COLORADO
Department of Public Health & Environment

Annual Influenza Surveillance Summary

Colorado, 2020-2021 Season

Overview

Surveillance for the 2020-2021 influenza season officially began September 27, 2020 and ended May 22, 2021. The season was markedly less severe than previous seasons. In Colorado, 34 influenza-associated hospitalizations were reported during the 2020-2021 season with a rate of 0.6 per 100,000 individuals across 64 counties. In comparison, the 2019-2020 season had 3,546 influenza-associated hospitalizations and a rate of 61.5 per 100,000 across 64 counties. Minimal flu activity was reported for other indicators such as outbreaks in long-term care facilities, emergency department and outpatient facility visits, and pediatric deaths. Strains of both influenza type A and type B were detected nationally and within the state of Colorado; however, due to decreased overall influenza circulation and therefore a lack of data, no dominant type was identified.

The 2020-2021 influenza season was significantly impacted by the COVID-19 pandemic. Circulation of influenza was at historically low levels statewide, nationally and globally.[1] Public health mitigation measures such as masking, social distancing, and stay-at-home orders were implemented to reduce the spread of SARS-CoV-2, the virus that causes COVID-19. This resulted in the reduced spread of other non-COVID-19 viral respiratory pathogens, including influenza[1].

Influenza vaccination may have also impacted viral circulation. Preliminary estimates from the CDC indicate that 50-55% of adults received a influenza vaccine during the 2020-2021 influenza season. Comparatively, 48% of adults received a influenza vaccine during the season of 2019-2020[2]. According to data from the Colorado Immunization Information System (CIIS), there was an 11.1% increase in influenza vaccine doses administered in the 2020-2021 season compared to the 2019-2020 season in Colorado.

Individuals ages 65 and older had the highest seasonal cumulative rate of hospitalizations at 2.27 per 100,000. In comparison, during the 2019-2020 influenza season, individuals aged 65 and older had a rate of hospitalization of 151.53 per 100,000. There were no reported pediatric influenza-associated hospitalization cases during the 2020-2021 season in children younger than 5 years old. There were no pediatric deaths reported in children less than 18 years of age during the 2020-2021 season. This has not occurred within the state of Colorado since the 2013-2014 season.

Components of Colorado's Influenza Surveillance

Surveillance activities during the 2020-2021 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
- Monthly Hospitalization Rate of Influenza compared with COVID-19

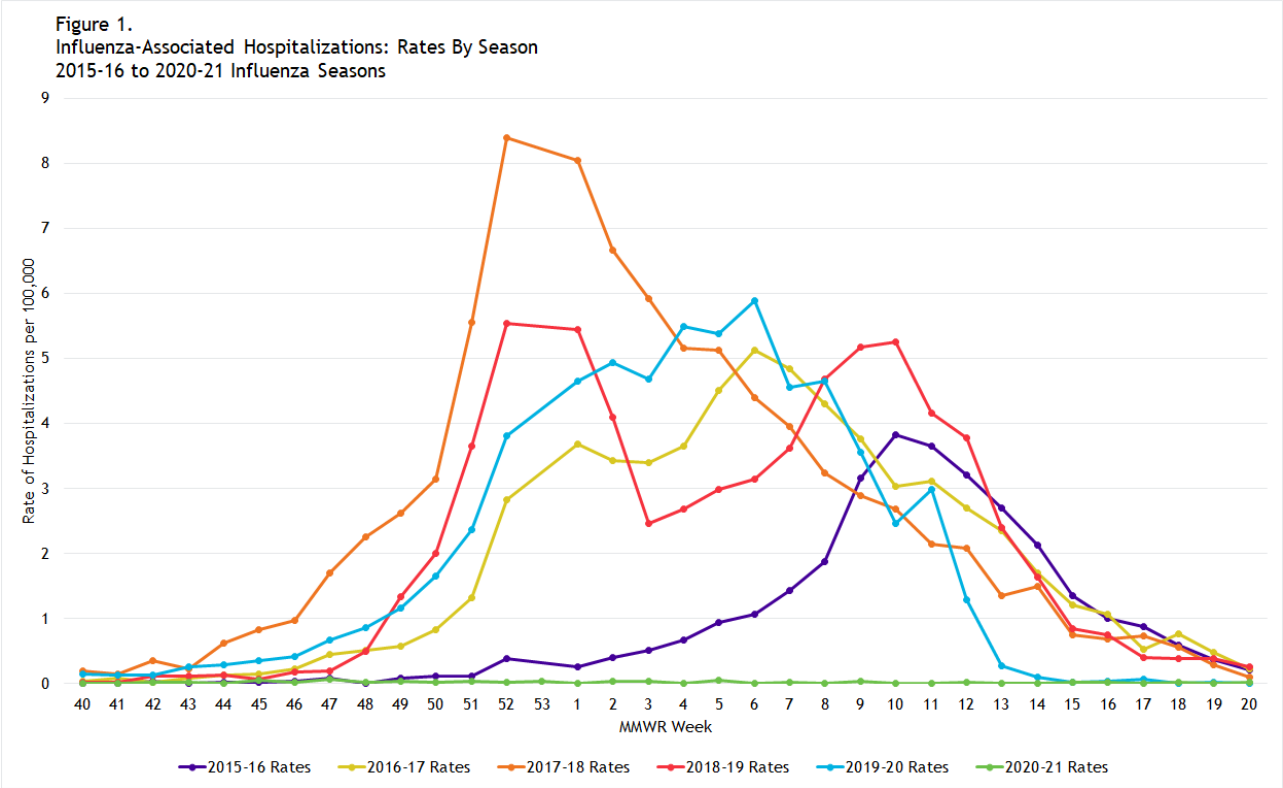
2020-2021 Colorado Influenza Season Severity

Beginning in 2017, the CDC implemented a new methodology of determining influenza season severity using the following key indicators: Influenza-like illness (ILI) visits to outpatient clinics; rates of influenza-associated hospitalizations; and mortality due to pneumonia or influenza during the season.3 The 2020-2021 influenza season severity has not yet been classified; however, it is expected to be low.

