Kansas Influenza Surveillance, 2016-2017

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 five components that provide data on outpatient influenza-like illness, influenza viruses, and influenza-associated deaths.

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 influenza-like illness (ILI), recognize trends in influenza transmission, determine the types of influenza circulating, and detect changes in influenza viruses. ILI is defined by the CDC as fever (≥100°F or ≥37.8°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 are asked to report the previous week's data by 11:00 AM each Tuesday to KDHE and this data is submitted to CDC via the internet or fax.

When the surveillance period began during the week ending October 2, 2016, 35 health care providers were enrolled in ILINet. These sites consisted of 20 family practice clinics, nine hospital emergency departments, four university student health centers, and two pediatric clinics (Figure 1).

Figure 1. Sites enrolled in the U.S. Outpatient Influenza-like Illness Surveillance Network (ILINet), Kansas, October 4, 2015 – May 21, 2016 (n=35)

Sites enrolled in the U.S. Outpatient Influenza-like Illness Surveillance Network (ILINet), Kansas, October 2, 2016 – May 20, 2017 (n=35)
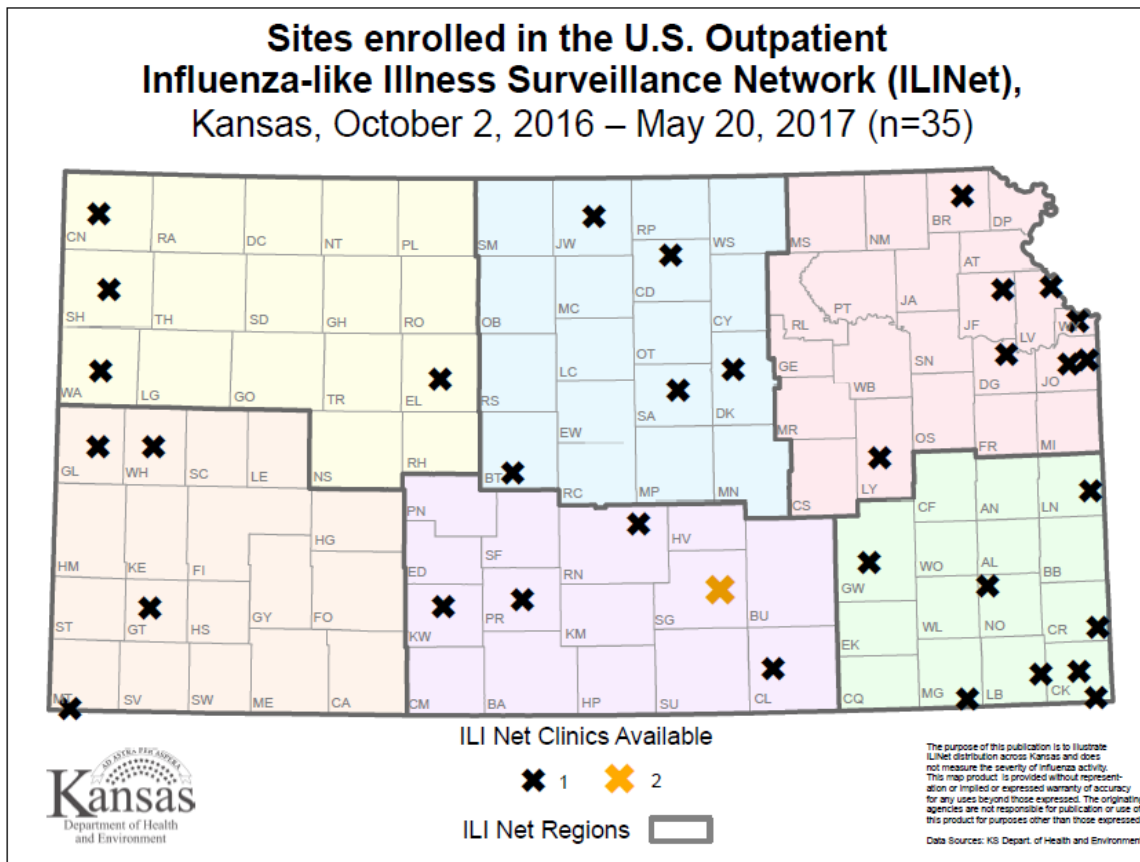
During the influenza surveillance period, starting October 2, 2016 (week 40) and ending May 20, 2017 (week 20), sites observed a total of 215,988 patients; 6,652 (3.1%) sought care for ILI. The rate of ILI rose steadily from December 2016 through February 2017. The ILI rate peaked at 10.4% during the week ending February 11, 2017. The rate of ILI dropped below 2% during the week ending April 15, 2017 and remained low through the end of the surveillance period (Figure 2).

