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Nutritional Quality of Food Prepared at Home and Away From Home, 1977-2008

Biing-Hwan Lin

Joanne Guthrie

Abstract

Food prepared away from home (FAFH)—whether eaten in restaurants, fast-food and other locations, or as take-out or delivery to be eaten at home—is now a routine part of the diets of most Americans, accounting for 41 percent of food expenditures and 32 percent of caloric intake. This report analyzes data on individuals 2 years of age and older from two national food consumption surveys (one conducted in 1977-78 and another in 2005-08) to assess changes in the consumption and nutritional quality of FAFH versus food prepared at home (FAH). In the past three decades, FAH has changed more in response to dietary guidance, becoming significantly lower in fat content and richer in calcium, whereas FAFH did not. In 2005-08, FAFH was also higher in saturated fat, sodium, and cholesterol and lower in dietary fiber than FAH. The increased popularity and lower nutritional quality of FAFH is prompting new health promotion strategies, such as menu labeling.

Keywords: food away from home, food at home, food consumption, diet quality, Nationwide Food Consumption Survey, NFCS, National Health and Nutrition Examination Survey, NHANES

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Contents

Summary

What Is the Issue?

Food prepared away from home (FAFH)—whether from table-service restaurants, fast-food establishments and other locations, or from a take-out or delivery meal eaten at home—is now a routine part of the diets of most Americans. Previous Economic Research Service (ERS) research found that FAFH tends to be lower in nutritional quality than food prepared at home (FAH), increases caloric intake, and reduces diet quality among adults and children. This study updates previous research by examining dietary guidance and the nutritional quality of FAH versus FAFH in 2005-08, compared with 1977-78. Poor diets contribute to obesity, heart disease, stroke, cancer, diabetes, osteoarthritis, and other health conditions that impose a substantial economic burden on individuals and society. The increased popularity of FAFH is prompting new health promotion strategies, such as menu labeling, to address this challenge.

What Did the Study Find?

As the share of food expenditures spent on FAFH has risen over the past 30 years, so has the share of calories and nutrients consumed from such food. Previous ERS research found that FAFH in the 1990s contained less of the food components Americans underconsume, such as calcium and dietary fiber, and more of those overconsumed, such as fat, compared with FAH.

Examining the changes in intake from FAFH and FAH, as reported in national Federal surveys for 1977-78 and 2005-08, we found that:

- Americans increased their away-from-home share of caloric intake from 17.7 percent in 1977-78 to 31.6 percent in 2005-08, mainly from table-service and fast-food restaurants.
- Mean daily consumption of total fat declined significantly over the period studied in both absolute terms (grams) and as a share of calories. On average, Americans consumed 85.6 grams of total fat per day in 1977-78, compared with 75.2 grams in 2005-08. The percent of calories from total fat also declined substantially from 39.7 percent to 33.4 percent between 1977 and 2008. Comparing estimates for total fat content between FAFH and FAH shows that the gap has widened over time. Total fat in 1977-78 accounted for 39.6 and 39.9 percent of calories from FAH and FAFH, respectively, compared with 30.5 and 37.2 percent in 2005-08.
- Mean daily calcium intake rose from 743 milligrams (mg) in 1977-78 to 919 mg in 2005-08. For every 1,000 calories from FAH, Americans increased their calcium intake from 425 mg to 559 mg in that time period, whereas the calcium density in FAFH remained relatively constant at 452-460 mg per 1,000 calories.
- Foods obtained at schools had the highest calcium content among all food sources in both periods, but the amount of calcium per 1,000 calories from school foods declined from 742 mg in 1977-78 to 646 mg in 2005-08. The amount of calcium per 1,000 calories in fast-foods increased from 344 mg in 1977-78 to 372 mg in 2005-08.

Data from 2005-08 also included information on saturated fat, cholesterol, sodium, and dietary fiber intake that was unavailable in 1977-78, allowing further analysis of the nutritional differences between FAH and FAFH in the more recent period. We found that in 2005-08:

- FAFH was higher in saturated fat than FAH. The higher percent of calories from saturated fat in fast-foods was especially noteworthy at 13.5 percent, compared with 11.9 percent in restaurant foods, 12.3 percent in school foods, and 10.7 percent in FAH.
- FAFH contained 1,820 mg of sodium per 1,000 calories, considerably higher than FAH at 1,369 mg of sodium. Foods from restaurants and fast-food establishments were particularly sodium-dense at 2,151 mg and 1,864 mg of sodium per 1,000 calories, respectively.
- Similarly, FAFH was more cholesterol-dense than FAH at 144 mg and 126 mg of cholesterol per 1,000 calories, respectively. Within FAFH sources, restaurant foods were most cholesterol-dense at 206 mg per 1,000 calories.
- Even though school foods had the highest calcium content among all food sources, low calcium content in foods consumed at restaurants and fast-food places resulted in lower calcium content overall for FAFH at 460 mg per 1,000 calories, compared with 559 mg for FAH.
- FAFH, especially fast-foods, were lower in dietary fiber (an underconsumed food component) than FAH, 6.8 grams versus 7.7 grams per 1,000 calories.

How Was the Study Conducted?

