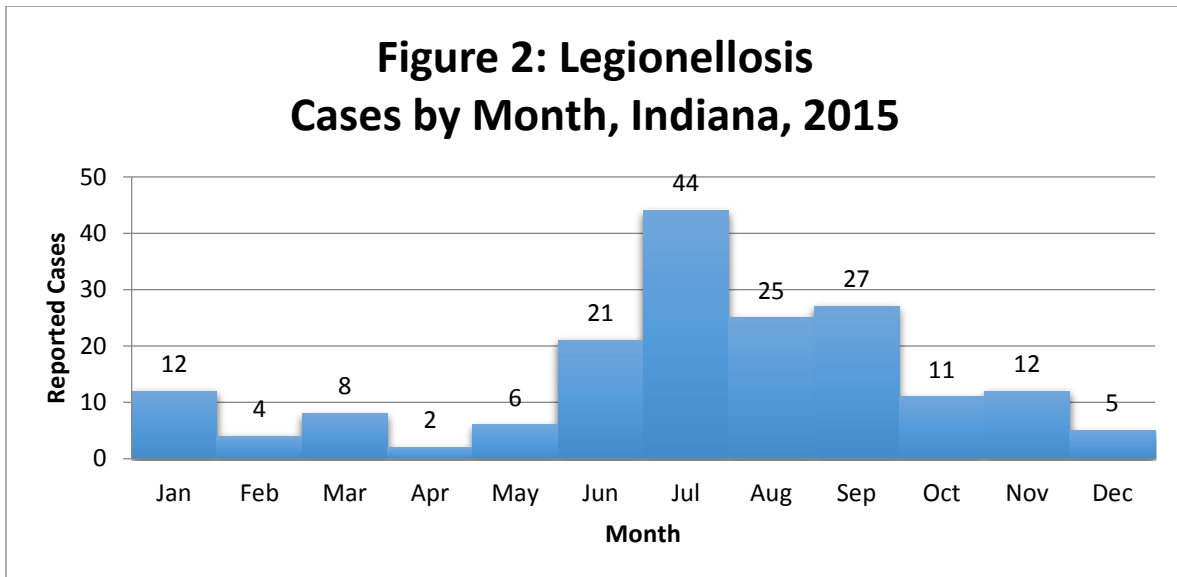
*Rate per 100,000 population based on U.S. Census Bureau's population data as of July 6, 2016.

*Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

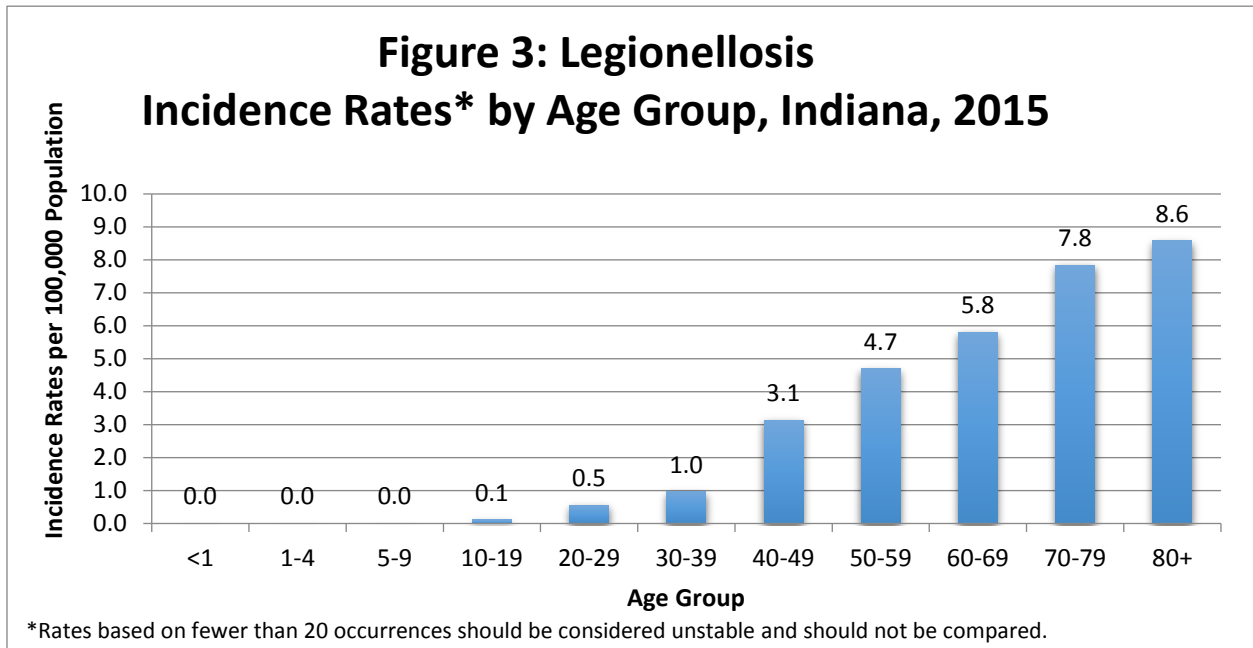
Figure 1 shows the number of cases by year for 2011-2015.



Incidence of legionellosis usually climbs in the summer. Figure 2 indicates an increased incidence in late summer and fall.

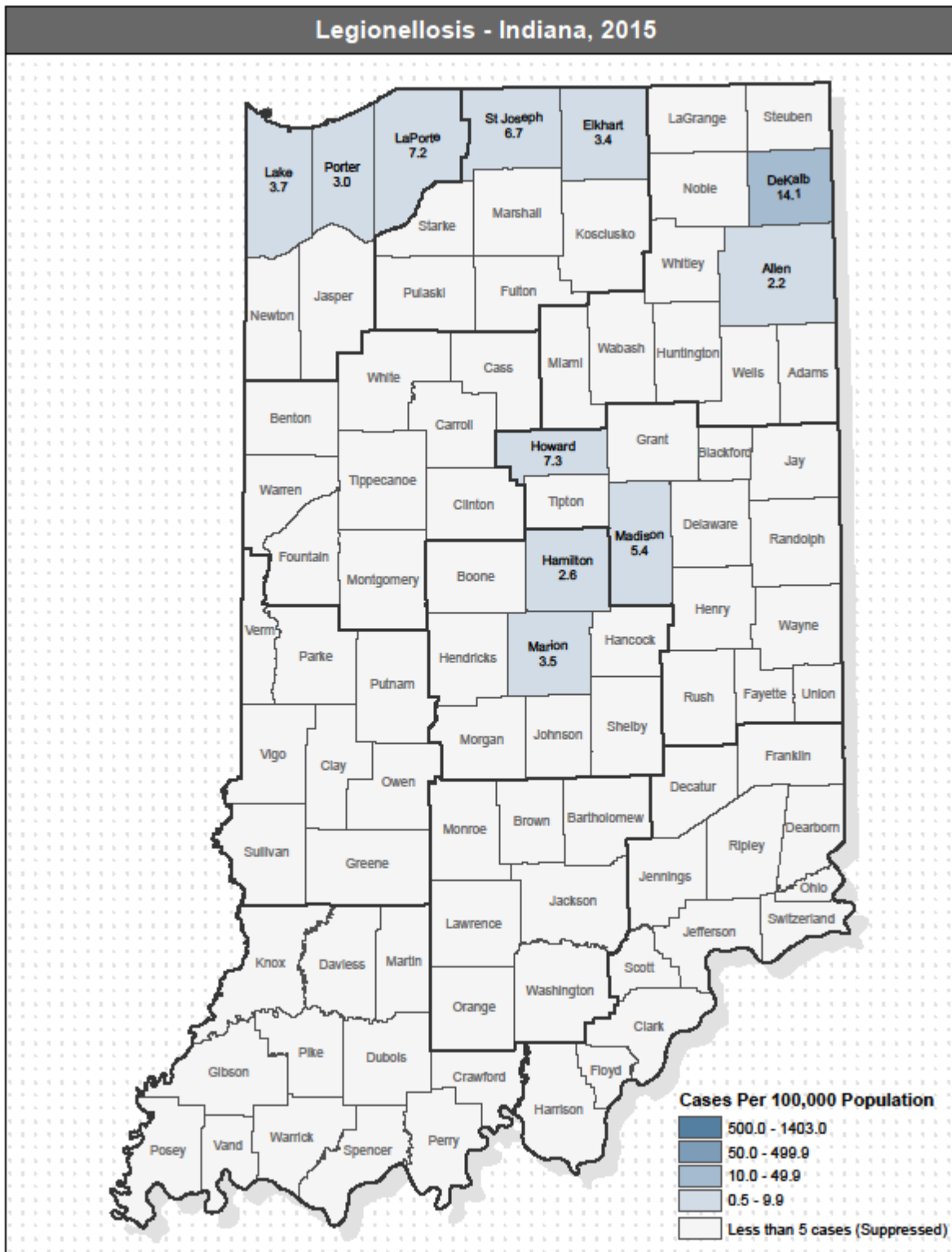


As seen in [Figure 3](#), cases of legionellosis in 2015 were reported more frequently in adults 80 years of age and over (8.6), followed by adults ages 70-79 (7.8).



Incidence rates were highest among the following counties reporting 5 or more cases: DeKalb (14.1), Howard (7.3), La Porte (7.2), St. Joseph (6.7) and Madison (5.4) ([Figure 4](#)). Some of the rates are based on fewer than 20 counts and should be considered unstable.

Figure 4.



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

http://www.in.gov/isdh/files/QuickFact_Legionellosis_2014.pdf

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 in skin biopsy. Cases with fewer 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 percent 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. A genetic study at the National Hansen's Disease Program reports that armadillos may be a source of infection in the southern United States. The program states that the risk of transmission from animals to humans is low, but animals should be handled with proper precautions.

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 used 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.

Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), laboratories, hospitals and healthcare providers must report leprosy or Hansen's disease within 72 hours to the local health department or the ISDH.

Healthy People 2020 Goal

There is no Healthy People 2020 Goal for leprosy.

Epidemiology and Trends

One case of leprosy were reported in Indiana during 2015. Three cases were reported during the five-year reporting period 2011-2015. Nationally, 89 cases were reported in 2015.

You can learn more about leprosy by visiting the following websites:

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

<http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5953a1.htm>

<http://www.hrsa.gov/hansensdisease/>.

LEPTOSPIROSIS

Leptospirosis is a bacterial disease of animals and humans caused by *Leptospira* bacteria, most commonly *Leptospira interrogans* and *Leptospira borgpetersenii*. The primary reservoirs of *Leptospira* are rats, dogs and livestock, but many domestic and wild animals can shed the bacteria. Humans generally become infected by direct contact with an infected animal or from exposure to water contaminated with urine from infected animals. The risk of exposure to the *Leptospira* bacteria increases after excessive rain or flooding events.

Public Health Significance

Symptoms of leptospirosis may appear abruptly and include fever, chills, severe headache, body aches, vomiting and jaundice. If leptospirosis is left untreated, kidney damage, liver failure, respiratory distress and swelling of the brain and heart 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.

Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report leptospirosis within 72 hours to the local health department or the ISDH. Laboratories are also required to report positive results of *Leptospira* species weekly to the ISDH.

Healthy People 2020 Goal

There is no Healthy People 2020 Goal for leptospirosis.

Epidemiology and Trends

Two confirmed cases of leptospirosis were reported in Indiana in 2015. Four cases of leptospirosis were reported during the five-year reporting period 2011-2015.

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

<http://www.cdc.gov/leptospirosis/index.html>.

LISTERIOSIS

Listeriosis is an infectious 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

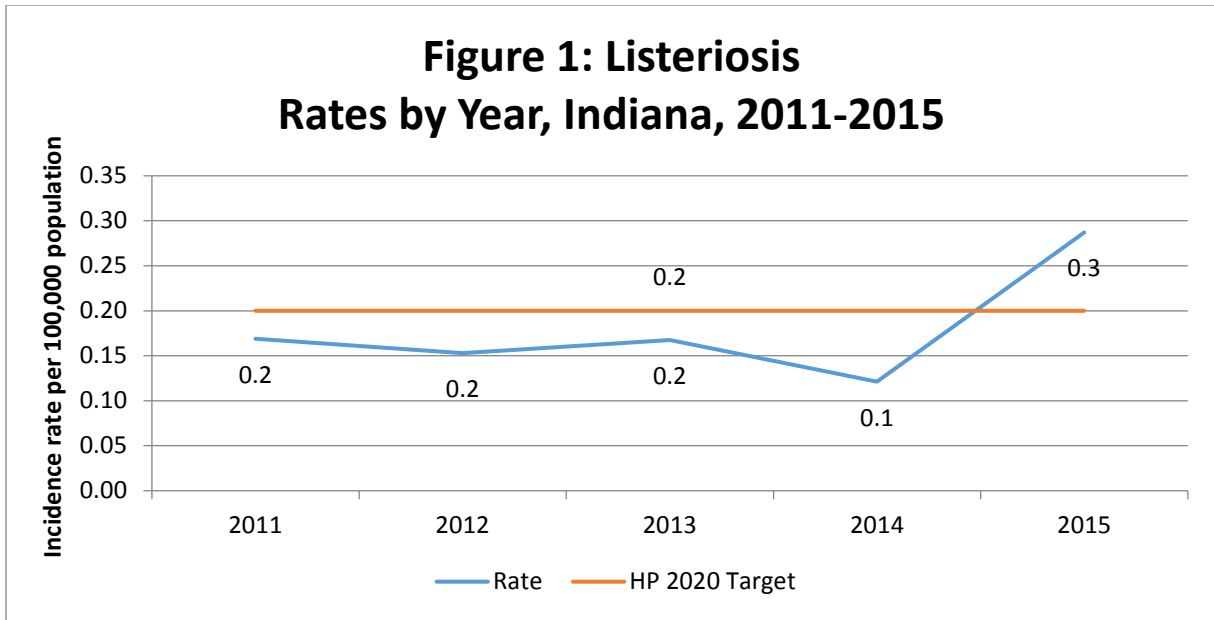
Symptoms of listeriosis include fever, headache, muscle aches, nausea, vomiting, abdominal cramps and diarrhea. Symptoms usually begin 21 days (range of 3-70 days) after exposure. Duration of symptoms depends on the health of the infected person; symptoms can last several days or several weeks. Healthy people usually do not have any symptoms or may have a mild illness. Illness can be very serious in pregnant women, newborns, the elderly and persons with weakened immune systems. In these persons, *Listeria* may cause invasive conditions such as bacteremia and meningitis. Pregnant women are about 20 times more likely than other healthy adults to get listeriosis. About one-third of listeriosis cases occur during pregnancy. 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. If infection occurs when a woman is pregnant, antibiotics given promptly can often prevent infection of her baby. Antibiotics are available to treat the infection in all persons, regardless of age.

Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report listeriosis within 72 hours to the local health department or the ISDH. Laboratories are also required to report positive results of listeriosis weekly to the ISDH. In addition, laboratories are required to submit *Listeria* isolates received to the ISDH Laboratory for further confirmation and subtyping.

Healthy People 2020 Goal

The Healthy People 2020 Goal for listeriosis is 0.2 cases per 100,000 population. During the five-year reporting period, 2011-2015, Indiana met the Healthy People 2020 goal every year except 2015 (Figure 1). The cause for the elevated rate of cases in 2015 is unknown. However, there were several food recalls in early 2015 due to listeria contamination. One Indiana case was confirmed to be associated with a recall.



Epidemiology and Trends

In 2015, 19 cases of listeriosis were reported in Indiana, for a rate of 0.29 cases per 100,000 population (Table 1).

Table 1: Listeriosis case rate by race and sex, Indiana, 2015

	Cases	Rate*	2011 - 2015 Total
Indiana	19	0.29	59
Race			
Black	0	0.00	2
White	13	0.23	44
Other	1	0.33	2
Not Reported	5	-	11
Sex			
Female	11	0.33	31
Male	8	0.25	28
Unknown	0	-	0

*Rate per 100,000 population based on U.S. Census Bureau's population data as of July 6, 2016.

*Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

Figure 2 shows reported listeriosis cases by year for 2011-2015.

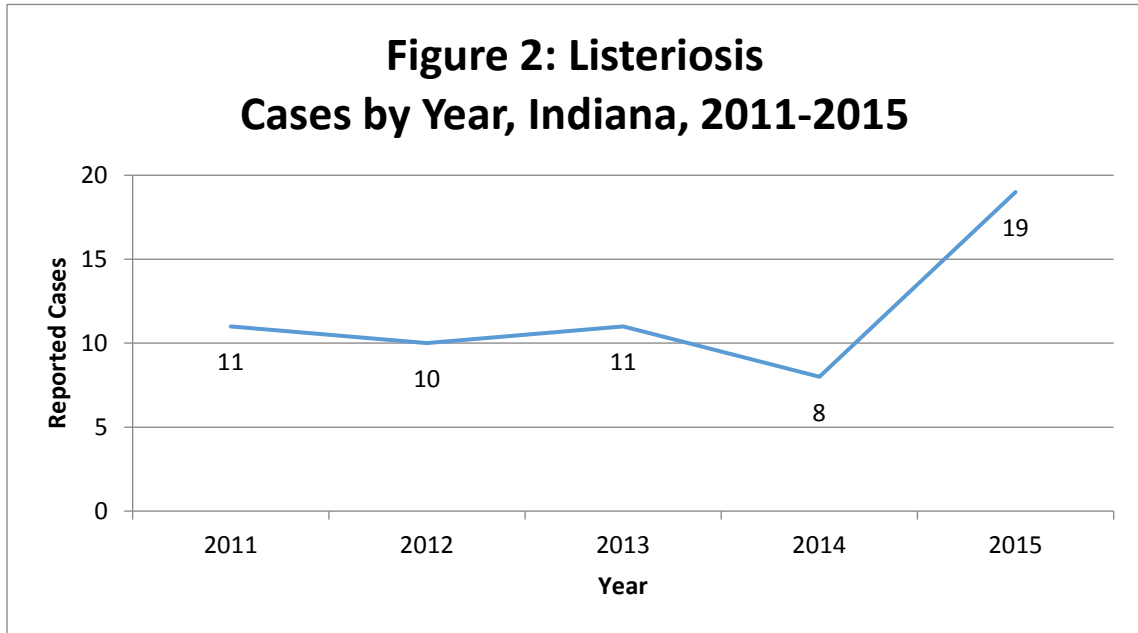
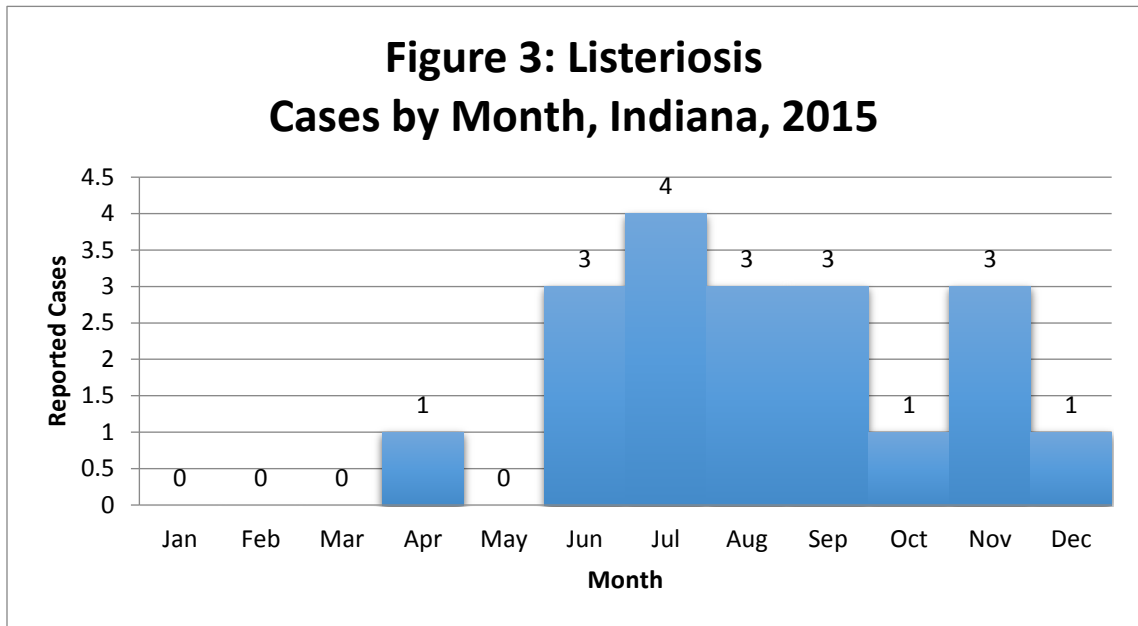
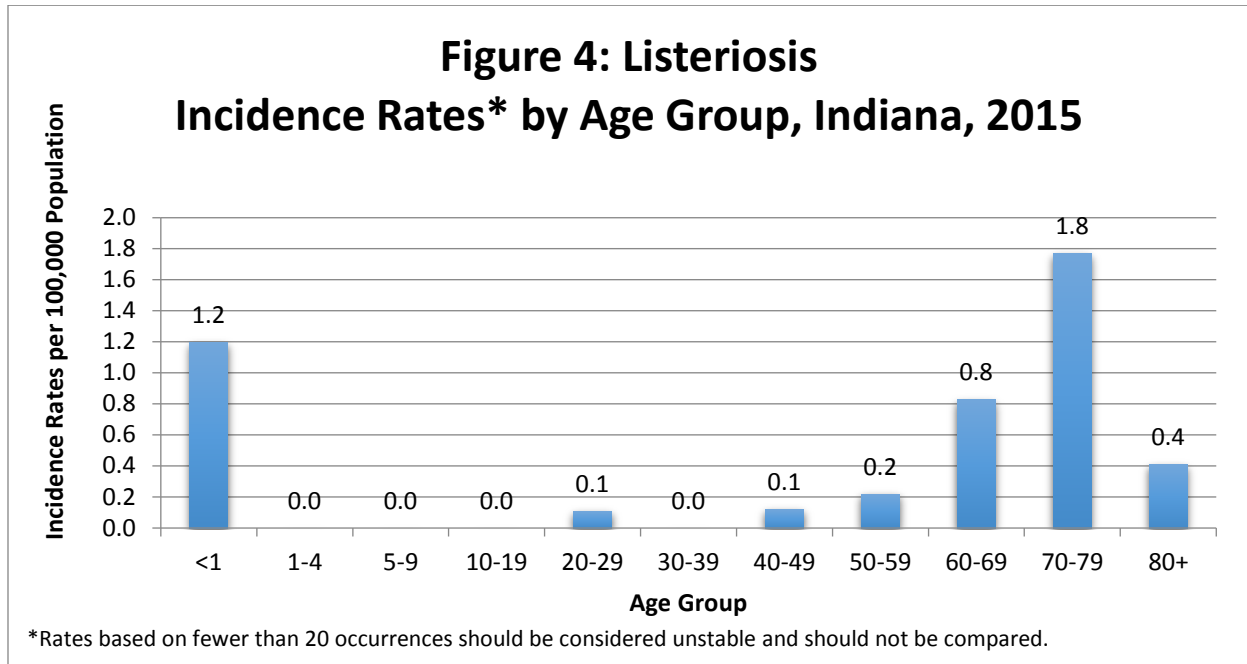


Figure 3 shows the number of listeriosis cases by month for 2015. Incidence of disease was highest in July.



As shown in [Figure 4](#), age-specific rates in 2015 were greatest for adults age 70-79 (1.8) and infants less than the age of 1 (1.2).



Fourteen counties reported having at least one listeriosis case in 2015, but no county reported five or more cases.

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

<http://www.cdc.gov/listeria/index.html>

<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 the United States. It is transmitted by the black-legged tick (*Ixodes scapularis*). Small wild rodents serve as the reservoir species. 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. Early symptoms may include fever, chills, headache, fatigue, muscle and joint aches, swollen lymph nodes and a “bullseye” skin rash known as erythema migrans. Later symptoms may include arthritis with severe joint pain and swelling, as well as neurologic or cardiologic manifestations. 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, heart disease, meningitis, loss of muscle tone (Bell’s palsy) and/or dermatological (skin) conditions.

Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report Lyme disease within 72 hours to the local health department or the ISDH. Laboratories are also required to report positive results of *Borrelia burgdorferi* weekly to the ISDH.

Healthy People 2020 Goal

There is no Healthy People 2020 Goal for Lyme disease.

Epidemiology and Trends

In 2015, 138 cases of Lyme disease were reported in Indiana, for a rate of 2.08 cases per 100,000 population. For the five-year reporting period from 2011-2015, 532 cases of Lyme disease were reported.

Table 1: Lyme disease case rate by race and sex, Indiana, 2015

	Cases	Rate*	2011 - 2015 Total
Indiana	138	2.08	532
Race			
Black	2	0.31	5
White	78	1.37	316
Other	0	0.00	7
Not Reported	58	-	204
Sex			
Female	58	1.73	227
Male	80	2.45	305
Unknown	0	-	0

*Rate per 100,000 population based on U.S. Census Bureau’s population data as of July 6, 2016.

*Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

Figure 1: Lyme Disease Cases by Year, Indiana, 2011-2015

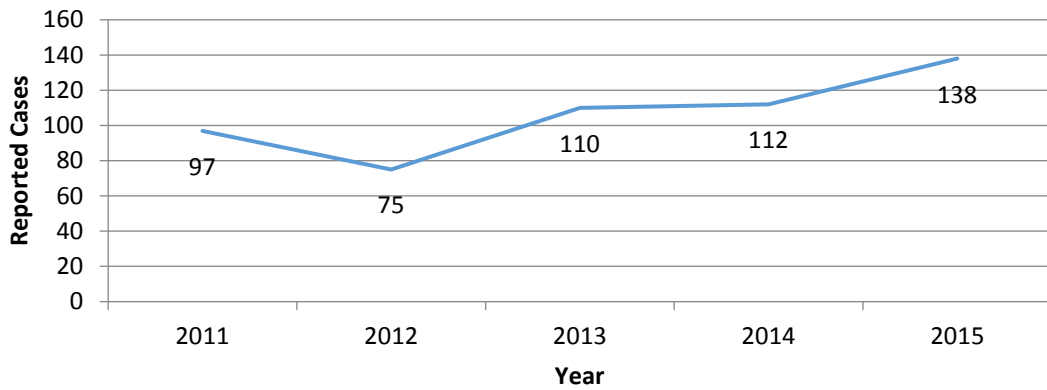
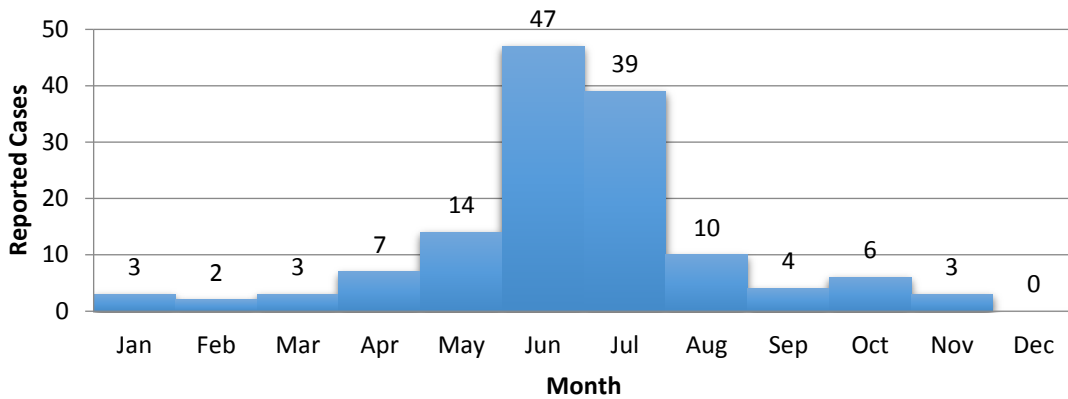


Figure 2: Lyme Disease Cases by Month, Indiana, 2015



As shown in [Figure 3](#), age-specific rates in 2015 were greatest for children ages 5-9 years (4.8) and ages 10-19 (2.8). Nationally, Lyme disease is most common among boys aged 5-9 years. This is attributed to the amount of time children spend outdoors and the fact that they may not notice when a tick has attached.

