

Research Methodology

Chapter 6: Sample Designs and Sampling Procedures

Sampling Terminology

- Sample
- Population or universe
- Population element
- Census

Sample

- Subset of a larger population

Population

- A **population** is the total collection of elements about which we wish to make some inferences.
- Any complete group
 - People
 - Sales territories
 - Stores

Census

- Investigation of all individual elements that make up a population

A **census** is a count of all the elements in a population.

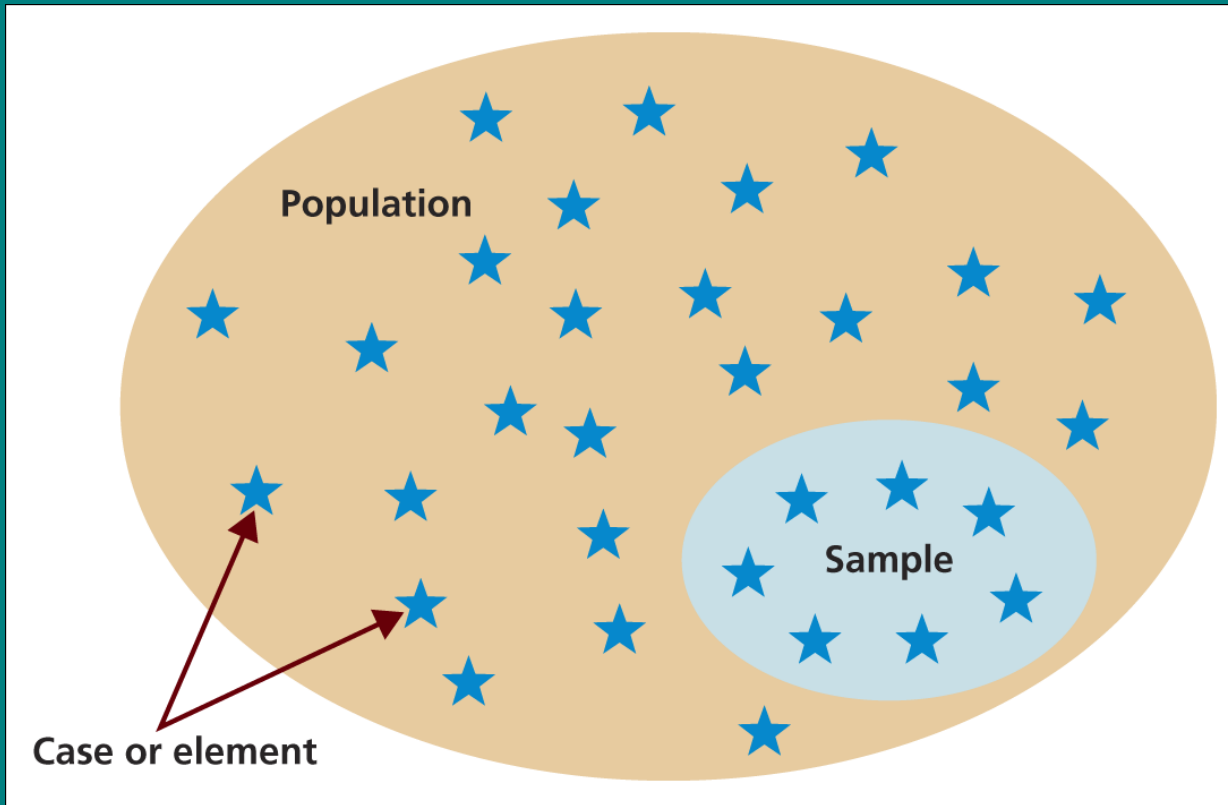


Sampling

- The process of using a small number of items or parts of larger population to make a conclusions about the whole population

Selecting samples

Population, sample and individual cases



Source: Saunders *et al.* (2009)

