Review Questions for Midterm:

1. What is the definition of an unbiased estimator? What is the difference between unbiased and consistent?
2. Explain how the three core assumptions figure in the proof that experiments generate unbiased estimates of the ATE.
3. Describe a practical scenario in which excludability is threatened.
4. What is the sharp null hypothesis of no effect? How does it differ from the null hypothesis of no effect?
5. In what sense does randomization inference generate “exact” p-values?
6. Suppose that prior to the launch of an experiment, a pre-test is administered to all subjects. Assume the core assumptions hold. Demonstrate that difference-in-differences estimation generates unbiased estimates.
7. Suppose a researcher estimates the ATE by regressing outcomes on a randomly assigned treatment and a covariate. What are the pros and cons of this regression vis-à-vis a regression of outcomes on the assigned treatment alone?
8. What is a “randomization check,” and what does it tell us?
9. What are the potential advantages of blocking? Are there disadvantages?
10. When is it appropriate to weight the data using inverse-probability weights?
11. Is it true that clustered assignment always leads to greater sampling variability than assignment of individuals?
12. What statistical complications arise when clusters of unequal size are allocated to experimental groups using complete random assignment? Explain how you would obtain unbiased estimates in this situation.
13. Suppose you intend to conduct a randomized experiment with clusters of unequal size, and suppose you cannot change the clusters with which you are working. Describe a design-based strategy for overcoming the complications of estimating the ATE with clusters of unequal size.
14. Define a Complier in the context of one-sided noncompliance. Define a Complier in the context of two-sided noncompliance.
15. What is the CACE? What is the ITT?
16. True or false: “Under excludability, the ITT for Always-takers is zero.”
17. Show that instrumental variables estimation, under certain assumptions, provides consistent estimates of the CACE.
18. Suppose that a researcher encounters one-sided noncompliance and decides to compare subjects who received the treatment to those who did not. Explain why this procedure will not in general render consistent estimates of the CACE.
19. What is a Defier? Under what circumstances does the presence of Defiers in the subject pool render the instrumental variables estimator inconsistent?
20. Explain how the apparent relationship between treatment assigned and treatment received can be used to place bounds on the proportion of Defiers in the subject pool.
21. What is a downstream experiment?
22. What is a placebo controlled design, and what are its strengths and weaknesses?