COLORADO
Department of Public Health & Environment

Dedicated to protecting and improving the health and environment of the people of Colorado

Influenza Surveillance Summary
Colorado, 2014-2015

Summary

Surveillance for the 2014 –2015 influenza season officially began on September 28, 2014 and ran through May 23rd, 2015. The Colorado Flu Report was published weekly to provide a concise and up to date summary of influenza activity in the State of Colorado. Influenza activity in the community during the 2014-2015 influenza season was severe, with 3397 hospitalized cases reported from 56 counties. This number far exceeds the 2157 hospitalizations reporting during the 2009-10 pandemic and is the highest number of hospitalizations reported during a season since hospitalizations became a reportable condition (2004-2005 season). Influenza A viruses were the predominant circulating strain until the shift during the week ending 2/7. This season was particularly hard on persons 65+ years of age, who accounted for nearly 60% of hospitalizations reported. There were 6 deaths in persons less than 18 years of age during the season. During past seasons when influenza A (H3N2) viruses have predominated, higher overall and age-specific hospitalization rates and more mortality have been observed, especially among older people, very young children, and persons with certain chronic medical conditions compared with seasons during which influenza A (H1N1) or influenza B viruses have predominated. Based on influenza surveillance data, the 2014-2015 influenza season peaked early, during the week ending 12/27/2014.

Components of Colorado's influenza surveillance

Surveillance activities during the 2014-2015 influenza season included: reporting of hospitalizations due to influenza, reporting of influenza-like illness (ILI) visits by selected sites, reporting of influenza testing activity by sentinel hospital labs, monitoring circulating influenza viruses through molecular typing at the state public health laboratory, outbreaks of influenza in long-term care facilities (LTCF), and reporting of influenza-associated deaths in children less than 18 years of age.

Reports of influenza-associated hospitalizations

Due to low influenza activity and the concern of false positives results from rapid antigen tests, influenza-associated hospitalizations during the early season were counted as cases only if they were positive by polymerase chain reaction (PCR), direct fluorescent antibody (DFA), or viral culture. Beginning the week ending November 22, 2014, a hospitalized patient with any positive influenza test was counted as an influenza-associated hospitalization.

Confirmatory molecular testing by PCR at the CDPHE laboratory was performed to a greater extent for the Denver metro area hospitals than for non-Denver metro area hospitals due to enhanced influenza surveillance conducted in the five county (Adams, Arapahoe, Denver, Douglas, Jefferson) Denver metro area as part of CDC-funded Emerging Infections Program grant activities. The substantially higher sensitivity of influenza PCR testing compared to rapid influenza testing likely increased influenza-associated hospitalization case ascertainment in the Denver metro area; 56% of all reported influenza-associated hospitalizations were from the five Denver metro counties which account for nearly 50% of the Colorado population.

A total of 3397 hospitalizations from 56 counties were reported between September 28th, 2014 and May 23rd, 2015. Influenza activity was elevated early in the season, steadily increasing until the season's peak during the week ending 12/27/2014 with 582 hospitalizations reported. This is the highest number of hospitalizations reported during a single week since hospitalizations became a reportable condition (2004-2005 season), including the pandemic (2009-2010 season) when 355 hospitalizations were reported (Figure 1). Surveillance shows that the 2014-15 season peaked considerably earlier than other seasons, excluding the 2009 H1N1 pandemic (Figure 2). Influenza A continued to be the predominant type until the shift to influenza B during the week ending 2/7/15 (Figure 3). Among these reported cases, 2760 (81%) were type A and 637 (19%) were type B. Of the type A cases, 1088 (39%) were subtype A (H3N2), 5 (0%) were subtype 2009 H1N1, and the remaining 1667 (60%) were not subtyped.

