

Kansas Influenza Surveillance, 2013-2014



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 four 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)

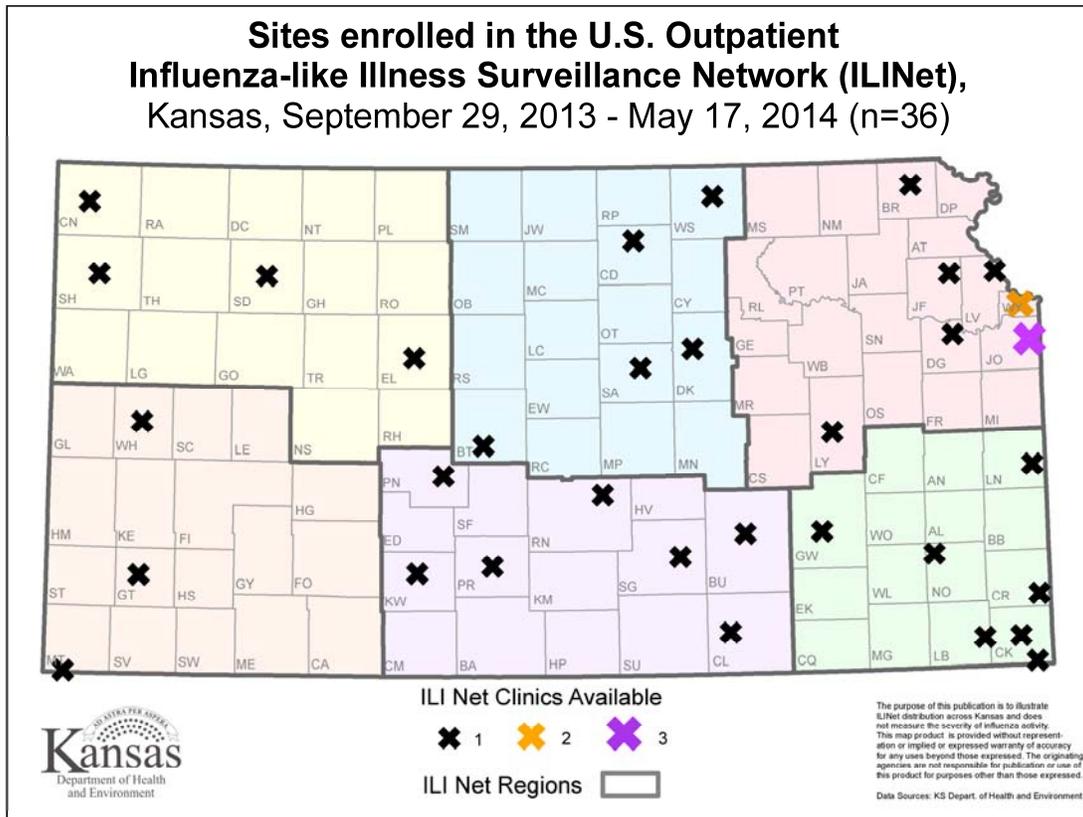
The U.S. Outpatient Influenza-like Illness Surveillance Network (ILINet) is a collaboration between the CDC and state, local, and territorial health departments. The purpose of the surveillance is to track influenza-like illness (ILI), recognize trends in influenza transmission, determine the types of influenza circulating, and detect changes in influenza viruses. Influenza-like illness is defined by the CDC as 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. This data was submitted to the CDC via the internet or fax; sites are asked to report the previous week's data by 11:00 AM each Tuesday.

