COVID-19 Cases And Deaths by Vaccination Status

Texas Department of State Health Services

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TEXAS Health and Human Services
Texas Department of State Health Services

Key Findings

1. From September 4 through October 1, 2021:
   - Unvaccinated people were 13 times more likely to become infected with COVID-19 than fully vaccinated people.
   - Unvaccinated people were 20 times more likely to experience COVID-19-associated death than fully vaccinated people.

2. Vaccination had a strong protective effect on infections and deaths among people of all ages. The protective impact on infections was consistent across adult age groups and even greater in people ages 12 to 17 years. The protective impact on COVID-19 deaths, which was high for all age groups, varied more widely. In the September time frame, unvaccinated people in their 40s were 55 times more likely to die from COVID-19 compared with fully vaccinated people of the same age. Unvaccinated people aged 75 years and older were 12 times more likely to die than their vaccinated counterparts.

3. Overall, regardless of vaccination status, people in Texas were four to five times more likely to become infected with COVID-19 or suffer a COVID-19-associated death while the Delta variant was prevalent in Texas (August 2021) compared with a period before the Delta variant became prevalent (April 2021).

Background

Vaccination is a critical tool to help stop the COVID-19 pandemic. All authorized COVID-19 vaccines in the US are highly effective at protecting people from getting sick or severely ill with COVID-19, including those infected with Delta and other known variants. COVID-19 vaccination can also reduce the spread of disease overall, helping to keep communities safe.

Because no vaccines are 100 percent effective, it is expected that some fully vaccinated people will get sick with COVID-19, and that number will increase as more people get vaccinated. Vaccine effectiveness can also be affected by an individual's own immune system, like how well they respond to the vaccine when it is given and how much their immunity wanes over time.

Real world, state-specific data showing the impact of vaccination on outcomes, including infection and death, can help illustrate these benefits, improve confidence in vaccines, and raise vaccination rates in Texas.

This analysis will be updated periodically to include the most recent four-week span with complete data.

Objective

Describe the impact of COVID-19 vaccination on cases and deaths in Texas.

To do this, the Texas Department of State Health Services (DSHS) analyzed linked data from:

- the electronic laboratory reporting (ELR) system, for information on positive tests for COVID-19 (operationally defined as cases of COVID-19 infection);
- the vital records system, for information on COVID-19-associated deaths; and
- the Texas Department of State Health Services Immunization Registry (ImmTrac2), for information on who was vaccinated against COVID-19.

This analysis focused mainly on people who were fully vaccinated compared with those who were unvaccinated. Calculations included only the population eligible to be vaccinated, those aged 12 years and older. The timeframe was chosen because January 15, 2021 represents the first day a Texan could be considered fully vaccinated, and October 1, 2021 represents the most recent date with complete available data.

Population description

During the time period of January 15, 2021 through October 1, 2021:

Among people with positive COVID-19 tests, including PCR and antigen tests (n = 1,545,390): 1,314,337 (85.0%) were unvaccinated, 184,732 (12.0%) were partially vaccinated, and 46,321 (3.0%) were fully vaccinated. Positive tests occurred more frequently among females (52.0%) than males (47.0%), with 1% missing/unknown. The overall mean age was 39 years, with most positive tests among those aged 18-29 years (24.3%) followed by those aged 30-39 years (19.7%) and those aged 50-64 years (17.7%).

Among people with COVID-19—associated deaths (n = 28,659), 24,517 (85.5%) were unvaccinated, 1,942 (6.8%) were partially vaccinated, and 2,200 (7.7%) were fully vaccinated. Deaths occurred more frequently among males (58.8%) than females (41.2%). The overall mean age was 67 years, with most deaths occurring among those aged 75 years and older (35.3%), followed by those aged 65-74 years (25.1%) and those aged 50-64 years (26.0%).

COVID-19 case and death rates by vaccination status and age group

Cases:

Time period: January 15, 2021 – October 1, 2021

From January 15, 2021 to October 1, 2021, unvaccinated people were 45 times more likely to have an infection with COVID-19 than fully vaccinated people. This impact was relatively consistent across age groups. However, in the 12 to 17 year age group, smaller numbers of cases decreased the numerator of the incidence rate (fully vaccinated people with COVID-19 positive ELRs per 100,000 fully vaccinated people). This in turn made the impact estimate (the ratio of the incidence rates) less stable and more difficult to interpret.

