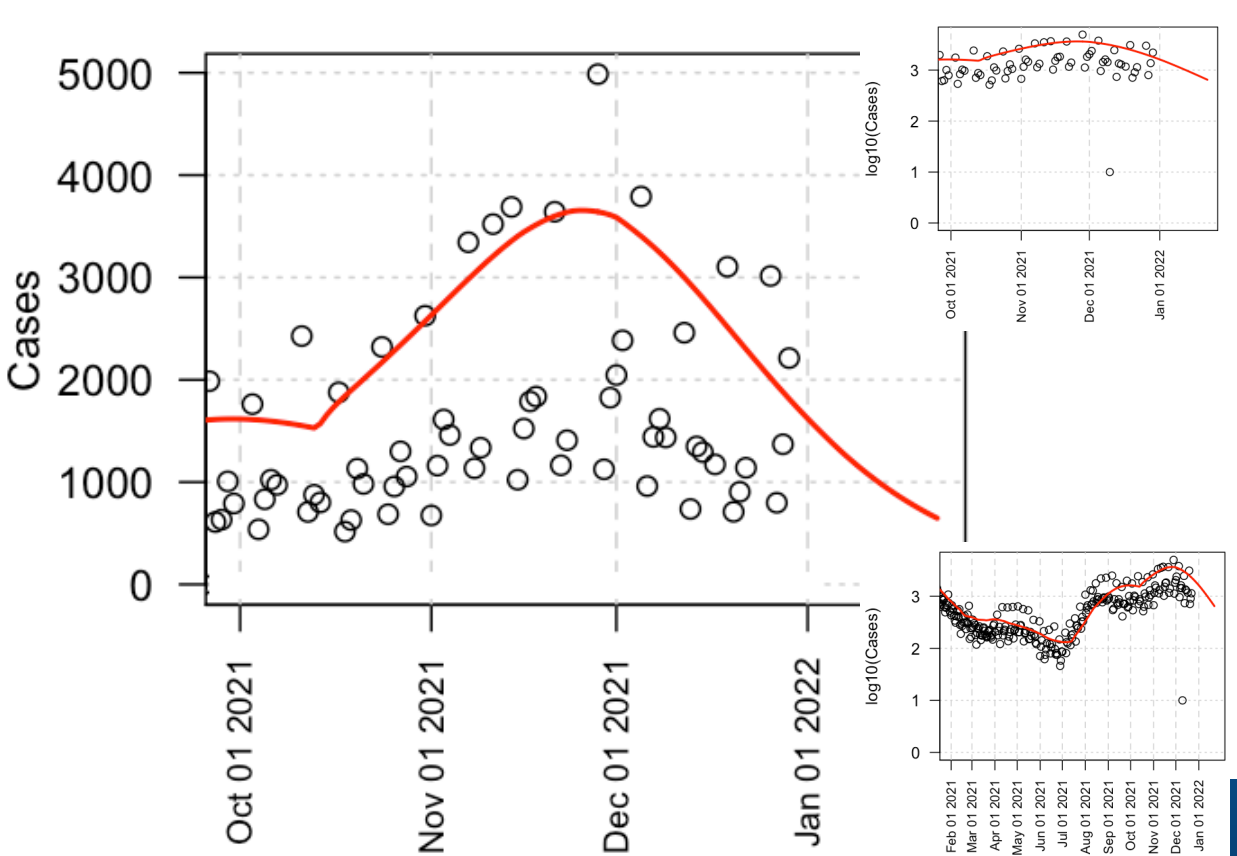
Modeling & Forecasting COVID-19 in NM

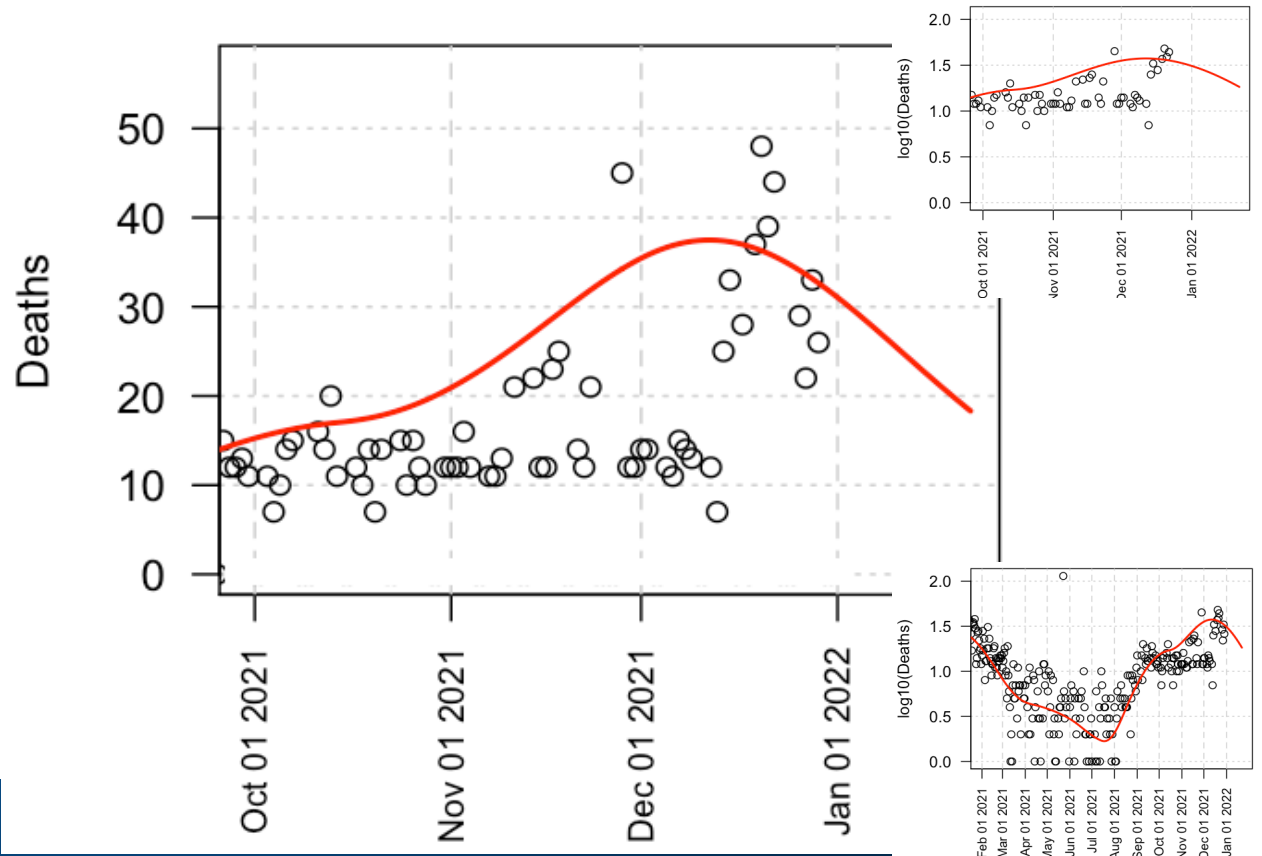
January 3, 2022

NNSA
National Nuclear Security Administration

4 Jan 2022: Epigrid modeling.

- New Mexico incidence continued to decline in December. This is explained by improved vaccination (boosters, initial series).
- Challenges: (i) Omicron variant rising now (immune evasion) (ii) Significant transmission over holidays likely (iii) Relaxed infection control is possible.
- *Indoor* masking remains critical to moderating all consequence. This is independent of genetic variation.
- New pharmaceuticals are not sensitive to changes in S protein; but Regeneron is.
- Drug administration is time-sensitive: Rapid contact-tracing is beneficial.



