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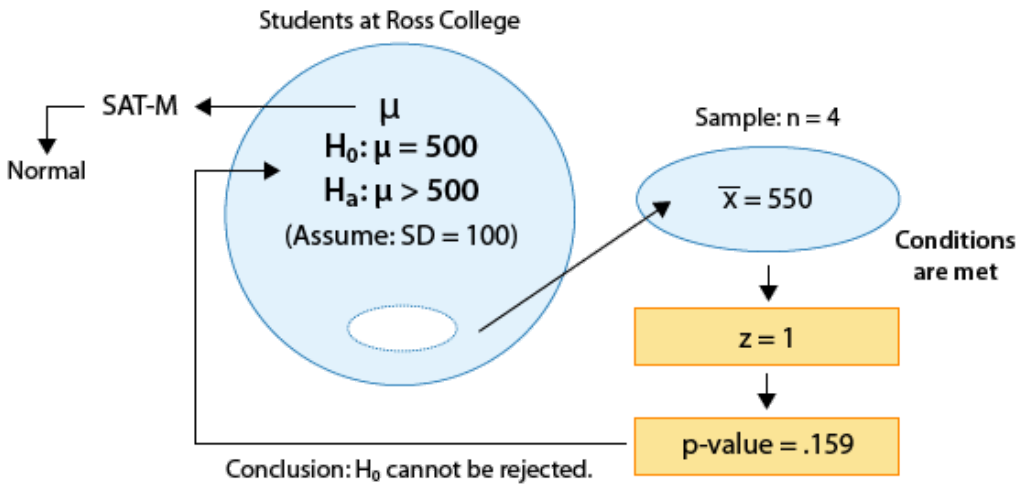
Statistics Package Exercise: Conducting the z-test for the Population Mean

Learning Objective: Carry out hypothesis testing for the population proportion and mean (when appropriate), and draw conclusions in context.

The purpose of this activity is teach you to run the z-test for the population mean while exploring the effect of sample size on the significance of the results.

Background:

Recall example 1 that we've just completed:



Even though the sample mean was 550, which is substantially greater than the null value, 500, this result was not significant, since it was based on data obtained from only 4 students. In other words, the data did not provide enough evidence to reject H_0 and conclude that the mean SAT-M score of all Ross

College students is larger than 500, the national mean. If this sample mean were obtained from 5 students, would that result be significant? If not, would 6 be enough? In other words, what is the smallest sample size for which a sample of $\bar{x} = 550$ would be significant? In this activity, we will use statistical software to explore this question.

Comment: If you think about it, this question is not very practical, because you do not know in advance what the sample mean will be, but it is intuitive enough that it will help you get a better sense of how the sample size affects the significance of the results.

- R
- StatCrunch
- TI Calculator
- Minitab
- Excel

R Instructions

For n = 4, we know that the result $\bar{x} = 550$ is not significant. Using the R instructions below and starting with n = 5 (and going up), create and fill in a table where the column headings are "n," "z (test statistic)," "p-value," and "significant at the 0.05 level (yes/no)." Stop after the first time your result becomes significant at the 0.05 significance level.

We can use the following code to test the significance of the test under different sample size scenarios, n = 5 to n = 15.

1. Create a list of numbers 5,6,7,...,15 to represent various sample sizes:
   - `n=5:15`
2. Calculate the z-scores for each sample size:
   - `z=(550-500)/(100/sqrt(n))`
3. Calculate the p-values.
   - `pvalue=1-pnorm(z)`
4. Test whether the p-values are significant at 0.05. TRUE=Significant, FALSE=Not Significant:
   - `significance=c(pvalue<0.05)`
5. Compile the information into a table:
   - `data.frame(n,z,pvalue,significance)`

Learn By Doing

1.0/1.0 point (graded)

What is the minimum sample size needed for a sample mean of 550 to be a significant result?

10+1 ✔

$10 + 1$

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