Yale SCHOOL OF PUBLIC HEALTH

Causal Controversies: Discussion Comments

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Thank You

Valuable Questions to Raise

1. Which of our "traditional" causal assumptions are **truly necessary**?
2. How do we handle assumptions that we **rarely fully believe**?
3. Which assumptions are **method-specific**?
4. Which assumptions are **context-specific**?
5. Which assumptions are better thought of with our **data and statistical assumptions**?

Points of Agreement

- Scientific theory must ground analyses and consideration of assumptions, methods, etc.

- Methods for interference exist, deserve more attention and use, and are especially valuable because of the public health relevance of spillover

Points of Agreement

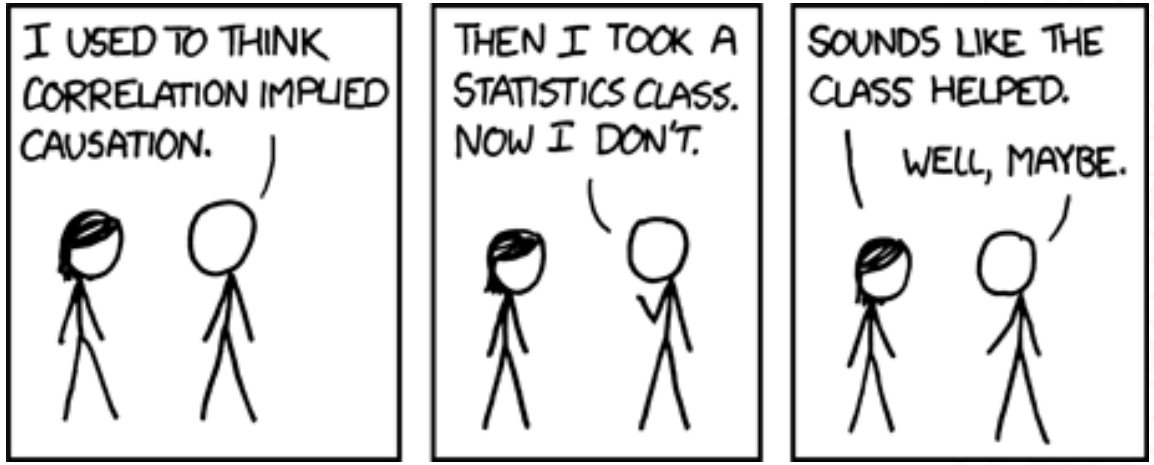
- We should have reasons for proposing new, more complex methods



https://twitter.com/EcologyOfGavin

Role of Exchangeability

- We too often focus on exchangeability as the *sine qua non* of causal inference
- We can then lose sight of important trade-offs that are made in that pursuit:
  - Power
  - Generalizability
  - Consistency

