Chapter 18 Part One: Confidence Intervals about Means

Recall: Remember from Chapter 15 Part II, that there are three conditions necessary for inference about sample means.

- **Randomization Condition:**
- **10% Condition:**
- **Nearly Normal Condition:**
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  -
    -
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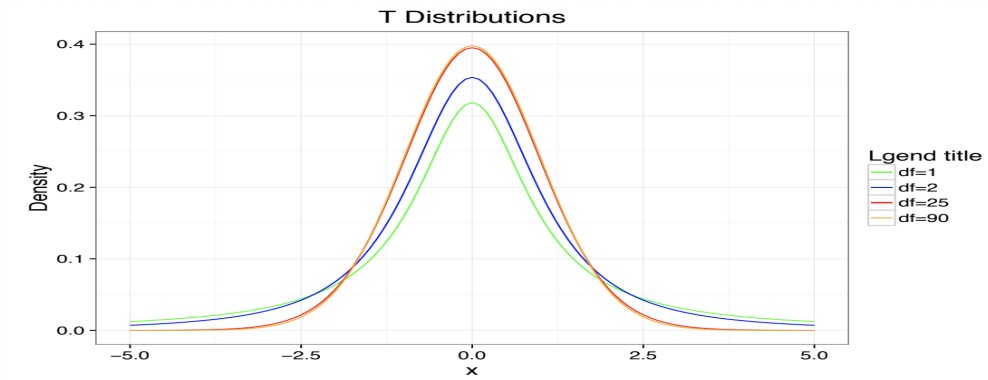
Once these conditions are met, then :

However, there's an issue. If we don't know the population standard deviation, σ, ahead of time (we usually don't) we need to substitute in with the sample mean s. But if we were to substitute in the sample mean, when we standardize scores using our normal z-score fomula, the resulting test statistic doesn't _____.

The t-distribution

The t-distribution is characterized by a parameter called the _____.



Fun Fact: The t-distribution was developed by William S. Gosset who was a statistician and the head brewer at the Guinnes brewery in Dublin, Ireland. He needed a way to analyze data even if the population standard deviation, σ is not known.

Properties of the t-distribution:

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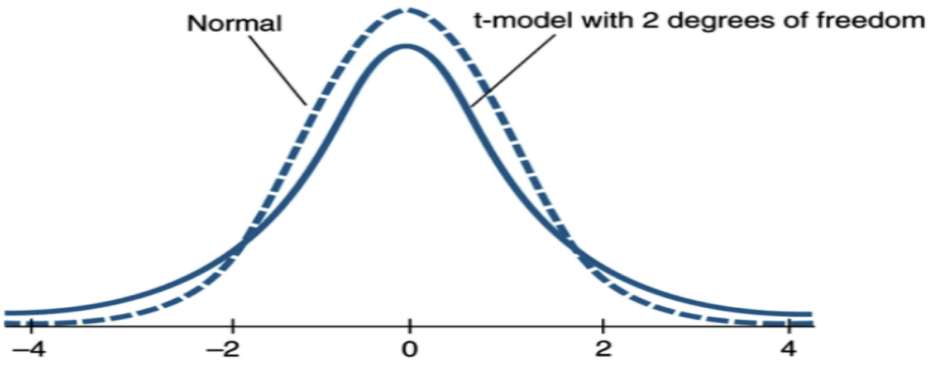

If the following conditions are met:

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-
-

then

follows a _____

Confidence Intervals

The confidence interval for a population mean can be computed using the following formula:

Where the _____ comes from a t-distribution with n-1 degrees of freedom. This is chosen based on the desired confidence level (using a t-table).

	0.20 0.10	0.10 0.05	0.05 0.025	0.02 0.01	0.01 0.005
df					
1	3.078	6.314	12.706	31.821	63.657
2	1.886	2.920	4.303	6.965	9.925
3	1.638	2.353	3.182	4.541	5.841
4	1.533	2.132	2.776	3.747	4.604
5	1.476	2.015	2.571	3.365	4.032
6	1.440	1.943	2.447	3.143	3.707
7	1.415	1.895	2.365	2.998	3.499
8	1.397	1.860	2.306	2.896	3.355
9	1.383	1.833	2.262	2.821	3.250
140	1.288	1.656	1.977	2.353	2.611
180	1.286	1.653	1.973	2.347	2.603
250	1.285	1.651	1.969	2.341	2.596
400	1.284	1.649	1.966	2.336	2.588
1000	1.282	1.646	1.962	2.330	2.581
∞	1.282	1.645	1.960	2.326	2.576
Confidence levels	80%	90%	95%	98%	99%

1. Find the t* for a 95% CI for a sample of size n = 10.

2. Find the t* for a 90% CI for a sample of size n = 15.

3. Find the t* for a 95% CI for a sample of size n = ∞

Interpretation:

Example *A survey of 755 randomly selected US cell phone users age 18 or older was taken in May 2011. The average number of text messages sent or received per day in the sample was 41.5 messagess with a standard deviation of 167.6. Construct a 95% confidence interval for the population mean.*

Example *In a random sample of 130 adults, the sample mean body temperature was 98.25 with a sample standard deviation of 0.73. Compute and interpret a 99% confidence interval for the population mean body temperature.*

Effects of Confidence Level and Sample Size:

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-
-
-

Meaning of Confidence

Confidence Interval:

Confidence Level: