
# Indiana State Department of Health

## Epidemiology Resource Center

# ANNUAL REPORT OF INFECTIOUS DISEASES 2016

## NOTES

All incidence rates throughout the report are calculated based per 100,000 population according to the 2016 U.S. Census Bureau's population estimates gathered on June 30, 2017.

Case counts for diseases/conditions other than arboviral and tickborne diseases with counties reporting fewer than five disease cases are not included to protect the confidentiality of cases.

Rates based on 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 2016 annual report are based on case definitions matching the National Notifiable Diseases list, which can be found at https://wwwn.cdc.gov/nndss/conditions/. Because changes are made to case definitions, the annual report counts and rates are not comparable to previous years.

## 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.

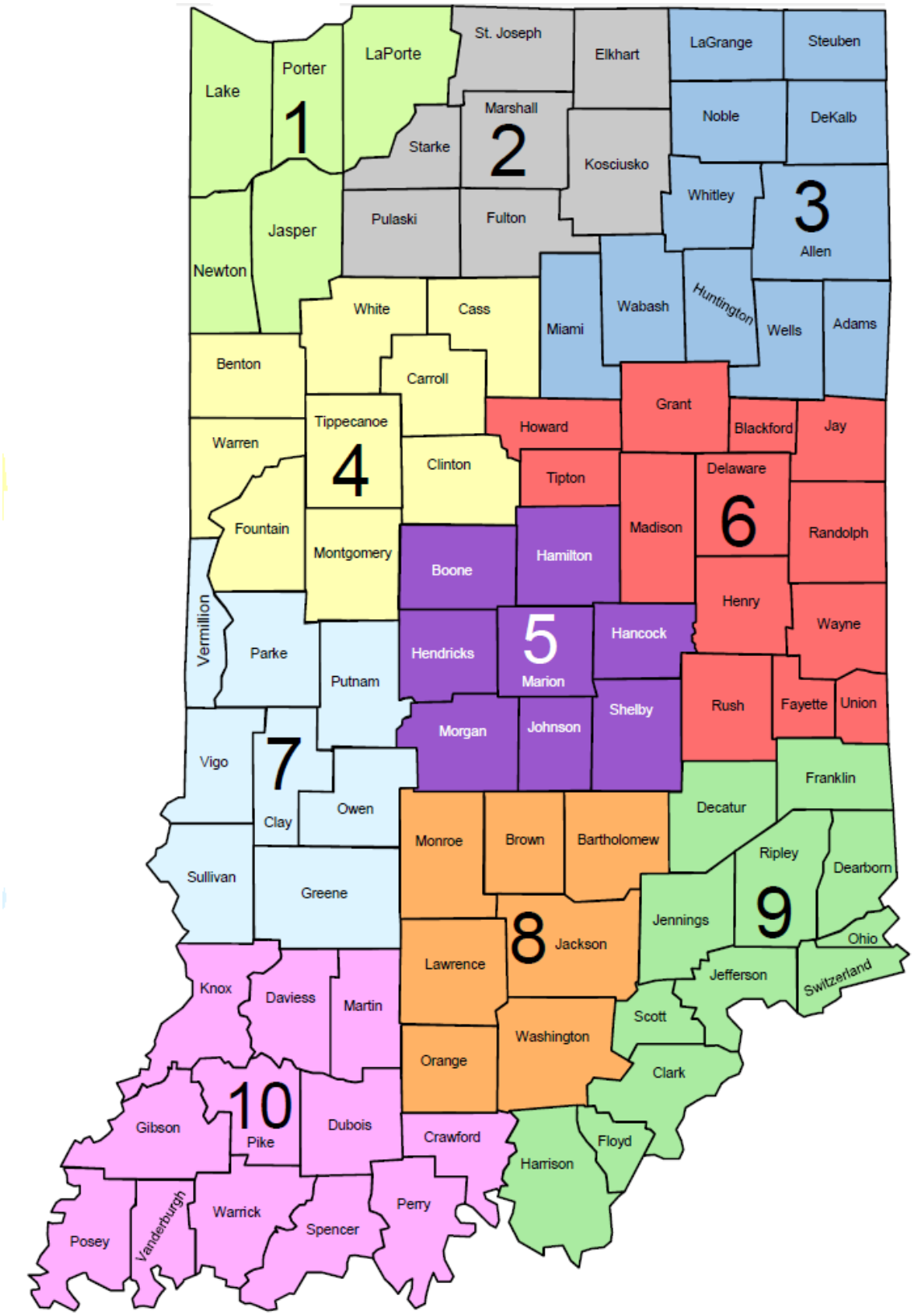
## WEBSITES

www.cdc.gov

www.fda.gov

www.who.int

## FIELD EPIDEMIOLOGY DISTRICTS



## INDIANA POPULATION ESTIMATES, 2016

| Year | Population |
|---|---|
| 2012 | 6,537,743 |
| 2013 | 6,569,102 |
| 2014 | 6,595,233 |
| 2015 | 6,612,768 |
| 2016 | 6,633,053 |

| Gender | 2015 Population | 2016 Population |
|---|---|---|
| Female | 3,353,958 | 3,363,491 |
| Male | 3,258,810 | 3,269,562 |
| **Race** | 2015 Population | 2016 Population |
| White | 5,667,021 | 5,678,630 |
| Black | 635,297 | 641,409 |
| Other | 310,450 | 313,014 |
| **Ethnicity** | 2015 Population | 2016 Population |
| Non-Hispanic | 6,173,681 | 6,183,182 |
| Hispanic | 439,087 | 449,871 |
| **Total** | 6,612,768 | 6,633,053 |

| Age | 2015 Population | 2016 Population |
|---|---|---|
| < 1 | 83,583 | 83,679 |
| 1-4 | 337,327 | 338,308 |
| 5-9 | 437,613 | 434,422 |
| 10-19 | 902,054 | 901,003 |
| 20-29 | 915,416 | 919,710 |
| 30-39 | 830,017 | 835,539 |
| 40-49 | 828,033 | 819,376 |
| 50-59 | 914,437 | 902,960 |
| 60-69 | 723,571 | 748,074 |
| 70-79 | 395,841 | 403,580 |
| 80 + | 244,876 | 276,402 |
| **Total** | 6,612,768 | 6,633,053 |

**Note:** Population estimates are based on the U.S. Census Bureau's population data as of July 1, 2016, gathered on June 30, 2017.

## INDIANA POPULATION ESTIMATES, 2016

| POPULATION BY COUNTY | | | | | |
|---|---|---|---|---|---|
| | 2015 | 2016 | | 2015 | 2016 |
| Adams | 34,967 | 35,232 | Lawrence | 45,485 | 45,518 |
| Allen | 368,040 | 370,404 | Madison | 129,495 | 129,296 |
| Bartholomew | 81,011 | 81,402 | Marion | 938,058 | 941,229 |
| Benton | 8,674 | 8,650 | Marshall | 46,756 | 46,556 |
| Blackford | 12,287 | 12,149 | Martin | 10,191 | 10,171 |
| Boone | 63,400 | 64,653 | Miami | 35,902 | 35,883 |
| Brown | 14,919 | 14,912 | Monroe | 144,257 | 145,496 |
| Carroll | 19,890 | 19,970 | Montgomery | 38,167 | 38,074 |
| Cass | 38,078 | 37,946 | Morgan | 69,646 | 69,698 |
| Clark | 115,090 | 116,031 | Newton | 14,002 | 13,924 |
| Clay | 26,485 | 26,309 | Noble | 47,759 | 47,638 |
| Clinton | 32,567 | 32,457 | Ohio | 5,936 | 5,932 |
| Crawford | 10,510 | 10,539 | Orange | 19,516 | 19,335 |
| Daviess | 32,836 | 32,969 | Owen | 20,809 | 20,840 |
| Dearborn | 49,475 | 49,331 | Parke | 16,878 | 16,800 |
| Decatur | 26,393 | 26,598 | Perry | 19,322 | 18,966 |
| DeKalb | 42,557 | 42,746 | Pike | 12,476 | 12,431 |
| Delaware | 116,019 | 115,603 | Porter | 167,631 | 167,791 |
| Dubois | 42,421 | 42,552 | Posey | 25,490 | 25,476 |
| Elkhart | 203,284 | 203,781 | Pulaski | 12,871 | 12,660 |
| Fayette | 23,426 | 23,331 | Putnam | 37,621 | 37,436 |
| Floyd | 76,761 | 76,990 | Randolph | 25,133 | 25,082 |
| Fountain | 16,536 | 16,486 | Ripley | 28,699 | 28,846 |
| Franklin | 22,890 | 22,715 | Rush | 16,725 | 16,649 |
| Fulton | 20,328 | 20,139 | St. Joseph | 268,134 | 269,141 |
| Gibson | 33,762 | 33,703 | Scott | 23,707 | 23,730 |
| Grant | 67,692 | 66,937 | Shelby | 44,442 | 44,324 |
| Greene | 32,450 | 32,211 | Spencer | 20,727 | 20,648 |
| Hamilton | 309,172 | 316,373 | Starke | 22,940 | 23,009 |
| Hancock | 72,392 | 73,717 | Steuben | 34,343 | 34,116 |
| Harrison | 39,639 | 39,826 | Sullivan | 20,927 | 20,802 |
| Hendricks | 158,059 | 160,610 | Switzerland | 10,509 | 10,527 |
| Henry | 48,894 | 48,521 | Tippecanoe | 185,741 | 188,059 |
| Howard | 82,581 | 82,568 | Tipton | 15,292 | 15,182 |
| Huntington | 36,607 | 36,400 | Union | 7,195 | 7,212 |
| Jackson | 43,941 | 44,013 | Vanderburgh | 181,941 | 181,721 |
| Jasper | 33,501 | 33,433 | Vermillion | 15,634 | 15,645 |
| Jay | 21,155 | 21,046 | Vigo | 107,708 | 107,931 |
| Jefferson | 32,465 | 32,418 | Wabash | 32,075 | 31,762 |
| Jennings | 27,913 | 27,758 | Warren | 8,280 | 8,166 |
| Johnson | 149,338 | 151,982 | Warrick | 61,894 | 62,498 |
| Knox | 37,891 | 37,744 | Washington | 27,721 | 27,670 |
| Kosciusko | 78,815 | 79,092 | Wayne | 66,984 | 66,568 |
| LaGrange | 38,671 | 39,110 | Wells | 27,937 | 27,949 |
| Lake | 487,649 | 485,846 | White | 24,224 | 23,999 |
| LaPorte | 110,762 | 110,015 | Whitley | 33,395 | 33,449 |

**Note:** Population estimates are based on the U.S. Census Bureau's population data as of July 1, 2016, gathered on June 30, 2017.

## LIST OF NOTIFIABLE DISEASES

**REPORTABLE COMMUNICABLE DISEASES AND CONDITIONS FOR HEALTH CARE PROVIDERS, HOSPITALS AND LABORATORIES (410 IAC 1-2.5-75 & 76)***

Requires immediate notification on suspicion:

- Anthrax
- Arboviral diseases
- Botulism
- Brucellosis
- Chikungunya virus
- Cholera
- Dengue
- Diphtheria
- Eastern equine encephalitis (EEE)
- Hantavirus pulmonary syndrome (HPS)
- Hemolytic uremic syndrome (HUS)
- Hepatitis A, viral
- Hepatitis B, viral, pregnant woman or perinatal
- Hepatitis E, viral
- Japanese encephalitis
- La Crosse encephalitis
- Measles
- Meningococcal disease▲
- Plague
- Poliomyelitis
- Powassan virus
- Q Fever
- Rabies in humans or animals
- Rubella
- Rubella congenital syndrome
- Shiga toxin-producing *E. coli* (STEC) ▲
- Shigellosis▲
- Smallpox
- St. Louis encephalitis
- Tularemia
- Typhoid and Paratyphoid fever▲
- West Nile Virus (WNV)
- Western equine encephalitis (WEE)
- Yellow fever

Report within 24 hours:

- Animal Bites
- *Haemophilus influenzae*, invasive▲
- Mumps
- Novel influenza A
- Pertussis

Report within 72 hours or as noted:

- Anaplasmosis
- Babesiosis
- Campylobacteriosis
- *Carbapenemase-producing Carbapenem-resistant Enterobacteriaceae* (CP-CRE) ▲
- Coccidioidomycosis
- Cryptosporidiosis
- Cyclosporiasis
- Cysticercosis
- Ehrlichiosis
- Giardiasis
- Hansen's disease (leprosy)
- Hepatitis B, viral
- Hepatitis C, viral, acute (within 5 days)
- Hepatitis D, viral
- Hepatitis, viral, unspecified
- Histoplasmosis
- Influenza-associated death
- Legionellosis
- Leptospirosis
- Listeriosis▲
- Lyme disease
- Malaria
- Psittacosis
- Rabies, postexposure treatment
- Rocky Mountain spotted fever
- Salmonellosis, non-typhoidal▲
- *Staphylococcus aureus*, vancomycin resistance level of MIC ≥ 8 µg/mL or severe in a previously healthy person▲
- *Streptococcus pneumoniae*, invasive▲
- *Streptococcus*, Group A, invasive▲
- Tetanus
- Toxic shock syndrome
- Trichinosis
- Typhus, endemic
- Varicella
- Vibriosis
- Yersiniosis

▲Requires additional testing including antimicrobial susceptibility or further confirmation and subtyping

**Note: Does not include HIV/AIDS, sexually transmitted diseases (STDs) or tuberculosis*

# ENTERIC DISEASES AND CONDITIONS

**INCLUDES:** Botulism, Campylobacteriosis, *Escherichia coli* (Shiga-toxin producing), Hemolytic Uremic Syndrome, Hepatitis A, Hepatitis E, Listeriosis, Salmonellosis, Shigellosis, Typhoid Fever, Yersiniosis

## ENTERIC DISEASE PREVENTION

Measures that would decrease transmission and likelihood of enteric diseases include:

- Practice good hygiene:
  - Thoroughly wash hands with soap and water after using the restroom; after assisting someone with diarrhea and/or vomiting; after cleaning soiled areas; 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 and 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.
- 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 United States 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.
- Eat safe foods and drink safe water:
  - 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, 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 bathtub.
  - Do not allow reptiles to roam the house.
  - Do not keep reptiles in daycare facilities or classrooms.
  - Children younger than five years of age, pregnant women and persons with weakened immune systems should not handle reptiles.

- Travel safely outside 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.
- 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.
- Exercise caution with infants and other high-risk individuals:
  - Be particularly careful with foods prepared for infants, the elderly and the immunocompromised.
  - Avoid contact between reptiles (e.g., turtles, iguanas, other lizards and snakes) and infants or immunocompromised persons. Do not wash cages or tanks in a sink or bathtub.
  - Do not handle raw poultry or meat and an infant (e.g., feed, change diaper) at the same time.

*Disease-specific Prevention*

- Botulism
  - Foodborne:
    - Properly process and prepare all home-canned foods. Instructions for safe home canning are available from county extension services or from the 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 younger 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.
- Hepatitis A
  - Two-dose vaccination is available and is required for all incoming kindergarten students in Indiana. Vaccination is recommended for persons at increased risk for infection, 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
- Typhoid fever
  - A vaccine is available for typhoid fever and is recommended for people traveling to endemic areas.

## CAMPYLOBACTERIOSIS

**2016 CASE TOTAL:** 1,043
**2015 CASE TOTAL:** 920

**2016 INCIDENCE RATE:** 15.72 per 100,000
**2015 INCIDENCE RATE:** 13.91 per 100,000

CAMPYLOBACTERIOSIS is a 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 or 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).

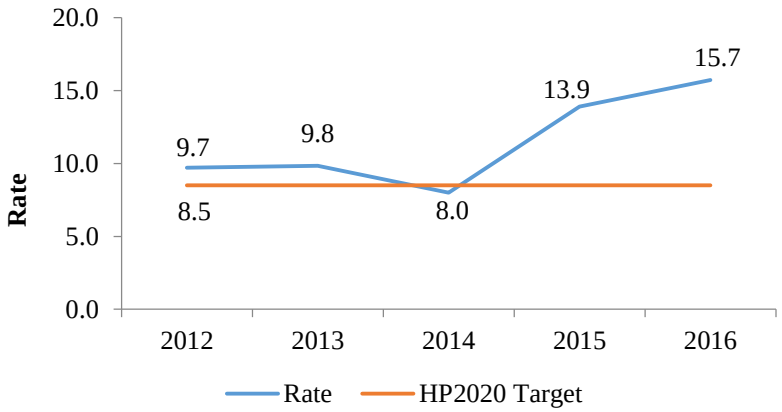
### CLINICAL AND PUBLIC HEALTH SIGNIFICANCE

Typical symptoms include diarrhea, stomach cramps and fever. Symptoms usually appear two to five days after exposure, with a range of one 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. Because 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.

### HEALTHY PEOPLE 2020 GOAL

The Healthy People 2020 Goal for campylobacteriosis is 8.5 cases per 100,000 population per year. The only year Indiana met this goal for the five-year period, 2012-2016, was 2014 (Figure 1). The rate increase from 2014 to 2016 may be due in part to the increased adoption of culture-independent diagnostic tests (CIDTs) that have resulted in the increased detection of probable cases.

**Figure 1**: Campylobacteriosis Rates by Year – Indiana, 2012-2016[*+]




### EPIDEMIOLOGY

In 2016, 1,043 cases of campylobacteriosis were reported in Indiana, for a rate of 15.72 cases per 100,000 population (Table 1). Females (16.24) were more likely to be reported than males (15.19). The rate of other races (14.70) was greater than the rate among those who identified as white (13.07) and those who identified as black (5.77); however, 218 cases did not report race data.

[*]All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

[+] Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

**Table 1**: Campylobacteriosis Case Rates by Race and Sex, Indiana, 2016[*+]

| | Cases | Rate | 2012-2016 Total |
|---|---|---|---|
| **Race** | | | |
| White | 742 | 13.07 | 2,641 |
| Black | 37 | 5.77 | 102 |
| Other | 46 | 14.70 | 114 |
| Unknown | 218 | - | 914 |
| **Sex** | | | |
| Male | 511 | 15.19 | 1,951 |
| Female | 531 | 16.24 | 1,818 |
| Unknown | 1 | - | 2 |
| **Total** | 1,043 | | 3,771 |

Figure 2 shows reported cases by year for 2012-2016.

**Figure 2:** Campylobacteriosis Cases by Year – Indiana, 2012-2016

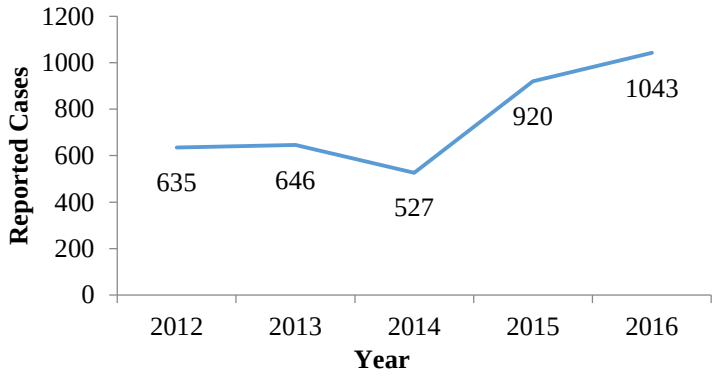
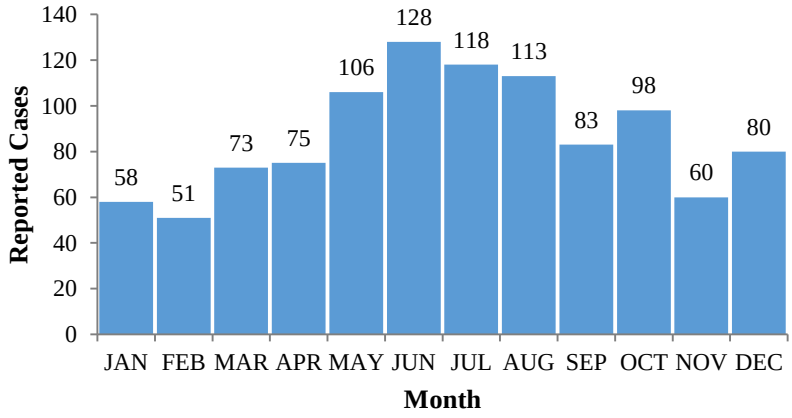



Figure 3 shows cases per month for 2016. Incidence of disease was greatest during the summer months.

**Figure 3:** Campylobacteriosis Cases by Month – Indiana, 2016

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As shown in Figure 4, age-specific rates in 2016 were greatest for infants younger than one year of age (35.9), followed by elderly adults aged 70-79 years (25.3).

**Figure 4:** Campylobacteriosis Incidence Rates by Age Group – Indiana, 2016[*+]

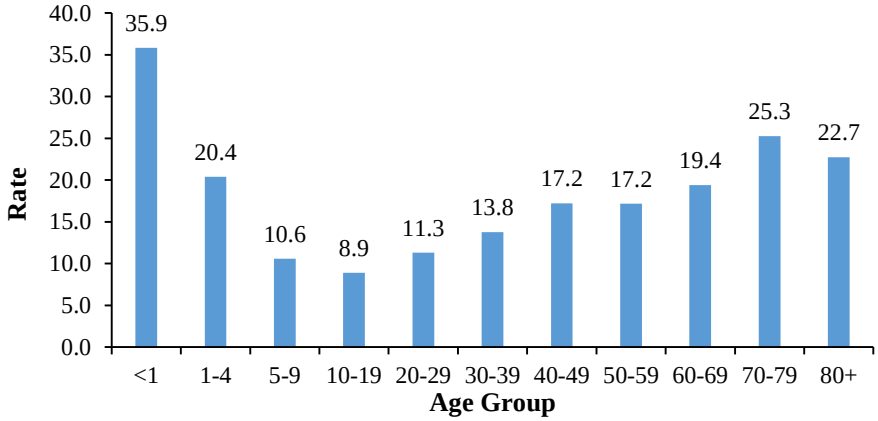


Figure 5 shows counties reporting five or more cases of campylobacteriosis in 2016. The incidence rate was highest among the following counties reporting five or more cases: Knox (82.1), Decatur (71.4) and Fulton (59.6).

## LEARN MORE

https://www.cdc.gov/foodsafety/diseases/campylobacter/index.html

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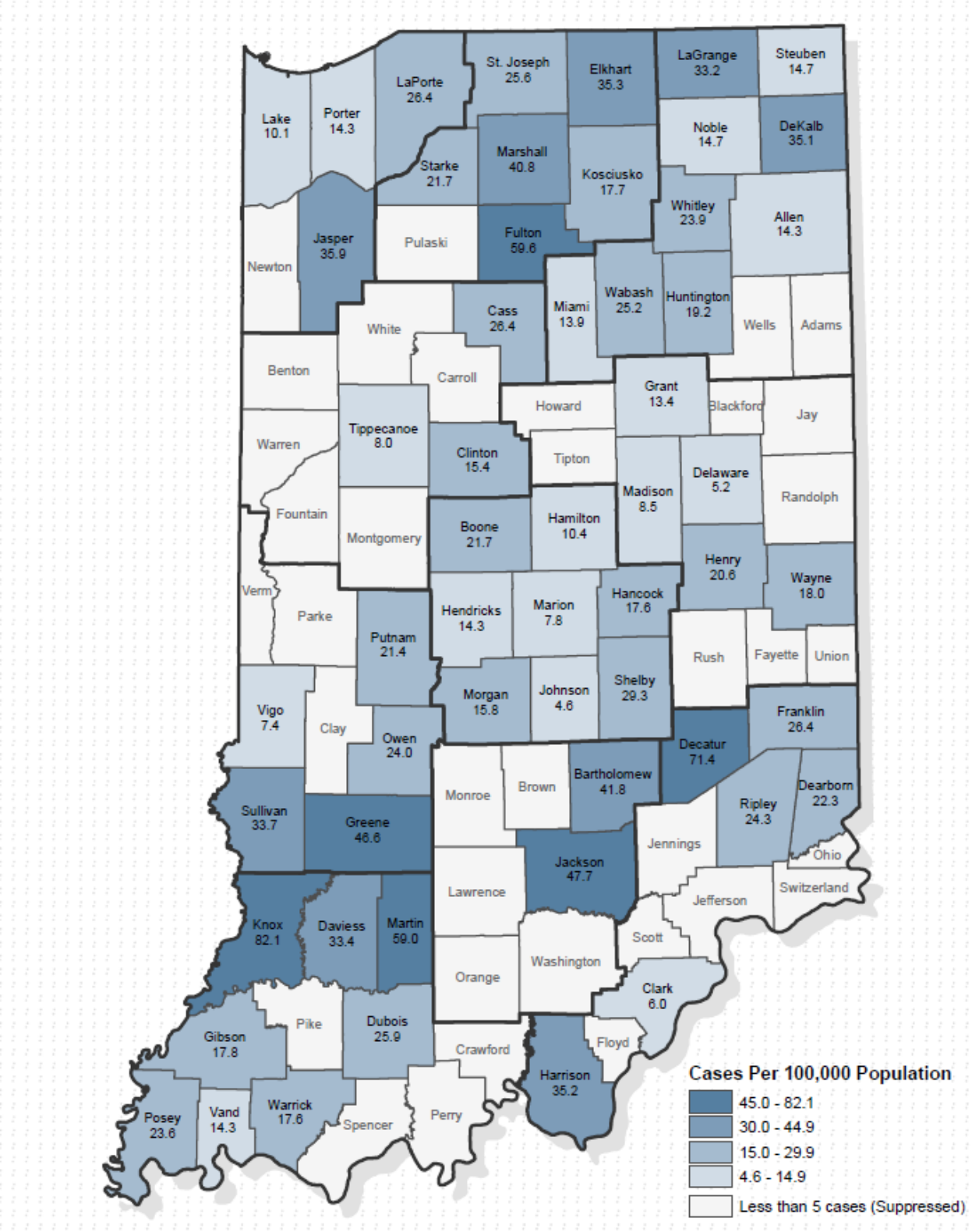
[+] Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

**Figure 5:** Campylobacteriosis Incidence Rates by County – Indiana, 2016*+




*All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

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

## *ESCHERICHIA COLI,* SHIGA TOXIN-PRODUCING

**2016 CASE TOTAL:** 101
**2015 CASE TOTAL:** 136

**2016 INCIDENCE RATE:** 1.52 per 100,000
**2015 INCIDENCE RATE:** 2.06 per 100,000

*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 made by some strains of *E. coli* 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, such as from lakes or streams
- Having direct contact with the stool of infected cattle, livestock or 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.

### CLINICAL AND PUBLIC HEALTH SIGNIFICANCE

Symptoms of STEC infection include diarrhea (bloody or non-bloody), abdominal cramps and little to no fever. Symptoms usually begin three to four days (range of two to 10 days) after exposure and last for approximately five to 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 younger than five years of age and the elderly are more likely to develop HUS. HUS may require hospitalization and extensive medical care and may even be fatal.

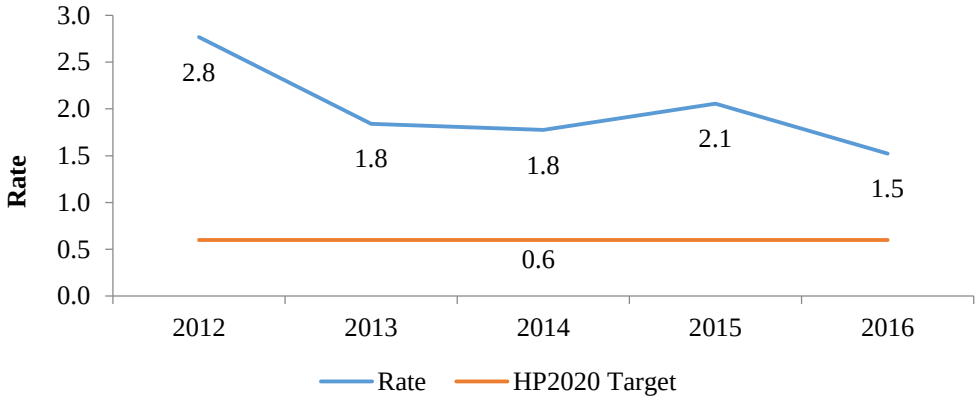
### HEALTHY PEOPLE 2020 GOAL

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 to 2015 (Figure 1). Since 2004, several national outbreaks of STEC have occurred, validating the need for continuous education on effective control measures and enhanced food safety systems.

*All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

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

**Figure 1**: Shiga Toxin-producing *E. coli* Rates by Year – Indiana, 2012-2016*+




## EPIDEMIOLOGY

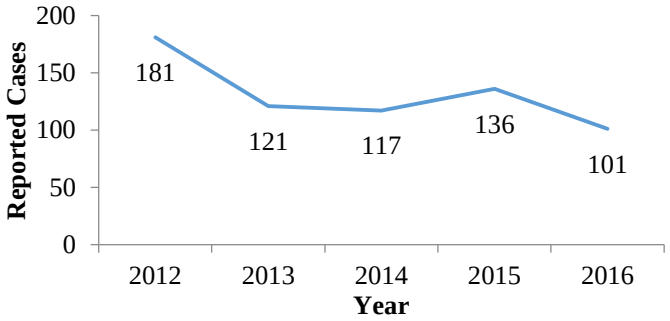
In 2016, 101 cases of Shiga toxin-producing *E. coli* infection were reported in Indiana, for a rate of 1.52 cases per 100,000 population (Table 1). Females (1.56) were slightly more likely to be reported than males (1.49). The rate of other races (1.28) was greater than the rate of those who identified as white (1.07) or those who identified as black (0.78); however, 31 cases did not report race data.

**Table 1**: Shiga Toxin-producing *E. coli* Case Rates by Race and Sex – Indiana, 2016*+

| | Cases | Rate | 2012-2016 Total |
|---|---|---|---|
| **Race** | | | |
| White | 61 | 1.07 | 437 |
| Black | 5 | 0.78 | 24 |
| Other | 4 | 1.28 | 26 |
| Unknown | 31 | - | 169 |
| **Sex** | | | |
| Male | 50 | 1.49 | 286 |
| Female | 51 | 1.56 | 370 |
| Unknown | 0 | - | 0 |
| **Total** | 101 | | 656 |

Figure 2 shows the number of reported cases per year for 2012-2016.

**Figure 2:** Shiga Toxin-producing *E. coli* Cases by Year –Indiana, 2012-2016

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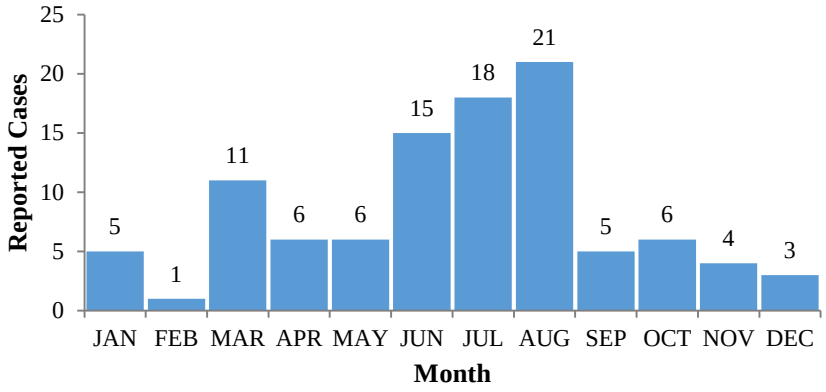
+ Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

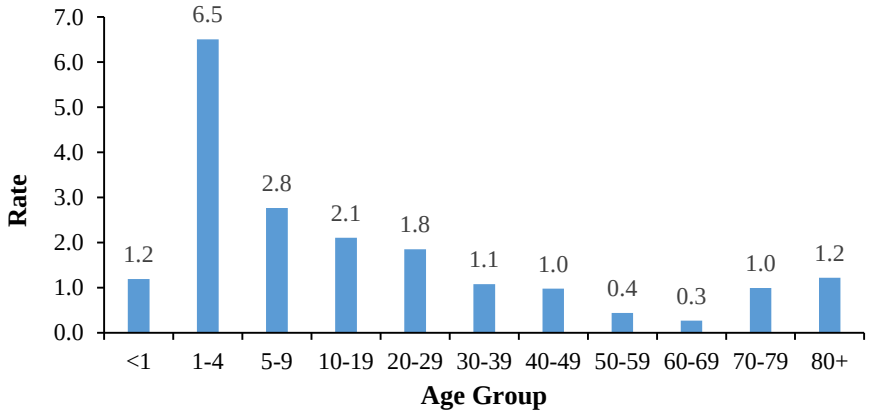
Figure 3 shows the number of cases per month in Indiana for 2016. Incidence of disease was greatest during the summer months, with August having the highest number of reported cases (21).

