

## *Haemophilus Influenzae* (Invasive Disease)

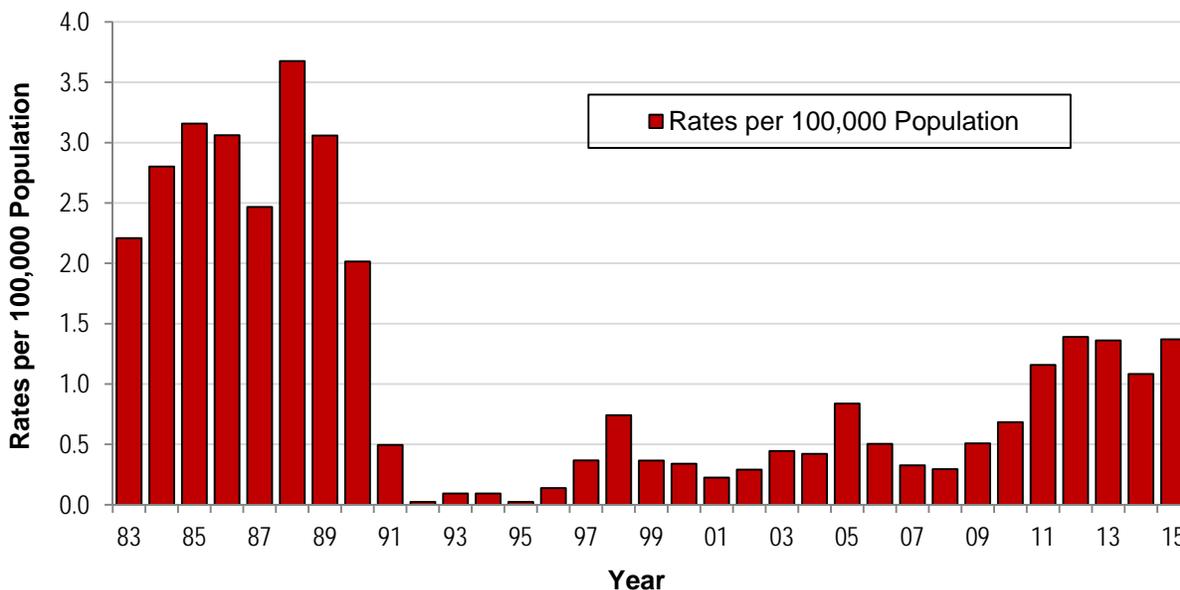
*Haemophilus influenzae* invasive disease is a Class A Disease and must be reported to the Office of Public Health within 24 hours.

Six types of *Haemophilus influenzae* bacteria are recognized: a, b, c, d, e and f. Type b has been infrequently associated with regional or widespread epidemics.

### Surveillance

Before the advent of effective vaccines, *Haemophilus influenzae* type b (Hib) was the most common cause of serious bacterial infections and meningitis and children in the United States. Pre-vaccine, Hib caused 300 invasive infections in Louisiana each year, half of which resulted in meningitis. Of these cases, between 5% and 10% resulted in death and an additional 10% of children were left with significant neurological sequelae including paralysis, mental retardation and hearing loss. In 1985, it was estimated that one of every 200 children in the United States would develop an invasive Hib infection by five years of age (Figure 1).

**Figure 1:** Incidence of *Haemophilus influenzae* invasive disease, all types  
Louisiana, 1983-2015



### 1. *Haemophilus influenzae* Type b (Hib)

Historically, Hib meningitis and invasive disease peaked in children between six and 18 months of age. It was more common in boys, African-Americans, Native Americans, child care

attendees, children living in crowded conditions and children who were not breastfed.

In 1985, the first Hib vaccine was licensed for use in the United States. In 1987, the vaccine was reformulated to be effective in children younger than 18 months of age. The current Hib vaccines are safe in children as young as six-weeks old. Since Hib vaccines were introduced, the incidence of invasive Hib disease in infants and children has fallen by 99%. In the past 10 years, there have only been 23 reported cases of invasive Hib disease.

