Objective: This study aimed to describe beverages purchased in restaurants among a nationally representative sample of US households.

Methods: Data were obtained from the US Department of Agriculture National Household Food Acquisition and Purchase Survey, 2012 to 2013. Survey-weighted multiple regressions assessed correlates of purchasing a sugar-sweetened beverage (SSB), purchasing a low-calorie beverage, and per capita beverage calories and grams of sugar among purchases from US restaurants (n = 14,669).

Results: Dining at a top fast-food chain (odds ratio = 1.9 [95% CI = 1.6, 2.3] vs. small chain or independent restaurants) and ordering a combination meal (2.8 [1.3, 3.3]) or from the kids’ menu (2.1 [1.2, 3.4]) were positively associated with purchasing an SSB. Age (young adult and adolescent vs. older adult; 0.7 [0.5, 0.9] and 0.4 [0.3, 0.7], respectively), race (Black vs. White; 0.4 [0.3, 0.6]), ethnicity (Hispanic vs. non-Hispanic; 0.8 [0.6, 0.9]), and household food security (very low vs. high; 0.7 [0.5, 0.8]) were associated with purchasing a low-calorie beverage. Caloric beverage purchases contained the most calories and grams of sugar per capita when purchased by Hispanic and non-Hispanic Black adolescents.

Conclusions: US households purchase a considerable amount of SSBs from the nation’s largest chain restaurants, particularly when combination meals or kids’ menu items are ordered, and there are disparities by age, race/ethnicity, and household food security.

Introduction

Sugar-sweetened beverage (SSB) consumption is a stubborn public health problem that contributes to socioeconomic and racial disparities in obesity and diet-related diseases (1-3). Although consumption has declined over the past decade, it remains high, and there are persistent disparities by race, ethnicity, income, and education (4-6). On a typical day, half of all adults and two-thirds of children consume SSBs (4). Among children, SSB consumption is associated with an increased risk of overweight and dental caries (7). High SSB consumption in adulthood has been linked to higher risk of developing diabetes, hypertension, and cardiovascular disease (8). SSBs contribute no nutritive value and may not be as satiating as solid food, contributing to overconsumption of calories (9). The prevalence and consequences of consumption make it an important policy target. It is considered by many to be a key “low-hanging fruit”—one of the most obvious opportunities for addressing obesity and diet-related disease.

Increasingly, beverages are consumed in restaurants, where roughly 40% of US food dollars are spent and where SSBs are widely available and heavily promoted (10). Nearly one-quarter of adult calories and more than 10% of child and adolescent calories from SSBs are consumed in this setting (11,12). In 2017, beverages in the 90 top-earning chain restaurants in the US contained an average of 281 kcal and 46 g of total sugar per item, with 80% of beverages containing more than 100 kcal per item (http://menustat.org/#/home). In recent years, chain restaurants have introduced new, lower-calorie food items and dropped higher-calorie foods from their menus, but availability of high-calorie beverages has not significantly changed (13,14). Similarly, foods listed and advertised on fast-food menu boards have become healthier and lower in calories over time, whereas the opposite patterns have been observed for beverages (15).

Many public health policy efforts aiming to reduce SSB consumption are relevant to restaurant settings, where substituting an SSB with plain water or another unsweetened beverage may reduce total energy consumption (16). Menu labeling policies, which require chain restaurants to provide calorie information on menu boards alongside price, could influence both consumer selection and industry reformulation of beverages, although evidence to date has been

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mixed (13,14,17-20). Several US cities have imposed beverage taxes, which raise the price of SSBs sold in restaurants and appear to be reducing purchases and consumption (21-23). Many jurisdictions have introduced bills that would require warning labels on the front of SSB packages or advertisements, although these efforts have been largely unsuccessful. Policies requiring healthier default beverage options—offering water or milk instead of an SSB with combination meals in chain restaurants—have become popular strategies for promoting healthy beverages with kids’ meals and could, in principle, be applied to combination meals promoted to adults on the regular menu board. Understanding the potential impact of these policies on health behaviors will require better monitoring of chain restaurant beverage purchases at the national level.

Research using the National Health and Nutrition Examination Survey (NHANES) has examined national trends in restaurant beverage consumption (16,24,25), but few studies have assessed restaurant beverage purchases (26-28). Although the NHANES is useful for describing prevalence of consumption and characteristics of consumers, it is less useful for targeting interventions aimed at reducing SSB consumption or for modeling the potential effects of proposed programs and policies. This is because the NHANES provides little information about the context in which SSBs are obtained. For example, more than a dozen cities, counties, and states have implemented policies requiring chain restaurants to offer healthy beverages instead of SSBs as the default option with children’s meals. National data on the proportion of kids dining at chain restaurants, the proportion of kids purchasing children’s meals, and characteristics of beverages purchased on these occasions would be useful for estimating policy reach and impact, but these data are unavailable in the NHANES. The US Department of Agriculture’s (USDA’s) National Household Food Acquisition and Purchase Survey (FoodAPS) collects information on foods and beverages acquired by a nationally representative sample of households and is the first data set to record detailed information about the context in which beverages are obtained, including information about the purchaser and specific details about the restaurant. In this study, we describe beverages purchased from US restaurants, using data from FoodAPS. Findings will be useful for monitoring trends in restaurant purchases over time, for targeting SSB reduction strategies in restaurants, and for estimating potential effects of proposed public policies.

