

# Modeling & Forecasting COVID-19 in NM

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December 7, 2021

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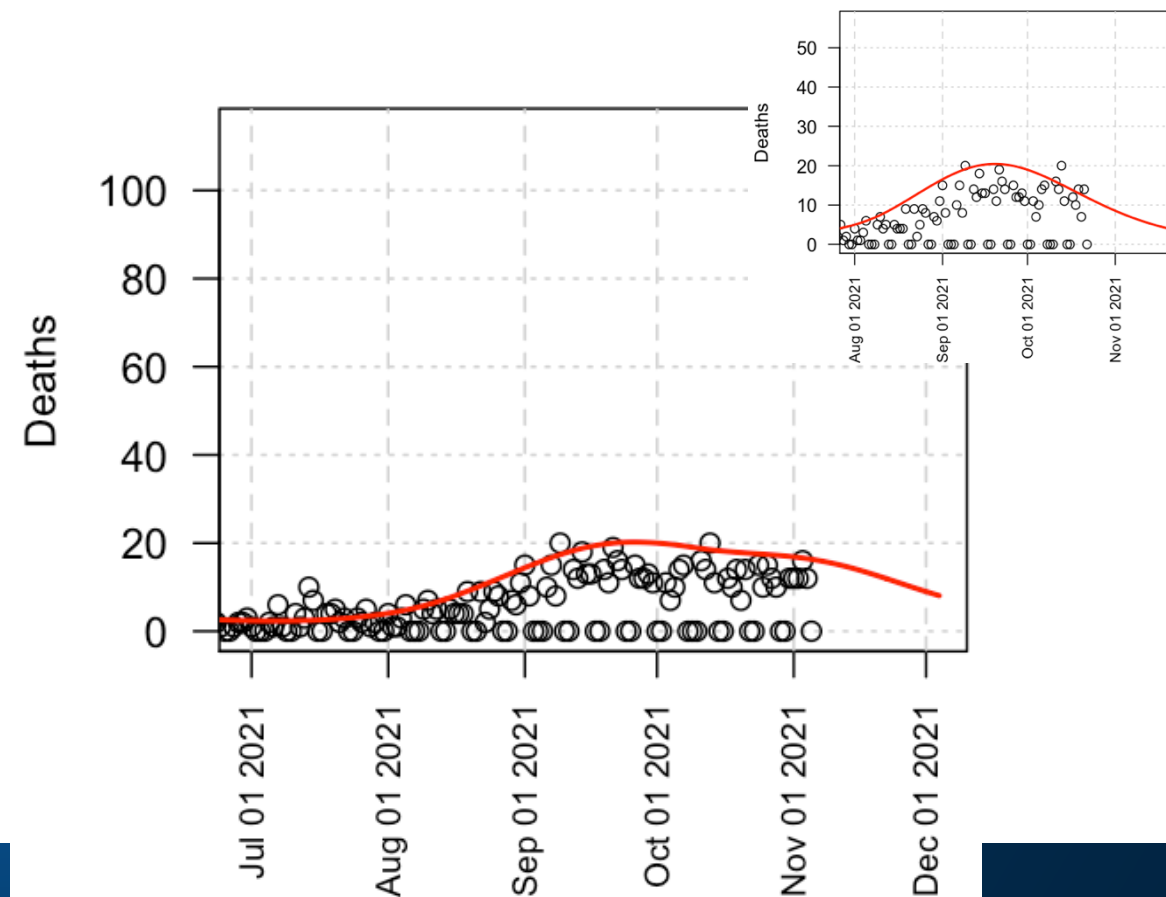
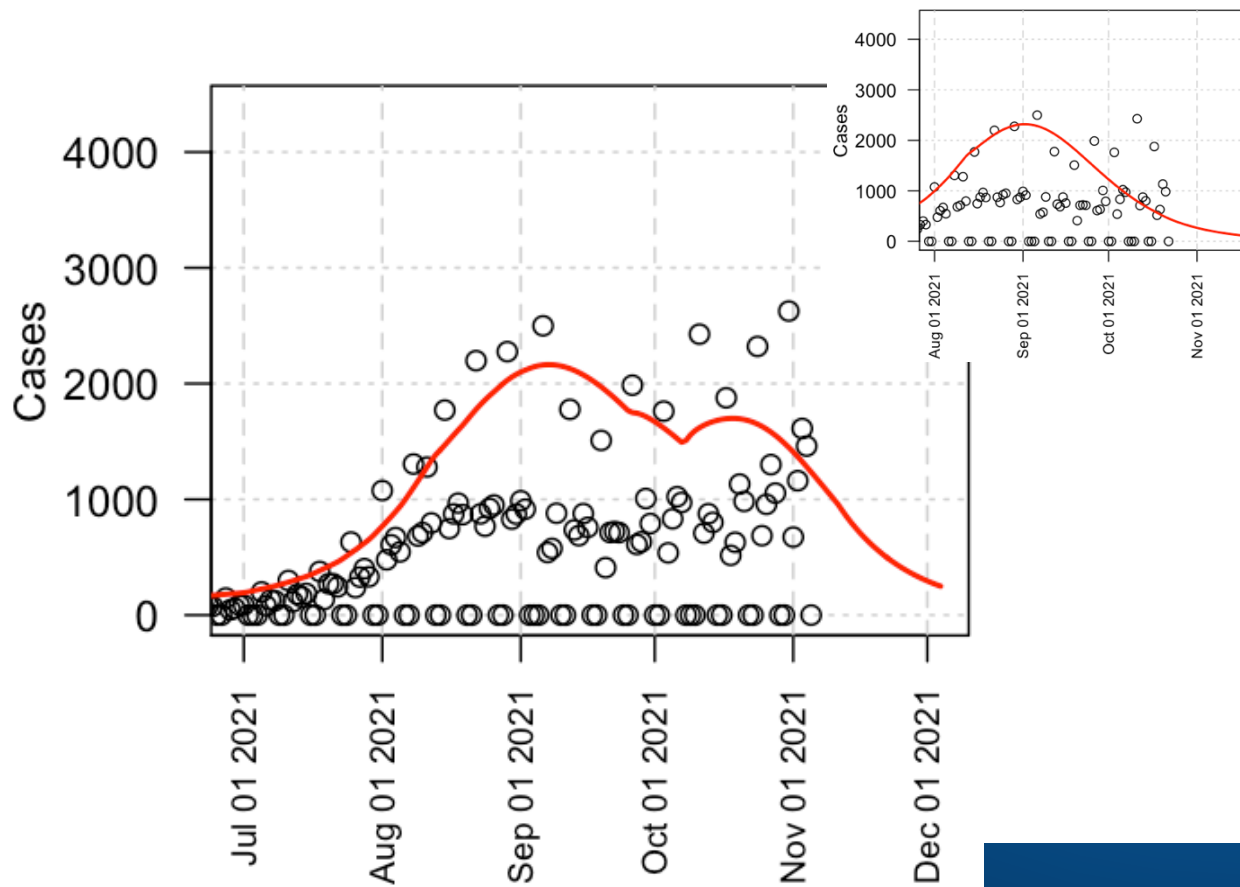
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# 7 Dec 2021: Epigrad modeling (Not updated).

- New Mexico might have a flat incidence rate recently.
- Deterioration of immunity/waning immunity *in the context of unvaccinated*. Omicron variant may add further difficulty in weeks.
- **Booster vaccination to address waning immunity, starting vaccination series to address large unvaccinated US population.**
- **Indoor masking remains critical** to moderating the consequence. This is independent of genetic variation.
- New pharmaceuticals are not sensitive to changes in S protein; contrast with Regeneron, vaccines, waning immunity.
- Drug administration is time-sensitive: Rapid contact-tracing is beneficial.

