



No Fat, No Sugar, No Salt . . . No Problem? Prevalence of “Low-Content” Nutrient Claims and Their Associations with the Nutritional Profile of Food and Beverage Purchases in the United States



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ABSTRACT

Background Nutrient claims are a commonly used marketing tactic, but the association between claims and nutritional quality of products is unknown. The objective of this study was to examine trends in the proportion of packaged food and beverage purchases with a nutrient claim, whether claims are associated with improved nutritional profile, and whether the proportion of purchases with claims differs by race/ethnicity or socioeconomic status.

Methods This cross-sectional study examined nutrient claims on more than 80 million food and beverage purchases from a transaction-level database of 40,000 US households from 2008 to 2012. χ^2 Tests were used to examine whether the proportion of purchases with a low/no-content claim changed over time or differed by race/ethnicity or household socioeconomic status. Pooled transactions were examined using *t*-tests to compare products' nutritional profiles overall and by food and beverage group.

Results Thirteen percent of food and 35% of beverage purchases had a low-content claim. Prevalence of claims among purchases did not change over time. Low-fat claims were most prevalent for both foods and beverages (10% and 19%, respectively), followed by low-calorie (3% and 9%), low-sugar (2% and 8%), and low-sodium (2% for both) claims. Compared to purchases with no claim, purchases with any low-content claim had lower mean energy, total sugar, total fat, and sodium densities. However, the association between particular claim types and specific nutrient densities varied substantially, and purchases featuring a given low-content claim did not necessarily offer better overall nutritional profiles or better profiles for the claimed nutrient, relative to products without claims. In addition, there was substantial heterogeneity in associations between claims and nutrient densities within food and beverage groups.

Conclusions Variations in nutrient density by claim type and food and beverage group suggests that claims may have differential utility for certain foods or nutrients and, in some cases, may mislead about the overall nutritional quality of the food.

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IN RECENT YEARS, MANY STRATEGIES TO REDUCE obesity have focused on improving the food retail environment,¹ including how foods are marketed to consumers.^{2,3} A wealth of literature has examined food

advertising, front-of-package logos, and other industry- and retailer-led initiatives to encourage healthier consumer choices, but few studies have explored the role of one common marketing strategy—nutrient content claims—and how these can relate to the nutritional profile of what consumers buy and eat. Shoppers' responses to products with nutrient content claims and the dietary implications of buying and consuming those products may be of particular interest for households with children, as the public health community continues to research ways to improve children's diets and health outcomes, particularly with regard to childhood obesity.

Nutrient content claims—defined as any claims that characterize the level of a nutrient in a food, such as “low-sugar”

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or “high-fiber”⁴—can alter consumer perceptions, knowledge, and behaviors.^{5–7} A 2006 to 2007 Food Label and Package survey found that 53% of all packaged foods and beverages in the United States had nutrient content claims.⁸ Another 2010 study examined 56,900 products in six stores in North Dakota and found that 49% had some form of nutritional marketing; of these, nutrient claims were the most prevalent, representing 76% of products with nutritional marketing.⁵ Although these studies quantify the overall prevalence of nutrient content claims in the US food supply as well as the most common claim types found on different foods, no study to date has examined the prevalence of such claims among actual purchases or described the nutritional profile of foods purchased with and without nutrient claims. Understanding the prevalence of these claims among food purchases is critical, as this reflects not only what is in the food supply, but also the degree to which US households buy (and ostensibly consume) these foods and beverages.

One key question is whether the prevalence of low-content claims (eg, low-fat, reduced sodium, cholesterol-free) in particular has increased as the food industry responds to growing consumer health-consciousness and concern with weight maintenance. For example, intake of products containing low-calorie sweeteners has increased dramatically in recent decades,^{9,10} possibly in response to increased concerns about adverse health effects linked to excess sugar intake. Also of interest is whether products with low-content claims are more commonly purchased from certain food groups (eg, grain-based desserts vs fruit), or whether these purchases have better nutritional profiles than those without a claim. It is possible that rather than identifying a healthy food or beverage choice, low-content claims simply indicate “less-unhealthy” products within a category of unhealthy foods.

Finally, some research suggests that certain subpopulations may be uniquely responsive to on-package marketing claims or nutrition information. For example, a 2010 experimental study of the United Kingdom’s traffic-light food labeling system demonstrated heterogeneity by socioeconomic status (SES) in consumers’ attitudes and responses.¹¹ Studies have also shown that customers with higher educational attainment report higher usage of food labels.^{12,13} No research has yet examined whether race/ethnic minorities or low-SES consumers are more or less likely to purchase foods and beverages with low-content nutrient claims. Given disparities in diet and health in the United States, understanding demographic differences in the prevalence of low-content claim purchases and whether these claims are associated with improved nutritional quality of purchases could help inform future policies or programs.

The objective of this study is to describe, among households with children aged 2 to 18 years, the prevalence of packaged food and beverage purchases containing low-content nutrient claims, characterize the association between these claims and the nutritional profile of purchases, and examine whether low-SES or race/ethnic minorities are more likely to purchase products with these claims.

METHODS

This study uses a commercial dataset of household food purchases from the IRI (Information Resources, Inc) Consumer

Network panel.¹⁴ This consists of data from households with children and adolescents aged 2 to 18 years and their household food purchases from 2008 to 2012.¹⁵ Participants use a handheld scanner to scan barcodes on all packaged foods and beverages purchased. Information gathered for each purchase includes volume, price, retailer, and date of purchase. For random-weight and loose products, such as fresh produce, meats, and baked goods, IRI provides booklets of barcodes for households to scan, and quantity or volume is computed based on price paid by the customer and the known mean price per unit of each product.

IRI also maintains a database of product dictionary information, obtained by visual examination and coding of product image scans.¹⁵ This includes, for most products, nutritional data from the Nutrition Facts label and any product claims made on the front of the package. Product claims data may be either nutrient content claims, such as “no,” “low,” or “less” of a nutrient, or functional claims (relating to a nutrient or component promoting or maintaining health or reducing disease). For the purpose of this study, only low-nutrient and no-nutrient claims were considered, including “low in,” “reduced,” or “no”/“free of” nutrients, such as calories, fat, sodium, and sugar.

Purchasing data from household scans is linked to products’ nutritional values and nutrient claims from the product dictionary information database, allowing examination of changes in purchasing patterns for products with or without claims, as well as evaluation of the relative nutritional value of purchased products featuring claims. The data set contains 90,046,893 transactions (purchases) from 2008 to 2012, of which 97% had Nutrition Facts label information for calories, 96% for sugars, 93% for total fat, and 97% for sodium. For low-nutrient claim analyses, only transactions with non-missing nutrient claim values were included (89% of the total transactions available, or 80,038,247 transactions). More information about IRI’s data collection methods and detailed household characteristics can be found in the US Department of Agriculture’s Economic Research Service bulletin, “Understanding IRI Household-Based and Store-Based Scanner Data.”¹⁵

It was determined by the Office of Human Research Ethics that this study does not constitute human subjects research as defined under federal regulations and does not require Institutional Review Board approval.

