

WN *Sugar*

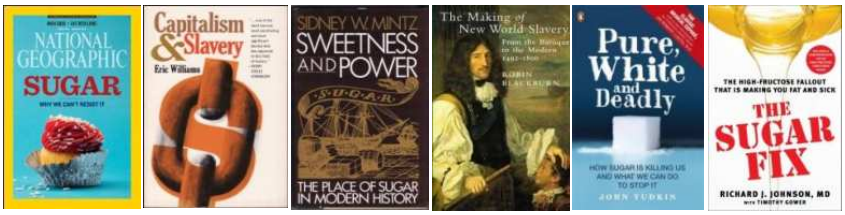
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History of sugar

The revenge of the slaves

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Sugar, the cheapest legal cash crop after tobacco, drove the slave trade which enriched and empowered Europe by exploiting Africa and Latin America. Origins, impact, and effects of sugar are entwined

Summary

Sugar, a preservative and bulking agent as well as a sweetener, is an essential basic ingredient in a vast number of ultra-processed products including soft drinks. It also has other significance. This commentary is adapted from a feature by Rich Cohen in *National Geographic* magazine (left) (1), and developed to include more information on consumption. It touches on the origins and history of sugar, the dependence of the sugar trade on slavery, and sugar as a lucrative cash crop in the enrichment of the European colonial powers, as described in the first three books shown above (2-4). This led to the Industrial Revolution, and working classes fed on cheapened including sweetened products. Estimates for past and present consumption of sugar, with future projections, are then given. Finally, as described in the two books on the right above (5,6), some of the ill-effects of sugar in amounts now typically consumed in industrialised countries, and liable soon to be consumed worldwide, are mentioned, with an evolutionary explanation. The current uncontrolled pandemic of obesity, and diabetes and other diseases that are or may be caused by sugar, can be seen as the revenge of the slaves.

Introduction

The impact of food, ingredients and processes on human health and well-being can be fully understood only in terms of the social, economic, environmental and political determinants of the nature of food systems and supplies. Biological accounts are not enough. Also, the significance of dietary patterns, diets and their constituents on health and well-being in a full sense goes beyond their relationship with human physical health, disability and disease.

Sugar is a source only of dietary energy. Its consumption in industrialised countries and settings is colossal. Humans are obviously not evolved or adapted to consume sugar in such amounts. However, most experts have not regarded sugar as an especially critical public health problem, dental caries aside, for a number of reasons. Here are seven. There are others.

- Until the middle of the last century the main nutrition-related issue was under-nutrition, as it still is in many parts of the global South. Sugar has been seen as beneficial, as a cheap, convenient and pleasant source of dietary energy.
- Sugar is classified chemically as a carbohydrate – as it still is on nutrition labels – and for this reason has often not been seen as fundamentally different from foods such as grains that are high in carbohydrates.
- As from the 1920s a dominant expert opinion has been that the chief dietary cause of diabetes is diets high in fat. As from the 1960s a dominant opinion has been that diets high in saturated fat are the chief dietary cause of cardiovascular disease.
- Big Sugar – which is to say, corporations whose profits depend on sugar – has been united worldwide for over 50 years in energetic and aggressive plentifully funded defence of sugar and thus their products.
- The habit-forming and even addictive effects of sugar as contained in sweetened ultra-processed products have been overlooked or ignored, largely as a result of industry determination to block or counter discussion.
- Research into the health effects of sugar by independent investigators has been under-funded, and findings – as are those of most research into any specific dietary macroconstituent – have been unimpressive.
- Evidence from historical, migrant, animal and behavioural studies has been downgraded as anecdotal or unpersuasive, and findings on social, cultural and environmental impacts have been dismissed as largely irrelevant.

This year the mood on sugar and human health has changed. Increasingly confident claims that sugar – particularly as contained as a main or the main ingredient in ultra-processed products including soft drinks – is a major cause of obesity and diabetes, and also of the multi-organ metabolic syndrome, are being made, and so far are not being effectively refuted.

