

Modeling & Forecasting COVID-19 in NM

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February 16, 2021

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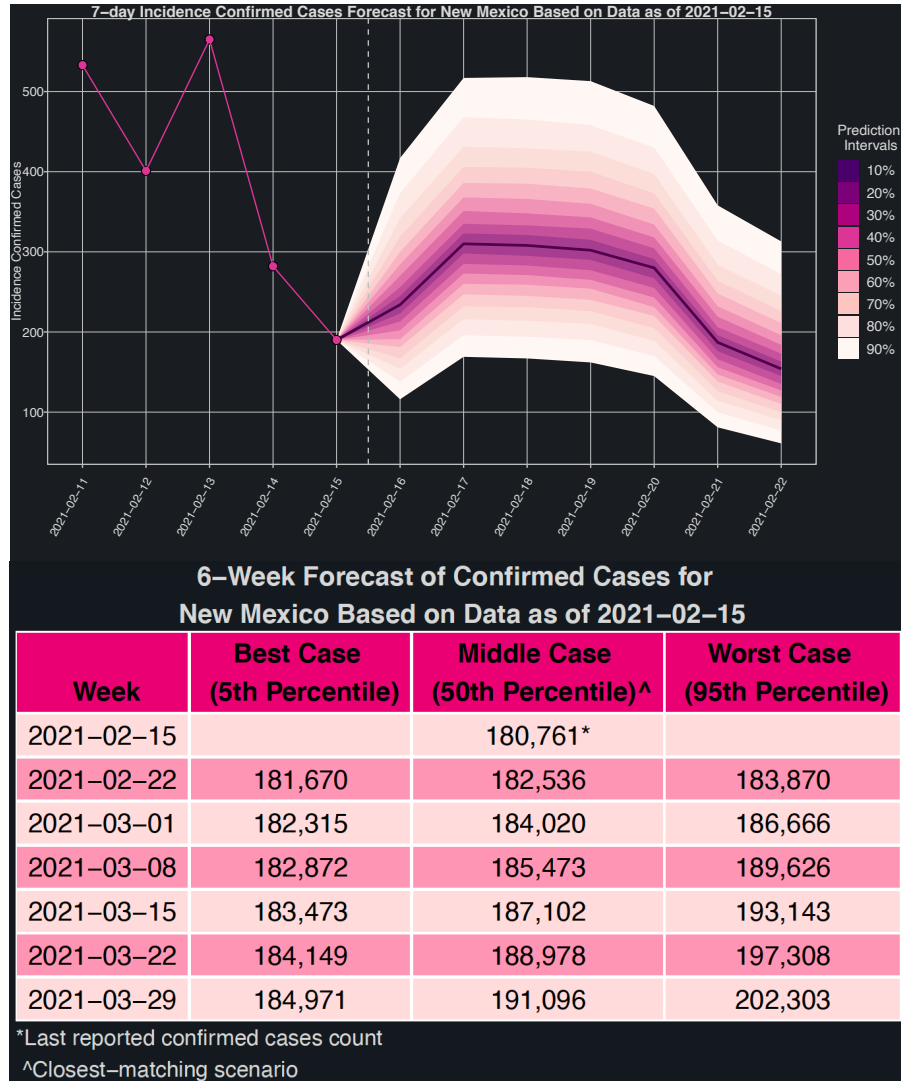
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Short- & Long-Term Forecast for NM: Cases



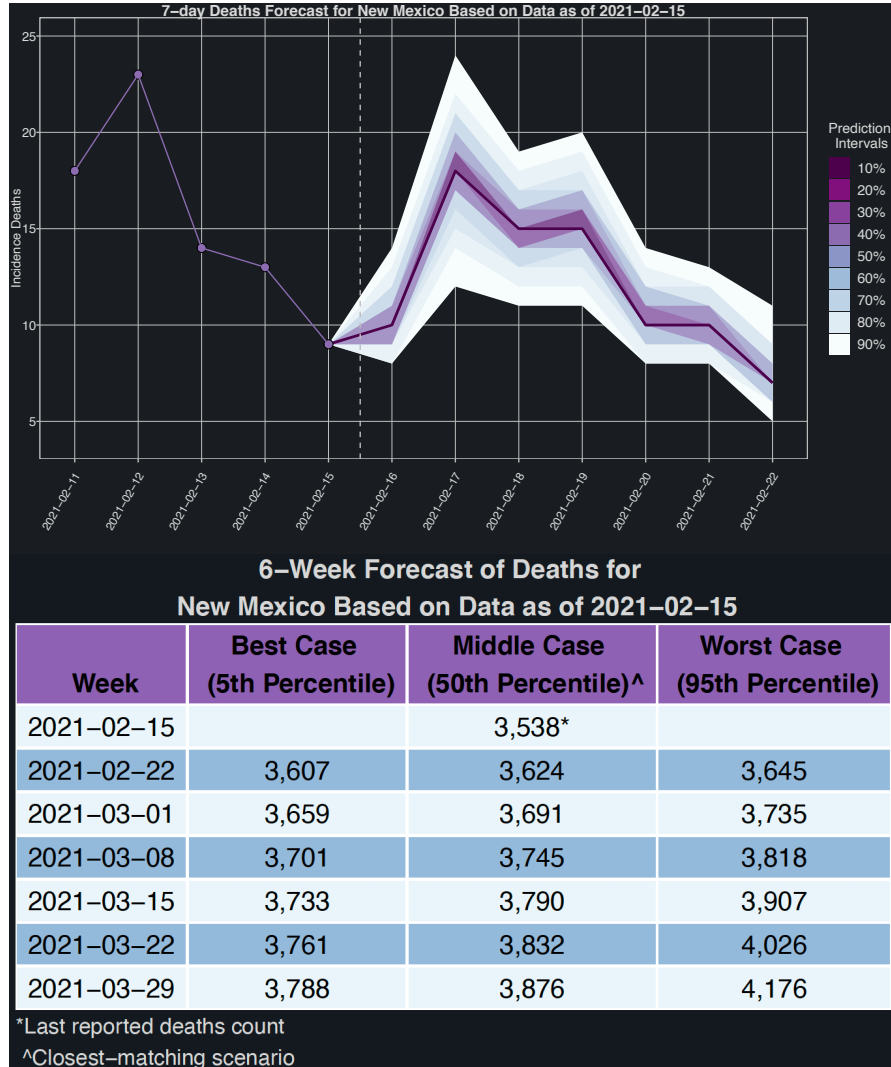
6-Week Forecast of Daily Average of Confirmed Cases for New Mexico Based on Data as of 2021-02-15

Week	Best Case (5th Percentile)	Middle Case (50th Percentile) [^]	Worst Case (95th Percentile)
2021-02-15		413*	
2021-02-22	130	254	444
2021-03-01	92	212	399
2021-03-08	80	208	423
2021-03-15	86	233	502
2021-03-22	97	268	595
2021-03-29	117	303	714

*Last reported confirmed cases count
[^]Closest-matching scenario

So what?
The daily number of cases are expected to range between 80 and 444 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 2021-02-15

Week	Best Case (5th Percentile)	Middle Case (50th Percentile) [^]	Worst Case (95th Percentile)
2021-02-15		18*	
2021-02-22	10	12	15
2021-03-01	7	10	13
2021-03-08	6	8	12
2021-03-15	5	6	13
2021-03-22	4	6	17
2021-03-29	4	6	21

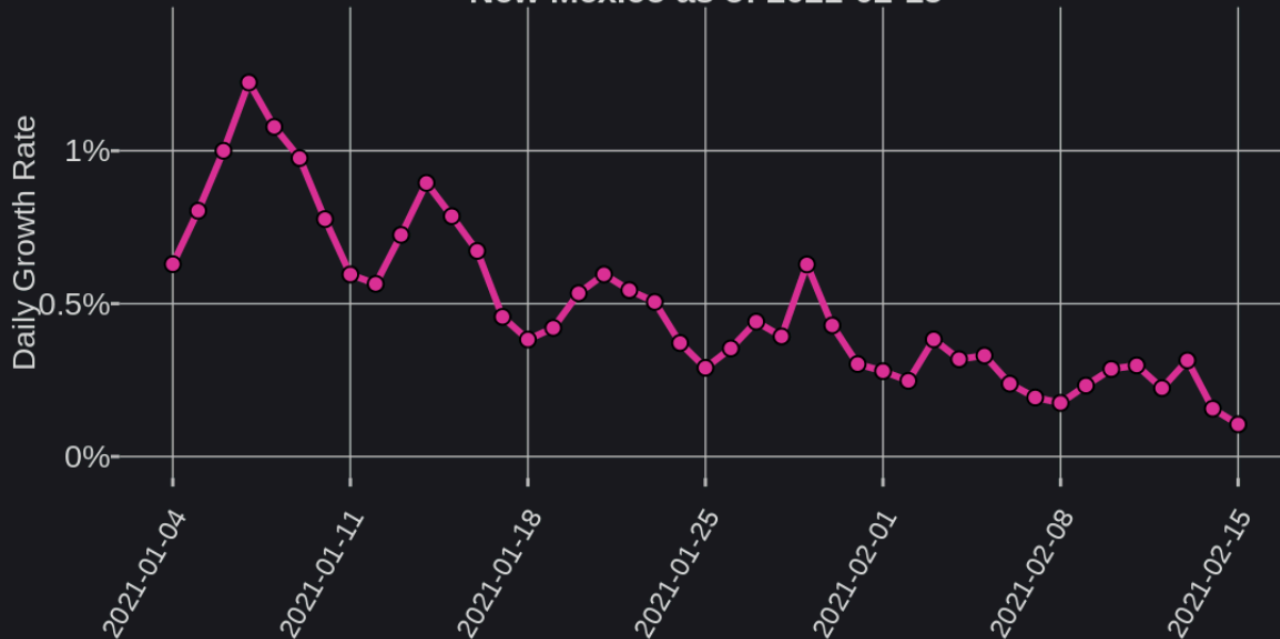
*Last reported confirmed deaths
[^]Closest-matching scenario

So what?

The daily number of deaths are expected to range between 6 and 15 in the next few weeks

Growth Rate for NM

Daily Growth Rate for the Past Six Weeks in New Mexico as of 2021-02-15



6-Week Forecast of the Average Weekly Growth Rate for New Mexico Based on Data as of 2021-02-15

Week	Best Case (5th Percentile)	Middle Case (50th Percentile) [^]	Worst Case (95th Percentile)
2021-02-15		0.23%*	
2021-02-22	0.072%	0.14%	0.24%
2021-03-01	0.051%	0.12%	0.22%
2021-03-08	0.044%	0.11%	0.23%
2021-03-15	0.047%	0.12%	0.26%
2021-03-22	0.053%	0.14%	0.31%
2021-03-29	0.064%	0.16%	0.36%