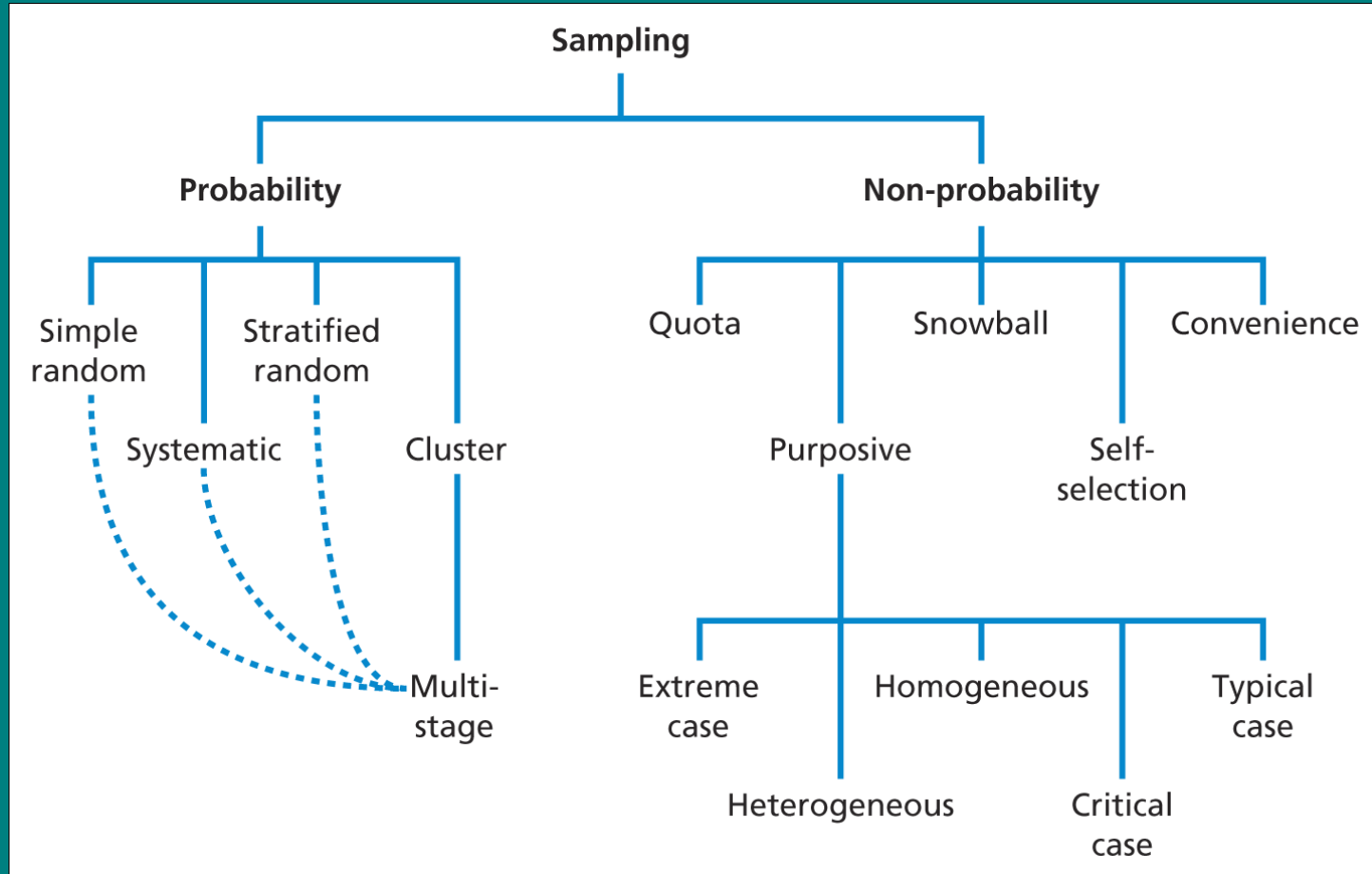
The need to sample

Sampling- a valid alternative to a census when

- A survey of the entire population is impracticable
- Budget constraints restrict data collection
- Time constraints restrict data collection
- Results from data collection are needed quickly

