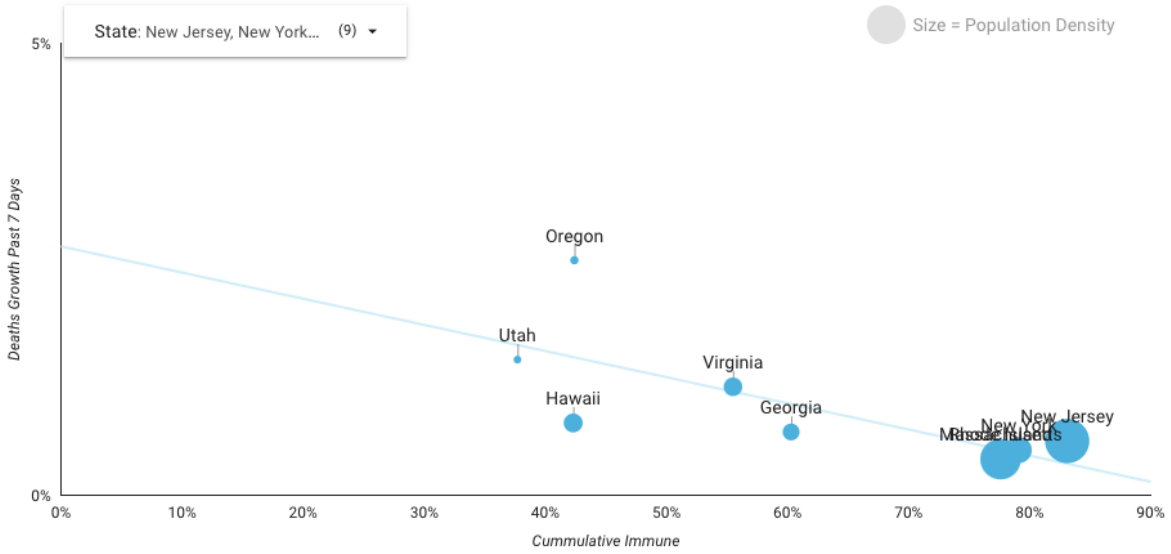
State of Vaccine Hesitancy in America

Did you know that every 300 vaccination averts 1 death in America?

The precise math is every 294 vaccinations averts 1 death. The calculation starts with a 95% effective vaccine, and then multiplies by the percent of population that could become infected (which I put at 85%) and the Infection Fatality Rate prior to vaccinations, which I calculate as 0.4%. The death rate has dropped thanks to Vaccinations. COVID-19 has averaged a 1.7% Case Fatality Rate since July of last year, and thanks to the vaccinations, that figure is now ata 1.0%. Based on the amount of vaccinations in the US, I calculate that over 400,000 people will be alive at the end of next year that otherwise would have died of COVID-19. If we achieve the vaccination goal of 70% of total US vaccinated, we will tip the scale so that more lives are saved from COVID-19 than lost to it.

If the US gets to 70% of the population fully vaccinated, the effective immune rate will be 85 percent, and SARS-CoV-2 spread new infections plummet. But if we don't, communities with low vaccination rates could be hit hard again this fall.

Certain states like New Jersey, New York, Rhode Island and Massachusetts are almost to 85%. Predictability, they have a lower rate of new cases and new deaths compared to states like Utah and Oregon, which have much less Immunity. The most life preserving approach is more vaccinations.

