AP Stats Chapter 10 FRQ

Henry Beveridge

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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:

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

$$\text{where } \hat{p}_1 = 0.668 \text{ and } \hat{p}_2 = 0.613 \text{ and}$$
$$n_1 = 367 \text{ and } n_2 = 364 \text{ and}$$
$$t^* = -\text{invNorm}(area : 0.005) \approx 2.576$$
$$0.055 \pm 0.091$$

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:

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

$$\text{where } \bar{x}_1 = 85.2 \text{ and } \bar{x}_2 = 82.1 \text{ and}$$
$$s_1 = 3.45 \text{ and } s_2 = 4.62 \text{ and}$$
$$n_1 = 31 \text{ and } n_2 = 30 \text{ and}$$
$$t^* = -\text{invT}(area : 0.005, df : 29) \approx 2.76$$
$$3.1 \pm 2.89$$

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)