COVID-19 Epidemiologic Update

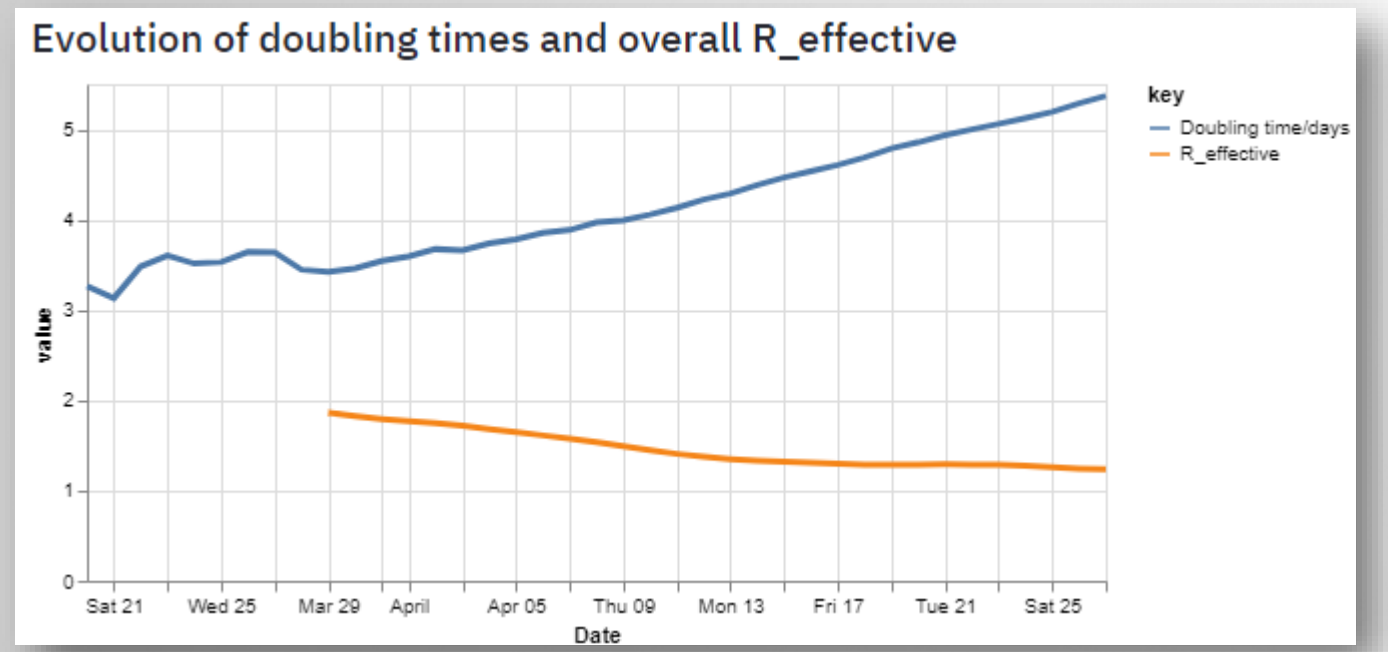
A Presbyterian, LANL, SNL, and NMDOH Partnership

April 28, 2020

Key context April 28, 2020

- Improvements in NM plateaued over this past week with an R_effective of 1.24 compared to 1.28 last week.
- There are rising concerns across many communities that patients may be delaying care for essential and urgent healthcare services.
- The NW sees continued growth extending into additional nursing homes and pueblos.
- Data suggest risk of more broad spread of COVID is increasing in the southern half of the state as well.

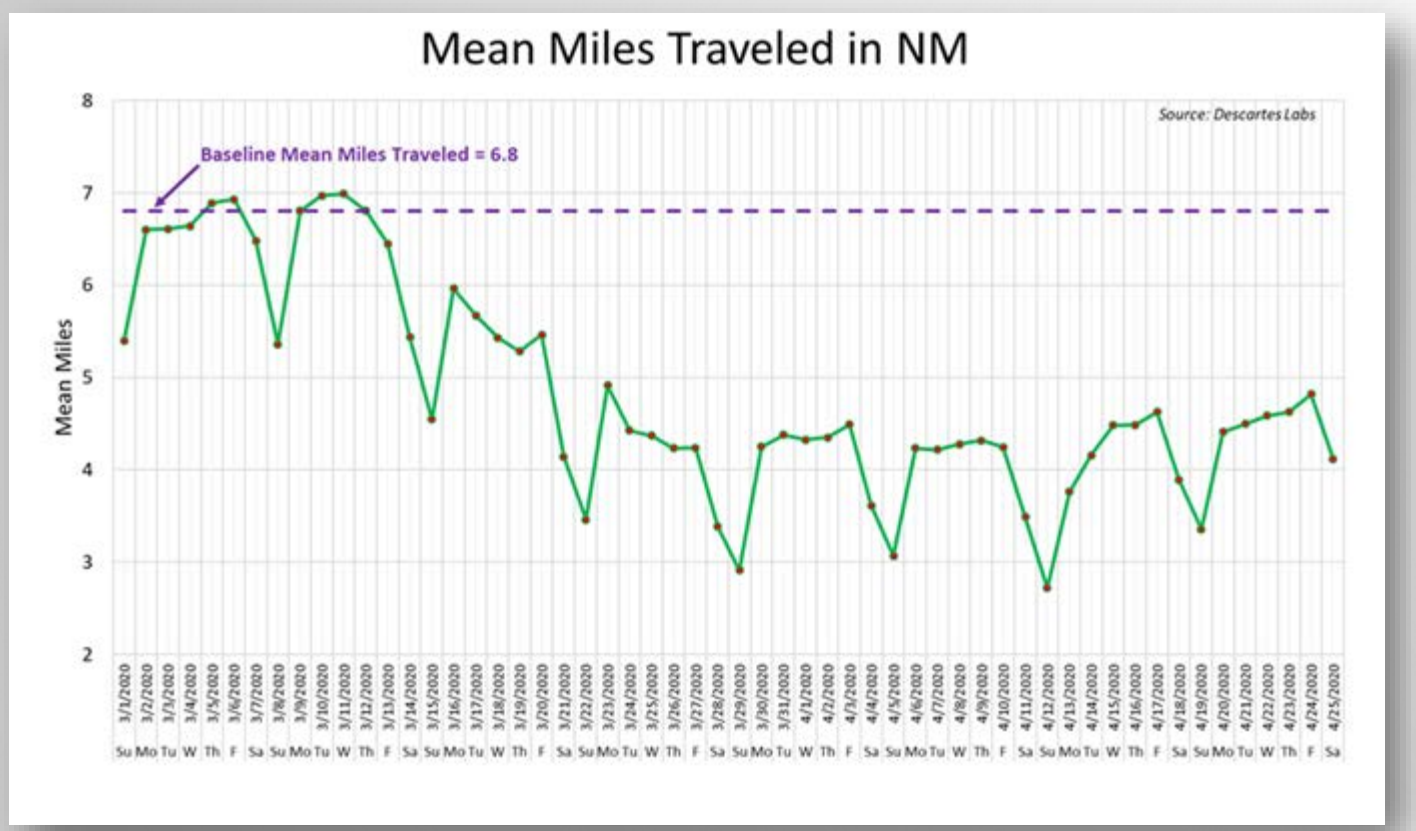
Improvements in the reduction of COVID has plateaued



Updated calculation in R_effective pushed back to retrospective graphing

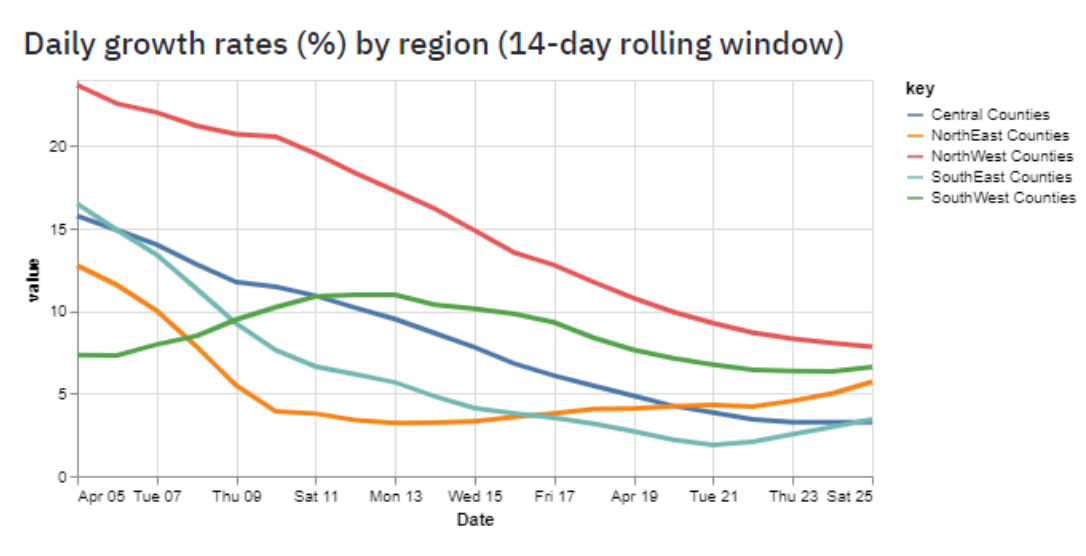
- Statewide R_effective improvements have now plateaued.
- Additional actions will be necessary to reduce transmission of COVID-19.