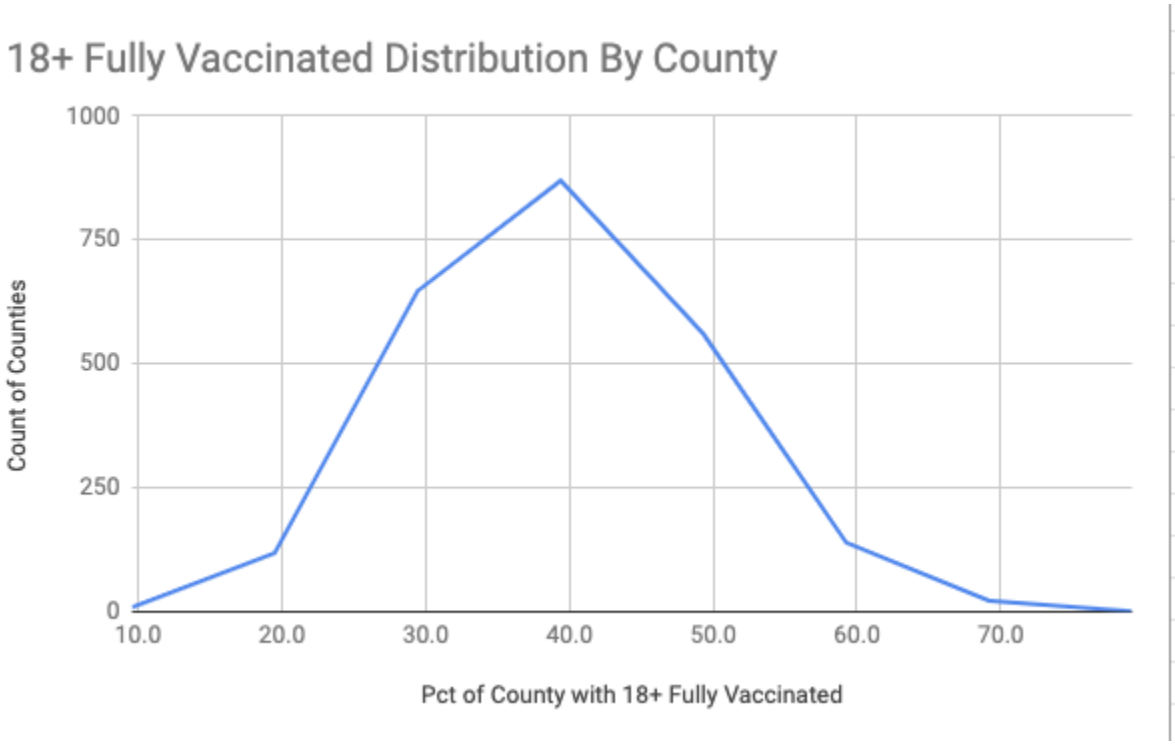


To see how your state stacks up, check out my dashboard www.speakerrex.com and click on "Herd Immunity." This chart is on the second page of the series, and you can select whichever state's you'd like to examine.

(Analysis Note: My calculation uses a randomized overlap between those who have already recovered and have a level of natural immunity and those who get vaccinated to arrive at the 85% combined immune figure.)

The Best & Worst States In Terms Of Vaccination Rates

Overall, the US is currently at 47.6% fully vaccinated among 18+. Some states and counties are way ahead. In fact, less populated counties (often rural) tend to lag behind. If we took an average of counties rather than of population, the average is 39.4%



Vaccine hesitancy is a problem in several states and counties. Thousands of lives will be lost as a result of the delay in vaccinations.

I've created a *Vaccine Hesitancy Score* based on the behavioral data available from the CDC. There are two parts to the Briggs Vaccine Hesitancy Score. First, I use the percentage of 18+ population fully vaccinated from May 18th and calculate an index compared to the national average. I used the population national average of 47.6% of 18+ are fully vaccinated as of May 18th.

Second, I compare the rate of change over the past month using the formula “This month - Last Month / (1 - Last Month).” The “1 - Last Month” denominator creates a curved scale, as it is harder to raise the level from a higher base than it is a lower base. I create an index against the national average. The National Average was a 23% increase in 18+ Fully Vaccinated over the past month.

Finally, I combine these indexes to calculate a score, and rank them from most behaviorally hesitant (ranked #1) to least (ranked #2373). There are other ways to calculate hesitancy. Mine is a simple behavioral view.

Using this behavioral view of hesitancy, **the five BEST states** are:

1. Vermont
2. Massachusetts
3. Hawaii
4. New Hampshire
5. Maine

These states have higher levels of vaccinations and show a greater increase in vaccinations compared to other states.

