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"A SPOONFUL OF SUGAR HELPS THE MEDICINE GO DOWN"[1]—BUT NOT AS WE MIGHT IMAGINE!

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The starting place to understand the relationship between sugar and medicine is obesity. What precisely is obesity? It certainly means to be "grossly" overweight, because of an excess of body fat. But how do we know if we or someone else fits the definition of obesity? Just looking at oneself or someone else is one way to verify obesity. But it's the *body mass index* that defines the *clinical* obesity recognized by the health professions and insurance industry. The body mass index or BMI standardizes measurement of body-fat health-effects in relation to height and weight.[2]

If the meaning of obesity is to be "grossly" overweight, what are the standard measures to establish clinical obesity? A score of 40+ represents "morbid obesity." Morbidity refers, of course, to *illness or disease*. A BMI score of 50+ represents "malignant obesity." We define a condition as malignant when it's likely to be deadly.

Approximately two-thirds of Americans over 20 are *overweight*, with a BMI of 25.0 to 29.9.[3] Nearly 40 percent (39.6 percent) of those over 20 who are overweight are *obese*, having a BMI of 30.0 or higher, which represents a sharp increase in a decade.[4] Obesity, if not checked, could catch up with lung cancer as the number one cause of death from non-infectious disease in the U.S.

What do we know about the predictable consequences of clinical obesity? More than one hundred thousand Americans die annually from obesity-related causes, according to reliable estimates.[5] Pediatricians are witnessing an associated dramatic increase in health problems, including high cholesterol, high blood pressure, sleep apnea, and Type 2 diabetes.

It's not only adults that are problematically overweight, but also children and adolescents. According to the Centers for Disease Control and Prevention (CDC), one of three children aged 6 to 19 is overweight or obese.

Children who develop diabetes have a much higher risk of kidney failure and death by middle age than people who develop diabetes as adults. Research studies show that obese children have arteries comparable to 45-year-olds.[6] This is especially significant because the thickness of artery walls is a more reliable indicator of heart disease risk than cholesterol levels or other indicators.

The findings support a growing body of research suggesting that childhood obesity in the U.S. is likely to result in heart disease as the children age. There are now authoritative predictions that obesity and its complications will result in *cardiovascular disease becoming a pediatric illness*—the disease of old age is becoming a disease of childhood. As the dean of the faculties of health, sciences and medicine at Columbia University put it: "The obesity epidemic in adolescents is the biggest adverse time bomb we've got going on in coronary diseases."[7]

However, cautious optimism may be justified, since obesity rates for WIC-enrolled (Special Supplemental Nutrition Program for Women, Infants and Children) 2 to 4-year-olds declined in 31 states and three territories, increased in four states, and otherwise were stable from 2010-2014.[8]

Obesity and Metabolic-Syndrome Diseases

Research studies have demonstrated links between the diseases we associate with obesity and metabolic syndrome. The list includes diabetes, high blood pressure, lipid problems, heart disease, and non-alcoholic fatty liver disease—all of which we will consider in more detail.

Some research in the past found that 20 to 30 percent of obese individuals do *not* have any symptoms of metabolic syndrome, that they have normal metabolism and will have a normal lifespan; and conversely, that up to 40 percent of normal-weight people *do* develop the diseases linked to metabolic syndrome. But more recent research has shown that, for the most part, the "healthy obese" do not *stay* healthy.[9] In a 20-year study, 51 percent of the so-called healthy obese were no longer healthy at the end of the study. They were almost eight times more likely to arrive at unhealthy obesity than

healthy adults who were not obese.[10] A 2013 systematic review of studies that followed obese people for more than 10 years, even those who were metabolically healthy, found an increased risk of cardiovascular death and heart attack; and the researchers concluded, "healthy obesity is a myth."[11] Other studies have reached somewhat different conclusions, drawing distinctions between different kinds of fat (e.g., belly or buttocks).

Many people believe that obesity is the root cause of metabolic diseases. But obesity is *not* the cause; it is a *marker* for metabolic dysfunction, which is even more prevalent than obesity. In any event, strictly speaking, our concern is *not* primarily obesity per se but with whatever causes the metabolic dysfunction. So, our question should be: *What food ingredients do research studies link to metabolic syndrome*?

