

Influenza Surveillance Summary Colorado, 2019-2020

Overview

Surveillance for the 2019-2020 influenza season officially began September 29, 2019 and ran through May 23, 2020. The 2019-20 influenza season was less severe than the 2018-19 season in terms of hospitalizations and outbreaks. In Colorado, 3,546 influenza-associated hospitalizations were reported during the 2019-20 season with a rate of 61.5 per 100,000 people across 64 counties. In comparison, the 2018-19 season had 3,832 hospitalizations and a rate of 68.3 per 100,000 people among 59 counties.

The 2019-2020 influenza season was unique in that influenza type B predominated before influenza type A, a trend that has not been nationally seen since the 1992-93 influenza season.¹ Influenza B viruses predominated until the week ending January 11, 2020 in which the predominating viruses shifted to Influenza A. Influenza-associated hospitalizations and influenza test positivity peaked the week ending February 8, 2020.

Individuals age 65 and older and children under 5 years of age had the highest rates of hospitalization. There were three pediatric deaths in children less than 18 years of age.

The 2019-20 season was also impacted by the COVID-19 pandemic which likely influenced individual health care seeking behavior, influenza-like illness reports at outpatient and emergency facilities attributable to COVID-19 at the inception of the pandemic, and levels of influenza transmission impacted by stay-at-home orders, social distancing, masking, and other precautionary measures.²

Components of Colorado's Influenza Surveillance

Surveillance activities during the 2019-2020 influenza season included:

- Influenza-associated hospitalizations
- Influenza-like illness (ILI) visits at outpatient facilities and emergency departments
- Positivity data from sentinel hospital laboratories
- Virologic surveillance
- Outbreaks of influenza in long-term care facilities and correctional facilities
- Influenza-associated pediatric deaths
- Pneumonia and influenza mortality

2019-20 Colorado Influenza Season Severity

CDC has utilized percentage influenza-like illness visits, influenza-associated hospitalization rates, and pneumonia and influenza mortality to assess flu severity since 2017.³ The 2019-20



influenza season was [severity level] according to this criteria. The 2018-19 season was considered moderately severe.

Influenza-like activity in Colorado was considered very high between the weeks ending December 28, 2019 and February 22, 2020 and again between the weeks ending March 14, 2020 through March 21, 2020.⁴ Pneumonia and influenza mortality remained well above the epidemic threshold into the end of the influenza season, which may have been due to increased pneumonia mortality from COVID-19.⁵ In terms of hospitalizations in Colorado, influenza activity gradually increased throughout October and November peaking during the week ending February 8, 2020 (Figure 1).



Influenza-Associated Hospitalizations

A hospitalized patient who tested positive for influenza via a rapid antigen, polymerase chain reaction (PCR), direct fluorescent antibody (DFA), or viral culture test was counted as an influenza-associated hospitalization.





Overall, 3,546 influenza-associated hospitalizations from 64 counties were reported between September 29, 2019 and May 23, 2020. This was the third highest end of season count for influenza-associated hospitalizations in the state of Colorado among the past five influenza seasons (Figure 3). Influenza activity was considered sporadic until the week ending November 9, 2019 and shifted from regional to widespread activity between the weeks ending December 14, 2019 and December 21, 2019. Influenza activity returned to a sporadic level during the week ending April 18, 2020.⁶

In Colorado, influenza-associated hospitalizations peaked during the week ending February 8, 2020 with 330 reported hospitalizations (Figure 2). Hospitalizations during the 2019-20 season experienced its highest peak six weeks later than the previous 2018-2019 flu season (Table 1). Nationally, influenza-associated hospitalizations from the World Health Organization (WHO) and National Respiratory and Enteric Virus Surveillance System (NREVSS) collaborating laboratories peaked during the week ending December 28, 2019 and again during the week ending February 8, 2020.⁷

The first half of the season was atypically predominated by influenza B until the week ending January 11, 2020 in which the predominant circulating type switched to influenza A. Among hospitalized cases, 1,108 (31.2%) were type B, 2,418 (68.2%) were type A, and 20 (0.6%) were positive, but not subtyped. Among influenza A cases, 851 (35.2%) were subtype A H1H1, 39 (1.6%) were subtype A H3N2, and the remaining 1,528 (63.2%) were not subtyped. Among influenza B cases, 38 (3.4%) were Victoria lineage and 1,070 (96.6%) did not have lineage testing performed.





