5.4 Confidence Interval Example

MBC 638

Data Analysis and Decision Making

Example: Hank's Process

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- Assume $\alpha = 0.05$

Confidence Interval Formulas for Mean

Boundaries of interval (two sided)	When population standard deviation is *known* (not often)	When population standard deviation is ***unknown*** and sample size ***n*** is ***large*** (≥ 30)	When population standard deviation is ***unknown*** and sample size ***n*** is ***small*** (< 30)
Upper confidence limits for μ	$U = \bar{x} + z^* \frac{\sigma}{\sqrt{n}}$	$U = \bar{x} + z^* \frac{s}{\sqrt{n}}$	$U = \bar{x} + t \frac{s}{\sqrt{n}}$
Lower confidence limits for μ	$L = \bar{x} - z^* \frac{\sigma}{\sqrt{n}}$	$L = \bar{x} - z^* \frac{s}{\sqrt{n}}$	$L = \bar{x} - t \frac{s}{\sqrt{n}}$
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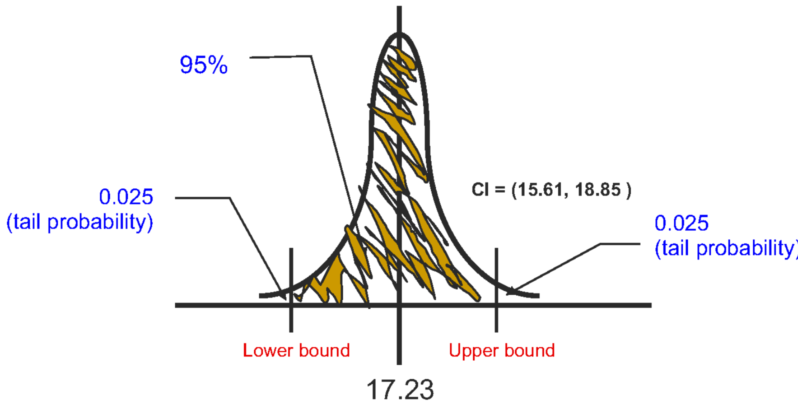
- We are 95% confident that the mean of the population (μ_{pop}) is between 15.61 and 18.85 days.

Other Ways to Interpret This CI



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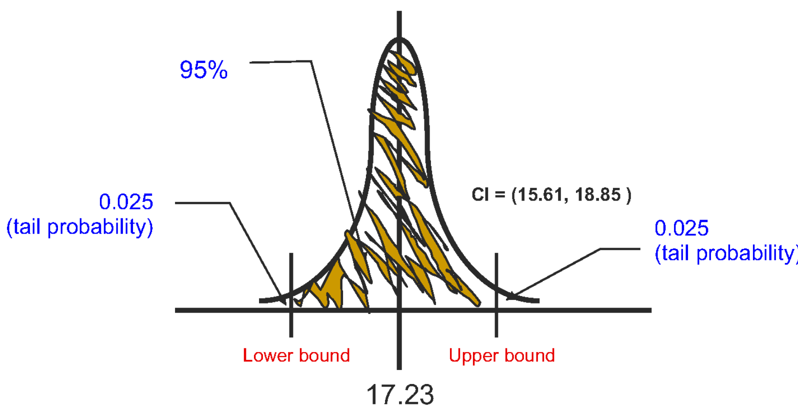

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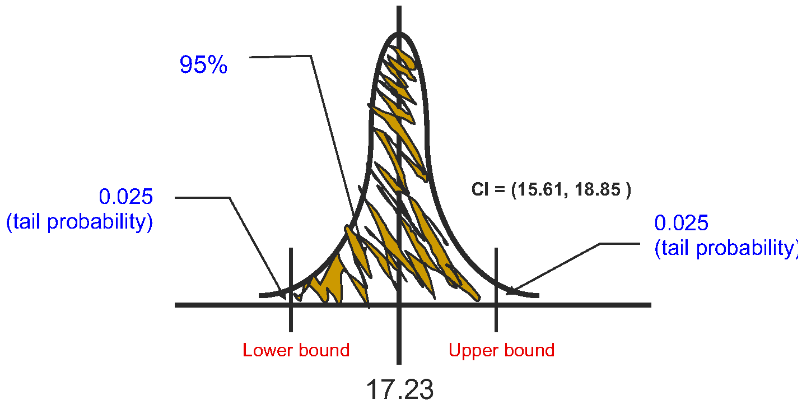

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- In 95% of all xbars (calculated from different samples of this process each having a different xbar) the interval (the shaded region) will include the population mean.
- **We are 95% confident that the population mean lies between this upper and lower bound.**
- Confidence intervals are NOT used to determine an interval at which any one observation of the distribution lies.

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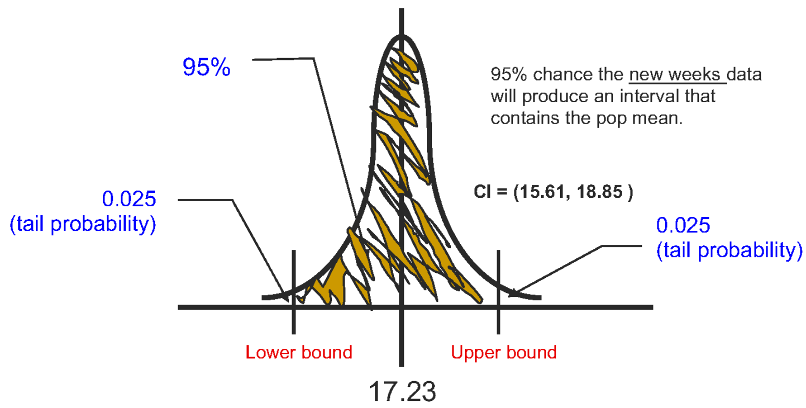

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Confidence Intervals

Confidence Interval = Parameter estimate ± [(Confidence) x (Variability)]

$\bar{x}$ Sample mean is a parameter estimate

margin of error (E)

Add and subtract this value from the parameter estimate

Use Excel to calculate "E"

=CONFIDENCE.NORM(alpha, std dev, sample size)

Hank's example:
Mean=17.23 days

=CONFIDENCE.NORM(0.05, 4.52 ,30) = 1.617

Confidence interval = 17.23 ± 1.617 = (15.61, 18.85)