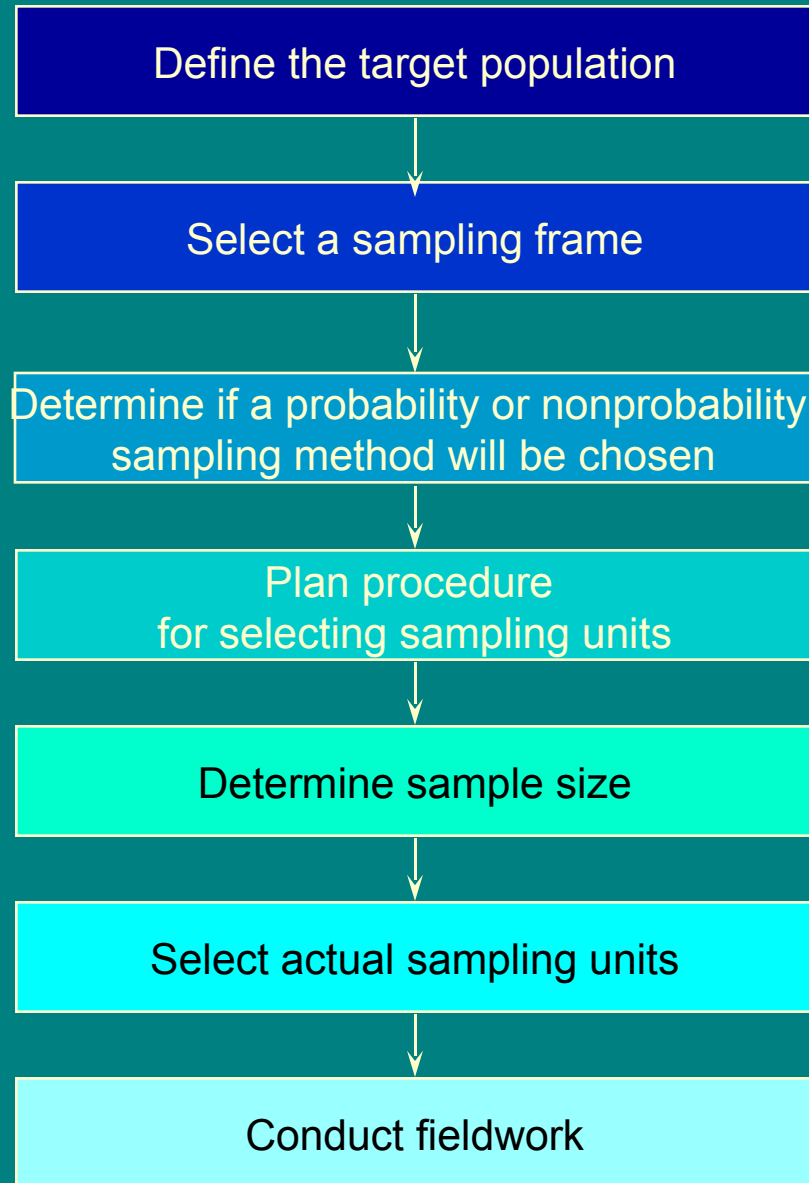
Overview of sampling techniques

Sampling techniques



Source: Saunders *et al.* (2009)

Stages in the Selection of a Sample



Target Population

- The specific , complete group to research project

Sampling Frame

- A **sample frame** is the listing of all population elements from which the sample will be drawn.

Sampling Units

- Group selected for the sample
- Primary Sampling Units (PSU)
- Secondary Sampling Units
- Tertiary Sampling Units

Random Sampling Error

- The difference between the sample results and the result of a census conducted using identical procedures
- Statistical fluctuation due to chance variations

Systematic Errors

- Nonsampling errors
- Unrepresentative sample results
- Not due to chance
- Due to study design or imperfections in execution

Errors Associated with Sampling

- Sampling frame error
- Random sampling error
- Nonresponse error

Two Major Categories of Sampling

- Probability sampling
 - Known, nonzero probability for every element
- Nonprobability sampling
 - Probability of selecting any particular member is unknown

Nonprobability Sampling

- Convenience
- Judgment
- Quota
- Snowball

Probability Sampling

- Simple random sample
- Systematic sample
- Stratified sample
- Cluster sample
- Multistage area sample

Convenience Sampling

- Convenience samples are nonprobability samples where the element selection is based on ease of accessibility. They are the least reliable but cheapest and easiest to conduct.
- Examples include informal pools of friends and neighbors, people responding to an advertised invitation, and “on the street” interviews.

