COVID-19 Update

Hospitalizations, Deaths, and Vaccine Breakthrough Infections

Through July 2021

The Section of Epidemiology, Alaska Division of Public Health

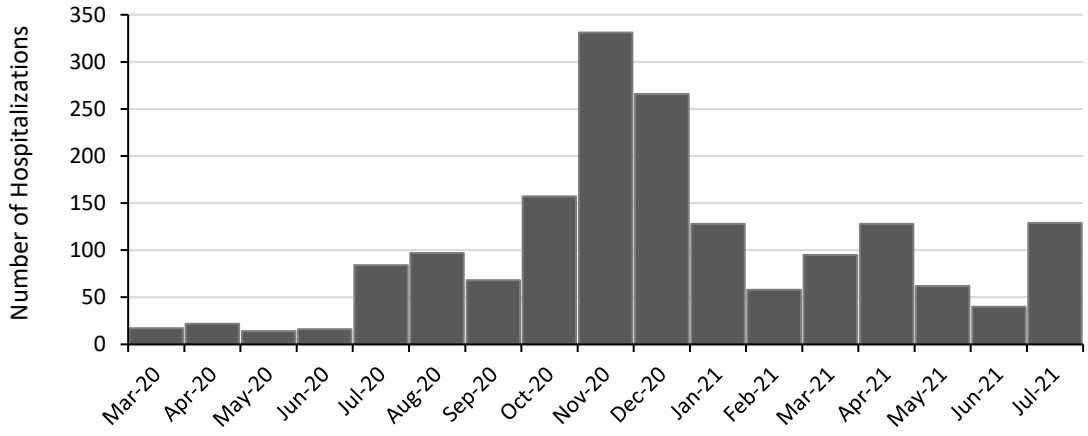
Introduction

This document is intended to provide routine updates on COVID-19 hospitalizations, deaths, and vaccine breakthrough infections in Alaska. Hospitalization and death data are those displayed on the Alaska Cases Dashboard. Vaccine breakthrough infections and multisystem inflammatory syndrome in children statistics are produced with additional data collected by the Section of Epidemiology (SOE). This report is not designed to track the burden of COVID-19 on hospitals; other data sources, such as HHS Protect or facility-level statistics may be more appropriate for those questions. It is likely that some hospitalizations are missing from these data, particularly more recent events. Data included are not final; efforts to increase completion and ensure data quality are ongoing and these numbers will change. Additionally, more detailed summaries and reports will be produced in the future. Data are for cases from March 2020 through July 2021.

Hospitalizations

As a matter of process, SOE removes hospitalizations that are not due to COVID-19; for example, asymptomatic behavioral health patients or laboring mothers tested on admission are excluded. A total of 1712 hospitalizations with a known admission date among Alaska residents were included in this analysis (Figure 1). For people with multiple admissions, the most severe/longer admission was counted. Regions were assigned by each patient's home region, not hospital location.

Figure 1. COVID-19 hospital admissions among Alaska residents by month of admission — March 2020 through July 2021



Demographics

During March 2020 through July 2021, the mean age of hospitalized persons was 61 years (range: 1 month to 98 years). For patients admitted in 2020, the mean age was 62 years (range: 1 month to 98 years). For patients admitted in 2021, the mean age was 59 years (range: 1 month to 98 years). Hospitalizations by sex and race are shown in Table 1.

