

Kansas Influenza Surveillance, 2018-2019



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 is 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.

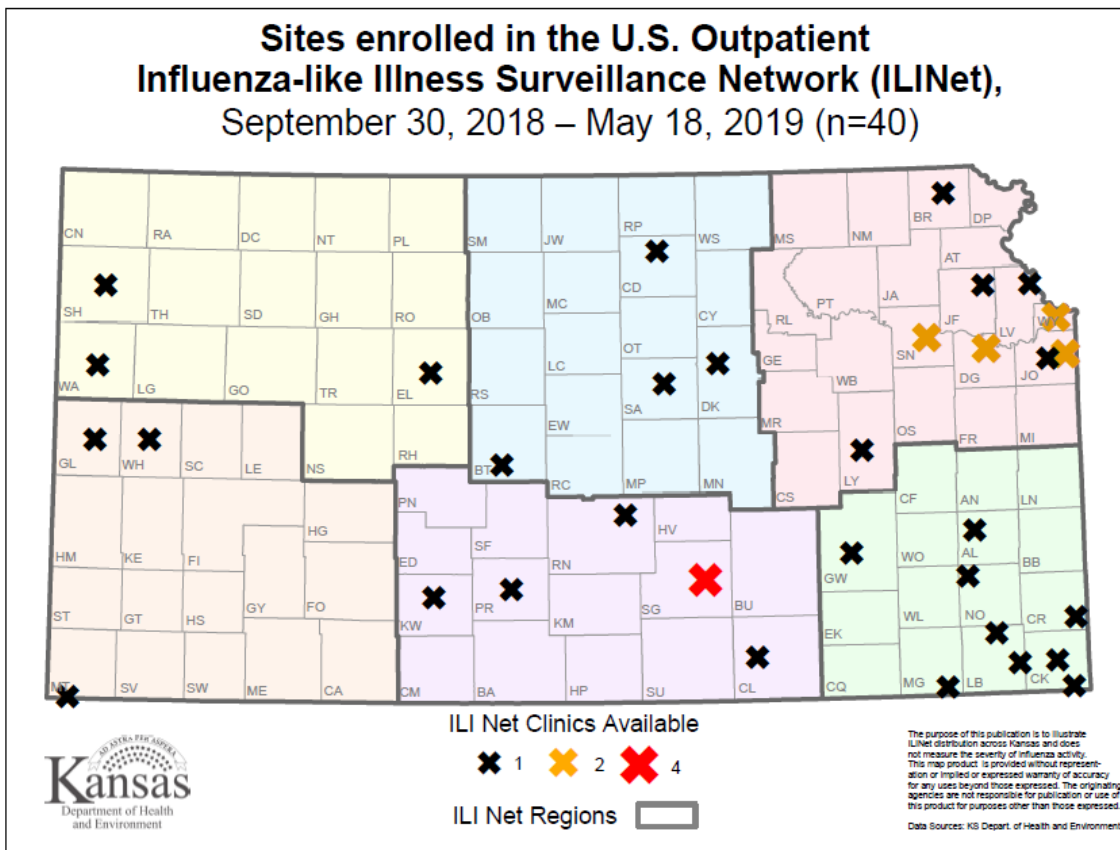
Morbidity Surveillance from the U.S. Outpatient Influenza-like Illness Surveillance Network (ILINet)

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 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.

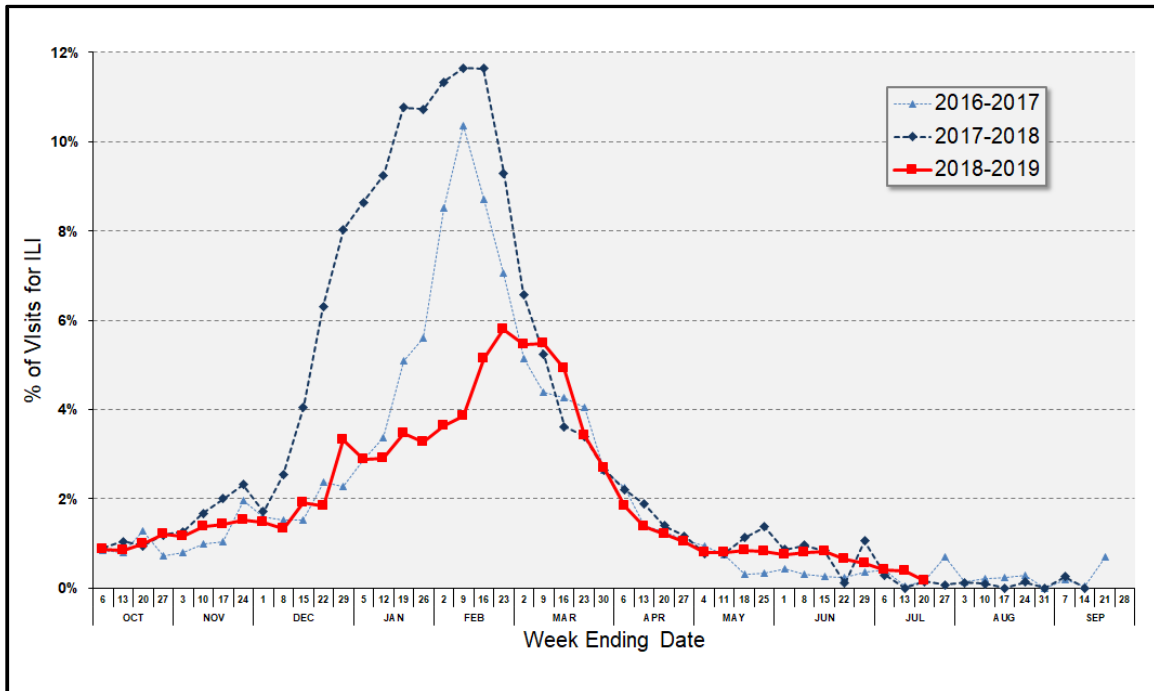
When the surveillance period began during the week ending September 30, 2018, 40 health care providers were enrolled in ILINet. These sites consisted of 17 hospital emergency departments, 17 family practice clinics, four university student health centers, and two pediatric clinics (Figure 1). Two family practice clinics and one emergency department failed to submit any data.

