



Vaccine-Preventable Diseases Reported in North Carolina, 2017

Controlling vaccine-preventable diseases (VPDs) requires the consistent, concerted and coordinated efforts of public health agencies and healthcare providers to rapidly identify and report suspected cases, and swiftly implement control measures. Although many VPDs are at or near record low levels, maintaining high immunization rates is still critical to prevent reemergence. This annual surveillance report summarizes 12 VPDs reported in North Carolina during 2017 in the table below. Additional details about diseases for which cases were reported are presented on subsequent pages.

Surveillance Highlights: Cases of pneumococcal meningitis increased significantly compared to the average of the previous five years (2012-2016). In North Carolina, hepatitis A decreased significantly compared to the five-year average; nationally, reported cases increased dramatically due to outbreak among high-risk populations including men who have sex with men, users of injection and non-injection drugs, and persons experiencing homelessness.

Cases of invasive *Haemophilus influenzae* continued to increase, but only two were attributable to type b, the only type that is covered by the vaccine. The number of pertussis cases increased following a two-year downward trend; 429 cases were reported, many of which were associated with outbreaks. No cases of diphtheria, measles, polio, rubella, or congenital rubella syndrome were reported.

Report Specifications. Notable information about this report includes:

- Cases presented include those classified as confirmed or probable.
- Case counts are based on the earliest date of illness identification, typically onset date. Therefore, case counts in this report may differ from those included in national summaries, which can be based either on the earliest date of illness identification or on the date when cases were closed and reported to the Centers for Disease Control and Prevention (CDC).
- Unless otherwise noted, ages are based on date when the case was entered in the North Carolina Electronic Disease Surveillance System.
- Incidence rates are based on data obtained from the CDC bridged-race population estimates. Rates for 2017 were calculated using 2016 population estimates. Note that estimates of rates based on a small number of cases are unstable and can fluctuate widely. Therefore, these estimates should be interpreted with caution. Ninety-five percent confidence intervals are shown for demographic-specific rates.
- The 12 VPDs summarized in this report are shown in the table below. Data for other VPDs such as influenza and hepatitis B are shown in separate reports.

Number of Cases of VPDs Reported in North Carolina, 2012-2017								
Disease	2012	2013	2014	2015	2016	Five-year average	2017	Significant Change*
Diphtheria	0	0	0	0	0	0	0	--
<i>Haemophilus influenzae</i> , invasive disease	102	140	141	169	180	146	206	--
Hepatitis A	38	42	43	39	52	43	30	↓
Measles	0	22	1	0	1	5	0	--
Meningococcal invasive disease	8	9	10	5	5	7	9	--
Mumps	2	4	2	4	35	9	37	--
Pertussis	626	625	785	347	300	537	429	--
Pneumococcal meningitis	39	35	35	34	30	35	52	↑
Polio	0	0	0	0	0	0	0	--
Rubella	0	0	0	0	0	0	0	--
Congenital rubella syndrome	0	0	0	0	0	0	0	--
Tetanus	0	0	0	3	0	1	3	--

* ↑ = significant increase (≥ 2 standard deviations above average) ↓ = significant decrease (≥ 2 standard deviations below average) -- = no significant change

***Haemophilus influenzae*, invasive disease**

Background

Haemophilus influenzae, or "H. flu", can cause a variety of clinical syndromes, including invasive diseases like bacteremia, pneumonia, meningitis, and epiglottitis. H. flu organisms are divided into serotypes a, b, c, d, e, and f, based on proteins found in the capsule that surrounds the organism. Strains without a capsule are called non-typeable. All serotypes, including non-typeable serotypes, can cause invasive disease and are reportable in North Carolina. *Haemophilus influenzae* serotype b (Hib) is the most virulent and is the only serotype for which there is a vaccine.

H. flu is often part of the normal respiratory flora. Carriage of Hib has dramatically decreased due to vaccination, but non-typeable strains can be found in the nose and throat of up to 80% of the population. It is transmitted from person to person by respiratory droplets. H. flu is not carried by animals and does not persist for long in the environment.

Hib was the leading cause of bacterial meningitis in children under 5 years of age before vaccine was available. Approximately 4-5% of Hib meningitis cases were fatal, and 20% of children who survived had complications such as hearing loss or mental retardation. Hib meningitis and other invasive Hib infections are now rare in the United States since the introduction of Hib vaccine into the routine childhood immunization series.

Immunization

The first conjugate Hib vaccine was licensed in 1987. Hib vaccine is currently a recommended routine childhood vaccine in the United States. Infants should receive 3 or 4 doses (depending on the type of vaccine) by 15 months of age. There are no vaccines for non-b or nontypeable H. flu.

Epidemiology

National

The rate of Hib disease has decreased by greater than 99% in children since 1987, while rates in adults have remained the same. Rates of Hib among Alaska Native populations remain higher than the rest of the United States. The success of the vaccine has caused a shift in the epidemiology of H. flu. The majority of invasive H. flu infections are now caused by nontypeable strains and primarily affect children under 5 years of age and adults over 50 years of age.

North Carolina

The number of H. flu cases in North Carolina has increased in recent years. In 2017, 206 cases were reported, the most since 1990 and 41% more than the previous five-year average. The reason for this trend is unknown.

The large majority of H. flu cases in North Carolina are caused by nontypeable strains. Only 1% of cases reported in 2017 were type b. The age group most affected in North Carolina reflects the national trend; adults aged 50 years and older made up 78% of cases.

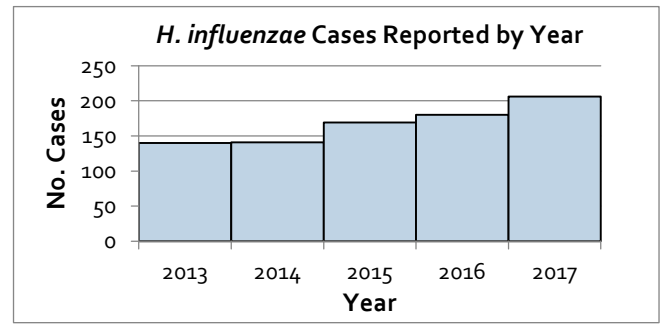
Outbreaks

No outbreaks of H. flu occurred in North Carolina in 2017.

Haemophilus influenzae , invasive disease, 2017

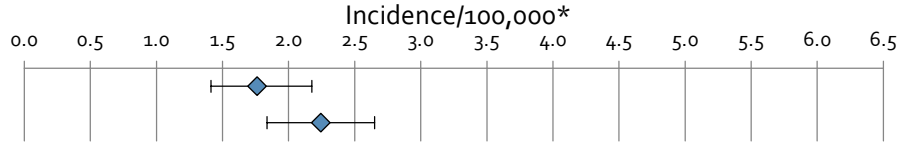
Annual Summary

	2013	2014	2015	2016	2017
Incidence / 100,000	1.4	1.4	1.7	1.8	2.0
No. cases	140	141	169	180	206
Serotypes	type b, <5 years	0%	0%	0%	0%
	type b, ≥ 5 years	2%	0%	1%	2%
	non-b, typeable	21%	24%	22%	18%
	nontypeable	66%	65%	67%	72%
	unknown	11%	10%	11%	8%

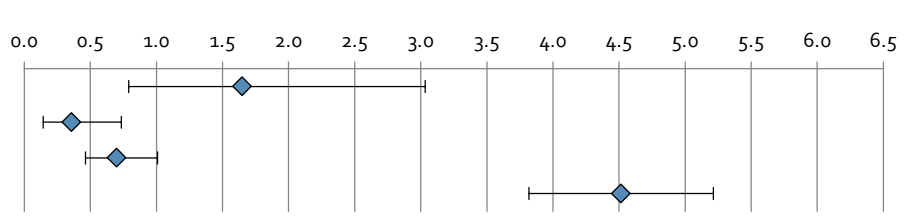


Case Demographics, 2017

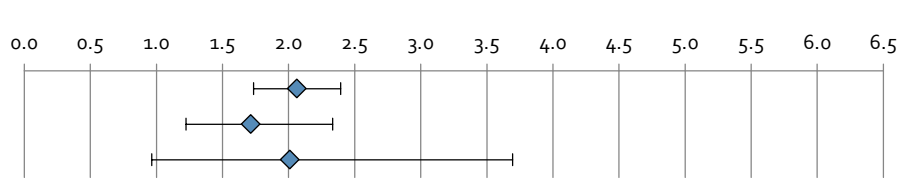
Sex	No. cases	% of total	Incidence/100,000
Male	87	42%	1.8
Female	117	57%	2.2
Unknown	2	1%	--



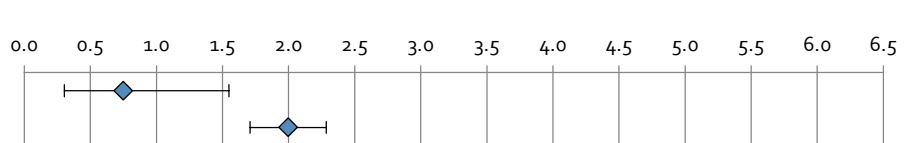
Age Group	No. cases	% of total	Incidence/100,000
Under 5 yrs.	10	5%	1.6
5-19 yrs.	7	3%	0.4
20-49 yrs.	28	14%	0.7
50+ yrs.	161	78%	4.5
Unknown	0	0%	--



Race	No. cases	% of total	Incidence/100,000
White	151	73%	2.1
Black	40	19%	1.7
Other	10	5%	2.0
Multiple or Unknown	5	2%	--