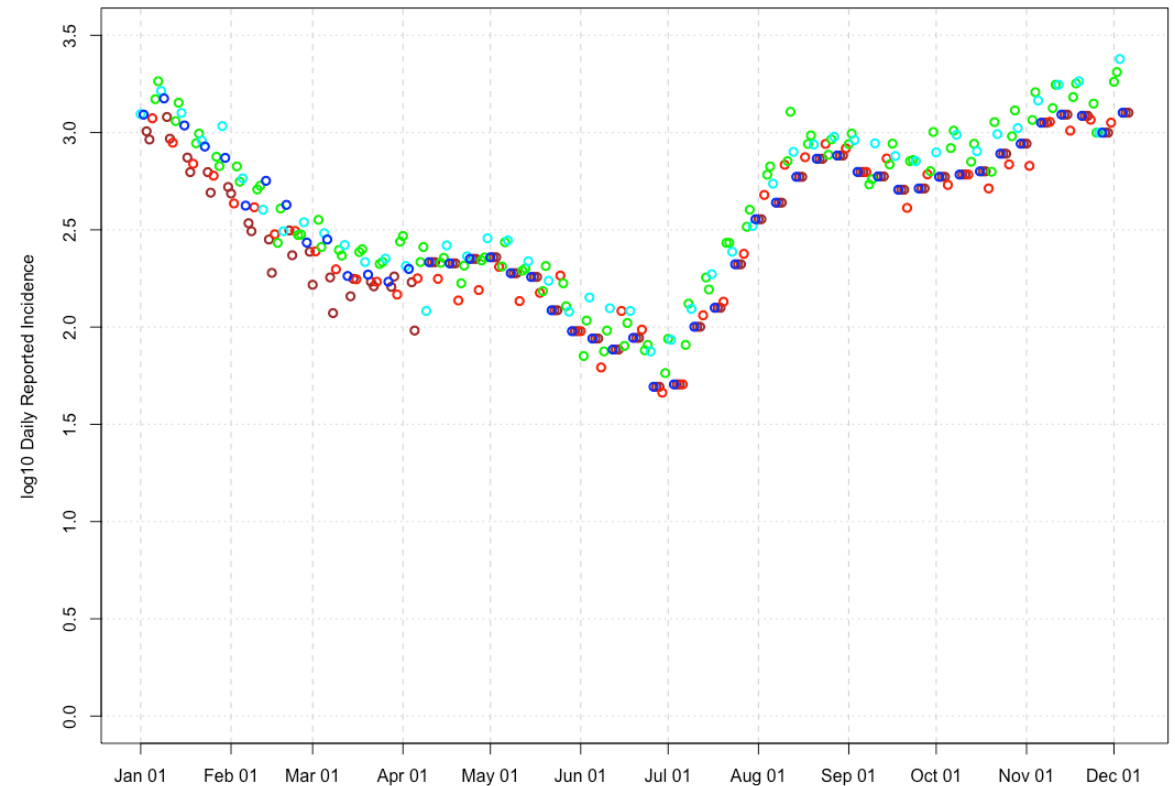
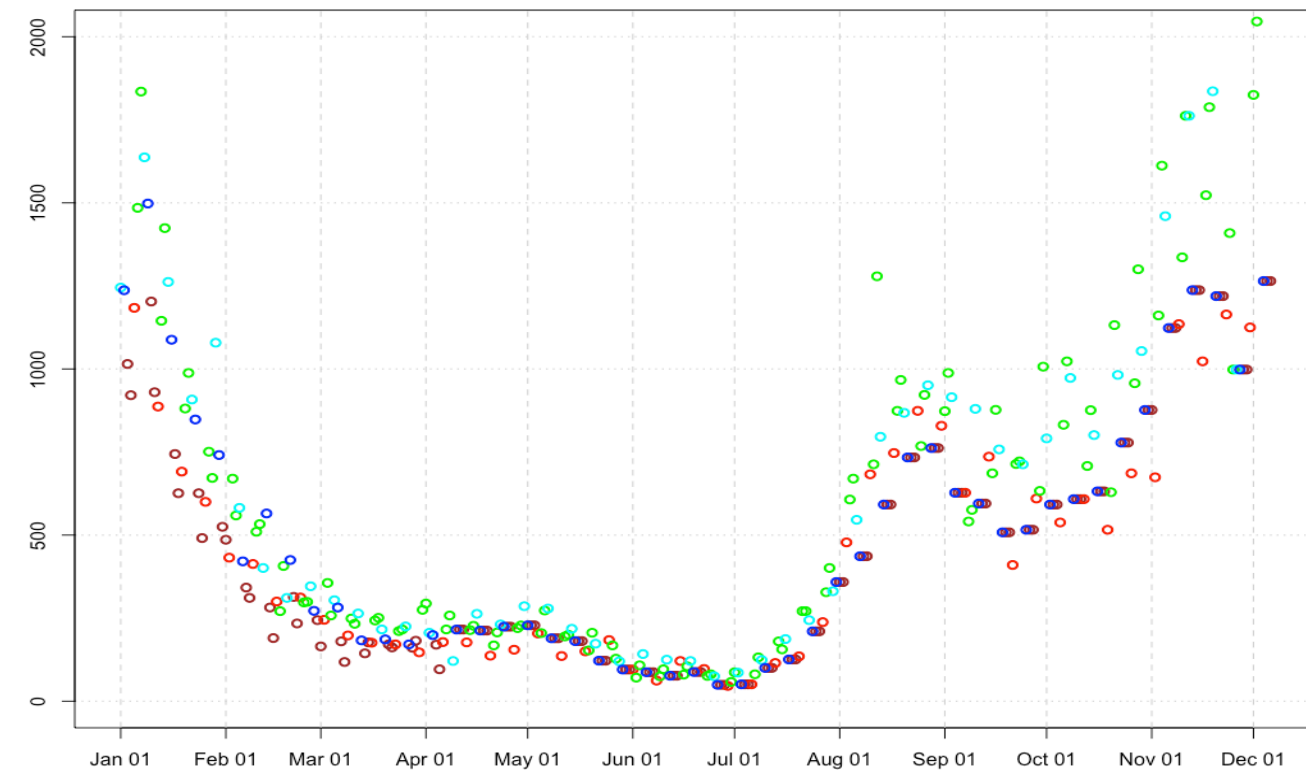


# A look at the raw incidence data

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

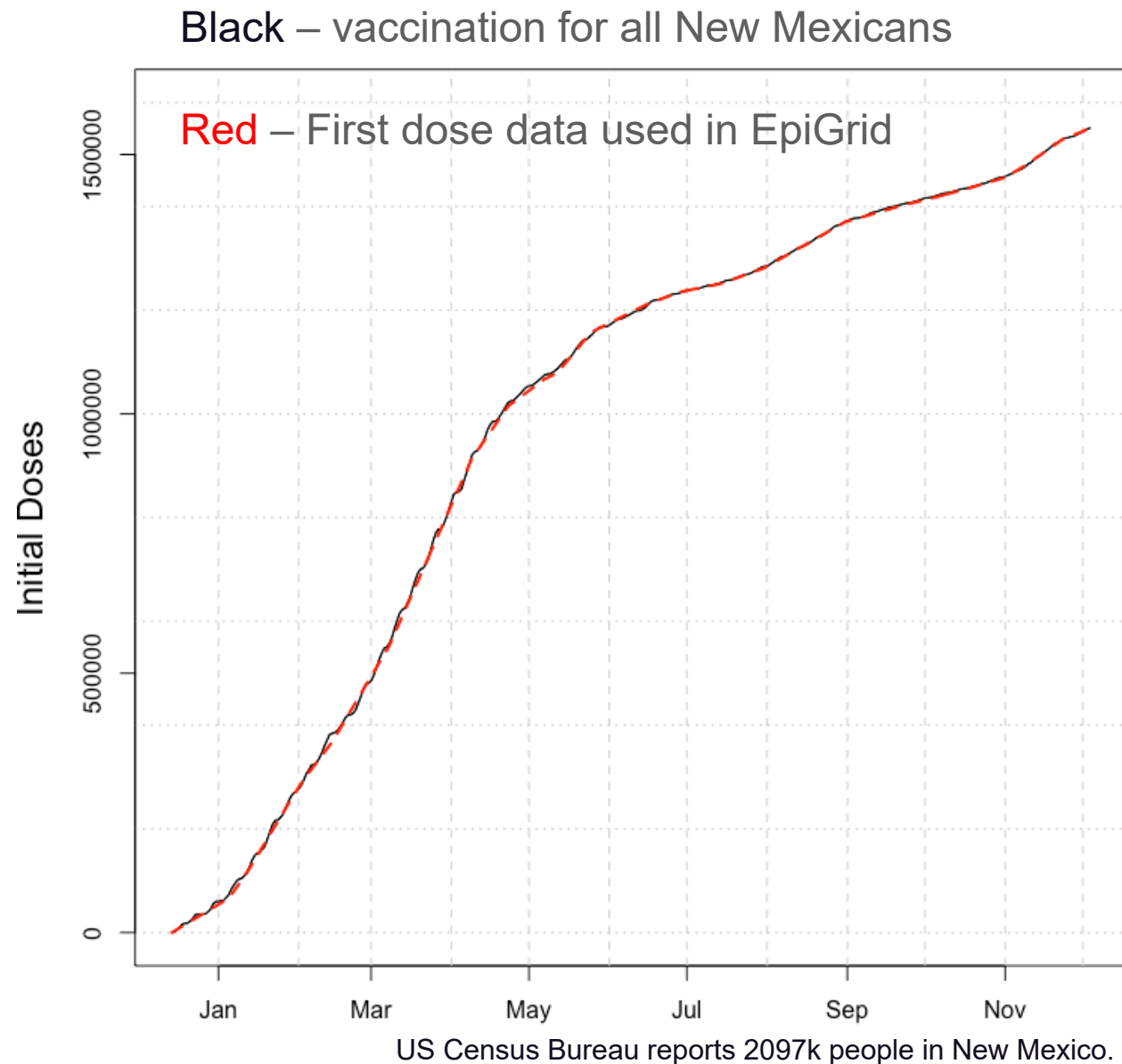
Reported cases rates may be leveling; within-weekly variation consistent with past performance.