**Figure 3:** Shiga Toxin-producing *E. coli* Cases by Month – Indiana, 2016




As shown in Figure 4, age-specific rates in 2016 were highest among preschoolers ages 1-4 years (6.5), followed by children ages 5-9 years (2.8), followed by children ages 10-19 years (2.1).

**Figure 4**: Shiga Toxin-producing *E. coli* Incidence Rates by Age Group – Indiana, 2016[*+]




Eleven cases of HUS were reported in 2016.

[*]All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

[+] Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

Table 2 shows the three counties with the highest disease incidence rates of Shiga toxin-producing *E. coli* in 2016. The incidence rates were highest among the following counties: Morgan (7.2), Hamilton (4.7) and Marion (1.5).

**Table 2**: Shiga Toxin-producing *E. coli* Rates by County – Indiana, 2016[*+]

| County | Cases | Rate |
|---|---|---|
| Morgan | 5 | 7.2 |
| Hamilton | 15 | 4.7 |
| Marion | 14 | 1.5 |

## LEARN MORE

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

[*]All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

[+] Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

## HEPATITIS A

**2016 CASE TOTAL:** 18
**2015 CASE TOTAL:** 19

**2016 INCIDENCE RATE:** 0.27 per 100,000
**2015 INCIDENCE RATE:** 0.29 per 100,000

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:
  - 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
  - Person who injects drugs

### CLINICAL AND PUBLIC HEALTH SIGNIFICANCE

An acute hepatitis A case is characterized by positive immunoglobulin M (IgM) antibody to hepatitis A virus (anti-HAV) and an acute illness with a) discrete onset of symptoms and 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 state. 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.

Post-exposure prophylaxis with hepatitis A vaccine or hepatitis A immune globulin is effective if received within two weeks of exposure. Indications for prophylaxis may include people who consumed food or beverages contaminated with HAV, household or sexual contacts of someone infected with HAV, children and staff members in the same daycare room as an infected case and residents and staff members in a health care center who have direct contact with someone infected.

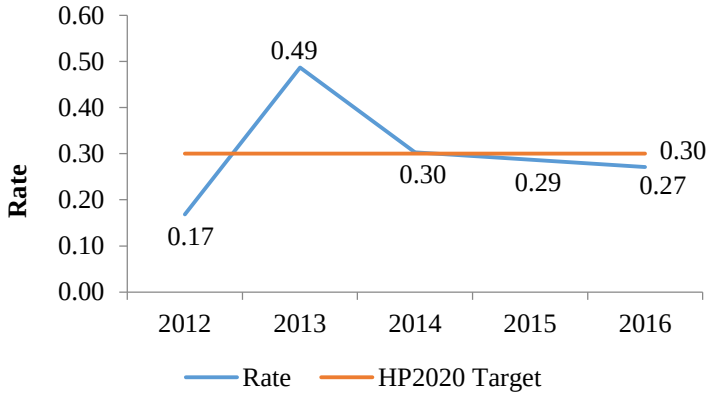
### HEALTHY PEOPLE 2020 GOAL

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 2012, 2014, 2015 and 2016 for the five-year reporting period 2012-2016 (Figure 1).

*All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

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

**Figure 1**: Hepatitis A Rates by Year – Indiana, 2016*+




## EPIDEMIOLOGY

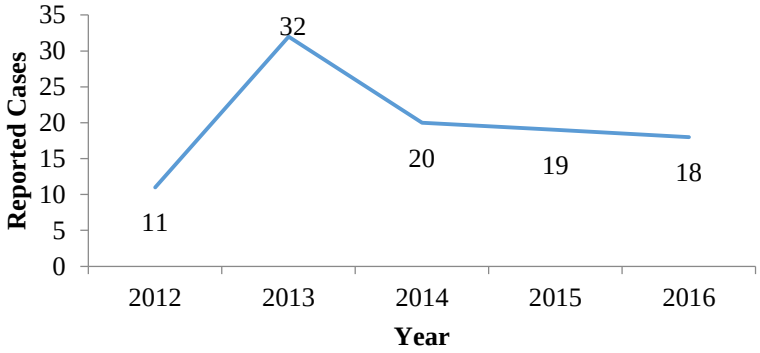
In 2015, 18 cases of hepatitis A were reported in Indiana for a rate of 0.27 cases per 100,000 population (Table 1). Males (0.27) and females (0.28) were evenly dispersed. The rate for other races (0.64) was greater than whites (0.23) or blacks (0.16); however, two cases did not report race data.

**Table 1**: Hepatitis A Case Rates by Race and Sex – Indiana, 2016*+

| | Cases | Rate | 2012-2016 Total |
|---|---|---|---|
| **Race** | | | |
| White | 13 | 0.23 | 60 |
| Black | 1 | 0.16 | 5 |
| Other | 2 | 0.64 | 11 |
| Unknown | 2 | - | 24 |
| **Sex** | | | |
| Male | 9 | 0.27 | 50 |
| Female | 9 | 0.28 | 49 |
| Unknown | 0 | - | 1 |
| **Total** | 18 | | 100 |

Figure 2 shows the number of reported cases per year for 2012-2016.

**Figure 2:** Hepatitis A Cases by Year – Indiana 2012-2016




*All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

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

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

**Figure 3:** Hepatitis A Cases by Month – Indiana, 2016

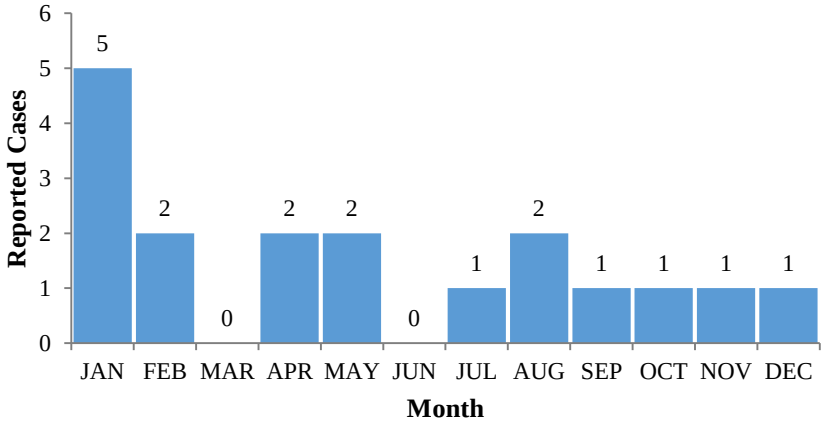
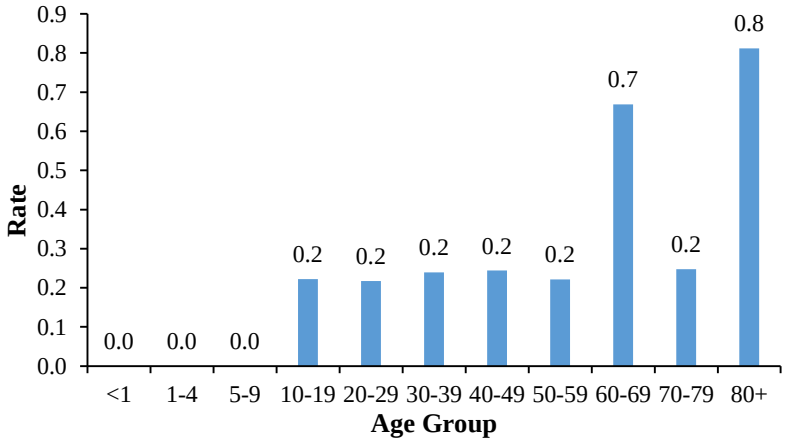



Figure 4 shows that age-specific rates were greatest for adults aged 80+ years (0.8) and adults aged 60-69 years (0.7).

**Figure 4:** Hepatitis A Incidence Rates by Age Group – Indiana, 2016[*+]




In 2016, no counties had a total case count greater than five.

## LEARN MORE

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

[*]All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

[+] Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

## LISTERIOSIS

**2016 CASE TOTAL:** 15
**2015 CASE TOTAL:** 19

**2016 INCIDENCE RATE:** 0.23 per 100,000
**2015 INCIDENCE RATE:** 0.29 per 100,000

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 and frozen. 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.

### CLINICAL AND 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 often can prevent infection of the baby. Antibiotics are available to treat the infection in all persons, regardless of age.

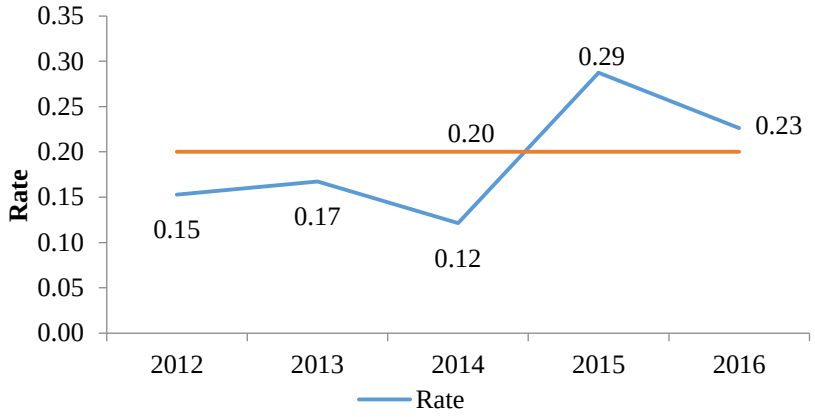
### HEALTHY PEOPLE 2020 GOAL

The Healthy People 2020 Goal for listeriosis is 0.2 cases per 100,000 population. During the five-year reporting period of 2012-2016, Indiana met the Healthy People 2020 goal every year except 2015 and 2016 (Figure 1). The cause for the elevated rate of cases in 2015 and 2016 is unknown. However, these two years have observed several food recalls due to *Listeria* contamination.

*All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

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

**Figure 1:** Listeriosis Rates by Year – Indiana, 2012-2016*+




## EPIDEMIOLOGY

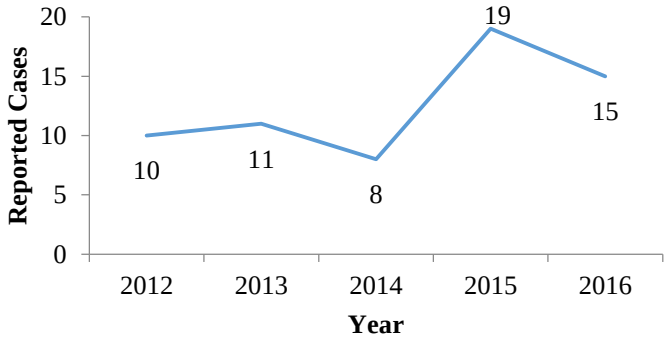
In 2016, 15 cases of listeriosis were reported in Indiana, for a rate of 0.23 cases per 100,000 population (Table 1).

**Table 1:** Listeriosis Case Rates by Race and Sex – Indiana, 2016*+

| | Cases | Rate | 2012-2016 Total |
|---|---|---|---|
| **Race** | | | |
| White | 13 | 0.23 | 16 |
| Black | 0 | - | 2 |
| Other | 1 | 0.32 | 3 |
| Unknown | 1 | - | 12 |
| **Sex** | | | |
| Male | 6 | 0.18 | 28 |
| Female | 9 | 0.28 | 35 |
| Unknown | 0 | - | 0 |
| **Total** | 15 | | 63 |

Figure 2 shows reported listeriosis cases by year for 2012-2016.

**Figure 2:** Listeriosis Cases by Year – Indiana, 2012-2016

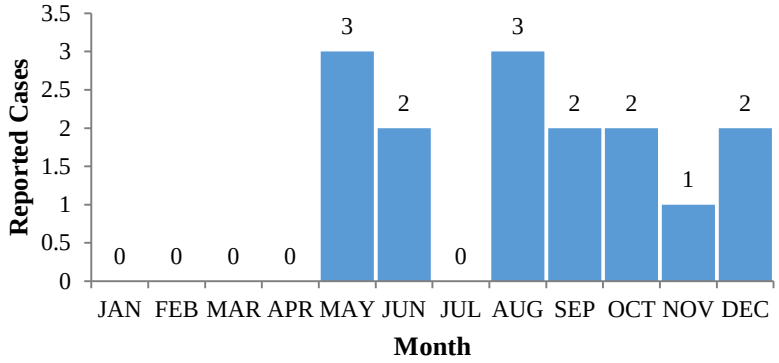



*All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

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

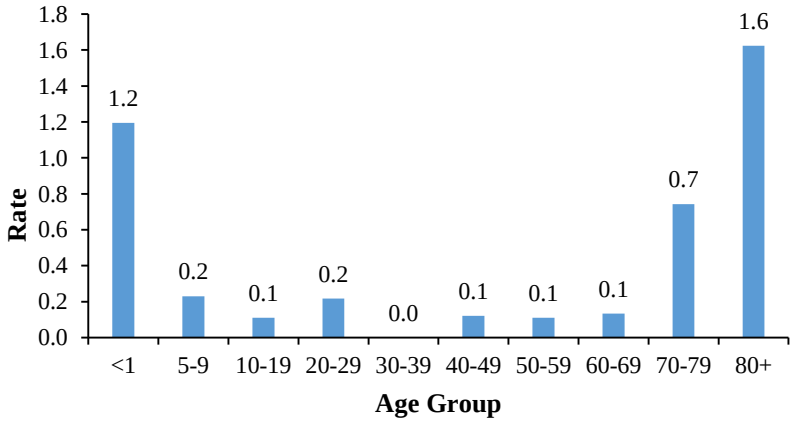
Figure 3 shows the number of listeriosis cases by month for 2016. Incidence of disease was highest in May and August.

**Figure 3:** Listeriosis Cases by Month – Indiana, 2016




As shown in Figure 4, age-specific rates in 2016 were greatest for adults aged 80+ years (1.6) and infants younger than one year of age (1.2).

**Figure 4:** Listeriosis Incidence Rates by Age Group – Indiana, 2016[*+]




In 2016, no counties had a total case count greater than five.

## LEARN MORE

http://www.cdc.gov/listeria/index.html
http://www.fda.gov/Food/FoodSafety/FoodborneIllness/FoodborneIllnessFoodbornePathogensNaturalToxins/BadBugBook/ucm070064.htm

[*]All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.
[+] Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

## SALMONELLOSIS

**2016 CASE TOTAL:** 799
**2015 CASE TOTAL:** 668

**2016 INCIDENCE RATE:** 12.05 per 100,000
**2015 INCIDENCE RATE:** 10.10 per 100,000

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 also 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.

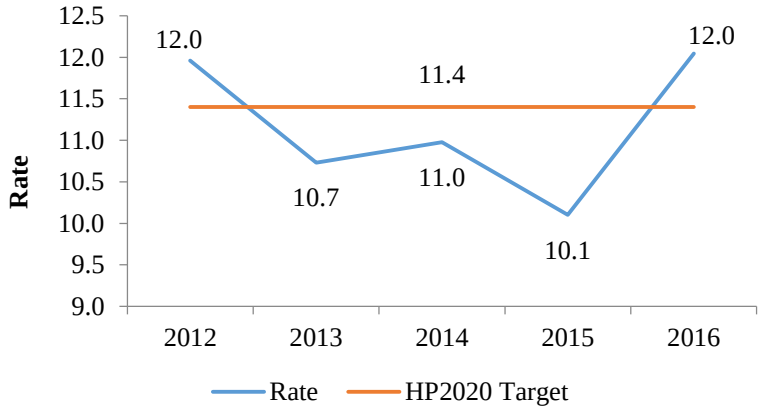
### CLINICAL AND PUBLIC HEALTH SIGNIFICANCE

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 and lungs and bones. Death from salmonellosis is rare. Children under age five, the elderly and people with weakened immune systems are at the greatest risk for severe complications. Most people recover within five to seven days without medical treatment, but antibiotics are available if indicated. Because diarrhea can cause dehydration, an infected person should drink plenty of fluids. There is no vaccine for salmonellosis.

### 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 2013, 2014 and 2015 during the five-year reporting period 2012-2016 (Figure 1).

**Figure 1:** Salmonellosis Rates by Year – Indiana, 2012-2016*+




### EPIDEMIOLOGY

In 2016, 799 cases of salmonellosis were reported in Indiana, for a rate of 12.05 cases per 100,000 population (Table 1). Females (13.61) were more likely to be reported with salmonellosis than males (10.52). The proportion of other races (14.70) was greater than blacks (7.48) or whites (9.25); however, 180 cases did not report race data.

*All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

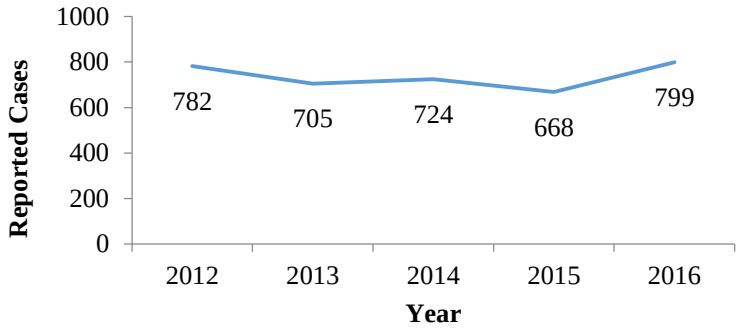
+ Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

**Table 1:** Salmonellosis Case Rates by Race and Sex – Indiana, 2016[*+]

| | Cases | Rate | 2012 - 2016 Total |
|---|---|---|---|
| **Race** | | | |
| White | 525 | 9.25 | 2,353 |
| Black | 48 | 7.48 | 208 |
| Other | 46 | 14.70 | 164 |
| Unknown | 180 | - | 953 |
| **Sex** | | | |
| Male | 354 | 10.52 | 1,672 |
| Female | 445 | 13.61 | 1,995 |
| Unknown | 0 | - | 11 |
| **Total** | 799 | | 3,678 |

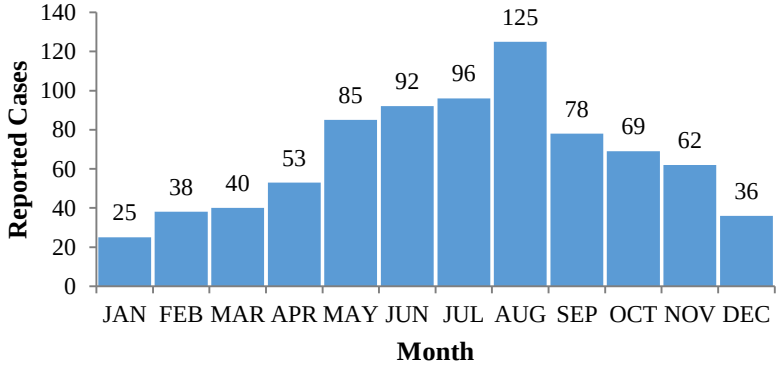
Figure 2 shows the number of reported cases for 2012-2016.

**Figure 2:** Salmonellosis Cases by Year – Indiana, 2012-2016




The incidence of salmonellosis was greatest during the summer months of 2016, peaking in August with 125 cases (Figure 3).

**Figure 3:** Salmonellosis Cases by Month – Indiana, 2016

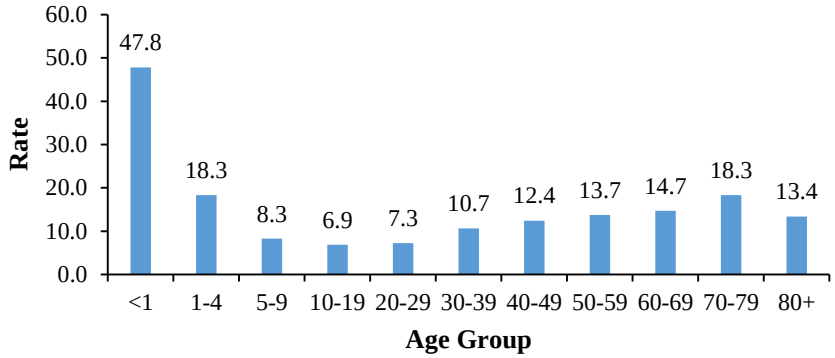



[*]All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

[+] Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

Figure 4 shows age-specific rates in 2016 were greatest among infants younger than one year of age (47.8).

**Figure 4:** Salmonellosis Incidence Rates by Age Group – Indiana, 2016*+




More than 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 743 isolates of *Salmonella* species tested in 2016.

**Table 2:** Top Three Reported Serotypes for Salmonellosis Cases – Indiana, 2016

| Serotype | Number | Percent |
|---|---|---|
| Enteritidis | 166 | 22.3% |
| Typhimurium | 101 | 13.6% |
| Newport | 53 | 7.1% |

Figure 5 shows Indiana counties reporting five or more cases. The following counties had the highest incidence rates of salmonellosis in 2016: Pike (64.4), Randolph (35.9), Whitley (29.9), LaGrange (28.1), DeKalb (28.1) and Noble (27.3).

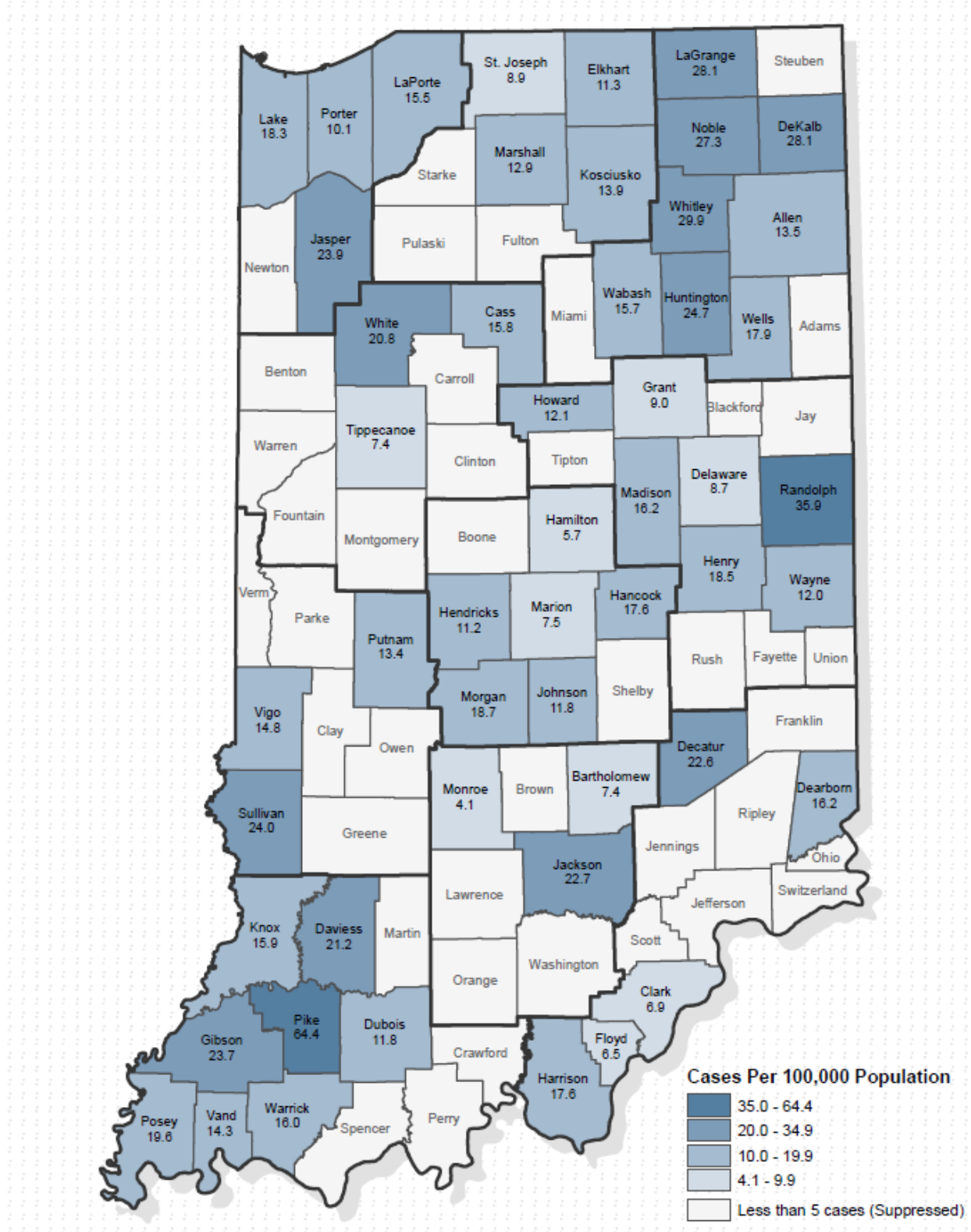
## LEARN MORE

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

**Figure 5:** Salmonella Incidence Rates by County – Indiana, 2016*+

*All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

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




*All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

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

## SHIGELLOSIS

**2016 CASE TOTAL:** 291
**2015 CASE TOTAL:** 278

**2016 INCIDENCE RATE:** 4.39 per 100,000
**2015 INCIDENCE RATE:** 4.20 per 100,000

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 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

### CLINICAL AND PUBLIC HEALTH SIGNIFICANCE

Symptoms of shigellosis include diarrhea, sudden stomach pain, cramps and fever. Symptoms usually begin 24-72 hours (range of 12 hours to five days) after exposure and last about four to seven days. Some people may have no symptoms but can still spread the infection to others. Antibiotics are recommended only for the treatment of severe infections of shigellosis or treatment of persons who have underlying immunosuppressive conditions. Some strains of *Shigella* bacteria are resistant to certain antibiotics.

### EPIDEMIOLOGY

In 2016, 291 cases of shigellosis were reported in Indiana, for a case rate of 4.39 cases per 100,000 population (Table 1). Males (3.66) were less likely to be reported than females (5.14). The rate of illness among blacks (9.82) was higher than the rate for other races (4.79) and whites (3.06); however, 39 cases did not report race data.

**Table 1:** Shigellosis Case Rates by Race and Sex – Indiana, 2016[*+]

| | Cases | Rate | 2012-2016 Total |
|---|---|---|---|
| **Race** | | | |
| White | 174 | 3.06 | 996 |
| Black | 63 | 9.82 | 785 |
| Other | 15 | 4.79 | 109 |
| Unknown | 39 | - | 319 |
| **Sex** | | | |
| Male | 123 | 3.66 | 986 |
| Female | 168 | 5.14 | 1,222 |
| Unknown | 0 | - | 1 |
| **Total** | 291 | | 2,209 |

Figure 1 shows the number of reported cases per year for 2012-2016. The number of shigellosis cases in 2014 was much higher than is typically seen due to a large outbreak in Indiana.

[*]All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

[+] Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

**Figure 1:** Shigellosis Cases by Year – Indiana, 2012-2016

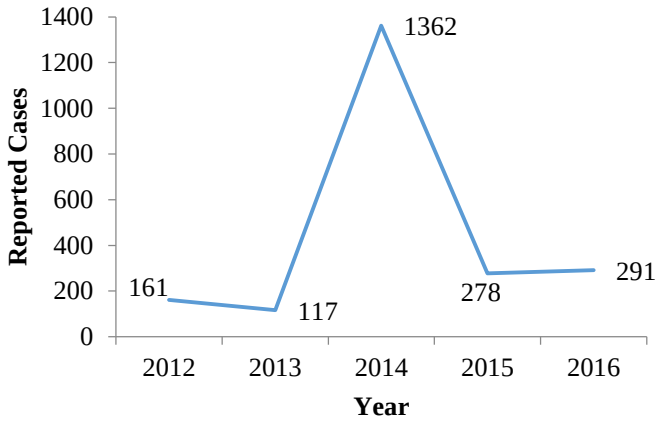
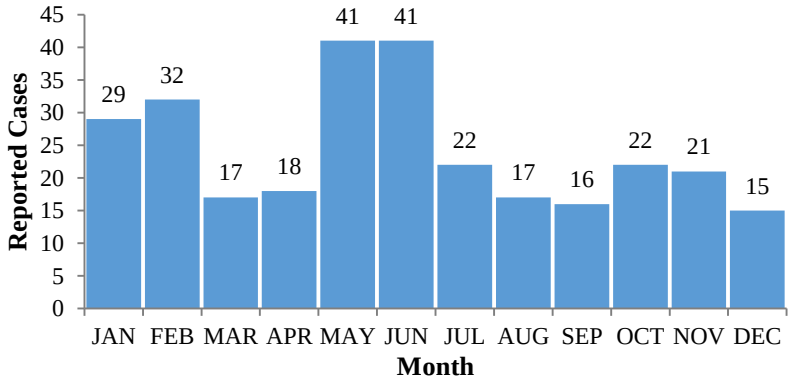



Figure 2 shows the number of cases per month in Indiana for 2016. Incidence of disease was present year round with May and June having the highest number of reported cases (41).

**Figure 2:** Shigellosis Cases by Month – Indiana, 2016




As shown in Figure 3, age-specific rates were highest among preschoolers ages 1-4 years (17.7), children ages 5-9 years (13.6) and infants under one year old (6.0).

**Figure 3:** Shigellosis Incidence Rates by Age Group – Indiana, 2016[*+]

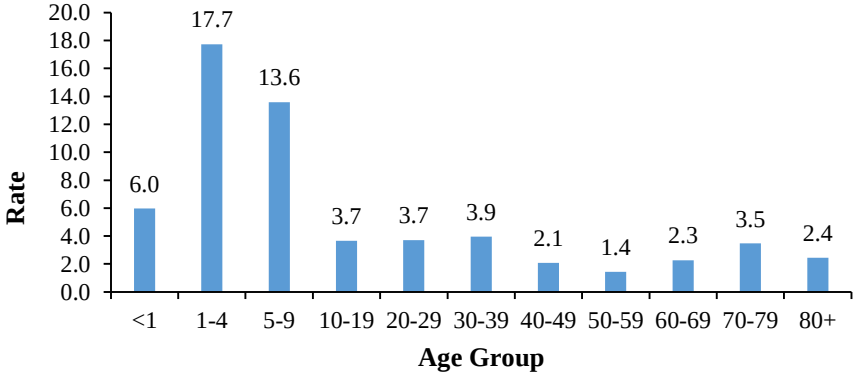
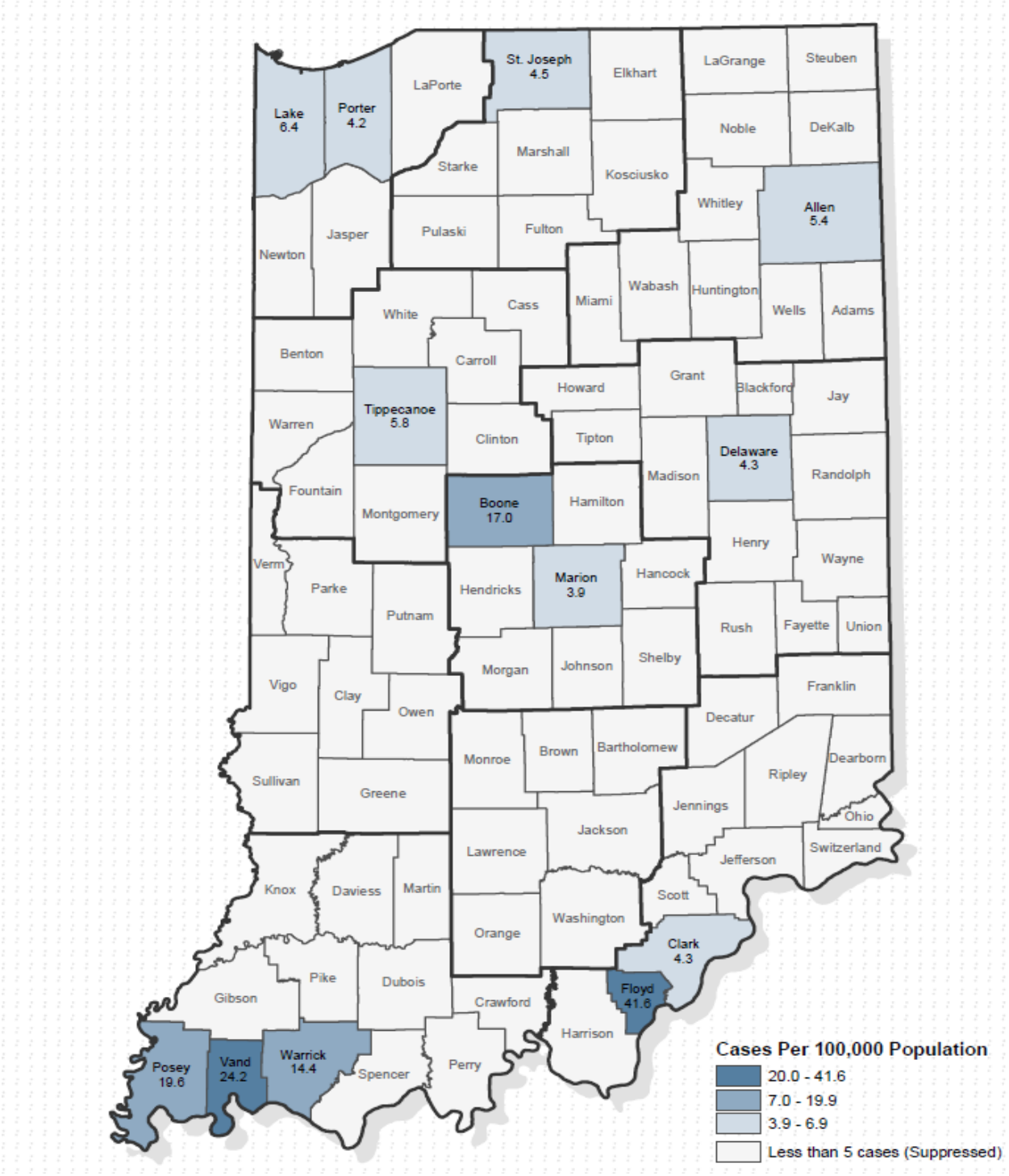



Figure 4 shows Indiana counties reporting five or more cases. The incidence rate was highest in Floyd County (41.6) followed by Vanderburgh County (24.2).