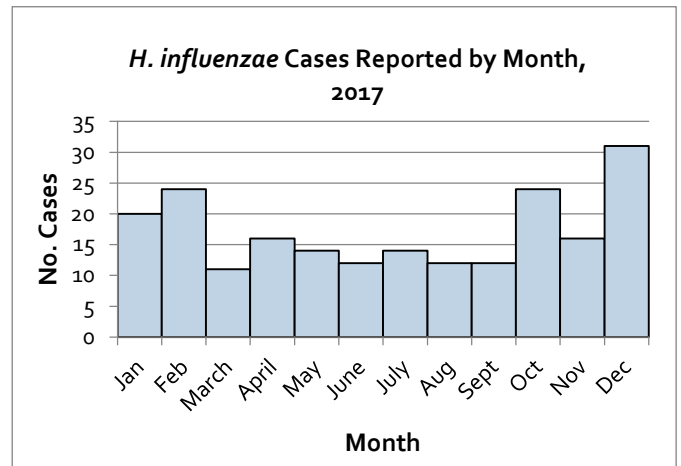
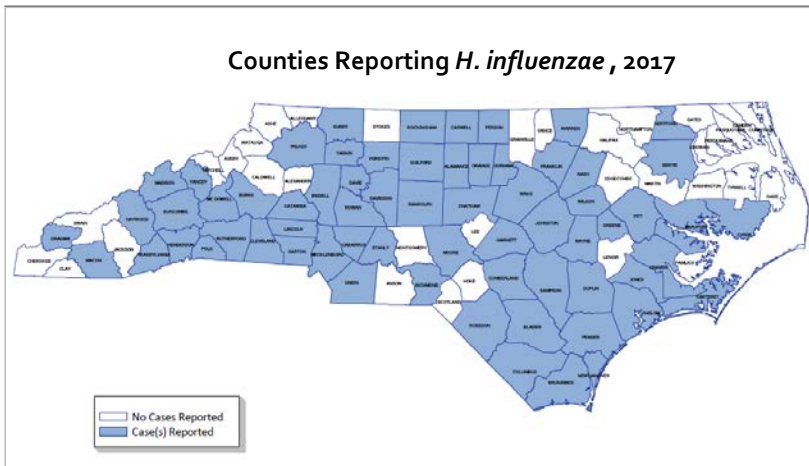
Hispanic Ethnicity	No. cases	% of total	Incidence/100,000
Yes	7	3%	0.8
No	184	89%	2.0
Unknown	15	7%	--



*Point estimates and 95% confidence intervals are shown

Geographic Distribution

Cases By Month



Hepatitis A

Background

Hepatitis A virus (HAV) is a cause of acute liver disease transmitted by the fecal-oral route. In the United States, person-to-person transmission is most common. Common signs and symptoms include nausea, vomiting, abdominal pain, fatigue, and jaundice; however, infection is often asymptomatic in children under 6 years of age. HAV infection is laboratory confirmed by demonstration of IgM antibody directed against the virus in the patient's serum.

Common-source outbreaks of HAV can occur via fecal contamination of food or water, but a specific source is rarely identified. Persons at increased risk for acquiring HAV infection include travelers to endemic areas, men who have sex with men, and users of injection drugs, but no risk factor is identified for the majority of cases. Control and prevention of hepatitis A rests upon promotion of personal hygiene, immunization, and proper food and water sanitation.

Persons with HAV infection are infectious from 2 weeks before jaundice onset to 1 week after. If the patient did not have jaundice, or the jaundice onset date is unknown, the infectious period is considered to be from 1 week before to 2 weeks after the onset of other symptoms. Shedding can be longer in some cases, particularly in young children.

Post-exposure prophylaxis (PEP) should be considered for susceptible individuals who are household or sexual contacts to a case. Child care center staff and attendees should receive PEP if one or more cases are identified in the facility, or if cases are identified in two or more households of childcare attendees. If a case is identified in a food handler who worked while infectious, PEP may be considered for other food handlers and patrons. Hepatitis A vaccine is recommended for PEP of contacts who are 1-40 years of age, and vaccine or immune globulin may be recommended for contacts outside this age range. PEP is not generally considered effective if it is given more than two weeks after the exposure.

Immunization

Hepatitis A vaccine has been one of the great success stories of public health. Hepatitis A vaccines were first licensed in 1995, and the number of people for whom vaccine is recommended has gradually expanded since that time. Two doses of hepatitis A vaccine administered at least six months apart are currently recommended as a routine immunization for all children beginning at 12 months of age. Hepatitis A vaccine is also recommended for high-risk groups such as international travelers, men who have sex with men, and illegal drug users.

Epidemiology

National

There has been a dramatic decrease in hepatitis A infections since vaccines became available in the United States, especially among children. Since 2002, rates among children have declined and are now similar in all age groups. Despite this success, hepatitis A is still a major public health problem. It is one of the most frequently reported diseases nationally, and has a major economic impact because of the cost required to identify contacts and provide PEP.

North Carolina

Reported cases of hepatitis A in 2017 decreased significantly when compared to the previous 5-year average. The number of cases remains far lower than cases reported around the turn of the century (an average of 192 cases per year were reported from 1999-2002).

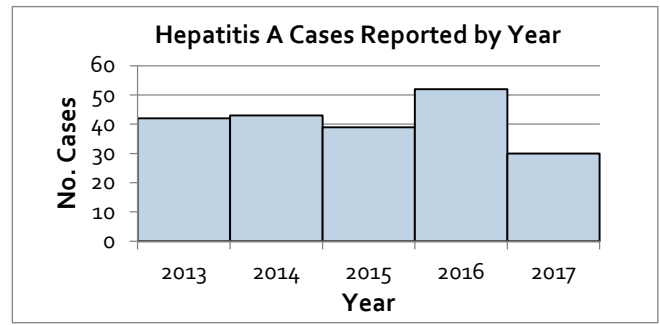
Outbreaks

No outbreaks of hepatitis A occurred in North Carolina during 2017. Multiple states experienced outbreaks of hepatitis A during 2017 that occurred primarily among persons who are homeless and persons who use injection and non-injection drugs. In these outbreaks, HAV is spread from person-to-person; contaminated food, drinks, or infected food handlers have not been identified as potential sources of infection.

Hepatitis A, 2017

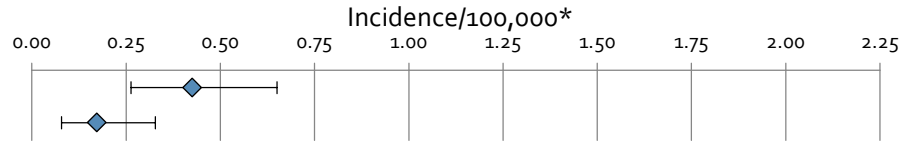
Annual Summary

	2013	2014	2015	2016	2017
Incidence / 100,000	0.43	0.43	0.39	0.51	0.30
No. cases	42	43	39	52	30

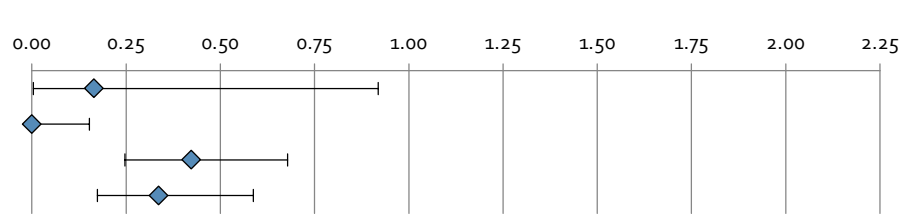


Case Demographics, 2017

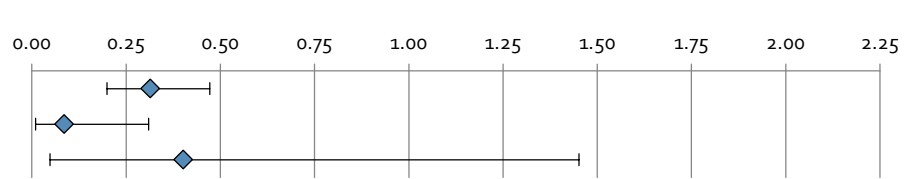
Sex	No. cases	% of total	Incidence/100,000
Male	21	70%	0.43
Female	9	30%	0.17
Unknown	0	0%	--



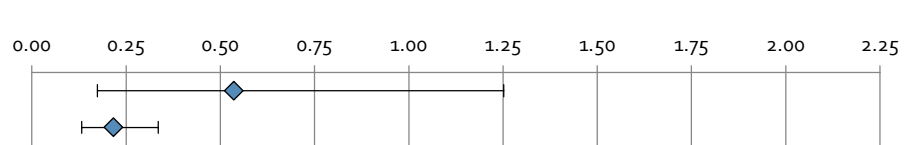
Age Group	No. cases	% of total	Incidence/100,000
Under 5 yrs.	1	3%	0.16
5-19 yrs.	0	0%	0.00
20-49 yrs.	17	57%	0.42
50+ yrs.	12	40%	0.34
Unknown	0	0%	--



Race	No. cases	% of total	Incidence/100,000
White	23	77%	0.31
Black	2	7%	0.09
Other	2	7%	0.40
Multiple or Unknown	3	10%	--



