

Modeling & Forecasting COVID-19 in NM

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January 26, 2021

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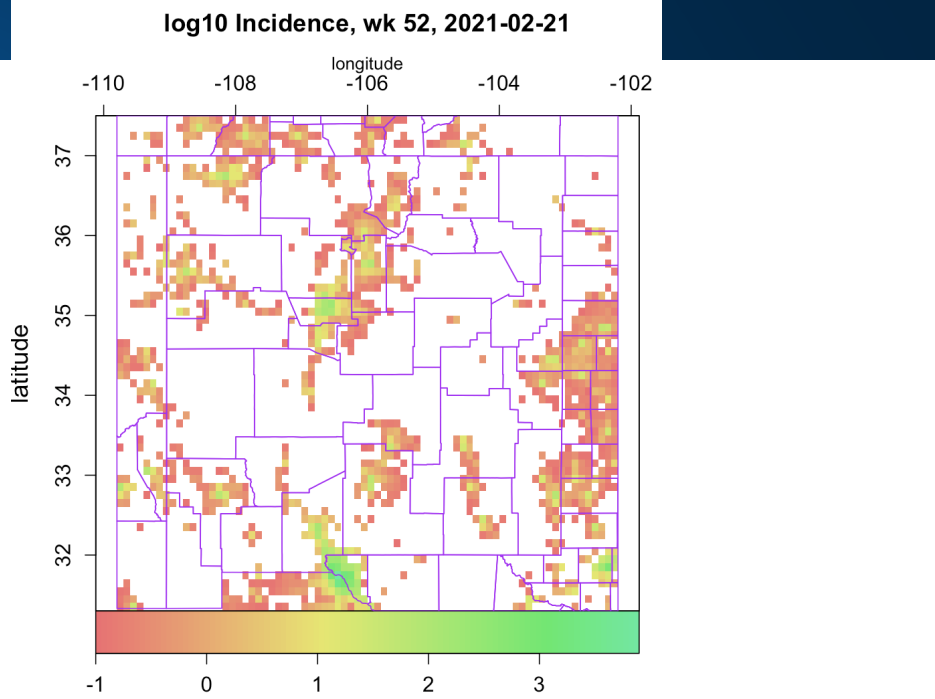
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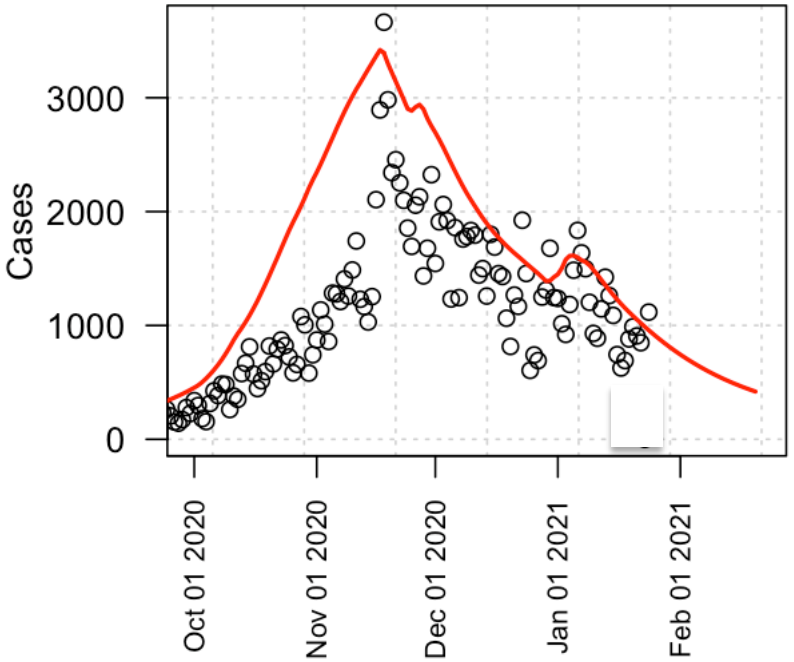
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26 Jan 2021: EpiGrid modeling

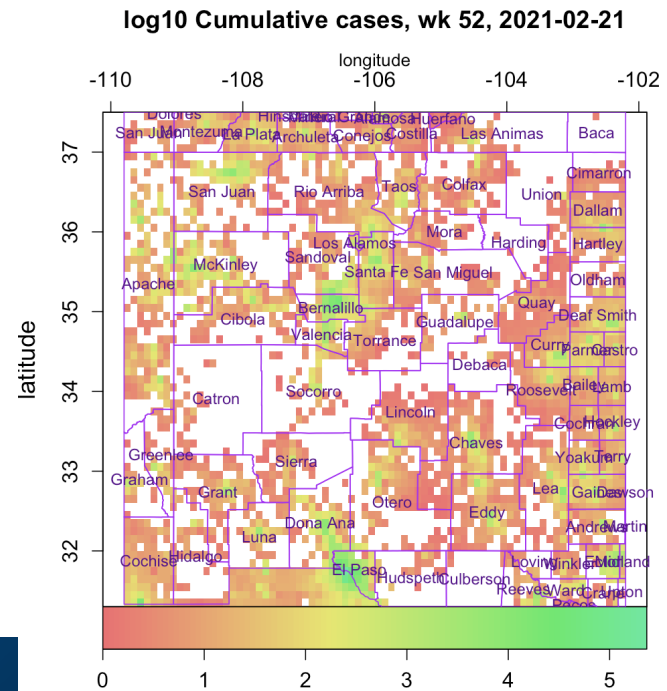
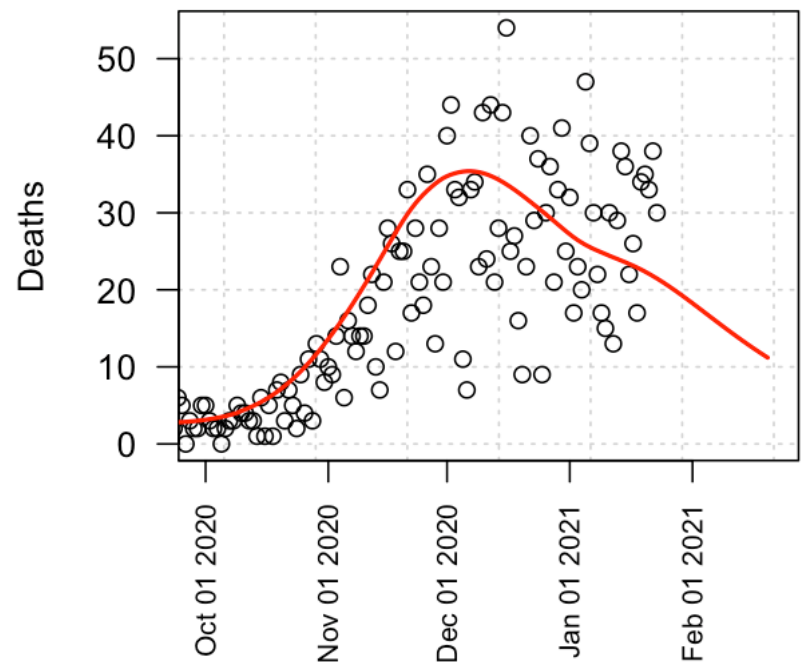
- Assumes that disease transmission parameters are related to mobility by the same approximate quantification, i.e. continued masking and physical distancing, and other PHO measures are unchanged.
- Transmission increases due to Christmas and New Year's are significantly increased over Thanksgiving (>~4x) and reflect a transient 3-4 day reporting delay.



United States__New Mexico



United States__New Mexico

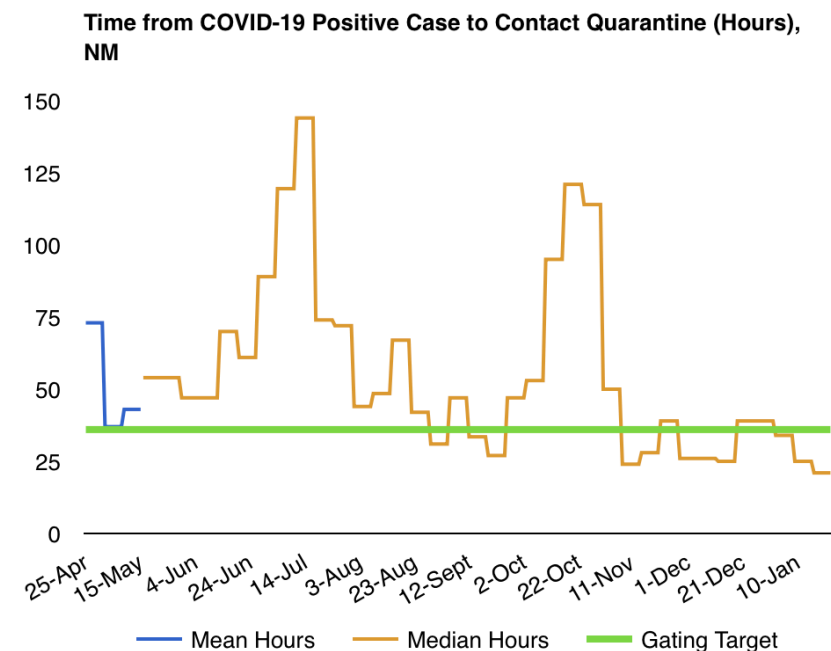


Date (Simulation - symptom onset)

Date (Simulation - symptom onset)

25 January 2021 Model (EpiGrid) – more details and information

- Daily reported cases in El Paso are approximately constant.
- Vaccination starts Dec. 15th with 2700 people per day changing to 3500 (was 3200) people per day on Jan 4th, and changing to 6000 per day on Jan 10th and 90% vaccine effectiveness. This results in 165,000 people vaccinated (1 or 2 doses) on Jan 25th. The NM and CDC report ~167,000.
- Transmission is based on mobility with modifications due to PHO's.
 - Modeling of public reaction and public health orders (PHO) is similar to previous models.
 - Geographical heterogeneity of mobility accounts for the majority of variations in the force of infection from county-to-county.
- Death rates now include more of the inhomogeneity by-county
 - Counties with larger at-risk populations have higher death rates.
- Isolation and quarantine rates are improved.
 - Swab to results times: Assuming 1-3 days
 - Base isolation rates mostly modeled at 50% Dec. 8th-22nd and 45% until Jan 10th when they are increased to 55%.
- Baseline results do *not* reflect novel variants of SARS-CoV-2
 - Potential for a 50% increase in contagion/force of infection.
 - No epidemiological evidence yet for strain replacement in New Mexico.
 - Properties of novel viral variants are not fully characterized.

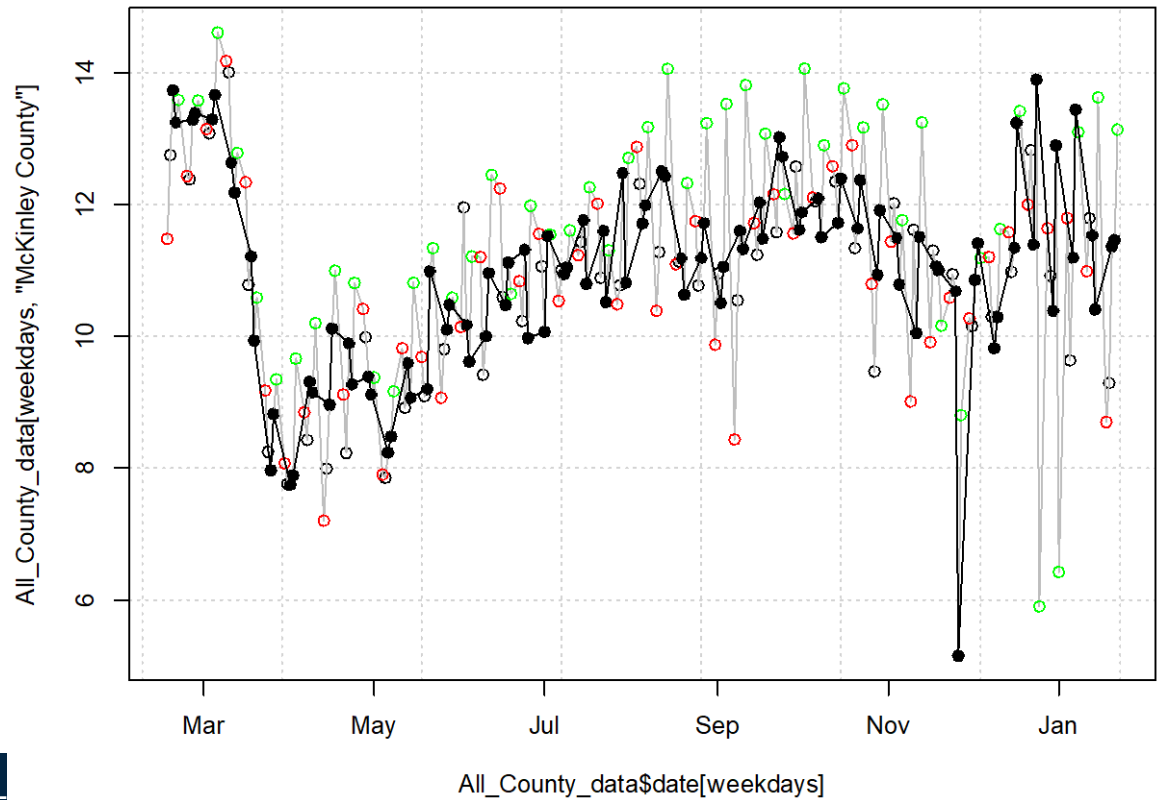


T-80 Mobility – northern counties (Data only).