Influenza-like illness activity was considered minimal between the weeks ending October 3, 2020 until May 22, 2021.4 Nationally and in Colorado, pneumonia and influenza mortality remained above the epidemic threshold throughout most of the 2020-2021 season. This may have been due to increased pneumonia mortality from COVID-19.

Influenza-associated hospitalization rates in Colorado remained low throughout the season from September 27, 2020 to May 22, 2021.

Figure 1.
Influenza-Associated Hospitalizations: Rates By Season
2015-16 to 2020-21 Influenza Seasons

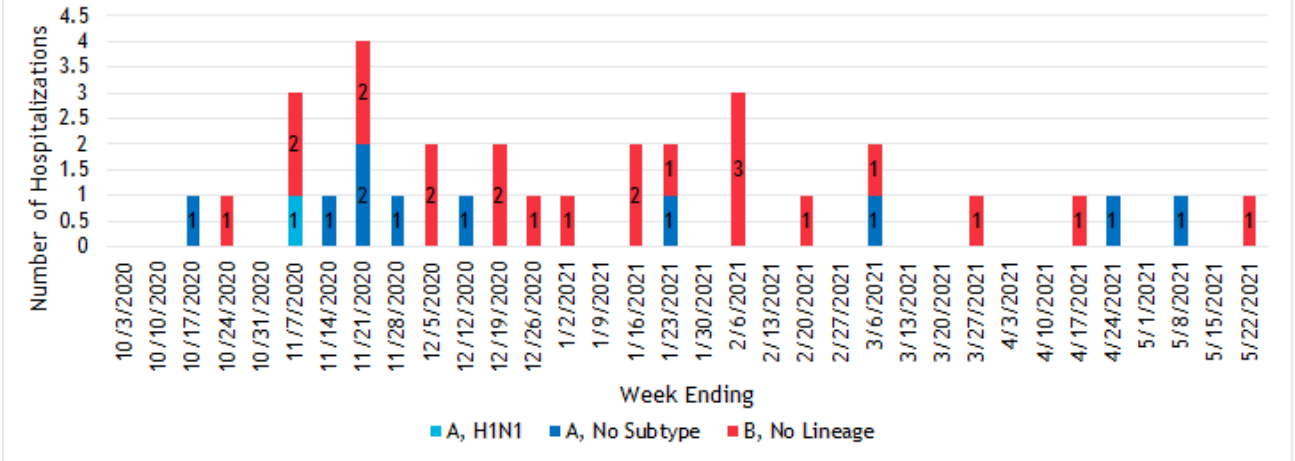


**The 2020-2021 influenza season had an MMWR Week 53, while the rest of the seasons in the graph above consisted of 52 MMWR weeks.*

Influenza-Associated Hospitalizations

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

Figure 2.
Influenza Virus Types Identified Among Hospitalized Cases: Case Numbers by Week of Diagnosis
Colorado, 2020-2021 Influenza Season



Overall, 34 influenza-associated hospitalizations were reported in Colorado from September 27, 2020, through May 22, 2021. In comparison, 3,546 influenza-associated hospitalizations from 64 counties were reported during the prior season between September 29, 2019, and May 23, 2020. Prior to the 2020-2021 season, the lowest number of hospitalizations recorded was during the 2006-2007 season, with 363 reported hospitalized cases. The 2020-2021 season had the lowest cumulative influenza-associated hospitalization rate among the past five influenza seasons in Colorado (Figure 3). In terms of geographical spread, influenza activity was considered sporadic throughout the 2020-2021 season. The seasonal cumulative hospitalization rate in Colorado during the 2020-2021 season was 0.58 hospitalizations per 100,000. Comparatively, the seasonal cumulative rate in the 2019-2020 season was 61.46 (Table 1). Overall, the national cumulative rate of hospitalization for influenza for the 2020-2021 season was 0.8 per 100,000, according to CDC's population-based surveillance network FluSurv-NET.[6]

In Colorado, no influenza-associated hospitalization peak or dominant influenza strain was determined during the 2020-2021 season, due to the low circulation of influenza (Figure 2). Among hospitalized cases, 21 cases (61.76%) were type B, 12 (35.29 %) cases were type A, and 1 (2.94%) case was positive for influenza, but not typed. Among influenza A cases, 8.33% (1) were subtyped as A H1N1. Among the remaining type A cases, 91.67% (11) were not typed. Among influenza B cases, no lineages were identified.

Figure 3.
Cumulative Rate of Influenza-Associated Hospitalizations: Rates by Season, Colorado 2016-17 to 2020-21