Table 1: Age-adjusted case rate by vaccination status, Jan. 15, 2021 – Oct. 1, 2021

	Rate per 100,000 in Unvaccinated People	Rate per 100,000 in Fully Vaccinated People	Impact
All Ages	14,196.6	315.9	45 times higher in unvaccinated

Table 2: Age-specific case rates by vaccination status, Jan. 15, 2021 – Oct. 1, 2021

Age Group	Number of Unvaccinated People with Positive COVID-19 ELRs	Rate per 100,000 in Unvaccinated People	Number of Fully Vaccinated People with Positive COVID-19 ELRs	Rate per 100,000 in Fully Vaccinated People	Impact
12-17 years	171,418	11,342.25	1,748	175.90	65 times higher in unvaccinated
18-29 years	338,288	12,700.31	7,236	311.63	41 times higher in unvaccinated
30-39 years	263,206	13,725.76	8,315	369.27	37 times higher in unvaccinated
40-49 years	211,701	15,131.84	8,546	366.47	41 times higher in unvaccinated
50-64 years	219,334	14,910.43	11,023	314.50	47 times higher in unvaccinated
65-74 years	70,132	17,657.57	5,644	305.44	58 times higher in unvaccinated
75+ years	40,129	15,379.10	3,809	310.11	50 times higher in unvaccinated

Time period: September 4, 2021 – October 1, 2021

From September 4, 2021 to October 1, 2021, unvaccinated people were 13 times more likely to become infected than fully vaccinated people. The impact was similar across most age groups. As with the full time period, smaller numbers of cases in the 12 to 17 year age group decreased the numerator of the incidence rate (fully vaccinated people with COVID-19 positive ELRs per 100,000 fully vaccinated people). This in turn made the impact estimate (the ratio of the incidence rates) less stable and more difficult to interpret.

Graph 1: Overall crude case rate (daily 7-day moving average) by vaccination status, January 15, 2021 to October 1, 2021

