

Lynda R. Wiest
College of Education
University of Nevada, Reno
October 2002

Better Nutrition by Analyzing Food Labels

Suggested Grade Levels: 7 and up

Possible Subject Area(s): Health; Consumer Education

Math Skills: calculating percents; writing formulas; reading, interpreting, and graphing data

Overview: Students will learn how to interpret food labels and analyze the nutritional composition of foods. They will do so mainly through applying an understanding of percent. To a lesser degree they will write some basic formulas and will also construct a triple bar graph.

Student Activities: Better Nutrition by Analyzing Food Labels

I. Answer the following questions using the food labels for Cheez-It regular and reduced-fat crackers (Fig. 1).

1. Nutritionists recommend that no more than 30% of a person's daily calories come from fat. Does either type of cracker have 30% or less of its calories from fat?
2. Less than 10% of a person's total daily calories should come from saturated fat.
 - A. Given that a gram of fat has 9 calories, does the saturated fat in either type of cracker meet this guideline?
 - B. Write a formula to show how you can determine the percent of saturated fat a food contains.
3. If total fat accounted for 30% of a food's calorie content, what maximum percent should saturated fat be *of the total fat*?
4. The box of reduced-fat version of Cheez-It crackers states that it has 40% less fat than regular Cheez-It crackers. Explain why you believe this claim is true or false.
5. Total carbohydrate should comprise about 60% of a person's daily caloric intake. Use the Daily Value chart at the bottom of the food label to determine how many calories one gram of carbohydrate has.

