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An Academic Medical Center's Data Science Response to a Pandemic

This is a team effort across 60+ colleagues and *multiple* departments at Stanford

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Example information needs

- **Operational planning**

- How many patients do we expect in our region?
- How many floor beds, ICU beds do we need to have ready?
- How long will our PPE supply last?

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- **Clinical care decisions**

- Given limited testing, who do we test?
- Can presenting symptoms help us screen better?
- Do patients with other viral co-infections need more aggressive care?

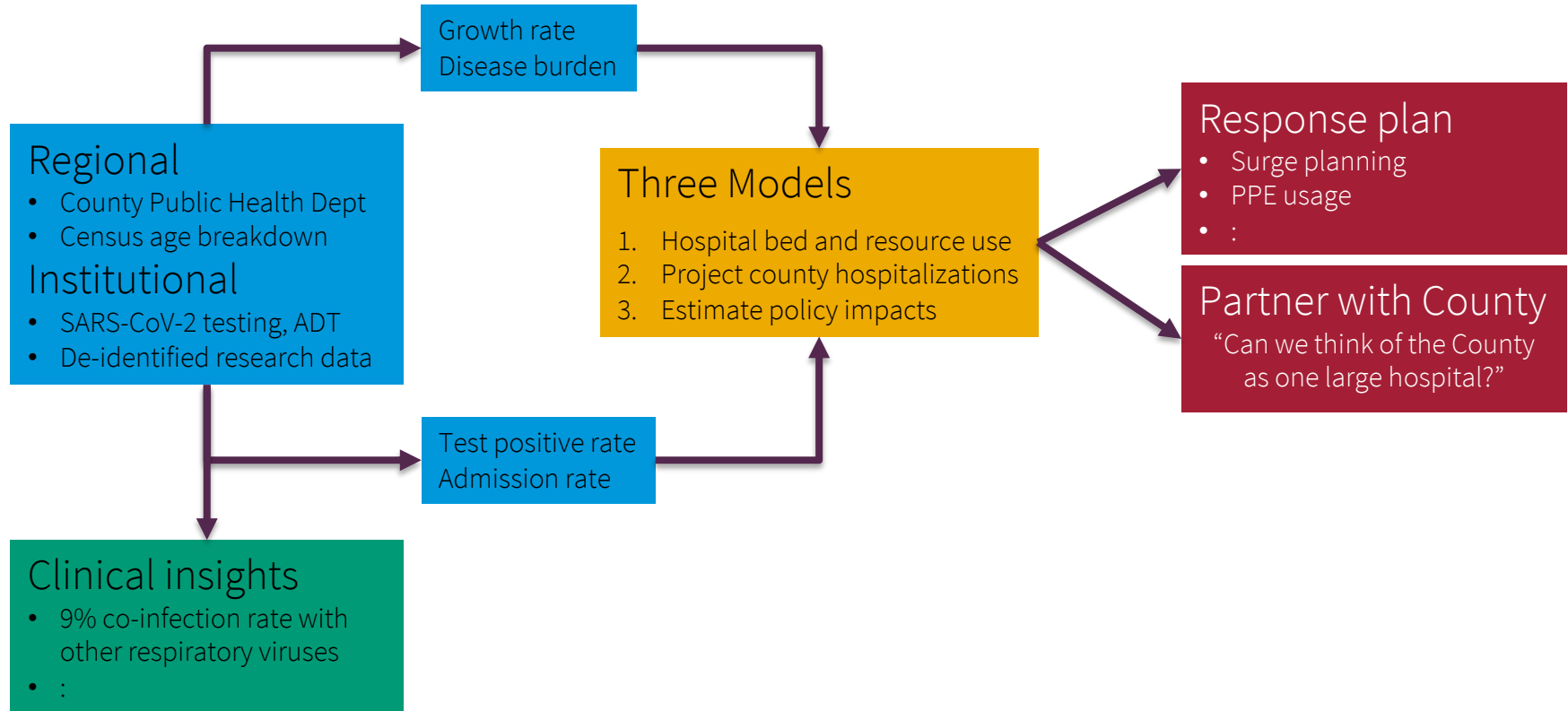
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- **Broader research questions**

- What are the effects of ACE2-altering drugs on clinical outcomes for COVID19 patients?
- What are the characteristics of COVID-19 patients nationwide?