Food Linked to Metabolic Syndrome

Fructose, in whatever form, when consumed as "free sugar"—that is, added to foods by a manufacturer, cook, or consumer—in more than small amounts, sets off bodily processes that lead to liver toxicity and a host of other metabolic diseases.[12] Natural fructose in fruits and other foods is not a problem, because the food's fiber diminishes its effect.[13] But "free sugar," because of the amount of fructose, induces all the diseases associated with metabolic syndrome—which, once again, include:

- Hypertension—that is, high blood pressure, because fructose increases uric acid, which raises blood pressure;
- Lipid problems—high triglycerides and insulin resistance through synthesis of fat in the liver, leading to cardiovascular disease;
- Diabetes—from increased liver glucose production combined with insulin resistance;
- Aging process—caused by damage to lipids, proteins, and DNA through binding of fructose to these molecules;
- Non-alcoholic fatty liver disease; and
- Risk of cancers of the uterus, kidney, gallbladder, and liver; and smaller risk increases for at least six other types of cancer—which are all linked to higher BMI.

It may seem unbelievable, but *sugar is toxic*, poisonous when consumed in substantial amounts as "free sugar."[14] The over-simplified explanation is that the body's organs do not metabolize fructose normally. The consequence is that the added sugar leads to the diseases we associate with metabolic syndrome. Dr. Robert Lustig, a neuroendocrinologist at the UCSF School of Medicine, provides a detailed explanation of the metabolic process, suitable for non-scientists, in a YouTube video presentation titled, "Sugar: No Ordinary Commodity."[15]

Of course, there are numerous causes of obesity. But food manufacturers have purposely added ingredients to many foods during the last two decades with the knowledge they would have two effects: (1) addicting consumers to the substance and thereby increasing their appetite and consumption, and in turn their own profits; and (2) causing consumers to gain weight, becoming overweight and obese, and thereby increasing their risk for life-threatening diseases.

The addictive potential of certain ingredients in food—especially sugar, but also salt and unhealthy fats—is not in doubt.[16] Not yet fully established scientifically are all the circumstances and processes through which addiction occurs. However, one of the major contributors to the rise in obesity and metabolic syndrome during the last two decades has been the introduction and ever-widening use of high fructose corn syrup (HFCS) in a broad range of processed foods. High fructose corn syrup is often thought *not* to be different in its effects from ordinary table sugar, but in addition to being much more widely and heavily used than sugar because government subsidies for growing corn have made it relatively cheap, there's another downside to HFCS: "High-fructose corn syrup is especially dangerous because, unlike sugar which is 50:50 glucose and fructose, high-fructose corn syrup may contain up to 75 percent fructose, which drives obesity, diabetes, cancer, fatty liver, and heart disease."[17]

To understand the effect of fructose on *appetite*, contributing to overweight and obesity, it's necessary to understand something about how sugar works in the human body:

- When we eat any kind of food that we metabolize as sugar—whether as carbohydrates in the form of bread, potatoes, or rice, fresh fruit, or in any refined form, such as table sugar—the pancreas produces insulin.
- Insulin helps the sugar get into the cells where it's turned into energy.
- Normally, when we eat some sugar, the body produces just enough insulin to metabolize it.
- But when the body takes in *too much sugar*, insulin levels become elevated.
- Over time, the body becomes resistant to the effects of insulin—it needs increasing amounts of it to do the same job.
- Insulin resistance is like drug addiction-tolerance, and with a high level of insulin in the blood, the body's tissues no longer respond normally to the hormone.
- So, the pancreas produces more of it, elevating insulin levels even higher in the body's response to overcome the resistance, and on and on in a vicious cycle.
- When we have more insulin in our blood than sugar, our body sends a message to the brain to eat some sugar to even out the balance.

- But every time we eat more sugar, our insulin level goes up even more—causing us to want more sugar.
- In the meantime, we store the excess sugar as *fat*, increasing BMI, slowing down metabolism, and promoting heart disease, high blood pressure, dementia, and cancer.

How addictive is sugar and other forms of fructose? Researchers have found that rats overwhelmingly prefer water sweetened with saccharin to cocaine.[18] Substituting sugar-water for saccharin doesn't change the rats' preference. Offering the rats larger doses of cocaine doesn't alter their preference for saccharin. The research subjected 24 cocaine-addicted rats to similar trials, and at the end of 10 days the majority preferred saccharin. The researchers concluded that sugar increases the levels of the brain-chemical dopamine, leading to a craving for more sweets.

