Modeling & Forecasting COVID-19 in NM

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May 4, 2021

Short- & Long-Term Forecast for NM: Cases

7–day Incidence Confirmed Cases Forecast for New Mexico Based on Data as of 2021–05–03

Prediction Intervals: 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90%

6–Week Forecast of Confirmed Cases for New Mexico Based on Data as of 2021–05–03

Week	Best Case (5th Percentile)	Middle Case (50th Percentile)^	Worst Case (95th Percentile)
2021–05–03		197,733*	
2021–05–10	197,976	198,686	200,241
2021–05–17	198,156	199,525	202,596
2021–05–24	198,291	200,279	204,809
2021–05–31	198,406	200,951	207,029
2021–06–07	198,482	201,586	209,225
2021–06–14	198,537	202,206	211,620

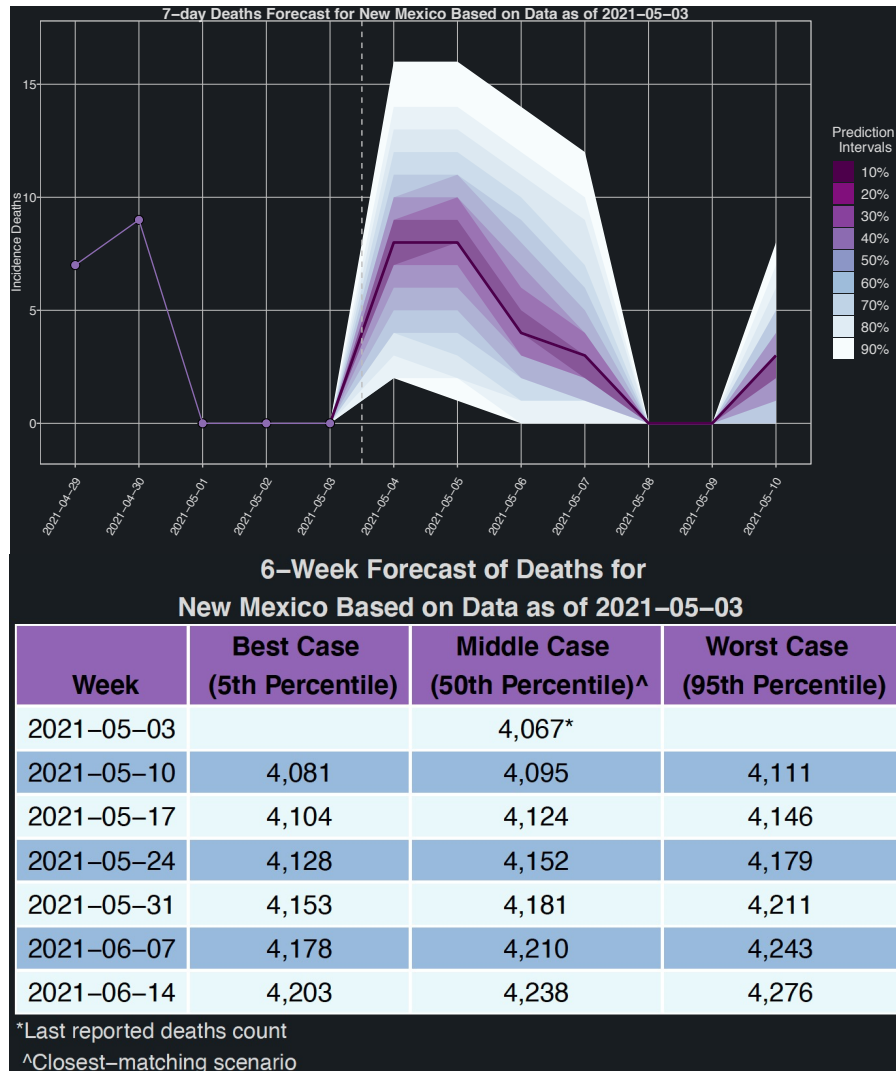*Last reported confirmed cases count
^Closest–matching scenario

6–Week Forecast of Daily Average of Confirmed Cases for New Mexico Based on Data as of 2021–05–03

Week	Best Case (5th Percentile)	Middle Case (50th Percentile)^	Worst Case (95th Percentile)
2021–05–03		127*	
2021–05–10	35	136	358
2021–05–17	26	120	336
2021–05–24	19	108	316
2021–05–31	16	96	317
2021–06–07	11	91	314
2021–06–14	8	88	342

*Last reported confirmed cases count
^Closest–matching scenario

So what?
The daily number of cases are expected to range between 100 and 140 for the middle case

Short- & Long-Term Forecast for NM: Deaths

7–day Deaths Forecast for New Mexico Based on Data as of 2021–05–03

6–Week Forecast of Deaths for New Mexico Based on Data as of 2021–05–03

Week	Best Case (5th Percentile)	Middle Case (50th Percentile)^	Worst Case (95th Percentile)
2021–05–03		4,067*	
2021–05–10	4,081	4,095	4,111
2021–05–17	4,104	4,124	4,146
2021–05–24	4,128	4,152	4,179
2021–05–31	4,153	4,181	4,211
2021–06–07	4,178	4,210	4,243
2021–06–14	4,203	4,238	4,276

*Last reported deaths count
^Closest–matching scenario

6–Week Forecast of Daily Average of Deaths for New Mexico Based on Data as of 2021–05–03

Week	Best Case (5th Percentile)	Middle Case (50th Percentile)^	Worst Case (95th Percentile)
2021–05–03		6*	
2021–05–10	2	4	6
2021–05–17	3	4	5
2021–05–24	3	4	5
2021–05–31	4	4	5
2021–06–07	4	4	5
2021–06–14	4	4	5

*Last reported confirmed deaths
^Closest–matching scenario

So what?
The <u>daily</u> number of deaths are expected to range between 2 and 6 in the next few weeks

Growth Rate for NM

Daily Growth Rate for the Past Six Weeks in New Mexico as of 2021-05-02
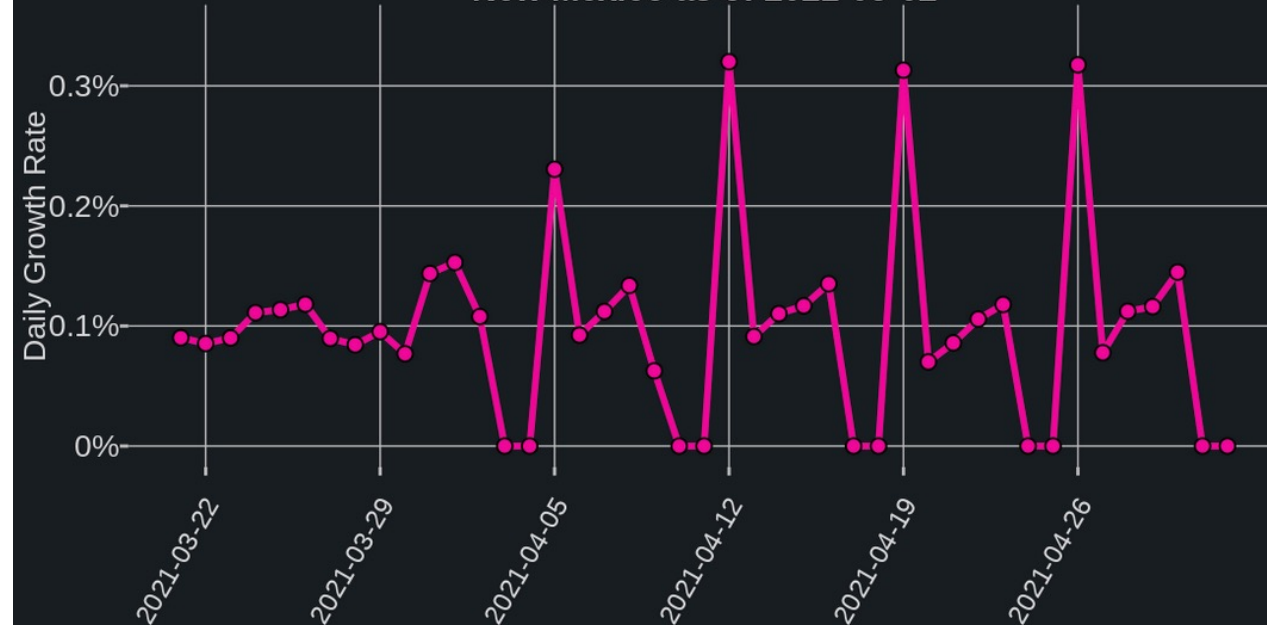
6-Week Forecast of the Average Weekly Growth Rate for New Mexico Based on Data as of 2021-05-02