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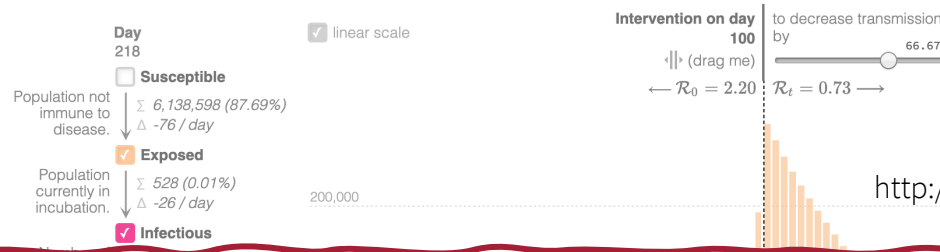
Responding to the information needs



There are two kinds of models

- SEIR simulations that capture the dynamics of an epidemic
 - These models tell us the impact of policy interventions
 - These need 10-12 diverse inputs, which are all guesses at moment
- Simple calculators that tell us about the next few days
 - These take very few inputs: cases, hospitalizations, bed capacity
 - It hard to get reliable counts of these simple inputs

There are many SEIR simulators: we need accurate inputs



By Gabriel Goh @ Open AI
<http://gabgoh.github.io/COVID/index.html>

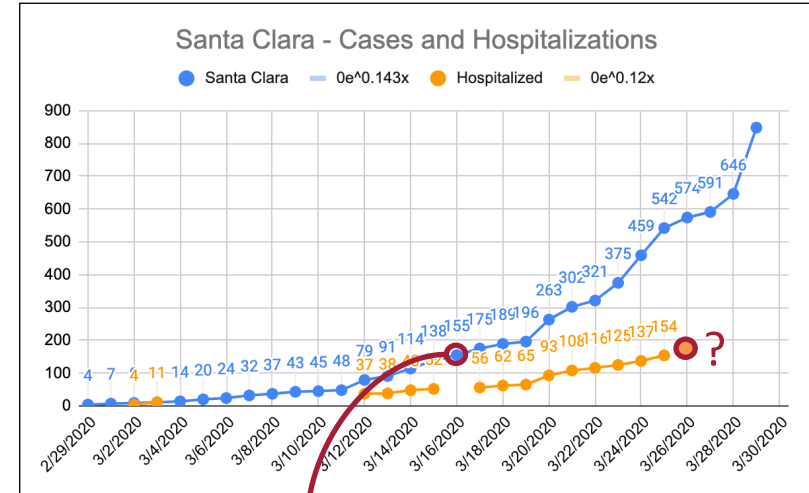
Quote from fivethirtyeight.com

Think of it like making a pie. If you have a normal recipe, you can do it pretty easily and expect a predictable result that makes sense. But if the recipe contains instructions like “*add three to 15 chopped apples, or steaks, or brussels sprouts, depending on what you have on hand*” ... well, that’s going to affect how tasty this pie is, isn’t it?



