

# Modeling & Forecasting COVID-19 in NM

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January 19, 2021

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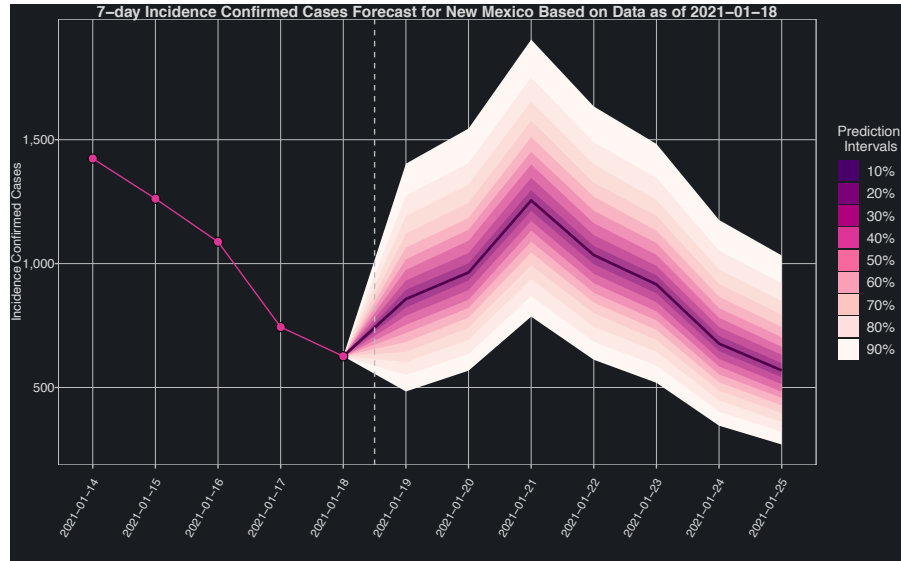
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# Short- & Long-Term Forecast for NM: Cases



**6-Week Forecast of Confirmed Cases for New Mexico Based on Data as of 2021-01-18**

Week	Best Case (5th Percentile)	Middle Case (50th Percentile) <sup>^</sup>	Worst Case (95th Percentile)
2021-01-18		164,263*	
2021-01-25	167,877	170,548	174,436
2021-02-01	171,228	176,754	184,532
2021-02-08	174,491	183,098	195,243
2021-02-15	177,782	189,755	206,781
2021-02-22	180,794	196,590	219,526
2021-03-01	183,703	203,933	234,293

\*Last reported confirmed cases count  
<sup>^</sup>Closest-matching scenario



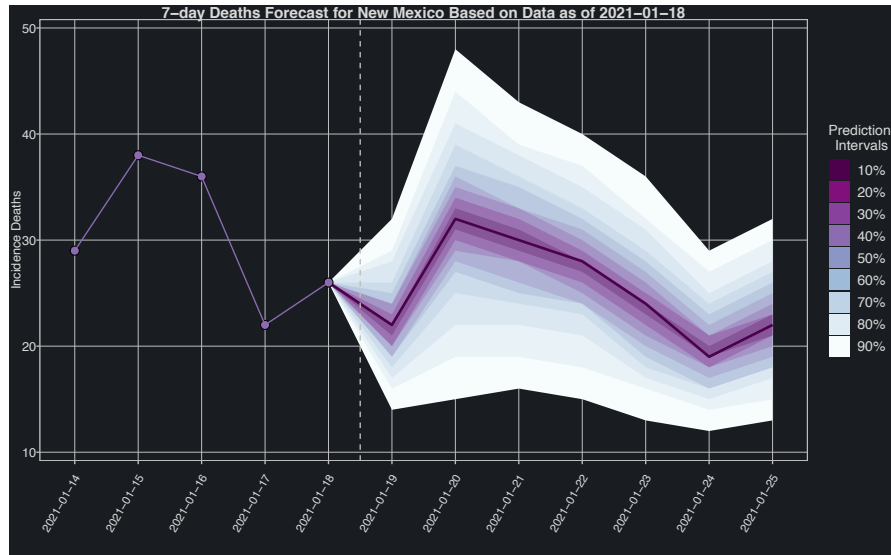
**6-Week Forecast of Daily Average of Confirmed Cases for New Mexico Based on Data as of 2021-01-18**

Week	Best Case (5th Percentile)	Middle Case (50th Percentile) <sup>^</sup>	Worst Case (95th Percentile)
2021-01-18		1,025*	
2021-01-25	516	898	1,453
2021-02-01	479	886	1,442
2021-02-08	466	906	1,530
2021-02-15	470	951	1,648
2021-02-22	430	976	1,821
2021-03-01	415	1,049	2,109

\*Last reported confirmed cases count  
<sup>^</sup>Closest-matching scenario

**So what?**  
 The daily number of cases are expected to range between 500 and 1,400 in the next two weeks with an average of 900 cases

# Short- & Long-Term Forecast for NM: Deaths



**6-Week Forecast of Deaths for New Mexico Based on Data as of 2021-01-18**

Week	Best Case (5th Percentile)	Middle Case (50th Percentile) <sup>^</sup>	Worst Case (95th Percentile)
2021-01-18		2,958*	
2021-01-25	3,063	3,134	3,201
2021-02-01	3,159	3,297	3,459
2021-02-08	3,248	3,463	3,731
2021-02-15	3,330	3,634	4,023
2021-02-22	3,417	3,810	4,371
2021-03-01	3,495	3,999	4,772

\*Last reported deaths count  
<sup>^</sup>Closest-matching scenario



**6-Week Forecast of Daily Average of Deaths for New Mexico Based on Data as of 2021-01-18**

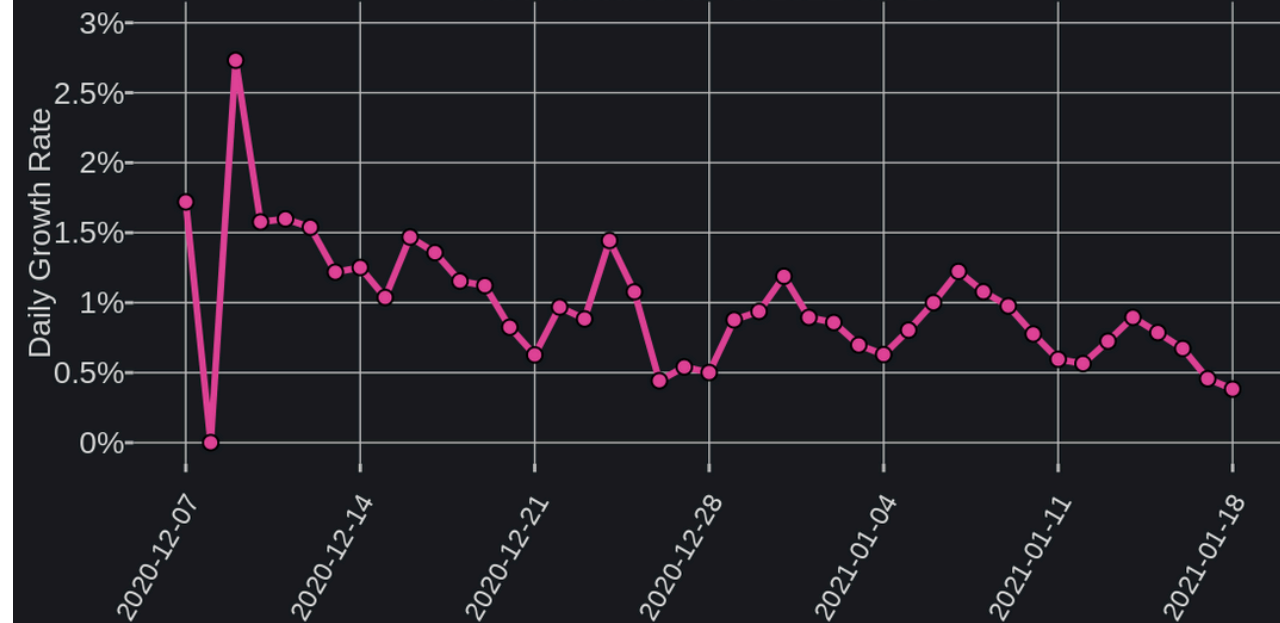
Week	Best Case (5th Percentile)	Middle Case (50th Percentile) <sup>^</sup>	Worst Case (95th Percentile)
2021-01-18		28*	
2021-01-25	15	25	35
2021-02-01	14	23	37
2021-02-08	13	24	39
2021-02-15	12	24	42
2021-02-22	12	25	50
2021-03-01	11	27	57

\*Last reported confirmed deaths  
<sup>^</sup>Closest-matching scenario

**So what?**  
**The daily number of deaths are expected to range between 15 and 40 in the next two weeks with an average of 25 cases**

# Growth Rate for NM

Daily Growth Rate for the Past Six Weeks in New Mexico as of 2021-01-18



6-Week Forecast of the Average Weekly Growth Rate for New Mexico Based on Data as of 2021-01-18

Week	Best Case (5th Percentile)	Middle Case (50th Percentile) <sup>^</sup>	Worst Case (95th Percentile)
2021-01-18		0.64%*	
2021-01-25	0.31%	0.54%	0.86%
2021-02-01	0.28%	0.51%	0.81%
2021-02-08	0.27%	0.51%	0.81%
2021-02-15	0.27%	0.51%	0.82%
2021-02-22	0.24%	0.51%	0.86%
2021-03-01	0.23%	0.53%	0.93%

\*Last weekly mean daily growth rate

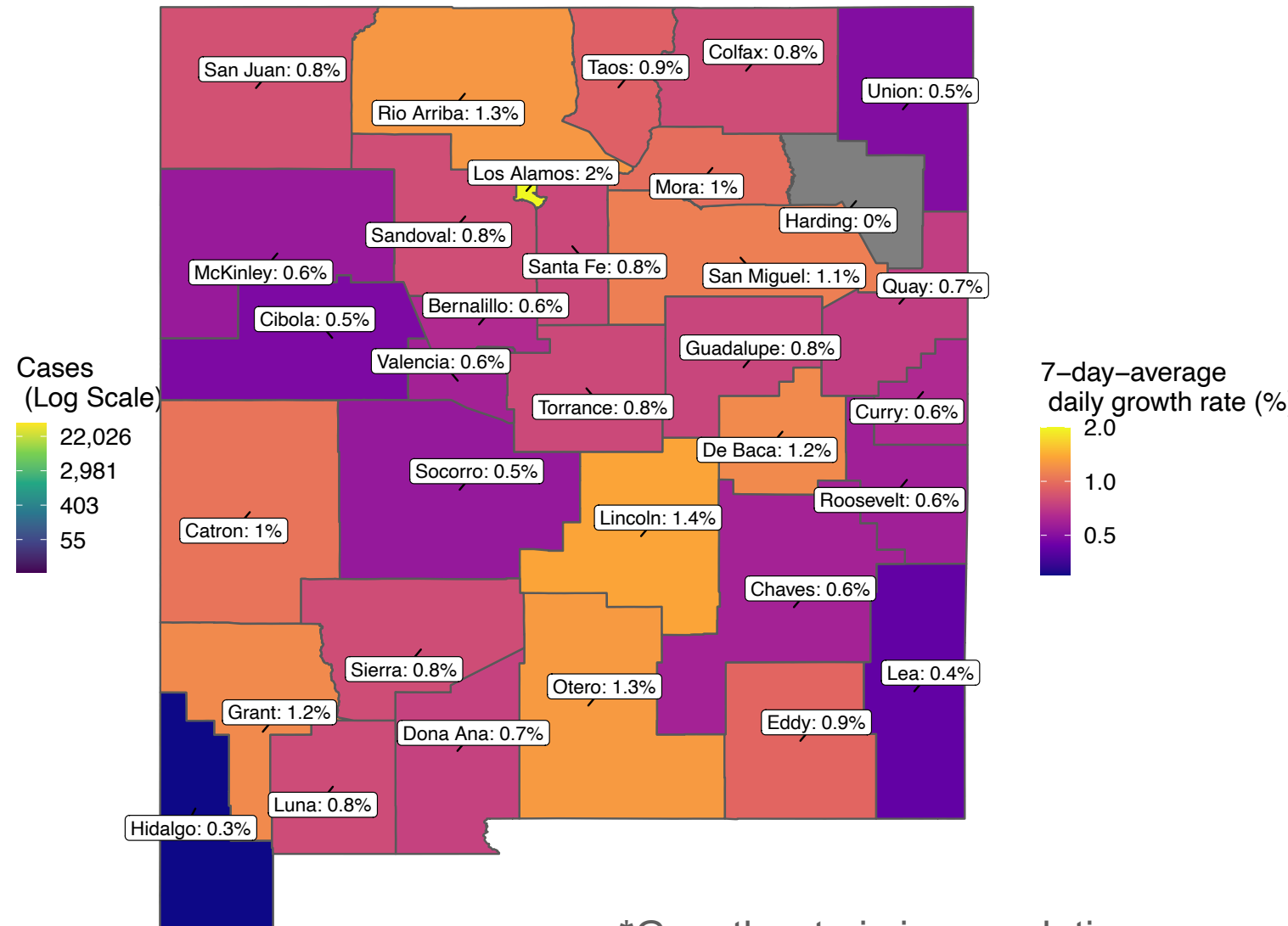
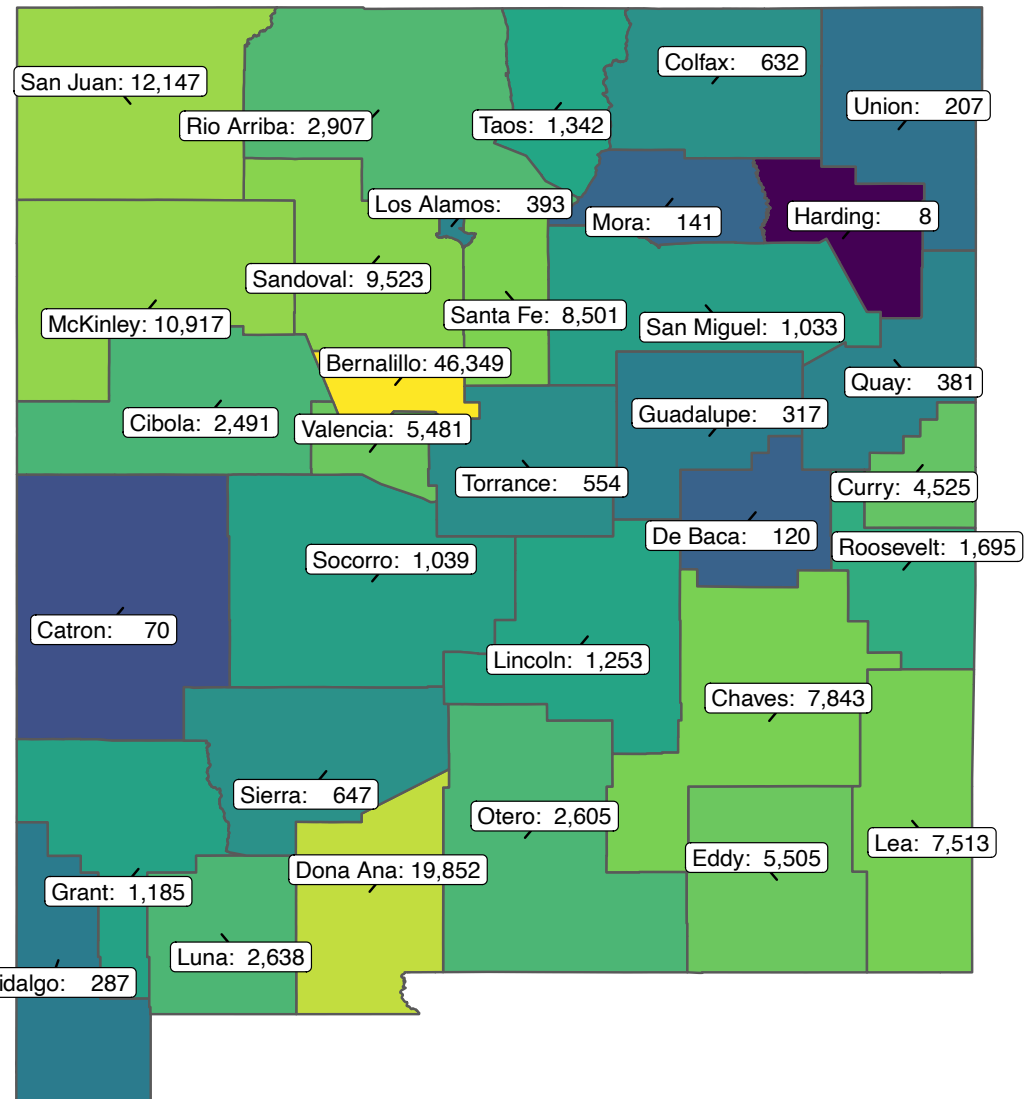
<sup>^</sup>Closest-matching scenario