Mass-Addiction to Toxic Amounts of Sugar

To understand the genesis of our county's addiction to toxic quantities of free sugar, we need to consider the role of "Big Food," and the similarities between the major agricultural and food industry players, their strategies and tactics, and the objectives and methods employed earlier by "Big Tobacco."[19]

Big Tobacco is a term of contempt often applied to the tobacco industry in general, or more particularly to the "big three" tobacco corporations in the United States—Philip Morris (Altria), Reynolds American (RJR), and Lorillard—because of the toxicity of their products and their strategies and tactics to foist those products on the public. Big Food similarly is a term of contempt that refers to giant multinational food, drink and alcohol companies that use strategies and tactics like those developed earlier by the tobacco industry

How big is Big Food? Big Food refers to the five largest food companies: PepsiCo, Dole, General Mills, Nestle, and Kraft Foods. Their combined revenues in 2012 were $216 *billion* dollars—an average of $43 billion per company. These companies combine their resources, working together to influence legislation, both at the national and state level. The Grocery Manufacturers Association, the voice for more than 300 food and beverage companies, promotes Big Food's lobbying interests. The Association is currently spending millions to prevent GMO (genetically modified organism) labeling in the U.S.

What are the strategies and tactics of "Big Food" that are like those employed by "Big Tobacco"?[20]

- The tobacco industry pledged to regulate itself in good faith, and the food industry has made similar disingenuous pledges.
- The tobacco industry introduced products claimed to be "safer," and the food industry has responded similarly.
- The tobacco industry simultaneously manipulated and denied the addictive nature of their products, and the food industry has done similarly.
- The tobacco industry mounted massive lobbying and public relations initiatives to obstruct government regulatory action, and the food industry has launched similar initiatives.

What are the important *differences* between the circumstances affecting the initiatives of Big Food and Big Tobacco, making the efforts of Big Food even more insidious?[21]

- Food is necessary to survive, whereas tobacco is not.
- Food is relatively cheap, whereas tobacco is not.
- Food is legal, whereas tobacco is *not* legal for minors.
- Food is for sale everywhere without restrictions, whereas tobacco sales are restricted.
- Food is desirable because of an innate human preference, whereas no such preference exists for tobacco.

Industry Market Control and Profitability

In a manner of speaking, the public exists in an agribusiness- and food industry-designed *advertising-public relations bubble* in which the growers and manufacturers control virtually all the sounds and images they hear and see about food. The public, a large proportion of which doesn't even read a daily newspaper or watch a TV news program, rarely if ever encounters the kind of information about food presented here.

For the mass of consumers, agribusiness and food industry advertising and promotions (e.g., product placement in movies and TV programs) dominate their experience of information about food. For example: the food and beverage industries are currently spending about $400 million a year on marketing soda to teenagers.[22] So Big Food can defeat the possibility of teenagers imagining alternative messages by ensuring that their exposure to alternatives is virtually nonexistent.

The public often has little or no knowledge of the extraordinary *political* influence wielded by agribusiness and the food industry, both in the U.S. Congress and in state legislatures. It's not a stretch of the imagination to think that most Americans would be shocked or at least surprised to learn that more than a dozen states have passed laws making it a tort—one is subject to a civil lawsuit—to "disparage" perishable agricultural or food industry products. Growers can sue anyone who criticizes their perishable product.

State legislatures passed these laws in response to agribusiness and food industry interests when

their products were “disparaged” by nonprofit public-interest and news-reporting organizations that were disseminating food-safety information. Various organizations have successfully resisted these statutes in trial and appellate courts, because they put unconstitutional limits on First Amendment free-speech rights.[23] But they nonetheless have a chilling effect on journalism and food-safety organizations, since suits by mega-corporations can easily drain their bank accounts. Yet it doesn't occur to most Americans to think that any industry has the power to secure the passage of laws in multiple states that dramatically limit their First Amendment freedom-of-speech rights.

The public is ignorant of the extent to which agribusiness and the food industry have sponsored the development of *food science* programs. Thousands of students in colleges and universities have majored in the field, which gives them the ability to introduce obscure ingredients into food products that have as one of their primary purposes, *addicting consumers* to those products.[24] To the average consumer, reading the list of ingredients on food packaging simply deepens the mystery of what the ingredients represent; there is nothing to suggest in the list of ingredients that their inclusion has been designed to make the product addictive. Moreover, agribusiness and the food industry understand and exploit susceptibility to food addiction based on one’s genetic inheritance—that is, that many people are highly susceptible to becoming addicted to certain foods, particularly sugar.

