Outbreak Investigations

Report Contents:

1. Surveillance and Outbreak Investigations

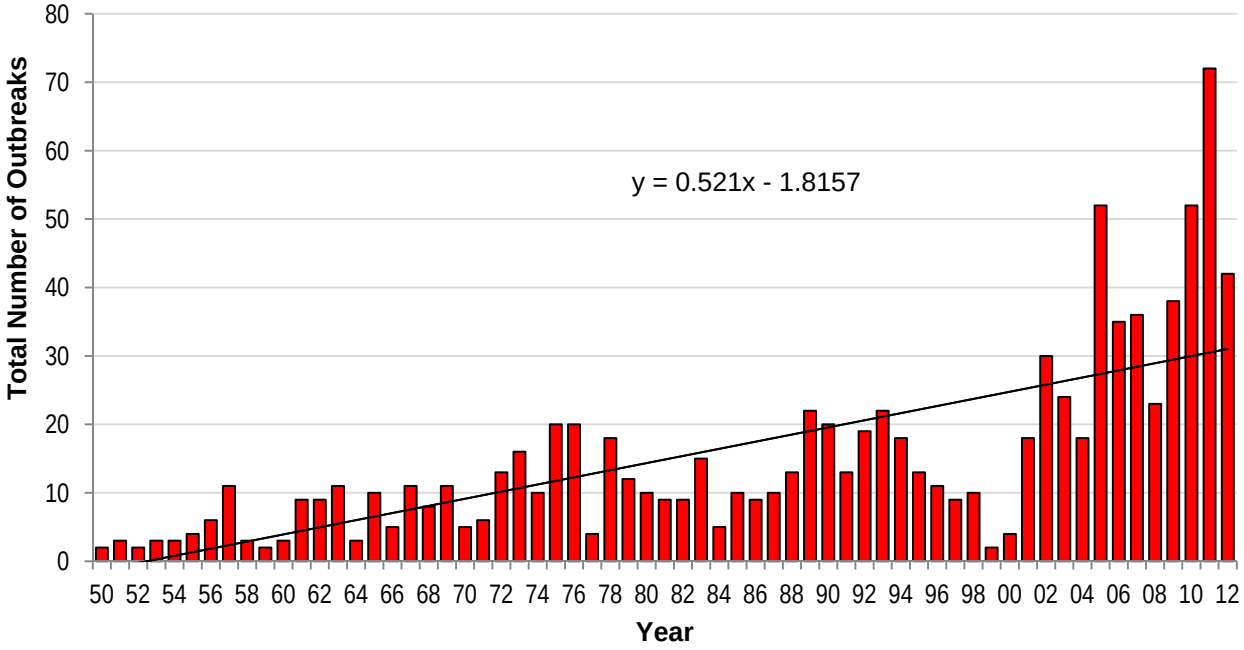
Health professionals are required by law to report selected infectious diseases (excluding STD, HIV and TB) to the Louisiana Office of Public Health Infectious Disease Epidemiology Section (IDES). Section epidemiologists look at the number of cases, their location and numerous other characteristics to study the distribution of these diseases and to draw some conclusions that guide the communicable disease control programs. This allows for the implementation of important preventive measures such as chemoprophylaxis to prevent invasive disease in close contacts of cases with meningococcal disease. Furthermore, section epidemiologists work closely with regional Disease Surveillance Specialists (DSS) for timely and accurate follow-up on suspected and confirmed cases.

Disease outbreaks are identified by the reportable disease surveillance system or by reports from the public or health professionals. Outbreak investigations have been expanded beyond the usual foodborne outbreaks to include arthropod-borne diseases, hospital acquired infections and other infectious disease outbreaks in institutions. Investigations are carried out by regional teams that are supported by the section's staff. Regional personnel including Infectious Disease-Rapid Response Team (ID-RRT) staff are regularly trained by the section.

2. Outbreak Summary 1950-2012

Infectious disease surveillance information in Louisiana is available from 1950 until the present day. From 1950 to 2012, there were a total of 937 recorded outbreaks in Louisiana (Figure 1).

Figure 1: Summary of total recorded outbreaks - Louisiana, 1950-2012



The number of outbreaks has steadily increased in the 62-year span; however this could be partly due to improved surveillance and reporting rather than an actual increase in the number of outbreaks. Referring to the peak in 2005, 60% of the outbreaks occuring that year were during the month of September, coinciding with the aftermath of Hurricane Katrina; 31%of those were foodborne.

3. Outbreaks 2010 to 2012

Outbreaks have been primarily categorized by transmission type. For analyses purposes, 12 categories have been designated. Foodborne/enteric outbreaks have been by far the most common type of outbreak in Louisiana, accounting for 44% of the outbreaks. Respiratory outbreaks have made up between 10% to 26% of the outbreaks over the last three years (Table 1).

Table 1: Number of outbreaks, by category and year - Louisiana, 2010-2012

EtiologyGroup	2010	2011	2012	Total
Arbovirus	0	0	0	0
Foodborne /Enteric	28	27	18	73
Fungal	0	1	0	1
HAI*	1	3	0	4
Hepatitis	0	0	0	0
Other	0	1	2	3
Parasite	4	12	3	19
Respiratory	10	7	11	28
SSTI**	3	2	2	7
Virus	4	2	6	12
Waterborne	0	1	0	1
Zoonosis	0	1	0	1
Total	**52**	**72**	**42**	**166**

* *HAI: hospital-acquired infection SSTI: Skin and soft tissue infection*
** *SSTI: Skin and soft tissue infection*

Between 2010 and 2012, there were no outbreaks caused by arboviruses or hepatitis, and few outbreaks causes by waterborne pathogens or by zoonosis. In the years 2010 to 2012, the causes of outbreaks were: parasites 7% to17%; skin and soft tissue infections 3% to 6%; viruses 3% to14% (Figure 2, Table 2).

