

Chapter 1: Answers

Why do we use samples?

We are usually interested in populations, but because we cannot collect data from every human being (or whatever) in the population, we collect data from a small subset of the population (known as a *sample*) and use these data to infer things about the population as a whole.

What is the mean and how do we tell if it's representative of our data?

The mean is a simple statistical model of the centre of a distribution of scores. A hypothetical estimate of the 'typical' score. We use the variance, or standard deviation to tell us whether it is representative of our data. The standard deviation is a measure of how much error there is associated with the mean: a small standard deviation indicates that the mean is a good representation of our data.

What's the difference between the standard deviation and the standard error?

The standard deviation tells us how much observations in our sample differ from the mean value within our sample. The standard error tells us not about how the sample mean represents the sample itself, but how well the sample mean represents the *population* mean. The standard error is the standard deviation of the *sampling distribution* of a statistic. For a given statistic (e.g. the *mean*) it tells us how much variability there is in this statistic across *samples* from the same *population*. Large values, therefore, indicate that a statistic from a given sample may not be an accurate reflection of the population from which the sample came.

What is a test statistic and what does it tell us?

A test statistic is a statistic for which we know how frequently different values occur. The observed value of such a statistic is typically used to test hypotheses, or to establish whether a model is a reasonable representation of what's happening in the population.

What are Type I and Type II errors?

A Type I error occurs when we believe that there is a genuine effect in our population, when in fact there isn't. A Type II error: occurs when we believe that there is no effect in the population when, in reality, there is.

What is an effect size and how is it measured?

An effect size is an objective and standardized measure of the magnitude of an observed effect. Measures include Cohen's *d*, Glass' *g* and Pearson's correlations coefficient, *r*.

What is statistical power?

Power is the ability of a test to detect an effect of a particular size (a value of 0.8 is a good level; to aim for).