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# Influenza Surveillance Summary Colorado, 2016-2017

#### Summary

Surveillance for the 2016 -2017 influenza season officially began on October 2, 2016 and ran through May 27, 2017. In contrast to the 2015-2016 season, influenza activity during the 2016-2017 season was moderate, with 3,340 reported hospitalizations and a rate of 61.4/100,000 from 55 counties (compared to 1,639 hospitalized cases and a rate of 31.1/100,000 reported from 52 counties in 15-16). Influenza A viruses were the predominant circulating strain among hospitalized cases until a shift to influenza B viruses occurred the week ending March 25, 2017. This influenza season, individuals aged 65 years or greater and children under 6 months of age had the highest rates of hospitalization. There were two pediatric deaths associated with influenza in children less than 18 years of age. Molecular typing of influenza-positive patient specimens conducted by the Colorado Department of Public Health and Environment (CDPHE) laboratory showed that Influenza A (H3N2) was the dominant subtype among inpatient and outpatient specimens tested at the CDPHE laboratory. The 2016-2017 influenza season peaked earlier compared to the previous season, during the week ending February 11, 2017.

#### Components of Colorado's Influenza Surveillance

Surveillance activities during the 2016-2017 influenza season included: reporting of hospitalizations due to influenza, reporting of influenza-like illness (ILI) visits by selected clinical sites, reporting of influenza testing activity by sentinel hospital labs, monitoring circulating influenza viruses through molecular typing at the CDPHE laboratory, reporting of outbreaks of influenza in residential settings (mainly long-term care facilities (LTCF), and reporting of influenza-associated deaths in children less than 18 years of age.

#### **Reports of Influenza-Associated Hospitalizations**

A hospitalized patient with any positive influenza test, resulting from a rapid antigen, polymerase chain reaction (PCR), direct fluorescent antibody (DFA), or viral culture, was counted as an influenza-associated hospitalization. This was the first year rapid antigen tests were not excluded during the early weeks of the season.

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; 53% of all reported influenza-associated hospitalizations were from the five Denver metro counties, which account for nearly 50% of the Colorado population.

Overall, 3,340 influenza hospitalizations from 55 counties were reported between October 2, 2016, and May 27, 2017. Influenza activity was sporadic early in the season, and did not begin steadily increasing until mid-November. Influenza-related hospitalizations peaked during the week ending February 11, 2017 with 280 hospitalizations reported that week. Surveillance shows 5 out of the last 13 seasons also peaked in

February (Figure 2 and Table 1). Influenza A continued to be the predominant type until the shift to influenza B during the week ending March 25, 2017 (Figure 1). Among hospitalized cases, 2,528 (76%) were type A and 812 (24%) were type B. Among influenza A cases, 36 (1%) were subtype A (2009H1N1), 876 (35%) were subtype A (H3N2), and the remaining 1616 (64%) were not subtyped. The distribution of influenza A viruses among hospitalized cases in the 2016-2017 season was dramatically different from the previous 2015-16 season when influenza A (2009 H1N1) was the predominant subtype circulating and only 176 hospitalized cases were typed as influenza A (H3N2).



#### Figure 1. Number of Confirmed Influenza Hospitalizations by Week of Diagnosis, Colorado 2016-17 Influenza Season

## Colorado Influenza Activity

Overall, influenza activity was moderate in Colorado during the 2016-17 season. This was similar to other seasons with influenza A (H3N2) predominating viruses. Activity remained low through October to December. The peak of the season occurred during the week ending on February 11, 2017. National influenza trends showed a peak during February 2017 as well. The peak of influenza-associated hospitalizations for the 16-17 season peaked earlier than last season. Influenza B viruses began increasing in late February and peaked the week ending April 1, 2017. Yamagata lineage predominated over Victoria lineage.

Table 1. Week of Peak Influenza Hospitalizations by Season

51 0	Date of
Flu Season	Peak
2004-05	2/19/05
2005-06	3/4/06
2006-07	3/17/07
2007-08	2/23/08
2008-09	2/28/09
2009-10	10/17/09
2010-11	2/26/11
2011-12	3/17/12
2012-13	1/4/13
2013-14	1/4/14
2014-15	12/27/14
2015-16	3/12/16
2016-17	2/11/17

Peak Influenza Hospitalizations by Season

Since Colorado began reporting influenza hospitalizations in the 2004, one season peaked in each of the months October and December, two seasons peaked in January, five seasons peaked in February and four peaked in March.





Overall influenza activity was moderate in Colorado during the 2016-17 season and had a higher hospitalization rate compared with the preceding season of 2015-16.

## Influenza-Associated Hospitalizations by Age Group

In Colorado, this influenza season was more severe compared with the preceding season of 2015-16; however, it was less severe than the 2014-15 season (Figure 2). The 2014-15 season was the last H3N2 predominant season. Influenza A (H3N2)-predominant seasons are typically more severe overall than Influenza A (2009 H1N1) predominant seasons.

As can be seen in Table 2 and Figure 4, the highest rates of hospitalization are in the elderly over 65 years of age, followed by children less than two years of age which is a typical pattern demonstrated by influenza.