Figure 2: The most common outbreaks, by transmission type - Louisiana, 2010-2012

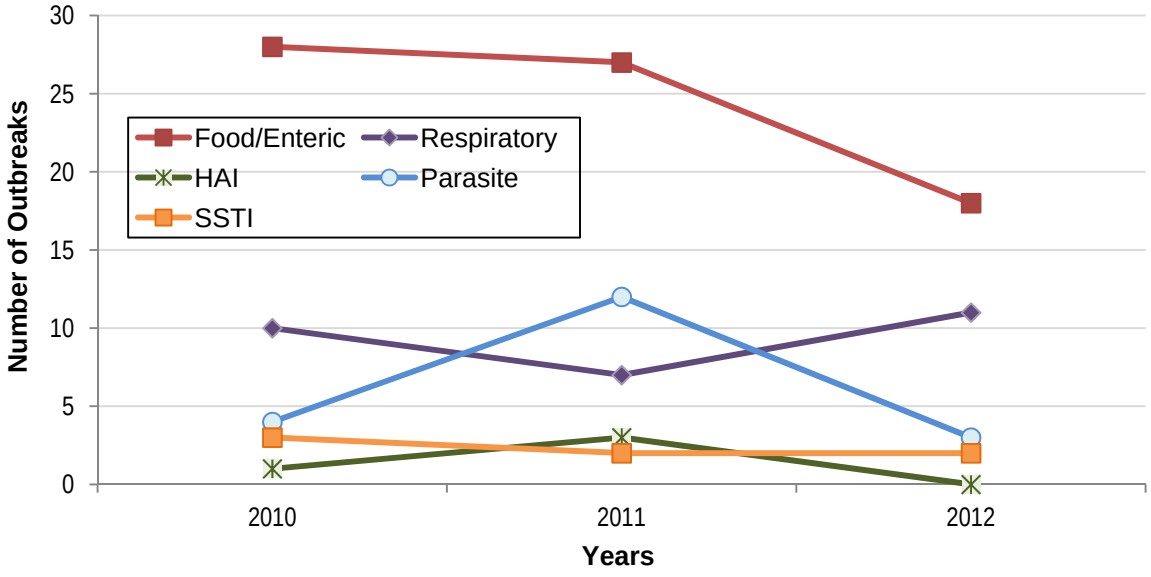


Table 2: Number of outbreaks, by simplified category – Louisiana, 2010-2012

Numbers	**2010**	**2011**	**2012**	**Total**
Food/Enteric	28	27	18	73
Respiratory	10	7	11	28
HAI	1	3	0	4
Parasite	4	12	3	19
SSTI	3	2	2	7
Total	**46**	**51**	**34**	**131***
Column Percent	**2010**	**2011**	**2012**	**Total**
Food/Enteric	60.1	52.9	52.9	55.7
Respiratory	21.7	13.7	32.4	21.4
HAI	2.2	5.9	0	3.1
Parasite	8.7	23.5	8.8	14.5
SSTI	6.5	3.9	5.9	5.3
Total	**100**	**100**	**100**	**100**

*There were 35 outbreaks that were not classified in these five categories.

The type of facility in which outbreaks occur often vary by the transmission mode of the disease. However, a commonality between all of these facilities is that they allow for large numbers of people to come in close contact with each other at any given point. This environment is conducive for diseases to spread (Table 3).

Table 3: Foodborne, Respiratory, Parasite and SSTI outbreaks, by facility type - Louisiana, 2010-2012

2010-2012	Numbers						Column Percent				
Facility	FoodBorne /Enteric	Respiratory	HAI	Parasite	SSTI	Total	FoodBorne /Enteric	Respiratory	HAI	Parasite	SSTI
Area	10			1		11	14.9			6.7	
Correction	2	1		1	1	5	3.0	3.6		6.7	14.2
DayCare	5	2				7	7.5	7.1			
Group Party	2					2	3.0				
LTCF	14	8		4	1	27	20.9	28.6		26.7	14.2
Medical	6	4	3	1	2	16	9.0	14.3	100	6.7	28.6
Other	3			1		4	4.5			6.7	
Outside Party	3					3	4.5				
Private Party	9	8		5		22	13.4	28.6		33.3	
Restaurant	9					9	13.4				
School	4	4		2	3	13	6.0	14.3		13.3	42.9
Ship		1				1		3.6			
Total	**67**	**28**	**3**	**15**	**7**	**120**					

The settings for these investigations were: Area (geographical area such as a city, parish or region), correctional facilities, day care center, school, medical facility, long term care facility (LTCF), restaurant, group party, private party, outside party (picnic, campsite), and ships.

Long term care facilities, geographic areas, restaurants and private parties are the main settings for foodborne and enteric disease outbreaks. The main settings for respiratory outbreaks are long term care facilities and private residences.

3.1 Hospitalizations

The following data shows outbreaks for which there was information on hospitalizationa. The proportion of outbreaks with hospitalized cases vary according to the type of outbreak (highest in foodborne outbreaks, lowest for SSTI), and with the period considered. The number of cases hospitalized is 4.0 per outbreak with hospitalized cases (Table 4).

Table 4: Hospitalizations – Louisiana, 2010-2012

2010-2012	Total Number	Number with Hospitalization	Percent with Hospitalization	Number Hospitalized	Avg /Hosp
Food/Enteric	67	25	37.3	82	3.3
Parasite	15	4	26.7	7	1.8
Respiratory	28	6	21.4	28	4.7
SSTI	7	1	14.3	2	2
Total	**117**	**36**	**30.8**	**119**	**3.3**

3.2 Deaths

Following are deaths associated with outbreaks (Table 5).

Table 5: Deaths – Louisiana, 2010-2012

Year	Category	Etiologic Agent	Facility Type	Number
2010	Food/Enteric	Perfringens	Other	3
2010	HAI	Acinetobacter	Med	2
2010	Food/Enteric	Listeria	Area	2
2011	HAI	Pseudomonas	Med	4
2011	Food/Enteric	Norovirus	LTCF	3
2011	HAI	Acinetobacter	Med	2
2011	Parasite	Balamuthia	Private	1
2011	Waterborne	Francisella novicida	Correction	1
2011	Respiratory	Influenza	LTCF	1
2011	Parasite	Naegleria	Private	1
2011	SSTI	MRSA	LTCF	1
2011	Parasite	Naegleria	Private	1
2011	HAI	Klebsiella	Med	1
2012	Food/Enteric	E. coli	Area	1

3.3 Foodborne/Enteric Outbreaks

A foodborne illness results from the consumption of foods contaminated with biological pathogens or toxins. The symptoms can include nausea, vomiting, abdominal pain, diarrhea, fever, headache and fatigue. In Louisiana there were 73 foodborne/enteric outbreaks reported between 2010 and 2012. Geographic areas, long term care facilities, private settings, and restaurant settings were the focal facility types where foodborne outbreaks were concentrated.

The most common etiologic agents of foodborne/enteric outbreaks were Norovirus, *Shigella* spp. (typically sonnei), and an unknown enteric pathogen (Tables 6 and 7).

Table 6: Most common etiologic agents of foodborne/enteric outbreaks - Louisiana, 2010-2012

Foodborne/Enteric	2010	2011	2012	Total
E. coli	0	2	3	5
Enteric Pathogen	2	5	2	9
Food Toxin	1	1	0	2
Foodborne Pathogen	6	0	8	14
Norovirus	14	11	5	30
Salmonella	1	2	1	4
Shigella	3	3	3	9
Total	**27**	**24**	**22**	**73**
Percent				
Enteric Pathogen	7.4	20.8	9.0	12.3
Food Toxin	3.7	4.2	0	2.7
Foodborne Pathogen	22.2	0	36.4	19.2
Norovirus	51.9	45.9	22.7	41.1
Salmonella	3.7	8.3	4.5	5.5
Shigella	11.1	12.5	13.6	12.3

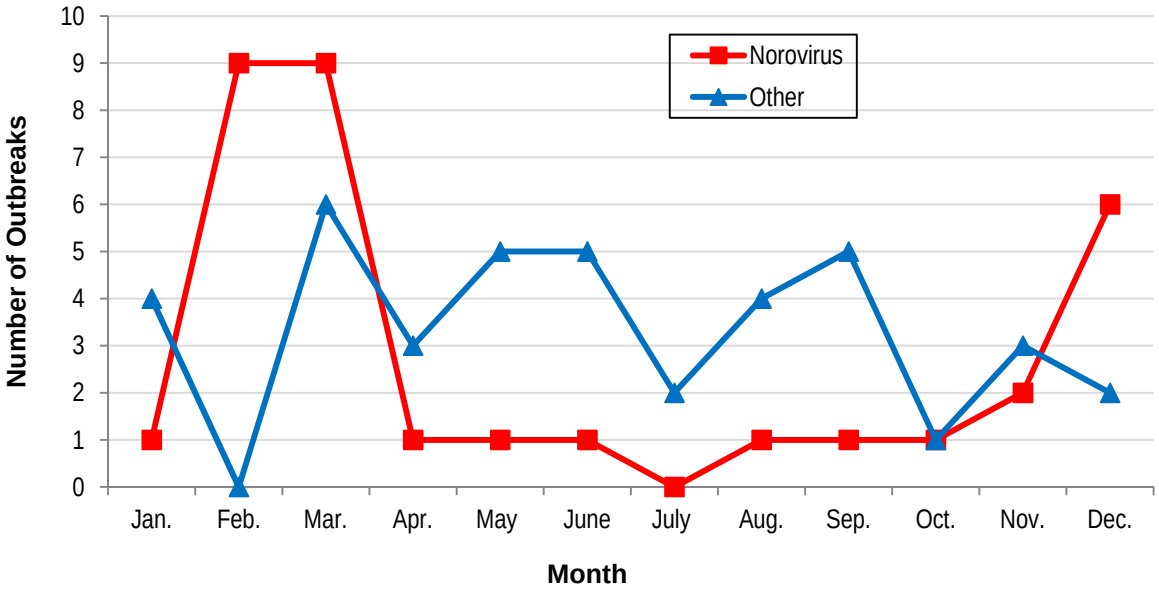
Table 7: Location of foodborne/enteric outbreaks by parish - Louisiana, 2010-2012