Food Groupings

Packaged foods and beverages are grouped into modules according to their location in the supermarket. For this study, aggregated modules were used to create meaningful food groups reflecting nutritional content, as well as how foods are actually consumed. Key food groups of interest included total packaged food purchases and total packaged ready-to-drink (RTD) beverages (ie, beverages that are ready to consume as opposed to requiring preparation). Key beverage groups examined separately included soda, juice and juice drinks, dairy beverages, lower-calorie carbonated soft drinks (“diet soda”), and other (including sport, energy, tea, and coffee drinks). Food groups included grain-based and dairy-based desserts, salty snacks, sweet snacks, fruits (frozen, fresh, dried, and canned), and vegetables (frozen, fresh, and canned) (Figure 1).

Packaged Foods	Examples
Grain- and dairy-based desserts	Cookies, pies, cakes, cheesecakes, puddings, ice creams
Sweet snacks	Yogurt-coated snacks, chocolate-covered pretzels, granola bars
Salty snacks	Dried meat snacks, microwave popcorn, chips
Ready-to-eat cereals	Cold breakfast cereals
Fruits (frozen, fresh, dried, canned)	Dried apples, frozen peaches, canned peaches, figs
Vegetables (frozen, fresh, and canned)	Frozen peas, canned green beans, kale
Ready-to-Drink Beverages	Examples
Soda	Carbonated soft drinks
Lower-calorie carbonated soft drinks	Low-sugar, low-calorie carbonated beverages, diet sodas, soda waters
Ready-to-drink juice and juice drinks	Apple juice, fruit drinks, nectars, fruit smoothies
Ready-to-drink dairy-based beverages	Plain milk, flavored milks, yogurt drinks
Ready-to-drink sport, energy, tea, and coffee drinks	Energy drinks, energy shots, sport quenchers, isotonic drinks, bottled iced teas, bottled lattes

Figure 1. Aggregate packaged food and ready-to-drink (ie, ready to consume upon purchasing) beverage groups and product examples from the 2008 to 2012 IRI Consumer Network panel, which categorizes packaged foods and beverages into modules according to their location in the supermarket. For this study, aggregated modules were used to create meaningful food and beverage groups reflecting nutritional content as well as how foods are actually consumed.

This study presents analyses of low-content nutrient claims for total packaged food and total packaged beverage purchases, providing information on overall prevalence of these types of claims among US household purchases, as well as a generalized understanding of whether these claims are associated with differences in nutritional density. Meanwhile, analysis by specific food and beverage group provides more detailed information on how the prevalence of low-content nutrient claims varies across categories. These food and beverage group analyses are also important for understanding how low-content nutrient claims are associated with nutritional characteristics of foods and beverages, because these associations may vary across category.

Sociodemographic Variables

SES was determined based on reported household income and grouped into low-, middle-, or high-SES based on the federal poverty level ($\leq 135\%$, 136% to 300% , and $>300\%$, respectively). Race/ethnicity was grouped into four mutually exclusive categories based on self-report: non-Hispanic white, non-Hispanic black, Hispanic, Asian, and non-Hispanic other.

Statistical Analyses

Data management and computing were performed using Microsoft SQL Server 2014¹⁶ (Microsoft Corporation). Statistical analysis was conducted using Matlab¹⁷ (Version 2014b, MathWorks) and Microsoft Excel 2013¹⁸ (Microsoft Corporation). First, the total number and proportion of transactions with low-content claims from 2008 to 2012 for total packaged foods and beverages, as well as select food and beverage groups, were determined using χ^2 tests to examine whether the proportion of transactions with these claims changed

over time. Transactions were then pooled from 2008 to 2012, and χ^2 tests were used to examine whether the proportion of total food and beverage packages with nutrient claims varied by SES or race/ethnicity. Using the pooled 2008 to 2012 data, mean nutrient density (kilocalories of energy, grams of total sugar, grams of total fat, and milligrams of sodium per 100 grams) was compared for each type of nutrient claim and any nutrient claim vs no nutrient claim for total packaged food and beverage purchases, as well as by food and beverage group, using t -tests with statistical significance achieved at $P < 0.05$. All tests were Bonferroni-corrected for multiple testing.

RESULTS

Overall Trends

There was no significant change in the proportion of purchases with any type of low/no-nutrient claim from 2008 to 2012 for foods or beverages (Figure 2). In 2012, 13% of food purchases had any low/no-nutrient claim, with low-fat being the most prevalent at 10%. Also in 2012, 35% of RTD beverages had a low/no-nutrient claim, with the most prevalent being low-fat (19%) as well, followed by low-calorie (9%) and low-sugar (8%).

Race/Ethnicity and SES

There were very few differences by race/ethnicity with regard to the prevalence of food purchases with any nutrient claim (Figure 3). For beverages, however, non-Hispanic whites had the highest prevalence of purchases with any claim (37.4%) compared with non-Hispanic blacks (24.6%), Hispanics (32.0%), non-Hispanic other (31.4%), or Asians (34.7%), driven

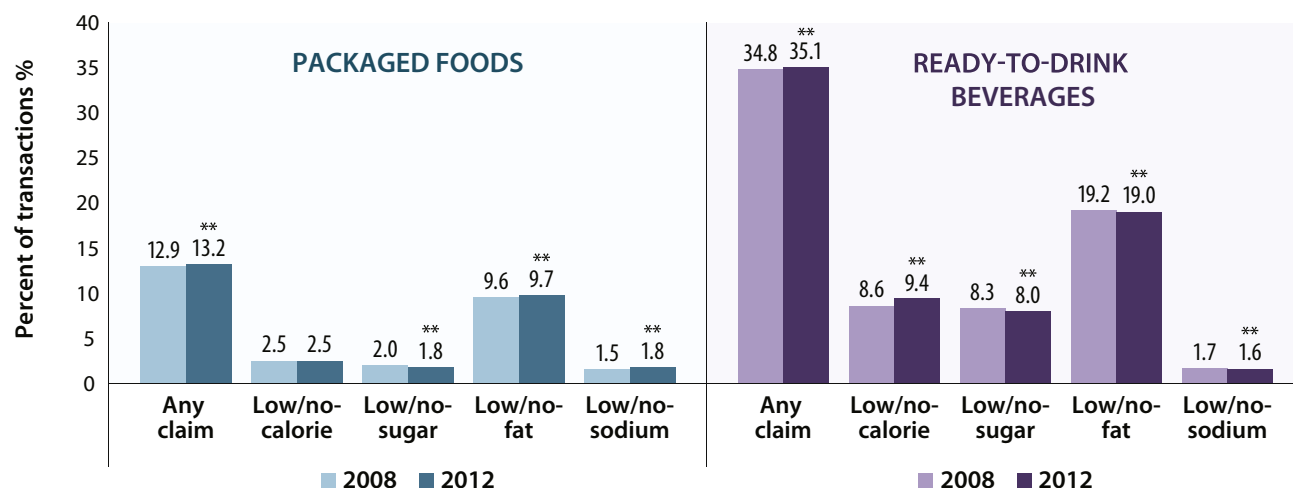


Figure 2. Overall trends in mean per capita percent of IRI Consumer Network panel purchases with low/no-content nutrient claims from 2008 to 2012 ($n=80,038,247$ purchases). ** $P<0.01$ for 2012 vs 2008.

primarily by a higher prevalence of low-fat beverage purchases ($P<0.01$ for each comparison).

