



COVID-19 Epidemiologic Update

A Presbyterian, LANL, SNL, and NMDOH Partnership

April 21, 2020

Key Context for New Mexico



- The actions taken by Governor Lujan Grisham in partnership with the DOH and the healthcare community have been very effective in **consistently slowing transmission** of COVID-19 in many regions of the state.

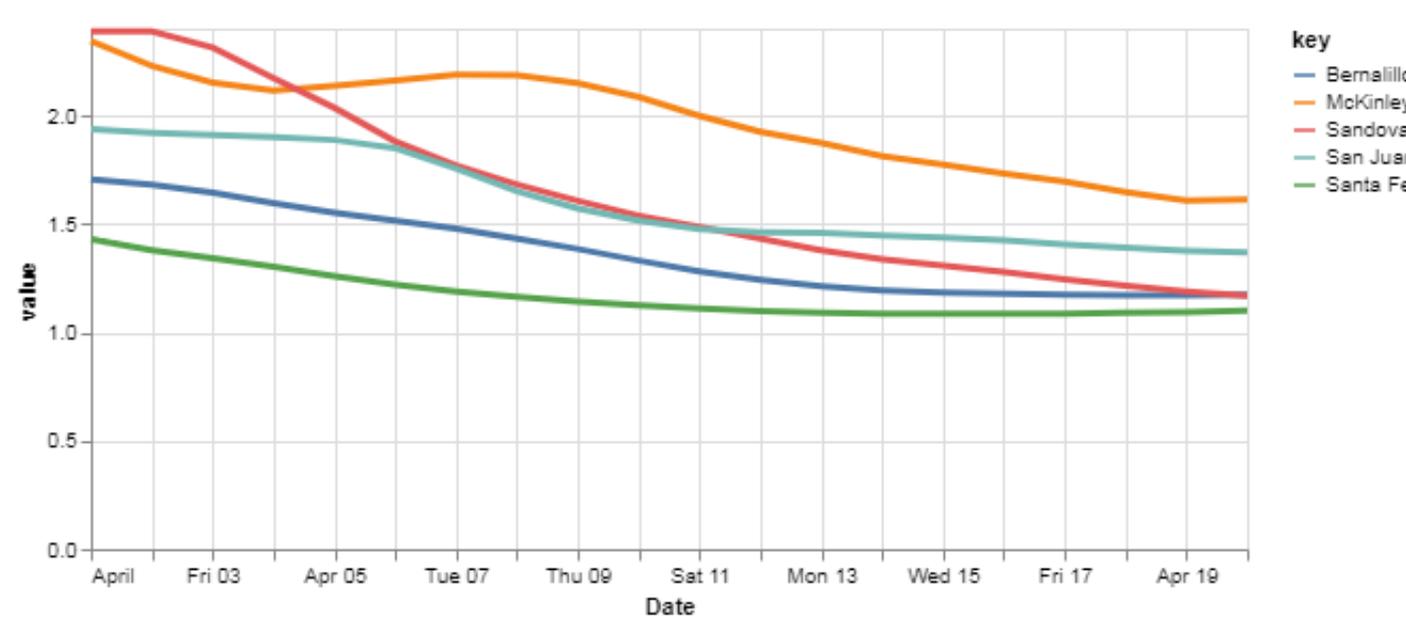


- NM has a window of opportunity and must now focus at a county level
 - **Ensure ICU** capacity in NW portion of state
 - **Develop** county level strategy for trial of relaxation of social distancing while preventing resurgence
 - **Improve** distancing in key counties
 - **Invest** in Testing and Tracing expansion

Actions in NM are Working

Statewide $R_{\text{effective}}$ is 1.28

R_{eff} over time, specific counties

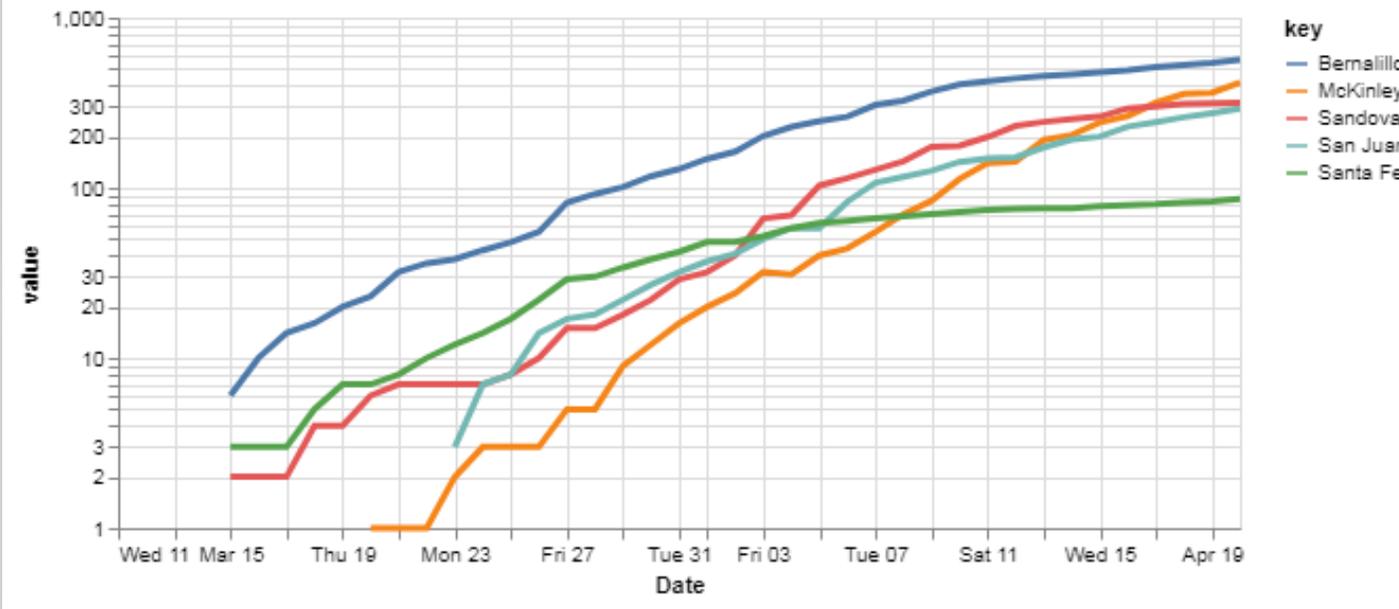


Updated calculation in $R_{\text{effective}}$ pushed back to retrospective graphing

- Updated modeling is now allowing very accurate calculations of $R_{\text{effective}}$
- Although entire state continues to improve, The NW area of the state must further reduce spread of COVID 19
- Counties may need an $R_{\text{effective}}$ at or below 1 to safely initiate relaxation of social distancing

Cases vary widely by geographic location

log(positive cases) over time, specific counties



- Santa Fe has almost fully flattened the curve
- Bernalillo has flattened the curve as well and is following the trend in Santa Fe
- San Juan, Sandoval and McKinley remain unmitigated in COVID spread

NM Modeling and Forecasting Update

- Enhanced **SIR Model** powered by Presbyterian in combination with LANL forecasting and Epi Modeling
- Near **Real-time daily data** feeds
 - State wide testing rates and results
 - Geographic distribution
 - Hospitalizations/Vents/ICU/ and outcomes
 - Capacity and demand by county and facility
 - County level SIR model projections
- Population **Risk Adjusted**
 - Integrated comprehensive data on social determinants of health (SDOH)
 - Integrated Johns Hopkins ACG Groupers for county level risk adjusted for disease burden
 - Further enhanced with health plan claims data and delivery system clinical data
- Partnered with **LANL, Sandia Labs and DOH**

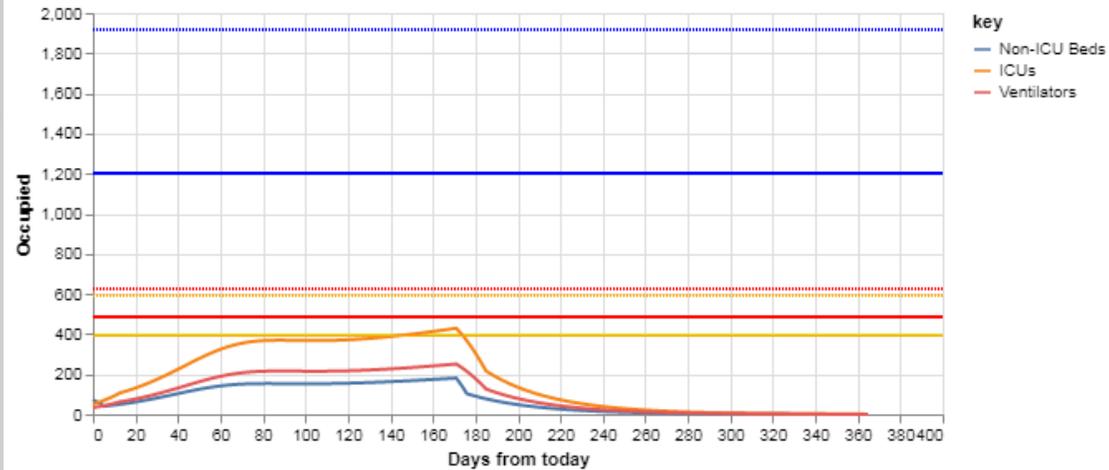
Shifting from initial assumptions to NM specific measured values increases accuracy of modeling

Variable	Initial Assumption	Measured Value	Value as of 4.16.20
R_Effective	2.5, 2.25, 1.5, 1.3 scenarios	Actual Measured Daily Value by key county	1.28
Positive Test Multiplier	4	Calculated by LANL	2
Hospitalization and Mortality	Medical 3.75% ICU 1.25% Vent Rate 75% of ICU Mortality 1%	Actual rolling value / estimated number of total infected	Medical 1.6% ICU 1.4% Vent Rate 58% of ICU Mortality 1.3%
Length of Stay	Medical 8 days ICU 15 days	Actual rolling value / estimated number of total infected	Medical 8 days ICU 10 days ICU on Vent 15 days

