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Trends in serving size, energy, and selected micronutrients for fast food restaurants in the United States, 1986-2016

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TRENDS IN SERVING SIZE, ENERGY, AND SELECTED MICRONUTRIENTS FOR FAST FOOD RESTAURANTS IN THE UNITED STATES, 1986-2016

by

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ABSTRACT

An integral part of the average American diet, fast food accounted for 4% of total caloric intake in 1977-78; in 2007-10, fast food made up 11% of daily total caloric intake. The same can be said for obesity: approximately 36% of U.S. adults 20 years and older are obese, up from around 14% in the late 1970s. These parallel trends in fast food consumption and obesity have warranted examination of trends in fast food composition, but a more recent and more expansive analysis of how fast food composition has changed is necessary. This study describes trends in serving size (g), energy (kcal), energy density (kcal/g), sodium (mg), sodium density (mg/g), calcium (% RDA), calcium density (%RDA/g), iron (%RDA), and iron density (%RDA/g) in fast food restaurants from 1986-2016 for fast foods by restaurant and by menu category. Fast food data for 1986, 1991, and 2016 were compiled from primary and secondary sources for eight restaurants: Arby's, Burger King, Dairy Queen, Hardee's, Jack in the Box, Long John Silver's, McDonald's and Wendy's. Each food item (N=1,558) was then classified under a menu category: entrees, sides, desserts or condiments. Descriptive statistics by restaurant and by menu category were calculated to give the results as follows: median serving size, energy, sodium, sodium density, calcium, and calcium density increased by (25%, 22%, 33%, 20%, 200%, and 67%), respectively. Energy density decreased by 4%, and though iron remained consistent over time, iron density decreased by 17% from 1986 to 2016.

Entrees showed the highest median sodium value each year and were consistently in the top two highest values compared to foods in the other menu categories each year. Desserts- in 1986, 1991, and 2016- showed the highest median serving size and calcium density. Each of the 8 restaurants analyzed showed an increase in the median energy and sodium of their food items, while four of eight showed an increase in energy density as well. Serving size increased for six of the eight restaurants from 1986 to 2016. The results show that widespread serving size increases influenced increases in the other variables, but examination of energy and nutrient densities helped illuminate trends of increases in energy, sodium and calcium densities and a slight decrease in iron density. Due to the associations of fast foods with concerning factors of overall health, fast food should be consumed occasionally in one's diet. Although these results are not surprising, they highlight the need to educate and provide the resources for enabling Americans to make healthier food choices when consuming fast food. These results also support the call for fast food restaurants to offer more reasonable serving sizes and healthier options.

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LIST OF ABBREVIATIONS

ACA ..... Affordable Care Act

BMI ..... Body Mass Index

CI ..... Confidence Interval

NHANES ..... National Health and Nutrition Examination Survey

RDA ..... Recommended Dietary Allowance

US ..... United States

INTRODUCTION

Approximately 36% of U.S. adults 20 years and older are obese, up from around 14% in the late 1970s (1,2). In turn, obesity is associated with increased mortality from many chronic diseases, which together account for 7 in 10 deaths in the United States (3). One factor often blamed for these statistics is fast food, defined as "easily prepared processed food served in snack bars and restaurants as a quick meal or to be taken away" (4, 5). Fast food consumption has been positively associated with body fatness and with increased daily caloric intake (6-8). It has been observed that for any given meal eaten outside of the home, adult Americans are likely to overeat by about 100-200 kcal/day (9,10). An integral part of the average American diet, fast food accounted for 4% of total caloric intake in 1977-78; in 2007-10, fast food made up 11% of daily total caloric intake (11,12). Restaurant foods tend to have large serving sizes, (13) as well as high energy density (6), two factors that have been causally associated with higher energy intake (14-18). Furthermore, several studies have shown that frequency of eating away from home is positively associated with a larger body mass index (BMI) and increased risk for chronic diseases like hypertension, obesity, and insulin-resistance (4, 19).

Fast food is associated with a diet high in sodium, and excess sodium is linked with hypertension; the more frequently fast food is consumed the higher one's daily sodium intake becomes (10, 20-21). With the exception of sodium, there has been relatively little attention paid to the micronutrient content of fast foods. However, away from home eating has been associated with lower serum concentrations of essential micronutrients in American adults (22), with fast food consumption specifically related to

a diet low in micronutrient density (17, 20-21). While between 1971-74 and 1999-2000, data from the National Health and Nutrition Examination Surveys (NHANES) indicated an increase in mean intake of iron (23), women aged 19-50 do not receive enough iron; in addition, Americans do not consume adequate amounts of calcium compared to the recommendation (24).

Previous studies have shown an increase in serving size over time from 1977-2006, and more specifically, a 2-5-time increase from 1983-2003 (25,26). Reports on fast food composition trends have been studied as far back as 1977 and up to 2013 but in separate reports (17,18,25,26). Therefore, there is a need for more recent analysis of trends in a wide variety of dietary variables, especially since there are few reports on changes in micronutrient content of fast foods over time. The purpose of this study was to describe trends over time in serving size, energy, energy density, sodium, calcium, and iron in food items of U.S. fast food restaurants from 1986 to 2016. Furthermore, we examined these trends grouped by menu category (i.e., entrees, sides, desserts or condiments) and restaurant. We hypothesized that over time, serving size, energy, energy density, and sodium have increased, while micronutrients decreased in each menu category and restaurant from 1986 to 2016.

