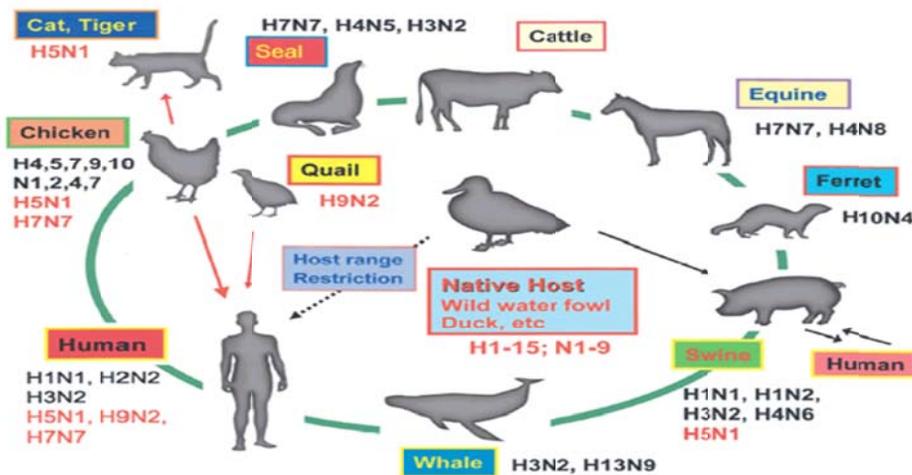




Center for Community and Preventive Health  
Infectious Disease Epidemiology Section  
Influenza Surveillance Handbook  
2013 – 2014 Season

*Version 2.0*

*September 2013*



## I. EPIDEMIOLOGY OF INFLUENZA

### A. Influenza Viruses

Influenza viruses belong to the Orthomyxoviridae family and can be divided into three types; A, B, and C. Influenza type C viruses are not associated with severe disease, epidemics, or pandemics and will not be discussed further. Influenza types A and B viruses are responsible for epidemics of respiratory illness that occur almost every winter in temperate climates and are often associated with increased rates of hospitalization and death. Influenza type A viruses are divided into subtypes based on surface proteins called hemagglutinin (HA) and neuraminidase (NA). To date, 17 HA subtypes and 9 NA subtypes have been identified. Influenza viruses can infect a wide range of animals, such as pigs, domestic and wild birds, horses, cats, ferrets, dogs, bats, and whales. While influenza A viruses of only a few HA subtypes have been isolated from mammals, all but one of the known HA and NA subtypes have been isolated from avian species. The two influenza A virus subtypes that have co-circulated in human populations since 1977 are influenza A (H1N1) and A (H3N2). A re-assortment of the influenza A (H1N1) and A (H3N2) viruses resulted in the circulation of A (H1N2) virus during the 2001–02 and 2002–03 influenza seasons. In April 2009, a novel influenza A (H1N1) virus, 2009 influenza A (H1N1), which was different from currently circulating influenza A (H1N1) viruses, emerged and its subsequent spread resulted in the first pandemic of the 21st century. Influenza type B viruses are not divided into subtypes like influenza A viruses. Influenza B viruses are normally only found in humans.

Influenza A and B viruses both undergo gradual, continuous change in the HA and NA proteins, known as antigenic drift. As a result of these antigenic changes, antibodies produced to influenza viruses as a result of infection or vaccination with earlier strains may not be protective against viruses circulating in later years. Consequently, yearly epidemics usually occur in populations, and multiple infections can occur over a person's lifetime. Antigenic changes also necessitate frequent updating of influenza vaccine components to ensure that the vaccine is matched to circulating viruses. Although the HA gene of influenza B viruses undergoes antigenic drift, lower rates of antigenic change, as well as cocirculation of antigenic variants for considerable periods of time, is characteristic of influenza B viruses. Since the mid 1980's the HA gene of influenza B viruses has been shown to have evolved into two distinct lineages represented by B/Yamagata/16/88-like and B/Victoria/02-87-like. Influenza B viruses from both lineages have circulated in most recent influenza seasons.