Origins



Ancient ways to extract sugar from cane, still used today by artisans (left); and (right) a European mediaeval factory for the manufacture of sugar, with 'loaves' seen lined up at left to be sent for sale

Cane was first grown for sugar in New Guinea, around 10,000 years ago. At first people picked cane and ate it raw, chewing a stem until the taste hit their tongue like a starburst. A kind of elixir, a cure for every ailment, an answer for every mood, sugar featured prominently in ancient New Guinea myths. In one, the first man makes love to a stalk of cane, yielding the human race. At religious ceremonies priests sipped cane sugar juice from coconut shells.

The cultivation of cane for sugar spread slowly from island to island, and reached the Asian mainland around 1000 BCE. Its first main uses are believed to have been medicinal. Thus by 500 CE in India it was being processed into a powder and used as a cure for headaches, stomach flutters, impotence. For centuries sugar refinement remained a secret science, passed master to apprentice. In most parts of the world it was unknown until after well after 1000.

Arab culture

But by 600 the art had spread from India to Persia, where rulers entertained guests with a plethora of sweets. When Arab armies conquered the region, they carried away the knowledge of sugar manufacture and love of sugar as a food, condiment and medicine. In the early 700s Islamic armies had conquered much of Spain, bringing the culture of sugar with them. 'Wherever they went, the Arabs brought with them sugar, the product and the technology of its production,' writes Sidney Mintz in his classic book *Sweetness and Power* (3). 'Sugar, we are told, followed the Koran.'

Muslim caliphs made a great show of sugar. Marzipan was the rage, ground almonds and sugar that could be sculpted into outlandish concoctions and constructions that demonstrated the wealth of the state. A 15th-century writer described an entire marzipan mosque commissioned by a caliph, which was marvelled at, prayed in, and devoured by the poor. The Arabs perfected sugar refinement and turned it into an industry. The work was brutally difficult, with the heat of the fields, the flash of the

scythes, the smoke of the boiling rooms, the crush of the mills. By 1500, with demand for sugar by the rich surging, the work was considered suitable only for the lowest of labourers. Many of the field hands were Europeans captured when Islamic and Christian armies clashed.

Outside Iberia the first Europeans to fall in love with sugar in a big way were French, German and English crusaders who went east to wrest the Holy Land from Islamic rule. They came home full of visions and stories and memories of sugar. Cane is not at its most productive in temperate climes. It needs tropical, rain-drenched fields to flourish. So the first European market was built on a trickle of Muslim trade.

The sugar that reached Western Europe was consumed only by the nobility, and was so rare it was classified as a precious spice. With the spread of the Ottoman Empire in the mid 1400s, trade with the East became more difficult. To the Western elite who had fallen under the spell of sugar, the options were to do business with the small southern European sugar manufacturers, or else defeat the Turk – or else develop new sources of sugar. Then came the European discovery of the Americas.

The Americas

In 1425 the Portuguese prince known as Henry the Navigator sent sugar cane to Madeira with an early group of colonists. The crop soon made its way to other newly discovered Atlantic islands – Cape Verde and the Canaries.

In 1493, when Columbus set off on his second voyage to the New World, he too carried cane to be planted, which was done on Hispaniola. Ironically, this was the island in which the first great slave revolt took place a little over 300 years later. Beginning 500 years ago, after cane was planted in Brazil and the Caribbean, production and consumption increased. The search for territories and islands that would send Europeans all around the world was largely a hunt for precious metals, for other raw materials – and for territory where sugar cane would prosper.

Sugar extraction mills were built on the heights of the first Caribbean islands to be colonised, including Jamaica and Cuba, where rainforests had been cleared and the native population eliminated by disease or war, or enslaved. At the same time the Portuguese, newly arrived in Brazil, also cleared forest for sugar mills in what are the North-Eastern states, especially Pernambuco.

As more cane was planted, the price of the product fell. As the price fell, demand increased. Economists call this a 'virtuous cycle' of more supply, more demand, and thus more supply, more demand, and so on. By the mid-17th century sugar began to change from a luxury spice, classed with nutmeg and cardamom, to a staple, first for the middle class, then for the poor. Thus dawned the age of big sugar, of Caribbean islands and slave plantations.