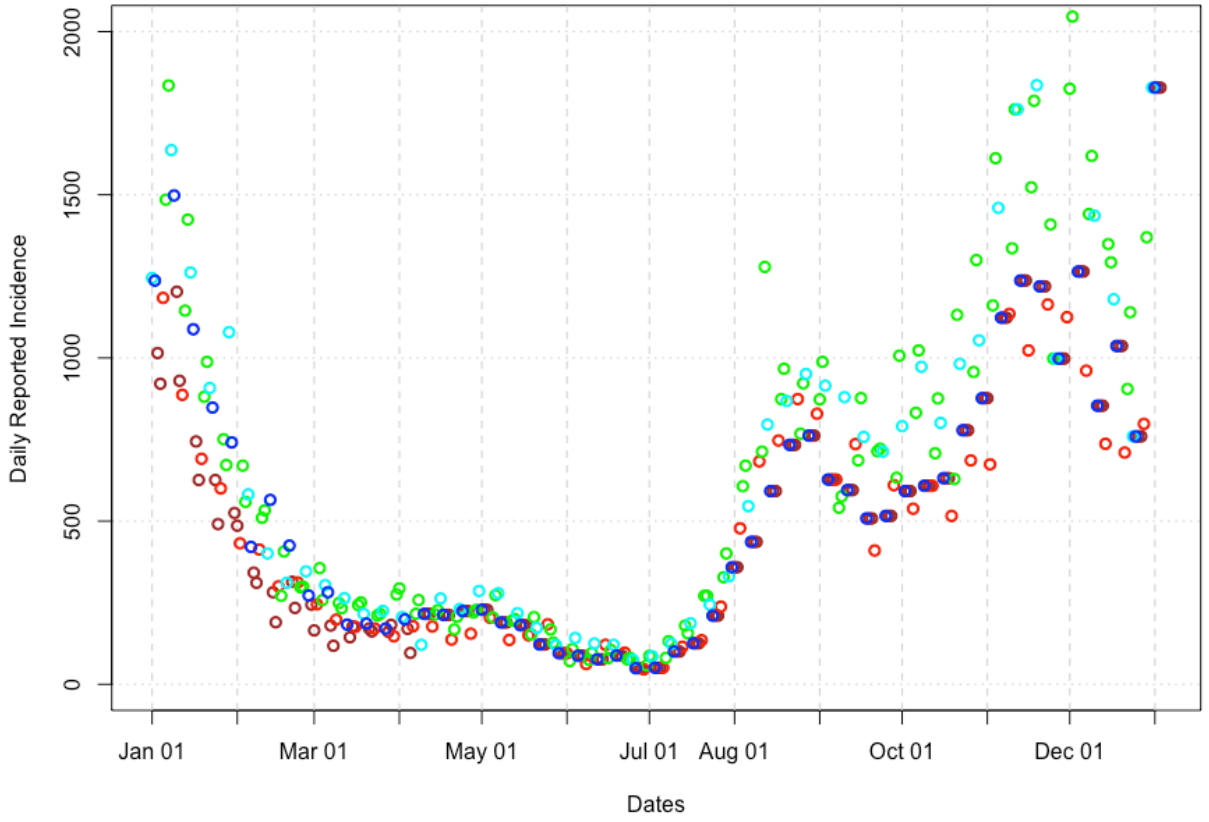


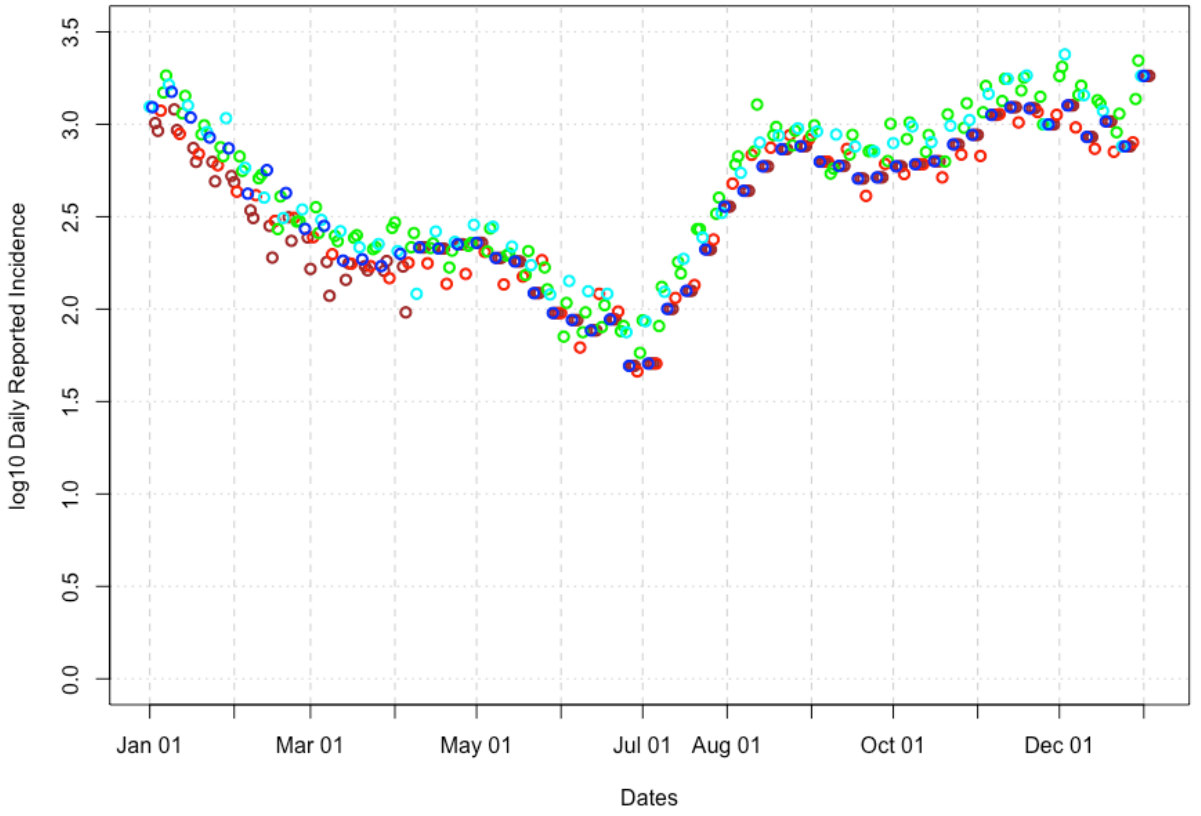
A look at the raw incidence data

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

Reported cases rates were declining, now a recent rise. (i) Holiday transmission? (ii) Fraction of Omicron cases is rising in New Mexico. Within-weekly variation remains consistent with past performance.

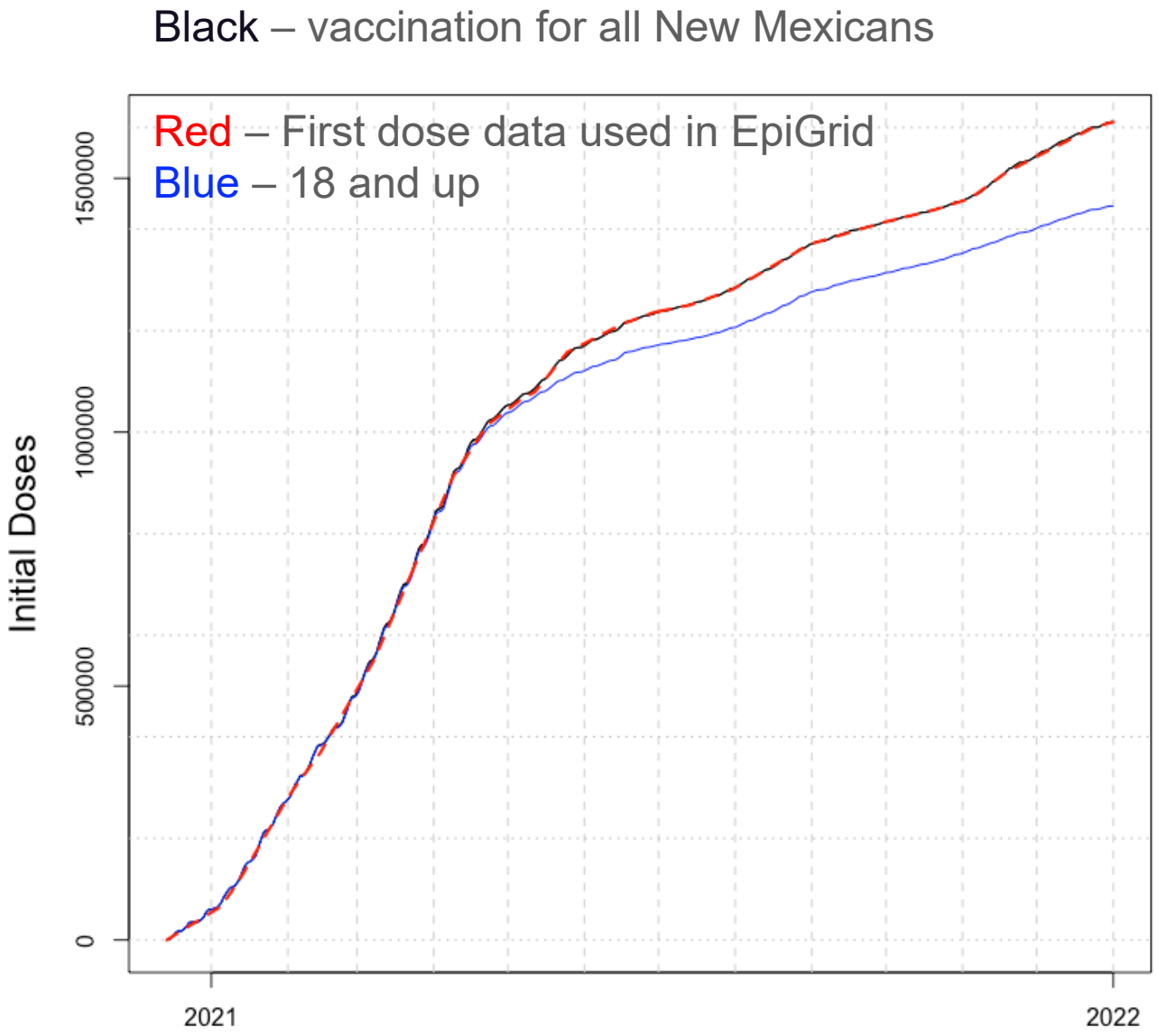
The 190 cases in the Lea county correctional facility are removed from data reported on March 26th. The 1/3 of reported cases that were > 2 weeks prior were removed from March 24th. Case reported for weekends starting April 10-12th are each divided by 3 to estimate individual day counts.





3 January 2021 Vaccine Analysis

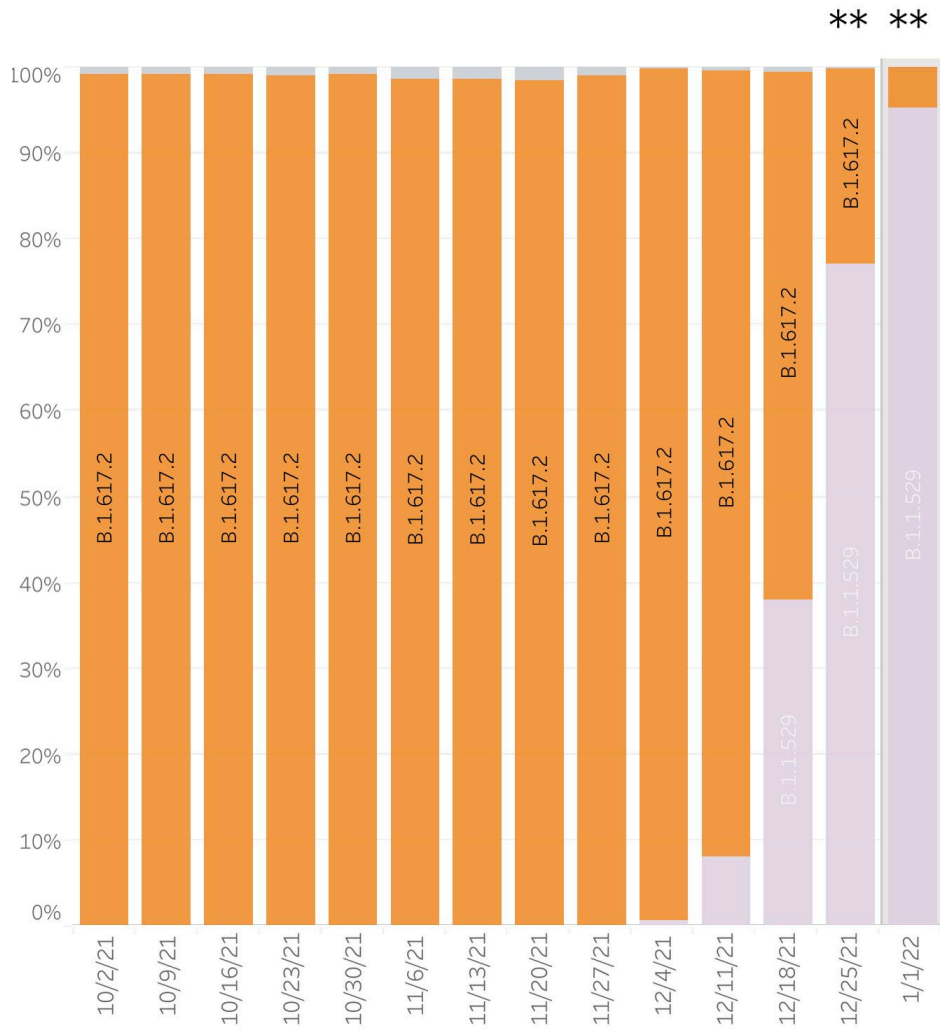
- **1611k first doses are used in modeling.**
- **~1611k first doses have been administered in NM.**
- **~1362k completed vaccine series in NM.**
- **~584k boosters completed in NM.**
- **~76.8% of all persons in New Mexico are at least minimally vaccinated.**
- **~94.5% of all persons in New Mexico are currently eligible (~1981k).**
- **76.8/94.5 ~81.3% of all eligible people are vaccinated.**
- **5-11 year-olds have received ~54k first doses (28.5%).**
- **Rapid adoption of booster doses in NM has lowered daily incidence in December.**
- **~500k unvaccinated New Mexicans are susceptible to infection. Even if half have been infected, likely >300k susceptible to infection.**
- **At 50% waning immunity against Delta for initial vaccination series, there would have been ~500k people susceptible to infection. Boosting has mitigated this.**
- **Omicron will be a stringent test of existing immunity for un-boosted individuals.**



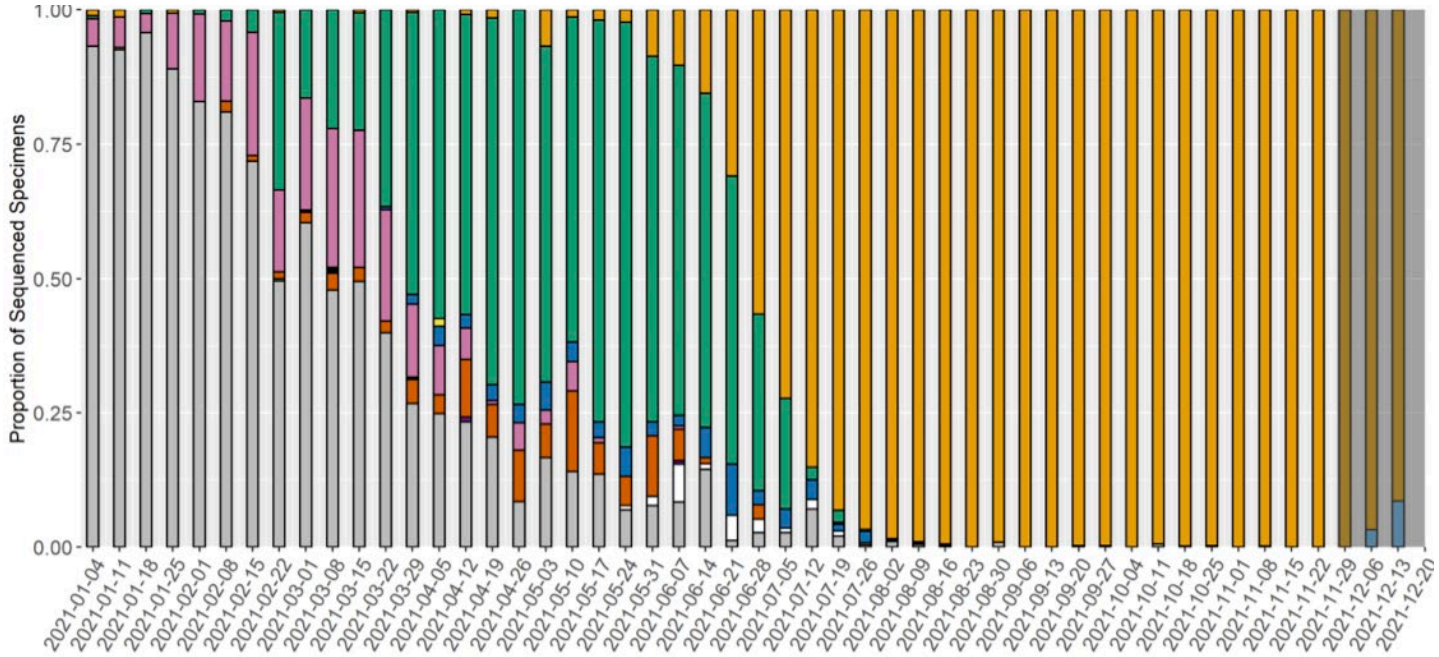
US Census Bureau reports 2097k people in New Mexico.

