

Math 110

Quiz 1 Sample Solutions

September 10, 2008

Be sure to provide explanations for your answers as indicated.

1. (a) Briefly, explain the term “observational study.”

In an observational study, the subjects of the study all have the condition being studied or are all undergoing the treatment being studied. The control group consists of people who do not have the condition or are not receiving the treatment. That is, people are placed in the groups because of their characteristics rather than a random procedure.

- (b) What is the major potential pitfall in doing observational studies? Why is this a problem?

The pitfall is the possibility that factors other than the distinction between treatment and non-treatment, which may also be associated with being in the treatment or control groups, may have an effect on the outcome. These factors are called confounders.

2. A pre-med student needs to obtain a point total of 70 or better (out of 100) in a biology course. The student has the choice of taking the course from Prof. Wide or Prof. Narrow. Prof. Wide advertises that the final point total in his course always has an average of 80 with a standard deviation of 15. Prof. Narrow advertises that the final point total in her course always has an average of 75 with a standard deviation of 5. Does the student have a better chance of obtaining 70 or better in Prof. Wide’s class or in Prof. Narrow’s class? Explain your answer. (Assume both classes follow the usual rule of thumb for data.)

In Prof. Wide’s class, scores of 65 to 70 are within one SD of the mean. In Prof. Narrow’s class, scores of 65 to 70 are outside one SD of the mean. This means that scores of 65 to 70 are more likely in Prof. Wide’s class and less likely in Prof. Narrow’s class. The student is better off in Prof. Narrow’s class.

3. The following figures show histograms for household income in 1999 for Washington, D.C. and Massachusetts. Note that 4.7% of the households in Washington, D.C. had income over \$200,000 and 3.5% of the households in Massachusetts had income over \$200,000. Also, 248,590 households were surveyed in Washington, D.C. and 2,444,588 households were surveyed in Massachusetts. (Data is from the 2000 US Census.)

(a) Did Washington, D.C., or Massachusetts have a higher percentage of low income people (income less than \$25,000)? Explain your answer.

Washington, D.C. had a higher percentage of low income people. This is because the blocks for the class intervals between \$0 and \$25,000 are taller relative to the same scale, hence, have more area.

(b) Were there more low income households in Washington, D.C., or in Massachusetts? Explain your answer?

Although the percentage of low income people in Washington, D.C. was higher, it was roughly only a third larger. However, the total number of households in Massachusetts was roughly 10 times as large as the total in Washington, D.C. This means that the total number of low income households in Massachusetts was roughly 6-8 times as large as that for Washington, D.C.

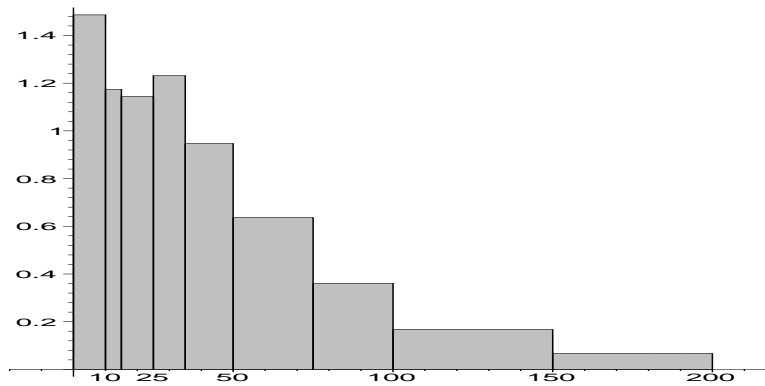


Figure 1: Washington, D.C. Household Income, 1999

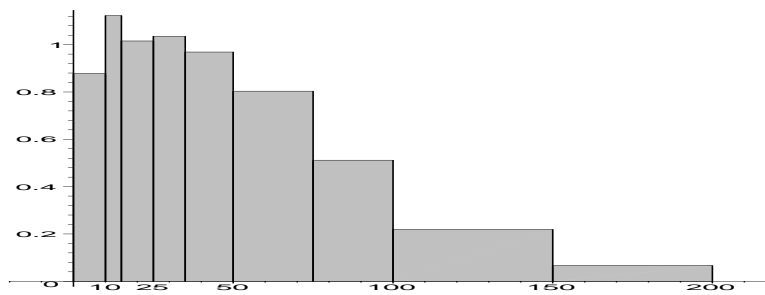


Figure 2: Massachusetts Household Income, 1999