In addition to antigenic drift, influenza type A viruses can undergo a more dramatic and abrupt type of antigenic change called an antigenic shift, which occurs when viruses belonging to a new influenza A subtype bearing either a novel HA protein or novel HA and NA proteins infect humans. A novel HA protein can include a virus of the same subtype but be dramatically antigenically different, as was seen during the 2009 H1N1 pandemic, where the HA likely came from a swine reservoir. While antigenic drift occurs continuously, antigenic shift occurs infrequently. When antigenic shift does occur, a large proportion, or even all, of the world's population has no antibody against the new virus. If the novel influenza A virus causes disease and is transmissible among humans, a worldwide epidemic called a pandemic may result. Novel influenza A viruses, but not influenza B viruses, can cause influenza pandemics. During the 20th century, pandemics occurred in 1918 (A[H1N1]), 1957 (A[H2N2]), and 1968 (A[H3N2]). In April 2009, 2009 influenza A (H1N1) virus emerged to cause the first influenza pandemic in more than 40 years.

## **B. Influenza Disease**

Influenza is an acute respiratory disease caused by infection with influenza viruses. The incubation period ranges from 1 to 4 days. In adults, peak virus shedding usually occurs from 1 day before onset of symptoms to 3 days after. Virus shedding may last longer in young children. Typical features of influenza include abrupt onset of fever and respiratory symptoms such as cough (usually nonproductive), sore throat, and coryza, as well as systemic symptoms such as headache, muscle aches, and fatigue. The clinical severity of infection can range from asymptomatic illness to primary viral pneumonia and death. Acute illness generally lasts about 2-7 days, although malaise and cough may continue for 2 weeks or longer. Common complications of influenza infection include secondary bacterial pneumonia, exacerbation of underlying chronic health conditions, and in children, otitis media and febrile seizures. Uncommon complications include encephalopathy, transverse myelitis, myositis, myocarditis, hemorrhagic pneumonia, pericarditis, and Reye syndrome (generally associated with the use of aspirin and other salicylate-containing medications in children and adolescents with influenza-like illness).

## **C. Epidemiology of Influenza**

In temperate climate regions, epidemics of influenza occur nearly annually, although the rates and severity of influenza illness can vary substantially from year to year depending on the (sub)types and strains of circulating viruses, the incidence of infections, and levels of protective antibody in the population. In tropical and subtropical regions seasonal epidemics of influenza have been linked to rainy seasons, however these patterns are not as well established as the patterns seen in the temperate regions of the world.

## **D. Timing and Seasonality of Regional Influenza Activity**

The timing of influenza activity around the world varies depending on the climate of the region. In temperate climates, the onset and peak of influenza activity may vary substantially from one influenza season to the next, but generally begins to increase in the late fall. In the Northern Hemisphere's temperate regions, annual epidemics of influenza typically occur during the fall or winter months, but the peak of influenza activity can occur as late as April or May. In temperate regions of the Southern Hemisphere, influenza activity typically peaks during May through August. Although temperate regions of the world experience a seasonal peak in influenza activity, influenza viruses can be isolated year-round. The timing of seasonal peaks in influenza activity in tropical and subtropical countries varies by region, and multiple peaks of activity during the same year have been seen in some areas. This variability in influenza seasonal peaks among countries in tropical and subtropical regions illustrates the importance of country specific and regional epidemiologic and virologic data.

The variability in the timing of influenza activity also has implications for persons traveling to another part of the world and for persons traveling in large international groups. For example, outbreaks of influenza have occurred on cruise ships during the summer months in temperate climates, presumably after influenza was introduced by infected persons from an area where influenza was in season. International or large group travel may result in exposure to influenza virus outside of an expected time period. Thus persons counseling travelers about influenza prevention should consider the travel mode and destination when considering timing of vaccination and the advisability of using influenza antiviral medications for treatment or prophylaxis.

Regardless of the overall seasonality of influenza in an area, influenza viruses can circulate at low levels during any time of the year and can cause both isolated cases of influenza in individuals as well as outbreaks during “off season” periods.

## II. INFLUENZA SURVEILLANCE

### A. Overview of the National System

The U.S. national influenza surveillance system is comprised of five categories: viral surveillance, outpatient surveillance, mortality surveillance, hospitalization surveillance, and the summary of geographic spread of influenza. Taken together, data from these five categories provide a national picture of influenza activity and can be used to monitor the timing and severity of influenza activity from season to season. The main objectives of the national influenza surveillance system are: to find out when and where influenza activity is occurring, determine the types and subtypes of circulating influenza viruses, detect changes in the influenza viruses, track outpatient influenza-related illness, and to measure the impact that influenza has on hospitalizations and deaths in the U.S.