Our analysis used national food consumption survey data from the 1977-78 Nationwide Food Consumption Survey (NFCS), conducted by the U.S. Department of Agriculture (USDA), as well as data from the 2005-06 and 2007-08 National Health and Nutrition Examination Survey (NHANES), conducted jointly by USDA and the U.S. Department of Health and Human Services, to examine how the nutritional quality of FAH and FAFH has changed. NHANES has been conducted continuously since 1999, however, 2009-10 NHANES data were not released until after this research was completed. Away-from-home sources include restaurants with wait staff, fast-food establishments, schools and day care (for children), and other away-from-home places (other). Analyses focused on the nutrient intake emphasized in Federal dietary guidelines for Americans 2 years of age and older. Changes in the consumption of calories, total fat, and calcium from FAH and FAFH sources over the past 30 years were examined statistically. In addition, intake of saturated fat, cholesterol, sodium, and dietary fiber during 2005-08 were analyzed to examine the differences in the nutritional quality of FAH and FAFH. Our analyses incorporated complex survey design effects and sample weights to estimate population means and test differences in means over time and by food source.

Introduction

Poor diets contribute to obesity, heart disease, stroke, cancer, diabetes, osteoarthritis, and other health conditions that impose substantial economic burden on Americans (USDA/USDHHS, 2011; USDHHS, 2010). The medical costs associated with overweight and obesity have been estimated as high as $147 billion, or 10 percent of all medical costs in 2008 (Finkelstein et al., 2009; O'Grady and Capretta, 2012; Tsai et al., 2011). These enormous costs are one reason that USDA and other public and private entities place a high priority on improving Americans' diets.

Food prepared away from home (FAFH)—whether eaten in restaurants, fast-food and other locations, or a take-out or delivery meal eaten at home—is now an important part of Americans' diets. The share of total food expenditures spent on FAFH rose steadily from 25.9 percent in 1970 to a peak of 41.9 percent in 2006-07 and then declined to 41.3 percent in 2010 (USDA/ERS, 2012). Previous ERS research found that, in the 1990s, the nutritional quality of FAFH was inferior to food prepared at home (FAH) (Guthrie et al., 2002). More recent ERS studies found that FAFH increased daily caloric intake and reduced diet quality in both adults and children after controlling for observed and unobserved personal characteristics that could be associated with differences (Todd et al., 2010; Mancino et al., 2010), contributing to poor diet and obesity risk.

Over time, however, differences between FAFH and FAH may change as consumers buy more pre-prepared items in grocery stores, possibly decreasing the differences between the two food sources (Smith, 2010); therefore, re-examination of differences between the two food categories is merited. In this study, we analyzed food consumption survey data collected by the U.S. Department of Agriculture (USDA) during 1977-78 and USDA and the U.S. Department of Health and Human Services (USDHHS) in 2005-08 to examine how the nutritional quality of FAH and FAFH has changed over the past 30 years. Data on three dietary components that have received considerable attention as a part of public health efforts—food energy (calories), total fat, and calcium—are available for both 1977-78 and 2005-08, allowing trend analysis. Reducing intake of calories and total fat was a major focus of dietary advice during much of the time period between the two surveys, as was the need to increase calcium intake. Trends in average intake, shares of intake by food source, and nutrient density by food source were compared statistically. Information on intake of four additional nutrients targeted as public health concerns—cholesterol, saturated fat, sodium, and dietary fiber—are available from the 2005-08 dataset. Differences in the FAFH and FAH content of these nutrients in 2005-08 are examined statistically. Comparing dietary quality by food preparation source provides insight into how the impact of dietary advice may be moderated by environmental factors, such as increased availability and consumption of FAFH.

Food preparation sources are categorized into two broad categories: FAH and FAFH. FAFH is disaggregated further into four sources—restaurant with waiter service (restaurant), fast-food establishment (fast-food), school cafeteria and school (day care center),[1] and other away-from-home places (other). We analyzed two sets of nationally representative survey data to report mean nutrient intake by food source for adults and children 2 years of age and older. Differences in intake over time and by food source were tested for statistical significance using SUDAAN software (RTI, 2005) to incorporate survey design and sample weights in the analysis.

[1]School (day care center) applies to children only.

Data and Methods

The Data: 1977-78 and 2005-08

Between 1935 and 1998, USDA conducted food consumption surveys to assess the nutritional well-being of the U.S. population. Since 2002, USDA has worked with USDHHS to collect and release "What We Eat in America," a component of the National Health and Nutrition Examination Survey (NHANES), which reports food consumption and nutrient intake data from a nationally representative sample of Americans (USDHHS, 2005-06 and 2007-08). In this study, we analyzed consumption data from USDA's 1977-78 Nationwide Food Consumption Survey (NFCS) as well as from the two most recent cycles of NHANES—2005-06 and 2007-08—available at the time of our analysis.

The 1977-78 NFCS collected food intake data for 3 consecutive days, and the 2005-08 NHANES recorded 2 nonconsecutive days of food intake data. In both surveys, respondents were interviewed in person to collect intake data for the first day, whereas intake information on subsequent days was collected using different methodologies (a self-reported food diary in 1977-78 versus a telephone interview in 2005-08). We analyzed only first-day data to minimize potential bias that may have occurred due to differences in timing (consecutive versus nonconsecutive days) and data collection methods (Cavadini et al., 2000). Because the Federal *Dietary Guidelines for Americans* (USDHHS/USDA, 2011) do not apply to individuals under 2 years of age, infants and toddlers were excluded from the analysis, resulting in 18,285 respondents from the 2005-08 NHANES and 29,402 respondents from the 1977-78 NFCS.

