Modeling & Forecasting COVID-19 in NM

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October 5, 2021

NNSA
National Nuclear Security Administration

Cumulative Cases & Daily Growth Rate for NM: Oct 4
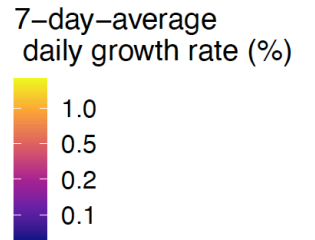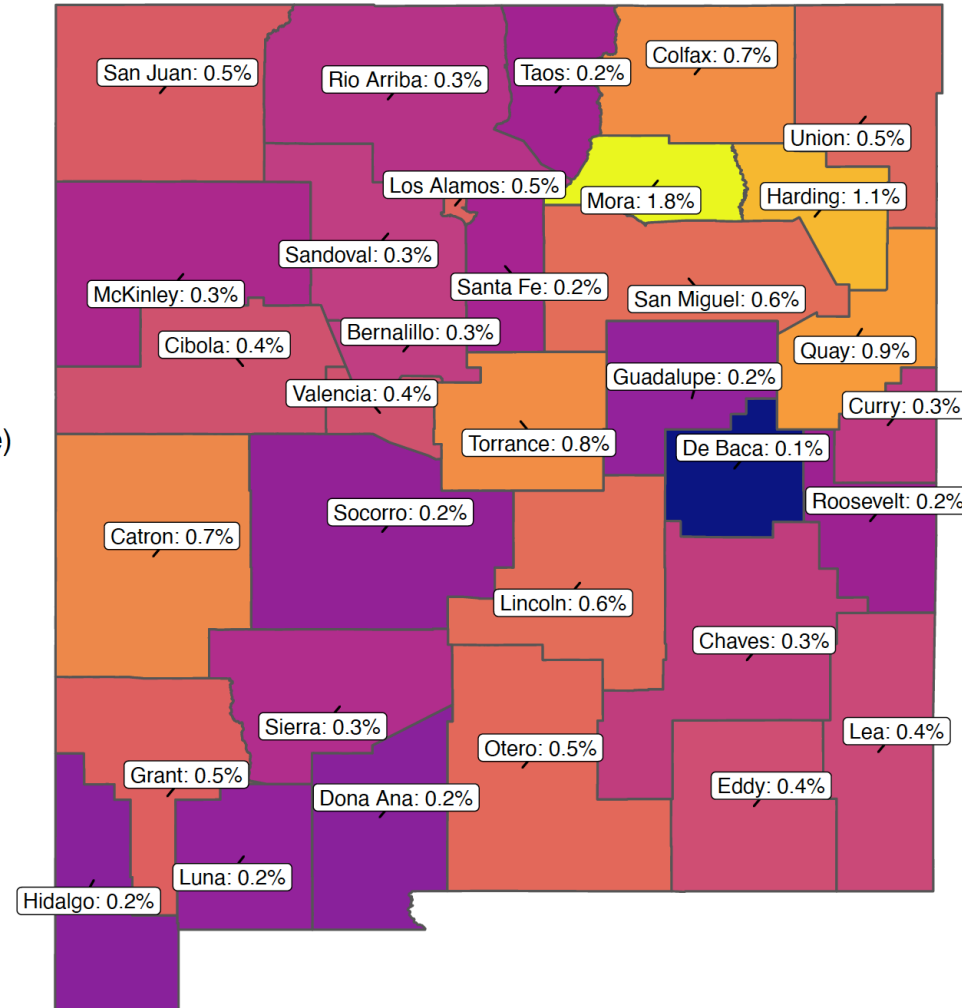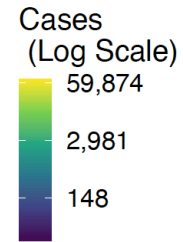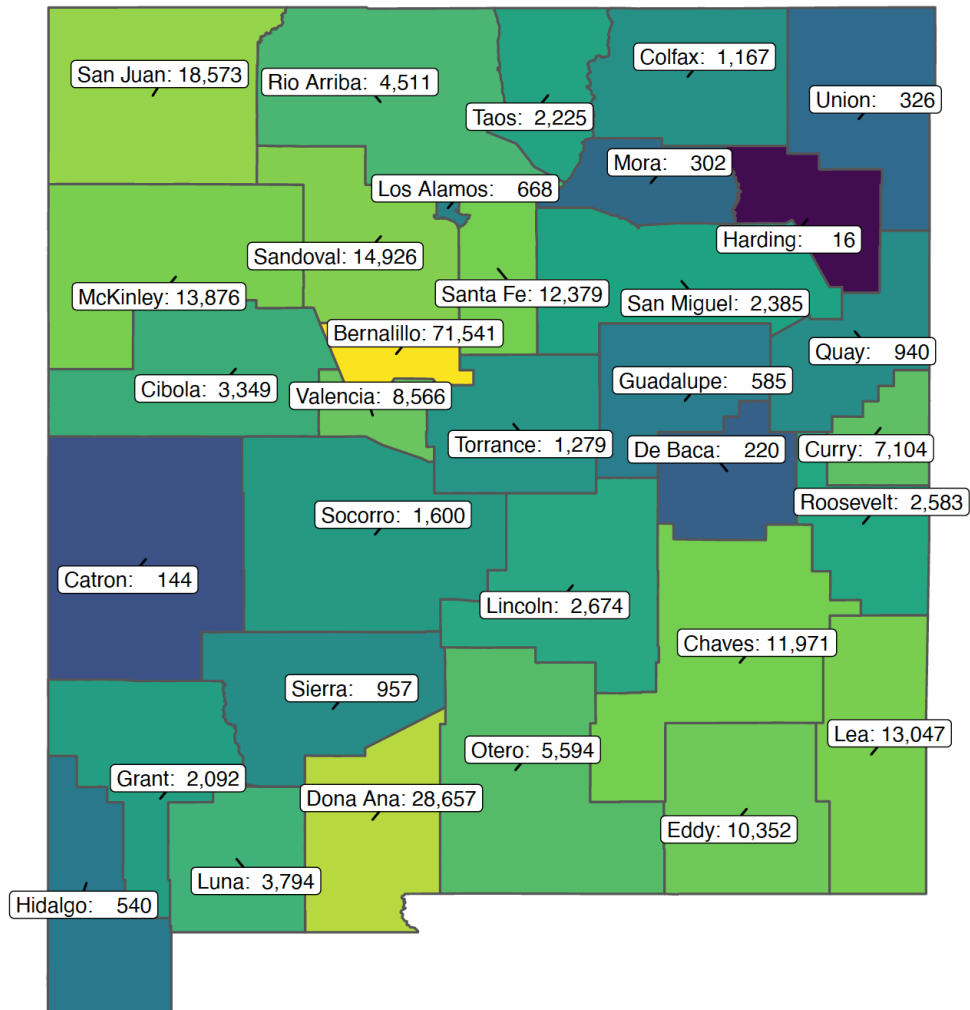
Cumulative growth rates are overall decreasing in NM *Growth rate is in cumulative cases

Weekly Growth Rate for NM: Another View (Sept 20)

Impacted New Mexicans

Counties with New Cases This Week

	Low	Med	High	
Accelerating	0k	0k	1.14M	

Growth Rate (vertical axis)

Accelerating	0k	0k	1.14M
Constant	0k	78k	138k
Decelerating	0k	408k	328k

Cases Per Capita

Counties With No New Cases In ...

