

Descriptive statistics consists of organizing and summarizing information collected, while inferential statistics uses methods that generalize results obtained from a sample to the population and measure the reliability of the results.

Determine whether the underlined numerical value is a parameter or a statistic. Explain your reasoning.

Two students in a class of 29 have red hair.

☒ Parameter, because the data set of all 29 students is a population.

Researchers wanted to determine if there was an association between the level of trauma of an individual and their risk of diabetes. The researchers studied 1788 people over the course of 10 years. During this 10-year period, they interviewed the individuals and asked questions about their daily lives and the hassles they face. In addition, hypothetical scenarios were presented to determine how each individual would handle the situation. These interviews were videotaped and studied to assess the emotions of the individuals. The researchers also determined which individuals in the study experienced any type of diabetes over the 10-year period. After their analysis, the researchers concluded that the trauma-free individuals were less likely to experience diabetes. Complete parts (a) through (c).

(a) What type of observational study was this? Explain.

This was a cohort study, because information was collected about a group of individuals by observing them over a long period of time.

(b) What is the response variable? What is the explanatory variable?

The response variable is whether or not diabetes was contracted, because it is the variable of interest.

The explanatory variable is level of trauma, because it affects the other variable.

(c) In the report, the researchers stated that "the research team also hasn't ruled out that a common factor like genetics could be causing both the emotions and the diabetes." Explain what this sentence means. Choose the correct answer below.

- ☒ A. The researchers may be concerned with confounding that occurs when the effects of two or more explanatory variables are not separated or when there are some explanatory variables that were not considered in a study, but that affect the value of the response variable.
- ☐ B. It is not important to adjust for explanatory variables.
- ☐ C. The researchers thought that genetics had greater influence than level of trauma.

Determine whether the variable is qualitative or quantitative.

State of residence

Is the variable qualitative or quantitative?

- ☐ A. The variable is quantitative because it is a numerical measure.
- ☒ B. The variable is qualitative because it is an attribute classification.
- ☐ C. The variable is quantitative because it is an attribute classification.
- ☐ D. The variable is qualitative because it is a numerical measure.

The Gallup Organization contacts 2024 male university graduates who have a white collar job and asks whether or not they had received a raise at work during the past 4 months.

What is the population in the study?

- ☐ A. Male university graduates.
- ☐ B. Male university graduates who have received a raise at work.
- ☒ C. Male university graduates who have a white collar job.
- ☐ D. Male university graduates who have a white collar job and have received a raise at work.

What is the sample in the study?

- ☐ A. The 2024 male university graduates who have received a raise at work.
- ☐ B. Male university graduates who have a white collar job.
- ☐ C. Male university graduates.
- ☒ D. The 2024 male university graduates who have a white collar job.

Researchers wanted to determine if having a television (TV) in the bedroom is associated with obesity. The researchers administered a questionnaire to 395 twelve-year-old adolescents. After analyzing the results, the researchers determined that the body mass index of the adolescents who had a TV in their bedroom was significantly higher than that of the adolescents who did not have a TV in their bedroom. Complete parts (a) through (e).

(a) Why is this an observational study? What type of observational study is this?

Why is this an observational study?

- ☐ A. This is an observational study because the researchers try to influence the outcome of the study.
- ☒ B. This is an observational study because the researchers observe the behavior of the individuals in the study without trying to influence an explanatory variable of the study.
- ☐ C. It is not an observational study.

What type of observational study is this?

- ☐ A. Case-control study
- ☐ B. Cohort study
- ☒ C. Cross-sectional study

(b) What is the response variable in the study? What is the explanatory variable?

What is the response variable in the study?

- ☐ A. The response variable is the number of the adolescents that participate in the study.
- ☐ B. The response variable is whether the adolescent has a TV in the bedroom or not.
- ☒ C. The response variable is the body mass index of the adolescents.

What is the explanatory variable?