### B. Louisiana Surveillance

#### 1) *Passive Surveillance*

The U.S. Outpatient Influenza-like Illness Surveillance Network (ILINet) is an online reporting system maintained by the CDC that is designed to collect information on influenza-like illness (ILI).

The outcome of interest is the number of clinical illness cases consistent with influenza (i.e. influenza-like illness or ILI) occurring in the general population. **The ILI case definition is fever  $\geq 100^{\circ}\text{F}$  [ $37.8^{\circ}\text{C}$ ], oral or equivalent, AND cough and/or sore throat (without a known cause other than influenza).** Data collected using any other case definition cannot be used. It is important to note that there is **no requirement for a positive influenza test** (i.e. rapid influenza diagnostic test) when determining the number of patient visits with ILI.

ILINet providers report the following summary data each week:

- Total number of patient visits for any reason
- Number of patient visits for ILI in the following age-groups:
  - 0-4 years
  - 5-24 years
  - 25-49 years
  - 50-64 years
  - >65 years

Participation in ILINet is open to the following healthcare providers and settings: Family practice, pediatricians, internal medicine, student health, infectious disease, hospital emergency departments, community clinics and urgent care. Though not required for participation in ILINet, influenza surveillance laboratory testing of a sample of patient specimens is also offered to participants free of charge at the state laboratory.

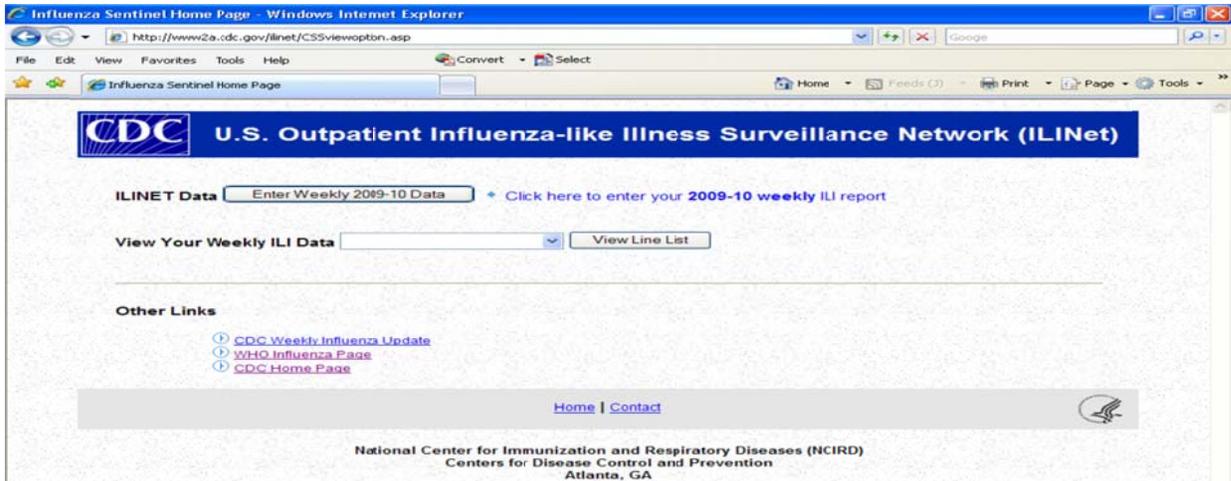
According to a survey of ILINet providers, most reported it takes less than 30 minutes to compile and report their weekly data (50% report 15 minutes or less and 39% report between 15-30 minutes).

Providers report data weekly **by noon each Tuesday** through the CDC's ILINet website or by fax. Direct reporting to CDC increases the timeliness of data receipt and analysis. If providers report by Internet, data are immediately available to surveillance coordinators on the password protected influenza surveillance website. An example of the online reporting form is included below.

