Case Investigations: Lessons Learned from the 1976 Philadelphia Legionellosis Outbreak

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Legionellosis is a disease resulting from *Legionella* bacteria. Legionellosis can result in two distinguishable conditions: Legionnaire's disease and Pontiac fever. Legionnaire's disease is characterized by pneumonia and is more severe than Pontiac fever, which is milder and often self-limited. Common symptoms of legionellosis include cough, shortness of breath, high fever, muscle aches, headaches, and sometimes gastrointestinal problems. Legionellosis is contracted when water mist droplets contaminated with *Legionella* bacteria are inhaled into the lungs. Legionellosis is not transmitted from person to person. Symptoms usually appear 2 to 10 days after exposure to the bacteria.

Many different species of *Legionella* bacteria are found naturally in soil and water. Even though legionellosis outbreaks have been linked to potting soil (*Legionella longbeachae*), the majority of legionellosis cases (*Legionella pneumophila)* are contracted from inhaling contaminated mist from warm (90°F to 108°F)[1], stagnant water found in hot tubs, cooling water towers, decorative fountains, nebulizers, and facilities with large plumbing systems. Facilities with large plumbing systems often have capped pipes or dead leg lines, infrequently used faucets, and storage tanks where nutrients can settle when the water is stagnant. The use of rubber hoses with spray nozzles, rubber washers, and plastic fittings allow for leaching of organic compounds into the water. These conditions, as well as the presence of amoebae and protozoa, provide a nutrient environment for *Legionella* growth.

Legionellosis is a fairly recently discovered disease. The history behind its discovery includes many interesting and some unfortunate events accompanied by several challenges that prevented timely identification, prompt investigation and positive communication from public health officials to the public. The process of discovering *Legionella* bacteria in the 1976 Philadelphia outbreak provided many lessons that have since helped epidemiologists to improve readiness, communication, teamwork, and open-mindedness to solving legionellosis outbreaks.

The Pennsylvania American Legion organization held their annual convention in July 1976 at the Bellevue Stratford Hotel located in Philadelphia to commemorate the bicentennial signing of the Declaration of Independence. During this outbreak, 182 Legionnaires' disease cases were reported with 29 deaths. The last weekend in July, Pennsylvania physicians started seeing patients with febrile illness and pneumonia. A physician reported that he contacted the Pennsylvania State Public Health Department (PSPDH) late Friday afternoon but was informed that the PSPHD was closed. Another physician attempted to notify the PSPHD on July 31, but was unable to report his concerns due to the department being closed.

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By the following Monday when the PSPHD responded, 18 of the conventioneers had already died of acute pneumonia. At this point in time, state and local health departments did not provide around the clock coverage, and there was a delay in starting the investigation. Since then, protocol has changed and public health organizations have procedures in place for operating 24/7 to ensure timeliness in responding to communicable disease outbreaks.

The majority of the cases had stayed at the Bellevue Stratford Hotel; however, there were a few cases that did not stay in the hotel. One deceased case lived on Broad Street and did not step inside the hotel; it was later determined that this case was within one block of the hotel. Philadelphia hosted several parades celebrating the bicentennial during July and many of the parade routes traveled in front of the hotel. One fatal case was a bus driver who had transported a marching band to the parade. He had spent only a few hours in Philadelphia and most of his time was spent on the bus. He did not enter the hotel at any time while in Philadelphia. This initially skewed the investigation that the source of the exposure was not the hotel. Because non-convention attendees were becoming ill, it was widely thought at first that the transmission was from person to person and not from a point source. Investigators spent time trying to identify an index case that was ill prior to attending the convention in Philadelphia with the thought that this case transmitted the illness to others after arriving. However, by September, the Centers for Disease Control and Prevention (CDC) released that there was no evidence of a person-to-person transmission and that the epidemic curve suggested a common point source exposure. However the source and agent had not been determined at that time.