Parish or Region	2010-2012		
	Number	Population in 100,000	Rate /100,000
Region 1	28	84	0.33
East Baton Rouge	21	44	0.48
Region 2 - EBR	10	24	0.42
Region 3	12	55	0.22
Region 4 - Lafayette	12	25	0.48
Lafayette	13	22	0.59
Region 5	13	34	0.38
Region 6	12	33	0.36
Region 7	11	66	0.17
Region 8	10	34	0.29
Region 9	23	40	0.58
Total	**165**	**457**	**0.36**

3.4 Seasonal Trends

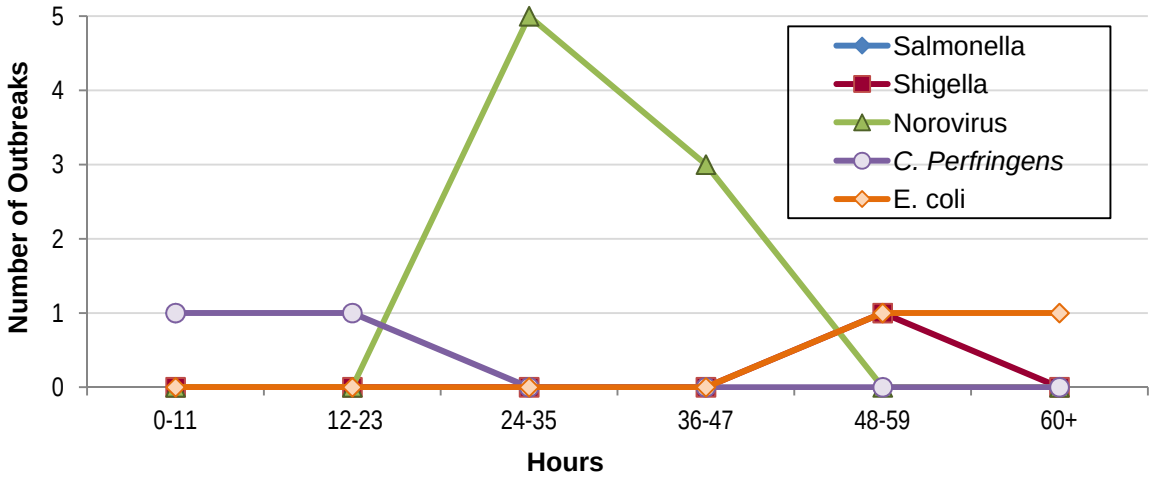
The seasonal trends are displayed for confirmed norovirus outbreaks (higher in the winter months), and for etiologies other than norovirus (higher in the warmer months), (Figure 3).

Figure 3: Seasonal transmission patterns of foodborne/enteric outbreaks – Louisiana 2010-2012



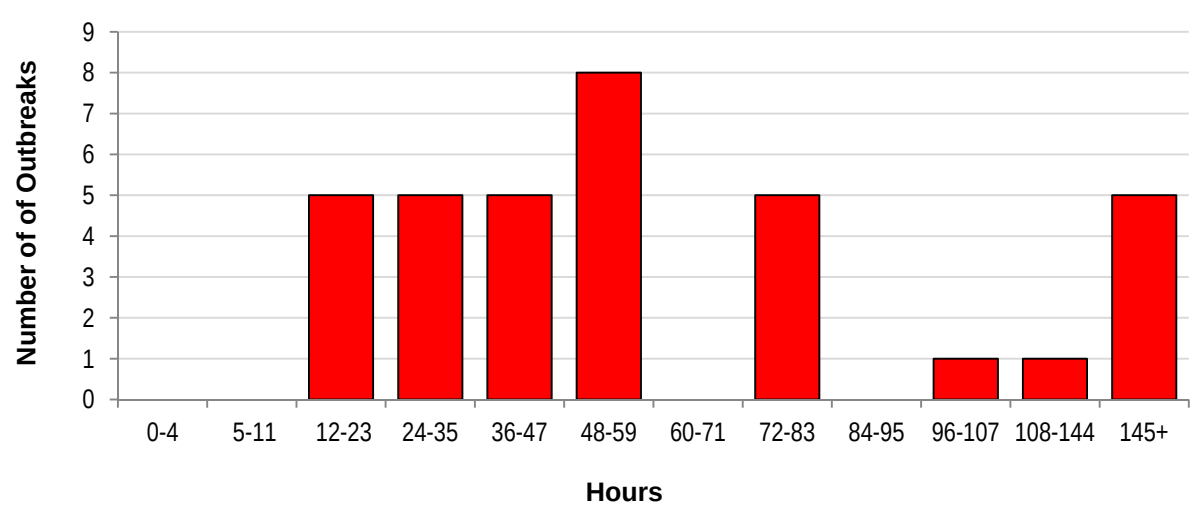
The time between infection and first onset of symptoms is known as the incubation period. This can vary between different organisms. Norovirus typically has an incubation period of 12 to 36 hours. *C. perfringens* emits an enterotoxin after being ingested and has an incubation period of eight to 16 hours. *Shigella* has an incubation period of 24 to 48 hours and pathogenic *E. coli* has an incubation period ranging from one to eight days (Figure 4).

Figure 4: Mean incubation periods of most common etiologic agents of foodborne/enteric outbreaks Louisiana, 2010-2012



The reported average duration of enteric symptoms per case for each outbreak lasted typically between 12 hours to three days after onset of illness. However, some cases reported symptoms lasting six days or longer (Figure 5).

Figure 5: Mean duration of illness in foodborne/enteric outbreaks – Louisiana, 2010-2012



3.5 Respiratory Outbreaks

Respiratory illnesses are easily transmitted to those in close contact due to respiratory droplets produced from coughing, sneezing and talking. Improper hand washing and sharing personal items with ill persons can also lead to disease transmission. In Louisiana, there were 27 reported respiratory-related outbreaks between 2010 and 2012 (Table 8).

Table 8: Most common etiologic agents of respiratory outbreaks - Louisiana, 2010-2012

Etiology	2010	2011	2012	Total
Influenza	3	4	5	12
H. influenzae				
Strepto/Pneumo	1			1
Pertussis	4	3	4	11
Legionella				
Virus				
Meningo	1			1
MRSA				
Other	1		2	3
Total	**10**	**7**	**11**	**27**

3.6 SSTI: Skin and Soft Tissue Infections

Between 2010 and 2012, all of the outbreaks related to skin and soft tissue infections (SSTI) were caused by the bacterium *Staphylococcus aureus;* 43% were due to MRSA and 57% were due to *Staphylococcus aureus*.