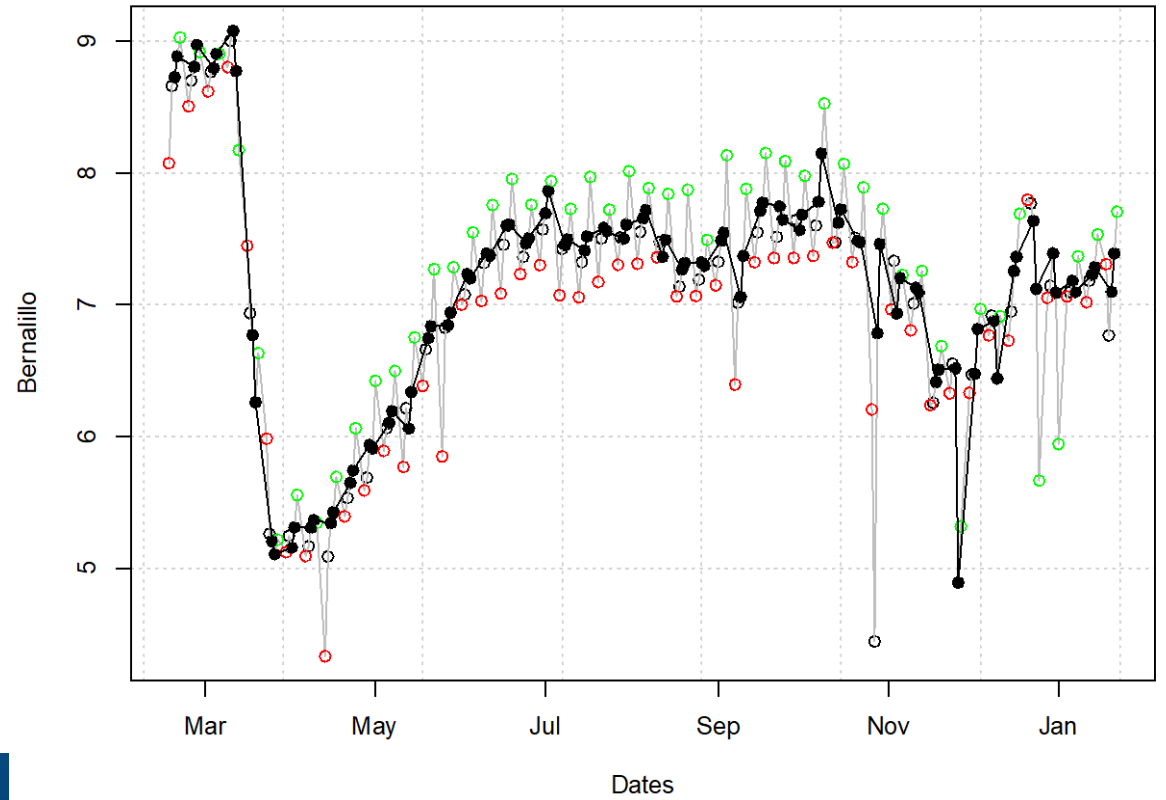
- Bernalillo, Sandoval, San Juan, Santa Fe, and Taos have (slightly) lower mobility than in the summer which is stable .
- McKinley, Los Alamos have similar mobility to the summer and possibly decreasing.
- Valencia has similar mobility to the summer and possibly increasing
- Rio Arriba has similar mobility to the summer peak and was increasing.

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

McKinley



Bernalillo

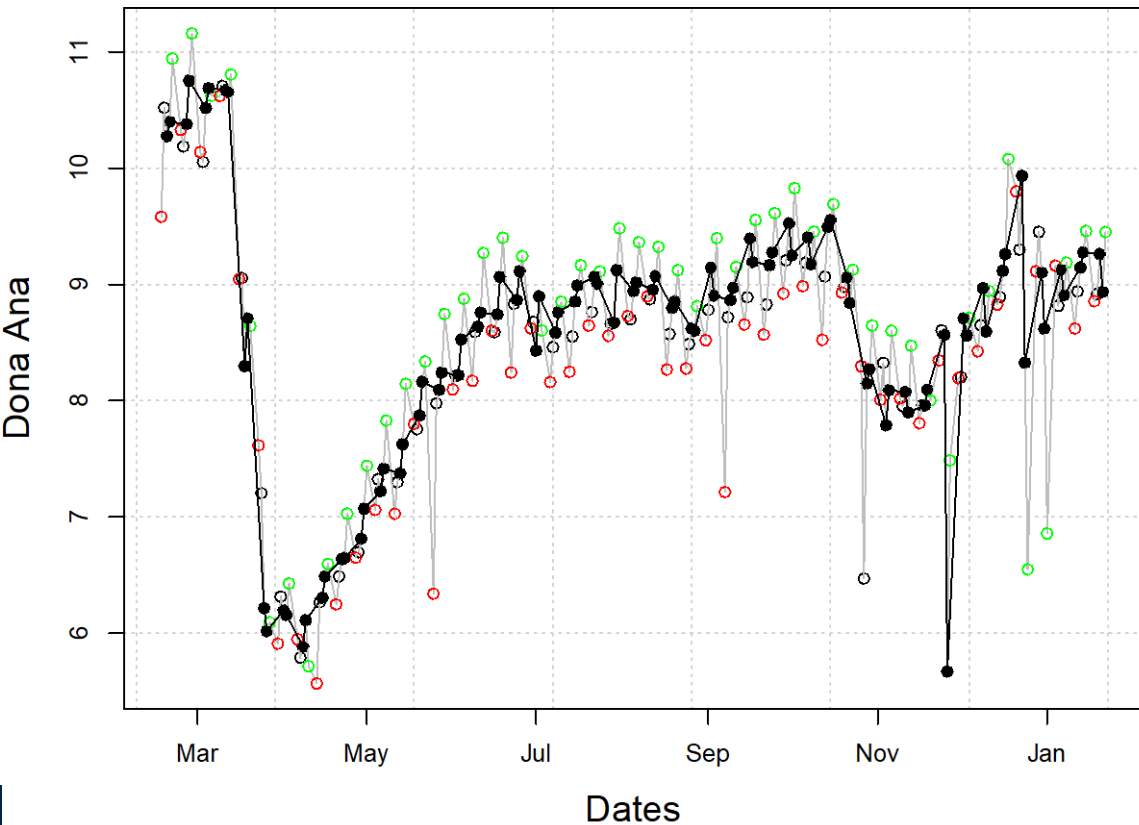


T-80 Mobility – southern counties and Curry (Data only)

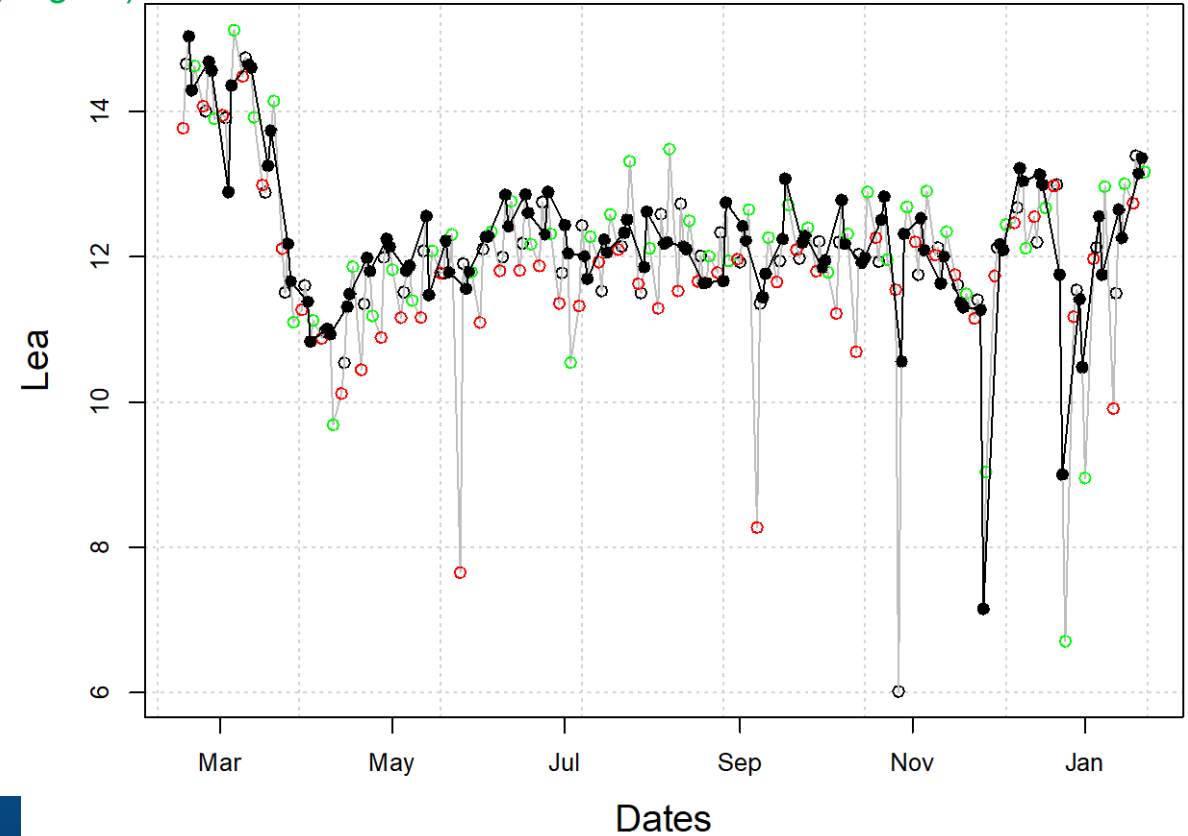
- Luna, Roosevelt lower than summer - with Luna possibly decreasing.
- Curry barely lower than summer
- Chaves, Dona Ana, Eddy, Grant, Socorro, Lincoln similar to summer
- **Eddy maintained the increased mobility shown last week. Lea increased this week in a similar manner to Eddy.**

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

Dona Ana



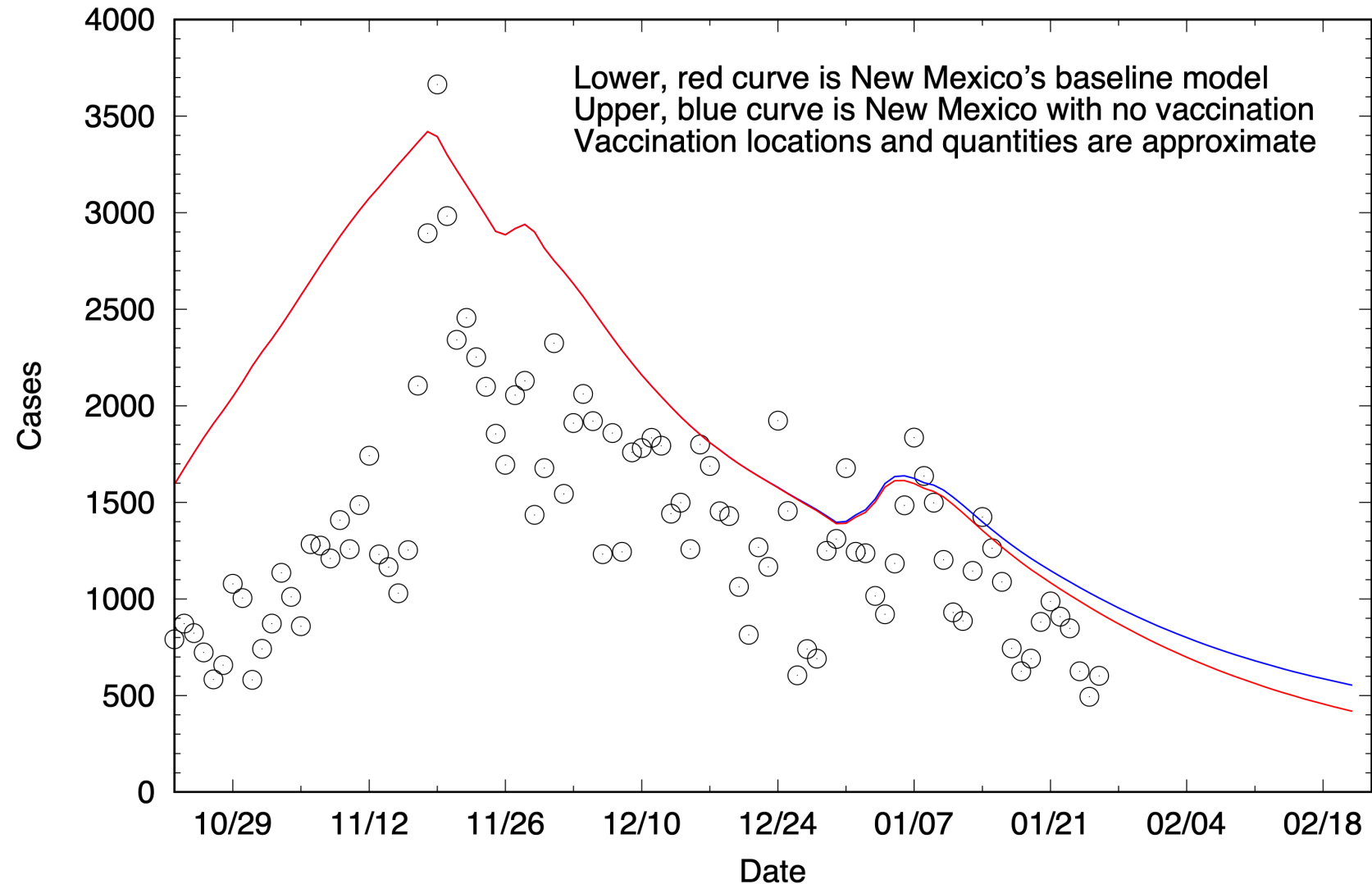
Lea



Effect of Vaccination on Daily Incidence

- Vaccination is lowering daily incidence ~10%.
- Infection control and quarantine *currently* play larger roles in epidemic control than vaccination.
- Dec 15th start 2700 people/day
- Jan 4th to 3500 people/day
- Jan 10th to 6000 people/day
- Currently modeling 90% vaccine effectiveness.
- Jan 25th Model as 165,000 people vaccinated (1 or 2 doses).
- NM & CDC data report ~167,000 people vaccinated.

