

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 *Bordetella pertussis*. Humans are the only known host. Pertussis is highly contagious.

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

Pertussis is vaccine-preventable. In the U.S. since the 1940s, infant/childhood vaccination has contributed to a reduction of more than 90% in pertussis-related morbidity and mortality. Estimates of childhood vaccination coverage comprised of more than three doses of pertussis-containing vaccine have exceeded 90% since 1994. Universal childhood vaccination is recommended. Despite widespread vaccination there has been an increasing trend in reported pertussis cases in the United States. Pertussis is an epidemic disease often exhibiting increased incidence in three- 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.

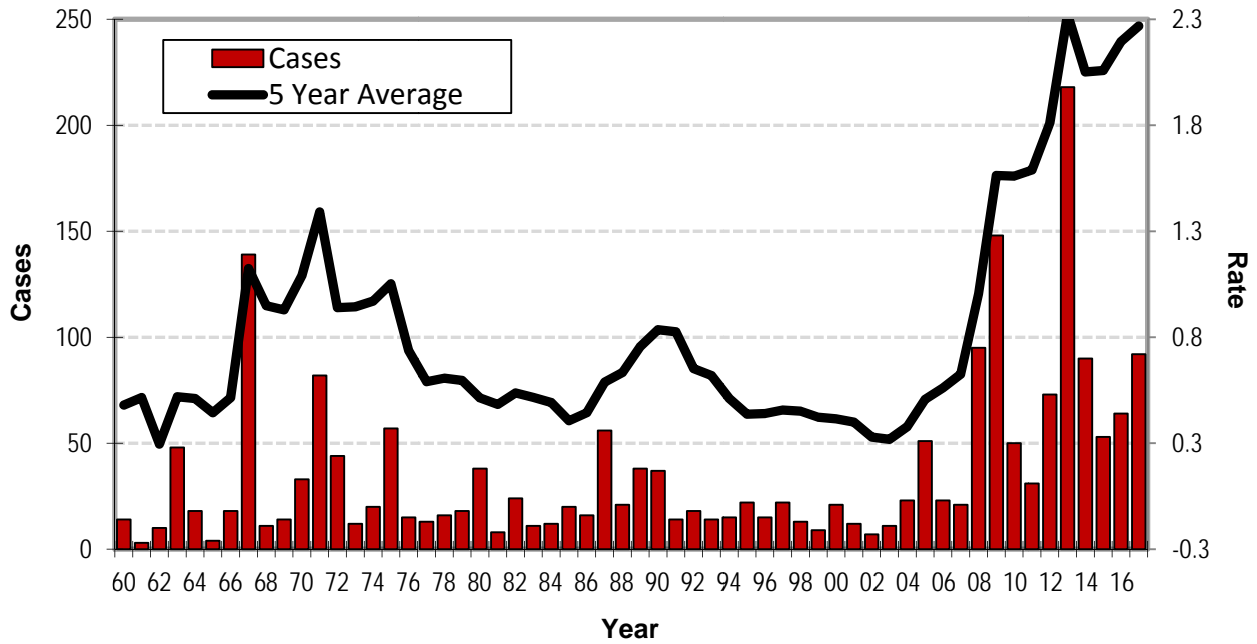
Recent studies support the hypothesis that pertussis infection is very common among adults. IgA antibodies to pertussis antigens are only produced after a natural infection and not after immunization. Prevalence studies of IgA antibodies show similar rates among adults in countries with generalized immunization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

Case, Rates and Trends

In the U.S. in the 1960s and 1970s, reported pertussis cases exhibited expected peaks and troughs. Reported 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). The Tdap is currently recommended for 11 to 12-year olds, with an additional dose administered every ten years thereafter to boost immunity.

In the past 15 years the number of pertussis cases in Louisiana has increased, with peaks of 149 cases in 2009 and 215 cases in 2013. Incidence rates have ranged from 0.24 to 4.53 per 100,000 persons. All Louisiana rates are below the national average incidence of 4.9 per 100,000 persons in 2017 (Centers of Disease Control and Prevention [CDC]), (Figure 1).

Figure 1: Pertussis cases and five-year average incidence rates - Louisiana, 1960-2017



All Louisiana average parish incidence rates have remained below the national average incidence as well (CDC), (Figures 2, 3 and 4).

