

# Sampling

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# Sampling

Defined

- Sampling is the process by which a portion of the population of interest is drawn to study
- Technically, any portion of a population is a sample. However, not all samples are good samples.

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# Sampling

Terminology

- Population
  - A collection of elements possessing a common set of characteristics*
  - The researcher defines the population*
- Sampling frame
  - An actual list from which the sample elements are drawn. It is "operationalized" population*
- Census
  - Study of the whole population*

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# Sampling

Terminology

- Sample
  - A subset of the population drawn for studying*
- Sampling unit
  - Selection unit from the frame*
  - May contain more than one element*
- Sample element
  - Elements in the sample that are individually studied*

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## Sampling

Potential errors

### ■ Sampling error

*Error stemming from the study of a portion of a population rather than using a census*

- Generally, sampling error occurs with a random behavior and its magnitude may be controlled

### ■ Frame error

*Error stemming from using a frame that does not properly represent the population*

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## Why sample?

Reasons for sampling

- Cost and time savings
- Result may be more accurate
- Measurement can be a destructive process

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## Sampling methods

Two major types

### ■ Probability sampling

*Any process where the elements of the population have a known probability of being included in the sample  
(Known in the sense that it can be calculated)*

### ■ Nonprobability sampling

*Any process where the elements of the population do not have a known probability of being included in the sample*

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## Probability sampling

Simple random sampling

- All the elements in the population have an equal probability of being included in the sample

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## Probability sampling

Simple random sampling, attributes

- More suitable for homogeneous populations
- Valid representation of the population
- Not an efficient sampling method
- Requires a complete listing of the population

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## Probability sampling

Systematic sampling

- Elements are selected with a fixed interval from a listing of the population
  - The selection interval,  $k$ , is calculated as:

*Frame size / Sample size*

1	John		
2	Mary	←	Starting point
3	Harry		
.	.		
.	.		
21	Hilary		
22	Joe	←	Next element

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## Probability sampling

Systematic sampling, attributes

- More efficient than simple random sampling
- Assumes sufficient randomness in the list
- Requires a list of the sampling frame
- Less representative than simple random
- Lists may have periodicity

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## Probability sampling

Cluster sampling

- Selects clusters of elements at random
- If clusters are geographic areas, it is called area sampling

Cluster 1	Cluster 2	Cluster 3	Cluster 4
15 18 14	50 25 48	95 108 41	19 80 164
17 101 38	17 83 39	10 86 81	77 181 51
23 89 12	46 16 34	34 99 20	185 90 168

*Use all elements (single-stage) or select some elements (multi-stage)*

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## Probability sampling

Cluster sampling, attributes

- Single-stage
- Multi-stage
- A sampling frame of clusters is available
- Economic efficiency

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## Probability sampling

Stratified sampling

- Creates more homogeneous strata and draws a simple random sample from each

Stratum 1	Stratum 2	Stratum 3	Stratum 4
15 18 14	50 52 48	95 108 104	159 180 164
17 11 11	47 38 39	107 86 101	177 181 151
23 9 12	36 60 54	103 99 120	185 190 168

*Take a simple random sample from each*

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## Probability sampling

Stratified sampling, attributes

- Proportionate allocation
- Disproportionate allocation
- Requires some knowledge of the population
- Increases efficiency

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## Nonprobability sampling

Convenience sampling

- Selects sample elements based on the convenience of the selection
  - A subjective process of selection
  - Some elements of the population may be omitted
  - Easy to implement
  - Potentially high control on the interviewers

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## Nonprobability sampling

Quota sampling

- One or more attributes of the sample are matched to that of the population
  - Attributes are given "quotas" to mimic the population
  - Interviewers determine the selection according to the quota

*A quota sample drawn from PC students may have gender quota to replicate the population distribution*

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## Nonprobability sampling

Judgment sampling

- Selects the elements based on the judgement of an expert because they represent the population
  - May be suitable for qualitative research
  - Quality of the sample depends on the quality of the judgement

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## Nonprobability sampling

Referral sampling

- Sample elements refer the researcher to other similar elements (snowball sampling)
  - Suitable when a sampling frame may not exist
  - More common in industrial marketing research

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