

CHAPTER 11
Basic Sampling Issues

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Learning Objectives

1. To understand the concept of sampling.
2. To learn the steps in developing a sampling plan.
3. To distinguish between probability, samples, and nonprobability samples.
4. To understand the concepts of sampling error and nonsampling error.

Learning Objectives

5. To review the types of probability sampling methods.
6. To gain insight into nonprobability sampling methods.

Basic Sampling Issues

To understand the concept of sampling.

DEFINITION OF IMPORTANT TERMS

Population or Universe

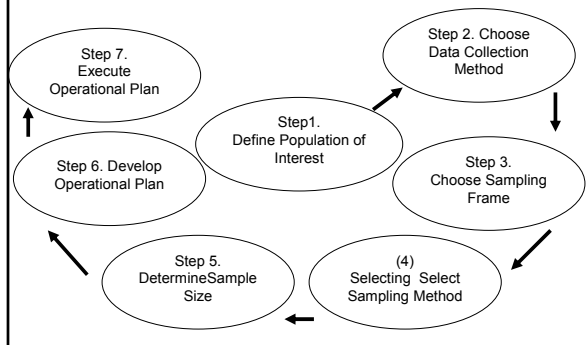
The total group of people from whom we need to obtain information.

Sample versus Census

Census: Data about every member of the population.

Sample: A subset of the population

Figure 11.1
Steps in Developing a Sample Plan



Basic Sampling Issues

To understand the steps in developing a sample plan.

STEPS IN DEVELOPING A SAMPLING PLAN

Step One: Define the Population of Interest

Specifying the characteristics from whom information is needed.

Step Two: Choose a Data Collection Method

Impacts subsequent steps.

Step Three: Choose a Sampling Frame

A list of population elements or members from which we select units to be sampled.

Chapter 11 | Learning Objective |

Basic Sampling Issues To understand the steps in developing a sample plan.

STEPS IN DEVELOPING A SAMPLING PLAN

Step Two: Select a Sampling Method

The selection will depend on:

- The objectives of the study
- The financial resources available
- Time limitations
- The nature of the problem

Chapter 11 | Learning Objective |

Basic Sampling Issues To distinguish between probability samples and nonprobability samples.

STEPS IN DEVELOPING A SAMPLING PLAN

Probability Samples
Selected with a known, nonzero probability of selection

Nonprobability Samples
Elements selected in a nonrandom manner.

Step Five: Determine the Population Size

- Available budget
- Rules of thumb
- Number of subgroups

Chapter 11 | Learning Objective |

Basic Sampling Issues To distinguish between probability samples and nonprobability samples.

STEPS IN DEVELOPING A SAMPLING PLAN

Step Six: Develop the Operational Procedures for Selecting Sample Elements

Specify whether a probability or nonprobability sample is being used

Step Seven: Execute the Sample Plan

The final step of the operational sampling plan

Chapter 11 | Learning Objective |

Basic Sampling Issues | To understand the concepts of sampling error and nonsampling error.

SAMPLING AND NONSAMPLING ERRORS | A population parameter is a value that defines a true characteristic of a total population.

Two types of sampling error:

- Administrative error: problems in the execution of the sample
- Random sampling error: due to chance and cannot be avoided

Chapter 11 | Learning Objective |

Basic Sampling Issues | To review the types of probability sampling methods.

PROBABILITY SAMPLING METHODS | **Simple Random Sampling**
The purest form of probability sample

Probability of Selection = $\frac{\text{Sample Size}}{\text{Population Size}}$

Systematic Sampling
Uses a fixed skip interval to draw elements from a numbered population.

Skip Interval = $\frac{\text{Population Size}}{\text{Sample Size}}$

Chapter 11 | Learning Objective |

Basic Sampling Issues | To review the types of probability sampling methods.

SAMPLING AND NONSAMPLING ERRORS | **Stratified Samples**

1. The original population is divided into two or more mutually exclusive and exhaustive subsets
2. Simple random samples of elements from the two or more subsets are chosen independently from each other.

Chapter 11 | Learning Objective |

Basic Sampling Issues To review the types of probability sampling methods.

SAMPLING AND NONSAMPLING ERRORS Three steps involved in implementing a properly stratified sample:

1. Identify salient demographic or classification factors correlated with the behavior of interest.
2. Determine what proportions of the population fall into various subgroups under each stratum.
 - proportional allocation
 - disproportional or optimal allocation

Chapter 11 | Learning Objective |

Basic Sampling Issues To review the types of probability sampling methods.

SAMPLING AND NONSAMPLING ERRORS 3. Select separate simple random samples from each stratum.

Cluster Samples

Probability samples drawn from a sample of geographic areas.

1. The population of interest is divided into mutually exclusive and exhaustive subsets.
2. A random sample of the subsets is selected.

Chapter 11 | Learning Objective |

Basic Sampling Issues To gain insight into nonprobability sampling methods.

NONPROBABILITY SAMPLING METHODS

Convenience Samples
Easy to collect

Judgement Samples
Based on judgmental selection criteria

Quota Samples
Demographic characteristics in the same proportion as in the population

Snowball Samples
Additional respondents selected on referral from initial respondents.

Internet Samples

CHAPTER 12
Sample Size Determination

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- Learning Objectives
1. To learn the financial and statistical issues in the determination of sample size.
 2. To discover the methods for determining sample size.
 3. To gain an appreciation of a normal distribution.
 4. To understand population, sample, and sampling distribution.

- Learning Objectives
5. To distinguish between point and interval estimates.
 6. To recognize problems involving sampling means and proportions.

