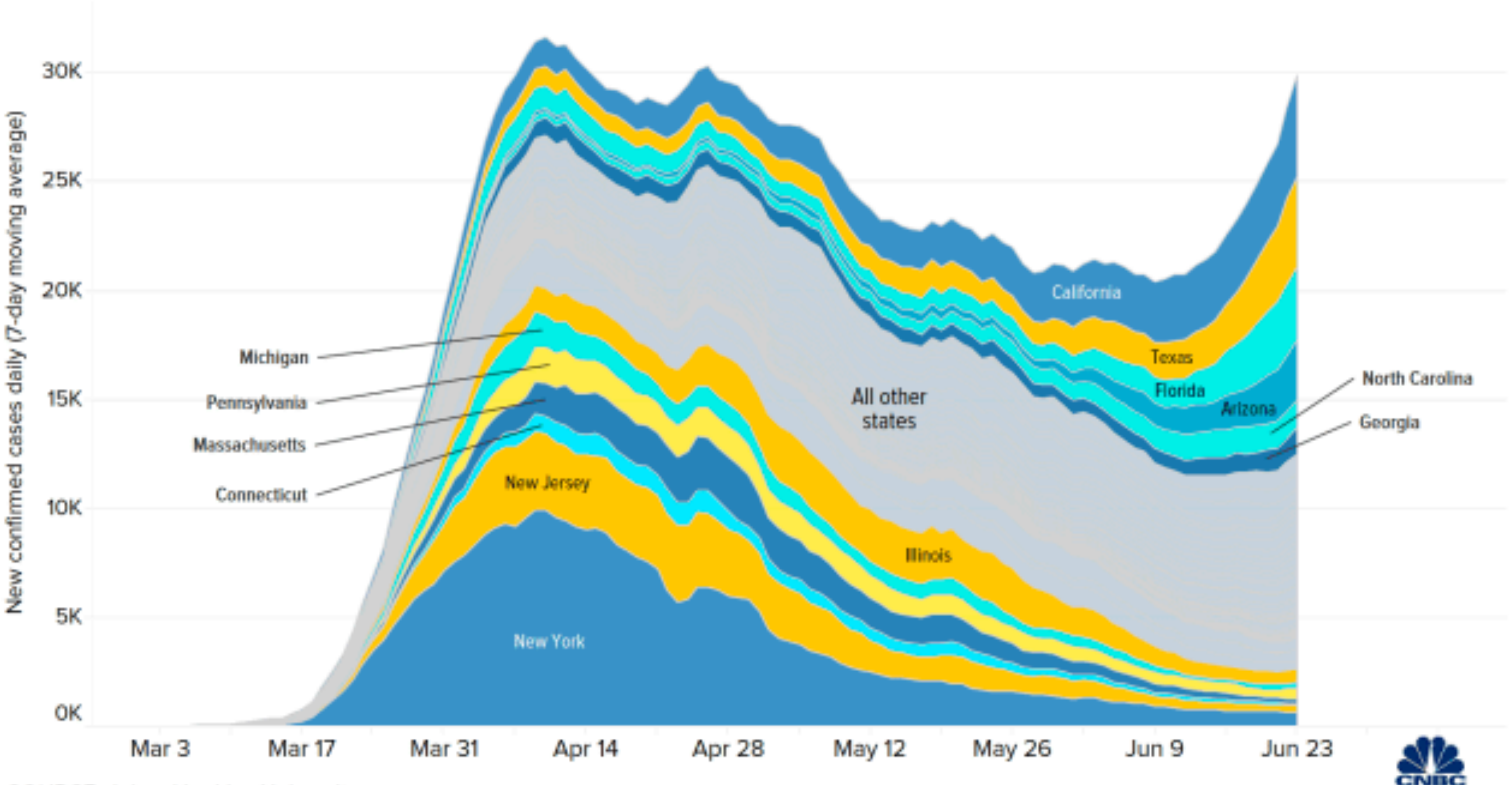
Coronavirus outbreaks



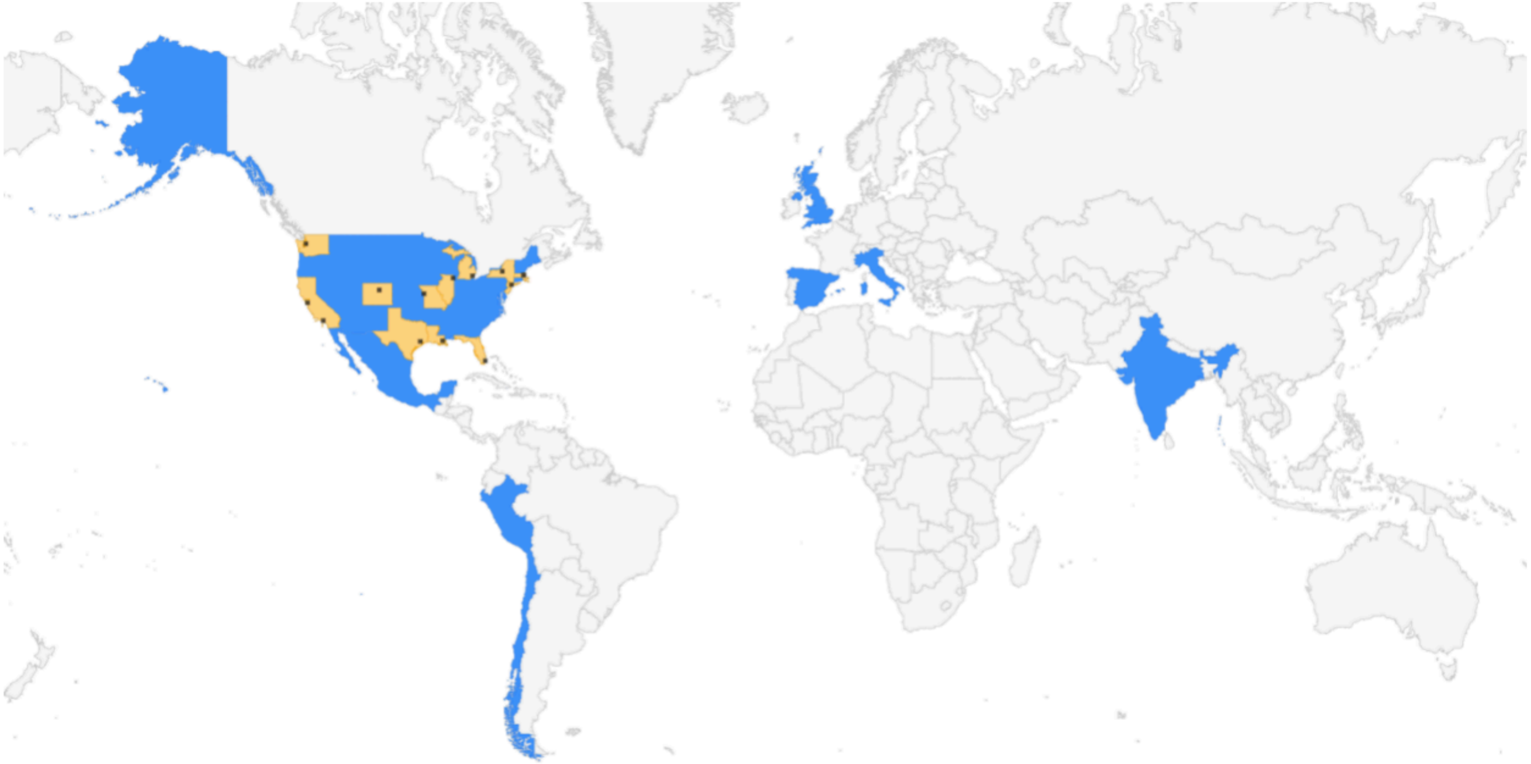
SOURCE: Johns Hopkins University

Outline

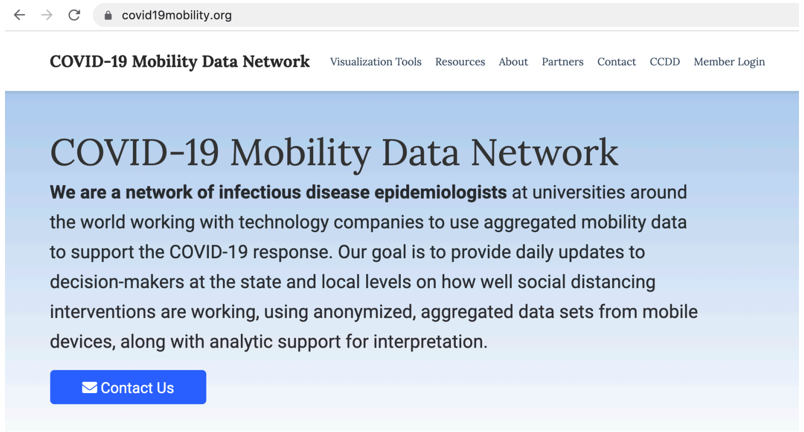
- Mobility data: representativeness and meaning
- Testing data: biases in confirmed case reports
- Assessing timing of policies versus epidemiology: accounting for non-linear dynamics

