



# Deal or no deal? The prevalence and nutritional quality of price promotions among U.S. food and beverage purchases



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## ARTICLE INFO

### Article history:

Received 24 February 2017

Received in revised form

27 June 2017

Accepted 8 July 2017

Available online 10 July 2017

### Keywords:

Price promotions

Food marketing

Food costs

Nutrition

Packaged foods

## ABSTRACT

**Objective:** This study examines trends in the prevalence of price promotions among packaged food and beverage purchases, differences in prevalence by household race/ethnicity or income, and the association between price promotions and the nutritional profile of purchases.

**Design:** This cross-sectional study utilizes a dataset of 90 million purchases from 38,744 (2008) to 45,042 (2012) US households in 2008–2012. Chi-square tests were used to examine whether the proportion of purchases with price promotions changed over time or differed by household race/ethnicity or income. T-tests were used to compare purchased products' nutritional profiles.

**Results:** Prevalence of price promotions among packaged food and beverage purchases increased by 8% and 6%, respectively, from 2008 to 2012, with both reaching 34% by 2012. Higher-income households had greater proportions of purchases with price promotions than lower-income households. Asian households had the highest proportion of purchases with any price promotion, followed by non-Hispanic whites. While total price-promoted packaged food purchases had higher mean energy, total sugar, and saturated fat densities than purchases with no price promotions, absolute differences were small.

**Conclusions:** Prevalence of price promotions among US household purchases increased from 2008 to 2012 and was greater for higher-income households. No clear associations emerged between presence of price promotions and nutritional quality of purchases.

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## 1. Introduction

The low cost of unhealthy foods and beverages has often been cited as a driver of the current obesity epidemic in the United States (Drewnowski & Specter, 2004; Drewnowski & Darmon, 2005; Powell & Chaloupka, 2009). Price promotions, in particular — including coupons or temporary discounts on products — incentivize consumers to purchase a food or beverage more quickly, more often, and in greater volume (Hawkes, 2009). Children and adults respond strongly to price promotions on both healthy and less-healthy foods in the theoretically expected direction (i.e., lowering prices increases consumer demand) (Andreyeva, Long, & Brownell, 2010; Epstein, Dearing, Handley, Roemmich, & Paluch,

2006a; Epstein et al., 2006b). Despite strong evidence linking price promotions to food choice, no studies have yet examined the prevalence of price promotions among US household food purchases or whether this prevalence has changed over time. More importantly, it is currently unknown whether price promotions are more prevalent among purchases of less healthy items such as sugar-sweetened beverages, salty snacks, or desserts compared to healthier purchases like fruits and vegetables. It is also currently unclear whether a product having a price promotion is associated with poorer nutritional quality relative to similar products that do not have price promotions.

Furthermore, no studies have examined whether the prevalence of purchases with price promotions varies by socio-economic status (SES) or by race/ethnicity. Some evidence suggests that lower-SES groups may respond uniquely to price promotions (Hoch, Kim, Montgomery, & Rossi, 1995; Glanz, Bader, & Iyer, 2012; Walters & Jamil, 2002). For example, some studies suggest that

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the link between price, diet, and weight outcomes is stronger in lower-SES populations (Powell & Chaloupka, 2009; Beydoun, Powell, & Wang, 2008), who tend to be more cost-conscious (Steenhuis, Waterlander, & de Mul, 2011) and more likely to take advantage of price promotions (Walters & Jamil, 2002). Conversely, other research finds that lower-SES consumers are not more responsive to price cuts than higher-SES consumers (Blakely et al., 2011; Bartlett, 1964; Huang & Lin, 2000; Park, Holcomb, Raper, & Capps, 1996; Gould, Cox, & Perali, 1990). Understanding whether the prevalence of purchases with price promotions varies by race/ethnicity and SES could inform future programs or policies seeking to reduce diet-related disparities in these groups, who often face greater barriers to achieving a nutritious diet.

Using a dataset of household food and beverage purchases among US households with children aged 2–18 years, this study aims to 1) describe the prevalence of price promotions among household food and beverage purchases, overall and by key food groups; 2) examine whether SES or race/ethnicity is associated with likelihood of purchasing products with price promotions; and 3) characterize the association between price promotions and the nutritional profile of purchases.

## 2. Methods

### 2.1. Dataset

This study uses data from the Information Resources, Inc. (IRI) Consumer Network panel (IRI, Chicago, IL). The dataset consists of data from households with children and adolescents aged 2–18 years, from 2008 to 2012 (Muth et al., 2016). Participating households scan barcodes on all packaged food and beverage purchases, gathering information on volume, price, retailer, and date of each purchase.

