
Influenza in Louisiana: An Analysis of Louisiana Influenza Sentinel Surveillance Data, 1998-2004

Erin Stanley, MPH; Theresa M. Sokol, MPH;
Cathy Scott, MT-ASC, MPH; and Raoult C. Ratard, MD, MPH&TM

Analysis of the influenza sentinel surveillance data from the Louisiana Office of Public health showed that the influenza season for Louisiana starts between October and December and ends between December and March. There is no consistent trend as to when the peak of the season occurs. The start of Louisiana's seasons ranged from one week (2002-2003 season) to two months (2001-2002) before the national start date. The finding that Louisiana's flu season starts about the same time as the national flu season is not consistent with the conventional thought that the flu season starts later in the South compared to the rest of the nation.

It is estimated that between 450,000 and 900,000 Louisiana residents become infected with influenza each year. On average, 1700-1800 Louisianans are hospitalized and 500-600 die each year due to complications of influenza.

The best way to prevent an influenza epidemic and to decrease the severity of the influenza season is to vaccinate the community. To have an effective vaccination campaign, enough people need to be vaccinated to invoke a herd immunity response. Vaccination campaigns are not beneficial if the influenza strains in the vaccine do not match the season's circulating strains. Through surveillance and laboratory testing, circulating influenza strains are identified and the strains that need to be included in the following year's vaccine can be determined. Surveillance can also help identify any changes in the virus and determine if a new influenza A subtype has emerged. Surveillance and laboratory testing can detect the development of antiviral resistance, which will determine the appropriate treatment or chemoprophylaxis that should be administered. The result of an effective vaccination campaign would be a decrease in the number of influenza cases, the number of doctor and emergency room visits, in school and work absenteeism, and a decrease in the use of other health-care resources.

Influenza Sentinel Surveillance

Because influenza infections are so common, influenza cases are reported from sentinel sites rather than through passive surveillance. Influenza activity in Louisiana is monitored through a sentinel surveillance system from October through mid May. The Louisiana Office of Public Health collects information from four types of sentinel surveillance sites: schools, nursing homes, physician's offices and hospital emergency rooms. The number of sentinel sites in Louisiana varies slightly from year to year; currently there are approximately 50 physicians, 19 schools, 30 hospitals and 20 nursing homes

participating in the influenza sentinel surveillance system. Between October and May each site reports numbers of influenza like illness (ILI) cases and denominator data to the Office of Public Health on a weekly basis. The cases are categorized into four age groups: 0-4 years (preschoolers), 5-24 years (school age children/adolescents), 25-64 years (adults), and 65+ (older adults). For the school data, the denominator is the student enrollment, for nursing homes it is the number of residents, and for physician's offices, it is the number of patients seen for any reason. Hospitals do not provide denominator data.

Case Definition

The definition of a case of ILI includes having a temperature ≥ 37.8 °C or 100 °F with upper respiratory tract infection symptoms (cough, sore throat).

Routine analysis

There are approximately 900 physicians throughout the U.S. who participate in the sentinel surveillance system. The data collected are used by the Centers for Disease Control and Prevention as one component in monitoring influenza activity throughout the country. The ILI activity each week is compared to the national baseline of 2.5% to determine if the season has started. Through sentinel surveillance, it can be determined if the number of ILI case is increasing or decreasing. However, the number of people infected with influenza during a season cannot be determined.

The Office of Public Health reports the estimated Influenza Activity Level from the influenza sentinel surveillance data on a weekly basis. The five influenza activity levels are as follows:

- *No Activity*: No laboratory-confirmed cases of influenza and no reported increase in the number of cases of ILI.
- *Sporadic*: Small numbers of laboratory-confirmed

influenza cases or a single influenza outbreak has been reported, but there is no increase in cases of ILI.

- *Local*: Outbreaks of influenza or increases in ILI cases and recent laboratory-confirmed influenza in a single region of the state.
- *Regional*: Outbreaks of influenza or increases in ILI and recent laboratory confirmed influenza in at least 2 but less than half the regions of the state.
- *Widespread*: Outbreaks of influenza or increases in ILI cases and recent laboratory-confirmed influenza in at least half the regions of the state.¹

METHODS

This special study was undertaken to analyze the trends in influenza incidence throughout several years. Data for five flu seasons (1998-1999, 2000-2001, 2001-2002, 2002-2003, and 2003-2004) were compiled into a MS Access® database. Only summary data for the 1999-2000 season were available, so this season was omitted from the analysis.

To determine if there was a difference in trends among the four age groups, data were combined for all sentinel sites and all ages for each season and were plotted in Microsoft Excel along with data for each of the different age groups. Because there was no difference in trends between the age groups and the combined data, for this analysis data from the age groups were combined.