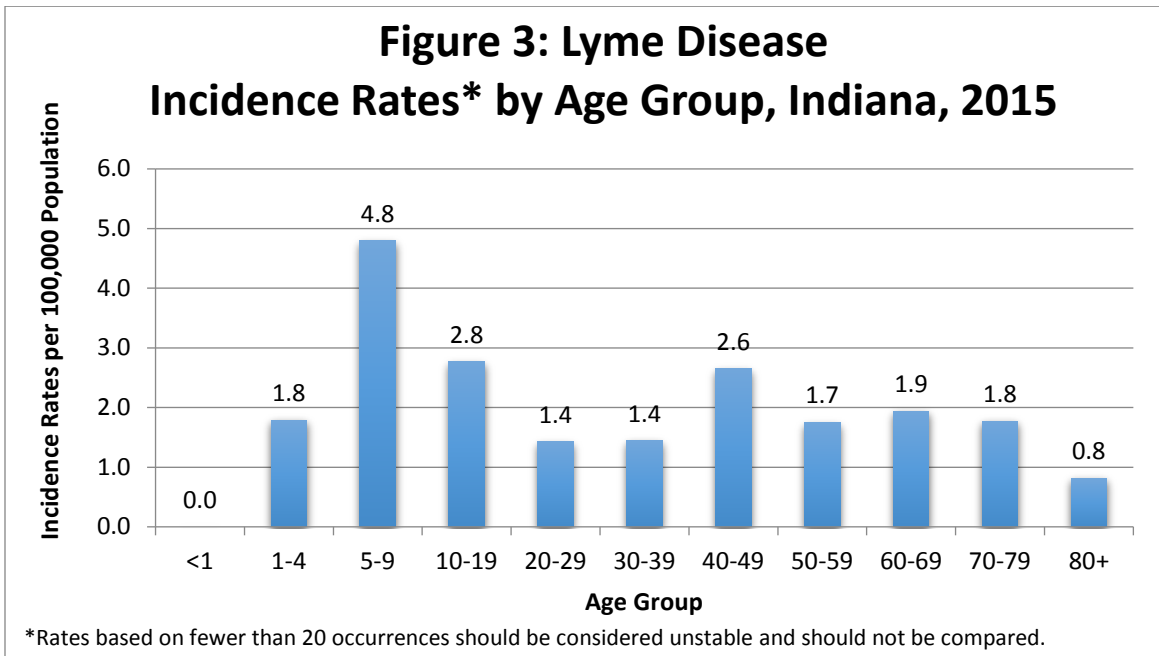
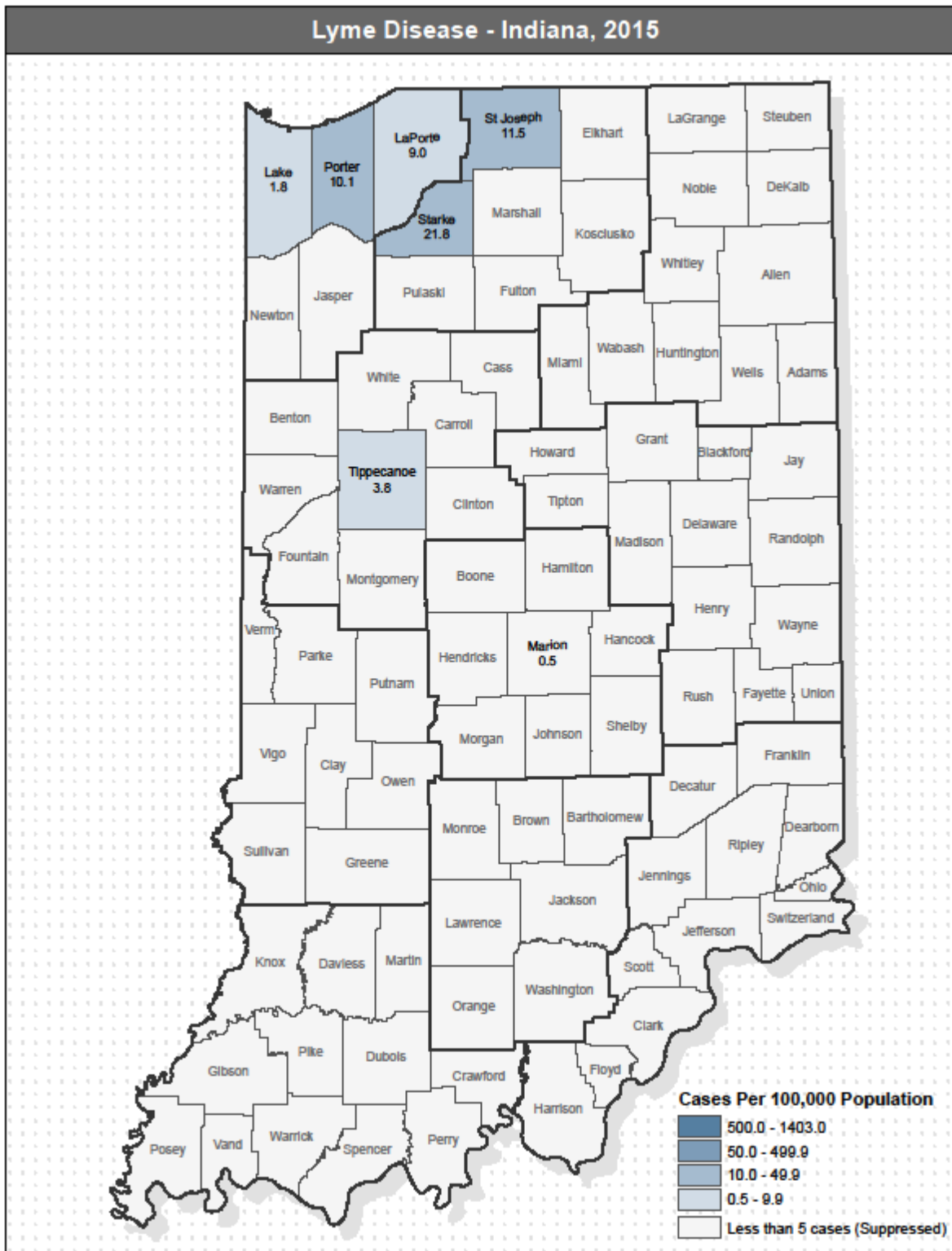


Figure 4. Some of the rates are based on fewer than 20 counts and should be considered unstable.



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 normally acquired by international travel to malaria high-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 fever, 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. 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 healthcare provider.

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

Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report malaria within 72 hours to the local health department or the ISDH. Laboratories are also required to report positive results of *Plasmodium* species weekly to the ISDH.

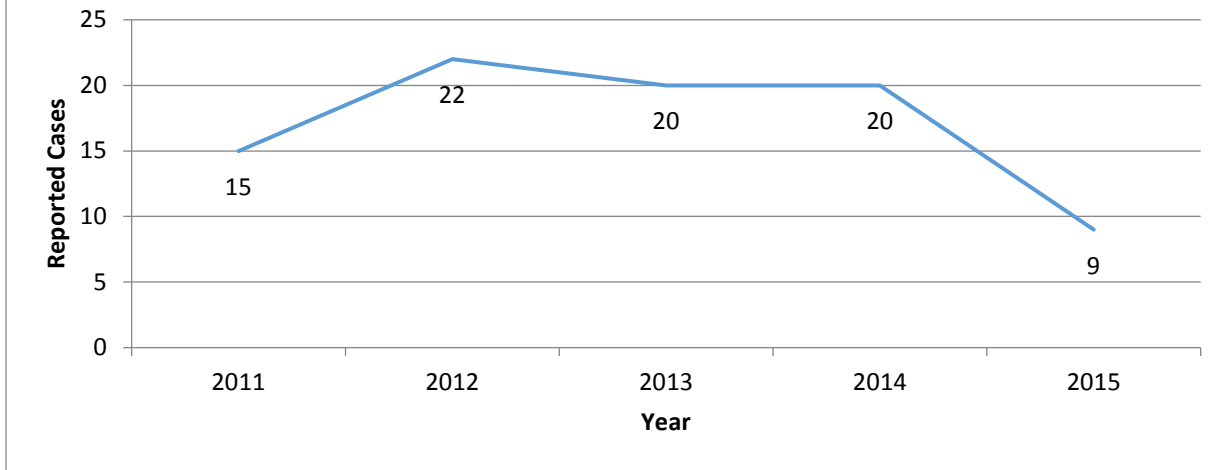
Healthy People 2020 Goal

The Healthy People 2020 Goal for malaria is to reduce the number of cases reported in the United States to 999. Malaria is one of three diseases that accounts for a large proportion of illness and disability for international travelers. In 2012, 1,687 new cases of malaria were reported in the US.

Epidemiology and Trends

In 2015, nine cases of malaria were reported in Indiana. A total of 86 cases of malaria were reported during the five-year reporting period, 2011-2015 (Figure 1). All were acquired outside the United States.

**Figure 1: Malaria
Cases by Year, Indiana, 2011-2015**



You can learn more about malaria by visiting the following Web sites:
<http://www.cdc.gov/malaria/>.

MEASLES

Measles is a highly contagious viral illness 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 and can remain airborne for up to two hours. Humans are the only reservoir for measles virus.

Public Health Significance

Symptoms of measles usually begin to appear 10-12 days after exposure to the virus. Symptoms of measles begin with tiredness, high 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 three days, but on average lasts 4-7 days. Persons with measles usually appear to be very ill at least two days before to two days after rash onset. Though historically considered a mild childhood disease, it can lead to serious complications, including ear infections, pneumonia, encephalitis, vision damage and even death. Fever may last 2-4 days and can peak as high as 103-105°F.

Measles virus is communicable four days prior to four days after the appearance of the classical rash, so following infection control guidelines and exclusion rules is 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, with 90 percent of susceptible persons being infected. 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 at least 28 days apart are recommended for healthcare workers, international travelers, and adults enrolled in secondary education. Infants traveling to endemic areas may receive a dose of MMR as early as 6 months, but should also receive routine vaccination again at 12-15 months and 4-6 years.

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 million to 4 million. Measles incidence in the United States decreased more than 98 percent 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, an estimated 114,900 measles deaths occurred globally in 2014, a decrease of nearly 30,000 deaths from 2013.

Reporting Requirements

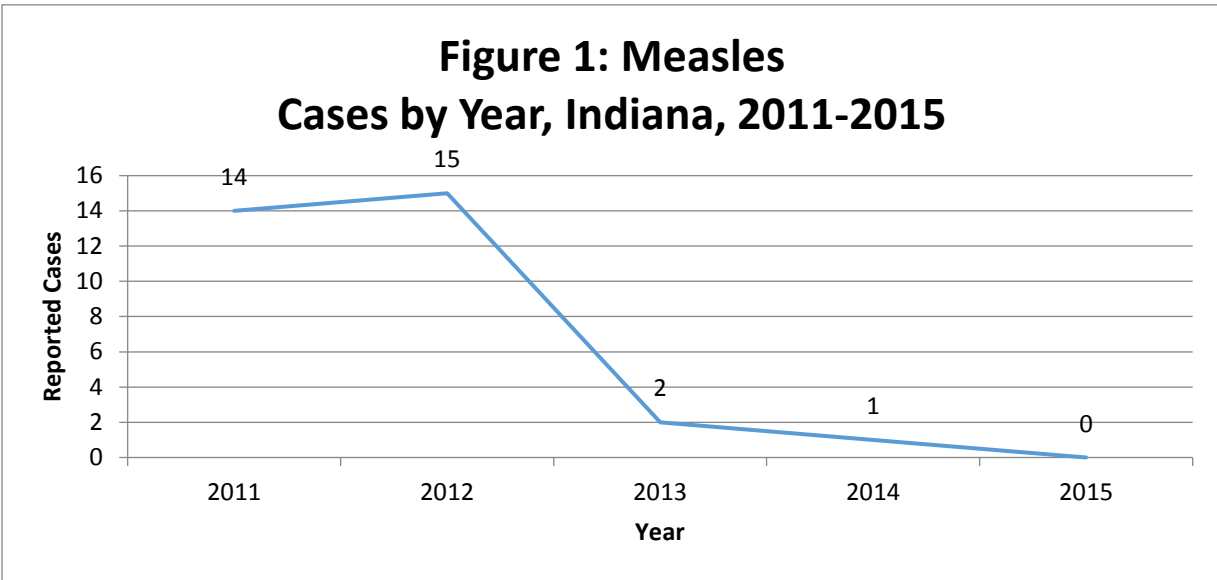
According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report measles immediately to the local health department or the ISDH. Laboratories are also required to report positive results of measles weekly to the ISDH.

Healthy People 2020 Goal

The Healthy People 2020 Goal for measles is fewer than 30 cases of U.S.-acquired measles cases per year nationwide (0.0096 cases per 100,000 population). Indiana met this goal, with no U.S.-acquired cases of measles in 2015. Indiana had one reported U.S.-acquired case in 2013 (plus one internationally-acquired case). 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, so prevention through vaccination is necessary until the virus is globally eradicated.

Epidemiology and Trends

No case of measles were reported in 2015 in Indiana. The last large outbreak of measles in Indiana occurred in 2012. This outbreak stemmed from adoption of children from an endemic country and resulted in 14 of the 15 measles cases reported that year. In 2011, an Indiana outbreak in an unvaccinated extended family with recent overseas travel resulted in 14 measles cases. Figure 1 shows reported cases of measles for the five-year period, 2011-2015.



During 2015, a total of 189 measles cases nationwide were reported to the Centers for Disease Control and Prevention (CDC), compared with a median of 56 (range: 37–220) cases reported annually during 2002–2012. Most of these cases were the result of a large outbreak associated with a theme park in the United States at the beginning of 2015, which produced over 100 cases of measles.

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

<http://wwwnc.cdc.gov/travel/yellowbook/2014/chapter-3-infectious-diseases-related-to-travel/measles-rubeola>

<http://www.cdc.gov/measles/index.html>

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

MENINGOCOCCAL DISEASE

Meningococcal disease is a life-threatening illness that occurs when *Neisseria meningitidis* bacteria invade a site in the body that is normally sterile, such as the blood or cerebral spinal fluid (CSF). The bacteria are transmitted from person to person through direct contact with nose and throat secretions of an infected person. The definition of a confirmed case of meningococcal disease is the isolation of the organism from a sterile body site or from purpuric lesions. It is estimated that 5 percent to 20 percent of the population may be colonized with the bacteria in the nasopharynx but have no symptoms of infection. Therefore, nasopharynx carriage is common, but invasive disease is rare. Invasive disease is most commonly manifested as meningitis (inflammation of the meninges) or meningococemia (meningococcal sepsis). 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. Even with antibiotic treatment, case fatality rates for meningococcal disease are estimated at 10 percent. Meningococemia is the most severe form of the infection and is fatal in up to 40 percent of cases. According to the Centers for Disease Control and Prevention (CDC), outbreaks of meningococcal disease are rare, and only about 2 or 3 of every 100 cases are related to outbreaks.

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

It is recommended that all children should be vaccinated with meningococcal conjugate vaccine (MCV4) at entry to sixth grade (11-12 years of age). The CDC recommends that all teens also receive a booster dose of MCV4 at age 16. For those who receive the first dose at age 13 through 15 years, a one-time booster dose should be administered, preferably at age 16 through 18 years, before the peak in increased risk. Adolescents who receive their first dose of MCV4 at or after age 16 years do not need a booster dose (<http://www.cdc.gov/vaccines/vpd-vac/mening/default.htm>).

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. In April 2011, the Food and Drug Administration approved the use of the quadrivalent meningococcal vaccine for children ages 9 months to 23 months who are at high risk for disease. Booster guidance was published in January 2012 for children ages 2 through 10 years; these updates are available at <http://www.cdc.gov/meningococcal>. Three vaccines are currently available to protect against meningococcal disease. All vaccines protect against four of the five encapsulated serogroups of the bacteria that cause invasive disease (A, C, Y, W-135). Two serogroup B meningococcal disease vaccines were licensed in the United States Trumenba® in 2014 and Bexsero® in 2015. Previously, the MenB vaccines were only recommended for high-risk groups, but the ACIP expanded the recommendation to include individuals ages 10-25 who their doctor believes may be at increased risk for MenB infection.

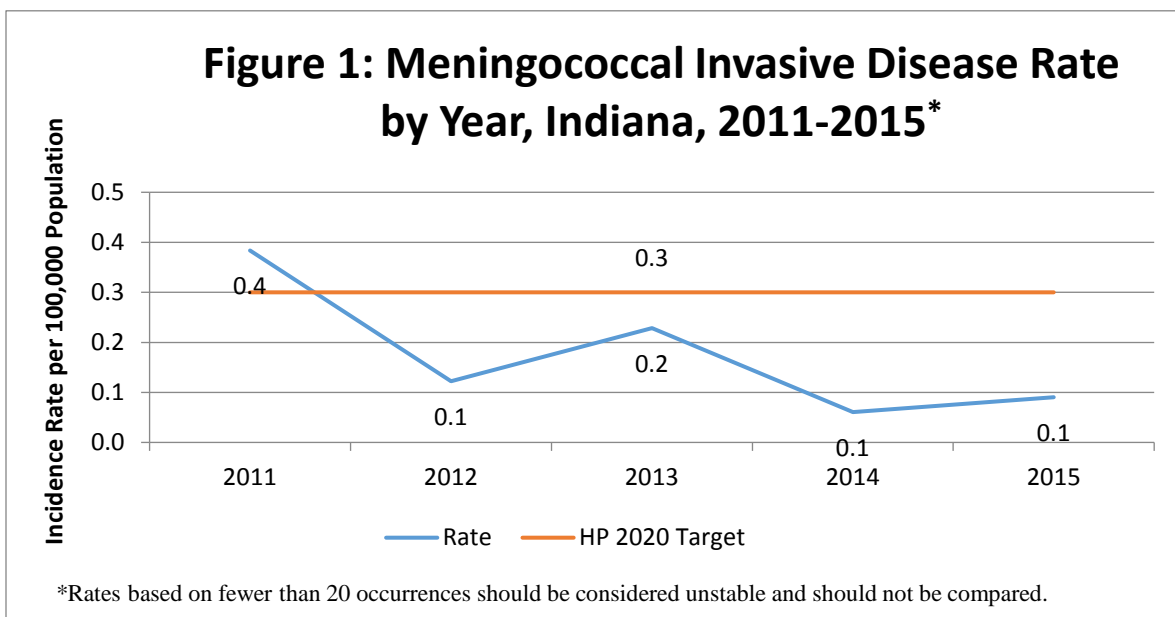
Increased hospital, provider, and laboratory awareness of the condition may improve clinical outcomes. Immediate recognition and treatment of suspected cases is crucial. Suspected cases should be treated prior to lab confirmation. Healthcare providers must immediately report suspected, probable and confirmed cases to the patient's local health department. Within 24 hours of alert, the local health department should share this information with the Indiana State Department of Health (ISDH) to ensure proper control measures can be implemented to prevent secondary cases. Individuals with direct exposure to the respiratory droplets of a case are at greater risk for contracting the disease within the first few days following symptom onset. Antibiotic prophylaxis is recommended for all high-risk close contacts and should be administered as soon as possible.

Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians, Hospitals, and Laboratories, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report meningococcal disease immediately to the local health department or the ISDH. Laboratories are also required to report positive results of *Neisseria meningitidis* weekly to the ISDH. Additionally, laboratories are required to submit isolates received to the ISDH Laboratory for serogroup evaluation and possible molecular testing at CDC.

Healthy People 2020 Goal

The Healthy People 2020 Goal for meningococcal disease is an incidence of 0.3 cases per 100,000 population per year. Indiana met the Healthy People 2020 Goal for 2015 (see [Figure 1](#)).



Epidemiology and Trends

In 2015, six confirmed and suspect cases of invasive meningococcal disease ([Table 1](#)) were reported.

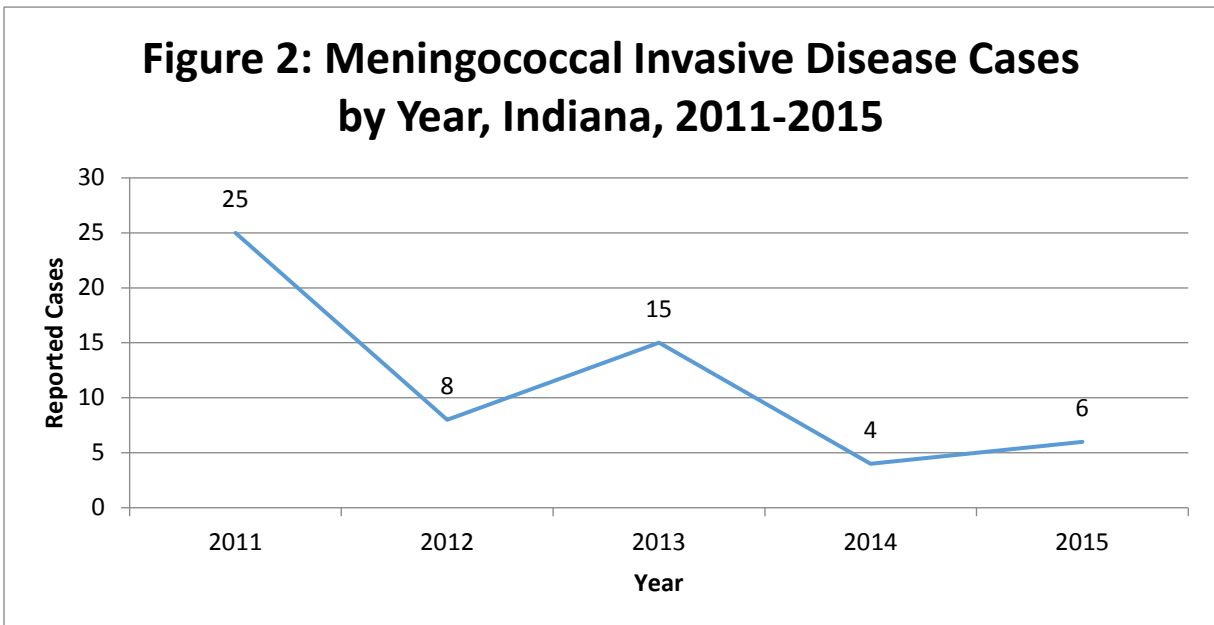
Table 1: Meningococcal cases rate by race and sex, Indiana, 2015

	Cases	Rate*	2011 - 2015 Total
Indiana	6	0.09	58
Race			
Black	0	0.00	4
White	5	0.09	48
Other	0	0.00	1
Not Reported	1	-	5
Sex			
Female	4	0.12	29
Male	2	0.06	29
Unknown	0	-	-

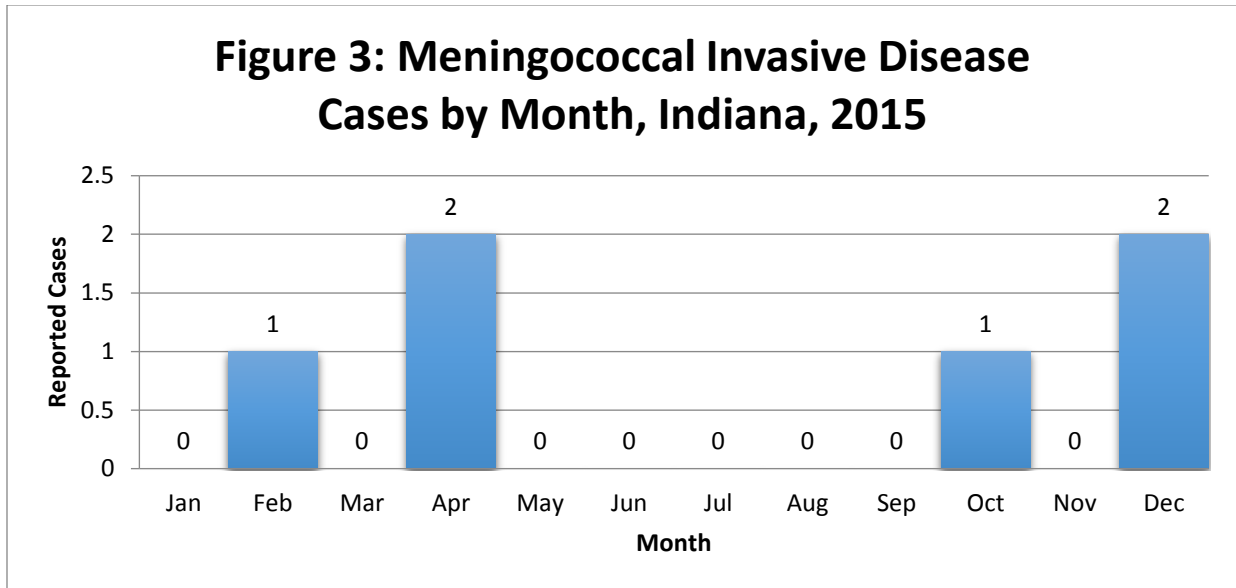
*Rate per 100,000 population based on U.S. Census Bureau's population data as of July 6, 2016.

*Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

Nationally, cases of meningococcal disease decreased significantly from the previous year, from 433 cases in 2014 to 348 in 2015. Indiana experienced a slight increase in disease, from four cases in 2014 to six cases in 2015. [Figure 2](#) displays the number of cases by year for the previous five years.



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 the Indiana trend with the number of cases by month. The highest number of cases occurred in April and December 2015.



Five counties reported confirmed or suspected cases during 2015. None of the counties reported five or more cases.

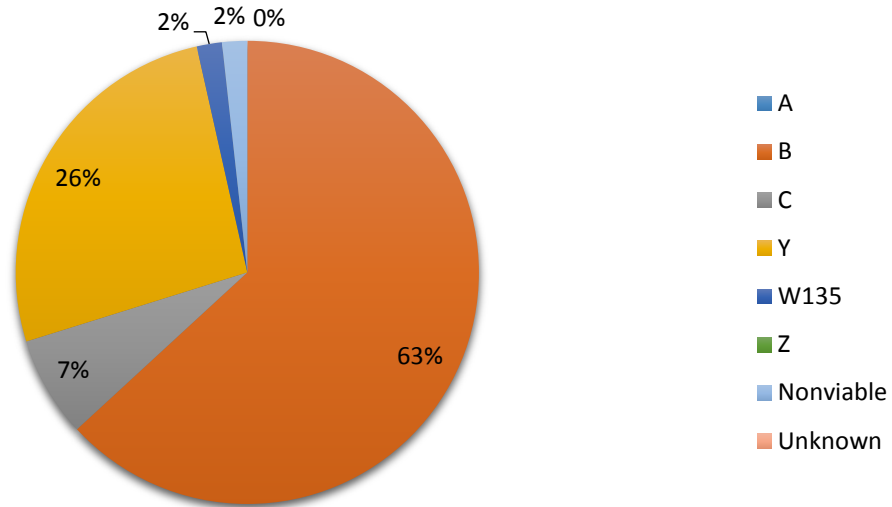
In the U.S., *Neisseria meningitidis* serogroups B, C, and Y are most frequently associated with invasive disease. The Indiana Communicable Disease Reporting Rule 410 IAC 1-2.3, require laboratories to submit isolates from invasive sites to the ISDH Laboratory for confirmation, serogrouping, and molecular typing at the CDC (quarterly or more quickly, if requested). Polymerase chain reaction (PCR) testing can be also performed at the CDC or a reference laboratory on specimens, if requested.