Table 1. Sex and race among COVID-19 hospitalized patients among Alaska residents — March 2020 through July 2021

Characteristic	Count (%)	Statewide population N (%)	Rate*
Sex			
Female	776 (45)	375,017 (51)	206.9
Male	936 (55)	353,886 (49)	264.5
Race			
American Indians and Alaska Natives	421 (25)	113,010 (16)	372.5
Asian	135 (8)	48,382 (7)	279.0
Black	58 (3)	26,408 (4)	219.6
Native Hawaiians and Other Pacific Islanders	150 (9)	11,706 (2)	1281.4
White	612 (36)	472,386 (65)	129.6
Other	77 (4)		
Multiple	73 (4)	57,011 (8)	128.0
Unknown	186 (11)		

**Rate is per 100,000 people in that race/ethnicity group.*

Severity Indicators

This summary includes **1388** hospitalizations among Alaska residents. Only hospitalization records for which both admission and discharge date had been entered are included. This restriction allows severity indicators and length of stay to be more adequately described but results in an undercount of total hospitalizations, especially those that occurred more recently. Tables 2 and 3 show severity indicators by all hospitalizations and hospitalizations with a fatality.

Table 2. COVID-19 hospitalizations among Alaska residents with severity indicators – March 2020 through July 2021

	No N (%)	Yes N (%)	Unknown N (%)
ICU	772 (56)	399 (29)	217 (16)
Ventilator	949 (68)	193 (14)	246 (18)

Table 3. COVID-19 hospitalizations with fatality (n=294), among Alaska residents with severity indicators – March 2020 through July 2021

	No N (%)	Yes N (%)	Unknown N (%)
ICU	88 (30)	158 (55)	43 (15)
Ventilator	132 (45)	125 (43)	37 (13)

Length of Stay

Table 4 describes the amount of time patients were admitted to the hospital. This analysis is restricted to 1388 patients for whom both an admission and discharge date have been entered. Patients who were admitted and discharged on the same day were counted as one day of hospitalization. Similarly, patients who were intubated and extubated on the same day were counted as one day of ventilation. Data for 2021 are likely missing patients who have been admitted for a long time, as they do not yet have a discharge date.

Table 4. Duration of COVID-19 hospital stay – March 2020 through July 2021

	2020			2021 to date		
	N	**Mean**	**Range**	**N**	**Mean**	**Range**
All hospitalizations	1072	9.5 days	1–124 days	640	7.4	1–50 days
Non-ICU patients	584	7 days	1–124 days	295	5.5 days	1–44 days
ICU patient (total duration of hospital stay)	295	14.6 days	1–75 days	104	11.3 days	1–50 days
ICU patient (duration of ICU stay)	244*	9.4 days	1–75 days	87	7.5 days	1–50 days
Ventilator days	100	9.9 days	1–44 days	23	11.4 days	1–41 days

**Duration of ICU stay was not available at the time of this report for 51 patients who were known to have been in the ICU at some point during their hospital stay.*

Multisystem inflammatory syndrome in children

Twelve children hospitalized with multisystem inflammatory syndrome in children (MIS-C) have been reported to the Alaska Section of Epidemiology since the beginning of the pandemic. MIS-C is defined by fever, laboratory evidence of inflammation, and evidence of clinically severe illness requiring hospitalization with multisystem organ involvement. The definition requires that the patient is <21 years of age with current or recent SARS-CoV-2 infection or exposure to a suspected or confirmed COVID-19 case within the 4 weeks prior to the onset of symptoms and no alternative plausible diagnoses.

Four of the 12 children met the MIS-C case definition because of a positive antibody test, so they are not included in the above desciption of SARS-CoV-2 positive hospitalized patients; the other eight were included in analysis of that patient population provided above. Six of the 12 children were female. Seven were aged 0–4 years at the time of admission, three were aged 5–10 years, and two were aged 11–20 years. Three children had a pre-existing condition. All children were admitted to the hospital, and seven were admitted to an intensive care unit. None of the children have died.

