Modeling & Forecasting COVID-19 in NM

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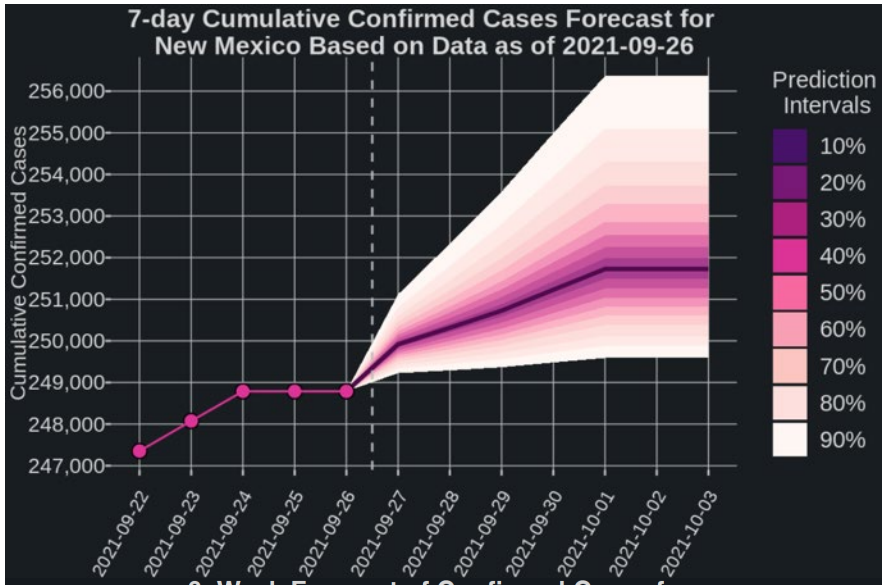
September 28, 2021

NNSA
National Nuclear Security Administration

Short- & Long-Term Forecast for NM: Cases

Cumulative Cases



6–Week Forecast of Confirmed Cases for New Mexico Based on Data as of 2021–09–26

Week	Best Case (5th Percentile)	Middle Case (50th Percentile)^	Worst Case (95th Percentile)
2021–09–26		248,788*	
2021–10–03	249,590	251,727	256,367
2021–10–10	250,337	254,619	264,023
2021–10–17	251,064	257,518	271,826
2021–10–24	251,782	260,498	279,945
2021–10–31	252,495	263,648	288,425
2021–11–07	253,140	266,870	297,805

*Last reported confirmed cases count
^Closest–matching scenario

Daily Average

6–Week Forecast of Daily Average of Confirmed Cases for New Mexico Based on Data as of 2021–09–26

Week End Date	Best Case (5th Percentile)	Middle Case (50th Percentile)^	Worst Case (95th Percentile)
2021–09–26		581*	
2021–10–03	114	420	1,084
2021–10–10	105	410	1,088
2021–10–17	99	413	1,122
2021–10–24	95	427	1,188
2021–10–31	91	442	1,261
2021–11–07	83	458	1,362

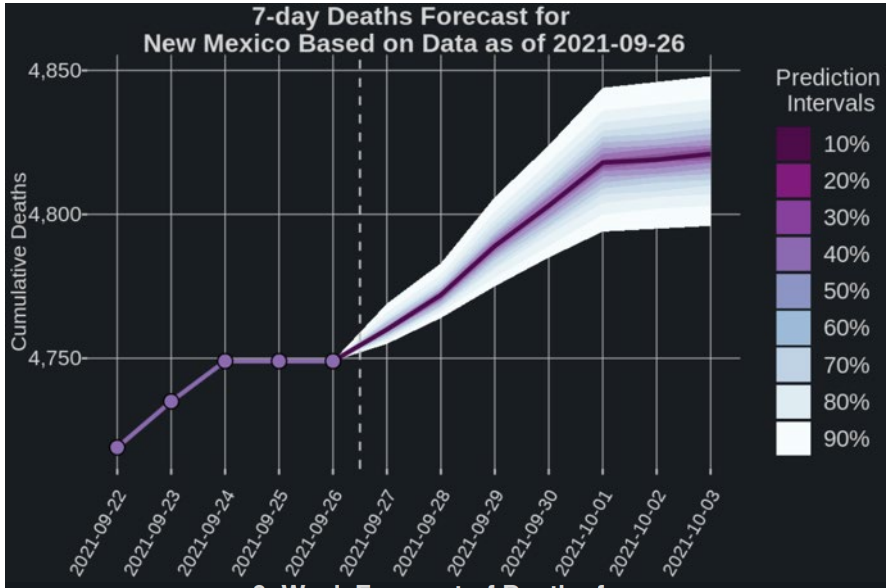
*Last reported confirmed cases count
^Closest–matching scenario

So what?

Our model suggests that the number of daily cases is expected to be around 400 in the next few weeks (middle case scenario)

Short- & Long-Term Forecast for NM: Deaths

Cumulative Cases



6–Week Forecast of Deaths for
New Mexico Based on Data as of 2021–09–26

Week	Best Case (5th Percentile)	Middle Case (50th Percentile)	Worst Case (95th Percentile)^
2021–09–26		4,749*	
2021–10–03	4,796	4,821	4,848
2021–10–10	4,839	4,892	4,956
2021–10–17	4,881	4,967	5,081
2021–10–24	4,920	5,044	5,235
2021–10–31	4,956	5,126	5,427
2021–11–07	4,994	5,214	5,667

*Last reported deaths count
^Closest–matching scenario

Daily Average

6–Week Forecast of Daily Average of Deaths
for New Mexico Based on Data as of 2021–09–26

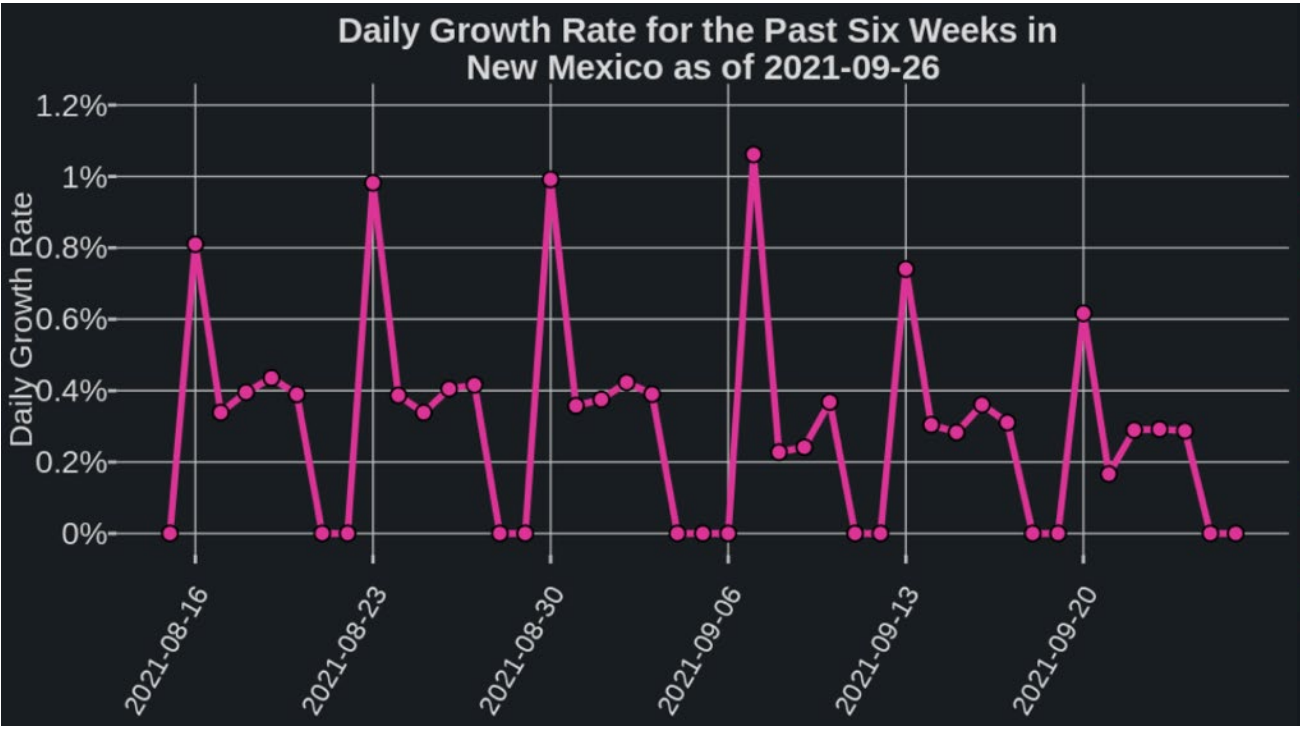
Week Start Date	Best Case (5th Percentile)	Middle Case (50th Percentile)	Worst Case (95th Percentile)^
2021–09–26		11*	
2021–10–03	5	10	16
2021–10–10	5	10	18
2021–10–17	5	10	20
2021–10–24	5	11	24
2021–10–31	5	11	29
2021–11–07	4	12	36

*Last reported confirmed deaths
^Closest–matching scenario

So what?

