COVID-19: How states can forecast the impacts on state budgets

May 13, 2020
Today’s webinar

• **Dr. Dylan George**, vice president of In-Q-Tel and former senior policy advisor in the White House Office of Science and Technology Policy

• **Dan White**, director of public sector research with Moody’s Analytics and former economist with the New Mexico State Legislature

• **Don Boyd**, co-director of the State and Local Government Finance Project, Rockefeller College, State University of New York at Albany and principal of Boyd Research
Key Points

- Data, analytics help understand the pandemic, consider potential scenarios, and respond
- COVID-19 likely will be disruptive for months
- Key metrics for understanding the pandemic
- Need a coordinated effort on analytics for outbreak response – like weather forecasting
Math modeling basics for outbreaks – SIR model

S – susceptible, I – Infectious, R- Recovered, removed

\[ \frac{dS}{dt} = -\frac{\beta IS}{N}, \]
\[ \frac{dI}{dt} = \frac{\beta IS}{N} - \gamma I, \]
\[ \frac{dR}{dt} = \gamma I, \]

1. R_0 – estimate of pathogen spread
2. Herd immunity – threshold of population protection

https://en.wikipedia.org/wiki/Compartmental_models_in_epidemiology
https://idmod.org/docs/general/model-vaccination.html
How to measure spread of the virus?

$R_0$ average number of secondary cases

$R_0 > 1$ spread increases, $R_0 < 1$ spread decreases

Three components –

- Probability of contact between susceptible and infectious individuals
- Probability of transmission given a contact
- Duration of infectiousness

Contact is a critical component for spread.
Herd immunity - immunity shield for a population

• Probability of contact between infectious and susceptible very low.
• Critical for vulnerable populations like immunocompromised
• Safest way to achieve herd immunity is through vaccination
• Can be estimated based on $R_0$

Modified from https://en.wikipedia.org/wiki/Herd_immunity
Estimated spread changing through time

1. Physical distancing is working to slow spread
2. More effort needed to control spread
3. Case identification and contact tracing as solutions

Estimates for King County, Washington State from IDM
Change in spread correlated with mobility data

- Washington State Department of Transportation mobility data.
- Traffic volume relative to same weekday last year.
Unclear what scenario will happen
Key metrics to watch

**Epidemiology – decreasing cases with sufficient testing, declining spread**
- Deaths, case counts, trends; vulnerable populations – long-term care facilities
- Rt
- Testing capacity

**Hospital capacity – surge capacity to avoid being overwhelmed**
- Hospitalization rates
- ICU bed availability
- PPE, ventilator, staff availability

**Public Health capacity – able to chase down the virus; “box it in”**
- Contact tracing capacity; cases found from tracing
- Isolation, quarantine services
Pandemics are not like natural disasters

Natural disasters
- Acute, discrete, rapid events – “lights and sirens”
- Bring people together uniquely
- Quickly transition efforts to recovery

Pandemics
- Slowly unfold over months
- Social, economic, and political disruption
- Consequential decisions are being made under conditions of uncertainty
Need a National Center for Epidemic Forecasting & Analytics

Thank you...

Dylan George, PhD
Vice President, BNext, In-Q-Tel
W: www.iqt.org
LinkedIn: www.linkedin.com/in/dylangeorge/
Twitter: @dylanbgeorge
Acknowledgements

Marc Lipsitch, Harvard
Marita Zimmerman, Institute for Disease Modeling
Caitlin Rivers, Johns Hopkins University
Resources


Resolve to save lives – https://preventepidemics.org

COVID Tracking Project - https://covidtracking.com

COVID act now - https://covidactnow.org

Institute for Disease Modeling - https://www.idmod.org
References

- This Is the Future of the Pandemic - https://www.nytimes.com/2020/05/08/health/coronavirus-pandemic-curve-scenarios.html
State Stress Tests – COVID 19
Managing Stress

Baseline Scenario
Moderate Stress

» Deep recession in first half of 2020 followed by modest rebound. Travel and business restrictions in effect through late second quarter.

» Peak jobless rate of 13% in 2020Q2. Peak-to-trough real GDP decline of 10%.

S3 Scenario
Severe Stress

» Travel and business restrictions last into the third quarter, delaying recovery and causing more long-term disruptions.

» Peak jobless rate of 17%. Peak-to-trough real GDP decline of 14%. 
Wide Range of Revenue Outcomes

Estimated revenue losses, % of 2019 general fund revenues

Largest impacts (S3):
- Alaska – 79.6
- Louisiana – 45.7
- North Dakota – 44.3
- West Virginia – 39.4
- Wyoming – 36.9
- New Jersey – 34.7

Smallest impacts (S3):
- Pennsylvania – 8.2
- Maryland – 10.1
- Massachusetts – 10.5
- Alabama – 11.1
- Arkansas – 11.9
- South Dakota – 12.2

Source: Moody’s Analytics
Unemployment Drives Medicaid Higher

Number of unemployed people in the U.S., mil

Sources: BLS, Moody’s Analytics
Economic Stress Is Unprecedented

| States with reserves they need to absorb baseline levels of projected economic stress |
| States with most of reserves they need to absorb the baseline scenario |
| An unprecedented 21 states would see budget gaps of 10% or more even after using reserves |

| Baseline Fiscal Shock, % of general fund |
| Baseline Shock Net of Reserves, % of general fund |