In 2015, serogroup B accounted for 83 percent (5/6) of Indiana cases. Serogroup B had the highest proportion of cases from 2011-2015 (63 percent) followed by serogroup Y with 26 percent. [Table 2](#) gives the total numbers for Indiana serogroups for the past five years. [Figure 5](#) displays the total percentage of serogroup results available from 2011 to 2015.

Table 2: 5-year totals (2011-2015) for Indiana *Neisseria meningitidis* serogroups:

Serogroup	2011	2012	2013	2014	2015	Total
A	-	-	-	-	-	-
B	12 (48%)	6 (75%)	9 (60%)	4 (100%)	5 (83%)	36
C	3 (12%)	-	1 (6.7%)	-	-	4
Y	8 (32%)	2 (25%)	5 (33.3%)	-	-	15
W135	1 (4%)	-	-	-	-	1
Z	-	-	-	-	-	-
Nonviable	1 (4%)	-	-	-	-	1
Unknown	-	-	-	-	1 (17%)	1

Figure 5: Meningococcal Invasive Disease Serogroups, Indiana, 2011-2015



You can learn more information on meningococcal disease, by visiting the following websites:

<http://www.in.gov/isdh/25455.htm>

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

<http://www.cdc.gov/meningococcal/pubs-tools/publications.html>

<http://wwwn.cdc.gov/nndss/script/conditionsummary.aspx?CondID=107>

<http://www.cdc.gov/vaccines/hcp/vis/vis-statements/mening.html>

<http://www.cdc.gov/vaccines/hcp/vis/vis-statements/mening-serogroup.html>

<http://www.cdc.gov/meningococcal/outbreaks/index.html>

<http://www.cdc.gov/abcs/reports-findings/survreports/mening13.html>.

MUMPS

Mumps is an acute viral illness transmitted through airborne transmission or direct contact with infected droplet nuclei or saliva. Humans are the only reservoir for mumps.

Public Health Significance

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

No antiviral is available to treat mumps. The most effective means of preventing mumps is vaccination. Children should receive one dose of measles, mumps, rubella (MMR) vaccine at 12-15 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 for all sporadically reported cases. Appropriate testing includes a serum specimen and a viral specimen (buccal swab) collected as early as possible following onset of parotitis. Although Indiana has a relatively low incidence of mumps cases, healthcare providers should consider mumps diagnosis and testing when parotitis of two days or longer has occurred.

Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report mumps within 72 hours to the local health department or the ISDH. Laboratories are also required to report positive results of mumps weekly to the ISDH.

Healthy People 2020 Goal

The Healthy People 2020 Goal for mumps is fewer than 500 cases of U.S.-acquired mumps per year nationwide (0.16 per 100,000 population). Indiana met the Healthy People 2020 Goal in 2014 with six cases (a rate of 0.11 cases per 100,000 population). 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.

Epidemiology and Trends

In 2015, six probable or confirmed cases of mumps were reported in Indiana. Some of these cases were associated with large ongoing outbreaks in other states. Forty-one cases were reported during the five-year period 2011-2015.

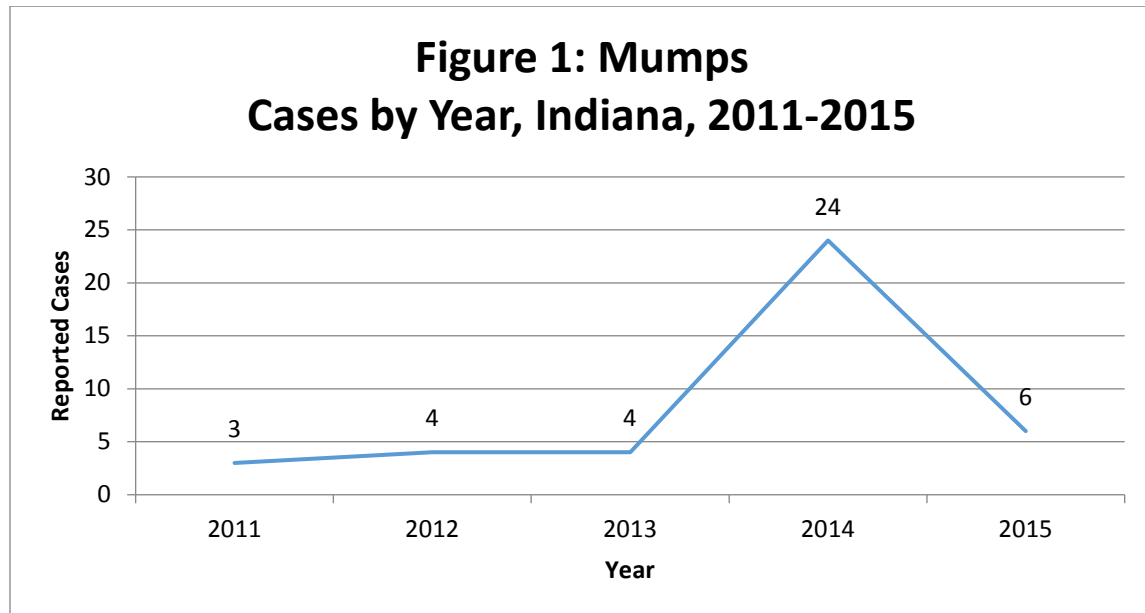
Table 1: Mumps case rate by race and sex, Indiana, 2015

	Cases	Rate*	2011 - 2015 Total
Indiana	6	0.09	41
Race			
Black	1	0.16	1
White	2	0.04	30
Other	1	0.33	3
Not Reported	2	-	7
Sex			
Female	4	0.12	15
Male	2	0.06	26
Unknown	0	-	0

*Rate per 100,000 population based on U.S. Census Bureau's population data as of July 6, 2016.

*Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

Figure 1 shows reported cases by year for 2011-2015.



You can learn more about mumps by visiting the following websites:

<https://www.cdc.gov/mumps/>

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

Prior to routine vaccination in the late 1940s, more than 200,000 cases of pertussis were reported in the United States each year. Pertussis incidence has decreased more than 80 percent since the pre-vaccine 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 diphtheria, tetanus and acellular pertussis (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. It is recommended that adults who have not received Tdap should receive a single dose of Tdap to protect against pertussis and reduce likelihood of transmission. A single dose of Tdap may be given instead of Td (tetanus and diphtheria) vaccine. In addition, pregnant women should receive a dose during every pregnancy (preferably between 27-36 weeks gestation). The introduction of the Tdap vaccine may help to reduce the rate of pertussis in adult and adolescent populations, who are most commonly responsible for infecting most infants.

Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report pertussis immediately to the local health department or ISDH. Laboratories are also required to report positive results of *Bordetella pertussis* weekly to the ISDH.

Healthy People 2020 Goal

The Healthy People 2020 Goals for pertussis are fewer than 2,500 cases of pertussis nationwide in children under 1 years of age (63.4 cases per 100,000 population) and fewer than 2,000 cases in adolescents aged 11-18 years (6.0 cases per 100,000 population). Indiana met those goals for children under 1 years of age (56.2 cases per 100,000 population – 47 cases) and adolescents ages 11-18 years (7.2 cases per 100,000 population – 52 cases) in 2015.

Epidemiology and Trends

Indiana had 223 reported cases of pertussis in 2015, for a rate of 3.37 cases per 100,000 population (Table 1). Females (3.66) had a slightly higher incidence rate than males (3.07). The rate for other races (4.31) was higher than for blacks (0.94) and for whites (2.76), though this trend could be a result of low prevalence of pertussis among non-white races.

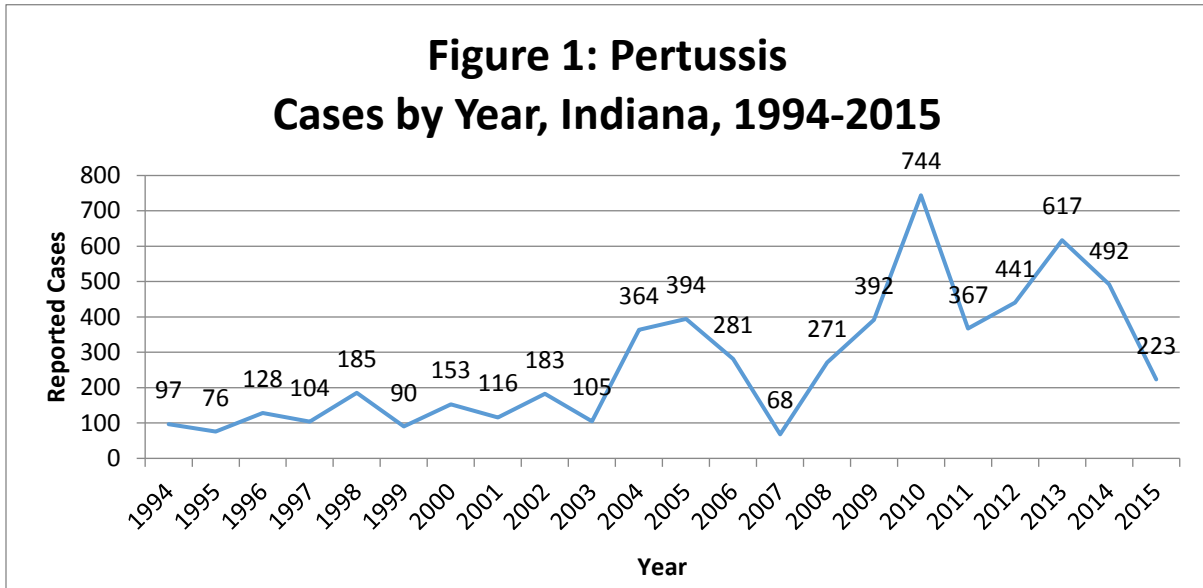
Table 1: Pertussis case rate by race and sex, Indiana, 2015

	Cases	Rate*	2011 - 2015 Total
Indiana	223	3.37	2,140
Race			
Black	6	0.94	61
White	157	2.76	1,751
Other	13	4.31	65
Not Reported	47	-	263
Sex			
Female	123	3.66	1,136
Male	100	3.07	1,000
Unknown	-	-	4

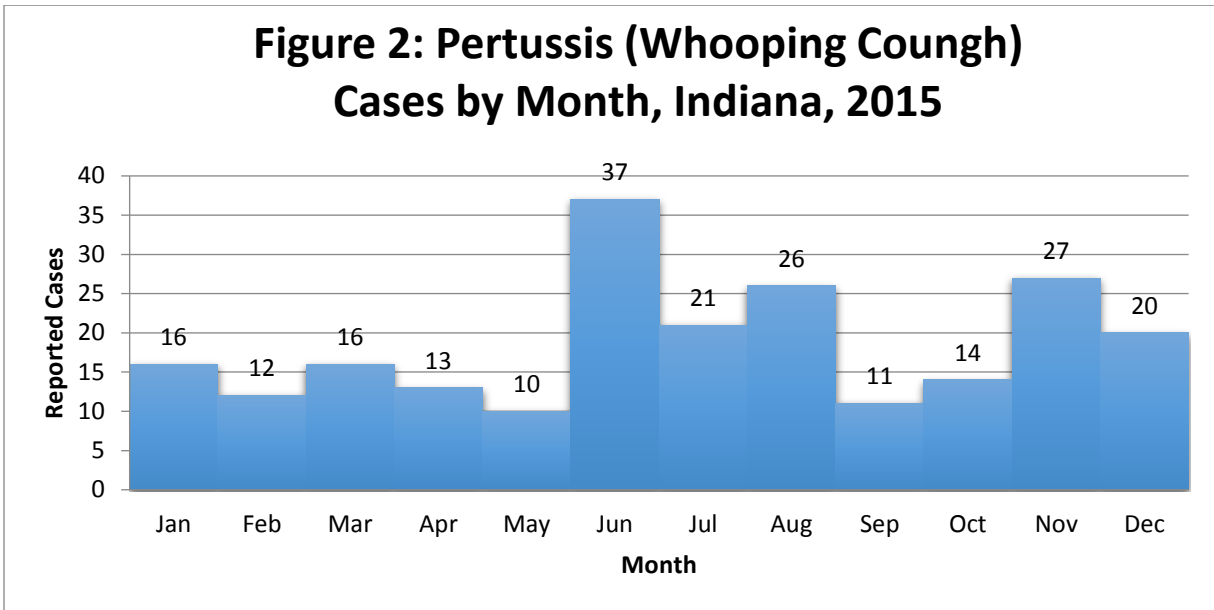
*Rate per 100,000 population based on U.S. Census Bureau's population data as of July 6, 2016.

*Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

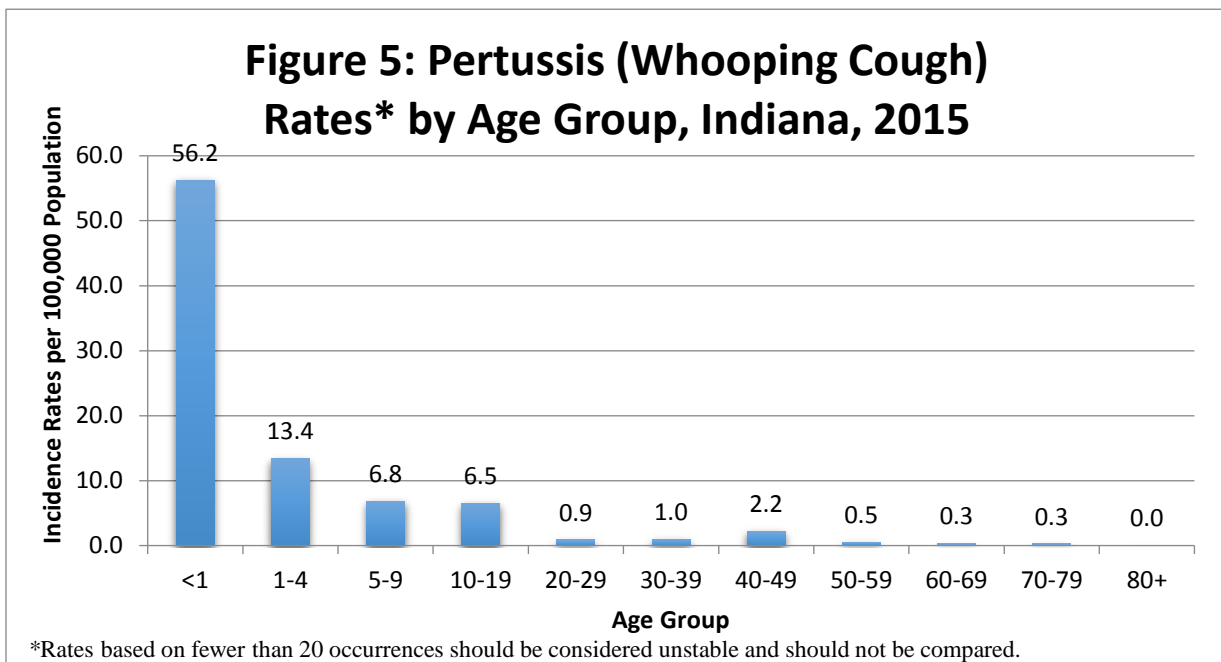
Pertussis incidence, unlike other vaccine-preventable diseases, has increased overall since the 1980s. Pertussis incidence is cyclic, with increases and decreases every 3-5 years. [Figure 1](#) illustrates this cycle.



In 2015, disease incidence was highest during June, November, and August, but pertussis can occur anytime during the year (Figure 2).



Pertussis is the most frequently reported vaccine-preventable disease among children under 5 years of age in Indiana. In 2015, 41.3 percent of all cases occurred in children less than 5 years of age. Incidence rates were highest for infants less than 1 year of age (56.2), followed by children ages 1-4 years (13.4) and children ages 5-9 years (6.8). School aged-children, 5-18 years of age, accounted for 39.5 percent of cases in 2015. Figure 3 shows incidence rates for all age groups.



In 2015, 53 counties reported at least one case, and 16 counties reported 5 or more cases of pertussis. The incidence rates were highest among the following counties reporting five or more cases (Figure 4): Jay (52.1), Franklin (26.2) and Lagrange (23.2). Some of the rates are based on fewer than 20 counts and should be considered unstable.

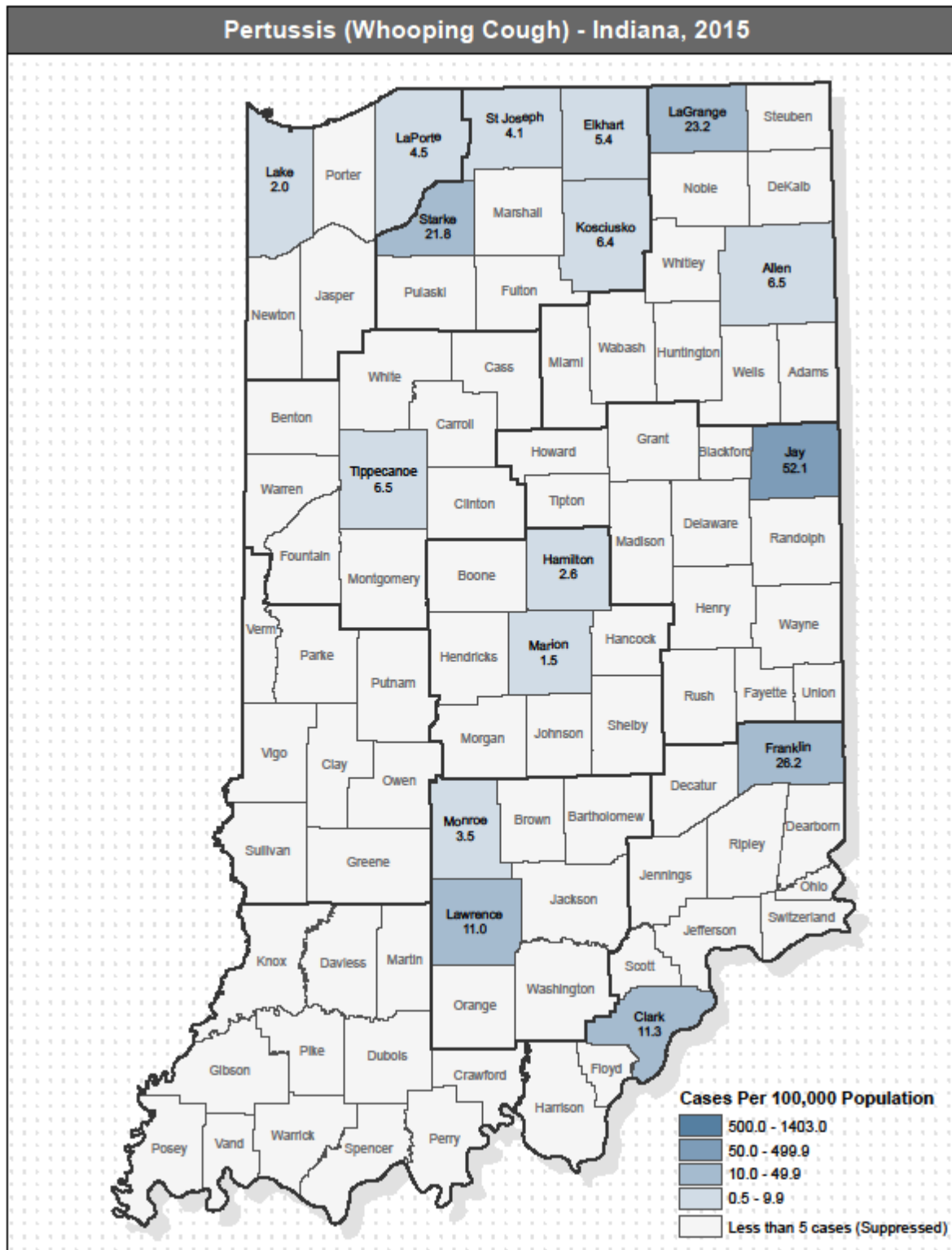
Unvaccinated children are at highest risk for severe disease, but appropriately immunized children may also develop illness. Table 2 reflects the vaccination history at time of illness for selected age groups based on earliest recommended age for vaccination.

Table 2: Vaccination history of selected age groups and number (percent), Indiana, 2015

Age Group	Total Cases	Unknown	0 doses	1-2 doses	3+ doses
3-11 Months	32	1 (3.1%)	9 (28.1%)	15 (46.9%)	8 (25.0%)
1-4 Years	46	2 (4.3%)	20 (43.5%)	3 (6.5%)	19 (41.3%)
5-9 Years	30	0 (0.0%)	12 (40.0%)	1 (3.3%)	17 (56.7%)
Total (3 mo-9 yrs)	108	3 (2.8%)	41 (38.0%)	19 (17.6%)	44 (40.7%)

Laboratory confirmation was obtained through culture and/or PCR for 177 (79.4%) of the reported pertussis cases. Since other illnesses 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.

Figure 4.



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 the bacterium, *Yersinia pestis*. 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. Three forms of the disease can occur: 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 percent 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. or in people with recent travel to 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 World War II.

Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report plague immediately to the local health department or the ISDH. Laboratories are also required to report positive results of *Yersinia* species, including *pestis* weekly to the ISDH.

Epidemiology and Trends

No cases of plague have been reported in Indiana to date.

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

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

*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 more than 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, productive cough, rusty sputum, difficulty breathing, rapid heart rate and fatigue. Pneumococcal bacteremia may present as fever, chills, rigors, sepsis, body aches and pains, and pneumococcal meningitis may present as stiff neck, altered mental status, headaches, fever, and other symptoms. 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 resistant to penicillin, erythromycin, trimethoprim-sulfamethoxazole and other antimicrobial agents. In some areas, the rates of resistance are as high as 30 percent. It is important for physicians to administer antibiotics cautiously and monitor use closely to prevent increased resistance.

Since the licensure of a 7-valent pneumococcal conjugate vaccine for children under 5 years of age in 2000, cases in this age group have decreased in Indiana. However, a high rate of invasive pneumococcal disease still occurs among young children, especially those younger than 2 years of age, and the most common serotypes were not included in the 7-valent vaccine. The current pneumococcal conjugate vaccine for administration to children less than 5 years of age and for adults over the age of 65 is a 13-valent pneumococcal conjugate vaccine (PCV13), which was licensed in 2010. The vaccine contains capsular polysaccharides from 13 *S. pneumoniae* serotypes that 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 or sneezing and hand washing will help prevent the spread of infection.

Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report invasive pneumococcal disease within 72 hours to the local health department or the ISDH. Laboratories are also required to report positive cultures of *Streptococcus pneumoniae* disease weekly to the ISDH. In addition, laboratories are required to submit isolates of *Streptococcus pneumoniae* in children less than five years of age with invasive disease to the ISDH Laboratory within five days of isolation for further confirmation and subtyping.

Healthy People 2020 Goal

The Healthy People 2020 lists several goals for pneumococcal disease. The Healthy People 2020 goal is 12 cases per 100,000 population for children under age 5 years and 31 cases per 100,000 population for adults age 65 and older. Indiana met the Healthy People 2020 Goal for children less than 5 years of age in 2015, with an incidence rate of 9.8 cases per 100,000 population. Indiana also met the Healthy People 2020 Goal for adults age 65 and older; the incidence rate for this population was 26.7 cases per 100,000 in 2015. Two additional Healthy People 2020 goals examine the rate of penicillin-resistant invasive *Streptococcus pneumoniae*. The Healthy People 2020 goal for penicillin-resistant invasive pneumococcal disease is three cases per 100,000 population for children under age 5 and two cases of penicillin-resistant cases per 100,000 population for adults age 65 and older. Indiana met the goal, with 1.43 cases per 100,000 children under age 5 with penicillin-resistant pneumococcal disease but did not meet the goal for adults 65 and older, with 2.38 cases per 100,000 with penicillin-resistant pneumococcal disease in 2015.

Epidemiology and Trends

In 2015, 627 cases of pneumococcal disease were reported in Indiana, for a case rate of 9.47 per 100,000 population. In 2015, the incidence rate among the black population (11.31 per 100,000 population) was higher than that of the white population (7.67 per 100,000) and other races (8.63 per 100,000).

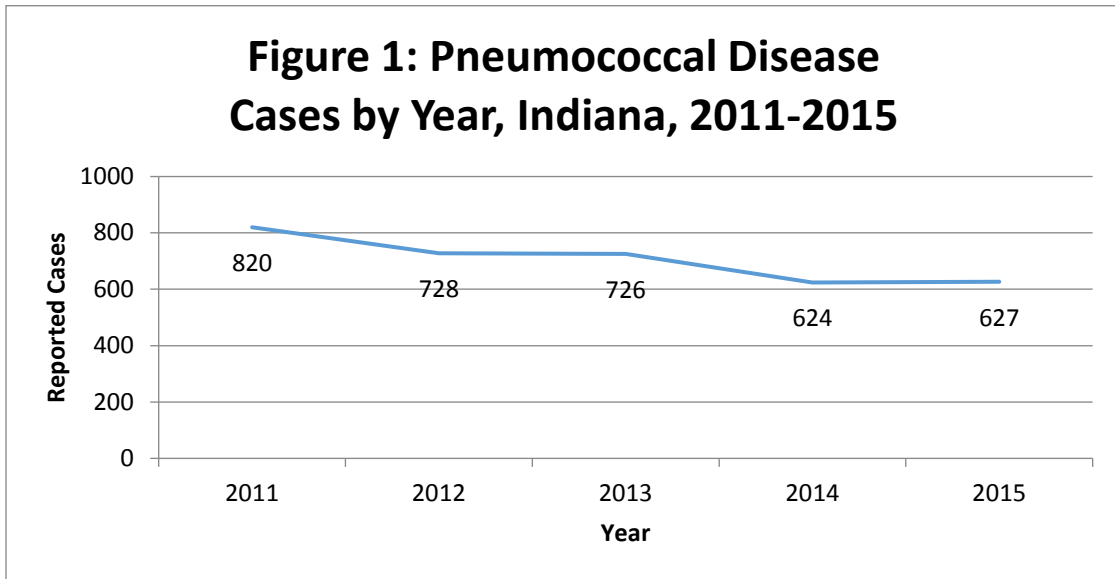
Table 1: Pneumococcal disease case rate by race and sex, Indiana, 2015

	Cases	Rate*	2011 - 2015 Total
Indiana	627	9.47	3,525
Race			
Black	72	11.31	369
White	436	7.67	2,527
Other	26	8.63	68
Not Reported	93	-	561
Sex			
Female	321	9.56	1,777
Male	306	9.38	1,748
Unknown	0	-	0

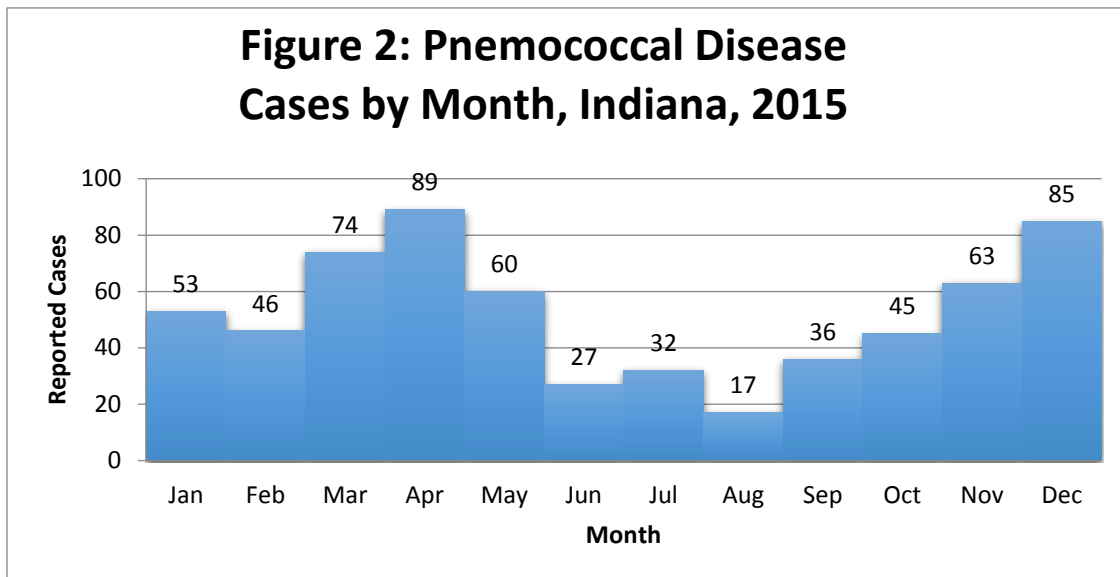
*Rate per 100,000 population based on U.S. Census Bureau's population data as of July 1, 2016.

*Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

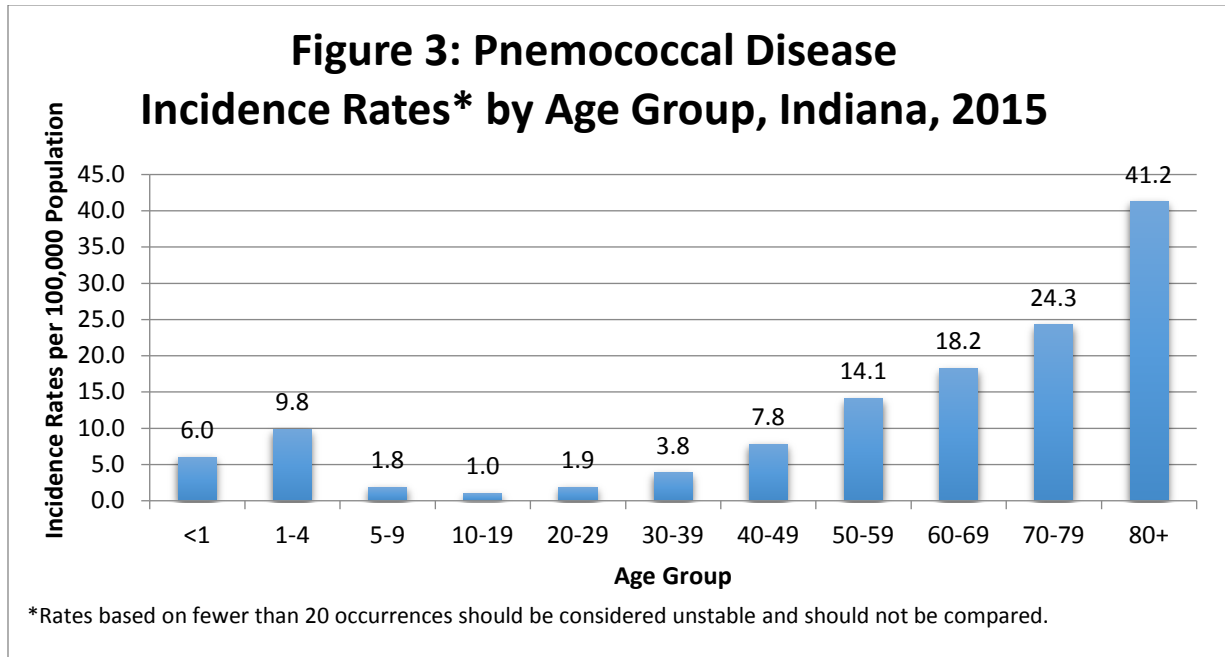
Figure 1 shows the number of reported cases per year for 2011-2015.



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



Incidence of invasive pneumococcal disease varies considerably with age. In 2015, the highest incidence rates were for adults age 80 and older (41.2 per 100,000 population), followed by adults ages 70-79 (24.3 per 100,000) (Figure 3).



Of all reported invasive pneumococcal cases, 6.1 percent occurred in children under age 5 in 2015 (38 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 age 5 for serotyping. Of the 38 cases under the age of five, viable isolates from 31 were sent to the Indiana State Department of Health for serotyping. Of these, 29 isolates were successfully serotyped and two were untypeable. Predominant serotypes included Group 15 (7.9%), Type 23B (7.9%), and Type 15B (7.9%). (Figure 4). Serotypes represented in the PCV13 vaccine represented 12.9 percent of cases under 5 for whom typing data was available. Of these, all cases occurred in children who had at least one dose of PCV13 vaccination. The majority of cases in children under 5 years of age occurred as a result of types not contained in the routine vaccines available for children (Figure 5). The number of cases caused by strains included in the PCV7 (4, 6B, 9V, 14, 18C, 19F, 23F) and PCV13 (all PCV7 strains + 1, 3, 5, 6A, 7F, and 19A) vaccines decreased in the period from 2011-2015.

Figure 4: Pneumococcal Serotypes, Children Under 5, Indiana, 2015

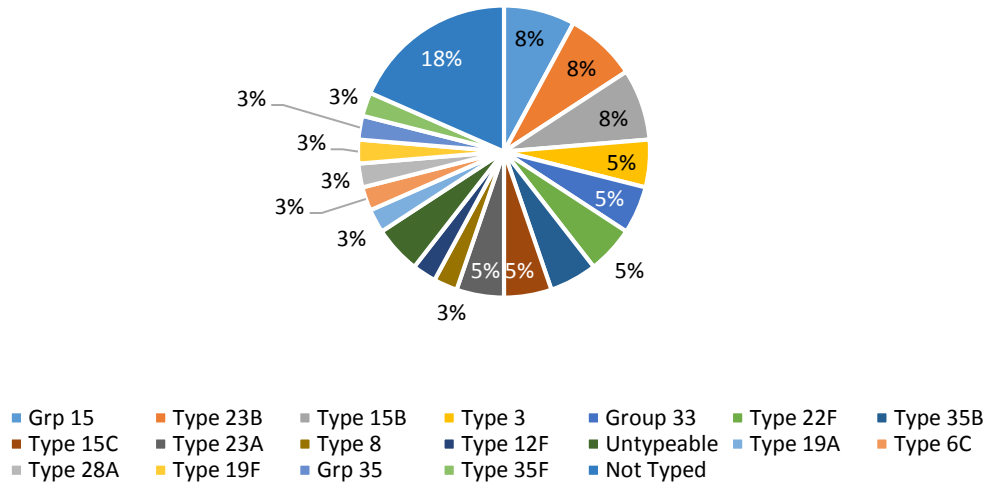
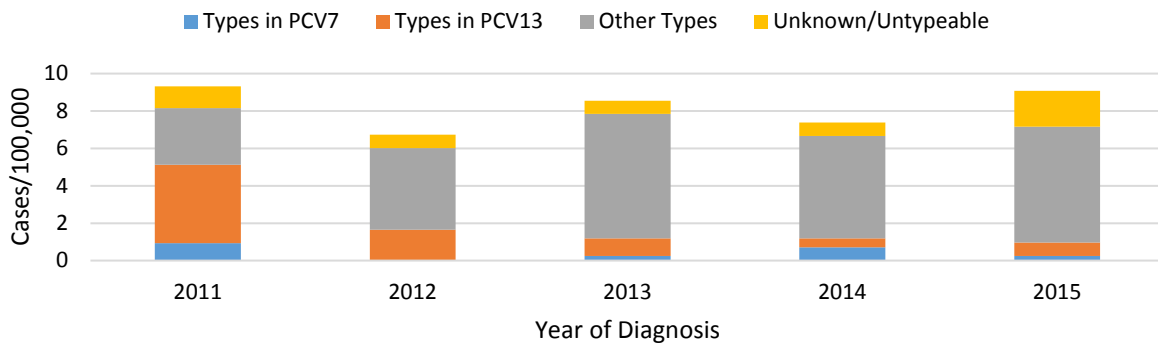
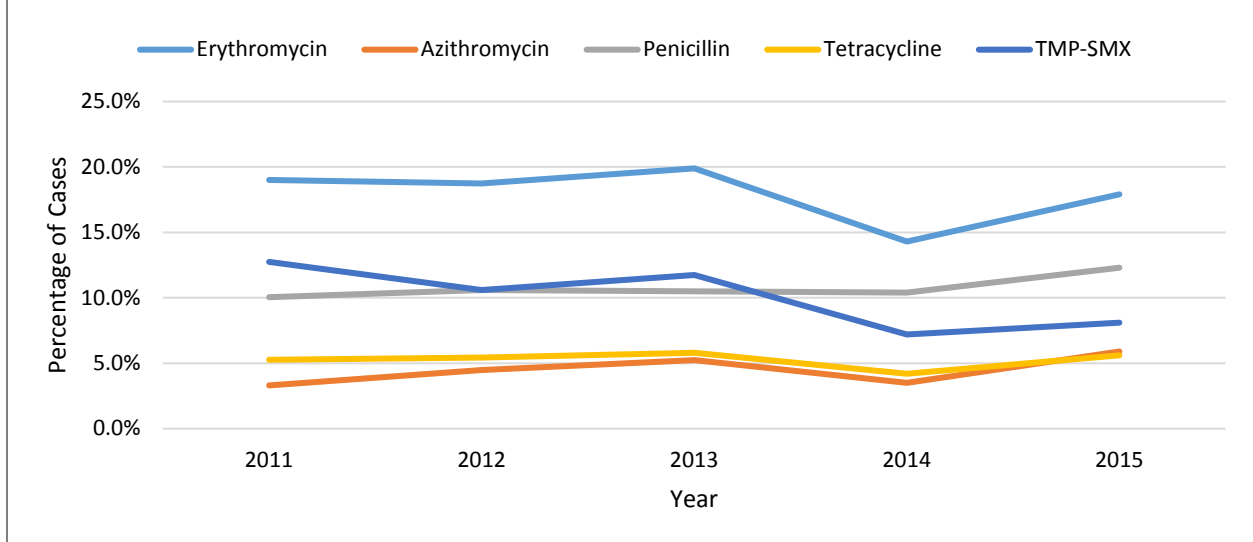


Figure 5: Incidence of Pneumococcal Serotypes in Children Under Age 5 by Vaccine Serotype Group, Indiana, 2011-2015



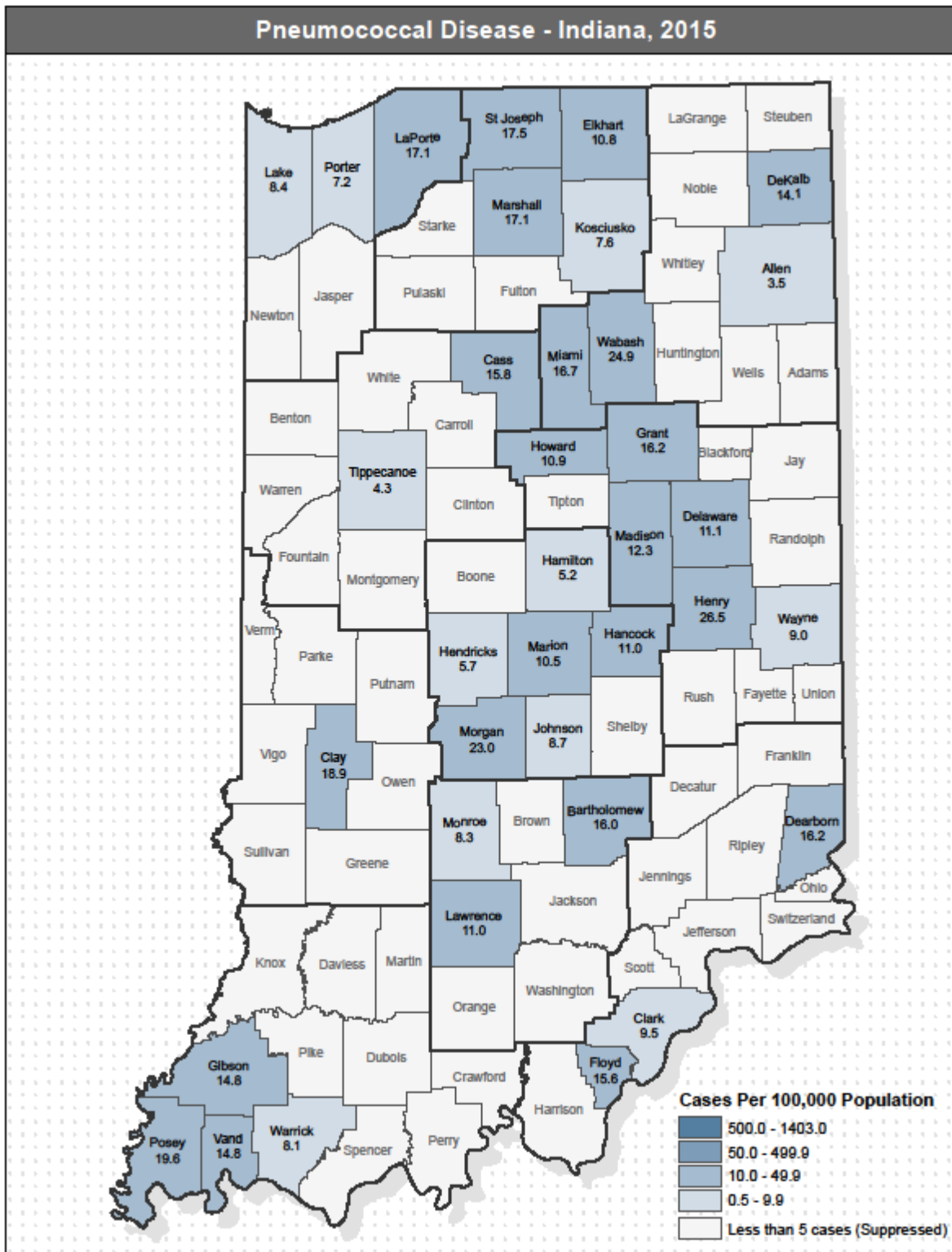
Among cases of all ages, 58.4% presented with pneumococcal bacteremia, 65.6% with pneumococcal pneumonia, and 5.4% with pneumococcal meningitis. Percentages may not sum to 100, as many individuals exhibited multiple presentations. In 2015, 197 (31.4%) cases of invasive pneumococcal disease of all ages showed some degree of resistance to at least one antibiotic. The odds of dying after invasive pneumococcal infection were 1.37 times higher for persons infected with bacteria resistant to at least one antibiotic compared to those infected with completely susceptible bacteria. Patterns of resistance in pneumococcal bacteria have changed from 2011-2015 (Figure 6). Trimethoprim-sulfamethoxazole (TMP-SMX) resistance has declined from 2011 to 2015, while erythromycin resistance remains high and penicillin resistance is increasing.

Figure 6: Antibiotic Nonsusceptibility by Year, Indiana, 2011-2015



In 2015, 76 counties reported at least one case, and 37 counties reported five or more cases of invasive pneumococcal disease (Figure 7). The incidence rates were highest among the following counties reporting five or more cases: Henry (26.5), Wabash (24.9) and Morgan (23.0). Some of the rates are based on fewer than 20 counts and should be considered unstable.

Figure 7.



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

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

<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, polio transmission has never been interrupted in two countries: Afghanistan 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 oral-oral 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 detect importation of wild poliovirus into the U.S. and 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. 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 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.

Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report polio immediately to the local health department or the ISDH. Laboratories are also required to report positive results of polio weekly to the ISDH.

Healthy People 2020 Goal

The Healthy People 2020 Goal for polio is to eliminate all U.S.-acquired paralytic 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. Polio is still endemic in Afghanistan and Pakistan.

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

<http://wwwnc.cdc.gov/travel/yellowbook/2014/chapter-3-infectious-diseases-related-to-travel/poliomyelitis>

<https://www.cdc.gov/polio/>

<https://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.

Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report psittacosis within 72 hours to the local health department or the ISDH. Laboratories are also required to report positive results of *Chlamydophila psittaci* weekly to the ISDH.

Healthy People 2020 Goal

There is no Healthy People 2020 Goal for psittacosis.

Epidemiology and Trends

No cases of psittacosis were reported in Indiana in 2015 and no cases of psittacosis were reported during the five-year period 2011-2015.

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.

Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report Q fever immediately to the local health department or the ISDH. Laboratories are also required to report positive results of *Coxiella burnetii* weekly to the ISDH.

Healthy People 2020 Goal

There is no Healthy People 2020 Goal for Q fever.

Epidemiology and Trends

One case of Q fever was reported in Indiana in 2015 and eight cases were reported during the five-year reporting period from 2011-2015.

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

<http://www.cdc.gov/qfever/index.html>

*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, several 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. 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 the past. In 2015, 1,091 animals of various species were tested for rabies in Indiana, and 13 tested positive. All were bats.

Public Health Significance

In humans, early symptoms of rabies infection are non-specific but may be similar to influenza (the flu) and may include headache, fever and malaise. As the disease rapidly progresses, symptoms include numbness/tingling at the site of the bite, 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 one to three months after exposure.

Rabies post-exposure prophylaxis is available in the form of immunoglobulin and vaccination. Treatment has not been shown to be effective if given 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.

Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report rabies immediately to the local health department or the ISDH. Use of rabies prophylaxis should also be reported to the local health department or the ISDH after being administered.

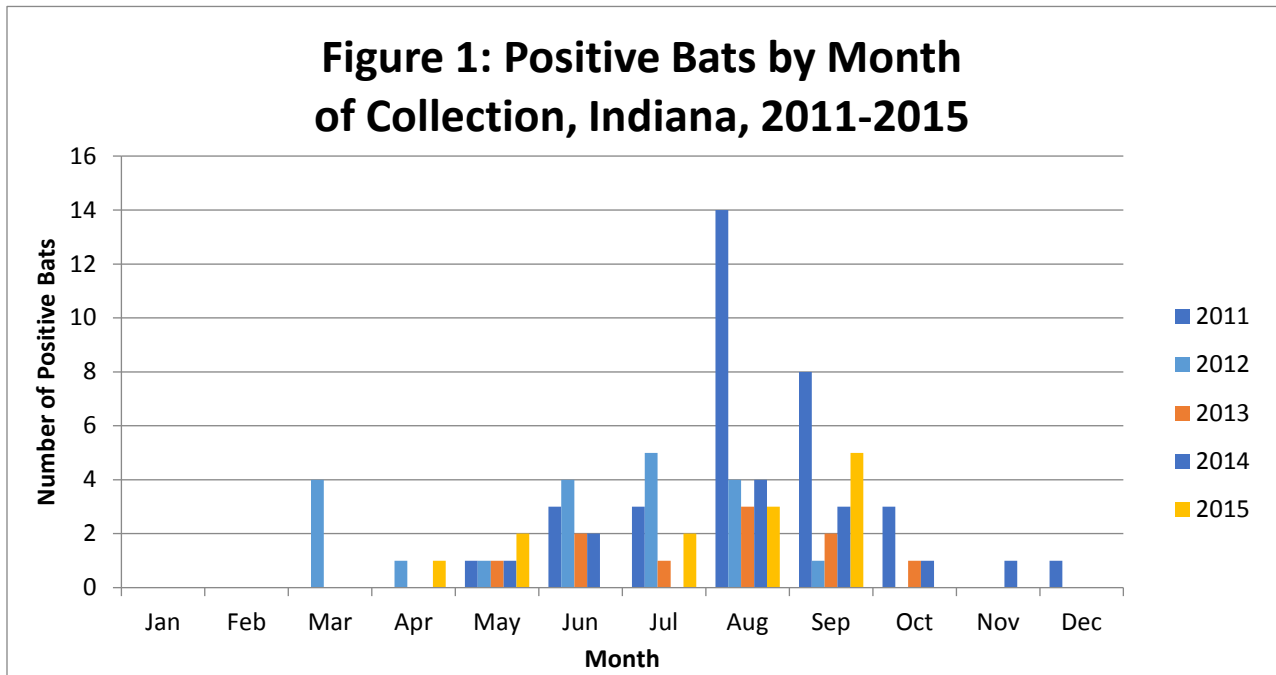
Healthy People 2020 Goal

There is no Healthy People 2020 Goal for rabies.

Epidemiology and Trends

Rabies is a rare disease of humans in the United States; no human cases were reported in Indiana in 2015 or in the five-year reporting period from 2011-2015. Since 1990, bats have been the predominant species testing positive for rabies at the ISDH Laboratory (the only Indiana laboratory that performs rabies testing). Bats continued that trend in 2015, being the only animal species found positive: 13 bats tested positive in 2015 and 88 bats tested positive from 2011-2015. The peak months for positive bats in 2015 were August and September (see [Figure 1](#)). The last domestic animal to be infected was a horse in 2002 that was found to have a bat strain of rabies virus. The most recent human rabies case in Indiana was also infected with a bat strain of the virus.

Figure 1: Positive bats by month of collection, Indiana, 2011-2015.



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/pdf/10.2460/javma.243.6.805>.

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.

According to the Centers for Disease Control and Prevention, patients with a particularly severe infection requiring prolonged hospitalization may have long-term health problems caused by this disease.

Rickettsia rickettsii infects the endothelial cells that line the blood vessels. The damage that occurs in the blood vessels results in a disease process called a "vasculitis," and bleeding or clotting in the brain or other vital organs may occur. Loss of fluid from damaged vessels can result in loss of circulation to the extremities, and damaged fingers, toes or even limbs may ultimately need to be amputated. Patients who suffer this kind of severe vasculitis in the first two weeks of illness may also be left with permanent long-term health problems such as profound neurological deficits, or damage to internal organs. Those who do not have this kind of vascular damage in the initial stages of the disease typically recover fully within several days to months.

Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report Rocky Mountain spotted fever within 72 hours to the local health department or the ISDH. Laboratories are also required to report positive results of *Rickettsia* species weekly to the ISDH.

Healthy People 2020 Goal

There is no Healthy People 2020 Goal for RMSF.

Epidemiology and Trends

In 2015, 30 cases of Rocky Mountain spotted fever were reported in Indiana. During the five-year period 2011-2015, 155 cases of RMSF were reported in Indiana. 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.

Figure 1: Rocky Mountain Spotted Fever Cases by Year, Indiana, 2011-2015

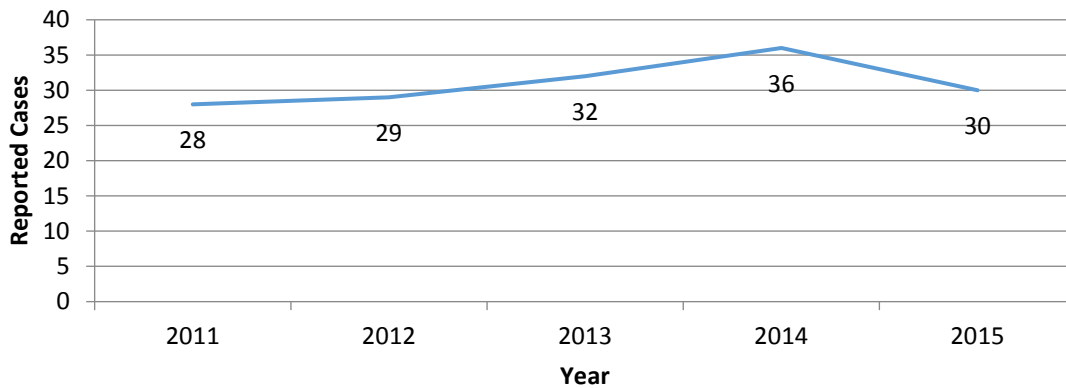
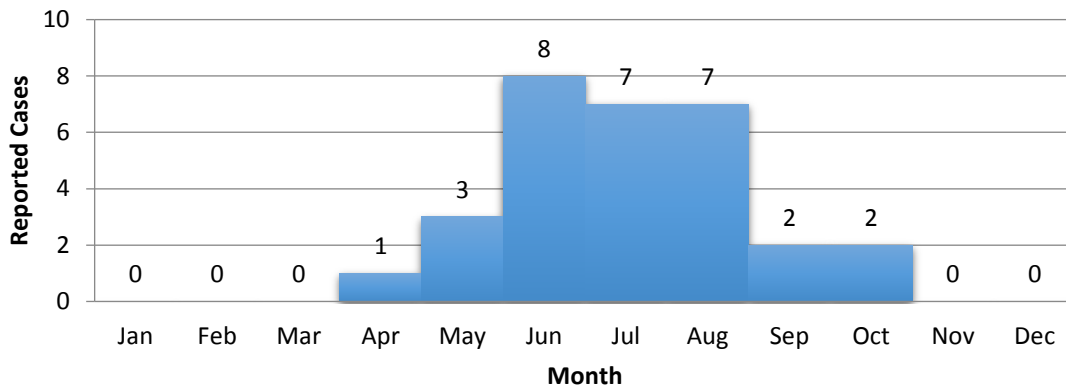


Figure 2: Rocky Mountain Spotted Fever Cases by Month, Indiana, 2015



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. Humans are the only reservoir for rubella.

Public Health Significance

Symptoms of rubella include rash, low-grade fever, malaise, lymphadenopathy and upper respiratory symptoms. Arthralgia may occur in persons who develop rubella, but is most common among women. Symptoms of rubella typically appear 12-23 days after exposure, and as many as 50 percent of infections may be subclinical or unapparent. In children and adults, rubella generally is a mild illness. Rare complications include thrombocytopenic purpura and encephalitis.

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 of the fetus, 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 and is the reason why routine rubella screening is conducted for pregnant women in the United States.

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 at 12-15 months of age, while a second dose is routinely administered at 4-6 years of age. Children and adults who have not received two doses of MMR vaccine should receive two doses at least 28 days apart. Healthcare workers, students of post-secondary educational institutions, and international travelers are considered at highest risk for rubella transmission and should be vaccinated with two doses of MMR.

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.

Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report rubella immediately to the local health department or the ISDH. Laboratories are also required to report positive results of rubella weekly to the ISDH.

Healthy People 2020 Goal

The Healthy People 2020 Goal for congenital rubella syndrome is to eliminate all cases of CRS from children less than one year of age. The Healthy People 2020 Goal for rubella is 10 U.S.-acquired cases per year. Indiana met this goal during the five-year reporting period 2011-2015, as only one case was reported in Indiana in 2012, but it is unknown where the case acquired the disease.

