# Modeling to mitigate COVID-19

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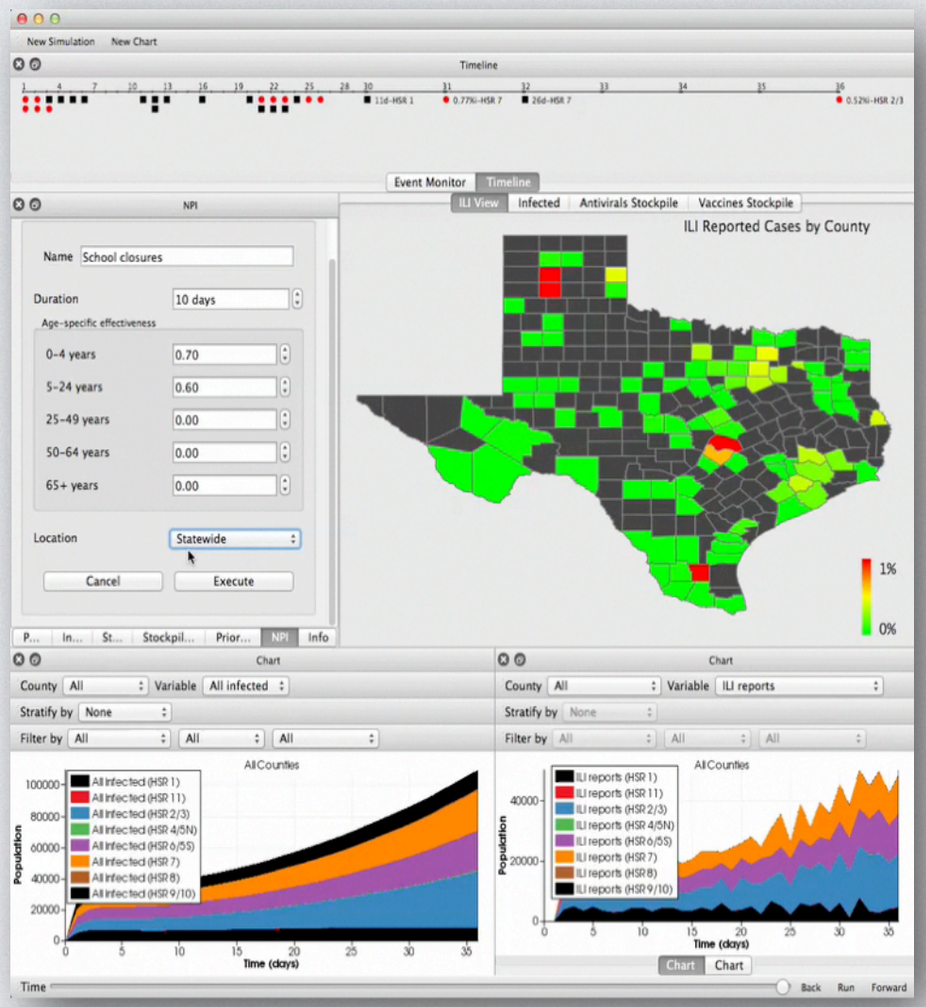
UT COVID-19 Modeling Consortium

June 17, 2020

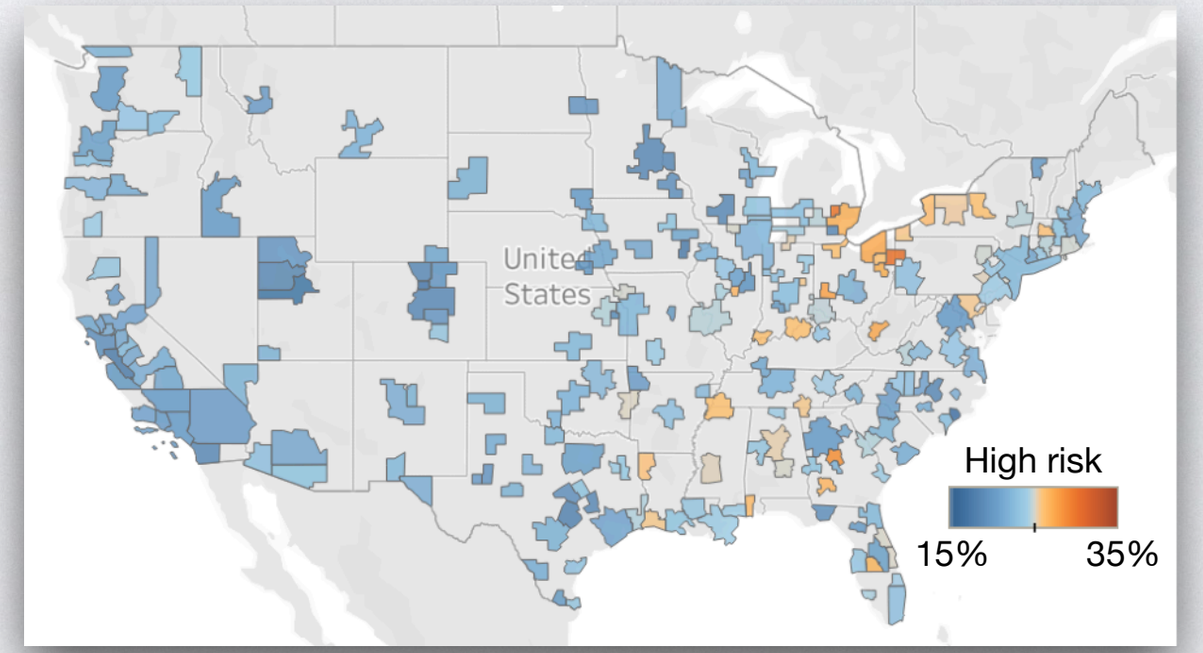
TEXAS
The University of Texas at Austin

# Background

Pandemic Exercise Tool (2013)




CDC FluCode - Pandemic Model (2020)



