Statistics One

Lecture 10
Confidence intervals

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Two segments

- Confidence intervals for sample means (M)
- Confidence intervals for regression coefficients (B)

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Lecture 10 ~ Segment 1

Confidence intervals for sample means (M)

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Confidence intervals

- All sample statistics, for example, a sample mean (M), are *point estimates*
- More specifically, a sample mean (M) represents a single point in a sampling distribution

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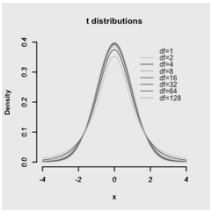
The family of t distributions



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Confidence intervals

- The logic of confidence intervals is to report a range of values, rather than a single value
- In other words, report an *interval estimate* rather than a *point estimate*

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Confidence intervals

- *Confidence interval*: an interval estimate of a population parameter, based on a random sample
  - Degree of confidence, for example 95%, represents the probability that the interval captures the true population parameter

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Confidence intervals

- The main argument for interval estimates is the reality of sampling error
- Sampling error implies that point estimates will vary from one study to the next
- A researcher will therefore be more confident about accuracy with an interval estimate

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Confidence intervals for M

- Example, IMPACT
- Assume N = 30 and multiple samples…
  - Symptom Score (Baseline), M = 0.05
  - Symptom Score (Baseline), M = 0.07
  - Symptom Score (Baseline), M = 0.03
  - …

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Confidence intervals for M

- Example, IMPACT
- Assume N = 10 and multiple samples…
  - Symptom Score (Baseline), M = 0.01
  - Symptom Score (Baseline), M = 0.20
  - Symptom Score (Baseline), M = 0.00
  - …

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Confidence intervals for M

- Example, IMPACT
- Assume N = 30 and multiple samples…
  - Symptom Score (Post-injury), M = 12.03
  - Symptom Score (Post-injury), M = 12.90
  - Symptom Score (Post-injury), M = 14.13
  - …

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Confidence intervals for M

- Example, IMPACT
- Assume N = 10 and multiple samples…
  - Symptom Score (Post-injury), M = 19.70
  - Symptom Score (Post-injury), M = 8.40
  - Symptom Score (Post-injury), M = 13.30
  - …

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Confidence intervals for M

- The width of a confidence interval is influenced by
  - Sample size
  - Variance in the population (and sample)
  - Standard error (SE) = SD / SQRT(N)

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Confidence intervals for M

- Example, IMPACT
- Assume N = 30
  - Symptom Score (Baseline)
  - 95% confidence interval
    - -0.03 – 0.10

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Confidence intervals for M

- Example, IMPACT
- Assume N = 10
  - Symptom Score (Baseline)
  - 95% confidence interval
    - -0.10 – 0.50

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Confidence intervals for M

- Example, IMPACT
- Assume N = 30
  - Symptom Score (Post-injury)
  - 95% confidence interval
    - 7.5 – 18.3

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Confidence intervals for M

- Example, IMPACT
- Assume N = 10
  - Symptom Score (Post-injury)
  - 95% confidence interval
    - 2.7 – 23.9

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Confidence interval for M

- Upper bound = M + t(SE)
- Lower bound = M – t(SE)
- SE = SD / SQRT(N)
- t depends on level of confidence desired and sample size

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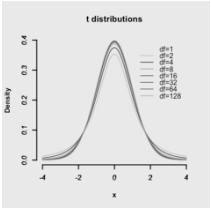
The family of t distributions



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Segment summary

- All sample statistics, for example, a sample mean (M), are *point estimates*
- More specifically, a sample mean (M) represents a single point in a sampling distribution

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Segment summary

- The logic of confidence intervals is to report a range of values, rather than a single value
- In other words, report an *interval estimate* rather than a *point estimate*

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Segment summary

- The width of a confidence interval is influenced by
  - Sample size
  - Variance in the population (and sample)
  - Standard error (SE) = SD / SQRT(N)

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END SEGMENT

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Lecture 10 ~ Segment 2

Confidence intervals for regression coefficients (B)

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Confidence intervals for B

- All sample statistics, for example, a regression coefficient (B), are *point estimates*
- More specifically, a regression coefficient (B) represents a single point in a sampling distribution

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Confidence intervals for B

- In regression, t = B / SE

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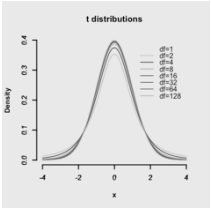
The family of t distributions



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Confidence intervals for B

- The logic of confidence intervals is to report a range of values, rather than a single value
- In other words, report an *interval estimate* rather than a *point estimate*

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Confidence intervals for B

- The main argument for interval estimates is the reality of sampling error
- Sampling error implies that point estimates will vary from one study to the next
- A researcher will therefore be more confident about accuracy with an interval estimate

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Confidence intervals for B

- The width of a confidence interval is influenced by
  - Sample size
  - Variance in the population (and sample)
  - Standard error (SE) = SD / SQRT(N)

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Confidence intervals for B

- Example, IMPACT
- Assume N = 40
  - Visual memory = B_0 + (B)Verbal memory

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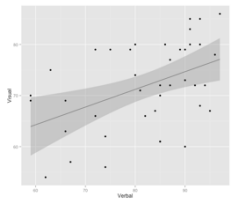
Confidence intervals for B



Confidence intervals for B

- Example, IMPACT
- Assume N = 20
  - Visual memory = B_0 + (B)Verbal memory

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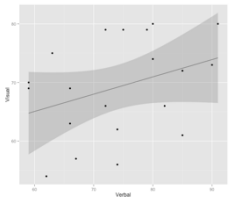
Confidence intervals for B



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Segment summary

- All sample statistics are *point estimates*
- More specifically, a sample mean (M) or a regression coefficient (B) represents a single point in a sampling distribution

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Segment summary

- The logic of confidence intervals is to report a range of values, rather than a single value
- In other words, report an *interval estimate* rather than a *point estimate*

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Segment summary

- The width of a confidence interval is influenced by
  - Sample size
  - Variance in the population (and sample)
  - Standard error (SE) = SD / SQRT(N)

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END SEGMENT

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END LECTURE 10

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