COVID19 Mobility Data Network:

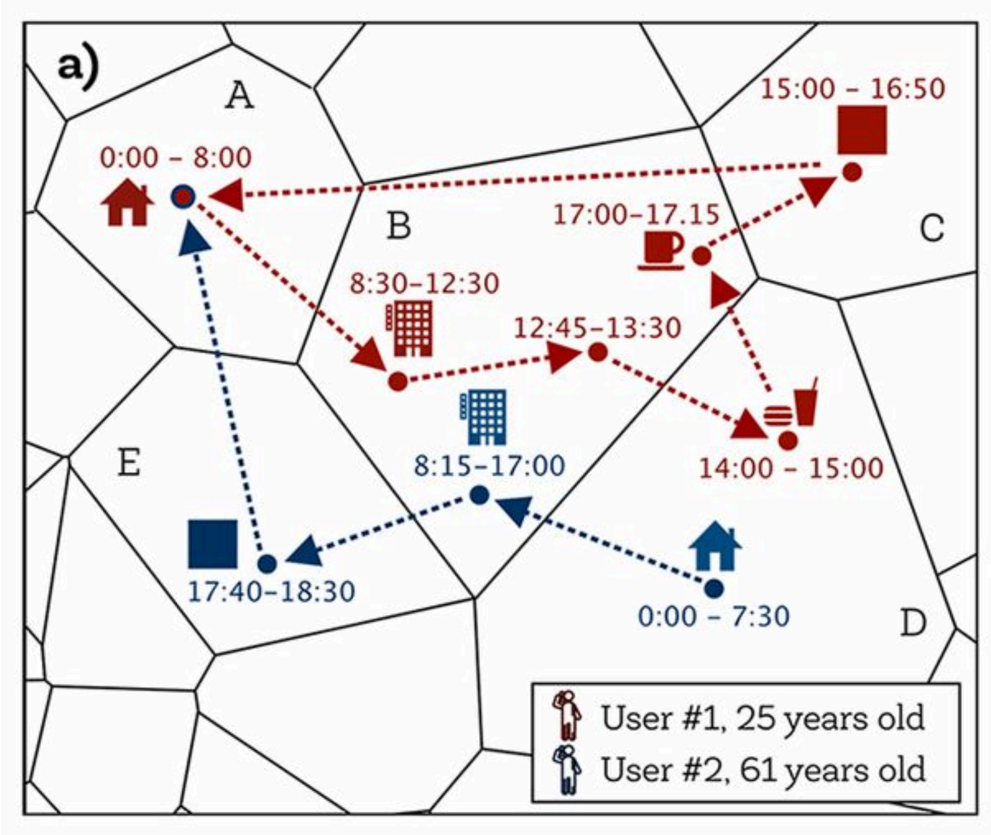
- ~50 researchers internationally
- DUAs with Facebook, Camber Systems (incl unacast etc), Cuebiq
- Direct 1:1 connections between network members and local/state policy makers to guide response
- Standardized analyses across locations and data platforms

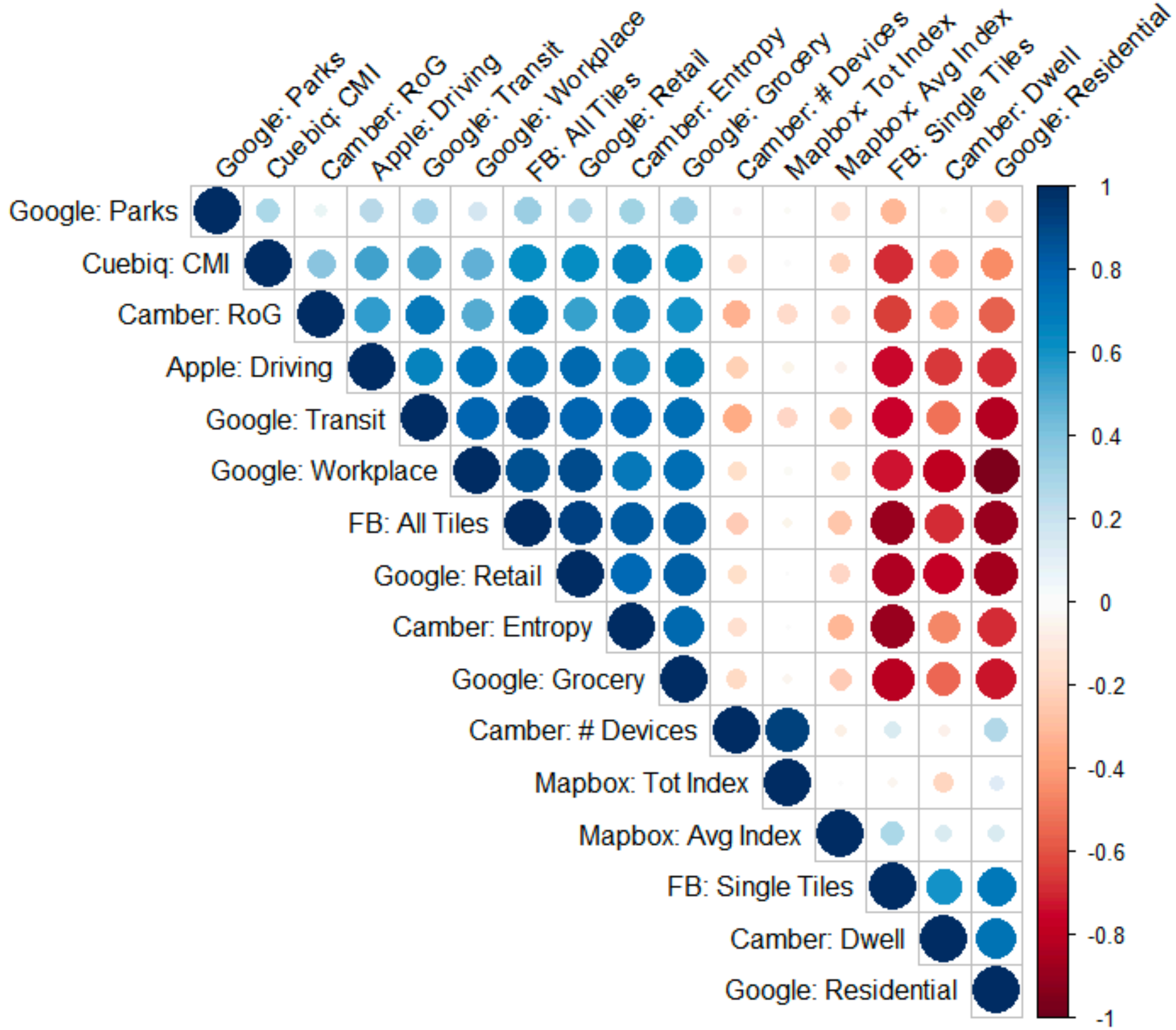


(Fig. 1 – **Countries** currently receiving support from the COVID-19 Mobility Data Network include: United States, Mexico, Peru, Chile, United Kingdom, Spain, Italy and India. **States** within the US include: New York, Massachusetts, Florida, Illinois, Michigan, Missouri, Louisiana, Texas, Colorado, Washington, and California. **Cities** within the US include: Boston, Cambridge, New York, Syracuse, Miami, Detroit, Chicago, New Orleans, Houston, Denver, Seattle, Santa Clara, San Jose and Los Angeles)