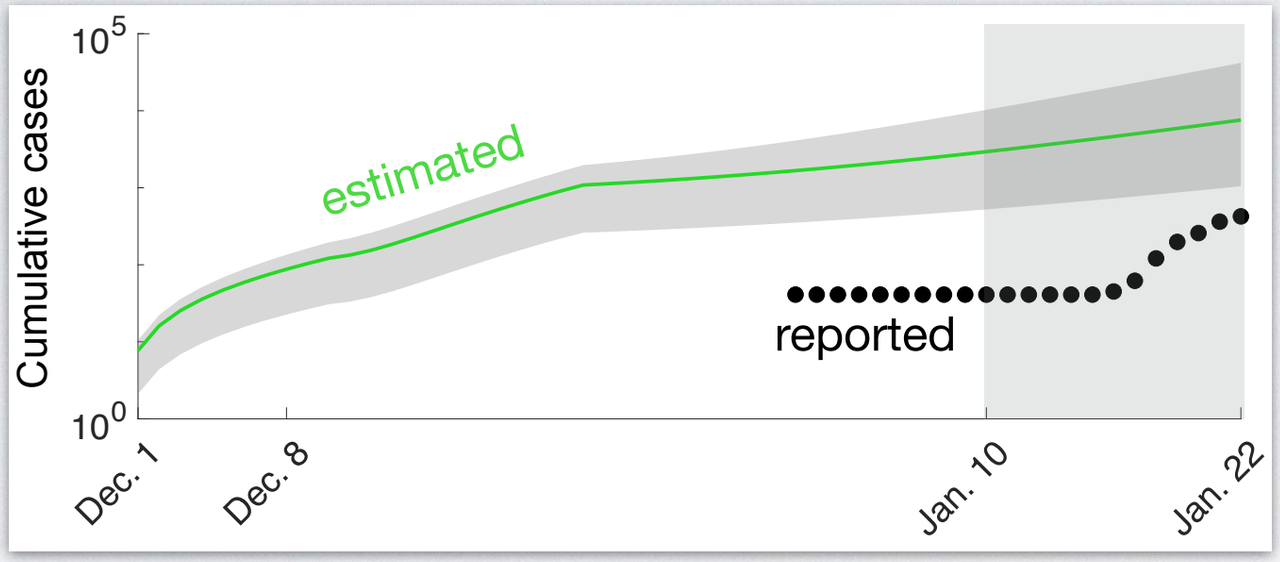
# The key questions

**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?

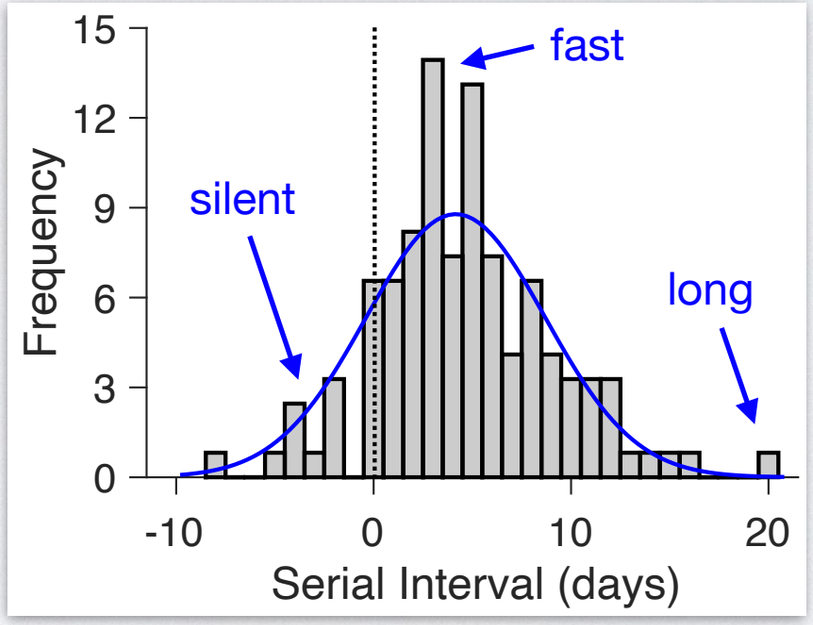
# Spread far and fast




12,400 cases

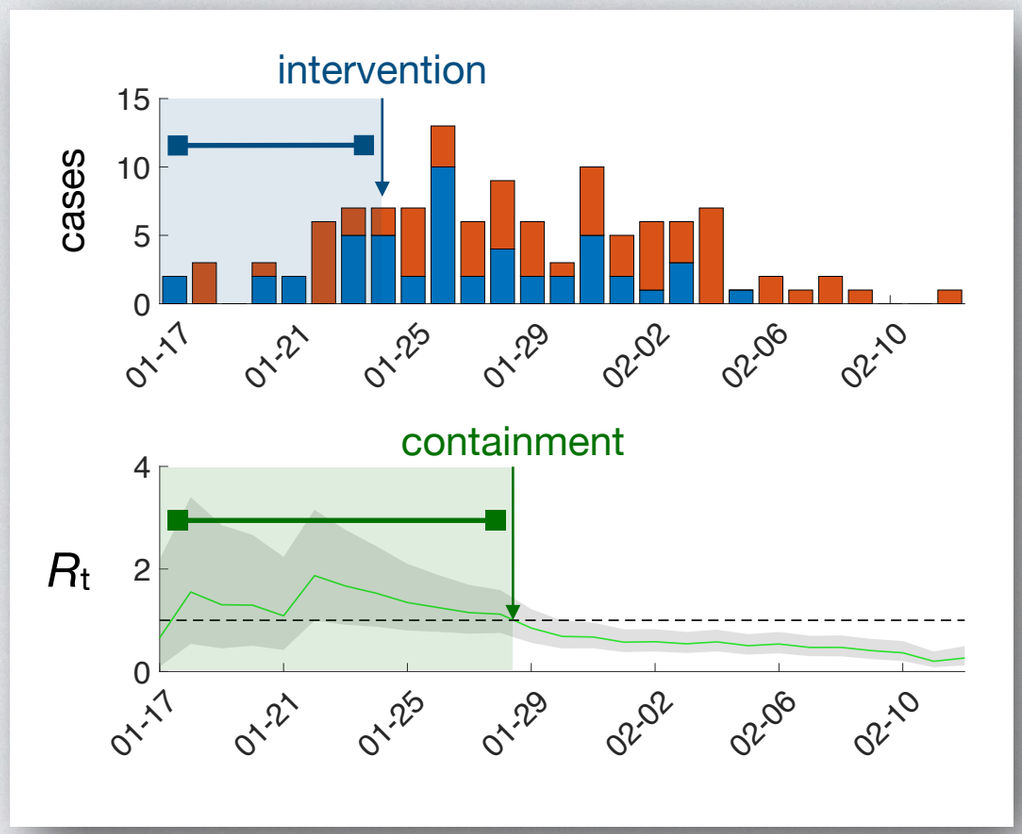
425 cases

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.

Du et al. (2020) Effects of Proactive Social Distancing on COVID-19 Outbreaks in 58 Cities, China. *Emerging Infectious Diseases.*