Epidemiology and Trends

No cases of rubella were reported in Indiana in 2015. Aside from one case in 2012, no other cases of rubella have been reported in Indiana since 1999.

You can learn more about rubella by visiting the following website:

<https://www.cdc.gov/rubella/>

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

SALMONELLOSIS

Salmonellosis is a contagious disease caused by *Salmonella* bacteria, which are found in the intestines of many healthy animals, including poultry, farm animals (e.g., cattle, pigs, chicks, ducklings), domestic animals (e.g., dogs, cats, 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).

Historically, widespread salmonellosis outbreaks have been linked to the consumption of eggs, poultry, ground beef, tomatoes, leafy greens, melons and commercially processed foods. Contact with live animals, such as poultry or reptiles, or dried pet food/treats have been associated with widespread salmonellosis outbreaks. Persons who work in certain occupations (food handlers, daycare providers, and health care providers) have a greater risk of transmitting infection to others.

Public Health Significance:

Symptoms of salmonellosis may include diarrhea, stomach cramps, fever, nausea or vomiting. Symptoms usually begin 12-36 hours (range of 6-72 hours) after exposure. Infected people may carry *Salmonella* in their bodies for weeks or months without symptoms and unknowingly infect others. Rarely, *Salmonella* can enter the blood stream and infect organs such as the heart, lungs and bones. Death from salmonellosis is rare. Children under age 5 years, 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:

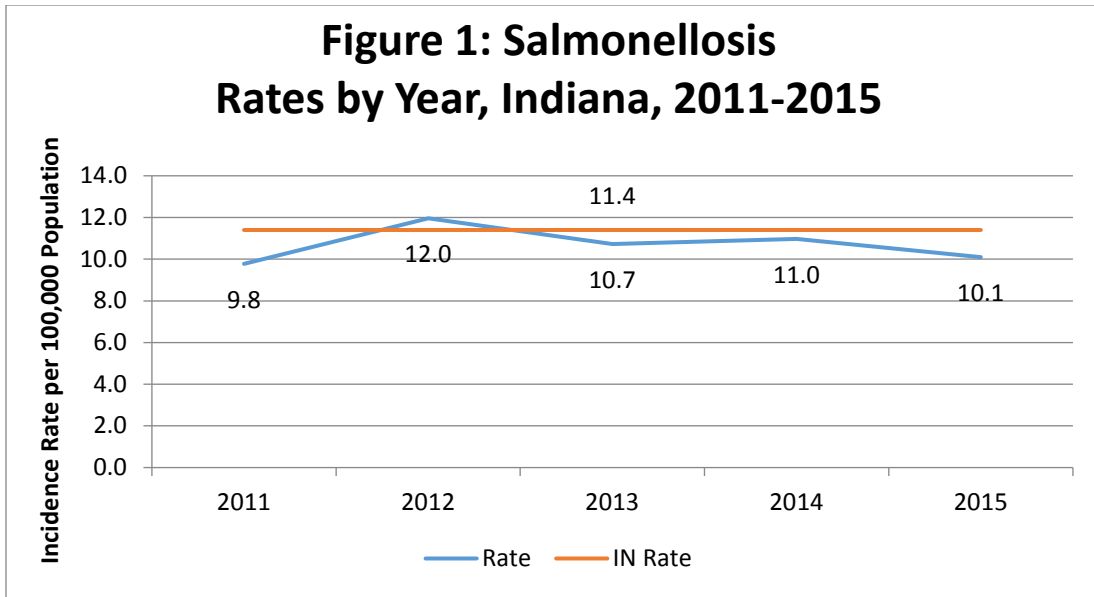
- Practice good hygiene:
 - Thoroughly wash hands with soap and water after using the restroom; after assisting someone with diarrhea and/or vomiting; after swimming; before, during and after food preparation; and after exposure to raw meat products.
 - Wash hands, kitchen work surfaces, and utensils with soap and warm water **immediately** after contact with raw meat or poultry.
 - Wash hands with soap after handling reptiles, birds, or baby chicks, and after contact with pet feces.
 - 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 barbecue 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 two 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 – beef, pork, veal, and lamb (steaks, chops, or roasts); ham (fresh or smoked); fish; and shellfish

- 160°F – ground meats and eggs
 - 165°F – all poultry, leftovers and casseroles
 - Reheat cooked hams packaged in USDA-inspected plants to 140°F and all others to 165°F.
- 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.
- Exercise caution around infants and other high-risk individuals.
 - Be particularly careful with foods prepared for infants, the elderly and the immunocompromised.
 - Avoid direct or even indirect contact between reptiles (e.g., turtles, iguanas, other lizards, snakes) and infants or immunocompromised persons. Do not wash cages or tanks in sink or tub.
 - Do not work with raw poultry or meat and an infant (e.g., feed, change diaper) at the same time.
 - Mother's milk is the safest food for young infants. Breastfeeding prevents salmonellosis and many other health problems.
- Exclusions:
 - 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.

Reporting Requirements According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report salmonellosis within 72 hours to the local health department or the ISDH. Laboratories are also required to report positive results of salmonellosis weekly to the ISDH. In addition, for *Salmonella* isolated from stool, urine, blood or other sterile sites, laboratories are required to submit isolates received to the ISDH Laboratory for further confirmation and subtyping.

Healthy People 2020 Goal

The Healthy People 2020 Goal for salmonellosis is 11.4 cases per 100,000 population per year. Indiana met this goal in 2011, 2013, and 2014 during the five-year reporting period 2010-2014 ([Figure 1](#)).



Epidemiology and Trends

In 2015, 668 cases of salmonellosis were reported in Indiana, for a rate of 10.09 cases per 100,000 population (Table 1). Females (10.87) were more likely to be reported with salmonellosis than males (9.29). The proportion of other races (10.28) was greater than blacks (8.48) or whites (6.93); however, 189 cases did not report race data.

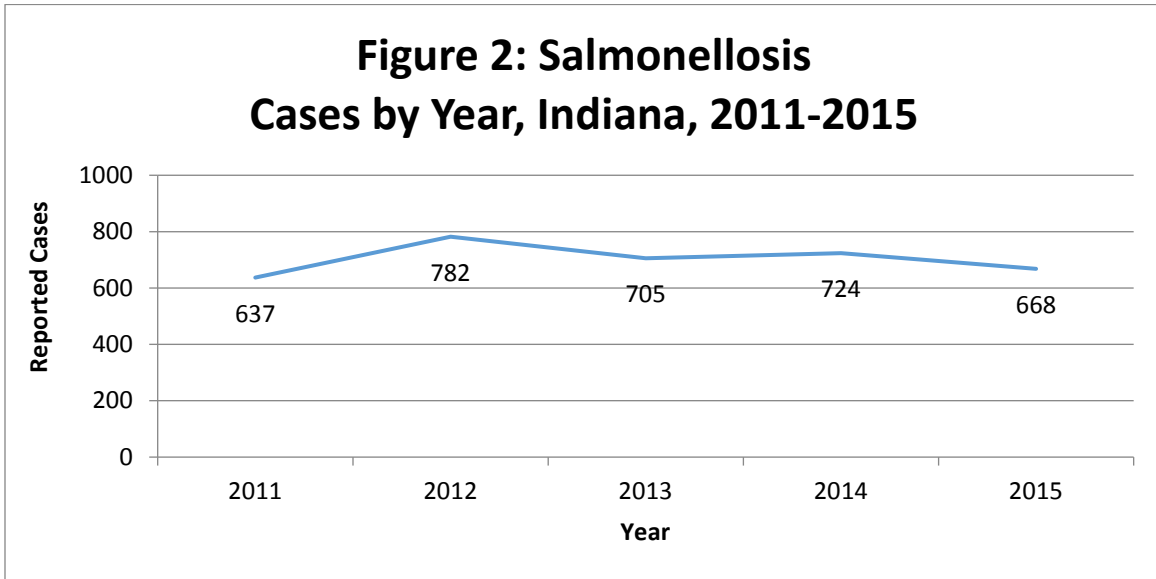
Table 1: Salmonellosis case rate by race and sex, Indiana, 2015

	Cases	Rate*	2011 - 2015 Total
Indiana	668	10.09	3,516
Race			
Black	54	8.48	181
White	394	6.93	2,229
Other	31	10.28	141
Not Reported	189	-	965
Sex			
Female	365	10.87	1,917
Male	303	9.29	1,588
Unknown	-	-	11

*Rate per 100,000 population based on U.S. Census Bureau's population data as of July 6, 2016.

*Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

Figure 2 shows the number of reported cases for 2011-2015.



The incidence of salmonellosis was greatest during the summer months of 2015 (Figure 3).

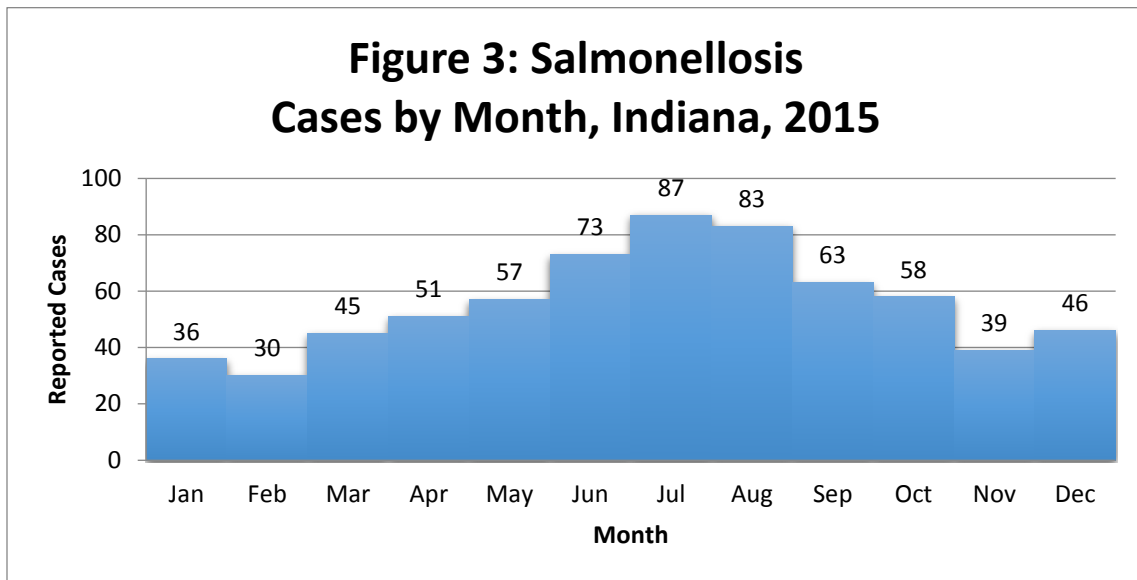
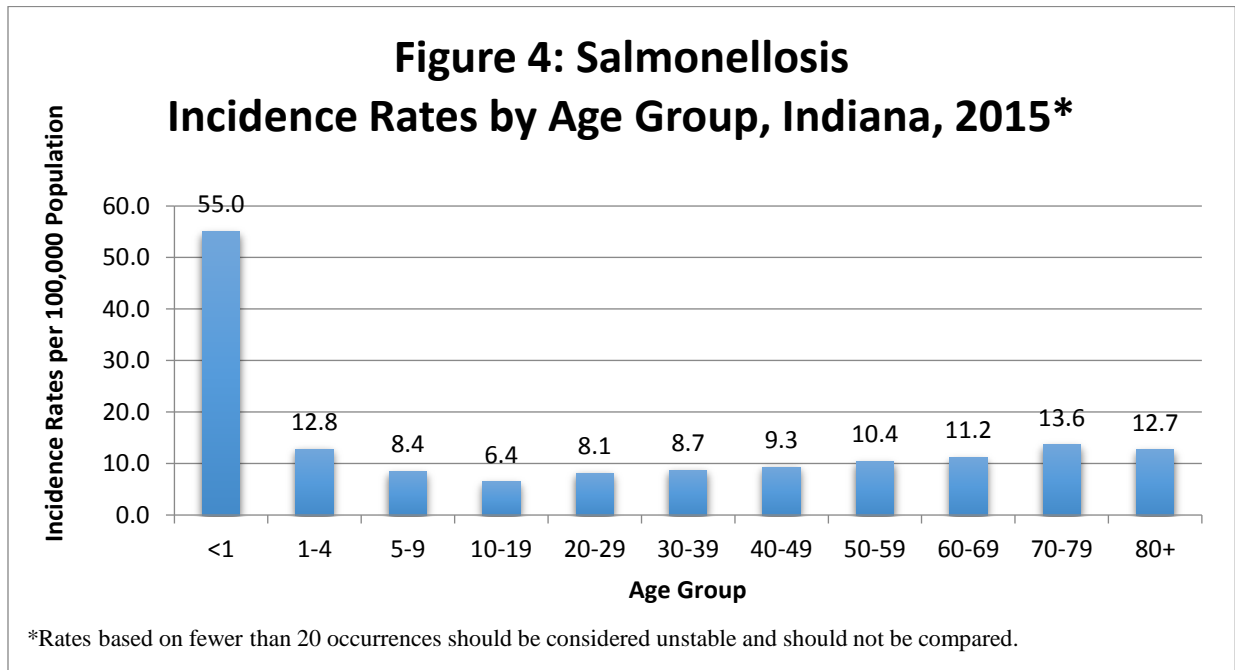


Figure 4 shows age-specific rates in 2014 were greatest among infants less than 1 year of age (55.0).



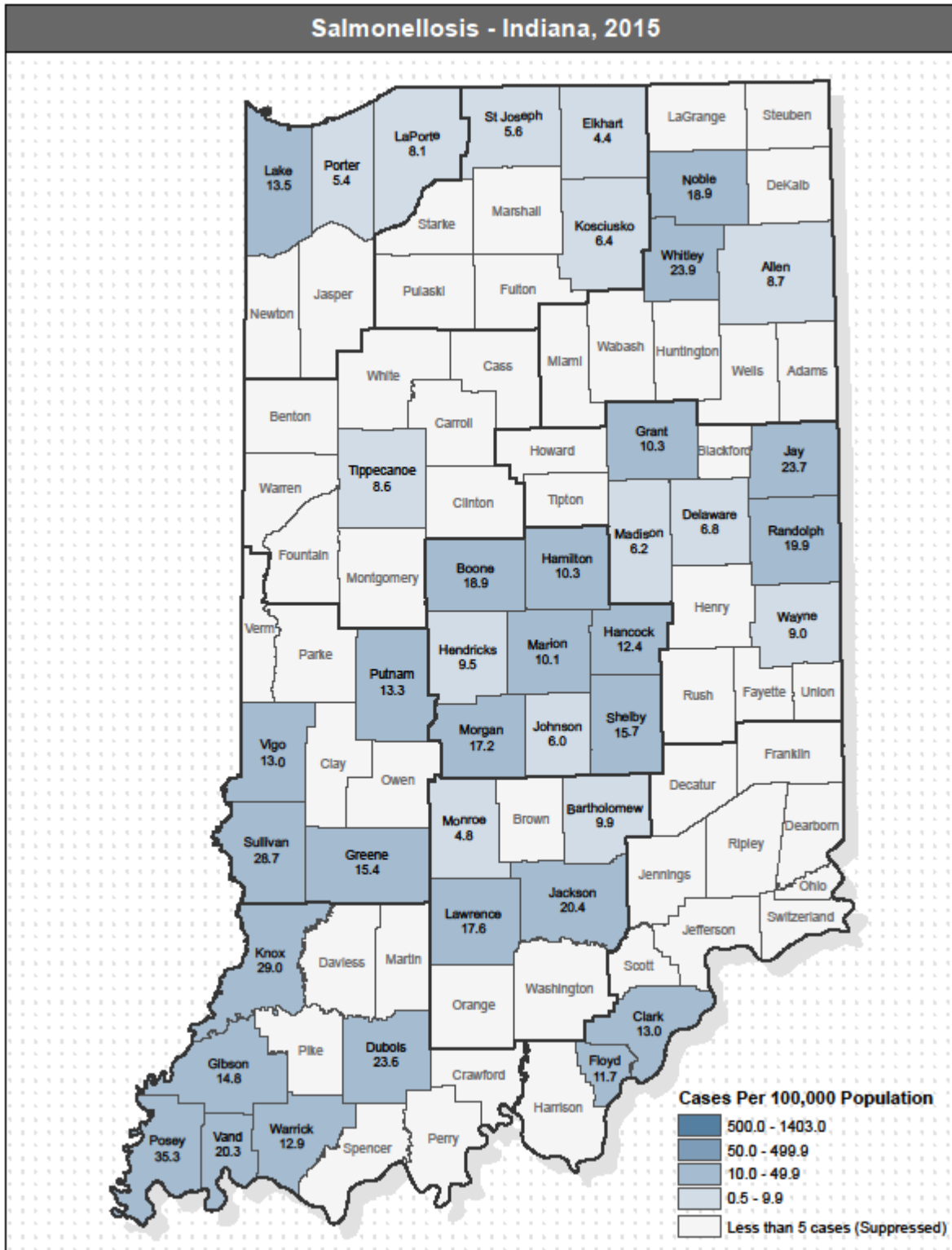
Over 2,500 different *Salmonella* serotypes exist and differ in somatic and flagellar antigens. Table 2 shows the top three *Salmonella* serotypes in Indiana from the 660 isolates of *Salmonella* species tested in 2015.

Table 2: Top Three Reported Serotypes for Salmonellosis Cases, Indiana, 2015

Serotype	Number	Percent
Enteritidis	168	25.5%
Typhimurium	79	12.0%
I 4,5:i:-	47	7.1%

Figure 5 shows Indiana counties reporting five or more cases. The following counties had the highest incidence rates of salmonellosis in 2015: Posey (35.3), Knox (29.0), Sullivan (28.7), Whitley (23.9), Jay (23.7), Dubois (23.6), Jackson (20.4), and Vanderburgh (20.3). Some of the rates are based on fewer than 20 counts and should be considered unstable.

Figure 5.



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

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

SHIGELLOSIS

Shigellosis is a contagious diarrheal illness caused by *Shigella* bacteria. *Shigella* bacteria are found only in humans. There are four species of *Shigella* bacteria: *sonnei*, *flexneri*, *boydii* and *dysenteriae*. *Shigella sonnei* is the most common species identified in the U.S. and Indiana; other species are most often associated with travel to endemic countries. *Shigella* is very easily passed from person to person. Shigellosis can be very serious in infants, elderly individuals, 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.

Persons who work in certain occupations, such as food handlers, daycare providers and healthcare providers, have a greater risk of transmitting infection to others. Children are especially prone to shigellosis due to poor hand washing habits and the tendency to put their hands or objects in their mouths.

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 five days) after exposure and last about 4-7 days. Some people may have no symptoms but can still spread the infection to others. Antibiotics can be used to treat shigellosis. However, some strains of *Shigella* bacteria are resistant to certain antibiotics.

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.
- Exclusions:
 - 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.
 - Persons employed in retail food establishments with diarrhea and/or vomiting should be excluded from the establishment.

Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report shigellosis immediately to the local health department or the ISDH. Laboratories are also required to report positive results of shigellosis weekly to the ISDH.

Healthy People 2020 Goal

There is no Healthy People 2020 Goal for shigellosis.

Epidemiology and Trends

In 2015, 278 cases of shigellosis were reported in Indiana, for a case rate of 4.20 cases per 100,000 population (Table 1). Males (3.89) were less likely to be reported than females (4.50). The rate of illness among blacks (10.21) was higher than the rate for other races (2.99) and whites (2.83); however, 43 cases did not report race data. The number of shigellosis cases in 2014 was much higher than is typically seen due to a large outbreak in Indiana.

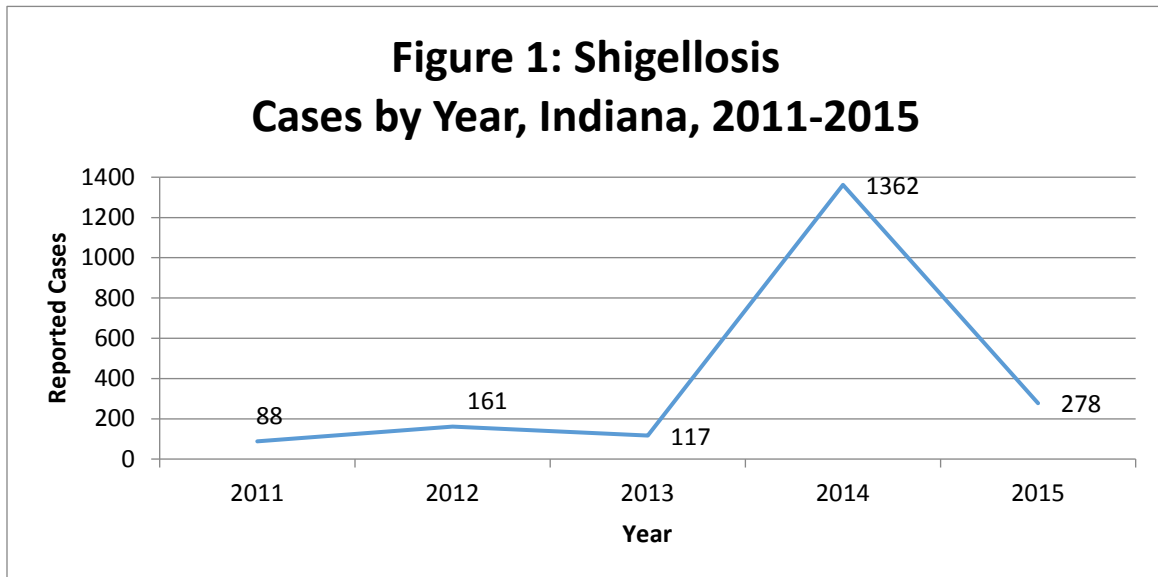
Table 1: Shigellosis case rate by race and sex, Indiana, 2015

	Cases	Rate*	2011 - 2015 Total
Indiana	278	4.20	2,006
Race			
Black	65	10.21	736
White	161	2.83	868
Other	9	2.99	103
Not Reported	43	-	299
Sex			
Female	151	4.50	1,099
Male	127	3.89	905
Unknown	-	-	2

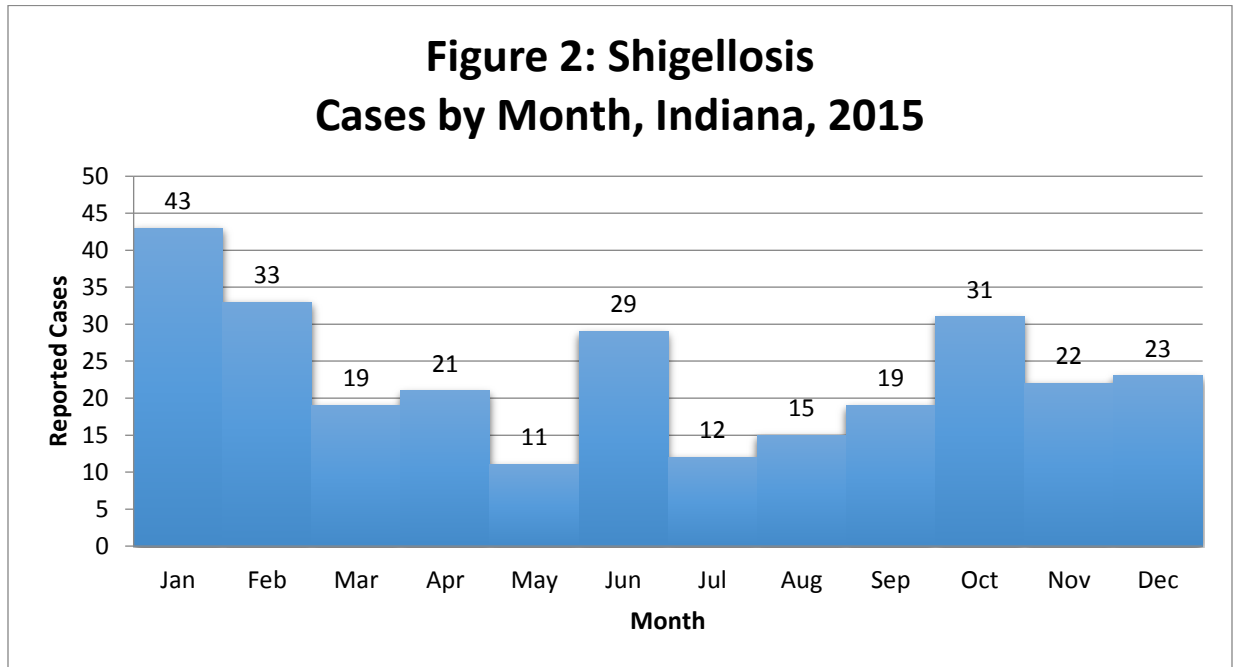
*Rate per 100,000 population based on U.S. Census Bureau's population data as of July 6, 2016.

*Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

Figure 1 shows the number of reported cases per year for 2011-2015.



The incidence of shigellosis was highest in January of 2015 (Figure 2).



As shown in Figure 3, age-specific rates were highest among preschoolers ages 1-4 years (19.6), children ages 5-9 years (16.2), and individuals between the age 30 and 39 (4.6).

