

# Fourteen-year trends in sodium content of menu offerings at eight leading fast-food restaurants in the USA

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## Abstract

*Objective:* To examine changes in the Na content of lunch/dinner menu offerings at eight of the leading fast-food restaurants in the USA between 1997/1998 and 2009/2010.

*Design:* Menu offerings and nutrient composition information for the menu items were obtained from archival versions of the University of Minnesota Nutrition Coordinating Center (NCC) Food and Nutrient Database. Nutrient composition information for lunch/dinner menu items sold by the fast-food restaurants included in the present study was updated in the database biannually. Menus were analysed for changes in mean Na content of all menu offerings (except beverages) and specific categories of menu items among all restaurants and for each individual restaurant.

*Setting:* USA.

*Subjects:* Lunch/dinner food menu of eight leading US fast-food restaurants.

*Results:* Between 1997/1998 and 2009/2010 the mean Na content of menu offerings across the eight restaurants increased by 23·4%. Examining specific food categories, mean Na content of entrées by increased 17·2% and that of condiments increased by 26·1%. Only side dishes showed a decrease of 6·6%. None of the restaurants examined had a decrease in Na across the lunch/dinner menu offerings over the 14 years examined.

*Conclusions:* Results suggest that over the time period studied there has been no meaningful reduction in the Na content of lunch/dinner menu offerings at the leading fast-food restaurants examined in the present study.

**Keywords**  
Sodium  
Fast food  
Longitudinal trends  
Restaurant

In the USA high dietary Na intake is associated with more attributable deaths than any other single dietary risk factor<sup>(1)</sup>. It is well known that excess dietary Na raises blood pressure, and this effect has been documented in both adults<sup>(2)</sup> and children<sup>(3)</sup>. High blood pressure is the most common risk factor for heart disease and stroke, the first and fourth leading causes of death in the USA. High-Na diets are also associated with kidney disease and osteoporosis<sup>(4)</sup>, as well as stomach cancer<sup>(5)</sup>.

Virtually all Americans consume more Na than recommended. Current dietary guidelines recommend a maximum daily intake of no more than 2300 mg Na and recommend an even further reduction to 1500 mg Na/d for children, people 51 years of age or older, and those of any age who are African American, or currently have hypertension, diabetes or chronic kidney disease<sup>(6)</sup>. The 1500 mg recommendation applies to more than half the US population<sup>(7)</sup>, but currently less than 15% of Americans consume less than 2300 mg Na/d<sup>(8)</sup>. Less than 1% of Americans adults are meeting the 1500 mg/d goal<sup>(8)</sup>.

Restaurant food as a whole is among the major contributors to Na in the American diet, with national dietary survey data indicating that one-quarter of all Na consumed by Americans is from this source. The subset of fast-food and pizza restaurants alone accounts for 13·6% of total Na intake<sup>(9)</sup>. While African Americans have a lower recommended upper Na limit there is often a higher concentration of fast-food chains in America's lower-income and urban black neighbourhoods<sup>(10)</sup>.

Restaurant food is a major source of Na due to how frequently Americans eat out and the high Na content of foods available at restaurants. In 2002, 50% of US food dollars were spent on foods eaten away from home<sup>(11)</sup>. Fast food is the leading source of food eaten away from home in the USA, accounting for about 38% of spending on food eaten away from home<sup>(12)</sup>. A recent survey of adults found that 80% purchased fast food in the last month and 28% consumed fast food two or more times per week<sup>(13)</sup>. Fast-food restaurant meals have been found to be high in Na<sup>(14)</sup>. In addition, frequent fast-food consumption has been associated with higher Na intake<sup>(15)</sup>.

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In consideration of the significant contribution of restaurant foods to Na in the American diet, the industry has been encouraged to lower the Na content of its menu offerings<sup>(7,16,17)</sup>. In 2010, with support of the Centers for Disease Control and Prevention, the New York City Department of Health and Mental Hygiene created the National Sodium Reduction Initiative, a public–private partnership to set Na reduction goals and track progress across food categories. Target dates to meet Na reduction goals were set for 2012 and 2014. Currently only twenty-eight food manufacturers including five restaurant chains have agreed to participate in meeting Na reduction goals in any of the sixty-eight food categories. To date, just two unpublished studies have examined trends in the Na content of restaurant menu offerings and only a small number of products were examined<sup>(18,19)</sup>. Thus, we have conducted a study to examine the change in the Na content of menu item offerings at eight leading fast-food restaurants in the USA over the past 14 years. More specifically, we examined whether the Na content of menu offerings at eight of the leading fast-food restaurants changed between 1997 and 2010, and if there were differences between specific fast-food restaurant chains in the pattern of change in Na content of the menu items over this time period. To our knowledge, this is the first comprehensive study to quantitatively examine changes in the Na content of fast-food menu offerings over time.