In addition, it was widely believed that the disease was caused by a viral, not bacterial, agent. The CDC had issued repeated warnings of swine influenza in the spring of 1976 due to two cases being diagnosed among army recruits at Fort Dix, New Jersey. The concern was that there would be an occurrence of a pandemic virus similar to the pandemic virus that caused the 1918 influenza epidemic. Because these warnings were prevalent and precluded the Legionellosis outbreak, it was initially hypothesized that the swine influenza virus was the cause of the illness. After test results ruled out influenza, it was still speculated that the disease agent was caused by a virus. Furthermore, chest radiographs revealed interstitial pneumonia, which was more commonly associated with viral infection. *Legionella* bacteria are refractory to most stains and the lung tissues specimens from the deceased cases did not show bacteria. The bacteria were not isolated using standard culture media, such as the Brown-Brenn technique. Laboratory experts continued to falsely conclude that they were dealing with a viral agent rather than a bacterial agent. It was not until December 1976, when a stain commonly used to identify rickettsial bacteria led to the discovery of the presence of *L. pneumophila*.

Another challenge during the investigation was the lack of communication among various organizations involved in the outbreak. As mentioned previously, physicians were unable to contact public health officials during the onset of the outbreak. During the first couple of weeks of investigations, the epidemiologists interviewed patients and reviewed autopsy reports, physicians submitted patient information and samples, and laboratory clinicians tested specimens independently of each other. Epidemiology investigation protocol at this point in time did not include active participation and communication between the field scientists interviewing patients and those in the laboratory testing specimens. Physicians were perturbed that there were no recommendations as to what the most effective treatment might be for patients[6]. The CDC attempted to inform the medical community through the release of information in the Morbidity and Mortality Weekly Report (MMWR). It is argued that CDC first reported respiratory illness in the August 6, 1976 MMWR[7]; less than a week after the case investigation started.

Three more MMWR entries were published by January 18, 1977. When the CDC discovered the cause of the outbreak to be *Legionella* bacteria, it was reported immediately through a special edition on January 18, 1977[10]. But in the overall picture, it was perceived that the CDC was not working fast enough.

The importance of working together and communicating as a team is an imperative lesson learned which enables investigators to see the entire picture, conduct a more thorough investigation, and to more quickly solve outbreaks. A lesson that can be learned by epidemiologists from this investigation is that cooperation and persistence between laboratory clinicians, medical doctors, patients, and the public health care community is necessary for successfully identifying the causes and transmission routes of an outbreak.

The media was already focusing on Philadelphia with the bicentennial celebration and the pneumonia outbreak was reported daily by the media including "body counts". The daily media coverage gave the public the opportunity to see how medical detectives work in solving an outbreak, but the public was running out of patience with the public health system and lost confidence since they were not able to quickly solve the unknown agent's identity that had caused so many deaths and illness. The media continued to speculate and report on rumors as to the cause and suggested possibilities, such as a maneuver from a pharmaceutical company to increase the demand for their swine influenza vaccination, CIA experiments in biological warfare that went wrong, and domestic terrorism. Dr. William Sundemna, a leading Philadelphia pathologist and toxicologist, poised the theory that the outbreak was due to nickel carbonyl poisoning, a topic that he had researched for years. This theory seemed plausible from some of the autopsy results until it was determined that the nickel contamination was from the instruments used in performing the autopsies. This led to the discontinuation of metal instruments and the use of plastic instruments for autopsies.

The theories, trials and errors that led to the discovery of the cause of the 1976 Philadelphia legionellosis outbreak are well documented. It is encouraging that many of these lessons have been learned and investigation procedures 40 years later have changed to not repeat these errors. Public health officials are readily available at any time to respond to concerns from the public and health care workers. Investigations are a team effort based on collaboration and open-mindedness among various organizations and specialists. The importance of communication is recognized but at times it is a balancing act between protecting patient's rights and releasing information to the public. The public must also realize that case investigations require time, especially when dealing with a novel or unknown agent. Learning from challenges presented during historical outbreak investigations can improve current practices and policies that strengthen the public health system.

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Adult Vaccination Coverage: Results from the Indiana BRFSS

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Data Analyst/BRFSS Coordinator

Vaccinations for influenza (flu), pneumonia, and shingles (herpes zoster) can prevent these diseases, make your illness milder if you do get sick, and also help protect the people around you who are more vulnerable to serious flu illness [Centers for Disease Control and Prevention, CDC]. The flu vaccine is recommended annually, while vaccination against pneumonia and shingles may only require one vaccine dose.