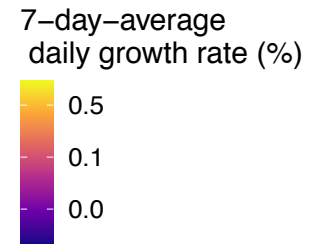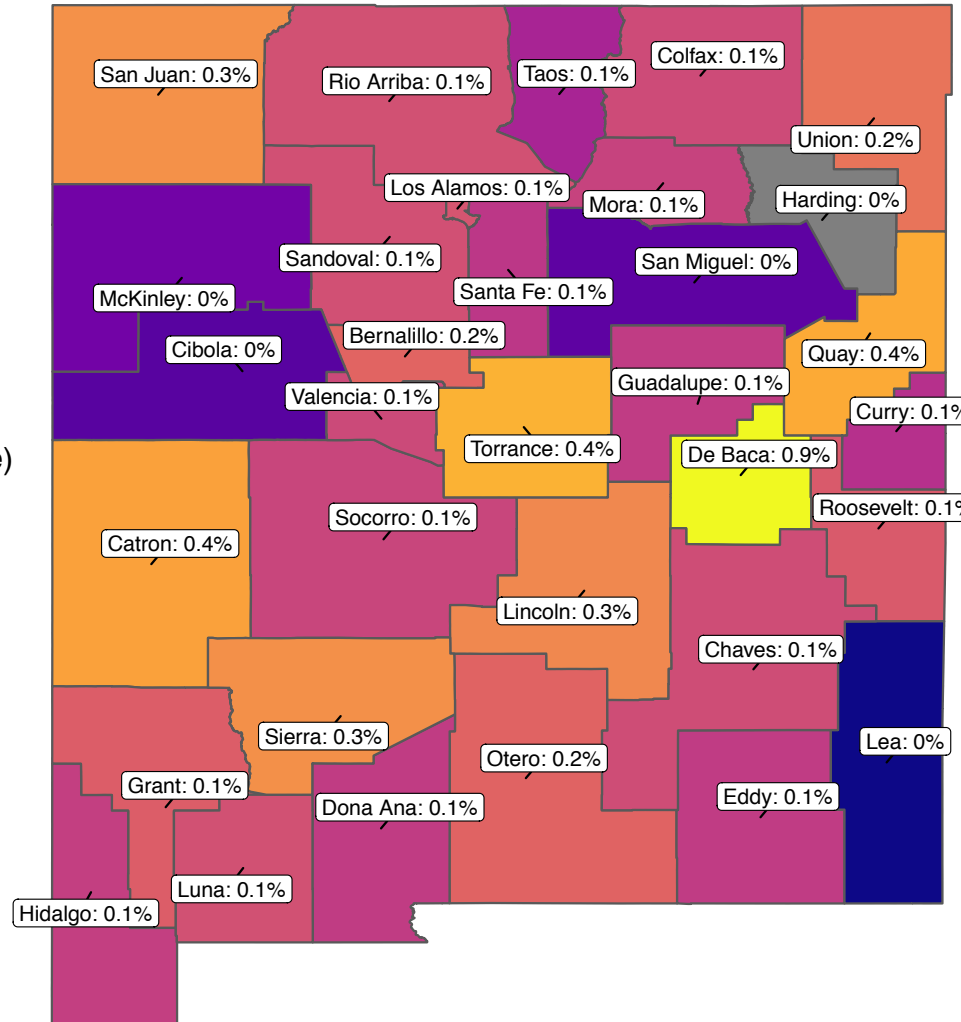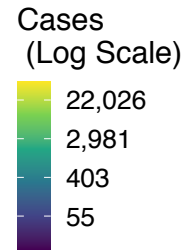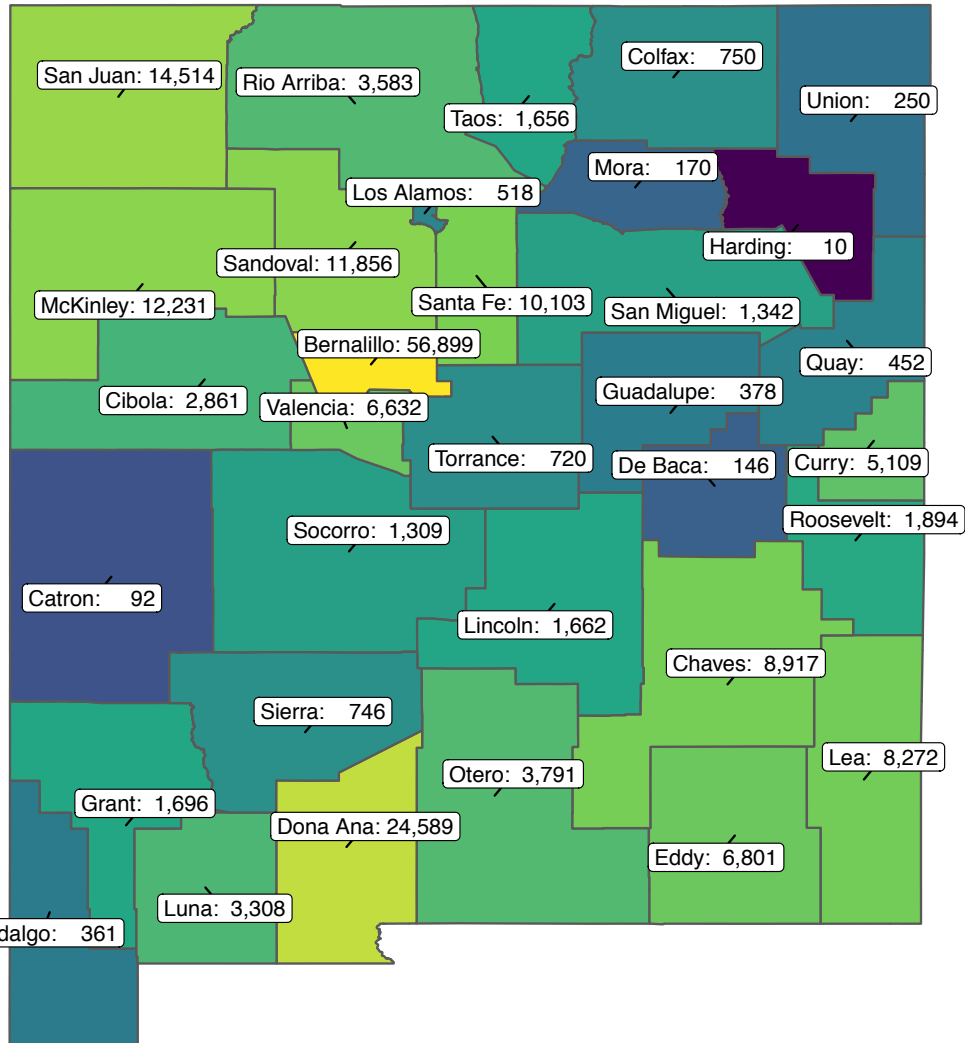| Week	Best Case (5th Percentile)	Middle Case (50th Percentile)^	Worst Case (95th Percentile)
2021-05-02		0.11%*	
2021-05-09	0.022%	0.077%	0.19%
2021-05-16	0.024%	0.083%	0.20%
2021-05-23	0.025%	0.088%	0.20%
2021-05-30	0.024%	0.090%	0.22%
2021-06-06	0.023%	0.095%	0.23%
2021-06-13	0.020%	0.097%	0.25%

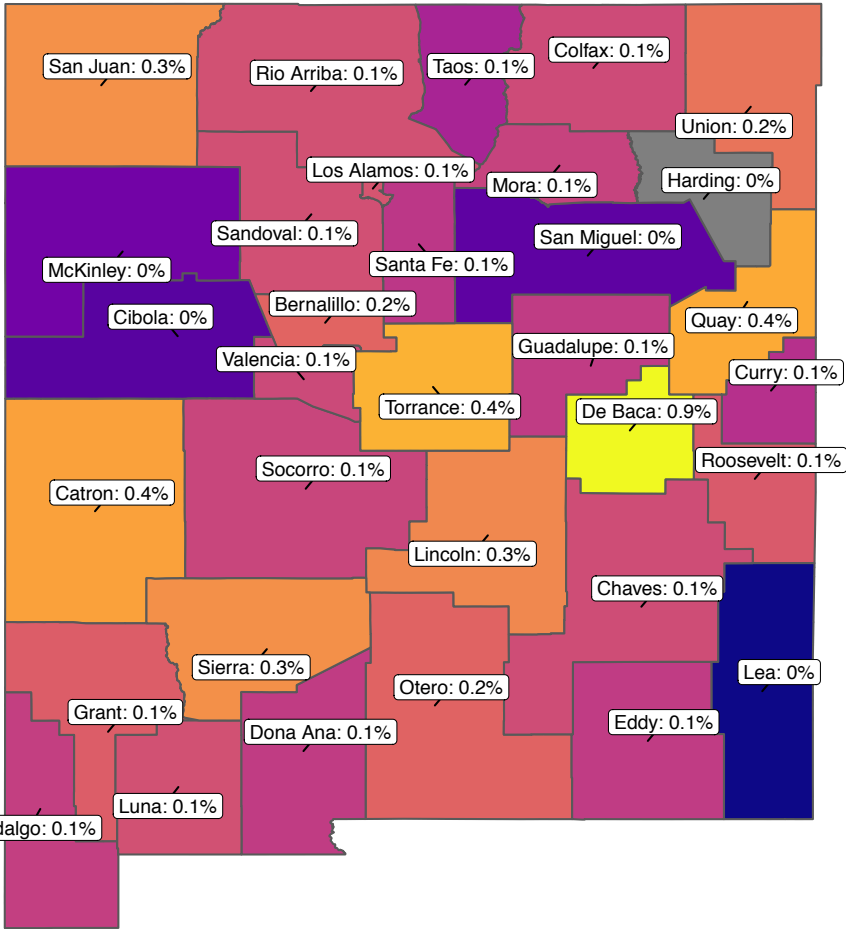*Last weekly mean daily growth rate
^Closest-matching scenario

