

1.3: Types of Statistical Studies (1 of 4)

Learning Objectives

- From a research question, determine the goal of a statistical study.

Before we begin our discussion of the types of statistical studies, we look closely at the types of research questions used in statistical studies.

Research Questions about a Population

Recall that a *population* is the entire group of individuals or objects that we want to study. Usually, it is not possible to study the whole population, so we collect data from a part of the population, called a *sample*. We use the sample to draw conclusions about the population.

For example, suppose our research question is “What is the average amount of money spent on textbooks per semester by full-time students at Seattle Central?” We cannot interview every full-time student at Seattle Central because would take too much time and cost too much money. We therefore carefully select a sample of full-time students at Seattle Central to represent the population of all full-time students at that college. Then we collect data from the sample to estimate the average amount spent on textbooks.

This example illustrates how the research question guides the investigation. A well-stated research question contains information about:

- The population (full-time students at Seattle Central).
- The information we will collect from each individual in the sample. We also call this the **variable**. The variable is what we plan to measure (amount of money spent on textbooks per semester).
- A numerical characteristic about the population related to this variable (the *average* amount of money spent on textbooks per semester).

Here are some common types of research questions about a population:

Type of Research Question	Examples
Make an estimate about the population (often an estimate about an <i>average</i> value or a <i>proportion</i> with a given characteristic)	What is the <i>average</i> number of hours that community college students work each week?
What <i>proportion</i> of all U.S. college students are enrolled at a community college?	
Test a claim about the population (often a claim about an <i>average</i> value or a <i>proportion</i> with a given characteristic)	Is the <i>average</i> course load for a community college student greater than 12 units?
Do the <i>majority</i> of community college students qualify for federal student loans?	
Compare two populations (often a comparison of population averages or proportions with a given characteristic)	In community colleges, do female students have a <i>higher</i> GPA than male students?
Are college athletes <i>more</i> likely than nonathletes to receive academic advising?	
Investigate a relationship between two variables in the population	Is there a <i>relationship</i> between the number of hours high school students spend each week on Facebook and their GPA?
Is academic counseling <i>associated</i> with quicker completion of a college degree?	

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Research Questions about Cause and Effect

A research question that focuses on a **cause-and-effect** relationship is common in disciplines that use experiments, such as medicine or psychology. These types of questions ask how one variable responds as another variable is manipulated. These types of questions involve two variables. Here are some examples:

- Does cell phone usage increase the risk of developing a brain tumor?
- Does drinking red wine lower the risk of a heart attack?
- Does playing violent video games increase aggressive behavior?
- Does sex education lower the incidence of teen pregnancy?

To provide convincing evidence of a cause-and-effect relationship, the researcher designs an experiment. We discuss experiments in “Collecting Data – Conducting an Experiment.”

Note: In the previous section, *Research Questions about a Population*, we included examples of questions about the relationship between two variables in a population. But in these types of questions, we used words like *associated*, *correlated*, *linked to*, and *connected*. These words do not imply a cause-and-effect relationship between the variables. We can investigate these types of questions without conducting an experiment – an observational study will do. We study observational studies in “Collecting Data – Sampling.”

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