METHODS

Data Collection

We used data from eight fast food restaurants presented in the 1986 and 1991 versions of The Fast Food Guide (27,28) and online through primary or secondary websites for 2016 data (29,30). Secondary websites were used to supply singular pieces of missing variable data from primary sources. These restaurants were chosen by identifying those, which had nutritional information available for the three years being analyzed. Restaurants were also required to have at least two food items for each dietary variable examined (e.g. serving size) per time point and per menu category (Table 1). Restaurants not meeting these requirements were excluded. For example, only three restaurants were used for analysis of condiments. Also, only 1991 and 2016 were included for condiments as adequate data were not available for 1986. Likewise, all calcium and iron data included was from four restaurants. Individual foods with no data for the nutritional variables available were excluded. All beverages were excluded because not all restaurants specified beverages sizes and data were not available for each year. All multi-component dinners or platters were also excluded because data were only given for select years in select restaurants.

Food Categorizing System

Foods from each restaurant were categorized broadly by food type (e.g. sandwich) based on details derived from its restaurant-specific name, like Arby's "Bac'n Cheddar Deluxe Roast Beef Sandwich" for example. Each assigned food type, like "sandwich", was a maximum of two words describing the food name as simply as possible, such as

"fries" for the "Fries, seasoned curly" from Jack in the Box, respectively, as shown in Table 2. This categorization allowed us group similar foods by menu category- entrees, sides, desserts, or condiments - based on guidance by headers for each online restaurant menu. There were not enough breakfast items in all restaurants for all years to examine separately, so these were assigned to entrees or sides as appropriate. Because The Fast Food Guide sources did not have foods categorized by menu item, whichever menu category applied to certain types of foods for a certain restaurant online was typically applied to the same type of foods in 1986 and 1991. For example, as seen in Table 2, the Arby's Super Roast Beef Sandwich was listed as a part of "entrees" in 2016 and its food type is sandwich. The Arby's "Bac'n Cheddar Deluxe Roast Beef" in 1986 was then classified an entrée because it was also a sandwich from Arby's.

Statistical Analysis

To analyze the trends over time in fast foods across the eight restaurants being considered, measures of center and spread were computed for serving size (g), energy (kcal), sodium (mg), calcium (% RDA), and iron (% RDA). These descriptive statistics were also analyzed for the following computed variables: energy density (kcal/g), sodium density (mg/g), calcium density (%RDA/g), and iron density (%RDA/g). Trends from 1986 to 2016 for energy, serving size, and micronutrients were examined for all foods together, for foods grouped by restaurant, and by specific menu categories. The descriptive statistics computed were the median, 95% confidence interval (CI), and the mean.

RESULTS

Trends by year

Median serving size, energy, sodium, and calcium increased in all food items, from 1986 to 2016. Table 3 shows the values for each year, while Figure 1 shows the 1991 and 2016 values as a % of the 1986 values. For 1986 to 2016, energy density decreased, by 4%, even though energy increased. Calcium showed a 200% increase 1986 to 2016 with a corresponding calcium density increase by 67%. While iron (% RDA) remained consistent over time, iron density (%RDA/g) decreased slightly.

Trends by menu category

Figure 2 shows trends in fast foods for each of the dietary variables by menu category. The serving size, energy, and sodium from 1986 to 2016 increased in each menu category besides condiments. Condiments, only available for 1991 and 2016, showed a decrease in each dietary variable, except for iron, iron density, calcium, and calcium density for which the median values remained 0 (Tables 5 and 6); however, condiments in both years were in the top two highest energy densities among the four menu categories.

Desserts had the highest median serving size for each year and the lowest energy densities (kcal/g) compared to foods in the other menu categories. Sides had the highest energy density in 2016 but consistently had the lowest serving size and energy median values. Each year, entrees showed the highest median sodium value and consistently had the top two highest values compared to foods in the other menu categories.

Tables 4-6 show iron and calcium (% RDA) with iron and calcium densities (%RDA/g) as well as sodium (mg) with sodium density (mg/g). Sodium and sodium density both increased from 1986 to 2016 for, entrees, sides and desserts and both decreased for condiments (Table 4). Desserts had the highest calcium density and lowest sodium density each year. Iron density was inconsistent with iron (% RDA) results for entrees and side. In addition, while calcium increased in entrees, calcium density stayed the same over time.

Trends by restaurants

Tables 7-10 show trends in dietary variables for food items in each restaurant from 1986 to 2016. Every restaurant showed an increase in energy, but only foods from half of these- Burger King, Jack in the Box, Long John Silver's and Wendy's- showed a corresponding median energy density increase from 1986 to 2016. Dairy Queen foods showed the highest median serving size and energy in 2016. Median serving size increased for foods in six restaurants from 1986 to 2016.

Each restaurant's foods showed an increase in median sodium, from 1986 to 2016 with five of eight having an analogous median sodium density increase. As for sodium, Arby's foods showed the largest increase, by 580 mg and a 91% increase from 1986 to 2016; Arby's also showed the highest median sodium, 1215mg, and sodium density, 6.2, values in 2016 (Table 8). Conversely, Dairy Queen showed the lowest sodium and sodium density values in 1986, 1991, and 2016.

All four restaurants- Arby's, Dairy Queen, McDonald's, and Wendy's- analyzed for calcium and iron showed an increase in median calcium (Table 9). Only McDonald's

foods showed a calcium density that remained the same from 1986 to 2016; foods in each of the other three restaurants increased in calcium density analogously with calcium. Dairy Queen had the highest median values of calcium, 25% RDA, and calcium density in 1986, 1991, and 2016. Although Wendy's foods showed the greatest percent increase in median calcium and calcium densities over time, values in 1986 and 2016 were still the lowest.