Deaths

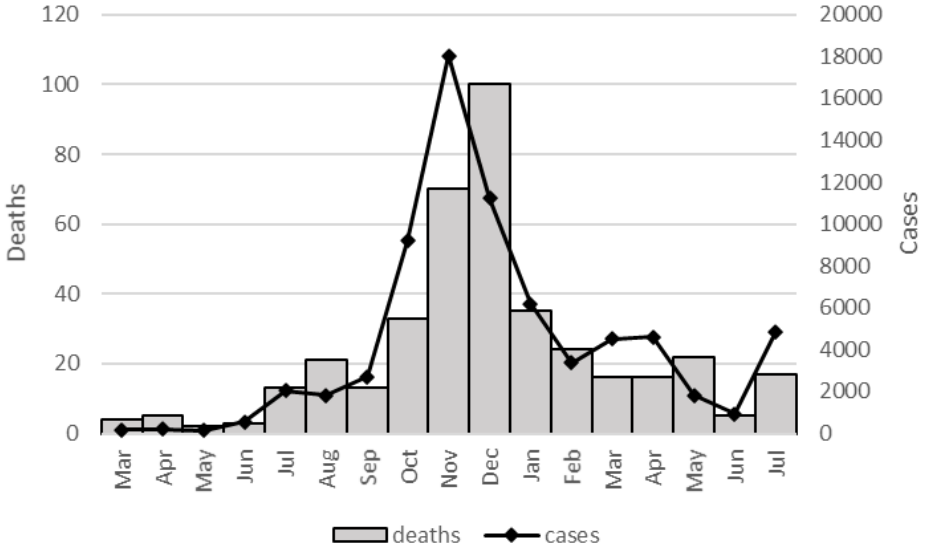
Methods

Deaths are counted as COVID-19-related in accordance with national standards. This process includes auditing death certificates to verify that COVID-19 was included as a primary or contributory cause of death, medical records review, or provider determination that the cause of death was COVID-19 based on laboratory testing and a consistent clinical presentation (e.g., respiratory signs and symptoms, fever or chills, and fatigue). Underlying conditions were determined by contact tracers and data analysts during interviews and records reviews. Rates were calculated using Alaska Department of Labor and Workforce Development population estimates and are listed per 100,000 person-years. Cases are attributed geographically to their permanent residence, which may or may not correlate to location of exposure, illness, or death. All data are preliminary, subject to change, and were congruent with public state data displays as of August 25, 2021.

Results

From January 1, 2020 through July 31, 2021, Alaska recorded 399 COVID-19-related deaths for a statewide death rate of 34.7 per 100,000 person-years (Figure 2). For this same period, the US death rate was 185 per 100,000 person-years. Of these 392 deaths, 316 (79.2%) were known to have been hospitalized and 169 (42.3%) had been admitted to an intensive care unit.

Figure 2. COVID-19 deaths and cases by month among Alaska residents – January 2020 through July 31, 2021



Note: Data are shown beginning in March, which was the first month in which there was a death in an Alaskan resident that was attributed to COVID-19.

Demographic characteristics

Table 5. Sex of Alaska residents with a COVID-19 -related Death — January 1, 2020 through July 31, 2021

Sex	Deaths N (%)	Statewide population N (%)	Deaths per 100,000 person-years
Male	242 (60.7)	375,017 (51.4)	40.9
Female	157 (39.3)	353,886 (48.6)	28.1
AK total	399	728,903	34.7

Table 6. Age of Alaska residents with a COVID-19-related Death— January 1, 2020 through July 31, 2021

Age in Years	Deaths N (%)	Statewide population N (%)	Deaths per 100,000 person-years
19 and under	0 (0)	199,809 (27.4)	0.0
20–29	6 (1.5)	98,606 (13.5)	3.9
30–39	9 (2.3)	111,831 (15.3)	5.1
40–49	18 (4.5)	85,855 (11.8)	13.3
50–59	32 (8.0)	90,703 (12.4)	22.4
60–69	74 (18.5)	85,259 (11.7)	55.0
70–79	128 (32.1)	41,509 (5.7)	195.4
80+	132 (33.1)	15,331 (2.1)	545.6
AK total	399	728,903	34.7

Table 7. Race of Alaska residents with a COVID-19-related Death — January 2020 through July 31, 2021