INFLUENZA SURVEILLANCE PROGRAM	
ILINet Internet Reporting System	
Data Input Page	
1. Provider ID Code:	<input type="text" value="48001"/>
2. Week Ending Date:	<input type="text"/>
3. ILI* AGE 0-4:	<input type="text" value="0"/>
4. ILI* AGE 5-24:	<input type="text" value="0"/>
5. ILI* AGE 25-49:	<input type="text" value="0"/>
6. ILI* AGE 50-64:	<input type="text" value="0"/>
7. ILI* AGE OVER 64:	<input type="text" value="0"/>
8. Total Patients Seen:	<input type="text" value="0"/>
9. Is this a revision of data reported at an earlier date?:	No <input type="checkbox"/> Yes <input type="checkbox"/>
<input type="button" value="Submit"/> <input type="button" value="Reset"/>	

The password protected influenza surveillance website is <http://www2a.cdc.gov/ilinet/>. CDC assigns providers an ID and password during enrollment and these remain with the provider during the entire time they participate in the system. Enrolled providers will receive a workfolder produced by CDC containing detailed instructions on Internet reporting.

Both providers and surveillance coordinators log into the same site but, based on the ID/password provided, the site recognizes which level of permissions to grant (i.e., providers can only enter and view their own data; coordinators can enter data for any of their providers and can view data from all providers within their jurisdiction). The options available to providers are (1) enter data, (2) view line list of the data they reported this season (regardless of reporting method used), and (3) view line list of data they entered during recent past seasons. Automatic queries are available from these line lists to identify duplicate or incorrect reports and the lists can be sorted by date code, reporting mechanism, or percent ILI. These features can help providers keep track of their data and potentially correct data entry errors.

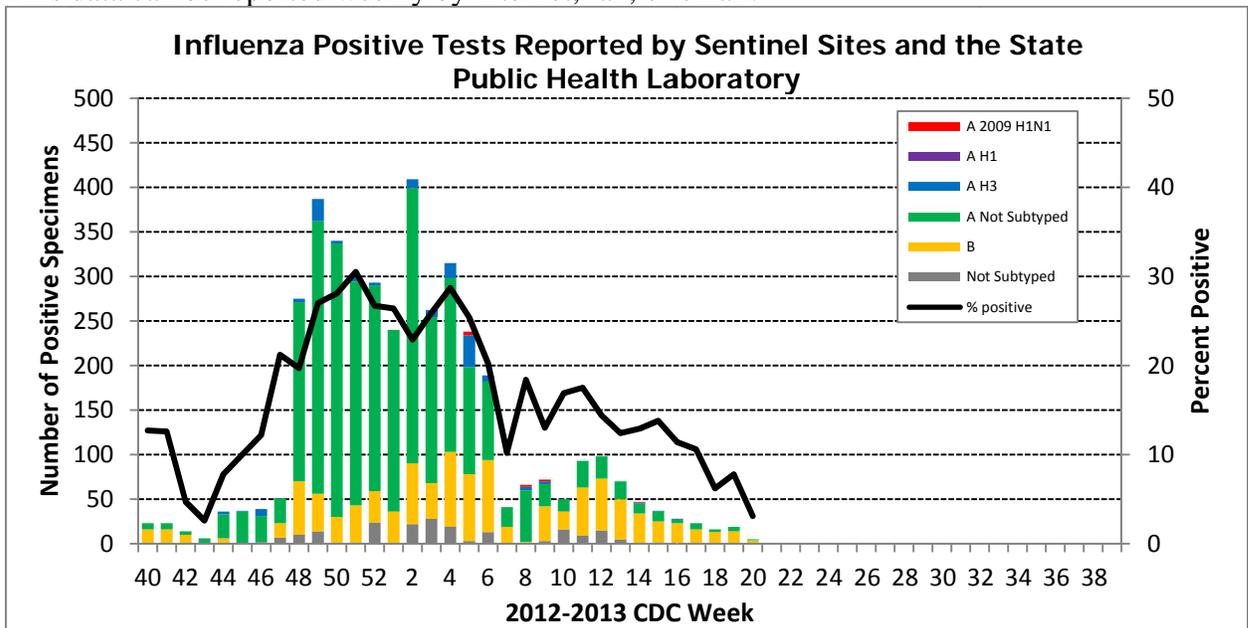


## 2) *Laboratory Surveillance*

Commercial rapid diagnostic tests are available that can detect influenza viruses within 15 minutes. Some tests are approved for use in any outpatient setting, whereas others must be used in a moderately complex clinical laboratory. These rapid tests differ in the types of influenza viruses they can detect and whether they can distinguish between influenza types. Different tests can detect 1) only influenza A viruses; 2) both influenza A and B viruses, but not distinguish between the two types; or 3) both influenza A and B and distinguish between the two types. None of the rapid diagnostic tests provides any information about influenza A subtypes.