DISCUSSION

This study provided an updated analysis of multiple variables of nutritional composition, including serving size, energy, energy density, and sodium for 8 fast food restaurants from 1986-2016. We also included iron and calcium, two important micronutrients for which reports on trends in fast food are scarce compared with sodium. From 1986 to 2016, fast foods overall increased in median serving size, energy, and sodium. The results concerning serving size, energy and sodium confirm our hypothesis and previous trends related to fast food composition over time. In addition, both calcium and median calcium density for fast foods increased over time, while median iron value remained the same and median iron density decreased. An increase in calcium density challenges our hypothesis of a decrease in calcium, while iron density decreasing confirms our hypothesis of a decrease in iron. However, results for both iron and calcium do confirm associations of fast food with low micronutrient density (14). Although these results are not surprising, they underscore the need to motivate, educate, and provide the resources for enabling Americans to make healthier food choices when consuming fast food and at the same time, incentivizing fast food restaurants to offer more reasonable serving sizes and healthier options.

Among all food items, median serving size and energy were shown to have increased from 1986 to 2016. The increases in serving size and energy are consistent with multiple previous reports of similar trends in fast foods (25,26) and challenge those that found energy and serving size to have recently stabilized (31,3). In the present study, median serving size and median energy increased similarly, which could imply

association between the two. Various controlled studies with adult American subjects have shown that the presentation of a larger serving size promotes higher calorie consumption compared with a smaller serving size of the same food (14-16). As larger serving size is postulated to be a key contributor to the obesity epidemic (10,32), it is important to have options for smaller sizes in restaurants. Our findings have relevance as they took place after the official Dec 1, 2014 Affordable Care Act (ACA) proposal for restaurant labeling and can give insight to how the fast food industry can help Americans make more informed choices when eating out (33).

The median sodium value increased among all food items to 720mg per item in 2016, 31% of the 2,300mg recommended daily allowance (RDA) of sodium (34). Mean sodium has been increasing, not just in fast foods (35). Over 80% of Americans consume sodium at or above the recommendation level (24). As excess sodium has been linked to hypertension, a major risk factor of stroke and cardiovascular disease, reducing instead of increasing sodium in fast food restaurants could impact the incidence of these fatal diseases. The U.S. food industry made progress in voluntarily reducing sodium as recommended by the FDA and we suggest that fast food restaurants follow suit (36).

Calcium density increased analogously with calcium density overall, while iron remained the same with a slight decrease in iron density. With density representing a per gram value, the disparity between iron and iron density could be explained by the increasing portion size in addition to the stagnant median iron value. Calcium's increase in foods overall could have been heavily influenced by Dairy Queen which contributed a large amount of dairy-based desserts to our data. However, though certain populations of

Americans struggle to get iron and calcium, desserts should not be the primary source of calcium as they also tend to be high calories and added sugars. Increases in type 2 diabetes, for which excess sugar consumption is a major risk factor, have been associated with higher obesity rates in the U.S. (37) and obese adults tend to consume less micronutrients (38). In addition, both overall median calcium and iron (%RDA), 20 %RDA, and 10%RDA respectively, were lower than they should be in proportion to the median energy per item, 440 kcal, which represents 22% of a 2,000-calorie diet.

Our study has both strengths and weaknesses. It is a model for studies that want to continue analyzing trends in fast foods but for specific variables such as cholesterol, fat, and saturated fat. The study was an aggregate of multiple restaurants, multiple variables of nutritional composition, and multiple menu categories. The data also included breakfast items, which are sometimes overlooked. However, the report was not perfect. The aforementioned menu categories were assigned slightly subjectively. In addition, the conclusions could be bolstered with more time points, ones that are more evenly spaced. Because of the interval in time between 1991 and 2016, the study does not directly apply to short-term, recent changes in fast food that occurred closer to 2016. In addition, the conclusions for micronutrients and condiments were made based on three and four of the eight restaurants, respectively, and only two time points were used for all condiment data.

The results of this study confirm as well as challenge previous findings and have many implications for future studies. The fast food industry should have better responses to reducing serving size, energy, and sodium and paying closer attention to iron and calcium values, as well as other essential micronutrients, in their menu items. These

trends were studied to inform better decisions for consumers, but the results should be comprehensibly disseminated to American consumers, especially to the communities that grossly and consistently fail to meet dietary guidelines. These healthful decisions should be guided by selecting more fruits, vegetables, whole grains, and dairy when possible as a part of a nutrient dense diet that avoids extra calories from fats, sugars, refined starches or sodium found in energy dense foods like fast foods (24). Fast food should be consumed occasionally to promote a nutrient dense diet. The restaurants in this study should show sensitivity to what they are serving American consumers to be in accordance with improving dietary-related health issues in the United States.