The facilities where these SSTI outbreaks occurred were schools (43%), hospitals (29%), long term care facilities (14%), and prisons (14%).

3.7 Other Outbreaks

There were 40 outbreaks caused by various other etiologic agents or unknown etiologic agents between 2010 and 2012 (Table 9).

Table 9: Etiologic agents/illness types of other outbreaks – Louisiana, 2010-2012

Etiologic Agent/ Illness Type	2010	2011	2012	Total
Arbovirus	0	0	0	0
Fungus	0	1	0	1
HAI	1	3	0	4
Other	0	1	2	3
Parasite	4	12	3	19
Virus	4	2	6	12
Water	0	0	0	0
Zoonosis	0	1	0	1
Total	**9**	**20**	**11**	**40**

4. Outbreaks 1950 to 2009

Outbreaks have been primarily categorized by transmission type. For analyses purposes, 14 categories have been designated. Foodborne/enteric outbreaks have been by far the most common type of outbreak in Louisiana, accounting for more than 50% of the total outbreaks observed from 1950 to 2009. Respiratory outbreaks are the second most common (11%), and the remaining individual types of outbreaks account each for 8% or less of the total observed outbreaks (Table 10).

Table 10: Number of outbreaks, by category and decade - Louisiana, 1950-2009

Etiology Group	5059	6069	7079	8089	9099	0009	Total
Arbovirus	0	0	2	0	1	0	4
Foodborne /Enteric	20	59	66	51	85	189	470
Fungal	0	1	0	0	0	4	5
HAI	0	1	1	6	2	4	14
Hepatitis	3	9	21	13	16	3	65
Other	1	1	2	0	2	4	10
Parasite	0	1	2	10	1	13	27
Respiratory	3	0	6	26	18	32	85
SSTI	0	7	6	3	8	12	36
Virus	0	0	11	2	1	15	29
Waterborne	1	0	2	0	0	1	4
Zoonosis	6	1	5	1	2	1	16
Total	**34**	**80**	**124**	**112**	**136**	**279**	**765**

The number of foodborne/enteric outbreaks has showed the greatest increase since 1950 with more resources having been spent on investigating food-borne outbreaks. These resources include more staff time, additional lab tests making it easier to identify food-borne pathogens and genetic finger-printing (PFGE) allowing to link cases into outbreaks.

Outbreaks of respiratory diseases were rarely investigated until the 1980's, when lab diagnostics and detection improved.

Prior to 2000, the majority of hepatitis outbreaks were attributed to hepatitis A. Due to better control efforts, incidence has been decreasing.

Skin and soft tissue infection (SSTI) outbreaks had remained low until recent years and since, have been on the rise due to the increase in Methicillin-Resistant *Staphylococcus Aureus* (MRSA) skin infections (Figure 6, Table 11).

Figure 6: The most common outbreaks, by transmission type and decade - Louisiana, 1950-2009

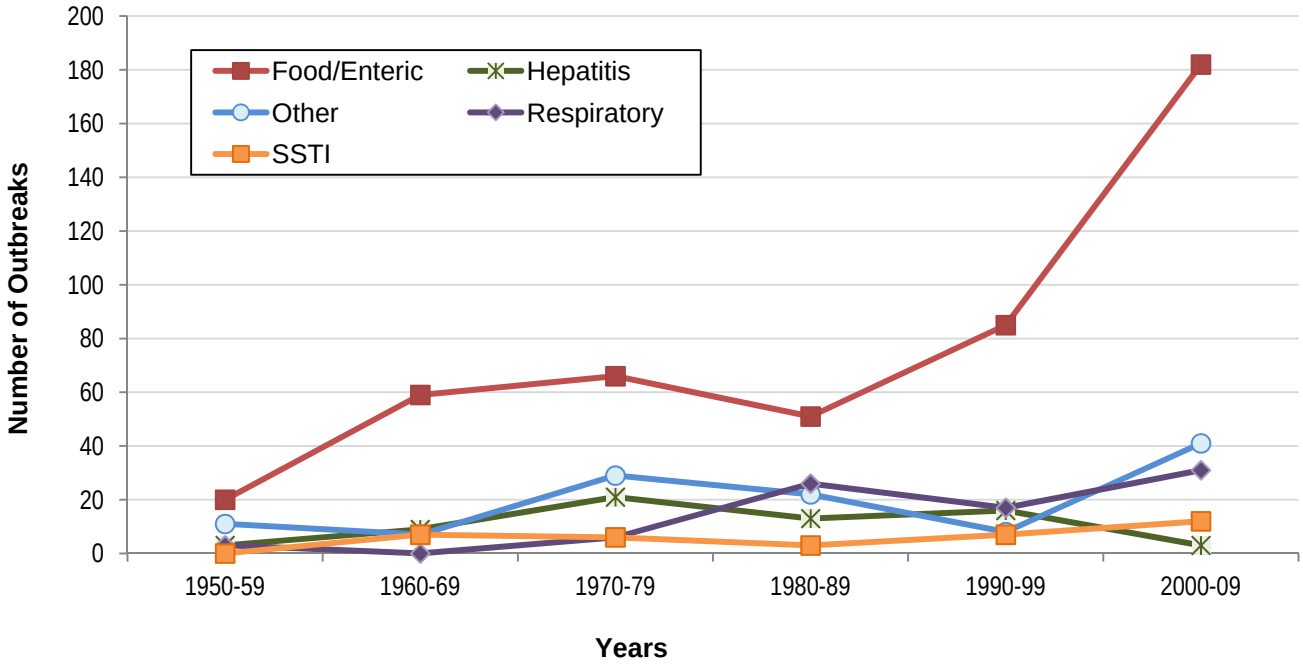


Table 11: Number of outbreaks, by simplified category and decade - Louisiana, 1950-2009

Numbers	**1950-59**	**1960-69**	**1970-79**	**1980-89**	**1990-99**	**2000-09**	**Total**
Food/Enteric	20	59	66	51	85	189	470
Hepatitis	3	9	21	13	16	3	65
Other	8	5	25	19	9	43	109
Respiratory	3	0	6	26	18	32	85
SSTI	0	7	6	3	8	12	36
Total	34	80	124	112	136	279	765
Column Percent	**1950-59**	**1960-69**	**1970-79**	**1980-89**	**1990-99**	**2000-09**	**Total**
Food/Enteric	58.8	73.8	53.2	45.5	62.5	67.7	61.4
Hepatitis	8.8	11.3	16.9	11.6	11.8	1.1	8.5
Other	23.5	6.3	20.2	17.0	6.6	15.4	14.2
Respiratory	8.8	0.0	4.8	23.2	13.2	11.5	11.1
SSTI	0.0	8.8	4.8	2.7	5.9	4.3	4.7
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

The types of facility in which outbreaks occur often vary by the transmission mode of the disease. However, a commonality between all of these facilities is that they allow for large

numbers of people to come in close contact with each other at any given point. This environment is conducive for diseases to spread (Table 12).

