Texas Influenza Summary Report, 2016-2017 Influenza Season (October 2, 2016 – September 30, 2017)

Overview

The 2016-2017 influenza season began on October 2, 2016, and went through September 30, 2017. During the season, influenza activity was low through November, started to increase in December and peaked around mid-February according to laboratory data. It steadily declined throughout the rest of the season. This is mirrored what was seen at the national level. In the United States, "activity remained low through November, increased during December, and peaked in February[1]. The United States, including Texas, "experienced low-level seasonal influenza virus activity" during the summer months; "beginning in early September, CDC received reports of a small number of localized influenza outbreaks caused by influenza A(H3N2) viruses." [2]. In Texas, there were eight outbreaks that were reported in August and September.

Influenza A (H3N2) virus was the predominant strain overall, but influenza A (H1N1) viruses were commonly identified from December to March. Influenza B viruses circulated throughout the entire influenza season, but became more predominant toward the end of the influenza season.

Nationally, "severity indicators (e.g., hospitalization and mortality rates) were within the range that has been observed during previous seasons when influenza A(H3N2) viruses predominated. Previous influenza A(H3N2)–predominant seasons have been associated with increased hospitalizations and deaths compared with seasons that were not influenza A(H3N2)–predominant, especially among children aged <5 years and adults aged ≥65 years. The majority of influenza viruses antigenically characterized at CDC were similar to the reference viruses representing the recommended components for the 2016–17 vaccine." "The composition of the 2017–18 influenza vaccine has been updated to better match circulating influenza viruses". Influenza-like illness reported by Texas ILINet providers, for the most part, was higher when compared to the last season but lower than the two preceding seasons. As far as mortality for the 2016-17 influenza season, a total of 110 influenza-associated pediatric deaths were reported in the US, of which 8 were reported from Texas[3].