[*]All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

[+] Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

**Figure 4:** Shigellosis Incidence Rates by County – Indiana, 2016*+




## LEARN MORE

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

*All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

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

## INVASIVE DISEASES AND CONDITIONS

**INCLUDES:** Hansen's Disease (Leprosy), Meningococcal Disease, *Streptococcus*, Group A (Invasive), Toxic Shock Syndrome

### INVASIVE DISEASE PREVENTION

*Leprosy*

- 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.
- A genetic study at the National Hansen's Disease Program reports that armadillos may be a source of infection in the southern U.S. The program states that the risk of transmission from animals to humans is low, but animals should be handled with proper precautions.
- Persons at greatest risk for the disease include household contacts of a case. Most cases in the U.S. occur in immigrants and refugees who acquired the disease in their native country.

*Meningococcal Disease*

- It is recommended that all children be vaccinated with meningococcal conjugate vaccine (MCV4) at entry to sixth grade (11-12 years of age). The Centers for Disease Control and Prevention (CDC) recommends that all teens also receive a booster dose of MCV4 at age 16 years. For those who receive the first dose at age 13-15 years, a one-time booster dose should be administered, preferably at age 16-18 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.
- Vaccination also is recommended for other at-risk populations, and education on the importance of receiving the vaccine is a primary strategy for reducing incidence of the disease. Revaccination for individuals who remain at high risk is recommended. Three vaccines are currently available to protect against meningococcal disease. 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 (MenB) vaccines are licensed in the U.S.: Trumenba© and Bexsero©. Previously, the MenB vaccines were recommended only for high-risk groups; however, the Advisory Committee on Immunization Practices (ACIP) expanded the recommendation to include individuals ages 10-25 years who may be at increased risk for MenB infection.

*Streptococcus*, Group A (Invasive)

- The risk of Group A Streptococcal (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. Health care providers may recommend that people who are exposed to someone with invasive disease or those who are identified as carriers in outbreak situations take antibiotics to prevent the spread of infection.

*Toxic Shock Syndrome*

- Toxic shock syndrome (TSS) can be caused by many kinds of bacteria, though it is most commonly caused by *Streptococcus* or *Staphylococcus* bacteria.
- The risk of menstrual TSS can be reduced by avoiding the use of highly absorbent vaginal tampons or using tampons intermittently. Thorough cleaning and drainage of wounds or removal of wound packing also may decrease the risk of infection.

## MENINGOCOCCAL DISEASE

**2016 CASE TOTAL:** 8
**2015 CASE TOTAL:** 6

**2016 INCIDENCE RATE:** 0.12 per 100,000
**2015 INCIDENCE RATE:** 0.09 per 100,000

MENINGOCOCCAL DISEASE is a life-threatening infection 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 5-20 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 most commonly occurs as meningitis (inflammation of the meninges—the lining of the brain) or meningococcemia (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. Meningococcemia 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 two or three of every 100 cases are related to outbreaks.

### CLINICAL AND PUBLIC HEALTH SIGNIFICANCE

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

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

Increased hospital, provider and laboratory awareness of the condition may improve clinical outcomes. Immediate recognition and treatment of suspected cases is crucial. Suspected cases should be treated prior to lab confirmation. Health care providers must immediately report suspected, probable and confirmed cases to the patient's local health department within 24 hours 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 few days following symptom onset. Antibiotic prophylaxis is recommended for all high-risk close contacts and should be administered as soon as possible.

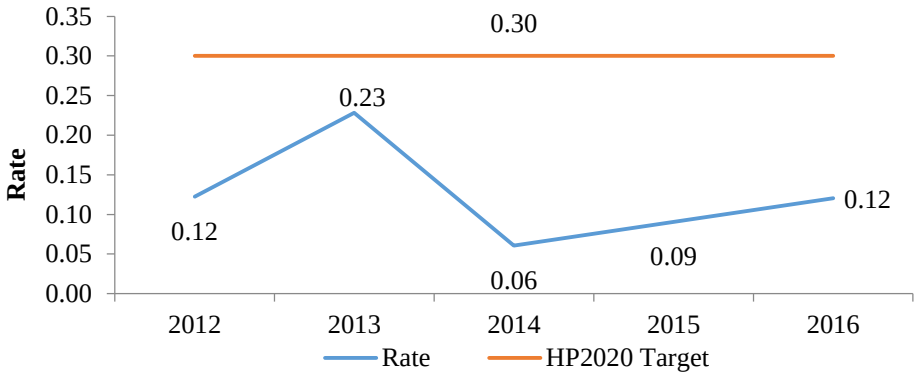
### HEALTHY PEOPLE 2020 GOAL

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 2016 (Figure 1).

*All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

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

**Figure 1:** Meningococcal Invasive Disease Rate by Year – Indiana, 2012-2016*+




## EPIDEMIOLOGY

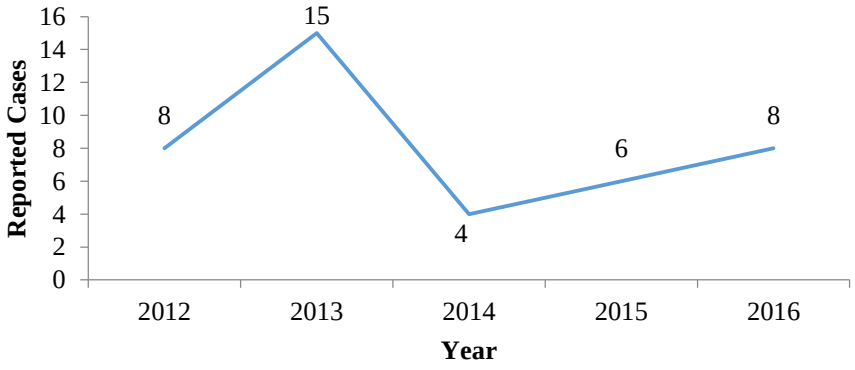
In 2016, eight confirmed and probable cases of invasive meningococcal disease (Table 1) were reported.

**Table 1:** Meningococcal Case Rates by Race and Sex – Indiana, 2016*+

| | Cases | Rate | 2012-2016 Total |
|---|---|---|---|
| **Race** | | | |
| White | 5 | 0.09 | 30 |
| Black | 3 | 0.47 | 5 |
| Other | 0 | - | 1 |
| Unknown | 0 | - | 5 |
| **Sex** | | | |
| Male | 4 | 0.12 | 22 |
| Female | 4 | 0.12 | 19 |
| Unknown | 0 | - | 0 |
| **Total** | 8 | | 41 |

Nationally, cases of meningococcal disease decreased significantly from the previous year, from 372 cases in 2015 to 340 in 2016. Indiana experienced a slight increase in disease, from six cases in 2015 to eight cases in 2016. Figure 2 displays the number of cases by year for the previous five years.

**Figure 2:** Meningococcal Invasive Disease Cases by Year – Indiana, 2012-2016

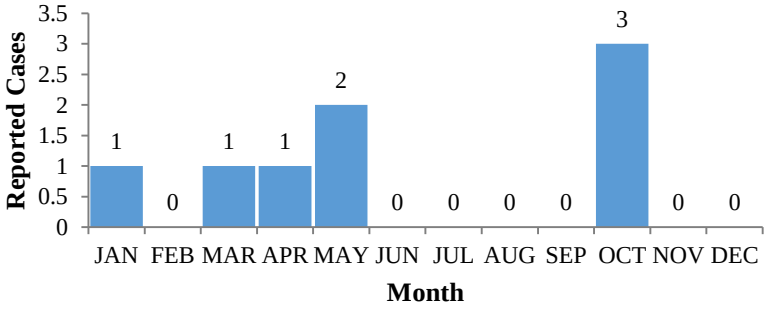



*All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

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

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 spring months and October 2016.

**Figure 3:** Meningococcal Invasive Disease Cases by Month – Indiana, 2016




Six counties reported confirmed or suspected cases during 2016. 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 1-2.5, requires 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 also can be performed at the CDC or a reference laboratory on specimens, if requested.

In 2016, serogroup B accounted for 62.5 percent of Indiana cases. Serogroup B had the highest proportion (70 percent) of cases from 2012 to 2016 followed by serogroup Y with 22.5 percent. Table 2 gives the total numbers for Indiana serogroups for the past five years.

**Table 2:** *Neisseria meningitidis* Serogroups – Indiana, 2012-2016

| Serogroup | 2012 | 2013 | 2014 | 2015 | 2016 | Total |
|---|---|---|---|---|---|---|
| A | - | - | - | - | - | - |
| B | 5 (62.5%) | 9 (60%) | 4 (100%) | 5 (83%) | 5 (62.5%) | 28 |
| C | - | 1 (6.7%) | - | - | 1 (12.5%) | 2 |
| Y | 3 (37.5%) | 5 (33.3%) | - | - | 2 (25%) | 9 |
| W135 | - | - | - | - | - | - |
| Z | - | - | - | - | - | - |
| Nonviable | - | - | - | - | - | - |
| Unknown | - | - | - | 1 (17%) | - | 1 |

## LEARN MORE

http://www.in.gov/isdh/25455.htm
http://www.cdc.gov/vaccines/hcp/vis/vis-statements/mening.html
https://www.cdc.gov/meningococcal/index.html

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

## STREPTOCOCCUS, GROUP A (INVASIVE)

**2016 CASE TOTAL:** 251
**2015 CASE TOTAL:** 201

**2016 INCIDENCE RATE:** 3.78 per 100,000
**2015 INCIDENCE RATE:** 3.04 per 100,000

GROUP A STREPTOCOCCAL (GAS) DISEASE is caused by the bacterium *Streptococcus pyogenes* and occurs 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 also may 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.

### CLINICAL AND 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 facilities and 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
- Persons who inject drugs

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 3.8 cases per 100,000.

### EPIDEMIOLOGY

In 2016, 251 cases of invasive GAS disease were reported in Indiana for a rate of 3.78 cases per 100,000 (Table 1). Incidence rates for males (1.49) and females (1.56) were similar. Race listed as other (5.11) had a higher rate than whites (3.19) and blacks (4.68), although low case numbers among minorities make rate comparisons problematic from year to year. Of these cases, 27 (10.8 percent) had manifestations of 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 Rates by Race and Sex – Indiana, 2016[*+]

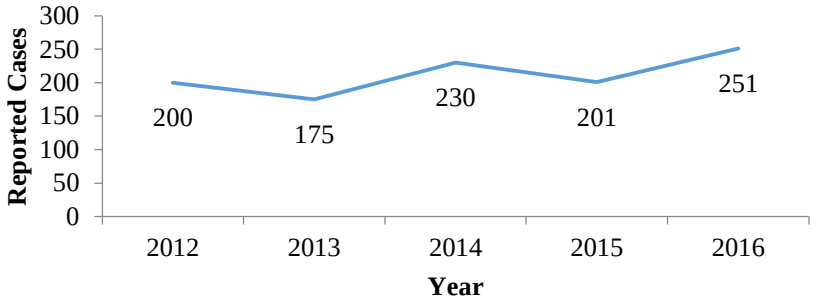
[*]All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

[+] Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

| | Cases | Rate | 2012-2016 Total |
|---|---|---|---|
| **Race** | | | |
| White | 181 | 3.19 | 761 |
| Black | 30 | 4.68 | 111 |
| Other | 16 | 5.11 | 42 |
| Unknown | 24 | - | 143 |
| **Sex** | | | |
| Male | 120 | 1.49 | 491 |
| Female | 131 | 1.56 | 566 |
| Unknown | 0 | - | 0 |
| **Total** | 251 | | 1,057 |

Figure 1 shows reported cases by year for the five-year reporting period 2012-2016.

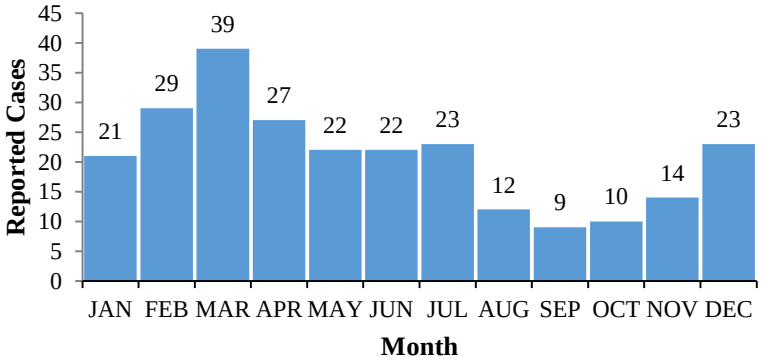
**Figure 1:** Group A *Streptococcus* Cases by Year – Indiana, 2012-2016□




□Case numbers include Group A *Streptococcus* and Streptococcal Toxic Shock Syndrome

In 2016, the incidence of invasive GAS peaked in the late winter and spring, as shown in Figure 2.

**Figure 2:** Group A *Streptococcus* Cases by Month – Indiana, 2016



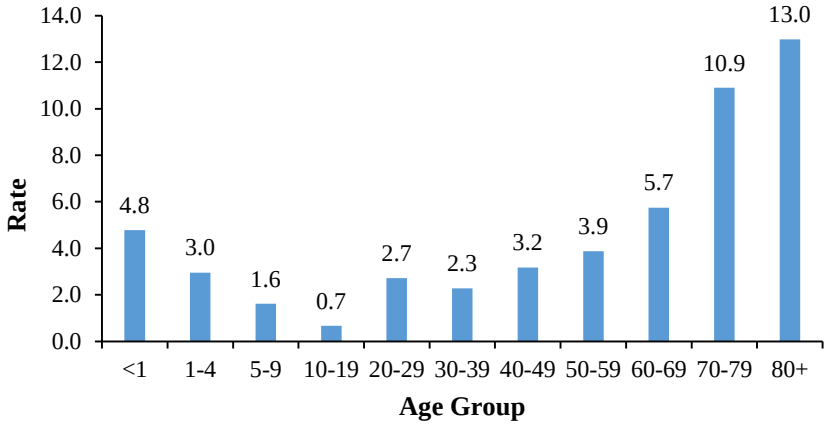

Very young infants and older adults are more likely to suffer from a compromised immune system or have underlying chronic medical conditions, such as diabetes or cancer, which predisposes them to GAS

*All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

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

disease. As shown in Figure 3, age-specific incidence rates were greatest for adults over the age of 80 (13.0), followed by adults 70-79 years of age (10.9).

**Figure 3:** Group A *Streptococcus* Incidence Rates by Age Group – Indiana, 2016*+□




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

Group A *Streptococcus* was reported in 61 counties. Incidence rates were highest among the following counties reporting five or more cases during the year: Lawrence, Marion, Madison, Vigo and Elkhart (Table 2).

**Table:** Group A *Streptococcus* Incidence Rates by County – Indiana, 2016*+

| County | Cases | Rate |
|---|---|---|
| Lawrence | 5 | 11.0 |
| Marion | 56 | 5.9 |
| Madison | 7 | 5.4 |
| Vigo | 5 | 4.6 |
| Elkhart | 9 | 4.4 |

## LEARN MORE

http://www.cdc.gov/groupastrep/about/index.html
https://www.cdc.gov/abcs/reports-findings/survreports/gas15.html

*All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

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

## MULTI-DRUG RESISTANT DISEASES & CONDITIONS

**INCLUDES**: Carbapenemase-Producing Carbapenem-Resistant *Enterobacteriaceae* (CP-CRE)

### ANTIMICROBIAL RESISTANCE PREVENTION

Antimicrobial resistance occurs when organisms are resistant to antimicrobial agents that would usually be utilized for treatment of an infection. Antimicrobial resistance develops when organisms are exposed to antimicrobial agents through clinical therapy and use in the agricultural setting. The overuse, misuse and abuse of antibiotics is the leading factor that contributes to the continued development of antimicrobial resistance.

Antimicrobial resistance can be transmitted from person to person, from resistant organisms that are persistent in the environment or from resistant bacteria that contaminate food. The best way to prevent the development of antimicrobial resistance is through the careful use of antimicrobials.

Patients can ensure careful antimicrobial use by:

- Talking to their health care provider about measures to relieve symptoms without using antibiotics
- Taking prescribed antibiotics exactly as directed by their health care provider, even if the patient starts to feel better
- Never pressuring a health care provider for an antibiotic prescription
- Never saving antibiotics for the next time they are sick
- Never sharing antibiotics with someone else

Health care professionals can help prevent the spread of antimicrobial resistance by:

- Prescribing an antibiotic that targets the bacteria that is most likely causing the infection
- Not treating asymptomatic colonized patients
- Prescribing an antibiotic only when it will benefit the patient

## CARBAPENEMASE-PRODUCING CARBAPENEM-RESISTANT *ENTEROBACTERIACEAE*

**2016 CASE TOTAL:** 354
**2015 CASE TOTAL:** NA

**2016 INCIDENCE RATE:** 5.34 per 100,000
**2015 INCIDENCE RATE:** NA

CARBAPENEMASE-PRODUCING CARBAPENEM-RESISTANT *ENTEROBACTERIACEAE* (CP-CRE) is any organism within the *Enterobacteriaceae* family (e.g., *Klebsiella pneumoniae*, *Escherichia coli*, *Enterobacter cloacae* complex) that is resistant to a carbapenem antibiotic through the production of a carbapenemase. Carbapenem antibiotics are a class of antibiotics used to treat serious infections and are often thought of as the last resort for treatment of antimicrobial-resistant organisms. Carbapenemases are enzymes produced by the bacteria that break down carbapenem antibiotics. CP-CRE surveillance includes identifying the production of the five most common carbapenemases globally: *Klebsiella pneumoniae* carbapenemase (KPC), Verona integron-mediated metallo-beta-lactamase (VIM), New Delhi metallo-beta-lactamase (NDM), Imipenemase (IMP) and Oxacillinase-48 (OXA-48).

### CLINICAL AND PUBLIC HEALTH SIGNIFICANCE

Invasive CP-CRE infections have been associated with mortality rates of up to 50 percent. In addition to high mortality rates, CP-CRE infections are often resistant to most and, in some cases, all antibiotics available for treatment. As a result, these infections are difficult to treat. Antibiotics available for treatment tend to be associated with worse side effects and more expensive therapies. CP-CRE tends to be identified among those individuals with extensive health care exposure; however, there is potential for these organisms to be spread within the community.

### EPIDEMIOLOGY

CP-CRE became newly reportable in December 2015, so accurate yearly counts are unavailable.

In 2016, 354 confirmed cases of CP-CRE were reported in Indiana, for a rate of 5.34 cases per 100,000 population (Table 1). Females (6.24) were more likely to be reported with CP-CRE than males (4.46). The rate in blacks (11.69) was greater than whites (3.57) or other races (7.99), while 51 cases did not report race data.

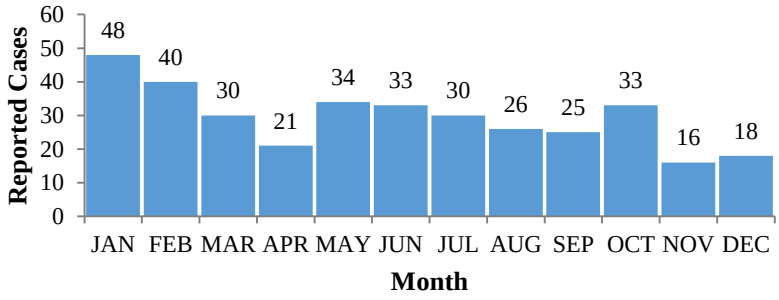
**Table 1:** CP-CRE Case Rates by Race and Sex – Indiana, 2016[*+]

| | Cases | Rate | 2012-2016 Total |
|---|---|---|---|
| **Race** | | | |
| White | 203 | 3.57 | 207 |
| Black | 75 | 11.69 | 83 |
| Other | 25 | 7.99 | 25 |
| Unknown | 51 | - | 53 |
| **Sex** | | | |
| Male | 150 | 4.46 | 155 |
| Female | 204 | 6.24 | 213 |
| Unknown | 0 | - | 0 |
| **Total** | 354 | | 368 |

[*]All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.
[+] Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

Cases of CP-CRE occurred year-round in 2016 with the greatest in the late winter months (Figure 1).

**Figure 1:** CP-CRE Cases by Month – Indiana, 2016




As shown in Figure 2, age-specific rates progressively increased among the older populations with the highest incidence observed in individuals aged 80 and older (25.2).

**Figure 2:** CP-CRE Incidence Rates by Age Group – Indiana, 2016[*+]

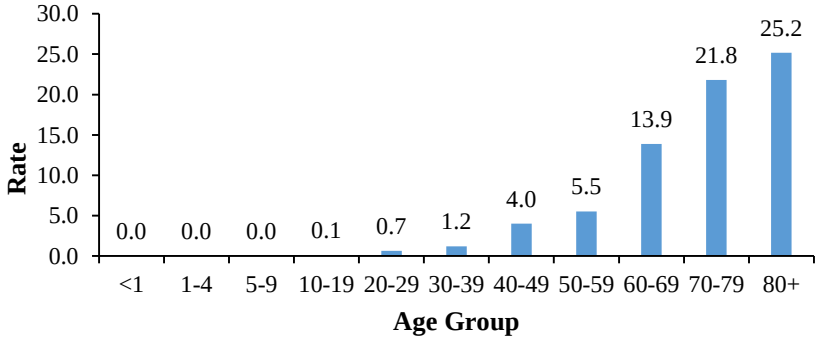


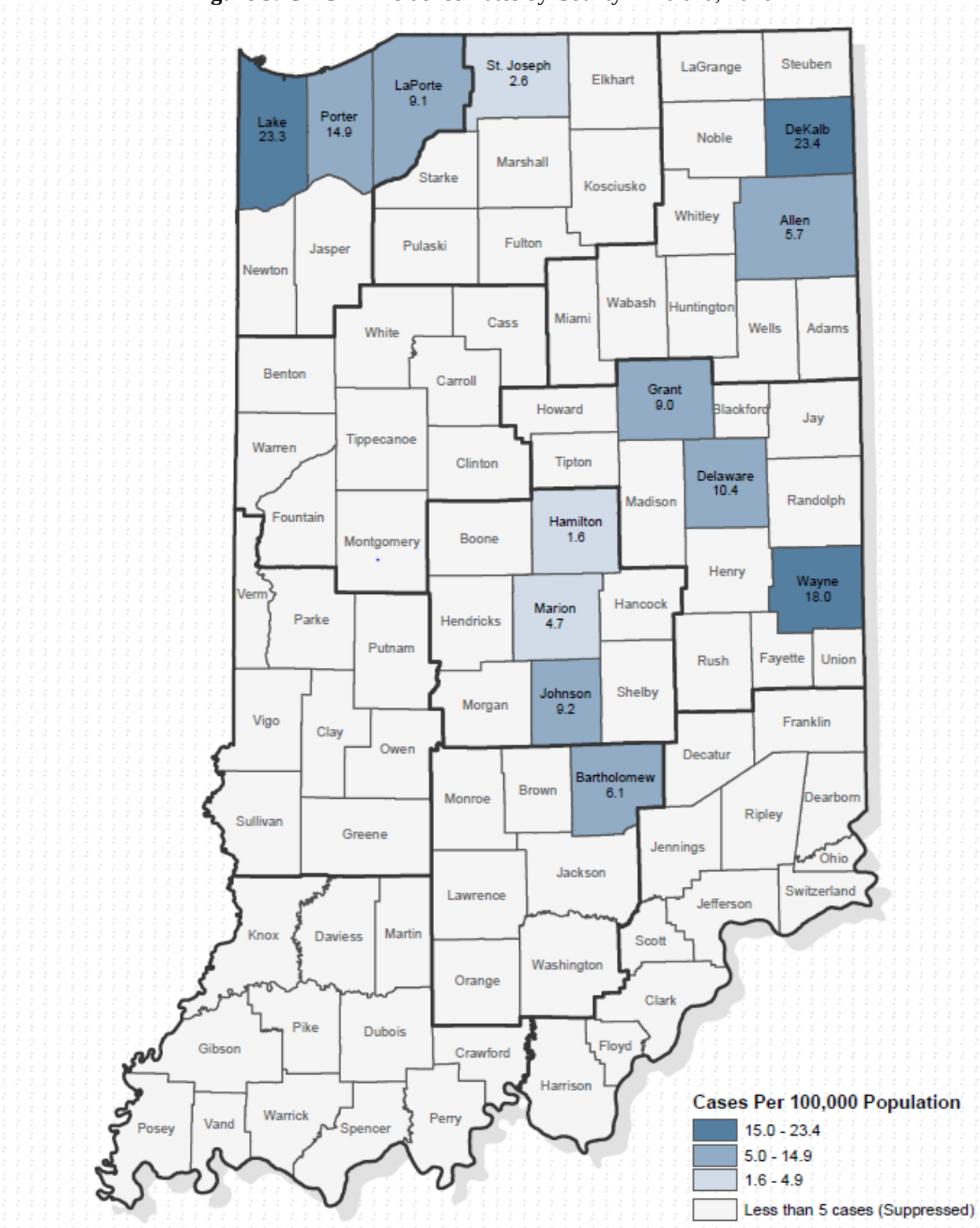

Figure 3 shows Indiana counties reporting five or more cases of CP-CRE. The incidence rate was highest in DeKalb County (23.4) followed closely by Lake County (23.3).

## LEARN MORE

Indiana State Department of Health CRE Quick Facts
Centers for Disease Control and Prevention CRE in Health care Settings

[*]All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.
[+] Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

**Figure 3:** CP-CRE Incidence Rates by County – Indiana, 2016[*+]




[*]All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

[+] Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

**INCLUDES**: Histoplasmosis, Influenza-Associated Deaths

## RESPIRATORY DISEASE PREVENTION

*Histoplasmosis*

It may be difficult to avoid breathing in *Histoplasma* in areas where it's common in the environment, such as areas surrounding the Ohio and Mississippi River valleys. It is important for those with weakened immune systems to avoid doing activities that are known to be associated with getting histoplasmosis, including:

- Disturbing material (digging in soil, excavating, chopping wood) where there are bird or bat droppings
- Cleaning chicken coops
- Cave exploring
- Cleaning, remodeling or demolishing old buildings

Large amounts of bird or bat droppings should be cleaned up by professional companies specializing in hazardous waste removal. Consult the document *Histoplasmosis: Protecting Workers at Risk* before starting a job or an activity where there's a chance of exposure to *Histoplasma*.

*Influenza-Associated Deaths*

Annual influenza vaccinations are encouraged before the beginning of the flu season to avoid getting infected with influenza. Because influenza viruses change over time, it is important to get vaccinated each year. The vaccine begins to protect you within a few days after you get the flu shot, but the vaccine is not fully effective until about 14 days after the shot.

Good respiratory hygiene is important to prevent the spread of influenza:

- Use your elbow or upper arm, instead of your hands, or a tissue to cover your mouth and nose when you cough or sneeze. Immediately throw used tissues into the trash can.
- Try not to touch your eyes, nose or mouth.
- Wash your hands often with soap and water; if soap and water are not available, use an alcohol-based hand rub.
- Avoid close contact with people who are sick.
- If you get the flu, stay home from work, school and social gatherings; take antiviral drugs if your doctor prescribes them.

## HISTOPLASMOSIS

**2016 CASE TOTAL:** 220
**2015 CASE TOTAL:** 151

**2016 INCIDENCE RATE:** 3.32 per 100,000
**2015 INCIDENCE RATE:** 2.28 per 100,000

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 *Histoplasma*, but accumulation of bird feces provides the organic enrichment needed for *Histoplasma* growth. Although birds might not carry *Histoplasma* in their feces, bat guano may contain the organism. Some studies have indicated that different clay minerals in soil can influence growth and activity of bacteria and fungi.

### CLINICAL AND PUBLIC HEALTH SIGNIFICANCE

Histoplasmosis is endemic in Indiana, and the Centers for Disease Control and Prevention (CDC) reports that 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 can 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, gardeners and those who have contact with bats or bat caves.

### EPIDEMIOLOGY

In 2016, 220 confirmed cases of histoplasmosis were reported in Indiana, for an incidence rate of 3.32 cases per 100,000 population (Table 1). Males (3.92) were more likely to be reported with histoplasmosis infection than females (2.69).

**Table 1:** Histoplasmosis Case Rates by Race and Sex – Indiana, 2016[*+]

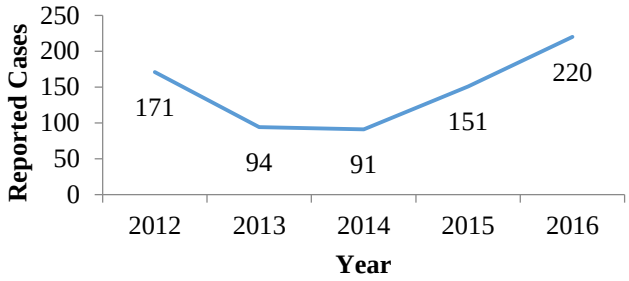
| | Cases | Rate | 2012-2016 Total |
|---|---|---|---|
| **Race** | | | |
| White | 135 | 2.38 | 435 |
| Black | 13 | 2.03 | 48 |
| Other | 13 | 4.15 | 27 |
| Unknown | 59 | - | 217 |
| **Sex** | | | |
| Male | 132 | 3.92 | 417 |
| Female | 88 | 2.69 | 309 |
| Unknown | 0 | - | 1 |
| **Total** | 220 | | 727 |

[*]All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

[+] 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 2012-2016.

**Figure 1:** Histoplasmosis Cases by Year – Indiana, 2012-2016




Histoplasmosis occurred throughout the year in 2016, with the largest number of cases occurring in December (Figure 2).