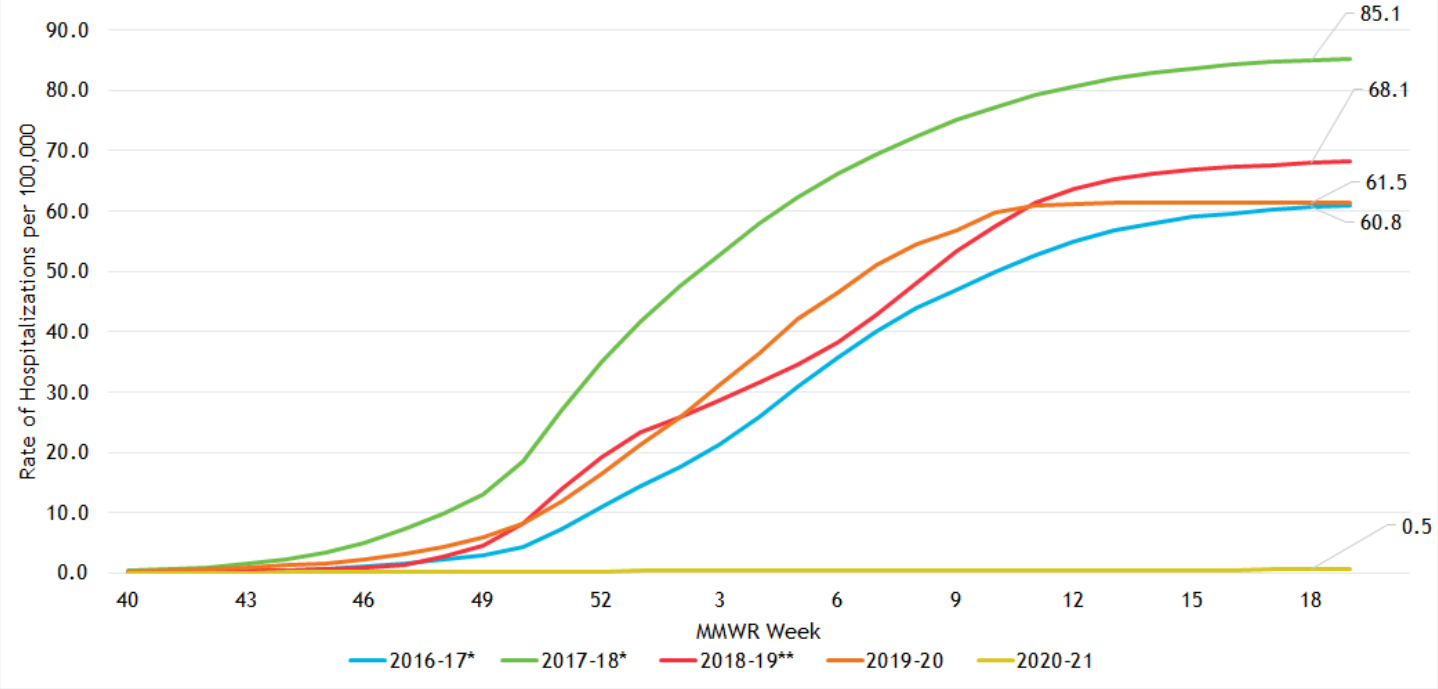


Table 1. Week of Peak Influenza-Associated Hospitalizations and Seasonal Cumulative Rate, Colorado

Flu Season	Date of Peak (week ending)	Seasonal Cumulative Rate (per 100,000 population)
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
2020-21	N/A	0.58

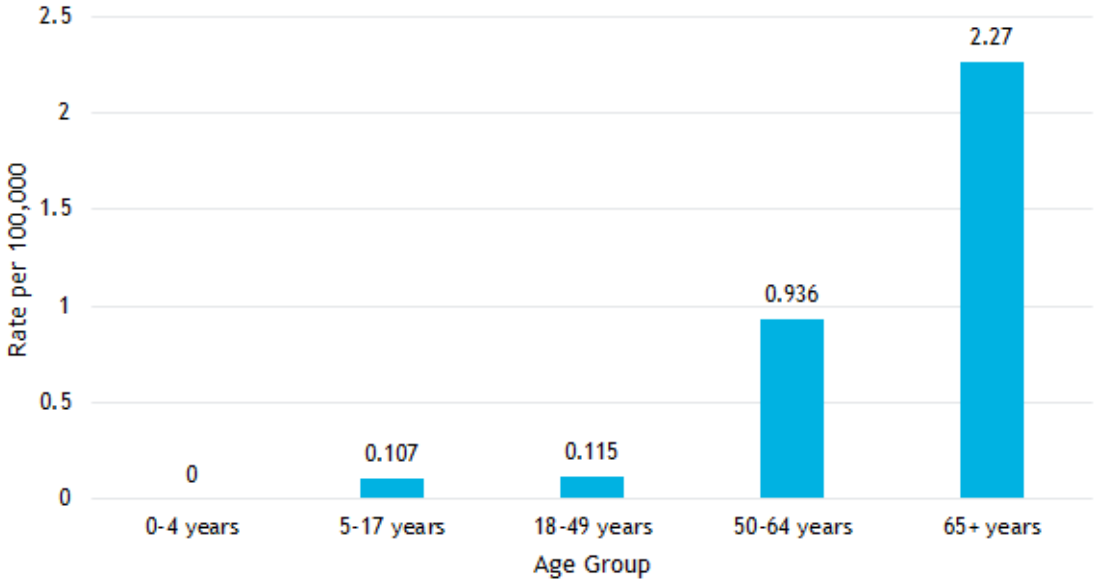
Influenza-Associated Hospitalizations by Age Group

During the 2020-21 season, adults over the age of 65 years in Colorado experienced the highest rate of hospitalizations of any age group (2.27 per 100,000), a common age-related trend in previous influenza surveillance seasons. However, in comparison, Coloradans 65 years of age and older had a rate of 151.53 per 100,000 during the 2019-20 season (Table 2 & Figure 4).

Table 2. Influenza-Associated Hospitalizations by Age Group, Colorado, 2020-2021 Season

Age Group	Number of hospitalizations	% of total hospitalizations	CO population	Rate per 100,000
0-4 years	0	0%	323,383	0
5-17 years	1	2.94%	930,433	0.107
18-49 years	3	8.82%	2,613,241	0.115
50-64 years	10	29.41%	1,068,489	0.936
65+ years	20	58.82%	877,662	2.27
All ages	34	100%	5,813,209	0.585

Figure 4.
Influenza-Associated Hospitalizations: Rates by Age Group
Colorado, 2020-2021 Influenza Season



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 Partners includes providers located in the Northwest region.

