

## Role of Policy and Government in the Obesity Epidemic Nicole L. Novak and Kelly D. Brownell

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## Role of Policy and Government in the Obesity Epidemic

Nicole L. Novak, MSc; Kelly D. Brownell, PhD

In 2001, the Surgeon General's "Call to Action to Prevent and Decrease Overweight and Obesity"<sup>1</sup> identified obesity as a key public health priority for the United States. Obesity rates were higher than ever, with 61% of adults nationwide overweight or obese. In the intervening years, several administrations have declared a commitment to deal with the problem, and the food industry has issued numerous pledges for change, yet the prevalence of overweight and obesity has risen further, to 68%.<sup>2</sup> Children have been particularly affected; >19% of school-aged children were obese in 2007 to 2008 compared with just 6% in the late 1970s.<sup>3</sup> Disease rates join high healthcare costs, so everyone is affected personally, economically, or both.<sup>4,5</sup>

A wide range of government policies and programs have been implemented, including the development of national clinical guidelines, nutrition labeling on packaged foods, education and social marketing efforts, and more recently, calorie labeling on restaurant menus and federal efforts to increase access and financing for fresh fruits and vegetables. However, most of these efforts focus on clinical and educational factors or on community interventions and, until recently, have rarely addressed environmental drivers of obesity.<sup>6,7</sup> There is growing theoretical and scientific support for policies that intervene on environmental determinants of overeating. The implementation of some policies is facing resistance from the food and beverage industries.<sup>8,9</sup>

### Optimal and Suboptimal Defaults

Evidence from behavioral economics has demonstrated that humans are heavily influenced by default conditions in their environment.<sup>10</sup> Defaults can be conceptualized as conditions to which people are exposed in day-to-day life that affect particular aspects of their behavior and health. For example, polluted air and water create negative defaults that damage health. Progress comes through removing the toxic agents, not by accepting them and urging people to react differently (eg, wear masks or boil water).

One remarkable example of defaults comes from research on organ donation rates.<sup>10</sup> A study of European countries compared rates in countries where individuals are not donors by default but can opt to become donors (similar to the US approach) with rates in countries where individuals are donors by default but can opt out. Individuals have the same choices in both circumstances, but organ donation enrollment

rates average 15% in countries with the opt-in defaults and 98% in countries where the default is reversed (see Figure 1). This is a stunning difference. Even with unlimited funds to educate and implore the population to become organ donors, the 98% enrollment that is found in countries where donation is simply the default could never be reached.

Evidence suggests that defaults in the food environment also influence behavior, especially in terms of selection and consumption of food.<sup>11</sup> This has been demonstrated in laboratory and field studies manipulating the availability, appearance, sizing, and serving of food.<sup>12,13</sup> It has also been demonstrated in schools, where changes to the food environment such as the elimination of unhealthy a la carte and vending machine foods have been shown to change the diet of students.<sup>14</sup> There are also broad environmental defaults that affect the entire population such as prices of foods, food marketing, and the widespread availability of unhealthy foods. As it stands now, the food environment creates a set of defaults that contribute to obesity, in the United States and elsewhere.<sup>7</sup>

Recent cost-effectiveness analyses of obesity treatment and prevention strategies suggest that policy interventions to change these defaults are the swiftest and most cost-effective way of creating change.<sup>6</sup> The Assessing Cost-Effectiveness (ACE) studies of obesity and of noncommunicable disease prevention identified the 3 most cost-effective policy interventions as a tax on unhealthy foods and beverages, a front-of-pack "traffic light" nutrition labeling system, and a reduction of marketing of unhealthy foods and beverages to children.<sup>6,15,16</sup> Recent reports from the Organization for Economic Cooperation and Development also support the idea that regulatory and fiscal policy could reduce obesity by improving defaults for the whole population.<sup>17,18</sup>

The role of defaults in obesity prevention is presented visually in Figure 2, which is adapted from Swinburn and colleagues' recent article in *The Lancet*.<sup>7</sup> Although individual behavioral factors (on the right half of the figure) affect energy imbalance, these behaviors are shaped by environmental and systemic drivers that shape "default" consumption and activity patterns. The triangle along the bottom of the figure represents the hypothesis that policy interventions to change environmental and systemic defaults will have the greatest population effect on obesity but will also be the most politically difficult to implement.

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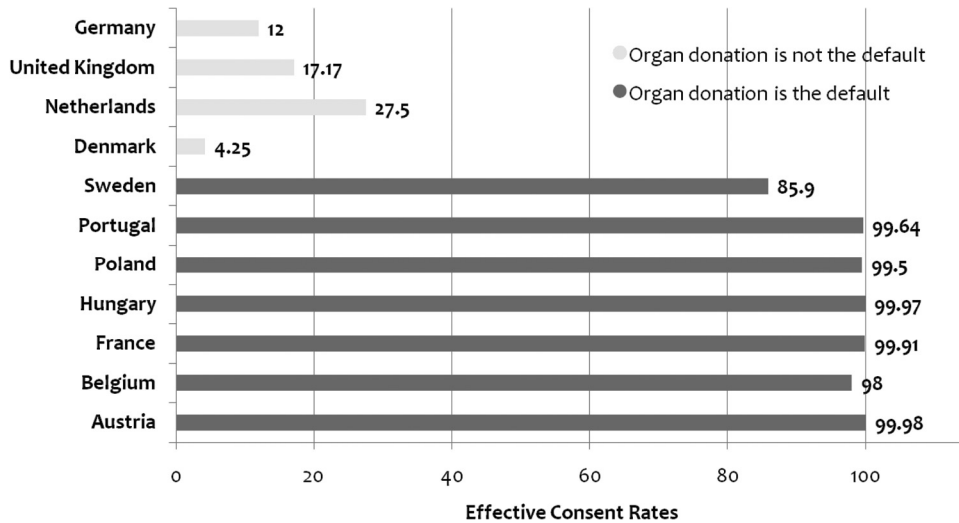
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**Figure 1.** Effective consent rates by country. Explicit (opt-in, gold) and presumed (opt-out, blue) consent. Reprinted from Johnson and Goldstein<sup>10</sup> with permission from the publisher. Copyright © 2003, American Association for the Advancement of Science.

Using the framework presented in Figure 2, this article describes the evidence that harmful dietary defaults are a key contributor to obesity and discusses 2 policy interventions that show promise for reducing obesity on a population level: restricting marketing of unhealthy food and beverages to children and taxing unhealthy products (in this case, sugary drinks). Although there is growing evidence that these interventions may have a positive impact on diet and weight gain in the population, their implementation has met considerable resistance from the food industry.