Figure 2: Pertussis incidence per 100,000 population - Louisiana, 1991-2000

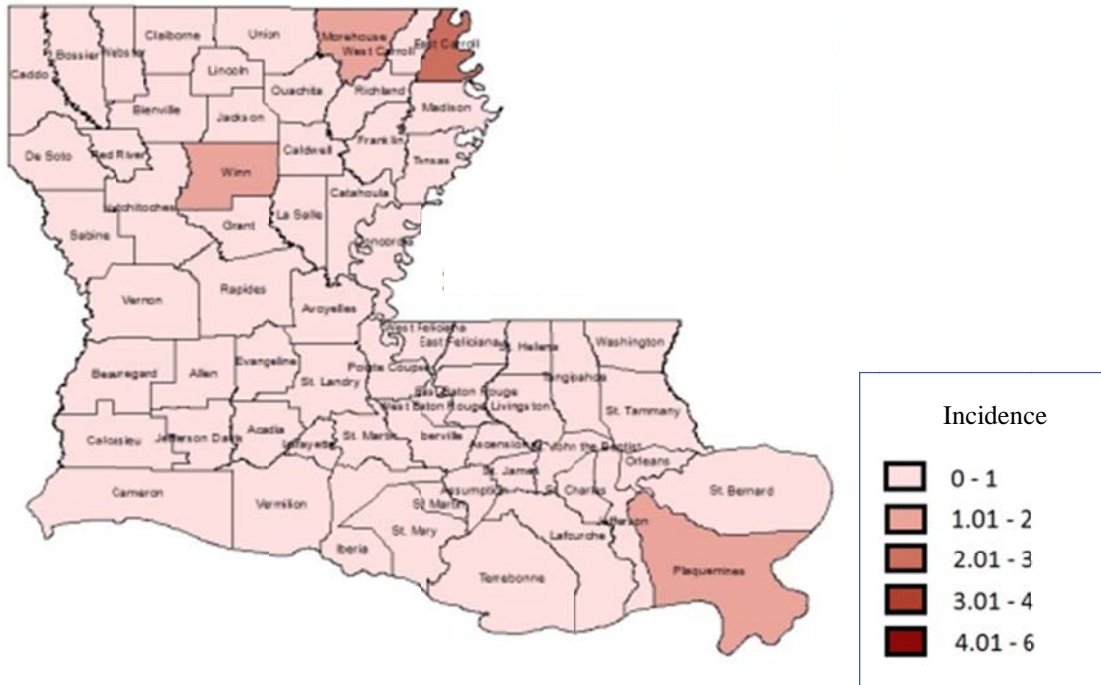


