Patterns and Trends in Food Portion Sizes, 1977-1998

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Patterns and Trends in Food Portion Sizes, 1977-1998

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Context While general consensus holds that food portion sizes are increasing, no empirical data have documented actual increases.

Objective To determine trends in food portion sizes consumed in the United States, by eating location and food source.

Design, Setting, and Participants Nationally representative data from the Nationwide Food Consumption Survey (1977-1978) and the Continuing Survey of Food Intake by Individuals (1989-1991, 1994-1996, and 1998). The sample consists of 63 380 individuals aged 2 years and older.

Main Outcome Measure For each survey year, average portion size consumed from specific food items (salty snacks, desserts, soft drinks, fruit drinks, french fries, hamburgers, cheeseburgers, pizza, and Mexican food) by eating location (home, restaurant, or fast food).

Results Portion sizes vary by food source, with the largest portions consumed at fast food establishments and the smallest at other restaurants. Between 1977 and 1996, food portion sizes increased both inside and outside the home for all categories except pizza. The energy intake and portion size of salty snacks increased by 93 kcal (from 1.0 to 1.6 oz [28.4 to 45.4 g]), soft drinks by 49 kcal (13.1 to 19.9 fl oz [387.4 to 588.4 mL]), hamburgers by 97 kcal (5.7 to 7.0 oz [161.6 to 198.4 g]), french fries by 68 kcal (3.1 to 3.6 oz [87.9 to 102.1 g]), and Mexican food by 133 kcal (6.3 to 8.0 oz [178.6 to 226.8 g]).

Conclusion Portion sizes and energy intake for specific food types have increased markedly with greatest increases for food consumed at fast food establishments and in the home.

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ALTHOUGH GENERAL CONSENsus holds that food portions have been increasing and that this increase is one factor contributing to the obesity epidemic in the United States, no empirical data to date have documented actual increases.[1] One recent study showed that most commonly available food portions exceeded the US Department of Agriculture (USDA) and Food and Drug Administration (FDA) standard portion sizes and that most foods are available in larger portion sizes than they were in the 1970s.[2] Another small study reported portion size increases for meat portions but not for other foods, whereas 2 studies have linked portion size increases to increased total energy intake.[3-5] The portion size changes are part of the "supersizing" phenomenon seen at fast food establishments and at restaurants.[6]

In this study, we used nationally representative dietary intake data to determine patterns and trends in portion sizes by type of food and eating location and to compare portion sizes eaten outside the home with those eaten at home.

METHODS

This study used data on individuals aged 2 years and older from 3 nationally representative surveys of the US population (N=63 380): 29 695 for the National Food Consumption Survey 1977 (NFCS77)[7] and 14 658 for the Continuing Survey of Food Intake for Individuals 1989 (CSFII89)[8] and 19 027 for 1996 (CSFII96).[9] The CSFII96 survey also included a sample of children aged 2 to 9 years surveyed in 1998, which was designed to be merged with the CSFII96.

The USDA surveys from 1977 and 1989 contained stratified area probability samples of noninstitutionalized US households in the 48 contiguous states, and the 1996 survey included samples from all 50 states. All 3 surveys were self-weighting and multistage. The sample weights compensate for unequal selection probabilities and nonresponse as well as sampling variability, and these were designed to achieve the specified sample sizes for various sex-age-income domains. Each survey year and the combination of the multiyear surveys were designed to be nationally representative. Detailed information about each survey has been published previously.[7-9]

The NFCS77 and CSFII89 surveys collected 1 day of food intake by in-home, interviewer-administered, 24-hour recall and 2 days of self-administered, 1-day food records. The CSFII96 collected 2 nonconsecutive, interviewer-administered, 24-hour food recalls approximately 10 days apart by telephone. For each food consumed, the respondent was asked whether the eating occasion was a meal or a snack and where the food was obtained. If the food was bought in a store, the respondent was asked whether the food was

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Table 1. Trends in Energy Intake by Eating Location and Key Food for Americans Aged 2 Years and Older[12]*

	Total Energy Consumed			Energy in Meals Consumed			Energy in Snacks Consumed		
	1977-1978	1989-1991	1994-1996	1977-1978	1989-1991	1994-1996	1977-1978	1989-1991	1994-1996
Key foods, %†	18.1	23.6	27.7	14.3	19.7	22.8	46.4	51.0	50.8
At home, %	76.9‡§	72.6‡‖	64.5§‖	77.0‡§	72.3‡‖	63.8§‖	76.0‡§	74.8‡‖	67.4§‖
Total energy, kcal	1791§	1795‖	1985§‖	1588‡§	1559‡‖	1634§‖	203‡§	236‡‖	351§‖