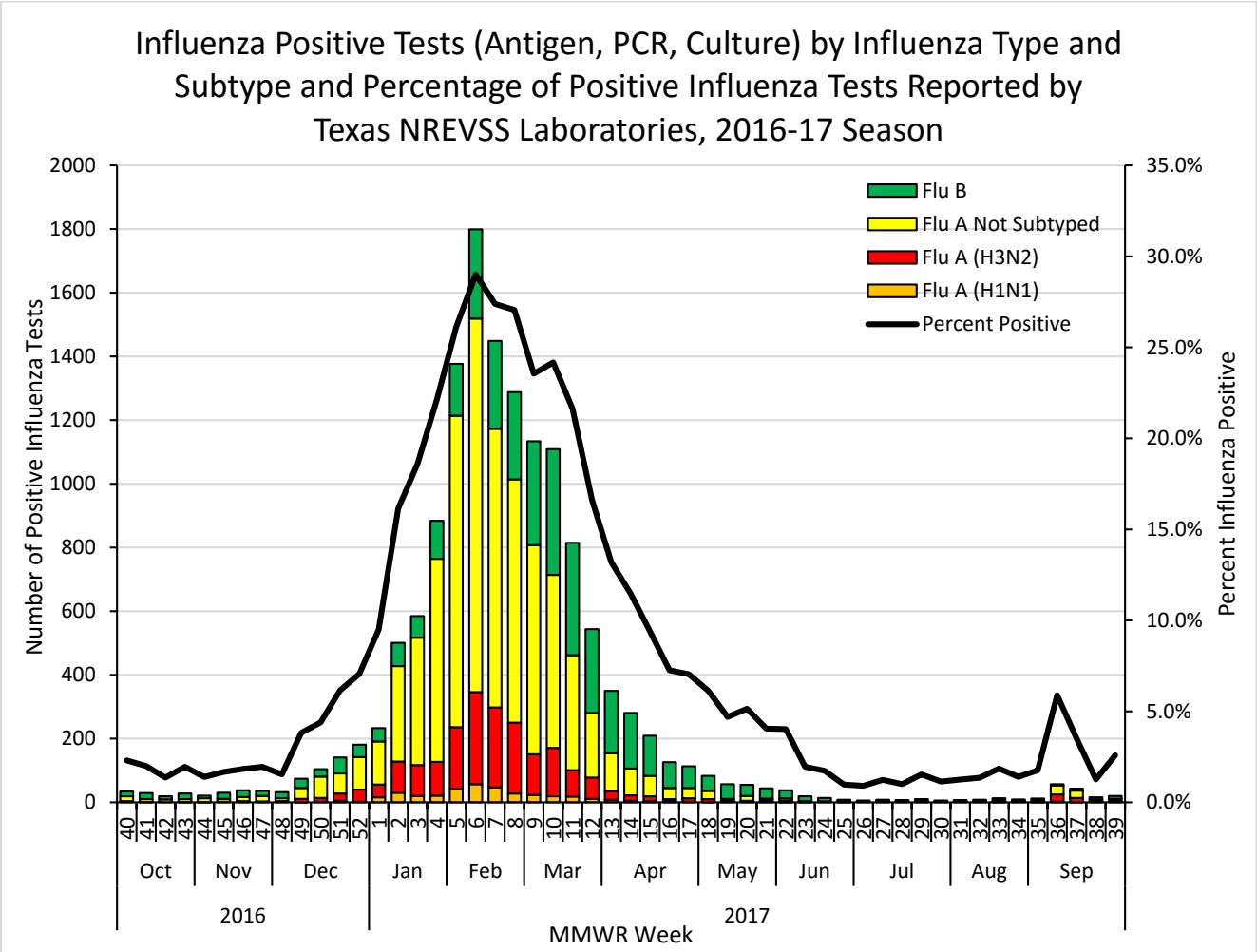
Viral Surveillance

National Respiratory and Enteric Virus Surveillance System (NREVSS)[i]

During the 2016–17 season, 25 participating laboratories in most Texas Health Service Regions (HSRs) submitted data to NREVSS on antigen detection, virus isolation (i.e. culture), and polymerase chain reaction (PCR) testing for influenza. Of the 104,444 influenza tests that were reported to NREVSS from Texas laboratories, 14,104 (13.50%) were positive for influenza virus. Of the 14,104 positive tests, 10,272 (72.83%) tests were positive for influenza A and 3,832 (27.17%) tests were positive for influenza B. The majority (76.81%) of the positive test results for influenza A reported through NREVSS were reported as influenza A (not subtyped) because most laboratories in Texas do not perform subtyping or perform mostly antigen detection tests (which do not provide a subtype result). Of the 2,382 influenza A results for which subtyping was reported, 16.04% were identified as influenza A (H1N1) and 83.96% were identified as influenza A (H3N2). The peak of influenza activity reported by Texas NREVSS laboratories occurred during the week ending

February 11, 2017 (MMWR week 6), when 29.0% of tests were positive for an influenza virus (Figure 1).

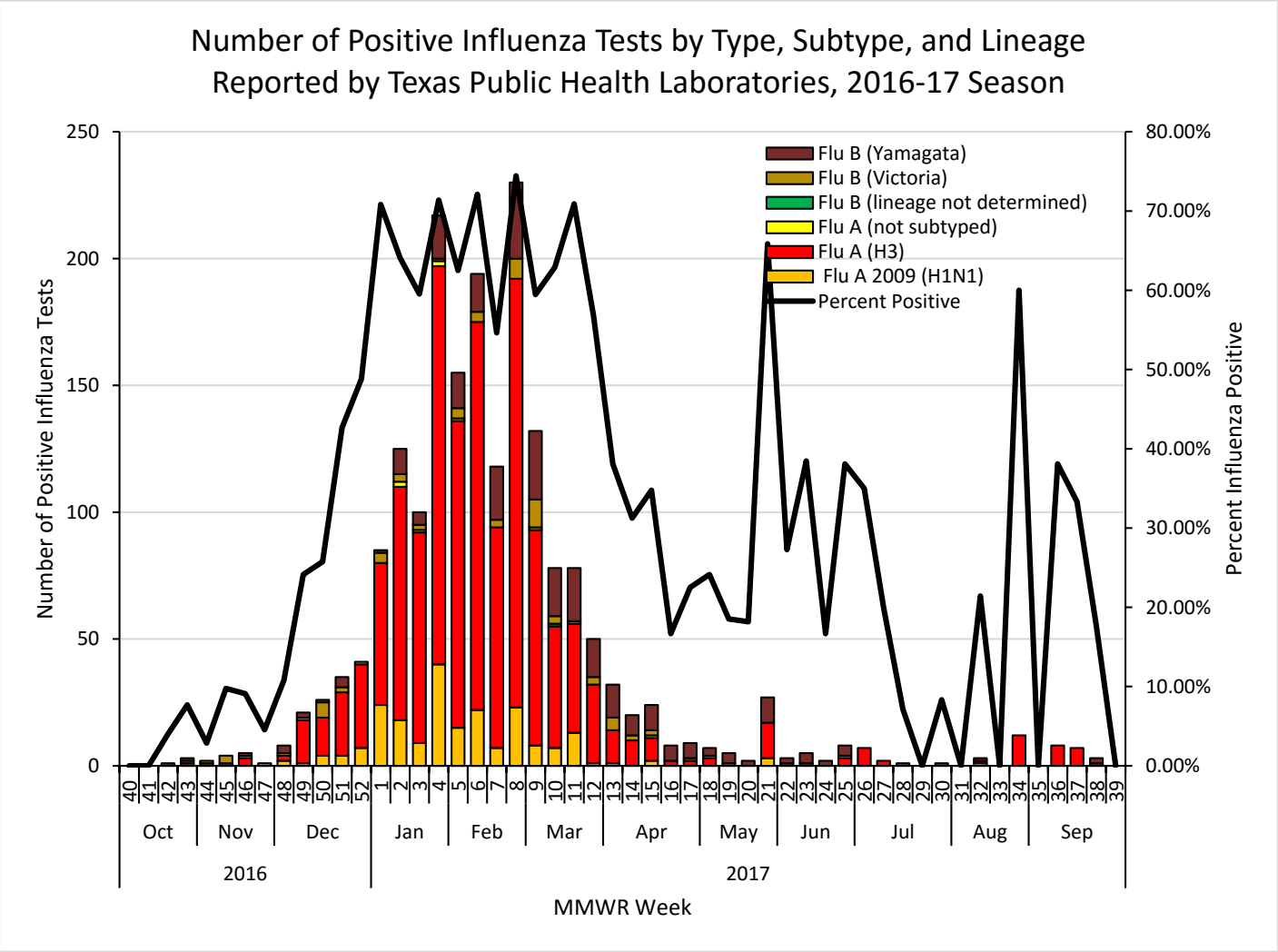
Figure 1. Influenza types and subtypes reported by Texas National Respiratory and Enteric Virus Surveillance System Laboratories, 2016-17 Season