Figure 3: Pertussis incidence per 100,000 population - Louisiana, 2001-2010

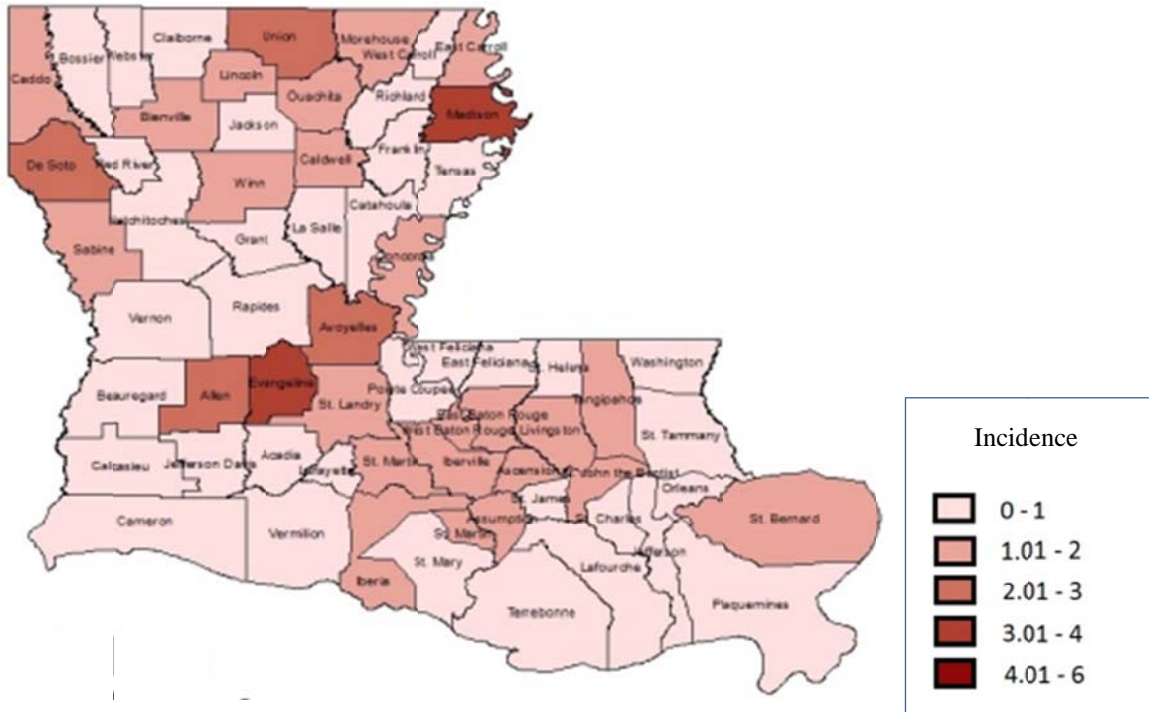
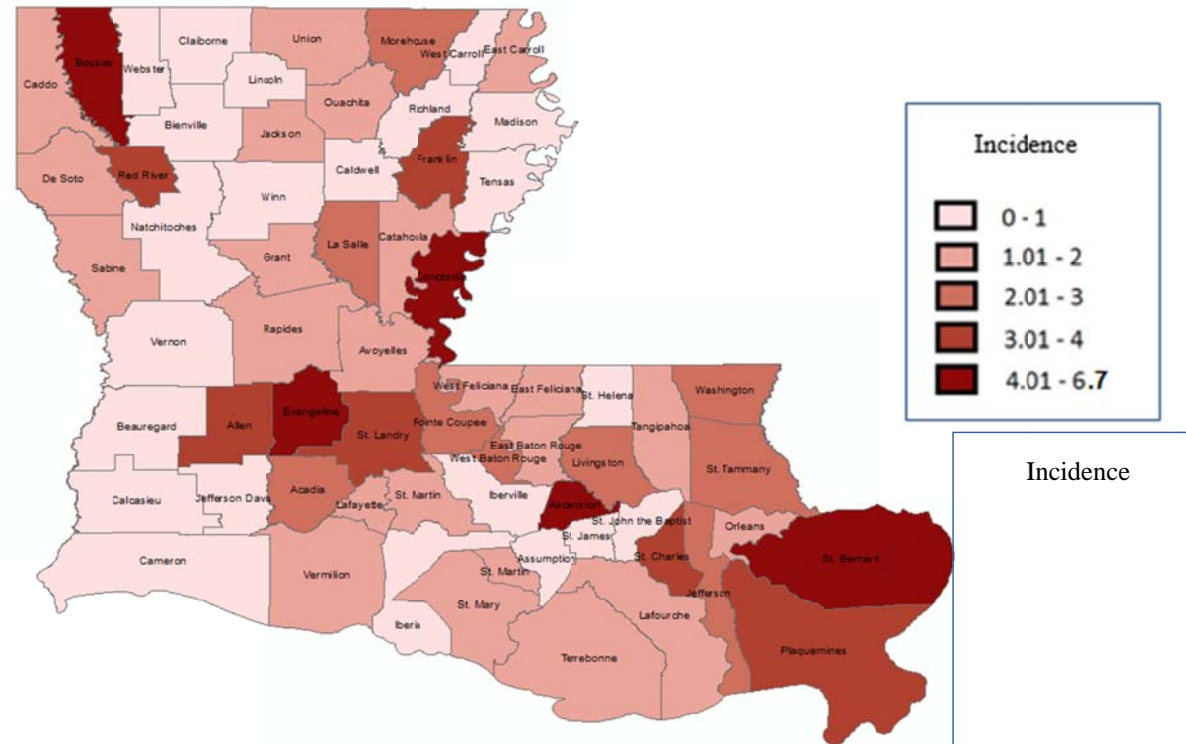


