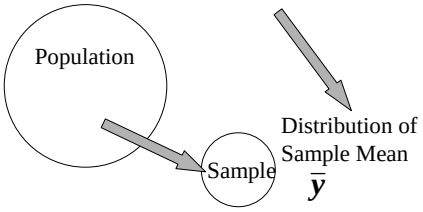
Stat 104 – Lecture 19

Sampling Distributions

Quantitative/Numerical variable
Population Parameter: μ known.



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Example

- Population? Stat 104 students in Section A.
- Variable? Number of children in your family.
- Type of variable? Numerical or Quantitative.

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Example

- Population
  - All Stat 104 students in Section A.
- Population Parameter
  - The mean number of children in a family of a Stat 104, Section A, student.

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Example

- Sample
  - 5 randomly selected students.
- Sample Statistic
  - The sample mean number of children in the 5 students' families.

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Random Samples

- First Sample
  - Sample mean number of children.
- Second Sample
  - Sample mean number of children.
- Third Sample
  - Sample mean number of children.

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What have we learned?

- Different samples produce different sample means.
- There is variation among sample means.
- Can we model this variation?
  - What is a model for the distribution of the sample mean?

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Simulation

We can simulate the repeated random selection of samples of individuals from a population.

www.ruf.rice.edu/~lane/stat_sim/sampling_dist/index.html

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Simulation

- Simple random sample of size n=5.
- Repeat many times.
- Record the sample mean, $\bar{y}$, to simulate the sampling distribution of $\bar{y}$.

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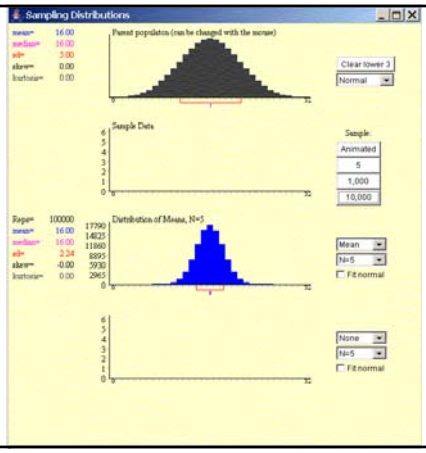

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Population

- Shape: Looks like a normal model.
- Center:
  - Mean, $\mu = 16$
- Spread:
  - Standard Deviation, $\sigma = 5$

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Distribution of the Sample Mean, $\bar{y}$

- n = 5
- Shape: Normal model
- Center: Mean, $\mu = 16$
- Spread: Standard Deviation,

$$\text{SD}(\bar{y}) = \frac{\sigma}{\sqrt{n}} = \frac{5}{\sqrt{5}} = 2.24$$

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Summary

- Sampling from a population that follows a Normal Model.
- Distribution of the sample mean, $\bar{y}$
  - Shape: Normal model
  - Center: μ
  - Spread: $\text{SD}(\bar{y}) = \frac{\sigma}{\sqrt{n}}$

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