There was a single confirmed case of Type b *H. influenza* invasive disease reported in 2009. This patient from the Tangipahoa Parish area was approximately 60 years old at the time of diagnosis.

There was a single confirmed case of Type b *H. influenza* invasive disease reported in 2010. This patient from the Rapides Parish area was approximately 40 years old at the time of diagnosis.

In 2011, there were two cases reported to the Infectious Disease Epidemiology Section. One patient, from the Rapides Parish area was approximately 78 years old at the time of diagnosis. The other confirmed case was 10-months-old at the time of diagnosis and was up-to-date on Hib vaccinations.

There were eight total cases reported in 2014. Of these, seven were confirmed cases with an average age of 68 years old. The probable case was five years old at the time of diagnosis. This patient tested positive for CSF directigen *H. influenza* type b, and negative for CSF culture, and was up-to-date on Hib vaccinations.

There were four confirmed case of type b *H. influenza* invasive disease reported in 2015. These patients were from different parts of the state and had an average age of 69 years at the time of diagnosis (Table 1).

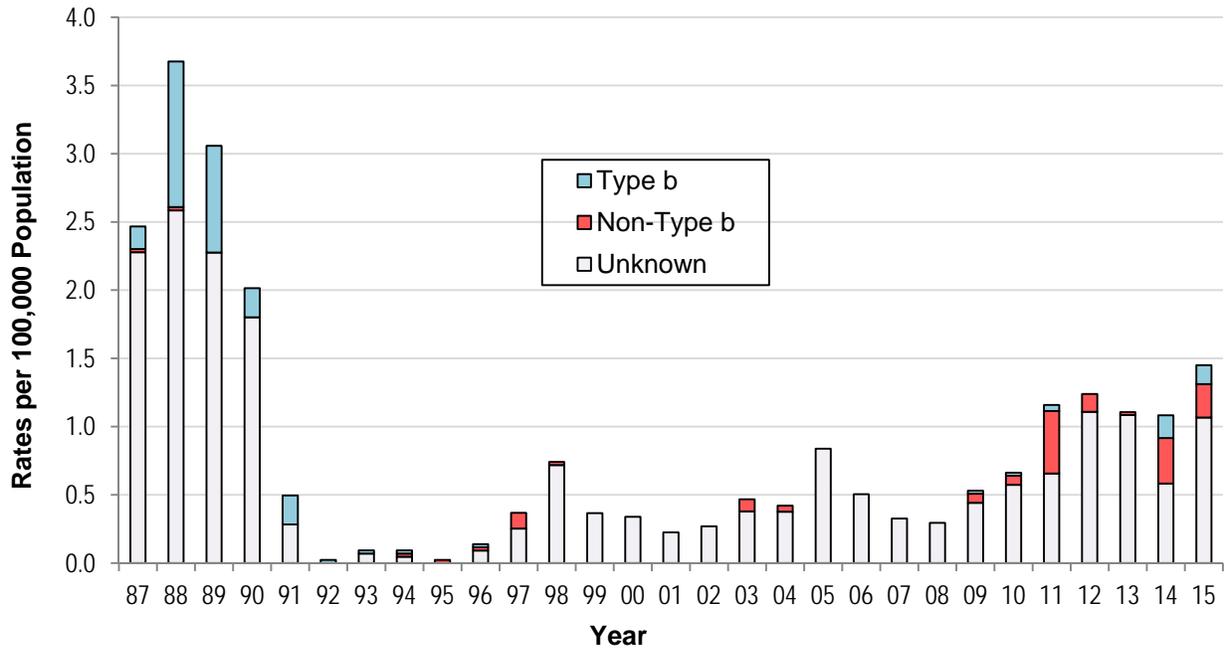
**Table 1:** *H. influenza* type b - case summaries – Louisiana, 2009-2015

