Soc 360
Statistics for Sociologists I

Chapter 15, Part I

Sampling Distributions

July 10, 2018

Overview – Chapter 15, Part 1 [15.1 – 15.3]

- Parameters vs. statistics
- Law of Large Numbers
- Introduction to sampling distributions
- Sampling exercise

Statistical Inference

- We can use information from a sample to infer something about a broader population
- Every possible sample is different, but if done right, they have a specific pattern
- We want to essentially know how often our results would be accurate out of the many, many possible samples

Parameters and Statistics

- Parameters are reserved for numbers that describe a population—they are almost always not known
- Statistics are those numbers that are computed from a sample
- The distinction between parameters and statistics did not matter for describing data, but does matter for inference

Parameters and Statistics

- Notation for parameters and statistics are different so we can tell them apart
- We have already been introduced to a couple of parameters and their corresponding statistics

Population Mean: μ

Sample Mean: $\bar{x}$

Population Standard Deviation: σ

Sample Standard Deviation: s

Estimation

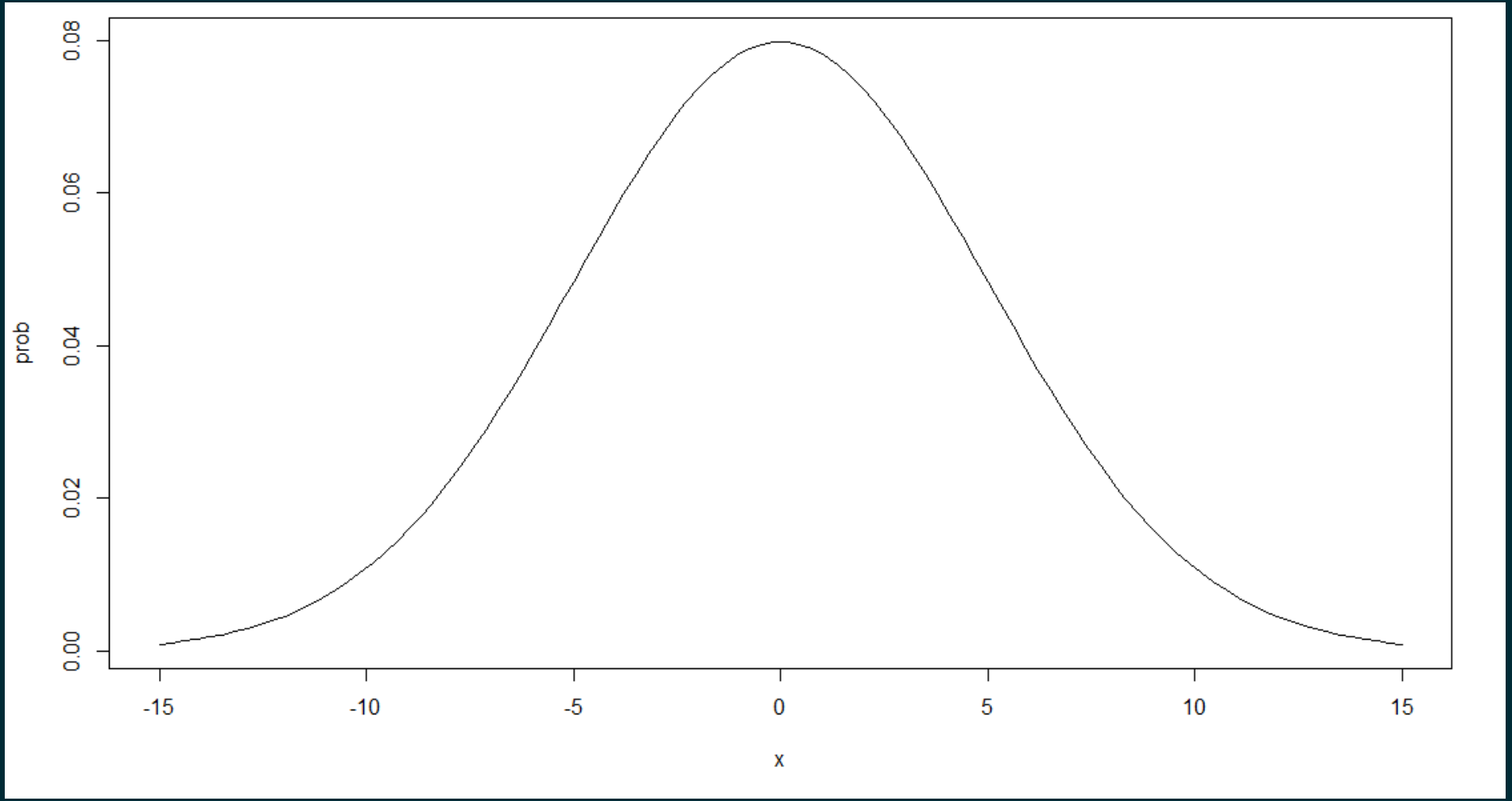
- Sample statistics are meant to be estimates of population parameters
- However, each different sample is going to produce a slightly different sample statistic
- As our sample size increases, though, our sample statistic is going to get closer and closer to the population parameter

