

Kansas Influenza Surveillance, 2017-2018



Introduction

Influenza is not a nationally notifiable disease, nor is it a notifiable disease in Kansas. Because patient-level data is not reported to state health departments or to the Centers for Disease Control and Prevention (CDC), the burden of disease must be tracked through non-traditional methods. Influenza surveillance in Kansas consists of seven components that provide data on outpatient influenza-like illness (ILI), influenza viruses, influenza-associated deaths, and outbreaks.

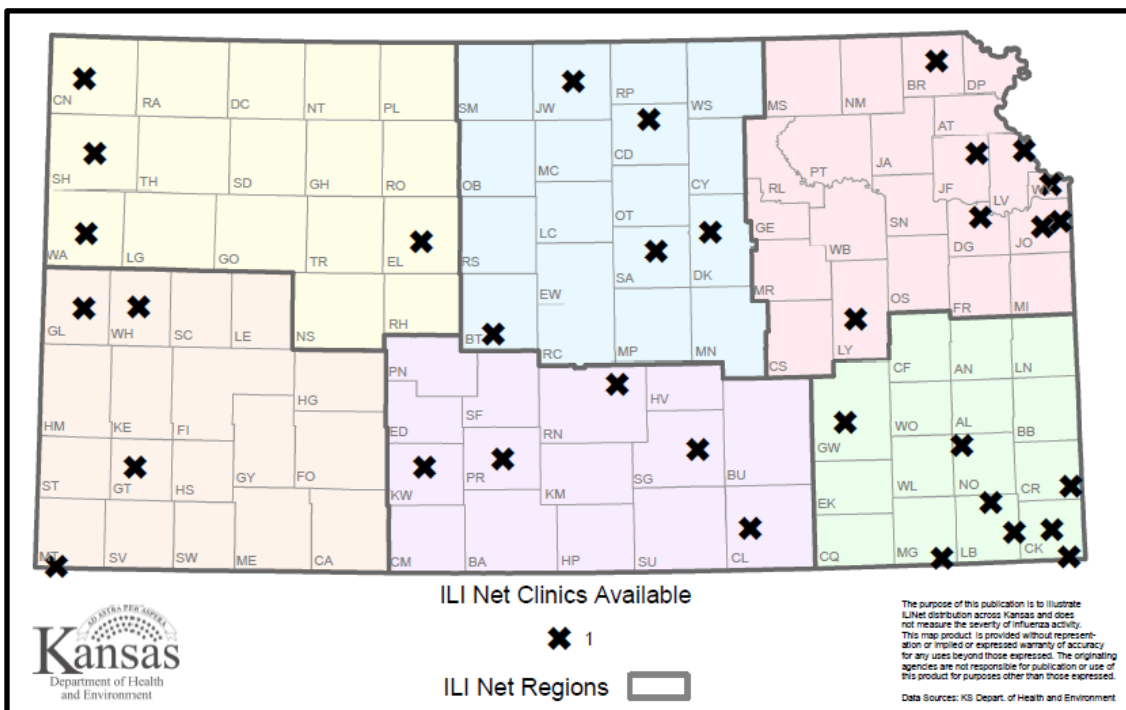
Morbidity Surveillance from the U.S. Outpatient Influenza-like Illness Surveillance Network (ILINet)

The U.S. Outpatient Influenza-like Illness Surveillance Network (ILINet) is a collaboration between CDC and state, local, and territorial health departments. The purpose of this surveillance is to track ILI, recognize trends in influenza transmission, determine the types of circulating influenza strains, and detect changes in influenza viruses. ILI is defined by CDC as a fever ($\geq 100^{\circ}\text{F}$ or $\geq 37.8^{\circ}\text{C}$, measured either at the ILINet site or at the patient's home) with cough and/or sore throat, in the absence of a known cause other than influenza.

The Bureau of Epidemiology and Public Health Informatics (BEPHI) at the Kansas Department of Health and Environment (KDHE) recruited health care providers throughout Kansas to participate in ILINet. Each week, ILINet site personnel determined the total number of patients seen with ILI during the previous week by age group — preschool (0-4 years), school age through college (5-24 years), adults (25-49 years and 50-64 years), and older adults (>64 years). In addition, the total number of patients seen during the previous week for any illness was recorded. Sites were asked to report the previous week's data by 11:00 AM each Tuesday to KDHE and this data was submitted to CDC via the internet or fax.