Social Costs of Sugar

The long-term economic, health-care, and human costs of metabolic syndrome place sugar overconsumption in the same category as tobacco. The United States endures about $150 billion annually in lost productivity, and spends somewhere between $200 and $225 billion annually on health-care resources for morbidities associated with metabolic syndrome. The U.S. spends approximately 75 percent of all health-care dollars now on treating these diseases and their resultant disabilities. Because the military rejects 25 percent of all applicants for obesity-related reasons, the past three occupants of the U.S. Surgeon General’s office and the Chairman of the U.S. Joint Chiefs of Staff have declared obesity “a threat to national security.”

One of the most damaging consequences of addiction to sugar is the stigma, potentiated by the phenomenal growth of social media, attached to obesity.[25] Dictionary definitions of stigma define it as “a mark of disgrace or infamy; stain or reproach, as on one's reputation”—which includes extremely bad reputation, public reproach, or strong condemnation as the result of a shameful, criminal, or outrageous acts.

The characteristics of "*weight* stigma" include treating obese individuals as:

- Lazy
- Weak-willed
- Unsuccessful
- Unintelligent
- Lacking self-discipline
- Lacking willpower
- Noncompliant with weight loss treatment

The consequences of stigmatization include prejudice and discrimination against overweight and obese people that result from stereotypes, which are common in workplaces, health care facilities, educational institutions, mass media, and interpersonal relationships.

Why shouldn’t we stigmatize overweight and obese individuals?[26] Stigmatization poses serious risks to their psychological and physical health. Stigmatization generates health disparities; and recently we’ve seen reports of doctors admitting they don’t treat overweight and obese patients the same as those of normal weight.[27] Stigmatization exacerbates social inequities[28] and interferes with implementation of obesity-prevention efforts.

There are serious questions regarding the efficacy of the U.S. national policy-response to the obesity epidemic.[29] Education has focused on *individual* choices regarding nutrition and physical activity. In effect, much of the effort to bring about weight loss has involved stigmatizing by directly or indirectly proposing that excess weight or obesity is the result of personal failing—that the individual is lazy, lacks self-control, etc. What are the drivers of this approach?

Both the tobacco industry and the food industry have revealed their diet-ideology in their persistent concentration on *personal responsibility*. Keep in mind that what the “helping professions” regard as the causes of disease and death, these industries regard as “profit centers” to improve their bottom-line. So, it’s in their interest to argue that smoking too much or eating too much isn’t the result of the *intended addictive qualities* of their products, but rather it’s the consumer’s *personal responsibility*. People who “overdo it” are undisciplined, lazy, morally weak, etc. In this regard, we might ask ourselves: Why does the claim of “personal responsibility” for the ill effects of tobacco and food ring true in American society? American culture, which idolizes rugged individualism, ridicules and dismisses social causes and sociological analysis. Why should the tobacco and food industries want to stigmatize the consumers of their products? Stigmatization has the ultimate effect of letting the food industry off the hook for civil liability, and it deters regulatory legislation that could ameliorate the situation.

If individuals are *not* mostly or entirely responsible for their excess weight or obesity, who or what is responsible? In the first instance, of course,

as already noted, manufacturers purposely make many foods addictive. In addition, other important variables include genetic and biological factors regulating body weight, and multiple social and economic influences that have significantly altered the environment to promote and reinforce obesity.[30] Influences have included: advancements in workplace technology and reduction of manual labor that have resulted in decreased energy expenditure; the built environment that has decreased opportunities for healthy lifestyle behaviors by way of urban design, land use, and public transportation availability; density and location of food stores and restaurants that have reinforced unhealthy eating habits; and neighborhood barriers to safety and walkability that have inhibited exercise.

What significant changes have taken place in the *food environment* in the last couple of decades? There has been a substantial increase in the accessibility of inexpensive foods. Prices of calorie-dense foods and beverages have decreased considerably in contrast to increasing prices of fresh fruits, vegetables, fish, and dairy items, contributing to increased consumption of unhealthy foods, especially as the portion sizes of these foods have grown considerably larger. Significant marketing and advertising of unhealthy, energy-dense foods by the food industry contribute to excessive food consumption in important ways, especially for children, who are heavily targeted.

How does the food industry manage to create and sustain a "toxic food environment"? Again, as we have already noted, agribusiness and the food industry control our food environment primarily by promoting addiction to unhealthy quantities of sugar; massive advertising and public relations initiatives; and exercising extraordinary legislative influence, as evidenced by their success in passage of agricultural disparagement laws.

