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Chapter: 10 Surgical Problem Analysis

Problem Definition: I have been asked to determine which of two procedures has a faster completion time. I will be comparing the existing old procedure with a newly developed procedure.

Hypothesis:

H_0: $\pi_{New} = \pi_{Old}$

H_1: $\pi_{New} < \pi_{Old}$

Decision Rule: If the Z test statistic is greater than 1.796 reject the null.

Test:

Estimation for Paired Difference

Mean	StDev	SE Mean	95% Upper Bound for μ_difference
-10.17	3.83	1.11	-8.18

μ_difference: population mean of (new - old)

Test

Null hypothesis	H_0: μ_difference = 0
Alternative hypothesis	H_1: μ_difference < 0

T-Value	P-Value
-9.19	0.000

Conclusion:

1) The Z test statistic of -9.19 is less than the critical value of 1.796. Reject the null hypothesis. There is a 5% chance that a type 1 error has been committed and a true null has been rejected.

2) P-value of 0.00 < 0.5 alpha α rejecting null hypothesis, the test is statistically significant.

3) The hypothesized value of equality or 0 difference does not fall within the confidence interval upper bound of -8.18. rejecting the null hypothesis.

Interpretation: The test shows that there is a statistically significant chance that on average the new procedure performed by 12 different surgeons, each operating on two different patients, has faster completion times. The surgeon should adopt the new procedure because it will save time and reduce costs. Training programs should be created to facilitate the transition from the old procedure to the new.

Assumptions: With a randomly selected dependent sample size of 12, a boxplot of the data is used to approximate normality. The median is centered, the whiskers are approximately equal, and the variability is similar on both sides of the IQR. There is a negative skew and approximate normality can be assumed under the central limit theorem.