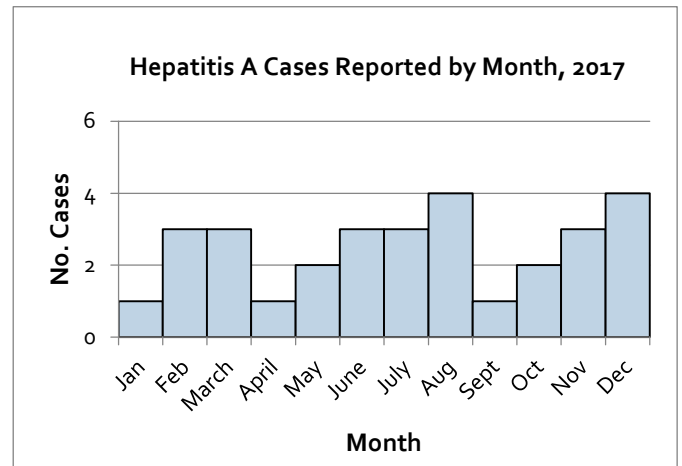
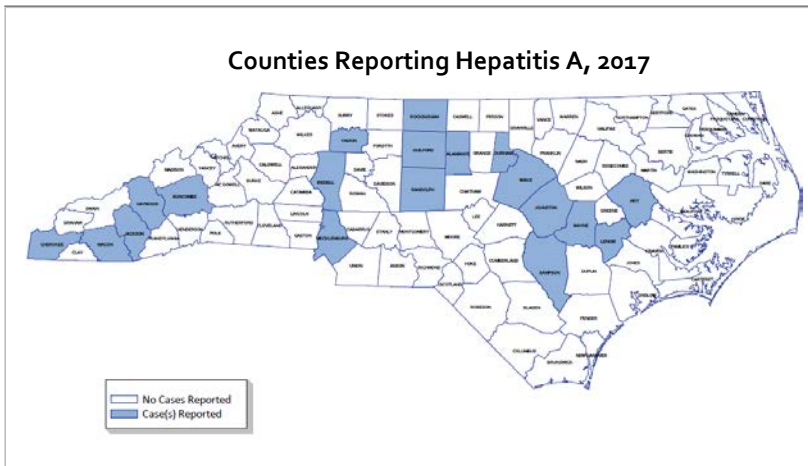
Hispanic Ethnicity	No. cases	% of total	Incidence/100,000
Yes	5	17%	0.54
No	20	67%	0.22
Unknown	5	17%	--



*Point estimates and 95% confidence intervals are shown

Geographic Distribution

Cases By Month



Meningococcal Invasive Disease

Background

Invasive meningococcal disease caused by *Neisseria meningitidis* is an acute, serious illness that can cause several syndromes including meningitis, bacteria, and sepsis. Infections can rapidly progress and result in death. Timely and appropriate antibiotic therapy is important for the treatment of this disease; however, even with the widespread use of antibiotics, the case-fatality rate is estimated to be 10-14%. Five serogroups are responsible for the vast majority of invasive disease: A, B, C, Y, and W-135.

Humans act as a natural reservoir for *N. meningitidis*. Up to 10% of adults are asymptomatic carriers, although most carriers develop immunity against the organism and do not develop invasive disease. Cases of meningococcal disease can occur sporadically or as part of outbreaks. Outbreaks can occur among groups living in close-contact settings, such as college dormitories, or among high-risk populations in a community setting.

Patients are considered infectious beginning approximately 7 days before onset until 24 hours after starting appropriate antibiotics. Post-exposure prophylaxis (PEP) should be given within 24 hours after the index patient is identified, if possible. It is of limited value if started more than 14 days after the last exposure. Effective antimicrobial regimens for prophylaxis include rifampin, ceftriaxone, and ciprofloxacin. PEP is critically important for close contacts of patients with invasive meningococcal infections, and is recommended for household contacts, childcare contacts, and others with direct exposures to the patient's oral secretions. PEP is not recommended for casual contacts such as coworkers, classmates, or healthcare workers who were not directly exposed to oral secretions.

Immunization

The quadrivalent meningococcal conjugate vaccine contains four serogroups (A, C, Y, and W-135). Two doses are recommended for children as part of the routine immunization schedule; the first at 11-12 years, and the second at age 16 years. Vaccination with quadrivalent and serogroup B vaccine is recommended apart from the routine schedule for various populations considered to be at increased risk for disease, such as immunocompromised children and adults, military recruits, and laboratory workers.

Epidemiology

National

The incidence rate of meningococcal disease in the U.S. has been declining since the 1990s, and is currently at an all-time low of 0.12 per 100,000 persons. There were 370 cases of meningococcal disease reported nationwide in 2016. Rates are highest in children less than one year of age, followed by adolescents and young adults. Serogroup B causes about 60% of cases in children under five years of age, but serogroups C, Y, and W-135 account for the majority of cases in adolescents and adults.

North Carolina

Rates of meningococcal invasive disease are at an all-time low in North Carolina, reflecting the national trend; the incidence rate in 2017 was just 0.09 per 100,000 persons. From 2013-2017, 38 cases of meningococcal invasive disease were identified; serogroup B caused the largest share of infections (39%) followed by serogroup Y (21%).

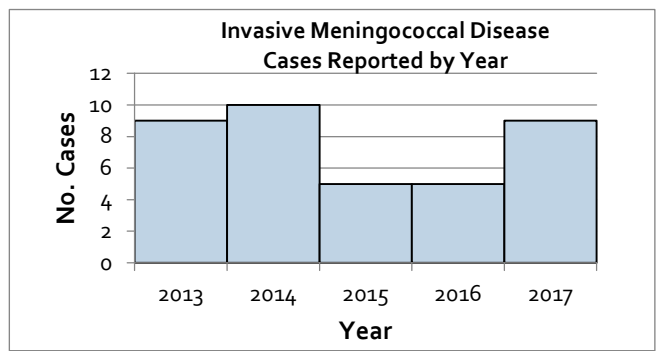
Outbreaks

No outbreaks of meningococcal invasive disease occurred in North Carolina during 2017.

Meningococcal Invasive Disease, 2017

Annual Summary

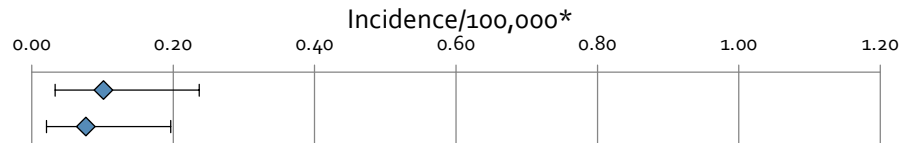
	2013	2014	2015	2016	2017
Incidence / 100,000	0.09	0.10	0.05	0.05	0.09
No. of cases	9	10	5	5	9
Serogroups	A	0%	0%	0%	0%
	C	11%	10%	20%	0%
	Y	33%	30%	0%	20%
	W-135	0%	10%	20%	0%
	B	33%	40%	40%	60%
	Unknown	22%*	10%	20%	20%



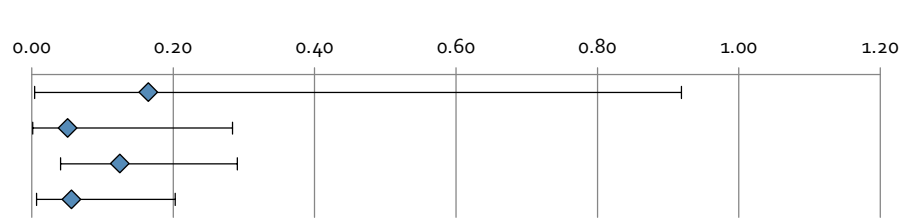
*1 unknown, 1 could not distinguish between C & W-135

Case Demographics, 2017

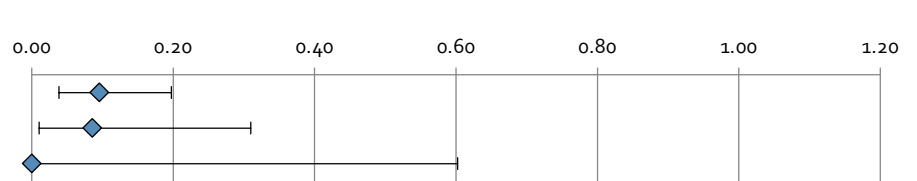
Sex	No. cases	% of total	Incidence/100,000
Male	5	56%	0.10
Female	4	44%	0.08
Unknown	0	0%	--



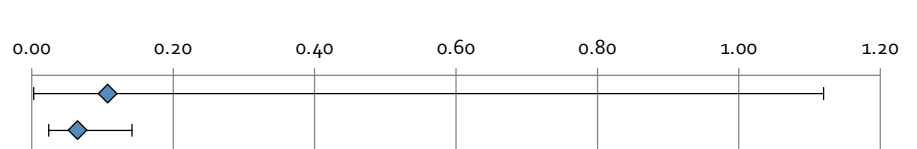
Age Group	No. cases	% of total	Incidence/100,000
Under 5 yrs.	1	11%	0.16
5-19 yrs.	1	11%	0.05
20-49 yrs.	5	56%	0.12
50+ yrs.	2	22%	0.06
Unknown	0	0%	--



Race	No. cases	% of total	Incidence/100,000
White	7	78%	0.10
Black	2	22%	0.09
Other	0	0%	0.00
Multiple or Unknown	0	0%	--



