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Lecture 4d: Practice Problem Solutions

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Solutions

1. Why do you think there is such a controversy regarding one-sided versus two-sided p-values?
   - If the “appropriate” one-sided hypothesis test is done (the one that best supports the sample data) the p-value will be half the p-value of the two sided test.
   - This allows for situations where the two sided p-value is not statistically significant, but the one-sided p-value is.

Solutions

2. Why can a small mean difference in a paired t-test produce a small p-value if *n* is large?

   - When *n* gets large (big sample), the estimated SE gets very small as $S\hat{E}(\bar{x}_{diff}) = \frac{s_{diff}}{\sqrt{n}}$
   - Since the "distance" measure is in terms of standard errors, i.e., $t = \frac{\bar{x}_{diff} - \mu_o}{S\hat{E}(\bar{x}_{diff})}$
   - When $S\hat{E}(\bar{x}_{diff})$ gets small t gets large in absolute magnitude.

Solutions

3. If you knew that the 90% CI for the mean blood pressure difference in the oral contraceptives example did NOT include 0, what could you say about the p-value for testing:

$$H_o: \mu_{diff} = 0$$
$$\textit{vs.} \quad H_A: \mu_{diff} \neq 0 \ ?$$

   - The p-value is less than .10 ($p < .10$). This is as specific as we can be with the given information.

Solutions

3. What if the 99% CI for mean difference did NOT include 0? What could you say about the p-value?
   - The p-value is less than .01 ($p < .01$)

Solutions

4. Explain the concept of type-1 error and its role in the hypothesis testing process.
   - By setting the type-1 error level (aka α-level, rejection level) the researcher is apriori both specifying the cutoff for "unlikely" under the null and how much risk they are willing to take in rejecting the null if its actually the underlying truth.

Solutions

5. Why is it potentially difficult to interpret a non-statistically significant result in a small sample study?
   - Small *n*'s lead to large standard errors (a lot of uncertainty in any sample based estimate of a population parameter).