Table	1. Week of Peak Influenza-Associated Hospitalizations and Seasonal Cumulative
Rate,	Colorado

Flu Season	Date of Peak (Week Ending)	Seasonal Cumulative Rate
2004-05	2/19/2005	21.37
2005-06	3/4/2006	18.49
2006-07	3/17/2007	7.92
2007-08	2/23/2008	21.83
2008-09	2/28/2009	11.01
2009-10	10/17/2009	43.08
2010-11	2/26/2011	20.42
2011-12	3/17/2012	10.66
2012-13	1/4/2013	29.89
2013-14	1/4/2014	33.86
2014-15	12/27/2014	64.46
2015-16	3/12/2016	31.03
2016-17	2/11/2017	61.03
2017-18	12/30/2017	85.22
2018-19	12/29/2018 and 3/9/2019	68.31
2019-20	2/8/2020	61.46



Influenza-Associated Hospitalizations by Age Group

The highest rates of influenza-associated hospitalizations were among adults 65 years of age and older (151.53 per 100,000 people) followed by children 0-4 years of age (120.99 per 100,000) (Table 2 & Figure 4). The higher rates among these age groups conform to the typical pattern exhibited by influenza. Colorado experienced a lower cumulative rate of hospitalizations among adults age 65 and older than the national rate of 173.8 per 100,000 people, but a slightly higher rate among children 0-4 years of age than the national rate of 94.2 per 100,000 people.⁸

Age Group	Number of Hospitalizations	% of Total Hospitalizations	CO Population	Rate per 100,000
0-4 years	404	11.4%	333912	120.99
5-17 years	250	7.0%	930496	26.87
18-49 years	851	24.0%	2514998	33.84
50-64 years	872	24.6%	1056972	82.50
65+ years	1,171	33.0%	772792	151.53
All ages	3,548	100.0%	5609171	61.42

Table 2. Influenza-Associated Hospitalizations by Age Group, Colorad
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Influenza-Like Illness (ILI) from Outpatient Facilities and Emergency Departments

Kaiser Permanente and Primary Care Partners report influenza-like illness (ILI) visits for outpatient encounters based on ICD-10 diagnostic codes. Kaiser Permanente includes providers located in the North Central, Northeast, Northwest, South and South Central regions of Colorado. Primary Care Providers includes providers located in the Northwest region.

CDPHE has been tracking ILI activity in emergency departments since the 2018-19 influenza season. This information is provided through syndromic surveillance, an integrated electronic health information system which collects ILI-defined chief complaints and ICD-10 codes from hospital emergency departments and standalone emergency departments in the following counties: Adams, Arapahoe, Boulder, Denver, Douglas, and Jefferson.

ILI activity from outpatient providers peaked 3 times during the 2019-20 season with the first peak during the week ending December 28, 2019 at 7.4%, the second peak during the week ending February 8, 2020 at 8.3%, and the third peak during the week ending March 14, 2020 at 7.6% (Figure 5). ILI activity reported from outpatient providers experienced a steep decline at the beginning of March which may have been due to changes in healthcare seeking behavior in terms of limiting provider visits to severe illness.²

ILI activity from emergency departments also had three notable peaks with the first during the week ending December 28, 2019 at 7.1%, the second during the week ending January 25, 2020 at 7.6%, and the final peak during the week ending March 14, 2020 at 7.7% (Figure 6).

Baseline levels for both ILI datasets are calculated using an average of non-influenza weeks for the past three seasons plus two standard deviations. A non-influenza week is defined as a period of two or more consecutive weeks in which each week accounted for less than 2% of the season's total number of influenza-associated hospitalizations.

