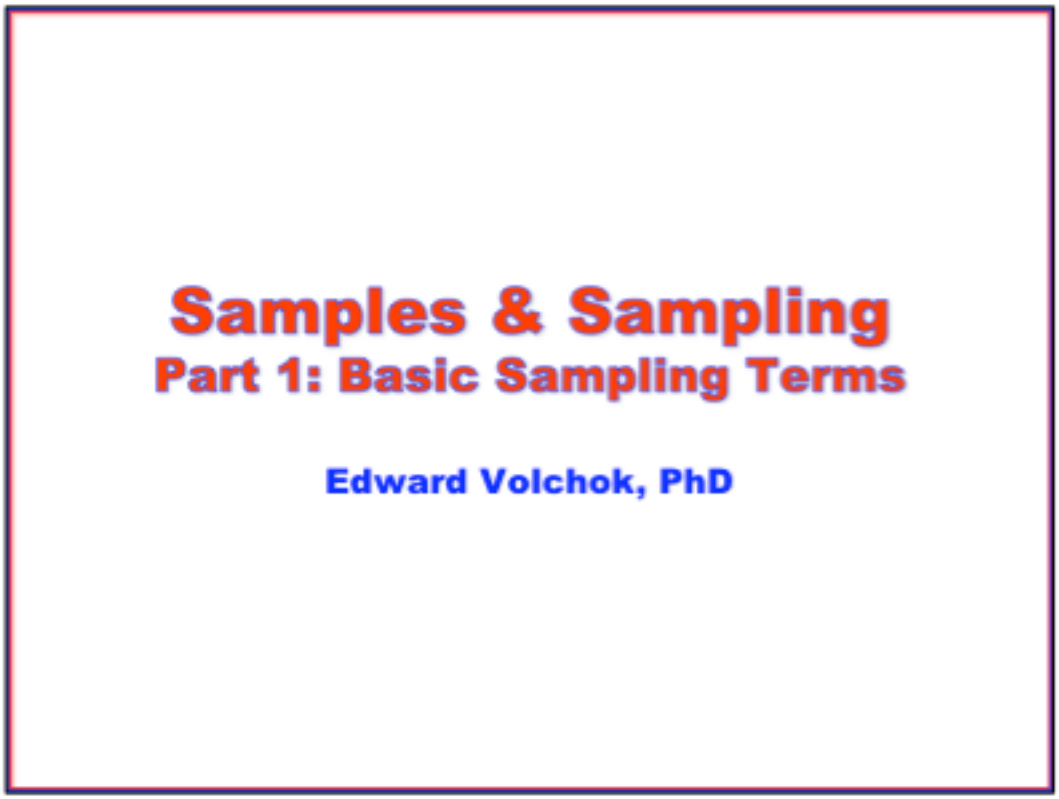
Samples & Sampling

Part 1: Basic Sampling Terms

Edward Volchok, PhD

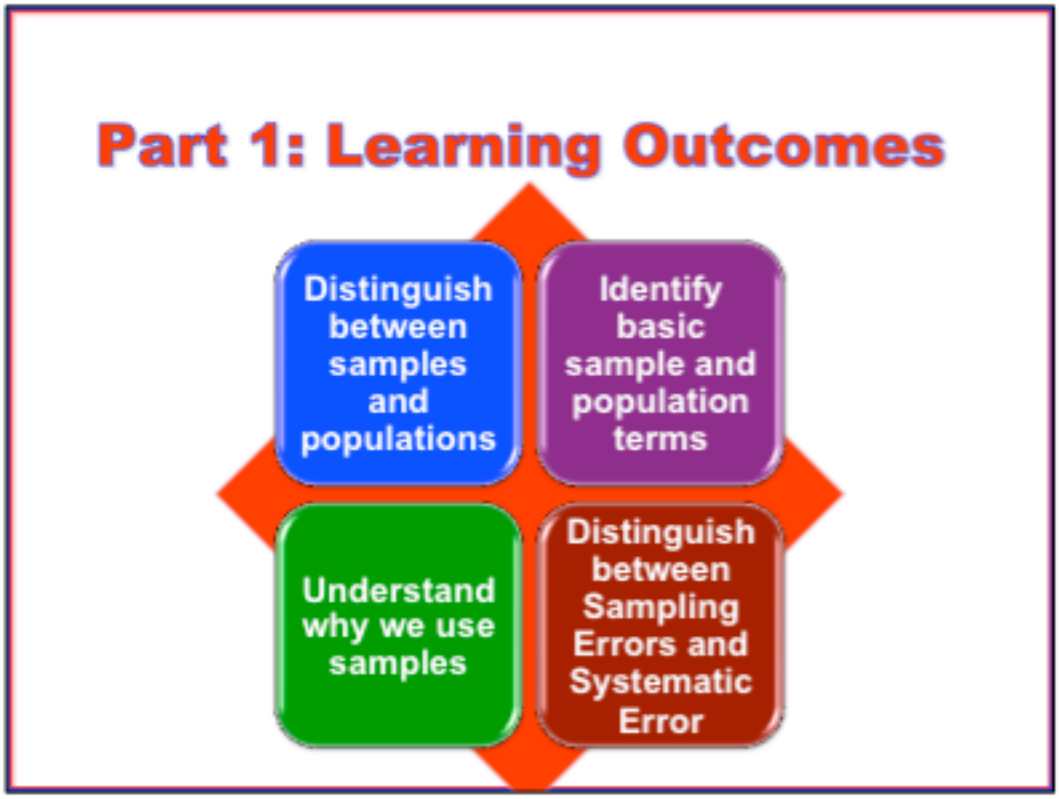


Video

Title Screen showing the name of the video, "Samples & Sampling, Part 1: Basic Sampling Terms."

Audio

Hello, this is Edward Volchok. Welcome to my lecture on Samples and Sampling. This video presents Part 1 of this lecture. In Part 1, we will review basic sampling terms.



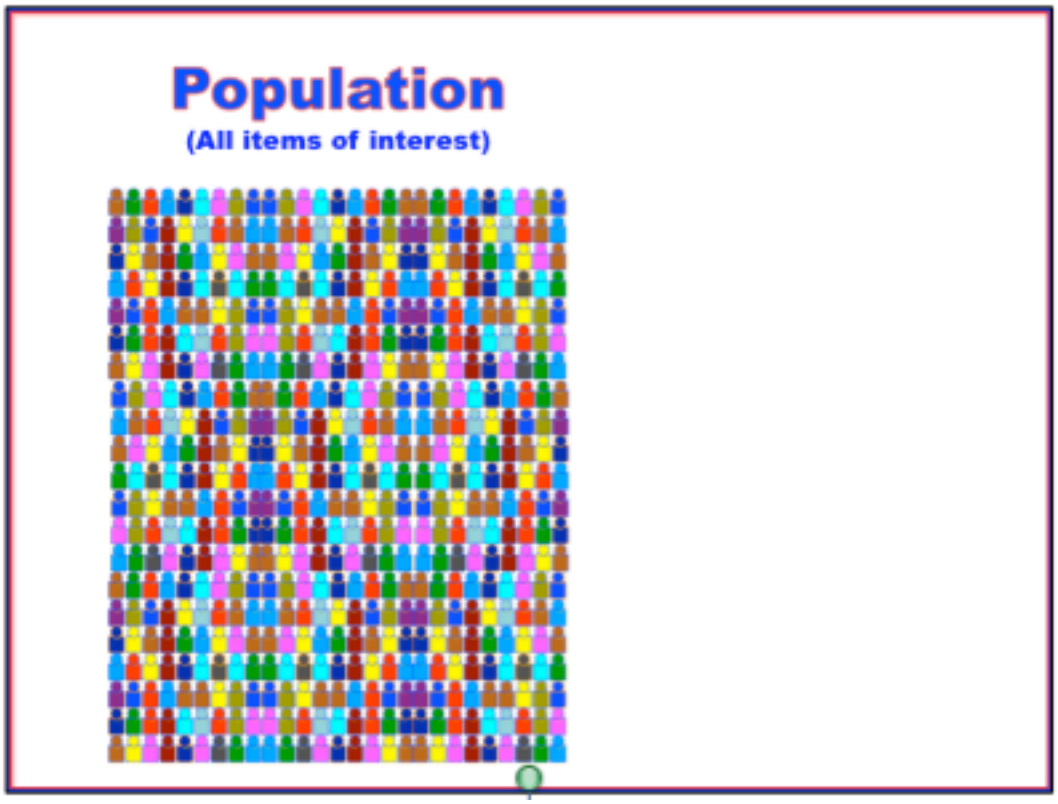
Video

The video shows a graphic listing the four learning outcomes.