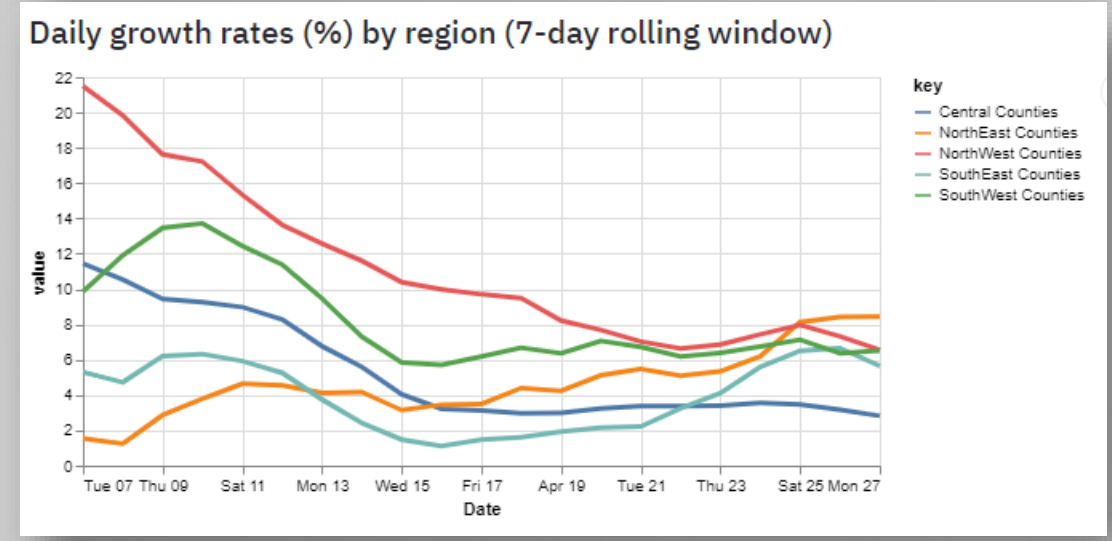
Data suggests statewide mobility may be increasing



- NM showed a steep reduction in cellphone mobility as a result of social distancing policy.
- Statewide trend appears to indicate some movement toward increased mobility.
- Rural communities may impact validity of data given need for long distance travel for essential businesses.

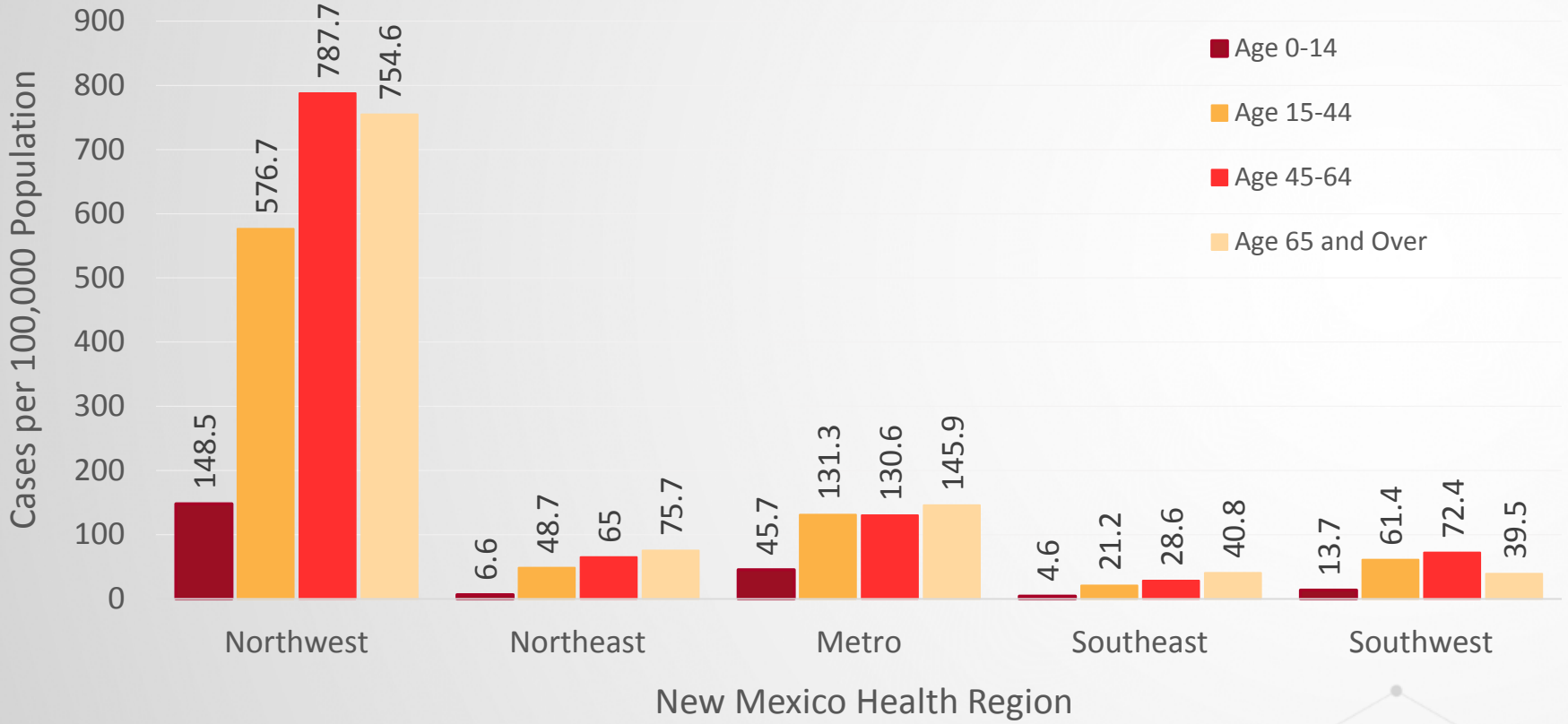
Regional growth rates remain above desired state



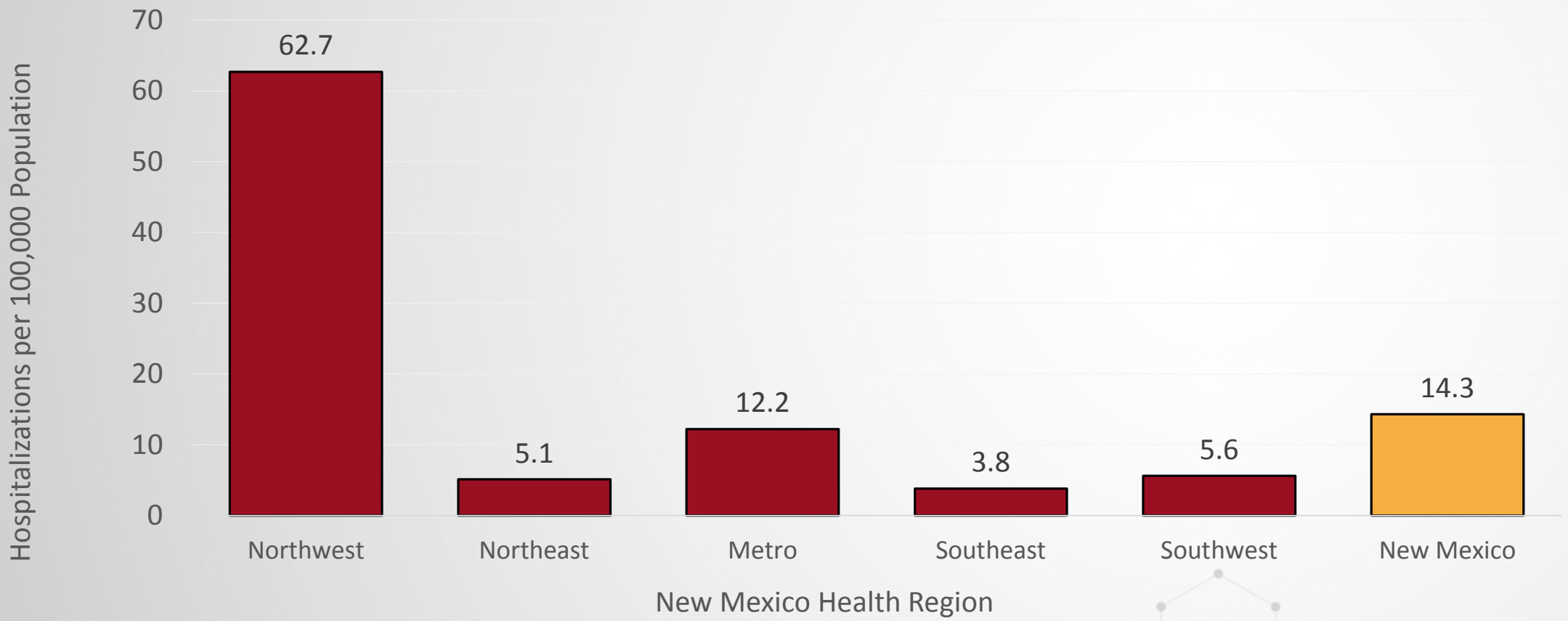


- **Central region** continues to approach a low level endemic state.
- **NW region** has the highest growth rate; week-over-week improvement is leveling off indicating additional actions are critical.
- **NE region** has very few cases making trending of growth rate less meaningful.
- **SW region** is seeing an acceleration in growth rate requiring mitigation to prevent large scale spread.
- **SE region** has a relatively low level of cases but is seeing increasing growth rate and at additional risk due to proximity of adjacent non-NM counties with increasing spread.