Texas Public Health Laboratories[ii]

The first PCR positive influenza specimens of the season were collected from a person who resides in HSR 2/3 during the week ending October 22, 2016 (week 42). The specimen was tested at the DSHS Laboratory in Austin and was identified as influenza B/Yamagata during week 42. Influenza viruses were detected every week from the third full week in October through the middle of July (week 42 through week 28), and then sporadically thereafter. The first positive specimen for influenza A (H3) was confirmed at the end of October (week 43). All four virus types, subtypes, and lineages circulated throughout the season; however, influenza A H3N2 was the predominant subtype of influenza A that was detected during the 2016–17 season in Texas.

Figure 2. Influenza types, subtypes, and lineages identified by Texas public health laboratories, 2016–17 season



Specimen submission began to increase beginning the week ending December 10, 2016 (week 49). The peak percentage of specimens positive for influenza, 74.43% (Figure 2), occurred during the week ending February 25, 2017 (week 08). The proportion of specimens positive for influenza virus in the 2015–16 season equaled or exceeded 10% for 32 consecutive weeks. Specimen submission peaked in the week ending February 25, 2017 (week 08) and slowly declined thereafter.

Over the course of the 2016-17 influenza season, Texas public health laboratories received 3,782 specimens for influenza surveillance that met specimen testing and handling requirements; of those, 1905 (50.4%) were positive for influenza virus. Of those that were positive for influenza virus, 1541 (80.9%) were identified as influenza A viruses and 364 (19.1%) were identified as influenza B viruses. Of the 1533 influenza A positives that were subtyped, 212 (13.8%) were identified as influenza A (H1N1) and 1321 (86.2%) were identified as influenza A (H3). Of the 362 influenza B positives in which a lineage was determined, 1285 (78.7%) were identified as influenza B/Yamagata lineage and 77 (21.3%) were identified as influenza B/Victoria lineage.

Antigenic Characterization of DSHS Austin Laboratory Influenza Positive [iii]
Ninety-five viruses from Texas were submitted for antigenic characterization during the 2016-17 season: 20 influenza A (H1N1) viruses, 35 influenza A (H3N2) viruses, and 40 influenza B viruses.

Of the 20 influenza A (H1N1) viruses characterized, 19 (95.0%) were characterized as A/CALIFORNIA/07/2009-like (H1N1)pdm09, the 2016-17 Northern Hemisphere influenza A (H1N1) vaccine component. One (5.0%) of the influenza A (H1N1) viruses was characterized as A/MICHIGAN/45/2015-LIKE (H1N1)pdm09, the 2017-18 Northern Hemisphere influenza A (H1N1) vaccine component.

Of the 35 influenza A (H3N2) viruses characterized, 35 (100.0%) were characterized as A/HONG KONG/4801/2014-LIKE (H3N2), the 2016–17 Northern Hemisphere influenza A (H3N2) vaccine component.