Audio

After completing this lecture you should be able to:

1) Distinguish between samples and populations
2) Define basic sample and population terms
3) Understand why we use samples so often instead of studying populations.
4) Distinguish between Sampling Errors and Systematic Errors



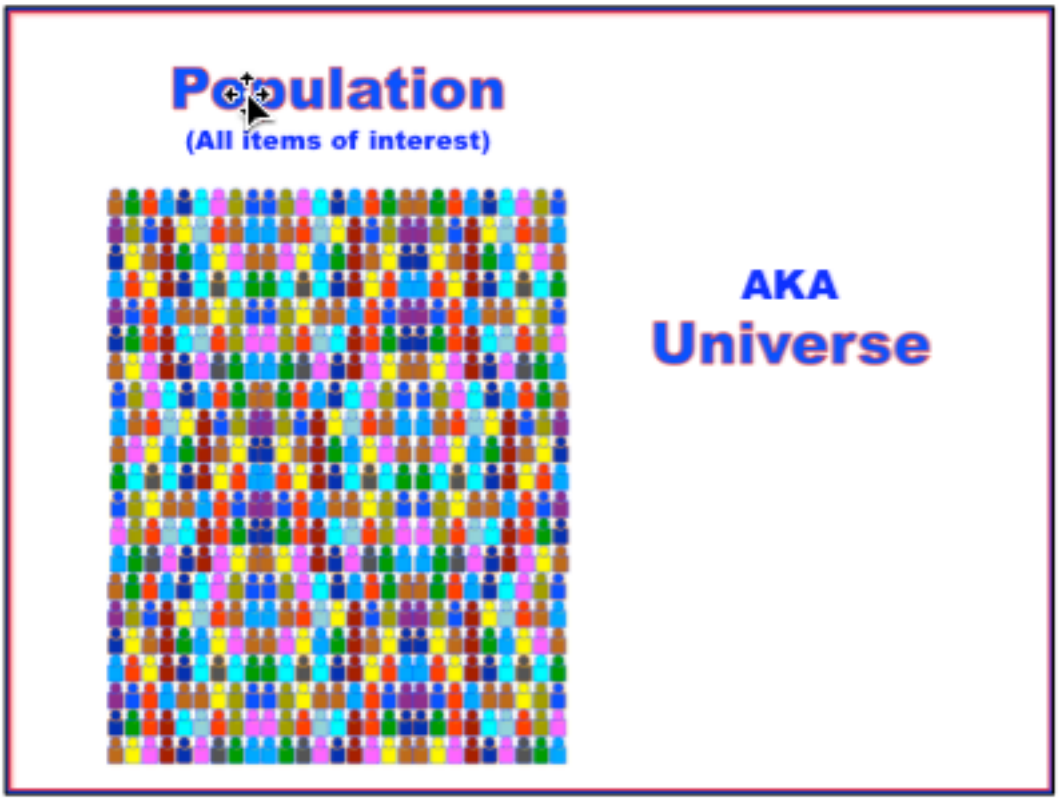
Video

The video shows a graphic listing of a population.

Audio

A population is the entire group we are interested in. A population can include:

1) People; for example, all students enrolled in undergraduate programs in the US)
2) Animals; for example, the number of Black Rhinos in the wild)
3) On, things; the number of AAA batteries Duracell® produced last week.

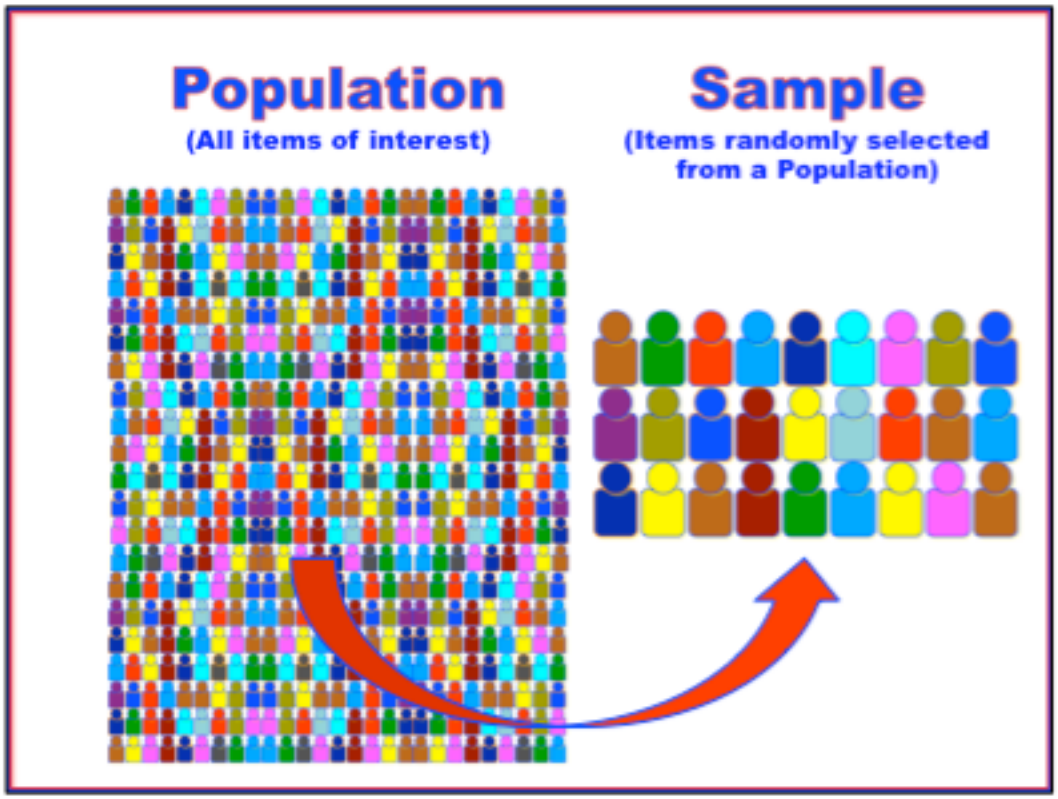


Video

The video shows a graphic listing of a population with an added line "AKA Universe."

Audio

A population is sometimes called a "universe."

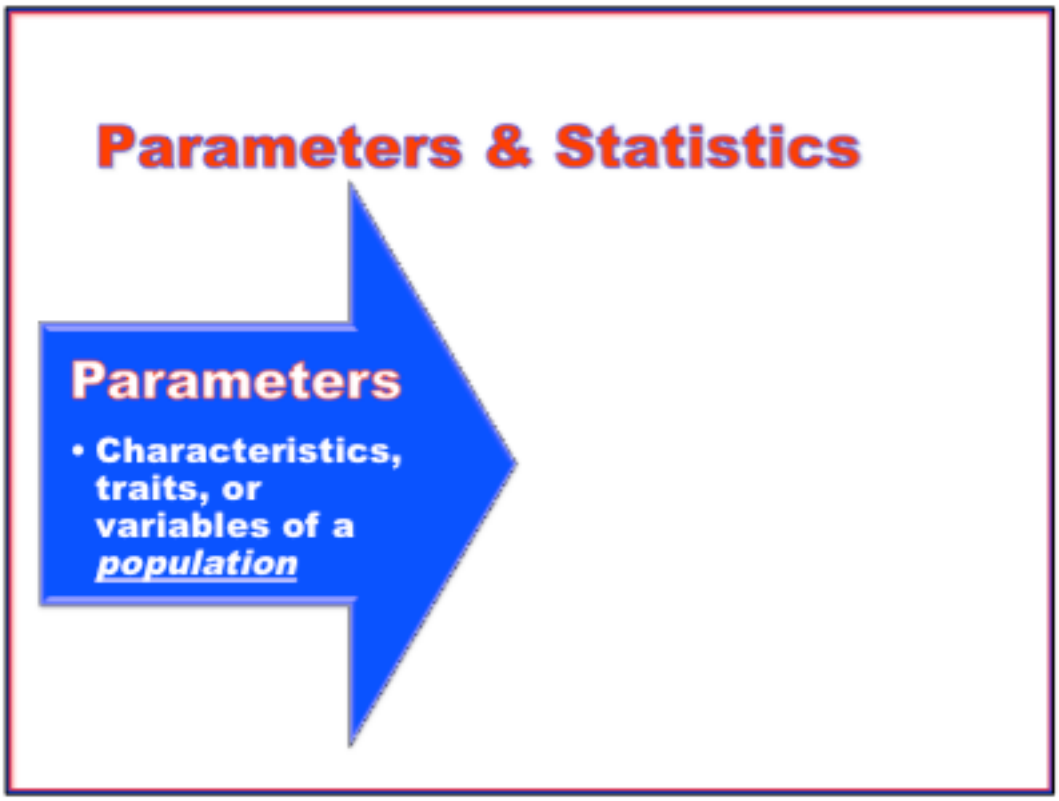


Video

Graphic of a sample being drawn from a population.