So what?
As of May 4th, the average growth rate in NM is at 0.11% (same as two weeks ago)

Cumulative Cases & Daily Growth Rate for NM: May 4

Left map — Cases (Log Scale):
San Juan: 14,514; Rio Arriba: 3,583; Colfax: 750; Union: 250; Taos: 1,656; Mora: 170; Los Alamos: 518; Harding: 10; Sandoval: 11,856; Santa Fe: 10,103; San Miguel: 1,342; McKinley: 12,231; Bernalillo: 56,899; Quay: 452; Cibola: 2,861; Valencia: 6,632; Guadalupe: 378; Torrance: 720; De Baca: 146; Curry: 5,109; Socorro: 1,309; Roosevelt: 1,894; Catron: 92; Lincoln: 1,662; Chaves: 8,917; Sierra: 746; Lea: 8,272; Grant: 1,696; Otero: 3,791; Dona Ana: 24,589; Eddy: 6,801; Luna: 3,308; Hidalgo: 361

Cases (Log Scale): 22,026 / 2,981 / 403 / 55

Right map — 7-day-average daily growth rate (%):
San Juan: 0.3%; Rio Arriba: 0.1%; Taos: 0.1%; Colfax: 0.1%; Union: 0.2%; Los Alamos: 0.1%; Mora: 0.1%; Harding: 0%; Sandoval: 0.1%; Santa Fe: 0.1%; San Miguel: 0%; McKinley: 0%; Cibola: 0%; Bernalillo: 0.2%; Quay: 0.4%; Valencia: 0.1%; Guadalupe: 0.1%; Curry: 0.1%; Torrance: 0.4%; De Baca: 0.9%; Roosevelt: 0.1%; Catron: 0.4%; Socorro: 0.1%; Lincoln: 0.3%; Chaves: 0.1%; Sierra: 0.3%; Lea: 0%; Grant: 0.1%; Otero: 0.2%; Eddy: 0.1%; Dona Ana: 0.1%; Luna: 0.1%; Hidalgo: 0.1%

7-day-average daily growth rate (%): 0.5 / 0.1 / 0.0

*Growth rate is in cumulative cases

Daily Growth Rate for NM May 4

7–day–average daily growth rate (%)

0.5
0.1
0.0
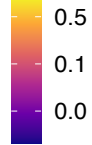
Socorro 0.1% =
Roosevelt 0.1% =
DeBaca 0.9% =
Los Alamos 0.1% =
Quay 0.4% =
Colfax 0.1% =
Harding 0.0%
Hidalgo 0.1% =
Guadalupe 0.1% =
Catron 0.4% =
Union 0.2% =
Mora 0.1%=

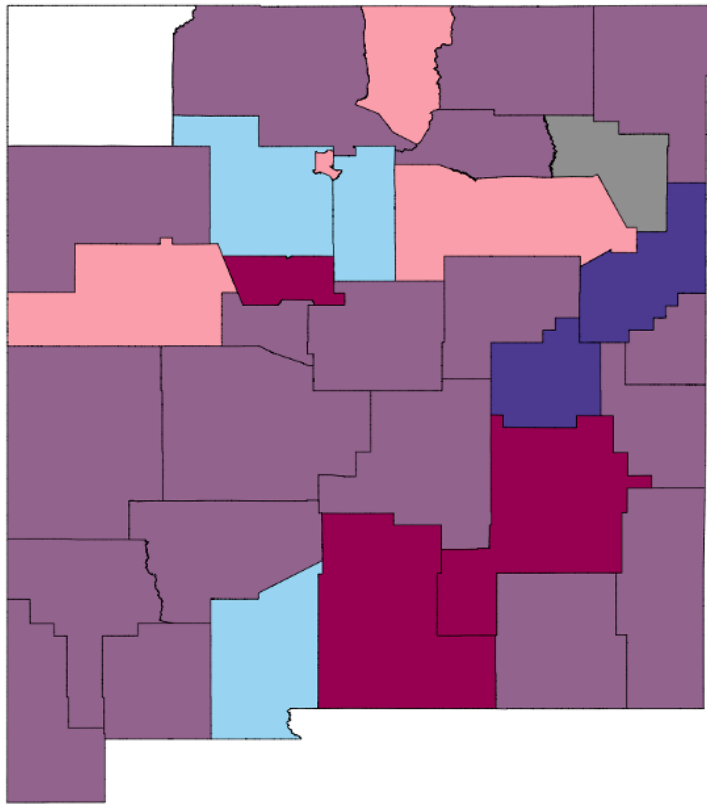*arrows indicate more than 0.5% difference in growth rate from last week's analysis; growth rate is in cumulative cases
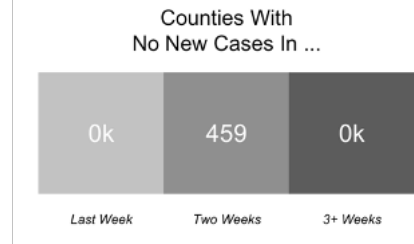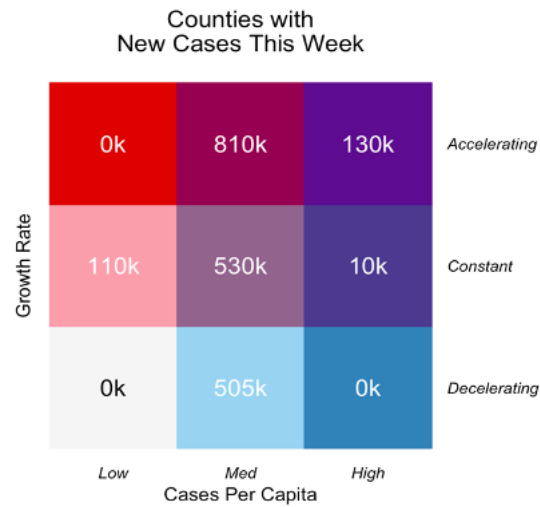
Los Alamos National Laboratory

County	Daily Growth Rate	Change
San Juan	0.3%	=
Rio Arriba	0.2%	=
Sierra	0.3%	=
McKinley	0.0%	=
Sandoval	0.1%	=
Santa Fe	0.1%	=
Cibola	0.0%	=
Bernalillo	0.2%	=
Valencia	0.1%	=
Torrance	0.4%	=
Lincoln	0.3%	=
San Miguel	0.0%	=
Chaves	0.1%	=
Dona Ana	0.1%	=
Otero	0.2%	=
Lea	0.0%	=
Eddy	0.1%	=
Curry	0.1%	=
Grant	0.1%	=
Luna	0.1%	=
Taos	0.1%	=

COVID-19 across New Mexico
A 7-day moving window comparison
May 3, 2021

Impacted New Mexicans

Counties with New Cases This Week

	Low	Med	High	
Growth Rate	0k	810k	130k	Accelerating
	110k	530k	10k	Constant
	0k	505k	0k	Decelerating

Cases Per Capita

Counties With No New Cases In ...

Last Week	Two Weeks	3+ Weeks
0k	459	0k

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

So what?

