Homework 2

P8130 Fall 2022

Due: October 7, 2022 at midnight EST

P8130 Guidelines for Submitting Homework

- Your homework must be submitted through Courseworks. No email submissions!

- Only one PDF file should be submitted, including all derivations, graphs, output, and interpretations. When handwriting is allowed (this will be specified), scan the derivations and merge ALL PDF files (http: //www.pdfmerge.com/).

- You are encouraged to use R for calculations, but you must show all mathematical formulas and derivations. Please include the important parts of your R code in the PDF file but also submit your full, commented code as a separate R/RMD file.

- To best follow these guidelines, we suggest using Word (built in equation editor), R Markdown, Latex, or embedding a screenshot or scanned picture to compile your work.

DO NOT FORGET: You are encouraged to collaborate on homeworks, explain things to each other, and test each other's knowledge. But **do NOT hand out answers to someone who has not done any work**. Everyone ought to have ideas about the possible answers or at least some thoughts about how to probe the problem further. Write your own solutions!

Problem 1 (15 points)

Suppose the probability of having at least one dental checkup during a two-year period is 73%. 56 random individuals are being studied for their health care utilization practices over a two-year period. Compute "part a" by hand and show key steps. For all other parts you may hand calculate or use R.

a) What is the probability that exactly 40 of these individuals will have at least one dental checkup?

b) What is the probability that at least 40 of these individuals will have at least one dental checkup?

c) Could you use an approximation method to calculate the probabilities above? If yes, calculate the probabilities using approximations and compare to exact values; otherwise, explain why approximation methods are not appropriate.

d) How many individuals do you expect to have at least one dental checkup?

e) What is the standard deviation of the number of individuals who will have at least one dental checkup?

Problem 2 (9 points)

Suppose the number of tornadoes in the United States follows a Poisson distribution with parameter $\lambda = 6$ tornadoes per year. Compute using tables or R. Show the formula for "part a" (it can be handwritten and embedded in the pdf file).

a) What is the probability of having fewer than 3 tornadoes in the United States next year?

b) What is the probability of having exactly 3 tornadoes in the United States next year?

c) What is the probability of having more than 3 tornadoes in the United States next year?

Problem 3 (12 points)

Assume the systolic blood pressure of 20-29 year old American males is normally distributed with population mean 128.0 and population standard deviation 10.2.

a) What is the probability that a randomly selected American male between 20 and 29 years old has a systolic blood pressure above 137.0?

b) What is the probability that the sample mean for blood pressure of 50 males between 20 and 29 years old will be less than 125.0?

c) What is the 90th percentile of the sampling distribution of the sample mean X for a sample size of 40?

Problem 4 (12 points)

Some researchers are interested in the mean pulse of young women suffering from fibromyalgia. They selected a random sample of 40 young females suffering from fibromyalgia. The sample mean of their pulses was 80 and the sample standard deviation was 10.

a) Compute the 95% confidence interval for the population mean pulse rate of young females suffering from fibromyalgia.

b) Interpret the calculated confidence interval.

c) Suppose the researchers now want to test the null hypothesis that the mean pulse of young women suffering from fibromyalgia is equal to 70, against the alternative that the mean pulse is not equal to 70, at the $\alpha = 0.01$ significance level. Conduct this hypothesis test, and interpret the results.