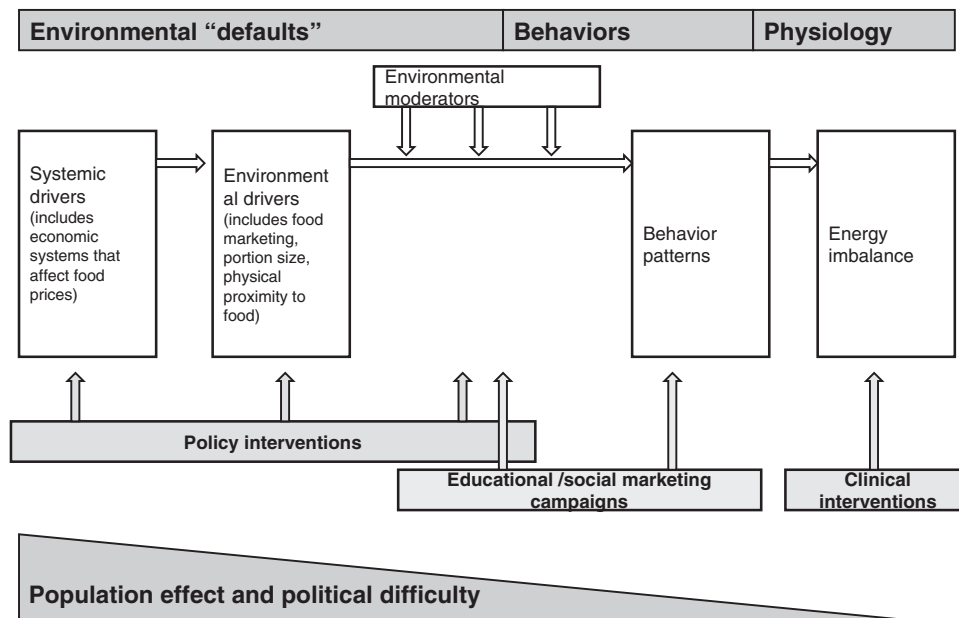
### Environmental Contributors to Obesity

The environment has a marked impact on dietary choices and physical activity. It is estimated that people make >200 food-related decisions each day (eg, when to eat, how much

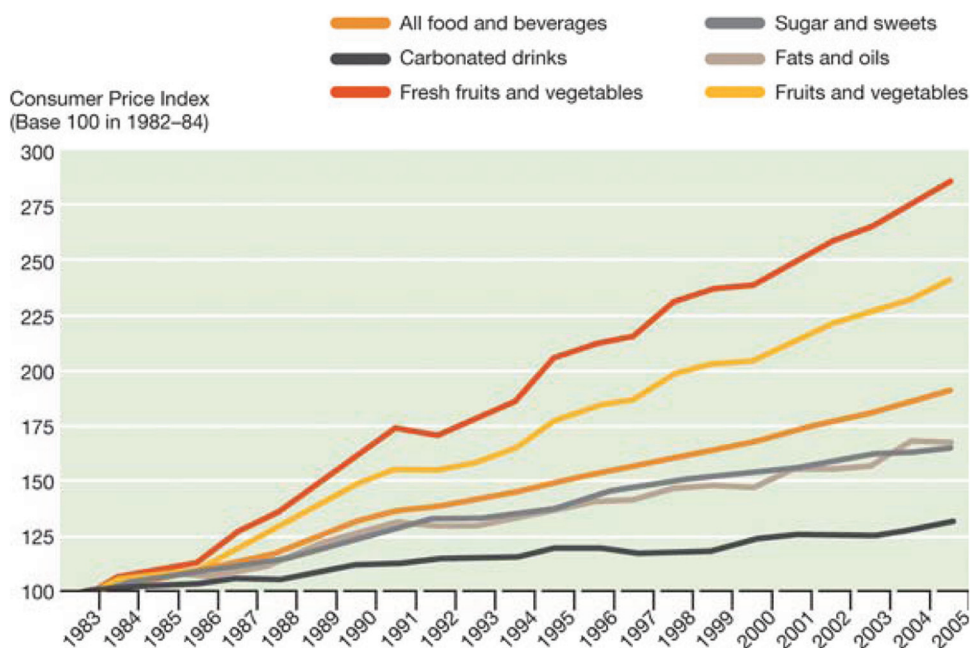
to serve themselves, whether to finish the amount served) but recall making <10% of those decisions.<sup>19</sup> This leaves the majority of people’s dietary choices vulnerable to default conditions around them, which may be influenced by the marketing, sizing, convenience, appearance, and pricing of foods and beverages, to name a few relevant factors. The following describes features of today’s food environment that nudge or even blatantly push people to consume more food.

### Food Environment

A growing body of literature documents the impact of the availability of foods high in sugar, fat, sodium, and calories on diet and body weight.<sup>20–24</sup> A longitudinal study of adults found that those who live closer to fast food restaurants consume fast food more frequently than others.<sup>25</sup> Children



**Figure 2.** Framework to categorize causes of obesity and corresponding policy responses. Adapted from Swinburn et al<sup>7</sup> with permission from the publisher. Copyright © 2012, Elsevier.



**Figure 3.** Development of relative prices for various foods in the United States from 1983 to 2005. Reprinted from Popkin<sup>30</sup> with permission from the publisher. Copyright © 2011, Nature Publishing Group.

whose schools serve more unhealthy foods or provide vending machines with unhealthy foods tend to be heavier than children whose schools do not permit such practices.<sup>26</sup> Similarly, adolescents who attend schools near fast food restaurants are more likely to be obese.<sup>27</sup> These studies suggest that proximity to unhealthy food may be 1 driver of weight.