The **ten WORST states** in terms of vaccination rate of growth and overall fully vaccinated levels are:

1. Mississippi
2. Wyoming
3. Louisiana
4. Alabama
5. Arkansas
6. West Virginia
7. Oklahoma
8. North Dakota
9. Idaho
10. Tennessee

These states have among the lowest vaccinations rates, and are showing a much lower rate of increase in vaccinations compared to other states. These states need to be better.

County Level Vaccination Rates & Hesitancy

When it comes to a county view, the data is not as good as we deserve from our government. It warrants as explanation of what I found in my data quality assurance checks. Please read more about the data issues in the "Come On CDC, Let's Get This Right!" section. The TL;DR (Too Long; Didn't Read) summary is:

> "My analysis covers a little over 80% of the US population, living in 42 States and 2,374 counties. I've cleaned out the missing data and outliers, but you should still check what I am reporting against your county and state dashboards as there still might be garbage data hiding in the middle of the CDC dataset I used."

With that caveat, here are the **10 BEST counties** in terms of my Vaccine Hesitancy Score:

1. New York, Hamilton (76% of 18+ fully vaccinated and 25% growth over past month)
2. California, Marin (73% of 18+ fully vaccinated and 45% growth over past month)
3. Wisconsin, Bayfield (73% of 18+ fully vaccinated and 30% growth over past month)
4. Michigan, Leelanau (72% of 18+ fully vaccinated and 39% growth over past month)
5. Minnesota, Cook (71% of 18+ fully vaccinated and 34% growth over past month)
6. Wisconsin, Door (68% of 18+ fully vaccinated and 39% growth over past month)
7. Wisconsin, Dane (68% of 18+ fully vaccinated and 41.9% growth over past month)
8. Idaho, Blaine (68% of 18+ fully vaccinated and 37% growth over past month)
9. Oregon, Hood River (68% of 18+ fully vaccinated and 35% growth over past month)
10. Maine, Cumberland (67% of 18+ fully vaccinated and 44% growth over past month)

10 WORST COVID VACCINATION SCORES

This list is a little harder to fully verify because many of these states are doing a lousy job with reporting data, which might be part of the problem. You can't easily manage what you aren't measuring. Nebraska dosen't show county data. They only show regional data. It is the ONLY state I found that didn't provide county level. According to the CDC data, McPherson only has a 11% fully completed vaccination rate among 18+, and grew by only 4% over the last month. Grant is at 14% with 7% growth. Logan is at 15% with 4% growth and Arthur at 16% with 5% growth. These are all well below the national average of 47.6% of 18+ fully vaccinated with 23% growth over the past month. But, since I can't verify these data, I am leaving them off the WORST 10 list, but leaving them in the data set, which you can sort and download at www.speakerrex.com, in the Vaccine section, second page of the series.

I am also leaving off three counties from North Dakota that, according to CDC data, are lagging well behind. I am leaving them off the list because their state data shows higher vaccination levels compared to CDC data. Not great levels overall, but not necessarily in the bottom 10 counties for the entire country. For example, CDC reports Grant North Dakota is at 16% while ND state dashboard reports 24%. There were also discrepancies for Slope and Billings. All of the counties listed on the WORST list have been verified by examining the state or county level vaccination reports. Sources and links are listed at the end of this report.

10 VERIFIABLY WORST COUNTIES:

1. Arkansas, Miller (9% of 18+ fully vaccinated and 3% growth over past month)
2. South Dakota, McPherson (10% of 18+ fully vaccinated and 4% growth over past month)
3. Louisiana, Cameron (12% of 18+ fully vaccinated and 3% growth over past month)
4. Nevada, Storey (14% of 18+ fully vaccinated and 5% growth over past month)
5. Montana, McCone (14% of 18+ fully vaccinated and 3% growth over past month)
6. South Dakota, Harding (15% of 18+ fully vaccinated and 3% growth over past month)
7. South Dakota, Harding (15% of 18+ fully vaccinated and 3% growth over past month)
8. Missouri, Reynolds (16% of 18+ fully vaccinated and 4% growth over past month)
9. Mississippi, Issaquena (9% of 18+ fully vaccinated and 5% growth over past month)
10. Tennessee, Moore (16% of 18+ fully vaccinated and 6% growth over past month)

These counties are behind the 32% national average and they are falling further behind with their anemic growth rates. My hope is that these counties turn things around, and that national efforts will put more resources into these bottom ranked communities to make a difference.

