Incorporating Away–From–Home Food into a Healthy Eating Plan

Summary

In our often time-pressed society, convenience is a way of life for many individuals. Foods and meals prepared outside of the home are an increasingly important part of the American diet.[1, 2] This is a trend that has coincided with a dramatic rise in the prevalence of obesity. While food, wherever prepared, is not the only factor affecting body weight, away-from-home food should be an important consideration for people aiming to maintain or lose weight. A growing body of literature indicates that the eating of away-from-home food can be a factor influencing energy intake. Informed choices pertaining to away-from-home food could help reduce calorie over-consumption and aid in weight management.

The objectives of this brief are to:

- ❖ Summarize environmental and societal changes that may contribute to the increased consumption of away-from-home food.
- ❖ Review the properties of away-from-home-food that may facilitate the over-consumption of energy.
- ❖ Examine studies investigating the relationship of away-from-home food with energy intake and obesity
- ❖ Present guidance to help navigate the wide range of away-from-home food choices available in today's food environment.

Much of this brief is based upon a recently published report: *The Keystone Forum on Away-From-Home Foods: Opportunities for Preventing Weight Gain and Obesity*.[3] The report resulted from consensus building workshops which included participants from the private sector, nongovernmental organizations, academia, and government to "identify the state of the evidence, as well as, important knowledge gaps, regarding obesity and weight gain prevention and away-from-home foods."

In this brief, away-from-home food refers to food prepared and purchased outside of the home. This includes full meals, single ready-to-eat items, take-away foods, and beverages purchased at restaurants, freshly-prepared food sections at grocery stores, institutional foodservice settings, and other outlets. The topic of school meals is sufficiently complex and important to merit consideration separately and is not examined here specifically.

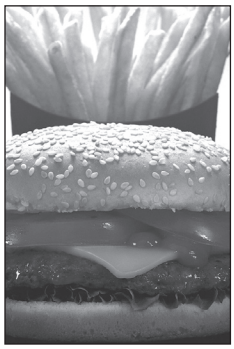
Research to Practice Series, No. 6

National Center for Chronic Disease Prevention and Health Promotion
Division of Nutrition, Physical Activity, and Obesity

Environmental and societal changes that may contribute to the increased consumption of away-from-home food

There has been an increase in the consumption of away-from-home food in the United States. As depicted in Figure 1, the percentage of the food budget spent on away-from-home food has steadily increased since the mid-1970s.[1, 2, 4] This trend is projected to continue.[5] Consequently, the proportion of calories provided by away-from-home food has increased in recent decades. In 1995, it accounted for 34% of total energy intake, an increase from 18% in 1977–1978.[1, 4]

A variety of factors may be contributing to the increased consumption of away-from-home food. The total number of foodservice establishments in the United States has almost doubled in the last three decades, increasing from 491,000 in 1972 to 878,000 in 2004.[3] Furthermore, changes in the workforce, including a rise in dual-income households and women working outside the home have coincided with the demand for take-out meals and convenience in food preparation.[6] Regardless of the cause, away-from-home food is and will continue to be an important part of the U. S. diet. The next section of this brief reviews the properties of these foods that may facilitate the over-consumption of energy and increase obesity risk.