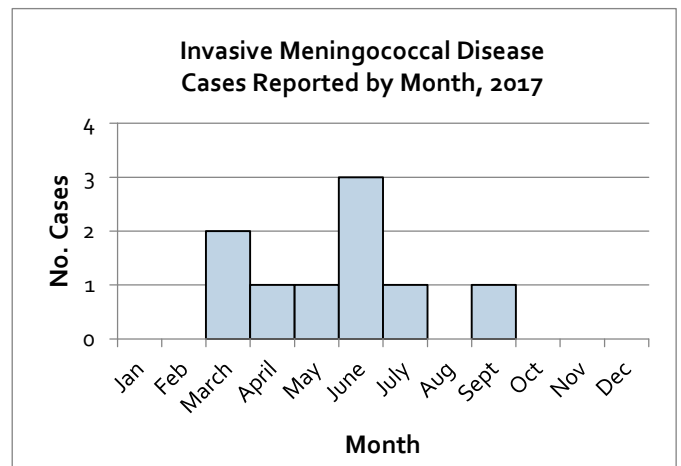
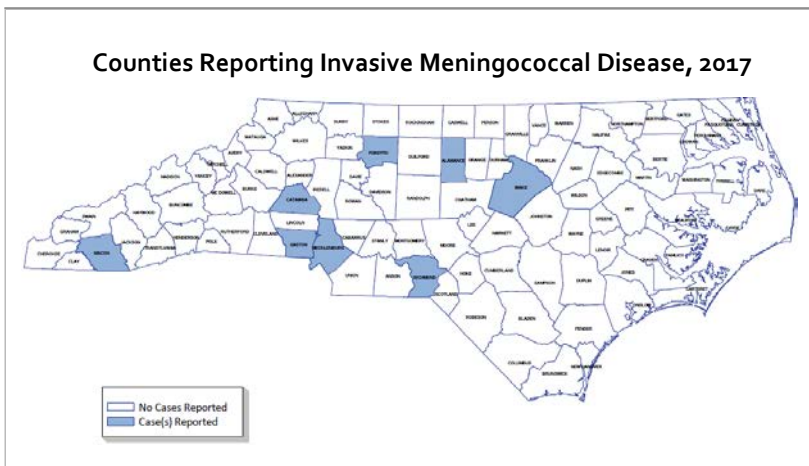
Hispanic Ethnicity	No. cases	% of total	Incidence/100,000
Yes	1	11%	0.11
No	6	67%	0.07
Unknown	2	22%	--



*Point estimates and 95% confidence intervals are shown

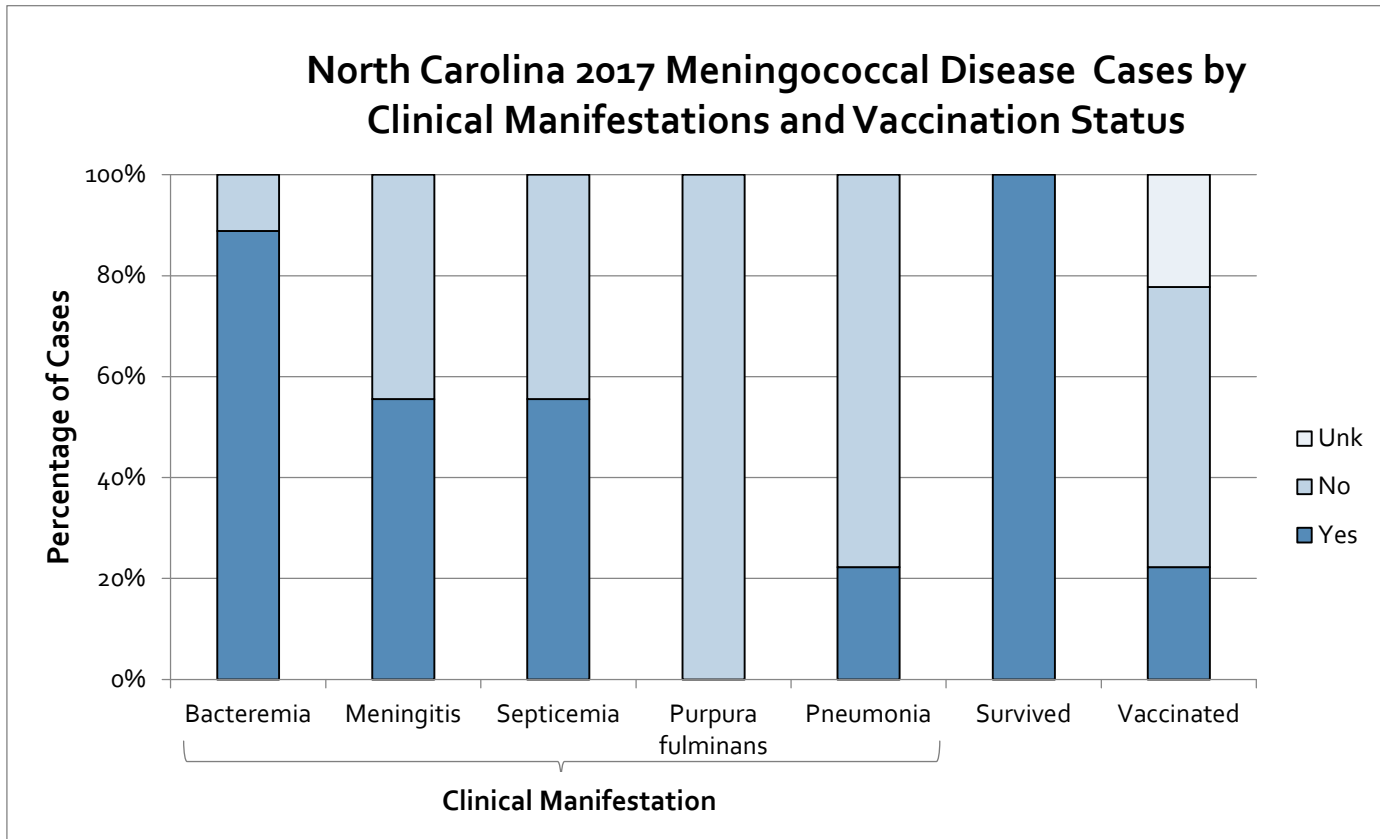
Geographic Distribution

Cases By Month

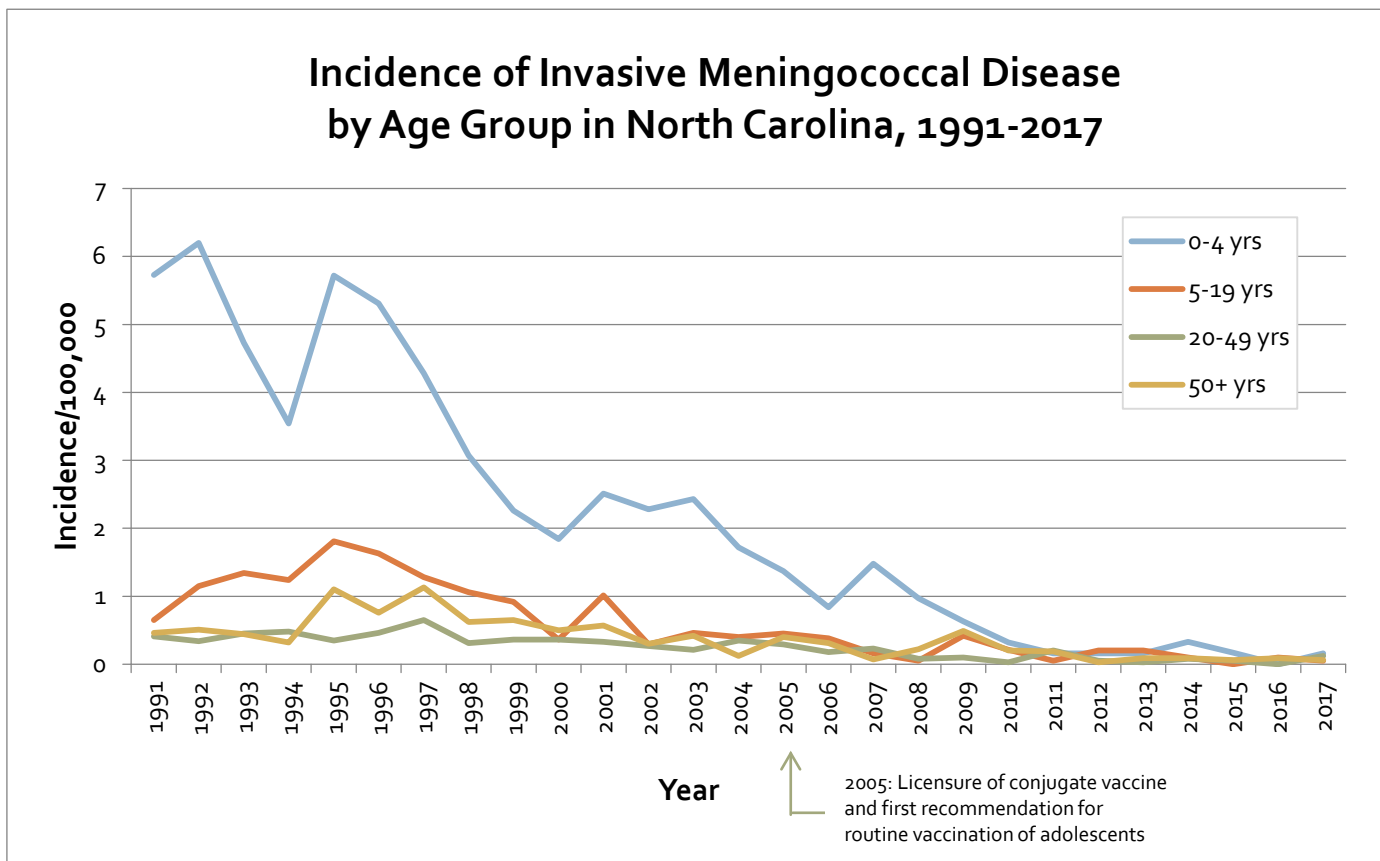


Meningococcal Invasive Disease, 2017 (continued)

2017 Case Summary



Meningococcal Disease Incidence by Age Group



Mumps

Background

Mumps is a viral illness best known for causing swelling of the salivary glands below the ears and above the jaw, called parotitis. Complications are possible from mumps, including orchitis (inflammation of the testicles) in males, oophoritis (inflammation of the ovaries) in females, deafness, and meningitis. People with mumps are considered contagious from 2 days before to 5 days after symptoms begin. A significant number of people infected with the mumps virus may not have symptoms (30-40%).