Curious how your county stacks up? Check out the Vaccination button on my dashboard, and filter for your state. www.speakerrex.com/. There is also a downloadable DMA list as well.

State | State_County

State	State_County	18+ April-18	18+ May-18	Rate of increase, past month	Briggs Vaccine Hesitancy Rank-May18
North Dakota	North Dakota, Slope	8.7	10.2	2%	1
Arkansas	Arkansas, Miller	6.1	9.3	3%	2
Louisiana	Louisiana, Cameron	9.5	12.4	3%	3
Nebraska	Nebraska, McPherson	7.2	10.9	4%	4
South Dakota	South Dakota, McPher...	6.8	10.9	4%	5
Montana	Montana, Garfield	18.1	19.0	1%	6
Montana	Montana, McCone	11.4	14.4	3%	7
Nebraska	Nebraska, Logan	11.2	14.5	4%	8
North Carolina	North Carolina, Perqui...	17.0	18.6	2%	9
North Dakota	North Dakota, Grant	13.3	16.1	3%	10
Missouri	Missouri, Reynolds	12.7	15.8	4%	11
South Dakota	South Dakota, Harding	11.0	14.8	4%	12
North Dakota	North Dakota, McKenzie	14.7	17.5	3%	13
Missouri	Missouri, Douglas	13.1	16.6	4%	14
Nebraska	Nebraska, Arthur	11.6	15.6	5%	15
Ohio	Ohio, Holmes	14.1	17.3	4%	16
North Carolina	North Carolina, Stanly	14.1	17.3	4%	16
Mississippi	Mississippi, Issaquena	12.0	16.0	5%	18
Nevada	Nevada, Storey	9.4	14.3	5%	19
North Dakota	North Dakota, Billings	12.2	16.5	5%	20
Kansas	Kansas, Neosho	17.2	20.0	3%	21
Missouri	Missouri, Dunklin	18.1	20.8	3%	22
Missouri	Missouri, Newton	14.2	18.2	5%	23

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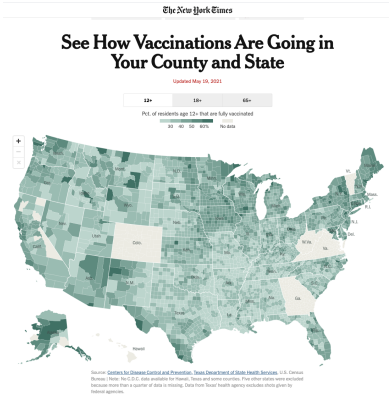
In Washoe County, Nevada, where I live, I have seen great efforts by our local doctors (shout out to Andy Pasternak), health professionals, schools, churches and ImmunizeNV. Washoe is now north of 50% of 18+ fully vaccinated and grew by 30% over the past month. It is the best county in Nevada, at the moment, in terms of the Briggs Hesitancy Score. We have a ways to go to achieve 70% of ALL people fully vaccinated, and together, we can get there.