## Experimental methods

Current and archival versions of the University of Minnesota Nutrition Coordinating Center (NCC) Food and Nutrition Database were utilized to examine trends in the Na composition of leading fast-food restaurant menus. Currently, this database includes menu items available at twenty-two US fast-food restaurant chains. Fast-food restaurants are selected for inclusion in this database on the basis of both popularity and availability of company-provided product ingredient listings and nutrient composition information for standard menu items. Therefore, most – but not all – leading fast-food restaurants are included in the database.

Of the twenty-two restaurants currently in the NCC Food and Nutrient Database, eight were selected for inclusion in the present study, reflecting 49.8% of the total sales of the top fifty US fast-food restaurants in 2009<sup>(20)</sup>. Restaurants were included in the study if the restaurant had been included in the database since 1997, the restaurant had a defined set of menu offerings and all standard menu offerings were included in the database.

The eight restaurants included in the present study are among the leading restaurants in the USA with regard to annual sales and number of locations (Table 1). The menu items available at each of the selected restaurants and their nutrient composition were updated in the database every other year on an alternating schedule over the time period included in the present analysis, thus allowing for examination of marketplace trends over an extended period of time. To maintain a steady workload in updating the database annually, restaurants were slotted into one of two update rounds in roughly equal numbers (e.g. about one-half of restaurants were slotted into one round and the other one-half into the other round). Updates were done on a rotating basis such that restaurants in each round were updated once every two years. Due to the alternating nature of the updates, trends were examined in seven 2-year time periods (1997/1998, 1999/2000, 2001/2002, 2003/2004, 2005/2006, 2007/2008 and 2009/2010) ensuring that all restaurants are represented in each period.

## NCC Food and Nutrient Database

The NCC Food and Nutrient Database is maintained using a standard set of well-defined and described procedures<sup>(21–24)</sup>. When updating nutrient information for a restaurant, a listing of all foods and beverages on the restaurant's breakfast and lunch/dinner menu is obtained from the restaurant corporation's website or publications produced by the company such as brochures or posters. The product nutrient composition and ingredient information is also obtained from these sources and used to create a formulation using an NCC-developed linear optimization algorithm that estimates the amount of each ingredient needed to produce a product with the given

**Table 1** Annual US sales ranking and database update schedule between 1997 and 2010 for each fast-food restaurant included in the study analysis<sup>(20)</sup>

Restaurant	2010 ranking	2009 annual sales (\$US millions)	Market share* (%)	Database update schedule
McDonald's	1	31 000.0	22.4	1998, 2000, 2002, 2004, 2006, 2008, 2010
Burger King	3	9000.0	6.5	1997, 1999, 2001, 2003, 2005, 2007, 2009
Wendy's	4	8388.0	6.1	1998, 2000, 2002, 2004, 2006, 2008, 2010
Taco Bell	6	6800.0	4.9	1998, 2000, 2002, 2004, 2006, 2008, 2010
KFC	9	4900.0	3.5	1997, 1999, 2001, 2003, 2005, 2007, 2009
Arby's	11	3228.8	2.3	1997, 1999, 2001, 2003, 2005, 2007, 2009
Jack in the Box	13	3072.1	2.2	1998, 2000, 2002, 2004, 2006, 2008, 2010
Dairy Queen	16	2640.0	1.9	1997, 1999, 2001, 2003, 2005, 2007, 2009

\*Percentage of total sales of the top fifty US fast-food/quick-serve restaurants (restaurants without a wait-staff) in 2009.

nutrient profile. From this formulation more detailed nutrient composition can be calculated.

A number of conventions are followed by NCC in maintaining fast-food restaurants in the database. As a rule, all portion sizes available for food items on restaurant menus are included in the database (e.g. small, medium, large French fries are included in the database). Exceptions to this rule include chicken entrée items such as chicken nuggets and strips which are included in the database in the unit of 'piece' or 'each' rather than by order size. With respect to foods that may be ordered with various topping options, entries are generally included in the database for the food and each topping separately. For example, salads at restaurants may generally be ordered with a choice of dressing. Therefore, the salad and each dressing choice are included as separate items in the database. Seasonal and short-term promotional menu items are generally not included in the database.

