



**Moving Toward
Mindful Portions
in America**

**A Review of Portion Guidance
Literature, Legislation
and Opportunities to
Improve Public Health**



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Introduction

The prevalence of obesity in the United States (U.S.) remains high and continues to be a major public health concern for adults and children.^{1,2} In fact, the 2015-2020 Dietary Guidelines for Americans (DGA) states that for more than 25 years, more than half of the adult population has been overweight and obese.³ Obesity raises risks for a variety of medical conditions⁴ as well as for premature death. Rates of these chronic, diet-related diseases, such as diabetes, continue to rise, and they come not only with increased health risks, but also at high cost. In 2008, the medical costs linked to obesity were estimated to be \$147 billion. In 2012, the total estimated cost of diagnosed diabetes was \$245 billion, including \$176 billion in direct medical costs and \$69 billion in decreased productivity.^{5,6,7} Reversing this epidemic will require a collaborative effort by those in the healthcare industry, government and the food industry.

Portion size refers to the amount of a food that is appropriate for an individual to consume within their daily calorie limits and nutrient needs. This paper will explore how oversized portions can contribute to obesity and the lack of understanding among consumers regarding portion sizes and calories. It will also discuss implications related to the U.S. Food and Drug Administration's (FDA) updates to the standard serving sizes on the Nutrition Facts label and highlight recommendations for those in the food and health sectors to address the need for public education on how to select reasonable portion sizes.

The U.S. Department of Agriculture's data on the availability of calories in the U.S. food supply and U.S. dietary intake surveys indicate that Americans are consuming more calories per day than they were in the late 1970s.^{9,10}

While a host of factors can account for weight gain, the basic cause is an excess of calorie intake over expenditure. Excessive calorie intake is encouraged by our current food environment, which promotes overeating, large portions and ubiquitous food.⁸ Indeed, the U.S. Department of Agriculture's (USDA) data on the availability of calories in the U.S. food supply and U.S. dietary intake surveys indicate that Americans are consuming more calories per day than they were in the late 1970s.^{9,10} Additional data shows that portion sizes of commonly consumed foods have increased considerably since the late 1970s. It has been concluded that one reason for the increase in obesity rates may be that people are eating larger food portions, and thus, more calories.¹¹



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Portion Size: The Issue At Hand



Portion Distortion

Many food portions are now two to five times larger than their original size.¹⁵

The Evolution of Larger Food Portions

Portions of most commonly consumed foods in the American diet, from bagels and muffins to hamburgers and soft drinks, have increased steadily over the past several decades, and have done so in parallel with rising obesity rates.^{12,13,14} In particular, this trend has been observed in packaged foods and drinks as well as energy-dense foods served in the highest-selling take-out establishments, restaurants and fast-food outlets. Many food portions are now two to five times larger than their original size,¹⁵ and recent observations suggest that portion sizes have continued to increase despite pleas from public health professionals to reduce them.¹¹

“Mega size,” “king size,” “triple” and “deluxe” are just a few descriptors commonly seen on menus and products. For example, a typical bagel today is equivalent to eating five slices of bread, and many muffins weigh nearly a half a pound. In restaurants, it’s common for a steak to contain more than a pound of meat which is enough for several days’ worth of protein. In addition to restaurant foods, many packaged foods sold in supermarkets have increased steadily in size over the past several decades.¹⁶

Larger-than-appropriate portions may contribute to obesity in several ways. Not only do they contain more calories than smaller portions by way of size, they also may encourage consumers to eat more and lead people to underestimate how much they are eating. These issues are explored in the following sections.

Calorie Contribution from Larger Portions

Large food portions contain more calories than smaller portions, and it is important for consumers to recognize this calorie difference.

For example, an 8 fl. oz. soft drink contains 100 calories while a 20 fl. oz. size contains 250 calories. A small order of French fries at a fast-food outlet contains approximately 200 calories while the large order contains more than 500 calories. While a single hamburger sandwich contains approximately 300 calories, a triple burger sandwich contains more than 1,000 calories.¹⁶ Many individual meals are now so large that they contribute substantially to the recommended 1,000 to 3,200 total calories per day guideline for most Americans to achieve or maintain a healthy weight.

The trend toward quantity-over-quality and larger food portions typically seen in today’s marketplace has contributed to “portion distortion,” a term that can be described as perceiving oversized portions as standard or normal. The terms “small,” “medium” and “large” often have little meaning when it comes to food,¹⁷ and many consumers have increased difficulty recognizing amounts of food that are appropriate for their weight and activity levels.^{18,19} This “eat more” environment combined with the marketing of calorie-dense and improperly portioned foods has played a role in rising obesity rates in the U.S.²⁰

Calorie Differences Between Small and Large Portions

8 fl. oz. Soft Drink	vs	20 fl. oz. Soft Drink
100 calories		250 calories
Small Order French Fries	vs	Large Order French Fries
200 calories		500 calories
Single Hamburger	vs	Triple Hamburger
300 calories		1,000 calories



The Effect of Portion Size and Environmental Cues on Food Intake

Considerable research has found that larger portions encourage most people to consume more food,^{21,22} and therefore, more calories.^{23,24} One study found that normal and overweight men and women consumed 30% more food and calories when served a large portion versus a standard portion. The study participants did not notice the difference in the size of portions they were served. Those

The effect of portion size on calorie intake can persist for at least several days. It has been observed that when a larger portion is consumed on a given day, people do not compensate by eating less over the next few days.³⁶

served the larger portion also reported similar levels of satiety after eating, despite having consumed more food.²⁵ Another study compared subjects’ consumption of soup from a self-refilling bowl versus a normal bowl. Study subjects ate 73% more soup from self-refilling bowls and did not believe themselves to have eaten more. Those eating from the self-refilling bowls also underestimated their actual consumption significantly more than those eating out of normal bowls.²⁶ Furthermore, a 2015