Our model suggests that the number of daily deaths is expected to range between 5 and 20 in the next few weeks (worst case scenario)

Growth Rate for NM



6-Week Forecast of the Average Weekly Growth Rate for New Mexico Based on Data as of 2021-09-26

Week	Best Case (5th Percentile)	Middle Case (50th Percentile)^	Worst Case (95th Percentile)
2021-09-26		0.24%*	
2021-10-03	0.046%	0.17%	0.43%
2021-10-10	0.043%	0.16%	0.42%
2021-10-17	0.041%	0.16%	0.42%
2021-10-24	0.041%	0.16%	0.42%
2021-10-31	0.040%	0.17%	0.43%
2021-11-07	0.036%	0.17%	0.46%

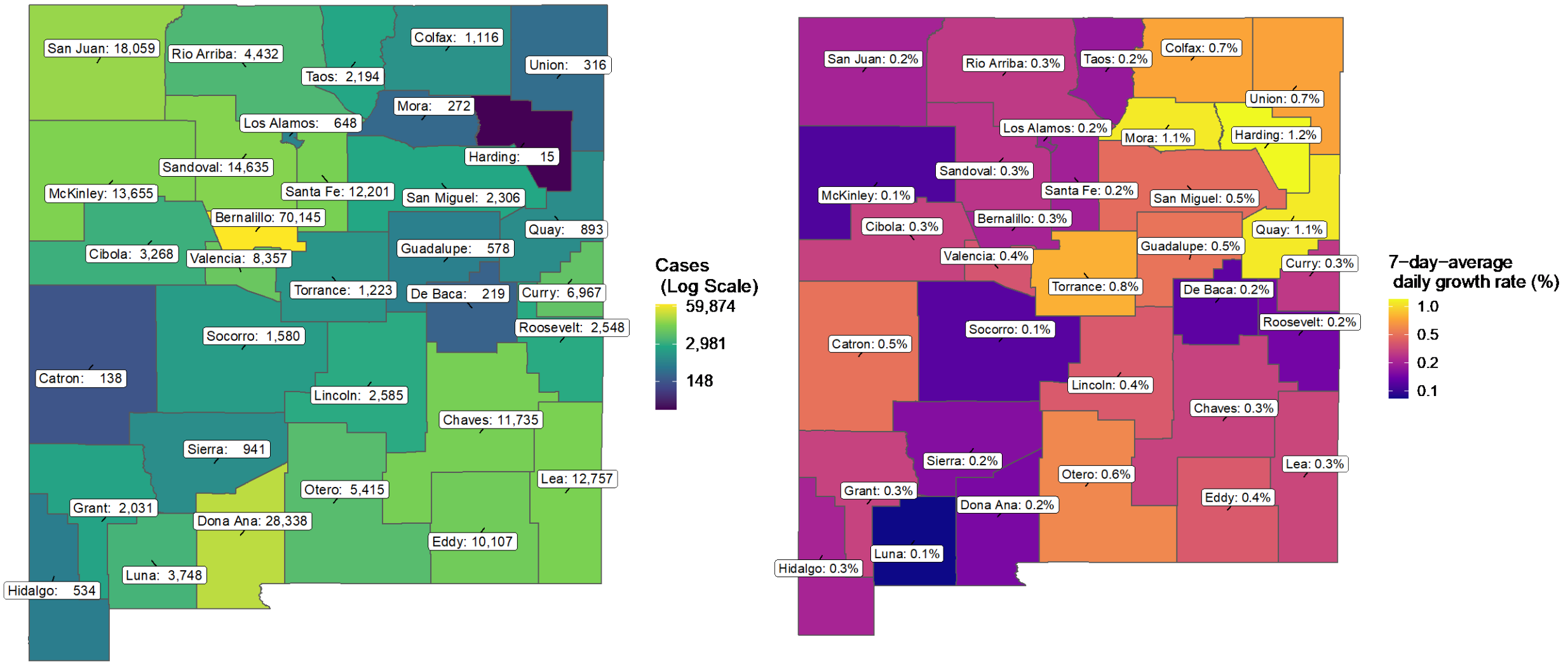
*Last weekly mean daily growth rate

^Closest-matching scenario

So what?

As of September 26th, the average growth rate in NM is at 0.24% (down from 0.27%)

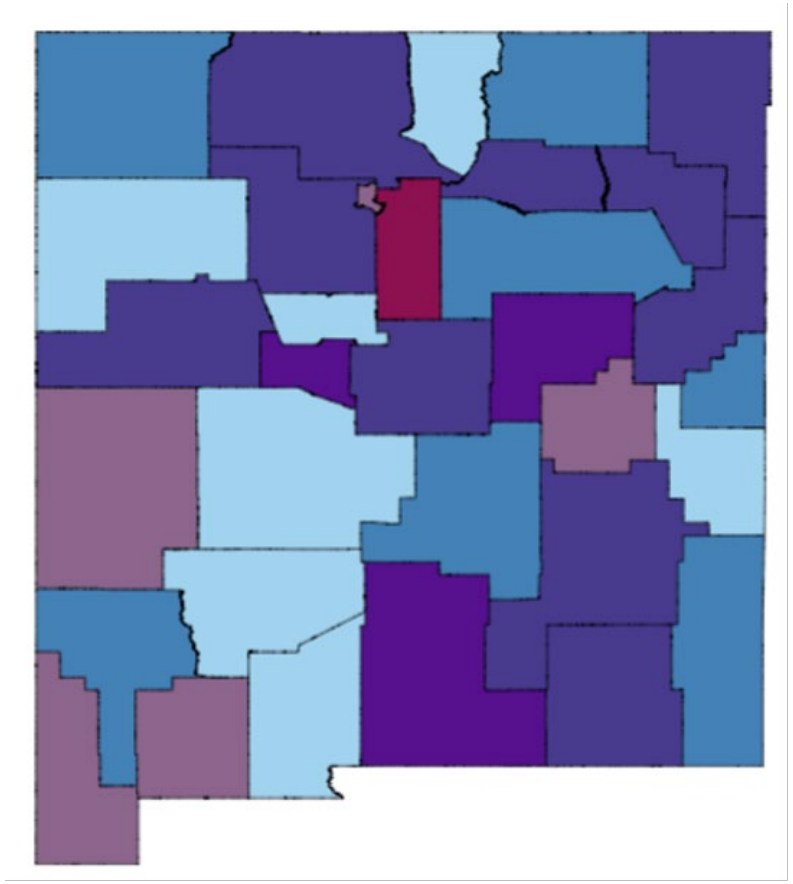
Cumulative Cases & Daily Growth Rate for NM: Sept 27



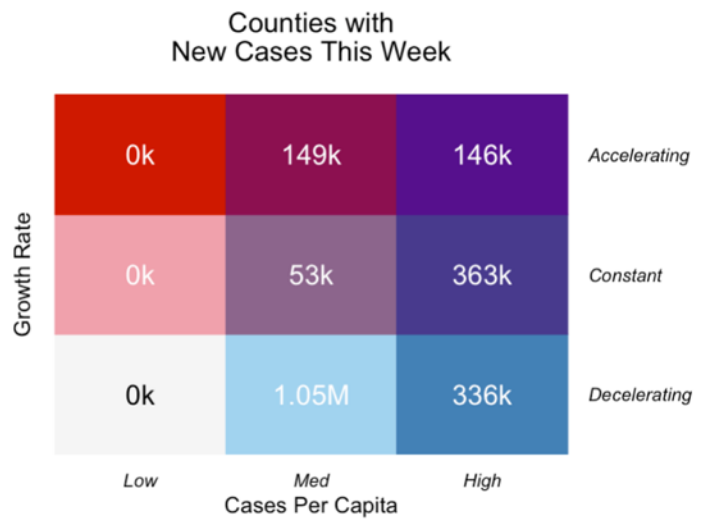
Otero, Torrance, and Northeast corner have increased growth rates

*Growth rate is in cumulative cases

Weekly Growth Rate for NM: Another View (Sept 27)



Impacted New Mexicans



So what?