**Methods**

**Data**

We obtained data from the USDA FoodAPS, which collected detailed information on foods and beverages acquired by a nationally representative sample of households over seven consecutive days \( n = 4,826 \) between April 2012 and January 2013. Households were sampled using a multistage sampling design, which oversampled households participating in the Supplemental Nutrition Assistance Program (SNAP) and low-income households (29). All adults and older children (11 years and older) in the household tracked foods purchased or acquired “at home” (e.g., supermarkets, convenience stores) and “away-from-home” (e.g., restaurants) using food records, scanned bar codes on foods, and receipts. The household primary respondent also reported on household resources and sociodemographic characteristics of individuals in the household in two in-person interviews. Additional details of food acquisitions were reported by the primary respondent in up to three telephone interviews. Of the 4,826 sampled households, 4,739 recorded acquisitions and purchases \( n = 55,118 \) acquisitions and purchases during the study period (Figure 1). For this study, we created a subpopulation that excluded food-at-home purchases \( n = 15,998 \) and food-away-from-home (FAFH) purchases from sources other than restaurants \( n = 23,251 \). FAFH purchases from restaurants \( n = 15,869 \) accounted for 41% of all FAFH and 29% of total purchases and acquisitions. We excluded from our subpopulation observations in which acquisitions were recorded but lacked item information \( n = 226 \) and observations missing data on timing of the meal \( n = 622 \) or other covariates \( n = 352 \). The final analytic sample included 14,669 restaurant purchases. Of these, 8,335 included a caloric beverage.

**Measures**

The primary units of observation were restaurant purchases. Individual and household characteristics were obtained from interviews with the primary respondent and included the age (child < 12 years, adolescent 12-19 years, young adult 20-39 years, or older adult 40+ years), sex (male or female), race (White, Black, or other race), ethnicity (Hispanic or non-Hispanic), and BMI (normal, overweight, obesity) of the person acquiring the purchase; number and age group of people sharing the purchase; and household participation in SNAP (yes/no) or the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) (yes/no), food security status assessed using the 18-item US Household Food Security Survey Module (food secure, marginal, low, or very low food security), poverty status (<100% federal poverty level [FPL], 100%–184% FPL, ≥185% FPL) of the household, and educational attainment (<high school, high school graduate, > high school) of the household primary respondent. A purchase was defined as “shared” if more than one person consumed the purchase. FoodAPS provides the number of people who shared the purchase and the identification of each person in the household who shared but does not describe how much was consumed or which items within the purchase were consumed by each person. Thus, a single purchase may be shared by multiple people of different ages in the household. Current participation in SNAP or WIC was ascertained primarily through administrative matching (SNAP) or self-report (WIC). Racial and ethnic groups were selected based on high consumption of SSBs among Black and Hispanic adults compared with White adults (4).

Information about each purchase included the timing of the meal (breakfast, lunch, dinner, snack, multiple meals), the number of items included in the purchase, and whether items were purchased from the kids’ menu (defined as the item unit or relative size containing the word kids), as part of a combination meal, or from a buffet. Beverages were coded by researchers as “sugar-sweetened beverages” (soft drinks, sport/energy drinks, fruit drinks, sweetened tea, sweetened flavored water) or “low-calorie beverages” (unsweetened coffee or tea, fruit beverages, water, or seltzer) based on USDA food codes and prior analyses using the NHANES (4,5). Nutrients (calories, sugar) and weight (grams) were matched to beverage descriptions and sizes from the Food and Nutrient Database for Dietary Studies in FoodAPS. For each purchase, researchers calculated per capita beverage grams, calories, and sugar by dividing total beverage weight and nutrients by the number of people who shared the meal. FoodAPS respondents recorded the name and location of all FAFH purchases and acquisitions. To protect participant privacy, purchase locations were grouped into broader categories (e.g., school, work, restaurant) by the FoodAPS team. Specific restaurant names were
available for acquisitions from the 78 “top” chain restaurants. This list of 78 restaurants was compiled based on the following characteristics: (1) restaurant is included in MenuStat, a database with nutrient information for the top restaurants by US sales based on a list from Nation’s Restaurant News in 2012 ($n = 66$) or (2) restaurant is not included in MenuStat but is included on a list of the top 30 fast-food and casual dining restaurants ranked by Quick Service Restaurant and Restaurants & Institutions in 2009 ($n = 12$). For these top restaurants, we coded each as fast food (e.g., McDonald’s), fast casual (e.g., Panera Bread), or full service (e.g., Chili’s Grill & Bar), based on a coding scheme developed for prior studies [13,14]. All other unnamed restaurants were grouped together as “small chain or independent restaurants.” All restaurants were coded by FoodAPS into a restaurant type (e.g., burger, Italian) based on classifications from InfoUSA. We made small changes to these classifications so that purchases from the same restaurant chain fell into the same category. For example, a McDonald’s located in an airport was recoded from “airport” to “burger.”

