

A Crisis in the Marketplace: How Food Marketing Contributes to Childhood Obesity and What Can Be Done

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Abstract

Reducing food marketing to children has been proposed as one means for addressing the global crisis of childhood obesity, but significant social, legal, financial, and public perception barriers stand in the way. The scientific literature documents that food marketing to children is (*a*) massive; (*b*) expanding in number of venues (product placements, video games, the Internet, cell phones, etc.); (*c*) composed almost entirely of messages for nutrient-poor, calorie-dense foods; (*d*) having harmful effects; and (*e*) increasingly global and hence difficult to regulate by individual countries. The food industry, governmental bodies, and advocacy groups have proposed a variety of plans for altering the marketing landscape. This article reviews existing knowledge of the impact of marketing and addresses the value of various legal, legislative, regulatory, and industry-based approaches to change.

Obesity (in children and adolescents): describes youth with BMIs in the 95th percentile or higher according to age- and gender-specific CDC charts

Population-level factors: conditions that affect groups of people

Energy density: Kcal. per food weight; foods with high energy density encourage greater calorie consumption

Environment: anything outside the individual, e.g., the food environment consists of external factors that influence an individual's food consumption behaviors

CHILDHOOD OBESITY: A CRISIS IN THE MARKETPLACE

Childhood obesity is a crisis by any standard. Prevalence in the United States has more than tripled in just three decades (14). According to standards established by the International Obesity TaskForce, 35% of American children are overweight or obese (64). Global trends point to increasing prevalence in nearly every country (97) such that overnutrition rivals undernutrition as the chief food problem even in developing countries; the prevalence of Type 2 diabetes (caused almost exclusively by diet, inactivity, and obesity) in the next 25 years is expected to rise by 36.5% in the United States, 75.5% in China, and 134% in India (102).

Reversing these trends will require bold, even heroic action that will be based on prevailing attributions of cause. It is de rigueur to claim that obesity results from a complex combination of genetics, family, and psychological variables and a host of environmental factors that affect diet, physical activity, or both. This stance discourages action because institutions such as the food industry and governments can claim exemption from responsibility because "there is no one cause for obesity" and because of a paucity of evidence of effective interventions.

The most pressing concern is to identify causes in populations. Rapid increases in prevalence cannot be attributed to genetic changes or worldwide failures in personal responsibility. It is essential to identify and then address population-level factors that make overnutrition and inactivity so widespread, not only to prevent obesity but to lower rates of diseases related to poor nutrition (e.g., hypertension, heart disease, cancer), which are suffered by people at all weights. In this context, an area of special concern is the marketing of energy-dense foods and beverages, especially to children.

WHY WORRY ABOUT FOOD MARKETING?

Food preferences are highly malleable. As an example, beef, pork, and insects are eaten with

delight in some cultures and despised in others. An important matter is the extent to which the food industry shapes the definition of what is acceptable and desirable to eat and the role it plays in the rapidly evolving food environment. The modern environment finds far fewer people involved in raising or growing food, products that are genetically modified and shipped thousands of miles, portions several multiples larger than only a few decades ago, and vast amounts of eating occurring outside the home; restaurant revenues in the United States grew from \$43 billion in 1970 to \$558 billion today (72). Products such as Pop Tarts, Cheetos, or Twinkies would have been unrecognizable as food just one century ago.

What leads the world down a path of heavy consumption of calorie-dense, nutrient-poor foods and toward such an inactive lifestyle? Marketing is often cited as a contributing factor. The first two words of the Institute of Medicine Report on *Food Marketing to Children and Youth* are "Marketing works" (49). Yet food and marketing companies typically deny that marketing hurts children and claim that only brand choices are affected. This article is written to provide an overview of the science on food marketing to children and to discuss barriers to and opportunities for change.

RESEARCH ON FOOD MARKETING TO CHILDREN

Children and adolescents represent a vast market opportunity for food companies. In the United States, these age groups spend an estimated \$200 billion per year, much of it on food products (49). With many years of consumer behavior ahead of them, it is not surprising that food companies invest heavily to increase sales and create brand loyalty among young consumers. Children's exposure to television food advertising has been documented extensively in the United States, the United Kingdom, Australia, and across Europe (33, 46, 49, 55). The average child in the United States for instance, views 15 television food advertisements every day, or nearly 5500 messages per

year (34). Although the bulk of marketing budgets is spent on television advertising (46, 49), food advertisers also promote their products extensively in other venues where young people spend a large amount of time, notably schools (41) and the Internet (18). In addition, the percentage of marketing budgets spent on television advertising has declined in recent years (38, 49) as advertisers become increasingly creative about how they market to children. Commonly used methods include product placements in the entertainment content of movies, television shows, music, and video games; viral and buzz marketing; sponsorships of popular sports and entertainment events; cross-promotions and licensing agreements with other child-targeted products (e.g., movies, toys, and games); and in-store promotions (15, 18, 56, 60, 80).

The extent of marketing targeted directly to children and adolescents is striking, but the content also alarms health experts. Many researchers have documented the predominance of advertising for calorie-dense, low-nutrient foods on children's television (33, 36, 46, 49). In the United States, more than 98% of the television food ads seen by children and 89% of those seen by adolescents are for products high in fat, sugar, and/or sodium (76). A series of studies conducted by Consumers International in 23 countries in Western Europe, central Europe, and Asia found that the most common food products advertised in most countries include confectionary, sweetened cereals, fast food, savory snacks, and soft drinks (21–23). Other studies show high levels of calorie-dense, low-nutrient foods promoted to children in other types of marketing, including marketing in schools (41), on children's Web sites (18) and in magazines (26). **Supplemental Table 1** provides an extensive list of published reports on food marketing in all media, together with access information (follow the **Supplemental Material link** in the online version of this article or at <http://www.annualreviews.org/>).

The messages conveyed in food marketing raise additional concerns. Unhealthy eating behaviors and positive outcomes from consuming nutrient-poor foods are portrayed frequently.