**Figure 2:** Histoplasmosis Cases by Month – Indiana, 2016

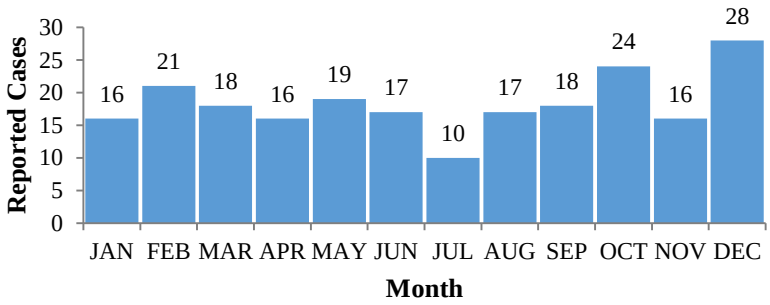
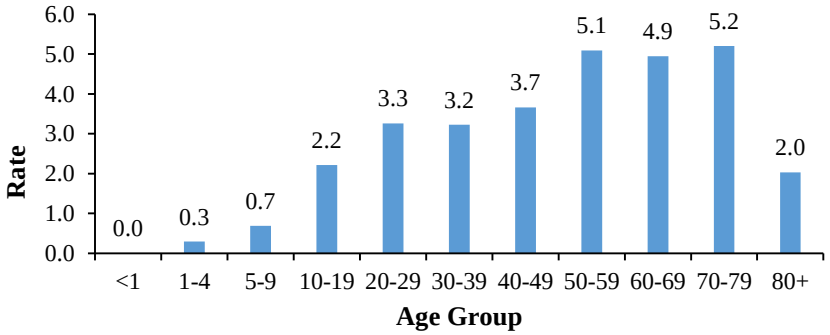



Figure 3 shows the distribution of cases by age group. Age-specific rates were greatest among adults aged 70 to 79 years (5.2) closely followed by adults aged 50 to 59 (5.1).

**Figure 3:** Histoplasmosis Incidence Rates by Age Group – Indiana, 2016[*+]




[*]All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

[+] Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

## HISTOPLASMOSIS

In 2016, 56 counties in Indiana reported at least one case of histoplasmosis. Table 2 shows the counties with the highest disease incidence rates of histoplasmosis in 2016. Incidence rates were highest among the following counties reporting five or more cases: Shelby (13.5), Bartholomew (11.1), Noble (10.5), Vigo (5.6) and Hendricks (5.0).

**Table 2:** Histoplasmosis Incidence Rates by County – Indiana, 2016[*+]

| County | Cases | Rate |
|---|---|---|
| Shelby | 6 | 13.5 |
| Bartholomew | 9 | 11.1 |
| Noble | 5 | 10.5 |
| Vigo | 6 | 5.6 |
| Hendricks | 8 | 5.0 |

### LEARN MORE

http://www.cdc.gov/fungal/diseases/histoplasmosis/index.html
http://www.in.gov/isdh/23254.htm

[*]All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.
[+] Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

## INFLUENZA-ASSOCIATED DEATHS

**2016 CASE TOTAL:** 73
**2015 CASE TOTAL:** 85

**2016 INCIDENCE RATE:** 1.10 per 100,000
**2015 INCIDENCE RATE:** 1.29 per 100,000

INFLUENZA-ASSOCIATED DEATH is caused by complications from an influenza virus infection. Influenza, or flu, is an illness caused by influenza viruses that infect the respiratory tract. The illness can be mild to severe and can cause death in some people. Although anyone can become infected with flu, the elderly, young children and anyone with other health problems are at more risk for hospitalizations and complications that can be attributed to influenza-associated deaths.

### CLINICAL AND PUBLIC HEALTH SIGNIFICANCE

In the United States, on average, 5 percent to 20 percent of the population gets the flu and more than 200,000 people are hospitalized from seasonal flu-related complications. Some people, such as older people, young children, pregnant women and people with certain health conditions, are at high risk for serious flu complications. These health conditions include:

- Asthma
- Neurological and neurodevelopmental conditions
- Chronic lung disease
- Heart disease
- Blood disorders
- Endocrine disorders (i.e., diabetes)
- Kidney and liver disorders
- Metabolic disorders
- Weakened immune systems due to medication or disease, such as HIV/AIDS
- People younger than 19 years of age receiving long-term aspirin therapy
- People who are morbidly obese

Every year up to 49,000 people die of influenza and its complications. About 90 percent of influenza-associated deaths occur in people aged 65 years and older.

### EPIDEMIOLOGY

In 2016, 73 confirmed cases of influenza-associated death were reported in Indiana, for an incidence rate of 1.10 cases per 100,000 population (Table 1). Males (1.13) were slightly more likely to be reported as an influenza-associated death than females (1.07).

**Table 1:** Influenza-Associated Death Case Rates by Race and Sex – Indiana, 2016[*+]

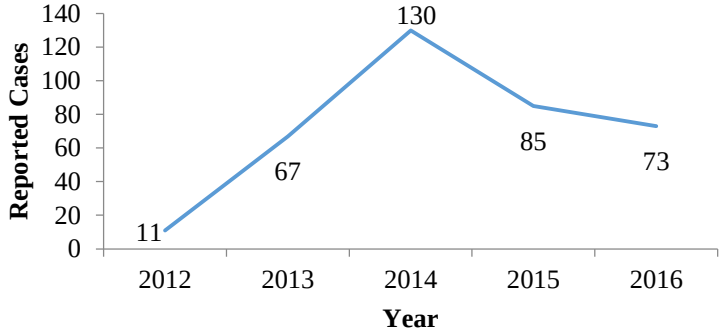
| | Cases | Rate | 2012-2016 Total |
|---|---|---|---|
| **Race** | | | |
| White | 54 | 0.95 | 282 |
| Black | 7 | 1.09 | 34 |
| Other | 8 | 2.56 | 11 |
| Unknown | 4 | - | 39 |
| **Sex** | | | |
| Male | 38 | 1.13 | 176 |
| Female | 35 | 1.07 | 189 |
| Unknown | 0 | - | 1 |
| **Total** | 73 | | 366 |

[*]All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

[+] 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 2012-2016.

**Figure 1:** Influenza-Associated Death Cases by Year – Indiana, 2012-2016




In 2016, influenza-associated deaths occurred throughout the normal flu season months of October through May. The largest number of cases occurred during the month of March, which coincided with the peak of the 2015-2016 flu season both nationally and in Indiana (Figure 2).

**Figure 2:** Influenza-Associated Death Cases by Month – Indiana, 2016

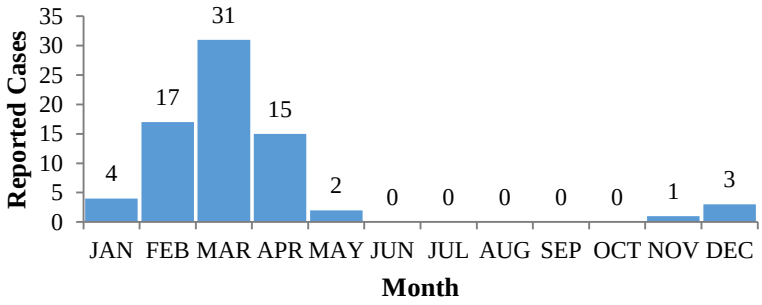
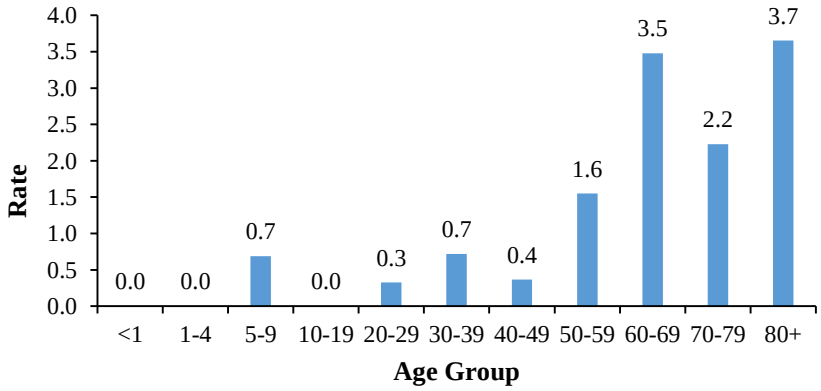



Figure 3 shows the distribution of cases by age group. Age-specific rates were greatest among adults aged 80+ (3.7) closely followed by adults aged 60-69 (3.5).

**Figure 3:** Influenza-Associated Death Incidence Rates by Age Group – Indiana, 2016[*+]




[*]All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

[+] Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

## INFLUENZA-ASSOCIATED DEATHS

In 2016, 27 counties in Indiana reported at least one case of influenza-associated death. Table 2 shows the counties with the highest disease incidence rates of influenza-associated death in 2016. Incidence rates were highest among the following counties reporting five or more cases: Lake (2.3), Marion (2.2) and Allen (1.9).

**Table 2:** Influenza-Associated Death Incidence Rates by County – Indiana, 2016[*+]

| County | Cases | Rate |
|---|---|---|
| Lake | 11 | 2.3 |
| Marion | 21 | 2.2 |
| Allen | 7 | 1.9 |

### LEARN MORE

https://www.cdc.gov/flu/about/index.html
http://www.in.gov/isdh/22104.htm
http://www.in.gov/isdh/25462.htm

[*]All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.
[+] Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

## VACCINE PREVENTABLE DISEASES & CONDITIONS

**INCLUDES**: Diphtheria, Invasive *Haemophilus influenzae*, Measles, Mumps, Pertussis, Pneumococcal Invasive Disease, Polio, Rubella, Smallpox, Tetanus, Varicella

### VACCINE PREVENTABLE DISEASE PREVENTION

*Diphtheria*

The typical series of vaccinations (for children seven years old and younger) is five doses given at two, four and six years; 15-18 months of age; and four to six years of age. Unvaccinated adults and children age seven 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 U.S.

*Invasive Haemophilus Influenzae*

*Haemophilus influenzae* type B (Hib) vaccine is recommended for all infants at two, four and six years and 12-15 months of age. The Hib vaccine often is combined with other routine vaccinations, which may require adjusted dosing. Because vaccine is available to protect only against Hib, serotyping all *H. influenzae* isolates from patients (especially from children younger than five 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.

*Measles, Mumps, Rubella*

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 four to six 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 health care workers, international travelers and adults enrolled in secondary education. Infants traveling to endemic areas can receive a dose of MMR as early as six months of age but also should receive routine vaccination again at 12-15 months and four to six years.

*Pertussis*

The DTaP vaccine is licensed to be administered at two, four and six years and 15-18 months of age, with an additional dose administered between four to six years of age. The DTaP vaccine should not be administered to persons over seven 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 the likelihood of transmission. A single dose of Tdap can be given instead of Td (tetanus and diphtheria) vaccine. In addition, pregnant women should receive a dose during every pregnancy (preferably between 27 and 36 weeks gestation).

*Pneumococcal Invasive Disease*

The current pneumococcal conjugate vaccine for administration to children younger than five years of age and for adults over the age of 65 is a 13-valent pneumococcal conjugate vaccine (PCV13). 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.

*Polio*

Poliomyelitis (polio) is a viral disease that infects the intestinal tract and was responsible for significant morbidity and mortality worldwide prior to vaccination efforts. Although 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. Inactivated polio vaccine (IPV) is recommended in four doses given at two months, four months, six to 18 months, and four to six years of age for children. Oral polio vaccine (OPV) is used in some countries around the world but has not been used in the U.S. since 2000.

*Smallpox*

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 U.S.

*Varicella*

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 might have a mild case of varicella disease known as “break through” 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.

**2016 CASE TOTAL:** 127
**2015 CASE TOTAL:** 119

**2016 INCIDENCE RATE:** 1.91 per 100,000
**2015 INCIDENCE RATE:** 1.80 per 100,000

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.

## CLINICAL AND 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*.

## HEALTHY PEOPLE 2020 GOAL

The Healthy People 2020 Goal for Hib disease is 0.27 cases of Hib disease per 100,000 children under five years of age. In 2016, two cases of Hib disease occurred in Indiana in children younger than five years of age for whom isolates were submitted for testing. In 2016, Indiana did not meet the Healthy People 2020 goal, with 0.47 cases of Hib per 100,000 children under five years of age.

## EPIDEMIOLOGY

In 2016, 127 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 (1.72 per 100,000) to acquire *H. influenzae*.

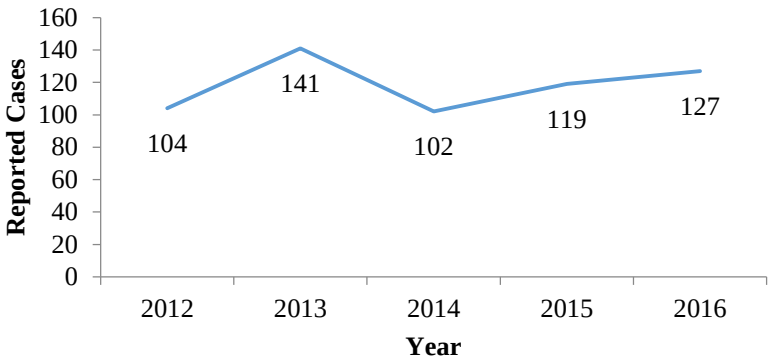
**Table 1:** *Haemophilus influenza* Case Rates by Race and Sex – Indiana, 2016[*+]

| | Cases | Rate | 2012-2016 Total |
|---|---|---|---|
| **Race** | | | |
| White | 100 | 1.76 | 452 |
| Black | 12 | 1.87 | 44 |
| Other | 7 | 2.24 | 20 |
| Unknown | 8 | - | 77 |
| **Sex** | | | |
| Male | 58 | 1.72 | 266 |
| Female | 69 | 2.11 | 327 |
| Unknown | 0 | - | 0 |
| **Total** | 127 | | 593 |

Figure 1 shows reported cases of *H. influenzae* for the five-year period 2012-2016.

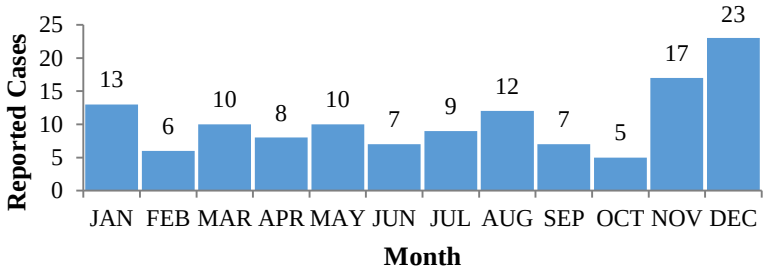
**Figure 1:** Invasive Haemophilus Influenzae Cases by Year – Indiana, 2012-2016

[*]All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.
[+] Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.



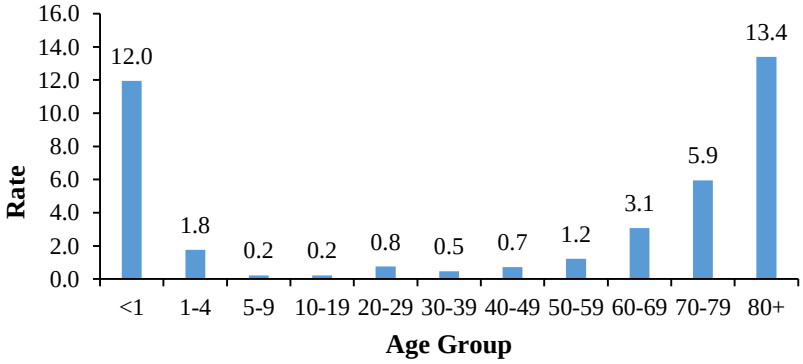

*H. influenzae* occurred throughout the year in 2016, with the highest number of cases occurring in November and December (Figure 2).

**Figure 2:** Invasive Haemophilus Influenzae Cases by Month – Indiana, 2016




Age-specific rates were greatest for adults aged 80 years and older (13.4) and infants younger than one year (12.0). Figure 3 shows *H. influenzae* incidence by age group.

**Figure 3:** Invasive Haemophilus Influenzae Incidence Rates by Age Group – Indiana, 2016[*+]




[*]All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

[+] Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

Although 46 counties reported cases of *H. influenzae*, only five counties (Allen, Lake, Marion, St. Joseph and Vanderburgh) had five or more cases. Of the 127 cases reported in 2016, 114 (91.3 percent) were serotyped. Table 2 provides a breakdown of *H. influenzae* cases by serotype.

**Table 2:** Percent of Reported *Haemophilus influenza* Cases by Serotype – Indiana, 2016

| Type | Number | Percent |
|---|---|---|
| a | 9 | 7.1% |
| b | 3 | 2.4% |
| e | 3 | 2.4% |
| f | 13 | 10.2% |
| Nontypeable | 86 | 67.7% |
| Not Tested/Unknown | 13 | 10.2% |
| Total | 127 | 100.0% |

## LEARN MORE

http://www.cdc.gov/hi-disease/index.html
http://www.cdc.gov/vaccines/vpd-vac/hib/

*All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

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

## MUMPS

**2016 CASE TOTAL:** 293
**2015 CASE TOTAL:** 6

**2016 INCIDENCE RATE:** 4.42 per 100,000
**2015 INCIDENCE RATE:** 0.09 per 100,000

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, and most mumps cases are sporadic. Mumps incidence has been historically low since the introduction of a vaccine, but in recent years, outbreaks of mumps in fully vaccinated individuals in highly close-contact settings or communities have been documented. In 2016, Indiana experienced four large mumps outbreaks among university students, with significant community spread, contributing to a national total of more than 6,000 cases nationally—the highest in a decade.

### CLINICAL AND 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 can present as a mild disease, it also can lead to severe complications, including hearing loss, encephalitis, pancreatitis, sterility and death.

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 the onset of parotitis. Although Indiana has a relatively low baseline incidence of mumps cases, health care providers should consider mumps diagnosis and testing when parotitis of two days or longer has occurred.

### 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 did not meet the Healthy People 2020 Goal in 2016 with 292 U.S.-acquired cases (a rate of 4.40 cases per 100,000 population).

### EPIDEMIOLOGY

In 2016, 293 probable or confirmed cases of mumps were reported in Indiana. Many of these cases were associated with large ongoing outbreaks at four universities in Indiana. During the five year period 2012-2016, 331 cases were reported.

**Table 1:** Mumps Case Rates by Race and Sex – Indiana, 2016

| | Cases | Rate | 2012-2016 Total |
|---|---|---|---|
| **Race** | | | |
| White | 180 | 3.17 | 208 |
| Black | 38 | 5.92 | 39 |
| Other | 19 | 6.07 | 21 |
| Unknown | 56 | - | 63 |
| **Sex** | | | |
| Male | 158 | 1.49 | 183 |
| Female | 135 | 1.56 | 148 |
| Unknown | 0 | - | 0 |
| **Total** | 293 | | 331 |

*All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

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

**Figure 1:** Mumps Cases by Year – Indiana, 2012-2016

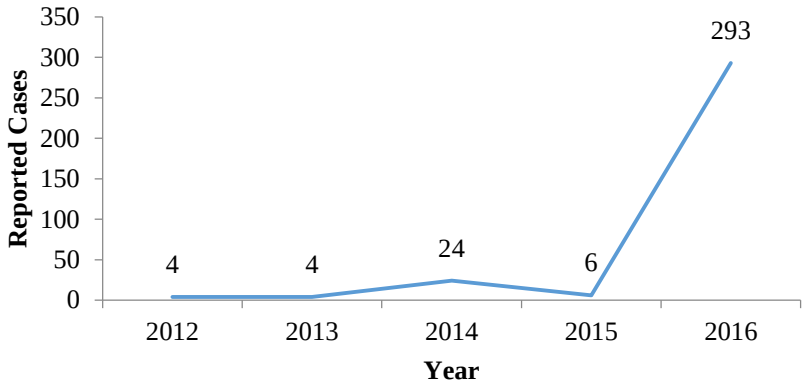



**Figure 2:** Mumps Cases by Month – Indiana, 2016

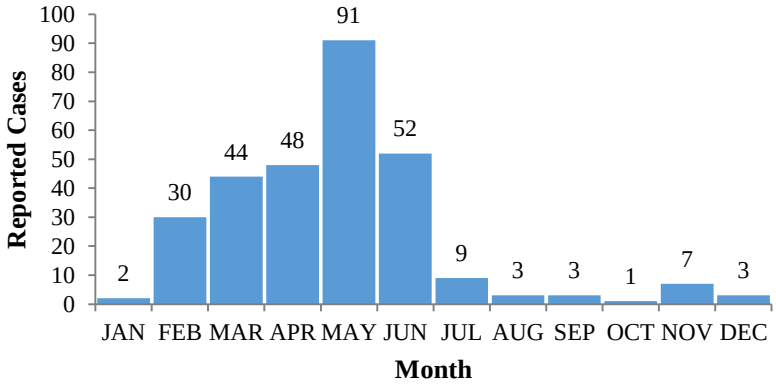
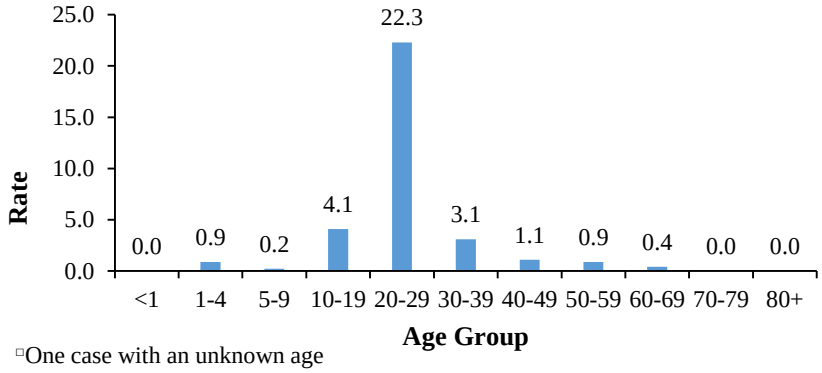



**Figure 3:** Mumps Cases by Age Group – Indiana, 2016[*+□]




□One case with an unknown age

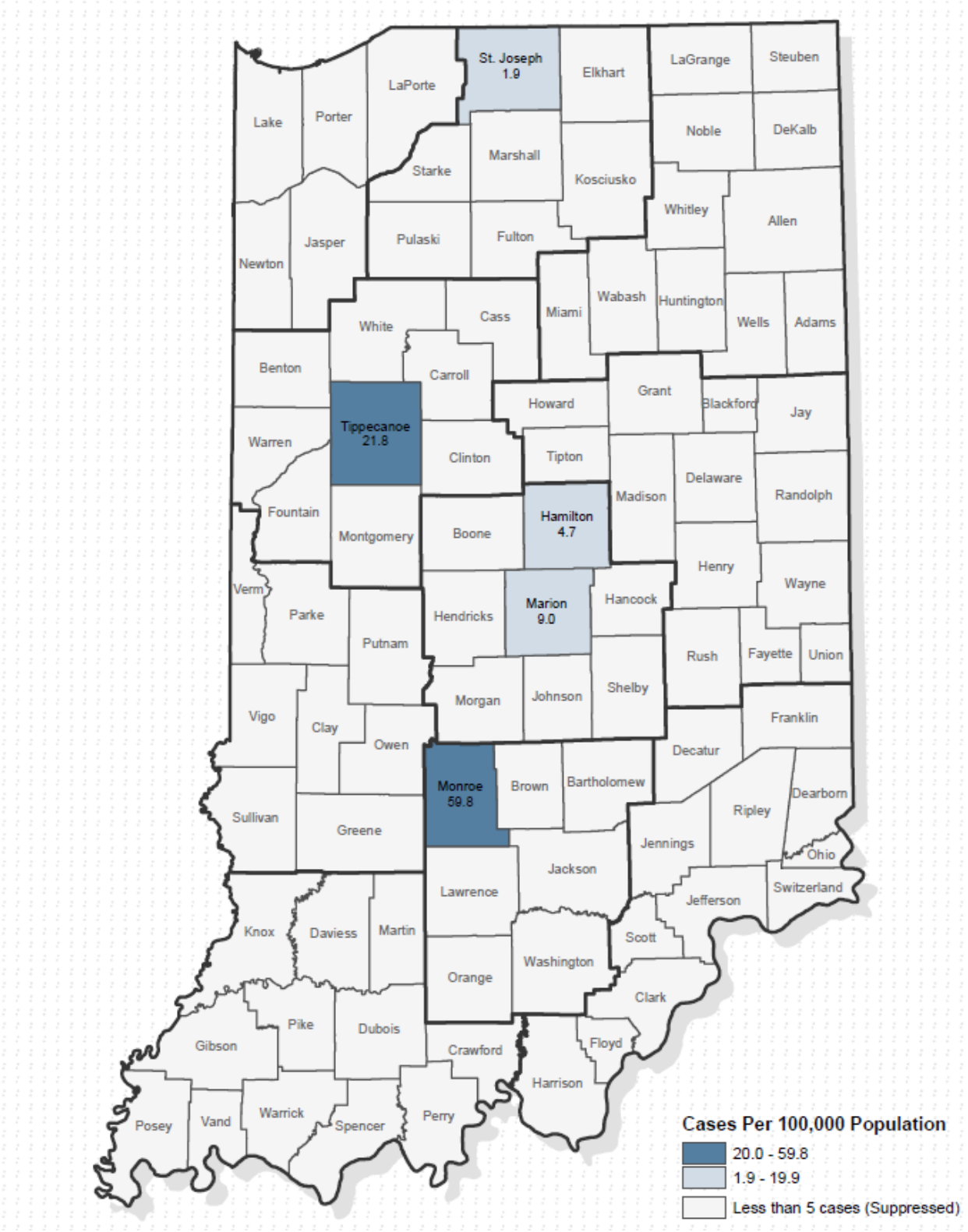
## LEARN MORE

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

*All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

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

**Figure 4:** Mumps Incidence Rates by County – Indiana, 2016*+




*All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

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

## PERTUSSIS

**2016 CASE TOTAL:** 178
**2015 CASE TOTAL:** 293

**2016 INCIDENCE RATE:** 2.68 per 100,000
**2015 INCIDENCE RATE:** 3.37 per 100,000

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.

### CLINICAL AND PUBLIC HEALTH SIGNIFICANCE

The illness is characterized by early symptoms of coryza (runny nose), sneezing, low-grade fever and mild cough. The cough usually persists and 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 can last 1-10 weeks, a convalescent stage occurs where the coughing spells become less severe and less frequent. Although antibiotics are used to treat pertussis and reduce transmission, they often have little impact on reducing the intensity of the coughing symptoms.

### HEALTHY PEOPLE 2020 GOAL

The Healthy People 2020 Goals for pertussis are fewer than 2,500 cases of pertussis nationwide in children under one year 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 one year of age with 38 cases (45.4 cases per 100,000 population) and adolescents aged 11-18 years with 29 cases (4.0 cases per 100,000 population) in 2016.

### EPIDEMIOLOGY

Indiana had 178 reported cases of pertussis in 2016, for a rate of 2.68 cases per 100,000 population (Table 1). Females (3.15) had a slightly higher incidence rate than males (2.23). The rate for other races (3.51) was higher than for blacks (1.71) and for whites (2.20), though this trend could be a result of low prevalence of pertussis among non-white races.

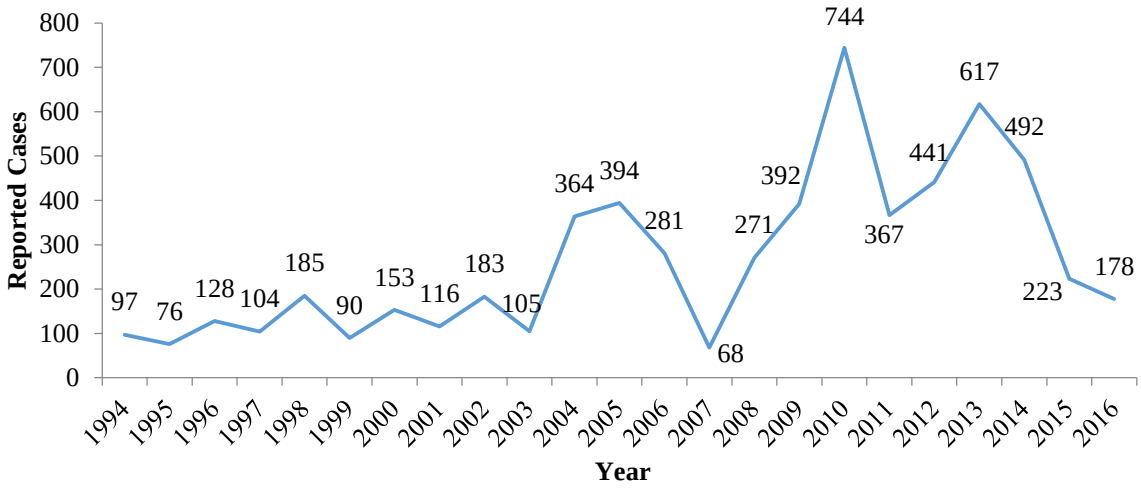
**Table 1:** Pertussis Case Rates by Race and Sex – Indiana, 2016[*+]

| | Cases | Rate | 2012-2016 Total |
|---|---|---|---|
| **Race** | | | |
| White | 125 | 2.20 | 1,546 |
| Black | 11 | 1.71 | 66 |
| Other | 11 | 3.51 | 63 |
| Unknown | 31 | - | 276 |
| **Sex** | | | |
| Male | 75 | 2.23 | 906 |
| Female | 103 | 3.15 | 1,041 |
| Unknown | 0 | - | 4 |
| **Total** | 178 | | 1,951 |

Pertussis incidence, unlike other vaccine-preventable diseases, has increased overall since the 1980s. Pertussis incidence is cyclic, with increases and decreases every three to five years. Figure 1 illustrates this cycle.

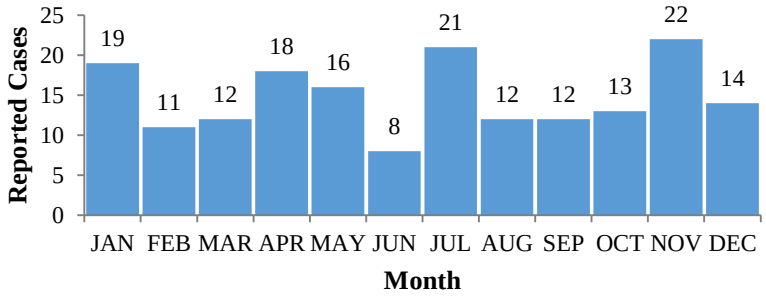
[*]All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.
[+] Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

**Figure 1:** Pertussis Cases by Year – Indiana, 1994-2016




In 2016, disease incidence was highest during January, April, July and November; however, pertussis can occur anytime during the year (Figure 2).

**Figure 2:** Pertussis Cases by Month – Indiana, 2016

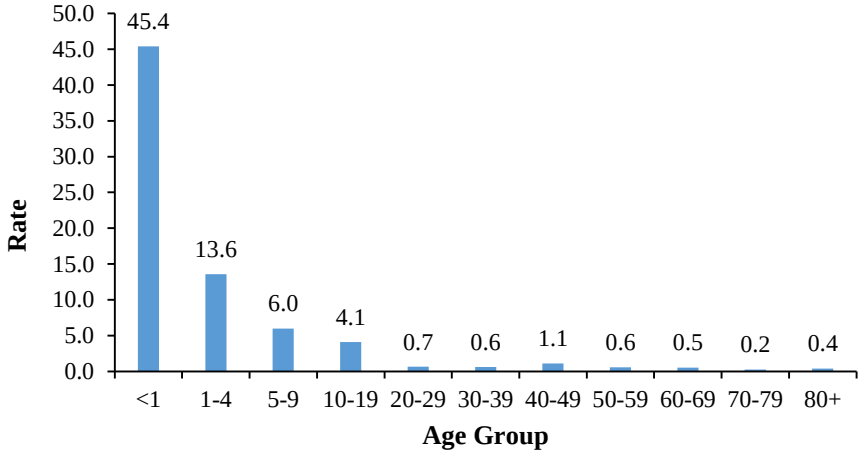



Pertussis is the most frequently reported vaccine-preventable disease among children under five years of age in Indiana. In 2016, 47.2 percent of all cases occurred in children younger than five years of age. Incidence rates were highest for infants younger than one year of age (45.4), followed by children ages 1-4 years (13.6) and children ages 5-9 years (6.0). School aged-children, 5-18 years of age, accounted for 35.4 percent of cases in 2016. Figure 3 shows the incidence rates for all age groups.

*All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

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

**Figure 3:** Pertussis Incidence Rates by Age Group – Indiana, 2016[*+]




In 2016, 48 counties reported at least one case, and 11 counties reported five or more cases of pertussis. The incidence rates were highest among the following counties reporting five or more cases (Figure 4): Lagrange (33.2), Jennings (21.6) and Clark (8.6). 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 also can develop illness. Table 2 reflects the vaccination history at time of illness for selected age groups based on the earliest recommended age for vaccination.