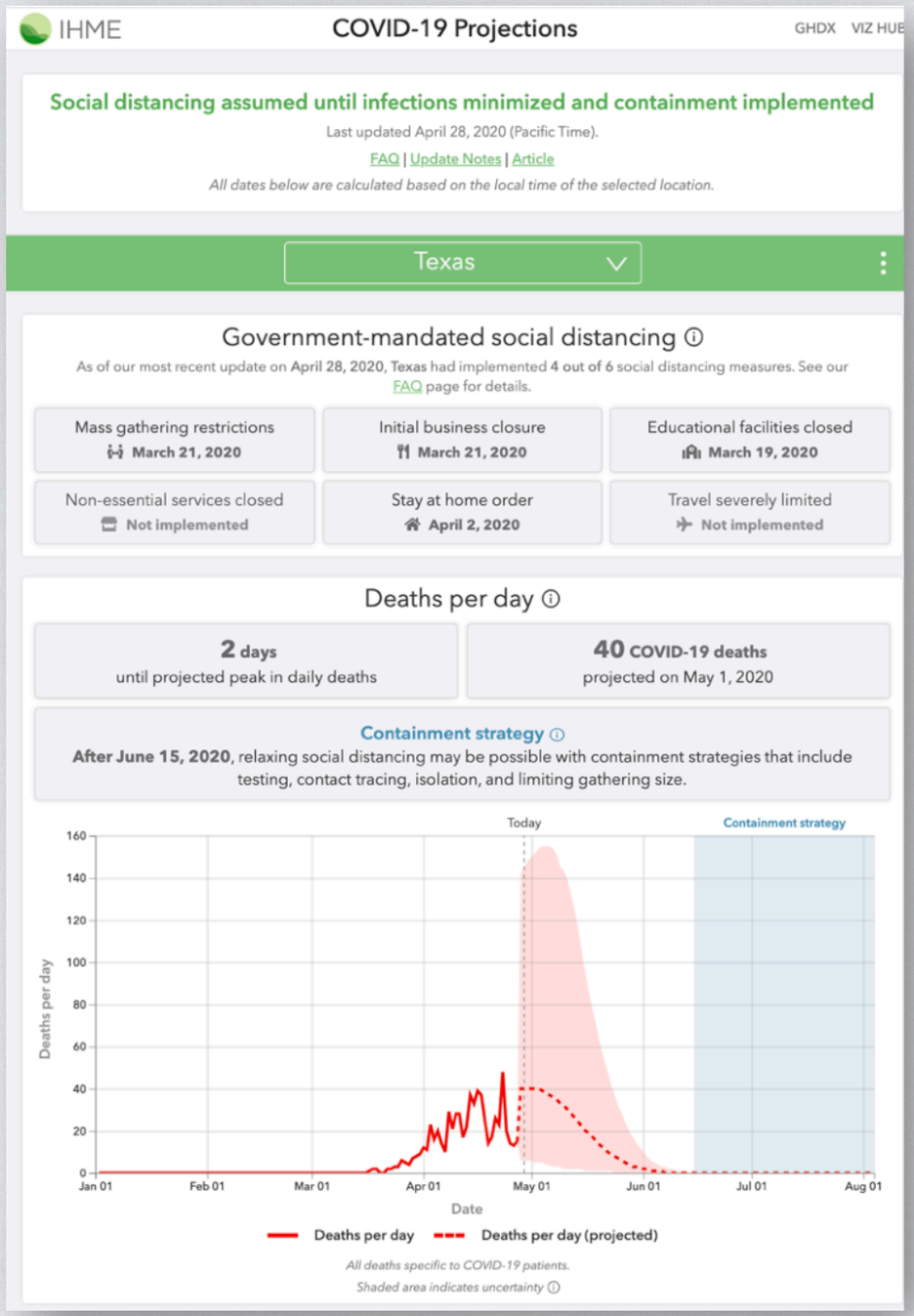
# The key questions

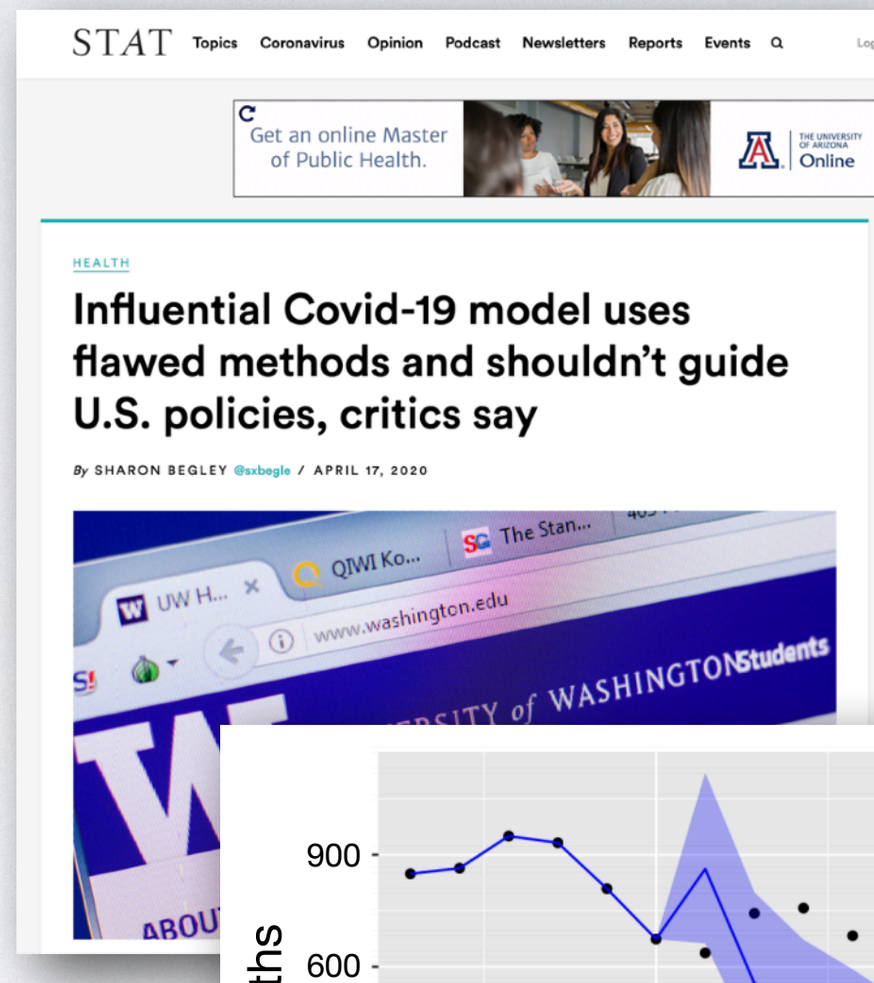
Situational awareness Where and how is it spreading today?

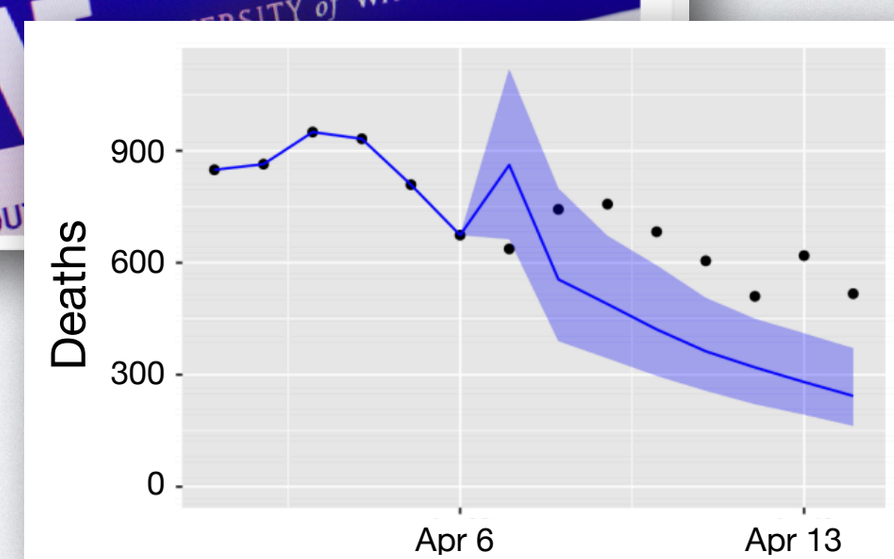
Forecasting **Where will it be spreading in the future?**