EpiGrid Model and Data (New Mexico)

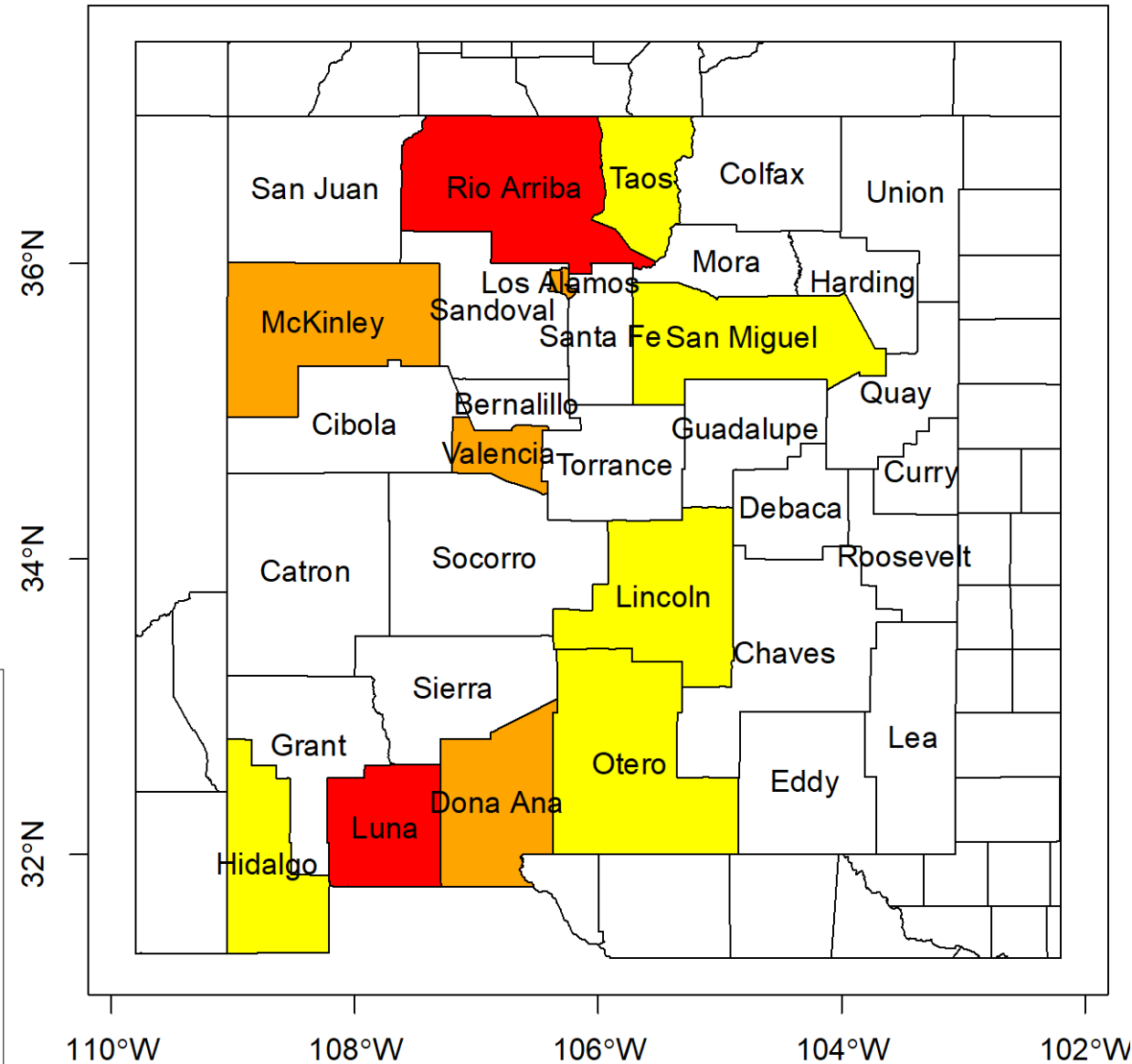
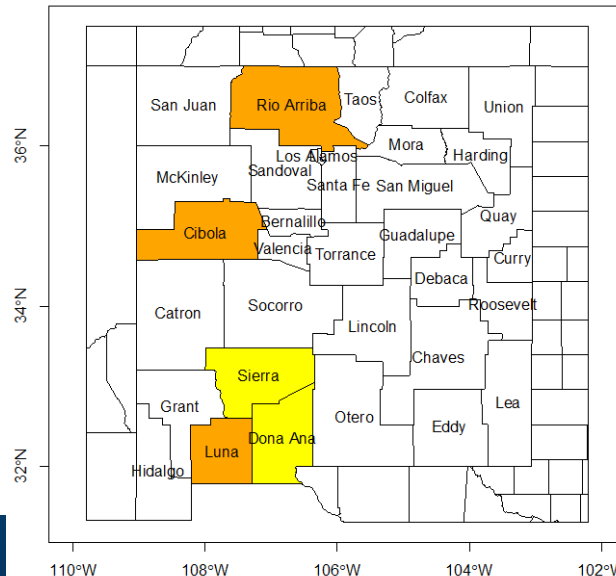


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Situational Awareness:

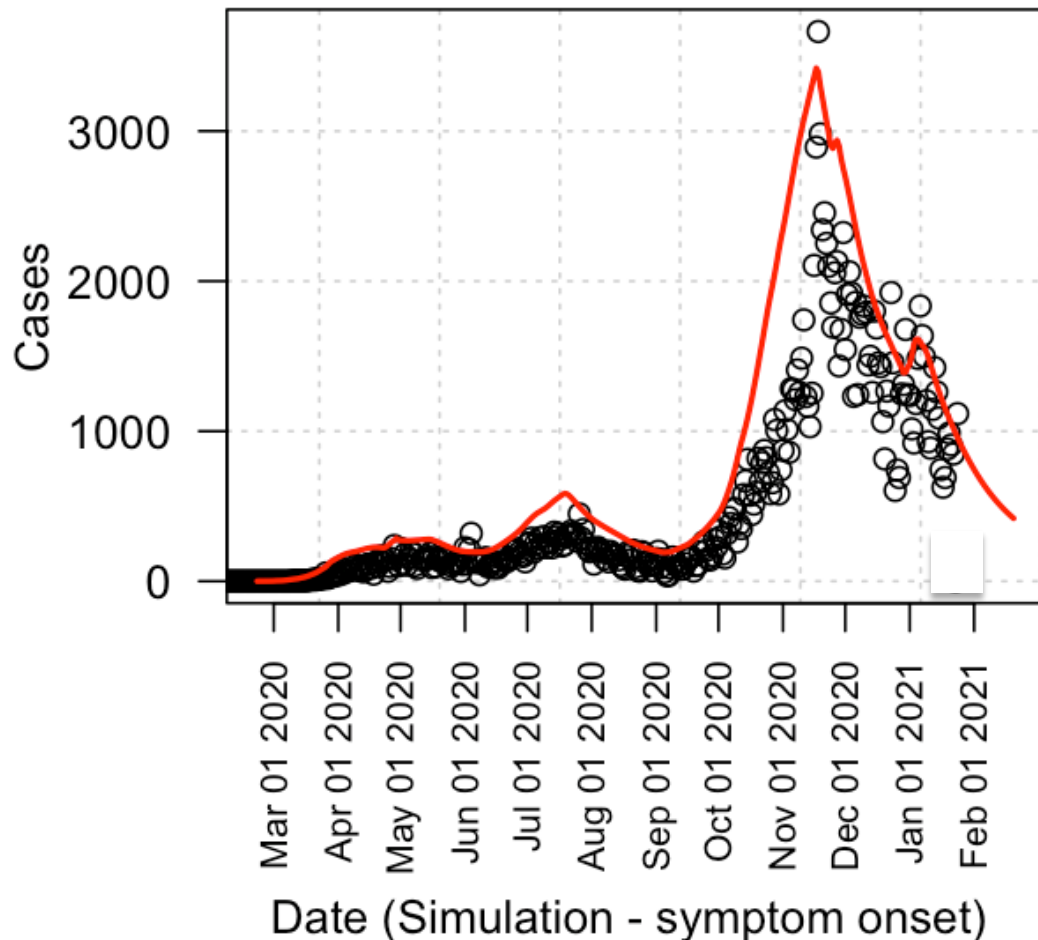
- **Luna** may not have decreasing cases counts. **Rio Arriba** needs substantially increased transmission (compared to mobility based transmission) to match it's very slowly decreasing incidence.
- **Dona Ana**, **Los Alamos**, **McKinley** and **Valencia** all need increased transmission in the model (compared to mobility to based transmission) to match case counts. Poor infection control is likely.
- **Hidalgo**, **Lincoln**, **Otero**, **San Miguel** and **Taos** are decreasing quite slowly, but mostly as expected. The recent/current outbreak in **Cochise County, AZ** is reason to watch **Hidalgo**.

Last week had fewer counties highlighted. As the state-wide situation improves, anomalies are becoming more apparent.