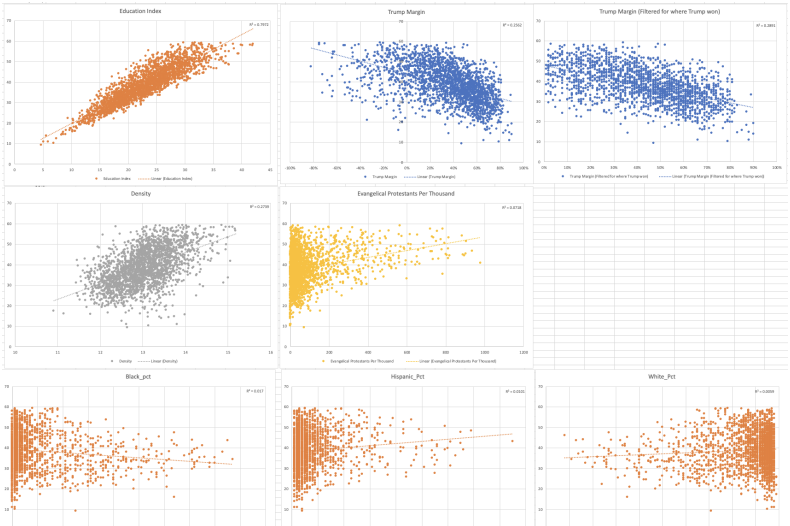
If you'd like a nice map of county level vaccination rates, can I suggest the New York Times? It has a very nice county level map, but it uses the CDC data, and as noted, there are errors in the data. Nonetheless, most of the counties have correct data. If in doubt, check your state or county data, as these are the most reliable sources.



https://www.nytimes.com/interactive/2020/us/covid-19-vaccine-doses.html

COMING SOON:

In my next post, I'll explain this chart, which looks at education, politics, religion, race and the urban/rural difference in vaccination rates.



SIDEBAR ON DATA QUALITY

Come On CDC, Let's Get This Right!

The data is noisy. Each state has their own dashboard and there doesn't seem to be much sharing of best practices, or general agreement on what should be reported or even how frequently it should be reported.

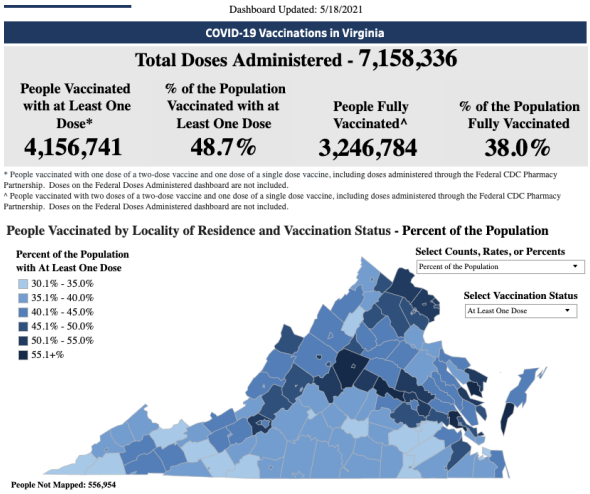
Some states don't report at the county level to the CDC at all.

Texas, I am talking about you. **Hawaii**, you too.

In addition to the two states that don't report at all at the county level, there are another six states whose data is so poor in the CDC database that a significant percentage of vaccinations administered aren't associated with a county. Here are the worst states for reporting to CDC county level vaccinations (coded in CDC file as "unknown" county):

1. Texas (100% missing)
2. Hawaii (100%)
3. Georgia (51%)
4. Virginia (49%)
5. West Virginia (46%)
6. Colorado (30%)
7. Vermont (26%)
8. New Mexico (21%)

Taking a closer look at Virginia, as an example, consider the state dashboard. It shows there are 556,954 people not mapped, or 17% of those fully vaccinated. Yet, CDC shows 49% unknown by county.



Source: https://www.vdh.virginia.gov/coronavirus/covid-19-vaccine-summary/

Unfortunately, the missing values are not evenly distributed. A close comparison shows some counties disproportionately have more missing data in the CDC set than others.

The first step in getting a usable data set was to remove the states with a high level of unknown county data, but that alone didn't solve the problem. Even for states where there are less "unknown" entries, like Massachusetts, with 12% unknown entries, I still found problems in the CDC data.

When I sorted the counties by 18+ fully vaccinated, three counties in Massachusetts were at the bottom of the list, with shockingly low vaccination rates. These counties are Nantucket (0.8%), Dukes (2.5%) and Barnsdale (3.7%). Could they really have this low of 18+ Fully Vaccinated?

