The Mike DeWine Cure?

- Initially tested positive and then over the next 3 days had 2 negative RT-PCR tests
- Gov Mike DeWine took the Quidel Corporation's antigen test
  - Sofia SARS Antigen Fluorescent Immunoassay (FIA) qualitative detection of nucleocapsid protein from SARS-CoV-2
  - Results in 15 minutes
- Why the sudden change in result:
  - Accuracy compared to a PCR test (not done their own sensitivity/specificity) – false negatives more likely .... But false positives also possible
  - Potential contamination at test center – Case western parking lot RNC test center
  - Conspiracy theory!
What are the most important metrics

Typical metrics that are used

- 14-day new cases and deaths trend
- New cases per 100K or per million (averaged over a 3 to 7-day period)
- Deaths per 100K or million (averaged over a 3 to 7-day period)
- COVID-19 test positivity rate (averaged over a 3 to 7-day period)
- Testing % of target
- R₀ or Rₜ rate
- ICU/Hospital bed capacity
- Contact tracing capability
Case Fatality Ratio

Case Fatality Ratio (CFR) = \( \frac{\text{Number of deaths from disease}}{\text{Number of confirmed cases of disease}} \times 100 \)

\[
\text{Case Fatality Ratio (CFR)} = \frac{160,157}{4,888,070} \times 100 = 3.28\%
\]

Case Fatality Ratio (CFR) = \( \frac{\text{Number of deaths from disease}}{\text{Number of deaths from disease + Number of recovered cases}} \times 100 \)

\[
\text{Case Fatality Ratio (CFR)} = \frac{160,157}{160,157 + 1,598.624} \times 100 = 9.1\%
\]

For comparison CFR for influenza estimated at 0.1%
Infection Fatality Ratio

Infection Fatality Ratio (IFR) = \( \frac{\text{Number of deaths from disease} \times 100}{\text{Number of infected individuals}} \)

Infection Fatality Ratio (IFR) = \( \frac{160,157}{??????????} \times 100 \)

CDC Latest Estimate of Infection Fatality Ratio (IFR) is 0.65%*

Experts estimate 40-70% of worlds population could become infected

National Forecast

New Weekly Deaths

- Reported
- Columbia-UNC
- Covid19Sim
- Columbia
- DDS
- LSHTM
- Geneva
- GT-DeepCOVID
- IHME
- ISU
- JCH
- JHU
- Karlen
- LANL
- LNUQ
- MIT-CovAlliance
- MOBS
- NotreDame-Mobility
- UCM
- Oliver Wyman
- PSI
- QJ-Hong
- ESG
- RPI-UW
- STH
- UA
- UCLA
- UMass-MB
- UM
- ERDC
- USC
- UT
- YYG

Inner Bands: 50% Prediction Intervals
Outer Bands: 95% Prediction Intervals

Jun-01 Jun-15 Jul-01 Jul-15 Aug-01 Aug-15 Sep-01

Total Deaths

- Reported
- Auquan
- Columbia-UNC
- Covid19Sim
- JCB
- MIT-ORC
- Columbia
- DDS
- LSHTM
- Geneva
- MOBS
- NotreDame-Mobility
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Inner Bands: 50% Prediction Intervals
Outer Bands: 95% Prediction Intervals

Jun-01 Jun-15 Jul-01 Jul-15 Aug-01 Aug-15 Sep-01

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Herd Immunity
Estimates vary 40-80% to get herd immunity

- New York City area
  April 25 - May 6
  23.2%

- Louisiana
  April 1 - April 8
  5.75%

- Connecticut
  May 21 - May 26
  5.18%

- Philadelphia area
  May 26 - May 30
  3.63%

- South Florida
  April 20 - April 24
  2.85%

- Missouri
  May 25 - May 30
  2.8%

- Minnesota
  May 25 - June 7
  2.18%

- Western Washington state
  April 27 - May 11
  2.06%

- Utah
  May 25 - June 5
  1.14%

- San Francisco Bay Area
  April 23 - April 27
  0.97%

Graphic courtesy of the Washington Post
## Coronavirus herd immunity threshold vs. modeled seroprevalence estimates