- Otero, Valencia, Guadalupe are accelerating with high per-capita; Santa Fe is accelerating with medium per-capita
- Most people in New Mexico are living in a county that is medium per-capita case counts and decelerating

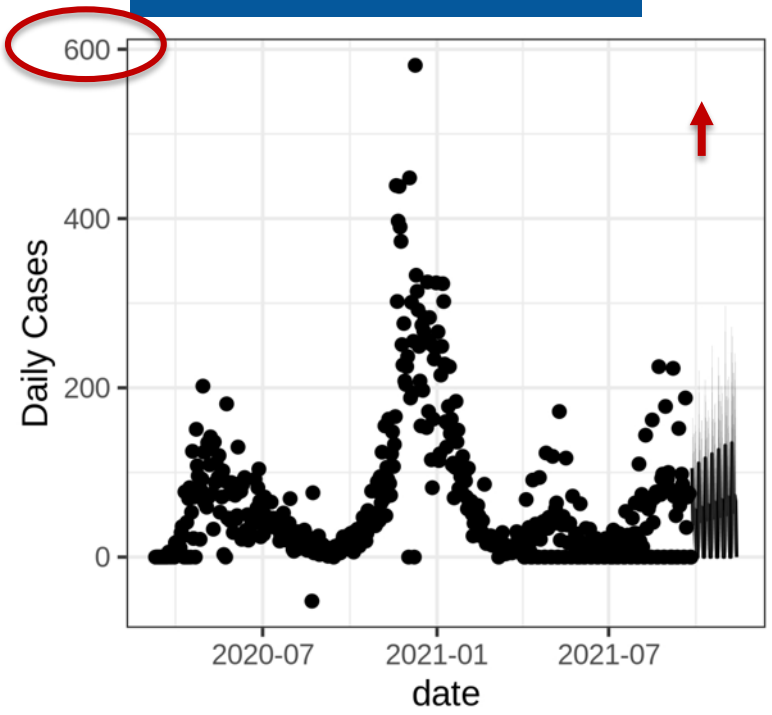
Number of New Mexicans living in regions with particular combinations of per capita case counts and 7-day growth rates

Low <10 cases/100k per week
Med 10-99 cases/100k per week
High >100 cases/100k per week

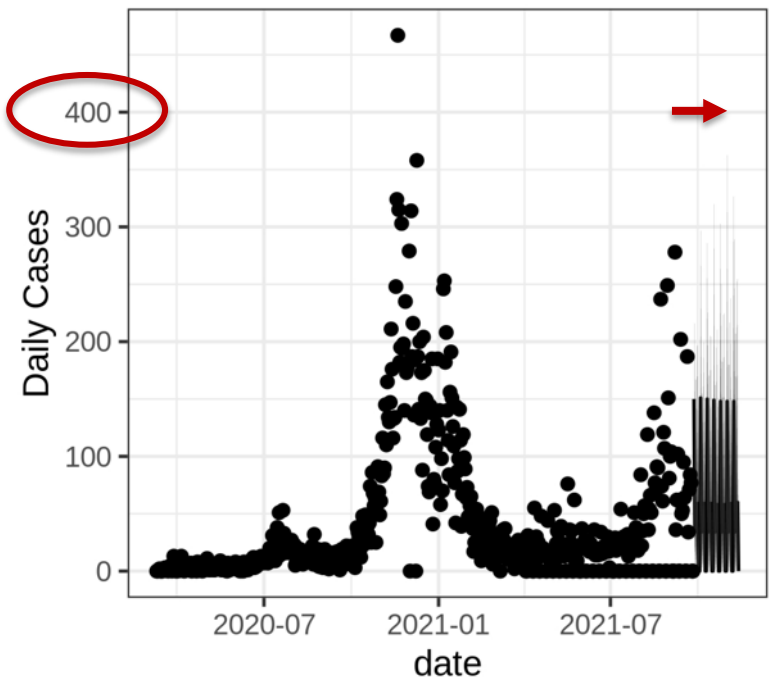
> Additional Regional Forecasts

Central & North Regions Daily Cases Forecast

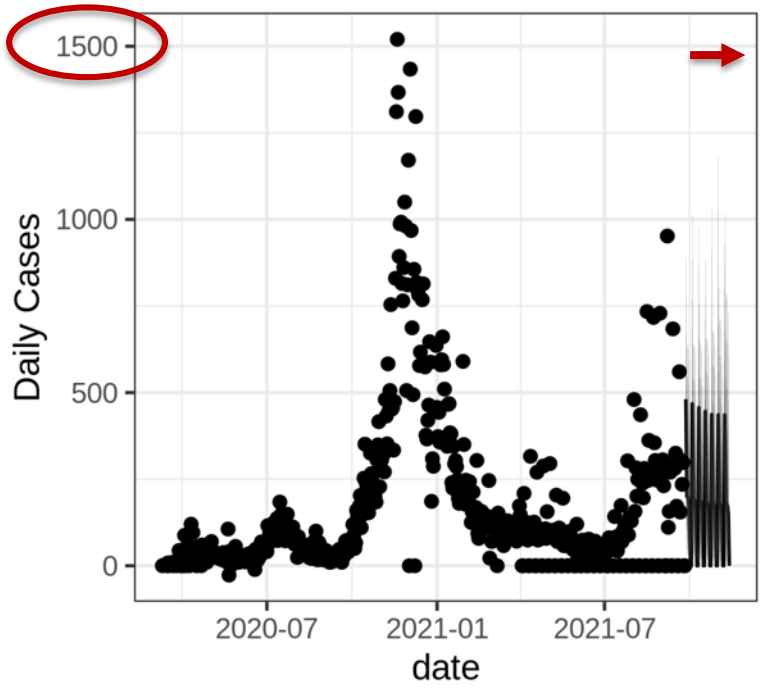
Northwest



Northeast



Central

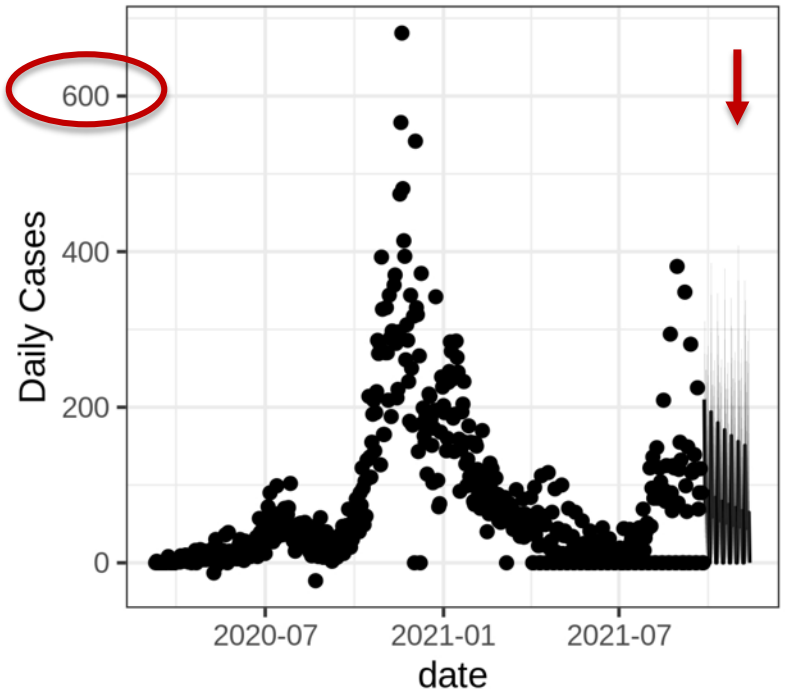


So what?

