Methodology for Cases, Hospitalizations, and Deaths in Unvaccinated vs. Vaccinated Individuals in the US January 1st through April 30th, 2021   Denise T. Plichta

I based these calculations upon several documents published online by the CDC:

- COVID-19 Vaccine Breakthrough Infections Reported to CDC —United States, January 1–April 30, 2021

  https://www.cdc.gov/mmwr/volumes/70/wr/mm7021e3.htm

- Trends in Number of COVID-19 Vaccinations in the US (click on "People Fully Vaccinated" and "Cumulative")

  https://covid.cdc.gov/covid-data-tracker/#vaccination-trends

- Trends in Number of COVID-19 Cases and Deaths in the US Reported to CDC, by State/Territory ("Cumulative Deaths" and "Cumulative Cases "in View/Left Axis)

  https://covid.cdc.gov/covid-data-tracker/#trends_dailytrendsdeaths

- Covid View Summary ending January 2, 2021

  https://www.cdc.gov/coronavirus/2019-ncov/covid-data/covidview/past-reports/01082021.html

- Covid Data Tracker Weekly Review for April 30, 2021

  https://www.cdc.gov/coronavirus/2019-ncov/covid-data/covidview/past-reports/04302021.html

COVID-19 IN VACCINATED (V) AND UNVACCINATED (UV) PEOPLE BY PERSON-DAYS JANUARY 1–APRIL 30, 2021

	Total	Unvaccinated	Per Person-Day	Vaccinated	Per Person-Day	OR (UV/V)	% full vacc	% unvacc
US population	331449281							
Person-Days		35248158271		4564152549				
cases	11,620,444	11610182	0.000329384	10262	2.24839E-06	146	0.68%	99.32%
hospitalizations	1986175	1985180	5.63203E-05	995	2.18003E-07	258	0.39%	99.61%
deaths	205572	205412	5.8276E-06	160	3.50558E-08	166	0.60%	99.40%

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PERSON-DAYS:

1) I used the most recent census data from April 20, 2020 as my baseline for the **US population: 331,449,281**. Any change in that number would affect the number of unvaccinated people. However, the US population rose by only 0.35% between July 2019 and July 2020 and there is no reason to expect a significant difference for current data.

2) Looking at Trends in Number of COVID-19 Vaccinations in the US, I clicked on "People Fully Vaccinated" and "Cumulative." I entered the number of fully vaccinated people into a spreadsheet for each individual date between January 1st and April 31. Then I tallied the total number of **Vaccinated Person-Days: 4,564,152,549**

3) I subtracted the number of Person-Days from 331,449, 281 for each date, then added those numbers to determine the number of **Unvaccinated Person-Days: 35,248,158,271**. Partially vaccinated people counted as Unvaccinated. On April 17, I switched from unvaccinated to vaccinated. So, 105 of the unvaccinated person-days and forty-six of the vaccinated person-days were from me.

   – I do not have data for how many events in the Vaccinated population occurred while antibody levels were rising during the two weeks following the final dose. They were counted as Fully Vaccinated, skewing the data for toward more events in Vaccinated.

   – People receiving each type of vaccine were aggregated into one pool. We do know that Johnson & Johnson tends to be less effective (72% vs 94% for Moderna and 95% for Pfizer). While that does not skew the data, it does increase the expected number of events in Vaccinated people.

CASES:

4) Using the Cumulative Cases from Trends in Number of COVID-19 Vaccinations in the US, I subtracted the total number of cases on January 1, 2021 (20,607,441) from the **total number of cases** on April 30, 2021 (32,227,885): **11,620,444**.

5) In COVID-19 Vaccine Breakthrough Infections Reported to CDC —United States, January 1–April 30, 2021, the CDC reported that **10,262 Vaccinated** individuals tested positive for Covid-19. I subtracted that number from the total number of cases to derive the number of people who tested positive and were **Unvaccinated: 11,610,182**.

   – Among cases in Vaccinated people, 6,446 (63%) occurred in females. The median patient age was 58 years. Twenty-eight percent of these cases were asymptomatic.

6) I divided the number of cases in each group by the corresponding number of **person-days**. There were **0.000329384 cases per Unvaccinated person** on each day and **0.00000224839 cases per Vaccinated person** on each day.

7) An Odds Ratio shows how much more likely an Unvaccinated person was to test positive on each day divided by how likely a Vaccinated person was to test on each day. It also shows how many cases occurred in Unvaccinated people for each Vaccinated person. 0.000329384 divided by 0.00000224839 yields an **Odds Ratio of 146**. That means for every 147 people who tested positive during January 2021 through April 2021, 146 were Unvaccinated.

8) Using the reciprocal of the Odds Ratio and multiplying by 100 gave me the **percentage of cases occurring in Vaccinated people**. One divided by 146 times 100 yields **0.68%**.

9) The final step was to subtract the percentage of cases in Vaccinated people from 100 to determine the **percentage of cases in Unvaccinated people: 99.32%**.

