Section F

Samples versus Populations, Part 2: Sample Distribution versus Underlying “Population Distribution”
■ In research, samples are taken from larger population

■ If the sample is taken randomly, the sample characteristics will imperfectly mimic the population characteristics

■ The characteristics include the mean, median and sd (but also the distribution of individual values)
Example 1: Blood Pressure in Males

- Histogram of BP values for random sample of 113 men
Example 1: Blood Pressure in Males

- Histogram of BP values for random sample of 500 men
Example 1: Blood Pressure in Males

- Histogram of BP values for male population
The Histogram and the Probability Density

- The *probability density* is a smooth idealized curve that shows the shape of the distribution in the population.

- This is generally a theoretical distribution that we can never see: we can only estimate it from the distribution presented by a representative (random) sample from the population.

- Areas in an interval under the curve represent the percentage of the population in the interval.

- The distributions shown are indicative of a symmetric, bell shaped distribution for blood pressure measurements in men.
Example 2: Hospital Length of Stay

- Histogram of LOS values for 100 patients
Example 2: Hospital Length of Stay

- Histogram of LOS values for 500 patients
Example 2: Hospital Length of Stay

- Histogram of LOS values for all patients
Common Shapes of the Distribution

- Some shapes of data distributions

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<tr>
<td>A</td>
<td>B</td>
<td>C</td>
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<tr>
<td>Symmetrical and bell shaped</td>
<td>Positively skewed or skewed to the right</td>
<td>Negatively skewed or skewed to the left</td>
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Some possible shapes for frequency distributions

- Bimodal
- Reverse J-shaped
- Uniform
Distribution Characteristics

- **Mode**: Peak(s)
- **Median**: Equal areas point
- **Mean**: Balancing point

![Diagram showing the relationship between mode, median, and mean in a distribution curve.](image)
Symmetric (right and left sides are mirror images)
- Left tail looks like right tail
- Mean = Median = Mode
• \textit{Right skewed} (positively skewed)
  • Long right tail
  • Mean > Median
**Left skewed** (negatively skewed)
- Long left tail
- Mean < Median