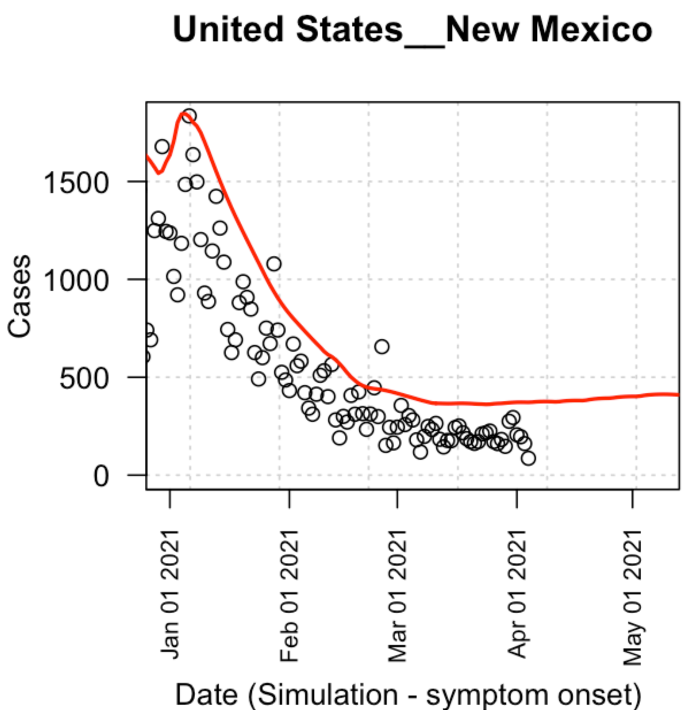
Modeling & Forecasting COVID-19 in NM

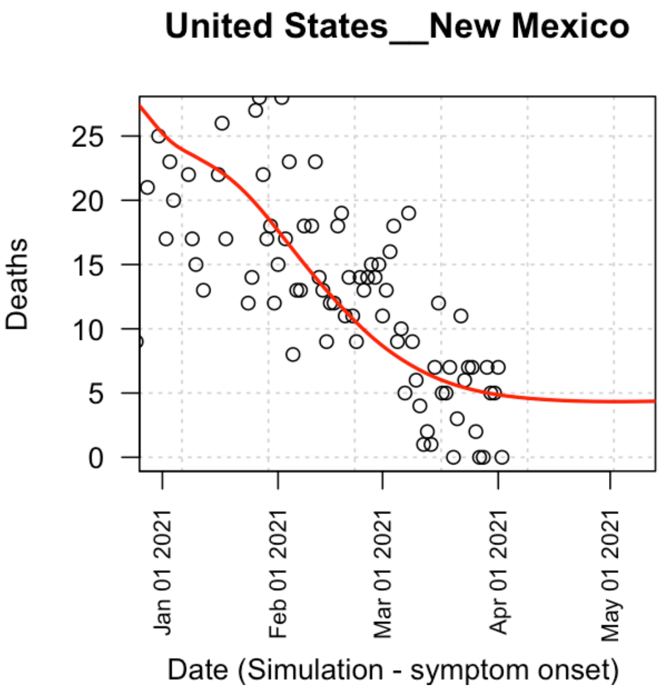
April 6, 2021

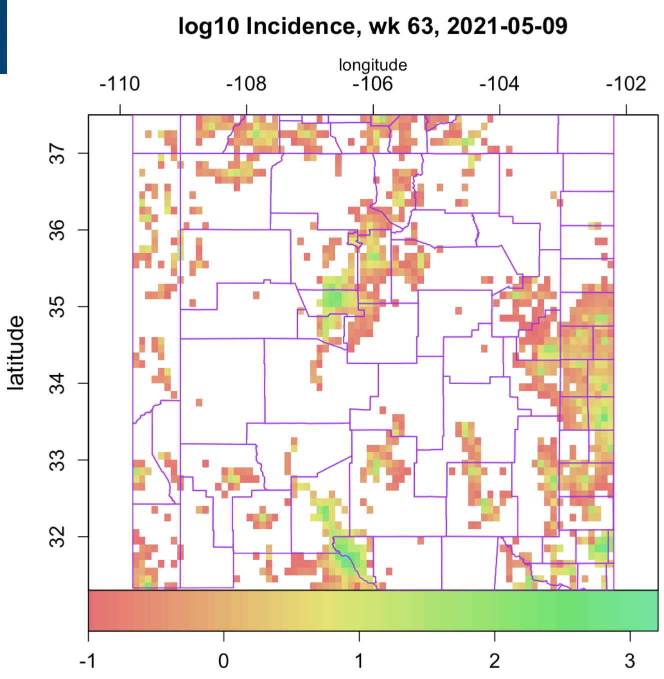
NNSA
National Nuclear Security Administration

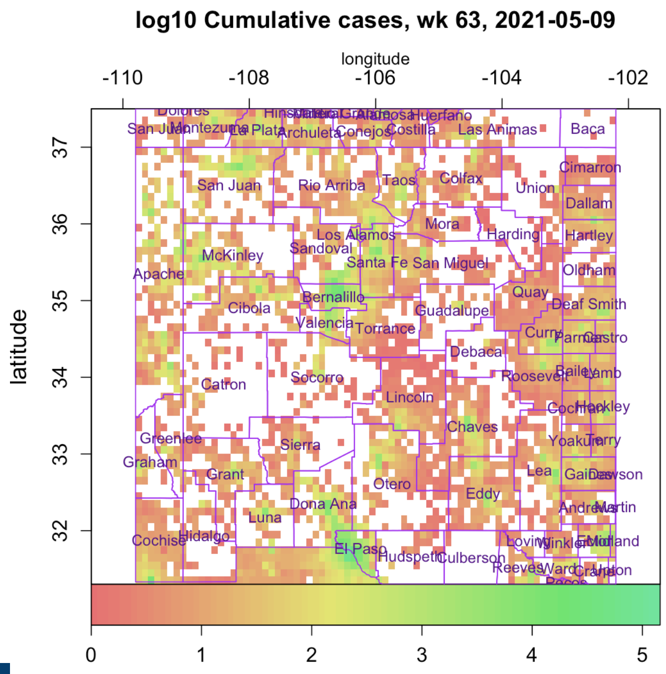
06 Apr 2021: EpiGrid modeling

- NM daily incidence is rising slowly.
- NM deaths are now slightly below the model.
  - Model does not yet account for vaccination of cohorts with higher death rates.