#### **Creation of data set for trends analysis**

For the present analysis a data set was created that included all menu items available at the eight restaurants during each time point. Although breakfast menu items were included in this data set, for the present study only lunch/dinner menu items were included in the analyses because not all of the restaurants offered breakfast over the study period. Menu items classified as drinks were also excluded from the analysis because beverages are generally not considered to be a significant source of Na. In the data set each available serving size of a food was included as a unique menu item. Therefore, changes in portion size over time, such as the addition or removal of an extra large or an extra small sized French fries order, and the accompanying changes in Na content of the item, would be detected. Condiments and toppings that were available as additional options to foods (e.g. salad dressing packet choices, sauce packets for chicken items, etc.) were included as separate menu items in the data set.

In order to evaluate changes in the Na content of menu items in specific categories and sub-categories of food over time, menu item categories were established (e.g. entrées, side dishes, etc.) and classification criteria were developed after review of the range of foods offered by each restaurant each year.

#### **Statistical analysis**

To assess overall change over the 14 years of data across all eight restaurants, descriptive statistics including the number of items on the menu and the mean, median, range and interquartile range of Na (mg) were calculated for all menu items, as well as categories of entrées, side items and condiments. To evaluate restaurant-specific changes in the Na content of food offerings between 1997/1998 and 2009/2010, the mean Na for each restaurant was reported for each time period and the percentage change in mean Na (mg)/menu item was calculated

between these two time periods. Because the menu items included in the analysis represent the entire population of foods offered at each restaurant, and the restaurants were not selected randomly in an effort to be representative of all fast-food restaurants, statistical testing and related *P* values are not appropriate. All analyses were completed using the statistical software package Stata SE 11.2.

## **Results**

### ***Trends in number of menu items offered***

During the 14-year period the number of non-beverage lunch/dinner food item offerings across the selected eight fast-food restaurant increased from 450 menu items to 695 menu items (Table 2). Within each of the food sub-categories examined the number of offerings increased.

### ***Trends in Na content of menu offerings***

Across the eight restaurants mean Na content of menu offerings increased by 23.4% over the 14 years studied (Table 2). The mean Na content of entrées increased by 17.2%, from 934 mg Na/item to 1095 mg Na/item. The mean Na content of side dishes decreased by 6.6%, from 624 mg Na/item to 583 mg Na/item. Side dishes, which included fruit offerings and side salads, was the only sub-category of food that showed a reduction in Na. It should be noted that salad dressings and fruit dipping sauces were included in the condiment sub-category which showed a 26.1% increase in mean Na, from 249 mg Na/item to 314 mg Na/item.

Mean Na increased markedly between 2003/2004 and 2005/2006, from 649 mg Na/item to 752 mg Na/item, respectively. There also was a slight decrease in mean Na between 2005/2006 and 2007/2008, from 752 mg Na/item to 735 mg Na/item. A marked increase in the upper end of the range was also evident in 2005/2006. The maximum Na content of menu item offerings varied from a low of 2515 mg in 1997/1998 to a high of 4642 mg in the 2005/2006 reporting period. Further examination of the outliers determined that two separate chicken sandwiches were offered in the 2005/2006 reporting period that had over 4500 mg Na each. These sandwiches contained almost 1500 mg more Na than the next highest menu offering over any reporting period. Removing these two offerings from the analysis brought the mean from the 2005/2006 reporting period to 739 mg Na/item (from 752 mg Na/item). Thus, removing these items from the analysis does not completely explain the sharp increase in mean Na between 2003/2004 and 2005/2006. However it does show that there was no notable difference in the average Na content of menu offerings between 2005/2006 and 2007/2008 when these two sandwiches were excluded from the analysis. This indicates that the downward trend in mean Na observed between these time periods may be attributable to the removal of these items from menu offerings in 2005/2006.