Of the 40 influenza B viruses characterized, 23 (57.5%) were characterized as B/Phuket/3073/2013-like (part of the B/Yamagata lineage), the influenza B component of the 2016-17 Northern Hemisphere quadrivalent influenza vaccine. Seventeen (42.5%) viruses were characterized as B/Brisbane/60/2008-like (a B/Victoria lineage virus), the influenza B component of the 2016-17 Northern Hemisphere trivalent and quadrivalent influenza vaccine. Both lineages were detected during the fall and winter of 2016 through the spring of 2017.

Antiviral Resistance Testing of DSHS Austin Laboratory Influenza Positives
During the 2016–17 season, 200 influenza isolates were tested by the CDC for resistance to commonly prescribed influenza antiviral medications (Table 1). All of the tested viruses from Texas were sensitive to oseltamivir, zanamivir and peramivir.

Table 1. Antiviral Resistance Results from Texas Influenza Viruses, 2016-17 Season

	Oseltamivir		Zanamivir		Peramivir^	
	Virus samples tested (n)	**Resistant viruses, number (%)**	**Virus samples tested (n)**	**Resistant viruses, number (%)**	**Virus samples tested (n)**	**Resistant viruses, number (%)**
Influenza A (H1N1)	32	0 (0%)	32	0 (0%)	32	0 (0%)
Influenza A (H3N2)	101	0 (0%)	101	0 (0%)	101	0 (0%)
Influenza B/Victoria	22	0 (0%)	22	0 (0%)	22	0 (0%)
Influenza B/Yamagata	45	0 (0%)	45	0 (0%)	45	0 (0%)

^ Peramivir is an intravenous antiviral medication that was FDA-approved for use on December 19, 2014

Morbidity Surveillance

US Outpatient Influenza-like Illness Surveillance Network (ILINet)[iv]

One hundred thirty providers in Texas submitted data to ILINet for at least one week during the 2016-17 season (i.e., 2016 MMWR week 40 to 20167 week 40) (Figure 3). During the official influenza reporting season (i.e., 2016 week 40 to 2017 week 20), an average of 112 providers submitted data on an average of 29,061 patient visits each week.

The Texas ILI baseline for the 2016–17 season was 6.64%[v]. According to data from Texas ILINet participants, the percentage of visits due to ILI first exceeded the Texas baseline during the week ending February 04, 2017 (week 5), with 8.57% of visits due to ILI (Figure 4). Influenza-like illness peaked during the week ending February 11, 2017 (week 6). During that week, ILINet providers reported that influenza-like illness accounted for 10.74% of all patient visits. The percentage of visits due to ILI fell below the state baseline in the week ending March 11, 2017 (week 11) and remained below the state baseline for the remainder of the 2016-17 season.

Overall, ILI activity in Texas exceeded the Texas baseline for 6 consecutive weeks. The peak percentage of visits due to ILI reported in Texas ILINet for the 2016-17 season was higher than the year before and occurred earlier in the flu season when compared to the previous season but later than the two seasons before that (Figure 5). The peak percentage for each of the three previous seasons was 7.01% during the week ending February 13, 2016, 14.17% during the week ending December 20, 2014 (week 51) of the 2014-15 season, and 13.75% during the week ending December 28, 2013 (week 52) of the 2013-14 season.

Figure 3. Number of active Texas participants per county in the US Outpatient Influenza-like Illness Surveillance Network, 2016-17 influenza season[vi]