Race/Ethnicity	Deaths n (%)	Statewide population n (%)	Deaths per 100,000 person-years
AIAN	129 (32.3)	113,010 (15.5)	72.3
Asian	41 (10.3)	48,382 (6.6)	53.4
Black	10 (2.5)	26,408 (3.6)	24.0
NHOPI	23 (5.8)	11,706 (1.6)	124.5
White	183 (45.9)	472,386 (64.8)	24.5
Multiple races	8 (2.0)	57,011 (7.8)	8.9
Race other/unknown	5 (1.3)	n/a	n/a
Hispanic (of any race)	19 (4.8)	53,202 (7.3)	22.6
Ethnicity unknown	16 (4.0)	n/a	n/a
AK total	399	728,903	34.7

Vaccine Breakthrough Infections

Key Messages

- COVID-19 vaccines continue to provide strong protection, especially against hospitalizations.
- Most COVID-19 hospitalizations in Alaska could have been prevented by vaccination.
- COVID-19 cases have become more common among fully vaccinated persons than they were in the initial months after vaccine roll-out.
- CDC recommends that fully vaccinated persons wear masks in public indoor settings in areas with substantial to high community transmission.

Introduction

COVID-19 vaccines were first administered in Alaska in mid-December 2020. In March 2021, all persons who lived or worked in Alaska and were ≥16 years old became eligible for vaccination. After the Pfizer/BioNTech vaccine was authorized for persons aged ≥12 years, eligibility was expanded accordingly in May 2021 to anyone aged ≥12 years. Randomized clinical trials showed conclusively that COVID-19 vaccines provide strong protection against symptomatic COVID-19. Subsequent observational studies have confirmed this finding in numerous real-world settings and have further demonstrated that COVID-19 vaccines reduce the risk of infection with SARS-CoV-2 and prevent COVID-19 hospitalizations and deaths.[1]

Methods

A vaccine recipient is considered fully vaccinated 14 days after receiving the second dose in a two-dose series (e.g., Pfizer/BioNTech or Moderna) or a single dose in a one-dose series (e.g., Johnson & Johnson / Janssen). Cases of COVID-19 that occur in fully vaccinated persons are classified as “vaccine breakthrough” (VB) cases.

All case and hospitalizations data were obtained from the Section of Epidemiology’s case-based surveillance system. COVID-19 vaccination status of each reported case was determined by queries of VacTrAK, Alaska’s immunization information system, and supplemented by reports from case investigators. Hospitalizations were reported by case investigators and hospitals. Medical records were reviewed to determine if COVID-19 was a cause of the hospitalization or if COVID-19 was an incidental finding (e.g., a patient was admitted for labor and delivery or a traumatic injury). Only the former hospitalizations are included in this analysis. This analysis is limited to data on Alaska residents; vaccination

status of non-residents diagnosed in Alaska cannot be consistently ascertained. All data and analyses are preliminary and subject to change.

Both cases and hospitalizations were attributed to date of specimen collection in all analyses. This date was used because it corresponds most closely to the definition of vaccine breakthrough. For example, if a person tested positive 12 days after completing the vaccination series, that would not be counted as a vaccine breakthrough case and, consequently, neither would a subsequent hospitalization due to COVID-19, even if the hospitalization itself occurred 14 or more days after series completion. When specimen collection date was unknown, confirmation date (the date the case was counted) was used instead.

To calculate COVID-19 case and hospitalization incidence rates for fully vaccinated and for not fully vaccinated persons, VacTrAK data and 2020 Alaska Department of Labor and Workforce Development population estimates were used to infer the number of fully vaccinated (both overall and by specific vaccine manufacturer) and not fully vaccinated residents by age group for each day from January 16, 2021, through July 31, 2021. Age-adjustment was performed via direct standardization to the Alaska resident population age 12 years and older using the following age categories: 12-19, 20-24, 25-29, … 85-89, and ≥90 years.[2] Ninety-five percent confidence intervals were calculated using gamma distributions.[3]

Results

Vaccine breakthrough cases over time

Through the end of July 2021, a total of 1890 vaccine breakthrough COVID-19 cases were documented among Alaska residents (Table 8).