**Statistical analysis**

Survey procedures were used in all analyses to account for the complex sampling design (clusters, strata, and household weights). Survey-weighted means and frequencies were calculated to describe characteristics of restaurant purchases overall and by age of the consumer. To estimate the odds of purchasing an SSB or low-calorie beverage, these variables (binary measures for whether SSBs and low-calorie beverages were purchased or not) were regressed on characteristics of the person acquiring the purchase (age group, sex, race, ethnicity, BMI), characteristics of the household (poverty status, food security status, participation in SNAP or WIC, educational attainment of the primary respondent), and characteristics of the purchase (timing of purchase; whether it was intended for multiple meals; restaurant type: top fast-food chain, top fast casual chain, top full-service chain, or other restaurant; combination meal, number of items purchased, whether the purchase was shared, kids’ menu, or buffet). After examining the odds of purchasing an SSB, we examined...
| Age of person in household who acquired purchase | Overall, % (SE) | Children <12 y, % (SE) | Adolescents 12-19 y, % (SE) | Adults 20-39 y, % (SE) | Adults 40+ y, % (SE) |
|------------------------------|-----------------|-----------------------|-----------------------------|-----------------------|---------------------|
| Child (<12 y)                 | 0.6 (0.1)       | 5.8 (0.9)             | 0.2 (0.1)                   | 0.1 (0.1)             | 0.1 (0.05)          |
| Adolescent (12-19 y)          | 5.9 (0.6)       | 5.0 (4.0)             | 50.1 (2.7)                  | 0.3 (0.1)             | 0.1 (0.04)          |
| Adult (20-39 y)               | 36.3 (1.6)      | 58.4 (3.4)            | 16.5 (2.7)                  | 91.8 (0.8)            | 3.0 (0.3)           |
| Adult (40+ y)                 | 57.1 (1.3)      | 30.7 (2.8)            | 33.2 (3.4)                  | 7.8 (0.8)             | 96.8 (0.3)          |

| How purchase was consumed | Overall, % (SE) | Children <12 y, % (SE) | Adolescents 12-19 y, % (SE) | Adults 20-39 y, % (SE) | Adults 40+ y, % (SE) |
|----------------------------|-----------------|-----------------------|-----------------------------|-----------------------|---------------------|
| Intended for multiple meals| 0.6 (0.1)       | 0.7 (0.3)             | 1.0 (0.3)                   | 0.6 (0.2)             | 0.6 (0.1)           |
| Consumed solely by one person | 54.5 (0.9)       | 5.8 (0.7)             | 31.0 (2.4)                  | 52.2 (1.7)            | 51.4 (1.2)          |
| Shared with other people    | 45.4 (0.9)      | 94.2 (0.7)            | 69.0 (2.4)                  | 47.8 (1.7)            | 48.6 (1.2)          |
| Number of people who shared, mean (SE) | 1.7 (0.02)       | 3.2 (0.1)             | 2.3 (0.1)                   | 1.8 (0.04)            | 1.7 (0.02)          |

| Timing of purchasea       | Overall, % (SE) | Children <12 y, % (SE) | Adolescents 12-19 y, % (SE) | Adults 20-39 y, % (SE) | Adults 40+ y, % (SE) |
|----------------------------|-----------------|-----------------------|-----------------------------|-----------------------|---------------------|
| Breakfast                  | 14.6 (1.0)      | 10.2 (1.2)            | 7.9 (1.2)                   | 12.8 (1.1)            | 16.6 (1.0)          |
| Lunch                      | 38.3 (0.8)      | 31.5 (2.0)            | 34.7 (3.0)                  | 38.1 (1.0)            | 37.3 (1.2)          |
| Dinner                     | 33.4 (0.6)      | 47.6 (1.6)            | 46.1 (2.3)                  | 36.3 (1.1)            | 32.1 (0.9)          |
| Snack                      | 14.4 (0.5)      | 11.5 (1.3)            | 12.5 (1.4)                  | 13.4 (1.0)            | 14.6 (0.8)          |