Economic features of the food environment also contribute to obesity. The cost per calorie of healthy foods exceeds the costs of energy-dense (and often nutrient-poor) foods.<sup>28</sup> In the past 30 years, this cost disparity has increased; between 1985 and 2000, the prices of healthy foods like fruits and vegetables, fish, and dairy products increased at more than twice the rate of the prices of sugar and sweets, fats and oils, and carbonated beverages<sup>29,30</sup> (Figure 3). The disparity in costs of healthy and unhealthy food may be exacerbated by the US Department of Agriculture's focus on scaling up (and subsidizing) production of commodity crops such as corn and soybeans and the relative neglect of fruit and vegetable production.<sup>31,32</sup>

Another troubling phenomenon is the growth of portion sizes. For children alone, the average portions of soft drinks, pizza, and Mexican foods increased by 34, 140, and 139 calories, respectively, between 1977 and 2006.<sup>33</sup> Sodas, sold originally in 6.5-oz bottles, are now typically sold in 20-ounce containers, triple their original size. Experimental studies indicate that portion size directly influences consumption and that nearly all consumers will eat more when given larger portions, often without realizing it.<sup>34,35</sup> Growing portion sizes have accompanied increasing eating occasions (ie, snacking) to lead to substantial rises in calorie intake: US adults consumed >500 more calories per day in 2006 than in 1977.<sup>36</sup>

The impact of growing portions is exacerbated by increased eating away from home. In 2008, Americans spent

49% of their food budget on food away from home compared with 33% in 1970.<sup>37</sup> On average, each meal eaten outside the home increases that day's consumption by 134 calories and decreases diet quality by reducing fruit, vegetable, and whole grain consumption and increasing saturated fat and added sugar.<sup>38</sup> This shift has occurred for children also; between 1977 and 2006, children increased their caloric intake away from home by 255 calories per day and decreased intake at home by only 76 calories per day.<sup>39</sup>

Another powerful force influencing diet today is food marketing.<sup>40,41</sup> It is estimated that children view 5500 food advertisements per year, with 95% of those advertising restaurant and fast food, sugared cereals, sugary drinks, and other unhealthy foods.<sup>42</sup> Harris and colleagues<sup>43</sup> found that the average preschool child sees >1000 advertisements per year for fast food alone.<sup>43</sup> These advertisements work; children's preferences for foods and their requests to parents for those foods increase with exposure to food marketing. Exposure to advertising also increases children's consumption of the advertised foods, often subconsciously.<sup>41</sup> Coca-Cola spent \$758 million on US advertising in 2010; McDonalds spent \$1.3 billion, and Burger King spent \$392 million.<sup>44</sup> In contrast, the budget for the development and promotion of the US Department of Agriculture's "My Plate" food guide released in 2011 is \$2 million per year.<sup>45</sup>

### A Note on Physical Activity

At the same time that the food environment has pushed Americans to consume more energy, physical activity levels have remained low. The Surgeon General recommends 30 minutes of moderate activity 5 days a week, yet >33% of Americans report being completely sedentary.<sup>46</sup> As with poor diet, low rates of physical activity can also be traced, at least in part, to social and economic causes. More people have sedentary jobs; it has been estimated that work-related energy

expenditure has dropped by >100 cal/d since 1960.<sup>47</sup> In 1969, 40% of children walked to school; by 2001, only 12% did.<sup>48</sup> At the same time, many schools are cutting funding for physical education; 36% of surveyed kindergarten through 12th grade physical education teachers said that their budgets had been cut between 2006 and 2009.<sup>49</sup>

Although low rates of physical activity are a major public health concern in their own right, growing evidence suggests that food intake is a more important contributor to obesity than sedentary behavior.<sup>7,50,51</sup> For example, Swinburn and colleagues<sup>51</sup> found that energy intake increased by  $\approx$ 500 cal/d for US adults and 350 cal/d for children between the 1970s and the 2000s, a change of much greater magnitude than any documented shifts in physical activity levels. Large amounts of increased physical activity ( $\approx$ 2 hours per person per day) would be required to compensate for this increase. There is no doubt that physical activity is an important public health priority, but it is unlikely to be an effective tool for obesity prevention without major shifts in caloric intake.

## The US Policy Response to Obesity

### Clinical and Behavioral Approaches

US policymakers have implemented a wide range of policies and programs to respond to obesity that began in the 1990s and increased after the Surgeon General's Call to Action in 2001. The majority have addressed clinical, behavioral, or educational issues, with less attention paid to environmental factors. For example, the "Clinical Guidelines on the Identification, Evaluation and Treatment of Overweight and Obesity in Adults"<sup>52</sup> were developed by the National Heart, Lung and Blood Institute in 1998. These guidelines drew on extensive reviews of the scientific literature to develop "principles of safe and effective weight loss" and are intended to be used by health practitioners who work with obese and overweight patients. The report by nature focuses almost entirely on therapies for weight loss in individuals, including dietary changes, exercise, pharmacotherapy, and surgery.

Another government program to address obesity is the Weight-Control Information Network, established in 1994 as a service of the National Institute of Diabetes and Digestive and Kidney Diseases. Although the clinical guidelines of the National Heart, Lung and Blood Institute are intended for a medical audience, the mission of Weight-Control Information Network is to provide evidence-based information about obesity and weight control to the general public and the media.

Other government policies have moved beyond the collation of clinical information to more proactive social marketing approaches that aim to motivate the population to change their diet and exercise habits. The HealthierUS Initiative launched by President George Bush in 2002 encouraged the American public to exercise daily and to eat a nutritious diet, primarily by promoting the "President's Challenge" to engage in an active lifestyle. The initiative also revamped the President's Council on Physical Fitness and Sports (now the Council on Fitness, Sports and Nutrition) to "expand national interest in and awareness of" exercise and sports.<sup>53</sup> Other programs include the US Department of Agriculture's "Team

Nutrition" program, a comprehensive, hands-on educational program in which students practice making food choices and differentiating between healthy and unhealthy foods.<sup>54</sup> This program and other social marketing projects such as the "Five a Day for Better Health" fruit and vegetable campaign borrow persuasive techniques developed for commercial marketing to augment the appeal of healthy behaviors and increase consumers' self-efficacy about making healthy choices.<sup>55</sup>

### Recent Shifts in Approach

Although clinical guidelines, educational programs, and social marketing campaigns are important, they do not address the environmental causes of the obesity epidemic and rely on individuals to prevail over a most challenging environment. Swinburn and colleagues<sup>7</sup> describe these types of policies as counteractions, ie, policies that react to environmental drivers of obesity without changing them directly. For example, educating children about the risks of consuming sugary drinks and entreating them to consume healthier beverages like low-fat milk is certainly important. However, children leave the classroom or the doctor's office only to confront a world where sugary drinks are cheaper and more ubiquitous than milk and where beverage marketing confronts them in movies,<sup>56</sup> on the Internet,<sup>43,57</sup> and even in schools,<sup>40</sup> increasingly with branding techniques targeted at the limbic, or emotional, part of the brain.<sup>58</sup> The intention of the policy to improve defaults is to make healthy choices easier.

