

Histoplasmosis

Histoplasmosis is not a reportable condition unless outbreaks are observed.

Histoplasma capsulatum var. *capsulatum* is a dimorphic fungus. The organism grows as a mold in soil and as yeast in animal and human hosts. It is encountered in many parts of the world and is endemic in Louisiana. The source of the organism is soil or dust in barnyards and other locations high in nitrogen concentrations, especially soil contaminated with bat or bird droppings. Infection is acquired through inhalation of airborne spores (conidia). The quantity of inoculum inhaled, strain virulence, and the immune status of the host affect the outcome of infection.

Epidemiology

Histoplasmosis is not contagious; it cannot be transmitted from an infected person or animal to another person. Infection does not always result in illness. Symptoms, when present, usually begin three to 17 days post exposure and range from mild conditions requiring no treatment to severe systemic illness. The illness is typically flu-like with symptoms such as fever, cough, fatigue, chills, headache, chest pain, and body aches. Children younger than two years of age, immune-compromised persons, and the elderly, especially those with underlying illnesses such as diabetes and chronic lung disease, are at increased risk for developing systemic histoplasmosis. Although the lung is the primary organ affected, disseminated disease can affect the bone marrow, liver, spleen, adrenal gland and meninges. In children, the most common sign of infection is hepatosplenomegaly. Mild disease usually resolves without treatment. Untreated systemic infections are frequently fatal. Treatment with appropriate antifungal drugs is usually successful. No vaccines are available.

Previous exposure or infection is detected by a positive skin test (histoplasmin skin test). The Centers for Disease Control and Prevention (CDC) estimates that approximately 80% of the population living in areas with endemic disease is skin-test positive. In a survey carried out throughout Louisiana in the early 1950s, the range of skin-test positivity ranged from 10% in the southeast to 75% in the northeast of the state. It is estimated that 50 million people have been infected in North America, most asymptotically. However 10% to 25% of HIV-infected persons in endemic areas will develop disseminated histoplasmosis. The mortality rate in HIV infected persons with disseminated disease is approximately 10%.

Histoplasma capsulatum grows in soils throughout the world. In the U.S., the proportion of people infected is higher along the Ohio and Mississippi River valleys in the central and southern states. Blackbird roosts (starlings, grackles, red-winged black-birds and cowbirds) are often found to be heavily contaminated. Pigeon and bat habitats and poultry houses with dirt floors are

also commonly infested areas. However birds are not infected with *H. capsulatum*. Birds provide a nutrient source that promotes growth of the organism already present in soil. Bats, however, can be infected and can excrete *H. capsulatum* in droppings.

Anyone working or recreating in areas where soils or materials are contaminated with *H. capsulatum* may be at risk for infection. Occupations and hobbies at risk for infection in endemic areas include bridge inspectors or painters, chimney cleaners, construction workers, demolition workers, farmers, gardeners, heating and air conditioning installers or technicians, microbiology lab workers, pest control personnel, workers in abandoned buildings, roofers and spelunkers. Immunocompromised persons (persons with cancer, transplant patients, HIV-infected individuals) are at increased risk of infection.

Outbreaks have occurred in people not directly in contact with soil. In the U. S. since 1970, two large school outbreaks infecting hundreds of students as well as other personnel were reported. One case involved raking of leaves and debris from a school courtyard; the other involved tilling soil - also in a school courtyard. Spores seem to have been distributed through the schools' ventilation systems.

Testing samples of soil to determine risk of infection or decontamination of sites is impractical in most situations. Prevention is best accomplished by assuming that soils in endemic regions as well as areas contaminated with bird or bat droppings are potentially contaminated and taking the appropriate precautions. Use of masks and reduction of dust by watering areas prior to dust generating activities are recommended. Hosing off footwear and placing clothing in airtight plastic bags for laundering also may reduce risk. Areas suspected of being contaminated with *H. capsulatum* should be posted with signs warning of the health risk.