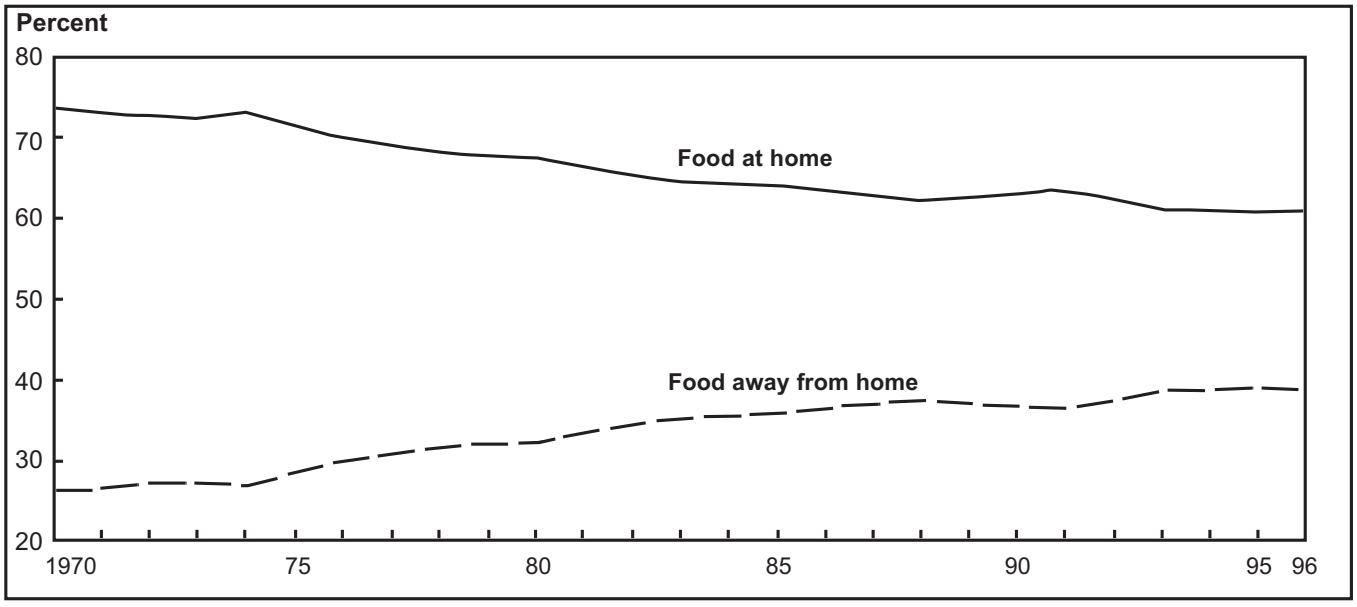
Features of away-from-home foods that may facilitate over-consumption

Eating at a restaurant may be viewed as a special opportunity for indulgence. Furthermore, the convivial atmosphere associated with restaurants and the consumption of alcohol may also contribute to over-consumption.[7, 8] Before reviewing the research linking the consumption of away-from-home food to energy intake and weight status, it is important to consider other properties and factors associated with away-from-home food that may contribute to over-consumption.

High energy density

There is a tendency to choose foods higher in energy density when dining out.[7, 9–11] Energy density refers to the amount of calories (i.e., energy) contained in a unit of food (e.g., kcal/g). Foods high in energy density provide a relatively large number of

Figure 1. The percentage of the food budget spent on away-from-home food has increased steadily since the 1970s.[1,2]



calories for a particular weight of food; whereas, foods lower in energy density provide fewer calories in the same weight of food. High-energy-dense foods generally have a high fat content and contain few ingredients with a high moisture content such as fruits or vegetables.[12] A few examples of foods with a relatively high energy density are included in Table 1. Also included in this table are similar food choices that have a lower energy density. Short-term, laboratory-based studies have found that individuals consume more energy when presented with higher-energy-dense foods than with similar foods having a lower energy density.[13–20] Cross-sectional studies have also found that higher-energy-dense diets were associated with higher energy intakes as well as higher body weights.[21–26] Further research is needed exploring the energy density of away-from-home foods and how the energy density of these foods influences total energy intake and body weight.

Large portion sizes

Another aspect of away-from-home food that may increase consumption is the availability of large portions sizes.[7] Large portions are increasingly common, from restaurants to supermarkets to vending machines. Portion sizes in the United States have increased both in restaurants and in the home over the past two decades.[27] Data indicate that people consume more when served large food portions. This has been shown for a variety of different types of foods in laboratory as well as real-world settings.[7, 28–35] For example, as depicted in Figure 2, a restaurant-based study found that when the size of a popular pasta dish was increased,

customers ate significantly more of that dish.[7, 35]