When the surveillance period began during the week ending October 5, 2013, 39 health care providers were enrolled in ILINet. Three sites dropped out during the week ending

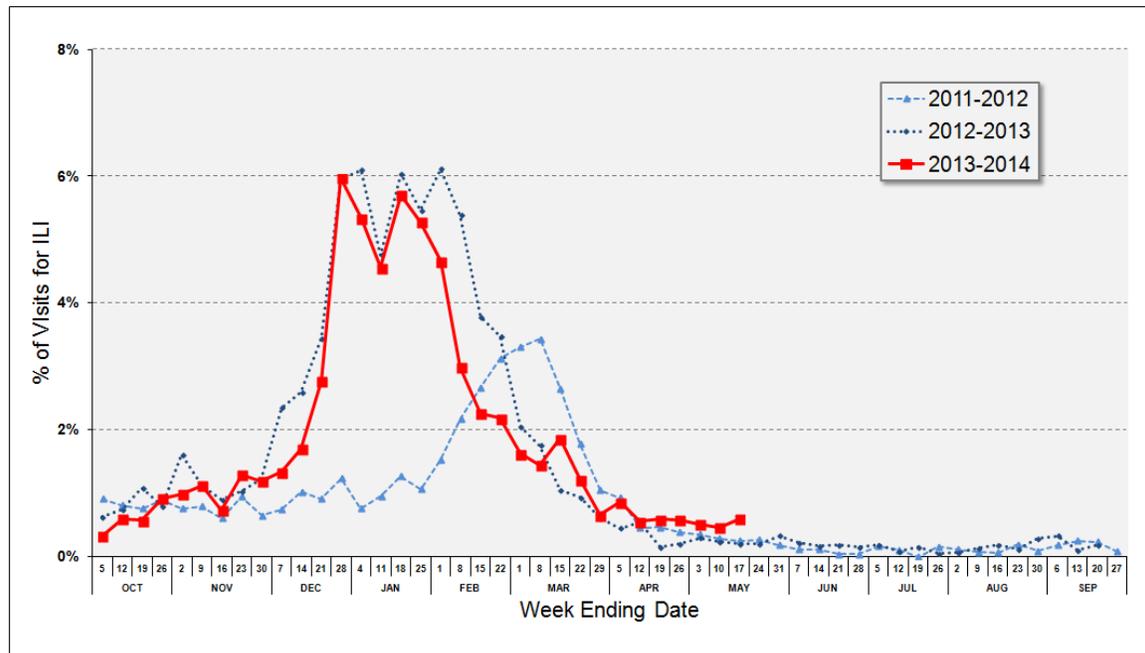
November 9, 2013. As a result, the 2013-2014 surveillance data was collected from 36 sites throughout the state: 19 family practice clinics, nine hospital emergency departments, four university student health centers, and four pediatric clinics (Figure 1).

Figure 1. Sites enrolled in the U.S. Outpatient Influenza-like Illness Surveillance Network (ILINet), Kansas, September 29, 2013 - May 17, 2014 (n=36)



During the influenza surveillance period, starting September 29, 2013 (week 40) and ending May 17, 2014 (week 20), sites observed a total of 216,479 patients—4,074 (1.9%) sought care for ILI. The rate of ILI rose steadily from November 2013 through January 2014. The ILI rate peaked at 6.0% during the week ending December 28, 2013. Typically, ILI in Kansas has peaked in December, January, or February. The rate of ILI dropped below 1% during the week ending March 29, 2014 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 2013 – May 2014 and previous two 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 2013-2014 week ending date; for example, week 40 of 2013 ended October 5, 2013, week 40 of 2012 ended October 6, 2012, and week 40 of 2011 ended October 8, 2011.*