More in depth guidelines are available on the National Institute for Occupational Safety and Health website (<http://www.cdc.gov/niosh/>).

Hospitalization Surveillance

Histoplasmosis is a reportable disease, and surveillance is based on hospital discharge data and the Louisiana Infectious Disease Reporting Information System (IDRIS). Hospitalization surveillance is based on the Louisiana Hospital Inpatient 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 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 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 2017 for IDRIS and 1999 to 2014 for LaHIDD.

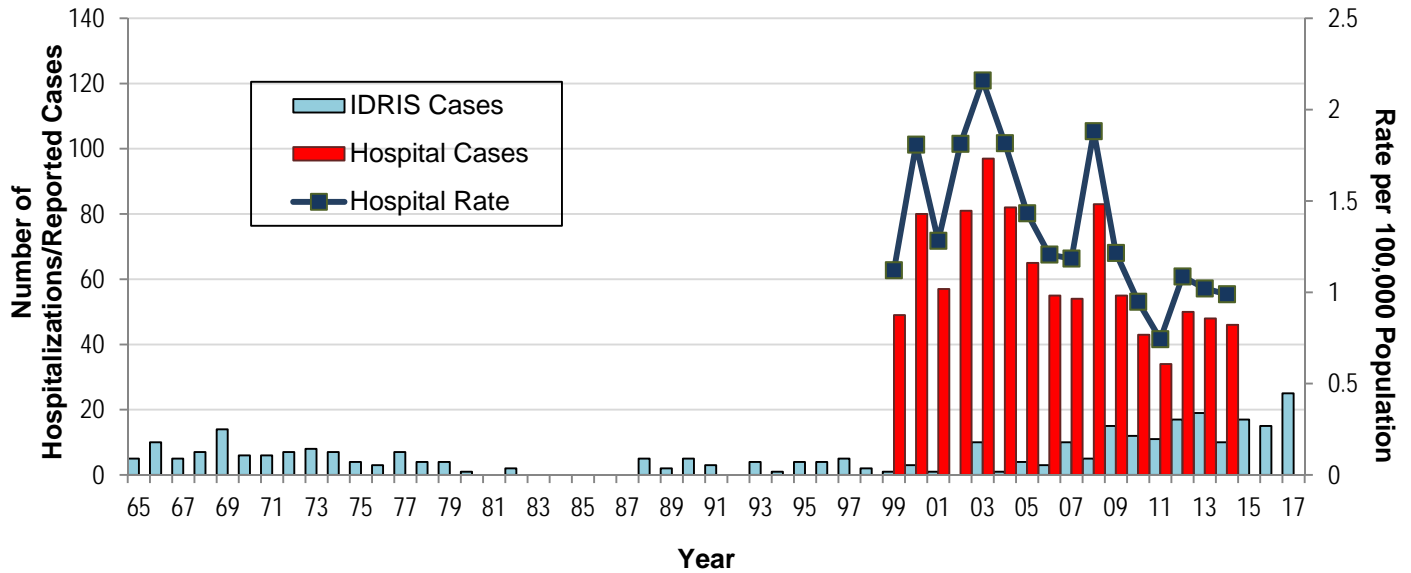
Records of patients with Histoplasmosis were extracted using the following ICD-9 codes whether in the main diagnosis or in the eight additional secondary diagnoses.