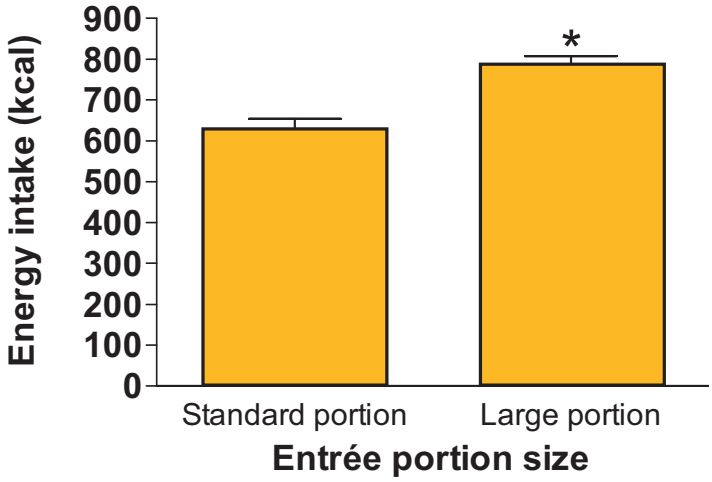
Large portions of food with a high energy density may be may be particularly problematic for people trying to control calorie intake. Laboratory-based studies have shown that, when both portion size and energy density are increased in a snack or meal, they have a synergistic effect in increasing overall energy intake.[19, 36, 37] One study found that subjects consumed 221 kcal more (56%) when served a large portion of a high-energy-dense entrée, compared to a small portion of a low-energy-dense entrée.[36]

Table 1. Examples of lower- and higher-energy dense foods that could be selected when choosing away-from-home entrees.

	Lower-Energy Dense, Lower-Calorie Option	Higher-Energy-Dense, Higher Calorie Option
Pizza slice	Thin crust cheese pizza 1 slice = 208 calories	Thick crust meat pizza 1 slice = 305 calories
Pasta with sauce	Pasta with tomato sauce 1 cup = 206 calories	Pasta with cream sauce 1 cup = 416 calories
Sandwich	Wrap with meat and vegetables 1 sandwich = 270 calories	Croissant with meat and cheese 1 sandwich = 356 calories
Meat Entrée	Stir-fried beef with vegetables 1 cup = 165 calories	Fried beef steak 1 medium steak = 588 calories

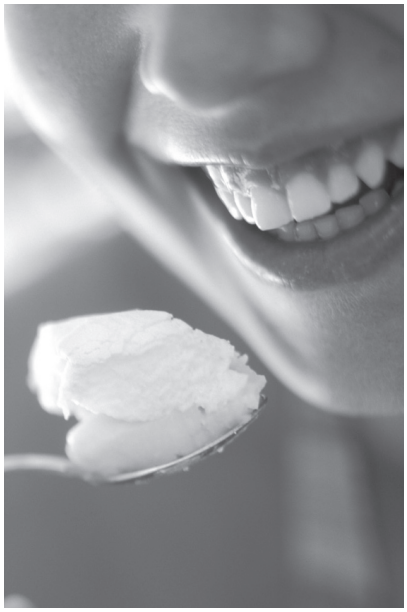
[1] Based on values from *Bowes & Church's Food Values of Portions Commonly Used* (59)

Figure 2. *A study in a cafeteria-style restaurant tested whether increasing the portion size of a main-entrée pasta dish from 248 grams (standard portion, 422 kcal) to 377 grams (large portion, 633 kcal), while keeping the price the same, would affect how much people ate. Customers ate a significantly greater amount of the meal when served the large entrée, compared to the standard-sized portion.*[7,35]



Variety and palatability

Taste is a major factor influencing eating decisions.[38] People tend to eat more of foods that taste good to them. Restaurants generally serve a variety of palatable foods, which can contribute to over-consumption.[39] While the palatability of a particular food declines as it is consumed, the appeal of other foods is not affected. Individuals thus are apt to have higher energy intakes when a variety of highly palatable foods are available.[40] Most laboratory-based studies showing an increase in energy intake as variety is increased have used palatable, energy-dense foods. Two studies with free-living individuals, however, suggest that consuming a variety of low-energy-dense foods is associated with reduced energy intakes as well as lower body fat and greater weight loss.[41, 42]



Away-from-home food, energy intake, and diet quality among youth and adults

The influence of away-from-home-food on energy intake and diet quality has not been extensively investigated. Most of the studies investigating these relationships have been cross-sectional and have only considered quick-service foods, which limits the conclusions that can be drawn. Several used data from the Continuing Survey of Food Intake by Individuals (CSFII). This is a population-based, cross-sectional study conducted by the U. S. Department of Agriculture which included two 24-hour dietary recalls to assess food intake.

