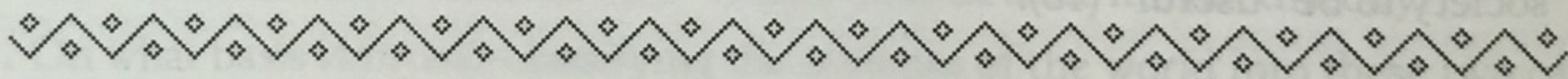


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THE TOXIC TRUTH ABOUT SUGAR



Robert Lustig is a professor of clinical pediatrics at the University of California, San Francisco, and his specialty is childhood obesity. Laura Schmidt and Claire Brindis also teach at UCSF in the Philip R. Lee Institute for Health Policy, which Brindis directs. In this article, first published in *Nature* in 2012, these three health experts put sugar in the same category as alcohol and tobacco. Classified this way, they argue, sugar likewise “warrants some form of societal intervention” and should be regulated like the other two substances.



Last September, the United Nations declared that, for the first time in human history, chronic noncommunicable diseases such as heart disease, cancer, and diabetes pose a greater health burden worldwide than do infectious diseases, contributing to 35 million deaths annually.

This is not just a problem of the developed world. Every country that has adopted the Western diet—one dominated by low-cost, highly processed food—has witnessed rising rates of obesity and related diseases. There are now 30 percent more people who are obese than who are undernourished. Economic development means that the populations of low- and middle-income countries

are living longer, and therefore are more susceptible to noncommunicable diseases; 80 percent of deaths attributable to them occur in these countries. Many people think that obesity is the root cause of these diseases. But 20 percent of obese people have normal metabolism and will have a normal lifespan. Conversely, up to 40 percent of normal-weight people develop the diseases that constitute the metabolic syndrome: diabetes, hypertension, lipid problems, cardiovascular disease and nonalcoholic fatty liver disease. Obesity is not the cause; rather, it is a marker for metabolic dysfunction, which is even more prevalent.

The UN announcement targets tobacco, alcohol, and diet as the central risk factors in noncommunicable disease. Two of these three—tobacco and alcohol—are regulated by governments to protect public health, leaving one of the primary culprits behind this worldwide health crisis unchecked. Of course, regulating food is more complicated—food is required, whereas tobacco and alcohol are nonessential consumables. The key question is: what aspects of the Western diet should be the focus of intervention?

In October 2011, Denmark chose to tax foods high in saturated fat, despite the fact that most medical professionals no longer believe that fat is the primary culprit. But now the country is considering taxing sugar as well—a more plausible and defensible step. Indeed, rather than focusing on fat and salt—the current dietary “bogeymen” of the US Department of Agriculture (USDA) and the European Food Safety Authority—we believe that attention should be turned to “added sugar,” defined as any sweetener containing the molecule fructose that is added to food in processing.

Over the past 50 years consumption of sugar has tripled worldwide. In the United States, there is fierce controversy over the pervasive use of one particular added sugar—high-fructose corn syrup (HFCS). It is manufactured from corn syrup (glucose), processed to yield a roughly equal mixture of glucose and fructose. Most other developed countries eschew HFCS, relying on naturally occurring sucrose as an added sugar, which also consists of equal parts glucose and fructose.

Authorities consider sugar as “empty calories”—but there is nothing empty about these calories. A growing body of scientific evidence is showing that fructose can trigger processes that lead to liver toxicity and a host of other chronic diseases.¹ A little is not a problem, but a lot kills—slowly. If international bodies

are truly concerned about public health, they must consider limiting fructose—and its main delivery vehicles, the added sugars HFCS and sucrose—which pose dangers to individuals and to society as a whole.

No Ordinary Commodity

In 2003, social psychologist Thomas Babor and his colleagues published a landmark book called *Alcohol: No Ordinary Commodity*, in which they estab-

See p. 243 on organizing a classification essay by distinguishing features.

lished four criteria, now largely accepted by the public-health community, that justify the regulation of alcohol—unavoidability (or pervasiveness throughout society), toxicity, potential for abuse, and negative impact on society.² Sugar meets the same criteria, and we believe that it similarly warrants some form of societal intervention.

First, consider unavoidability. Evolutionarily, sugar was available to our ancestors as fruit for only a few months a year (at harvest time), or as honey, which was guarded by bees. But in recent years, sugar has been added to nearly all processed foods, limiting consumer choice.³ Nature made sugar hard to get; man made it easy. In many parts of the world, people are consuming an average of more than 500 calories per day from added sugar alone.