**So what?**

**As of November 18<sup>th</sup>, the average growth rate in NM is at 0.64% (down from 0.92%)**

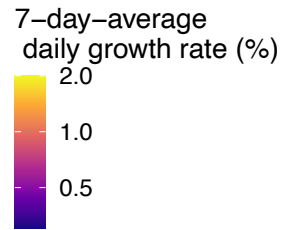
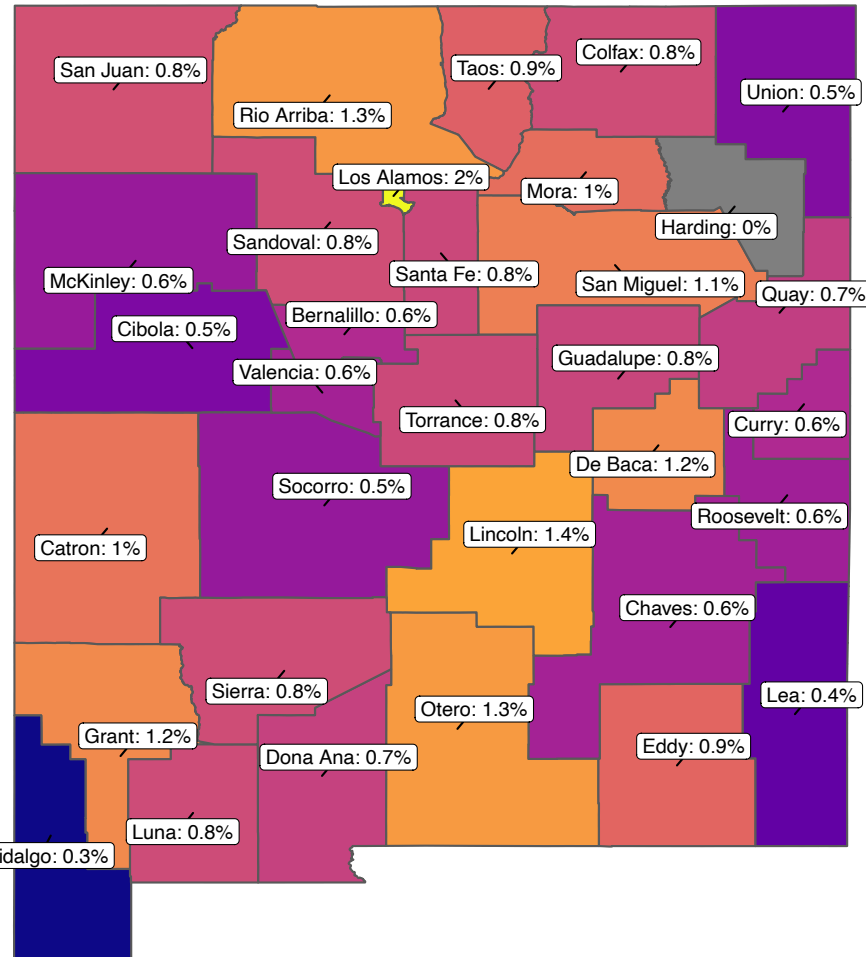
# > Growth Rates, & Hospitalizations

# Cumulative Cases & Daily Growth Rate for NM: Jan 18



\*Growth rate is in cumulative cases

# Daily Growth Rate for NM Jan 18



Socorro 0.5% =  
**Mora 1.0%** =  
 Hidalgo 0.3% ↓  
 Roosevelt 0.6% =  
**DeBaca 1.2%** =  
**Los Alamos 2.0%** =  
**Catron 1.0%** =  
 Quay 0.7% =  
 Union 0.5% =  
 Colfax 0.8% ↓

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

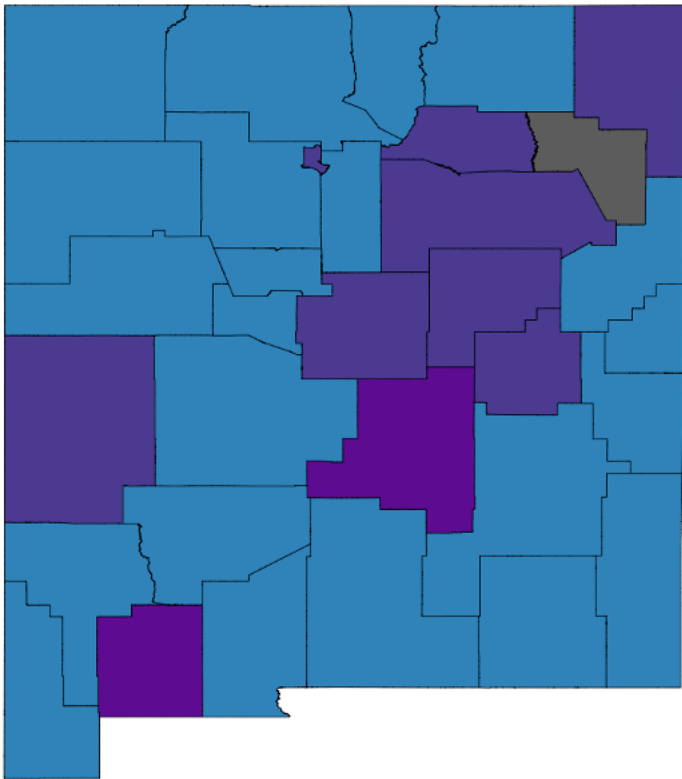
County	Daily Growth Rate	Change
San Juan	0.8%	↓
<b>Rio Arriba</b>	<b>1.3%</b>	↓
Sierra	0.8%	=
McKinley	0.6%	=
Sandoval	0.8%	=
Santa Fe	0.8%	=
Cibola	0.5%	=
Bernalillo	0.6%	=
Valencia	0.6%	=
Torrance	0.8%	=
<b>Lincoln</b>	<b>1.4%</b>	=
<b>San Miguel</b>	<b>1.1%</b>	=
Chaves	0.6%	=
Dona Ana	0.7%	=
<b>Otero</b>	<b>1.3%</b>	=
Lea	0.4%	↓
Eddy	0.9%	=
Curry	0.6%	=
<b>Grant</b>	<b>1.2%</b>	↓
Luna	0.8%	=
Taos	0.9%	=

# Weekly Growth Rate for NM: Another View (Jan 18)

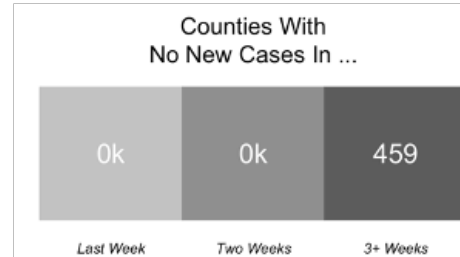
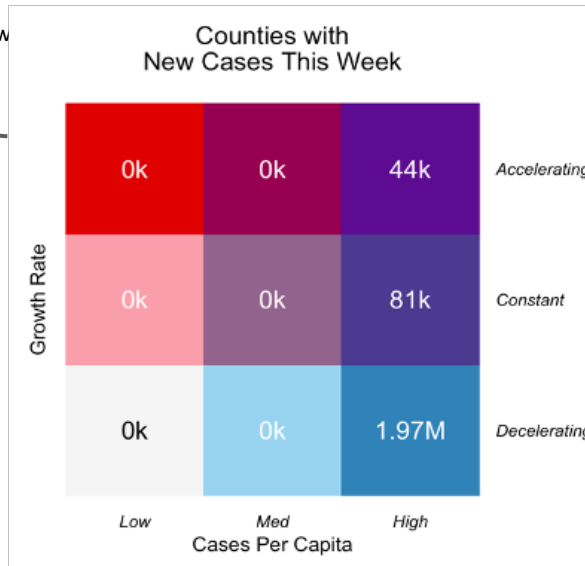
## COVID-19 across New Mexico

A 7-day moving window comparison

January 18, 2020



Impacted New Mexicans



## So what?

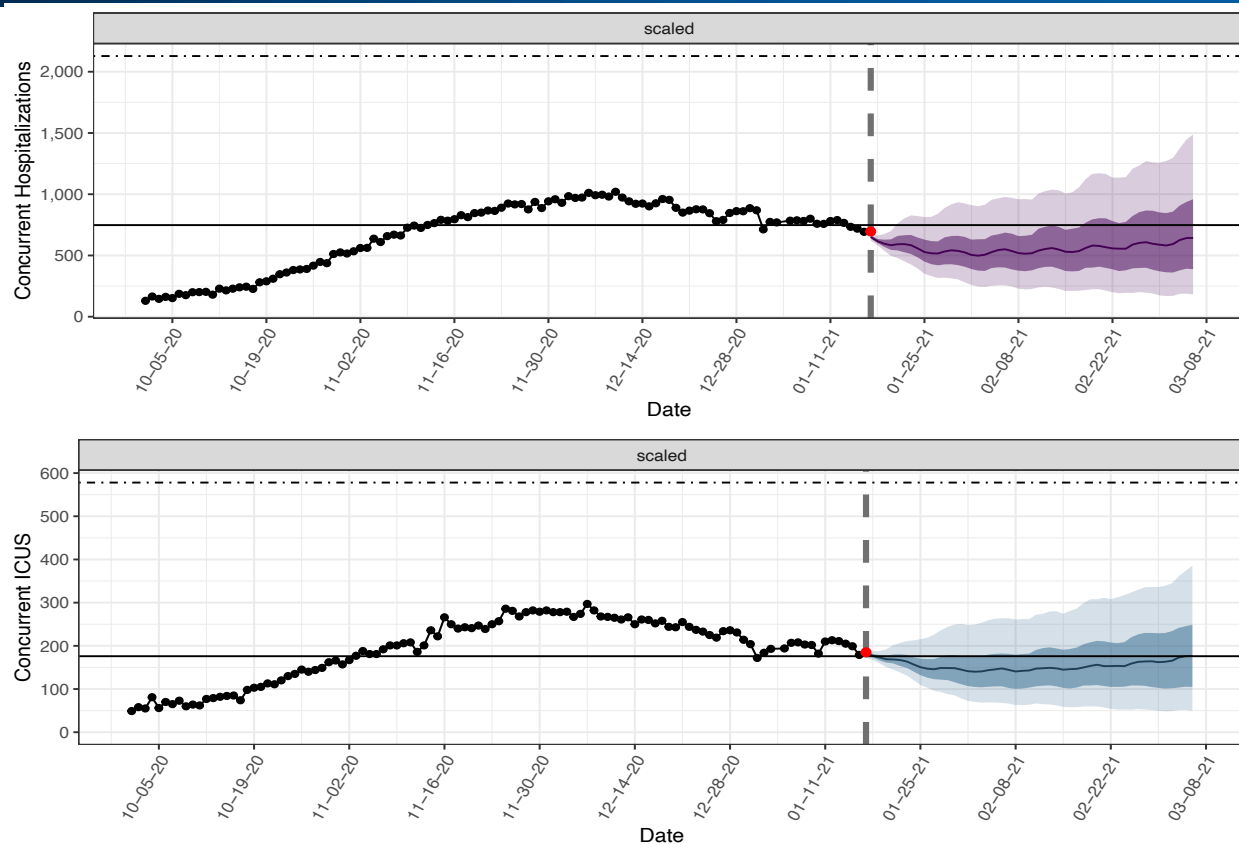
- Most people in New Mexico are living in a county that is decelerating
- Counties with >500 weekly cases per 100k: **Rio Arriba, Eddy**
- Luna and Lincoln are **accelerating**