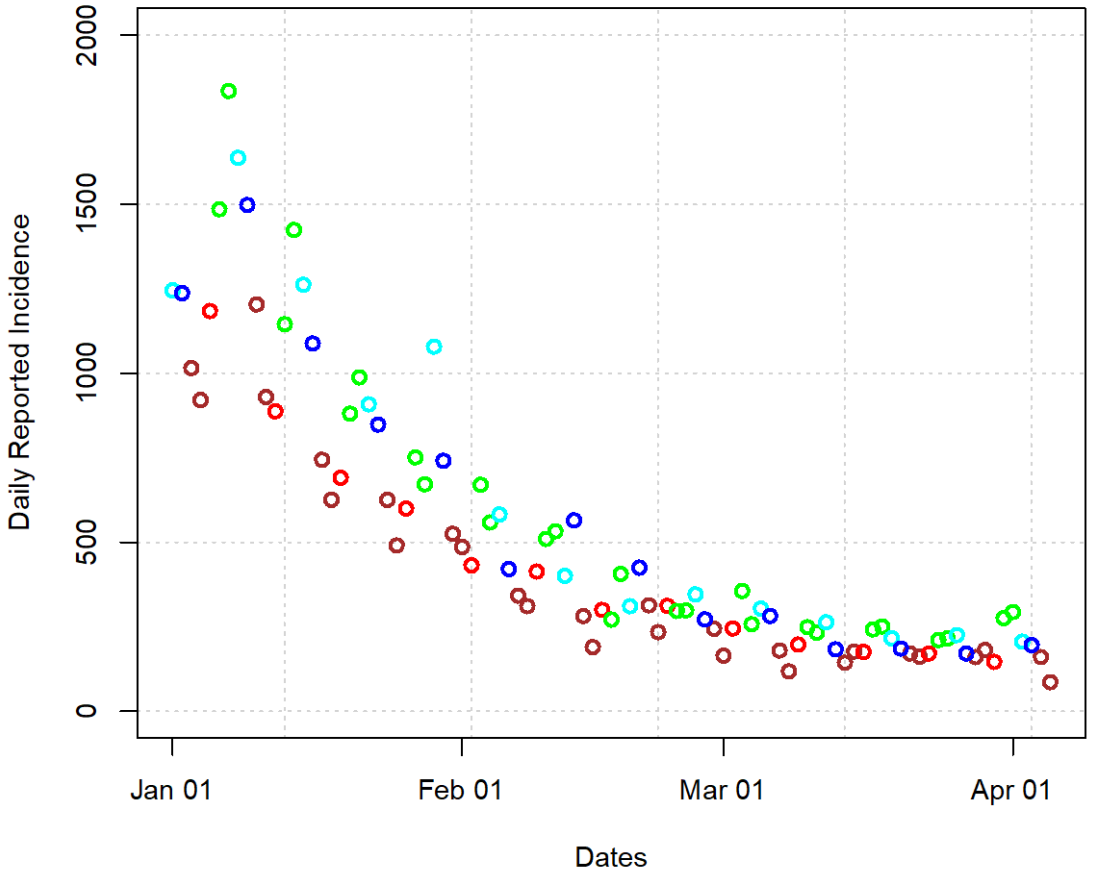






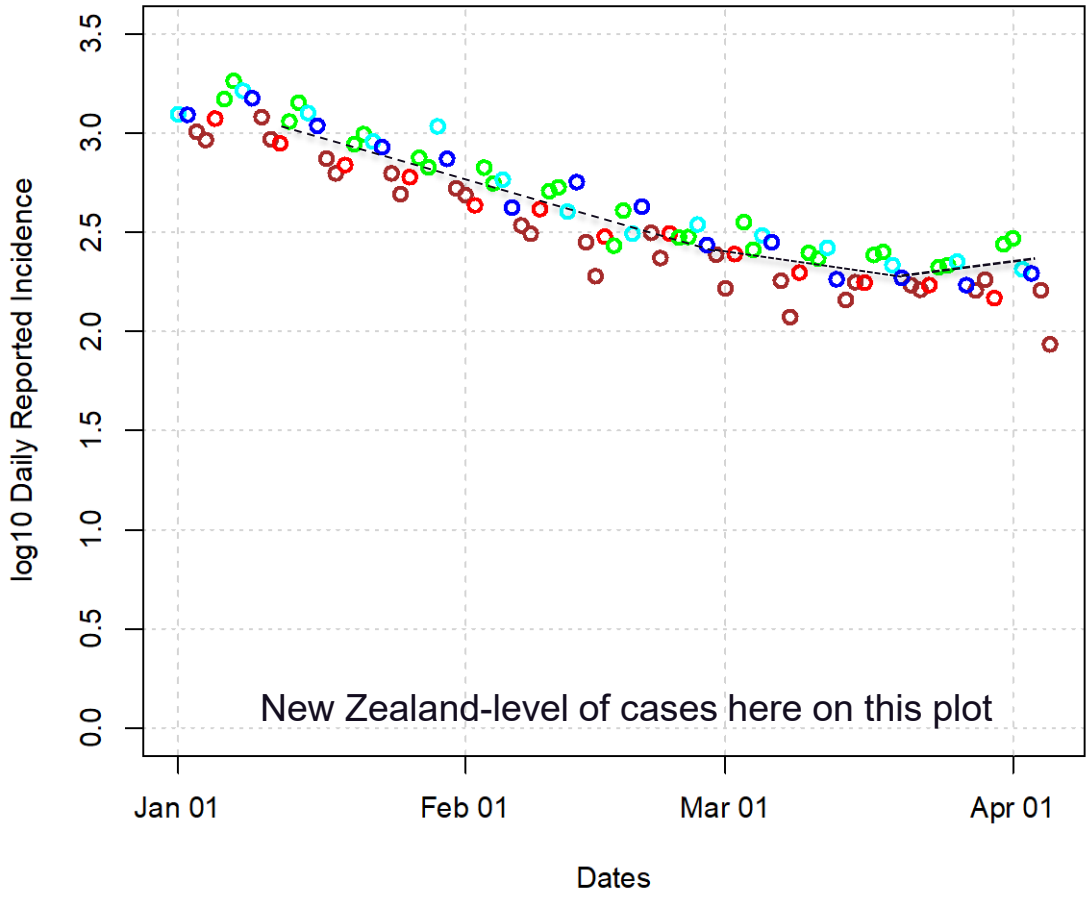
A look at the raw incidence data

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



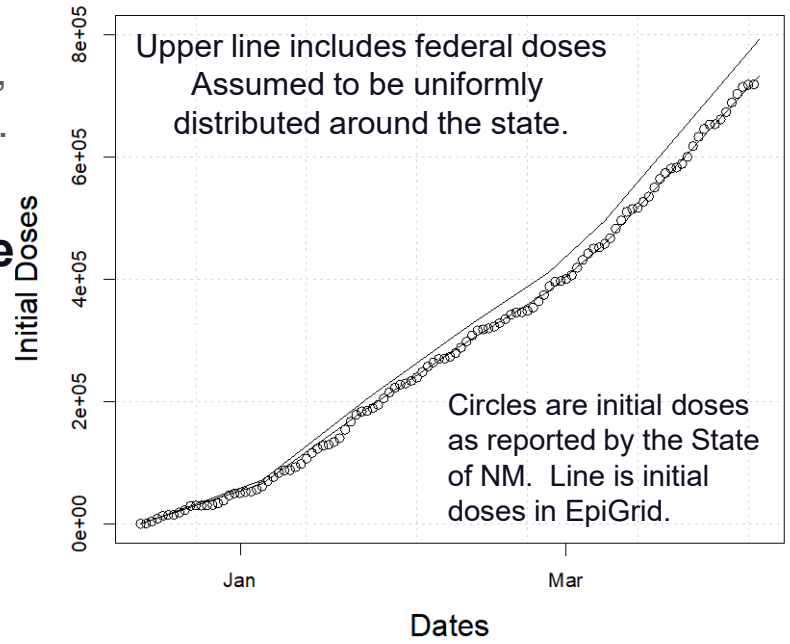
Cases appear to be rising, currently slowly.

The 190 cases in the Lea county correctional facility are removed from data reported on the March 26th. The 1/3 of reported cases that were > 2 weeks prior were removed from March 24th.



06 April 2021 Model (Mechanistic) – more details and information

- **See Figure for historical first-dose vaccinations.**
  - Some Federal doses are uniformly distributed around the state, the rest are in McKinley, Cibola, and San Juan Counties. Graph includes only federal uniformly distributed doses.
  - 804,991 first doses have been administered in 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 possibly increasing, some ambiguity.**



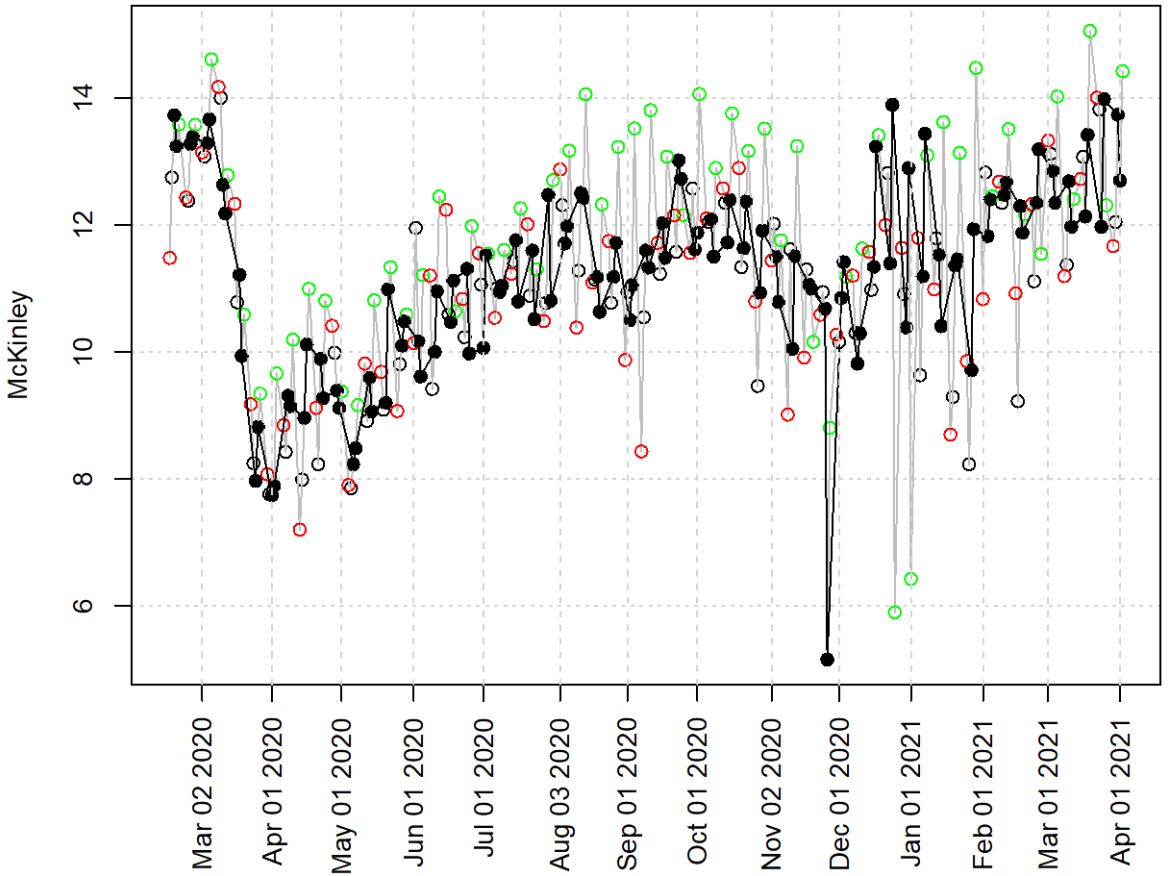
- **Isolation and quarantine rates are assumed to be stable based on state-reported quarantine times.**
  - Base isolation rates mostly modeled as 50% Dec. 8th-22nd,45% until Jan 10th then are increased to 55%.
- **Baseline results reflect novel variants of SARS-CoV-2. The effect may be detectable in the near future.**
  - Potential for a 50% increase in contagion/force of infection.
  - Epidemiological evidence does not discount strain replacement in New Mexico.
  - Without vaccination and with the current state of PHO opening, an increased daily incidence would be occurring.

