

## Short Communication

# Unsavory choices: The high sodium density of U.S. chain restaurant foods

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## ABSTRACT

The restaurant industry is a major component of the food environment, but the sodium density (mg sodium per 1000 kcal) of menu offerings is not well documented. This cross-sectional study reports on the sodium density of 30,073 menu items from 237 unique U.S. chain restaurant brands in 2010. Sodium density was evaluated with descriptive statistics and stratified by restaurant characteristics and menu type (regular or children's). Sodium density varies substantially based on restaurant type, cuisine, and item type. Sodium density is very high overall, an average of 2196 mg sodium/1000 kcal across all regular menu items and 1865 across all children's menu items. A tremendous gap exists between the sodium density of most restaurant foods and what consumers must eat to stay within recommended daily limits. The restaurant industry must reduce the default amount of salt used in order to help our taste buds readjust to healthier sodium levels.

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## 1. Introduction

The Institute of Medicine has called upon the food industry to make foods less salty, and for the Food and Drug Administration to set national standards for the sodium content of foods (Henney et al., 2010). Restaurants play a major role in the U.S. diet, with nearly half (47%) of Americans eating three or more meals prepared away from home a week (USDA, 2014), and changes to restaurant foods can reduce population sodium intake. Sodium density (mg sodium per 1000 kcal) is a useful comparison measure, since it standardizes by energy. However, the sodium density of prepared foods is not well documented, in comparison to total sodium content. A better understanding of the sodium density of restaurant foods provides evidence on the saltiness level of these items. This study reports on sodium density of U.S. chain restaurant foods, using data from a comprehensive review of 2010 menus.

## 2. Methods

This cross-sectional study used sodium and energy data from major U.S. chain restaurant menus, which were collected in 2010 from restaurants' websites; methods are detailed elsewhere (Wu and Sturm, 2013). Evidence suggests that restaurant-reported data on energy are generally accurate (Urban et al., 2011), though similar evidence related to sodium is too limited to draw conclusions about its accuracy (Root et al., 2004). Sodium content was reported previously, but sodium density is a unique measure that adds a perspective on how the saltiness levels of foods fit in with U.S. Department of Agriculture (USDA) standards; dietary saltiness has been linked to higher body weight (Yoon and Oh, 2013). The study population comprised the 237 unique restaurant brands that reported both sodium and energy data from the 2009 Restaurants & Institutions Magazine top 400 restaurants list, representing 28,693 regular and 1380 children's menu items (Restaurants & Institutions Magazine, 2009).

Sodium density was evaluated with descriptive statistics and stratified by menu type (regular or children's), restaurant characteristics (service model and cuisine), and item type. Average sodium density for menus depends on the mixture of item types, so analyses also show sodium density excluding types that are generally non-savory (specialty drinks, desserts/baked goods).

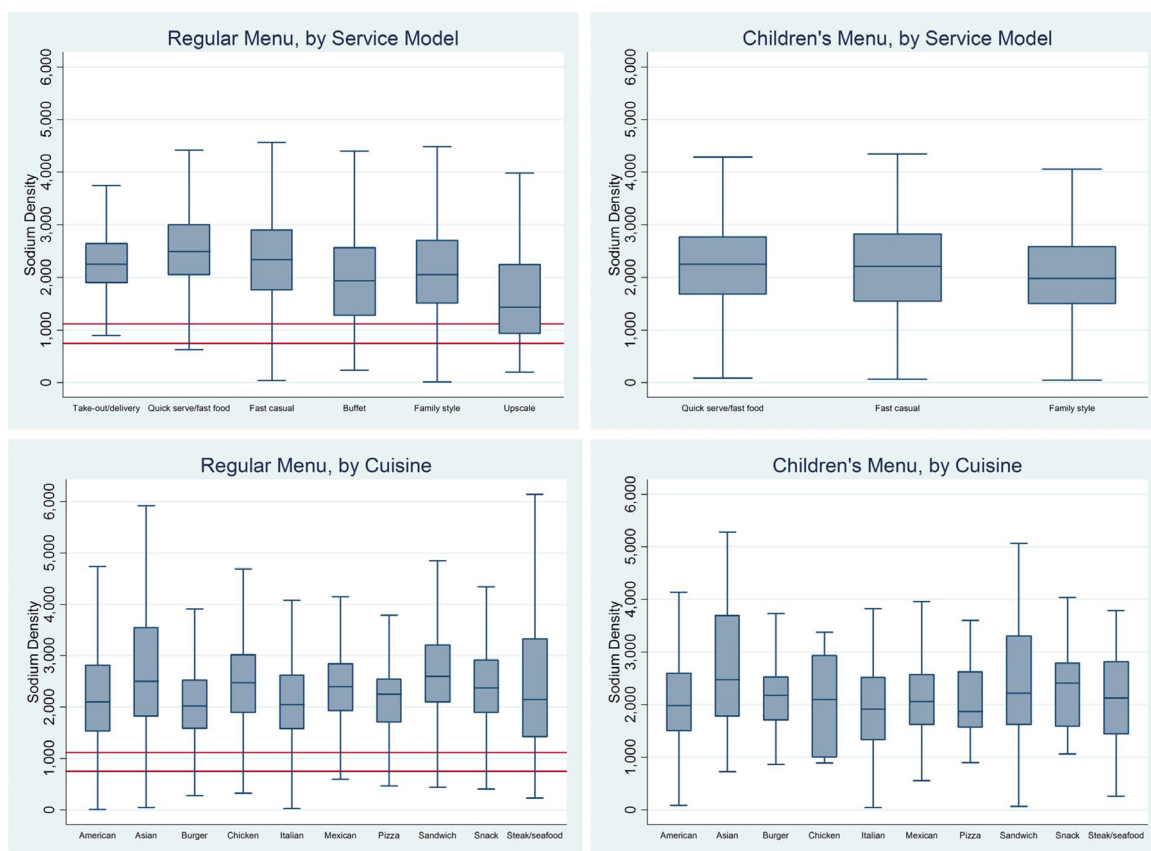
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**Table 1**

