25 Jan 2022: Epigrid modeling

- NM daily incidence has, or will very shortly, plateau. Viral evolution leading to the Omicron variant was the primary driver of the rise.
- Boosting is a strong countervailing effect to the evolution-driven rise, and is helping to bring the NM Omicron epidemic under control.
- Events are consistent with gradually improving respiratory infection control, and accelerating initial vaccination.
- **Decreases** in the case fatality rate are largely due to improved vaccination status.
- **Some** reduction in disease severity due to viral evolution is **possible**, but is not established or proven by these data.
- Omicron is about as infectious as Delta variant. Virus evolution leading to immune evasion explains the main part of the rise in cases.
- **Indoor** masking remains critical to moderating all consequence. Respirator use instead of cloth masks will 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.
- Immunological diversity from updated vaccines will be helpful when available, starting ~ March 2022.
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 level is high, significantly driven by viral evolution that lead to Omicron’s partial evasion of existing antibody responses.

Within-weekly variation still visible in NM data. Contrast some other states.

Color-coded by-day-of-week decline is visible (log plot). Confirm with more days of data.

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.
25 January 2022 Vaccine Analysis (NM)

- 1663k first doses are used in modeling.
- 1663k first doses have been administered, +27k, +13k, +12k.
- 1396k completed initial vaccine series, +16k, +9k, +9k.
- ~683k boosters completed, +31k, +35k, +33k.
- ~79.3% of all persons in New Mexico are at least minimally vaccinated.
- ~94.5% of all New Mexicans are eligible (~1981k).
- 78.0/94.5=83.9% of eligible New Mexicans vaccinated.
- 5-11 year-olds: 65k first doses (34.6% +1.9%, +1.9%, +1.9%).
- ~434k unvaccinated New Mexicans. Many have been infected.
- ~267k incompletely vaccinated New Mexicans.
- Likely >275k 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.
- ~275k at higher risk for serious outcome (Omicron). This is ~13% of the population relatively to naïve to SARS-CoV-2 (excepting distant T-cell responses).
- >=646k at lower risk for serious outcome (Omicron) but who are susceptible to infection.
- ~1180k functionally immune (Omicron, for now only).
- These population levels of protection depend on the viral-variant.

US Census Bureau reports 2097k people in New Mexico.
Variant Monitoring: Omicron is the current variant

https://www.cdc.gov/covid-data-tracker/#variant-proportions

- New variants have appeared without evident intermediates. Need better global monitoring.
- NM small-number statistics, likely all B.1.1.529 (Omicron) in NM.
- Extremely rapid rise; faster than \( \Delta \). Viral evolution / immune evasion played a major role.
- Possible shorter foot-to-head time of NM epidemic suggests help from vaccination.
- 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.
Recent By-State Trends: Most Populous 10 States: True incidence?

Trends over the last 1-3 weeks: Increasing: N. Carolina    Flat: Illinois, Michigan, New Mexico, Ohio*, Texas*. 
Declining: California, Florida, Georgia, New York, Pennsylvania?.

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.?  

<table>
<thead>
<tr>
<th></th>
<th>Cases</th>
<th>Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>New York</td>
<td>154.13</td>
<td>1.055</td>
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<tr>
<td>Michigan</td>
<td>199.88</td>
<td>1.132</td>
</tr>
<tr>
<td>Ohio</td>
<td>168.6</td>
<td>1.299</td>
</tr>
<tr>
<td>Florida</td>
<td>170.49</td>
<td>0.394</td>
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<tr>
<td>New Mexico</td>
<td>264.64</td>
<td>0.774</td>
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<tr>
<td>Illinois</td>
<td>209.1</td>
<td>1.039</td>
</tr>
<tr>
<td>Texas</td>
<td>194.17</td>
<td>0.413</td>
</tr>
<tr>
<td>California</td>
<td>282.69</td>
<td>0.291</td>
</tr>
<tr>
<td>North Carolina</td>
<td>271.16</td>
<td>0.387</td>
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<tr>
<td>Georgia</td>
<td>147.36</td>
<td>0.452</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>150.3</td>
<td>0.977</td>
</tr>
</tbody>
</table>

* = case report failed “heart-beat”

Daily rates per 100,000 residents averaged January 18\(^{th}\) 2022 thru January 24\(^{th}\) 2022.
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Short- & Long-Term Forecast for NM: Cases

So what?

Our model suggests that the number of daily cases is expected to stay high (but decreasing) over the next 2-3 weeks and then begin steady decline.
Short- & Long-Term Forecast for NM: Deaths

So what?

Our model suggests that the number of daily deaths is expected to range between 5 and 65 in the next few weeks, slowly declining toward the end of February and beginning of March.
Forecast for Incident Weekly Cases in NM

The CDC ForecastHub is predicting a 2% increase in incident weekly cases to 39,995K (from Jan 22 at 38,995K)

COVIDhub-4_week_ensemble prediction, COVID 19 ForecastHub
https://viz.covid19forecasthub.org/
Cumulative Cases & Daily Growth Rate for NM: Jan 25

Los Alamos, Santa Fe and Taos counties have the highest cumulative growth rates.

*Growth rate is in cumulative cases
Number of New Mexicans living in regions with particular combinations of per capita case counts and 7-day growth rates

So what?

- Most people in New Mexico are living in a county that has **high per-capita case counts** and **accelerating growth**.
> Additional Regional Forecasts
Central & North Regions Daily Cases Forecast

So what?
The Central region is expected to see the most number of cases followed by the Northwest and Northeast regions. Cases still trending upward, Northeast appears to be plateauing.
South Regions Daily Cases Forecast

So what?
Both regions trending upward still before predicted decline. The Southwest region is expected to see higher number of cases.
> Hospitalization Forecast: Model is Still Calibrating to Latest Hospitalization Ratios
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>1/30/22</td>
<td>73</td>
<td>120</td>
<td>282</td>
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<tr>
<td>2/6/22</td>
<td>18</td>
<td>99</td>
<td>367</td>
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<tr>
<td>2/13/22</td>
<td>8</td>
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<td>2/20/22</td>
<td>6</td>
<td>93</td>
<td>406</td>
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<tr>
<td>2/27/22</td>
<td>6</td>
<td>81</td>
<td>377</td>
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<tr>
<td>3/6/22</td>
<td>5</td>
<td>77</td>
<td>354</td>
</tr>
</tbody>
</table>

“Scaled” Scenario

So what?

Model is predicting an decrease in COVID-19 ICU beds needed over the next several weeks (possibly too optimistic)
Concurrent Hosp & ICU Beds Based on Forecasts – Average Stay of 8 Hosp, 15 Days for ICU/vent & 25% ICU rate

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>1/30/22</td>
<td>119</td>
<td>267</td>
<td>783</td>
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<tr>
<td>2/6/22</td>
<td>35</td>
<td>243</td>
<td>953</td>
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<tr>
<td>2/13/22</td>
<td>19</td>
<td>241</td>
<td>994</td>
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<tr>
<td>2/20/22</td>
<td>15</td>
<td>224</td>
<td>957</td>
</tr>
<tr>
<td>2/27/22</td>
<td>13</td>
<td>199</td>
<td>911</td>
</tr>
<tr>
<td>3/6/22</td>
<td>11</td>
<td>187</td>
<td>856</td>
</tr>
</tbody>
</table>

“So Scaled” Scenario

So what?

Med-surge general bed needs are predicted to decrease overall during the next 3 weeks (possibly too optimistic)