<table>
<thead>
<tr>
<th>Baseline</th>
<th>Severe - S3</th>
</tr>
</thead>
<tbody>
<tr>
<td>$ bil</td>
<td>% of GF</td>
</tr>
<tr>
<td>Revenues</td>
<td>130.4</td>
</tr>
<tr>
<td>Medicaid</td>
<td>27.4</td>
</tr>
<tr>
<td>Fiscal shock</td>
<td>157.8</td>
</tr>
</tbody>
</table>

Sources: NASBO, Moody’s Analytics
Even Best Prepared States Could Eventually Struggle

State governments, $ bil

- **COVID-19 Spending** - $150b
- **Economic impacts** - $203b
- **Estimated shortfall** - $172b
- **Family First** - $35b
- **CARES** - $110b
- **Reserve draws** - $36b

Source: Moody’s Analytics

- Assumes states will initially draw on roughly half of their overall reserves
- Total need for additional federal aid comes to nearly $200 billion through FY21
- Impacts through FY22 could be at least another $100 billion+
- Shortfalls of this magnitude will lead to massive layoffs and substantially increase the likelihood of local government defaults
To the extent permitted by law, MOODY’S and its directors, officers, employees, agents, representatives, licensors and suppliers disclaim liability for any direct or compensatory losses or damages caused to any person or entity, including but not limited to any negligence (but excluding fraud, willful misconduct or any other type of liability that, for the avoidance of doubt, by law cannot be excluded) on the part of, or on any contingency within or beyond the control of, MOODY’S or any of its directors, officers, employees, agents, representatives, licensors or suppliers, arising from or in connection with the information contained herein or the use of or inability to use any such information.

NO WARRANTY, EXPRESS OR IMPLIED, AS TO THE ACCURACY, TIMELINESS, COMPLETENESS, MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE OF ANY CREDIT RATING, ASSESSMENT, OTHER OPINION OR INFORMATION IS GIVEN OR MADE BY MOODY’S IN ANY FORM OR MANNER WHATSOEVER.

MOODY’S Investors Service, Inc., a wholly-owned credit rating agency subsidiary of Moody’s Corporation ("MCO"), hereby discloses that most issuers of debt securities (including corporate and municipal bonds, debentures, notes and commercial paper) and preferred stock rated by Moody’s Investors Service, Inc. have, prior to assignment of any credit rating, agreed to pay Moody’s Investors Service, Inc. for credit ratings opinions and services rendered by it fees ranging from $1,000 to approximately $2,700,000. MCO and Moody’s Investors Service also maintain policies and procedures to address the independence of Moody’s Investors Service credit ratings and credit rating processes. Information regarding certain affiliations that may exist between directors of MCO and rated entities, and between entities who hold credit ratings from Moody’s Investors Service and have also publicly reported to the SEC an ownership interest in MCO of more than 5%, is posted annually at www.moodys.com under the heading “Investor Relations — Corporate Governance — Director and Shareholder Affiliation Policy.” Additional terms for Australia only: Any publication into Australia of this document is pursuant to the Australian Financial Services License of Moody’s affiliate, Moody’s Investors Service Pty Limited ABN 61 003 395 657AFSL 336969 and/or Moody’s Analytics Australia Pty Ltd ABN 04 105 136 972 AFSL 385389 (as applicable). This document is intended to be provided only to “wholesale clients” within the meaning of section 761G of the Corporations Act 2001. By continuing to access this document from within Australia, you represent to Moody’s that you are, or are accessing the document as a representative of, a “wholesale client” and that neither you nor the entity you represent will directly or indirectly disseminate this document or its contents to retail clients or to any other entity, or allow access to it by retail clients or any other entity as well as not to disclose to retail clients any information in connection with the information contained herein.

All information contained herein is obtained by MOODY’S from sources believed to be accurate and reliable. Because of the possibility of human or mechanical error as well as other factors, however, all information contained herein is provided "AS IS" without warranty of any kind. MOODY’S adopts all necessary measures so that the information it uses in assigning a credit rating is of sufficient quality and from sources MOODY’S considers to be reliable, including, where appropriate, independent third-party sources. However, MOODY’S is not an auditor and cannot in every instance independently verify or validate information received in the rating process or in preparing its Publications.

To the extent permitted by law, MOODY’S and its directors, officers, employees, agents, representatives, licensors and suppliers disclaim liability to any person or entity for any indirect, special, consequential, or incidental losses or damages whatsoever arising from or in connection with the information contained herein or the use or inability to use any such information, even if MOODY’S or any of its directors, officers, employees, agents, representatives, licensors or suppliers is advised in advance of the possibility of such losses or damages, including but not limited to (a) any loss of present or prospective profits or (b) any loss or damage arising where the relevant financial instrument is not the subject of a particular credit rating assigned by MOODY’S.
Questions?

• Please submit a question by clicking the control panel on the right side of the screen.

• Once you do so, enter your query in the “Questions” box. We ask that you please include your state.
Angela Oh
Senior manager, state fiscal health
aoh@pewtrusts.org