Last Week	Two Weeks	3+ Weeks
0k	0k	0k
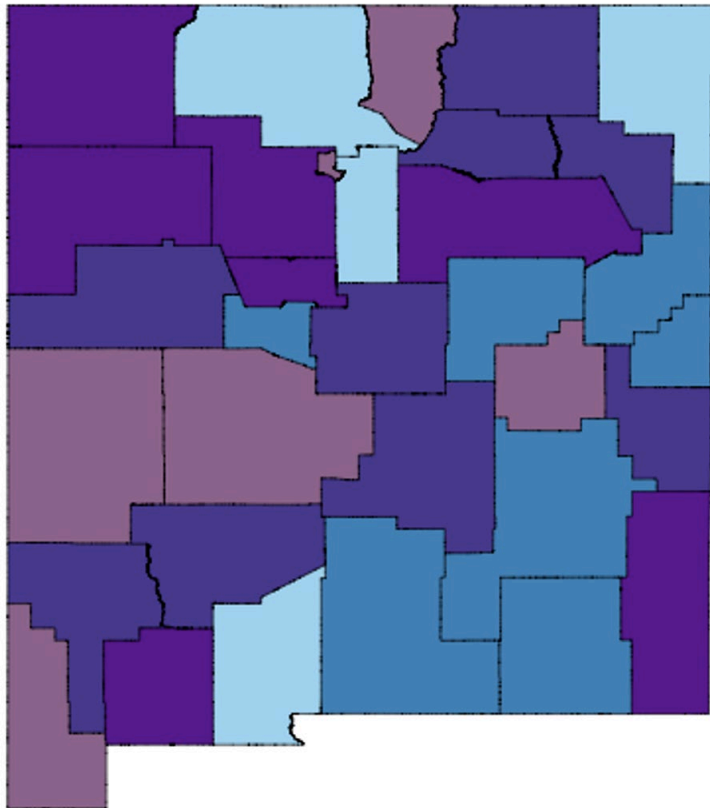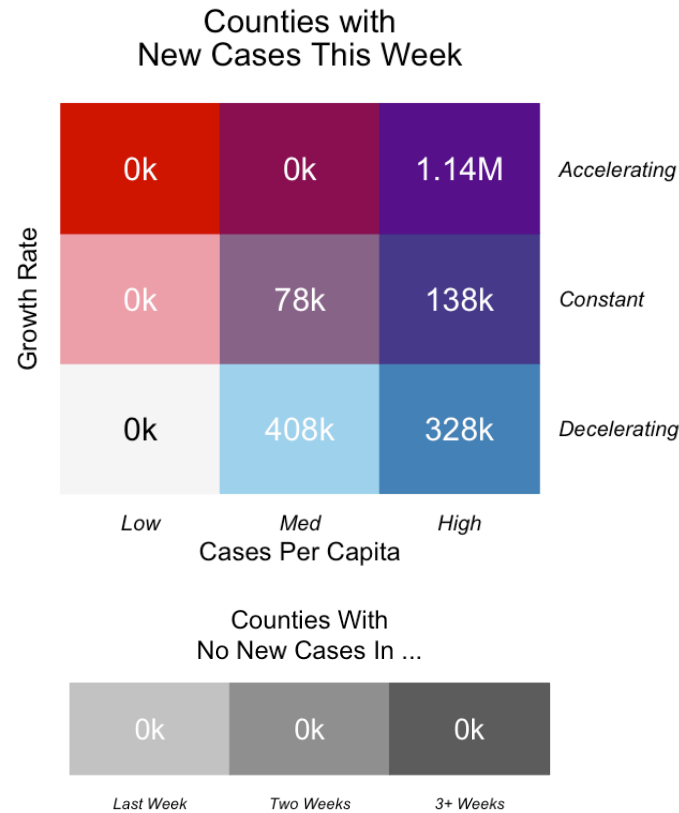
So what?

- **Most people in New Mexico are living in a county that is high per-capita case counts with mixed 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