Screen Shot from CDC Website:
https://covid.cdc.gov/covid-data-tracker/#vaccinations-county-view

County Level Vaccination Data for Massachusetts

CDC | Data as of: May 18, 2021 6:00am ET. Posted: Tuesday, May 18, 2021 3:01 PM ET

Download Data

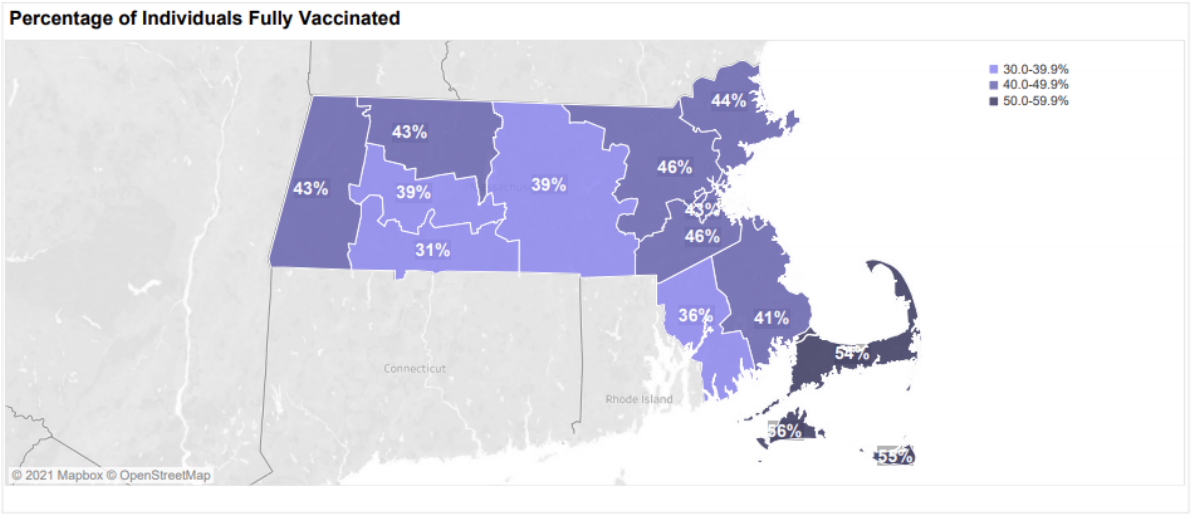
County	Percent of Total Pop Fully Vaccinated - Resident	Percent of 12+ Pop Fully Vaccinated - Resident	Percent of 18+ Pop Fully Vaccinated - Resident	Percent of 65+ Pop Fully Vaccinated - Resident
Barnstable	3.7	4.1	4.4	5.7
Berkshire	33.5	37.4	39.6	56.5
Bristol	36.6	42.1	45.4	69.1
Dukes	2.5	2.8	3	3.5
Essex	44.6	51.7	55.6	78.9
Franklin	42.5	47.6	50.5	70
Hampden	34.1	39.5	42.9	68.4
Hampshire	40.4	44.3	46.4	76.4
Middlesex	48.6	55.8	59.3	80.3
Nantucket	0.8	0.9	1	2.4
Norfolk	47.9	55.2	59.3	77.4
Plymouth	41.9	48.3	52.3	75.1
Suffolk	43.8	49.3	51.9	71.2
Worcester	39.4	45.4	49	74

I checked the MA state reports, and the most recent report, from May 11th, show these three counties are the **highest** (not lowest) in the state. According to the State's report, over half the population of these counties are fully vaccinated. If you aren't familiar with Massachusetts county geography, the countries are Cape Cod and the Islands off Cape Cod. That's 56% for Dukes County, 55% for Nantucket, and 54% for Barnsdale, In case you can't read the hard to read map.

Massachusetts Department of Public Health COVID-19 Dashboard - Thursday, May 13, 2021

Cumulative Percentage of Individuals who are Fully Vaccinated by County of Resident Address

Data as of May 11, 2021



NOTE: Data from MIIS (see "definitions"). Data reflect doses administered and reported (see "definitions"), including Janssen/Johnson & Johnson beginning on 3/5/21. An individual is counted as fully vaccinated if they have received the 2nd dose of Moderna or Pfizer or have received a dose of Janssen/Johnson & Johnson vaccine. Doses without address records are not included in this view. Some individuals may receive a first or second dose of Moderna or Pfizer from a non-reporting provider and would not be included as fully vaccinated. These proportions use Donahue population estimates from 2019. Colors may be reindexed as data evolve.