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

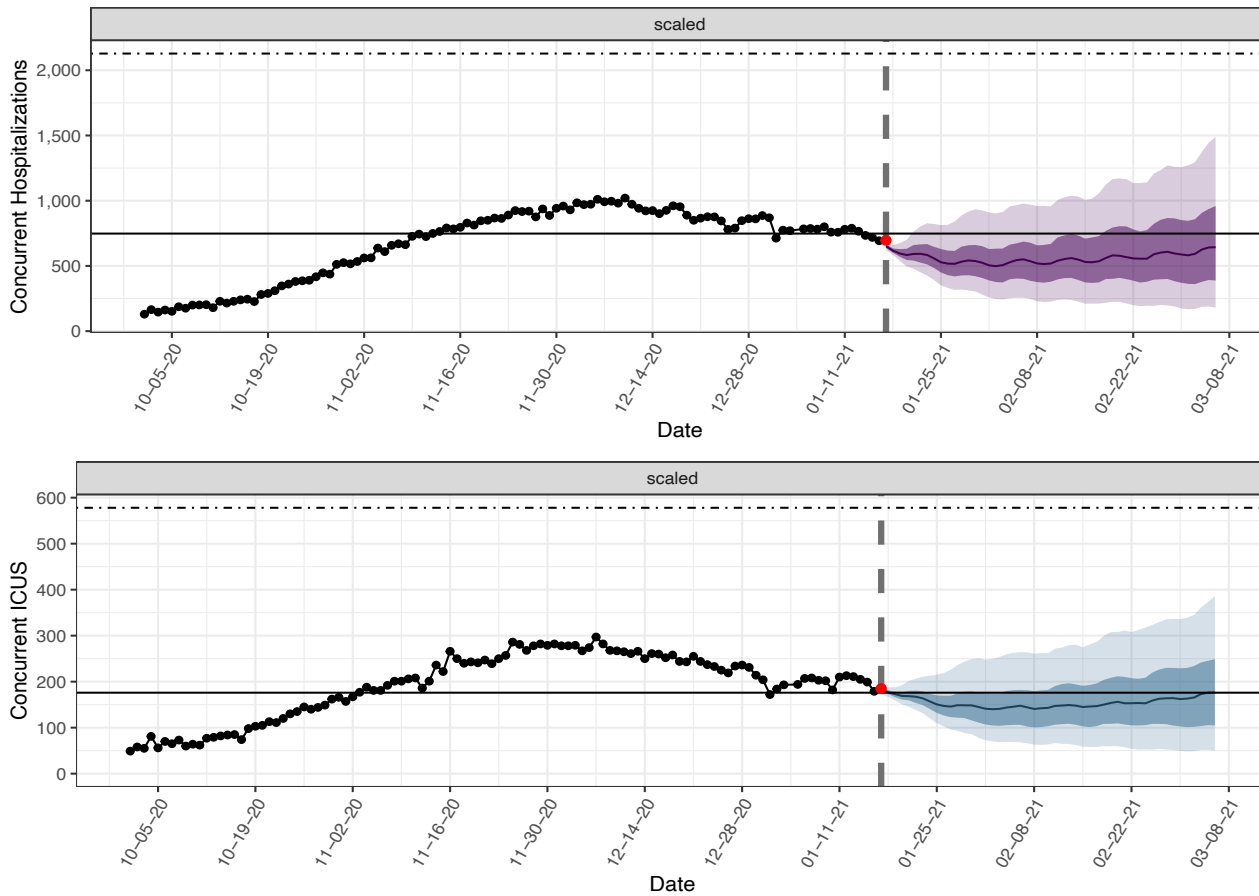
Week	Qu. 5% (best case)	Qu. 50% (median)	Qu. 95% (worst case)
1/24	120	157	213
1/31	78	145	251
2/7	66	144	264
2/14	62	148	280
2/21	57	153	311
2/28	51	164	336

“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 gradual 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)
1/24	271	401	609
1/31	202	380	674
2/7	181	392	707
2/14	165	400	752
2/21	156	414	854
2/28	138	431	924

“Scaled” Scenario

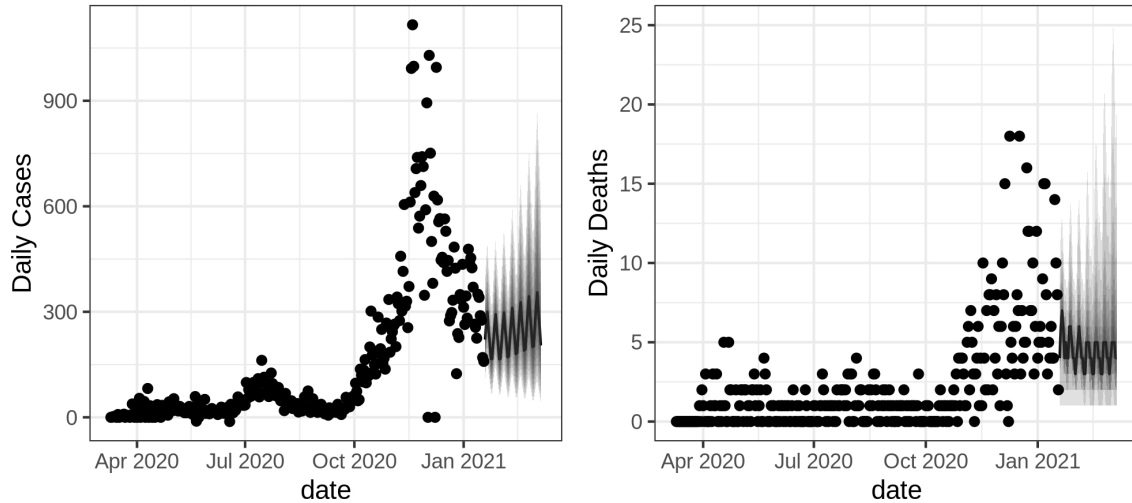
So what?

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

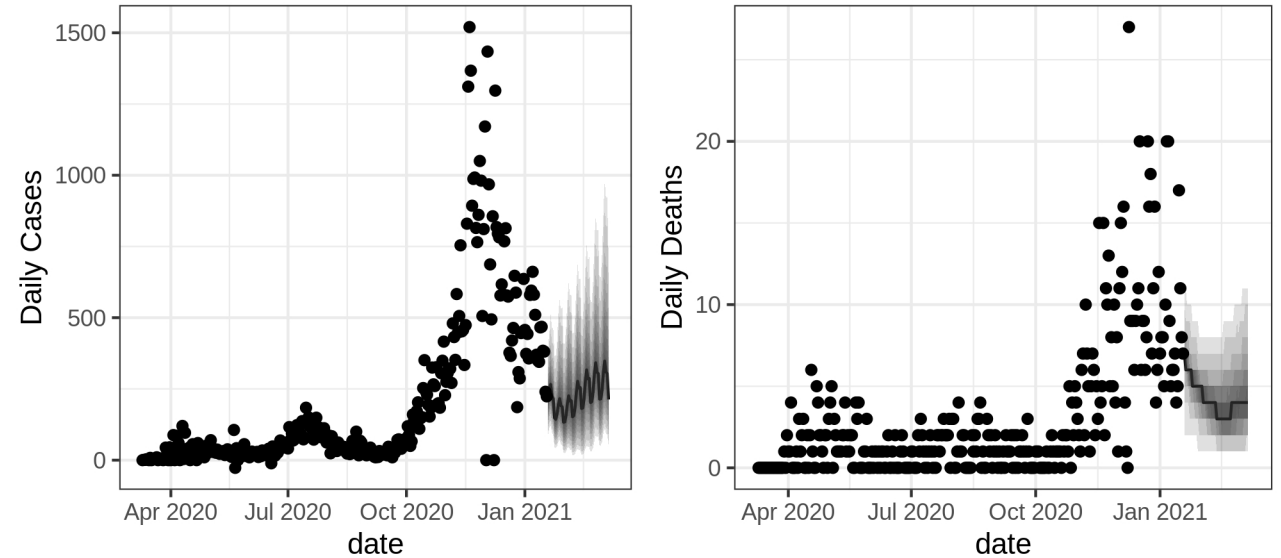
# > Regional Forecasts & Hospitalizations

# Central Region Forecasts

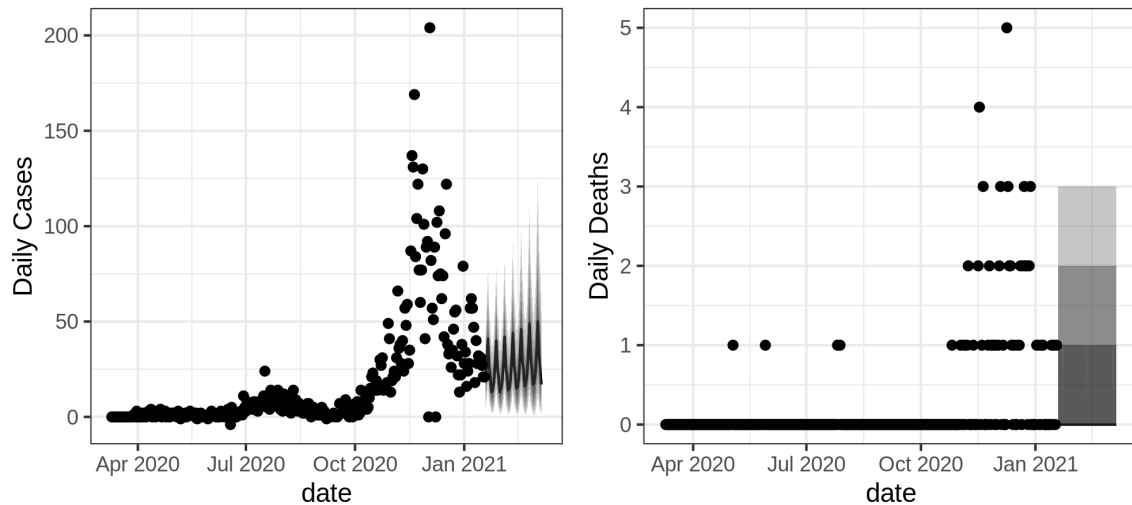
*New Mexico - Bernalillo*



*Health Region - NM Central Region*



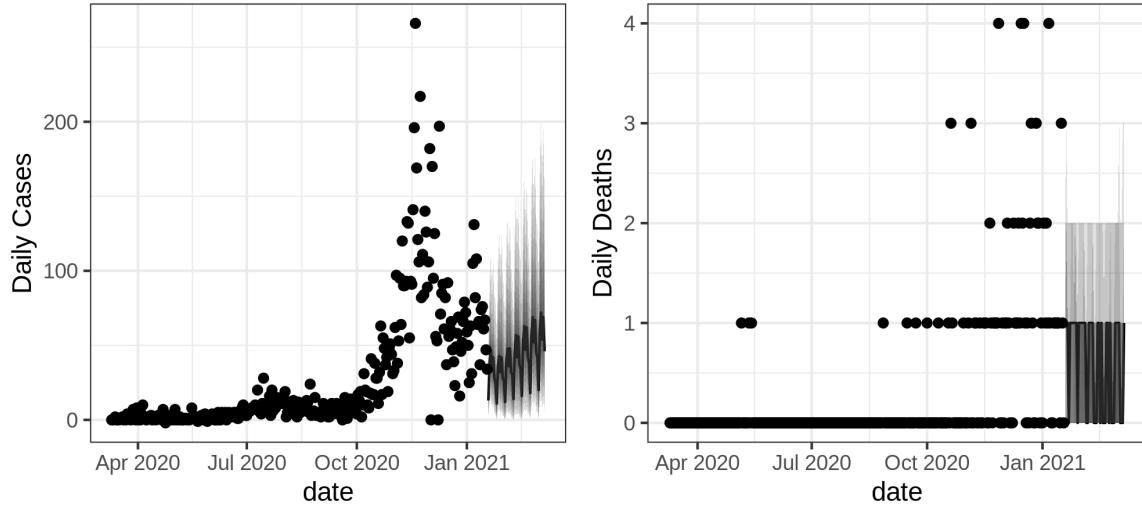
*New Mexico - Valencia*



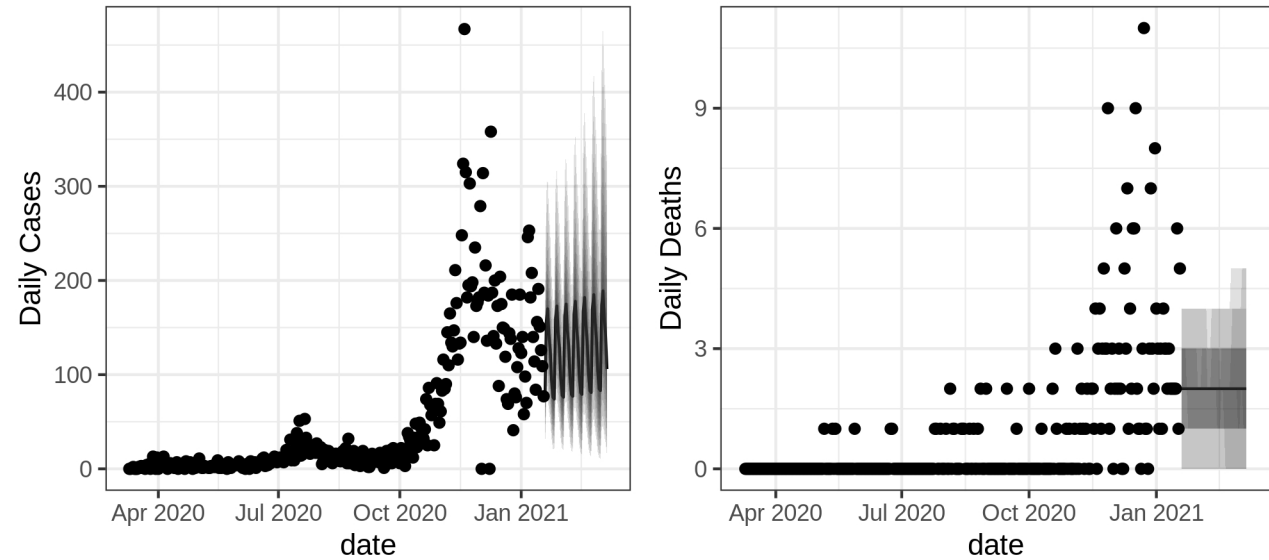
**So what?**  
The average number of cases for the Central Region is expected to be around 250 next week