Snacking at nonmeal times appears in 58% of food ads during children's programming (45), and only 11% of food ads are set in a kitchen, dining room, or restaurant (77). In addition to good taste, the most common product benefits communicated include fun, happiness, and being "cool." Even during preschool programming on sponsor-supported networks, fast-food advertisers predominate, and their promotional spots associate fast food with fun and happiness (20). Child marketing makes clear that it is exciting, fun, and cool to eat great-tasting, high-calorie food almost any time or anywhere, and there are no negative consequences for doing so.

Effects of Food Marketing Exposure

Several papers have reviewed the numerous studies on effects of children's food marketing (see **Supplemental Table 2** for a list and description of these reviews). In a review of the reviews, Livingstone (61) concludes that there is tacit consensus among reviewers that, "food promotion has a causal and direct effect on children's food preferences, knowledge and behavior" (p. 283). Direct evidence indicates that television food advertising increases children's preferences for the foods advertised and their requests to parents for those foods (46, 49, 52, 74, 84). Hastings and colleagues also conclude that these effects occur at both the brand and the category level (46). In addition, food advertising increases children's consumption of advertised foods in the short term, usually measured by a choice of foods following exposure to advertising (46, 49, 74, 84).

Most studies examine television advertising in elementary-school-age children; hence most reviews highlight the need for research on nontelevision food marketing (46, 49, 84) and its effects on very young children and adolescents (49). In addition, the Institute of Medicine report calls for research on how advertising for healthier foods affects children's preferences and eating behaviors. Some studies have begun to address these questions. For example, Auty & Lewis found that product

Unhealthy food:
energy-dense,
nutrient-poor foods
that are high in fat,
sugar, and/or salt

placement of a Pepsi bottle on the table in a movie scene increased children's choice of Pepsi over Coke, whether or not they had noticed the Pepsi bottle (5). Another study demonstrated that radio advertising increased adolescent's brand preference and intent to buy a recently introduced soft drink (8).

Many studies on advertising use experimental methods that prove a causal relationship between advertising and outcome variables, but they tend to occur in laboratory settings and therefore raise questions of external validity. More studies are needed in real-world settings. For instance, research shows that families in Quebec (where advertising to children under age 13 is banned) purchase fast food less often than do similar families in Ontario (where there is no such ban) (9) and that French-speaking families purchase less children's cereal than do English-speaking families (who watch television programming originated primarily outside of Quebec) (39). Fast food and children's cereals are among the most highly advertised food products on children's television (76).

Indirect effects. Most reviews also highlight the need for studies to test the causal effects of food advertising on broader health behavior outcomes, including overall diet and adiposity, and to control for other potential explanations (46, 49). Most studies of food advertising and diet utilize correlational methods and report that greater television viewing is associated with more unhealthy diets, but correlation does not prove causation. Media viewing in general might explain the outcomes, or a third variable might affect both exposure to advertising and diet (e.g., parents who allow more television watching may be less likely to enforce rules limiting unhealthy consumption, or children with low self-restraint may be more likely to watch television and consume unhealthy foods).

Much of the relationship between television viewing and body mass index (BMI) could be due to increased food consumption while watching television (30–32, 78). One recent trial found that lowering television viewing significantly reduced BMI in young children at

or above the 75th BMI percentile, especially for those in lower socioeconomic status households (32). The BMI reductions were due to reduced energy intake and not changes in physical activity. Experimental studies have also shown that children eat more when they see food advertising than when they see other types of commercials (even of foods not included in the advertising) (42–44).

Livingstone (61) concludes that food advertising has a "modest effect by comparison with more influential factors such as parental diet, peer pressure, exercise, and so on" (p. 283). We believe that this conclusion is premature because these other factors have been studied in isolation, and food advertising exposure is likely to moderate their effects. This field needs longitudinal studies that quantify the effect of accumulated media exposure over time and measure the interactions with other relevant variables. This methodology has been used successfully to demonstrate causal effects of violent media on aggressive behaviors (2), alcohol advertising on alcohol consumption (83), and even children's educational television on prosocial behaviors (3). These types of studies are sorely needed but have not yet been conducted in the food marketing arena.

Mechanisms of Food Marketing Effects

The extent of what is known about child food marketing has also been limited by the models commonly used to explain children's advertising effects. Widely held assumptions, adapted from psychological theories of the 1970s, are still common (13). These models assume an information-processing approach, in which marketing effects are posited to follow a sequential path from exposure to behavior (69). This path is assumed to be mediated by preferences, attitudes, and beliefs about the advertised products (49). A related assumption is that greater cognitive maturity reduces the effects of marketing as children become better able to defend against marketing messages (53, 58, 98). Overemphasis on these assumptions limits

researchers' ability to understand the full range of marketing effects, and understanding additional mechanisms through which marketing affects children will help to identify ways to counteract harmful effects.

For example, marketers often do not directly convince consumers of the superiority of their products but rather create a brand image or set of associations about their products (54). These positive associations are assumed to develop over time. Every interaction with a brand is designed to reinforce these associations, from watching an enjoyable commercial (perhaps on a link "instant messaged" to them by a friend), to viewing a favorite celebrity using the product, to seeing a brand logo on a sign during a sporting event, to actually consuming the product. Companies attempt to maximize positive experiences with their brands, from as early an age as possible, hoping to create strong affinity for and loyalty to their products. By age 2, children recognize brand logos on product packages (95), and by preschool, children recall brand names seen on television (68). A recent study demonstrated the consequences of this brand affinity: Preschoolers indicated a significantly higher preference for the taste of foods and beverages when such items were placed in McDonald's packaging compared with the same foods presented in plain packaging (79).

Food marketing may also serve as an environmental cue that triggers purchase and consumption behaviors automatically, without directly affecting food attitudes and beliefs (6). Television food advertising often emphasizes taste, enjoyment, and immediate gratification. This focus on the sensory and rewarding aspects of foods makes self-restraint more difficult (65, 70) and can trigger hedonic hunger, or "thoughts, feelings and urges about food in the absence of energy deficits" (67). In addition, food marketing cues in the purchasing environment can trigger unplanned purchasing behaviors (28). Food packaging and in-store placements and promotions are designed to encourage impulse purchases.