NM Has Flattened the Curve – We must now work at the county level

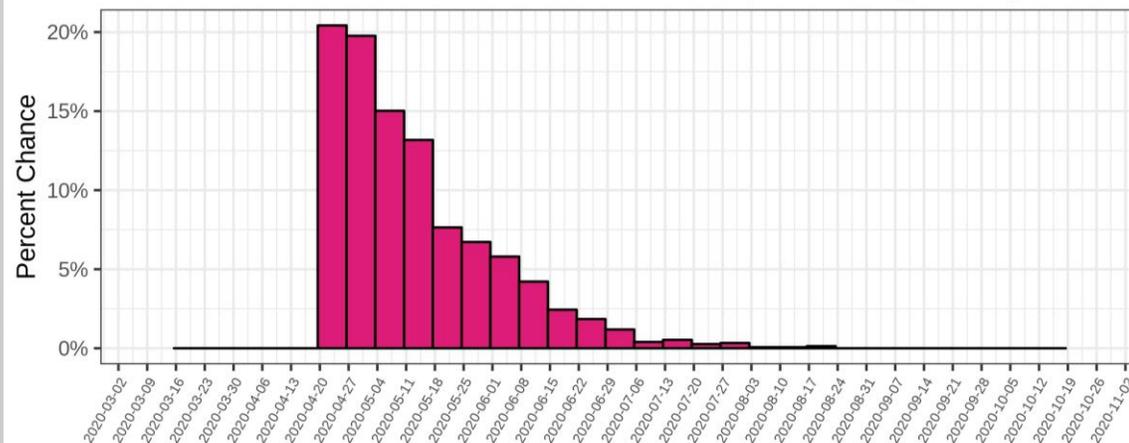
Demand on beds, ICUs, and ventilators

Note: beds and ICUs are counted separately. ICU counts are not a subset of bed counts



- As a state we have successfully flattened the curve.
- As a state we will likely hit our cumulative peak in the next two weeks.
- The statewide view is now less helpful as we have regional patterns that diverge from one another.
- Any changes in social distancing will lead to additional peaks as we do not have adequate herd immunity in NM or the US.

If New Daily Confirmed Cases Have Not Peaked in New Mexico On or Before 2020-04-19, When Might They?

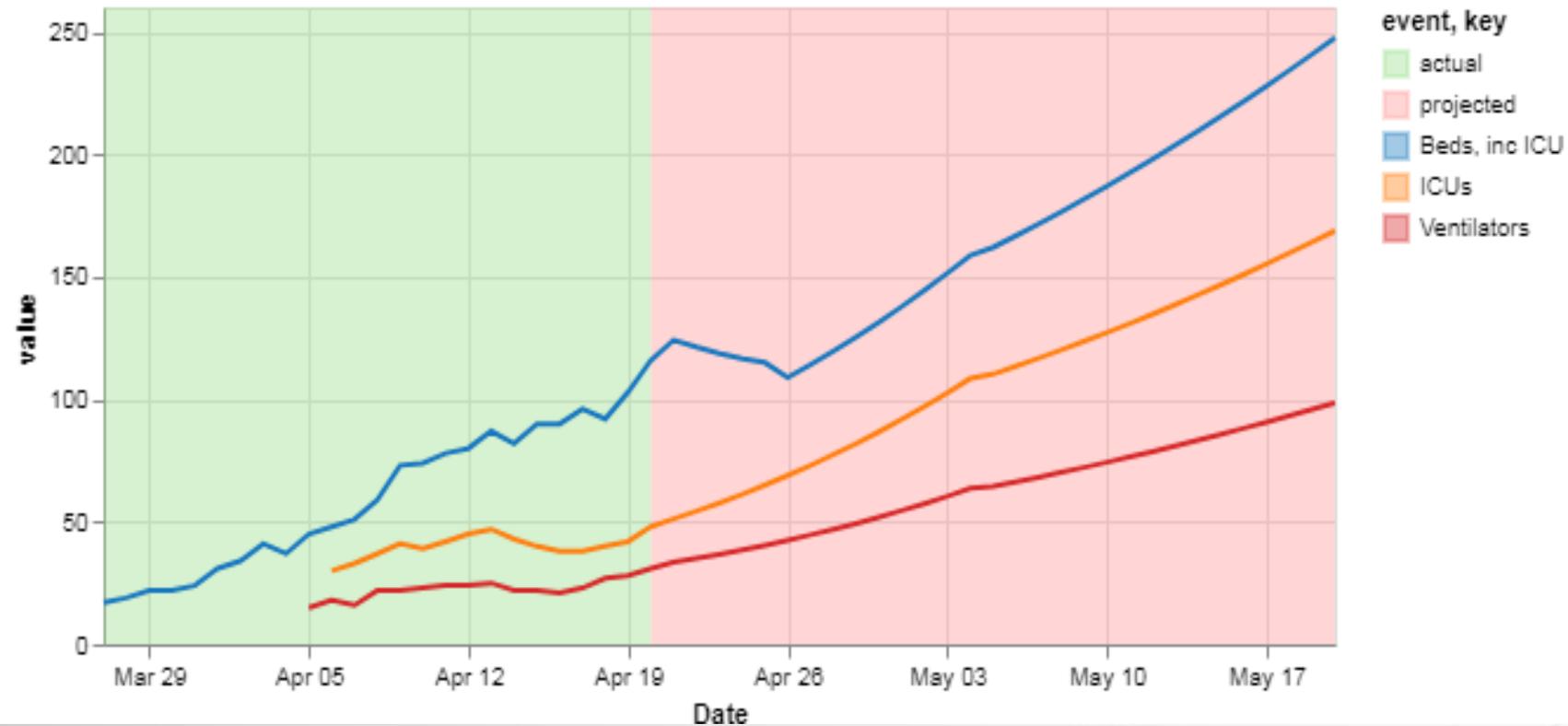


Regional modeling is now required and included in this report.

Healthcare Utilization is tracking to the model

Hospitalized, to-date and projections

For comparison against state-reported data, this chart **includes** ICUs in the count of beds



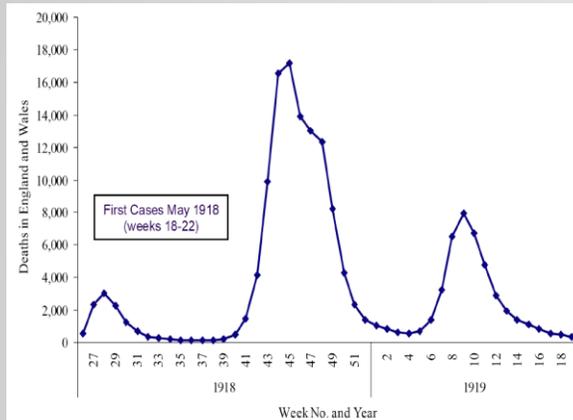
ACTUAL

PROJECTED

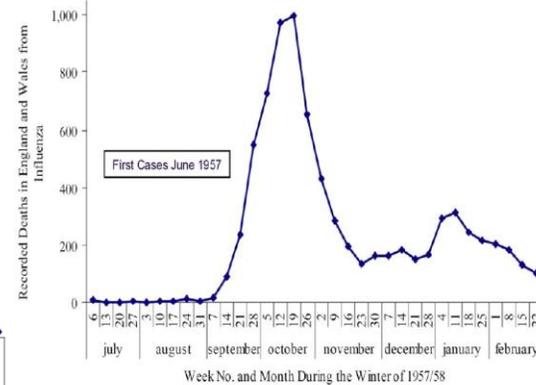
- Actual resources are tracking to modeled expectations.

Pandemics include subsequent peaks

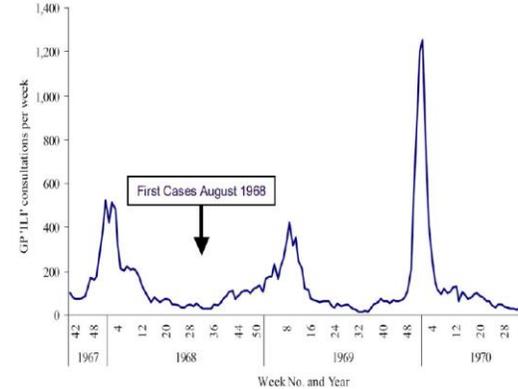
Influenza 1918



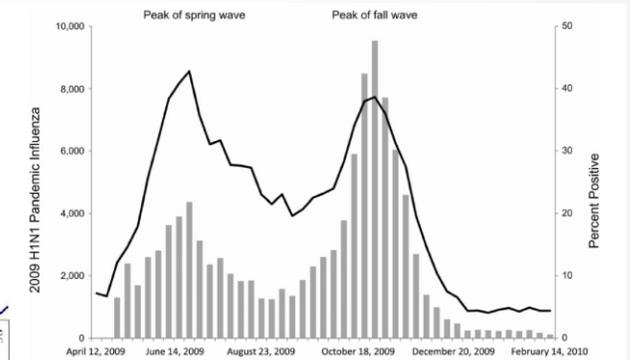
1957



1968



2009 H1N1



- COVID-19, like other pandemics will likely have subsequent peaks
- The degree of relaxation of social distancing will impact the timing and intensity
- Winter months may be complicated due to combined volumes of seasonal Influenza and Covid 19