Focus on getting the right inputs

- Growth rate
- Disease burden



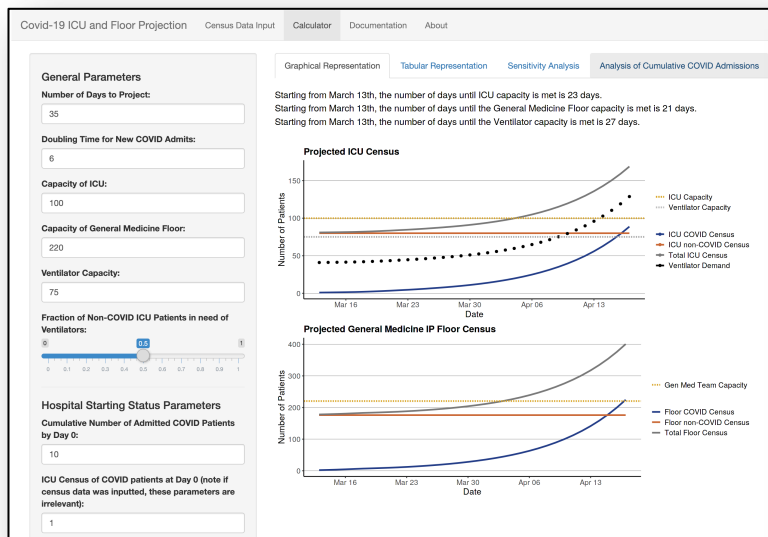
Age, years	Population	% infected	Possible cases	% hospitalized	Hospitalizations
0-9	231,605	0.34%	787	1.00%	8
10-19	237,135	0.34%	806	1.00%	8
20-29	278,072	0.34%	945	1.00%	9
30-39	302,185	0.34%	1,027	5.00%	51
40-49	270,163	0.34%	919	5.00%	46
50-59	252,777	0.34%	859	5.00%	43
60-69	104,502	0.34%	355	10.00%	36
70-79	261,131	0.34%	888	10.00%	89
80+	261,131	0.34%	888	10.00%	89
Total	2,198,701		7,476		379

Our suggestion: Use hospitalization data

- Use hospitalization data from your local region for Health system capacity planning
- Remember the 12-14 days lag between interventions and “peak demand” for hospitalization
 - Day-to-day variation in case rates can mislead
 - At a growth rate of 15%, peak demand will be 5x-6x times higher than it is when you intervened

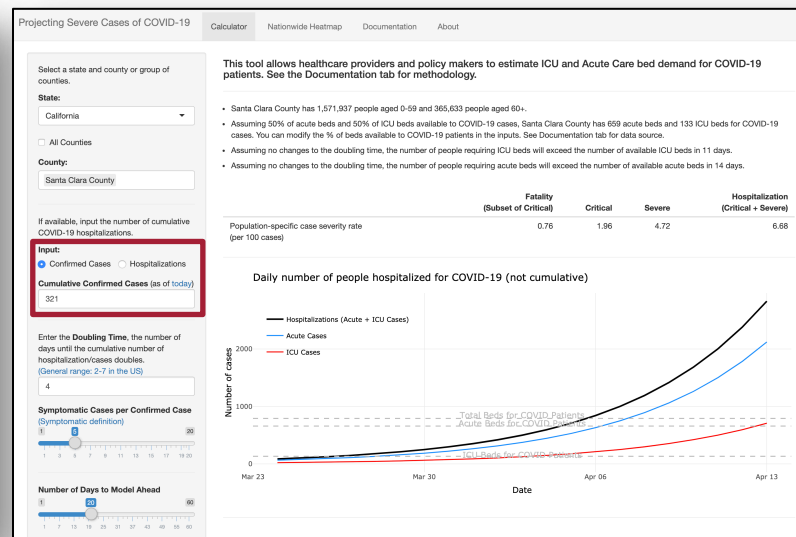
<https://tinyurl.com/SARS-COV-2-SCC>

Stanford Medicine Calculators



Hospital bed and resource use projections

Teng Zhang, Kelly McFarlane, Jacqueline Vallon, Linying Yang, Jin Xie, Jose Blanchet, Peter Glynn, Kristan Staudenmayer, Kevin Schulman, **David Scheinker**