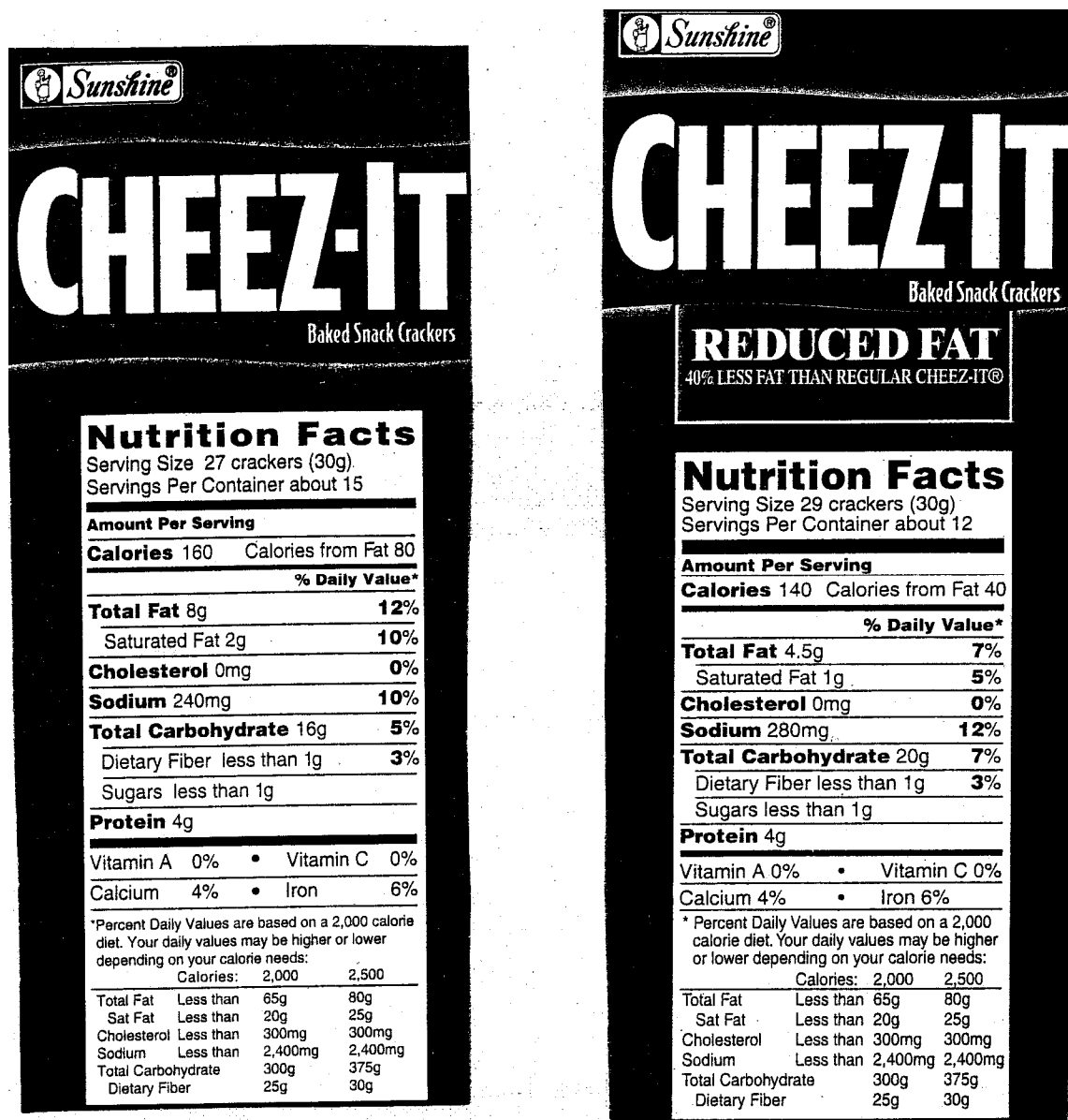


Fig. 1. Food labels for regular and reduced fat Cheez-It crackers.

6. The reference diets at the bottom of the food label show two of the three macronutrients (major, energy-producing nutrients) that make up our food: fat (including saturated fat) and carbohydrate (including dietary fiber). The missing macronutrient is protein, which makes up the remainder of the calories (cholesterol and sodium are insignificant amounts).
 - A. Explain how you could use the Daily Value chart for reference diets to find what percent protein should make up of a person's diet.
 - B. How many calories is a gram of protein?
 - C. What percent of the Daily Value does the protein in Cheez-It crackers provide?
7. Assume you consume 25 g of fat, 75 g of carbohydrate, and 65 g of protein in a particular meal.
 - A. How many calories will you have eaten?
 - B. How does this balance of nutrients compare to the percents recommended for these macronutrients in a healthy daily diet?
 - C. Write a formula that would show how many calories a person has eaten based on the number of grams of each macronutrient he or she has eaten in a meal.
8. Some sources provide a range of percents for appropriate daily macronutrient intake. Williams (1997) states that proteins should comprise 10% to 20% of a person's daily calories, carbohydrates 50% to 60%, and fats a maximum of 25% to 30%. Using these guidelines for a 2500-calorie diet, find the recommended range of values in *calories* for each macronutrient.
9. How can you verify that the amount of sodium in the reduced-fat Cheez-It crackers is 12% of the amount a person should have in a day (i.e., the Daily Value)? Do you think this is a low, moderate, or high amount of sodium, and why?
10. Based on the information found on the food label, tell how many milligrams of calcium a person should have each day.

II. Answer the following questions using the chart below, which shows four types of milk based on differing amounts of fat content.

Calorie Information for Types of Sunnyside Farms Milk				
	Fat Free	1%	2%	Regular
Calories	90	120	120	150
Fat Calories	0	20	45	80

1. How many grams of fat does the regular milk have?
2. Which types of milk fall at the 30% or below guideline for amount of calories from fat?
3. What percent less fat does the 1% milk have than the 2%?

4. The U.S. government regulates the use of some descriptive terms placed on food packaging. Consider the following two.
- ◆ For a product to state that it is “*reduced*” in fat, it must have 25% lower fat calories than the reference food.
 - ◆ For a food to say it is “*light*” (in fat), it must fall within these guidelines:
 - If a reference food has more than 50% of its calories from fat, a light version must be reduced in fat by at least 50%.
 - If a reference food has less than 50% of its calories from fat, a light version must be either reduced in calories by at least one-third or reduced in fat by at least 50%.
- Can Sunnyside Farms claim that any of its types of milk are reduced or light in fat? (The reference food is the regular milk.)
5. Is it possible for a product to legitimately use the descriptor “reduced” or “light” but still have more than the recommended maximum of 30% calories from fat?
6. Is the distribution of macronutrients (fat, carbohydrate, protein) the only thing a person should consider in choosing healthy foods?

III. The table below shows the actual daily macronutrient intake for individuals according to gender and three age groups. Use it to answer the following questions.

Macronutrient Intake of Individuals by Sex and Selected Age Groups						
	Protein (g)		Carbohydrate (g)		Fat (g)	
	Males	Females	Males	Females	Males	Females
20 < yrs	94.9	63.8	298.8	211.7	94.9	50.5
40-49 yrs	95.3	63.5	294.7	213.8	95.3	63.5
70 > yrs	72.9	56.6	239.2	183.5	72.9	49.2

Source: Berdanier, Carolyn D. (Ed.) (2002). *Handbook of nutrition and food*. Boca Raton: CRC Press.