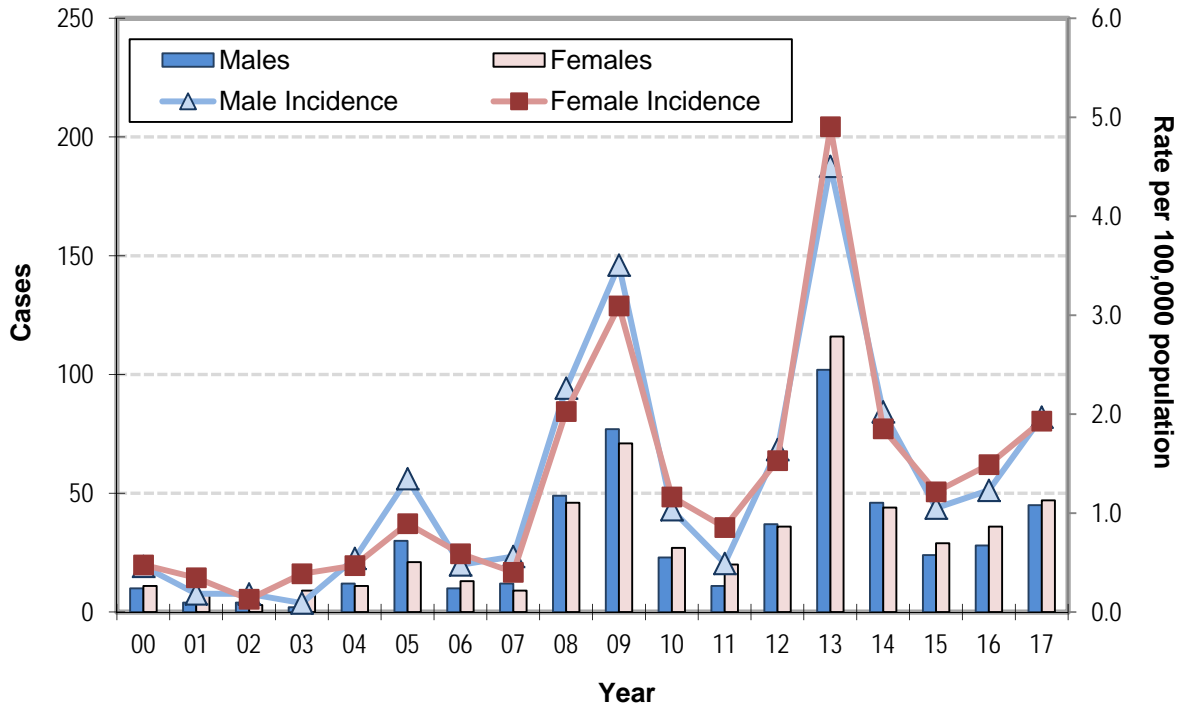
Figure 4: Pertussis incidence per 100,000 population - Louisiana, 2011-2017



Sex, Age group and Race Distribution

There is no significant difference between males and females even when calculated by gender and age group (Figure 5).

Figure 5: Pertussis cases and annual incidence rates by gender – Louisiana 2000-2017



The age group distribution shows that pertussis in Louisiana mostly affects infants (newborn to one year of age), and young children more than adolescents and adults. In recent years however, incidence rates have increased among adults and the elderly. In 2010, there was a notable increase in the incidence rate for the 25 to 34-year old age group. Adult cases are generally under-reported because they are not diagnosed, due to the usual mild nature of symptoms in older victims (Figures 6 and 7).

Figure 6: Pertussis average incidence rates by age group - Louisiana, 2000-2017

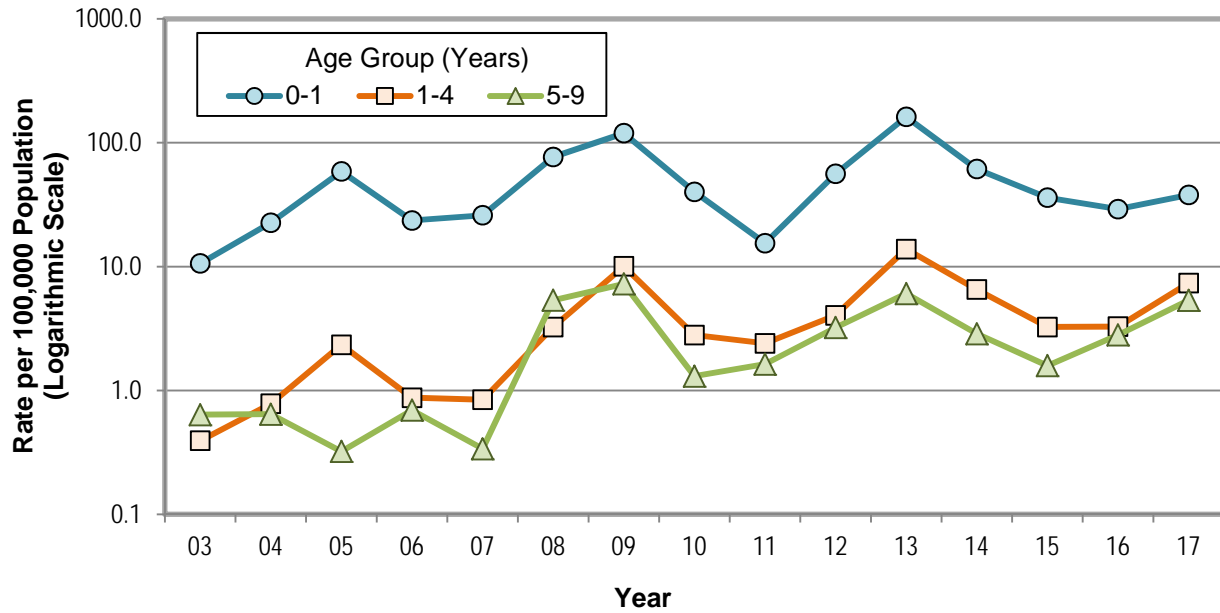
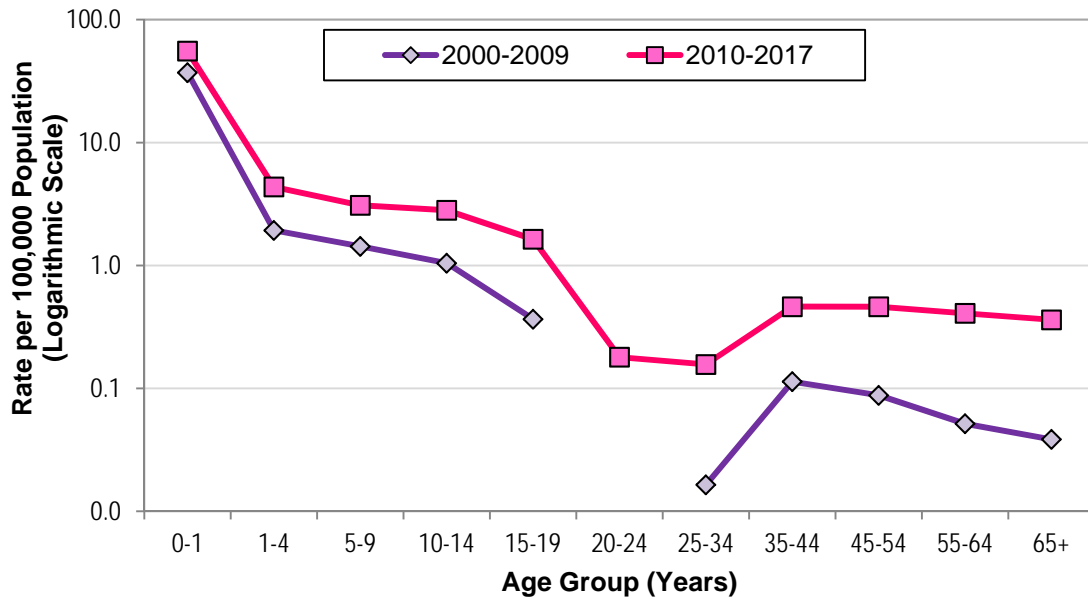
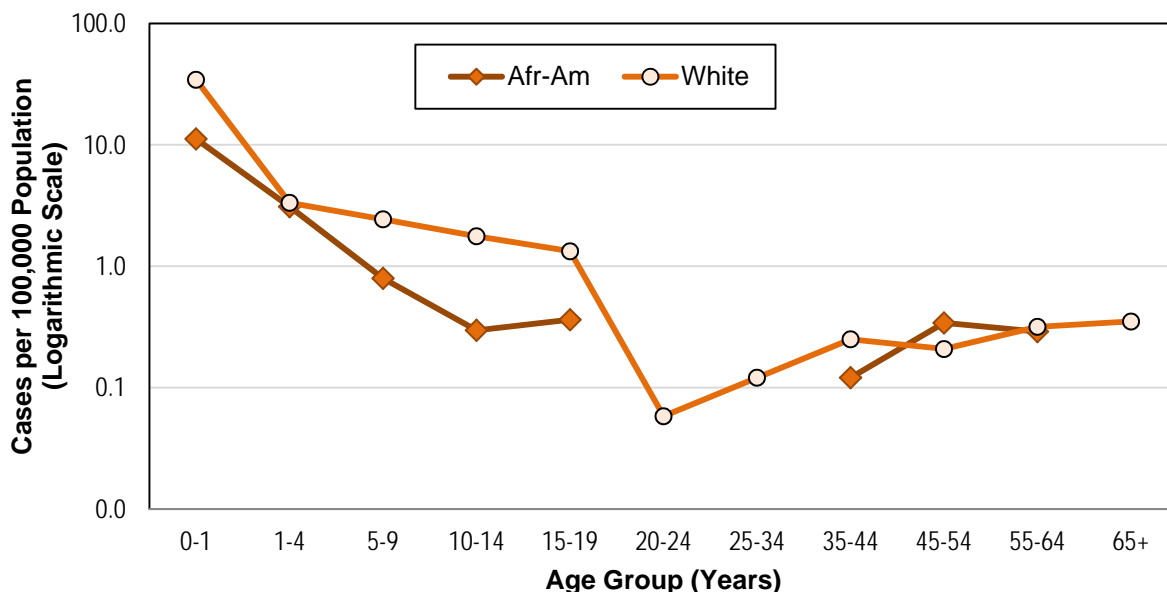