Laboratory Surveillance

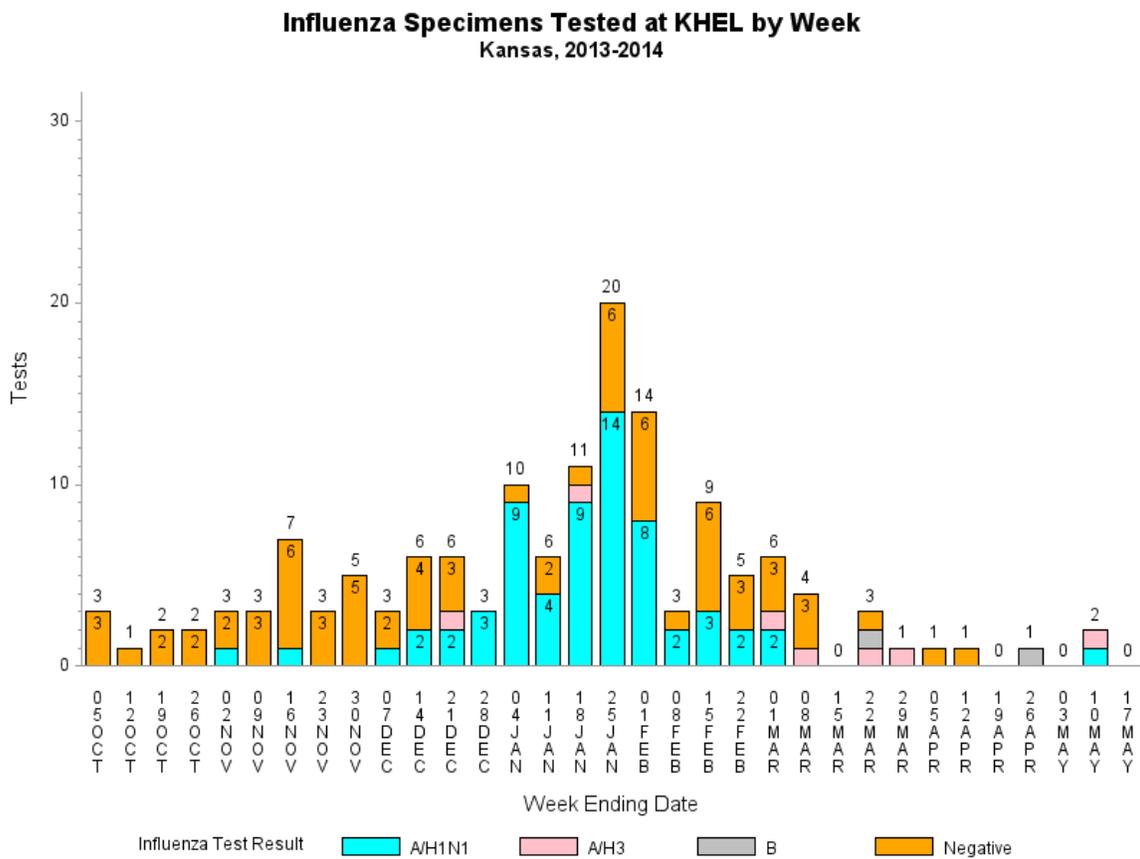
The Kansas Health and Environmental Laboratories (KHEL) provided confirmatory testing for ILINet site patients with ILI, as well as for hospitalized patients throughout the state. Real-Time Polymerase Chain Reaction (RT-PCR) tests were used to analyze nasal and nasopharyngeal swabs for the presence of 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 1, 2013, when the first respiratory specimen for influenza testing was received, until May 17, 2014, when the 2013-2014 surveillance period ended, KHEL tested 144 specimens for influenza. ILINet sites submitted 131 (91%) specimens; the remainder was primarily submitted by hospitals. Influenza was detected in 73 (50%) of the specimens. Both influenza type A and B viruses were detected. Two influenza A subtypes, A/H1 and A/H3, were seen. The influenza A/H1 subtype was most frequently detected, representing of 88% of all positive specimens (Table 1, Figure 3).

Table 1: Laboratory-confirmed influenza viruses by subtype, Kansas, October 1, 2013 – May 17, 2014 (n=73)