Table 8. Reported COVID-19 vaccine breakthrough cases by month of specimen collection among Alaska residents ≥12 years-old — January 16, 2021 through July 31, 2021

	Total cases	VB cases (% of total monthly cases)	Proportion of AK residents aged ≥12 years-old who were fully vaccinated*
January	2001	2 (0.1)	1.2%[±]
February	2943	45 (1.5)	6.1%
March	3956	114 (2.9)	18.9%
April	3950	203 (5.1)	31.8%
May	1525	131 (8.6)	43.1%
June	787	173 (22.0)	47.4%
July	4134	1222 (29.6)	50.8%

**Mean daily estimated percentage of Alaska residents aged ≥12 years who were fully vaccinated by the end of each month.*

[±]January data are from the period January 16, 2021 through January 31, 2021. January 16, 2021 was the first date that any Alaska residents were fully vaccinated.

The incidence of COVID-19 among vaccinated persons has been consistently lower than among persons who were not fully vaccinated (Figure 2).

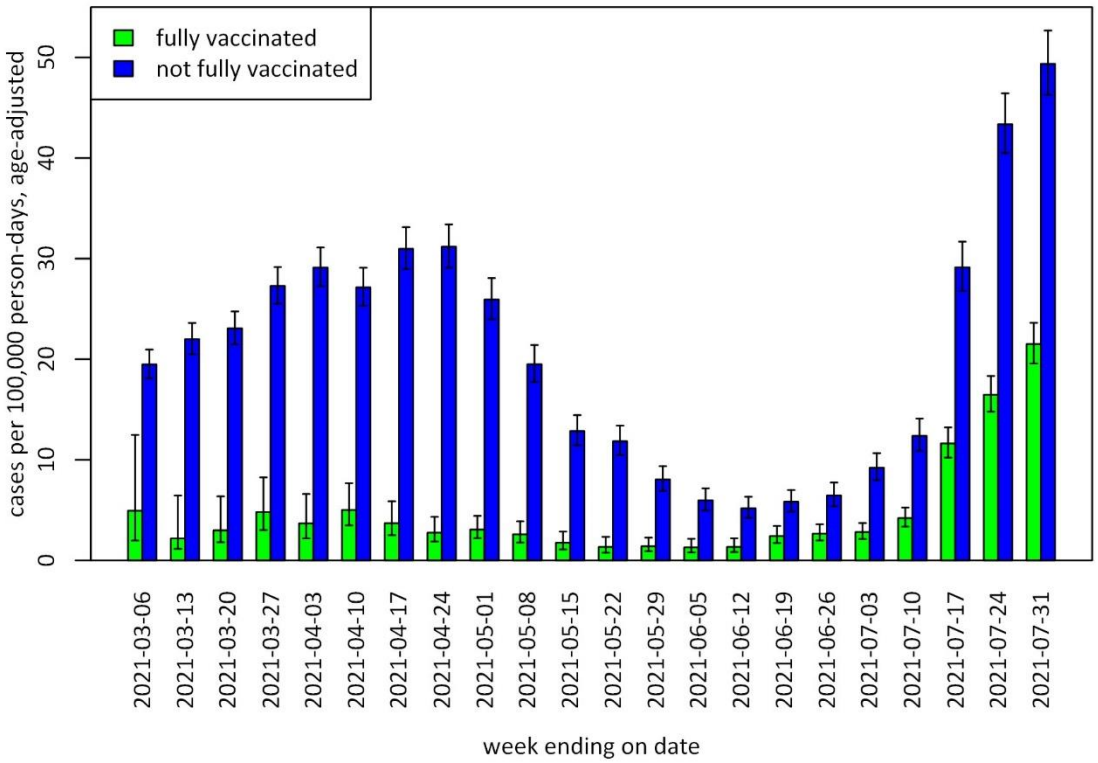


Figure 3. Weekly age-adjusted per capita incidence of COVID-19 among Alaska residence ≥12 years-old by vaccination status (fully vaccinated versus not fully vaccinated). Data are shown beginning the week of February 28, 2021, which was the first week in which at least 20 vaccine breakthrough cases were documented. Incidence rate estimates from weeks with very few or no VB cases are imprecise.