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



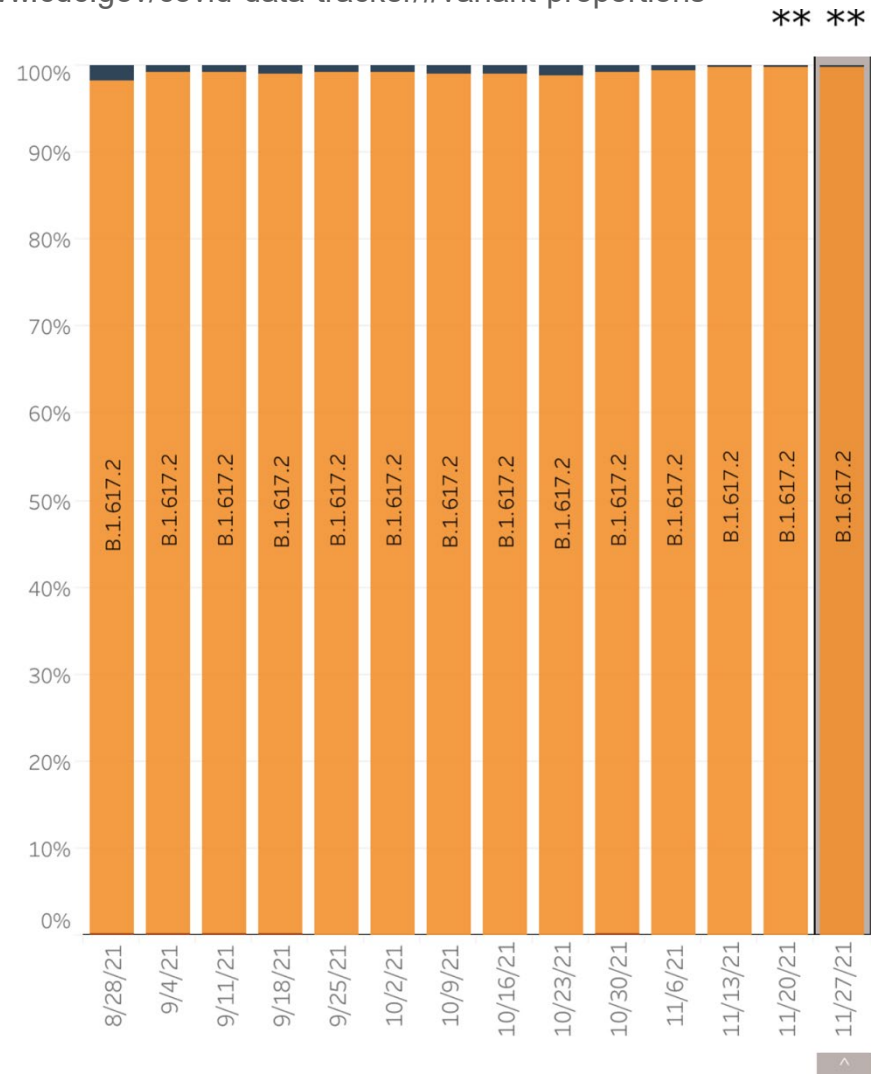
## 6 December 2021 Vaccine Analysis

- 1551k first doses are used in modeling.
  - ~1551k first doses have been administered in NM.
  - ~1319k completed vaccine series in NM.
  - ~423k boosters completed in NM.
  - ~74.0% of all persons in New Mexico are at least minimally vaccinated.
  - ~94.5% of all persons in New Mexico are currently eligible (~1981k).
  - 74.0/94.5 ~78.3% of all eligible people are vaccinated.
  - 5-11 year-olds have received ~37k first doses.
- 
- The state data are consistent with waning immunity (e.g. see DOH reports)
  - Waning immunity is not a surprising result, given known-immune system responses.
  - Compare with pediatric vaccine schedules where doses are generally separated by 6 months to 5 years. This is a side effect of “warp speed” in a pandemic.
  - Rapid adoption of booster doses in NM is likely leading to a moderation of new case data.

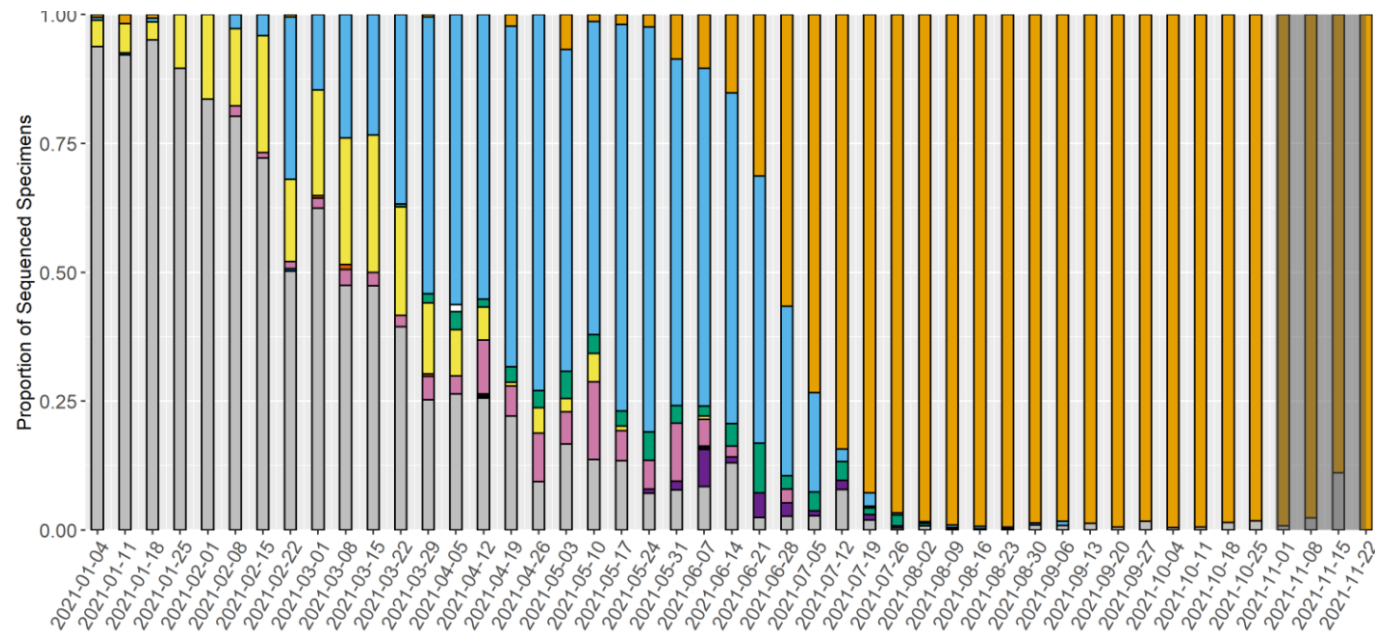


# Variant Monitoring: not driving the current epidemic dynamics

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



- B.1.617.2, “Δ”, ”Delta”, is the “Indian” variant.
- New variants have appeared without evident intermediates.
- Latest no-intermediate variant is B.1.1.529 (Omicron)
- Omicron next?
- Possibility of immune evasion by Omicron’s S protein. Quantify.
- Speculation of S1 recombination consistent with novel receptor, Venkatakrisnan et al. ins214EP