T-80 Mobility – northern counties (Data only)

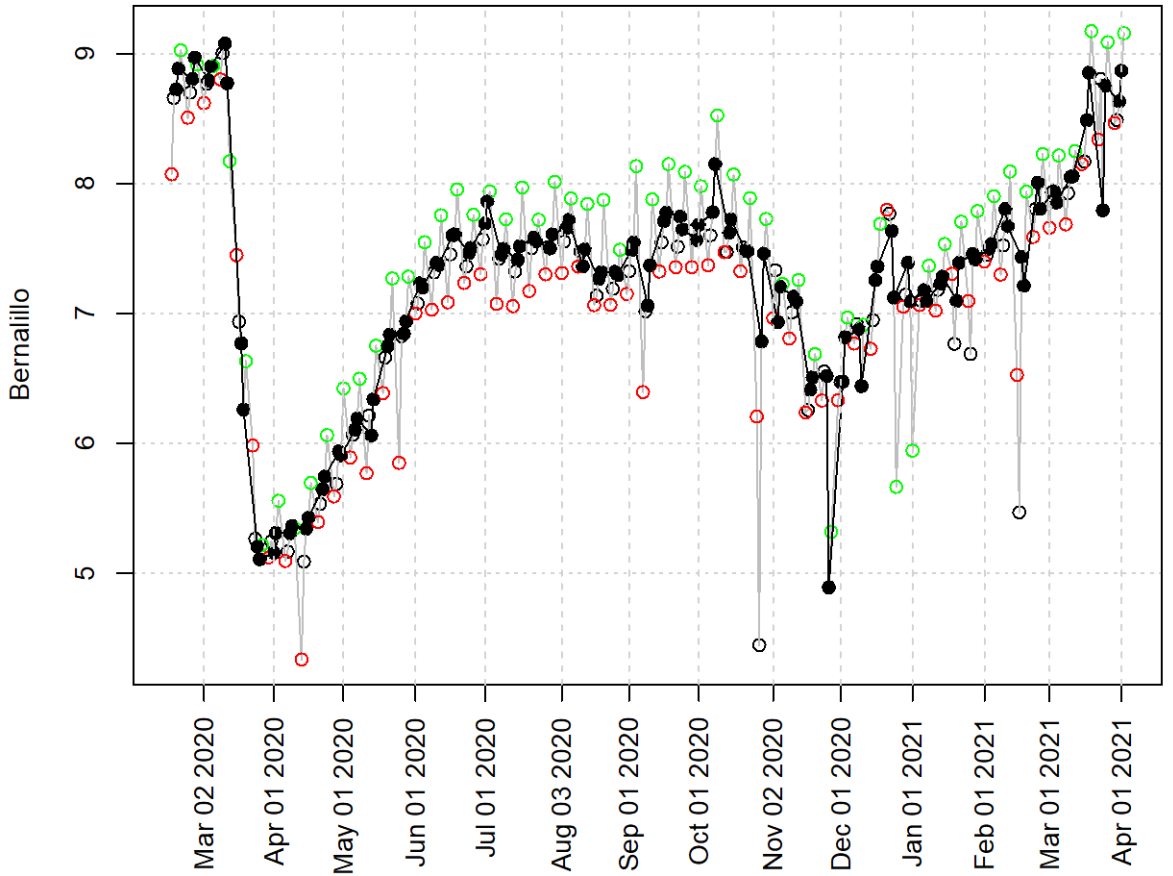
- Mobility is very similar to pre- covid-19 (Bernalillo, McKinley, Rio Arriba, Santa Fe, Taos) with a few counties being slightly lower (Sandoval, Valencia), one possibly higher (San Juan) and one varying a lot (Los Alamos).

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

McKinley



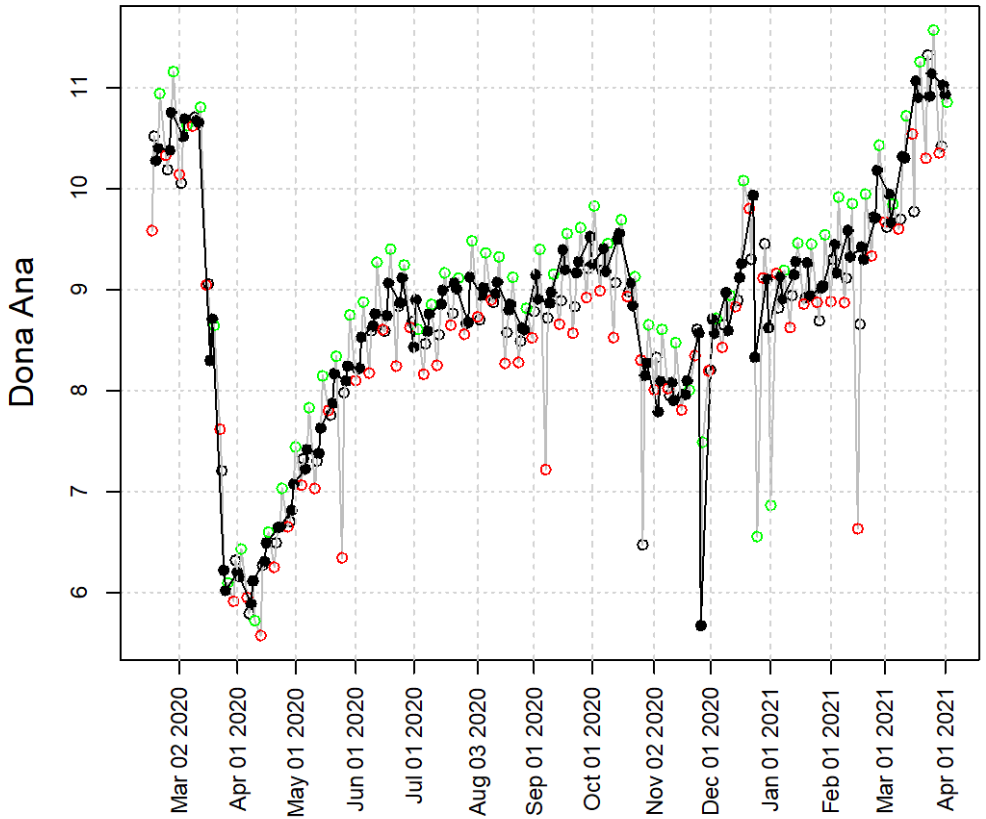
Bernalillo



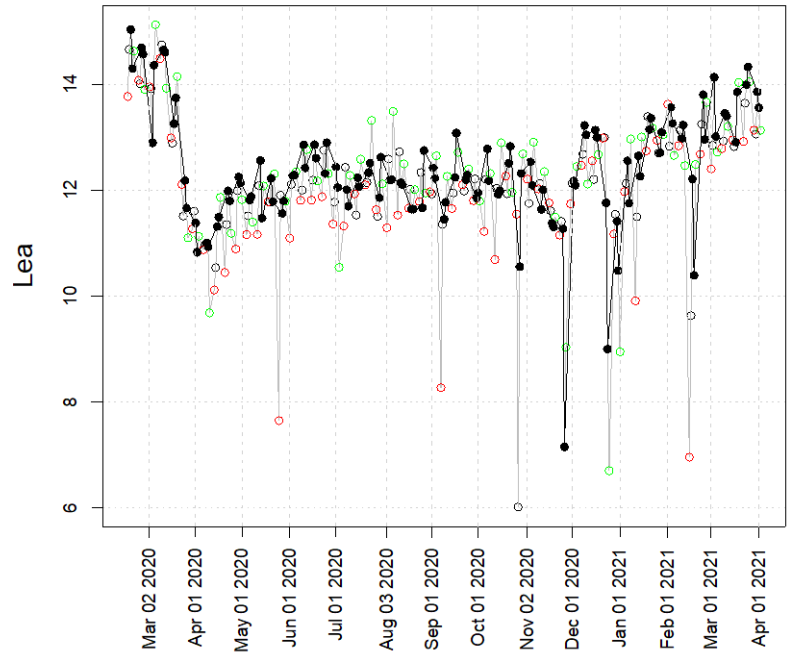
T-80 Mobility – southern counties and Curry (Data only)

- Mobility is similar to pre covid-19 (Chaves, Curry, Grant, Otero, Roosevelt) with some counties having higher mobility (Dona Ana, Lincoln, Socorro) and some possibly with lower mobility (Eddy, Lea, Luna).