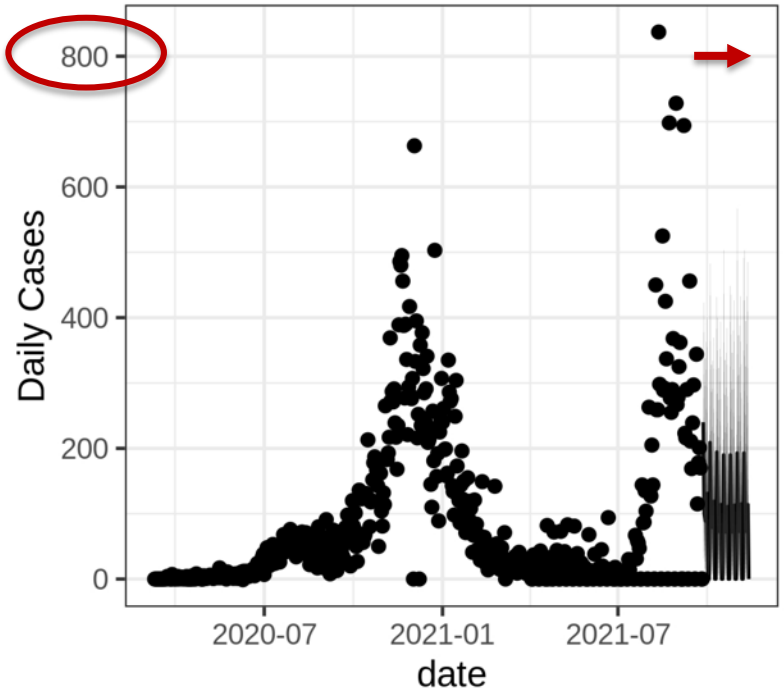
The number of daily cases across most regions appear to plateau but the Northwest may see a slight increase

South Regions Daily Cases Forecast

Southwest



Southeast



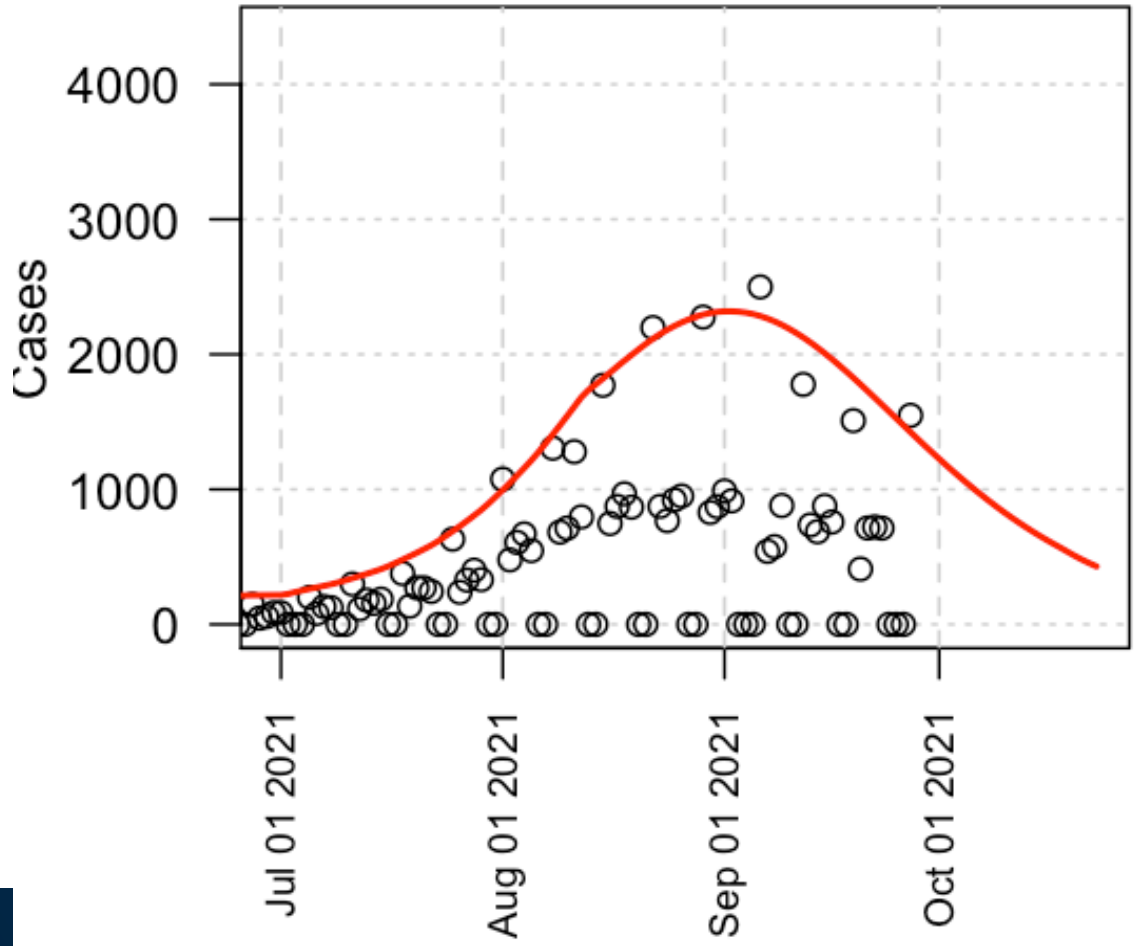
So what?

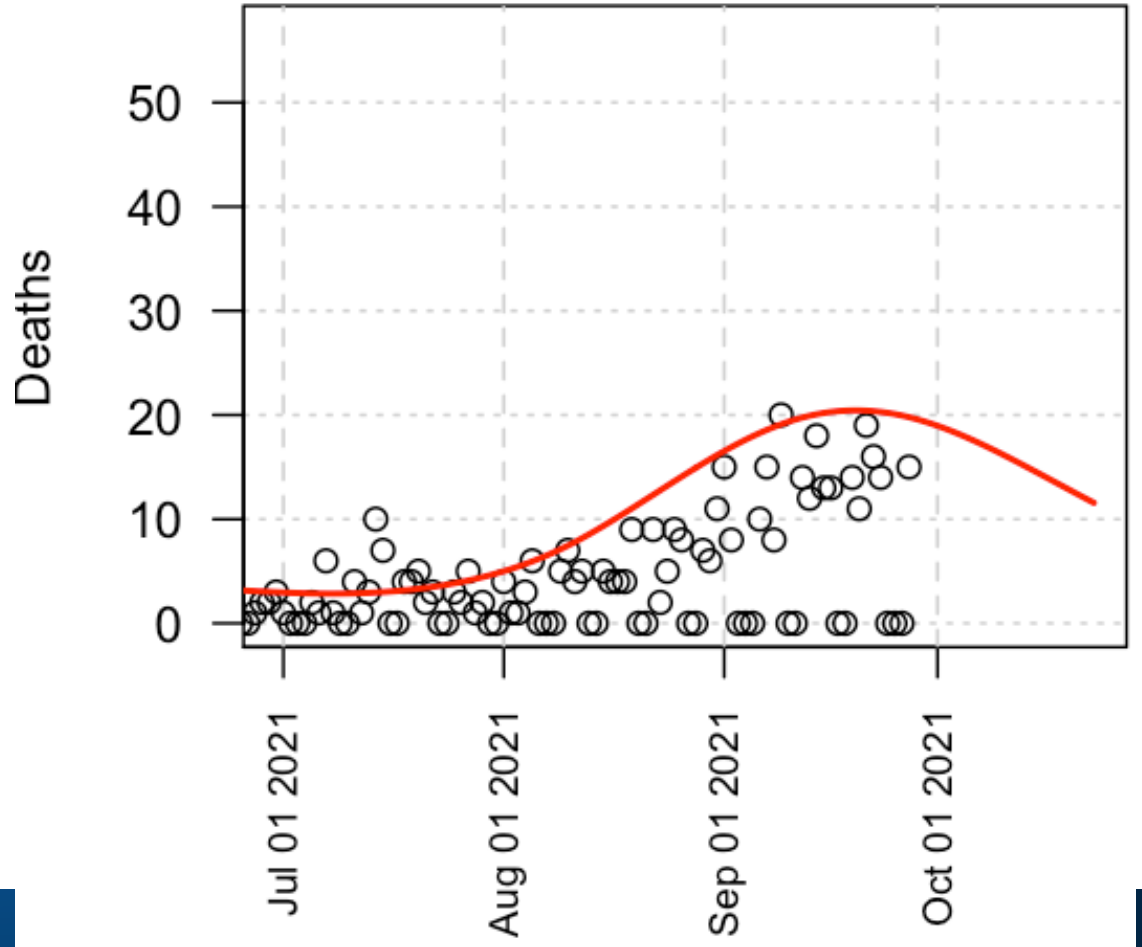
The number of daily cases across the Southeast appear to plateau but the Southwest may see a slight decrease