1. Describe what you see in the table above (for example, intake differences according to sex or age, how well different groups of individuals adhere to the recommended balance of macronutrients in their diet, etc.).
2. Working in pairs, have one partner make a triple bar graph showing macronutrient intake for males and females at the three age-level groupings and have the other partner make a double bar graph showing macronutrient intake for the three age-level groupings by sex. Be sure to give your graph a title and to label both axes appropriately. Compare graphs and discuss what each shows.

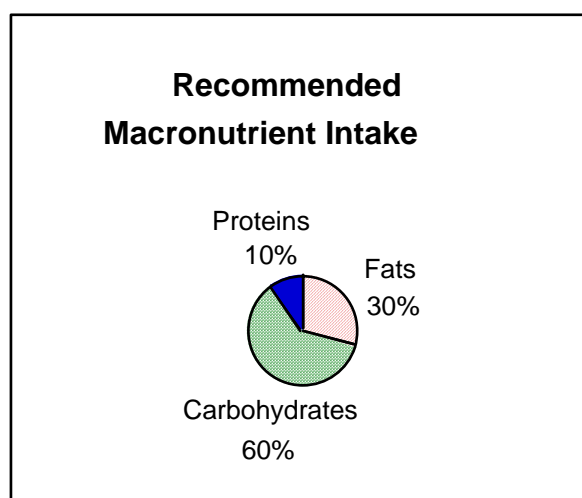
Information for the Teacher

All food labels must contain particular information. Labels first list serving size and servings per container and then per-serving nutrition facts, in particular, calorie information and nutrients. The bottom of the food label shows what proportion of a 2000- and 2500-calorie diet should

come from fat (including saturated fat), cholesterol, sodium, and carbohydrate (including dietary fiber). (Note that this information, then, is the same on all food labels.) The % Daily Value shows what percent each nutrient comprises of a 2000-calorie reference diet.

The macronutrients, which are the body's major energy-suppliers, are protein, carbohydrate, and fat. Nutritionists recommend that no more than 30% of a person's daily calories come from fat, with less than 10% of the total daily calories coming from saturated fat. Other facts about the macronutrients are shown in the table below. Note that these figures refer to total daily intake. Therefore, foods eaten across the day should balance out to stay within these guidelines, but individual foods do not necessarily need to maintain the indicated proportions. (The figures in this chart represent the general standard as used on food labels. However, a suggested range is probably more appropriate. Williams, 1997, for example, states that proteins should comprise 10% to 20% of a person's daily calories, carbohydrates 50% to 60%, and fats a maximum of 25% to 30%.)

Macronutrient Facts		
	Recommended Percent of Daily Calories	Number of Calories per Gram
Protein	10%	4 calories
Carbohydrate	60%	4 calories
Fat	30%	9 calories



The U.S. government regulates the use of some descriptive terms placed on food packaging. Two of these are as follows:

- ◆ For a product to state that it is “*reduced*” in fat, it must have 25% lower fat calories than the reference food.
- ◆ For a food to say it is “*light*” (in fat), it must fall within these guidelines:
 - If a reference food has more than 50% of its calories from fat, a light version must be reduced in fat by at least 50%.

- If a reference food has less than 50% of its calories from fat, a light version must be either reduced in calories by at least one-third or reduced in fat by at least 50%.

Whole milk has 3.5% milkfat. (This information is not needed for these activities, but students may raise this question.)

Answers to Problems and Questions

I. Cheez-It Crackers Problems

[Note: Students may note or the teacher may raise for discussion the fact that regular Cheez-It crackers have 8 grams of fat but 80 fat calories. This yields a calories-per-gram total of 10 calories, where in fact a gram of fat has about 9 calories. It may be worth pointing out to students that federal law allows for five different methods of calculating calorie content. This, combined with rounding error (for example, fat calories greater than 50 must be expressed to the nearest 10-calorie increment), can yield this type of discrepancy. Because of potential consumer confusion, in 1993 the Food and Drug Administration revised its initial requirement that the bottom of food labels list calorie-conversion information, thereafter making it voluntary.]