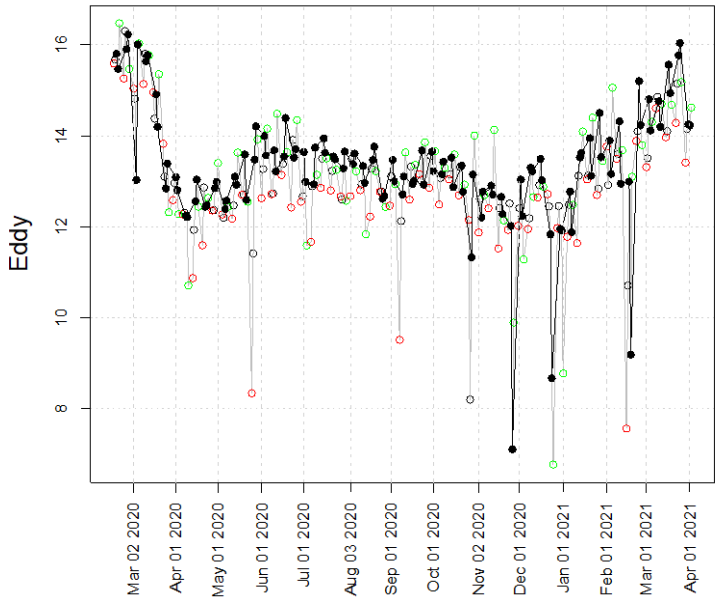
Dona Ana



Lea



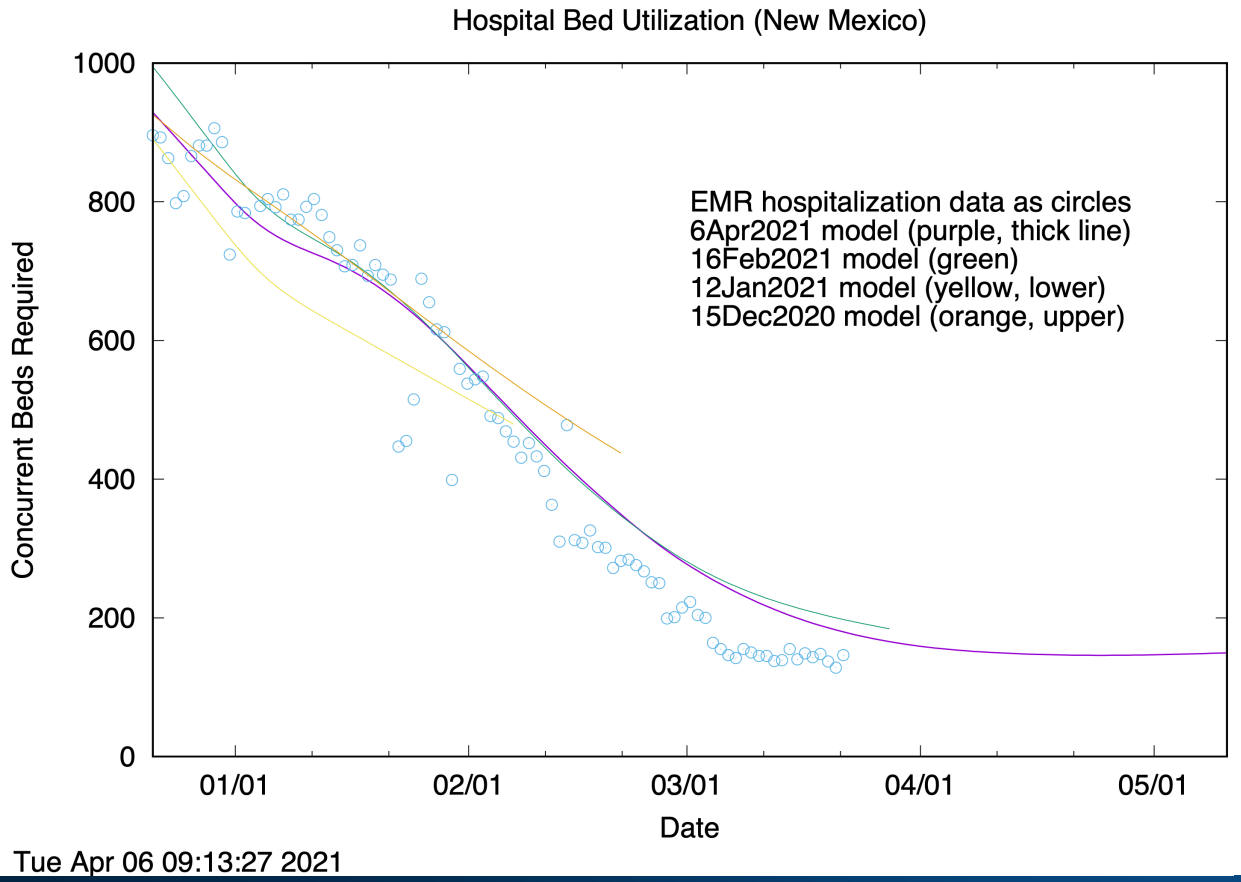
Eddy

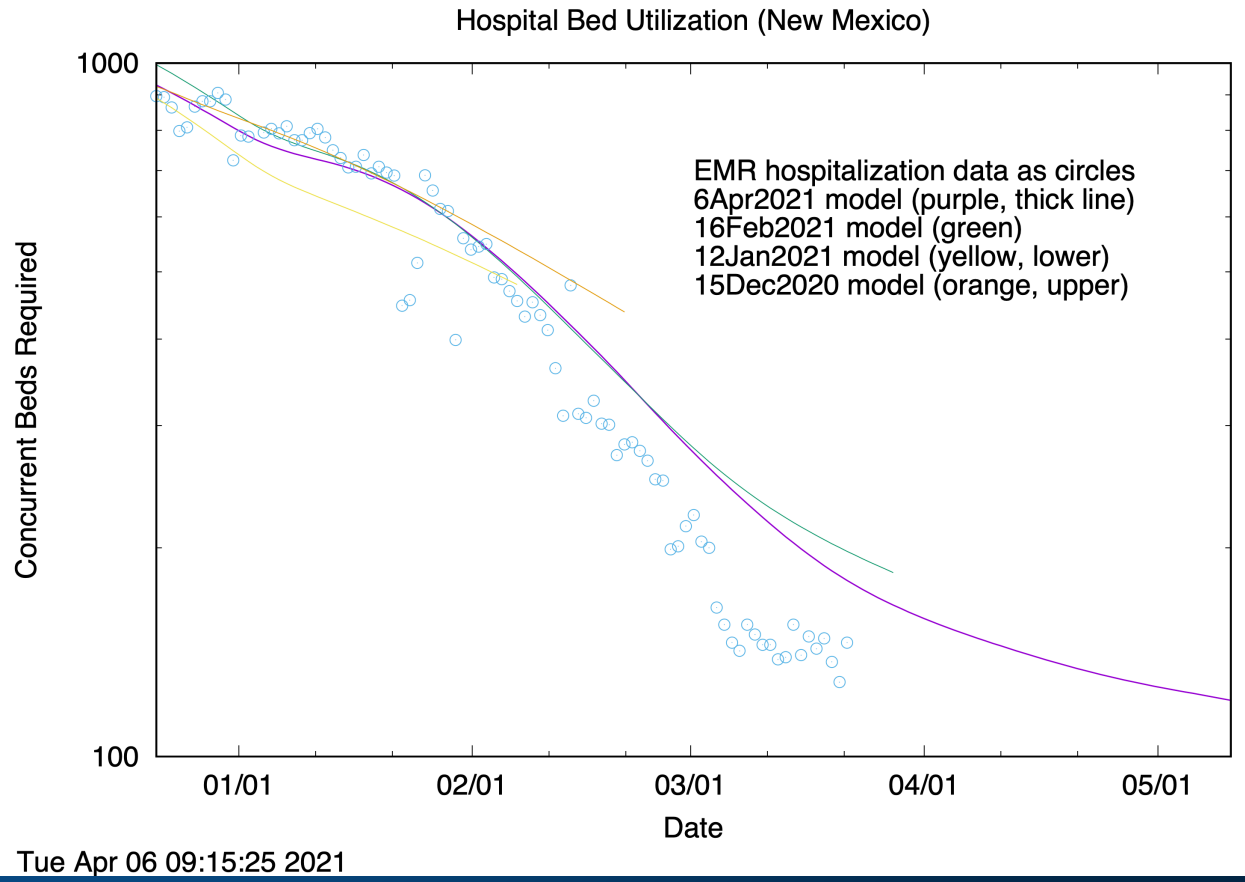


- Weekends NOT shown
- Monday
- Wednesday/Thursday
- Friday (usually higher)

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

- Left panel: Linear vs. time (y-scale=0:1200) shows hospital beds.
- Right panel: Log vs. time, same data and models (y-scale = 100:1000, 10x).
- Divergence between 15Dec2020 model, subsequent EMR data, and later EG models reflects the impact of vaccination.
- Long-term change in slope may be due to shifting demographics.
- Our flattening in cases is delayed compared with data by about two weeks.





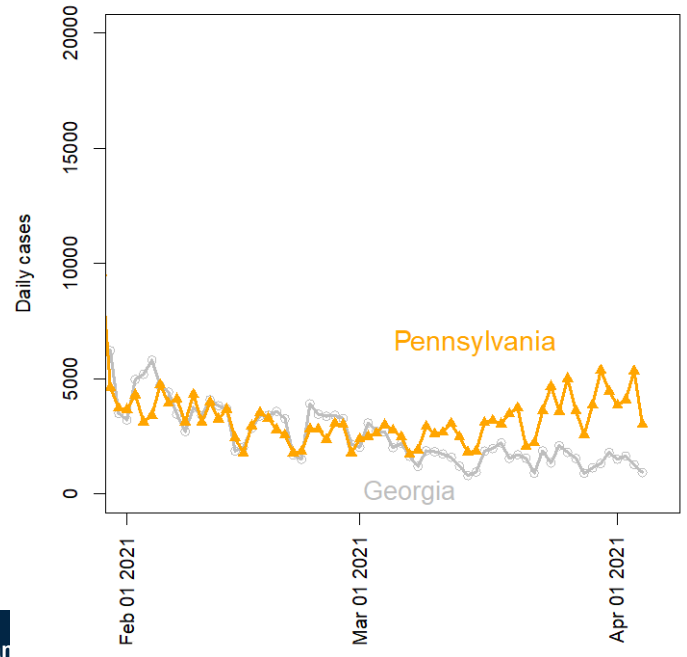
What is happening in the rest of the U.S.?

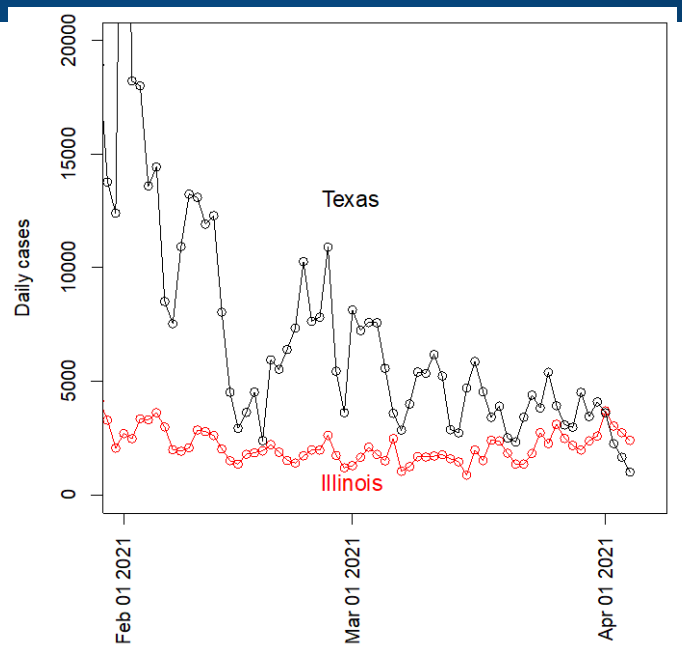
The 10 most populous states

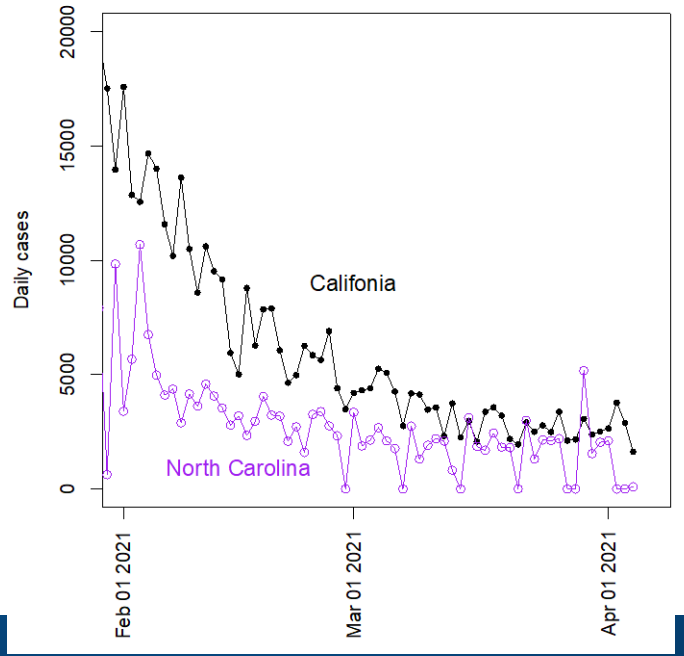
Case are rising: Florida, Illinois, Michigan, Pennsylvania