- **Most people in New Mexico are living in a county that is medium per-capita case counts with a constant growth**

- **Bernalillo, Chaves and Otero are accelerating with medium per-capita case counts**

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

Concurrent Hosp & ICU Beds Based on Forecasts – Average Stay of 8 Hosp, 15 Days for ICU/vent & 25% ICU rate
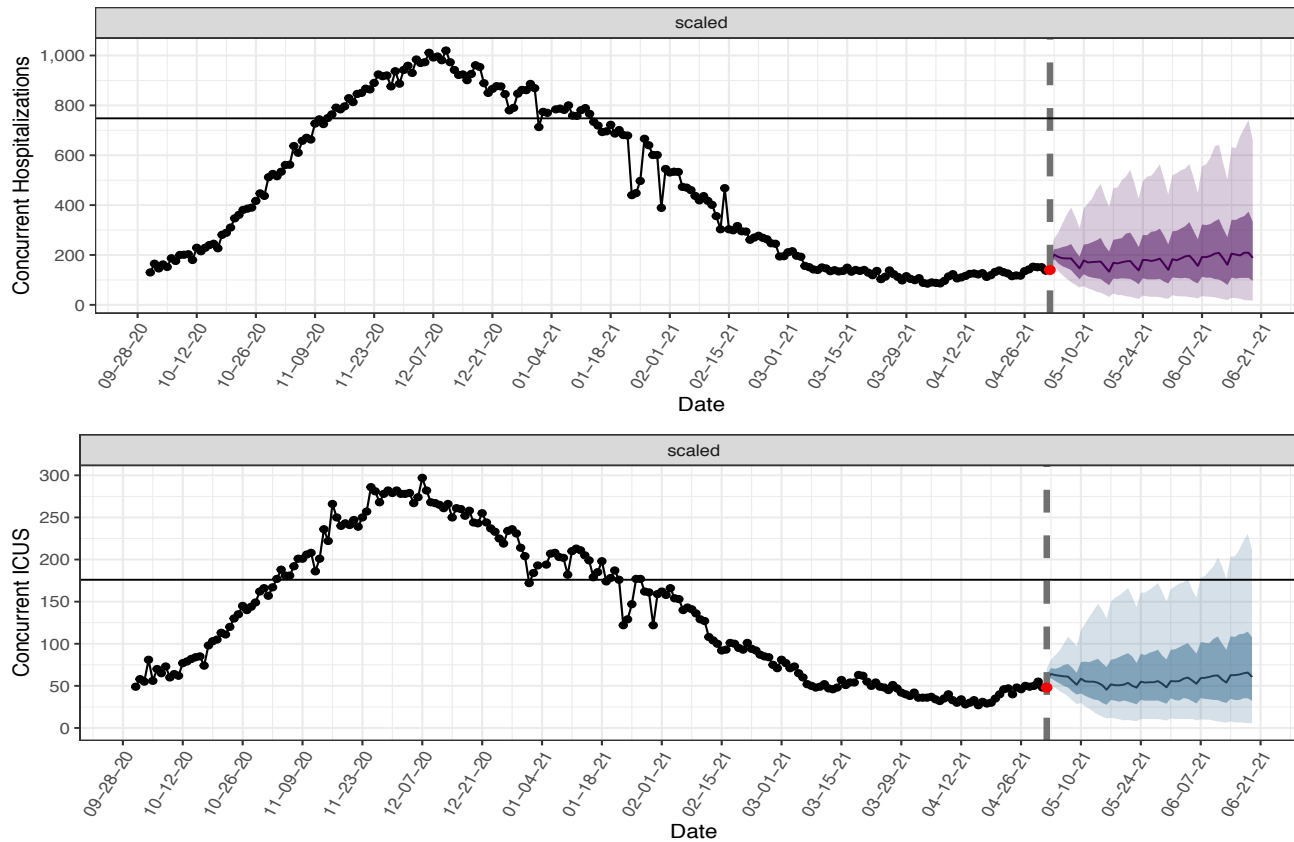
Concurrent COVID-19 ICU beds

Week	Qu. 5% (best case)	Qu. 50% (median)	Qu. 95% (worst case)
5/9	29	51	97
5/16	11	45	130
5/23	8	48	144
5/30	9	48	150
6/6	9	53	155
6/13	6	54	177

"Scaled" Scenario

?

ver the next 3 weeks. We are tracking

4 May 2021: EpiGrid modeling

- NM daily incidence is flat, but model rises slowly
  - Model over-predicts incidence in a few counties (Eddy, Lea, Quay, Roosevelt) with low *State* vaccination levels.
- NM deaths are now slightly below the model.
  - Model does not account for better vaccination of cohorts with higher death rates, nor potential changes in severity with B.1.1.7 being the major variant

log10 Incidence, wk 66, 2021-05-30

United States__New Mexico

United States__New Mexico
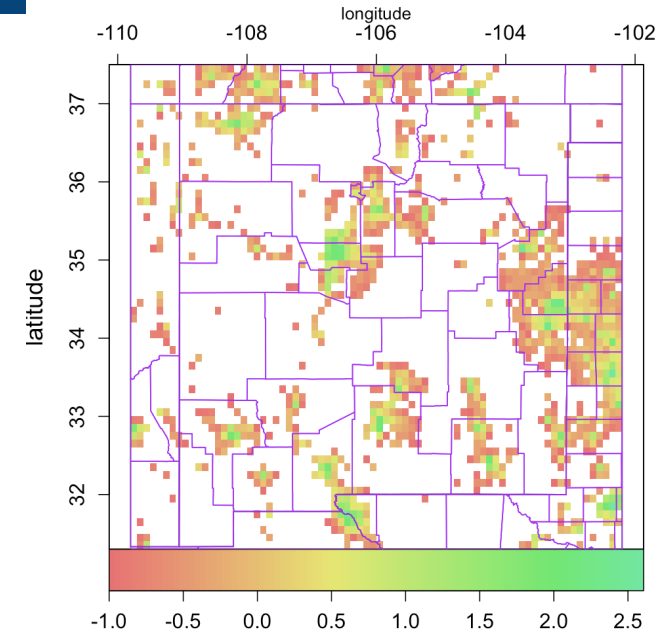
log10 Cumulative cases, wk 66, 2021-05-30
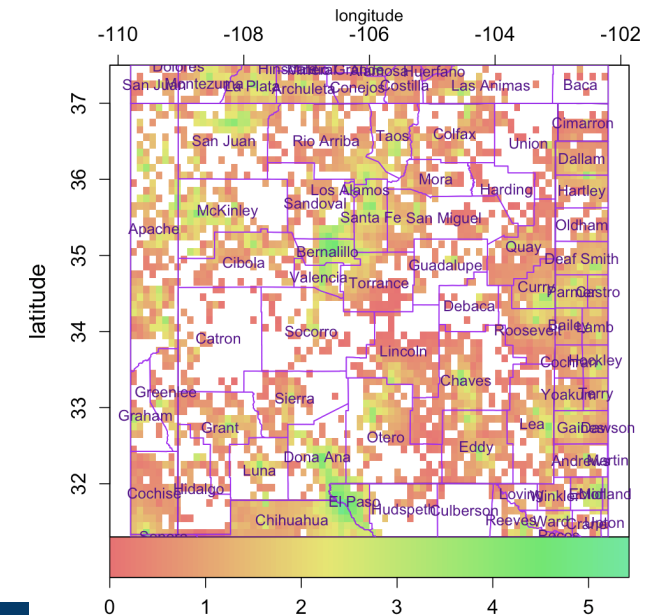
A look at the raw incidence data

- Sunday, Monday
- Tuesday
- Wednesday/Thursday
- Friday
- Saturday
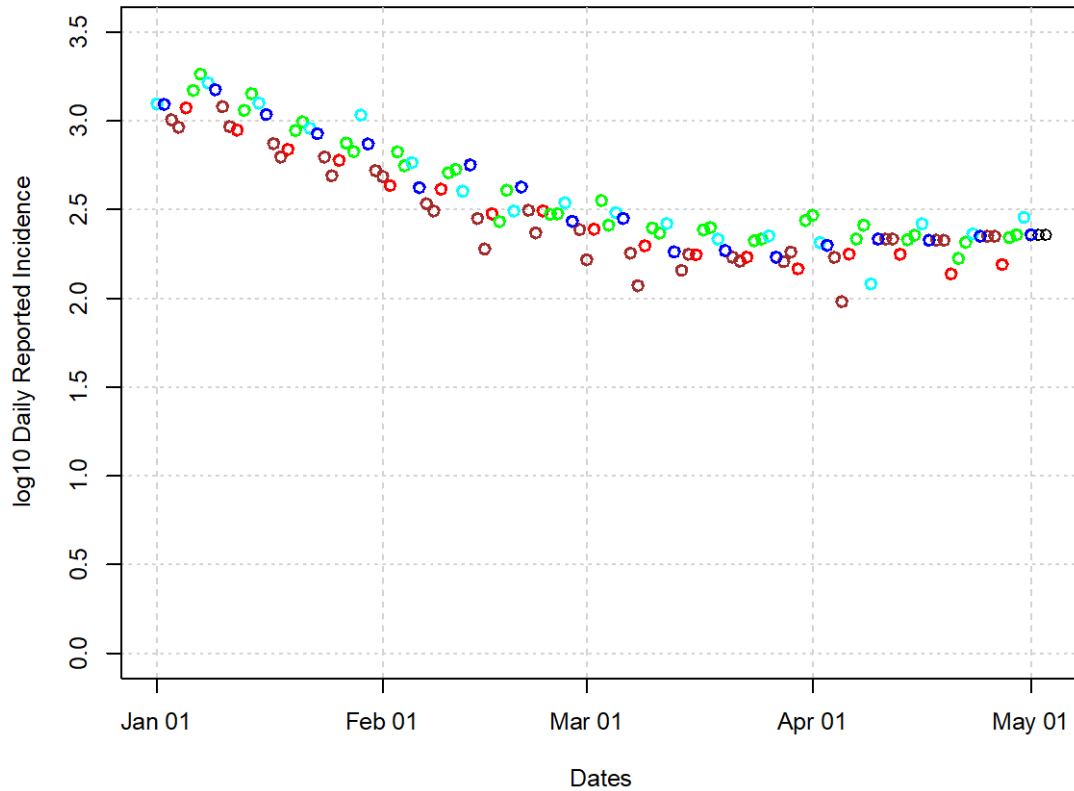
Cases appear to be nearly constant.

