Factsheet: Simple random sampling

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Summary

This factsheet summarises simple random sampling {srs} and defines its expectation and variance.

Before reading this factsheet, it is recommended that you read [Guide: Introduction to sampling]

Simple random sampling {srs; $\bar{y}$}

In simple random sampling, everything in the population has **equal probability** of being chosen. Also, every possible sample has **equal probability** of being chosen.

> **i** Definition: Probability of selecting a particular sample under srs
>
> If a population has N individuals and you take a sample size of n, then:
> P(Selecting a particular sample) is
>
> $$\frac{1}{\binom{N}{n}}$$
>
> or
>
> $$\binom{n}{N}$$
>
> where:
>
> $$\binom{n}{N} = \frac{n!}{N!(n-N)!}$$

In srs, $\bar{y}$ is the sample mean of y, such that $\bar{y} = \frac{1}{n}\sum_{i=1}^{n} y_i$ and it is an unbiased estimator for the population mean μ.

This table contains key properties of $\bar{y}$ for srs:

Expectation $=$ E[$\bar{y}$]	μ

Variance = Var[$\bar{y}$]	$(1-f)\frac{S^2}{n}$
Confidence interval (CI)	$\bar{y} \pm Z_{\frac{\alpha}{2}} \frac{s}{\sqrt{n}} \sqrt{(1-f)}$

where,

- S^2 = Finite population variance of y = $\frac{1}{(N-1)} \sum_{i=1}^{n} (y_i - \mu)^2$
- f = Sampling fraction = $\frac{n}{N}$

Further reading

Version history

v1.0: initial version created 12/06 by Millie Harris as part of a University of St Andrews VIP project.