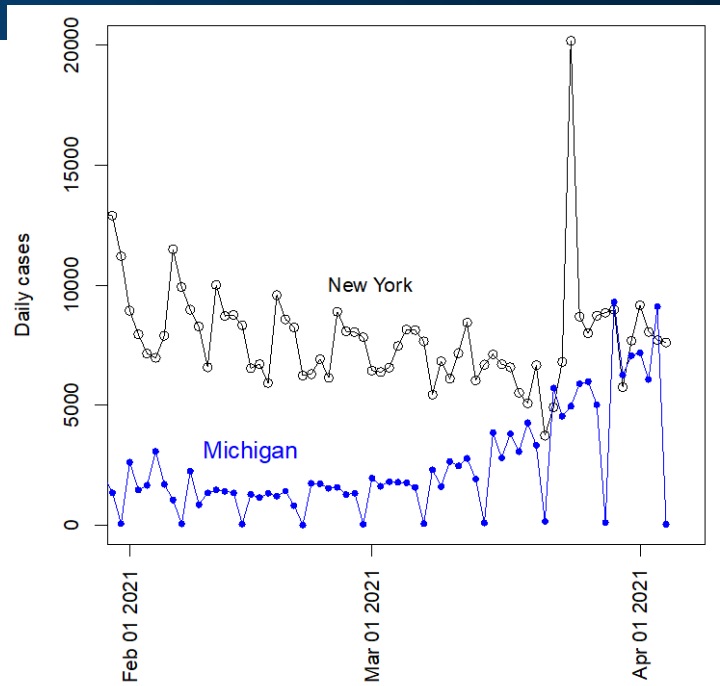
Possibly rising: California, New York, Ohio

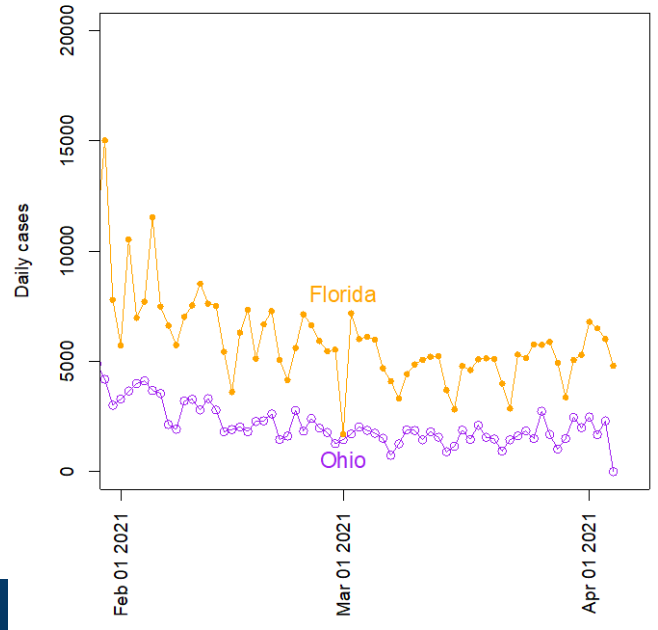
Case are not rising: Georgia, North Carolina, Texas





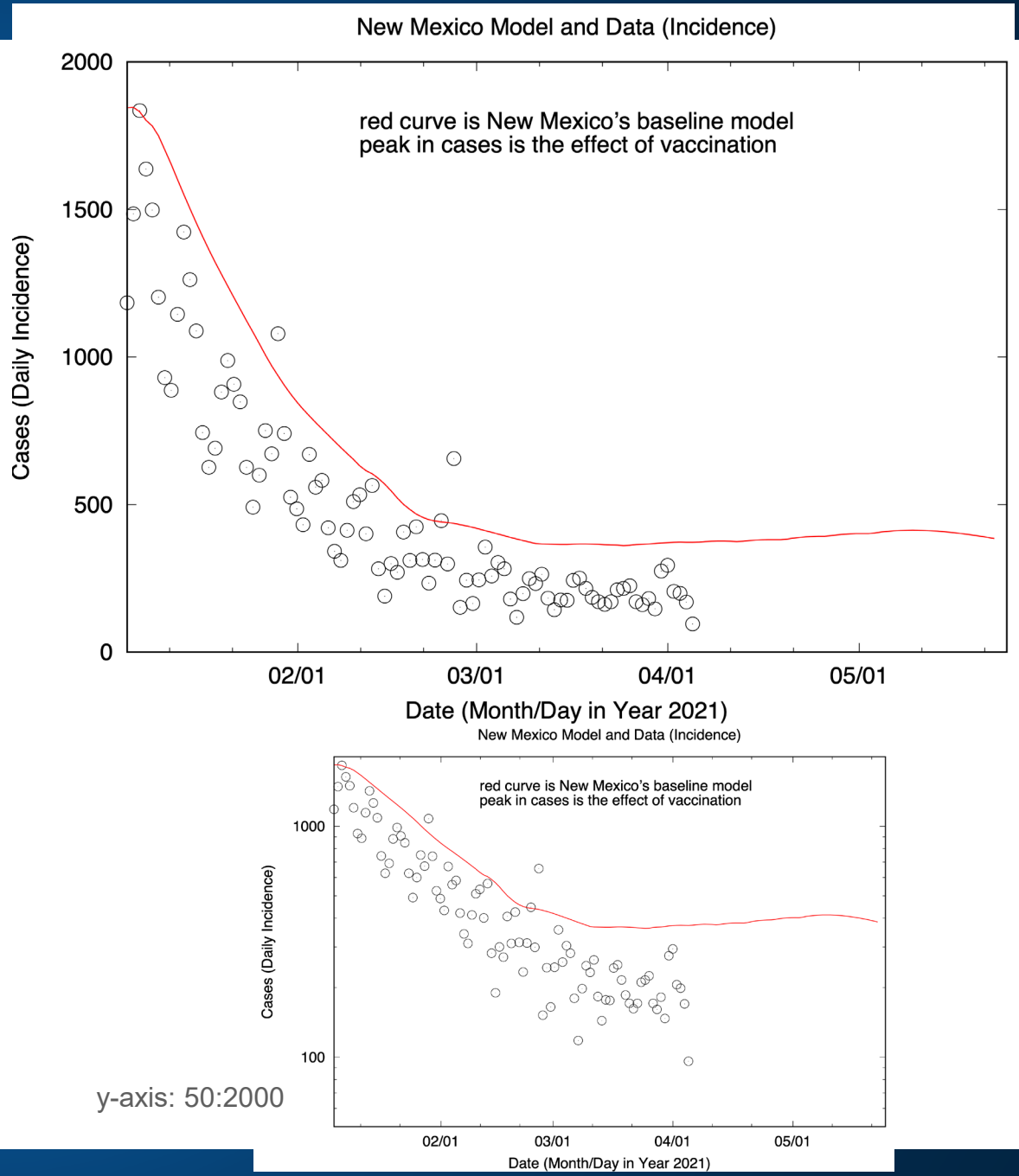






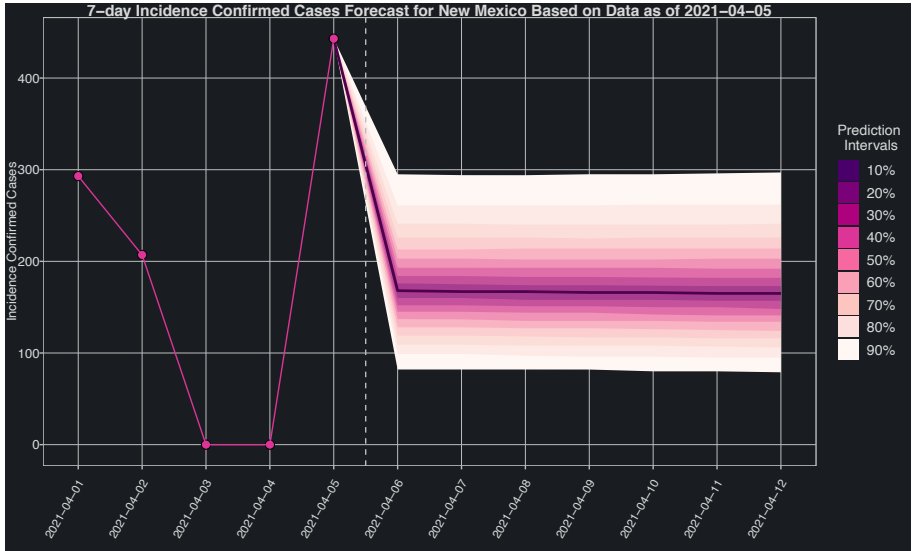
Outlook with Vaccination

- Quarantine *currently* plays a similar role to vaccination.
- Infection control also appears to be comparable to vaccination.
- Currently modeling 90% vaccine effectiveness.
- Apr 6th model: >804k people vaccinated (1 or 2 doses).
- By-county matching to vaccination.
- NM is currently trading relaxed infection control for vaccination. NM appears just above the “speed limit”
- Variant replacement possibly contributing to the rise.
- Assuming only susceptible people are vaccinated.
- Unchanged quarantine effectiveness assumed in all cases.
- Vaccine hesitancy not account for yet.