*Last weekly mean daily growth rate

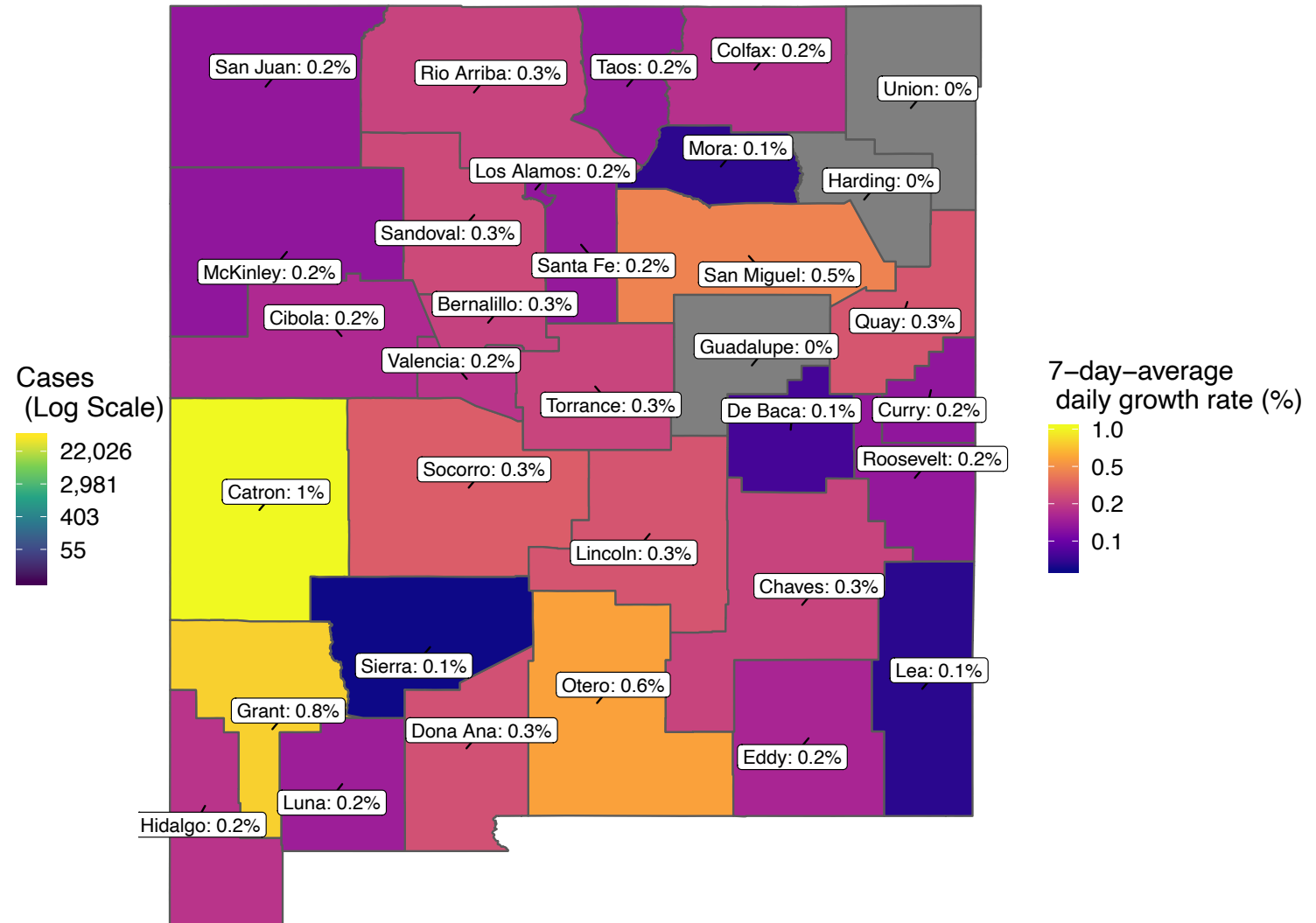
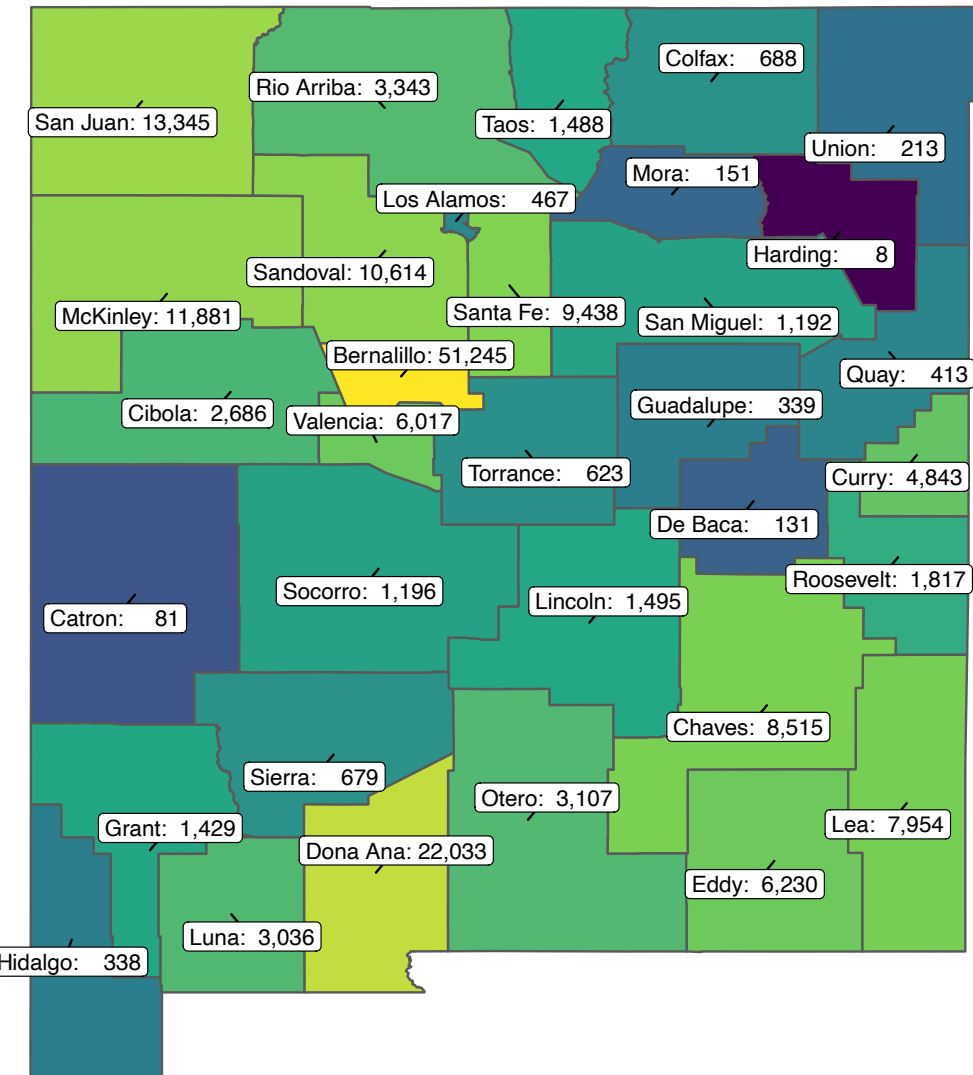
[^]Closest-matching scenario

So what?

As of February 16th, the average growth rate in NM is at 0.23% (down from 0.27%)

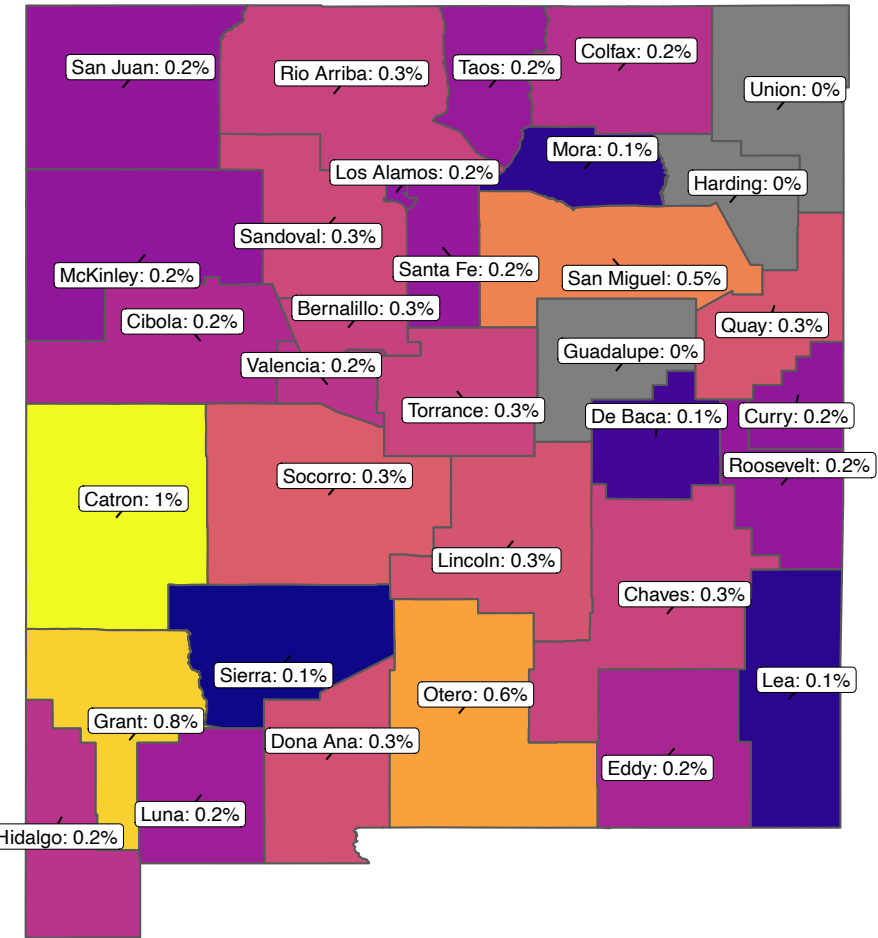
> Regional Growth Rates, Hospitalization & Shelter Forecasts

Cumulative Cases & Daily Growth Rate for NM: Feb 15

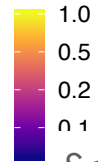


*Growth rate is in cumulative cases

Daily Growth Rate for NM Feb 15



7-day-average daily growth rate (%)



- Socorro 0.3% =
- Mora 0.1% =
- Roosevelt 0.2% =
- DeBaca 0.1% =
- Los Alamos 0.2% =
- Quay 0.3% =
- Union 0.0% =
- Colfax 0.2% =
- Harding 0.0% =
- Hidalgo 0.2% =
- Guadalupe 0.0% =

Catron 1.0% = ↑

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

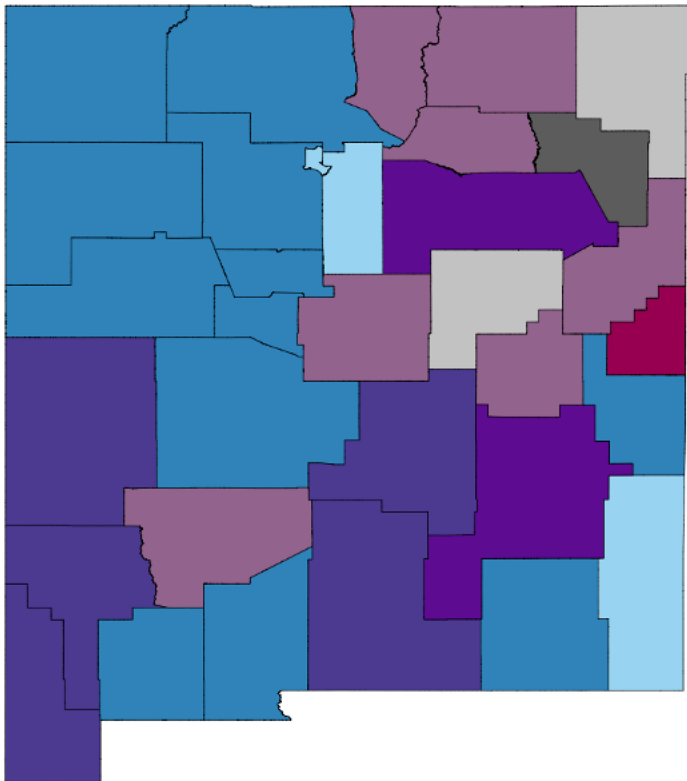
County	Daily Growth Rate	Change
San Juan	0.2%	=
Rio Arriba	0.3%	=
Sierra	0.1%	=
McKinley	0.2%	=
Sandoval	0.3%	=
Santa Fe	0.2%	=
Cibola	0.2%	=
Bernalillo	0.3%	=
Valencia	0.2%	=
Torrance	0.3%	=
Lincoln	0.3%	=
San Miguel	0.5%	=
Chaves	0.3%	=
Dona Ana	0.3%	=
Otero	0.6%	=
Lea	0.1%	=
Eddy	0.2%	=
Curry	0.2%	=
Grant	0.8%	=
Luna	0.2%	=
Taos	0.2%	=

Weekly Growth Rate for NM: Another View (Feb 15)