Example: Law of Large Numbers

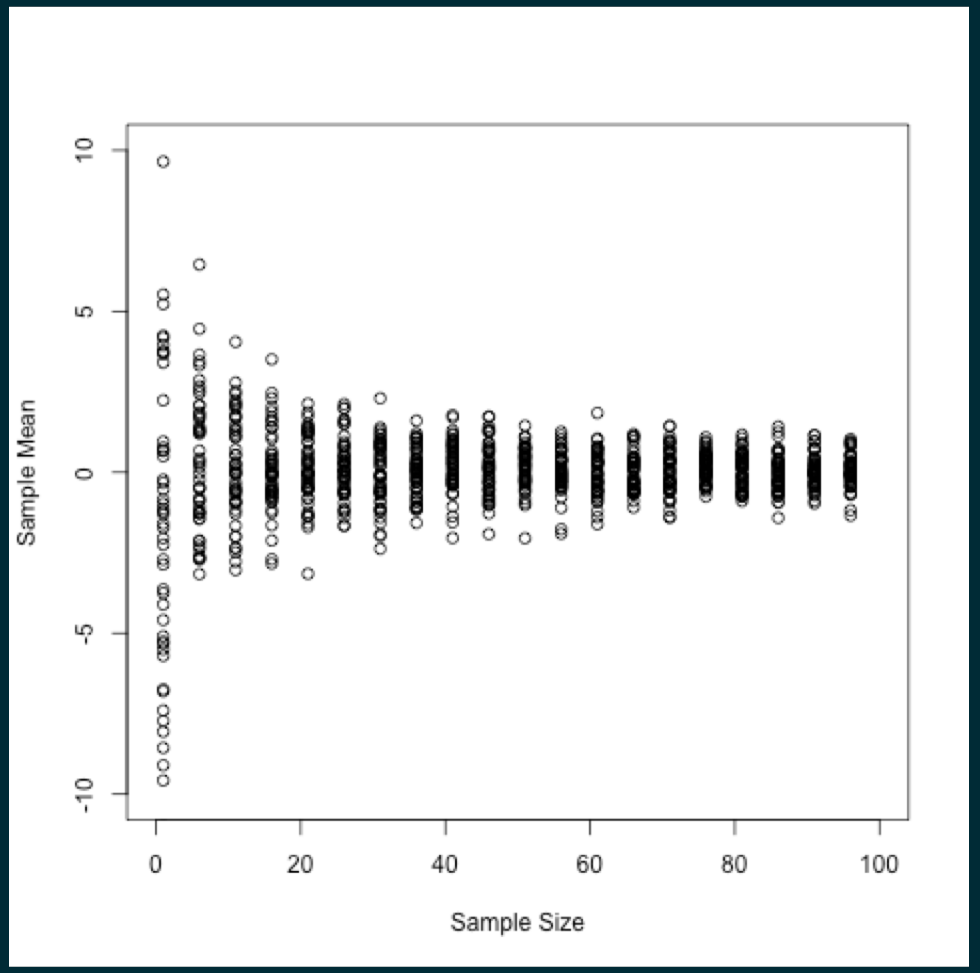
- As our sample size increases our sample statistic gets closer and closer to the population parameter

- Say I'm interested in the mean height of students in this room
  - What is my population?

