

Homework 2

QUANTITATIVE REASONING II

due: 1/22/25

Instructions: There are two parts to this homework. The first are free response questions on readings and course material. The second is a computing tutorial to be completed and submitted on our computing site. Please submit solutions for the first part on Populi, written professionally and saved as a pdf. Note: The first part may involve some local R computing work as well.

1. Free Response

Problem 1: Refer to *The Art of Statistics* for the following questions.

- In chapter 8 (pg. 222), the question is proposed: If we observe everything, where does probability come in? Provide your own answer and give a concrete example other than the book's Poisson example.
- In chapter 8 (pg. 216), what is probability anyway? Pick two suggested answers and contrast/elaborate in your own words.

Problem 2: Take the *Factfulness Quiz* and report your score out of 13 and which questions you missed.

Problem 3: The data `predimed.csv` is from a randomized control trial (RCT) of diet variation among participants at risk for a cardiovascular event. The type of diet was randomly assigned, and a key outcome variable is whether or not the person had a cardiac event, denoted `event` in the data. There are two variants of the Mediterranean diet, one supplemented with nuts and the other supplemented with extra virgin olive oil (EVOO).¹ We will use this data to estimate a variety of probabilities and assess the effectiveness of a Mediterranean diet.

- Estimate the following probabilities: $P(\text{event})$, $P(\text{any MedDiet})$, $P(\text{event}, \text{any MedDiet})$, and $P(\text{event} \mid \text{any MedDiet})$.
- Estimate $P(\text{event} \mid \text{Control})$. Using this result and the answer from the previous question, assess whether the Mediterranean diet has an effect on the chance of a cardiac event?
- What are the effects on cardiac event likelihood of the Mediterranean diet on `Female` and `Male` subpopulations relative to the control diet?

2. Computing Tutorial

~~Problem 1:~~ No online tutorial due this week. Please start working through *Tutorial 2* on prediction! The corresponding exercises will be assigned on our next homework.

¹The original study is *Primary Prevention of Cardiovascular Disease with a Mediterranean Diet*. *The New England Journal of Medicine*, 2013, 368:1279-1290.