Cases per 100,000 show disproportionate concentration in NW



Hospitalization rate per 100,000



Cases will continue to grow over next 6 weeks

6-Week Forecast of Confirmed Cases for New Mexico Based on Data as of 2020-04-26

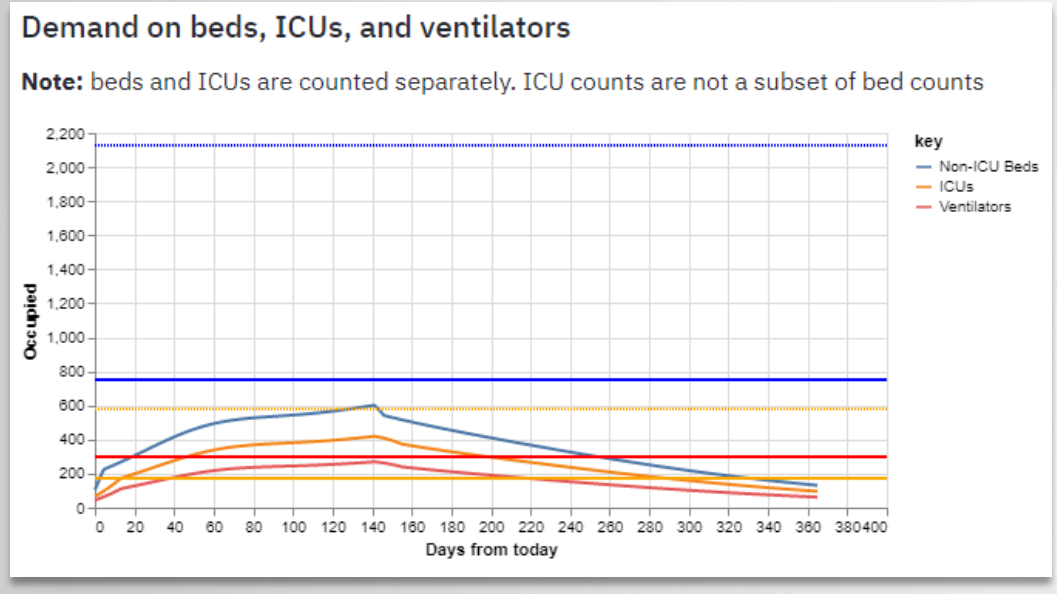
Week	Best Case (5th Percentile)^	Middle Case (50th Percentile)	Worst Case (95th Percentile)
2020-04-26		2,726*	
2020-05-03	2,905	3,547	6,351
2020-05-10	3,070	4,431	10,906
2020-05-17	3,203	5,229	15,971
2020-05-24	3,295	6,019	21,895
2020-05-31	3,374	6,665	28,264
2020-06-07	3,439	7,268	35,862

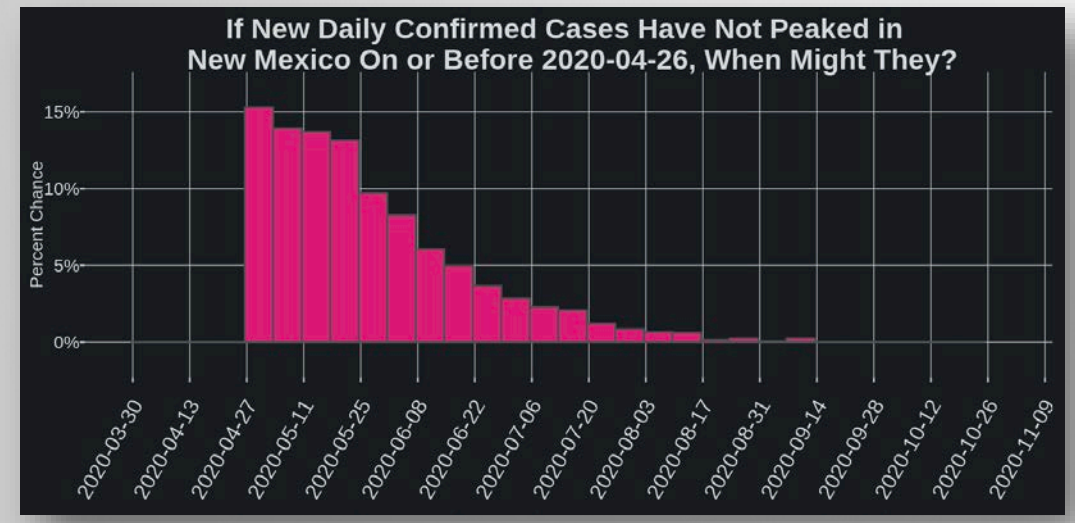
*Last reported confirmed cases count

^Closest-matching scenario

- LANL middle case projections have had very high correlation with actual counts.
- Changes in current social distancing policy would impact these projections.

State has flattened the curve – We must now work regionally

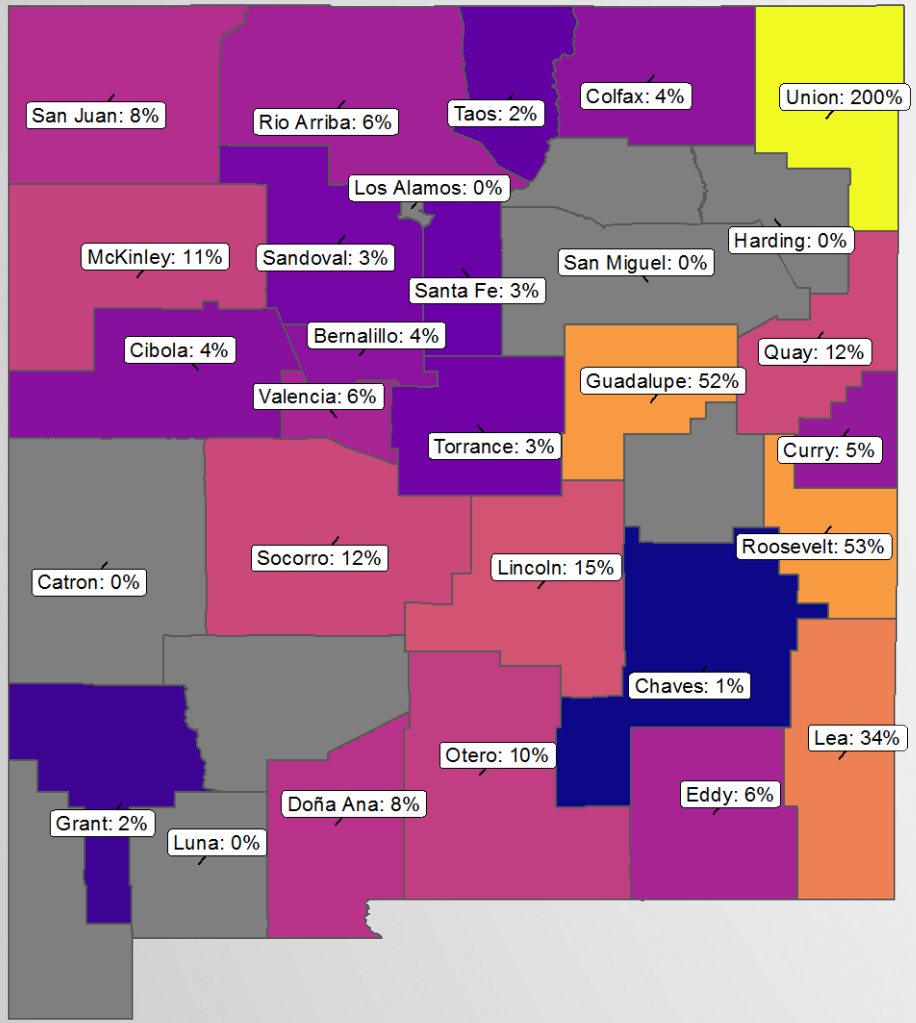




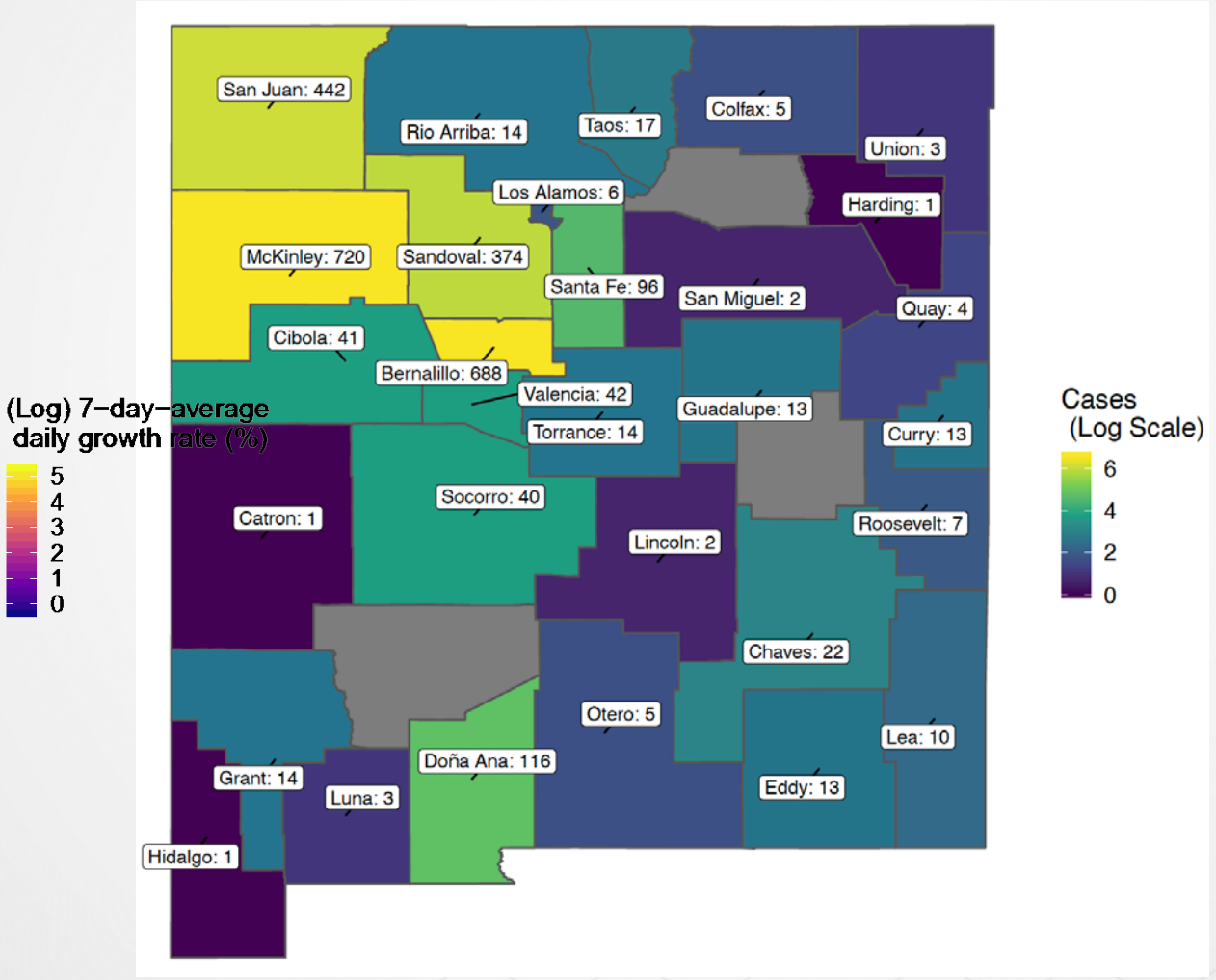
- As a state we have successfully flattened the curve preventing health system from being overwhelmed.
- Changes in social distancing policy or practice will lead to additional peaks due to lack of herd immunity.
- As a state we have, or will hit, our peak between now and end of May assuming no changes in social distancing.