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

# Correlation? How does “date-of-40%-vaccinated” go with current incidence trend?

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

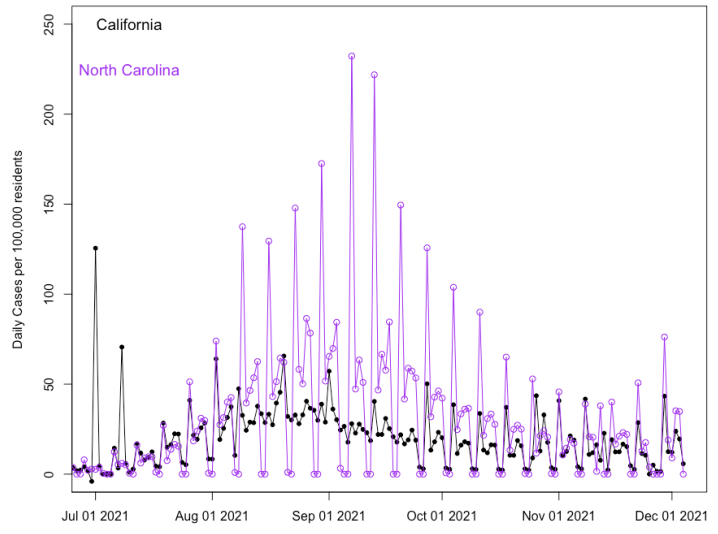
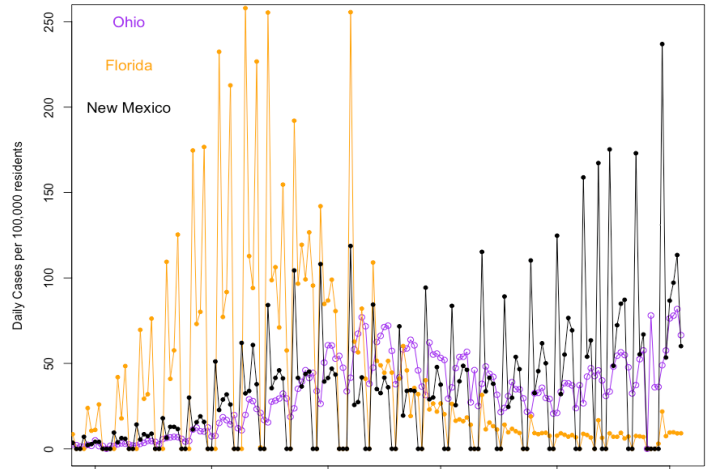
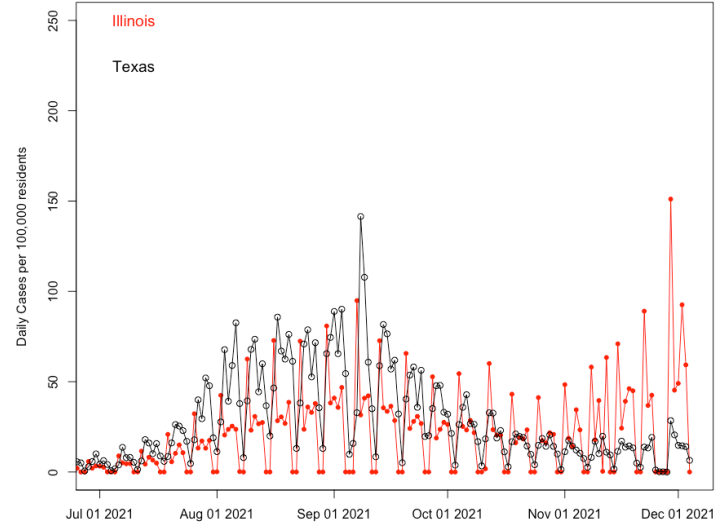
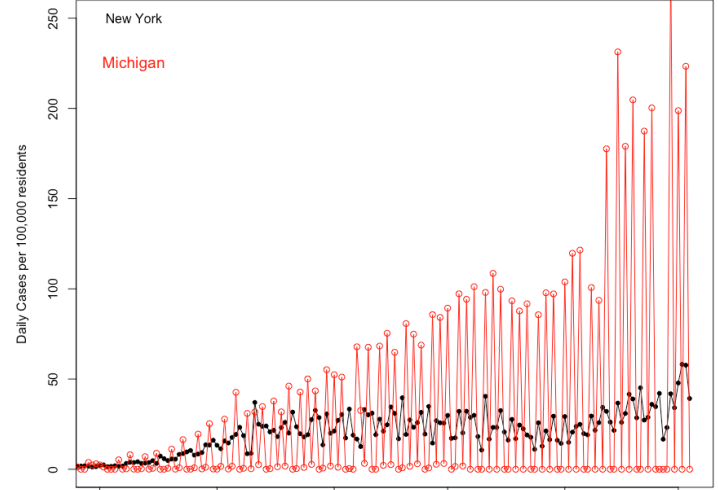
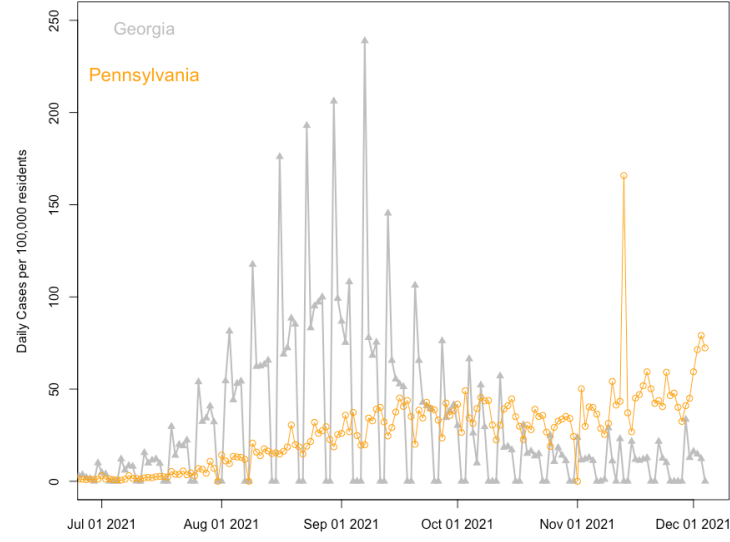
## Date-of-40%-vaccinated:

Red = May 2020, or earlier  
Green = after May 2020

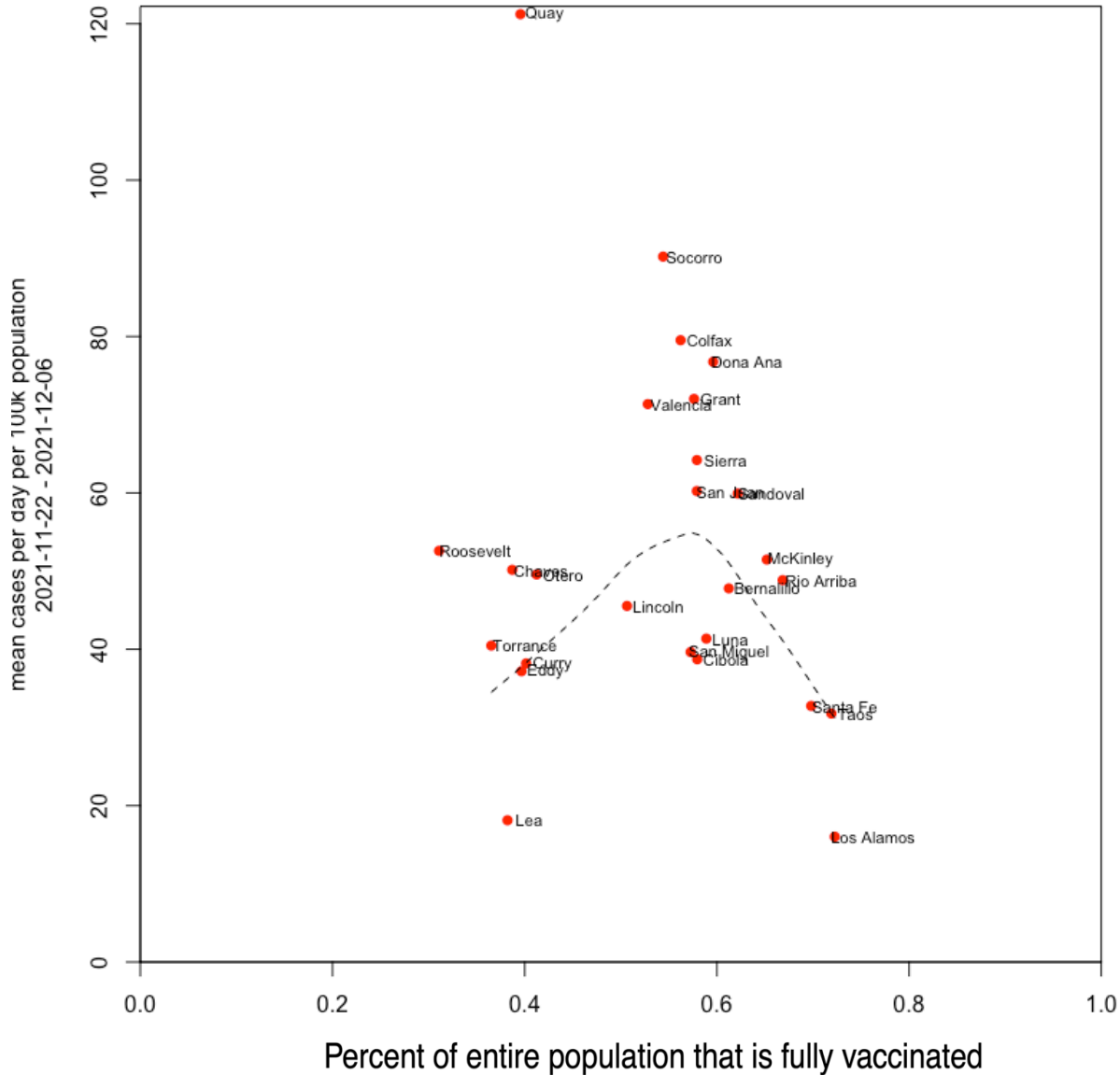
No improvement in any populous state.

	Cases	Deaths
New York	43.13	0.237
Michigan	99.95	1.235
Ohio	63.62	0.449
Florida	9.95	0.361
New Mexico	83.94	0.658
Illinois	56.76	0.299
Texas	14.11	0.27
California	16.93	0.227
North Carolina	24.88	0.182
Georgia	12.79	0.394
Pennsylvania	57.25	0.678

Daily rates per 100,000 residents averaged November 10<sup>th</sup> thru December 6<sup>th</sup> 2021.