The common assumption that young children are more influenced by advertising is based

on consumer development research showing that children younger than age 7 or 8 do not possess the cognitive abilities to understand that advertising presents a biased point of view (10, 58). A corollary is that understanding advertiser intent and skepticism about advertising helps older children defend against marketing messages. Recent reviews cite evidence that older children and adolescents may be influenced as well, but in less direct ways (62, 71). A recent study of 5- to 11-year-olds found that the effects of exposure to advertising on food preferences were not significantly related to age (17). In addition, newer forms of marketing, including product placements, viral marketing, and sponsorships, are designed to circumvent active processing of advertising information and, thus, deactivate skepticism and other defenses (29).

A Call for New Approaches to Study Marketing Effects

Expansion of research models is likely to reveal a broader, more far-reaching impact of food marketing on young people's diets. Researchers are incorporating recent psychological and sociological theories to understand the impact of marketing. For example, Schor & Ford (81) describe how advertisers use "symbolic messages" through which they associate products with children's sense of identity. Marketers often symbolically portray their products as oppositional, or "antiadult," making pronutrition messages unlikely to change children's attitudes. Research inspired by contemporary social cognitive theories demonstrates that food advertising can "prime," or automatically activate, increased food consumption in children and young adults and that these effects are not mediated by hunger, advertising awareness, or mood (44). Story and colleagues (85) propose an ecological framework in which marketing is one macrolevel environmental factor that affects eating behaviors, along with other factors at the individual and social, physical, and macroenvironmental levels. Food marketing can be understood best by evaluating all levels of

Mechanisms: psychological processes through which exposure to an external stimulus causes behavior

Food marketing (or promotion): any activity conducted by a company in the food, beverage, or restaurant industry to encourage purchase of its products

Commercial speech (in the United States): proposes a commercial transaction; expression related solely to the economic interests of the speaker and its audience

influence and how they interact with exposure to food messages in the media, home, schools, and communities.

POTENTIAL SOLUTIONS

Concern over food marketing to children has been expressed for several decades (40) but calls for change have been thwarted by a series of defensive maneuvers by commercial interests and inadequate attention to the public health consequences.

The Dimensions of Possible Approaches

A wide spectrum of possible approaches have been proposed by food companies, governments and advocacy groups to reduce children's exposure to commercial marketing. These approaches can be categorized according to several dimensions. First, the locus of responsibility can range from the individual and family level through single-corporation, trade association, state, federal, and international control. Second, marketing methods can range from

broadcast commercials through nonbroadcast promotional marketing, point-of-sale promotions, pricing incentives, labeling, and product formulation. Third, the controls on marketing can be set as a general restriction on all commercial promotions, only on those that target children, only on those that promote foods and beverages, or only on those that promote energy-dense products. This dimension raises issues of whether children have a more general right to a commercial-free childhood, through to a specific risk-based approach that places restrictions or requirements only on hazardous promotions deemed likely to undermine nutritional health.

In **Table 1**, we have ranged the approaches according to the degree of regulatory powers and sanctions involved (see **Supplemental Table 3** for more detailed commentary and specific examples of each approach). Several of the interventions could be adopted simultaneously. Statutory controls on marketing depend largely on the regulatory context, which in some countries allows greater control over commercial speech than it does in others. All countries face problems controlling marketing

Table 1 Approaches to protecting children

Type of action	Form of protection
No intervention	No control on promotional marketing to children.
Family control	Hold the family responsible.
Company promises	Single brand or company statements claiming reduced marketing to children.
Sector promise	Pledges by a food sector, usually through a representative trade body, to restrict marketing.
Self-regulation	Code written by the food industry; compliance monitored and sanctions imposed on any enterprise that breaks the code by an industry-sponsored body set up specifically for that purpose.
Coregulation	Government-approved code agreed to by industry; monitoring and sanctioning role maintained by industry-sponsored body.
Industry performance indicators	Targets for changes; in practice set by government but executed by the industry.
School rules	Single-institution regulations to restrict marketing (e.g., beverage vending, gifts of branded equipment).
Local regulations	City, county, or state regulations and by-laws.
National regulations	Statutory acts and regulations set at national level.
International rules	Codes, conventions, and regulations agreed upon through U.N. bodies such as the World Health Assembly or Codex Alimentarius; monitored and applied nationally or through an agency such as the World Trade Organization.
Private litigation	Individual or class actions taken against specified companies.

messages received from outside their national boundaries, so country-level regulations may not prevent children from exposure to marketing from other countries, unless such control is supported by international agreements.

Industry Self-Regulation and Voluntary Pledges

Private industry has increasingly supported the development of self-regulation of food marketing to children, often as a means of deflecting stronger forms of regulation and of countering negative publicity (48). In 2004, the global business organization the International Chamber of Commerce published their *Framework for Responsible Food and Beverage Marketing Communication* (51), and these guidelines were adopted by the European Confederation of the Food and Drink Industries (19). This industry code states that food and drink marketing should not mislead children, promote excessive consumption, or undermine the role of parents or the importance of a healthy diet. It has been widely criticized by consumer and health advocacy organizations for failing to address the nature, quantity, and frequency of promotions for sugary and fatty products and to call attention to nonbroadcast forms of promotional marketing (11, 47). Some are also concerned about the monitoring and enforcement of industry self-adjudicated regulation.

Individual companies have made promises that go well beyond the industry codes and that start to address consumers' concerns. Recent statements from specific companies include promises not to market in schools and to under-6s (57), under-8s (12), or under-12s (1, 25) and promises to remove Internet marketing to young children (1, 25). These moves have been more generally welcomed by advocacy organizations, but these groups also voice concerns that the proposals are more appearance than substance: The school marketing proposal may apply only to elementary or primary schools, and the marketing age limits are likely to prove unenforceable. Promises may be made for some regions [e.g., the

European Union (EU)] but not others, and the industry has no monitoring systems or enforcement sanctions nor any mechanisms to sustain these promises in the longer term (37). Furthermore, while some companies make commitments, others may increase their marketing to take advantage of the opportunity to persuade children to change brands, resulting in little or no overall benefit to children.