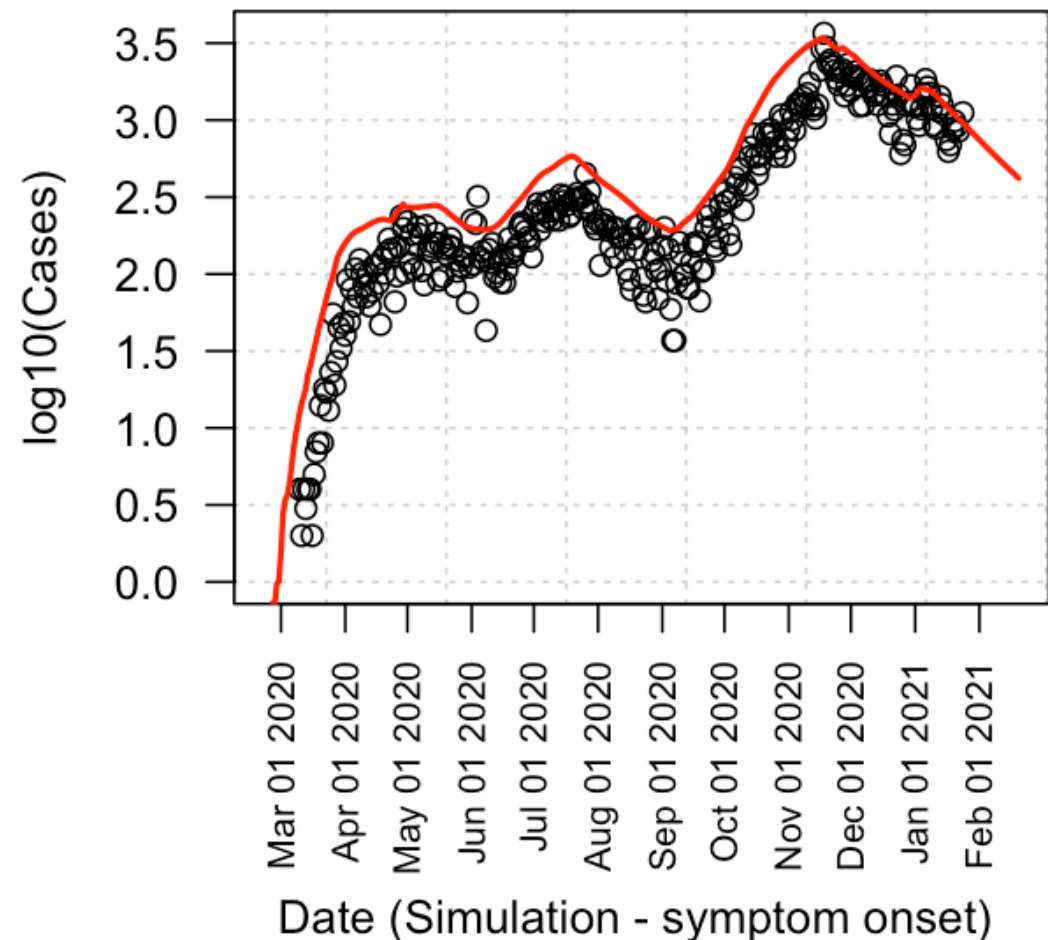


A year's worth of Epigrad model (23Feb2020 – 23Feb2021): Incidence

United States__New Mexico

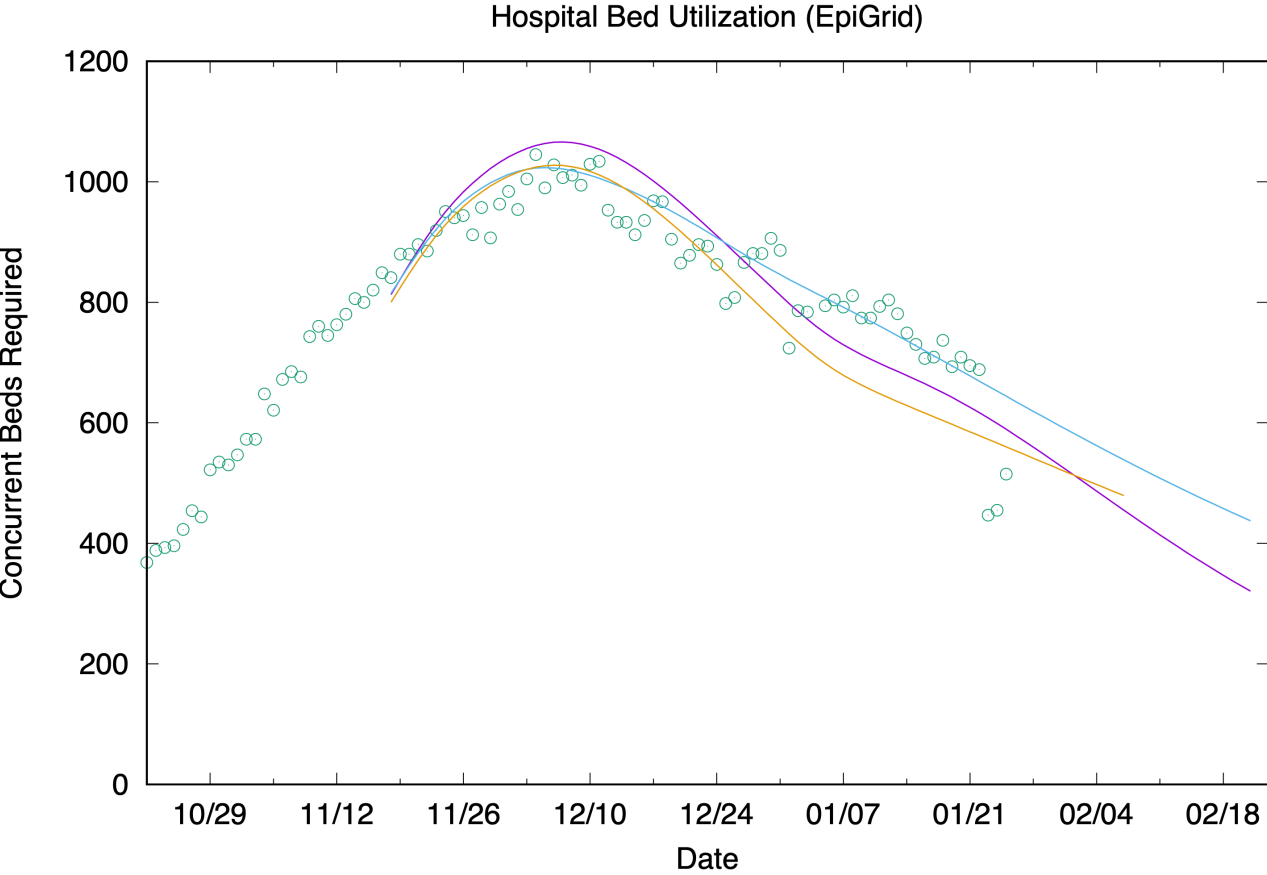


United States__New Mexico

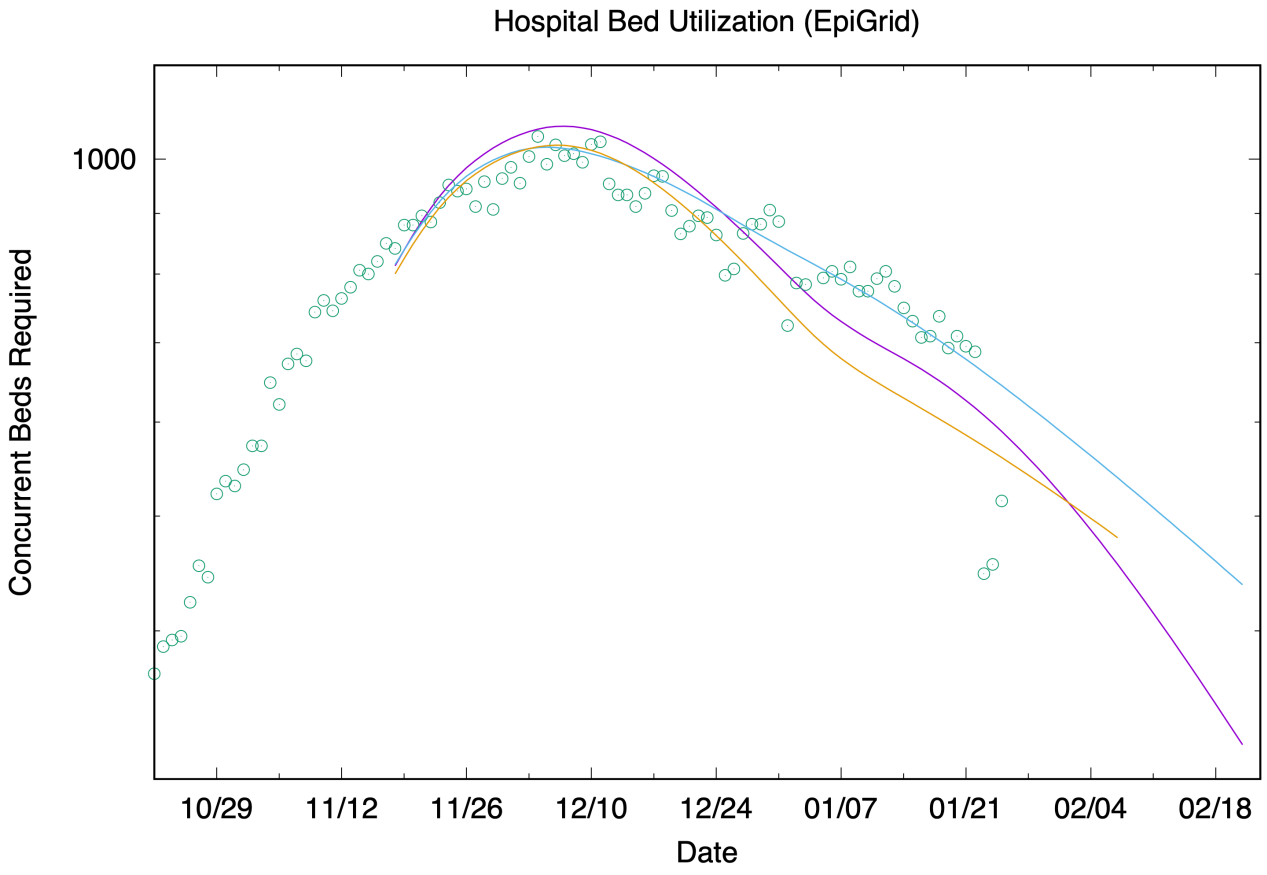


Hospital bed concurrent usage by COVID-19 patients

- Left panel: Linear vs. time (y-scale=0:1200) shows hospital beds. Models: 26Jan21 (middle), 12Jan21 (lower), 15Dec20 (upper).
- Right panel: Log vs. time, same data and models (y-scale = 300:1200).
- Christmas and New Year's are 4-5x Thanksgiving modulation of the force of infection/level of contagion.
- Model likely shows initial detectable effects of COVID-19 vaccination on the hospitalization rate.



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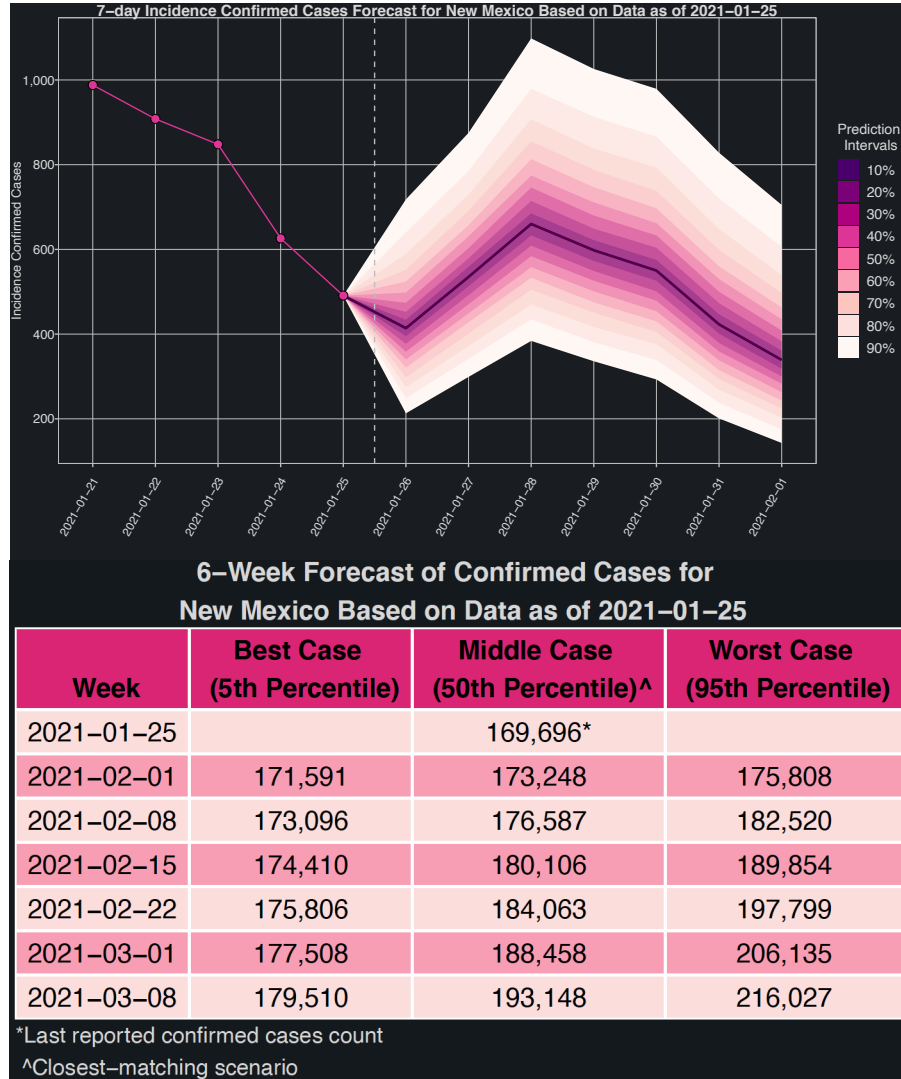


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Conclusions and Discussion

- New Mexico's daily incidence is declining state-wide. Some counties are not comparably improving.
- COVID-19 vaccination reported by the State is responsible for an approximately 10% reduction in daily incidence.
- Infection control and quarantine continue to play significantly 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 will continue to be a need.
- El Paso's daily incidence is flat over the last week.
- Nationwide geographical dispersion is likely seeding local transmission.
- Bernalillo County no longer plays a role in driving over-capacity at hospitals.
- The NM testing positivity rate is close to 7% recently. Situational awareness is improving.
- Targeting vaccine to high-mortality areas and populations will have the largest immediate effect on this model.
- Hospital loading appears predictable for ~1 month with error bars comparable to daily variation in incidence.
- Discussion:
 - Vaccinating high risk-of-mortality populations will lower the mortality rate *and* further lower hospital loading.
 - Schools are highly mitigated if they comply with infection control guidance, elementary schools provides little evidence for in-school spread with the current viral strain. Improved PPE may be required in response to viral variant emergence. Meal times, busses, and passing periods are likely the riskiest school-related activities (in the presence of good in-class infection control).
 - 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.

Short- & Long-Term Forecast for NM: Cases



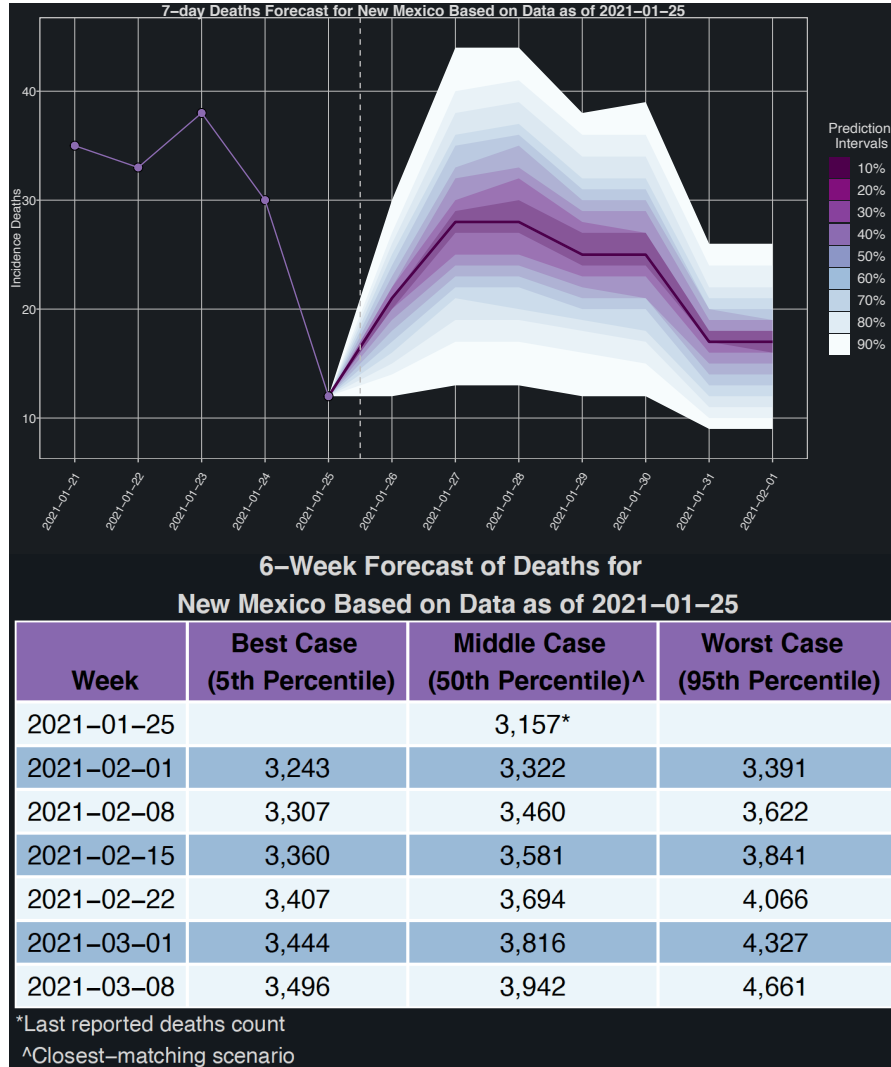
6-Week Forecast of Daily Average of Confirmed Cases for New Mexico Based on Data as of 2021-01-25

Week	Best Case (5th Percentile)	Middle Case (50th Percentile) [^]	Worst Case (95th Percentile)
2021-01-25		776*	
2021-02-01	271	507	873
2021-02-08	215	477	959
2021-02-15	188	503	1,048
2021-02-22	199	565	1,135
2021-03-01	243	628	1,191
2021-03-08	286	670	1,413

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

So what?
 The daily number of cases are expected to range between 477 and 507 in the next few weeks for the middle case scenario

Short- & Long-Term Forecast for NM: Deaths



6-Week Forecast of Daily Average of Deaths for New Mexico Based on Data as of 2021-01-25

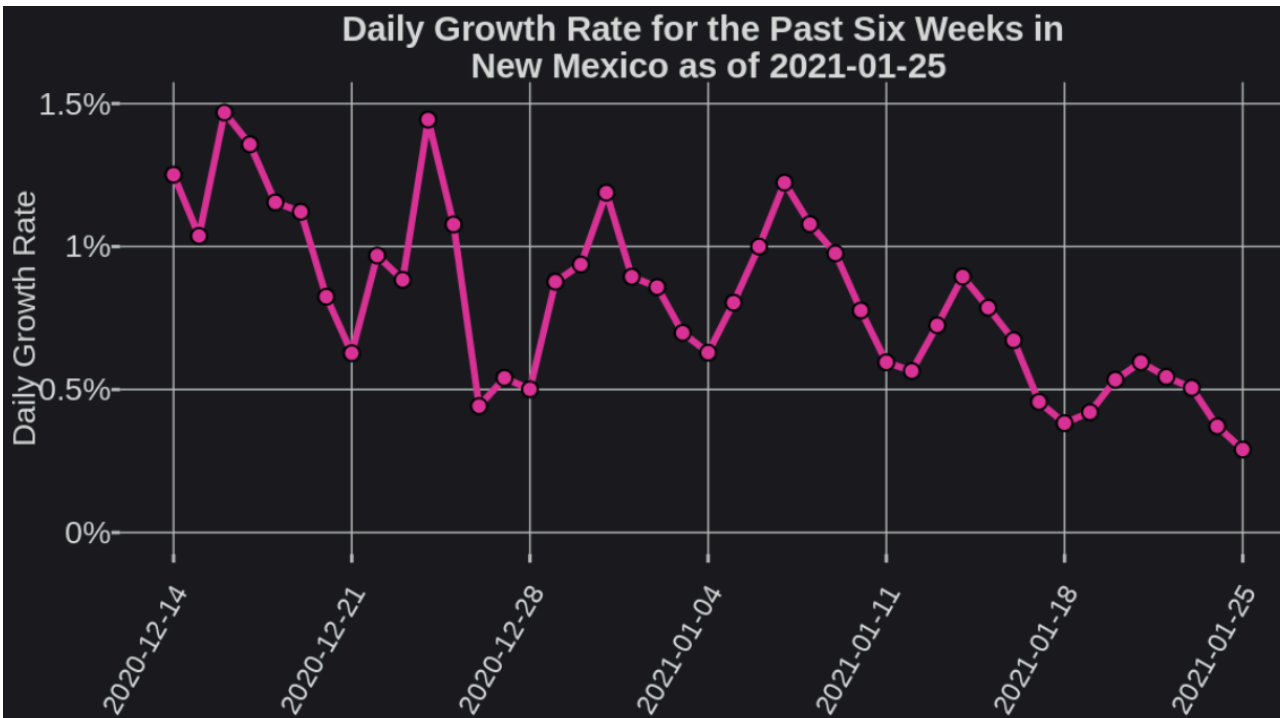
Week	Best Case (5th Percentile)	Middle Case (50th Percentile) [^]	Worst Case (95th Percentile)
2021-01-25		28*	
2021-02-01	12	24	33
2021-02-08	9	20	33
2021-02-15	8	17	31
2021-02-22	7	16	32
2021-03-01	5	17	37
2021-03-08	7	18	48

*Last reported confirmed deaths
^Closest-matching scenario

So what?