**Table 2**: Vaccination History of Selected Age Groups – Indiana, 2016

| Age Group | Total Cases | Unknown | 0 Doses | 1-2 Doses | 3+ Doses |
|---|---|---|---|---|---|
| **3-11 Months** | 37 | 3 (8.1%) | 18 (48.6%) | 10 (27.0%) | 6 (16.2%) |
| **1-4 Years** | 46 | 3 (6.5%) | 25 (54.3%) | 0 (0.0%) | 18 (39.1%) |
| **5-9 Years** | 26 | 0 (0.0%) | 8 (30.8%) | 0 (0.0%) | 18 (69.2%) |
| **Total (3 mos-9 yrs)** | 109 | 6 (5.5%) | 51 (46.8%) | 10 (9.2%) | 42 (38.5%) |

Laboratory confirmation was obtained through culture and/or polymerase chain reaction (PCR) for 123 (69.1 percent) of the reported pertussis cases. Because other illnesses have similar symptoms, it is important for physicians to test potential cases. PCR and culture are the preferred testing methods. However, health care providers should not wait for test results before treating a suspected case of pertussis.

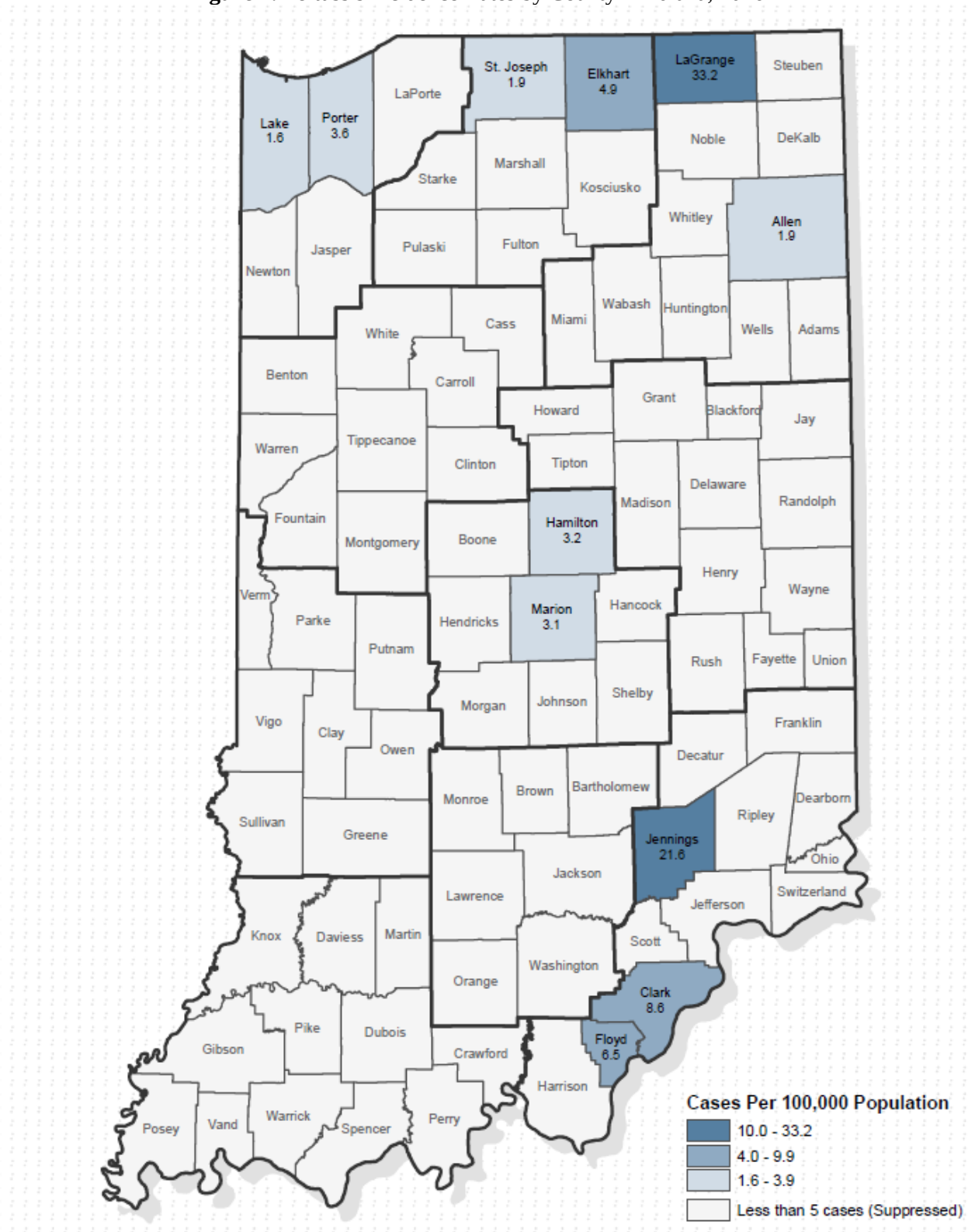
## LEARN MORE

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

[*]All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

[+] Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

**Figure 4:** Pertussis Incidence Rates by County – Indiana, 2016[*+]




[*]All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

[+] Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

## PNEUMOCOCCAL DISEASE

**2016 CASE TOTAL:** 688
**2015 CASE TOTAL:** 628

**2016 INCIDENCE RATE:** 10.37 per 100,000
**2015 INCIDENCE RATE:** 9.50 per 100,000

PNEUMOCOCCAL DISEASE is caused by the bacterium *Streptococcus pneumoniae* and the source of significant illness and death in the U.S. Prior to routine vaccination of children and elder adults, this disease represented a large proportion of deaths in young children 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 noses and throats of healthy people and are rarely spread through contact with respiratory droplets of an infected person. Only cases of invasive disease (i.e., from normally sterile body sites) are reportable in Indiana.

### CLINICAL AND 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; 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.

### 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 five years and 31 cases per 100,000 population for adults age 65 and older. Indiana met the Healthy People 2020 Goal for children under five years of age in 2016, with an incidence rate of 4.7 cases per 100,000 population. Indiana did not meet the Healthy People 2020 Goal for adults age 65 and older; the incidence rate for this population was 33.1 cases per 100,000 in 2016. 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 five and two cases of penicillin-resistant cases per 100,000 population for adults age 65 and older. Indiana met the goal, with 1.18 cases per 100,000 children under age five with penicillin-resistant pneumococcal disease but did not meet the goal for adults 65 and older, with 3.53 cases per 100,000 with penicillin-resistant pneumococcal disease in 2016.

### EPIDEMIOLOGY

In 2016, 688 cases of pneumococcal disease were reported in Indiana, for a case rate of 10.37 per 100,000 population (Table 1). In 2016, the incidence rate among the black population (11.07 per 100,000 population) was higher than that of the white population (9.54 per 100,000) and other races (9.58 per 100,000).

*All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

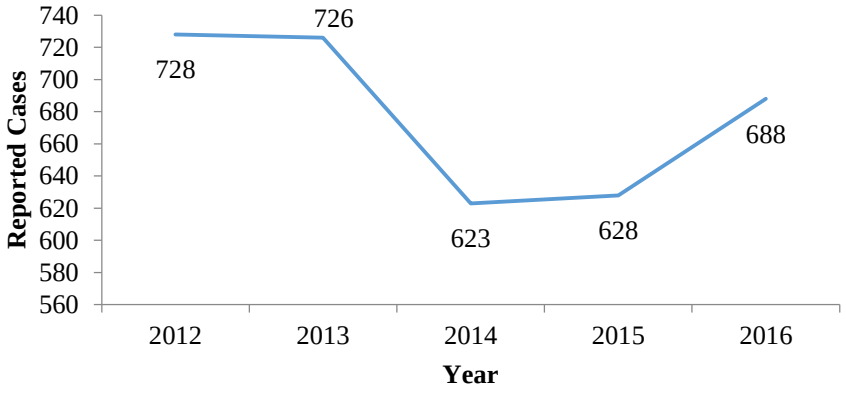
+ Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

**Table 1:** Pneumococcal Disease Case Rates by Race and Sex – Indiana, 2016[*+]

| | Cases | Rate | 2012-2016 Total |
|---|---|---|---|
| **Race** | | | |
| White | 542 | 9.54 | 2,454 |
| Black | 71 | 11.07 | 361 |
| Other | 30 | 9.58 | 85 |
| Unknown | 45 | - | 493 |
| **Sex** | | | |
| Male | 333 | 9.90 | 1,677 |
| Female | 355 | 10.86 | 1,716 |
| Unknown | 0 | - | 0 |
| **Total** | 688 | | 3,393 |

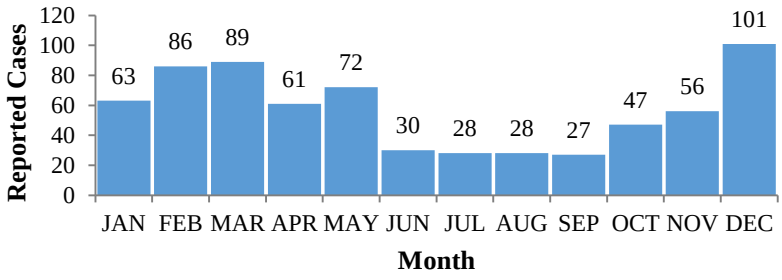
Figure 1 shows the number of reported cases per year for 2012-2016.

**Figure 1:** Pneumococcal Disease Cases by Year – Indiana, 2012-2016




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

**Figure 2:** Pneumococcal Disease Cases by Month – Indiana, 2016

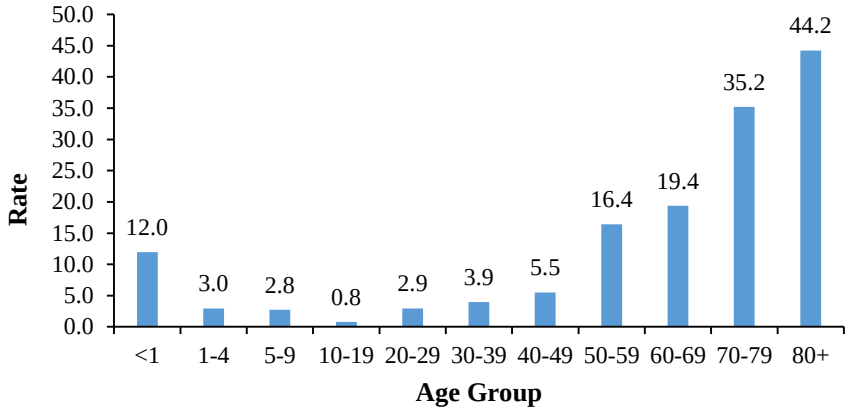



[*]All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

[+] Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

Incidence of invasive pneumococcal disease varies considerably with age. In 2016, the highest incidence rates were for adults ages 80 and older (44.2 per 100,000 population), followed by adults ages 70-79 (35.2 per 100,000) (Figure 3).

**Figure 3:** Pneumococcal Disease Incidence Rates by Age Group – Indiana, 2016*+

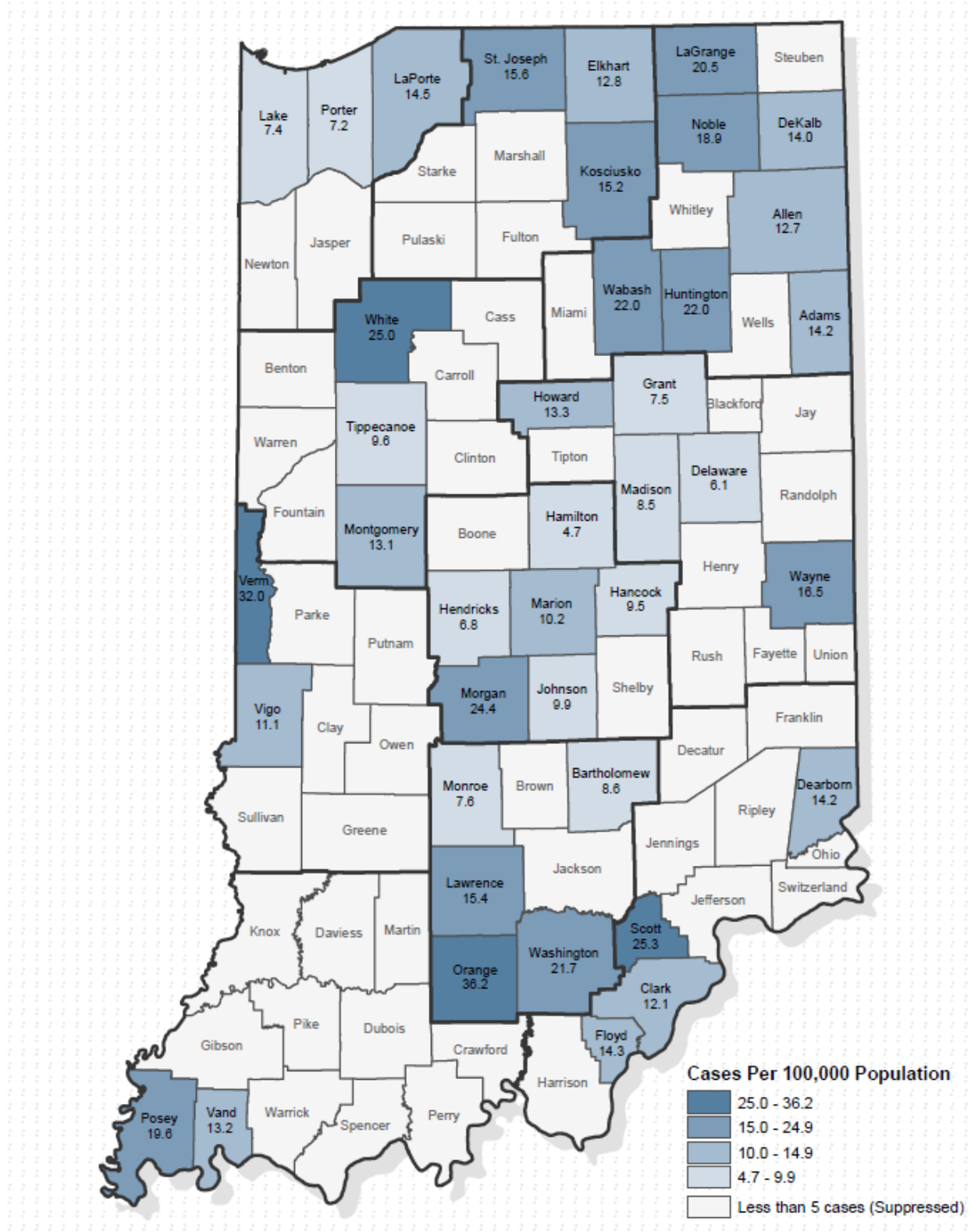



In 2016, 86 counties reported at least one case, and 40 counties reported five or more cases of invasive pneumococcal disease (Figure 4). The incidence rates were highest among the following counties reporting five or more cases: Orange (36.2), Vermillion (32.0) and Scott (25.3).

**Figure 5:** Pneumococcal Disease Incidence Rates by County – Indiana, 2016*+

*All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

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




*All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

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

410 IAC 1-2.5 requires laboratories to submit isolates from all invasive cases under age five for serotyping. Of the 20 cases under the age of five, viable isolates from 15 were sent to ISDH for serotyping. All 15 isolates were successfully serotyped. Predominant serotypes included Type 22F (15.0 percent), Type 23B (10.0 percent) and Type 35B (10.0 percent) (Figure 6). Serotypes represented in the PCV13 vaccine represented 12.9 percent of cases under age five 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 five years of age occurred as a result of types not contained in the routine vaccines available for children (Figure 7). The number of cases caused by strains included in the PCV7 (4, 6B, 9V, 14, 18C, 19F and 23F) and PCV13 (all PCV7 strains + 1, 3, 5, 6A, 7F and 19A) vaccines decreased in the period from 2012 to 2016.

**Figure 6:** Pneumococcal Serotypes, Children Under Age Five – Indiana, 2016

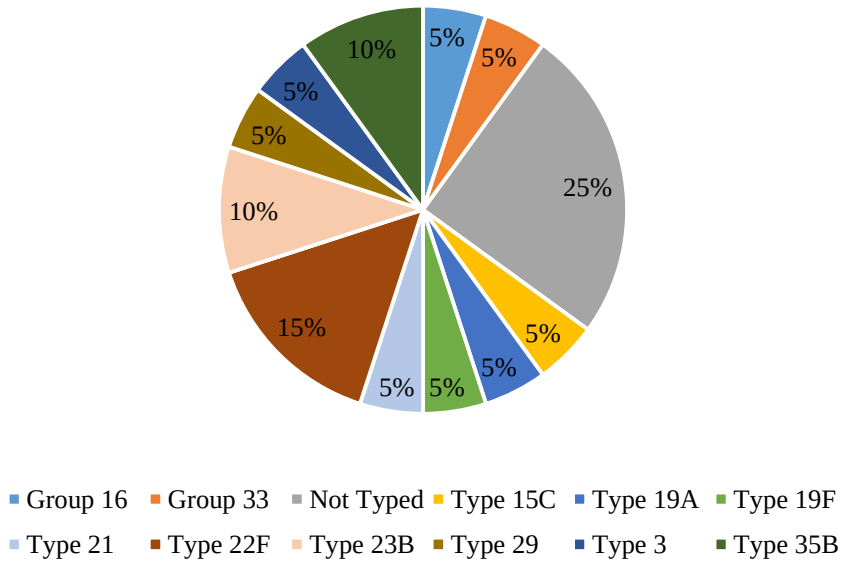
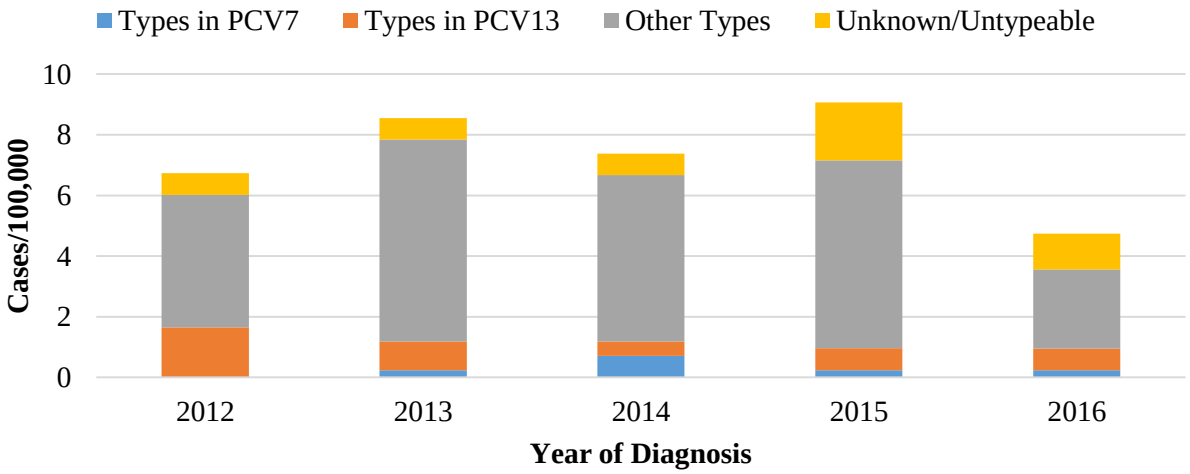



**Figure 7:** Incidence of Pneumococcal Serotypes, Children Under Age Five by Vaccine Serotype Indiana, 2012-2016

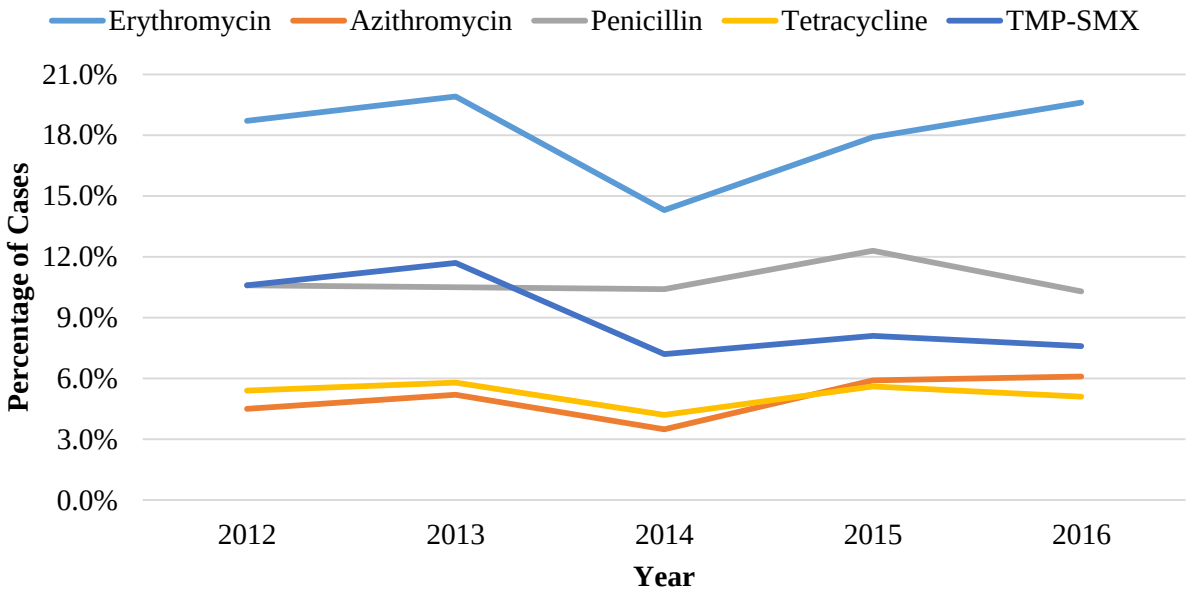



*All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

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

Among cases of all ages, 65.8 percent presented with pneumococcal bacteremia, 63.5 percent presented with pneumococcal pneumonia and 5.1 percent presented with pneumococcal meningitis. Percentages might not sum to 100 because many individuals exhibited multiple presentations. In 2016, 206 (29.9 percent) cases of invasive pneumococcal disease of all ages showed some degree of resistance to at least one antibiotic. Patterns of resistance in pneumococcal bacteria have changed from 2012 to 2016 (Figure 8). Trimethoprim-sulfamethoxazole (TMP-SMX) resistance has declined from 2012 to 2016, while erythromycin resistance remains high and penicillin resistance remains relatively steady.

**Figure 8:** Antibiotic Nonsusceptibility by Year – Indiana, 2012-2016




## LEARN MORE

http://www.cdc.gov/pneumococcal/
http://www.cdc.gov/vaccines/vpd-vac/pneumo/default.htm

*All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

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

# VARICELLA

**2016 CASE TOTAL:** 209
**2015 CASE TOTAL:** 173

**2016 INCIDENCE RATE:** 3.15 per 100,000
**2015 INCIDENCE RATE:** 2.62 per 100,000

PRIMARY VARICELLA INFECTION (CHICKENPOX) is caused by varicella-zoster virus, a member of the herpesvirus family. The virus is transmitted from person to person through direct contact with fluid from vesicular lesions or droplet or airborne spread of respiratory secretions. 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.

## CLINICAL AND PUBLIC HEALTH SIGNIFICANCE

The varicella rash first appears as flat, red lesions that 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.

## HEALTHY PEOPLE 2020 GOAL

The Healthy People 2020 Goal for varicella is fewer than 100,000 cases nationally for persons younger than 18 years of age. This translates to a rate of 135.6 per 100,000 population. Indiana met this goal in 2016, with 209 cases of varicella reported in children under the age of 18 (rate of 3.15 per 100,000 population).

## EPIDEMIOLOGY

In 2016, 209 cases of varicella were reported in Indiana. Three of these cases were hospitalized with no reported deaths. The incidence rate of varicella was 3.15 cases per 100,000 population (Table 1). The rate of varicella disease was higher in other races (7.03) than either whites (2.24) or blacks (2.34). A slightly higher rate was observed in males (3.42) than in females (2.78). The rate of hospitalizations was 0.05 per 100,000 populations (Table 1), a decrease from 2015 (0.17 per 100,000).

**Table 1:** Varicella Case Rates by Race and Sex – Indiana, 2016[*+]

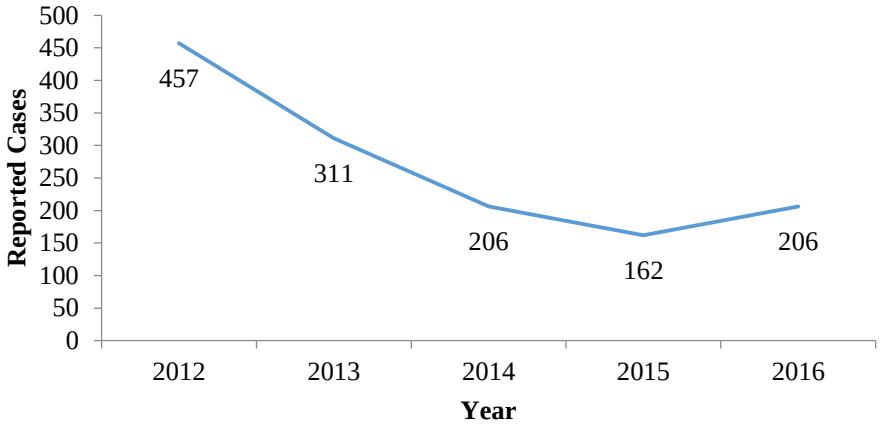
| | Hospitalized Cases | | Varicella (Not Hospitalized) | |
|---|---|---|---|---|
| | **Cases** | **Rate** | **Cases** | **Rate** |
| Indiana | 3 | 0.05 | 206 | 3.11 |
| **Race** | | | | |
| White | 3 | 0.05 | 127 | 2.24 |
| Black | 0 | - | 15 | 2.34 |
| Other | 0 | - | 22 | 7.03 |
| Unknown | 0 | - | 42 | - |
| **Sex** | | | | |
| Male | 2 | 0.06 | 115 | 3.42 |
| Female | 1 | 0.03 | 91 | 2.78 |
| Unknown | 0 | - | 0 | - |

[*]All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

[+] Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

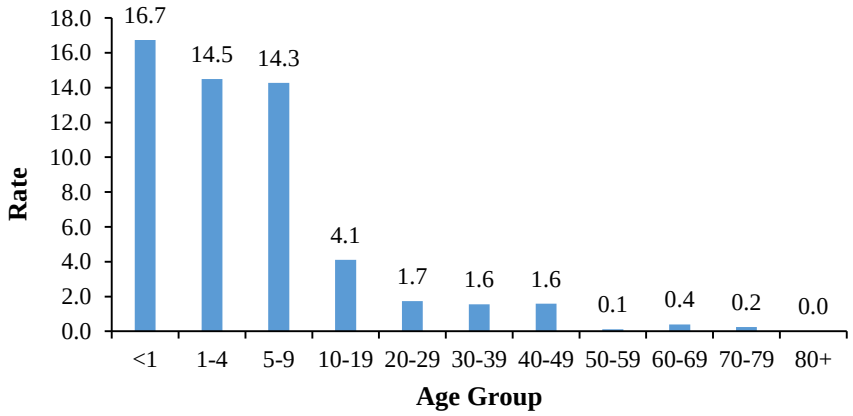
Figure 1 shows total reported varicella cases by year from 2012 to 2016.

**Figure 1:** Varicella Cases by Year – Indiana, 2012-2016




Incidence of varicella varies considerably with age. In 2016, the highest varicella incidence rate occurred in children under one year old at 16.7 cases per 100,000 population, followed by children ages 1-4 (incidence of 14.5 cases per 100,000 population). Few cases of chickenpox were reported in adults over the age of 50 (Figure 2).

**Figure 2:** Varicella Incidence Rates by Age Group – Indiana, 2016[*+]




The total number of cases was highest in September 2016 (28 cases) and lowest in the summer. The number of cases continued to be higher throughout the fall and spring, corresponding roughly with the timing of the 2015-2016 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 might be artificially low during the summer months when school is not in session.

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[+] Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

**Figure 3:** Varicella Case by Month – Indiana, 2016

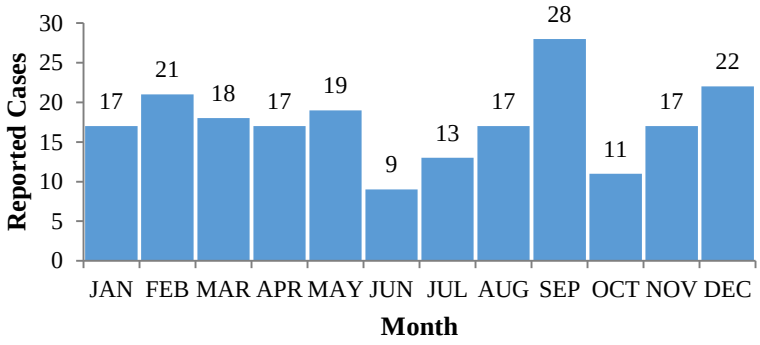
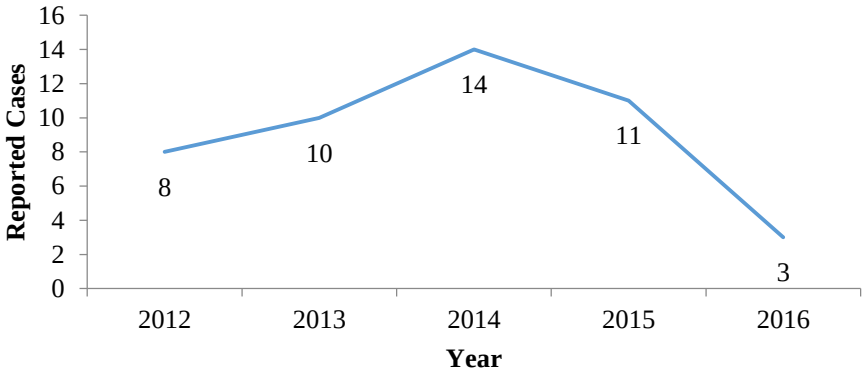



Figure 4 shows reported hospitalized cases by year from 2012 to 2016, the number of which has remained steady since 2012 with further decrease within the last two years.

**Figure 4:** Varicella Hospitalization Cases by Year – Indiana, 2012-2016




In 2016, 50 counties reported at least one case, and 13 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: Porter (16.1), Adams (14.2) and Hendricks (11.8).

