Modeling & Forecasting COVID-19 in NM

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18 Jan 2022: Epigrid modeling (Red line is 12Jan22 model).

- New Mexico incidence has risen sharply. Viral evolution leading to the Omicron variant is the primary driver of the rise.
- Daily incident events are consistent with gradually improving compliance with respiratory infection control. Further improvement possible.
- Statewide peak in daily incidence is estimated for the last week of January. A lower, flatter, peak is possible with improved infection control.
- Boosting is a strong countervailing effect to the evolution-driven rise, and is limiting the rise in cases.
- Fatality model is intended to be pessimistic: it does not account for a possible modest reduction in disease severity.
- No unambiguous evidence for increased intrinsic infectivity of Omicron. Virus evolution and perhaps increased contact over holidays explains rise.
- *Indoor masking remains critical* to moderating all consequence. Respirator use instead of cloth masks may further mitigate consequences.
- New pharmaceuticals will improve the situation when available in large quantities.
- Drug administration is time-sensitive: Rapid contact-tracing is beneficial for early treatment.
- Testing positivity in NM likely reflects some compromised situational awareness in NM, as in nearly all States.
A look at the raw incidence data

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

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.

- Reported incidence rising, significantly driven by viral evolution leading to Omicron’s partial evasion of existing antibody responses.
- T-cell responses likely remain significantly protective, esp. against severe outcomes.
- Within-weekly variation still visible in NM data. Contrast some other states.
17 January 2021 Vaccine Analysis

- 1635k first doses are used in modeling.
- ~1636k first doses have been administered in NM, +13k, +12k.
- ~1380k completed initial vaccine series in NM, +9k, +9k.
- ~652k boosters completed in NM, +35, +33k.
- ~78.0% of all persons in New Mexico are at least minimally vaccinated.
- ~94.5% of all New Mexicans are eligible (~1981k).
- 78.0/94.5=82.6% of eligible New Mexicans vaccinated.
- 5-11 year-olds have received ~57k first doses (32.5%, +1.9%).
- ~461k unvaccinated New Mexicans. Many have been infected.
- ~256k incompletely vaccinated New Mexicans.
- Likely ~350k New Mexicans are relatively unprotected.
- 50% VE against Omicron for initial series ~500k susceptible, less serious outcomes.
- 75% VE boosted against Omicron, ~150k, less serious.
- >345k at higher risk for serious outcome (Omicron). This is ~15% of the population relatively naïve to SARS-CoV-2 (excepting distant T-cell responses).
- >~620k at lower risk for serious outcome (Omicron) but who are susceptible to infection.
- ~1135k functionally immune (Omicron, for now only).
- These numbers depend on the viral-variant.
Variant Monitoring: Omicron is the current variant

- New variants have appeared without evident intermediates. Need better global monitoring.
- Small number New Mexico statistics, likely all or nearly all B.1.1.529 in NM.
- Latest no-intermediate variant is B.1.1.529 (Omicron). Extremely rapid rise; faster than Δ. Viral evolution / immune evasion played a major role.
- If Omicron’s rise in New Mexico is slower than the national experience, this suggests (i) better infection control in New Mexico than nationally, and (ii) faster boosting.
- Approximately 6-12 months is the longest variant-interval: D614G (~3 months), Alpha (~6-9 months), Delta (~6 months), Omicron (~6 months).
- Updated mRNA vaccine from Pfizer in March 2022? Less than 6 months.

https://www.cdc.gov/covid-data-tracker/#variant-proportions
Recent By-State Trends: Most Populous 10 States: True incidence?


14-Day Testing positivity (CDC): Red >=25% positivity, Blue >= 20% & <25% positivity, Black >- 15% & <20% positivity, Orange No Data, uncounting may be possible at these levels of test positivity. Serosurvey, T-cell epitopes, etc.?

* = case report failed “heart-beat”

Daily rates per 100,000 residents averaged January 11th 2022 thru January 17th 2022.

