Sugar-coating Science

How the Food Industry Misleads Consumers on Sugar

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Whether or not you believe that Lucky Charms cereal is "magically delicious," that "life tastes good" when you drink a Coke, or that "there's a lot of joy in Chips Ahoy," the odds are good that you have heard these and other advertising slogans for sugary foods and drinks.

Billions of dollars are spent annually by food and beverage manufacturers along with industry-supported organizations such as trade associations, front groups, and public relations (PR) firms (hereafter "sugar interests") on emotional appeals such as these. Such ads insert the brands and products into our everyday lives, infuse our psyches with manufactured cravings for them, and shape the complex relationship we have with food.

Evading Science, Engineering Opinion

While it should be no surprise to consumers that cookies and soda contain added sugar, food companies also engineer the image of many foods to appear healthier than they actually are. Many unlikely products contain surprising amounts of added sugar. These foods include breads, crackers, pasta sauces, salad dressings, yogurts, and a wide variety of other processed foods. Yogurt, for example, has nutritional benefits, and General Mills wants us to eat its brand Yoplait because it "tastes SO good" (Yoplait 2014). However, whether we choose the healthy-sounding Blackberry Harvest flavor or the more dessert-themed Boston Cream Pie, Yoplait Original yogurt contains 26 grams of sugar per serving—more than six teaspoons of sugar, which surpasses the American Heart Association's recommendations for a woman's total daily consumption. Yoplait Light contains 10 grams of sugar per 90-calorie serving, still a lot of sugar-laden calories for a product marketed for its healthfulness.

Scientific research shows that the overconsumption of added sugar in our diets—not just the actual calories but the sugar itself—has serious consequences for our health. Added sugars—whether from corn syrup, sugar cane, or sugar beets—are a source of harmful calories that displace calories from other, more nutritious foods, especially at the level these sugars are consumed by most Americans (O'Callaghan 2014; Hellmich 2012). As discussed in our forthcoming report *Added Sugar, Subtracted Science: How Industry Obscures Science and Undermines Public Health Policy on Sugar*, scientific evidence increasingly confirms a relationship between sugar consumption and a rise in the incidence of chronic metabolic diseases—obesity, diabetes, cardiovascular disease, high triglycerides, and hypertension (Basu et al. 2013; Lustig, Schmidt, and Brindis 2012; Tappy 2012; Stanhope et al. 2011; Johnson et al. 2007; Jacobson 2005). Also, new research suggests that a higher percentage of calories from sugar is associated with an increased risk of heart disease, independent of the link between sugar and obesity (Yang et al. 2014).

This scientific evidence has led several scientific and governmental bodies, including the World Health Organization, the American Heart Association, the U.S. Department of Health and Human Services, and the U.S. Department of Agriculture, to recommend sugar intake limits far below typical American consumption levels. In March 2014, the World Health Organization proposed new draft guidelines that recommend, as did the organization's 2002 guidelines, that sugar should not exceed 10 percent of a person's total energy intake per day (which amounts to a maximum of 50 grams per day or 12 teaspoons for a 2000-calorie diet). The 2014 guidelines further suggest that a reduction of sugar to below 5 percent of the total calorie intake per day—that is, six teaspoons—would have additional benefits, especially in slowing tooth decay, which is now globally prevalent (WHO 2014).

Yet despite the existence of a great deal of scientific evidence linking excessive sugar intake to a range of health problems, and despite these science-based recommendations by prominent national and international organizations, Americans have continued to consume high levels of added sugar. One factor that has kept our sugar consumption so high is the deceptive and exploitative marketing strategies of industry sugar interests. Through advertising, marketing, and

PR, sugar interests influence public opinion and consumer behavior at the cost of scientific evidence.

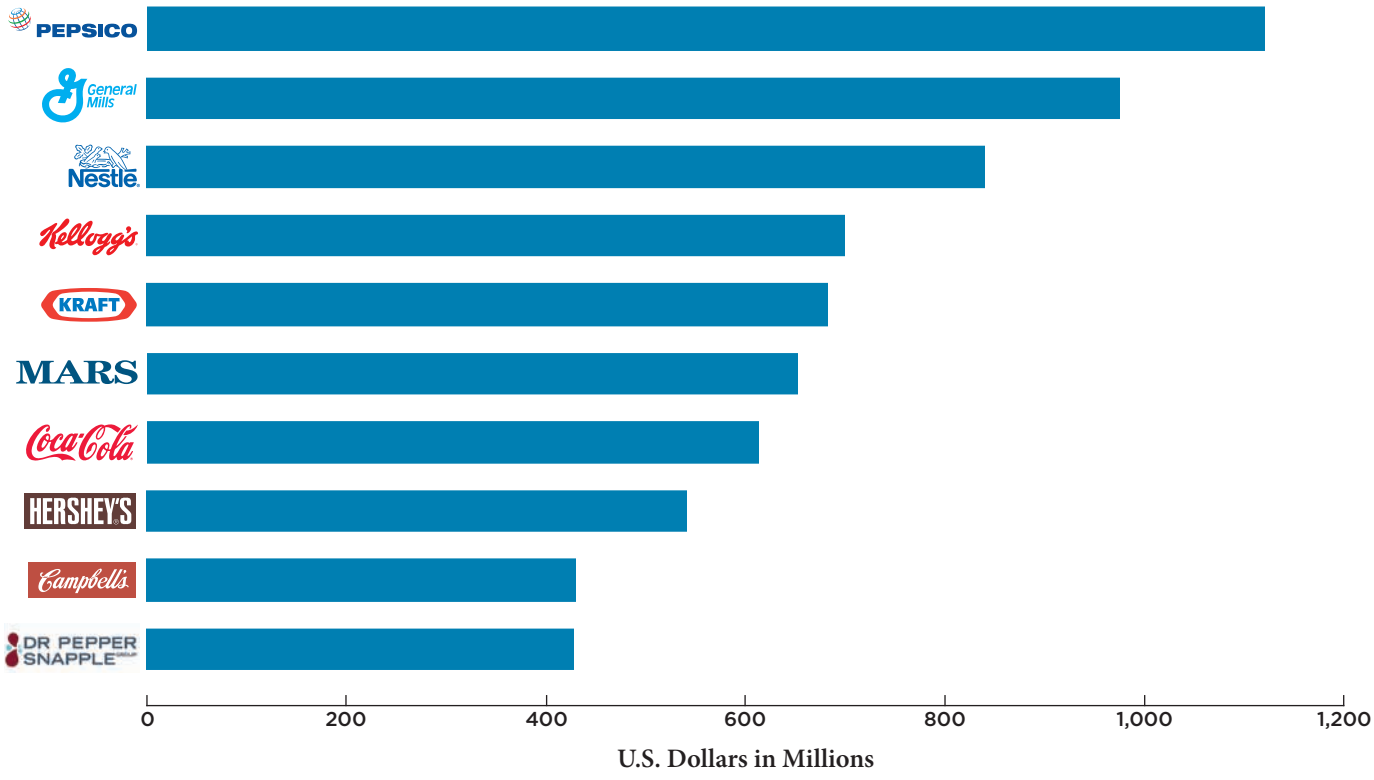
Their tactics trigger psychological, behavioral, social, and cultural responses that distract and manipulate consumers and divert their attention away from science-based health and nutrition information. Some companies have engaged in blatantly false advertising, and major industry trade groups have financed sophisticated PR campaigns that emphasize consumer freedom but facilely overlook the influence of sugar interests in shaping consumers' perceptions of available food choices. The industry also targets children, women, minorities, and low-income populations—strategic for the industry, but a problem for public health. Children are unable to recognize persuasive intent the way adults do, women are exploited as the primary food decision makers in most families, and minorities and low-income groups in the United States have disproportionately high obesity rates driven by sugar interests' concern for their profits rather than for public health.

