A Story of Magic, Spice, Slavery, Freedom and Science

Sugar Changed the World
A Story of Magic, Spice, Slavery, Freedom and Science
by Marc Aronson and Marina Budhos

2011

Presentation outline

- History of sugar
- Sugar consumption - Changes in Transitioning Societies
- Traditional use of sugar in food in SEA

- The first plant from which sugar was extracted was the sugar cane: *Saccharum officinarum*.
- There are 4 cultivated species:
  - *S. officinarum* L.
  - *S. barberi* Jeswiet
  - *S. Sinense* Roxb.
- Numerous hybrids have been produced from these species.
New Guinea and the adjacent Melanesia and Polynesian islands in the Pacific Ocean were probably the first to cultivate sugar cane, estimated about 8,000 years ago.

- About 2000 years later, sugarcane had reached Indonesia, the Philippines, and India.
- Indian envoys introduced sugarcane cultivation methods to China during the reign of Emperor Taizong of Tang (626–649AD)

### Historical Records – From New Guinea

- **In Europe**
  - Until the 16th century, sugar was affordable only to the rich, and was known as “white gold”.
  - Wealthy people actually stored sugar as a form of savings.
  - The rich used sugar to sweeten food, for medicinal purposes, and as a preservative.
  - The introduction of tea, coffee, and chocolate into Europe boosted demand for sugar and greatly encouraged the expansion of the Caribbean sugar cane industry.

- **From India to The Middle East, North Africa and South Europe**
  - In 510 BC Darius I, the Persian Emperor brought sugar cane from India to Egypt. The Persian people had used honey to sweeten food, and so they called sugar cane *'the reed which gives honey without bees'*. 
  - Through invasions, and trading links, the Arabs spread sugar to the western Mediterranean region, including Cyprus, Southern Spain, Sicily and to North Africa (Morocco, Syria and Tunisia) around 714 AD. Around 1420 the Portuguese introduced sugar cane to Madeira, Canary Islands and West Africa.

- **In the New World**
  - In 1493, Christopher Columbus brought sugar cane from the Canary Islands and grew in what is now the Dominican Republic.
  - Beginning in the 1500s, the economies of entire islands of Guadeloupe, Barbados, and Jamaica became based on sugar production.
  - By 1750 the French colony of Saint-Dominigue (now Haiti) became the largest sugar producer in the world.
In the New World

- The European settlers depended on the slave trade for the workforce in the sugar plantations.
- Between 1450 and 1900, 11.7 million West Africans were imported to the Caribbean.
- In the mid 17th century, Brazil and the Portuguese dominated world sugar production.
- In the 1700s, Cuba grew to become a major center, enabling Spain to challenge the Portuguese control of the sugar market.

Sugar from sugar beet

The second half of the 19th century saw the decline of the sugar cane industry. This was as much due to the increased production of European sugar beet as to the abolition of slavery.

Although beet has been grown for food and fodder since ancient times, it was only in 1747 that Andreas Marggraf, a German chemist, succeeded in extracting sugar from beet in a form which could be used in cooking.

By 1880, beet was the main source of sugar in Europe.

Consumption of sugar - Changes in Transitioning Societies

Since the early 1990s, diets in developing countries began to shift from a high proportion of locally grown staple grains, legumes, low animal based food toward increased reliance upon processed foods, increased away from home intake, and greater use of edible oils and sugar-sweetened beverages.

which has a huge impact on the rising prevalence of chronic non-communicable diseases like diabetes, obesity and other associated diseases.

(Popkin, Adair & Ng 2012)
Heart failure in Southeast Asia: facts and numbers
Carolyn S.P. Lam. ESC Heart Failure 2015; 2: 46–49

- "Southeast Asia is home to a growing population of >600 million people, the majority younger than 65 years.
- Rapid epidemiological transition has led to high rates of premature death from non-communicable diseases (chiefly CVD) (up to 28% in the Philippines vs. 12% in UK).
- There is a strikingly high prevalence of stage A heart failure (HF) risk factors in SEA, particularly hypertension (>24% in Cambodia and Laos vs. 13–15% in UK and USA), tobacco smoking (>36% in Indonesia), physical inactivity (>50% in Malaysia) and raised blood glucose (10–11% in Brunei, Malaysia, Singapore and Thailand), in spite of a lower prevalence of overweight/obesity (21–26% in SEA vs. 67–70% in UK and USA)."