Judgment Sampling

- Also called purposive sampling
- An experienced individual selects the sample based on his or her judgment about some appropriate characteristics required of the sample member

Quota Sampling

- Ensures that the various subgroups in a population are represented on pertinent sample characteristics
- To the exact extent that the investigators desire
- It should not be confused with stratified sampling.

Snowball Sampling

- A variety of procedures
- Initial respondents are selected by probability methods
- Additional respondents are obtained from information provided by the initial respondents

Simple Random Sampling

- A sampling procedure that ensures that each element in the population will have an equal chance of being included in the sample

Simple Random

Advantages

- Easy to implement with random dialing

Disadvantages

- Requires list of population elements
- Time consuming
- Larger sample needed
- Produces larger errors
- High cost

Systematic Sampling

- A simple process
- Every n th name from the list will be drawn

Systematic

Advantages

- Simple to design
- Easier than simple random
- Easy to determine sampling distribution of mean or proportion

Disadvantages

- Periodicity within population may skew sample and results
- Trends in list may bias results
- Moderate cost

Stratified Sampling

- Probability sample
- Subsamples are drawn within different strata
- Each stratum is more or less equal on some characteristic
- Do not confuse with quota sample

Stratified

Advantages

- Control of sample size in strata
- Increased statistical efficiency
- Provides data to represent and analyze subgroups
- Enables use of different methods in strata

Disadvantages

- Increased error if subgroups are selected at different rates
- Especially expensive if strata on population must be created
- High cost

Cluster Sampling

- The purpose of cluster sampling is to sample economically while retaining the characteristics of a probability sample.
- The primary sampling unit is no longer the individual element in the population
- The primary sampling unit is a larger cluster of elements located in proximity to one another

Cluster

Advantages

- Provides an unbiased estimate of population parameters if properly done
- Economically more efficient than simple random
- Lowest cost per sample
- Easy to do without list

Disadvantages

- Often lower statistical efficiency due to subgroups being homogeneous rather than heterogeneous
- Moderate cost

Examples of Clusters

Population Element	Possible Clusters in the United States
U.S. adult population	States Counties Metropolitan Statistical Area Census tracts Blocks Households

Examples of Clusters

Population Element	Possible Clusters in the United States
College seniors	Colleges
Manufacturing firms	Counties
	Metropolitan Statistical Areas
	Localities
	Plants

Examples of Clusters

Population Element	Possible Clusters in the United States
Airline travelers	Airports Planes
Sports fans	Football stadiums Basketball arenas Baseball parks

What is the Appropriate Sample Design?

- Degree of accuracy
- Resources
- Time
- Advanced knowledge of the population
- National versus local
- Need for statistical analysis

Internet Sampling is Unique

- Internet surveys allow researchers to rapidly reach a large sample.
- Speed is both an advantage and a disadvantage.
- Sample size requirements can be met overnight or almost instantaneously.
- Survey should be kept open long enough so all sample units can participate.

Internet Sampling

- Major disadvantage
 - lack of computer ownership and Internet access among certain segments of the population
- Yet Internet samples may be representative of a target populations.
 - target population - visitors to a particular Web site.
- Hard to reach subjects may participate

Web Site Visitors

- Unrestricted samples are clearly convenience samples
- Randomly selecting visitors
- Questionnaire request randomly "pops up"
- Over- representing the more frequent visitors

Panel Samples

- Typically yield a high response rate
 - Members may be compensated for their time with a sweepstake or a small, cash incentive.
- Database on members
 - Demographic and other information from previous questionnaires
- Select quota samples based on product ownership, lifestyle, or other characteristics.
- Probability Samples from Large Panels

Internet Samples

- Recruited Ad Hoc Samples
- Opt-in Lists