Some recent policies indicate a shift toward the defaults approach described above. Federal legislation in 2009 allocated \$183 million for Safe Routes to School, a project that promotes active transport to schools by building bike lanes, trails, and sidewalks. The Let's Move! campaign launched by First Lady Michelle Obama in 2010 includes efforts to improve food environments in schools, to increase opportunities for physical activity, and to augment both the affordability and accessibility of healthy foods. The Healthy Food Financing Initiative announced in 2010 also aims to increase access to healthy foods by attracting supermarkets to areas currently lacking them.<sup>59</sup> The Healthy, Hunger-Free Kids Act of 2010 gave the US Department of Agriculture the authority to regulate the availability and quality of foods sold to children in schools.<sup>60</sup> Federal menu-labeling legislation was passed in 2010 as part of the Patient Protection and Affordable Care Act.<sup>61</sup> Assessing the effectiveness of these changes is a challenge; methods to measure environmental changes and to connect them to individual behavior and/or population health are still in development. Evidence suggests that policy to improve safe routes to school may increase walking or bicycle travel,<sup>62</sup> but this change has not been connected to changes in body weight. Evaluations of menu labeling interventions have had mixed results; although it is not clear that menu labeling has a marked impact on the amount of calories ordered, there is some evidence that consumers may consume less later in the day.<sup>63</sup>

These initiatives represent important shifts in the US policy approach to obesity, yet many of the most powerful defaults in the food environment such as marketing of unhealthy foods to youth and the prominent availability of sugary drinks have yet to be changed.



A fundamental reality must be recognized and addressed explicitly. Although promotion of healthy foods through food access programs is valuable, growing evidence suggests that reducing consumption of unhealthy foods may be at least as important. A study that followed up adults for 20 years found that the primary determinants of weight gain were consumption of unhealthy foods such as potato chips, French fries, sugary drinks, and meats. Consumption of fruits and vegetables was associated with less weight gain, but the impact was much smaller than that of the unhealthy foods.<sup>64</sup> Similarly, proximity to supermarkets, which are presumed to have more healthy foods, has less influence on diet than proximity to unhealthy foods.<sup>25</sup> It is not clear that simply promoting access and consumption of healthy foods (without discouraging consumption of unhealthy foods) will address obesity.

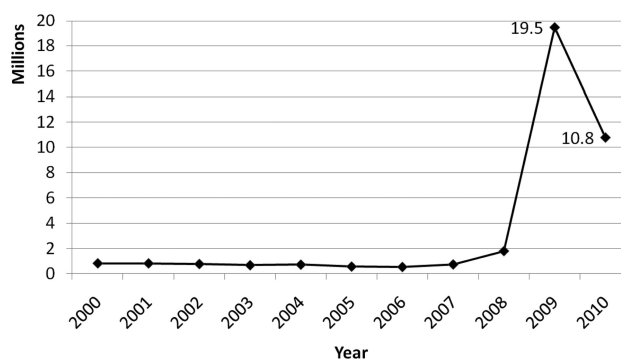
### Two Potentially Powerful Policies

A great deal of work is occurring on obesity prevention policies, including nutrition policies in schools, policies to encourage consumption of water in lieu of sugared beverages, changes in zoning laws to change the food landscape, and programs to improve the built environment. Here, we discuss 2 areas that have been identified as strategies<sup>6,15–18</sup> for cost-effective population-level change: taxes on sugary drinks and restrictions on marketing to children.

#### Taxes on Sugary Drinks

Fiscal interventions like taxes can be a powerful tool to improve the economic landscape of the food environment.<sup>65</sup> Beverages with added sugar are a prime candidate for taxation; they constitute >10% of caloric intake nationwide and provide little or no nutritional value.<sup>66</sup> Consumption of these beverages is associated with weight gain and a variety of other health conditions, including diabetes mellitus, hypertension, and metabolic syndrome.<sup>67–72</sup>

A penny-per-ounce excise tax on sugary drinks would effectively raise the shelf price of sugary drinks by  $\approx 20\%$ .<sup>65</sup> A number of studies have modeled the effect of such a tax, predicting a 14% to 20% reduction in the consumption of taxed beverages.<sup>73–79</sup> The ultimate effect on body weight will depend on the degree to which people substitute other high-calorie beverages such as juice and whole milk. Estimates of substitution are mixed. Fletcher and colleagues<sup>78</sup> found that children and adolescents substitute juice and whole milk to offset caloric reductions from sugar-sweetened beverages, whereas Smith and colleagues<sup>74</sup> found much smaller increases in consumption in other categories. However, reducing consumption of sugary drinks has metabolic benefits in its own right, and the policy is likely to have a public health effect even if a substantial portion of the calories are offset by increases in other categories.<sup>69,80,81</sup> An analysis of food prices and health outcomes in the Coronary Artery Risk Development in Young Adults (CARDIA) study found that increases in soda prices were associated with lower caloric intake, lower body weight, and reduced insulin resistance.<sup>82</sup> The revenue generated by a tax would be substantial (eg, \$790 million for New York State in 2012<sup>83</sup>) and could be earmarked for further obesity prevention efforts.<sup>84</sup>



**Figure 4.** The American Beverage Association (ABA) federal lobbying expenditures, 2000 to 2010. The ABA stepped up federal lobbying when a sugary drink tax was considered in 2009 (Lobbying Disclosure Act Data [cited February 15, 2011]; <http://soprweb.senate.gov/>).

Taxes on sugary drinks have been gaining interest across the nation. They were considered as a measure at the federal level to fund healthcare reform in 2009 and were proposed in 11 states and 2 major cities in the 2009 to 2010 legislative cycle.<sup>85</sup> In each case, these proposals met massive resistance from the beverage industry through its trade association, the American Beverage Association. This industry typically spent about \$1 million on lobbying Congress each year but increased lobbying expenditure to \$19 million when beverage taxes were considered at the federal level in 2009 (see Figure 4).<sup>85</sup> Since then, the American Beverage Association has also spent heavily in states considering sugary drink taxes, spending \$13 million and \$14 million on lobbying in the states of New York and Washington, respectively.<sup>86,87</sup> Antitax campaigns have also been waged by industry-funded front groups such as Americans Against Food Taxes that position themselves as grassroots consumer organizations, reminiscent of tobacco industry front groups made to look like grassroots groups of smokers.<sup>9</sup>

Although the industry has so far been successful in fending off sugary drink taxes, policymakers are increasingly considering them to promote public health and to close budget gaps.<sup>88,89</sup>

