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Consumer underestimation of sodium in fast food restaurant meals: Results from a cross-sectional observational study

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ABSTRACT

Restaurants are key venues for reducing sodium intake in the U.S. but little is known about consumer perceptions of sodium in restaurant foods. This study quantifies the difference between estimated and actual sodium content of restaurant meals and examines predictors of underestimation in adult and adolescent diners at fast food restaurants. In 2013 and 2014, meal receipts and questionnaires were collected from adults and adolescents dining at six restaurant chains in four New England cities. The sample included 993 adults surveyed during 229 dinnertime visits to 44 restaurants and 794 adolescents surveyed during 298 visits to 49 restaurants after school or at lunchtime. Diners were asked to estimate the amount of sodium (mg) in the meal they had just purchased. Sodium estimates were compared with actual sodium in the meal, calculated by matching all items that the respondent purchased for personal consumption to sodium information on chain restaurant websites. Mean (SD) actual sodium (mg) content of meals was 1292 (970) for adults and 1128 (891) for adolescents. One-quarter of diners (176 (23%) adults, 155 (25%) adolescents) were unable or unwilling to provide estimates of the sodium content of their meals. Of those who provided estimates, 90% of adults and 88% of adolescents underestimated sodium in their meals, with adults underestimating sodium by a mean (SD) of 1013 mg (1,055) and adolescents underestimating by 876 mg (1,021). Respondents underestimated sodium content more for meals with greater sodium content. Education about sodium at point-of-purchase, such as provision of sodium information on restaurant menu boards, may help correct consumer underestimation, particularly for meals of high sodium content.

1. Introduction

Population-wide sodium reduction is an important strategy for reducing cardiovascular disease and mortality in the U.S. where sodium consumption among children, adolescents, and adults exceeds the National Academies of Sciences, Engineering, and Medicine's upper limit (2300 mg/day) by nearly 1000 mg/day (National Academies of Sciences, Engineering, Medicine, 2004, New York City Department of Health & Mental Hygiene & American Heart Association, 2014, Cogswell et al., 2014, Centers for Disease Control and Prevention (CDC), 2012). In the U.S. adults and adolescents consume nearly 25% of dietary sodium from restaurant sources, and restaurant food contains more sodium per calorie than foods purchased from grocery stores or other food outlets (Cogswell et al., 2014; Centers for Disease Control and Prevention (CDC), 2012). In the National Health and Nutrition Examination Surveys, consumption of restaurant foods is associated with significantly higher average daily sodium intake among adolescents and adults (An, 2016; Nguyen & Powell, 2014; Powell & Nguyen, 2013). A 2012 study of menu items served by the 400 top-earning restaurants in the U.S. found that the average sodium content of entrees was 1512 mg, more than half the upper limit recommended for daily consumption (Wu & Sturm, 2013; National Academies of Sciences, Engineering, Medicine, 2004).

Recognition of the health consequences of high sodium intake and the concentration of such a high proportion of total intake in restaurant food has compelled policymakers to propose measures to highlight items with high sodium levels. The New York City

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Board of Health recently issued a mandate requiring all restaurants with 15 or more locations to place salt warning labels on items that exceed the recommended daily upper limit of 2300 mg of sodium (New York City, 2015). Other municipalities could proceed with similar policies, especially considering prior rapid adoption of calorie labeling after New York City implemented its calorie labeling policy in 2008 (Long, Tobias, Cradock, Batchelder, & Gortmaker, 2015). Labeling policies intend to correct a perceived consumer knowledge deficit and have successfully increased consumer knowledge and awareness of health risks in other settings. For example, there is evidence that placing prominent text warning labels on cigarette packages increased consumer risk perceptions and decreased intent to purchase cigarettes (Hammond, 2011). In experimental settings, similar effects have been found when health warning labels are displayed prominently on sugary drinks (Roberto, Wong, Musicus, & Hammond, 2016; VanEpps & Roberto, 2016). Although research on how calorie labels in restaurants influence consumer food choices has been mixed, several studies have found that the labels increase consumer awareness of calories, and may influence purchase intentions, particularly when the information displayed defies consumer expectations (Long et al., 2015; Chen et al., 2015; Dumanovsky, Huang, Bassett, & Silver, 2010; Krieger et al., 2013; Burton, Howlett, & Tangari, 2009; Reale & Flint, 2016).

Sodium warning labels may have a similar effect on consumer awareness of sodium in restaurant food; however, little research has documented this. Experimental studies have found that consumers likely significantly underestimate sodium in restaurant foods. In a 2006 study, 193 adults received a mail survey and were asked to estimate the sodium content of several selected restaurant items. Participants underestimated sodium content in entrees by 115–811%, with less accuracy for the highest sodium items (Burton, Creyer, Kees, & Huggins, 2006).