Figure 2. Comparison of percentage of visits for influenza-like illness (ILI) reported by ILINet sites, Kansas, October 2016 – May 2017 to two previous surveillance periods*
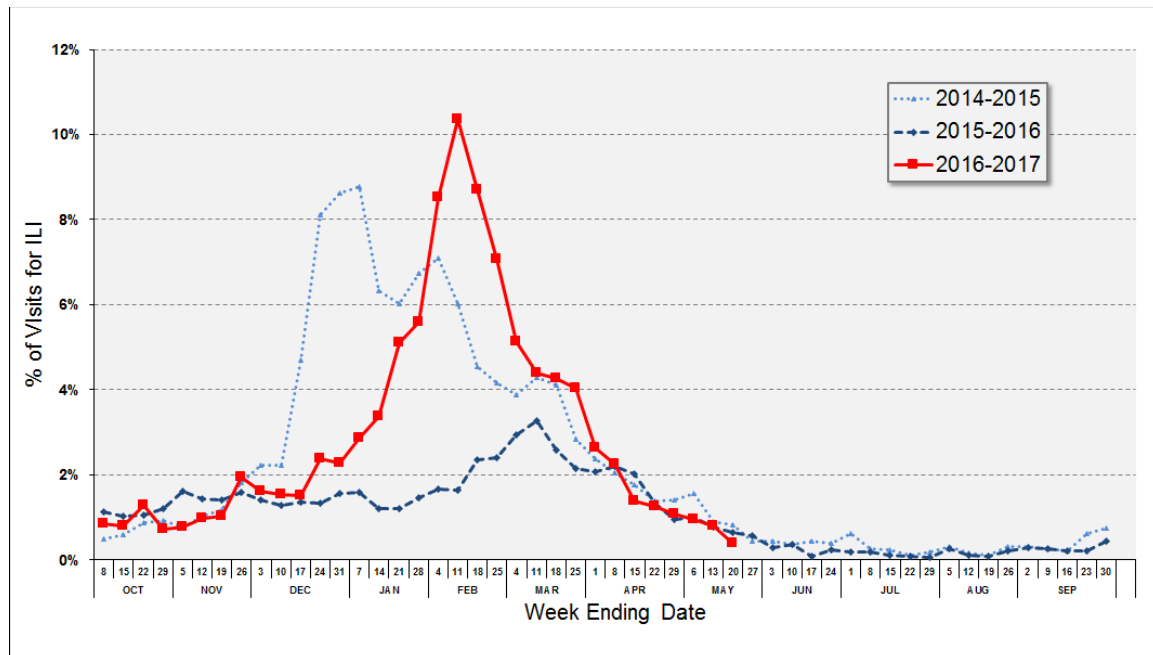
ILINet sites may vary in number and type (student health, family practice, etc.) each season. Data from the previous two surveillance years are plotted according to week number corresponding to the 2016-2017 week ending date; for example, week 40 ended October 8, 2016, week 40 of 2015 ended October 10, 2015, and week 40 of 2014 ended October 4, 2014.

Laboratory Surveillance

During the 2016-2017 surveillance period, the Kansas Health and Environmental Laboratories (KHEL) provided confirmatory testing for ILINet site patients with ILI. In an effort to reach CDC's Right Size Influenza Virologic Surveillance goals, KHEL partnered with a Kansas hospital; that hospital submitted influenza-positive specimens to KHEL, where confirmatory testing was conducted. Real-Time Polymerase Chain Reaction (RT-PCR) tests were used to analyze nasal and nasopharyngeal swabs for the presence of influenza virus. 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 13, 2016, when the first respiratory specimen for influenza testing was received, until May 20, 2017, when the 2016-2017 surveillance period ended, KHEL tested 222 unscreened specimens for influenza. Influenza was detected in 69 (31%) 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

seen. The influenza A/H3 subtype was most frequently detected, representing 81% of all previously unscreened, positive specimens (Table 1, Figure 3).