A clear socioeconomic gradient emerged with regard to proportion of purchases bearing low/no-content nutrient claims (Figure 3). Middle- and high-SES households were more likely to purchase both foods and beverages with a nutrient claim relative to low-SES households ($P<0.01$), primarily due to a higher proportion of purchases with a low-fat claim.

Nutritional Density

Relative to purchases with no nutrient claim, packaged food purchases with any nutrient claim had lower mean energy density (-96.7 kcal/100 g or -32.2%), total sugar density (-1.6 g/100 g or -11.3%), total fat density (-6.9 g/100 g or -52.5%), and sodium density (-342.3 mg/100 g or -49.8%) than did products with no claim ($P<0.01$) (Figure 4). However, claim types varied substantially, and food purchases with a given low/no-nutrient claim did not necessarily have the lowest mean nutrient levels for that nutrient. For

example, foods with a low-sodium claim had a lower mean total sugar density (5.1 ± 0.1 g/100 g) than did purchases with a low-sugar claim (5.6 ± 0.2 g/100 g), although both had lower mean total sugar density than purchases with no claim (14.2 ± 0.0 g/100 g). Similarly, low-sugar, low-fat, and low-calorie purchases had lower mean sodium density (216.5 ± 0.63 mg/100 g, 366.4 ± 0.26 mg/100 g, and 354.5 ± 0.56 mg/100 g, respectively) than did products with a low-sodium claim (385.8 ± 0.95 mg/100 g), although all were significantly lower than foods with no claim (687.3 ± 0.27 mg/100 g) ($P<0.01$ for each claim type vs no claim). Low-sugar purchases had a lower mean total fat density (3.9 ± 0.02 g/100 g) than did low-fat purchases (5.3 ± 0.00 g/100 g), although low-sodium purchases had the highest total fat density (13.9 ± 0.02 g/100 g).

Among RTD beverages, purchases with any nutrient claim had lower mean energy density (-2.3 kcal/100 g or -5.8%) and mean total sugar density (-3.2 g/100 g or -38.1%), but slightly higher mean total fat ($+0.3$ g/100 g or $+79.7\%$) and sodium densities ($+15.6$ mg/100 g or $+70.1\%$) than

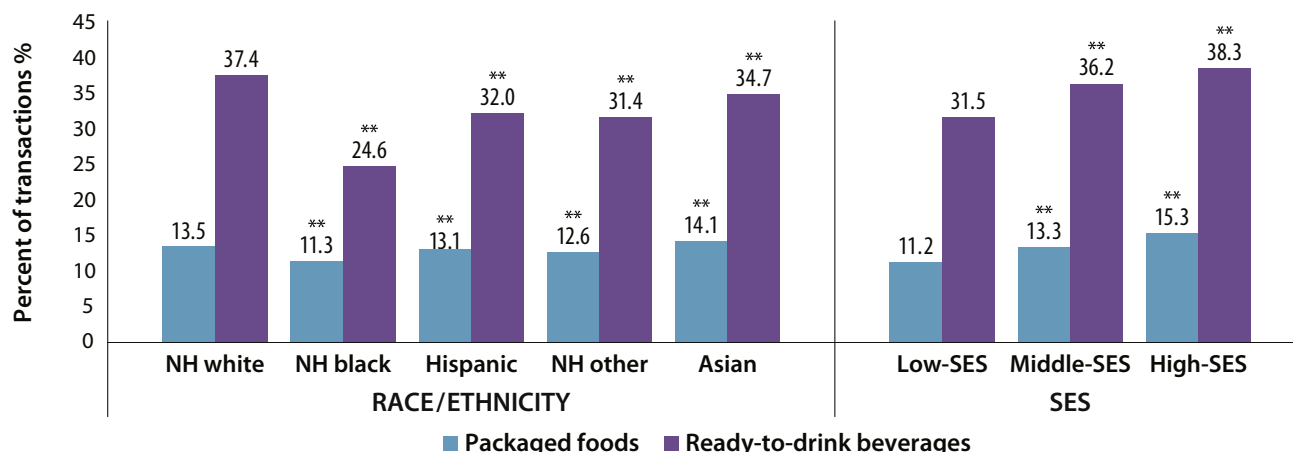


Figure 3. Trends in mean per capita percent of IRI Consumer Network panel purchases with low/no-content nutrient claims from 2008 to 2012, by household race/ethnicity and socioeconomic status (SES) ($n=80,038,247$ purchases). ** $P<0.01$ for each race/ethnic group vs. non-Hispanic (NH) white and SES group vs low-SES.

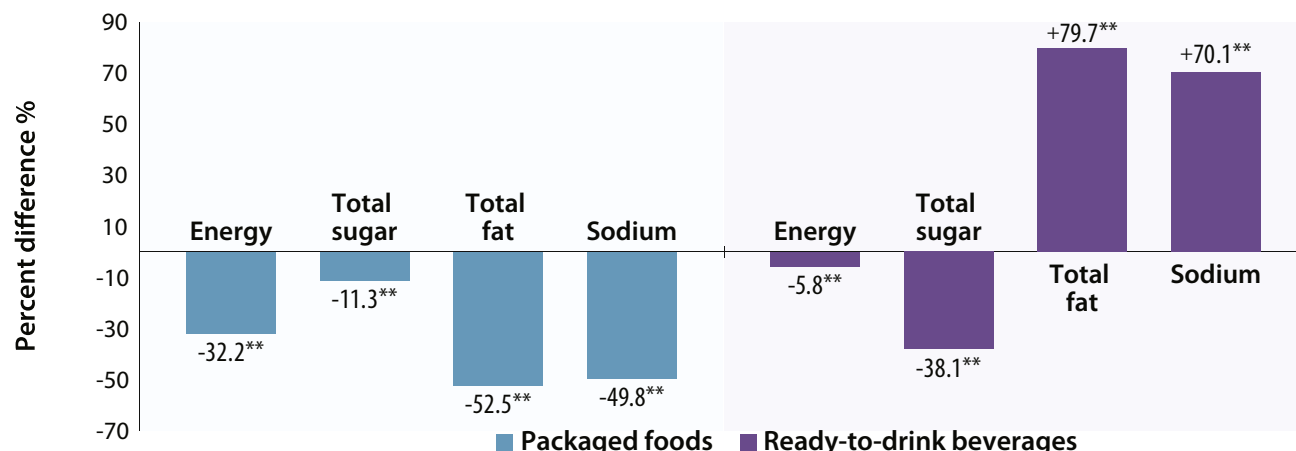


Figure 4. Relative difference in mean nutrient densities for 2008 to 2012 IRI Consumer Network panel purchases of packaged foods ($n=67,411,269$ purchases) and ready-to-drink beverages ($n=12,626,978$ purchases) for any low/no-content nutrient claim vs no claim. ** $P<0.01$ for any claim vs no claim.

purchases without nutrient claims ($P<0.01$ for each comparison). Beverages with a given low/no claim did not necessarily have lower mean nutrient densities than products with other types of claims. For example, low-fat beverage purchases had the highest mean sodium density (56.2 ± 0.03 mg/100 g) and highest mean total fat density (1.3 ± 0.00 g/100 g), while low-sugar beverage purchases had the highest mean total sugar density of purchases with claims (8.1 ± 0.01 g/100 g), although this was marginally lower than purchases with no nutrient claim (8.5 ± 0.0 g/100 g).