**Table 2** Trends in sodium content of menu offerings at eight leading US fast-food restaurants between 1997/1998 and 2009/2010

		1997/1998	1999/2000	2001/2002	2003/2004	2005/2006	2007/2008	2009/2010
Complete lunch/dinner food menu	No. of items	450	457	472	509	574	590	695
	mg Na/item							
	Mean	624	632	643	649	752	735	770
	SD	498	523	522	523	608	552	583
	Median	525	525	546	549	647	679	691
	IQR	111–946	199–926	209–912	198–942	253–1106	250–1100	277–1133
Lunch/dinner entrée	Range	0–2515	0–3012	0–2616	0–2436	0–4642	0–2984	0–3150
	No. of items	211	212	221	230	297	315	380
	mg Na/item							
	Mean	934	950	969	1013	1125	1070	1095
	SD	469	514	497	496	582	493	518
	Median	883	878	875	928	1062	1022	1015
Side dishes	IQR	615–1189	617–1189	622–1238	654–1320	710–1426	740–1400	729–1419
	Range	24–2515	41–3012	50–2616	98–2436	27–4642	29–2984	76–3150
	No. of items	71	72	77	78	94	93	105
	mg Na/item							
	Mean	624	633	608	549	483	507	583
	SD	427	449	461	420	374	422	542
Condiments	Median	636	633	537	457	437	378	495
	IQR	205–933	222–879	245–803	196–870	158–782	158–797	198–802
	Range	0–1743	0–1743	0–2601	0–1640	0–1468	0–1800	0–2629
	No. of items	74	78	76	92	96	96	108
	mg Na/item							
	Mean	249	262	268	314	343	317	314
	SD	221	223	227	260	288	245	223
	Median	163	212	231	221	259	259	263
	IQR	86–386	95–413	87–388	101–494	134–559	138–418	145–425
	Range	1–1010	0–1022	1–1028	1–1080	1–1599	1–1060	1–901

IQR, interquartile range.

### Trends in restaurant-specific menu offerings

None of the restaurants examined had a decrease in mean Na across the lunch/dinner menu over the 14 years of observation. Rather, increases ranging from 6% to 55% were seen at seven of the eight restaurants and no change occurred at one of the restaurants (Table 3).

With respect to menu item sub-categories, an increase of 10% or more Na in lunch/dinner entrée offerings was seen at all restaurants. In contrast, findings were more disparate across restaurants for the other sub-categories examined. Na reductions for side dishes were seen at four of the eight restaurants, with no change ( $n$  1) and an increase ( $n$  3) observed at the other restaurants. For condiments an increase was observed at five of the seven of the restaurants for which this trend could be examined (nutrition information for condiment offerings was not available from Dairy Queen in the first reporting period, thus percentage change could not be calculated for this restaurant). Decreases in the Na content of condiments were observed at two of the restaurants.

### Discussion

It has been contended that individual efforts to reduce Na are mostly ineffective because more than 75% of dietary Na comes from prepared foods<sup>(9)</sup>. As a major purveyor of prepared foods, the fast-food industry therefore may contribute to Na intake of the population;

and documenting changes in the Na content of fast-food restaurant menu offerings over time is important to understanding changes in the American food environment.

Results suggest that over the time period studied there has been no meaningful reduction in the Na content of menu offerings at the eight leading fast-food restaurants examined, with the exception of side dishes. Rather, upward trends were evident for the menus as a whole and for entrée and condiment menu offerings. No restaurant examined showed a decrease in Na in its lunch/dinner menu between 1997/1998 and 2009/2010.

Our findings are somewhat similar to those of the Center for Science in the Public Interest, which has been monitoring the Na content of a limited number of prepared and restaurant foods since 1983. Among the sixty-nine foods tracked by this organization between 1983 and 2004, the average Na content decreased by 5% between 1983 and 2004. However, between 1994 and 2004 the average Na content increased by 6%<sup>(19)</sup>. Beginning in 2005 the Center for Science in the Public Interest began monitoring a larger sample of food offerings, including an increased assortment of fast-food menu offerings. It measured the change in Na density (Na mg/100 g product) of each product between 2005 and 2008. Of the eighty-two menu items where Na density changes could be determined, 50% showed an increase, 40% a decrease and 10% showed no change in Na density<sup>(19)</sup>.