Year	Age <10 Years, Detailed	Age 25-64	Age 65+	Total
2009	0	1	0	1
2010	0	1	0	1
2011	1, UTD on Hib vaccines	0	1	2
2014	1, UTD on Hib vaccines	4	3	8
2015	0	1	3	4

## 2. Haemophilus Invasive Disease, Non-Type B

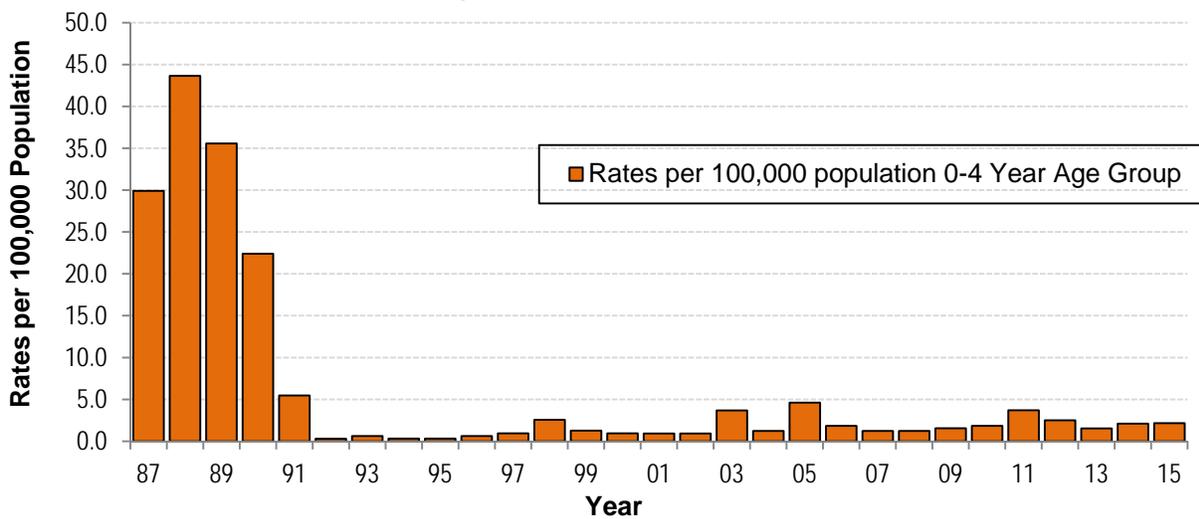
While Hib invasive infections declined dramatically following widespread vaccination, there is currently no vaccine that protects against other types of *Haemophilus influenzae* (types a, c-f). Although for most of the reported cases the type is unknown, it is likely that disease caused by types other than b is increasing (Figure 2).

**Figure 2:** Reported *Haemophilus* invasive disease cases, by type - Louisiana, 1987-2015



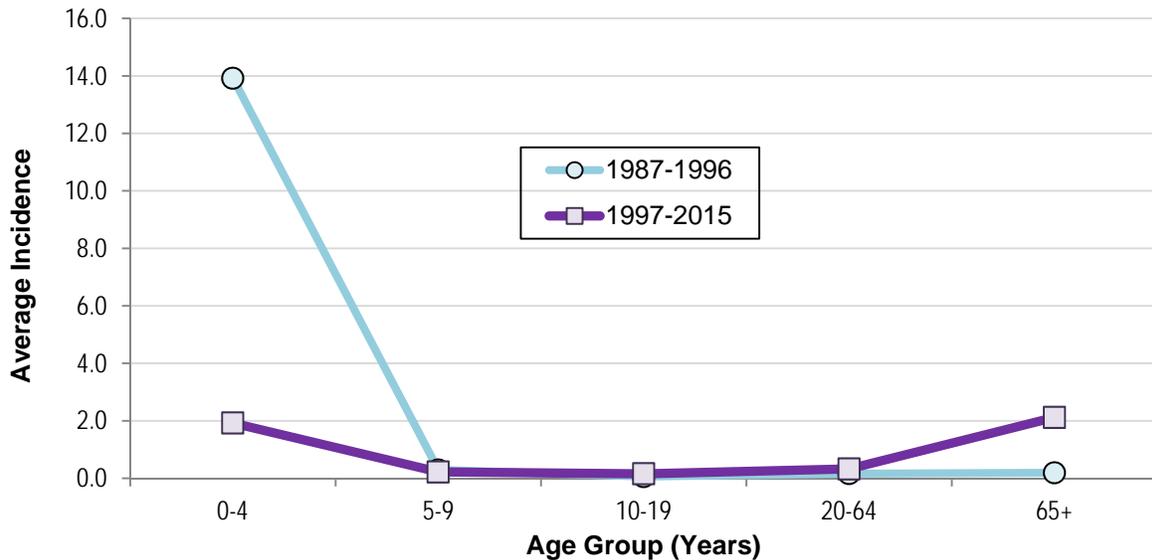
Much of the decrease in *Haemophilus* cases seen since the introduction of Hib vaccine occurred in children younger than four-years of age. The apparent recent increase in *Haemophilus* among children under four is due to non-type b strains (Figure 3).