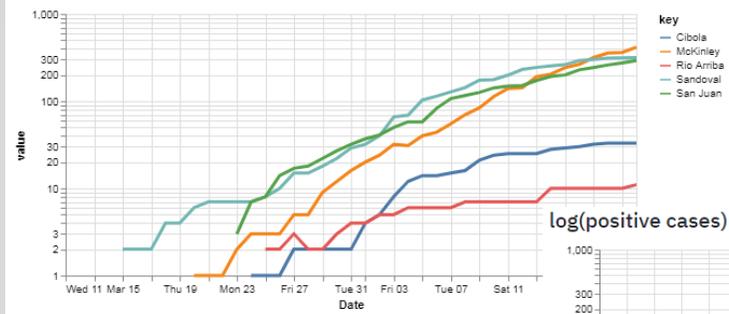
Regional Analysis: Overview

New Mexico

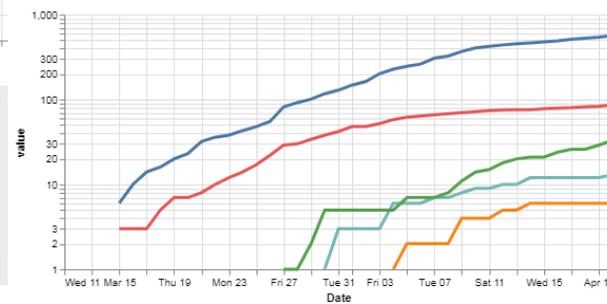
COVID-19 Evaluation by Region

County level models have been built and will be discussed in detail within this section

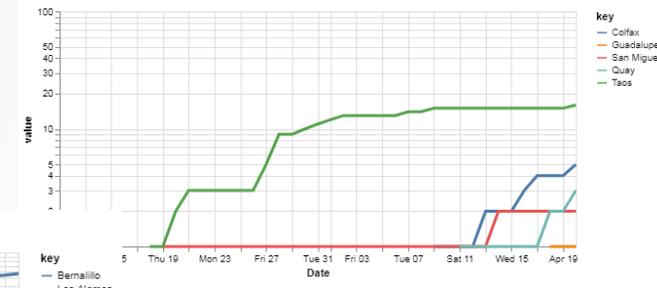
log(positive cases) over time, NorthWest Counties



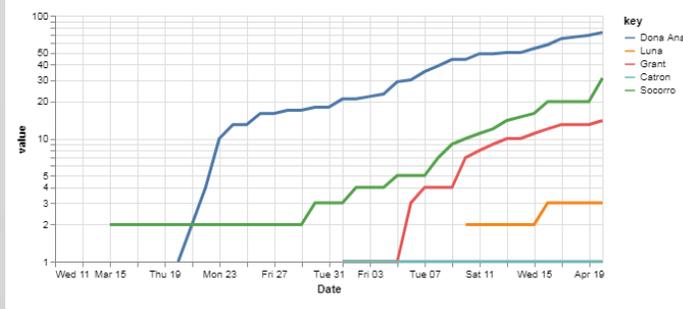
log(positive cases) over time, Central Counties



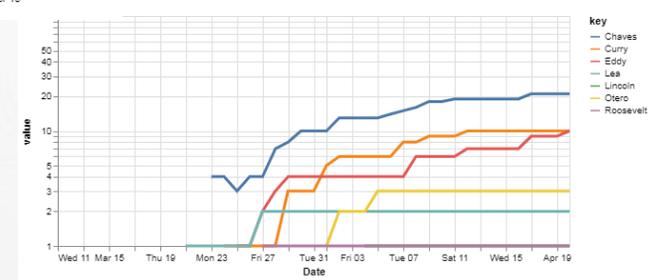
log(positive cases) over time, NorthEast Counties



log(positive cases) over time, SouthWest Counties



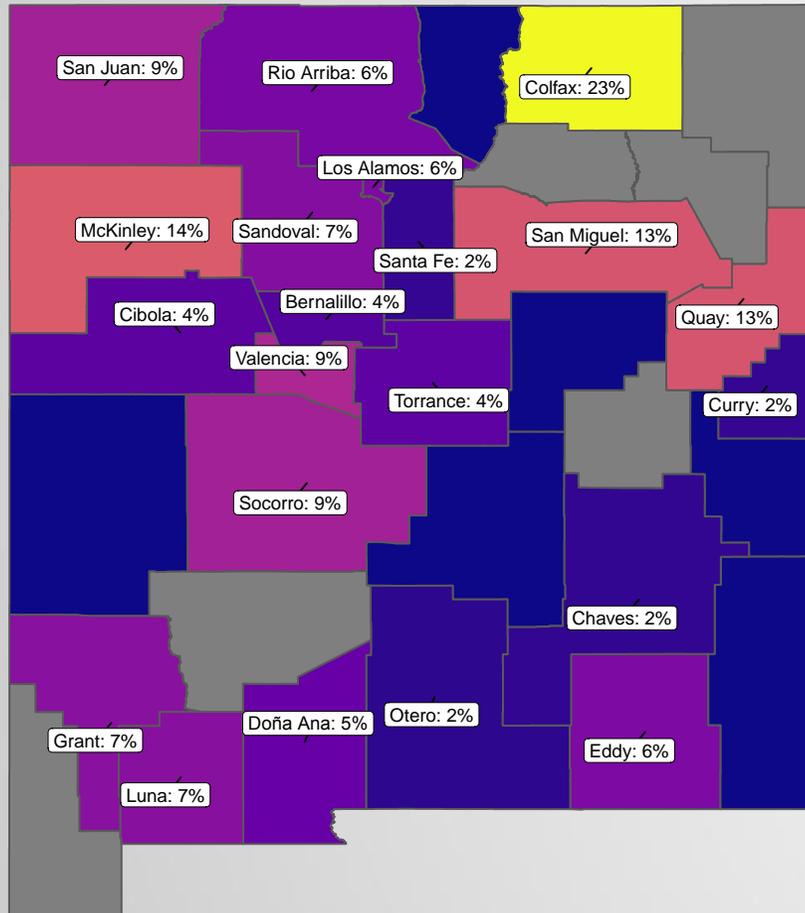
cases) over time, SouthEast Counties



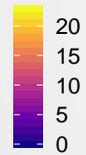
Regional growth

COVID-19 growth rate by county

County COVID-19 Weekly Growth Rate



7-day-average daily growth rate (%)

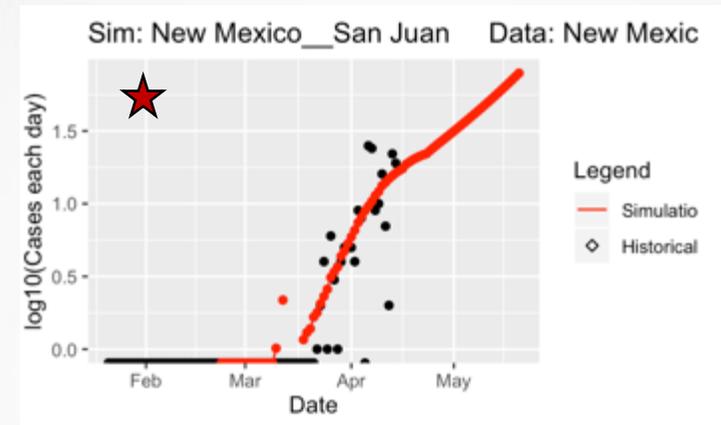


County	Daily Growth Rate	Change from Last Week
San Juan	9%	=
Rio Arriba	6%	↓
Colfax	23%	↑
Los Alamos	6%	↓
McKinley	14%	↓
Sandoval	7%	↓
Santa Fe	2%	=
Cibola	4%	↓
Bernalillo	4%	↑
Valencia	9%	↓
Torrance	4%	↓
Curry	2%	↓
Socorro	9%	↓
Chaves	2%	↓
Grant	7%	↓
Dona Ana	5%	=
Otero	2%	↓
San Miguel	13%	↓
Eddy	3%	↓
Quay	13%	↑

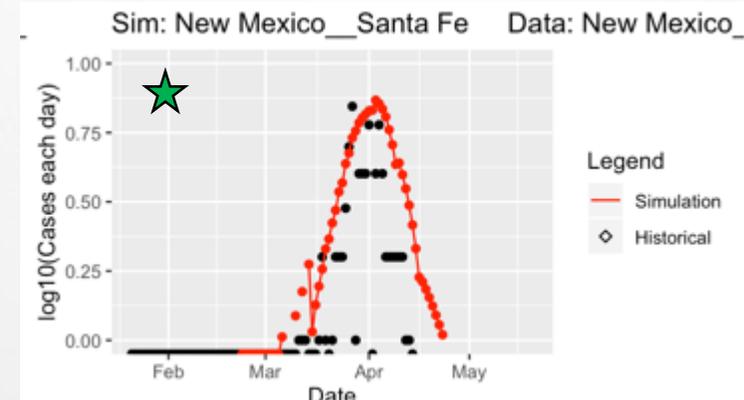
Interpreting County-Specific LANL Projections

- Modeling for each county has been completed by LANL
- The series of graphs show the actual growth and a projection if no further actions or changes are made.
 - Black dots are actual result
 - Red line is simulation of expected growth based on current trend
- The following set of charts help each county understand if their current efforts are adequate.
 - Example to right shows San Juan needs additional action to prevent continued spread
 - Santa Fe model shows full control