Figure 1. Sites enrolled in the U.S. Outpatient Influenza-like Illness Surveillance Network (ILINet), Kansas, September 30, 2018 – May 18, 2019 (n=40)



During the influenza surveillance period, starting September 30, 2018 (week 40) and ending May 18, 2019 (week 20), sites observed a total of 476,392 patients; 11,740 (2.5%) sought care for ILI. The rate of ILI rose steadily from December 2018 through February 2019 and it peaked at 5.8% during the week ending February 23, 2019 (Figure 2). The rate of ILI dropped below 2% during the week ending April 6, 2019 and remained low through the end of the surveillance period.

Figure 2. Percentage of visits for influenza-like illness (ILI) reported by ILINet sites, Kansas, October 2016 – May 2019*



*ILINet sites may vary in number and type each season. Data from the previous two surveillance years are plotted according to week number corresponding to the 2018-2019 week ending date; for example, week 40 of 2018 ended October 6, 2018, week 40 of 2017 ended October 7, 2017, and week 40 of 2016 ended October 8, 2016.

Emergency Department Syndromic Surveillance

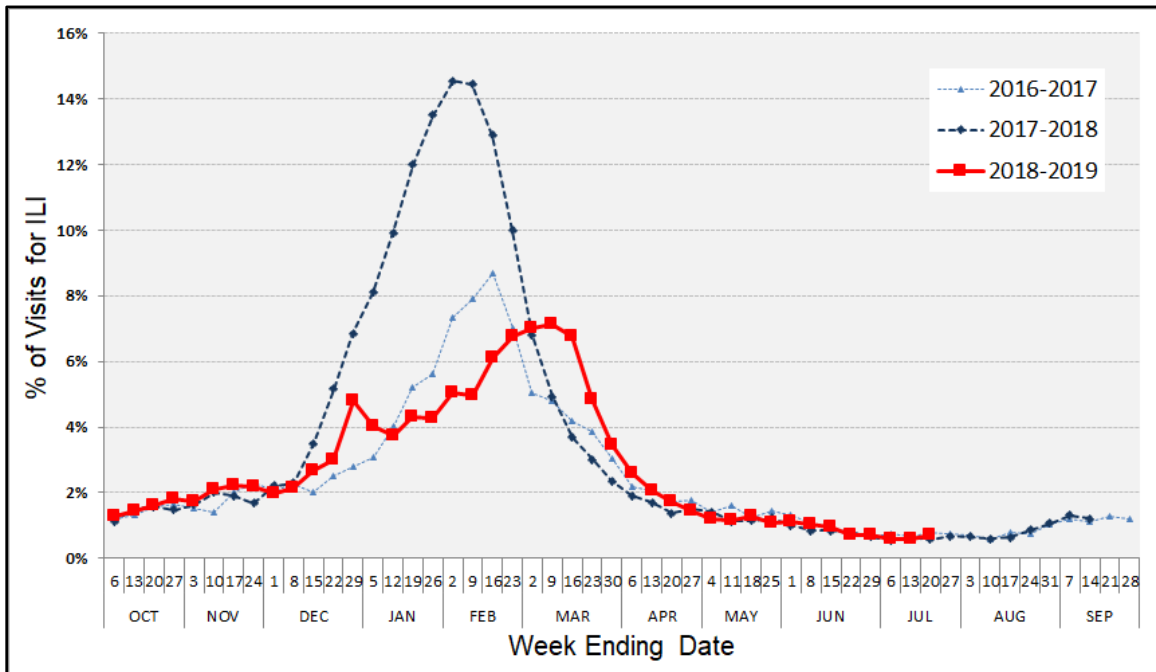
KDHE participates in the National Syndromic Surveillance Program and receives data from emergency departments (EDs) across Kansas. These de-identified records can be queried to detect disease trends and outbreaks. ED records were queried using the criteria developed by the National Syndromic Surveillance 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 1). 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 1: ILI chief complaint terms and diagnosis codes included and excluded in search criteria, Kansas, 2018-2019