Suspected cases of mumps should avoid contact with others from the time of diagnosis until 5 days after the onset of parotitis. Suspected cases should stay home from work or school and stay in a separate room from other people if possible. Susceptible close contacts to mumps cases should be offered vaccine and instructed to monitor for signs and symptoms of mumps. Healthcare workers with unprotected exposure to a mumps patient must show evidence of immunity to mumps or be excluded from work from day 12-25 after exposure.

Vaccination is the best way to prevent mumps. Persons without evidence of immunity should receive age-appropriate measles-mumps-rubella (MMR) vaccine. Persons born before 1957 are considered immune based on likely exposure during childhood. Persons who are unvaccinated are more likely to contract mumps and have complications than persons who are vaccinated.

Immunization

Two doses of MMR vaccine are routinely recommended for children; the first at 12-15 months, and the second at 4-6 years.

Epidemiology

National

Before the U.S. mumps vaccination program began in 1967, about 200,000 cases of mumps were reported each year. Since that time, there has been more than a 99% decrease in mumps cases in the United States. However, the number of reported cases of mumps has recently spiked, with an average of approximately 6,000 cases per year reported during 2016 and 2017. Adolescents and college-aged adults appear to be at increased risk for disease, likely due to close-contact, congregate settings like schools and universities.

North Carolina

Thirty-seven cases of mumps were reported in North Carolina during 2017. Most cases were outbreak-associated (see outbreak descriptions below).

Outbreaks

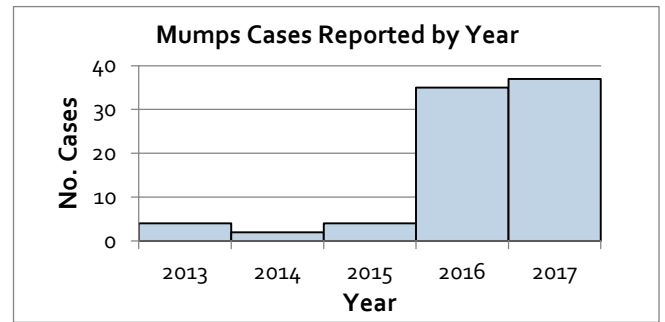
Two mumps outbreaks occurred in North Carolina during 2017. One outbreak occurred from April—June 2017 at Appalachian State University in Watauga County. Twelve cases were identified among university students.

A second outbreak was linked to the Charlotte metropolitan area beginning in May 2017. Twelve cases were identified in total, with eight (67%) occurring in men who have sex with men (MSM).

Mumps, 2017

Annual Summary

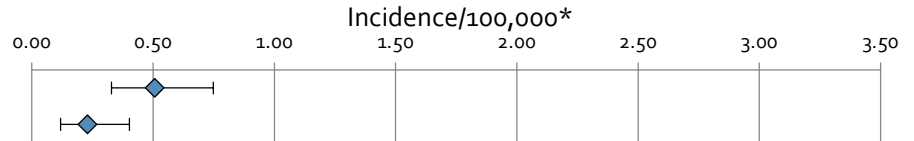
	2013	2014	2015	2016	2017
Incidence / 100,000	0.04	0.02	0.04	0.34	0.36
No. cases	4	2	4	35	37
Confirmed	0%	0%	0%	31%	62%
Probable	100%	100%	100%	69%	38%
Unvaccinated or unknown immune status*	25%	100%	0%	40%	30%



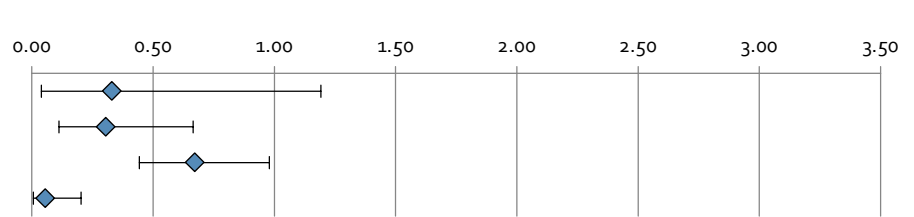
*Cases born before 1957 are considered immune

Case Demographics, 2017

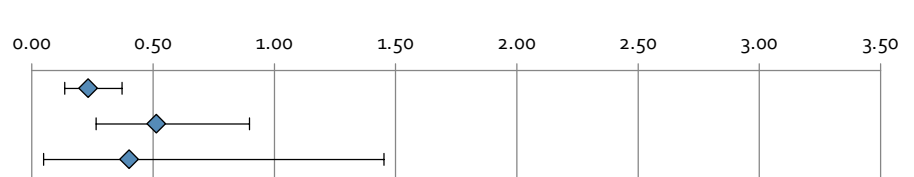
Sex	No. cases	% of total	Incidence/100,000
Male	25	68%	0.51
Female	12	32%	0.23
Unknown	0	0%	--



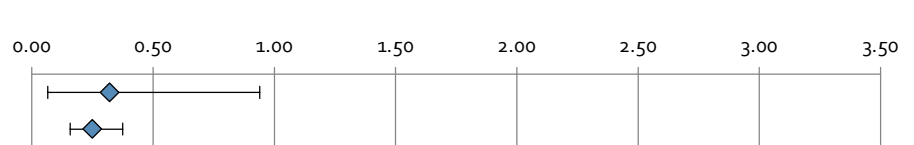
Age Group	No. cases	% of total	Incidence/100,000
Under 5 yrs.	2	5%	0.33
5-19 yrs.	6	16%	0.31
20-49 yrs.	27	73%	0.67
50+ yrs.	2	5%	0.06
Unknown	0	0%	--



Race	No. cases	% of total	Incidence/100,000
White	17	46%	0.23
Black	12	32%	0.51
Other	2	5%	0.40
Multiple or Unknown	6	16%	--



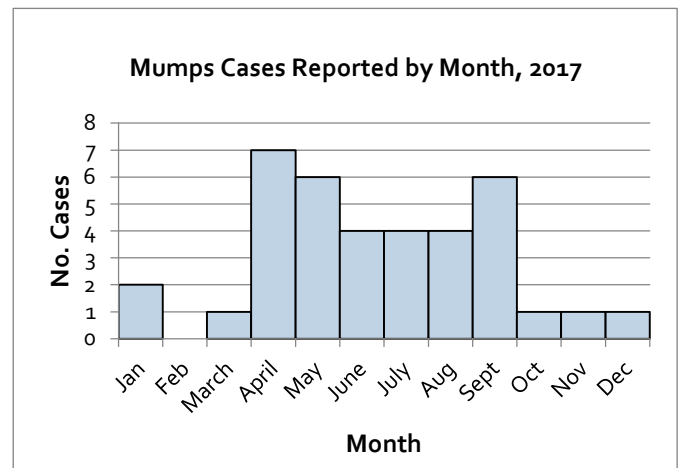
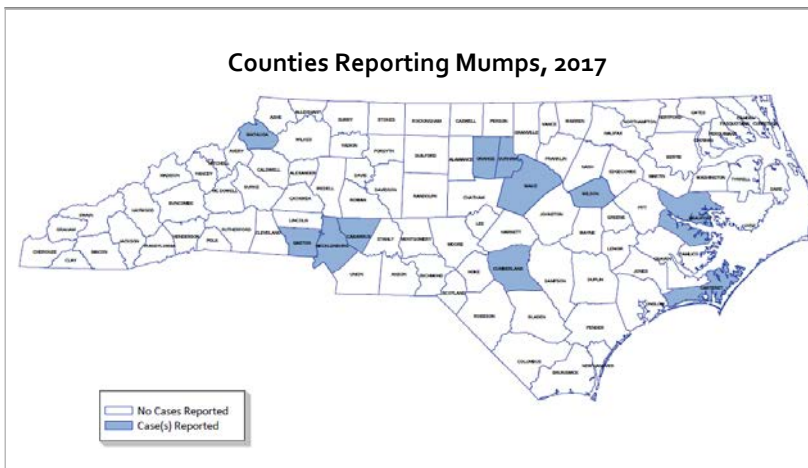
Hispanic Ethnicity	No. cases	% of total	Incidence/100,000
Yes	3	8%	0.32
No	23	62%	0.25
Unknown	11	30%	--



*Point estimates and 95% confidence intervals are shown

Geographic Distribution

Cases By Month



Pertussis

Background

Pertussis (commonly known as “Whooping Cough”) is a highly contagious respiratory infection spread from person to person through respiratory droplets from a cough or sneeze or by direct contact with respiratory secretions. Pertussis is primarily a toxin-mediated disease. *Bordetella pertussis* causes disease by attaching to the cilia in the upper respiratory tract and releases toxins that paralyze the cilia, causing inflammation of the respiratory tract. The incubation period of pertussis ranges from 5-21 days, but typically is 10-14 days. Persons with pertussis are infectious from the start of symptoms through 3 weeks of cough, or if treated, until completion of appropriate antibiotic treatment.

Pertussis occurs in three disease stages. The first is the catarrhal stage, which generally begins with the gradual onset of runny nose, sneezing and low-grade fever with a mild, occasional cough, similar to the common cold. Next is the paroxysmal stage, characterized by the onset of paroxysms, or uncontrollable fits of coughing. Following one of these fits of coughing, the patient may gasp for air, which can sometimes result in a “whooping” sound. The paroxysmal stage can be quite long with paroxysms increasing in frequency during the first 1-2 weeks and then remaining stable for 2-3 weeks. A gradual recovery begins during the convalescent stage and the coughing fits become less frequent. Secondary infections are most likely to occur during this stage, and paroxysms can recur with later respiratory infections for many months after the onset of pertussis.