   – On May 1, 2021, the CDC stopped tracking the number of cases which occur in fully vaccinated people, making future updates to this calculation impossible. It is important to know that the current vaccines may be less effective against the delta variant, which was less prevalent during the months being studied. However, recent reports indicate that 99% of deaths in June occurred m Unvaccinated people.

https://www.cdc.gov/vaccines/covid-19/health-departments/breakthrough-cases.html

https://healthfeedback.org/claimreview/unvaccinated-individuals-now-account-for-the-vast-majority-of-covid-19-hospitalizations-and-deaths-in-the-u-s-according-to-available-data/

HOSPITALIZATIONS:

10) Steps 1–3 resulted in **4,564,152,549 Vaccinated** person-days and **35,248,158,271 Unvaccinated** person-days**.**

11) Using the Covid View Summary ending January 2, 2021 and the Covid Data Tracker Weekly Review for April 30, 2021, I subtracted the total number of new hospital admissions by January 1, 2021 (111,960) from the **total number of hospital admissions** by April 30, 2021 (2,098,135): **1,986,175**.

12) In COVID-19 Vaccine Breakthrough Infections Reported to CDC —United States, January 1–April 30, 2021, the CDC reported **995 hospital admissions in Vaccinated** individuals. I subtracted that number from the total number of hospital admissions among people who tested positive during January through April to derive the number of **hospital admissions in Unvaccinated** people**: 1,985,180**.

–   Among the 995 Vaccinated patients who were admitted to the hospital, 289 (29%)
were asymptomatic or hospitalized for a reason unrelated to COVID-19. Removing
those patients would drop the number of Vaccinated individuals to 706. A major
complaint among people who discount the severity of the virus is that people who test
positive but do not have symptoms are being included in hospitalization counts.
Leaving the higher number in place does skew the results toward more Vaccinated
people but offsets that argument.

13) I divided the number of hospitalizations in each group by the corresponding number of
person-days. There were **0.0000563203 hospital** admissions per **Unvaccinated** person on
each day and **0.000000218003 hospital** admissions **per Vaccinated person** on each day.

14) An Odds Ratio shows how much more likely an Unvaccinated person was to enter the
hospital on each day divided by how likely a Vaccinated person was to enter the hospital on
each day. It also shows how many hospital admissions occurred in Unvaccinated people for
each Vaccinated person. **0.0000563203** divided by **0.000000218003** yields an **Odds Ratio of
258**. That means for every 259 people who tested positive for Covid and were admitted to the
hospital during January 2021 through April 2021, 258 were Unvaccinated.

15) Using the reciprocal of the Odds Ratio and multiplying by 100 gave me the **percentage of
hospital admissions occurring in Vaccinated people**. One divided by 258 times 100 yields
0.39%.

16) The final step for hospital admissions was to subtract the percentage of cases in Vaccinated
people from 100 to determine the **percentage in Unvaccinated people admitted to the
hospital: 99.61%**.

DEATHS:

17) Steps 1–3 resulted in **4,564,152,549 Vaccinated** person-days and **35,248,158,271
Unvaccinated** person-days**.**

18) Using Trends in Number of COVID-19 Cases and Deaths in the US Reported to CDC, by
State/Territory ("Cumulative Deaths" in View/Left Axis), I subtracted the total number of
deaths by January 1, 2021 (372,721) from the **total number of deaths** by April 30, 2021
(578,953): **205,572.**

19) In COVID-19 Vaccine Breakthrough Infections Reported to CDC —United States, January
1–April 30, 2021, the CDC reported **160 deaths in Vaccinated** individuals. I subtracted that
number from the total number of deaths among people who tested positive during January
through April (206,122) to derive the number of **deaths in Unvaccinated** people**: 205,412.**

– Among the 160 Vaccinated people who died, 28 (17.5%) were asymptomatic or died for a reason unrelated to COVID-19. Removing those patients would drop the number of deaths in Vaccinated individuals to 132. A major complaint among people who discount the severity of the virus is that people who test positive but died for other reasons are being included in death counts. Leaving the higher number in place does skew the results toward more Vaccinated people but offsets that argument.

20) I divided the number of deaths in each group by the corresponding number of person-days. There were **0.0000058276 deaths per Unvaccinated** person on each day and **0.0000000350558 deaths per Vaccinated person** on each day.

21) An Odds Ratio shows how much more likely an Unvaccinated person was to die on each day divided by how likely a Vaccinated person was to die on each day. It also shows how many deaths occurred in Unvaccinated people for each Vaccinated person. **0.0000058276** divided by **0.0000000350558** yields an **Odds Ratio of 166**. That means for every 167 people who tested positive for Covid and died during January 2021 through April 2021, 166 were Unvaccinated.

22) Using the reciprocal of the Odds Ratio and multiplying by 100 gave me the **percentage of deaths occurring in Vaccinated people**. One divided by 166 times 100 yields **0.60%**.

23) The final step was to subtract the percentage of cases in Vaccinated people from 100 to determine the **percentage of deaths in Unvaccinated people: 99.40%**.

– It is important to know that the current vaccines may be less effective against the delta variant, which was less prevalent during January through April. However, recent reports indicate that 99% of Covid-19 deaths in June 2021 still occurred m Unvaccinated people.

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