Together, sugar interests' actions interfere with how the public responds to scientific information about added sugar, distorts our understanding of our food choices, and contributes to our continued high consumption of foods with added sugar.

Leveraging a Multi-Billion Dollar Message

The food industry spends billions of dollars annually to persuade Americans to eat and drink more sugary foods and beverages. The 10 largest food and beverage producing companies in the United States, are responsible for selling a majority of the sugary products consumed by Americans. According to rankings by the advertising industry, these 10 major food and beverage companies (see Figure 1), whose familiar "megabrands" are sugar-heavy, also rank among the top 100 companies of all kinds for advertising dollars spent in the United States in 2012. U.S. ad spending for the 10 major food

FIGURE 1. U.S. Food Industry Advertising Spending, 2012



These 10 food and beverage companies with high-sugar "megabrands" together spent more than $6.9 billion in U.S. advertising in 2012. With this tremendous spending, companies are able to effectively mislead consumers and persuade them to consume foods and beverages containing excessive added sugar.

SOURCE: ADVERTISING AGE 2014.

companies in 2012 was more than $6.9 billion (Advertising Age 2014).

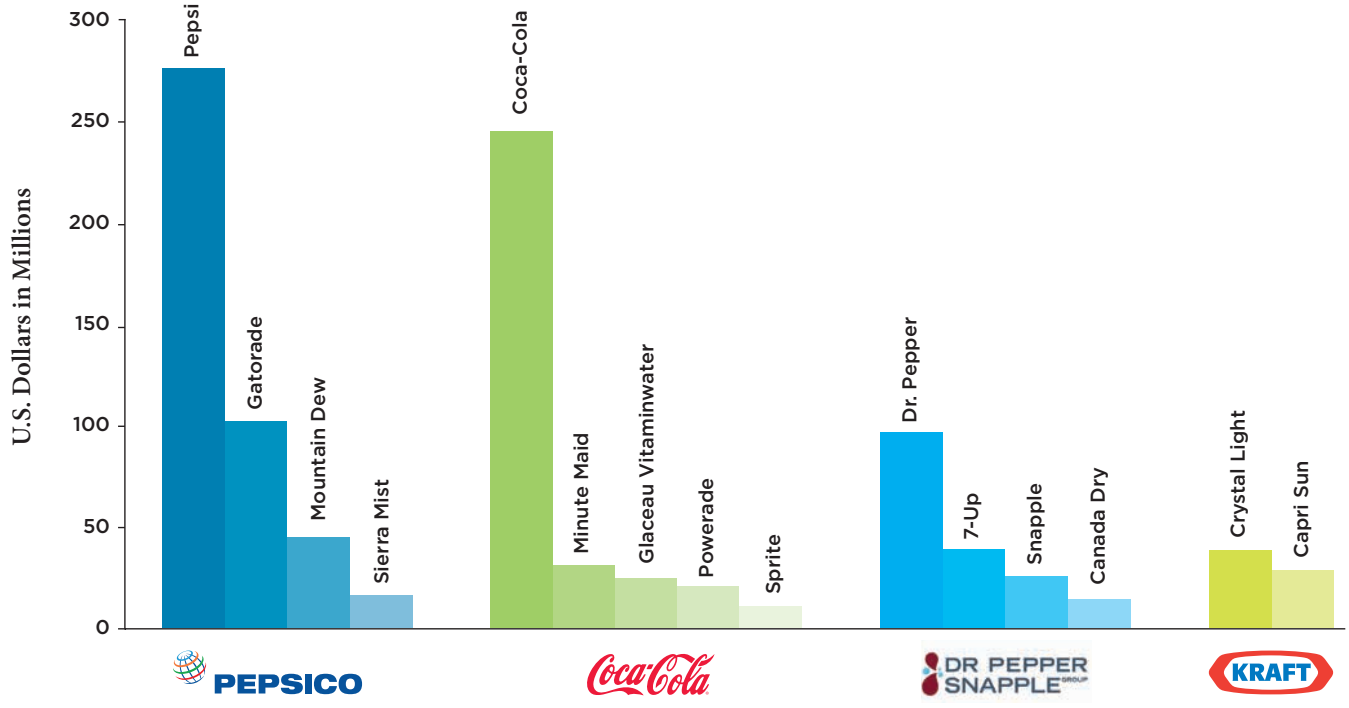
The megabrands from these 10 companies that dominated ad spending in 2012 included products that are obviously high in sugar as well as products that are not noticeably sweet but that contain high levels of sugar and whose packaging and promotion make them appear healthier than they actually are (Advertising Age 2014). Among all megabrand products, advertising on soda, a product obviously high in sugar, was the highest. For example, PepsiCo owns dozens of brands, but the company spent $274 million of its $1.1 billion in advertising on the Pepsi megabrand (Advertising Age 2014). Other high-sugar megabrand beverages with high advertising spending were Coca-Cola ($243.4 million), Gatorade ($101.4 million), Dr. Pepper ($95.8 million), and Mountain Dew ($44.2 million). Ad spending for sugar-sweetened megabrand beverages from all 10 companies, including soda, fruit drinks, and sports drinks, was more than $1 billion (Figure 2).

Advertising on sugary cereals—a major product category targeted at children—was also high. Food companies spent some $678 million in advertising these products. Megabrand cereals included General Mills' Cheerios ($166.8 million), Lucky Charms ($15.4 million), and Trix ($14 million); as well as Kellogg's Special K ($141.2 million), Mini Wheats ($67.1 million), Frosted Flakes ($49.8 million), and Froot Loops ($12.6 million).

Alongside products with obviously high sugar content, many seemingly healthy megabrand products—breads, baked goods, snacks, yogurts, salad dressings, and processed foods—also account for a large percentage of advertising and often contain hidden sugars. General Mills, for example, spent $112.2 million on Yoplait yogurts and $113.8 million on Pillsbury products, including the famous Pillsbury refrigerated biscuits, most varieties of which contain four grams (about one teaspoon) of sugar per biscuit.

Total advertising expenditures for megabrand products that consumers often perceive as healthy were highest for cereals. These cereals—e.g., Cheerios, Mini Wheats, Special K—originated as low-sugar products, but many of their newer "flavors" are very high in sugar (see Table 1).

FIGURE 2. U.S. Advertising Spending on Sugar-Sweetened Beverages, 2012



Companies spent more than $1 billion promoting sugar-sweetened beverages in the United States in 2012. Megabrands from PepsiCo and Coca-Cola dominated. Sugar-sweetened beverages are a major source of added sugar for many Americans.

SOURCE: ADVERTISING AGE 2014.

TABLE 1. Sugar Content Comparison for Popular Cereal Brands

Low Sugar		High Sugar	
	**Cheerios** 1 gram of sugar		**Apple Cinnamon Cheerios** 10 grams of sugar
	**Rice Chex** 2 grams of sugar		**Honey Nut Chex** 9 grams of sugar
	**Special K** 4 grams of sugar		**Special K Chocolatey Delight** 9 grams of sugar
	**Kashi 7 Whole Grain Honey Puffs** 6 grams of sugar		**Kashi GoLean Crisp!** 11 grams of sugar
	**Corn Flakes** 3 grams of sugar		**Frosted Flakes** 11 grams of sugar

High-sugar cereals often hide behind healthier versions of the same brand name. Sugary cereals benefit from consumers' perceptions of the healthfulness of the originals. Some brands add up to 10 times the amount of sugar contained in the original.