# Northeast Region Forecasts

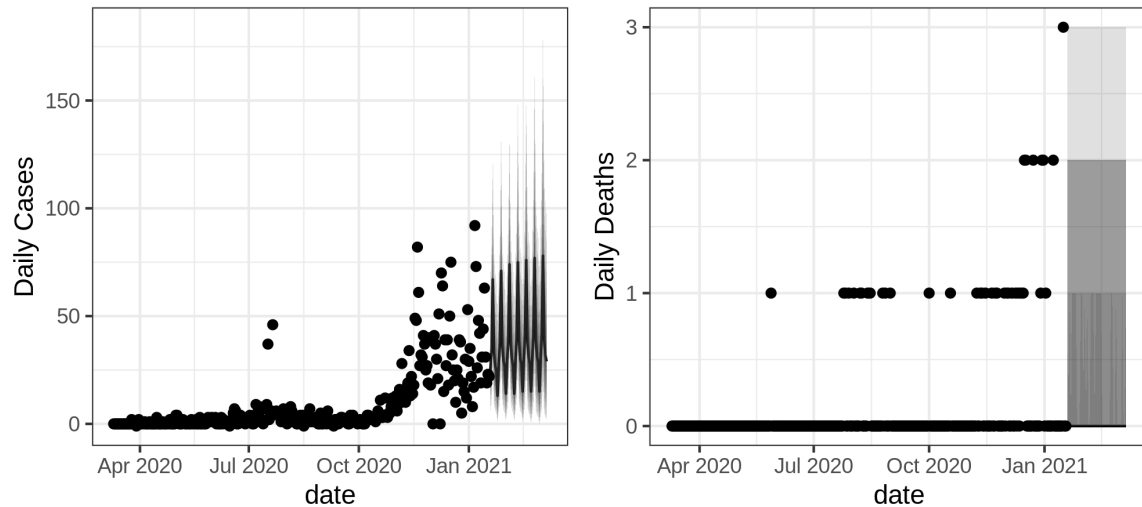
*New Mexico - Santa Fe*



*Health Region - NM Northeast Region*



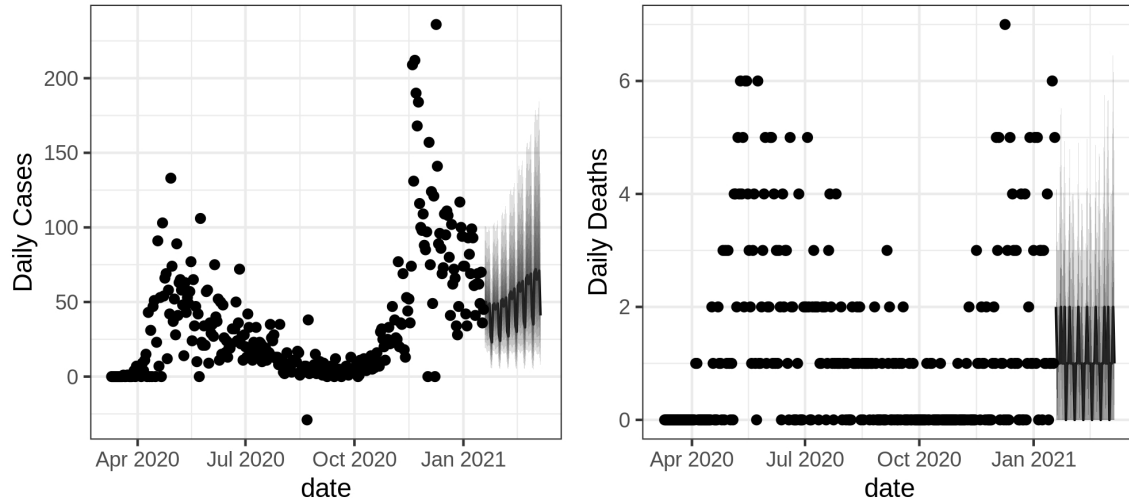
*New Mexico - Rio Arriba*



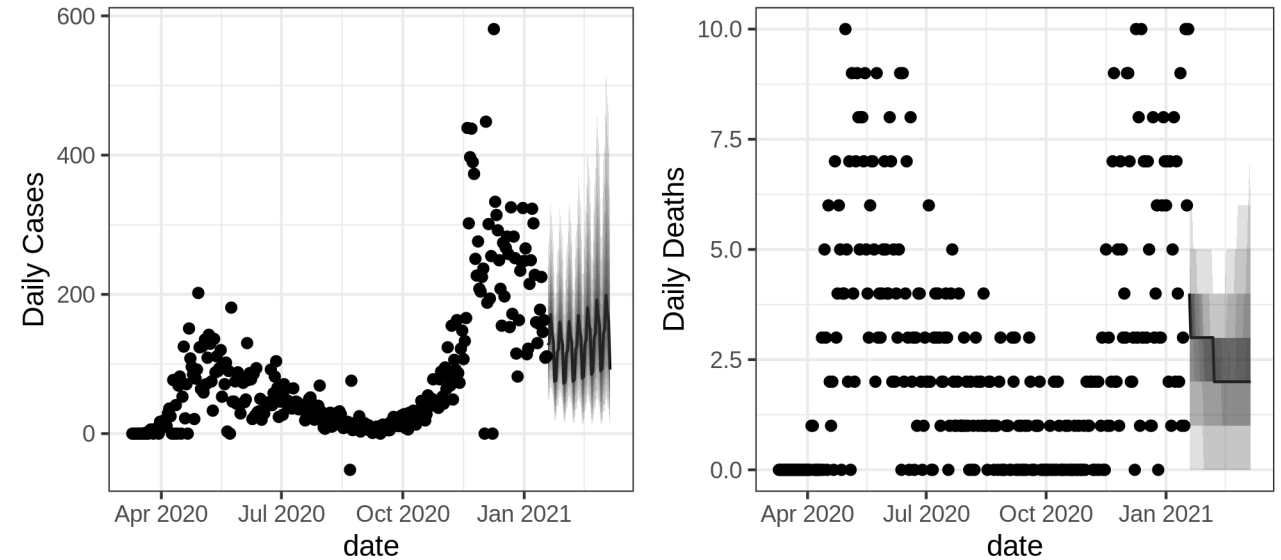
**So what?**  
**The average number of cases for the Northeast Region is expected to be around 130 next week**

# Northwest Region Forecasts

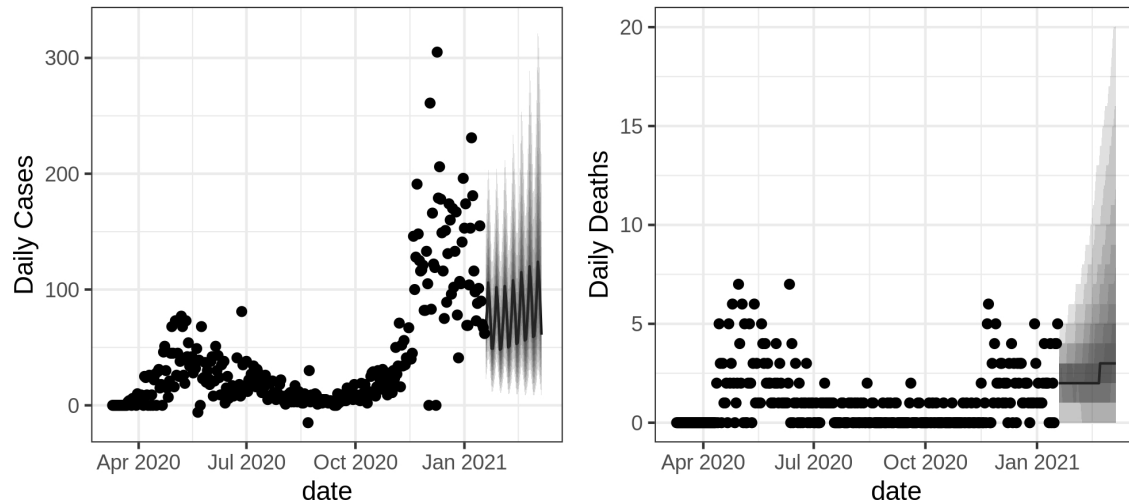
*New Mexico - McKinley*



*Health Region - NM Northwest Region*



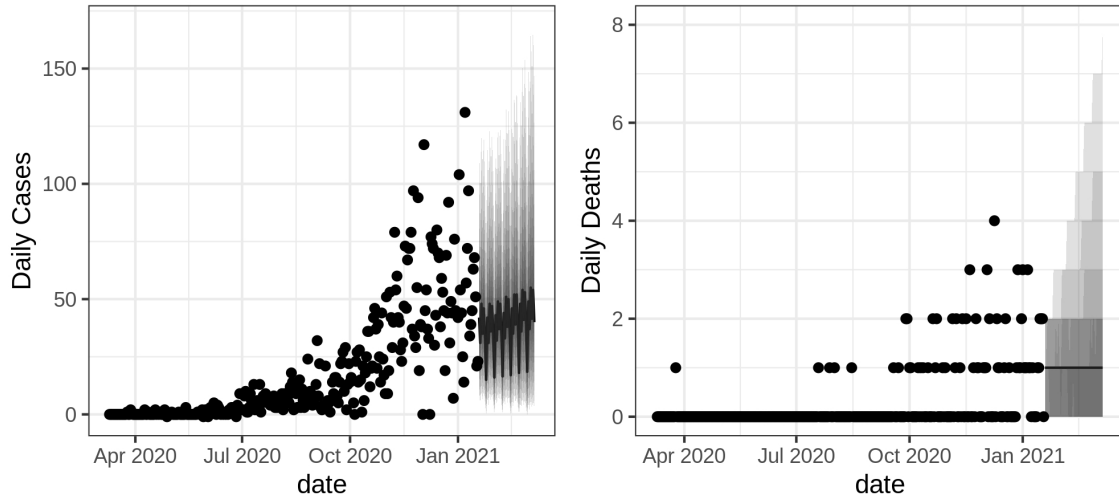
*New Mexico - San Juan*



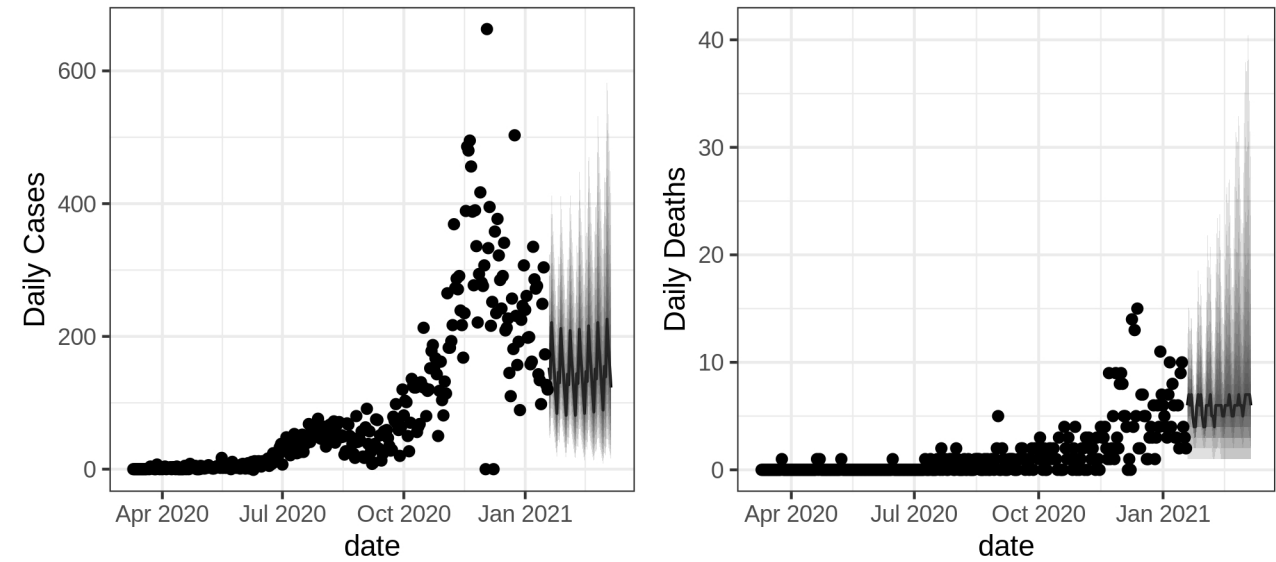
**So what?**  
**The average number of cases for the Northwest Region is expected to be around 150 next week**

# Southeast Region Forecasts

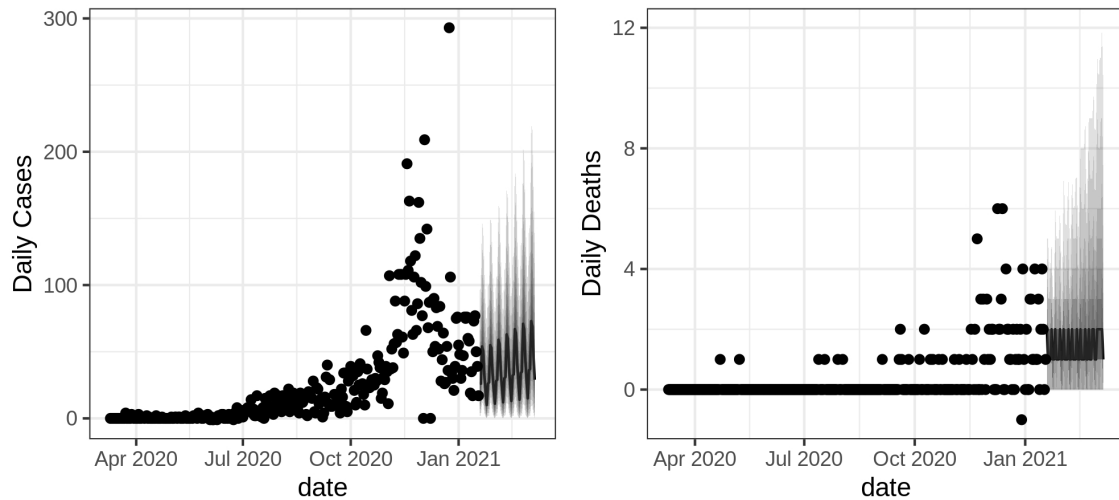
*New Mexico - Eddy*



*Health Region - NM Southeast Region*



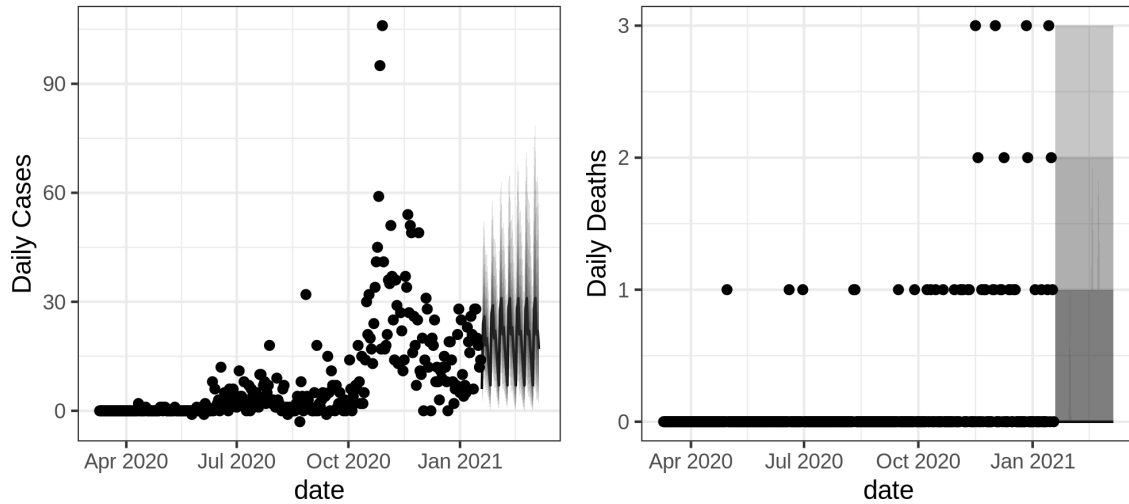
*New Mexico - Chaves*



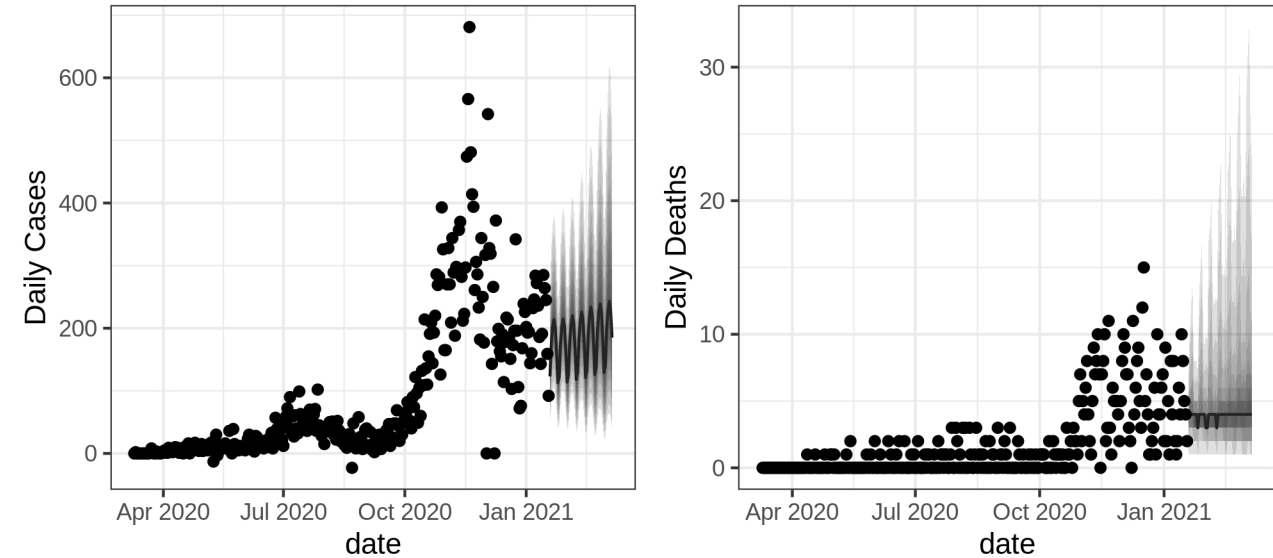
**So what?**  
**The average number of cases for the Southeast Region is expected to be around 150 next week**