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

# The IHME Model

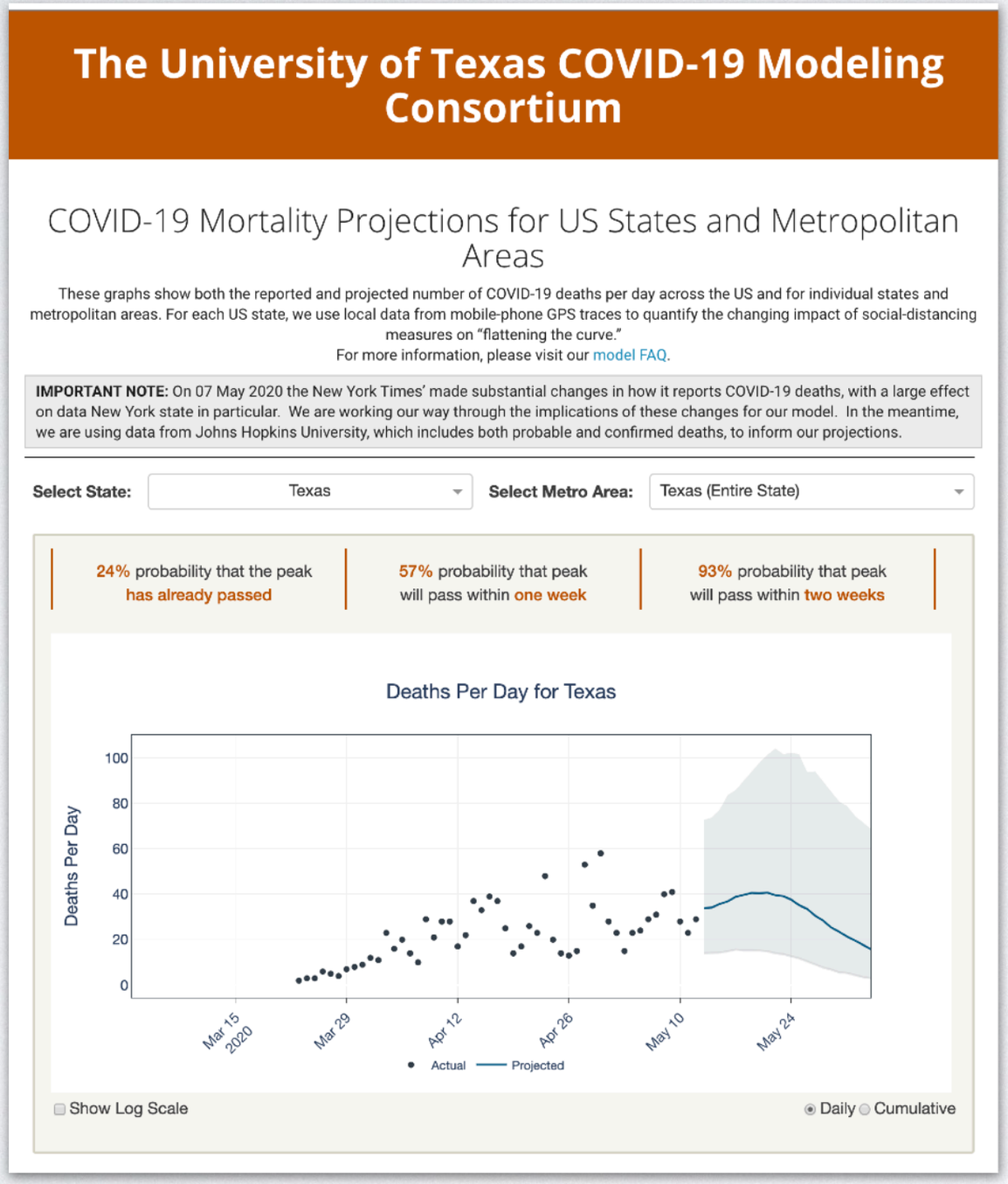


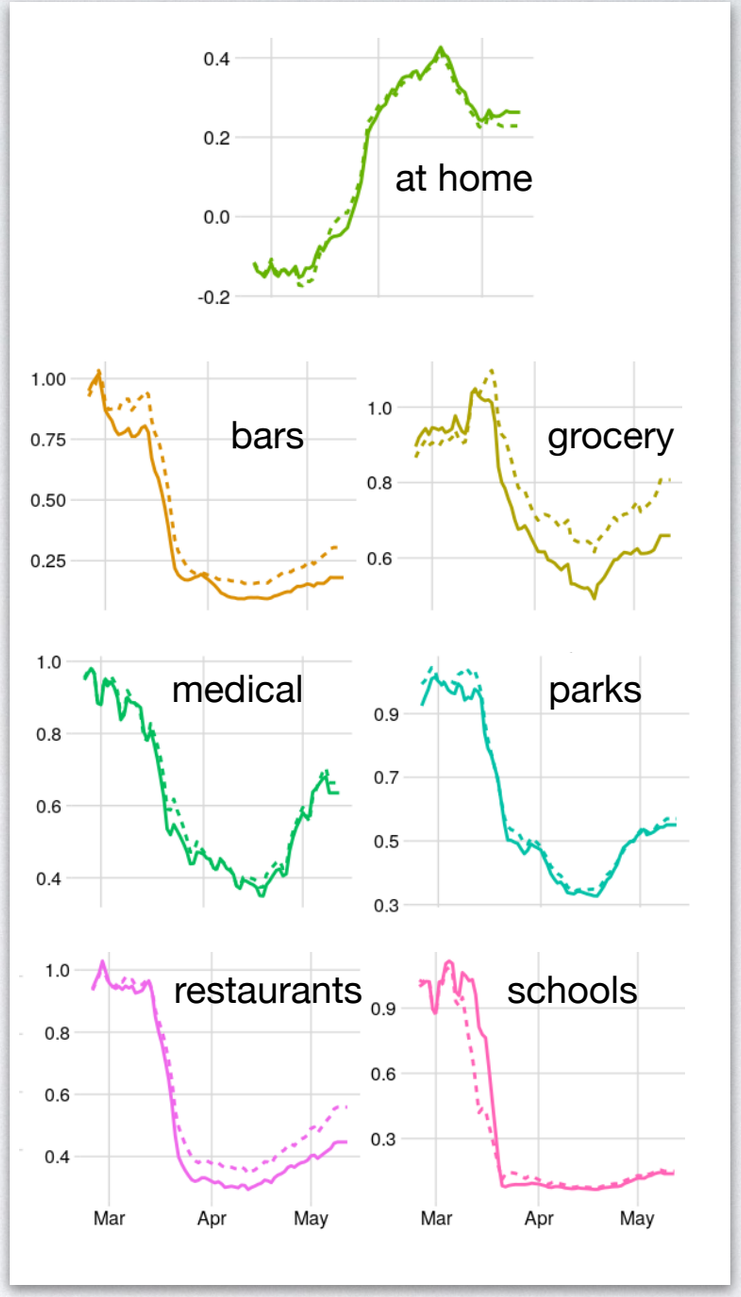




Backcast for Spain

# 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
Deaths Per Day
100
80
60
40
20
0
Mar 15 2020
Mar 29
Apr 12
Apr 26
May 10
May 24
Actual
Projected
Show Log Scale
Daily
Cumulative


at home
0.4
0.2
0.0
-0.2
bars
1.00
0.75
0.50
0.25
grocery
1.0
0.8
0.6
medical
1.0
0.8
0.6
0.4
parks
0.9
0.7
0.5
0.3
restaurants
1.0
0.8
0.6
0.4
schools
0.9
0.6
0.3
Mar
Apr
May
Mar
Apr
May