#### Reducing Food and Beverage Marketing to Children

Reducing the harmful effects of youth-targeted food and beverage marketing has been identified as a policy priority.<sup>41,90</sup> Governments in some other countries have already taken action on this issue.<sup>91</sup> In the United States, the only restrictions are the self-regulatory standards that food companies established in 2007 through the Children's Food and Beverage Advertising Initiative (CFBAI). The CFBAI commits companies to reduce or eliminate the marketing of unhealthy food to children <12 years of age. Unfortunately, vague definitions of "advertising primarily directed at children" and "healthier food" have allowed CFBAI companies to continue to market unhealthy products to children, especially with Web-based advertising, including product-themed online games, banner ads, and marketing on social media sites like Facebook and Twitter.<sup>43,92,93</sup> A number of studies have documented continuing pervasive practices of marketing to children despite these pledges.<sup>43,57,93–95</sup>

The US government has taken some steps to address this issue. In 2009, Congress established an Interagency Working Group on Food Marketed to Children that included representatives of the Federal Trade Commission, Food and Drug Administration, Centers for Disease Control and Prevention, and US Department of Agriculture, with the mandate to develop recommendations for nutritional quality standards for food marketed to children.<sup>90</sup> A proposed set of voluntary standards, which held that all foods marketed to youths 2 to 17 years of age should contribute to a healthy diet and have minimal levels of saturated and *trans* fat, added sugar, and sodium, was released for comment in April 2011.<sup>96</sup> Major trade associations for the food industry, the Grocery Manufacturers of America<sup>86</sup> and the National Restaurant Association,<sup>85</sup> and a number of food companies released statements criticizing the proposal. The CFBAI also objected and presented revised pledges as an alternative approach.<sup>97</sup> Industry associations and food companies spent millions of dollars lobbying on the issue,<sup>98</sup> and the revised standards released by the Federal Trade Commission in October 2011 were substantially weakened, applying only to children  $\leq 12$  of age.<sup>99,100</sup> Reuters called the Federal Trade Commission's weakening of the marketing standards a partial victory for the food industry.<sup>101</sup>

Although CFBAI made some improvements to the rigor and consistency of its marketing pledges in July 2011, they do not apply to teens and continue to permit extensive marketing and branding on programs and Web sites that have many child viewers but are not technically child targeted (such as American Idol or even [www.luckycharms.com](http://www.luckycharms.com)). Furthermore, 25% of food marketing to children continues to come from non-CFBAI companies, such as Dr Pepper/Seven Up.<sup>93</sup> It is also worth noting that CFBAI announced these changes only after the far more rigorous (although voluntary) standards of the Interagency Working Group on Food Marketed to Children were being considered.<sup>97</sup> Industry self-regulation could be a positive force but is likely to be beneficial only in the presence of a serious threat of government regulation.<sup>102</sup>

## Conclusions

It is likely that reducing obesity will require policy changes that improve the food and physical activity defaults for all Americans, not just targeted individuals. Some environmental policies such as physical activity promotion and efforts to improve access to healthy foods are unlikely to meet resistance. However, recent experience suggests that implementing some of the policies with the greatest potential benefit to public health will be politically difficult.

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## Disclosures

None.

## References

1. US Department of Health and Human Services. The Surgeon General's call to action to prevent and decrease overweight and obesity. Report

- No. 2001. <http://www.surgeongeneral.gov/library/calls/obesity/CaltoAction.pdf>. Accessed July 8, 2011.
2. Flegal KM, Carroll MD, Ogden CL, Curtin LR. Prevalence and trends in obesity among US adults, 1999–2008. *JAMA*. 2010;303:235–241.
3. Ogden CL, Carroll MD, Curtin LR, Lamb MM, Flegal KM. Prevalence of high body mass index in US children and adolescents, 2007–2008. *JAMA*. 2010;303:242–249.
4. Wang YC, McPherson K, Marsh T, Gortmaker SL, Brown M. Health and economic burden of the projected obesity trends in the USA and the UK. *Lancet*. 2011;378:815–825.
5. Lavie CJ, Milani RV, Ventura HO. Obesity and cardiovascular disease: risk factor, paradox, and impact of weight loss. *J Am Coll Cardiol*. 2009;53:1925–1932.
6. Gortmaker SL, Swinburn BA, Levy D, Carter R, Mabry PL, Finegood DT, Huang T, Marsh T, Moodie ML. Changing the future of obesity: science, policy, and action. *Lancet*. 2011;378:838–847.
7. Swinburn BA, Sacks G, Hall KD, McPherson K, Finegood DT, Moodie ML, Gortmaker SL. The global obesity pandemic: shaped by global drivers and local environments. *Lancet*. 2011;378:804–814.
8. Brownell KD, Warner KE. The perils of ignoring history: Big Tobacco played dirty and millions died; how similar is Big Food? *Milbank Q*. 2009;87:259–294.
9. Kameron D. The case of the sugar sweetened beverage tax. *BMJ*. 2010;341:c3719.
10. Johnson J, Goldstein D. Do defaults save lives? *Science*. 2003;302:1338–1339.
11. Brownell KD, Kersh R, Ludwig DS, Post RC, Puhl RM, Schwartz MB, Willett WC. Personal responsibility and obesity: a constructive approach to a controversial issue. *Health Aff (Millwood)*. 2010;29:379–387.
12. Wansink B, van Ittersum K, Painter JE. Ice cream illusions bowls, spoons, and self-served portion sizes. *Am J Prev Med*. 2006;31:240–243.
13. Wansink B, Painter JE, Lee YK. The office candy dish: proximity's influence on estimated and actual consumption. *Int J Obes*. 2006;30:871–875.
14. Schwartz MB, Novak SA, Fiore SS. The impact of removing snacks of low nutritional value from middle schools. *Health Educ Behav*. 2009;36:999–1011.
15. Vos T, Carter R, Barendregt J, Mihalopoulos C, Veerman L, Magnus A, Cobiac L, Bertram M, Wallace A. Assessing Cost-Effectiveness in Prevention (ACE-Prevention). 2010. [http://www.sph.uq.edu.au/docs/BODCE/ACE-P/ACE-Prevention\\_final\\_report.pdf](http://www.sph.uq.edu.au/docs/BODCE/ACE-P/ACE-Prevention_final_report.pdf). Accessed July 8, 2011.
16. Carter R, Moodie M, Markwick A, Magnus A, Vos T, Swinburn B, Haby MM. Assessing Cost-Effectiveness in Obesity (ACE-Obesity): an overview of the ACE approach, economic methods and cost results. *BMC Public Health*. 2009;9:419.
17. Sassi F. *Obesity and the Economics of Prevention: Fit not Fat*. Paris, France: Organization for Economic Cooperation and Development; 2010.
18. Sassi F, Cecchini M, Lauer J, Chisholm D. *Improving Lifestyles, Tackling Obesity: The Health and Economic Impact of Prevention Strategies*. 2009. OECD Health Working Papers No. 48. <http://search.oecd.org/officialdocuments/displaydocumentpdf/?doclanguage=en&cote=delsa/health/hwp%282009%296>. Accessed July 8, 2011.
19. Wansink B, Sobal J. Mindless eating: the 200 daily food decisions we overlook. *Environ Behav*. 2007;39:106–123.
20. Feng J, Glass TA, Curriero FC, Stewart WF, Schwartz BS. The built environment and obesity: a systematic review of the epidemiologic evidence. *Health Place*. 2010;16:175–190.
21. Casey AA, Elliott M, Glanz K, Haire-Joshu D, Lovegreen SL, Saelens BE, Sallis JF, Brownson RC. Impact of the food environment and physical activity environment on behaviors and weight status in rural U.S. communities. *Prev Med*. 2008;47:600–604.
22. Mehta NK, Chang VW. Weight status and restaurant availability: a multilevel analysis. *Am J Prev Med*. 2008;34:127–133.
23. Morland KB, Evenson KR. Obesity prevalence and the local food environment. *Health Place*. 2009;15:491–495.
24. Mujahid MS, Diez Roux AV, Shen M, Gowda D, Sanchez B, Shea S, Jacobs DR Jr, Jackson SA. Relation between neighborhood environments and obesity in the Multi-Ethnic Study of Atherosclerosis. *Am J Epidemiol*. 2008;167:1349–1357.
25. Boone-Heinonen J, Gordon-Larsen P, Kiefe CI, Shikany JM, Lewis CE, Popkin BM. Fast food restaurants and food stores: longitudinal associ-

