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**Exposure to Sugar Rationing in the First 1000 Days of Life Protected Against Chronic Disease**

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**Abstract**

We examined the impact of exposure to sugar restrictions within 1000 days after conception on

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A landmark study published in *Science* reveals that restricting sugar intake during the first 1,000 days of life—from conception through a child's second birthday—significantly lowers the risk of developing chronic diseases like Type 2 diabetes and high blood pressure in adulthood.

## Overview of the Study

- **The Natural Experiment:** Researchers used a historical turning point: when the United Kingdom ended wartime sugar rationing in September 1953. When rationing stopped, the public's sugar consumption almost doubled overnight, creating a rare "natural experiment" to compare adults who were exposed to low sugar levels early in life versus those exposed to high sugar levels.
- **The Dietary Limits:** During the rationing period, sugar caps closely matched today's modern health recommendations (under 40 grams daily for adults, very little for children, and none for toddlers under age two).

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## Core Findings

• Lower Disease Risk**:** Adults who experienced sugar rationing in their first 1,000 days had a **35% lower risk** of Type 2 diabetes and a **20% lower risk** of hypertension (high blood pressure).

• Delayed Onset**:** For individuals who did eventually develop these conditions, early-life sugar restriction **delayed the onset** by four years for diabetes and two years for hypertension.

• In Utero vs. Postnatal Impact**:** Being exposed to a low-sugar diet while in the womb (*in utero*) accounted for about one-third of the risk reduction. However, the protective benefits grew stronger the longer the restriction continued after birth—especially after six months of age when solid foods are typically introduced.

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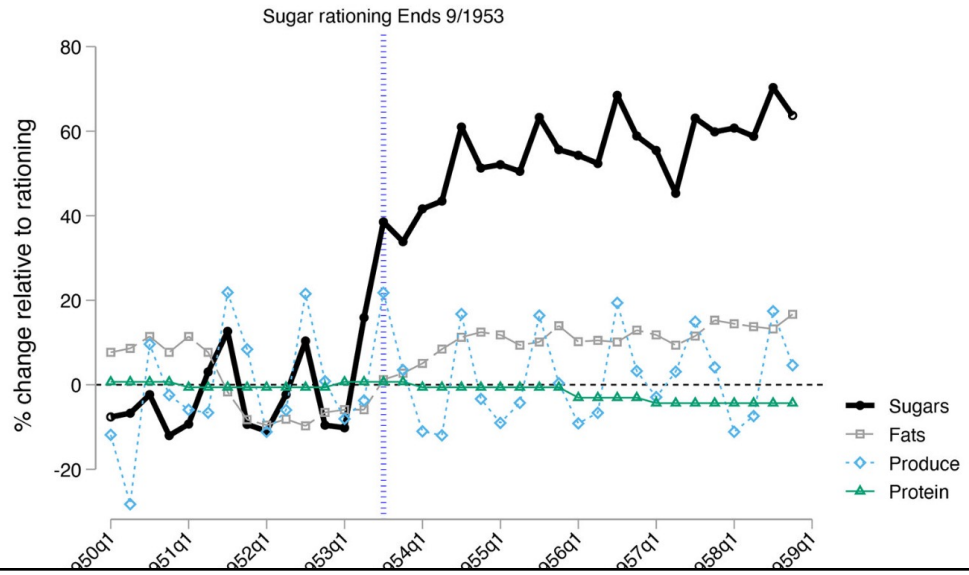
A) Percent changes in intake of sugars and other food groups relative to diet during rationing

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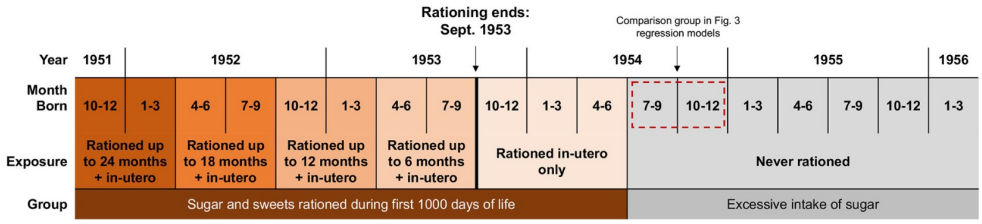


**Fig. 1. Sugar and sweets rationing timeline and diet during and after rationing.** (**A**) Calculations using National Food Survey data. (**B**) Rationed groups are shown in shades of orange, and never-rationed group is shown in gray. The red dashed rectangle represents adults born between July and December in 1954, which constitutes the first group that never experienced sugar and sweets rationing. This group of adults serves as the reference or comparison group in regression models.

