



Portion Size: Then and Now

It is no secret that portion sizes, as well as waistlines, in this country are expanding. *The Dietary Guidelines for Americans 2005*¹ urge Americans to pay special attention to portion sizes, which have increased significantly over the past 2 decades. Restaurant meals of all kinds have gotten larger with an emphasis on getting more food for the money. However, the rise of portion sizes is not limited to restaurants alone. Bags of snack foods or soft drinks in vending machines and the grocery store are offered in larger and larger sizes that contain multiple servings while a 1-ounce bag of snack food or an 8-ounce soft drink, which are the recommended single serving sizes, are very difficult to find. Americans are surrounded by larger portion sizes at relatively low prices, appealing to the consumer's economic sensibilities. However, the cost to America's health may be higher than most people realize.

In the section on weight management, the Dietary Guidelines address portion sizes, stating that there are no empirical studies to show a causal relationship between increased portion sizes and obesity, but there are short-term studies showing that controlling portion sizes helps limit calorie intake, particularly when eating high-calorie foods. What is missing from the research is whether people monitor portion sizes and consistently choose to eat recommended serving sizes, thus consuming the appropriate amount of calories for maintaining or losing weight.

The following research review examines what science underlies the notion that large portion sizes have contributed to weight gain among Americans. The research-to-practice section offers ideas to practitioners about how to counsel their patients or clients about portion size.

Research Review

Eat More Than You Use = Weight Gain

The fundamental rule of weight management is that people gain weight when they eat more calories than they expend. Therefore, the number of calories in the amount of food consumed is integral to weight management. Portion size does not matter if the person chooses to eat only an appropriate serving or eats fewer calories in subsequent meals and snacks that allow them to stay within recommended calorie limits. But do people look at food that is offered and automatically assess how much is a normal serving size, and then actually eat only the normal serving size? Do they adjust what they eat after consuming large portion sizes? The research says they may not.

Trends in Increasing Portion Sizes

Restaurants

Eating in restaurants offers many opportunities to encounter large portion sizes. The number of eating establishments in the United States increased by 75 percent between 1977 and 1991.² While Americans have many choices in restaurants, the food (especially from fast food restaurants) is often very cheap and available in large quantities.^{3,4} A study shows that the frequency of eating out, particularly at fast-food restaurants, is associated with an increase in energy and fat intake and with a higher body mass index.⁵

Eating at Home and Snacks

Even those who do not frequent restaurants are confronted with large portion sizes of prepackaged or convenience foods. Young and Nestle⁶ reported on a study examining the current weight of ready-to-eat foods and comparing them with past weights using data from manufacturers. Portion sizes of these foods began increasing in the 1970s and have continued to do so



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through today to the point where most exceed federal serving size standards.

Nielsen and Popkin⁷ compared two cross-sectional surveys using Nationwide Food Consumption Survey data from 1977 and the Continuing Survey of Food Intake by Individuals (CSFII) data from 1989 and 1996-1998 to determine patterns and trends of portion sizes by type of food and eating location. "Key foods" (salty snacks, desserts, soft drinks, fruit drinks, French fries, hamburgers, cheeseburgers, pizza, and Mexican food) were chosen because they had the greatest percent change of energy in the U.S. diet. When data on the key foods were combined, they represented 18 percent of calories consumed in the United States in 1977-1978 and 27.7% of all calories in 1994-1996. The study found that between the survey years, portion sizes and energy intake increased for all key foods except pizza. The portion size increase resulted in an increased caloric intake for salty snacks (93 calories more), soft drinks (49 calories), hamburgers (97 calories), French fries (68 calories), and Mexican dishes (133 calories).

