Equitable Equations: *Experiments and Observational Studies*

The following problems are taken from *OpenIntro Statistics*, Fourth Edition, by David Diez, Mine Çetinkaya-Rundel, and Christopher Barr. Pay what you want or download for free at `https://www.openintro.org/book/os/`

Problem 1

1.22 Stressed out, Part I. A study that surveyed a random sample of otherwise healthy high school students found that they are more likely to get muscle cramps when they are stressed. The study also noted that students drink more coffee and sleep less when they are stressed.

(a) What type of study is this? Observation study. It is a survey Correlation is not causation

(b) Can this study be used to conclude a causal relationship between increased stress and muscle cramps? Depends on sample size

(c) State possible confounding variables that might explain the observed relationship between increased stress and muscle cramps. And other confounding Variables

Confounding variables include what the causes of stress are, physical fitness, and food intake among other things. Otherwise health is not a great descriptor because we don't know what the study counts as healthy. Coffee consumption and lack of sleep

Problem 2

1.30 Vitamin supplements. To assess the effectiveness of taking large doses of vitamin C in reducing the duration of the common cold, researchers recruited 400 healthy volunteers from staff and students at a university. A quarter of the patients were assigned a placebo, and the rest were evenly divided between 1g Vitamin C, 3g Vitamin C, or 3g Vitamin C plus additives to be taken at onset of a cold for the following two days. All tablets had identical appearance and packaging. The nurses who handed the prescribed pills to the patients knew which patient received which treatment, but the researchers assessing the patients when they were sick did not. No significant differences were observed in any measure of cold duration or severity between the four groups, and the placebo group had the shortest duration of symptoms.[32]

(a) Was this an experiment or an observational study? Why? Experiment. The researchers manipulated a variable.

(b) What are the explanatory and response variables in this study? Vitamins dosage and duration of the cold

(c) Were the patients blinded to their treatment? Yes, they didn't know which treatment they received.

(d) Was this study double-blind? Yes, the researchers did not know which group was which.

(e) Participants are ultimately able to choose whether or not to use the pills prescribed to them. We might expect that not all of them will adhere and take their pills. Does this introduce a confounding variable to the study? Explain your reasoning.

Yes. If the vitamins have an effect on the duration of the cold then not taking them will change the results. Even not taking the placebo could change the results if the patients believed the placebo was the vitamins. It also means there could be less patients per group if an equal amount chose to not consume the vitamins. This reduces control. If a patient only takes some of the vitamins it adds the confounding variable of dosage, which is the explanatory variable the researchers were trying to observe in the first place. Maybe certain demographic are less likely to take medication. Telling them they don't need to take it may make people less likely to take it even if they are volenteers.