The slave trade



Representation of part of a 'slaver', carrying Africans to the Americas mostly to work in the sugar plantations (left). (Right), a container for sugar made in the East Indies and therefore not by slaves

Slave labour made sugar very profitable. The triangular trade of people and produce between Africa, the Americas and Europe, which depended in large part on sugar, gradually became very substantial. The European colonial powers – initially Spain and Portugal, then England, Holland and France – became enriched, even engorged, with gold, silver, sugar, liquor, tobacco, and later cotton and coffee, all from the Americas, of which the one substance consumed as a food was sugar. The total number of Africans imported to the Americas as slaves, sent mostly to Brazil and the Caribbean, is estimated at 15 million. Of these perhaps one in ten, perhaps a greater proportion, died on board ship (4).

By the 18th century the marriage of sugar and slavery was complete. Every few years a new island – Puerto Rico, Trinidad – was colonised, cleared, and planted. The native people, who refused hard labour, mostly died off quickly, and the planters replaced them with African slaves. After the crop was harvested and milled, it was piled in the holds of ships and carried to London, Amsterdam, Paris, and other European centres, where it was traded for finished goods made by early working class people who were in effect wage-slaves. These goods were then shipped to the west coast of Africa and traded for more slaves. The bloody side of this 'triangular trade' was known as the Middle Passage.

More than half of the Africans that were shipped to the Americas from the beginnings until the final end of the slave trade, ended up on sugar plantations. Others worked in gold and other mines and tobacco plantations, and later in cotton fields and coffee plantations. Some become house servants.

According to historian and politician Eric Williams, who between 1962 and 1981 was prime minister of Trinidad (2), 'Slavery was not born of racism; rather, racism was the consequence of slavery.' Africans, in other words, were not enslaved because they were seen as inferior; they were seen as inferior to justify the enslavement required for the prosperity of the early sugar trade.

The original British sugar island was Barbados. Deserted when a British captain landed there in May 1625, the island was soon filled with grinding mills, plantation houses, and shanties. Tobacco and cotton were grown in the early years, but cane quickly overtook the island, as it did wherever it was planted in the Caribbean. Within a century the fields were depleted, the water table sapped. By then the most ambitious planters had left Barbados in search of the next island to exploit.

If you go to Barbados today you can see the legacies of sugar: the ruined mills, their wooden blades turning in the wind, marking time; the faded mansions; the roads that rise and fall but never lose sight of the sea; the hotels where the tourists are filled with jam and rum; and those few factories where the cane is still heaved into the presses, and the raw sugar, sticky sweet, is sent down the chutes. In one refinery, as men in hard hats rush around, there is a handwritten sign. This is a prayer written by the plantation owner, beseeching the Lord to grant the wisdom, protection, and strength to bring in the crop. By 1720 Jamaica, by then a British possession, had captured the sugar crown.

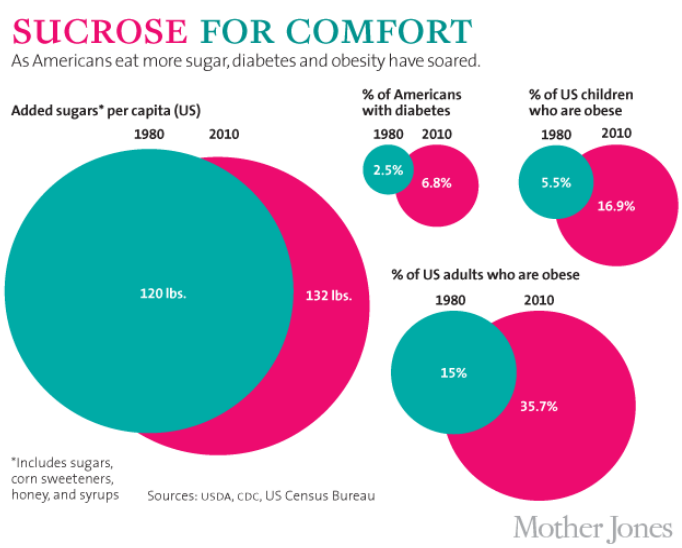
For an African, life on these islands was hell. Throughout the Caribbean, hundreds of thousands, perhaps millions, died in the fields and pressing houses or while trying to escape. Gradually the sin of the trade began to be felt in Europe. Reformers preached abolition; housewives boycotted slave-grown cane. In *Sugar: A Bittersweet History* Elizabeth Abbott quotes Quaker leader William Fox, who told a crowd that for every pound of sugar, 'we may be considered as consuming two ounces of human flesh.' A slave in Voltaire's *Candide,* missing both a hand and a leg, explains his mutilation:

> When we work in the sugar mills and we catch our finger in the millstone, they cut off our hand; when we try to run away, they cut off a leg; both things have happened to me. It is at this price that you eat sugar in Europe.

At the height of popular demonstrations against slavery (picture left, above), thousands of pamphlets were printed encouraging people to boycott sugar produced by slaves. Estimates suggest some 300,000 people abandoned sugar, with sales for a while dropping by a third to a half. Some shops advertised goods which had been produced by 'freemen' and sales of sugar from India (the 'East Indies' – picture right, above) where slavery was not used, increased tenfold over two years.

But there was no stopping the increase in sugar production and consumption. Sugar was too attractive, to manufacturers and to consumers. It was the oil of its day, fuelling not automobiles but people. The more people tasted, the more they wanted. It is estimated that in 1700 average consumption of sugar in Britain, where most sugar was consumed, was around 2 kilograms (4 pounds) a year. It was still a luxury. By 1800 that amount had more than doubled, to perhaps over 4 kilograms (9 pounds) a person a year.

Mass consumption



The graphic above from the campaigning magazine Mother Jones, correlates data on sugar entering into consumption in the US 1980-2010, with increases in diabetes and obese children and adults

The boom in production and consumption, which made sugar a staple commodity for all classes, came with the Industrial Revolution in the 1800s, at first in Britain, and then in all countries that then became industrialised. Profits from the slave trade and its main business of sugar built and enriched the English ports of Liverpool and Bristol. Production and consumption in Britain, the world centre of the sugar trade, increased in the 1800s as a result of mechanisation, to around 8 kilograms (18 pounds) in the 1850s, and soared after abolition of tax on sugar in the mid 1870s to around 33 kilograms (72 pounds) in the 1880s. Production and consumption in other industrialised countries later also increased to this level.

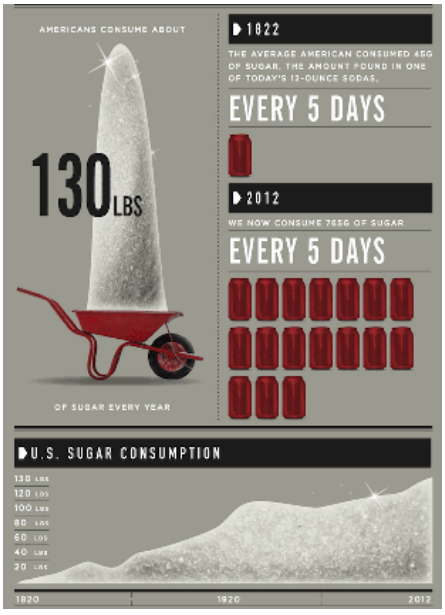
Sugar is an essential and central part of industrial food supplies. By the end of the 19th century sugar had become a cheap staple commodity in food supplies, and constant use was made of sugar in cooking and at table. Sugar as a preservative and bulking agent as well as a sweetener, was used to make oils, fats, starches and flours palatable, in mass produced products such as biscuits and cakes, as well as being the main ingredient of confectionery and soft drinks. World production of sugar in 1900 was 8 million tonnes, which then amounted to average consumption per person in the world of 8 kilograms (18 pounds) a year.