The Colorado Department of Public Health & Environment established a syndromic surveillance system during the 2018-19 influenza season. This system began tracking ILI activity in patients seen in emergency departments. ILI is defined by both chief patient complaints and ICD-10 codes recorded by a provider during a healthcare visit. This data is collected through Essence, an integrated electronic health information system which gathers information from hospital and standalone emergency departments in Adams, Arapahoe, Boulder, Denver, Douglas, and Jefferson counties. Just prior to the start of the 2020-21 season, hospitals and emergency departments in Larimer, El Paso, Boulder and La Plata counties were newly enrolled to the ILI syndromic surveillance network. CDPHE works in partnership with the Tri-County Health Department to obtain syndromic surveillance data.

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.

During the 2020-21 season, influenza-like-illness was defined as "fever (temperature of 100°F [37.8°C] or greater) and cough and/or a sore throat without a known cause other than influenza, or the presence of an ILI diagnosis code." In comparison, COVID-19-like-illness was defined as: "fever and cough or shortness of breath, or difficulty breathing, or the presence of a coronavirus diagnosis code."

The 2020-2021 influenza season did not have any notable peaks of ILI activity from outpatient and emergency department providers (Figures 5, 6). Comparatively, the 2019-2020 season had three peaks (the last week of December, 2019, mid-January 2020, and the first week of March, 2020). Notably, outpatient providers experienced a decline in cases of ILI in early March 2020, when cases of COVID-19 were first detected in Colorado.

The peak percentage of ILI-coded visits with outpatient providers was significantly lower during the 2020-2021 season (1.67%) when compared to the previous 2019-2020 season (8.3%). The peak percentage of ILI-coded visits at emergency departments was also significantly lower during the 2020-2021 season (1.31%) than during the 2019-2020 season (7.7%).

ILI activity during the 2020-21 season was likely impacted by pandemic-associated non-pharmaceutical interventions. Surveillance may have also been impacted by the COVID-19 pandemic by symptom overlap between influenza and COVID-19 illnesses, shifts in respiratory testing priorities and the burden of respiratory illness on healthcare systems.

Figure 5.
Influenza-Like Illness: Percentage of Clinical Visits at Kaiser Permanente and Primary Care Providers 2019-20 vs. 2020-21 Season

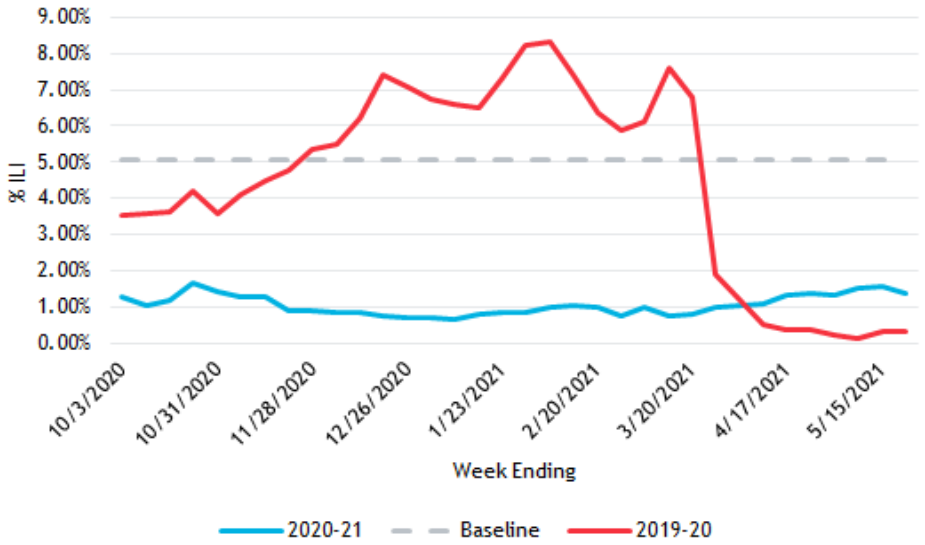
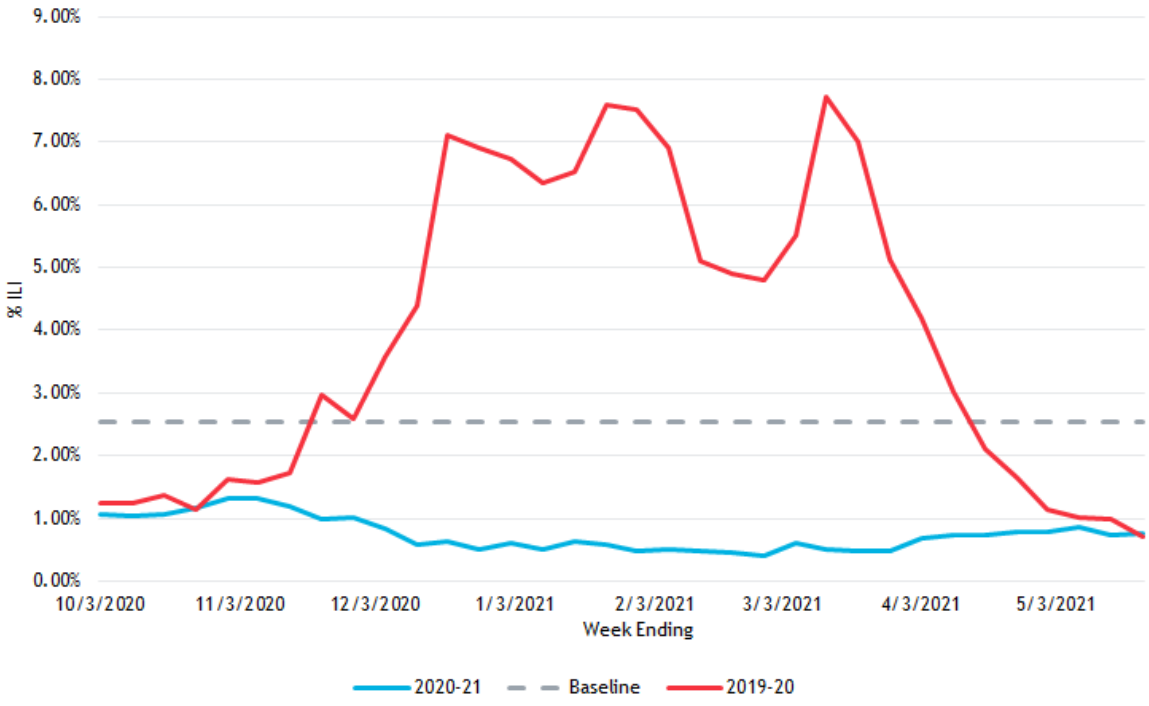