Providers, clinics, and hospitals can also enhance the data collected by reporting rapid influenza test results. Obtaining the number of tests that were positive for influenza A, influenza B, undifferentiated A/B or specific subtypes of influenza assists public health in determining which types of influenza are circulating around the state.

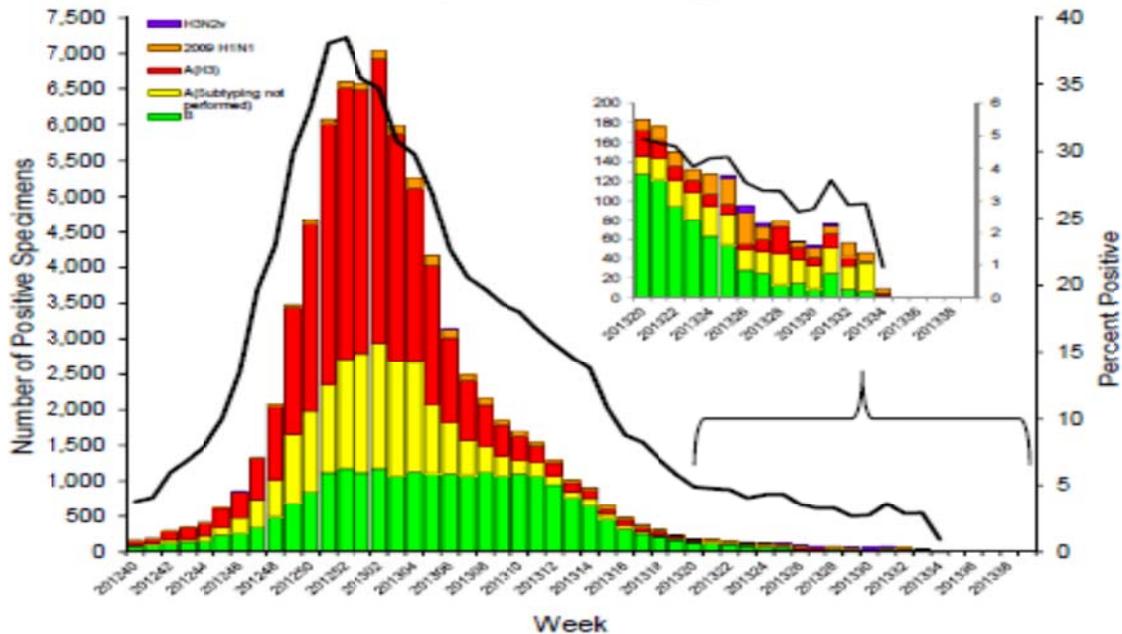
This data can be reported weekly by internet, fax, or email.



### 3) Active Virologic Surveillance

Virologic surveillance is an essential component of influenza surveillance. A comprehensive system for influenza virologic surveillance is important to confirm when and where influenza viruses are circulating each year and identify changes in the circulating viruses which may impact vaccine or treatment decisions or signal the emergence of a new virus with pandemic potential.

Influenza Positive Tests Reported to CDC by U.S. WHO/NREVSS Collaborating Laboratories, National Summary, 2012-13



Beginning in the 2013-2014 influenza season, the goal is for the Louisiana State Public Health Laboratory to increase samples to meet requirements in the Association of Public Health Laboratories *Influenza Virologic Surveillance Right Size Roadmap*. The increase in sample submission will require regular participation from a core group of surveillance sites statewide. All materials required for sample collection and submission will be provided free of charge and transportation will be coordinated through Statewide transport.

