AP Stats Chapter 10 FRQ

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March 21, 2025

11.

a)

STATE: 99% confidence interval for $p_1 - p_2$, where p_1 is the proportion of prostate cancer diagnosed men assigned to the surgery that survived for 5 years and p_2 is the proportion of prostate-cancer diagnosed men treated with observation only that survived for 5 years.
PLAN: two-sample z test for $p_1 - p_2$

Random: participants were randomly assigned

10%: likely 367 is more than 10% of all prostate-cancer patients and thus same with 364.

Large Counts: $\hat{p}_1 n_1 = 245 \geq 10$, $(1 - \hat{p}_1)n_1 = 122 \geq 10$, $\hat{p}_2 n_2 = 223 \geq 10$ and $(1 - \hat{p}_2)n_2 = 141 \geq 10$
DO:

$$\hat{p}_1 - \hat{p}_2 \pm z^* \sqrt{\frac{\hat{p}_1(1-\hat{p}_1)}{n_1} + \frac{\hat{p}_2(1-\hat{p}_2)}{n_2}}$$

where $\hat{p}_1 = 0.668$ and $\hat{p}_2 = 0.613$ and

$n_1 = 367$ and $n_2 = 364$ and

$t^* = -\text{invNorm}(area : 0.005) \approx 2.576$

$$0.055 \pm 0.091$$

CONCLUDE: Thus, we are 99% confident that the true difference in proportions of prostate cancer diagnosed men who are treated with surgery and with observation is between -0.036 and 0.146.

b)

No, the confidence interval does not provide convincing evidence that the true proportions differ because the interval contains 0.

12.

a)

STATE: 99% confidence interval for $\mu_1 - \mu_2$, where μ_1 is the mean amount of food Piper eats when she is offered Pick-a-Pair and μ_2 is the mean amount of food Piper eats when she is offered Pickled Peppers.
PLAN: two-sample t test for $\mu_1 - \mu_2$
Random: each trial is randomly assigned
10%: 31 is likely less than 10% of all times Piper ate, and same with 30.
Large Counts: $n_1 = 31 \geq 30$ and $n_2 = 30 \geq 30$
DO:

$$\bar{x}_1 - \bar{x}_2 \pm t^* \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$$

where $\bar{x}_1 = 85.2$ and $\bar{x}_2 = 82.1$ and
$s_1 = 3.45$ and $s_2 = 4.62$ and
$n_1 = 31$ and $n_2 = 30$ and
$t^* = -\text{invT}(area : 0.005, df : 29) \approx 2.76$

$$3.1 \pm 2.89$$

CONCLUDE: Thus, we are 99% confident that the true difference in means of the amount of food Piper eats when she is offered Pick-a-Pair and when she is offered Pickled Peppers is between 0.21 and 5.99.

b)

Null Hypothesis: $H_0 : \mu_1 - \mu_2 = 0$ (the mean amount of food Piper eats when she is offered Pick-a-Pair is equal to the mean amount of food Piper eats when she is offered Pickled Peppers)
Alternative Hypothesis: $H_a : \mu_1 - \mu_2 > 0$ (the mean amount of food Piper eats when she is offered Pick-a-Pair is greater than the mean amount of food Piper eats when she is offered Pickled Peppers)

c)

Since the P-value (0.002) is less than the significance level (0.01), we reject the null hypothesis and conclude that there is convincing evidence that the mean amount of food Piper eats when she is offered Pick-a-Pair is greater than the mean amount of food Piper eats when she is offered Pickled Peppers)

13.

a)

These are paired data because the person that is being evaluated si the same person before and after the treatment, so we have are comparing the same individual.

b)

Mean Difference: $\frac{1+2+2+1+2+0+3+0}{8} = 11/8 = 1.375$

This means that the average flexibility rating after Tai Chi is 1.375 points higher than the average flexibility rating before Tai Chi for this sample.

c)

The P-value of 0.004 means that if the null hypothesis is true (the true mean difference in flexibility rating is zero), then there is a 0.4% chance of getting a sample mean difference as extreme as the one we got (1.375) or more extreme.

d)

No, we cannot conclude that the difference in the mean flexibility rating was caused by the Tai Chi lessons because the study is observational and thus there could be other factors that influenced the difference in flexibility rating.