# Southwest Region Forecasts

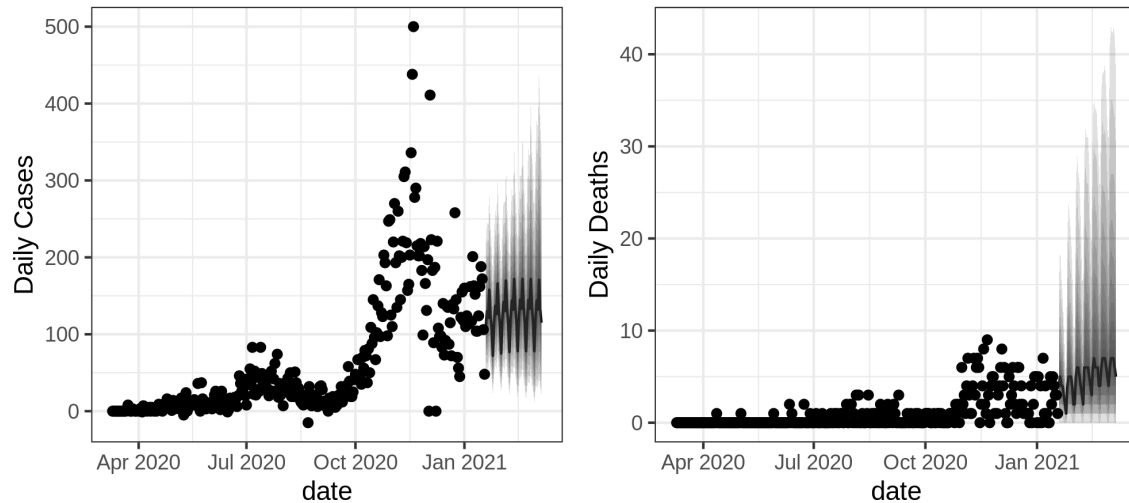
*New Mexico - Luna*



*Health Region - NM Southwest Region*



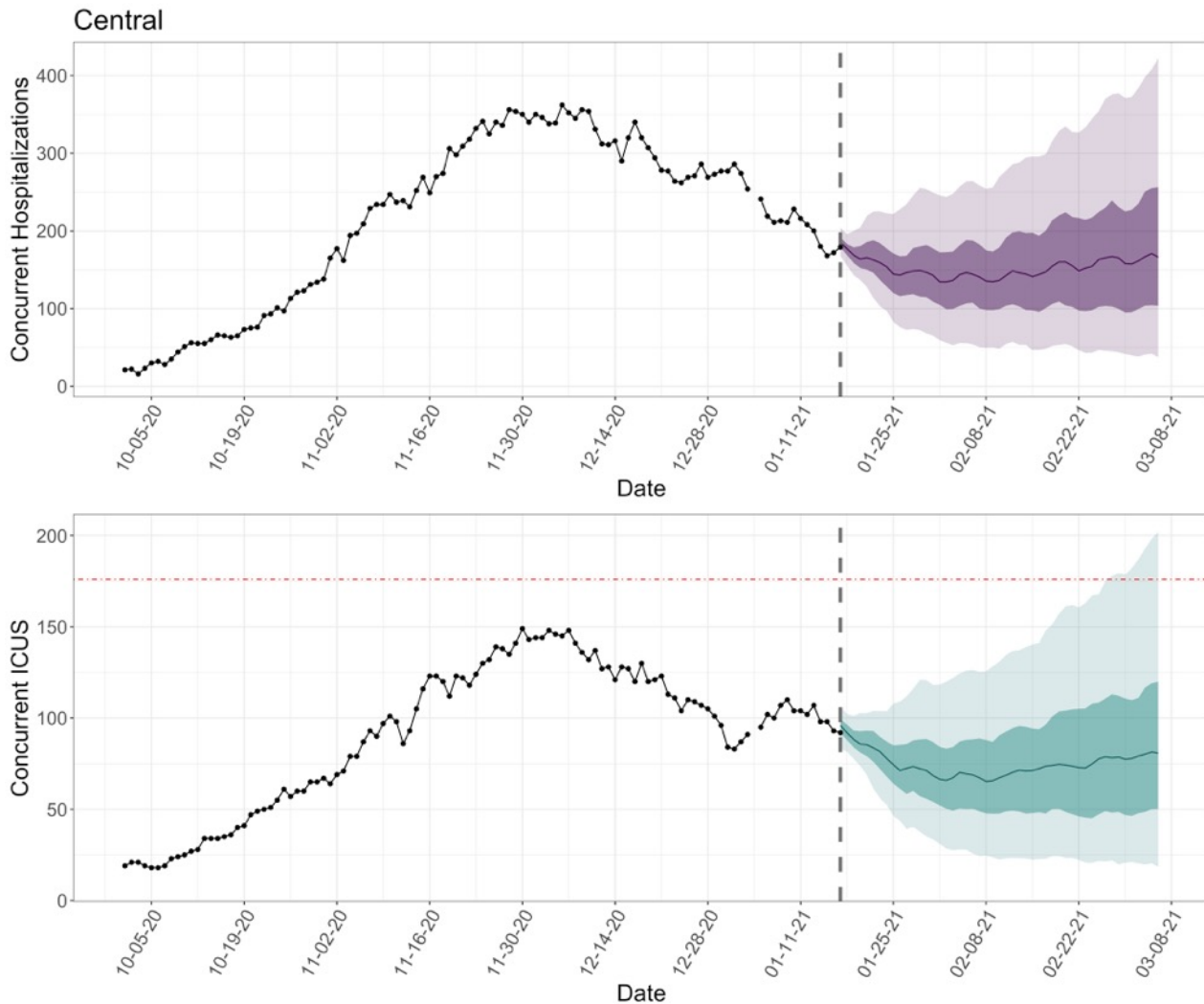
*New Mexico - Dona Ana*



**So what?**  
The average number of cases for the Southwest Region is expected to be around 200 next week



# Regional Hospitalization Forecasts: Central



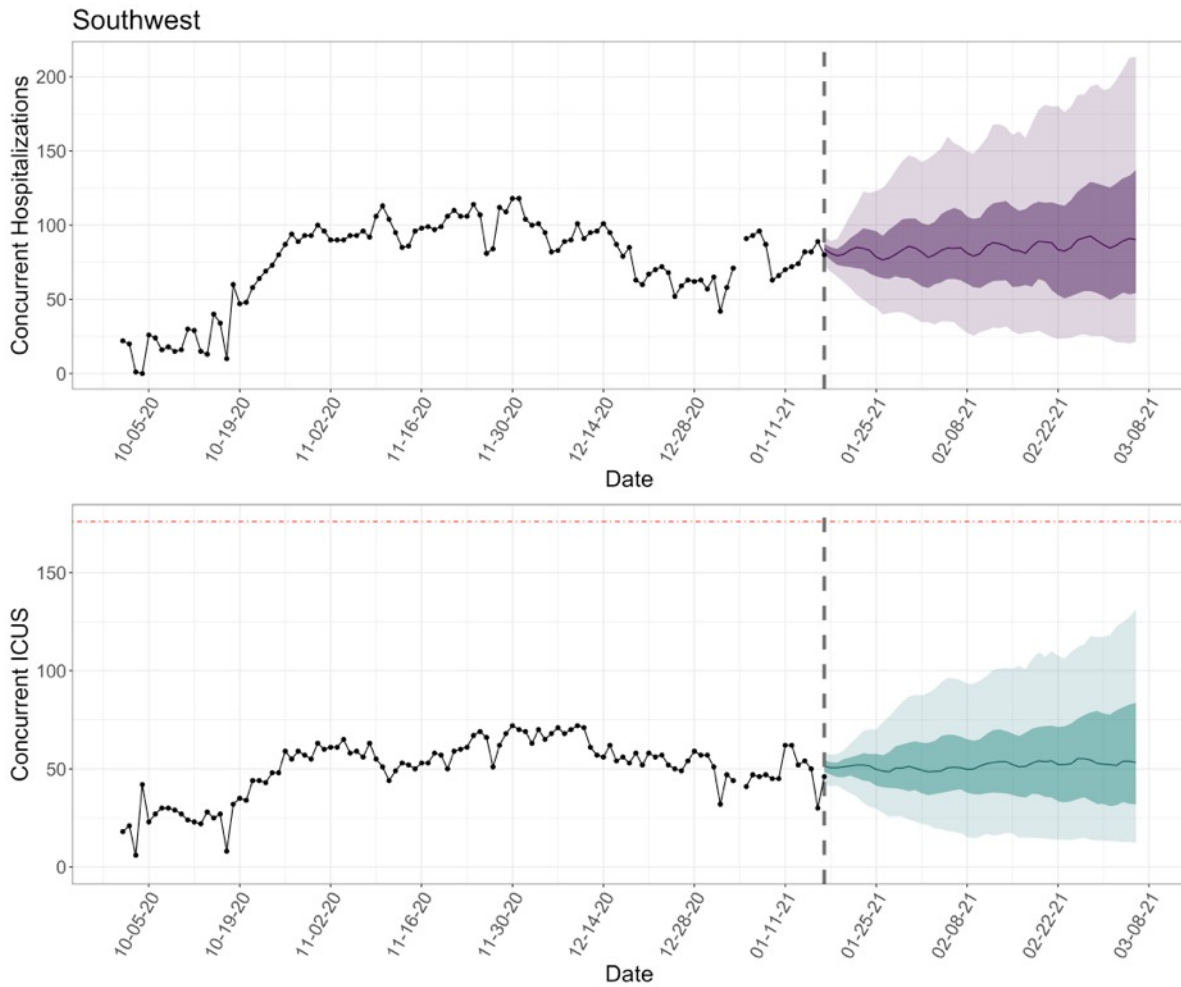
## Concurrent COVID-19 ICUs beds: Central

Week	Qu. 5% (best case)	Qu. 50% (median)	Qu. 95% (worst case)
1/24	52	78	104
1/31	34	68	118
2/7	24	67	125
2/14	23	71	139
2/21	23	74	162
2/28	20	79	179

So what?

ICU bed usage is expected to gradually decrease; tracking with median.

# Regional Hospitalization Forecasts: Southwest



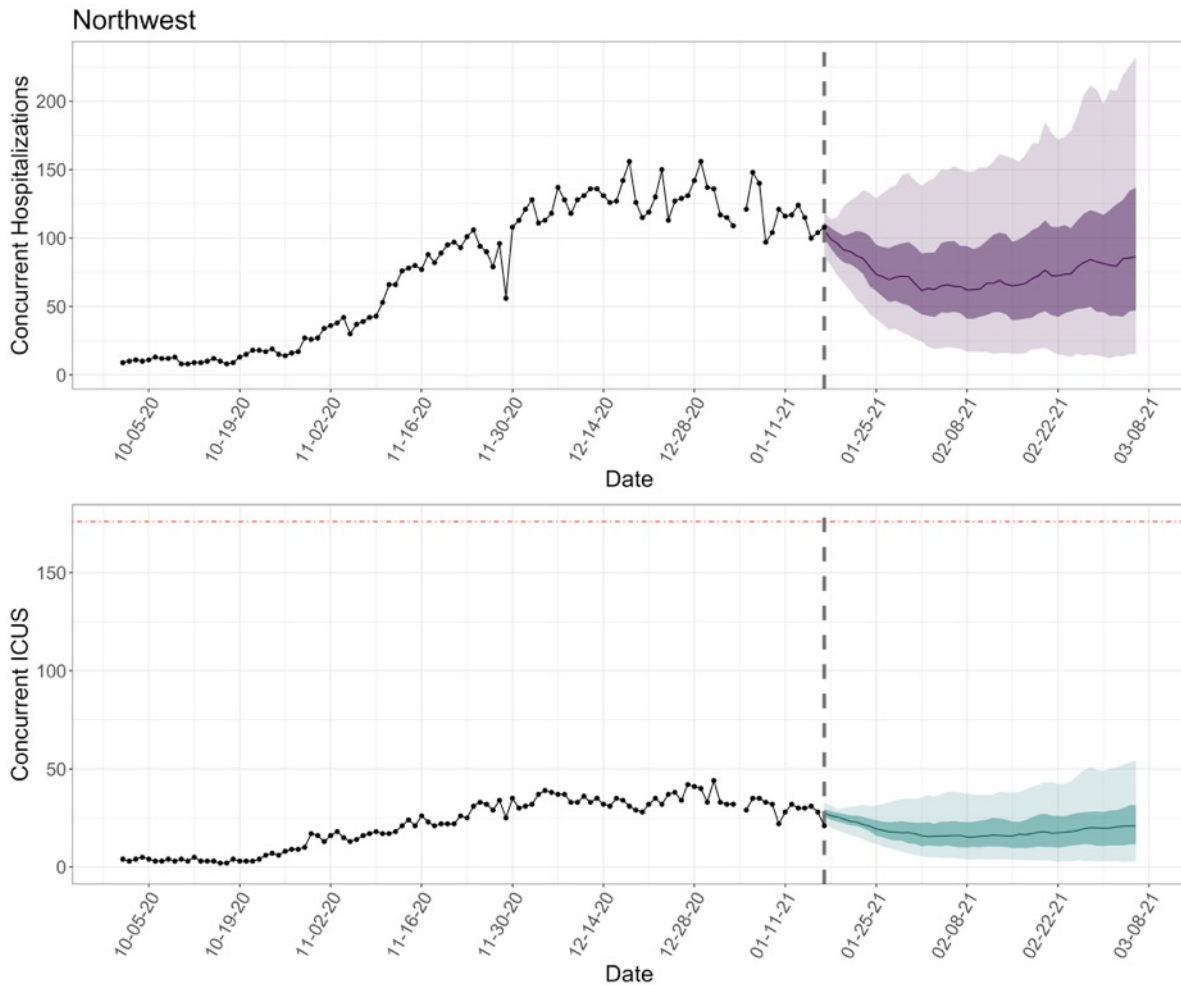
## Concurrent COVID-19 ICUs beds: Southwest

Week	Qu. 5% (best case)	Qu. 50% (median)	Qu. 95% (worst case)
1/24	31	51	70
1/31	23	50	88
2/7	17	51	95
2/14	17	54	101
2/21	14	54	110
2/28	14	53	117

So what?