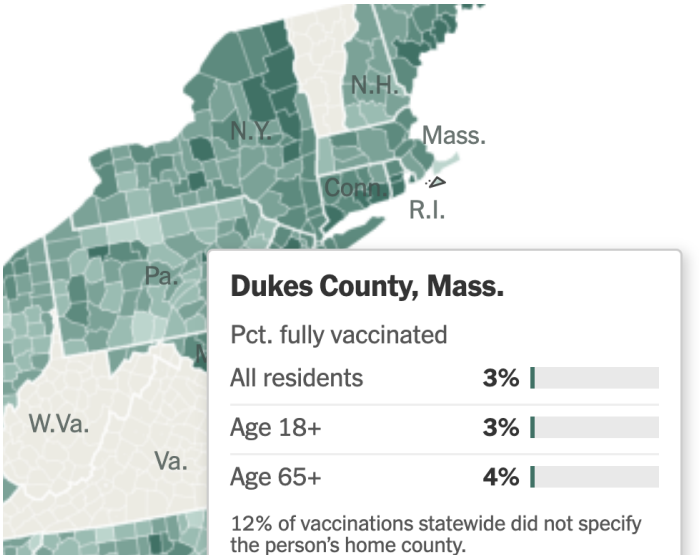
9

Source: https://www.mass.gov/doc/weekly-covid-19-vaccination-report-may-13-2021/download

If you are thinking, why does a state that houses MIT, Harvard and many other fine Universities have no dashboard and only share the data in a map, in PDF, once a week… I agree, a downloadable table, updated daily, would be better. That's what my home state of Nevada does.

Since the CDC data is pretty different from the 2.5% reported by CDC, I looked to see if the news organizations that typically do a good job vetting data have been able to solve the mystery of state vs county data.

I looked into NY Times site for the right data on Dukes county, I found they were pulling directly from CDC, without any algorithm to catch outliers, and and they too had the error.



https://www.nytimes.com/interactive/2020/us/covid-19-vaccine-doses.html

In my home state of Nevada, I worked with NV Independent, which has an excellent dashboard for Nevada https://thenevadaindependent.com/coronavirus-data-nevada. Thanks to Megan Messerly, who runs the dashboard for checking. She offered her thumbs up on the data I was getting from CDC.

Next, after removing the counties with 20% or more missing county values, I ranked the 2,387 counties, and identified the counties that were three standard deviations beyond the average. In a normal distribution, 3SD covers 99.7% of the observations, meaning about 8 counties could legitimately fall outside this range, but they could also be data errors. This approach would catch the problem with Nantucket, Dukes and Barnsdale. Since I will be creating a top 10 and bottom 10 list of counties, I manually checked each against the state records.

The check led me to remove the following counties due to suspected data errors:

1. Massachusetts, Nantucket
2. Massachusetts, Dukes
3. Massachusetts, Barnstable
4. Georgia, Appling
5. Alabama, Winston

These counties appear to be undercounted in the CDC data. In addition, I'm placing an asterisk by Nebraska as I found their state vaccine dashboards impossible to drill down to the county level. North Dakota was also suspect, as the percentages reported seemed similar to CDC, but in a different rank order for the worse five performing counties.

On the other end of the spectrum, the following counties appear to be overcounted in CDC.

1. Georgia, Chattahoochee (Georgia reported 99% vaccination rate last month as well)
2. North Carolina, Martin
3. Montana, Glacier
4. Wyoming, Teton
5. Arizona, Santa Cruz
6. Kansas, Graham
7. Montana, Blaine
8. Montana, Big Horn
9. Illinois, Jo Daviess
10. Montana, Rosebud

I also removed a handful of small population, rural counties in California that simply didn't report any vaccination data.

What is left to analyze are 42 states and 2,374 counties. The analysis covers a bit over 80% of the Total US population.