**Figure 3:** Reported incidence of *Haemophilus influenzae* invasive disease - aged newborn to four years - Louisiana, 1987-2015



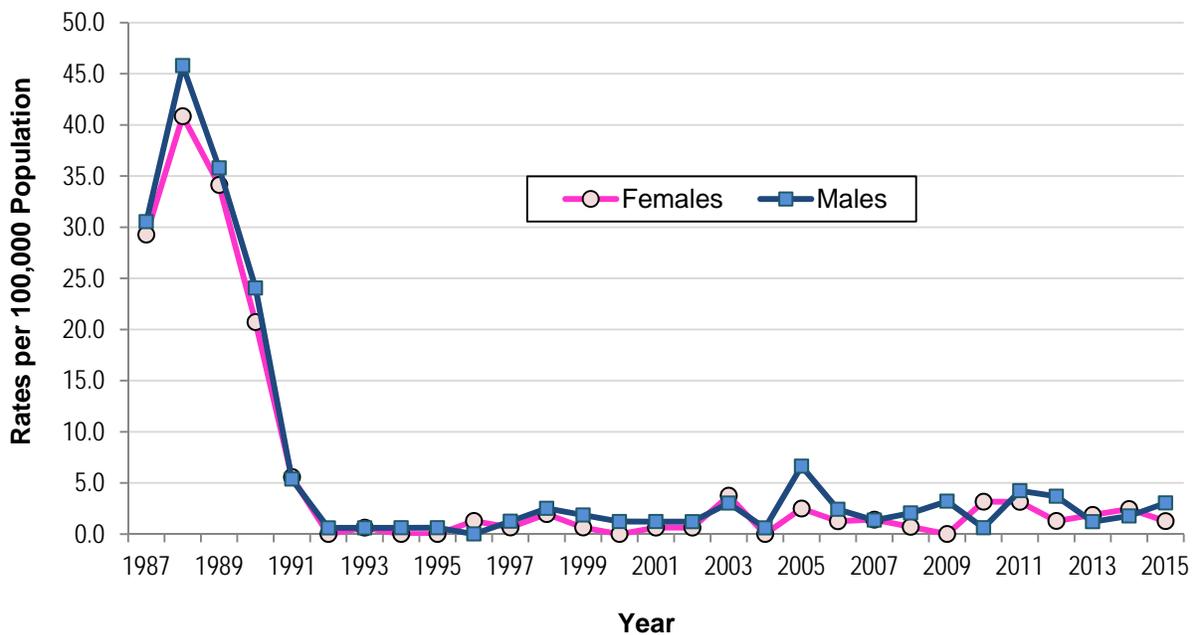
The incidence rates in other age groups have remained low, yet have increased in persons aged 65-years and older after 1997 (Figure 4).