Covid19mobility.org





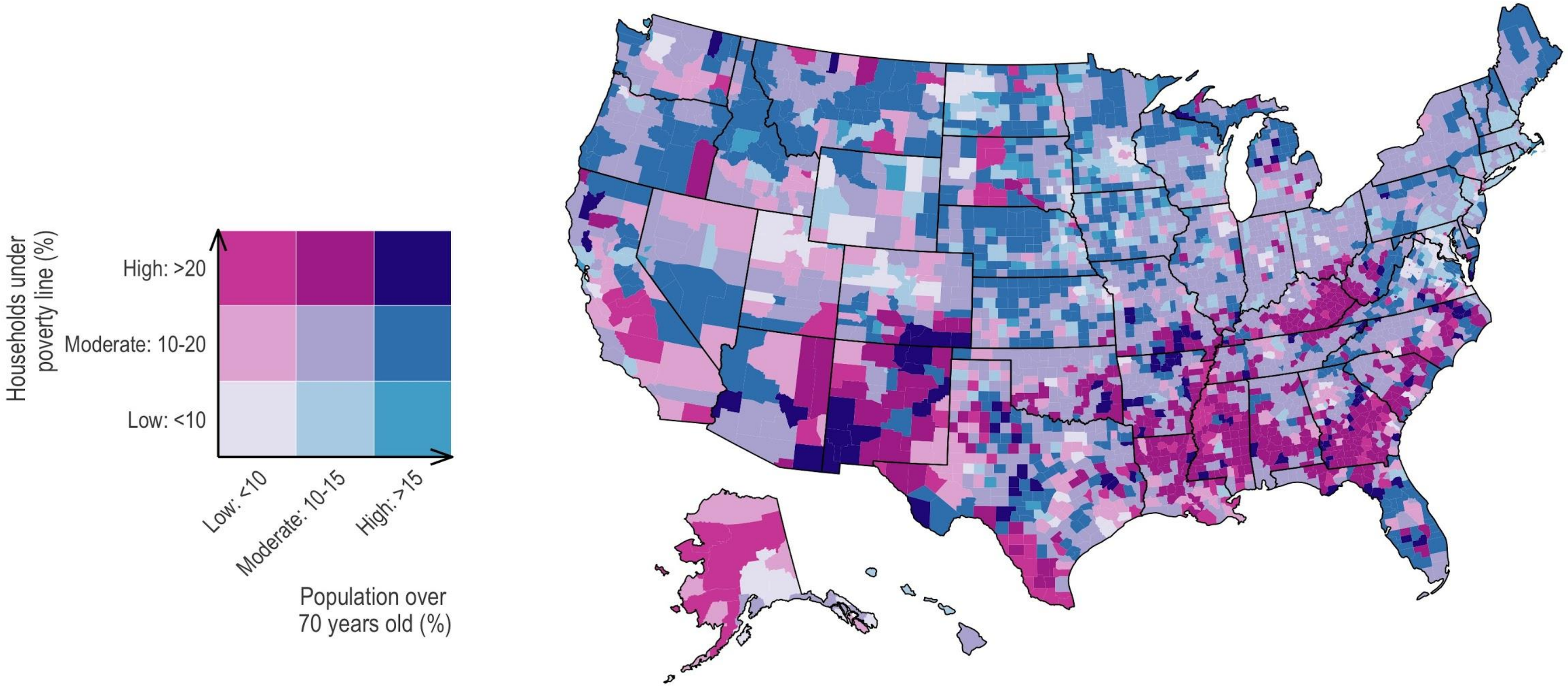
EDITORIAL

Mobile phone data for informing public health actions across the COVID-19 pandemic life cycle

Nuria Oliver[1,2], Bruno Lepri[2,3], Harald Sterly[4], Renaud Lambiotte[5,6], Sébastien Delataille[7], Marco De Nadai[3], Emmanuel Leto...
+ See all authors and affiliations

Science Advances 27 Apr 2020:
eabc0764
DOI: 10.1126/sciadv.abc0764

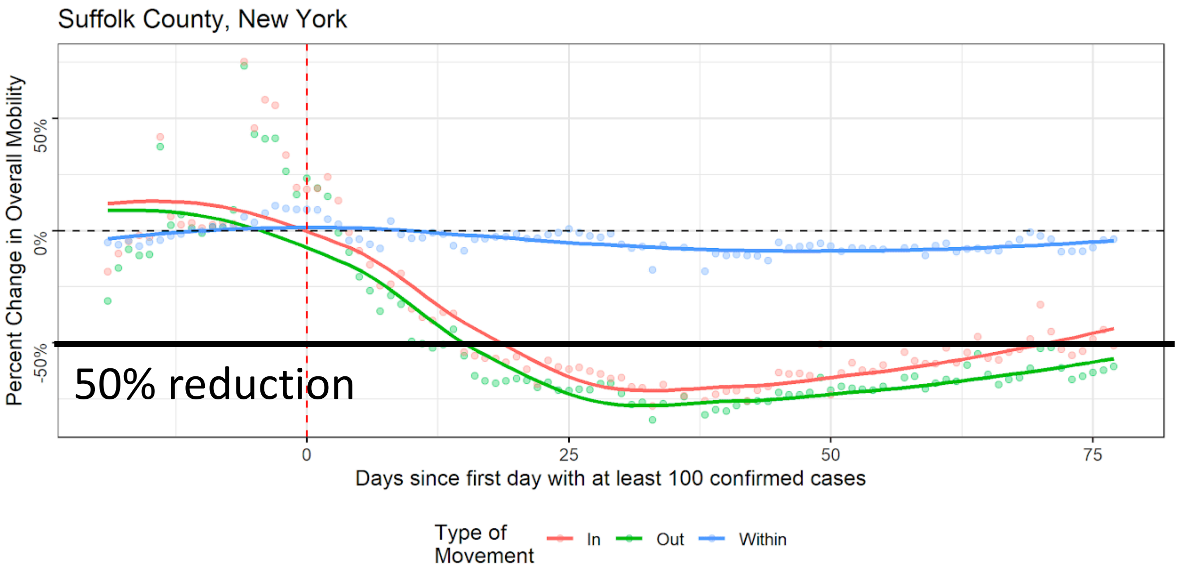
with Nishant Kishore, Mathew Kiang, Navin Vembar