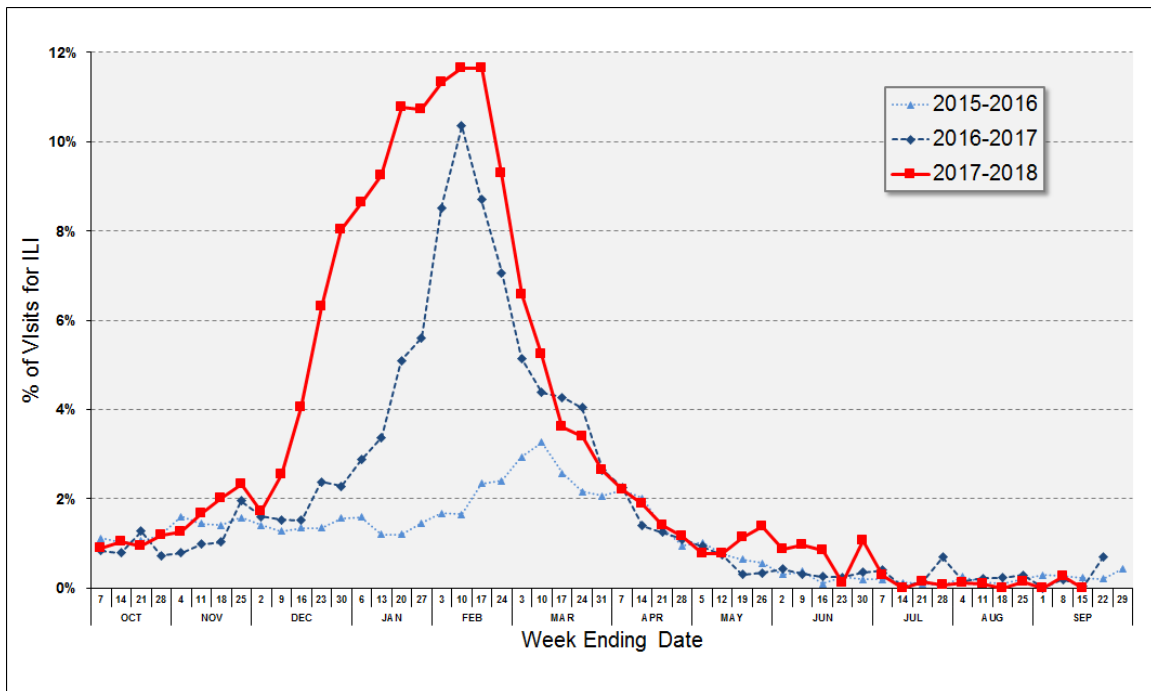
When the surveillance period began during the week ending October 1, 2017, 34 health care providers were enrolled in ILINet. These sites consisted of 18 family practice clinics, 10 hospital emergency departments, 4 university student health centers, and 2 pediatric clinics (Figure 1). One emergency department stopped participating in ILINet midseason and two family practice clinics failed to submit any data.

Figure 1. Sites enrolled in the U.S. Outpatient Influenza-like Illness Surveillance Network (ILINet), Kansas, October 1, 2017 – May 19, 2018 (n=34)



During the influenza surveillance period, starting October 1, 2017 (week 40) and ending May 19, 2018 (week 20), sites observed a total of 212,949 patients; 10,106 (4.7%) sought care for ILI. The rate of ILI rose steadily from December 2017 through January 2018 and it peaked at 11.7% during the week ending February 17, 2018. The rate of ILI dropped below 2% during the week ending April 14, 2018 and remained low through the end of the surveillance period (Figure 2).

Figure 2. Percentage of visits for influenza-like illness (ILI) reported by ILINet sites, Kansas, October 2015 – May 2018*



*ILINet sites may vary in number and type (student health, family practice, etc.) each season. Data from the previous two surveillance years are plotted according to week number corresponding to the 2017-2018 week ending date; for example, week 40 ended October 7, 2017, week 40 of 2016 ended October 8, 2016, and week 40 of 2015 ended October 10, 2015.

Laboratory Surveillance

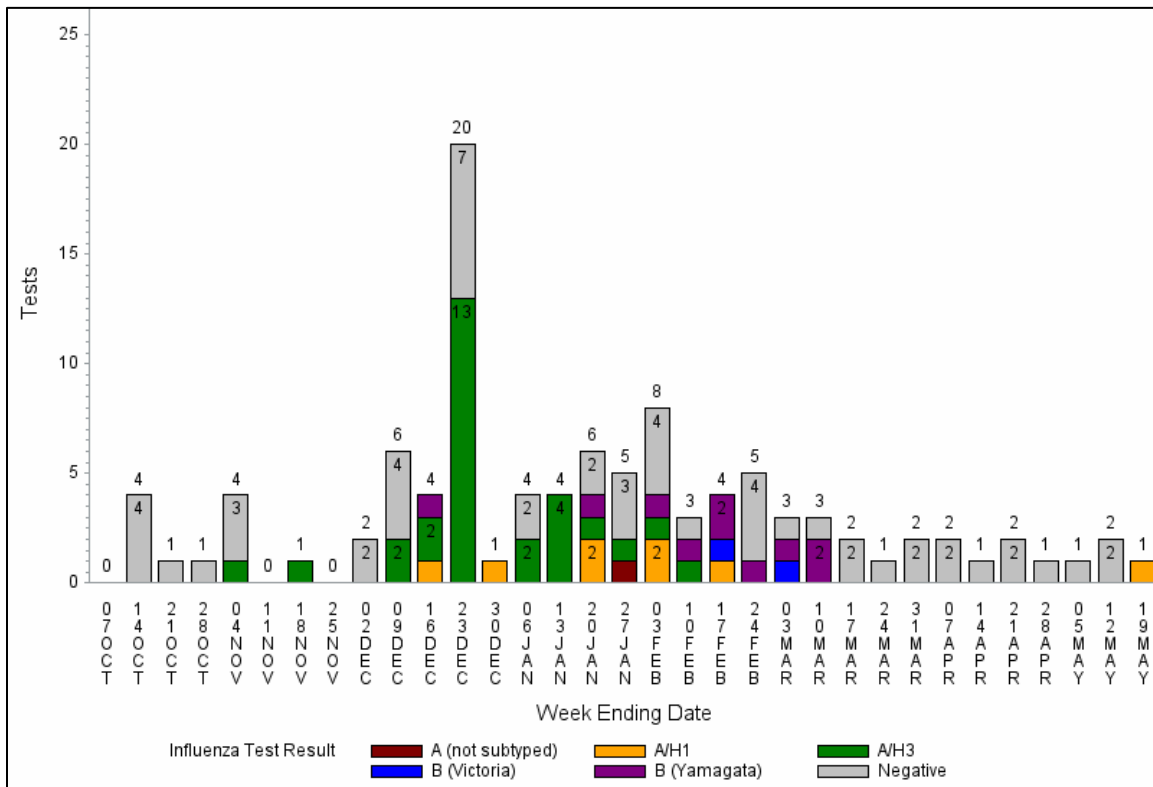
During the 2017-2018 surveillance period, the Kansas Health and Environmental Laboratories (KHEL) provided confirmatory testing for ILINet site patients with ILI. Real-time polymerase chain reaction (RT-PCR) tests were used to analyze nasal and nasopharyngeal swabs for the presence of influenza viruses. Laboratory data was sent weekly to CDC by KHEL. In addition, KHEL forwarded a subset of its specimens to CDC for subtyping, antigenic characterization, and antiviral resistance testing.