**Figure 4:** Reported incidence of *Haemophilus influenzae* invasive disease - all types by age Louisiana, 1987-2015



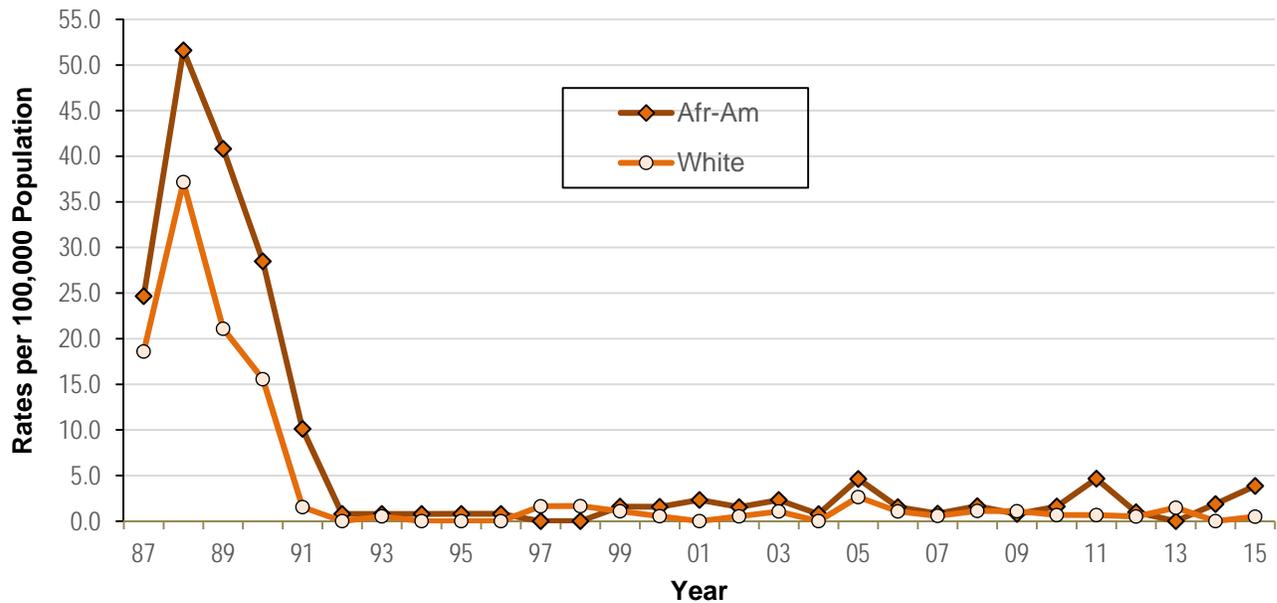
Since 1987, no difference has been observed in the rates of *Haemophilus influenzae* invasive disease among male and female children younger than five-years of age. This is in contrast to the pre-vaccine era, where males had higher incidence rates than females (Figure 5).

**Figure 5:** *Haemophilus influenzae* invasive disease - all types rates among children younger than five-years old by gender - Louisiana, 1987- 2015



Between 1987 and 1992, incidence rates among African-American children younger than five-years old were slightly higher than the rates among White children. However, both races exhibit similar trends in incidence rates during the 1987 to 2015 period (Figure 6).

**Figure 6:** *Haemophilus influenzae* invasive disease - all rates among children younger than five years of age by race - Louisiana, 1987-2015



## Hospitalization Surveillance

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 two years. 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. The data are based on the years 1999 to 2014.

Records of patients with *Haemophilus influenzae* were extracted using the following ICD-9 codes whether in the main diagnosis or in the eight additional secondary diagnoses. Hospitals do

not type strains when diagnosing *H. influenzae* infections; thus the following reported data includes all strains (a-f) of *H. influenzae*.