Now, let's consider toxicity. A growing body of evidence argues that excessive sugar consumption affects human health beyond simply adding calories.⁴ Importantly, sugar induces all of the diseases associated with metabolic syndrome.⁵ This includes: hypertension (fructose increases uric acid, which raises blood pressure); high triglycerides and insulin resistance through synthesis of fat in the liver; diabetes from increased liver glucose production combined with insulin resistance; and the aging process, caused by damage to lipids, proteins, and DNA through non-enzymatic binding of fructose to these molecules. It can also be argued that fructose exerts toxic effects on the liver that are similar to those of alcohol.⁶ This is no surprise, because alcohol is derived from the fermentation of sugar. Some early studies have also linked sugar consumption to human cancer and cognitive decline.

Sugar also has clear potential for abuse. Like tobacco and alcohol, it acts on the brain to encourage subsequent intake. There are now numerous stud-

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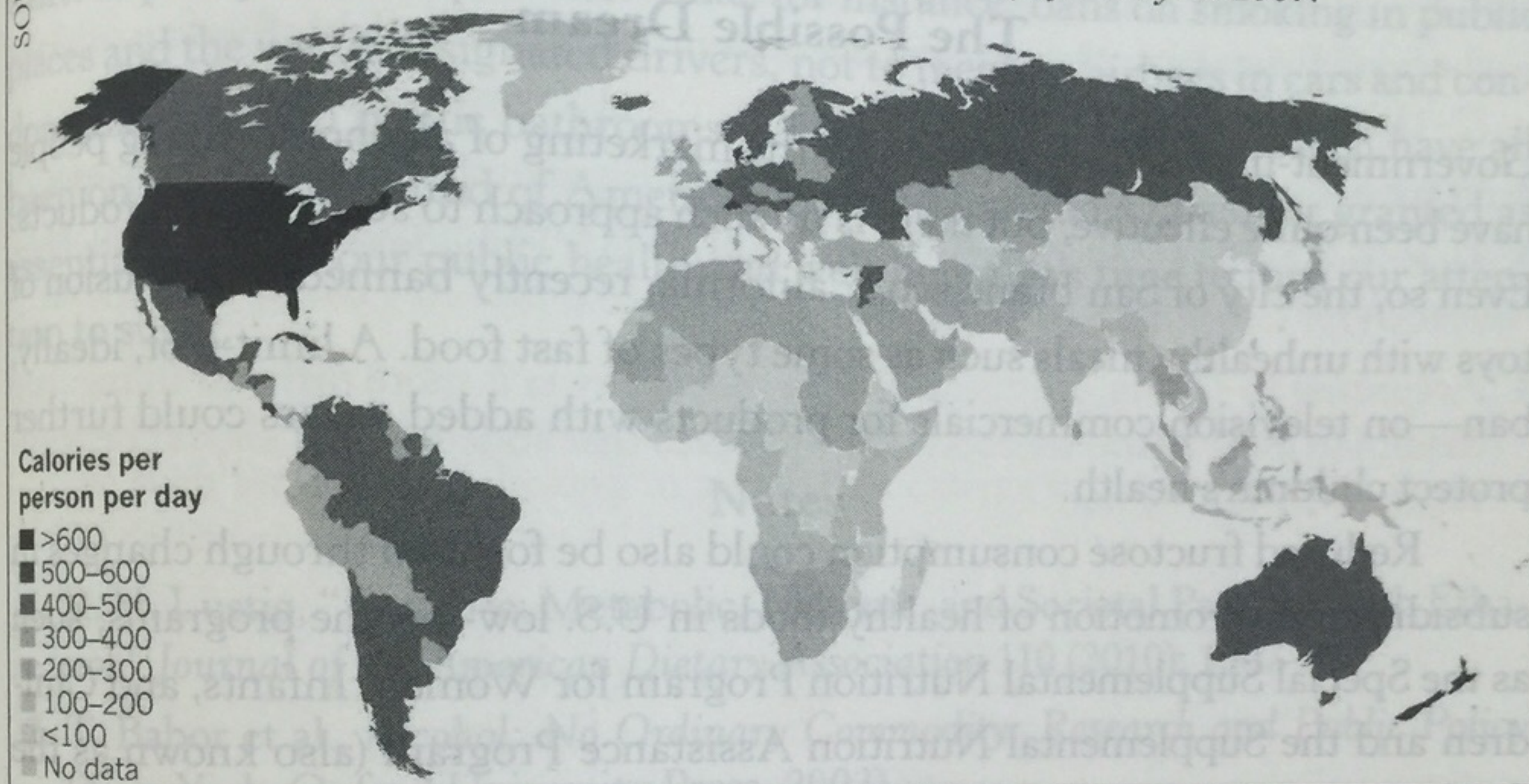
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SOURCE: FAO

THE GLOBAL SUGAR GLUT

Global sugar supply (in the form of sugar and sugar crops, excluding fruit and wine) expressed as calories per person per day, for the year 2007.



