

Modeling & Forecasting COVID-19 in NM

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May 17, 2022

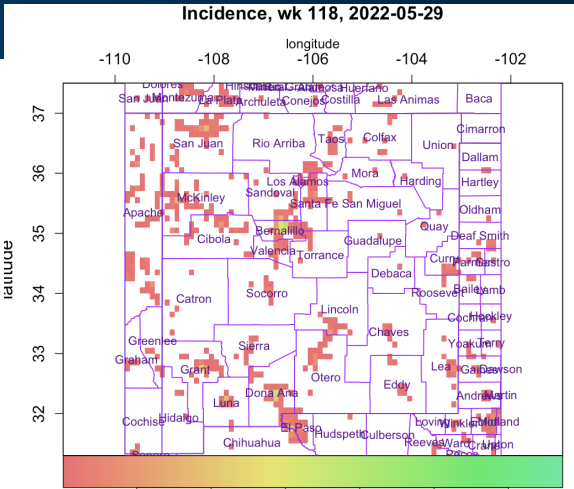
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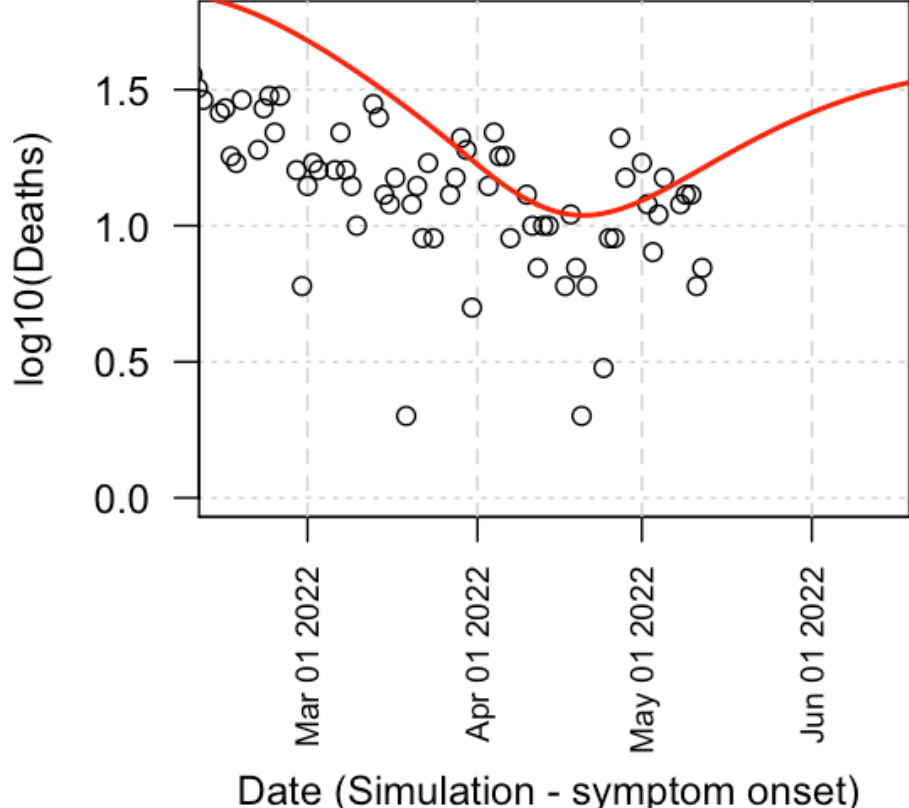
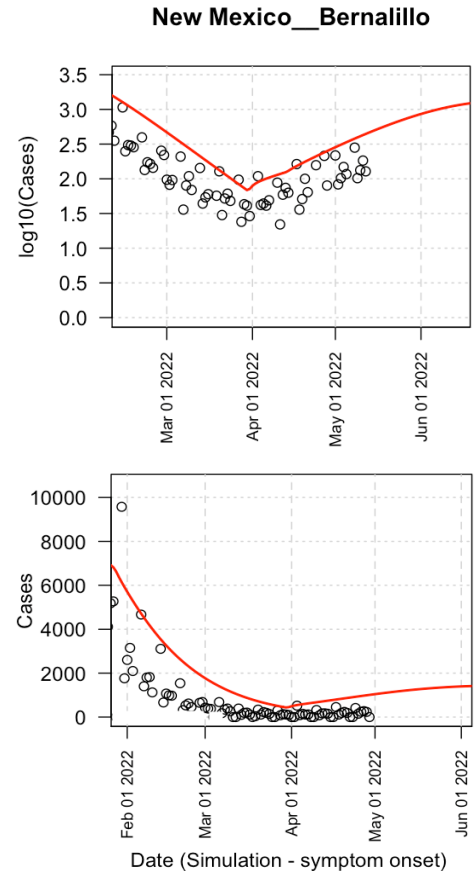
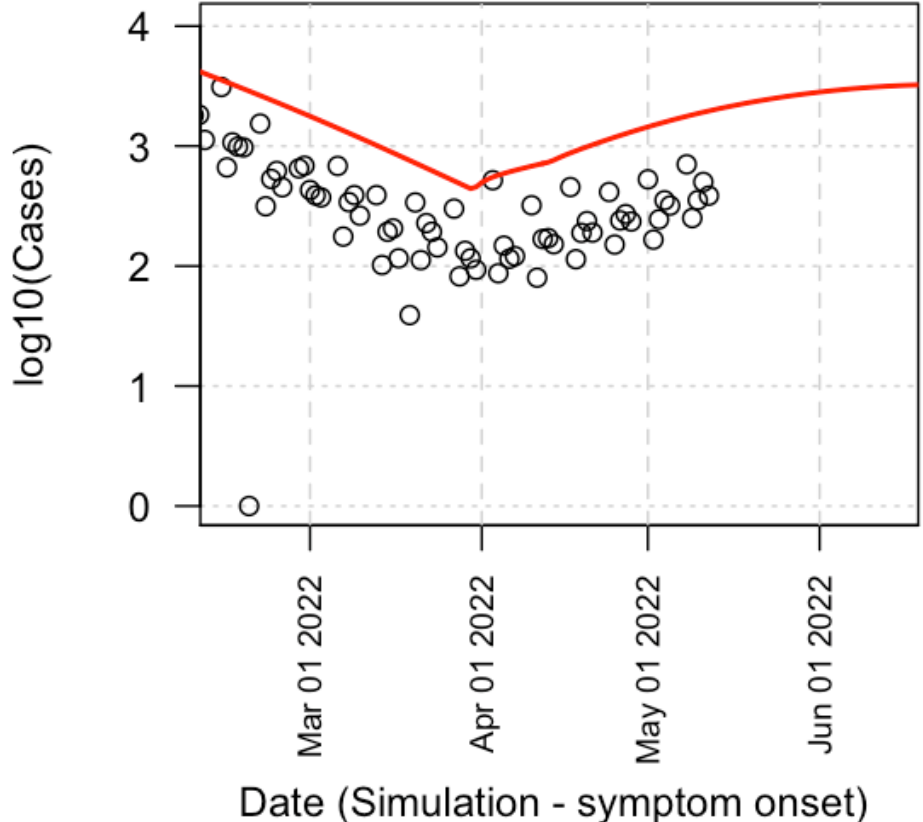
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17 May 2022: Epigrad modeling