> Hospitalization Forecast: This analysis will resume shortly

28 Sept 2021: EpiGrid modeling

- NM daily incidence remains consistent with the model. *Caution: Week-on-week cases are flat for the last week.*
- By-county time dependence continues to be highly heterogeneous.
- Effectiveness of *some* mitigations likely improving (i.e. tracing, followed by quarantine or isolation).
- NM daily deaths will likely peak in September. A long tail into October is certain.



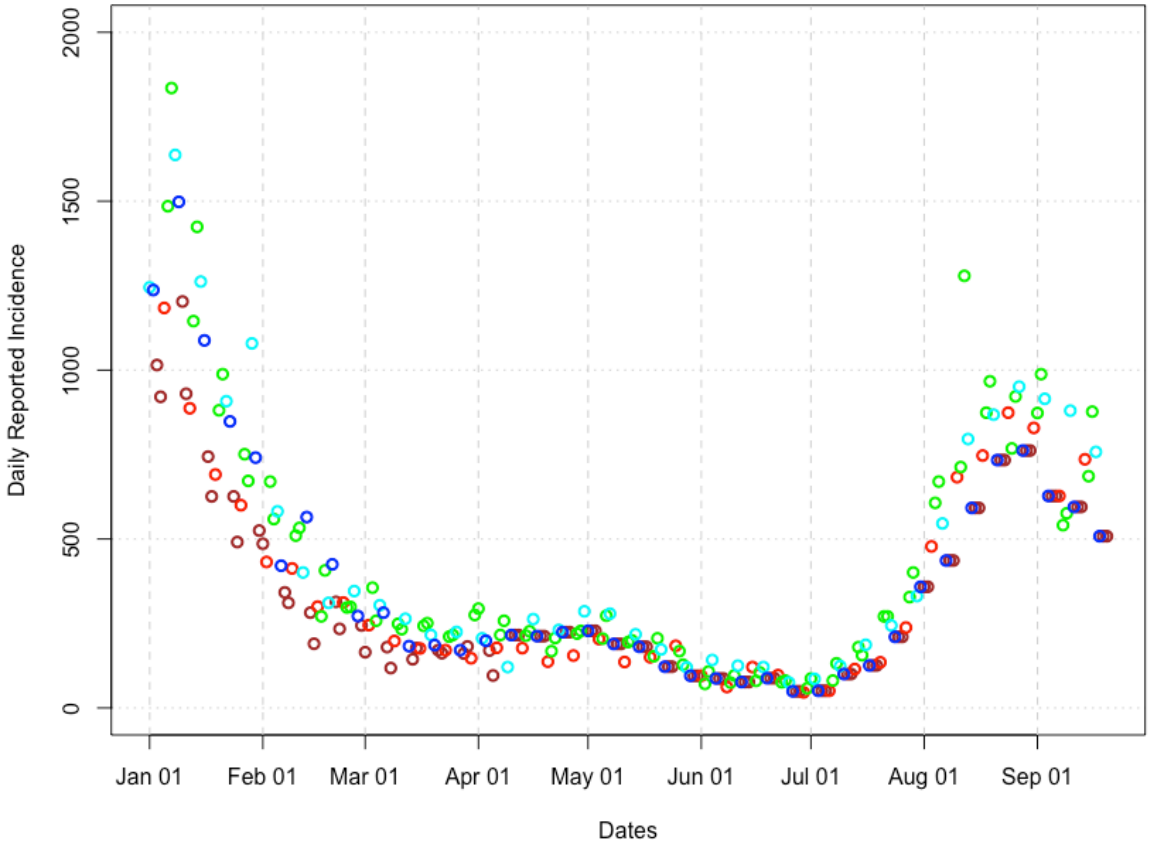


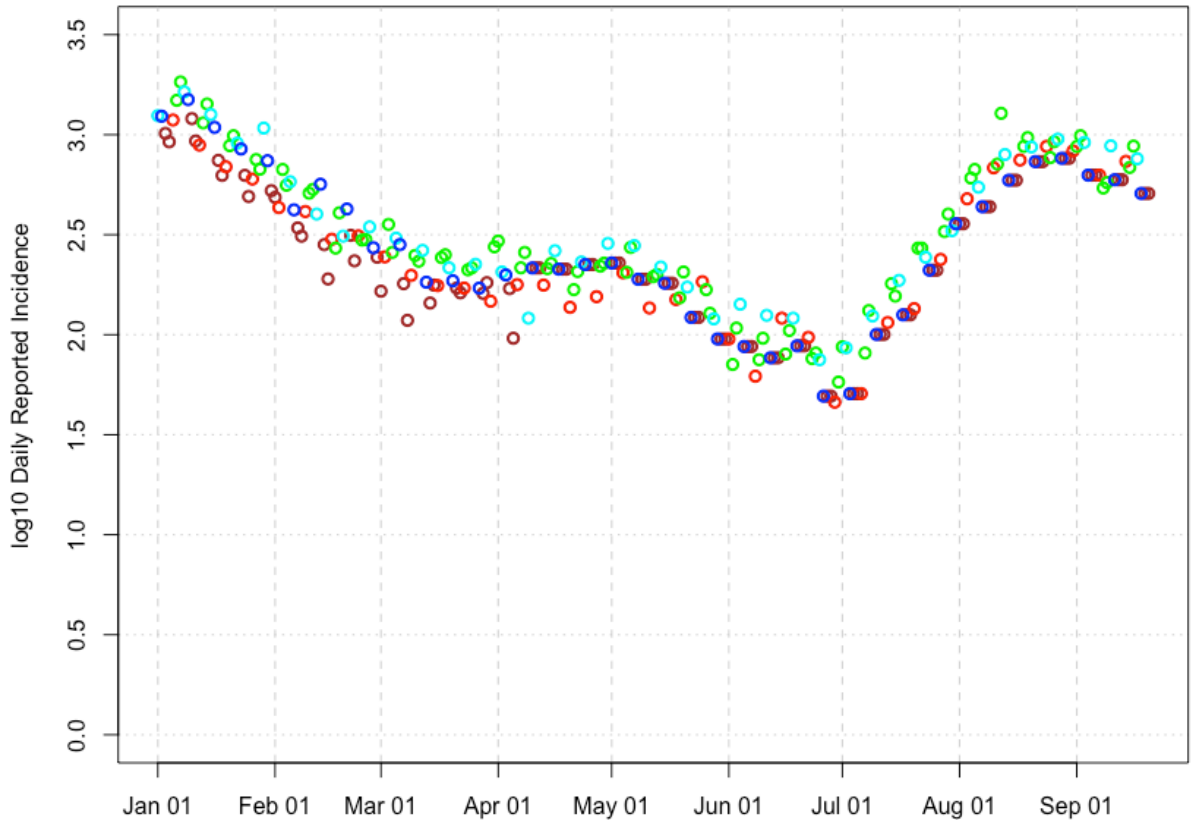
A look at the raw incidence data

- Sunday, Monday
- Tuesday
- Wednesday/Thursday
- Friday
- Saturday

Cases rates are *down* due to mitigations.

