Section II: Influenza Surveillance Overview

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Goals of Influenza Surveillance

Influenza has a tremendous impact on the health of the public. Every year an influenza epidemic occurs in the United States. This epidemic occurs regularly between October and May, and therefore this time period is referred to as influenza season. An estimated 23,607 (range 3,349-48,614) deaths associated with influenza occur every year in the United States (*1*).

In addition to yearly epidemics, influenza pandemics may also occur. An influenza pandemic occurs when a new influenza virus strain begins circulating among people. The number of people impacted by influenza increases substantially during pandemics because there is little to no immunity against the new strain among the population. The severity of the pandemic depends on the actual strain. Some pandemics have high case fatality rates while others have low case fatality rates.

Influenza surveillance is performed in order to monitor yearly epidemics and detect possible introductions of new strains of influenza. The information collected from influenza surveillance is used to guide public health recommendations for prevention and control at local, state, national and international levels.

Texas goals of influenza surveillance

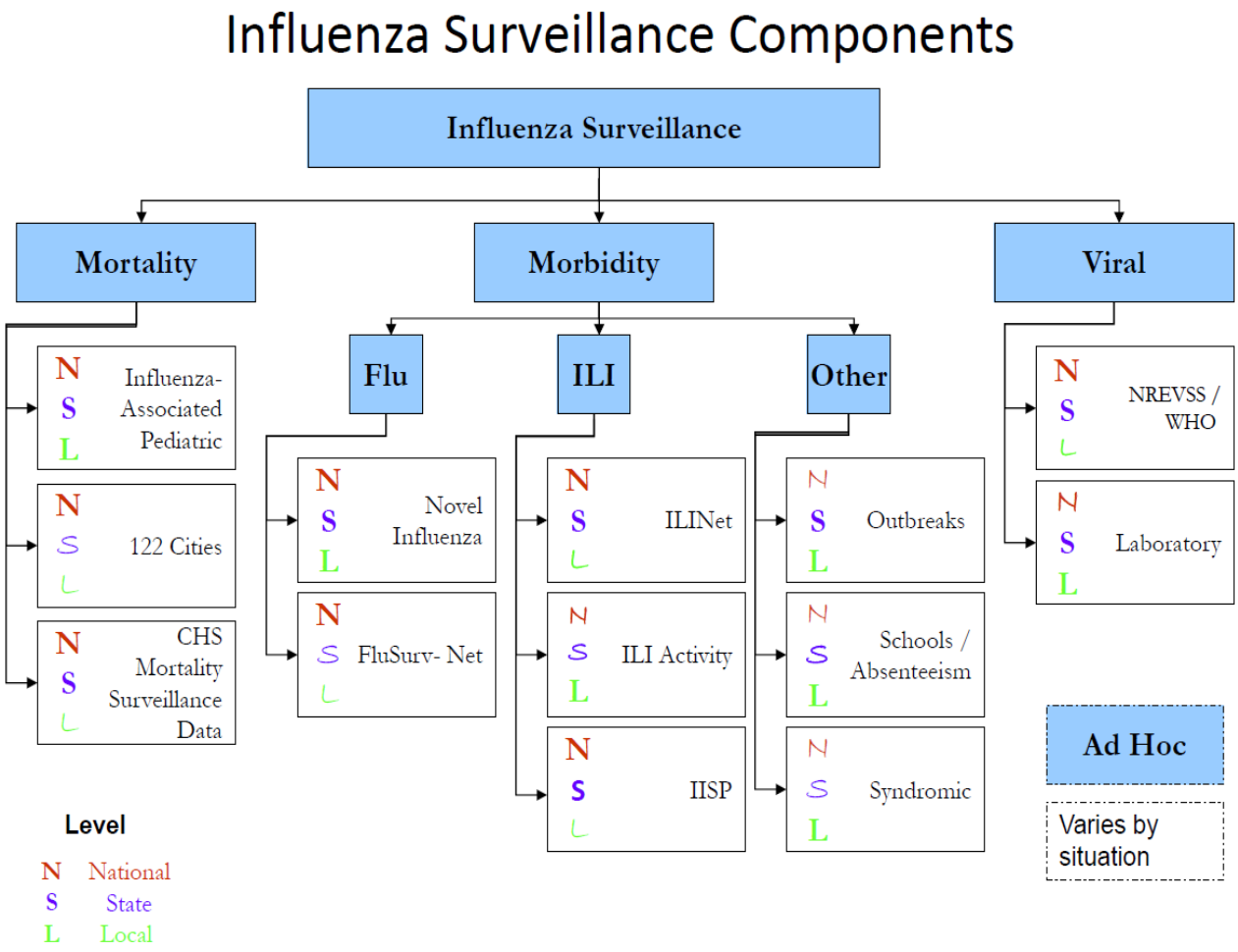
- Determine when and where influenza viruses are circulating
- Determine if circulating influenza viruses match the vaccine strains
- Detect changes in the influenza viruses
- Track influenza-like illness
- Determine the severity of influenza activity