A study by Smiciklas-Wright et al.⁸ illustrates the difficulty of assessing whether larger portion sizes are being consistently consumed. Their study of self-reported energy intake of food eaten at home compares quantities per eating occasion (portion size) using CSFII data from 1989-1991 and 1994-1996. The results showed that about one-third of the 107 commonly eaten foods showed significant differences in portion size. The majority of foods with significant differences were larger sizes in 1994 - 1996, including seven types of grains and cereals (e.g., oat rings, pasta, spaghetti with tomato sauce), and 11 beverages, such as orange juice, all soft drinks, beer, wine, and fruit drinks. Smaller portion sizes in 1994-1996 were reported for macaroni and cheese, pizza, chicken, bacon, margarine, and mayonnaise. No foods showed significant differences in portion sizes between the survey years for every age and sex category in this study.

People can compensate for eating larger portions in one eating occasion by eating fewer calories during the rest of the day or the time period before or following the eating occasion. However, this is often difficult for many to do. In some of the studies in this brief,^{2,6} the researchers found that the people eating larger portion sizes did not notice the size difference and ate their normal amount of food at the following meal.

Differences in Portion Size and Serving Size

Portion size is the amount of a single food item served in a single eating occasion, such as a meal or a snack. Many people confuse portion size with serving size, which is a standardized unit of measuring foods—for example, a cup or ounce—used in dietary guidance, such as the Dietary Guidelines for Americans. Portion size is the amount offered to a person in a restaurant, the amount offered in the packaging of prepared foods, or the amount a person chooses to put on his or her plate. For example, bagels or muffins are often sold in sizes that constitute at least 2 servings, but consumers often eat the whole thing, thinking that they have eaten 1 serving. They do not realize that they have selected a large portion size that was more than 1 serving.

Portion Size Affects How Much People Consume in an Eating Occasion.

Short-term studies show that people eat more when they are confronted with larger portion sizes. The research studies described in the following cover only one or a few eating occasions in a short time frame. Research studies have yet to assess the impact of portion sizes over longer periods of time. However, the phenomenon of unknowingly eating larger amounts when presented with a large portion is an important aspect of weight management.

A study by Rolls et al.⁹ tested how adults responded to meals on different days of four different portion sizes of macaroni and cheese. They found that the bigger the portion, the more participants ate. Participants consumed 30% more energy (162 cal) when offered the largest portion (1000g) compared to the smallest portion (500g). They also reported similar ratings of hunger and fullness after each meal despite the intake differences. After the study, only 45% of the subjects reported noticing that there were differences in the size of the portions served.

Another study by Rolls et al.¹⁰ gave the same subjects different size sandwiches on several occasions to look at the effect on energy intake of increasing the portion size of a food served as a discrete unit (sandwich). Men and women who were offered different size (6-, 8-, 10-, and 12-inch) sub sandwiches for lunch on four different days ate significantly more as the size of the sandwich offered became larger. A study by Diliberti et al.¹¹ in a restaurant setting showed that when a pasta entrée was served in different portion sizes on different days, people ate larger amounts when they were given larger portions.

This tendency to eat more when offered more was observed nearly 30 years ago when Pudal and Oetting¹² conducted an observational study in which they served people soup from normal bowls to determine their

customary intake. On the 4th day, researchers secretly substituted trick bowls that slowly refilled from a hidden reservoir under the table. Both obese and lean participants ate more than their usual portion. The participants were told about the trick, and their intake was measured over the next 6 days. Normal-weight individuals adjusted their intake while obese participants continued to overeat.

Studies on portion sizes of snacks have had similar results. Researchers¹³ on five different occasions gave men and women an afternoon snack of potato chips that were packaged in bags that looked the same except that they progressively increased in size (from 28g to 170g). For both men and women, the snack intake increased significantly as the package size increased. From the 170g bag, women ate 18% more and men 37% more than when served the 85g bag. Notably, when dinner was served several hours later, participants did not adjust their intakes to compensate for the differences in snack intake. Therefore the combined calorie intake from the snack and dinner increased significantly for both men and women when the larger snack was consumed.

In a study by Wansink and Park,¹⁴ people in a movie theater were given a medium (120g) or large (240g) bucket of popcorn. Subjects were divided into two groups based on whether they thought the taste was favorable or unfavorable. Larger portion sizes had the effect of increasing the amount eaten regardless of how the participants rated the taste of the popcorn.