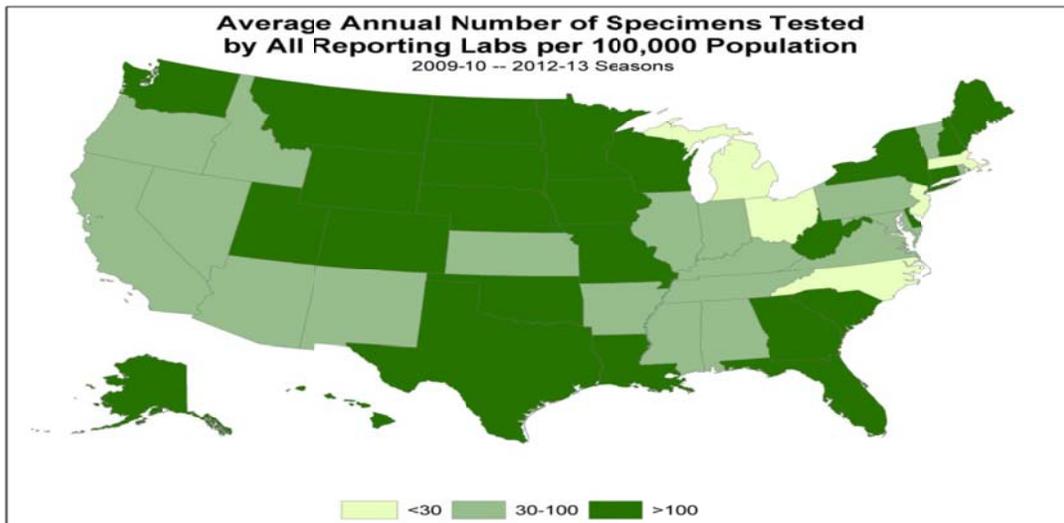
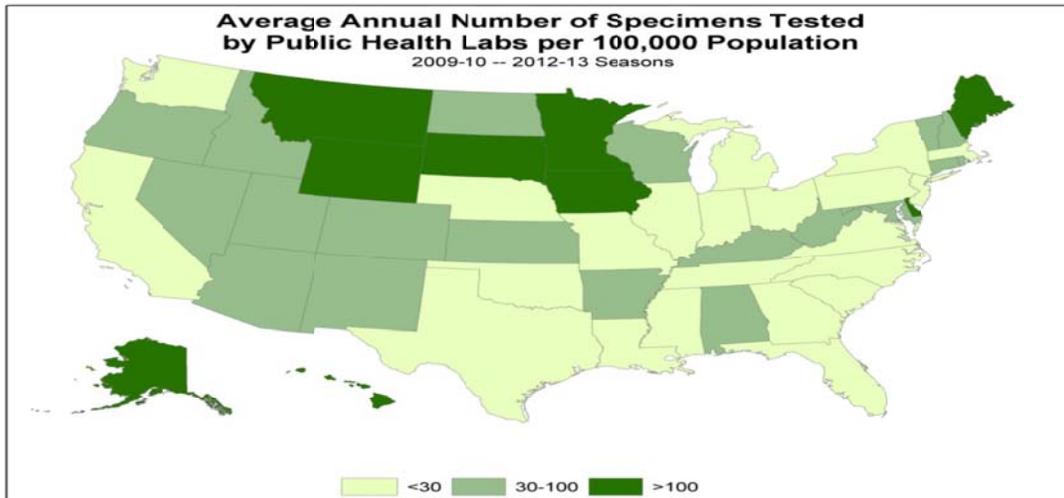
Participation in active surveillance will require:

- Collecting a nasal or nasopharyngeal (NP) swab on all patients who present with clinical symptoms resembling influenza-like illness on any one day of the week.
- Packing specimens in ice chest with proper ice blocks (all provided) for Statewide transport pick-up.

A portion of flu positives from active surveillance will be forwarded to CDC for further antigenic characterization and antiviral resistance testing. All flu negative NP swabs submitted will be tested for other respiratory viruses including Respiratory Syncytial Virus, Parainfluenza, Human Metapneumovirus, and Adenovirus.

A detailed surveillance protocol will be sent to providers who agree to support Louisiana influenza laboratory surveillance along with their first set of supplies.

The volume of testing by both public health and non-public health laboratories varies by jurisdiction. The maps below show the average annual number of specimens tested per 100,000 population by state for both public health laboratories and all laboratories combined reporting to CDC during the 2009-10 through 2012-13 seasons.