Figure 7: Pertussis average incidence rates by age group comparing year periods Louisiana - 2000-2009 and 2010-2017



The distribution by race shows that rates are higher among the White population in most age groups compared to African-Americans (Figure 8).

Figure 8: Pertussis average incidence rates by race and age - Louisiana, 2010-2017



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

Table 1: Pertussis incidence rates by parish - Louisiana, 1990-2017

Parish	1991-2000	2001-2010	2011-2017
ACADIA	0.00	0.17	2.47
ALLEN	0.00	2.71	3.77
ASCENSION	0.74	1.84	5.31
ASSUMPTION	0.44	1.28	0.59
AVOUELLES	0.00	2.41	1.32
BEAUREGARD	0.31	0.57	0.39
BIENVILLE	0.00	1.39	0.97
BOSSIER	0.22	0.70	4.04
CADDO	0.49	1.03	1.91
CALCASIEU	0.17	0.27	0.72
CALDWELL	0.98	1.93	0.00
CAMERON	0.00	0.00	0.00

CATAHOULA	0.00	0.97	1.33
CLAIBORNE	0.00	0.00	0.81
CONCORDIA	0.49	1.49	4.67
DESOTO	0.79	2.27	1.04
EAST BATON ROUGE	0.25	1.02	1.39
EAST CARROLL	2.12	1.27	1.79
EAST FELICIANA	0.00	0.97	1.37
EVANGELINE	0.30	3.80	4.09
FRANKLIN	0.00	0.48	3.34
GRANT	0.00	0.45	1.87
IBERIA	0.00	1.77	0.95
IBERVILLE	0.64	1.20	0.83
JACKSON	0.00	0.62	1.71
JEFFERSON	0.51	0.84	2.15
JEFF. DAVIS	0.00	0.96	0.44
LA SALLE	0.00	0.68	2.80
LAFAYETTE	0.11	0.89	1.75
LAFOURCHE	0.68	0.31	1.59
LINCOLN	0.47	1.30	0.59
LIVINGSTON	0.14	1.76	2.39
MADISON	0.00	3.26	0.00
MOREHOUSE	1.27	1.37	2.48
NATCHITOCHE	0.27	0.51	0.70
ORLE ANS	0.48	0.89	1.78
OUACHITA	0.55	1.25	1.63
PLAQUEMINES	1.56	0.00	3.01
POINTE COUPEE	0.44	0.88	2.44
RAPIDES	0.24	0.92	1.37
RED RIVER	0.00	0.00	3.05