The surveys collected data on the types and amounts of foods individuals ate and where the food was obtained; using this information, calorie and nutrient intake data were calculated by USDA. The distinction between food at home (FAH) and food away from home (FAFH) in the study was based on where the food was obtained, not where it was eaten. FAH is purchased at retailers, such as a grocery store, a convenience store, or a supermarket; it may be eaten at home or away, as in a brown-bag lunch. FAFH is purchased mainly from foodservice establishments and is further disaggregated into four sources—restaurant, fast-food, school, and other. It may be eaten at one of those establishments or eaten at home, as with a delivery or take-out meal.

Food consumption survey methodology has improved over the past three decades. Some methodological changes may have contributed to the differences reported here:

- A five-step Automated Multiple-Pass Method (AMPM) improves the completeness of data collection and has been employed in NHANES but not in NFCS (Raper et al., 2004). Adopting AMPM may reduce underreporting, resulting in an increase in reported food intake, but the extent of its contribution is unknown.
- Food sources have been expanded, and Hispanic names of eating occasions have been added in NHANES. Because eating occasions are not defined for the respondents, interpretations of eating-occasion names may

play a role in the observed differences in meal eating patterns. Consequently, we chose not to report meal eating patterns and nutritional quality by meal occasion in this report.[2]

Methods

Both NFCS and NHANES employed complex survey designs and provided sample weights to generate nationally representative projections. We used SUDAAN statistical software (RTI, 2005) to incorporate survey design effects and sample weights to generate estimates of means and standard errors. NFCS and NHANES were treated as independent samples to test the differences in means for the two periods or by food sources.

There are two approaches to estimating population means and proportions (Freedman et al., 2008). We used the mean approach, in which, for a given nutrient value (e.g., FAFH's share of calories), we calculated the share for each respondent and then calculated the weighted average using sample weights. Alternatively, the weighted sum of a variable (e.g., calories from FAFH) can be calculated and then totaled in a first step, and then the analyst can take the ratio—the ratio approach. These two approaches often yield similar results, although they may produce different but equally valid results (Krebs-Smith et al., 1989).

Observed changes in dietary patterns over time may come from a variety of sources, including an aging U.S. population, the changing racial and ethnic makeup of the U.S. population, and other socioeconomic factors that may influence food consumption decisions. In this study, we compared mean dietary patterns for the two periods without adjusting for changing age, racial, and ethnic composition over time. Further research would be needed to identify the role of such factors.

[2]In addition to eating-out frequency, caloric intake from FAFH and its share of total calories are influenced by portion size and the difference in caloric content of the same food prepared at home and away from home. Changes in portion sizes over time have been studied by Nielsen and Popkin (2003). There are more than 7,000 food items reported in NHANES, and there are additional data challenges in comparing the nutritional quality of the same food prepared at home and away from home. Further research on the factors affecting caloric intake by food source is needed to explain differences.

Changes in the Nutritional Quality of Food Prepared at Home and Away From Home: 1977-2008

Seven dietary components were examined in the study, including calories, total fat, saturated fat, cholesterol, sodium, dietary fiber, and calcium. In 1980, the Federal Government began publishing the *Dietary Guidelines for Americans*, a set of recommendations to the U.S. population for healthy eating that is updated every 5 years. Over most of the period studied, these guidelines encouraged Americans to control their caloric intake to maintain or achieve healthy weight, moderate total fat, reduce saturated fat, cholesterol, and sodium, and increase calcium and fiber intake (Davis and Saltos, 1999; USDA/USDHHS, 2005). Of these targeted nutrients, only calories, total fat, and calcium were reported in the 1977-78 NFCS. Our discussion focuses first on the intake trends for calories, total fat, and calcium between 1977 and 2008, followed by a discussion of intake during 2005-08 of all the food components examined in this study.

Food Prepared Away From Home Grabs a Larger Share of Caloric Intake

Estimated caloric intake rose significantly from 1,875 calories a day during 1977-78 to 2,002 calories in 2005-08 (table 1). It should be noted, however, that improved survey methodology could contribute to the increase in reported caloric intake. Americans increased their shares of caloric intake from FAFH, from 17.7 percent in 1977-78 to 31.6 percent in 2005-08 (table 2, fig. 1). During 1977-2008, the share of calories from restaurants doubled (from 3.3 to 6.7 percent) and fast-food places registered a four-fold increase (from 3.1 to 13.2 percent). School's share of total caloric intake rose to 3.7 percent in 2005-08 from 3.0 percent in 1977-78.