To gather data on price promotions, households are asked upon scanning a product whether or not they received a price reduction on that item. If they answer, “Yes,” the scanner prompts them to qualify the reduction as one of the following: a store sale (e.g., a temporary price reduction or a loyalty card discount offered by the particular store), a store coupon, a manufacturer coupon, or “other sale” (another type of discount such as senior citizen or employee). For coupons, the household enters the value of the coupon. For the purposes of this study, price promotions were classified as either coupons (combining store coupons and manufacturer coupons) or deals (combining store sales and other sales).

Finally, purchase data from these scans is linked to IRI's product dictionary information database containing each product's nutritional data from the nutrition facts panel (NFP) as well as any product claims made on the front of the package (Muth et al., 2016). This allows for examination of the relative nutritional value of purchased products with and without price promotions.

The dataset contains 90,046,893 purchases from 2008 to 2012, of which 97% had NFP information for calories, 97% for sugars, 94% for total fat and 97% for sodium. All purchases contained information on whether a price promotion was present. With the exception of purchases from fruit and ready-to-eat cereal subgroups, purchases with price promotions were 4%–34% less expensive than those without price promotions in 2012 (Supplemental Table 1).

More information about IRI's data collection methods and detailed household characteristics can be found in the USDA Economic Research Service bulletin, “Understanding IRI Household-Based and Store-Based Scanner Data” (Muth et al., 2016).

### 2.2. Food categorization

In addition to examining total packaged food and ready-to-drink

(RTD) beverage purchases (i.e., beverages that are ready to consume upon purchase as opposed to requiring preparation), packaged foods and beverages were grouped into modules according to where they are found in the supermarket and aggregated to create meaningful food and beverage subgroups reflecting nutritional content as well as how the products are typically consumed. Key food subgroups included grain- and dairy-based desserts, ready-to-eat (RTE) cereals, salty snacks, sweet snacks, fruits (frozen, fresh, dried and canned), and vegetables (frozen, fresh, and canned). Beverage subgroups included soda, RTD juice and juice drinks, RTD dairy beverages, lower-calorie carbonated soft drinks (“diet soda”), and RTD sports, energy, tea and coffee drinks) (Supplemental Table 2).

#### 2.2.1. Socio-demographic variables

Socio-economic status was determined using reported household income from the IRI data and grouped into low-, middle-, or high-SES based on the Federal Poverty Level ( $\leq 135\%$ , 136–300%,  $>300\%$ , respectively). Self-reported household race/ethnicity was grouped into four mutually exclusive categories: non-Hispanic White, non-Hispanic Black, Hispanic, and non-Hispanic other.

#### 2.2.2. Statistical analyses

Data management and computing were performed using Microsoft Sql Server 2014 (Microsoft Corporation, Redmond, WA). Statistical analysis was conducted using Matlab (Version 2014b; MathWorks, Natick, MA) and Microsoft Excel 2013 (Microsoft Corporation, Redmond, WA). First, the number and proportion of all packaged foods and beverages purchased with price promotions from 2008 to 2012 was examined using chi-square tests to determine whether the proportion of all purchases with price promotions changed over time. Next, pooled purchases from 2008 to 2012 were examined using *t*-tests (with statistical significance achieved at  $P < 0.01$ ) to determine mean nutrient density (kJ or kcal of energy, g total sugar, g saturated fat, and mg sodium per 100 g) for each type of price promotion as well as any price promotion vs no promotion. Finally, chi-square tests were used to examine whether the proportion of purchases with price promotions varied by SES or race/ethnicity. All tests were Bonferroni-corrected for multiple testing.

## 3. Results

### 3.1. Overall trends

From 2008 to 2012, prevalence of price promotions among purchases increased from 25% to 33% for packaged foods and 28%–34% for RTD beverages. Deals were more prevalent than coupons for both foods and beverages (30% vs 10% for foods, and 31% vs 8% for beverages in 2012) (Fig. 1).

Prevalence of purchases with price promotions increased from 2008 to 2012 for all packaged food and RTD beverage subgroups (Supplemental Fig. 1). The highest proportions of price promotions were seen for RTE cereal purchases among foods (45% in 2012) and lower-calorie carbonated soft drink purchases among beverages (48% in 2012). The greatest relative increase in price promotion prevalence from 2008 to 2012 occurred in sports, energy, tea, and coffee drinks purchases (+12.7% more purchases) among beverages. The greatest increases for foods were among sweet snack and RTE cereal purchases (+10.3%) and grain- and dairy-based dessert purchases (+9.1%).

Purchases of fruits (+5.7 percentage points) and vegetables (+5.0 percentage points) among foods and RTD dairy-based beverages (+1.6 percentage points) saw the lowest relative growth from 2008 to 2012 in price promotion prevalence.

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