The peak percentage of ILI-coded visits at outpatient providers was lower during the 2019-2020 season (8.3%) than the previous 2018-2019 season (9.8%) while the peak percentage of ILI-coded visits at emergency departments was higher during the 2019-2020 season (7.7%) than the 2019-2020 season (7.0%).

2019-20 ILI activity may have been impacted by local and statewide public health orders that were implemented during the COVID-19 pandemic as well as changes in healthcare seeking behavior, increased use of telemedicine, and increased social distancing.^{9,2} Additionally, ILI surveillance may have been impacted by the presence of COVID-19-like illness (CLI) due to the overlap of symptoms between COVID-19 and influenza (fever and cough).^{10,11}









Positivity Data from Sentinel Hospital Laboratories

During the influenza season, 23 clinical hospital laboratories report weekly the number of influenza tests they perform and the number of positive tests that result. During the 2019-20 season, the percentage of specimens that tested positive for influenza peaked twice (Figure 7). The first peak was during the week ending December 28, 2019 with 25.06% positivity (2,682 specimens tested). The second peak was during the week ending January 25, 2020 with 25.70% positivity (2,813 specimens tested).



During the 19-20 flu season, both Influenza Type A and Type B had respective peaks (Figure 8). Influenza Type B viruses predominated during the beginning of the flu season peaking at 18.08% positivity during the week ending December 21, 2019. Influenza Type A viruses predominated during the latter half of the flu season, peaking at 16.78% positivity during the week ending February 8, 2020.





Nationally, total percent positivity peaked during the week ending February 8, 2020 with 30.25% positivity. Influenza Type B peaked at 17.59% positivity during the week ending December 28, 2019 and Type A peaked during the week ending February 22, 2020 at 19.49% positivity.¹²

Virologic Surveillance

Sentinel Clinical Laboratories

Among specimens from hospitalized patients in Colorado that were typed and subtyped by sentinel clinical laboratories, 523 (60.4%) were positive for influenza A and 195 (22.5%) were positive for influenza B. Among influenza A specimens, 463 (88.5%) were H1N1 2009, 52 (9.9%) were H3N2, and 8 (1.5%) were unable to be subtyped (viral titer too low). For influenza B specimens, all 195 specimens (100.0%) were Victoria lineage. 12 (1.4%) specimens resulted inconclusive and 132 (15.2%) did not detect influenza virus, likely due to low viral titers.

Colorado Department of Public Health and Environment Laboratory

The Colorado Department of Public Health and Environment collects influenza specimens for further testing through a right sizing strategy. Clinical laboratories were recruited from all regions of the state to participate in the program. Each site was asked to send up to five influenza specimens to the state public health lab per week during non-peak weeks and up to ten specimens per week during peak weeks.

Overall, the virology trends in Colorado followed a similar pattern to the national trends.¹³ Based on typing and subtyping reported to CDC from Colorado, Influenza A (H1N1 pdm09) was most prevalent throughout the 2019-20 season, followed by Influenza B (Victoria lineage),



Influenza B (lineage unspecified), Influenza A (H3N2), and Influenza A (subtyping not performed), respectively. 615 (64.9%) specimens were Influenza A, of which 552 (89.8%) were H1N1 pdm09, 53 (8.6%) H3N2, and 10 (1.6%) did not have subtyping performed. 332 (35.1%) specimens were Influenza B, of which 187 (56.3%) were Victoria lineage and 145 (43.7%) did not specify lineage.

Centers for Disease Control (CDC)

Subtyping not performed

Victoria lineage

Influenza B

A sample of specimens tested at the CDPHE state lab are then forwarded to the CDC for further genetic and antigenic characterization. Hemagglutinin inhibition (HI) assays are used to antigenically characterize the viruses. 42 specimens from Colorado were antigenically characterized at CDC.



