Student Handout 2.4: Picturing Healthcare Data with Graphs

Theme: Medical Literacy & Healthcare

Specific Objectives

Students will understand that

- the scale on graphs can change perception of the information they represent.
- to fully understand a pie chart, the reference value must be known.

Students will be able to

- calculate relative change from a line graph.
- estimate the absolute size of the portions of a pie chart given its reference value.
- use data displayed on two graphs to estimate a third quantity.

Specific Language and Literacy Objectives

Students will be able to

- Read and comprehend the problem situation.

- Read, interpret, and explain the data in line graphs about trends in obesity.

- Complete CaS chart with quantitative and health care information connecting diabetes and weight from problem situation.

- Demonstrate understanding of mathematics through complete and correct written answers to problems.

- Demonstrate ability to describe, interpret, synthesize, and predict information using lesson text about diabetes and nutrition.

- Use appropriate quantitative and healthcare vocabulary to discuss mathematics in this lesson.

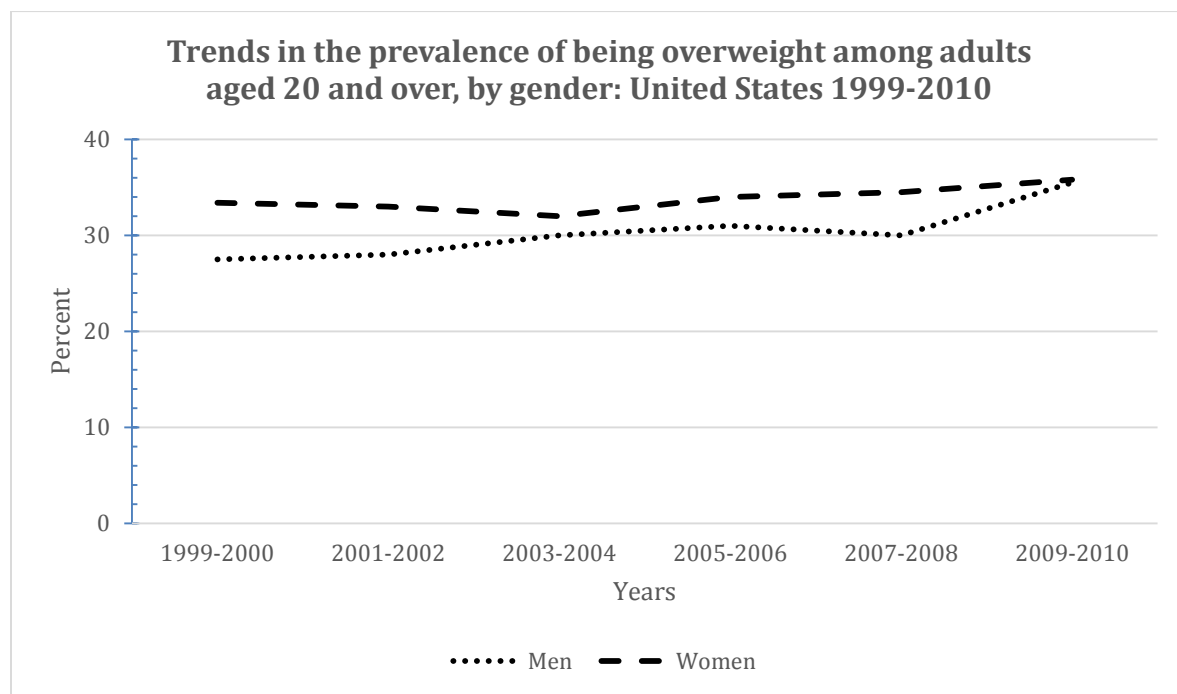## Problem Situation 1: Understanding Diabetes

You are a nurse practitioner and have a new patient named Jane. Jane makes an appointment for a physical examination. You notice in her chart that Jane has gained over 100 lbs in the past five years. You run and review some tests on Jane. These tests show that Jane has elevated blood sugar and high blood pressure. She doesn't have diabetes right now, but you are concerned that she may develop the disease. These tests indicate that she is at high risk for developing diabetes. In addition to diabetes,

obesity increases risks of having high blood pressure, heart disease, strokes, cancer and many other health problems.