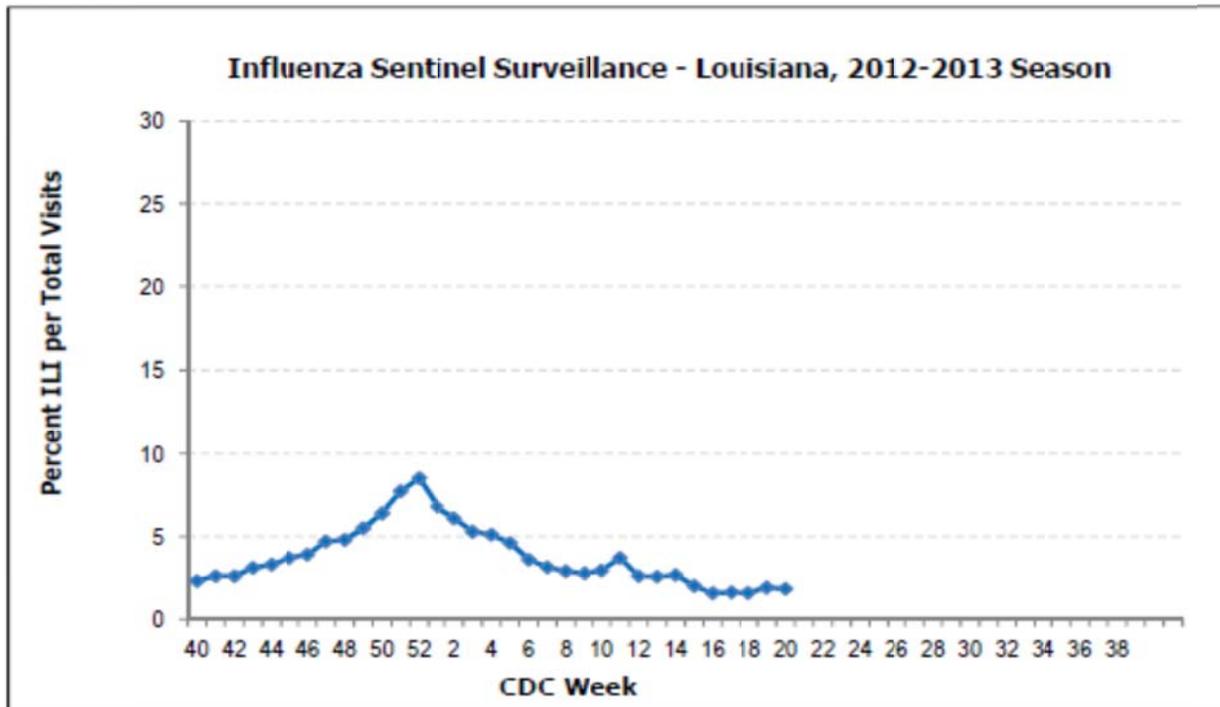
### III. LOUISIANA INFLUENZA SURVEILLANCE REPORT

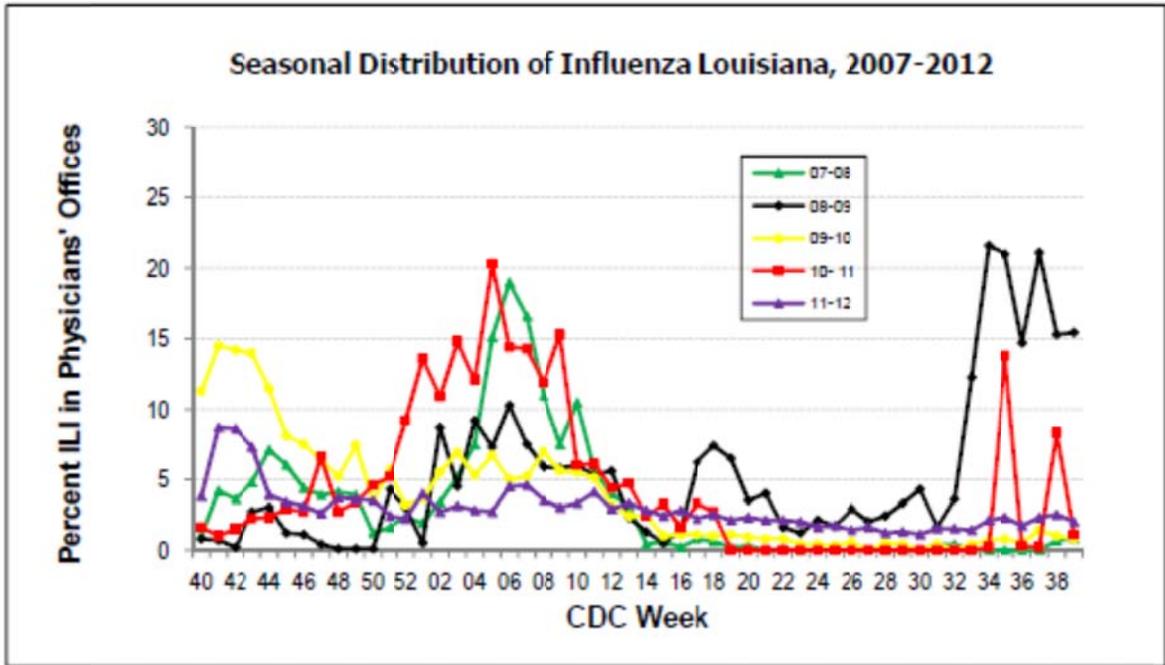
The Infectious Disease Epidemiology Influenza Coordinator collects and collates reports from the local and regional health departments, participating laboratories and ILINet to produce the Louisiana Weekly Influenza Surveillance Report. This report is distributed by email to participating providers and posted on the Internet each Friday at: <http://new.dhh.louisiana.gov/index.cfm/page/1591>