| Purchase location         | Overall, % (SE) | Children <12 y, % (SE) | Adolescents 12-19 y, % (SE) | Adults 20-39 y, % (SE) | Adults 40+ y, % (SE) |
|----------------------------|-----------------|-----------------------|-----------------------------|-----------------------|---------------------|
| Non-top chain or independent restaurant | 42.5 (2.1) | 36.2 (3.8) | 33.5 (3.3) | 40.8 (2.6) | 45.1 (2.2) |
| Top fast-food chain restaurant | 44.7 (2.0) | 52.3 (3.1) | 55.8 (2.6) | 45.6 (2.3) | 41.8 (2.1) |
| Top fast casual chain restaurant | 6.1 (0.5) | 3.7 (0.9) | 3.5 (0.8) | 7.1 (0.7) | 5.6 (0.6) |
| Top full-service chain restaurant | 6.8 (0.5) | 7.8 (1.0) | 7.2 (1.2) | 6.5 (0.5) | 7.4 (0.6) |

| Restaurant type          | Overall, % (SE) | Children <12 y, % (SE) | Adolescents 12-19 y, % (SE) | Adults 20-39 y, % (SE) | Adults 40+ y, % (SE) |
|--------------------------|-----------------|-----------------------|-----------------------------|-----------------------|---------------------|
| Sandwich                 | 7.8 (0.4)       | 4.3 (0.7)             | 8.0 (0.7)                   | 8.1 (0.4)             | 7.3 (0.7)           |
| Steak house              | 1.3 (0.2)       | 2.3 (1.3)             | 1.8 (1.1)                   | 1.1 (0.3)             | 1.2 (0.2)           |
| Seafood                  | 1.6 (0.3)       | 0.9 (0.4)             | 1.6 (0.5)                   | 1.7 (0.6)             | 1.6 (0.2)           |
| Mexican                  | 8.4 (0.4)       | 7.8 (1.1)             | 8.3 (1.0)                   | 10.6 (0.8)            | 7.4 (0.5)           |
| Asian                    | 4.2 (0.4)       | 3.5 (0.7)             | 4.5 (0.8)                   | 5.5 (0.5)             | 4.0 (0.6)           |
| American                 | 12.4 (1.0)      | 11.0 (2.7)            | 10.4 (2.4)                  | 10.1 (0.6)            | 14.0 (1.3)          |
| European                 | 2.2 (0.3)       | 1.4 (0.3)             | 1.5 (0.5)                   | 2.0 (0.4)             | 2.6 (0.4)           |
| Pizza                    | 6.6 (0.4)       | 12.5 (1.4)            | 10.3 (1.4)                  | 7.9 (0.6)             | 5.9 (0.5)           |
| Chicken                  | 5.1 (0.5)       | 6.0 (0.8)             | 6.6 (1.0)                   | 5.6 (0.6)             | 4.7 (0.6)           |
| Burger                   | 28.6 (1.2)      | 34.8 (2.2)            | 34.8 (2.1)                  | 27.0 (1.4)            | 27.9 (1.3)          |
| Buffet                   | 0.9 (0.2)       | 1.0 (0.3)             | 1.2 (0.4)                   | 0.6 (0.1)             | 1.2 (0.3)           |
| Coffee/bakery            | 13.8 (1.1)      | 8.8 (0.9)             | 5.6 (0.9)                   | 14.0 (0.1)            | 14.2 (1.3)          |
| Otherb                   | 7.1 (0.6)       | 5.6 (0.9)             | 5.3 (1.3)                   | 5.8 (0.6)             | 8.0 (0.9)           |

| Menu type                | Overall, % (SE) | Children <12 y, % (SE) | Adolescents 12-19 y, % (SE) | Adults 20-39 y, % (SE) | Adults 40+ y, % (SE) |
|----------------------------|-----------------|-----------------------|-----------------------------|-----------------------|---------------------|
| Combination meal          | 16.7 (0.9)      | 25.6 (1.7)            | 22.8 (1.5)                  | 17.3 (1.2)            | 15.7 (1.1)          |
| Kids’ menu                | 1.6 (0.3)       | 5.9 (1.0)             | 1.2 (0.3)                   | 1.8 (0.3)             | 1.6 (0.4)           |
| Purchase includes a beverage | 64.4 (1.2)       | 65.6 (2.3)            | 62.8 (2.8)                  | 62.8 (0.8)            | 65.2 (1.6)          |
correlates of per capita beverage calories and sugar when a caloric beverage was purchased. We regressed per capita beverage calories and sugar on the independent variables (except variables indicating whether a meal was shared and the number of items purchased) and estimated predicted means using the postregression margins command in Stata. Stratified analyses by age of the consumer, household poverty, race, and ethnicity were also conducted. Analyses were weighted to be representative of the US population, and robust variance was estimated using Taylor linearization, which accounts for correlation of residuals between purchases within the same individual and household. Significance was assessed at \( P < 0.05 \). Analyses were conducted in Stata version 14 (StataCorp LLC, College Station, Texas) in 2018.