Sentinel physician data were determined to be the most complete data set because denominator data were complete and coverage of regions by physician sites was the most adequate. As a result, physicians' data were used for more detailed analysis of influenza activity in Louisiana.

To obtain regional data, the number of ILI cases seen by all physicians in a region were combined. The denominator for the percentage of ILI cases seen was the total number of patient visits that week as reported by

the physician. Because the number of sentinel physician sites changes from season to season and varies across regions, it was more accurate to use the percentage of ILI cases seen as opposed to the number of ILI cases reported (Figure 1).

Missing data for a week before the season peak were replaced with case numbers from the prior week. Missing data for a week after the season peak were replaced with case numbers from the next week. For the five seasons in this analysis, the average percentage of weeks missing data for each region was 10.6%.

In order to determine when the influenza season started, the baseline of ILI activity for each surveillance season needed to be established. Data for weeks with a percentage of ILI cases less than 1% before the season and weeks less than 1% after the season were averaged and used as the baseline. The baseline plus two standard deviations was used to determine when the season started and ended. The start of the season was when the percentage of ILI cases exceeded this number (the baseline + two standard deviations). The end of the season was when the percentage of ILI cases dropped below this number.

The intensity of the season was calculated by taking the average of the highest three percentages of ILI cases seen for the season.

RESULTS

Louisiana

The percentage of ILI cases seen by physicians for all regions follows the same trend as the total number of ILI cases seen in all regions (Figure 1).

Based on the influenza activity data analysis, the influenza season for Louisiana starts between October and December and ends between December and March (Table 1).

The duration of the influenza season varies between 9 and 17 weeks. The intensity of the season (as defined as the proportion of patient visits due to ILI) ranges from 2.38% and 7.97% (Table 1). There is no correlation between the duration and the intensity of the flu season ($r^2 = 0.0482$). There is no correlation between the duration of the season and whether the season started early or late.

Louisiana and National Data

National information on the percentage of physician visits for ILI during the 1998-1999 season is not available in detail. The national baseline as determined by the CDC is calculated as the mean percentage of ILI visits during non-influenza weeks plus two standard deviations. For all seasons except the 2002-2003 season the baseline was 2.5%. A baseline of 1.9% was used for the 2002-2003 season.¹ This national baseline is higher than the baseline that is used for Louisiana in this analysis.

In an analysis of the last 4 flu seasons for which data

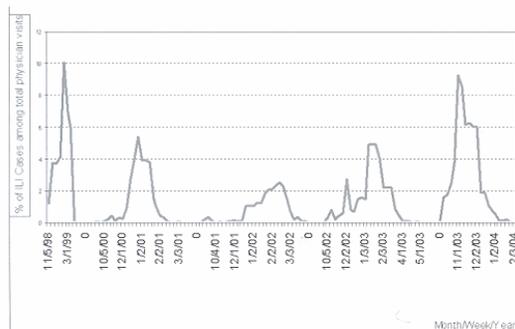


Figure 1. Louisiana Influenza Seasons 1998-2004 by Sentinel Physician Sites.

Season	Surveillance Start (mo/wk)	Season Start (mo/wk)	Season End (mo/wk)	Surveillance End (mo/wk)	Duration (Weeks)	Intensity (%)
1998-1999	Dec/01	Dec/01	Mar/03	Mar/03	>15	7.6
2000-2001	Oct/02	Dec/02	Feb/02	Mar/04	9	4.4
2001-2002	Oct/01	Nov/04	Mar/04	Apr/03	17	2.4
2002-2003	Oct/05	Dec/02	Mar/02	May/01	13	4.9
2003-2004	Oct/02	Oct/02	Dec/05	March/01	13	8.0

(mo/wk) = (month / week)

Season	Louisiana Start (mo/wk)	National Start (mo/wk)	Louisiana End (mo/wk)	National End (mo/wk)	Louisiana Duration (weeks)	National Duration (weeks)	Louisiana Peak Intensity (%)	National Peak Intensity (%)	Louisiana Peak (mo/wk)	National Peak (mo/wk)	
1998-1999	L Dec/01	Dec/04	Mar/03	N Feb/03	>15		7.65	4-6	Feb/02-Mar/02	Dec/04-Feb/01	N
2000-2001	L Dec/02	Jan/04	Feb/02	Mar/01	9	9	4.41	4	Dec/04-Jan/03	Feb/02	L
2001-2002	L Nov/04	Dec/03	Mar/04	N Feb/04	17	7	2.38	3.2	Feb/03-Mar/01	Feb/01	N
2002-2003	N Dec/02	Nov/02	Mar/02	N Jan/01	13	11	4.89	3.2	Jan/03-Feb/01	Dec/04	N
2003-2004	Oct/02		Dec/05		12	10	7.97	7.6	Nov/01-Nov/04		