Food and Beverage Groups

Among food purchases, 36.6% of fruits had a nutrient claim in 2012, compared with 10.3% of grain and dairy-based desserts, 9.4% of salty snacks, 8.0% of sweet snacks, 5.0% of ready-to-eat (RTE) cereals, and 9.8% of vegetables (Figure 5A, available online at www.jandonline.org). Among beverage purchases, dairy-based drinks had the highest prevalence of nutrient claims, with 71.1% in 2012, comprised predominantly of low-fat claims, whereas only 24.6% of juices and juice drinks had a claim (predominantly low-sugar claims) and 22.6% of sport, energy, tea, and coffee drinks (Figure 5B, available online at www.jandonline.org). Only 0.2% of regular sodas purchased had a nutrient claim (low-sodium), and 58.8% of lower-calorie carbonated soft drinks had claims (predominantly low-calorie and low-sugar).

Regarding nutritional differences, grain- and dairy-based dessert purchases with any low/no-nutrient claim showed the greatest absolute and relative differences in mean energy (-153.2 kcal/100 g, or -38.6%), total sugar (-12.4 g/100 g, or -44.0%), and total fat (-9.9 g/100 g, or 62.0%) compared with desserts with no nutrient claim ($P<0.01$) (Figure 6A, available at www.jandonline.org). Salty snacks with a low/no-nutrient claim had the greatest absolute difference in mean sodium density (-87.8 mg/100 g or -12.0%) compared with salty snacks with no claim ($P<0.01$), but vegetables had the greatest relative difference in mean sodium density

(-68.3 mg/100 g or -31.1%) compared with vegetables with no nutrient claim ($P<0.01$).

Among beverages, only dairy beverages showed meaningful absolute differences by any nutrient claim (Figure 6B, available online at www.jandonline.org). Relative to those with no claim, dairy beverages with any low/no-nutrient claim had lower mean energy density (-14.9 kcal/100 g, or -23.1%), total sugar density (-1.0 g/100 g, or 14.9%), and total fat density (-1.4 g/100 g, or -52.2%) ($P<0.01$ for all comparisons).

Examining nutrient densities by specific claim type, several substantial differences were observed for groups featuring a low/no-content claim for a nutrient that is commonly high in that group, and these differences typically followed the expected direction (ie, products with a particular low-nutrient claim had lower density of that nutrient than products without a claim). In particular, salty snack and vegetable purchases with low-sodium claims had 68% (-479.9 mg/100 g) and 78% (-172.0 mg/100 g) lower mean sodium densities than purchases with no claim, respectively ($P<0.01$), and grain- and dairy-based dessert purchases with low-sugar claims had 93% lower mean total sugar density than those with no claim (-26.2 g/100 g; $P<0.01$) (Table 1, available online at www.jandonline.org). In addition, sweet snack purchases with low-calorie claims had 10% lower mean energy density (-40.8 kcal/100 g) and 39% lower mean total sugar density (-12 g/100 g) than those with no claims ($P<0.01$).

In some groups, however, purchases with a specific nutrient claim had greater mean density for that nutrient than purchases with no claim. For example, RTE cereal purchases with a low-calorie claim had greater mean energy density than those with no claim ($+18.8$ kcal/100 g or $+5\%$; $P<0.01$). Within beverages, purchases of RTD juice and juice drinks with low-sugar claims had greater mean total sugar density than those with no claim ($+0.2$ g/100 g or $+2\%$; $P<0.01$), and RTD juice purchases with low-sodium claims had higher mean sodium density than those with no claim ($+18.3$ mg/100 g or $+94.7\%$; $P<0.01$) (Table 2, available online at www.jandonline.org). RTD sport, energy, tea, and coffee

drinks with low-sodium claims had 16.7% greater mean sodium density (+5.8 mg/100 g; $P < 0.01$) than those with no claims.

DISCUSSION

Trends/General

This study found that 13% of packaged food and 35% of packaged beverage purchases included low-content nutrient claims, and this proportion of purchases did not change significantly between 2008 and 2012. These are lower than previous studies' estimates of the overall prevalence of nutrient claims in the US food supply^{5,8} (53% in the most recent Food Label and Package Survey⁸), which could be because previous estimates included both low- and high-content nutrient claims (eg, "high-fiber," "good source of calcium," or "enriched with vitamin C"), or because previous studies examined the overall prevalence of products with claims in the food supply, whereas this study examines actual food and beverage purchases made by consumers.

In general, purchased beverages had a higher prevalence of low/no-nutrient claims than did foods, largely due to dairy beverages with low/no-fat milk claims. Among beverage purchases, the prevalence of low-content nutrient claims increased slightly from 2008 to 2012 for both lower-calorie carbonated soft drinks (diet sodas) and RTD sport, energy, tea, and coffee drinks. Among packaged food purchases, fruits not only had the highest prevalence of low-content nutrient claims in both 2008 and 2012, but also saw the greatest increase in claims across this time. Predominance of particular claim types (ie, low/no-fat vs low/no-sugar) vary by food or beverage group. For example, low/no-fat claims are much less likely to appear on sodas than low/no-sugar claims, as sugar is the nutrient of focus for this group.

Low/no-fat claims continue to be the most prevalent for both food and beverage purchases with claims. These results suggest that consumers still respond to low-fat claims, followed by low-calorie and low-sugar claims. Continued tracking of purchasing data on products with such claims could be useful, as information and perceptions about these nutrients evolve with scientific advances, manufacturer messaging and marketing strategies, and popular social and media trends.

Nutritional Implications

These results demonstrate that for overall packaged foods and beverages, purchases featuring a low/no-nutrient claim do not necessarily offer better overall nutritional profiles or even better profiles for the particular nutrient that is the subject of the claim, relative to other choices with no claim. This is likely due in part to low or reduced claims being relative within brands or specific food categories. Certain products known for being high in a given nutrient are more likely to feature a low/no-content for that nutrient. For example, a low-sugar cookie may contain less sugar than the "regular" version of the same cookie, but more sugar than other cookies or foods in other categories (such as salty snacks).

This study found substantial variation in the prevalence of purchases with nutrient claims between food groups, as well as differences in the extent to which a low/no-nutrient claim was linked to reductions of that nutrient within a food group.

In other words, a low/no claim means different things for different foods. This could potentially lead to confusion if consumers focus on seeking out products with specific nutrient claims or use a claim to justify the purchase of less-healthy foods. Previous experimental work has shown that low-fat labels provoke increased serving size and decreased consumption guilt, leading consumers (especially overweight consumers) to overeat snack foods.¹⁹ This is concerning, given that in this study, low-fat was the claim type associated with the lowest total fat density for only one of six food groups (sweet snacks).