### Results

More than half of restaurant purchases came from top chain restaurants (58%), with 45% from top fast-food chains (Table 1). Most adult purchases were consumed alone, whereas the majority of child (94%) and adolescent (69%) purchases were shared with others. Overall, most purchases were acquired by an adult (93%), except among adolescents, who acquired about half of purchases they consumed. The most popular cuisines were burger restaurants (29% of purchases), followed by pizza restaurants among children and adolescents and coffee/bakery establishments among adults. On average, purchases contained 93 kcal and 20 g of sugar from beverages per capita. Nearly two-thirds (64%) of purchases contained a beverage. On average, one-third (34%) of purchases contained an SSB, and SSBs were more prevalent in purchases consumed by younger versus older consumers (48% of child and adolescent purchases, 38% of young adult purchases, and 30% of older adult purchases).

In adjusted models, the strongest correlates of purchasing an SSB or a low-calorie beverage were the age, race, and ethnicity of the individual acquiring the purchase; household food security status; and the characteristics of the restaurant (Table 2). Compared with older adults, young adults and adolescents were more likely to purchase SSBs (odds ratio = 1.5 [95% CI = 1.2, 1.8] and 2.6 [1.6, 4.4], respectively), and the odds of purchasing a low-calorie beverage decreased with age (0.1 [0.0, 0.3] comparing children with older adults). Purchases were half as likely to include a low-calorie beverage (0.4 [0.3, 0.6]) when acquired by a Black person compared with a White person, and 20% less likely to include a low-calorie beverage when acquired by a Hispanic versus non-Hispanic person (0.8 [0.6, 0.9]). Compared with food-secure households, the odds of purchasing an SSB were higher in households with marginal and low food security (1.3 [1.0, 1.6] and 1.5 [1.1, 2.1], respectively), and the odds of purchasing a low-calorie beverage were lower in households with very low food security (0.7 [0.5, 0.8]). Purchases at top fast-food chains were 1.9 times more likely to include an SSB (1.9 [1.6, 2.3]) and less likely to include a low-calorie beverage (0.6 [0.5, 0.8]) than purchases from small chain or independent restaurants. When purchases included a combination meal

### Table 1 (continued).

| Beverage type | Overall, % (SE) | Children <12 y, % (SE) | Adolescents 12-19 y, % (SE) | Adults 20-39 y, % (SE) | Adults 40+, % (SE) |
|---------------|----------------|------------------------|-----------------------------|------------------------|-------------------|
| Sugar-sweetened beverage | 33.7 (1.1) | 48.0 (2.3) | 48.0 (3.1) | 38.3 (1.4) | 29.6 (1.6) |
| Soft drink | 21.5 (1.0) | 37.1 (2.4) | 35.1 (3.9) | 25.1 (1.4) | 18.1 (1.0) |
| Fruit drink | 4.8 (0.3) | 7.9 (1.1) | 8.1 (0.8) | 5.8 (0.5) | 3.9 (0.5) |
| Sport/energy drink | 0.4 (0.1) | 0.6 (0.2) | 0.9 (0.4) | 0.6 (0.2) | 0.3 (0.1) |
| Sweetened tea | 9.6 (0.7) | 11.2 (1.7) | 11.3 (1.6) | 9.7 (0.7) | 9.8 (1.0) |
| Flavored milk | 0.5 (0.1) | 3.4 (0.7) | 0.5 (0.2) | 0.9 (0.2) | 0.3 (0.1) |
| Milk shake | 2.2 (0.2) | 3.6 (0.7) | 4.3 (0.7) | 1.8 (0.2) | 2.2 (0.3) |
| Sweetened coffee or coffee drink | 2.0 (0.2) | 1.3 (0.4) | 1.5 (0.4) | 2.9 (0.5) | 1.4 (0.2) |
| Unsweetened coffee and tea | 16.1 (1.1) | 6.4 (0.8) | 5.0 (1.1) | 11.0 (0.9) | 20.9 (1.7) |
| Water or seltzer | 9.6 (0.6) | 7.9 (0.8) | 8.1 (1.3) | 9.6 (1.0) | 10.0 (0.9) |
| Plain milk | 0.8 (0.1) | 2.8 (0.7) | 0.8 (0.4) | 0.5 (0.1) | 0.9 (0.2) |
| 100% juice | 2.0 (0.2) | 6.1 (1.1) | 2.1 (0.4) | 2.2 (0.2) | 1.9 (0.3) |
| Weight (g) | 370.3 (9.4) | 267.8 (12.9) | 359.1 (18.1) | 378.0 (10.7) | 356.2 (11.7) |
| Calories (kcal) | 92.5 (3.7) | 86.5 (4.9) | 115.1 (6.9) | 107.9 (5.0) | 76.1 (4.6) |
| Sugar (g) | 20.1 (0.8) | 19.3 (1.2) | 26.1 (1.6) | 23.2 (1.1) | 16.7 (1.0) |

Values representative of national population (n = 14,669). Standard errors (SE) account for sampling design.

Percentages do not add to 100 because purchases could be for multiple meals/snacks.

Includes specialty top restaurants (e.g., Jamba Juice) and restaurants of unspecified type.