Many health conditions are not reportable; thus, prevalence data must be obtained from another source. The Behavioral Risk Factor Surveillance System (BRFSS) is a state-based system of health surveys created by the CDC in 1984 to gather information on the health of non-institutionalized adults ages 18 years and older.

The BRFSS is an annual random digit-dial telephone survey conducted through a cooperative agreement with the CDC, and all states and the District of Columbia participate. The BRFSS survey uses a complex survey design to randomly select respondents with either listed or unlisted landline and cell telephones. State health departments conduct the BRFSS surveys continuously throughout the year using a standardized core questionnaire and optional modules. The BRFSS is the primary source of state-level health risk factors, behaviors, and prevalence of certain chronic conditions.

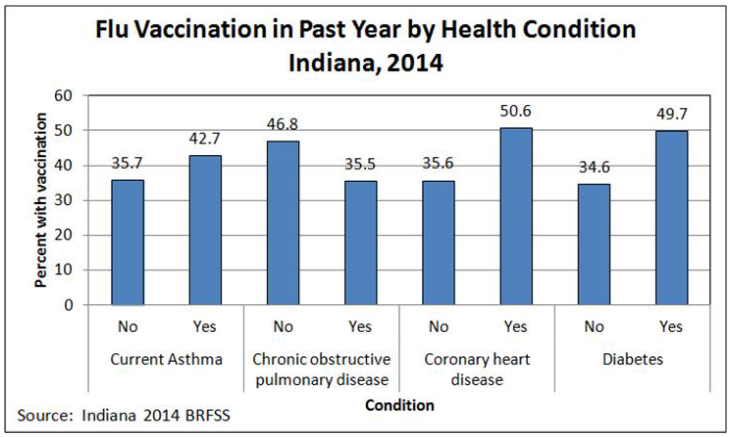
The BRFSS relies on self-reported data. This type of survey has certain limitations that should be understood when interpreting the data. Respondents have the tendency to underreport behaviors that may be considered socially unacceptable, such as smoking and driving after drinking alcohol. Conversely, respondents may overreport behaviors that are desirable, such as physical activity. The differences reported in this article are statistically significant ($p<0.05$) unless otherwise noted.

Influenza

Influenza is an illness caused by flu viruses that infect the respiratory tract and is mainly spread by droplets made when people with flu cough, sneeze or talk. In the US, 5% to 20% of the population on average gets the flu each year, with more than 200,000 people being hospitalized from seasonal flu-related complications (CDC). BRFSS respondents were asked if they had the flu vaccine (shot in arm or nasal spray) within the past 12 months. Overall, 36.4% of adults reported having an annual vaccination in 2014. The prevalence has been unchanged from 2011 to 2014 (approximately 35%).

For adults ages 65 years and older, 56.3% reported having a flu shot in the past year, and there were no differences by sex; however, black, non-Hispanic adults had a lower prevalence of annual flu vaccination than white, non-Hispanic adults (38.8% vs. 57.4%, respectively). There were no differences by income, but flu shot prevalence did increase by education: respondents with less than a high school education had a lower prevalence than college graduates in having a vaccination in the past 12 months (50.5% vs. 65.9%, respectively). While anyone can become infected with the flu, adults who are over age 65 or have certain health conditions (e.g., asthma, chronic obstructive pulmonary disease, coronary heart disease, and diabetes) are at higher risk for getting flu-related complications. Adults with these chronic conditions had a higher prevalence than those without the condition in having an annual flu vaccination (Figure 1). Adults considered to be morbidly obese (BMI>=40.0) are also at greater risk of getting the flu; however, there was no difference in flu vaccination prevalence between those considered morbidly obese (BMI>35.0) (37.7%) and those considered to be at a healthy weight (18.5<=BMI<=24.9) (34.4%).

Figure 1.