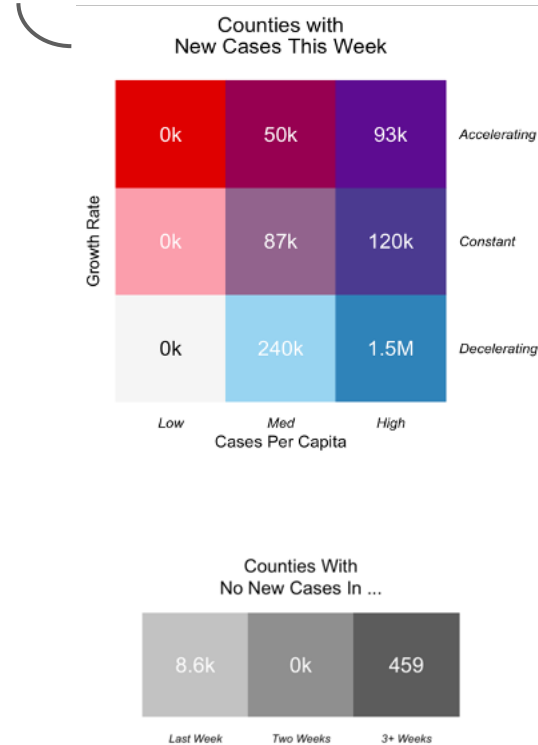
COVID-19 across New Mexico

A 7-day moving window comparison

February 15, 2020



Impacted New Mexicans



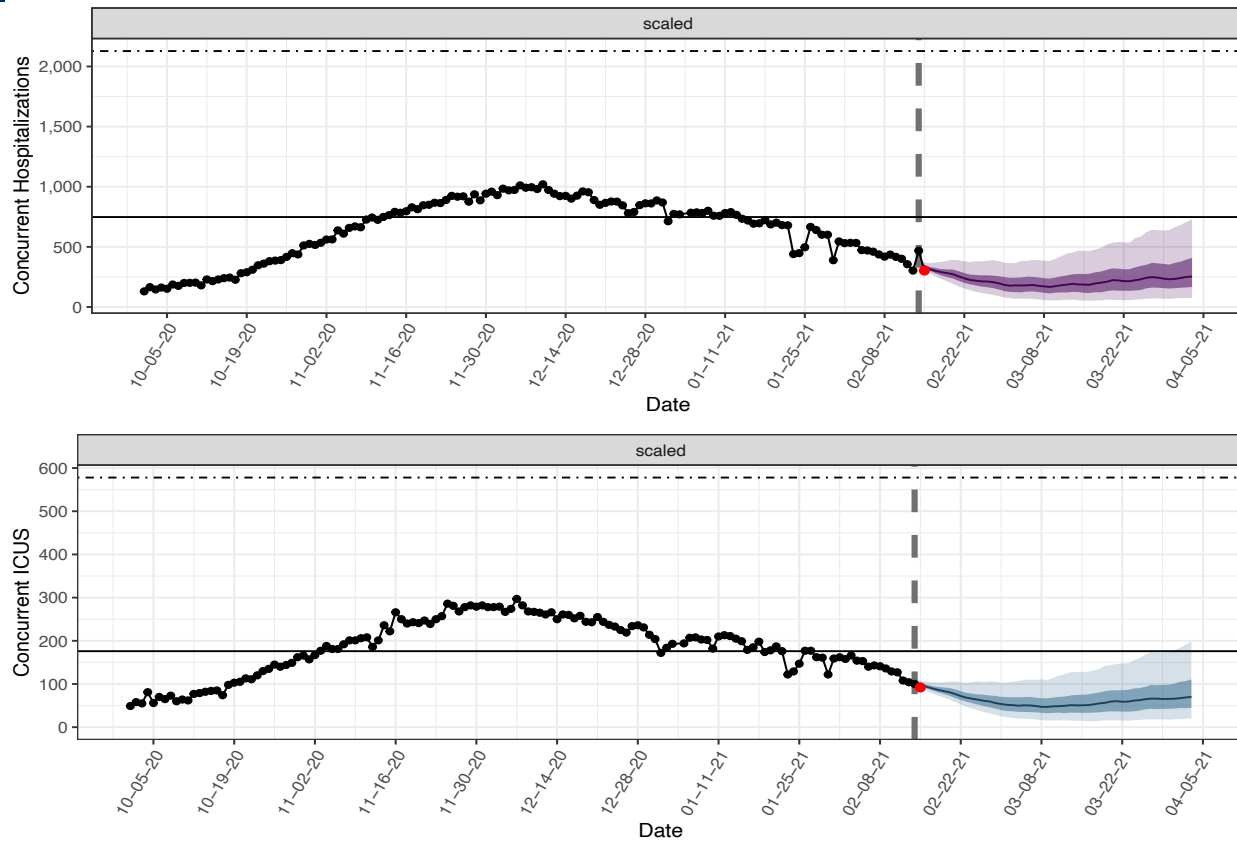
So what?

- Most people in New Mexico are living in a county that is decelerating with high per-capita case counts
- Counties with >500 weekly cases per 100k: **None**
- Chaves and San Miguel are accelerating; Chaves has the highest per-capita case counts in the state (253/100k/week)

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

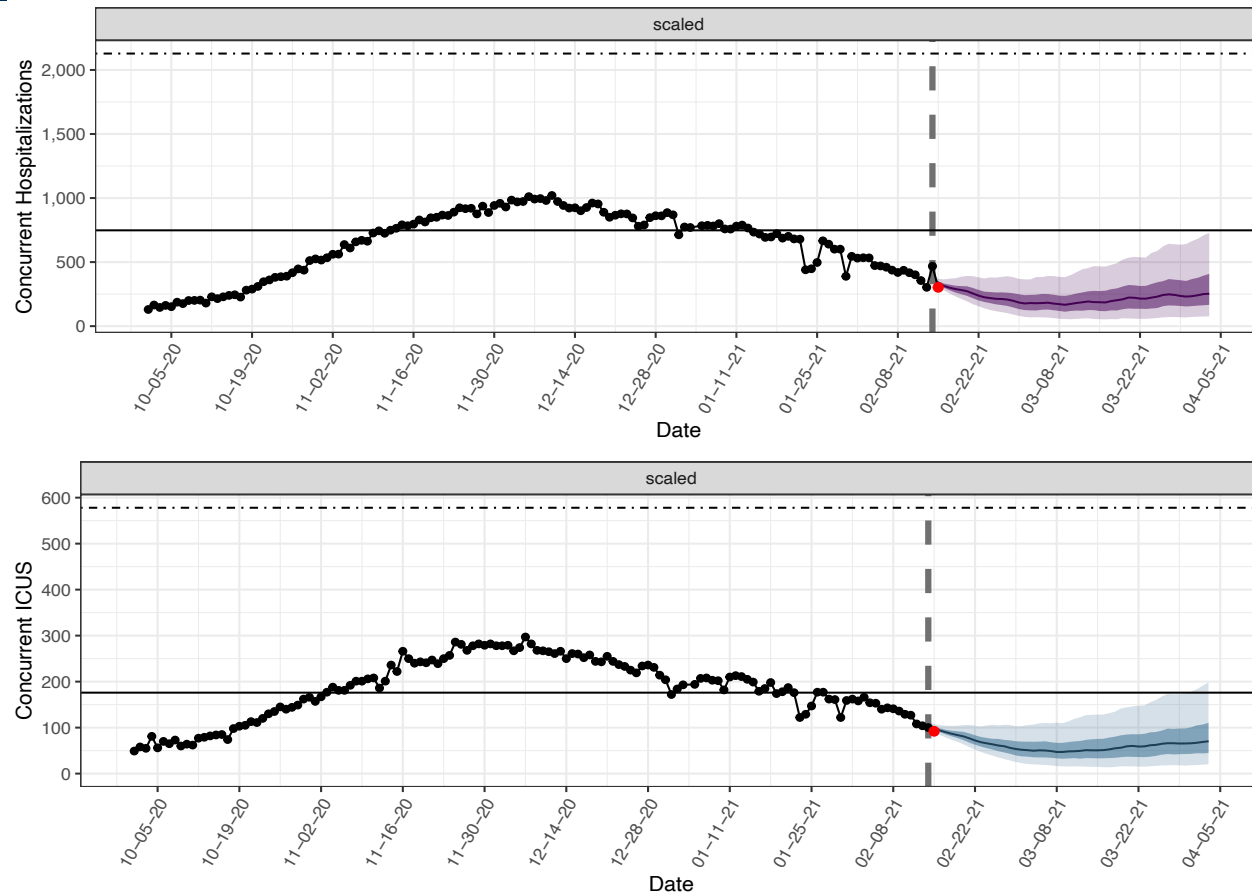
Week	Qu. 5% (best case)	Qu. 50% (median)	Qu. 95% (worst case)
2/21	58	77	106
2/28	28	56	106
3/7	18	49	110
3/14	15	51	128
3/21	16	60	146
3/28	18	66	172

“Scaled” Scenario

So what?

We are below ICU bed capacity for concurrent COVID-19 patients. Model is predicting a decrease over the next 3 weeks and then leveling off or potentially an increase again

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

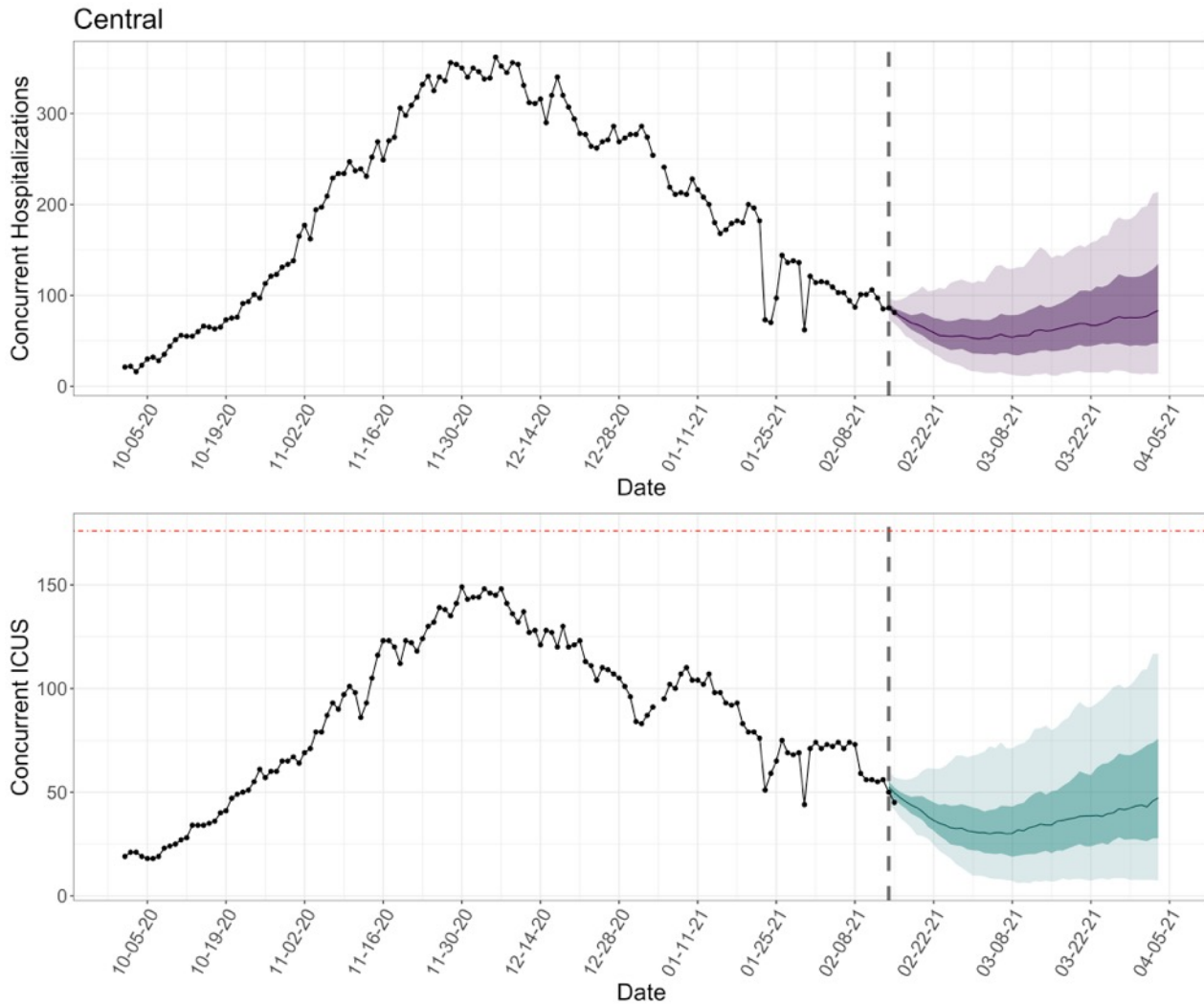
Week	Qu. 5% (best case)	Qu. 50% (median)	Qu. 95% (worst case)
2/21	113	178	284
2/28	62	142	277
3/7	45	127	281
3/14	42	137	341
3/21	42	161	395
3/28	53	178	466

“Scaled” Scenario

So what?

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

Regional Hospitalization Forecasts: Central



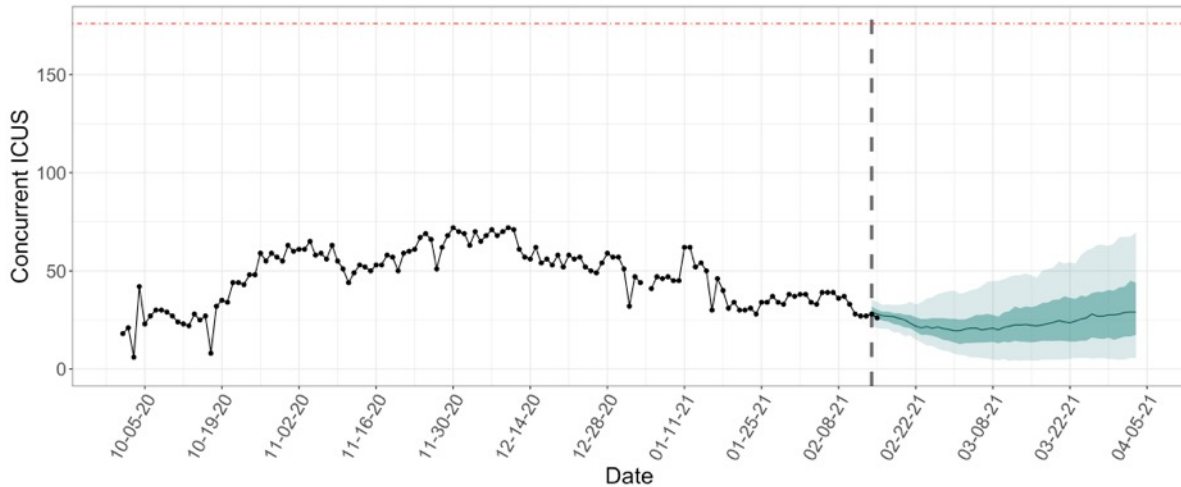
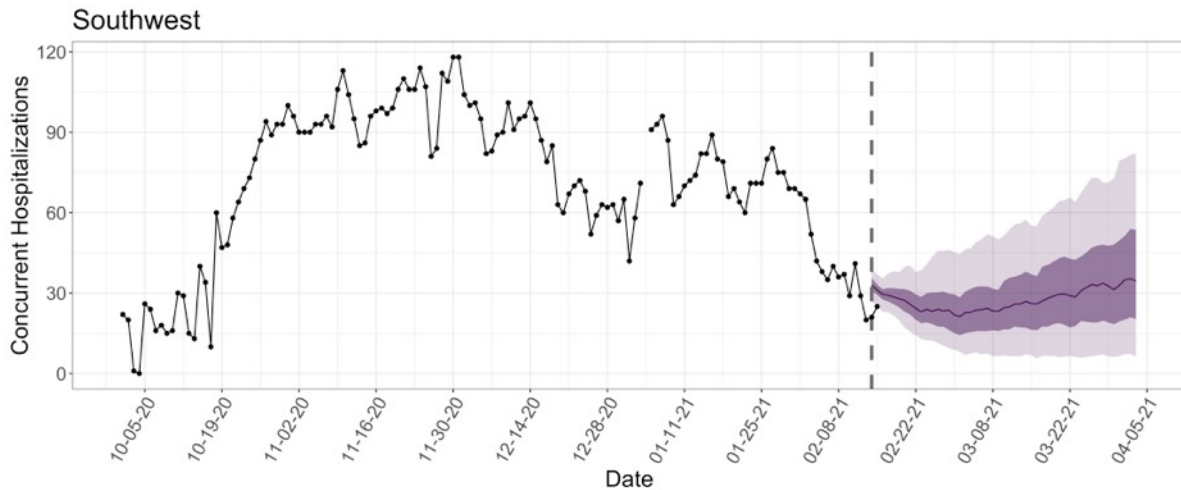
Concurrent COVID-19 ICUs beds: Central

Week	Qu. 5% (best case)	Qu. 50% (median)	Qu. 95% (worst case)
2/21	27	38	62
2/28	12	31	67
3/7	8	30	71
3/14	7	34	82
3/21	8	39	91
3/28	8	41	100

So what?

