

Pertussis

Pertussis is a Class A Disease and must be reported to the state within 24 hours.

Pertussis (Whooping Cough) is an acute bacterial disease caused by *B. pertussis*. Humans are the only known host. Pertussis is highly contagious.

It is characterized by paroxysmal cough, post-tussive vomiting and an inspiratory whoop. Pertussis also can occur as a mild or moderate cough illness in persons who are partially immune. In the U.S., most hospitalizations and nearly all deaths from pertussis are reported in infants younger than six months of age, but substantial morbidity does occur in other age groups.

Pertussis is vaccine-preventable. Infant/childhood vaccination has contributed to a reduction of more than 90% in pertussis-related morbidity and mortality since the early 1940s in the United States. Estimates of childhood vaccination coverage with more than three doses of pertussis-containing vaccine have exceeded 90% since 1994. Pertussis is the only disease for which universal childhood vaccination is recommended and that has an increasing trend in reported cases in the United States. Pertussis is an epidemic disease with two- to five-year cycles. Immunization reduced the total number of cases, but did not change the cycles, suggesting that immunization controlled the disease, but not the propagation of infection in the human population.

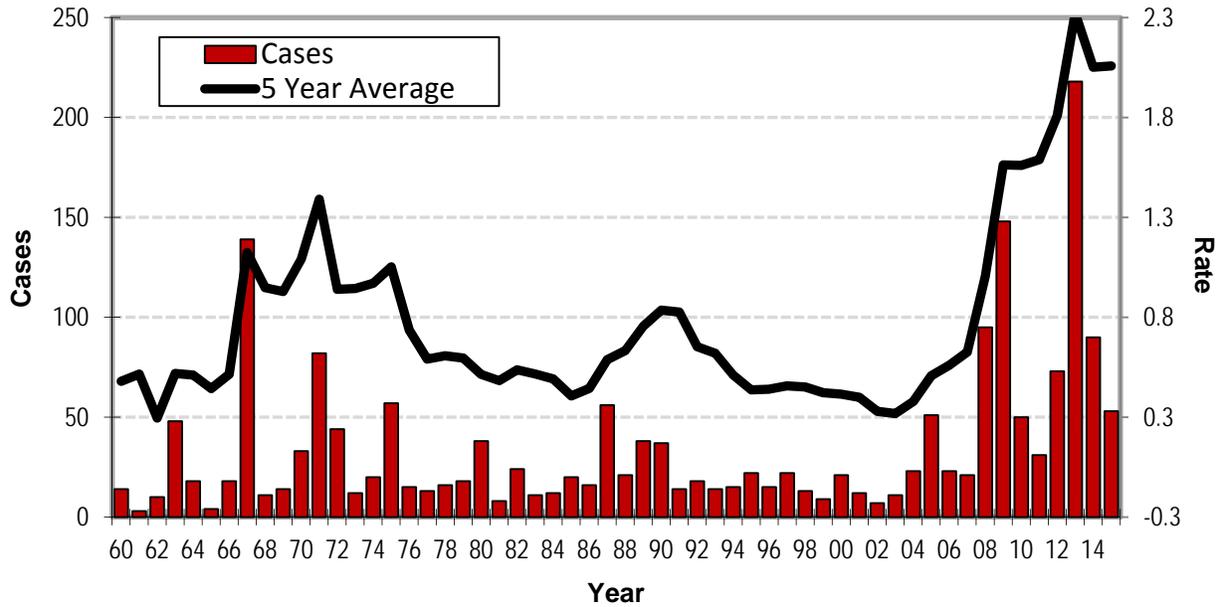
Recent studies support the hypothesis that pertussis infection is very common among adults. IgA antibodies to pertussis antigens are only produced after a natural infection and not after immunization. Prevalence studies of IgA antibodies show similar rates among adults in countries with generalized immunization (U.S.), and in countries with no systematic pertussis immunization (Germany in the 1970s).