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.

New Zealand-level of cases here on this plot
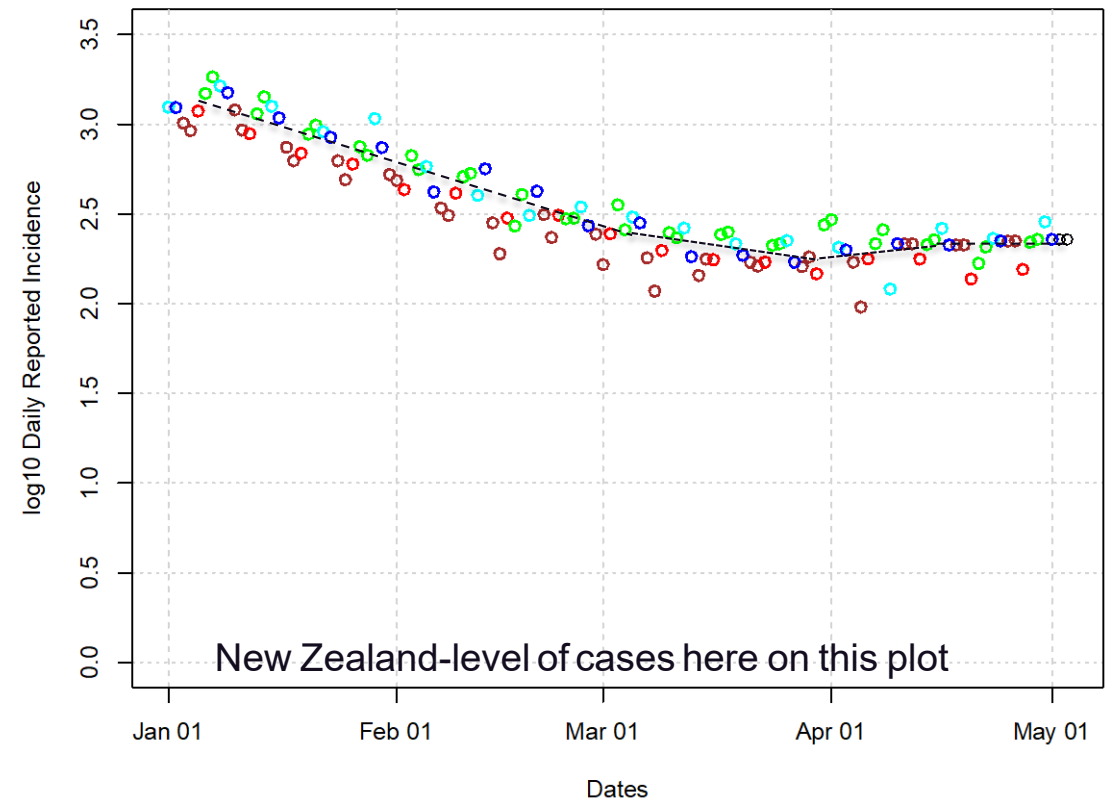
4 May 2021 Model (Mechanistic) – more details and information

- **~1,000,000 first doses have been administered in NM (Federal and State).**
  - Federal and state doses attributed to counties according to data provided by state of NM
- **Transmission is based on mobility with modifications due to PHO's and the red/yellow/green/turquoise (RYGT) framework.**
  - Public health orders (PHO) and public behavior similar to previous models.
  - There are no extrapolations to RYGT assignments.
  - Currently modeling turquoise counties as a progressively increasing force-of-infection.
- **Daily reported cases in El Paso are flat, some ambiguity.**

Vaccination is slowing down

Top line is state plus federal first doses.

Circles are initial doses as reported by the state of NM.

Initial Doses

Dates
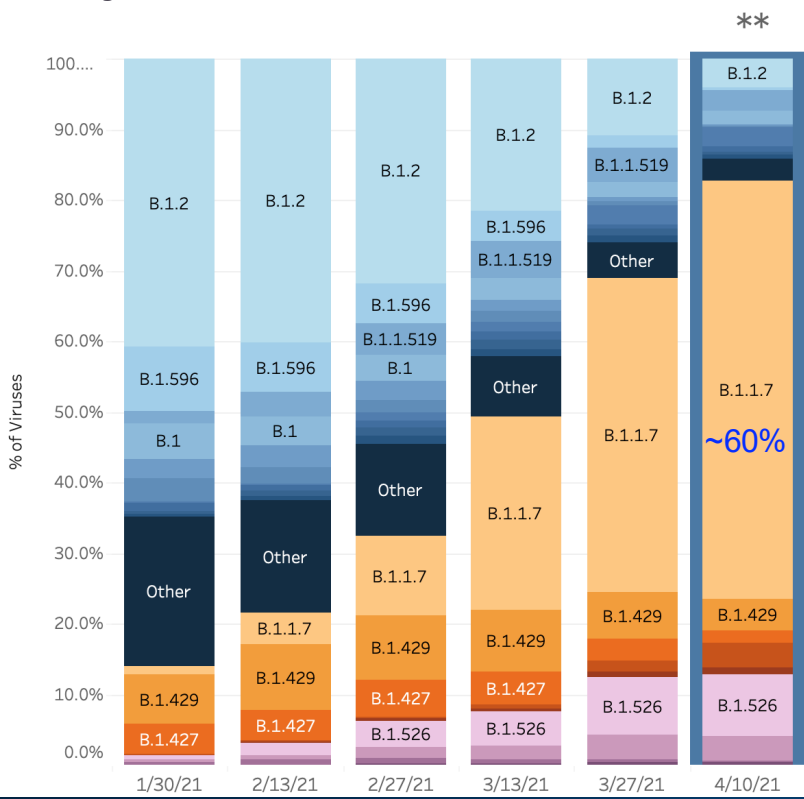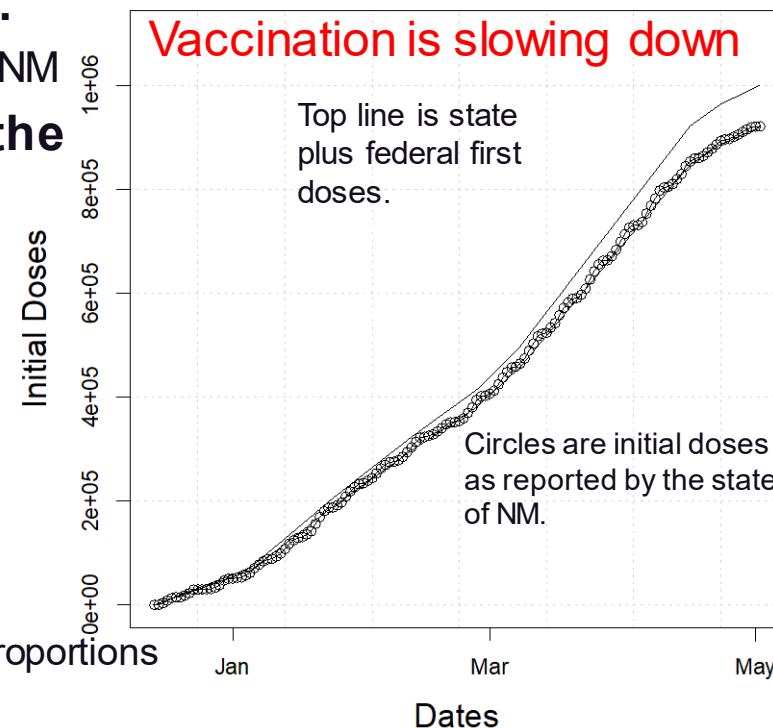
B.1.1.7 is primary variant in US
https://covid.cdc.gov/covid-data-tracker/#variant-proportions