Original Cheerios, for example, contains only one gram of sugar per serving, but Multi Grain Cheerios Dark Chocolate Crunch contains nine grams per serving and the healthy-sounding Apple Cinnamon Cheerios contains 10 (General Mills 2014a; General Mills 2014b). Cheerios' and Special K's newer, high-sugar siblings benefit from brand recognition and consumers' perceptions of the healthfulness of the originals.

Sugar Interests' Tactics: Targeting Cultural Values Through False Advertising and Front Groups

Sugar interests' PR campaigns, advertising, and marketing are effective at spreading misinformation because they capitalize on powerful cultural values and distort the public's understanding of its food choices, including the choices made by health-conscious consumers. Often the food environments in which Americans live are limited in the availability and accessibility of foods with low or no added sugar. While supermarkets abound with the appearance of product variety, many of these products are high in sugar but marketed to obscure their sugar content. Sugar interests falsely claim that products—both those obviously high in sugar and those with hidden sugar—are healthy, when scientific research has shown that they are not. Sugar interests appeal to consumers' cultural values through gestures of philanthropic goodwill (CSPI 2013a) and endorsements from athletes and celebrities (Bachman 2013), and they misleadingly connect their products to consumers' identities as patriotic Americans who value free choice in selecting their foods. Yet, given the engineered landscape most Americans enter when they walk through the grocery store's doors, choosing foods low in sugar is not as easy as it should be.

FALSE AND MISLEADING ADVERTISING BY COMPANIES THEMSELVES

Some food and beverage companies are facing charges of false advertising for making nutrition and health claims about their sugary products that are not backed by science. Such cases can be difficult to prosecute because plaintiffs must prove intent to deceive. In the case of sugary foods and beverages, the deception often involves the clever manipulation of terms, many of which lack legal definitions. The tobacco industry once used terms such as "light," "mild," and "low" on packaging to make its products appear healthier but have recently been legally prohibited from doing so (FDA 2013). Now sugar interests are fighting similar battles over whether their terminology, including "healthy," "natural," "naturally sweetened," and even "lightly sweetened," is deceptive to consumers.

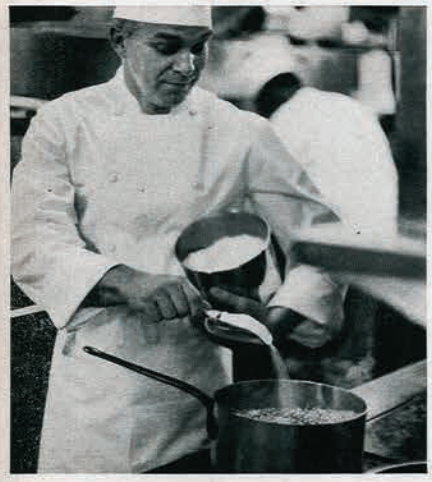
Why you were born with an instinctive liking for sugar

You get only 4 messages from your sense of taste: sweet, salty, sour, and bitter

The only one of these you liked from the day you were born was *sweet*—the flavor of sugar

This is the way things should be according to what science tells us about sugar

No other food provides us with essential energy so fast

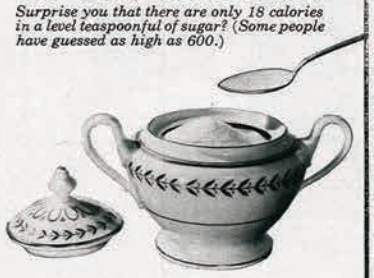


Why do good cooks add sugar to peas? It's a matter of flavor. In taste tests, people say that peas with sugar added taste more like peas. Even soup tastes brighter with a little sugar added. Try it and see.

Sugar helps dieters exercise! The best (and probably the hardest) exercise for dieters is pushing away from the table. Sugar makes it easier by satisfying appetite. No other food does it so fast—with so few calories.

18 CALORIES!

Surprise you that there are only 18 calories in a level teaspoonful of sugar? (Some people have guessed as high as 600.)



No other food satisfies your appetite so fast with so few calories.

All statements in this message apply to both cane and beet sugar.

Published in the interest of better nutrition by **SUGAR INFORMATION, INC.** a non-profit organization

SUGAR INTERESTS' MISINFORMATION

Sugar Information Inc. was the precursor to the Sugar Association, a trade organization that today promotes consumption of sugar. This ad appeared in 1960. Although it contains some factual information (e.g., humans are born with an innate attraction to sweet tastes), it also contains misinformation (e.g., no other food satisfies your appetite so fast). The statement, "published in the interest of better nutrition," misleads consumers about the motivations of the organization, and suggests that added sugar is good for our health.

In 2009, the Center for Science in the Public Interest (CSPI), a nonprofit that advocates for science-based nutrition and health policies, filed a lawsuit against Coca-Cola for misrepresenting the nutritional and health qualities of its Vitaminwater line of "enhanced" waters (CSPI 2009). Coca-Cola's claims about Vitaminwater were unsupported by science in at least three different ways: false claims about the ingredients in the product, false claims about the immediate physical effects of the product, and false claims about the long-term health effects of the product.

Vitaminwater, which has sugar content comparable to that of soda, was being marketed as a natural and healthy beverage through the use of health buzzwords such as "defense," "rescue," and "energy" whose use was unsubstantiated by the product's ingredients. Moreover, Vitaminwater flavors, such as "endurance peach mango," suggested that the product contained a considerable amount of fruit juice, when it contained between 0 and 1 percent juice. Coca-Cola was also claiming that VitaminWater reduced the risk of diseases and improved immune system functioning—again, claims unsupported by science but which held high persuasive value for consumers seeking to live a healthy lifestyle (CSPI 2009). As of May 2014, the case is still in the courts, but in July 2013 a federal magistrate recommended that it proceed as a class action suit in which plaintiffs may sue for declaratory and injunctive relief—that is, to require Coca-Cola to stop misrepresenting the product—though not for damages (CSPI 2013b).

Similarly, in 2011, CSPI filed suit against General Mills for misrepresenting the sugar content of its Fruit Roll-Ups "fruit snacks" (CSPI 2011). The product, which features added sugars as three of its five ingredients, was advertised as healthy, nutritious, and "made from real fruit"—claims that are highly appealing to health-conscious consumers. The product in fact has almost no nutritional value and can only be understood to contain fruit if "fruit" means fruit concentrate and "strawberry" means "pear." Despite the claim on the front of the package that the product is "made with real fruit," the "top secret strawberry" flavor contains pear concentrate but no strawberries and no whole fruit of any kind. Under pressure of the lawsuit, General Mills agreed to make its labeling for this product more accurate (CSPI 2012).

MISLEADING FRUIT ROLL-UPS PACKAGING
General Mills claimed that its strawberry Fruit Roll-Ups were "made with real fruit," but the product is made with no strawberries or whole fruit of any kind. Although the ingredients and nutrition information are displayed on the side panel, front-panel messaging misleadingly suggested this product was healthier than it actually is. As a result of a 2011 lawsuit, the company is now required to make this product's packaging more accurate.

TRADE ASSOCIATIONS AND FRONT GROUPS

Sugar interests have tried, through sophisticated advertising and marketing strategies, to obscure the link between the consumption of added sugar and adverse health consequences. Internal documents were recently released in a lawsuit involving two major trade groups representing the interests of companies that profit from products with added sugar—the Sugar Association and the Corn Refiners Association (CRA)—and these documents reveal that more secretive measures have been taken to intentionally mislead the public. Both of these sugar interests have engaged in tactics including using scientist spokespersons as "hired guns" and employing high-powered PR firms (SA v. CRA 2013).