Figure 6:
Influenza-Like Illness: Percentage of Emergency Room Visits in the Denver- Metro Area by Week 2019-20 vs. 2020-21



Positivity Data from Sentinel Hospital Laboratories

During the 2020-2021 influenza season, up to 26 clinical hospital laboratories reported the total number of influenza tests performed weekly and the number that were positive for influenza. Throughout the season, specimen positivity remained low. There was no notable peak in positivity overall due to the low number of overall positive tests (Figures 7 and 8). No dominant influenza type was noted in sentinel positivity surveillance during the season. In contrast, the 2019-2020 season had two peaks in test positivity, with the second peak reaching 25.70% positivity. In contrast, the highest percentage positivity during the 2020-2021 season was 0.17% during the week ending February 13, 2021 (Figure 7).

Figure 7.
Positive Influenza Tests Reported From Sentinel Laboratories by Week
Colorado, 2020-2021 Influenza Season

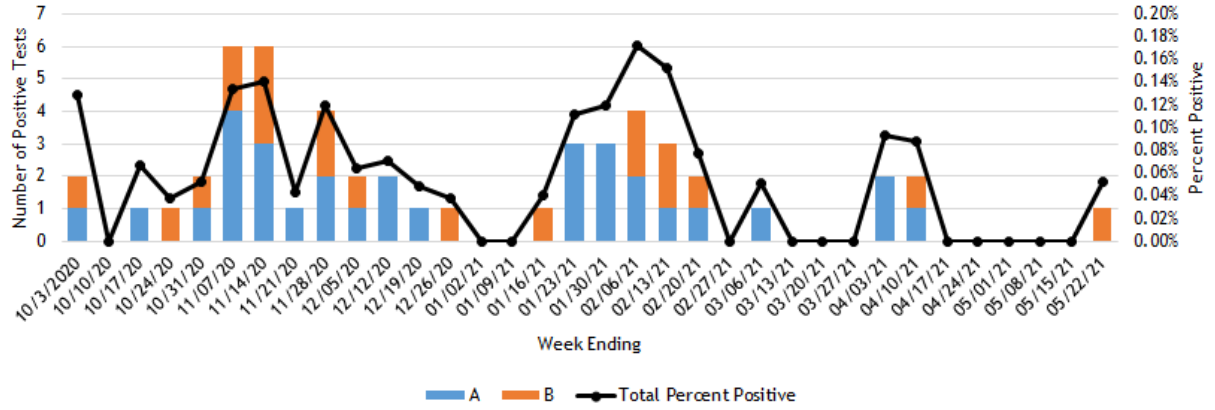
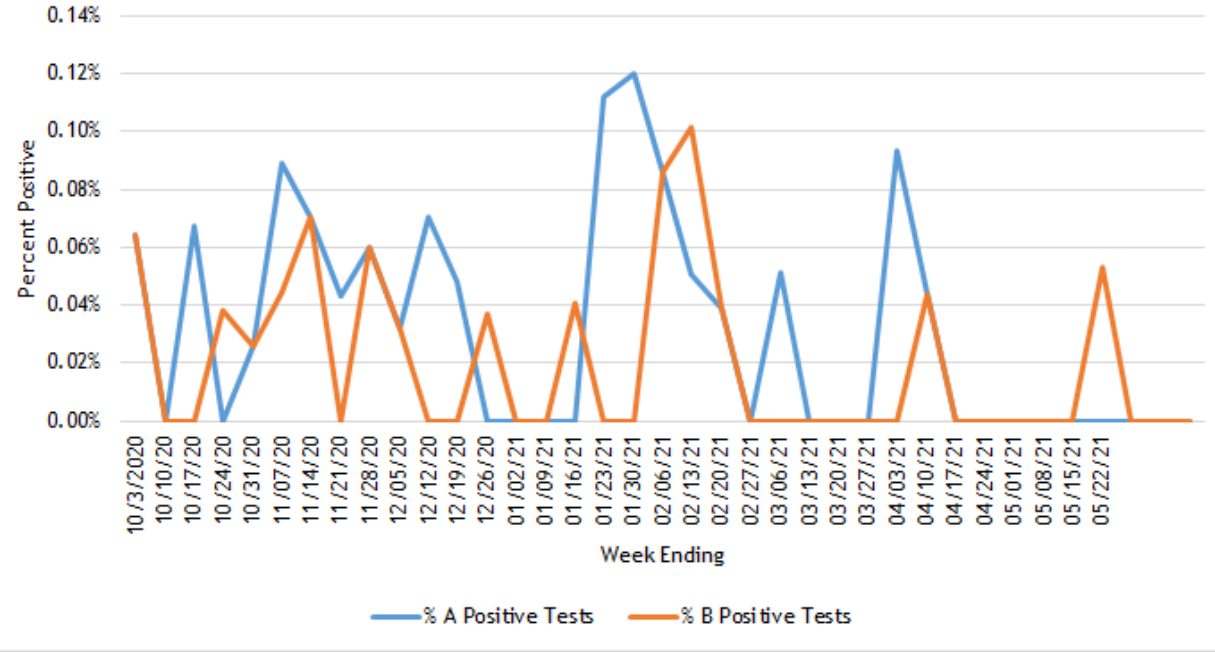