**CODE    DISEASE**

4822    PNEUMONIA DUE TO *H. INFLUENZAE*

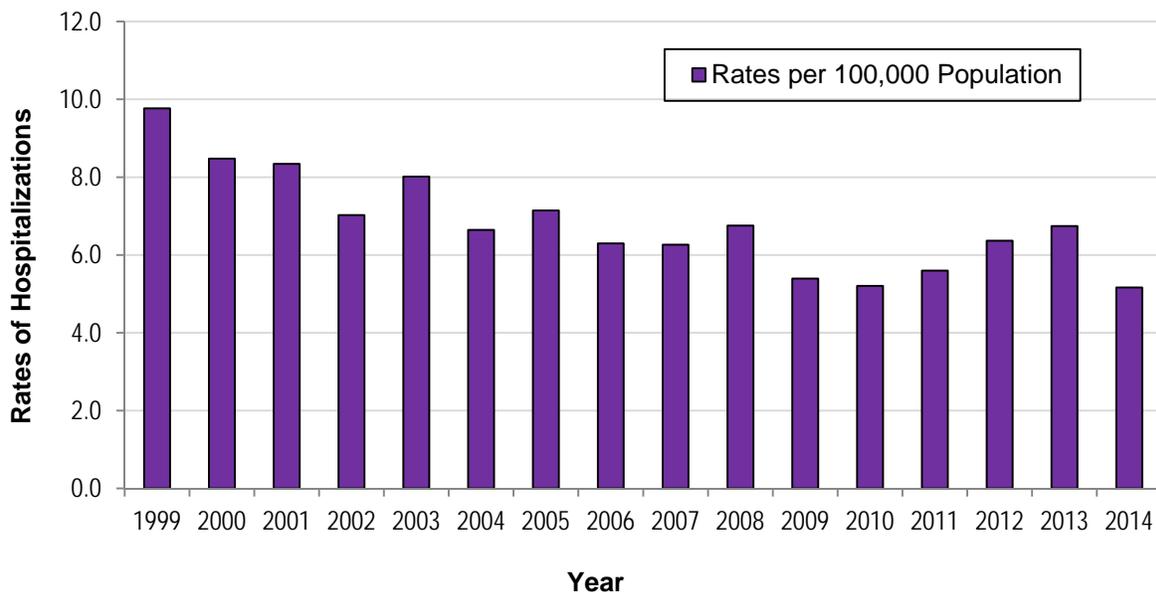
0415    *H. INFLUENZAE* INFECTION NOT OTHERWISE SPECIFIED

03841    SEPTICEMIA DUE TO *H. INFLUENZAE*

### Hospitalization Numbers, Rates and Trends

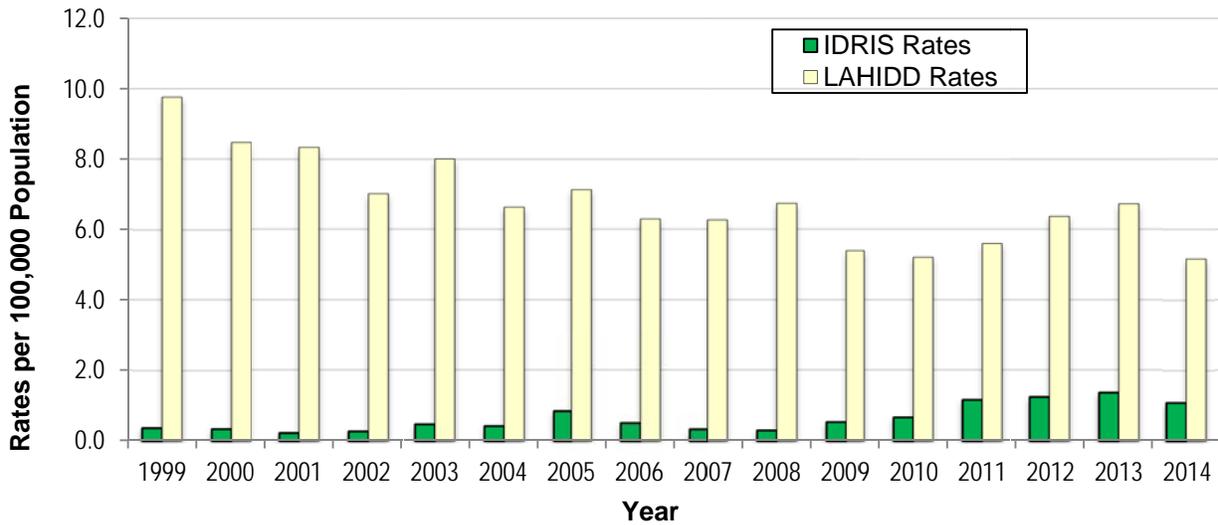
The following statistics are based on unduplicated patients. Between 1999 and 2014, there were 4,919 diagnosed cases of *H. influenzae* in hospitalized patients in Louisiana, an average of 6.82 per 100,000 population per year. Rates of *H. influenzae*-associated hospitalizations have steadily decreased during this period from 9.69 per 100,000 in 1999 to 5.16 per 100,000 in 2014, averaging 6.8 hospitalizations per 100,000 per year (Figure 7).