Table 1
U.S. mean daily caloric and nutrient intakes of individuals 2 years of age and older, 1977-78 and 2005-08

Nutrient	Period	Mean	SE
Calories (kcal)	1977-78	1,875.12	12.84
	2005-08	2,002.46	12.29
Total fat (grams)	1977-78	85.63	0.85
	2005-08	75.19	0.66
Calcium (milligrams)	1977-78	743.45	11.58
	2005-08	918.61	8.47
Saturated fat (grams)	2005-08	25.45	0.23
Cholesterol (milligrams)	2005-08	259.26	2.37
Sodium (milligrams)	2005-08	3,085.15	21.42
Dietary fiber (grams)	2005-08	13.91	0.14

SE = Standard error of the mean.
kcal = Kilocalories.
Note: The sample size for 1977-78 was 29,402 and for 2005-08 was 18,285.
Source: First-day intake from the USDA 1977-78 Nationwide Food Consumption Survey and the USDA/USDHHS 2005-08 National Health and Nutrition Examination Survey.

Table 2

Average shares of U.S. caloric and nutrient intakes, by food source, for individuals 2 years of age and older, 1977-78 and 2005-08

	Calories		Total fat		Calcium		Saturated fat		Cholesterol		Sodium		Fiber	
Source	Mean %	SE	Mean %	SE	Mean %	SE	Mean %	SE	Mean %	SE	Mean %	SE	Mean %	SE
Home														
1977-78	82.28	0.40	81.94	0.40	83.14	0.35	na		na		na		na	
2005-08	68.45	0.44	65.10	0.49	70.26	0.42	65.68	0.48	63.91	0.54	64.14	0.48	68.61	0.45
Away from home:														
1977-78	17.72	0.40	18.06	0.40	16.86	0.35	na		na		na		na	
2005-08	31.55	0.44	34.90	0.49	29.74	0.42	34.32	0.48	36.09	0.54	35.86	0.48	31.39	0.45
Restaurant														
1977-78	3.27	0.22	3.52	0.23	2.86	0.20	na		na		na		na	
2005-08	6.72	0.19	7.47	0.22	5.36	0.16	7.09	0.20	8.76	0.25	8.16	0.25	6.90	0.19
Fast-food														
1977-78	3.11	0.11	3.21	0.12	2.74	0.10	na		na		na		na	
2005-08	13.17	0.27	15.78	0.32	11.66	0.25	15.50	0.32	16.13	0.35	15.59	0.31	13.20	0.28
School														
1977-78	2.95	0.14	3.08	0.14	3.68	0.15	na		na		na		na	
2005-08	3.65	0.21	3.78	0.23	4.45	0.25	3.95	0.23	3.89	0.23	3.88	0.24	3.89	0.24
Others														
1977-78	8.40	0.26	8.24	0.25	7.59	0.24	na		na		na		na	
2005-08	8.00	0.22	7.86	0.23	8.28	0.18	7.78	0.23	7.32	0.25	8.24	0.23	7.39	0.21

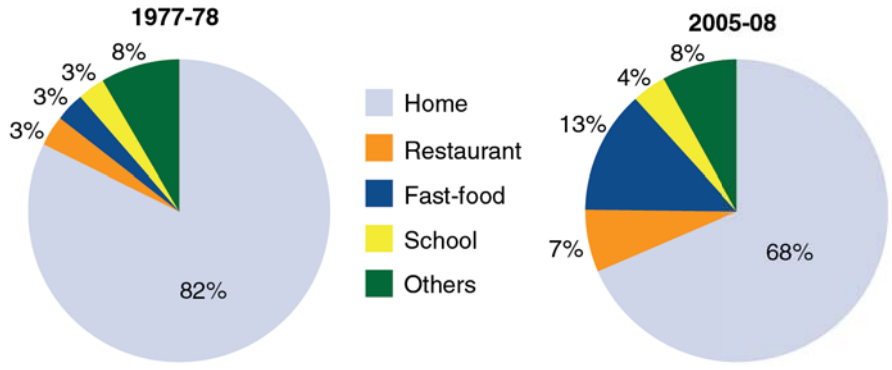
na = Not available. SE = Standard error of the mean.

Note: The sample size for 1977-78 was 29,402 and for 2005-08 was 18,285.

Source: First-day intake from the USDA 1977-78 Nationwide Food Consumption Survey and the USDA/USDHHS 2005-08 National Health and Nutrition Examination Survey.

Figure 1

Between 1977-78 and 2005-08, food away from home (particularly fast-food) increased its share of calories



Source: USDA, Economic Research Service analysis using 1977-78 Nationwide Food Consumption Survey data and 2005-08 National Health and Nutrition Examination Survey data.

Intake of Total Fat Fell Substantially

U.S. daily intake of total fat for individuals 2 years of age and older declined significantly from 85.6 grams in 1977-78 to 75.2 grams in 2005-08 (see table 1). FAFH's share of total fat intake rose proportionally more than the increase in its share of caloric intake during 1977-2008. The largest change was seen in fast-food, which accounted for 3.2 percent of the total fat intake in 1977-78, whereas the share rose to 15.8 percent in 2005-08 (see table 2).