Table 1: Laboratory-confirmed influenza viruses detected from previously unscreened specimens at Kansas Health and Environmental Laboratories by subtype, Kansas, October 13, 2016 – May 21, 2017 (n=69)

Influenza subtype	Number	Percent of Total
A/H3	56	81%
A/H1	2	3%
B (Yamagata lineage)	6	21%
B (Victoria lineage)	2	3%
A (not subtyped)	2	3%
B (not subtyped)	1	1%

From November 29, 2016 to February 11, 2017, KHEL received 64 prescreened influenza-positive specimens from a sentinel hospital in Kansas. These specimens were tested in effort to reach CDC's Right Size Influenza Virologic Surveillance goals, which include monitoring circulating viruses and novel subtypes that might be a sign of a pandemic. The majority of these specimens were A/H3 (97%) (Table 2).

Table 2: Laboratory-confirmed influenza viruses detected from prescreened influenza-positive specimens at Kansas Health and Environmental Laboratories by subtype, Kansas, November 29, 2016 – February 11, 2017 (n=64)

Influenza subtype	Number	Percent of Total
A/H3	62	97%
A/H1	2	3%

Figure 3: Influenza specimens tested at Kansas Health and Environmental Laboratories by week ending date, October 13, 2016 – May 20, 2017 (n=286)
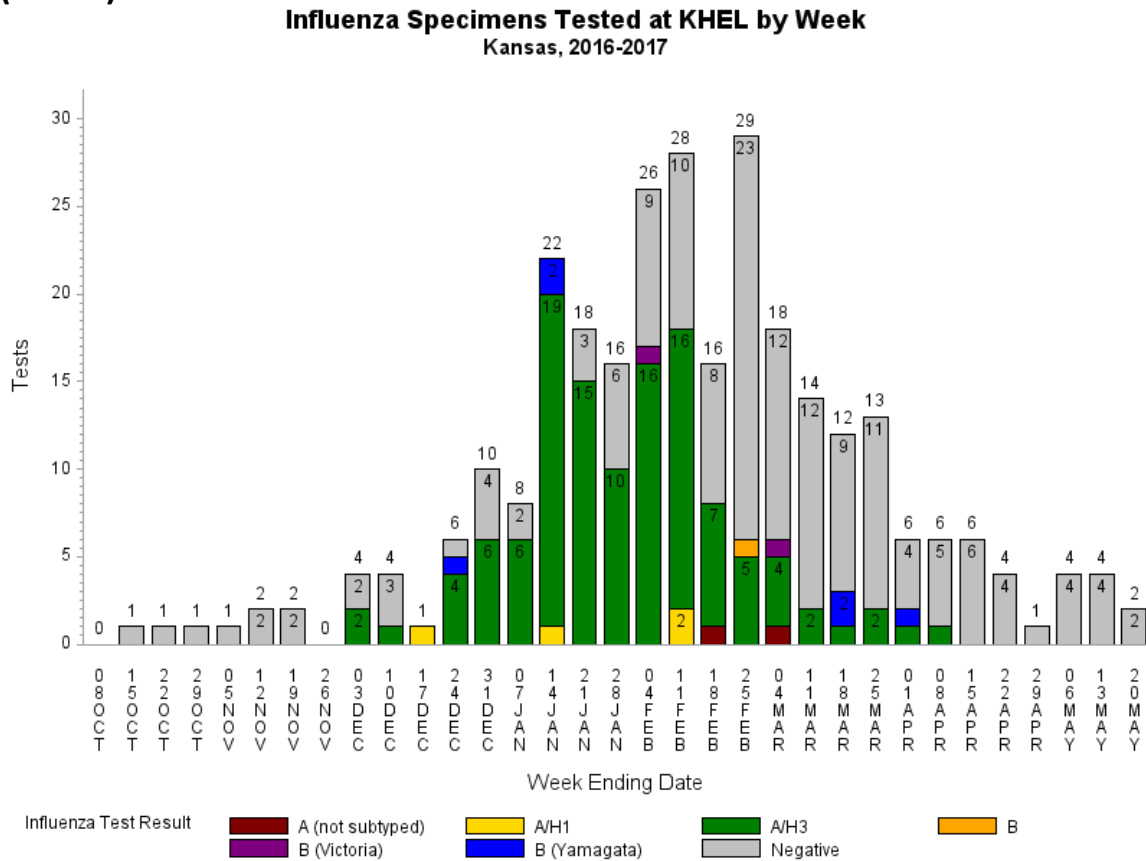
KHEL sent 25 positive influenza specimens to designated influenza reference centers for antigenic characterization. Testing performed on influenza isolates submitted by all states to the CDC showed that the majority of the tested viruses were similar to the recommended components of the 2016-2017 Northern Hemisphere vaccines.