y-axis: 50:2000

Short- & Long-Term Forecast for NM: Cases



6–Week Forecast of Confirmed Cases for New Mexico Based on Data as of 2021–04–05

Week	Best Case (5th Percentile)	Middle Case (50th Percentile)^	Worst Case (95th Percentile)
2021–04–05		192,595*	
2021–04–12	193,165	193,758	194,662
2021–04–19	193,691	194,901	196,761
2021–04–26	194,161	196,028	198,937
2021–05–03	194,557	197,142	201,239
2021–05–10	194,908	198,270	203,817
2021–05–17	195,213	199,419	206,579

*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 2021–04–05

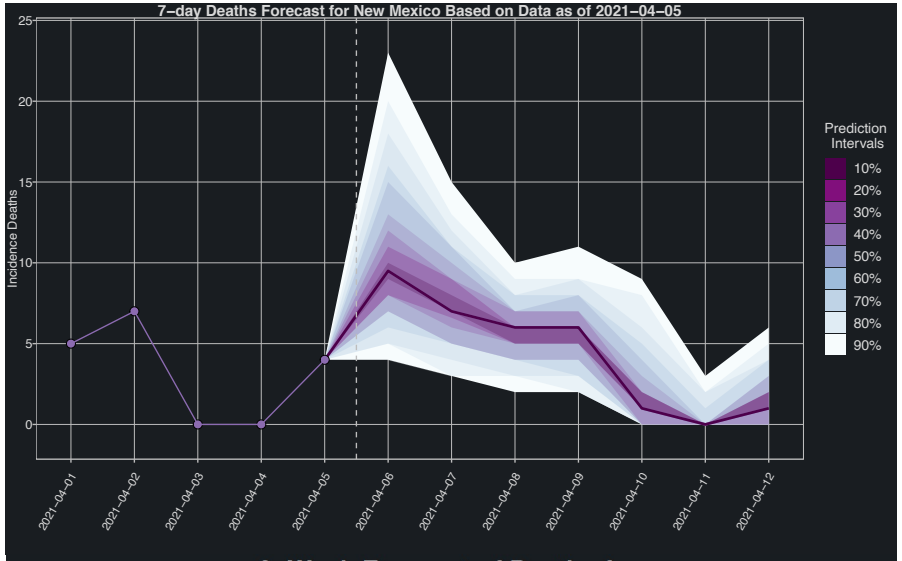
Week	Best Case (5th Percentile)	Middle Case (50th Percentile)^	Worst Case (95th Percentile)
2021–04–05		195*	
2021–04–12	81	166	295
2021–04–19	75	163	300
2021–04–26	67	161	311
2021–05–03	57	159	329
2021–05–10	50	161	368
2021–05–17	44	164	395

*Last reported confirmed cases count
^Closest–matching scenario

So what?

The <u>daily</u> number of cases are expected to range between 81 and 300 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 2021–04–05

Week	Best Case (5th Percentile)^	Middle Case (50th Percentile)	Worst Case (95th Percentile)
2021–04–05		3,953*	
2021–04–12	3,975	3,988	4,005
2021–04–19	4,004	4,023	4,046
2021–04–26	4,035	4,059	4,087
2021–05–03	4,066	4,094	4,125
2021–05–10	4,098	4,129	4,164
2021–05–17	4,130	4,165	4,203

*Last reported deaths count
^Closest–matching scenario

6–Week Forecast of Daily Average of Deaths for New Mexico Based on Data as of 2021–04–05

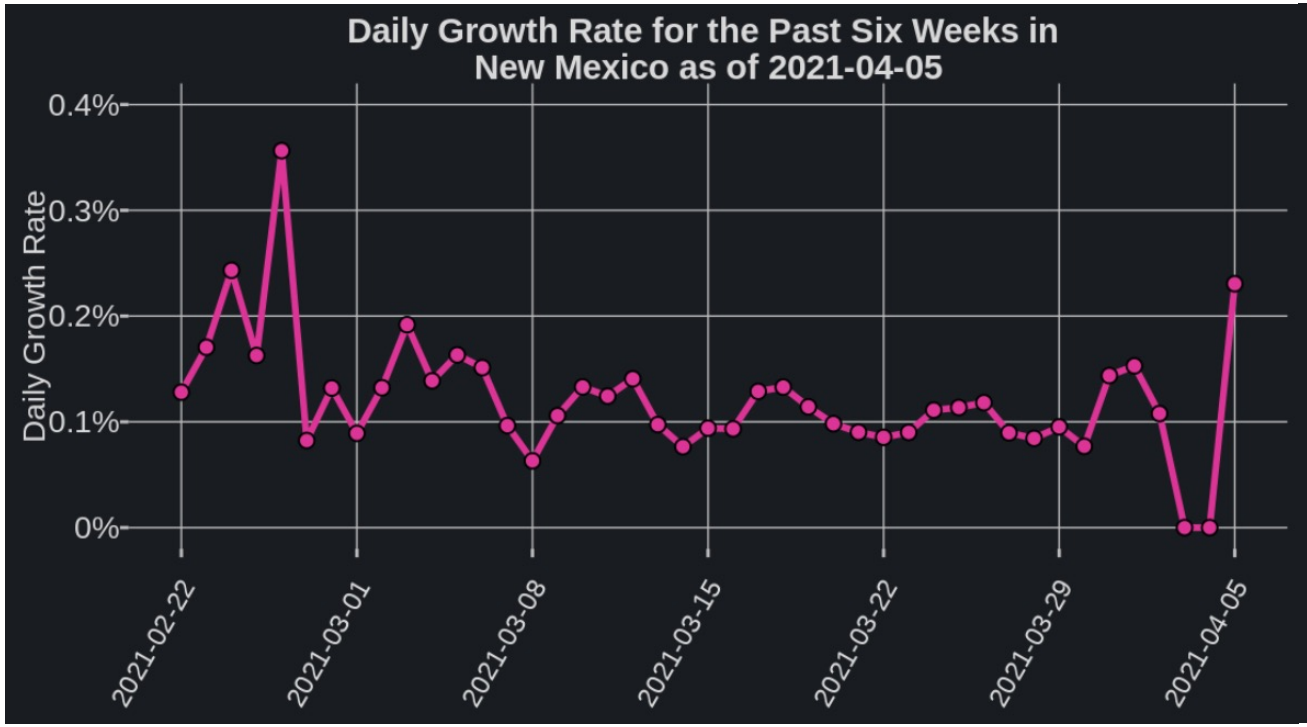
Week	Best Case (5th Percentile)^	Middle Case (50th Percentile)	Worst Case (95th Percentile)
2021–04–05		4*	
2021–04–12	3	5	7
2021–04–19	4	5	6
2021–04–26	4	5	6
2021–05–03	4	5	5
2021–05–10	5	5	6
2021–05–17	5	5	6

*Last reported confirmed deaths
^Closest–matching scenario

So what?

The daily number of deaths are expected to range between 3 and 7 in the next few weeks

Growth Rate for NM



6-Week Forecast of the Average Weekly Growth Rate for New Mexico Based on Data as of 2021-04-05

Week	Best Case (5th Percentile)	Middle Case (50th Percentile)^	Worst Case (95th Percentile)
2021-04-05		0.10%*	
2021-04-12	0.042%	0.086%	0.15%
2021-04-19	0.039%	0.084%	0.15%
2021-04-26	0.035%	0.082%	0.16%
2021-05-03	0.029%	0.081%	0.16%
2021-05-10	0.026%	0.081%	0.18%
2021-05-17	0.022%	0.083%	0.19%

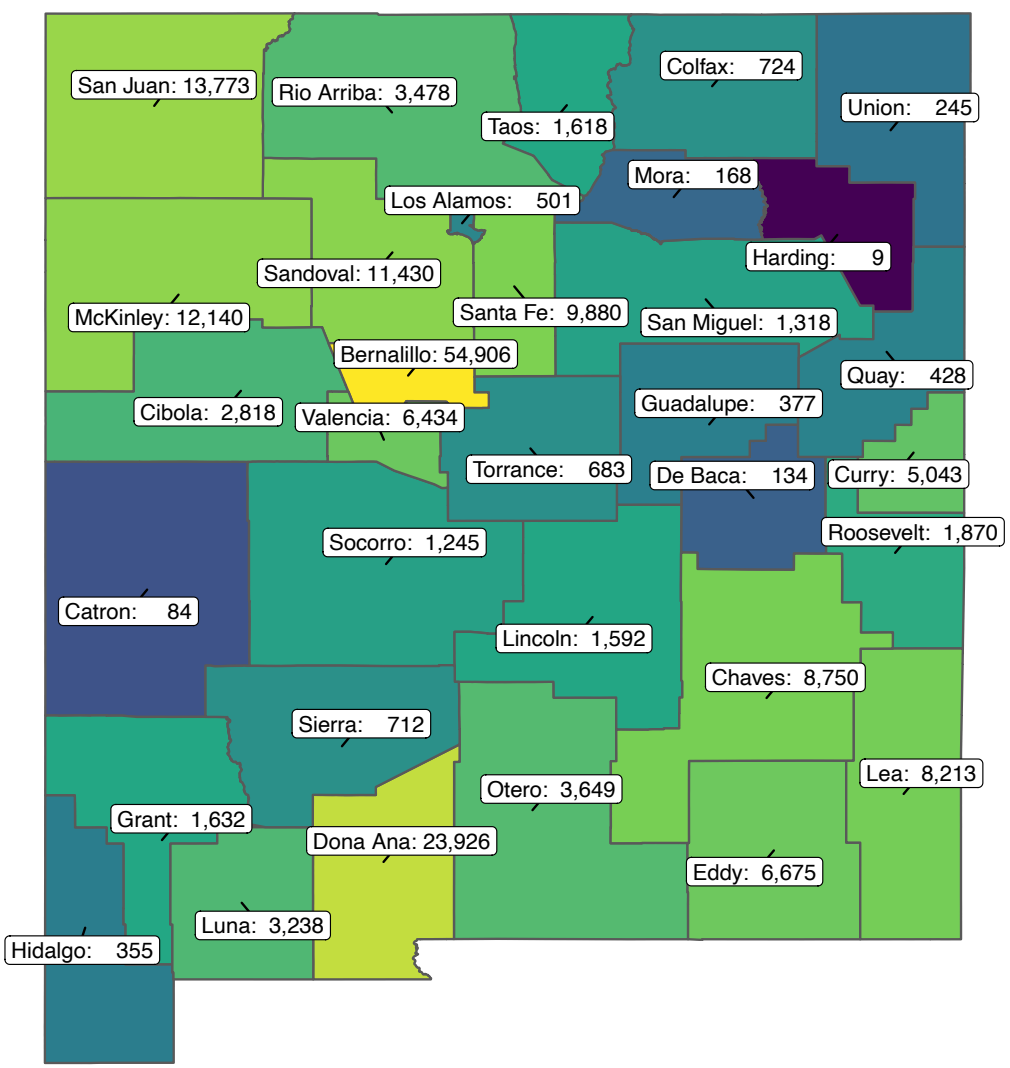
*Last weekly mean daily growth rate

^Closest-matching scenario

So what?