The gap in total fat content between FAH and FAFH was almost nonexistent in 1977-78 but has since widened. In 1977-78, total fat accounted for 39.6 and 39.9 percent of caloric intake from FAH and FAFH foods, respectively (table 3). In 2005-08, total fat accounted for 30.5 and 37.2 percent of total

Table 3
Average nutrient density, by food source, for U.S. individuals 2 years of age and older, 1977-78 and 2005-08

Source	Total fat		Calcium		Saturated fat		Cholesterol		Sodium		Fiber	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
	Percent kcal		*mg/1,000 kcal*		*Percent kcal*		*mg/1,000 kcal*		*mg/1,000 kcal*		*g/1,000 kcal*	
Total												
1977-78	39.72	0.17	405.80	3.97	na		na		na		na	
2005-08	33.39	0.14	488.41	3.38	11.37	0.06	130.30	1.23	1,535.80	5.69	7.24	0.06
Home												
1977-78	39.61	0.17	425.38	3.85	na		na		na		na	
2005-08	30.45	0.17	558.91	10.38	10.68	0.07	126.21	1.68	1,368.87	6.86	7.71	0.07
Away from home:												
1977-78	39.93	0.19	451.71	9.20	na		na		na		na	
2005-08	37.23	0.17	459.86	23.29	12.36	0.06	143.97	1.56	1,820.17	12.59	6.78	0.06
Restaurant												
1977-78	44.78	0.37	325.06	4.55	na		na		na		na	
2005-08	38.34	0.40	332.14	6.69	11.85	0.16	205.89	3.98	2,151.42	24.72	7.47	0.11
Fast-food												
1977-78	40.25	0.25	343.60	9.65	na		na		na		na	
2005-08	41.05	0.17	372.43	5.76	13.47	0.07	143.11	1.61	1,864.29	16.65	5.94	0.06
School												
1977-78	39.90	0.22	741.74	20.76	na		na		na		na	
2005-08	33.62	0.35	645.66	16.55	12.28	0.13	111.96	3.42	1,609.49	22.12	7.67	0.20
Others												
1977-78	38.13	0.28	438.05	9.44	na		na		na		na	
2005-08	31.46	0.32	645.11	65.29	11.33	0.14	127.91	3.64	1,591.37	56.63	7.69	0.13

na = Not available. SE = Standard error of the mean. kcal = Kilocalories. mg = Milligrams. g = Grams.
Note: The sample size for 1977-78 was 29,402 and for 2005-08 was 18,285.

Source: First-day intake from the USDA 1977-78 Nationwide Food Consumption Survey and the USDA/USDHHS 2005-08 National Health and Nutrition Examination Survey.

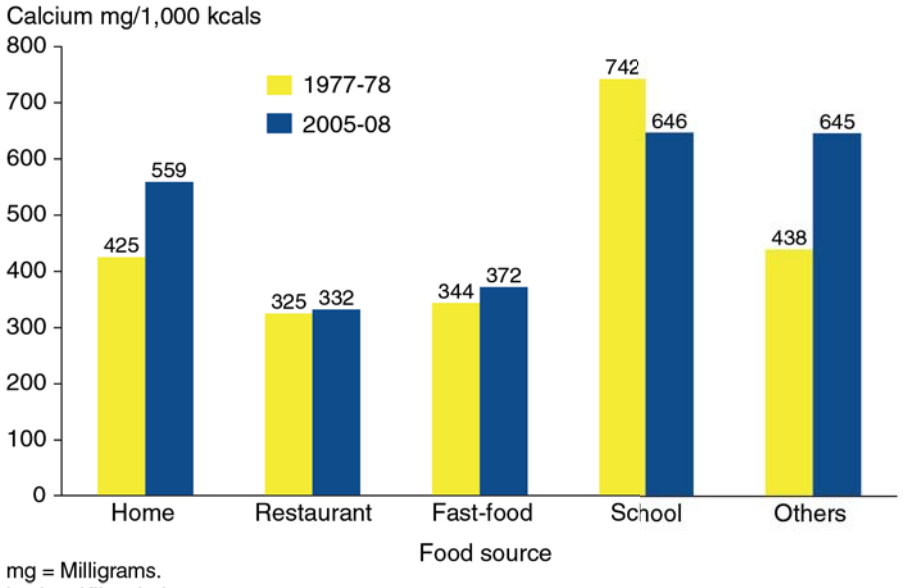
calories from FAH and FAFH, respectively. Food consumed at restaurants had the highest total fat content (44.8 percent of calories from total fat) in 1977-78, but their fat content declined over time and was surpassed by fast-foods in 2005-08. Fast-food places are the only food source from which foods have become more fat dense over time, rising from 40.3 percent of calories from fat in 1977-78 to 41.1 percent in 2005-08. In contrast, the fat content of foods consumed at schools declined over time, from 39.9 percent of calories from total fat in 1977-78 to 33.6 percent in 2005-08. During the period studied, school foods may have changed in response to the Healthy Meals for Healthy Americans Act of 1994 (Public Law 103-448), which required the National School Lunch and School Breakfast Programs to meet standards based on the 1990 edition of the *Dietary Guidelines for Americans*, including the requirement that no more than 30 percent of the calories in a meal come from total fat (Ralston et al., 2008).

Calcium Density Fell for School Foods

Mean calcium intake rose significantly from 743 mg a day in 1977-78 to 919 mg in 2005-08 (see table 1). Mirroring the increasing popularity of eating out, the FAFH share of calcium intake rose significantly from 16.9 percent in 1977-78 to 29.7 percent in 2005-08 (see table 2). The calcium density of FAH rose significantly from 425 mg per 1,000 calories in 1977-78 to 559 mg in 2005-08 (see table 3, fig. 2). The calcium density of FAFH, however, has remained essentially constant over time; the increase from 452 mg to 460 mg per 1,000 calories between 1977 and 2008 was not statistically significant.