Cochrane review produced some of the most conclusive evidence to date that portion, package and tableware size can influence food consumption. Researchers looked at results from 61 high quality studies and found that people consistently consume more food when offered larger portions compared to smaller portions.²⁷

Environmental factors such as the size of plates, bowls and utensils or serving method can have a large impact on how much food people consume.²⁸ It has been observed that the size of bowls and spoons affects how much food people serve themselves. For example, one study found that people who were given a larger bowl and a larger serving spoon served themselves nearly 60% more ice cream than those given a smaller bowl and spoon. Interestingly, those with the larger bowl and spoon were unaware of having served themselves larger portions.²⁹ In another study, children requested more cereal and consumed more food when given a larger bowl. The effect of bowl size on amount of food requested occurred regardless of the children’s body mass index (BMI), age or sex.³⁰ A 2017 study further identified the impact of serving style on portion sizes, especially as it relates to snacking. Participants were more likely to take candy pieces and dried fruit when snacks were made available in pre-served cups (32% and 16%, respectively) versus participants who were offered the same snacks, but were required to serve themselves (0% and 6%, respectively).



In one study, nearly 25% of adults, adolescents and parents of school-aged children underestimated the calorie content of a meal by at least 500 calories.⁴¹

This study identified the physical involvement in serving oneself may have positive portion size implications.³¹

People tend to eat in “units” and when served a food that comes in a unit, such as a cookie or sandwich, most people will eat the entire portion regardless of its size.³² As the size of the unit increases, it is likely the amount of food consumed will increase. Indeed, one study found that subjects ate considerably more calories when given a larger-size sandwich and did not report feeling more satiated than those who ate a smaller sandwich.³³ The amount of food in a package or container also influences how much subjects eat.³⁴ This may occur regardless of how favorable people perceive the food as findings from one study showed that even when subjects were served stale food out of a large container, they still consumed a larger portion.³⁵

The effect of portion size on calorie intake can persist for at least several days. It has been observed that when a larger portion is consumed on a given day, people do not compensate by eating less over the next few days.³⁶ In fact, the effect of eating a large portion on energy intake may be sustained for more than a week³⁷ and may contribute to increasing body weight over time.³⁸ Indeed, this relationship makes sense as larger food portions contain more calories than small portions.

The Consumer’s Struggle to Identify Proper Portions

It appears that most people, regardless of body weight, gender, age or social status have trouble estimating proper portions.³⁹ In addition to encouraging consumers to eat more food (and, thus more calories), large portions encourage consumers to underestimate the calories they are eating.⁴⁰ In one study, nearly 25% of adults, adolescents and parents of school-aged children underestimated the calorie content of a meal by at least 500 calories.⁴¹ In a study that compared healthy subjects taking small sips or large sips of soup, the individuals who took large sips ate more soup and underestimated how much they ate.⁴² Underestimating how much one eats and

how many calories foods actually contain may lead to overeating as many people tend to overcompensate by eating more.

The oversized portions often served in restaurants pose a particularly difficult situation when it comes to navigating portion control. The Centers for Science in the Public Interest’s Xtreme Eating report identifies high-calorie restaurant meals. With meals reaching over 2,500 calories, the 2016 report further discussed how large portion sizes can fog nutritional estimates of dishes.⁴³ Even trained nutrition professionals have been found to have difficulty estimating the calorie and fat content of restaurant meals. When researchers showed trained registered dietitians several restaurant meals, they underestimated the calorie content by 220 to 680 calories, and the fat content by 18 to 57 grams.⁴⁴

Two recent studies among children showed they ate more when given larger packages, and the effect of the package size was stronger for foods with higher sugar levels.⁴⁵ Another study found that parents of obese children felt that their children should be eating larger portion sizes.⁴⁶ The collective research identifies that parents play a role in both modeling healthy eating behaviors and serving proper portion sizes.

People also tend to underestimate the calories in foods that they perceive as healthy⁴⁷ or low-fat.⁴⁸ Known as the “health halo effect,” evidence suggests that when a food is marketed as healthy, consumers will underestimate the calories.⁴⁹



Upcoming Changes to Serving Size Requirements on the Nutrition Facts Labels

The History of the U.S. Food and Drug Administration’s Reference Amounts Customarily Consumed

Nutrition information is required on most packaged foods and beverages to help consumers make informed choices regarding the nutritional content of a food. In response to rising obesity rates, updated science and more recent food consumption surveys, the FDA announced the new Nutrition Facts label for packaged foods in Spring 2016. The key contents of a Nutrition Facts label include serving size, number of servings per container and calories and nutrient content per serving, among other features. The size of the serving on the label is determined based on the Reference Amounts Customarily Consumed (RACCs) as defined by FDA, which in turn determines the calorie and nutrient content displayed on the label.

Prior to serving size revisions, data from dietary intake surveys showed that 27 out of 158 (17%) of RACCs used to calculate labeled serving sizes did not reflect the amount typically consumed.

The Nutrition Labeling and Education Act requires serving sizes to be based on amounts of food and beverages that people actually eat rather than the amount that they should eat.⁵⁰ FDA established the current RACCs in 1993 primarily based on data from food consumption surveys conducted in the 1970s and 1980s.⁵¹ Because the surveys were conducted more than 30 years ago, the RACCs were, in many cases, smaller than typical marketplace portions and may cause confusion for people trying to follow dietary advice.¹⁵ If the RACC and, therefore, the labeled serving size was smaller than the amount typically consumed, consumers may have assumed they were consuming fewer calories and nutrients than they were actually taking in.