Respiratory Viral Panel Testing

A subset of specimens which test negative for influenza by RT-PCR at the Kansas Health and Environmental Laboratories (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 respiratory viruses were circulating in Kansas during 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*

A total of 173 specimens were tested on the KHEL BioFire assay, 134 (83%) of which were negative for all viral targets. Rhinovirus/enterovirus was the most common virus found (n=13) (Figure 4). The KHEL RVP specimens showed no time-specific disease trends over this surveillance period. The dramatic increase of specimens tested on the Biofire assay was due heightened respiratory surveillance as a result of several mumps outbreaks.

Figure 4: Respiratory Viral Panel results excluding influenza, Kansas Health and Environmental Laboratories, October 2016 – May 2017 (n=173?)
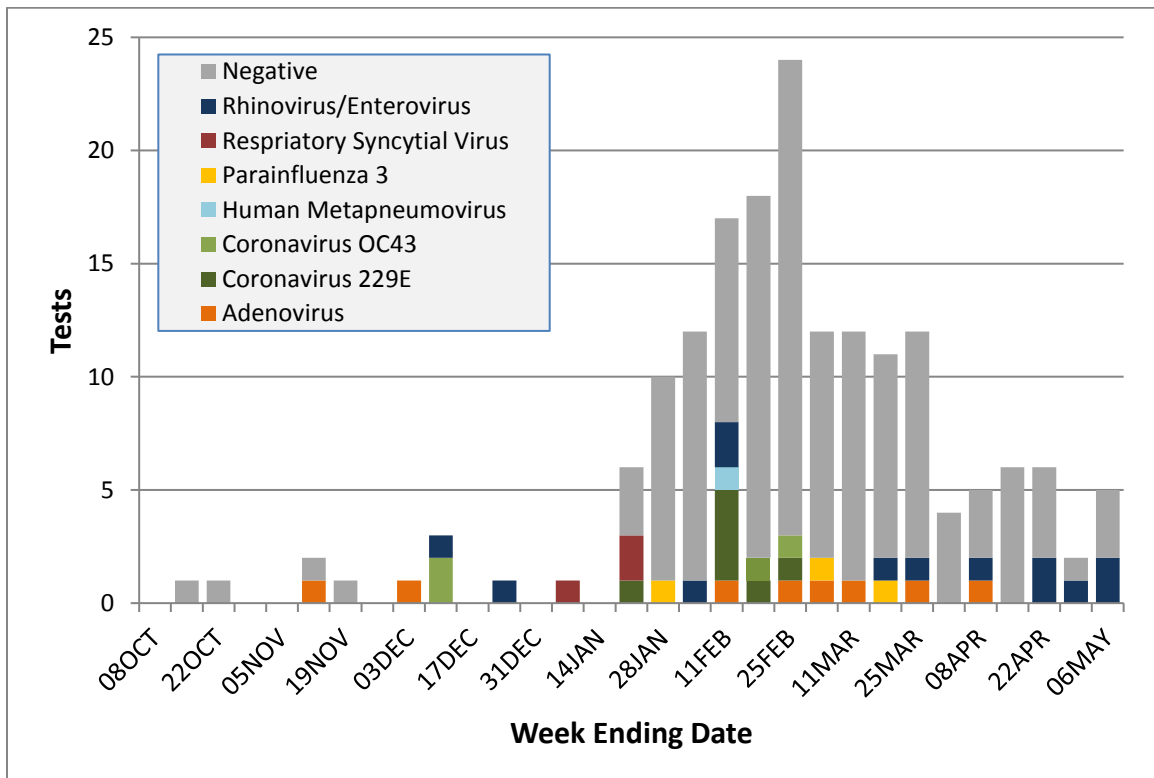
For the 2016-17 season, Via Christi Laboratories in Sedgwick County shared its RVP data with KDHE. RVP results were sent to KDHE monthly and represented the majority of respiratory virus surveillance in the south central region of Kansas.