1. Yes, the reduced-fat Cheez-It crackers have about 28.6% fat.
2. A. Yes, the reduced-fat Cheez-It crackers. They have 1 g of saturated fat, which is 9 calories, or about 6% of the 140 calories in a serving of crackers. The regular Cheez-It crackers have 2 g of saturated fat, which is 18 calories, or about 11% of the 160-calorie serving.
B. $[(S \times 9) \div C] \times 100$, where S = saturated fat in grams and C = calories in a serving of food
3. 33 1/3%.
4. It is true because a serving of reduced-fat Cheez-It crackers has 3.5 g less fat than a serving of regular Cheez-It crackers. 3.5 g is about 44% of the 8 g of fat in regular Cheez-It crackers.
5. 4 calories. Total carbohydrate should comprise about 60% of a person's diet. 60% of a 2000-calorie diet is 1200 calories. $1200 \text{ calories} \div 300 \text{ g} = 4 \text{ calories}$.
6. A. The following is for a 2000-calorie diet. Fat: $65 \text{ g} \times 9 \text{ cal.} = 585 \text{ calories}$. Carbohydrate: $300 \text{ g} \times 4 \text{ cal.} = 1200 \text{ calories}$. $585 + 1200 = 1785 \text{ calories}$. Protein makes up the remaining 215 calories. $215 \text{ cal.} \div 2000 \text{ calories} = 10.75\%$. (The recommendation is about 10%. Rounding error in presenting the figures in the table causes the discrepancy.)
B. 4 calories. The following is for a serving of regular Cheez-It crackers. Fat accounts for 80 calories. Of the other 80 calories, carbohydrate comprises $16 \text{ g} \times 4 \text{ cal.} = 64 \text{ calories}$. $80 \text{ cal. fat} + 64 \text{ cal. carbohydrate} = 144 \text{ calories}$. $160 \text{ cal.} - 144 \text{ cal.} = 16 \text{ calories protein}$. Protein: $16 \text{ cal.} \div 4 \text{ g} = 4 \text{ calories}$.
C. $215 \text{ cal. (from part 6A)} \div 16 \text{ cal. (part 6B)} = \text{about } 13\%$.

7. Assume you consume 25 g of fat, 75 g of carbohydrate, and 65 g of protein in a particular meal.
- A. 785 calories. Fat: $25 \text{ g} \times 9 \text{ cal.} = 225 \text{ calories}$. Carbohydrate: $75 \text{ g} \times 4 \text{ cal.} = 300 \text{ calories}$. Protein: $65 \text{ g} \times 4 \text{ cal.} = 260 \text{ calories}$. $225 + 300 + 260 = 785 \text{ calories}$.
- B. The meal is okay in terms of fat, but it is too low in carbohydrate and too high in protein. Fat: $225 \text{ cal.} \div 785 \text{ cal.} = 29\%$. Carbohydrate: $300 \text{ cal.} \div 785 \text{ cal.} = 38\%$. Protein: $260 \text{ cal.} \div 785 \text{ cal.} = 33\%$. (Government-recommended guidelines are 30% max. fat, 60% carbohydrate, and 10% protein.) Note, however, that the nutrition guidelines apply to *daily* caloric intake rather than for a specific meal.
- C. $T = 9F + 4C + 4P$ for total number of calories (T), where F = grams of fat, C = grams of carbohydrate, and P = grams of protein.
8. Protein: 250-500 calories (10-20% of 2500). Carbohydrate: 1250-1500 calories (50-60% of 2500). Fat: 625-750 calories (25-30% of 2500).
9. One way is to find 12% of the Daily Value of 2400 mg listed for a 2000-calorie diet. This yields 288 mg. The amount of sodium listed for the product is 280 mg. This can be considered to be close enough to be accurate (rounding error in listing figures on the label results in some discrepancies). This might be considered to be a high amount of sodium, because one serving of this snack alone accounts for about one-eighth (12%) of the Daily Value, or the recommended amount of sodium for an entire day. Also, one serving is 12% of the Daily Value of sodium but only 7% of the total daily calories.
10. It isn't possible to determine this. Students should be encouraged to tell what piece of information they would need to figure this. They would need to know the number of milligrams of calcium the product contains in addition to its 4% Daily Value as listed on the label.

II. Milk Types Problems

Calorie Information for Types of Sunnyside Farms Milk				
	Fat Free	1%	2%	Regular
Calories	90	120	120	150
Fat Calories	0	20	45	80

- About 9 grams ($80 \text{ fat calories} \div 9 \text{ calories per gram of fat}$).
- Fat Free and 1%. Fat free = 0% fat; 1% = 17% fat; 2% = 37.5% fat; regular = 53% fat.
- 55.6% less fat ($45 \text{ fat calories} - 20 \text{ fat calories} = 25 \text{ fat calories}$; $25 \text{ fat calories} \div 45 \text{ fat calories} = 0.5555$; $0.5555 \times 100 = 55.6\%$).
- A reduced-fat version would have to be reduced by at least 25% of the 80 fat calories in regular milk (20 fat calories or more). A light version would have to have 50% lower fat calories (40 fat calories or more). This means that the 2% milk can be called *reduced* fat, and

the 1% can be called *light*. (The reference food, regular milk, has at least 50% of its calories from fat, so the first bullet under the reduced-fat description applies.)