Figure 8.
Positive Influenza Tests by Type Reported From Sentinel Laboratories by Week
Colorado, 2020-2021 Influenza Season



Nationally, percent positivity peaked at 0.38% during the week ending October 10, 2020 (MMWR Week 41), according to data reported to CDC by U.S. Clinical Laboratories.[7] Influenza type A peaked during the week ending October 17, 2020

(MMWR Week 42) with 0.17% positivity, while influenza type B peaked during the week ending December 19, 2020 (MMWR Week 51) with a positivity of 0.19%.[7]

Virologic Surveillance

CDPHE State Laboratory & Sentinel Surveillance Laboratories

During the influenza surveillance season, the CDPHE State Laboratory collects a designated number of positive influenza specimens on a weekly basis for confirmatory PCR testing and subtyping. Ten sentinel clinical laboratories across all regions of the state confirmed their participation in the program. As in past seasons, the right-sizing strategy for the 2020-2021 season dictated that each participating clinical lab submit 5-10 influenza-positive specimens per week. This quantity of specimens was not realized due to extremely low circulation of influenza.

During the 2020-2021 influenza season, the CDPHE State Laboratory received 14 respiratory specimens in total for influenza testing and subtyping. In comparison, 718 total specimens were received from sentinel laboratories during the 2019-20 season. At their respective submitting clinical laboratories, four of the 14 specimens tested positive for influenza, two of which also tested positive for SARS-CoV-2. However, none of the specimens were confirmed as positive for influenza at the State Laboratory and three tested positive for SARS-CoV-2.

Virologic Analysis at the Centers for Disease Control (CDC)

During a typical influenza season, a certain percentage of positive influenza specimens received at the CDPHE laboratory would be forwarded to the CDC for further genetic and antigenic characterization. However, due to the lack of positive specimens received and detected during the 2020-2021 influenza season, no specimens were submitted to the CDC.

Table 3. Influenza Test Typing and Subtyping, CO Hospitalized Cases and National Cumulative Data, 2020-21 Influenza Season (MMWR Week 20 - 40)

	CO Cumulative Data (Hospitalized cases)		National Cumulative Data*	
Total positive specimens	34		2,053	
Influenza A	12	35.29%	777	37.85%
Influenza B	21	61.76%	1,276	62.15%

**Includes influenza positive tests reported to CDC by U.S. Clinical Laboratories 7*

Table 4. Influenza Test Typing and Subtyping, CO Hospitalized Cases and National Cumulative Data, 2020-21 Influenza Season (MMWR Week 20 - 40)

	CO Cumulative Data (Hospitalized cases)		National Cumulative Data*	
Total positive specimens	**34**		**264**	
Influenza A	**12**	**35.29%**	**161**	**60.98%**
— H1N1	1	2.94%	21	7.95%
— H3N2	0	0%	1	0.37%
— H3	N/A	N/A	21	7.95%
— Subtyping not performed	11	32.35%	118	44.70%
— Unable to subtype	N/A	N/A	0	0%

Influenza B	**21**	**61.76%**	**103**	**39.01%**
— Victoria lineage	0	0%	17	6.44%
— Yamagata lineage	0	0%	8	3.0%
— Lineage testing not performed	21	61.76%	78	29.55%
— A/B not distinguished	**1**	**2.94%**	**N/A**	**N/A**

**Includes influenza positive tests reported to CDC by U.S. Public Health Laboratories* [8]

Influenza-Associated Pediatric Deaths

Since the 2004-2005 influenza season, influenza-associated pediatric deaths have been a reportable condition in Colorado. The highest number of pediatric influenza-associated deaths in Colorado occurred during the 2009-2010 season (12 deaths). During the 2020-2021 season, there were no pediatric influenza-associated deaths reported in Colorado. This has not occurred since the 2013-2014 flu season (Table 4). Nationally, one influenza-associated pediatric death was reported during the 2020-2021 season.[5] In comparison, there were 199 influenza-associated pediatric deaths reported nationally during the 2019-2020 season.[5]

Table 4. Influenza-Associated Pediatric Deaths in Colorado: 2008-09 - 2020-21 Influenza Seasons

