

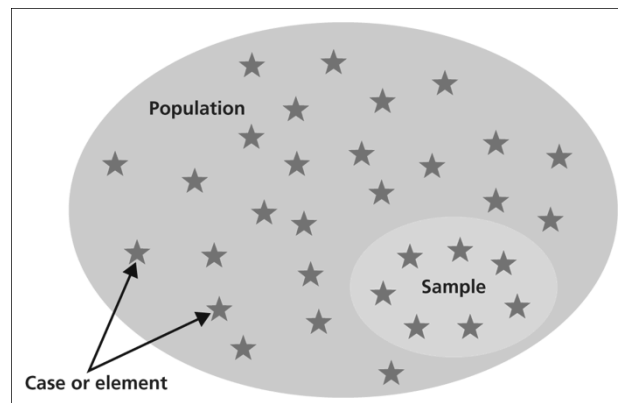
Slide 7.1

Selecting Samples - Sampling methods

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Slide 7.2

Selecting samples Population, sample and individual cases



Source: Saunders *et al.* (2009)

Figure 7.1 Population, sample and individual cases

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The need to sample

Sampling- a valid alternative to a census when

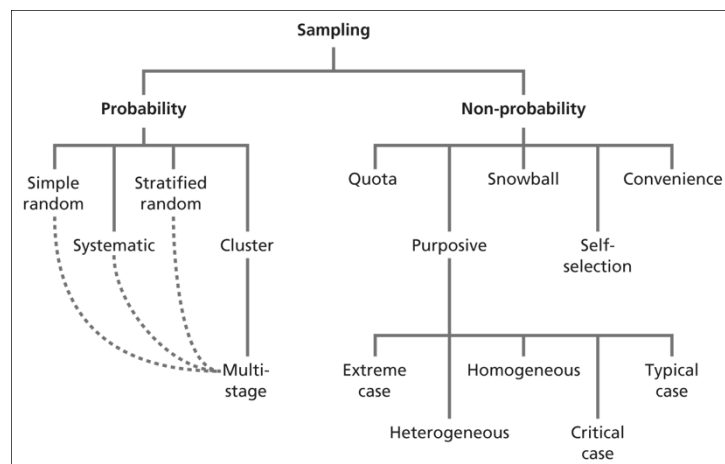
- A survey of the entire population is impracticable
- Budget constraints restrict data collection
- Time constraints restrict data collection
- Results from data collection are needed quickly

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Overview of sampling techniques

Sampling techniques



Source: Saunders *et al.* (2009)

Figure 7.2 Sampling techniques

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Probability sampling

The four stage process

1. Identify sampling frame from research objectives
2. Decide on a suitable sample size (relative to the desired confidence level).
3. Select the appropriate technique and the sample
4. Check that the sample is representative

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Identifying a suitable sampling frame

Key points to consider

- Distribution of features within the population (is the distribution “normal”?)
- Extent of possible generalisation from the sample
- Validity and reliability
- Avoidance of bias

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Sample size

Choice of sample size is influenced by

- Confidence needed in the data
- Margin of error that can be tolerated
- Types of analyses to be undertaken
- Size of the sample population and distribution of features within the sample.

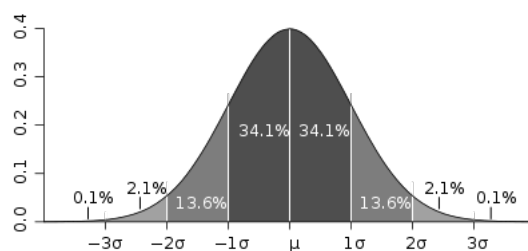
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Some types of distribution

- It is only meaningful to use an “average” (arithmetic mean) when a characteristic is distributed normally.

In a normal distribution,

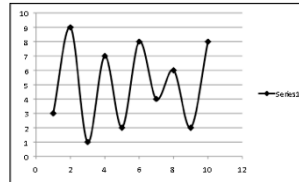


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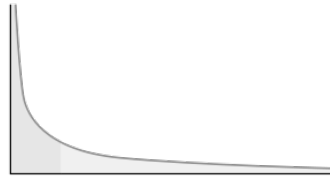
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Examples of non-normal distribution

- In a bi-modal (or multi-modal) distribution, the “average” (mean) is clearly meaningless:



- Similarly, a ‘power law’ distribution (Pareto or Zipf law distribution), the “average” (mean) would be very misleading!
E.g. The “80-20 law”, according to which 20% of all people receive 80% of all income, and 20% of the most affluent 20% receive 80% of that 80%, and so on, holds precisely when the Pareto index is $\alpha = \log_4 5$, approximately = 1.161.



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The importance of response rate

Key considerations

- Non-respondents and analysis of refusals
- Obtaining a representative sample
- Calculating the active response rate: whereas ‘total response rate’ is (number of responses)/(number in sample - ineligible responses), it is more usual to use the ‘active response rate (ARR)’ calculated by (total number of responses)/(number in sample - (ineligible + unreachable responses)).
- Estimating response rate and sample size: determining sample size needs to estimate the likely response rate = proportion of cases from the sample who will respond.

Actual sample size n^a can be estimated as $n \times 100/re\%$, where n is the minimum sample size relative to the required margin of error, $re\%$ is the estimated response rate.

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Selecting a sampling technique

Five main techniques used for a probability sample

- Simple random
- Systematic
- Stratified random
- Cluster
- Multi-stage

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Probability Sampling Methods 1

- **Simple Random sampling:** -- draw sample from a sampling frame at random -- using random number tables or a random number generator.
- **Systematic sampling:** number each case in the sampling frame uniquely; select first number at random.

Calculate the sampling fraction (= actual sample size n^a / total population).

Select subsequent cases systematically using the sampling fraction (e.g. if the fraction is 1/3, select one in every three cases)

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Probability Sampling Methods 2

- **Stratified random:** -- a modification of simple random in which the sampling frame is subdivided into two or more 'strata' based on the different attributes of the population (age, gender, income, class, ethnicity, etc.) Sample is drawn using random choices from each stratum ensuring the distribution of choices reflects the distribution of these attributes in the total population.
- **Cluster:** -- similar to stratified sampling -- but forming the sub-groups by natural (or practical) subdivisions (e.g. by geographical region or type of business)

Use random sampling relative to the distribution proportion of each sub-cluster.
- **Multi-stage:** -- a variant of cluster sampling except that different sampling frames are used for each cluster -- except that each sub-group is then re-sampled at a second stage, using random selection.

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Non- probability sampling (1)

Key considerations

- Deciding on a suitable sample size
- Selecting the appropriate technique

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Non- probability sampling (2)

Sampling techniques

- Quota sampling (larger populations)
- Purposive sampling
- Snowball sampling
- Self-selection sampling
- Convenience sampling

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Summary:

- Choice of sampling techniques depends upon the research question(s) and their objectives
- Factors affecting sample size include:
 - Distribution characteristics in the population
 - confidence needed in the findings
 - accuracy required
 - likely categories for analysis

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Summary:

- Probability sampling requires a sampling frame and can be more time consuming
- When a sampling frame is not possible, non-probability sampling is used
- Many research projects use a combination of sampling techniques

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Summary:

All choices of sample depend on the ability to gain access to data sources and your judgement as to whether the data values required can be obtained from those sources.

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