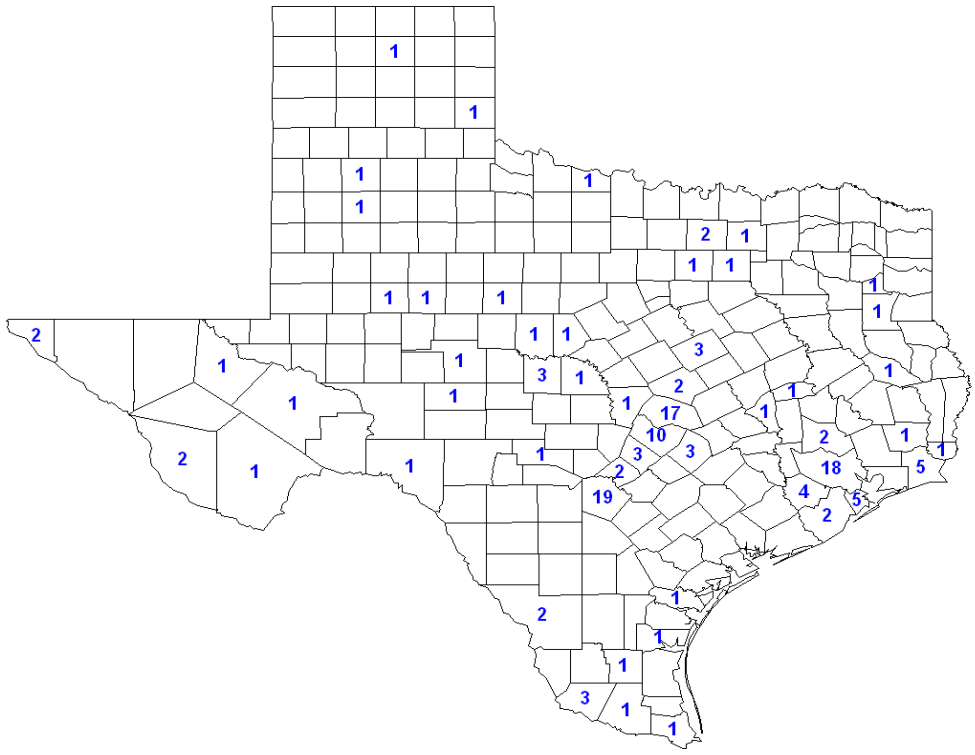


Figure 4. Percentage of visits for influenza-like illness reported by the US Outpatient Influenza-like Illness Surveillance Network in Texas, 2016–17 season