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

Figure 5: Positive Respiratory Viral Panel results, Via Christi Laboratories, October 2016 – May 2017
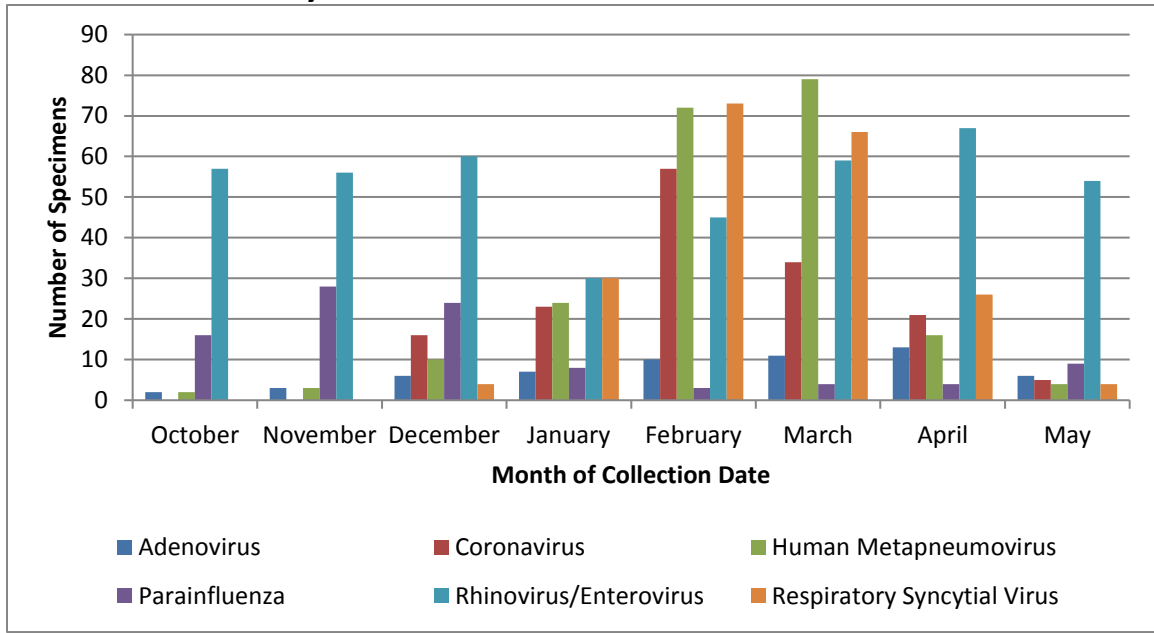

Syndromic Surveillance

KDHE's Vital and Health Statistics Data Analysis section 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 by diagnosis codes related to ILI. ICD 10 codes included and excluded in the search are detailed in the table below (Table 3). ICD 10 is the 10th revision of the International Statistical Classification of Diseases and Related Health Problems which is a medical classification list used to code diseases, signs and symptoms, etc.

Table 3: ILI ICD 10 diagnosis codes included and excluded in search criteria, Kansas, 2016-2017

Included ICD 10 Codes

J09	Influenza due to certain identified influenza viruses
J10	Influenza due to other identified influenza virus
J11	Influenza due to unidentified influenza virus
J12	Viral pneumonia, not elsewhere classified
J13	Pneumonia due to Streptococcus pneumoniae
J14	Pneumonia due to Hemophilus influenzae
J15	Bacterial pneumonia, not elsewhere classified
J16	Pneumonia due to other infectious organisms, not elsewhere classified
J17	Pneumonia in diseases classified elsewhere
J18	Pneumonia, unspecified organism

Excluded ICD 10 Codes

J82	Allergic or eosinophilic pneumonia
J69.0	Aspiration pneumonia NOS
P24.01	Meconium pneumonia
P24.-	Neonatal aspiration pneumonia
J69.-	Pneumonia due to solids and liquids
P23.9	Congenital pneumonia
I00	Rheumatic pneumonia
J95.851	Ventilator associated pneumonia

The percentage of ED visits with ILI diagnosis codes increased steadily from August through December, then increased to its peak (6.2%) in January (Figure 6). This trend matched ILINet data reported by providers during the same period. Syndromic Surveillance ILI diagnosis codes were calculated as a percentage of total visits received by KDHE's Syndromic Surveillance Program during each month.