Furthermore, purchasing products with low-nutrient claims may not lead to more nutritious overall diets.²⁰ Purchasing and consuming more low- or no-sugar products, for example, may not reduce total dietary sugar intake due to a "health halo" effect in which consumers believe, based on the nutrient claim, that the product is inherently healthier and can be eaten in higher quantities or combined with other, less-healthy foods without consequence.^{21,22} It will likely also fail to reduce preference for sweetness, especially as an increasing number of products rely on noncaloric sweeteners or a combination of caloric and noncaloric sweeteners.¹⁰

With regard to specific nutrient claims within food groups, having a low/no-content claim for a particular nutrient was usually, but not always, related to lower mean nutrient density for that nutrient. For example, salty snack purchases with a low-sodium claim had, as expected, lower mean sodium density than salty snacks without a claim or with any other nutrient-specific claim (eg, low-calorie or low-fat). A handful of less straightforward associations arose, however, in which purchases with a given low-nutrient claim actually had higher mean density for that nutrient than did purchases from the same food or beverage group with other claims or no claim. RTE cereal purchases with a low-calorie claim, for example, actually had greater mean energy density than those without a claim or with a different nutrient claim. Similarly, RTD juice and juice drink purchases with low-sugar claims had the highest mean total sugar density compared to juices with other claims or no claim. The association between having a low-content claim and having the lowest mean nutrient density for that nutrient also varied by claim type: while low-calorie claims were associated with the lowest mean energy density for most food groups (except RTE cereals, as noted) and most beverage groups (except for low-sugar purchases in the soda and RTD juice groups), low-fat claims, conversely, were not associated with the lowest mean total fat density for all but one food group and three of the five beverage groups.

These discrepancies between claim type and nutrient density likely arise because in the United States, the nutrient thresholds used to determine whether a claim can be made are determined relative to reference foods of the same product type or from the same category—not using absolute nutrient thresholds across all products and categories.²³ In the RTE cereal category, for example, a low-calorie granola may be able to claim low calories simply because it has lower energy density than another granola within that brand or other brands of granolas, while still having higher energy density than other nongranola cereals.

In fact, these results suggest (but are not conclusive) that in some cases, products that tend to be high in calories, sodium, sugar, or fat actually may be more likely to have

low/no-content nutrient claims on the relevant nutrient. This type of marketing strategy could be misleading to consumers, as it makes it very difficult to ascertain whether a food is truly low in a certain nutrient, or merely low relative to other products (while still having very high energy, sodium, fat, or sugar density). Absolute thresholds may be a more useful indicator of a product's nutrient content. For example, in July 2016, Chile implemented a regulation that applies warning labels to foods high in energy, sodium, fat, or sugar based on a set of absolute nutrient density thresholds for foods and beverages, regardless of category.²⁴ Future research will be required to better understand consumer perceptions of these types of labeling initiatives and how they affect purchasing decisions.

Finally, these specific claim findings within groups highlight a few examples of how a claim could frame an otherwise unhealthy product as a healthy alternative. Salty snack purchases with low-sodium claims, for example, were associated with the highest mean energy and total fat densities of salty snacks with any other or no claim type—even while having the lowest mean sodium density. Similarly, RTD sport, energy, tea, and coffee drink purchases with low-sodium claims had the highest mean energy, total sugar, and total fat densities of purchases in this beverage category with any other claim type or no claim. These findings reiterate the point that nutrient claims made relative to similar products may offer limited utility for determining overall product nutrition and could mislead shoppers both in purchasing and consumption.

Race/Ethnicity and SES

While observed differences in purchasing patterns by race/ethnicity were not substantial, some significant trends by specific claim type are worth noting. For packaged foods, non-Hispanic white households were most likely to purchase select food groups with a “low-calorie” claim; Asian households were most likely to purchase select food groups with any, “low-fat,” or “low-sodium” claims; and non-Hispanic black households were least likely to purchase select food groups with any, “low-calorie,” or “low-fat” claims. For RTD beverages, non-Hispanic white households were most likely to purchase those with any, “low-calorie,” or “low-fat” claims, and non-Hispanic black households were most likely to purchase beverages with no claim and least likely to purchase those with any, “low-calorie,” or “low-fat” claims. It remains unclear, however, whether these different race/ethnic responses to various types of nutrient claims result from cultural differences in food preferences, perceptions of what these claims mean, and/or differences in reliance on claims and food package labeling, in general. No studies to date have specifically examined differential use of packaged food and beverage nutrient claims by race/ethnicity in the United States, but some studies have found that non-Hispanic whites are more likely to use nutrition labels (specifically Nutrition Facts labels) than other race/ethnic groups.^{25,26} In the context of established nutritional disparities in diet quality for non-Hispanic blacks in the United States,²⁷⁻²⁹ the findings presented here suggest the need for additional research into the appeal and efficacy of different claim types and how each type might improve or impair overall diet quality when used by certain shoppers.

Similar to previous studies showing that higher income levels are associated with a greater likelihood to use food labels,^{25,26,30} higher SES households purchased more foods and beverages with a low-content nutrient claim. As with race/ethnicity, this study cannot determine whether this association is due to a response to the claims, differences in dietary preferences, or greater use of food labeling, in general.

More work is needed to understand how low/no-nutrient claims might exacerbate nutrition-related disparities for both race/ethnic groups and different levels of SES. For example, if high-SES shoppers respond more to nutrient content claims, and products bearing such claims offer healthier nutrient profiles, the use of this marketing feature might contribute disproportionately to a better diet for these consumers.

On the other hand, the results of this study indicate that products with low/no-content nutrient claims are not always healthy products or healthier choices relative to other products without claims, so it remains unclear whether purchasing a higher relative proportion of these products necessarily improves overall diet. The ultimate effect of purchasing more or less products with low/no-content nutrient claims likely depends on a combination of which specific claim types different groups utilize most, in what combinations, and to what degree these claim types ultimately influence overall intake (ie, serving size, relative intake of different food groups). Future research might also explore whether or not food manufacturers actually target specific subpopulations by placing nutrient claims on certain types of products and if so, whether or not this targeting is contributing to or mitigating nutritional disparities.

Limitations and Future Directions

This study offers a cross-sectional description of the overall prevalence of low-content nutrient claims among US household food purchases. As such, these results do not inform the degree to which nutrient claims elicit a certain consumer response, nor whether claims cause improved nutritional quality of purchases or dietary intake. While studying purchases is helpful in providing an understanding of population-level consumer behavior, it is not possible with these data to differentiate whether changes in consumer behavior (ie, choosing to purchase a product with a low-nutrient claim) or changes in the food supply (ie, increased production of products with these types of claims) drive observed associations.

In addition, examination of packaged foods and RTD beverages limits understanding of how nutrient claims (or lack thereof) may affect purchases or substitutions between packaged products and loose products, such as raw fruits and vegetables. For example, it would be useful to understand the degree to which nutrient claims on frozen green beans might or might not influence a consumer to purchase frozen beans over frozen beans without a claim, or fresh beans without a claim. Future research might also explore purchases and nutritional profiles of products with other claims, such as high-content and functional/health claims.

Finally, the findings presented here are based on purchases from a sample of US households that participated in

the IRI Consumer Network panel from 2008 to 2012, specifically households with children and adolescents aged 2 to 18 years old. Although IRI data and the analyses presented here are weighted to reflect national demographics, the possibility remains that those households participating regularly in the panel may differ from the general public in their dietary, health, or shopping attitudes and behaviors.¹⁵ Even so, the IRI Consumer Network panel lends strength to this study, as the large number of participating households and very large quantity of transactions included provide a useful tool for tracking meaningful patterns in food purchasing behaviors.