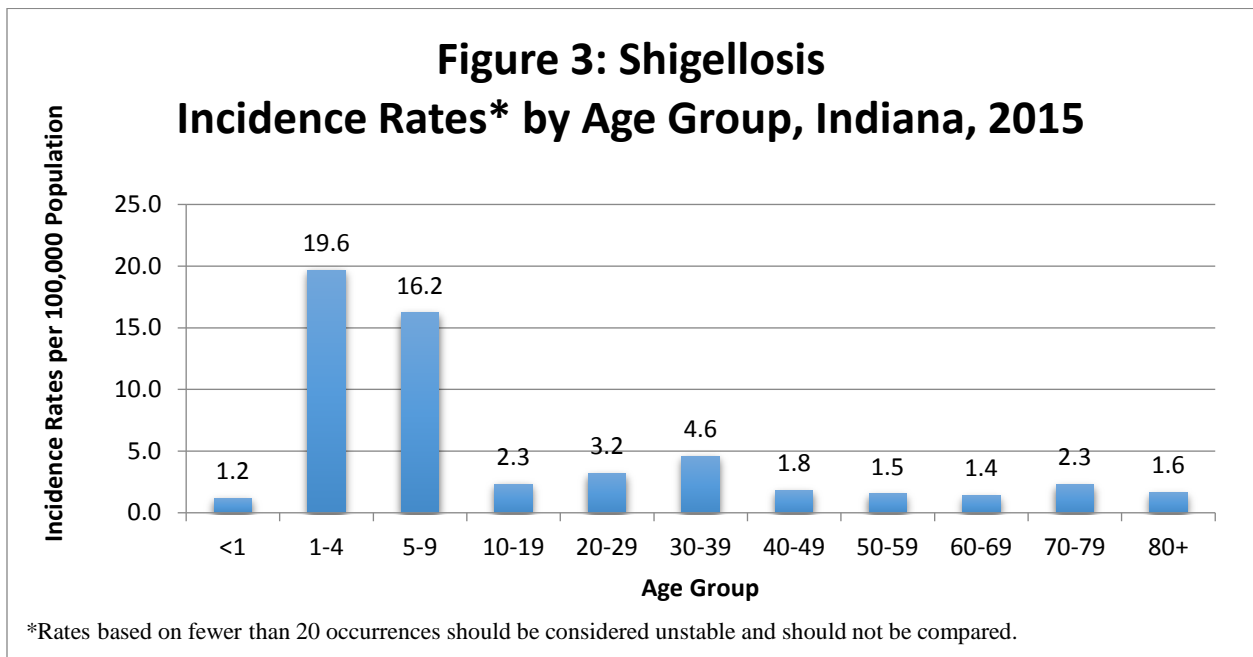
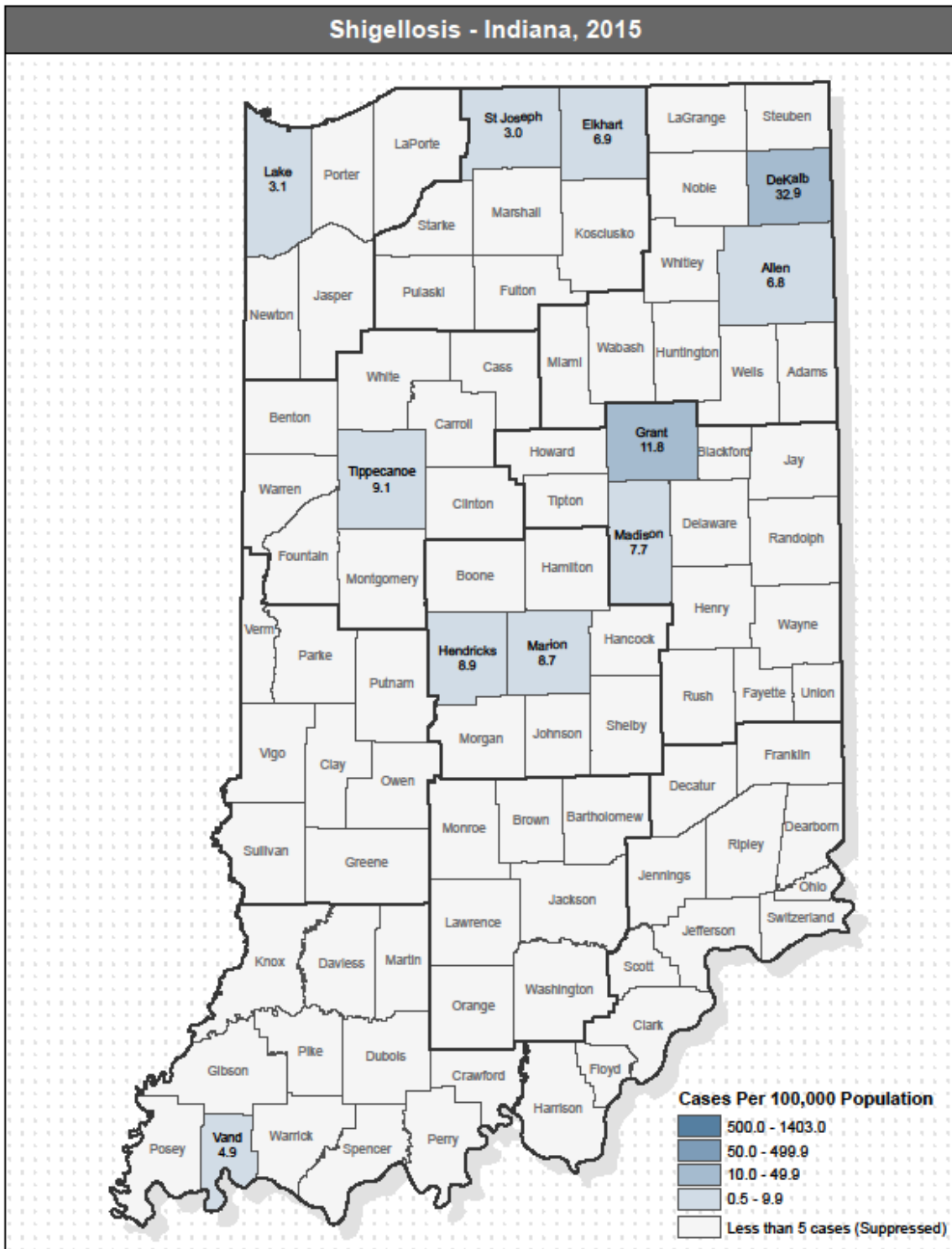


Figure 4 shows Indiana counties reporting five or more cases. The incidence rate was highest in DeKalb County (32.9) among counties reporting five or more cases. Some of the rates are based on fewer than 20 counts and should be considered unstable.

Figure 4.



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

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

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 fatality rate for smallpox is about 30 percent. The last case of smallpox worldwide was identified in 1977 and the last case of smallpox in the U.S. was reported in 1949. Smallpox disease was declared to be eradicated worldwide in 1980.

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. Because initial presentation of smallpox is similar to other rash illnesses, it may not be diagnosed until other differential diagnoses are ruled out by physicians. In light of the seriousness of the disease and the security threat it poses, it is important that physicians understand and recognize the symptoms of smallpox and diagnose accordingly, especially in individuals at greater risk as bioterrorism targets.

Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report suspicion of smallpox immediately to the local health department or ISDH.

Healthy People 2020 Goal

There is no Healthy People 2020 Goal for smallpox.

Epidemiology and Trends

In Indiana, no cases of smallpox have been reported in more than 60 years.

You can learn more about smallpox by visiting the following websites:

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

*Bioterrorism Agent List:

<http://emergency.cdc.gov/agent/agentlist.asp>.

STREPTOCOCCUS, GROUP A (INVASIVE DISEASE)

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 disease") is a rapidly progressive infection that destroys muscle, fat, and skin tissue. Streptococcal toxic shock syndrome (STSS) causes 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 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, long term care, 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 handwashing 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. Healthcare 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 streptococcal invasive disease at 3.7 cases per 100,000 population, <http://www.cdc.gov/abcs/reports-findings/survreports/gas13.html>.

Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report GAS within 72 hours to the local health department or the ISDH. Laboratories are also required to report positive results of GAS weekly to the ISDH.

Healthy People 2020 Goal

There is no Healthy People 2020 Goal for invasive GAS infections.

Epidemiology and Trends

In 2015, 201 cases of invasive GAS disease were reported in Indiana, for a rate of 3.04 cases per 100,000 persons (Table 1). Incidence rates for males (2.42) and females (3.63) were similar. Race listed as other

(2.99) had a higher rate than whites (2.60) and blacks (2.51), although low case numbers among minorities make rate comparisons problematic from year to year. Of these cases, 10 percent (21/201) had manifestations of streptococcal toxic shock syndrome (STSS). Prior to 2007, confirmed cases of STSS 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.

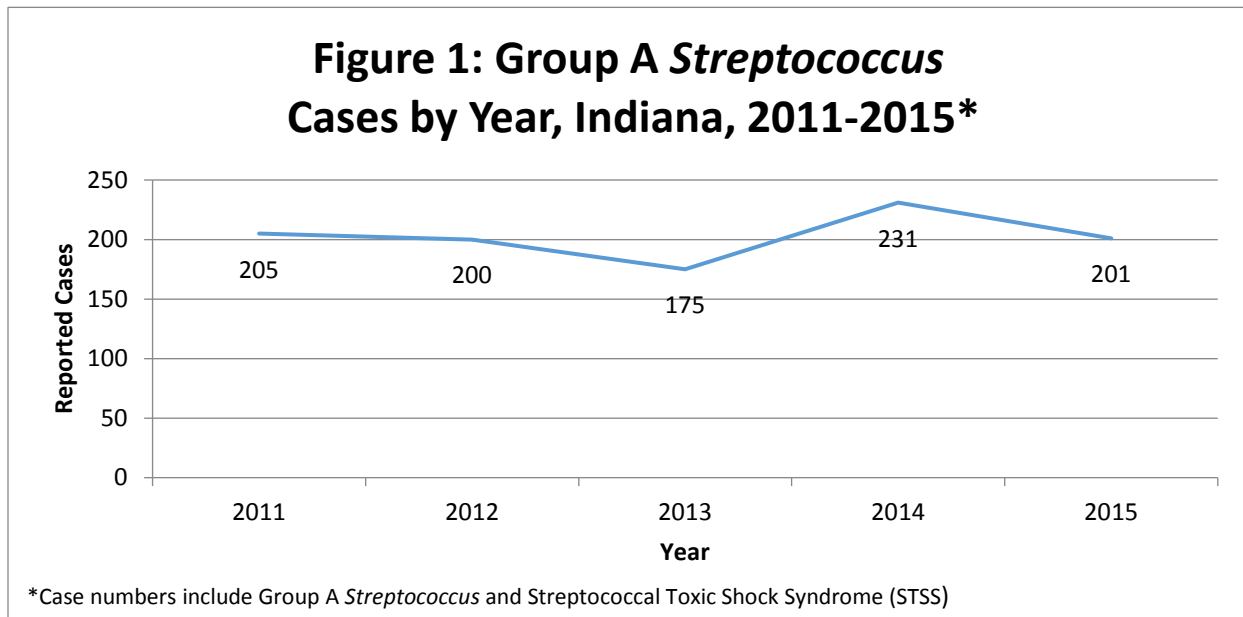
Table 1: Group A *Streptococcus* case rate by race and sex, Indiana, 2015

	Cases	Rate*	2011 – 2015 Total
Indiana	201	3.04	1,012
Race			
Black	16	2.51	104
White	148	2.60	721
Other	9	2.99	31
Not Reported	28	-	156
Sex			
Female	122	3.63	539
Male	79	2.42	473
Unknown	0	-	0

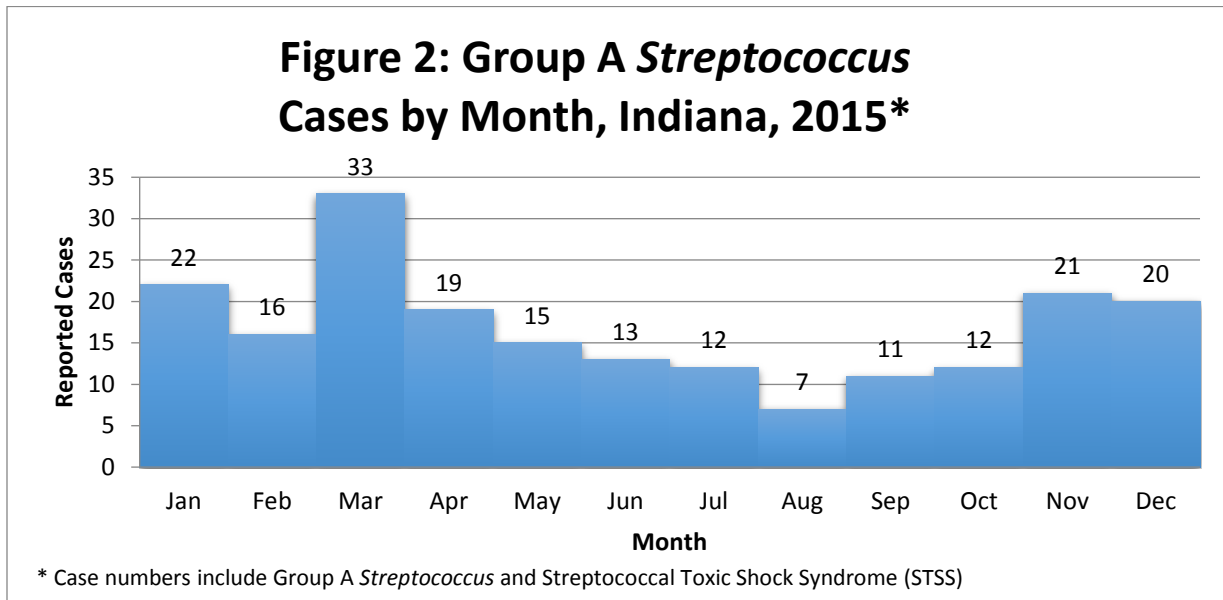
*Rate per 100,000 population based on U.S. Census Bureau’s population data as of July 6, 2016.

*Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

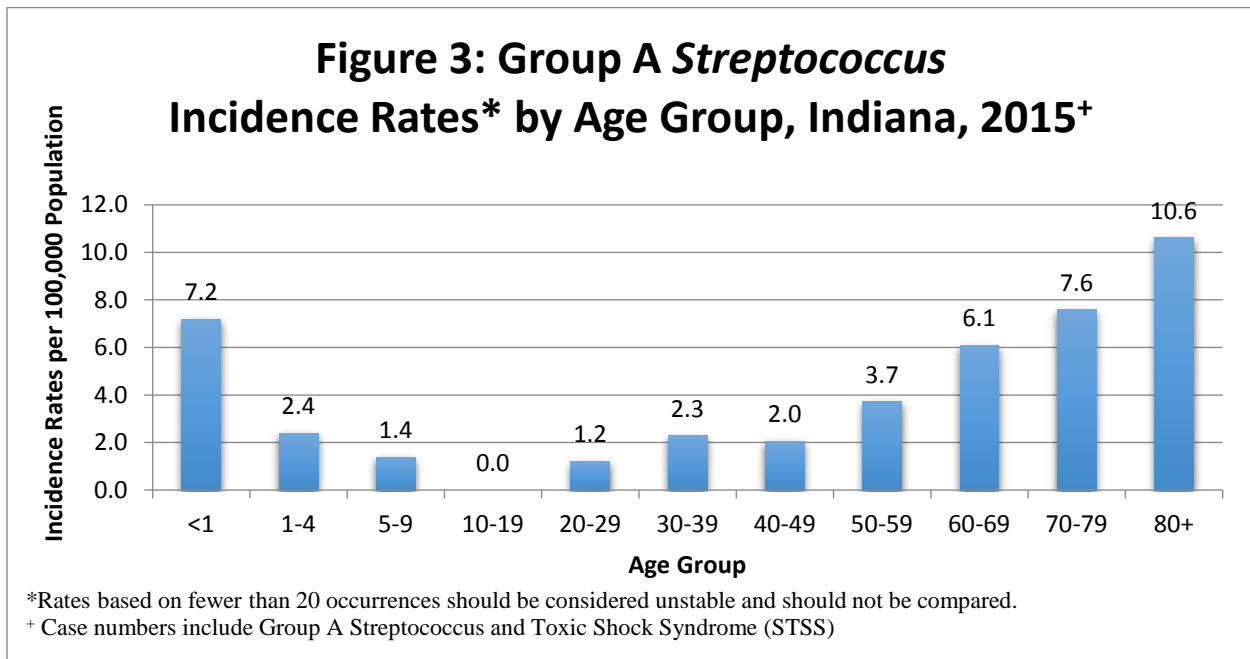
Figure 1 shows reported cases by year for the five-year reporting period 2011-2015.



In 2015, incidence of invasive GAS peaked in the late winter and early spring as shown in [Figure 2](#).

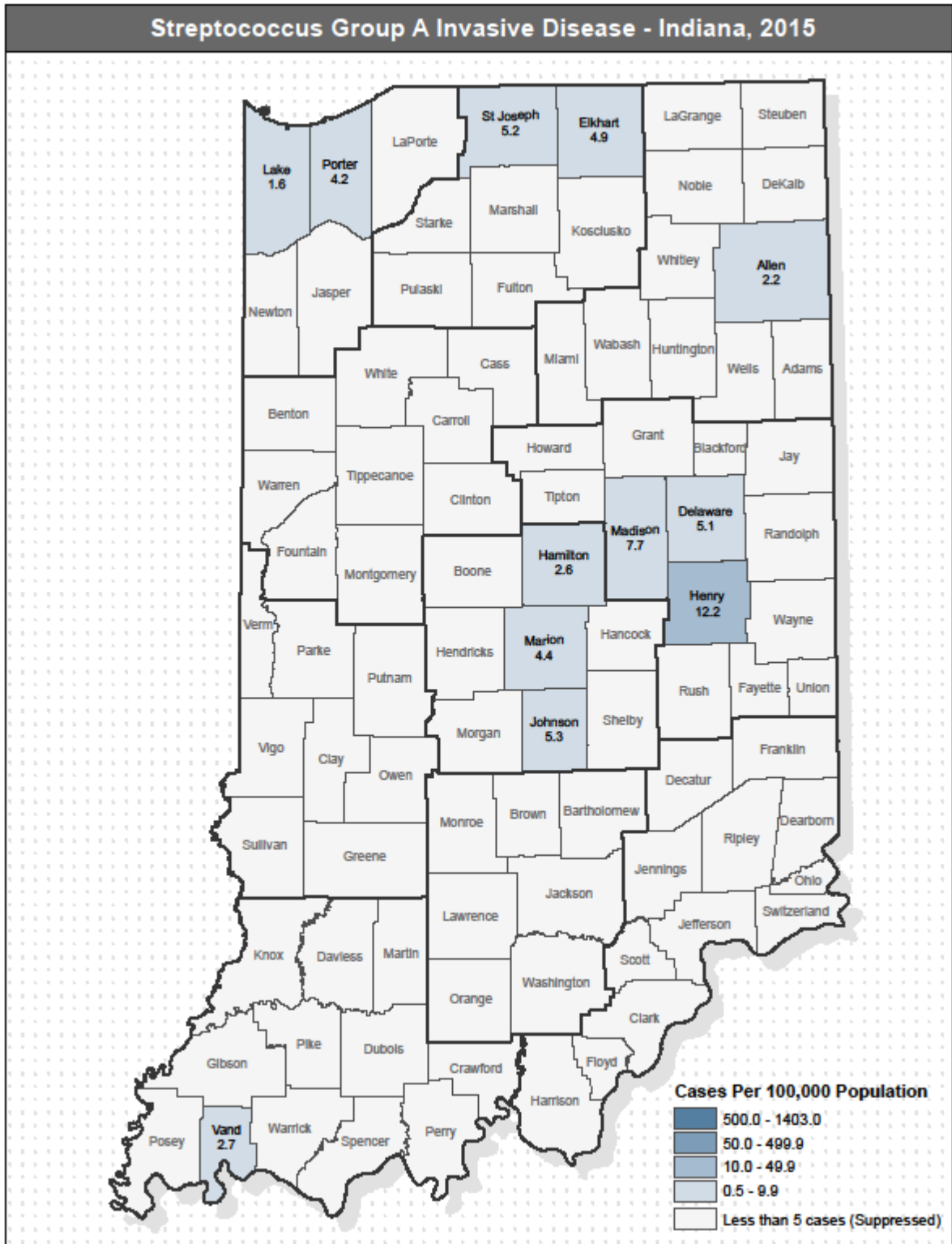


Very young infants and older adults are more likely to suffer from a compromised immune system or have underlying chronic medical conditions, such as diabetes or cancer, which predisposes them to GAS disease. As shown in [Figure 3](#), age-specific incidence rates were greatest for adults over the age of 80 (10.6), followed by adults 70-79 years of age (7.6).



GAS was reported in 52 counties. Incidence rates were highest among the following counties reporting five or more cases during the year: Henry (12.2), Madison (7.7), Johnson (5.3), St. Joseph (5.2), and Delaware (5.1) ([Figure 4](#)). Some of the rates are based on fewer than 20 counts and should be considered unstable.

Figure 4.



You can learn more about group A streptococcal disease by visiting the following website:
<http://www.cdc.gov/groupastrep/about/index.html>.

STREPTOCOCCUS, GROUP B (INVASIVE DISEASE)

Group B streptococcal (GBS) disease is caused by the bacterium *Streptococcus agalactiae* and is manifested as many types of illness, including 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. Approximately 10 percent to 30 percent 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 infections. Only cases of invasive disease are reportable in Indiana.

Public Health Significance

Cases occurring in infants less than six 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

The American College of Obstetricians and Gynecologists (ACOG) and the American Academy of Pediatrics (AAP) guidelines to reduce early-onset GBS disease recommend universal screening (consisting of a urogenital swab) of all women at 35-37 weeks’ gestation for group B strep 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 2013, disease rate is approximately 9.2 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 0.25 cases per 1,000 live births; estimates of late-onset disease were 0.27 cases per 1,000 live births (<http://www.cdc.gov/abcs/reports-findings/survreports/gbs13.html>).

Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3, hospitals and healthcare providers must report GBS within 72 hours to the local health department or the ISDH. Laboratories are also required to report positive results of GBS weekly to the ISDH.

Healthy People 2020 Goal

The Healthy People 2020 Goal for early-onset GBS disease is 0.25 cases per 1,000 live births per year. Indiana met that goal for 2015, with a rate of 0.15 cases of early-onset disease per 1,000 live births (2014 Indiana state natality data). This finding should be interpreted with caution, as 2014 natality data was used in the calculation.

Epidemiology and Trends

In 2015, 427 cases of GBS were reported in Indiana, for a rate of 6.45 cases per 100,000 persons (Table 1). Rates of disease in blacks (6.60) were slightly greater than that of whites (5.49). The rates of males (7.91) exceeded the rate in females (4.97). Thirty-two of the 427 cases occurred in newborns less than 3 months of age, with 13 cases of early-onset disease.

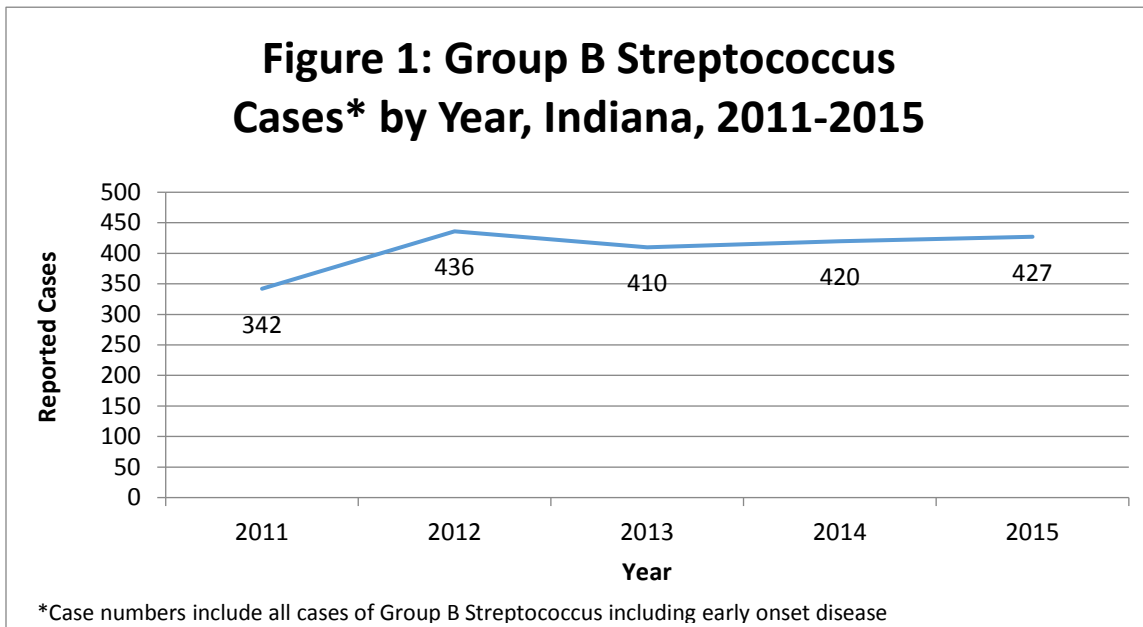
Table 1: Group B Streptococcus case rate by race and sex, Indiana, 2015

	Cases	Rate*	2011 - 2015 Total
Indiana	427	6.45	2,035
Race			
Black	42	6.60	208
White	312	5.49	1428
Other	15	4.98	50
Not Reported	58	-	349
Sex			
Female	167	4.97	887
Male	258	7.91	1144
Unknown	2	-	4

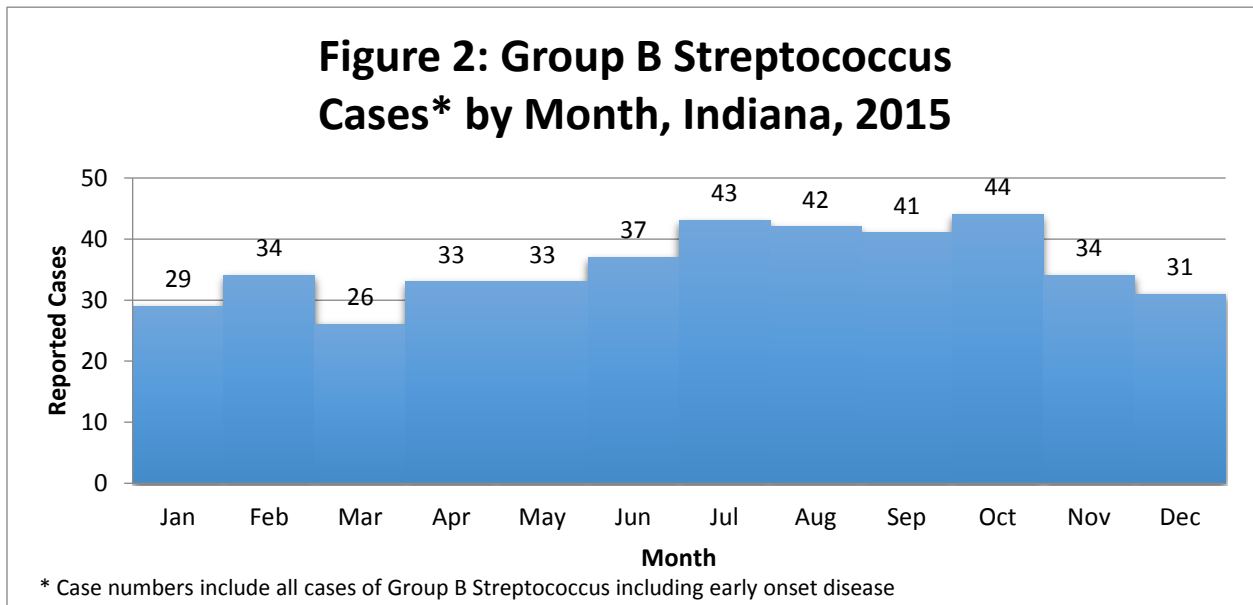
*Rate per 100,000 population based on U.S. Census Bureau’s population data as of July 6, 2016.

*Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

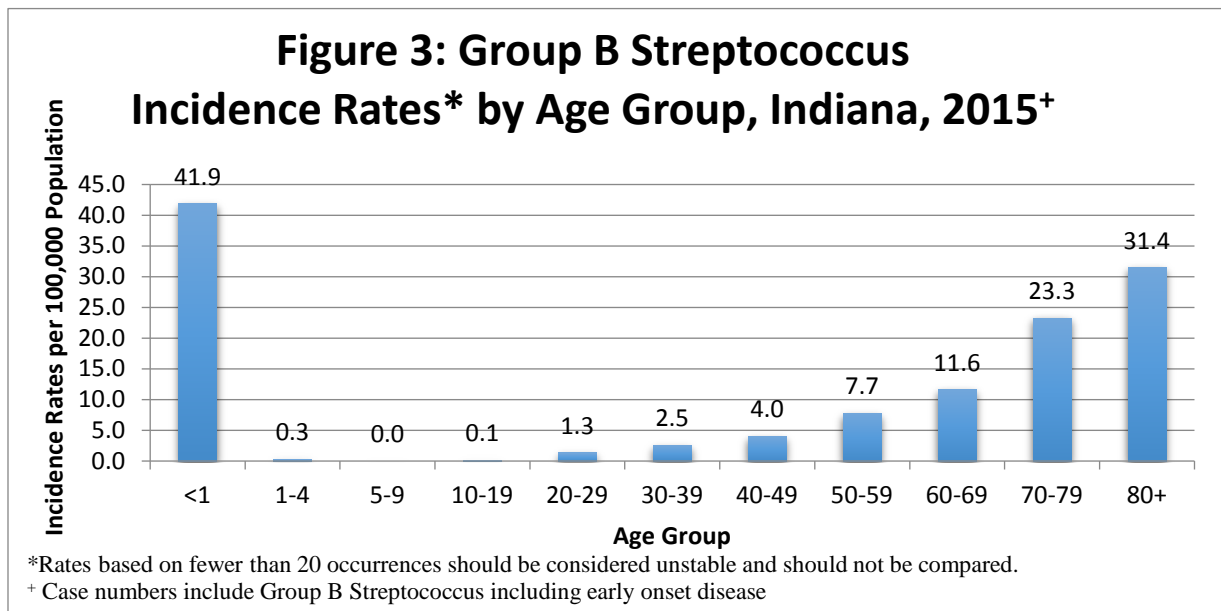
Figure 1 shows reported cases by year for 2011 – 2015. Cases have steadily increased over the last four years; this could be due to electronic reporting.