<table>
<thead>
<tr>
<th>State</th>
<th>Seroprevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Jersey</td>
<td>19.4%</td>
</tr>
<tr>
<td>Louisiana</td>
<td>18.7%</td>
</tr>
<tr>
<td>Arizona</td>
<td>18.5%</td>
</tr>
<tr>
<td>Mississippi</td>
<td>17.8%</td>
</tr>
<tr>
<td>Georgia</td>
<td>16.8%</td>
</tr>
<tr>
<td>Florida</td>
<td>15.0%</td>
</tr>
<tr>
<td>Alabama</td>
<td>13.0%</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>12.9%</td>
</tr>
<tr>
<td>Connecticut</td>
<td>11.7%</td>
</tr>
<tr>
<td>New York</td>
<td>11.6%</td>
</tr>
<tr>
<td>Nevada</td>
<td>11.6%</td>
</tr>
<tr>
<td>Rhode Island</td>
<td>11.5%</td>
</tr>
<tr>
<td>Maryland</td>
<td>11.0%</td>
</tr>
<tr>
<td>South Carolina</td>
<td>10.8%</td>
</tr>
<tr>
<td>District of Columbia</td>
<td>10.7%</td>
</tr>
<tr>
<td>Illinois</td>
<td>9.2%</td>
</tr>
<tr>
<td>Delaware</td>
<td>8.9%</td>
</tr>
<tr>
<td>United States</td>
<td>9.1%</td>
</tr>
<tr>
<td>Tennessee</td>
<td>8.6%</td>
</tr>
<tr>
<td>Iowa</td>
<td>8.0%</td>
</tr>
<tr>
<td>Texas</td>
<td>7.5%</td>
</tr>
<tr>
<td>California</td>
<td>7.4%</td>
</tr>
<tr>
<td>Missouri</td>
<td>7.4%</td>
</tr>
<tr>
<td>North Carolina</td>
<td>7.0%</td>
</tr>
<tr>
<td>Arkansas</td>
<td>7.0%</td>
</tr>
<tr>
<td>New Mexico</td>
<td>6.9%</td>
</tr>
<tr>
<td>Minnesota</td>
<td>6.6%</td>
</tr>
<tr>
<td>Oklahoma</td>
<td>6.4%</td>
</tr>
<tr>
<td>Virginia</td>
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</tr>
<tr>
<td>Indiana</td>
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<tr>
<td>Nebraska</td>
<td>6.0%</td>
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<tr>
<td>Ohio</td>
<td>5.8%</td>
</tr>
<tr>
<td>Michigan</td>
<td>5.8%</td>
</tr>
<tr>
<td>Wisconsin</td>
<td>5.8%</td>
</tr>
<tr>
<td>Kentucky</td>
<td>5.5%</td>
</tr>
</tbody>
</table>

Graphic courtesy of the Washington Post
Rt vs population immunity vs social connectivity
What is the cost in deaths?

U.S. population: 328 million

Herd immunity threshold: 60% (.60)

Cases to reach herd immunity: 197 million

Fatality rate: 0.6% (.006)

Deaths to reach herd immunity: 1.18 million

Reported COVID-19 deaths in the United States as of Aug. 7: 157 thousand

Each circle equals 50,000 deaths

U.S. population: 328 million

Herd immunity threshold: 40% (.40)

Cases to reach herd immunity: 131 million

Fatality rate: 0.6% (.006)

Deaths to reach herd immunity: 787 thousand

Reported COVID-19 deaths in the United States as of Aug. 7: 157 thousand

Each circle equals 50,000 deaths

www.nebgh.org
What is the cost in deaths?

U.S. population 328 million \times 80\% (.80) = 262 million

Cases to reach herd immunity

262 million \times 0.3\% (.003) = 787 thousand

Deaths to reach herd immunity

Reported COVID-19 deaths in the United States as of Aug. 7
157 thousand

Each circle equals 50,000 deaths

U.S. population 328 million \times 80\% (.80) = 262 million

Cases to reach herd immunity

262 million \times 0.8\% (.008) = 2.10 million

Deaths to reach herd immunity

Reported COVID-19 deaths in the United States as of Aug. 7
157 thousand

Each circle equals 50,000 deaths

Deaths to reach herd immunity
Over 90% recover so what’s the big deal?