Revision of the Reference Amounts Customarily Consumed and Implications

In March 2014, FDA issued a proposal to update the Nutrition Facts label. As part of this effort, serving size requirements would be updated to reflect how much people typically eat based on more recent dietary intake surveys. As FDA indicated upon the release of the proposal, data from dietary intake surveys showed that 27 out of 158 (17%) of RACCs used to calculate the labeled serving sizes did not reflect the amount typically consumed. The final rule was posted in July 2016. Though implementation was intended to go into effect by July 2018, the FDA plans to extend the compliance date.

Under the new rule, RACCs for some foods will increase while others will decrease. For example, the updated RACC will increase the serving size of ice cream from one-half cup to two-thirds cup – increasing the calories and other nutrients shown on the label.⁵²

The changes will also require that packaged foods and drinks typically consumed in one sitting be labeled as a single serving, and that manufacturers declare the calorie and nutrient information for the entire package. For example, a 20 fl. oz. bottle of soda will be labeled as one serving and 250 calories instead of 2.5 servings and 100 calories per serving. Stating the total number of calories on the label in such foods (as opposed to the calories in an unrealistic serving size) will help make consumers more aware of how many calories they actually are consuming.



Call to Action

For packages that could be consumed in either one sitting or several sittings, FDA will require manufacturers to provide a “dual column” label to indicate the calories and nutrients per serving and per package. This will enable consumers to understand how many calories and nutrients are in one serving, as well as the entire package. In addition, the refreshed Nutrition Facts label design will more prominently display calories per serving and number of servings per package.

Consumer Confusion Around Serving Sizes on Food Labels

Labeled serving sizes have long been confusing to consumers. Many purported single-serving packages actually contain multiple servings. Therefore, calories per serving appear lower on these foods to the consumer who would typically eat the entire package.⁵³ One survey found that labels for various products including canned soup, ice cream and coffee creamer understated calorie and nutrient content compared to the actual amounts consumed. Specifically, 62% of consumers reported eating an entire can of soup in one sitting even though the package label stated multiple servings per package. Furthermore, only 10% of consumers indicated they would eat a one cup portion.⁵⁴

Research has found that consumers often do not take note of the serving size when using food labels and may, therefore, make incorrect conclusions about the nutrient content of a packaged product. This applies especially to products typically consumed in a single sitting.⁵⁵ For such products that are often consumed in one eating occasion, labeling them as a single serving or using the dual column approach may help consumers make healthier choices.^{56,57}

These updated nutrition labeling requirements will help consumers understand how many calories are actually in the amounts of foods and beverages that are typically consumed and to negate portion confusion. These changes will make it easier for consumers to make healthier choices and be more realistic about the number of calories and nutrients they are actually taking in.⁵⁸

Without proper education and guidance on the updates to the RACCs and what they mean in a practical sense, consumers may continue to be confused as to the appropriate portion sizes for their health needs. While food labels themselves cannot actually contain such individualized recommendations, all institutions involved with food labeling have both a responsibility and an opportunity to communicate the updated nutrition label changes and to assist consumers in choosing more reasonable food and beverage portions.

All sectors of society including health professionals, educators, government and the food industry would benefit from working together in an effort to better educate the public on the relationship between portion sizes, calorie intake and obesity. Health care professionals can continue to educate consumers regarding portion control and healthy food choices. Government agencies may implement policies and public health campaigns to advocate for portion control. Several recommendations are provided below for how these groups can collaborate and amplify a strong, consistent message to the public regarding proper portions. In addition, the food industry can play a major role in helping consumers choose appropriate portions by how they market and package their food. This is explored in the next section.

Education and Public Health Campaigns

Health professionals and educators should continue to advise the public to consume foods within their calorie needs by choosing smaller portions and eating mindfully. A report by the Institute of Medicine highlights the role of the health professional as an advocate to support healthy lifestyles and improve dietary choices.⁵⁹ Nutrition educators and practitioners are uniquely qualified to teach consumers about food labels and to help raise awareness about consuming foods in reasonable portions.⁶⁰

Physicians and dietitians also should advocate portion control strategies as a means to reduce energy intake when advising patients who need to lose weight.⁶¹

Research has shown approaches that focus on portion control can be very effective. For example, a study found that obese children have an easier time

following a portion controlled diet than a reduced carbohydrate diet, particularly in the long-term.⁶² Obese adults also are more likely to report achieving meaningful weight loss if they eat smaller portions rather than following fad diets.⁶³ Indeed, research has found that the quickest and most direct route to losing weight is to control portion sizes at meals and snacks.⁶⁴ Consumers also should be encouraged to eat fewer energy-dense foods and more nutrient-dense foods such as fruits and vegetables.⁶⁵

Multiple public health campaigns have been proposed and/or implemented to create awareness around the issues of portion size and obesity. In 2012, the New York City Department of Health and Mental Hygiene encouraged more and better focused portion education campaigns. It launched a campaign called *Cut Your Portions. Cut Your Risk.* featuring posters throughout the subway system encouraging New York residents to choose smaller portions as a means to reduce risks for obesity, type 2 diabetes and other health problems.⁶⁶ Although it was eventually overturned, former New York City Mayor Michael Bloomberg proposed a limit to the sales of sugary drinks larger than 16 ounces in 2012. Similarly, public health measures were being taken on the opposite coast. The Los Angeles County Department of Public Health also launched a portion control campaign in 2012 as an effort to educate residents that larger portions contain more calories than smaller portions.⁶⁷ The campaign *Choose Less, Weigh Less* aims to raise awareness about recommended calorie limits and to encourage people to consume fewer calories.



The Food Industry's Role In Promoting Proper Portions



In May 2017, the FDA extended the compliance date for the menu labeling rule requiring establishments with 20 or more locations to disclose calories on menus right before it was supposed to go into effect.