Table 1. Number of items by menu category and restaurant, 1986-2016.[1]

	Condiments		Desserts			Entrees			Sides		
Restaurant	1991	2016	1986	1991	2016	1986	1991	2016	1986	1991	2016
Arby's	10	16	5	15	15	19	35	71	9	25	24
Burger King	20	21	3	9	21	17	25	64	3	4	14
Dairy Queen	4	15	23	35	157	17	17	50	3	5	20
Hardee's	15	6	3	18	8	23	46	72	9	8	23
Jack in the Box	9	29	4	6	12	20	28	66	4	10	22
Long John Silver's	9	14	3	3	3	9	12	14	5	9	18
McDonald's	11	20	10	20	30	15	26	75	6	12	14
Wendy's	70	37	2	6	16	15	21	56	29	21	15

[1]Per restaurant menu category and year, example shown is number of items with serving size information available. Numbers vary according to variable. Restaurants were excluded if did not meet the criteria of at least two items per restaurant per menu category (each cell). This was the case for condiments, for which five restaurants were excluded from data in this table. Condiments calculations used 3 restaurants: Arby's, Wendy's, and McDonald's. This was also the case for calcium and iron, for which 4 restaurants were excluded from data in this table. Calcium and iron calculations used 4 restaurants: Arby's, Dairy Queen, McDonald's, and Wendy's.

Table 2. Sample of food data categorization.[2]

Restaurant	Year	Food Name	Food Type	Menu Category
Arby's	1986	Bac'n Cheddar Deluxe Roast Beef	Sandwich	Entrees
Jack in the Box	1986	Fries, seasoned curly	Fries	Sides
Arby's	2016	Super Roast Beef Sandwich	Sandwich	Entrees
McDonald's	1991	Milkshake, Vanilla	Ice Cream	Desserts
Long John Silver's	2016	Ketchup	Sauce	Condiments

[2]Original food name was used to assign simple food type identifier. Food type could then be used to assign menu category: entrees, sides, desserts and condiments.

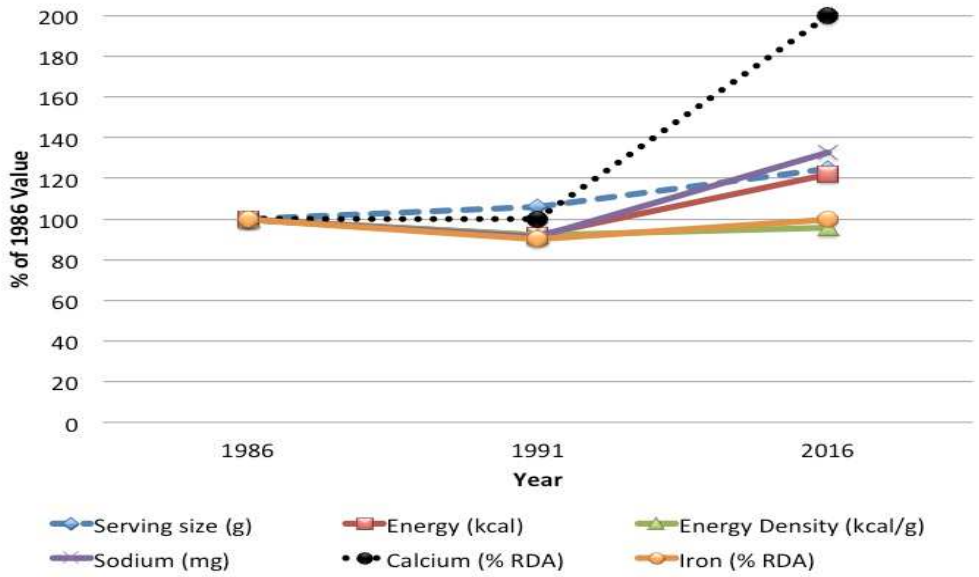

Figure1. Trends in U.S. fast food restaurants for serving size, energy, energy density, sodium, calcium, and iron in 1991 and 2016 as a percentage of their 1986 values. Values shown are median, (95% Confidence Interval (CI)), mean. Condiments data are excluded from this table as five restaurants were excluded for condiments calculations, leaving Arby's, Wendy's, and McDonald's. Calcium and iron data are included but for only after 4 restaurants were excluded. Calcium and iron calculations used 4 restaurants: Arby's, Dairy Queen, McDonald's, and Wendy's.

Table 3. Trends in serving size, energy, and micronutrients in fast food items, 1986-2016.[3]

	1986	1991	2016
Serving size (g)	147 (160-186) 173	156 (167-186) 176	184 (205-223) 214
Energy (kcal)	360 (357-417) 387	330 (324-358) 341	440 (456-489) 472
Energy Density (kcal/g)	2.5 (2.3-2.9) 2.6	2.3 (2.1-2.3) 2.2	2.4 (2.4-2.6) 2.5
Sodium (mg)	543 (566-674) 620	493 (524-606) 565	720 (736-839) 801
Sodium density (mg/g)	4.0 (3.7-5.5) 4.6	3.7 (3.4-3.9) 3.6	4.8 (4.3-4.7) 4.5
Calcium (% RDA)	10 (11-15) 13	10 (12-15) 13	20 (21-25) 23
Calcium density (%RDA/g)	0.06 (0.06-0.07) 0.07	0.06 (0.06-0.08) 0.07	0.10 (0.08-0.10) 0.09
Iron (% RDA)	10 (11-14) 12	9 (11-14) 12	10 (12-13) 13
Iron density (%RDA/g)	0.06 (0.06-0.08) 0.07	0.05 (0.07-0.10) 0.08	0.05 (0.06-0.07) 0.06

[3]Values shown are median, (95% CI), mean. Restaurants were excluded if did not meet the criteria of at least two items per restaurant per menu category. This was the case for condiments, for which five restaurants were excluded from data in this table. Condiments calculations used 3 restaurants: Arby's, Wendy's, McDonald's. This was also the case for calcium and iron, for which 4 restaurants were excluded from data in this table. Calcium and iron calculations used 4 restaurants: Arby's, Dairy Queen, McDonald's, and Wendy's.

