

0.1: Introduction to the lesson

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In many statistical studies or experiments, we want to get answers to questions regarding a population of interest. For example, what is the average annual income of American adults? In this example, the population of interest is American adults. Ideally, we would like to obtain the data from every single American adult. However, due to constraints such as time and money, we are unable to obtain the data from every person who makes up the population. We then typically collect data from a random sample of American adults. A sample is ideally a subset and is representative of the population. We then collect data from the sample, and then use the characteristics of the sample, called statistics, to make an inference about the characteristics of the population, called parameters.

Consider the sample mean annual income among 500 American adults is **\$52,000**. Does this mean the population mean annual income among all American adults is **\$52,000**? Probably not. The sample mean, even if it comes from a representative and large sample, is probably close to the population mean, but unlikely to be exactly equal to the population mean. This uncertainty is simply due to the variability associated with the sample mean. Another random sample of 500 American adults may result in a sample mean with a different value, for example, **\$51,000**. This is where statistical inference comes in. Statistical inference allows us to quantify the variability associated with statistics and allows us to make inferences about the parameter. The main inferential methods we will use are confidence intervals and hypothesis tests.