Figure 6: Percent of ED visits reported to KDHE's Syndromic Surveillance Program with ILI diagnosis codes by month, Kansas, 2016-2017
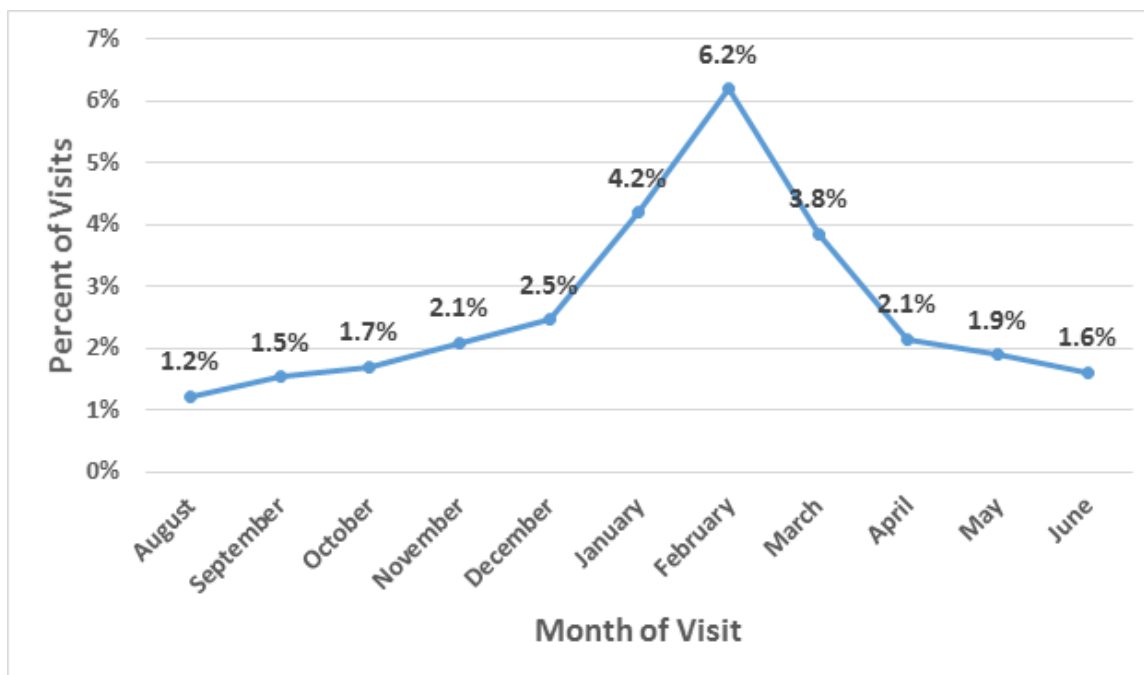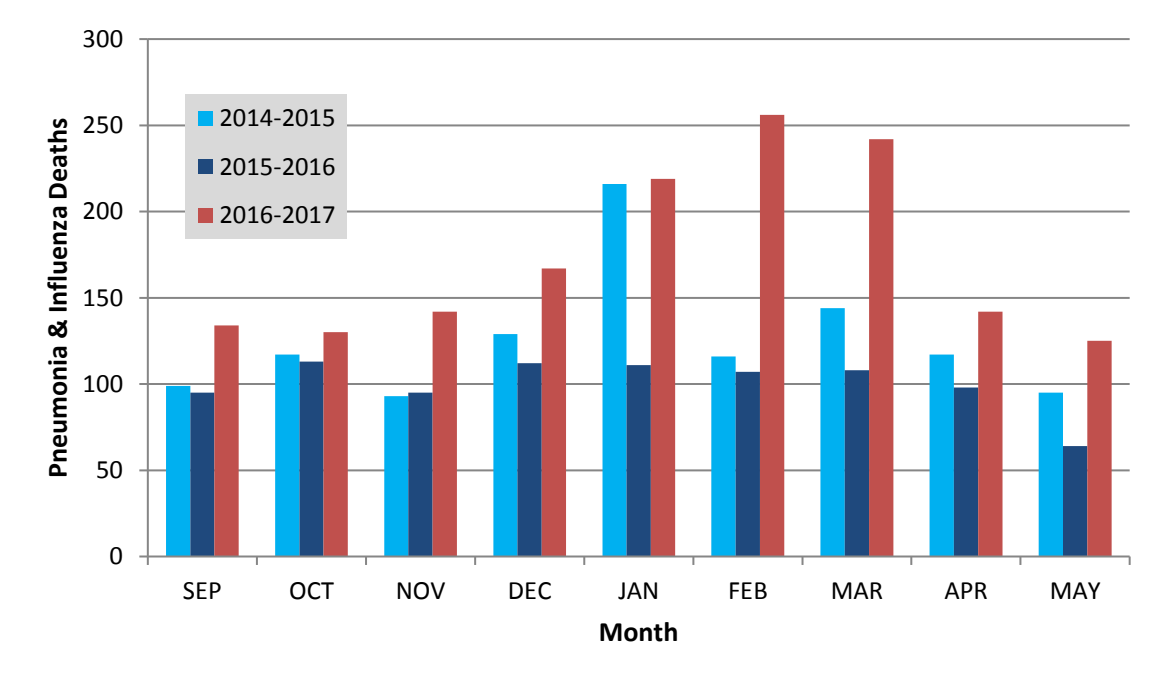
Pneumonia and Influenza (P&I) Mortality

BEPHI monitored influenza-related mortality. Death certificate data was collected 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 2016-2017 period, the number of P&I deaths peaked at 256 in the month of February (Figure 7).