- **Baseline results reflects B.1.1.7 variant of SARS-CoV-2.**
  - Assumes a 50% increase in contagion/force of infection.
  - CDC shows the NM, TX, OK, AR, LA region as being 69% B.1.1.7
  - EG incorporates B.1.17 strain replacement and now has B.1.1.7 at 73%.
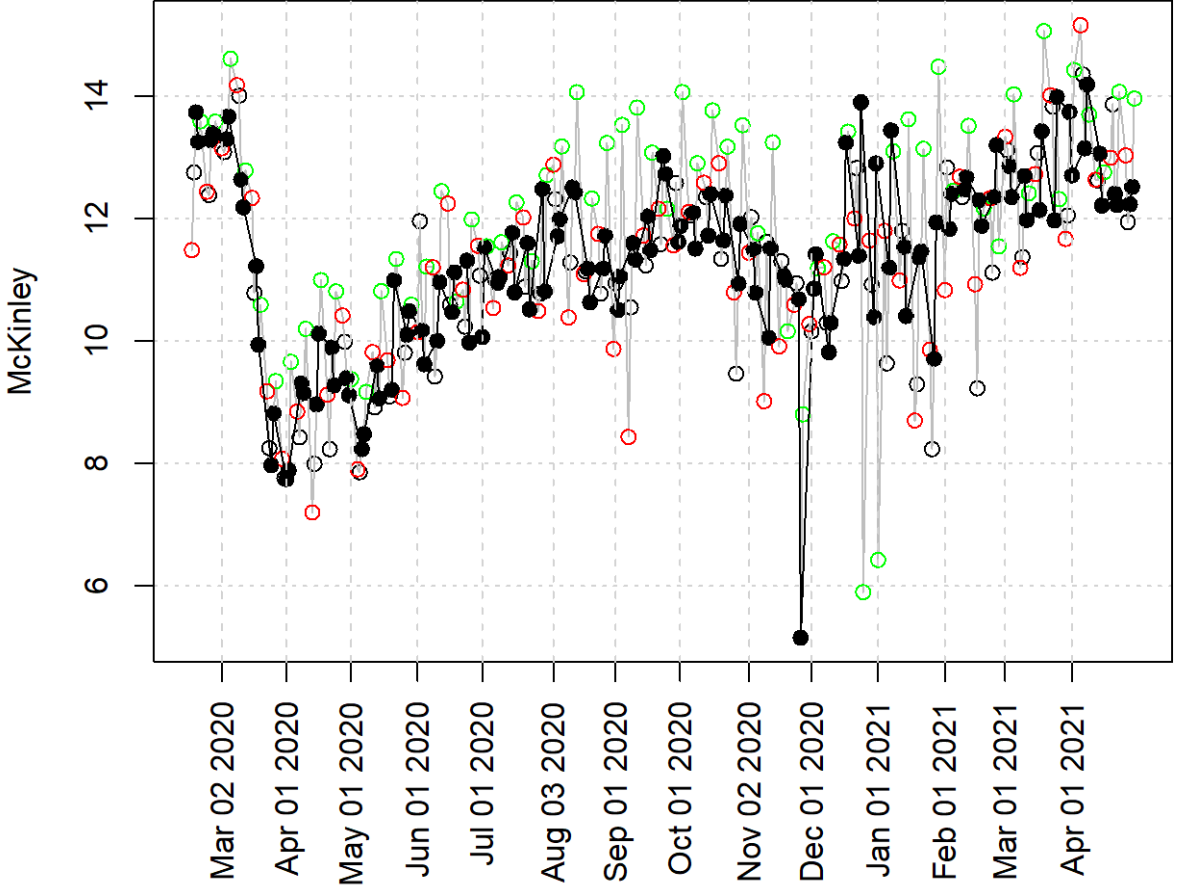
T-80 Mobility – northern counties (data only)

Mobility is stable or slightly decreased
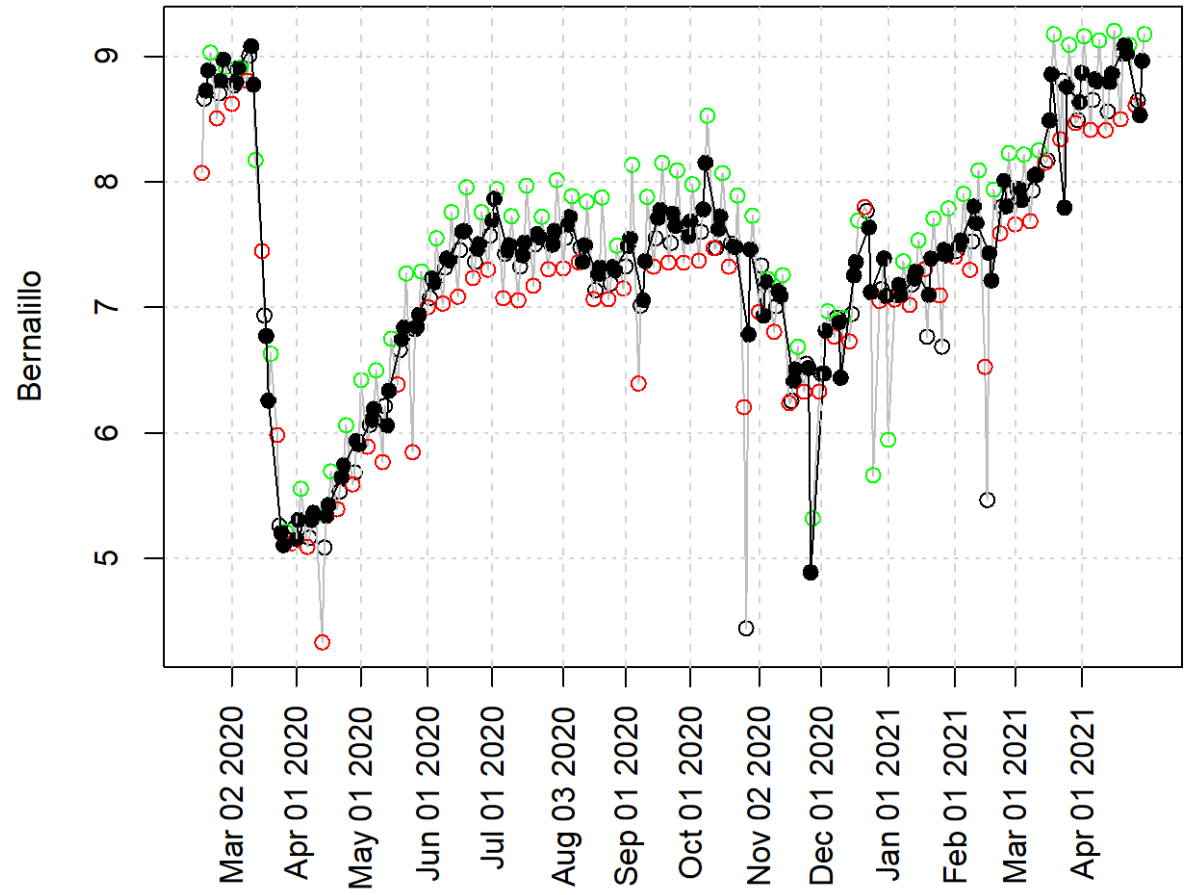Stable: Bernalillo, Los Alamos, Sandoval, San Juan, Santa Fe, Taos, Valencia
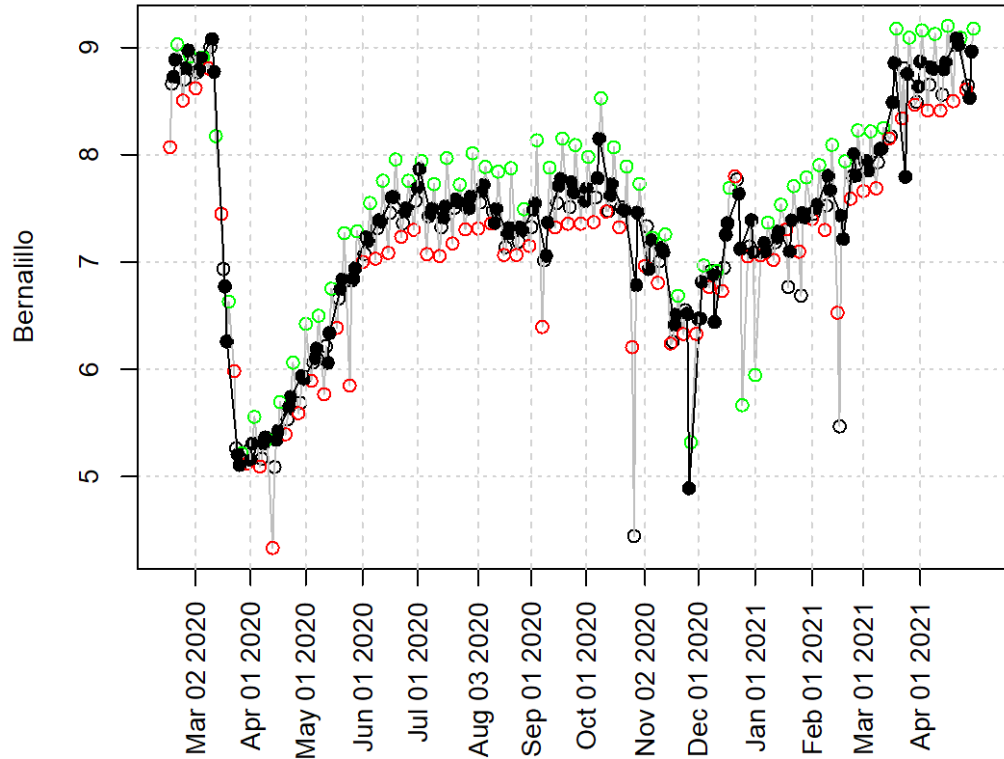Decreased: McKinley, Rio Arriba