Post-exposure prophylaxis (PEP) is recommended for household contacts of pertussis cases, as well as high-risk contacts like infants, women in the third trimester of pregnancy, and immunocompromised persons. Azithromycin is the most common choice of antimicrobial used for both treatment of pertussis and PEP.

Immunization

The current pertussis vaccines available in the United States contain acellular pertussis antigens in combination with tetanus and diphtheria toxoids (DTaP and Tdap). Five doses of DTaP are recommended for children at 2, 4, 6, and 15-18 months and 4-6 years. One dose of Tdap is recommended for adolescents, preferably at 11-12 years. Tdap is also recommended for pregnant women during the 3rd trimester of each pregnancy, to facilitate the transfer of maternal antibodies to the infant.

Epidemiology

National

In recent years, an increasing burden of disease has been observed in children, likely due to the transition to the acellular pertussis vaccine in the 1990s. Since that time, cases have steadily risen, culminating in over 48,000 cases and an incidence rate of 15.4 per 100,000 persons in 2012. Pertussis is cyclical in nature with peaks occurring every 3-5 years, likely because of an increase in the number of susceptible persons accumulating following peak years.

Infants are at highest risk of complications and death from pertussis. Secondary bacterial pneumonia is the most common complication in both infants and other age groups.

North Carolina

The cyclical nature of pertussis transmission is evident in North Carolina. The average number of cases in North Carolina during 2012-2014 was 679. Transmission trended downward from 2015-2016, but the number of cases increased again during 2017 because of a significant number of outbreak-associated cases.

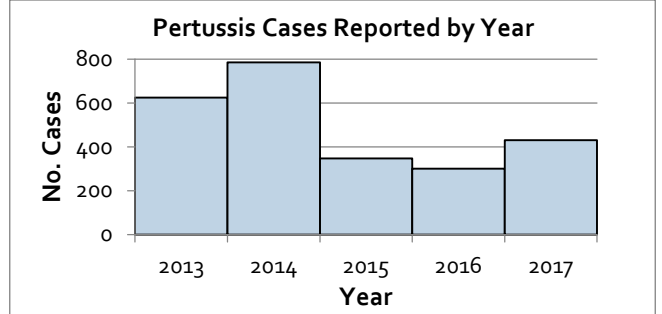
Outbreaks

Eight pertussis outbreaks were reported during 2017 in Chatham, Durham, Forsyth, Guilford, Henderson, Johnston, Orange, and Wake counties. All outbreaks occurred primarily among school-aged children. The largest outbreak occurred in Henderson County, which reported 102 outbreak-associated cases.

Pertussis, 2017

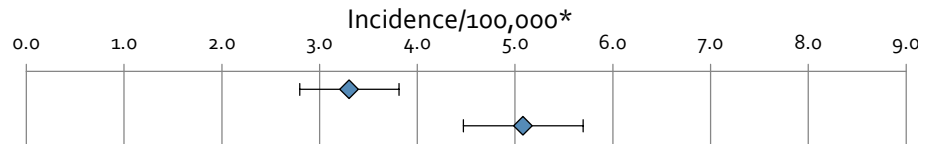
Annual Summary

	2013	2014	2015	2016	2017
Incidence / 100,000	6.4	7.9	3.5	3.0	4.2
No. cases	625	785	347	300	430
Culture confirmed	8%	7%	3%	3%	3%
PCR confirmed	53%	44%	33%	37%	48%
Epi-link confirmed	10%	14%	10%	8%	9%
Probable	28%	35%	54%	52%	41%

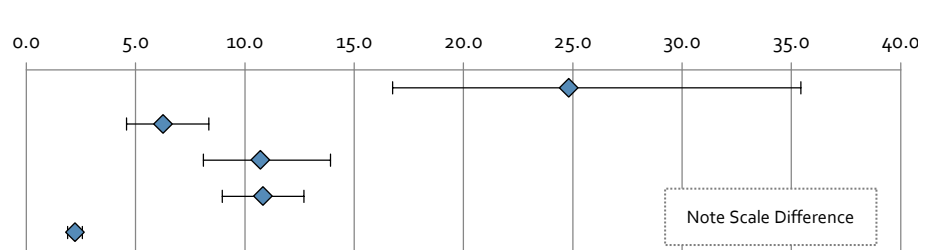


Case Demographics, 2017

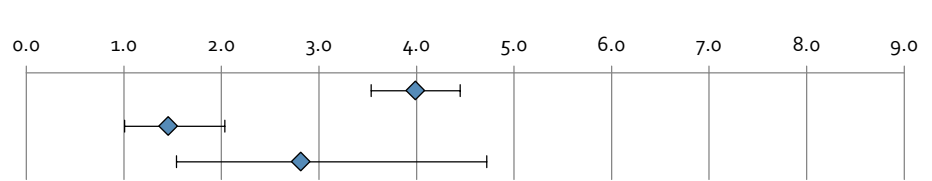
Sex	No. cases	% of total	Incidence/100,000
Male	163	38%	3.3
Female	265	62%	5.1
Unknown	2	0%	--



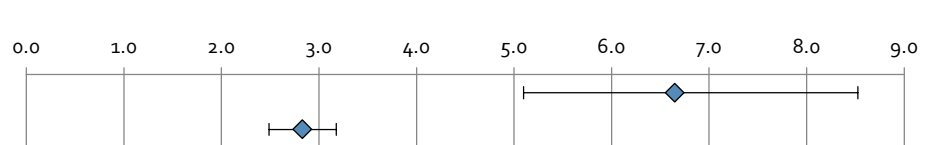
Age Group	No. cases	% of total	Incidence/100,000
Infants (<1 yr.)	30	7%	24.8
1-6 yrs.	46	11%	6.3
7-10 yrs.	56	13%	10.7
11-19 yrs.	129	30%	10.8
20+ yrs.	169	39%	2.2
Unknown	0	0%	--



Race	No. cases	% of total	Incidence/100,000
White	292	68%	4.0
Black	34	8%	1.5
Other	14	3%	2.8
Multiple or Unknown	90	21%	--



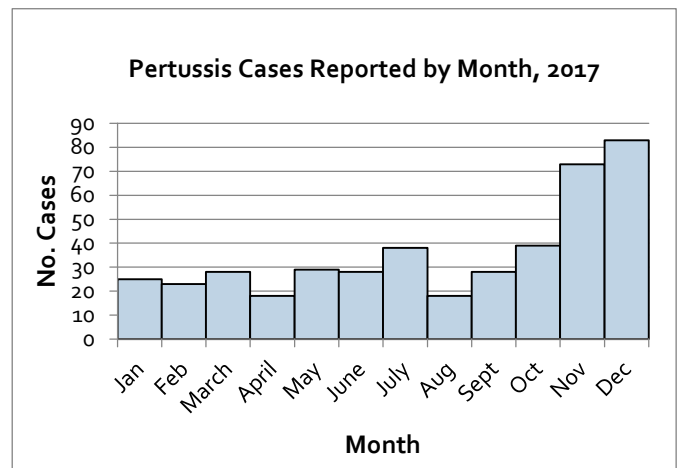
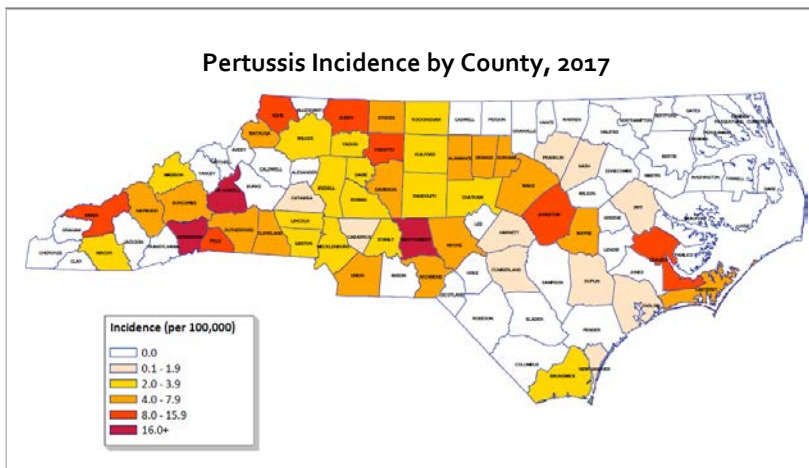
Hispanic Ethnicity	No. cases	% of total	Incidence/100,000
Yes	62	14%	6.7
No	261	61%	2.8
Unknown	107	25%	--