Figure 1

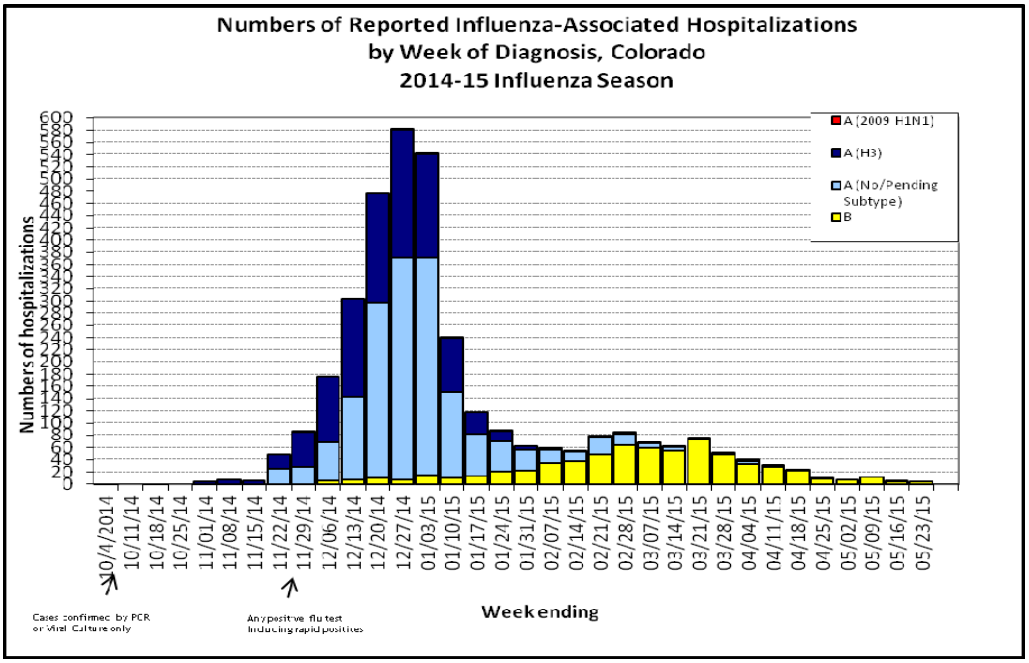


Figure 2

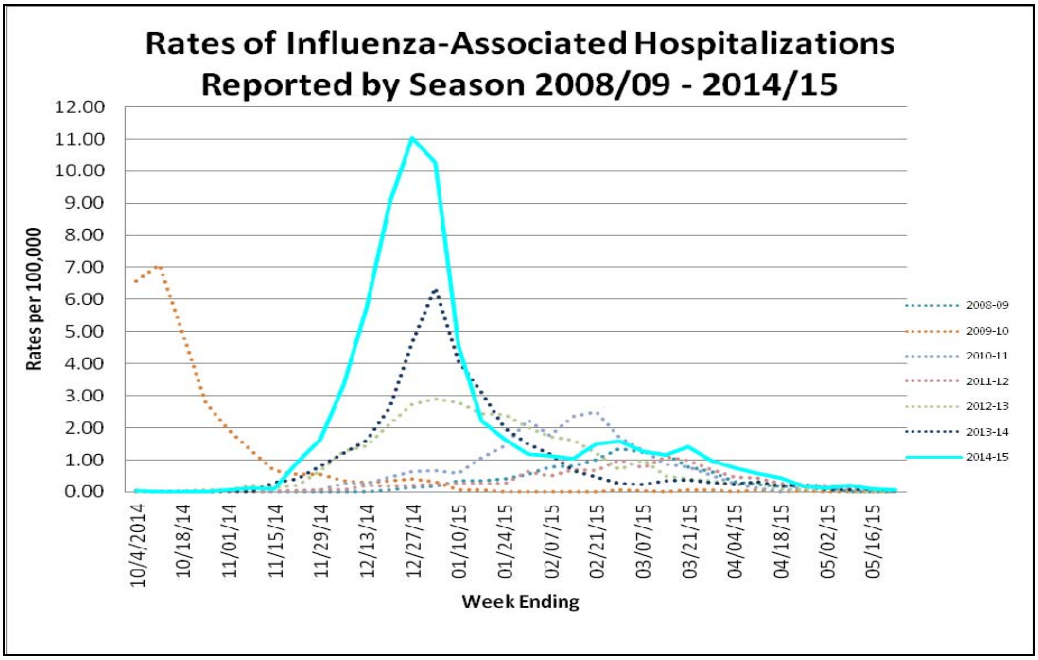
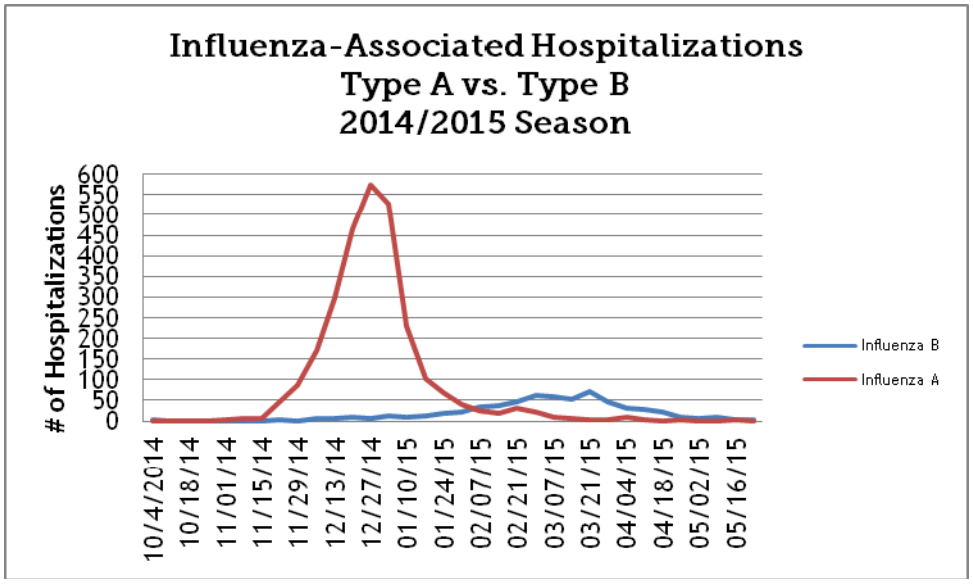


