Please complete this quiz by recording your answers on the answer sheet provided.

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Questions for Module III part 1: Bean Biostatistics

I. Questions # 1 to 4 Use this information for each question.

In a report summarizing the results of a study comparing serum sodium levels in normotensive patients and newly diagnosed hypertensive patients prior to dietary sodium restriction, a team of clinical researchers state that the difference in mean serum sodium levels was not statically significant at the 5% level of significance. In addition, the researchers report that, for the sample sizes employed in the study, the power of the chosen statistical test to detect a difference in mean serum sodium levels of a least 5 mEq/L between the two patient populations is .20.

1) Assume that serum sodium levels in the two populations do, in fact, differ by at least 5 mEq/L. The probability that the statistical test will fail to detect this difference could then be described by all of the following statements EXCEPT

   a. This probability is equal to .80
   b. This probability increases as the level of significance is decreased
   c. This probability represents the type II error rate
   d. This probability is smaller than the probability that the test will fail to detect a difference in serum sodium levels of at least 10 mEq/L

2) All of the following statements about the power of the chosen statistical test are true EXCEPT

   a. The reported value for power suggests that the research team should not conclude that "no difference exists between the mean serum sodium levels of the two populations"
   b. The power of the test will decrease if the probability of a type II error increases
   c. This value represents a 20% chance that the statistical test will detect a difference in serum sodium levels between the two populations of at least 5 mEq/L, given that such a difference actually exists
   d. This value represents the probability of detecting a difference of at least 5 mEq/L in mean serum sodium levels when H_O is true
   e. Given the reported value of power, a statistically significant difference in the mean serum sodium levels of the two patient populations may have been observed if the investigators had used a larger sample size

3) If the investigators repeat the study with a larger sample size, they would expect which of the following changes to occur?

   a. The probability that they will detect a difference in mean serum sodium levels between normotensive and hypertensive patients, given that no such difference actually exists, increases
   b. The probability that they will fail to detect a difference in mean serum sodium levels between the two populations, given that such a difference does exist, decreases
   c. The power of the statistical test will decrease
   d. The level of significance, α, will increase
   e. The probability that the statistical test will have a false negative outcome will increase

4) Which of the following is a result of carrying out a given statistical test of hypothesis at a level of significance $\alpha = .01$?

   a. The probability of accepting H_O when it is false is .01
   b. H_O is more likely to be rejected than if the investigator had chosen a level of significance $\alpha = .05$

c. The probability of observing a statistical significant result is .01
d. The probability of rejecting H_O when it is true is .01
e. H_O is true at least 1% of the time

II. Questions #5 to 7 Use this information for each question

A physician wants to know if the number of male esophageal cancer patients diagnosed with multiple primary tumors differs from the proportion of female esophageal cancer patients with the same diagnosis. She selects random samples of 60 male and 40 female esophageal cancer patients and records the number in each sample diagnosed with multiple primary tumors. Forty men and 10 women with the tumors are identified. The calculated value for the test statistic is 16.67.

5) What is the H_O for this study?
   a. The proportion of male esophageal cancer patients with multiple primary tumors is greater than that of female esophageal cancer patients with such tumors
   b. An association exists between gender and the presence of multiple primary tumors
   c. The proportion of male esophageal cancer patients diagnosed with multiple primary tumors does not differ from that of female esophageal cancer patients diagnosed with multiple primary tumors
   d. The proportion of men with esophageal cancer does not differ from that of women with esophageal cancer
   e. The proportion of men with esophageal cancer differs from that of women with esophageal cancer

6) If the tabulated critical value of the chi-square statistic for the 5% level of significance is 3.84, what is the most appropriate conclusion that can be drawn from this study?
   a. The proportion of male esophageal cancer patients diagnosed with multiple primary tumors differs from the proportion of female esophageal cancer patients diagnosed with such tumors ($p<.05$)
   b. The proportion of male esophageal cancer patients diagnosed with multiple primary tumors does not differ from the proportion of female esophageal cancer patients diagnosed with such tumors ($p>.05$)
   c. It is 95% certain that the proportion of male esophageal cancer patients diagnosed with multiple primary tumors equals the proportion of female patients with the same diagnosis
   d. The investigator can be 95% certain that more men than women have esophageal cancer
   e. The observed sample difference is likely to be due to random chance

7) Which of the following statements is an accurate interpretation of the p-value associated with the study conclusion?
   a. The probability of obtaining the given sample results by random chance, from populations in which no difference in the proportion of esophageal cancer patients diagnosed with multiple primary tumors exists, is less than 5%
   b. The observed difference in sample frequencies is likely to be due to random chance
   c. The sample sizes are too small to detect a significant difference in frequency
   d. The investigator can be certain that the proportion of men diagnosed with multiple primary tumors differs from the proportion of women with the same diagnosis
   e. The chance of error associated with the failure of the statistical test to detect a significant difference in the number of men and women diagnosed with multiple primary tumors is less than 5%