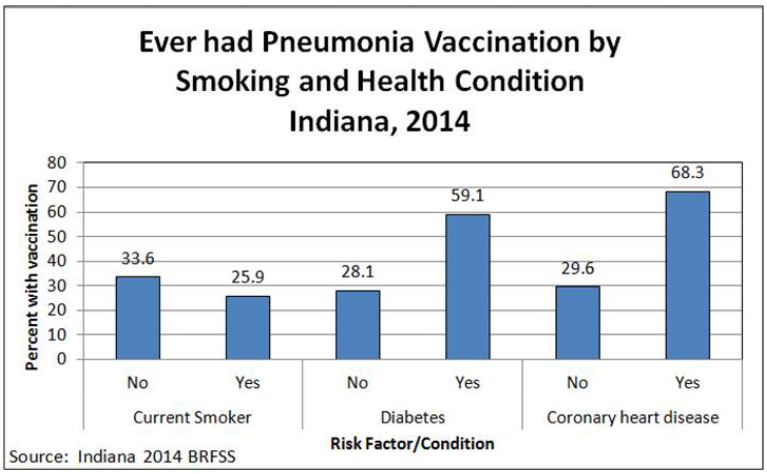


Pneumonia

Pneumonia is an infection of the lungs that can cause mild to severe illness. An average of one million people in the US each year are hospitalized with pneumonia and about 50,000 people die from the disease (CDC). Certain people are more likely to become ill with pneumonia: adults ages 65 years and older; children younger than 5 years of age; those with asthma, heart disease or diabetes; and those who smoke.

BRFSS respondents ages 50 years and older were asked if they had ever had a pneumonia vaccination. Overall, 31.8% reported having the vaccination, while the prevalence for respondents ages 65 years and older was 69.7%. For adults ages 65 years and older, there were no differences by sex, race (white and black, non-Hispanic), or education level for ever having a pneumonia vaccination. The only difference by income was for those with household income of $35,000-$49,999 having a higher prevalence than those with income of $75,000 or more (72.3% vs. 61.6%, respectively). Non-smokers were more likely than current smokers to report ever having a pneumonia vaccination. Adults who had diabetes or coronary heart disease had a higher prevalence of ever having pneumonia vaccination than those without the condition (Figure 2). Two types of pneumococcal vaccine are recommended for adults: a pneumococcal conjugate vaccine (PCV13) and a pneumococcal polysaccharide vaccine (PPSV23). The CDC recommends both PCV13 and PPSV23 for all adults ages 65 years and older and adults ages 19-64 years who have conditions or treatments that affect the immune system (e.g., HIV, leukemia), functional or anatomic asplenia, cochlear implants, or cerebrospinal fluid leaks [CDC].

Figure 2.



Shingles

Shingles (herpes zoster) is caused by a reactivation of varicella zoster virus, the same virus that causes chickenpox. Only people who have had chickenpox can develop shingles, which is a painful rash that develops on one side of the face or body. The rash forms blisters that typically scab over in 7-10 days and clear up within 2 to 4 weeks (CDC). 2014 was the first year the question was included in the BRFSS survey, and respondents ages 50 years and older were asked if they had ever had the shingles, or zoster, vaccine. Overall, 19.2% reported ever having the shingles, or zoster, vaccine. The vaccination prevalence increased with age, from 3.9% for those age 50-54 years to 32.9% for those age 65 years and older. Females had a higher prevalence than males in ever having the vaccine (20.8% vs. 17.4%, respectively). A shingles vaccine is available for people age 60 years and older, and results in fewer recurrences and can make recurrences less severe and painful. Vaccination is the best way to prevent influenza, pneumonia and shingles. Those with health conditions that increase their risk for these illnesses and complications should seek guidance from their healthcare providers.

Health care providers can provide information on these conditions and what types of vaccination are recommended for you and your family. Visit the ISDH website for additional information on flu (http://www.in.gov/isdh/25462.htm), pneumonia (http://www.in.gov/isdh/25443.htm) and shingles (http://www.in.gov/isdh/25432.htm).