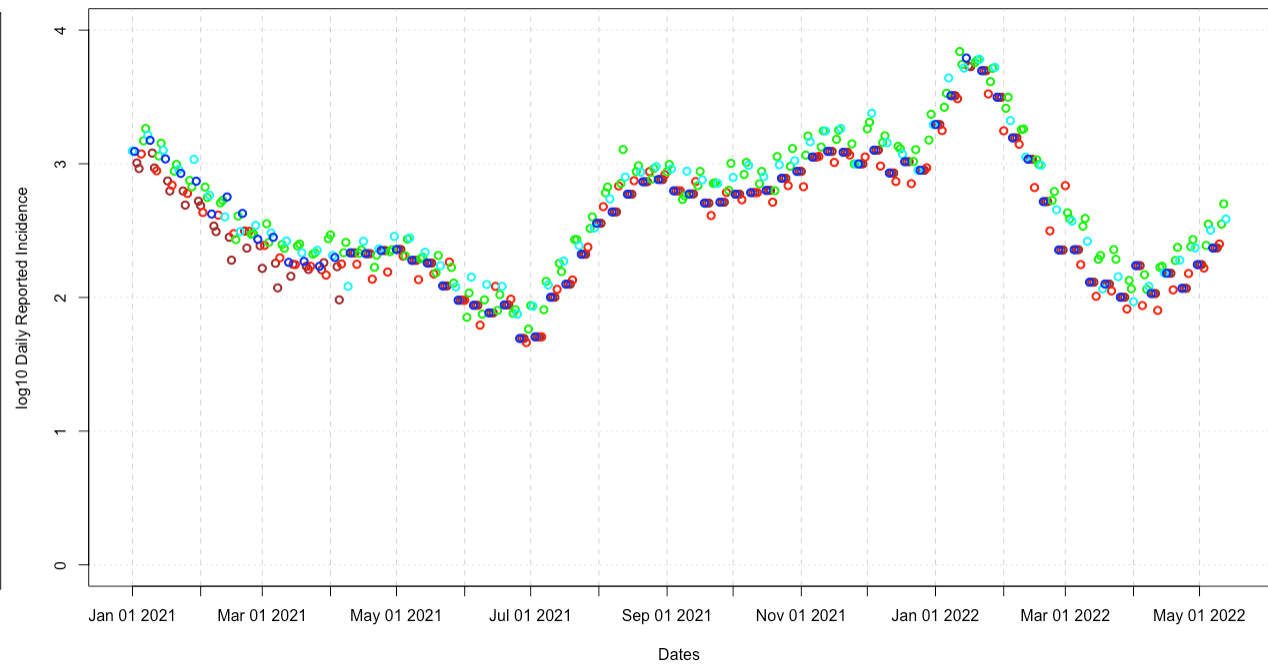
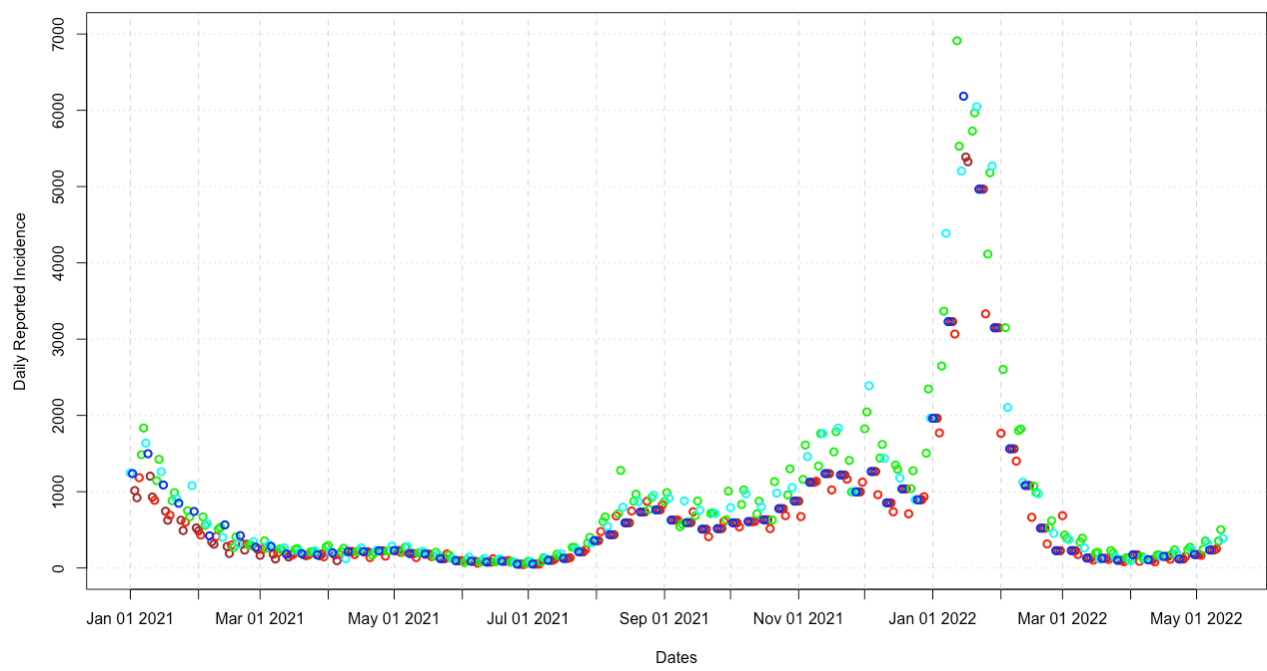
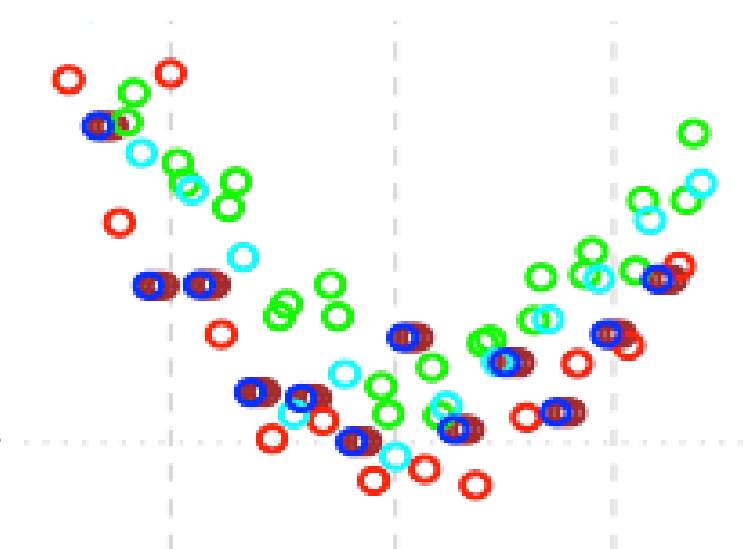
- NM daily incidence is rising. Immune evasion is a significant factor.
- Reduced indoor masking facilitates community spread.
- Use of high-quality, well-fitted N95s enhances stopping transmission of covid, as observed in hospitals.
- Waning immunity is also likely significant to the current rise in daily incidence.
- Vaccination is largely protective against severe outcomes, as are timely, approved treatments.



A look at the raw incidence data

- Sunday, Monday
 - Tuesday
 - Wednesday/Thursday
 - Friday
 - Saturday
- The reported incidence is rising.
 - Color-coded by-day-of-week incidence is rising.
 - Recent within-week incidence does *not* show evidence of State-wide deceleration of growth.

The 190 cases in the Lea county correctional facility are removed from data reported on March 26th, 2021. The 1/3 of reported cases that were > 2 weeks prior were removed from March 24th, 2021. Case reported for weekends starting April 10-12th, 2021 are each divided by 3 to estimate individual day counts.

