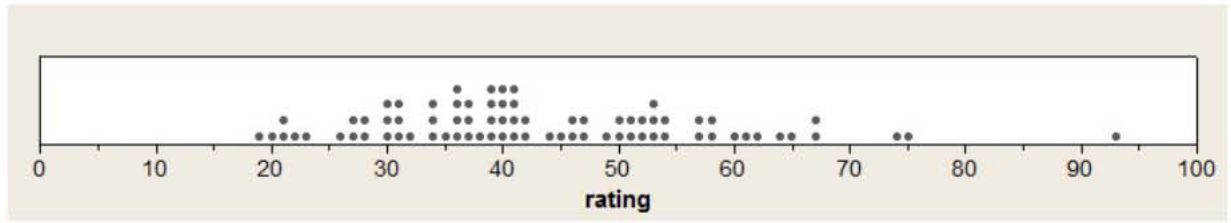
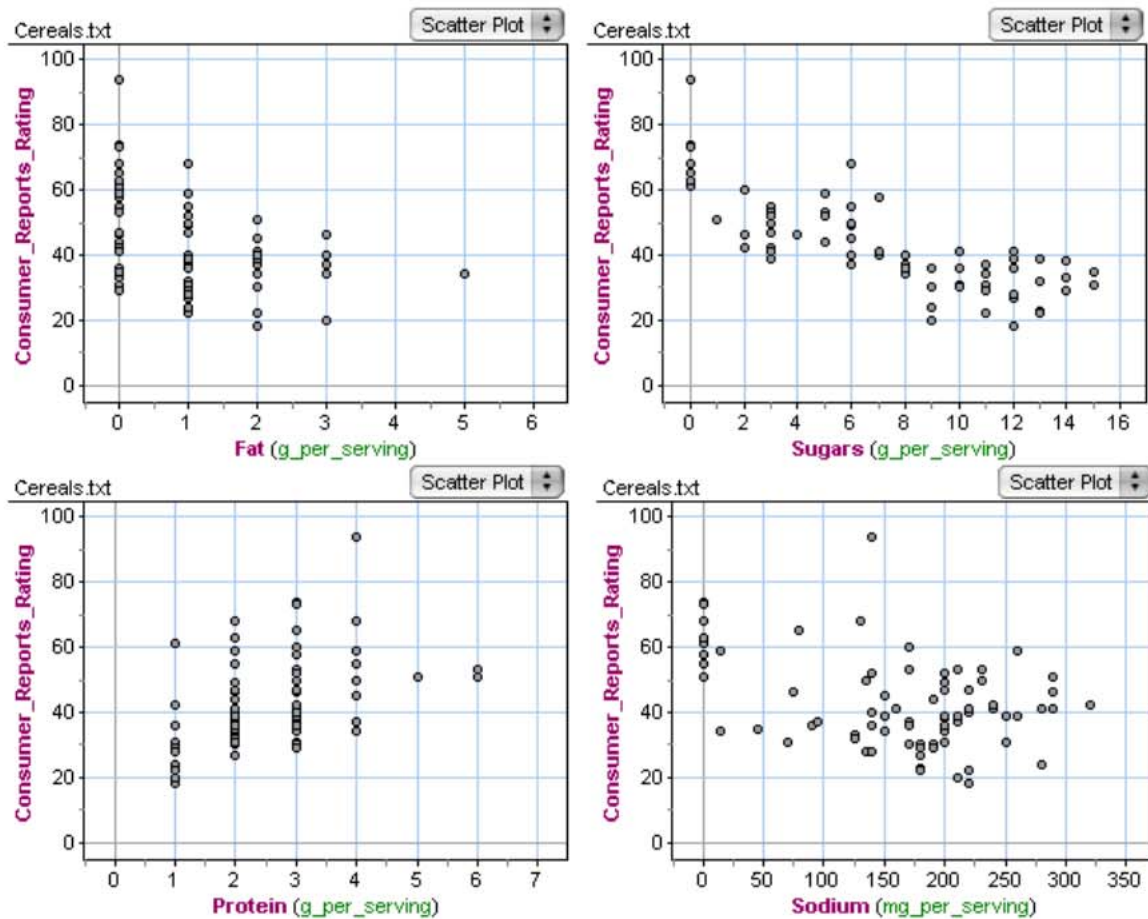


Initiating Lesson 3.1.1: Introduction to Scatterplots and Bivariate Relationships



- What does each dot represent in this distribution?
- For this distribution, what seems to be an average rating?
- How would you describe the variability in ratings?
- How would you describe the shape of this distribution? What does the shape suggest about the rating system?