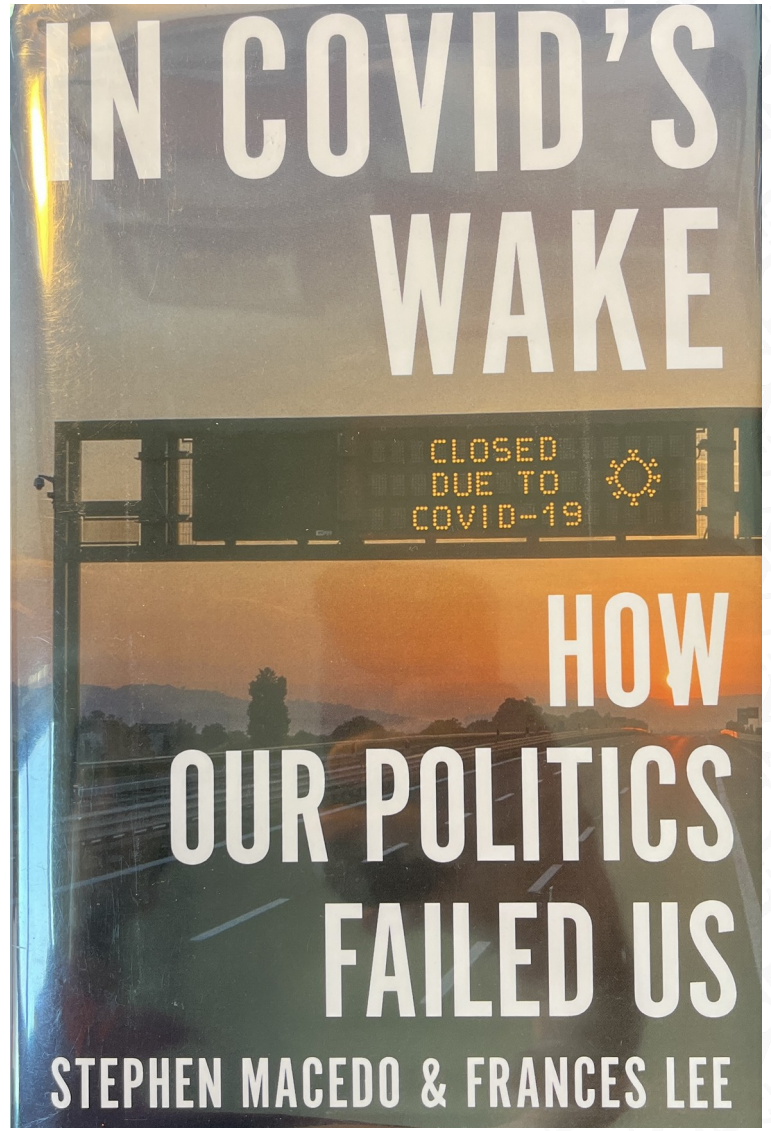


https://xkcd.com/552/

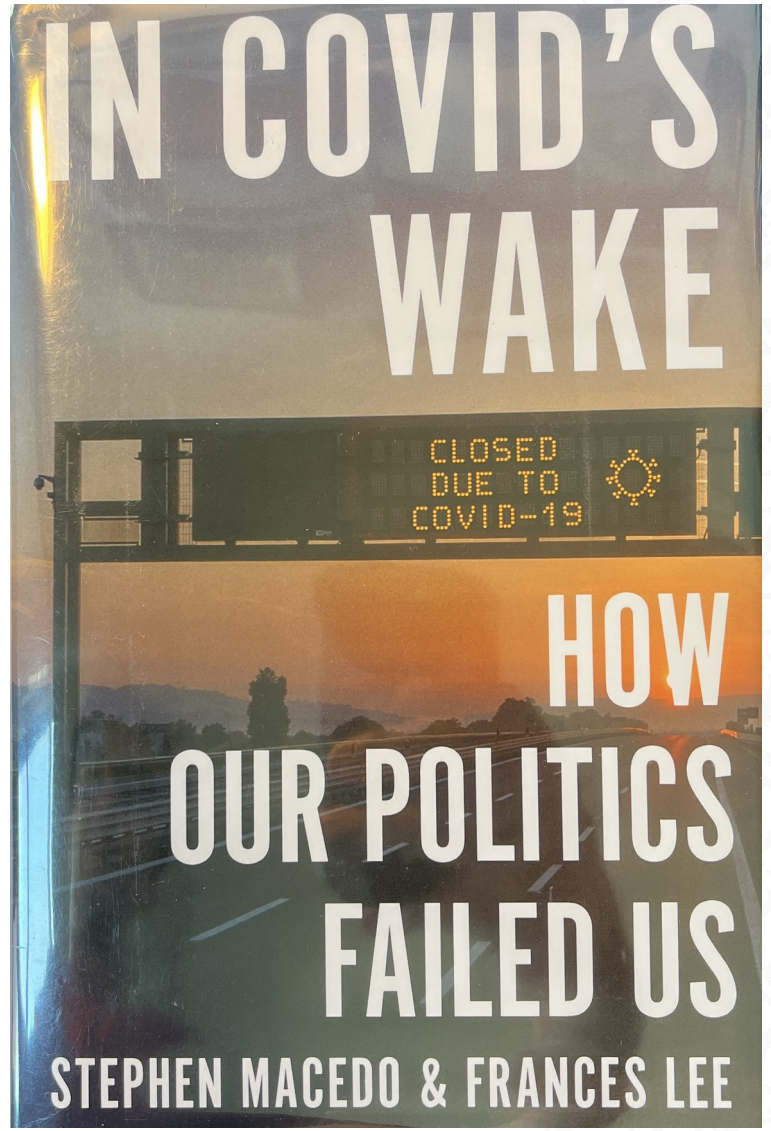
A Different Setting

Evaluating COVID-19 Policies

- Setting: Infectious Disease, Policy Intervention
- Methods: Simplistic Comparisons
- High public involvement & interest