While delays to menu labeling implementation and the intended compliance date extension for the Nutrition Facts label reform have been seen at a federal level, local rulings continue to move forward. For example, in 2017, New York City became the first in the nation to require chain food retailers and restaurants to post calorie counts and full nutritional information. Also in 2017, Philadelphia's soda tax resulted in soda brands pulling 2-liter offerings from store shelves.

Federal Advice on Portion Sizes

Consumers need clear information on how much food to eat and how the calorie content of the foods they eat relates to their energy needs. In December 2014, the FDA published menu labeling regulations to require chain restaurants to post calorie information on menu boards.⁶⁸ Whether or not these regulations will help consumers better grasp the concept that larger portions have more calories remains to be established. Results are mixed as to whether menu labeling leads to improved food choices.^{69,70,71,72}

FDA oversees nutrition labeling requirements and establishes RACCs to determine serving sizes on Nutrition Facts labels, as previously discussed. In addition, the DGA recommend consuming daily or weekly amounts of the various food groups to achieve nutrients at the level people need for good health.⁷³

However, the serving size information found on labels is likely to be confusing to consumers in the face of USDA and the Department of Health and Human Services (HHS) guidance aimed at implementing the guidelines. The disconnect between labeled servings to inform a consumer's purchase decision and guidance on servings to consumers from different food groups may result in mixed messages. While the new Nutrition Facts label may offer more realistic serving sizes, FDA and USDA have an opportunity to work together to develop a uniform system to better educate the public on the meaning of labeled serving sizes and how to relate such information to the dietary guidelines.⁷⁴

With the changes to the Nutrition Facts label, there is an opportunity for food labels to indicate directly that serving size information is based on what consumers actually eat, not what they should eat. The World Health Organization supports this recommendation, stating that regulatory actions that change the food environment (such as standardized information on nutrition labels for age-appropriate servings) could lead to a reduction in portion sizes consumed by adults and children. As children age, internal hunger and satiety cues may become less effective at moderating energy intake, and external factors including portion size begin to play a more important role. Interventions designed to improve knowledge of appropriate portion sizes for children among parents and caregivers may help them make better decisions about their children's nutrition.⁷⁵

Other agencies under the HHS umbrella can amplify portion guidance messages as they too are engaged in various efforts to improve the public's health. Agencies including the Centers for Disease Control, National Institutes of Health and the Office of Disease Prevention and Health Promotion should also be aligned with educational efforts to promote proper portion sizes and deliver consistent messages around healthy eating guidelines. They can do so by integrating nutrition labeling and portion guidance into their own campaigns, programs and educational materials.

Education alone is rarely sufficient to change behavior.⁷⁶ A discussion paper published in November 2014 by the McKinsey Global Institute recognizes that education and personal responsibility are critical elements to any obesity reduction program, but changes to the environment and to social norms are also needed.⁷⁷ Indeed, one study found that even after consumers were educated on mindfulness and portion sizes, they overate when given large portions.⁷⁸ Portion control is one of many interventions that food and beverage manufacturers, retailers, food-service providers and restaurants can implement in an effort to help reduce obesity rates.⁷⁷ The food industry is positioned to play a pivotal role in helping consumers embrace healthier food options by marketing smaller portion sizes and reformulating products to make them healthier, lower in calories, more accessible and more affordable.

Marketing Smaller Portion Sizes

The 2010 Dietary Guidelines for Americans urged the food industry to market food portions in more appropriate sizes, and the current 2015-2020 Dietary Guidelines encourages portion guidance through a quality over quantity approach, and suggests a focus on nutrient density, variety and amounts.^{73,79} Dietary guidance messaging supporting USDA's MyPlate food icon also advises the public to "avoid oversized portions."⁸⁰ Former first lady Michelle Obama urged the food industry to market food portions in more appropriate sizes through her various efforts around childhood obesity and nutrition.⁸¹ Foods packaged and marketed in smaller sizes may shift consumers toward choosing more reasonable portions, such as reducing jumbo size packages and offering more single-serve products. Because people eat in units,³² selling smaller units could encourage consumers to eat reasonable portions for more healthful diets.

In addition to providing a wider range of portion sizes, the food industry can implement initiatives to make smaller portions more

appealing. One such initiative would be offering price incentives for small portions. If price points for smaller packages could be worked out favorably, this strategy could be helpful as a way to encourage consumers to purchase foods sold in smaller portions. One way to accomplish this goal may be by "bundling" multiple small servings into a larger package. This would maintain profitability for manufacturers by maintaining larger units for consumers to purchase while still encouraging them to eat smaller portions.

Evidence indicates that voluntary efforts by the food industry to reduce portion sizes may prove useful. One study found that overweight individuals consumed fewer pretzels when packaged in single-serve packages as opposed to standard size packages.⁸² Another study found that consumers felt just as satisfied with eating smaller portions (and therefore fewer calories) of common snack foods including chocolate, potato chips and apple pie.⁸³ Research also has shown that decreasing the size of individual candies may lead to decreased calorie intake, indicating that decreasing the size of a food item may reduce overall energy intake at snacking occasions.⁸⁴

Keeping in mind that food portions consumed away from home have increased, it is important to address steps that restaurants and take-out establishments can take steps to help consumers choose thoughtful portions. One such step is the marketing of smaller portions and half-orders to customers. In addition, these establishments could offer price incentives on these menu items. Research has found that customers are receptive to smaller portioned options. One study offered customers the option to order a half-size portion. While only 1% of diners asked for a smaller portion on their own, one-third accepted the offer to downsize to a half portion, which led to decreased calorie intake. In addition, those who chose the smaller portion did not compensate by ordering more food.⁸⁵ These studies underscore opportunities for

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Conclusion

There is an opportunity to begin to shift consumers' perception of value away from "more is better" to "less is more" with reasonable portions. The Cochrane review published in 2015 mentioned earlier lends significant evidence that larger-sized portions increase food intake, and suggests that eliminating large portions from the diet could potentially result in a 29% decrease in calorie intake in U.S. adults.²⁷ Awareness of portion sizes is a fundamental principle that, if embraced by consumers, can result in significant strides towards reducing the prevalence of obesity and its associated

chronic diet-related illnesses. Numerous, multi-faceted interventions will be required from a wide range of sectors in society to significantly impact obesity rates. However, research suggests that portion control may be the highest-impact intervention area, potentially resulting in cost-savings and reducing the total disease burden attributable to high body mass index (BMI).⁷⁷ It is time for health professionals, policy makers and the food industry to come together to educate consumers on the consumption of more reasonable portion sizes and the beneficial effects on the nation's health.

One study found that reductions in both portion sizes and calorie density of foods yielded decreases in calorie intake that persisted for a couple of days.⁸⁷

food manufacturers, restaurants and take-out establishments to play a crucial role in reversing the obesity epidemic.

Additional ways that restaurants can support proper portions and healthier eating include offering the ability to share a main dish and the option to add a salad or vegetable serving to one's meal. Allowing customers to add a fruit and/or vegetable side dish to their meal will actually help them meet the dietary guidelines when eating away from home and promote dietary diversity. Encouraging appetizer-size portions as main dishes for adults and children is another way to support portion control. A menu that simply offers a "take home" pack for leftovers also may be helpful to consumers attempting to eat smaller portions.

Reformulating Food Products

Food manufacturers also can consider the opportunity to reformulate food products by adding in healthier ingredients and reducing the amount of energy-dense ingredients in their products. Preliminary evidence suggests that this approach may be promising. Research has found that incorporating pureed vegetables into foods can decrease the caloric density of a food and that this strategy can lead to a substantial reduction in calorie intake.⁸⁶ Adding nutrient-dense ingredients, such as fruits and vegetables, can boost consumers' diet quality as well. One study found that reductions in both

portion sizes and calorie density of foods yielded decreases in calorie intake that persisted for a couple of days.⁸⁷

Offering Portion Guidance Resources

There are various strategies that food manufacturers can employ to guide consumers in choosing appropriate portions. The food industry can create portion guidance resources and tools and promote them through their communication channels to educate consumers on how to select reasonable portions of their products. Channels may include company websites, but also may encompass more wide-reaching channels such as social media outlets and smart phone applications to help consumers choose proper portions and build nutritious meals.

The food industry also can promote calorie consciousness through creative packaging and promotional materials. One such example is the offering of 100-calorie portion packs, single-serve products and other portion-controlled offerings.⁵⁵ Portion guidance on packaging such as front-of-pack labeling can also be provided by food manufacturers to draw attention to portion sizes and suggest that consumers eat smaller portions. Preliminary evidence suggests that this strategy may be promising. One study found that inserting visual markers in a potato chip package (a "red potato chip" at regular intervals) served as a visual cue and led subjects to eat considerably less.⁸⁸

Awareness of portion sizes is a fundamental principle that, if embraced by consumers, can result in significant strides towards reducing the prevalence of obesity and its associated chronic diet-related illnesses.



Summary



The prevalence of obesity in the United States remains high and constitutes a major public health concern. Expanding portion sizes over the last several decades may be one contributing factor.

What We Know About Portion Size

Conclusions from the Research

- Portions of commonly consumed foods have increased steadily over the past several decades, and have done so in parallel with rising obesity rates.^{12,13,14}
- The trend toward quantity-over-quality and larger food portions typically seen in today's marketplace has contributed to "portion distortion," a term that can be described as perceiving oversized portions as standard or normal.
- Considerable research has found that larger portions encourage most people to consume more food,^{21,22,27} and therefore, more calories.^{23,24} Environmental factors such as the size of bowls and spoons encourage people to serve themselves and consume larger portions.²⁷

Action Strategies to Promote Proper Portions

Healthcare Professionals and Educators

- Continue to teach consumers about food labels and help raise awareness about the importance of consuming foods in reasonable portions.
- Advocate portion control strategies when advising patients who need to lose weight.
- Encourage consumers to eat fewer energy-dense foods and more nutrient-dense foods such as fruits and vegetables.

Government Agencies and Policy Makers

- Explore and implement evidenced-based policies aimed at delivering meaningful and transparent nutrition information to consumers including a clearer Nutrition Facts label.
- Promote inter-agency collaboration to develop a uniform system to better educate the public on the meaning of labeled serving sizes and how to relate such information to the dietary guidelines.

Food and Restaurant Industry

- Package and market foods in smaller sizes and/or eliminate jumbo and oversized portions.
- Offer price incentives for smaller portions.
- Explore reformulating products to reduce the amount of energy-dense foods and add nutrient-dense foods such as fruits and vegetables.
- Create portion guidance resources and tools and promote them through company communication channels and on product packages.



Future Areas of Research to Explore

Portion size awareness is a key principle which may result in weight reduction. While a combination of interventions may be required to reduce obesity rates, portion control may be amongst the highest-impact intervention areas. Below are some additional research topics that may be explored in the future to help build on our understanding of portion size as it relates to the obesity epidemic and potential solutions to this public health issue.

Future Research Areas to Explore Regarding Portion Size

How to ensure consumer understanding of the Nutrition Facts label

- Explore how to best educate consumers and ensure their understanding and ability to use the updated Nutrition Facts label.

How portion size affects sugar, sodium and saturated fat consumption

- To what extent does portion size affect consumption of these nutrients and what is the potential relationship of these nutrients to chronic diseases other than obesity?

Price of larger portions compared to smaller portions

- How do price points differ between large and small portions? Explore the issue of larger portions (such as fast-food meals) that may be more inexpensive than smaller portions and how that may affect diet quality.