The industry argues that self-regulatory pledges obviate the need for government action, but plausible predictions can be made that industry actions will help, hurt, or have no impact. We believe that certain conditions must be met for industry pledges to be taken seriously: (a) The expected outcomes should be defined in advance by, or at least in consultation with, public health organizations; (b) these outcomes must be linked to the food consumption of children; (c) benchmarks must be created against which industry performance is measured; (d) objective assessment must be done by credible nonindustry researchers who are not financed by the industry to test the fidelity of industry actions and their impacts on children; (e) pledges should have global scope and not be confined to practices in a single country; and (f) research must be comprehensive enough to test whether the industry moves its child marketing finances to other, and perhaps even more cost-effective, forms of marketing.

Actions of the World Health Organization and Nongovernment Organizations

Acknowledging the problems with self-regulation and voluntary industry measures, the World Health Organization (WHO) convened a panel of experts in Oslo in 2006 (101), who stated,

[f]or the purpose of substantially reducing the volume and impact of commercial promotion of food and beverages to children, self-regulation is not sufficient; it is however a valuable supplementary strategy to ensure promotions are legal, truthful, decent

EU: European Union
WHO: World Health Organization

and honest and to deal with other aspects of marketing (e.g., product, price, place) not addressed in this document. (p. 30)

The meeting also concluded,

WHO should support national actions to substantially reduce the volume and impact of commercial promotion of energy-dense, micronutrient-poor food and beverages to children; and consider the development of an international code on the marketing of food and beverages to children to address issues such as cross-border television advertising, and global promotional activities, and to protect children in countries where national action has not been fully implemented. (p. 28)

In May 2007, the World Health Assembly, comprising all United Nations (UN) members worldwide, resolved that WHO should develop a set of "recommendations on marketing of foods and nonalcoholic beverages to children" (100). This resolution is currently being implemented and is likely to report in 2009.

Advocacy organizations have also pressed for greater controls on advertising at the national and, increasingly, international levels. A set of principles on marketing to children, the Sydney Principles, was adopted by the International Association for the Study of Obesity (IASO) in 2006 (50). Subsequently, a draft international code has been proposed by IASO, Consumers International, and the International Obesity TaskForce (24). This code provides a marker for the ongoing WHO process, but more importantly, it acts as a benchmark by which to judge the promises and activities of the industry in the future.

BARRIERS TO CHANGE

Social Attitudes and Opinions

Establishing international guidelines is an important step, but public and government perceptions pose substantial barriers to change. Emphasizing action only on individual and family levels, logical when obesity is attributed only to failures in personal responsibility, avoids dis-

cussion of solutions at the population level. If the public or government fails to conceptualize child obesity as a public health problem, and one for which policy solutions are needed, there will be currency to industry arguments that government action intrudes on personal decisions. A classic example of this personal responsibility approach was made in a 2006 speech by U.K. Prime Minister Tony Blair, who stated, "Our public health problems are not, strictly speaking, public health problems at all. They are questions of individual lifestyle—obesity, smoking, alcohol abuse, diabetes, sexually transmitted disease . . . —they are the result of millions of individual decisions, at millions of points in time" (7). He did acknowledge the role of environment, but the emphasis was that people, not governments or businesses, must change.

Legislation before the United States Congress bears a similar message. In 2004 (88) and again in 2005 (89) legislators proposed two similar bills, sometimes dubbed Cheeseburger Bills but formally titled the Personal Responsibility in Food Consumption Act and the Commonsense Consumption Act (92). The bills would shield fast-food restaurants from litigation claiming damages produced by consumption of their products. One congressman supporting the legislation stated, "This bill is about self-responsibility. If you eat too much, you get fat. It is your fault. Don't try to blame somebody else" (90). The original bills ultimately failed, but from 2003 to 2006, fueled by lobbying of the National Restaurant Association and its state affiliates, 24 states enacted similar legislation (87). The Commonsense Consumption Act was reintroduced in May 2007, in both the House (91) and the Senate (93), but has not received enough support to be passed into legislation. The success of similar state bills underscores both the political power of the industry and the use of the personal responsibility philosophy to immunize industry.

It is ironic that industry emphasizes personal responsibility while often undermining consumers' ability to be responsible. Consumers need information to make responsible

decisions. Yet the restaurant industry fights efforts requiring calorie values on restaurant menus (73), and marketers use stealth, viral, and guerilla marketing campaigns to conceal marketing intent (29).

An unfortunate corollary of the personal responsibility approach is that education is seen as the logical remedy for child obesity. Although this seems wholesome, even empowering, education has been ineffective in changing behavior (82). Victim blaming may also be inherent in instructing individuals to change without altering the environment to make these changes possible (27), especially important in the context of health disparities (75). Moreover, government spending on healthy messages cannot compete with industry. Food marketers spend \$1.6 billion a year to reach U.S. children and adolescents through television, the Internet, radio, packaging, in-store promotions, video games, and text messages (35). Compare this to the “5-a-day” fruit and vegetable program, which at its peak cost the National Cancer Institute \$2 Million (94).

Free Markets and Protected Speech

Belief in free-market economies cedes power to industry in policy-making and increases faith in industry self-regulation. In highly individualistic countries such as the United States and Britain, government remains detached as the default and is activated only when externalities become overwhelming. Some signs, in public-opinion polls and in comments made by some legislators, indicate that perceptions of externalities are growing stronger.

Restricting marketing involves placing limits on commercial speech. A belief in the fair and efficient functioning of free markets underlies the position that more information in the commercial marketplace is favored over restricting speech. The U.S. Supreme Court has interpreted the First Amendment to protect commercial speech, in addition to political, religious, and other forms of speech (96). Hence, courts must determine whether a commercial actor’s First Amendment rights are vi-

olated by government restrictions (16).¹ The Supreme Court’s resolution of *Lorillard v. Reilly* reveals the difficulty faced by local officials trying to restrict advertising to children (66). In this case, Massachusetts attempted to restrict advertising of tobacco products within 1000 feet of schools and playgrounds. The Court found this violated the companies’ free speech rights, explaining that “the governmental interest in protecting children from harmful materials . . . does not justify an unnecessarily broad suppression of speech addressed to adults.”² Because the industry and their adult consumers were found to have a protected interest in the communication at issue, the Court struck down the ban because it left little space available for such communication in populated areas.