The daily number of deaths are expected to range between 17 and 24 in the next few weeks for the middle case

Growth Rate for NM



6-Week Forecast of the Average Weekly Growth Rate for New Mexico Based on Data as of 2021-01-25

Week	Best Case (5th Percentile)	Middle Case (50th Percentile)^	Worst Case (95th Percentile)
2021-01-25		0.47%*	
2021-02-01	0.16%	0.30%	0.51%
2021-02-08	0.12%	0.27%	0.54%
2021-02-15	0.11%	0.28%	0.56%
2021-02-22	0.11%	0.31%	0.59%
2021-03-01	0.14%	0.34%	0.59%
2021-03-08	0.16%	0.35%	0.67%

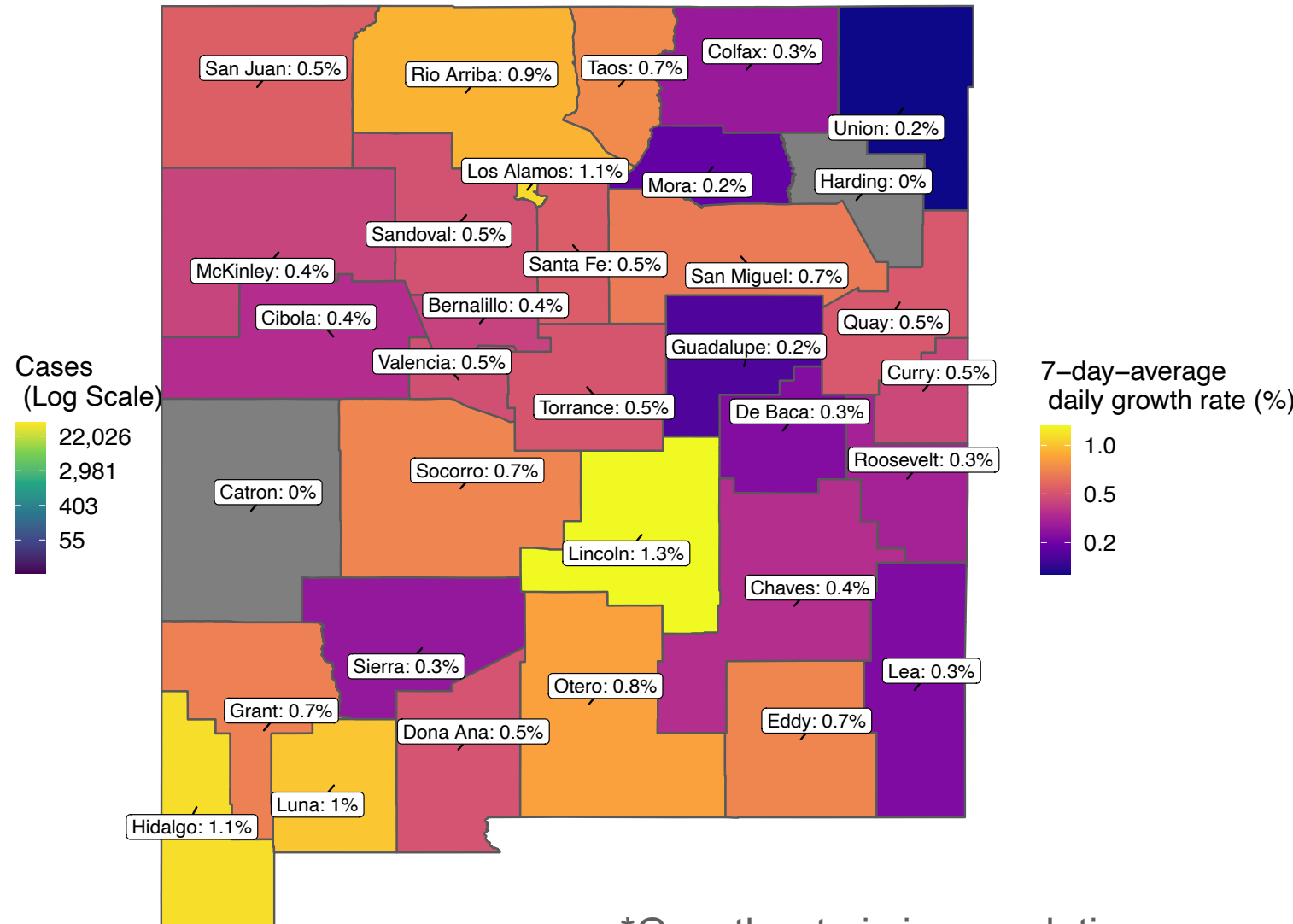
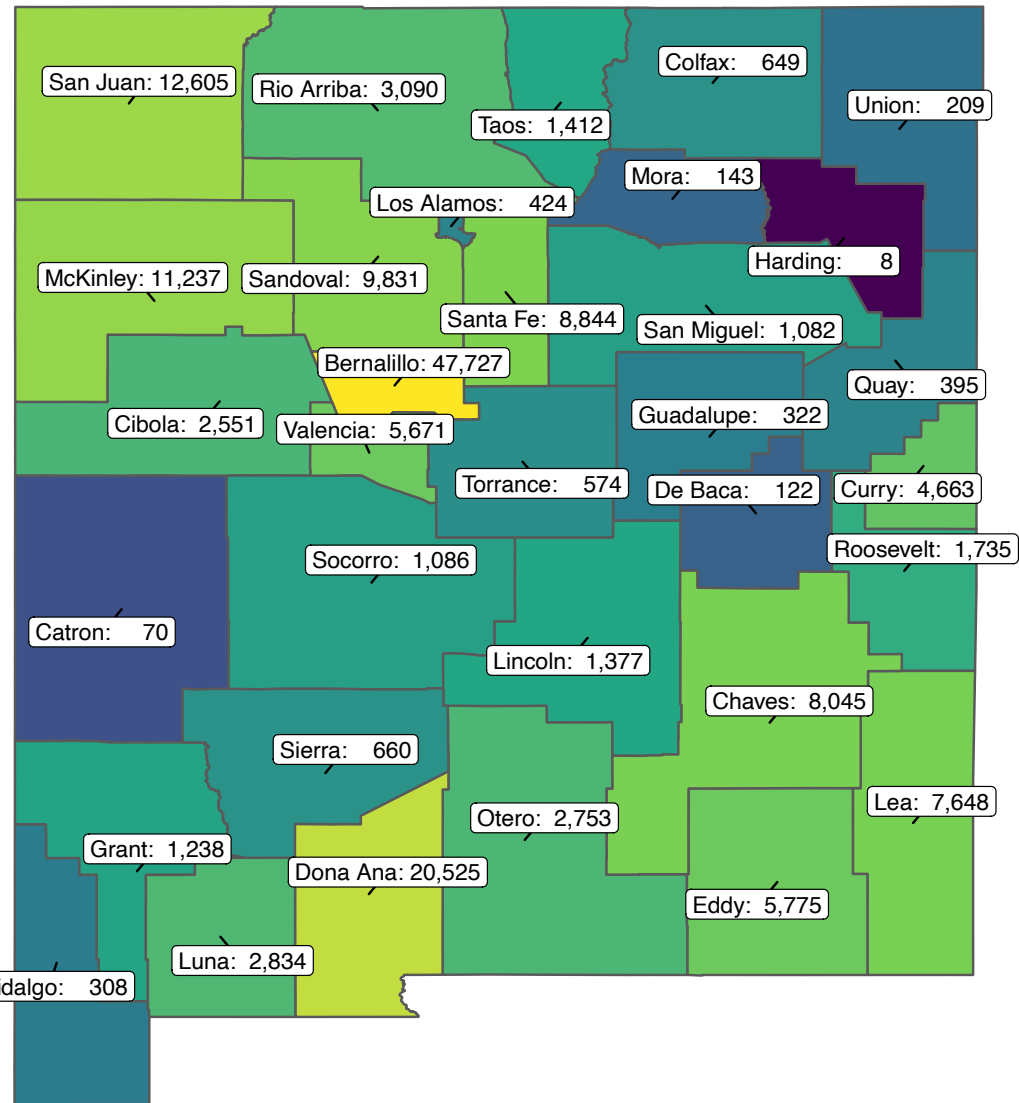
*Last weekly mean daily growth rate
^Closest-matching scenario

So what?

As of January 25th, the average growth rate in NM is at 0.47% (down from 0.64%)

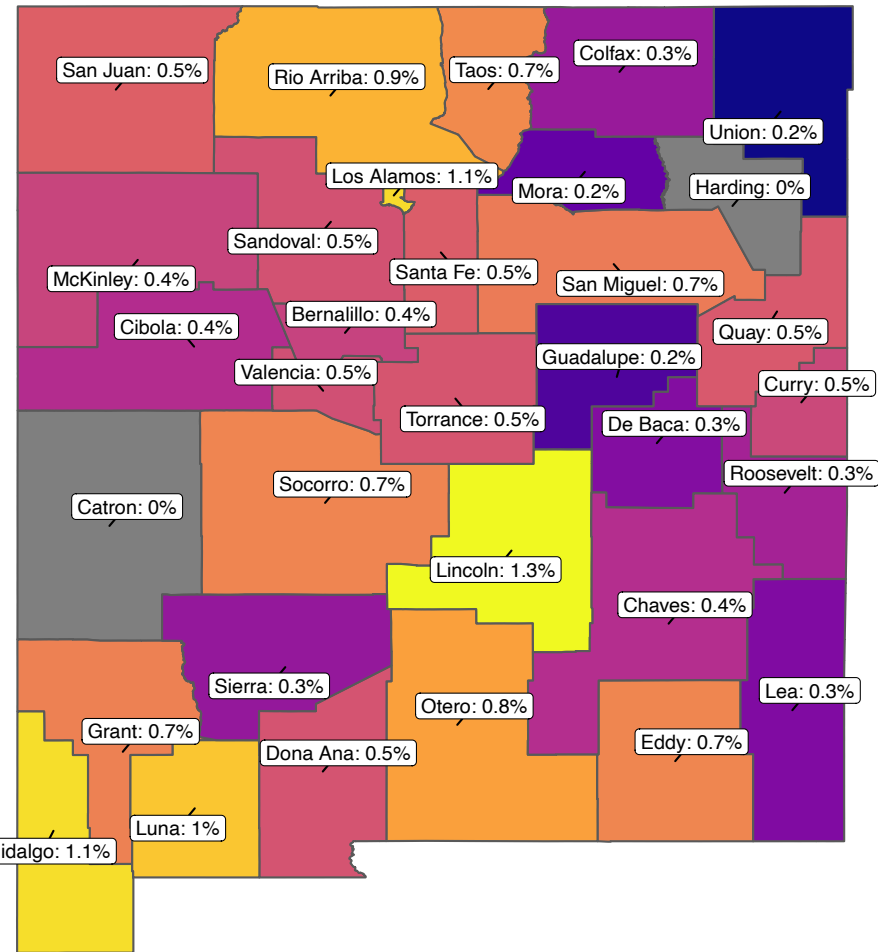
> Regional Growth Rates, Hospitalizations, & Shelters

Cumulative Cases & Daily Growth Rate for NM: Jan 25

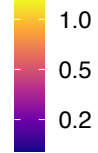


*Growth rate is in cumulative cases

Daily Growth Rate for NM Jan 25



7-day-average daily growth rate (%)



Socorro 0.7% =
 Mora 0.2% ↓
 Roosevelt 0.3% =
 DeBaca 0.3% ↓
Los Alamos 1.1% ↓
 Catron 0.0% = ↓
 Quay 0.5% =
 Union 0.2% =
 Colfax 0.3% ↓
 Harding 0.0% =

Hidalgo 1.1% ↑

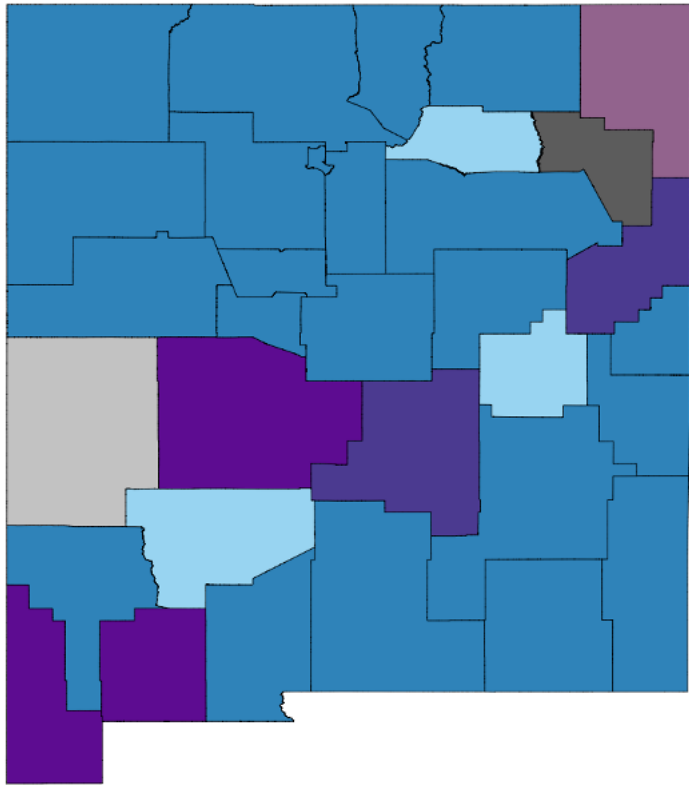
*arrows indicate more than 0.5% difference in growth rate from last week's analysis; growth rate is in cumulative cases