Vaccine breakthrough cases by age

Vaccine breakthrough cases occurred during July 2021 among Alaskans of all ages (Table 9).

Table 9. Reported COVID-19 vaccine breakthrough cases by age group among Alaska residents — July 2021

Age group	Total cases	VB cases (% of total cases per age group)	Proportion of AK residents aged ≥12 years-old who were fully vaccinated*
12–19	461	37 (8.0)	28.4%
20–29	867	164 (18.9)	39.6%
30–39	934	245 (26.2)	45.9%
40–49	651	239 (36.7)	53.2%
50–59	515	181 (35.1)	56.6%
60–69	420	193 (46.0)	66.1%
70+	286	163 (57.0)	74.5%

**Mean of the daily estimated percentage for each day in July 2021 of Alaska residents who are fully vaccinated, by age group.*

Vaccine breakthrough cases, by manufacturer

Among Alaska residents aged 20–59 years, the incidence of COVID-19 during July 2021 was lower among persons who were fully vaccinated with each of the three FDA-authorized vaccines compared to persons who were not fully vaccinated. The incidence rate ratio adjusted for age, calendar day, and region was largest when comparing not fully vaccinated persons to persons fully vaccinated with the Moderna COVID-19 vaccine (IRR: 3.9; 95% CI: 3.4, 4.5), followed by the Pfizer (IRR: 2.3; 95% CI: 2.0, 2.5), and Janssen (IRR: 2.2; 95% CI: 1.81 2.7) vaccines.

Vaccine breakthrough hospitalizations

Among vaccine breakthrough cases with specimen collection date on or prior to July 31, 2021, 49 hospitalizations due to COVID-19 were documented (Table 10). While both the number and proportion of hospitalizations among fully vaccinated persons was higher in July than any previous month, fully vaccinated persons were still much less likely to be hospitalized due to COVID-19 than persons who were not fully vaccinated (Figure 4). Adjusted for age, region, and calendar day, the incidence of hospitalization among persons who were not fully vaccinated was 8.8 (95% CI: 5.7, 13.6) times higher than the incidence among fully vaccinated persons, based on COVID-19 cases with specimen collection date in July and hospitalizations documented as of August 23, 2021. For hospitalizations with specimen collection date between January 16 and June 30, 2021, the adjusted incidence rate ratio was 19.0 (95% CI: 11.0, 33.0). Among Alaska residents ≥12 years-old with specimen collection dates in July who were hospitalized due to COVID-19, the median age among those who were fully vaccinated was 71.7 years, and the median age of those who were not fully vaccinated was 57.7 years.

Table 10. Reported hospitalizations due to COVID-19 vaccine breakthrough infections, by month of specimen collection among Alaska residents aged ≥12 years — January 16, 2021 through July 31, 2021

	Total hospitalizations	VB hospitalizations (% of total monthly hospitalizations)
January–March*	204	1 (0.5)
April	126	8 (6.3)
May	66	3 (4.5)
June	42	5 (11.9)
July	165	32 (19.4)

**Data are from January 16, 2021 onwards. January, February, and March data have been aggregated to protect patient privacy.*