McKinley

Bernalillo

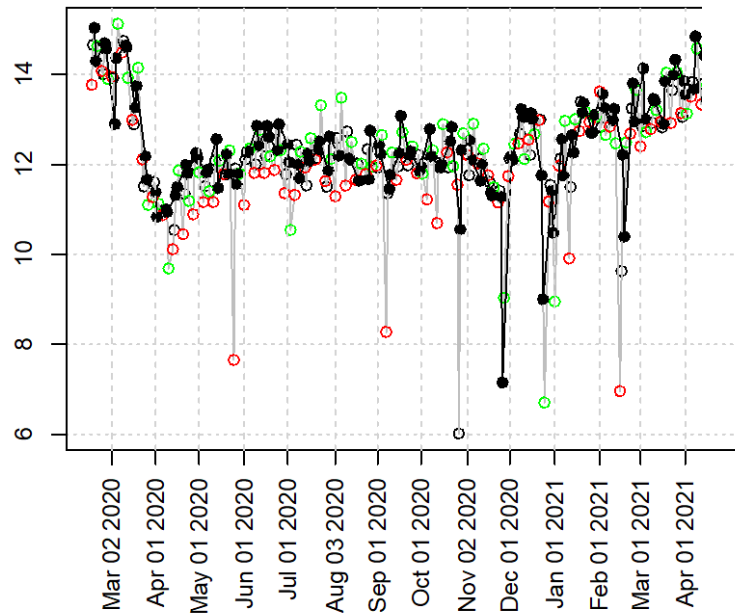# T-80 Mobility – southern counties and Curry (data only)

Increasing: Curry
Staying the same: Chaves, Dona Ana, Grant, Lea, Lincoln, Luna, Otero, Socorro
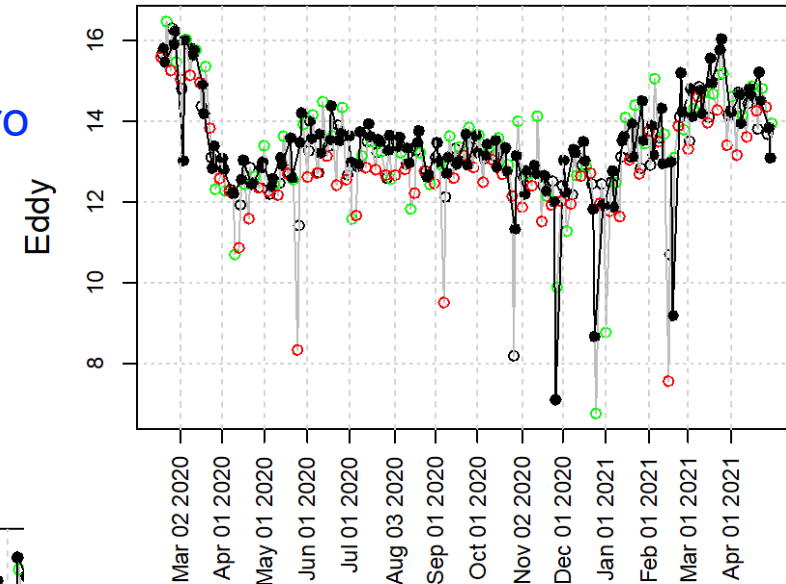decreasing: Eddy, Roosevelt

Eddy

Dona Ana

Lea

- Weekends NOT shown
- Monday
- Wednesday/Thursday
- Friday (usually higher)

Counties to Watch

- **San Juan – there has been a significant uptick in cases.   San Juan reports a larger proportion of school cases per total population than other counties.** (data from COVID-By-The-Numbers Weekly Report – New Mexico Public Education Department, April 21, 2021)

- **Several other counties could be seeing the start of an increase in cases: Lincoln, Quay, Roosevelt, Torrance**