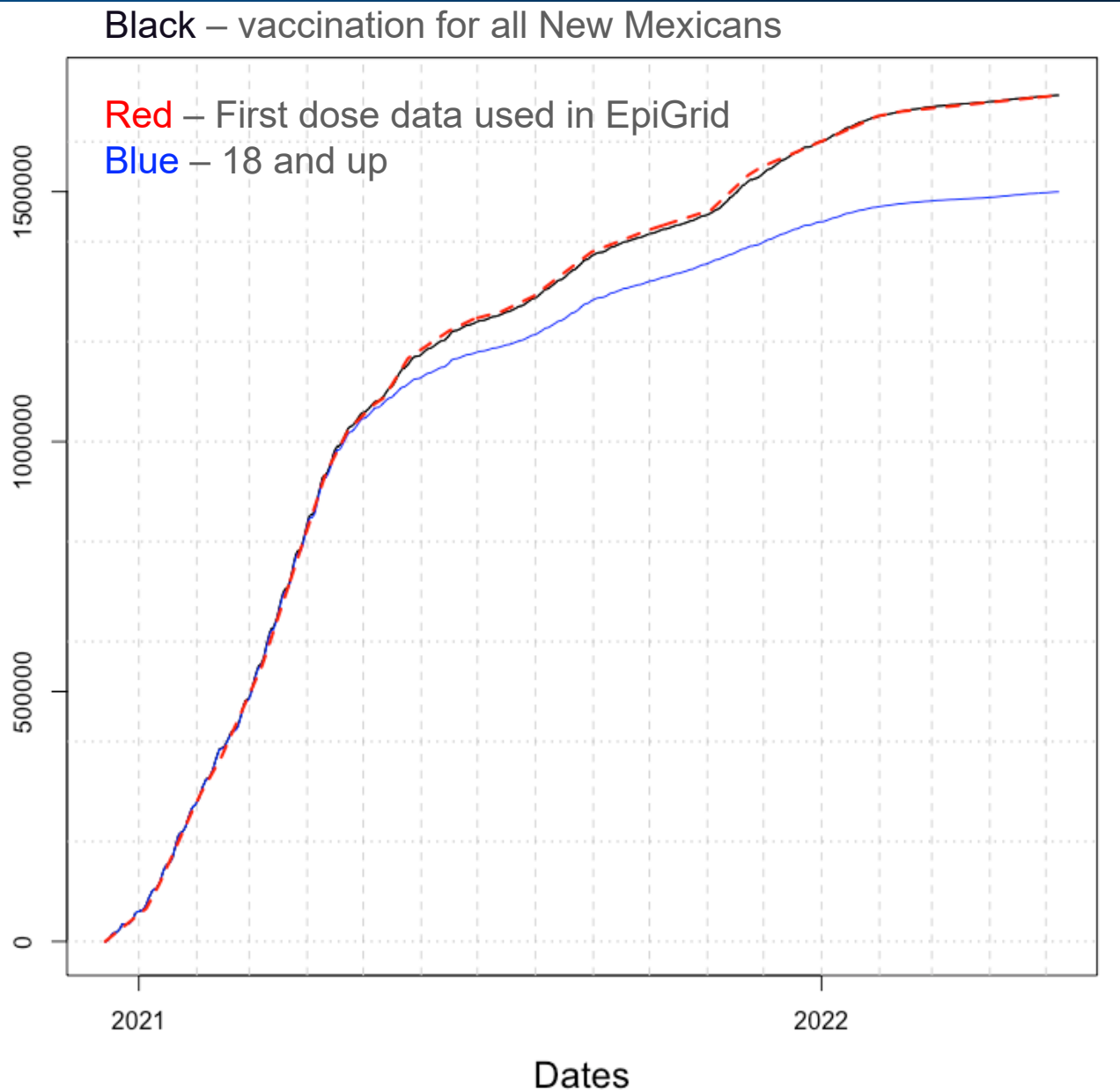


17 May 2022 Vaccine Analysis (NM)

- 1694k first doses.
- 1453k completed initial vaccine series
- 807k boosters completed +2k/2
- 117k fourth doses completed +39k/2
- 5-11 year old vaccinations continue to be slow.

- 805k * ~1/3 = >200k eligible for dose 4, but ~100k not inoculated.
- ~600k eligible for dose 3 who have not yet received it.
- **Waning immunity in May 2022 is likely playing a role:**
 - Effect on infection rate likely
 - Effect on severity is possible, data ambiguous
- **Viral evasion may eventually outpace the current low vaccination rate.**

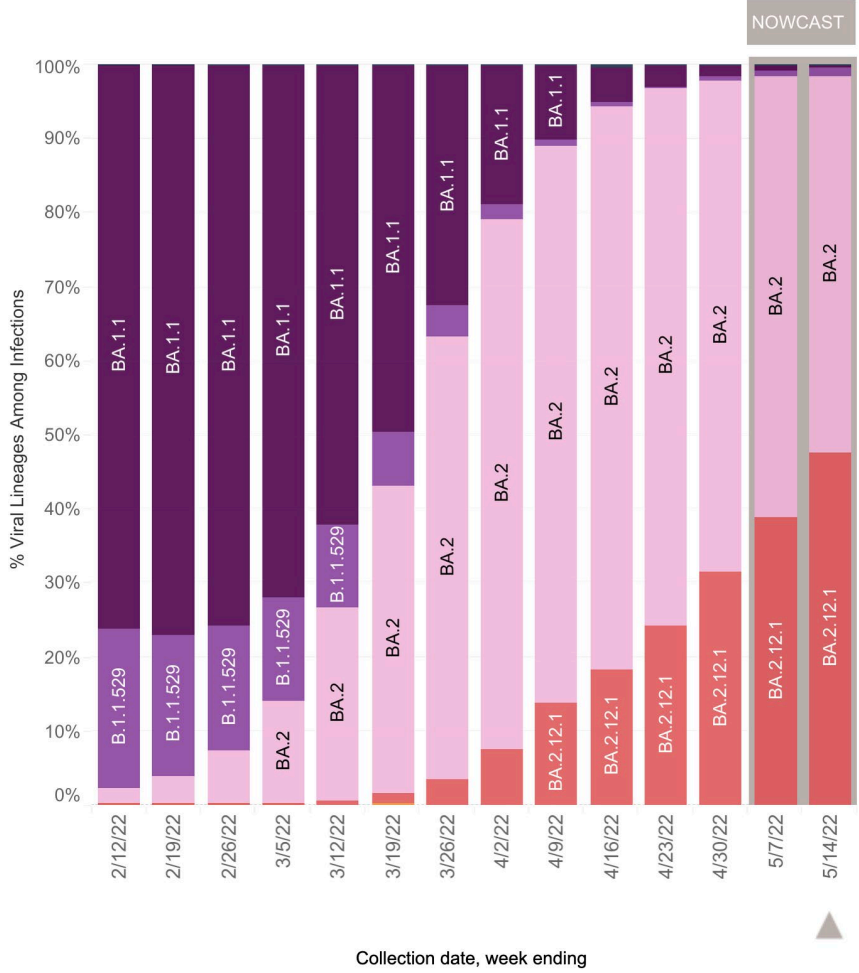
- Vaccines with updated antigens would have high utility now.



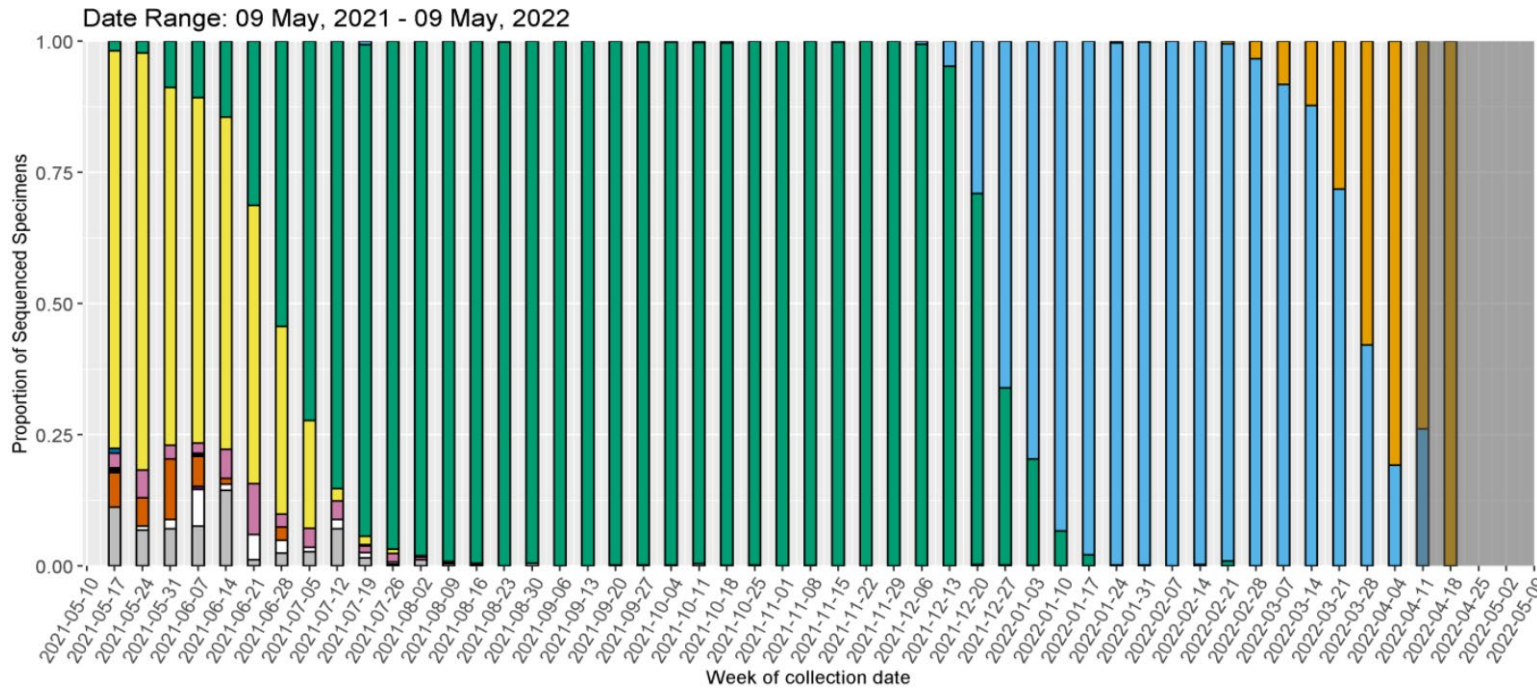
US Census Bureau reports 2097k people in New Mexico.