Influenza subtype	Number	Percent of Total
A/H1	64	88%
A/H3	7	10%
B	2	3%

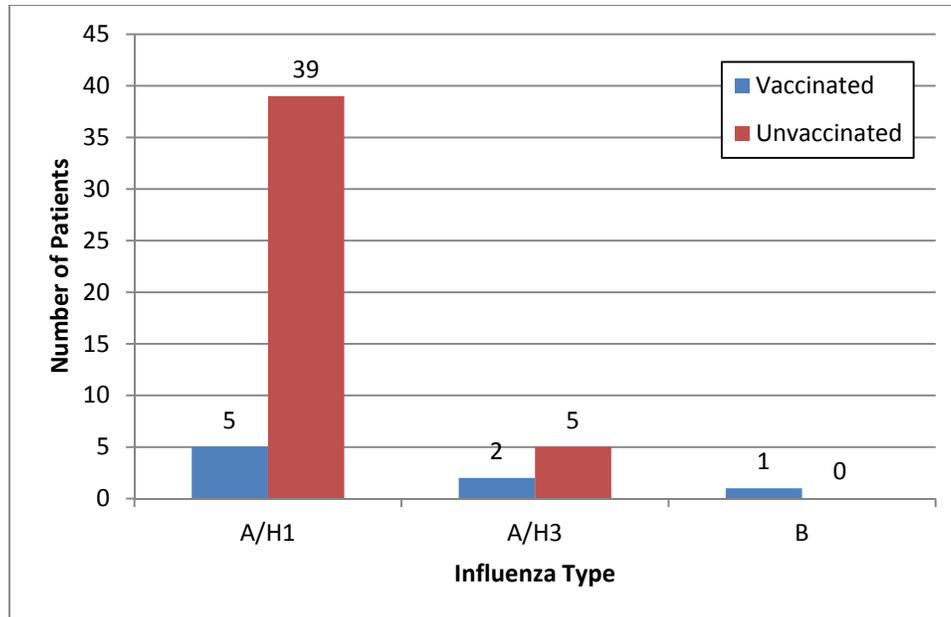
Figure 3: Influenza specimens tested at Kansas Health and Environmental Laboratories by week ending date, October 5, 2013 – May 17, 2014 (n=144)



Antigenic characterization testing performed on influenza isolates submitted by all states to the CDC showed that 71% of the B isolates, 95% of the A/H3 isolates, and 99% of the A/H1 isolates matched their corresponding components in the 2013-2014 seasonal influenza vaccine. KHEL sent 34 positive influenza specimens to CDC for antigenic characterization; all 34 specimens were found to be similar to the vaccine strains: A/California/7/2009-like, A/Texas/50/2012-like, and B/Massachusetts/02/2012-like.

Influenza vaccination status was known for 52 of the 73 RT-PCR-positive patients. Of the 44 patients who tested positive for A/H1 with a known vaccination status, 39 (89%) were unvaccinated, while 5 (11%) were vaccinated. Of the 7 patients who tested positive for A/H3 with a known vaccination status, 5 (71%) were unvaccinated, and 2 (29%) were vaccinated. And lastly, only 1 patient who tested positive for influenza B had a known vaccination status and was vaccinated (Figure 4).

Figure 4: Influenza RT-PCR-positive patients by vaccination status and influenza type, September 30, 2013 - May 17, 2014 (n=52)