Table 12: Foodborne, Respiratory, Hepatitis and SSTI outbreaks, by facility type - Louisiana, 1950-1999

1950-1999	Numbers						Column Percent				
Facility Total 486 Missing data 192	**FoodBorne /Enteric**	**Respiratory**	**Hepatitis**	**SSTI**	**Other**	**Total**	**FoodBorne /Enteric**	**Respiratory**	**Hepatitis**	**SSTI**	**Other**
Area	7	2	1	0	7	17	4.0	4.7	2.8	0.0	28.0
Correction	16	0	3	0	0	19	9.1	0.0	8.3	0.0	0.0
DayCare	8	21	14	0	1	44	4.6	48.8	38.9	0.0	4.0
Food Supplier	6	1	0	1	0	8	3.4	2.3	0.0	6.7	0.0
Group Party	17	1	1	1	1	21	9.7	2.3	2.8	6.7	4.0
LTCF	6	8	1	8	0	23	3.4	18.6	2.8	53.3	0.0
Medical	16	4	1	3	9	33	9.1	9.3	2.8	20.0	36.0
Other	0	1	0	0	0	1	0.0	2.3	0.0	0.0	0.0
Outside Party	8	1	1	0	0	10	4.6	2.3	2.8	0.0	0.0
Private Party	21	2	0	0	5	28	12.0	4.7	0.0	0.0	20.0
Restaurant	22	1	2	0	1	26	12.6	2.3	5.6	0.0	4.0
School	47	0	12	2	1	62	26.9	0.0	33.3	13.3	4.0
Ship	1	1	0	0	0	2	0.6	2.3	0.0	0.0	0.0
Total	**175**	**43**	**36**	**15**	**25**	**294**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

The settings for these investigations were: Area (geographical area such as a city, parish or region), correctional facilities, day care center, school, medical facility, long term care facility (LTCF), restaurant, food supplier, group party, private party, outside party (picnic, campsite), ship.

School, restaurant and private parties are the main settings for food-borne outbreaks. Schools may be over-represented in comparison with the other two settings because school officials would be eager to get an investigation done, while for restaurants and private parties, reporting may be often missed.

The main setting for respiratory outbreaks is day care centers, probably due to enhanced concerns by the parents. Schools and day care are the main settings for hepatitis outbreaks (Table 13).

Table 13: Foodborne, Respiratory, SSTI and other outbreaks, by facility type
Louisiana, 2000-2009

2000-2009	Numbers					Column Percent				
Facility Total 279 Missing data 1	**FoodBorne /Enteric**	**Respiratory**	**SSTI**	**Other**	**Total**	**FoodBorne /Enteric**	**Respiratory**	**SSTI**	**Other**	**Total**
Area	2	4	1	5	12	1.1	12.5	8.3	10.9	4.3
College	0	1	0	0	1	0.0	3.1	0.0	0.0	0.4
Correction	11	1	1	0	13	5.9	3.1	8.3	0.0	4.7
DayCare	10	1	0	6	17	5.3	3.1	0.0	13.0	6.1
Dormitory other	0	0	1	3	4	0.0	0.0	8.3	6.5	1.4
Food Supplier	7	0	0	1	8	3.7	0.0	0.0	2.2	2.9
Group Party	3	0	3	1	7	1.6	0.0	25.0	2.2	2.5
LTCF	31	4	0	7	42	16.5	12.5	0.0	15.2	15.1
Medical	31	8	2	11	52	16.5	25.0	16.7	23.9	18.7
Office	0	1	0	0	1	0.0	3.1	0.0	0.0	0.4
Other	7	1	0	0	8	3.7	3.1	0.0	0.0	2.9
Outside Party	3	0	1	2	6	1.6	0.0	8.3	4.3	2.2
Private Party	16	0	1	4	21	8.5	0.0	8.3	8.7	7.6
Restaurant	42	0	0	1	43	22.3	0.0	0.0	2.2	15.5
School	21	11	2	4	38	11.2	34.4	16.7	8.7	13.7
Ship	4	0	0	1	5	2.1	0.0	0.0	2.2	1.8
Total	**182**	**32**	**12**	**46**	**278**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

The column hepatitis is no longer presented since the number of outbreaks is so small. Outbreaks of hepatitis are lumped together with others.

4.1 Hospitalizations and Deaths

The following data shows outbreaks for which there were information on hospitalization. The proportion of outbreaks with hospitalized cases vary according to the type of outbreak (highest in respiratory outbreaks, lowest for SSTI), and with the period considered. The proportion of outbreak with hospitalized cases increased from 12% before the year 2000 to 24% after the year 2000. The increase is due to intensified efforts at documenting all aspects of outbreaks after the year 2000. The number of cases hospitalized is 4.0 per outbreak with hospitalized cases (Table 14).

Table 14: Hospitalizations – Louisiana, 1950-2009

1950 to 1999	Total Number	Number with Hospitalization	Percent with Hospitalization	Number Hospitalized	Avg /Hosp
Food/Enteric	281	27	9.6%	153	5.7
Hepatitis	62	2	3.2%	5	2.5
Other	66	7	10.6%	22	3.1
Respiratory	53	22	41.5%	58	2.6
SSTI	24	3	12.5%	13	4.3
Total	486	61	12.6%	251	4.1
2000 to 2009	**Total Number**	**Number with Hospitalization**	**Percent with Hospitalization**	**Number Hospitalized**	**Avg /Hosp**
Food/Enteric	189	46	24.3%	153	3.3
Hepatitis	3	1	33.3%	5	5.0
Other	43	10	23.3%	22	2.2
Respiratory	32	10	31.3%	58	5.8
SSTI	12	2	16.7%	13	6.5
Total	279	69	24.7%	251	3.6

4.2 Deaths

There were very few deaths associated with the following outbreaks (Table 15).

Table 15: Deaths associated with outbreaks - Louisiana, 1950-2009

Year	Category	Etiological Agent	Facility Type	Number
2005	Food/Enteric	Norovirus	Nursing Home	1
2003	Respitatory	Pertussis	Hospital	1
2002	Other	Echovirus 7	Hospital	3
2002	Respiratory	Influenza A	Nursing Home	1
1998	Respiratory	Meningococcal Meningitis	Residential Facility	1
1980	Other	Trichinosis	City	1

4.3 Foodborne/Enteric Outbreaks

Foodborne illness results from the consumption of foods contaminated with biological pathogens or toxins. The symptoms can include nausea, vomiting, abdominal pain, diarrhea, fever, headache and fatigue. In Louisiana, there have been from 60 to 90 foodborne outbreaks per decade since 1950 with a sharp increase to 180 for the decade from 2000 to 2009. This sharp increase is due to a forward leaning robust response posture to outbreaks including: investigating all reported outbreaks, completion of investigations in a timely fashion, systematical provision of feed-back and enhanced use of laboratory support.

From 1950 through 1999, the majority of foodborne outbreaks occurred in schools, households/private parties, restaurants and prisons (Table 12). Since 2000, restaurants, hurricane shelters, nursing homes and schools have been the focal facility types where foodborne outbreaks have been concentrated (Table 13).

The average number of cases per outbreak from 1950 to 1999 has been 58 persons with a range from two to 870 cases per outbreak and a total number of 6,044 cases. The average number of cases per outbreak from 2000 to 2009 has been 28 persons with a range from two to 332 cases per outbreak and a total number of 4,957 cases.

The most common etiologic agents of foodborne/enteric outbreaks are Norovirus, *Salmonella* spp., *Shigella* spp. (typically sonnei), *Clostridium perfringens* and *Staphylococcus aureus*, respectively (Table 16).