As with the national influenza report, FluView, the surveillance information answers the questions of where, when and what influenza viruses are circulating. It may also be used to determine if influenza activity is increasing or decreasing, but it cannot be used to ascertain how many people have become ill with influenza during the season.

During the influenza off-season (MMWR week 21 to week 39), the Louisiana Influenza Surveillance Report will be distributed monthly.

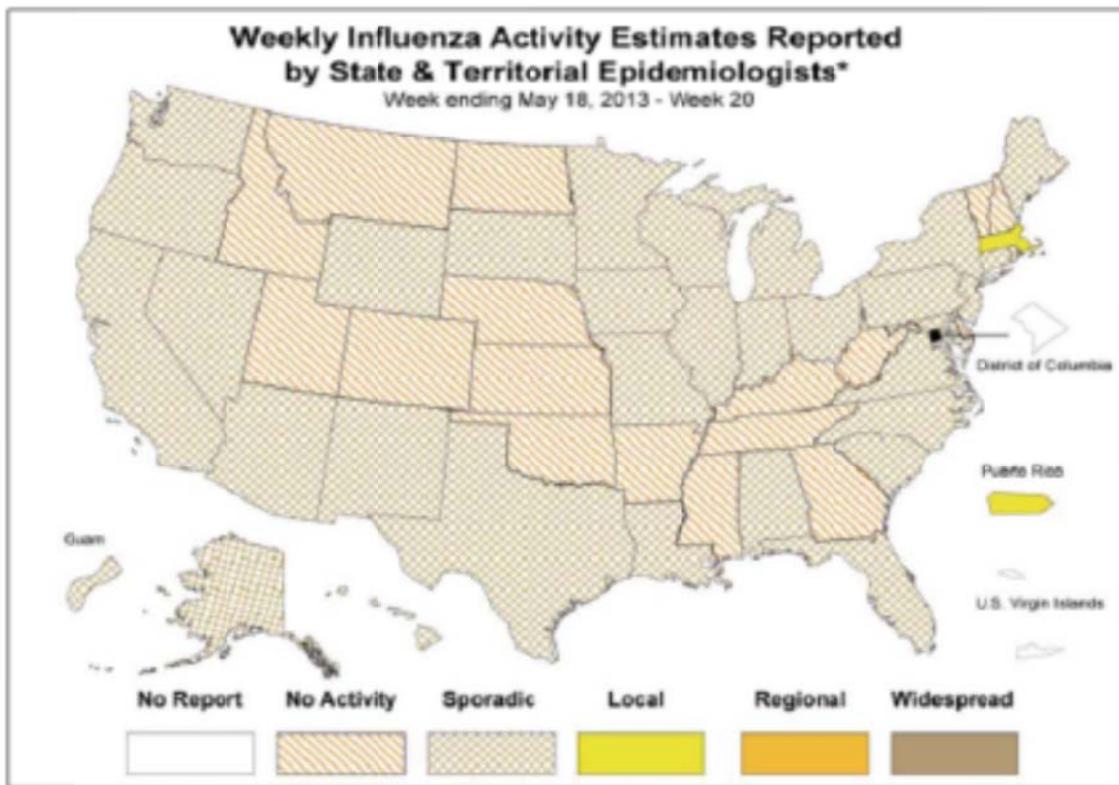
The following are examples of data presented in the weekly report:





### Geographical Distribution of ILI





**Influenza-Like Illness (ILI) Activity Level Indicator Determined by Data Reported to ILINet  
2012-13 Influenza Season Week 20 ending May 18, 2013**