- ations with diet in young to middle-aged adults: the CARDIA study. *Arch Intern Med.* 2011;171:1162–1170.
26. Fox MK, Dodd AH, Wilson A, Gleason PM. Association between school food environment and practices and body mass index of US public school children. *J Am Diet Assoc.* 2009;109:S108–S117.
  27. Currie J, DellaVigna S, Moretti E, Pathania V. The effect of fast food restaurants on obesity and weight gain. *Am Econ J Econ Policy.* 2010; 2:32–63.
  28. Drewnowski A. The cost of US foods as related to their nutritive value. *Am J Clin Nutr.* 2010;92:1181.
  29. Finkelstein EA, Ruhm CJ, Kosa KM. Economic causes and consequences of obesity. *Annu Rev Public Health.* 2005;26:239–257.
  30. Popkin BM. Agricultural policies, food and public health. *EMBO Rep.* 2011;12:11–18.
  31. Ludwig DS, Nestle M. Can the food industry play a constructive role in the obesity epidemic? *JAMA.* 2008;300:1808–1811.
  32. Wallinga D. Agricultural policy and childhood obesity: a food systems and public health commentary. *Health Aff (Millwood).* 2010;29: 405–410.
  33. Pienas C, Popkin BM. Food portion patterns and trends among U.S. children and the relationship to total eating occasion size, 1977–2006. *J Nutr.* 2011;141:1159–1164.
  34. Kelly MT, Wallace JM, Robson PJ, Rennie KL, Welch RW, Hannon-Fletcher MP, Brennan S, Fletcher A, Livingstone MB. Increased portion size leads to a sustained increase in energy intake over 4 d in normal-weight and overweight men and women. *Br J Nutr.* 2009;102:470–477.
  35. Flood JE, Roe LS, Rollis BJ. The effect of increased beverage portion size on energy intake at a meal. *J Am Diet Assoc.* 2006;106:1984–1990.
  36. Duffey KJ, Popkin BM. Energy density, portion size, and eating occasions: contributions to increased energy intake in the United States, 1977–2006. *PLoS Med.* 2011;8:e1001050.
  37. United States Department of Agriculture (USDA) Economic Research Service (ERS) Food Expenditure Series. Food CPI and Expenditures. Table 10. 2010. <http://www.ers.usda.gov/data-products/food-expenditures.aspx>.
  38. Todd JE, Mancino L, Lin B-H. The impact of food away from home on adult diet quality. Washington, DC: Economic Research Service; 2010. Report No. ERR-90.
  39. Poti JM, Popkin BM. Trends in energy intake among US children by eating location and food source, 1977–2006. *J Am Diet Assoc.* 2011; 111:1156–1164.
  40. Institute of Medicine. Food marketing to children and youth: threat or opportunity? Washington, DC: National Academies Press. Report No. 2006.
  41. Harris JL, Pomeranz JL, Lobstein T, Brownell KD. A crisis in the marketplace: how food marketing contributes to childhood obesity and what can be done. *Annu Rev Public Health.* 2009;30:211–225.
  42. Holt DJ, Ippolito PM, Desrochers DM, Kelley CR. Children's exposure to TV advertising in 1977 and 2004: information for the obesity debate. Washington, DC: Federal Trade Commission. Report No. 2007.
  43. Harris J, Schwartz M, Brownell K, Sarda V, Ustjanauskas A, Javadizadeh J, Weinberg M, Munsell C, Speers S, Bukofzer E, Cheyne A, Gonzalez P, Reshetnyak J, Agnew H, Ohri-Vachaspati P. Fast food FACTS: evaluating fast food nutrition and marketing to youth. Rudd Center for Food Policy & Obesity. 2010. [www.fastfoodmarketing.org](http://www.fastfoodmarketing.org).
  44. Marketer Trees 2011. Database of 100 leading national advertisers. June 2011. <http://adage.com/datacenter/markertertrees2011/>. Accessed July 8, 2011.
  45. Neuman W. Nutrition plate unveiled, replacing food pyramid. *The New York Times.* June 3, 2011. B3.
  46. Pleis J, Ward B, Lucas J. Summary health statistics for U.S. adults: National Health Interview Survey. *Vital Health Stat 10.* 2009;2010:10.
  47. Church TS, Thomas DM, Tudor-Locke C, Katzmarzyk PT, Earnest CP, Rodarte RQ, Martin CK, Blair SN, Bouchard C. Trends over 5 decades in U.S. occupation-related physical activity and their associations with obesity. *PLoS One.* 2011;6:e19657.
  48. McDonald NC. Active transportation to school: trends among U.S. schoolchildren, 1969–2001. *Am J Prev Med.* 2007;32:509–516.
  49. Roslow Research Group. Physical education trends in our nation's schools: a survey of practicing K-12 physical education teachers. Reston, VA: National Association for Sport and Physical Education. Report No. 2009.
  50. Scarborough P, Burg MR, Foster C, Swinburn B, Sacks G, Rayner M, Webster P, Allender S. Increased energy intake entirely accounts for increase in body weight in women but not in men in the UK between 1986 and 2000. *Br J Nutr.* 2011;105:1399–1404.