From October 10, 2017, when the first respiratory specimen for influenza testing was received, until May 19, 2018, when the 2017-2018 surveillance period ended, KHEL tested 102 specimens for influenza. Influenza was detected in 49 (48%) of the specimens. Both influenza type A and B viruses were detected. Two influenza A subtypes, A/H3 and A/H1, and two influenza B lineages, Yamagata and Victoria, were identified. The influenza A/H3 subtype was most frequently detected, representing 59% of all positive specimens (Table 1, Figure 3).

Table 1: Laboratory-confirmed influenza viruses detected from specimens at Kansas Health and Environmental Laboratories by subtype, Kansas, October 10, 2017 – May 19, 2018 (n=49)

Influenza subtype	# of specimens	% of specimens
A/H3	29	59%
B (Yamagata lineage)	10	20%
A/H1	7	14%
B (Victoria lineage)	2	4%
A (not subtyped)	1	4%

Figure 3: Influenza specimens tested at Kansas Health and Environmental Laboratories by week ending date, October 10, 2017 – May 19, 2018 (n=102)



KHEL sent 27 positive influenza specimens to CDC designated influenza reference centers for antigenic characterization. Results showed that all isolates were similar to the recommended components of the 2017-2018 Northern Hemisphere vaccines.

Respiratory Viral Panel Testing

Specimens that tested negative for influenza by RT-PCR at KHEL were tested using the BioFire multiplex PCR instrument. The BioFire FilmArray Respiratory Panel probed for 17 viral targets and 3 bacterial targets per specimen listed below. The goal of BioFire testing was to better understand which other respiratory viruses were circulating in Kansas during the 2017-2018 influenza season.

Viral Targets

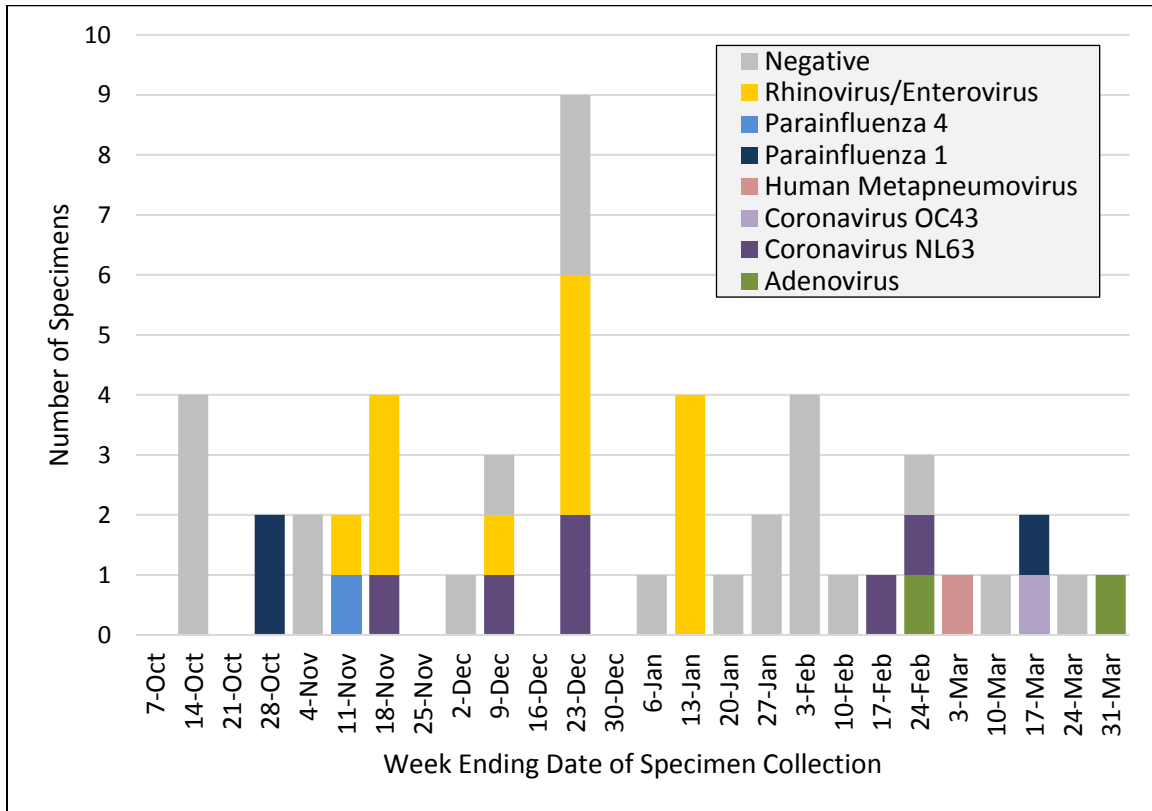
- Adenovirus
- Coronavirus HKU1
- Coronavirus NL63
- Coronavirus 229E
- Coronavirus OC43
- Human Metapneumovirus
- Influenza A
- Influenza A/H1
- Influenza A/H1-2009
- Influenza A/H3
- Influenza B
- Parainfluenza 1
- Parainfluenza 2
- Parainfluenza 3
- Parainfluenza 4
- Respiratory Syncytial Virus

Bacterial Targets

- *Bordetella pertussis*
- *Chlamydophila pneumoniae*
- *Mycoplasma pneumoniae*

Forty-nine specimens were tested on the KHEL BioFire assay and 26 (53%) were positive for one of the viral targets. Rhinovirus/enterovirus was the most common virus found (Figure 4). The RVP specimens tested at KHEL showed no time-specific disease trends over this surveillance period.