*Adjusted for age, sex, education level, race/ethnicity, region, urban classification, household size, and percentage at poverty level.
†Combined percentage that salty snacks, desserts, soft drinks, fruit drinks, french fries, hamburgers, cheeseburgers, pizza, and Mexican food contribute to that segment of the diet.
‡A significant difference between 1977-1978 and 1989-1991, $P \leq .01$.
§A significant difference between 1977-1978 and 1994-1996, $P \leq .01$.
‖A significant difference between 1989-1991 and 1994-1996, $P \leq .01$.

brought into the home and if so, whether it was eaten at home. These data were then used to classify food sources into the 4 following categories: (1) eaten or prepared at home, (2) from a fast food establishment, (3) from a restaurant, or (4) from any other source. Other than food that was bought from a store, food from any other source was considered to be from that source even if brought into the home.

To examine the thousands of foods contributing to energy intake, the food-grouping system[10] from the University of North Carolina at Chapel Hill was used in this study. This system aggregates all foods in the USDA nutrient composition tables into 74 descriptive and nutrient-based subgroups. In addition, selected popular foods, such as pizza, hamburgers, and french fries, were identified to examine trends in energy intake over time. These foods had been identified in a previous study that examined trends in fat intake.[11]

The foods chosen for this study were those identified as having the greatest kilocalorie changes in Americans' diets between 1977 and 1996.[12] These key foods combined represented 18.1% of all kilocalories consumed in 1977-1978 and represented 27.7% of all kilocalories consumed in 1994-1996 for Americans aged 2 years and older (TABLE 1). While 77% of total kilocalories were consumed at home in 1977-1978, this decreased to 65% of total kilocalories consumed at home in 1994-1996 for Americans aged 2 years and older. During this same period, meals have decreased from approximately 89% of total kilocalories consumed to 81% of kilocalories consumed, and snacks have increased by those 7 percentage points for Americans aged 2 years and older.[12] As previously reported, intakes of medium-fat and high-fat beef and pork products and high-fat luncheon meats and hot dogs have decreased, probably related to increasing amounts of cheeseburgers, pizza, and Mexican food being consumed, and this is consistent with a shift from medium-fat and high-fat meat items to medium-fat and high-fat mixed grain dishes.[13]

The USDA data show each food item consumed, along with the self-reported eating occasion and the self-reported location where food was obtained and eaten. For each survey year, the average consumption of selected food categories (ie, salty snacks, desserts, soft drinks, fruit drinks, hamburgers, cheeseburgers) and other selected food groups (ie, pizza, Mexican food) and the eating location (ie, at home, restaurant, fast food establishment) were determined for each of the following age groups: 2 to 18 years, 19 to 39 years, 40 to 59 years, and 60 years and older). The food category salty snacks included crackers, potato chips, pretzels, puffed rice cakes, and popcorn. The food category desserts included ice cream, pies, cakes, and cookies. Mexican food included burritos, enchiladas, tacos, tostadas, and similar products.

Food consumption was estimated in 2 ways: as energy intake in kilocalories and amount consumed in ounces (0.035 oz = 1.0 g). Average portion sizes were calculated using reported portion sizes of each food at 1 meal or snack. Food models are used to assist respondents in identifying the size of a portion. However, there is wide variability in reported portion size, that is, based on individual specification of amount consumed. These data do not reflect cumulative amount of foods consumed by individuals during the course of a day because these data were examined on an individual meal basis. Thus, these were per-consumer averages, not per capita averages, and were intended to show changes over time in the average portion size for those who consume a specific item, not that the number of individuals consuming an item has changed. All analyses used the 1994-1996 updated nutrient database.[10] To test for statistical differences, SAS version 8.1 (SAS Institute Inc, Cary, NC) and SUDAAN 7.5.6 (Research Triangle Park, NC) software packages were used, which also allowed for weights and control of sample design effects. $P \leq .01$ was set for statistical significance.

RESULTS

Between 1977 and 1996, portion sizes and energy intake increased for all key foods (except pizza) at all locations examined for the total US population aged 2 years and older surveyed (TABLE 2). During this 19-year period, the quantity of salty snacks increased by 93 kcal (0.6 oz), soft drinks by 49 kcal (6.8 oz), hamburgers by 97 kcal (1.3 oz), french fries by 68 kcal (0.5 oz), and Mexican dishes by 133 kcal (1.7 oz).