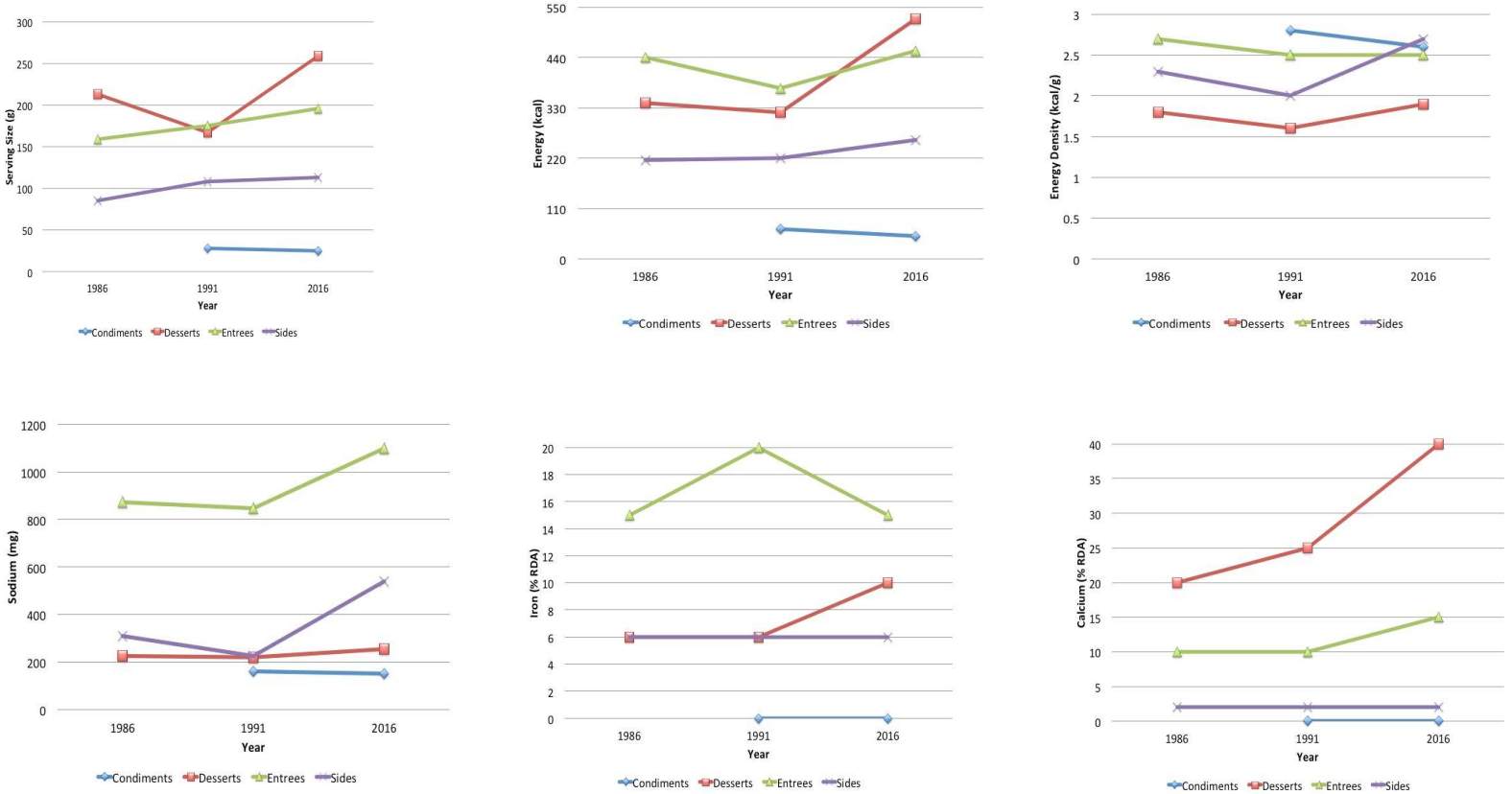

Figure 2. Trends in fast foods by menu category for serving size, energy, energy density, sodium, calcium, and iron, 1986-2016. Median values were used. Restaurants were excluded if did not meet the criteria of at least two items per restaurant per menu category. This was the case for condiments, for which five restaurants were excluded from condiments data in this figure. Condiments calculations used 3 restaurants: Arby's, Wendy's, and McDonald's. This was also the case for calcium and iron, for which 4 restaurants were excluded from their data in this figure. Calcium and iron calculations used 4 restaurants: Arby's, Dairy Queen, McDonald's, and Wendy's.

Table 4. Trends in sodium and sodium density by menu category, 1986-2016.[4]

	Sodium (mg)			Sodium Density (mg/g)		
	1986	1991	2016	1986	1991	2016
Condiments	--	160 (198-273) 23	150 (166-218) 192	--	8.2 (6.4-10.9) 8.7	7.7 (2.9-37.8) 20.4
Desserts	225 (192-246) 219	220 (191-243) 217	255 (264-305) 285	0.8 (1.1-1.8) 1.5	0.9 (1.1-2.0) 1.6	0.9 (1.2-1.6) 1.4
Entrees	871 (839-962) 901	846 (784-881) 832	1100 (1100-1190) 1145	5.5 (5.2-5.9) 5.5	5.0 (4.9-5.5) 5.2	5.8 (5.6-6.1) 5.9
Sides	310 (283-443) 363	224 (302-465) 384	540 (547-713) 630	2.5 (1.7-8.8) 5.2	1.8 (2.4-3.4) 2.9	5.5 (4.6-5.7) 5.2

[4]Values shown are median, (95% CI), mean. Restaurants were excluded if did not meet the criteria of at least two items per restaurant per menu category. This was the case for condiments, for which five restaurants were excluded from data in this table. Condiments calculations used 3 restaurants: Arby's, Wendy's, and McDonald's.