One study using CSFII data was reported by Bowman and colleagues.[10] Using data from 6,212 individuals aged 4 to 19 years and collected in 1994 to 1996 and 1998, it found that 30% of the sample ate quick-service food on one of the two survey days. The children who ate quick-service food, compared with those who did not, consumed significantly more total energy (187 kcal), more total fat (9 g), more added sugars (26 g), more sugar-sweetened beverages (228 g), less fiber (-1.1 g), less milk (-65 g), and fewer fruits and non-starchy vegetables (-45 g). Among those consuming quick-service foods, energy intake was greater and diet quality was lower on days when quick-service foods were eaten. Similarly, Schmidt and colleagues found that consuming quick-service food was positively associated with intakes of energy, sodium, total fat, and saturated fat among a sample of 2,379 black and white adolescent girls, aged 9 to 19 years that participatrd in the National Heart, Lung, and Blood Growth and Health Study.[43]

Zoumas-Morse et. al., investigated adolescent intake of a broader spectrum of away-from-home-foods, including those from restaurants, delicatessens, stores, and cafeterias, as well as quick-service establishments.[44] Based on data from 811 individuals aged 7 to 17 years, it was found that children consumed almost twice as much energy when they ate a meal at a restaurant (765 calories) compared to an average meal at home (425 calories). Children and adolescents also consumed more energy from fat and saturated fat when eating at a restaurant compared to at home. Using data from the 1989–1991 CSFII, Lin and colleagues found that the foods

children ate from quick-service and other restaurants were higher in fat and saturated fat and lower in fiber, iron, calcium, and cholesterol than other foods.[45]

The relationship between away-from-home food and high energy intakes and poor diet quality has also been documented in adults. Using CSFII data from 17,370 individuals collected from 1994 to 1996 and in 1998, Paeratakul and colleagues found that both adults and children who reported eating quick-service foods on at least one of the two survey days had higher intakes of calories, fat, saturated fat, and sodium, and lower intakes of vitamins A and C, milk, fruits, and vegetables, compared to people who did not eat quick-service food.[46] Similarly, Bowman and Vinyard, using CSFII 1994-96 data, found that, among 9,872 men and women, those who consumed quick-service food on one or both survey days had diets higher in energy and energy density than those who did not report consuming quick-service food.[11] They also found that those who consumed quick-service food had diets lower in fiber, vitamins A and C, carotenes, calcium, and magnesium. Satia and colleagues also found eating in quick-service restaurants to be associated with higher total fat intake, higher saturated fat intake, and lower vegetable intake among a sample of 658 African-American adults.[47] Similar results were presented for a group of postmenopausal women.[48]

These studies, which have mostly focused on quick-service food, indicate that consumption of away-from-home food is associated with diet quality and energy intake. Eating quick-service meals was linked to consuming more energy, more saturated fat, fewer fruits and vegetables, and less milk. The available data suggest that consumption of away-from-home food may have an adverse effect on dietary quality in ways that plausibly could increase obesity risk. Further studies are warranted, particularly studies comparing eating pattern on days when away-from-home food is and is not consumed, as well as, studies focusing on different types of restaurants.

Away-from-home food and weight status

In light of the growing proportion of meals consumed outside of the home and the potential influence of these foods on energy intake, it is important to consider whether away-from-home foods contribute to overweight and obesity. A variety of different types of evidence support this hypothesis.

An ecological study reported by Maddock, found that states with higher levels of obesity had more quick-service restaurants per person.[49] While these were aggregate correlational data, they are supported by findings from other types of studies.

Two cross-sectional studies have used 1994–1996 CSFII data to explore relationships between away-from-home food and self-reported body weight. Bowman and Vinyard found that adults who reported eating quick-service food on at least one survey day had higher mean body mass index (BMI) values than those who did not eat quick-service food on either survey day.11 When examining quick-service as well as other types of eating establishments, Binkley et al., also found that eating away-from-home food was related to obesity.[50]

Three additional cross-sectional studies have shown relationships between away-from-home food and adiposity. McCrory et al., found that the frequency of consuming restaurant food was associated positively with body fatness (partial $r = 0.42$, $p = 0.003$).[51] In a study with 658 African-American adults, Satia et al., found that individuals who reported eating quick-service food often had significantly higher BMI values than those who reported consuming these foods 'rarely' or 'never'.[47] Additionally, Jeffery and French reported that consumption of quick-service meals was positively associated with BMI in women, but not in men, when examining data from 1,059 men and women.[52]

