exercises_week8

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Question 1

Suppose you are interested in the effect of the presence of vending machines in schools on childhood obesity. What randomized experiment would you want to do (in a perfect world) to evaluate this question?

- Given a truly random experiment, we would expect that the covariates will be on average the same pre treatment across treatment and control groups. So, we can compare the two groups and theoretically would not have to control for confounding variables.
- If the experiment was not truly random and balanced, you would probably want to control for factors such as average student income, public or private status, or geographic region.
- Randomly assign vending machines to x amount of schools (treatment) and then assign no vending machines to y amount of schools (control) in a large sample size. The control and treatment group should be relatively equal and balanced.
- In a perfect world, we would sample from the population of elementary schools (the question specified childhood obesity) in the US
- The vending machines will have the same foods for sale.
- Measure the average obesity levels in the treatment and control groups after a year for four years.
- If the sample size is large enough, the treatment effect should not be substantively changed by individual student movements or any other abnormalities.

Question 4

Part a

The average treatment effect in the population of 2400 persons is ...

2. You can see that the true treatment effect is 2 for each category

Part b

Is it plausible to believe that these data came from a randomized experiment?

- The amount of people in categories: more people were assigned treatment than control. That suggests that it may not be experimental.

- The number of people in categories are round numbers (200, 300, 500). That suggests that it may be random and experimental.
- There is a 50/50 split between genders, suggesting that it may be experimental.

The round numbers in the categories and the perfect 50/50 split between genders suggests that the data could plausibly come from a randomized experiment.

We have access to the counter-factual observations, so this definitely wasn't real.

Part c

Another population quantity is the mean of y for those who received the treatment minus the mean of y for those who did not. What is the relation between this quantity and the average treatment effect?

weighted avg of y1 - weighted avg of y0

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w_avg_T <- (500*6 + 500*6 + 200*12 + 200*12) / 1400

w_avg_C <- (300*4 + 300*4 + 200*10 + 200*10) / 1000

effect <- w_avg_T - w_avg_C
```

The value for the treatment minus control weighted averages is 1.31. This is less than the average treatment effect we calculated in part a.

Part d

For these data, is it plausible to believe that treatment assignment is ignorable given sex?

From the textbook: "For ignorability to hold, it is not necessary that the two treatments be equally likely to be picked, but rather that the probability that a given treatment is picked should be equal"

In the context of this problem, that would mean that men are equally as likely to be assigned control or treatment and women are euqlaly as likely to be assigned control or treatment. This seems to hold given the information below:

x = 0: 50% are T = 1, 50% are T = 0

x = 1: 50% are T = 1, 50% are T = 0

The probability of being assigned treatment or control is 50% for both sex categories, meaning that sex is ignorable.