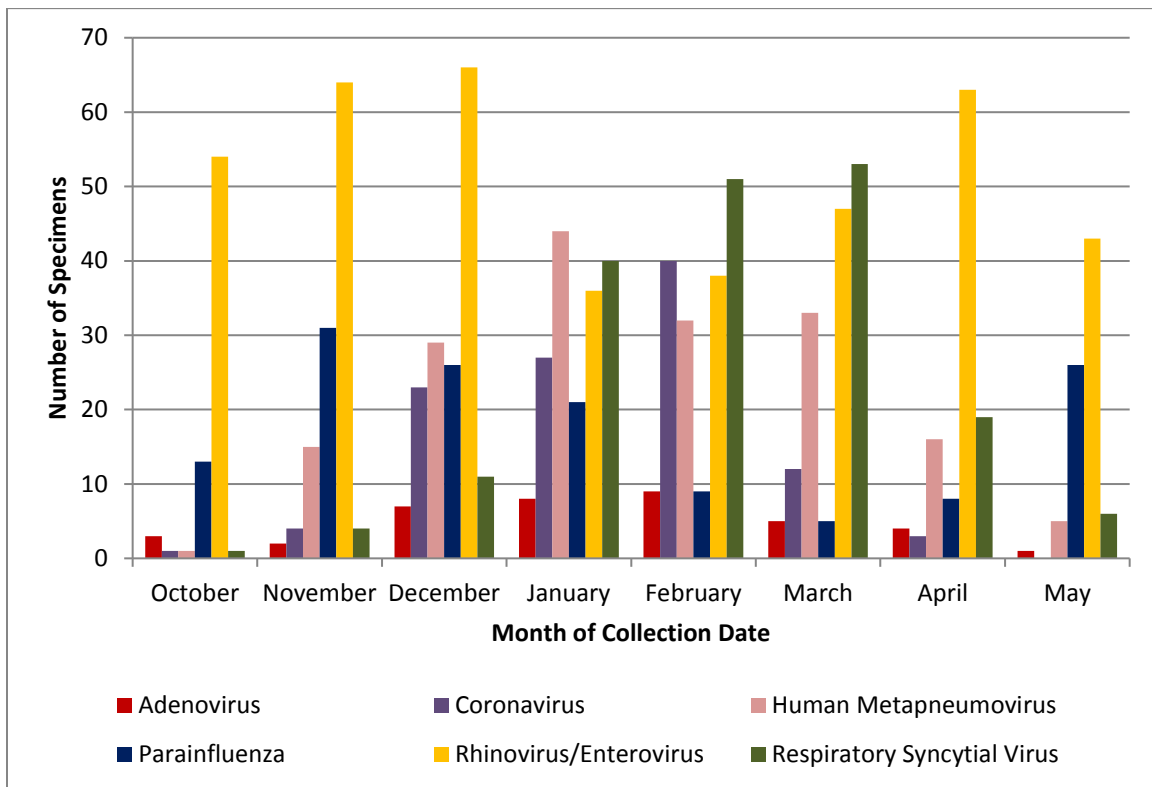
Figure 4: Respiratory Viral Panel results excluding influenza, Kansas Health and Environmental Laboratories, October 2017 – March 2018 (n=49)



For the 2017-2018 season, Via Christi Laboratories in Sedgwick County shared its RVP data with KDHE. RVP results were sent to KDHE monthly and represented the majority of respiratory virus surveillance in the south central region of Kansas.

Via Christi saw many respiratory virus trends during the influenza season (Figure 5). The most common virus found was rhinovirus/enterovirus. They also reported high numbers of respiratory syncytial virus and coronavirus during peak flu season. Other viruses detected were adenovirus, human metapneumovirus, and parainfluenza.

Figure 5: Positive Respiratory Viral Panel results, Via Christi Laboratories, October 2017 – May 2018 (n=1,059)



