

1.3.1: Exercises

1. Give an example of a research question that involves estimating a characteristic about the population of Registered Nurses in California.
2. Improve this poorly stated research question: Do registered nurses work a lot?
3. Create a cause-and-effect research question.

“Alkaline water: the secret to glowing skin” is the headline of an article that appeared in *Scratch Magazine* (February 10, 2021). The article claims that consuming alkaline water instead of tap water improves the hydration of skin and therefore, improves skin appearance. Consider the following hypothetical study designs. For each study, answer the questions that follow.

4. Study design 1: Two hundred students were selected at random from those enrolled at a large college in California. Each student in the sample was asked whether they drank alkaline water more than once in a typical week. A skin specialist rated skin health for each student on a scale of 1 to 10. It was concluded that skin health was significantly better on average for the group that reported drinking alkaline water more than once a week than it was for the group that did not.
 - a. Explain why this is an observational study.
 - b. Was random selection used to create the sample? Explain.
 - c. Did the study use random assignment to experimental groups? If so, explain what method was used to randomly assign students.
 - d. Is the conclusion “drinking alkaline water leads to healthier skin” reasonable given the study description? Explain your answer.
 - e. Is it reasonable to generalize conclusions from this study to some larger population? Justify your answer. If so, what population?

5. Study design 2: One hundred people volunteered to participate in a statistical study. For each volunteer, a coin was tossed in order to place them into a group. If the coin landed head up, the volunteer was assigned to group 1. If the coin landed tail up, the volunteer was assigned to group 2. Those in group 1 were asked to drink one cup of alkaline water daily for three months. Those in group 2 were asked to drink one cup of tap water daily for three months. At the end of the three months, a skin specialist rated skin health on a scale of 1 to 10 for each of the volunteers. It was concluded that skin health was significantly better on average for those in group 1 than for those in group 2.

a. Explain why this is an experiment.

b. Was random selection used to create the sample? Explain.

c. Did the study use random assignment to experimental groups? If so, explain what method was used to randomly assign students.

d. Is the conclusion “drinking alkaline water leads to healthier skin” reasonable given the study description? Explain your answer.

e. Is it reasonable to generalize conclusions from this study to some larger population? Justify your answer. If so, what population?

6. Study design 3: One hundred students were selected at random from those enrolled at a large college. Each of the selected students was asked to participate in a study and all agreed. For each student, a coin was tossed in order to place them into one of two groups. If the coin landed head up, the student was assigned to group 1. If the coin landed tail up, the student was assigned to group 2. Those in group 1 were asked to drink one cup of alkaline water daily for three months. Those in group 2 were asked to drink one cup of tap water daily for three months. At the end of the three months, a skin specialist rated skin health on a scale of 1 to 10 for each of the volunteers. It was concluded that skin health was significantly better on average for those in group 1 than for those in group 2.

a. Is this an observational study or an experiment? Justify your answer.

b. Was random selection used to create the sample? Explain.

c. Did the study use random assignment to experimental groups? If so, explain what method was used to randomly assign students.

d. Is the conclusion “drinking alkaline water leads to healthier skin” reasonable given the study description? Explain your answer.

e. Is it reasonable to generalize conclusions from this study to some larger population? Justify your answer. If so, what population?

7. Study design 4: One hundred people who live in Miami volunteered to participate in a statistical study. The volunteers were divided into two experimental groups based on sex, with females in group 1 and males in group 2. Those in group 1 were asked to drink one cup of alkaline water daily for three months. Those in group 2 were asked to drink one cup of tap water daily for three months. At the end of the three months, a skin specialist rated skin health on a scale of 1 to 10 for each of the volunteers. It was concluded that skin health was significantly better on average for those in group 1 than for those in group 2.

a. Is this an observational study or an experiment? Justify your answer.

b. Was random selection used to create the sample? Explain.

c. Did the study use random assignment to experimental groups? If so, explain what method was used to randomly assign students.

d. Is the conclusion “drinking alkaline water leads to healthier skin” reasonable given the study description? Explain your answer.

e. Is it reasonable to generalize conclusions from this study to some larger population? Justify your answer. If so, what population?

8. Study design 5: Two hundred cosmetology students enrolled at a large college in California were chosen to participate in the statistical study. Each student in the sample was asked whether they drank alkaline water more than once in a typical week. A skin specialist rated skin health for each student on a scale of 1 to 10. It was concluded that skin health was significantly better on average for the group that reported drinking alkaline water more than once a week than it was for the group that did not.
- Is this an observational study or an experiment? Justify your answer.
 - Was random selection used to create the sample? Explain.
 - Did the study use random assignment to experimental groups? If so, explain what method was used to randomly assign students.
 - Is the conclusion “drinking alkaline water leads to healthier skin” reasonable given the study description? Explain your answer.
 - Is it reasonable to generalize conclusions from this study to some larger population? Justify your answer. If so, what population?
9. What are the four steps in the statistical analysis process?