Variant Monitoring: Omicron is the current variant

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



- Viral variant BA.2.12.1 is more evasive than BA.1 and BA.2
- NM data is consistent with BA.2.12.1 being evasive and contributing to growth.
- Case growth rates (~2x/month) are slower than BA.1
- Unlikely prior variants that appeared without evident intermediates, BA.2.12.1 is a derivative variant. More gradual changes are a possibility.
- Approximately 6-12 months is the longest variant-interval: D614G (~3 months), Alpha (~6-9 months), Delta (~6 months), Omicron BA.1 (~6 months). BA.2.12.1 May be only a 4 months interval.



Screenshot-only of CDC variant data, no static image available

Recent By-State Trends: Most Populous 10 States and New Mexico

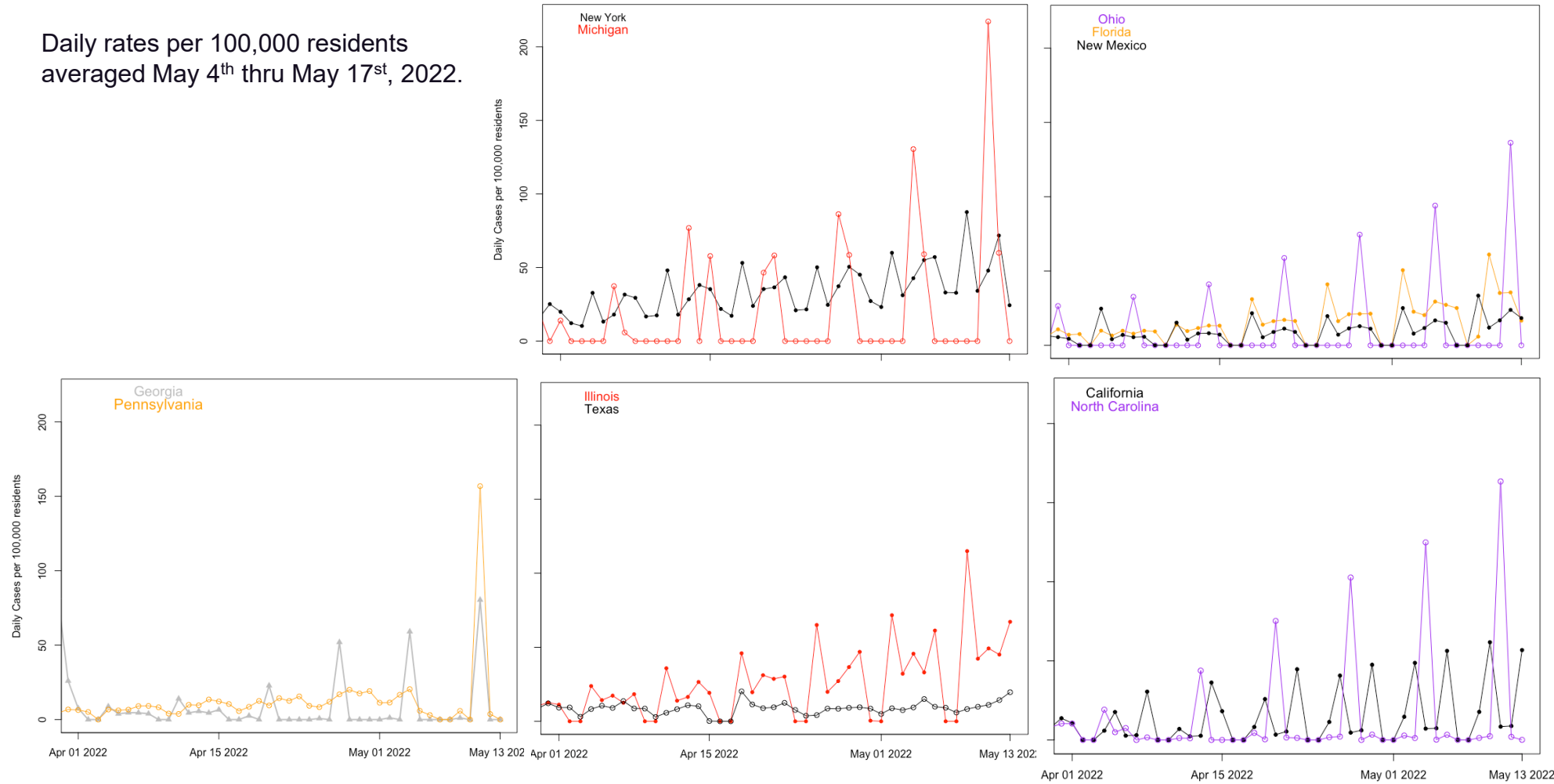
Trends over the last 1-3 weeks: *Increasing*: California, Florida, Georgia, Illinois, Michigan, New Mexico, New York, N. Carolina, Ohio, Pennsylvania, Texas. *Flat*: n/a. *Declining*: n/a.

	Cases	Deaths
New York	47.41	0.111
Michigan	39.61	0.109
Ohio	19.48	0.067
Florida	25.64	0.077
New Mexico	14.91	0.305
Illinois	45.52	0.056
Texas	11.18	0.037
California	21.96	0.092
North Carolina	24.18	0.015
Georgia	11.65	0.141
Pennsylvania	23.78	0.09

Daily rates per 100,000 residents averaged May 4th thru May 17st, 2022.

Through 05/13			
	Cases	Deaths	
1 New York	35.76	42.37	47.41
2 Michigan	20.7	27.08	39.61
3 Ohio	10.65	13.43	19.48
4 Florida	17.24	21.45	25.64
5 New Mexico	8.9	10.93	14.91
6 Illinois	27.94	34.87	45.52
7 Texas	7.32	9.16	11.18
8 California	15.77	19.2	21.96
9 North Carol	15.72	18.92	24.18
10 Georgia	7.53	8.62	11.65
11 Pennsylvani	14.26	12.56	23.78

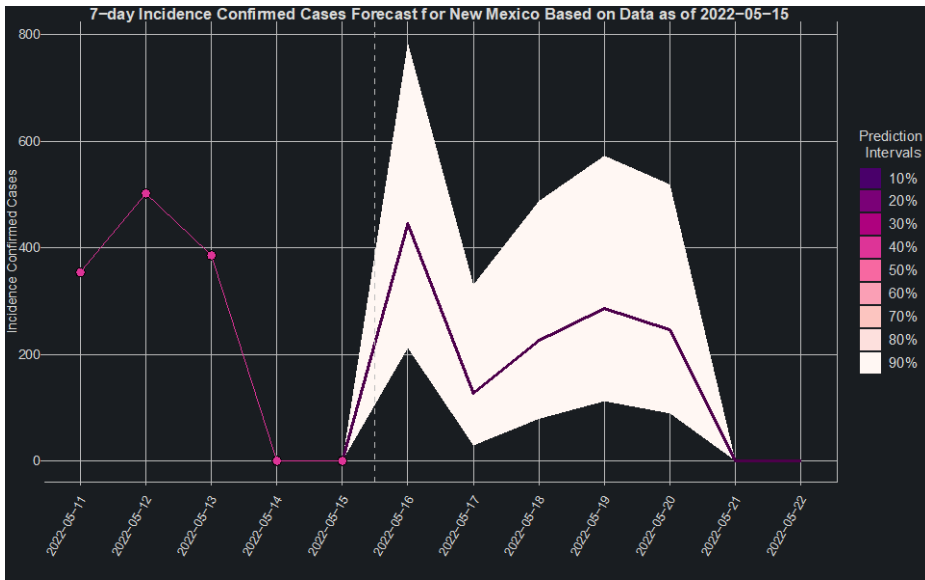
	Deaths		
1 New York	0.078	0.089	0.111
2 Michigan	0.096	0.089	0.109
3 Ohio	0.083	0.082	0.067
4 Florida	0.077	0.073	0.077
5 New Mexico	0.387	0.428	0.305
6 Illinois	0.044	0.066	0.056
7 Texas	0.044	0.035	0.037
8 California	0.118	0.102	0.092
9 North Carol	0.056	1.565	0.015
10 Georgia	0.174	0.197	0.141
11 Pennsylvani	0.079	0.078	0.09