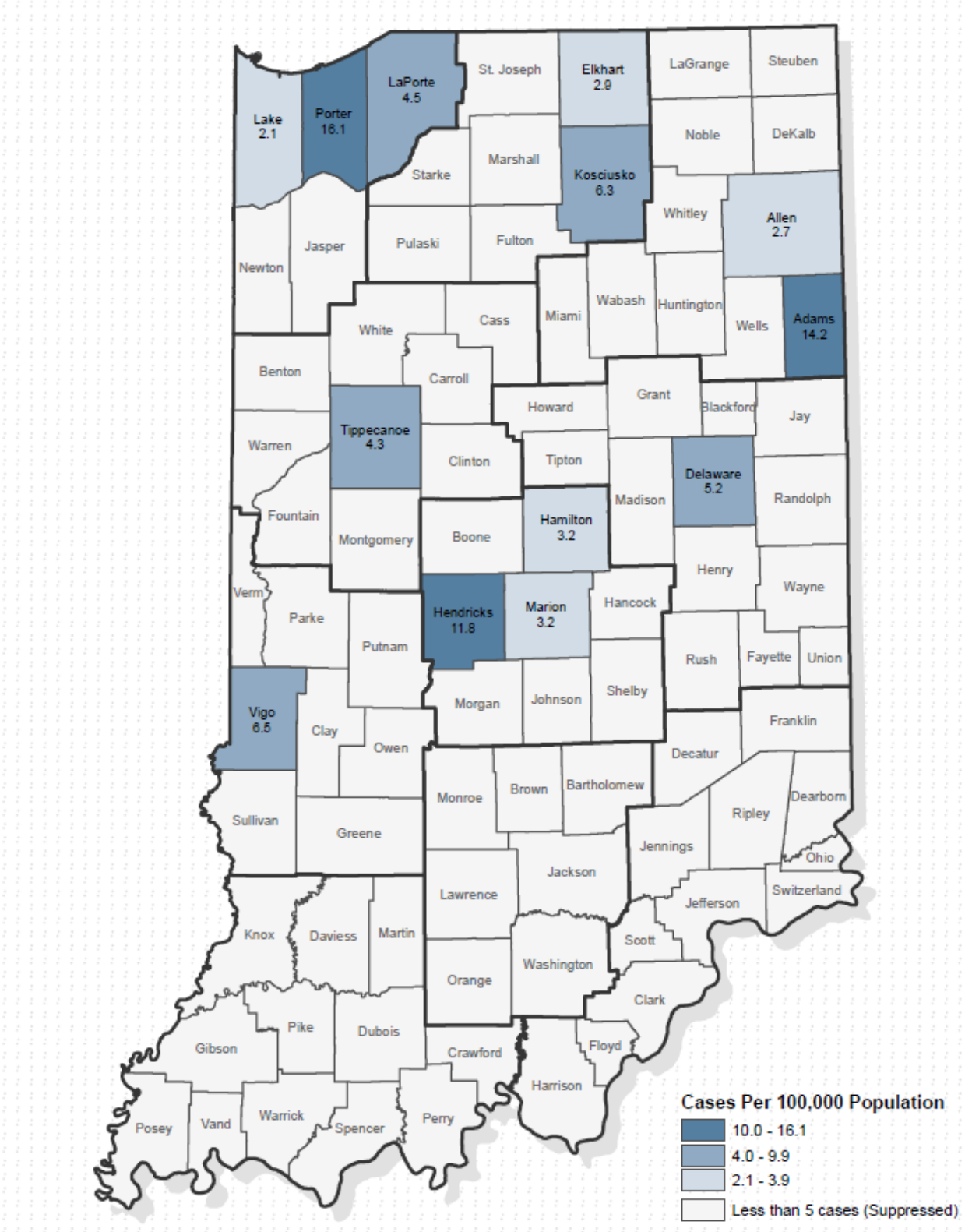
## LEARN MORE

http://www.cdc.gov/chickenpox/index.html
http://www.cdc.gov/vaccines/vpd-vac/varicella/default.htm

*All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

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

**Figure 5:** Varicella Incidence Rates by County – Indiana, 2016[*+]




[*]All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

[+] Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

## VECTORBORNE AND ZOONOTIC DISEASES & CONDITIONS

**INCLUDES**: Animal Bites, Anthrax, Arboviral Encephalitis, Babesiosis, Brucellosis, Chikungunya, Dengue, Ehrlichiosis, Hantavirus Pulmonary Syndrome, La Crosse Encephalitis, Lyme Disease, Malaria, Plague, Psittacosis, Q Fever, Rabies, Rocky Mountain Spotted Fever, Trichinosis, Tularemia, Typhus, West Nile Virus, Yellow Fever, Zika Virus

### VECTOR/ZOONOTIC DISEASE PREVENTION

*Animal Bites*

While any animal has the potential to bite, most reported bites come from dogs. 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.

*Mosquito Bites*

Be vigilant against mosquito bites in warmer months (April–September), when mosquitoes are most active.

Avoid contact with mosquitoes:

- Avoid being outdoors when mosquitoes are active (especially late afternoon, dusk to dawn and early morning).
- Cover exposed skin by wearing a hat, long sleeves and long pants in places where mosquitoes are especially active, such as wooded areas.
- Install or repair screens on windows and doors to keep mosquitoes out of homes or other buildings.

Repel mosquitoes on skin and clothing:

- Apply an EPA-registered insect repellent containing DEET, picaridin, IR3535, oil of lemon eucalyptus or para-menthane-diol to clothes and exposed skin.
- Apply products containing permethrin to clothing and gear, such as boots, pants, socks and tents. Permethrin remains protective through several washings and should not be used on bare skin.

Take steps to control mosquitoes inside and outside your home:

- Use screens on windows and doors. Repair holes in screens to keep mosquitoes outside.
- Once a week, empty and scrub, turn over, cover or throw out any items that hold water, such as tires, buckets, planters, toys, pools, birdbaths, flowerpot saucers and trash containers. Drill holes in the bottom of recycling containers left outdoors.
- Tightly cover water storage containers (buckets, cisterns, rain barrels).
- If you have a septic tank, repair cracks or gaps. Cover open vents or plumbing pipes.
- Keep grass cut short and shrubbery trimmed.
- Clean clogged roof gutters, particularly if leaves tend to plug up the drains.
- Flush ornamental fountains and birdbaths periodically.
- Aerate ornamental pools or stock them with predatory fish.

*Tick Bites*

Although it is a good idea to take preventative measures against ticks year-round, be extra vigilant in warmer months (April–September) when ticks are most active.

Avoid direct contact with ticks by:

- Avoiding wooded and brushy areas with high grass and leaf litter
- Walking in the center of trails
- Wearing a long-sleeved shirt and light-colored pants, with the shirt tucked in at the waist and the pants tucked into socks, while in grassy or wooded areas

Repel ticks on skin and clothing by:

- Using EPA-registered insect repellent that contains 20 percent or more DEET, picaridin or IR2525 on exposed skin for protection that lasts several hours.
- Applying products containing permethrin to clothing and gear, such as boots, pants, socks and tents. Permethrin remains protective through several washings and should not be used on bare skin.

Find and remove ticks from your body by:

- Bathing or showering as soon as possible after coming indoors (preferably within two hours) to wash off and more easily find ticks that are crawling on you.
- Conducting a full-body tick check using a handheld or full-length mirror to view all parts of your body upon return from tick-infested areas. Parents should check their children for ticks under the arms, in and around the ears, inside the belly button, behind the knees, between the legs, around the waist and especially in the hair.
- Examining gear and pets. Ticks can ride into the home on clothing and pets and then attach to a person later, so carefully examine pets, coats and day packs.
- Tumble drying clothes in a dryer on high heat for 20-30 minutes to kill ticks on dry clothing after you come indoors.
- Ticks can be safely removed by using tweezers to grasp the tick close to the skin and then pulling outward with steady and even pressure. After the tick is removed, the area should be washed thoroughly. The tick should be discarded by submerging it in alcohol, placing it in a sealed bag or container, wrapping it tightly in tape or flushing it down the toilet. Ticks should never be crushed with the fingernails.

## ANIMAL BITES

**2016 CASE TOTAL:** 7,863
**2015 CASE TOTAL:** 7,248

**2016 INCIDENCE RATE:** 118.54 per 100,000
**2015 INCIDENCE RATE:** 109.61 per 100,000

ANIMAL BITES are preventable injuries that also can be associated with the 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.

### CLINICAL AND PUBLIC HEALTH SIGNIFICANCE

Although 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.

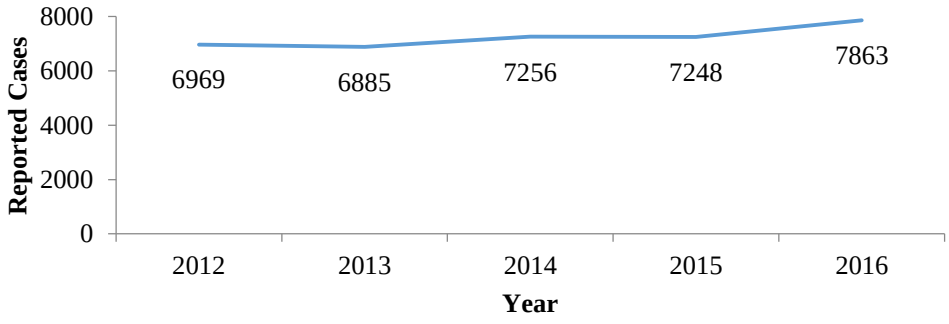
After an animal bite is reported to public health officials, the biting animal will be either quarantined for 10 days to observe for signs of rabies or submitted to the ISDH Rabies Laboratory for diagnostic testing. Post-exposure prophylaxis to prevent rabies may be recommended for the exposed person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

Any animal has the potential to bite, but 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.)

### EPIDEMIOLOGY

In the 2016 calendar year, 7,863 animal bite cases were reported in Indiana. This is a slight increase from previous years when data were collected (Figure 1).

**Figure 1:** Animal Bites Cases by Year – Indiana, 2012-2016

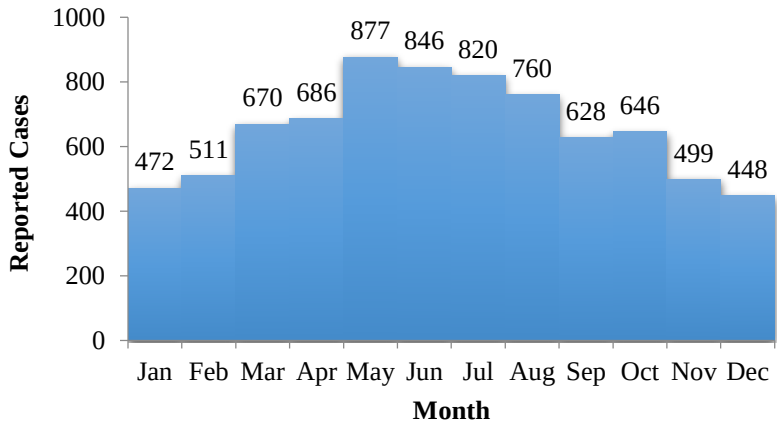



Animal bites occurred at all times of the year but were most common in the spring and summer months (Figure 2).

*All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

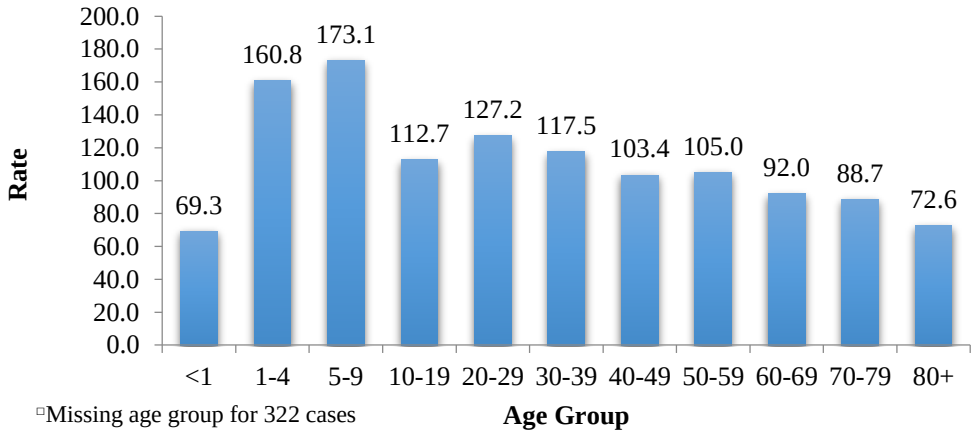
+ Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

**Figure 2:** Animal Bites Cases by Month – Indiana, 2016




The risk for animal bites was highest among children ages 1-9 years (Figure 3).

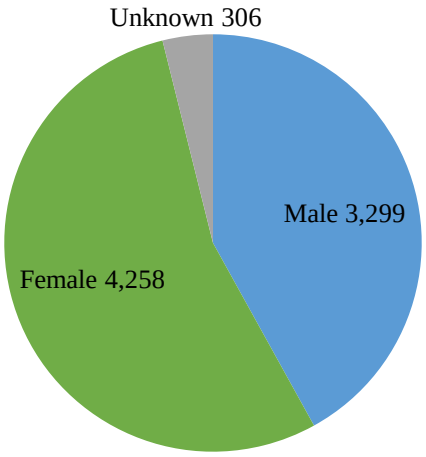
**Figure 3:** Animal Bites Incidence Rates by Age Group – Indiana, 2016*+□




□Missing age group for 322 cases

There was a slightly higher proportion of female victims (Figure 4).

**Figure 4:** Animal Bites by Gender of Victim – Indiana, 2016




*All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

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

The majority of biting animals were domestic dogs and cats (Table 1).

**Table 1:** Animal Bites by Species – Indiana, 2016

| Type of Animal | Number | Percent |
|---|---|---|
| Dog | 6,004 | 76% |
| Cat | 1,406 | 18% |
| Bat | 228 | 3% |
| Raccoon | 55 | <1% |
| Squirrel | 27 | <1% |
| Other | 143 | 2% |
| Total | 7,863 | 100% |

Substantial proportions of biting dogs and cats were sexually intact (Table 2).

**Table 2:** Animal Bites by Spay or Neuter Status for Dogs and Cats – Indiana, 2016

| | Dogs | | Cats | | Dogs and Cats | |
|---|---|---|---|---|---|---|
| | Number | Percent | Number | Percent | Number | Percent |
| Spayed or neutered | 1,713 | 23% | 462 | 6% | 2,175 | 29% |
| Not spayed or neutered | 1,098 | 15% | 207 | 3% | 1,305 | 18% |
| Unknown | 3,193 | 43% | 737 | 10% | 3,930 | 53% |
| **Total** | **6,004** | **81%** | **1,406** | **19%** | **7,410** | **100%** |

Substantial proportions of biting dogs and cats were unvaccinated against rabies (Table 3) or had unknown status for these risk factors.

**Table 3:** Animal Bites by Rabies Vaccination Status for Dogs and Cats – Indiana, 2016

| | Dogs | | Cats | | Dogs and Cats | |
|---|---|---|---|---|---|---|
| | Number | Percent | Number | Percent | Number | Percent |
| Vaccinated | 2,392 | 32% | 381 | 5% | 2,773 | 39% |
| Not vaccinated | 667 | 9% | 291 | 4% | 958 | 13% |
| Unknown | 2,945 | 40% | 734 | 10% | 3,679 | 48% |
| **Total** | **6,004** | **81%** | **1,406** | **19%** | **7,410** | **100%** |

## LEARN MORE

https://www.cdc.gov/features/dog-bite-prevention/index.html
https://www.avma.org/public/Pages/Dog-Bite-Prevention.aspx

*All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

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

## EHRLICHIOSIS

**2016 CASE TOTAL:** 24
**2015 CASE TOTAL:** 20

**2016 INCIDENCE RATE:** 0.36 per 100,000
**2015 INCIDENCE RATE:** 0.30 per 100,000

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.

### CLINICAL AND 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 might 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. The estimated case fatality rate is 1.8 percent. 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.

### EPIDEMIOLOGY

Twenty-four confirmed and probable cases of ehrlichiosis were reported in 2016 in Indiana. From 2012 to 2016, 176 cases of ehrlichiosis were reported in Indiana. Ehrlichiosis can occur in all areas of Indiana, but most cases occur in the southern portion of the state.

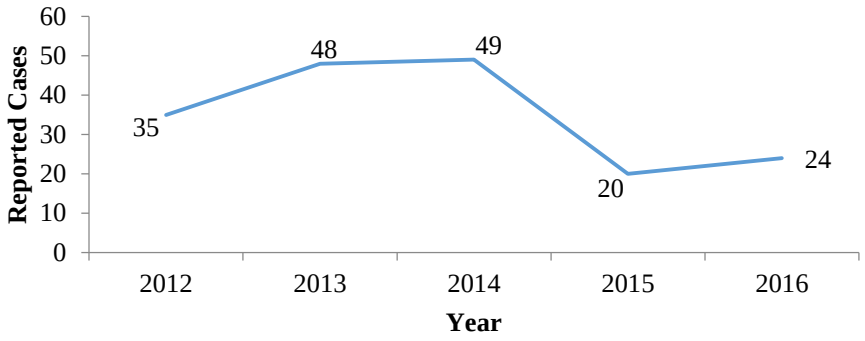
**Table 1:** Ehrlichiosis Case Rates by Race and Sex – Indiana, 2016[*+]

| | Cases | Rate | 2012-2016 Total |
|---|---|---|---|
| **Race** | | | |
| White | 19 | 0.33 | 138 |
| Black | 0 | - | 3 |
| Other | 0 | - | 1 |
| Unknown | 5 | - | 34 |
| **Sex** | | | |
| Male | 14 | 0.42 | 102 |
| Female | 10 | 0.31 | 74 |
| Unknown | 0 | - | 0 |
| **Total** | 24 | | 176 |

The number of reported cases of ehrlichiosis in Indiana has increased steadily in recent years but dropped in 2015 with a slight increase in 2016 (Figure 1).

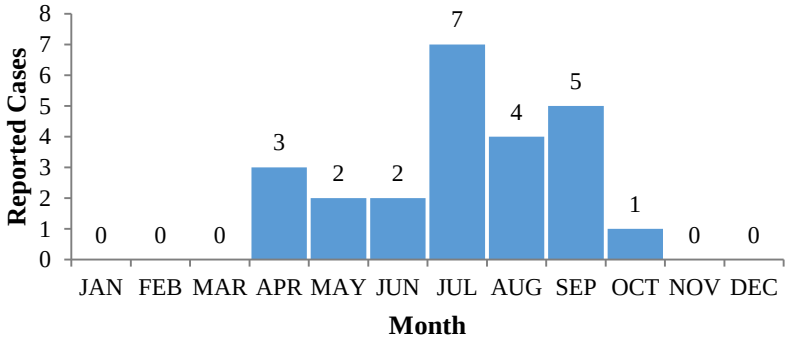
[*]All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.
[+] Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

**Figure 1:** Ehrlichiosis Cases by Year – Indiana, 2012-2016




Although the disease is most common in the spring and summer months when ticks are active, ehrlichiosis can occur anytime during the year (Figure 2).

**Figure 2:** Ehrlichiosis Cases by Month – Indiana, 2016




In 2016, 14 counties had at least one case of ehrlichiosis; however, none had counts greater than five.

## LEARN MORE

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

*All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

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

## LYME DISEASE

**2016 CASE TOTAL:** 152
**2015 CASE TOTAL:** 139

**2016 INCIDENCE RATE:** 2.29 per 100,000
**2015 INCIDENCE RATE:** 2.10 per 100,000

LYME DISEASE is caused by the bacterium *Borrelia burgdorferi* and is the most commonly diagnosed tick-borne disease in the U.S. It is transmitted by the black-legged tick (or deer tick, *Ixodes scapularis*). Small wild rodents serve as the reservoir species. In most cases, the tick must be attached for 36-48 hours or more before the Lyme disease bacterium can be transmitted.

### CLINICAL AND 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 can 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.

### EPIDEMIOLOGY

In 2016, 153 cases of Lyme disease were reported in Indiana, for a rate of 2.29 cases per 100,000 population. For the five-year reporting period from 2012 to 2016, 589 cases of Lyme disease were reported.

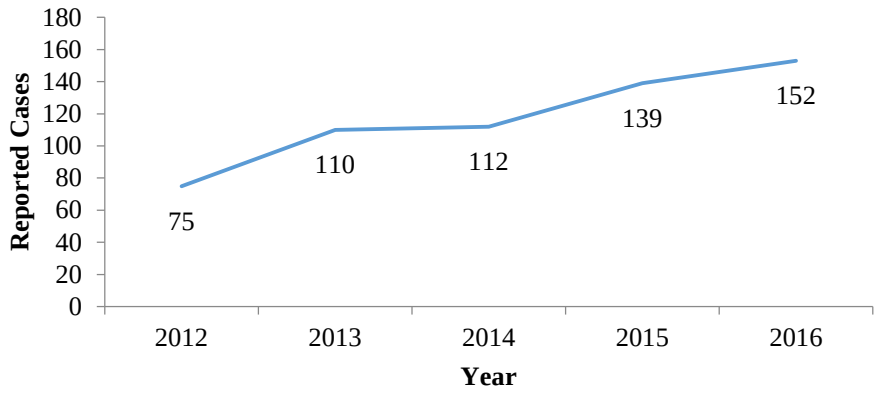
**Table 1:** Lyme Disease Case Rates by Race and Sex – Indiana, 2012 - 2016[*+]

| | Cases | Rate | 2012-2016 Total |
|---|---|---|---|
| **Race** | | | |
| White | 88 | 1.55 | 350 |
| Black | 1 | 0.16 | 5 |
| Other | 10 | 3.19 | 16 |
| Unknown | 53 | - | 218 |
| **Sex** | | | |
| Male | 89 | 2.65 | 338 |
| Female | 63 | 1.93 | 251 |
| Unknown | 0 | - | 0 |
| **Total** | 152 | | 589 |

[*]All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

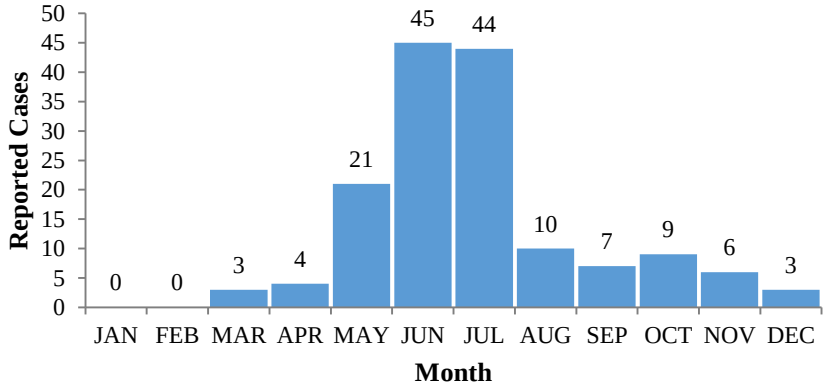
[+] Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

**Figure 1:** Lyme Disease Cases by Year – Indiana, 2012-2016



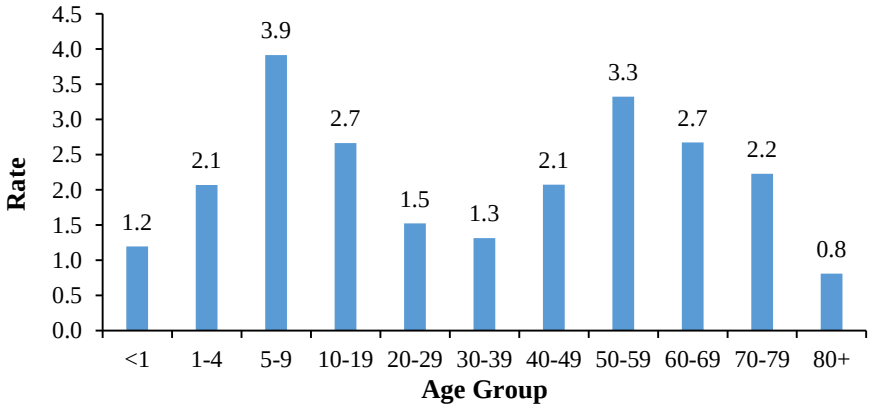

While the disease is most common in the spring and summer months when ticks are active, Lyme disease can occur anytime during the year (Figure 2).

**Figure 2:** Lyme Disease Cases by Month – Indiana, 2016




Reported cases of Lyme disease in Indiana are most common among boys aged 5-9, which is consistent with the national trend (Figure 3).

**Figure 3:** Lyme Disease Incidence Rates by Age Group – Indiana, 2016[*+]

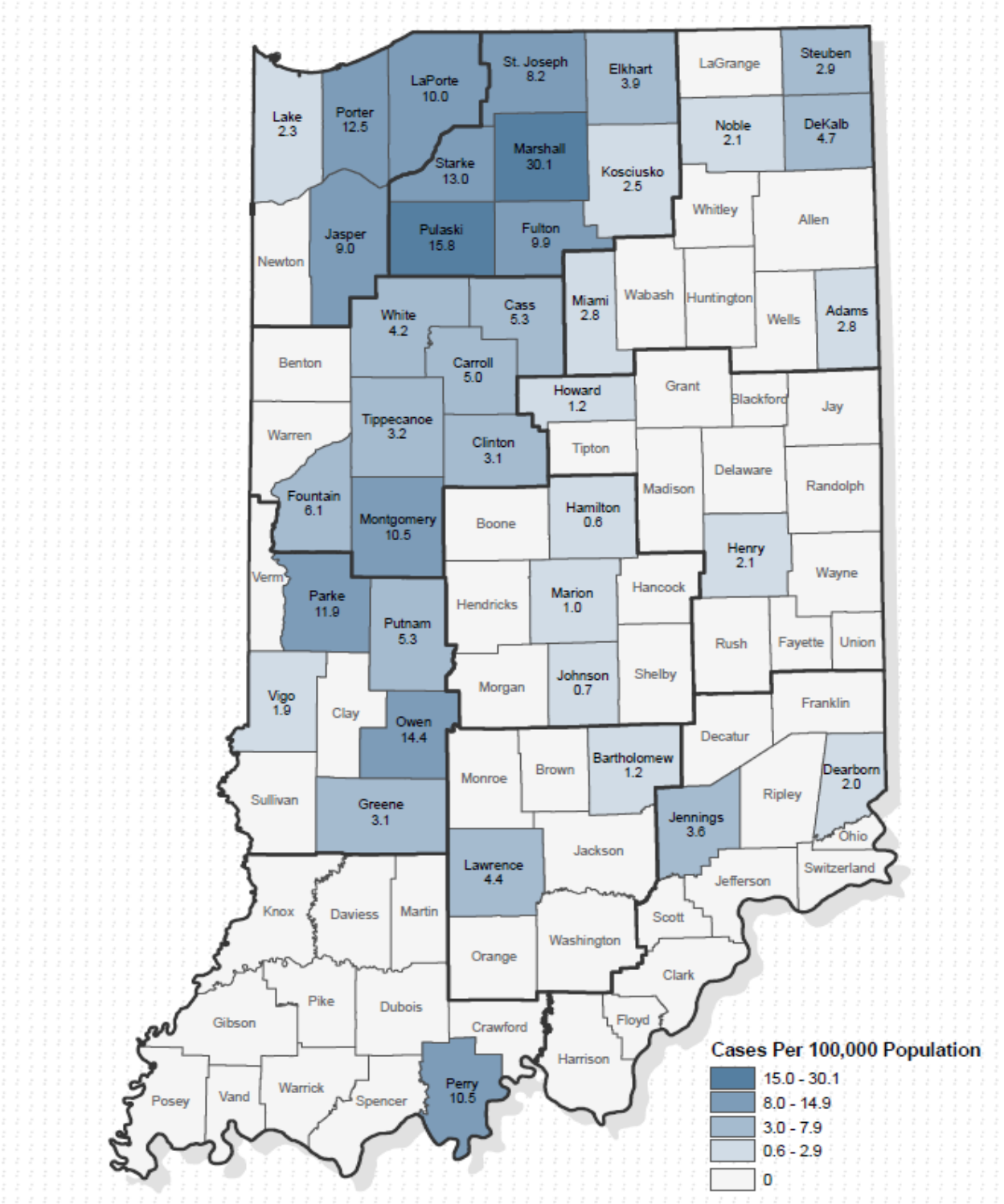



Lyme disease can occur in all areas of Indiana, but most cases occur in the northwest part of the state (Figure 4).

[*]All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

[+] Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

**Figure 4:** Lyme Disease Incidence Rates by County – Indiana, 2016*+




## LEARN MORE

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

*All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

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

## MALARIA

**2016 CASE TOTAL:** 17
**2015 CASE TOTAL:** 9

**2016 INCIDENCE RATE:** 0.26 per 100,000
**2015 INCIDENCE RATE:** 0.14 per 100,000

MALARIA is a serious and sometimes fatal 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., the vast majority of cases are in international travels and immigrants returning from countries where malaria transmission occurs. 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.

### CLINICAL AND PUBLIC HEALTH SIGNIFICANCE

Malaria symptoms are similar to influenza and can include fever, chills, headache, body 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 or prevent malaria symptoms. Delays between exposure and development of symptoms can result in misdiagnosis or delayed diagnosis because of reduced clinical suspicion by the health care provider.

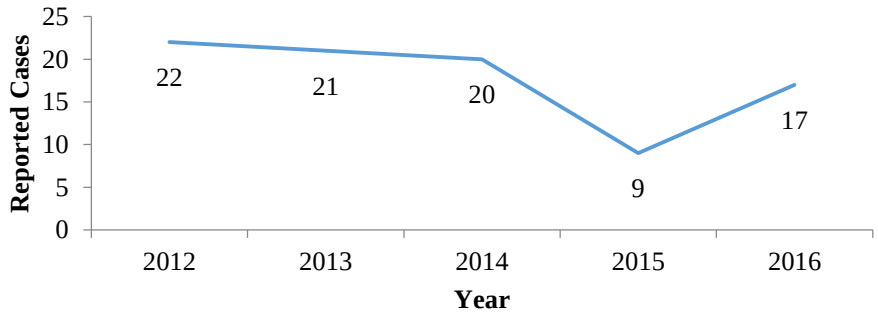
### HEALTHY PEOPLE 2020 GOAL

The Healthy People 2020 Goal for malaria is to reduce the number of cases reported in the U.S. to 999. Malaria is one of three diseases that account for a large proportion of illness and disability for international travelers. In 2015, 1,390 new cases of malaria were reported in the U.S. for a rate of 0.43 per 100,000 population.

### EPIDEMIOLOGY

In 2016, 17 cases of malaria were reported in Indiana. A total of 89 cases of malaria were reported during the five-year reporting period from 2012 to 2016 (Figure 1). All were acquired outside the U.S.

**Figure 1:** Malaria Cases by Year – Indiana, 2012-2016




### LEARN MORE

http://www.cdc.gov/malaria/

*All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

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

## RABIES

**2016 CASE TOTAL:** 0
**2015 CASE TOTAL:** 0

**2016 INCIDENCE RATE:** N/A
**2015 INCIDENCE RATE:** N/A

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) and cause 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 2016, 1,131 animals of various species were tested for rabies in Indiana, and 17 tested positive. All were bats.

### CLINICAL AND PUBLIC HEALTH SIGNIFICANCE

In humans, early symptoms of rabies infection are nonspecific but may be similar to influenza (the flu) and can 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.

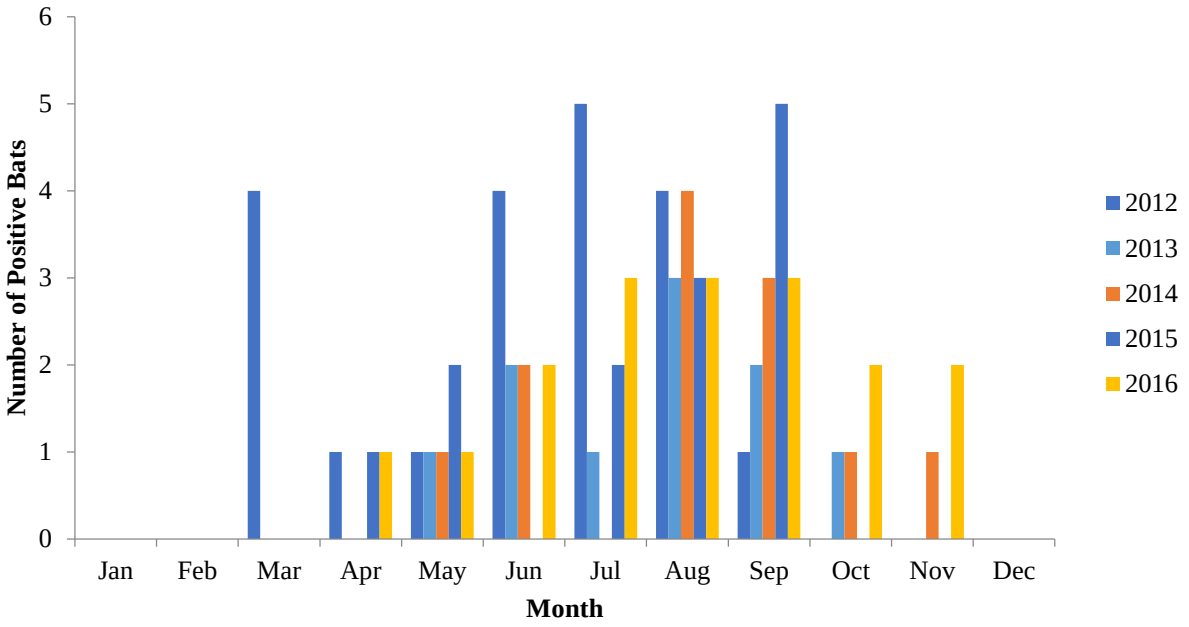
### EPIDEMIOLOGY

Rabies is a rare disease of humans in the U.S.; no human cases were reported in Indiana in 2016 or in the five-year reporting period from 2012 to 2016. 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 2016, being the only animal species found positive: 17 bats tested positive in 2016 and 72 bats tested positive from 2012 to 2016. The peak months for positive bats in 2016 were July through 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.