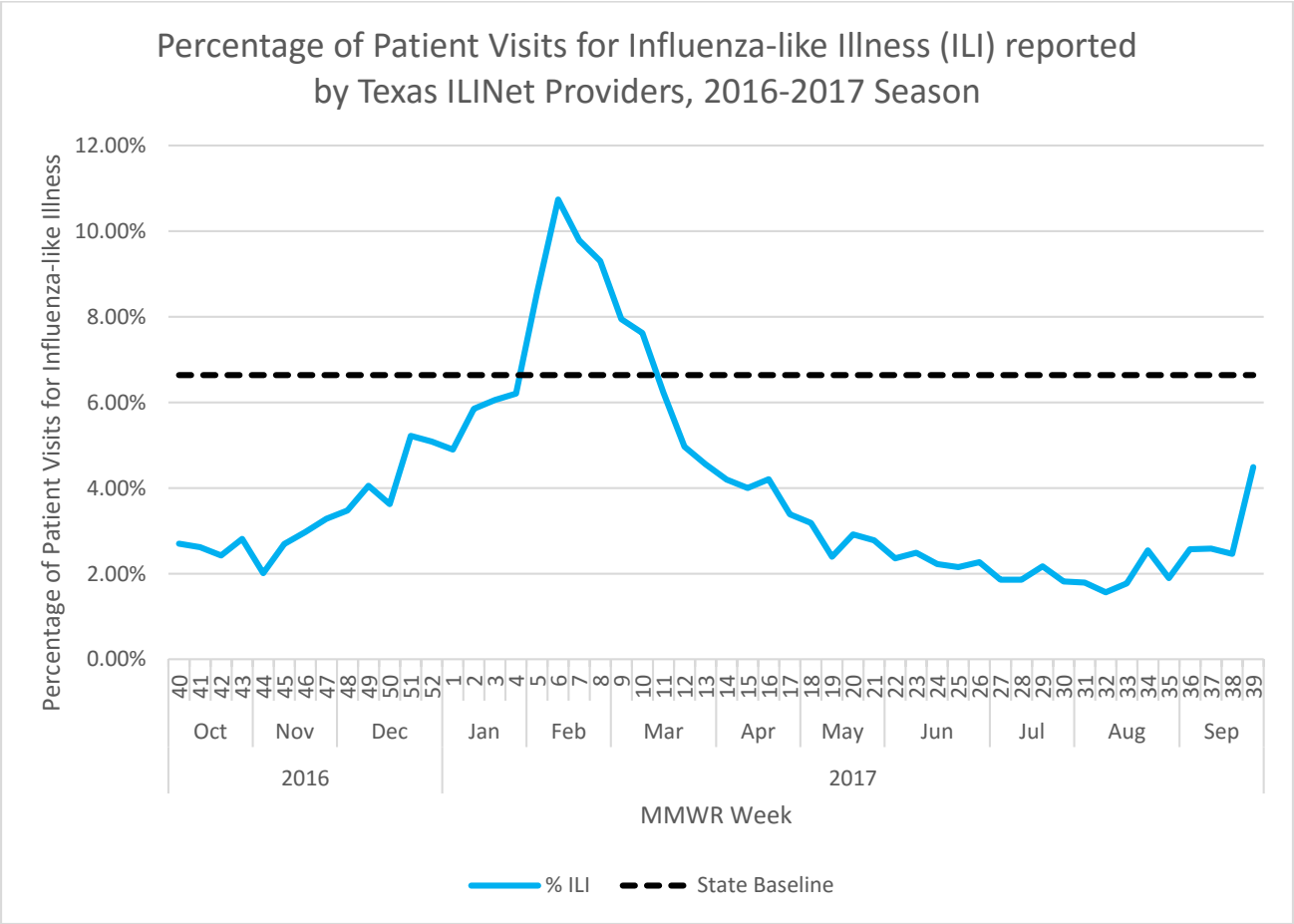
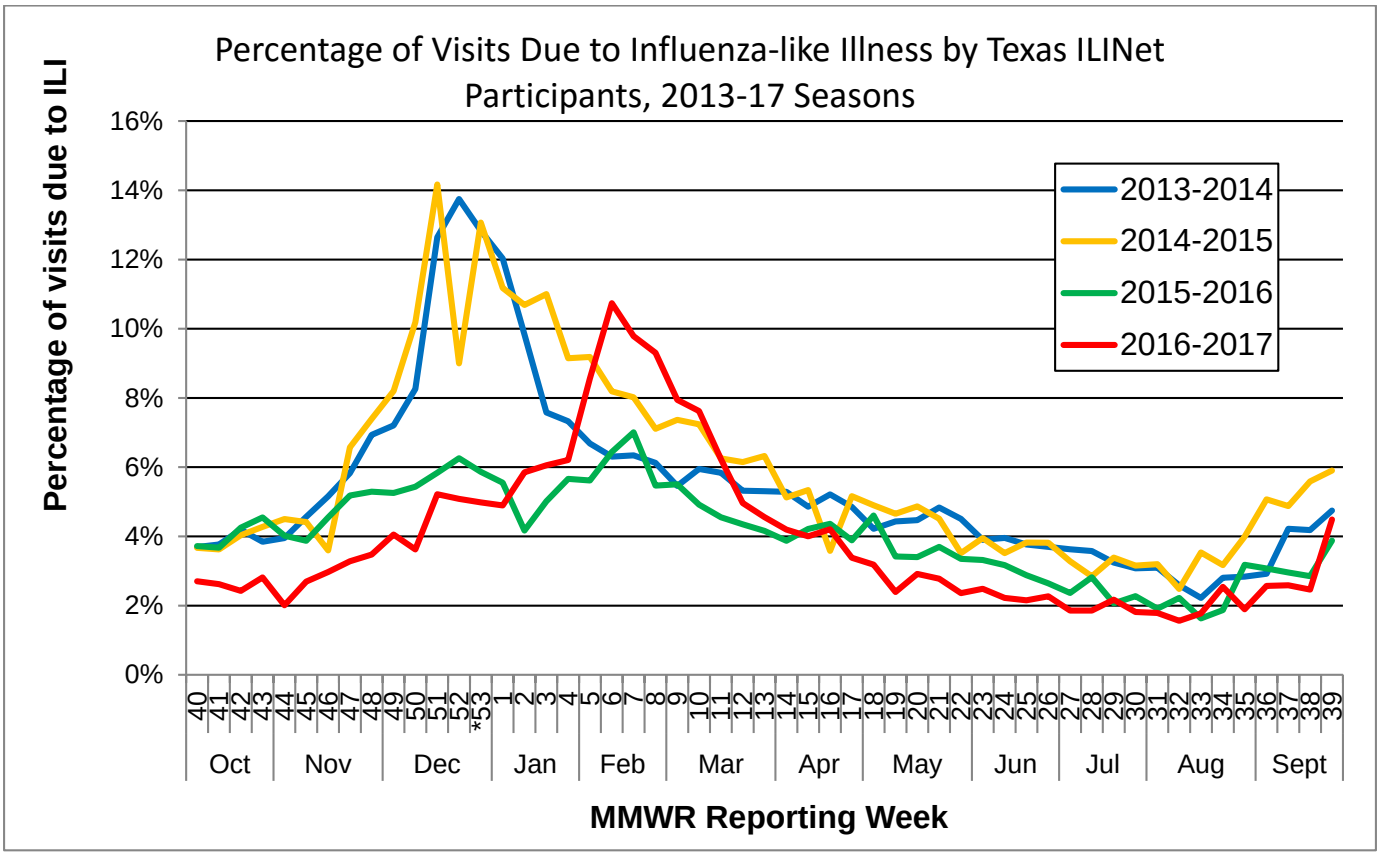


Figure 5. Percentage of visits due to influenza-like illness reported by Texas ILINet Participants, 2013-17 Seasons



*There was a week 53 in the 2014-2015 influenza season, but there was not a week 53 for the 2015-2016 influenza season or the other previous seasons; therefore the week 53 data point for those seasons is an average of week 52 and 1.