Variant Monitoring: Omicron has arrived nationally. NM slightly delayed arrival?

https://www.cdc.gov/covid-data-tracker/#variant-proportions



- Latest no-intermediate variant is B.1.1.529 (Omicron). Extremely rapid rise; faster than Δ. Immune evasion plays a major role.
- B.1.617.2, "Δ", "Delta", is the "Indian" variant. Soon to be rare.
- New variants have appeared without evident intermediates.
- NM Data showing replacement in-progress by Omicron/B.1.1.529
- If Omicron's rise is in New Mexico is slower than the national experience, this would indicate better infection control in New Mexico than nationally.



Screen shot of CDC variant data only, no static image available

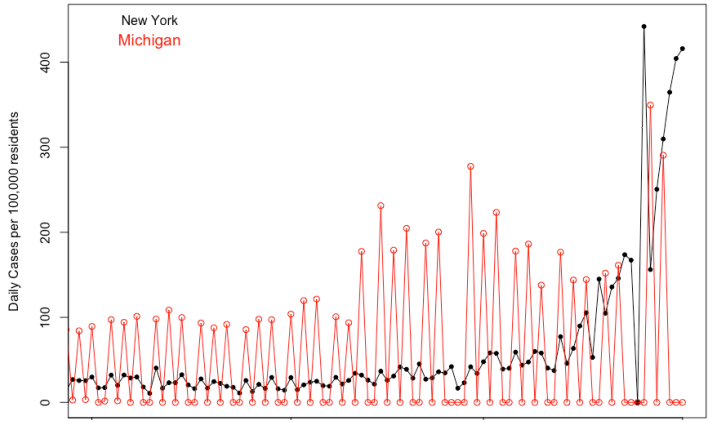
Recent By-State Trends: Most Populous 10 States

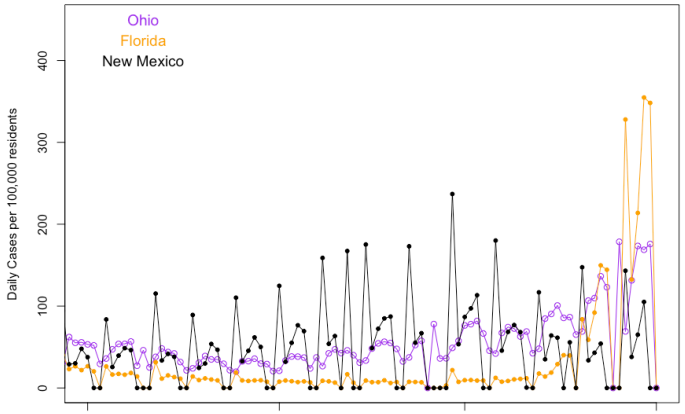
Trends over the last 3 weeks: Increasing: California, Florida, Georgia, Illinois, Michigan, New York, N. Carolina, Ohio, Pennsylvania, Texas. Steady: n/a. Modest Declines: New Mexico. Declining: n/a.

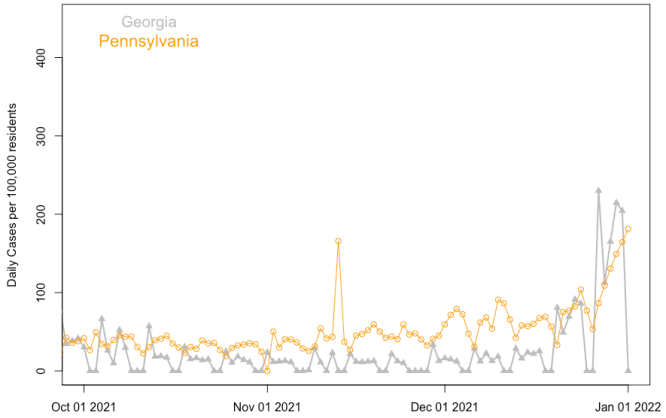
Date-of-40%-vaccinated:
Red = May 2020, or earlier
Green = after May 2020
Only NM improved. Boosting likely important.
Better infection control possible.

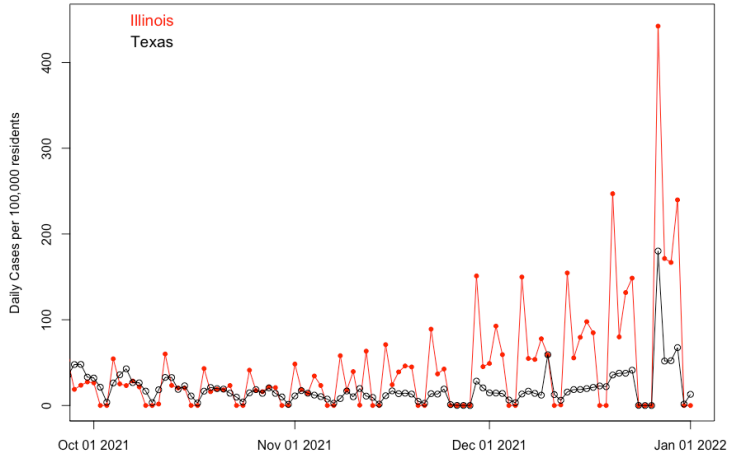
	Cases	Deaths
New York	334.77	0.476
Michigan	91.46	0.964
Ohio	128.17	0.887
Florida	196.72	0.102
New Mexico	50.18	0.747
Illinois	145.77	0.513
Texas	52.35	0.205
California	80.51	0.14
North Carolina	103.77	0.258
Georgia	132.43	0.293
Pennsylvania	124.92	0.741

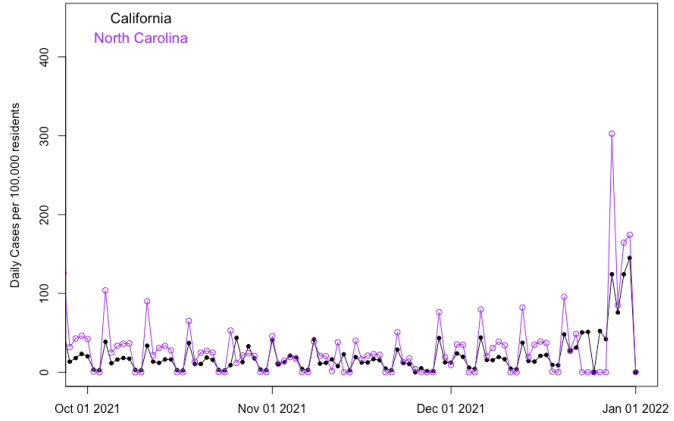
Daily rates per 100,000 residents averaged December 21th 2021 thru January 3th 2022.