5 Oct 2021: EpiGrid modeling

- NM daily incidence are generally consistent with model amplitude. Rate of decline has deteriorated.
- This model may be optimistic.
- By-county variation is very large; *some locales are failing to control the SARS-CoV-2 Delta variant.*
- NM daily deaths may have peaked in September. A tail into October is occurring. This is an approximately three-week lagging indicator.
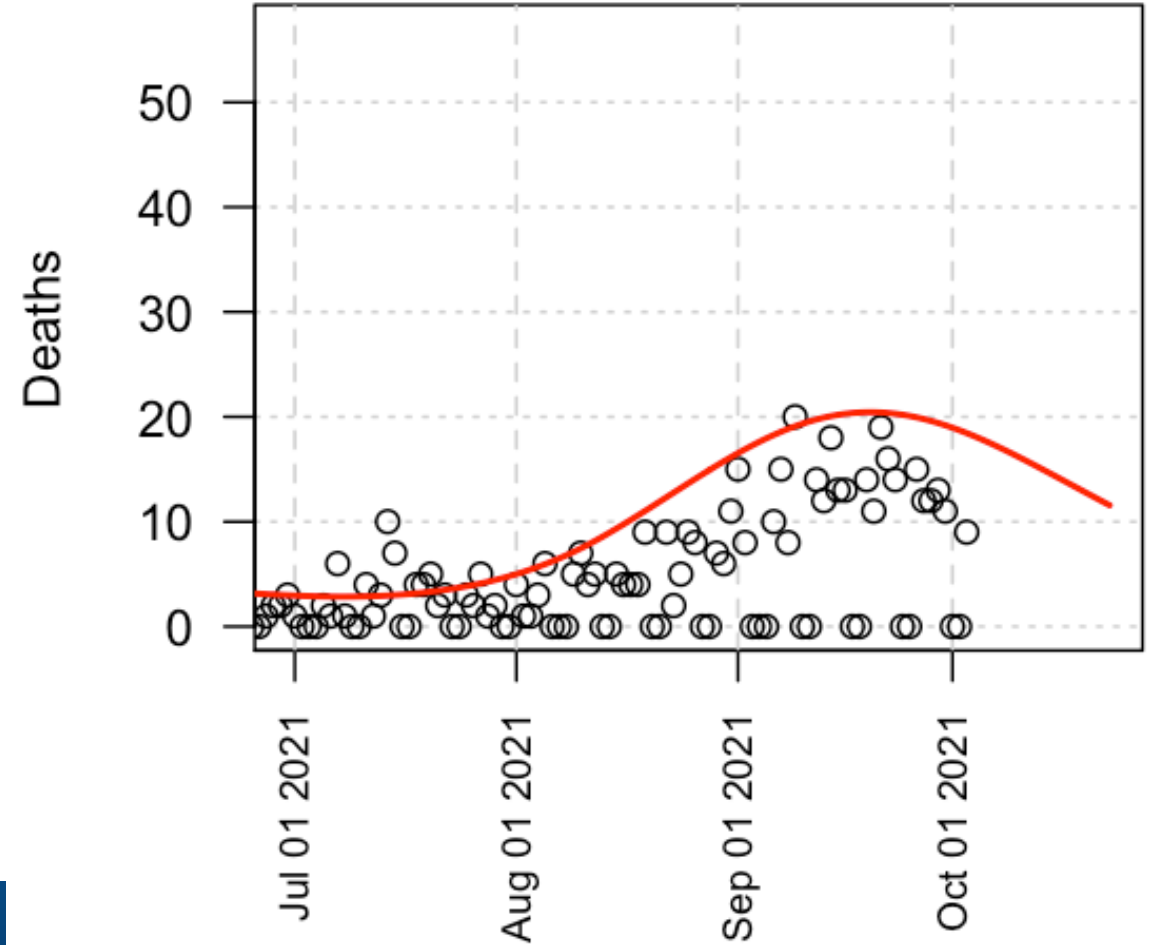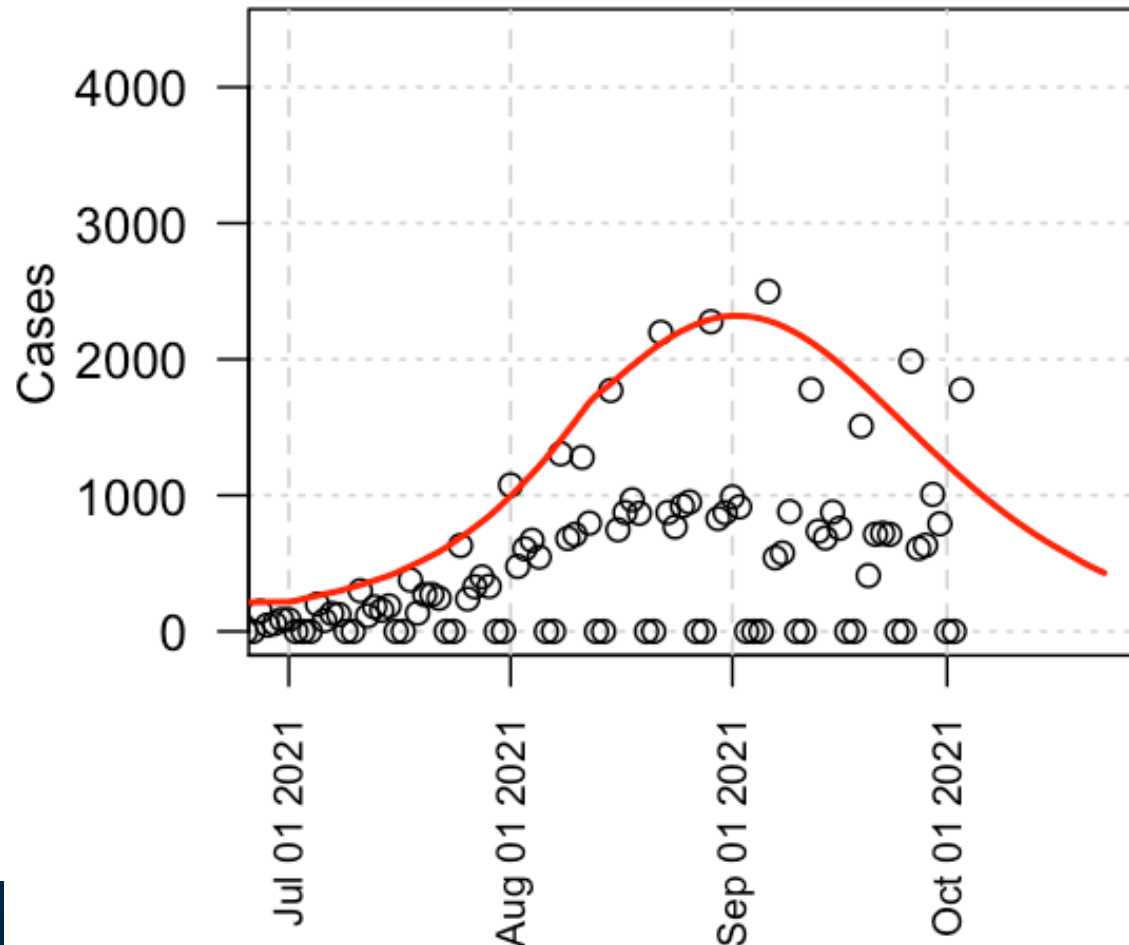
A look at the raw incidence data

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

Cases rates are leveling at a high incidence.