ICU bed usage is expected to decrease

Regional Hospitalization Forecasts: Southwest



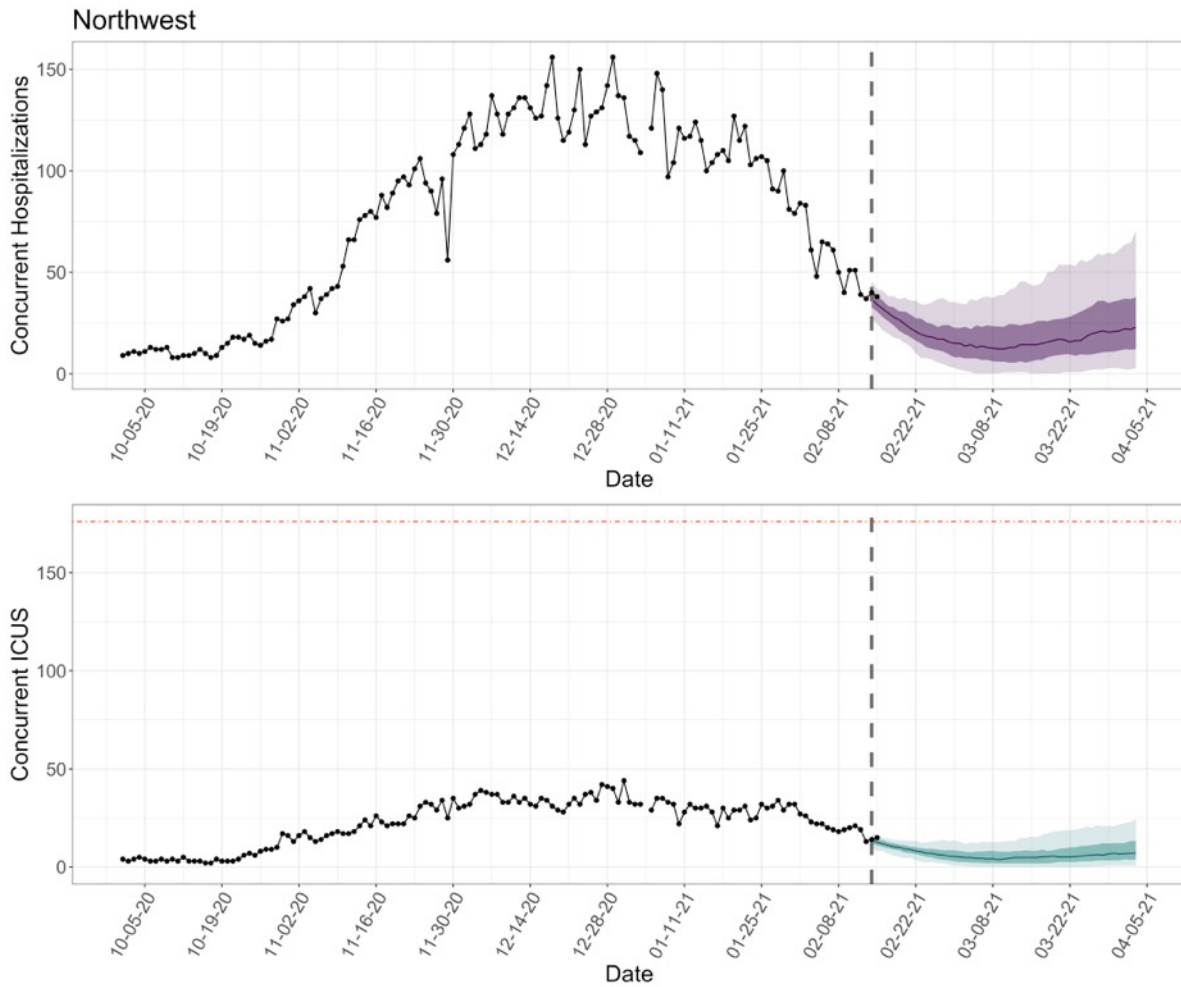
Concurrent COVID-19 ICUs beds: Southwest

Week	Qu. 5% (best case)	Qu. 50% (median)	Qu. 95% (worst case)
2/21	17	23	34
2/28	9	20	40
3/7	5	20	44
3/14	4	23	49
3/21	5	24	54
3/28	6	27	63

So what?

ICU bed usage is expected to decline in the Southwest region.

Regional Hospitalization Forecasts: Northwest



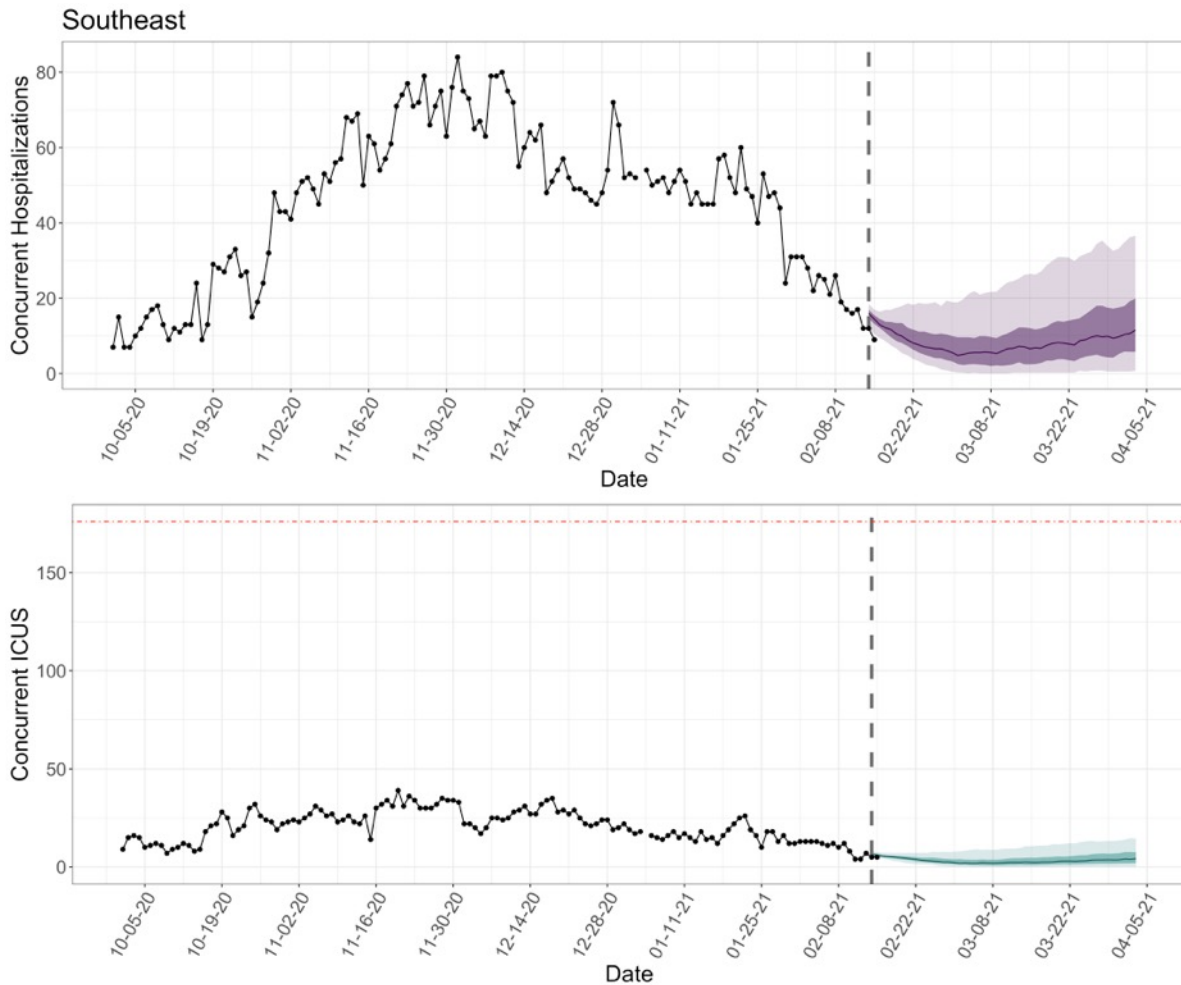
Concurrent COVID-19 ICUs beds: Northwest

Week	Qu. 5% (best case)	Qu. 50% (median)	Qu. 95% (worst case)
2/21	4	9	13
2/28	1	6	13
3/7	0	4	13
3/14	0	5	15
3/21	0	5	19
3/28	0	6	21

So what?

ICU bed usage is expected to decrease in the Northwest region

Regional Hospitalization Forecasts: Southeast



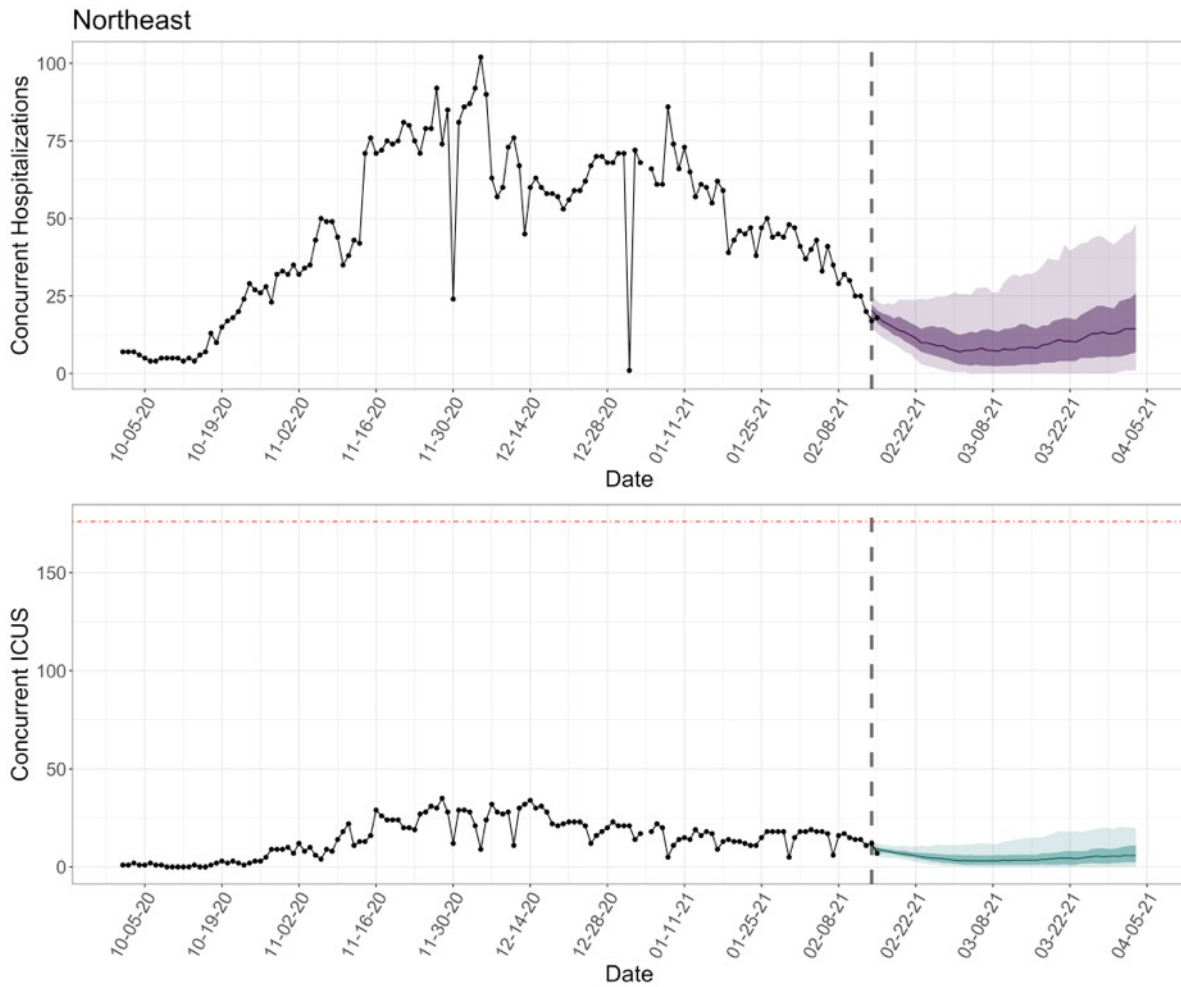
Concurrent COVID-19 ICUs beds: Southeast

Week	Qu. 5% (best case)	Qu. 50% (median)	Qu. 95% (worst case)
2/21	2	4	7
2/28	0	2	8
3/7	0	2	9
3/14	0	2	11
3/21	0	3	12
3/28	0	4	13

So what?

