

# Descriptive and Inferential Statistics

Laerd Statistics (<https://statistics.laerd.com/statistical-guides/descriptive-inferential-statistics.php>)

When analysing data, such as the grades earned by 100 students, it is possible to use both descriptive and inferential statistics in your analysis. Typically, in most research conducted on groups of people, you will use both descriptive and inferential statistics to analyse your results and draw conclusions. *So what are descriptive and inferential statistics? And what are their differences?*

## Descriptive Statistics

Descriptive statistics is the term given to the analysis of data that helps describe, show or summarize data in a meaningful way such that, for example, patterns might emerge from the data. Descriptive statistics do not, however, allow us to make conclusions beyond the data we have analysed or reach conclusions regarding any hypotheses we might have made. They are simply a way to describe our data.

Descriptive statistics are very important because if we simply presented our raw data it would be hard to visualize what the data was showing, especially if there was a lot of it. Descriptive statistics therefore enable us to present the data in a more meaningful way, which allows simpler interpretation of the data. For example, if we had the results of 100 pieces of students' coursework, we may be interested in the overall performance of those students. We would also be interested in the distribution or spread of the grades. Descriptive statistics allow us to do this.

Typically, there are two general types of statistic that are used to describe data:

- **Measures of central tendency:** these are ways of describing the central position of a frequency distribution for a group of data. In this case, the frequency distribution is simply the distribution and pattern of

grades scored by the 100 students from the lowest to the highest. We can describe this central position using a number of statistics, including the mode, median, and mean. You can read about measures of central tendency [here](#).

- **Measures of spread:** these are ways of summarizing a group of data by describing how spread out the scores are. For example, the mean score of our 100 students may be 65 out of 100. However, not all students will have scored 65 marks. Rather, their scores will be spread out. Some will be lower and others higher. Measures of spread help us to summarize how spread out these scores are. To describe this spread, a number of statistics are available to us, including the range, quartiles, absolute deviation, variance and [standard deviation](#).

When we use descriptive statistics it is useful to summarize our group of data using a combination of tabulated description (i.e., tables), graphical description (i.e., graphs and charts) and statistical commentary (i.e., a discussion of the results).

## **Inferential Statistics**

We have seen that descriptive statistics provide information about our immediate group of data. For example, we could calculate the mean and standard deviation of the exam grades for 100 students and this could provide valuable information about this group of 100 students. Any group of data like this, which includes all the data you are interested in, is called a **population**. A population can be small or large, as long as it includes all the data you are interested in. For example, if you were only interested in the exam grades of 100 students, the 100 students would represent your population. Descriptive statistics are applied to populations, and the properties of populations, like the mean or standard deviation, are called **parameters** as they represent the whole population (i.e., everybody you are interested in).

Often, however, you do not have access to the whole population you are interested in investigating, but only a limited number of data instead. For example, you might be interested in the exam grades of all students in the UK. It is not feasible to measure all exam grades of all students in the whole of the UK so you have to measure a smaller **sample** of students (e.g., 100 students), which are used to represent the larger population of all UK students.

Properties of samples, such as the mean or standard deviation, are not called parameters, but **statistics**. Inferential statistics are techniques that allow us to use these samples to make generalizations about the populations from which the samples were drawn. It is, therefore, important that the sample accurately represents the population. The process of achieving this is called sampling (sampling strategies are discussed in detail [here](#) on our sister site). Inferential statistics arise out of the fact that sampling naturally incurs sampling error and thus a sample is not expected to perfectly represent the population. The methods of inferential statistics are (1) the estimation of parameter(s) and (2) [testing of statistical hypotheses](#).