It Depends:

Modeling and Forecasting in the Time of a Pandemic

Eric Lofgren MSPH, PhD

Associate Professor, Paul G. Allen School for Global Health

Washington State University

Who Am I?

- PhD in Epidemiology from UNC Chapel Hill
- Postdoc at Network Dynamics and Simulation Science Lab, Virginia Tech
- Now an Associate Professor at the Paul G. Allen School for Global Health at Washington State University

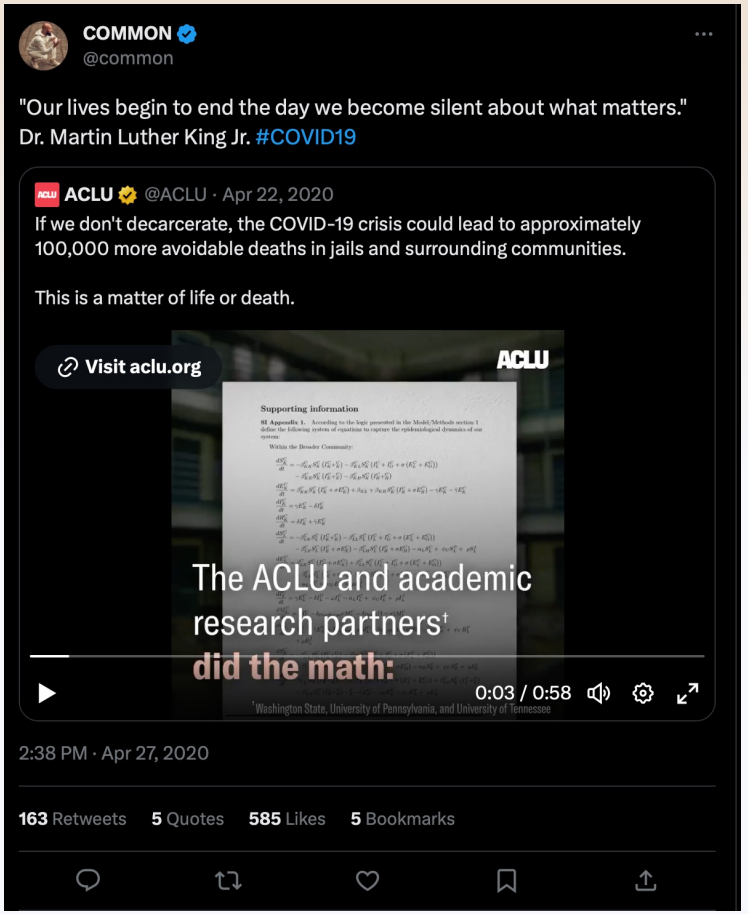
What Went Right

Modeling as a Tool

- Modeling entered mainstream public awareness as an important public health tool
- *Way* more people knew what R_0 meant than beforehand
- Models and forecasts were both in high demand and widespread use in decision-making, thresholds, etc.

Distributed Modeling

- The decentralized nature of the response to the pandemic, and the multifaceted impacts of it, meant there was a need – and the use – of modeling in a number of roles outside the usual national or state level modeling efforts
- Working with NGOs, universities (about themselves), large employers, etc.
- Adding some rigor, at least structurally, to what might have been guesswork



Forecasts Everywhere!

- Georgia Tech COVID-19 Event Risk Tool
  - Personally used this along with other forecasts, models of vaccine rollout, etc. for everything from toy soldiers to federal court cases
- This is much closer to helping inform decision making at a very granular level than a lot modeling in the past