What's the relationship between stigmatizing obese individuals and *social inequality*? A disproportionate percentage of the obese are low-income people. Research reported in 2010 suggests the obesity epidemic is substantially due to growing insecurity, stress, and a sense of *powerlessness* in societies where high-sugar and high-fat foods are increasingly omnipresent.[31] After exploring the evidence of a link between stress and obesity, the authors suggest that the obesity epidemic is symptomatic of a social mistake: the continual pursuit of maximum economic growth in rich countries where the problem of material scarcity has essentially been solved. When the researchers began to study the issue of obesity, they realized that those most overweight are the least privileged members of society. And among the least privileged, it tended to be minorities. And among minorities, it tended to be women. The people who possess the least control over their lives suffer the greatest insecurity and stress.

What are the progressive policy recommendations regarding obesity stigma? We should address weight stigma when working with overweight and obese individuals; include anti-stigma messages in obesity prevention campaigns; and focus on health outcomes—not achieving an ideal weight.[32]

It's blindingly obvious that obesity prevention needs to go beyond individual behavior to policies that target the social and environmental conditions that foster obesity and metabolic syndrome in the first place. Withal, it's reasonable to promote "behavioral justice" in relation to obesity. That is, we should not hold individuals responsible for healthy behavior if they do not have full access to the conditions that enable such behavior. We should not ignore personal responsibility, but our *emphasis* should shift from personal blame to ensuring social justice.

Regulating Sugar as Potentially Toxic

As already noted, the fructose component of sugar, HFCS, honey, agave syrup,[33] etc., when consumed as "free sugar" is toxic and addictive, with the same potential as ethanol (i.e., alcohol), and has a high potential for abuse because of tolerance—the body requires greater amounts for the same effect.

What are the usual *Diagnostic and Statistical Manual of Mental Disorders* (DSM)[34] criteria for regulation and control of similar substances—and does fructose satisfy these criteria?

- Unavoidability (e.g., 80 percent of 600,000 food items sold today have sugar or HFCS added);
- Physical tolerance and withdrawal; and
- Psychological addiction—including:
    1. Craving or strong desire to use (e.g., uncontrolled appetite);
    2. Use that undermines major role obligations (e.g., illness that affects work and school);
    3. Recurrent use in physically hazardous situations (e.g., eating compulsively while driving);
    4. Use notwithstanding resulting social or interpersonal problems (e.g., social ridicule and rejection because of overweight or obesity);
    5. Increased dosage, over an extended period, beyond what the user originally intended;
    6. Numerous failed attempts to quit or reduce the amount used (e.g., endless unsuccessful dieting);
    7. Time spent seeking or recovering from use;
    8. Interference with normal life activities (e.g., family relationships); and

9. Use notwithstanding wide-ranging negative consequences.

What possible public health policies could reduce the morbidity and mortality associated with sugar overconsumption? The policies governments have adopted to limit smoking provide a model that points to the following:

- Taxing processed foods that have added sugar with special excise and sales taxes;[35]
- Limiting availability by restricting when certain sugar-laden products are available for sale, controlling the location and density of retail markets that sell the products, and limiting who can legally purchase the products;
- Reducing or removing subsidies for corn production that create low-cost HFCS;
- Promoting healthy foods through WIC (the Special Supplemental Nutrition Program for Women, Infants, and Children) and SNAP (Special Nutrition Assistance Program—food stamps) programs;
- Limiting the amount of sugar that producers and distributors can legally add to foods; and
- Requiring that the U.S. Food and Drug Administration, as a matter of policy, remove fructose from the GRAS or Generally Regarded as Safe list, which allows food manufacturers to add unlimited amounts to any food.

What constituencies and interest groups might we expect to oppose and support such policies? The opposition would certainly include agribusiness and Big Food, plus all the industries and services linked to them. In support, we would expect to find most parents, health professionals, and the health-insurance industry.

Envisioning A Spectrum of Action

What's undoubtedly needed to speed up the adoption of obesity-related health policies and ultimately transform the health of the nation itself is (1) a variety of coordinated grassroots organizing and lobbying campaigns to achieve a unified purpose, aimed at legislative and policy changes, (2) eventually the launching of a national social-media-driven consumer boycott, and (3) civil and criminal legal actions.

We certainly have myriad opportunities for organizing campaigns. Beginning on the local level, for example, parents of school-age children in California have the option of using the so-called "trigger law" to take control of their local schools. According to the California Department of Education, "The Parent Empowerment Act enables parents and legal guardians who are dissatisfied with their children's struggling schools to voice their discontent and overhaul the structure and operations of their schools. The law creates a process which allows parents of students in low-performing schools to sign a petition to implement one of the intervention models—replacing all or some of the staff, turning the school over to a charter operator, transforming it through some programs, or closing the school altogether."[36] This law, incidentally, gives parents the means to introduce into their local schools, health-oriented innovations—such as eliminating junk-food vending machines from the school grounds, requiring that only healthy foods be served in the cafeteria, and mandating curriculum updates that focus on social and political action in addition to individual behavior and lifestyle changes to combat the metabolic-disease epidemic.