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.
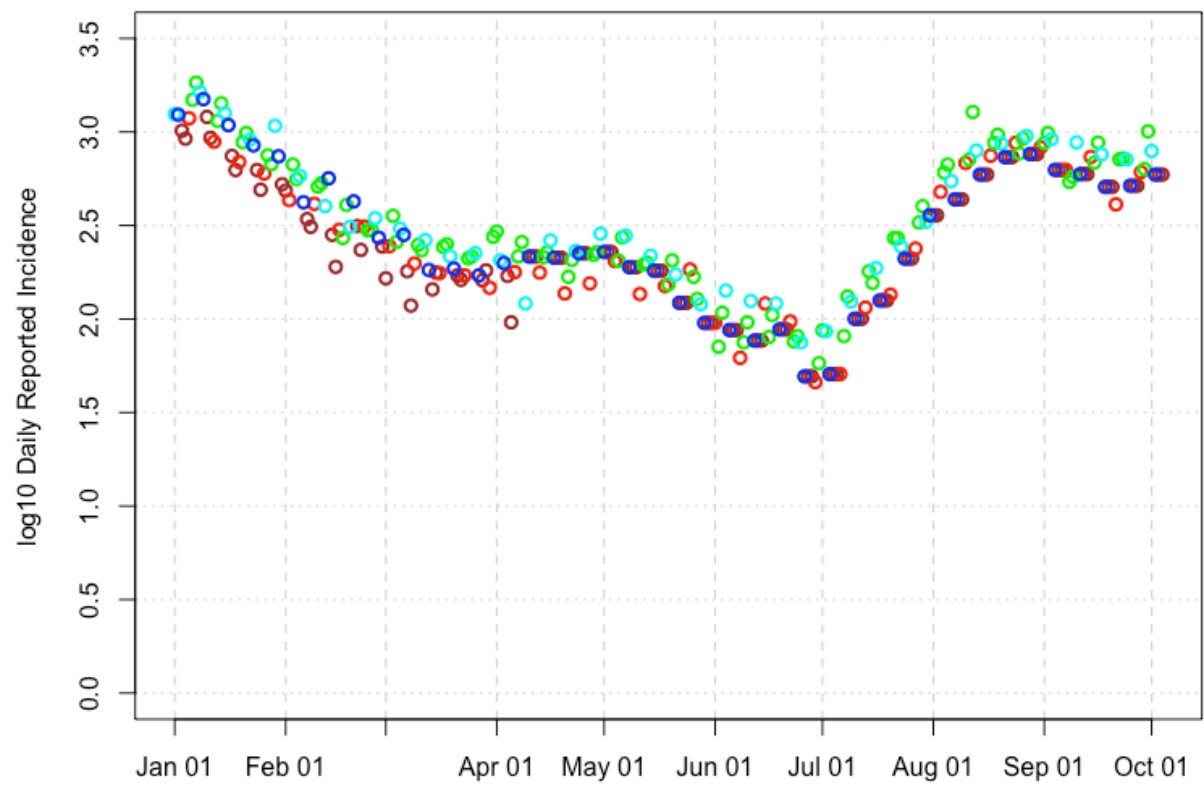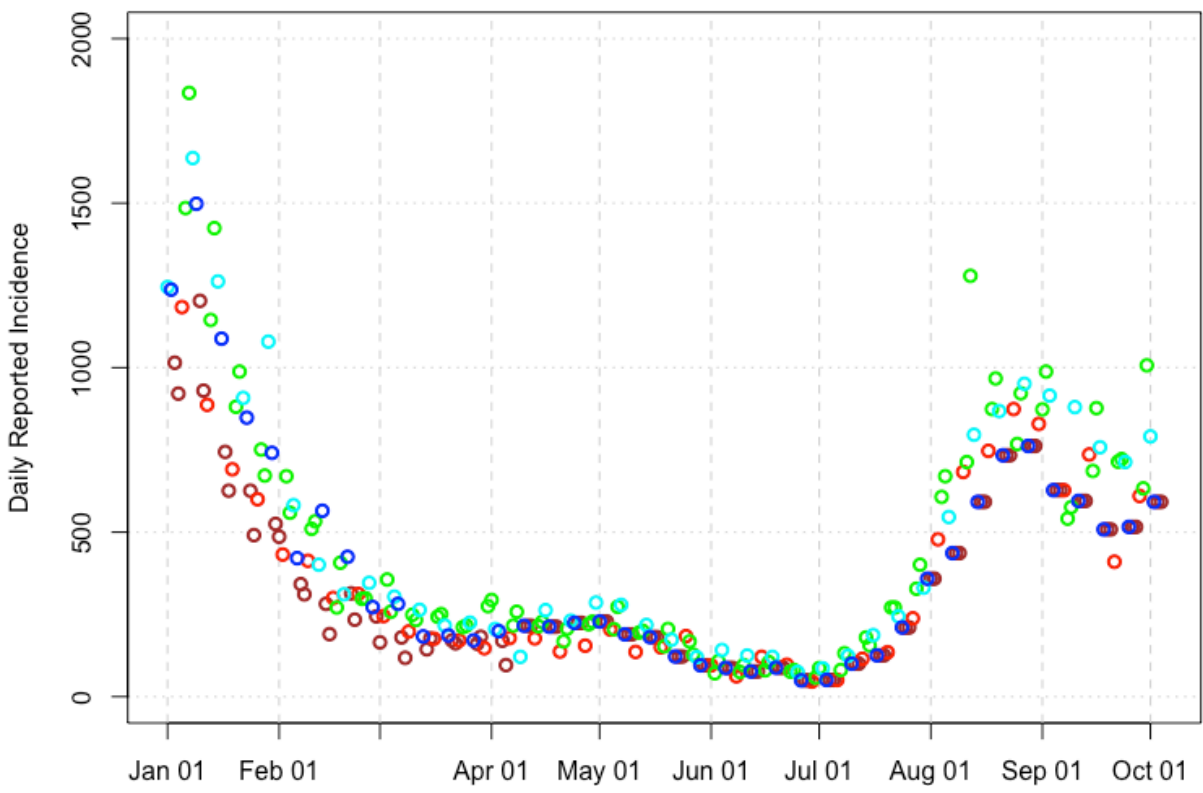
5 October 2021 Vaccine Analysis

- **~1415k first doses have been administered in NM.**
- **~1248k completed vaccine series in NM.**
- **~67.5% of all persons in New Mexico are at least minimally vaccinated.**
- **~85.5% of all persons in New Mexico are currently eligible (~1792k).**

Black – vaccination for all New Mexicans

Red – First dose data used in EpiGrid.
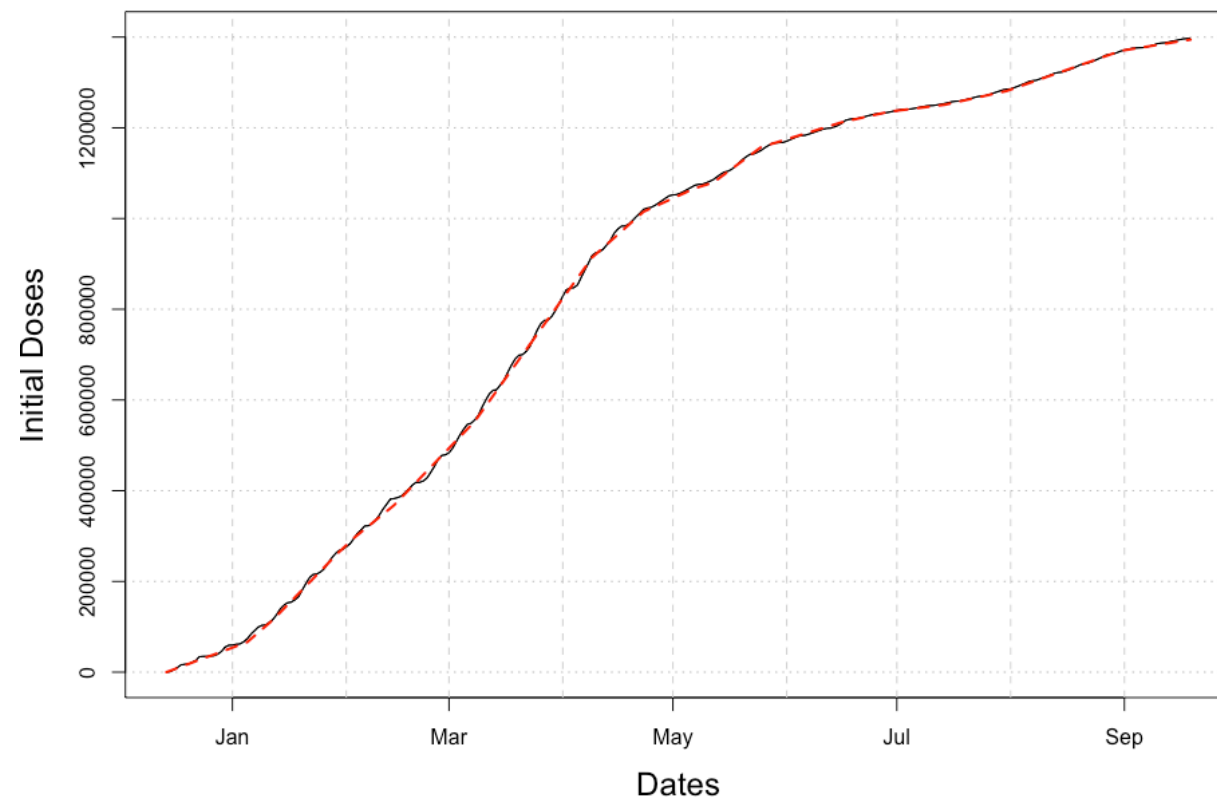
Variants: Still Delta-dominant.