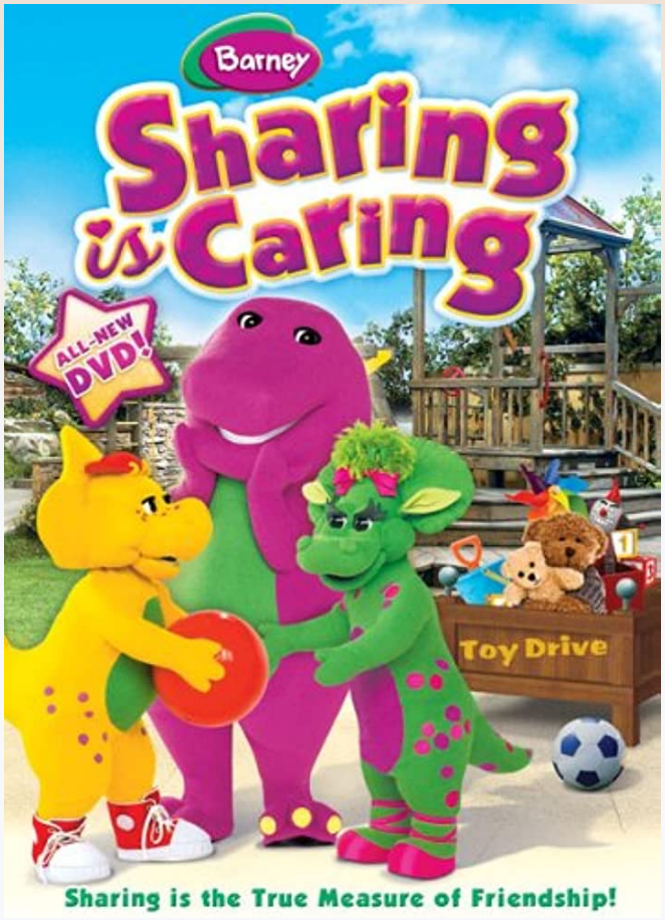
What Went (More) Right

Preprints

- Epidemiology is, generally, not a field *terribly* concerned about being scooped
- Nevertheless, modeling work often has an “expiration date”
  - ”Should we cancel football this year” is obviously only a salient question for a little while
- This frequently does not align with publication timelines
  - Especially not in a pandemic, where the overworked people making the models are the overworked people reviewing the models
- Preprints are especially helpful for smaller groups, who don’t have the professional “weight” to ensure their findings are disseminated in conference calls, etc.
  - Also makes sure that the people *on* those calls aren’t the only ones who can access them

Sharing

- Modelers can be (paradoxically) both really open to sharing and *really not*
- The COVID-19 pandemic saw, in my mind, an increased amount of sharing of models, results, etc.
  - The original models for the WSU response were built off other university models that were open
- Data is still often held a little tight to the vest
- Tools like GitHub and Shiny are *massive* here



What Went Wrong

“The Boys Will Be Home By Christmas”

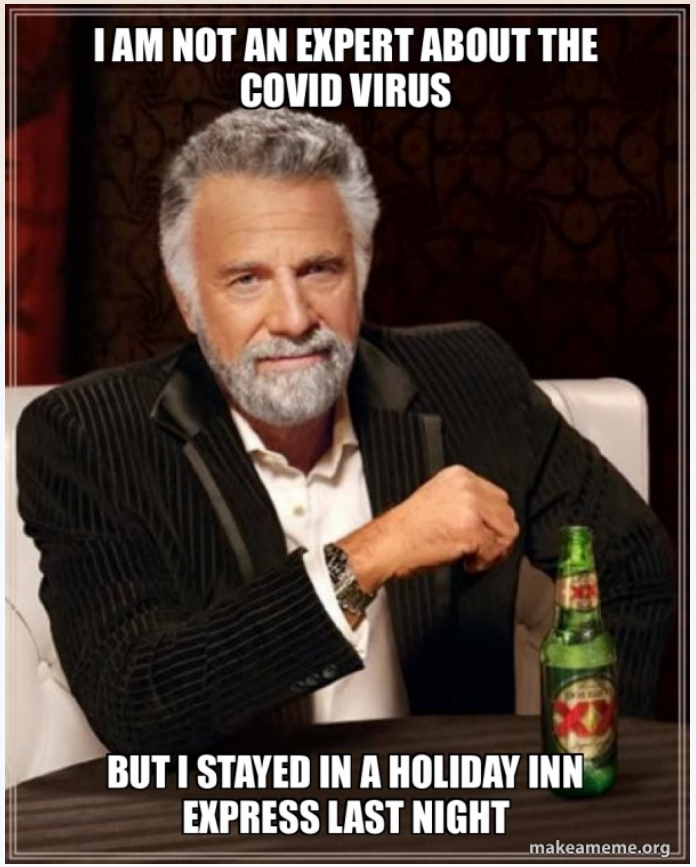
- A forecast can, either by methodological error or design – or deciding to ignore the source of methodological errors – give politically favorable forecast
- Usually this was “The worst is over” in one form or another
- This had very serious ramifications for stakeholder trust in modeling as a tool more broadly