*Point estimates and 95% confidence intervals are shown

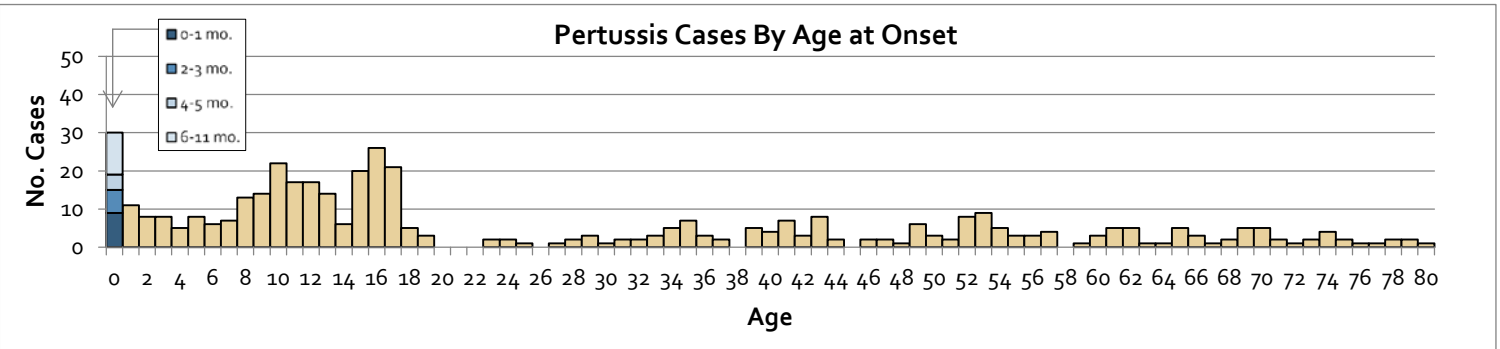
Geographic Distribution

Cases By Month



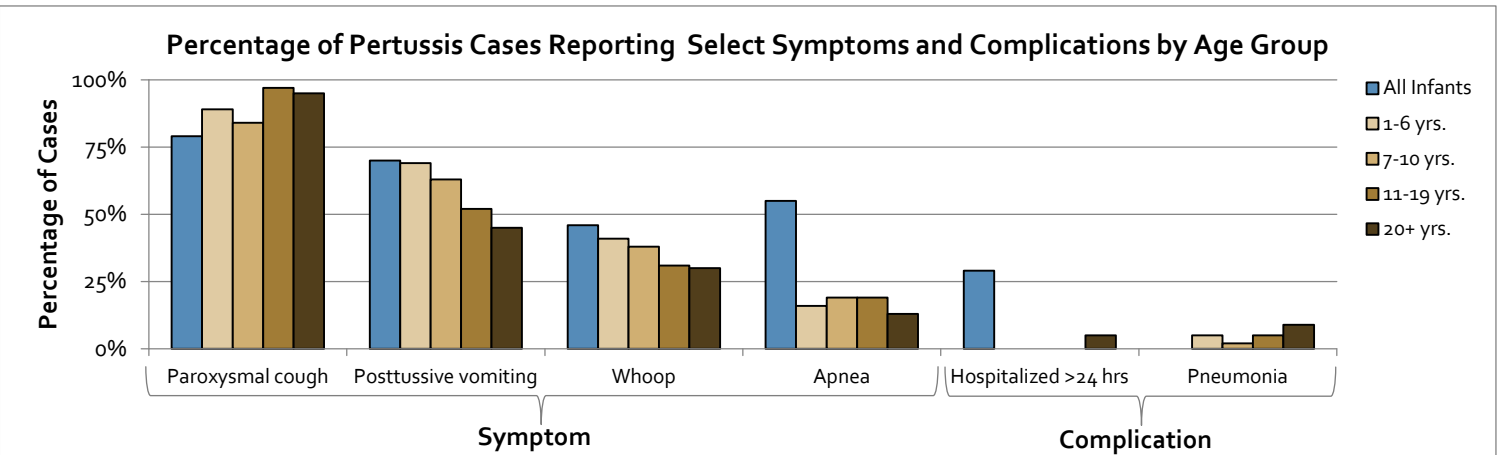
Pertussis, 2017 (continued)

Age Distribution



Clinical Information

	Infant Age Groups				Age Groups					All Ages
	0-1 mo.	2-3 mo.	4-5 mo.	6-11 mo.	All Infants	1-6 yrs.	7-10 yrs.	11-19 yrs.	20+ yrs.	
No. cases	9	6	4	11	30	46	56	129	168	429
Symptoms (No. cases, % of known responses)										
Paroxysmal cough	6 67%	4 66%	3 75%	10 100%	23 79%	40 89%	47 84%	124 97%	158 95%	392 91%
Posttussive vomiting	5 55%	6 100%	3 75%	7 64%	21 70%	31 69%	35 63%	65 52%	74 45%	226 53%
Whoop	1 13%	3 50%	3 75%	6 60%	13 46%	19 41%	21 38%	39 31%	49 30%	141 33%
Apnea	6 67%	3 50%	3 75%	4 40%	16 55%	7 16%	10 19%	22 19%	20 13%	75 17%
Complications (No. cases, % of known responses)										
Hospitalized >24 hrs	4 44%	2 33%	1 25%	1 11%	8 29%	0 0%	0 0%	0 0%	8 5%	16 4%
Pneumonia	0 0%	0 0%	0 0%	0 0%	0 0%	2 5%	1 2%	5 5%	13 9%	21 5%
Seizures	0 0%	0 0%	0 0%	0 0%	0 0%	0 0%	0 0%	0 0%	0 0%	0 0%
Encephalopathy	0 0%	0 0%	0 0%	0 0%	0 0%	1 2%	0 0%	0 0%	0 0%	1 <1%
Died	0 0%	0 0%	0 0%	0 0%	0 0%	0 0%	0 0%	0 0%	0 0%	0 0%



Maternal Tdap (for infant cases <1 year of age)

Mother Received Tdap in Association with Case Pregnancy	No. cases in 2017	% of total
Yes, during pregnancy	12	40%
Yes, postpartum	2	7%
No	8	27%
Unknown	8	27%
Total	30	100%

Pneumococcal Meningitis

Background

Streptococcus pneumoniae (pneumococcus) is a gram-positive bacterium that can cause many clinical syndromes including pneumonia, bacteremia, and meningitis. Pneumococcal meningitis is the only form of invasive disease that is reportable in North Carolina. There are over 90 pneumococcal serotypes, and vaccines are available to protect against those that are most likely to cause invasive disease. Pneumococcal infections are most common during the late winter and early spring.

Transmission of pneumococcus occurs as the result of direct contact with respiratory droplets from an infected person. Certain groups are at higher risk of invasive pneumococcal disease, including children less than 2 years of age, adults over 65, and people with certain chronic medical conditions. Contacts to persons infected with pneumococcus are not generally at increased risk for disease and antibiotic prophylaxis is rarely indicated.

Immunization

PCV13 is a conjugate vaccine that protects against the thirteen serotypes most commonly associated with severe infections. PPSV23 is a pneumococcal polysaccharide vaccine, and protects against 23 of the most common *S. pneumoniae* serotypes.

Routine vaccination with a series of 4 PCV13 vaccinations prior to 15 months of age is recommended for all children. Pneumococcal vaccination with PCV13 followed by PPSV23 is recommended for all adult over the age of 65 and for adults aged 18-64 who are at increased risk of infection. The recommended number of doses for high-risk adults and additional recommendations for catch-up vaccination and vaccination of individuals with certain conditions can be found at the CDC's website at www.cdc.gov/vaccines/vpd/pneumo/hcp/recommendations.html

Epidemiology

National

The first pneumococcal conjugate vaccine, PCV7, was introduced in 2000. Since that time, rates of invasive pneumococcal disease have declined significantly among children less than 5 years of age, and rates have continued to decline with the use of PCV13 as a routine childhood vaccination.

North Carolina

Rates of pneumococcal infections have been consistent in North Carolina for several years; typically, 30 to 40 cases are reported yearly. However, the number of pneumococcal infections in North Carolina significantly increased during 2017. Fifty-two cases were reported, which was the most since 2001.

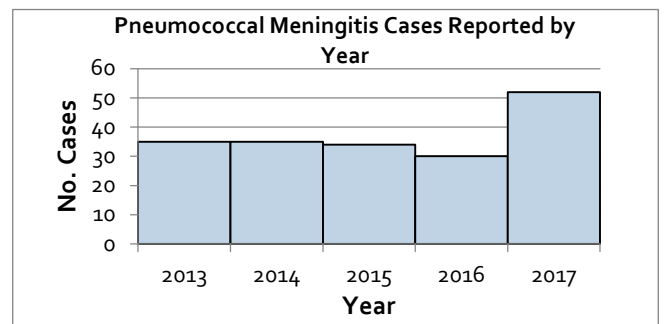
Outbreaks

No outbreaks of pneumococcal meningitis were reported in 2017.

Pneumococcal Meningitis, 2017

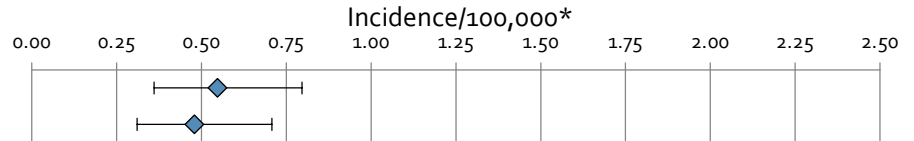
Annual Summary

	2013	2014	2015	2016	2017
Incidence / 100,000	0.36	0.35	0.34	0.30	0.51
No. cases	35	35	34	30	52
<5 yrs.	6%	9%	12%	20%	6%
≥ 5 yrs.	94%	91%	88%	80%	94%
Unvaccinated or unknown vaccination status (<5 yrs. only)	0%	67%	25%	0%	0%

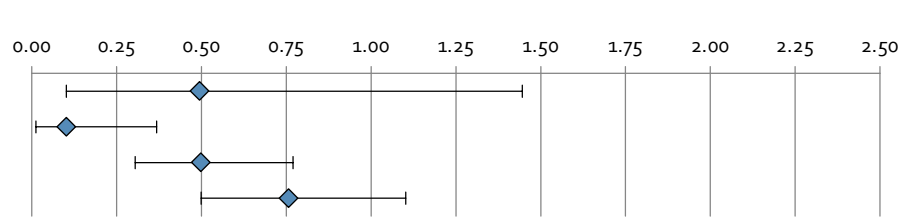


Case Demographics, 2017

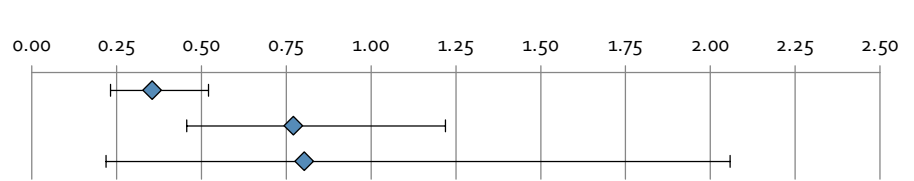
Sex	No. cases	% of total	Incidence/100,000
Male	27	52%	0.55
Female	25	48%	0.48
Unknown	0	0%	--