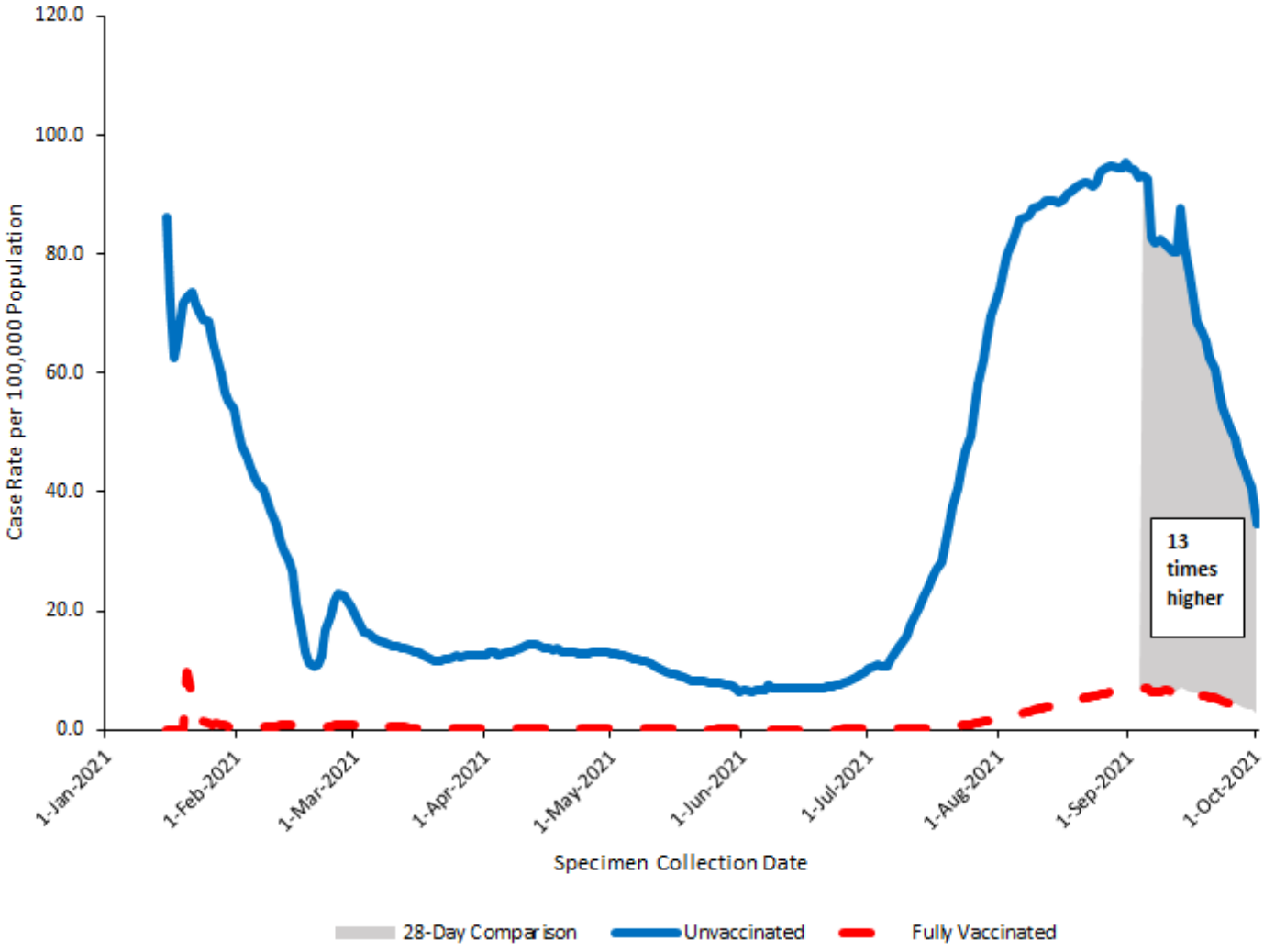

Table 3: Age-adjusted case rate by vaccination status, Sept. 4, 2021 – Oct. 1, 2021

	Rate per 100,000 in Unvaccinated People	Rate per 100,000 in Fully Vaccinated People	Impact
All Ages	1,767.0	133.8	13 times higher in unvaccinated

Table 4: Age-specific case rates by vaccination status, Sept. 4, 2021 – Oct. 1, 2021

Age Group	Number of Unvaccinated People with Positive COVID-19 ELRs	Rate per 100,000 in Unvaccinated People	Number of Fully Vaccinated People with Positive COVID-19 ELRs	Rate per 100,000 in Fully Vaccinated People	Impact
12-17 years	30,287	2,004.01	888	89.36	22 times higher in unvaccinated
18-29 years	40,274	1,512.00	2,951	127.09	12 times higher in unvaccinated
30-39 years	35,492	1,850.85	3,493	155.13	12 times higher in unvaccinated
40-49 years	26,485	1,893.08	3,696	158.49	12 times higher in unvaccinated
50-64 years	24,648	1,675.58	4,638	132.33	13 times higher in unvaccinated
65-74 years	7,830	1,971.41	2,360	127.72	15 times higher in unvaccinated
75+ years	4,353	1,668.25	1,522	123.91	14 times higher in unvaccinated

Deaths:

Time period: January 15, 2021 – October 1, 2021

From January 15, 2021 to October 1, 2021, unvaccinated people were 40 times more likely to experience COVID-19-associated death than fully vaccinated people. The impact of vaccination generally varied somewhat between age groups. The small number of deaths among the 12 to 17 and 18 to 29 year age groups made the impact estimate less stable and more difficult to interpret for those groups. Because the total number of deaths among the 12 to 17 age group was so small, it was not presented separately in Table 6.