**Figure 7:** Hospitalized patients diagnosed with *H. influenzae* - Louisiana, 1999-2014



From 1999 to 2014 there were 461 cases of invasive *H. influenzae* of all types reported through IDRIS while there were 4,919 cases identified through LAHIDD, a ratio of 11 *H. influenzae* cases in LAHIDD for one case in IDRIS. This large discrepancy is mostly due to a lack of reporting (Figure 8).

**Figure 8:** Comparison of cases of *H. influenzae* in IDRIS and LAHIDD - Louisiana, 1999-2014

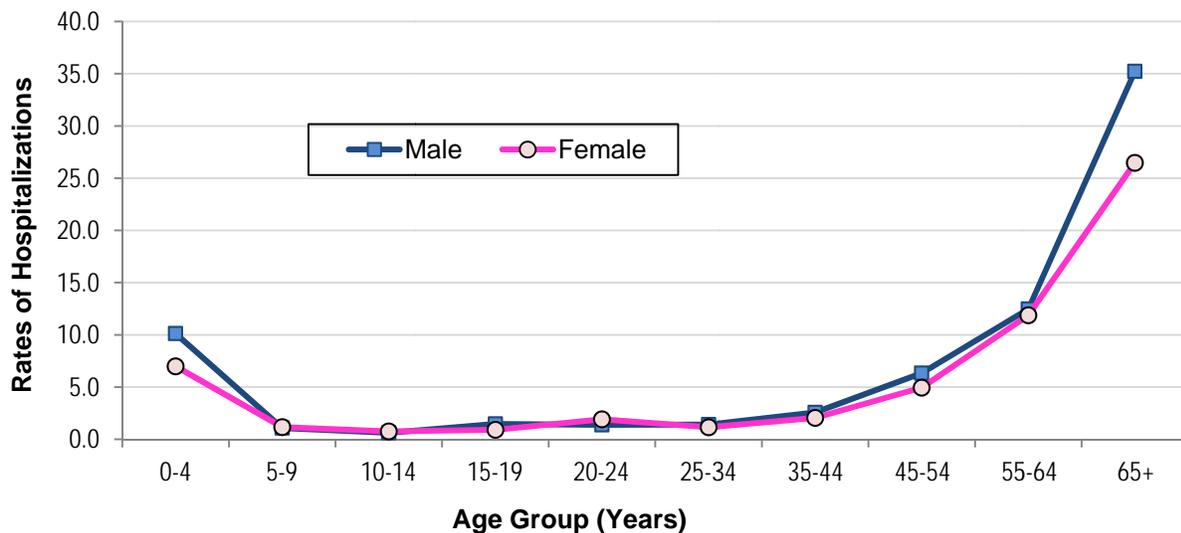


There are minor differences in the rates of *H. influenzae* infections among hospitalized patients by gender.

Rates of hospitalizations associated with *H. influenzae* are slightly higher in the newborn to four-year-old age group than others, yet increase significantly in the elderly age groups.