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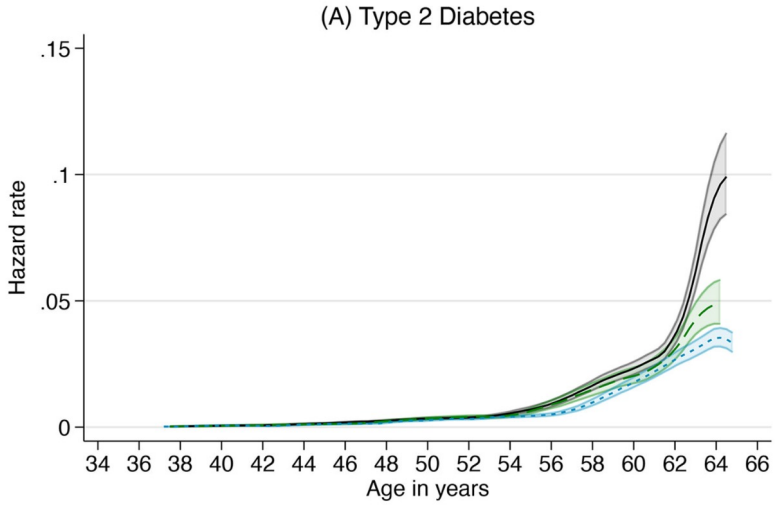


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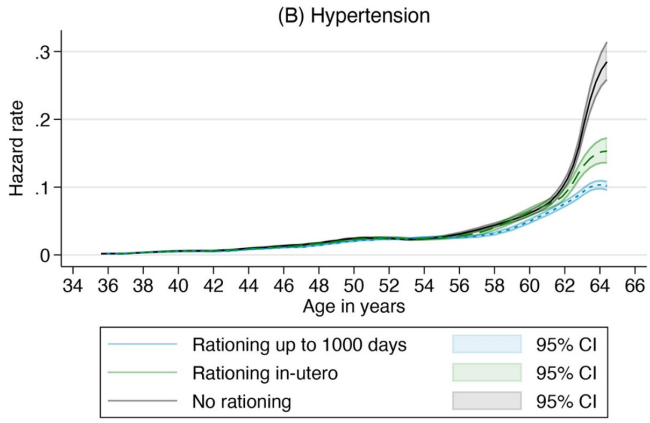


**Fig. 2. Smooth hazard functions for type 2 diabetes and hypertension by exposure to rationing.** (**A**) Hazard function for T2DM by rationed in utero or longer versus never-rationed. (**B**) Hazard function for hypertension by rationed in utero or longer versus never-rationed. Log-rank test confirmed significant difference between survival curves at $p<0.001$. 95% confidence intervals are shown.

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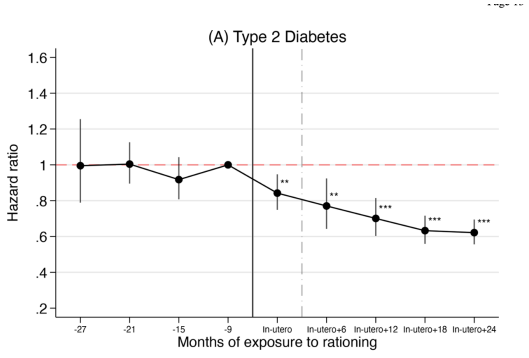


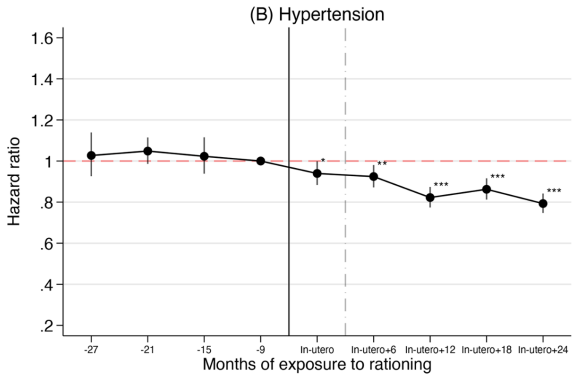


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# Nutritional Epigenetics

- Randy Jirtle PhD
- Relationship between nutrition, methylation and gene expression
- Protection against BPA toxicity in nutrient-methylation models