In 2009, the CRA paid the PR firm Berman and Company to create deceptive TV and print ads promoting the "naturalness" of high-fructose corn syrup. The ads were aimed at consumers concerned about eating excess sugar in the form of high-fructose corn syrup, encouraging them to disbelieve information from scientific experts that eating sugar in any form had negative health outcomes. Market research performed by the CRA ahead of the campaign had "demonstrated that information from experts is more powerful than just having the CRA state the facts," and the ads were designed to "move the needle in a positive direction on our issue" (SA v. CRA 2013). In other words, the CRA knew that the public valued information from scientists and public health experts more than it did the CRA's own statements on sugar, and it wanted to correct that situation. The CRA paid Berman and Company to create ads that would undermine consumers' trust in the actual facts provided by scientific and public health experts and instead accept misinformation, presented as fact, from sugar interests (SA v. CRA 2013).

The CRA attempted to hide its sponsorship of the ad campaign by having the campaign run through a nonprofit

Center for Consumer Freedom/SweetScam.com

This ad was part of the Corn Refiners Association's public relations campaign to dispel public concerns about high-fructose corn syrup and hide its affiliation with the ads by hiring the Center for Consumer Freedom. The ad features celebrity sex therapist Dr. Ruth counseling an ear of corn about the "naturalness" of his sugar. The commercial is crass but through its humor helps persuade consumers of its misleading message—namely, that consuming excess sugar, no matter in what form, is harmless because sugar is "natural."

called the Center for Consumer Freedom (CCF) without mention of Berman and Company. The CCF, founded and run by Berman and Company's founder Rick Berman, is ostensibly a nonprofit "devoted to promoting personal responsibility and protecting consumer choices," but in reality it functions behind the scenes to promote the interests of corporate clients that seek out the PR services of Berman and Company and do not wish to be directly associated with certain messaging campaigns (Strom 2010).

In this case, the CRA wanted to promote the messages that all added sugars were "natural" and that the quantities that Americans should eat was a matter of consumer freedom—messages contrary to scientific evidence linking sugar to metabolic diseases and to the recommendations to limit sugar intake by major public health organizations. The CRA's then-president Audrae Erickson wanted the public to know the CRA supported the campaign's messaging but not that the CRA was responsible for it. Erickson stated in the trade group's internal emails that "our sponsorship of this campaign is confidential. We are funding Berman & Co. directly, not the Center for Consumer Freedom, which is running the ads. If asked, please feel free to state the following: 'The Corn Refiners Association is not funding the Center for Consumer Freedom. It is not surprising, however, that the food and beverage industry would want to defend this highly versatile ingredient'" (SA v. CRA 2013). Put another way, the trade association was paying Berman and Company for an industry PR campaign that would appear to the public as an independent statement about sugar as a consumer choice without disclosing that sugar interests were behind the campaign.

The CCF's consumer choice message is bought and paid for by the same food industry that seeks to engineer our food landscape and encourages the public to accept the appearance of choice rather than demanding actual choice. According to CCF messaging on sugar, although Americans live in an "obesogenic" society—that is, a society that promotes excessive weight gain—the health consequences of eating too much sugar are the result of consumers' personal choices (Obesity Myths 2014). These consumer choices, the CCF claims in material on its website and in the ads it created for the CRA, are not subject to the sophisticated, manipulative pressures of advertising, marketing, distribution patterns, or cost—nor the vulnerabilities of biology,

psychology, culture, or policy so effectively exploited by the food industry.

This industry-funded messaging has a powerfully patriotic ring to it: Americans have the right to choose how they live and what they eat and drink. Berman has even invented a conspiracy of "food police"—scientists, government officials, public health advocates—who seek to impose "authoritarian proposals to tax, legislate, and litigate away many food and beverage choices" (CCF 2014), while it is Berman and the CCF, undercover agents for the food industry, who are exerting the real control. While consumers would appear to have many healthy choices at mainstream grocery stores for bread, cereal, juices, and other processed food and beverage products, the reality is that many of these products contain hidden added sugar, and members of the public, if they rely on advertising and sugar interests' PR campaigns for nutritional guidance, are often in the dark about how much added sugar they are consuming.

Demographic Groups Targeted with Misinformation

Sugar interests' own misleading and false advertising—and their use of front groups to attempt to convince health-conscious consumers that the amount of sugar they eat is an unconstrained matter of personal choice—are directed at different demographic groups in unique ways. Groups

A DAY'S WORTH OF SUGAR IN A "HEALTHY" MEAL
Added sugar in seemingly healthy foods makes low-sugar meal choices difficult. See the table at right for the sugar contained in this meal, which exceeds the World Health Organization's recommendation for an entire day.

TABLE 2. Sugar Content of a "Healthy" Meal

Food Item	Grams of Sugar per Serving
Campbell's Tomato Soup	12
Grilled cheese sandwich made with two slices of Pepperidge Farms Farmhouse Honey Wheat Bread and two Kraft Singles	10 (bread) 2 (cheese)
Small mixed-greens salad with Kraft Zesty Italian dressing	1
Snapple "All Natural" Lemon Tea	36
Yoplait Light Strawberry Yogurt	10
Total	**71**
WHO Daily Recommendation	**50**

Added sugar is often present where consumers may not expect it. Even consumers consciously trying to make healthy choices may not always realize how much added sugar they are consuming from foods they may not expect. This meal contains almost 17 teaspoons (71 grams) of sugar. The World Health Organization recommends that daily intake not exceed 12 teaspoons (50 grams).

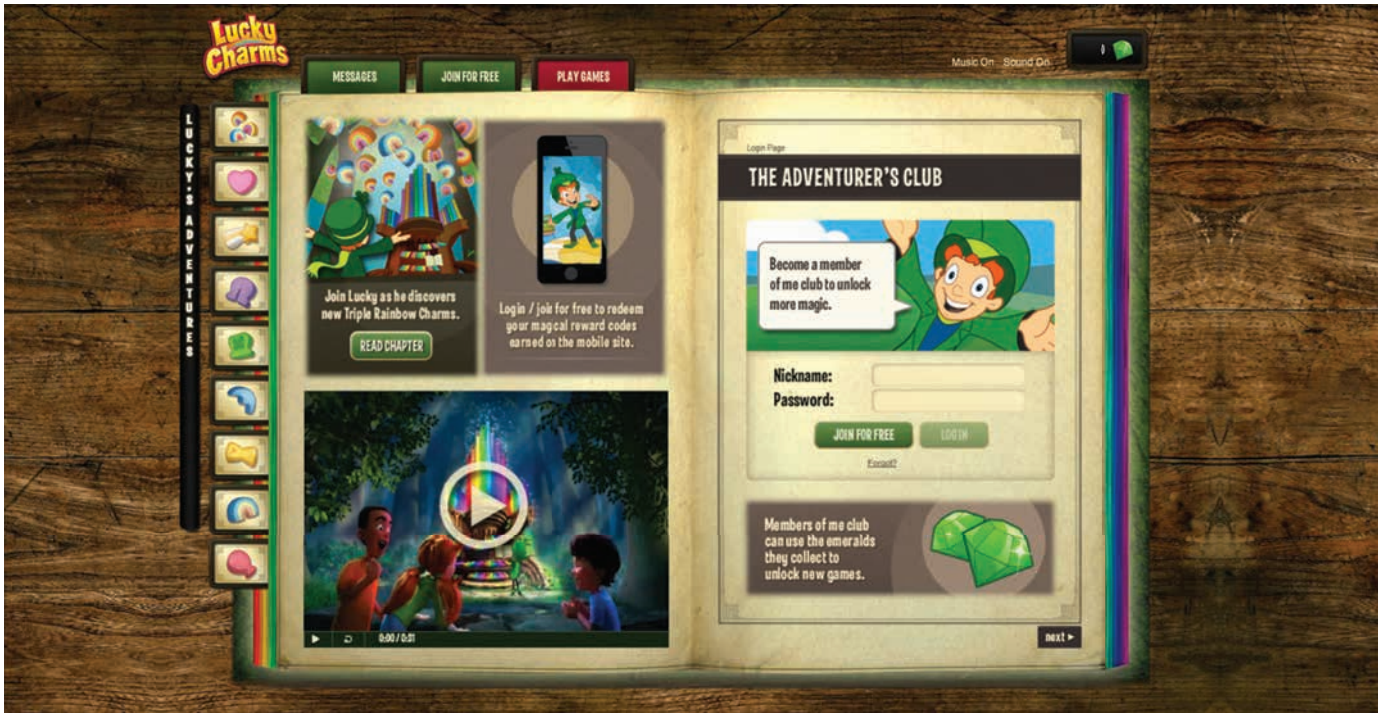
specifically targeted include children; women; members of minority groups including, in particular, African-Americans and Hispanics; and low-income people. By targeting these groups in particular, sugar interests take advantage of these individuals' psychological, social, and economic vulnerabilities to increase sales of products known to cause harm when ingested in excessive amounts.

