Sweet truths

What the health of those raised on sugar rationing is revealing seven decades on

Linda Geddes

They were born into a Britain still recovering from the hardships of war. Though the air-raid sirens had fallen silent, many foods remained rationed, including sugar. Adults were restricted to about 3 tablespoons (40g) a day to stretch between cups of tea, baking and desserts; children were limited to less than a tablespoon. Babies and very young children were expected to have little or no added sugar.

Then, in 1953, the brakes came off. Separate restrictions on sweets and chocolate were lifted in February, followed by sugar in September. By the second half of 1954, average sugar consumption had almost doubled.

The lifting of postwar rationing inadvertently created a natural experiment, whose consequences scientists are only beginning to unpick. A flurry of recent studies suggest that spending the first 1,000 days of life under sugar rationing may have left traces on people's health.

"What makes the end of sugar rationing particularly interesting is the nature of the exposure," said Dr Jiazhen Zheng at Hong Kong University of Science and Technology in Guangzhou, China, who worked on several of the recent studies. "In September 1953, sugar availability changed quite abruptly at the population level, largely because of policy rather than individual choice."

The first of this recent wave of sugar rationing studies was published in the journal Science two years ago. Dr Tadeja Gračner at the University of Southern California and her colleagues used data from the UK Biobank to compare the health of people born shortly before and after sugar rationing ended in the UK. Some had been exposed to this low sugar environment only in the womb; others remained exposed for months or years, while those conceived after rationing ended were not exposed at all.

1953

The year UK sugar rationing ended. By the second half of 1954, average sugar intake had almost doubled

Gračner found that the longer people had spent under rationing, the lower their risk of developing type 2 diabetes and high blood pressure in mid to later life: those exposed to rationing throughout their first 1,000 days had a 35% lower risk of type 2 diabetes and a 20% lower risk of high blood pressure than those who had never experienced rationing.

Over the past few months, further studies drawing on UK Biobank data have linked reduced sugar exposure to lower risks of a growing list of health conditions.

"I have been more struck by the consistency across different organ systems than by any single effect estimate," Zheng said. "We have seen associations with cardiovascular disease, liver disease, respiratory health, dementia and, more recently, broader measures of ageing. Our ageing study, for example, found a lower overall incidence of diseases linked to the hallmarks of ageing and modestly younger biological and organ ages among people exposed to rationing early in life."

Gračner is not entirely surprised. "Many of these outcomes are connected," she said. "Diabetes, hypertension and obesity are major risk factors for cardiovascular disease, cognitive decline and several other conditions."

Perhaps more surprising is the suggestion that the effects could extend beyond physical health. In August, Prof Nophar Geifman at the University of Surrey and her colleagues reported that people who had spent their first 1,000 days of life under sugar rationing had a 33% lower risk of being diagnosed with anxiety than those born after rationing ended. They were also less likely to report a preference for sweet foods decades later. "Early nutritional environments appear to have lasting relevance for mental health," Geifman said.

How such a relatively brief difference in sugar exposure might leave traces detectable many decades later remains uncertain. Gračner said: "We can show that growing up with less sugar was protective decades later, but not how: whether through sugar itself, through taste preferences formed early, or through a metabolic response set in early life."

Her team's latest research, now under peer review, suggests growing up under rationing may weaken the influence of genes that predispose people to a higher body weight. "Importantly, while we observe that people exposed to rationing do consume less free sugar in adulthood, we find that dietary difference is similar across genetic-risk groups," Gračner said. "That points to a response that is not purely behavioural: early nutrition may act on physiological pathways such as metabolic programming, insulin sensitivity, appetite and satiety regulation, or adipose-tissue [fat tissue] development."

Explaining the anxiety finding was trickier. Geifman said the brain developed rapidly in the womb and the first few years of life, which could make it particularly sensitive to its nutritional environment. High-sugar diets have also been linked to inflammation and an altered gut microbiome - both possible routes through which sugar could affect brain function.

Zheng's ageing study offers another potential clue. People exposed to rationing scored about a year younger on several measures of biological age. The researchers also found differences in proteins involved in pathways that help cells respond to nutrients and have been implicated in ageing.

Since the 1970s, researchers have used famines to investigate the consequences of severe nutritional deprivation. Much of this research has focused on the Dutch "hunger winter" of 1944-45, when German restrictions left millions in the Netherlands facing severe food shortages. Because it began and ended abruptly in a previously well-nourished group, rations were recorded and birth records survived, it has been possible to compare those exposed to famine in utero with those born before the crisis or conceived afterwards. "The most reliable findings [for those exposed to famine in the womb] are an increased risk of overweight, obesity and type 2 diabetes," said Prof LH Lumey of the Columbia Mailman School of Public Health in New York.

Although the British rationing studies might appear to point in the opposite direction, the conditions were very different. Zheng said: "British sugar rationing was not famine, and it did not involve severe overall caloric deprivation. Rather, it selectively constrained sugar intake."

The lesson, then, is not simply that less nutrition is better.

Sugar intake under rationing was broadly comparable to current UK guidelines, which state that free sugars - those added to foods and drinks, or naturally present in honey and fruit juices - should not exceed 30g a day for adults and children aged 11 and over, with lower limits for younger children. "Sugars should not be added to food or drinks given to babies," the NHS says. In practice, average UK consumption is about twice the recommended level.

The question raised by these studies is whether keeping sugar intake closer to recommended levels may have benefits that extend much further into later life.

◀ *Children snack on carrots as a sweet treat in 1941, when sugar and chocolate, above, where still rationed. Below left and top, school pupils crowd a sweet shop in 1953, the year the restrictions lifted*

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