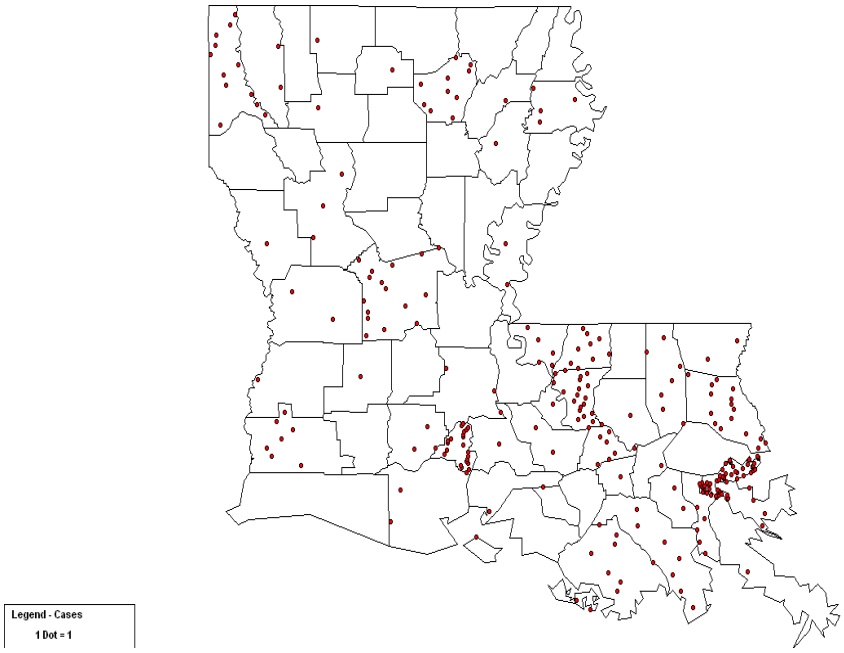
Table 16: Most common etiologic agents of foodborne/enteric outbreaks, by decade
Louisiana, 1950-2009

FoodBorne/Enteric	1950-59	1960-69	1970-79	1980-89	1990-99	2000-09	Total
E. coli	0	1	0	0	2	0	3
Enteric Pathogen	12	36	37	21	21	84	211
Food Toxin	0	9	3	7	14	22	55
GI Virus	0	0	0	0	0	2	2
Norovirus	0	0	0	1	27	46	74
Salmonella	8	13	14	7	13	14	69
Shigella	0	0	8	8	8	13	37
Vibrio	0	0	4	7	0	1	12
Total	20	59	66	51	85	182	463
Percent	**1950-59**	**1960-69**	**1970-79**	**1980-89**	**1990-99**	**2000-09**	**Total**
Enteric Pathogen	60.0	61.0	56.1	41.2	24.7	46.2	45.6
Food Toxin	0.0	15.3	4.5	13.7	16.5	12.1	11.9
Norovirus	0.0	0.0	0.0	2.0	31.8	25.3	16.0
Salmonella	40.0	22.0	21.2	13.7	15.3	7.7	14.9
Shigella	0.0	0.0	12.1	15.7	9.4	7.1	8.0

Norovirus has accounted for an increasing proportion of cases after 1990 (32% and 25%) followed closely by food toxin (16% and 12%, *C. perfringens* mostly). The proportions of Samonella and Shigella have remained constant. The proportion of outbreaks without identification of an etiologic agent decreased from 60% in the 1950s to 45% currently. This demonstrates the result of improved diagnostics and surveillance capabilities over the past few decades, which could account for the large increases in Norovirus and *C. perfringens*.

Although the occurrence of foodborne/enteric outbreaks is spread across the state, the majority have been concentrated in Orleans & Jefferson Parishes (27% of total foodborne/enteric outbreaks) (Figure 7).

Figure 7: Location of foodborne/enteric outbreaks, by parish - Louisiana, 2000-2009



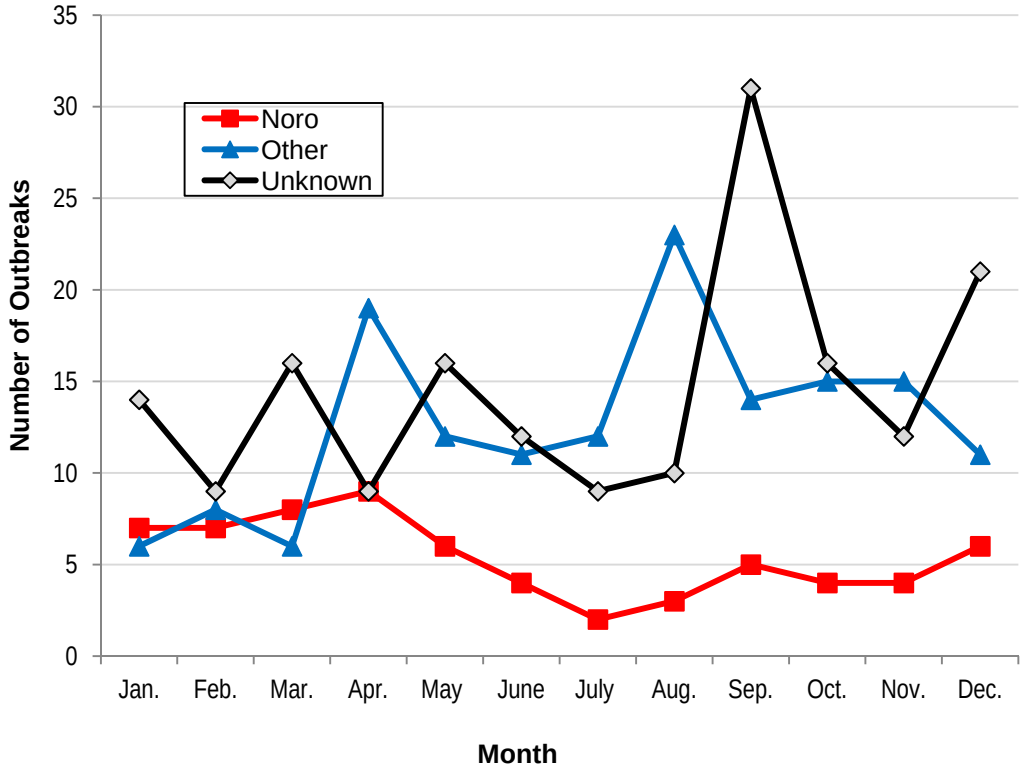
The incidence of foodborne/enteric outbreaks in Louisiana has ranged from 0.07 to 0.17 outbreaks per 100,000 population by region/parish from 1950 through 1999 and ranged from 0.12 to 0.83 outbreaks per 100,000 population by region/parish from 2000 through 2008. Lafayette parish and Region 2 (Baton Rouge area) exhibited the greatest increase of rates between 1950 to1999 and 2000 to 2008 (Table 17).

Table 17: Location of foodborne/enteric outbreaks, by parish and decades
Louisiana, 1950-2009

Parish or Region	1950-99			2000-09		
	Number	Population in 100,000	Rate /100,000	Number	Population in 100,000	Rate /100,000
Region 1	135	466	0.29	73	93	0.78
East Baton Rouge	23	145	0.16	20	42	0.48
Region 2 - EBR	10	70	0.14	25	21	1.19
Region 3	31	165	0.19	20	43	0.47
Region 4 - Lafayette	25	131	0.19	12	36	0.33
Lafayette	9	59	0.15	23	18	1.28
Region 5	17	114	0.15	9	28	0.32
Region 6	28	117	0.24	20	30	0.67
Region 7	31	230	0.13	20	53	0.38
Region 8	23	163	0.14	16	35	0.46
Region 9	45	124	0.36	25	46	0.54
Total	**377**	**1,811**	**0.21**	**263**	**445**	**0.59**