Weak or Uncertain Regulatory Authority

The global reach of marketing raises significant questions about regulatory authority. As an example, in 1980 the Canadian province of Quebec banned marketing of any products to children under age 13. Access to U.S. television channels is common in Quebec, and children are exposed to marketing through the Internet and other media produced outside the province. Similar bans on advertising to children exist in Norway and Sweden, and the United Kingdom has a limited ban on junk-food

¹The Supreme Court established a four-part test to determine whether the commercial actor’s First Amendment rights were violated. First, the court must determine whether the expression is protected by the First Amendment, which means that it at least must concern lawful activity and not be misleading. Second, the courts “ask whether the asserted governmental interest is substantial.” If so, the court must “determine whether the regulation directly advances the governmental interest asserted,” and fourth, “whether it is not more extensive than is necessary to serve that interest” (16).

²See, e.g., *Bolger v. Youngs Drug Products Corp.*, 463 U.S. 60, 74, 77 liters. Ed. 2d 469, 103 S. Ct. 2875 (1983) (“The level of discourse reaching a mailbox simply cannot be limited to that which would be suitable for a sandbox”); *Butler v. Michigan*, 352 U.S. 380, 383, 1 liters. Ed. 2d 412, 77 S. Ct. 524 (1957) (“The incidence of this enactment is to reduce the adult population . . . to reading only what is fit for children”) (66).

Nutrient profiling: refers to different methods developed by nutrition researchers and food companies to identify healthy versus unhealthy foods

advertising to children. However, youth in these countries continue to be exposed to programming from other EU countries that do not impose such bans. Advergaming on Web sites, product placements in video games and movies, and commercial messages spread through social networking and information exchange Web portals such as My Space and YouTube make local, state, and provincial, and even national regulation a difficult challenge. International agreements will be a necessity.

Weak regulatory authority within countries is also an issue. In 1978 the U.S. Federal Trade Commission (FTC), in an effort known as Kid-Vid, used its authority under the FTC Act, which prohibits “unfair and deceptive acts or practices,” to propose banning television advertising to children under age 8 and advertising of sugary foods to children 8–11 years old (99). When it appeared the agency might succeed, the industry exerted considerable pressure on Congress and argued that bans would violate their First Amendment rights. Congress responded with harsh action and removed the FTC’s authority to make rules directed at protecting children under the “unfair” prong of the FTC Act. Restoring and strengthening FTC authority may be one necessary step in protecting children from marketing practices.

The application of self-regulation may be inconsistent between different countries. For example, Advertising Standards Canada launched a voluntary initiative (1) almost identical to the Better Business Bureau’s initiative in the United States (25); Nestle signed on to the Canadian commitment but did not commit to the U.S. pledges.

Codes could be designed to encourage the marketing of products that meet some definition of “healthy”; however, a wide range of company-devised criteria has been used, to date, to define “better-for-you” products, and no such company-devised criteria exists for a “worse-for-you” product. As a result, various governments have considered forms of nutrient profiling that define both better and worse foods, with the intention of restricting the promotion to children of only those that are de-

finer as worse. One example from the United Kingdom involves regulations that prohibit the TV advertising of certain foods—defined by their nutritional profile—during child-oriented programs (63). For such regulation to be successful, the industry needs to agree on nutrient profile standards capable of defining junk foods across international boundaries. No such standards exist at present, but once agreed, such standards may then be used not only for advertising controls but also for controlling health claims, for school food vending machines, for product and menu labeling, and for other purposes.

Perhaps the greatest problem faced when developing regulatory controls is the size and wealth of industry and their ability to influence the political agenda. Coca-Cola spent more than \$1.7 million in 2007 to lobby against marketing regulations, school nutrition legislation, and trade issues among other industry-related issues in the U.S. alone (4).

DISCUSSION AND CONCLUSIONS

Progress on child nutrition is difficult to imagine unless the powerful force of food and beverage marketing is attenuated, if not eliminated. To place the power of marketing in context, consider the Robert Wood Johnson Foundation \$100 million per-year commitment to reverse child obesity trends—the single largest effort of its type in history. The food industry spends more than that every month, marketing primarily junk foods directly to youth, just in the United States (35).

A great deal is known about food marketing directed at children and youth:

- Young people are important to food companies because they spend money, affect what adults buy, and develop brand loyalties early in life.
- The exposure of children to food marketing is massive and begins early.
- Nearly all food marketing to children worldwide promotes products that can adversely affect their health.

- Marketing affects what children eat by increasing their awareness of, desire for, and intention to buy the products promoted.
- Psychological research has identified mechanisms through which marketing influences behavior outside of the individual's conscious awareness; these affect adolescents and adults, as well as children.
- Intervention studies show beneficial changes from reducing marketing exposure, supporting the need for policies that limit marketing.

There remain considerable gaps in the science. These are a predictable and inevitable consequence of the glacial speed of science compared with rapid changes in marketing practices. Marketing campaigns are far in the past by the time scientists secure funding, complete studies, and publish the results (a process that can take three years or more). In that time, new forms of marketing can emerge, not to mention new campaigns. It will never be possible to study the marketing of all products to all demographic groups in all forms.

Does the available science justify action now? On a precautionary principle alone, there is more than ample reason to protect children from any inducement to put their health at risk. Increasing evidence demonstrates that such protection can be scientifically justified, and with virtually every new research study, the justification is strengthened.

Barriers to change are significant and require study in their own right. Cultures vary in the extent to which obesity is seen as a public health versus a private health matter and whether parents are blamed for their children's weight problems. Specific efforts will be necessary to understand how these issues are framed and how the frames can be altered to benefit public health.