Is added sugars implicated in the rise of CVD risks?

Added Sugar Intake and Cardiovascular Diseases Mortality Among US Adults Yang et al., JAMA Int Med 2014 174:516-526


Most adults consumed 10% or more of calories from added sugar (71.4%) and about 10% consumed 25% or more in 2005-2010.

Compared with those who consumed about 8.0% of calories from added sugar, participants who consumed 17% to 21% of calories from added sugar had a 38% higher risk of CVD mortality. This relative risk was more than double for those who consumed 21% or more (highest quintile) of calories from added sugar.

This change was mainly attributed to the increased consumption of sugar-sweetened beverages.
Soft drink intake in relation to incident ischemic heart disease, stroke, and stroke subtypes in Japanese men and women: the Japan Public Health Centre-based study cohort I
Eshak et al., AJCN 2012 Dec; 96(6): 1390 -1397

- A prospective study in 39,786 Japanese men and women aged 40–59 yrs
- Soft drink intake was determined by using a self-administered FFQ
- Follow-up was from 1990 to 2008.

- Soft drink intake was positively associated with risks of total and ischemic strokes for women, whereas a non-significant inverse trend was shown for men. No consensus about why an adverse effect of soft drink is stronger for women than for men.
- Adjustment for BMI and total energy intake had little effect, which suggested that these variables are not major mediators.
- No association was shown between soft drink intake and risk of hemorrhagic stroke for either sex. Plausible explanation may be that soft drink–related increases in BMI, triglycerides, and glucose are not risk factors for hemorrhagic stroke in Japanese populations.

Soft drink and juice consumption and risk of physician-diagnosed incident type 2 diabetes: the Singapore Chinese Health Study.

A prospective cohort study of 43,580 participants aged 45–74 years and free of diabetes and other chronic diseases at baseline.

Participants consuming 2 soft drinks per week had a relative risk of type 2 diabetes of 1.42 (1.25, 1.62) compared with those who rarely consumed soft drinks.

Similarly, consumption of 2 juice beverages per week was associated with an increased risk of 1.29 (1.05, 1.58).
Dietary sugars and body weight: systematic review and meta-analyses of randomised controlled trials and cohort studies
Morenga Lt, S Mallard & J Mann BMJ 2013;346:e7492

In children, intakes of sugar sweetened beverages after one year follow-up in prospective studies, the odds ratio for being overweight or obese increased was 1.55 (1.32 to 1.82) among groups with the highest intake compared with those with the lowest intake.

Similarly, in adults, increased sugars intake was associated with a comparable weight increase (0.75 kg, 0.30 to 1.19; P=0.001).

Among free living people involving ad libitum diets, intake of free sugars or sugar sweetened beverages is a determinant of body weight.

Fructose-Containing Sugars and Cardiovascular Disease
Rippe JM and TJ Angelopoulos Advances in Nutrition 2015;6:430–9

- The effects on blood pressure of intake of simple sugars at normal population levels remain uncertain.
- The reviews suggest that calories are more important than fructose with regard to weight gain and obesity.
- Whether there is any unique relation between fructose-containing sugars and insulin resistance remains unresolved.
- There does, however, seem to be a marker for increased TGs, which most studies suggest increase when >20% of kcal/d are consumed as added sugars, particularly in hypercaloric trials.
Traditional use of sugar in foods in South East Asian countries

Sugar supply (kg/capita/year) in Southeast Asian countries in 1991-2011

The Philippines: Background of the sugar industry

- Sugar cane industry started some two to four thousand years BC, where vessels from the Celebes brought sugarcane cuttings to Mindanao.
- By 1521 when Ferdinand Magellan reached the Philippines, sugarcane was cultivated in many of the islands.
- Between 1775 to 1779, the Philippines was the largest exporter of sugar in Asia.
The Philippines: Background of the sugar industry

- The euphoria of the good world prices in 1974-75 was short-lived as prices dropped from U.S. 65 cents per pound in 1975 to less than 3 cents in 1985.
- The 'sugar crisis' in late 1985 led to widespread poverty and malnutrition especially in the Negros island, where 60% of total sugar in the Philippines was produced.
- A survey conducted by the National Secretariat of Social Action showed that in 1985, 40% of children under the age of 14 years were malnourished and one year later, the prevalence rose to 73%.