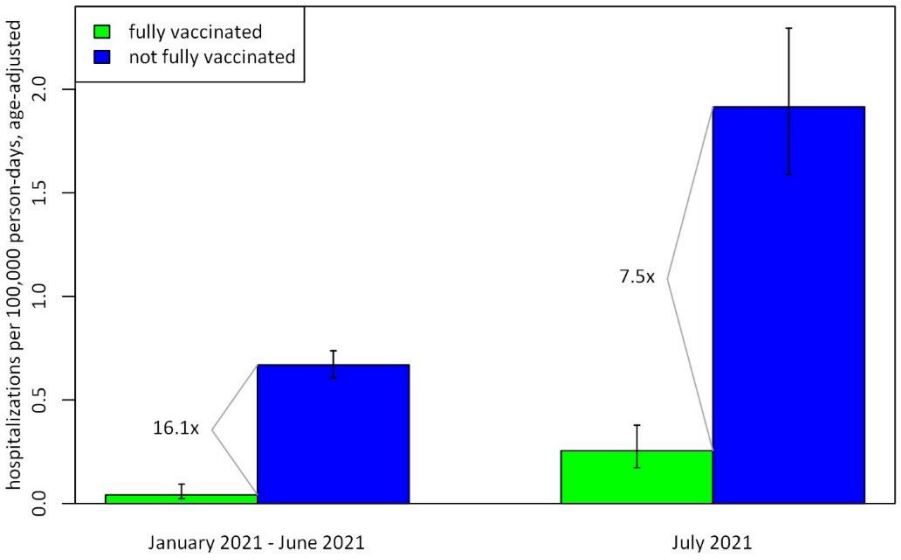


Figure 4. Age-adjusted incidence of hospitalization due to COVID-19 among Alaska residents aged ≥12 years by vaccination status (fully vaccinated versus not fully vaccinated), stratified by hospitalizations among COVID-19 cases with first positive specimen collected from January 16 through June 30 or during July 2021.

Vaccine breakthrough deaths

Of the 17 COVID-19 deaths that occurred during July 2021 and were documented as of August 24, 2021, 4 occurred in fully vaccinated persons. Death data are delayed and incomplete due to technical limitations in processing vital records. Death data will be further analyzed in future reports.

Discussion

COVID-19 vaccines continue to be our most important tool to prevent COVID-19 cases and severe outcomes such as hospitalizations and deaths.

The proportion of COVID-19 cases that occurred in fully vaccinated persons was larger in July 2021 than in previous months. Multiple factors determine the proportion of documented COVID-19 cases among fully vaccinated persons. When the proportion of the population that is fully vaccinated is higher, the expected proportion of cases among fully vaccinated persons is also larger. Also, as more cases of COVID occur among unvaccinated persons, the proportion of the unvaccinated population that is susceptible to infection goes down, and the expected proportion of cases in this group goes down. Another important factor is that waning immunity occurs over time. Waning immunity tends to occur more quickly in older people, which might contribute to increasing VB hospitalization rates because older people are known to be at increased risk for COVID hospitalization. Moreover, moderately or severely immunocompromised people don't always build the same level of immunity after vaccination the way non-immunocompromised people do, and they are now advised to receive an additional dose to ensure adequate protection against COVID-19. These individuals might also disproportionately contribute to higher VB hospitalizations in recent months. Finally, declines in vaccine effectiveness can lead to an increasing proportion of COVID-19 cases among fully vaccinated persons. The Delta variant rapidly became the dominant SARS-CoV-2 variant in Alaska during June and July and reductions in vaccine effectiveness against the Delta variant likely also contributed to the increased proportion of vaccine breakthrough cases.

The data presented here were collected for public health surveillance purposes and may be subject to unmeasured confounding and bias. For example, persons who were fully vaccinated and not fully vaccinated may differ in their adherence to COVID-19 mitigation measures (e.g., mask wearing and avoiding indoor crowded spaces). Moreover, the magnitude of these differences may vary over time. Additionally, COVID-19 cases among fully vaccinated persons may be more likely to be detected than COVID-19 cases among persons who are not fully vaccinated (e.g., health care workers are more likely to be vaccinated than the general population and may be more likely to get tested), which would artificially increase the proportion of detected cases among fully vaccinated persons. Finally, as mentioned above, infection-induced immunity may build up in the unvaccinated population faster than in the vaccinated population, thereby making vaccination appear less effective.[5]