CDC utilizes Next Generation Sequencing (NGS) to genetically characterize influenza viruses. We are currently awaiting additional information on genetic characterization from the CDC.

all	ational Cumulative Data, 2019-20 initializa Season (MMWR week 20 - week 40)				
		CO Cumulative Data (Hospitalized Cases)		National Cum	ulative Data*
	Total Positive Specimens	3,546		45,808	
	Influenza A	2,418	68.2%	26,873	58.66%
	H1N1	851	35.2%	23,327	86.80%
	H3N2	39	1.6%	1,819	6.77%

31.2%

63.2%

3.4%

18,935

1,528

38

1,108

Table 3. Influenza Test Typing and Subtyping, CO Cumulative Hospitalized Case and National Cumulative Data, 2019-20 Influenza Season (MMWR Week 20 - Week 40)



41.34%

1.727

14,573

6.43%

76.96%

Yamagata lineage	0	0	239	1.26%
Lineage testing not performed	1,070	96.6%	4,123	21.77%
A/B not distinguished	20	0.6%	N/A	N/A

*Includes influenza positive tests reported to CDC by U.S. Public Health Laboratories¹⁴

Influenza-Associated Pediatric Deaths

Pediatric influenza-associated deaths have been a reportable condition in Colorado since the 2004-05 influenza season. The highest number of influenza-associated deaths occurred during the 2009-10 season with 12 pediatric deaths. The 12-year average is 3.6 deaths per year (Table 4).

During the 2019-20 season, there were 3 pediatric deaths. Colorado had the same number of pediatric deaths as the preceding 2018-19 season. Nationally, there were 186 influenza-associated pediatric deaths reported during the 2019-20 season which was higher than the preceding 2018-19 season in which there were 144 influenza-associated pediatric deaths.¹⁵

Table 4. Influenza-Associated Pediatric Deaths,	Colorado	2008-09	through	2019-20
Influenza Seasons				

Flu Season	Pediatric Deaths
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
2017-18	1
2018-19	3
2019-20	3

*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

Influenza Outbreaks in Long-Term Care Facilities and Correctional 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, and group homes). An outbreak is defined as at least one resident with a positive test for influenza among two or more residents with influenza-like illness (ILI). Due to the COVID-19 emergency response, changes in both reporting from facilities and follow up information on certain outbreaks may have affected outbreak reporting data.

During the 2019-20 influenza season, 71 influenza-associated outbreaks were reported. Of those outbreaks, 61 occurred in long-term care facilities and 10 in correctional facilities. Among the last six influenza seasons, the highest number of outbreaks occurred during the 2017-18 season with 183 outbreaks reported.



Pneumonia and Influenza Mortality

Pneumonia and influenza mortality data comes from the National Center for Health Statistics mortality surveillance. This information comes from death certificate data provided by the state and vital statistics offices (Figure 10).

The seasonal baseline was calculated using data applied from the previous 5 years. The epidemic threshold represents the point at which the observed proportion of deaths attributed to pneumonia or influenza was significantly higher than what is expected for that time of year in the absence of substantial influenza-related mortality.



During the 2019-20 season, the percentage of deaths due to pneumonia and influenza in Colorado first peaked during the week ending January 4, 2020 at 10.5%. Nationally, pneumonia and influenza mortality first peaked between the weeks ending January 11, 2020 and January 18, 2020 at 7.5%.¹⁶

The highest percentage of deaths due to pneumonia and influenza in Colorado occurred during the week ending April 11, 2020. This week had 17.2% of deaths related to pneumonia and influenza. Nationally, the highest percentage of deaths due to pneumonia and influenza mortality was also during the week ending April 11, 2020 (MMWR Week 15) at 15.8%.¹⁶ It is likely that this significant increase in mortality due to pneumonia and influenza was affected by COVID-19 as deaths from COVID-19 are frequently complicated by pneumonia.¹⁷ During this week in Colorado, there were 188 pneumonia deaths and 3 influenza deaths. Nationally, during this week, there were 11,903 pneumonia deaths and 471 influenza deaths.¹⁶