CHILDREN: MISCOMMUNICATING SCIENCE IN WAYS THAT EXPLOIT BIOLOGICAL AND PSYCHOLOGICAL VULNERABILITIES

The food industry spends close to a quarter of its nearly $7 billion annual advertising budget on youth-directed advertising, of which soda, snacks, cereals, candy, and other sugar-heavy products make up the largest percentage (FTC 2012). Children are also exposed to advertising for these products aimed at general audiences. Despite (potentially countervailing) parental influence, children's food choices are significantly influenced by their exposure to food advertising (Ferguson, Muñoz, and Medrano 2011).

The advertising and marketing of sugary foods and beverages to children is omnipresent in the media landscape that children encounter, and television advertising dominates. In 2010, children and adolescents were potentially exposed to 896 different TV ads for sugar-sweetened beverages alone (Harris et al. 2011). Food and beverage companies also increasingly rely on the Internet to reach children, devoting space on company websites to child-centered content, establishing separate websites for products that appeal to children, and utilizing the sharing capabilities of social media to promote peer-to-peer communication among children about sugary products (FTC 2012). Top-ranking websites such as MyCokeRewards.com often receive more than 100,000 unique child and adolescent visitors each month, where children encounter humorous and engaging brand messaging, animated spokes-characters, athletes and celebrities, and incentives for purchasing sugary products, rather than information about the products' health or nutritional attributes (Harris et al. 2011). Companies also disguise ads for sugary foods and beverages as games known as "advergames" (Weatherspoon et al. 2013).

Children influence an estimated $300 billion in adults' spending, of which the largest category is food (Schor and Ford 2007). When a trip to the grocery store can mean a parent's putting up with a child's tantrum or giving in to the child's demands for sugary treats, many parents will reach for the soda, candy, cookies, or box of highly sweetened cereal that their child points to, if it means achieving a temporary calm (Ferguson, Muñoz, and Medrano 2011). Also, children are themselves a growing class of independent consumers, spending tens of billions of dollars annually on a wide variety of products, with an estimated one-third of their



General Mills/LuckyCharms.com

"Advergames" are ads disguised as games and aimed at children. On the Lucky Charms cereal website, depicted here, children can watch videos, play games, and join the "Adventurer's Club" (General Mills 2013a). Advergames are a strategic way for sugar interests to reach children, but they are problematic because children lack the cognitive skills necessary to recognize persuasive intent.

expenditures going to sugar-sweetened foods and beverages (Schor and Ford 2007).

Neither children's cravings nor parents' willingness to give in are simple matters of free choice. Through advertising and marketing, food companies manufacture desire for their sugar-laden products by manipulating children's unique biological and psychological vulnerabilities.

BIOLOGICAL VULNERABILITY

Children are innately more receptive to sweet tastes than adults and are thus attracted to the foods and beverages with excessive sugar that the food industry aggressively advertises and markets to them (Cuda Kroen 2011; Beauchamp and Mennella 2009).

Sugar interests have long been aware of physiological research that documents children's attraction to sweet tastes and have funded it through institutes such as the Monell Center, a nonprofit research organization that studies taste and smell and maintains a corporate sponsorship program (Moss 2013). While the exact cause for children's heightened preference for sweet tastes is unknown, according to researchers, developmental physiology, perception, and cognition are all suspected to play a role (Coldwell, Oswald, and Reed 2009). Researchers at the Monell Center found that sugar has pain-reducing effects in children but not in adults (Pepino and Mennella 2005). They also found that children's preference for sweet tastes is likely the result of an evolutionary adaptation that conferred an advantage on individuals who readily accepted mothers' milk and sweet fruits containing vital nutrients for growth (Ventura and Mennella 2011). The preference has been shown to decline in late adolescence when children stop growing (Coldwell, Oswald, and Reed 2009).

On the basis of children's attraction to sweet tastes, sugar interests have argued (through op-eds, fact sheets, and other PR materials) that added sugar helps children maintain a healthy diet by encouraging them to eat larger amounts of nutritious foods made more appealing by the presence of more sugar—for example, chocolate flavoring added to milk (SA v. CRA 2013; Murphy et al. 2008). While there may be some truth to this, children's attraction to sweetness causes them, if they are given the opportunity, to consume sugar far in excess of nutritional recommendations. Researchers have found, for example, children to prefer a sugar-water solution with sugar content so high that the sugar no longer dissolves in the water; adults, by contrast, indicated the sugar-water solution was too sweet when it exceeded the amount of sugar in a typical soda (Cuda Kroen 2011; Ventura and Mennella 2011).

By marketing and advertising sugary products to children, the food industry is exploiting children's innate attraction to sweet foods and drinks, which are vastly more abundant in children's lives than they were for past generations. Today's food environment is very different from the food environment in which the preference for sweets evolved—or even from the food environment of 40 years ago.

Neither children's craving nor parents' willingness to give in are simple matters of free choice. Food companies manufacture desire for their sugar-laden products.

In 1970, the average American consumed 74.7 grams of sugar per day—more than 18 teaspoons (USDA 2012). By 2012, it had jumped to 82.1 grams—more than 20 teaspoons (USDA 2012). This is almost double the U.S. Department of Agriculture's recommended allowance of 42 grams per day, more than double the American Heart Association's recommended allowance for men, and more than triple the association's recommended allowance for women (USDA 2012). The quantity and availability today of foods and beverages with excessive added sugar leave all consumers, but especially children, vulnerable to the pressure from industry advertising and marketing to over-consume.