# Ensemble forecasting

## COVID-19 Forecasts

Print Page

Updated May 6, 2020

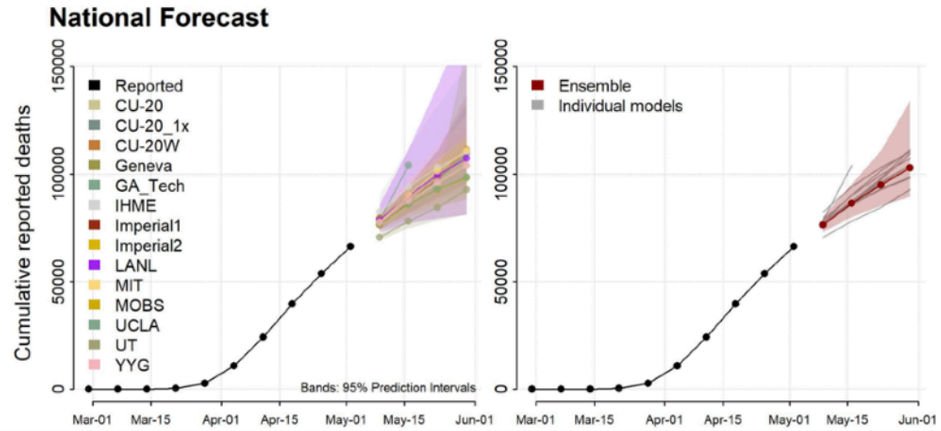
### Interpretation of Cumulative Death Forecasts

- 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.

On This Page



### National Forecast



# The key questions

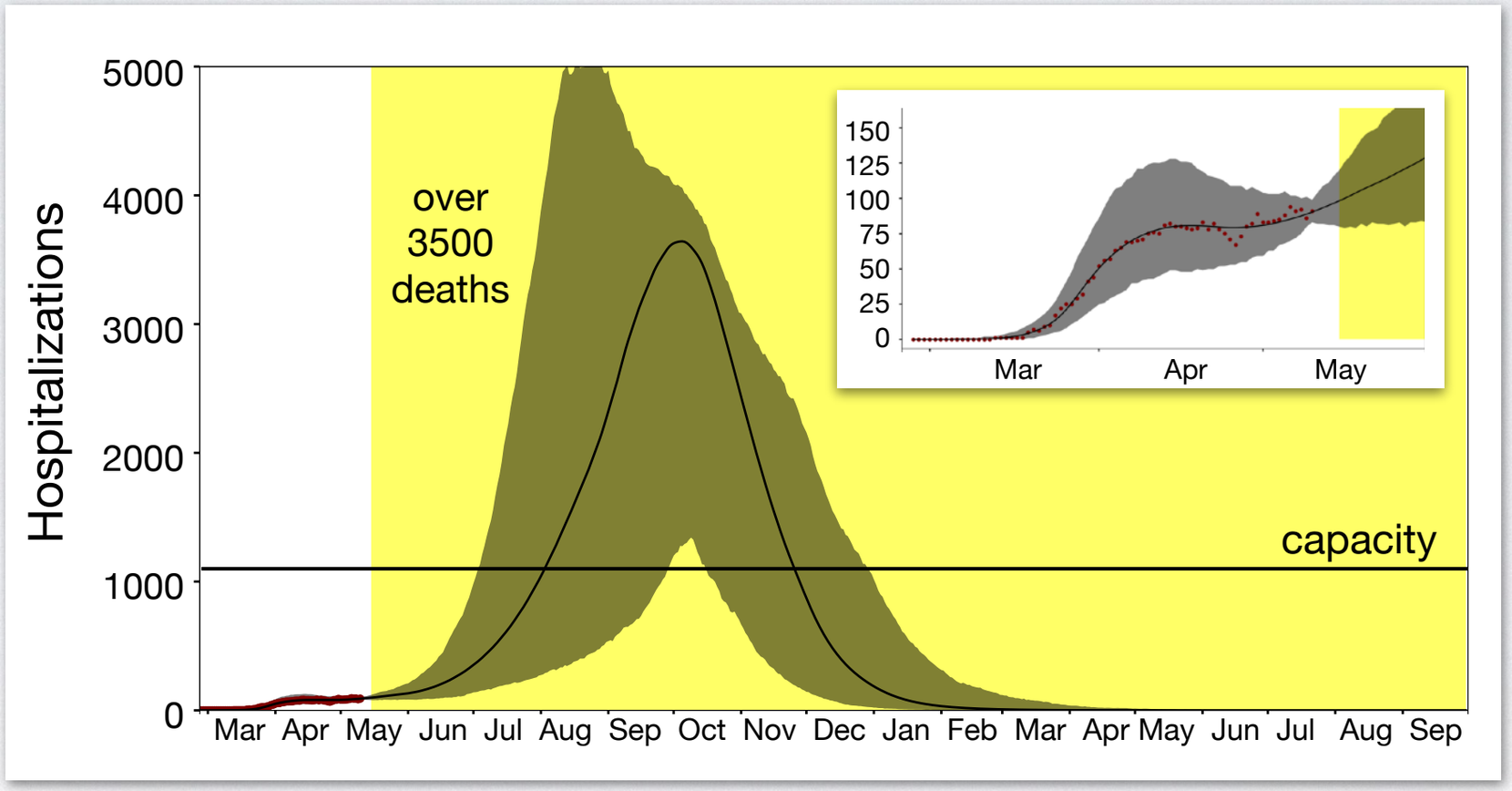
Situational awareness Where and how is it spreading today?

Forecasting Where will it be spreading in the future?