### Table 2. Influenza-Associated Hospitalizations by Age Group

Age	No.*	%	CO population	Rate per 100,000
<6 mo	49	1.5	33657	145.6
6-23 mo	58	1.7	100574	57.7
2-4 yr	72	2.2	203660	35.4
5-18 yr	151	4.5	1017121	14.8
19-24 yr	68	2.0	461147	14.7
25-49 yr	371	11.1	1863842	19.9
50-64 yr	685	20.5	1064243	64.4
65+ yr	1886	56.5	712208	264.8
Total	3340	100	5456452	61.2

#### Influenza-Associated Hospitalizations by Age Group, Colorado 2016-17

Figure 4. Influenza-Associated Hospitalizations Rates by Age Group



### Reports of Influenza-like Illness (ILI) by Sentinel Providers

Kaiser Permanente (KP) in the Denver-Boulder metropolitan area and Primary Care Partners, P.C. of Mesa County reported influenza-like illness (ILI) visits for outpatient encounters based on ICD-10 diagnostic codes.

KP ILI had a peak of 2.0% during the weeks ending February 4, February 11, and February 18 (Figure 5). Mesa County ILI peaked during the week ending March 18, 2017 at 2.6% (Figure 6). The peak percentage of outpatient ILI visits for both sentinel providers was similar the previous season.





\*Kaiser Permanente (KP) reported ICD-10 codes J06.9 (acute upper respiratory infection), J11.1 (influenza due to unidentified influenza virus with other respiratory manifestations), and B34.9 (viral infection).

## Figure 6. Influenza-like Illness Reported by Mesa County Health Department



\*Primary Care Partners, P.C. reported the following ICD-10 codes for the 2015-2016 season: J10.1 (influenza due to other identified influenza virus with other respiratory manifestations), J11.1 (influenza due to unidentified influenza virus with other respiratory manifestations), and B97.89 (other viral agents as the cause of diseases classified elsewhere).

## Circulating Influenza Virus Surveillance

An important component of influenza surveillance consists of the typing and subtyping of influenza viruses throughout the season to determine the predominant circulating strain(s) of influenza virus. Sentinel providers and hospital laboratories submit clinical specimens (both inpatient and outpatient) to the CDPHE laboratory where virus typing and subtyping are performed. Some of these specimens are sent to CDC for further antigenic and genetic characterization.

Based on typing and subtyping at the CDPHE laboratory, influenza A H3N2 viruses predominated. Among 525 influenza-positive specimens (out of 638) tested at the CDPHE laboratory, 264 (50%) were type A and 190 (45%) were type B. Of the type A specimens, 261 (99%) subtyped as H3N2 and 3 (1%) typed as H1N1. Of the 257 specimens confirmed for influenza B, 225 (88%) were Yamagata lineage and 32 (12%) were Victoria lineage. Only specimens positive for Influenza B were asked to be submitted after January 10, 2017, which makes the virology data biased toward B viruses after that point.

For typing and subtyping performed at hospitals throughout the state of Colorado, 2528 (76%) of positive specimens were positive for influenza A, and 812 (24%) were positive for influenza B. For influenza A

specimens, 1616 (64%) were not subtyped, 876 (35%) were H3N2 and 36 (1%) were H1N1. For influenza B specimens, 649 (80%) were not subtyped, 14 (17%) were Yamagata lineage and 21 (3%) were Victoria lineage (Table 3).

National viral surveillance and characterization data can be accessed at: <a href="http://www.cdc.gov/mmwr/volumes/65/wr/mm6522a3.htm">http://www.cdc.gov/mmwr/volumes/65/wr/mm6522a3.htm</a>

### Table 3. Virologic Surveillance, 2016-2017

	Data Cumulative Oct 2, 2016-May 27, 2017
Total Positive Specimens (Rapid and PCR)	3340
Influenza A	2528 (76%)
A (2009 H1N1)	36 (1%)
H3N2	876 (35%)
Subtyping not performed	1616 (64%)
Influenza B	812 (24%)
Yamagata lineage	42 (17%)
Victoria lineage	21 (3%)
Lineage not performed	649 (80%)

## Sentinel Laboratory Reporting of Influenza Testing

The percentage of respiratory specimens that tested positive for influenza at 26 sentinel hospital labs peaked during the week ending February 11, 2017 (red line in figure 8). Type A viruses predominated until the week ending March 18, 2017, after which B viruses were predominant (Figure 8).

### Figure 8. Positive Influenza Tests Reported from Sentinel Laboratories



### Reports of Pediatric Deaths Due to Influenza

Pediatric influenza-associated deaths have been a reportable condition in Colorado since the 2004-05 influenza season. In the 2003-2004 season 12 pediatric deaths were reported, since then an average of 2.6 deaths have been reported each season, excluding the 2009 H1N1 pandemic during the 2009-2010 season (Table 4). During the 2016-2017 season, there were two pediatric deaths (in a child less than 18 years of age). Colorado had one more influenza-associated pediatric deaths compared to the preceding season of 2015-16 in which there was one influenza-associated pediatric deaths. Nationally, there were 98 influenza-associated pediatric deaths reported during the 2016-17 season, which was also higher than the 85 influenza-associated pediatric deaths reported for the preceding season.

#### Table 4. Influenza-Associated Pediatric Deaths

Flu Season	Pediatric 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
2015-16	1
2016-17	2

Influenza-Associated Pediatric Deaths, Colorado 2003-04 through 2015-16 Influenza Seasons

\*Includes death reported in 2008-09 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

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

During the 2016-2017 influenza season, 128 influenza-associated outbreaks were reported. Of those outbreaks, 123 occurred in long-term care facilities (LTCF), two in group-homes and two in correctional facilities. This is almost 100 more outbreaks in LTCFs than were reported during the 2015-2016 influenza season, which had 29 outbreaks in long-term care facilities.

#### Figure 9. Influenza-Associated Outbreaks in Residential Settings

(Long-term care facilities, rehabilitation facilities, homeless shelters and correctional facilities)