The magnitude of bias and confounding may differ across settings and consequently direct comparisons to data from other jurisdictions or to prospective evaluations of vaccine effectiveness are difficult. Additionally, this analysis is not a formal evaluation of vaccine effectiveness in that it compares fully vaccinated persons versus not fully vaccinated persons, a category which includes both unvaccinated and partially vaccinated persons, and it does not account for differential testing rates that might occur between vaccinated and unvaccinated people. It is biologically implausible that COVID-19 vaccines would perform differently in Alaska compared to other parts of the United States.

Interpreting differences in COVID-19 incidence by vaccine manufacturer is challenging because persons who received one type of COVID-19 vaccine may systematically differ from persons who received a different type. For example, the Pfizer vaccine was available before the Moderna vaccine and so health care workers and persons in long-term care facilities may have been more likely to have received it. However, restricting the comparison of manufacturers to persons aged 20–59 years should limit the extent to which bias may reflect the use of a particular vaccine in long-term care facilities. Further research is needed to better understand the long-term effectiveness of each COVID-19 vaccine.

COVID-19 vaccines in Alaska remain very protective against COVID-19 illness and tremendously protective against hospitalization and death. The level of protection of vaccination against hospitalization observed among Alaskans in July is similar to recent estimates from a large national COVID-19 hospitalization case control study.[6] The vast majority of COVID-19 hospitalizations that occurred among persons who tested positive in Alaska could have been prevented through vaccination.

Considering emerging evidence on vaccine breakthrough cases and the potential for onward transmission from breakthrough infections, the Centers for Disease Control and Prevention (CDC) recommended on July 27, 2021, that all persons, including fully vaccinated persons, wear a mask when in public indoor settings in locations experiencing substantial or high levels of community transmission.[7] The Advisory Committee on Immunization Practices and CDC recommend that persons who are moderately or severely immunocompromised receive a third dose of an mRNA vaccine at least 28 days after receiving the second dose.[8] Additionally, the US government has announced a plan to offer booster doses beginning 6 months after receiving the primary vaccine series starting on September 20, 2021.[9]

References

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7. CDC. Interim Public Health Recommendations for Fully Vaccinated People. Available at: https://www.cdc.gov/coronavirus/2019-ncov/vaccines/fully-vaccinated-guidance.html
8. CDC. Interim Clinical Considerations for Use of COVID-19 Vaccines Currently Authorized in the United States. Available at: https://www.cdc.gov/vaccines/covid-19/clinical-considerations/covid-19-vaccines-us.html
9. CDC. Joint Statement from HHS Public Health and Medical Experts on COVID-19 Booster Shots. Available at: https://www.cdc.gov/media/releases/2021/s0818-covid-19-booster-shots.html

Additional Resources

- CDC. Older Adults and COVID-19. Available at: https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/older-adults.html
- CDC. Certain Medical Conditions and Risk for Severe COVID-19 Illness. Available at: https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/people-with-medical-conditions.html
- CDC. Health Equity Considerations and Racial and Ethnic Minority Groups. Available at: https://www.cdc.gov/coronavirus/2019-ncov/community/health-equity/race-ethnicity.html
- CDC. Understanding Death Data Quality: Cause of Death from Death Certificates. Available at: https://www.cdc.gov/nchs/nvss/covid-19.htm#understanding-death-data-quality
- State of Alaska. Population Estimates. Available at: https://live.laborstats.alaska.gov/pop/
- CDC. COVID Data Tracker. Available at: https://covid.cdc.gov/covid-data-tracker/
- State of Alaska. Epidemiology *Bulletins*. Available at http://www.epi.alaska.gov/bulletins/
- CDC. SARS-CoV-2 Variant Classifications and Definitions. Available at: https://www.cdc.gov/coronavirus/2019-ncov/variants/variant-info.html