County	Daily Growth Rate	Change
San Juan	0.5%	=
Rio Arriba	0.9%	=
Sierra	0.3%	↓
McKinley	0.4%	=
Sandoval	0.5%	=
Santa Fe	0.5%	=
Cibola	0.4%	=
Bernalillo	0.4%	=
Valencia	0.5%	=
Torrance	0.5%	=
Lincoln	1.3%	=
San Miguel	0.7%	=
Chaves	0.4%	=
Dona Ana	0.5%	=
Otero	0.8%	↓
Lea	0.3%	=
Eddy	0.7%	=
Curry	0.5%	=
Grant	0.7%	↓
Luna	1.0%	=
Taos	0.7%	=

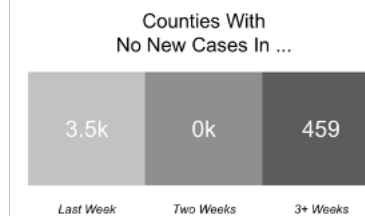
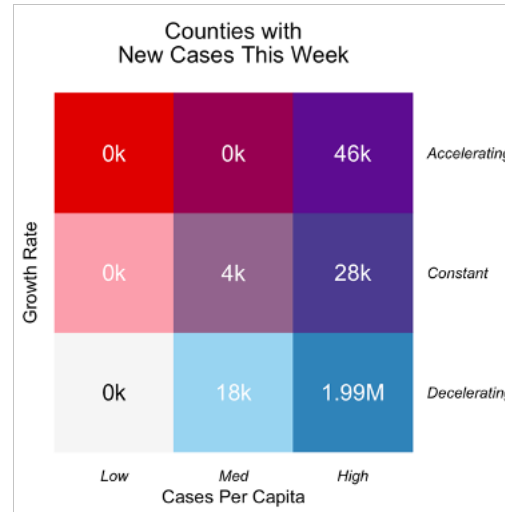
Weekly Growth Rate for NM: Another View (Jan 25)

COVID-19 across New Mexico

A 7-day moving window comparison
January 25, 2020



impacted New
Mexicans



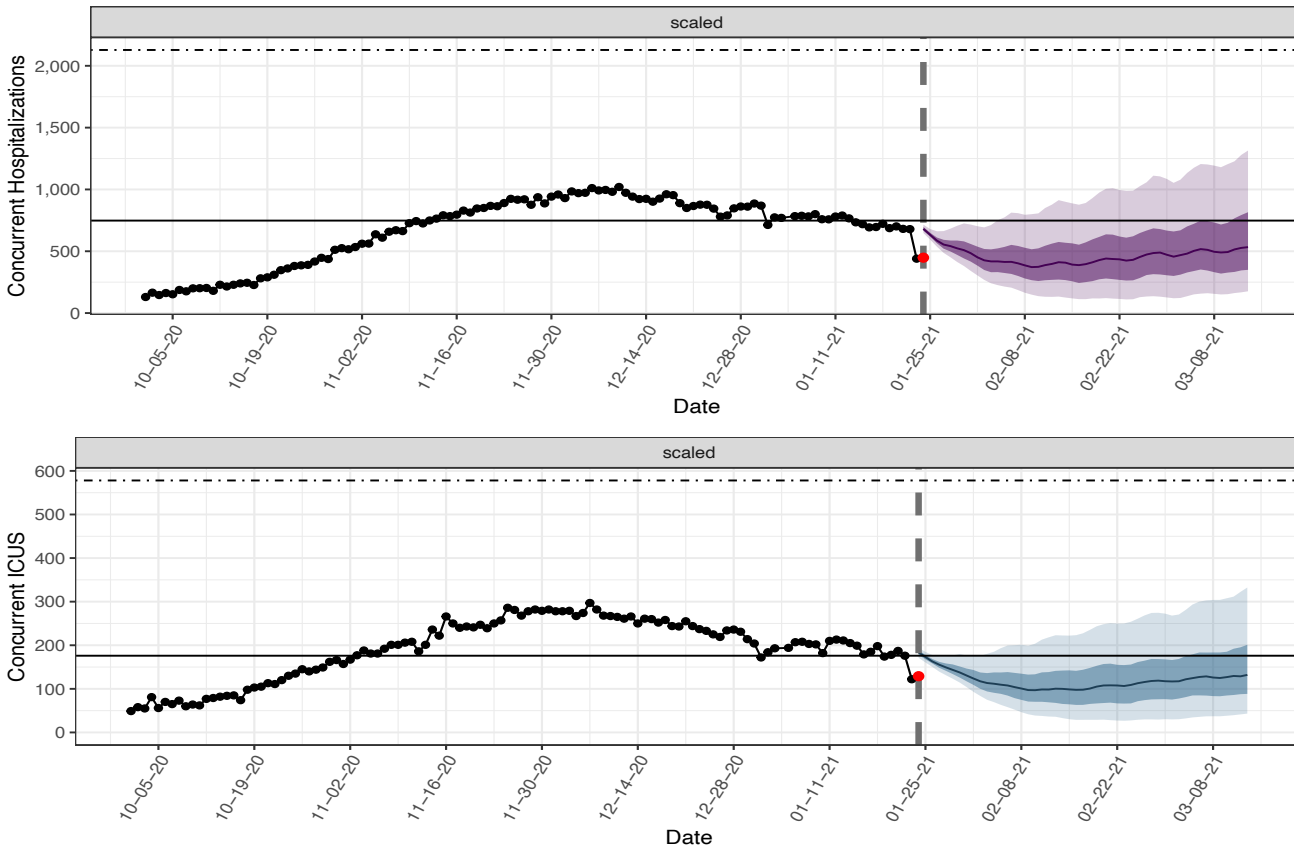
So what?

- 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: **Luna**
- **Luna**, Hidalgo, and Socorro are **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

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



Concurrent COVID-19 ICUs beds

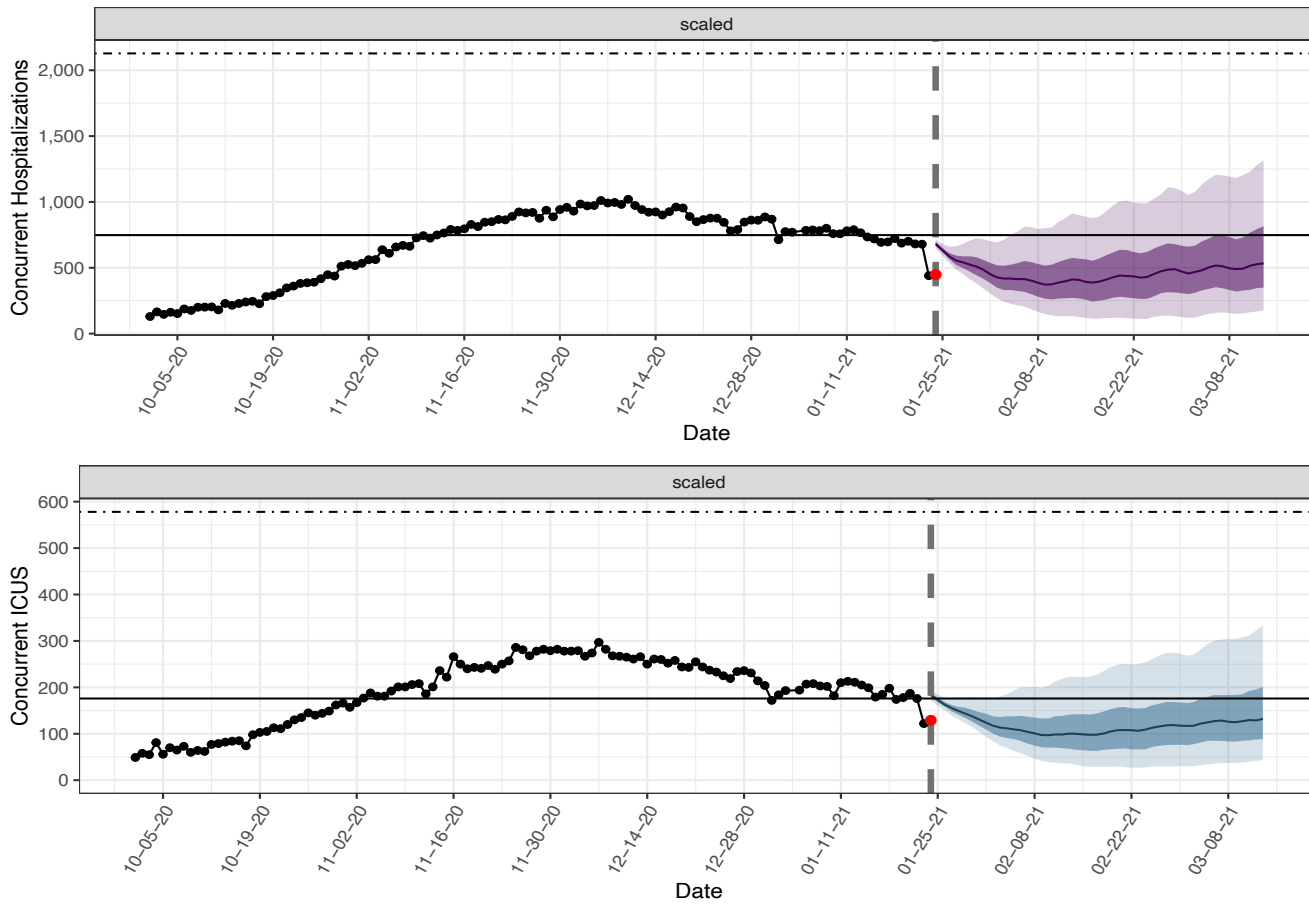
Week	Qu. 5% (best case)	Qu. 50% (median)	Qu. 95% (worst case)
1/31	104	131	177
2/7	52	104	200
2/14	33	100	222
2/21	28	108	251
2/28	30	119	274
3/7	37	129	303

“Scaled” Scenario

So what?

We are at ICU bed capacity for concurrent COVID-19 patients; our model is tracking with the median this week. Model is predicting a 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

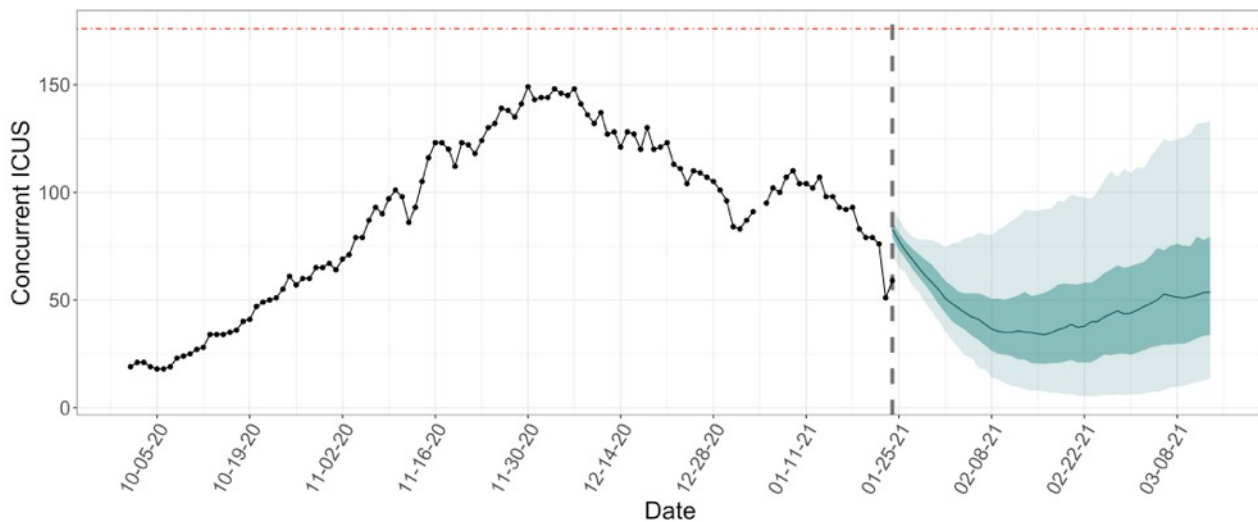
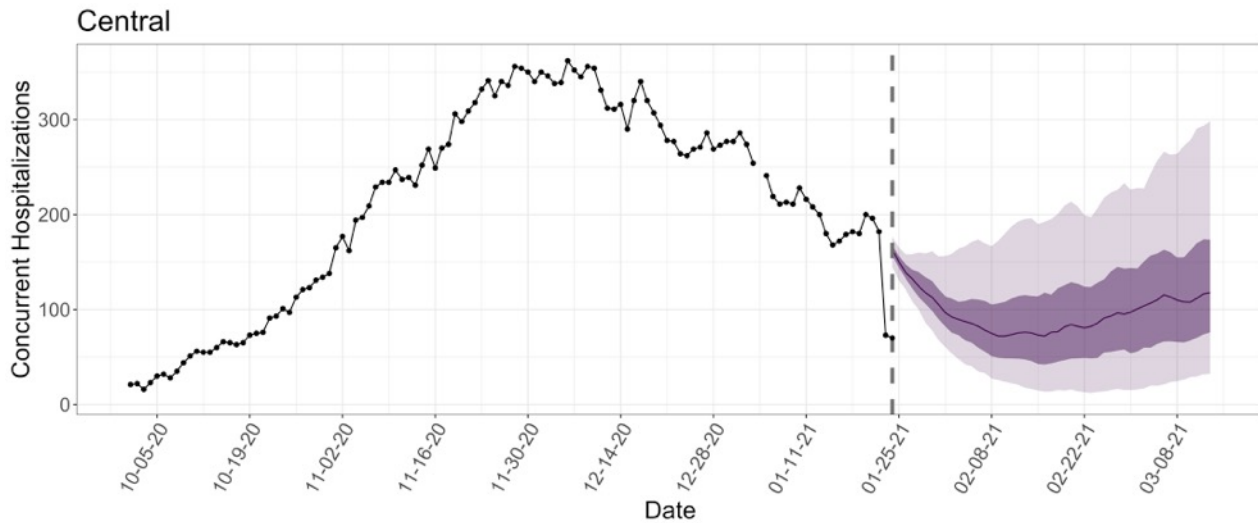
Week	Qu. 5% (best case)	Qu. 50% (median)	Qu. 95% (worst case)
1/31	237	354	539
2/7	133	298	608
2/14	93	308	678
2/21	89	329	759
2/28	103	371	831
3/7	124	383	899

“Scaled” Scenario

So what?