Variation in the sodium density of U.S. chain restaurant foods.

| Sodium density (mg/1000 kcal) | Regular menu     |               |                         |               | Children's menu  |             |                         |             |
|-------------------------------|------------------|---------------|-------------------------|---------------|------------------|-------------|-------------------------|-------------|
|                               | All item types   |               | Drinks & desserts excl. |               | All item types   |             | Drinks & desserts excl. |             |
| <b>By service model</b>       | <b>Mean (SE)</b> | <b>n</b>      | <b>Mean (SE)</b>        | <b>n</b>      | <b>Mean (SE)</b> | <b>n</b>    | <b>Mean (SE)</b>        | <b>n</b>    |
| Take-out/delivery             | 1336 (33)        | 2687          | 2576 (70)               | 952           | 832 (94)         | 57          | 1686 (285)              | 13          |
| Fast food                     | 2019 (36)        | 6845          | 2905 (45)               | 4013          | 1765 (100)       | 140         | 2207 (96)               | 107         |
| Fast casual                   | 2493 (42)        | 5640          | 2886 (50)               | 4510          | 2313 (188)       | 185         | 2358 (192)              | 180         |
| Buffet                        | 2634 (75)        | 1466          | 3067 (93)               | 1130          | 2843 (601)       | 6           | 2843 (601)              | 6           |
| Family style                  | 2314 (25)        | 11,759        | 2561 (27)               | 10,232        | 1851 (47)        | 985         | 2071 (50)               | 849         |
| Upscale                       | 1620 (74)        | 296           | 1855 (78)               | 253           | 1497 (140)       | 7           | 1497 (140)              | 7           |
| <b>By cuisine type</b>        | <b>Mean (SE)</b> | <b>n</b>      | <b>Mean (SE)</b>        | <b>n</b>      | <b>Mean (SE)</b> | <b>n</b>    | <b>Mean (SE)</b>        | <b>n</b>    |
| American                      | 2419 (32)        | 10,294        | 2755 (38)               | 8413          | 1817 (54)        | 608         | 2040 (57)               | 518         |
| Asian                         | 2991 (79)        | 848           | 3068 (80)               | 820           | 2391 (296)       | 32          | 2445 (301)              | 31          |
| Burger                        | 1509 (34)        | 2569          | 2270 (50)               | 1483          | 1759 (120)       | 99          | 2079 (123)              | 80          |
| Chicken                       | 2794 (165)       | 526           | 3017 (178)              | 477           | 2594 (737)       | 16          | 2736 (773)              | 15          |
| Italian                       | 2272 (43)        | 1918          | 2378 (44)               | 1814          | 1857 (127)       | 153         | 1986 (133)              | 141         |
| Mexican                       | 2432 (33)        | 2411          | 2510 (33)               | 2314          | 2009 (68)        | 177         | 2096 (65)               | 167         |
| Pizza                         | 2228 (40)        | 1844          | 2266 (38)               | 1777          | 1876 (304)       | 44          | 2027 (324)              | 40          |
| Sandwich                      | 3112 (111)       | 1841          | 3244 (89)               | 1666          | 2205 (138)       | 73          | 2242 (139)              | 71          |
| Snack                         | 1203 (22)        | 4959          | 3120 (77)               | 1020          | 1430 (303)       | 111         | 2930 (729)              | 43          |
| Steak & Seafood               | 2840 (78)        | 1483          | 3092 (85)               | 1306          | 2005 (237)       | 67          | 2364 (258)              | 56          |
| <b>By item type</b>           | <b>Mean (SE)</b> | <b>n</b>      |                         |               | <b>Mean (SE)</b> | <b>n</b>    |                         |             |
| Main entrée                   | 2378 (13)        | 12,943        |                         |               | 2178 (37)        | 915         |                         |             |
| Appetizer                     | 2648 (50)        | 1119          |                         |               | n/a              | 0           |                         |             |
| Side                          | 2650 (91)        | 2979          |                         |               | 1686 (181)       | 213         |                         |             |
| Salad                         | 2298 (33)        | 1756          |                         |               | 1817 (148)       | 15          |                         |             |
| Salad dressing                | 4013 (227)       | 894           |                         |               | 2750 (1185)      | 10          |                         |             |
| Soup                          | 5723 (86)        | 1399          |                         |               | 6853 (1330)      | 9           |                         |             |
| Specialty drink               | 592 (9)          | 3149          |                         |               | 399 (27)         | 84          |                         |             |
| Dessert/baked good            | 873 (35)         | 4454          |                         |               | 530 (29)         | 134         |                         |             |
| <b>Overall</b>                | <b>2196 (17)</b> | <b>28,693</b> | <b>2715 (20)</b>        | <b>21,090</b> | <b>1865 (44)</b> | <b>1380</b> | <b>2124 (48)</b>        | <b>1162</b> |