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		

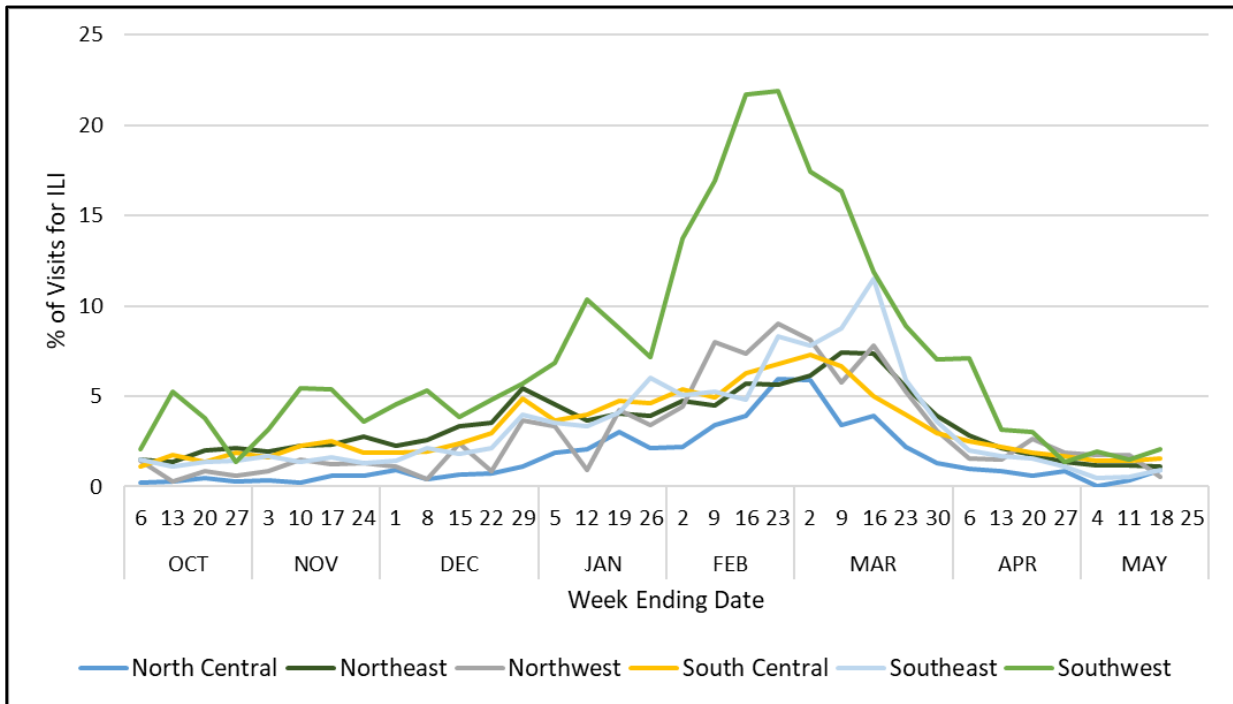
The percentage of ED visits meeting the ILI syndrome definition increased steadily from December 2018 through February 2019, then rapidly increased to its peak (7.1%) in March (Figure 3). This trend was similar to ILINet data reported by providers during the same period.

Figure 3: Percentage of visits for influenza-like illness (ILI) reported to ESSENCE, Kansas, October 2016 – May 2019



During the 2018-2019 influenza season, KDHE updated regional charts specific to the six Kansas ILINet regions. All six regions showed similar trends with peaks in February and March. Southwest Kansas experienced the highest percent of visits related to ILI (Figure 4).

Figure 4: Percentage of visits for influenza-like illness (ILI) reported to ESSENCE by ILINet region, Kansas, October 2018 – May 2019



Laboratory Surveillance

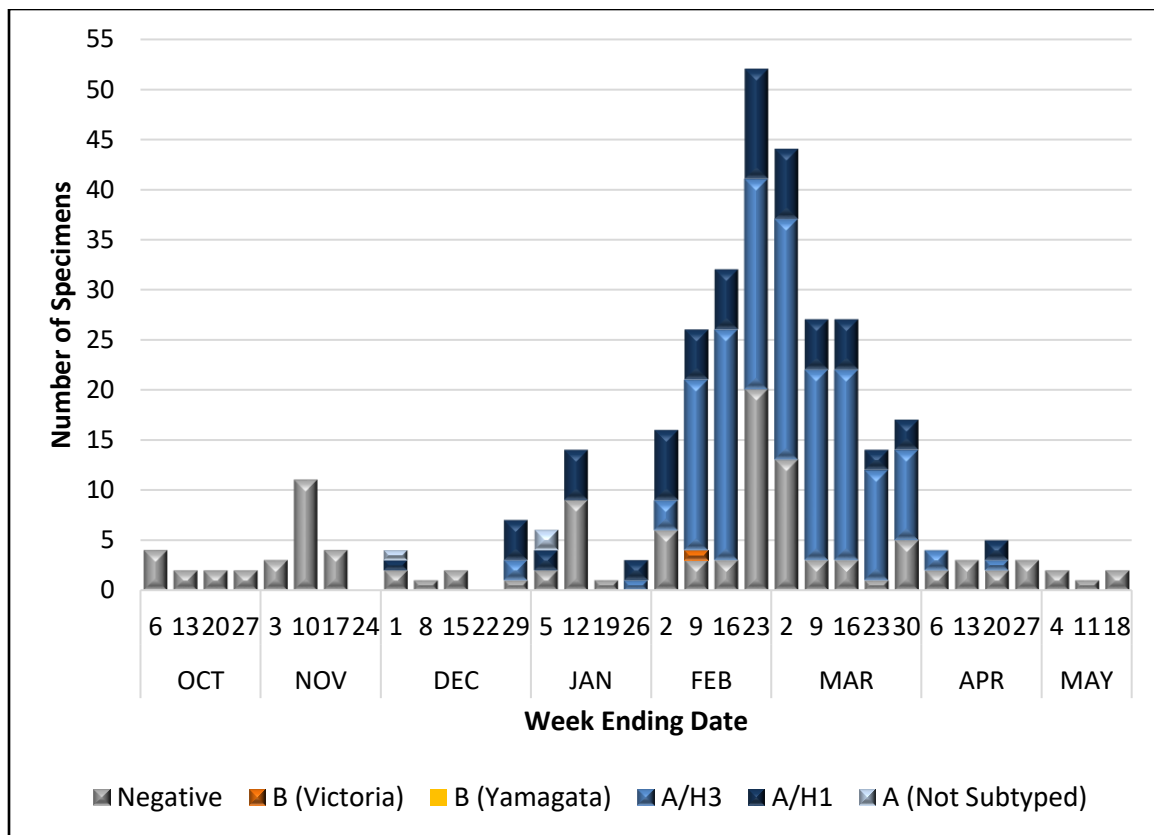
During the 2018-2019 influenza surveillance period, the Kansas Health and Environmental Laboratories (KHEL) provided confirmatory testing for ILINet site patients with ILI. Real-time reverse transcription polymerase chain reaction (RT-PCR) tests were used to analyze nasal and nasopharyngeal swabs for the presence of influenza viruses. Laboratory data was sent weekly to CDC by KHEL. In addition, KHEL forwarded a subset of its positive specimens to CDC for subtyping, antigenic characterization, and antiviral resistance testing.