Use of the NCC Food and Nutrition Database for restaurant menu information is both a strength and limitation

**Table 3** Percentage change in mean sodium content of lunch/dinner menu offerings at specific fast-food restaurant chains between 1997/1998 and 2009/2010

	Lunch/dinner menu excluding beverages			Lunch/dinner entrées			Lunch/dinner side dishes		
	Mean Na (mg)/item, 1997–1998	Mean Na (mg)/item, 2009–2010	Percentage change	Mean Na (mg)/item, 1997–1998	Mean Na (mg)/item, 2009–2010	Percentage change	Mean Na (mg)/item, 1997–1998	Mean Na (mg)/item, 2009–2010	Percentage change
McDonald's	383	594	55	730	954	31	258	124	-52
Burger King	697	699	0	919	1009	10	670	419	-37
Wendy's	601	827	38	842	1109	32	458	771	68
Taco Bell	836	1030	23	911	1108	22	803	800	0
KFC	583	620	6	668	803	20	538	352	-35
Arby's	816	1039	27	1258	1478	17	697	834	20
Jack in the Box	700	830	19	1029	1135	10	861	607	-30
Dairy Queen	414	587	42	1002	1162	16	534	588	10

of the present study. Use of this database offers historic information that may not be available directly from restaurant corporations at this time, and has not been archived elsewhere. This database was developed and has been maintained to examine the food and nutrient intake of individuals, and consequently it has some limitations for examining restaurant menu offerings. One shortcoming is that bundled meal offerings (e.g. children's meals, value meals) cannot be examined. For some menu items it is not possible to assess the portions in which they are offered, as they are in the database per piece (e.g. chicken nuggets may be offered as a 4-, 6- or 20-piece order but are included in the database in the unit of 'each'). This shortcoming may result in underestimates of the amount of Na offered at fast-food chains where many of these types of items are on the menu. This issue should not affect trends because these items were handled in a consistent manner over time in the database. However, this issue precludes us from making valid comparisons of the relative Na content of menu offerings at each restaurant (e.g. ranking restaurants by the Na content of their menu offerings). Dipping sauces and salad dressings are included in a separate category from the entrée or side dish that they are served with. Hence, this issue must be considered in interpreting Na trends for entrées and side dishes, as entrée and side salads are typically ordered or eaten with salad dressing. Another shortcoming of the present study is that the chain restaurants included were not selected randomly, which limits the generalizability of study findings. In consideration of this limitation findings from this study are only considered representative of the eight restaurant chains included in the analysis.

Results indicate that consumers wishing to moderate their Na intake must choose meals very carefully when eating at one of the fast-food restaurants included in the present study. Indeed, choosing a hypothetical idealized meal that contains an entrée, side dish and condiment with the mean Na content for these categories in 2009/2010 would result in a meal that contained 1992 mg Na, which well exceeds the 1500 mg Na/d maximum recommended for anyone younger than 14 years, older than 51 years, and those of any age who are African American, or have hypertension, diabetes or chronic kidney disease. Also, this total nears the 2300 mg Na/d maximum recommended for everyone else<sup>(6)</sup>.

From a public health perspective, results suggest that stepped-up efforts may be needed to lower the Na content of menu offerings at the leading fast-food restaurants examined in the present study. None of the restaurants examined for the study participates in the National Sodium Reduction Initiative, the public-private partnership created by the New York City Department of Health and Mental Hygiene with support of the Centers for Disease Control and Prevention<sup>(25)</sup>. In July 2011, McDonald's issued a press release pledging to reduce Na by an average of 15% overall across its national menu of



food choices by 2015<sup>(26)</sup>, although the present study shows that they had a 55% increase in Na in the past 14 years. No other restaurant examined has made any Na reduction pledge in the USA.

Na has a complex role in taste, texture and overall flavour of food, as well as having an important role in food preservation and food safety, so it cannot be removed entirely. Salt is an inexpensive, unregulated food additive, and by increasing the amount added a manufacturer can make one brand taste better while simultaneously making a lower-Na competitor's brand taste bland in comparison. Therefore, there are few market forces to support voluntary Na reduction. Since food needs to be palatably competitive to compete in the consumer marketplace, food producers including fast-food restaurants may be better able to reduce Na in a regulated and monitored environment. In the 'Strategies to Reduce Sodium Intake' report released by the Institute of Medicine in 2010 it is contended that policy changes, including the US Food and Drug Administration changing salt's status from its current unregulated Generally Recognized as Safe to that of a food additive, are required to create a market environment to support measurable and sustained Na reduction in the food supply<sup>(7)</sup>. Results from the present study, which indicate that the Na content of menu offerings at eight leading restaurant chains increased between 1997 and 2010, provide some support for this recommendation. Continued and expanded monitoring of the Na content of restaurant menu offerings, including a representative sample of both fast-food and sit-down restaurants, is warranted to more fully evaluate whether restaurants in the USA are failing to voluntarily lower the Na content of their menu offerings.

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