# Chapter 23

# The Accuracy of Averages

# Confidence Intervals

**Example 1.** HANES women 18-24 have an average height of 64.3"
with an SD of 2.6". Suppose we take a random sample of 100 of these
women. What is the expected value of the average height of the
women in the sample? It's SE?

**Example 2.** HANES women 18-24 have an average height of 64.3"
with an SD of 2.6".  Suppose we take a random sample of 100 of these
women.

a) What's the chance the sample average will be more than 64.5"?

b) What percentage of the women are taller than 64.5"?

- What is in the box?

- What is the average of the numbers in the box?

**The Bootstrap**

When we do not know what is in the box, we estimate the SD of the box by the SD of the sample.

**Confidence Intervals**

A 95% confidence interval for the population average is given by

Sample average ± 2(SE for AV)

The confidence interval is valid if the number of draws is large enough.

**Example 3.** A lake contains a large number of fish of a particular type. A simple random sample of 300 of these fish gives an average weight of 4.13 pounds with an SD of 2.1 pounds. Find a 95% confidence interval for the average weight of all the fish in the lake.

**Example 4.** A nutrition student takes a simple random sample of 100 people from a large population and carefully monitors their caloric intake for 1 day. The average caloric intake for the sample is 2000 with an SD of 400.

a) Find a 95% confidence interval for the average caloric intake for the population.

b) Is your confidence interval valid if the histogram for caloric intake is not normal?

**Example 5.** A university has 12,000 students. A simple random sample of 500 students has average age 22.3 years with an SD of 4.1 years. Find a 90% confidence interval for the average age of all students at the university.

## Reminder

Normal curve calculations, including confidence intervals, are valid if the number of draws is large enough.

How large is "large enough"? It depends on the box. If the box is a long way from normal (e.g. a box with lots of 0s and very few 1s) then the number of draws needs to be quite large.