Table 5. Trends in calcium and calcium density by menu category, 1986-2016.[5]

	Calcium (%RDA)			Calcium Density (%RDA/g)		
	1986	1991	2016	1986	1991	2016
Condiments	--	0 (0.1-1.1) 0.6	0 (0.1-0.8) 0.4	--	0 (0.00-0.04) 0.02	0 (-0.03-0.15) 0.06
Desserts	20 (17-27) 22	25 (18-24) 21	40 (33-39) 36	0.10 (0.08-0.10) 0.09	0.10 (0.08-0.11) 0.10	0.12 (0.10-0.11) 0.11
Entrees	10 (10-14) 12	10 (10-14) 12	15 (14-16) 15	0.07 (0.06-0.08) 0.07	0.06 (0.06-0.08) 0.07	0.07 (0.07-0.09) 0.08
Sides	2 (4-10) 7	2 (3-7) 5	2 (4-14) 9	0.02 (0.02-0.05) 0.03	0.01 (0.02-0.06) 0.04	0.02 (0.03-0.15) 0.09

[5]Values shown are median, (95% CI), mean. Restaurants were excluded if did not meet the criteria of at least two items per restaurant per menu category. This was the case for condiments, for which five restaurants were excluded from data in this table. Condiments calculations used 3 restaurants: Arby's, Wendy's, and McDonald's. This was also the case for calcium, for which 4 restaurants were excluded from data in this table. Calcium calculations used 4 restaurants: Arby's, Dairy Queen, McDonald's, and Wendy's.

Table 6. Trends in iron and iron density for fast foods by menu category, 1986-2016.[6]

	Iron (% RDA)			Iron Density (% RDA/g)		
	1986	1991	2016	1986	1991	2016
Condiments	--	0 (0.1-2.2) 1.1	0 (0.1-0.4) 0.3	--	0 (0-0.06) 0.03	0 (-0.04-0.14) 0.05
Desserts	6 (5-9) 7	6 (5-7) 6	10 (10-12) 11	0.03 (0.03-0.05) 0.04	0.03 (0.03-0.05) 0.04	0.04 (0.03-0.05) 0.04
Entrees	15 (15-21) 18	20 (18-23) 20	15 (15-17) 16	0.11 (0.09-0.12) 0.11	0.11 (0.10-0.17) 0.14	0.09 (0.08-0.09) 0.09
Sides	6 (6-11) 8	6 (6-10) 8	6 (5-8) 7	0.04 (0.04-0.07) 0.06	0.04 (0.04-0.07) 0.06	0.05 (0.02-0.11) 0.06

[6]Values shown are median, (95% CI), mean. Restaurants were excluded if did not meet the criteria of at least two items per restaurant per menu category. This was the case for condiments, for which five restaurants were excluded from data in this table. Condiments calculations used 3 restaurants: Arby's, Wendy's, McDonald's. This was also the case for iron, for which 4 restaurants were excluded from data in this table. Iron calculations used 4 restaurants: Arby's, Dairy Queen, McDonald's, Wendy's.

Table 7. Trends in serving size, energy, and energy density for fast foods by restaurant, 1986-2016.[7]

	Serving Size (g)			Energy (kcal)			Energy Density (kcal/g)		
Restaurant	1986	1991	1986	1986	1991	2016	1986	1991	2016
Arby's	192 (165-231) 198	208 (182-224) 203	210 (205-245) 225	386 (363-454) 409	345 (313-380) 346	465 (449-511) 480	2.4 (2.1-2.6) 2.4	2.1 (1.8-2.4) 2.1	2.3 (2.2-2.5) 2.3
Burger King	159 (146-222) 184	153 (157-231) 194	142 (148-183) 165	374 (354-537) 446	348 (328-463) 396	380 (384-463) 424	2.6 (2.3-2.8) 2.5	2.5 (2.0-2.6) 2.3	2.7 (2.4-3.5) 3.0
Dairy Queen	196 (180-256) 218	184 (183-237) 210	247 (251-300) 273	440 (397-531) 464	350 (346-442) 394	520 (501-585) 543	2.3 (2.1-2.4) 2.3	2.0 (1.8-2.2) 2.0	2.0 (2.1-2.7) 2.4
Hardee's	129 (123-174) 148	139 (135-170) 151	171 (185-229) 207	376 (317-407) 362	350 (312-372) 342	430 (431-530) 480	2.8 (2.4-3.0) 2.7	2.6 (2.2-2.7) 2.5	2.5 (2.3-2.6) 2.4
Jack in the Box	165 (147-218) 182	161 (148-201) 174	171 (185-238) 212	427 (332-709) 521	371 (360-478) 419	515 (492-590) 541	2.8 (1.9-6.4) 4.1	2.7 (2.4-3.0) 2.7	2.9 (2.5-2.9) 2.7
Long John Silver's	106 (66-163) 114	113 (88-147) 118	91 (87-138) 113	202 (161-293) 227	145 (132-235) 184	230 (201-309) 255	2.4 (1.9-2.8) 2.3	2.2 (1.4-2.3) 1.9	3.0 (2.1-3.1) 2.6
McDonald's	121 (116-167) 141	117 (116-153) 134	167 (167-202) 185	342 (314-412) 363	270 (231-300) 265	420 (381-453) 417	2.9 (2.5-3.2) 2.8	2.4 (2.0-2.7) 2.4	2.4 (2.1-2.4) 2.3
Wendy's	118 (123-202) 162	170 (151-235) 193	187 (185-234) 210	270 (222-348) 285	330 (260-390) 325	380 (365-452) 409	2.0 (1.7-2.5) 2.1	1.7 (1.5-2.1) 1.8	2.4 (1.9-2.3) 2.1

[7]Values shown are median, (95% CI), mean. Condiments data are excluded from this table as calculations used 3 restaurants: Arby's, Wendy's, and McDonald's.