Influenza 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
2020-21	0

**Includes deaths reported in 2008-09 that occurred outside the defined surveillance season dates*

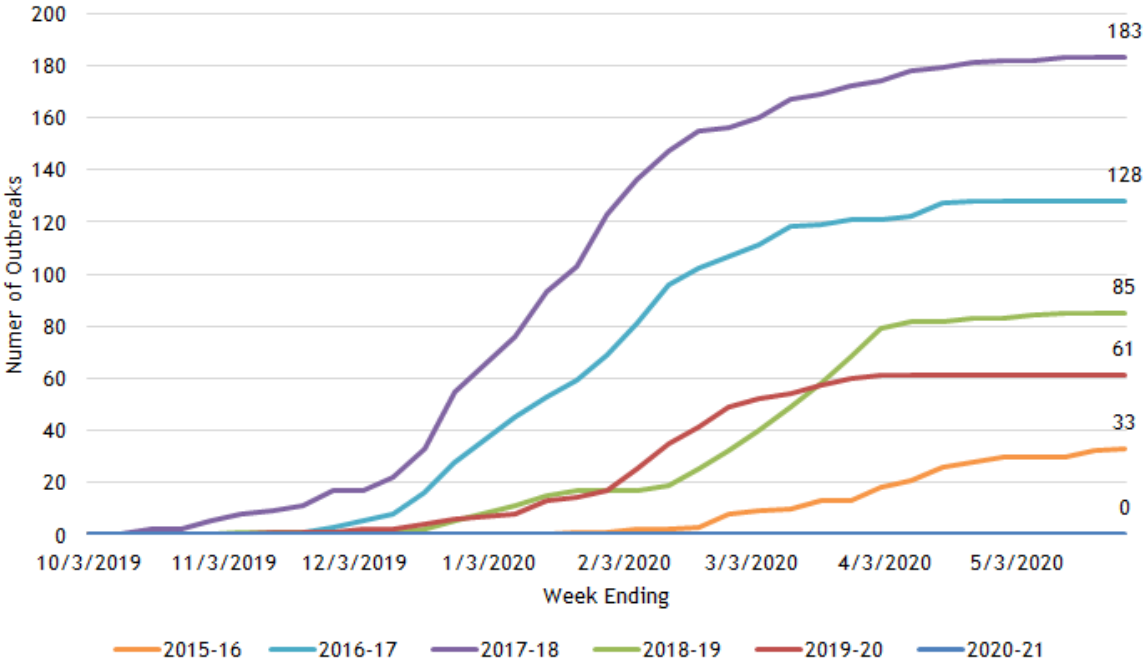
***2009 H1N1 Pandemic*

Influenza Outbreaks in Long-Term Care Facilities and Correctional Facilities

In the state of Colorado, all communicable disease outbreaks are considered reportable. CDPHE specifically tracks, monitors and provides guidance for influenza outbreaks in long-term care facilities and correctional facilities. A confirmed influenza outbreak is defined as: Two or more residents/inmates with positive influenza tests. In previous seasons, an outbreak was defined as only one positive influenza test among two or more other residents/inmates with influenza-like illness (ILI). This definition was changed as a result of the COVID-19 pandemic to improve specificity in the midst of high rates of COVID-19-like illness.

During the 2020-21 influenza season there were no influenza-associated outbreaks reported in long-term care or correctional facilities. The occurrence and reporting of influenza outbreaks may have been affected by the COVID-19 pandemic in regards to reduced influenza testing, reduced capacity for follow-up and reporting, COVID-19 infection prevention and mitigation measures, and the overall reduced circulation of influenza. In comparison, during the 2019-2020 season there were 61 influenza-associated outbreaks reported in long-term care facilities and correctional facilities. The 2017-2018 season had the most influenza-associated outbreaks of any season since 2015 (183 outbreaks, Figure 9).

Figure 9.
Cumulative Number of Influenza-Associated Outbreaks in Long-Term Care Facilities Counts by Season
2015-16 to 2020-21 Seasons



Pneumonia and Influenza Mortality

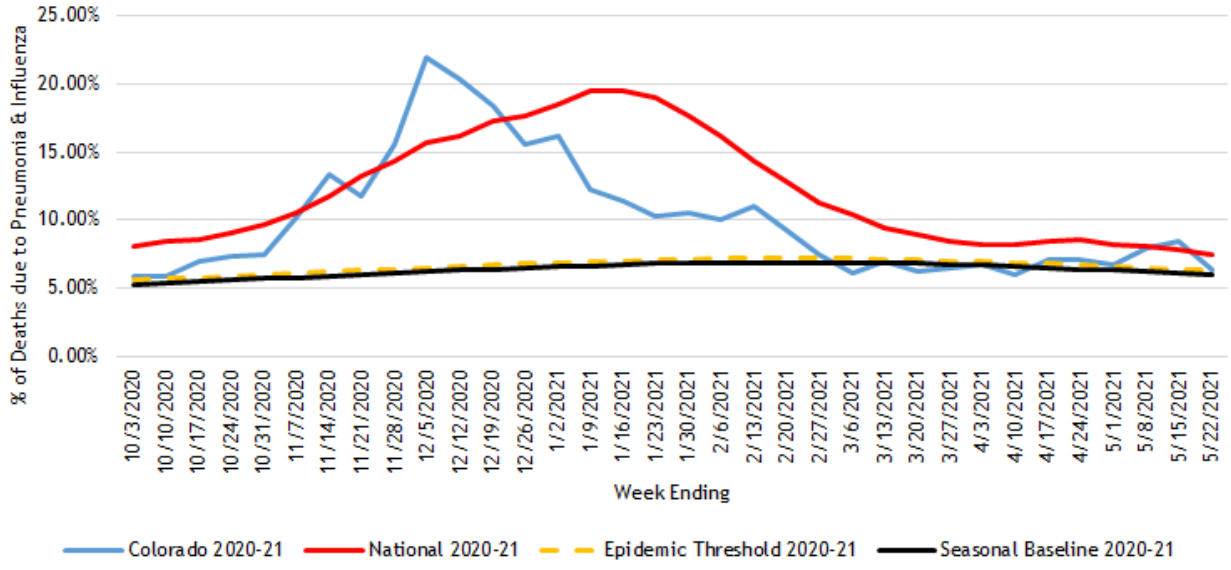
Pneumonia and influenza (P&I) mortality data come from the National Center for Health Statistics (NCHS) Mortality Surveillance System. NCHS collects death certificate data provided by the state and vital statistics offices for all deaths occurring in the United States. Pneumonia and/or influenza deaths are identified using ICD-10 multiple cause of death codes.