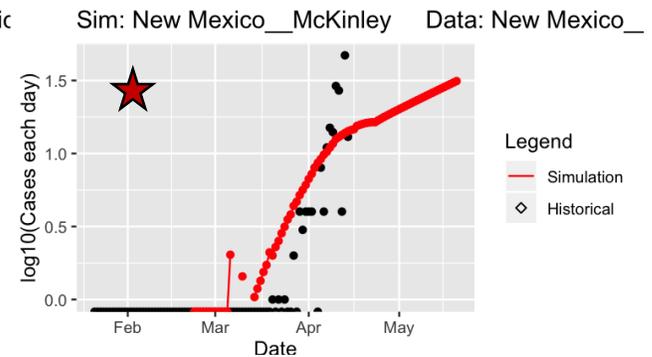
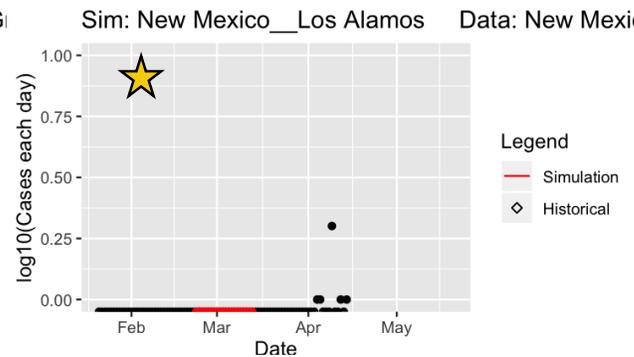
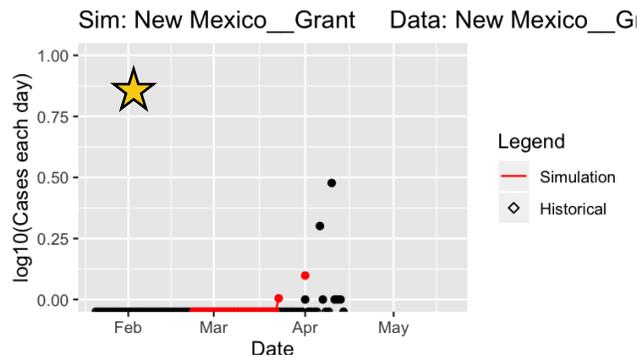
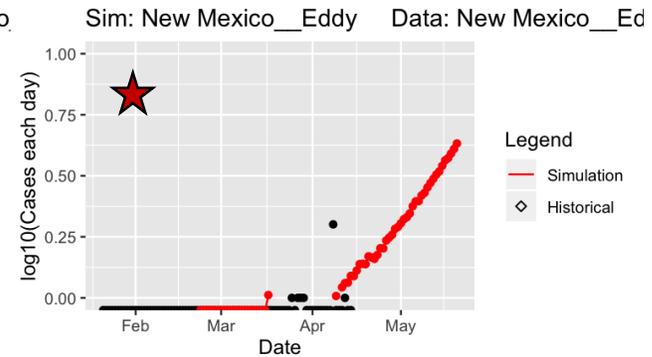
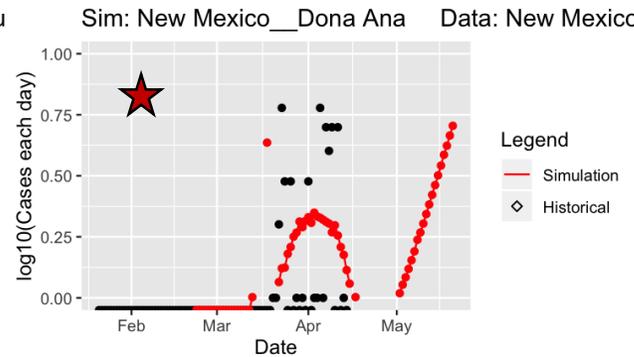
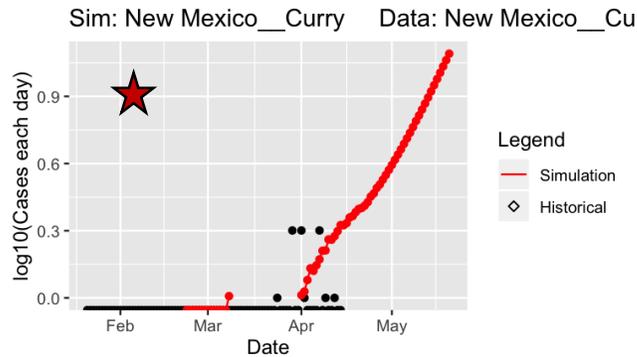
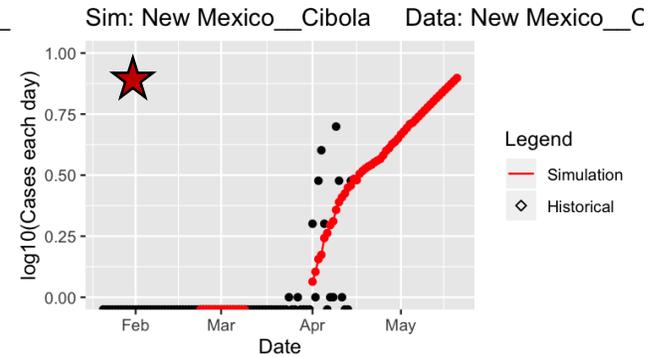
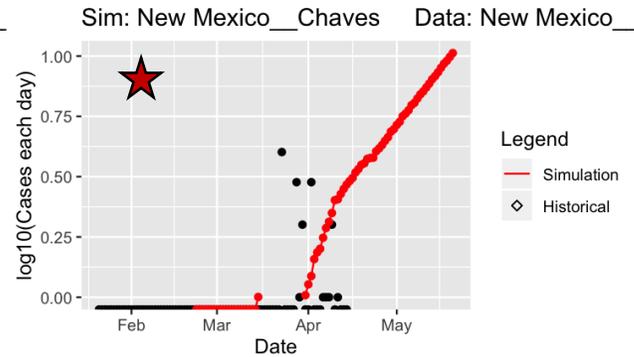
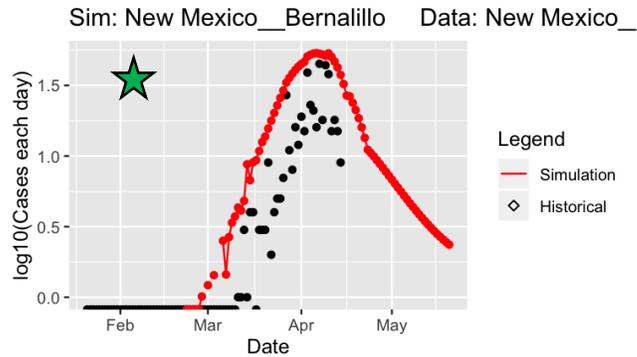
In San Juan historical results model out continued growth



In Santa Fe historical results mirror simulation of full control



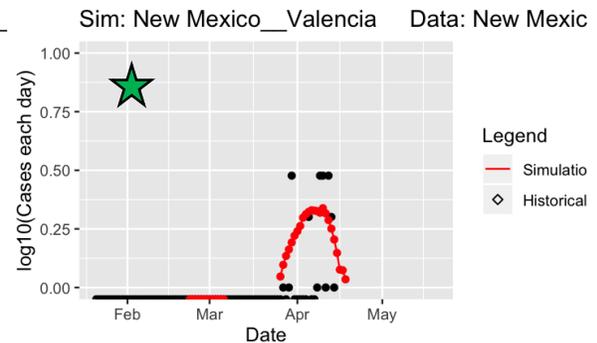
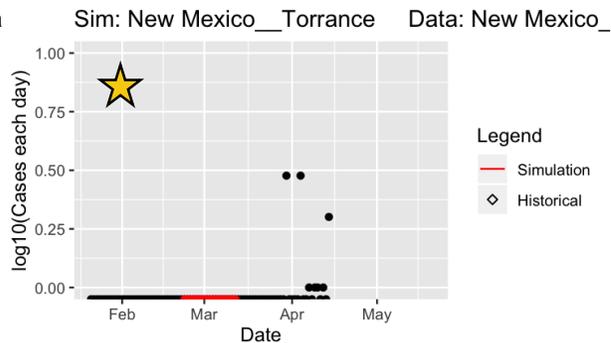
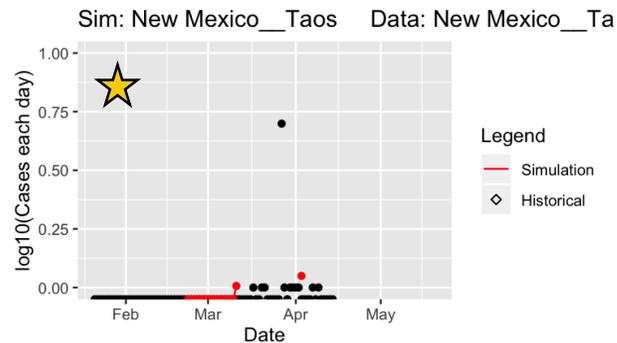
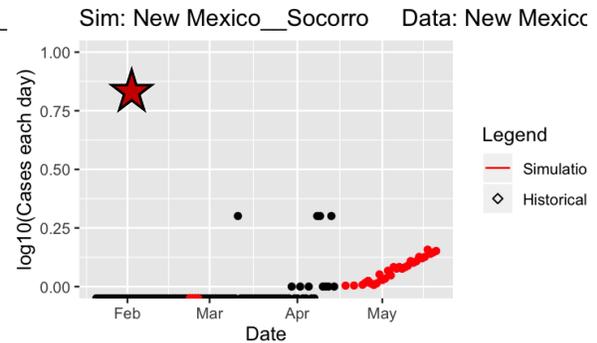
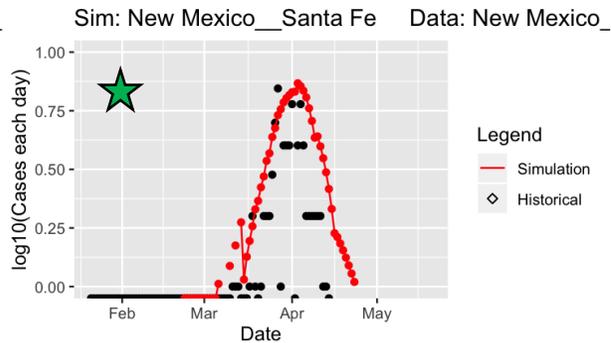
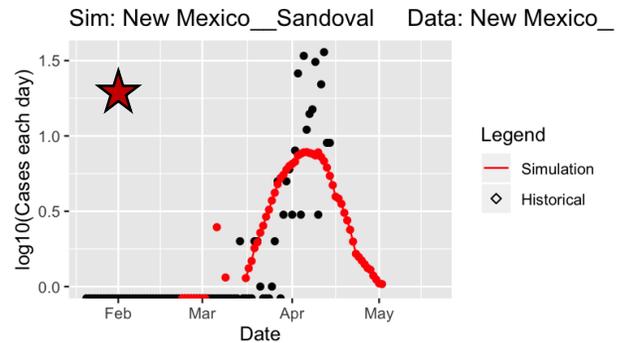
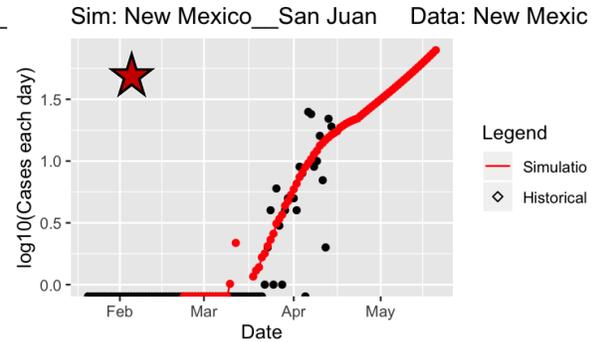
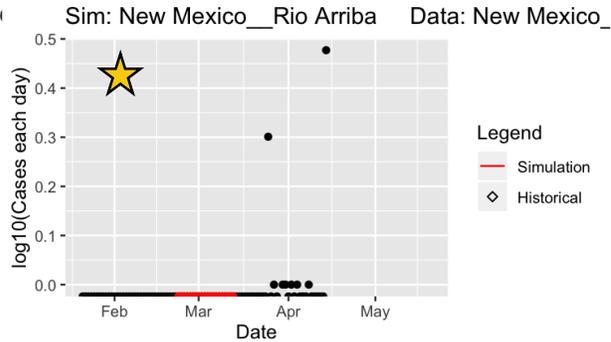
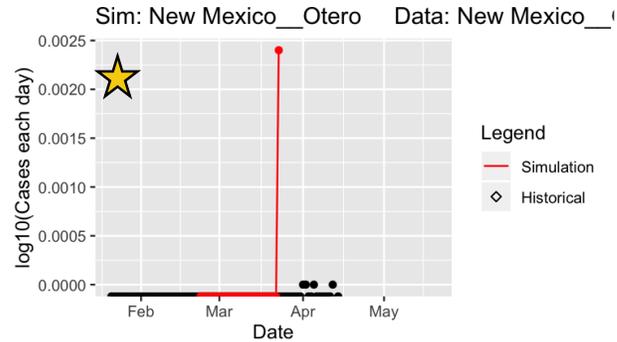
County-by-county if **no** further improvements in mitigation