Examining different sources of FAFH reveals disparate trends. The calcium density of restaurant foods has remained constant; whereas foods consumed at fast-food places have become more calcium dense, rising significantly

Figure 2
Between 1977-78 and 2005-08, calcium density declined in school foods



mg = Milligrams.
kcals = Kilocalories.
Source: USDA, Economic Research Service analysis using 1977-78 Nationwide Food Consumption Survey data and 2005-08 National Health and Nutrition Examination Survey data.

from 344 mg to 372 mg per 1,000 calories between 1977 and 2008 (see table 3). This increase was offset by a decline in calcium density of foods obtained at school.

Because milk is a required food component in the USDA National School Lunch Program, previous research has shown that foods consumed at school cafeterias have the highest calcium density among all food sources (Lin et al., 1999). The calcium density of school foods dropped significantly, however, from 742 mg to 646 mg per 1,000 calories between 1977 and 2008 (see table 3). This is consistent with declining average milk consumption among children and the proportion of children consuming milk over time (Lin and Ralston, 2003). These changes may be attributable to the increased availability of non-USDA foods and beverages for sale in schools (so called "competitive foods") over this period (Poppendieck, 2010). Substitution of these competitive foods and beverages (e.g., sugar-sweetened beverages in place of milk) may have led to the lower calcium density of foods obtained at school. Schools are the only food source for which calcium density has declined, and the drop is noteworthy at 13 percent.

Nutritional Quality of Foods, by Food Source: 2005-08

In addition to calorie, fat, and calcium data, the 2005-08 NHANES included information on intake of saturated fat, cholesterol, sodium, and dietary fiber that was not available in the 1977-78 NFCS. This allowed us to conduct more extensive comparisons of food quality by food preparation source in the more recent period.

Away-From-Home Food Sources Are High in Overconsumed Food Components

During 2005-08, FAFH foods accounted for 31.6 percent of caloric intake and 34.9 percent of total fat intake (see table 2), indicating that FAFH foods are higher in fat than FAH. In fact, the shares of total fat intake from restaurant, fast-food, and school sources were all higher than their shares of caloric intake. There are 11 pair-wise differences in total fat content by various food sources; each pair-wise difference was statistically significant at the 1-percent or better probability level (table 4). Fast-food had the highest total fat content at 41.1 percent, followed by restaurant and school foods at 38.3 and 33.6 percent, respectively, as compared with 30.5 percent for home foods. Similarly, FAFH foods were higher in saturated fat content than home foods (12.4 versus 10.7 percent of caloric intake), and fast-food had the highest saturated fat content (13.5 percent) among all food sources, followed by schools and restaurants (12.3 and 11.9 percent, respectively). As in the case of total fat, each pair-wise difference in saturated fat content by food source was statistically significant at the 1-percent probability level, except for the differences between restaurants and schools and between restaurants and other FAFH sources, which were significant at the 5-percent level (table 4).

Americans 2 years of age and older consumed an average of 259 mg of cholesterol per day during 2005-08 (see table 1), below the 300-mg-per-day limit recommended by Federal dietary guidance (USDA/USDHHS, 2010). Each of the 11 pair-wise differences in cholesterol density by food source was statistically significant at the 1-percent level, except for home foods and other FAFH foods (table 4). For every 1,000 calories of intake, restaurant foods contained 206 mg of cholesterol, fast-foods contained 143 mg, and other FAFH contained 128 mg. School foods had the lowest cholesterol density (112 mg per 1,000 calories) followed by home foods (126 mg per 1,000 calories).

Individuals 2 years of age and older consumed an average of 3,085 mg of sodium per day during 2005-08 (see table 1), compared with the current Federal dietary recommendation of less than 2,300 mg per day (USDA/USDHHS, 2011). As with total fat, saturated fat, and cholesterol, FAFH foods are more sodium dense than FAH. With the exception of the difference between foods consumed at school and other FAFH sources, each pair-wise difference by food source was statistically significant at the 1-percent level. For each 1,000 calories of intake, foods consumed in restaurants and fast-food places contained 2,151 mg and 1,864 mg of sodium, respectively, compared with 1,369 mg in home foods (see table 3, fig. 3).

Table 4

Statistical significance of differences in nutrient density, by food source, 2005-08

	Home					Restaurant			Fast-food		School
Nutrient	All away	Restaurant	Fast-food	School	Other FAFH	Fast-food	School	Other FAFH	School	Other FAFH	Other FAFH
Total fat											
T-statistic	-28.74	-18.11	-44.47	-8.11	-2.80	-6.19	8.82	13.40	18.96	26.50	4.54
Significant level	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Calcium											
T-statistic	3.88	18.37	15.71	-4.44	-1.30	-4.56	-17.57	-4.77	-15.60	-4.16	0.01
Significant level	0.00	0.00	0.00	0.00	0.19	0.00	0.00	0.00	0.00	0.00	0.99
Saturated fat											
T-statistic	-17.67	-6.67	-27.64	-10.53	-4.18	-9.32	-2.07	2.43	7.89	13.73	4.91
Significant level	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.02	0.00	0.00	0.00
Cholesterol											
T-statistic	-7.75	-18.46	-7.27	3.75	-0.42	14.63	17.91	14.46	8.25	3.82	-3.19
Significant level	0.00	0.00	0.00	0.00	0.67	0.00	0.00	0.00	0.00	0.00	0.00
Sodium											
T-statistic	-31.47	-30.50	-27.50	-10.39	-3.90	9.63	16.34	9.06	9.20	4.62	0.30
Significant level	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.77
Dietary fiber											
T-statistic	10.27	1.84	19.03	0.17	0.12	11.96	-0.92	-1.32	-8.48	-12.32	-0.07
Significant level	0.00	0.07	0.00	0.87	0.90	0.00	0.35	0.19	0.00	0.00	0.94