[World price of raw sugar 1950-1999]

Thailand: Background of the sugar industry

- Sugar production in Thailand is believed to date back to about 1372.
- Migrant Chinese from Chao-Chou province were thought to be responsible for bringing sugar production know how to Thailand.
- Today, Thailand is one of the largest sugar exporters in the world, mostly to Asia. In 2014, the total sugar production was 11 million tons, out of which 8.5 million metric tons were exported.

Thailand: Traditional culinary use of sugar: desserts and snacks

- Bibingkas are rice cakes made by soaking the rice overnight, grinding it with a mortar stone and mixing in coconut milk and sugar.
- Suman at manga are sticky rice snacks steamed in banana or coconut leaves, often paired with sweet ripe mangoes.
- Taho is a sweet dessert. Brown sugar syrup is stirred into warm soybean custard and topped with sago pearls.

- Banana Leaf Sticky Rice is made from sticky rice, coconut milk, sugar, sweet black beans, all candied in a banana leaf wrapper.
- Sticky rice (made green by soaking in Pandanus leaves), bananas, sugar and shredded coconut.

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**Thailand**

**Traditional culinary use of sugar: desserts and snacks**

Sticky rice with chunks of durian (left) or sweet yellow mango (right) swimming in a thick coconut cream syrup.

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**Indonesia: Background of the sugar industry**

- With the Slavery Abolition Act of 1833, European sugar cane planters turned to Asia, especially India and Indonesia.
- By the late 19th century, Indonesia was in the forefront of the world's sugar producers, second only to Cuba.
- Almost three-quarters of Indonesia's cane was on Java, with its rich volcanic soils and a vast supply of labour.
- However, due to high input costs, poor management practices, inefficient policies and cheaper imports, the sugar industry declined.
- The country has been a net importer of sugar since the 1960s, mainly from Thailand and now ranks as one of the world's biggest importers.

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**Indonesia: Background of the sugar industry**

After 1900, the old export products of sugar, coffee, pepper and tobacco, were increasingly supplemented with highly profitable exports of petroleum, rubber, copra and palm oil.

- In 1957, the sugar industry was nationalised and imports are regulated.

Indonesia also produces non-nutritive sweeteners such as saccharin, cyclamates and sorbitol for the domestic market and for use in diet beverages.

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**Indonesia**

**Traditional culinary use of sugar: desserts and snacks**

- Indonesian cuisine varies greatly by region of different indigenous cultures.
- The food of Central Java is renowned for its sweetness.
- Traditional cakes and snacks are usually made from rice flour, coconut milk, coconut sugar and mostly steamed or fried.
- Coconut palm sugar is widely used as a sweetener in cooking and baking.
- Arenga palm sugar from the sap of palm tree nectar (nira), is not only used as a sweetener, but also believed to cure various diseases, if consumed regularly, with the dose and certain herbs.

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The Economic History of Indonesia, Jeroen Touwen, Leiden University, Netherlands

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<thead>
<tr>
<th>1870</th>
<th>1940</th>
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<tbody>
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<td>sugar</td>
<td>petroleum</td>
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<td>rubber</td>
<td>coffee, tobacco, copra</td>
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Foreign Exports from the Netherlands-Indies, 1870-1940 (in millions of guilders, current values). Source: Trade statistics

Foreign Exports from the Netherlands-Indies, 1870-1940 (in millions of guilders, current values). Source: Trade statistics

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Klepon
Sweet coconut rice balls

Sweet baked coconut cake

Kueh Lapis legit
Over the past 20 years, the cultivation of sugarcane in Malaysia has remained relatively small, at around 20,000 hectares, compared to other leading crops.

Domestic consumption of sugar has increased rapidly in recent years. During the first half of the 1990s, sugar consumption averaged about 800,000 tonnes annually, compared with about 500,000 during the first-half of the 1980s, a 57% increase.

While 66% of total sugar consumption occurs in the household, there has been a strong growth in the food processing industry. Ice cream, chocolates, sweetened condensed milk, and soft drinks are some of the items that have created new demand for sugar.