Syndromic Surveillance

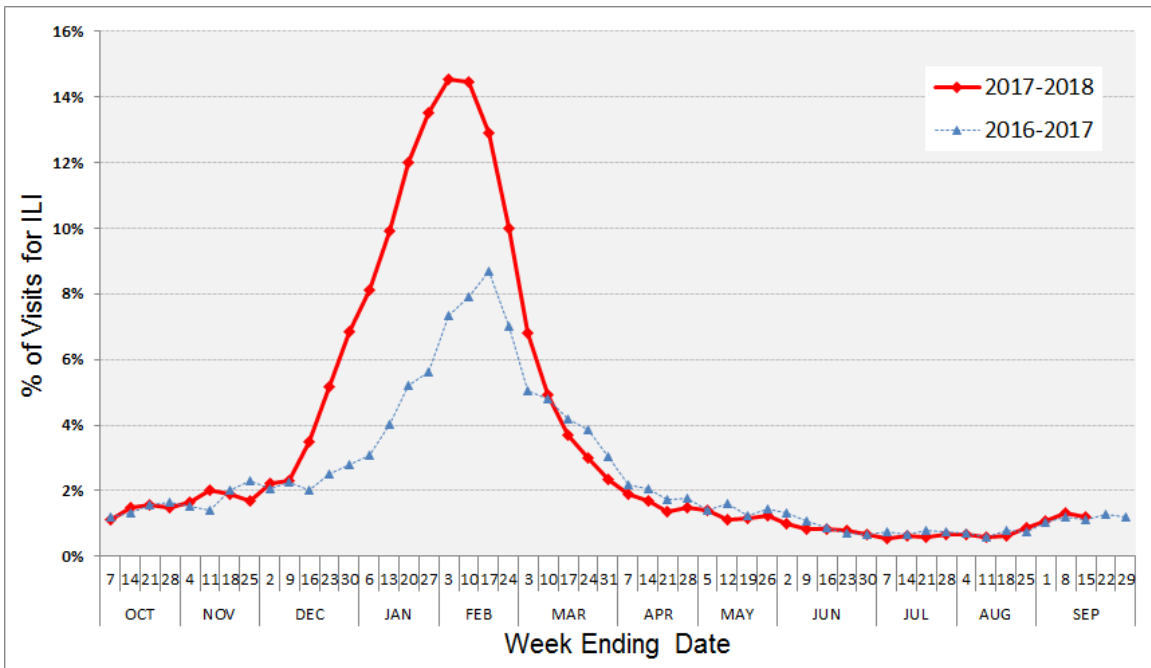
KDHE participates in the National Syndromic Surveillance Program and receives data from emergency departments (EDs) across Kansas. These de-identified records can be queried to detect disease trends and outbreaks. ED records were queried using the criteria developed by the National Syndromic Surveillance Program (NSSP). These criteria identify related ED visits by reviewing the patient’s chief complaint terms and diagnosis codes related to ILI. Chief complaint query methods include free-text terms that indicate a visit is related to ILI. An example would be a search for “FLU” and not “STOMACH FLU”. Chief Complaint queries are combined with inclusionary and exclusionary diagnosis codes in ICD-9, ICD-10, and SNOMED (Table 2). ICD-9 and ICD-10 are the 9th and 10th revisions of the International Statistical Classification of Diseases and Related Health Problems, and SNOMED is the Systematized Nomenclature of Medicine.

Table 2: ILI Chief Complaint terms and diagnosis codes included and excluded in search criteria, Kansas, 2017-2018

Included Chief Complaint Term Categories		Excluded Chief Complaint Term Categories	
Fever	Fever, Chills, Pyrexia, Febrile, High Temp, Feels Hot	Fever	No Fever, Denies Fever
Cough	Cough	Cough	No Cough, Denies Cough
Sore Throat	Sore Throat, Strep, Pharyngitis	Sore Throat	No Negations
Upper Respiratory Infection	Upper Respiratory	Upper Respiratory Infection	No Negations
Influenza	Influenza, Flu, Flu Like	Influenza	No Flu, Denies Flu, Shot, Vaccine, Immunization, Stomach
Included Diagnosis Codes		Excluded Diagnosis Codes	
J09, J10, J11	Influenza due to identified and unidentified influenza viruses	A08.4	Viral intestinal infection
487.0, 487.1, 487.8, 488.0, 488.1, 488.8	Influenza due to identified and unidentified influenza viruses		
442696006	Influenza A		
442438000	Influenza A		
6142004	Influenza (unspecified)		
195878008	Pneumonia and influenza		

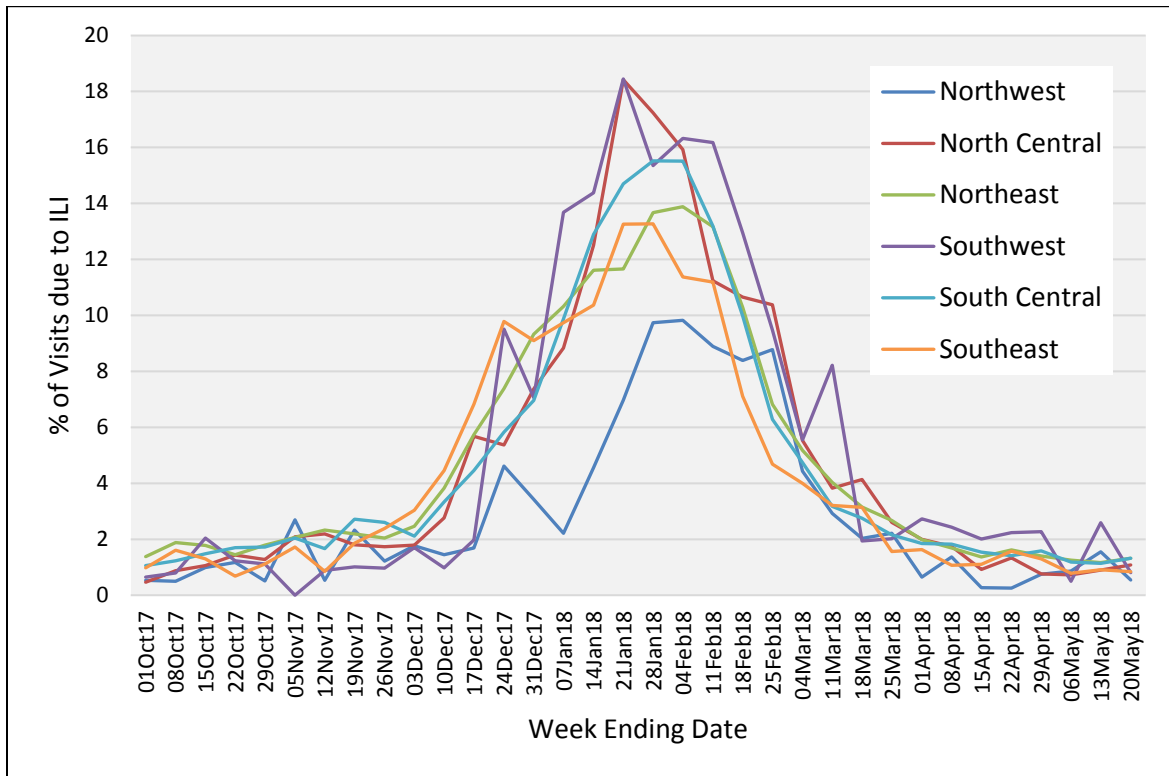
The percentage of ED visits meeting the ILI syndrome definition increased steadily from December 2017 through January 2018, then rapidly increased to its peak (14.6%) in February (Figure 6). This trend matched ILINet data reported by providers during the same period. Syndromic Surveillance ILI ED visits are calculated as a percentage of total visits received by KDHE’s Syndromic Surveillance Program during each month.