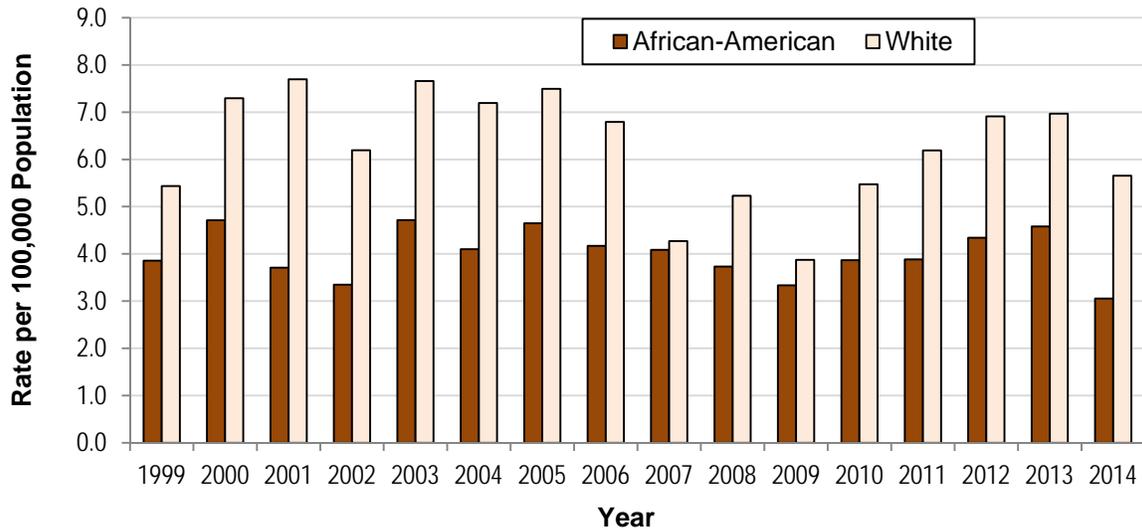
Approximately 77% of *H. influenzae*-related hospitalizations occurred in patients older than 45 years of age. Other underlying conditions and/or immunosuppression are likely to be responsible for this trend (Figure 9).

**Figure 9:** Hospitalized patients diagnosed with *H. influenzae*, by gender and age Louisiana, 1999-2014



Hospitalization rates by gender show that White patients experience a 1.5 to two times higher rate of *H. influenzae* diagnosed infections than do African-American patients, yet both exhibited similar rate trends during the 1999 to 2014 period (Figure 10).

**Figure 10:** Hospitalized patients diagnosed with *H. influenzae*, by race – Louisiana, 1999-2014



Approximately 65% of all of the main diagnoses for patients hospitalized with *H. influenzae* infections were due to other serious conditions. For the patients who had *H. influenzae* infections as their primary diagnosis, 87% were in the form of pneumonia (Table 2).

**Table 2:** Main diagnoses for hospitalized patients with *H. influenzae* infections  
Louisiana, 1999-2014

Main Diagnosis	Number of Diagnosed Cases	Percent
Pneumonia, <i>H. influenzae</i>	1494	30.37
Obstructive chronic bronchitis	385	7.83
Respiratory failure	258	5.24
Septicemia due to <i>H. influenzae</i>	215	4.37
Pneumonia, unspecified	175	3.56
Obs chr Bronc W ac Bronc	86	1.75
Congestive heart failure	83	1.69
Acute bronchitis	69	1.40
<i>H. influenzae</i> infection, other	17	0.35
Other	1463	29.74

### *Haemophilus influenzae*-Associated Mortalities

Deaths due to a *Haemophilus influenzae* infection as the primary diagnosis varied yearly, yet remained low throughout the 1999 to 2014 period (Figure 11).

**Figure 11:** Mortality cases in hospitalized patients diagnosed with *H. influenzae* infections by main diagnosis - Louisiana, 1999-2014