A Novel Outbreak of Enterovirus D68 in 2014

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Field 10 Epidemiologist

Enterovirus D68 (EV-D68) is one of more than 100 enteroviruses. While enteroviruses are a common cause of infections in the United States with seasonal peaks in the summer and fall, the D68 strain was not so common. EV-D68 was first isolated from four hospitalized children with respiratory infections in 1962 in California. It has previously been known as human rhinovirus 87 (HRV-87) and also human enterovirus 68 (HEV-68). Only 26 cases were reported from 1970-2005. During 2006-2013, small clusters of EV-D68 were reported in Asia, Europe and the United States. It was so rare that many infection disease specialists were unaware of it. All of that changed in 2014 when the previously rarely seen virus caused widespread disease and was responsible for some serious outcomes.

On August 19, 2014, Children's Mercy Hospital in Kansas City, Missouri notified the Centers for Disease Control (CDC) of an elevated number of children with severe respiratory disease with a corresponding increase of nasopharyngeal specimens testing positive for rhinovirus/enterovirus by polymerase chain reaction (PCR). Sequencing by the CDC Laboratory identified the virus as EV-D68 in 19 of 22 samples from Kansas City and 11 of 14 submitted by University of Chicago Medicine Comer Children's Hospital. Further continued infections across the country in late summer and fall of 2014 resulted in the largest and most widespread EV-D68 outbreak ever recorded. Nearly 12,000 infections were confirmed in 49 states. Indiana confirmed 40 cases during the outbreak. Nationwide, fourteen deaths were attributed to EV-D68.

EV-D68 has some curious viral characteristics. It is an enterovirus which acts more like a rhinovirus. Enteroviruses and rhinoviruses are closely related pathogens in the *Picornaviridae* family. EVD-68 infects the nasopharynx, like a rhinovirus, rather than the GI tract, like most enteroviruses.

Enteroviruses are classified in four human species (A, B, C, D) by RNA sequence with numbered serotypes. Hence, "EV" signifies enterovirus; "D" denotes the species, and "68" the number assigned to the serotype.

Most enterovirus infections are asymptomatic. The full spectrum of EV-D68 symptoms is not well-defined. It can cause mild to severe respiratory illness primarily in infants, children and teens, including fever, runny nose, sneezing, cough and achiness. Severe cases may experience wheezing or difficulty breathing. Children with asthma and respiratory issues are more vulnerable to more severe symptoms.

EV-D68 had been associated almost exclusively with respiratory signs and symptoms, but troublesome and unexpected neurological sequelae surfaced in sporadic cases which initially tested positive for EV-D68. A few infected children progressed to meningitis, encephalitis or some with polio-like paralytic illness. Coinciding temporally with a national outbreak of severe respiratory disease among children caused by EV-D68, physicians at Children's Hospital Colorado in Aurora, Colorado, noted a cluster of cases of acute limb weakness among children. Most reported having a febrile respiratory illness preceding the onset of neurologic symptoms. CDC has logged reports of 118 children (≤ 21years of age) in 34 states who developed an acute onset of weakness in one or more arms or legs and had MRI scans showing inflammation of the spinal cord affecting predominantly the gray matter, from August 2, 2014 to April 14, 2015. Specific causes of this focal limb weakness are still under investigation as CDC continues to collaborate with partners nationally to explore reports, risk factors, and possible etiologies of this condition.

A retrospective cohort study which focused on the association of paralysis and EV-D68 infections during last year's outbreak was published in the June 2015 issue of The Lancet. A research team led by University of California at San Francisco scientists included 48 patients who were identified in two hospitals in Colorado and California or through the California Department of Public Health. Researchers analyzed the genetic sequences of patients with acute flaccid myelitis (sudden, unexplained muscle weakness and paralysis) who were positive for EV-D68 and discovered that they all matched a clade B strain which emerged in 2010. This clade B strain has mutations similar to those found in poliovirus or another closely related nerve-damaging enterovirus, D70. An alternative infectious cause was not identified, even after checking the cerebrospinal fluid for every known pathogen. Their conclusions bolstered the reputed association between EV-D68 and acute flaccid myelitis and that the paralytic illness, although seldom evidenced, is a clinical manifestation of EV-D68 infection.