Some studies show the same behavior in children. In a study by Fisher et al.,¹⁵ 30 preschool-age children (mean age, 4 years; range, 2.9-5.1) were evaluated during two series of lunches in which either an age-appropriate portion or a large portion of an entrée along with side dishes was served. Doubling of an age-appropriate portion resulted in a significant increase in the energy intake from the entrée by 25% and total energy intake from the meal by 15%. These increases were not significantly related to sex, order of the portion sizes served, or age. However, another study of preschool-age children suggests that increasing portion size resulted in increased food intake among 5-year-olds, but had no influence on the amount consumed by 3½-year-olds.¹⁶ This suggests that children may lose the ability to adjust their food intake to meet their energy needs when given larger portions sizes.

McConahy et al.¹⁷ conducted a study that compared data from the Continuing Survey of Food Intake of Individuals (CSFII 1994 -1996, 1998) and the Nationwide Food Consumption Survey (1977-1978) of children 1 to 2 years of age. They assessed portion size z-scores and related it to body weight and energy intake. Average portion size z-scores were positively related to both body weight and energy intake, but there were no differences in number of eating occasions or number of foods eaten. The authors

concluded that children may adjust their food intake based on portion sizes throughout the day to sustain their energy intake.

Another study by the same researchers,¹⁸ evaluated the relationship of portion size and other food behaviors to total energy intake among children 2 to 5 years of age who participated in the CSFII, 1994-1996, 1998. Energy intake was positively related to number of eating occasions, number of foods consumed, and portion size z-score (composite value for each child) for the most commonly consumed foods (milk, bread, soft drinks, cereal, juice, cookies, French fries, banana, peanut butter, and macaroni and cheese). In multiple regression models predicting energy intake, portion size as a single predictor explained the greatest amount of the variance in energy intake, suggesting portion sizes served to children influences their caloric intake.

Of course, eating larger portion sizes at one eating occasion will not cause weight gain unless it contributes to a total eating pattern in which a person consumes more calories than he or she expends. Although the research has not yet shown that this happens, the literature does show that people are offered many opportunities to be exposed to large portion sizes. Certainly people who need to lose or maintain weight should consider all opportunities to eat appropriate amounts to avoid excess calorie intake.

Assessing Amount of Intake

Even though there is information available about appropriate serving sizes, people generally do not correctly assess the amount they are eating. Often people are unable to tell the differences in portion size when offered different sizes on different days.^{19,20,21} Although the ability to accurately determine appropriate amounts of food to eat is important, there is little research to suggest which methods would be most successful in helping people estimate appropriate serving sizes. Young and Nestle²² concluded that characteristics of people (gender, age, body weight, level of education) cause differences in the way they estimate portion size, and error in estimating becomes greater as portions increase. In addition, physiologic satiety cues are readily overridden by food cues, such as large portions, easy access, and the sensory attractiveness of food.¹²

In addition to food cues, other factors add to the effect of portion size, causing people to eat more than they need, particularly in a restaurant setting. Eating out can affect energy intake not only because of portion size, but also by convivial atmosphere, tendency to choose foods with high energy density, and alcohol consumption.²³

Research Gaps

Because of the importance of portion size, it would be helpful to understand more clearly certain aspects of its

impact on weight and weight management. For example, there have been no long-term studies published that determine the impact of portion size on energy balance or weight maintenance. There have been no published intervention studies on portion size and weight control, such as those that would train people to recognize appropriate serving sizes and incorporate that knowledge into their eating behavior.

RESEARCH TO PRACTICE: What does this mean for those who want to lose or maintain weight?

As we have seen from the research review above, portion sizes in this country have increased over the past two decades. The research also shows that portion size influences how many calories a person consumes, and may hinder the ability of individuals to accurately assess how much they are eating. Because oversized portions are pervasive in our culture, from restaurants to supermarkets to vending machines, it is important to make people aware of the subtle ways in which portion size can sabotage even the most valiant weight control efforts, and to give them strategies for avoiding some common pitfalls.