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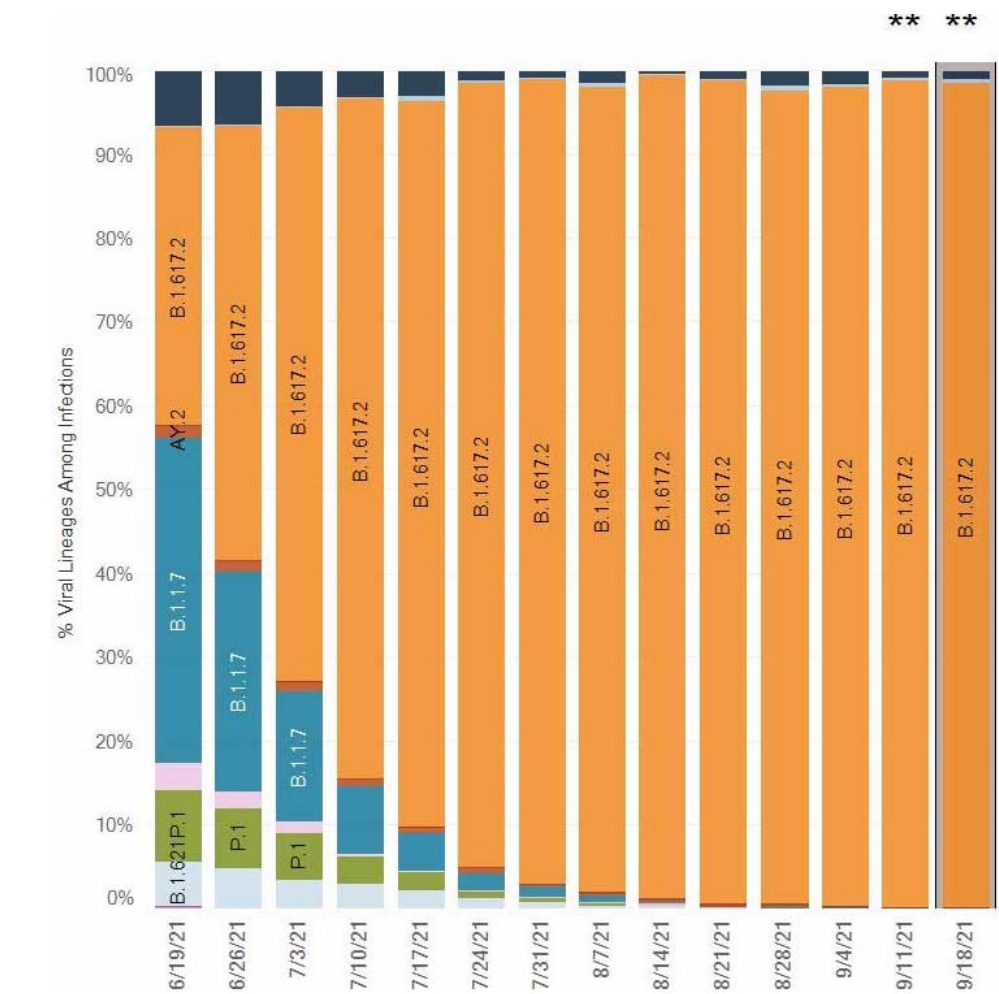
https://www.cdc.gov/coronavirus/2019-ncov/covid-data/covidview/09242021/images/variants1_09242021.jpg?_=34227?noicon