From October 1, 2018 until May 18, 2019, KHEL tested 340 specimens for influenza. Influenza was detected in 223 (66%) specimens. Both influenza type A and B viruses were detected. Two influenza A subtypes, A/H3 and A/H1, and one influenza B lineage, Victoria, were identified. The influenza A/H3 subtype was most frequently detected, representing 68% of all positive specimens (Table 2, Figure 5). Four hospital laboratories were asked to send up to 20 pre-screened influenza A specimens each week. A total of 244 specimens were sent from those four laboratories; all specimens may not have been pre-screened positive specimens.

Table 2: Laboratory-confirmed influenza viruses detected from specimens at Kansas Health and Environmental Laboratories by subtype, Kansas, October 1, 2018 – May 18, 2019 (n=223)

Influenza subtype	# of specimens	% of specimens
A/H3	152	68%
A/H1	67	30%
A (not subtyped)	3	1%
B (Victoria lineage)	1	<1%

Figure 5: Influenza specimens tested at Kansas Health and Environmental Laboratories by week ending date, Kansas, October 1, 2018 – May 18, 2019 (n=340)



KHEL sent 28 positive influenza specimens to CDC designated influenza reference centers for genetic/antigenic characterization. All specimens were genetically characterized through sequencing, but eight of those specimens were also chosen for antigenic characterization. Two influenza A/H1 viruses chosen for characterization were antigenically similar to the influenza A/H1 component of the vaccine; however, the six

influenza A/H3 viruses that were characterized were only weakly inhibited by antisera, indicating that the vaccine would be less effective against these strains.

Respiratory Viral Panel Testing

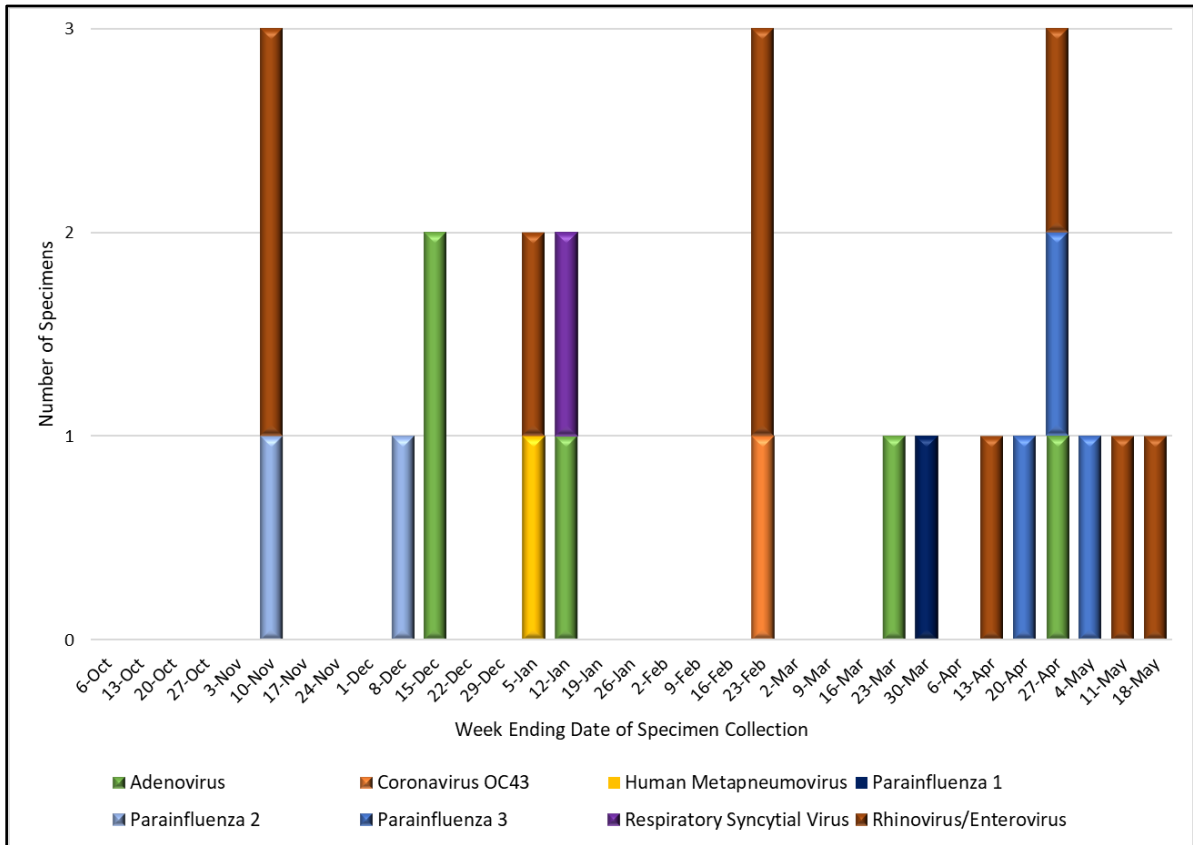
Specimens that tested negative for influenza by RT-PCR at KHEL were tested using a multiplex PCR instrument to better understand which other respiratory viruses were circulating in Kansas during the 2018-2019 influenza season. This BioFire FilmArray Respiratory Panel probed for 17 viral targets and 3 bacterial targets per specimen (Table 3).