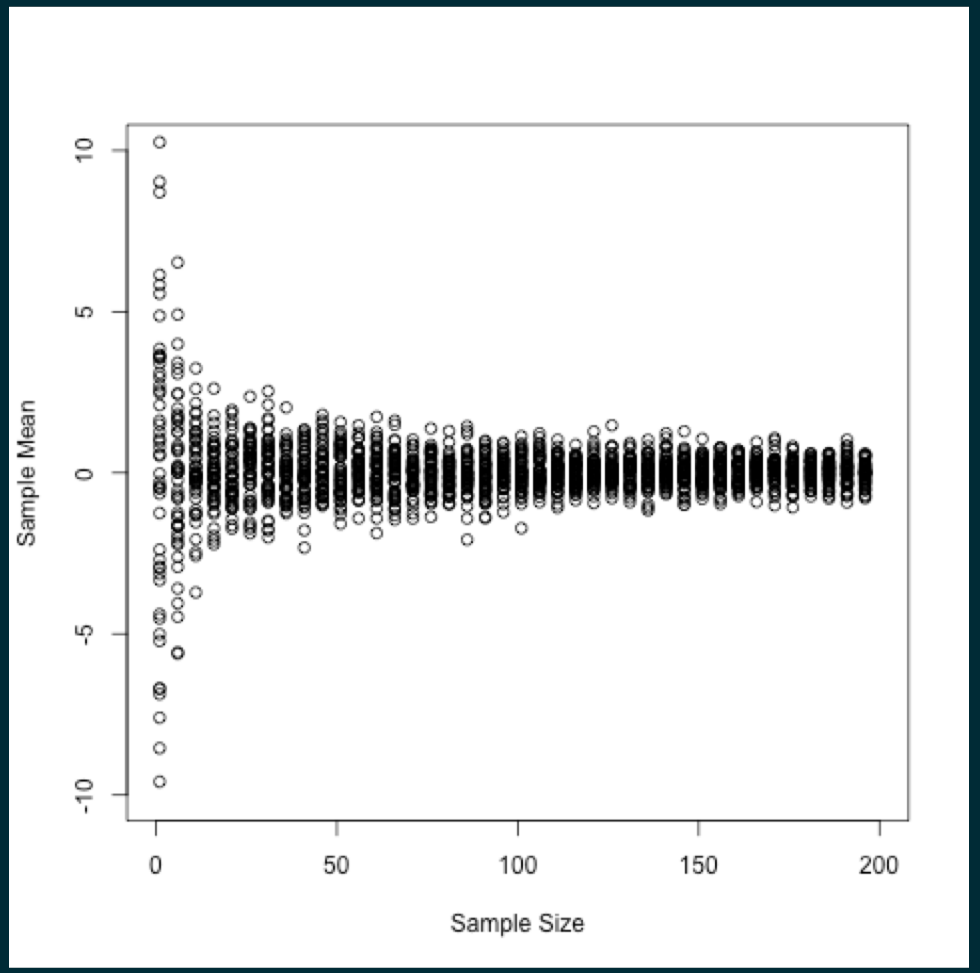
Law of Large Numbers



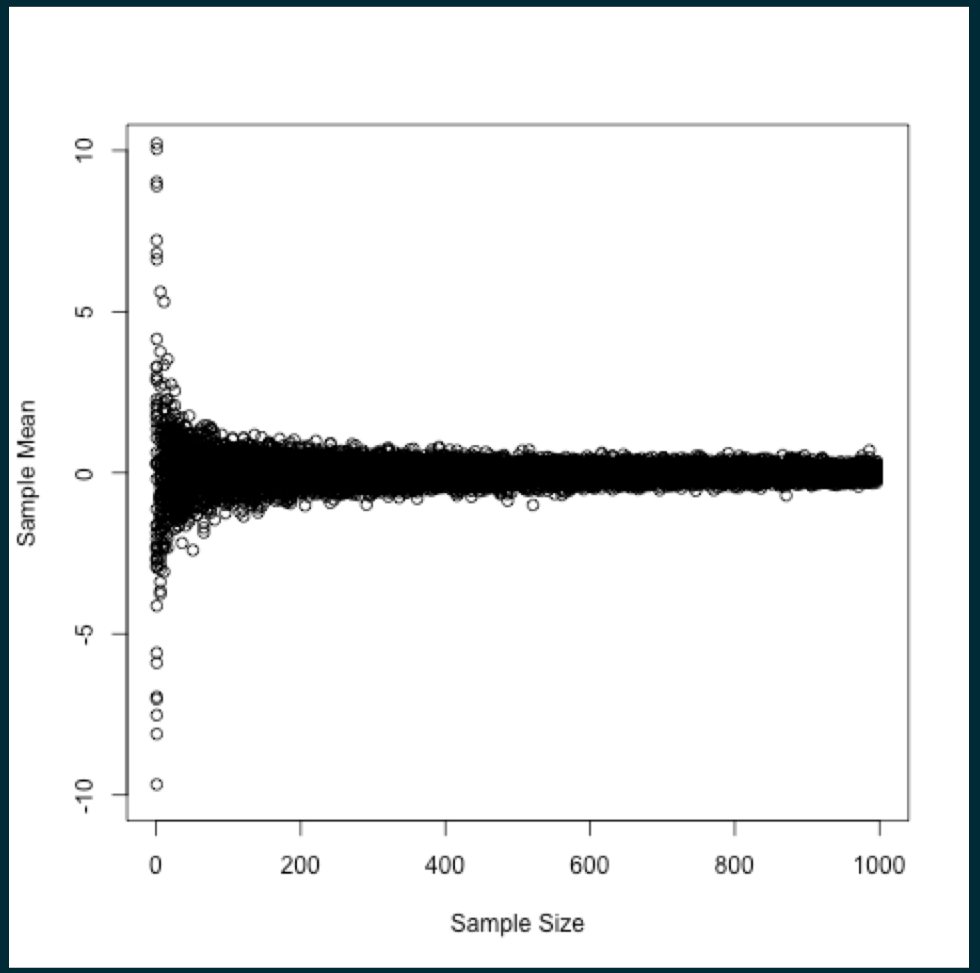
Law of Large Numbers



Law of Large Numbers



Law of Large Numbers



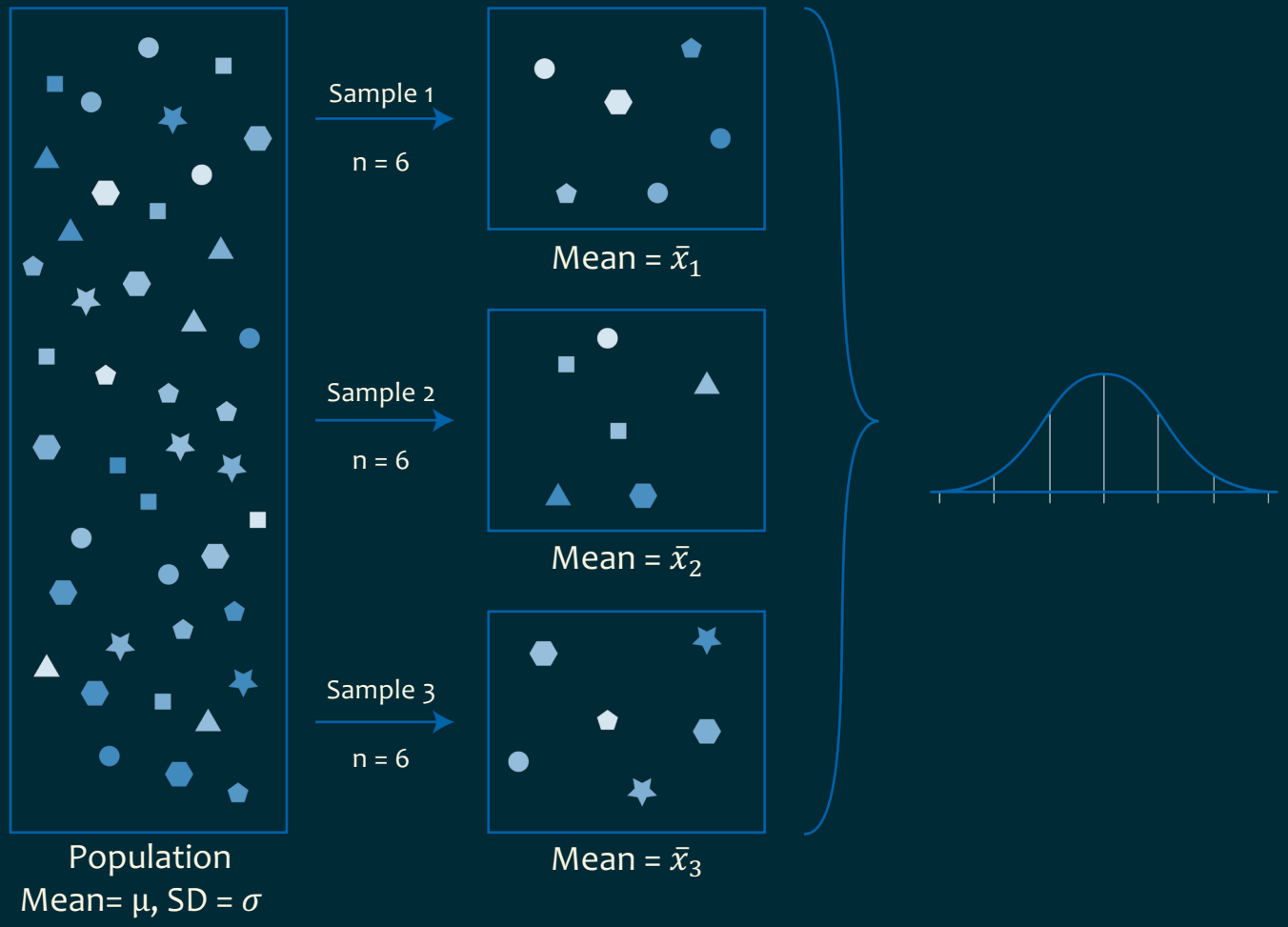
Sampling Distributions

- The Law of Large Numbers tells us that the mean for any given sample will be closer to the population mean as the sample size increases

- Sampling distributions allow us to think about what would happen if we took many samples of a given size from a population

- The distribution of the sample statistic from each of those samples makes up a sampling distribution

Sampling Distributions



Sampling Distributions

- Multiple different distributions to keep straight