Audio

A sample is a subset of items selected from a population of interest. Sampling is the process by which we obtain a sample from a population. There are a variety of sampling methods. We will review these sampling methods in detail in Part 5.

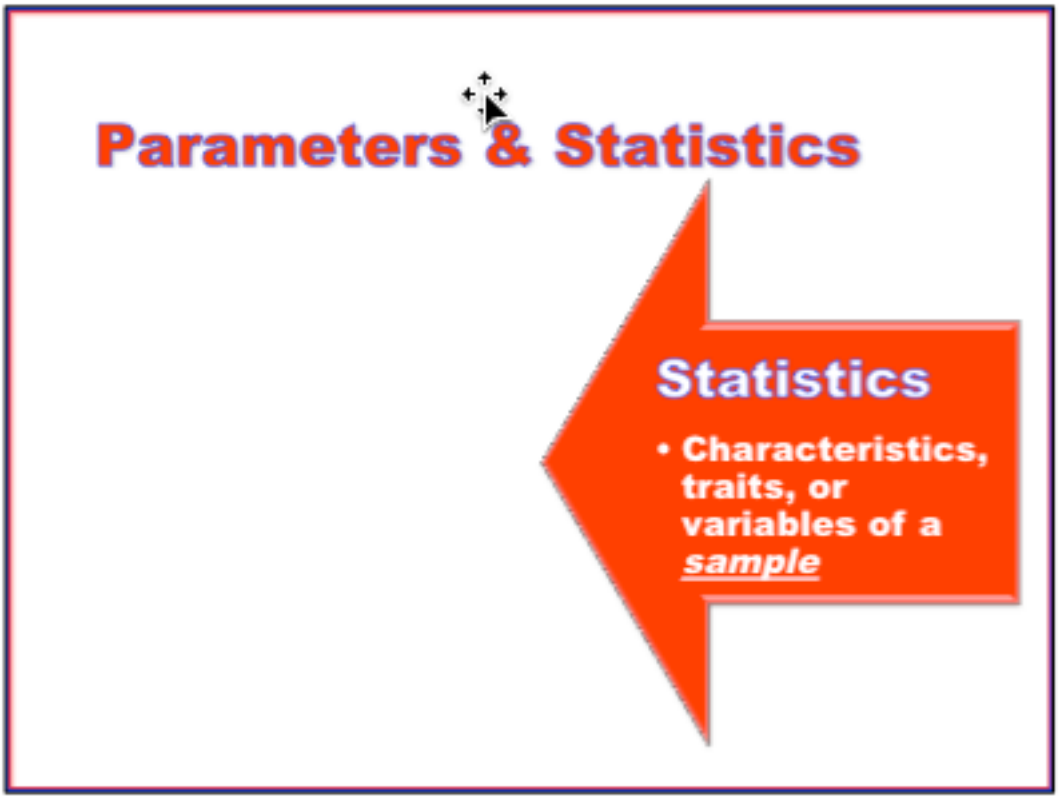


Video

Graphic with the definition of parameters.

Audio

Characteristics, traits, or variables from a population are called “parameters.”

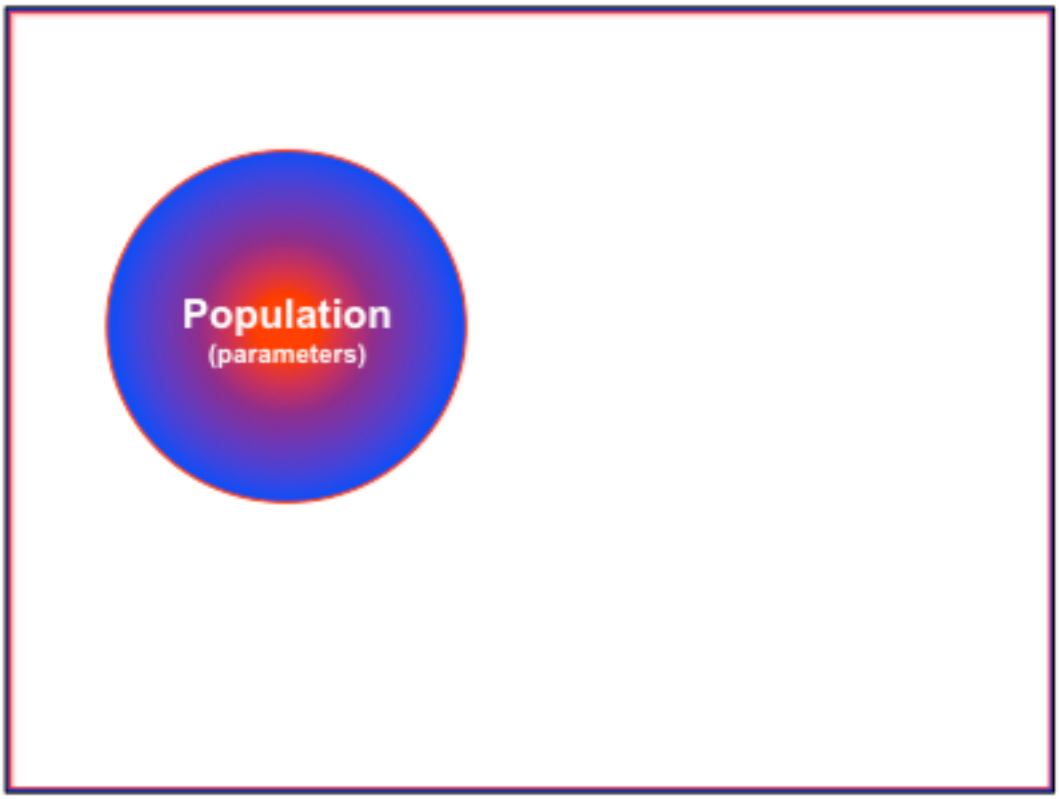


Video

Graphic with the definition of statistics.

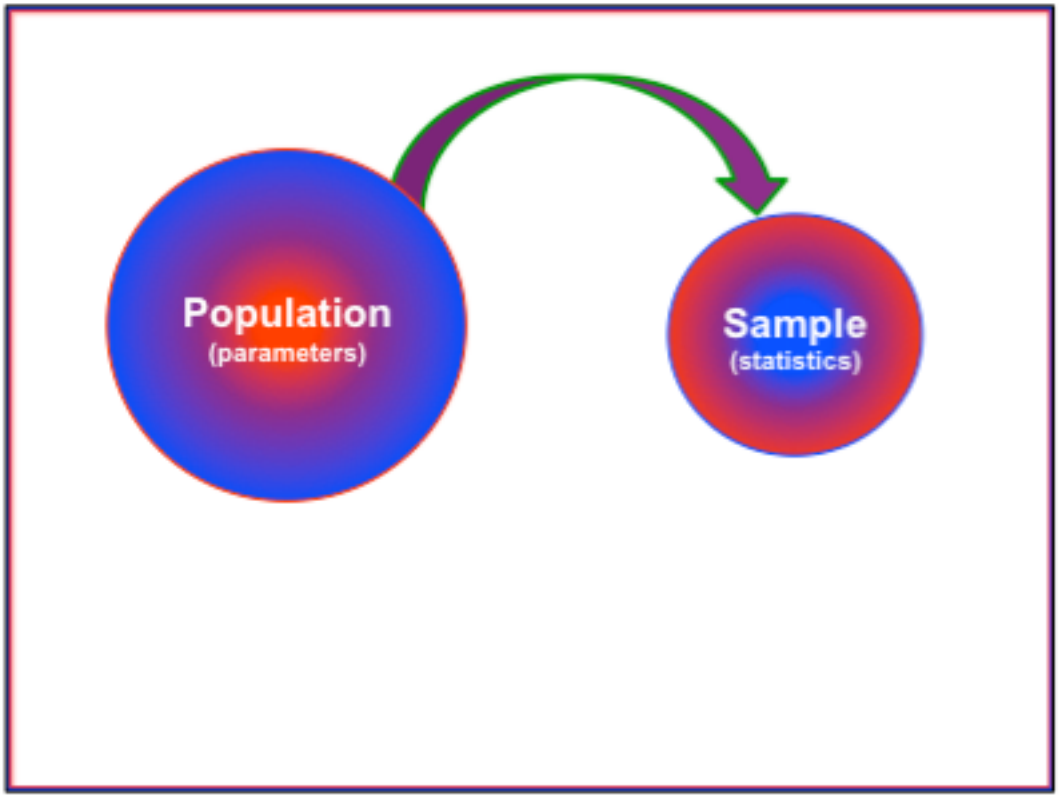
Audio

Characteristics, traits, or variables from a sample are called “statistics.