As the evidence confirms, reversing the epidemic of metabolic-syndrome diseases will require, especially in the early stages, far more than the commitments of individuals to change their behavior or lifestyle. The lack of public knowledge about metabolic disease, the role of agribusiness and Big Food in promoting unhealthy food choices and consumption, and the devastating individual and social consequences of the epidemic indicate its causes and the "cure." Thus, the antidote to this epidemic must envision a spectrum of action, from grassroots organizing and lobbying of legislative bodies to a broad-based public education campaign, targeted legal actions, and ultimately a mass boycott-movement to convince the food industry and its surrogate political allies that it's not in their economic interest to continue promoting foods that are both addictive and toxic—especially when laced with "free sugar."

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[1] "A Spoonful of Sugar" is a song from Walt Disney's 1964 film and the musical versions of *Mary Poppins*, composed by Robert B. Sherman and Richard M. Sherman.

[2] Numerous BMI calculators are available online, including one provided by the Centers for Disease Control and Prevention at http://www.cdc.gov/healthyweight/assessing/bmi/.

[3] See Cynthia L. Ogden et al., "Obesity Among Adults in the United States—No Statistically Significant Change since 2003–2004," *NCHS Data Brief*, No. 1, National Center for Health Statistics (November 2007) [http://www.cdc.gov/nchs/data/databriefs/db01.pdf] and U.S. Department of Health and Human Services, *Health, United States, 2013*, Centers for Disease Control and Prevention, DHHS Publication No. 2014-1232 (2014:213) [http://www.cdc.gov/nchs/data/hus/hus13.pdf#064].

[4] From 2007-2008 to 2015-02016, obesity (BMI $\geq$30) increased from 33.7 percent to 39.6 percent of the U.S. adult population 20 years or older. See Craig M. Hales et al., "Trends in Obesity and Severe Obesity Prevalence in US Youth

and Adults by Sex and Age, 2007-2008 to 2015-2016," American Medical Association, Research Letter (March 23, 2018) [https://jamanetwork.com/journals/jama/fullarticle/2676543].

[5] For example, see Ryan K. Masters, "The Impact of Obesity on US Mortality Levels: The Importance of Age and Cohort Factors in Population Estimates," *American Journal of Public Health*, 103(10):1895-1902 (2013).

[6] See "Obese Kids' Artery Plaque Similar to Middle-aged Adults," *Science Daily* (November 12, 2008) [http://www.sciencedaily.com/releases/2008/11/081111142558.htm].

[7] Quoted by Pam Belluck in "Child Obesity Seen As Warning of Heart Disease," *New York Times* (November 12, 2008).

[8] The rates varied from a low of 8.2 percent to a high of 20 percent, topping 15 percent in 18 states. See Trust for America's Health, "The State of Childhood Obesity," Robert Wood Johnson Foundation (n.d.) [https://stateofobesity.org/childhood].

[9] For example, see S.L. Appleton et al., "Diabetes and cardiovascular disease outcomes in the metabolically healthy obese phenotype: a cohort study," *Diabetes Care*, 36(8):2388-94 (2013).

[10] See Joshua A. Bell et al., "The Natural Course of Healthy Obesity Over 20 Years," *Journal of the American College of Cardiology*, 65(1):101-2 (2015) [http://content.onlinejacc.org/article.aspx?articleID=2087915].

[11] See Caroline K. Kramer, "Are Metabolically Healthy Overweight and Obesity Benign Conditions? A Systematic Review and Meta-analysis," *Annals of Internal Medicine*, 159(11):758-69 (2013).