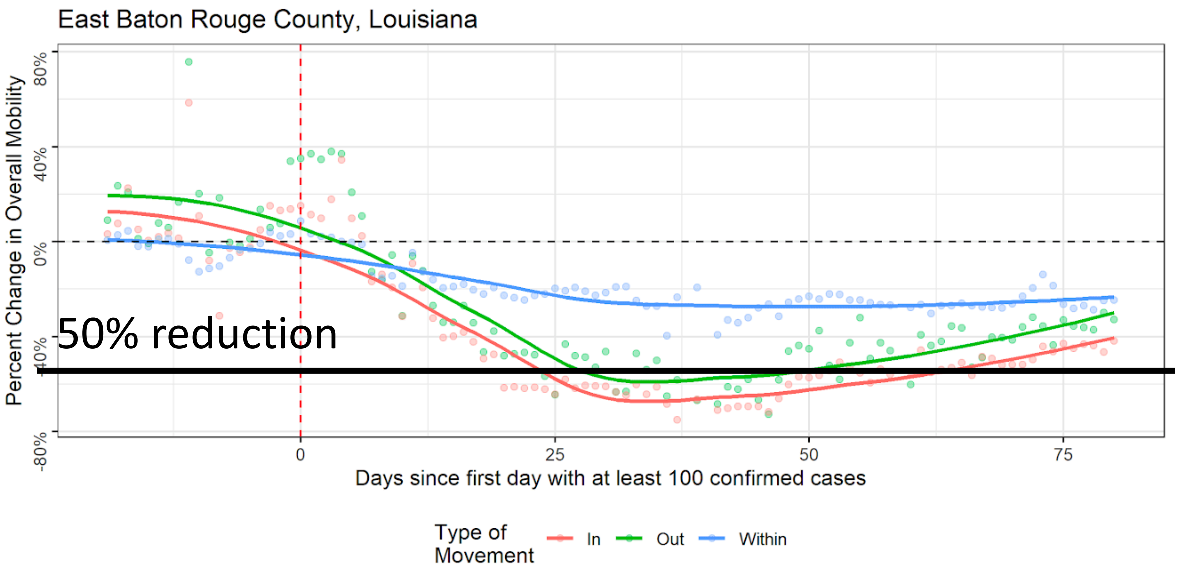


U.S. county-level characteristics to inform equitable COVID-19 response

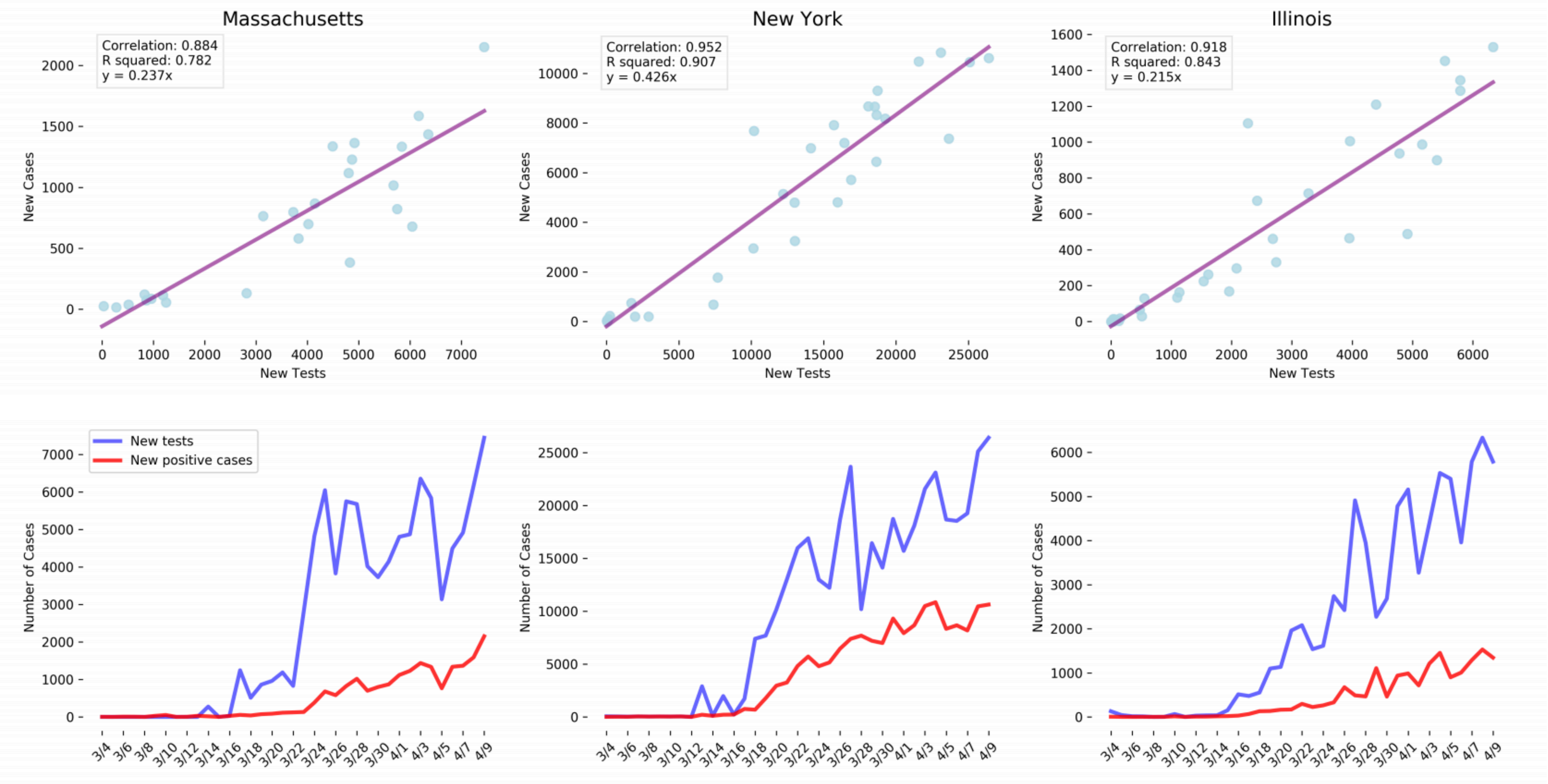
Taylor Chin, Rebecca Kahn, Ruoran Li, Jarvis T. Chen,
Nancy Krieger, Caroline O. Buckee, Satchit Balsari,
Mathew V. Kiang

doi: https://doi.org/10.1101/2020.04.08.20058248

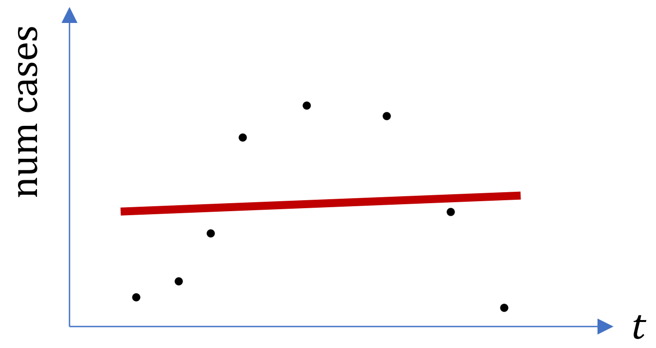




Data from Facebook, graphs by Nishant Kishore



Kaashok & Santillana http://dx.doi.org/10.2139/ssrn.3574849



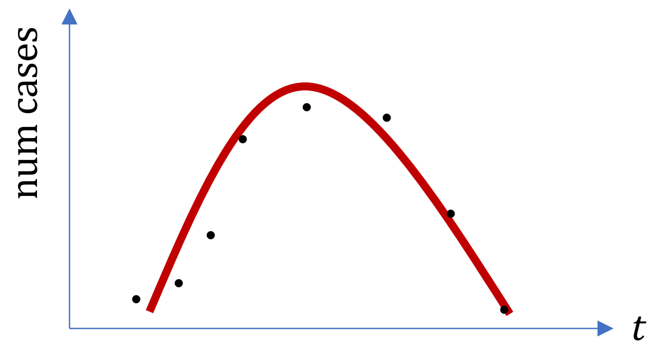
Linear Regression

$$y = ax + b$$

Advantage: simple interpretation of a

Drawback: does not fit these data

Can we transform the variables?