Video
Graphic of a population.

Audio
With sampling, we first identify a population of interest.

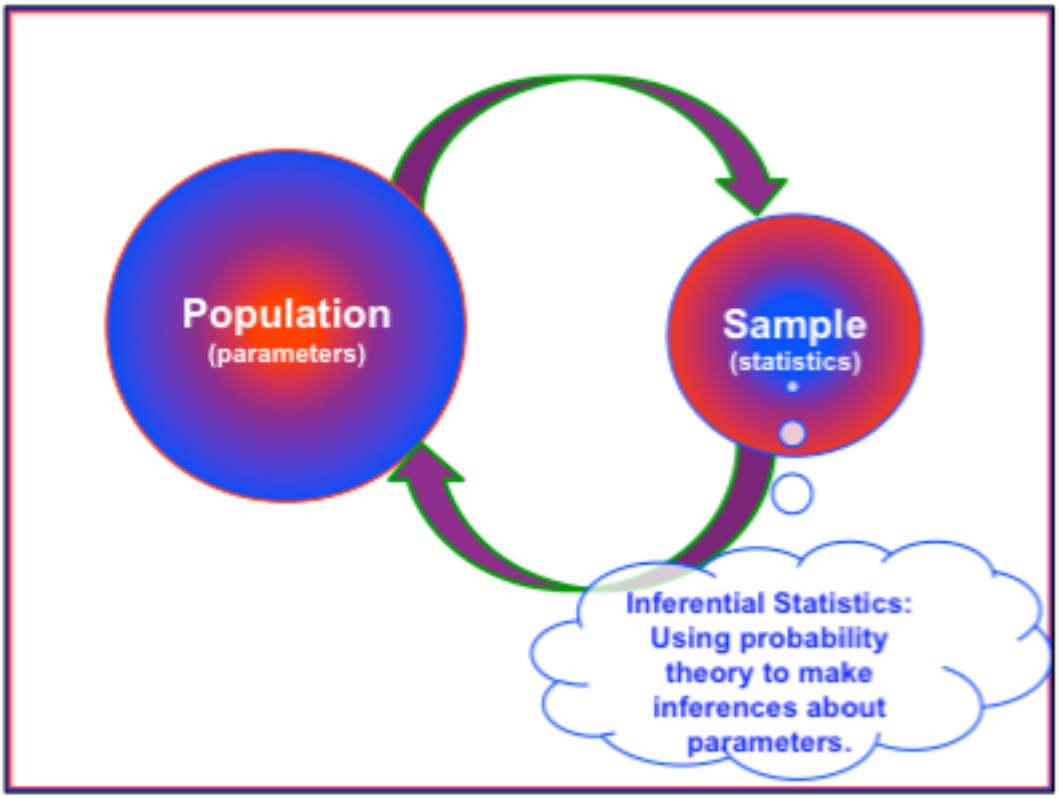


Video

Graphic of a sample being drawn from a population.

Audio

From this population we construct our sample.

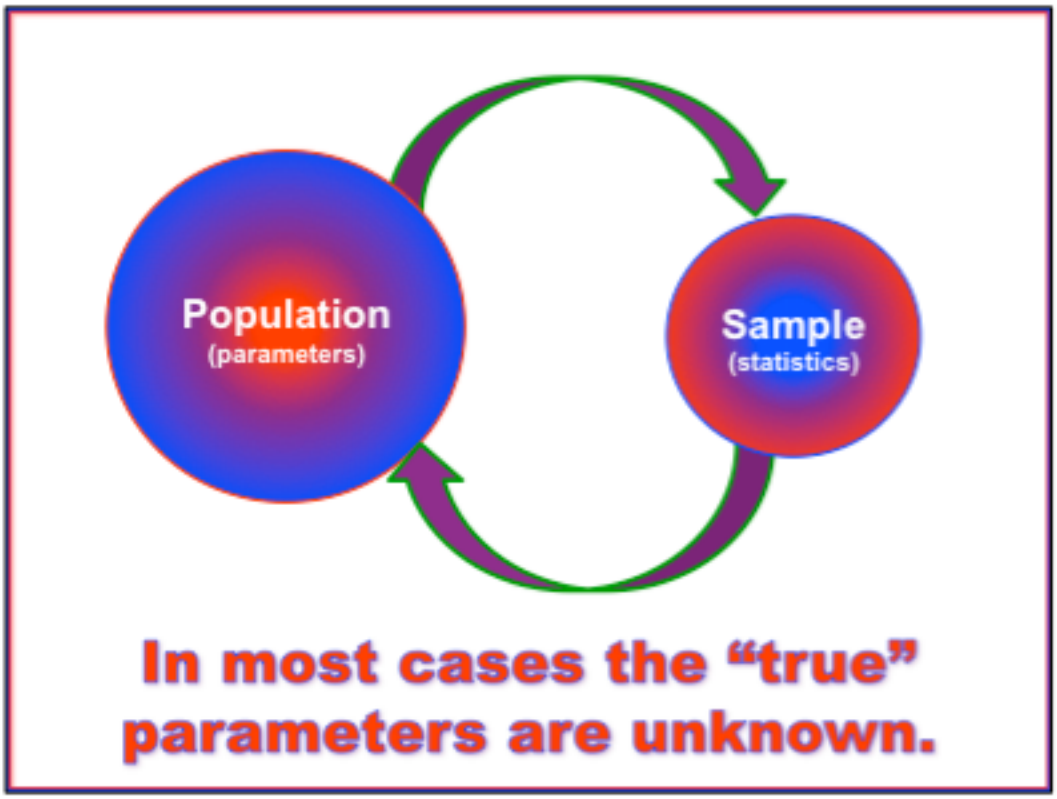


Video

Graphics of inferences being made about of population based on a sample.

Audio

With inferential statistics, we use probability theory to make inferences about the population parameters

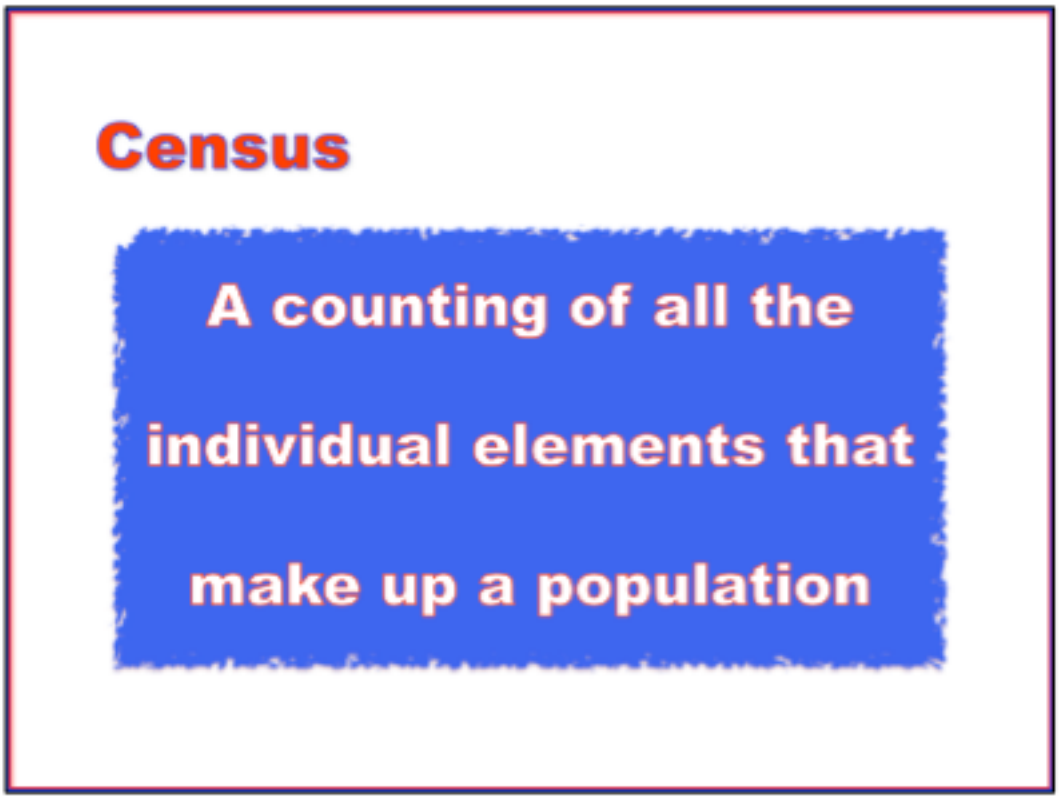


Video

Graphics of inferences being made about of population based on a sample with a super that reads, "In most cases the 'true' parameters are unknown."