ICU bed usage is expected to be low in the Southeast region

Regional Hospitalization Forecasts: Northeast



Concurrent COVID-19 ICUs beds: Northeast

Week	Qu. 5% (best case)	Qu. 50% (median)	Qu. 95% (worst case)
2/21	3	6	10
2/28	0	4	11
3/7	0	3	12
3/14	0	3	15
3/21	0	5	18
3/28	0	5	20

So what?

ICU bed usage is expected to be low in the Northeast region

> **Non-Congregational Shelter Forecast**

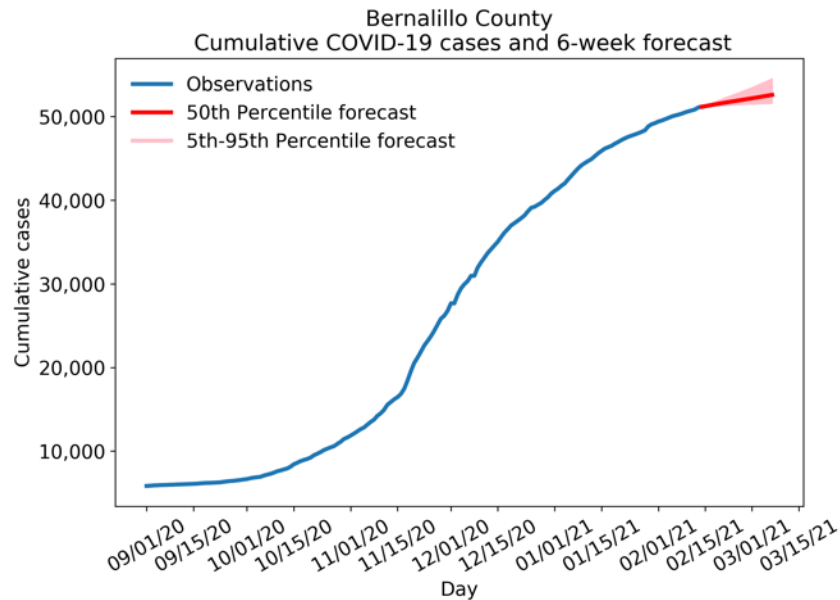
Non-Congregate Shelter Forecast

- Our goal is to inform the capacity of shelters for forecasting the need of additional rooms
- We calculate a ratio between the mean number of daily new cases over the previous two weeks to current occupied rooms
 - We apply this ratio to the forecast of COVID-19 cases from the LANL COFFEE model to estimate the number of rooms needed
- We use the spread in the case forecast to report a subsequent spread in the shelter forecast
- We calculate the number of new rooms need by applying the ratio of occupied rooms:new cases to the number of cases forecasted in each county
- **NEW AS OF 2/7/21:** We added a second forecast method for comparison by averaging the shelter forecast with current shelters in use to smooth the forecast

Non-Congregate Shelter Forecast: Bernalillo

Number of cases as of 2/14/21: **51,179**
 Number of shelter rooms available: **221**
 Total number of patients/medical workers (including specialty): **36**
 Number of patients: **33**
 Number of medical workers: **3**
 Occupied rooms:new cases ratio: **0.26**
 2-week avg. new cases per day: **140**

	2/21/21	2/28/21	3/7/21
Total cases	51,683 (51,361-52,253)	52,126 (51,496-53,311)	52,599 (51,617-54,529)
# of rooms needed	19 (7-40)	16 (5-39)	17 (4-45)
Deficit (-) or surplus of rooms	202	205	204
# of rooms needed (new forecast method)	27	24	22



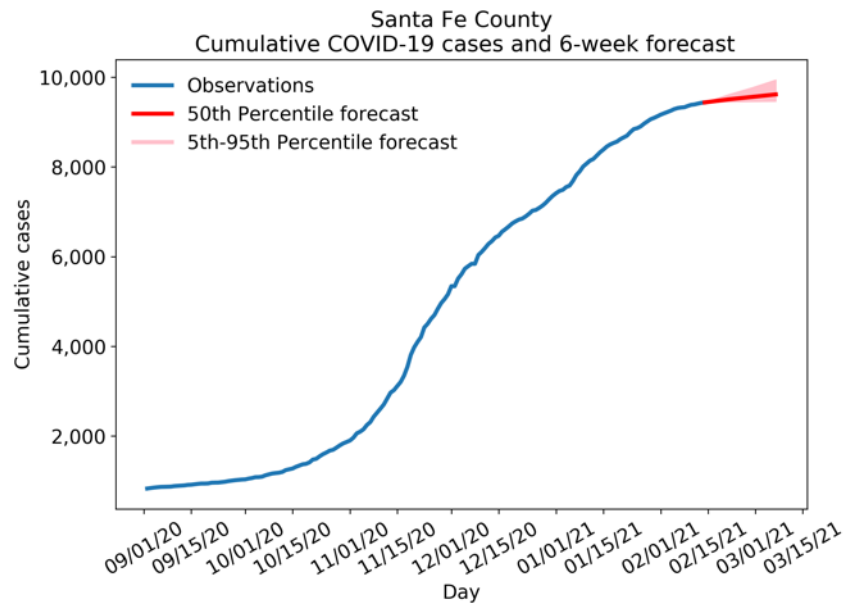
2-week avg. new cases per day decreased from 179 last week to 140 this week

Last week we forecasted 23 (10-43) rooms in use, 32 rooms with the adjustment; there are 36 actually in use, so we are continuing to slightly under forecast

Non-Congregate Shelter Forecast: Santa Fe

Number of cases as of 2/14/21: **9,438**
 Number of shelter rooms available: **52**
 Total number of patients/medical workers (including specialty): **13**
 Number of patients: **13**
 Number of medical workers: **0**
 Occupied rooms:new cases ratio: **0.59**
 2-week avg. new cases per day: **22**

	2/21/21	2/28/21	3/7/21
Total cases	9,506 (9,454-9,610)	9,561 (9,462-9,766)	9,617 (9,468-9,938)
# of rooms needed	6 (1-15)	5 (1-13)	5 (1-15)
Deficit (-) or surplus of rooms	46	47	47
# of rooms needed (new forecast method)	9	8	7



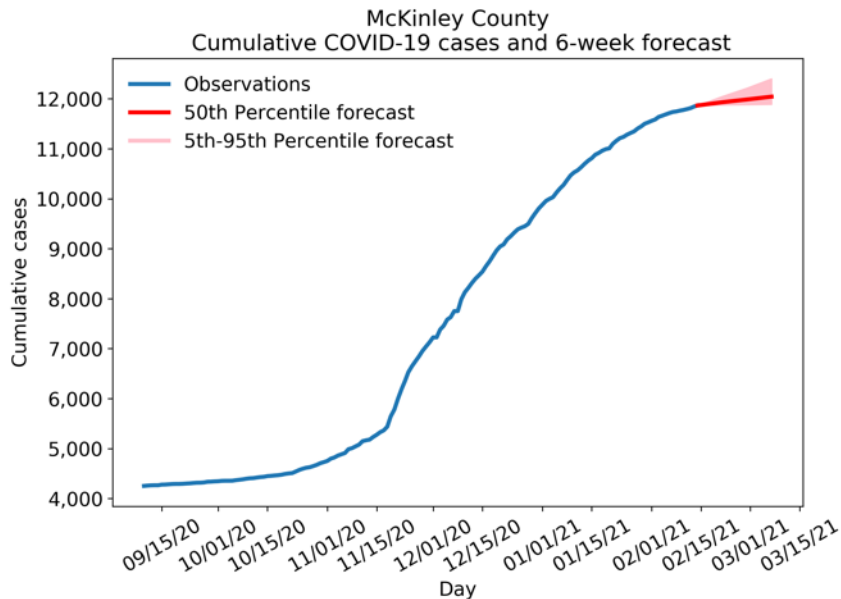
2-week avg. new cases per day decreased from 34 last week to 22 this week

Last week we forecasted 7 (3-13) rooms in use, 9 rooms with the adjustment; there are 13 actually in use, so we are under forecasting

Non-Congregate Shelter Forecast: McKinley

Number of cases as of 2/14/21: **11,866**
 Number of shelter rooms available: **160**
 Total number of patients/medical workers (including specialty): **23**
 Number of patients: **18**
 Number of medical workers: **5**
 Occupied rooms:new cases ratio: **0.95**
 2-week avg. new cases per day: **24**

	2/21/21	2/28/21	3/7/21
Total cases	11,931 (11,878-12,047)	11,986 (11,884-12,214)	12,043 (11,891-12,401)
# of rooms needed	9 (2-25)	7 (1-23)	8 (1-25)
Deficit (-) or surplus of rooms	151	153	152
# of rooms needed (new forecast method)	16	13	12

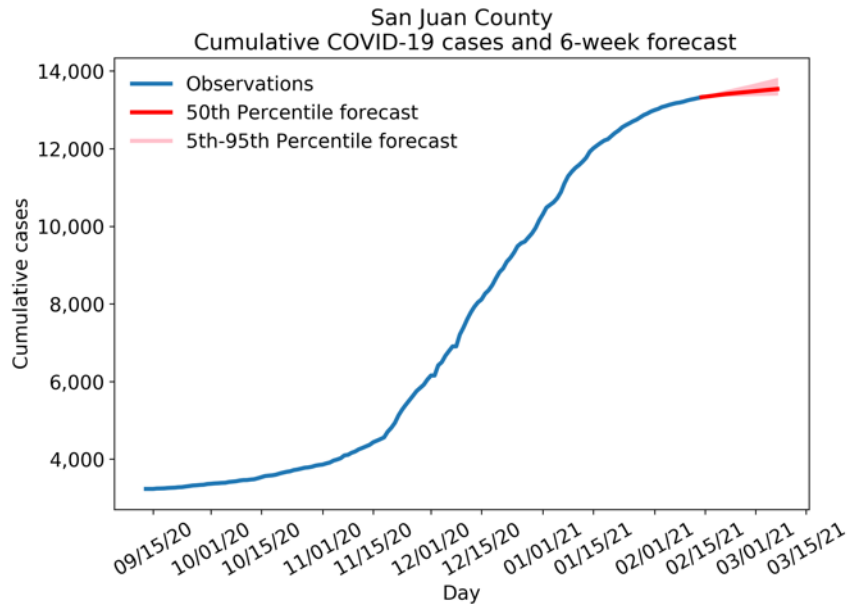


2-week avg. new cases per day decreased from 36 last week to 24 this week

Last week we forecasted 13 (4-30) rooms in use, 22 rooms with the adjustment; there are 23 actually in use, so the adjustment may be a more accurate forecast

Non-Congregate Shelter Forecast: San Juan

Number of cases as of 2/14/21: **13,326**
 Number of shelter rooms available: **21**
 Total number of patients/medical workers (including specialty): **1**
 Number of patients: **1**
 Number of medical workers: **0**
 Occupied rooms:new cases ratio: **0.04**
 2-week avg. new cases per day: **26**



	2/21/21	2/28/21	3/7/21
Total cases	13,410 (13,356-13,499)	13,474 (13,374-13,647)	13,537 (13,388-13,810)
# of rooms needed	0 (0-1)	0 (0-1)	0 (0-1)
Deficit (-) or surplus of rooms	21	21	21
# of rooms needed (new forecast method)	1	1	1

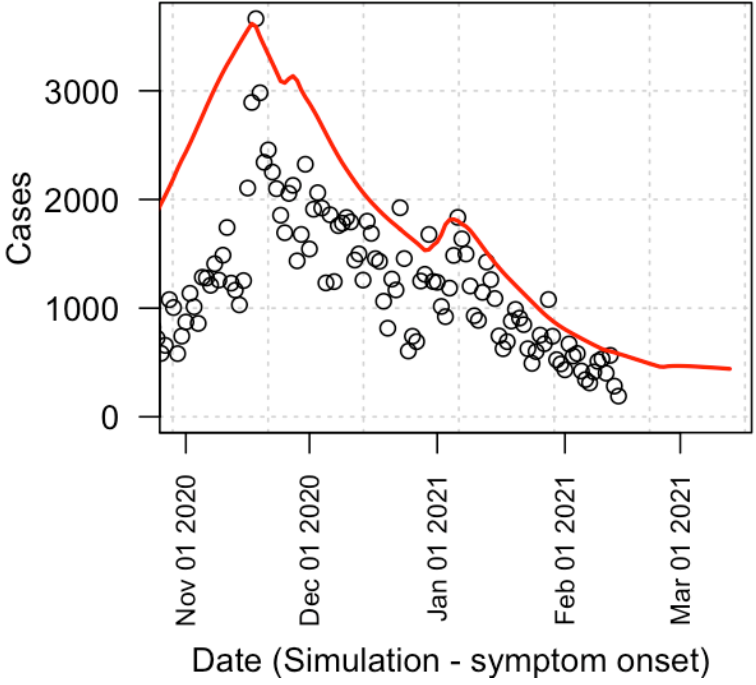
2-week avg. new cases per day decreased from 41 last week to 26 this week.