*All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

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

**Figure 1.** Rabid Bats by Month of Collection – Indiana, 2012-2016




## LEARN MORE

https://www.cdc.gov/rabies/
https://www.avma.org/public/Health/Pages/rabies.aspx

*All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

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

## ROCKY MOUNTAIN SPOTTED FEVER

**2016 CASE TOTAL:** 40
**2015 CASE TOTAL:** 30

**2016 INCIDENCE RATE:** 0.60 per 100,000
**2015 INCIDENCE RATE:** 0.45 per 100,000

ROCKY MOUNTAIN SPOTTED FEVER (RMSF) is a serious tick-borne illness caused by the bacterium *Rickettsia rickettsii*. RMSF is transmitted in Indiana by the American dog tick (*Dermacentor variabilis*), which lives in wooded areas and tall, grassy fields throughout the state.

### CLINICAL AND PUBLIC HEALTH SIGNIFICANCE

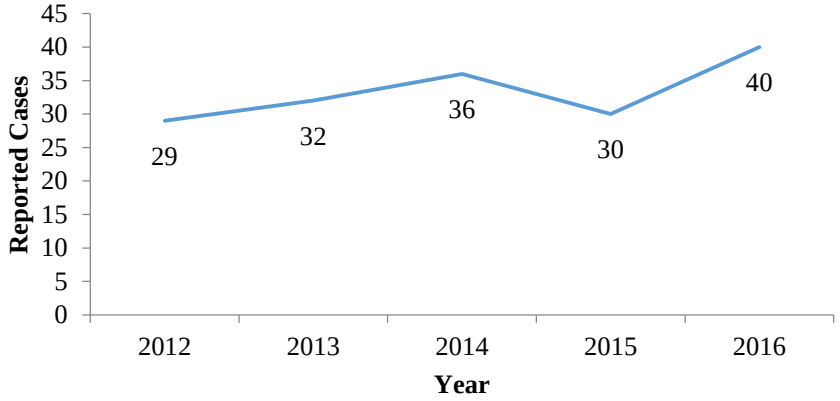
Rocky Mountain spotted fever is the most severe rickettsiosis in the U.S. The first symptoms of RMSF usually appear 3-12 days after a bite from an infected tick. The illness generally begins with sudden onset of fever and headache. Other signs and symptoms may include nausea, vomiting, abdominal pain, muscle and joint pain, and lack of appetite, followed by a rash. Children with RMSF frequently report experiencing nausea, vomiting, loss of appetite and rash but are less likely to report a headache than adults. Progression of the disease varies greatly. If left untreated, more than 20 percent of cases can be fatal. Early treatment with antibiotics can prevent death and severe illness.

Untreated disease may lead to more severe manifestations that include encephalitis, shock, seizures, gangrene and acute respiratory and renal failure. Patients with a particularly severe infection requiring prolonged hospitalization might 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 ultimately might need to be amputated. Patients who suffer this kind of severe vasculitis in the first two weeks of illness also can 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.

### EPIDEMIOLOGY

In 2016, 40 cases of Rocky Mountain spotted fever were reported in Indiana. During the five-year period from 2012 to 2016, 167 cases of RMSF were reported in Indiana with no reported deaths. 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, 2012-2016

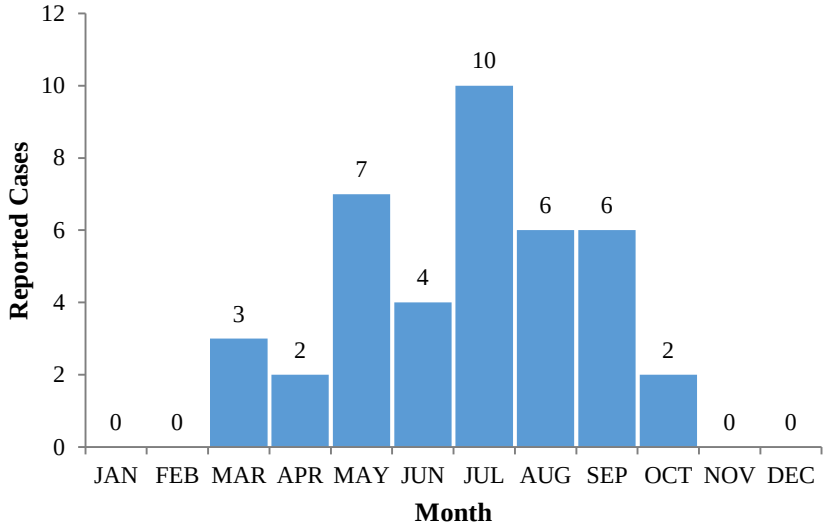



*All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

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

Although the disease is most common in the spring and summer months when ticks are active, RMSF can occur anytime during the year (Figure 2).

**Figure 2:** Rocky Mountain Spotted Fever Cases by Month – Indiana, 2016




In 2016, 19 counties reported at least one case of RMSF with only Warrick County (5) having five cases or more.

## LEARN MORE

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

*All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

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

**2016 CASE TOTAL:** 18
**2015 CASE TOTAL:** 21

**2016 INCIDENCE RATE:** 0.27 per 100,000
**2015 INCIDENCE RATE:** 0.32 per 100,000

WEST NILE VIRUS (WNV) is an arthropod-borne virus (arbovirus) most commonly spread by infected mosquitoes. West Nile virus transmission was first detected in North America in 1999 and was first identified in Indiana in 2001. Mosquitoes become infected with WNV when they feed on infected birds. Infected mosquitoes can then spread the virus to humans and other animals. In a very small number of cases, WNV has been spread through blood transfusions; through organ transplants; and from mother to baby during pregnancy, delivery or breastfeeding.

## CLINICAL AND PUBLIC HEALTH SIGNIFICANCE

Symptoms of WNV disease include fever, headache, body aches, joint pain and skin rash. Less than 1 percent of people who are infected will develop a serious neurologic illness caused by inflammation of the brain or surrounding tissues. The symptoms of neurologic illness can include headache, high fever, neck stiffness, disorientation, coma, tremors, seizures and paralysis. People over 60 years of age and those with certain medical conditions are at the greatest risk for severe neurologic disease. Most people infected with WNV do not develop any symptoms. Symptoms of WNV usually appear 3-14 days after exposure. There is no specific treatment or vaccine for WNV in humans.

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.

## EPIDEMIOLOGY

In 2016, Indiana reported 18 cases of WNV with two deaths. In the five-year reporting period from 2012 to 2016, 150 human cases of WNV, including 15 deaths, were reported (Table 1). Cases of WNV disease occur throughout the state.

**Table 1:** WNV Human Cases and Deaths – Indiana, 2012-2016

| | Cases | Neuroinvasive Disease | Non-Neuroinvasive Disease | Deaths |
|---|---|---|---|---|
| **2016** | 18 | 15 | 3 | 2 |
| **2015** | 21 | 16 | 5 | 3 |
| **2014** | 10 | 9 | 1 | 0 |
| **2013** | 24 | 19 | 4 | 2 |
| **2012** | 77 | 46 | 31 | 8 |
| **Five-year total** | 150 | 105 | 44 | 15 |

In 2016, mosquito samples were collected from 92 Indiana counties; a total of 167,354 mosquitoes divided into 2,934 pools were tested for WNV. In 2016, 261 pools collected from 58 different counties tested positive for WNV (Table 2).

*All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

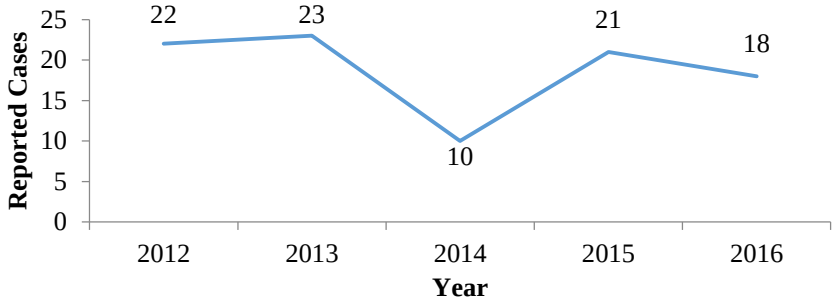
+ Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

**Table 2:** WNV Positive Mosquitoes – Indiana, 2016

| | 2016 |
|---|---|
| **Number of mosquitoes collected** | 167,354 |
| **Number of pools tested** | 2,934 |
| **WNV positive pools** | 261 |
| **Percent positivity of pools** | 8.9% |
| **Number of counties with WNV-positive mosquitoes** | 58 |

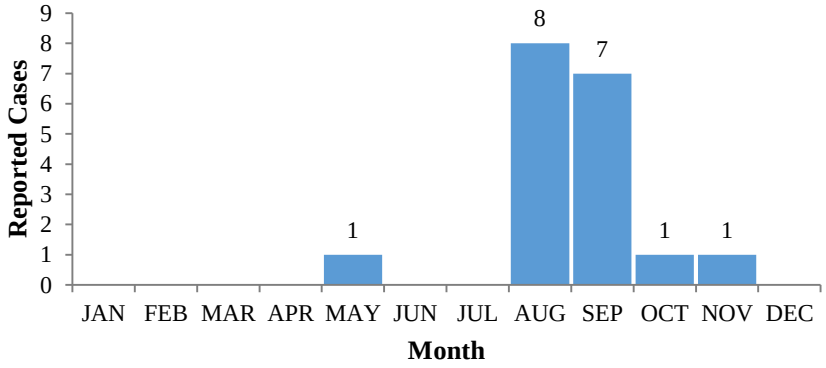
Figure 1 shows reported cases by year from 2012 to 2016.

**Figure 1:** WNV Cases by Year – Indiana, 2012-2016




Although the disease is most common in the late summer months, WNV disease can occur anytime during the year (Figure 2).

**Figure 2:** WNV Cases by Month – Indiana, 2016

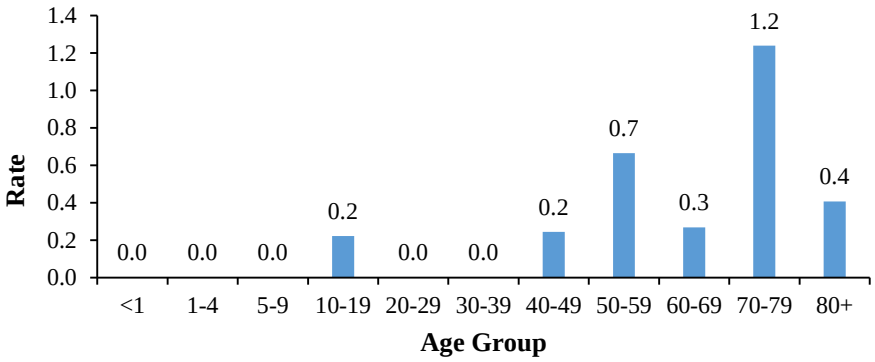



*All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

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

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.

**Figure 3:** WNV Incidence Rates by Age Group – Indiana, 2016[*+]




In 2016, 10 counties reported at least one case of WNV with only Lake County (7) having five or more cases.

## LEARN MORE

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

[*]All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

[+] Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

## ZIKA VIRUS

**2016 CASE TOTAL:** 49
**2015 CASE TOTAL:** 3

**2016 INCIDENCE RATE:** 0.74 per 100,000
**2015 INCIDENCE RATE:** 0.05 per 100,000

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. Zika 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.

### CLINICAL AND PUBLIC HEALTH SIGNIFICANCE

Symptoms of Zika occur within 14 days after exposure. The most common symptoms of Zika are fever, rash, headache, joint pain, conjunctivitis and muscle pain. Zika is usually mild with symptoms lasting several days to a week, although many people infected with Zika do not develop symptoms. There is no vaccine to prevent or medicine to treat Zika.

Zika virus is primarily spread through mosquito bites. Zika virus also can be spread from an infected person to his/her sex partner before symptoms start, while symptomatic and after symptoms end. Zika also can be passed from an infected pregnant woman to her fetus during pregnancy or around the time of birth. Zika is a cause of microcephaly and other severe fetal brain and eye defects. For this reason, the CDC recommends that pregnant women should not travel to areas with documented or likely Zika virus transmission. Zika virus also may be introduced into new areas by travelers who become infected while visiting tropical areas where Zika is endemic.

Before 2007, at least 14 cases of Zika had been documented, although other cases were likely to have occurred and were not reported. Because the symptoms of Zika are similar to those of many other diseases, many cases may not have been recognized. Starting in early 2015, a Zika outbreak began in Brazil that spread to many countries and territories throughout the Americas, Pacific Islands and Africa. Zika continues to be a risk in multiple countries and territories, with the most updated information on "Areas with Zika" on the CDC Zika webpage.

### EPIDEMIOLOGY

In 2016, 49 confirmed and probable cases of Zika virus disease were reported in residents of Indiana. From 2015 to 2016, 52 cases of Zika virus disease were reported in Indiana. All cases were acquired during foreign travel to tropical and subtropical areas.

### LEARN MORE

http://www.cdc.gov/zika/index.html
http://wwwnc.cdc.gov/travel/diseases/zika

*All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017

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

# VIRAL HEPATITIS

**INCLUDES:** Hepatitis A^, Hepatitis B, Hepatitis C, Hepatitis D, Hepatitis E^

^See Enteric Diseases

## VIRAL HEPATITIS PREVENTION

*Hepatitis B*

- Safe and effective vaccines have been available for hepatitis B virus (HBV) 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 age of the recipient and type of vaccine.
- Since 1991, a comprehensive strategy for the elimination of HBV transmission in the U.S. 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).

*Hepatitis C*

- In 2016, ISDH continued 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 2015, ISDH began planning a rapid hepatitis C (HCV) testing pilot project in response to the HIV/HCV outbreak among injection drug users in Scott County, Indiana. Testing began in 2016, with eight local health departments in southeastern Indiana participating. In efforts to improve testing among two major subpopulations affected by HCV, baby boomers and injection drug users, ISDH expanded the rapid HCV testing project across Indiana with 24 participating organizations, including local health departments, health centers and special population support programs. To improve linkage to care among those infected with HCV, each participating organization identified referral sources in its area to refer HCV-positive patients to for follow-up care and treatment.
- Prevention measures for HBV also are applicable to the control of HCV; however, prophylaxis with immune globulin (IG) is not effective. There is also no vaccine for HCV.

*Hepatitis D*

- Although there is a vaccine for HBV, there is no vaccine for hepatitis D virus (HDV). Because HDV is dependent on HBV infection, preventing HBV infections will prevent HDV infections. This serious coinfection or superinfection is uncommon in the U.S. but endemic in Asia and South America and results in fulminant liver failure in 1 percent of patients. Of those with a superinfection of hepatitis D, 90 percent will develop chronic HDV and have a poor prognosis with no effective treatment.

## HEPATITIS B

**2016 CASE TOTAL (ACUTE):** 171
**2015 CASE TOTAL (ACUTE):** 133

**2016 INCIDENCE RATE:** 2.58 per 100,000
**2015 INCIDENCE RATE:** 2.01 per 100,000

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 HBV infection is a short-term illness that occurs within the first six months after someone is exposed to HBV.

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 in about 6 percent to 10 percent of adults. 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.

### CLINICAL AND PUBLIC HEALTH SIGNIFICANCE

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.

Risk for hepatitis B infection varies with occupation, lifestyle and the environment where there is contact with blood from infected persons. Populations at high risk for hepatitis B infection include immigrants from areas with endemic rates, infants born to infected mothers, sex partners of infected persons, persons who inject drugs, tattoo recipients, men who have sex with men (MSM) and household contacts of infected persons. Populations at intermediate risk include prisoners, health care workers, heterosexuals with multiple partners, persons with a sexually transmitted disease(s) (including hepatitis C virus and/or human immunodeficiency virus) and travelers to regions with intermediate or high rates of hepatitis B (HBsAg+ prevalence of greater than 2 percent).

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 Centers for Disease Control and Prevention (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 2016, the testing and reporting of the hepatitis B status of refugees residing in Indiana continued.

*All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

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

## HEALTHY PEOPLE 2020 GOAL

The Healthy People 2020 objective for hepatitis B is to reduce both new and chronic infections in a variety of populations: Reduce new infections in adults age 19 years and older to 1.5 cases per 100,000; reduce new infections among persons who inject drugs to 215 cases; and reduce new hepatitis B infections among MSM to 45 cases. Risk factor percentages in Indiana can be found in Table 1.

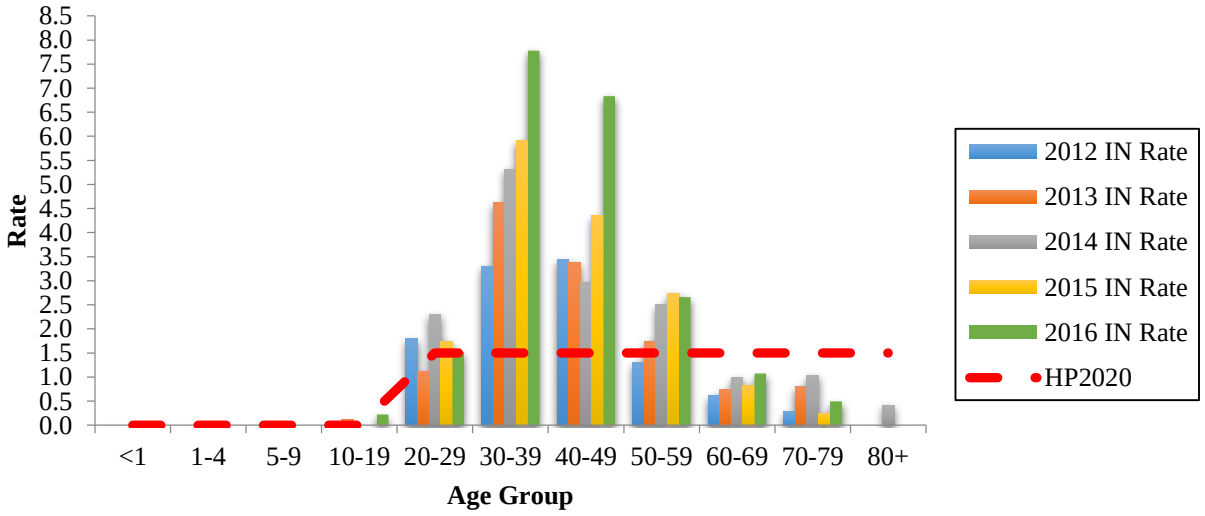
**Table 1:** Acute Hepatitis B Risk Factors – Indiana, 2016

| Risk Factors | Number of Cases (Percent of Cases) |
|---|---|
| Injection drug use | 36 (21.1%) |
| Multiple sex partners | 19 (11.1%) |
| Contact of a case | 12 (7.0%) |
| History of surgery | 11 (6.4%) |
| History of dental work | 11 (6.4%) |
| Application of a tattoo | 9 (5.3%) |
| MSM | 7 (4.1%) |
| Medical employment | 1 (0.6%) |

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

Figure 1 shows Indiana's incidence rates of hepatitis B per 100,000 population, per age group. Also included is the reference level for the Healthy People 2020 goal for reducing new infections in adults ages 19 and older. As evidenced in the table, during 2016 Indiana met the Healthy People 2020 goal only for the 20-29, 60-69 and 70-79 year age groups. Overall for 2016, an increase in the incidence rate of infection was noted in the 30-39 age group (5.9 to 7.8) and 40-49 age group (4.3 to 6.8). The rate of acute infection dropped from 1.7 to 1.5 in the 20-29 year age group.

**Figure 1:** Acute Hepatitis B Incidence Rates by Age Group – Indiana, 2012-2016*+




*All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

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

## EPIDEMIOLOGY

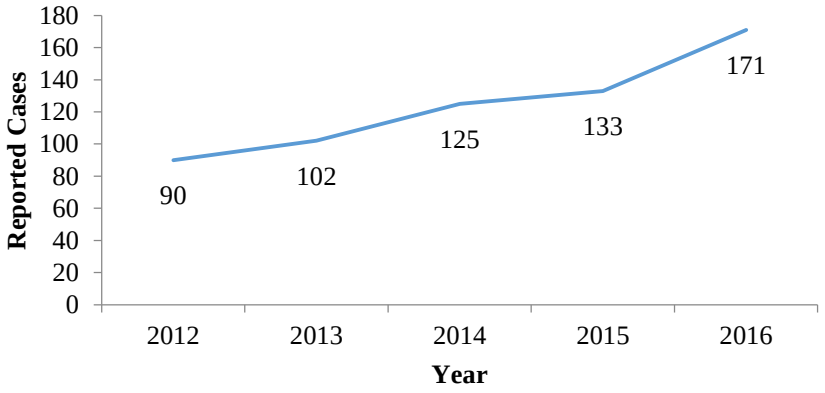
In 2016, 171 confirmed cases of acute hepatitis B disease were reported in Indiana (Table 2). An overall increase in acute cases of hepatitis B was reported in 2016. It should be noted that the data presented in this report does not include the burden of disease caused by chronic infection with HBV, which certainly remains a substantial public health problem, both nationally and in Indiana, especially with foreign-born individuals.

**Table 2:** Acute Hepatitis B Case Rates by Race and Sex – Indiana, 2016*+

| | Cases | Rate | 2012-2016 Total |
|---|---|---|---|
| **Race** | | | |
| White | 124 | 2.18 | 438 |
| Black | 10 | 1.56 | 39 |
| Other | 10 | 3.19 | 17 |
| Unknown | 27 | - | 128 |
| **Sex** | | | |
| Male | 102 | 3.03 | 384 |
| Female | 69 | 2.11 | 238 |
| Unknown | 0 | - | 0 |
| **Total** | 171 | | 622 |

Figure 2 shows reported cases of acute hepatitis B for the five-year period 2012-2016. In 2016, the number of reported cases of acute hepatitis B increased compared to 2015 (171). This increase can be attributed to the rise in awareness for testing and an increase in IDU in Indiana and nationwide[1].

**Figure 2:** Acute Hepatitis B Cases by Year – Indiana, 2012-2016




Acute hepatitis B cases occurred and were reported during each month in 2016 without specific seasonality except for spikes in July and August for unknown reasons (Figure 3).

[1] National Institute on Drug Abuse. Drug use and Viral Infections (HIV, Hepatitis), March, 2017. Retrieved from https://www.drugabuse.gov/publications/drugfacts/drug-use-viral-infections-hiv-hepatitis

*All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

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

**Figure 3:** Acute Hepatitis B Cases by Month – Indiana, 2016

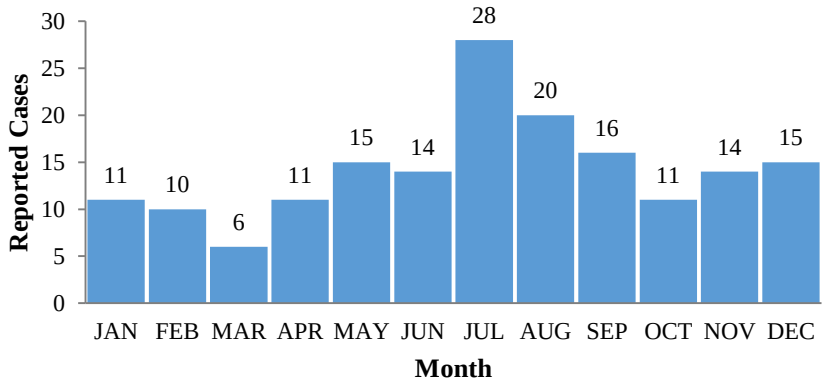
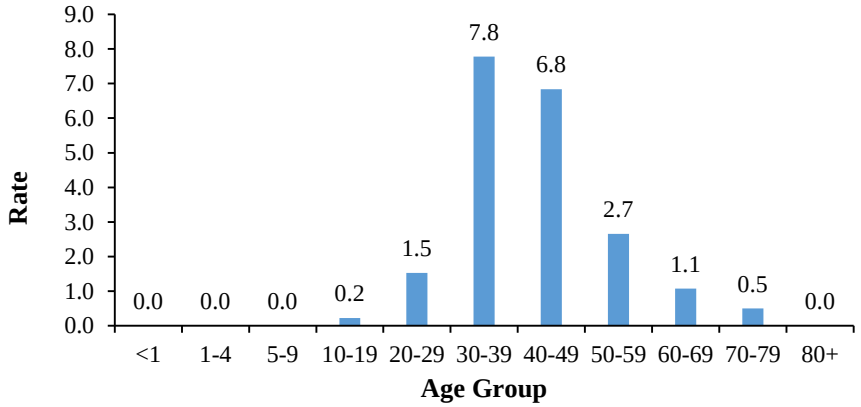



Figure 4 shows acute hepatitis B incidence rates by age group per 100,000 population. In Indiana, as well as nationally, higher rates of hepatitis B disease continue among adults, particularly males 30-39 and 40-49 years of age and persons with identified risk factors (e.g., IDU, contacts with those diagnosed with HBV, MSM and persons with multiple sex partners) (Table 1).

**Figure 4:** Acute Hepatitis B Incidence Rates by Age Group – Indiana, 2016*+




In 2016, 49 Indiana counties reported at least one case of acute hepatitis B. This is increased from those counties reporting acute cases in 2015 (38 counties). Table 2 shows the five counties with the highest disease incidence rates per 100,000 population.

**Table 2**: Acute Hepatitis B Incidence Rates by County – Indiana, 2016*+

| County | Cases | Rate |
|---|---|---|
| Morgan | 8 | 11.5 |
| Shelby | 5 | 11.3 |
| Henry | 5 | 10.3 |
| Wayne | 5 | 7.5 |
| Madison | 9 | 7.0 |

## LEARN MORE

ISDH Hepatitis B: http://www.in.gov/isdh/25477.htm
CDC Viral Hepatitis Home Page: https://www.cdc.gov/hepatitis/index.htm
Hepatitis B Foundation: http://www.hepb.org

*All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.
+ Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

## HEPATITIS C

**2016 CASE TOTAL (ACUTE):** 181
**2015 CASE TOTAL (ACUTE):** 139

**2016 INCIDENCE RATE:** 2.73 per 100,000
**2015 INCIDENCE RATE:** 2.10 per 100,000

HEPATITIS C is the leading chronic blood-borne disease in the U.S. and is caused by the hepatitis C virus (HCV). The HCV virus infects the liver, causing inflammation. Infections can range from asymptomatic or mild illness lasting several weeks to serious, lifelong chronic infection. The burden of HCV in the U.S. is approximately 3.5 million cases, with 75 percent 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 2016, but data also were 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.

### CLINICAL AND PUBLIC HEALTH SIGNIFICANCE

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 percent to 20 percent 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.

Prior to the implementation of universal antibody screening of blood donors in 1992, most 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. Although no vaccination is currently available for HCV, treatments are available that can eliminate infection.

### HEALTHY PEOPLE 2020 GOAL

The Healthy People 2020 goal is to reduce the number of new hepatitis C infections to the rate of 0.25 per 100,000 population per year. Indiana did not meet this goal in either 2015 or 2016 with a rate of acute infections of 2.73 per 100,000 in 2016 alone.

### EPIDEMIOLOGY

*Acute*

In 2016, 181 cases of acute hepatitis C infection were reported, representing a 30.2 percent increase from 2015. The incidence rate for acute hepatitis C infection among males was 2.71 cases per 100,000 males, while the rate among females was 2.75 per 100,000 females.

*Chronic*

For chronic hepatitis C infection, 8,166 cases were reported during 2016 for an incidence rate of 123.11 cases per 100,000 population (Table 1); however, incidence may be higher because reporting of chronic cases is not required. During 2016, males had an incidence rate of 144.64 per 100,000 males and females had an incidence rate of 100.78 per 100,000 females (Table 1). In 2016, race was not reported for more than 24 percent of all hepatitis C cases.

▲All Hepatitis C data are accurate as of Aug. 4, 2017.
*All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.
+ Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

**Table 1:** Hepatitis C case Rate by Race and Sex – Indiana, 2016*+▲

| | Acute | | Chronic | | 2012-2016 |
|---|---|---|---|---|---|
| | Cases | Rate | Cases | Rate | Total Cases |
| **Race** | | | | | |
| White | 143 | 2.52 | 4,943 | 87.05 | 20,119 |
| Black | 3 | 0.47 | 534 | 83.25 | 2,393 |
| Other | 11 | 3.51 | 431 | 137.69 | 890 |
| Unknown | 24 | - | 2,258 | - | 9,530 |
| **Sex** | | | | | |
| Male | 91 | 2.71 | 4,865 | 144.64 | 20,088 |
| Female | 90 | 2.75 | 3,295 | 100.78 | 12,832 |
| Unknown | - | - | 6 | - | 12 |
| **Total** | 181 | 2.73 | 8,166 | 123.11 | 32,932 |

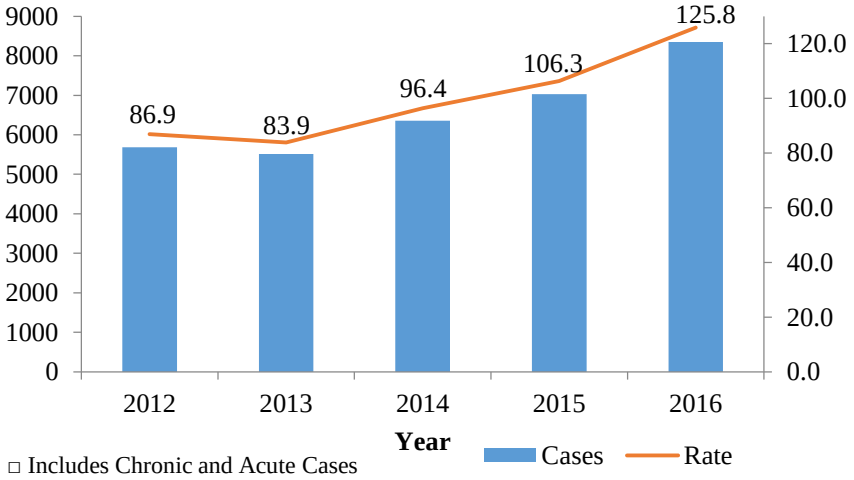
Table 2 highlights the most common risk factors identified in 2016 for acute hepatitis C cases in Indiana. Completeness of reporting risk factor information varies.

**Table 2:** Acute Hepatitis C Risk Factors – Indiana, 2016

| Risk Factor | Number of Cases (%) |
|---|---|
| Inject drugs not prescribed by doctor | 90 (49.7%) |
| Use street drugs but do not inject | 75 (41.4%) |
| Incarcerated | 52 (28.7%) |
| Social contact of HCV-positive person | 40 (22.1%) |

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

**Figure 1:** Hepatitis C Cases and Incidence Rates by Year – Indiana, 2012-2016▲




□ Includes Chronic and Acute Cases

▲All Hepatitis C data are accurate as of Aug. 4, 2017.

*All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

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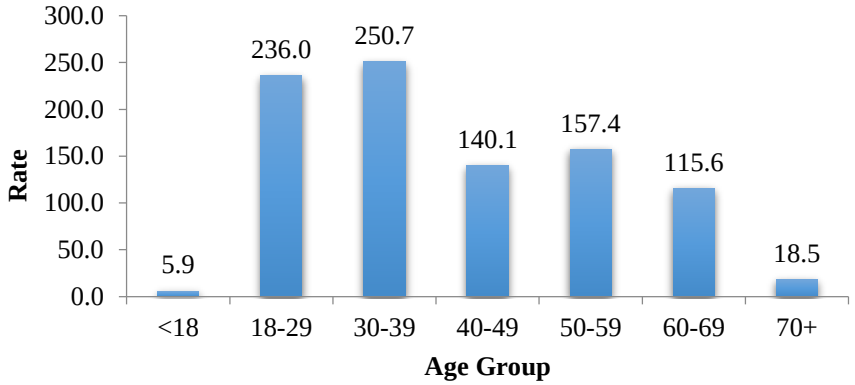
Figure 2 includes age-specific incidence rates for total acute and chronic reported cases of hepatitis C infection during 2016. Rates were highest among adults ages 18-29 and 30-39 (236.0 per 100,000 and 250.7.0 per 100,000 respectively).

**Figure 2:** Hepatitis C Prevalence Rates by Age Group – Indiana, 2016▲#




+Five cases of hepatitis C with an unknown age

In 2016, 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 both acute (confirmed) and chronic (confirmed and probable) hepatitis C infections by county for individuals, including the Indiana Department of Corrections (IDOC). Figure 4 excludes IDOC cases.