The Texas goals align closely with the national goals:

- Determine when and where influenza activity is occurring
- Track influenza-related illness
- Determine what influenza viruses are circulating
- Detect changes in influenza viruses
- Measure the impact influenza is having on deaths in the United States

Components of Influenza Surveillance

Influenza surveillance in the United States has three major components: mortality, morbidity and viral surveillance. For each of these components, activities may be conducted at the national, state or local level. Texas has regional health departments that perform both state and local level surveillance activities.



The following pages provide a brief description of the most common influenza surveillance activities. For a more detailed description of the activities conducted in Texas, please refer to Section IV of this handbook.

Mortality Surveillance

Mortality surveillance focuses on tracking deaths associated with influenza. Mortality surveillance is used as one indicator of severity of influenza epidemics and pandemics.

The following table describes the main activities included in mortality surveillance:

Activity	Conducted at	Description
Influenza-Associated Pediatric Mortality *See Section IVf*	Local, state and national levels	Local and regional health departments investigate reports of influenza-associated pediatric deaths, a reportable condition. State health departments and the CDC track these deaths and monitor the data for trends. The data are used to support public health recommendations for influenza prevention. This surveillance occurs year-round.
Center for Health Statistics (CHS) Mortality Surveillance Data (*2*)	State and national levels	The Center for Health Statistics at the state and national level collect and maintain death certificate data. Data for this surveillance activity comes from death certificates for which pneumonia or influenza was listed as the underlying or contributing cause of death. At the national level, surveillance data is aggregated by the week of death occurrence and the percentage of all deaths due to pneumonia and influenza is compared with a seasonal baseline and an epidemic threshold value that is calculated for each week. This surveillance occurs year-round.
122 Cities Mortality Reporting System (*2*) Discontinued after week 39 (week ending Oct. 1, 2016) of the 2015-2016 influenza season	National level	Vital Statistics offices in 122 major cities in the United States reported directly to the CDC the total number of death certificates processed and the number of those for which pneumonia or influenza was listed as the underlying or contributing cause of death by age group. The percentage of all deaths due to pneumonia and influenza was compared with a seasonal baseline and an epidemic threshold value that was calculated for each week. Seven cities in Texas participated by submitting data weekly. This surveillance occurred year-round.

Some health jurisdictions may conduct other surveillance activities to track influenza-related mortality. For example, health departments may receive reports from their local vital statistics office on the number of deaths attributable to pneumonia and influenza each week. Other health departments may work closely with local hospitals, medical examiners, and justices of the peace to obtain aggregate data on the number of deaths due to influenza each week.

Morbidity Surveillance

Morbidity surveillance focuses on tracking illness associated with influenza. The breadth of activities classified under morbidity surveillance reflects the wide spectrum of disease associated with influenza. Morbidity surveillance can be subdivided into surveillance activities related to laboratory confirmed influenza, influenza-like illness or a combination of the two. Morbidity surveillance can also focus on different spectrums of illness. For example, influenza data collected from hospitals reflect more severe cases of illness while influenza data collected from over-the-counter sales of cough and cold medicine reflect milder cases of illness.