Mitigation **How to use limited resources to slow spread and save lives?**

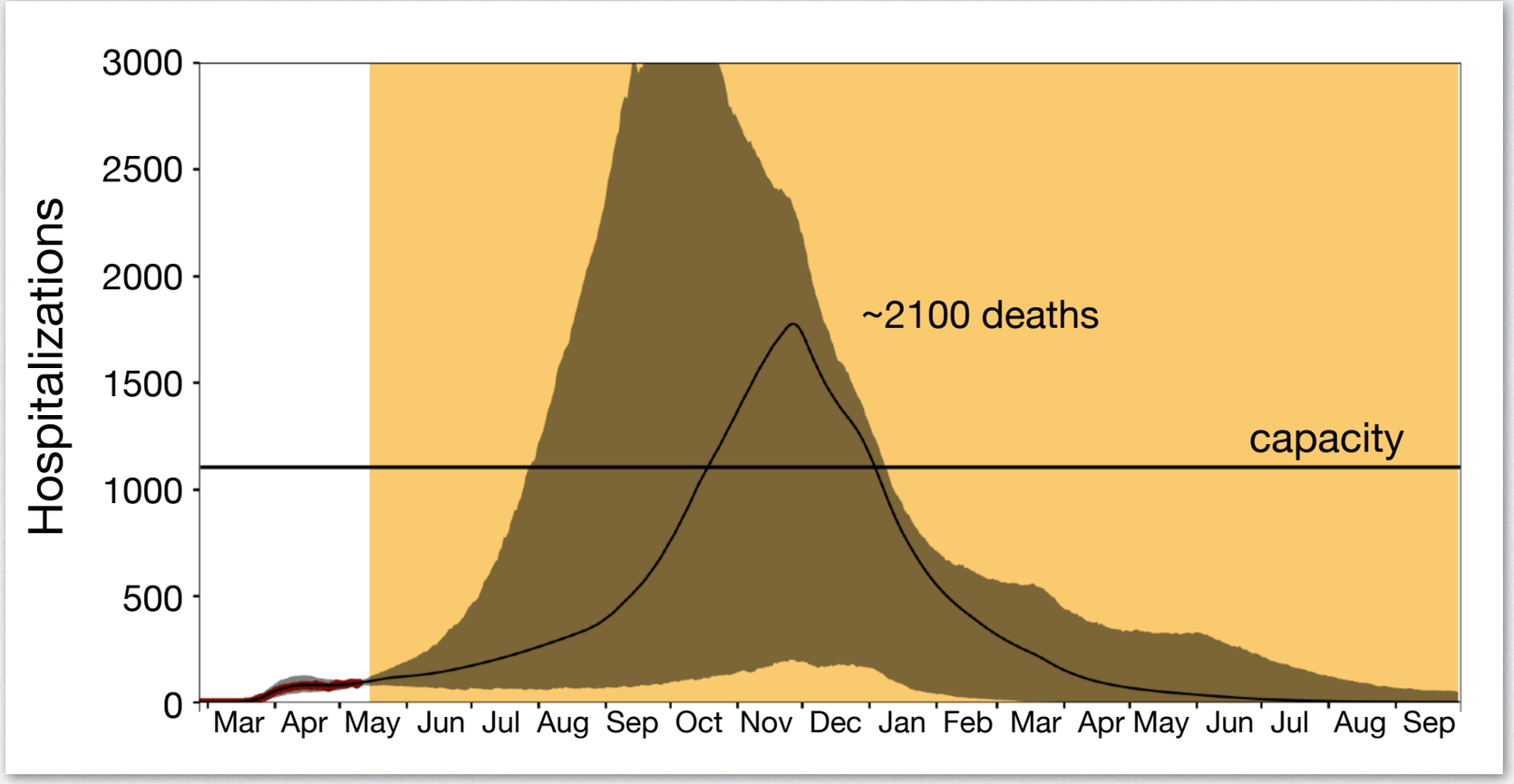
# How will reopening play out?

If transmission **increases by 50%** relative to the stay-home period …



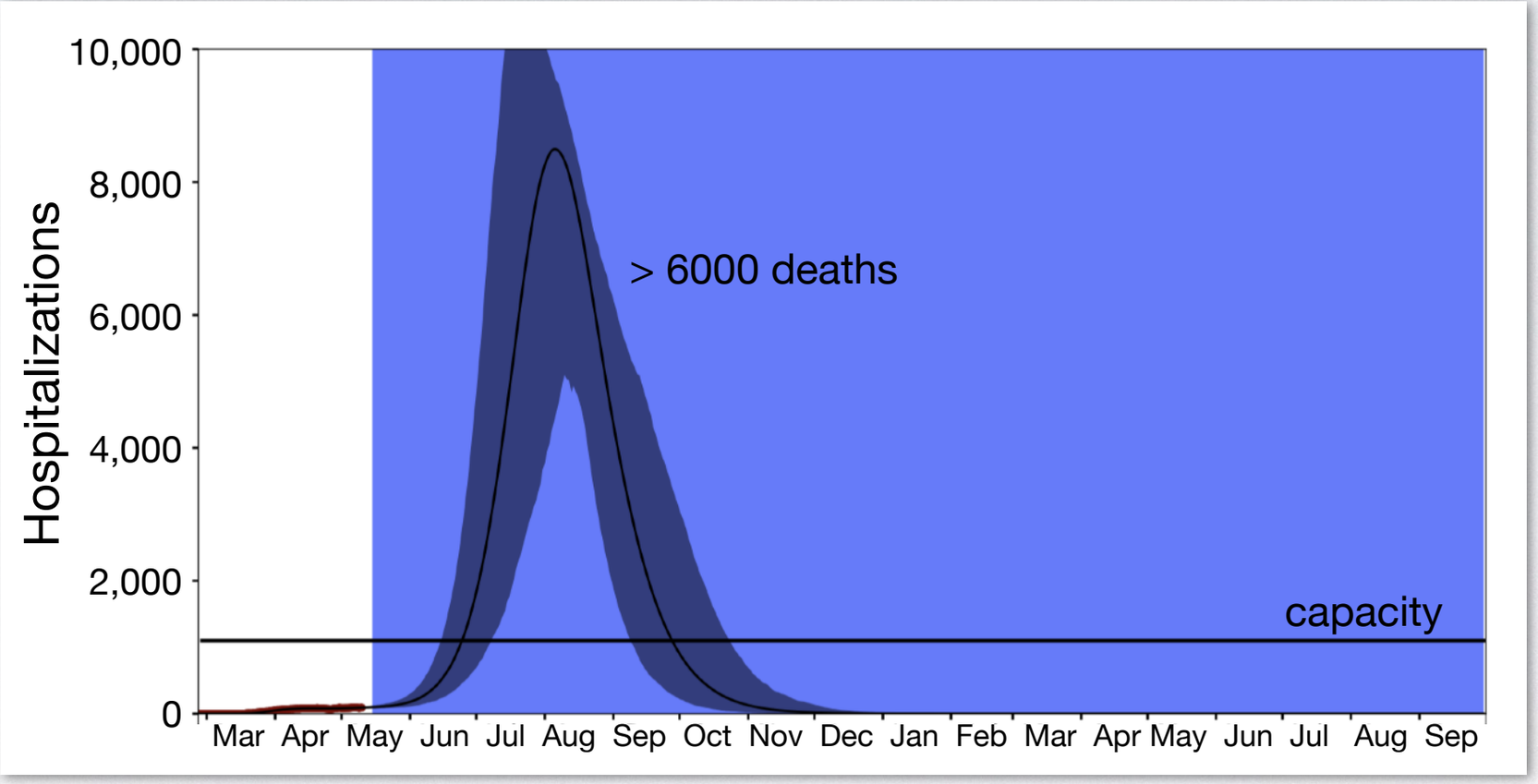
# How will reopening play out?