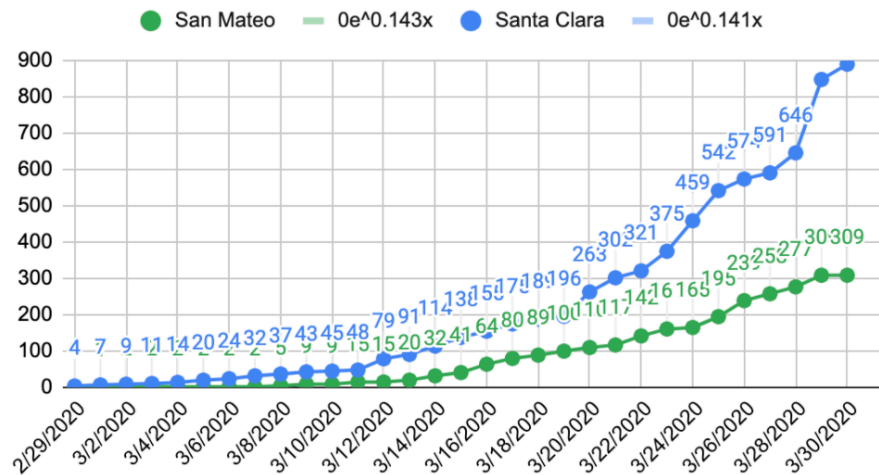


County hospitalization projections

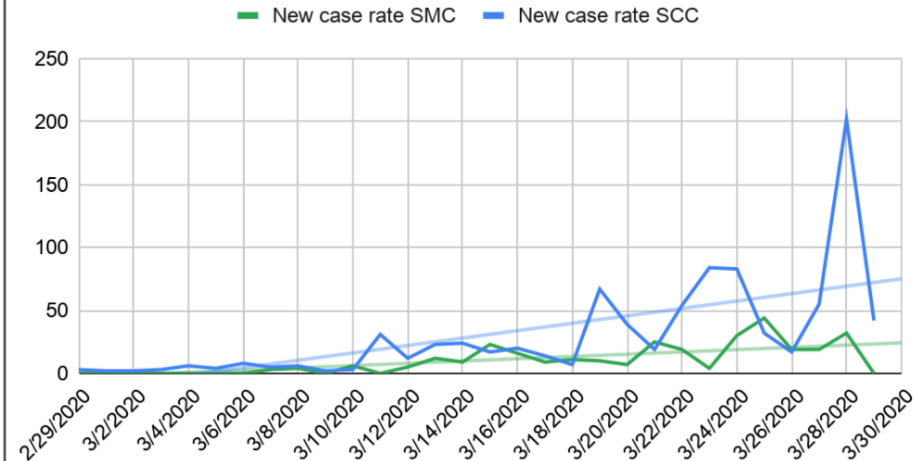
Johannes Ferstad, Angela Gu, Raymond Lee, Isha Thapa, Alejandro Martinez, Andy Shin, Joshua Salomon, Peter Glynn, Nigam Shah, Arnold Milstein, Kevin Schulman, **David Scheinker**