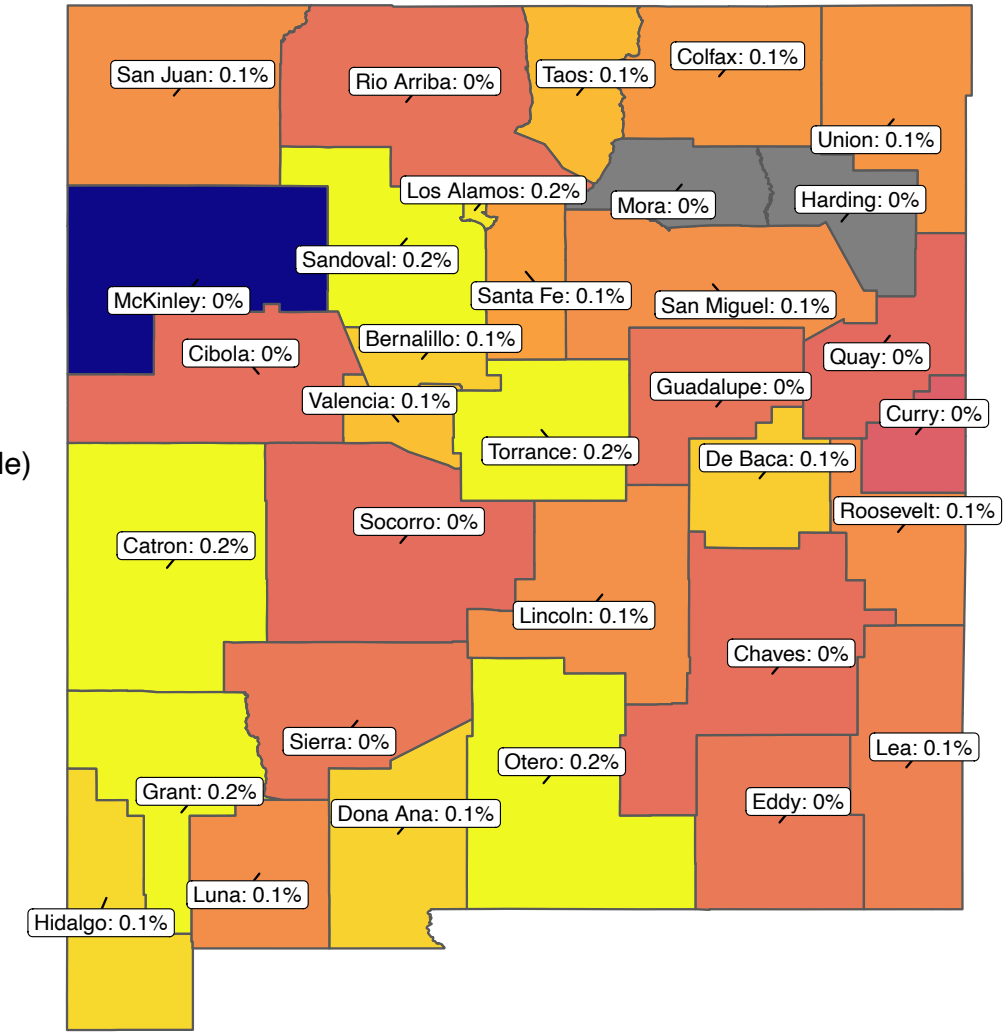
As of April 5th, the average growth rate in NM is at 0.10% (same as last week)

Cumulative Cases & Daily Growth Rate for NM: April 6



Cases
(Log Scale)

22,026
2,981
403
55

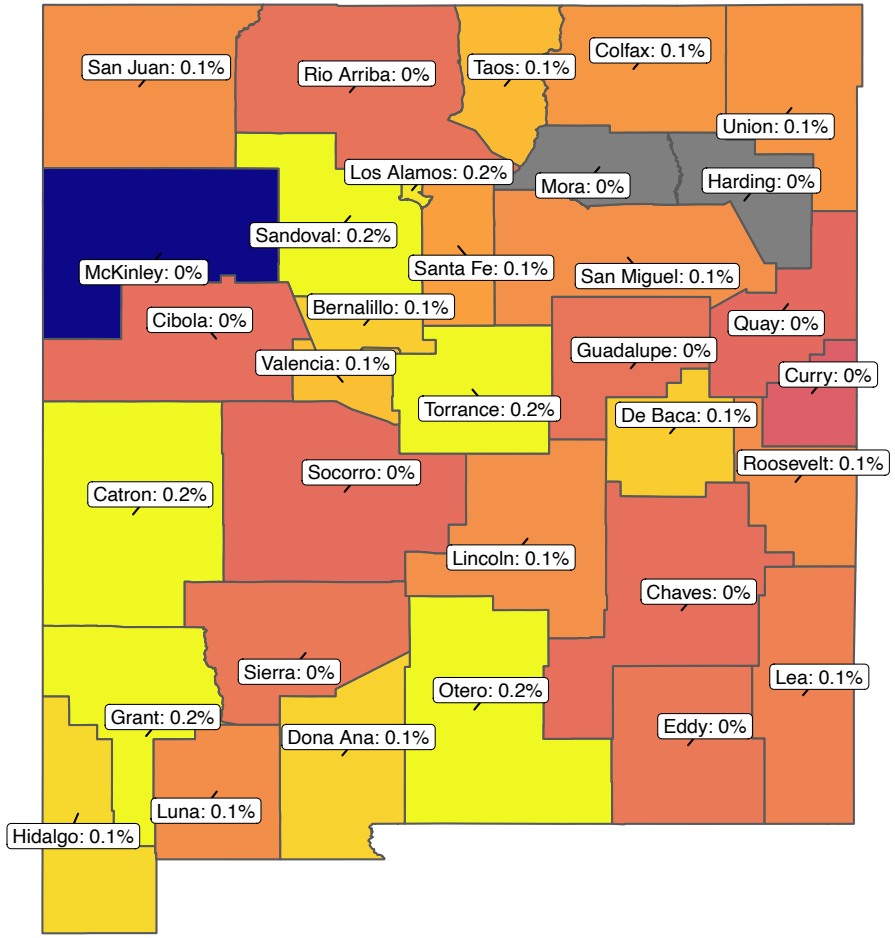


7–day–average
daily growth rate (%)

0.1
0.0
0.0

*Growth rate is in cumulative cases

Daily Growth Rate for NM April 6



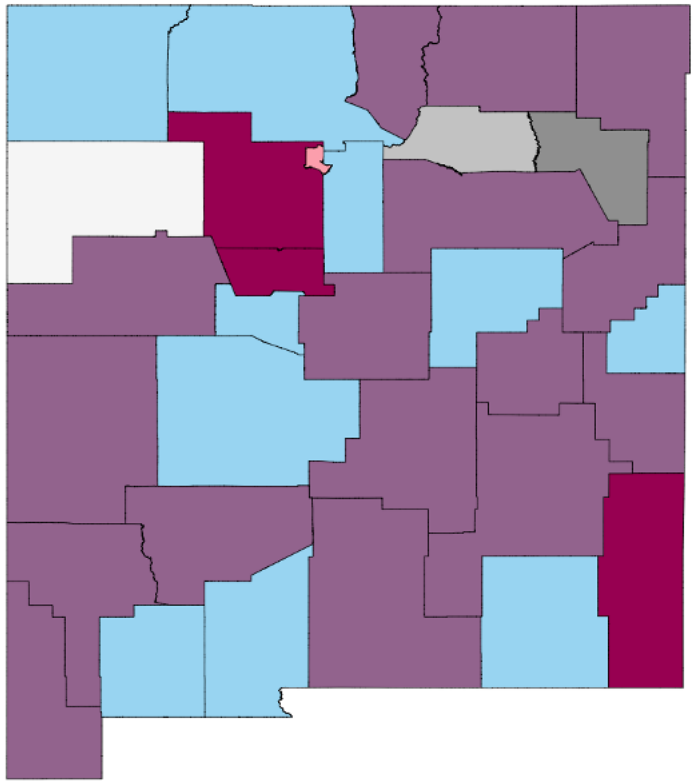
*arrows indicate more than 0.5% difference in growth rate from last week's analysis; growth rate is in cumulative cases