Growth and case count, by county

COVID-19 growth rate by county



COVID-19 cases by county



Regional growth

Greatest Concerns:

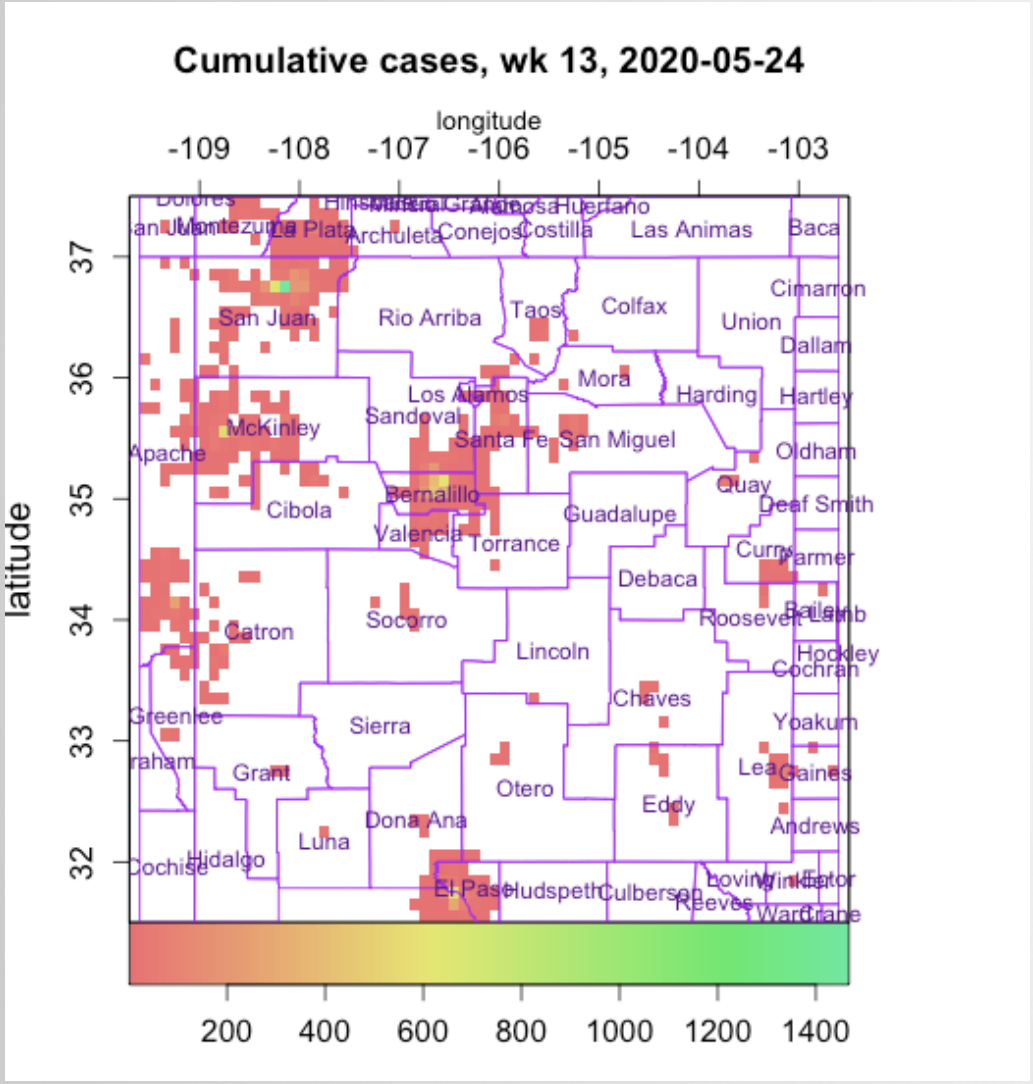
- Increasing growth rate in Socorro and Dona Ana are significant.
- Growth in Guadalupe is concerning for initiation of significant community spread
- Growth rates remain concerning in McKinley, Dona Ana, San Juan, and Socorro are concerning due to the relatively large number of cases in these areas.

Other:

- Santa Fe had an increase in growth rate but remains at a relatively lower overall growth rate
- Small numbers of cases in Roosevelt, Lea, Eddy, and Quay make growth rate difficult to interpret as single cases cause large delta.

County	Daily Growth Rate	Change
San Juan	8%	=
Rio Arriba	2%	↑
Colfax	4%	↓
Roosevelt	53%	↑
McKinley	11%	↓
Sandoval	3%	↓
Santa Fe	3%	=
Cibola	4%	↑
Bernalillo	4%	=
Valencia	6%	↓
Torrance	3%	↑
Guadalupe	52%	↑
Socorro	12%	↓
Chaves	1%	↓
Grant	2%	↓
Dona Ana	8%	↑
Otero	10%	=
Lea	34%	↑
Eddy	6%	↑
Quay	12%	↓
Roosevelt	53%	↑
Union	20%	↑

Adjacent State Impact - 20 Day Forecasting

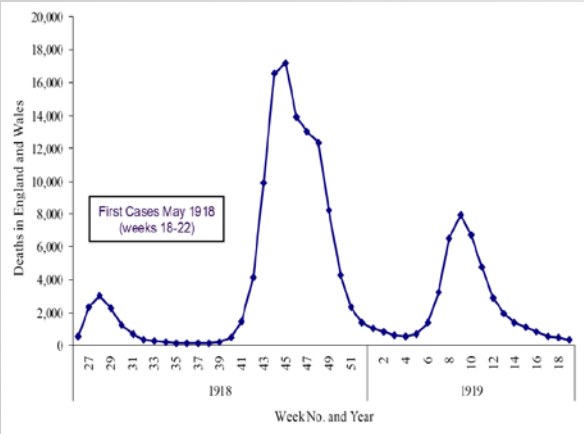


- The SE portion of the state has potential for significant spread of COVID due to current growth rate and risks associated with the adjacent counties in Texas
- The NW continues to have significant growth
- The SW is at increased risk for spread from adjacent communities in Arizona

Modeling changes in social distancing

- Safely relaxing social distancing will require additional modeling and predictions.
- These triggers have been built into the modeling so we can begin to assess impact of different scenarios.
  - Allow configuration of duration and intensity of distancing relaxation as well as reimplementation of strict distancing.
  - Assumptions around impact of different actions such as resuming elective procedures, opening schools, opening restaurants will need to be tuned and based on this, and other, historic pandemics.
- Winter months may be complicated due to combined volumes of seasonal Influenza and COVID-19

Influenza 1918



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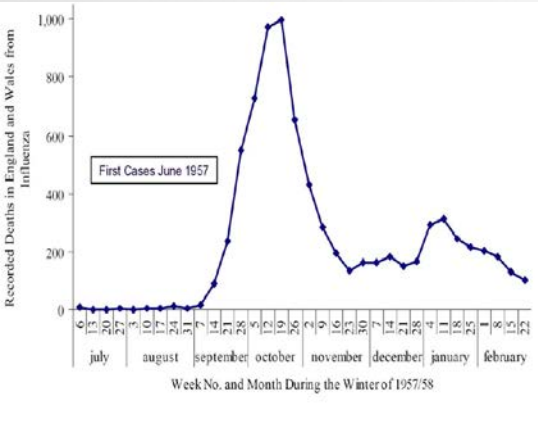

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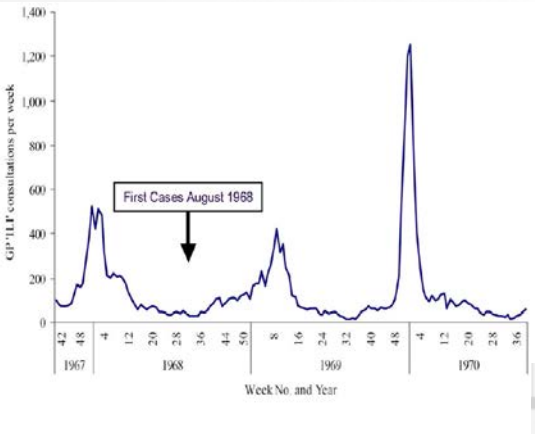
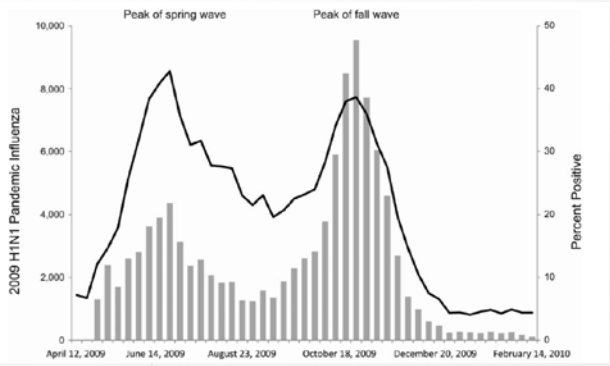
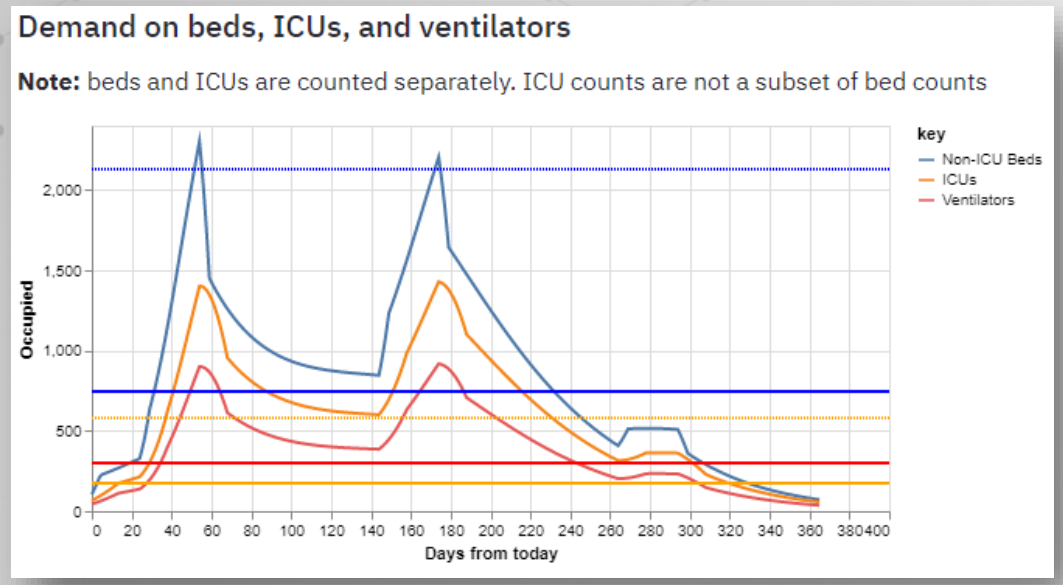