Percentages do not add to 100 because purchases could contain more than one beverage and more than one sugar-sweetened beverage.
### TABLE 2 Correlates of purchasing sugar-sweetened beverage or noncaloric beverage at restaurants, US households, 2012-2013 ($n = 14,669$)

| Characteristics of person acquiring purchase | Sugar-sweetened beverage*<sup>a</sup>, OR (95% CI) | Low-calorie beverage*<sup>b</sup>, OR (95% CI) |
|---------------------------------------------|-----------------------------------------------|-----------------------------------------------|
| **Characteristics of person acquiring purchase** |                                              |                                              |
| Age                                         |                                              |                                              |
| Adult (40+ y)                               | ref                                          | ref                                          |
| Adult (20-39 y)                             | 1.5 (1.2, 1.8)**                             | 0.7 (0.5, 0.9)**                             |
| Adolescent (12-19 y)                        | 2.6 (1.6, 4.4)**                             | 0.4 (0.3, 0.7)**                             |
| Child (<12 y)                               | 1.8 (0.7, 4.9)                              | 0.1 (0.0, 0.3)**                             |
| Sex                                         |                                              |                                              |
| Male                                        | ref                                          | ref                                          |
| Female                                      | 0.9 (0.7, 1.0)                              | 1.1 (0.9, 1.4)                              |
| Race                                        |                                              |                                              |
| White                                       | ref                                          | ref                                          |
| Black                                       | 1.1 (0.9, 1.3)                              | 0.4 (0.3, 0.6)**                             |
| Other race                                  | 0.8 (0.7, 0.9)**                             | 0.9 (0.7, 1.1)                              |
| Hispanic                                    |                                              |                                              |
| No                                          | ref                                          | ref                                          |
| Yes                                         | 1.1 (0.9, 1.3)                              | 0.8 (0.6, 0.9)**                             |
| BMI category                                |                                              |                                              |
| No overweight                               | ref                                          | ref                                          |
| Overweight                                  | 1.0 (0.8, 1.2)                              | 1.2 (1.0, 1.5)                              |
| Obesity                                     | 1.1 (0.9, 1.4)                              | 1.1 (0.9, 1.4)                              |
| **Characteristics of household**            |                                              |                                              |
| Educational attainment                      |                                              |                                              |
| <High school                                | ref                                          | ref                                          |
| High school grad                            | 1.0 (0.7, 1.3)                              | 1.2 (0.8, 1.7)                              |
| >High school                                | 0.8 (0.7, 1.1)                              | 1.0 (0.7, 1.5)                              |
| Poverty status                              |                                              |                                              |
| 185% + FPL                                  | ref                                          | ref                                          |
| 100%-184% FPL                               | 1.1 (0.9, 1.4)                              | 0.9 (0.6, 1.2)                              |
| <100% FPL                                   | 1.0 (0.7, 1.3)                              | 0.9 (0.7, 1.2)                              |
| Food security status                        |                                              |                                              |
| Food secure                                 | ref                                          | ref                                          |
| Marginal food security                      | 1.3 (1.0, 1.6)*                             | 0.7 (0.5, 1.0)                              |
| Low food security                           | 1.5 (1.1, 2.1)*                             | 0.8 (0.5, 1.3)                              |
| Very low food security                      | 1.2 (0.9, 1.5)                              | 0.7 (0.5, 0.8)**                             |
| Food assistance participation              |                                              |                                              |
| SNAP                                        | ref                                          | ref                                          |
| Yes                                         | 1.0 (0.8, 1.2)                              | 0.7 (0.6, 0.8)**                             |
| WIC participant                             |                                              |                                              |
| No                                          | ref                                          | ref                                          |
| Yes                                         | 1.3 (0.9, 1.8)                              | 0.8 (0.6, 1.1)                              |
| **Characteristics of purchase**             |                                              |                                              |
| Restaurant type                             |                                              |                                              |
| Small chain or independent restaurant       | ref                                          | ref                                          |
| Top fast-food chain                         | 1.9 (1.6, 2.3)**                            | 0.6 (0.5, 0.8)**                            |
| Top fast casual chain                       | 1.0 (0.8, 1.4)                              | 1.5 (1.1, 2.1)*                             |
| Top full-service chain                      | 1.1 (0.8, 1.4)                              | 1.2 (0.9, 1.7)                              |
or kids’ menu items, they were more than twice as likely to include an SSB (2.8 [1.3, 3.3] and 2.1 [1.2, 3.4], respectively).

Caloric beverages purchased by adolescents and young adults contained significantly more calories (214 and 188 vs. 137, respectively) and grams of sugar (47 and 40 vs. 30, respectively) than those purchased by older adults (Table 3). Caloric beverages purchased by Black people contained significantly more calories (195 vs. 158) and grams of sugar (45 vs. 34) than those purchased by White people, and purchases by Hispanic people contained more calories (176 vs. 158) and grams of sugar (38 vs. 34) than those by non-Hispanic people. Compared with food-secure households, households with marginal and very low food security purchased more beverage calories (172 and 179 vs. 154, respectively). Purchases were highest in beverage calories when purchased from a top fast-food or fast casual chain compared with a small chain or independent restaurant (191 and 173 vs. 121, respectively) and were lower in calories when items were ordered from the kids’ menu (129 vs. 161).