Table 3: BioFire FilmArray Respiratory Panel Targets

Viral Targets	Bacterial Targets
Adenovirus	<i>Bordetella pertussis</i>
Coronavirus HKU1	<i>Chlamydomphila pneumoniae</i>
Coronavirus NL63	<i>Mycoplasma pneumoniae</i>
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	

Twenty-three specimens tested positive on the BioFire FilmArray Respiratory Panel at KHEL. Rhinovirus/enterovirus was most commonly detected (Figure 6). These specimens showed no time-specific disease trends over this surveillance period.

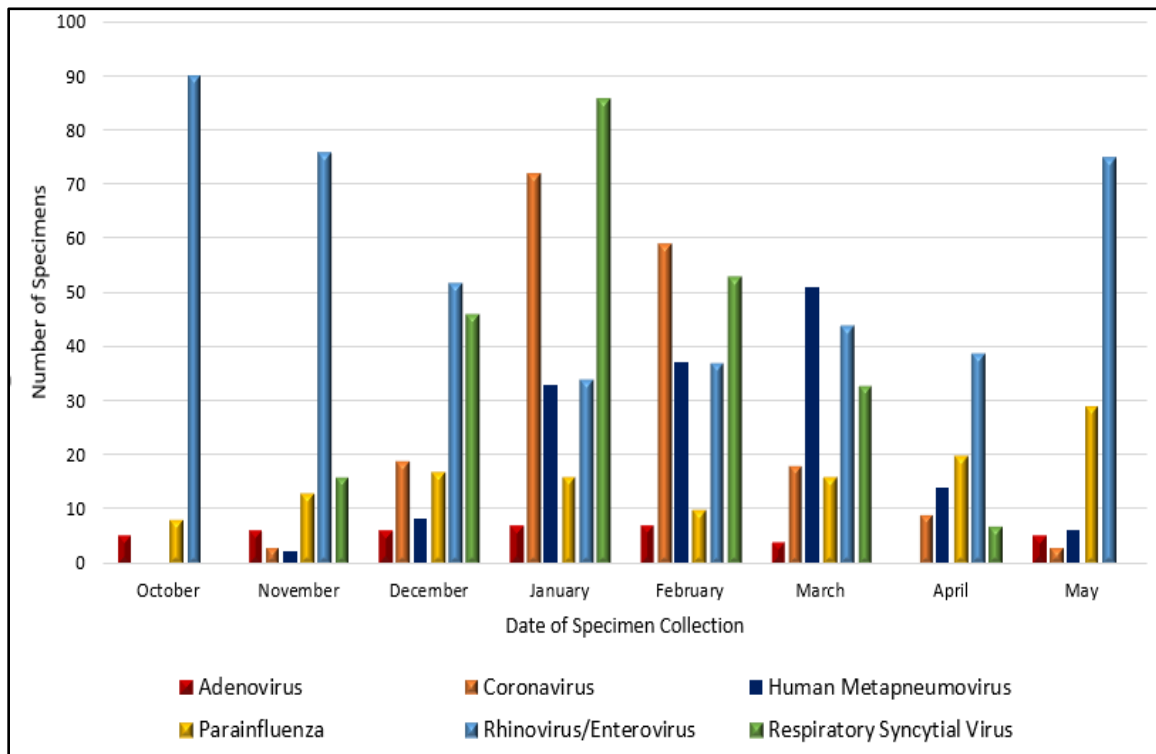
Figure 6: Positive respiratory viral panel results excluding influenza, Kansas Health and Environmental Laboratories, Kansas, October 2018 – March 2019 (n=23)



Via Christi Laboratories in Sedgwick County shared its respiratory viral panel (RVP) data with KDHE for the sixth time. RVP results were sent to KDHE monthly.

Via Christi observed many respiratory virus trends during the 2018-2019 influenza season (Figure 7). The most common virus detected 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.

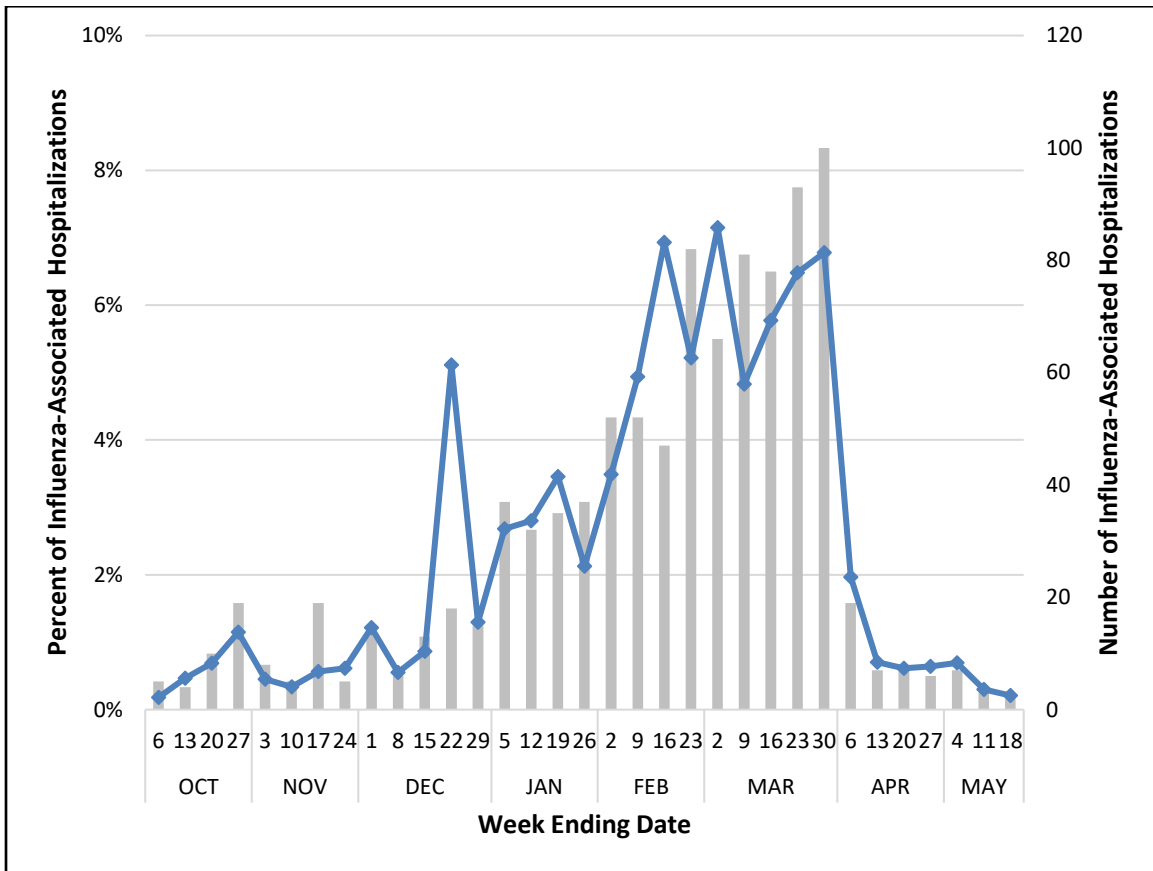
Figure 7: Positive respiratory viral panel results, Via Christi Laboratories, October 2018 – May 2019 (n=1,191)



