STA101 Problem Set 1 - KEY

Summer I, 2021, Duke University

Exercises from the OpenIntro book - 100pts total

Problems include: Chapter 1 exercises 1.4, 1.12, 1.30 (except part (e)), 1.35, 1.37, 1.42.

1.4 (14pts total)

(a) **(4pts)** The research question is "Do asthmatic patients who practice the Buteyko method experience improvement in their condition?".

(b) **(4pts)** The cases are 600 adult patients aged 18-69 years diagnosed and currently treated for asthma.

(c) **(3pts for naming variables, 3pts for types of variables)** The variables are whether or not the patient practiced the Buteyko method (categorical) and measures of quality of life, activity, asthma symptoms and medication reduction of the patients (categorical, ordinal). (Note: It may also be reasonable to treat the ratings on a scale of 0 to 10 as discrete numerical variables.)

1.12 (8pts total)

(a) **(4pts)** Year, country, issue, the vote (yes/no). (Note: any reasonable variables in addition to "year" and "country" are okay.)

(b) **(4pts)** Year: numerical, discrete. All the others should be categorical (not ordinal).

1.30 (18pts total)

(a) **(3pts for "experiment", 3pts for rationale)** Experiment, since the researchers randomly assigned different treatments to the participants.

(b) **(2pts for response variable, 2pts for explanatory variable)** Response variable: Duration of the cold. Explanatory variable: Treatment, with 4 levels; placebo, 1g, 3g, 3g with additives.

(c) **(4pts for an "yes" answer)** The patients were blinded as they did not know which treatment they received.

(d) **(4pts for "yes" or "partially double-blind")** The study was double-blind with respect to the researchers evaluating the patients, but the nurses who briefly interacted with patients during the distribution of the medication were not blinded. (It was partially double-blind.)

1.35 (16pts total)

(a) **(4pts)** Observational study.

(b) **(2pts for each)** The most common dog name is Lucy, and the most common cat name is Luna.

(c) **(2pts for each)** Oliver and Lily are more common for cats than dog. (Should be the ones below the $y = x$ line.)

(d) **(4pts)** The relationship is positive, which means that as the popularity of a name for dogs increases, so does the popularity of that name for cats.

1.37 (22pts total)

(a) **(4pts)** This is an experiment.

(b) **(2pts for treatment, 2pts for control)** The treatment is 25 grams of chia seeds twice a day and the control is a placebo.

(c) **(2pts for "Yes", 2pts for "gender")** Yes, the blocking variable is gender.

(d) **(4pt for "Yes" or "single blind")** Yes, the study is single blind since the patients were blinded to the treatment they received.

(e) **(3pts for "yes to causal", 3pts for "not generalizable")** Since this is an experiment, we can make a causal statement. However, since the sample is not random, the causal statement cannot be generalized to the population at large.

1.42 (22pts total)

(a) **(4pts)** This is an observational study.

(b) **(4pt for identifying "screen time")** The explanatory variables are screen time, child's sex and age and the mother's education, ethnicity, psychological distress, and employment. (Note: only saying screen time is okay too.)

(c) **(4pts)** The response variable is psychological well-being.

(d) **(3pts for "yes to generalize", 3pts for rationale)** The results of the study can be generalized to the population since the data are a representative sample.

(e) **(4pts for "no to causal")** The results of the study cannot be used to establish causal relationships since the study was observational.