Medical professionals think about *risk factors* that might put patients in danger of having diabetes. Risk factors for diabetes include age, family history of diabetes, high blood pressure, level of physical activity and lifestyle choices, being overweight, and ethnicity. [1]

You are concerned about Jane because obesity significantly increases the chance a person will develop diabetes. 85.2% of people with Type 2 diabetes are overweight. Obesity is increasing in the United States. Approximately 33% of adults and 17% [2] of teens and children are overweight or obese in the United States. *Figures 1* and *2* below show trends of adult obesity in the United States.

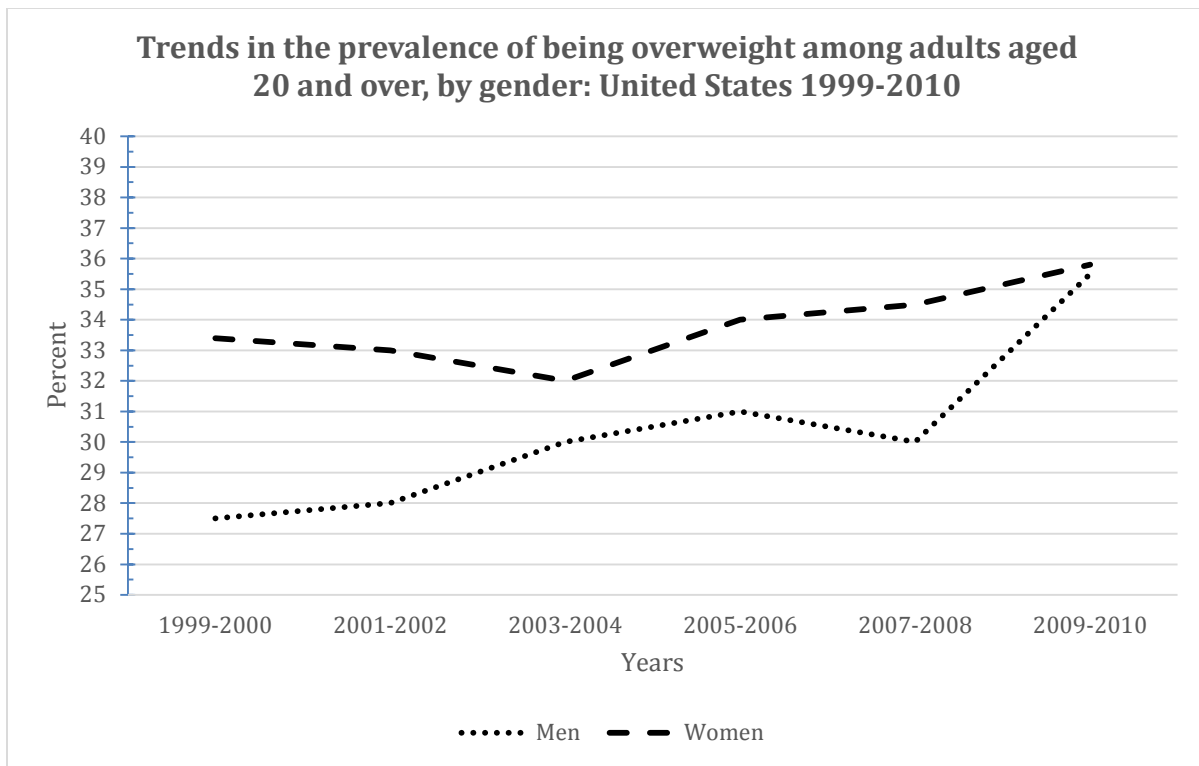*Figure 1*: Line Graph Depicting Trends of Obesity in the United States

Trends in the prevalence of being overweight among adults aged 20 and over, by gender: United States 1999-2010

* Charts are based on data from the Center of Disease Control: http://www.cdc.gov/nchs/data/hestat/obese/obese99.htm.

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[1] http://www.diabetes.org/diabetes-basics/?loc=db-slabnav

[2] http://professional.diabetes.org/admin/UserFiles/0%20-%20Sean/FastFacts%20March%202013.pdf

Figure 2: Line Graph Depicting Trends of Obesity in the United States

Trends in the prevalence of being overweight among adults aged 20 and over, by gender: United States 1999-2010

······ Men   ▬ ▬ Women

* Charts are based on data from the Center of Disease Control: http://www.cdc.gov/nchs/data/hestat/obese/obese99.htm.

You suggest that Jane lose weight to lower her risk of developing diabetes. Your task is to help Jane understand the link between weight and the high risk of developing diabetes, and to make better food and exercise choices to promote weight loss.