Influenza-Associated Hospitalizations

Starting in the 2018-2019 influenza surveillance season, infection preventionists were asked to report the number of hospitalizations by age group each week that were due to influenza to monitor severity of illness throughout the season. Most hospitalizations due to influenza or influenza-like illness occurred in February and March 2019 (Figure 8).

Figure 8: Percentage and number of influenza-associated hospitalizations for reporting Kansas hospitals by week, October 2018-May 2019

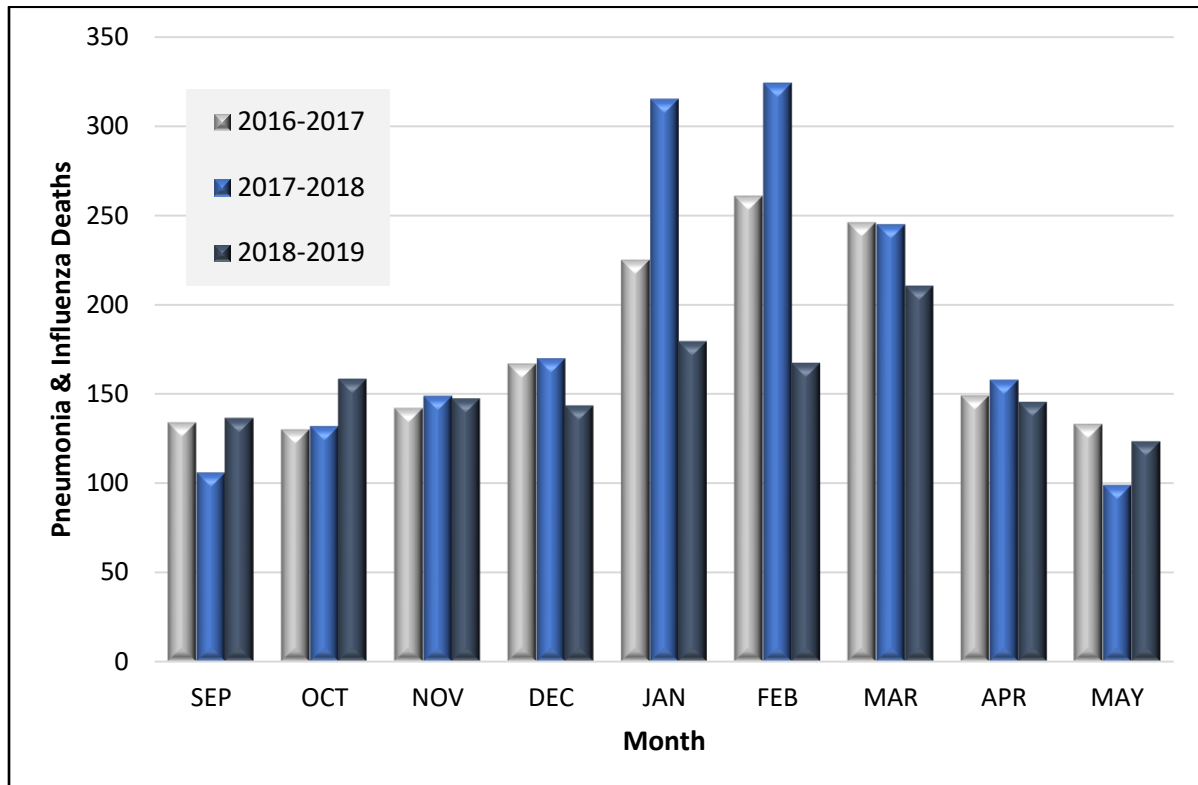


Pneumonia and Influenza (P&I) Mortality

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

Traditionally, P&I mortality data includes deaths that occurred from September through May. During the 2018-2019 period, the number of P&I deaths peaked at 210 in the month of March (Figure 9).