By-County Daily Incidence Trends (mostly) in New Mexico

- **Rising daily incidence: Bernalillo, Cibola, Los Alamos, Rio Arriba, Sandoval, Santa Fe, Socorro, Valencia.**
- **Rising, but possibly exhausting susceptibles (for the time being): Curry, Dona Ana, Taos.**
- **Rising recently: Eddy, Grant, San Juan, Mora, Otero, San Miguel; El Paso, TX.**
- **Plateau in daily incidence: Chavez, Colfax, Guadalupe, Hidalgo, Lea, Lincoln, Luna, McKinley, Roosevelt, Sierra, Torrance.**

Short- & Long-Term Forecast for NM: Cases



6-Week Forecast of Confirmed Cases for New Mexico Based on Data as of 2022-05-15

Week	Best Case (5th Percentile)	Middle Case (50th Percentile)	Worst Case (95th Percentile)
2022-05-15		526,137*	
2022-05-22	526,666	527,470	528,828
2022-05-29	527,458	529,232	532,123
2022-06-05	528,390	531,293	535,932
2022-06-12	529,344	533,576	540,160
2022-06-19	530,279	535,994	544,698
2022-06-26	531,089	538,624	549,862

*Last reported confirmed cases count



6-Week Forecast of Daily Average of Confirmed Cases for New Mexico Based on Data as of 2022-05-15

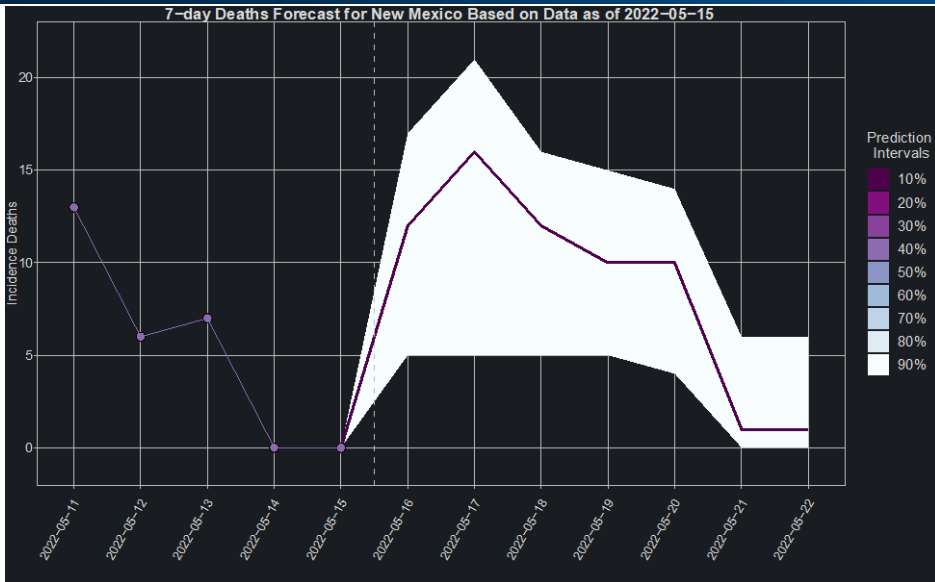
Week End Date	Best Case (5th Percentile)	Middle Case (50th Percentile)	Worst Case (95th Percentile)
2022-05-15		314*	
2022-05-22	74	190	385
2022-05-29	108	251	475
2022-06-05	125	294	547
2022-06-12	124	325	622
2022-06-19	114	348	691
2022-06-26	101	370	769

*Last reported confirmed cases count

So what?

Our model suggests that the number of daily cases is expected to range between 75 and 800 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 2022-05-15

Week	Best Case (5th Percentile)	Middle Case (50th Percentile)	Worst Case (95th Percentile)
2022-05-15		7,607*	
2022-05-22	7,633	7,670	7,688
2022-05-29	7,659	7,732	7,770
2022-06-05	7,688	7,801	7,862
2022-06-12	7,718	7,878	7,973
2022-06-19	7,749	7,962	8,103
2022-06-26	7,784	8,049	8,257

*Last reported deaths count



6-Week Forecast of Daily Average of Deaths for New Mexico Based on Data as of 2022-05-15

Week Start Date	Best Case (5th Percentile)	Middle Case (50th Percentile)	Worst Case (95th Percentile)
2022-05-15		7*	
2022-05-22	3	9	14
2022-05-29	3	8	14
2022-06-05	4	9	16
2022-06-12	4	10	19
2022-06-19	4	11	21
2022-06-26	4	12	25

*Last reported confirmed deaths

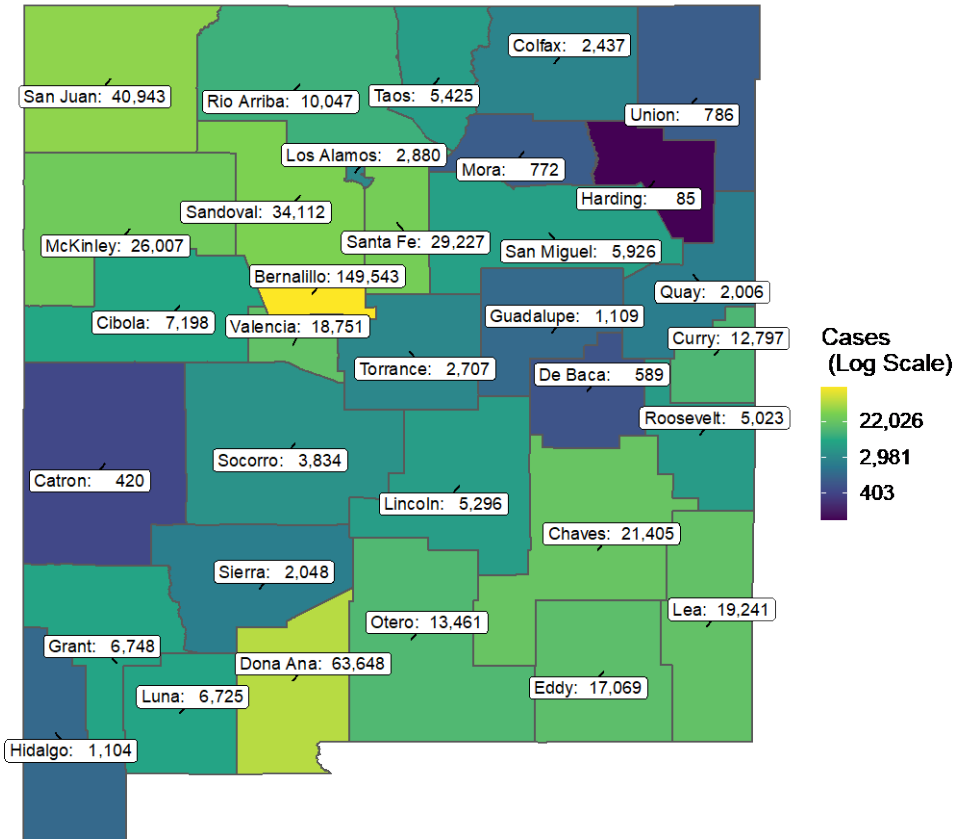
So what?