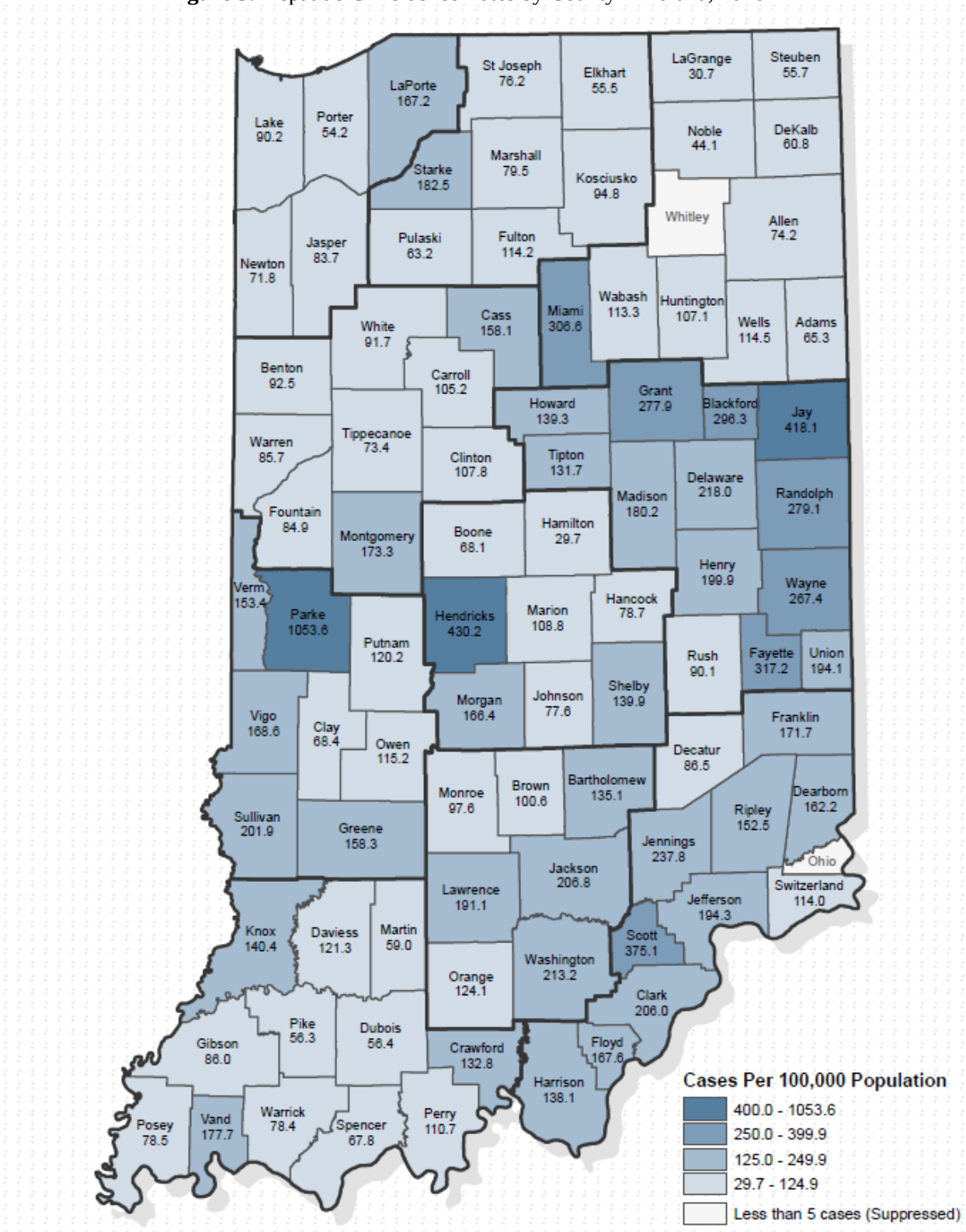
The larger number of cases seen for Hendricks and Parke counties is due mostly to the locations of Regional Diagnostic Centers for male and female offenders within the IDOC facilities in those counties. Offenders are tested for bloodborne diseases, such as hepatitis C, at these facilities but likely reside in other Indiana counties.

## LEARN MORE

http://www.in.gov/isdh/25474.htm

▲All Hepatitis C data are accurate as of Aug. 4, 2017.
*All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.
+ Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

**Figure 3:** Hepatitis C Incidence Rates by County – Indiana, 2016*+▲

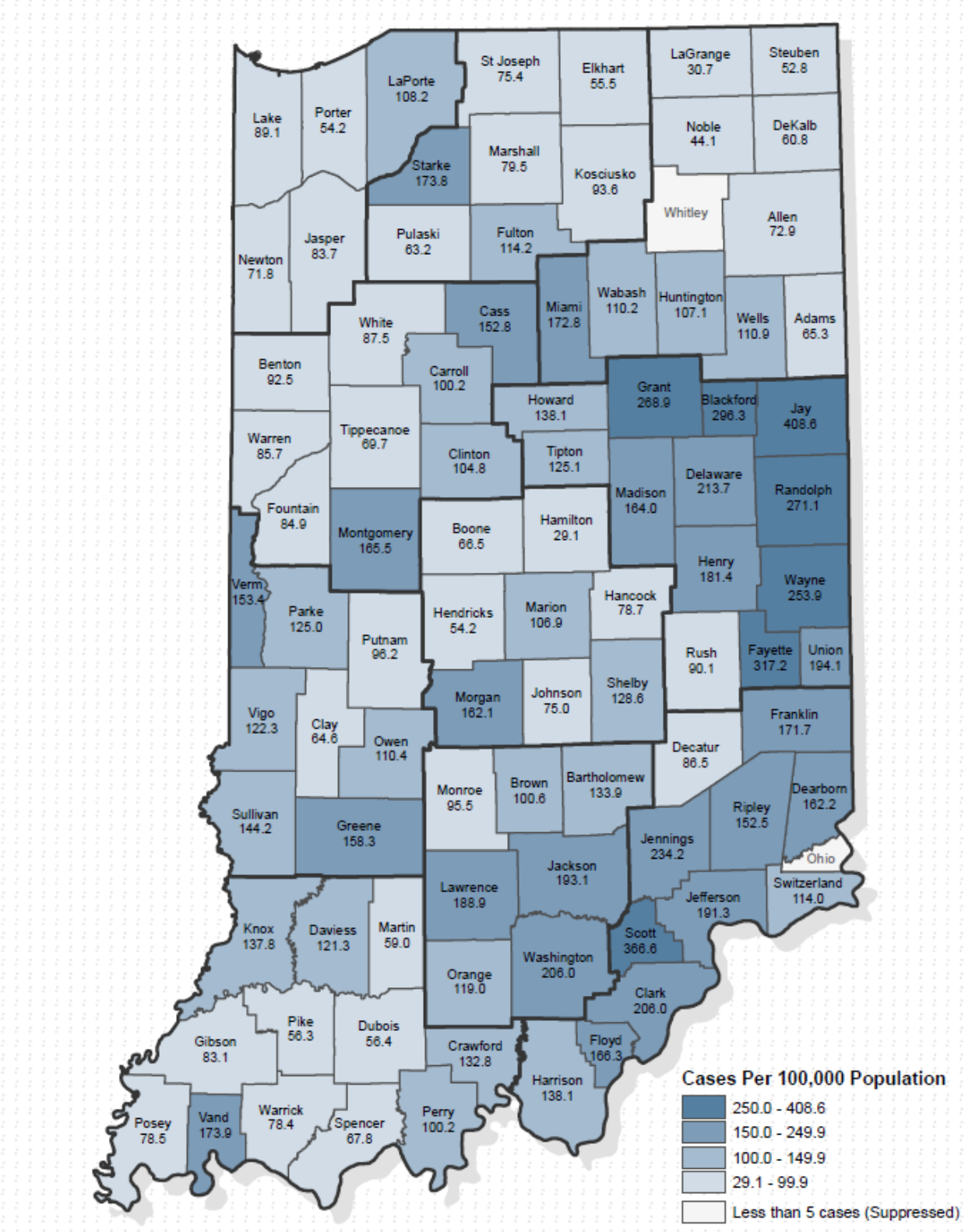



▲All Hepatitis C data are accurate as of Aug. 4, 2017.

*All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

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

**Figure 4:** Hepatitis C Incidence Rates by County Excluding DOC – Indiana, 2016*+▲




▲All Hepatitis C data are accurate as of Aug. 4, 2017.

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## WATERBORNE DISEASES & CONDITIONS

**INCLUDES**: Cholera, Cryptosporidiosis, Cyclosporiasis, Giardiasis, Legionellosis, Leptospirosis, Vibriosis

### WATERBORNE DISEASE PREVENTION

In general, waterborne diseases 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; 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.
- 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.
  - Do not eat uncooked shellfish or fish, including ceviche.
  - 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 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 and 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 younger 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.
  - Do not bring raw produce or shellfish back into the U.S.

## CRYPTOSPORIDIOSIS

**2016 CASE TOTAL:** 213
**2015 CASE TOTAL:** 189

**2016 INCIDENCE RATE:** 3.21 per 100,000
**2015 INCIDENCE RATE:** 2.86 per 100,000

CRYPTOSPORIDIOSIS is a contagious disease caused by the microscopic parasites *Cryptosporidium hominis* and *Cryptosporidium parvum*, which can live in the intestines 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) that 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.

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 zoos or fair venues.
- Not washing hands after contact with stool from a contaminated surface such as diapers/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. *Cryptosporidium* outbreaks linked to swimming have doubled since 2014 in the U.S., and there has been an increase in outbreaks related to animals in farms and petting zoos.

### CLINICAL AND 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 might 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 reinfection.

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

### EPIDEMIOLOGY

In 2016, 213 cases of cryptosporidiosis were reported in Indiana, for a rate of 3.21 cases per 100,000 population (Table 1). In 2016, males (3.15) and females (3.27) were at similar risk of *Cryptosporidium*, and whites (2.85) were at greater risk than blacks (2.18).

*All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

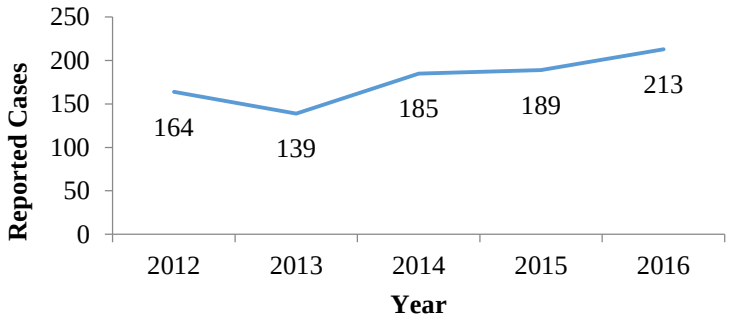
+ Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

**Table 1:** Cryptosporidiosis Case Rates by Race and Sex – Indiana, 2016[*+]

| | Cases | Rate | 2012 - 2016 Total |
|---|---|---|---|
| **Race** | | | |
| White | 162 | 2.85 | 659 |
| Black | 14 | 2.18 | 51 |
| Other | 5 | 1.60 | 18 |
| Unknown | 32 | - | 162 |
| **Sex** | | | |
| Male | 106 | 3.15 | 433 |
| Female | 107 | 3.27 | 456 |
| Unknown | 0 | - | 1 |
| **Total** | 213 | | 890 |

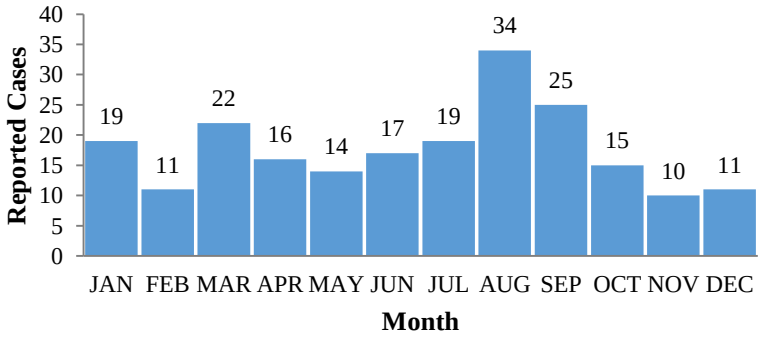
Figure 1 shows the number of reported cases each year for 2012-2016. From 2012 to 2016, an average of 178 cases of cryptosporidiosis were reported in Indiana each year.

**Figure 1:** Cryptosporidiosis Cases by Year – Indiana, 2012-2016




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

**Figure 2:** Cryptosporidiosis Cases by Month – Indiana, 2016




As shown in Figure 3, age-specific rates were greatest for children ages 1-4 years (8.0).

[*]All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

[+] Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

**Figure 3:** Cryptosporidiosis Incidence Rates by Age Group – Indiana, 2016*+

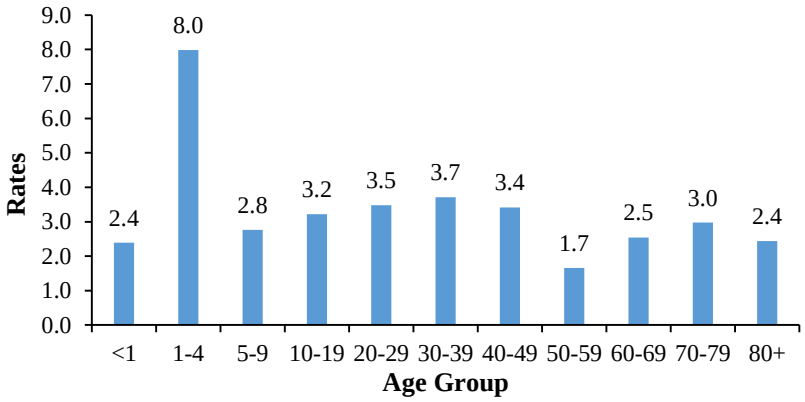



Table 2 shows the five counties with the highest disease incidence rates. The incidence rates were highest among the following counties reporting five or more cases: Steuben (23.4), Huntington (22.0), DeKalb (16.4), Henry (10.3) and LaPorte (8.2).

**Table 2:** Cryptosporidiosis Incidence Rates by County – Indiana, 2016*+

| County | Cases | Rate |
|---|---|---|
| Steuben | 8 | 23.4 |
| Huntington | 8 | 22.0 |
| DeKalb | 7 | 16.4 |
| Henry | 5 | 10.3 |
| LaPorte | 9 | 8.2 |

## LEARN MORE

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

*All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

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

## GIARDIASIS

**2016 CASE TOTAL:** 197
**2015 CASE TOTAL:** 181

**2016 INCIDENCE RATE:** 2.97 per 100,000
**2015 INCIDENCE RATE:** 2.74 per 100,000

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.

*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.

### CLINICAL AND 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 from two to six weeks. Infected people may carry *Giardia* in their bodies for weeks or months without symptoms and unknowingly infect others. Although medications are available to treat giardiasis, they are not needed if the person does not have diarrhea. Over-the-counter drugs might relieve symptoms but will not get rid of the parasite.

### EPIDEMIOLOGY

In 2016, 197 cases of giardiasis were reported in Indiana, for a rate of 2.97 cases per 100,000 population (Table 1). Males (3.48) were at greater risk of giardiasis than females (2.45). The rate for other races (5.11) was higher than that for whites (2.18) or blacks (2.81); however, 39 cases (19.8 percent) did not report race data.

*All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

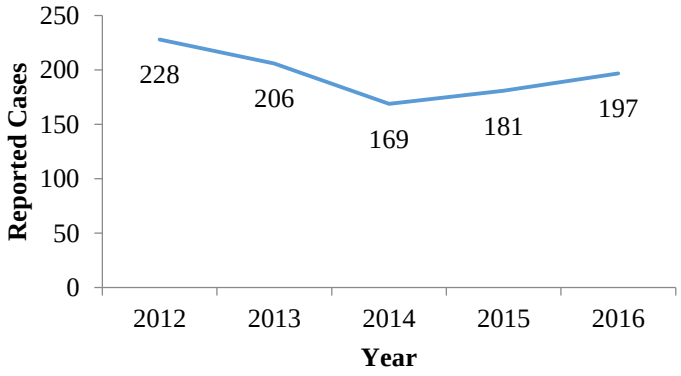
+ Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

**Table 1**: Giardiasis Case Rates by Race and Sex, Indiana, 2016*+

| | Cases | Rate | 2012-2016 Total |
|---|---|---|---|
| **Race** | | | |
| White | 124 | 2.18 | 564 |
| Black | 18 | 2.81 | 98 |
| Other | 16 | 5.11 | 96 |
| Unknown | 39 | - | 223 |
| **Sex** | | | |
| Male | 117 | 3.48 | 564 |
| Female | 80 | 2.45 | 416 |
| Unknown | 0 | - | 1 |
| **Total** | 197 | | 981 |

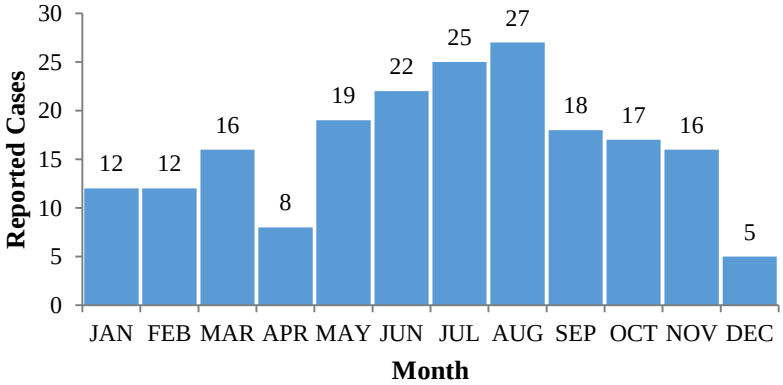
Figure 1 shows the number of reported cases each year for 2012-2016. From 2012 to 2016, an average of 196 cases of giardiasis were reported in Indiana each year.

**Figure 1:** Giardiasis Cases by Year – Indiana, 2012-2016




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

**Figure 2**: Giardiasis Cases by Month – Indiana, 2016*+




*All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

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

As shown in Figure 3, age-specific rates were greatest for children ages 1-4 (5.3) and adults ages 70-79 (5.0).

**Figure 3:** Giardiasis Incidence Rates by Age Group – Indiana, 2016*+

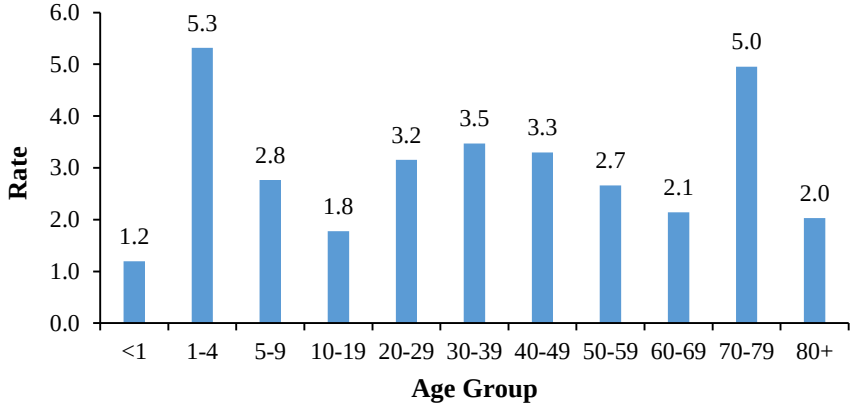



Table 2 shows the five counties with the highest disease incidence rates. The incidence rates were highest among the following counties reporting five or more cases: Hamilton (5.1), Allen (4.9), Vigo (4.6), St. Joseph (4.5) and Elkhart (4.4).

**Table 2**: Giardiasis Incidence Rates by County – Indiana, 2016*+

| County | Cases | Rate |
|---|---|---|
| Hamilton | 16 | 5.1 |
| Allen | 18 | 4.9 |
| Vigo | 5 | 4.6 |
| St. Joseph | 12 | 4.5 |
| Elkhart | 9 | 4.4 |

## LEARN MORE

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

*All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

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

## LEGIONELLOSIS

**2016 CASE TOTAL:** 172
**2015 CASE TOTAL:** 177

**2016 INCIDENCE RATE:** 2.59 per 100,000
**2015 INCIDENCE RATE:** 2.68 per 100,000

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 systems and the environment, in 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, cooling towers and evaporative condensers.

### CLINICAL AND 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 developing Legionnaires' disease are:

- Adults age 50 and older
- Current or former smokers
- People with chronic lung disease (like emphysema)
- People with weakened immune systems from diseases such as 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 also can 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 nosocomial case is 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 to nine days after discharge from a health care facility. Hospitals and large facilities 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 investigation focuses 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 occurs.

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.

*All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

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

## EPIDEMIOLOGY

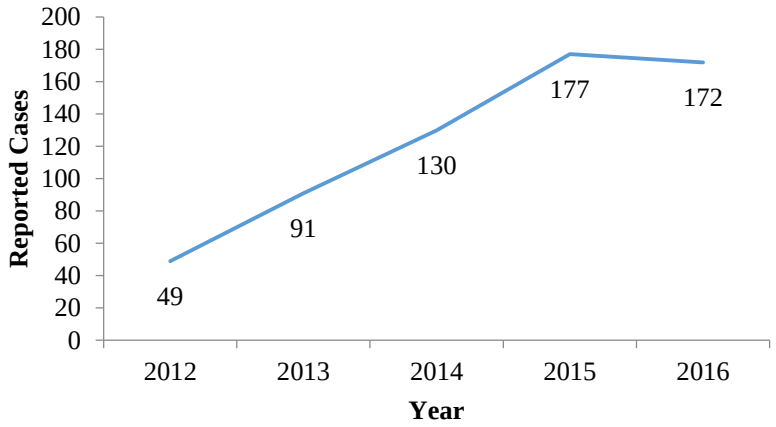
In 2016, 172 confirmed cases of legionellosis were reported in Indiana (Table 1), for a case rate of 2.59 per 100,000. In 2016, blacks (4.83) were at higher risk for legionellosis than whites (2.13). Additionally, males (3.12) were at higher risk than females (2.05).

**Table 1:** Legionellosis Case Rates by Race and Sex – Indiana, 2016[*+]

| | Cases | Rate | 2012-2016 Total |
|---|---|---|---|
| **Race** | | | |
| White | 121 | 2.13 | 428 |
| Black | 31 | 4.83 | 99 |
| Other | 1 | 0.32 | 7 |
| Unknown | 19 | - | 85 |
| **Sex** | | | |
| Male | 105 | 3.12 | 384 |
| Female | 67 | 2.05 | 235 |
| Unknown | 0 | - | 0 |
| **Total** | 172 | | 619 |

Figure 1 shows the number of cases by year for 2012-2016.

**Figure 1:** Legionellosis Cases by Year – Indiana, 2012-2016

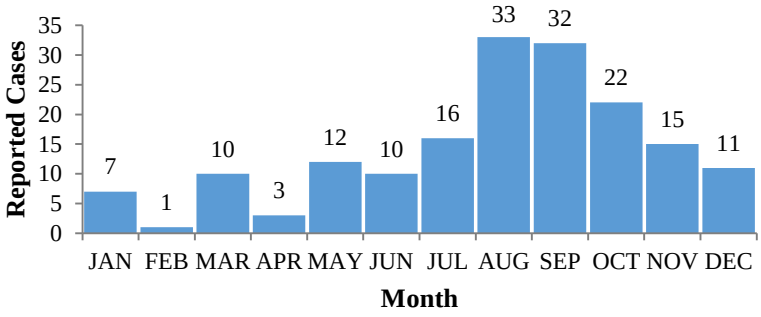



Incidence of legionellosis usually climbs in the summer. Figure 2 indicates an increased incidence in late summer and fall of 2016.

[*]All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

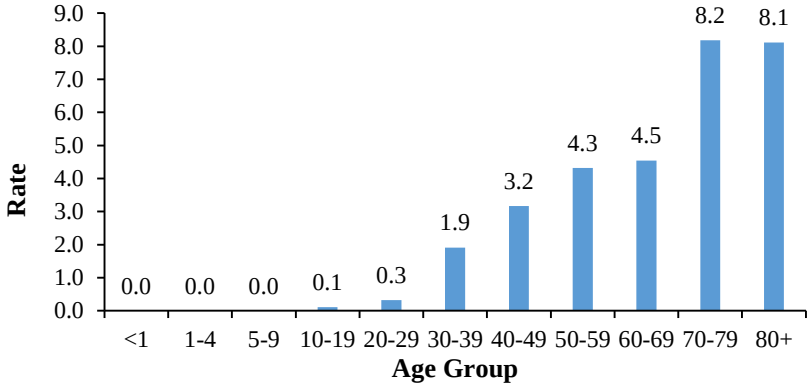
[+] Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

**Figure 2:** Legionellosis Cases by Month – Indiana, 2016




As seen in Figure 3, cases of legionellosis in 2016 were reported more frequently in adults ages 70-79 years (8.2) followed by adults 80 years of age and older (8.1).

**Figure 3:** Legionellosis Incidence Rates by Age Group – Indiana, 2016[*+]




Incidence rates were highest among the following counties reporting five or more cases: St. Joseph (6.7), Vigo (5.6), Elkhart (5.4), LaPorte (4.5) and Lake and Delaware (4.3) (Figure 4).

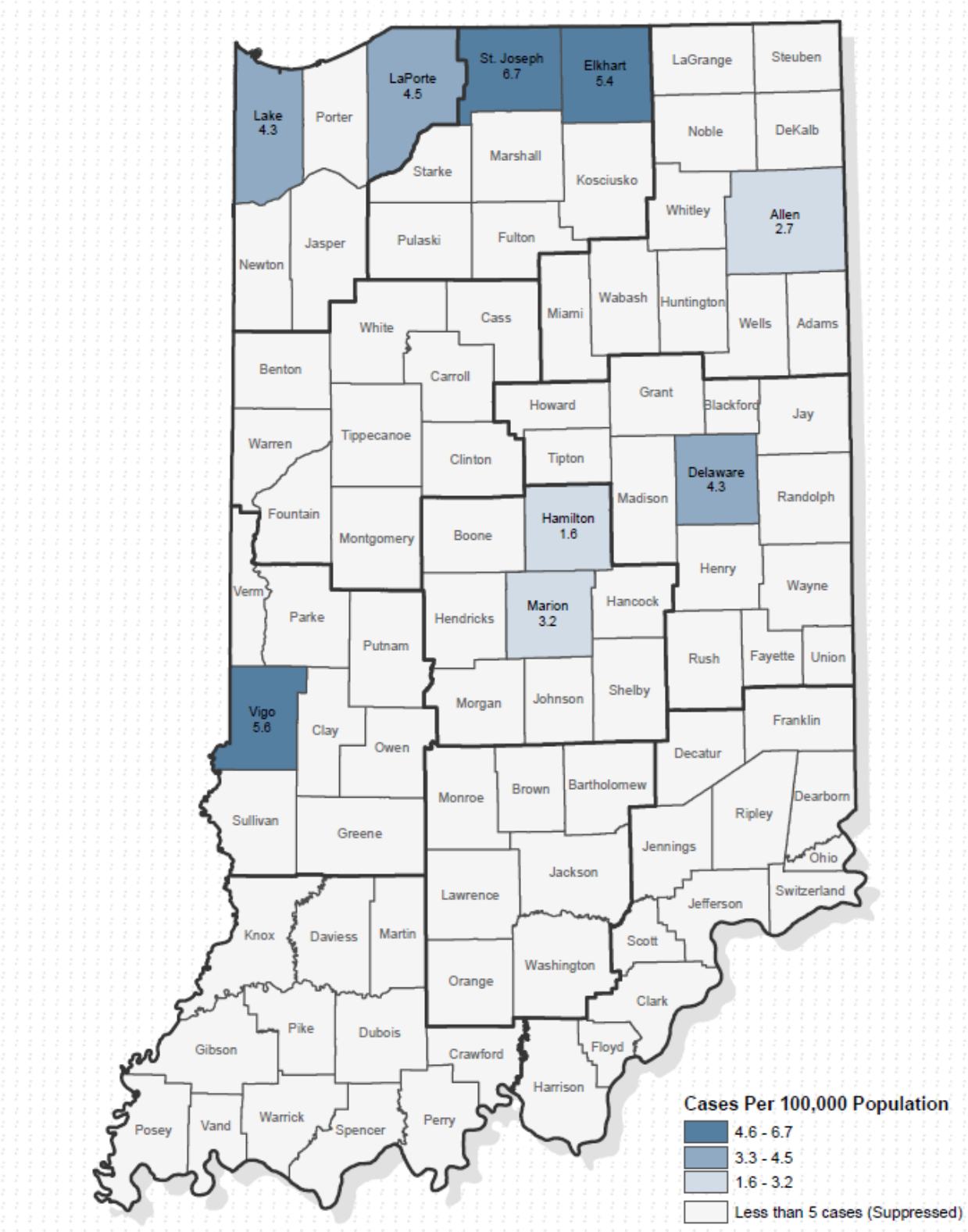
## LEARN MORE

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

[*]All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

[+] Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

**Figure 4:** Legionellosis Incidence Rates by County – Indiana, 2016[*+]




[*]All rates are calculated per 100,000 population based on the U.S. Census Bureau's population estimates as of July 1, 2016, obtained on June 30, 2017.

[+] Rates based on fewer than 20 occurrences should be considered unstable and should not be compared.

## DISEASES AND CONDITIONS OF INFREQUENT OCCURRENCE

| | 2016 CASES | 2015 | 2014 | 2013 | 2012 | 5-YEAR TOTAL (2012-2016) |
|---|---|---|---|---|---|---|
| Anthrax | 0 | 0 | 0 | 0 | 0 | 0 |
| Arboviral Encephalitis | 0 | 0 | 0 | 0 | 0 | 0 |
| Babesiosis | 0 | 0 | 0 | 1 | 0 | 1 |
| Botulism | 0 | 0 | 1 | 0 | 0 | 1 |
| Brucellosis | 0 | 2 | 0 | 1 | 3 | 6 |
| Chikungunya | 2 | 7 | 33[1] | NR | NR | 42 |
| Cholera | 0 | 0 | 0 | 0 | 0 | 0 |
| Cyclosporiasis | 3 | 0 | 2 | 1 | 0 | 6 |
| Dengue | 8 | 0 | 5 | 6 | 8 | 27 |
| Severe Dengue | 1 | 0 | 0 | 0 | 1 | 2 |
| Diphtheria | 0 | 0 | 0 | 0 | 0 | 0 |
| Hansen's Disease (Leprosy) | 0 | 1 | 0 | 1 | 0 | 2 |
| Hantavirus Pulmonary Syndrome | 1[2] | 1 | 0 | 0 | 0 | 2 |
| Hepatitis D | 7 | 3 | 4 | 2 | 1 | 17 |
| Hepatitis E | 2 | 2 | 1 | 4 | 3 | 12 |
| La Crosse Encephalitis | 0 | 0 | 2 | 1 | 0 | 3 |
| Leptospirosis | 0 | 2 | 1 | 0 | 0 | 3 |
| Measles | 1 | 0 | 1 | 2 | 15[3] | 19 |
| Plague | 0 | 0 | 0 | 0 | 0 | 0 |
| Poliomyelitis | 0 | 0 | 0 | 0 | 0 | 0 |
| Psittacosis | 0 | 0 | 0 | 0 | 0 | 0 |
| Q Fever | 1 | 1 | 2 | 1 | 2 | 7 |
| Rubella | 0 | 0 | 0 | 0 | 1 | 1 |
| Smallpox | 0 | 0 | 0 | 0 | 0 | 0 |
| Tetanus | 1 | 0 | 1 | 1 | 3 | 6 |
| Toxic Shock Syndrome (Other than Streptococcal) | 2 | 2 | 0 | 1 | 1 | 6 |
| Trichinosis | 0 | 1 | 1 | 0 | 0 | 2 |
| Tularemia | 0 | 3 | 2 | 5 | 4 | 14 |
| Typhoid Fever | 7 | 6 | 5 | 4 | 4 | 26 |
| Typhus Fever | 0 | 0 | 0 | 0 | 0 | 0 |
| Vibriosis | 12 | 3 | 6 | 9 | 6 | 36 |
| Yellow Fever | 0 | 0 | 0 | 0 | 0 | 0 |
| Yersiniosis | 13 | 10 | 13 | 6 | 10 | 52 |

[1]This was the first year of reporting. All cases were acquired via foreign travel.
[2]Although reported to the CDC, this case was classified as non-pulmonary Hantavirus.
[3]Fourteen cases related to a single-family outbreak acquired from individuals in an endemic country.