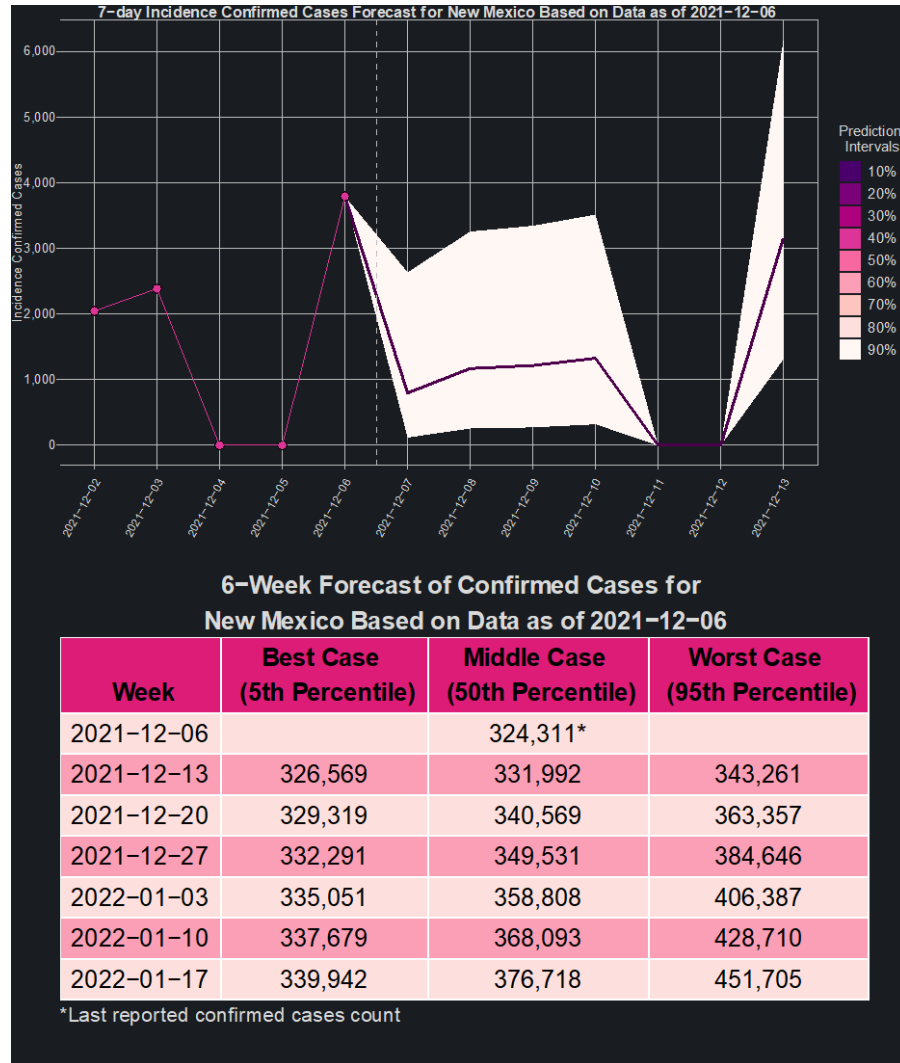
# Cases plotted versus vaccination by county



Recent case load relative to the fraction of the entire population vaccinated.

- General correlation between vaccination and cases still holds in the large majority of counties (75%).
- Roosevelt, Chavez, Lea, Lincoln, Torrance, Curry, Eddy, Otero have anomalously low case reports.
- Quay is anomalously high.
- **All counties have high absolute transmission**, well above  $10^5$  per day over the last two weeks.
- Endemicity will require broader population-wide immunity, hopefully acquired without infection, and
- Endemicity is likely to require broader antigenic diversity in each person.
- This complex situation is a consequence of national and global vaccination times being longer than the time to reach a lower-level, less rapidly evolving/changing viral dynamics.
- Expect to see normalization of these plots as boosters become a major factor.

# Short- & Long-Term Forecast for NM: Cases



**6-Week Forecast of Daily Average of Confirmed Cases for New Mexico Based on Data as of 2021-12-06**

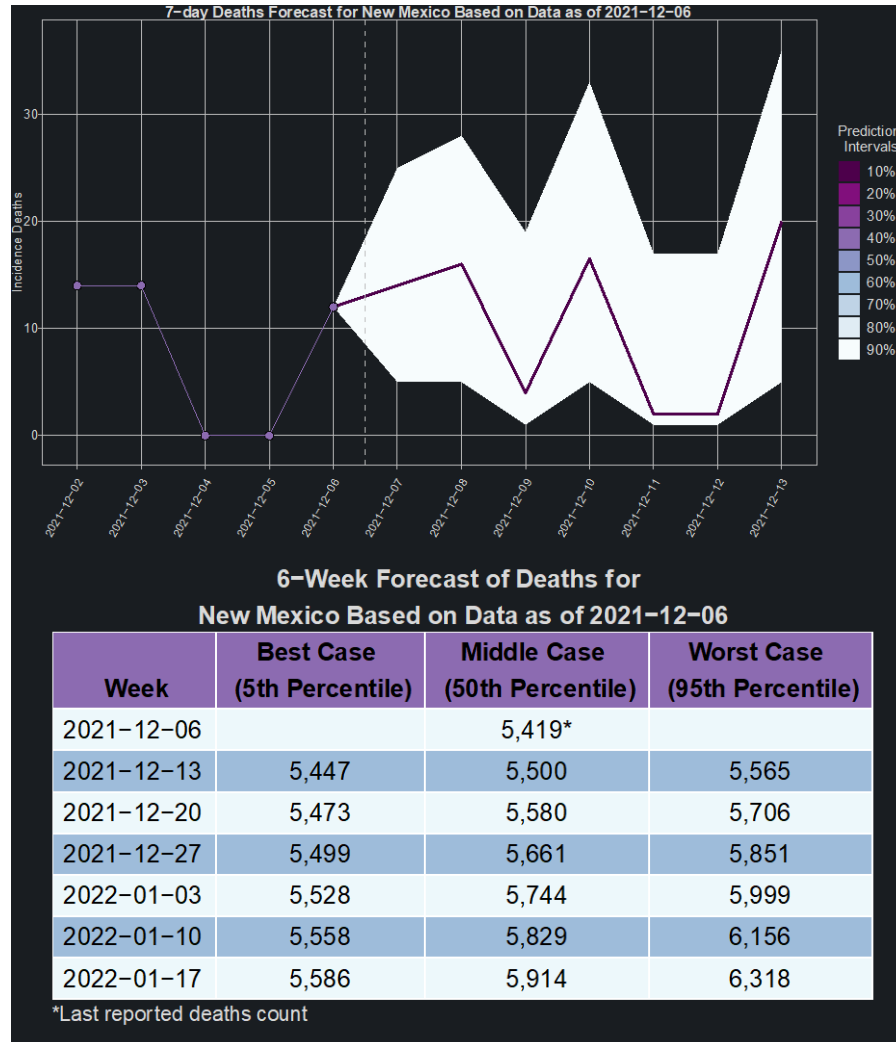
Week End Date	Best Case (5th Percentile)	Middle Case (50th Percentile)	Worst Case (95th Percentile)
2021-12-06		1,596*	
2021-12-13	325	1,094	2,702
2021-12-20	383	1,221	2,913
2021-12-27	402	1,290	3,067
2022-01-03	378	1,303	3,174
2022-01-10	334	1,285	3,261
2022-01-17	292	1,254	3,350

\*Last reported confirmed cases count

**So what?**  
**Our model suggests that the number of daily cases is expected to range between 325 and 3,400 in the next few weeks**