- ☐ A. The explanatory variable is the number of the adolescents that participate in the study.
- ☒ B. The explanatory variable is whether the adolescent has a TV in the bedroom or not.
- ☐ C. The explanatory variable is the body mass index of the adolescents.

(c) Can you think of any lurking variables that may affect the results of the study?

- ☒ A. Yes. For example, possible lurking variables might be eating habits and the amount of exercise per week.
- ☐ B. There is not enough information to answer this question.
- ☐ C. No, there are no lurking variables in this study.

(d) In the report, the researchers stated, "These results remain significant after adjustment for socioeconomic status." What does this mean?

- ☒ A. The researchers made an effort to avoid confounding by accounting for potential lurking variables.
- ☐ B. It means that socioeconomic status is not an explanatory variable and that including this variable in the study does not change the results of the study.
- ☐ C. It means that socioeconomic status is an explanatory variable and that including this variable in the study changes the results of the study.

(e) Does a television in the bedroom cause a higher body mass index? Explain.

- ☒ A. No, a television in the bedroom and obesity are associated because the body mass index of the adolescents who had a TV in their bedroom was significantly higher than that of the adolescents who did not have a TV in their bedroom.
- ☐ B. No, a television in the bedroom does not cause obesity because the body mass index of the adolescents who had a TV in their bedroom was significantly higher than that of the adolescents who did not have a TV in their bedroom.
- ☐ C. Yes, a television in the bedroom causes obesity because the body mass index of the adolescents who had a TV in their bedroom was significantly higher than that of the adolescents who did not have a TV in their bedroom.

A(n) **statistic** is a numerical summary of a sample.

A(n) **parameter** is a numerical summary of a population.

Determine whether the study depicts an observational study or an experiment.

Forty people are divided into two groups. One group is exposed to atonal classical music. The other is not. After one month, both groups are questioned about their ability to remember random phrases.

Is the study an observational study or an experiment?

- ☐ A. The study is an observational study because the study examines individuals in a sample, but does not try to influence the response variable.
- ☐ B. The study is an observational study because the researchers control one variable to determine the effect on the response variable.
- ☒ C. The study is an experiment because the researchers control one variable to determine the effect on the response variable.
- ☐ D. The study is an experiment because the study examines individuals in a sample, but does not try to influence the variable of interest.

The data on the right relate to setups A through E of widescreen high-definition televisions.

Identify the individuals, variables, and data corresponding to the variables. Determine whether each variable is qualitative, continuous, or discrete.

Setup	Size (in)	Screen Type	Number of Channels Available
A	59	Projection	300
B	58	Plasma	109
C	46	Plasma	425
D	44	Plasma	269
E	51	Projection	289

What are the individuals being studied?

- ☒ A. The setups A through E of widescreen high-definition televisions.
- ☐ B. Television setups that include more than 100 channels.
- ☐ C. Plasma and projection widescreen high-definition televisions.
- ☐ D. Televisions with screen sizes between 40 in and 60 in.

What are the variables and their corresponding data being studied?

- ☒ A. Size (59, 58, 46, 44, 51), screen type (Projection, Plasma, Plasma, Plasma, Projection), and number of channels available (300, 109, 425, 269, 289)
- ☐ B. Size (59, 58, 46, 44, 51) and number of channels available (300, 109, 425, 269, 289)
- ☐ C. Setup (A, B, C, D, E), size (59, 58, 46, 44, 51), screen type (Projection, Plasma, Plasma, Plasma, Projection), and number of channels available (300, 109, 425, 269, 289)

Determine whether each variable is qualitative, continuous, or discrete.

Size is a **continuous** variable.

Screen type is a **qualitative** variable.

Number of channels available is a **discrete** variable.

Determine the level of measurement of the variable

Letter grades in a math course

Choose the correct level of measurement.

- ☐ Ratio
- ☐ Interval
- ☐ Nominal
- ☒ Ordinal