In subgroup analyses, there were no meaningful differences in the effect of the restaurant (e.g., restaurant type) on beverage choice across income, age of consumer, race or ethnicity, but there were marked differences across race and ethnicity by age (Figure 2). The highest amount of beverage calories (261 kcal) per capita was purchased by non-Hispanic Black adolescents, who purchased significantly more than non-Hispanic Black children (132 kcal) and non-Hispanic White adolescents (206 kcal).

**Discussion**

Households included in this study purchased large amounts of calories and sugar from beverages in US restaurants, with marked differences by race, ethnicity, household food security, and restaurant type. More than one-third of purchases consumed by adults and half of those consumed by children included an SSB. Restaurant purchases contained an average of 93 calories and 20 g of sugar from beverages per capita—approximately the amount of calories and sugar in an 8-oz can of soda. Consistent with the most recent literature on SSB consumption, Black and Hispanic individuals purchased more beverage calories and grams of sugar per capita than White individuals, with the highest amounts of calories and sugar purchased by non-Hispanic Black adolescents and young adults (4). Households with very low food security purchased more beverage calories and grams of sugar than food-secure households—findings that align with prior studies showing a correlation between food security and diet quality (30). These disparities are particularly notable given the disproportionately higher risk of obesity and chronic disease among food-insecure, Black, and Hispanic adults (31-34).

Another important finding was the strong correlation between aspects of the restaurant and SSB purchases. Purchases from top fast-food chain restaurants (compared with smaller chain or independent restaurants) were nearly twice as likely to include an SSB and half as likely to include a low-calorie beverage. Further, per capita beverage calories and sugar were highest among purchases from top fast-food chain restaurants compared with other restaurant types. Promotions within the restaurant also influenced beverage choice. Specifically, purchasing a combination meal increased the odds of selecting an SSB by 2.8 times, and purchasing items from the kids’ menu doubled the odds of selecting an SSB. These results are similar to those from a study of adults dining at fast-food restaurants in New York and New Jersey, which found that ordering a combination meal was associated with both a higher risk of ordering an SSB and with purchasing more beverage calories per order (27).

There are some notable limitations to this study. First, in shared meals, beverages could not be linked to the individual who consumed them. For purchases intended for one person only, it is unknown whether the entire beverage or only a portion was consumed. Second, although product bar codes were scanned for food-at-home purchases, reporting of chain restaurant purchases largely relied on self-report, which is subject to recall bias. Third, although this study is based on the most recently released FoodAPS data, these data were collected in 2012 to 2013, which could make findings outdated if consumer dining patterns have undergone a significant shift over the past 5 years. Lastly, this is a cross-sectional study, so we cannot determine the direction of associations (i.e., whether attributes of top fast-food chain restaurants
### TABLE 3 Predicted mean per capita beverage calories and sugar and 95% CI from purchases containing caloric beverage, US households, 2012-2013 (n = 8,335)