Our model suggests that the number of daily deaths is expected to range between 3 and 25 in the next few weeks

Cumulative Cases & Daily Growth Rate for NM: May 15

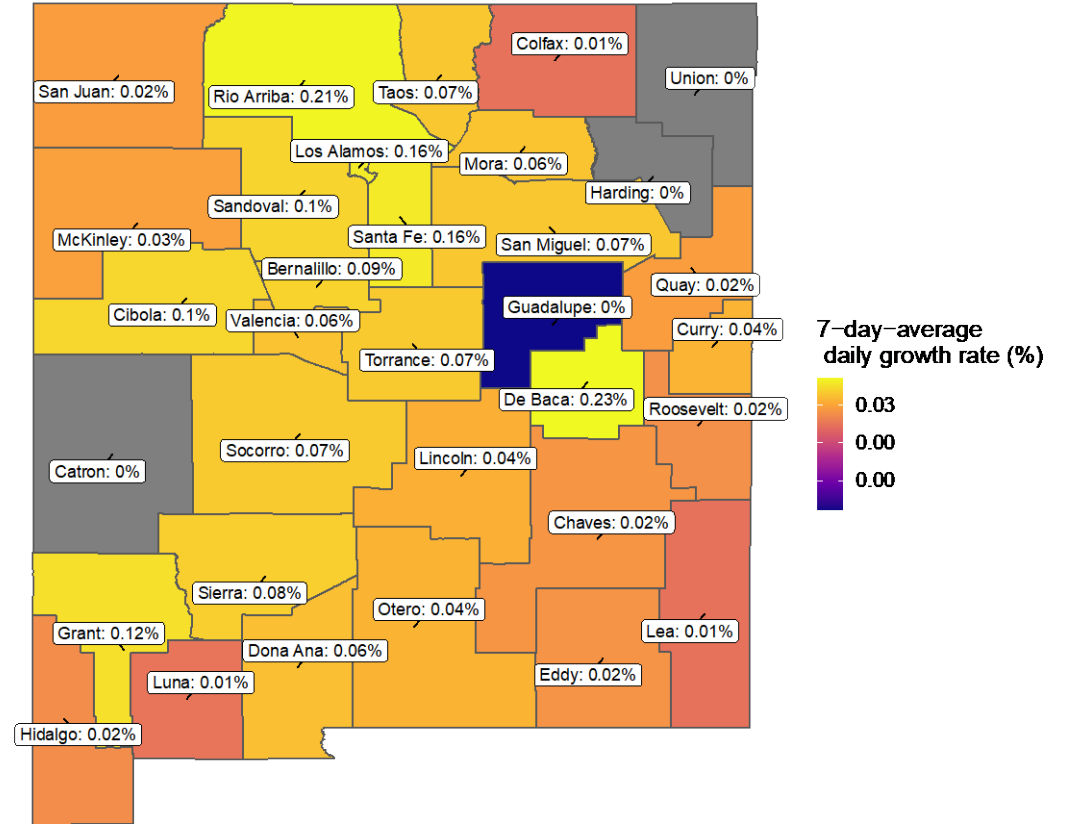
Cumulative Cases: 2022-05-15

Data Source: JHU <https://github.com/CSSEGISandData/COVID-19>



County COVID-19 Weekly Growth Rate

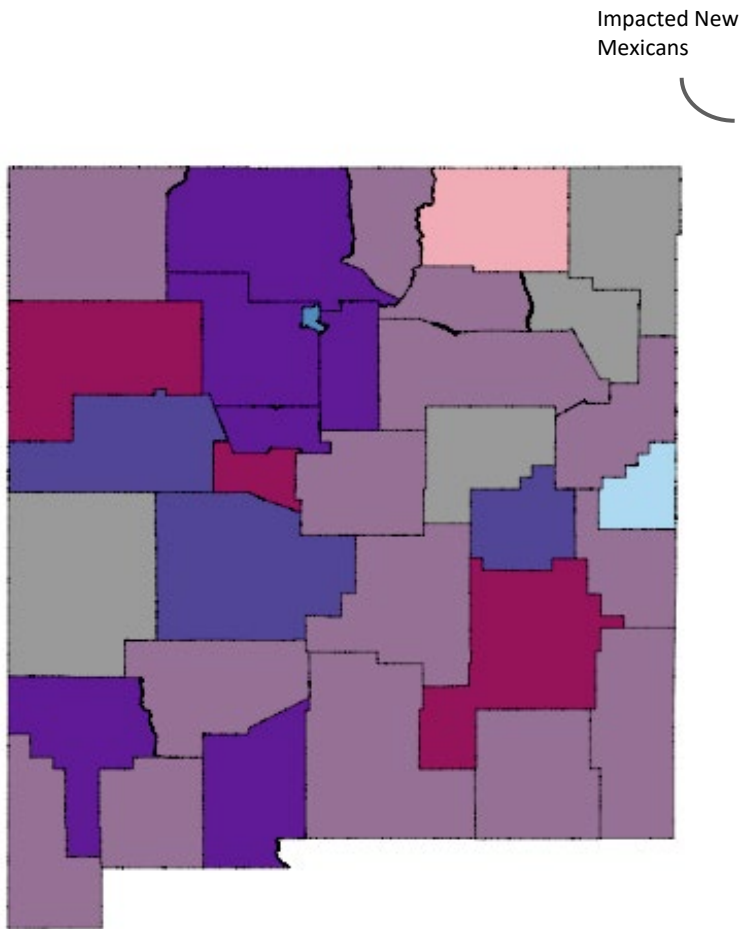
Data Source: JHU <https://github.com/CSSEGISandData/COVID-19>



De Baca, Rio Arriba, Los Alamos, and Santa Fe counties have the highest cumulative growth rates.

*Growth rate is in cumulative cases

Weekly Growth Rate for NM: Another View (May 16)



Counties with New Cases This Week

Growth Rate	0k	214k	1.25M	Accelerating
	12k	489k	46k	Constant
	0k	50k	18k	Decelerating
	Low	Med	High	Cases Per Capita

Counties With No New Cases In ...

0k	13k	0k
Last Week	Two Weeks	3+ Weeks

So what?

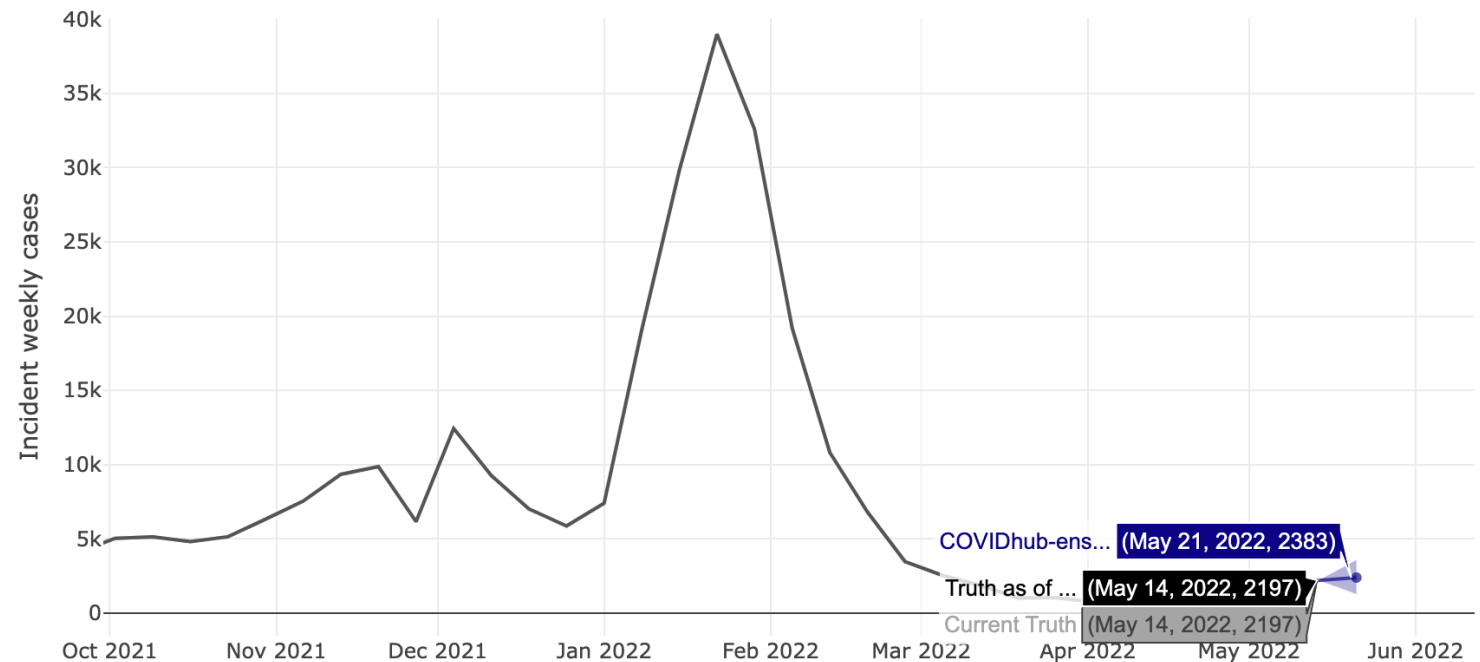
- Most people in New Mexico are living in a county that has **high per-capita case counts and accelerating**