[12] See: Jeffrey B. Schwimmer et al., "Effect of Low Free Sugar Diet vs Usual Diet on Nonalcoholic Fatty Liver Disease in Adolescent Boys, A Randomized Clinical Trial," JAMA Preliminary Communication (January 22, 2019) [https://jamanetwork.com/journals/jama/fullarticle/2721179?guestAccessKey=ffa785f7-f1ce-49f0-b577-c1c94fd91f0a&utm_source=silverchair&utm_campaign=jama_network&utm_content=weekly_highlights&cmp=1&utm_medium=email]; J.S. Wang et al., "Adiposity and glucose intolerance exacerbate components of metabolic syndrome in children consuming sugar-sweetened beverages: QUALITY cohort study," *Pediatric Obesity*, 8:284-93 (2012); Jiawei Wang, "Consumption of added sugars and development of metabolic syndrome components among a sample of youth at risk of obesity," *Applied Physiology, Nutrition, and Metabolism*, 39(4):512 (2014); George A. Bray et al., "Sugar-sweetened beverages and risk of metabolic syndrome and type 2 diabetes: a meta-analysis," *Diabetes Care*, 33(11):2471 (2010); and Richard J. Johnson et al., "Potential role of sugar (fructose) in the epidemic of hypertension, obesity and the metabolic syndrome, diabetes, kidney disease, and cardiovascular disease," *American Journal of Clinical Nutrition*, 86:899-906 (2007).

[13] Beyond lessening the negative effects of sugar that occurs in foods naturally, in fruit for example, a high-fiber diet can have extraordinarily positive effects. See Yang Yang et al., "Association Between Dietary Fiber and Lower Risk of All-Cause Mortality: A Meta-Analysis of Cohort Studies," *American Journal of Epidemiology*, 181(2):83-91 January 2015)—the abstract for which concludes: "A higher dietary fiber intake was associated with a reduced risk of death" (p. 83). For specific beneficial effects, see for example: Bjoern O. Schroeder et al., "Bifidobacteria or Fiber Protects Against Diet-Induced Microbiota-Mediated Colonic Mucus Deterioration," *Cell Host & Microbe*, 23(1):27-40 (January 2018); Ping-Yu Wang et al., "Higher intake of fruits, vegetables or their fiber reduces the risk of type 2 diabetes: A meta-analysis," *Journal of Diabetes Investigation*, 7(1):56-69 (January 2016); and Yihua Wu et al., "Association between dietary fiber intake and risk of coronary heart disease: A meta-analysis," *Clinical Nutrition*, 34(4):603-611 (August 2015).

[14] See Robert H. Lustig et al., "Public Health: The toxic truth about sugar," *Nature*, 482:27-29 (2012). See also Department of Health and Human Services, Department of Agriculture, *Scientific Report of the 2015 Dietary Advisory Committee, Advisory Report to the Secretary of Health and Human Services and the Secretary of Agriculture* (February 2015) [http://www.health.gov/dietaryguidelines/2015-scientific-report/PDFs/Scientific-Report-of-the-2015-Dietary-Guidelines-Advisory-Committee.pdf] for the federal government's advisory report on dietary guidelines, which reflects the current research on the toxic effects of "free sugar."

[15] Online at https://www.youtube.com/watch?v=-sVlJEhnRu4.

[16] See Picower Institute for Learning and Memory, "Decoding sugar addiction," *MIT News* (January 29, 2015) [http://mews.mit.edu/2015/decoding-sugar-addiction—0129]; Edward H. Nieh et al., "Decoding Neural Circuits that Control Compulsive Sucrose Seeking," *Cell*, 160:528-41 (January 29, 2015) [www.cell.com/cell/pdf/S0092-8674(15)00004-5.pdf]; Christopher M. Olsen, "Natural Rewards, Neuroplasticity, and Non-Drug Addictions," *Neuropharmacology*, 61(7):1109-22 (December 2011) [https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3139704/pdf/nihms-287046.pdf]; American Society of Addiction Medicine, "Definition of Addiction" (2011) [https://www.asam.org/quality-practice/definition-of-addiction]; Yogarabindranath Swarna Nantha, "Addiction to Sugar and Its Link to Health Morbidity: A Primer for Newer Primary Care and Public Health Initiatives in Malaysia," *Journal of Primary Care and Community Health*, 5(4):263-70 (2014); Mark Hyman, "5 Clues You Are Addicted to Sugar," *Huffington Post* (June 26, 2013) [http://www.huffingtonpost.com/dr-mark-hyman/sugar-addiction_b_3502807.html]; and James J. Dinicolantonio and Sean C. Lucan, "Sugar Season. It's Everywhere, and Addictive," *New York Times* (December 22, 2014).

[17] See Mark Hyman, *Eat Fat, Get Thin* (New York-Boston-London: Little, Brown and Company, 2016), p. 48 (Kindle edition).

[18] See Magalie Lenoir et al., "Intense Sweetness Surpasses Cocaine Reward," *PLoS ONE*, 2(8):e698 (2007) [http://www.plosone.org/article/fetchArticle.action?articleURI=info%3Adoi%2F10.1371%2Fjournal.pone.0000698#abstract0].