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

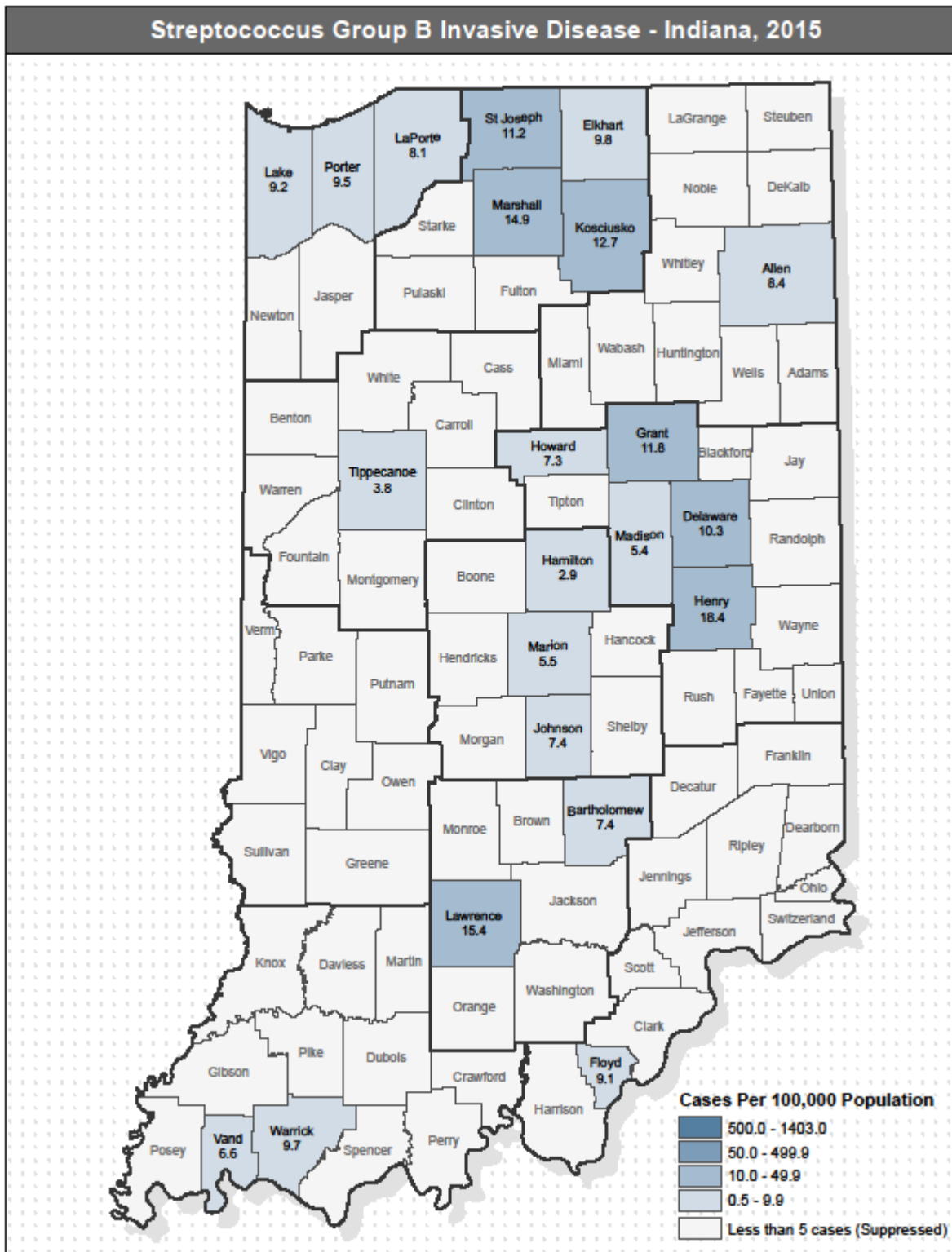


Rates of disease in 2015 were highest among at-risk groups and blacks. Age-specific rates were highest for infants less than 1 year of age (41.9), followed by older adults ages 70-79 years (23.3) and adults at least 80 years old (31.4) as demonstrated in [Figure 3](#).



Twenty-two counties reported five or more cases during the year. Incidence rates were highest among the following counties reporting five or more cases: Henry (18.4), Lawrence (15.4), Marshall (14.9), Kosciusko (12.7), Grant (11.8), St. Joseph (11.2) and Delaware (10.3) ([Figure 4](#)). Some of the rates are based on fewer than 20 counts and should be considered unstable.

Figure 4.



You can learn more about group B streptococcal infections by visiting the following websites:

<http://www.in.gov/isdh/25426.htm>

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

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 occurs primarily through contaminated wounds.

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 and tetanus immune globulin or equine antitoxin are available for treatment of tetanus.

The most effective prevention for tetanus is vaccination. The typical series of vaccinations for tetanus (for children seven years old and younger) is five doses of DTaP vaccine given at 2, 4, 6, and 15-18 months, and 4-6 years of age. Unvaccinated adults and children 7 years of age and older require three vaccinations. Both adults and children should receive a Tdap dose and then Td boosters every 10 years following completion of the Tdap dose. It is recommended that one dose of Td be replaced with Tdap vaccine to protect against pertussis. Prior to routine vaccination, 500-600 cases of tetanus were reported in the United States each year. In the U.S., 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.

Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report tetanus within 72 hours to the local health department or the ISDH. Laboratories are also required to report positive results of *Clostridium tetani* weekly to the ISDH.

Healthy People 2020 Goal

There is no Healthy People 2020 Goal for tetanus.

Epidemiology and Trends

No cases of tetanus was reported in Indiana in 2015. During the five-year period 2011-2015, five cases of tetanus were reported in Indiana (three in 2012, one in 2013, and one in 2014). The case in 2013 was unvaccinated. 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.

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

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

<https://www.cdc.gov/tetanus/>.

TOXIC SHOCK SYNDROME

Toxic shock syndrome (TSS) is caused by *Staphylococcus 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 sunburn-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.

Reporting Requirements

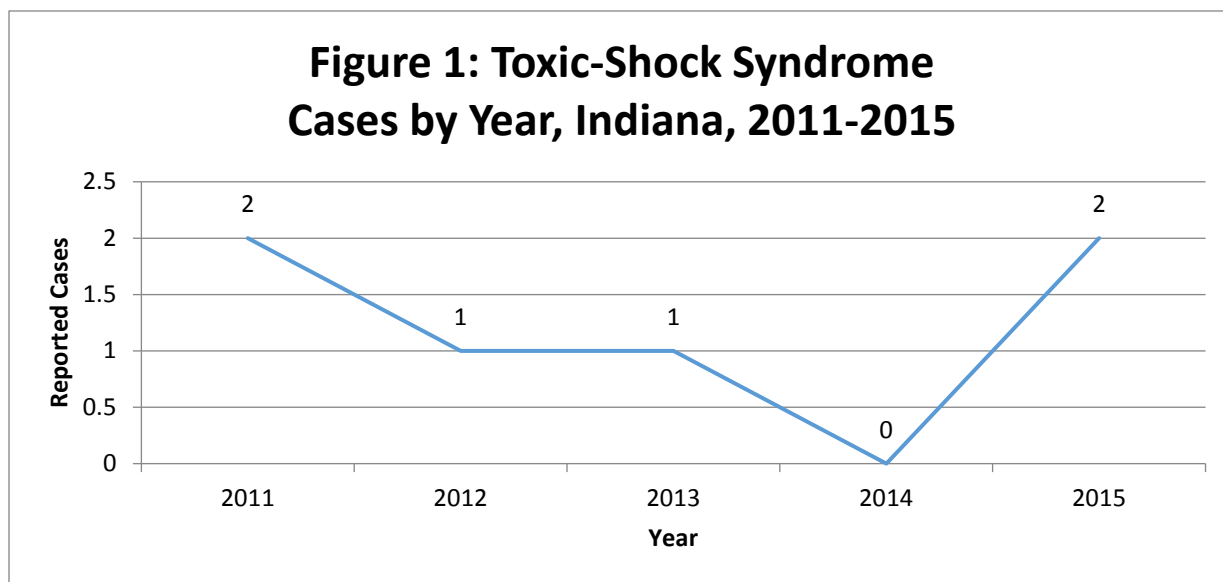
According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report toxic shock syndrome within 72 hours to the local health department or the ISDH.

Healthy People 2020 Goal

There is no Healthy People 2020 Goal for toxic shock syndrome.

Epidemiology and Trends

Two cases of toxic shock syndrome were reported in Indiana in 2015. Six cases were reported during the five-year period 2011-2015 (Figure 1).



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

<http://www.in.gov/isdh/25423.htm>

<http://wwwn.cdc.gov/nndss/script/conditionsummary.aspx?CondID=150>.

TRICHINOSIS

Trichinosis is caused by parasites of the genus *Trichinella*. This genus includes several species, but the one with the most historical association with human illness is *T. spiralis*, which 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 a safe internal temperature. All poultry products should be cooked to an internal temperature of 165 degrees Fahrenheit. Ground meats (excluding poultry) should be cooked to an internal temperature of 160 degrees Fahrenheit, while whole cuts of meats (excluding poultry) may be cooked to an internal temperature of 145 degrees Fahrenheit. Freezing pork products, less than six inches thick, at 5 degrees Fahrenheit for 20 days will also kill the *Trichinella* parasite that infects swine. Freezing of wild game meats, unlike freezing pork products, may not always kill the parasites associated with those animals because some worm species are freeze-resistant. Salting, drying, smoking and/or microwaving are not reliable methods of destroying infective cysts. Cooking of garbage fed to swine, as well as preventing swine from consuming rat carcasses, are important practices in reducing the infection in swine. Proper hand washing and separation of raw and ready to eat food is also important.

Healthy People 2020 Goal

There is no Healthy People 2020 Goal for trichinosis.

Epidemiology and Trends

One case of trichinosis was reported in Indiana in 2015. Three cases of trichinosis were reported during the five-year period 2011-2015.

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

<http://www.cdc.gov/parasites/trichinellosis/index.html>.

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. It is not transmissible from person to person.

Public Health Significance

F. tularensis can infect the skin, mucous membranes, gastrointestinal tract or lungs, or disseminate throughout the body. 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–October) and hunting season are peak times for exposure. 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.

Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report tularemia immediately to the local health department or the ISDH. Laboratories are also required to report positive results of *Francisella tularensis* weekly to the ISDH.

Healthy People 2020 Goal

There is no Healthy People 2020 Goal for tularemia.

Epidemiology and Trends

Three cases of tularemia was reported in Indiana in 2015. Fifteen cases were reported during the five-year reporting period 2011-2015.

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, *Salmonella* Typhi is not found in animals. Typhoid fever is extremely rare in the U.S. and is almost always related to travel to the developing world (e.g., Asia, Africa, Latin America).

People become infected with *Salmonella* Typhi by ingesting feces from an infected person (fecal-oral route), usually because of poor hand hygiene after using the restroom. *Salmonella* Typhi is also transmitted by drinking or washing food (raw produce) in water contaminated with sewage. Transmission can occur through person-to-person contact, handling food and touching contaminated items (e.g., soiled diapers or linens) and then touching the mouth.

Public Health Significance

Symptoms of typhoid fever include a sustained high fever (as high as 103° to 104°F), chills, weakness, headache, abdominal pain, loss of appetite and, in some cases, flat, rose-colored rash. Symptoms usually begin within 7-14 days (range of 3-60 days) after exposure. Persons given antibiotics usually begin to feel better within 2-3 days. Infected people may carry *Salmonella* Typhi in their bodies for weeks or months without symptoms (i.e., carriers), and unknowingly infect others.

Antibiotics are available to treat the illness. Most people who take medication recover completely. A vaccine is available for typhoid fever and is recommended for people traveling to endemic areas.

Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report typhoid fever (cases and carriers) immediately to the local health department or the ISDH. Laboratories are also required to report positive results of typhoid fever weekly to the ISDH. In addition, for typhoid fever, laboratories are required to submit isolates received to the ISDH Laboratory for further confirmation and subtyping.

Healthy People 2020 Goal

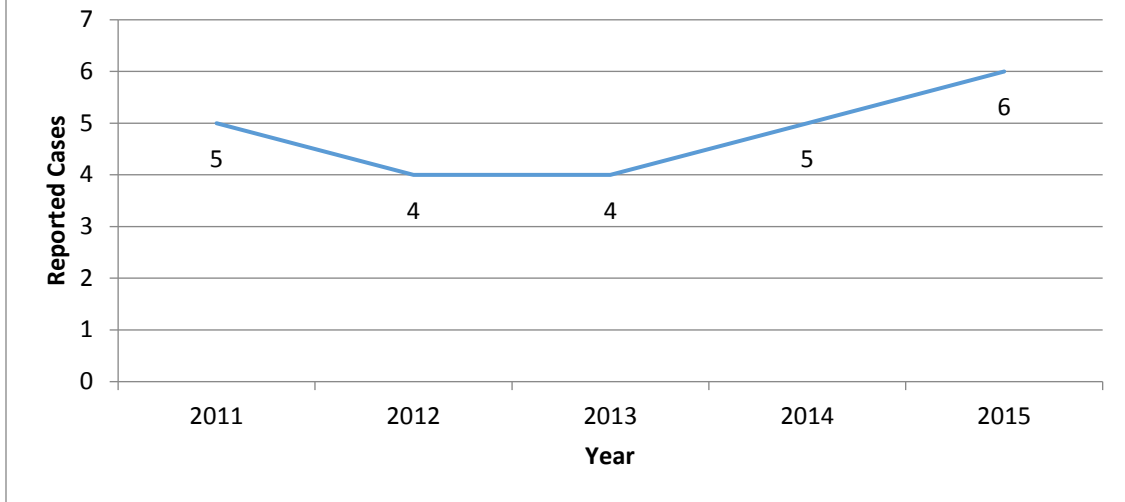
There is no Healthy People 2020 Goal for typhoid fever.

Epidemiology and Trends

In 2015, six cases of typhoid fever were reported in Indiana, and 24 cases were reported during the five-year period, 2011-2015 (Figure 1). All were associated with international travel.

There were no outbreaks associated with typhoid fever in 2015.

**Figure 1: Typhoid Fever
Cases by Year, Indiana, 2011-2015**



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* bacteria 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. No vaccine is available in the U.S. Murine typhus can be successfully treated with antibiotics.

Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report typhus within 72 hours to the local health department or the ISDH. Laboratories are also required to report positive results of *Rickettsia species* weekly to ISDH.

Healthy People 2020 Goal

There is no Healthy People 2020 Goal for typhus.

Epidemiology and Trends

There were no reported cases of typhus in Indiana in 2015. One case was reported during the five-year period 2011-2015.

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 from vesicular lesions.

Varicella is commonly considered a childhood illness; however, anyone who does not have a history of varicella or even those who have 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 death.

Public Health Significance

The varicella rash first appears as flat, red lesions, which become itchy, raised and blister-like (vesicles). 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 occur before rash onset. Onset of symptoms usually occurs 10-21 days after exposure to an individual with primary varicella infection or exposure to fluid from the rash of an individual with shingles. Hospitalizations and deaths due to varicella still occur in Indiana.

Vaccines are available to protect individuals from acquiring varicella. Another benefit is that those who are vaccinated with varicella vaccine are less likely to develop shingles later in life than those who acquire varicella disease. Some children and adults who receive one or even two doses of the vaccine may have a mild case of varicella disease known as “breakthrough” varicella, which is still infectious. Some individuals, as well as health care providers, may choose not to vaccinate. Thus the incidence of varicella infections has reached a plateau, and outbreaks remain common in schools and other residential facilities.

Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians and Hospitals, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report varicella within 72 hours to the local health department or the ISDH.

Healthy People 2020 Goal

The Healthy People 2020 Goal for varicella is fewer than 100,000 cases nationally for persons less than 18 years of age. This translates to a rate of 135.6 per 100,000 population. Indiana met this goal in 2014, with 140 cases of varicella reported in children under the age of 18 (rate of 8.86 per 100,000 population).

Epidemiology and Trends

In 2015, 162 cases of varicella were reported in Indiana. Eleven cases were hospitalized, with no reported deaths. The rate of varicella (not hospitalized) was 2.45 cases per 100,000 population (Table 1). The rate of varicella disease was higher in other races (3.65) than either whites (2.04) or blacks (0.79). A slightly higher rate was observed in males (2.70) than in females (2.20).

The rate of hospitalizations was 0.17 per 100,000 populations (Table 1), a decrease from 2014 (0.21 per 100,000). The rate of varicella hospitalizations for males (0.28) was much higher than that for females (0.06), however, since all counts were less than 20, these rates may be unstable.

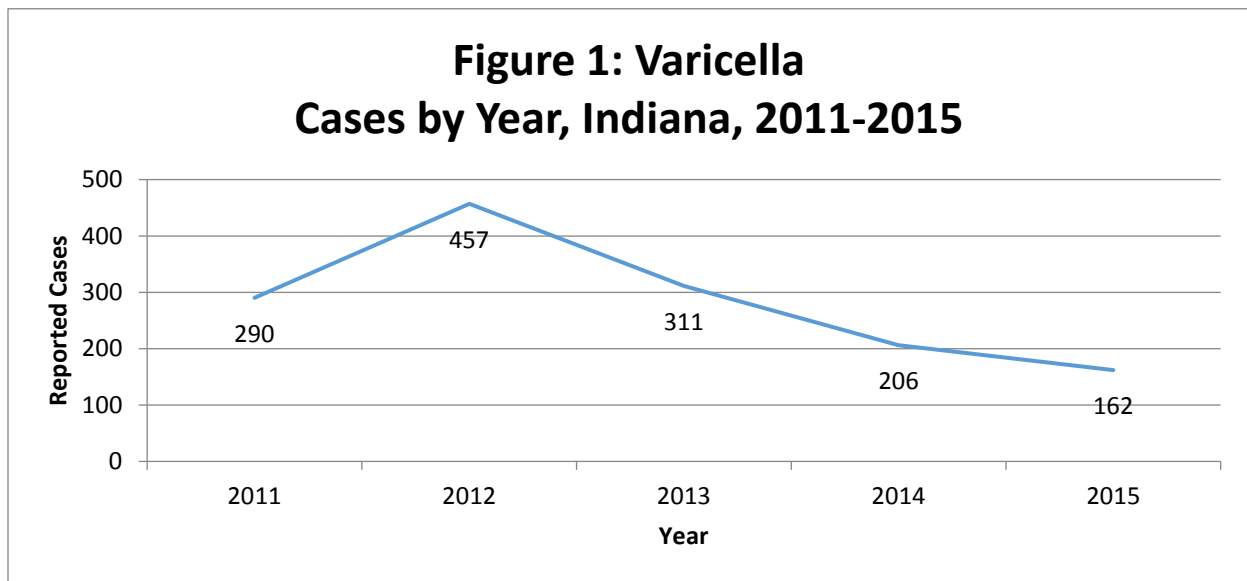
Table 1. Varicella cases by race and sex, Indiana 2015

	Hospitalized cases		Varicella (not hospitalized)	
	Cases	Rate*	Cases	Rate*
Indiana	11	0.17	162	2.45
Race				
Black	3	0.47	5	0.79
White	6	0.11	116	2.04
Other	1	0.33	11	3.65
Not Reported	1	-	30	-
Sex				
Female	2	0.06	74	2.20
Male	9	0.28	88	2.70
Unknown	0	-	0	-

*Rate per 100,000 population based on U.S. Census Bureau's population data as of July 6, 2016.

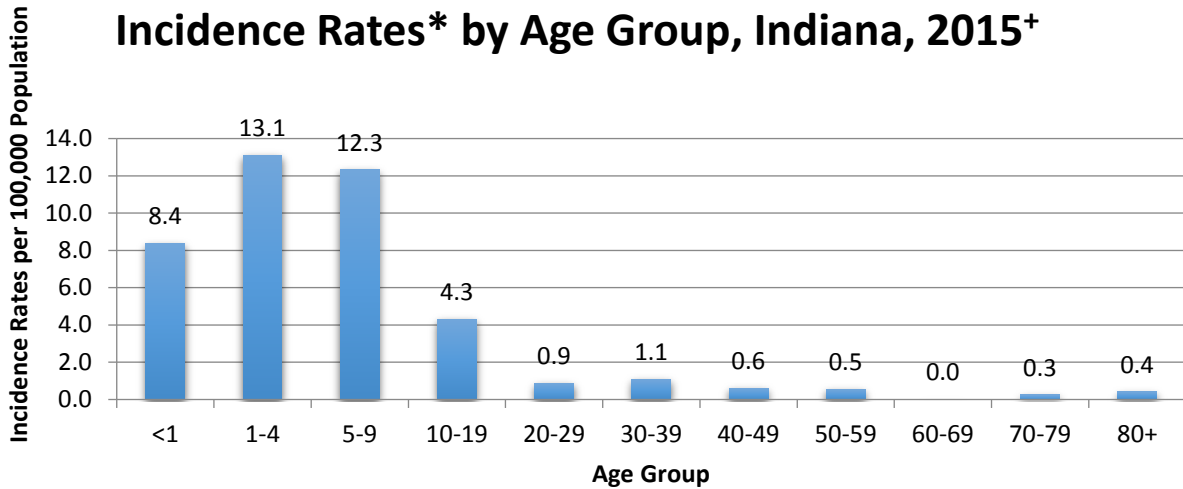
*Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

Figure 1 shows total reported varicella cases by year from 2011-2015.



Incidence of varicella varies considerably with age. In 2015, the highest varicella incidence rate occurred in children 1-4 years old at 13.1 cases per 100,000 population, followed by children ages 5-9 (incidence of 12.3 cases per 100,000 population). Few cases of chickenpox were reported in adults over the age of 50. (Figure 2).

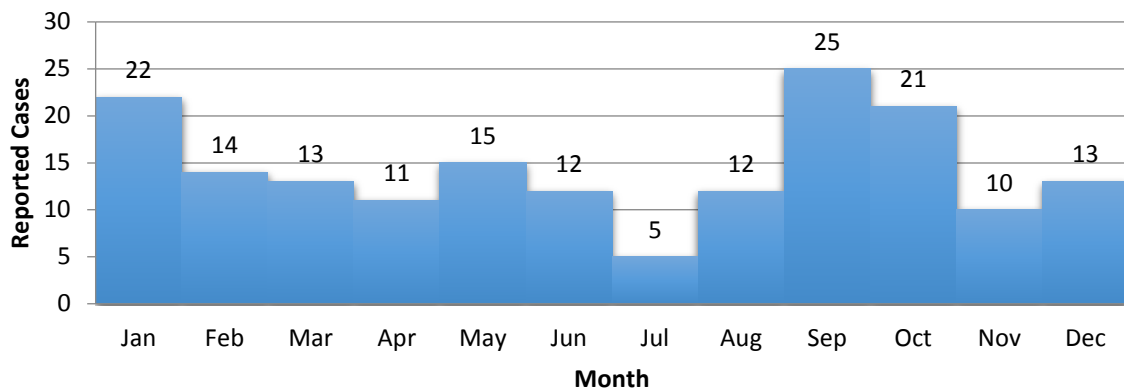
**Figure 2: Varicella (Chickenpox)
Incidence Rates* by Age Group, Indiana, 2015+**



*Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.
* Includes hospitalizations and deaths

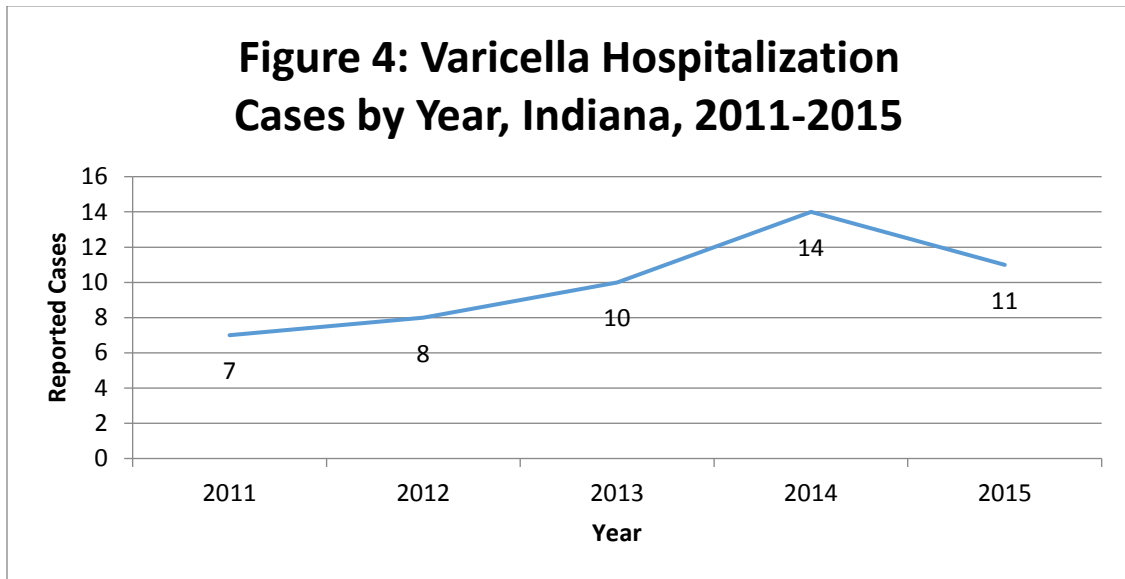
The total number of cases was highest in September 2015 (25 cases) and lowest in the summer. The number of cases continued to be high throughout the fall and spring, corresponding roughly with the timing of the 2014-2015 school year, which is a characteristic pattern for varicella (Figure 3). Many varicella cases are first identified by vigilant school nurses, suggesting that case reports may be artificially low during the summer months when school is not in session.

