

Discussion

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Causal Inference

- Yesterday focused on measurement and epidemiology
- Today, most of these papers interested in estimating causal effects: effects of programs or policies
 - What can we do to reduce gun violence?
 - Comparison of outcomes under different states of the world
 - But we only see one state of the world
- Thus have to estimate/predict unobserved potential outcomes
 - Will basically always involve some untestable assumptions about those unobserved potential outcomes
 - A special type of missing data
 - This is what distinguishes causal inference from statistical inference



This is a challenging area

- Lots of interventions, policies
 - One state/locale may implement a new law/policy
 - Or multiple states/locales, but variation in law/policy, or just variation in effects
- Many factors influencing gun violence
- Need for transparency
- Often infeasible to randomize
 - Although great to see McDonald take advantage of opportunity to do so!

But we also need answers!

So need to figure out how to get the most accurate answers to the key questions; balance rigor and relevance.



Make theories elaborate

- Recognize that one study unlikely to be definitive
- Round out a story
- Fisher/Cochran/Rosenbaum/Rubin:
 - “Make your theories elaborate”
- Role for better integration of evidence
 - Evidence synthesis
 - Next generation meta-analysis/meta-regression!



What can/should statisticians do?

- Provide bridge between fields
 - Difference in difference/interrupted time series/group panel data/longitudinal models/...
- Examine statistical properties of methods, and develop new methods as needed
 - Rare outcomes
 - Combining sources of evidence (meta-analysis/meta-regression!)
 - Small area estimation/questions of aggregation
 - Sensitivity analyses
- Lots of questions, especially with regard to these comparative interrupted time series settings (Ludwig, Schell)



What should statisticians do? (cont.)

- Work closely with scientific experts
 - Prior specification (Schell/Morell)
 - Knowledge of data (e.g., Virginia Tech in NIBRS)
 - Knowledge of context and extent of interventions on the ground (Ludwig)
- Serve as resource/arbiters of rigorous and unbiased studies
 - Particularly important in contentious areas



Some other work to keep an eye on

Statisticians just starting to discover the interesting issues in these comparative interrupted time series approaches

- Laura Hatfield, Harvard Dept. of Health Care Policy
 - <https://diff.healthpolicydatascience.org/>
 - <https://hcp.hms.harvard.edu/people/laura-hatfield>
- Avi Feller, UC Berkeley Goldman School of Public Policy
 - Augmented synthetic control
 - <https://gsppi.berkeley.edu/avi-feller/>