CONCLUSIONS

Low-content nutrient claims are a common feature among US household food and beverage purchases and are more common among RTD beverages than packaged foods. However, low-content nutrient claims are not necessarily reliable

indicators of a product's nutritional quality. When examined collectively, packaged food and beverage purchases with any low/no-content claim had lower mean energy, total sugar, total fat, and sodium densities relative to purchases with no such claim, but substantial variation in nutrient density by claim type and within food and beverage groups indicates that some claims may have limited utility for certain types of products or nutrients. Key questions for future research include how nutrient claims affect consumer choice, as well as how claims interact with other common marketing strategies such as sales or price promotions to influence purchasing behavior and, ultimately, dietary quality and health.

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PRACTICE IMPLICATIONS

What Is the Current Knowledge on this Topic?

Previous research has described the prevalence of nutrient content claims in the US food supply. Recent studies found that roughly half of all packaged foods and beverages in the United States feature such claims, but it is unknown how many products with nutrient claims are actually purchased or how such claims might be linked to products' nutritional quality.

How Does this Research Add to Knowledge on this Topic?

This research will be the first to examine the proportion of actual purchases in the United States that feature low-content or no-content nutrition claims. It will also be the first to connect purchases of food and beverage products with these low/no-nutrient content claims to products' nutritional profile. This study highlights the fact that low/no-nutrient claims may not always be a reliable indicator of healthier or healthiest product choices.

How Might this Knowledge Impact Current Dietetics Practice?

Better understanding of the proportion of purchases with low/no-nutrient content claims and their nutritional quality is important as companies reformulate products in response to increasing consumer awareness of health and nutrition issues. This will impact registered dietitian nutritionists working in food science, retail, and industry, as well as those counseling individuals and groups to make informed choices at the store.

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STATEMENT OF POTENTIAL CONFLICT OF INTEREST

No potential conflict of interest was reported by the authors.

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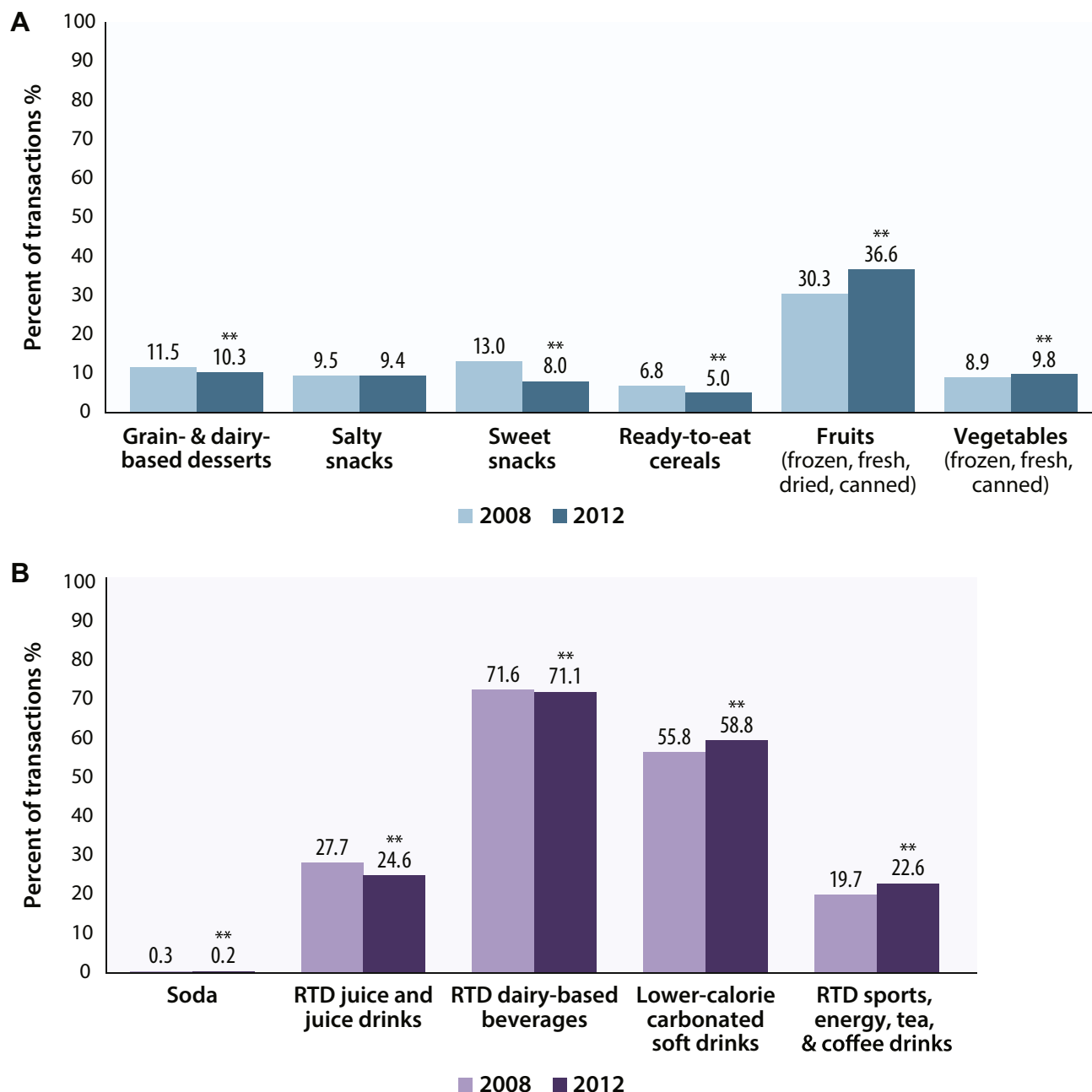


Figure 5. Trends in percent of IRI Consumer Network panel purchases with any low/no-content nutrient claims by packaged food group (A) (n=67,411,269 purchases) and ready-to-drink (RTD) (ie, beverages that are ready to consume upon purchasing) beverage group (B) (n=12,626,978 purchases), 2008 to 2012. ** $P < 0.01$ for 2012 vs 2008.

