INFORMATION POINT:

Confidence Interval

A 95% confidence interval for a population parameter, say the population mean, is the range of values within which we are reasonably confident (95% confident) that the true population value, which is unknown, will fall.

Most studies use data on a sample of individuals to make inferences about a wider target population. For example, the value of the sample mean is our best guess, called a point estimate, of the population mean for the target population. However, repeating the study is likely to result in a different sample mean, so a different estimate. Rather than quoting a single value best guess, it would be preferable to quote a range of values within which we feel confident that the population mean will lie. That is, to quote (*point estimate – margin of error*) to (*point estimate + margin of error*). This is called a confidence interval and produces a move from a single value estimate to a range of values that are considered plausible for the population parameter. The imprecision of our study is indicated by the width of the confidence interval, that is the margin of error.

The width of the confidence interval depends on three factors: the *sample size*; the *variability* of the characteristic being studied; and the *degree of confidence* required. The larger the sample size the more information we will have, so the result is more precise. Thus the width of the confidence interval should reduce as sample size increases. Wide confidence intervals emphasize the unreliability of conclusions based on small samples. The lower the variability from person to person of the characteristic being studied the more precise our sample estimate and the narrower our confidence interval.

The higher we want the degree of confidence that our interval will include the true population value, then the wider we need our confidence interval. For example, a 99% confidence interval will be wider than a 95% confidence interval because to be more confident that the true population value falls within the interval we will need to allow more potential values within the interval. The confidence level most commonly adopted is 95%.

We can calculate confidence intervals for a variety of population features, for example, for the mean or mean change, or for a proportion. Generally we will need to make some distributional assumptions in order to calculate a confidence interval. Gardner & Altman (1989) provide an excellent introduction to the calculation and interpretation of different confidence intervals.

Consider the study reported on p. 617: there is a significant mean difference in the Factor 2 score for nurses working on medical and surgical wards – this is shown by the P value given for the t-test and by the 95% confidence interval (–3.21 to –0.072) excluding zero. However, being significant does not necessarily imply the difference is of size large enough to matter clinically. Seeing the range of plausible values indicated by the confidence interval allows the healthcare professional to make a judgement about the clinical importance of differences in the feature being measured.

Further reading

Gardner M.J. & Altman D.G. (eds) (1989) *Statistics with confidence*. British Medical Journal, London.

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