  51. Swinburn B, Sacks G, Ravussin E. Increased food energy supply is more than sufficient to explain the US epidemic of obesity. *Am J Clin Nutr.* 2009;90:1453–1456.
  52. Clinical guidelines on the identification, evaluation and treatment of overweight and obesity in adults: the evidence report. Bethesda, MD: National Heart, Blood, and Lung Institute. Report No. 1998.
  53. Office of the Press Secretary. *President Outlines Health and Fitness Initiative at White House Fitness Expo.* Washington, DC: The White House; 2002.
  54. Levine E, Olander C, Lefebvre C, Cusick P, Biesiadecki L, McGoldrick D. The Team Nutrition pilot study: lessons learned from implementing a comprehensive school-based intervention. *J Nutr Educ Behav.* 2002; 34:109–116.
  55. Balch GI, Loughrey K, Weinberg L, Lurie D, Eisner E. Probing consumer benefits and barriers for the national 5 A Day campaign: focus group findings. *J Nutr Educ.* 1997;29:178–183.
  56. Sutherland LA, Mackenzie T, Purvis LA, Dalton M. Prevalence of food and beverage brands in movies: 1996–2005. *Pediatrics.* 2010;125: 468–474.
  57. Harris JL, Schwartz MB, Brownell KD. Cereal FACTS: Nutrition and Marketing Ratings of Children's Cereals. Washington, DC: The Obesity Society. [www.cerealfacts.org](http://www.cerealfacts.org). Accessed July 16, 2011.
  58. Harris JL, Brownell KD, Bargh JA. The Food Marketing Defense Model: integrating psychological research to protect youth and inform public policy. *Soc Issues Policy Rev.* 2009;3:211–271.
  59. Holzman DC. White House proposes healthy food financing initiative. *Environ Health Perspect.* 2010;118:A156.
  60. Child Nutrition Reauthorization Fact Sheet. The White House. 2010. [http://www.whitehouse.gov/sites/default/files/Child\\_Nutrition\\_Fact\\_Sheet\\_12\\_10\\_10.pdf](http://www.whitehouse.gov/sites/default/files/Child_Nutrition_Fact_Sheet_12_10_10.pdf).
  61. Swartz JJ, Braxton D, Viera AJ. Calorie menu labeling on quick-service restaurant menus: an updated systematic review of the literature. *Int J Behav Nutr Phys Act.* 2011;8:135.
  62. Boarnet MG, Anderson CL, Day K, McMillan T, Alfonso M. Evaluation of the California Safe Routes to School legislation: urban form changes and children's active transportation to school. *Am J Prev Med.* 2005; 28:134–140.
  63. Roberto CA, Larsen PD, Agnew H, Baik J, Brownell KD. Evaluating the impact of menu labeling on food choices and intake. *Am J Public Health.* 2010;100:312–318.
  64. Mozaffarian D, Hao T, Rimm EB, Willett WC, Hu FB. Changes in diet and lifestyle and long-term weight gain in women and men. *N Engl J Med.* 2011;364:2392–2404.
  65. Andreyeva T, Chaloupka FJ, Brownell KD. Estimating the potential of taxes on sugar-sweetened beverages to reduce consumption and generate revenue. *Prev Med.* 2011;52:413–416.
  66. Woodward-Lopez G, Kao J, Ritchie L. To what extent have sweetened beverages contributed to the obesity epidemic? *Pub Health Nutr.* 2011; 14:499–509.
  67. Malik VS, Popkin BM, Bray GA, Despres JP, Hu FB. Sugar-sweetened beverages, obesity, type 2 diabetes mellitus, and cardiovascular disease risk. *Circulation.* 2010;121:1356–1364.
  68. Vartanian LR, Schwartz MB, Brownell KD. Effects of soft drink consumption on nutrition and health: a systematic review and meta-analysis. *Am J Public Health.* 2007;97:667–675.
  69. Malik VS, Popkin BM, Bray GA, Despres JP, Willett WC, Hu FB. Sugar-sweetened beverages and risk of metabolic syndrome and type 2 diabetes: a meta-analysis. *Diabetes Care.* 2010;33:2477–2483.
  70. Chen L, Caballero B, Mitchell DC, Loria C, Lin PH, Champagne CM, Elmer PJ, Ard JD, Batch BC, Anderson CA, Appel LJ. Reducing consumption of sugar-sweetened beverages is associated with reduced blood pressure: a prospective study among United States adults. *Circulation.* 2010;121:2398–2406.
  71. Fung TT, Malik V, Rexrode KM, Manson JE, Willett WC, Hu FB. Sweetened beverage consumption and risk of coronary heart disease in women. *Am J Clin Nutr.* 2009;89:1037–1042.
  72. de Koning L, Malik VS, Rimm EB, Willett WC, Hu FB. Sugar-sweetened and artificially sweetened beverage consumption and risk of type 2 diabetes in men. *Am J Clin Nutr.* 2011;93:1321–1327.
  73. Finkelstein EA, Zhen C, Nonnemaker J, Todd JE. Impact of targeted beverage taxes on higher- and lower-income households. *Arch Intern Med.* 2010;170:2028–2034.
  74. Smith TA, Lin BH, Lee JY. Taxing caloric sweetened beverages: potential effects on beverage consumption, calorie intake, and obesity.