2009 H1N1

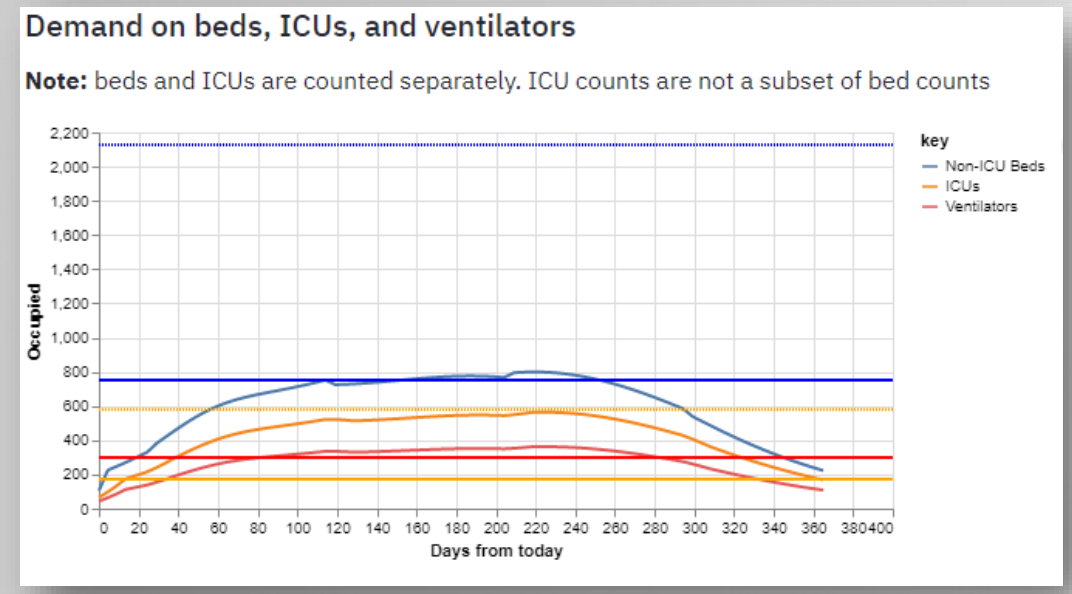


Simulating reductions in social distancing



Scenario 1

- Social distancing significantly relaxed causing NM to revert back to our R_effective as of April 1.
- Relaxation stays for 30 days then we reinstitute current social distancing for 90 days and relax again.
- Example – reopening schools for a month



Scenario 2

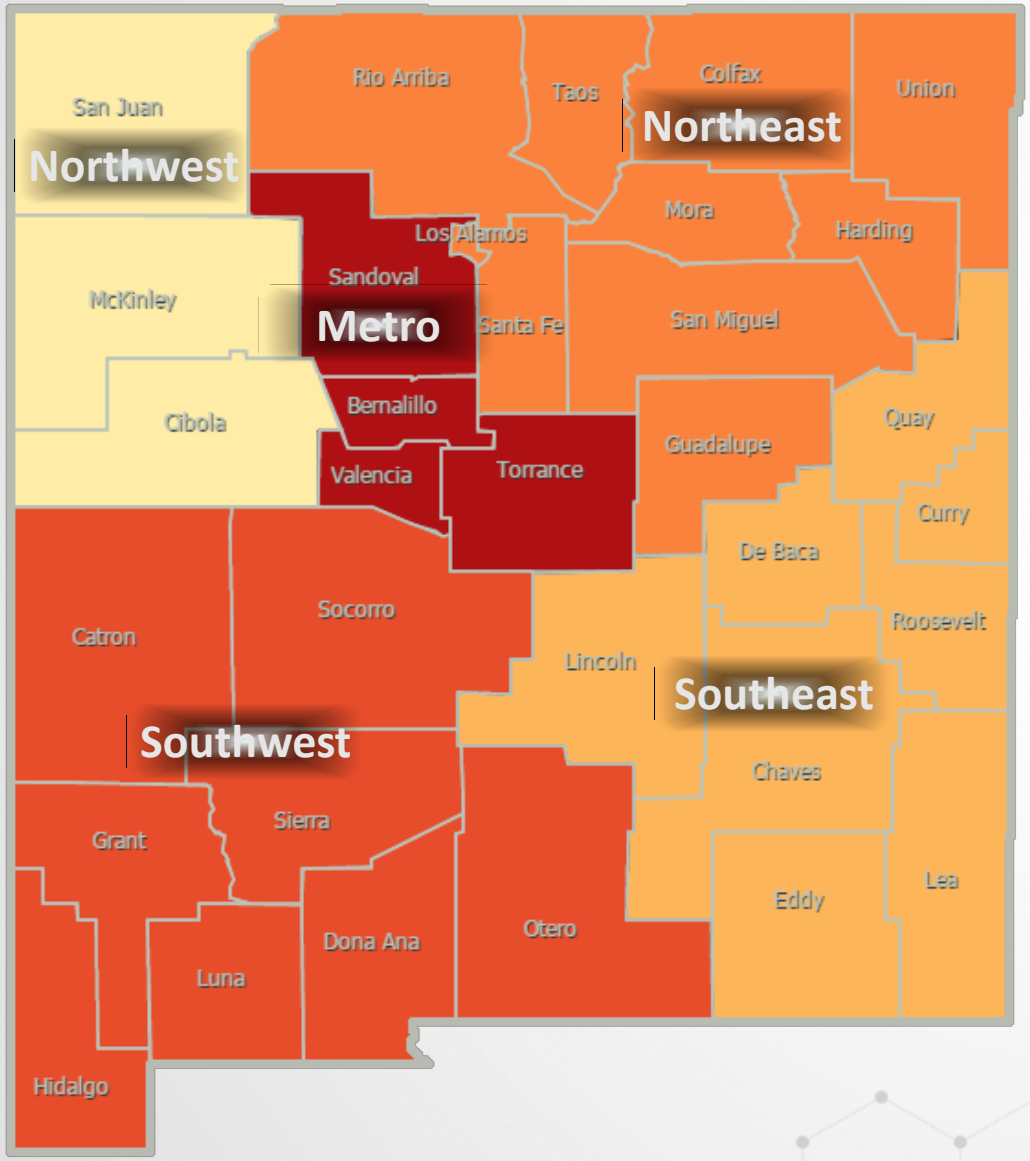
- Social distancing minimally relaxed causing a 10% slip in the gains we have made since April 1.
- Relaxation stays for 90 days then we reinstitute current social distancing for 90 days and relax again.
- Example – reopening a very limited segment of the economy state wide today