Case, Rates and Trends

In the 1960s and 1970s, pertussis showed the expected peaks and troughs in the United States. Reported pertussis cases reached a low in the late 1980s and 1990s. The number increased progressively in the 2000s. A large increase in reported cases has occurred among adolescents, who become susceptible to pertussis approximately six to ten years after childhood vaccination. More recently, booster vaccines for adolescents and adults combining pertussis antigens with tetanus and diphtheria toxoids (Tdap) were approved by the Food and Drug Administration (FDA). On June 30, 2005, the Advisory Committee on Immunization Practices (ACIP) recommended Tdap for all persons between the ages of 11 to 18 years.

In the past 10 years the number of pertussis cases in Louisiana has increased, with peaks at 95 in 2008, 149 cases in 2009, 72 cases in 2012, 215 cases in 2013 and 92 cases in 2014. Incidence rates have ranged from 0.24 to 4.53 per 100,000 persons. All Louisiana rates are below the national average incidence of 5.54 per 100,000 persons in 2009 (Centers of Disease Control and Prevention - CDC). More recent national rates have ranged from 7.72 to 15.4 per 100,000 population (Figure 1).

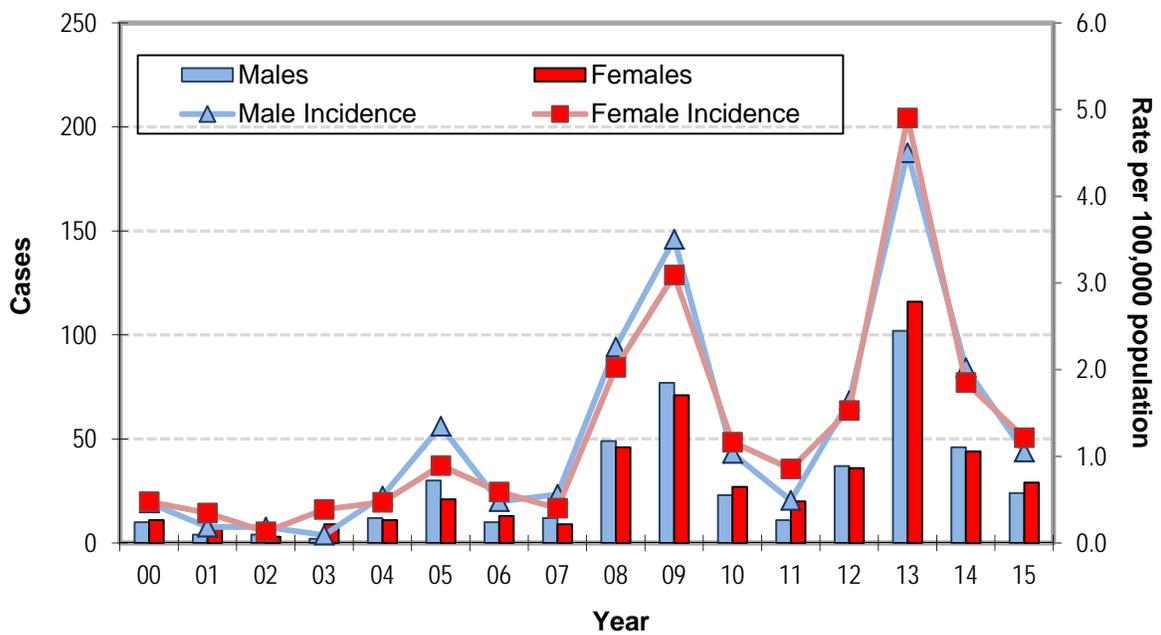
Figure 1: Pertussis cases and five-year average incidence rates - Louisiana, 1960-2015



Sex, Age group and Race Distribution

There is no significant difference between males and females even when calculated by gender and age group (Figure 2).