Luminex Respiratory Viral Panel Testing

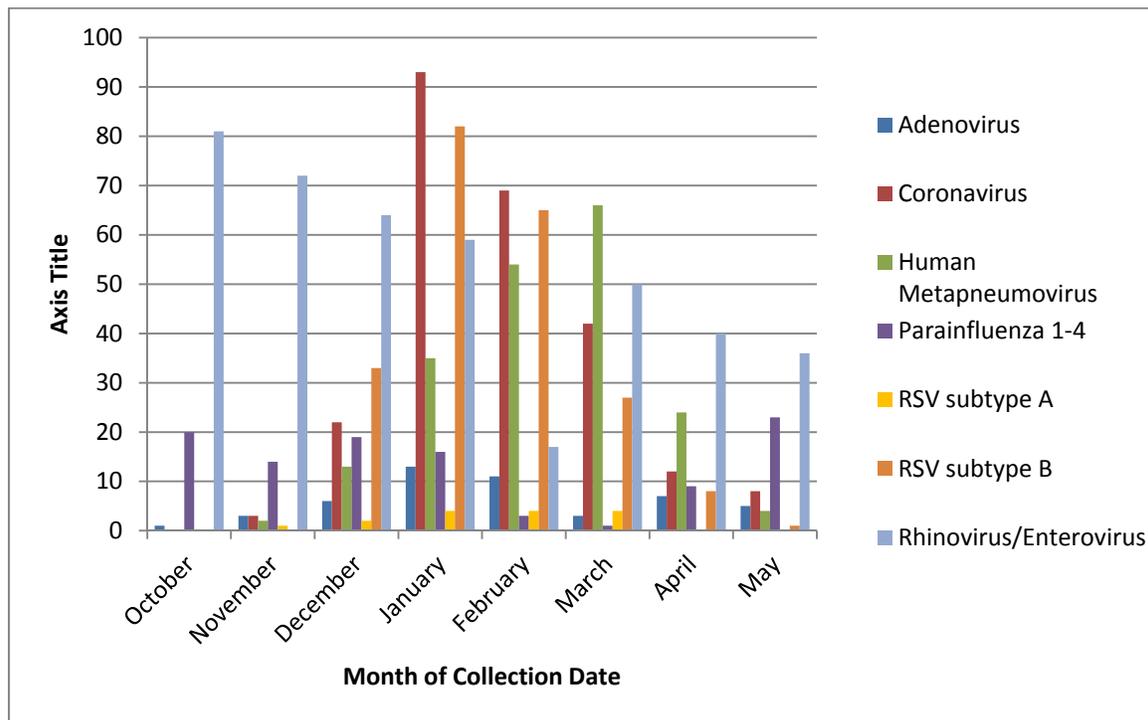
A subset of specimens which test negative for influenza by RT-PCR at the Kansas Health and Environmental Laboratories (KHEL) were tested using the Luminex PCR instrument. The Luminex assay probed for the following 12 viral targets per specimen: influenza A, influenza A subtype H1, influenza A subtype H3, influenza B, respiratory syncytial virus subtype A, respiratory syncytial virus subtype B, parainfluenza 1, parainfluenza 2, parainfluenza 3, human metapneumovirus, rhinovirus, and adenovirus. The goal of Luminex testing was to better understand which respiratory viruses were circulating in Kansas during influenza season.

For the 2013-14 season, Via Christi Laboratories in Sedgwick County shared its RVP data with KDHE. Via Christi Laboratories' RVP can detect Parainfluenza 4 and four different coronaviruses in addition to the 12 targets in the RVP panel used by KHEL; RVP results were sent to KDHE monthly and represented the majority of respiratory virus surveillance in the south central region of Kansas. The resources available at KHEL focused on the remaining five regions of the state.

A total of 43 specimens were tested on the KHEL Luminex assay, 31 of which were negative for all viral targets. Rhinovirus was the most common virus found (n=8). The other viruses identified using Luminex included human metapneumovirus (n=2) and adenovirus (n=1). The KHEL RVP specimens showed no time-specific disease trends over this surveillance period.

Via Christi saw many respiratory virus trends during the flu season (Figure 5). The most common virus found was rhinovirus/enterovirus, which declined throughout the season. They also reported high numbers of RSV subtype B and coronaviruses during peak flu season. Other viruses detected were adenovirus, RSV subtype A, human metapneumovirus, and parainfluenzas.

Figure 5: Positive Respiratory Viral Panel Results, Via Christi Laboratories, October 2013 – May 2014



**Via Christi Laboratories uses an RVP panel to test patient specimens, which can detect Parainfluenza 4 and four different coronaviruses in addition to the 12 targets in the RVP panel used by the Kansas Health and Environmental Laboratories.*