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: Michigan. Steady: N. Carolina, New Mexico, Pennsylvania, New York.
Modest Declines: Illinois, Ohio. Declining: California, Florida, Georgia, Texas.
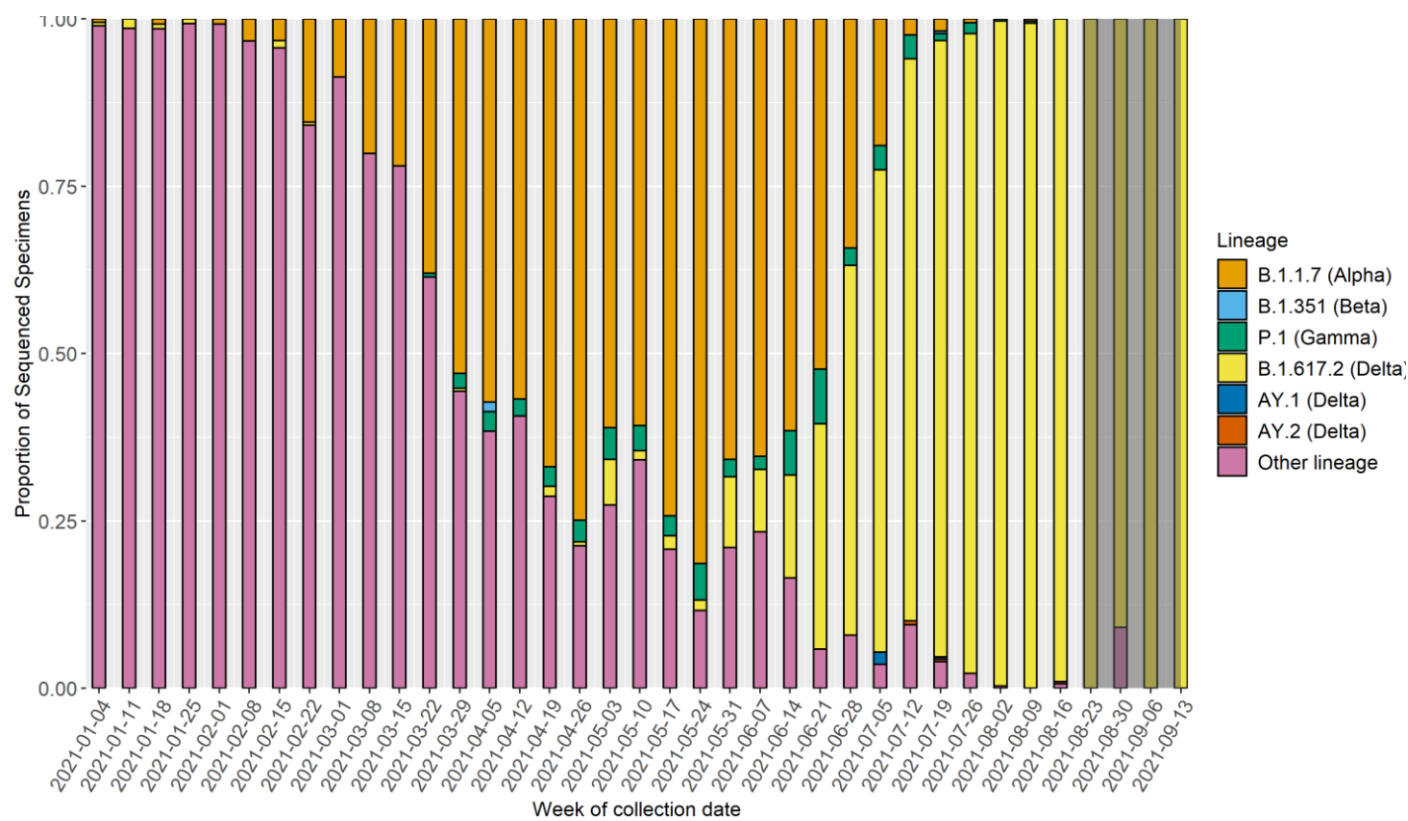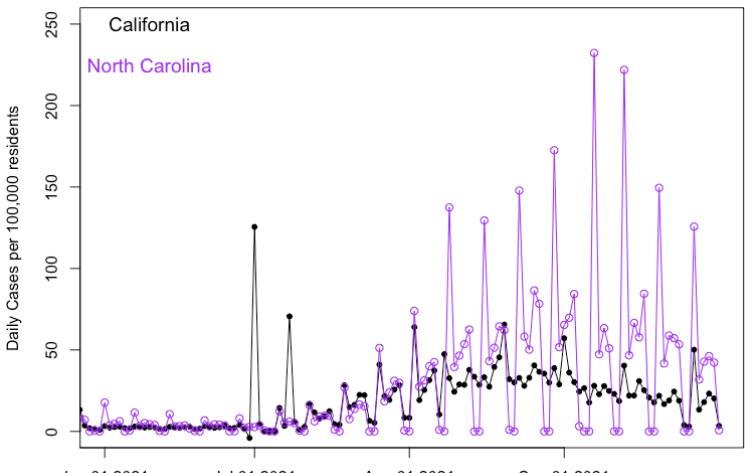
	Cases	Deaths
New York	24.93	0.202
Michigan	37.98	0.322
Ohio	49.45	0.552
Florida	22.61	1.119
New Mexico	34.12	0.428
Illinois	21.29	0.311
Texas	33.92	0.88
California	18.77	0.239
North Carolina	41.36	0.666
Georgia	31.52	0.975
Pennsylvania	34.47	0.402

Daily rates per 100,000 residents averaged September 27th thru October 4th 2021.
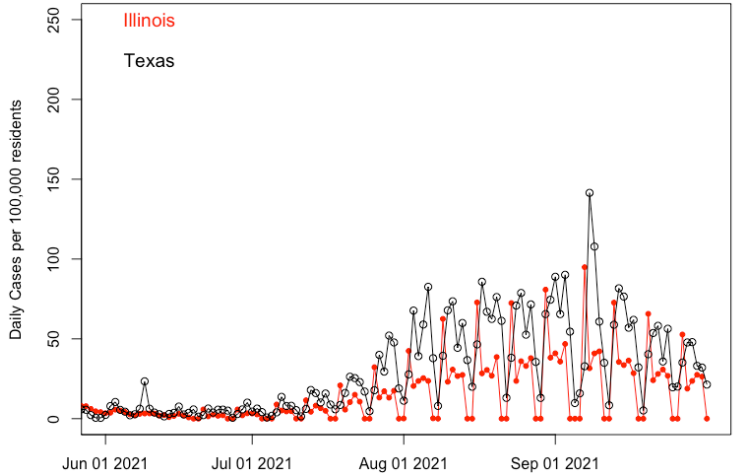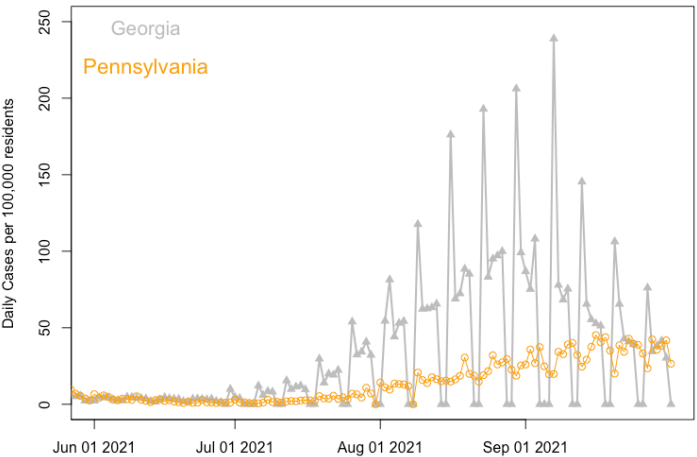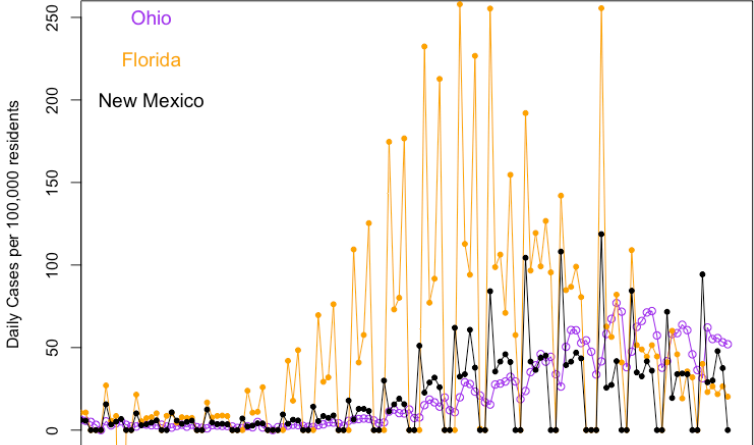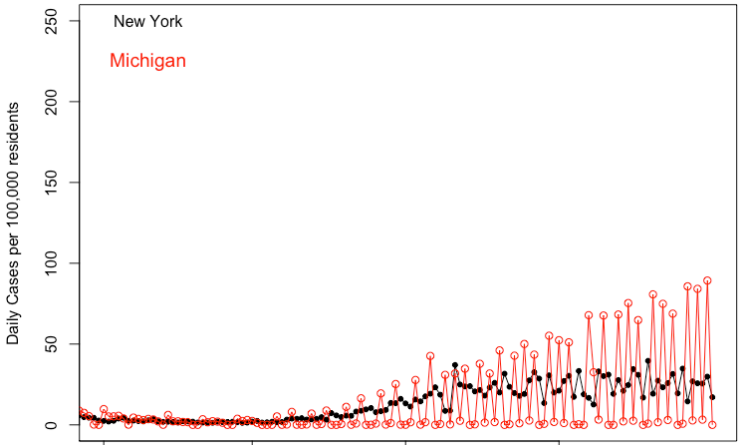
State-wide epidemics are strongly heterogeneous, and unstable.