Experimental evidence suggesting a relationship between adiposity and quick-service food is provided by two studies reported by Ebbeling and colleagues.[53] These studies compared food intakes of 26 overweight and 28 lean adolescents aged 14 to 17 years. In one study, participants were provided with an "extra large" quick-service meal at a food court. They were instructed to eat as much or little

as desired. The overweight participants consumed more energy than the lean participants (1,860 vs. 1,458 kcal). In the second study, energy intake was assessed under free-living conditions for two days when quick-service food was consumed and for two days when it was not consumed. While the overweight participants consumed more energy on days when quick-service food was consumed (2,703 vs. 2,295 kcal/d), this effect was not observed among lean participants. While these studies suggest a link between quick-service food and obesity, further experimental studies are warranted.

Four longitudinal studies have examined the effect of quick-service food on weight status over time. With a cohort of 7,745 girls and 6,610 boys, aged 9 to 14 years, Taveras and colleagues found that, over a 1-year period, increased consumption of fried away-from-home food was associated with increased BMI values.[54] In another study with adolescents, Thompson et al., reported that among 101 girls aged 8 to 12 year, those who consumed quick-service food twice a week or more had a greater increase in BMI when they were 11 to 19 years than those who reported eating quick-service food once a week or less.[55] As part of a prospective intervention trial on weight gain prevention, French and colleagues examined the frequency of quick-service restaurant use in a community-based sample of 891 adult women.[56] During a 3-year period, increases in frequency of quick-service restaurant use were associated with increases in body weight. Additionally, Pereira et al. used data from the Coronary Artery Risk Development in Young Adults (CARDIA) study to investigate the association between quick-service habits and changes in bodyweight over a 15-year period.[57] This study included 3,031 black and white adult men and women from 18 to 30 years of age at baseline. Researchers found that an increase in quick-service meal frequency over 15 years was associated with weight gain. Specifically, participants who ate quick-service food more than twice a week at baseline and at the 15-year follow-up gained an extra 4.5 kg of body weight compared to those who consumed quick-service food less than once a week at these time points. While some, but not all, of these studies have controlled for total energy consumption,[56,57] these findings suggest there may be an association between eating away from home and overweight and obesity in children and adults.

A direct causal relationship between away-from-home foods and obesity has not, however, been established. Further research, particularly longitudinal studies, are needed to better understand the influence of away-from-home foods on body weight. Nevertheless, away-from-home foods are an increasingly important part of the American diet and individuals should ensure that these items are part of a balanced diet.[1,2]

Incorporating away-from-home food into a healthy eating plan

With approximately 1/3 of daily calorie consumption in the United States coming from away-from-home foods it is important to consider how individuals can fit these items into a healthy eating plan.[1,4]

Tailor away-from-home meals to make them as healthful as possible.

- Patronize establishments that offer a variety of food choices and are willing to make substitutions or changes.
- Look for lower-fat, lower calorie menu items:
  - Steamed, broiled, baked, roasted, or poached items tend to have a lower fat content than fried foods.
  - Choose lower-calorie sauces and condiments. For example, foods with butter and cream sauce are likely to have more fat than items with a broth or mustard sauce.
  - Select a low-calorie soup or salad as an appetizer.
  - Use nutrition information to guide food choices Many restaurants have nutrition information available on-site or on websites. Patrons can examine this information before ordering to make the best food choices.
  - Modify a menu item to make it a healthier option. For example, ask for a main dish salad to be served with grilled chicken instead of fried chicken, choose a low fat or nonfat dressing, and order the dish without cheese and croutons.
- Treat this as an opportunity to eat more fruits and vegetables.
  - Order a vegetarian meal.
  - Substitute colorful vegetables for other side dishes. Have the entrée be accompanied by a healthfully-prepared salad, fruit, or steamed vegetables.
  - Select fresh fruit for dessert.
  - When at a buffet, make sure that a substantial

portion of the plate is covered by low calorie fruits and vegetables.