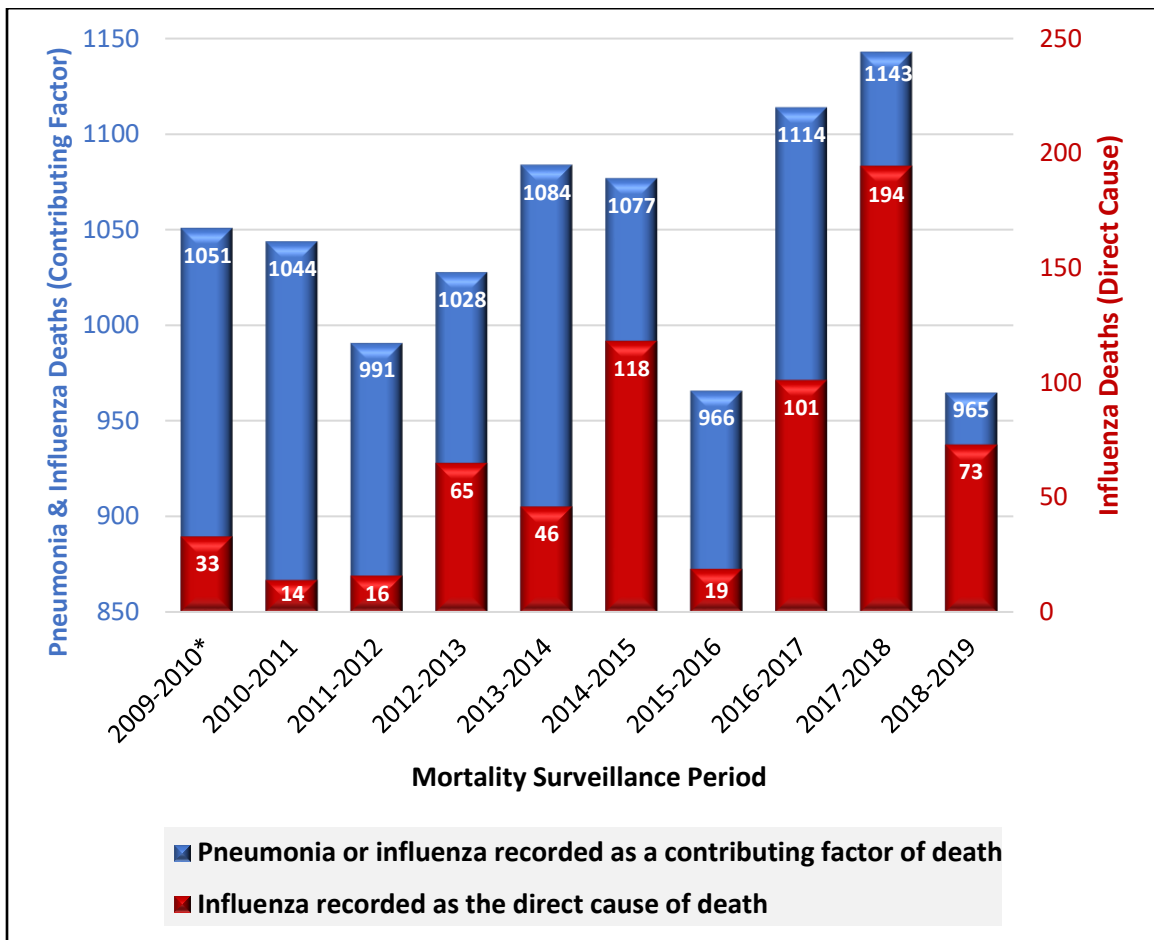
Figure 9: Deaths attributed to pneumonia or influenza by month, Kansas, September 2016-May 2019*



** 2018-2019 data is provisional and subject to change.*

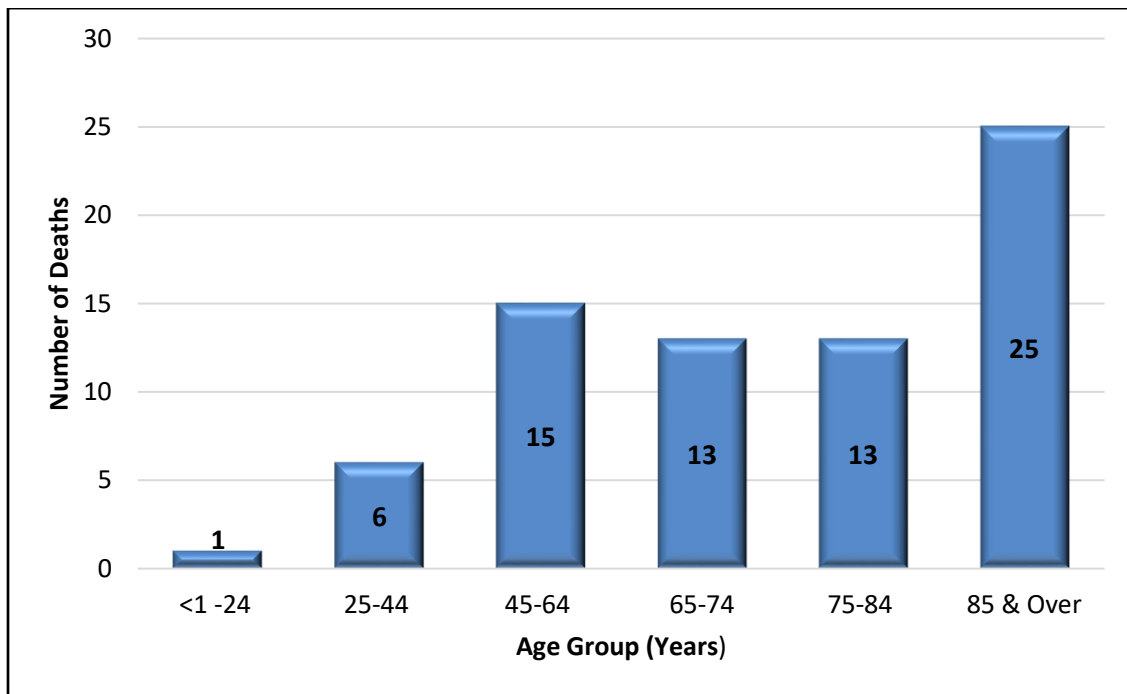
A total of 1,400 pneumonia and influenza deaths occurred during the 2018-2019 surveillance period (Figure 10). This observed mortality was below the 10-year median of 1,572. During the 2018-2019 surveillance period, 72 deaths (5.1%) were directly attributed to influenza, which was above the 10-year median (56 deaths) and the 10-year mean (68 deaths). Twenty-five (34%) of these deaths occurred in individuals 85 years of age and older (Figure 11).