The following table describes the main activities included in morbidity surveillance:

Activity	**Conducted at**	**Description**
Novel Influenza *See Section IVg*	Local, state and national levels	Local, regional and state health departments investigate reports of novel influenza to identify possible spread in the community. Novel influenza is a reportable disease in Texas. The first indication of novel influenza is often a specimen that is not able to be subtyped by a laboratory with subtyping capability. Initial confirmation of novel influenza can only be done by the CDC Laboratory. This surveillance occurs year-round.
FluSurv-NET (*2*)	National level	Laboratory confirmed cases of influenza in hospitalized children and adults from selected hospitals in 13 states are reported to the CDC. Cases are identified by reviewing hospital laboratory and admission databases and infection control logs for patients hospitalized during the influenza season with a documented positive influenza test [viral culture, direct/indirect fluorescent antibody assay (DFA/IFA), reverse transcription-polymerase chain reaction (RT-PCR), or a commercial rapid antigen test]. Estimated hospitalization rates are reported each week during the influenza season by the CDC. This surveillance is not conducted in Texas. This is an expansion of the flu surveillance activities performed through the Emerging Infections Program (EIP).

Activity	Conducted at	Description
New Vaccine Surveillance Network (NVSN) (*3*) No longer an active system	National level	Hospitals in three counties (Hamilton County, OH; Davidson County, TN; and Monroe County, NY) reported laboratory confirmed influenza hospitalization rates for children <5 years of age. Children admitted to NVSN hospitals with fever or respiratory symptoms were prospectively enrolled and respiratory samples were collected and tested by viral culture and RT-PCR. NVSN estimated rates were reported every two weeks through 2011 during the influenza season by the CDC. This surveillance was not conducted in Texas.
U.S. Outpatient Influenza-like Illness Surveillance Network (ILINet) *See Section IVa*	Primarily supported at the state and national levels; local level participation varies	Healthcare providers report the total number of patients seen and the number of those patients with influenza-like illness (ILI) by age group to a CDC database that is accessible to state health departments. Starting with the 2016-2017 influenza season, providers will have the option to report the total number of patients seen by age group. This surveillance occurs year-round but not all participants enter data outside of the official influenza season.
Influenza Incidence Surveillance Project (IISP) *See Section IVb*	Primarily supported at the state and national levels; local level participation varies	Healthcare providers report the total number of patients seen by age group and the number of those patients with ILI by age group to the state health department. Healthcare providers also submit specimens with demographic and clinical information on the first ten patients seen each week with ILI. Participation is limited to five to eight healthcare providers in Texas. This surveillance occurs year-round. The 2012-2013 season was the last surveillance year for the full project. Texasdiscontinued participation in IISP or an IISP-like surveillance project in the 2016-2017 influenza season.

Activity	Conducted at	Description
ILI Activity *See Section IVc*	Primarily conducted at the local level; collected data contribute to state and national influenza reports	ILI activity surveillance is highly variable from one health department to another. In addition to or in lieu of having providers report through ILINet, health departments (HDs) have providers report directly to the HD. This enables the HD to tailor the information collected to their needs. HDs may collect more information than ILINet captures, such as rapid influenza test data. This activity also allows providers to report less information than ILINet (e.g., no age group information). ILI activity data can also be reported from non-traditional influenza reporters such as schools. ILI data from schools can include the number of students seen by the school nurse with ILI or the number of students who are absent with the parents reporting ILI as the reason. Some HDs have established electronic systems to collect reports from school nurses and administration. This surveillance can occur either year-round or seasonally.
Behavioral Risk Factor Surveillance System (BRFSS) (*4*)	National level	BRFSS is an on-going telephone health survey system, tracking health conditions and risk behaviors in the United States. The CDC added questions to assess ILI in BRFSS calls in 2009. It was thought that these questions would capture milder illnesses that may not have resulted in provider visits. The usefulness of this type of surveillance is still being explored by the CDC. This surveillance occurs year-round.
Outbreak Investigations *See Sections VII and IVi*	Primarily conducted at the local and state levels; collected data contribute to state and national influenza reports	Local, regional and state health departments investigate reports of outbreaks and implement immediate control measures to stop the outbreaks. This surveillance occurs year-round.