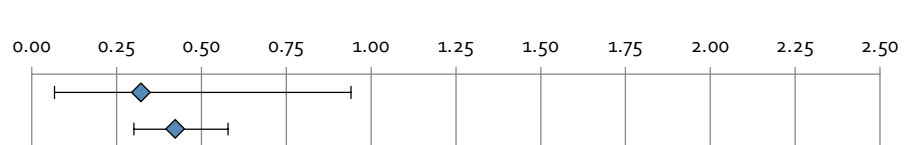
Age Group	No. cases	% of total	Incidence/100,000
Under 5 yrs.	3	6%	0.49
5-19 yrs.	2	4%	0.10
20-49 yrs.	20	38%	0.50
50+ yrs.	27	52%	0.76
Unknown	0	0%	--



Race	No. cases	% of total	Incidence/100,000
White	26	50%	0.36
Black	18	35%	0.77
Other	4	8%	0.80
Multiple or Unknown	4	8%	--



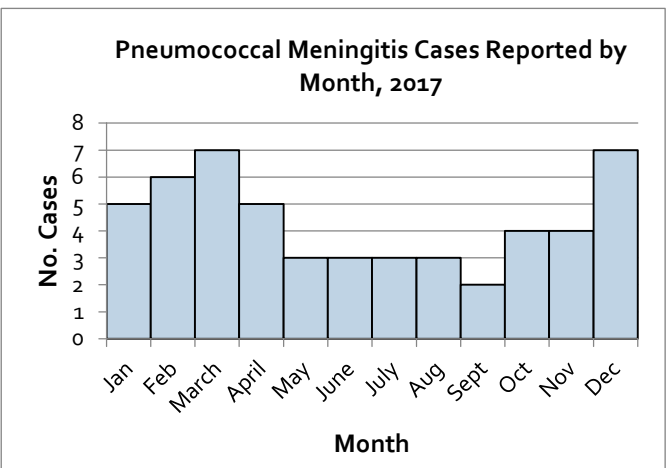
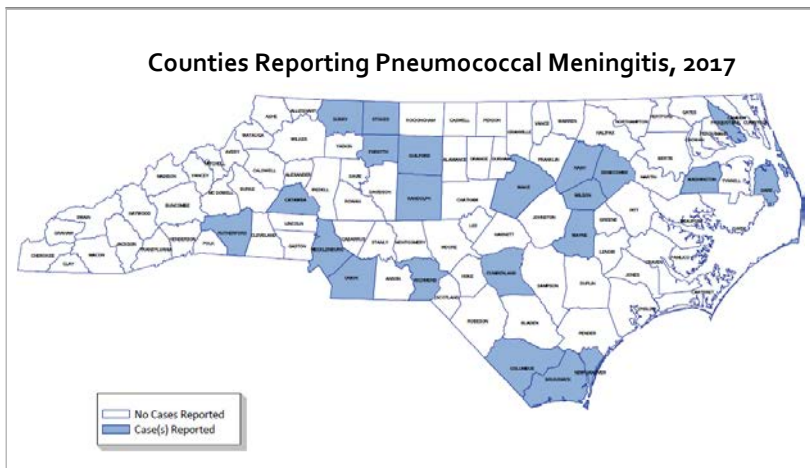
Hispanic Ethnicity	No. cases	% of total	Incidence/100,000
Yes	3	6%	0.32
No	39	75%	0.42
Unknown	10	19%	--



*Point estimates and 95% confidence intervals are shown

Geographic Distribution

Cases By Month



Tetanus

Background

Tetanus infections are caused by the bacterium *Clostridium tetani*. Spores of tetanus bacteria are present naturally in the environment and are widespread in dust, soil, and manure. Spores thrive in anaerobic conditions, meaning that they can grow in environments without oxygen. When spores are introduced into dead tissue or deep wounds, they germinate into full-grown bacteria and secrete tetanus toxin, which causes disease.

Certain types of wounds are more likely to become infected with tetanus bacteria because of the anaerobic conditions present. Deep puncture wounds (e.g. stepping on a nail), burn wounds, or crush injuries that are contaminated with dust or dirt are at higher risk of becoming infected than shallow wounds. Tetanus is not transmitted from person to person.

Symptoms of tetanus include jaw cramping (“lockjaw), muscle spasms and stiffness, headache, and fever. Serious complications can occur, including seizures, broken bones, difficulty breathing, and death. Tetanus is treatable with antibiotics and tetanus immune globulin (TIG).

Immunization

Tetanus vaccines are combined with vaccines for diphtheria and pertussis (DTaP and Tdap). Five doses of DTaP are recommended for children at 2, 4, 6, and 15-18 months and 4-6 years. One dose of Tdap is recommended for adolescents, preferably at 11-12 years, and should be followed by a dose of Td vaccine (excludes the pertussis component) every ten years.

Epidemiology

National

Cases of tetanus have declined by 95% since the disease began to be reported in 1947, and deaths have been reduced by 99%. Sporadic cases of tetanus still occur in persons who are not up-to-date on their tetanus vaccination.

North Carolina

Tetanus is rare in North Carolina. Since 2005, only eight infections have been reported. However, 75% of those infections have occurred during 2015 and 2017, which emphasizes the need for strong vaccination recommendations for persons who are not up-to-date or who are unsure of their vaccination status.

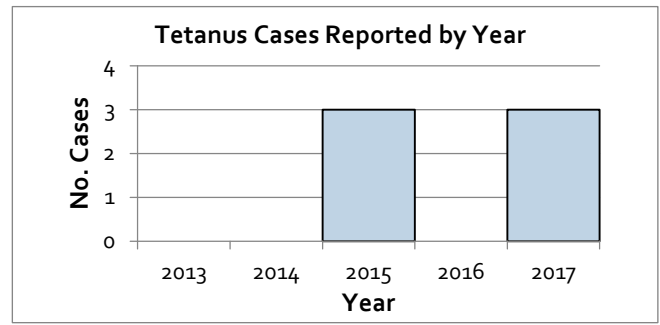
Outbreaks

No outbreaks of tetanus were reported in 2017

Tetanus, 2017

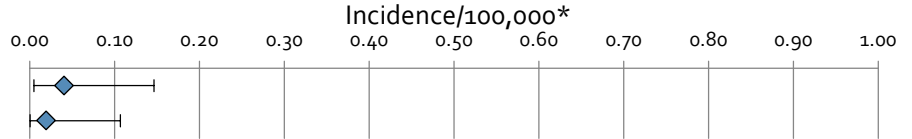
Annual Summary

	2013	2014	2015	2016	2017
Incidence / 100,000	0.00	0.00	0.03	0.00	0.03
No. cases	0	0	3	0	3

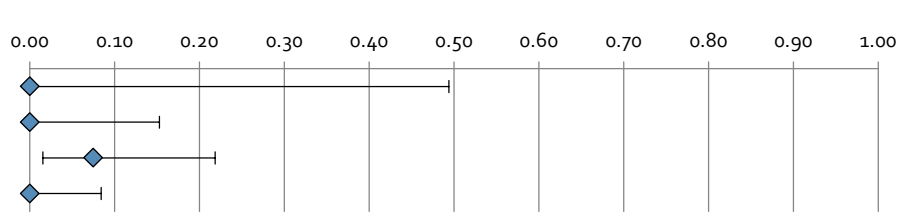


Case Demographics, 2017

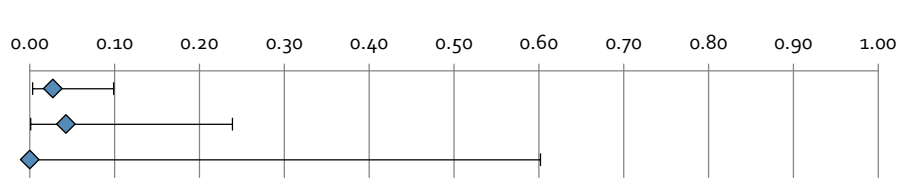
Sex	No. cases	% of total	Incidence/100,000
Male	2	67%	0.04
Female	1	33%	0.02
Unknown	0	0%	--



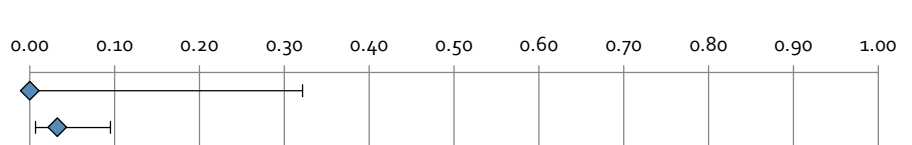
Age Group	No. cases	% of total	Incidence/100,000
Under 5 yrs.	0	0%	0.00
5-19 yrs.	0	0%	0.00
20-49 yrs.	3	100%	0.07
50+ yrs.	0	0%	0.00
Unknown	0	0%	--



Race	No. cases	% of total	Incidence/100,000
White	2	67%	0.03
Black	1	33%	0.04
Other	0	0%	0.00
Multiple or Unknown	0	0%	--



Hispanic Ethnicity	No. cases	% of total	Incidence/100,000
Yes	0	0%	0.00
No	3	100%	0.03
Unknown	0	0%	--



*Point estimates and 95% confidence intervals are shown

Geographic Distribution

Cases By Month