Industry figures for world consumption in 2013 are 170 million tonnes, or 23 kilograms (50 pounds) a person a year. These average figures are not very meaningful. In fully industrialised countries the average amount entering into consumption is around 40 kilograms (88 pounds) a year which, allowing for wastage, is somewhat under 20 per cent of the 2000 kilocalories a day seen as adult average

energy turnover. This is reckoned by the industry to be saturation point (7,8). The strategy of industry now is to boost consumption particularly in Asia and Africa. This is being done mainly not by sales of sugar as such, but by sweetened ready to consume ultra-processed products, including soft drinks.

Any estimates for average sugar consumption need to be treated with caution. Many estimates are of sugar 'entering into consumption', which are reckoned to be about 10 per cent above actual consumption. It also depends what is meant by 'sugar': the most relevant figures are of 'added' sugars and syrups made from cane, beet and corn, taken together. Any average, whether global or national, masks variations: thus it is known that a substantial percentage of young people consume well above the average, mostly from sweetened soft drinks.

The impact of sugars, including added sugars, on human health, varies according to the form in which they are consumed: thus sugared soft drinks, and other sweet ultra-processed products manufactured to be intensely palatable, are now believed to impose a special metabolic load. What though is most striking, in the vivid graphics like those above and below (9,10) is the very rapid increase in obesity and diabetes between 1980 and 2010 (above) and the rocketing rise in consumption of sugar that comes with industrialisation (below). Both graphics are taken from US data, and as said, the totals of sugar actually consumed are lower than shown. But both are an appalling warning of what will happen in the global South as food supplies become industrialised – and indeed of what is happening now, particularly in Asian and Latin American countries.



The graphic above from Forbes, the US financial journal, also overestimates actual sugar consumed in the US, but its main point, of the dizzying rise in consumption of sugar in modern times, is valid

The diabetes crisis



Some scientists have always worried about sugar, such as Thomas Willis (left) who in the 17th century diagnosed diabetes, and now kidney expert Richard Johnson (centre), Robert Lustig (right).

'It seems like every time I study an illness and trace a path to the first cause, I find my way back to sugar.' This is Richard Johnson (above, centre), a nephrologist (kidney specialist) at the University of Colorado at Denver (6). He says:

> Why is it that one-third of adults [worldwide] have high blood pressure, when in 1900 only 5 percent had high blood pressure? Why did 153 million people have diabetes in 1980, and now we're up to 347 million? Why are more and more Americans obese? Sugar, we believe, is one of the culprits, if not the major culprit.

As far back as 1675, when western Europe was experiencing its first sugar boom, Thomas Willis (1621-1675), physician and founding member of Britain's Royal Society (above, left) noted that the urine of people afflicted with diabetes tasted 'wonderfully sweet, as if it were imbued with honey or sugar.' Over two centuries later, Haven Emerson (1874-1957), at one time New York deputy commissioner of health, pointed out that a remarkable increase in deaths from diabetes between 1900 and 1920 corresponded with an increase in sugar consumption.

And in the 1960s John Yudkin, a physiologist and professor of nutrition at a branch of London University, conducted a series of experiments on animals and people showing that high amounts of sugar in the diet led to high levels of fat and insulin in the blood – risk factors for heart disease and diabetes (5). But Yudkin's message was drowned out by a chorus of other scientists blaming the rising rates of obesity and heart disease instead on cholesterol deposits caused by too much saturated fat in the diet.

As a result, fat makes up a smaller portion of the US diet than it did 30 years ago. Yet the proportion of people in the US that is obese has greatly increased. The primary reason, says Richard Johnson, along with other experts, is sugar, and in particular fructose. Sucrose, or table sugar, is composed of equal amounts of glucose and fructose, the latter being the kind of sugar you find naturally in fruit. It's also what gives table sugar its intense sweetness. (High-fructose corn syrup is also a mix of

fructose and glucose – about 55 percent and 45 percent in soft drinks. The impact on health of sucrose and high fructose corn syrup appears to be similar.)

