Discussion of Pre-Specified Analysis Plans by Peterson et al.

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Some Basic Elements

- Let Y be an outcome, X a policy variable and W additional unit-specific covariates

- A population is a joint distribution $F_{W,X,Y}(w,x,y)$

- An estimand is some function of this joint distribution.

  - e.g., a difference in partial means

$$\beta\left(x',x\right) = \mathbb{E}_W\left[\mathbb{E}\left[Y|\,W,X=x'\right] - \mathbb{E}\left[Y|\,W,X=x\right]\right]$$

Some Basic Elements (continued)

- Reification of estimand involves argument (e.g., randomization, 'as if' randomization)

- If $x' = 1$ and $x = 0$, randomly assigned, $\beta(x', x)$ is an Average Treatment Effect (ATE)

- Estimation/inference requires a statistical model for $F_{W,X,Y}(w, x, y)$

Some Comments

- All steps important, last two especially tricky and fraught with pitfalls

- **Problem:** If W is high dimensional a non-parametric treatment of $F_{W,X,Y}$ is impractical; semiparametric modelling, as it requires the a priori imposition of restrictions on the DGP, involves 'art'.

- In ATE example the statistical/inference issues is one of covariate adjustment with a potentially high dimensional conditioning vector (this is a well-posed research topic)

- Reification step is typically heroic in observational work

  - ...but estimand may still be interesting (apples-to-apples comparisions)

Final Comments

- We typically deal with broken randomized experiments (attrition, refusal etc.) via covariate adjustment
  - Under a missing-at-random (MAR) type assumption this adjustment is a statistical matter

- Partial identification may be a useful complement to invoking MAR in this setting.

Final Comments (continued)

- Research will be easier to evaluate if above steps are clearly separate.
  - population – sampling frame/design
  - estimand – functional of a joint distribution
  - reification – involves research design and/or persuasion
  - estimation/inference – well-defined problem, but hard!