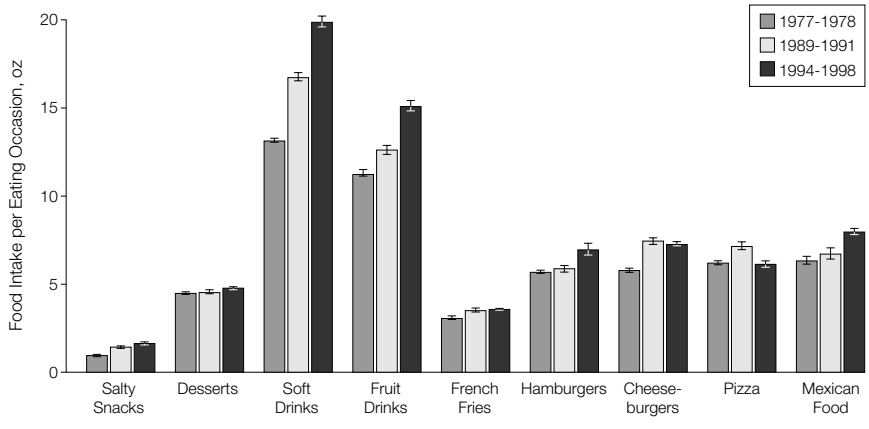
Portion sizes of certain foods increased more than others. Between 1977 and 1996, the average energy intake and portion size of salty snacks increased from 132 to 225 kcal (1.0 to 1.6 oz); the average soft drink consumed increased from 144 to 193 kcal (13.1 to 19.9 fl oz), and the average cheese-

Table 2. Trends in Energy Intake and Portion Size of Key Food Items and by Eating Location for Americans Aged 2 Years and Older*

	Home			Restaurant			Fast Food			Total		
	1977-1978	1989-1991	1994-1996	1977-1978	1989-1991	1994-1996	1977-1978	1989-1991	1994-1996	1977-1978	1989-1991	1994-1996
Energy Intake, kcal												
Salty snacks	127†‡	189†§	206‡§	113‡	150	178‡	160‡	185	249‡	132†‡	199†§	225‡§
Desserts	302‡	315	324‡	259‡	280	306‡	277†	331†	302	316†‡	334†§	357‡§
Soft drinks	130‡	133§	158‡§	125‡	126§	155‡§	131†‡	143†§	191‡§	144†‡	157†§	193‡§
Fruit drinks	137†‡	149†§	181‡§	133‡	125§	201‡§	147‡	135§	210‡§	139†‡	152†§	189‡§
French fries	196†‡	240†	236‡	168†‡	229†	222‡	171†‡	260†§	284‡§	188†‡	247†	256‡
Hamburgers	390	397	608	362	335	362	419‡	414§	497‡§	389‡	392§	486‡§
Cheeseburgers	405‡	465	542‡	381	425	485	406†‡	564†	537‡	397†‡	544†	533‡
Pizza	493†	591†§	506§	628	571	516	538	603§	503§	487†	556†§	476§
Mexican food	452‡	509	559‡	396	448	495	410‡	431§	594‡§	408‡	446§	541‡§
Portion Size, oz												
Salty snacks	1.0†‡	1.4†§	1.5‡§	0.8‡	1.1	1.3‡	1.2‡	1.3§	1.9‡§	1.0†‡	1.4†§	1.6‡§
Desserts	4.2	4.2	4.4	4.0	4.3	4.5	3.9†‡	4.7†	5.2‡	4.5‡	4.5	4.8‡
Soft drinks	12.2†‡	14.7†§	17.0‡§	10.8†‡	13.6†§	15.7‡§	10.9†‡	14.0‡§	17.7†§	13.1†‡	16.8†§	19.9‡§
Fruit drinks	11.3†‡	12.4†§	14.7‡§	9.7‡	9.5§	14.4‡§	10.4‡	11.8§	15.4‡§	11.3†‡	12.6†§	15.1‡§
French fries	3.6†	4.2†	3.9	2.3†‡	3.1†	3.1‡	2.1†‡	3.0†§	3.3‡§	3.1†‡	3.5†	3.6‡
Hamburgers	5.7	5.7	8.4	5.3	4.9	5.0	6.1‡	6.3	7.2‡	5.7‡	5.9§	7.0‡§
Cheeseburgers	5.8‡	6.4	7.4‡	5.5	5.7	6.8	5.9†‡	7.7†	7.3‡	5.8†‡	7.4†	7.3‡
Pizza	6.2†	7.6†§	6.5§	7.9	7.4	6.8	6.8	7.8§	6.5§	6.2†	7.1†§	6.1§
Mexican food	7.1	7.4	8.3	6.0‡	7.0	7.9‡	6.0‡	6.7	8.2‡	6.3‡	6.7§	8.0‡§

*Weighted to be nationally representative for each time period. To convert ounces to grams, divide by 0.035, and to convert fluid ounces to milliliters, multiply by 29.57.
†A significant difference between 1977-1978 and 1989-1991, $P \leq .01$.
‡A significant difference between 1977-1978 and 1994-1996, $P \leq .01$.
§A significant difference between 1989-1991 and 1994-1996, $P \leq .01$.