Table 8. Trends in sodium and sodium density for fast foods by restaurant, 1986-2016.

	Sodium (mg)			Sodium Density (mg/g)		
Restaurant	1986	1991	2016	1986	1991	2016
Arby's	635 (547-879) 713	730 (608-809) 708	1215 (1074-1299) 1186	4.0 (3.2-5.0) 4.1	4.1 (3.4-4.5) 3.9	6.2 (5.3-6.3) 5.8
Burger King	651 (524-813) 669	555 (456-684) 570	710 (681-872) 777	3.7 (3.2-4.8) 4.0	3.7 (2.7-4.1) 3.4	4.7 (4.4-6.1) 5.2
Dairy Queen	215 (312-586) 449	220 (262-436) 349	350 (439-552) 495	0.7 (1.6-3.3) 2.5	0.8 (1.4-2.5) 2.0	1.0 (2.1-2.9) 2.5
Hardee's	825 (607-872) 739	710 (582-796) 689	1130 (1055-1318) 1186	6.0 (4.4-6.0) 5.2	5.0 (4.1-6.2) 5.1	6.0 (5.5-6.4) 5.9
Jack in the Box	888 (699-1078) 889	740 (616-890) 753	955 (893-1107) 1000	5.7 (0.8-17.2) 9.0	5.1 (4.0-5.2) 4.6	5.4 (4.6-5.6) 5.1
Long John Silver's	390 (311-736) 524	415 (268-561) 414	460 (416-688) 552	3.7 (3.4-6.9) 5.2	3.7 (2.6-4.9) 3.7	5.6 (4.6-7.1) 5.8
McDonald's	506 (465-752) 609	310 (339-514) 427	680 (588-761) 674	4.9 (2.8-5.8) 4.8	3.9 (3.1-4.6) 3.9	4.7 (3.7-4.7) 4.2
Wendy's	410 (350-584) 467	342 (350-609) 479	700 (631-832) 732	3.4 (2.5-5.0) 3.8	1.9 (1.9-3.1) 2.5	4.3 (3.5-4.6) 4.1

[8] Values shown are median, (95% CI), mean. Condiments data are excluded from this table as calculations used only 3 restaurants: Arby's, Wendy's, and McDonald's.

Table 9. Trends in calcium and calcium density of fast foods by restaurant, 1986-2016.[9]

	Calcium (% RDA)			Calcium Density (% RDA/g)		
Restaurant	1986	1991	2016	1986	1991	2016
Arby's	10 (9-17) 13	8 (8-12) 10	15 (15-24) 20	0.04 (0.04-0.07) 0.06	0.04 (0.04-0.07) 0.05	0.07 (0.07-0.11) 0.09
Dairy Queen	15 (15-25) 20	20 (17-25) 21	25 (27-34) 30	0.09 (0.08-0.10) 0.09	0.10 (0.08-0.12) 0.10	0.11 (0.08-0.12) 0.10
McDonald's	12 (9-17) 13	8 (8-13) 10	15 (17-23) 20	0.08 (0.06-0.10) 0.08	0.07 (0.06-0.09) 0.07	0.08 (0.08-0.10) 0.09
Wendy's	4 (5-11) 8	10 (8-16) 12	10 (8-14) 11	0.03 (0.03-0.05) 0.04	0.05 (0.04-0.08) 0.06	0.06 (0.05-0.07) 0.06

[9] Values shown are median, (95% CI), mean. Condiments data are excluded from this table as calculations used 3 restaurants: Arby's, Wendy's, and McDonald's. Calcium results used 4 restaurants: Arby's, Dairy Queen, McDonald's, and Wendy's.

Table 10. Trends in iron and iron density of fast foods by restaurant, 1986-2016.[10]

	Iron (% RDA)			Iron Density (% RDA/g)		
Restaurant	1986	1991	2016	1986	1991	2016
Arby's	10 (11-17) 14	15 (11-14) 12	13 (12-16) 14	0.07 (0.06-0.09) 0.07	0.08 (0.07-0.09) 0.08	0.07 (0.06-0.08) 0.07
Dairy Queen	8 (9-16) 12	8 (8-12) 10	15 (12-14) 13	0.04 (0.04-0.08) 0.06	0.04 (0.04-0.06) 0.05	0.05 (0.04-0.07) 0.06
McDonald's	9 (8-14) 11	8 (7-10) 9	10 (10-13) 11	0.10 (0.07-0.10) 0.09	0.07 (0.04-0.17) 0.11	0.07 (0.06-0.08) 0.07
Wendy's	13 (9-16) 12	15 (13-25) 19	15 (11-16) 13	0.06 (0.05-0.09) 0.07	0.07 (0.07-0.13) 0.10	0.06 (0.06-0.08) 0.07

[10] Values shown are median, (95% CI), mean. Condiments data are excluded from this table as calculations used 3 restaurants: Arby's, Wendy's, and McDonald's. Iron results used 4 restaurants: Arby's, Dairy Queen, McDonald's, and Wendy's.