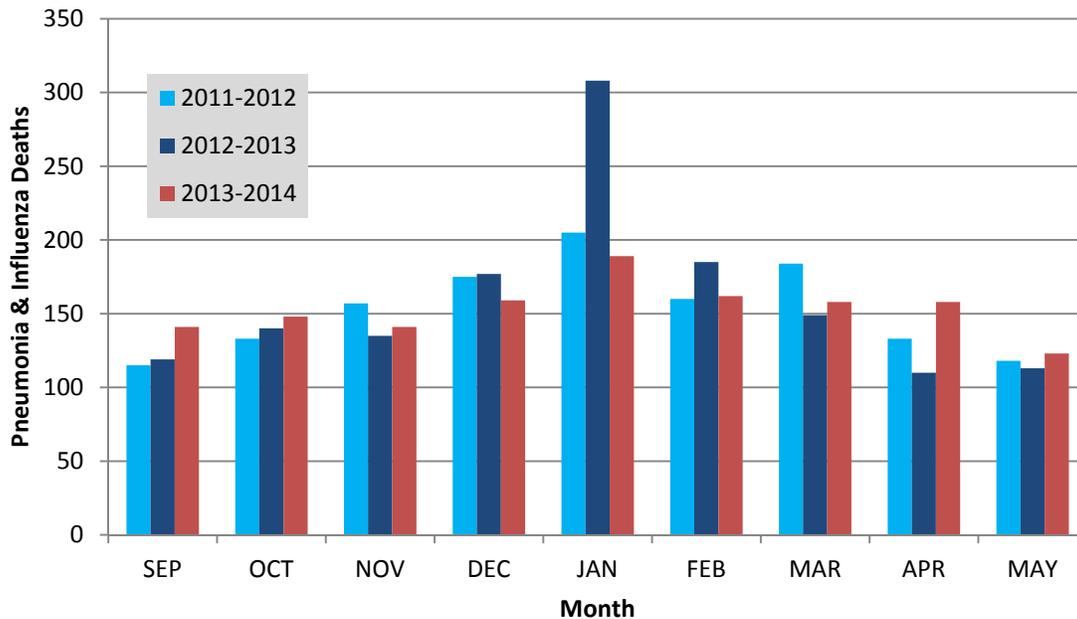
Via Christi Laboratories tests specimens from patients seen at Via Christi hospitals as well as specimens from AMS Reference Laboratory. RVP results are sent to KDHE monthly and will represent the majority of respiratory virus surveillance in the south central region of Kansas.

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, and pneumonia recorded as the direct cause of death.

Traditionally, P&I mortality data includes deaths that occurred from September through May. During the 2013-2014 period, the largest number of P&I deaths (n=189) were recorded in the month of January (Figure 6).

Figure 6: Deaths attributed to pneumonia or influenza by month, Kansas, September 2011-May 2014*