Activity	Conducted at	Description
Absenteeism Surveillance *See Section IVi*	Primarily conducted at the local level; collected data contribute to state and national influenza reports	Absenteeism surveillance activities vary widely. Absenteeism data specific to ILI are better for influenza surveillance than general absentee counts; however, broader absenteeism data can be beneficial for monitoring overall community health and detecting potential outbreaks. This surveillance can occur either year-round or seasonally.
Syndromic Surveillance *See Section IVi*	Primarily conducted at the local level; collected data contribute to state and national influenza reports	Automated data mining of healthcare facility databases allows flexible and timely analysis of trends in accessing care. The two most common uses of syndromic surveillance data for influenza surveillance include examining: • Percentage of total visits due to ILI and comparison of visits with historical trends • Percentage of cough medications sold by zip code and comparison of sales with historical trends This surveillance occurs year-round.
Border Influenza Surveillance Network (BISN) *See Section IVi*	Primarily conducted at the local level; collected data contribute to a multi-state report	The Border Influenza Surveillance Network is a multi-state collaboration to share influenza data from the border regions of Arizona, California, New Mexico, Texas and Mexico. The network uses data from existing influenza surveillance activities. This reporting is seasonal.

Viral Surveillance

Viral surveillance focuses on laboratory identification of circulating influenza strains and their characteristics. Viral surveillance is critical for detecting novel strains of influenza and helping public health monitor for antiviral resistance among all circulating strains of influenza.

The following table describes the main activities included in viral surveillance:

Activity	**Conducted at**	**Description**
National Respiratory and Enteric Virus Surveillance System (NREVSS) *See Section IVe*	Primarily supported at the state and national levels; local level participation varies	Laboratories report the total number of respiratory specimens tested and the number positive for influenza types A (categorized by subtype, if known) and B. Laboratory data for additional respiratory and enteric viruses are also collected through NREVSS. This surveillance occurs year-round.
World Health Organization (WHO) Collaborating Laboratories	National level	Many laboratories that participate in NREVSS surveillance also support WHO surveillance. The DSHS Virology Laboratory is a WHO Collaborating Laboratory. This surveillance occurs year-round.
Laboratory Surveillance *See Sections IVd and VI*	Primarily conducted at the local and state levels; collected data contribute to national influenza reports	Specimens from patients with symptoms compatible with influenza are submitted to the DSHS Laboratory or a Laboratory Response Network (LRN) Laboratory for influenza testing. Testing at the DSHS Laboratory may include culture, PCR and antiviral resistance testing. Several specimens are submitted to CDC for further testing and identification throughout the season. This surveillance occurs year-round with increased participation during the influenza season.

Ad Hoc Surveillance

Ad hoc surveillance includes any surveillance activities that are designed and implemented to respond to a specific situation and usually only occur for a specific time period. Ad hoc surveillance may be done to capture the same elements as mortality, morbidity or viral surveillance.

The following table describes the examples of ad hoc surveillance:

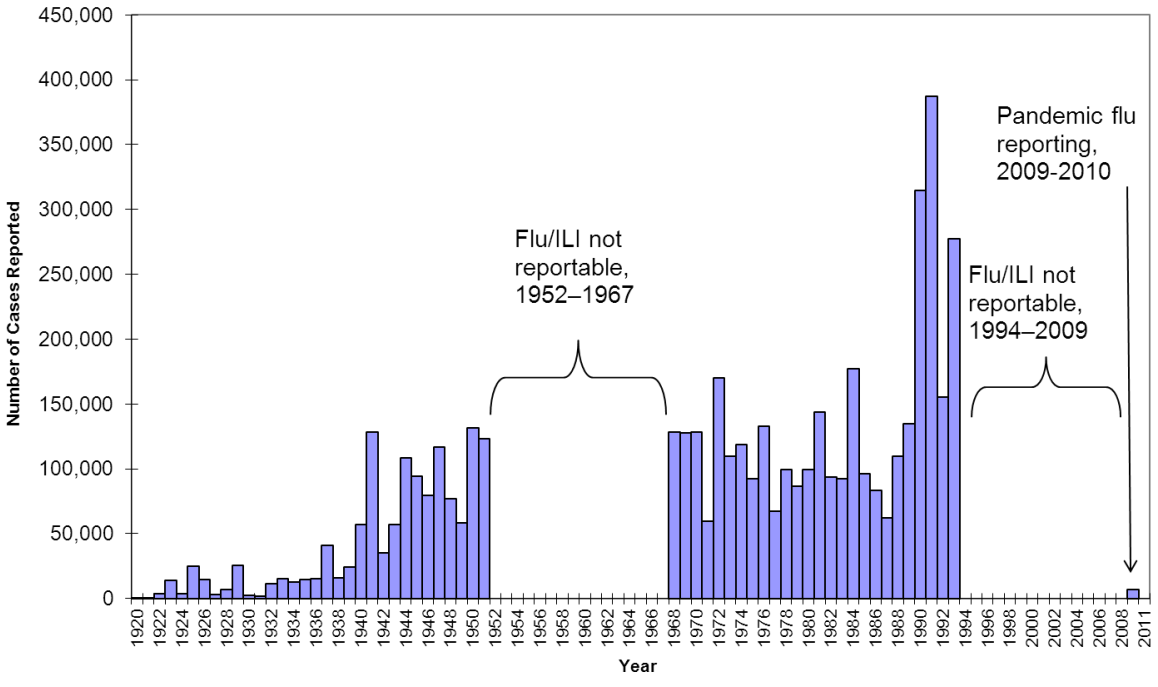
Activity	**Conducted at**	**Description**
Confirmed pH1N1 Hospitalization Surveillance	Conducted from June 2009 to May 2010	Hospitals were asked by the CDC and DSHS to voluntarily report the number of people that were hospitalized (admitted) who were confirmed as having pH1N1. Aggregate hospitalization counts were reported beginning in September 2009. This surveillance was created specifically as a response to the 2009 pandemic to help track severity.
Influenza-Associated Pregnant/Postpartum Mortality Surveillance *See Section IVh*	Conducted from August 2009 through 2010-2011 influenza season	Health departments were asked by the CDC to investigate reports of influenza-associated deaths in women who were pregnant or up to six weeks postpartum. This surveillance was created after reports were received of increased impact of pH1N1 on women who were pregnant during the 2009 pandemic. This surveillance was extended through the 2010-2011 influenza surveillance season.
Enhanced Surveillance for an Outbreak *See Sections VII and IVi*	Performed during an outbreak investigation and may extend for a week or more after the outbreak	A health department investigating an outbreak may conduct enhanced surveillance for influenza in the community to help determine if the outbreak is contained or has spread to the community. The extent of the surveillance, what data are collected and how frequently data are reported is determined by the lead epidemiologist/investigator of the outbreak.

A Brief History of Influenza Reporting in Texas

Influenza morbidity has been reported in Texas since at least 1920, although not continuously and not using the same case definition. Starting in 1920 and continuing through 1945, annual public health reports and summary tables included "influenza" case counts (*5*). The reports from 1946 to 1951 changed to "influenza/flu-like" cases. Influenza and influenza-like illnesses (ILI) reporting ceased from 1952 through 1967 and then resumed again from 1968 until 1993. We do not have a record of how influenza, influenza-like illness and ILI were defined during these time periods so the data may not reflect actual disease trends. It is clear that by the end of the 1970s, influenza and ILI were only reportable to the state health department as aggregate counts rather than individual reports. By 1994, influenza and ILI were again removed from the Texas Notifiable Conditions list since influenza data collected through surveillance were thought to vastly underestimate true morbidity (*6*).

After 1993, voluntary surveillance from "sentinel" sites became the main source of influenza surveillance data in Texas and continues to this day for influenza and ILI. In this type of surveillance, reports of influenza and ILI are received from a subset of healthcare providers rather than from all healthcare providers. In 2007, Texas expanded influenza surveillance by adding influenza-associated pediatric mortality to the list of notifiable conditions. From April 2009 through May 2010, human cases, hospitalizations, ICU admissions and deaths related to the pandemic influenza A (H1N1) virus were reportable under the "exotic disease" or "unusual group expression" portion of the Notifiable Conditions list (*7*). The case definitions for reporting changed frequently as the pandemic evolved; in particular, reporting of cases of 2009 influenza A (H1N1) in persons without more severe disease manifestations (i.e., hospitalizations or deaths) was discontinued early in the pandemic. In 2013, Novel Influenza was added to the Texas Notifiable Conditions list.

Influenza & ILI as Reportable Conditions in Texas, 1920–2011



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