# Short- & Long-Term Forecast for NM: Deaths



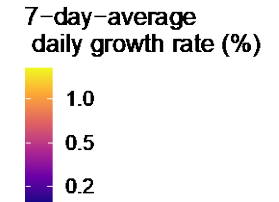
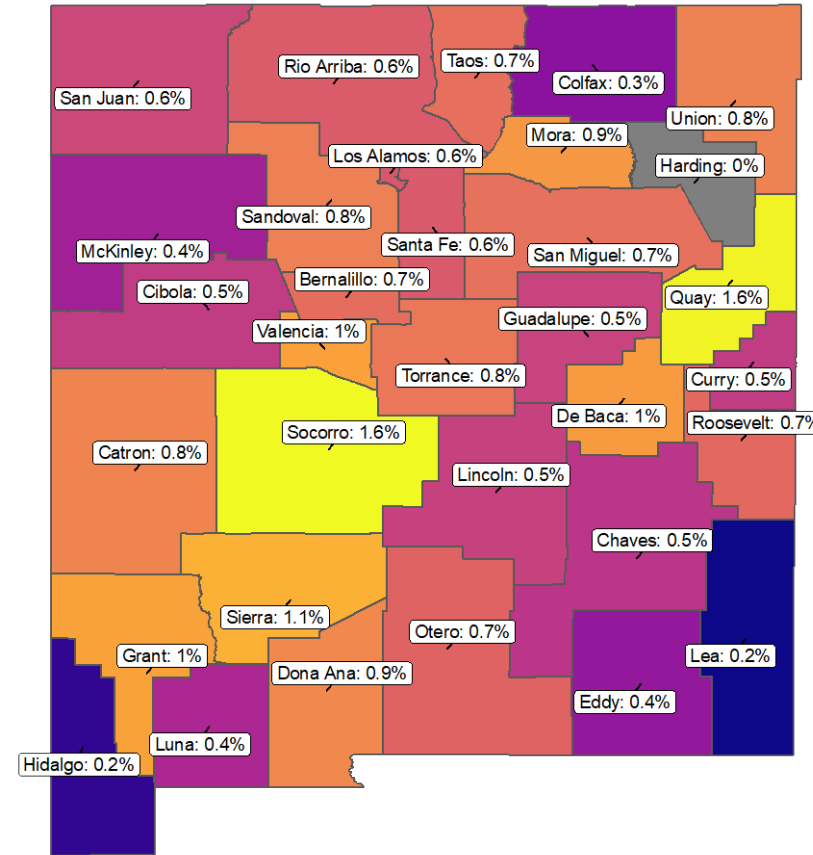
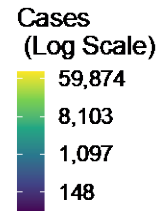
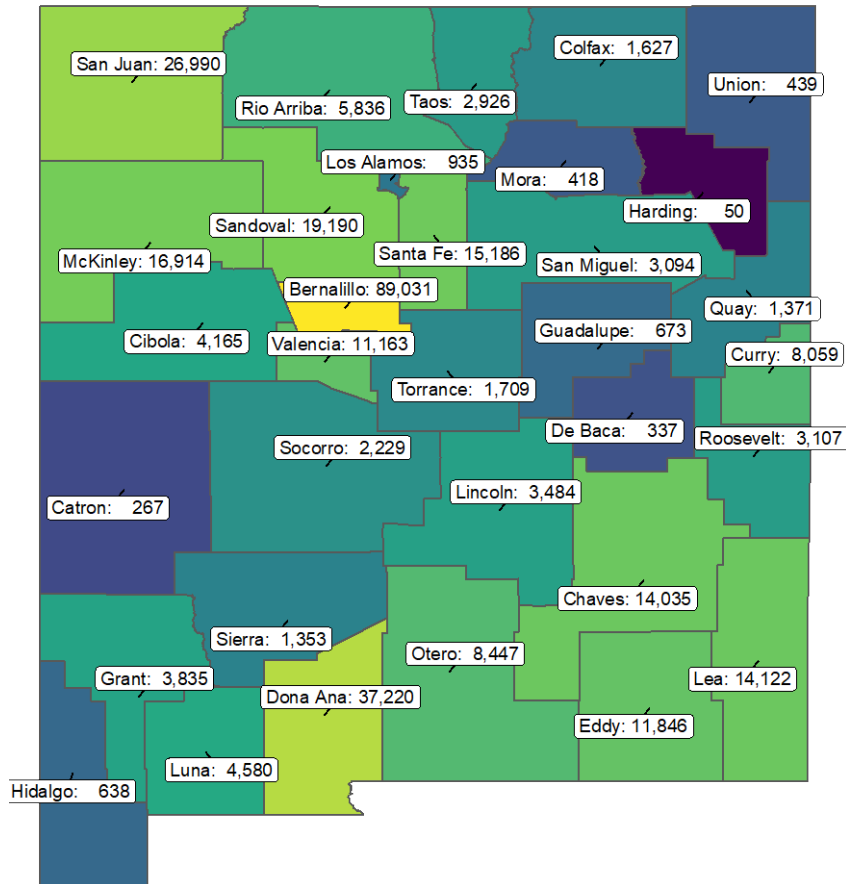
6-Week Forecast of Daily Average of Deaths for New Mexico Based on Data as of 2021-12-06

Week Start Date	Best Case (5th Percentile)	Middle Case (50th Percentile)	Worst Case (95th Percentile)
2021-12-06		9*	
2021-12-13	3	11	25
2021-12-20	3	10	25
2021-12-27	3	10	25
2022-01-03	3	11	26
2022-01-10	3	11	27
2022-01-17	3	10	28

\*Last reported confirmed deaths

**So what?**  
 Our model suggests that the number of daily deaths is expected to range between 3 and 30 in the next few weeks

# Cumulative Cases & Daily Growth Rate for NM: Dec 6

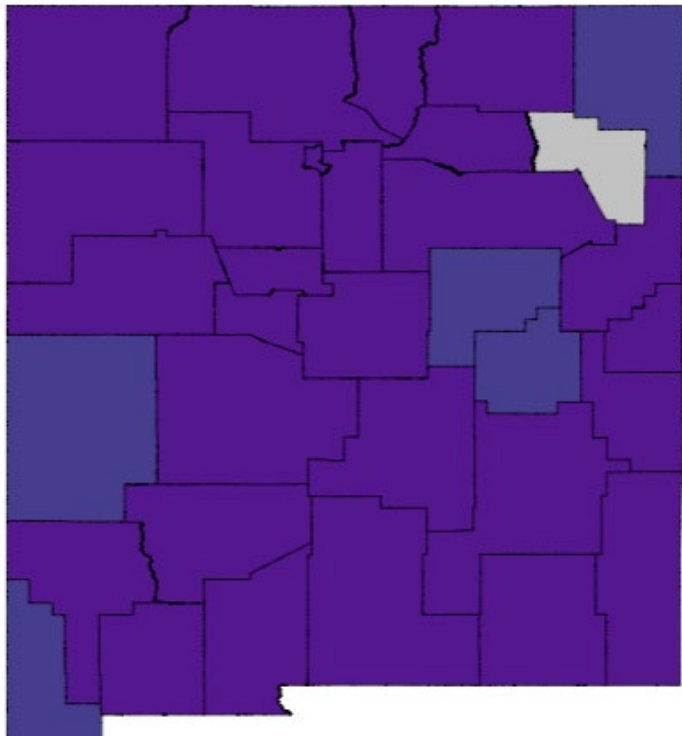


Catron, De Baca, Sierra, Socorro, Torrance, Quay and Union counties have an elevated cumulative growth rate, with an overall upward trend in rates statewide

\*Growth rate is in cumulative cases

# Weekly Growth Rate for NM: Another View (Dec 6)

A 7-day moving window comparison  
Dec 06, 2021



Impacted New  
Mexicans

Counties with  
New Cases This Week

Growth Rate	0k	0k	2.07M	Accelerating
	0k	0k	19k	Constant
	0k	0k	0k	Decelerating
	Low	Med	High	Cases Per Capita

Counties With  
No New Cases In ...

0.5k	0k	0k
Last Week	Two Weeks	3+ Weeks

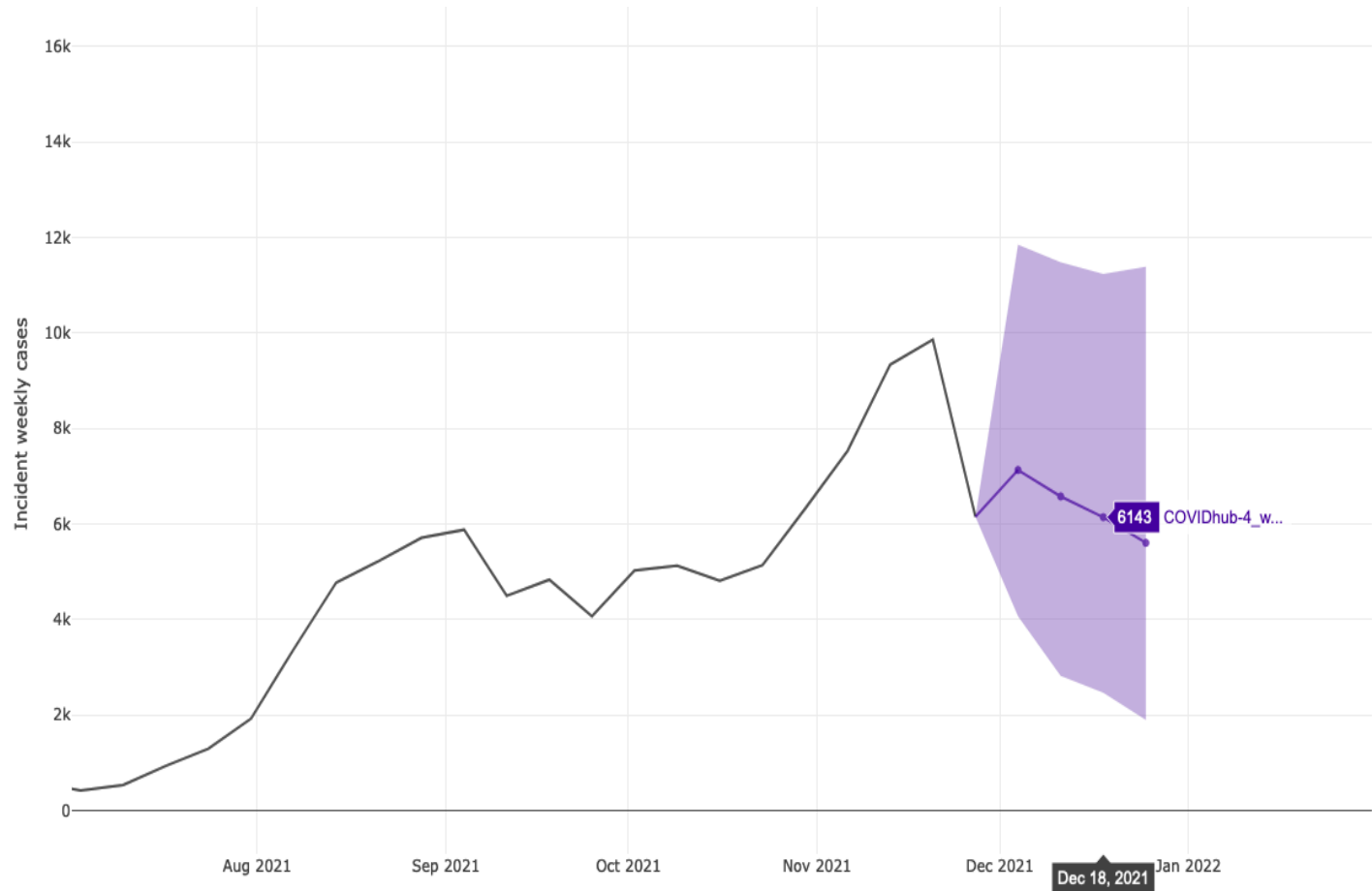
- ## So what?
- Most counties statewide are accelerating
  - Most people in New Mexico are living in a county that has **higher per-capita case counts and accelerating**

