Modeling & Forecasting COVID-19 in NM

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Cumulative Cases & Daily Growth Rate for NM: Oct 4

Cumulative growth rates are overall decreasing in NM

*Growth rate is in cumulative cases
Los Alamos National Laboratory

So what?

• Most people in New Mexico are living in a county that is high per-capita case counts with mixed decelerating growth rates.

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
5 Oct 2021: EpiGrid modeling

- NM daily incidence are generally consistent with model amplitude. Rate of decline has deteriorated.
- This model may be optimistic.
- By-county variation is very large; *some locales are failing to control the SARS-CoV-2 Delta variant.*
- NM daily deaths may have peaked in September. A tail into October is occurring. This is an approximately three-week lagging indicator.
A look at the raw incidence data

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

Cases rates are leveling at a high incidence.

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.
5 October 2021 Vaccine Analysis

- ~1415k first doses have been administered in NM.
- ~1248k completed vaccine series in NM.
- ~67.5% of all persons in New Mexico are at least minimally vaccinated.
- ~85.5% of all persons in New Mexico are currently eligible (~1792k).
Variants: Still Delta-dominant.

B.1.617.2, “Δ” is the “Indian variant”
B.1.1.7, “α” is the “UK variant” (apparently now minor)
P.1 is the “Brazil variant” (apparently now minor)

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>State</th>
<th>Cases</th>
<th>Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>New York</td>
<td>24.93</td>
<td>0.202</td>
</tr>
<tr>
<td>Michigan</td>
<td>37.98</td>
<td>0.322</td>
</tr>
<tr>
<td>Ohio</td>
<td>49.45</td>
<td>0.552</td>
</tr>
<tr>
<td>Florida</td>
<td>22.61</td>
<td>1.119</td>
</tr>
<tr>
<td>New Mexico</td>
<td>34.12</td>
<td>0.428</td>
</tr>
<tr>
<td>Illinois</td>
<td>21.29</td>
<td>0.311</td>
</tr>
<tr>
<td>Texas</td>
<td>33.92</td>
<td>0.88</td>
</tr>
<tr>
<td>California</td>
<td>18.77</td>
<td>0.239</td>
</tr>
<tr>
<td>North Carolina</td>
<td>41.36</td>
<td>0.666</td>
</tr>
<tr>
<td>Georgia</td>
<td>31.52</td>
<td>0.975</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>34.47</td>
<td>0.402</td>
</tr>
</tbody>
</table>

Daily rates per 100,000 residents averaged September 27th thru October 4th 2021.

State-wide epidemics are strongly heterogeneous, and unstable.
The relationship between vaccination and cases is strong and highly protective on a by-county basis.

Infection control relative to vaccination rates.
- Quay County 2-week incidence is high.
- Eddy, Lincoln, Colfax Counties are high.
- Lea, Chaves, San Juan, San Miguel, Cibola, and Río Arriba Counties are marginally high compared with vaccination.
- 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.

- Most counties continue to 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?)

- 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:** Bernalillo, Dona Ana, Eddy, Lea, Otero, Roosevelt, San Miguel, Taos.

- **Counties with steady incidence:** Catron, Colfax, De Baca, Grant, Guadalupe, Los Alamos, Harding, Hidalgo, Lincoln, Luna, McKinley, Mora, Quay, Rio Arriba, Sandoval, Santa Fe, Sierra, Socorro, Torrance, Union, Valencia.

- **Counties with rising incidence:** Cibola, 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)
- Deviation of the data below the model is evident beginning on ~19 August.
- Partial model of mAbs use reported by NM can account for a substantial part of the suppression of hospitalizations.
- ~2k courses of mAbs given that could have affected hospital loading (~500 courses given, benefit to be realized).
- As many as 1400 averted hospitalizations. Demographics matter.
- Time dependence not yet fit (sharp corner in the data).