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

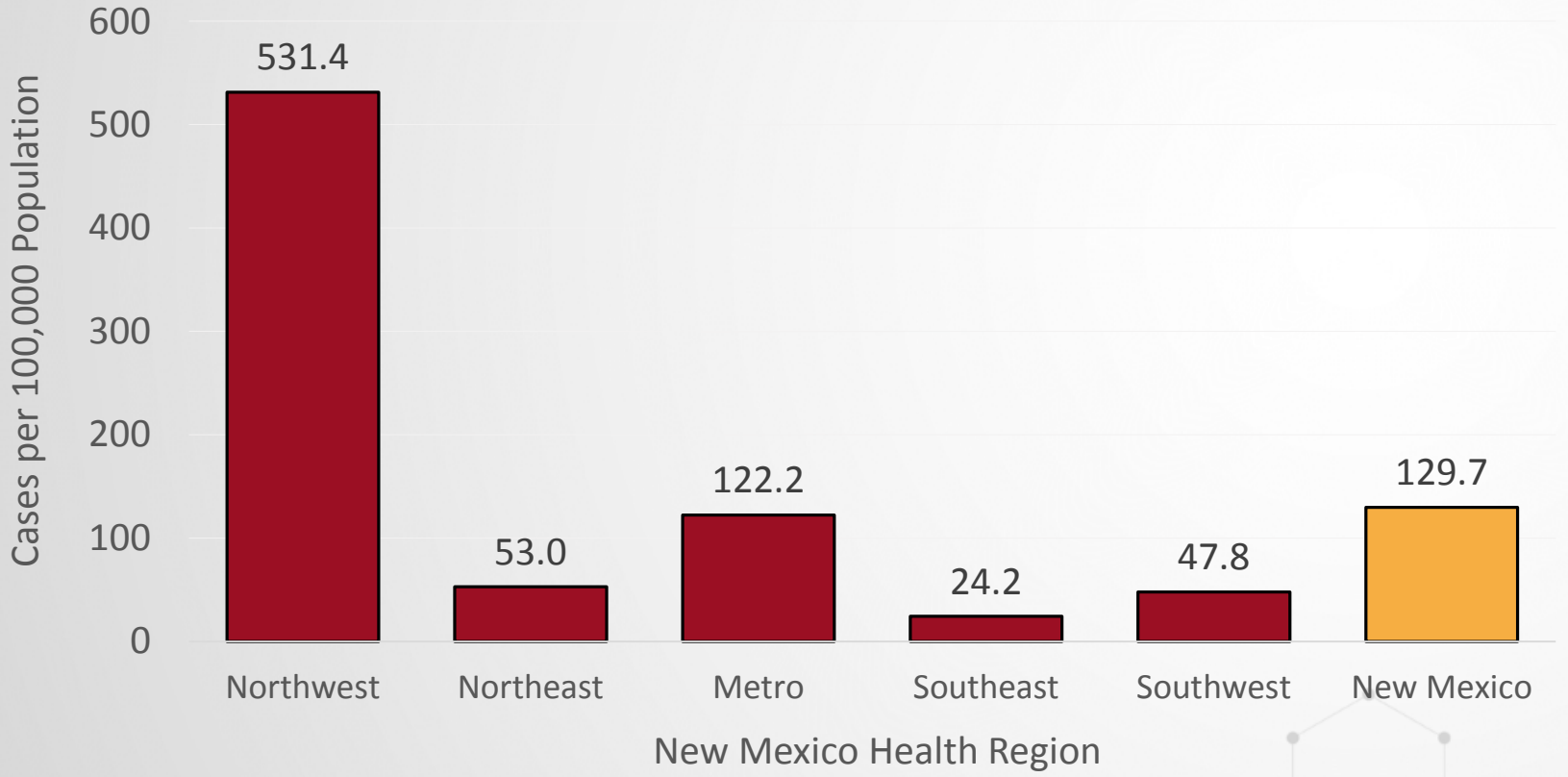
Epidemiology Details

New Mexico Health Regions



Prevalence Rate

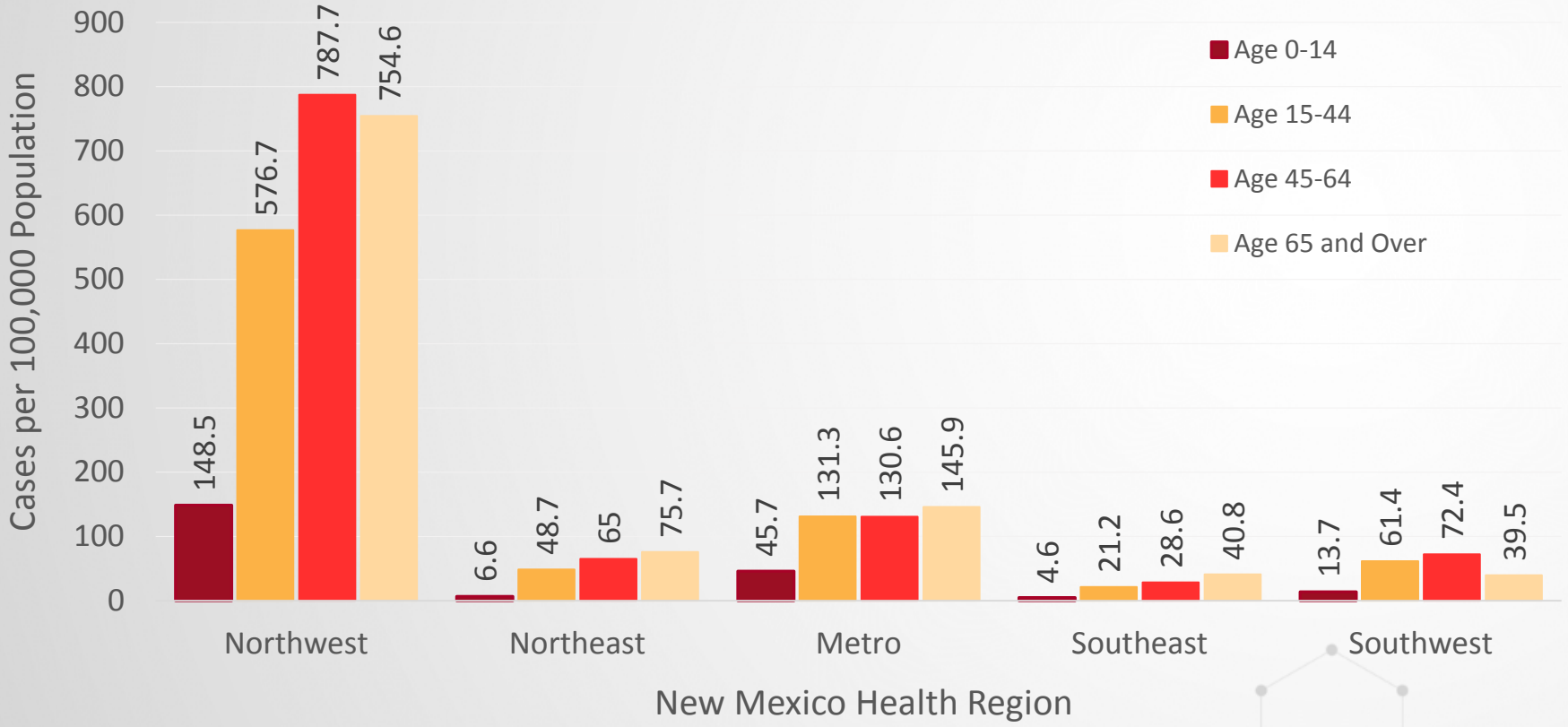
Number of COVID-19 Cases per 100,000 Population by Health Region, New Mexico



Source: Infectious Disease Epidemiology Bureau, Epidemiology and Response Division 4.27.2020, New Mexico Department of Health. Population estimates, UNM Geospatial and Population Studies Program.

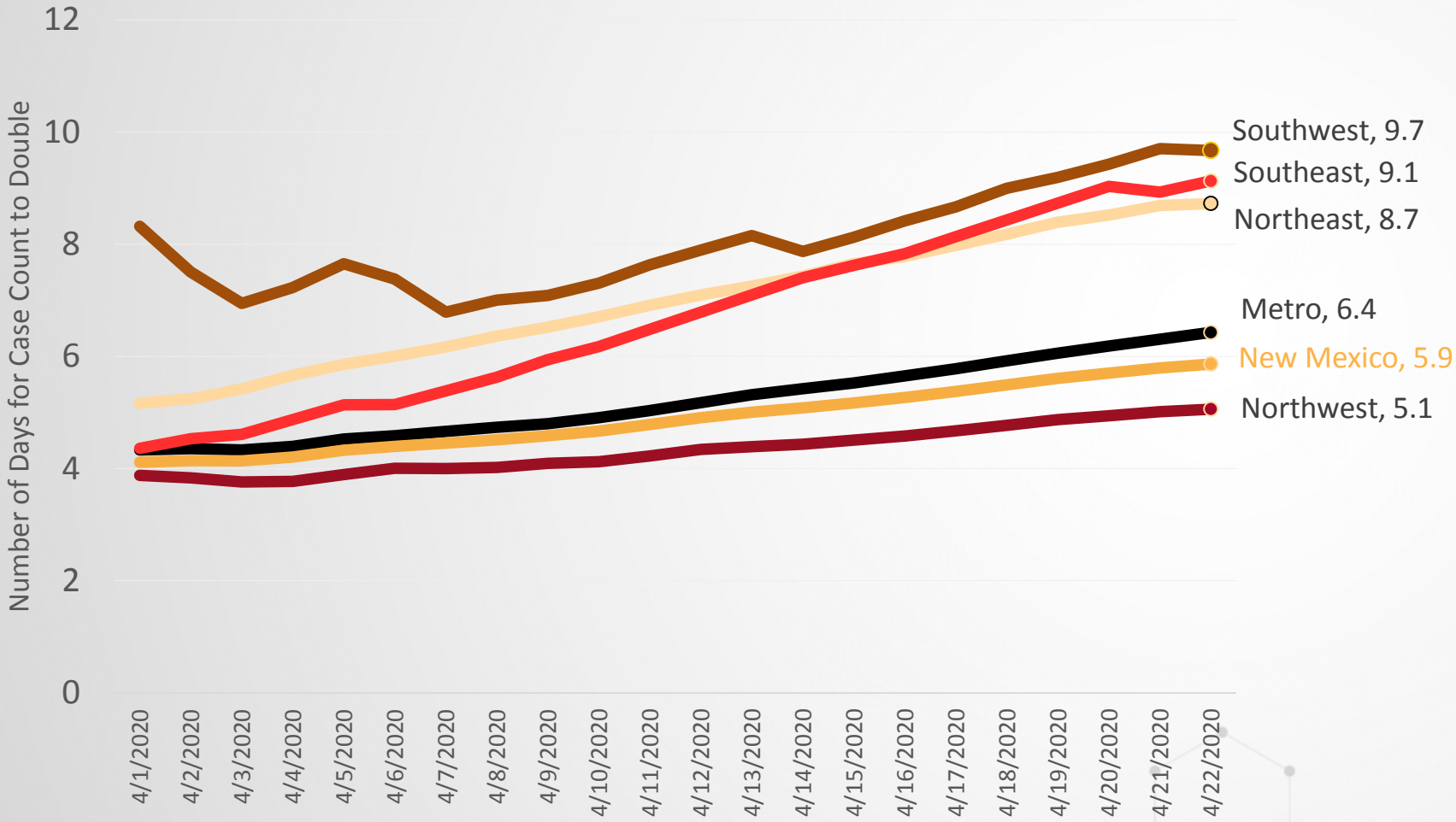
Prevalence Rate

Number of COVID-19 Cases per 100,000 Population by Health Region and Age Group, New Mexico



Source: Infectious Disease Epidemiology Bureau, Epidemiology and Response Division 4.26.2020, New Mexico Department of Health. Population estimates, UNM Geospatial and Population Studies Program.