Foods that do not have a label (e.g. take-out or restaurant foods)

- What proportion of foods do not contain labels (as eaten in the diet of Americans) and what tools can be offered to determine appropriate portion sizes for those foods without a label?

References



- Flegal KM, Carroll MD, Kit BK, et al. Prevalence of obesity and trends in the distribution of body mass index among US adults, 1999-2010. *JAMA*. 2012;307:491-497.
- Ogden CL, Carroll MD, Kit BK, et al. Prevalence of childhood and adult obesity in the United States, 2011-2012. *JAMA* 2014;311:806-814.
- US Department of Health and Human Services; US Department of Agriculture. 2015-2020 Dietary Guidelines for Americans. 8th ed. Washington, DC: US Dept of Health and Human Services; December 2015. <http://www.health.gov/DietaryGuidelines>.
- National Institutes of Health, National Heart, Lung, and Blood Institute. Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults. Bethesda, MD: National Institutes of Health, National Heart, Lung, and Blood Institute, 1998. Publication 98-4083.
- Adams KF, Schatzkin A, Harris TB, et al. Overweight, obesity, and mortality in a large prospective cohort of persons 50 to 71 years old. *N Engl J Med*. 2006;355:763-78.
- Jee SH, Sull JW, Park J, et al. Body-mass index and mortality in Korean men and women. *N Engl J Med*. 2006;355:779-87.
- Cawley J, Meyerhoefer C. The medical care costs of obesity: an instrumental variables approach. 2010. <http://www.nber.org/papers/w16467>. Accessed 20 Jan 2015.
- Levitsky DA, Pacanowski CR. Free will and the obesity epidemic. *Public Health Nutr*. 2011;15:1-16.
- Ford ES, Dietz WH. Trends in energy intake among adults in the United States: findings from NHANES. *Am J Clin Nutr*. 2013;97:848-853.
- Food Availability (Per Capita) Data System: Loss-Adjusted Food Availability. U.S. Department of Agriculture Economic Research Service. <https://www.ers.usda.gov/data-products/food-availability-per-capita-data-system/>. Updated November 23, 2016. Accessed July 3, 2017.
- Young LR, Nestle M. Reducing portion sizes to prevent obesity: a call to action. *Am J Prev Med*. 2012;43:565-568.
- Young LR, Nestle M. The contribution of increasing portion sizes to the obesity epidemic. *Am J Pub Health*. 2002;92:246-249.
- Nielsen SJ, Popkin BM. Patterns and trends in food portion sizes, 1977-1998. *JAMA*. 2003;289:450-453.
- Young LR, Nestle M. Portion sizes and obesity: responses of the fast-food companies. *J Pub Health Policy*. 2007;28:238-248.
- Young LR, Nestle M. Expanding portion sizes in the US marketplace: implications for nutrition counseling. *J Am Diet Assoc*. 2003;103:231-234.
- Young LR. The Portion Teller Plan. New York, NY: Three Rivers Press, Random House, 2005.
- Young LR, Nestle M. Variation in perceptions of a "medium" food portion: implications for dietary guidance. *J Am Diet Assoc*. 1998;98:458-459.
- Hogbin MB, Hess MA. Public confusion over food portions and servings. *J Am Diet Assoc*. 1999;99:1209-1211.
- Schwartz J, Byrd-Bredbenner C. Portion distortion: typical portion sizes selected by young adults. *J Am Diet Assoc*. 2006;106:1412-1418.
- Nestle M, Nesheim M. *Why Calories Count*. Berkeley, CA: University of California Press, 2012.
- Rolls BJ, Engell D, Birch LL. Serving portion size influences 5-year-old but not 3-year-old children's food intakes. *J Am Diet Assoc*. 2000;100:232-34.
- Levitsky D, Youn T. The more food young adults are served, the more they overeat. *J Nutr*. 2004;134: 2546-2549.
- Piernas C, Popkin BM. Increased portion sizes from energy dense foods affect total energy intake at eating occasions in US children and adolescents: patterns and trends by age group and socio-demographic characteristics, 1977-2006. *Am J Clin Nutr*. 2011; 94:1324-1332.
- Diliberti N, Bordi PL, Conklin MT, et al. Increased portion size leads to increased energy intake in a restaurant meal. *Obes Res*. 2004;12:562-568.
- Rolls BJ, Morris EL, Roe LS. Portion size of food affects energy intake in normal-weight and overweight men and women. *Am J Clin Nutr*. 2002;76:1207-1213.
- Wansink B, Painter JE, North J. Bottomless bowls: why visuals cues of portion size may influence intake. *Obes Res*. 2005;13:93-100.
- Hollands G, Shemilt I, Marteau T, et al. package or tableware size for changing selection and consumption of food, alcohol and tobacco. ePub ahead of print: <http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD011045.pub2/full>. Accessed 17 Sep 2015.
- Wansink B. Environmental factors that increase the food intake and consumption volume of unknowing consumers. *Annu Rev Nutr*. 2004; 24:455-479.
- Wansink B, van Ittersum K, Painter J. Ice cream illusions: bowls, spoons, and self-served portion sizes. *Am J Prev Med*. 2006;31:240-243.
- Wansink B, Van Ittersum K, Payne CR. Larger bowl size increases the amount of cereal children request, consume, and waste. *J Ped*. 2014;164:323-326.
- Hagen L, Krishna A, et al. Rejecting Responsibility: Low Physical Involvement in Obtaining Food Promotes Unhealthy Eating. *J Market Res*. Forthcoming 2017.