What you cannot tell from the dotplot is how the cereal ingredients (such as sugar or fat) are related to the ratings. You need a new type of graph, called a scatterplot, to investigate how two variables relate to each other. The scatterplots below show the amount of an ingredient in a serving of cereal and the *Consumer Reports* rating for 77 breakfast cereals.



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Initiating Lesson 3.1.1: Introduction to Scatterplots and Bivariate Relationships

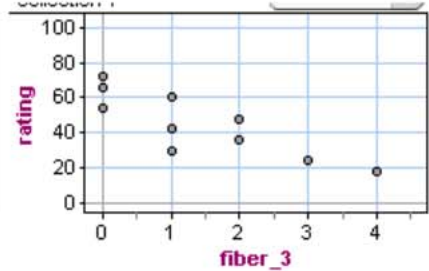
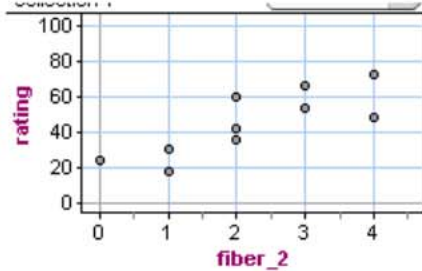
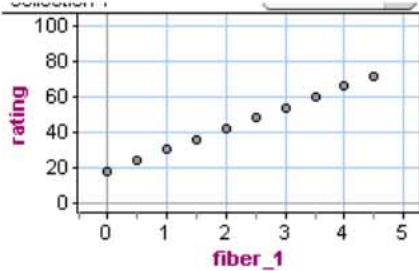
Conceptual Task 2: Seeing Patterns and Relationships in Scatterplots

Now you will continue your detective work with *Consumer Reports* ratings. Try to identify ingredients that are good predictors of ratings and ingredients that are not. More importantly, focus on how patterns in the data are related to identifying ingredients that are good predictors.

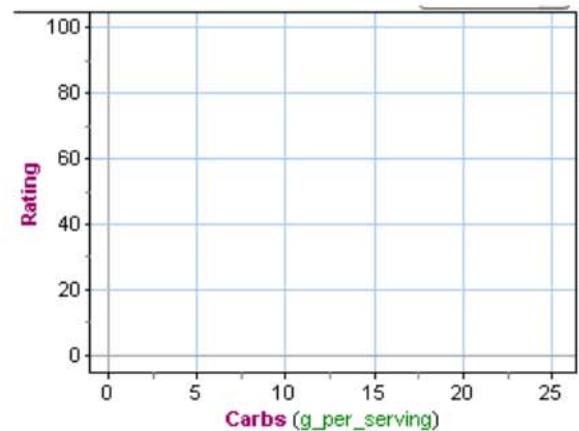
- (6) There are four cereals that have 3 grams of fat in a serving. Estimate the ratings for these four cereals. What might explain the variability in the ratings?
- (7) Imagine changing the recipe for a cereal that has 0 grams of fat in a serving and a rating of 60. Increase the amount of fat to 3 grams in a serving. Do you think the rating will probably increase or decrease or remain about the same? Or do you think that it is impossible to use the scatterplot to predict the impact of this change on the rating? How does the pattern in the data support your decision?

Initiating Lesson 3.1.1: Introduction to Scatterplots and Bivariate Relationships

(8) Think about how the amount of fiber in a cereal might relate to the *Consumer Reports* rating. Here are three scatterplots with make-believe data from 10 made-up cereals. Which scatterplot do you think displays a pattern similar to what you may see in the actual data? Why?