Table 5: Age-adjusted death rate by vaccination status Jan. 15, 2021 – Oct. 1, 2021

	Rate per 100,000 in Unvaccinated People	Rate per 100,000 in Fully Vaccinated People	Impact
All Ages	463.7	11.6	40 times higher in unvaccinated

Table 6: Age-specific death rates by vaccination status, Jan. 15, 2021 – Oct. 1, 2021*

Age Group	Number of Unvaccinated COVID-19 Associated Deaths	Rate per 100,000 in Unvaccinated People	Number of Fully Vaccinated COVID-19 Associated Deaths	Rate per 100,000 in Fully Vaccinated People	Impact
18-29 years	339	12.73	<10	0.13	99 times higher in unvaccinated
30-39 years	1,019	53.14	25	1.11	48 times higher in unvaccinated
40-49 years	2,332	166.69	62	2.66	63 times higher in unvaccinated
50-64 years	6,789	461.52	357	10.19	45 times higher in unvaccinated
65-74 years	6,215	1,564.79	509	27.55	57 times higher in unvaccinated
75+ years	7,810	2,993.12	1,243	101.20	30 times higher in unvaccinated

**Numbers between 0 and 10 have been suppressed in order to protect confidentiality and because rate estimates tend to be highly unstable.*

Time period: September 4, 2021 – October 1, 2021

From September 4, 2021 to October 1, 2021, unvaccinated people were 20 times more likely to experience COVID-19-associated death than fully vaccinated people. The impact generally decreased with age. However, the relatively smaller number of deaths among younger age groups made the impact estimate less stable and more difficult to interpret. Because the total number of deaths among the 12 to 17 age group was so small, it was not presented separately.

Graph 2: Overall crude death rate (daily 7-day moving average) by vaccination status, Jan. 15, 2021 to Oct. 1, 2021

