Homework for Chapter 10: Treatment Effects

1. Define *in your own words* (i.e., don’t just copy down what’s written in the glossary) each of the following terms:
   1. Conditional average treatment effect
   2. Average treatment on the treated
   3. Average treatment on the untreated
2. Provide an example of a treatment effect that you would expect to be highly heterogeneous, and explain why you think it is likely to be heterogeneous
3. Consider the data in the table below that shows the hypothetical treatment effect of cognitive behavioral therapy on depression for six participants. For the sake of this example, the six participants represent the population of interest.

|  |  |  |  |
| --- | --- | --- | --- |
| Case | Age | Gender | Effect |
| A | 15 | Man | 7 |
| B | 40 | Woman | 3 |
| C | 30 | Woman | 7 |
| D | 20 | Non-binary | 8 |
| E | 15 | Man | 7 |
| F | 25 | Woman | 4 |

* 1. What is the overall average treatment effect for the population?
  2. What is the average treatment effect for Women?
  3. If nearly all Non-binary people get treated, and about half of all Women get treated, and we control for the differences between Women and Non-binary people, what kind of treatment effect average will we get, and what can we say about the numerical estimate we’ll get?
  4. If we assume that, in the absence of treatment, everyone would have had the same outcome, and also only teenagers (19 or younger) ever receive treatment, and we compare treated people to control people, what kind of treatment effect average will we get, and what can we say about the numerical estimate we’ll get?

1. Give an example where the average treatment effect on the treated would be more useful to consider than the overall average treatment effect, and explain why
2. Which of the following describes the average treatment effect of assigning treatment, whether or not treatment is actually received?
   1. Local average treatment effect
   2. Average treatment on the treated
   3. Intent-to-treat
   4. Variance-weighted average treatment effect
3. On weighted treatment effects:
   1. Describe what a variance-weighted treatment effect is
   2. Describe what a distribution-weighted treatment effect is
   3. Under what conditions/research designs would we get each of these?
4. Suppose you are conducting an experiment to see whether pricing cookies at $1.99 versus $2 affects the decision to purchase the cookies. The population of interest is all adults in the United States. You recruit people from your university to participate and randomize them to either see cookies priced as $1.99 or $2, then write down whether they purchased cookies. What kind of average treatment effect can you identify from this experiment?
5. For each of the following identification strategies, what kind of treatment effect(s) is most likely to be identified?
   1. A randomized experiment using a representative sample
   2. True randomization within only a certain demographic group
   3. Closing back door paths connected to variation in treatment
   4. Isolating the part of the variation in treatment variable that is driven by an exogenous variable
   5. The control group is comparable to the treatment group, but treatment effects may be different across these groups