Figure 6: Percentage of visits for influenza-like illness (ILI) reported to ESSENCE, Kansas, October 2017 – May 2018



During the 2017-2018 ILI season, KDHE updated regional charts specific to the six Kansas ILINet regions. This allowed users to interact with a map of Kansas and return ILI trends specific to their ILINet region. All six regions showed similar trends with peaks in January. Southwest and north central Kansas experienced the highest percent of visits related to ILI during this influenza season. Of the visits submitted to the Kansas Syndromic Surveillance Program, over 18% of both region’s total visits were related to ILI.

Figure 7: Percentage of visits for influenza-like illness (ILI) reported to ESSENCE by ILINet Region, Kansas, October 2017 – May 2018

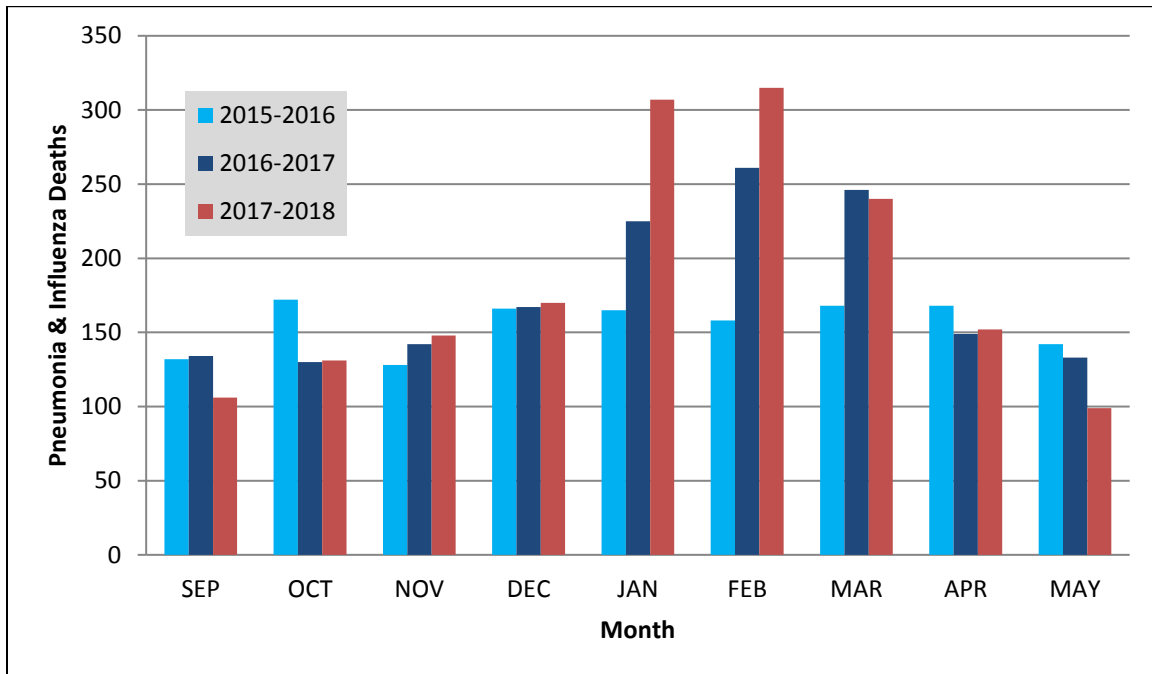


Pneumonia and Influenza (P&I) Mortality

BEPHI monitored influenza-related mortality through death certificate surveillance to determine the number of deaths caused by pneumonia or influenza (P&I). Mortality was divided among three categories: pneumonia or influenza recorded as a contributing factor of death, influenza recorded as the direct cause of death, or pneumonia recorded as the direct cause of death.

Traditionally, P&I mortality data includes deaths that occurred from September through May. During the 2017-2018 period, the number of P&I deaths peaked at 315 in the month of February (Figure 7).