Figure 3



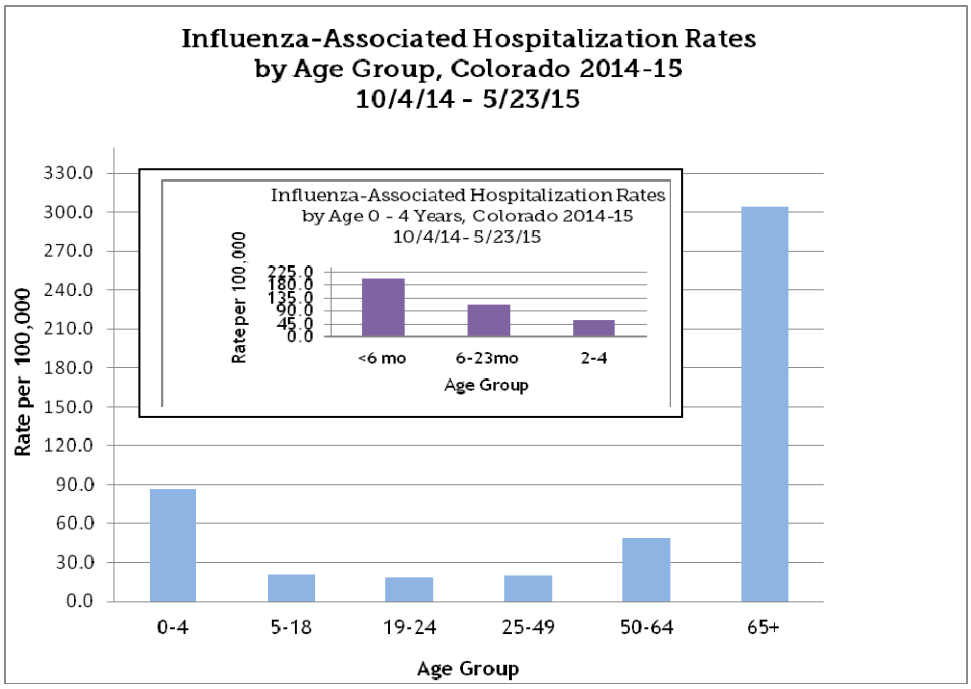
Influenza A (H3N2) viruses were the predominant circulating strain until the shift to influenza B during the week ending 2/7. Influenza A (H3N2) was particularly hard on persons 65+ years of age, who accounted for nearly 60% of hospitalizations (Table 1, Figure 4). The hospitalization rate for this group was 304/100,000 persons. During past seasons when influenza A (H3N2) viruses have predominated, higher overall and age-specific hospitalization rates and more mortality have been observed, especially among older people, very young children, and persons with certain chronic medical conditions compared with seasons during which influenza A (H1N1) or influenza B viruses have predominated. This is the highest rate reported for the 65+ age group since reporting began in 2004-2005. The majority of circulating influenza A (H3N2) viruses were different from the influenza A (H3N2) component of the 2014–15 Northern Hemisphere seasonal vaccines, and the predominance of these drifted viruses resulted in reduced vaccine effectiveness this season.