The 190 cases in the Lea county correctional facility are removed from data reported on March 26th. The 1/3 of reported cases that were > 2 weeks prior were removed from March 24th. Case reported for weekends starting April 10-12th are each divided by 3 to estimate individual day counts.



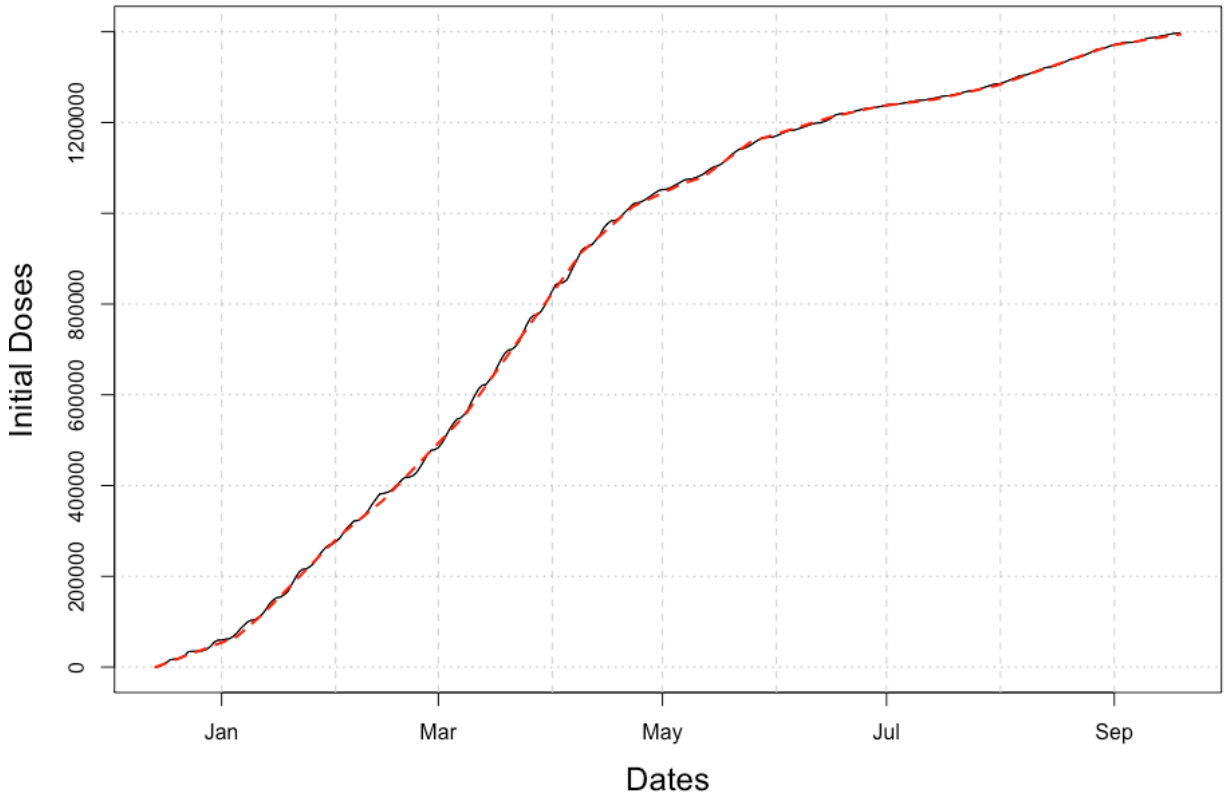


28 September 2021 Vaccine Analysis and Summary

- **~1404k first doses have been administered in NM.**
- **~1235k completed vaccine series in NM.**
- **Epigrid is modeling this as 1407k first doses.**
- **~67.1% of all persons in New Mexico are at least minimally vaccinated.**
- **~85.5% of all persons in New Mexico are currently eligible (~1792k).**
- **Time to completely vaccinate all eligible at the current rate is ~18.4%□0.5%/week = ~37 weeks; mid-June 2022.**
- **Federal vaccine orders: 8 December 2021**
- **Federal civilian employees**
  - in the US: 1847k,
  - in NM: 22k
- **Federal contractor employees in the US:**
  - Large …
- ***Safe* relaxation of masking orders will be difficult for months to come based on current vaccination rates.**

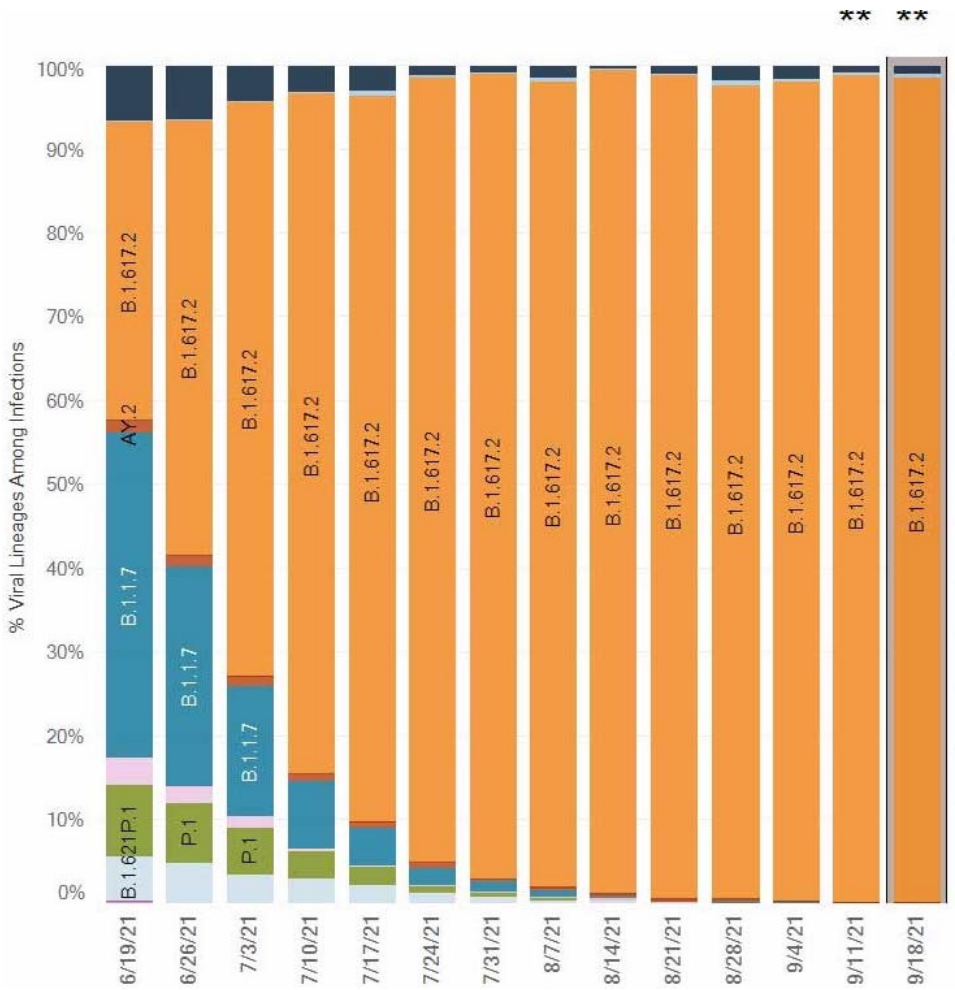
Black – vaccination for all New Mexicans

Red – First dose data used in EpiGrid.