Audio

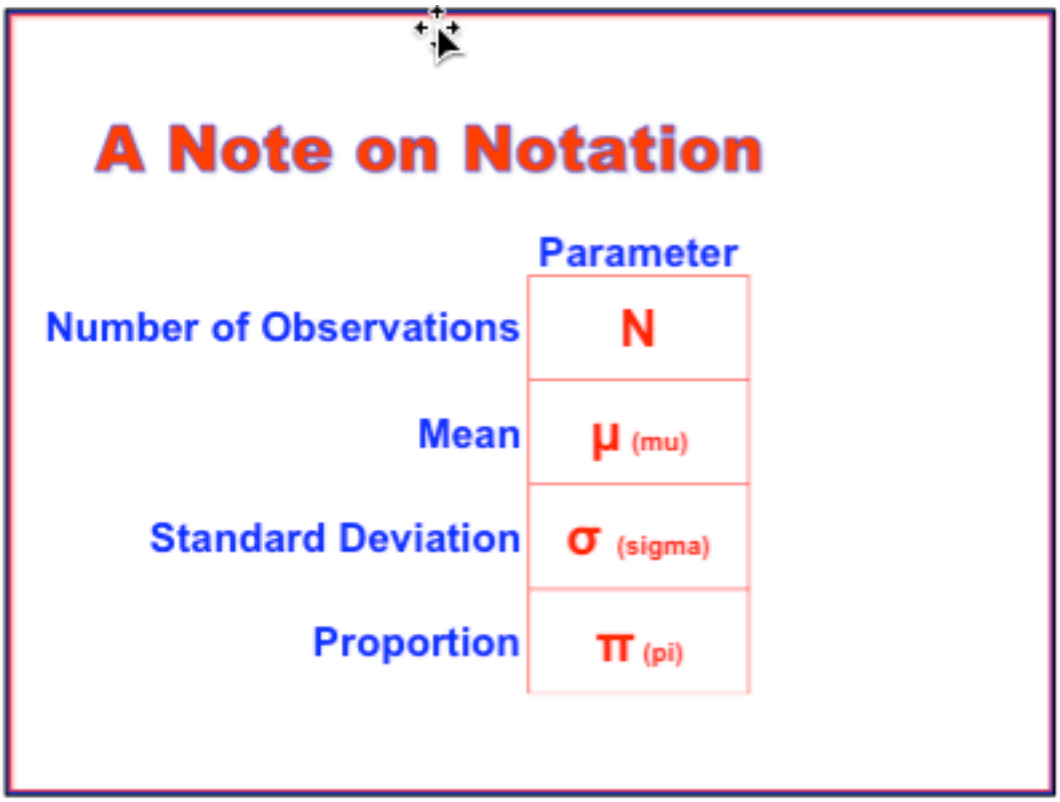
In most cases, the "true" parameters are unknown.



Video
A graphics of the definition of a census.

Audio
A census is the counting of all the individual elements that make up a population.

Governments have been conducting censuses for thousands of years. The Babylonians conducted the first known census nearly 6,000 years ago in 3800 BCE. The oldest existing census was taken during in Han Dynasty in China over 2000 years ago. Both the Old and New Testaments make references to censuses. The Book of Numbers is named after the counting of the Israelite population during the Exodus from Egypt. And, in the Book of Luke, the birth of Jesus occurred in Bethlehem because Mary and Joseph had travelled there to be counted in a Roman census.

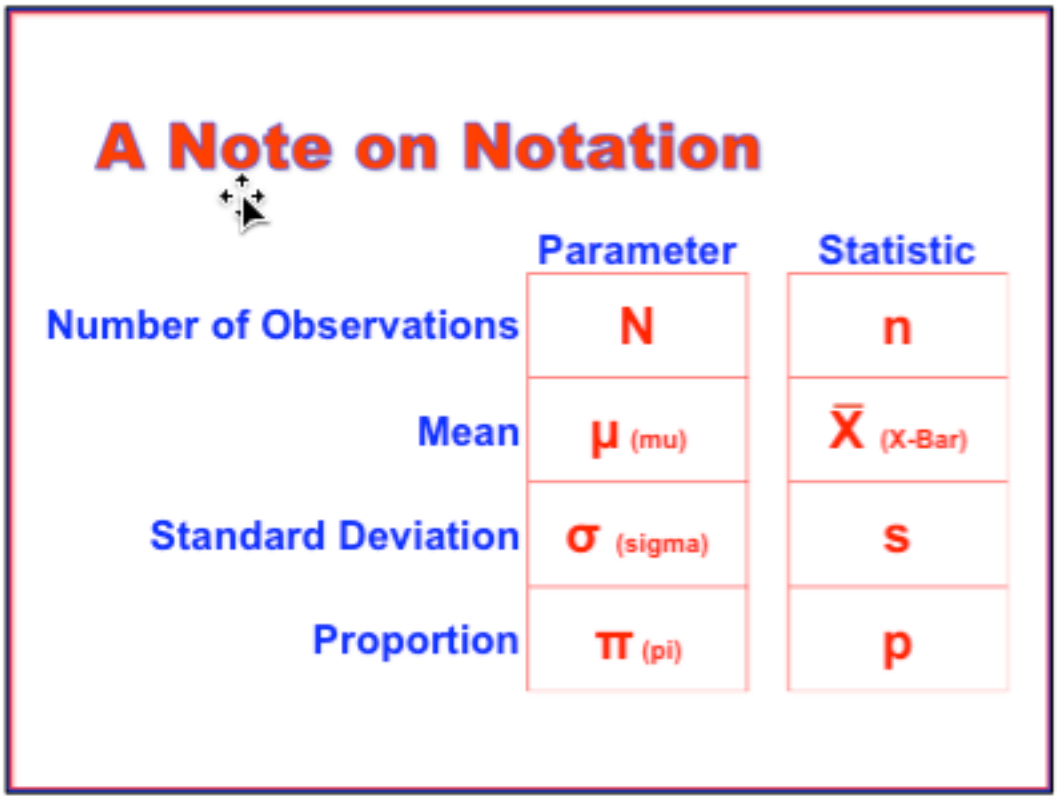


Video

Graphic showing commonly used notion for populations.

Audio

Population Parameters and Sample Statistics have their own notations. It is common practice to use the following notation with parameters: Capital N stands for the number of observations in the population. Measurements from populations take Greek letters. The Greek letter Mu (μ) stands for the population mean. The lower case Greek letter Sigma (***σ***) stands for the population standard deviation. And, the Greek letter Pi (π) stands for the population proportion.

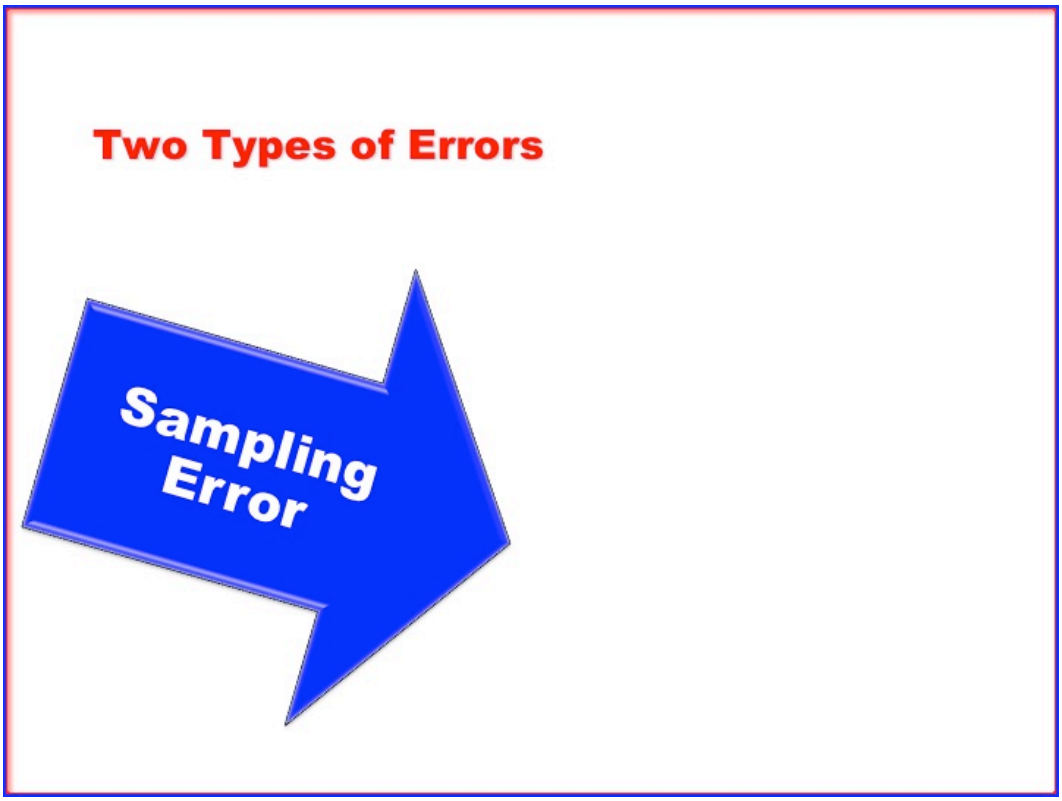


Video

Graphic showing commonly used notion for populations and samples.