(1) You've just read about the link between weight and diabetes. Using *Figure 1* and *Figure 2,* answer the questions below.

      (a) Compare the two line graphs about the prevalence of obesity in the United States. To compare, describe how the two graphs are similar and different. What do you notice?

      (b) Using the graphs, calculate the relative change in being obese from 1999 to 2010 for men and the relative change for women.

(c) Based on your calculations, would you conclude that, in the future, men more likely to be at risk for developing diabetes than women?

Provide support for your answer by connecting the quantitative information from the line graphs to the problem situation Write your answer in 2-3 sentences.

(2) Two pairs of statements are given below about Jane's weight gain. How can both statements be true?

Statement 1: In 2005, Jane gained 25 pounds, representing an increase of 20% of her body weight.

Statement 2: In 2010, Jane gained 25 pounds, representing an increase of 10% of her body weight.

CaS Chart

In this lesson, you use the Comprehension and Synthesis (CaS) Chart you used in lesson 1.4. Remember, CaS Charts help you understand what the main issue(s) are that need to be resolved and to recognize what quantitative information is available to solve the problem.

(3) On your own, read through **Problem Situation 2: Nutrition and Weight Loss** below. Complete Columns A, B, and C as you are reading.

CaS Chart: Nutrition and Weightloss

Column A	Column B	Column C
What are the main issue(s) in this problem situation?	**What is the key quantitative information you need to solve the issues in the problem situation?**	**Explain why knowing the issues (column A) and quantitative information (column B) help you understand the problem situation.**

Problem Situation 2: Nutrition and Weight loss

As a medical professional, you understand that losing weight can be difficult. You help Jane develop a plan to lose weight. You explain to her that she must monitor her calorie intake. Also, Jane needs to balance the amount of fat, carbohydrates, and proteins in her diet.

For patients trying to lose or maintain weight, doctors recommend that fat should not be more than 35% of a person's total calorie intake. You explain to Jane that 1 gram of fat has 9 calories; 1 gram of protein has 4 calories; and 1 gram of carbohydrates has 4 calories. Fat contributes the most number of calories per gram. You tell Jane to limit the amount of fat she eats. Monitoring her fat intake will also help Jane limit the number of calories she consumes.[3]

The problem is that Jane must lose weight. What information does Jane need to make better food choices?

(4) Refer to the problem situation to answer 4 (a) and (b).   Jane follows a 2000-calorie diet per day.

  (a) Using your **estimation skills** find Jane's recommended calorie intake from fat per day.

  (b) Calculate the number of grams of fat Jane can consume per day if she follows her diet.

(5) The Nutrition Label below (*Figure 3)* lists 'Percent Daily Value' based on a 2000-calorie diet per day. Does your answer to part 4 (b) correspond to the information on the nutrition label? Discuss it with your group. Hint: Look at the % Daily Value of 'Total Fat' for macaroni and cheese in *Figure 3.*

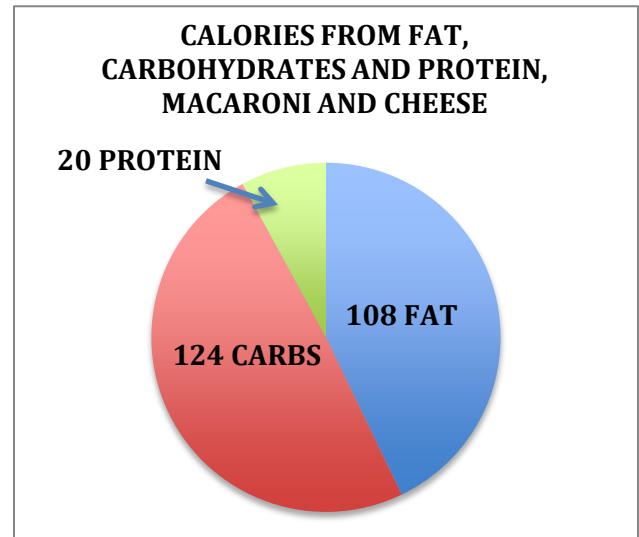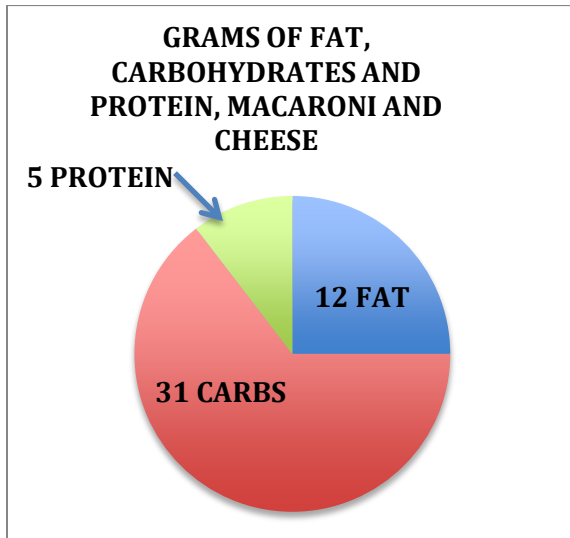*Figure 3*: Nutrition Label for Macaroni & Cheese

