

# Factsheet: Confidence intervals

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## Summary

This factsheet summarises key information on constructing and understanding confidence intervals using the normal distribution.

*Before reading this factsheet, it is recommended that you read [Guide: Introduction to confidence intervals](#)*

## What is a confidence interval?

A confidence interval is a **range of values** which contains the true estimate with certain confidence, in repeated sampling.

### How to construct

$$[\bar{x} \pm Z_{\frac{\alpha}{2}} \frac{\sigma}{n}]$$

- $\bar{x}$  = the sample mean
- $Z_{\frac{\alpha}{2}}$  = the Z value
- $\sigma$  = the standard deviation
- $n$  = population total

## Confidence levels

Every CI has a confidence level (CL).

A confidence level (CL) suggests that if you were to repeat the study many times, you would expect the true estimate to fall within CL% of the results.

### Caution!

This does not mean there is a 95% chance the range of values contains the true estimate. Instead, if you were to **repeat the study** many times, with a CL of 95% - you would

**expect** 95% of the CIs to contain the true estimate.

## **$Z$ values for commonly used confidence levels**

This is a summary table of commonly used CL and their  $Z$  values, following a normal distribution.

Confidence level (CL)	$\frac{\alpha}{2}$	$Z_{\frac{\alpha}{2}}$
0.80 = 80%	0.10	1.282
0.85 = 85%	0.075	1.440
0.90 = 90%	0.05	1.645
0.95 = 95%	0.025	1.960
0.99 = 99%	0.005	2.576

## **Further reading**

For more questions on the subject, please go to [Questions: Confidence Intervals](#).

## **Version history**

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

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