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 …



# 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?**

# Policy thresholds

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

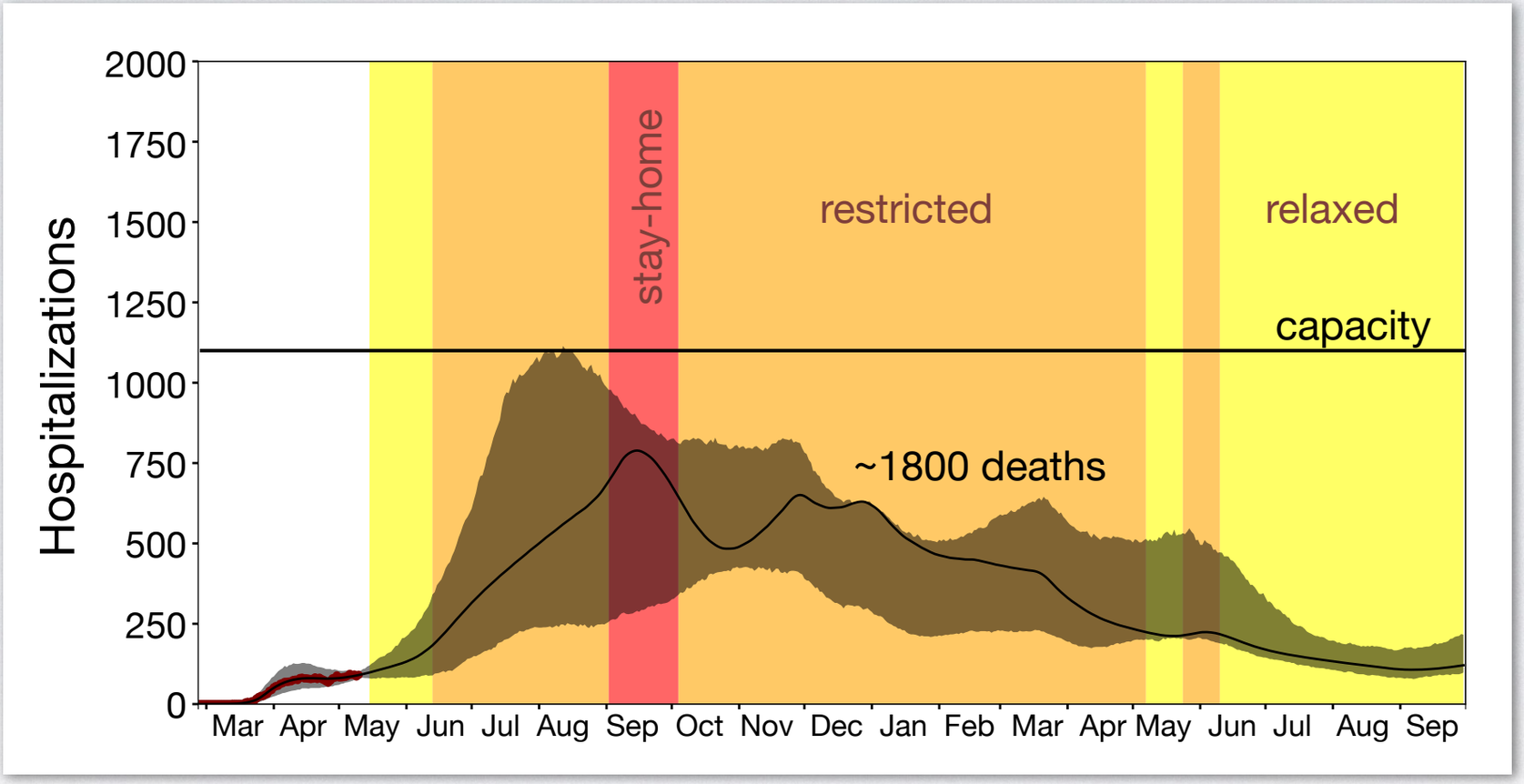
## COVID-19: Risk-Based Guidelines

| | Practice Good Hygiene / Stay Home If Sick / Avoid Sick People | Maintain Social Distancing | Wear Facial Coverings | Higher Risk Individuals (Age over 65, diabetes, high blood pressure, heart, lung and kidney disease, immunocompromised, obesity): Avoid Gatherings | Higher Risk Individuals: Avoid Non-Essential Travel | Higher Risk Individuals: Avoid Dining/ Shopping | Lower Risk Individuals (No substantial underlying health conditions): Avoid Gatherings | Lower Risk Individuals: Avoid Non-Essential Travel | Lower Risk Individuals: Avoid Dining/ Shopping | Workplaces Open |
|---|---|---|---|---|---|---|---|---|---|---|
| Stage 1 (1 →) | • | | | greater than 25 | | except with precautions | gathering size TBD | | | all businesses |
| Stage 2 (5 →) | • | • | • | greater than 10 | | except as essential | greater than 25 | | except with precautions | essential and re-opened businesses |
| Stage 3 (20 →) | • | • | • | social and greater than 10 | • | except as essential | social and greater than 10 | | except with precautions | essential and re-opened businesses |
| Stage 4 (70 →) | • | • | • | social and greater than 2 | • | except as essential | social and greater than 10 | • | except expanded essential businesses | expanded essential businesses |
| Stage 5 | • | • | • | outside of household | • | except as essential | outside of household | • | except as essential | essential businesses only |

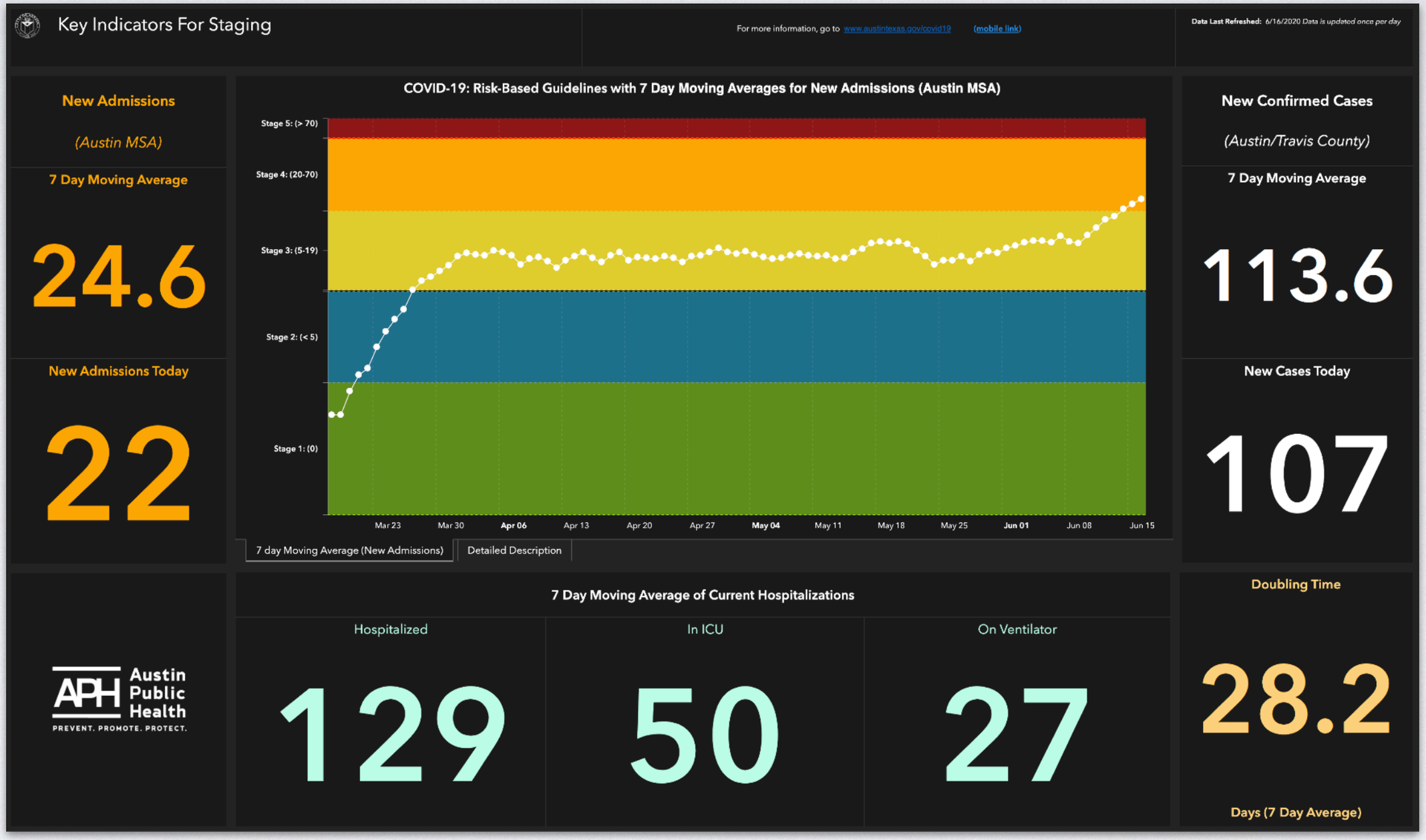
Use this color-coded alert system to understand the stages of risk. This chart provides recommendations on what people should do to stay safe during the pandemic. Individual risk categories identified pertain to known risks of complication and death from COVID-19. This chart is subject to change as the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