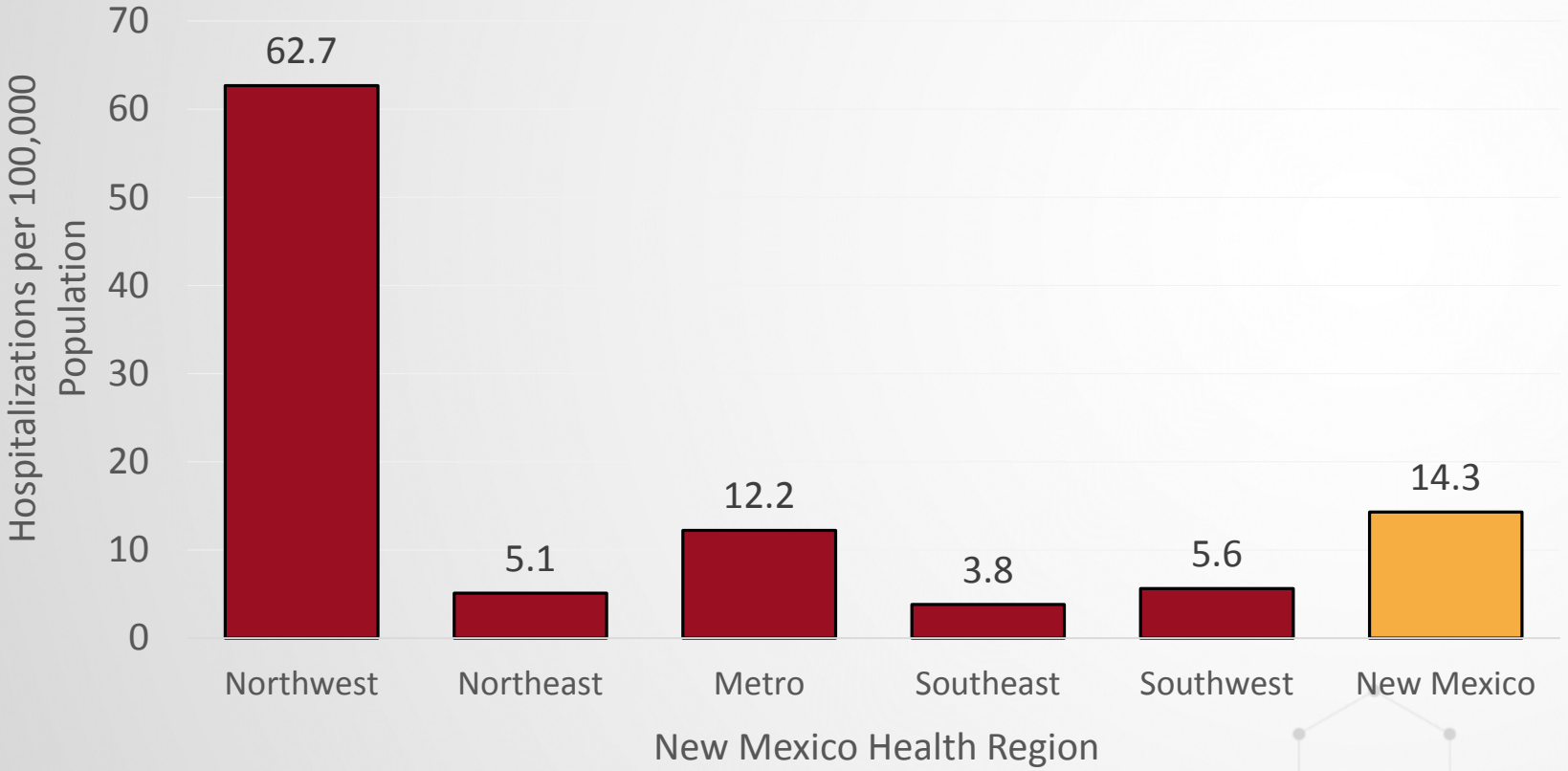
Projected Doubling Time



Projected Doubling Time Based on Date of Test Specimen Collection and Cumulative Average Rate of Increase.
Source: Infectious Disease Epidemiology Bureau, Epidemiology and Response Division 4.27.2020, New Mexico Department of Health.

Hospitalization Rate

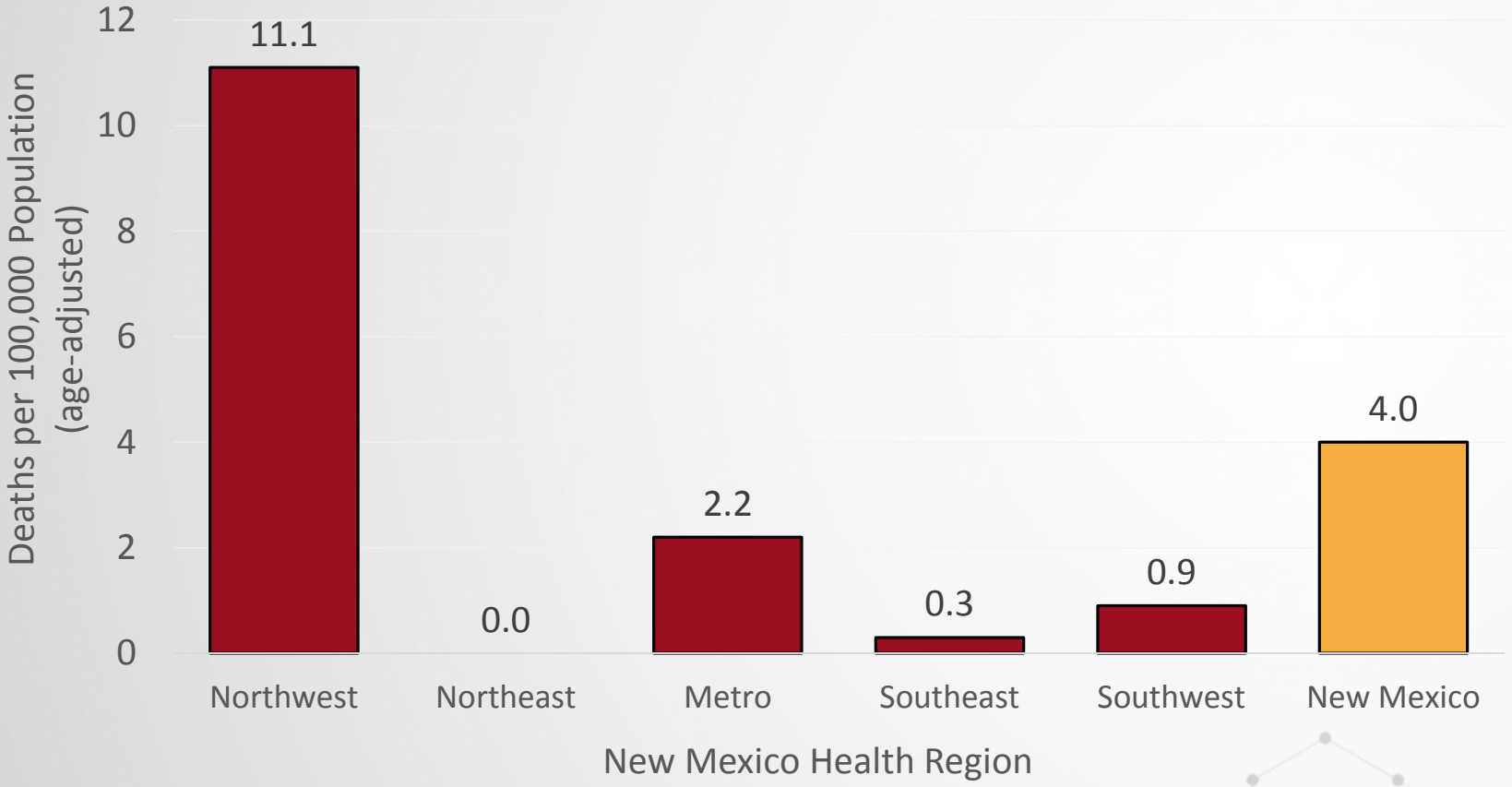
Number of COVID-19 Hospitalizations per 100,000 Population by Health Region, New Mexico



Source: New Mexico Electronic Disease Surveillance System, 4.27.2020 11:15A, Epidemiology and Response Division, New Mexico Department of Health. Population estimates, UNM Geospatial and Population Studies Program.

Mortality Rate

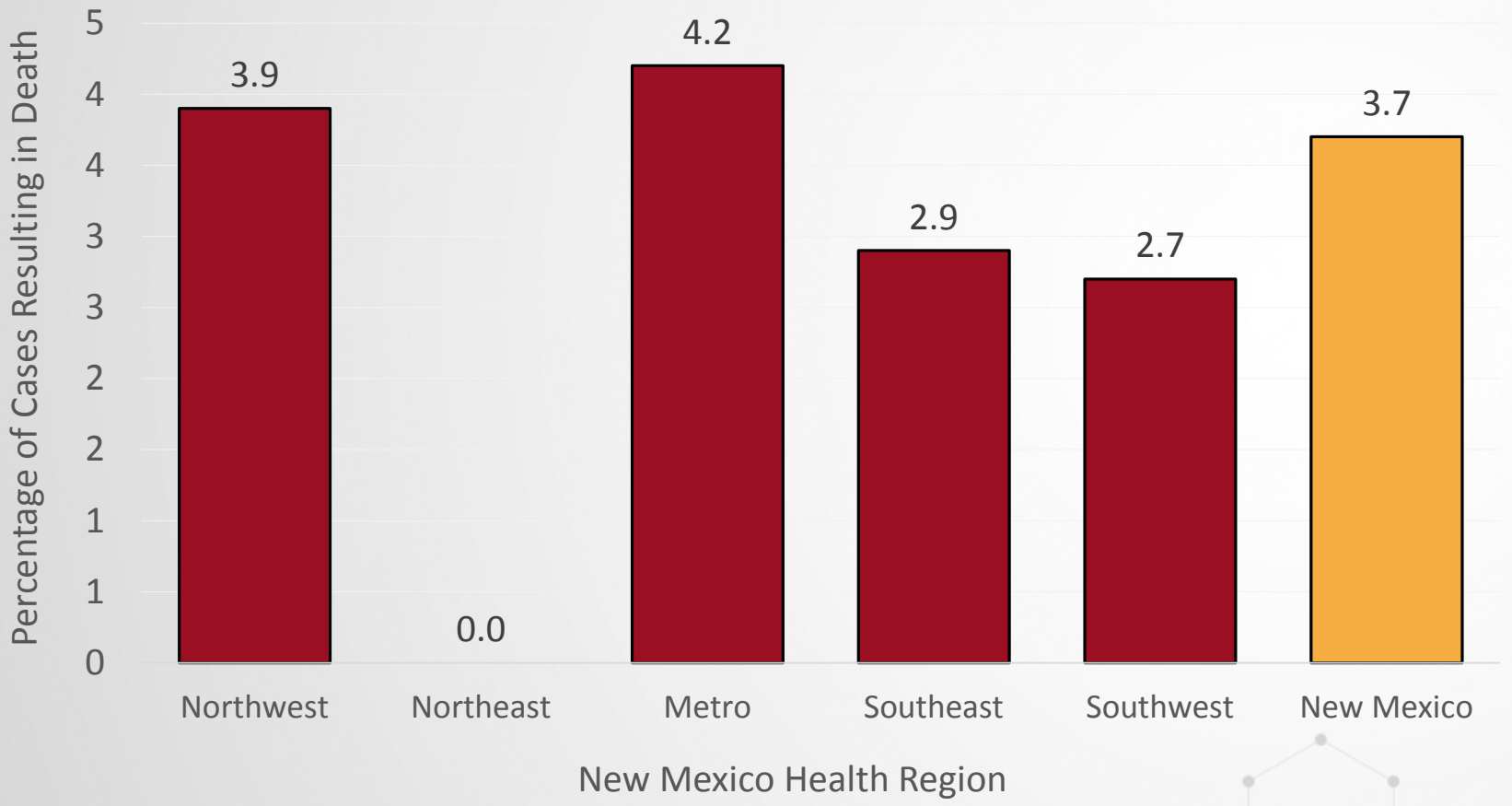
Number of COVID-19 Deaths per 100,000 Population by Health Region, New Mexico