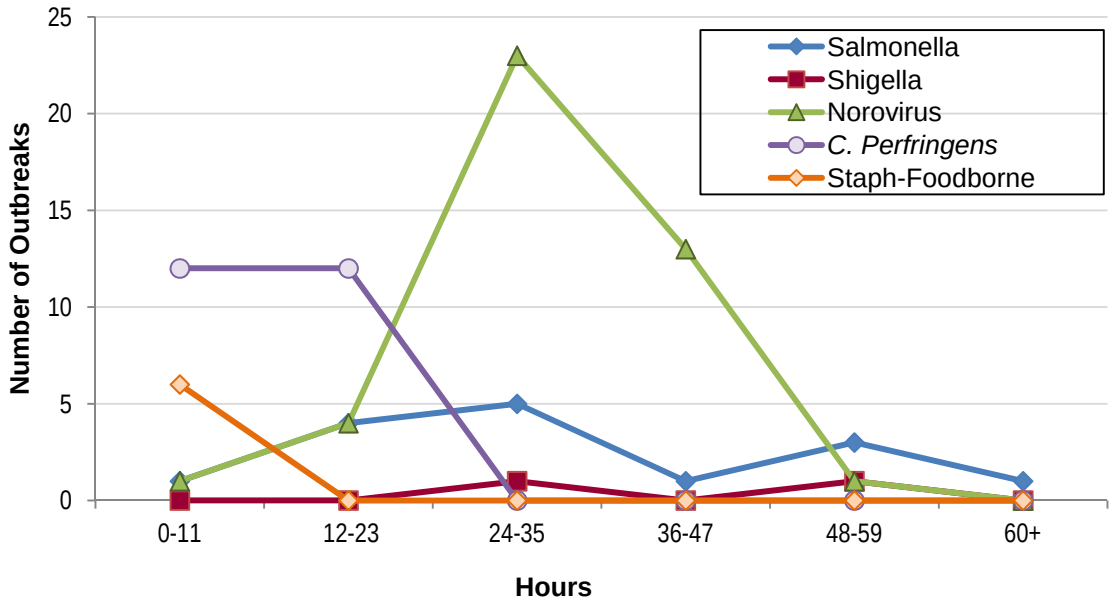
Seasonal trends are displayed for confirmed norovirus outbreaks (higher in the winter months), for confirmed etiologies except norovirus (high peak in September) and those with unknown etiology (peak in April and August) (Figure 8).

Figure 8: Seasonal transmission patterns of foodborne/enteric outbreaks – Louisiana 1950-2009



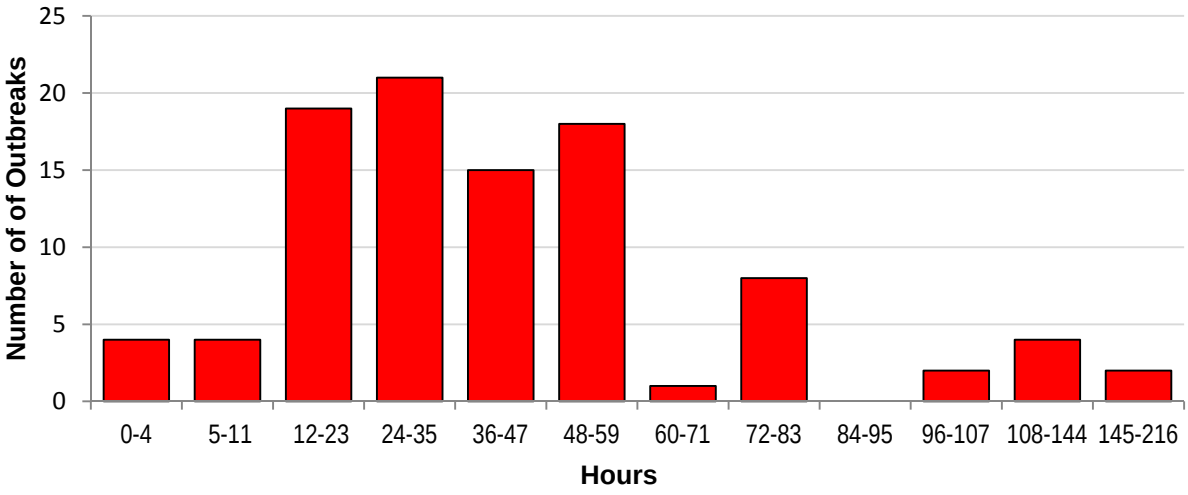
The time between infection and first onset of symptoms is known as the incubation period. This can vary between different organisms. Foodborne *S. aureus* causes illness quickly by emitting an enterotoxin once consumed. The observed mean incubation period for outbreaks due to *S. aureus* lasted no more than 11 hours. *Clostridium perfringens* also emits an enterotoxin after ingested. Mean incubation periods for *C. perfringens* lasted less than one day. The remaining pathogens' incubation periods show greater variations (Figure 9).

Figure 9: Mean incubation periods of most common etiologic agents of foodborne/enteric outbreaks – Louisiana, 1950-2009



The reported average duration of enteric symptoms per case for each outbreak lasted typically between 12 hours to 2.5 days after onset of illness. However, some cases reported symptoms lasting for up to nine days (Figure 10).

Figure 10: Mean duration of illness in foodborne/enteric outbreaks - Louisiana, 1950-2008



4.4 **Respiratory Outbreaks**

Respiratory illnesses are easily transmitted to those in close contact due to respiratory droplets produced from coughing, sneezing and talking. Improper hand washing and sharing personal items with ill persons can also lead to disease transmission. In Louisiana from 1950 through 2009, there have been a reported total of 85 respiratory-related outbreaks.

The main etiologic agents of respiratory-related outbreaks in Louisiana during this time period are *Haemophilus influenzae, Neisseria meningitidis,* Streptococcus spp., Influenza Type A, *Legionella pneumophila* and *Bordetella pertussis*, respectively. *H. influenzae* has accounted for 20% of the total number of respiratory-related outbreaks, followed closely by *N. meningitidis* at 17% (Table 18).

Table 18: Most common etiologic agents of respiratory outbreaks, by decade
Louisiana, 1950-2009

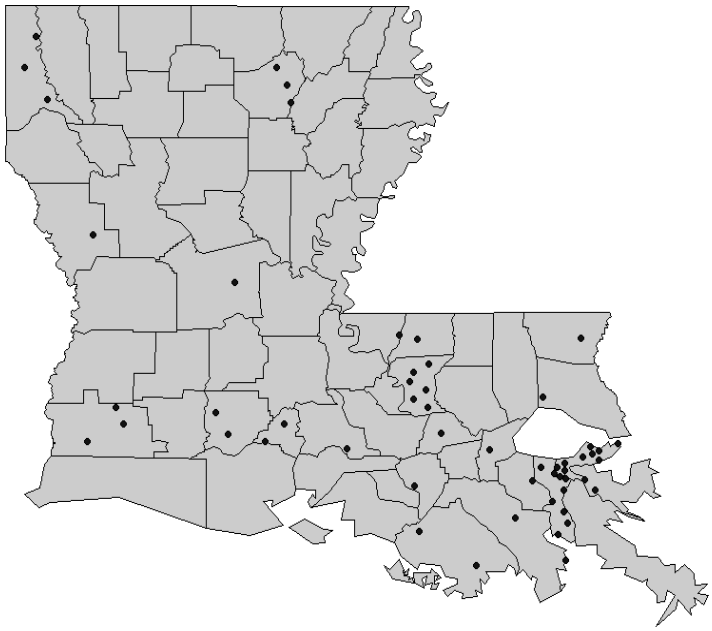
Etiology	1950-59	1960-69	1970-79	1980-89	1990-99	2000-09
Influenza	1	0	2	2	3	7
H. influenzae	0	0	1	12	1	0
Strepto/Pneumo	2	0	1	0	2	6
Pertussis	0	0	0	3	0	4
Legionella	0	0	1	1	2	1
Virus	0	0	0	0	2	2
Meningo	0	0	0	7	3	3
MRSA	0	0	0	0	0	1
Other	0	0	1	1	3	5
Total Respiratory	**3**	**0**	**6**	**26**	**16**	**29**

There has been a sharp decrease in the number of *H. influenzae* outbreaks since the 1980's due to the advent of the Hib vaccine in 1985. In 1987, the vaccine was reformulated to be effective in children younger than18 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%.