Last week we forecasted 1 (0-2) rooms in use, 2 rooms with the adjustment; there is 1 actually in use

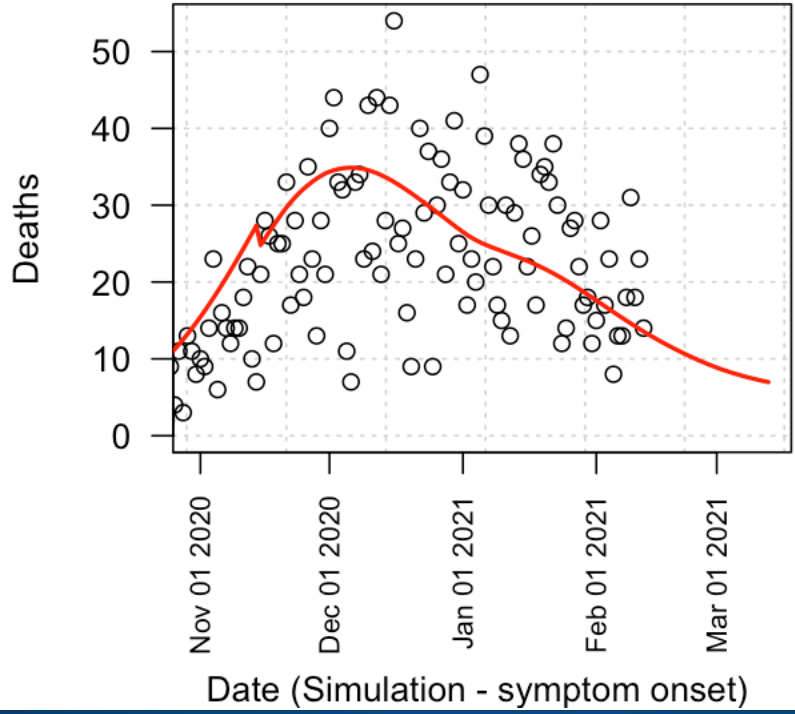
16 Feb 2021: EpiGrid modeling

- A 15-20% increase in transmissibility is assumed for yellow/green counties as compared with red counties up thru Feb. 24th.
- A 30-40% increase in transmissibility is assumed for yellow/green counties starting Feb. 24th. Takes time and confidence for restaurants to open.

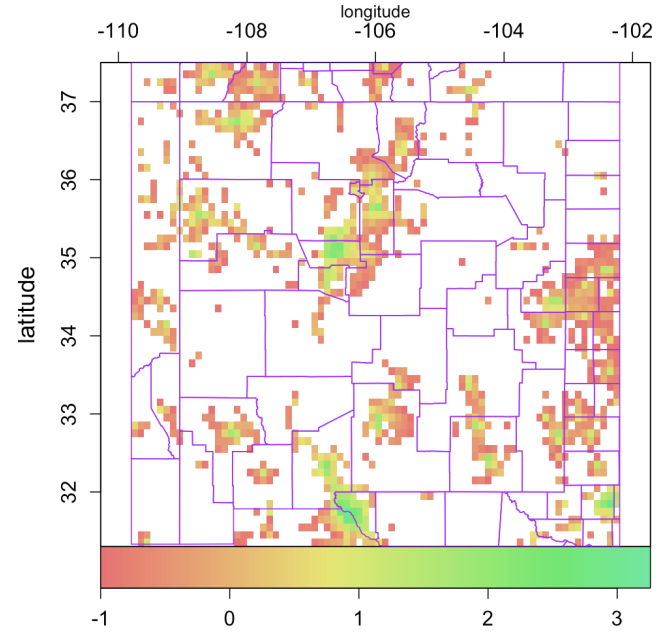
United States__New Mexico



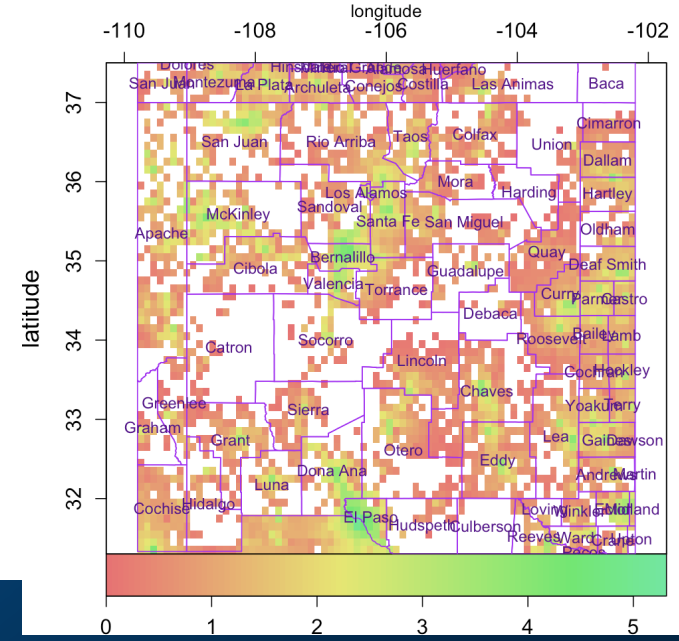
United States__New Mexico



log10 Incidence, wk 55, 2021-03-14

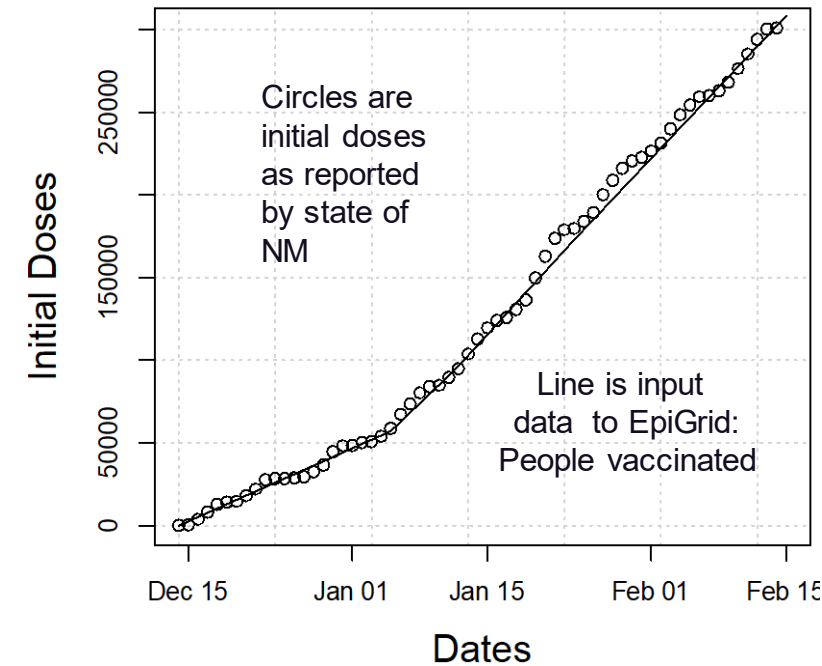


log10 Cumulative cases, wk 55, 2021-03-14



16 February 2021 Model (EpiGrid) – more details and information

- **Daily reported cases in El Paso are approximately constant.**
- **See Figure for historical vaccinations. 300,913 people have at least one dose.**
- **Cumulative vaccinations match by-county.** The time sequence increases the same way for each county.
- **Transmission is based on mobility with modifications due to PHO's and the red/yellow/green framework.**
 - Modeling of public reaction and public health orders (PHO) similar to previous models.
 - Assumes most counties are yellow or green starting Feb. 24th.
- **Death rates include some of the inhomogeneity by-county.**
 - Counties with larger at-risk populations have higher death rates.
 - Starting to model the expected change in death rate due to vaccination of older population.
- **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 is numerically small at this time.**
 - Potential for a 50% increase in contagion/force of infection *in the future*.
 - No epidemiological evidence yet for strain replacement in New Mexico. Good infection control helps.
 - **Without vaccination, an increased daily incidence in March would have been a distinct possibility (with red/yellow/green changes, and increasing mobility in some counties).**
 - Properties of novel viral variants are not fully characterized.

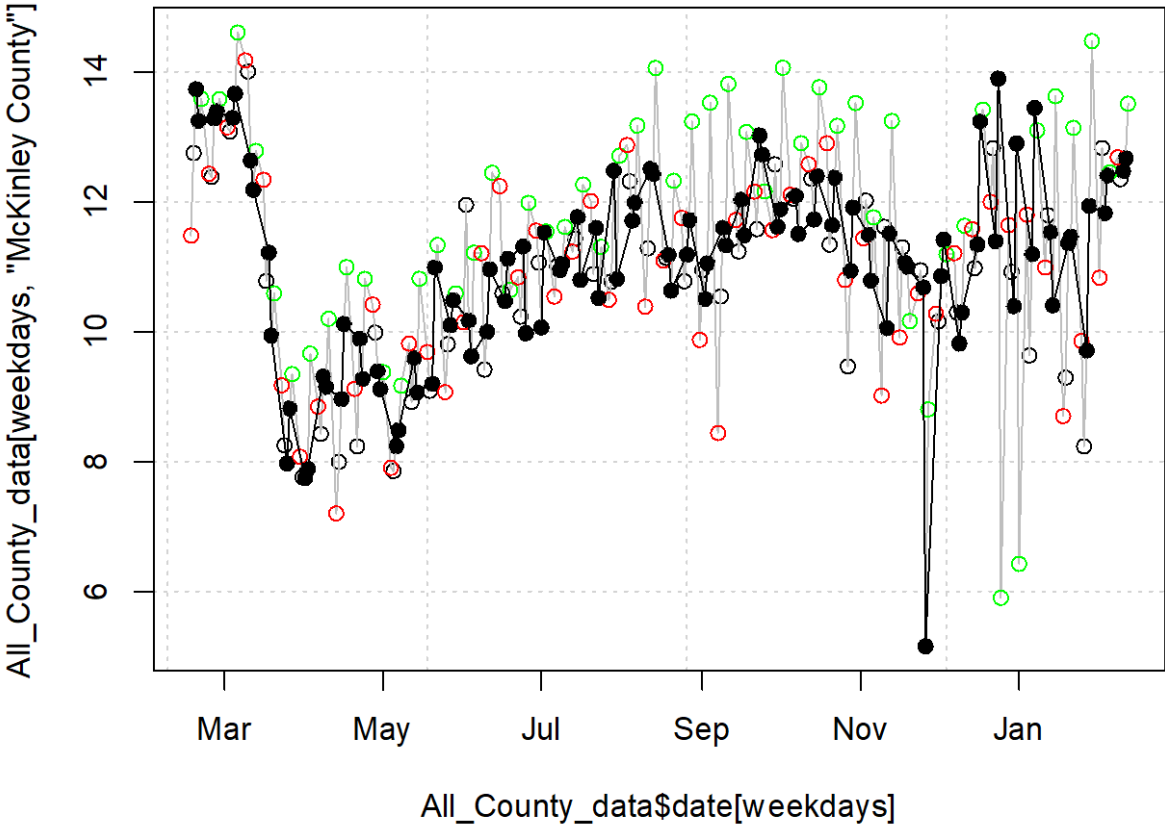


T-80 Mobility – northern counties (Data only)