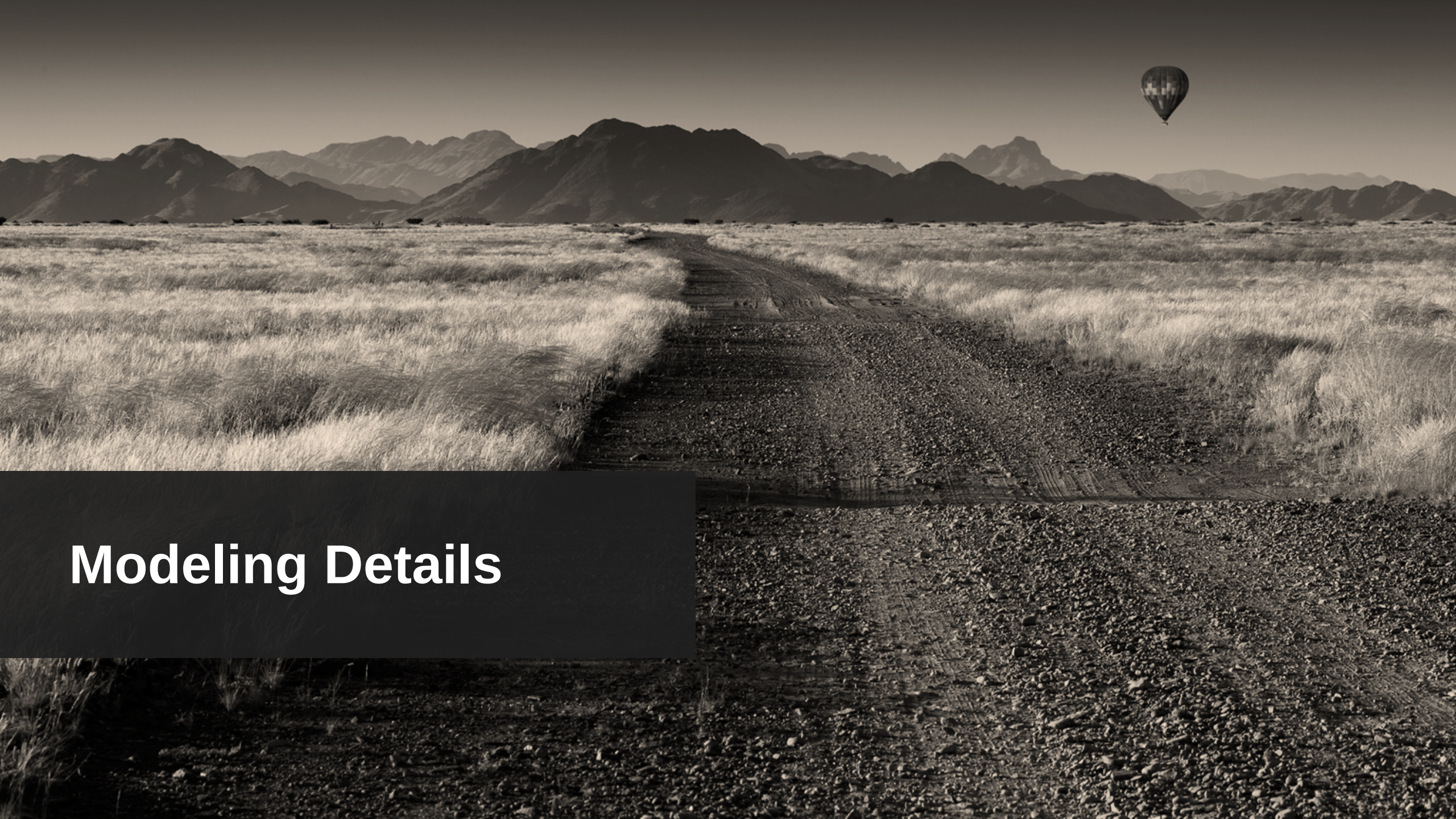
Rates have been age-adjusted to the U.S. 2000 standard population.
Source: Bureau of Vital Records and Health Statistics and Infectious Disease Epidemiology Bureau, Epidemiology and Response Division 4.26.2020, New Mexico Department of Health. Population estimates, UNM Geospatial and Population Studies Program.

Case Fatality Rate

Percentage of COVID-19 Cases Resulting in Death by Health Region, New Mexico



Source: Bureau of Vital Records and Health Statistics and Infectious Disease Epidemiology Bureau, Epidemiology and Response Division, reporting through 4.27.2020, New Mexico Department of Health.



Modeling Details

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	R_eff=1.24
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 6.5% ICU 1.6% Vent Rate 64.2% of ICU Mortality 2.5%
Length of Stay	Medical 8 days ICU 15 days	Actual rolling value / estimated number of total infected	Medical 5 days ICU 14 days ICU on Vent 14 days

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_effective from these variables lacks specificity
  - The NM model calculates the R_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.

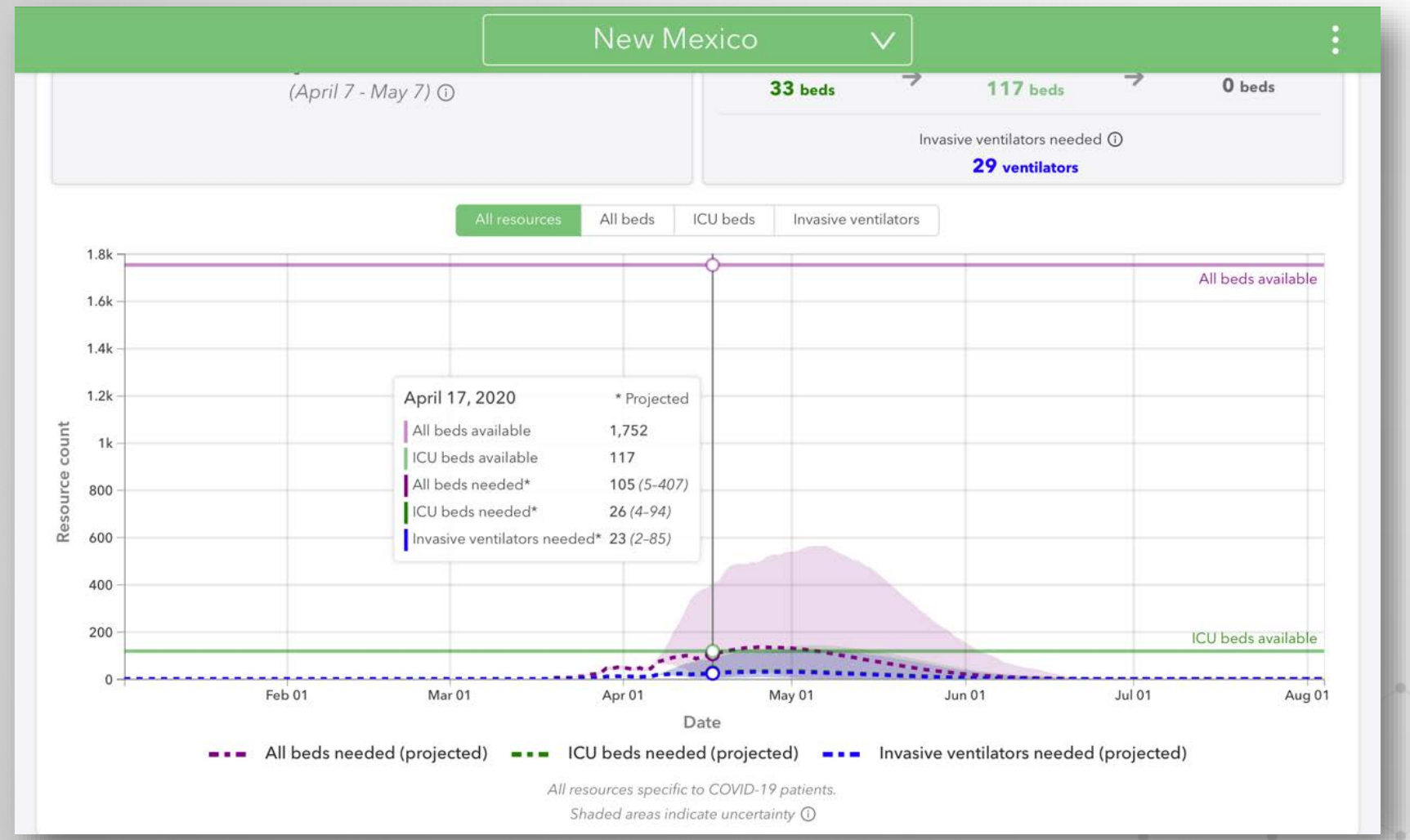
Background to the differences between the two models

- 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_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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