Mortality Surveillance

Influenza-Associated Pediatric Mortality[vii]

Eight influenza-associated pediatric fatalities were reported to DSHS for the 2016-17 influenza season. The 2016-17 influenza season had the third lowest number of reported influenza-associated pediatric deaths in a single influenza season since reporting for this condition began in Texas in 2007. Only the 2011-12 season and the 2015-16 season had fewer reported influenza-associated pediatric deaths when only 4 and 7 influenza-associated pediatric deaths were reported, respectively.

The reported deaths occurred during the week ending December 3, 2016 (week 48) through the week ending April 29, 2017 (week 17). These deaths were reported in residents of six Texas HSRs (HSR 2/3- 2 deaths, HSR 6/5S- 2 deaths, HSR 7- 1 death, HSR 8- 1 death, HSR 9/10- 1 death, and HSR 11- 1 death). Five (62.5%) patients had confirmed influenza A infections and 3 (37.5%) patients had influenza B infections. Subtyping of the influenza A virus was performed for four of the influenza A infections; three were identified as influenza A (H3N2) and one was identified as influenza A (H1N1).

The median age at death was 8.5 years with patients ranging in age from 5 months to 17 years. Of the eight reported cases, one case was younger than 6 months of age, one cases were 6 months

to 4 years of age, three cases were 5 to 10 years of age, and three cases were 11 to 17 years of age. Of the six cases who were eligible for vaccination and for whom influenza vaccination status was known, all six (100.0%) were fully vaccinated for the current season. Five (62.5%) cases had significant underlying medical conditions.

Pneumonia and Influenza (P&I) Mortality[viii]

Ten thousand nine hundred and fifty-five P&I deaths were reported in Texas during the 2016-17 influenza season. The 65 years or older age category had the highest number of P&I deaths with 8,404 (76.7%) followed by the 50-64 years of age category with 1,831 P&I deaths (16.7%). The number of P&I deaths for the other age categories (0-4, 5-17, and 18-49) were low (see table 3 below). When looking at P&I deaths by HSR, HSR 4/5N had the highest mortality rate with 53.40 per 100,000 followed by HSR 1 with 48.03 per 100,000 (see table 4).

Table 2: Texas P&I Deaths Occurring Oct. 02, 2016-Sep. 30, 2017 by Age

Age Category (years)	Number of P&I Deaths+	Mortality Rate (per 100,000)
0 - 4	61	2.94
5 - 17	35	0.64
18 - 49	624	4.90
50 - 64	1831	36.28
65 +	8404	239.28
Overall	10955	38.04

*NOTE: Data are provisional and subject to change, errors, and duplicates

Table 43: Texas P&I Deaths Occurring Oct. 02, 2016-Sep. 30, 2017 by Health Service Region (HSR)

HSR	Number of P&I Deaths	Mortality Rate (per 100,000)
1	437	48.03
2/3	3019	36.26
4/5N	6857	53.40
6/5S	2503	33.32
7	1250	35.76
8	1256	42.17
9/10	598	38.50
11	1032	42.70
Unknown	<10	N/A
Overall	10955	38.04

*NOTE: Data are provisional and subject to change, errors, and duplicates

Texas Influenza Surveillance System

Background

Influenza and influenza-like illnesses (ILI) were last reportable by law in any county in Texas in 1993[4]. During that year, over 275,000 cases of influenza and influenza-like illness were reported to the Texas Department of State Health Services (DSHS) (legacy agency Texas Department of Health). The only influenza categories reportable by law in Texas for the 2016–17 season included influenza-associated pediatric fatalities, outbreaks associated with influenza, and novel influenza A infections in humans. Because there is no current reporting requirement for the majority of influenza illnesses, it is not known how many influenza-related illnesses, hospitalizations, and deaths occur each year in Texas residents. A small number of influenza cases are reported voluntarily through sentinel surveillance networks composed of laboratories, hospitals, physicians, nurses, schools, and universities located throughout the state. Additional

resources include web-based influenza and ILI reporting systems, as well as local and regional health departments that gather data from surveillance participants in their jurisdictions. Data from all sources are reported to the DSHS Central Office in Austin, compiled, and presented weekly in the Texas Influenza Surveillance Report.