Table 1

Influenza-Associated Hospitalizations by Age Group, Colorado 2014-15 10/04/2014 - 5/23/2015

Age	No.*	%	Population	Rate per 100,000
<6 mo	65	1.9	32687	198.9
6-23mo	110	3.2	98513	111.7
2-4	114	3.4	204072	55.9
5-18	200	5.9	986589	20.3
19-24	79	2.3	435675	18.1
25-49	347	10.2	1816235	19.1
50-64	499	14.7	1039747	48.0
65+	1983	58.4	651527	304.4
Total	**3397**	100.0	**5265045**	**64.5**

Figure 4



Reports of influenza-like illness (ILI) by sentinel providers

Kaiser Permanente (KP) for the Denver-Boulder metropolitan area and Primary Care Partners, P.C. of Mesa County reported influenza-like illness (ILI) based on ICD-9 diagnostic codes 487.1 (influenza with other respiratory manifestations) and/or 079.99 (unspecified viral infection) from their electronic medical records database. Peak levels of outpatient ILI were record breaking during 2014-2015 season, excluding the pandemic. KP ILI had a distinct peak of 6.2% during the week ending 12/27 (Figure 5). This is the highest ILI rate seen since the pandemic (8.4%) (Figure 6). Mesa County ILI peaked during the week ending 1/3 at 4.7% (Figure 7).