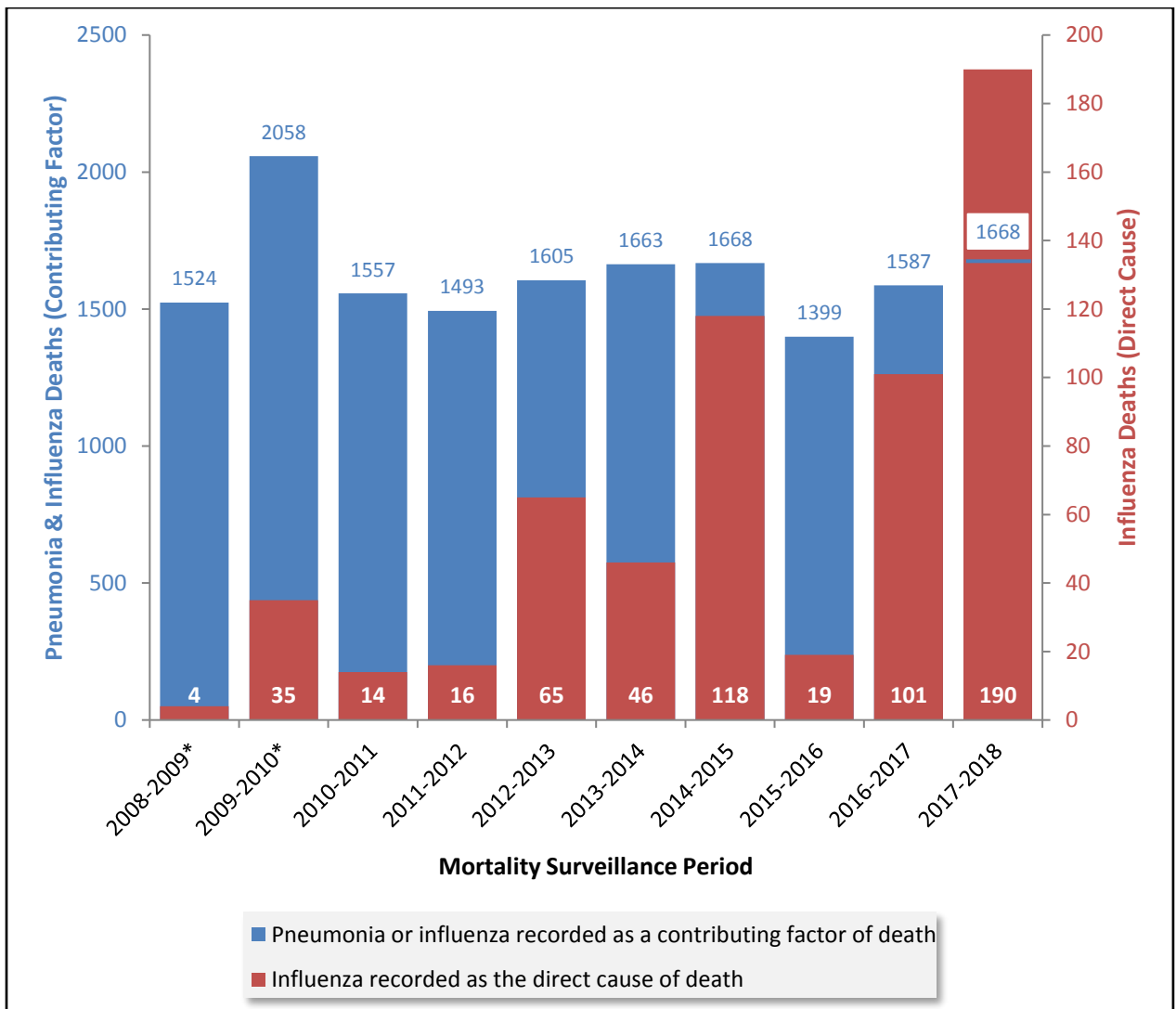
Figure 7: Deaths attributed to pneumonia or influenza by month, Kansas, September 2015-May 2018*



** 2017-2018 data is provisional and subject to change.*

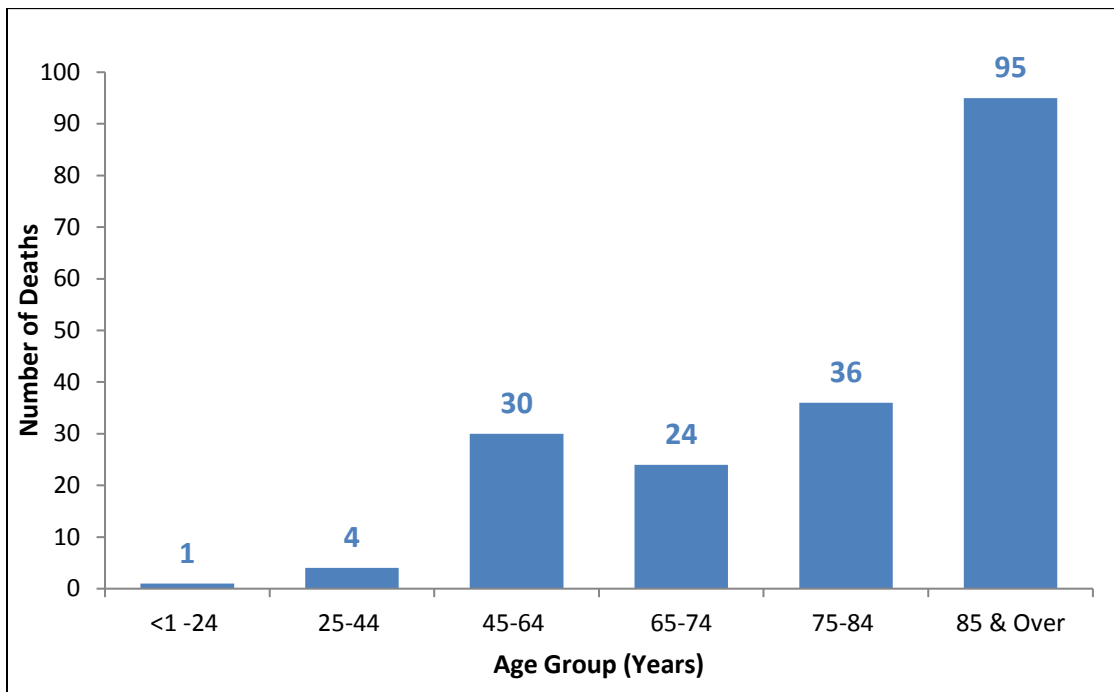
A total of 1,668 pneumonia and influenza deaths occurred during the 2017-2018 surveillance period (Figure 8). This observed mortality was above the 10-year median of 1,596. During the 2017-2018 surveillance period, 190 deaths (11.4%) were directly attributed to influenza, which was above the 10-year median (40 deaths) and the 10-year mean (61 deaths). Ninety-five (50%) of these deaths occurred in individuals 85 years or age or older (Figure 9).