KEY

- ★ COVID Spread not in control
- ★ COVID Spread nearing control
- ★ Inadequate cases to allow modeling

County-by-county if **no** further improvements in mitigation



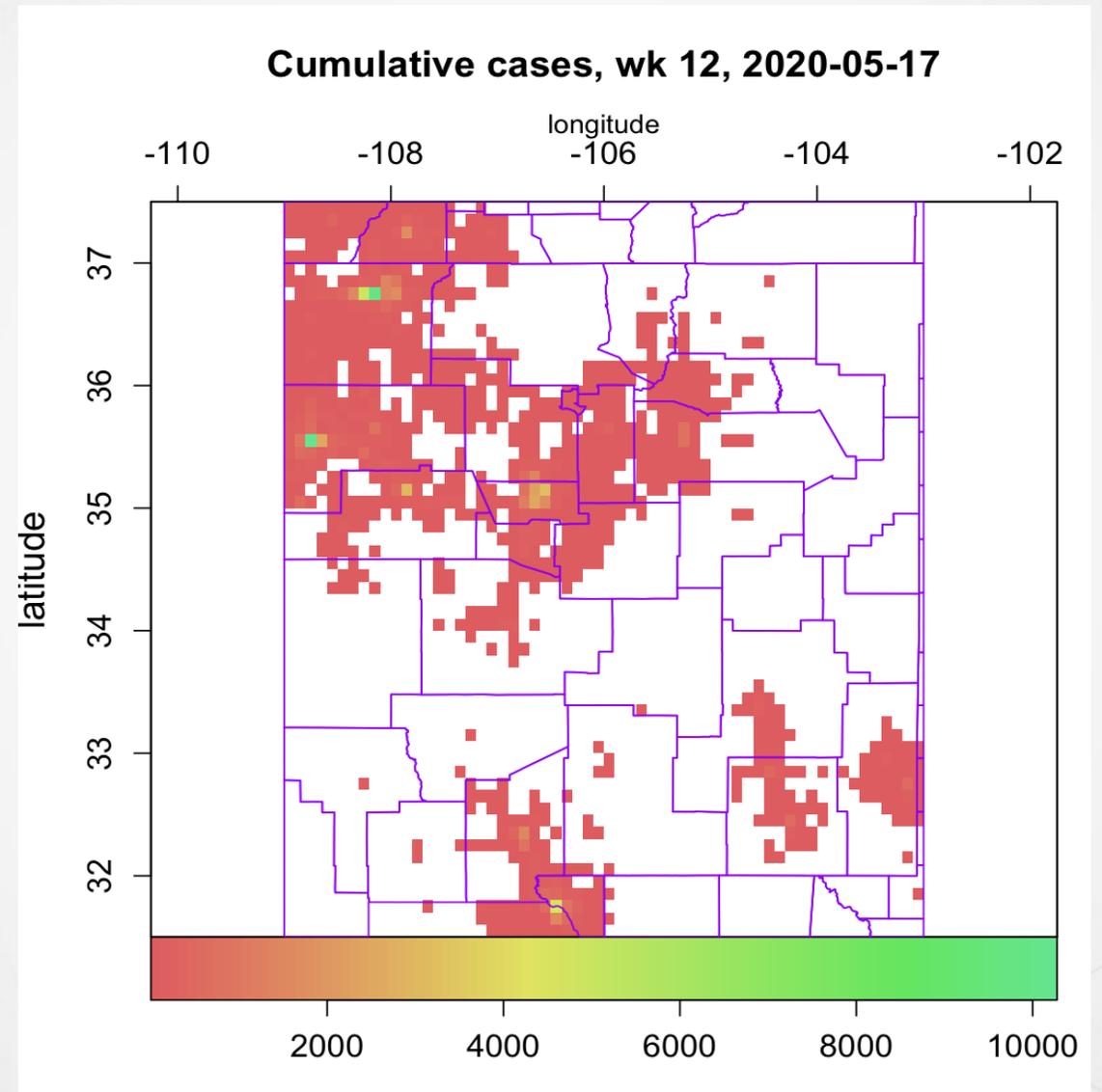
KEY

- ★ COVID Spread not in control
- ★ COVID Spread nearing control
- ★ Inadequate cases to allow modeling

Risk of upcoming spread - LANL analytics

- Counties at **risk** of becoming future hot spots within the next month:

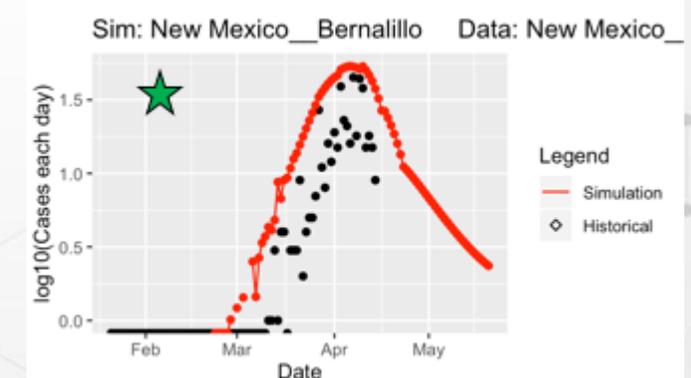
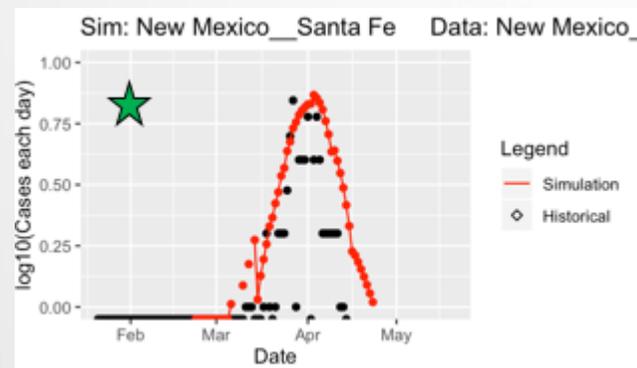
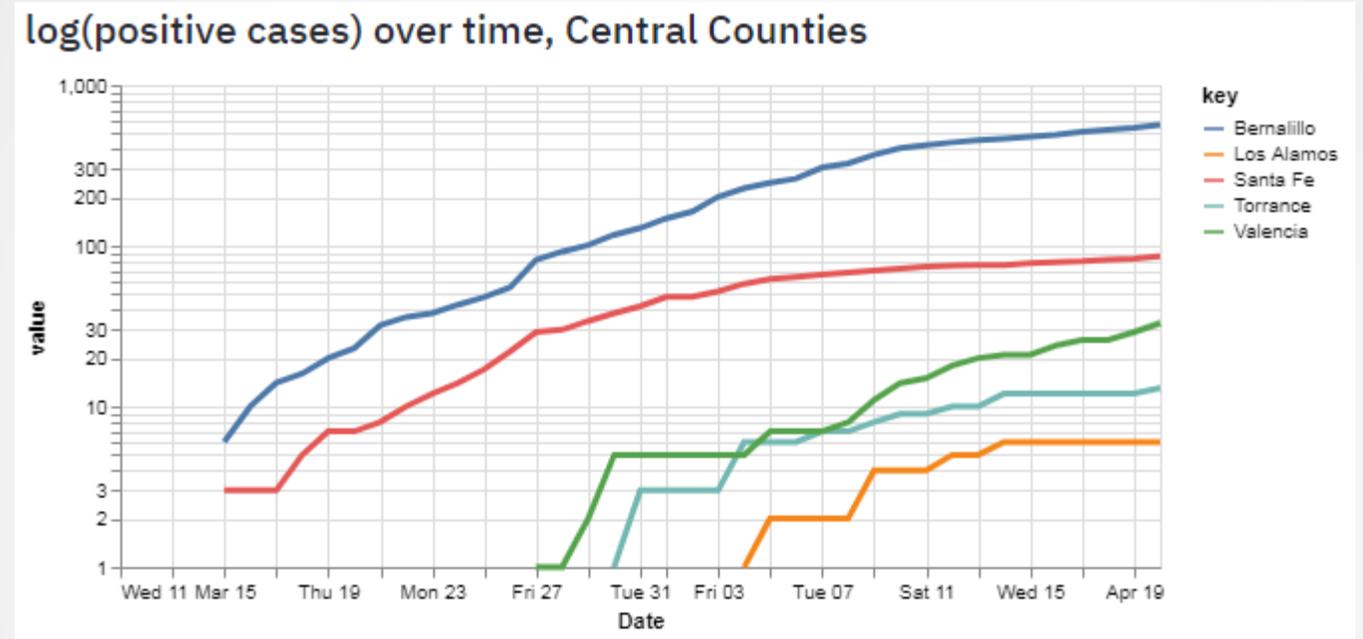
- Valencia
- Torrance
- Sandoval
- San Miguel
- Mora
- Lea
- Eddy