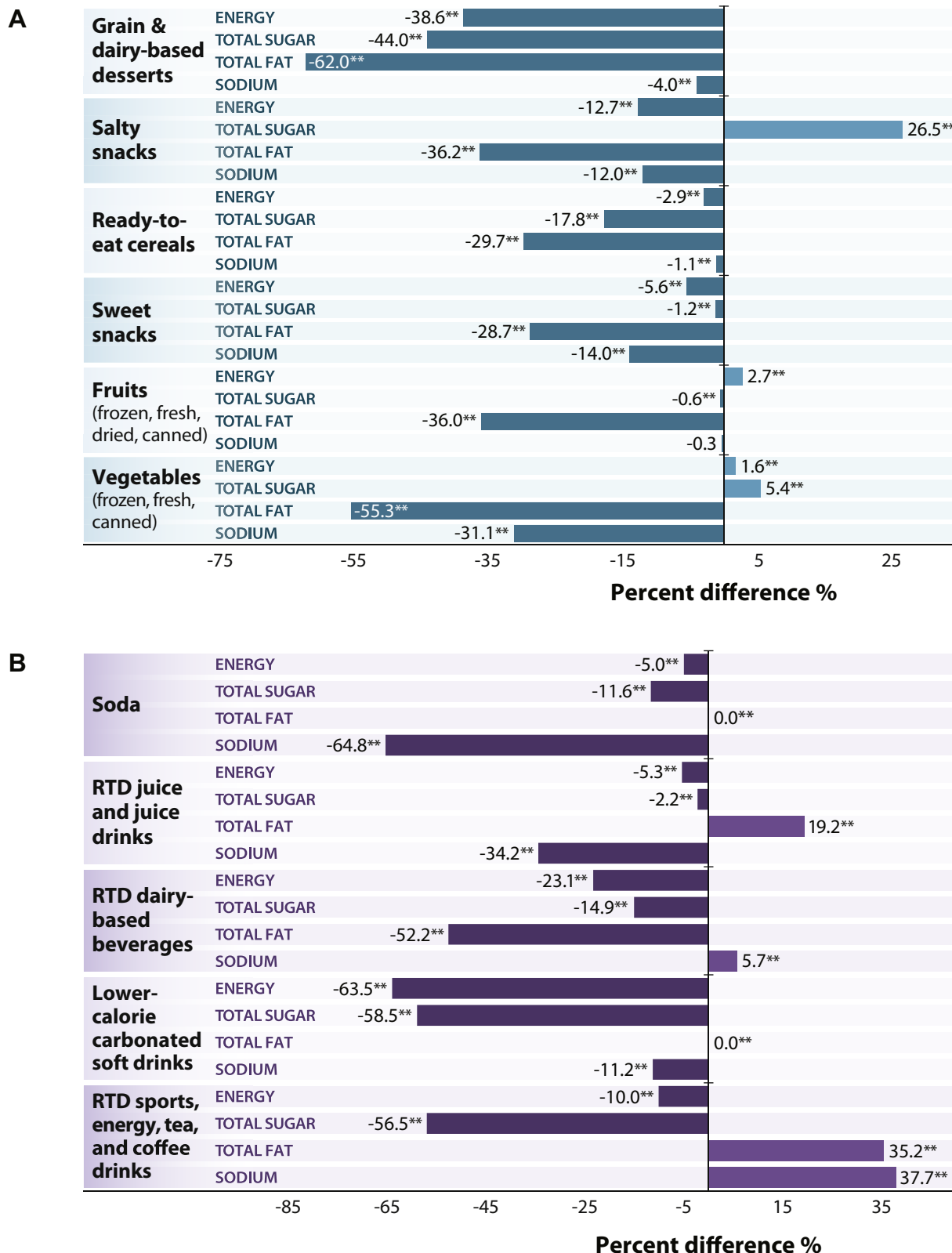


Figure 6. Relative difference in mean nutrient densities for IRI Consumer Network panel purchases with any low/no-content nutrient claim vs no nutrient claim by packaged food group (A) (n=67,411,269 purchases) and ready-to-drink (RTD) (ie, beverages that are ready to consume upon purchasing) beverage group (B) (n=12,626,978 purchases), 2008 to 2012. ** $P < 0.01$ for any claim type vs no claim.

Table 1. Mean energy, total sugar, total fat, and sodium densities of 2008 to 2012 IRI Consumer Network panel packaged food purchases (n=67,411,269 purchases) by nutrient content claim type

Variable	Energy Density (kcal/100 g)			Total Sugar Density (g/100 g)			Saturated Fat Density (g/100 g)			Sodium Density (mg/100 g)		
	Mean	SE ^a	P value	Mean	SE	P value	Mean	SE	P value	Mean	SE	P value
Grain+dairy-based desserts												
No nutrient claim	396.6	0.2	—	28.2	0.0	—	16.0	0.0	—	434.8	0.2	—
Low-calorie	181.6	1.7	0.000	9.9	0.1	0.000	4.1	0.1	0.000	687.3	2.9	0.000
Low-sugar	204.6	1.9	0.000	2.0	0.1	0.000	5.8	0.1	0.000	778.1	3.2	0.000
Low-fat	247.4	1.1	0.000	19.5	0.1	0.000	5.8	0.0	0.000	380.2	1.1	0.000
Low-sodium	406.7	1.6	0.003	6.3	0.1	0.000	12.5	0.1	0.000	344.1	1.9	0.000
Any nutrient claim	243.4	0.9	0.000	15.8	0.1	0.000	6.1	0.0	0.000	417.3	1.0	0.000
Salty snacks												
No nutrient claim	510.6	0.1	—	4.6	0.0	—	29.1	0.0	—	733.8	0.3	—
Low-calorie	321.4	0.5	0.000	1.2	0.0	0.000	6.2	0.1	0.000	709.0	1.9	0.000
Low-sugar	392.3	1.5	0.000	1.1	0.2	0.000	10.9	0.3	0.000	711.9	20.0	0.267
Low-fat	416.9	0.1	0.000	6.6	0.0	0.000	11.9	0.0	0.000	813.8	0.7	0.000
Low-sodium	512.8	0.3	0.000	3.9	0.0	0.000	34.0	0.0	0.000	235.9	0.5	0.000
Any nutrient claim	445.5	0.1	0.000	5.8	0.0	0.000	18.6	0.0	0.000	646.0	0.7	0.000
Sweet snacks												
No nutrient claim	408.0	0.1	—	31.1	0.0	—	13.0	0.0	—	318.4	0.1	—
Low-calorie	367.2	0.5	0.000	19.1	0.1	0.000	10.4	0.1	0.000	338.6	5.0	0.041
Low-sugar	407.6	0.2	1.000	22.4	0.1	0.000	13.2	0.0	0.160	304.7	0.5	0.000
Low-fat	375.2	0.1	0.000	33.1	0.0	0.000	7.6	0.0	0.000	270.1	0.2	0.000
Low-sodium	429.1	0.6	0.000	29.5	0.1	0.000	16.5	0.1	0.000	207.5	1.2	0.000
Any nutrient claim	385.3	0.1	0.000	30.7	0.0	0.000	9.3	0.0	0.000	273.9	0.2	0.000
RTE^b cereals												
No nutrient claim	380.0	0.0	—	29.3	0.0	—	4.2	0.0	—	507.0	0.1	—
Low-calorie	398.8	0.5	0.000	43.3	0.0	0.000	4.9	0.0	0.170	413.4	5.3	0.000
Low-sugar	360.2	0.4	0.000	14.0	0.1	0.000	2.2	0.0	0.000	283.8	2.6	0.000
Low-fat	369.6	0.1	0.000	25.6	0.0	0.000	2.8	0.0	0.000	565.0	0.7	0.000

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Table 1. Mean energy, total sugar, total fat, and sodium densities of 2008 to 2012 IRI Consumer Network panel packaged food purchases (n=67,411,269 purchases) by nutrient content claim type (*continued*)