- ❖ Control food and beverage portions to make them appropriate for energy needs
  - • Order a half-portion.
  - • Share a meal with a companion.
  - • Take half or more of the meal home. Having a portion of a meal boxed up before eating may reduce the temptation to overindulge.
  - • Focus on food quality not quantity. Instead of placing value on large food portions, enjoy smaller portions of high quality food.

When eating out is a family affair, lay the groundwork for a lifetime of healthful eating.

- ❖ Serve as a good role model for children by practicing healthy eating habits.
- ❖ Choose kid-friendly restaurants that offer a variety of healthful items children will enjoy.
- ❖ When ordering a meal for a child:
  - • Ask about alternative to French fries such as apple slices or apple sauce.
  - • Order low fat or nonfat milk instead of a shake, soda, or other sugar-sweetened beverage.
  - • If only deep fried or high-fat options are available on the children's menu, ask whether the chef can make a simple sandwich on whole grain bread such as a cheese sandwich.

Reduce reliance on away-from-home food.

- ❖ Pack healthy snacks to reduce the impulse visit to the vending machine.
- ❖ When cooking a healthful dinner at home, prepare extra food that can be taken for lunch or frozen for a busy day.
- ❖ When traveling, bring along nutritious foods that will not spoil, such as fresh fruits and vegetables or pack a cooler with items such as low-fat yogurt.

Approaches to increasing access to healthful away-from-home foods

The Keystone Forum report, on which this brief is based, also encouraged restaurants, work sites, educational institutions, healthcare facilities, and faith-based organizations to offer and promote healthful items where foods and beverages are sold or made available for consumption. Some opportunities include:

- ❖ Adding new menu items and modifying existing items to increase the availability of healthful foods. A modest decrease in fat, along with an increase in the vegetable content of many menu items, can reduce the calorie content without necessarily affecting taste.
- ❖ Conducting promotional activities and offering pricing incentives, which can help encourage the selection of nutritious items.
- ❖ Providing appropriate serving sizes of foods and beverages, which may help people control caloric intake.
- ❖ Increasing the availability of nutrition information and providing educational opportunities, which may help consumers make the most appropriate choices.

.....

References

1. Lin B-H, Frazao E, Guthrie J. Away-from-home foods increasingly important to quality of American diet. Economic Research Service/ USDA. Agriculture Information Bulletin No. 749, 1999.

2. Putnam J, Allshouse J. Food consumption, prices, and expenditures. Statistical bulletin 928: US Department of Argiculture, Economic Research Service, 1996.

3. The keystone forum on away-from-home foods: opportunities for preventing wight gain and obesity. Washington, DC: The Keystone Center, May 2006.

4. Guthrie JF, Lin B-H, Frazao E. Role of food prepared away from home in the American diet, 1977–1978 versus 1994–1996: changes and consequences. Journal of Nutrition Education and Behavior 2002;34:140–150.

5. Stewart H, Blisard N, Bhuyan S, Nayga RM. The demand for food away from home: full-service or fast food, Agricultural Economic Report #829. Washington, DC: USDA, 2004.

6. U.S. Bureau of the Census. Measuring 50 years of economic change using the march current population survey, current population reports, P60-203,. Washington, DC: U.S. Government Printing Office, 1998.

7. Ledikwe JH, Ello-Martin JA, Rolls BJ. Portion sizes and the obesity epidemic. J Nutr 2005;135:905–909.

8. Rolls BJ. The supersizing of America: portion size and the obesity epidemic. Nutrition Today 2003;38:42–53.

9. Prentice AM, Jebb SA. Fast foods, energy density and obesity: a possible mechanistic link. Obesity Reviews 2003;4:187–194.

10. Bowman SA, Gortmaker SL, Ebbeling CB, Pereira MA, Ludwig DS. Effects of fast-food consumption on energy intake and diet quality among children in a national household study. Pediatrics 2004;113:112–118.

11. Bowman SA, Vinyard BT. Fast food consumption of U.S. adults: impact on energy and nutrient intakes and overweight status. J Am Coll Nutr 2004;23:163–168.

12. Ledikwe JH, Blanck HM, Khan LK, et al. Low-energy-density diets are associated with high diet quality in adults in the United States. J Am Diet Assoc 2006;106:1172–1180.

13. Bell EA, Castellanos VH, Pelkman CL, Thorwart ML, Rolls BJ. Energy density of foods affects energy intake in normal-weight women. American Journal of Clinical Nutrition 1998;67:412–420.