Another potential area of vulnerability is the addictiveness of sugar and sugar interests' efforts to "hook" consumers early on (Lustig 2014; Moss 2013). Research has demonstrated that some individuals show brain responses to sugar similar to those observed in drug users and alcoholics, suggesting that sugar may have addictive qualities for some people (Ahmed, Guillem, and Vandaele 2013; Avena, Rada, and Hoebel 2008; Drewnowski et al. 1995; Drewnowski et al. 1992). A former Coca-Cola executive has spoken publicly about the company's own research—informed by these sugar addiction studies—into tactics to motivate "heavy users," that is, people who consume large amounts of Coca-Cola beverages, to consume even more (Moss 2013). Although Coca-Cola has a policy against advertising directly to children under 12, many food companies, Coca-Cola included, see adolescents as a consumer base ripe for cultivation (Moss 2013). Since most children and adolescents have not yet developed brand loyalty, they represent a lifetime of increasing revenue for those companies that can "hook" them early and keep them coming back (Moss 2013).

PSYCHOLOGICAL VULNERABILITY

In targeting advertising to children, sugar interests also exploit children's psychological vulnerability. Children are more vulnerable to advertising than adults because they have not yet developed the cognitive functions necessary to recognize and process persuasive intent (Baiocco, D'Alessio, and Laghi 2009). Adults understand that advertisers have interests different from their own, that advertising messages are intended to make people think in a certain way, that these messages are biased, and that special strategies are needed to interpret them (Baiocco, D'Alessio, and Laghi, 2009). Children lack these cognitive mechanisms entirely before the age of seven and begin to acquire them only as they get older (Baiocco, D'Alessio, and Laghi 2009).

But even as children do develop the capacity to recognize persuasive intent, advertisers can use techniques that short-circuit this recognition. For example, fantasy characters (e.g., Tony the Tiger for Frosted Flakes, the Lucky Charms leprechaun, the Keebler elves) in sugary food and beverage ads targeted at children were found to produce positive associations and low perception of manipulative intent in children aged 8 to 10 (Rose, Merchant, and Bakir 2012). Although children in this age group possessed some cognitive potential to recognize persuasion, when they were engaged with animated characters, color, action, and adventure, they were less likely to exercise it (Rose, Merchant, and Bakir 2012).

The advertising and marketing of sugary products to children also utilize themes central to kids' psychological development such as adventure, rebellion, and "the cool factor" (Schor and Ford 2007). Academic researchers have found food advertisers to be "sophisticated anthropologists" who "build on basic social relationships and the connection of food to those relationships" (Schor and Ford 2007). By inserting food into an emotional context that resonates with kids, advertisers can avoid rational appeals on the basis of a product's health or nutrition information, or even its taste.

"Bedroom"—a commercial for Oreos aired in May 2013—exemplifies the sophistication of advertisers' use of fantasy, animation, childhood themes, and social relationships (Nudd 2013). Incorporating Oreos, the commercial tells the story of a little girl and her dad. The girl sings a song in which she wonders whether, if she gives her dad an Oreo, he will let her stay up past her bedtime so they can spend more time together. As she sings, animation is overlaid on the live action illustrating happy scenes inside the girl's imagination—playing with toys, watching movies, telling jokes, and, of course, eating Oreos. According to its creative director, Magnus Hierta, the commercial is intended to capture "that magic moment when a kid has to go to bed during the summer but it's still kind of light out" (Nudd 2013). It is part of a marketing campaign called "Wonderfilled" that is "about seeing the world with open eyes and a curious heart" (Nudd 2013). In the fantasy world of the commercial, however, curiosity excludes any curiosity that viewers—children or their parents—might have about product health or nutrition information.

While it may seem a stretch to suggest that either kids or their parents would care about the nutrition information of Oreos, diverting consumers' attention from the science about added sugar through childhood themes and social relationships is not limited to obviously high-sugar products like Oreos. Commercials for the child-targeted, healthy-seeming General Mills yogurt GoGurt rely on these tactics to engage both children and their parents. In one GoGurt commercial, a brother and sister walk into the kitchen to pick up their lunches and are appalled to find their mother wearing terrible eye makeup. The mother says, "What?! It's called a smoky-eye," as she hands them their GoGurt-containing lunches. A voice-over then enters as the children head off to school—mortified by their mother but happy with the GoGurt in their lunches—and tells parents, "You may not be the best at new trends, but you know what's best for your kids. So we listened when you said GoGurt should have only natural colors and natural flavors. And no high-fructose corn syrup" (General Mills 2013b). By identifying with the characters and social relationships in the commercial, children are led to believe that GoGurt is cool, even if mom is not, while parents are misled to believe that GoGurt is healthy, even though it contains nine grams of sugar per serving—a fact conveniently omitted from the information provided in the commercial.

> ***Children are more vulnerable to advertising than adults because they have not yet developed the cognitive functions necessary to recognize and process persuasive intent.***

This GoGurt commercial also demonstrates another diversionary strategy that companies use to advertise sugary foods and beverages to children, known as "dual messaging." Dual messaging works by making the product seem fun to kids while emphasizing the informational attributes to parents (Schor 2004). This can be misleading because a product high in sugar might also be high in fiber or some other healthy ingredient. But research has

shown that a majority of parents misinterpret the meaning of nutrition claims commonly used on children's foods, notably on products with high levels of sugar and low levels of healthful ingredients (Harris et al. 2011). Messaging to parents highlights health claims but omits or downplays sugar content, and some of the most sugary, child-targeted cereals make some of the most prominent health claims (Hellmich 2012). For example, minus the sophisticated social dynamics in the GoGurt commercial, dual messaging is used to sell Froot Loops through a blatant mixture of fun and fiber content. According to Kelllogg's, the cereal is "packed with delicious fruity taste, fruity aroma, and bright colors. Made with whole grains and lightly sweetened, Froot Loops is a fun part of a complete breakfast, and is a good source of fiber" (Kellogg Company 2011). However, "lightly sweetened" is an understatement; the first ingredient of Froot Loops is sugar, and each one-cup serving contains 12 grams of it.

Marketing and advertising to children has been shown to undermine parental efforts to promote healthy diets in their children (Ferguson, Muñoz, and Medrano 2011). Since food industry research is largely proprietary, it is difficult to determine exactly how much scientific knowledge is deliberately driving the food industry's targeted appeals to children. However, based on the type and amount of information—especially about addiction—that emerged during tobacco lawsuits, the knowledge about how to motivate kids' consumption of sugar is considerable and the result of extensive research by sugar interests (Schor and Ford 2007).

WOMEN, MINORITIES, AND LOW-INCOME POPULATIONS

In addition to children, food companies target other segments of the population with ads for sugar-heavy products. Advertising and marketing that exploit the social

Why Isn't Children's TV Programming Better Regulated?

Today, there are few restrictions on marketing sugary foods and beverages to children, despite the scientific evidence of their vulnerability to ads. Federal agencies once tried to enact such regulation but were stripped of their authority decades ago.

In 1978, the Federal Trade Commission (FTC)—which regulates unfair and deceitful advertising, among other things—proposed broad rules restricting advertising to children. The agency sought to ban all television advertising to children six and younger based on the evidence that these children could not recognize and interpret persuasive intent. The agency also proposed to ban advertising of sugary products to children aged 8 to 11 because, although they could recognize persuasion, they could not understand the long-term health consequences of consuming sugar. Finally, the agency proposed that disclosure of health consequences needed to accompany advertising of sugary products to children 12 and older. Abundant scientific evidence—including some 60,000 pages of expert testimony—was presented to support the agency's position. However, the rule was never finalized. Sugar interests feared that implementation would hurt the sales of cereals, candy, soda, and other sugar-heavy products. Responding to pressure from these interests, Congress severely cut back funding for the FTC, causing a partial agency shutdown that lasted for years. Although the FTC did recover and today does regulate some TV advertising to children, it never again attempted to restrict advertising of sugary products (Westen 2006; Kunkel 2001).

