# Chapter Eight

Estimation

**Summary**

• The goal of most research is to find population parameters. The major objective of sampling theory and statistical inference is to provide estimates of unknown parameters from sample statistics.

• Researchers make point estimates and interval estimates. Point estimates are sample statistics used to estimate the exact value of a population parameter. Interval estimates are ranges of values within which the population parameter may fall.

• Confidence intervals can be used to estimate population parameters such as means or proportions. Their accuracy is defined with the confidence level. The most common confidence levels are 90%, 95%, and 99%.

• To establish a confidence interval for a mean or a proportion, add or subtract from the mean or the proportion the product of the standard error and the Z value corresponding to the confidence level.

**Outline**

* Estimation Defined
  + A process whereby we select a random sample from a population and use a sample statistic to estimate a population parameter
  + The major objective of sampling theory and statistical inference is to provide estimates of unknown population parameters from sample statistics
  + Point estimates are sample statistics used to estimate the exact value of a population parameter
    - The problem with point estimates is that sample statistics vary, usually resulting in some sort of sampling error
  + One method of increasing accuracy is to use an interval estimate, or range of values called a confidence interval
    - The radius of a confidence interval is called a margin of error
* Procedures for Estimating Confidence Intervals for Means
  + Reintroduce the example from Chapter Seven: Estimating the mean commuting time of the population of students on our campus
  + Determining the confidence interval
    - Calculate the standard error of the mean
    - Decide on the level of confidence, and find the corresponding Z value
    - Calculate the confidence interval
    - Interpret the results
  + One way to reduce the risk of being incorrect is by increasing the level of confidence
  + To calculate confidence intervals, we need to know the standard error of the sampling distribution, which is a function of the population standard deviation and the sample size
  + Researchers can increase the precision of their estimate by increasing the sample size
* Statistics in Practice
  + Hispanic migration and earnings
* Confidence Intervals for Proportions
  + The procedures for estimating proportions and percentages are identical
  + The same conceptual foundations of sampling and statistical inference that are central to the estimation of population means—the selection of random samples and the special properties of the sampling distribution—are also central to the estimation of population proportions
  + Determining confidence levels for proportions
    - Calculate the estimated standard error of the proportion
    - Decide on the level of confidence, and find the corresponding Z value
    - Calculate the confidence interval
    - Interpret the results
* Statistics in Practice
  + The 2012 Benghazi terrorist attack investigations