RICHLAND	0.49	0.48	0.00
SABINE	0.00	1.25	1.15
ST. BERNARD	0.00	1.47	6.57
ST. CHARLES	0.42	0.77	3.42
ST. HELENA	0.00	0.90	0.00
ST. JAMES	0.00	0.45	0.63
ST. JOHN	0.70	1.52	0.60
ST. LANDRY	0.37	1.19	3.50
ST. MARTIN	0.44	1.54	1.86
ST. MARY	0.18	0.56	1.02
ST. TAMMANY	0.70	0.61	2.20
TANGIPAHOA	0.11	1.18	1.72
TENSAS	0.00	0.00	0.00
TERREBONNE	0.20	0.18	1.61
UNION	0.47	2.65	1.22
VERMILION	0.20	0.69	1.91
VERNON	0.70	0.39	0.53
WASHINGTON	0.93	0.85	2.35
WEBSTER	0.47	0.24	0.67
WEST BATON ROUGE	0.00	1.31	2.92
WEST CARROLL	0.84	0.00	0.00
WEST FELICIANA	0.00	0.65	1.78
WINN	1.16	1.89	0.00
Louisiana	0.36	1.05	1.90

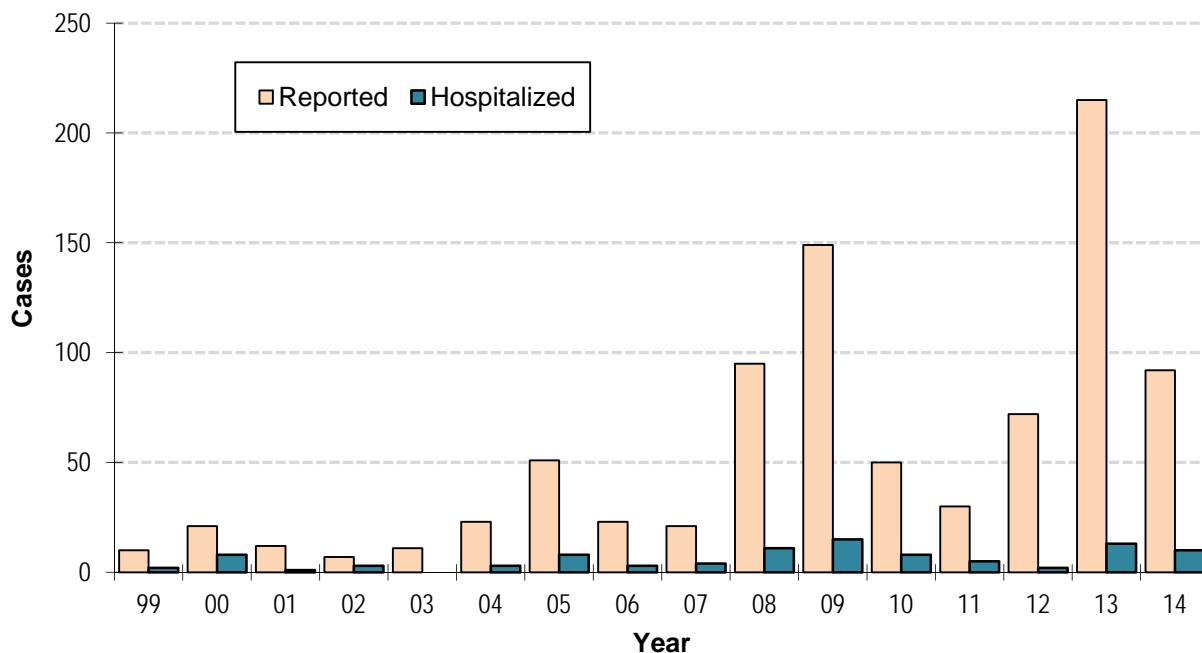
Hospitalization

Hospitalization surveillance is based on Louisiana Inpatient Hospital Discharge Data (LaHIDD). In 1997, the Louisiana legislature mandated the reporting of hospital discharge data. LaHIDD

serves as the state registry maintaining hospital discharge data submitted to the Louisiana 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 usually available after a several month delay. The Infectious Disease Epidemiology Section uses these data sets for the surveillance of infectious diseases in hospitals. LaHIDD data 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 ICD-9 code 0330 whether in the main diagnosis, or in the eight additional secondary diagnoses.

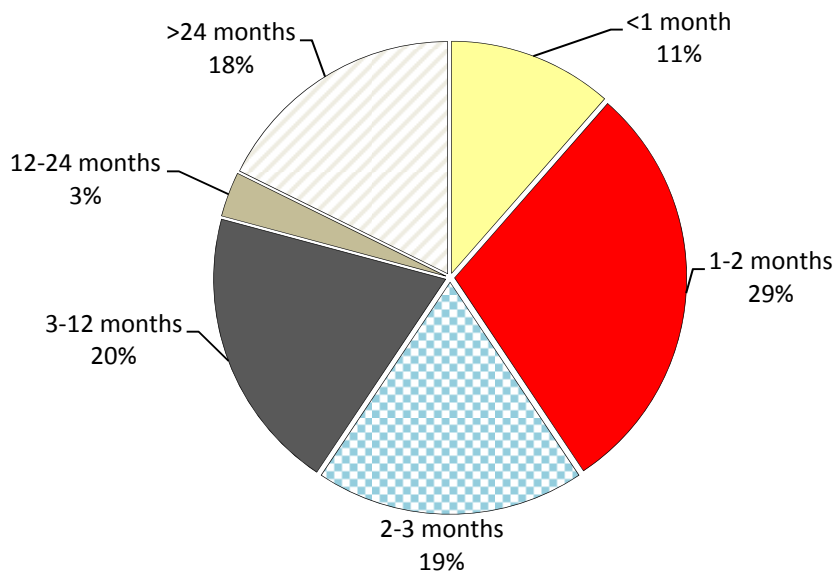
The number of hospitalizations has ranged from zero to ten per year. Inpatient data are available through 2014. A spike in cases was noted in 2013, so hospitalizations would be expected to reflect the increase. Admissions diagnoses included: pertussis (26%), bronchiolitis, pneumonia, cough and apnea. Pertussis was primarily reported as the main diagnosis or Diagnosis 1 (Figure 9).

Figure 9: Reported and hospitalized pertussis cases – Louisiana, 1999-2014



The majority of cases are admitted before the age of three months (Figure 10).

Figure 10: Age at admission – pertussis – Louisiana, 1999-2014



Mortality

In Louisiana, only seven 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, two one-month old males in 2005, and a one-month old female in 2016.

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 related cases.

In the last nine years, most outbreaks have occurred among family groups, accounting for 50% to 100% of all outbreaks in each year (Tables 2, 3 and Figure 11). One outbreak in 2016 was associated with the city of residence, rather than a particular family or gathering place.

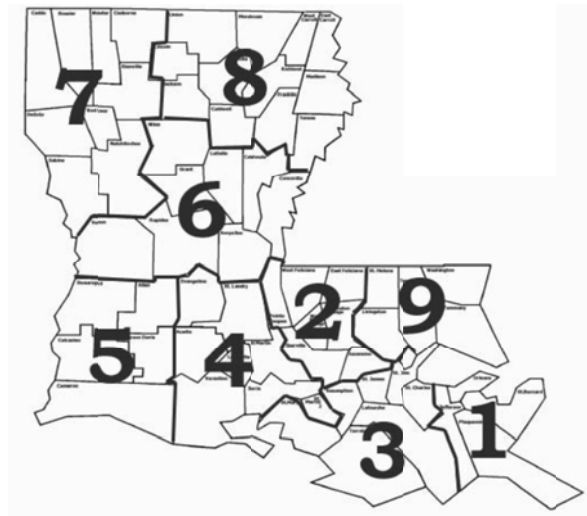
Table 2: Pertussis Outbreaks Last Five Years - Louisiana, 2009-2017

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%)
2016	2	5	1(50%)	0 (0%)
2017	1	3	1 (100%)	0 (0%)
Total	38	85	30 (79%)	7 (18%)

Table 3: Outbreaks by Region – Louisiana 2009-2017

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
2016	0	0	0	0	0	0	2	0	0
2017	0	0	0	0	0	0	0	1	0
Total	4	6	4	5	1	0	9	5	5

Figure 11: Louisiana Department of Health Regional Map



Pertussis has no distinct seasonal pattern, but may increase in the summer and fall. Most outbreaks in the last nine years have occurred during the summer months (Figure 12).

Figure 12: Pertussis Outbreaks by Month – Louisiana, 2009-2017