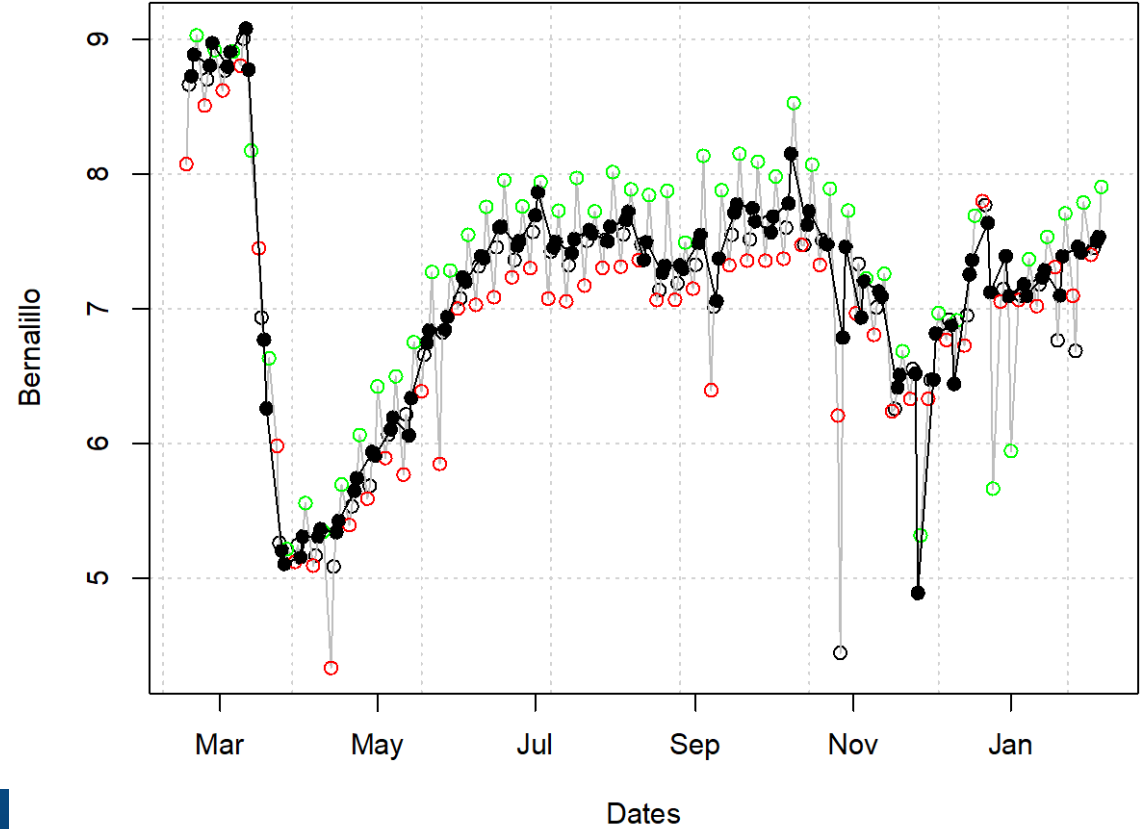
- Bernalillo, Sandoval and Valencia have had increasing mobility over the last 4 weeks.
- San Juan and Santa Fe also appears to be increasing.
- Los Alamos, McKinley, Rio Arriba, Taos have fairly stable mobility similar mobility to the summer of 2020.

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

McKinley



Bernalillo

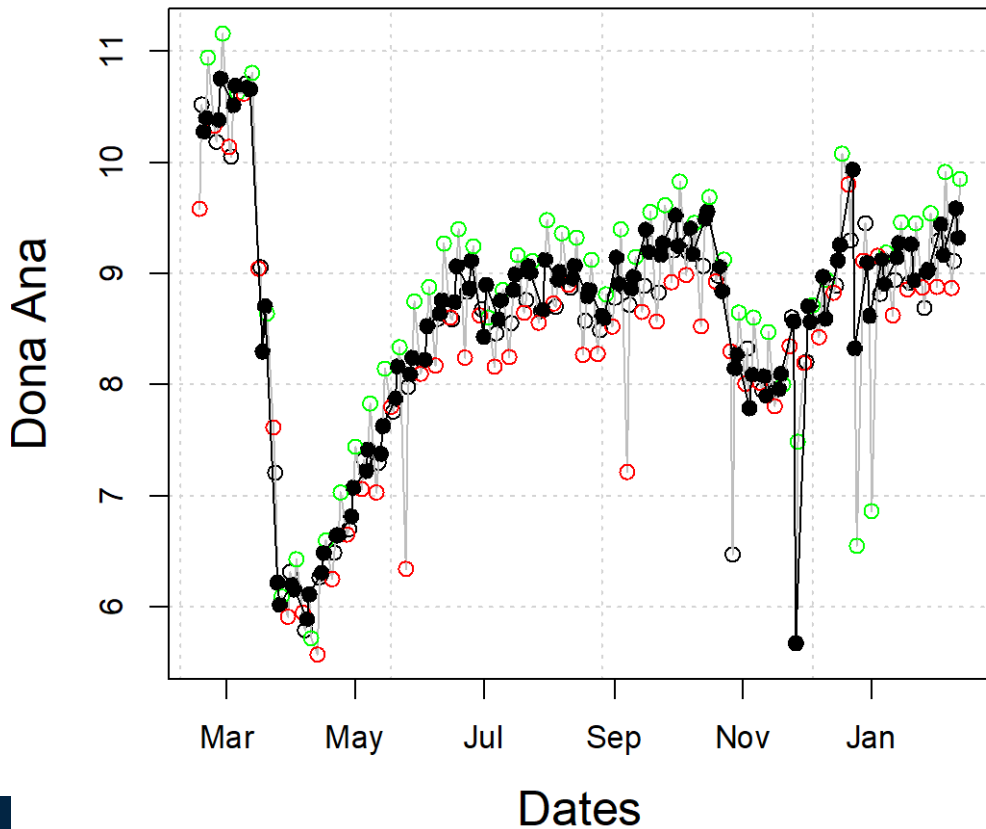


T-80 Mobility – southern counties and Curry (Data only)

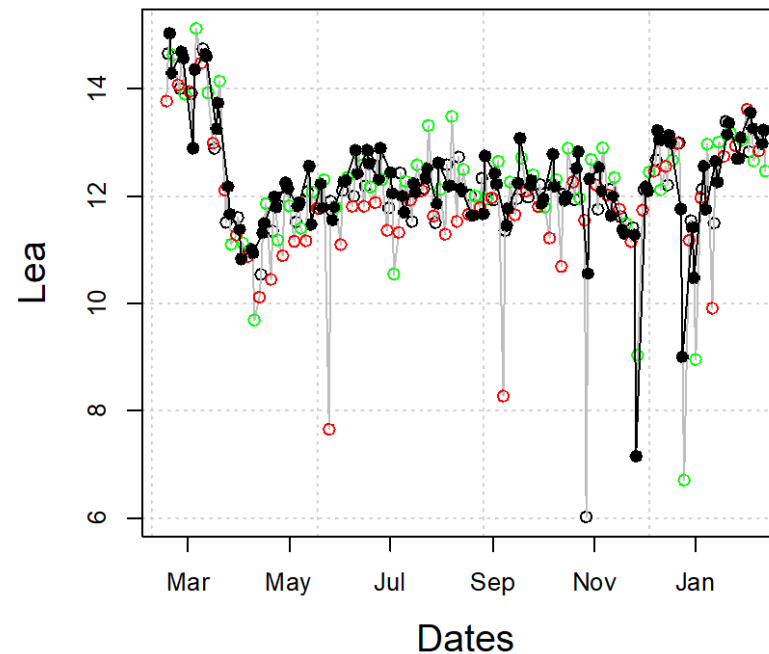
- Dona Ana, Chaves, Curry, Grant, Luna, Otero have increased in last two weeks.
- Chaves, Eddy, Lea, Lincoln, Roosevelt, Socorro are stable (to within the noise).

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

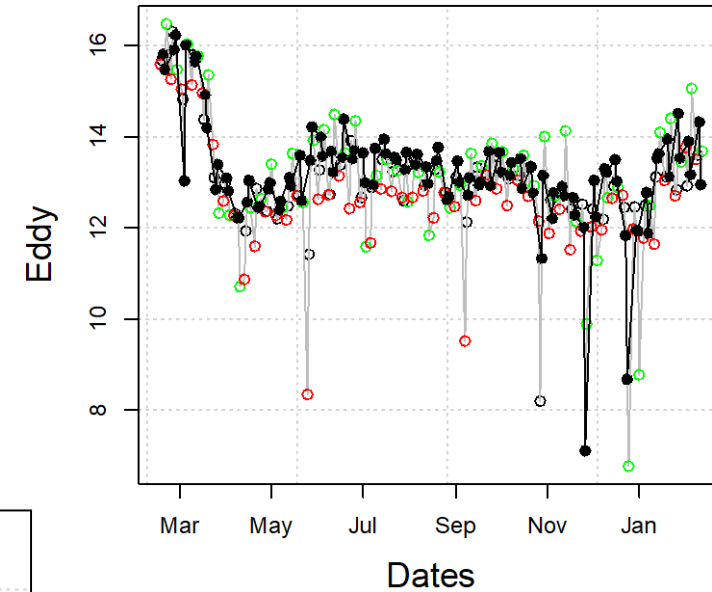
Dona Ana



Lea



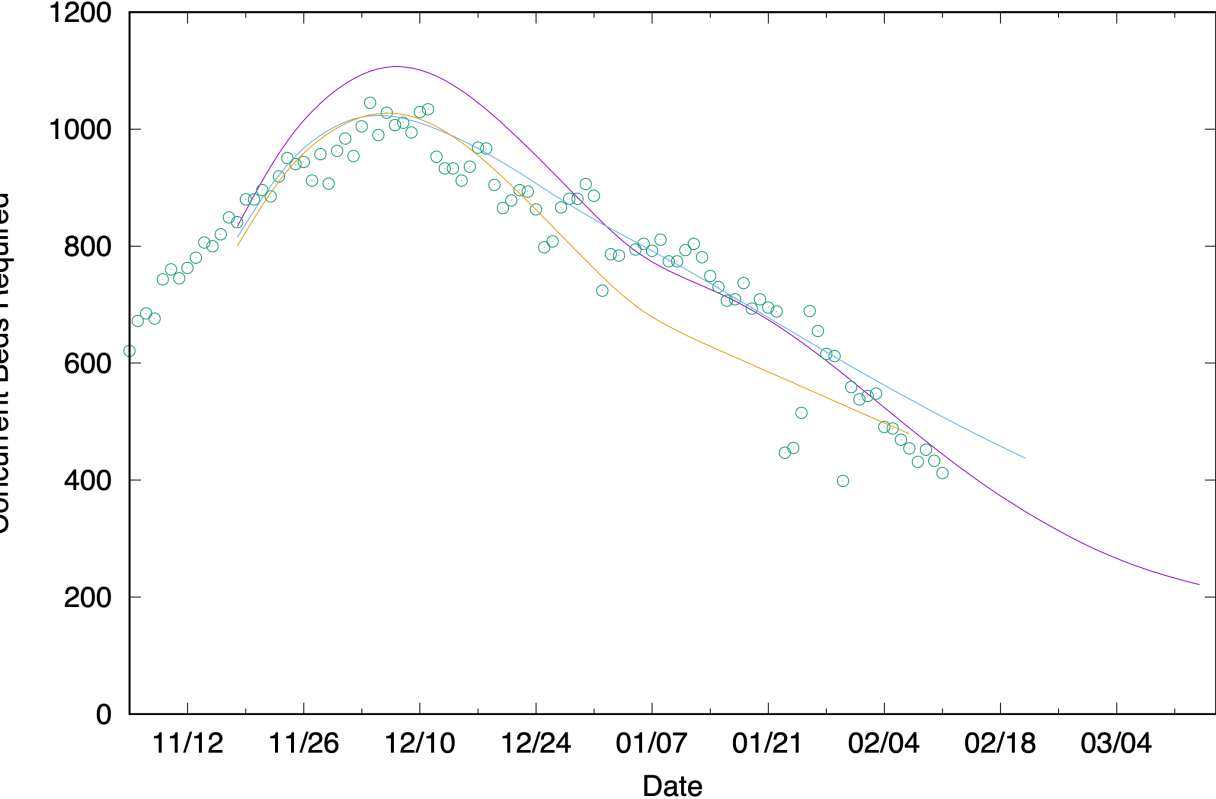
Eddy



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

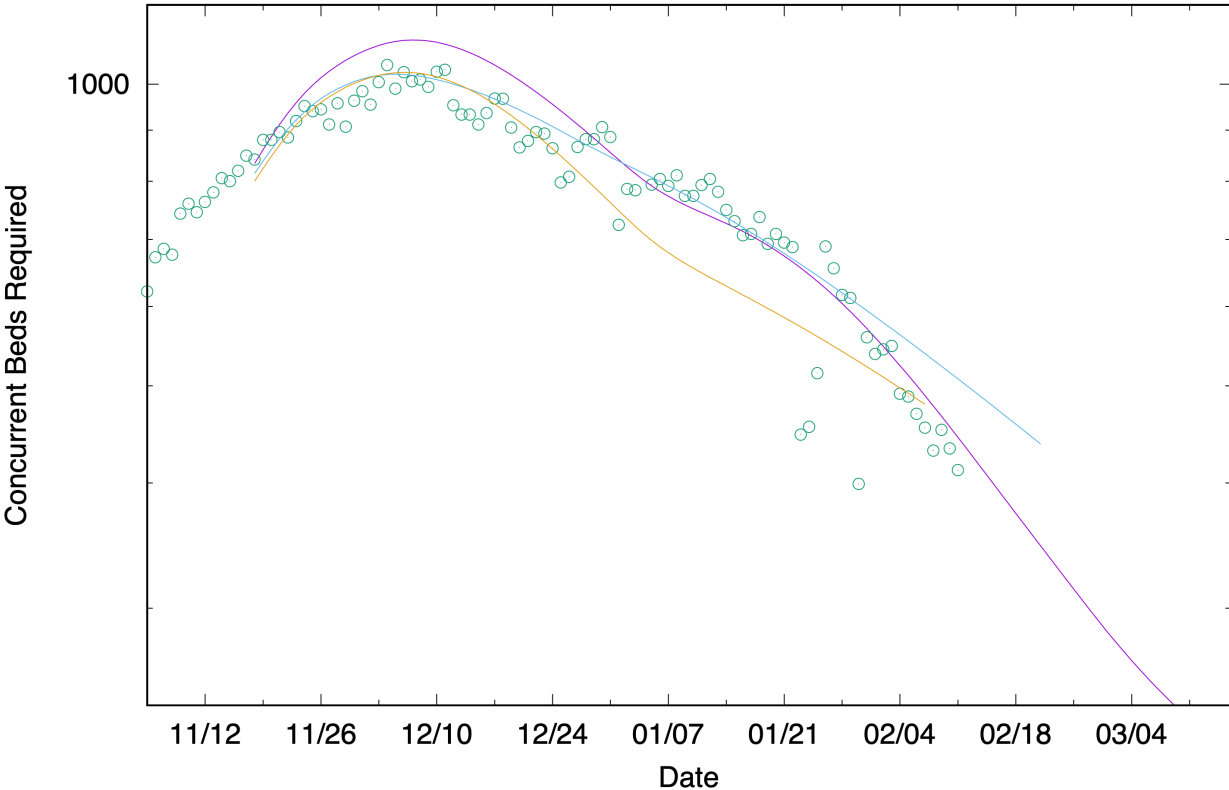
- Left panel: Linear vs. time (y-scale=0:1200) shows hospital beds. Models: 09Feb21 (purple), 12Jan21 (yellow), 15Dec20 (cyan).
- Right panel: Log vs. time, same data and models (y-scale = 240:1200, 5x).
- Christmas and New Year's are 4-5x Thanksgiving modulation of the force of infection/level of contagion.
- Unresolved hospitalized COVID-19 cases dating from Christmas and New Year's are declining.