5. Yes. For example, if a 220-calorie serving of food contained 160 fat calories, a reduced-fat version would have 120 or fewer fat calories, and a light version would have 80 or fewer fat calories. However, 80 fat calories out of a 220-calorie total amounts to 36%, still higher than the recommended 30% maximum for fat calories in food. (Students might be challenged to find such a product. They might also discuss how such descriptors on labels can, in such situations, be misleading.)
6. No. Even if the fat in a particular food comprises less than 30% of the total calories, the total calories in the food and the total amount of fat might be rather high. It is also important to note the amount of saturated fat, which should not exceed 10% of a person's daily caloric intake. Other things a wise consumer might consider is the amount of sodium, cholesterol, and sugar in products, as well as the vitamin and nutrient content. The number and amount of food additives is also worth considering (this is particularly pertinent in lower fat and lower sugar foods where additives might be included in greater measure in order to boost taste). Moderation and variety in food choices are also important general considerations.

III. Macronutrient Intake by Sex and Age Problems

1. Females eat slightly more carbohydrate than males, and males eat slightly more fat than females. Both males and females eat too much fat (more than the recommended 30% maximum). Males eat about the same balance of the three macronutrients over time. Females eat about the same amount of protein over time, but they eat less carbohydrate and more fat in the middle and older age groups than in the youngest age group. Males take in more total daily calories than females, and elderly people's diets are lower in calories than individuals in the younger two age groups. (The first figure shown in each cell is calories, obtained by multiplying grams by 4 calories for protein and carbohydrate and by 9 calories for fat. Percents show the percent of the daily caloric intake the macronutrient comprises. These figures have been rounded to the nearest whole number; therefore, the table contains rounding error.)

Macronutrient Intake of Individuals by Sex and Selected Age Groups						
	Protein (cal / % diet)		Carbo. (cal / % diet)		Fat (cal / % diet)	
	Males	Females	Males	Females	Males	Females
20 < yrs	380 / 16%	255 / 16%	1195 / 49%	847 / 54%	854 / 35%	455 / 29%
40-49 yrs	381 / 16%	254 / 15%	1179 / 49%	855 / 51%	858 / 35%	572 / 34%
70 > yrs	292 / 15%	226 / 16%	957 / 50%	734 / 52%	656 / 34%	443 / 32%

1. Students will construct the noted graphs using the percents shown in the table above. They will make comments similar to those discussed in Number 1 above, but they might note that the graphs do not seem to show much difference between or among groups. This might be a good time to examine the impact of labeling the vertical axes on the graphs differently (e.g., by ones, twos, or fives, or by including a break in the axis).

References

1. Read, Marsha. (2002). The health-promoting diet throughout life: Adults. In Carolyn D. Berdanier (Ed.), *Handbook of nutrition and food* (pp. 299-317). Boca Raton: CRC Press.
2. Williams, Sue Rodwell. (1997). *Nutrition and diet therapy* (8th ed.). St. Louis: Mosby.

Selected Resources

1. American Dietetic Association: Nutrition Resources:
<http://www.eatright.org/nuresources.html>
2. Berdanier, Carolyn D. (Ed.) (2002). *Handbook of nutrition and food*. Boca Raton: CRC Press.
3. Center for Nutrition Policy and Promotion, U.S. Department of Agriculture:
<http://www.usda.gov/cnpp/>
4. Rosenbloom, Christine A. (Ed.). (2000). *Sports nutrition: A guide for the professional working with active people* (3rd ed.). Chicago: The American Dietetic Association.
5. Wardlaw, Gordon M. (2000). *Contemporary nutrition: Issues and insights* (4th ed.). Columbus, OH: McGraw-Hill.
6. Whitney, Eleanor N., Cataldo, Corinne B., DeBruyne, Linda K., & Rolfes, Sharon R. (2001). *Nutrition for health and health care* (2nd ed.). Stamford, CT: Wadsworth.
7. Williams, Melvin H. (2002). *Nutrition for health, fitness and sport* (6th ed.). Boston: McGraw-Hill.