Figure 5

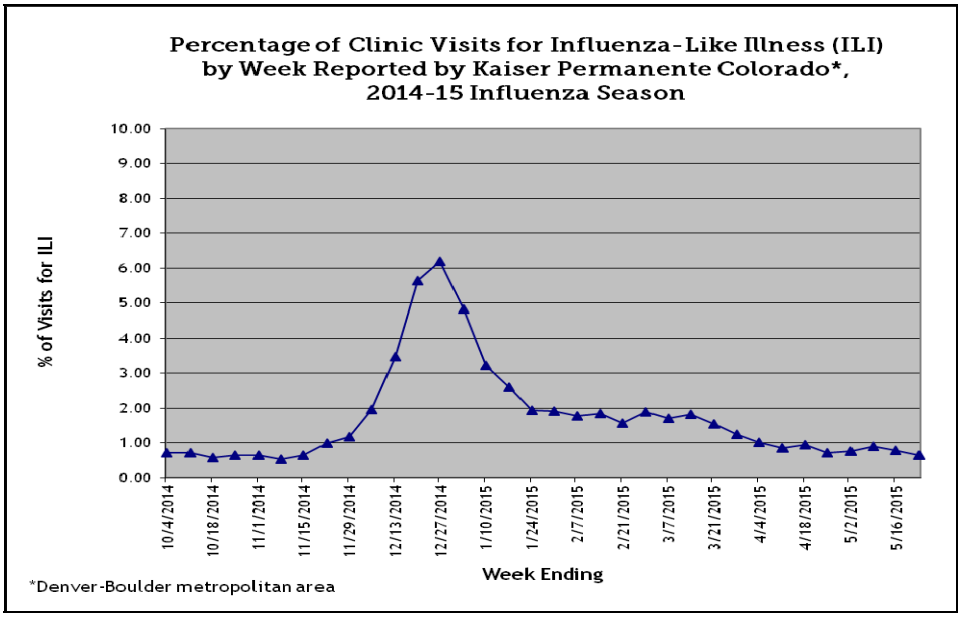


Figure 6

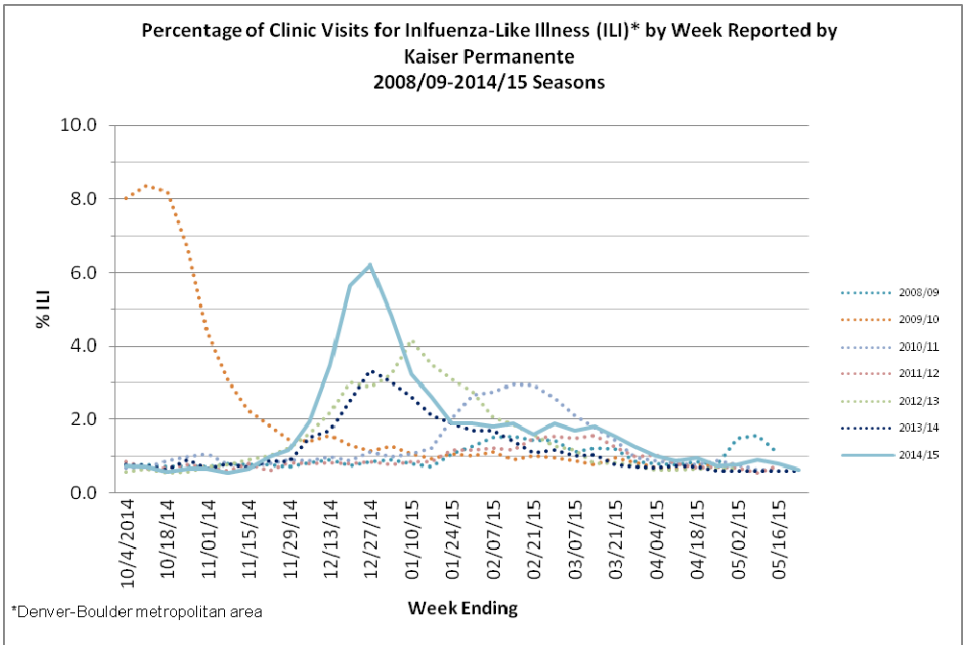
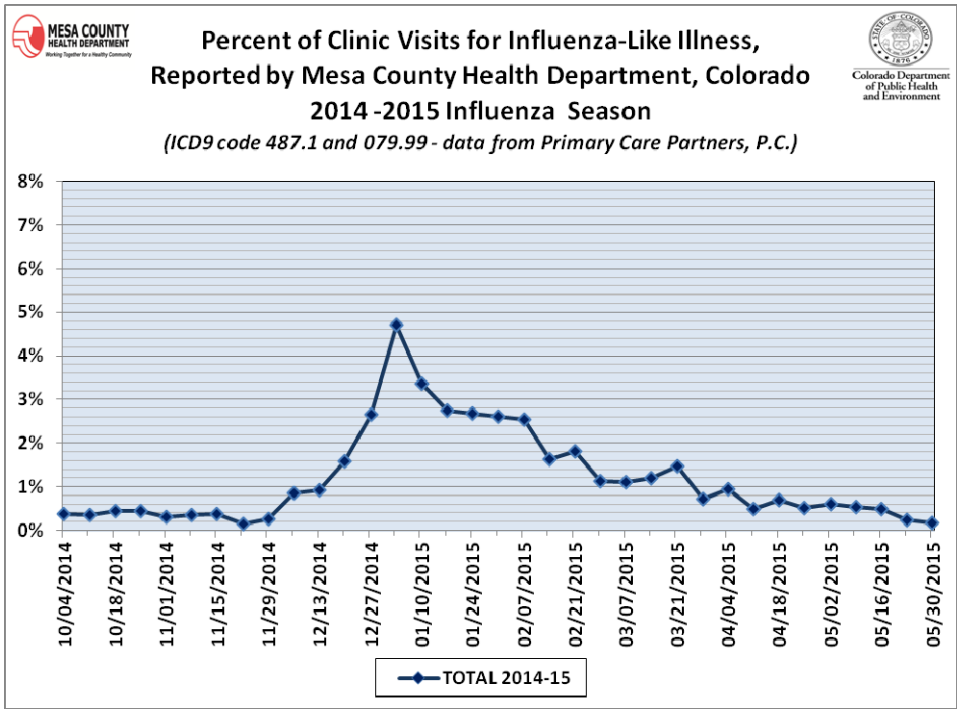