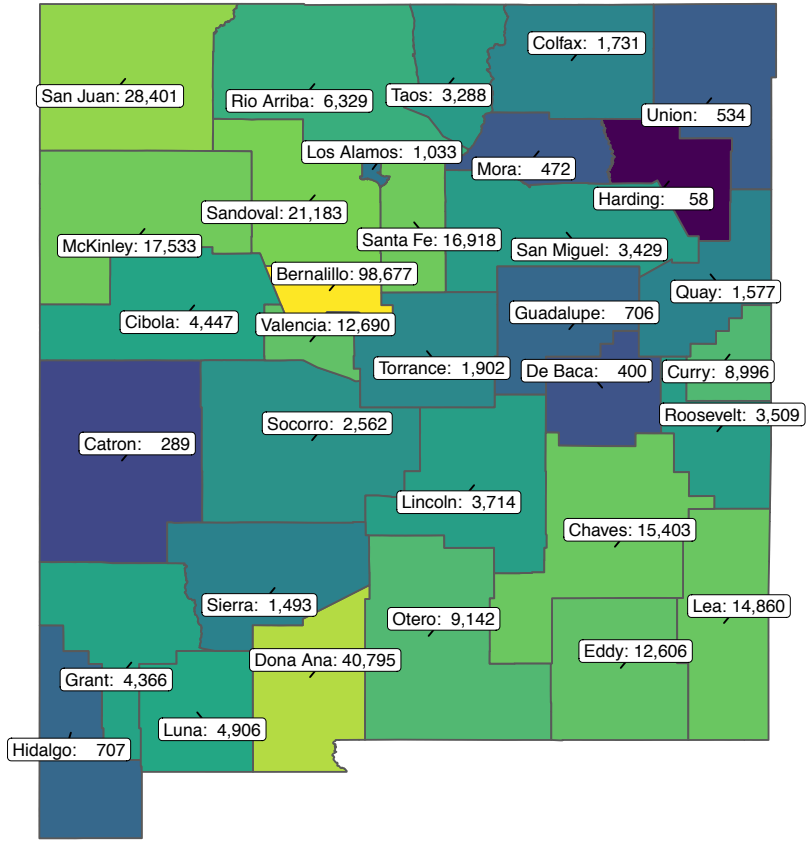


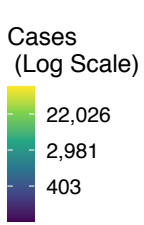


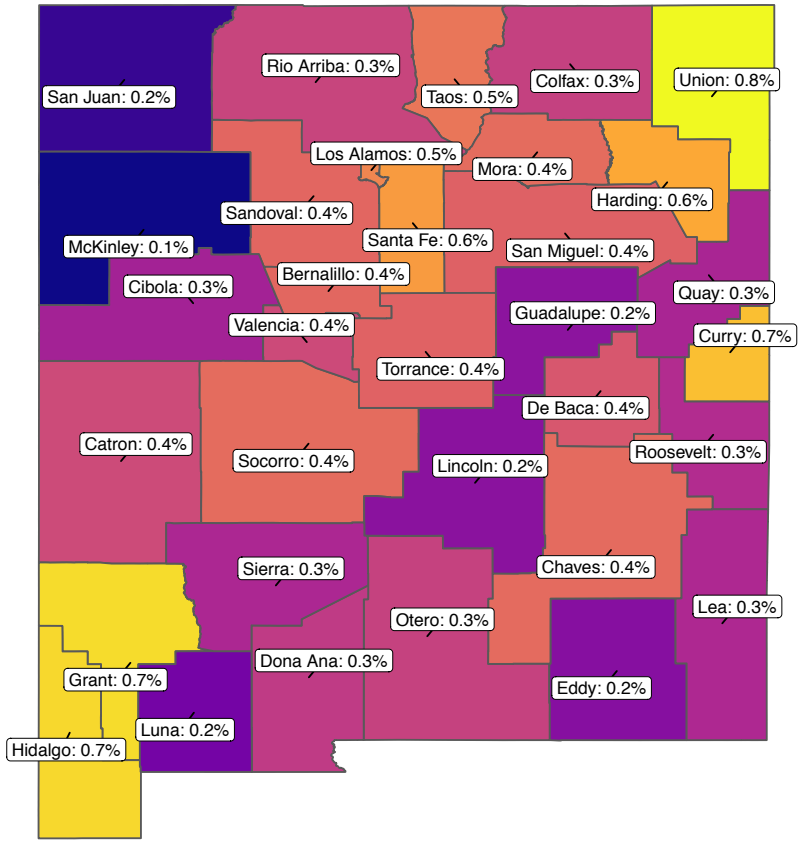


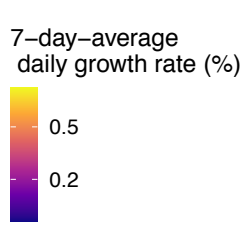


Cumulative Cases & Daily Growth Rate for NM: Jan 3





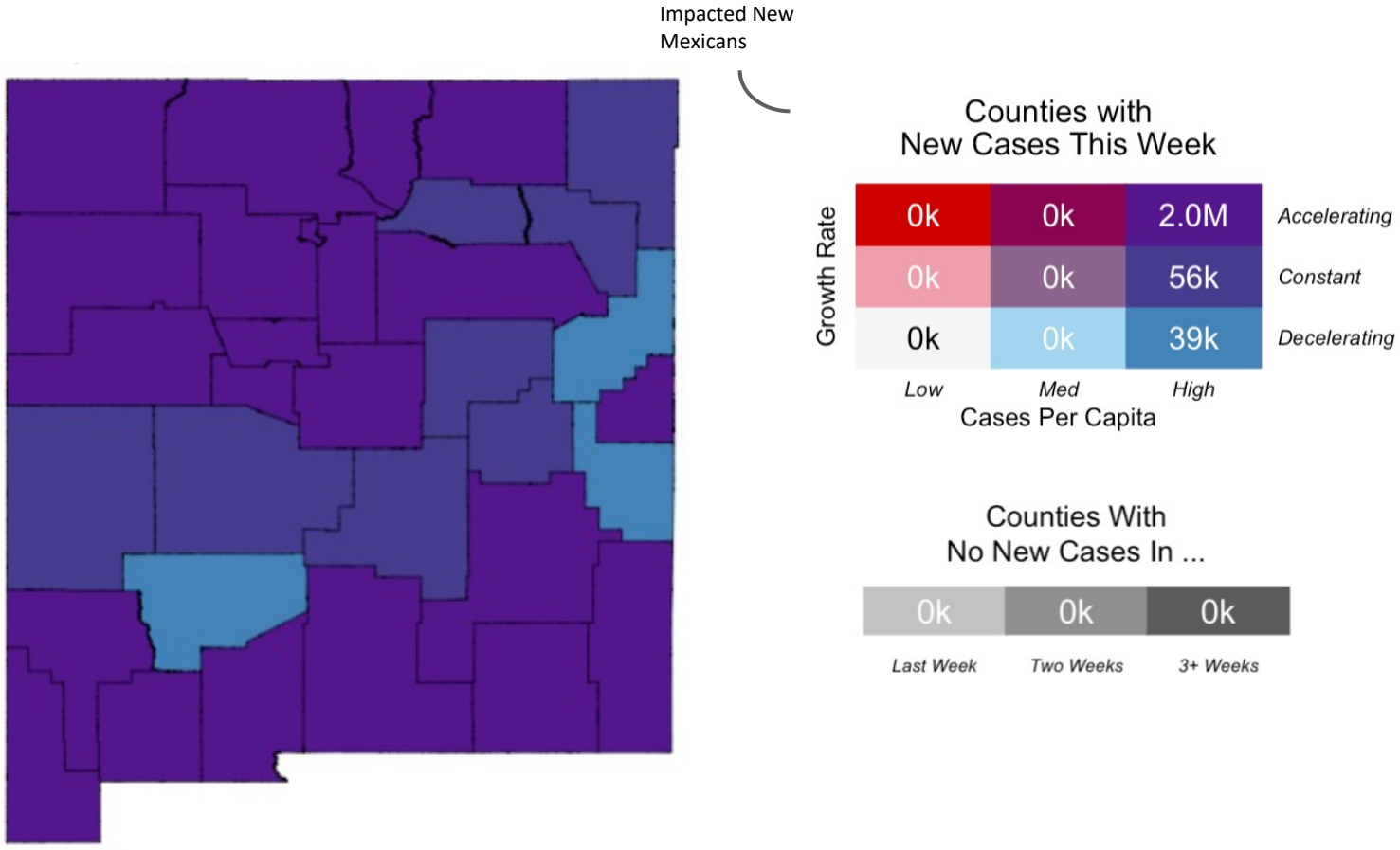




Curry, Grant, Hidalgo, Santa Fe, and Union counties have an elevated cumulative growth rate.

*Growth rate is in cumulative cases

Weekly Growth Rate for NM: Another View (Jan 3)



So what?

- **Most people in New Mexico are living in a county that has higher per-capita case counts and accelerating**