<table>
<thead>
<tr>
<th>State</th>
<th>Cases</th>
<th>Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>New York</td>
<td>271.73</td>
<td>0.862</td>
</tr>
<tr>
<td>Michigan</td>
<td>182.97</td>
<td>1.078</td>
</tr>
<tr>
<td>Ohio</td>
<td>237.65</td>
<td>1.037</td>
</tr>
<tr>
<td>Florida</td>
<td>266.15</td>
<td>0.306</td>
</tr>
<tr>
<td>New Mexico</td>
<td>202.42</td>
<td>1.099</td>
</tr>
<tr>
<td>Illinois</td>
<td>234.93</td>
<td>0.991</td>
</tr>
<tr>
<td>Texas</td>
<td>233.03</td>
<td>0.339</td>
</tr>
<tr>
<td>California</td>
<td>300.55</td>
<td>0.272</td>
</tr>
<tr>
<td>North Carolina</td>
<td>251.22</td>
<td>0.38</td>
</tr>
<tr>
<td>Georgia</td>
<td>177.16</td>
<td>0.323</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>215.88</td>
<td>1.064</td>
</tr>
</tbody>
</table>
Our model suggests that the number of daily cases is expected to range between 2400 and 9025 in the next few weeks.
So what?

Our model suggests that the number of daily deaths is expected to range between 10 and 120 in the next few weeks.
Chaves, De Baca, Los Alamos, Santa Fe and San Miguel counties have the highest cumulative growth rates.

*Growth rate is in cumulative cases*
So what?

- Most people in New Mexico are living in a county that has high per-capita case counts and decelerating growth rates.
The CDC ForecastHub shows a 29% decrease from incident weekly cases observed at 29,826 (Jan 15) to 22,178 by Feb 12, 2021.

COVIDhub-4_week_ensemble prediction, COVID 19 ForecastHub
https://viz.covid19forecasthub.org/
> Additional Regional Forecasts
Central & North Regions Daily Cases Forecast

So what?
Central and Northeast trending upward. The central region is expected to see the most number of cases followed by the northwest and northeast regions.
South Regions Daily Cases Forecast

Southwest

Southeast

So what?
Both regions trending upward. The southwest region is expected to see the most number of cases followed by the southeast region.
Hospitalization Forecast
Concurrent Hosp & ICU Beds Based on Forecasts – Average Stay of 8 Hosp, 15 Days for ICU/vent & 25% ICU rate

Concurrent COVID-19 ICU beds

<table>
<thead>
<tr>
<th>Week</th>
<th>Qu. 5% (best case)</th>
<th>Qu. 50% (median)</th>
<th>Qu. 95% (worst case)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/23/22</td>
<td>167</td>
<td>289</td>
<td>456</td>
</tr>
<tr>
<td>1/30/22</td>
<td>132</td>
<td>387</td>
<td>794</td>
</tr>
<tr>
<td>2/6/22</td>
<td>120</td>
<td>408</td>
<td>1097</td>
</tr>
<tr>
<td>2/13/22</td>
<td>112</td>
<td>343</td>
<td>1165</td>
</tr>
<tr>
<td>2/20/22</td>
<td>103</td>
<td>298</td>
<td>923</td>
</tr>
<tr>
<td>2/27/22</td>
<td>94</td>
<td>282</td>
<td>579</td>
</tr>
</tbody>
</table>

“Scaled” Scenario

So what?

Model is predicting an increase in COVID-19 ICU beds needed over the next several weeks
Concurrent COVID-19 non-ICU “med-surge” beds

<table>
<thead>
<tr>
<th>Week</th>
<th>Qu. 5% (best case)</th>
<th>Qu. 50% (median)</th>
<th>Qu. 95% (worst case)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/23/22</td>
<td>350</td>
<td>703</td>
<td>1187</td>
</tr>
<tr>
<td>1/30/22</td>
<td>297</td>
<td>910</td>
<td>1919</td>
</tr>
<tr>
<td>2/6/22</td>
<td>263</td>
<td>880</td>
<td>2642</td>
</tr>
<tr>
<td>2/13/22</td>
<td>241</td>
<td>730</td>
<td>2587</td>
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<tr>
<td>2/20/22</td>
<td>227</td>
<td>641</td>
<td>1851</td>
</tr>
<tr>
<td>2/27/22</td>
<td>206</td>
<td>621</td>
<td>1125</td>
</tr>
</tbody>
</table>

“Scaled” Scenario

Med-surge general bed needs are predicted to increase during the next 3 weeks