Hospital Bed Utilization (EpiGrid)



Tue Feb 16 10:59:17 2021

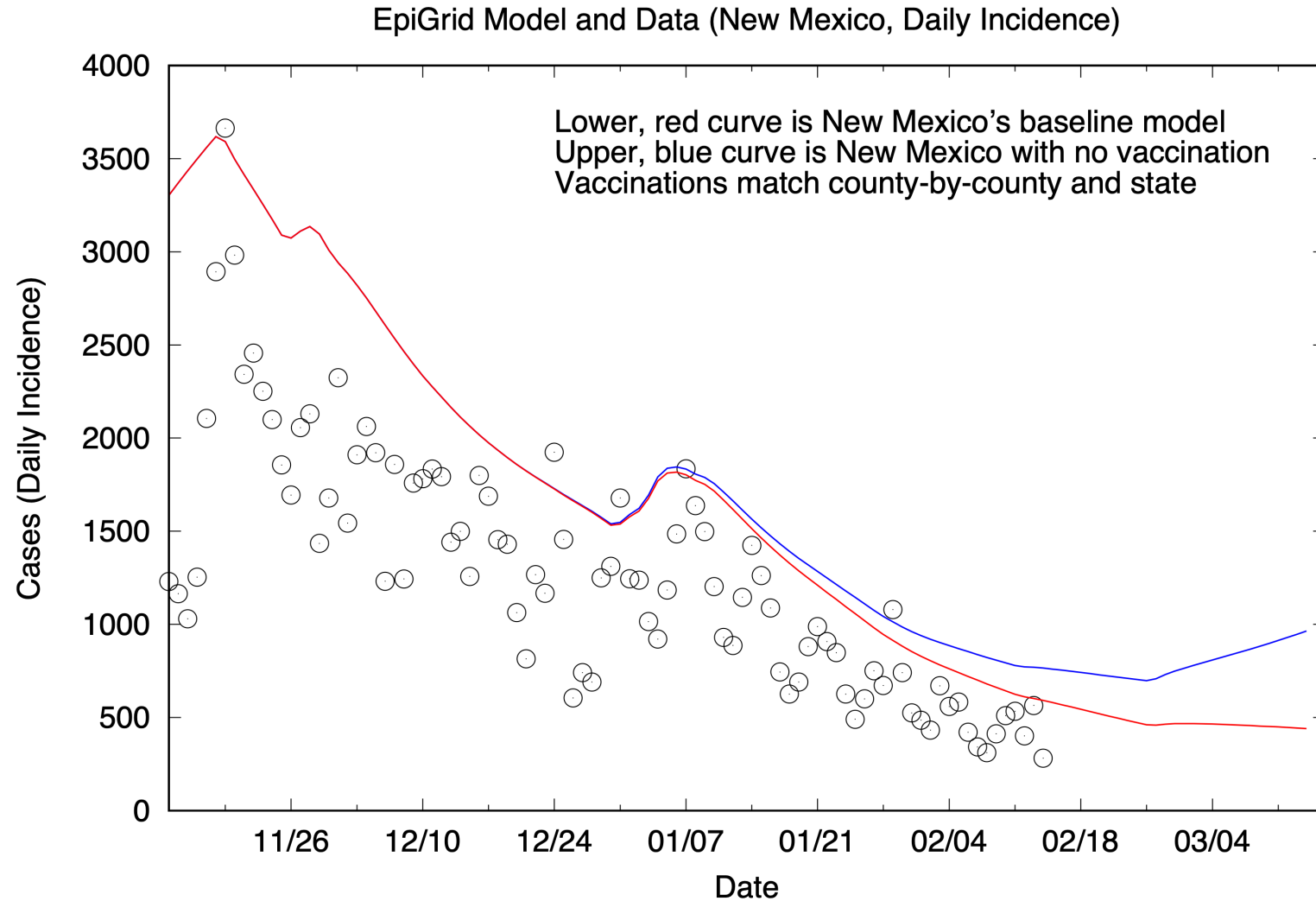
Hospital Bed Utilization (EpiGrid)



Tue Feb 16 10:59:35 2021

Effect of Vaccination on Incidence

- Vaccination is lowering daily incidence >20%.
- Infection control and quarantine *currently* play larger roles in epidemic control than vaccination.
- Currently modeling 90% vaccine effectiveness.
- Feb 16th Model: ~300k people vaccinated (1 or 2 doses).
- NM reports 300,913 people vaccinated.
- By-county matching to vaccination.
- **Flat red curve in March does not account for additional vaccine that may be available.**
- **Flattening of daily incidence is a consequence of red to green counties and increased mobility.**
- **Unchanged quarantine effectiveness assumed in all cases.**

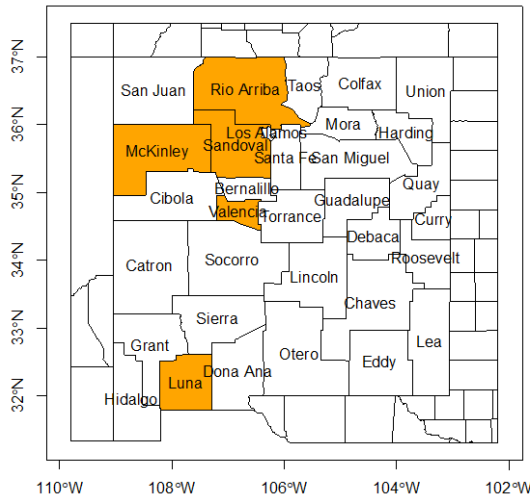


Tue Feb 16 14:43:48 2021

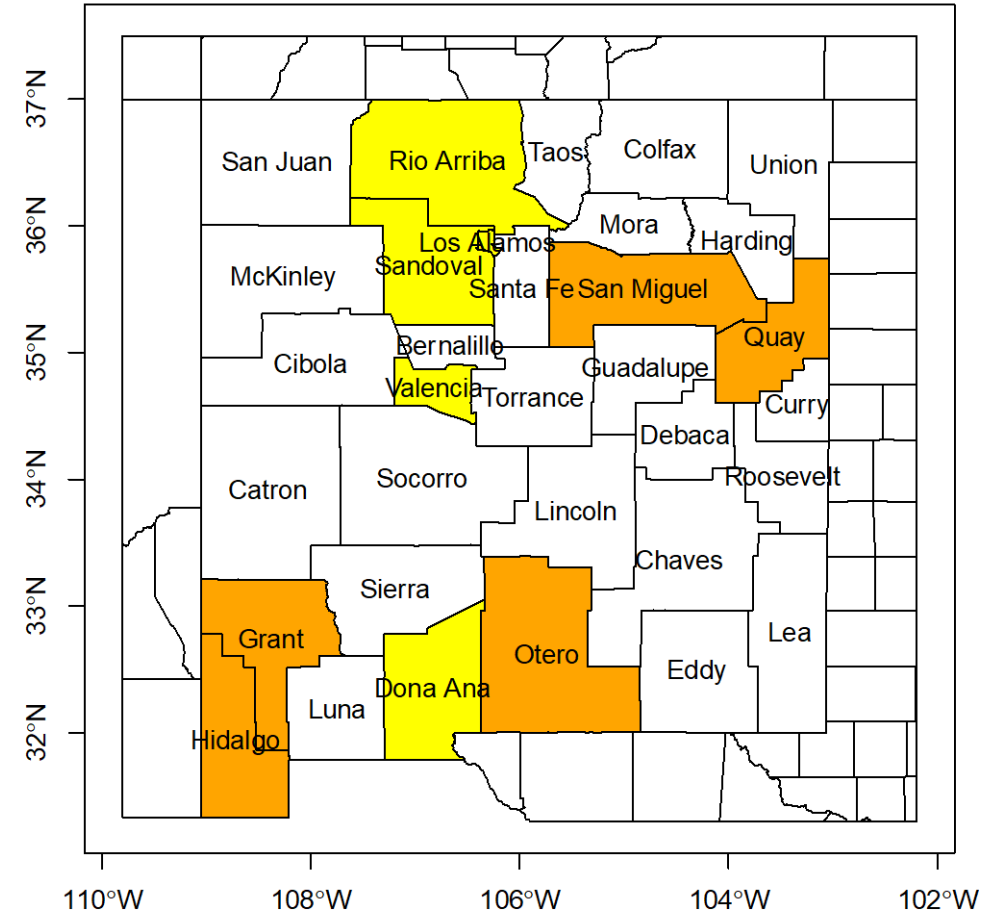
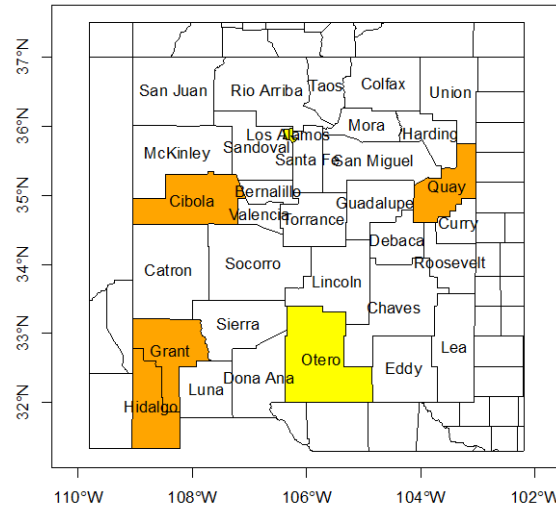
Situational Awareness:

- Cases in **Grant, Hidalgo, Otero and Quay, San Miguel** may not be decreasing.
- Cases in Dona Ana, **Los Alamos, Rio Arriba, Sandoval, and Valencia** are decreasing but still higher than at the start of October. *In contrast* other counties have incidence similar to early October.

Two weeks ago



Previous week



Conclusions and Discussion

- New Mexico's daily incidence is slowly declining state-wide. **Daily incidence could stop declining by March.**
- Increased vaccine supply and administration and/or improved effective quarantine rates likely needed to see continued epidemic improvement in the context of great activity/mobility, opening, and contact.
- **COVID-19 vaccination reported by the State is responsible for an >20% reduction in daily incidence.**
- **Infection control and quarantine continue to play larger roles than vaccination in epidemic control.**
- Multiple viral variants continue to pose a risk to epidemic control. National and State monitoring for strain emergence is likely improving. Model is *assuming* about 1:1000 variant cases in late January.
- El Paso's daily incidence is roughly flat.
- Nationwide geographical dispersion is seeding some local transmission and variants.
- **Testing suggests that situational awareness is fair to good.**
- Targeting vaccine to high-mortality areas and populations will have the largest immediate effect on this model.
- Discussion:
 - Vaccinating high risk-of-mortality populations will lower the mortality rate *and* further lower hospital loading.
 - Good infection control in schools appears to be well-correlated with improved outcomes. **Improved PPE may be required in response to viral variant emergence. Meal times, busses, and passing periods are likely the riskiest school-related activities.**
 - There is not yet clear *epidemiological* evidence for a more contagious variant of SARS-CoV-2 in New Mexico. This is not a warning system.
 - Qualitatively higher testing rates (i.e. 10x) can substantially offset local epidemics (i.e. South Korea) by facilitating tracing and quarantine. Sequencing can provide diagnostics, and provides variant-level information that is likely to become important in the near future, and is compatible with high testing rates.
 - Elimination of COVID-19 removes or reduces the risk of novel variant emergence.