Central NM

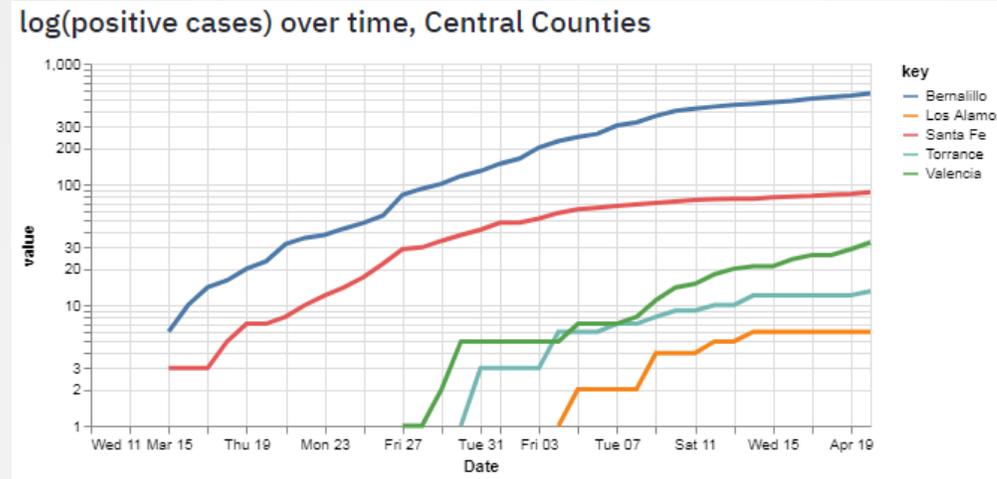
Achieving Control of COVID 19 – Central NM

- Santa Fe and Los Alamos have reached a low level endemic state where judicious initial relaxation of social distancing may be possible
- Bernalillo is reaching control and with additional efforts could achieve similar control to Santa Fe
- Valencia remains in growth phase and additional actions must be taken
- Torrance has inadequate cases to project accurate modeling but at this time has control along with Santa Fe and Los Alamos



Consideration: Preparing for Relaxation of Social Distancing

- Consider phased approach to relaxation of social distancing in Counties or Regions where a low level endemic state has occurred and maintained.
- Titrate social distancing according to response in new infections, recognizing there is up to a 2 week lag in new infections.
- Rapid testing and tracers will be required to prevent secondary wave of infections.
- County specific illustrative examples
 - Healthcare
 - Resumption of Priority 3 surgeries; examples include hips, knees, shoulders, and backs causing sever pain or disability
 - Resumption of necessary imaging for prevention and treatment of illness
 - Ensuring immunizations and treatment of chronic illness in ambulatory practice
 - Business
 - Tactical approach will be needed as well



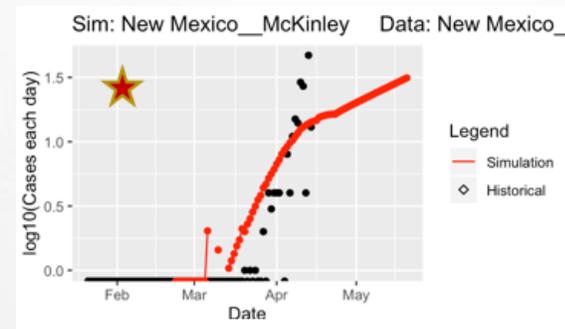
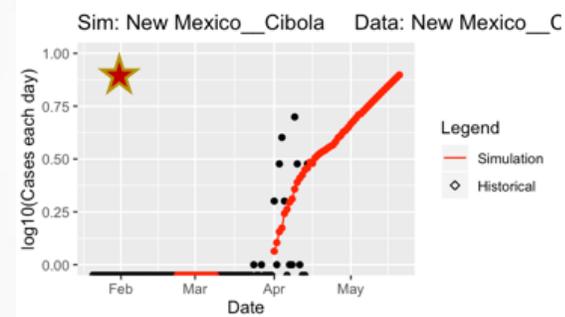
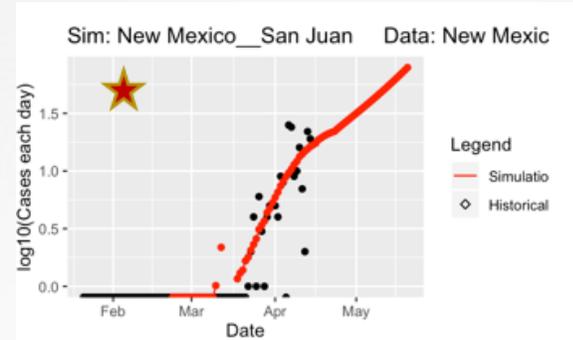
Recommendation:

- **Initiate MAT workgroups** to evaluate literature, data, and best practices in the safe reduction of social distancing in healthcare services.
- Recognize that relaxation of social distancing will result in some **increase in transmission** and COVID cases that must be mitigated
- **NOTE: ONLY THE GOVERNOR MAY MAKE CHANGES TO CURRENT SOCIAL DISTANDING POLICY**

Northwest Region

NW New Mexico - partial mitigation of spread

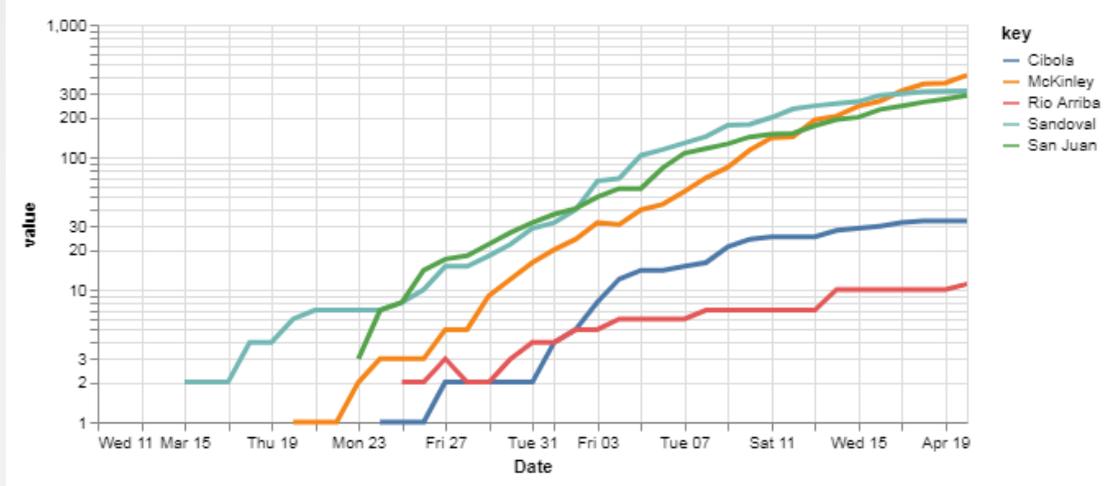
- Counties in NW New Mexico continue to exhibit **spread** leading to **high volumes in regional ICUs**
- NW Licensed Regional Capacity expected to be **exceeded this week.**
- Statewide capacity is available
 - Consider **transfer of ICU** patients to available beds in central NM to ensure availability of new cases