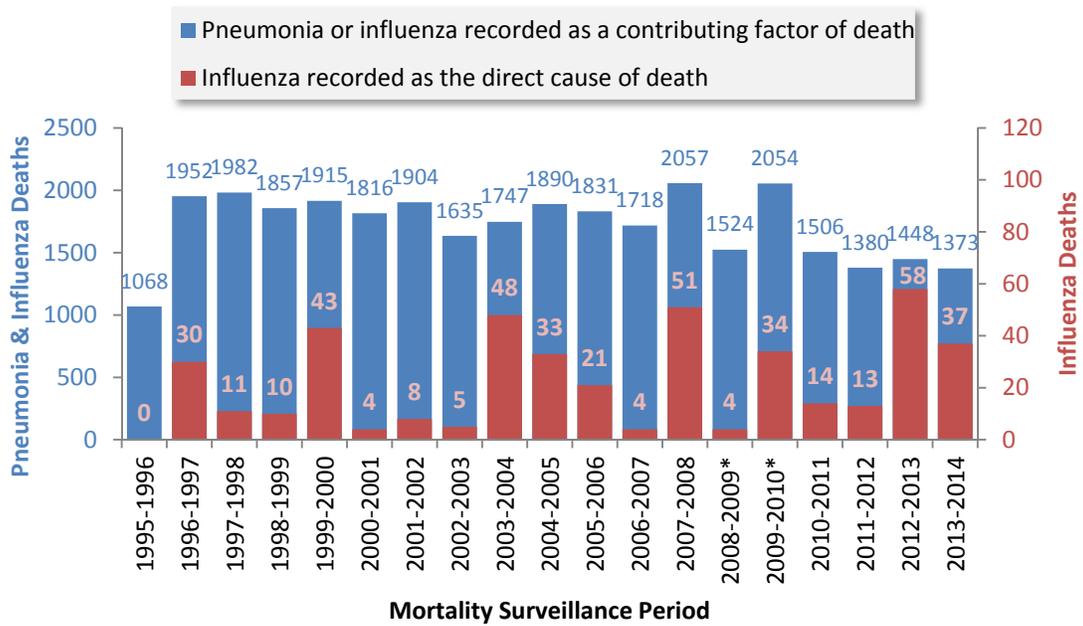


* 2013-2014 data is provisional and subject to change.

A total of 1,373 deaths occurred during the 2013-2014 surveillance period. The observed mortality was below the 19-year median of 1,816 (Figure 7). During the 2013-2014, 36 deaths were directly attributed to influenza—this number was above the 19-year median (14 deaths) observed since the 1995-1996 surveillance period, and above the 19-year mean (22 deaths).

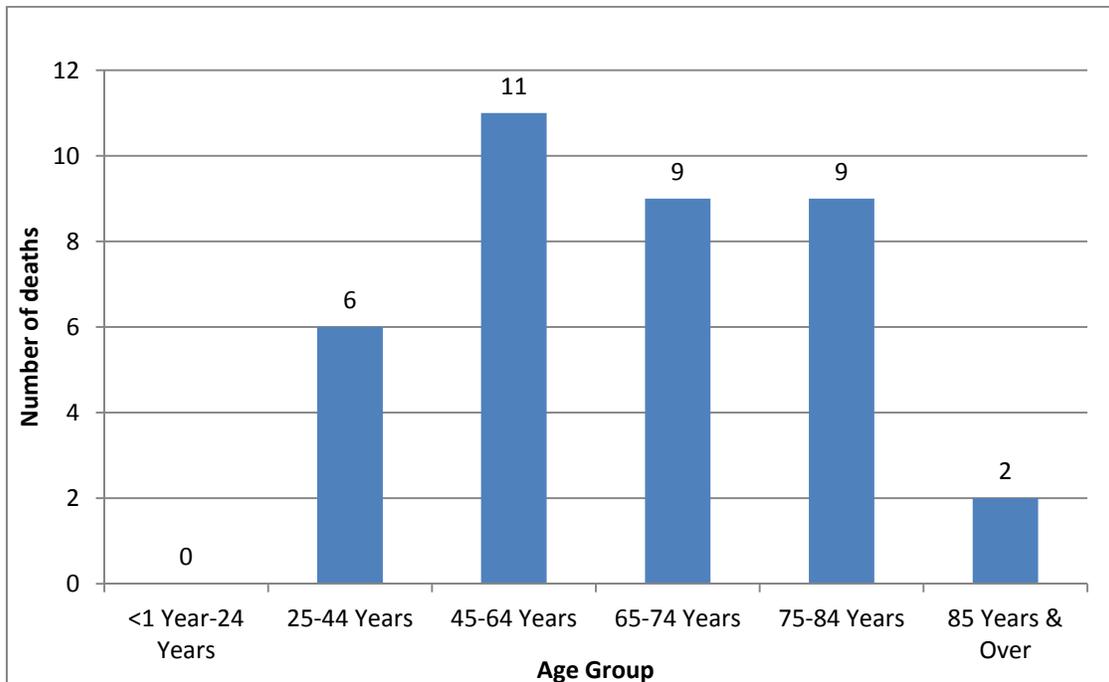
Of the total number of P&I deaths (n=1,373) recorded during the 2013-2014 surveillance period, 37 (3%) were directly attributed to influenza. The majority of these deaths occurred in individuals aged 75 years or older with 11 deaths (30%) (Figure 8).