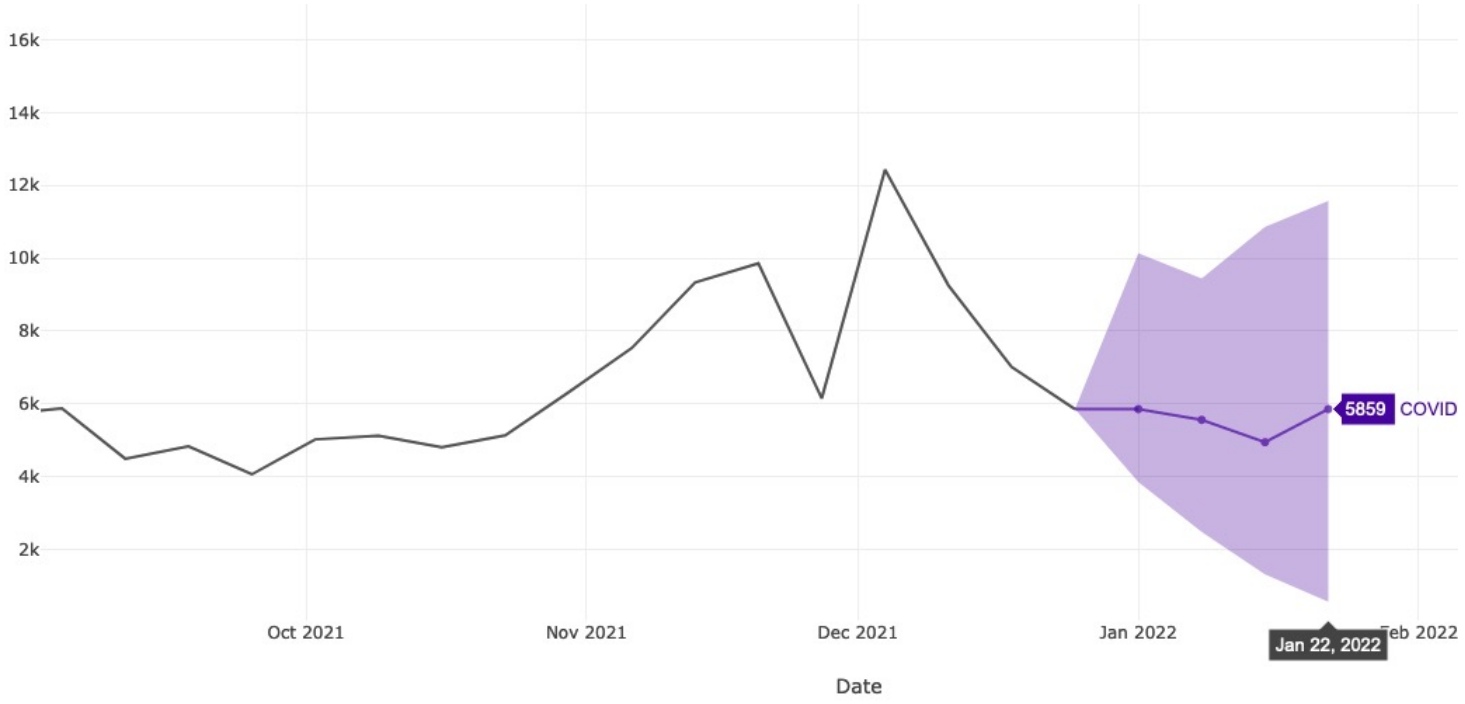
Number of New Mexicans living in regions with particular combinations of per capita case counts and 7-day growth rates

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

> State Forecasts: Interpret with caution as new and delayed data comes in this week; we expect a higher increase than predicted based on outbreaks other states

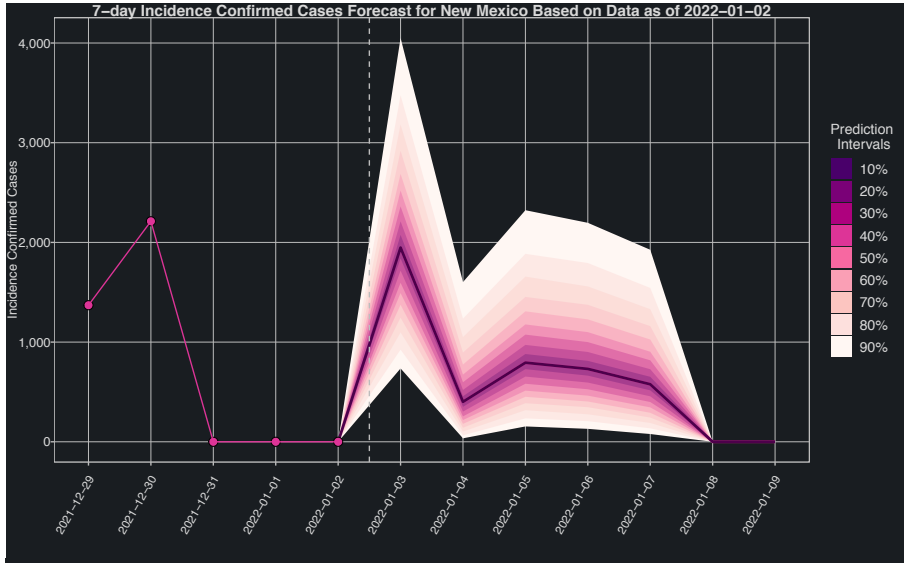
Forecast for Incident Weekly Cases in NM

The CDC ForecastHub shows a slight decrease from incident weekly cases observed at 5859 (Dec 25) and then rise by Jan 22, 2021



COVIDhub-4_week_ensemble prediction, COVID 19 ForecastHub
https://viz.covid19forecasthub.org/

Short- & Long-Term Forecast for NM: Cases



6–Week Forecast of Daily Average of Confirmed Cases for New Mexico Based on Data as of 2022–01–02

Week End Date	Best Case (5th Percentile)	Middle Case (50th Percentile)	Worst Case (95th Percentile)
2022–01–02		1,056*	
2022–01–09	162	636	1,728
2022–01–16	183	706	1,847
2022–01–23	199	776	1,974
2022–01–30	209	835	2,127
2022–02–06	202	888	2,297
2022–02–13	193	920	2,484

*Last reported confirmed cases count

6–Week Forecast of Daily Average of Confirmed Cases for New Mexico Based on Data as of 2022–01–02

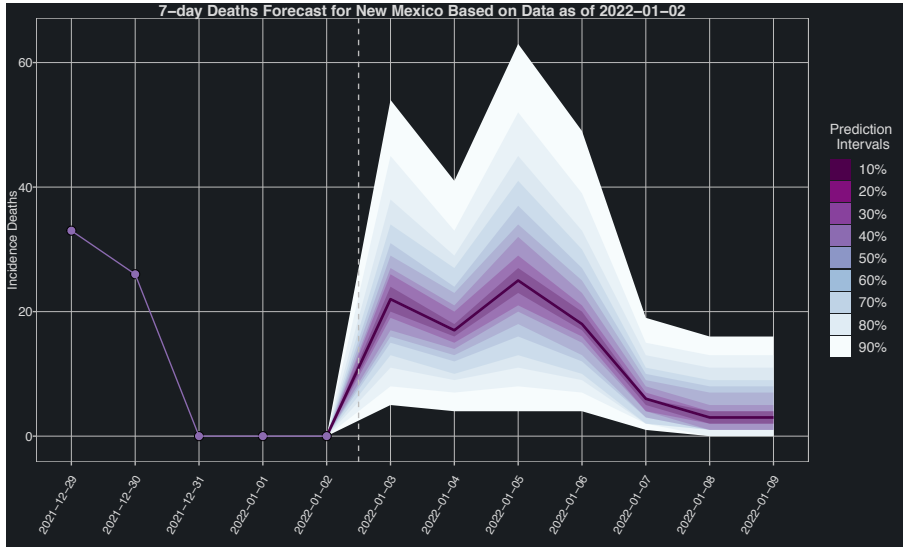
Week End Date	Best Case (5th Percentile)	Middle Case (50th Percentile)	Worst Case (95th Percentile)
2022–01–02		1,056*	
2022–01–09	162	636	1,728
2022–01–16	183	706	1,847
2022–01–23	199	776	1,974
2022–01–30	209	835	2,127
2022–02–06	202	888	2,297
2022–02–13	193	920	2,484

*Last reported confirmed cases count

So what?

Our model suggests that the number of daily cases is expected to range between 160 and 2,485 in the next few weeks

Short- & Long-Term Forecast for NM: Deaths



6–Week Forecast of Deaths for New Mexico Based on Data as of 2022–01–02

Week	Best Case (5th Percentile)	Middle Case (50th Percentile)	Worst Case (95th Percentile)
2022–01–02		5,855*	
2022–01–09	5,878	5,962	6,072
2022–01–16	5,898	6,069	6,317
2022–01–23	5,918	6,179	6,617
2022–01–30	5,937	6,298	6,994
2022–02–06	5,957	6,429	7,476
2022–02–13	5,976	6,570	8,077

*Last reported deaths count

6–Week Forecast of Daily Average of Deaths for New Mexico Based on Data as of 2022–01–02

Week Start Date	Best Case (5th Percentile)	Middle Case (50th Percentile)	Worst Case (95th Percentile)
2022–01–02		16*	
2022–01–09	3	13	37
2022–01–16	2	13	41
2022–01–23	2	14	50
2022–01–30	2	15	62
2022–02–06	2	16	76
2022–02–13	2	18	92

*Last reported confirmed deaths

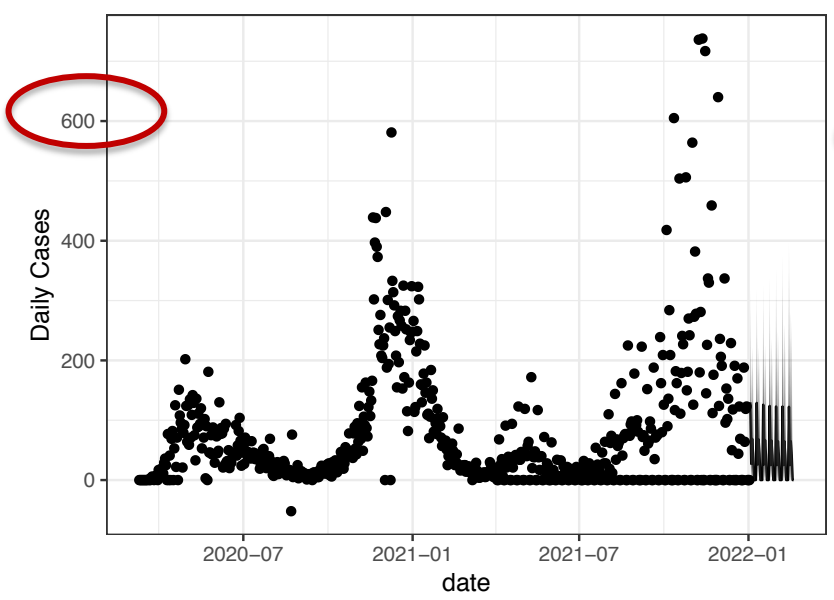
So what?

Our model suggests that the number of daily deaths is expected to range between 3 and 92 in the next few weeks

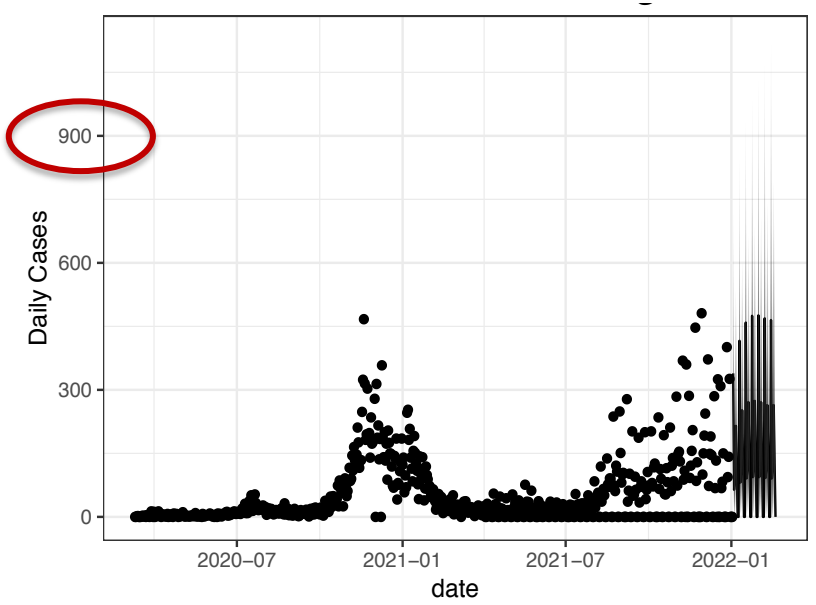
> Regional Forecasts: Interpret with caution as new and delayed data comes in this week

Central & North Regions Daily Cases Forecast

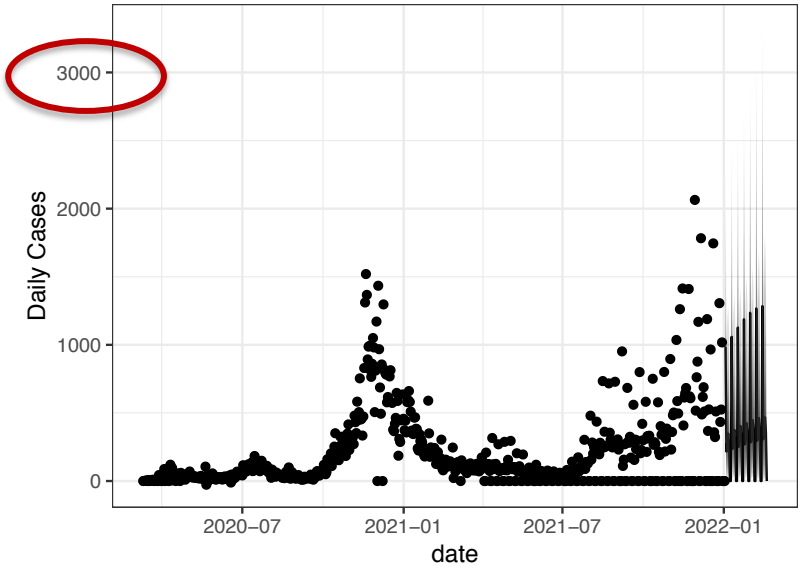
Northwest



Northeast



Central

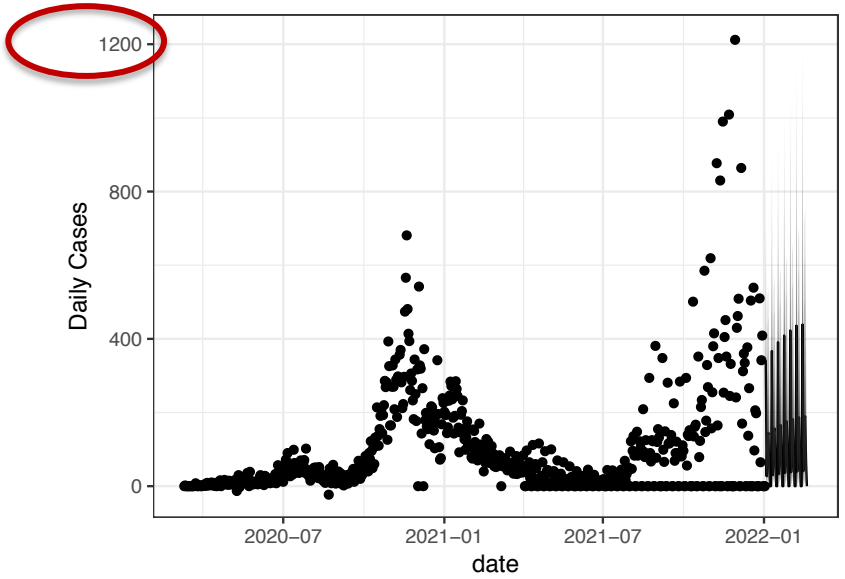


So what?

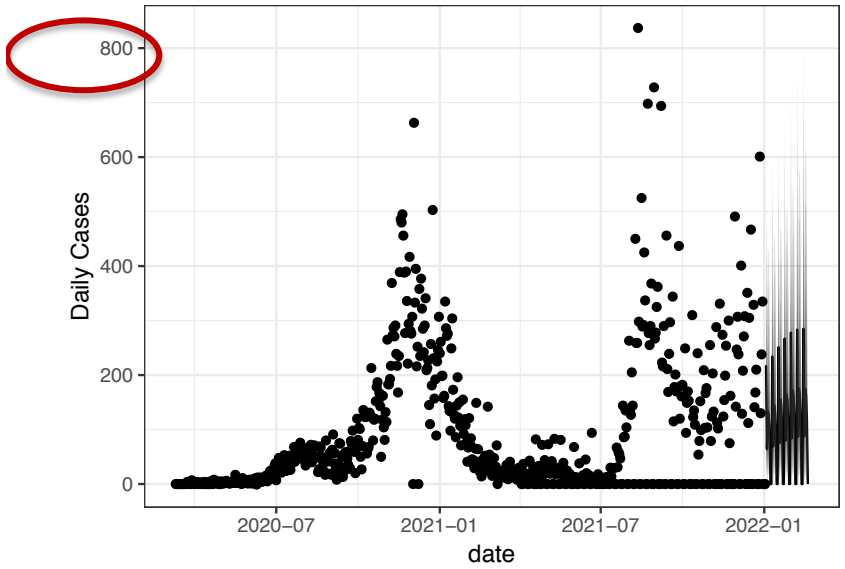
The central region is expected to see an increase in cases with Northwest and Northeast projected to be steady.