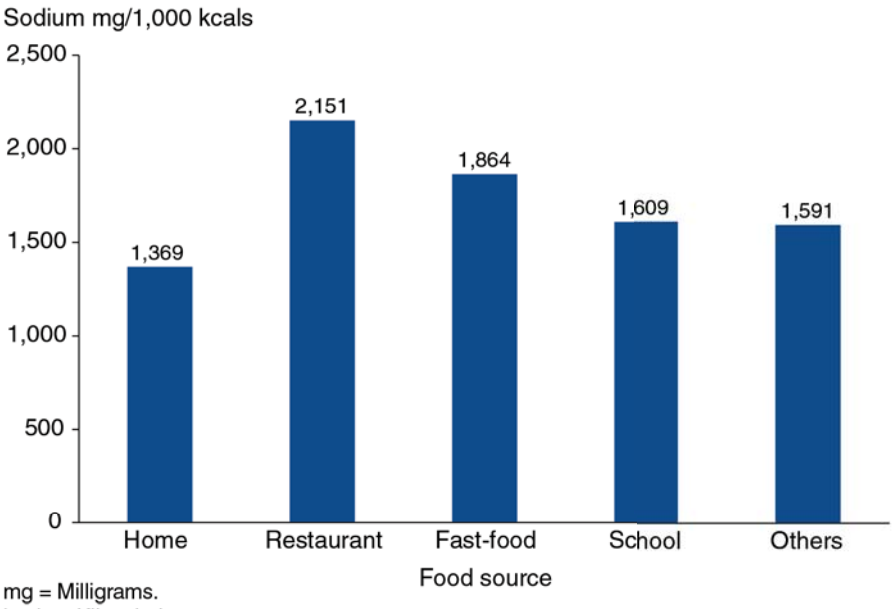
FAFH = Food prepared away from home.

Note: The tests are based on the means, standard errors of the mean, and the sample size (18,285).

Source: First-day intake from the USDA/USDHHS 2005-08 National Health and Nutrition Examination Survey.

Figure 3

Restaurants offered the most sodium-dense foods in 2005-08



mg = Milligrams.
kcals = Kilocalories.

Source: USDA, Economic Research Service analysis using 2005-08 National Health and Nutrition Examination Survey data.

Away-From-Home Foods Are Low in Calcium and Dietary Fiber

For every 1,000 calories consumed during 2005-08, FAH contained 559 mg of calcium, which was 22 percent higher than the 460 mg per 1,000 calories in FAFH foods as a whole (see table 3). School foods had the highest calcium density (646 mg per 1,000 calories), compared with fast-food establishments and restaurants (372 mg and 332 mg, respectively). FAH was also higher in dietary fiber density than FAFH (7.7 compared with 6.8 grams per 1,000 calories), mainly because of the low fiber density of fast-food (5.9 grams). There was no significant difference in the fiber density of FAH and that of food consumed at schools and other FAFH places. The fiber density of restaurant foods was slightly lower than the fiber density of foods made at home; the difference was significant at the 10-percent level.

Discussion

Over the past 30 years, food prepared away from home (FAFH) has become a regular part of most Americans' diets, and those who monitor food trends expect this to continue (Balzer, 2012). FAFH accounted for 41 percent of food spending in 2008 (USDA/ERS, 2012) and contributed 32 percent of caloric intake, based on our analysis. Unfortunately, consumption of FAFH has been found to increase caloric intake and reduce diet quality in both adults and children (Todd et al., 2010; Mancino et al., 2010).

Poor diets contribute to obesity, heart disease, stroke, cancer, diabetes, osteoarthritis, and other health conditions that impose substantial economic burdens on individuals and society (USDA/USDHHS, 2011; USDHHS, 2010). With estimates of the medical costs associated with overweight and obesity in 2008 ranging as high as $147 billion, or 10 percent of all medical costs (Finkelstein et al., 2009), it is not surprising that USDA, USDHHS, and other public and private entities place a high priority on improving Americans' diets.

National food consumption survey data collected in 1977-78 and 2005-08 were used to compare the nutritional profiles of FAFH and FAFH over the past 30 years. In 2005-08, Americans consumed more calories, less fat, and more calcium compared with 1977-78. In general, FAH was more dense in two underconsumed dietary components—calcium and dietary fiber—and less dense in total fat, saturated fat, cholesterol, and sodium compared with FAFH.