Figure 2: Pertussis cases and annual incidence rates by gender – Louisiana 2000-2015



The age group distribution shows that pertussis in Louisiana is mostly affecting infants (newborn to one year-olds), and young children more than adolescents and adults. In recent years however, incidence rates have increased amongst adults and the elderly. In 2010, there was a notable increase in the incidence rate for the 25- to 34-year age group. Adult cases are generally under-reported because they are not being diagnosed (Figures 3 and 4).

Figure 3: Pertussis average incidence rates by age group - Louisiana, 2000-2015

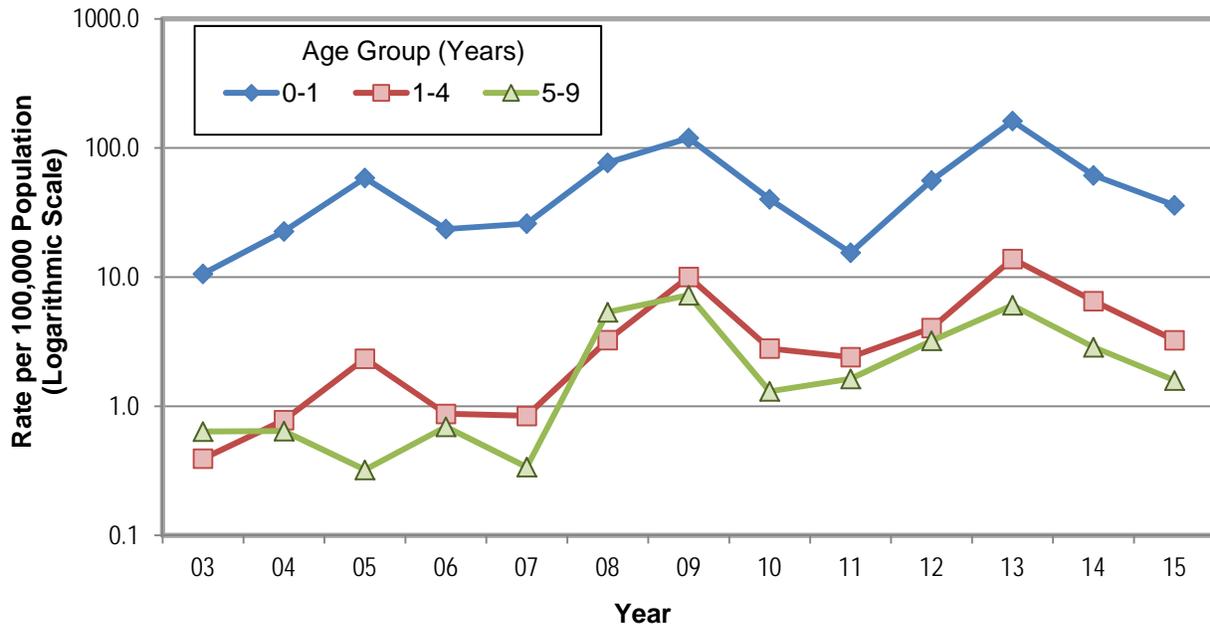
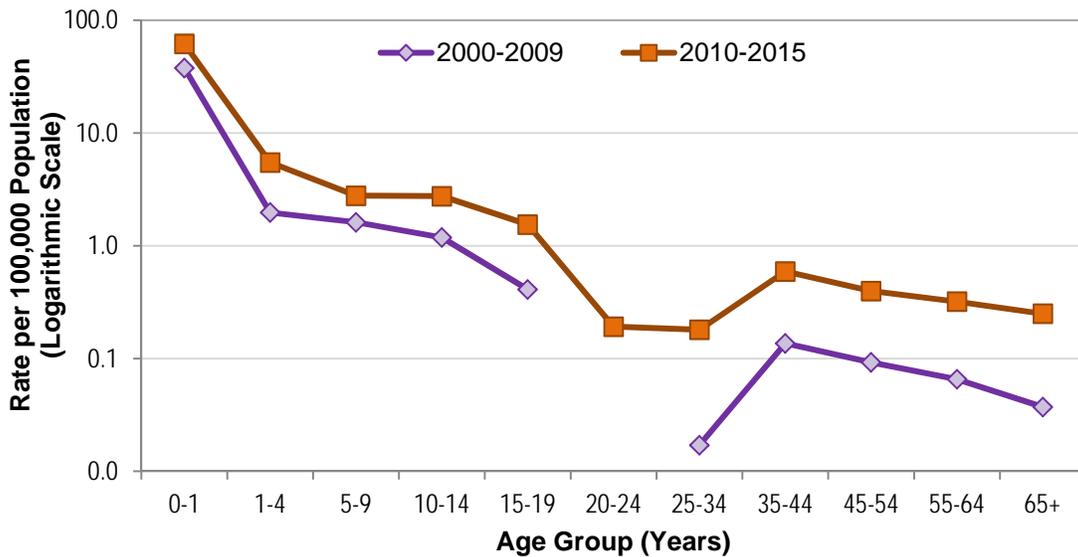
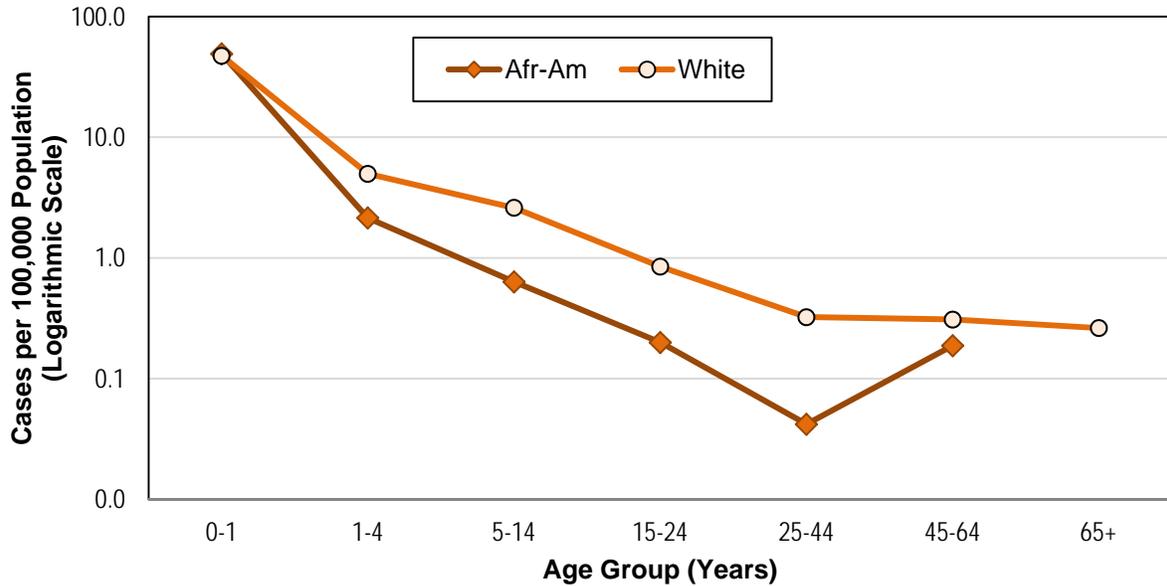