Med-surge general bed needs are tracking with the median case scenario this week; med-surge beds predicted to decrease during the next 3 weeks

Regional Hospitalization Forecasts: Central



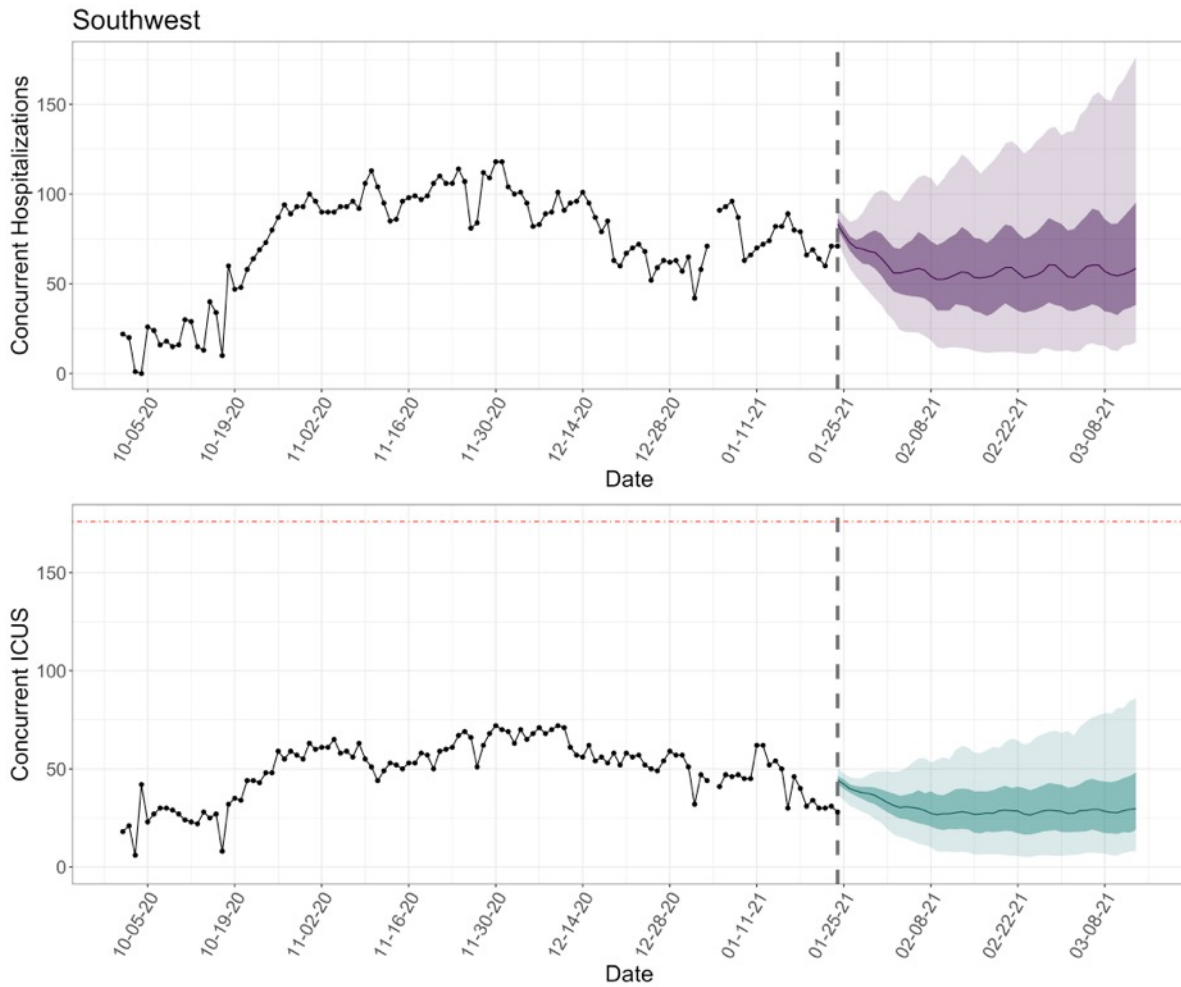
Concurrent COVID-19 ICUs beds: Central

Week	Qu. 5% (best case)	Qu. 50% (median)	Qu. 95% (worst case)
1/31	40	55	77
2/7	18	39	81
2/14	8	35	91
2/21	6	37	98
2/28	6	44	111
3/7	9	52	124

So what?

ICU bed usage is expected to decrease; tracking with median (except yesterday).

Regional Hospitalization Forecasts: Southwest



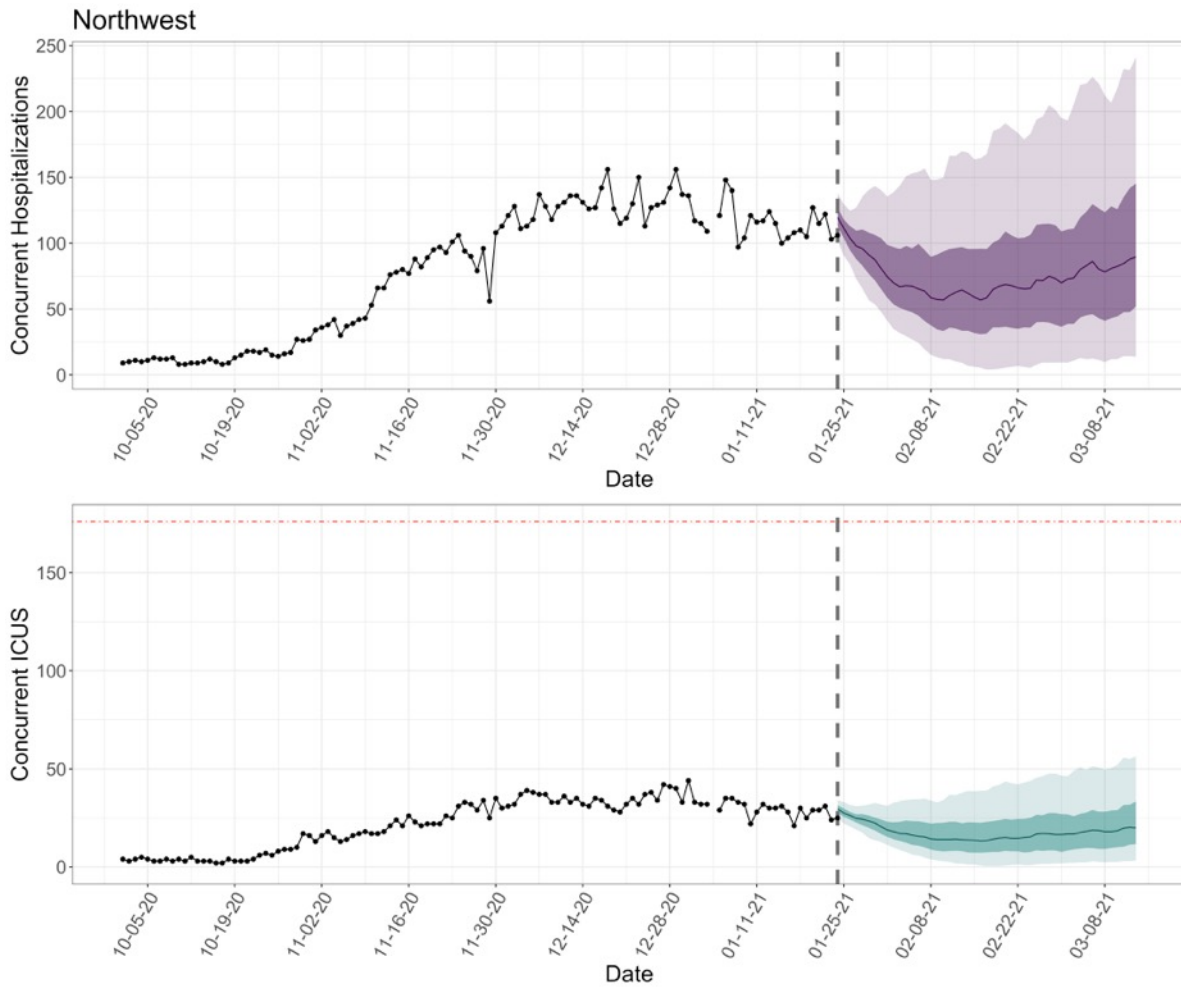
Concurrent COVID-19 ICU beds: Southwest

Week	Qu. 5% (best case)	Qu. 50% (median)	Qu. 95% (worst case)
1/31	23	35	49
2/7	11	29	56
2/14	7	28	61
2/21	6	29	65
2/28	6	29	69
3/7	7	29	77

So what?

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

Regional Hospitalization Forecasts: Northwest



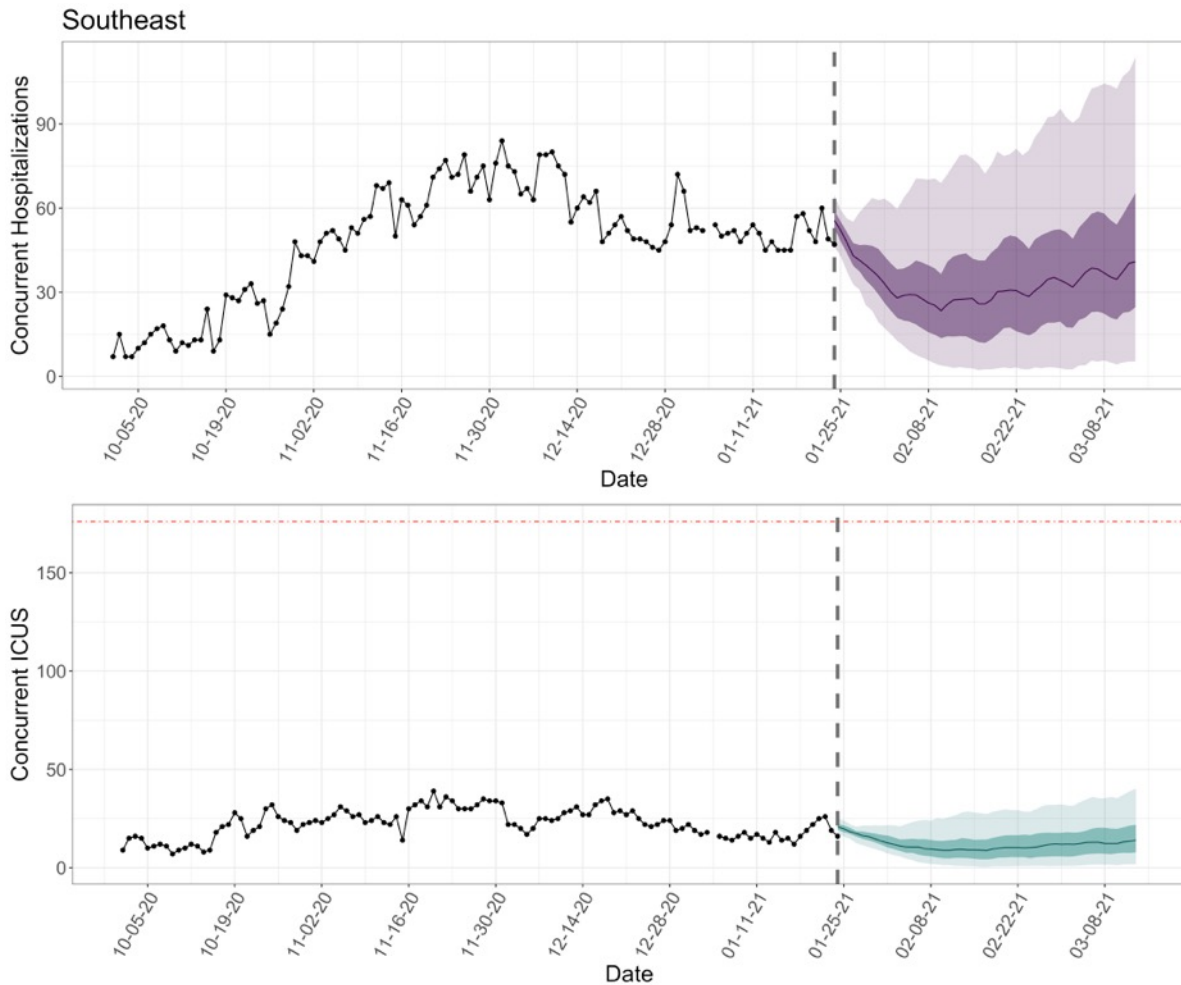
Concurrent COVID-19 ICUs beds: Northwest

Week	Qu. 5% (best case)	Qu. 50% (median)	Qu. 95% (worst case)
1/31	13	21	32
2/7	5	15	35
2/14	1	14	39
2/21	1	15	43
2/28	2	17	48
3/7	3	19	51

So what?