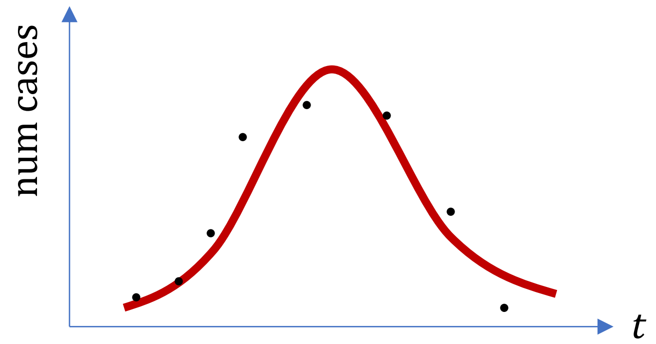


Quadratic Regression

$$y = ax^2 + bx + c$$

Advantage: fits the data better

Drawback: cannot interpret a and b

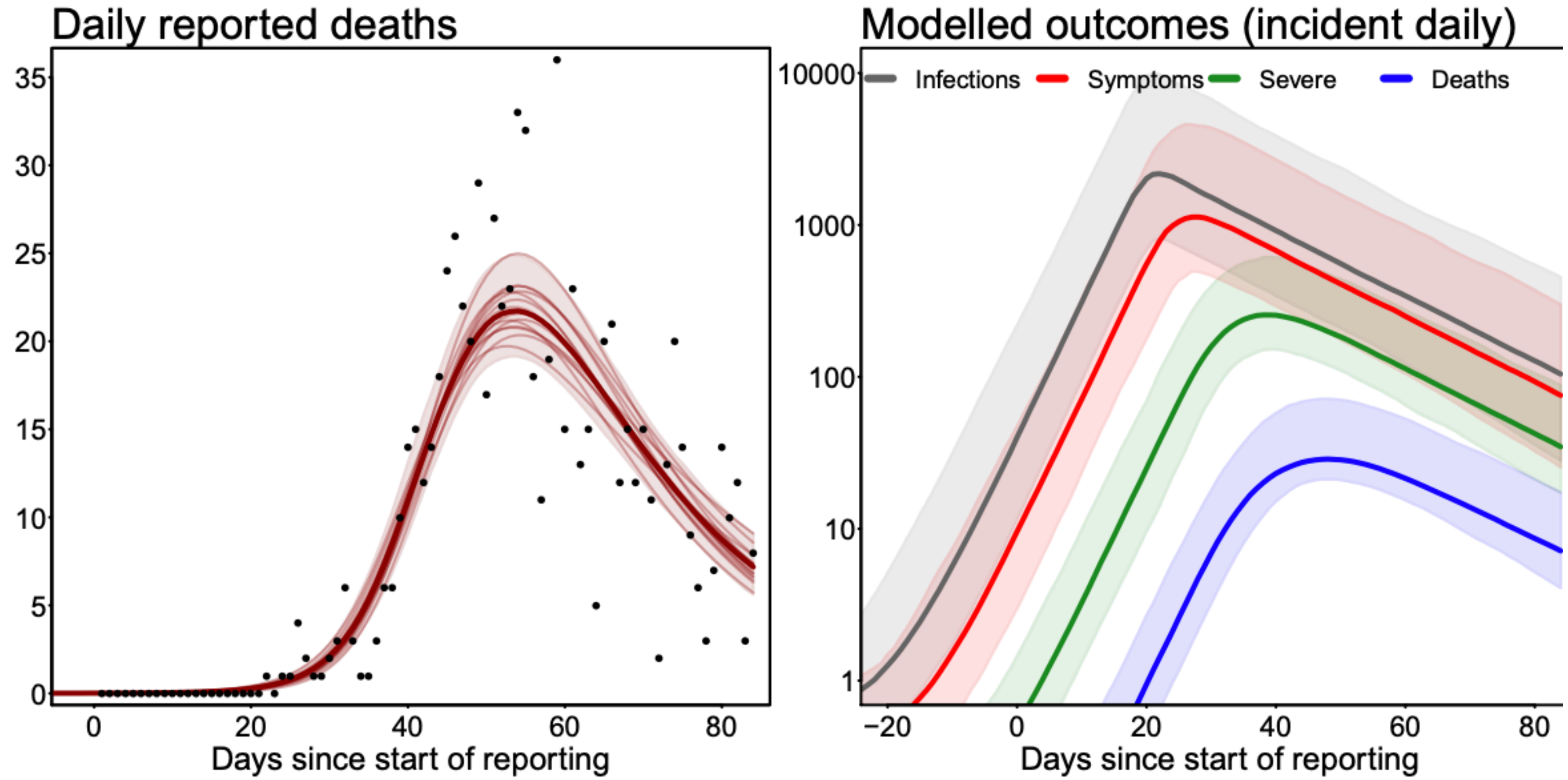


"SIR" Regression

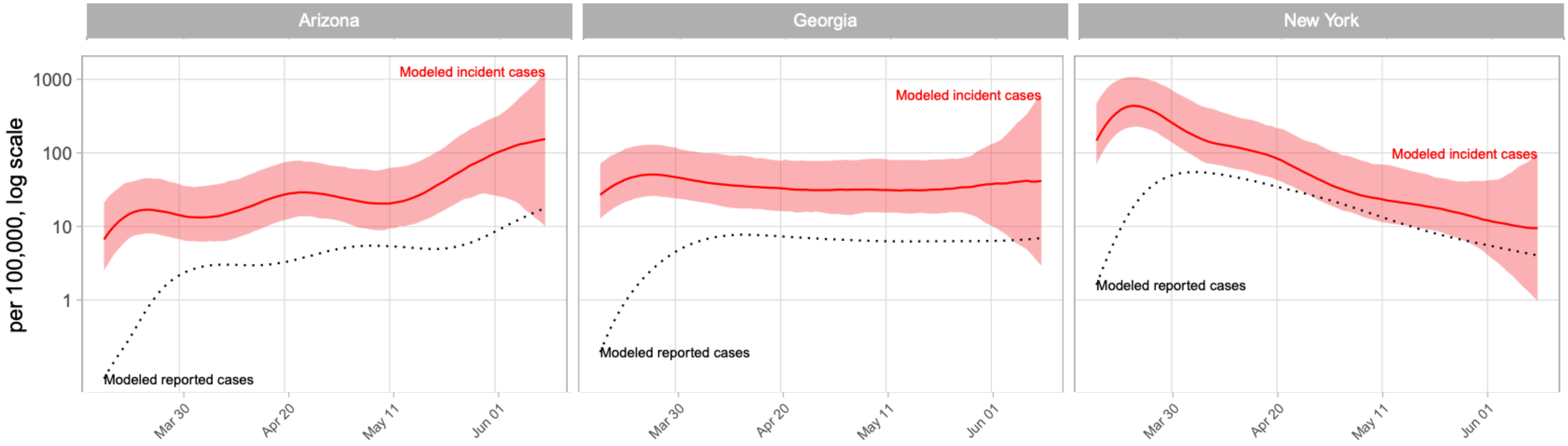
$$y = f(\beta, v)$$

Advantage: fits the data well

Advantage: can interpret β and v



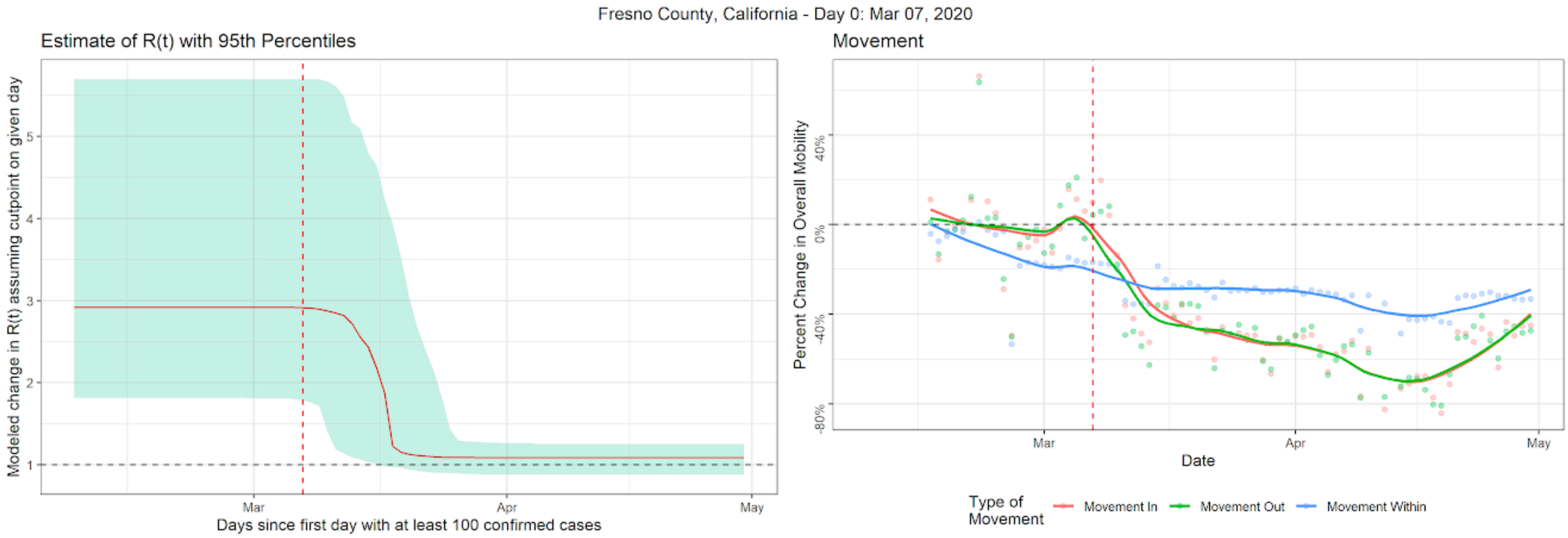
Collaboration with Nishant Kishore (HSPH), Nick Menzies (HSPH), Ted Cohen (Yale), Aimee Taylor (HSPH), Pierre Jacob (Harvard)