The aim of this study was to fill a gap in our understanding of consumer knowledge of sodium in restaurant foods by examining the accuracy of consumer estimates of sodium in restaurant meals. To our knowledge, this is the first study to assess consumer estimates of sodium in a real-world setting and the first study of any kind to examine sodium estimates among adolescents. Using a sample of adolescents and adults dining at six fast food restaurant chains in four New England cities, this study quantified the difference between estimated and actual sodium content of restaurant meals and examined predictors of underestimation. Consistent with prior studies of nutrition knowledge and label reading, we hypothesized that age, gender, race, body mass index, restaurant chain, importance of nutrition information in making food choices, and ability to accurately estimate recommendations for daily sodium intake would be associated with accuracy of sodium estimation (Ayala, Tong, Valerrama, Ivy, & Keenan, 2010; Campos, Doxey, & Hammond, 2011; Long et al., 2015). This research provides evidence quantifying consumer misperceptions about sodium in restaurant food and potential demographic disparities, which will inform ongoing policy debates around the need for sodium warning labels, or other methods for conveying sodium information, in restaurant settings.

2. Methods

2.1. Study design

Data for this study were collected in the context of a separate study evaluating the effects of calorie labels on adult, adolescent, and child fast-food meal purchases. Data for the calorie labeling study were collected from 2010 to 2014, but questions about sodium were not added to adult and adolescent questionnaires until June 2013. This analysis is based on the subsample of adults and adolescents who were asked questions about sodium in 2013 and 2014. Data were collected from June–September in 2013 and May–September in 2014.

Restaurants selected for the study were located in four New England cities: Boston, MA; Springfield, MA; Providence, RI; and Hartford, CT. These cities range in size from 179,000–650,000 people and are demographically diverse, with populations ranging from 16 to 38% black, 18–44% Hispanic, and 22–33% of individuals in poverty (U.S. Census Bureau, 2015). Restaurant chains with the highest U.S. sales and at least two locations in each city were selected for the adult sample, and restaurant chains with at least two locations within one mile of a high school were selected for the adolescent sample. The restaurant chains for the adult sample were McDonald's, Burger King, Wendy's, Kentucky Fried Chicken (KFC) and Subway. The same restaurant chains were used for the adolescent sample except Dunkin' Donuts was substituted for KFC. A detailed description of restaurant chain sampling has been described elsewhere (Block et al., 2013). No restaurant chains in the adult or adolescent sample printed sodium information on menus. In some stores, sodium information was available on wall posters, food containers/wrappers, napkins, or cups. All chains listed nutrition information, including sodium content, on their websites.

Street intercept survey methodology was used to collect data from participants outside restaurant entrances or, if research assistants were not permitted to work on the restaurant's property, on a public sidewalk adjacent to the restaurant. Every effort was made to visit the same restaurants in 2013 and 2014; however, this was not always possible due to management refusals. In the adolescent sample, four of 36 restaurants visited in 2013 were replaced with two new restaurants in 2014 and in the adult sample four of 43 restaurants visited in 2013 were replaced with three new restaurants in 2014. Research assistants approached diners who appeared eligible based on age for each of the samples and asked them to save their receipts if interested in participating in a study about "choices in fast food restaurants." Age eligibility for the different samples was 18 + years of age for adults and 11–20 years of age for adolescents. The adolescent group included a relatively wide range of ages, from adolescent to young adult, but we refer to this group as "adolescents" for the ease of presentation. We included this wide range of age for the adolescent category to recruit as many young people as possible. While there was age overlap between the two samples, it was highly unlikely that individuals would cross over both samples as we collected data at lunchtime for adolescents and in the evening for adults. When customers exited the restaurant, research assistants collected receipts, asked participants to identify items (or portions of items, if items were intended for sharing) purchased for individual consumption, and completed an item questionnaire. The item questionnaire clarified details about the order, such as whether the meal was shared, fountain beverage choices, and meal customization (e.g., addition of condiments or dipping sauces). A respondent's meal was defined as all purchased items intended for individual consumption. To calculate actual calorie and sodium content of meals, information for each item on receipts was linked to nutrition information from restaurant websites, collected in July of each year of data collection. Research comparing nutrition information on restaurant menus to measurements taken in a lab shows that the stated energy content of restaurant foods is generally accurate (Urban, McCrory, & Dallal, 2011). While no studies have validated the accuracy of sodium information stated on restaurant websites, a study of Canadian food labels found that laboratory values for sodium were within 20% of stated values for most items (Fitzpatrick et al., 2014). A brief questionnaire was administered to capture the participant's estimation of the meal's calorie and sodium