Structural barriers in governments can also inhibit change. Some countries, with the United States being a notable example, offer considerable legal protection to commercial speech, have weak penalties and poor enforcement for violations, or do not provide sufficient regulatory authority to government agen-

cies. We agree with the WHO position that industry self-regulation will not be sufficient. Legislation will need to be the means for creating changes on these fronts. The identification of clear market failures have proven valuable in the process of calling for legislation in the European context and may also be valuable elsewhere (86).

The public health community and policy makers face several important strategic questions in deciding on the optimal role of governments (see Strategic Research and Policy Questions). These questions can help form a roadmap for scientists to follow if their research is to link with important social questions. But governments need not wait for the resolution of outstanding questions to begin protecting our children. Of the factors posited to be linked to childhood obesity, food marketing is one of the most thoroughly tested. Evidence shows clear and powerful effects and justifies action now by organizations and governments.

STRATEGIC RESEARCH AND POLICY QUESTIONS

- Which foods and marketing practices contribute most to the ill health of children and youth?
- What are the indirect effects of food marketing on the diets and overall health of children and youth?
- Is change most fruitful through local, state or provincial, country-level, or international action?
- How can countries protect their children from marketing practices that have global reach (e.g., the Internet, satellite TV)?
- What is the most effective role for bodies such as the WHO, the EU, and the World Economic Forum?
- Which actions are possible, given legal protections of commercial speech in some countries?
- Who will evaluate the impact of industry pledges?
- Under which circumstances can industry self-regulation be considered acceptable?

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The authors are not aware of any biases that might be perceived as affecting the objectivity of this review.

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LITERATURE CITED

1. Advert. Stand. Can. 2007. *Canadian Children's Food and Beverage Advertising Initiative*. <http://www.adstandards.com>
2. Anderson CA, Bushman BJ. 2002. The effects of media violence on society. *Science* 295:2377-79
3. Anderson DR, Huston AC, Schmitt K, Linebarger DL, Wright JC. 2001. Early childhood television viewing and adolescent behavior: the recontact study. *Monogr. Soc. Res. Child Dev.* 66:1-147
4. Assoc. Press. 2008. Coca-Cola spent more than \$1.7M to lobby. *Assoc. Press* Feb. 21
5. Auty S, Lewis C. 2004. Exploring children's choice: the reminder effect of product placement. *Psychol. Mark.* 21:697-713
6. Bargh JA, Ferguson MJ. Beyond behaviorism: the automaticity of higher mental processes. *Psychol. Bull.* 126:925-45
7. BBC. 2006. *Blair calls for lifestyle change*. July 26: <http://news.bbc.co.uk>
8. Bao Y, Shao AT. 2002. Nonconformity advertising to teens. *J. Advert. Res.* 42(3):56-65
9. Baylis K, Dhar T. 2007. *Effect of the Quebec advertising ban on junk food expenditure*. http://works.bepress.com/kathy_baylis/15/
10. Bjurstrom E. 1994. Children and television advertising. *Rep. No. 1994/95:8*, Swed. Consum. Agency, Stockholm
11. Branca F, Nikogosian H, Lobstein T. 2007. *The Challenge of Obesity in the WHO European Region and the Strategies for Response*. Copenhagen: World Health Organ. Reg. Off. Eur.
12. Cadbury Schweppes. 2008. *Responding to the World Health Organization concerns*. <http://www.cadburyschweppes.com/en/>
13. Calvert S. 2008. Children as consumers: advertising and marketing. *Fut. Child.* 18:205-34
14. Cent. Dis. Control, Natl. Cent. Health Stat. 2007. *Prevalence of overweight among children and adolescents: United States, 2003-2004*. <http://www.cdc.gov>
15. Cent. Sci. Public Interest. 2003. *Pestering Parents: How Food Companies Market Obesity to Children*. Washington, DC: CSPI. <http://www.cspinet.org>
16. *Central Hudson Gas & Elec. Corp. v. Public Serv. Common NY*. 447 U.S. 557, 566 (1980)
17. Chernin A. 2008. The effects of food marketing on children's preference: testing the moderating roles of age and gender. *Ann. Acad. Polit. Soc. Sci.* 615:102-18
18. Chester J, Montgomery K. 2007. *Interactive food and beverage marketing: targeting children and youth in the digital age*. A report from Berkeley Media Studies Group. <http://www.digitalads.org>
19. CIAA. 2006. Codes of conduct for food and beverage marketing communication. <http://commitments.ciaa.edu>
20. Connor SM. 2006. Food-related advertising on preschool television: building brand recognition in young viewers. *Pediatrics* 118:1478-85
21. Consum. Int. 1996. *A Spoonful of Sugar—Television Food Advertising Aimed at Children: An International Comparative Survey*. London: CI. <http://www.consumersinternational.org>
22. Consum. Int. 1999. *Easy Targets—A Survey of Food and Toy Advertising to Children in Four Central European Countries*. London: CI. <http://www.consumersinternational.org>