The FTC shares responsibility for regulating TV advertising with the Federal Communications Commission (FCC). In 1974, the FCC mandated that advertising, whether product placement or promotion by a character or host, was prohibited during children's programs. Commercials were permitted but had to be separated from programs by a five-second buffer announcing a break from the program. Another five-second buffer had to follow the commercials before the program resumed. Deregulation during the 1980s eliminated the buffer periods and eroded restrictions on product promotion during programming (Kunkel 2001). Today, both agencies play only a limited role in regulating marketing of sugary products to children, allowing youth-targeted deceptive ads to continue to air.

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Today, there are few restrictions on TV marketing to children, despite the scientific evidence of their vulnerability to ads.

vulnerabilities of women, minorities, and low-income populations allow companies to divert consumers' attention away from the science about added sugar.

WOMEN: MISCOMMUNICATING SCIENCE THROUGH GENDER-BASED MARKETING AND ADVERTISING

The food industry's relationship to women and science is complex. Gender-based marketing and advertising by food companies take advantage of women's frequent role as the predominant food decision maker for the family (Lake et al. 2006), as well as insecurities women may have about fulfilling their obligations in this role (Parkin 2007). To appeal to women's sense of responsibility for family health and well-being, sugar interests emphasize that their products are wholesome and healthy through "scientific claims about foods' beneficial qualities such as vitamins and fiber to bolster their credibility" (Parkin 2007). However, the scientific basis for such claims is limited. Companies circumvent scientific information that places sugar in a negative light through omissions, diversionary tactics, and emotional appeals that associate sugary foods, especially baking and baked goods, with being a good mother, wife, and homemaker (Parkin 2007).

The lasting success of the Betty Crocker brand exemplifies how sugar interests approach gender-based marketing and advertising. Betty Crocker, never a real person, was invented in 1921 by executives at the Washburn Crosby Company, which later merged with General Mills, as a persona to answer inquires about baking and cooking from female customers (Moss 2013). The brand evolved as women moved into the workforce and had less time to spend in the kitchen, but it continued to emphasize women's role as food decision makers and providers of healthy food, even as convenience became a cornerstone (Moss 2013). The industry has long recognized that Betty Crocker is perceived by women—especially less-educated, working women and stay-at-home moms—as a female role model and authoritative voice on the science of food preparation (Parkin 2007).

Today, although the image of Betty as a person has given way to a brand logo, "Betty" has her own website, bettycrocker.com, where consumers can purchase products such as cake and cookie mixes and dessert-decorating kits, find coupons, read the Betty Blog, and find "healthified" recipes that incorporate General Mills products. These "healthified" recipes are either gluten-free or lower in fat and calories than similar desserts. However, while the recipes are promoted for these qualities, many are also very high in sugar. For example, a recipe for "Healthified Mini Chocolate Cheesecakes" is promoted in bold text as having "57% less fat, 61% less saturated fat, 37% fewer calories than the original recipe. Tempt your tastebuds with a chocolaty cheesecake that's easier on the waistline" (General Mills 2013c). The recipe, however, still contains a great deal of added sugar. If consumers care to read the small print below (see Figure 3), they can see that each small, individual-serving cheesecake contains 18 grams, or more than four teaspoons, of sugar—75 percent of the total amount of daily added sugar recommended by the American Heart Association for women and more than half what is recommended for men (AHA 2009).

Another key way that the food industry markets sugary foods to women is by connecting these foods to women's insecurities about weight, appearance, and attractiveness. While it may seem counterintuitive to market sugary foods as a means of weight control, this is exactly what some companies do. A new line of chocolates from Hershey's called

> ***Food companies exploit women as primary family food decision makers.***

Simple Pleasures, for example, proclaims "30% less fat vs. the average leading milk chocolate" and enlists "mommy bloggers" to promote "sweet independence" in the form of a guilt-free indulgence that provides an escape from family responsibilities (Hershey Company 2014). The product is relatively low in calories but contains 22 grams—more than five teaspoons—of sugar per serving. More disturbingly, a commercial run in 2011 for Yoplait Light suggested that women should feel guilty for their food choices and that choosing Yoplait Light's raspberry cheesecake flavor would generate less guilt than an actual slice of raspberry cheesecake. The ad was pulled off the air when the National Eating Disorders Association criticized it for promoting unhealthy behaviors and thought patterns (Williams 2011).

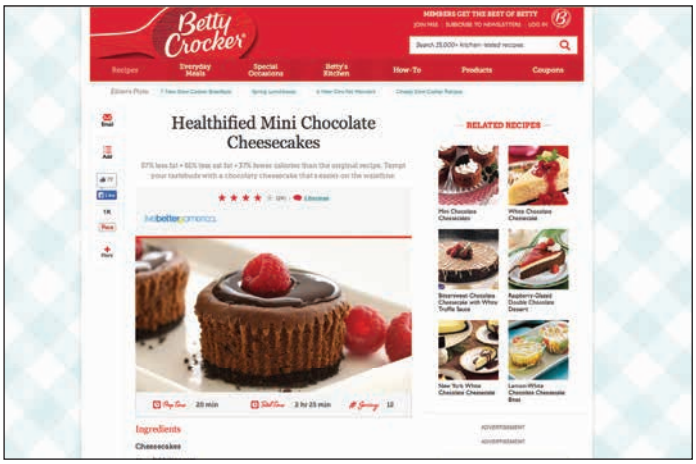
MINORITIES AND LOW-INCOME GROUPS: DISPROPORTIONATE EXPOSURE TO SUGAR ADS

Minorities and low-income populations are disproportionately exposed to marketing and advertising of sugary foods and beverages relative to other demographic groups. Disproportionate exposure occurs through culturally targeted marketing and advertising to minorities, pressures to assimilate into mainstream American culture, and economic disparities that motivate purchasing among low-income populations (Ethan, Samuel, and Basch 2013; Grier and Kumanyika 2008; Tirodkar and Jain 2003).

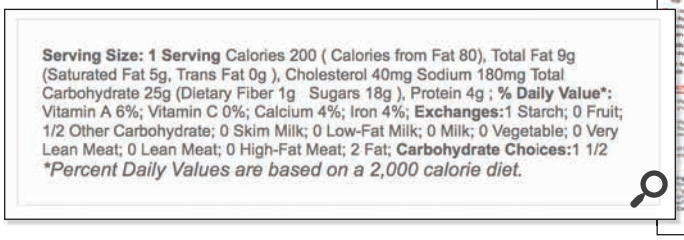
African-Americans have been aggressively targeted as a distinct demographic group by the food industry since the civil rights era and have been targeted by the sugar-sweetened beverage industry, in particular, since as early as

FIGURE 3. The Hidden Sugar in "Healthified" Recipes

Portion of Recipe Viewable without Scrolling



Entire Recipe and Nutrition Information



Betty Crocker's "Healthified Mini Chocolate Cheesecakes" recipe includes barely legible small print beneath that indicates that each serving contains a whopping 18 grams—or more than four teaspoons—of sugar.

the 1930s (Grier and Kumanyika 2008). The population of African-Americans is growing in the United States, and thus is a growing group of potential consumers of sugary products. In addition, growing groups outside of the dominant culture have socioeconomic mobility but still cultural separation, thus constituting a promising audience for culturally distinct messages. Food companies approach African-Americans through a general strategy of more frequently promoting "low-cost, high-calorie, and low-nutrition food and beverage products" than they do to other groups (Grier and Kumanyika 2008). African-American television audiences also experience greater exposure to food industry messaging through more commercials for sugary products such as candy, soda, and sports drinks aired during TV programs aimed at them, more product placement during this programming, and more acceptance of overconsumption in program content (Tirodkar and Jain 2003). Inequities in dietary quality and obesity rates between African-Americans and other U.S. populations have caused researchers to question whether a causal link exists between these disparities and food industry advertising exposure (Grier and Kumanyika 2008).