| Characteristics of person acquiring purchase | Calories (kcal) per capita per purchase, predicted mean (95% CI) | Sugar (g) per capita per purchase, predicted mean (95% CI) |
|---------------------------------------------|---------------------------------------------------------------|-----------------------------------------------------------|
| **Age**                                     |                                                               |                                                           |
| Adult (40+ y) (ref)                         | 137 (125, 150)                                                | 30 (28, 33)                                               |
| Adult (20-39 y)                             | 188 (175, 201)***                                            | 40 (38, 43)***                                            |
| Adolescent (12-19 y)                        | 214 (205, 224)***                                            | 47 (45, 49)***                                            |
| Child (<12 y)                               | 172 (134, 210)                                                | 36 (26, 46)                                               |
| **Sex**                                     |                                                               |                                                           |
| Male (ref)                                  | 161 (150, 172)                                                | 36 (33, 38)                                               |
| Female                                      | 159 (148, 171)                                                | 34 (32, 37)                                               |
| **Race**                                    |                                                               |                                                           |
| White (ref)                                 | 158 (149, 168)                                                | 34 (32, 36)                                               |
| Black                                       | 195 (176, 214)***                                            | 45 (41, 49)***                                            |
| Other race                                  | 142 (126, 159)*                                              | 32 (28, 36)                                               |
| **Hispanic**                                |                                                               |                                                           |
| No (ref)                                    | 158 (149, 167)                                                | 34 (32, 36)                                               |
| Yes                                         | 176 (158, 194)*                                              | 38 (35, 41)*                                              |
| **BMI category**                            |                                                               |                                                           |
| No overweight (ref)                         | 164 (150, 178)                                                | 36 (33, 39)                                               |
| Overweight                                  | 156 (140, 172)                                                | 34 (30, 38)                                               |
| Obesity                                     | 160 (145, 176)                                                | 34 (31, 37)                                               |
| **Characteristics of household**            |                                                               |                                                           |
| Educational attainment                      |                                                               |                                                           |
| <High school (ref)                          | 157 (131, 183)                                                | 35 (29, 41)                                               |
| High school grad                            | 160 (147, 174)                                                | 35 (32, 38)                                               |
| >High school                                | 160 (150, 171)                                                | 35 (32, 37)                                               |
| Poverty status                              |                                                               |                                                           |
| 185% + FPL (ref)                            | 159 (148, 170)                                                | 34 (32, 37)                                               |
| 100%-184% FPL                               | 164 (149, 179)                                                | 37 (33, 41)                                               |
| <100% FPL                                   | 165 (147, 183)                                                | 37 (32, 41)                                               |
| **Food security status**                    |                                                               |                                                           |
| Food secure (ref)                           | 154 (142, 166)                                                | 34 (31, 36)                                               |
| Marginal food security                      | 172 (159, 185)*                                              | 37 (34, 40)                                               |
| Low food security                           | 188 (154, 222)                                                | 38 (35, 41)                                               |
| Very low food security                      | 179 (160, 198)*                                              | 40 (35, 44)*                                              |
| **Food assistance participation**           |                                                               |                                                           |
| SNAP                                        |                                                               |                                                           |
| No (ref)                                    | 160 (150, 169)                                                | 35 (33, 37)                                               |
| Yes                                         | 168 (151, 184)                                                | 37 (34, 41)                                               |
| WIC participant                             |                                                               |                                                           |
| No (ref)                                    | 160 (151, 169)                                                | 35 (33, 37)                                               |
| Yes                                         | 161 (138, 184)                                                | 36 (31, 42)                                               |
| **Characteristics of purchase**             |                                                               |                                                           |
| Restaurant type                             |                                                               |                                                           |
| Non-top chain (ref)                         | 121 (108, 134)                                                | 26 (23, 29)                                               |
influence consumer beverage choices or whether people go to top fast-food chain restaurants because they intend to purchase an SSB. Strengths of this study include a nationally representative weighted sample of households and detailed information about the restaurant and purchase. To our knowledge, this is the first study to describe household restaurant purchases on a national scale.

Results from this study could help target policy changes and voluntary programs aimed at reducing disparities in SSB consumption in the restaurant setting. For example, this study found higher purchases of beverage calories and sugar among food-insecure households. There is growing momentum around beverage taxes, which may increase the price of SSB calories in restaurants and reduce SSB purchases, particularly among low-income adults (although income is not perfectly correlated with food insecurity, the two are closely related). Evidence from Mexico (1-peso/L tax) found a 7.6% decline in SSB purchases after 2 years, with larger reductions among the lowest-income households (35), and evidence from Berkeley, California, (1-cent/oz tax) found a 21% reduction in SSB consumption in low-income neighborhoods 4 months after implementation (22). Second, in this study, SSBs were more likely to be purchased with combination meals, likely because SSBs are offered with these meals as the default option, are heavily advertised on menu boards, and are value priced to encourage larger portions. These findings suggest that policies requiring restaurants to offer only healthy beverages as the default option in combination meals instead of SSBs may encourage no-calorie or low-calorie choices. This hypothesis is supported by behavioral research, which shows that consumers strongly favor the status quo and will tend to select the default or automatic option (36,37).

Future research is needed to understand the causal relationship between the restaurant environment and beverage choice, and recent changes in the market for SSBs and other sugary drinks. Additional studies could also examine the impact of interventions targeting household purchases in the restaurant setting, such as menu labeling or taxes on sugary beverages. Understanding the factors that influence consumer choices at the restaurant level is crucial for developing effective policies to reduce SSB consumption and improve public health.
to local policy offer opportunities for natural experiments to study the influence of price changes and healthy defaults on restaurant beverage selection. For example, beverage taxes apply to beverages served in chain restaurants, but real-world studies of the effect of these taxes on restaurant pricing and consumer selection are lacking. As a second example, more than 10 cities and counties have adopted healthy default beverage ordinances, but it is unclear how such ordinances influence child drink selection and consumption. In the meantime, findings from this study can help to estimate the potential public health impact of popular policy options and highlight aspects of the restaurant environment, such as combination meals and kids’ menus, that are ripe for policy action.

### Conclusion

Adults and children purchase a considerable amount of SSBs from the nation’s largest chain restaurants. This is particularly true in top fast-food chains, when combination meals are ordered, when items are ordered from the kids’ menu, and for individuals who are racial/ethnic minorities or food insecure. Understanding how recent policy and programmatic efforts to reduce SSB consumption may influence purchases in the restaurant setting is a key area of future inquiry.

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