ies examining the dependence-producing properties of sugar in humans.⁷ Specifically, sugar dampens the suppression of the hormone ghrelin, which signals hunger to the brain. It also interferes with the normal transport and signaling of the hormone leptin, which helps to produce the feeling of satiety. And it reduces dopamine signaling in the brain's reward centre, thereby decreasing the pleasure derived from food and compelling the individual to consume more.⁸

Finally, consider the negative effects of sugar on society. Passive smoking and drunk-driving fatalities provided strong arguments for tobacco and alcohol control, respectively. The long-term economic, health-care, and human costs of metabolic syndrome place sugar overconsumption in the same category.⁹ The United States spends \$65 billion in lost productivity and \$150 billion on health-care resources annually for morbidities associated with metabolic syndrome. Seventy-five percent of all U.S. health-care dollars are now spent on treating these diseases and their resultant disabilities. Because about 25 percent of military applicants are now rejected for obesity-related reasons, the past three U.S.

surgeons general and the chairman of the U.S. Joint Chiefs of Staff have declared obesity a “threat to national security.”

The Possible Dream

Government-imposed regulations on the marketing of alcohol to young people have been quite effective, but there is no such approach to sugar-laden products. Even so, the city of San Francisco, California, recently banned the inclusion of toys with unhealthy meals such as some types of fast food. A limit—or, ideally, ban—on television commercials for products with added sugars could further protect children’s health. 12

Reduced fructose consumption could also be fostered through changes in subsidization. Promotion of healthy foods in U.S. low-income programs, such as the Special Supplemental Nutrition Program for Women, Infants, and Children and the Supplemental Nutrition Assistance Program (also known as the food-stamps program) is an obvious place to start. Unfortunately, the petition by New York City to remove soft drinks from the food-stamp program was denied by the USDA. 13

Ultimately, food producers and distributors must reduce the amount of sugar added to foods. But sugar is cheap, sugar tastes good and sugar sells, so companies have little incentive to change. Although one institution alone can’t turn this juggernaut around, the US Food and Drug Administration could “set the table” for change.¹⁰ To start, it should consider removing fructose from the Generally Regarded as Safe (GRAS) list, which allows food manufacturers to add unlimited amounts to any food. Opponents will argue that other nutrients on the GRAS list, such as iron and vitamins A and D, can also be toxic when overconsumed. However, unlike sugar, these substances have no abuse potential. Removal from the GRAS list would send a powerful signal to the European Food Safety Authority and the rest of the world. 14

Regulating sugar will not be easy—particularly in the “emerging markets” of developing countries where soft drinks are often cheaper than potable water or milk. We recognize that societal intervention to reduce the supply and demand for sugar faces an uphill political battle against a powerful sugar lobby, and will 15

require active engagement from all stakeholders. Still, the food industry knows that it has a problem—even vigorous lobbying by fast-food companies couldn't defeat the toy ban in San Francisco. With enough clamor for change, tectonic shifts in policy become possible. Take, for instance, bans on smoking in public places and the use of designated drivers, not to mention airbags in cars and condom dispensers in public bathrooms. These simple measures—which have all been on the battleground of American politics—are now taken for granted as essential tools for our public health and well-being. It's time to turn our attention to sugar.

Notes

1. R. H. Lustig, "Fructose: Metabolic, Hedonic, and Societal Parallels with Ethanol," *Journal of the American Dietary Association* 110 (2010): 1307–21.
2. T. Babor et al., *Alcohol: No Ordinary Commodity: Research and Public Policy* (New York: Oxford University Press, 2003).
3. F. Vio and R. Uauy, "The Sugar Controversy," in *Food Policy for Developing Countries: Case Studies*, eds. P. Pinstrip-Andersen and F. Cheng, no. 9-5 (Ithaca, NY: Cornell University, 2007).
4. Joint WHO/FAO Expert Consultation, *Diet, Nutrition, and the Prevention of Chronic Diseases*, WHO Technical Report Series 916 (Geneva: WHO, 2003).
5. Lustig, "Fructose"; see also: L. Tappy, K. A. Lê, C. Tran, and N. Paquot, "Fructose and Metabolic Diseases: New Findings, New Questions," *Nutrition* 26 (2010): 1044–49.
6. Lustig, "Fructose."
7. A. K. Garber and R. H. Lustig, "Is Fast Food Addictive?" *Current Drug Abuse Reviews* 4 (2011): 146–62.
8. Lustig, "Fructose"; Garber and Lustig, "Is Fast Food Addictive?"
9. E. A. Finkelstein, I. C. Fiebelkorn, and G. Wang, "National Medical Spending Attributable to Overweight and Obesity: How Much, and Who's Paying?" *Health Affairs* W3 (suppl., 2003): 219–26.
10. C. L. Engelhard, A. Garson Jr., and S. Dorn, *Reducing Obesity: Policy Strategies* (Washington, DC: Urban Institute, 2000); see www.urban.org (4–5).