Richard Johnson explains that although glucose is metabolised by cells all through your body, fructose is processed primarily in the liver. If you eat too much, especially in quickly digested forms like soft drinks and candy, your liver breaks down the fructose and produces fats called triglycerides.

Some of these fats stay in the liver, which over long exposure can turn fatty and dysfunctional. But a lot of the triglycerides are pushed out into the blood too. Over time, blood pressure goes up, and tissues become progressively more resistant to insulin. The pancreas responds by pouring out more insulin, trying to keep things in check. Eventually the condition known as metabolic syndrome kicks in, characterised by obesity especially around the waist, high blood pressure, and other metabolic changes that, if not checked, can lead to diabetes, with a heightened danger of heart attack thrown in for good measure. As much as a third of the US adult population could meet the criteria for metabolic syndrome set by the National Institutes of Health.

Recently the American Heart Association added its voice to the warnings against too much added sugar in the diet. But its rationale is that sugar provides calories with no nutritional benefit. According to Richard Johnson and his colleagues, this misses the point. Excessive sugar isn't just empty calories; it's toxic. Endocrinologist Robert Lustig of the University of California, San Francisco (above, right) says:

> It has nothing to do with calories. Sugar is a poison by itself when consumed at high doses.

Richard Johnson says that conventional wisdom is that people in the US are fat because they eat too much and exercise too little. But they eat too much and exercise too little because they're addicted to sugar, which not only makes them fatter but, after the initial sugar rush, also saps their energy, beaching them on the couch:

> The reason you're watching TV is not because TV is so good, but because you have no energy to exercise, because you're eating too much sugar.

The solution? Stop eating so much sugar. When people cut back, many of the ill effects disappear. The trouble is, in today's world it's extremely difficult to avoid sugar, which is one reason for the spike in consumption. Manufacturers use sugar to replace taste in foods bled of fat so that they seem more healthful, such as fat-free baked goods, which often contain large quantities of added sugar. It's a worst-case scenario: You sicken unto death not by eating foods you love, but by eating foods you hate – because you don't want to sicken unto death.

Ape adaptation

If sugar is so bad for us, why do we crave it? The short answer is that an injection of sugar into the bloodstream stimulates the same pleasure centres of the brain that respond to heroin and cocaine. All tasty foods do this to some extent – that's why they're tasty! – but sugar has a sharply pronounced effect. In this sense it is literally an addictive drug.

This raises the question, however, of why our brains would evolve to respond pleasurably to a potentially toxic compound. The answer, believes Richard Johnson, lies deep in our simian past, when a craving for fructose would be just the thing our ancestors needed to survive.

What are even the best theories, if not the old stories told again in the language of science? Some 20 or so million years ago, apes filled the canopy of the African rain forest. They survived on the fruit of the trees, sweet with natural sugar, which they ate year-round – a summer without end.

Surviving winter

One day, perhaps five million years later, a cold wind blew through this Eden. The seas receded, the ice caps expanded. A spit of land emerged from the tides, a bridge that a few adventurous apes followed out of Africa. Nomads, wanderers, they settled in the rainforests that then blanketed Eurasia. But the cooling continued, replacing tropical groves of fruit with deciduous forests, where the leaves flame in autumn, then die. A time of famine followed. The woods filled with starving apes. 'At some point a mutation occurred in one of those apes,' Richard Johnson proposes. It made that ape an efficient processor of fructose. Even small amounts were stored as fat, a huge survival advantage in months when winter lay upon the land and food was scarce.

Then one day that ape, with its mutant gene and healthy craving for rare, precious fruit sugar, returned to its home in Africa and begot the apes we see today, including the one that has spread its sugar-loving progeny across the globe. Richard Johnson explains:

> The mutation was such a powerful survival factor that only animals that had it survived, so today all apes have that mutation, including humans. It got our ancestors through the lean years. But when sugar hit the West in a big way, we had a big problem. Our world is flooded with fructose, but our bodies have evolved to get by on very, very little of it.

It's a great irony: The very thing that saved us could kill us in the end.

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Status

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