AustinTexas.gov/COVID19 Published: May 13, 2020 Austin Public Health PREVENT. PROMOTE. PROTECT.

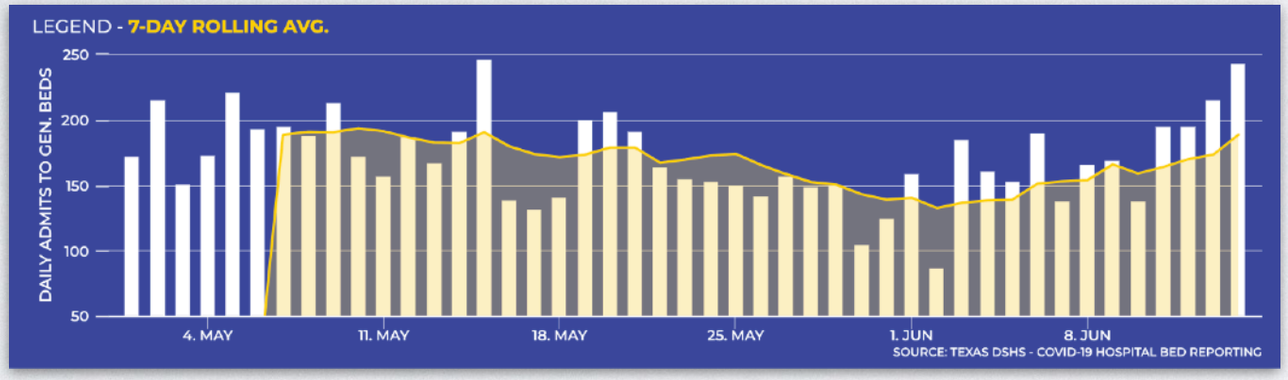
# Projections with stages



# Data-driven policy in action



# Houston




7-day average COVID-19 admissions: **189**

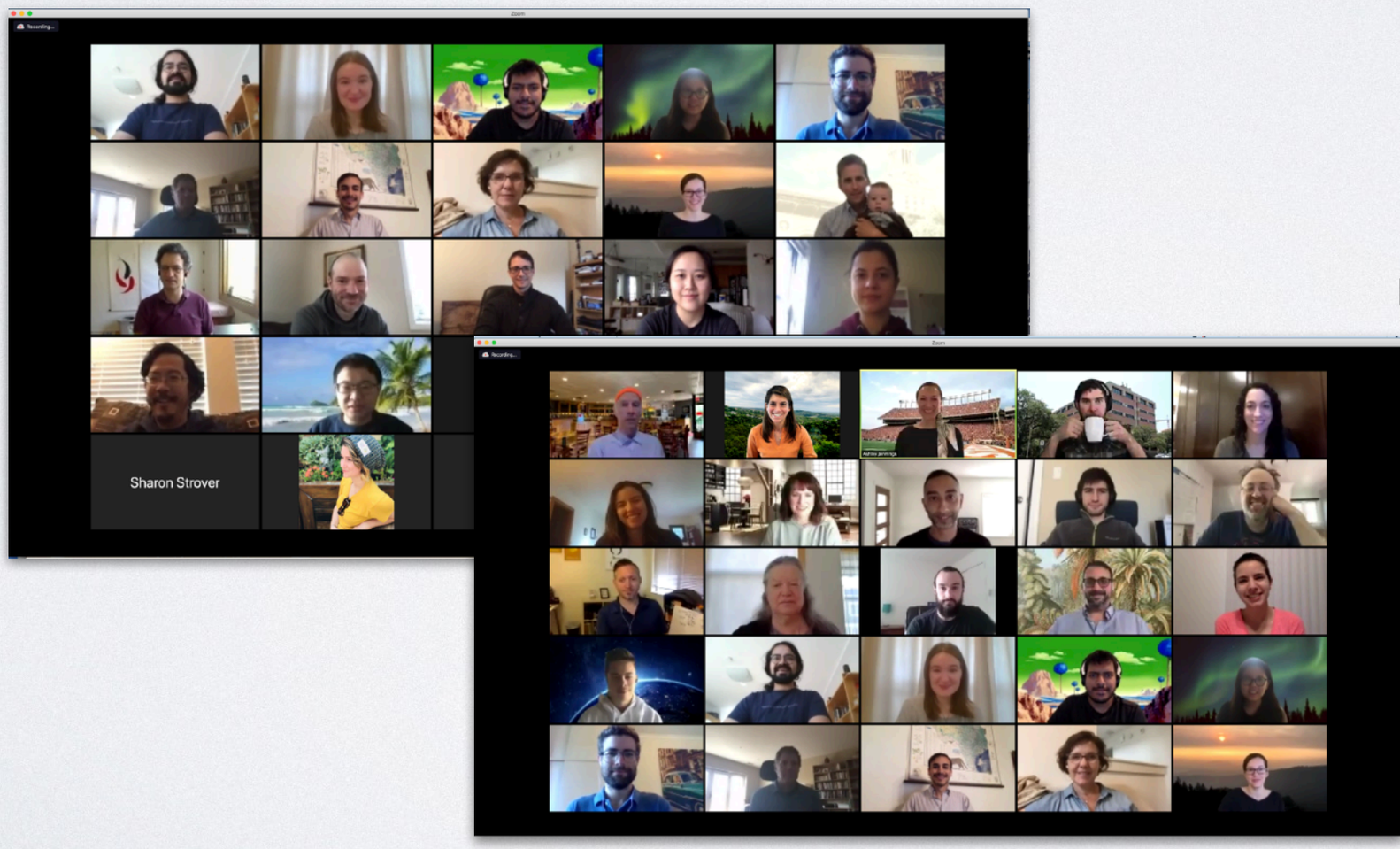
189


189


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