14. Rolls BJ, Bell EA, Castellanos VH, Chow M, Pelkman CL, Thorwart ML. Energy density but not fat content of foods affected energy intake in lean and obese women. American Journal of Clinical Nutrition 1999;69:863–871.

15. Bell EA, Rolls BJ. Energy density of foods affects energy intake across multiple levels of fat content in lean and obese women. American Journal of Clinical Nutrition 2001;73:1010–1018.

16. Devitt AA, Mattes RD. Effects of food unit size and energy density on intake in humans. Appetite 2004;42:213–220.

17. Stubbs RJ, Whybrow S. Energy density, diet composition and palatability: influences on overall food energy intake in humans. Physiol Behav 2004;81:755–764.

18. Rolls BJ, Roe LS, Meengs JS. Salad and satiety: energy density and portion size of a first course salad affect energy intake at lunch. Journal of the American Dietetic Association 2004;104:1570–1576.

19. Rolls BJ, Roe LS, Meengs JS. 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.

20. Rolls BJ, Bell EA, Thorwart ML. Water incorporated into a food but not served with a food decreases energy intake in lean women. American Journal of Clinical Nutrition 1999;70:448–455.

21. Ledikwe JH, Blanck HM, Kettel Khan L, et al. Dietary energy density is associated with energy intake and weight status in US adults. Am J Clin Nutr 2006;83:1362–1368.

22. Cuco G, Arija V, Marti-Henneberg C, Fernandez-Ballart J. Food and nutritional profile of high energy density consumers in an adult Mediterranean population. European Journal of Clinical Nutrition 2001;55:192–199.

23. de Castro JM. Dietary energy density is associated with increased intake in free-living humans. J Nutr 2004;134:335–341.

24. Stookey JD. Energy density, energy intake and weight status in a large free-living sample of Chinese adults: exploring the underlying roles of fat, protein, carbohydrate, fiber and water intakes. European Journal of Clinical Nutrition 2001;55:349–359.

25. Kant AK, Graubard BI. Energy density of diets reported by American adults: association with food group intake, nutrient intake, and body weight. Int J Obes (Lond) 2005;29:950–956.

26. Marti-Henneberg C, Capdevila F, Arija V, et al. Energy density of the diet, food volume and energy intake by age and sex in a healthy population. European Journal of Clinical Nutrition 1999;53:421–428.

27. Smiciklas-Wright H, Mitchell DC, Mickle SJ, Goldman JD, Cook A. Foods commonly eaten in the United States, 1989–1991 and 1994–1996: are the portion sizes changing? Journal of the American Dietetic Association 2003;103:41–47.

28. Rolls BJ, Roe LS, Kral TVE, Meengs JS, Wall DE. Increasing the portion size of a packaged snack increases energy intake in men and women. Appetite 2004;42:63–69.

29. Rolls BJ, Morris EL, Roe LS. Portion size of food affects energy intake in normal-weight and overweight men and women. American Journal of Clinical Nutrition 2002;76:1207–1213.

30. Rolls BJ, Roe LS, Meengs JS, Wall DE. Increasing the portion size of a sandwich increases energy intake. Journal of the American Dietetic Association 2004;104:367–372.

31. Diliberti N, Bordi PL, Conklin MT, Rolls BJ. Increasing the portion size of a restaurant entrée results in increased food intake. FASEB Journal 2003;17:A809.

32. 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.

33. Rolls BJ, Roe LS, Meengs JS. Larger portion sizes lead to a sustained increase in energy intake over 2 days. J Am Diet Assoc 2006;106:543–549.

34. Rolls BJ, Roe LS, Meengs JS. The effect of increased portion size on energy intake is sustained for 11 days. Obesity Research 2005;13:A36.

35. Diliberti N, Bordi P, Conklin MT, Roe LS, Rolls BJ. Increased portion size leads to increased energy intake in a restaurant meal. Obesity Research 2004;12:562–568.

36. Kral TVE, Roe LS, Rolls BJ. Combined effects of energy density and portion size on energy intake in women. American Journal of Clinical Nutrition 2004;79:962–968.

37. Ello-Martin JA, Ledikwe JH, Rolls BJ. The influence of food portion size and energy density on energy intake: implications for weight management. Am J Clin Nutr 2005;82:236S-241S.