Figure 4: Pertussis average incidence rates by age group comparing year periods Louisiana - 2000-2009 and 2010-2015



The distribution by race shows that five-year rates are higher among White population compare to African-Americans in all age groups (Figure 5).

Figure 5: Pertussis five-year average incidence rates by race and age - Louisiana, 2010-2015



The geographical distribution does not show any remarkable trends or differences (Table 1).

Table 1: Pertussis incidence rates by parish - Louisiana, 1990-2015

Parish	1991-2000	2001-2010	2011-2015
ACADIA	0.00	0.17	3.21
ALLEN	0.00	2.71	5.44
ASCENSION	0.74	1.84	4.88
ASSUMPTION	0.44	1.28	0.86
AVOUELLES	0.00	2.41	1.45
BEAUREGARD	0.31	0.57	0.55
BIENVILLE	0.00	1.39	1.44
BOSSIER	0.22	0.70	3.22
CADDO	0.49	1.03	2.19
CALCASIEU	0.17	0.27	0.51
CALDWELL	0.98	1.93	0.00
CAMERON	0.00	0.00	0.00
CATAHOULA	0.00	0.97	1.97
CLAIBORNE	0.00	0.00	1.21
CONCORDIA	0.49	1.49	0.00
DESOTO	0.79	2.27	0.00
EAST BATON ROUGE	0.25	1.02	1.62
EAST CARROLL	2.12	1.27	2.64

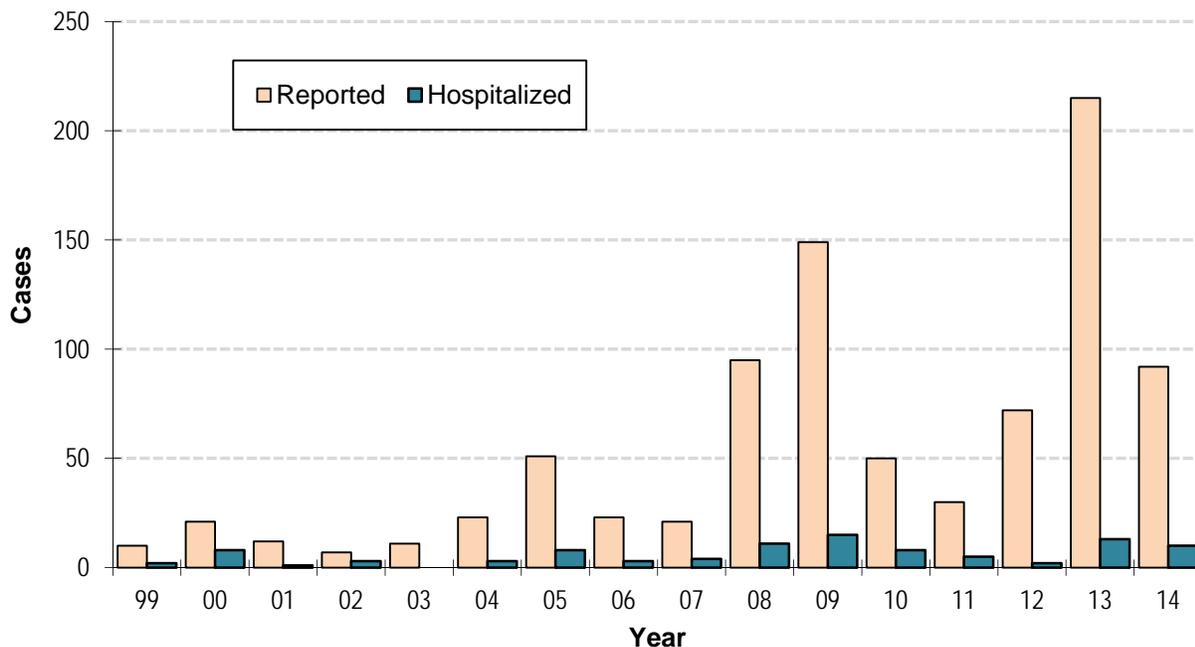
EAST FELICIANA	0.00	0.97	2.03
EVANGELINE	0.30	3.80	5.92