Figure 10: Pneumonia and influenza mortality by surveillance period, Kansas, 2009-2019*



**Each influenza season begins September 1 and ends May 31 of the following year, with the exception of 2009-2010 (May 1, 2009 through May 31, 2010). This time shift is due to the emergence of pandemic H1N1 in May 2009. The 2018-2019 data is provisional and subject to change.*

Figure 11: Influenza recorded as direct cause of death by age group, Kansas, September 2018 – May 2019



Influenza-Associated Pediatric Mortality

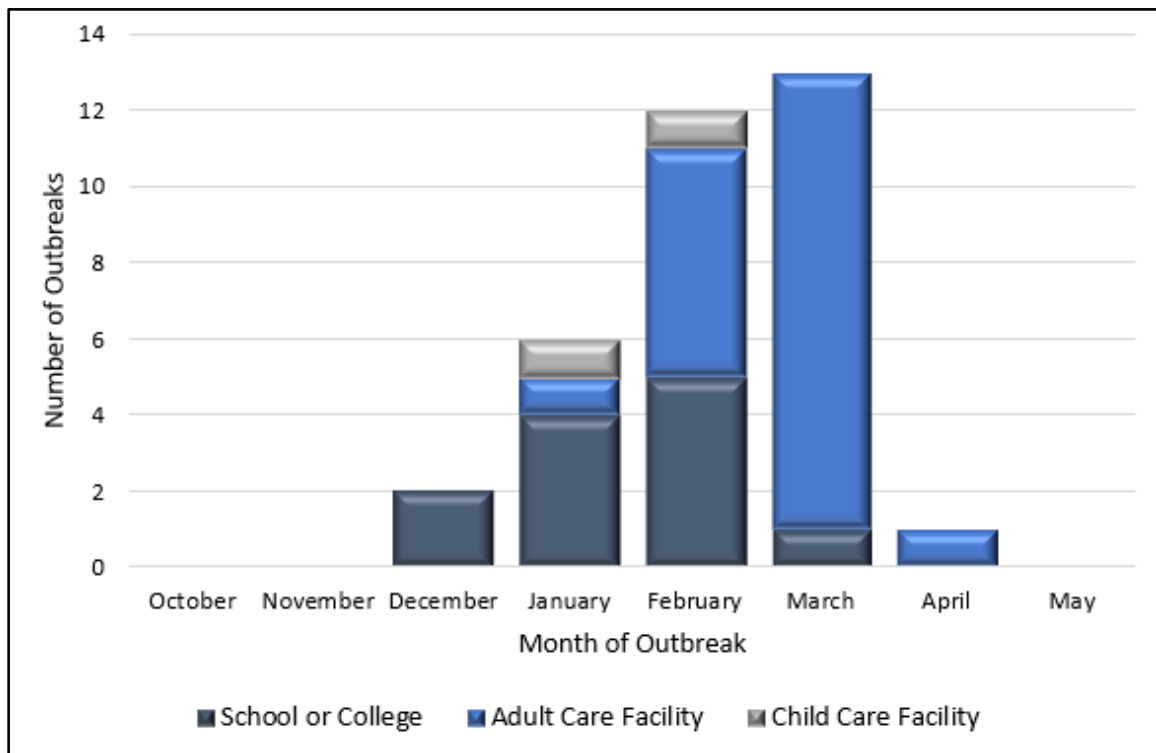
Since 2004, CDC has requested information on influenza-associated pediatric deaths; this condition has been reportable in Kansas since 2006. For surveillance purposes, pediatric deaths were considered influenza-related if there was no period of complete recovery between the clinically compatible illness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

During the 2018-2019 surveillance period, two influenza-associated pediatric deaths were reported in Kansas. Neither had received the 2018-2019 influenza vaccine.

Influenza Outbreaks

A total of 34 outbreaks were reported to KDHE and investigated during the 2018-2019 surveillance period. The majority of outbreaks occurred in March (13), followed by February (12), January (6), December (2) and April (1). The average number of cases was 48 (range: 5-100). Of the 16 outbreaks for which hospitalization data was available, the average number of hospitalizations was one (range: 0-6). Death data was available for 16 outbreaks and seven deaths were recorded. Most of the outbreaks (20) occurred in adult care facilities. The remainder of outbreaks occurred in schools (12) and child care facilities (2) (Figure 12).

Figure 12: Influenza outbreaks by month reported, Kansas, October 2018-May 2019 (n=34)



Summary

Typically, ILI in Kansas has peaked in December, January, or February. For the 2018-2019 influenza season, ILI peaked at 5.8% during the week ending February 23, 2019. This peak was lower than what was observed during the previous two surveillance periods; ILI peaked at 11.8% during 2017-2018, and 10.4% during 2016-2017. Three influenza viruses were detected in Kansas during the 2018-2019 season: A/H1, A/H3, and one B lineage. The predominant strain in Kansas and the U.S. was A/H3.

The influenza-associated hospitalization component monitored severity of illness due to influenza throughout the season. Most hospitalizations due to influenza or influenza-like illness corresponded with the ILI peak and occurred in February and March 2019.

During the 2018-2019 influenza season, 73 deaths in Kansas were directly attributed to influenza. This was a sharp decrease from the previous season that resulted in 190 deaths. Of the Kansas deaths, 34% were among those 85 years and older. A total of 34 influenza outbreaks were investigated during the 2018-2019 influenza season.

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