ICU bed usage is expected to remain steady in the Southwest region.

# Regional Hospitalization Forecasts: Northwest



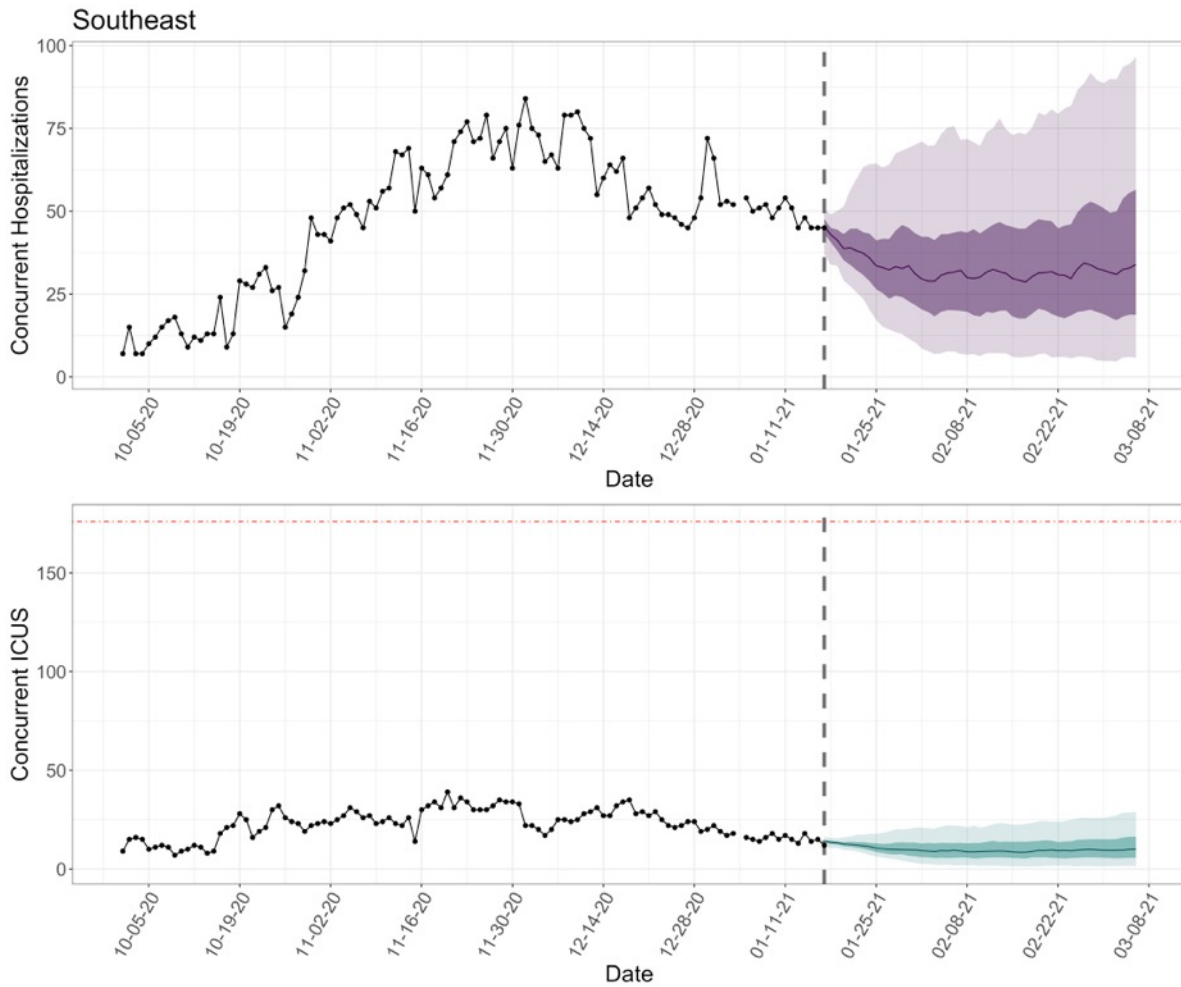
## Concurrent COVID-19 ICUs beds: Northwest

Week	Qu. 5% (best case)	Qu. 50% (median)	Qu. 95% (worst case)
1/24	12	21	31
1/31	6	17	35
2/7	4	16	38
2/14	4	16	38
2/21	3	17	43
2/28	3	20	49

So what?

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

# Regional Hospitalization Forecasts: Southeast



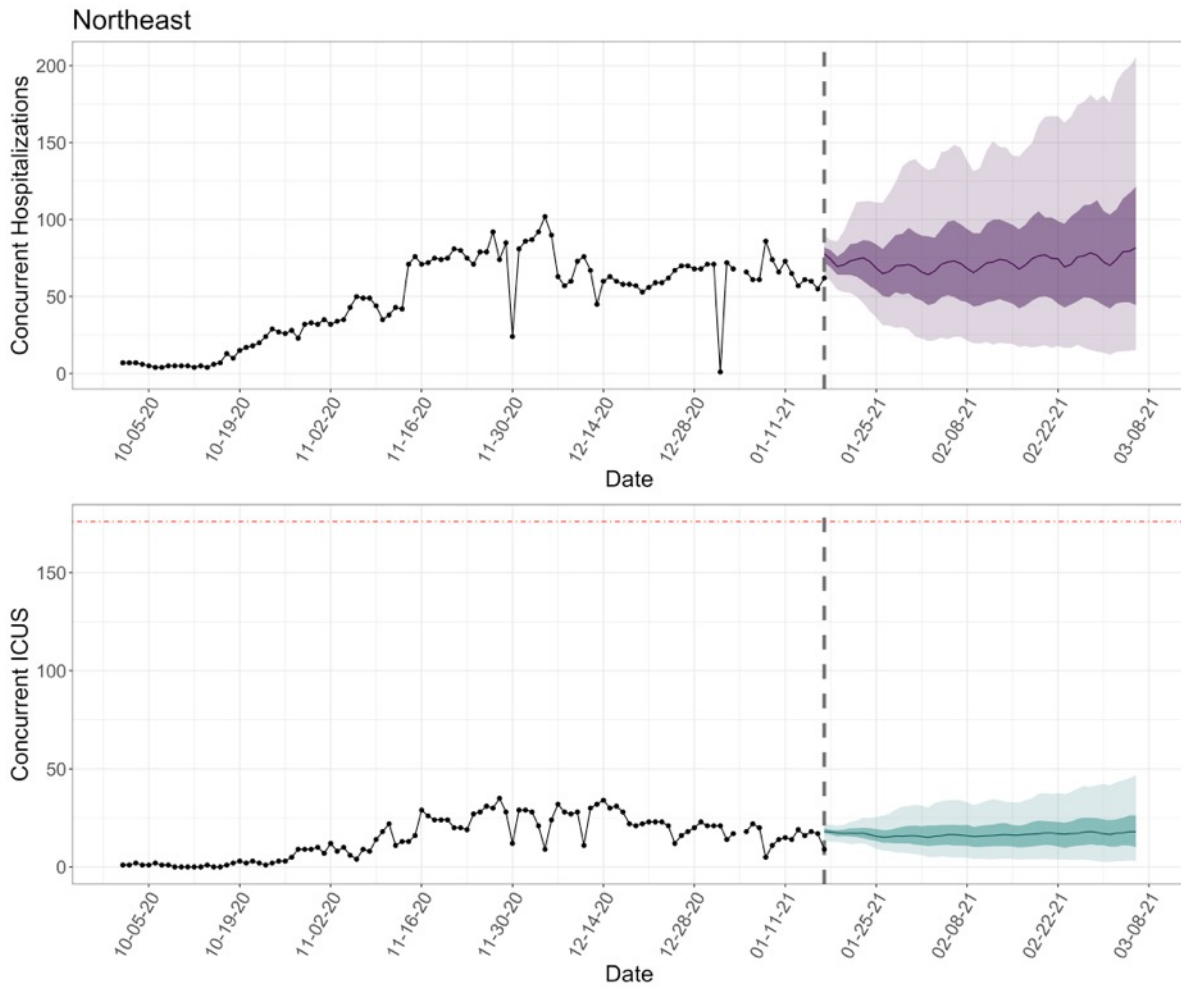
## Concurrent COVID-19 ICUs beds: Southeast

Week	Qu. 5% (best case)	Qu. 50% (median)	Qu. 95% (worst case)
1/24	7	11	18
1/31	3	10	21
2/7	2	9	22
2/14	1	9	23
2/21	2	10	24
2/28	1	10	26

So what?

ICU bed usage is expected to gradually 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)
1/24	11	16	25
1/31	7	16	32
2/7	5	16	34
2/14	4	16	33
2/21	4	17	37
2/28	3	18	42

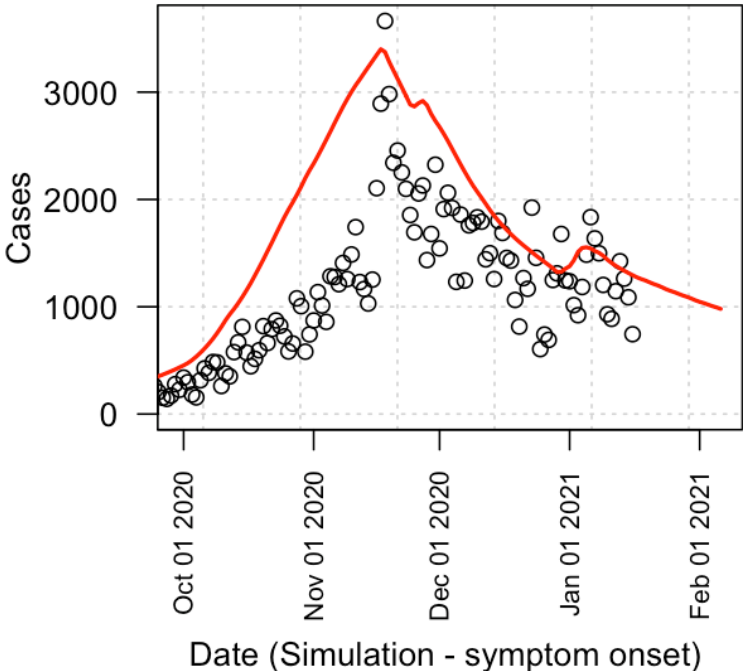
So what?

ICU bed usage is expected to remain steady in the Northeast region

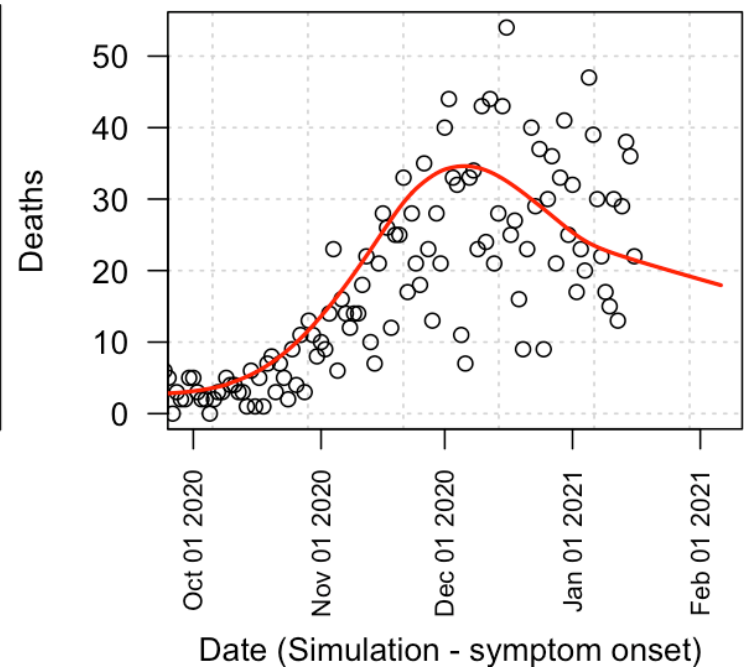
# 19 Jan 2021: EpiGrid modeling

- Assumes all counties remain “red”. (More precisely we assume that transmission parameters stay as they are.)
- Transmission increases due to Christmas and New Year’s are significantly increased over Thanksgiving (>~4x) and reflect a transient 3-4 day reporting delay.

