Welcome to

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The Session Will Begin Shortly

START

Statistics in R with Tidyverse

Session 8: Estimation via Theory-based Methods

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Estimation Primer

- Use sample data to estimate population parameters

- Focus on estimating the population mean

- Confidence intervals provide a range of plausible values

- Interpretation is key: they offer insight into the reliability of estimates

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Understanding Confidence Levels

• Confidence intervals estimate the population parameter

• Provide a range of values rather than a single point

• Interval width reflects the uncertainty of the estimate

• Interpretation: "95% confident the population mean is within this range"

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Constructing Confidence Intervals

- Based on sample mean and standard error

- Wider intervals indicate more uncertainty

- Narrower intervals suggest more precise estimates

- Confidence level determines the certainty we have about the interval

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CLT and Confidence Intervals

- Central Limit Theorem (CLT) helps estimate the population mean

- With large samples, sample means follow a normal distribution

- Use CLT to construct confidence intervals even if population distribution is unknown

- Ensures validity of intervals for large sample sizes

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Confidence Level

- Common levels: 90%, 95%, 99%

- Higher confidence means a wider interval

- Lower confidence results in a narrower interval

- Trade-off between precision and certainty

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Standard Error and Interval Width

- Standard error depends on sample size

- Larger samples reduce standard error

- Reduced error means narrower intervals

- Smaller samples result in wider intervals, increasing uncertainty

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Using Confidence Intervals

- Useful for decision-making and interpreting data

- Practical for comparing groups or estimating trends

- Avoids over-reliance on single values (point estimates)

- Strengthens conclusions with a clear range

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Interpreting Confidence Intervals

- Example: "We are 95% confident the mean lies between X and Y"

- Understand it's about the method, not a 95% probability

- A narrower interval gives more insight, but requires larger sample sizes

- Consider context and trade-offs when interpreting

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Demo & Exercises

Q & A

STOP