South Regions Daily Cases Forecast

Southwest



Southeast

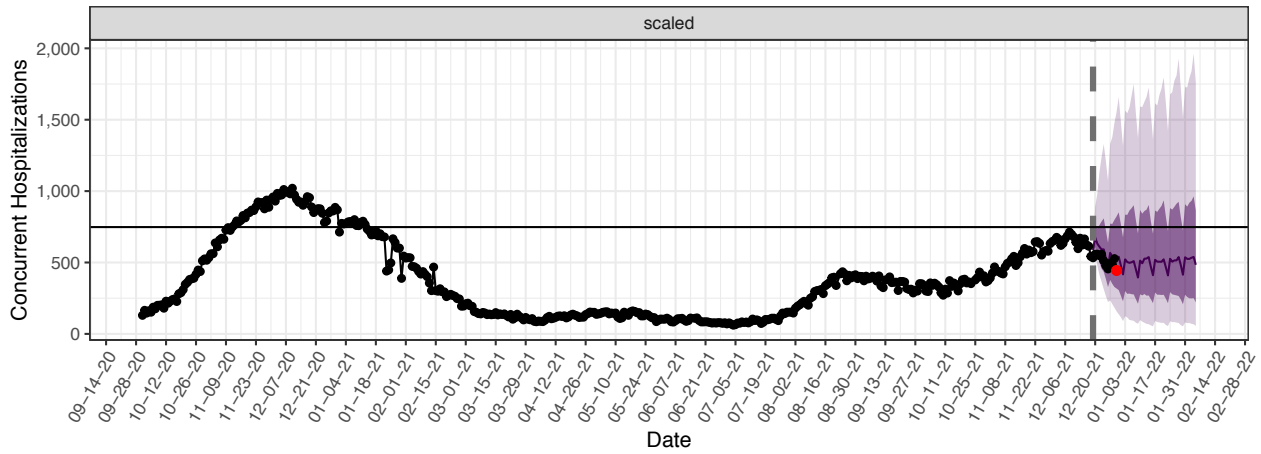


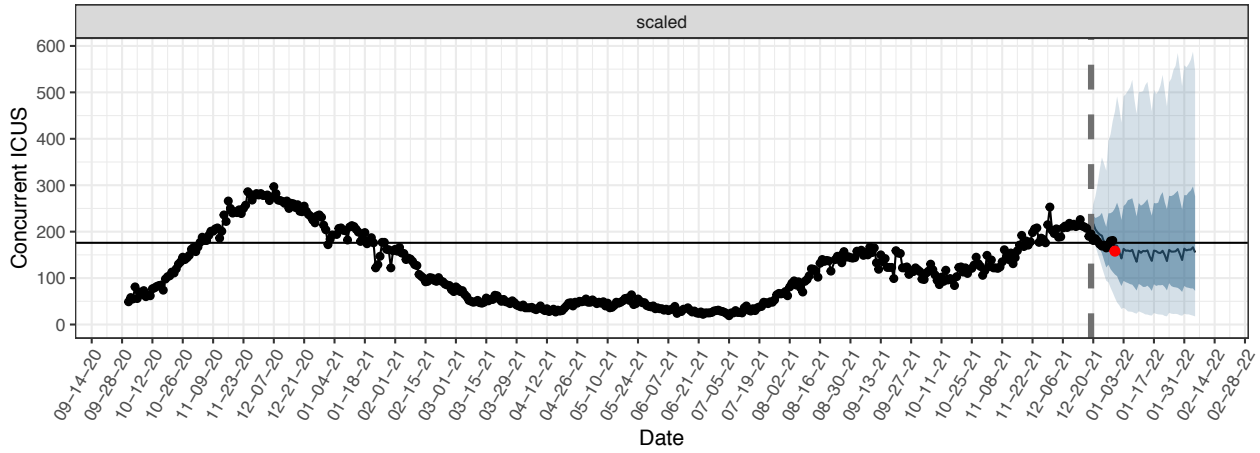
So what?

The southwest and southeast regions are expected to increase over the next few weeks

> Hospitalization Forecast: The 2-6 week ahead forecast will be impacted by new and delayed data coming in this week

Concurrent Hosp & ICU Beds Based on Forecasts – Average Stay of 8 Hosp, 15 Days for ICU/vent & 25% ICU rate





Concurrent COVID-19 ICU beds

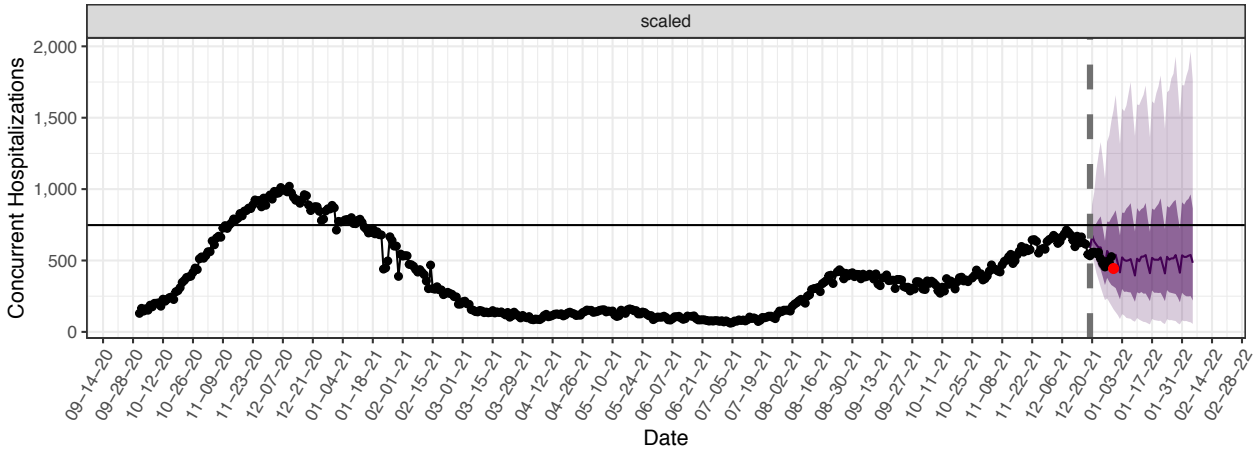
Week	Qu. 5% (best case)	Qu. 50% (median)	Qu. 95% (worst case)
12/26/21	94	162	331
1/2/22	33	142	435
1/9/22	23	135	454
1/16/22	19	137	459
1/23/22	18	137	470
1/30/22	19	139	514

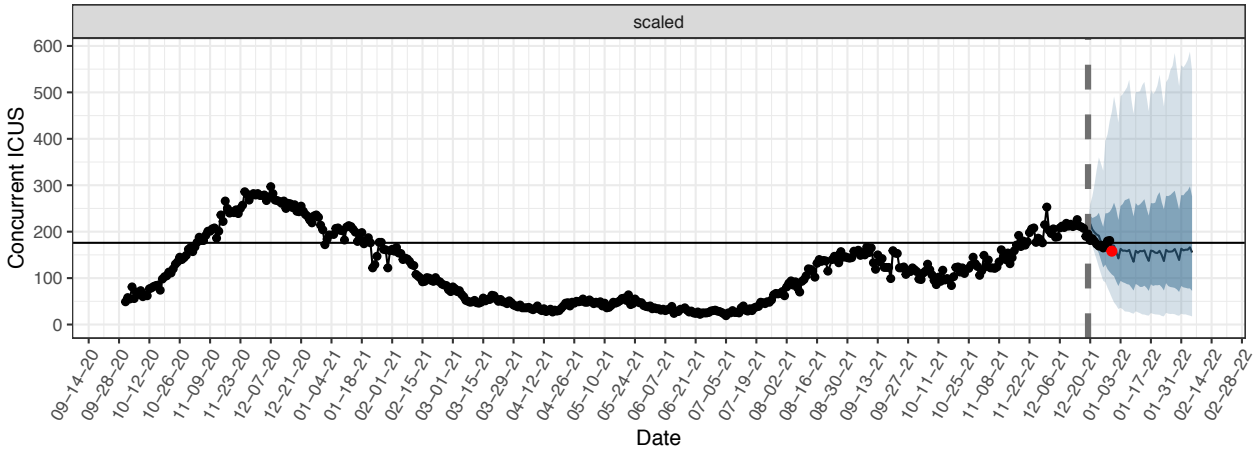
"Scaled" Scenario

So what?

Model is predicting a decrease in COVID-19 ICU beds needed over the next 3 weeks

Concurrent Hosp & ICU Beds Based on Forecasts – Average Stay of 8 Hosp, 15 Days for ICU/vent & 25% ICU rate





Concurrent COVID-19 non-ICU "med-surge" beds

Week	Qu. 5% (best case)	Qu. 50% (median)	Qu. 95% (worst case)
12/26/21	129	300	742
1/2/22	56	274	882
1/9/22	48	260	919
1/16/22	33	274	904
1/23/22	37	273	953
1/30/22	34	275	1002

"Scaled" Scenario

So what?

Med-surge general bed needs are predicted to decrease slightly, then increase during the next 3 weeks