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

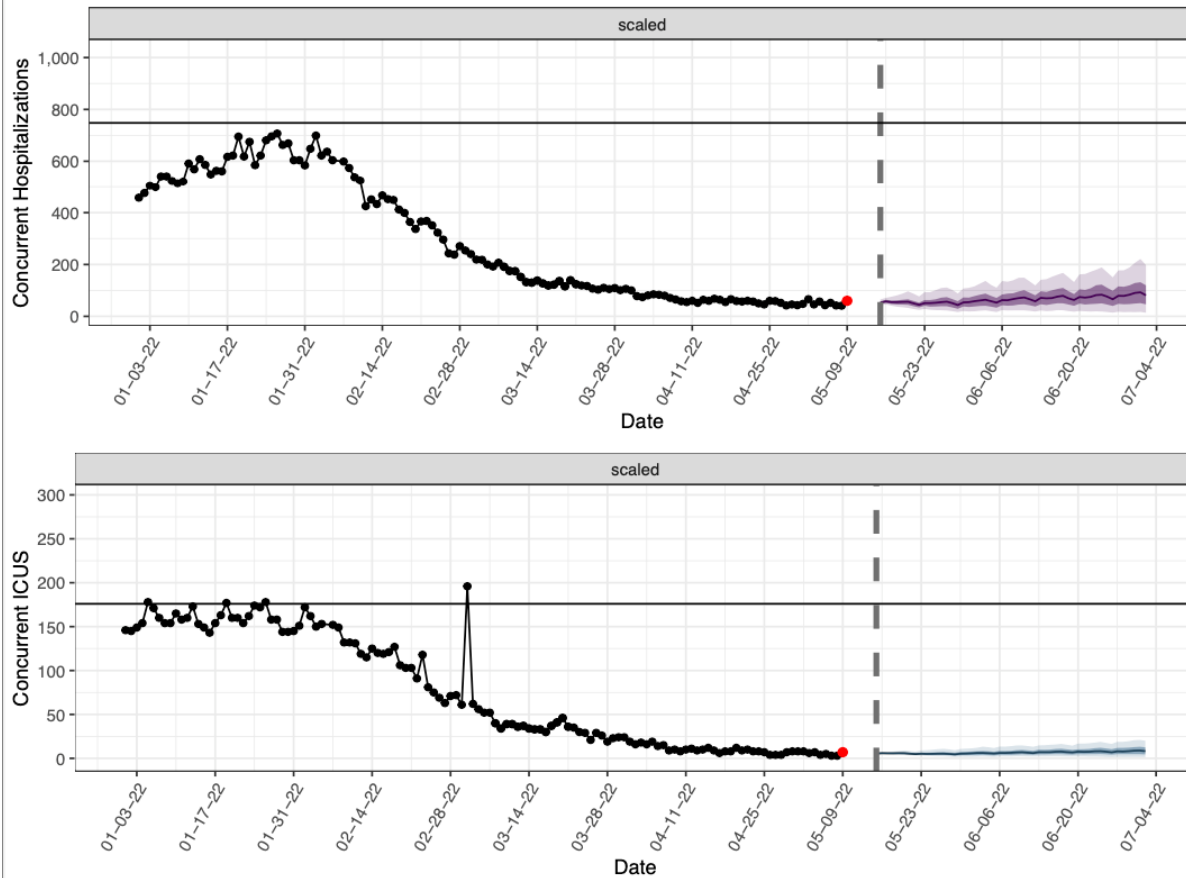
The CDC ForecastHub is predicting an 8% increase in one week incident cases to 2,383 (from May 14 at 2,197)



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

> Additional Regional Forecasts

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

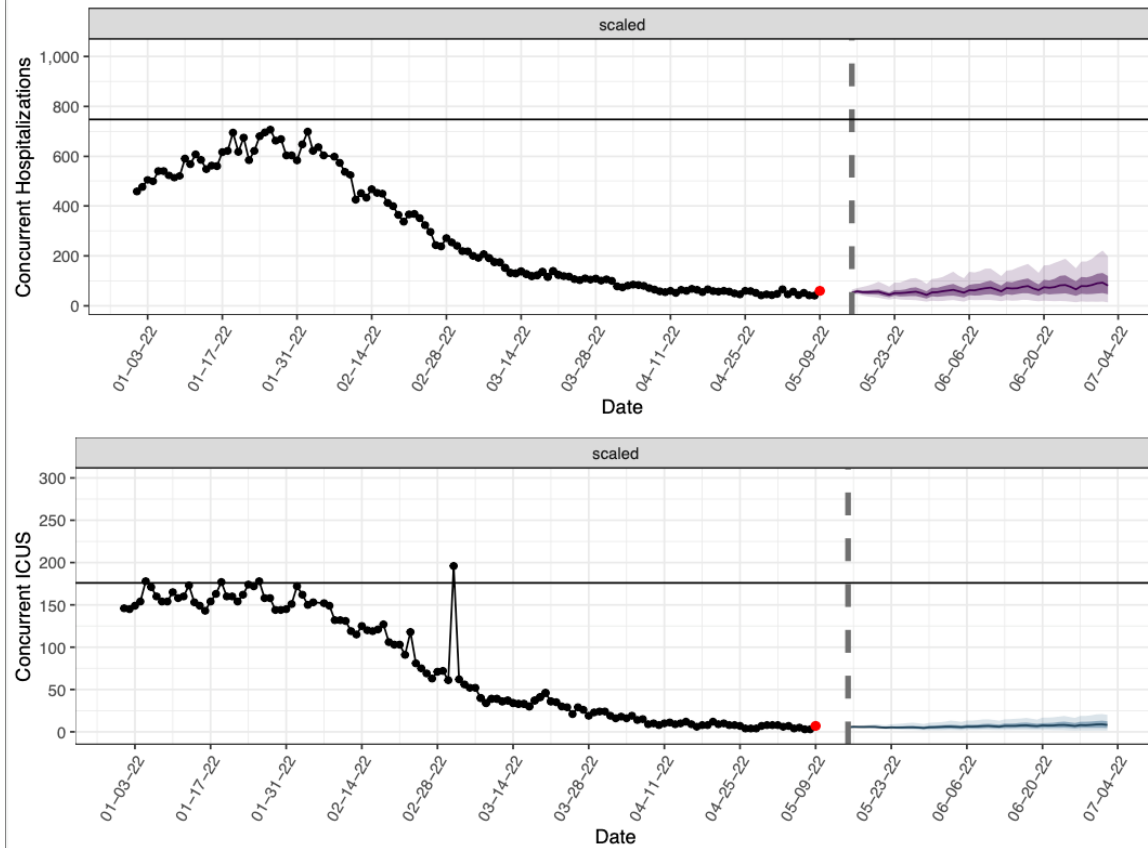
Week	Qu. 5% (best case)	Qu. 50% (median)	Qu. 95% (worst case)
5/22/22	3	5	8
5/29/22	2	5	9
6/5/22	2	5	12
6/12/22	2	6	13
6/19/22	2	7	14
6/26/22	1	7	16

“Scaled” Scenario

So what?

Model is predicting an increase in COVID-19 ICU beds needed over the next several 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)
5/22/22	22	40	69
5/29/22	15	39	79
6/5/22	15	47	99
6/12/22	16	52	106
6/19/22	16	56	118
6/26/22	13	59	134

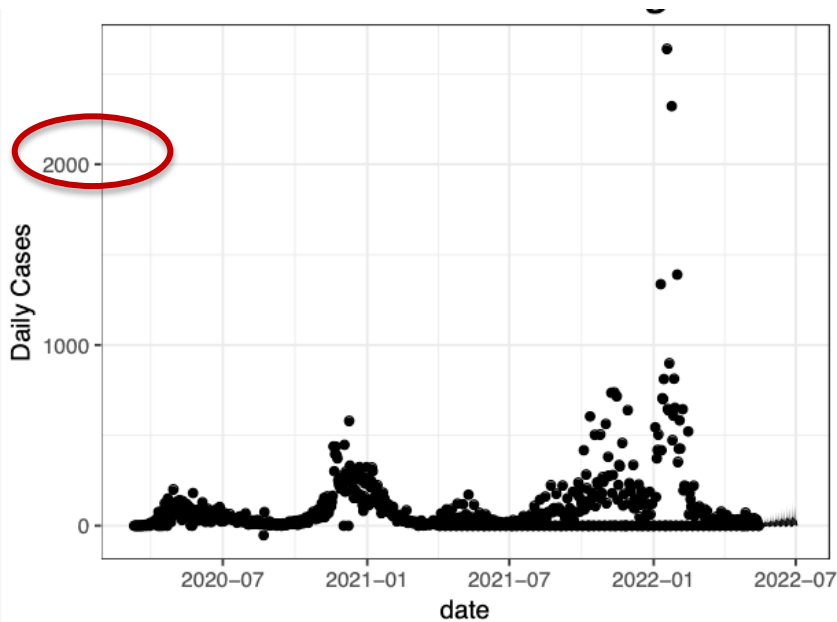
“Scaled” Scenario

So what?