Raise Awareness of Portion Distortion.

Portion sizes have increased across multiple venues, including restaurants, grocery stores and vending machines. Because these changes in portion size can translate into excess calories, it's important to make your patients or clients aware of the issue. The Portion Distortion Quiz from the National Heart Lung and Blood Institute (NHLBI) (<http://hin.nhlbi.nih.gov/portion/>) is a good tool to illustrate how portion sizes of some common foods have changed over the years.

Food labels can also help people understand that portion sizes are often larger than they think. The following Web sites are good tools to help people learn to use the Nutrition Facts Label on food packages:

- How to Understand and Use the Nutrition Facts Label, Food and Drug Administration, Center for Food Safety and Applied Nutrition. <http://www.cfsan.fda.gov/~dms/foodlab.html>
- Test Your Food Label Knowledge (quiz), Food and Drug Administration, Center for Food Safety and Applied Nutrition. <http://www.cfsan.fda.gov/~dms/flquiz1.html>

Help people control calorie intake when faced with large portions.

The research suggests that people inadvertently consume more calories when faced with larger portions. Practitioners should counsel their patients and clients on how to avoid this trap. Here are some suggestions:

- ❖ Portion control when eating out. Many restaurants serve more food than is appropriate for one person. Encourage your patients or clients to control the amount of

food that ends up on their plate by splitting an entrée with a friend, or asking the waiter to put half of the meal in a "doggie bag" before it's even brought to the table.

- ❖ Portion control when eating in. To minimize the temptation of second and third helpings when eating at home, people should serve reasonable portions on individual plates, instead of putting the serving dishes on the table. Keeping the excess food out of reach may discourage inadvertent overeating.
- ❖ Portion control in front of the TV. When eating or snacking in front of the TV, encourage people to put a reasonable amount of food into a bowl or container, and leave the rest of the package in the kitchen. It's easy to overeat when a person's attention is focused on something else.
- ❖ Controlling hunger between meals. Encourage your patients or clients to eat a snack, like a piece of fruit or small salad, if they feel hungry between meals to avoid overeating during the meal.

Help people assess the right amount to eat.

The most accurate way to monitor portion sizes is to measure out food with a scale and measuring cup. However, this is not realistic at many eating occasions. Your patients or clients can use this handy Serving Size Wallet card from NHLBI (<http://hin.nhlbi.nih.gov/portion/servingcard7.pdf>) to help them estimate the right amount to eat. And they can take the NHLBI Visual Reality quiz (<http://nhlbisupport.com/chd1/visualreality/visualreality.htm>) to test their skills at estimating serving sizes.

Help people control their environment.

Different aspects of the environment may act as cues to consume more food than people realize. It is important that people understand how their surroundings can influence their calorie intake so they can make simple changes within their environments.

- ❖ Package size may influence consumption. For some reason, the larger the package, the more people consume from it without realizing it. To minimize this effect, encourage patients or clients to
 - Divide up the contents of one large package into several smaller containers to help avoid over-consumption.
 - Don't eat straight from the package. Instead, serve a reasonable portion in a bowl or container.
- ❖ Out of sight, out of mind. People tend to consume more when they have easy access to food. Advise patients or clients to make their home a "portion friendly zone."
 - Get rid of the candy dish, or better yet, replace it with a fruit bowl.

- Place especially tempting foods, like cookies, chips, or ice cream, out of immediate eyesight, like on a high shelf or at the back of the freezer. Move the healthy fare to the front at eye level.
- When buying in bulk, store the excess in a place that's not convenient to get to, such as in a garage or basement.

It's All About Balance.

The bottom line to weight control is that the number of calories people consume must not exceed the number of calories they expend. A good way to monitor this is by keeping a daily log of food consumption and physical activity. The USDA's MyPyramid Tracker (<http://www.mypyramidtracker.gov/>) is a fast, easy way for your patients or clients to keep track of calorie balance and monitor their weight.

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