Chapter 11 | Learning Objective |

Basic Sampling Issues The financial and statistical issues in the determination of sample size.

DETERMINING the SAMPLE SIZE for PROBABILITY SAMPLES **Financial, Statistical, and Managerial Issues**

The sample, the less the sampling error. Larger samples cost more.

Budget Available
Financial constraints challenge the researcher.

Rules of Thumb
A gut feeling for the right sample size?

Chapter 11 | Learning Objective |

Basic Sampling Issues To discover the methods for determining sample size.

DETERMINING the SAMPLE SIZE for PROBABILITY SAMPLES **Number of Subgroups To Be Analyzed**

The sample should contain at least 100 respondents in each major subgroup.

Traditional Statistical Methods

- An estimate of the population standard deviation.
- The acceptable level of sampling error.
- The desired level of confidence that the sample will fall within a certain range of the true population values.

Chapter 11 | Learning Objective |

Basic Sampling Issues To gain an appreciation of a normal distribution.

THE NORMAL DISTRIBUTION **General Properties**

- Continuous, bell shaped, symmetrical about the mean
- Mean, median, mode are equal
- Sixty-eight percent within $+1/-1$ one standard deviation.
- Ninety-five percent within $+2/-2$ standard deviations.
- Ninety-nine percent within $+3/-3$ standard deviations

Chapter 11 | Learning Objective |

Basic Sampling Issues To gain an appreciation of a normal distribution.

THE NORMAL DISTRIBUTION

The Central Limit Theorem
Approximates a normal distribution regardless of the actual distribution.

The Standard Normal Distribution

$Z = \frac{\text{value of the variable} - \text{mean of the variable}}{\text{standard deviation of the variable}}$

Chapter 11 | Learning Objective |

Basic Sampling Issues To understand population, sample, and sampling distribution.

POPULATION, SAMPLE, and SAMPLING DISTRIBUTIONS

Population Distribution
A frequency distribution of all the elements of a population.

Sample Distribution
A frequency distribution of all the elements of an individual sample.

Sampling Distribution of the Sample Mean
A frequency distribution of the means of many sample means: same population

Chapter 11 | Learning Objective |

Basic Sampling Issues To understand population, sample, and sampling distribution.

POPULATION, SAMPLE, and SAMPLING DISTRIBUTIONS

The Standard Error of the Mean
The deviation of a distribution of sample means.

The Population Distribution
↓
Provides Data for
↓
Possible Sample Distributions
↓
Provide Data for
↓
The Sampling Distribution of the Sample Means

Chapter 11	Learning Objective
Basic Sampling Issues	To understand population, sample, and sampling distribution.
SAMPLING DISTRIBUTION of the MEAN	<p>Basic Concepts</p> <ol style="list-style-type: none"> 1. A normal distribution 2. Mean equal to the population mean. 3. Standard deviation: population of the standard deviation divided by the square root of the sample size. <p>Making Inferences on the Basis of a Single Sample</p> <p>Probability that any one random sample will produce an estimate of the population mean that is ± 1 standard error of the true population mean.</p>

Chapter 11	Learning Objective
Basic Sampling Issues	To distinguish between point and interval estimates.
SAMPLING DISTRIBUTION of the MEAN	<p>Point Estimates</p> <p>Inferences regarding the sampling error associated with a particular estimate of the population value.</p> <p>Interval Estimate</p> <p>Inference regarding the likelihood that a population value will fall within a certain range.</p> <p>Confidence Level</p> <p>The probability that a particular confidence interval will include the true population value.</p>

Chapter 11	Learning Objective
Basic Sampling Issues	To recognize problems involving sampling means and proportions.
SAMPLING DISTRIBUTION of the PROPORTION	<p>The Sampling Distribution of the Proportion</p> <p>A relative frequency distribution of the sample proportions of a large number of random samples of a given size drawn from a particular population.</p> <p>Examples:</p> <ul style="list-style-type: none"> • the percentage of the population who is aware of a particular ad • the percentage of the population who will buy a new product

Chapter 11 | Learning Objective |

Basic Sampling Issues To recognize problems involving sampling means and proportions.

SAMPLE SIZE DETERMINATION **Problems Involving Means**

1. Specification of the acceptable level of sampling error.
 - the amount of sampling error the researcher is willing to accept
2. Specification of the acceptable level of confidence in standard errors or Z values.
3. Estimate the population standard deviation
 - the standard deviation of a variable for the entire population

Chapter 11 | Learning Objective |

Basic Sampling Issues To recognize problems involving sampling means and proportions.

SAMPLE SIZE DETERMINATION **Problems Involving Proportions**

1. Decide on an acceptable value for E.
2. Assume researcher has determined a need to be 95 percent confident that the sample estimate is within $\pm 4\%$ of the true population proportion.
3. Use, for this example, a value of .3 for P.

Chapter 11 | Learning Objective |

Basic Sampling Issues To recognize problems involving sampling means and proportions.

SAMPLE SIZE DETERMINATION **Population Size and Sample Size**

Rule of thumb
Make an adjustment in the sample size if the sample size is more than 5 percent of the size of the total population.

Finite Population Correction (FPC)
An adjustment in cases where the sample is expected to be equal to 5 percent or more of the total population. $(N-n) / (N-1)$

Basic Sampling Issues

To recognize problems involving sampling means and proportions.

STATISTICAL POWER

Statistical Power

The probability of not making a Type II error.

Type I Error

The error of concluding that there is a difference when there is not a difference.

Type II Error

The error of saying that there is no difference when there actually is a difference.