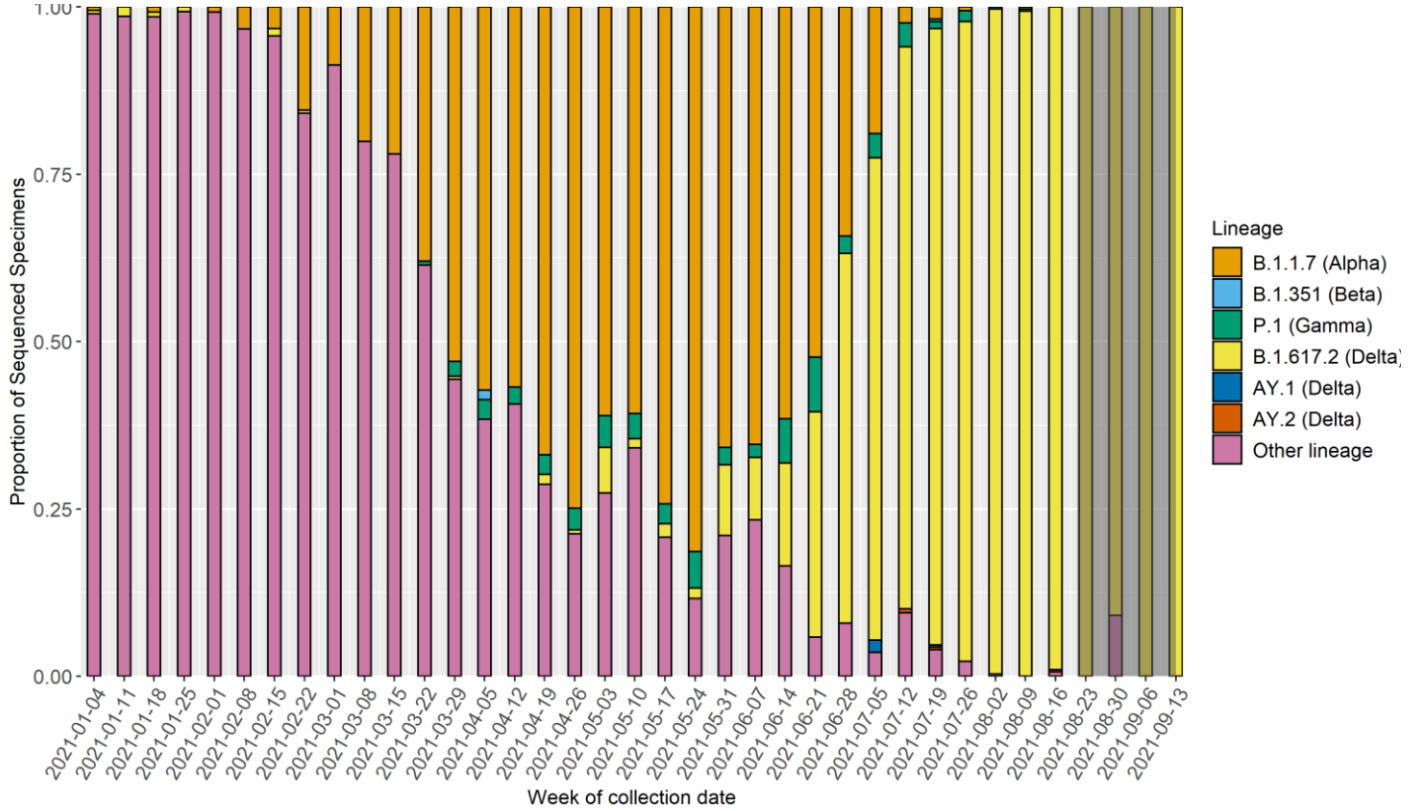
Variants: Still Delta-dominant.

https://www.cdc.gov/coronavirus/2019-ncov/covid-data/covidview/index.html



B.1.617.2, "Δ" is the "Indian variant"
B.1.1.7, "α" is the "UK variant" (apparently now minor)
P.1 is the "Brazil variant" (apparently now minor)

New Mexico's data are consistent with Delta being dominant.



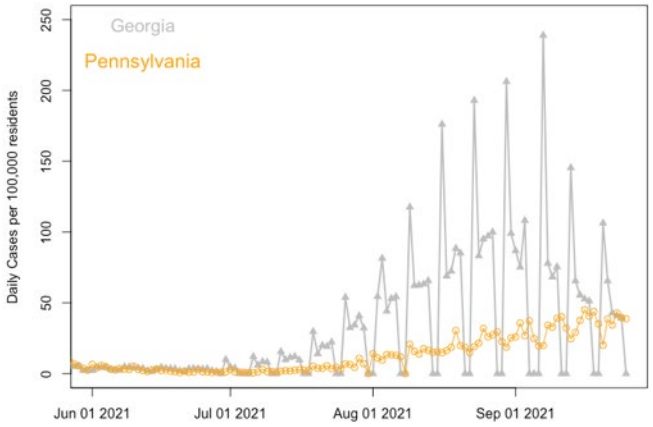
https://www.cdc.gov/coronavirus/2019-ncov/covid-data/covidview/09242021/images/variants1_09242021.jpg?_=34227?noicon

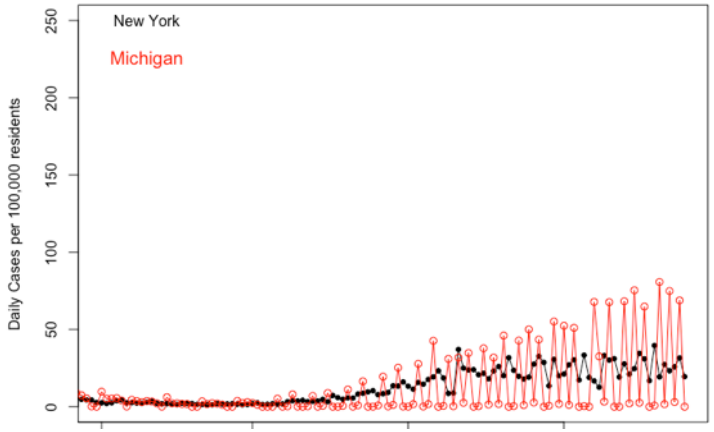
What is happening in the rest of the U.S.? The 10 most populous states and New Mexico

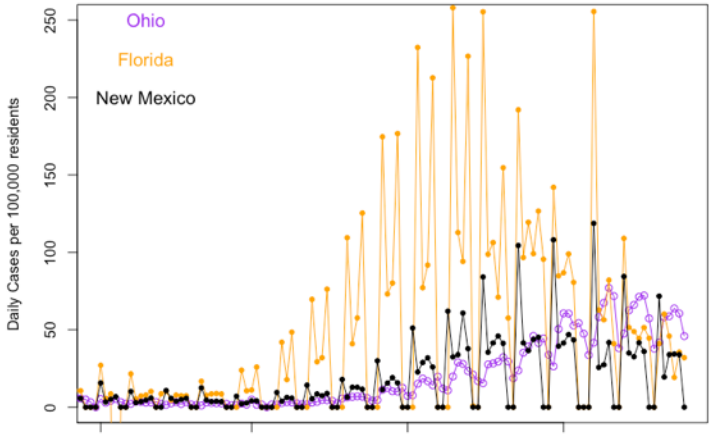
Trends over the last 3 weeks: Increasing: Pennsylvania. Steady: Michigan, Ohio, New York. Modest Declines: N. Carolina, Texas. Declining: California, Florida, Georgia, Illinois, New Mexico.