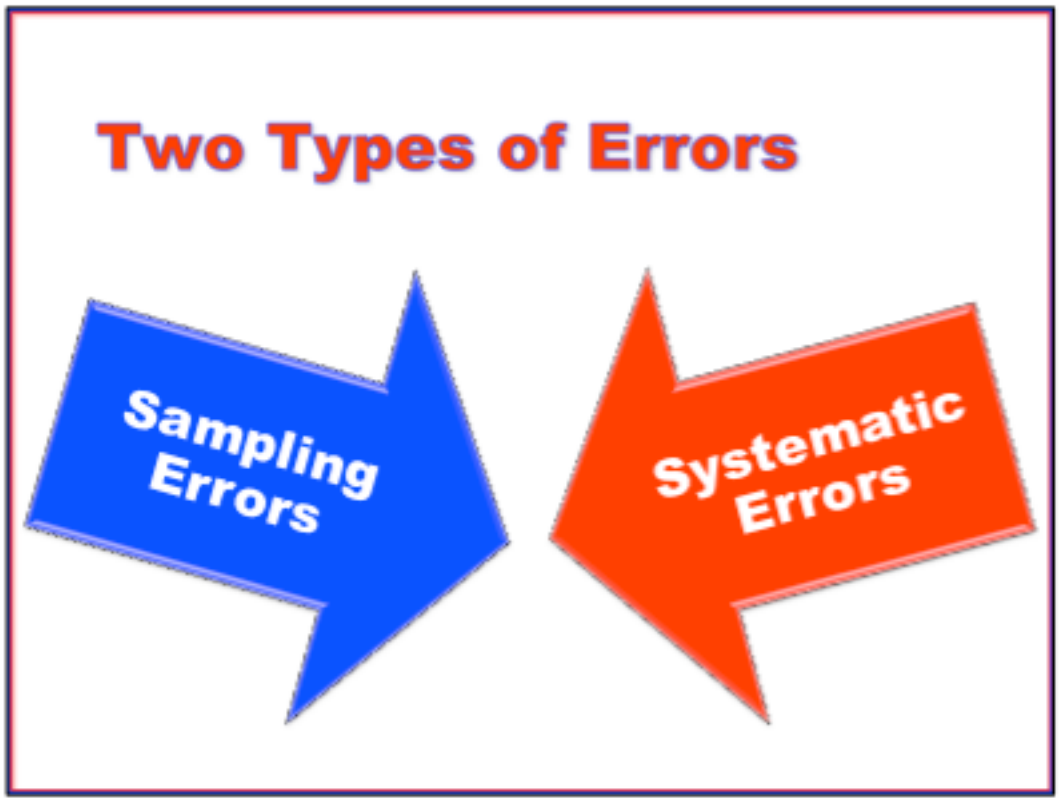
Audio

Commonly used symbols for Sample Statistics are: Lower case n for the number of observations in the sample. The symbol $\bar{X}$ (pronounced X-Bar) stands for the sample mean, s for the sample standard deviation, and p for the sample proportion.



Video
Graphic showing Sampling Errors.

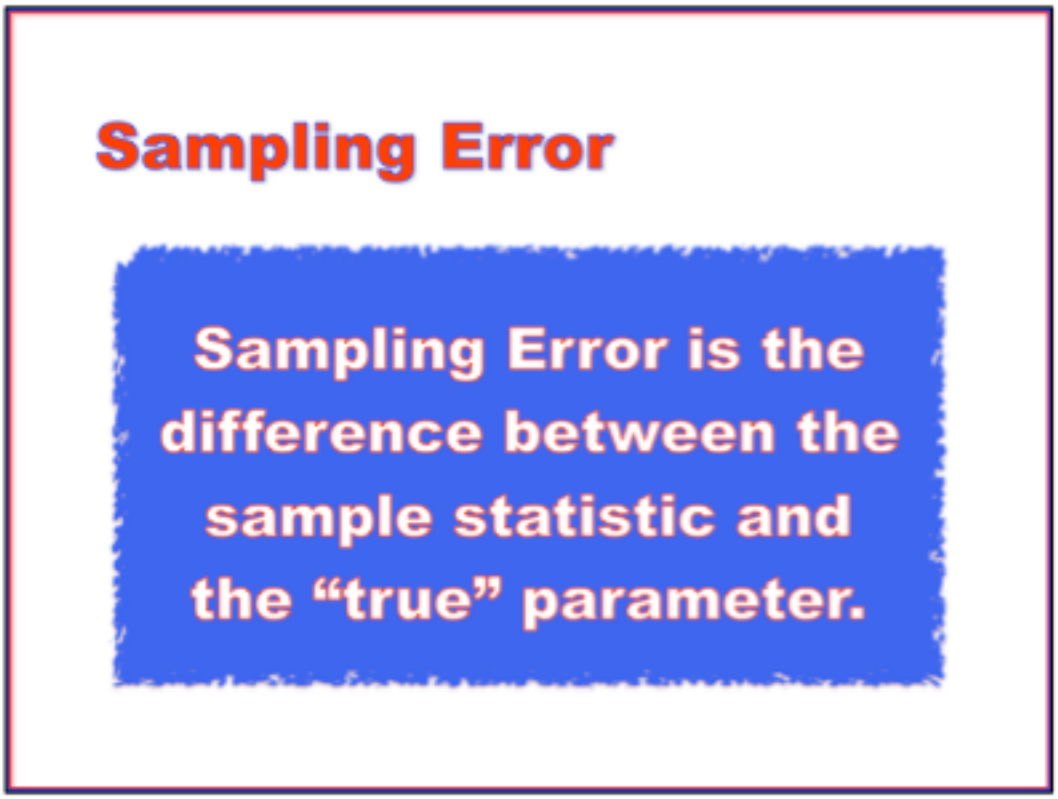
Audio
Whenever we conduct samples we have two sources of errors. The first is Sampling Error.



Video
Graphic showing Systematic Errors.

Audio
And, the second is Systematic Errors.

These errors distort the picture of the population. Whenever we review sample statistics, we should be aware that our findings can be distorted by these errors.