Components

The national influenza reporting period begins in early October [Morbidity and Mortality Weekly Report (MMWR) week 40] and continues through late May (MMWR week 20). Influenza surveillance in Texas continues year-round, although in reduced capacity during the summer months. The goals of influenza surveillance are to determine when and where influenza viruses are circulating, if the circulating viruses match the vaccine strains, what changes are occurring in the viruses, what impact influenza is having on hospitalizations and deaths, and the severity of influenza activity. The three main Texas influenza surveillance components are viral, morbidity, and mortality surveillance. Viral influenza surveillance at the state level consists of influenza test results reported by Texas laboratories in the National Respiratory and Enteric Virus Surveillance System (NREVSS) and specimens sent to public health laboratories for influenza surveillance testing. Morbidity surveillance consists of reports of novel influenza A virus infections in humans; reports of ILI from Texas participants in the US Outpatient Influenza-like Illness Surveillance Network (ILINet), and local and regional health department surveillance; and reports of influenza or ILI outbreaks. Mortality surveillance includes influenza-associated deaths in children younger than 18 years of age and pneumonia and influenza (P&I) deaths among Texas residents of all ages.

References

1. Blanton L, Alabi N, Mustaquim D et al. Update: Influenza Activity in the United States During the 2016-17 Season and Composition of the 2017-18 Influenza Vaccine. MMWR Morb Mortal Wkly Rep 2017;66: 668–676.
2. Blanton L, Wentworth D, et al. Update: Influenza Activity — United States and Worldwide, May 21–September 23, 2017. MMWR Morb Mortal Wkly Rep 2017;66:1043–1051.
3. Centers for Disease Control and Prevention. Fluview: 2017-2018 Influenza Season Week 03 ending January 20, 2018. Retrieved January 26, 2018 from https://www.cdc.gov/flu/weekly/.
4. Texas Department of Health. Epidemiology in Texas 1993 Annual Report. Available at: http://www.dshs.texas.gov/idcu/Data/annual/1990s/.
5. Centers for Disease Control and Prevention. U.S. Outpatient Influenza-like Illness Surveillance Network: 2016–2017 Workfolder. 55.20E, Rev. 03/2015.
6. Council of State and Territorial Epidemiologists. Influenza Incidence Surveillance Project – Application. April 1, 2011.
7. Centers for Disease Control and Prevention. Influenza-Associated Pediatric Mortality, 2004 case definition. Available at: https://wwwn.cdc.gov/nndss/conditions/influenza-associated-pediatric-mortality/case-definition/2004/. Accessed on December 22, 2017.

[i] NREVSS is an online laboratory results reporting system for several respiratory and enteric viruses that is maintained by the CDC. NREVSS reporters in Texas are primarily hospital laboratories, although two public health laboratories (Tarrant County Public Health [Laboratory Response Network] Lab and the DSHS Austin Laboratory) also participate. See http://www.cdc.gov/surveillance/nrevss/ for more information.

[ii] Influenza surveillance specimens are submitted for PCR testing to the DSHS Austin laboratory, the Houston Department of Health and Human Services Laboratory, and the Texas Laboratory Response Network (LRN) laboratories throughout the season by physicians, hospitals, clinics, and health departments across Texas. The Texas LRN laboratories have been participating in influenza surveillance since the 2008–2009 influenza season; the participating LRN laboratories are located in Corpus Christi, Dallas, El Paso, Fort Worth, Harlingen, Houston, Lubbock, San Antonio, and Tyler.

[iii] Like other state virology laboratories in the country, DSHS submits early, mid, and late-season as well as unusual influenza viruses to the CDC for strain characterization. Specimens and influenza viruses are also submitted at regular intervals according to CDC's instructions.

[iv] Texas participants in ILINet report weekly on the number of patient visits for ILI by age group and the total number of patients seen for any reason. For ILINet reporting, ILI is defined as "fever (≥100°F [37.8°C], oral or equivalent) *and* cough and/or sore throat without a known cause other than influenza"[5]. ILINet data are used to calculate a weekly percentage of visits due to ILI.

[v] The baseline is the mean percentage of patient visits for ILI during non-influenza weeks for the previous three seasons plus two standard deviations. A "non-influenza week" is defined as a week that accounted for less than 2% of the season's total number of specimens that tested positive for influenza.

[vi] In order to be considered an active participant in ILINet, a provider must report at least one week during the season. Therefore, active providers did not necessarily report every week of the influenza reporting season.

[vii] "An influenza-associated death is defined for surveillance purposes as a death resulting from a clinically compatible illness that was confirmed to be influenza by an appropriate laboratory or rapid diagnostic test. There should be no period of complete recovery between the illness and death. Influenza-associated deaths in all persons aged <18 years should be reported[7]."

[viii] Pneumonia and influenza (P&I) death data are obtained from death certificates of Texas residents whose underlying or contributing cause(s) of death is reported as pneumonia or influenza. P&I deaths are identified based on ICD-10 multiple cause of death codes. The death data comes from the DSHS Center for Health Statistics. P&I Mortality Surveillance began during the 2015-16 influenza season.