Enteroviruses can be spread through contact with respiratory secretions of an infected person or touching objects or surfaces contaminated with the viruses. Routes of transmission for EV-D68 specifically are not fully understood. Infection control guidelines for hospitalized patients include standard and contact precautions as appropriate for all enteroviruses. If a facility experiences a cluster of cases or a suspect case of EV-D68, droplet precautions should be implemented as well.

EV-D68 is not nationally notifiable for reporting purposes but suspected clusters of severe respiratory disease are accepted by local and state health departments. Laboratory detection of enteroviruses is voluntarily reported to the CDC National Enterovirus Surveillance System.

Currently no vaccines are available for prevention of EV-D68 infections. No specific treatment exists, so clinical care is supportive.

The best way to prevent transmission of enteroviruses is to:

- Wash hands often with soap and water for 20 seconds, especially after diaper changing.
- Avoid touching eyes, nose, and mouth with unwashed hands.
- Avoid contact with ill people.
- Disinfect frequently touched surfaces, such as toys and doorknobs, especially if someone is sick.
- Cover your coughs and sneezes.
- Stay at home when sick.
- Do not share eating utensils or drinking vessels.

Clinicians should consider EV-D68 as one of many causes of viral respiratory disease, especially if occurring in clusters with an unexplained cause. Commercially available, rapid multiplex PCR assays can detect but not differentiate rhinoviruses from enteroviruses due to their genetic similarity. State health departments can generally perform diagnostic and molecular typing for enteroviruses. Before sending specimens, please contact the ISDH at 317-921-5500 to request authorization for suspect cases.

Sources:

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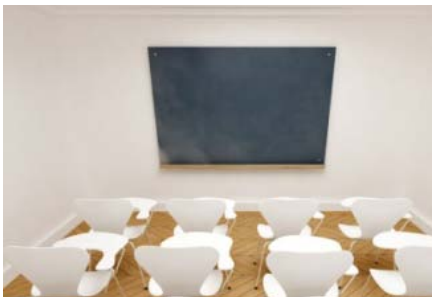

Training Room

INDIANA STATE DEPARTMENT OF HEALTH IMMUNIZATION PROGRAM PRESENTS: Immunizations from A to Z

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- Childhood and Adolescent Vaccine—Preventable Diseases
- Adult Immunizations—Pandemic Influenza
- General Recommendations on Immunization
  - Timing and Spacing
  - Indiana Immunization Requirements
  - Administration Recommendations
  - Contraindications and Precautions to Vaccination
- Safe and Effective Vaccine Administration
- Vaccine Storage and Handling
- Vaccine Misconceptions
- Reliable Resources

This course is designed for all immunization providers and staff. Training manual, materials and certificate of attendance are provided to all attendees. Please see the Training Calendar for presentations throughout Indiana. Registration is required. To attend, schedule/host a course in your area or for more information, please visit http://www.in.gov/isdh/17193.htm.

ISDH Data Reports

The following data reports and the *Indiana Epidemiology Newsletter* are available on the ISDH webpage: http://www.IN.gov/isdh/

HIV/STD/Viral Hepatitis Semi-Annual Report (June 2007 - December 2013)	Indiana Mortality Report (1999–2013)
Indiana Cancer Reports: Incidence; Mortality; Facts & Figures	Indiana Linked Infant Birth/Death Report (1999, 2002, 1990-2003)
Indiana Health Behavior Risk Factors Report (1999–2013)	Indiana Natality Report (1998–2013)
Indiana Health Behavior Risk Factors (BRFSS) Newsletter (2003–2014)	Indiana Induced Termination of Pregnancy Report (1998–2014)
Indiana Hospital Consumer Guide (1996)	Indiana Marriage Report (1995, 1997-2004)
Public Hospital Discharge Data (1999–2014)	Indiana Infectious Disease Report (1999-2013)
Assessment of Statewide Health Needs (2007)	Indiana Maternal & Child Health Outcomes & Performance Measures (1989-1998 through 2002–2011)

HIV Disease Summary

Information as of June 30, 2015 based on 2014 population of 6,596,855

HIV - without AIDS:

177	New HIV cases from April 1, 2015 thru June 30, 2015	3-month incidence	2.68 cases/100,000
5,564	Total HIV-positive, alive and without AIDS on June 30, 2015	Point prevalence	84.34 cases/100,000

AIDS cases:

65	New AIDS cases from April 1, 2015 thru June 30, 2015	3-month incidence	1.00 cases/100,000
5,886	Total AIDS cases, alive on June 30, 2015	Point prevalence	89.22 cases/100,000

18,425 Total AIDS cases, cumulative (alive and dead) on June 30, 2015

Reported cases of selected notifiable diseases		
Disease	**Cases Reported in April - June MMWR Weeks 14-26**	
	2014	**2015***
Arbovirus:		
California serogroup (La Crosse) encephalitis virus	0	0
Chikungunya virus	1	0
Dengue virus	1	0
Eastern equine encephalitis virus	0	0
St. Louis encephalitis virus	0	0
West Nile Virus neuroinvasive disease	0	0
Animal Bites	2,142	1,626
Brucellosis	0	0
Campylobacteriosis	118	72
Chlamydia	6,544	6,319
Cryptococcus neoformans	8	6
Cryptosporidiosis	16	18
E. coli, shiga toxin-producing	28	18
Giardiasis	39	21
Gonorrhea	1,623	1,581
Haemophilus influenzae, invasive	22	25
Hansen's Diseases (Leprosy)	0	0
Hemolytic Uremic Syndrome (HUS)	2	1
Hepatitis A	8	6
Hepatitis B (acute)	38	25
Hepatitis C (acute)	21	1
Hepatitis D	2	0
Hepatitis E	0	0
Histoplasmosis	15	27
Influenza Deaths (all ages)	1	3
Legionellosis	19	14
Listeriosis	0	0
Lyme Disease	27	1
Malaria	4	0
Measles (rubeola)	0	0
Meningitis, other	2	0
Meningococcal, invasive	1	2
Mumps	5	1
Pertussis (Whooping Cough)	112	27

Reported cases of selected notifiable diseases (cont.)		
Diseases	**Cases Reported in April - June MMWR Weeks 14-26**	
	2014	**2015***
Rabies, Animal	0	0
Rocky Mountain Spotted Fever	0	0
Rubella	0	0
Salmonellosis	233	114
Shigellosis	317	42
Severe *Staphylococcus aureus* Infection in Previously Healthy Person	4	0
Group A Streptococcus, invasive	62	27
Group B, Streptococcus, Invasive (All ages)	89	74
Group B, Streptococcus, invasive Newborn	11	4
Streptococcus pneumoniae (invasive, all ages)	148	107
Streptococcus pneumoniae (invasive, drug resistant)	5	42
Streptococcus pneumoniae (invasive, <5 years of age)	9	3
Syphilis (Primary and Secondary)	41	54
Toxic Shock Syndrome, streptococcal (STSS)	4	4
Tuberculosis	26	33
Tularemia	1	0
Typhoid Fever	0	0
Typhus/Rickettsial disease	0	0
Varicella (Chickenpox, confirmed and probable)	45	35
Varicella (Hospitalization or Death)	4	0
Vibriosis (non-cholera Vibro species infections)	0	1
Yersiniosis	3	2
*Provisional		
For information on reporting of communicable diseases in Indiana, call the *ERC Surveillance and Investigation Division* at 317.233.7125.		

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The *Indiana Epidemiology Newsletter* is published quarterly by the Indiana State Department of Health to provide epidemiologic information to Indiana health care professionals, public health officials and communities.

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Indiana State Department of Health
Epidemiology Resource Center

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News from CDC:

Outbreak

Ebola Update

CDC response to Ebola in United States and West Africa and what you need to know about Ebola.

Vital Signs

Antibiotic Resistance

Antibiotic-resistant germs cause more than 2 million illnesses each year in the US.

News

School Start Times

Most US middle and high schools start the school day too early for adequate sleep.

Feature

Legionnaires' Disease

The bacteria that cause Legionnaires' disease are not spread from person to person.

http://www.cdc.gov/