[19] Our comparisons of Big Tobacco and Big Food rely on Kelly D. Brownell and Kenneth E. Warner, "The Perils of

Ignoring History: Big Tobacco Played Dirty and Millions Died. How Similar Is Big Food?" *The Milbank Quarterly*, 87(1):259–94 (2009) [http://www.yaleruddcenter.org/resources/upload/docs/what/industry/foodtobacco.pdf].
[20] Ibid.
[21] Ibid.
[22] See Andrew D. Cheyne, Lori Dorfman, and Eliana Bukofzer, "Marketing Sugary Cereals to Children in the Digital Age: A Content Analysis of 17 Child-Targeted Websites," *Journal of Health Communication***,** 18(5):563-82 (2013) and see also Mark Bittman, "Kids and . . . ," *New York Times* (May 20, 2014).
[23] See Lindsay Abrams, "Idaho passes industry-backed 'ag-gag' bill," *Salon.com* (February 28, 2014) [http://www.salon.com/2014/02/28/idaho_passes_industry_backed_ag_gag_bill/] and see also Laura Zuckerman, "ACLU Challenges Idaho 'Ag Gag' Law, Saying It Violates Free Speech And Freedom Of The Press," *Huffington Post* (March 17, 2014) [http://www.huffingtonpost.com/2014/03/17/aclu-challenges-idaho-ag-gag-law_n_4983203.html].
[24] For the downside of corporate-sponsored food science, see Ralph Nader, "Food Science: What's the Harm," *Huffington Post* (September 15, 2014) [http://www.huffingtonpost.com/ralph-nader/food-science-whats-the-ha_b_5824036.html].
[25] See Anna North, "Shamed, Flamed, Harassed: What It's Like To Be Called Fat Online," *New York Times* (October 3, 2014) and Wen-ying Sylvia Chou, Abby Prestin, and Stephen Kunath, "Obesity in social media: a mixed methods analysis," *Translational Behavioral Medicine*, 4:314-23 (2014) [http://link.springer.com/article/10.1007%2Fs13142-014-0256-1#page-1].
[26] For a comprehensive treatment of this question, see Rebecca M. Puhl and Chelsea A. Heuer, "Obesity Stigma: Important Considerations for Public Health," *American Journal of Public Health*, 100(6):1019-28 (2010) [http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2866597/].
[27] See Anahad O'Connor, "Blaming the Patient, Then Asking Forgiveness," *New York Times* (July 12, 2013).
[28] See Cynthia L. Ogden et al., "Obesity and Socioeconomic Status in Adults: United States, 2005-2008," *NCHS Data Brief*, No. 50, U.S. Department of Health and Human Services, Centers for Disease Control and Prevention (December 2010) [http://www.cdc.gov/nchs/data/databriefs/db50.htm] and see also Food Research and Action Center, "Relationship Between Poverty and Overweight or Obesity" (2010) [http://frac.org/initiatives/hunger-and-obesity/are-low-income-people-at-greater-risk-for-overweight-or-obesity/].
[29] See Puhl and Heuer, op. cit.
[30] We have excerpted from Puhl and Heuer, op. cit., their enumeration of environmental changes that have affected the extent of overweight and obesity.
[31] See Jon D. Wisman and Kevin W. Capehart, "Creative Destruction, Economic Insecurity, Stress, and Epidemic Obesity," *American Journal of Economics and Sociology*, 69(3):936-82 (2010).
[32] See Puhl, and Heuer, op. cit.
[33] For example, notwithstanding the heralded health benefits of agave syrup, see Joseph Mercola, "*This* Sweetener Is Far Worse Than High Fructose Corn Syrup," *Huffington Post* (June 15, 2010) [http://www.huffingtonpost.com/dr-mercola/agave-this-sweetener-is-f_b_537936.html].
[34] Published by the American Psychiatric Association, Washington, DC (2013).
[35] See William Neuman, "Proposed Tax on Sugary Beverages Debated," *New York Times* (September 17, 2009). The approach is now in various stages of implementation. For example, see Robert Reich, "Berkeley vs. Big Soda," *Huffington Post* (September 8, 2014) [http://www.huffingtonpost.com/robert-reich/berkeley-vs-big-soda_b_5786028.html].
[36] The "trigger law," officially designated the Parent Empowerment Act, established by the California Education Code, sections 53300-53303, became effective on April 12, 2010. See California Department of Education, "Parent Empowerment" [http://www.cde.ca.gov/ta/ac/pe/].