Between 1989 till 2014, wholesale and retail prices for refined sugar in Malaysia were regulated under the Supplies Regulation Act of 1974, at RM1 145 (US$452) per tonne and RM1.20 per kilogram (US 47 cents a kilogram), respectively.

This move was to support domestic production, owing to rising raw sugar prices in the international market.

Since the sugar subsidy was removed, the retail price of refined sugar has risen to RM2.90.

On a per caput basis, the level of sugar consumption in Malaysia at about 50 kilograms (raw equivalent) is among the highest of the region.

**Malaysia : Background of the sugar industry**

- Kueh Keria- Malaysian-style doughnuts made from sweet potatoes with a glazed sugar coating.
  - 24.2±2.4 g/100g total sugar and 17.3±0.7 g/100g of starch.

- Traditional kuih lapis has nine layers like most Malaysian kuih, its core ingredients are rice flour, coconut milk, sugar, and water.
  - 14.9±0.9g/100g total sugar and 12.7±0.7 g/100g of starch.

- Tong sui (dessert soups)
  - Cantonese in origin, these warm or cool dessert "soups" are wildly varied (and often terribly sweet); pictured here is one of longan, gingko nut, and red bean— which might be sold alongside other fruit-based versions, or thin soups of sweet peanut or milky almond.

- Cendol is a rich creamy dessert made of coconut milk, green starched jelly noodles with pandan flavouring and palm sugar.

Cambodia

Palm sugar comes from the sugar palm (*skor t'hoat, Borassus flabellifer*),

- Sugar palms are of great importance to the rural Cambodian economy, with every part of the tree being put to good use.
- The sweet juice extracted from the palm’s flower-bearing stalk is either drunk fresh or fermented to produce palm beer.

- **Palm sugar**, much used in Khmer cooking, is made by thickening the juice in a cauldron and then pouring it into cylindrical tubes to set, after which it resembles grainy honey-coloured fudge.
- Palm fruits, slightly larger than a cricket ball, have a tough, fibrous black coating containing juicy, delicately flavoured kernels, which are translucent white and have the consistency of jelly; they’re eaten either fresh or with syrup as a dessert.

![Traditional boiling palm sap over wood-stove.](image1)

![Solar reflectors used to process palm sugar since 2013](image2)

![Solar palm sugar](image3)

![Palm sap on solar stove.](image4)
School-aged children have been photographed working in the sugar plantation in potential breach of the international convention on child labour. *Photo: Nicolas Axelrod*

Depika Sherchan; ActionAid Cambodia and Oxfam GB, May 2015

Concluding remarks

Dietary shifts in transitioning societies usually experience an increasing intake of fat and animal products, accompanied by a decrease in the quantity of carbohydrate sources.

This often translates to a worsening of the quality of carbohydrate sources, from a diet of coarse whole grains, roots, tubers and legumes to one of highly refined carbohydrates, including added sugars.

“Most populations have an almost insatiable appetite for sweet foods, but our metabolism has not evolved sufficiently to be able to process the fructose from high fructose corn syrup in the quantities that some people are consuming it,” (Stanley Ulijaszek, director of the Institute of Social and Cultural Anthropology at the University of Oxford).

Hence addressing obesity and other NCDs calls for, not only decreasing consumption of total calories, but also increasing the proportion of calories from a diversity of staple carbohydrate sources that have diminished with the nutrition transition globally.

“Well-designed, well-powered randomized controlled trials will be needed to answer the lingering and important scientific and public health questions on beverage intake and obesity risk.

These experiments will need to include studies of mechanisms of action, include detailed assessment of behaviors on both sides of the energy balance equation, and address both efficacy and effectiveness”.

*Sugar-Sweetened and Artificially-Sweetened Beverages in Relation to Obesity Risk*
Thank you

Sugar-sweetened beverages (SSBs) are beverages that contain added caloric sweeteners such as sucrose, high-fructose corn syrup or fruit-juice concentrates, all of which result in similar metabolic effects.

- They include the full spectrum of soft drinks, carbonated soft drinks, fruitades, fruit drinks, sports drinks, energy and vitamin water drinks, sweetened iced tea, cordial, squashes, and lemonade.

- Collectively, these beverages/drinks are the largest contributor to added sugar intake in the United States.