Evaluating COVID-19 Policies



Core Problems with Results

1. Lack of Consistency: spillover effects, bypass effects

2. Lack of Consistency: heterogeneous treatment policies and timings grouped together (and proxied)

3. Lack of Exchangeability: different initial conditions

Possible Solutions

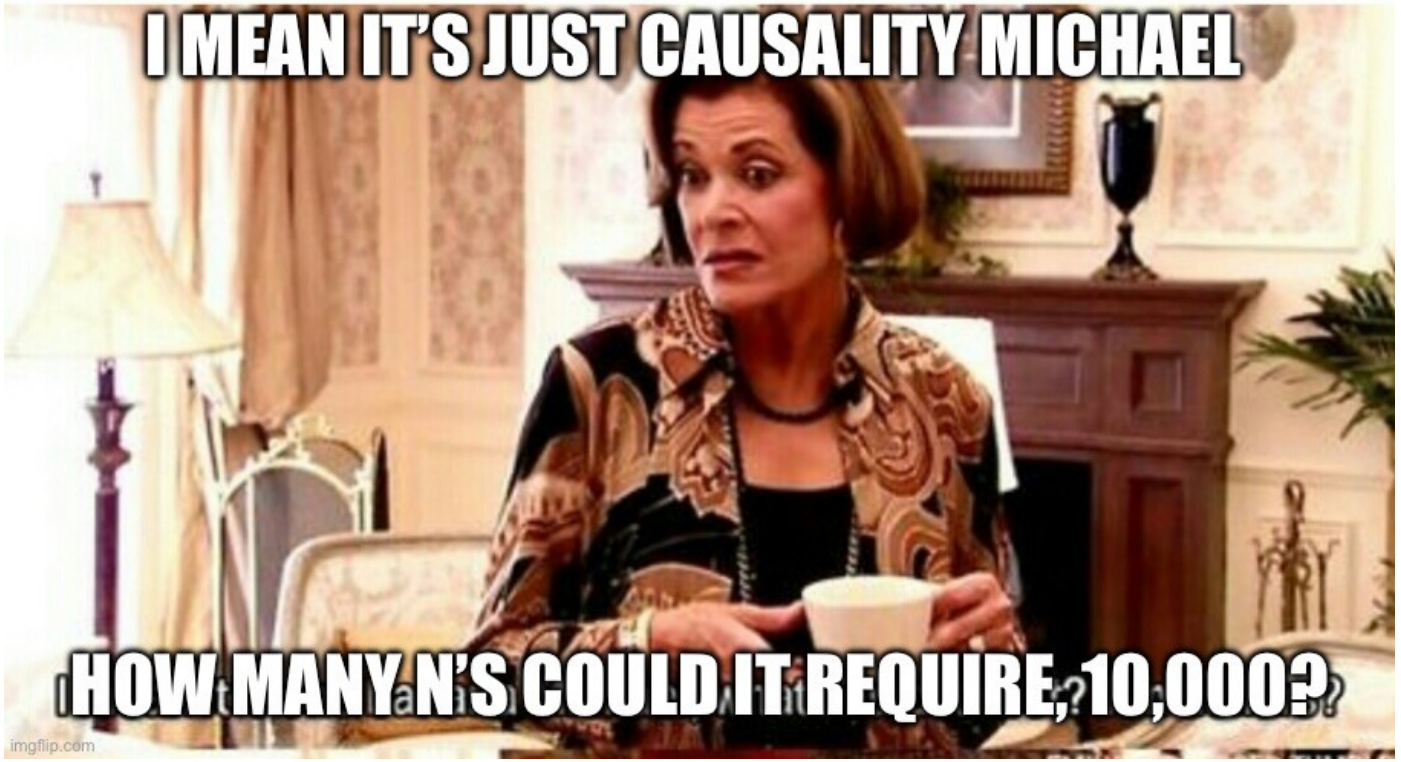
1. Model spillovers (hard!)

2. Interpret as weighted average of treatment policies (not quite the estimand we're interested in)

3. Adjust for initial conditions (with what method?)

Where To Next?

Value in the Future



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Value of Causal Assumptio

Consistency and positivity are valuable for causal education and communication

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https://bit.ly/4hAuNBA

- An educational tool
- A framework for evaluation of claims
- A platform for discussion of believability of results
- Encourage clarification of estimand
- Point toward appropriate methods

What We Can Do Better

- Setting-specific consideration of assumptions
- Accessible and contextual language
- Acknowledge trade-offs of seeking these assumptions
- Integrate data/infomration, statistical, and causal considerations (see also Greenland & Cole, *Am J Epidemiol*, 2026)

Causal inference theory has brought us a long way in improving our studies and analyses.

At the same time, these assumptions should not be used to prevent analyses that may yield useful information.

They are valuable considerations and points to consider alongside others, rather than boxes to check off before proceeding.