Learn By Doing Activity

Scenario: Smoking and Drinking During Pregnancy

The purpose of this activity is to give you guided practice in going through the whole process of hypothesis testing for the population mean (assuming that σ is known).

Background:

The length of human pregnancy is known to have a mean of 266 days and a standard deviation of 16 days. Based on records from a large women's hospital, a random sample of 25 women who were smoking and/or drinking alcohol during their pregnancy and their pregnancy lengths are recorded. Do the data provide enough evidence to support the (well-known) fact that women who smoke and/or drink alcohol during their pregnancy have shorter pregnancies than women in general (in other words, are more likely to have premature labor)?

Comment:

It is reasonable to assume that the known standard deviation of 16 days applies also to women who smoke and/or drink during their pregnancy.

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State the null and alternative hypotheses, and define clearly what the parameter μ represents.

Your Answer:

Ho: μ = 266
Ha: μ < 266

Our Answer:
Let μ be the mean pregnancy length of women who smoke and/or drink alcohol during their pregnancy. Since we want to test whether pregnancy length of women who smoke and/or drink alcohol during pregnancy is shorter than women in general, we are testing: H0: μ = 266 Ha: μ < 266

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Below is a histogram of the data. Have the conditions that allow us to safely use the z-test been met?

Your Answer:

I can't see the histogram :(but I'd be checking if it's normally distributed, and if there are outliers. Oh, and randomness, and number of samples.

Our Answer:
There are two conditions we need to check: (i) The sample is random. (ii) We are not told whether pregnancy length varies normally, so in order to check whether the sample size (n = 25) is large enough to ensure that the Central Limit Theorem "kicks in," we would need to look at the histogram and verify that it is not extremely skewed and/or have outliers. In fact, the data are slightly skewed to the right and include no outliers, so n = 25 should be more than enough.

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1/1 point (graded)
Given that we know that n = 25, μ = 266 and σ = 16, we calculate the sample mean pregnancy length of the 25 women as 259.68. What is the value of the z statistic? Report your answer to TWO decimal places.

-1.98 ✔

-1.98

Answer
Correct: The z-test is calculated by: (259.68 - 266) / (16 / √(25)) = -1.98

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Given that the p-value for the z test statistic above is 0.024, what conclusion would you draw?

Your Answer:

It is unlikely to see the test statistic. So, we reject Ho and accept Ha.

Our Answer:

The p-value is 0.024, which (using the 0.05 significance level) is small enough to indicate that the results are significant. In other words, the data provide enough evidence to reject Ho and conclude that the mean pregnancy length of women who smoke and/or drink alcohol during pregnancy is smaller than the mean pregnancy length of women in general.

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