Discussion Assignment #3

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Question 7: Under the assumption of sequential randomization and positivity, write out the (counterfactual or "post intervention") distribution $Q^{\bar{a}}$ a of the counterfactual non-intervention variables $(W; \bar{L}_5^{\bar{a}}, Y^{\bar{a}})$ as a function of the observed data distribution P_0.

The "Post Intervention" distribution $Q^{\bar{a}}$ of the counterfactual non-intervention variables is:

$$P_O^{\bar{a}} = Q^{\bar{a}}(Y^{\bar{a}}, \bar{L}_K^{\bar{a}}, W) = Q_Y(Y|\bar{C}_K = 0, \bar{A}_{K-1} = \bar{a}_{K-1}, \bar{L}_{K-1}, W) \times \prod_{t=1}^{K-1} Q_{L_t}(L_t|\bar{C}_t = 0, \bar{A}_{t-1} = \bar{a}_{t-1}, \bar{L}_{t-1}, W) Q_W(W)$$

Question 8: Specify the statistical estimand using the traditional G-computation formula.

$$E(Y_{\bar{a}}) = \sum_{\bar{l}} E_0(Y|\bar{A}(5) = \bar{a}(5), \bar{L}(5) = \bar{l}(5), \bar{C}(5) = 0, W) \times$$

$$\prod_{1}^{5} P_0(L(t) = l(t)|\bar{A}(t-1) = \bar{a}(t-1), \bar{L}(t-1) = \bar{l}(t-1), \bar{C}(t) = 0, W) P_0(W)$$

Question 9: Briefly review implementation of "traditional" longitudinal parametric G-Computation for this estimand. What are some possible pros/cons to this approach?

"Traditional" longitudinal parametric G-Computation requires:

- estimation of distribution of each time-varying covariate given the past, and
- evaluation through simulation.

Pros:

- Fairly easy to set up and run
- Efficient, if the model is correct

Cons:

- Susceptible to bias if model not correctly specified
- Requires estimating lots of conditional densities