- Many COVID-19 patients continue to have symptoms weeks and months after their diagnosis:
  - Fatigue, muscle and joint pains
  - Trouble thinking clearly
  - Loss of sense of smell
  - Long term damage to the heart, lungs, kidneys, and brain

- Hospitalized patients may have the most long-term issues
  - Study in Italy found 87% of hospitalized patients were still having issues after 2 months
  - The COVID Symptom Study found 10-15% of people had ongoing symptoms, even some mild cases
  - Two studies that people can participate in:
    - The COVID Symptom Study [https://covid.joinzoe.com/us](https://covid.joinzoe.com/us)
    - The CORAL study [https://www.thecoralstudy.com/participate](https://www.thecoralstudy.com/participate)
Years of life lost (YLL)

- As most people dying with COVID-19 are older with underlying long-term conditions (LTCs) are we just bringing forward the inevitable by months or a year?
- What’s the big deal?

“Of course I think about death. I’d like to die young at a very old age.”
Years of life lost (YLL)

- Standard WHO life tables, YLL per COVID-19 death was 14 for men and 12 for women
- After adjustment for LTCs, the mean YLL was 13 for men and 11 years for women

![Table](https://wellcomeopenresearch.org/articles/5-75)
Years of life lost (YLL)

- Harvard study - estimates that more than 138,000 years of potential human life have been lost before age 65
  - Black Americans lost, collectively, 45,777 years of life
  - Hispanics and Latinos lost 48,204
  - White Americans lost 33,446

Table 2: Years of potential life lost with age 65 cutoff (YPLL65) and age-standardized YPLL65 rate per 100,000 by race/ethnicity, with age-standardized YPLL65 rate ratios and rate differences per 100,000, COVID-19 related deaths in the United States, February 1-May 20, 2020

<table>
<thead>
<tr>
<th>Race/ethnicity</th>
<th>YPLL65</th>
<th>Age-standardized YPLL65 rate per 100,000</th>
<th>Age-standardized YPLL65 rate ratio</th>
<th>Age-standardized YPLL65 rate difference per 100,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Hispanic White</td>
<td>33,446 (32,061 to 34,832)</td>
<td>18.9 (16.6, 21.2)</td>
<td>1.00 (reference)</td>
<td>0.0 (reference)</td>
</tr>
<tr>
<td>Non-Hispanic Black</td>
<td>45,777 (44,023 to 47,531)</td>
<td>127.6 (114.4, 140.9)</td>
<td>6.7 (6.7, 6.8)</td>
<td>108.7 (95.3, 122.2)</td>
</tr>
<tr>
<td>Non-Hispanic American Indian or Alaska Native</td>
<td>1,745 (1,371 to 2,119)</td>
<td>75.4 (30.6, 120.2)</td>
<td>4.0 (3.9, 4.0)</td>
<td>56.5 (11.6, 101.3)</td>
</tr>
<tr>
<td>Non-Hispanic Asian or Pacific Islander</td>
<td>8,905 (8,156 to 9,654)</td>
<td>50.1 (39.2, 61.0)</td>
<td>2.6 (2.6, 2.7)</td>
<td>31.2 (20.0, 42.3)</td>
</tr>
<tr>
<td>Hispanic or Latino</td>
<td>48,204 (46,328 to 50,080)</td>
<td>101.3 (91.2, 111.4)</td>
<td>5.4 (5.3, 5.4)</td>
<td>82.4 (72.0, 92.7)</td>
</tr>
</tbody>
</table>

What does this all mean?

- We should be taking this pandemic very seriously
- Continue with masks and social distancing
- Continue with some restrictions on activity:
  - Maybe more targeted than blanket lock-downs
  - School reopening's bring with them challenges
Improving trends .....
Questions