

1.1: Introduction

Scientists seek to answer questions using rigorous methods and careful observations. These observations - collected from the likes of field notes, surveys, and experiments - form the backbone of a statistical investigation and are called data. Statistics is the study of how best to collect, analyze, and draw conclusions from data. It is helpful to put statistics in the context of a general process of investigation:

1. Identify a question or problem.
2. Collect relevant data on the topic.
3. Analyze the data.
4. Form a conclusion.

Statistics as a subject focuses on making stages 2-4 objective, rigorous, and efficient. That is, statistics has three primary components: How best can we collect data? How should the data be analyzed? What can we infer from the analysis?

The topics scientists investigate are as diverse as the questions they ask. However, many of these investigations can be addressed with a small number of data collection techniques, analytic tools, and fundamental concepts in statistical inference.

You are exposed to statistics regularly. If you are a sports fan, then you have the statistics for your favorite player. If you are interested in politics, then you look at the polls to see how people feel about certain issues or candidates. If you are an environmentalist, then you research arsenic levels in the water of a town or analyze the global temperatures. If you are in the business profession, then you may track the monthly sales of a store or use quality control processes to monitor the number of defective parts manufactured. If you are in the health profession, then you may look at how successful a procedure is or the percentage of people infected with a disease. There are many other examples from other areas.

“There are of course many problems connected with life, of which some of the most popular are: Why are people born? Why do they die? Why do they want to spend so much time wearing digital watches?” (Adams, 2002)

To understand how to collect and analyze data, you need to understand what the field of statistics is. Many of the words defined throughout this course have common definitions that are also used in non-statistical terminology. In statistics, some of these terms have slightly different definitions. It is important that you notice the difference and utilize the statistical definitions.

Statistics is the study of how to collect, organize, analyze, and interpret data collected from a group

There are two main branches of statistics. One is called **descriptive statistics**, which is where you collect, organize and describe data. The other branch is called **inferential statistics**, which is where you interpret data. First, you need to look at descriptive statistics since you will use the descriptive statistics when making inferences. In order to use inferential statistics, we will briefly touch on a completely new topic called **Probability**. Once we get some background in probability combined with your knowledge of descriptive statistics, we will move into Inferential Statistics.

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