Forty nine percent of the respiratory-related outbreaks in Louisiana occurred in day care facilities prior to 2000, along with an additional 19% occurring in nursing homes and hospitals/ clinics (Table12). From 2000-2009, respiratory-related outbreaks have mainly occurred in schools and hospitals/clinics (Table 13). The average number of cases per outbreak from 1950-2008 was 16 persons with a range from one to 275 cases per outbreak.

Respiratory outbreaks have been largely concentrated in Jefferson and Orleans parishes, as well as in East Baton Rouge (Figure 11).

Figure 11: Location of respiratory-related outbreaks, by parish - Louisiana, 1950-2009



There is no definite seasonal trend for respiratory-related outbreaks over the past 59 years. These outbreaks are due to mixture of numerous pathogens, the combination of which yields no obvious seasonal patterns.

4.5 Hepatitis Outbreaks

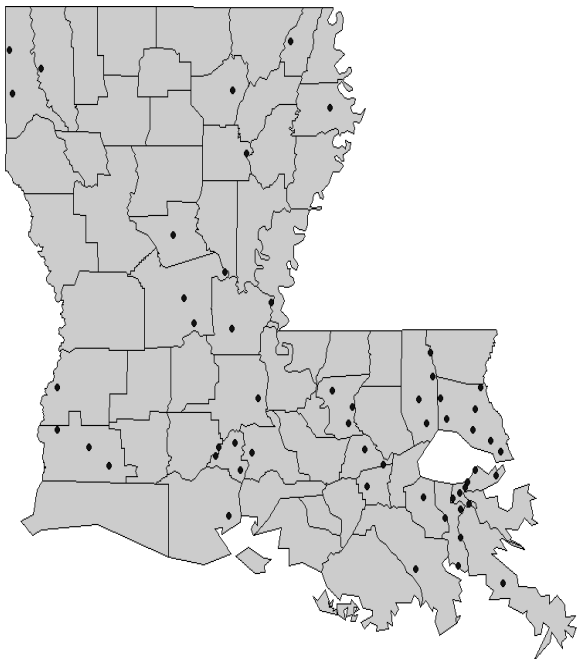
In the United States, hepatitis is most commonly due to types A, B, C and less commonly, due to D and E. Depending on the type of hepatitis virus, the transmission can vary. Types A and E are typically transmitted via the fecal-oral route, type B via blood and other bodily fluids and type C mostly via blood.

From 1950 to 2009, there have been a total of 64 reported outbreaks of hepatitis in Louisiana. Although the virus type of most of these are unknown, particularly prior to the advent and improvement of laboratory diagnostics, the remaining hepatitis outbreaks have been caused by types A, B and E. Type A has been the leading single most common cause of hepatitis outbreaks, accounting for 95% of the total reported hepatitis outbreaks. The majority of Hepatitis A outbreaks occurred from 1970 to1979 (n=20). Since 2000, there has only been one Hepatitis A outbreak. Type B has only accounted for two outbreaks in the 1970's and 80's. Type E accounted for one outbreak in 2007.

Prior to 2000, day cares and schools constituted 42% of the hepatitis outbreak locations-likely due to fecal-oral transmission among children (Tables 11 and 12). Hepatitis outbreaks from 1950-2009 have ranged from one to 72 persons with an average case number of 9.6 persons per outbreak.

St. Tammany, Tangipahoa, Lafayette, Orleans and Jefferson parishes exhibit the most concentrated locations of hepatitis outbreaks from 1950 through 2008 (Figure 12).

Figure 12: Location of hepatitis outbreaks, by parish - Louisiana, 1950-2008



The seasonal trend of hepatitis outbreaks show peaks in June and September.

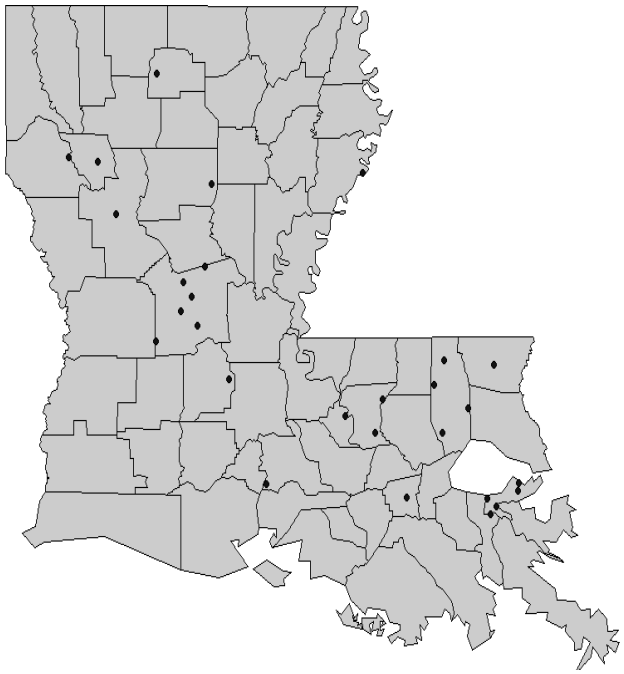
4.6 SSTI: Skin and Soft Tissue Infections

From 1950 to 2009, all of the outbreaks related to skin and soft tissue infections have been caused by the bacterium *Staphylococcus aureus*. However, beginning in 1991, outbreaks caused by the strain of *Staphylococcus aureus* which is resistant to methicillin drugs (commonly called "MRSA") were identified. Out of the 36 total reported SSTI outbreaks in Louisiana, seven (20%) are known to have been caused by MRSA and four are suspected to have been caused by MRSA.

The single most common type of facility where SSTI outbreaks have occurred are nursing homes/residential facilities, accounting for 26% of the total number of SSTI outbreaks in Louisiana from 1950 through 1999. Hospitals/clinics as well as schools were also the major location of SSTI outbreaks prior to 2000 (Table 13). Since 2000, schools and company gatherings have been the main location types of SSTI outbreaks (Table 13).

The majority of SSTI outbreaks have occurred in Rapides and Orleans parishes. Otherwise, there does not appear to be a pattern of SSTI outbreaks across the state (Figure 13).

Figure 13: Location of SSTI outbreaks, by parish - Louisiana, 1950-2009



September and May appear to be the peak months of the year for SSTI outbreaks. Transmission is relatively low and stable the rest of the year.

4.7 Other

There were 108 outbreaks caused by various other etiologic agents or unknown etiologic agents (Table 19).

Table 19: Etiologic agents/illness types of other outbreaks, by decade – Louisiana, 1950-2008

Etiologic Agent/ Illness Type	1950-59	1960-69	1970-79	1980-89	1990-99	2000-09	Total
Arbovirus	0	0	2	0	1	0	3
Fungus	0	1	0	0	0	4	5
HAI	0	1	1	6	2	4	14
Other	1	1	2	0	2	4	10
Parasite	0	1	2	10	1	13	27
Virus	0	0	11	2	1	15	29
Water	1	0	2	0	0	1	4
Zoonosis	6	1	5	1	2	1	16
Total	**8**	**5**	**25**	**19**	**9**	**42**	**108**