<u>CODE</u>	<u>DISEASE</u>
115	Histoplasmosis
1150	Infection by <i>Histoplasma Capsulatum</i>
11500	Infection by <i>Histoplasma Capsulatum</i> , Without Mention of Manifestation
11501	<i>Histoplasma Capsulatum</i> Meningitis
11502	<i>Histoplasma Capsulatum</i> Retinitis
11503	<i>Histoplasma Capsulatum</i> Pericarditis
11504	<i>Histoplasma Capsulatum</i> Endocarditis
11505	<i>Histoplasma Capsulatum</i> Pneumonia
11509	Infection by <i>Histoplasma Capsulatum</i> , With Mention of Other Manifestation
1151	Infection by <i>Histoplasma Duboisii</i>
11510	Infection by <i>Histoplasma Duboisii</i> , Without Mention of Manifestation
11511	<i>Histoplasma Duboisii</i> Meningitis
11512	<i>Histoplasma Duboisii</i> Retinitis
11513	<i>Histoplasma Duboisii</i> Pericarditis
11514	<i>Histoplasma Duboisii</i> Endocarditis
11515	<i>Histoplasma Duboisii</i> Pneumonia
11519	Infection by <i>Histoplasma Duboisii</i> with Mention of Other Manifestation
1159	Histoplasmosis, Unspecified
11590	Histoplasmosis, Unspecified Without Mention of Manifestation
11591	Histoplasmosis Meningitis
11592	Histoplasmosis Retinitis
11593	Histoplasmosis Pericarditis
11594	Histoplasmosis Endocarditis
11595	Histoplasmosis Pneumonia
11599	Histoplasmosis, Unspecified With Mention of Other Manifestation

Histoplasmosis-Associated Hospitalizations and Reports

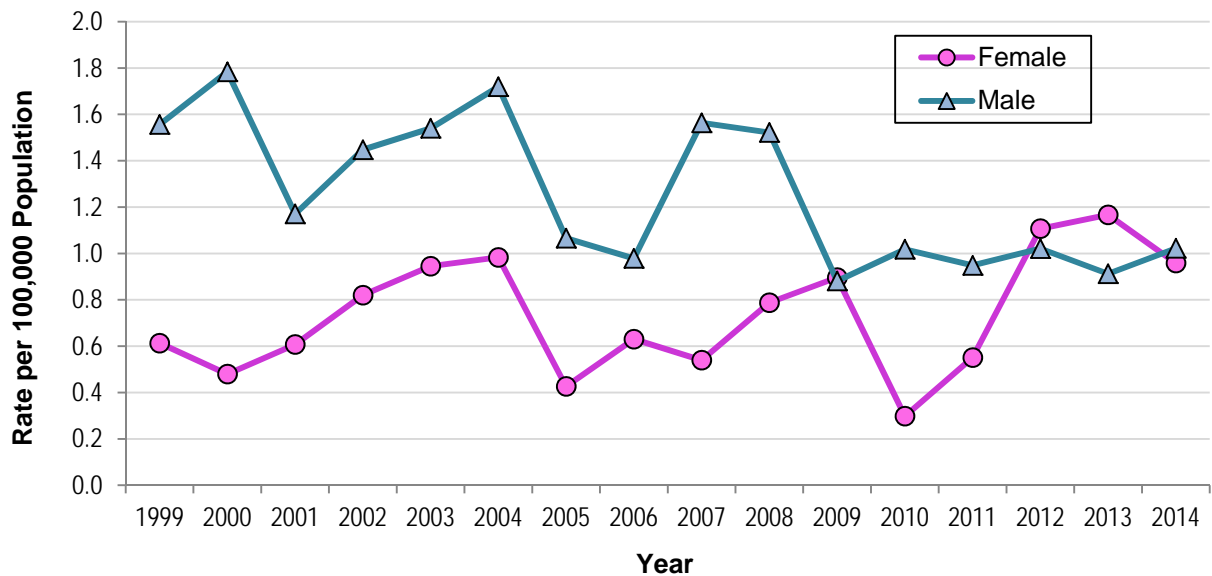
The following statistics are based on unduplicated patients. A total of 979 cases were reported to LaHIDD from 1999 to 2014, but only 122 cases were reported to OPH through IDRIS in that same time period. On average, 50% of the patients diagnosed yearly are also infected with HIV. While rates of hospitalization were generally declining up until 2014, the number of cases reported to OPH has fluctuated over time (Figure 1). OPH began more enhanced surveillance of fungal disease in 2016, which likely accounts for the apparent increase in cases in 2017.