Missed Forecasts

- We are, to be frank, only so-so at forecasting epidemics right now
  - This is the subject of a considerable amount of introspection
- Some of the errors of previous pandemics were not repeated
  - Many fewer very long-term forecasts
  - Use of ensemble modeling for national scale and scenario models
  - Greater hesitance by some modeling teams to make leaps
- Arguably, early forecasts were overly optimistic
  - Without good evidence on extensive asymptomatic spread, SARS-CoV-2 seems containable
- Other settings with a complete absence of data
  - What's the mixing rate of students and alumni while tailgating at a football game?

Epidemic Chauvinism

- In the face of an increasingly crowded field of ”experts” on the pandemic, epidemiology and public health (maybe rightly) had a bit of a “stay in your lane” impulse
- The problem is modeling *isn’t our lane*
- There are many infectious disease epidemiologists who aren’t well trained in modeling
  - In the U.S., modeling isn’t necessarily a widely taught
- There are *many* modelers who aren’t found in epidemiology departments
  - Including me, and both my postdoctoral mentor and the modeling expert on my dissertation committee…



Where Do We Go From Here

Building Relationships Before We Need Them

- ”Who do we call?” was a huge problem
  - Both for people in need of modelers, and modelers in need of data
- It’s *really* hard to do this during a pandemic
- This seems obvious, but it’s also really daunting if we’re not going to assume a central response to the next pandemic
  - It’s not just your state – it’s your local hospital systems, schools, employers, etc.

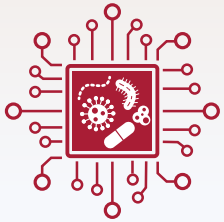
Sustained Funding

- How this normally works goes something like this:
  - A modeler is working on something else, and an emerging epidemic occurs
  - There's a period of very intense work that is essentially uncompensated, supported by understanding program officers
  - CDC contracts, NSF RAPID grants, supplements, etc. help plug the gap
  - There's a wave of funding that the modelers do their best to sock away
  - The emergency passes and funding dries up well before the work is done
- This obviously isn't sustainable, and the CDC Center for Forecasting and Outbreak Analytics is partially meant to resolve this

A Modeling Literate Public Health Workforce

- Modeling should (in my opinion) not be a niche discipline within infectious diseases in terms of training
- Modeling *literacy* is a basic skill in epidemiology
- This is not just an academic public health problem
  - Can your county epidemiologist identify where modeling might helpful?
  - How about hospital administrators or infection control teams?
- If we do continue to follow the decentralized modeling paradigm we saw for COVID-19, we need both more modelers and more modeling literate public health practitioners at all levels of public health

Thank You and Funding



WASHINGTON STATE UNIVERSITY
Resistance Epidemiology
Modeling Initiative

- Contact Information:
  - Eric.Lofgren@wsu.edu
  - Twitter: @GermsAndNumbers
- Funding:
  - NIH R35GM147013 and CDC U01CK000673
- We're hiring!
  - Actively recruiting *at least* one postdoc and graduate students
  - Staff position in data management to work on some very cool global health projects
  - Interested in helping lead and develop an undergraduate program in public health? Come talk to me