Modeling to mitigate COVID-19

Lauren Ancel Meyers

UT COVID-19 Modeling Consortium

June 17, 2020
Background

Pandemic Exercise Tool (2013)

CDC FluCode - Pandemic Model (2020)
The key questions

Situational awareness  Where and how is the virus spreading today?

Forecasting  Where will the virus be spreading in the future?

Mitigation  How to use limited resources to slow spread and save lives?
Spread far and fast

Du et al. (2020) Risk for Transportation of 2019 Novel Coronavirus Disease from Wuhan to Other Cities in China. *Emerging Infectious Diseases*

Du et al. (2020) Serial Interval of COVID-19 among Publicly Reported Confirmed Cases. *Emerging Infectious Diseases*
Early action matters

A 1-day delay in intervention prolongs the outbreak by ~2.4 days.

The key questions

- **Situational awareness** Where and how is it spreading today?
- **Forecasting** Where will it be spreading in the future?
- **Mitigation** How to use limited resources to slow spread and save lives?
The IHME Model

Social distancing assumed until infections minimized and containment implemented

Last updated April 28, 2020 (Pacific Time)

Deaths per day

2 days until projected peak in daily deaths

40 COVID-19 deaths projected on May 1, 2020

Containment strategy

After June 15, 2020, relaxing social distancing may be possible with containment strategies that include testing, contact tracing, isolation, and limiting gathering size.
Our model

The University of Texas COVID-19 Modeling Consortium

COVID-19 Mortality Projections for US States and Metropolitan Areas

These graphs show both the reported and projected number of COVID-19 deaths per day across the US and for individual states and metropolitan areas. For each US state, we use local data from mobile-phone GPS traces to quantify the changing impact of social-distancing measures on "flattening the curve."

For more information, please visit our model FAQ.

IMPORTANT NOTE: On 07 May 2020 the New York Times made substantial changes in how it reports COVID-19 deaths, with a large effect on data New York state in particular. We are working our way through the implications of these changes for our model. In the meantime, we are using data from Johns Hopkins University, which includes both probable and confirmed deaths, to inform our projections.

Select State: Texas  Select Metro Area: Texas ( Entire State )

24% probability that the peak has already passed
57% probability that peak will pass within one week
93% probability that peak will pass within two weeks

Deaths Per Day for Texas

Showing Log Scale

at home
bars
grocery
medical
parks
restaurants
schools
Ensemble forecasting

COVID-19 Forecasts

Updated May 6, 2020

Interpretation of Cumulative Death Forecasts

- National-level forecasts now include fourteen individual forecasts, and all indicate an increase in deaths in the coming weeks. Predicted rates of increase differ among the forecasts, depending on assumptions about the strength and coverage of social distancing behaviors.
- State-level ensemble forecasts (only shown for states and territories with at least two forecasts) indicate that some states may have limited additional deaths in the coming weeks, while substantial increases may occur in others.

National Forecast

On This Page
National Forecast
State Forecasts
Why Forecasting COVID-19 Deaths in the US is Critical
What the Forecasts Aim to Predict
Working to Bring Together Forecasts for COVID-19
Deaths in the US
The key questions

- **Situational awareness** Where and how is it spreading today?
- **Forecasting** Where will it be spreading in the future?
- **Mitigation** How to use limited resources to slow spread and save lives?
How will reopening play out?

If transmission **increases by 50%** relative to the stay-home period …
How will reopening play out?

If transmission increases by 25% relative to the stay-home period ...
How will reopening play out?

If transmission **doubles** relative to the stay-home period …

> 6000 deaths
Decision-support modeling

**Goals:** Avoid overwhelming surge and avoid stay-home orders

**Approach:** Multiple stages of risk to allow ‘tapping’ on brakes

- What to track?
- When to trigger?
Use this color-coded alert system to understand the stages of risk. This chart provides recommendations on what people should do to stay safe during the pandemic. Individual risk categories identified pertain to known risks of complication and death from COVID-19. This chart is subject to change as the situation evolves.

### Triggers
7-day average daily COVID-19 hospital admissions

### COVID-19: Risk-Based Guidelines

<table>
<thead>
<tr>
<th>Stage</th>
<th>Practice Good Hygiene</th>
<th>Maintain Social Distancing</th>
<th>Wear Facial Coverings</th>
<th>Avoid Gatherings</th>
<th>Avoid Non-Essential Travel</th>
<th>Avoid Non-Essential Travel</th>
<th>Avoid Dining/Shopping</th>
<th>Workplaces Open</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 1</td>
<td>•</td>
<td></td>
<td></td>
<td>greater than 25</td>
<td>except with precautions</td>
<td>gathering size TBD</td>
<td>all businesses</td>
<td></td>
</tr>
<tr>
<td>Stage 2</td>
<td>• • •</td>
<td></td>
<td></td>
<td>greater than 10</td>
<td>except as essential</td>
<td>greater than 25</td>
<td>essential and reopen</td>
<td></td>
</tr>
<tr>
<td>Stage 3</td>
<td>• • • •</td>
<td>social and greater than 10</td>
<td></td>
<td>except as essential</td>
<td>social and greater than 10</td>
<td>except with precautions</td>
<td>essential and reopen</td>
<td></td>
</tr>
<tr>
<td>Stage 4</td>
<td>• • • •</td>
<td>social and greater than 2</td>
<td></td>
<td>except as essential</td>
<td>social and greater than 10</td>
<td>except as essential</td>
<td>expanded essential</td>
<td></td>
</tr>
<tr>
<td>Stage 5</td>
<td>• • • •</td>
<td>outside of household</td>
<td></td>
<td>except as essential</td>
<td>outside of household</td>
<td>except as essential</td>
<td>essential</td>
<td></td>
</tr>
</tbody>
</table>

### Practice Good Hygiene
- Stay Home if Sick
- Avoid Sick People

### Higher Risk Individuals
- Age over 65, diabetes, high blood pressure, heart, lung and kidney disease, immunocompromised, obesity

### Lower Risk Individuals
- No substantial underlying health conditions

### Workplaces Open
- All businesses
- Essential and reopened businesses
- Essential and reopened businesses
- Expanded essential businesses
- Essential businesses only

---

**AustinTexas.gov/COVID19**
Published: May 13, 2020
Projections with stages
Data-driven policy in action
Houston

7-day average COVID-19 admissions: 189
Funding and team

US Centers for Disease Control and Prevention
National Institutes of Health
National Science Foundation
Texas Advanced Computing Center
Tito’s Handmade Vodka

Simon Cauchemez, Institute Pasteur
Ben Cowling, U Hong Kong
Maytal Dahan, TACC
Oscar Dowson, Northwestern University
Zhanwei Du, UT
Daniel Duque Villarreal, Northwestern
Spencer Fox, UT
Kelly Gaither, TACC
Alison Galvani, Yale
Neo Huang, Precima, LoyaltyOne
Emily Javan, UT
Clay Johnston, Dell Med
Michael Lachmann, Santa Fe Institute
David Morton, Northwestern
Ciara Nugent, UT
Remy Pasco, UT
Michaela Petty, UT
Kelly Pierce, TACC
Michael Pignone, Dell Med
James Scott, UT
Mauricio Tec, UT
Suzanna Wang, UT
Spencer Woody, UT