Figure 1: Reported histoplasmosis cases - Louisiana, 1965-2017



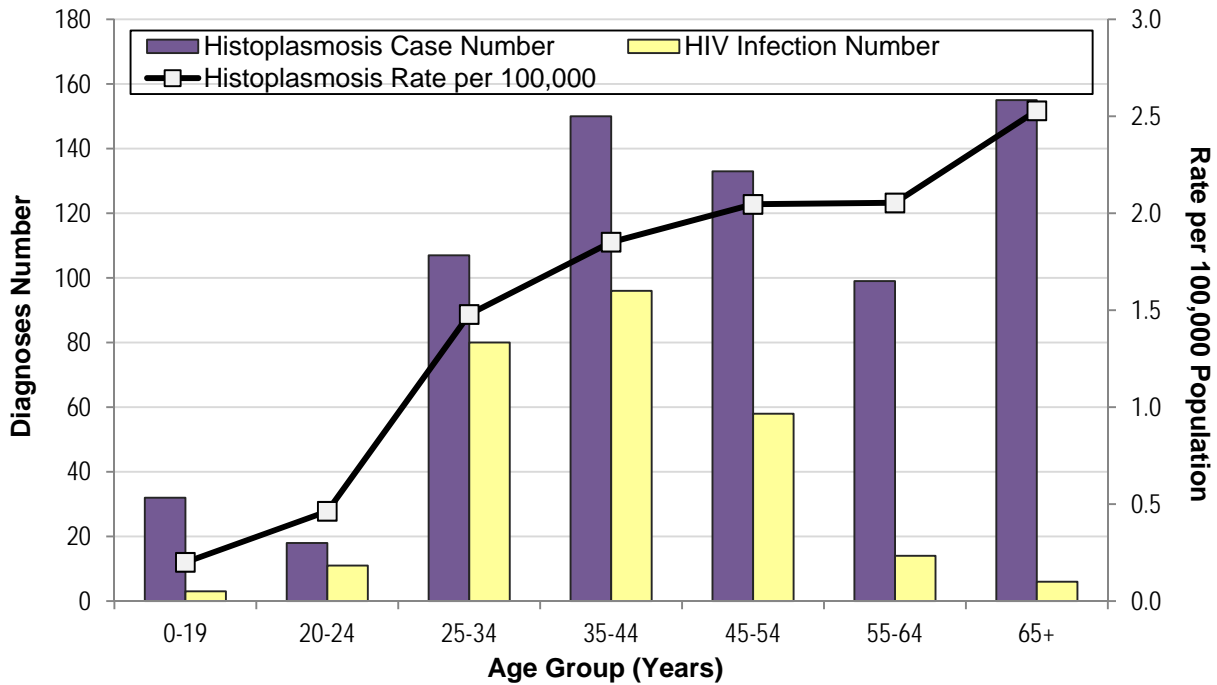
Similar to rate trends for reported cases of histoplasmosis, rates of *Histoplasma* infections among male hospitalized patients have been substantially higher than rates among female patients. This is due to a higher proportion of co-infection with HIV among males than females. Of the 271 hospitalized patients infected with both HIV and *Histoplasma*, 73% were male (Figure 2).

Figure 2: *Histoplasma* infections among reported and hospitalized patients, by gender Louisiana, 1999-2014