Hispanic Americans' integration into mainstream, English-speaking U.S. culture has been shown to increase their exposure to food advertising and marketing that contains lower informational content about health and nutrition than Spanish-only promotions (Abbatangelo-Gray, Byrd-Bredbenner, and Austin 2008). Content analysis of food advertising during Spanish-only and English-only prime-time programming showed statistically significant differences in the amount and quality of nutrition and health information that was communicated (Abbatangelo-Gray, Byrd-Bredbenner, and Austin 2008). Commercials aired during Spanish-only programming contained more and better information relating to nutrition and health (Abbatangelo-Gray, Byrd-Bredbenner, and Austin 2008). As acculturation increases among Hispanic Americans, so does their preference for English-only programming (Ueltschy and Krampf 2011)—and therefore the greater their exposure to the misinformation from English-only ads and the less exposure to the better information in Spanish-only ads. Potential links exist between obesity rates and Hispanics' acculturation, their length of time in the United States, their English proficiency, and their exposure to English-only food advertising (Abbatangelo-Gray, Byrd-Bredbenner, and Austin 2008; Himmelgreen et al. 2004).

Hispanic youth are especially vulnerable to these observed effects. The food industry views them as a growing class of consumers for sugary, nutrient-poor foods, and targets them in both Spanish and English (Watson 2012). Their higher obesity rates relative to other youth populations in the United States suggest that they experience enhanced effects from their exposure to these ads (Fleming-Milici et al. 2013).

Low-income populations may also be exposed disproportionately to products with high sugar content because of the cost savings these foods represent (Drewnowski et al. 2014; Darmon and Drewnowski 2008). Foods high in sugar are among the cheapest available sources of energy (Drewnowski 2003). In addition, low-income neighborhoods have fewer supermarkets with more healthy options and more convenience stores with fewer healthy options (Zenk and Powell 2008; Powell et al. 2007). Promotional flyers and coupons highlighting cost savings of high-sugar products have been correlated with low-income neighborhoods (Ethan, Samuel, and Basch 2013). In one study that analyzed more than 2,000 grocery store flyers in poor neighborhoods in the Bronx, more than 84 percent of the products being promoted were processed (and thus likely to contain added sugar), and three-quarters of the sugar-sweetened beverages advertised were associated with cost savings (Ethan, Samuel, and Basch 2013).

Communicating Science through Science-based Strategies

Advertising executives, speaking publicly at a conference on science communication organized by the National Academy of Sciences, commented on how industry has "outmaneuvered" the science community by doing a better job of applying research in the behavioral and social sciences to convey industry messages (NRC 2014). Not only is industry acutely aware of academic research on how to engineer choices and influence public opinion and behavior, but companies are actively conducting their own research. Peter Zandan, global vice chair of Hill+Knowlton Strategies (the PR firm notorious for its role in developing the tobacco industry's doubt strategy), cited $9.5 billion as an annual amount invested by the business community, including the food industry, in research to understand the effectiveness of its messaging (NRC 2014).

Industry's increasing effectiveness at reaching the public has been the result of a strategic, science-based communications shift from informing audiences to engaging them (NRC 2014). Instead of messaging around the qualities of a product, industry messaging today attempts to connect products directly to consumers' lives (NRC 2014). Sugar interests have done this through advertising strategies that use emotion to bypass reason and through the deceptive but values-based messaging of front groups like the Center for Consumer Freedom. The public-interest goals of communicating science-based health and nutrition information about sugar are clearly different, yet there are lessons to be learned for the science community from businesses' strategic emphasis on engagement. And there is reason for hope that more science-based information about sugary products and the health effects of consuming added sugar will reach the public. The increasing role of social media in most Americans' lives, for example, means that it is possible to reach millions of people without the large expenses associated with traditional forms of advertising.

To reach citizens, public interest and science communicators must more aggressively bring out science-based understanding of the health effects of sugar consumption and expose misinformation by engaging with the public through social media and other formats and connecting science directly to their lives. While sugar interests have exploited advertising to misinform the public and shape consumers' perception of choice, advertising can also be used effectively to promote the public good. The history of successful public service announcement (PSA) campaigns illustrates the potential to influence public opinion and shape behavior in positive ways through science-informed messaging (Ad Council 2004). These ads have been effective because they persuade people that their actions make a difference. The Advertising Council, a nonprofit organization that both develops and studies PSAs, has reported on decades of successful campaigns. For example, a 1971 pollution-prevention campaign called "The Crying Indian" motivated more than 100,000 Americans within the first four months to request more information on pollution reduction and led to an estimated 88 percent drop in littering nationwide by 1983 (Ad Council 2004). The ad engaged viewers by telling them to "Get involved now. Pollution hurts all of us"; used powerful emotional and visual appeals along with rational, factual ones; and has received awards from the advertising industry for the effectiveness of its messaging (Ad Council 2004).

Successful PSAs have been credited with reducing smoking, increasing seatbelt use, increasing minority college enrollment, and preventing drunk driving, crime, and forest fires (Ad Council 2004). New York City has already been at the front lines of addressing the obesity epidemic through initiatives such as food standards for its agencies, which specify amounts of fruits and vegetables and limits on fat and salt for meals served at New York City agencies, schools, hospitals, senior centers, community centers, correctional facilities, and other public service entities. In 2009, the city launched an anti-sugar PSA campaign (NYCDHMH 2009).

New York Department of Health and Mental Hygiene

This commercial from New York City's anti-sugar PSA campaign was picked up by the CDC for nationwide airing. PSAs in the past are credited with reducing smoking and littering, among other successes. Perhaps reducing Americans' consumption of sugar will be the next great PSA campaign.

One particularly powerful commercial features a man sitting in a restaurant dumping packet after packet of sugar down his mouth. On either side of him sit customers drinking sodas. Text in the foreground asks viewers: "You'd never EAT sixteen packs of sugar. Why would you DRINK sixteen packs of sugar?" (Kiefaber 2012). The commercial has been adopted by the Centers for Disease Control and Prevention (CDC) for a nationwide public health campaign to decrease sugar consumption (NYC 2012). New York City's case may be paving the way for sugar to be the next success story for PSAs and for science-informed public health improvements everywhere.

Recommendations

Sugar interests should be held accountable by experts, investors, decision makers, the media, and the public for their current efforts to obscure the science on sugar and its detrimental health effects:

- **The media** should publicly call out sugar interests' misstatements.
- **Scientific experts** should disclose all real or perceived conflicts of interest.
- **Investors and citizens** should pressure companies to align their public messaging with science and to cease funding to trade and front groups that spread misinformation.
- **Congress** should restore the Federal Trade Commission and Federal Communications Commission to their full capacity to regulate marketing to children so that the agencies can regulate youth-targeted marketing.
- **The Food and Drug Administration** should implement a strong rule requiring the labeling of added sugar in nutrition labels as the agency announced it intends to do. This will better inform the public about how much sugar has been added to processed foods.
- **Federal, state, and local health agencies** should develop aggressive public information campaigns to emphasize the scientific evidence demonstrating sugar's health impacts and counter the misinformation from sugar interests.

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