- Geier A, Rozin P, Doros G. A new heuristic that helps explain the effect of portion size on food intake. *Psych Science*. 2006;17:521-525.
- Rolls BJ, Roe LS, Meengs JS, et al. Increasing the portion size of a sandwich increases energy intake. *J Am Diet Assoc*. 2004;104:367-372.
- Wansink B. Can package size accelerate usage volume? *J Marketing*. 1996;60:1-13.
- Wansink B, Kim J. Bad popcorn in big buckets: portion size can influence intake as much as taste. *J Nutr Educ Behav*. 2005;37:242-245.
- Rolls BJ, Roe LS, Meengs JS. Large portion sizes lead to a sustained increase in energy intake over 2 days. *J Am Diet Assoc*. 2006;106:543-549.
- Rolls BJ, Roe LS, Meengs JS. The effect of large portion sizes on energy intake is sustained for 11 days. *Obesity*. 2007;15:1535-1543.
- Jeffery RW, Rydell S, Dunn CL, et al. Effects of portion size on chronic energy intake. *Intl J Behav Nutr and Phys Act*. 2007;4:27. doi:10.1186/1479.
- Young LR, Nestle M. Portion sizes in dietary assessment: issues and policy implications. *Nut Rev*. 1995;53:149-158.
- Wansink B, Chandon P. Meal size, not body size, explains errors in estimating the calorie content of meals. *Ann Intern Med*. 2006;145:326-332.
- Block J, Condon S, Kleinman K, et al. Consumers' estimation of calorie content at fast food restaurants: cross sectional observational study. *BMJ*. 2013;346. doi: 10.1136/bmj.f2907.
- Bolhuis DP, Lakemond CM, de Wijk RA, et al. Consumption with large sip sizes increases food intake and leads to underestimation of the amount consumed. *PLoS One*. 2013;8:e53288. doi:10.1371/journal.pone.0053288.
- Centers for Science in the Public Interest. Xtreme Eating 2016. <https://cspinet.org/eating-healthy/foods-avoid/xtreme2016>. Accessed 17 May 2017.
- Backstrand JR, Wootan MG, Young LR, et al. Fat chance: a survey of dietitians' knowledge of the calories and fat in restaurant meals. Washington, DC: Center for Science in the Public Interest, Jan 1997.
- Aerts G, Smits, T. The Package Size Effect: How Package Size Affects Young Children's Consumption of Snacks Differing in Sweetness. *Food Quality & Preference*. 2017; 60: 72-80.
- Potter C, Ferriday D, et al. Parental beliefs about portion size, not children's own beliefs, predict child BMI. *Pediatric Obesity*. 2017. 10.1111/ijpo.12218.
- Faulkner GP, Pourshahidi LK, Wallace JMW, et al. Perceived "healthiness" of foods can influence consumers' estimations of energy density and appropriate portion size. *Int J Obes*. 2014. doi:10.1038/ijo.2013.69.
- McCann MT, Wallace JMW, Robson PJ, et al. Influence of nutrition labeling on food portion size consumption. *Appetite*. 2013;65:153-158.
- Chandon P, Wansink B. The biasing health halos of fast food restaurant health claims: lower calorie estimates and higher side-dish consumption intentions. *J Consumer Res*. 2007;34:301-314.
- Food and Drug Administration. Proposed changes to the nutrition facts label. <http://www.fda.gov/Food/GuidanceRegulation/GuidanceDocumentsRegulatoryInformation/LabelingNutrition/ucm385663.htm>. Updated 27 Feb 2014. Accessed 20 Jan 2015.
- Food and Drug Administration. Food labeling: serving sizes. *Fed Reg*. 1993;58:2229-91.
- Food and Drug Administration. Changes to the Nutrition Facts Label. May 2016. <https://www.fda.gov/Food/GuidanceRegulation/GuidanceDocumentsRegulatoryInformation/LabelingNutrition/ucm385663.htm>. Accessed 3 April 2017.
- Pelletier AL, Chang WW, Delzell JE, et al. Patients' understanding and use of snack food package nutrition labels. *J Am Board Fam Pract*. 2004;17:319-323.
- Center for Science in the Public Interest. Unrealistic serving sizes understate calories, sodium, saturated fat, says CSPI. Aug 2011. <http://cspinet.org/new/201108021.html>. Accessed 20 Jan 2015.
- Mohr GS, Lichtenstein DR, Janiszewski C. The effect of marketer-suggested serving size on consumer responses: the unintended consequences of consumer attention to calorie information. *J Marketing*. 2012;76:59-75.
- Lando AM, Labiner-Wolfe J. Helping consumers make more healthful food choices: consumer views on modifying food labels and providing point-of-purchase nutrition information at quick-service restaurants. *J Nutr Educ Behav*. 2007;39:157-163.
- Lando AM, Lo SC. Single-larger-portion-size and dual-column nutrition labeling may help consumers make more healthful food choices. *J Acad Nutr Diet*. 2013;113:241-50.
- Food and Drug Administration. Food Servings Sizes Getting a Reality Check. FDA Consumer Health Information. Feb 2014. <http://www.fda.gov/downloads/ForConsumers/ConsumerUpdates/UCM387437.pdf>. Accessed 20 Jan 2015.
- Institute of Medicine. Accelerating progress in obesity prevention: solving the weight of the nation. Consensus Report. Washington, DC: The National Academies Press, 2012.
- Ollberding NJ, Wolf RL, Contento I. Food label use and its relation to dietary intake among US adults. *J Am Diet Assoc*. 2010;110:1233-1237.
- Seagle HM, Strain GW, Makris A, et al. Position of the American Dietetic Association: weight management. *J Am Diet Assoc*. 2009 Feb;109(2):330-46.
- Kirk S, Brehm B, Saelens BE, et al. Role of carbohydrate modification in weight management among obese children: a randomized clinical trial. *J Ped*. 2012;161:320-327.