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[3] http://www.mckinley.illinois.edu/handouts/macronutrients.htm

Nutrition Facts

Serving Size 1 cup (228g)
Servings Per Container 2

Amount Per Serving

Calories 250   Calories from Fat 110

	% Daily Value*
Total Fat 12g	18%
Saturated Fat 3g	15%
Trans Fat 3g	
Cholesterol 30mg	10%
Sodium 470mg	20%
Total Carbohydrate 31g	10%
Dietary Fiber 0g	0%
Sugars 5g	
Protein 5g	

Vitamin A	4%
Vitamin C	2%
Calcium	20%
Iron	4%

* Percent Daily Values are based on a 2,000 calorie diet.
Your Daily Values may be higher or lower depending on
your calorie needs.

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Source: http://www.harristeeter.com/yourwellness/yourwellness_for_life/food_labels.aspx

Figure 4: Pie Chart of grams of carbs, protein, and fat

Figure 5: Pie chart of calories that come from carbs, protein and fat

GRAMS OF FAT, CARBOHYDRATES AND PROTEIN, MACARONI AND CHEESE

5 PROTEIN

12 FAT

31 CARBS

CALORIES FROM FAT, CARBOHYDRATES AND PROTEIN, MACARONI AND CHEESE

20 PROTEIN

108 FAT

124 CARBS

(6) You are using the two pie charts above *(see Figures 4 and 5)* to help Jane better understand how to make better food decisions to aid in her weight loss plan. Explain to Jane how the two pie charts look different. Write this explanation in **1-2 complete sentences. (It is important to write complete sentences because it helps your instructor better understand your mathematical thinking.)**

(7) Would you recommend this macaroni and cheese to Jane while she is trying to lose weight? Explain. (Note: Remember, it is recommended that a person should not consume products that have no more than 35% of calories from fat.)

Problem Situation 3: Interpreting Bar Graphs-Making Healthy Food Choices

Your task is to help Jane understand how to make healthier food choices. Jane must understand why monitoring fat intake is important when trying to lose weight. Each gram of fat contains more calories

than each gram of carbohydrates or protein. Therefore, eating a lot of fat can increase calorie intake significantly.
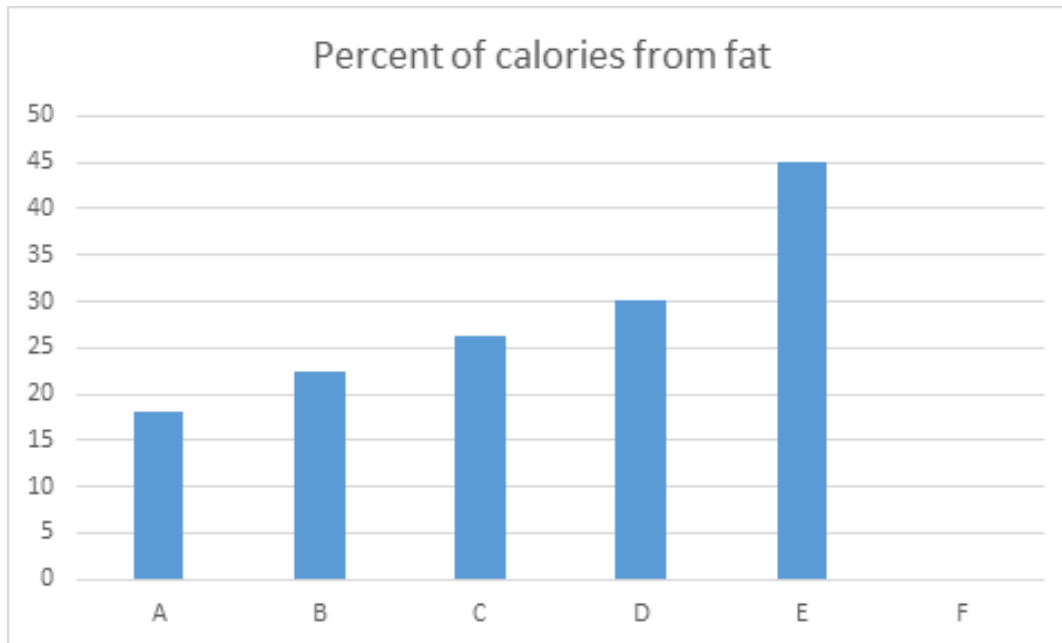
The following two bar graphs below depict four food products and the fat content in each product. Help Jane understand which products would best support weight loss.

