Modeling & Forecasting COVID-19 in NM

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12 Oct 2021: EpiGrid modeling

- This model is still optimistic. New Mexico has flat (or rising) incidence. Some updated model results are shown (insets).
- Some large-population counties are deteriorating.
- NM has no statewide trend toward recovery.
- NM daily deaths show a weak peak in September. A long tail of mortality into October is occurring. An increase in mortality is possible.
- Rising cases are in part due to poor infection control of Delta variant and lower vaccination rates.
A look at the raw incidence data

- Sunday, Monday
- Tuesday
- Wednesday/Thursday
- Friday
- Saturday

Cases rates are rising (or flat).

The 190 cases in the Lea county correctional facility are removed from data reported on March 26th. The 1/3 of reported cases that were > 2 weeks prior were removed from March 24th. Case reported for weekends starting April 10-12th are each divided by 3 to estimate individual day counts.
12 October 2021 Vaccine Analysis

- ~1424k first doses have been administered in NM.
- ~1255k completed vaccine series in NM.
- ~67.9% of all persons in New Mexico are at least minimally vaccinated.
- ~85.5% of all persons in New Mexico are currently eligible (~1792k).
- 67.9/85.5 ~ 79.5% of all eligible people.
- 5-11 year old should soon provide significant help.
- US Census Bureau reports 2097k people in New Mexico.

Black – vaccination for all New Mexicans

Red – First dose data used in EpiGrid.
Variant Monitoring.

B.1.617.2, “Δ”, ”Delta”, is the “Indian” variant.

- New variants have appeared without evident intermediates.
- Low levels of old variants often persist (E.g. the A-lineage).

New Mexico’s data are consistent with Delta being dominant.
What is happening in the rest of the U.S.? The 10 most populous states and New Mexico


<table>
<thead>
<tr>
<th>States</th>
<th>Cases</th>
<th>Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>New York</td>
<td>25.53</td>
<td>0.173</td>
</tr>
<tr>
<td>Michigan</td>
<td>42.28</td>
<td>0.375</td>
</tr>
<tr>
<td>Ohio</td>
<td>43.45</td>
<td>0.666</td>
</tr>
<tr>
<td>Florida</td>
<td>15.51</td>
<td>0.891</td>
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<td>New Mexico</td>
<td>34.8</td>
<td>0.387</td>
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<tr>
<td>Illinois</td>
<td>21.89</td>
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<tr>
<td>Texas</td>
<td>25.52</td>
<td>0.857</td>
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<tr>
<td>California</td>
<td>15.28</td>
<td>0.27</td>
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<tr>
<td>North Carolina</td>
<td>33.52</td>
<td>0.662</td>
</tr>
<tr>
<td>Georgia</td>
<td>26.3</td>
<td>1.113</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>41.03</td>
<td>0.467</td>
</tr>
</tbody>
</table>

Daily rates per 100,000 residents averaged October 4th thru October 11th 2021.
Cases plotted versus vaccination by county

The relationship between vaccination and cases is strong and highly protective on a by-county basis.

Infection control relative to vaccination rates.
- San Juan, Quay Counties have very high incidence.
- Lincoln, Colfax, McKinley Counties are high.
- Eddy, Chaves, Cibola, Lea, Los Alamos, Rio Arriba, and San Miguel Counties are marginally high compared with vaccination.
- Curry, Dona Ana, Luna, Socorro, and Sierra have better than typical incidence compared to vaccination.
- Roosevelt has surprisingly low incidence.
- Seven counties are not on this plot due to relative isolation and small populations: Catron, De Baca, Guadalupe, Harding, Hidalgo, Mora and Union.

Vaccination rates are uniformly low in: Quay, Lea, Eddy, Chaves, Torrance, Curry, Otero, and Roosevelt Counties. All have rates below ~40% of their total population.
- All counties have high absolute transmission, well above 10 per 10^5 per day.
- Further improvement in both vaccination and infection control are crucial to minimizing the pandemic’s burden.
- Improvement in poorly-performing regions benefits all counties because travel drives epidemic spread from areas of high incidence.
Recent by-county *trends* in daily incidence (are things getting better? **No.**)

- Trends, meaning time-dependence, not magnitude
- Per capita normalization not needed here (trends, not magnitude)
- Not referenced to vaccination rates (see the previous slide)
- Not referenced to whether the situation is currently intermediate, bad, or really bad. Barely reaching good anywhere in the USA.

- **Counties with falling incidence:** Chaves, Curry.

- **Counties with slowly falling incidence:** Lea.

- **Counties with steady incidence:** Bernalillo, Catron, Colfax, De Baca, Dona Ana, Eddy, Guadalupe, Hidalgo, Lincoln, Luna, McKinley, Mora, Otero, Quay, Rio Arriba, Roosevelt, Sandoval, Santa Fe, San Miguel, Sierra, Socorro, Taos, Torrance, Union, Valencia.

- **Counties with rising incidence:** Cibola, Grant, Harding, Los Alamos, San Juan.

Statewide by-county incidence trends are heterogeneous, with few areas of good control, some counties with poor control, and most in an unstable intermediate range.

*Need a population-wide understanding of what makes good infection control.* The Delta variant is sufficiently contagious that people will have to re-learn what constitutes good infection control because lessons learned for the Alpha variant are no longer correct.
Hospital bed concurrent usage by COVID-19 patients (Statewide)

- Left panel: linear vs. time (y-scale = 0:800). Right panel: log vs. time (y-scale = 40:800, 20x).
- Two models, purple (old), green (with a model of Regeneron usage with time). Further improvements to be made to the model.
- >2k courses of mAbs have likely lowered hospital loading. Likely > 1400 averted hospitalizations.
- Taking into account Remdesivir likely to improve model fit to data. Additional drugs may be coming on-line soon.
- Using better-than-expected hospital loading improves the model’s match to the death rate.
- Full adoption of vaccination would greatly lower the burden on hospitals and the medical profession.
Cumulative Cases & Daily Growth Rate for NM: Oct 11

Otero, Grant, San Juan, Los Alamos, Harding, Mora have elevated cumulative growth rates

*Growth rate is in cumulative cases
So what?

- San Juan, Grant, Los Alamos, Otero, Sandoval, Socorro, Santa Fe, Taos, Harding, and Chavez are accelerating.
- Most people in New Mexico are living in a county that is high per-capita case counts and decelerating, but nearly half 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