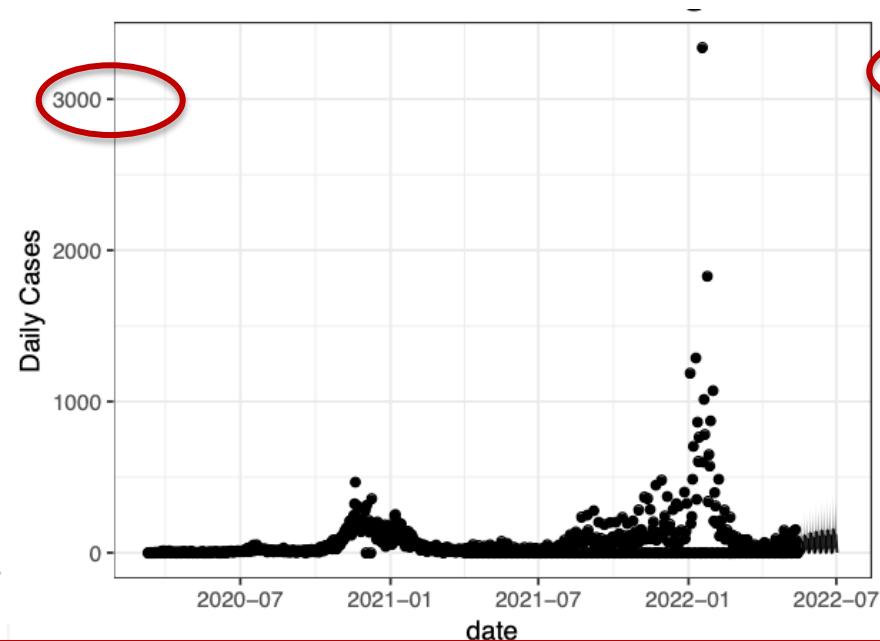
Med-surge general bed needs are predicted to increase overall during the next 3 weeks

Central & North Regions Daily Cases Forecast

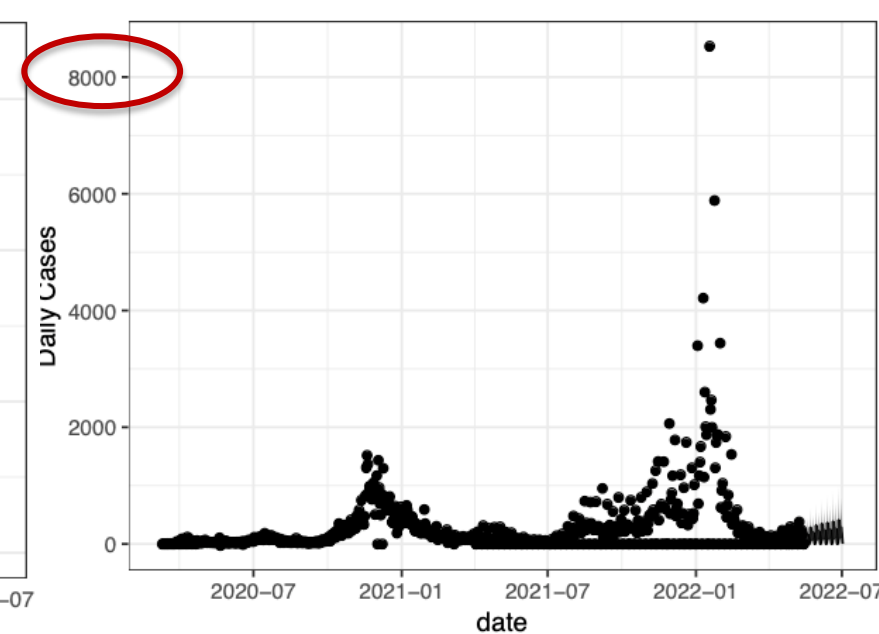
Northwest



Northeast



Central

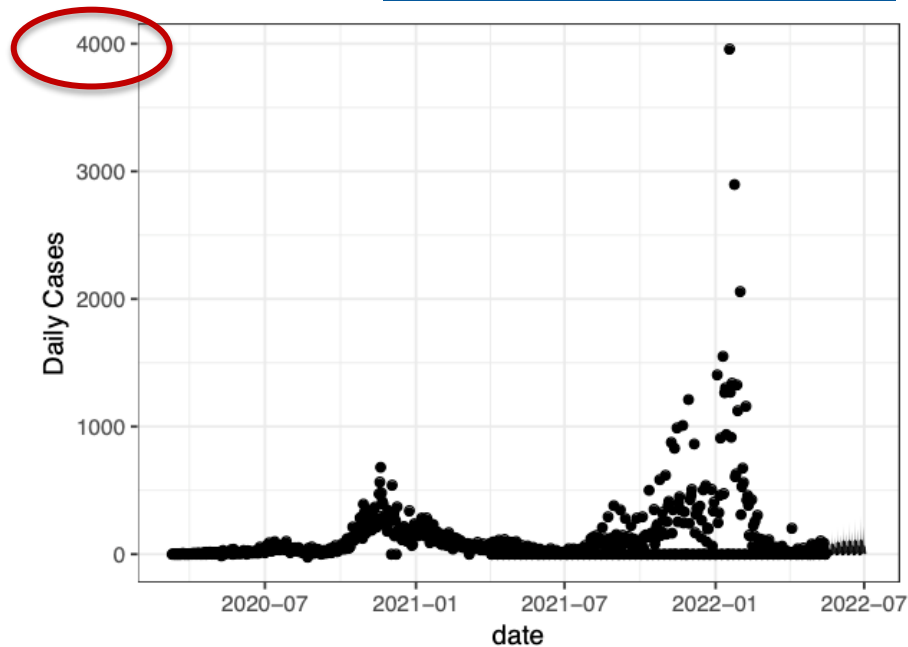


So what?

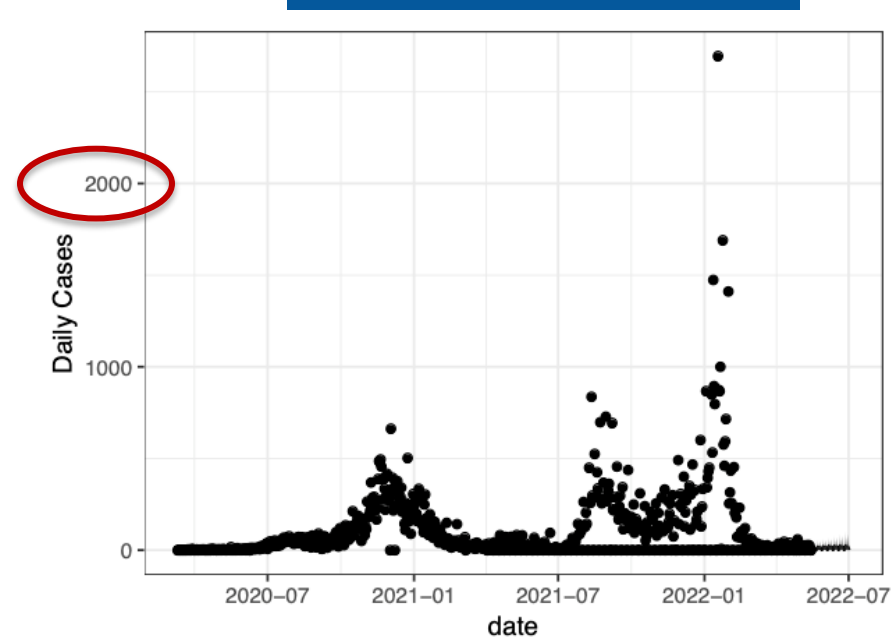
**The Central region is expected to see the most number of cases.
Cases appear to be increasing.**

South Regions Daily Cases Forecast

Southwest



Southeast



So what?

Both regions have a predicted plateau. The Southwest region is expected to see higher number of cases.

> Hospitalization Forecast