<https://surf.stanford.edu/covid-19-tools/>

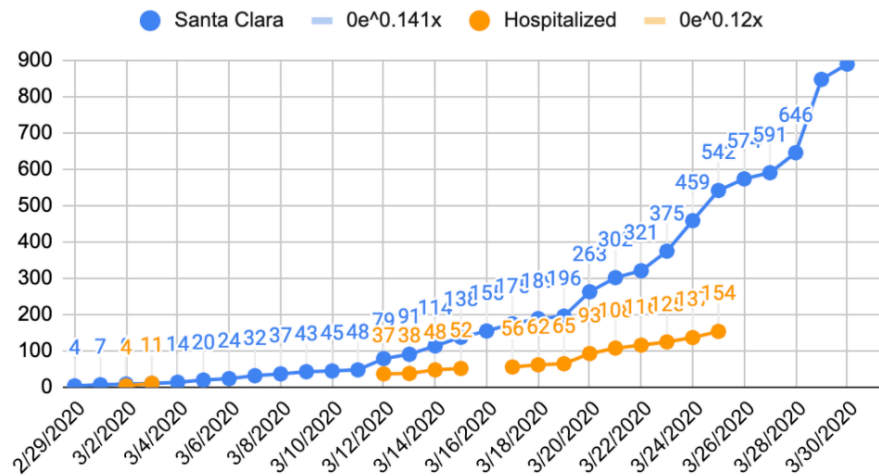
San Mateo and Santa Clara



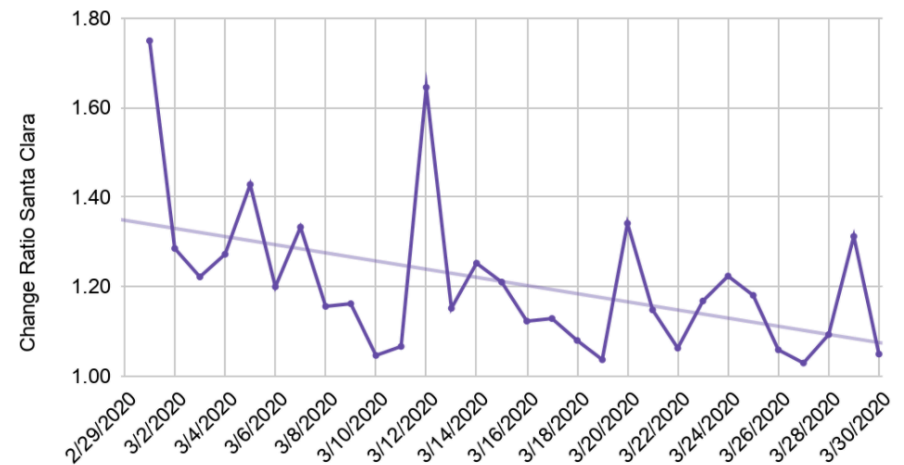
New case rate SMC and New case rate SCC



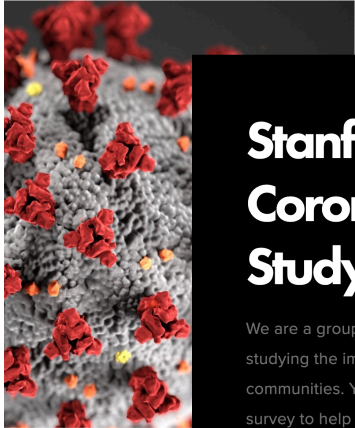
Santa Clara - Cases and Hospitalizations



Change Ratio Santa Clara



Population insights



Stanford Coronavirus Study

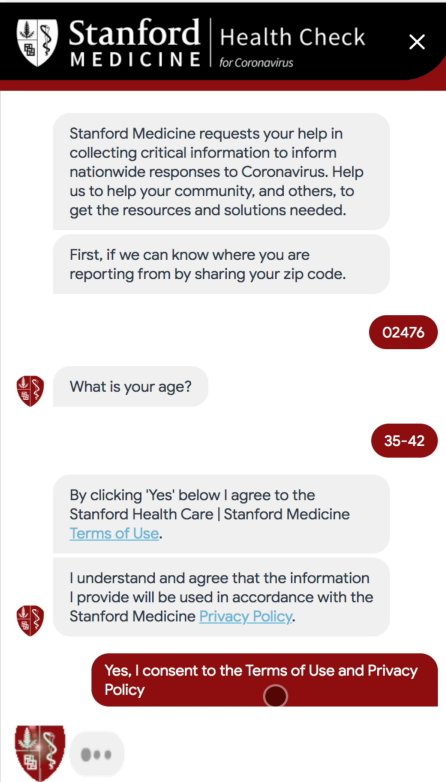
We are a group of Stanford University researchers studying the impact of COVID-19 on our communities. You are invited to take this 5-minute survey to help us track the impact of the virus and understand the actions individuals and households are taking in response to the epidemic. You must be 18 years of age or older to take this survey.

This research is conducted in collaboration with the **Stanford Department of Epidemiology & Population Health**, **Stanford Department of Dermatology** and the **Center for Population Health Sciences**.

Eleni Linos,
Julia Simard

Rusty Hofmann,
Steve Goodman

<https://pcrt.stanford.edu/covid>



Stanford MEDICINE | Health Check for Coronavirus

Stanford Medicine requests your help in collecting critical information to inform nationwide responses to Coronavirus. Help us to help your community, and others, to get the resources and solutions needed.

First, if we can know where you are reporting from by sharing your zip code.

02476

What is your age?

35-42

By clicking 'Yes' below I agree to the Stanford Health Care | Stanford Medicine [Terms of Use](#).

I understand and agree that the information I provide will be used in accordance with the Stanford Medicine [Privacy Policy](#).

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COVID Counter

www.tinyurl.com/sm-covid-query

Stanford Data Science researchers
may be able to help answer them.