Bayesian nowcasting with adjustment for delayed and incomplete reporting to estimate COVID-19 infections in the United States

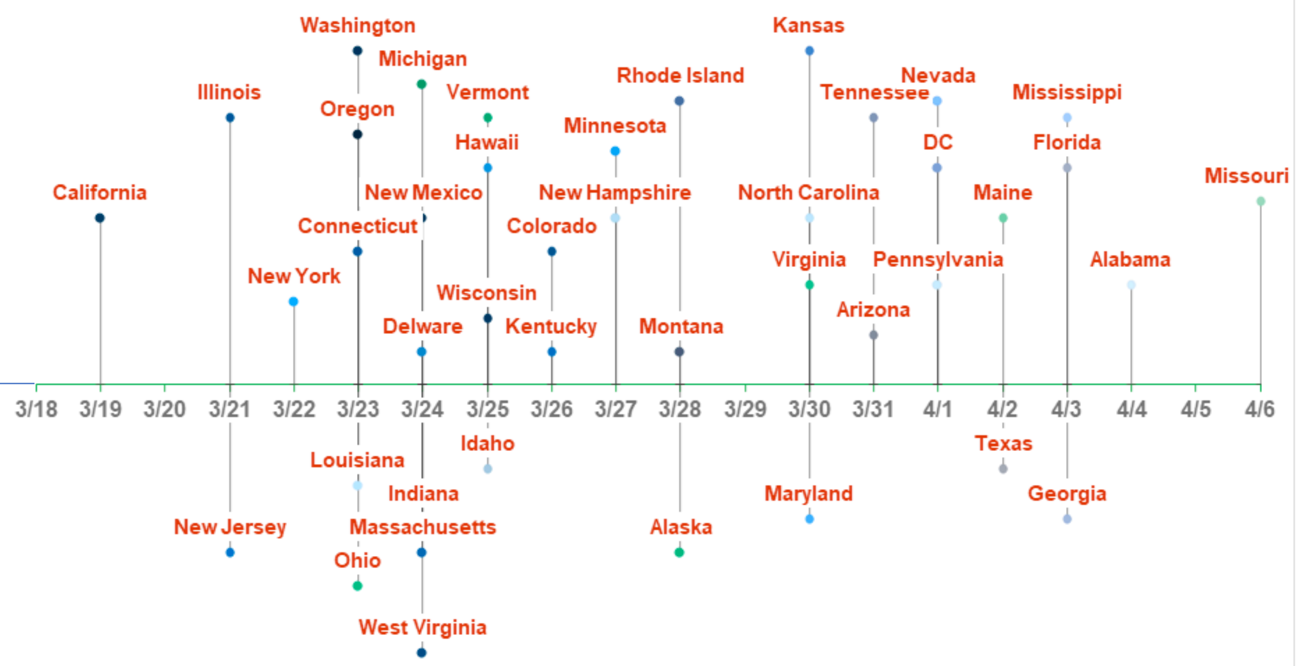
Melanie H Chitwood, Marcus Russi, Kenneth Gunasekera, Joshua Havumaki, Virginia E. Pitzer, Joshua L Warren, Daniel Weinberger, Ted Cohen, Nicolas A Menzies

medRxiv 2020.06.17.20133983; doi: https://doi.org/10.1101/2020.06.17.20133983



Collaboration with Nishant Kishore (HSPH), Nick Menzies (HSPH), Ted Cohen (Yale), Aimee Taylor (HSPH), Pierre Jacob (Harvard)

State Mandated Stay-At-Home Orders by Date of Implementation

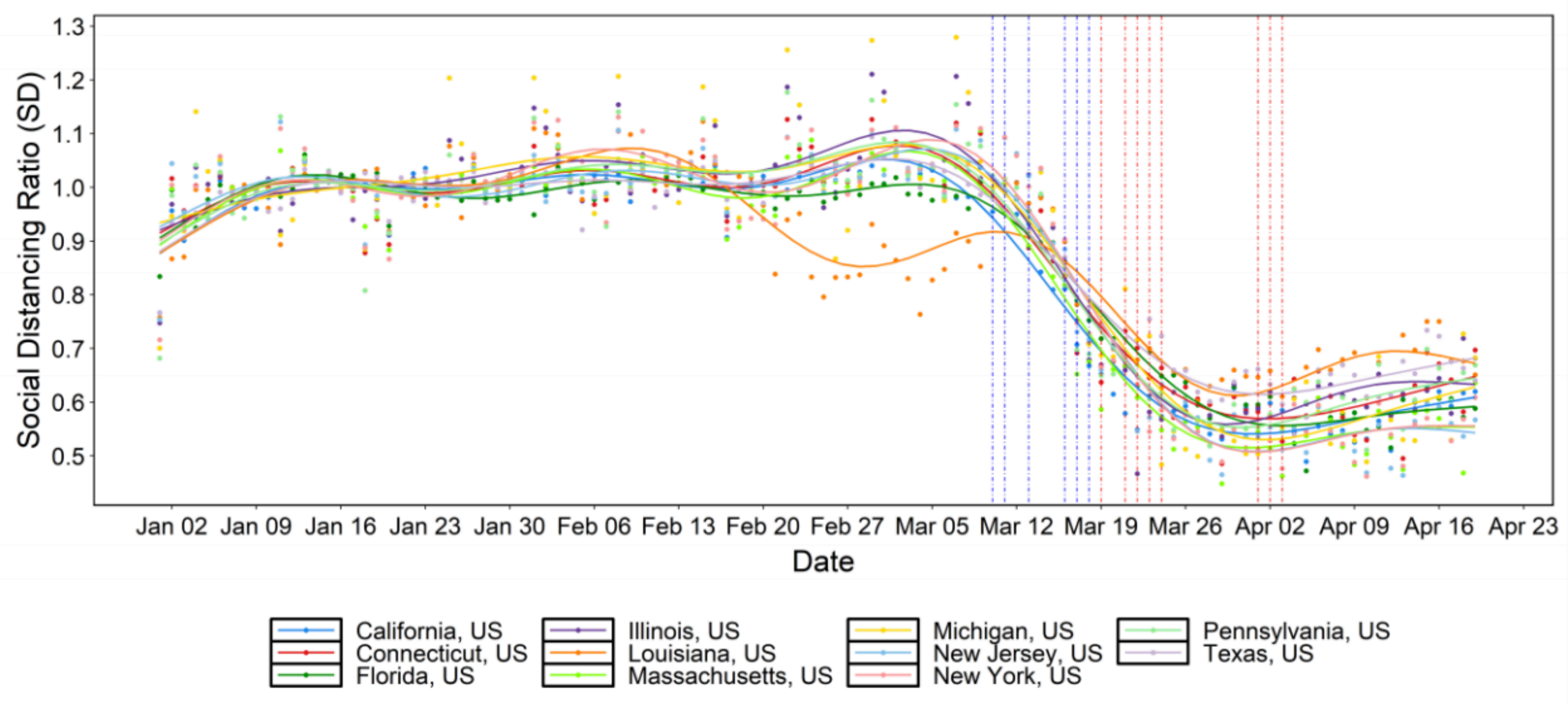


SOURCE: KFF, State Data and Policy Actions to Address Coronavirus, https://www.kff.org/health-costs/issue-brief/state-data-and-policy-actions-to-address-coronavirus/#note-3-10 and state government websites.