Variable	Energy Density (kcal/100 g)			Total Sugar Density (g/100 g)			Saturated Fat Density (g/100 g)			Sodium Density (mg/100 g)		
	Mean	SE ^a	P value	Mean	SE	P value	Mean	SE	P value	Mean	SE	P value
Low-sodium	362.9	0.3	0.000	15.3	0.1	0.000	3.6	0.0	0.000	78.8	0.9	0.000
Any nutrient claim	369.0	0.1	0.000	24.1	0.0	0.000	2.9	0.0	0.000	501.7	0.7	0.000
Fruits (frozen, fresh, dried, canned)												
No nutrient claim	178.1	0.1	—	30.1	0.0	—	1.2	0.0	—	46.5	0.2	—
Low-calorie	48.1	0.1	0.000	9.4	0.0	0.000	0.0	0.0	0.000	9.2	0.0	0.000
Low-sugar	68.0	0.1	0.000	12.7	0.0	0.000	0.2	0.0	0.000	6.6	0.0	0.000
Low-fat	289.9	0.2	0.000	46.1	0.0	0.000	1.3	0.0	0.000	82.5	0.2	0.000
Low sodium	146.3	1.2	0.000	27.0	0.2	0.000	0.9	0.0	0.000	16.1	0.2	0.000
Any nutrient claim	183.0	0.2	0.000	30.0	0.0	0.000	0.8	0.0	0.000	46.4	0.1	1.000
Vegetables (frozen, fresh, canned)												
No nutrient claim	69.0	0.0	—	3.0	0.0	—	1.3	0.0	—	219.5	0.1	—
Low-calorie	45.2	0.2	0.000	2.3	0.0	0.000	1.6	0.0	0.000	128.4	0.9	0.000
Low-sugar	72.0	0.6	0.000	3.1	0.0	0.012	1.9	0.0	0.000	103.2	0.9	0.000
Low-fat	84.9	0.1	0.000	3.0	0.0	1.000	0.6	0.0	0.000	233.3	0.3	0.000
Low-sodium	55.9	0.1	0.000	3.4	0.0	0.000	0.5	0.0	0.000	47.5	0.2	0.000
Any nutrient claim	70.1	0.1	0.000	3.1	0.0	0.000	0.6	0.0	0.000	151.2	0.3	0.000

^aSE=standard error.^bRTE=ready-to-eat.

Table 2. Mean energy, total sugar, total fat, and sodium densities of 2008 to 2012 IRI Consumer Network panel ready-to-drink beverage purchases (n=12,626,978 purchases) by nutrient content claim type

Variable	Energy Density (kcal/100 g)			Total Sugar Density (g/100 g)			Saturated Fat Density (g/100 g)			Sodium Density (mg/100 g)		
	Mean	SE ^a	P value	Mean	SE	P value	Mean	SE	P value	Mean	SE	P value
Soda												
No nutrient claim	46.7	0.0		12.7	0.0		0.0	0.0		14.9	0.0	
Low-calorie	33.7	2.0	0.000	10.1	0.5	0.000	0.0	0.0	1.000	13.5	0.6	0.382
Low-sugar	20.7	1.0	0.000	5.6	0.3	0.000	0.0	0.0	1.000	8.9	0.4	0.000
Low-fat	113.5	14.1	0.000	11.0	0.2	0.090	2.1	0.4	0.000	147.5	28.7	0.000
Low-sodium	43.8	0.1	0.000	11.3	0.0	0.000	0.0	0.0	1.000	2.2	0.1	0.000
Any nutrient claim	44.4	0.3	0.000	11.2	0.0	0.000	0.0	0.0	0.000	5.2	0.5	0.000
RTD^b juice and juice drinks												
No nutrient claim	45.3	0.0		10.2	0.0		0.1	0.0		19.4	0.0	
Low-calorie	17.8	0.0	0.000	3.7	0.0	0.000	0.3	0.0	0.000	15.0	0.0	0.000
Low-sugar	44.4	0.0	0.000	10.4	0.0	0.000	0.1	0.0	0.009	11.8	0.0	0.000
Low-fat	50.4	0.2	0.000	7.3	0.1	0.000	1.7	0.0	0.000	17.8	0.4	0.016
Low-sodium	33.3	0.1	0.000	7.0	0.0	0.000	0.0	0.0	0.000	37.7	0.2	0.000
Any nutrient claim	42.9	0.0	0.000	10.0	0.0	0.000	0.1	0.0	0.000	12.7	0.0	0.000
RTD dairy-based beverages												
No nutrient claim	64.4	0.0		6.4	0.0		2.7	0.0		53.4	0.0	
Low-calorie	47.0	0.2	0.000	5.1	0.0	0.000	1.3	0.0	0.000	62.6	0.6	0.000
Low-sugar	40.2	0.2	0.000	3.6	0.0	0.000	1.4	0.0	0.000	58.0	0.1	0.000
Low-fat	49.6	0.0	0.000	5.5	0.0	0.000	1.3	0.0	0.000	56.4	0.0	0.000
Low-sodium	47.5	0.1	0.000	4.4	0.0	0.000	1.6	0.0	0.000	46.2	0.1	0.000
Any nutrient claim	49.5	0.0	0.000	5.5	0.0	0.000	1.3	0.0	0.000	56.4	0.0	0.000
Lower-calorie carbonated soft drinks												
No nutrient claim	0.9	0.0		0.3	0.0		0.0	0.0		13.8	0.0	
Low-calorie	0.1	0.0	0.000	0.1	0.0	0.000	0.0	0.0	0.009	12.6	0.0	0.000
Low-sugar	1.0	0.0	0.549	0.3	0.0	0.000	0.0	0.0	0.486	11.7	0.0	0.000
Low-fat	3.3	0.3	0.000	0.8	0.1	0.000	0.0	0.0	1.000	3.3	0.3	0.000

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Table 2. Mean energy, total sugar, total fat, and sodium densities of 2008 to 2012 IRI Consumer Network panel ready-to-drink beverage purchases (n=12,626,978 purchases) by nutrient content claim type (*continued*)

Variable	Energy Density (kcal/100 g)			Total Sugar Density (g/100 g)			Saturated Fat Density (g/100 g)			Sodium Density (mg/100 g)		
	Mean	SE ^a	P value	Mean	SE	P value	Mean	SE	P value	Mean	SE	P value
Low-sodium	0.5	0.0	0.000	0.1	0.0	0.000	0.0	0.0	1.000	1.4	0.0	0.000
Any nutrient claim	0.3	0.0	0.000	0.1	0.0	0.000	0.0	0.0	0.006	12.3	0.0	0.000
RTD sport, energy, tea, and coffee drinks												
No nutrient claim	30.5	0.0		7.6	0.0		0.1	0.0		34.9	0.1	
Low-calorie	27.0	0.2	0.000	3.0	0.0	0.000	0.0	0.0	0.000	34.4	0.1	0.000
Low-sugar	37.9	0.4	0.000	1.7	0.0	0.000	0.1	0.0	1.000	97.3	2.1	0.000
Low-fat	67.5	0.2	0.000	10.6	0.0	0.000	1.1	0.0	0.000	43.8	0.2	0.000
Low-sodium	76.8	8.7	0.000	11.5	1.0	0.000	2.4	0.4	0.000	40.8	4.3	0.297
Any nutrient claim	27.4	0.2	0.000	3.3	0.0	0.000	0.1	0.0	0.000	48.1	0.5	0.000

^aSE=standard error.
^bRTD=ready-to-drink.