FRANKLIN	0.00	0.48	1.94
GRANT	0.00	0.45	2.68
IBERIA	0.00	1.77	1.35
IBERVILLE	0.64	1.20	1.20
JACKSON	0.00	0.62	1.24
JEFFERSON	0.51	0.84	2.02
JEFF. DAVIS	0.00	0.96	0.00
LA SALLE	0.00	0.68	4.05
LAFAYETTE	0.11	0.89	2.16
LAFOURCHE	0.68	0.31	2.25
LINCOLN	0.47	1.30	0.84
LIVINGSTON	0.14	1.76	3.12
MADISON	0.00	3.26	0.00
MOREHOUSE	1.27	1.37	3.73
NATCHITOCHE	0.27	0.51	1.02
ORLEANS	0.48	0.89	1.74
OUACHITA	0.55	1.25	2.30
PLAQUEMINES	1.56	0.00	3.39
POINTE COUPEE	0.44	0.88	2.65
RAPIDES	0.24	0.92	1.06
RED RIVER	0.00	0.00	2.25
RICHLAND	0.49	0.48	0.00
SABINE	0.00	1.25	0.83
ST. BERNARD	0.00	1.47	6.02
ST. CHARLES	0.42	0.77	3.43
ST. HELENA	0.00	0.90	0.00
ST. JAMES	0.00	0.45	0.92
ST. JOHN	0.70	1.52	0.91
ST. LANDRY	0.37	1.19	4.31
ST. MARTIN	0.44	1.54	2.26
ST. MARY	0.18	0.56	1.49
ST. TAMMANY	0.70	0.61	1.66
TANGIPAHOA	0.11	1.18	1.44
TENSAS	0.00	0.00	0.00
TERREBONNE	0.20	0.18	2.31
UNION	0.47	2.65	1.77
VERMILION	0.20	0.69	2.36
VERNON	0.70	0.39	0.38
WASHINGTON	0.93	0.85	3.00
WEBSTER	0.47	0.24	0.49
WEST BATON ROUGE	0.00	1.31	2.39
WEST CARROLL	0.84	0.00	0.00
WEST FELICIANA	0.00	0.65	1.29
WINN	1.16	1.89	0.00
Louisiana	0.36	1.05	1.83