ICU bed usage is expected to decrease in the Northwest region

Regional Hospitalization Forecasts: Southeast



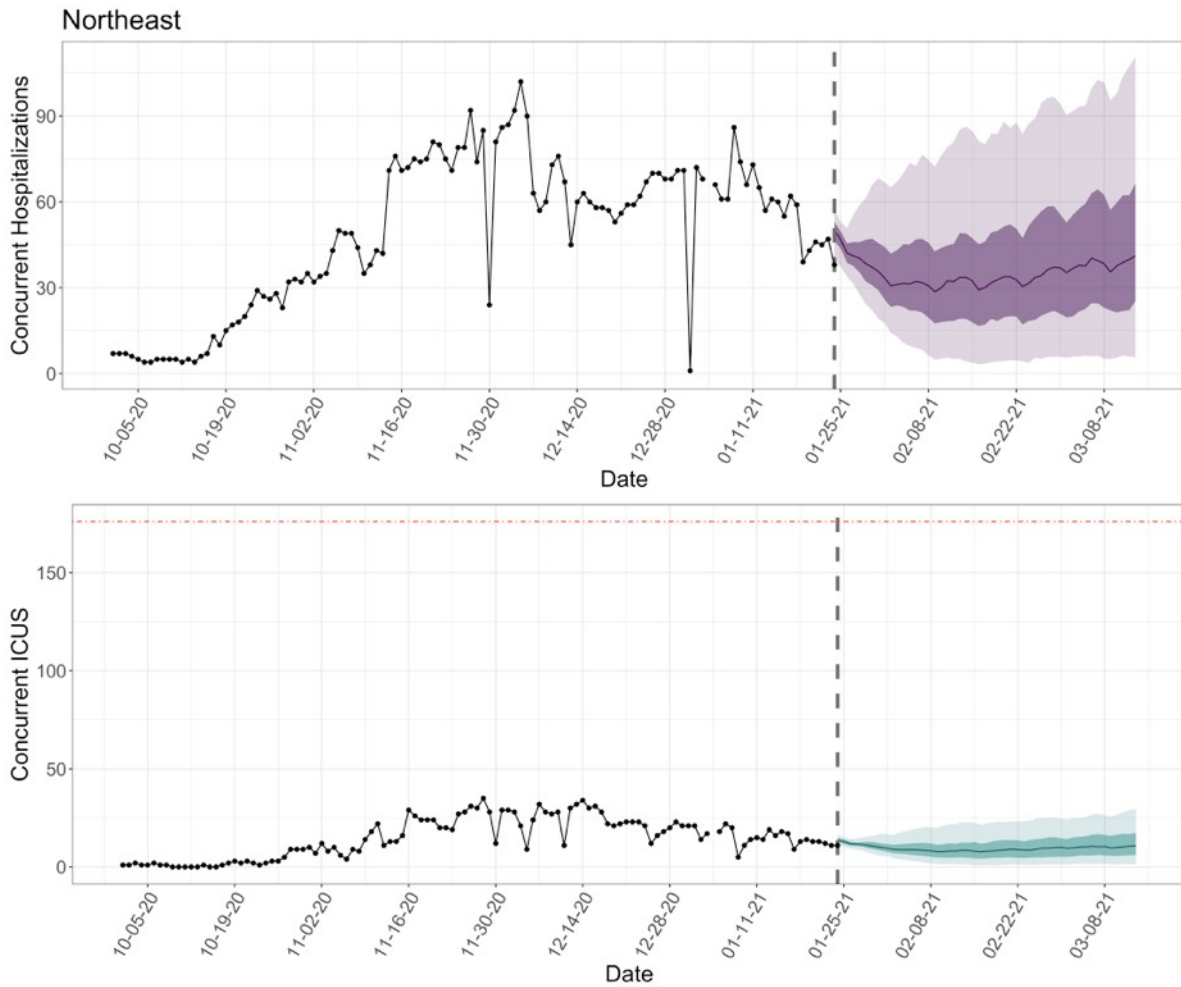
Concurrent COVID-19 ICUs beds: Southeast

Week	Qu. 5% (best case)	Qu. 50% (median)	Qu. 95% (worst case)
1/31	9	14	21
2/7	2	10	24
2/14	1	9	29
2/21	1	10	29
2/28	1	12	32
3/7	2	13	35

So what?

ICU bed usage is expected to decrease 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)
1/31	6	10	17
2/7	2	8	20
2/14	1	8	23
2/21	1	9	23
2/28	1	10	25
3/7	2	10	27

So what?

ICU bed usage is expected to gradually decrease in the Northeast region

> **Non-Congregational Shelter Forecast**

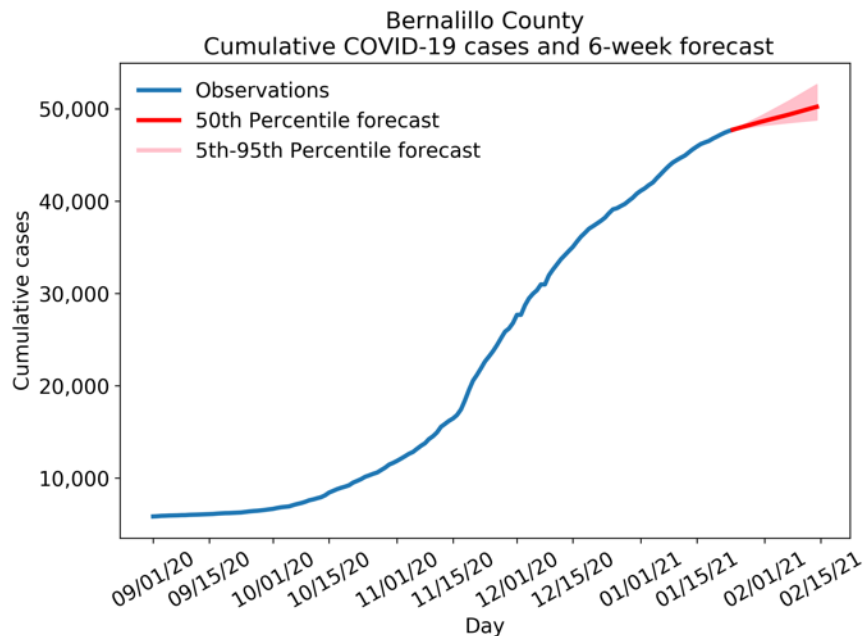
Non-Congregate Shelter Forecast

- **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**

Non-Congregate Shelter Forecast: Bernalillo

Number of cases as of 1/25/21: **47,727**
 Number of shelter rooms available: **221**
 Total number of patients/medical workers (including specialty): **35**
 Number of patients: **30**
 Number of medical workers: **5**
 Occupied rooms:new cases ratio: **0.15**
 2-week avg. new cases per day: **235**

	2/1/21	2/8/21	2/15/21
Total cases	48,583 (48,180-49,204)	49,364 (48,511-50,841)	50,212 (48,799-52,619)
# of rooms needed	18 (10-31)	17 (7-35)	18 (6-38)
Deficit (-) or surplus of rooms	203	202	203



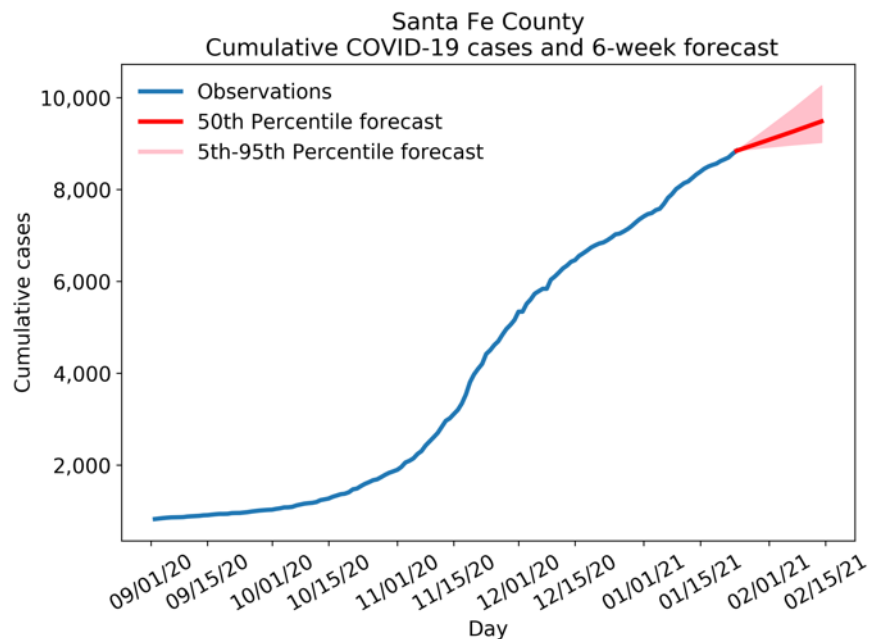
2-week avg. new cases per day decreased from 321 last week to 235 this week

Last week we forecasted 30 shelter rooms needed [16-48] and 35 are currently in use, so we are slightly **under forecasting**

Non-Congregate Shelter Forecast: Santa Fe

Number of cases as of 1/25/21: **8,844**
 Number of shelter rooms available: **52**
 Total number of patients/medical workers (including specialty): **31**
 Number of patients: **30**
 Number of medical workers: **1**
 Occupied rooms:new cases ratio: **0.56**
 2-week avg. new cases per day: **55**

	2/1/21	2/8/21	2/15/21
Total cases	9,052 (8,918-9,295)	9,263 (8,978-9,59)	9,483 (9,030-10,257)
# of rooms needed	17 (6-36)	17 (5-37)	18 (4-40)
Deficit (-) or surplus of rooms	35	35	34

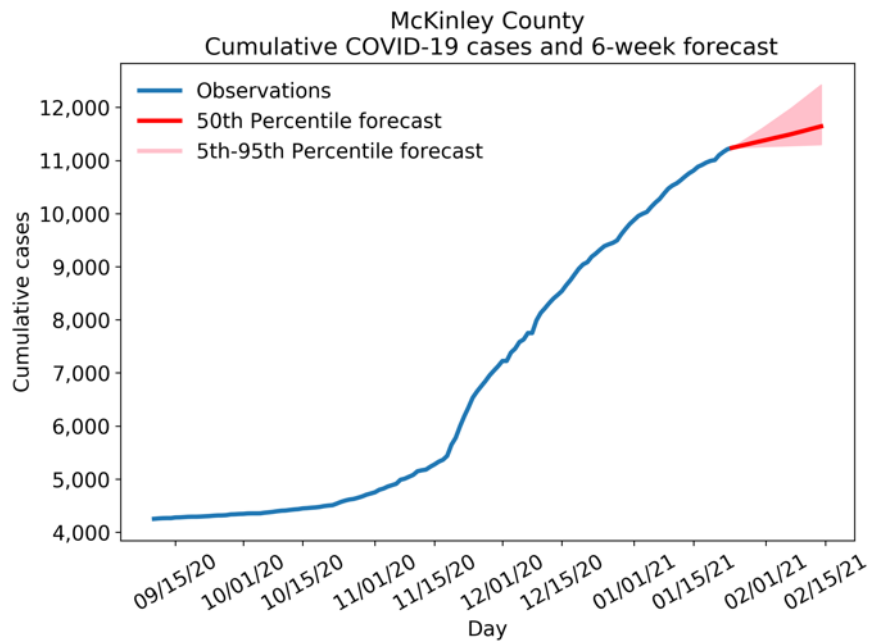


2-week avg. new cases per day decreased from 70 last week to 55 this week

We are still **forecasting too low**: Caution to follow the higher side of this forecast to measure shelter usage

Non-Congregate Shelter Forecast: McKinley

Number of cases as of 1/25/21: **11,237**
 Number of shelter rooms available: **160**
 Total number of patients/medical workers (including specialty): **55**
 Number of patients: **47**
 Number of medical workers: **8**
 Occupied rooms:new cases ratio: **1.1**
 2-week avg. new cases per day: **51**



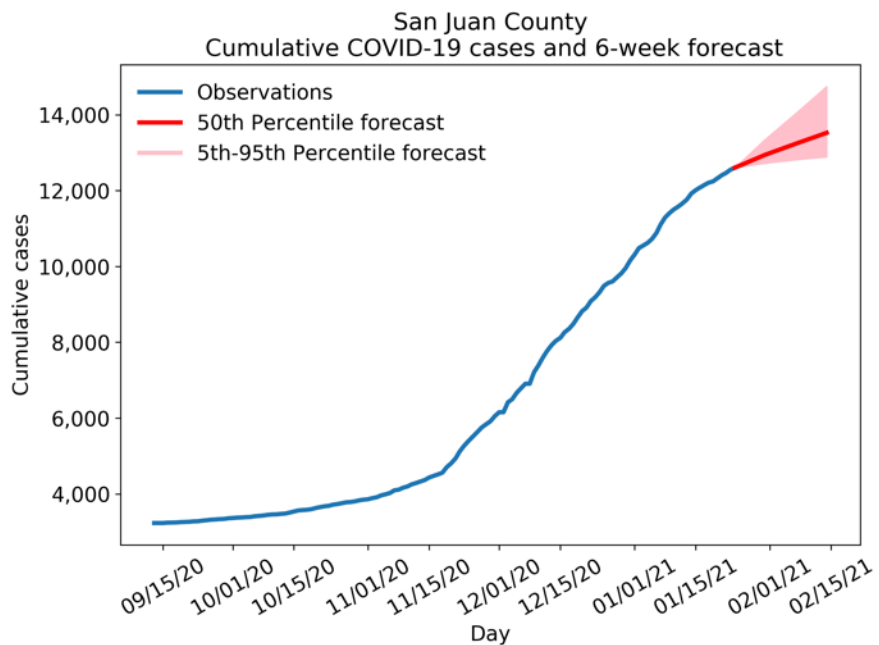
	2/1/21	2/8/21	2/15/21
Total cases	11,367 (11,263-11,595)	11,496 (11,283-11,986)	11,643 (11,302-12,422)
# of rooms needed	20 (4-56)	20 (3-61)	23 (3-67)
Deficit (-) or surplus of rooms	140	140	137

2-week avg. new cases per day decreased from 67 last week to 51 this week

Last week we forecasted 42 shelter rooms needed [18-80] and 55 are currently in use, so we are **under forecasting**

Non-Congregate Shelter Forecast: San Juan

Number of cases as of 1/25/21: **12,605**
 Number of shelter rooms available: **21**
 Total number of patients/medical workers (including specialty): **7**
 Number of patients: **7**
 Number of medical workers: **0**
 Occupied rooms:new cases ratio: **0.09**
 2-week avg. new cases per day: **79**



	2/1/21	2/8/21	2/15/21
Total cases	12,946 (12,723-13,356)	13,238 (12,816-14,040)	13,523 (12,890-14,745)
# of rooms needed	4 (1-10)	4 (1-9)	4 (1-9)
Deficit (-) or surplus of rooms (SJ)	17	17	17

2-week avg. new cases per day decreased from 114 last week to 79 this week.

Last week we forecasted 10 shelter rooms needed [4-20] and 7 are currently in use