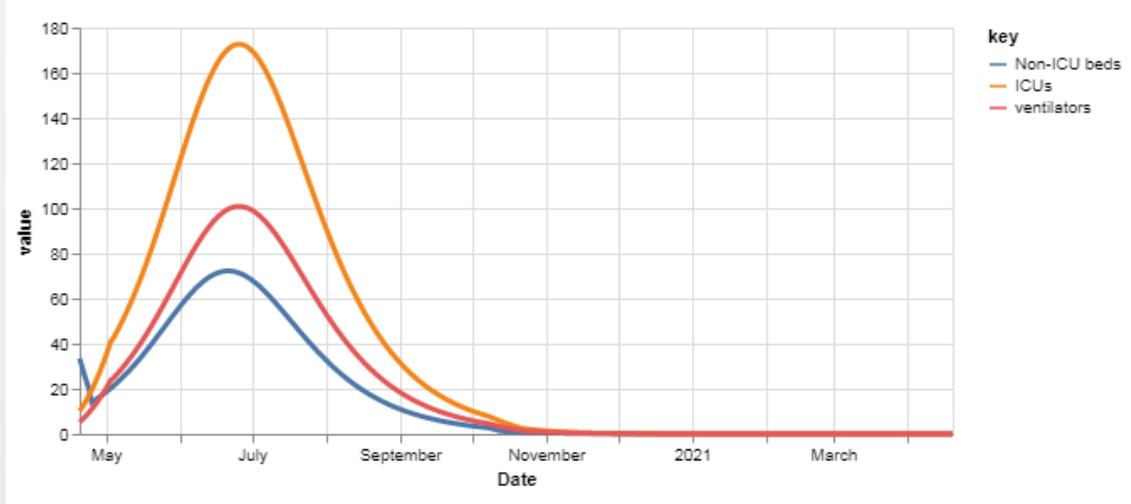
NW NM – Improvements **must** occur to prevent significant loss of life

- San Juan, Sandoval, and McKinley have only partially mitigated spread of COVID 10
- If we continue with the current trend significant numbers of lives will be lost and regional ICUs overwhelmed
- Consider larger scale testing and tracing in these communities.

log(positive cases) over time, NorthWest Counties



Projections of (beds, ICUs, vents), MCKINLEY



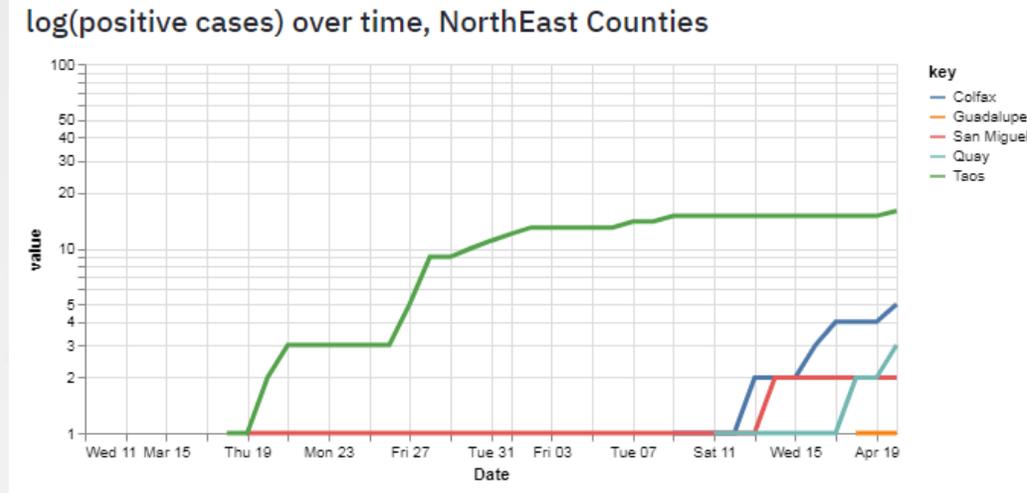
Northwest NM **Will Require** additional ICU Support

- ICU Capacity in McKinley, San Juan, Sandoval, and Cibola will be exceeded
- This is supported and consistent with
 - Presbyterian modeling
 - LANL Forecasting
 - LANL Epi (unmitigated scenario)
- Recommendation
 - Implement and Open **Alternate Care Site** in Gallup / Farmington
 - Enhance and Enforce social distancing and **Testing and Tracing**
 - Partner with Tribes and Navajo Nation to assist with **testing** and **resources for self isolation and quarantine**
 - Consider **transferring ICU** patients to central NM to ensure emergency capacity

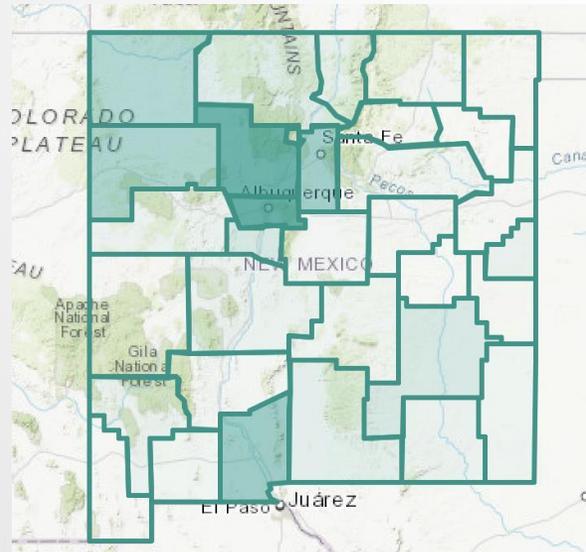
Northeast Region

NE Counties early in COVID

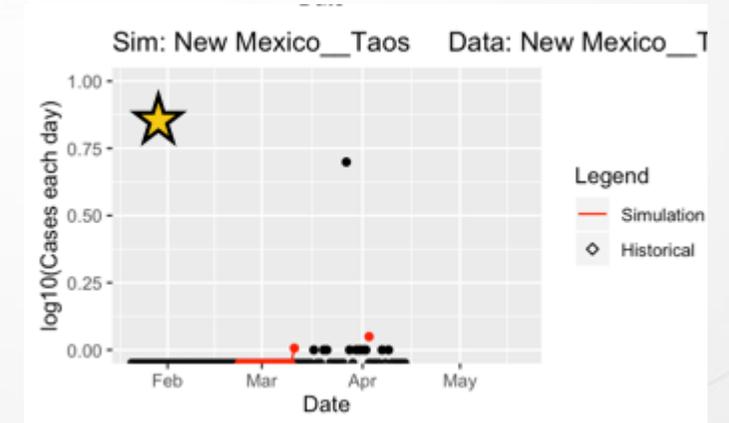
- Very few cases leading to inability to trend
- Minimal community testing completed so actual disease burden is unknown
- Data suggestive of late spread to region
- At risk for spread if social distancing measures are not effective
- Taos cases have leveled off but overall data is inadequate to model control
- Upcoming evaluation to assist with regional decisions includes cellphone mobility data



Minimal testing has occurred in the NE



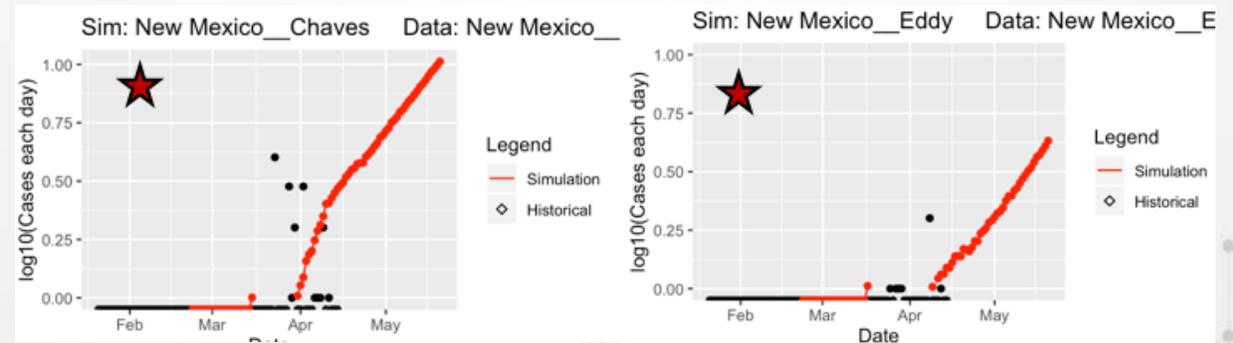
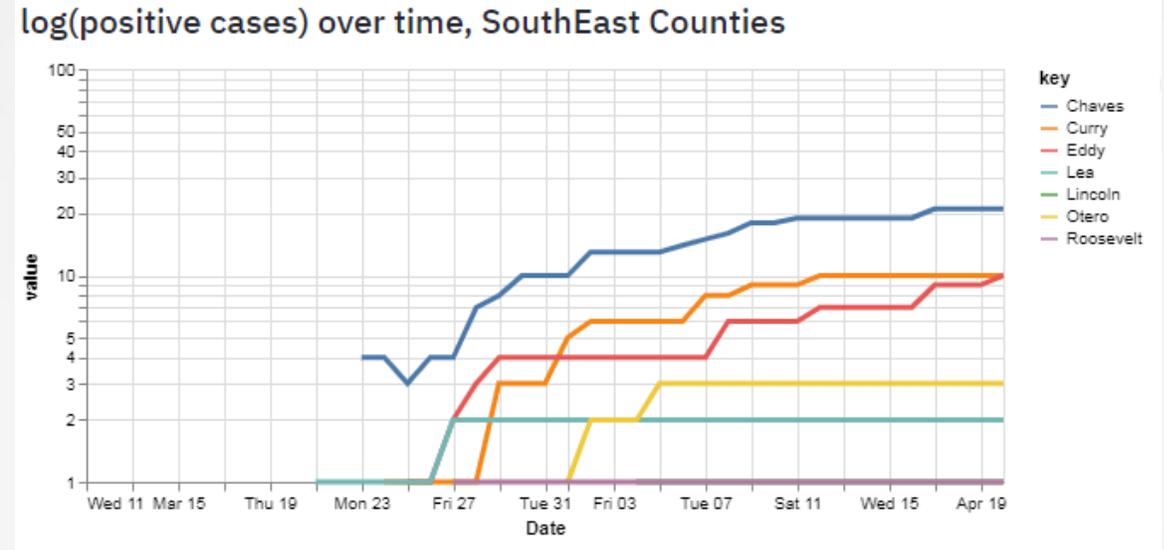
Data inadequate to model control



Southeast Region

High Risk SE Counties With Continued Spread

- SE remains early and can benefit from additional testing and strengthening of social distancing
- SE section of the state requires additional attention as areas remain in a growth phase and do not project adequate control
- Small number of cases limit statistical analysis of SE counties
 - Counties with minimal or **no community spread** will continue to exhibit an interest in a trial of relaxation of social distancing.
 - There is **significant risk** to rapid COVID spread without an increase in testing and tracing and validation of current effectiveness of social distancing. Cell phone mobility data will be reviewed for additional source of data this week.