Figure 1. Portion Sizes for Selected Key Food Items for Americans Aged 2 Years and Older, 1977-1996



Error bars indicate SE.

burger from 397 to 533 kcal (5.8 to 7.3 oz) (Table 2 and FIGURE 1).

Overall portion sizes for all of the selected foods, other than pizza, increased. There were no differing trends within age groups that were statistically significant; however, there are age group differences, particularly for the 60-year-olds. For people aged 2 to 18 years, hamburger portion sizes in restaurants decreased. For people aged 60 years and older, portion sizes for soft drinks decreased. Additional information for specific age groups can be obtained from the authors.

In 1994-1998, the largest portion sizes for most foods were found at fast food establishments, including salty snacks, soft drinks, fruit drinks, french fries, and Mexican food (Table 2 and FIGURE 2). For desserts, hamburgers, and cheeseburgers, the largest portion sizes were found at home. Consistently, restaurant portion sizes were smaller across all key foods except pizza.

COMMENT

This study provides evidence to support the general consensus that there is a marked trend toward larger portion sizes in the United States. Between 1977 and 1996, both inside and outside the home, portion sizes increased for salty snacks, desserts, soft drinks, fruit drinks, french fries, hamburgers, cheeseburgers, and Mexican food. Pizza portions in general decreased during this period. The size of the increases are substantial. Since an added 10 kcal per day of unexpended energy is equivalent to an extra pound (0.45 kg) of weight per year, it is easy to see the potential impact of large increases in portion sizes that ranged from 49 to 133 kcal (0.3 to 1.7 oz in weight; 3.8 to 6.8 fl oz) per item for com-

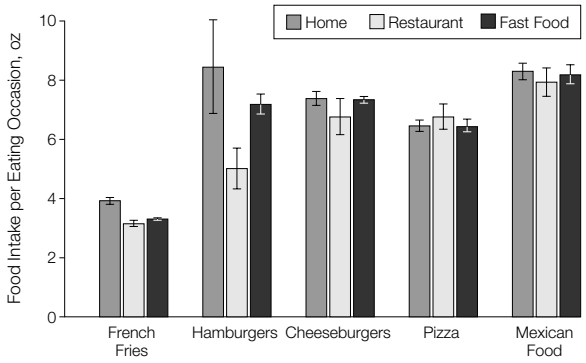
monly consumed items, such as salty snacks, soft drinks, hamburgers, french fries, and Mexican food.

Some potential limitations of our study are that the USDA changed its methods for collecting dietary data[14,15] and that persons who are overweight most likely underreport their energy intake,[14-18] with the extent of underreporting having increased over time.[19] There is no information to date in the United States to indicate systematic bias in reporting by eating location. Furthermore, due to increasing underreporting, the estimates of portion size are most likely smaller than the actual portion sizes being consumed. Thus, we believe that the trends in eating behavior highlighted in this article are representative of those occurring among the US population. The USDA is no longer conducting its survey; the last one conducted was the CSFII96. The survey has been combined with the National Health and Nutrition Examination Survey[7-9] and currently there are no comparable data. The next comparable data set is being collected in 2002-2003. The data presented are most likely underestimations of current portion sizes.

Our study also identifies salient differences in portion size by food location. For most of the selected foods, fast food establishments served the largest and restaurants the smallest portion sizes. This might relate to fast food establishments' pricing practices of "value adding" whereby they offer much larger portions for a minor cost increase, and in some cases it is less expensive to eat larger portions in value packages than smaller portions. At the same time, the most surprising result is the large portion size increases for food consumed at home—a shift that indicates marked changes in eating behavior in general.

These findings suggest that the public requires better education about control of portion size both inside and outside the home. Simply educating the public about which foods to eat or not to eat is not enough, as an equally important issue is the quantity of food being consumed. While the exact contribution of portion size changes to the increases in US overweight and obesity rates cannot be determined, the prevalence of adult obesity has increased from 14.5% in 1971 to 30.9% in 1999.[20] The results of this study indicate that control of portion size must be systematically addressed both in general and as it relates to fast food pricing and marketing. The best way to encourage people to eat smaller portions is if food portions served inside and outside the home are smaller. However, this change in behavior may be difficult to achieve due to the US advertising climate and its influence on the public.

Figure 2. Portion Sizes for Selected Food Items Consumed by Eating Location for Americans Aged 2 Years and Older, 1994-1998



Error bars indicate SE.

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Analysis and interpretation of data: Nielsen, Popkin.
Drafting of the manuscript, statistical expertise, and administrative, technical, or material support: Nielsen.
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