Given the current epidemic of obesity among Americans, the higher caloric intake associated with FAFH has drawn particular policy attention. Anderson and Matsa (2011) have argued that this level of concern is exaggerated, as individuals may compensate for higher caloric intake from FAFH meals by eating fewer calories at a later meal. Levitsky (2005), however, in a review of several experimental tests of energy compensation, concluded that compensation for overconsumption appears to be imprecise and suggested that this may explain changes in body mass index (BMI) associated with long-term exposure to environmental factors that encourage higher caloric intake. Because NHANES collects intake data for 2 nonconsecutive days, the data are not suitable for examining the extent of compensation. More research on the effects of regular, long-term consumption of FAFH on caloric intake, diet quality, and weight status is needed, but our results suggest that its association with higher caloric intake and lower diet quality deserves public health attention.

Both FAH and FAFH changed in many ways between the two periods. Over time, FAH has come to include more pre-prepared items, which might make FAH more nutritionally similar to FAFH (Smith, 2010). Despite this continuing trend, the nutritional quality of FAH changed much more than that of FAFH, perhaps in response to dietary recommendations, such as those to reduce fat and saturate fat intake; it also became more calcium dense. Given these differences, many experts encourage Americans to eat more home-prepared meals as a means of improving diets. Time constraints associated with changes in household structure and women's workforce involvement, however, may discourage cooking (Mancino and Newman, 2007). Innovations that simplify and speed food preparation, such as pre-washed,

peeled, and/or chopped vegetables (Lucier et al., 2006) and quick, healthy, simple recipes (USDA/NAL, 2012), have become popular and may help address such barriers.

To improve FAFH nutritional quality, not only must healthy food options be available but consumers must respond by making those choices. There are several reasons why consumers might behave differently when choosing and consuming food prepared away from home compared with home-prepared food (Lin et al., 1999). They might have different attitudes about FAFH, considering it a special treat, compared with FAH. Even if they are concerned about FAFH's nutrient content, they might lack the information to make good choices or have fewer healthy options available.

School food is a special case in that schools are more regulated environments. Changes in USDA school meal regulations that occurred in the 1990s appear to have had an effect on the quality of school food, reducing its total fat content. Fat content declined most in elementary schools, where school food services faced less competition from non-USDA "competitive" foods (Newman et al., 2009). More recent legislation, the Healthy Hunger-Free Kids Act of 2010, requires further improvement in USDA school meals and limits the availability of less-healthful competitive foods and beverages (USDA/FNS, 2010). This has the potential to further improve the nutritional profile of foods obtained at school.

Outside of the school environment, other solutions may be considered. One policy change now underway hinges on improving nutrition information. Since the 1990s, most packaged food sold in retail outlets has been required to carry nutrition labeling. This may have encouraged consumers to make healthier purchases. In contrast, consumers may have less knowledge of the nutritional content of food prepared in restaurants and other outlets. In 2010, the Patient Protection and Affordable Care Act mandated that calorie information be made available on menu boards in chain restaurants with more than 20 outlets nationally to provide consumers with nutritional information that may help them make better choices.

Will menu labeling improve food choices? A limited amount of research has been conducted based on implementation of local menu labeling laws. The findings from these studies were not completely consistent, but generally suggested that menu labeling had a relatively limited impact on consumer behavior (Larson and Story, 2009; Lowenstein, 2011). Information may not be the only factor driving differences in consumer choices when purchasing FAFH. As mentioned previously, consumers may have different attitudes about FAFH; they may still consider it an occasional treat for which less nutritional concern is warranted. This attitude may have fit with the eating patterns of 1977-78 but does not match eating patterns today. Nutrition education efforts and point-of-purchase messages raising awareness of the importance of FAFH as a part of the everyday diet may be helpful and increase consumer response to menu labeling information. Menu labeling may also prompt restaurants to offer more healthy options and to reformulate current offerings. A California study found that restaurants were particularly likely to reformulate items high in calories, fat, or sodium in response to the establishment of a State menu labeling law (Robert Wood Johnson

Foundation, 2011). Such supply-oriented effects may increase the effectiveness of menu labeling.

Another potential explanation for differences in FAH and FAFH can be proposed based on behavioral economic theory. Behavioral economics posits that visceral factors, such as hunger and sensory stimuli, may overwhelm self-control, resulting in more impulsive decisions that deliver short-term rewards (Mancino and Kinsey, 2008). For example, when hungry, the sight and smell of a high-calorie treat may be particularly irresistible. FAFH decisions are more likely to be made just prior to eating, and thus fall prey to this problem. Current behavioral economic research explores strategies for avoiding these problems, such as pre-commitment. For example, ordering a healthy meal online and picking it up on the way home may help consumers avoid the temptation to choose a less healthy option when standing in line at a take-out restaurant. Behavioral economics also has demonstrated the power of defaults in guiding choice. In response, public health advocates have urged restaurants and fast-food places to make the healthier options for beverages and side dishes the default choice in children's meals, with positive results among operators who have made the switch (CSPI, 2011). Several other strategies based on behavioral economics may encourage healthful choices (Wansink, 2006) and merit further study.

Implementing menu labeling regulations will provide an opportunity to test the value of nutrition information in helping consumers make better choices when eating out. Consumer education, increased numbers of healthy FAFH offerings, and behavioral economic strategies may also help, reinforcing information approaches. Given the importance of FAFH in overall diet quality, the success of such efforts will have important implications for improving Americans' diets and health.

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