23. Consum. Int. 2004. *The Junk Food Generation—A Multi-Country Survey of the Influence of Television Advertisements on Children*. <http://epsl.asu.edu/ceru/Articles/CERU-0407-227-OWI.pdf>
24. Consum. Int. 2008. *Recommendations for an international code of marketing of food and beverages to children*. Int. Obes. Task Force Int. Assoc. Study Obes. London. <http://consint.live.poptech.coop>
25. Counc. Better Bus. Bur. (US). 2006. *Better Business Bureau announces food and beverage advertising commitments from 11 industry leaders*. <http://www.bbb.org>
26. Cowburn G, Boxer A. 2007. Magazines for children and young people and the links to Internet food marketing: a review of the extent and type of food advertising. *Public Health Nutr*. 10(10):1024–31
27. Crawford R. 2005. Are you dangerous to your health: the ideology and politics of victim blaming. In *Embodying Inequality Epidemiologic Perspectives*, ed. N Krieger, pp. 79–98. New York: Baywood
28. Dijksterhuis A, Smith PK, van Baaren RB, Wigboldus DHJ. 2005. The unconscious consumer: effects of environment on consumer behavior. *J. Consum. Psychol*. 15(3):193–202
29. Eisenberg D, McDowell J, Berestein L, Tsiantar D, Finan E. 2002. It's an ad, ad, ad, ad world. *Time* 160(10):38–42
30. Epstein LH, Paluch RA, Consalvi A, Riordan K, Scholl T. 2002. Effects of manipulating sedentary behavior on physical activity and food intake. *J. Pediatr*. 140(3):334–39
31. Epstein LH, Roemmich JN, Paluch RA, Raynor HA. 2005. The influence of changes in sedentary behavior on energy and macronutrient intake in youth. *Am. J. Clin. Nutr*. 81(2):361–66
32. Epstein LH, Roemmich JN, Robinson JL, Paluch RA, Winiewicz DD, et al. 2008. A randomized trial of the effects of reducing television viewing and computer use on body mass index in young children. *Arch. Pediatr. Adolesc. Med*. 162:239–45
33. Eur. Heart Netw. 2005. *The marketing of unhealthy food to children in Europe: a report of Phase 1 of the "Children, obesity and associated avoidable chronic diseases" project*. <http://www.ehnheart.org>
34. Fed. Trade Comm. (US). 2007. *Children's exposure to TV advertising in 1977 and 2004*. Bur. Econ. Staff Rep. <http://www.ftc.gov>
35. Fed. Trade Comm. 2008. *Marketing food to children and adolescents: a review of industry expenditures, activities and self-regulation*. <http://www.ftc.gov>
36. Folta SC, Goldberg JP, Economos C, Bell R, Meltzer R. 2006. Food advertising targeted to school-age children: a content analysis. *J. Nutr. Educ. Behav*. 38:244–48
37. Food Comm. 2008. *Forgotten promises: how the companies have reneged on their 2004 manifesto promises on marketing*. In *The Food Magazine*. London: Food Comm. In press
38. Forrester Res. "Forrester Research releases US online advertising and marketing forecast—market to reach \$26 billion by 2010," news release, May 3, 2005. <http://www.forrester.com>
39. Goldberg ME. 1990. A quasi-experiment assessing the effectiveness of TV advertising directed to children. *J. Mark. Res*. 27:445–54
40. Goodwin MT, Pollen G. 1980 (1974). *Creative Food Experiences for Children*. Washington, DC: CSPI
41. Gov. Account. Off. (US). 2005. School meal programs. Competitive foods are widely available and generate substantial revenues for schools. *Rep. No. GAO-05-563*, GAO, Washington, DC
42. Halford JCG, Boyland MJ, Hughes G, Oliveira LP, Dovey TM. 2007. Beyond-brand effect of television (TV) food advertisements/commercials on caloric intake and food choice of 5–7-year-old children. *Appetite* 49:263–67
43. Halford JCG, Gillespie J, Brown V, Pontin EE, Dovey TM. 2004. Effect of television advertisements for foods on food consumption in children. *Appetite* 42:221–25
44. Harris JL, Bargh JA, Brownell KD. 2008. Priming effects of television food advertising on eating behavior. *Health Psychol*. In press
45. Harrison K, Marske AL. 2005. Nutritional content of foods advertised during the television programs children watch most. *Am. J. Public Health* 95:1568–74
46. Hastings G, Stead M, McDermott L, Forsyth A, MacKintosh A, et al. 2003. *Review of Research on the Effects of Food Promotion to Children*. Glasgow, UK: Cent. Soc. Mark., Univ. Strathclyde
47. Hawkes C. 2005. Self-regulation of food advertising: what it can, could and cannot do to discourage unhealthy eating habits among children. *Nutr. Bull*. 30:374–82

48. Hawkes C. 2007. Regulating food marketing to young people worldwide: trends and policy drivers. *Am. J. Public Health* 97:1962–73
49. Inst. Med. (US), Comm. Food Mark. Diets Children Youth. 2006. *Food Marketing to Children and Youth: Threat or Opportunity?* ed. JM McGinnis, J Gootman, VI Kraak. Washington, DC: Natl. Acad. Press
50. Int. Assoc. for the Study of Obes. 2006. *The Sydney Principles*. Sydney: Int. Cong. Obes.
51. Int. Chamber of Commer. 2006. *ICC framework for responsible food and beverage marketing communication*. <http://www.iccwbo.org>
52. Jarlbro G. 2001. *Children and Television Advertising. The Players, the Arguments, and the Research During the Period 1994–2000*. Stockholm, Sweden: Swed. Consum. Agency
53. John DR. 1999. Consumer socialization of children: a retrospective look at twenty-five years of research. *J. Consum. Res.* 26:183–213
54. Keller KL. 2003. Brand synthesis. The multidimensionality of brand knowledge. *J. Consum. Res.* 29:595–600
55. Kelly B, Smith B, King L, Flood V, Bauman A. 2008. Television food advertising to children: the extent and nature of exposure. *Public Health Nutr.* 10:1234–40
56. Kenway J, Bullen E. 2001. *Consuming Children: Education—Entertainment—Advertising*. Buckingham, UK: Open Univ. Press
57. Kraft Foods. 2008. *Europeans slow to move on obesity concerns—new report reveals data on attitudes to controlling obesity*. <http://www.kraftfoods.co.uk>
58. Kunkel D, Wilcox BL, Cantor J, Palmer J, Linn S, et al. 2004. *Report of the APA task force on advertising and children*. <http://www.apa.org>
59. Deleted in proof
60. Linn SE. 2004. *Consuming Kids: The Hostile Takeover of Childhood*. New York: New Press
61. Livingstone S. 2005. Assessing the research base for the policy debate over the effects of food advertising to children. *Int. J. Advert.* 24(3):273–96
62. Livingstone S, Helsper EJ. 2006. Does advertising literacy mediate the effects of advertising on children? A critical examination of two linked research literatures in relation to obesity and food choice. *J. Commun.* 56:560–84
63. Lobstein T, Davies S. 2008. Defining healthy and unhealthy foods. *Public Health Nutr.* 29:1–10. In press
64. Lobstein T, Jackson-Leach R. 2007. Child overweight and obesity in the USA: prevalence rates according to USA definitions. *Int. J. Ped. Obes.* 2:62–64
65. Loewenstein G. 1996. Out of control: visceral influences on behavior. *Organ. Hum. Decis. Process.* 65:272–92
66. *Lorillard v. Reilly*. 533 U.S. 525, 564 (2001)
67. Lowe MR, Butryn ML. 2007. Hedonic hunger: a new dimension of appetite. *Physiol. Behav.* 91:432–39
68. Macklin MC. 1996. Preschoolers' learning of brand names from visual cues. *J. Consum. Res.* 23:251–61
69. McGuire WJ. 1976. Some internal psychological factors influencing consumer choice. *J. Consum. Res.* 2(4):302–19
70. Metcalfe J, Mischel W. 1999. A hot/cool system of delay of gratification: dynamics of willpower. *Psychol. Bull.* 100(1):3–19
71. Moore ES. 2004. Children and the changing world of advertising. *J. Bus. Ethics* 52:161–67
72. Natl. Restaur. Assoc. 2008. *Restaurant industry facts*. <http://www.restaurant.org>
73. *NY State Restaur. Assoc. v. NYC Board of Health et al.* 1:07-cv-05710-RJH. (2007)
74. Off. Commun. 2004. *Childhood Obesity—Food Advertising in Context. Children's Food Choices, Parents' Understanding and Influence, and the Role of Food Promotion*. London, UK: Ofcom
75. Pomeranz J. 2008. A historical analysis of public health, the law, and stigmatized social groups: the need for both obesity and weight bias legislation. *Obes. Suppl.* In press
76. Powell LM, Szczpka G, Chaloupka FJ, Braunschweig CL. 2007. Nutritional content of television food advertisements seen by children and adolescents. *Pediatrics* 120:576–83
77. Reece BB, Rifon NJ, Rodriguez K. 1999. Selling food to children. Is fun part of a balanced breakfast? In *Advertising to Children: Concepts and Controversies*, ed. LC Macklin, L Carlson, pp. 189–208. Thousand Oaks, CA: Sage

