

When to use z or t for the Small Sample Mean Test

Climent

Both the z-test and t-test for a single mean require the normality assumption. Given that the normality assumption is satisfied, when should you use each of these tests? You should use the z-test when the population is normal and σ is known. The t-test should be used when the population is normal and σ is unknown. How does one know from the wording of the problem whether or not σ is known? You have to look carefully at the sentence in which the standard deviation is given and ask your self what the subject of the sentence is, the sample or the population.

Typical wording where σ is unknown:

A random sample of 16 students had an average score of 81.2 with a standard deviation of 15. Assume that the scores are normally distributed. (The subject of the 1st sentence is the random sample, hence $s = 15$.)

Alternative wording:

A random sample of 16 students had an average score of 81.2. The standard deviation was found to be 15. Assume that the scores are normally distributed. (Here the 2nd sentence is talking about the sample, because by implication the standard deviation can only be found from the sample, hence $s = 15$.)

Typical wording where σ is known:

A random sample of 16 students had an average score of 81.2. Assume that the scores are normally distributed with a standard deviation of 15. (The 2nd sentence is talking about the population, because it states that the scores are normally distributed. Normally distributed is a population characteristic, hence by implication $\sigma = 15$.)

Alternative wording:

A random sample of 16 students had an average score of 81.2. The standard deviation is known to be 15. Assume that the scores are normally distributed. (Whenever one states that something is “known to be” it implies that we are talking about the population. Population characteristics are known quantities whereas sample quantities are estimated values. Here $\sigma = 15$.)

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