KFF HENRY J KAISER FAMILY FOUNDATION

State of emergency declared, March 13

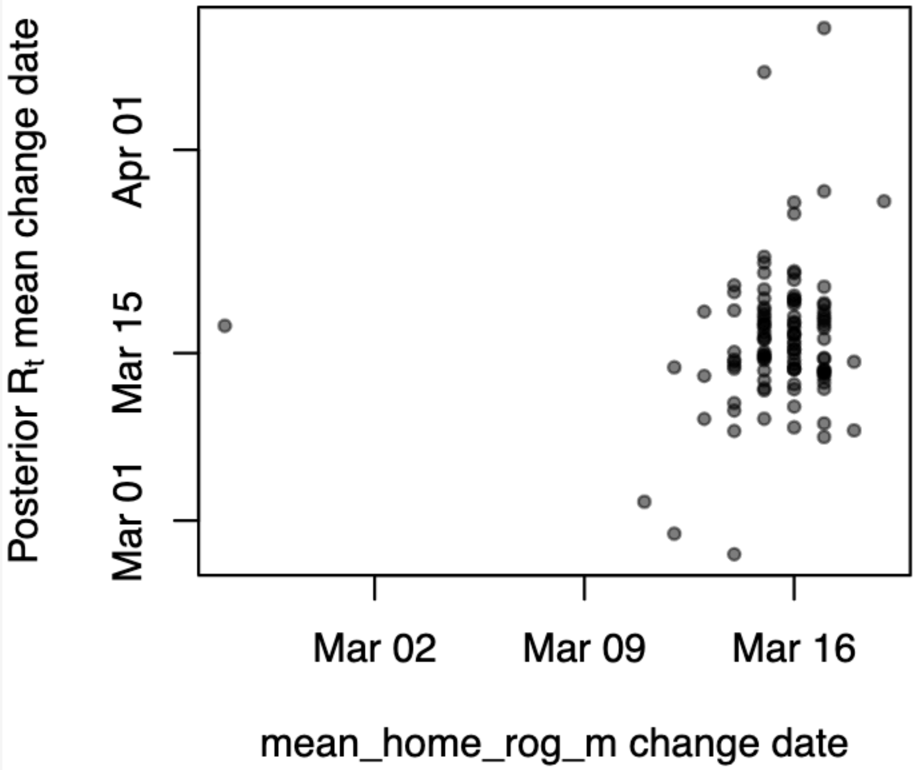
NBA cancels season, March 11

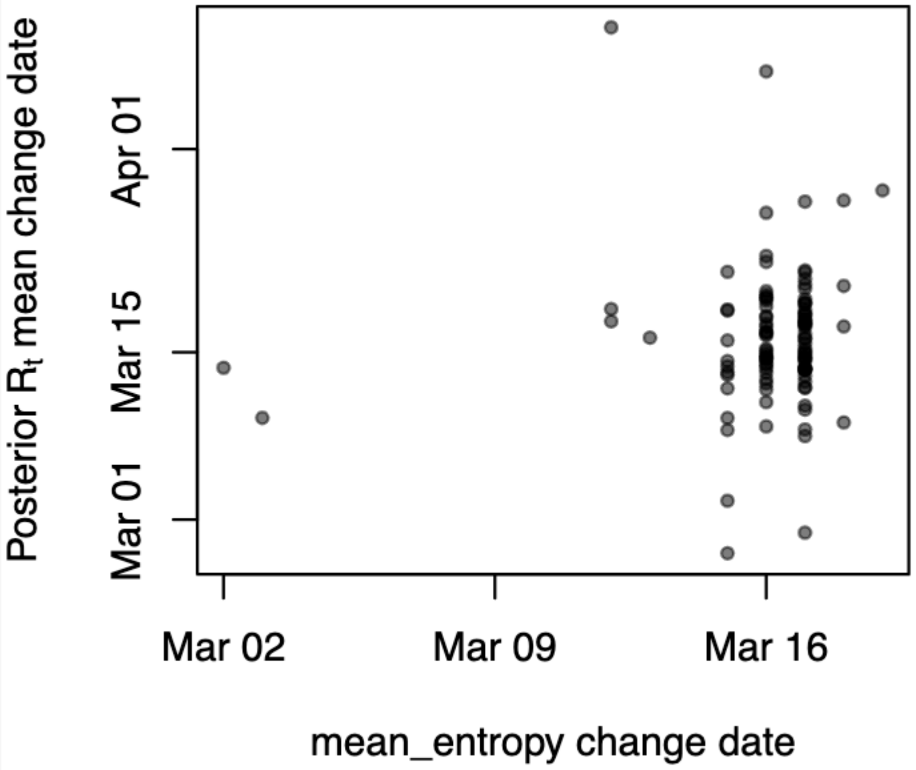


Social Distancing is Effective at Mitigating COVID-19 Transmission in the United States

Hamada Badr, Hongru Du, Max Marshall, Ensheng Dong, Marietta Squire, Lauren Marie Gardner

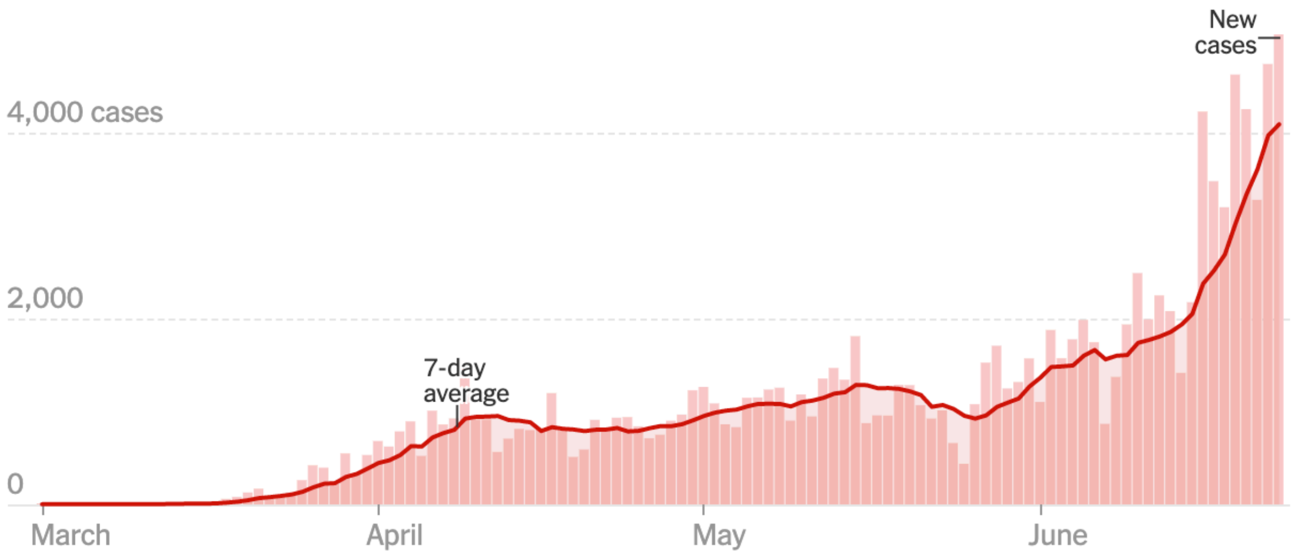
medRxiv 2020.05.07.20092353; doi: https://doi.org/10.1101/2020.05.07.20092353



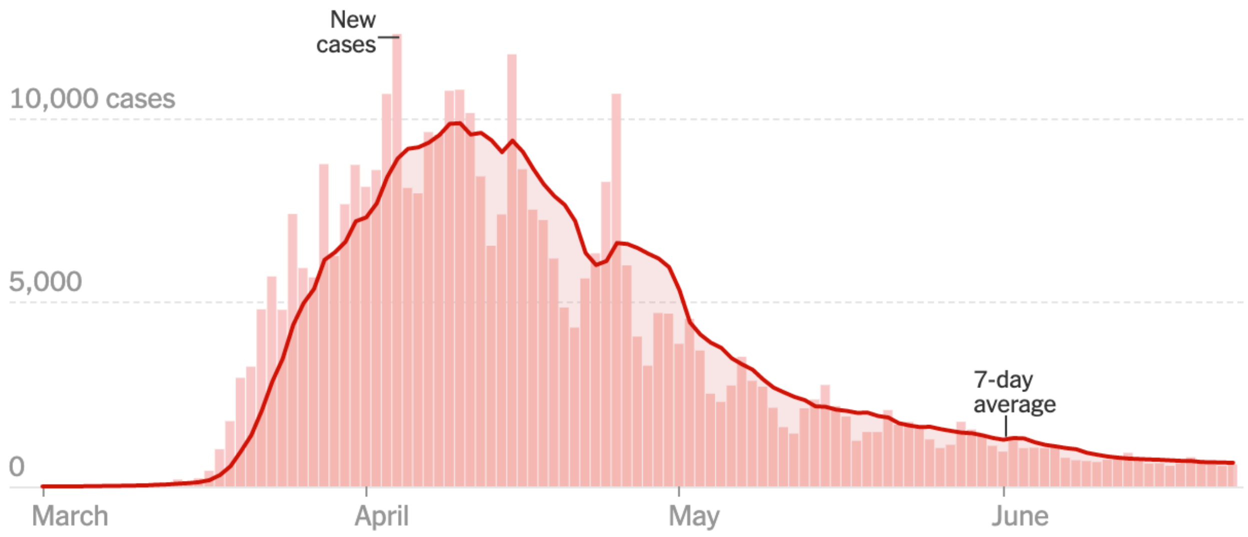


Collaboration with Nishant Kishore (HSPH), Nick Menzies (HSPH), Ted Cohen (Yale), Aimee Taylor (HSPH), Pierre Jacob (Harvard)