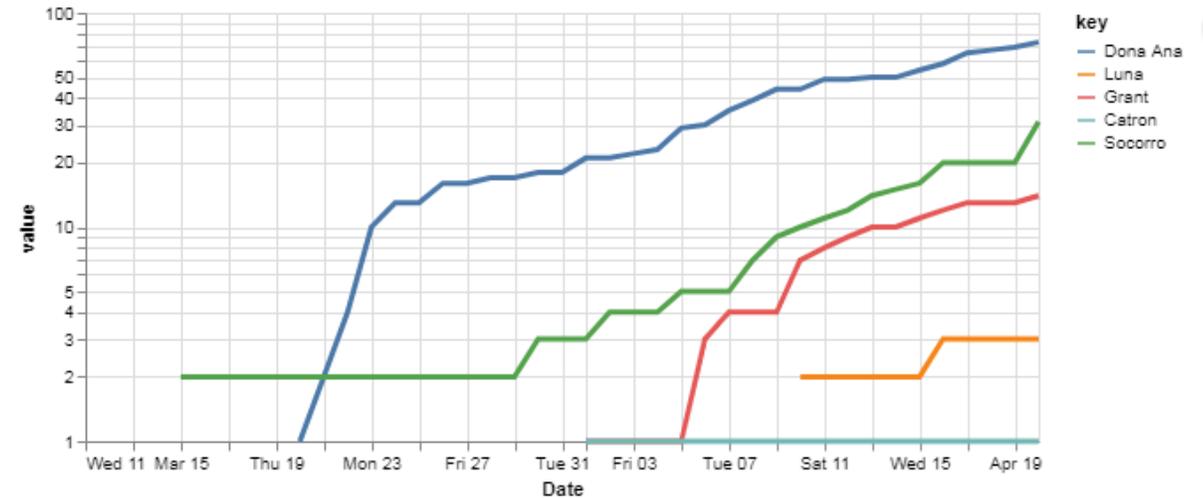
LANL Modeling shows continued risk of spread in SE portion of the state

Southwest Region

SW Counties With Continued Spread

- SW region of the state is in an active phase of COVID growth and spread
- These regions need significant additional attention to reduce spread
- Additional testing will be important in reducing spread
- Current evaluation is occurring regarding source of new cases- community spread vs travel into area

log(positive cases) over time, SouthWest Counties



Successful interventions

- Early closing of schools
- All non-essential businesses closed
- Expand testing capabilities in NM
- Early tracing of positive cases with expanded DOH workforce from redeployment
- Enactment of NM Crisis Standards of Care
- Enforcement of social distancing
- Closing of additional non-essential business



Further intervention considerations

- **Increase and augment DOH staffing for tracers to enhance early isolation and quarantine**
 - Consider augmenting staff with furloughed state and healthcare employees.
 - Consider leveraging health system training capabilities to onboard workforce early.
- **Mandatory and enforced quarantine of all household members of COVID positives and PUIs**
 - Weekly random observation.
 - Requires essential-needs support for food/water/sanitation.
- **Enhanced social media campaign**
 - Partner with local media and healthcare organizations on a comprehensive and exhaustive campaign to educate community members, dispel myths, and reinforce social distancing.
 - Protect against social distancing “fatigue” as nationally and federally there is a drive to re-open at the end of April prior to the NM peak.
- **Prevention of spread from adjacent states**

APPENDIX

The NM Model is the most accurate model for our State

- **Specific causes of differences between the NM SIR Model and the IHME Model**

- IHME's approach of extrapolating from current death rate is likely to have substantial errors in a state like NM with few very deaths.
- All models—New Mexico's and IHME's—are highly sensitive to the assumptions related to social distancing
 - The IMHE model assumes four potential Non Pharmaceutical Interventions (close schools, close non-essential businesses, stay-at-home order, travel severely limited). Once a state implements 3 of the 4 interventions, the IHME model considers that the state has automatic maximized effect of social distancing. There are many more social distancing techniques than these that are highly effective. Extrapolating a fixed $R_{\text{effective}}$ from these variables lacks specificity
 - The NM model calculates the $R_{\text{effective}}$ each day based on actual NM data and updates day to day ensuring projections are accurate
- The NM model allows for modeling around many aspects of social distancing and also provides risk adjustment for age, disease burden, and social determinants of health by county.

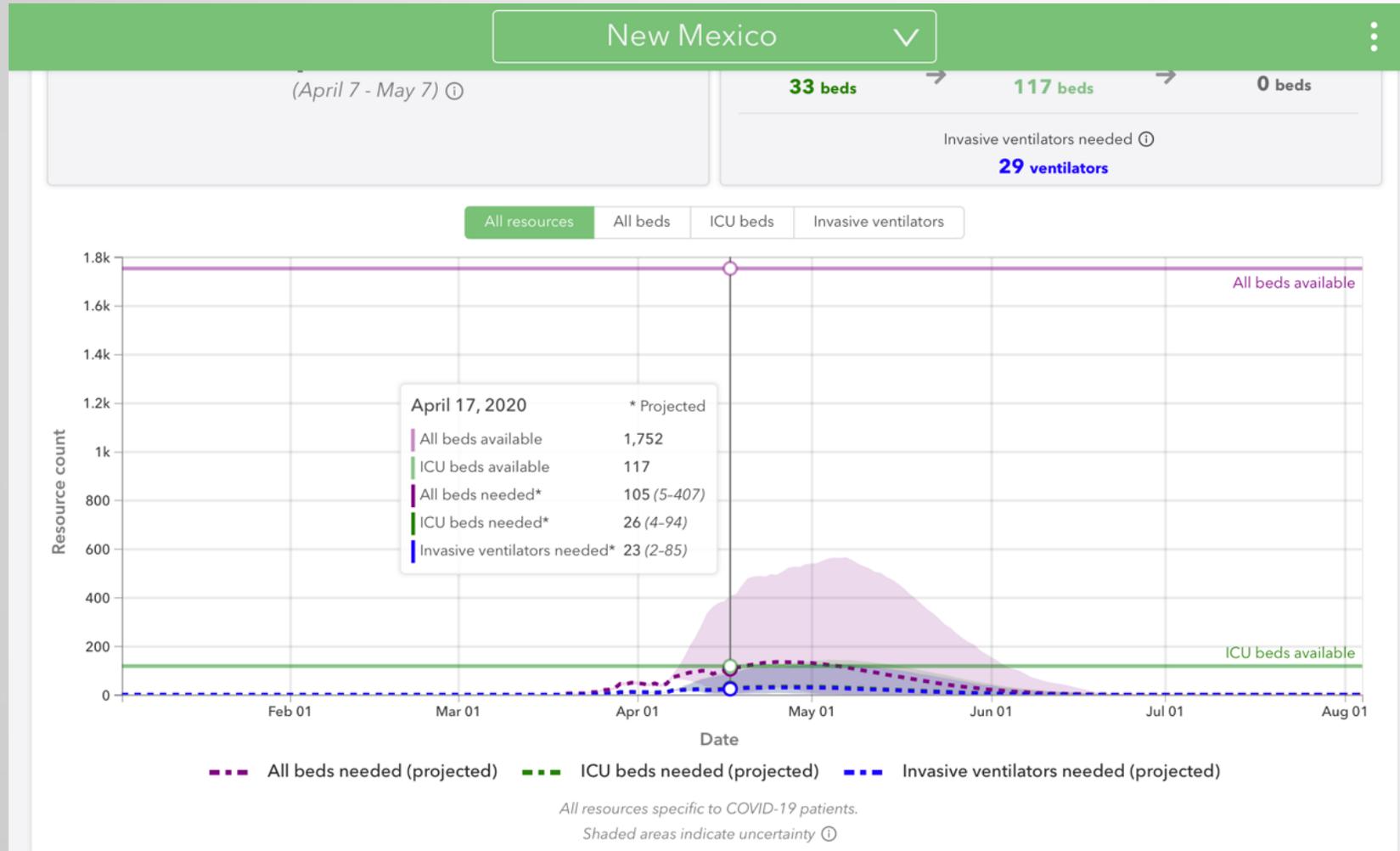
- **Background to the differences between the two models**

- The NM model (and most others that have been published) compartmentalize the population into Susceptible, Infected, and Recovered, and models the movement of individuals between these compartments. We then are able to look at variable length of stay for ICU and medicine beds and enrich model with demographic data as well.
- In contrast, IHME assumes that death rates in a pandemic follow a particular S-shape and tunes the model parameters to match that observed death rate. It was tuned using historic data (including estimates of levels of social distancing) from China, Italy, S. Korea, and the 27 US states that had already exceeded a death rate threshold.
- The IHME approach predicts death rates directly. It then infers the number of hospitalizations, ICUs etc. that would lead to this death rate using a separate utilization model.

- **Risk for following IHME**

- NM (current) low death rate causes problems in IHME's extrapolation
- It lacks specificity for NM and ability to analyze regional areas of NM
- It estimates the $R_{\text{effective}}$ as opposed to using actual data and shows a factor of up to 2000% variation on a single day in NM for resources
- It does not take into account the unique characteristics of the nineteen Pueblos, three Apache Tribes, and Navajo Nation within New Mexico

IHME Model Provides Unusable Range of Predictions



- IHME shows profound ranges on a single day
 - ICU beds of 4 to 94
 - Ventilators 2 to 85
 - All beds 5 to 406
- This demonstrates an intolerable level of prediction.



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