CDC, please work with the states called out in this report to clean up the data. This really is life or death data. The counties with the least vaccinations need the most effort, and data is how we know if the efforts are working or not.

A Caveat, An Ask and An Offer

Caveat: There can be data problems hiding within the 2,374 counties that I am using in the analysis, after removing the obvious outliers.

Ask: Check your county against your state's figures. Since the data I'm analyzing is from CDC on May 18th, you should find a slightly higher number of 18+ Fully Vaccinated today than what is shown in my table. **If what you find is lower, or a lot higher, help us crowdsource the data errors in the CDC reporting.** Tweet me (@rexbriggs), and CDC (@CDCgov).

Offer: CDC, if you are listening, please clean up this data. If you need help, I'm raising my hand to offer pro bono assistance.

Why this matters: My next step is to build a model that measures the effectiveness of strategies to help increase vaccinations at the local level. My data helps organizations like the Ad Council, which use this data to prioritize where to invest advertising dollars with their vaccination campaign. It is open source so other organizations in the COVID Collaborative and beyond can use this data too. The better we do in this effort, the fewer deaths from COVID, and the more stable our economic recovery can become.

SOURCES:

CDC: https://covid.cdc.gov/covid-data-tracker/#vaccinations-county-view

Sources Checked For Outliers:

Montana: https://montana.maps.arcgis.com/apps/MapSeries/index.html?appid=7c34f34125364394 91adcc2103421d4b (Doesn't calculate %, not downloadable).

North Carolina: https://covid19.ncdhhs.gov/dashboard/vaccinations

New York: https://covid19vaccine.health.ny.gov/covid-19-vaccine-tracker

Arizona: https://www.azdhs.gov/covid19/data/index.php#vaccine-admin (very good dashboard)

Kansas: https://www.kansasvaccine.gov/158/Data

Wyoming:
https://health.wyo.gov/publichealth/immunization/wyoming-covid-19-vaccine-information/covid-19-vaccine-distribution-data/

California (dashboard sucks)
Marin County Dashboard: https://coronavirus.marinhhs.org/vaccine/data

Wisconsin: https://www.dhs.wisconsin.gov/covid-19/vaccine-data.htm (very good dashboard)

Michigan: https://www.michigan.gov/coronavirus/0,9753,7-406-98178_103214-547150--,00.html

Minnesota: https://mn.gov/covid19/vaccine/data/index.jsp

Illinois: https://www.dph.illinois.gov/covid19/vaccinedata?county=Illinois

Idaho: https://public.tableau.com/profile/idaho.division.of.public.health#!/vizhome/COVID-19VaccineDataDashboard/LandingPage

Oregon: https://covidvaccine.oregon.gov/

Maine: https://www.maine.gov/covid19/vaccines/dashboard

Maryland: https://coronavirus.maryland.gov/
Montgomery County (good dash): https://www.montgomerycountymd.gov/covid19/data/

Florida: http://ww11.doh.state.fl.us/comm/_partners/covid19_report_archive/vaccine-county/vaccine_county_report_latest.pdf

Georgia: https://experience.arcgis.com/experience/3d8eea39f5c1443db1743a4cb8948a9c

Arkansas: https://www.healthy.arkansas.gov/programs-services/topics/novel-coronavirus (dashboard is horrible)

North Dakota: https://www.health.nd.gov/covid19vaccine/dashboard

Nebraska: https://experience.arcgis.com/experience/ece0db09da4d4ca68252c3967aa1e9dd/page/page_1/
(No County Level Reporting: No evidence to remove data, but data should be treated with caution.)

Louisiana: https://ldh.la.gov/covidvaccine/

Alabama: https://www.arcgis.com/apps/MapSeries/index.html?appid=d84846411471404c83313bfe7ab2a367

Missouri: https://covidvaccine.mo.gov/data/

Mississippi: https://msdh.ms.gov/msdhsite/_static/resources/12130.pdf

Tennessee: https://www.tn.gov/health/cedep/ncov/covid-19-vaccine-information.html

Maryland: https://coronavirus.maryland.gov/#Vaccine