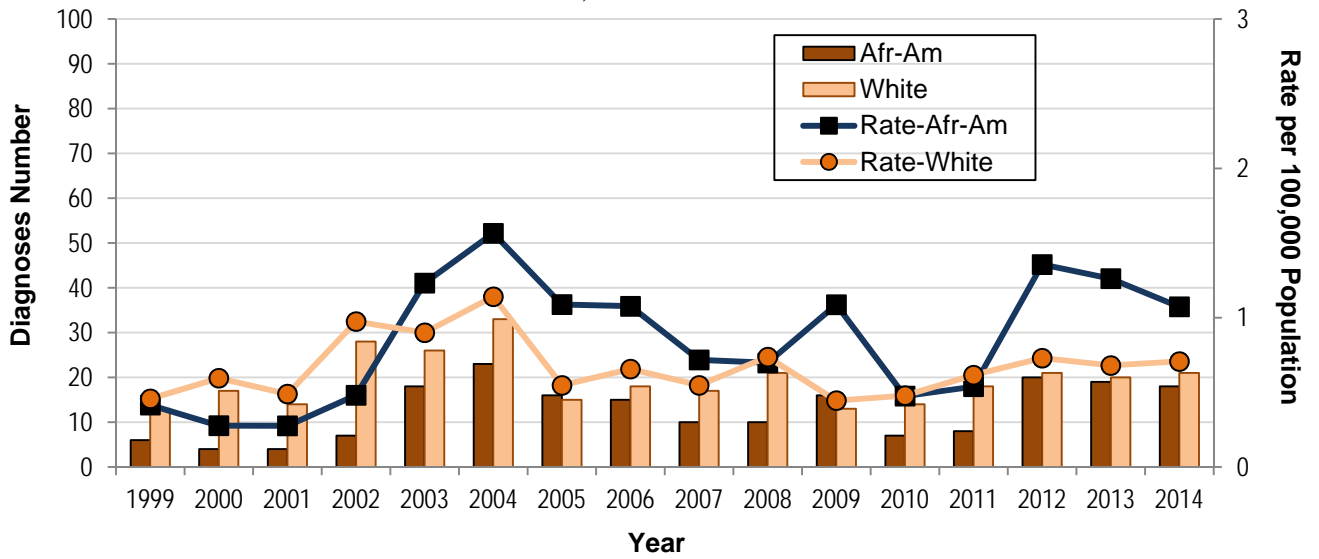
The highest proportion of *Histoplasma* hospital diagnoses are among patients 25 years and older, mostly attributed to immunosuppression due to HIV co-infection (25 to 54 year-old age group) or other conditions (55+ year-old age groups), (Figure 3).

Figure 3: Reported and hospitalized patients co-infected with HIV and *Histoplasma*, by age Louisiana, 1999-2014



Rate trends for both races were relatively similar until 2003. Rates in the African-American population exhibited a significant increase after 2003, and have continued to hover above the rates for the White population with the most remarkable disparities demonstrated from 2011 forward (Figure 4).

Figure 4: Reported and hospitalized patients diagnosed with *Histoplasma* infections, by race Louisiana, 1999-2014



Of the 694 *Histoplasma* infections diagnosed in hospitalized and reported patients, only 18% were primary diagnoses. Between 1999 and 2014, the single major condition of all histoplasmosis-related hospital admissions was HIV. The remaining 43% of histoplasmosis admissions were associated with respiratory infections and other complications (Table 1).

Table 1: Main diagnoses for reported and hospitalized patients with *Histoplasma* infections Louisiana, 1999-2014

Main Diagnosis	Diagnosed Case Number	Percent Total Cases
HIV infection	224	32.3%
Histoplasmosis, unspecified	64	9.2%
<i>Histoplasma capsulatum</i> pneumonia	46	6.6%
Malignant neoplasm, all types	20	2.9%
Pneumonia, unspecified	15	2.2%
Care involving other rehab procedure	9	1.3%
Atrial Fibrillation	7	1.0%
Volume depletion disorder	5	0.7%
Congestive heart failure	5	0.7%

Geography

Table 2 shows cases and rates by parishes with high rates of histoplasma infections in both rural and urban areas of Louisiana. This geographical distribution may be reflective of the fact that no one parish in the state is completely urbanized and that the fungus is so pervasive in the state (especially areas near the Mississippi River) that exposure is ubiquitous.