Figure 6: Bar Graph of Fat Grams in Food Products
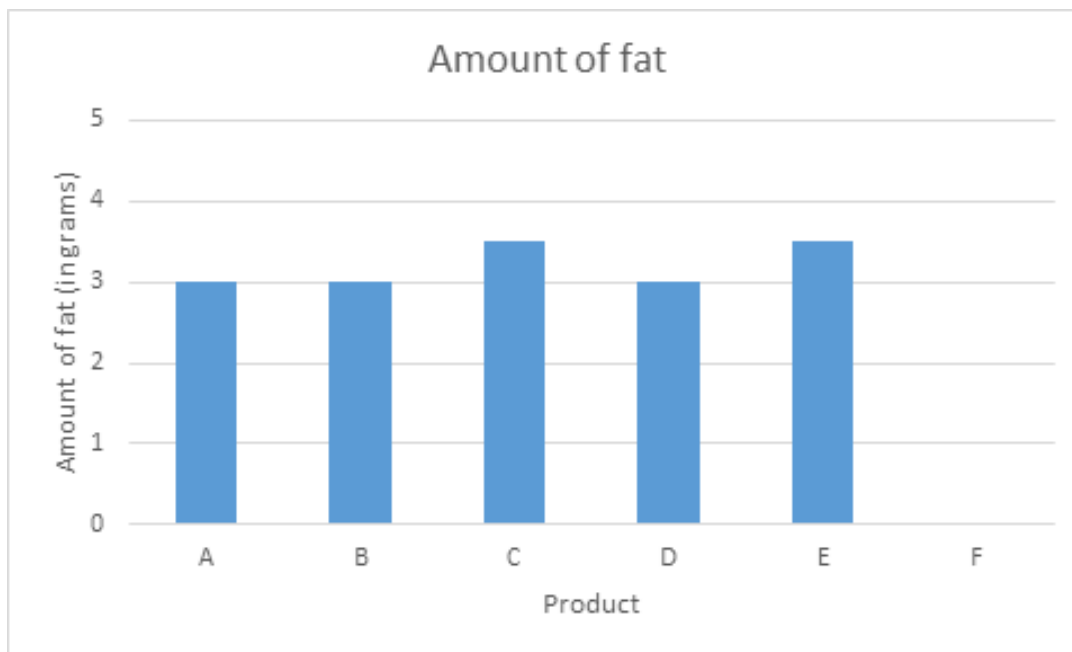
Graph based on data from: http://nutritiondata.self.com/

Figure 7: Bar Graph of Percent of Calories from Fat in Food Products

Graph based on data from: http://nutritiondata.self.com/

(8) Think about the statement, "Food items A, B, and D have the same number of grams of fat, but the products have different percentages of fat content."

    (a) How can this be true? Write your answer in **1-2 complete sentences.**

    (b) Which products would you recommend to someone who is trying to lose weight, and why? Remember, one way to monitor fat intake is to choose foods with less than 35% of calories from fat.

(c) Using both bar graphs (*Figure 6* and *7)*, compare products C and E. How are they similar? How are they different?

(9) Product F in *Figure 6* and *Figure 7* has 3.7 grams of fat and it contains 140 calories.

(a) Calculate the percent of calories that come from fat.

(b) Put your answer above into *Figure 6* and *Figure 7* bar graph in column F.

(c) Would you recommend this product for someone trying to lose weight?

[Student Handout]

Making Connections

Record the important mathematical ideas from the discussion.

Further Applications

(1) Using the information from *Figure 6* and *Figure 7* bar graphs, determine how many calories are in 'Product D'? (Remember: There are 9 calories per 1 gram of fat).

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