Figure 7



Circulating influenza virus surveillance

An important component of influenza surveillance consists of the typing and subtyping of influenza virus isolates throughout the season to determine the circulating strain(s) of influenza virus. Sentinel providers and hospital laboratories submit clinical specimens to the state laboratory where virus isolation, typing and subtyping are performed. Some of these are then sent to CDC for further antigenic characterization (assessment of match to the vaccine strains).

CDC characterized 305 influenza viruses collected by U.S. laboratories during the 2014-15 season. U.S. influenza viral characterization data indicates that 78 (32.6%0 of the influenza A (H3N2) viruses collected and analyzed by CDC were antigenically "like" the 2014-2015 influenza A (H3N2) vaccine component, but that 161 (67.4%) were antigenically different (drifted) from the H3N2 vaccine virus. In past seasons during which predominant circulating influenza viruses have been antigenically drifted, decreased vaccine effectiveness has been observed.

Thirty-nine (70%) of the influenza B viruses tested belong to B/Yamagata/16/88 lineage and the remaining 17 (30%) influenza B viruses tested belong to B/Victoria/02/87 lineage. All 39 B/Yamagata-lineage viruses were characterized as B/Massachusetts/2/2012-like, which is included as an influenza B component of the 2014-2015 Northern Hemisphere trivalent and quadrivalent influenza vaccines. Fifteen (88%) of the 17 B/Victoria-lineage viruses were characterized as B/Brisbane/60/2008-like, the virus that is included as an influenza B component of the 2014-2015 Northern Hemisphere quadrivalent influenza vaccine. Two (12%) of the B/Victoria-lineage viruses tested showed reduced titers to B/Brisbane/60/2008.

*CDC routinely uses hemagglutination inhibition (HI) assays to antigenically characterize influenza viruses year-round to compare how similar currently circulating influenza viruses are to those included in the influenza vaccine, and to monitor for changes in circulating influenza viruses. However, a portion of recent influenza A(H3N2) viruses do not grow to sufficient hemagglutination titers for antigenic characterization by HI. For many of these viruses, CDC is also performing genetic characterization to infer antigenic properties.