78. Robinson TN. 1999. Reducing children's television viewing to prevent obesity: a randomized clinical trial. *JAMA* 282:1561-77
79. Robinson TN, Borzekowski DL, Matheson DM, Kraemer HC. 2007. Effects of fast food branding on young children's taste preferences. *Arch. Pediatr. Adolesc. Med.* 161(8):792-97
80. Schor JB. 2004. *Born to Buy: The Commercialized Child and the New Consumer Culture*. NY: Scribner
81. Schor JB, Ford M. 2007. From tastes great to cool: children's food marketing and the rise of the symbolic. *J. Law Med. Ethics* 35:10-21
82. *Sci. Daily*. 2007. Diet education had no long term impact on childhood obesity. <http://www.sciencedaily.com>
83. Snyder LB, Milici FF, Slater M, Sun H, Strizhakova Y. 2006. Effects of alcohol advertising exposure on drinking among youth. *Arch. Ped. Adolesc. Med.* 160:18-24
84. Story M, French S. 2004. Food advertising and marketing directed at children and adolescents in the U.S. *Int. J. Behav. Nutr. Phys. Act.* 1:3
85. Story M, Kaphingst KM, Robinson-O'Brien R, Glanz K. 2008. Creating healthy food and eating environments: policy and environmental approaches. *Annu. Rev. Public Health* 29:253-72
86. Suhrcke M, Nugent RA, Stuckler D, Rocco L. 2006. *Chronic Disease: An Economic Perspective*. London: Oxford Health Alliance
87. Trust for America's Health. 2007. *F as in fat: how obesity policies are failing in America. Obesity-related legislation action in states*. <http://healthyamericans.org>
88. U.S. Congress. House Represent. 2004. *Personal Responsibility in Food Consumption Act*. 108th Cong. H.R. 339
89. U.S. Congress. House Represent. 2005. *Personal Responsibility in Food Consumption Act of 2005*. 109th Cong., H.R. 554
90. U.S. Congress. House Represent. 2005. *Statement of Rep. Chabot*. 151st Cong. Rec. H8927, Oct. 19
91. U.S. Congress. House Represent. 2007. *Commonsense Consumption Act of 2007*. 110th Cong., 1st sess., HR 2183 1H
92. U.S. Congress. Senate. 2005. *Commonsense Consumption Act of 2005*. 109th Cong., S. 908
93. U.S. Congress. Senate. 2007. *Commonsense Consumption Act of 2007*. 110th Cong., 1st sess., S 1323 1S
94. U.S. Dep. Agric., Food Nutr. Serv. 2008. *Nutrition education home page*. <http://www.fns.usda.gov/fns/nutrition.htm>
95. Valkenburg PM, Buijzen M. 2005. Identifying determinants of young children's brand awareness: television, parents and peers. *J. App. Devel. Psychol.* 26(4):456-68
96. *Virginia Pharmacy Board v. Virginia Citizens Consumer Council*. 425 U.S. 748 (1976)
97. Wang Y, Lobstein T. 2006. Worldwide trends in childhood overweight and obesity. *Int. J. Ped. Obesity* 1:11-25
98. Ward S, Wackman DB, Wartella E. 1977. *How Children Learn to Buy*. Beverly Hills, CA: Sage
99. Westen T. 2006. Regulation of food marketing to children: the Federal Trade Commission and the KID-VID controversy. *Loyola Los Angel. Law Rev.* 39:477-89
100. World Health Assembly. 2007. *Resolution WHA60.23 Prevention and control of noncommunicable diseases: implementation of the global strategy, item 2 (6)*. Adopted by the World Health Assem., 60th, 14-23 May, Geneva, Switz. <http://www.who.int>
101. World Health Organ. 2006. Marketing of food and nonalcoholic beverages to children. *Rep. WHIO Forum Tech. Meet.*, 2-5 May, Oslo, Norway
102. Yach D, Stuckler D, Brownell KD. 2006. Epidemiologic and economic consequences of the global epidemics of obesity and diabetes. *Nat. Med.* 12:62-66



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