STAT 3400 - Homework #5

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Due March 1, 2023

Problem 11.5.2

a. Proportion

b. Mean

c. Proportion

d. Proportion

e. Mean

Problem 11.5.4

a. You will mistakenly reject the null hypothesis 5% of the time.

b. You will mistakenly reject the null hypothesis 1% of the time.

c. You will mistakenly reject the null hypothesis 10% of the time.

Problem 11.5.6

a. Null hypothesis: Displaying calorie counts on menus had no influence on the average number of calories consumed. Alternate hypothesis: Displaying calorie counts on menus had some influence on the average number of calories consumed.

b. Null hypothesis: The change in time from 2004-2007 to 2021 had no influence on the average GRE score. Alternate hypothesis: The change in time from 2004-2007 to 2021 had some influence on the average GRE score.

Problem 11.5.8

a. The stacked bar plot does not indicate that patient survival is independent of whether they got a heart transplant because both whether they survived until the end of the study is significantly different between the control and treatment groups.

b. They suggest that the treatment is highly effective because the entire IQR of the control group is below 100 days while the IQR of the treatment group appears to span from about 100 to 600 days.

c. Control: 30/34 = 0.882 Treatment: 45/69 = 0.652

d. i. Null hypothesis: Getting a heart transplant does not influence the likelihood of gravely ill people surviving beyond the end of the period of this study. Alternate hypothesis: Getting a heart transplant influences the likelihood of gravely ill people surviving beyond the end of the period of this study.

ii. We write alive on *28* cards representing patients who were alive at the end of the study, and deceased on *75* cards representing patients who were not. Then, we shuffle these cards and split them into two groups: one group of size *69* representing treatment, and another group of size *34* representing control. We calculate the difference between the proportion of cards in the treatment and control groups (treatment - control) and record this value. We repeat this 100 times to build a distribution centered at *0*. Lastly, we calculate the fraction of simulations where the simulated differences in proportions are *as low or lower than the test statistic if the test statistic below 0 or as high or higher than the test statistic if the test statistic above 0*. If this fraction is low, we conclude that it is unlikely to have observed such an outcome by chance and that the null hypothesis should be rejected in favor of the alternative.

iii. The transplant program is effective because the test statistic is 0.652 - 0.882 = -0.23 and there doesn't appear to be any data at that point or lower

Problem 12.5.2

0.435 - 0.465

Problem 12.5.4

A. 0.13 B. 0.43 C. 0.30 D. 0.22

Problem 12.5.6

a. A

b. A, B

c. A, B, C

d. A, B

e. A

Problem 12.5.8

a. This is not supported by the interval because 3 hours (180 minutes) is well outside the interval.

b. This is supported by the interval because 2.2 hours (132 minutes) is in the interval.

c. It would be because it's already supported by the 95% confidence interval and the 99% interval would be even wider.