(9) Suppose that carbohydrates are not used in the *Consumer Reports* rating formula. Sketch a scatterplot with make-believe data from 10 make-believe cereals to illustrate what the data might look like in this situation.



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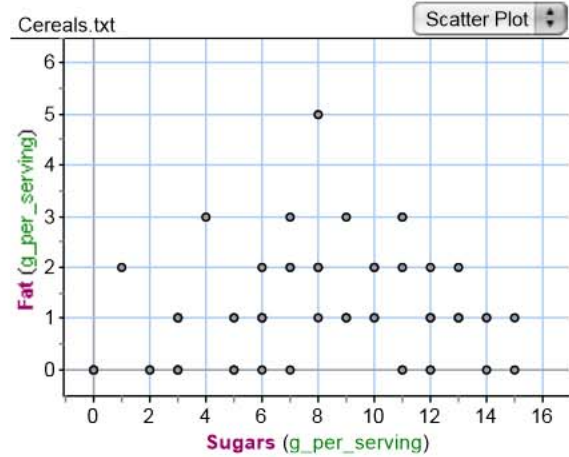
Initiating Lesson 3.1.1: Introduction to Scatterplots and Bivariate Relationships

Part III: Homework

- (10) Summarize what you feel you learned today.
- (11) The average *Consumer Reports* rating for these 77 cereals is 44. What is the largest amount of sugar per serving in a cereal that has above average ratings?
- (12) Which is a better predictor of the *Consumer Reports* ratings: sugar or sodium? Explain how the scatterplots support your answer.

Initiating Lesson 3.1.1: Introduction to Scatterplots and Bivariate Relationships

- (13) A friend says that she only pays attention to sugar amounts, even though she is also concerned by fat. Her reasoning is that low levels of sugar signal that the food also has low amounts of fat. Similarly, high levels of sugar signal that the food also has high amounts of fat. Does this appear to be true for breakfast cereals? Explain how the scatterplot supports your answer.



Supporting Lesson 3.1.2: Developing an Intuitive Sense of Form, Direction, and Strength of the Relationship Between Two Measurements

Estimated number of 50-minute class sessions: 1

Learning Goals

Students will understand that

- each point on the scatterplot represents a single observation consisting of measurements on two variables.
- the overall pattern in a scatterplot can be described in terms of the direction, form, and strength of the relationship between the two measurements.
- the linear relationship between two measurements is positive if smaller values of x tend to correspond to smaller values of y and larger values of x tend to correspond to larger values of y .
- the linear relationship between two measurements is negative if smaller values of x tend to correspond to larger values of y and larger values of x tend to correspond to smaller values of y .

Students will be able to distinguish between

- linear and nonlinear relationships,
- strong and weak relationships, and
- positive and negative linear relationships.

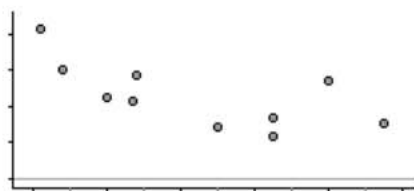
Introduction [Student Handout]

In this lesson, you will compare and contrast a variety of scatterplots with the goal of thinking about how to describe relationships you see in the data. At the end of the lesson, you will discuss ways that statisticians describe these relationships.

Tasks [Student Handout, 15 minutes]

(1) Match each set of measurements to a scatterplot, and briefly explain your reasoning.

Scatterplot 1



Scatterplot 2



- (a) x = city miles per gallons and y = highway miles per gallon for 10 cars
- (b) x = sodium (milligrams/serving) and y = *Consumer Reports* quality rating for 10 salted peanut butters

(Answer: Scatterplot 1: b, Scatterplot 2: a)

(2) For each scatterplot in Question 1, describe what a dot represents.

(Answer: Scatterplot 1: Each dot is a peanut butter. Scatterplot 2: Each dot is a car.)