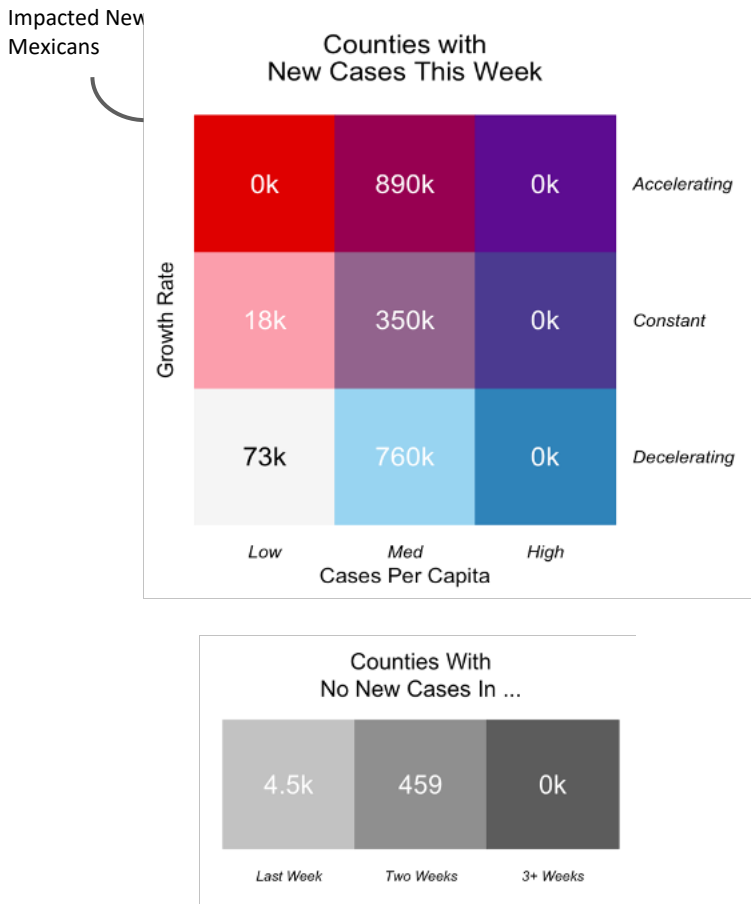
Socorro 0.0% =
Roosevelt 0.1% =
DeBaca 0.1% =
Los Alamos 0.2% =
Quay 0.0% =
Colfax 0.1% =
Harding 0.0% =
Hidalgo 0.1% =
Guadalupe 0.0% =
Catron 0.2% =
Union 0.1% =
Mora 0.0%=

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

Weekly Growth Rate for NM: Another View (April 6)

COVID-19 across New Mexico
A 7-day moving window comparison
April 5, 2021





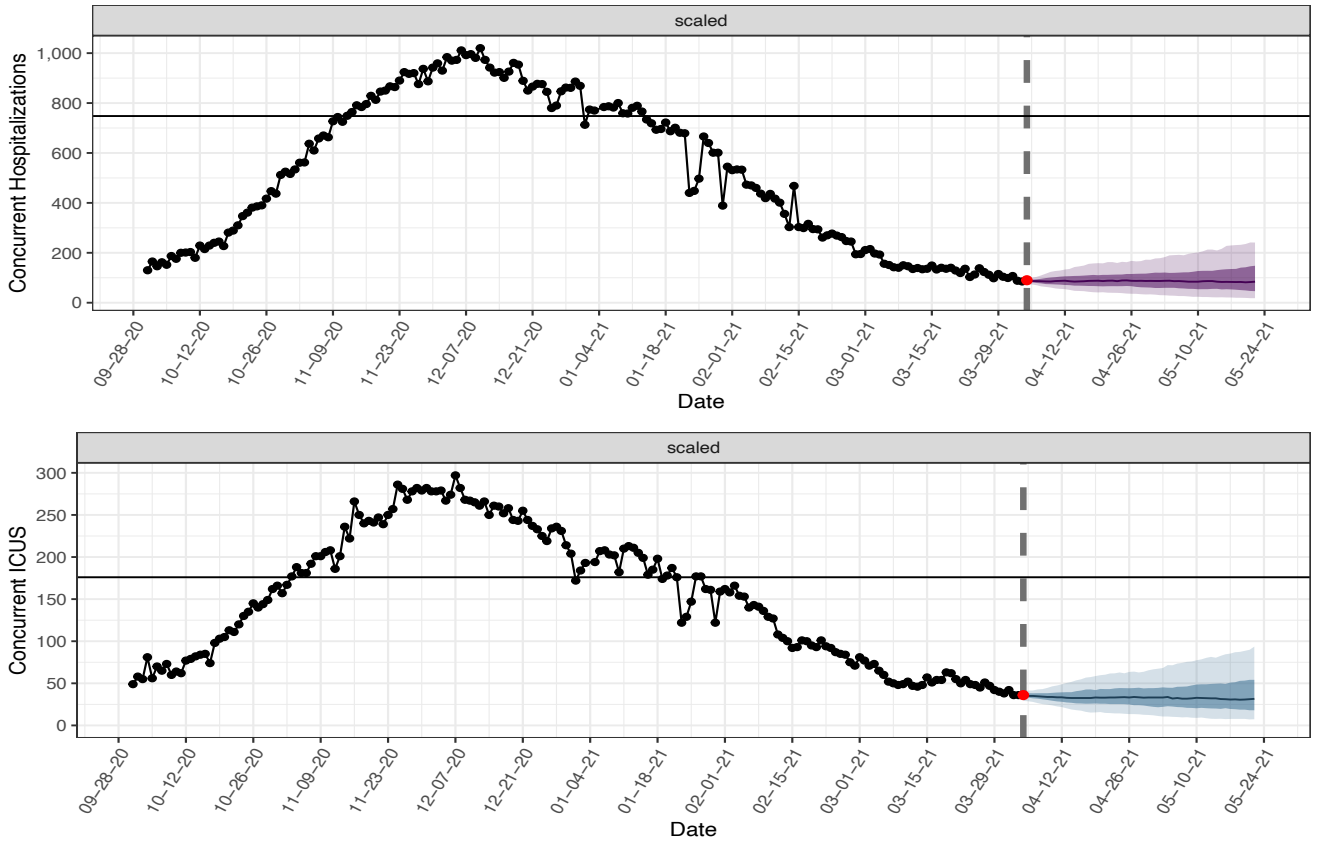
So what?

- Most people in New Mexico are living in a county that is medium per-capita case counts with a mixture of decelerating and constant
- Lea, Otero, Sandoval are accelerating; Bernalillo was classified as accelerating but is more likely constant

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

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

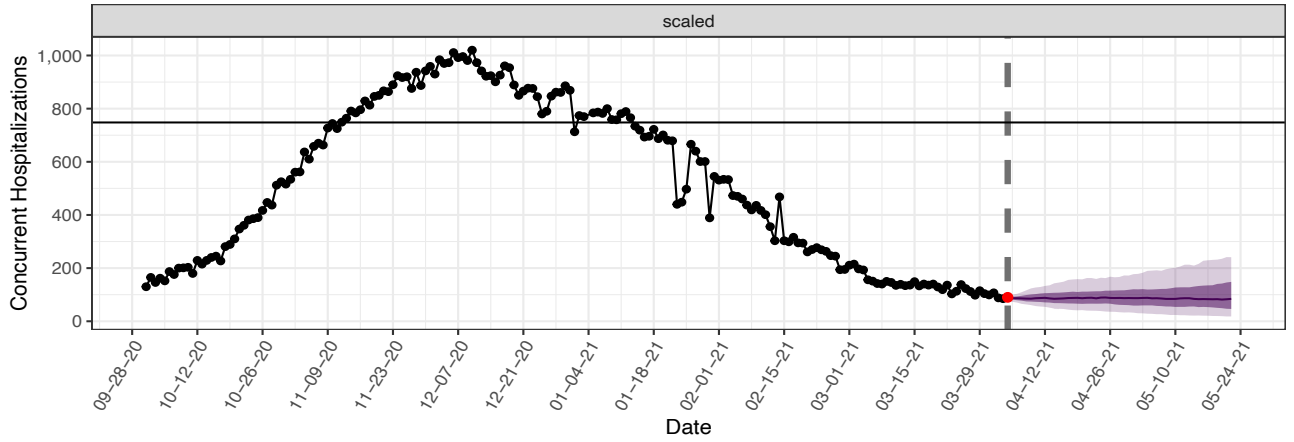
Week	Qu. 5% (best case)	Qu. 50% (median)	Qu. 95% (worst case)
4/11	23	33	47
4/18	15	33	57
4/25	14	34	62
5/2	11	33	67
5/9	9	32	76
5/16	8	31	84

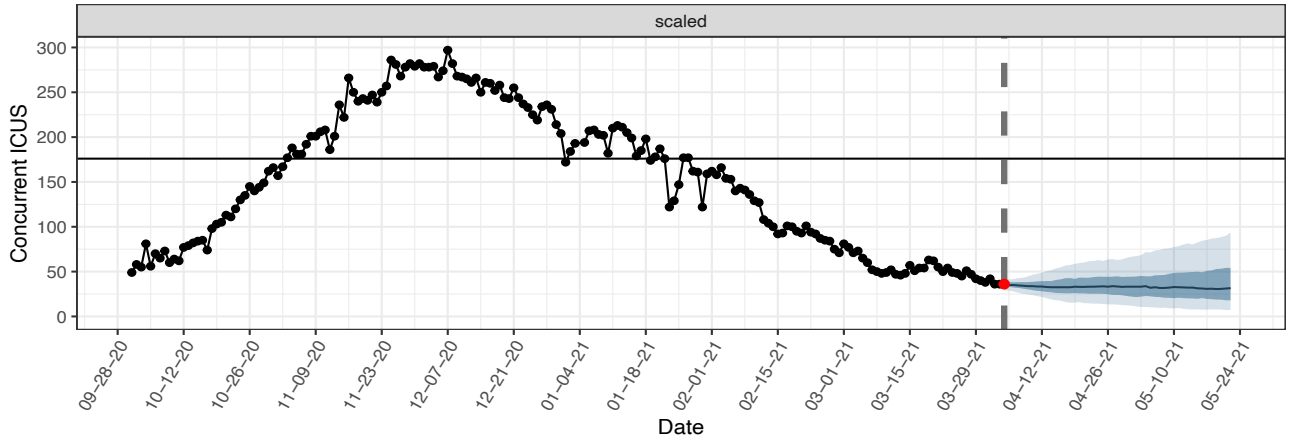
"Scaled" Scenario

So what?

Model is predicting ICU beds to stay the same or decrease 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)
4/11	33	54	82
4/18	27	55	100
4/25	23	56	100
5/2	19	54	111
5/9	14	52	123
5/16	13	52	143

"Scaled" Scenario

So what?

Med-surge general bed needs are predicted to stay the same over the next 3 weeks.