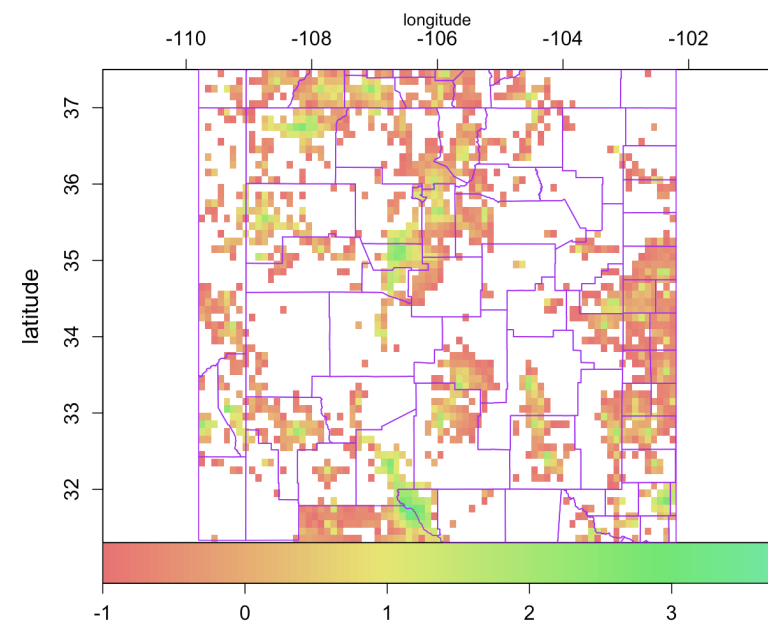
United States\_\_New Mexico



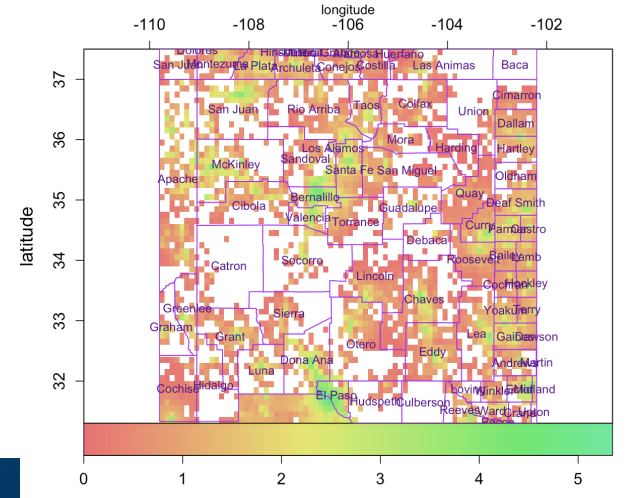
United States\_\_New Mexico



log10 Incidence, wk 50, 2021-02-07

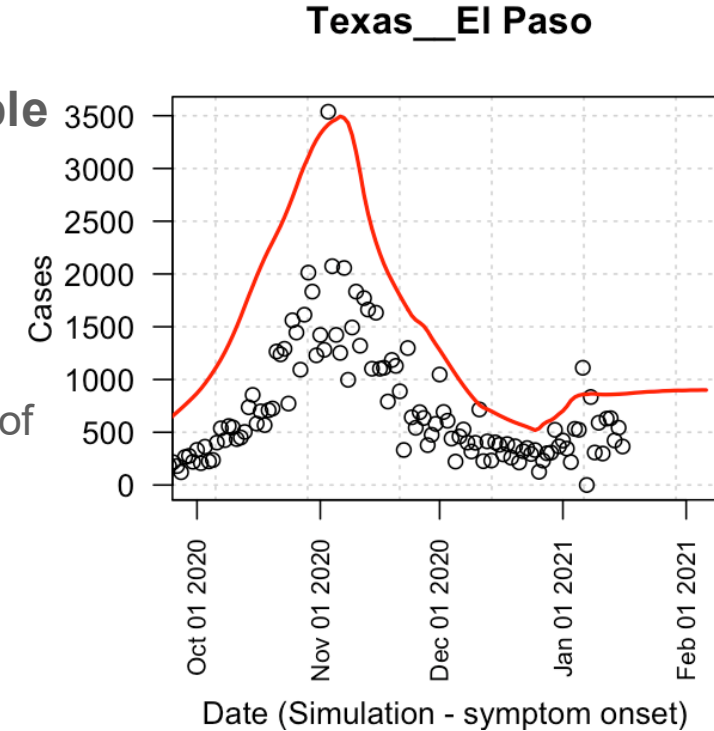


log10 Cumulative cases, wk 50, 2021-02-07



## 19 January 2021 Model (EpiGrid) – more details and information

- Daily reported cases in El Paso are approximately constant.
- Vaccination starts Dec. 15<sup>th</sup> with 2700 people per day changing to 3200 people per day on Jan 4<sup>th</sup> and 90% vaccine effectiveness. This results in 98,800 people vaccinated (1 or 2 doses) on Jan 18<sup>th</sup>. The CDC reports ~99,000.
- 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 higher-risk populations have higher death rates.
- Isolation and quarantine rates are assumed to be stable.
  - Swab to results times: Assuming 1-3 days
  - Base isolation rates mostly modeled at 50% Dec. 8<sup>th</sup>-22<sup>nd</sup> and 45% afterwards (quarantine times slower later).
- Baseline results do *not* reflect B.1.1.7 (N501Y/"Kent") variant of SARS-CoV-2
  - Potential for a 50% increase in contagion/force of infection.
  - No clear epidemiological evidence for widespread B.1.1.7 in New Mexico at this time.
  - Caveats apply, non-flat age distribution of cases, higher viral titers, no increased pathology.

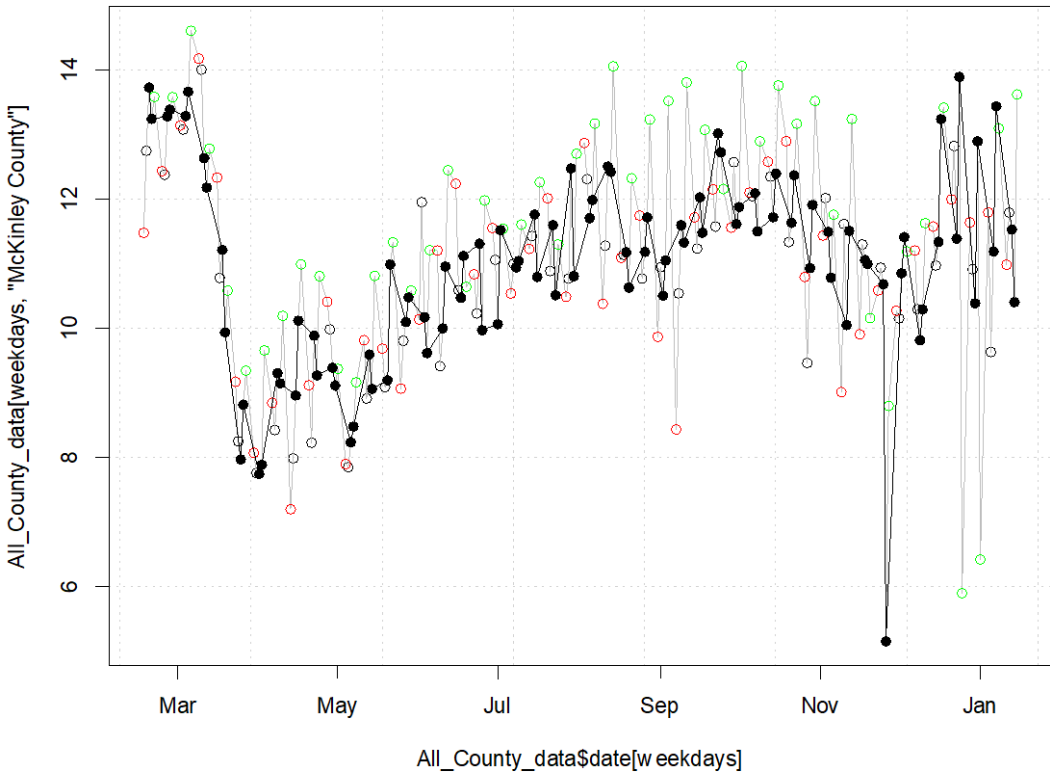


# T-80 Mobility – northern counties (Data only).

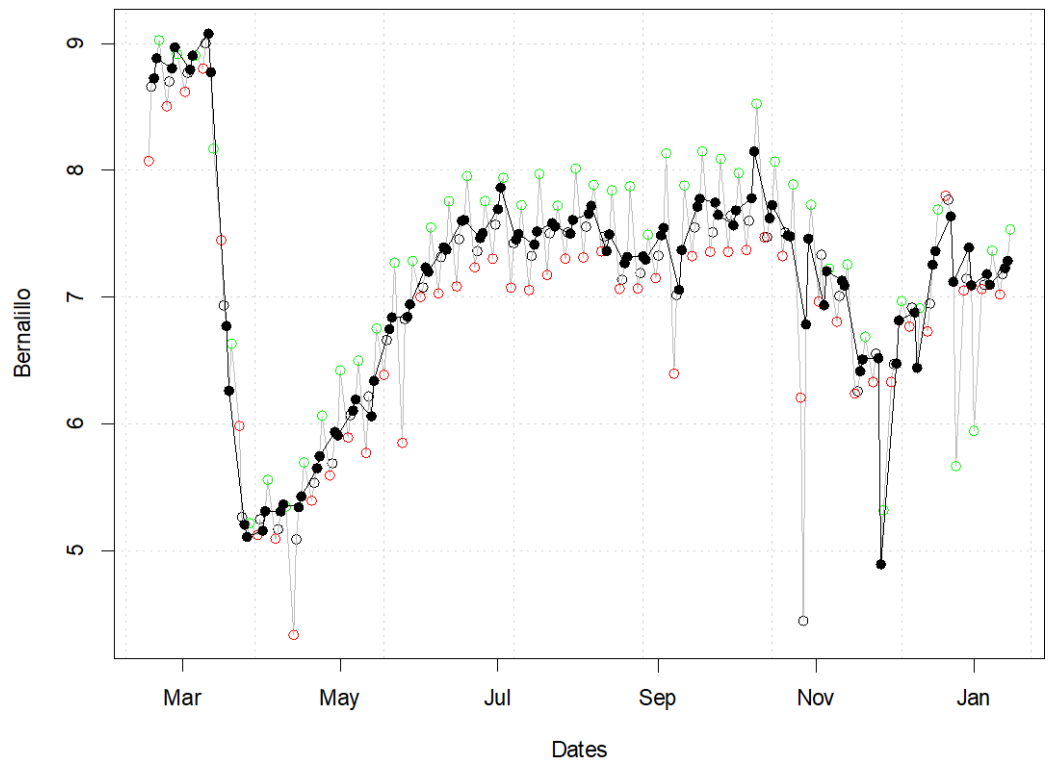
- Bernalillo, Rio Arriba, Sandoval, and San Juan which had relatively low mobility compared to summer last week all have increasing mobility.
- McKinley, Los Alamos, Santa Fe, Taos, and Valencia have fairly stable mobility which is still slightly higher than the first set on average.

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

McKinley



Bernalillo

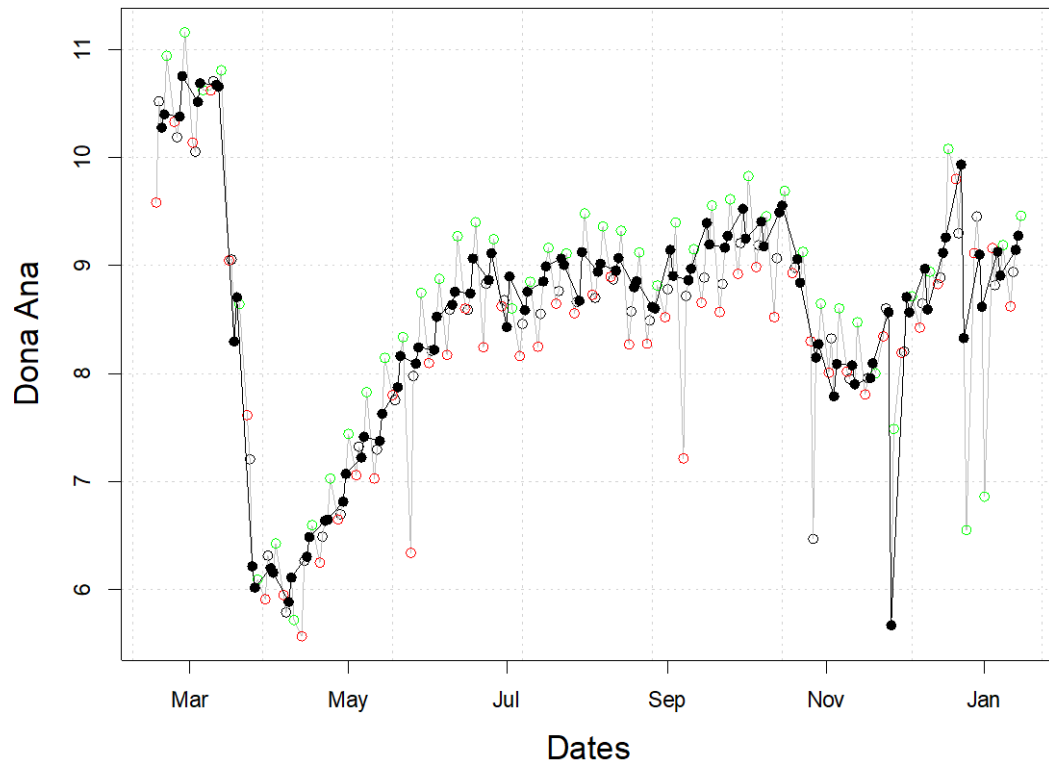




# T-80 Mobility – southern counties (and Curry) (Data only)

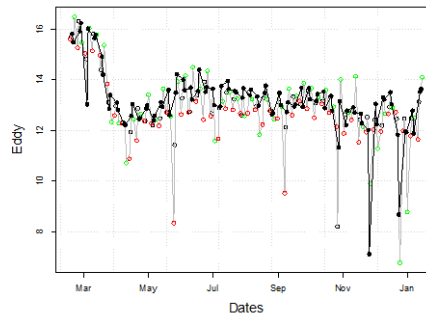
- Luna, Roosevelt lower than summer - with Roosevelt possibly decreasing.
- Curry barely lower than summer
- Chaves, Dona Ana, Eddy, Grant, Lea, Socorro, Lincoln similar to summer, with Eddy increasing a lot (shown).

Dona Ana

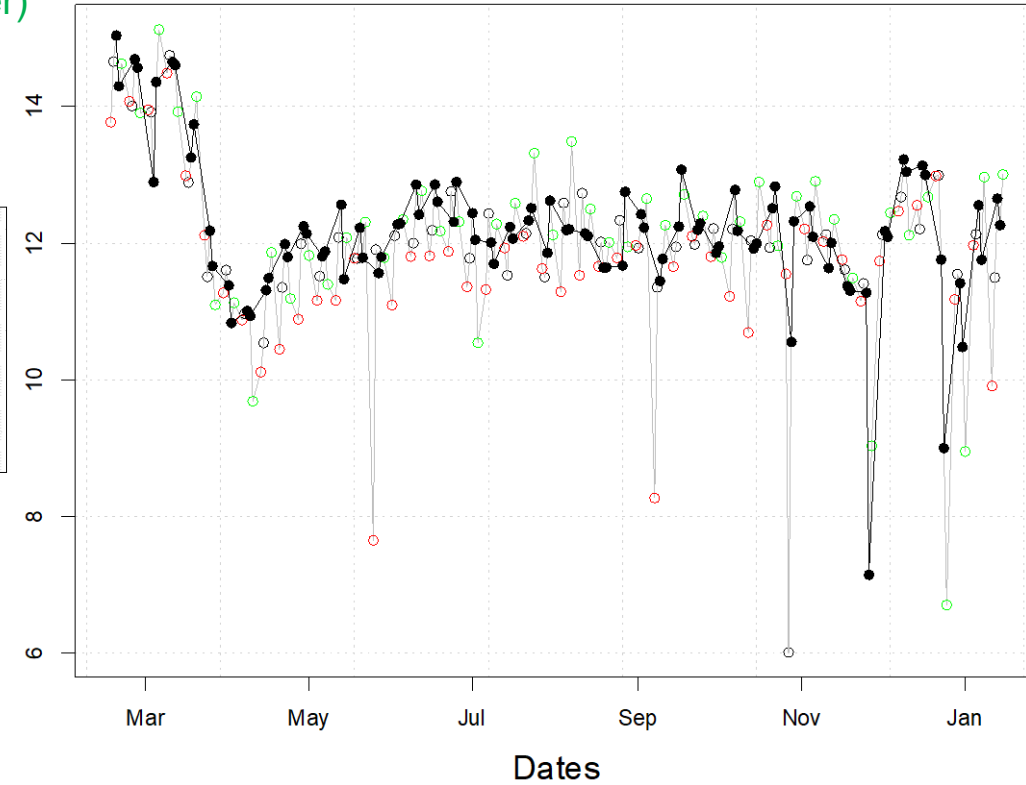


- Weekends NOT shown
- Monday
- Wednesday/Thursday
- Friday (usually higher)

Eddy



Lea



# Fundamental Considerations for Vaccination Objectives. Effects Modeled.

## 0. Vaccination is included.

**1. Reduce the death rate.** Time frame ~4 weeks to initial effects with Pfizer. Minimal evidence – based on epidemiological data – of a reduction in CFR or IFR.

- Early administration to high-risk populations and individuals at elevated risk of mortality (immediately after 1a).
  - At-risk and often congregated populations in multi-generation housing, etc.
  - People living with ESRD, DMII, COPD, etc.
  - 65-and-over years of age, see *recent TX directives for vaccination* after group 1a (older populations).
- *These populations are driving hospital load, and mortality.*
- High risk-for-mortality populations are *widely distributed* and preferential administration is unlikely to inhibit other objectives.