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

- Left panel: Linear vs. time (y-scale=0:1000) shows hospital beds.
- Right panel: Log vs. time, same data and models (y-scale = 80:800, 10x).
- Modest increase in hospital load compared with expectation is possible.
- Begin prioritizing viral sequencing of hospitalized patients to maintain awareness of severity vs. viral variant?
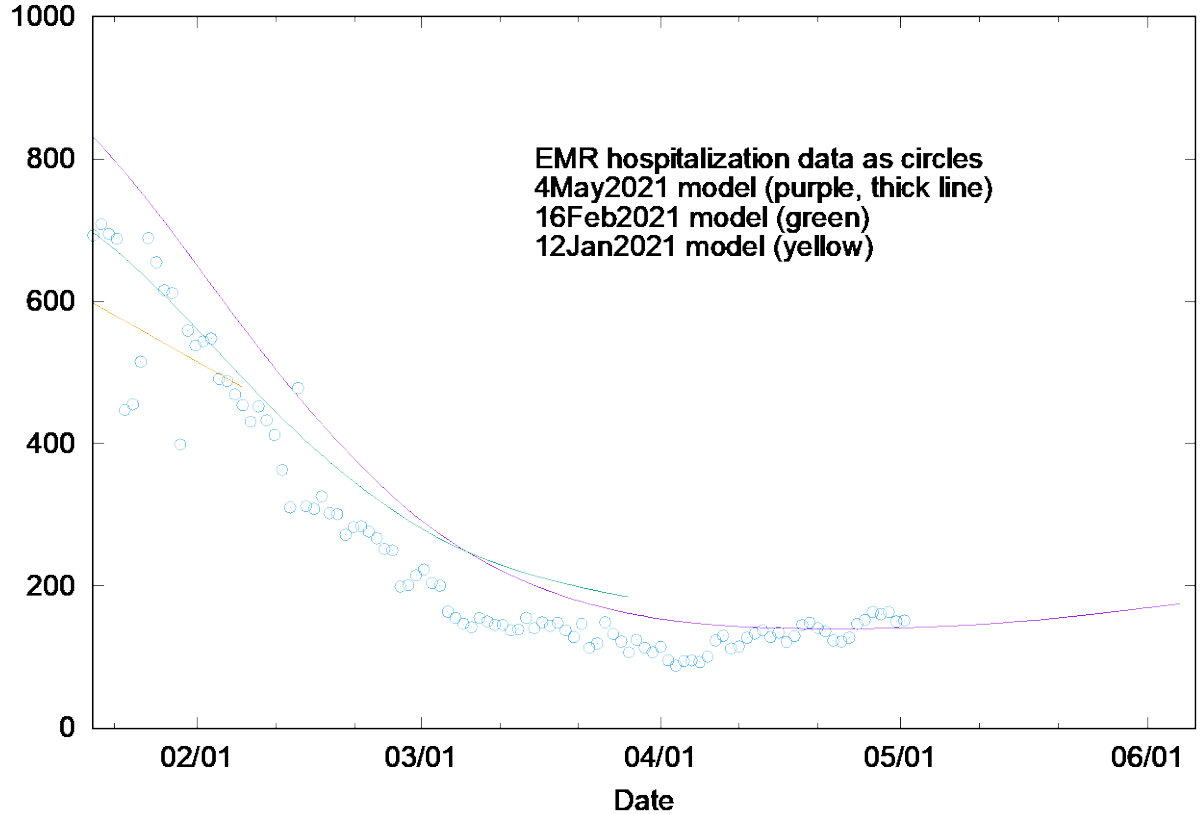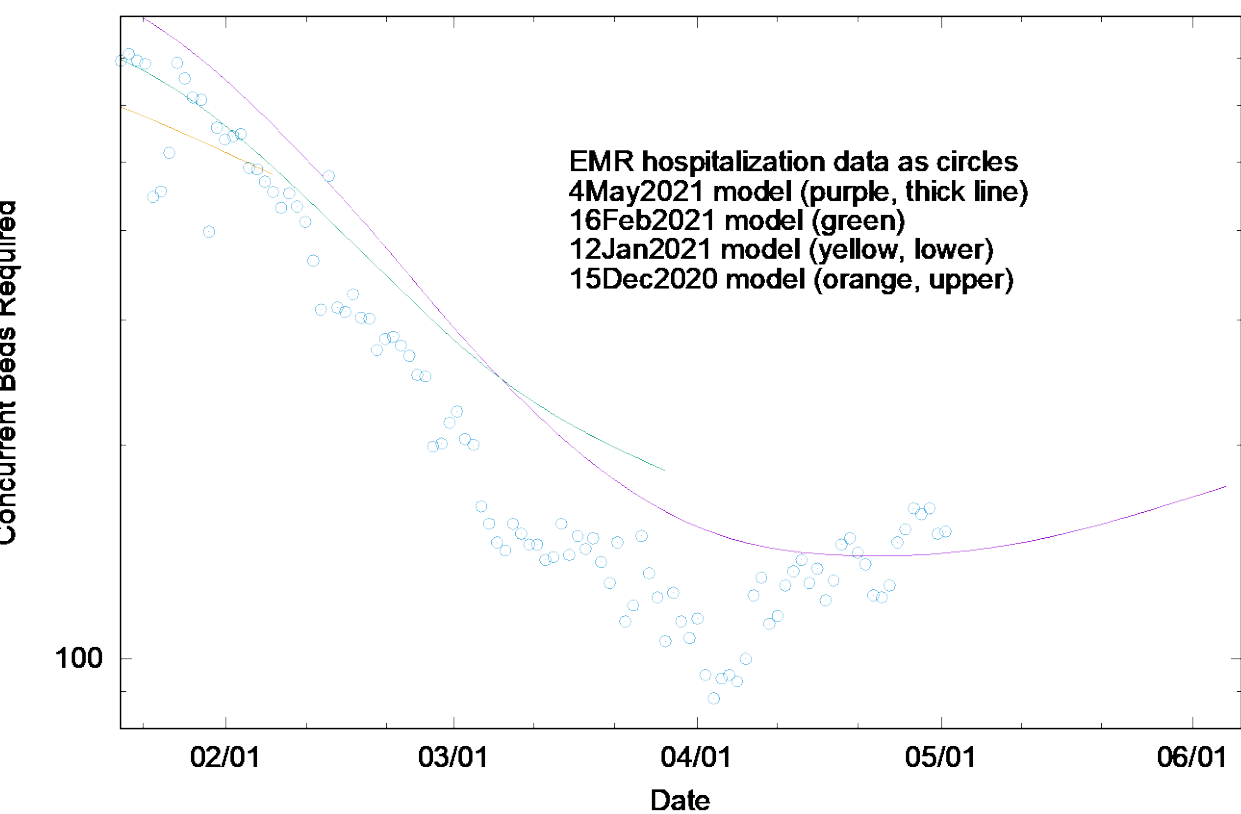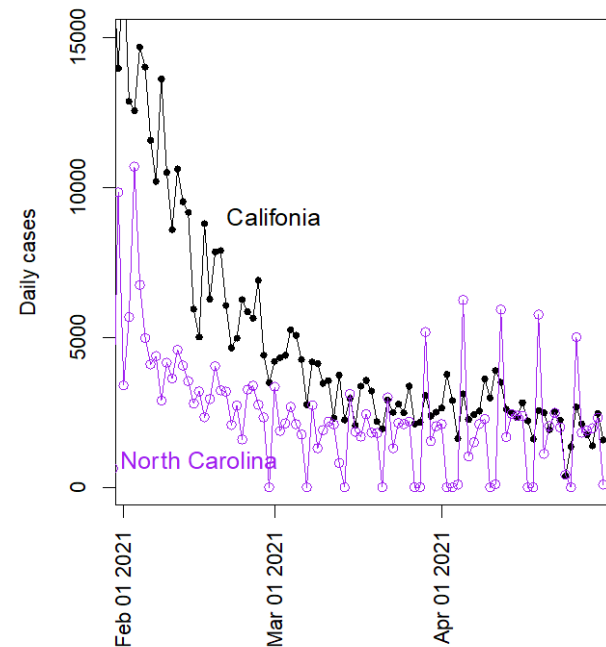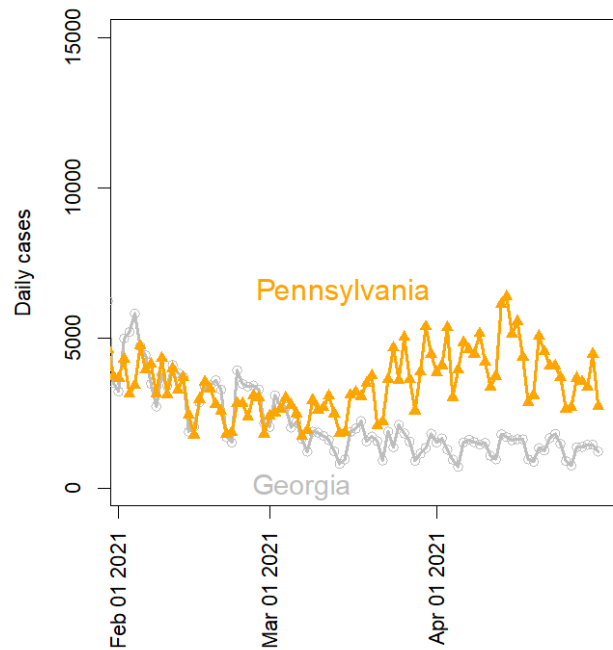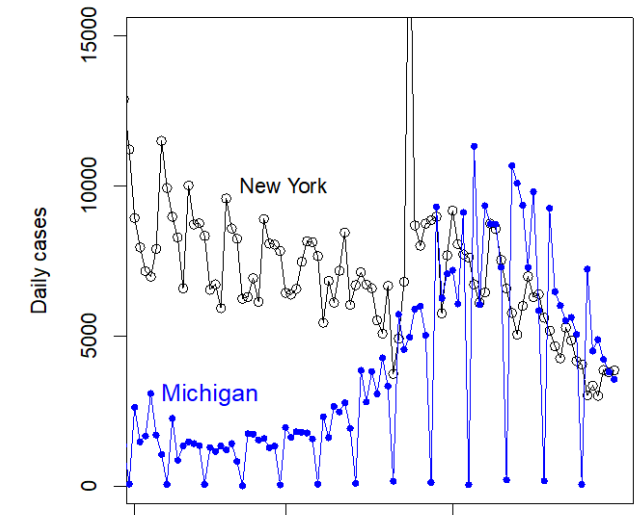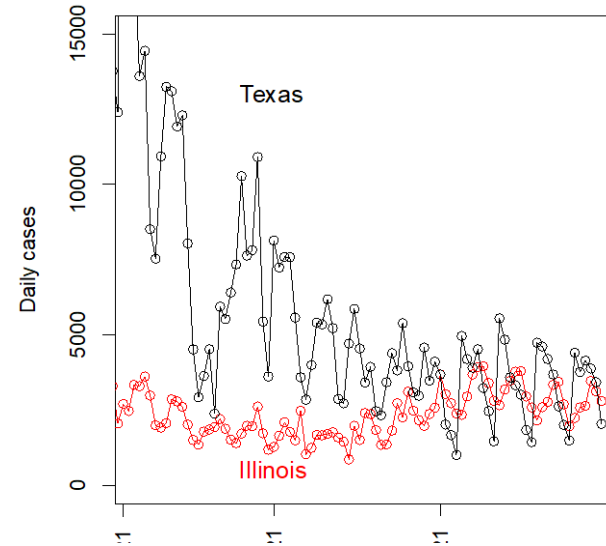
What is happening in the rest of the U.S.?

The 10 most populous states

Cases are steady: Georgia, Illinois, North Carolina Ohio, Texas

Case are decreasing: California, Florida, Michigan, New York, Pennsylvania
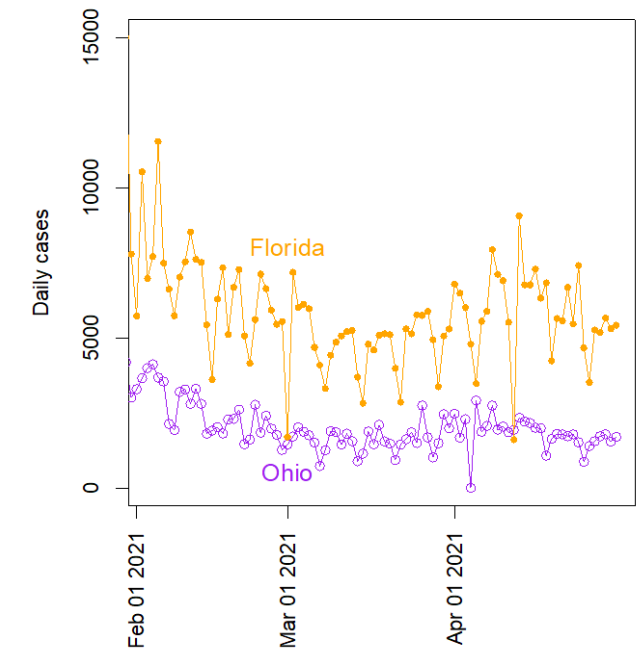
Outlook with Vaccination

- ~1000k people vaccinated (1 or 2 doses).
- ~747k people with 2 doses.
- New vaccination rate has slowed dramatically in New Mexico.
- Expanded EUA for ages >= 12 years is likely important.
- Quarantine continues to play an important role in control.
- Infection control is important but may be playing a numerically less-dominant role at this time.
- Currently modeling 90% vaccine effectiveness.
- Matching to county vaccination data.
- Are out-of-state vaccines making a net contribution in some counties?
- Curry, Eddy, Roosevelt, and Quay Counties cannot be easily explained with the reported vaccination data and observed cell phone T80 mobility data. (Shorter list than last time).
- Both susceptible and recovered people are vaccinated.
- Interim vaccine hesitancy numbers are being implicitly account.

New Mexico Model and Data (Incidence)

Upper, red curve is New Mexico's baseline model
Lower, blue curve is New Mexico regaining 10k/day vaccinations