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

In the 2020-2021 season, the highest percentage of P&I deaths in Colorado occurred during the week ending on December 5, 2020, at 21.9% (MMWR Week 49; Figure 10). Nationally, the highest percentage of P&I deaths occurred on the week ending on January 16, 2021, at 19.5% (MMWR Week 2).[9]

It is important to note that the 2020-2021 influenza season was concurrent with the ongoing COVID-19 pandemic. Pneumonia is considered an intermediate cause of death which can be due to a number of etiologic pathogens including SARS-CoV-2, the virus that causes COVID-19.[10] Therefore, the rate of pneumonia and influenza mortality could have been affected by the highly prevalent SARS-CoV-2 virus during the 2020-2021 season.

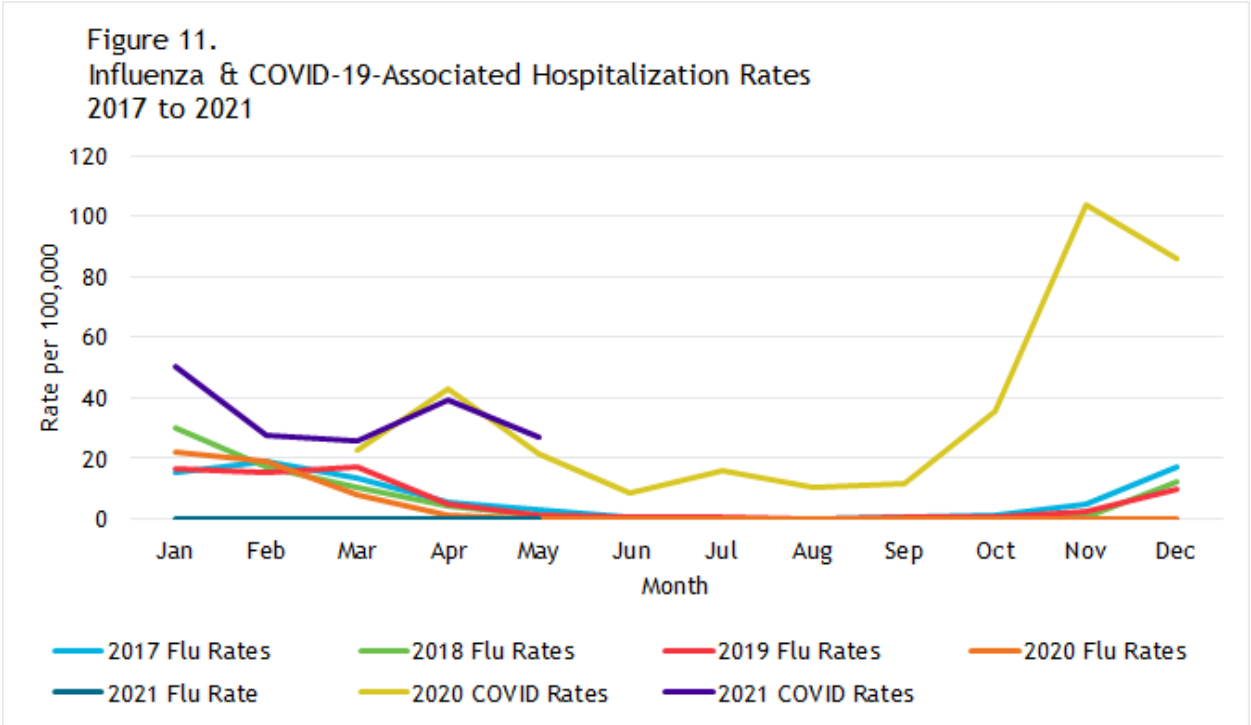
Figure 10.
Pneumonia & Influenza Mortality from the National Center for Health Statistics
Colorado vs. National, 2020-21 Influenza Season



Special Note on the Pandemic

SARS-CoV-2 was first detected in Colorado in March 2020. Since then, COVID-19 cases and associated hospitalizations have been actively tracked throughout the state. As stated previously, the 2020-2021 influenza season was likely impacted greatly by the COVID-19 pandemic. Mask mandates, social-distancing, closures, and other precautionary measures are some of the possible contributors to the historically low influenza rates. In Colorado the COVID-19 monthly hospitalization rate peaked in November 2020 at 113.7 cases per 100,000 (Figure 11). In comparison, the highest monthly rate of influenza-associated hospitalizations in the past 5 years occurred in January 2018, reaching a peak of 30.2 per 100,000 (Figure 11).

Figure 11.
Influenza & COVID-19-Associated Hospitalization Rates
2017 to 2021



References

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2 2020-2021 Flu Season Summary. https://www.cdc.gov/flu/season/faq-flu-season-2020-2021.htm Published July 22nd, 2021. Accessed October, 19, 2021.

3 How CDC Classifies Flu Severity. Centers for Disease Control and Prevention. https://www.cdc.gov/flu/about/classifies-flu-severity.htm Published September 14, 2018. Accessed August 11, 2021.

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6 FluSurvNET: Influenza Hospitalization Surveillance Network, Centers for Disease Control & Prevention. https://gis.cdc.gov/GRASP/Fluview/FluHospRates.html. Accessed October 20, 2021.

7 INFLUENZA Isolates Data TableWeek 25, Season 2020-2021. Centers for Disease Control and Prevention. https://www.cdc.gov/flu/weekly/weeklyarchives2020-2021/data/whoAllregt_cl25.html Accessed August 11, 2021.

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9 National Center for Health Statistics Mortality Surveillance System. Centers for Disease Control and Prevention. https://gis.cdc.gov/grasp/fluview/mortality.html. Accessed August 9, 2021.

10 National Center for Health Statistics. Guidance for certifying deaths due to COVID–19. https://www.cdc.gov/nchs/data/nvss/vsrg/vsrg03-508.pdf Viewed on 08/09/2021. Published April 2020. Accessed August 11, 2020.