## 2. Lower the rate of spread. Connectivity-based, and geographically-based.

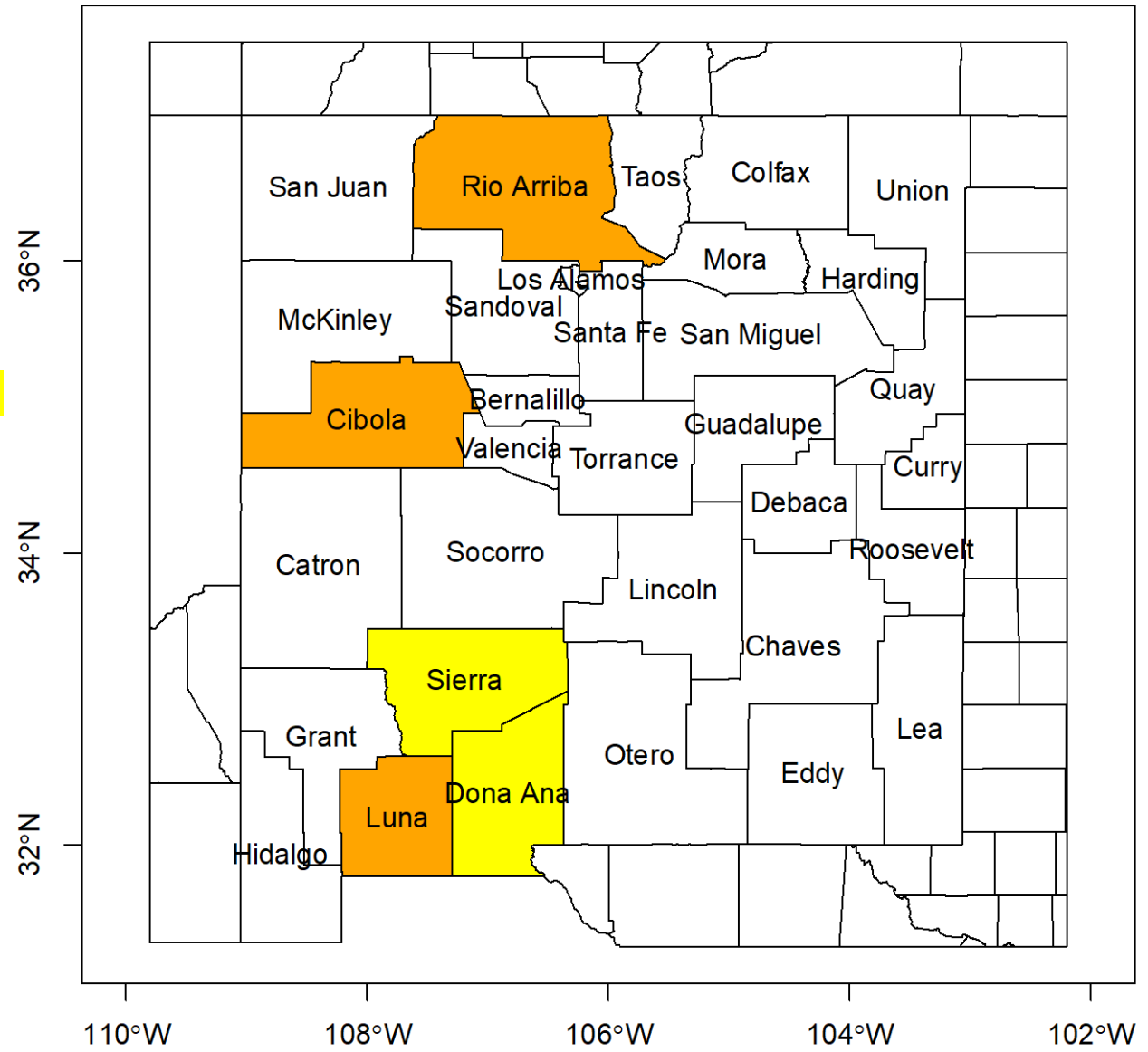
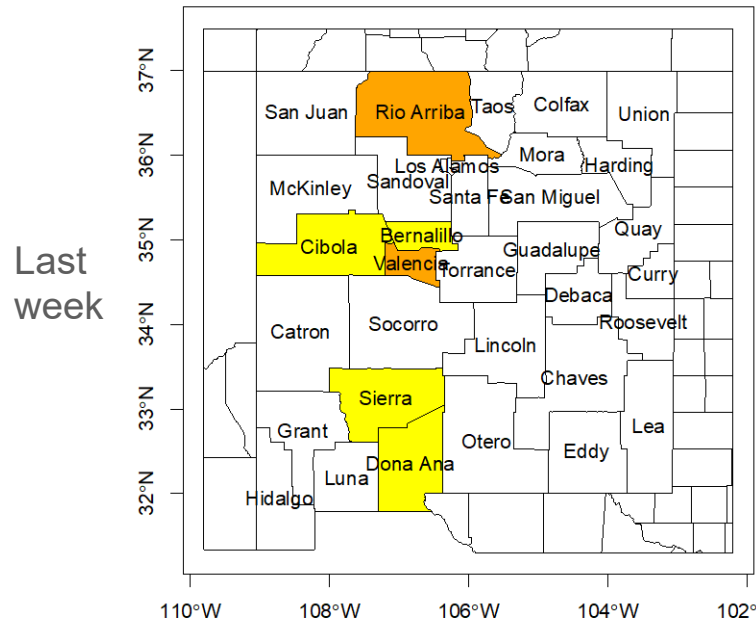
- Initial (threshold-discernable) effects on epidemic growth rate are present in NM's EpiGrid *model*. Quantification remains to be done.

**3. Achieve vaccine-mediated herd immunity.** Time frame determined by integrated vaccine production and administration.

- Because vaccine-mediated herd immunity can go well beyond the extinction threshold, this creates an opportunity for the elimination of COVID.
- Recent events in the B.1.1.7 (N501Y & assoc. mutations) point out the *extraordinary utility of elimination as distinct from epidemic “control”*.
- The presence of B.1.1.7 in the US may create a race between strain replacement and vaccination to avoid undesirably outcomes.

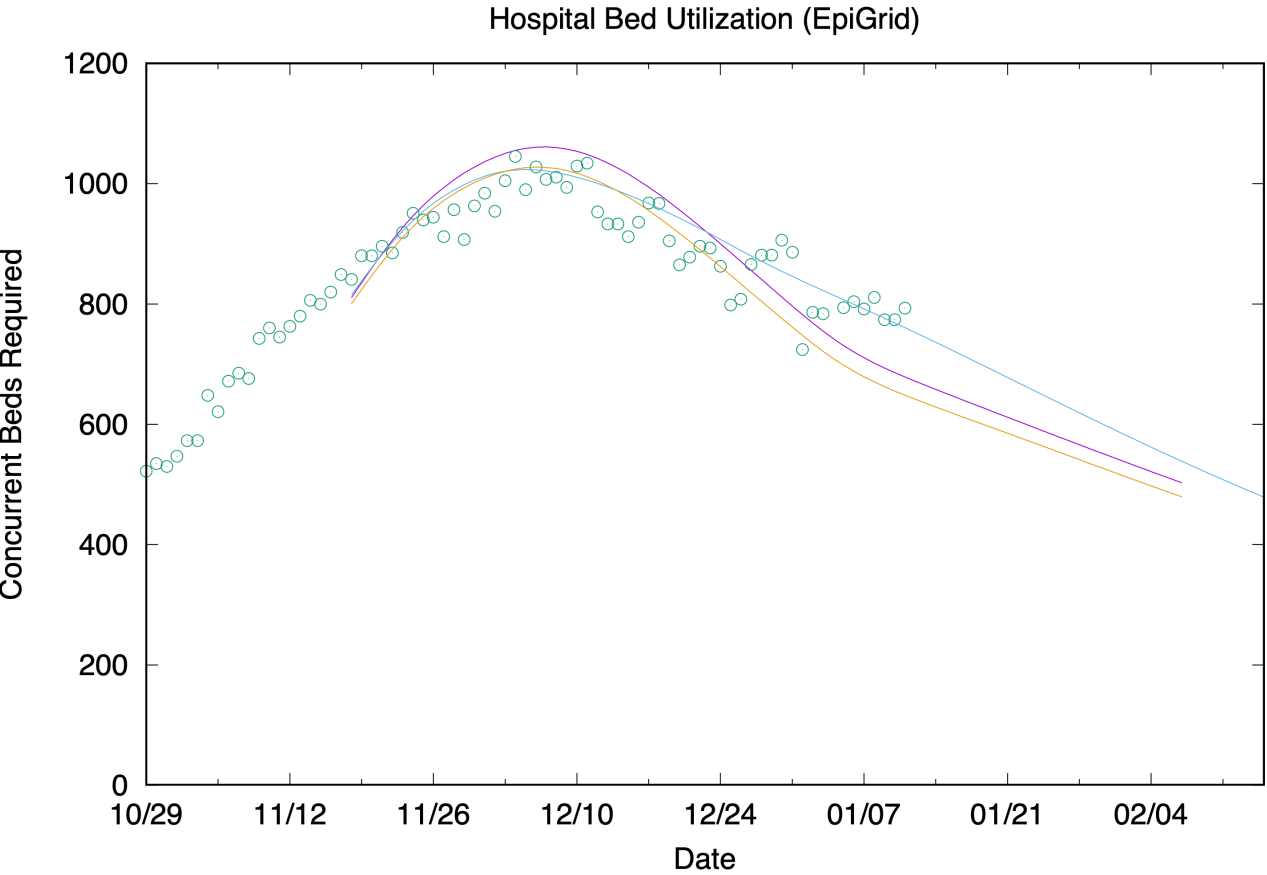
# Situational Awareness:

- Cibola, Luna and Rio Arriba have increased transmission compared to what is expected from mobility.
- Dona Ana, and Sierra have slightly increased transmission compared to what is expected from mobility.

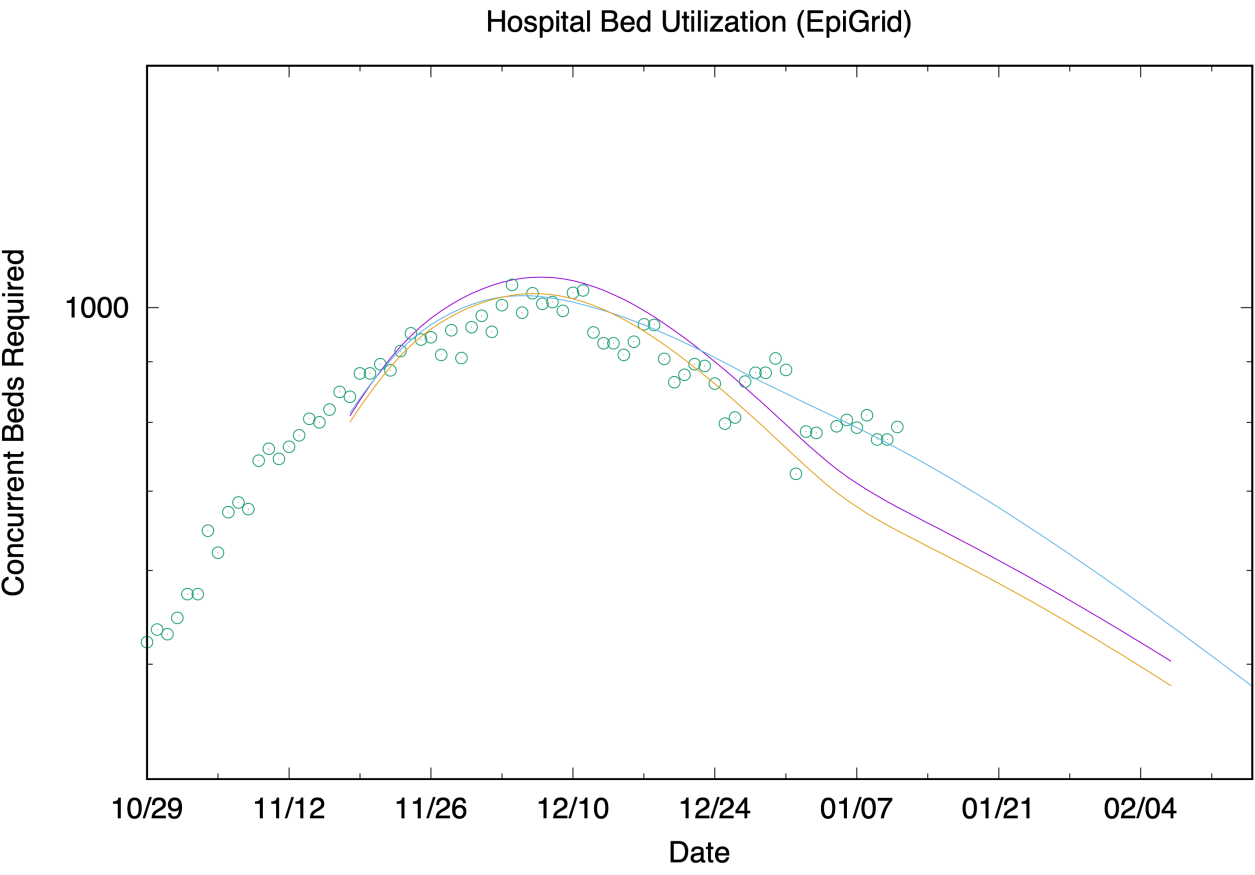


# Hospital bed concurrent usage by COVID-19 patients

- Left panel: Linear vs. time (y-scale=1:1200) shows hospital beds. Models: 19Jan21 (middle), 12Jan21 (lower), 15Dec20 (upper).
- Right panel: Log vs. time, same data and models (y-scale = 400:1600).
- Christmas and New Year's are 4-5x Thanksgiving modulation of the force of infection/level of contagion.
- Some slowing in the decline may soon be evident (relative to 15 December 2020).



Tue Jan 19 10:55:50 2021



Tue Jan 19 11:00:44 2021

# Conclusions and Discussion

- New Mexico's epidemic spread appears to be slowing declining and at a high level of incidence.
- **Variant B.1.1.7 (N501Y/"Kent") represents a source of potentially dangerous uncertainty through strain replacement. Monitoring capable of detecting B.1.1.7 spread in New Mexico should be a priority.**
- **El Paso's recent daily incidence is level.**
- Nationwide geographical dispersion likely a significant source of cross-state seeding of local transmission.
- Bernalillo's role driving ICU need/requirements is less important compared to statewide resources than in the past.
- The effects of vaccination are detectable in New Mexico's *Epigrad model*. Quantification not yet available.
- Targeting vaccine to high-mortality areas and populations will have a large 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 demand for beds from COVID-19 patients.
  - Schools are highly mitigated, elementary school provides little evidence for in-school spread with the current viral strain. SARS-CoV-2 strain B.1.1.7 represents a potential risk to in-person schooling plans. Improved PPE might be required, etc.
  - B.1.1.7 is not yet the dominant epidemiological variant in New Mexico.
  - **There is an urgent need for a capability to detect B.1.1.7. The level of contagion may be 1.5x that of the current "Milan" strain that dominates in the US and NM.**
  - 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.