


Sampling Theory and Methods

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Learning Objectives

- ▶ Explain the role of sampling in the research process
 - ▶ Distinguish between probability and nonprobability sampling
 - ▶ Understand the factors to consider when determining sample size
 - ▶ Understand the steps in developing a sampling plan
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Sampling

Sampling is the process of selecting a small number of elements from a larger defined target group of elements such that the information gathered from the small group will allow judgments to be made about the larger groups

Census

U.S. Census Bureau

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United States
**Census
2010**



[2010 Census Main](#) | [About 2010 Census](#) | [Jobs](#) | [Timeline of Activities](#) | [Promotional Materials](#) | [FAQs](#)

About 2010 Census

In this section:

- [Why fill out the census form?](#)
- [2010 Census is Different](#)
- [How we prepare for 2010](#)
- [Census History](#)

You are here: [2010 Census](#) » [About 2010 Census](#)

About 2010 Census

What
Count
The census is a count of everyone residing in the United States: in all 50 states, Puerto Rico and the Island Areas.

Who
Everyone
All residents of the United States must be counted. This includes people of all ages, races, ethnic groups, citizens and non-citizens.

When
Every 10 years
Every 10 years, and the next census occurs in 2010. Census questionnaires will be mailed or delivered to every household in the United States in March 2010. The questions ask you to provide information that is accurate for your household as of April 1, 2010.

The Census Bureau must count everyone and submit state population totals to the U.S. President by December 31, 2010.

The first Census was conducted in 1790 and has been carried out every 10 years since then.

Basics of Sampling Theory

Population

Element

Defined target
population


Sampling unit

Sampling frame


Sampling Error

Sampling error is any type of bias that is attributable to mistakes in either drawing a sample or determining the sample size

Developing a Sampling Plan

1. Define the Population of Interest
 2. Identify a Sampling Frame (if possible)
 3. Select a Sampling Method
 4. Determine Sample Size
 5. Execute the Sampling Plan
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Defining Population of Interest

- ▶ Population of interest is entirely dependent on Management Problem, Research Problems, and Research Design.
 - ▶ Some Bases for Defining Population:
 - Geographic Area
 - Demographics
 - Usage/Lifestyle
 - Awareness
- 

Sampling Frame

- ▶ A list of population elements (people, companies, houses, cities, etc.) from which units to be sampled can be selected.
- ▶ Difficult to get an accurate list.
- ▶ *Sample frame error* occurs when certain elements of the population are accidentally omitted or not included on the list.
- ▶ See Survey Sampling International for some good examples

<http://www.surveysampling.com/>

Sampling Methods



Probability
sampling



Nonprobability
sampling

Types of Sampling Methods

Probability

- ▶ Simple random sampling
- ▶ Systematic random sampling
- ▶ Stratified random sampling
- ▶ Cluster sampling

Nonprobability


- ▶ Convenience sampling
- ▶ Judgment sampling
- ▶ Quota sampling
- ▶ Snowball sampling

Simple Random Sampling

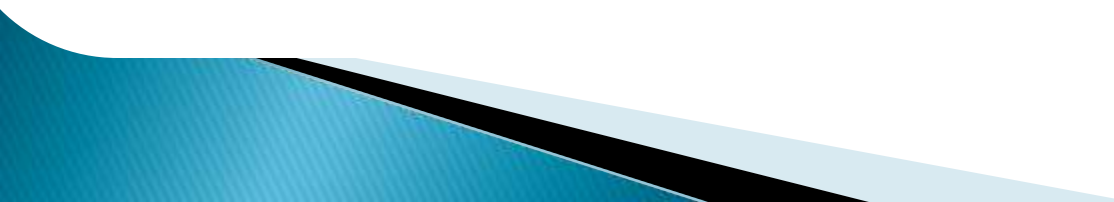
Simple random sampling is a method of probability sampling in which every unit has an equal nonzero chance of being selected

Systematic Random Sampling

Systematic random sampling is a method of probability sampling in which the defined target population is ordered and the sample is selected according to position using a skip interval




Steps in Drawing a Systematic Random Sample

- ▶ 1: Obtain a list of units that contains an acceptable frame of the target population
 - ▶ 2: Determine the number of units in the list and the desired sample size
 - ▶ 3: Compute the skip interval
 - ▶ 4: Determine a random start point
 - ▶ 5: Beginning at the start point, select the units by choosing each unit that corresponds to the skip interval
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Stratified Random Sampling

Stratified random sampling is a method of probability sampling in which the population is divided into different subgroups and samples are selected from each

Steps in Drawing a Stratified Random Sample

- ▶ 1: Divide the target population into homogeneous subgroups or strata
 - ▶ 2: Draw random samples from each stratum
 - ▶ 3: Combine the samples from each stratum into a single sample of the target population
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Nonprobability Sampling Methods

Convenience sampling relies upon convenience and access

Judgment sampling relies upon belief that participants fit characteristics

Quota sampling emphasizes representation of specific characteristics

Snowball sampling relies upon respondent referrals of others with like characteristics

Factors to Consider in Sample Design

Research objectives

Degree of accuracy

Resources


Time frame

Knowledge of
target population

Research scope

Statistical analysis needs


Determining Sample Size

- ▶ How many completed questionnaires do we need to have a representative sample?
 - ▶ Generally the larger the better, but that takes more time and money.
 - ▶ Answer depends on:
 - How different or dispersed the population is.
 - Desired level of confidence.
 - Desired degree of accuracy.
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Common Methods for Determining Sample Size

- ▶ Common Methods:
 - Budget/time available
 - Executive decision
 - Statistical methods
 - Historical data/guidelines
 - See Table

Factors Affecting Sample Size for Probability Designs

- ▶ Variability of the population characteristic under investigation
 - ▶ Level of confidence desired in the estimate
 - ▶ Degree of precision desired in estimating the population characteristic
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Probability Sampling and Sample Sizes

- ▶ When estimating a population mean

$$n = (Z^2_{B,CL})(\sigma^2/e^2)$$

- ▶ When estimates of a population proportion are of concern

$$n = (Z^2_{B,CL})([P \times Q]/e^2)$$

For a simple sample size calculator, click here:

<http://www.surveysystem.com/sscalc.htm>