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

# Forecast for Incident Weekly Cases in NM

The CDC ForecastHub shows a <1% decrease in incident weekly cases by Dec 18, 2021 from current counts observed at 6154 (Nov 27)



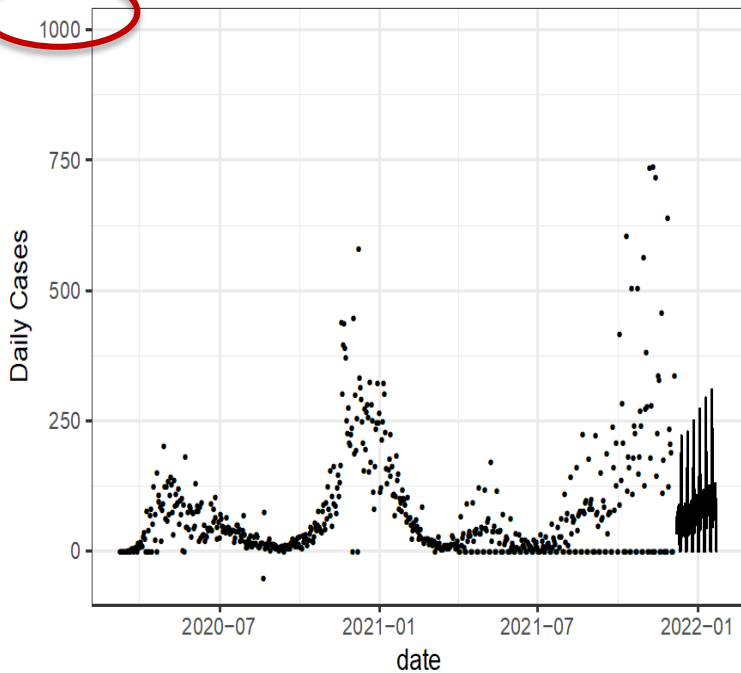
COVIDhub-4\_week\_ensemble prediction, COVID 19  
ForecastHub

<https://viz.covid19forecasthub.org/>

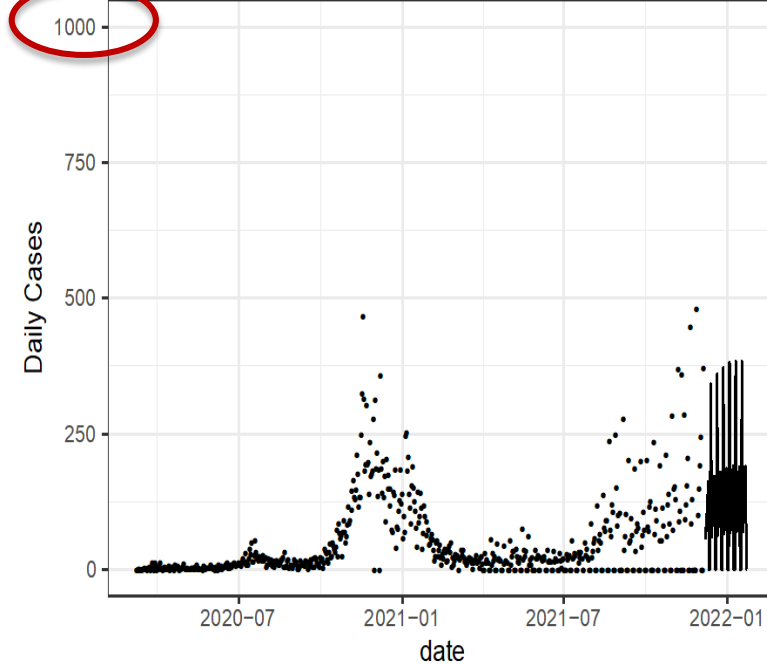
## > **Additional Regional Forecasts**

# Central & North Regions Daily Cases Forecast

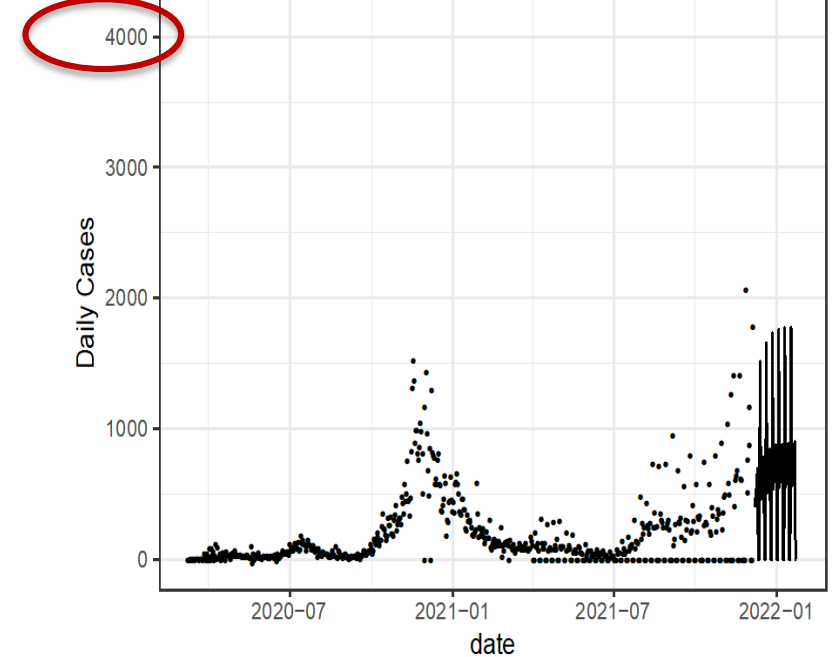
## Northwest



## Northeast



## Central

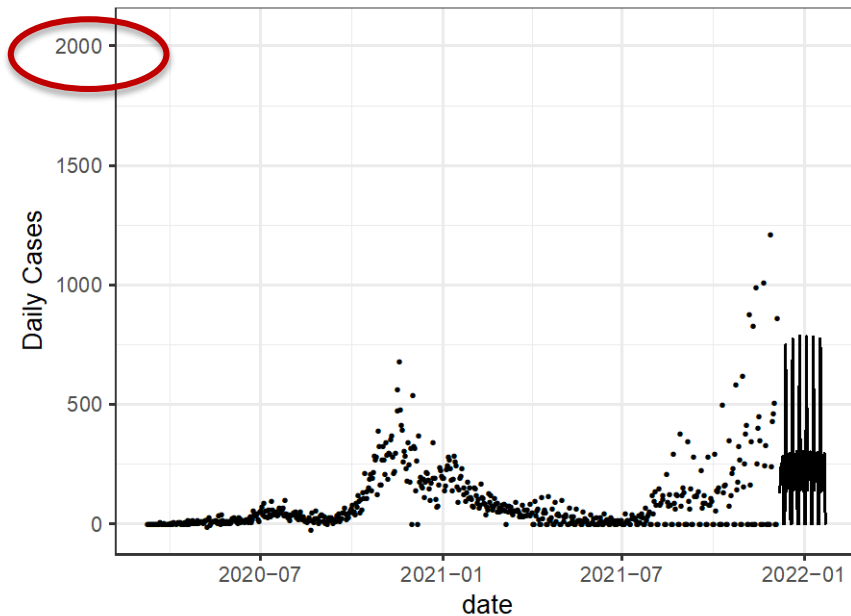


**So what?**

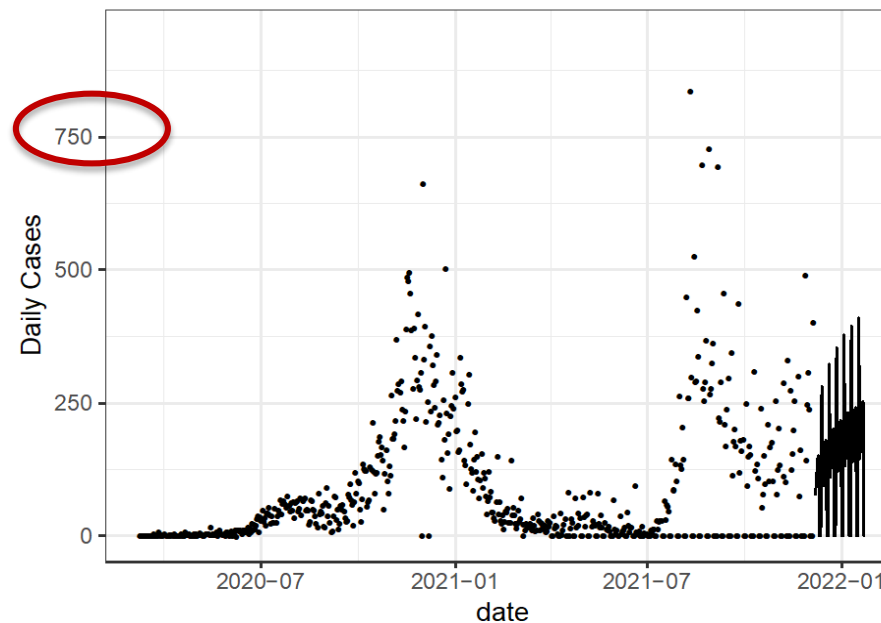
**The central region is expected to see the most number of cases followed by the northeast and northwest regions.**