Figure 7: Pneumonia and influenza mortality by surveillance period, Kansas, 1995-2014 *



**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 2013-2014 data is provisional and subject to change.*

Figure 8: Influenza recorded as direct cause of death by age group, Kansas, September 2013 – May 2014



Influenza-Associated Pediatric Mortality

Since 2004, CDC has requested information on influenza-associated pediatric deaths; the condition was added to the list of reportable diseases 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 2013-2014, two confirmed influenza-associated pediatric deaths were reported in Kansas.

Influenza Vaccine Coverage

The CDC's Advisory Committee on Immunization Practices (ACIP) recommended all individuals older than six months of age be immunized against influenza. For the 2013-2014 season, the ACIP stressed vaccination among the following groups at high risk for influenza complications:

- All children aged 6 months through 4 years (59 months)
- All persons aged 50 years and older
- Adults and children who have chronic pulmonary (including asthma), cardiovascular (except hypertension), renal, hepatic, neurologic, hematological or metabolic disorders (including diabetes mellitus)
- Adults and children who have immunosuppression (including immunosuppression caused by medications or by human immunodeficiency virus)
- Women who are or will be pregnant during the influenza season
- Children and adolescents (6 months - 18 years of age) receiving long-term aspirin therapy who therefore might be at risk for experiencing Reye syndrome after influenza virus infection
- Residents of nursing homes and other long-term care facilities
- American Indians and Alaska Natives
- Persons who are morbidly obese (BMI \geq 40)
- Health-care personnel
- Household contacts and caregivers of children aged <5 years and adults aged 50 years and older, with particular emphasis on vaccinating contacts of children aged <6 months
- Household contacts and caregivers of persons with medical conditions that put them at higher risk for severe complications from influenza

Vaccine coverage levels were measured by the Kansas Behavioral Risk Factor Surveillance System (BRFSS). Self-reported vaccine coverage levels reported from the BRFSS questionnaire are shown in Table 4. The coverage levels among other priority groups were not examined. The 2013 influenza immunization rate among individuals 18 years and older was 42.2%.

Table 4: Percentage of Kansans reporting intramuscular or intranasal influenza vaccination during the past 12 months, 2013 BRFSS

Group	% Vaccinated
Age 18 and older	42.2%
Age 50 and older	54.0%
Age 65 and older	64.8%
Adults with asthma	47.4%
Adults with diabetes	57.5%

The influenza vaccine coverage rates measured by the 2013 BRFSS are complex. The survey, conducted throughout the 2013 calendar year, asked if respondents have received a flu vaccine within the past twelve months. In effect, this measured the coverage rate from January 2012 through December 2013. If the respondent was interviewed from January 2013 to the summer of 2014, his or her vaccine was administered for the 2012-2013 influenza season; if the interview was conducted during the fall of 2013, the vaccine may have been administered in anticipation of the 2013-2014 season. The 2013 BRFSS results, then, measured the coverage rate for portions of two vaccination campaigns, rather than only the 2013-2014 season.

Summary

The ILI rate peaked in Kansas at 6.0% during the week ending December 28, 2013. During the 2012-13 season, the ILI rate peaked at 6.1% and the peak during the 2011-12 season was 3.4 %. Three influenza viruses were detected in Kansas: A/H1, A/H3, and B. The predominant strain in Kansas and the U.S. was A/H1.

Testing conducted by the CDC indicated that nearly all circulating influenza viruses were antigenically similar to the components of the 2013-2014 influenza vaccine; however, 8 of 52 patients tested at KHEL were RT-PCR-positive despite receiving the vaccine. The reasons for these vaccinated cases was not clear. Vaccine effectiveness can vary according to the age and health of the individual, as well as the vaccine's correlation to circulating influenza strains. Additionally, it can take up to two weeks after vaccination to develop antibodies against influenza viruses.

During the 2013-14 influenza season, 37 deaths were directly attributed to influenza. Of those deaths, 30% were among those 75 years and older.