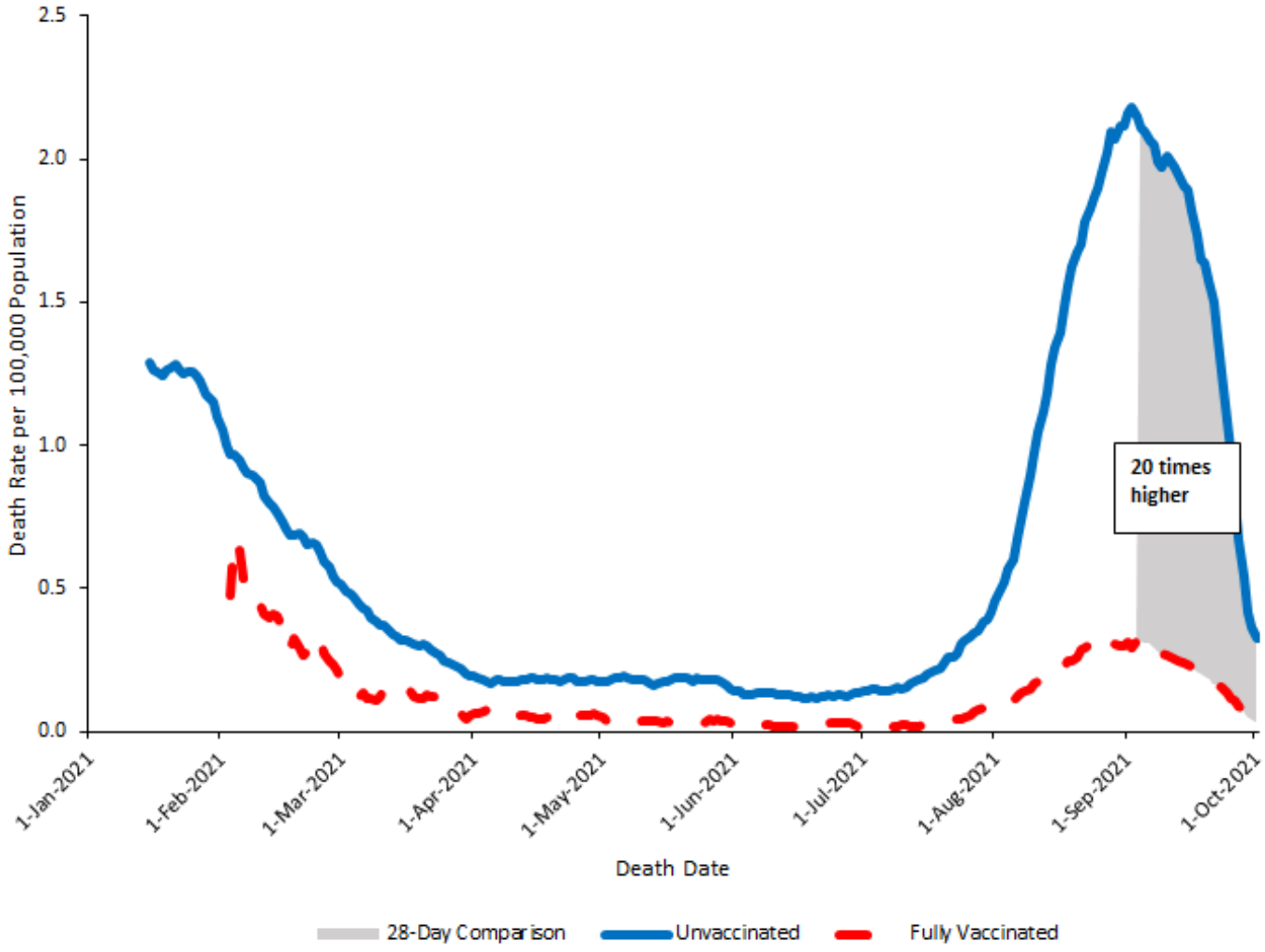

Table 7: Age-adjusted death rate by vaccination status, Sept. 4, 2021 - Oct. 1, 2021

	Rate per 100,000 in Unvaccinated People	Rate per 100,000 in Fully Vaccinated People	Impact
All Ages	63.66	3.25	20 times higher in unvaccinated

Table 8: Age-specific death rates by vaccination status, Sept. 4, 2021 - Oct. 1, 2021*

Age Group	Number of Unvaccinated COVID-19 Associated Deaths	Rate per 100,000 in Unvaccinated People	Number of Fully Vaccinated COVID-19 Associated Deaths	Rate per 100,000 in Fully Vaccinated People	Impact
18-29 years	84	3.15	<10	0.09	37 times higher in unvaccinated
30-39 years	236	12.31	12	0.53	23 times higher in unvaccinated
40-49 years	496	35.45	15	0.64	55 times higher in unvaccinated
50-64 years	1,191	80.96	100	2.85	28 times higher in unvaccinated
65-74 years	847	213.25	162	8.77	24 times higher in unvaccinated
75+ years	793	303.91	324	26.38	12 times higher in unvaccinated

*Numbers between 0 and 10 have been suppressed in order to protect confidentiality and because rate estimates tend to be highly unstable.

Pre-Delta vs Post-Delta Comparison

People in Texas were four to five times more likely to become infected with COVID-19 or suffer a COVID-19-associated death while the Delta variant was prevalent in Texas (August 2021) compared with a period before the Delta variant became prevalent (April 2021). Of note, the Delta variant exceeded 50% prevalence of sequenced samples in Texas in late June 2021.

Cases

Table 9: Pre vs Post Delta period age-adjusted case rate

	Rate per 100,000 for April 2021	Rate per 100,000 for August 2021	Impact
All Cases	301.7	1302.1	4 times higher in August

Deaths

Table 10: Pre vs Post Delta period age-adjusted death rate

	Rate per 100,000 for April 2021	Rate per 100,000 for August 2021	Impact
All Deaths	5.0	22.8	5 times higher in August

Proportions

The highest proportion of COVID-19 cases and COVID-19-associated deaths were among unvaccinated people compared with those who were fully or partially vaccinated. Over time, however, as more and more people get vaccinated, the proportion of cases and deaths among vaccinated people is expected to rise.