Table 2. Histoplasmosis-related hospitalizations/reports and rates by parish per 100,000 population - Louisiana, 1999-2014

Region	Parish	HOSPITALIZATIONS/Reported Cases				Region	Parish	HOSPITALIZATIONS/Reported Cases			
		2014		1999-2014				2014		1999-2014	
		Num.	Rate	Avg.	Avg. Rate			Num.	Rate	Avg.	Avg. Rate
1	Orleans	3	4.60	7	9.68	6	Vernon	0	0.00	5	3.54
1	Jefferson	0	0.00	4	14.51	6	Grant	0	0.00	2	0.65
1	Plaquemines	0	0.00	0	0.22	6	Winn	0	0.00	6	0.97
1	St. Bernard	0	0.00	0	0.54	6	La Salle	1	0.28	2	0.09
2	E. Baton Rouge	2	4.50	6	12.53	6	Catahoula	0	0.00	2	0.08
2	W. Baton Rouge	0	0.00	0	0.91	6	Concordia	0	0.00	5	1.15
2	E. Feliciana	0	0.00	0	2.06	7	Caddo	8	33.20	131	35.98
2	W. Feliciana	0	0.00	0	0.28	7	De Soto	0	0.00	3	0.28
2	Ascension	2	0.74	0	0.19	7	Sabine	0	0.00	4	2.70
2	Iberville	0	0.00	1	0.21	7	Bossier	5	22.83	68	23.78
2	Pointe Coupee	0	0.00	1	4.86	7	Webster	0	0.00	11	2.90
3	Lafourche	0	0.00	0	3.92	7	Claiborne	0	0.00	6	0.67
3	Terrebonne	2	18.19	1	10.55	7	Bienville	0	0.00	9	1.25
3	St. Mary	1	5.50	0	1.79	7	Red River	0	0.00	2	1.75
3	St. John	0	0.00	0	1.23	7	Natchitoches	1	4.28	14	4.62
3	St. Charles	0	0.00	0	0.69	8	Ouachita	0	0.00	66	8.95
3	St. James	0	0.00	0	0.03	8	Union	0	0.00	9	0.65
3	Assumption	0	0.00	0	0.68	8	Lincoln	1	1.81	9	1.23
4	Lafayette	0	0.00	2	8.08	8	Jackson	1	1.73	0	0.11
4	St. Martin	0	0.00	1	1.44	8	Morehouse	0	0.00	4	0.22
4	Iberia	1	4.56	0	1.16	8	Caldwell	0	0.00	1	0.11
4	Acadia	0	0.00	0	1.20	8	Richland	1	18.02	6	9.34
4	Vermilion	1	1.29	0	0.17	8	E. Carroll	0	0.00	2	0.12
4	Evangeline	0	0.00	0	0.40	8	W. Carroll	0	0.00	7	1.92
4	St. Landry	0	0.00	2	9.60	8	Madison	1	1.63	9	1.25
5	Calcasieu	3	0.66	1	0.32	8	Franklin	0	0.00	2	0.26
5	Cameron	0	0.00	0	0.00	8	Tensas	0	0.00	0	0.00
5	Beauregard	0	0.00	0	0.03	9	St. Tammany	2	4.59	25	4.05
5	Jeff. Davis	0	0.00	0	0.30	9	Tangipahoa	1	3.98	16	4.80
5	Allen	0	0.00	0	0.50	9	Washington	1	8.15	2	1.53
6	Rapides	2	4.05	2	4.29	9	St. Helena	0	0.00	4	2.21
6	Avoyelles	0	0.00	0	0.28	9	Livingston	1	6.18	13	5.84

Mortality

There were a total of 62 deaths involving a histoplasmosis infection among hospitalized patients from 1999 to 2014. Of these, 69% were patients co-infected with HIV. Deaths due to a *Histoplasma* infection as the primary condition are relatively uncommon; there was one death among hospitalized and reported patients in 2014.