**Figure 3: Varicella (Chickenpox)
Cases* by Month, Indiana, 2015**



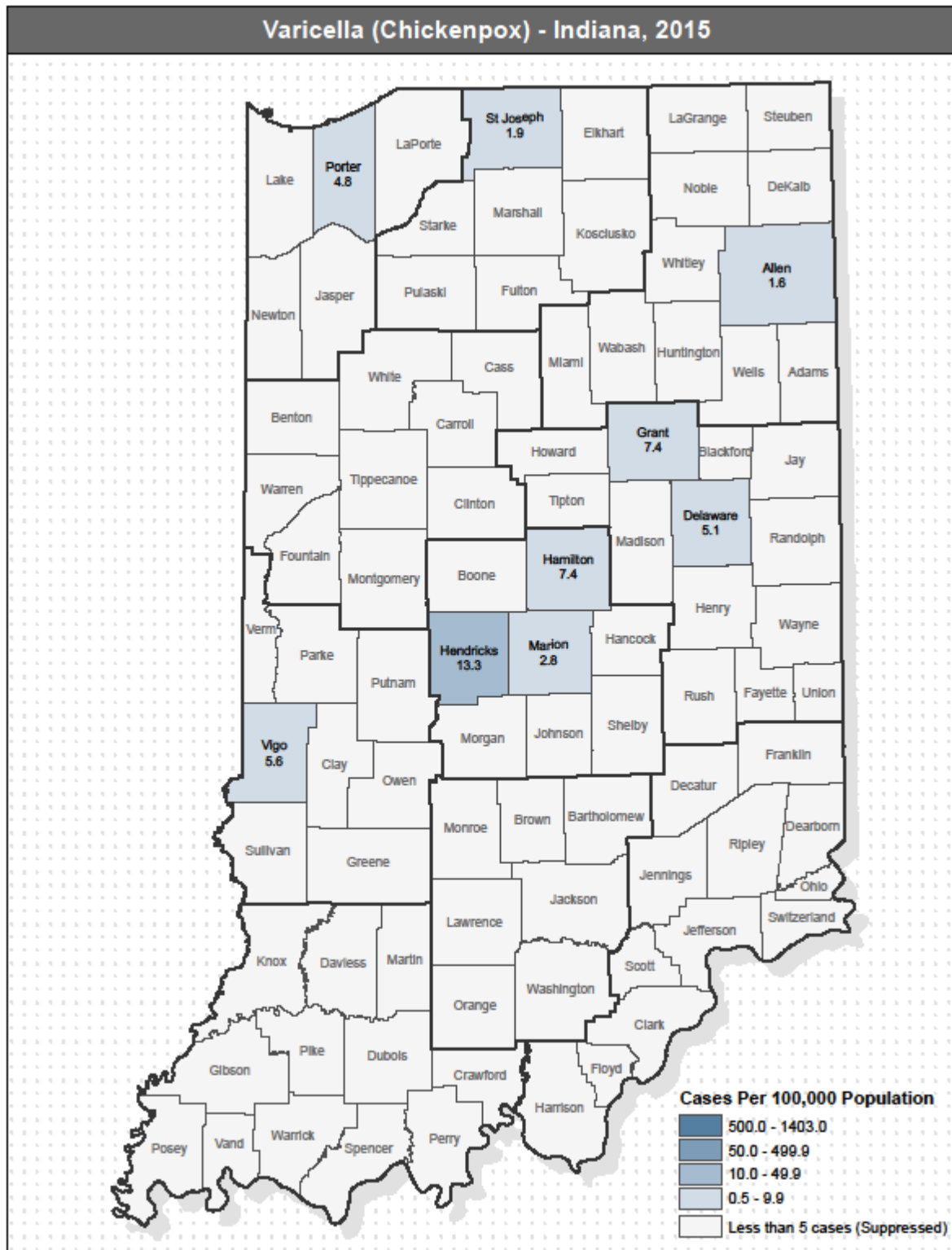
* Includes hospitalizations and deaths

Figure 4 shows reported hospitalized cases by year from 2011-2015, the number of which has remained steady over the past four years.



In 2015, 45 counties reported at least one case, and nine counties reported five or more cases of varicella (Figure 5). Incidence rates were highest among the following counties reporting five or more cases during the year: Hendricks (13.3), Hamilton (7.4) and Grant (7.4). Some of the rates are based on fewer than 20 counts and should be considered unstable.

Figure 5.



You can learn more about varicella by visiting the following website:

<http://www.cdc.gov/chickenpox/index.html>

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

VIBRIOSIS

Vibriosis is an illness caused by a variety of noncholera *Vibrio* bacteria species, 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 and fall. Wound infections may occur when a preexisting wound is exposed to contaminated water or from punctures resulting from the handling of contaminated shellfish.

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. Wound infections can be severe if the person is immunocompromised or has a liver disease. *Vibrio vulnificus* infections can result in bloodstream infections, characterized by fever, chills, decreased blood pressure and blistering skin lesions; high mortality rates are associated with *V. vulnificus* infections.

Reporting Requirements

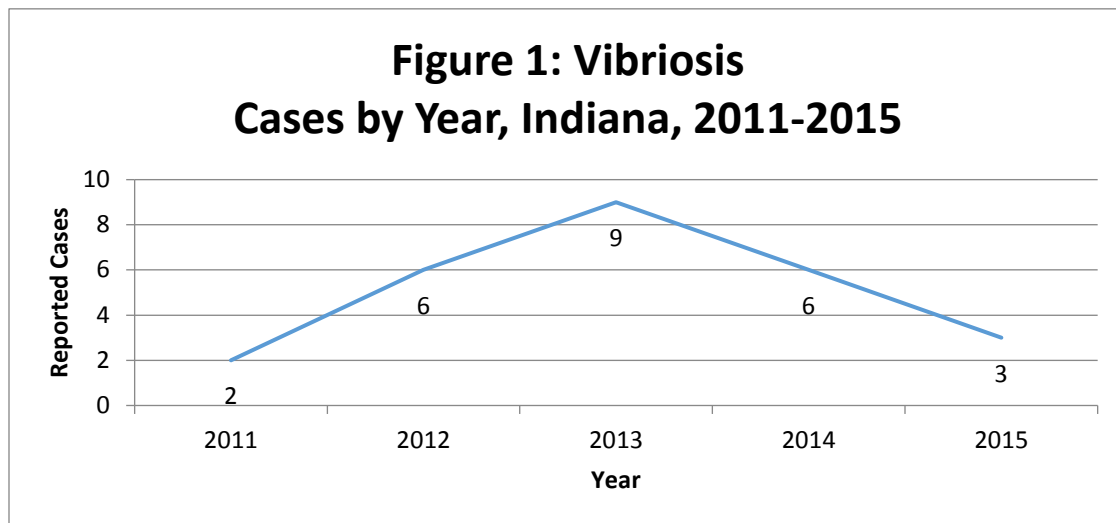
According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report vibriosis within 72 hours to the local health department or the ISDH. Laboratories are also required to report positive results of vibriosis weekly to the ISDH.

Healthy People 2020 Goal

The Healthy People 2020 Goal for vibriosis is 0.2 cases per 100,000 population per year. Indiana met this goal in 2014 (0.09).

Epidemiology and Trends

In 2015, three cases of vibriosis were reported in Indiana, and 26 cases were reported during the five-year period 2011-2015.



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

<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 one horse). In 2015, Indiana was one of 44 states to report human WNV cases. Nationally in 2015, 2,175 human cases were reported, with 146 deaths. Indiana had 21 reported cases, with three deaths. 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 in humans.

In addition to passive human surveillance, the ISDH conducts active mosquito surveillance. Throughout the mosquito breeding season (normally May through October), mosquitoes are trapped, collected, separated by species and tested for arboviral diseases, including West Nile virus.

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

- Use insect repellent according to manufacturer's instructions.
- 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 other containers. Change the water in birdbaths and other containers at least 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.

Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report arboviral disease, including WNV immediately to the local health department or the ISDH. Laboratories are also required to report positive results of WNV weekly to the ISDH.

Healthy People 2020 Goal

There is no Healthy People 2020 Goal for WNV.

Epidemiology and Trends

In 2015, Indiana reported 21 cases of WNV with three deaths. In the five-year reporting period from 2011-2015, 140 human cases of WNV, including 14 deaths, were reported (Table 1). Cases were reported from the following counties: Allen (4), Bartholomew (1), Delaware (1), Hamilton (1), Hendricks (1), Howard (1), Huntington (2), Jasper (1), Lake (1), Madison (1), Marion (2), St. Joseph (1), Tippecanoe (1), and Vanderburgh (3).

Table 1: WNV human cases and deaths, 2011-2015

	Cases	Neuroinvasive Disease	Non-Neuroinvasive Disease	Deaths
2015	21	16	5	3
2014	10	9	1	0
2013	23	19	4	2
2012	77	46	31	8
2011	9	7	2	1
Five-year total	140	97	43	14

In 2015, mosquito samples were submitted from 92 Indiana counties; a total of 213,125 mosquitoes divided into 3,043 pools were tested for WNV. In 2015, 472 pools collected from 83 different counties tested positive (Table 2).

Table 2: WNV positive mosquitoes, 2015

	2015
Number of mosquitoes collected	213,125
Number of pools tested	3,043
WNV positive pools	472
Number of counties with WNV-positive mosquitoes	83

Figure 1 shows reported cases by year from 2011-2015.

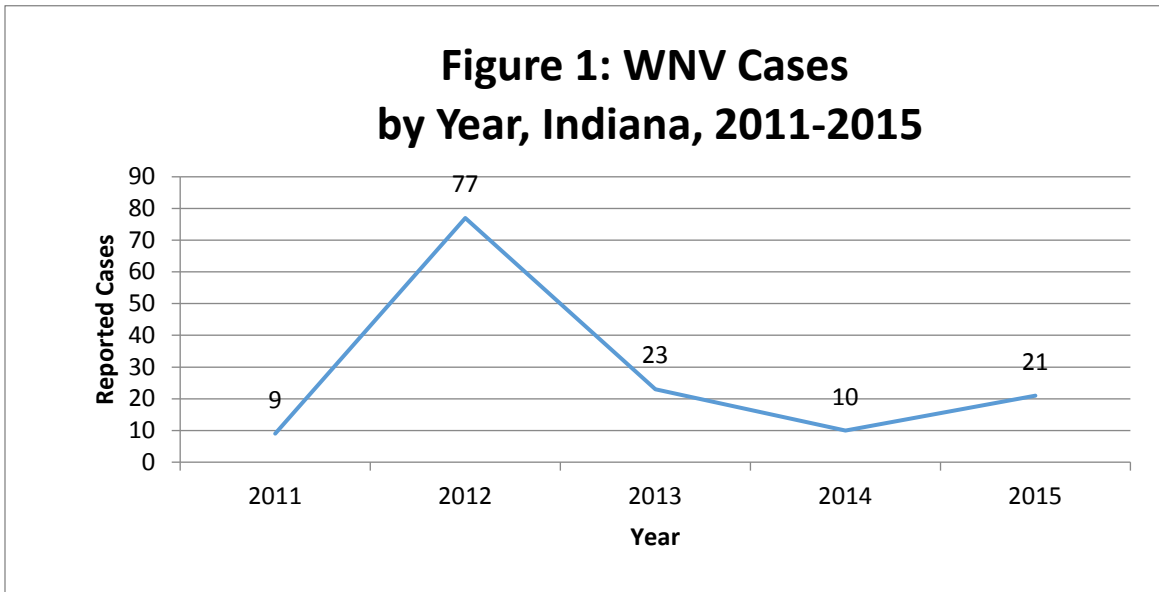


Figure 2 shows reported cases by month, with the largest number of cases occurring in September.

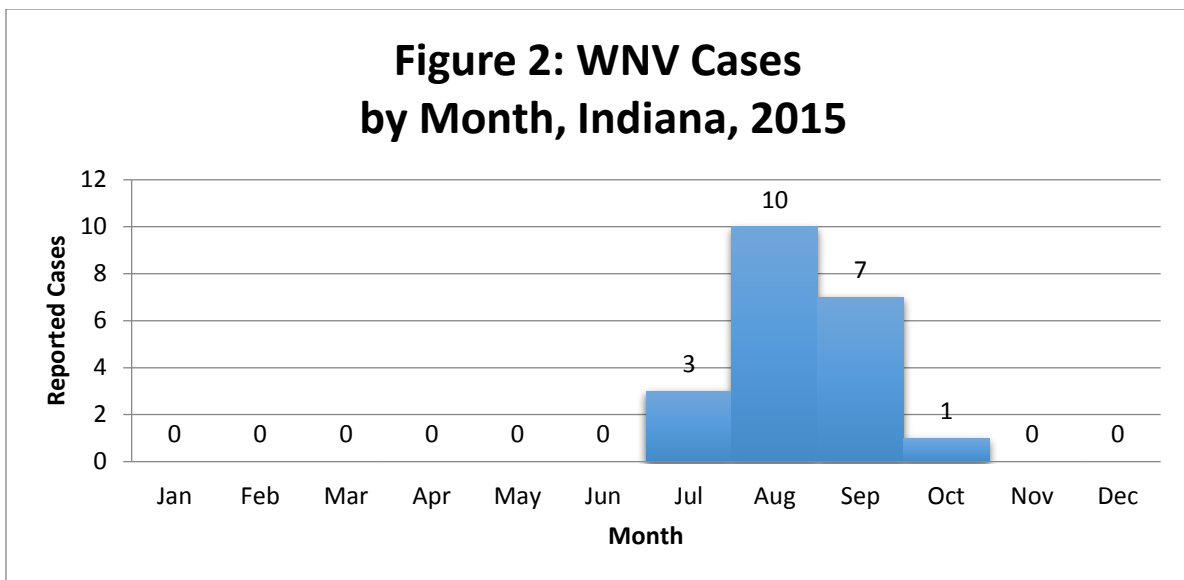
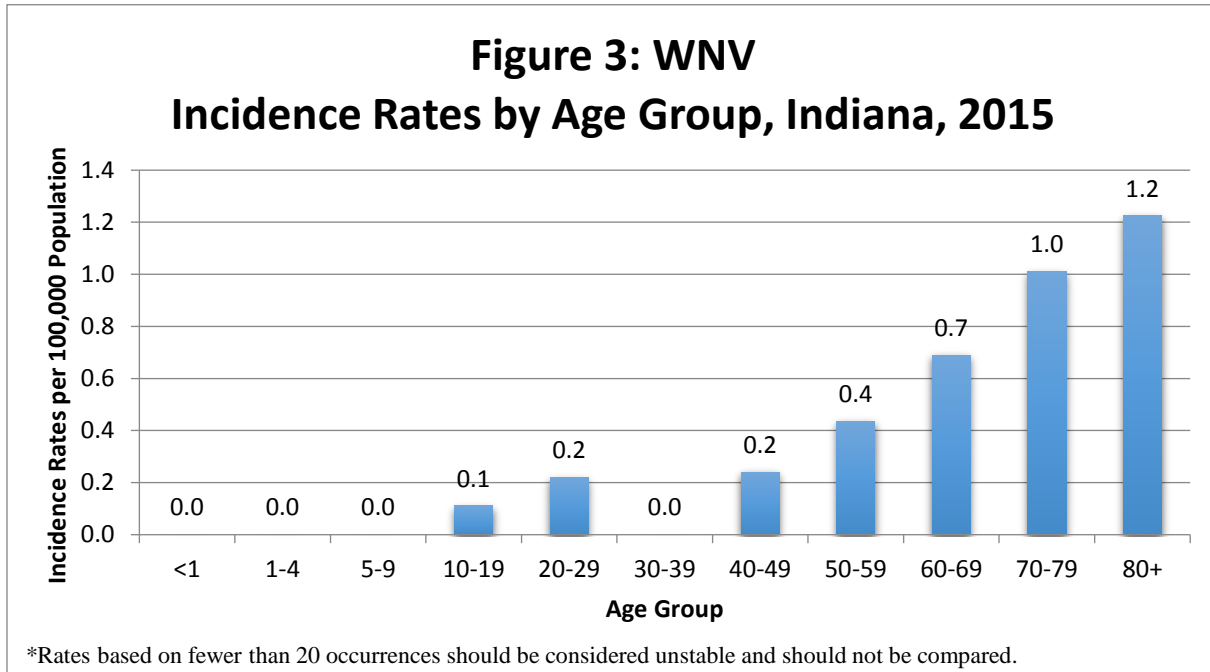


Figure 3 shows the incidence of WNV by age group. People older than age 50 are known to be at higher risk of WNV-associated neuroinvasive disease.



You can learn more about West Nile virus by visiting the following Web site:
<http://www.cdc.gov/ncidod/dybid/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 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, or 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 on the ISDH website 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.

Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report yellow fever within 72 hours to the local health department or the ISDH. Laboratories are also required to report positive results of yellow fever virus weekly to the ISDH.

Healthy People 2010 Goal

There is no Healthy People 2020 Goal for yellow fever.

Epidemiology and Trends

No cases of yellow fever were reported in Indiana during 2015 or during the five-year period 2011-2015.

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

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

YERSINIOSIS

Yersiniosis is a disease most commonly caused by *Yersinia enterocolitica* bacteria, which live in livestock and domestic animals and can be found in untreated water. These 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, eating contaminated food 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.

Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report yersiniosis within 72 hours to the local health department or the ISDH. Laboratories are also required to report positive results of yersiniosis weekly to the ISDH.

Healthy People 2020 Goal

The Healthy People 2020 Goal for yersiniosis is 0.3 cases per 100,000 population per year. Indiana met this goal every year during the five-year reporting period 2011-2015.

Epidemiology and Trends

In 2015, 10 cases of yersiniosis were reported in Indiana, for a rate of 0.15 cases per 100,000 population (Table 1).

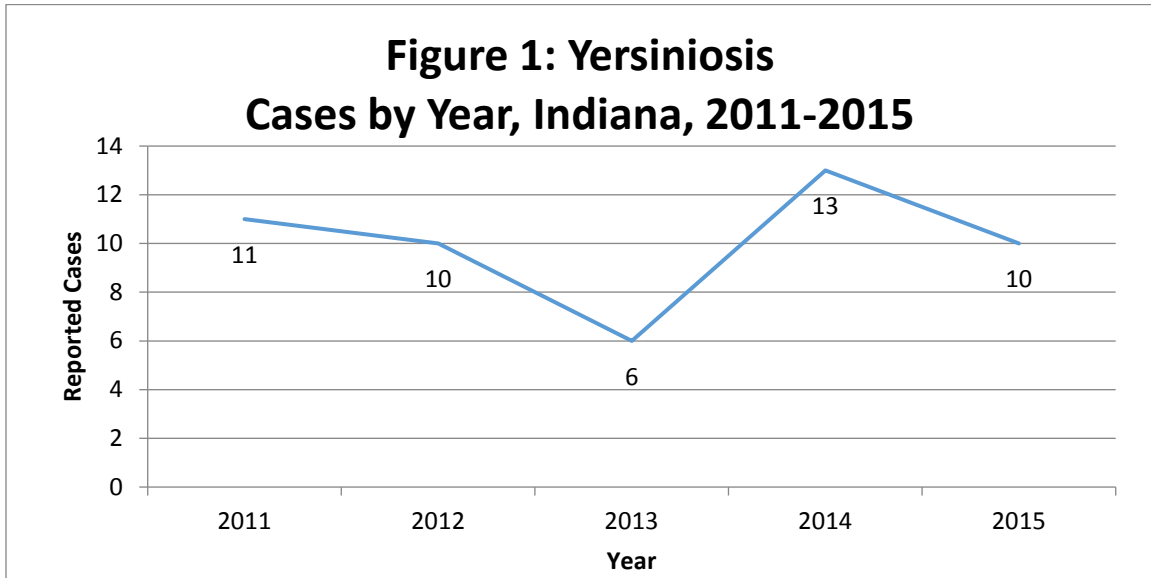
Table 1. Yersiniosis cases by race and sex, Indiana, 2015

	Cases	Rate*	2011 - 2015 Total
Indiana	10	0.15	50
Race			
Black	1	0.16	6
White	6	0.11	25
Other	0	0.00	1
Not Reported	3	-	18
Sex			
Female	8	0.24	34
Male	2	0.06	16
Unknown	-	-	0

*Rate per 100,000 population based on U.S. Census Bureau's population data as of July 6, 2016.

*Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

Figure 1 shows reported cases by year for 2010-2015.



Incidence of yersiniosis can occur at any time of the year; however, it was most common in the summer of 2015 (Figure 2).

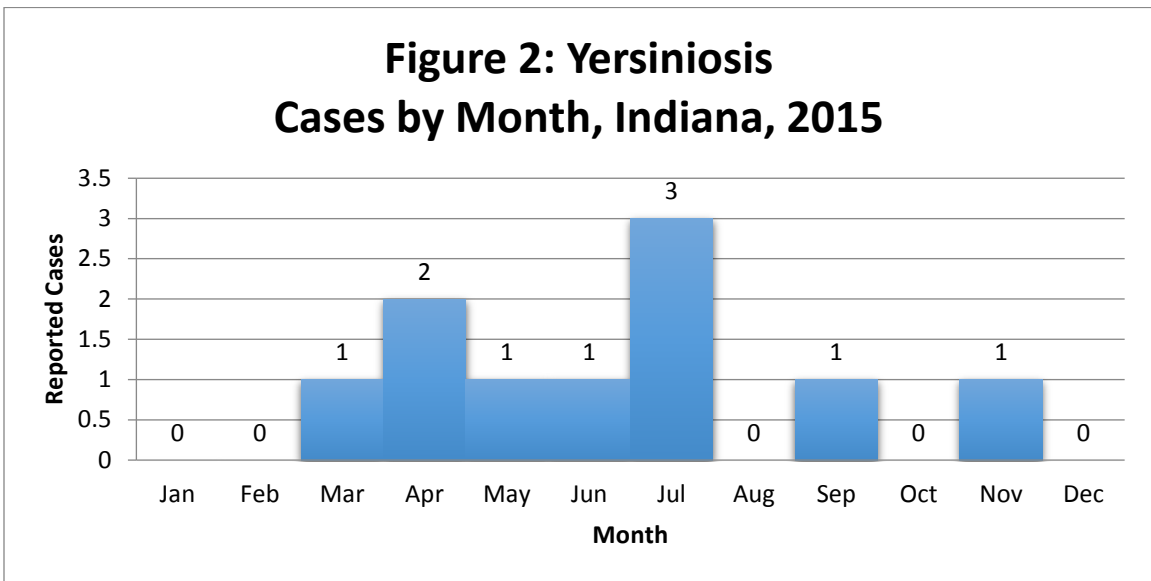
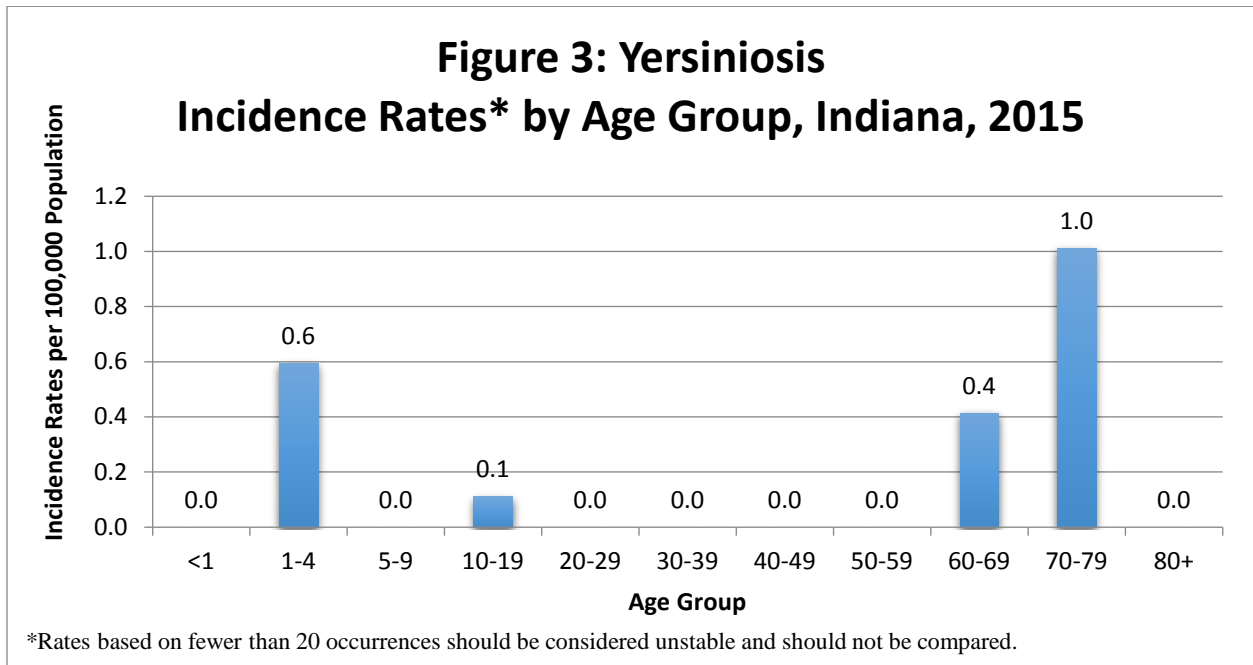


Figure 3 shows age-specific rates were greatest elderly adults aged 70-79 years (1.0) followed by preschool aged children aged 1-4 years (0.6).



No counties reported five or more cases, and no outbreaks of yersiniosis were reported in Indiana in 2015.

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

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

ZIKA VIRUS

Zika virus disease (Zika) is caused by a single-stranded RNA virus of the *Flaviviridae* family. The virus occurs in tropical and subtropical areas of the world. The primary vector, the *Aedes aegypti* mosquito, is rarely seen in Indiana. However, another competent vector, *Aedes albopictus*, is present in several of Indiana's counties, most predominantly in the southern part of the state. ZIKV is found in the same parts of the world, is transmitted by the same mosquito species, and has some clinical similarities to dengue virus and chikungunya virus.

Public Health Significance

Symptoms of Zika occur within 14 days after exposure. Symptoms include fever, rash, joint pain and conjunctivitis. Zika is usually mild, with many people never developing symptoms. Zika virus can also be spread from infected persons to their sex partners and from an infected pregnant woman to her baby. Zika virus may be introduced into new areas by travelers who become infected while visiting tropical areas where Zika is endemic.

Starting in early 2015, a Zika outbreak began in Brazil that has since spread to many countries and territories throughout the Americas, Pacific Islands, and Africa. Local transmission of Zika virus by mosquitoes was not detected in the continental United States in 2015.

Reporting Requirements

According to the Communicable Disease Reporting Rule for Physicians, Hospitals and Laboratories, 410 IAC 1-2.3, [http://www.in.gov/isdh/files/comm_dis_rule\(1\).pdf](http://www.in.gov/isdh/files/comm_dis_rule(1).pdf), hospitals and healthcare providers must report all arboviruses that cause disease in humans, including emerging arboviruses such as Zika, immediately to the local health department or the ISDH. Laboratories are also required to report positive results of Zika virus weekly to the ISDH. Zika virus was added to the national notifiable disease list by the Council of State and Territorial Epidemiologists in 2016. The Communicable Disease Reporting Rule 410 IAC 1-2.3 is currently under revision to explicitly require mandatory reporting of Zika virus disease by health care providers and laboratories.

Healthy People 2020 Goal

There is no Healthy People 2020 Goal for Zika virus.

Epidemiology and Trends

In 2015, three cases of Zika virus disease were reported in Indiana residents. These were the first cases of Zika virus disease ever reported in Indiana. All cases were acquired during foreign travel to tropical and subtropical areas.

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

<http://www.cdc.gov/zika/index.html>

<http://wwwnc.cdc.gov/travel/diseases/zika> .