Cases plotted versus vaccination by county

Percent of entire population that is fully vaccinated
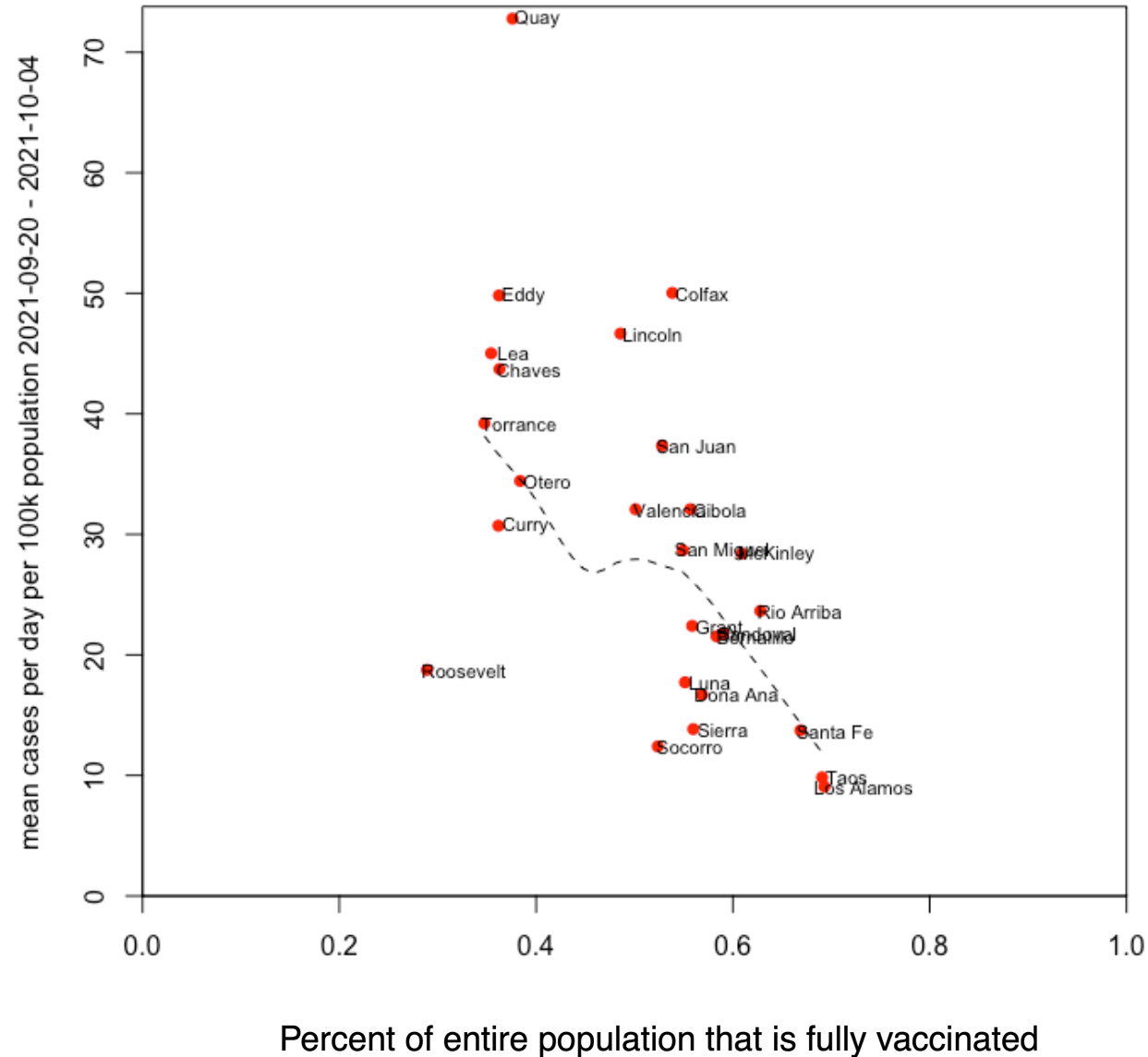
The relationship between vaccination and cases is strong and **highly** protective on a by-county basis.

Infection control *relative to vaccination rates*.
- Quay County 2-week incidence is high.
- Eddy, Lincoln, Colfax Counties are high.
- Lea, Chaves, San Juan, San Miguel, Cibola, and Rio Arriba Counties are marginally high compared with vaccination.
- Socorro, and Sierra have better than typical incidence compared to vaccination.
- Roosevelt has surprisingly low incidence.
- 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 poorly-performing 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: Chaves, Curry.**

- **Counties with slowly falling incidence: Bernalillo, Dona Ana, Eddy, Lea, Otero, Roosevelt, San Miguel, Taos,.**

- **Counties with steady incidence: Catron, Colfax, De Baca, Grant, Guadalupe, Los Alamos, Harding, Hidalgo, Lincoln, Luna, McKinley, Mora, Quay, Rio Arriba, Sandoval, Santa Fe, Sierra, Socorro, Torrance, Union, Valencia.**