Season	Intensity of Season (%)			Start of Season (number of regions)			End of Season (number of regions)			Duration of Season (weeks)		
	Mean	Range	Standard Deviation	Early	Within a 30 day period of each other	Late	Early	Within a 30 day period of each other	Late	Mean	Range	Standard Deviation
1998-1999	7.624	0.174-23.888	8.450									
2000-2001	5.738	0.220-14.902	4.800		8	1		9		11	2-15	4.272
2001-2002	2.466	0.774-6.217	1.524		7	2	1	7	1	9.444	1-15	4.586
2002-2003	6.211	3.081-8.750	3.060	1	5	3	1	7	1	13.556	2-20	5.897
2003-2004	8.928	3.824-21.610	5.752		9		1	8		10.778	8-15	3.114

are available, the start of Louisiana's season was earlier than the national season 3 times and later once (Table 2). The peak of the season for Louisiana occurred before the national peak once and after the national peak three times (Table 2). Thus, there is no obvious difference for the timing of the flu season between Louisiana and the nation. For all but one season (2001-2002), the Louisiana intensity (defined as proportion of ILI among physician visits) was greater than the national intensity (Table 2).

Regional Data (Figure 2)

Region 3 had the highest intensity for two seasons and

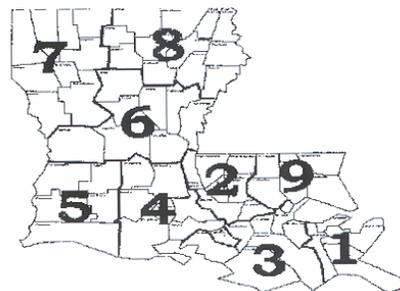


Figure 2. Louisiana Office of Public Health Regions

had the second highest intensity for two seasons (Table 3). Region 5 had the lowest intensity of the regions for three seasons; for 1998-1999 there were no data. There was no region that always had the longest or the shortest season. No region consistently demonstrated the earliest start of the flu season. Most regions started and ended within a 30-day period of each other. Often the regions with a high intensity had a longer flu season, but this was not always the case. Often the region with the shortest season also had a season of low intensity, but the lowest intensity corresponded with the shortest season only once (2000-2001).

Overall, there was no correlation between the mean duration and the mean intensity of the regions ($r^2 = 0.1637$). Region 8 was the only region where there was a correlation between duration and intensity of the season ($r^2 = 0.9893$).

DISCUSSION

From this analysis, it appears that Louisiana's flu season starts about the same time as the national flu season. There is no consistent trend dictating when the peak of the season occurs. The finding that Louisiana's flu season starts at about the same time as the national flu season is not consistent with the conventional thought that the flu season starts later in the South compared to the rest of the nation.

There is no clear trend in the start of the flu season for Louisiana; it varies from year to year and can range from October to December. There is also no clear trend in the ending of the flu season for Louisiana, ranging from December to March. These data suggest that starting influenza surveillance in October may be too late. If surveillance starts shortly before the season, the baseline for influenza activity cannot be established, and the start of the season may not be captured by the surveillance system. Likewise, having surveillance end in March, as was the case in previous years (Table 1), may be too early, and the end of the season may not be captured by surveillance. The current surveillance system does not always capture the beginning or end of the flu season. Because the start and end of the season vary from year to year, year-round influenza surveillance needs to be implemented. This change will ensure that the start and end of the flu season are captured and that a more accurate baseline can be calculated.

To measure better the burden of influenza on the community, influenza sentinel surveillance participation is encouraged. Sentinel surveillance allows for estimation of the severity of the flu season for the state and for each region. To obtain a more accurate and representative estimate of influenza activity in the state's regions, there should be a sentinel site in each parish. By having at least one of each of the four sentinel sites (school, physician's office, hospital, and nursing home) participating in the program in each parish, not only will the

region's influenza data be more accurate and representative, but the state data for each age group will be as well. Increasing the number of sentinel sites which participate in the influenza sentinel surveillance system in each parish and each region will provide a more accurate and detailed estimate of influenza activity for the state. A more complete sentinel surveillance system will more quickly detect unusual variations in the influenza season such as occurred with the early and severe 2003-2004 season.

REFERENCES

1. Flu Activity Reports and Surveillance Methods in the United States. Centers for Disease Control and Prevention. July 1, 2004. <<http://www.cdc.gov/flu/weekly/fluactivity.htm>>

Ms. Stanley an MPH student and **Ms. Sokol** is the Chief of Infectious Disease Surveillance in the Infectious Disease Epidemiology Section, Louisiana Office of Public Health. **Dr. Ratard** is the State Epidemiologist. **Ms. Scott** is the Influenza Surveillance Coordinator in the Immunization Section, Louisiana Office of Public Health.