- Nicklas JM, Huskey KW, Davis RB, et al. Successful weight loss among obese US adults. *Am J Prev Med*. 2012; 42(5):481-485.
- Logue EE, Jarjoura DG, Sutton KS, et al. Longitudinal relationship between elapsed time in the action stages of change and weight loss. *Obes Res*. 2004;12:1499-1508.
- Ledikwe JH, Eilo-Martin JA, Rolls BJ. Portion sizes and the obesity epidemic. *J Nutr*. 2005;135: 905-909.
- New York City Department of Mental Health and Hygiene. New ad campaign spotlighting increasing portion sizes and their devastating consequences. 2012. <http://www.nyc.gov/html/doh/html/home/home.shtml>. Accessed 20 Jan 2015.
- Los Angeles County Department of Public Health. Portion control: food portion size matters. Oct 2012. <http://www.choosehealthla.com/>. Accessed 20 Jan 2015.
- Food labeling; nutrition labeling of standard menu items in restaurants and similar retail food establishments, 79 Federal Register 230 (1 Dec 2014), pp.71156-71259. <http://www.gpo.gov/fdsys/pkg/FR-2014-12-01/pdf/2014-27833.pdf>. Accessed 20 Jan 2015.
- Dumanovsky T, Huang CY, Nonas CA, et al. Changes in energy content of lunchtime purchases from fast food restaurants after introduction of calorie labelling: cross sectional customer surveys. *BMJ*. 2011;343:d4464.
- Roberta CA, Larsen PD, Agnew H, et al. Evaluating the impact of menu labeling on food choices and intake. *Am J Pub Health*. 2010;100:312-318.
- Finkelstein EA, Strombotne BA, Chan NL, et al. Mandatory menu labeling in one fast-food chain in King County, Washington. *Am J Prev Med*. 2011;40:122-127.
- Elbel B, Gyamfi J, Kersh R. Child and adolescent fast-food choice and the influence of calorie labeling: a natural experiment. *Int J Obesity*. 2011;5:493-500.
- US Department of Health and Human Services; US Department of Agriculture 2015-2020 Dietary Guidelines for Americans. 8th ed. Washington, DC: Table 1.1: Healthy U.S.-Style Eating Patterns at the 2,000-Calorie Level, With Daily or Weekly Amounts From Food Groups, Subgroups, & Components. <https://health.gov/dietaryguidelines/2015/guidelines/chapter-1-a-closer-look-inside-healthy-eating-patterns/>. Accessed 3 April 2017.
- Hennessey, M. How much do consumers use—and understand—food labels? *Food Navigator USA*. Mar 3, 2014. <http://www.foodnavigator-usa.com/Regulation/How-much-do-consumers-use-and-understand-nutrition-labels#UxSvwjtAegA.twitter>. Accessed 20 Jan 2015.
- WHO Technical Staff. Limiting portion sizes to reduce the risk of childhood overweight and obesity. WHO e-Library of Evidence for Nutrition Actions (eLENA), Sept 2014. http://www.who.int/elena/bbc/portion_childhood_obesity/en. Accessed 20 Jan 2015.
- Mancino L, Kinsey J. Is Dietary Knowledge enough? Hunger, stress, and other roadblocks to healthy eating. US Department of Agriculture, Economic Research Service. 2008.
- Dobbs R, Sawers C, Thompson F, et al. Overcoming obesity: an initial economic analysis. McKinsey Global Institute, Nov 2014. http://www.mckinsey.com/insights/economic_studies/how_the_world_could_better_fight_obesity. Accessed 20 Jan 2015.
- Cavanagh K, Vartanian LR, Herman CP, et al. The effect of portion size on food intake is robust to food education and mindfulness exercises. *J Health Psych*. 2013. DOI: 10.1177/1359105313478645
- US Department of Agriculture (USDA) and Health and Human Services (HHS). *Dietary Guidelines for Americans, 2010*. <http://www.health.gov/dietaryguidelines/dga2010/DietaryGuidelines2010.pdf>. Accessed 20 Jan 2015.
- US Department of Agriculture. MyPlate. Washington, 2011. www.choosemyplate.gov. Accessed 20 Jan 2015.
- LetsMove.gov. The first lady challenges restaurants to offer healthy options. 2010. <http://www.letsmove.gov/blog/2010/09/13/first-lady-challenges-restaurants-of-fer-healthy-options>. Accessed 20 Jan 2015.
- Haire C, Raynor HA. Weight status moderates the relationship between package size and food intake. *Acad Nutr Diet*. 2014 pii: S2212-2672(13)01894-7. <http://dx.doi.org/10.1016/j.jand.2013.12.022>. Accessed 20 Jan 2015.
- Van Kleef E, Shimizu M, Wansink B. Just a bite: considerably smaller snack portions satisfy delayed hunger and craving. *Food Quality and Pref*. 2013;27:96-100.
- Marchiori D, Waroquier L, Klein O. Smaller food item sizes of snack foods influence reduced portions and caloric intake in young adults. *J Am Diet Assoc*. 2011;5:727-731.
- Schwartz J, Riis J, Elbel B, et al. Inviting consumers to downsize fast-food portions significantly reduces calorie consumption. *Health Aff*. 2012;31:399-407.
- Blatt AD, Roe LS, Rolls BJ. Hidden vegetables: an effective strategy to reduce energy intake and increase vegetable intake in adults. *Am J Clin Nutr*. 2011. doi:10.3945/ajcn.110.009332
- Rolls B, Roe L, Meengs J. Reductions in portion size and energy density of foods are additive and lead to sustained decreases in energy intake. *Am J Clin Nutr*. 2006;83:11-17.
- Geier A, Wansink B, Rozin P. Red potato chips: segmentation cues can substantially decrease food intake. *Health Psychol*. 2012;31:398-401.

Notes



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