- U.S. Department of Agriculture, Economic Research Service. 2010. Report No. ERR-100.
75. Dharmasena S, Capps O. Intended and unintended consequences of a proposed national tax on sugar-sweetened beverages to combat the U.S. obesity problem. *Health Econ*. 2012;21:669–694.
  76. Sturm R, Powell LM, Chriqui JF, Chaloupka FJ. Soda taxes, soft drink consumption, and children's body mass index. *Health Aff (Millwood)*. 2010;29:1052–1058.
  77. Fletcher JM, Frisvold D, Tefft N. Taxing soft drinks and restricting access to vending machines to curb child obesity. *Health Aff (Millwood)*. 2010;29:1059–1066.
  78. Fletcher JM, Frisvold DE, Tefft N. The effects of soft drink taxes on child and adolescent consumption and weight outcomes. *J Public Econ*. 2010;94:967–974.
  79. Block JP, Chandra A, McManus KD, Willett WC. Point-of-purchase price and education intervention to reduce consumption of sugary soft drinks. *Am J Public Health*. 2010;100:1427–1433.
  80. Chaloupka FJ, Powell LM, Chriqui JF. Sugar-sweetened beverages and obesity: the potential impact of public policies. *J Policy Anal Manage*. 2011;30:645–655.
  81. Runge CF, Johnson J, Runge CP. Better milk than cola: soft drink taxes and substitution effects. *Choices*. 2011;26.
  82. Duffey KJ, Gordon-Larsen P, Shikany JM, Guilkey D, Jacobs DR Jr, Popkin BM. Food price and diet and health outcomes: 20 years of the CARDIA Study. *Arch Intern Med*. 2010;170:420–426.
  83. Revenue calculator for sugar-sweetened beverage taxes. Rudd Center for Food Policy and Obesity. 2011. <http://yaleruddcenter.org/sodatax.aspx>. Accessed January 27, 2012.
  84. Brownell KD, Farley T, Willett WC, Popkin BM, Chaloupka FJ, Thompson JW, Ludwig DS. The public health and economic benefits of taxing sugar-sweetened beverages. *N Engl J Med*. 2009;361:1599–1605.
  85. Novak NL, Brownell KD. Taxation as prevention and as a treatment for obesity: the case of sugar-sweetened beverages. *Curr Pharm Des*. 2011;17:1218–1222.
  86. Blain G. Soda lobbyists spent 12.9M on lawmakers, more than any other group, in 2010. *NY Daily News*. March 5 2011. [http://articles.nydailynews.com/2011-03-05/news/28673770\\_1\\_tax-on-sugary-drinks-penny-per-ounce-tax-fat-tax](http://articles.nydailynews.com/2011-03-05/news/28673770_1_tax-on-sugary-drinks-penny-per-ounce-tax-fat-tax). Accessed November 7, 2011.
  87. Welch C. Money pours into ballot race. *Seattle Times*. September 13, 2010. [http://seattletimes.nwsourc.com/html/localnews/2012889716\\_sodatax14m.html](http://seattletimes.nwsourc.com/html/localnews/2012889716_sodatax14m.html). Accessed November 7 2011.
  88. Krieger J, Friedman R, Greenstein J, Goodman A, Schwarz D, Sterling P. Taxing sugary drinks: action at the state and local levels in 2011. Washington, DC: American Public Health Association 139th Annual Meeting and Exposition. <http://apha.confex.com/apha/139am/webprogram/Session33459.html>. Accessed October 31, 2011.
  89. Fry C, Paloma M, Brownell KD, Chaloupka FJ, McLaughlin I, Hysell A. Sugar-sweetened beverage tax policy: what public health needs to know. Denver, CO: American Public Health Association 138th Annual Meeting & Expo. <http://apha.confex.com/apha/138am/webprogram/Session28980.html>. Accessed October 31, 2011.
  90. Kraak VI, Story M, Wartella EA, Ginter J. Industry progress to market a healthful diet to American children and adolescents. *Am J Prev Med*. 2011;41:322–333.
  91. Hawkes C, Lobstein T. Regulating the commercial promotion of food to children: a survey of actions worldwide. *Int J Pediatr Obes*. 2011;6:83–94.
  92. Schwartz MB, Ross C, Harris JL, Jernigan DH, Siegel M, Ostroff J, Brownell KD. Breakfast cereal industry pledges to self-regulate advertising to youth: will they improve the marketing landscape? *J Public Health Policy*. 2010;31:59–73.
  93. Harris JL, Schwartz MB, Brownell KD, Javadizadeh J, Weinberg M, Sarda V, Munsell C, Shin C, Fleming Milici F, Ustjanauskas A, Gross R, Speers S, Cheyne A, Dorfman L, Gonzalez P, Mejia P. Sugary drink FACTS: evaluating sugary drink nutrition and marketing to youth. Rudd Center for Food Policy and Obesity. [www.sugarydrinkfacts.org](http://www.sugarydrinkfacts.org). 2011.
  94. Speers SE, Harris JL, Schwartz MB. Child and adolescent exposure to food and beverage brand appearances during prime-time television programming. *Am J Prev Med*. 2011;41:291–296.
  95. Powell LM, Schermbeck RM, Szczypka G, Chaloupka FJ, Braunschweig CL. Trends in the nutritional content of television food advertisements seen by children in the United States: analyses by age, food categories, and companies. *Arch Pediatr Adolesc Med*. 2011;165:1078–1086.
  96. Interagency Working Group on Food Marketed to Children. Preliminary proposed nutrition principles to guide industry self-regulatory efforts: request for comments. Washington, DC: Federal Trade Commission; 2011. <http://www.ftc.gov/os/2011/04/110428foodmarketproposedguide.pdf>.
  97. Hernandez M, Kolish E. General comments and comments on the proposed nutrition principles and marketing definitions. Children's Food and Beverage Advertising Initiative. 2011. <http://www.bbb.org/us/storage/0/Shared%20Documents/CFBAI%20IWG%20Comment%207-14-2011.pdf>.
  98. Bartz D. U.S. food lobby fighting hard to defend kid ads. Reuters. November 7, 2011. <http://www.reuters.com/article/2011/11/07/us-advertising-children-idUSTRE7A660A20111107>.
  99. Radelat A. Food industry, ad groups pan administration's guidelines on marketing to kids. *Advertising Age*. October 12, 2011. <http://adage.com/article/news/marketers-call-ftc-scrap-food-guidelines/230366/>.
  100. Vladeck DC. Prepared statement of the Federal Trade Commission on the Interagency Working Group on Food Marketed to Children. Report No. 2011.
  101. US FTC weakens proposals for food ads to children. Reuters. October 11, 2011. <http://www.reuters.com/article/2011/10/12/advertising-children-idUSN1E79A26O20111012>.
  102. Sharma LL, Teret SP, Brownell KD. The food industry and self-regulation: standards to promote success and to avoid public health failures. *Am J Public Health*. 2010;100:240–246.

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