38. Glanz K, Basil M, Maibach E, Goldberg J, Snyder D. Why Americans eat what they do: taste, nutrition, cost, convenience, and weight control as influences on food consumption. Journal of the American Dietetic Association 1998;98:1118–1126.

39. Rolls BJ. Sensory-specific satiety. Nutrition Reviews 1986;44:93-101.

40. Rolls BJ, Rolls ET, Rowe EA, Sweeney K. Sensory specific satiety in man. Physiology & Behavior 1981;27:137–142.

41. McCrory MA, Fuss PJ, McCallum JE, et al. Dietary variety within food groups: association with energy intake and body fatness in men and woman. American Journal of Clinical Nutrition 1999;69:440–447.

42. Raynor HA, Jeffery RW, Tate DF, Wing RR. Relationship between changes in food group variety, dietary intake, and weight during obesity treatment. International Journal of Obesity 2004;28:813–820.

43. Schmidt M, Affenito SG, Striegel-Moore R, et al. Fast-food intake and diet quality in black and white girls: the National Heart, Lung, and Blood Institute Growth and Health Study. Arch Pediatr Adolesc Med 2005;159:626–631.

44. Zoumas-Morse C, Rock CL, Sobo EJ, Newhouser ML. Children's patterns of macronutrient intake and associations with restaurant and home eating. Journal of the American Dietetic Association 2001;101:923–925.

45. Lin B-H, Guthrie J, Blaylock J. Diets of America's Children: Influence of Dining Out, Household Characteristics, and Nutrition Knowledge, Agricultural Economic Report #726 Washington, DC: USDA, 1996.

46. Paeratakul S, Ferdinand DP, Champagne CM, Ryan DH, Bray GA. Fast-food consumption among US adults and children: dietary and nutrient intake profile. J Am Diet Assoc 2003;103:1332–1338.

47. Satia JA, Galanko JA, Siega-Riz AM. Eating at fast-food restaurants is associated with dietary intake, demographic, psychosocial and behavioural factors among African Americans in North Carolina. Public Health Nutr 2004;7:1089–1096.

48. Clemens LHE, Slawson DL, Klesges RC. The effect of eating out on quality of diet in premenopausal women. Journal of the American Dietetic Association 1999;99:442–444.

49. Maddock J. The relationship between obesity and the prevalence of fast food restaurants: state-level analysis. Am J Health Promot 2004;19:137–143.

50. Binkley JK, Eales J, Jekanowski M. The relation between dietary change and rising US obesity. International Journal of Obesity 2000;24:1032–1039.

51. McCrory MA, Fuss PJ, Hays NP, Vinken AG, Greenberg AS, Roberts SB. Overeating in America: association between restaurant food consumption and body fatness in healthy adult men and women ages 19–80. Obesity Research 1999;7:564–571.

52. Jeffery RW, French SA. Epidemic obesity in the United States: are fast foods and television viewing contributing? Am J Public Health 1998;88:277–280.

53. Ebbeling CB, Sinclair KB, Pereira MA, Garcia-Lago E, Feldman HA, Ludwig DS. Compensation for energy intake from fast food among overweight and lean adolescents. Jama 2004;291:2828–2833.

54. Taveras EM, Berkey CS, Rifas-Shiman SL, et al. Association of consumption of fried food away from home with body mass index and diet quality in older children and adolescents. Pediatrics 2005;116:e518-24.

55. Thompson OM, Ballew C, Resnicow K, et al. Food purchased away from home as a predictor of change in BMI z-score among girls. Int J Obes Relat Metab Disord 2004;28:282–289.

56. French SA, Harnack L, Jeffery RW. Fast food restaurant use among women in the Pound of Prevention study: dietary, behavioral and demographic correlates. International Journal of Obesity 2000;24:1353–1359.

57. Pereira MA, Kartashov AI, Ebbeling CB, et al. Fast-food habits, weight gain, and insulin resistance (the CARDIA study): 15-year prospective analysis. Lancet 2005;365:36–42.

58. Pennington JAT, Douglass JS. Bowes & Church's Food Values of Portions Commonly Used. 18th ed. Baltimore, MD: Lippincott, Williams & Wilkins, 2005.