Hospitalization

Hospitalization surveillance is based on the Louisiana Inpatient Hospital Discharge Data (LaHIDD). In 1997, the Louisiana legislature mandated the reporting of hospital discharge data. LaHIDD serves as the state registry containing hospital discharge data submitted to the Department of Health (LDH). The Office of Public Health (OPH) is responsible for making the data available to OPH sections as needed. The data is available with a delay of several months. The Infectious Disease Epidemiology Section uses these data sets for the surveillance of infectious diseases in hospitals. LaHIDD data sets contain demographic information (names, gender, age, date of birth, address, admit diagnosis, discharge diagnoses (main plus eight more diagnoses), procedures (main plus five), charges, length of stay and hospital name. The diagnoses and procedures are coded with ICD-9 codes. Repeat hospitalizations are not included. Records of patients with pertussis were extracted using the ICD9 code 0330 whether in the main diagnosis, or in the eight additional secondary diagnoses.

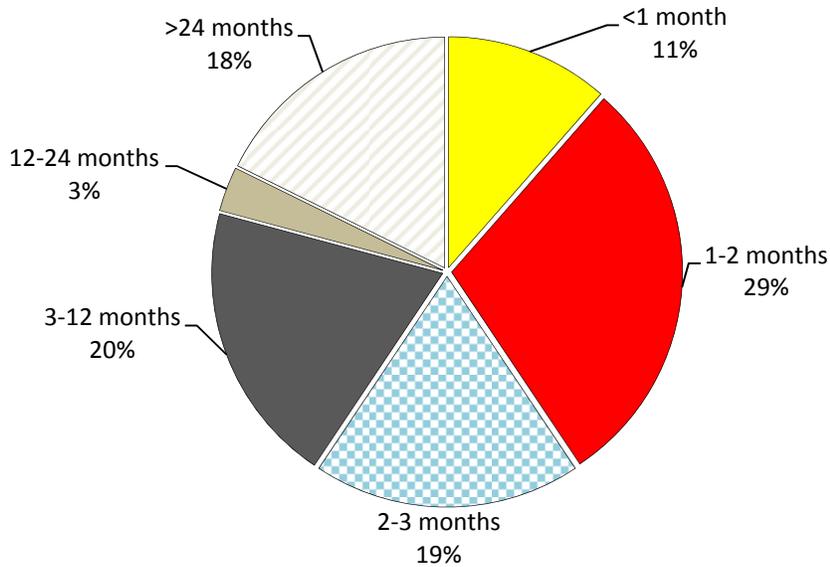
The number of hospitalizations has ranged from zero to ten per year. There is inpatient data up until 2014. There was a spike in cases in 2013 so hospitalizations would be expected to follow the increase. Admissions diagnoses are: pertussis (26%), bronchiolitis, pneumonia, cough and apnea. Pertussis is mostly reported as the main diagnosis or Diagnosis 1 (Figure 6).

Figure 6: Reported and hospitalized pertussis cases – Louisiana, 1999-2014



The majority of cases are admitted before the age of three months (Figure 7).

Figure 7: Age at admission – pertussis – Louisiana, 1999-2014



Mortality

In Louisiana, only six deaths have been attributed to pertussis: a three-year old female in 1987, a one-month old male in 1989, a three-month old male in 1990, a one-month old female in 2003, and two one-month old males in 2005.

Outbreaks

Pertussis outbreaks can be difficult to identify and manage. Other respiratory pathogens often cause clinical symptoms similar to pertussis; co-circulation with other pathogens (bacterial and viral) does occur. In order to respond appropriately (e.g., provide appropriate antibiotic prophylaxis), it is important to confirm that *B. pertussis* is circulating in the outbreak setting and to determine whether other pathogens are contributing to the outbreak. Polymerase chain reaction (PCR) tests vary in specificity, so obtaining culture confirmation of pertussis for at least one suspicious case is recommended any time there is suspicion of a pertussis outbreak. Pseudo outbreaks of pertussis have resulted because of false positive test results with PCR. This underscores the importance of recognizing clinical signs and symptoms and practicing careful laboratory testing. An outbreak of pertussis is defined as the occurrence of two or more cases which are related.

In the last five years, most outbreaks have occurred among family groups with a range of 50%-100% of all outbreaks that year (Tables 2 & 3).

Table 2: Pertussis Outbreaks Last Five Years - Louisiana, 2009-2014

Year	Total Number of Outbreaks	Total Number of Cases in Outbreaks	Outbreak Among Family Group	Outbreak At School or Daycare
2009	8	19	6 (75%)	2 (25%)
2010	4	8	2 (50%)	2 (50%)
2011	3	11	3 (100%)	0 (0%)
2012	4	10	3 (75%)	1 (25%)
2013	10	24	9 (90%)	1 (10%)
2014	3	6	3(100%)	0 (0%)
2015	3	7	2(67%)	1 (33%)
Total	35	85	28 (80%)	7 (20%)

Table 3: Outbreaks by Region – Louisiana 2009-2014

OPH Region									
	Reg 1	Reg 2	Reg 3	Reg 4	Reg 5	Reg 6	Reg 7	Reg 8	Reg 9
2009	0	4	1	1	1	0	0	1	1
2010	1	0	0	1	0	0	1	1	0
2011	1	0	0	0	0	0	1	0	1
2012	0	2	1	0	0	0	0	0	1
2013	1	0	2	3	0	0	1	2	1
2014	0	0	0	0	0	0	2	0	1
2015	1	0	0	0	0	0	2	0	0

Pertussis has no distinct seasonal pattern, but may increase in the summer and fall. Most outbreaks in the last five years have occurred during the summer months (Figure 8).

Figure 8: Pertussis Outbreaks by Month – Louisiana, 2009-2015