  - Population distribution: the distribution of values of a given variable among all the individuals in a population
  - Sample distribution: the distribution of values of a given variable among the individuals in a given sample
  - Sampling distribution of a statistic: the distribution of values taken by the statistic in all possible samples of the same size from the same population

Sampling Distributions

- The sampling distribution is a theoretical construct that represents what would happen if we took all possible samples of a given size from a population

- Sampling distributions are just like any other distribution—they can be defined by shape, center, and variability

- We can construct a sampling distribution of any statistic from a sample

Practice: Sampling Distributions

- Each bag contains the same 200 slips of paper with one number on each piece (heights of a population, in inches)

- Within each pair, draw four samples
  - 2 samples of 10
  - 2 samples of 25
  - Record the numbers from each sample and calculate the sample mean for each

Practice: Sampling Distributions

n=10

64	
65	0
65	5
66	233
66	669
67	2334
67	788889
68	022233
68	55667778
69	34
69	5
70	4
70	68
71	

Practice: Sampling Distributions

n=10

64	
65	0
65	5
66	233
66	669
67	2334
67	788889
68	022233
68	55667778
69	34
69	5
70	4
70	68
71	

n=25

64	
65	
65	
66	
66	56679
67	002234
67	6667788889
68	001233334444
68	5667
69	0
69	6
70	
70	
71	

Summary – Chapter 15, Part 1

- Parameters vs. statistics
- The Law of Large Numbers
- Sampling distributions