References

- 1. Brammer L, Fukuda K, Arden N, et al. Influenza Surveillance -- United States, 1992-93 and 1993-94. Centers for Disease Control and Prevention. https://www.cdc.gov/mmwr/preview/mmwrhtml/00046025.htm. Published January 31, 1997. Accessed July 31, 2020.
- 2. Surveillance data. Colorado COVID-19 Updates. https://covid19.colorado.gov/data/surveillance-data. Accessed August 5, 2020.
- 3. How CDC Classifies Flu Severity. Centers for Disease Control and Prevention. https://www.cdc.gov/flu/about/classifies-flu-severity.htm#:~:text=Flu severity is assessed using, that occurred during each season. Published September 14, 2018. Accessed August 3, 2020.
- 4. ILINet State Activity Indicator Map. Centers for Disease Control and Prevention. https://gis.cdc.gov/grasp/fluview/main.html. Accessed August 3, 2020.
- 5. Provisional Death Counts for Coronavirus Disease 2019 (COVID-19). Centers for Disease Control and Prevention. https://www.cdc.gov/nchs/nvss/vsrr/covid19/index.htm. Published August 4, 2020. Accessed August 4, 2020.
- 6. Weekly US Map: Influenza Summary Update. Centers for Disease Control and Prevention. https://www.cdc.gov/flu/weekly/usmap.htm. Published July 31, 2020. Accessed August 3, 2020.
- 7. Laboratory-Confirmed Influenza Hospitalizations. Centers for Disease Control and Prevention. https://gis.cdc.gov/grasp/fluview/FluHospChars.html. Published July 25, 2020. Accessed August 4, 2020.
- 8. Laboratory-Confirmed Influenza Hospitalizations. Centers for Disease Control and Prevention. https://gis.cdc.gov/GRASP/Fluview/FluHospRates.html. Published July 25, 2020. Accessed August 5, 2020.
- 9. Public health & executive orders. Colorado COVID-19 Updates. https://covid19.colorado.gov/prepare-protect-yourself/prevent-the-spread/public-he alth-executive-orders. Accessed August 5, 2020.
- 10. Purpose and Methods. Centers for Disease Control and Prevention. https://www.cdc.gov/coronavirus/2019-ncov/covid-data/covidview/purpose-methods .html. Accessed August 4, 2020.
- 11. U.S. Influenza Surveillance System: Purpose and Methods. Centers for Disease Control and Prevention. https://www.cdc.gov/flu/weekly/overview.htm. Published July 8, 2020. Accessed August 4, 2020.
- 12. INFLUENZA Isolates Data TableWeek 30, Season 2019-2020. Centers for Disease Control and Prevention. https://www.cdc.gov/flu/weekly/weeklyarchives2019-2020/data/whoAllregt_cl30.ht ml. Accessed August 5, 2020.
- 13. National, Regional, and State Level Outpatient Illness and Viral Surveillance. Centers for Disease Control and Prevention.

https://gis.cdc.gov/grasp/fluview/fluportaldashboard.html. Accessed August 6, 2020.



- 14. INFLUENZA Isolates Data TableWeek 30, Season 2019-2020. Centers for Disease Control and Prevention. https://www.cdc.gov/flu/weekly/weeklyarchives2019-2020/data/whoAllregt_phl30.ht ml. Accessed August 5, 2020.
- 15. Weekly U.S. Influenza Surveillance Report. Centers for Disease Control and Prevention. https://www.cdc.gov/flu/weekly/index.htm. Published July 31, 2020. Accessed August 4, 2020.
- 16. National Center for Health Statistics Mortality Surveillance System. Centers for Disease Control and Prevention. https://gis.cdc.gov/grasp/fluview/mortality.html. Accessed August 4, 2020.
- 17. Provisional Death Counts for Coronavirus Disease 2019 (COVID-19). Centers for Disease Control and Prevention. https://www.cdc.gov/nchs/nvss/vsrr/covid19/index.htm. Published August 4, 2020. Accessed August 4, 2020.