Table 11: Numbers and percentages of COVID-19 cases (ages 12+) by vaccination status

	January 15, 2021 - October 1, 2021		September 4, 2021 - October 1, 2021	
Status	Number of Cases	Percent of Cases	Number of Cases	Percent of Cases
Fully Vaccinated	46,321	3.0%	19,548	8.4%
Partially Vaccinated	184,732	12.0%	45,271	19.3%
Unvaccinated	1,314,337	85.0%	169,391	72.3%

Table 12: Numbers and percentages of COVID-19-associated deaths (ages 12+) by vaccination status

	January 15, 2021 - October 1, 2021		September 4, 2021 - October 1, 2021	
Status	Number of Cases	Percent of Cases	Number of Cases	Percent of Cases
Fully Vaccinated	2,200	7.7%	615	13.7%
Partially Vaccinated	1,942	6.8%	225	5.0%
Unvaccinated	24,517	85.5%	3,652	81.3%

Methods

Data Sources

- ImmTrac2, Texas Immunization Registry
- Death Registry, Vital Statistics
- COVID-19 ELR, National Electronic Disease Surveillance System Electronic Laboratory Reporting

The rates presented in this report were calculated using the state population distribution based on the 2019 U.S. Census standard population estimates. Calculations included only the 12 years and older population because they are eligible to be vaccinated. The analysis timeframe was chosen because January 15, 2021 represents the first day a Texan could be fully vaccinated, and October 1, 2021 represents the most recent date with complete available data.

Definitions

- Fully vaccinated cases: cases who received their last recommended dose of an FDA-authorized COVID-19 vaccine, with the appropriate interdose interval if they received a 2-dose series and have had at least 14 days to establish protection.
- Unvaccinated cases: cases who did not receive any doses of an FDA-authorized COVID-19 vaccine.
- A COVID-19–associated death occurred in an individual with a documented COVID-19 diagnosis who died, or whose death local health authorities reviewed to make a determination using vital records and public health investigation. A COVID-19– associated death is defined as a confirmed or probable case with no period of complete recovery between the illness and death. Case classification must align with the Council of State and Territorial Epidemiologists (CSTE) case definitions, found here. A death should not be reported if after review and consultation there is an alternative agreed upon cause of death which is unrelated to an infectious process (For example, an adult with a positive SARS-CoV-2 test whose death clearly resulted from trauma after a car accident would not qualify as a case.)
- A fully vaccinated case is a COVID-19 case (either PCR or an antigen) in a vaccinated person that occurred ≥14 days after completion of their vaccination series.
- A COVID-19 case in a person who was unvaccinated occurred when the person did not receive an FDA-authorized COVID-19 vaccine before the specimen collection date.

Timeframes

- The first COVID-19 vaccines were administered in Texas in mid-December 2020. Full protection from the vaccine in those vaccinated early would occur in mid-January. Therefore, we are reporting cases and deaths beginning with January 15, 2021.

Linking methods

- All information on COVID-19 cases and deaths provided by this report use ELR and death registry data linked to vaccination data. The links are based on a comparison of the first name, last name, and date of birth of cases to the first name, last name, and date of birth of those with COVID-19 vaccination in ImmTrac2. Only exact matches on all three items are considered the same person. Missing or misspelled names and incorrect dates of birth may lead to some vaccinated people being incorrectly classified as unvaccinated. COVID-19 cases with vaccines not reported to ImmTrac2 as described above are considered unvaccinated in this report.

Rate Calculations

- The fully vaccinated population is defined as the number of cases who are determined to be fully vaccinated in Texas in the specified age group at the start of the time period.
- The unvaccinated population is defined by subtracting the number of fully vaccinated for the specified age group and time period from the entire Texas state population 12 years and older.
- When considering rates, it's important to adjust for age. For example, older adults are both more likely to be vaccinated than younger people and more likely to have underlying health conditions that may increase their risk for dying if they get COVID. In order to compare most accurately, we compare vaccinated and unvaccinated people of similar ages. This is called adjusting for age.
- "Impact" in the report tables was calculated as the Incidence Rate Ratio: incidence rate among unvaccinated cases / incidence rate among vaccinated cases.

Limitations

- Duplicates among exact matches were hand checked. Those who had outliers such as a vaccine dose date after a date of death were classified as unvaccinated. However variable linkage of case, vaccination, and mortality data might have resulted in misclassifications that could influence IRR estimates.
- ELR data and death registry are updated on an ongoing basis, lags in reporting may have led to some information being incomplete at the time of analysis.
- Immunization data for COVID-19 are dependent on clinician report of status to ImmTrac2.