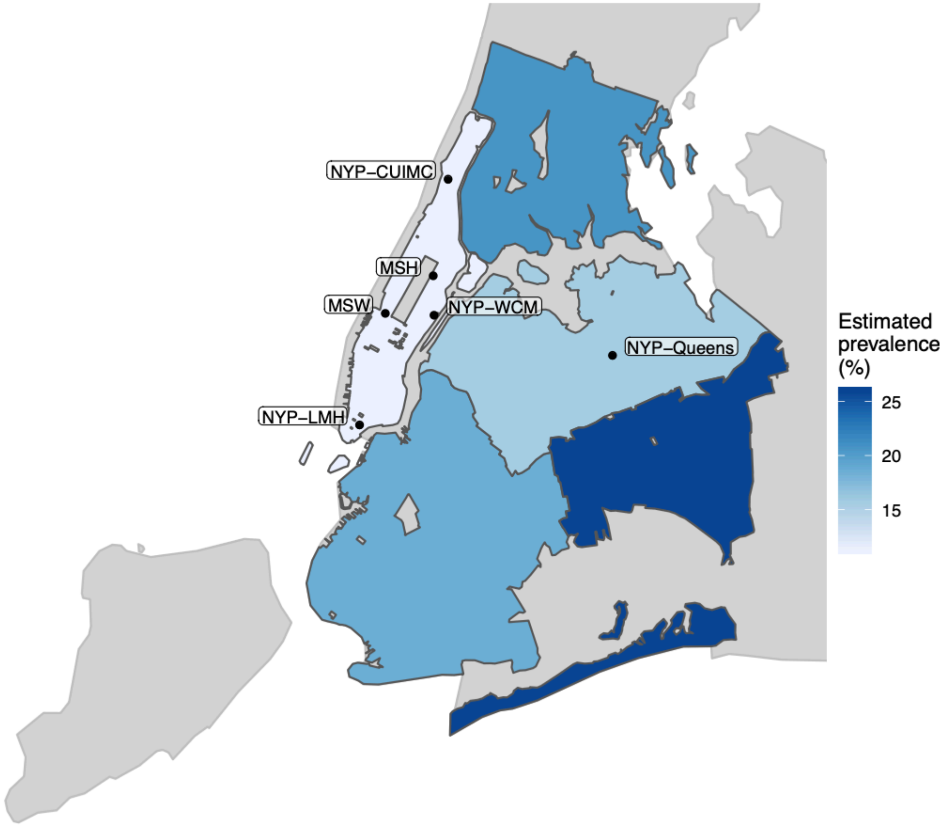
New reported cases by day in Texas

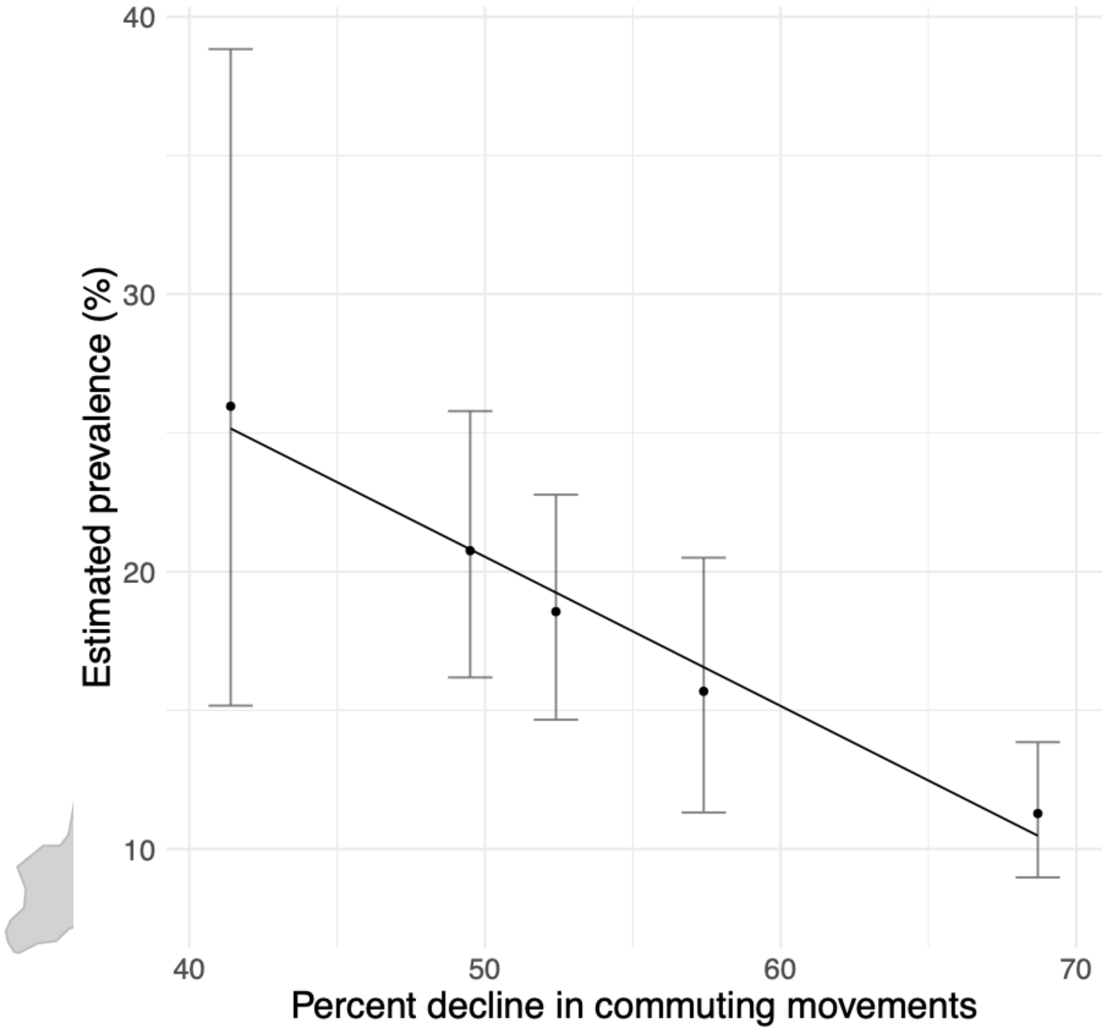


New reported cases by day in New York



Cumulative incidence measured by serosurveillance





Reductions in commuting mobility predict geographic differences in SARS-CoV-2 prevalence in New York City

Stephen M. Kissler[1]*, Nishant Kishore[2]*, Malavika Prabhu[4]*, Dena Goffman[5]*, Yaakov Beilin[8,9]*, Ruth Landau[6], Cynthia Gyamfi-Bannerman[5], Brian T. Bateman[7], Daniel Katz[8,9], Jonathan Gal[8], Angela Bianco[9], Joanne Stone[9], Daniel Larremore[3], Caroline O. Buckee[2], Yonatan H. Grad[1]

Conclusions

- Consistency in finding that messaging and orders unlikely to have been driving factor in behavior change
- Lockdowns *were* highly effective at reducing growth rate of epidemics
- Nonlinearities and variable timing intrinsic to epidemic dynamics important
- Testing and mobility data both have limitations, not necessarily appropriate to use them quantitatively as indicators
- We are very far from herd immunity. This is going to be a long haul.