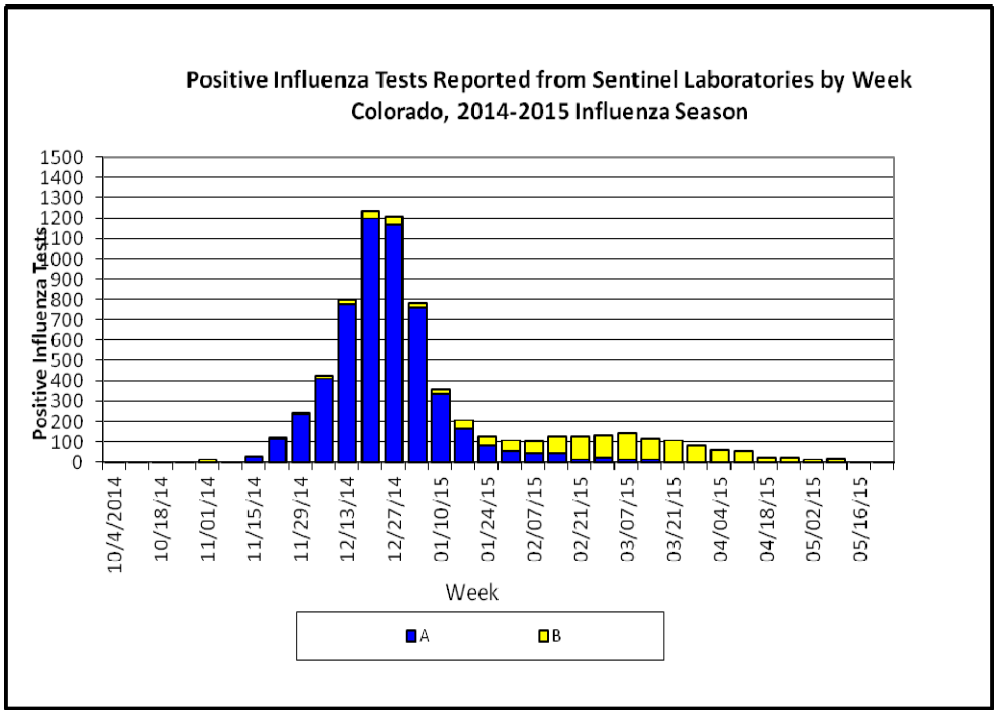
Because of the detection of these drifted influenza A (H3N2) viruses, CDC issued a Health Advisory on December 3rd, to re-emphasize the importance of the use of neuraminidase inhibitor antiviral medications when indicated for treatment and prevention of influenza, as an adjunct to vaccination.

Based on typing and subtyping at the state laboratory, influenza A (H3) viruses predominated. Among 1350 positive specimens (out of 1593) tested at the state laboratory, 1295 (96%) were type A and 55 (4%) were type B. Of the type A specimens, 1350 (100%) subtyped as H3N2. Of the 55 specimens confirmed for influenza B, 21 (38%) were Victoria lineage, and 14 (25%) were Yamagata lineage, and the remaining 20 (36%) were unknown lineage.

Sentinel laboratory reporting of influenza testing

The percentage of respiratory specimens that tested positive for influenza at 22 sentinel hospital labs peaked during the week ending December 20th (red line in graph below). Type B viruses comprised of only 1% of the positive influenza tests reported by sentinel laboratories during that week but became the predominant circulating type after the shift from influenza A during the week ending 2/7 (Figure 8).

Figure 8



Reports of pediatric deaths due to influenza

Pediatric influenza-associated deaths have been a reportable condition in Colorado since the 2004-05 influenza season. During the 2003-2004 season 12 pediatric deaths were reported, since then an average of 2.75 deaths have been reported each season, excluding the pandemic (Table 2). During the 2014-15 season there were 6 pediatric deaths (in persons less than 18 years of age).

Table 2

Influenza-Associated Pediatric Deaths
2003/04-2014/15 Influenza Season

Season	Deaths
2003-04	12
2004-05	2
2005-06	2
2006-07	1
2007-08	2
2008-09	7*
2009-10	12**
2010-11	3
2011-12	0
2012-13	5
2013-14	0
2014-15	6

*Includes death reported in 08-09 season but after defined season dates which may have been acquired on domestic and/or international travel.
** 2009 H1N1 Pandemic

Reports of influenza outbreaks in long-term care facilities

Each year, between 5 and 55 long-term care facilities in Colorado report an influenza outbreak. An outbreak is defined as at least one resident with a positive test for influenza among two or more residents with ILI. While all influenza associated outbreaks in any setting are reportable to public health per state regulations, for the purpose of this surveillance report, we only count influenza outbreaks that occur in residential settings (such as long term care facilities, correctional facilities, and boarding schools).

During the 2014-2015 influenza season 142 influenza-associated outbreaks were reported (138 in long-term care facilities (LTCF) and 4 from correctional facilities). This is the highest number of LTCF outbreaks reported during a season since outbreaks became reportable (2004-2005 season). Outbreak data peaked during the week ending 12/20/2015 with 24 outbreaks reported (Figure 9).

Figure 9