APPENDIX

Table 1. Trends in energy (kcal) within each menu category by restaurant, 1986-2016[1]

	Entrees			Sides			Desserts			Condiments	
Restaurant	1986	1991	2016	1986	1991	2016	1986	1991	2016	1991	2016
Arby's	460 (379-483) 431	399 (352-437) 394	540 (487-559) 523	290 (250-533) 392	240 (201-330) 265	350 (295-440) 367	340 (288-417) 353	340 (302-436) 369	440 (396-517) 457	90 (59-258) 159	50 (41-112) 76
Burger King	478 (396-614) 505	361 (346-521) 433	420 (422-519) 471	227 (81-361) 221	276 (-13-487) 237	320 (226-427) 326	321 (244-423) 333	345 (222-500) 361	310 (264-427) 345	--	--
Dairy Queen	490 (394-573) 484	365 (306-457) 382	400 (407-506) 456	280 (115-418) 267	240 (65-401) 233	235 (176-462) 319	460 (366-584) 475	400 (358-489) 423	570 (546-652) 599	--	--
Hardee's	426 (387-463) 425	372 (349-411) 380	470 (482-604) 543	239 (123-309) 216	310 (177-423) 300	320 (250-375) 313	282 (158-476) 317	255 (199-327) 263	288 (211-575) 393	--	--
Jack in the Box	516 (349-864) 607	485 (398-550) 474	555 (528-627) 577	302 (23-510) 267	355 (186-466) 326	280 (241-397) 319	325 (276-414) 345	320 (298-340) 319	770 (556-946) 751	--	--

Long John Silver's	202 (108-370) 239	140 (99-271) 185	280 (205-437) 321	176 (119-232) 176	140 (72-187) 129	190 (142-241) 191	280 (221-329) 275	340 (290-390) 340	300 (156-504) 330	45 (34-79) 56	43 (24-87) 56
McDonald's	467 (394-520) 457	333 (262-370) 316	420 (388-455) 422	198 (145-279) 212	165 (97-246) 172	150 (90-258) 174	331 (269-357) 313	265 (205-306) 255	520 (428-609) 519	60 (44-203) 123	50 (37-75) 56
Wendy's	350 (289-523) 406	430 (360-529) 444	385 (367-470) 418	160 (144-287) 216	70 (112-289) 201	270 (185-360) 273	380 (126-634) 380	338 (94-591) 343	435 (384-621) 503	--	--

[1]Values shown are median, (95% CI), mean. Restaurants were excluded if did not meet the criteria of at least two items per restaurant per menu category. This was the case for condiments, for which five restaurants were excluded from data in this table: Burger King, Dairy Queen, Hardee's, Jack in the Box, and Wendy's.

Table 2. Trends in serving size (g) within each menu category by restaurant, 1986-2016[2]

	Entrees			Sides			Desserts			Condiments	
Restaurant	1986	1991	2016	1986	1991	2016	1986	1991	2016	1991	2016
Arby's	161 (150-197) 174	189 (171-220) 195	240 (215-248) 231	312 (141-351) 246	244 (172-245) 209	128 (119-158) 138	250 (66-344) 205	312 (138-283) 211	340 (226-438) 332	37 (26-54) 40	28 (21-35) 28
Burger King	170 (153-239) 196	159 (154-219) 186	181 (172-216) 194	74 (48-94) 71	107 (61-148) 105	116 (98-151) 124	273 (7-448) 227	293 (121-390) 256	78 (63-103) 83	--	--

Dairy Queen	177 (152-218) 185	184 (143-203) 173	180 (172-221) 197	85 (37-143) 90	99 (70-138) 104	113 (70-199) 135	248 (195-322) 258	213 (205-281) 243	326 (278-340) 309	--	--
Hardee's	162 (145-199) 172	150 (145-179) 162	205 (207-261) 234	75 (64-108) 86	99 (72-157) 115	132 (112-151) 132	87 (-213-524) 156	119 (103-198) 150	120 (59-301) 180	--	--
Jack in the Box	168 (149-216) 183	189 (163-220) 191	215 (196-249) 223	66 (-54-180) 63	106 (51-162) 106	90 (87-135) 111	320 (110-433) 272	209 (78-340) 209	368 (217-443) 330	--	--
Long John Silver's	74 (9-220) 115	124 (69-184) 127	85 (72-158) 115	99 (46-182) 114	98 (67-141) 104	102 (74-156) 115	113 (113-113) 113	128 (101-145) 123	89 (59-113) 86	25 (19-29) 24	21 (13-25) 19
McDonald's	145 (132-179) 155	163 (130-179) 154	167 (172-203) 188	66 (52-89) 70	80 (62-94) 78	80 (69-149) 109	140 (95-230) 163	114 (104-183) 143	196 (160-291) 226	32 (24-59) 41	14 (10-24) 17
Wendy's	128 (115-218) 166	205 (168-302) 235	184 (177-229) 203	98 (102-219) 160	91 (92-212) 152	159 (125-233) 179	164 (-840-1168) 164	154 (29-354) 192	212 (174-369) 271	--	--

[2]Values shown are median, (95% CI), mean. Restaurants were excluded if did not meet the criteria of at least two items per restaurant per menu category. This was the case for condiments, for which five restaurants were excluded from data in this table: Burger King, Dairy Queen, Hardee's, Jack in the Box, and Wendy's.

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