Figure 7: Deaths attributed to pneumonia or influenza by month, Kansas, September 2014-May 2017*


* 2016-2017 data is provisional and subject to change.

A total of 1,557 pneumonia and influenza deaths occurred during the 2016-2017 surveillance period. The observed mortality was below the 20-year median of 1,733 (Figure 8). During the 2016-2017 surveillance period, 99 deaths (6%) were directly attributed to influenza, which was above the 20-year median (20 deaths) observed since the 1997-1998

surveillance period, but below the 20-year mean (33 deaths). The majority of these deaths occurred in individuals aged 85 years old or older with 53 deaths (54%) (Figure 9).

Figure 8: Pneumonia and influenza mortality by surveillance period, Kansas, 1996-2017*
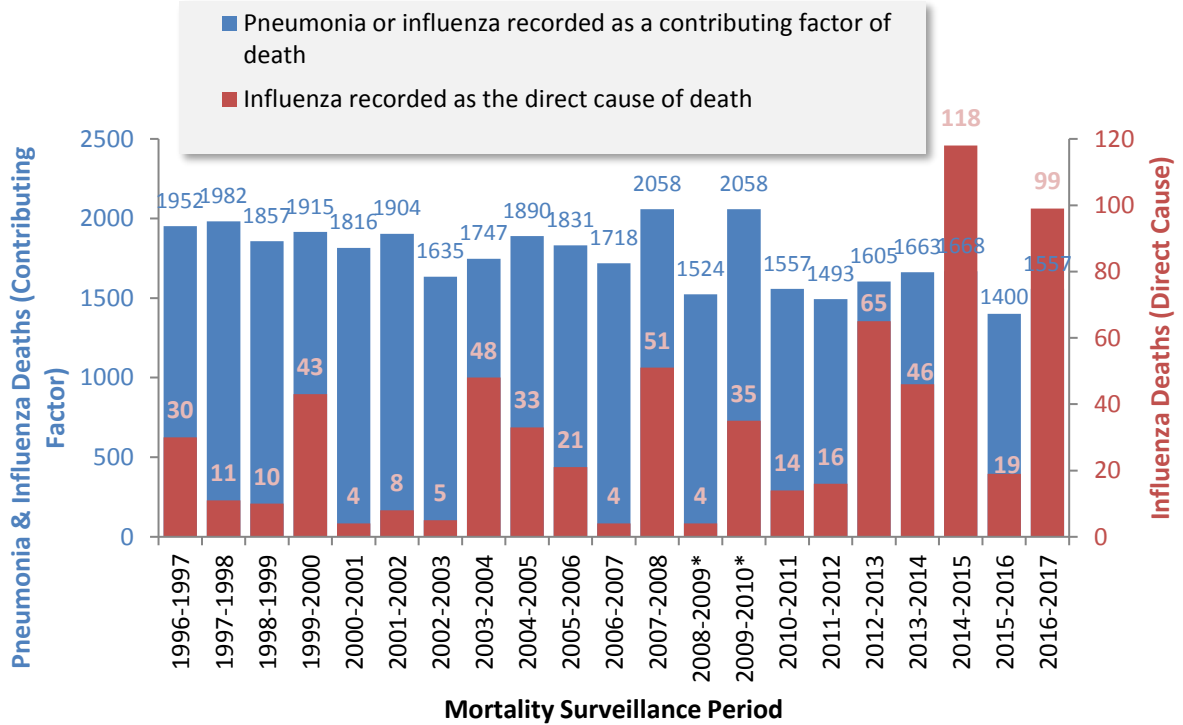
*Each influenza season begins September 1 and ends May 31 of the following year, with the exception of 2008-2009 (September 1, 2008 through April 30, 2009) and 2009-2010 (May 1, 2009 through May 31, 2010). This time shift is due to the emergence of pandemic H1N1 in May 2009. The 2016-2017 data is provisional and subject to change.