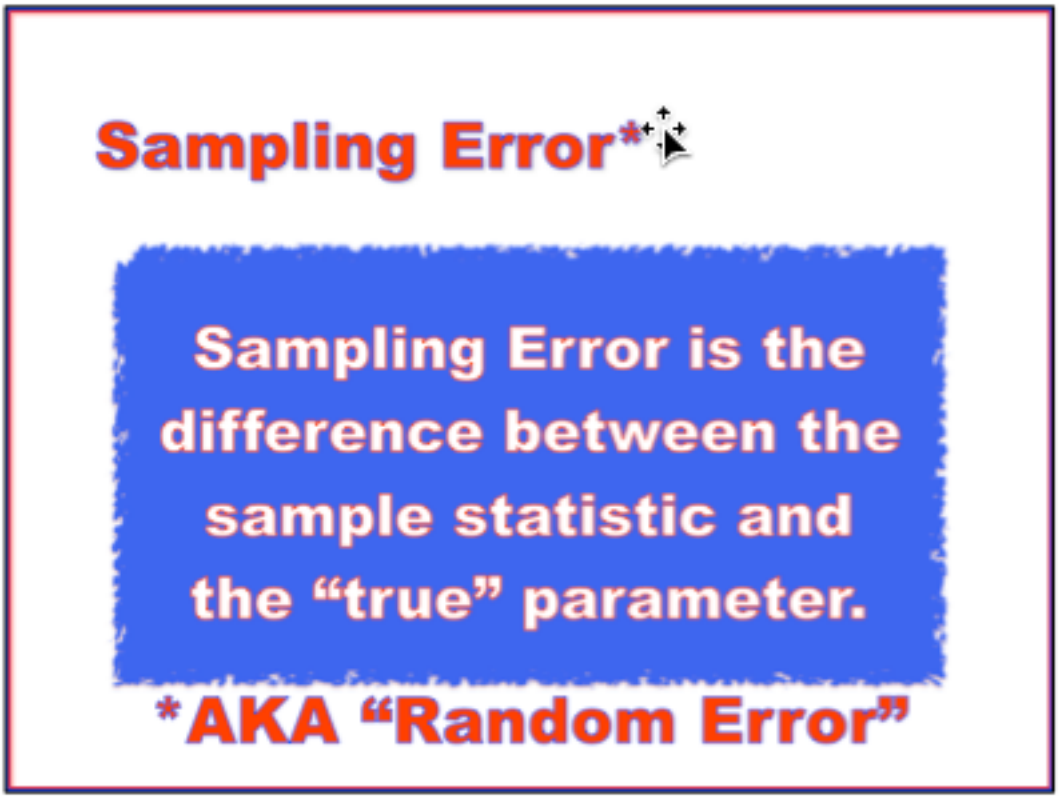


Video

Graphic showing the definition of Sampling Error.

Audio

Sampling Error is the difference between the Sample Statistic and the "true" Population Parameter.

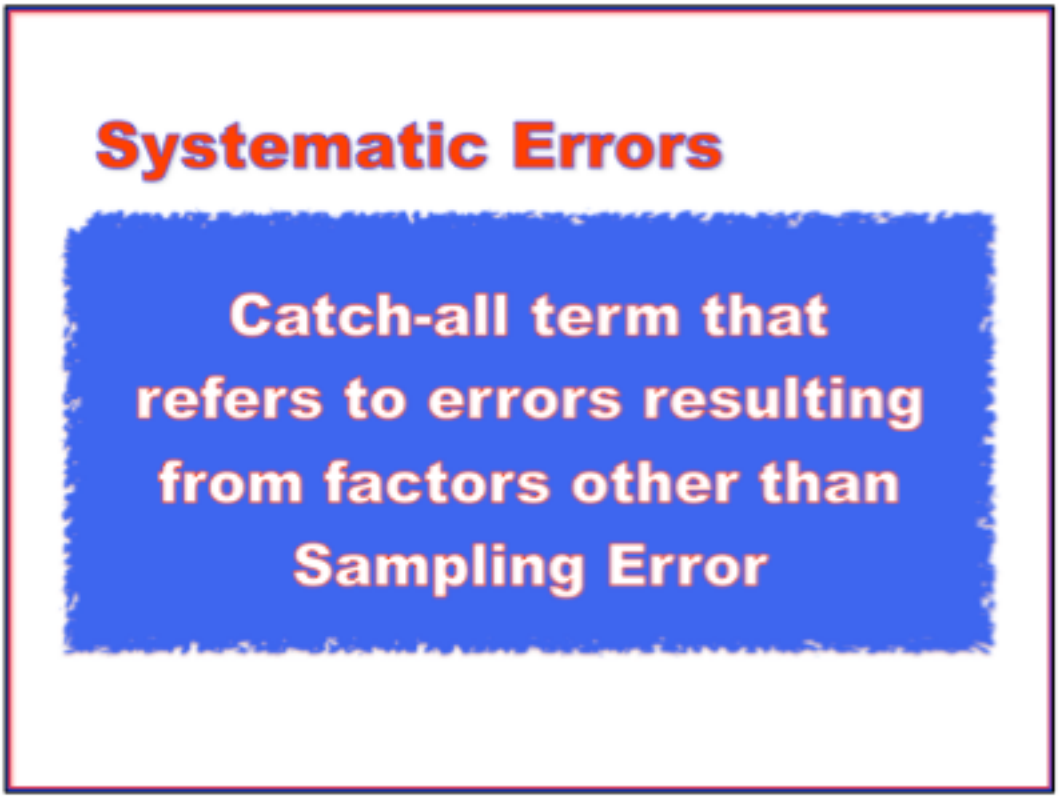


Video

Graphic showing the definition of Sampling Error with a super that reads, "AKA, Random Error."

Audio

Sampling Error is also know as Random Error and Random Sampling Error. We will investigate Sampling Error in greater detail in Part III.

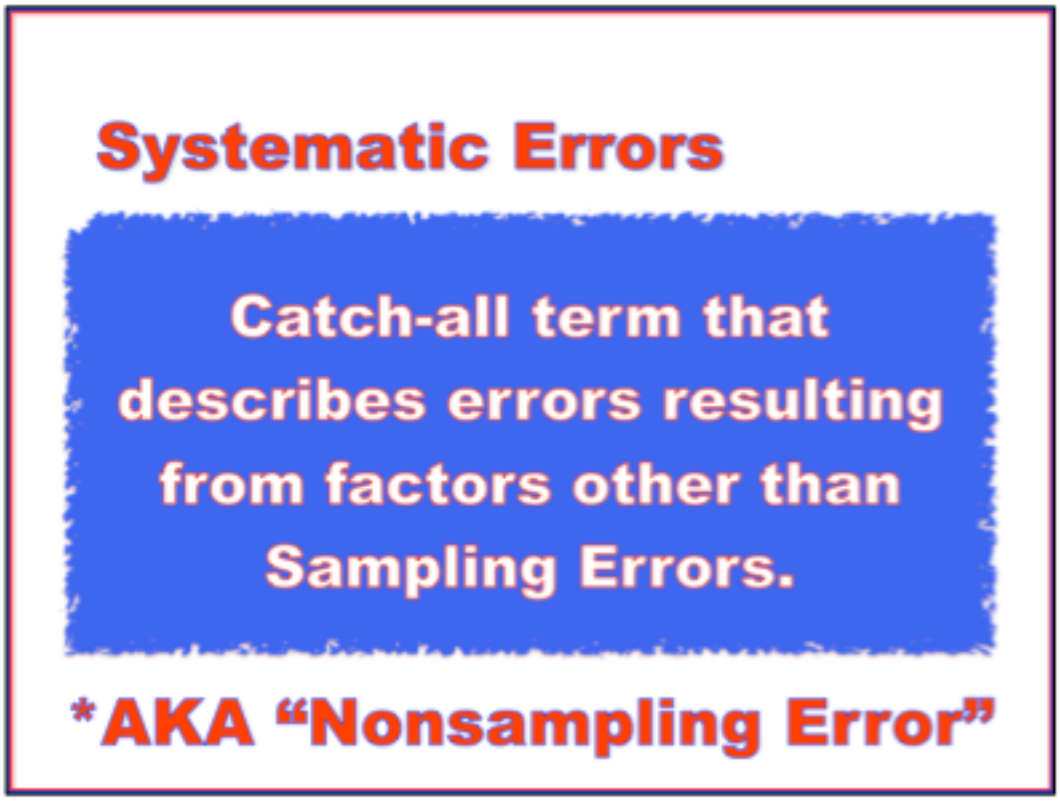


Video

Graphic showing the definition of Systematic Errors.

Audio

Systematic Errors is a catch-all term that refers to a variety of errors that result from factors other than those related to Sampling Error.