**Fig. 1.** Sodium density of main entrées, by service model and cuisine. Take-out/delivery, buffet, and upscale service models not shown for children's menu items; sample sizes in these sub-groups were very small. Reference lines in regular menu graphs are set at 1115 and 750, the average needed to stay within a 2300 and 1500 mg sodium in a 2000 kcal/day diet.

Finally, boxplot analyses of main entrées only were included to illustrate differences in the distribution of sodium density by menu type and restaurant characteristics. The boxplots include reference lines to illustrate how/whether the sodium density level of entrées fit in with the USDA recommended upper limit for sodium (1500 or 2300 mg/day for adults, depending on risk category) (USDA, 2010).

### 3. Results

Sodium density varies widely by restaurant characteristics and item type (Table 1), and it is very high overall. The average sodium density across all regular menu items is 2196. After consuming a single 1000 kcal restaurant meal, one would exceed the 1500 mg/day USDA recommended upper limit that applies to nearly half of all Americans, and one would likely exceed the 2300 mg/day limit that applies to all others after consuming other foods throughout the day (USDA, 2010).

By service model, buffets feature the most sodium-dense foods, and upscale restaurants the least. Items from fast casual restaurants may be perceived as healthier than fast food, but are not so based on sodium density. By cuisine, pizza and burger restaurant items, which may be perceived as less healthy, are lower in average sodium density than in sandwich, Asian, and chicken restaurants. Sodium density was lower overall (1865) and usually also by subgroup for children's vs. regular menus.

Analysis of entrées only finds more evidence that it is practically impossible for one to stay within recommended upper limits after eating a restaurant meal (Fig. 1). Boxplots show the range of entrées' sodium density across restaurant types. Items below a sodium density of 750 or 1115 are in line with a 1500 or 2300 daily sodium intake based on a 2000 kcal diet, respectively, but few items fall beneath those reference lines. This implies that anyone trying to meet the 1500 mg limit could probably not do so while meeting their energy needs, at the current sodium density levels of restaurant entrées.

### 4. Discussion

This study presents new data on the sodium density of restaurant foods, drawing from the largest known study to date of restaurant nutrition (Wu and Sturm, 2013). It adds to evidence that restaurant foods are more sodium dense (2196) than food consumed at home (1369) (Lin and Guthrie, 2012; Johnson et al., 2010), furthering the argument that restaurants contribute to excessive sodium intake. The heavy concentration of entrées for which sodium density is too high to fit in with USDA guidelines illustrates that there are many ways for consumers to choose

poorly, but only a few ways to choose well. Findings can inform public health and policy efforts on how to design restaurant-focused interventions for maximum benefit.

A strength of this analysis is the size and diversity of restaurants represented, which could be generalized to major chain restaurants broadly, although not necessarily to independent or small chain restaurants. A limitation is the accuracy of nutrition data, which may vary by preparation and customizations. As this study reports on the objective nutrition environment faced by consumers, the set of menu offerings differs from what is consumed.

A huge discrepancy exists between what's on the menu and what consumers should eat. Consumers can try to make better choices, but the variation in sodium density, dearth of lower sodium entrées, and absence of sodium information at the point of purchase leave an unsavory set of choices. The food industry sets the standard for how our taste buds respond to salt. Restaurants can help reset them by preparing lower-sodium foods by default, since it can be added, but not taken away.

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