Figure 9: Influenza recorded as direct cause of death by age group, Kansas, September 2016 – May 2017
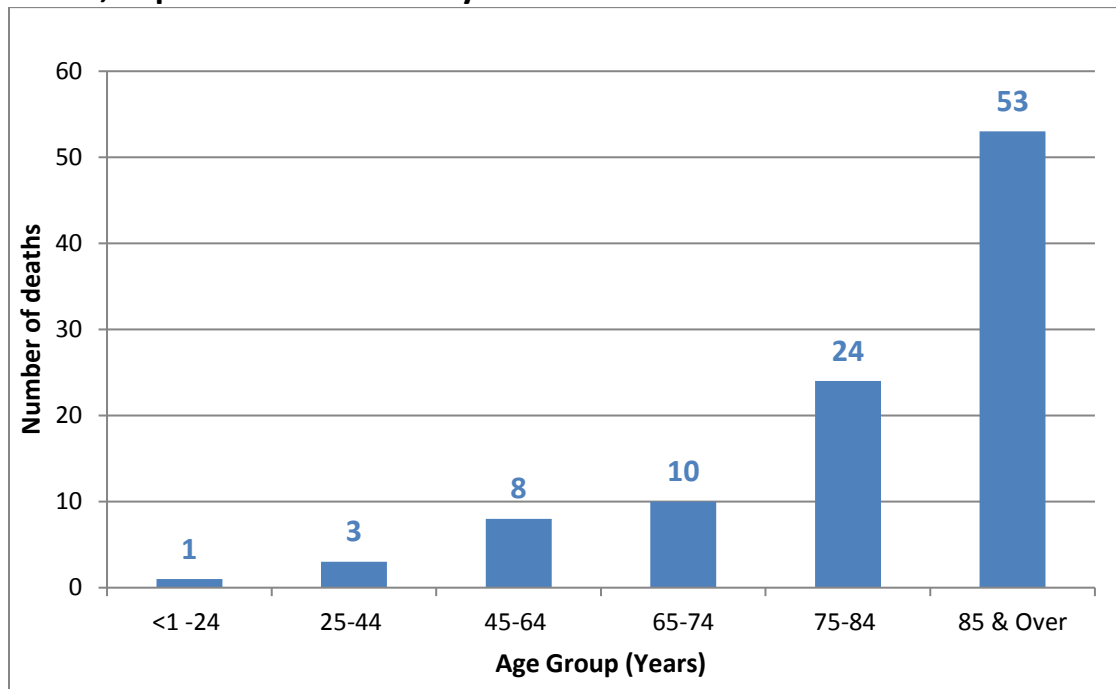
Influenza-Associated Pediatric Mortality

Since 2004, CDC has requested information on influenza-associated pediatric deaths; this condition was added to the reportable disease list in Kansas in 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 or rapid diagnostic test.

During the 2016-2017 surveillance period, three confirmed influenza-associated pediatric deaths were reported in Kansas. Two had received the 2016-2017 influenza vaccine and the other had an unknown vaccination status.

Influenza Outbreaks

A total of 44 outbreaks were identified and investigated during the 2016-2017 surveillance period. Thirteen occurred in January, 27 in February, and four during March. The average number of cases was 17 (range: 2-70) and the average number of hospitalizations was 0 (range: 0-5). There were six deaths associated with these outbreaks. The majority, 29 (66%), occurred in long- term care facilities. The remainder of outbreaks occurred in schools (11), hospitals (2), a child care facility (1), and a correctional facility (1).

Summary

Typically, ILI in Kansas has peaked in December, January, or February. The ILI rate peaked in Kansas at 10.4% during the week ending February 11, 2017. This peak rate was higher than what was observed during the previous two surveillance periods; ILI peaked at 3.3% during 2015-16, and 8.8% during 2014-15. Four influenza viruses were detected in Kansas: A/H1, A/H3, and two B lineages. The predominant strain in Kansas and the U.S. was A/H3. Antigenic characterization performed by CDC indicated the 2016-2017 seasonal influenza vaccine was a good match for all circulating viruses.

During the 2016-17 influenza season, 99 deaths were directly attributed to influenza. This was a sharp increase from the previous season with 19 deaths. Of the Kansas deaths, 54% were among those 85 years or older. A total of 44 influenza outbreaks were investigated during the 2016-17 influenza season.