Figure 8: Pneumonia and influenza mortality by surveillance period, Kansas, 2008-2018*



**Each influenza season begins September 1 and ends May 31 of the following year, with the exception of 2008-2009 (September 1, 2008 through April 30, 2009) and 2009-2010 (May 1, 2009 through May 31, 2010). This time shift is due to the emergence of pandemic H1N1 in May 2009. The 2017-2018 data is provisional and subject to change.*

Figure 9: Influenza recorded as direct cause of death by age group, Kansas, September 2017 – May 2018



Influenza-Associated Pediatric Mortality

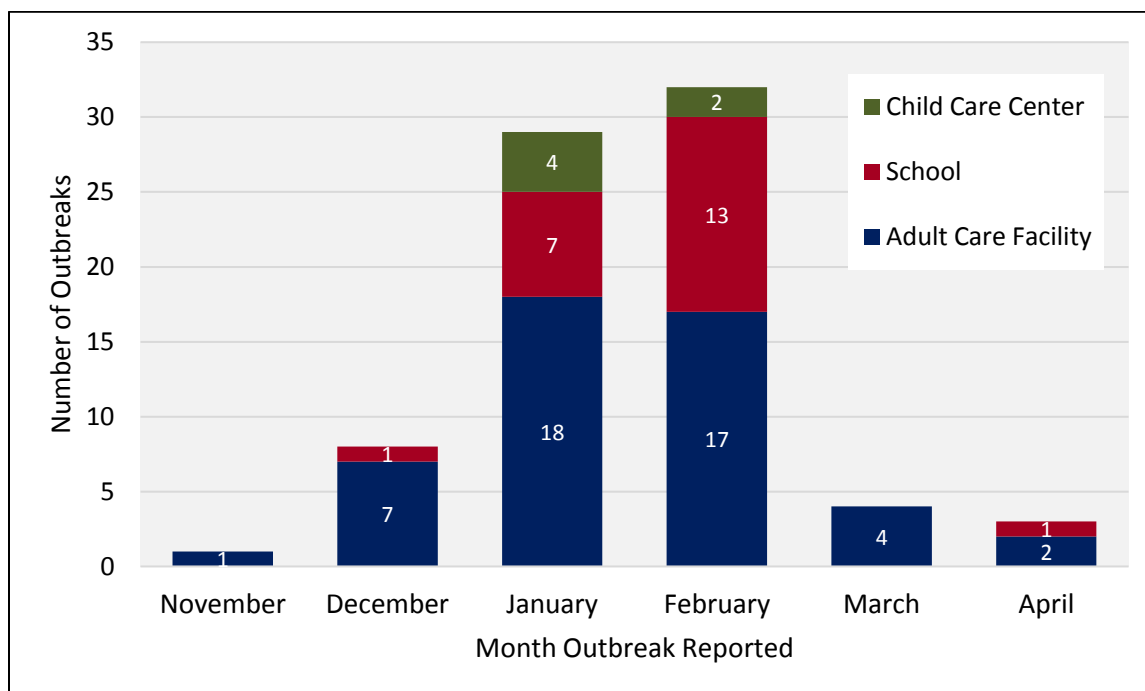
Since 2004, CDC has requested information on influenza-associated pediatric deaths; this condition has been reportable in Kansas since 2006. For surveillance purposes, pediatric deaths were considered influenza-related if there was no period of complete recovery between the clinically compatible illness and death, and if the diagnosis was confirmed to be influenza by an appropriate laboratory test.

During the 2017-2018 surveillance period, two influenza-associated pediatric deaths were reported in Kansas. One did not receive the 2017-2018 influenza vaccine and the other had an unknown vaccination status.

Influenza Outbreaks

A total of 77 outbreaks were reported to KDHE and investigated during the 2017-2018 surveillance period. The majority of outbreaks occurred in February (32), followed by January (29) and December (8). The average number of cases was 30 (range: 2-421). Seventeen outbreaks had an unknown number of cases due to being lost to follow-up. Of the 66 outbreaks for which hospitalization data was available, the average number of hospitalizations was one (range: 0-6). Death data was available for 65 outbreaks and eight deaths were recorded. Most of the outbreaks (49) occurred in adult care facilities. The remainder of outbreaks occurred in schools (22) and child care facilities (6) (Figure 10).

Figure 10: Influenza outbreaks by month reported, Kansas, 2017-2018 (n=77)



Summary

Typically, ILI in Kansas has peaked in December, January, or February. For the 2017-2018 influenza season, ILI peaked at 11.7% during the week ending February 17, 2017. This peak was higher than what was observed during the previous two surveillance periods; ILI peaked at 10.4% during 2016-2017, and 3.3% during 2015-2016. Four influenza viruses were detected in Kansas during the 2017-2018 season: A/H1, A/H3, and two B lineages. The predominant strain in Kansas and the U.S. was A/H3. All characterization testing results of influenza virus isolates submitted to CDC by Kansas were similar to the recommended components of the 2017-2018 Northern Hemisphere vaccines.

Nationally, overall hospitalization rates (all ages) during the 2017-2018 season were the highest ever recorded, breaking the previously recorded highs during the 2014-2015 season; a high severity H3N2-predominant season.

During the 2017-2018 influenza season, 190 deaths in Kansas were directly attributed to influenza. This was a sharp increase from the previous season with 99 deaths. Of the Kansas deaths, 50% were among those 85 years or older. A total of 77 influenza outbreaks were investigated during the 2017-2018 influenza season.

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