- **Counties with rising incidence: Cibola, San Juan.**

Statewide by-county incidence trends are heterogeneous, with few areas of good control, some counties with poor control, and most in an unstable intermediate range.
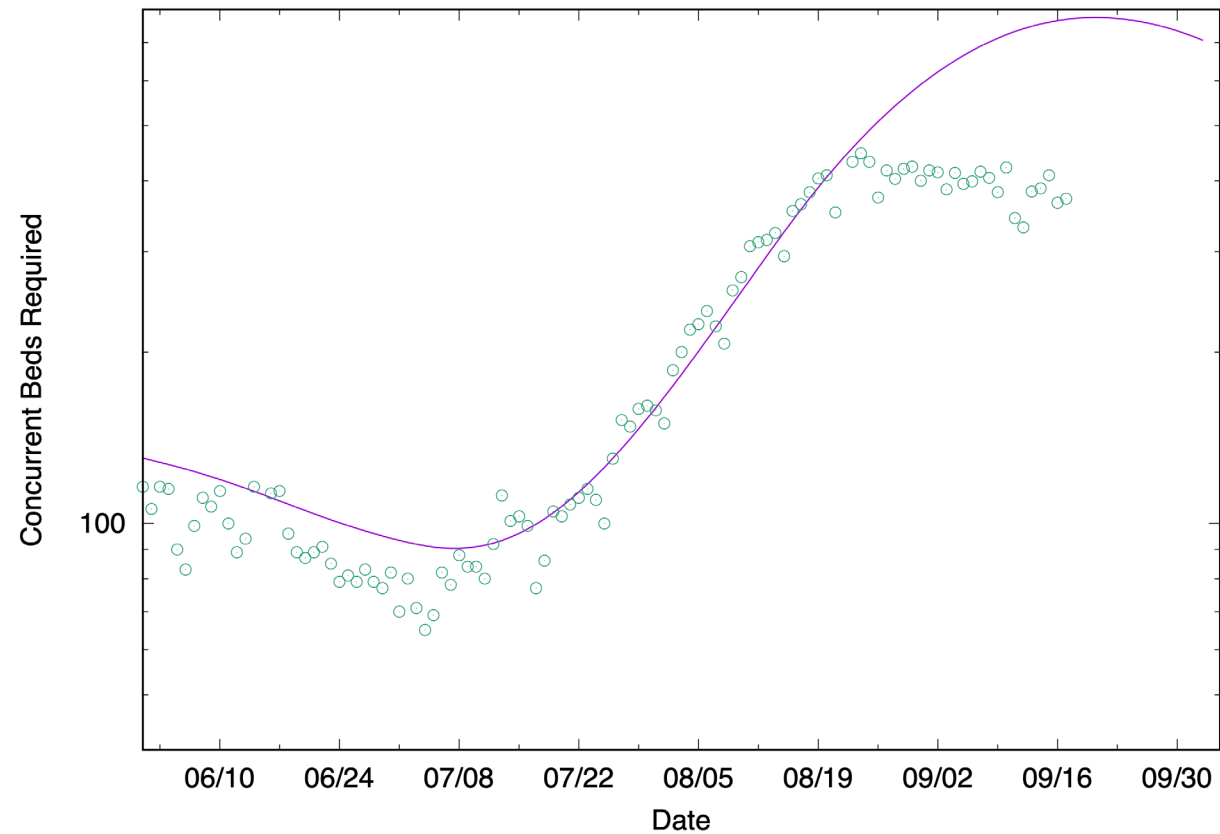
Need a population-wide understanding of what makes good infection control. The Delta variant is sufficiently contagious that people will have to re-learn what constitutes good infection control because lessons learned for the Alpha variant are no longer correct.

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.
- Partial model of mAbs use reported by NM can account for a substantial part of the suppression of hospitalizations.
- ~2k courses of mAbs given that could have affected hospital loading (~500 courses given, benefit to be realized).
- As many as 1400 averted hospitalizations. Demographics matter.
- Time dependence not yet fit (sharp corner in the data).
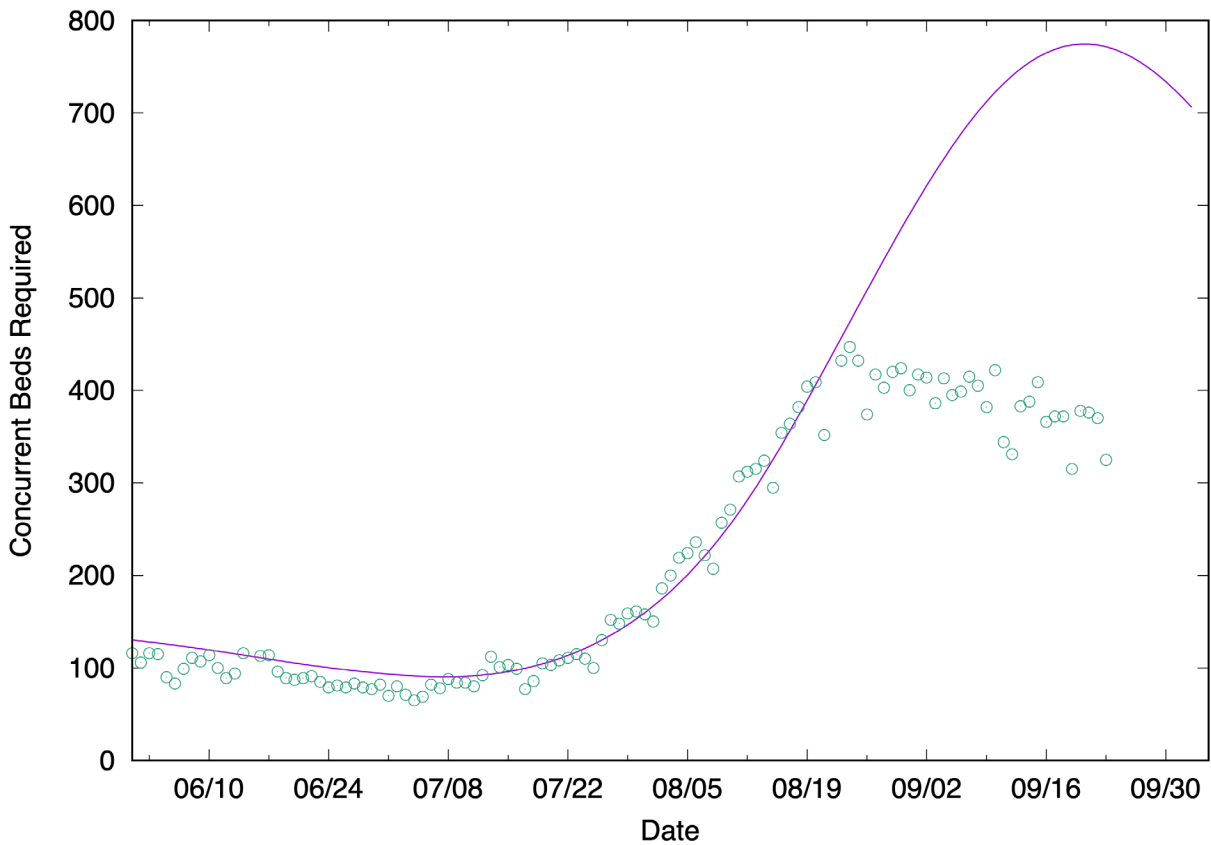
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