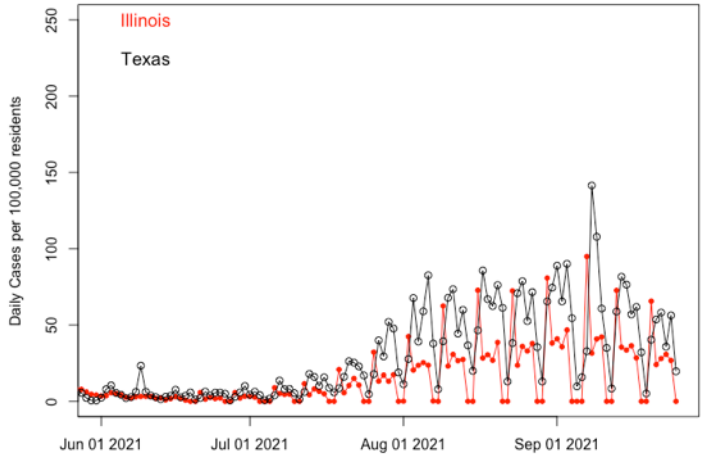
	Cases	Deaths
New York	26.62	0.203
Michigan	32.84	0.306
Ohio	52.4	0.426
Florida	33.42	1.523
New Mexico	27.61	0.502
Illinois	25.06	0.301
Texas	38.45	0.984
California	17.53	0.254
North Carolina	51.53	0.654
Georgia	42.11	1.141
Pennsylvania	35.62	0.316

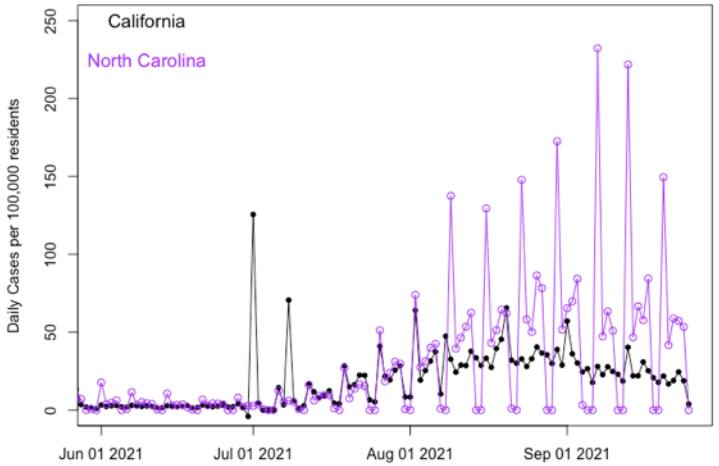
Daily rates per 100,000 residents averaged September 13th thru September 27th 2021.





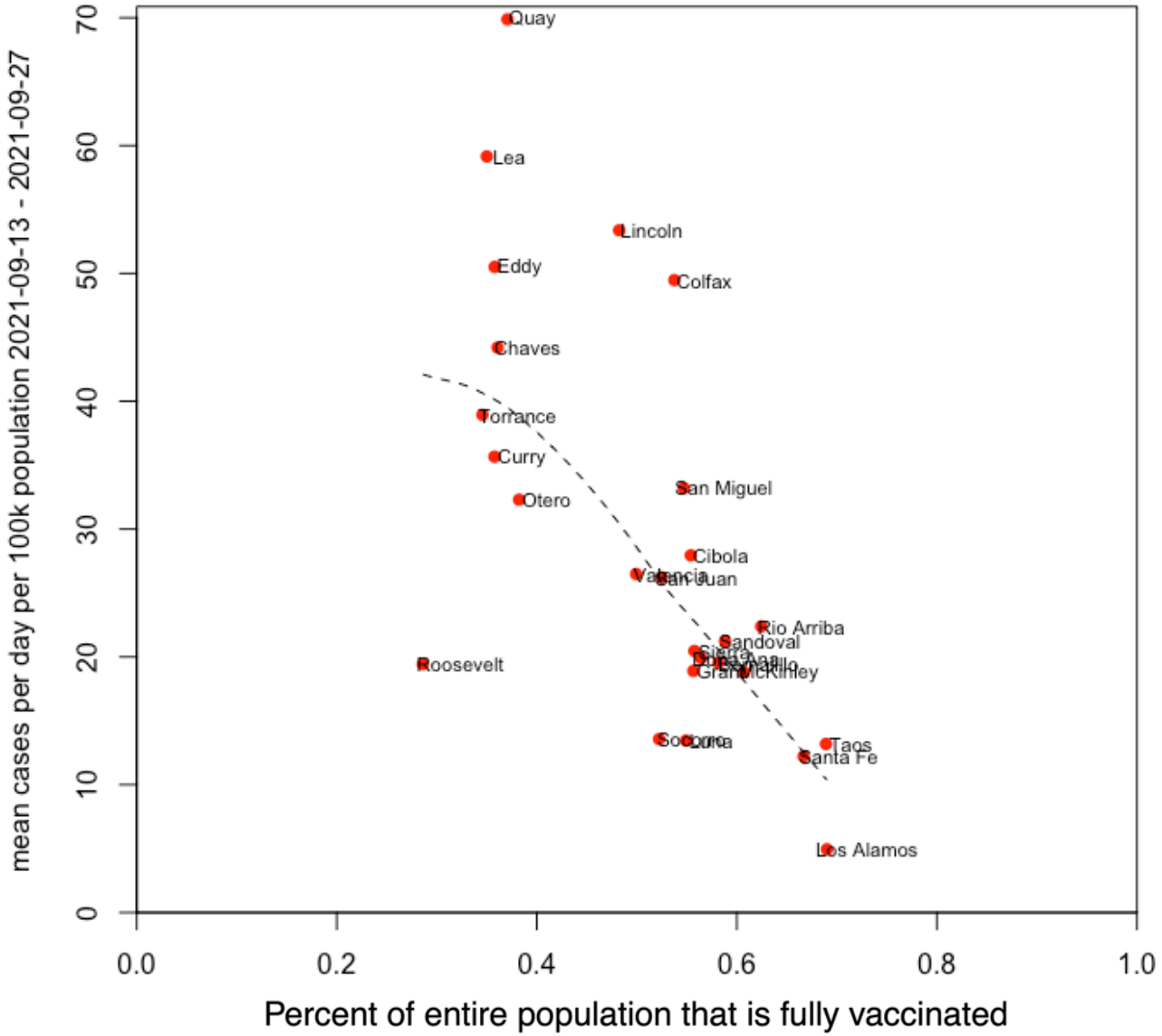






State-wide epidemics continue to be strongly heterogeneous.

Cases plotted versus vaccination by county



The relationship between vaccination and cases is strong and **highly** protective on a by-county basis.

Infection control *relative to vaccination rates*.

- Quay County daily incidence has risen very high.
- Lea, Lincoln, Colfax Counties are high.
- Eddy, Chaves, San Miguel, Cibola, and Rio Arriba Counties are marginally high compared with vaccination.
- Socorro, Los Alamos, Roosevelt, and Luna have better than typical incidence compared to vaccination.
- Seven counties are not on this plot due to relative isolation and small populations: Catron, De Baca, Guadalupe, Harding, Hidalgo, Mora and Union.

Vaccination rates are uniformly low in: Quay, Lea, Eddy, Chaves, Torrance, Curry, Otero, and Roosevelt Counties. All have rates below 40% of their total population.

- Most counties continue to have high absolute transmission, well above 10 per 10^5 per day.
- Further improvement in both vaccination and infection control are crucial to minimizing the pandemic's burden.
- Improvement in low vaccination rate regions benefits all counties because travel drives epidemic spread from areas of high incidence.

Recent by-county *trends* in daily incidence (are things getting better?)

- Trends, meaning time-dependence, not magnitude
- Per capita normalization not needed here (trends, not magnitude)
- Not referenced to vaccination rates (see the previous slide)
- Not referenced to whether the situation is currently intermediate, bad, or really bad. Barely reaching good anywhere in the USA.

- **Counties with falling incidence: Bernalillo, Chaves, Curry, Eddy, Sandoval.**

- **Counties with slowly falling incidence: Colfax, Dona Ana, Lea, Los Alamos, McKinley, Roosevelt, San Miguel, Santa Fe, Socorro, Taos, Valencia.**

- **Counties with steady incidence: Grant, Guadalupe, Hidalgo, Lincoln, Luna, Mora, Otero, Rio Arriba, San Juan, Sierra, Torrance, Union.**

- **Counties with rising incidence: Quay.**

Need a broad understanding of what makes good infection control. It is plausible that the Delta variant is sufficiently contagious that residents have to re-learn what constitutes good infection control because lessons learned during the Alpha variant wave are no longer correctly calibrated.

Comparisons of what is "what works" for infection control differs between areas with 70+% vaccination and those with ~35% vaccination.

Hospital bed concurrent usage by COVID-19 patients (Statewide)

- Left panel: linear vs. time (y-scale = 0:800)
- Right panel: log vs. time (y-scale = 40:800, 20x)
- Deviation of the data below the model is evident beginning on ~19 August.
- Flattening of the hospital load data is due to improved disease outcomes and or other factors not present from March through late July or early August, 2021.
- An empirical, linear extrapolation of data seems useful at this point in time.