# South Regions Daily Cases Forecast

## Southwest



## Southeast



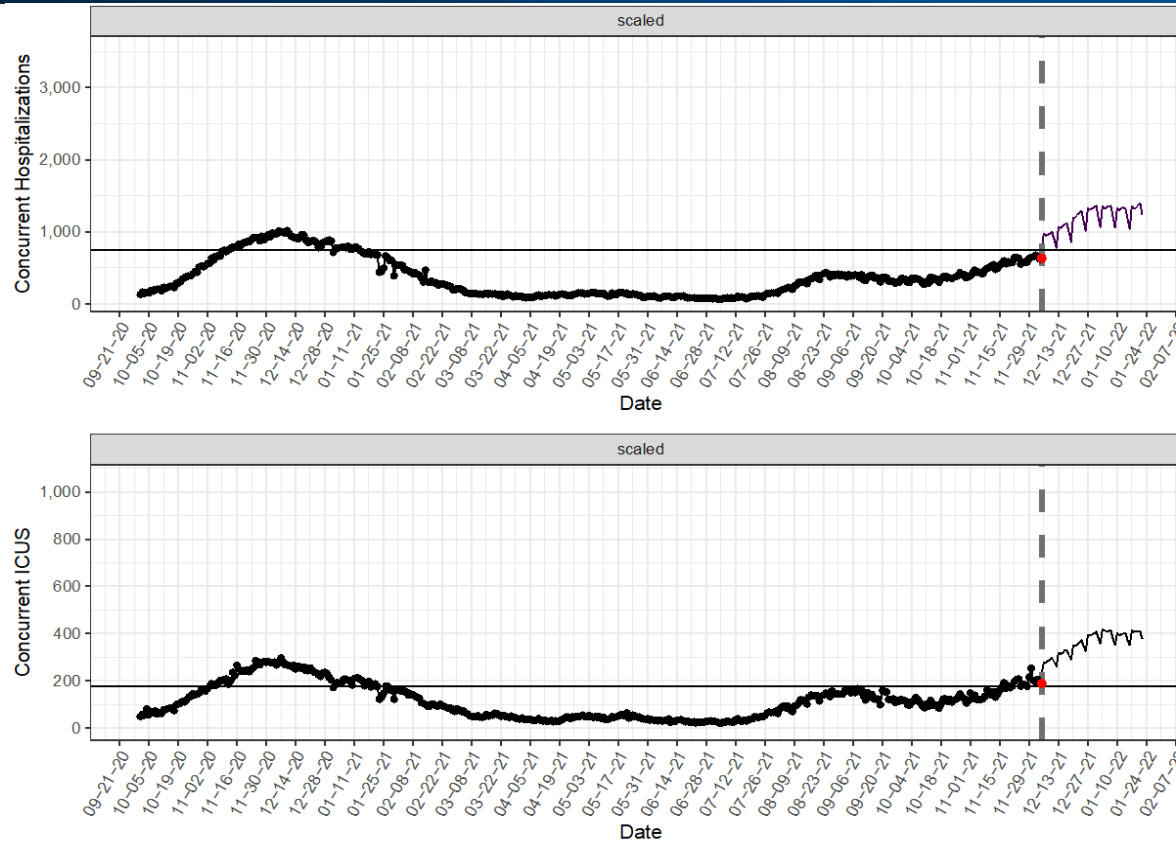
**So what?**

**The southwest region is expected to see the most number of cases followed by the southeast region**

# > Hospitalization Forecast



# 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

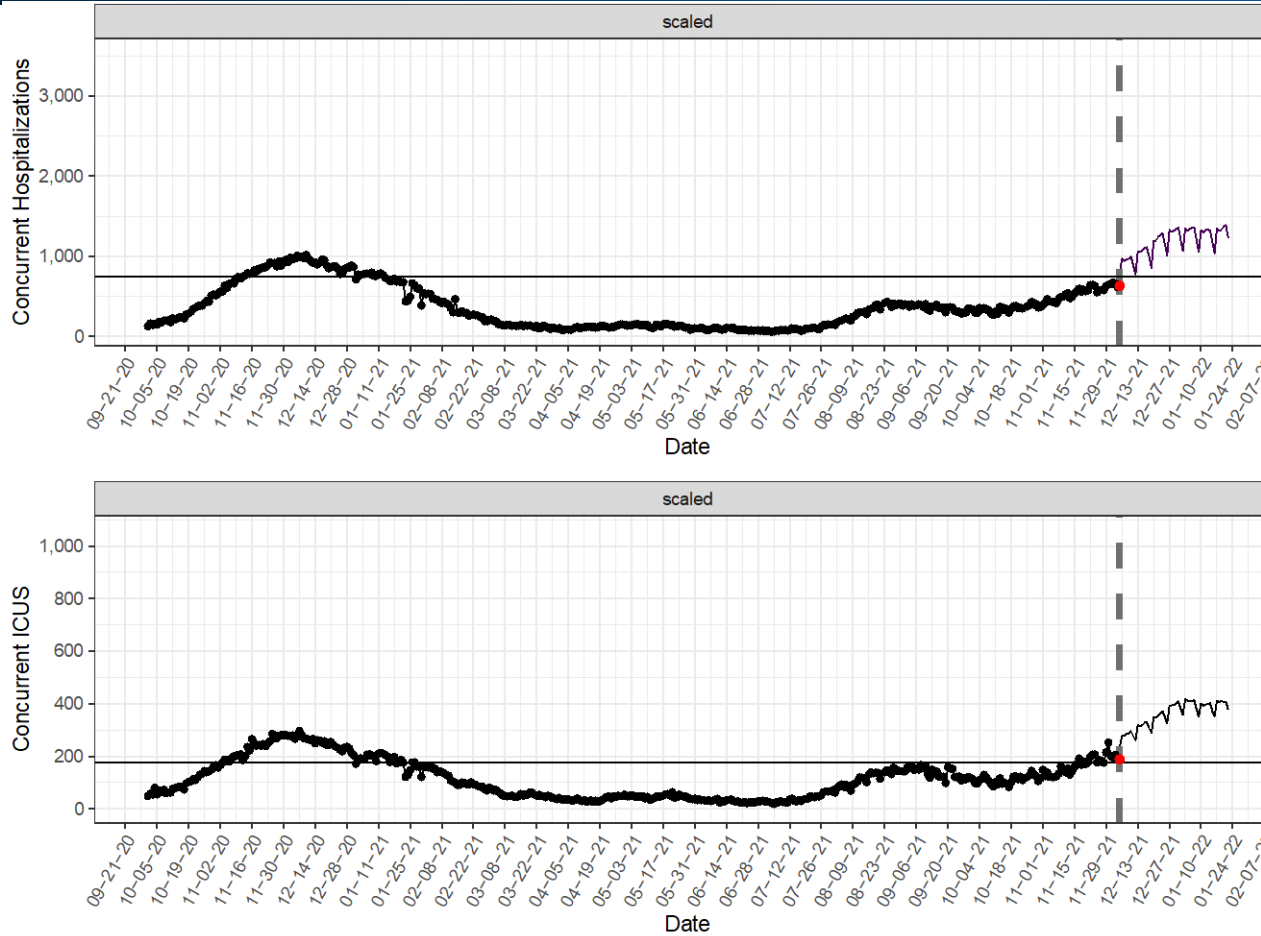
Week	Qu. 5% (best case)	Qu. 50% (median)	Qu. 95% (worst case)
12/12	157	259	487
12/19	92	289	685
12/26	91	325	786
1/2/22	92	357	878
1/9/22	85	352	920
1/16/22	73	351	922

“Scaled” Scenario

So what?

Model is predicting an increase in COVID-19 ICU beds needed over the next 3 weeks. Calibration is nearly complete, but model estimates may be high.

# 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)
12/12	253	519	1141
12/19	182	567	1479
12/26	173	689	1666
1/2/22	178	710	1826
1/9/22	170	705	1865
1/16/22	140	690	1856

“Scaled” Scenario

So what?

Med-surge general bed needs are predicted to increase during the next 3 weeks. Calibration is nearly complete, but estimates may be high.