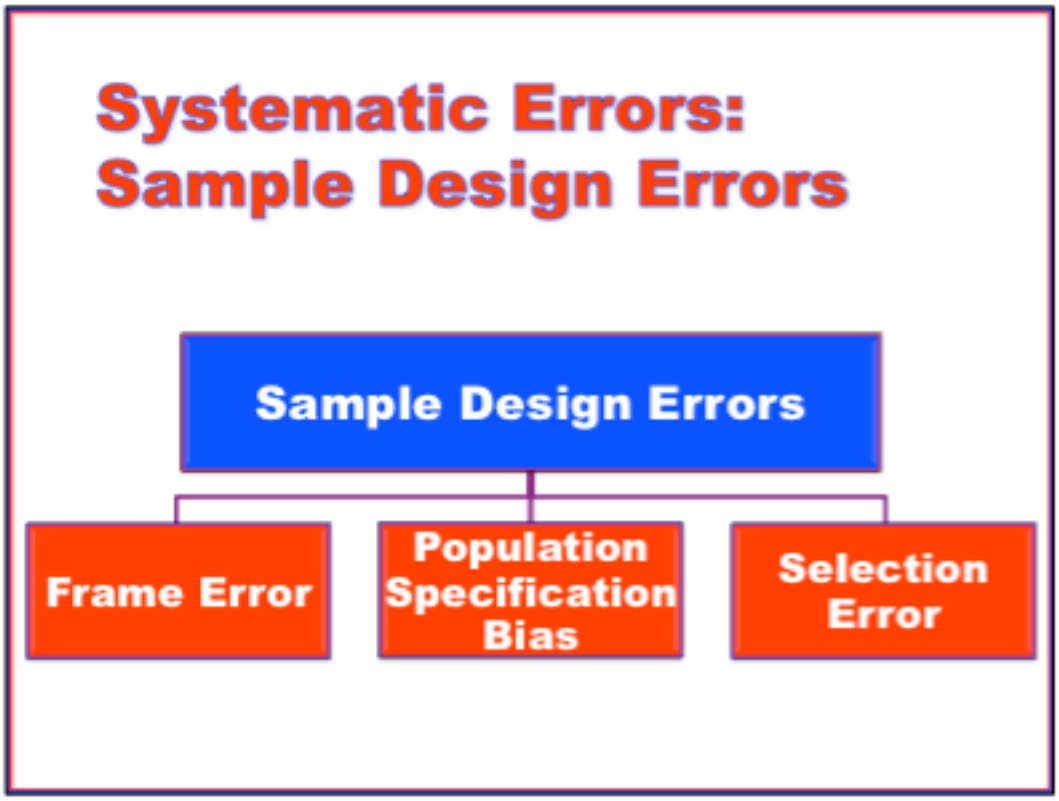


Video

Graphic showing the definition of Sampling Error with the added super that reads, "Nonsampling Error."

Audio

Systematic errors are also known as Nonsampling Errors.

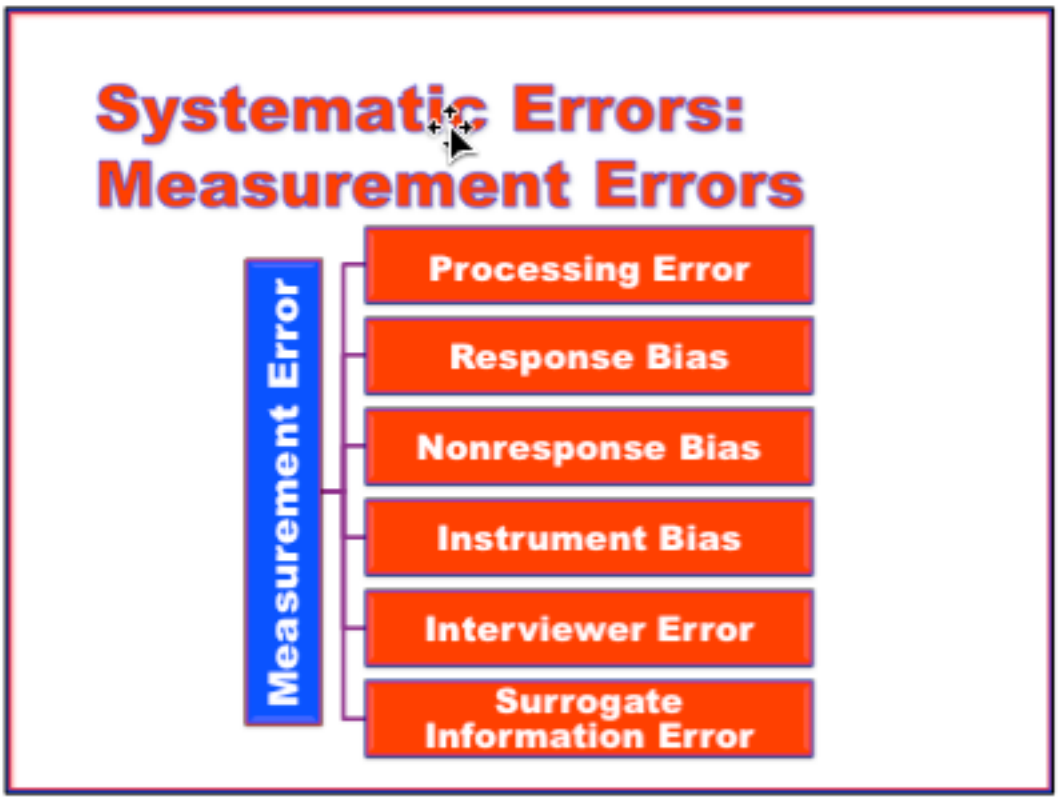


Video

Graphic showing the three types of Sample Design Errors: Frame Error, Population Specification Bias, and Selection Error.

Audio

Systematic Errors can be divided into two broad categories. The first category is Sample Design Errors, which include Sampling Frame Error, Population Specification Bias, and Selection Error.



Video

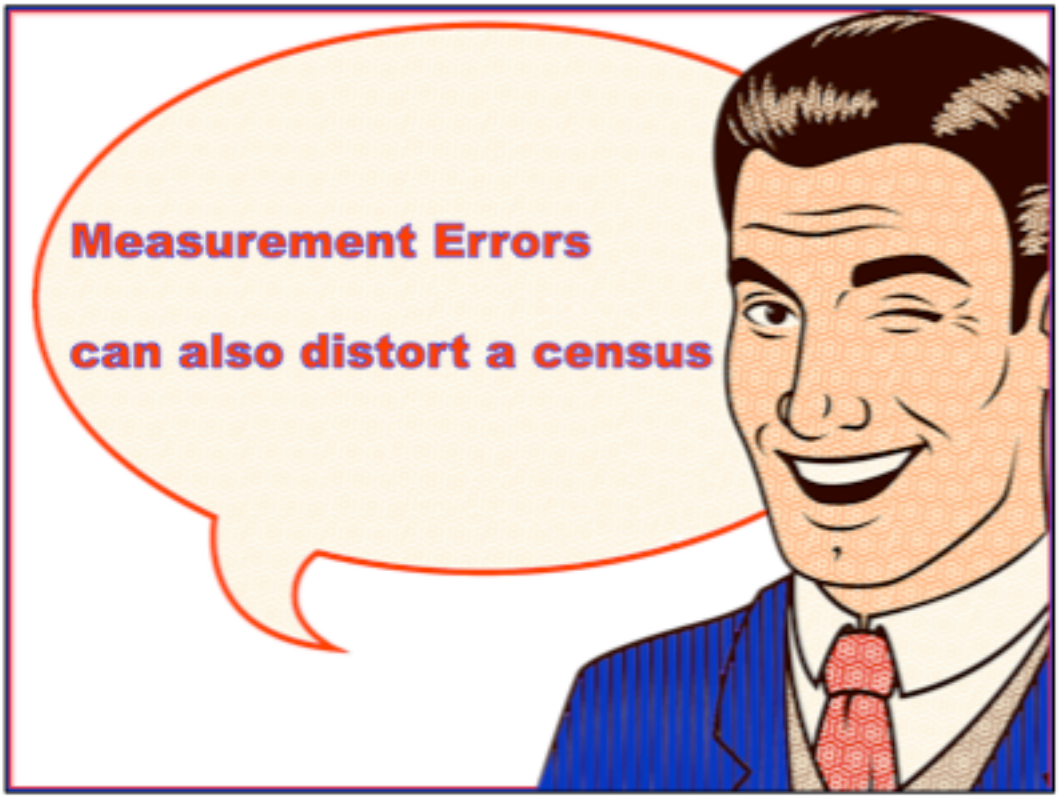
Graphic showing the six types of Measurement Errors: Processing Error, Response Bias, Nonresponse Bias, Instrument Bias, Interviewer Error, and Surrogate Information Error.

Audio

The second category is Measurement Errors, which includes Processing Error, Response Bias, Nonresponse Bias, Instrument Bias, Interviewer Error, and Surrogate Information Error. We will review Systematic Errors in detail in Part 6.

Video
Picture of a distorted image of a boy in a funhouse mirror.

Audio
Sampling Errors and Systematic Errors can distort the picture of the population. Credible data present a reasonably accurate, or unbiased, portrait of the population of interest. Whenever we use data, we must consider both Sampling Error and Systematic Errors.



Video
Cartoon of a man saying, “Measurement Errors can also distort a census.”

Audio
It is important to note that Measurement Errors may distort censuses as well as samples.

Video

Graphic of a arrow pointing to "Part 2: Why We Sample."

Audio

Let's move on to Part 2 where we will discuss the reasons why we typically rely on samples instead of populations.