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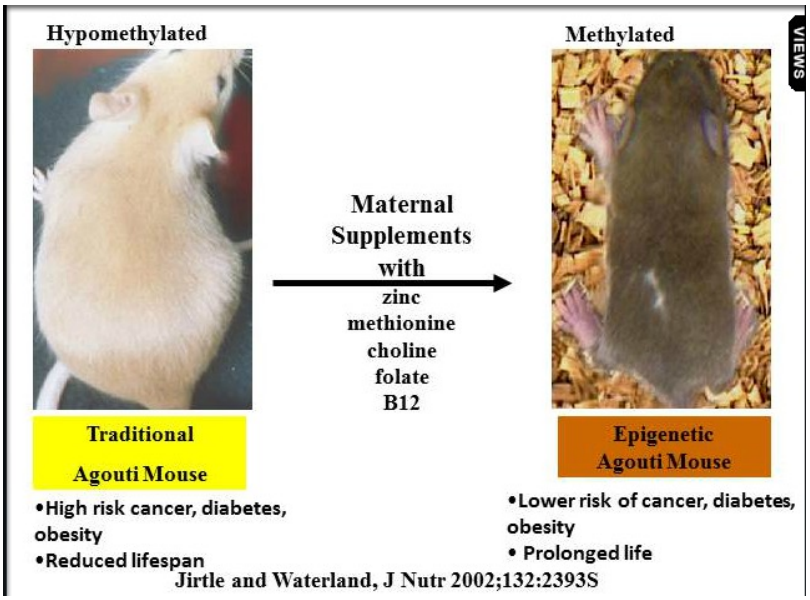


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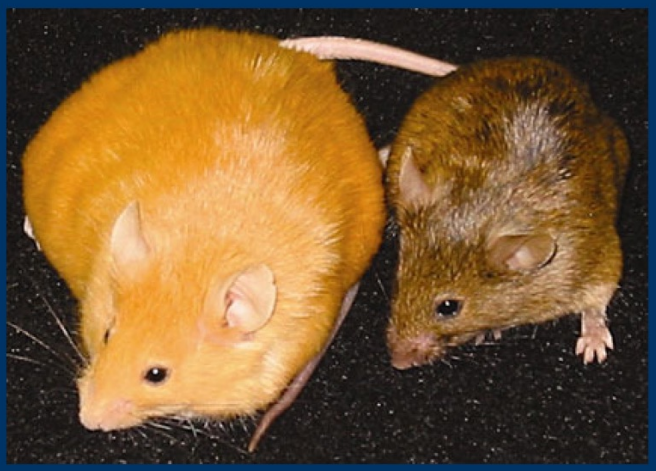
## Epigenetics: Feeding Your Genes



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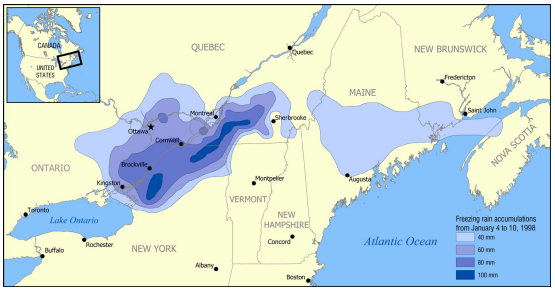
RESEARCH ARTICLE

VIEWS SHA

### DNA Methylation Signatures Triggered by Prenatal Maternal Stress Exposure to a Natural Disaster: Project Ice Storm

Lei Cao-Lei, Renaud Massart, Matthew J. Suderman, Ziv Machnes, Guillaume Elgbeili, David P. Laplante, Moshe Szyf, Suzanne King

Published: September 19, 2014 • DOI: 10.1371/journal.pone.0107653




## Conclusions

*"These data provide first evidence in humans supporting the conclusion that PNMS results in a lasting, broad, and functionally organized DNA methylation signature in several tissues in offspring. We can infer that the epigenetic effects found in Project Ice Storm are due to objective levels of hardship experienced by the pregnant women."*

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## Environmental Programming of Gene Activity- Bonding

Glucocorticoid Receptor Gene

**Child Abuse**

↓ GR Gene

↓ GR Receptors

↑ Stress Response

**Bonding**

↑ GR Gene

↑ GR Receptors

↓ Stress Response

McGowan PO, Sasaki A, D'Alessio AC, Dymov S, Labonte B, Szyf M, Turecki G, Meaney MJ. Epigenetic regulation of the glucocorticoid receptor in human brain associates with childhood abuse. Nat Neurosci. 2009;12(3):342-348.

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## Different carbohydrates produce unique genomic responses

high glycemic carbs

62 genes up-regulated

linked to oxidative stress, Cytokine mediated immunity and Interleukin pathways

low glycemic carbs

71 genes down-regulated

regulating insulin signaling and adipocyte cell size

Improved insulin index

Source: Kallio et al. Am J Clin Nutr;2007:851:1417-27

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## Key Guidelines

•General Daily Limit: Keep added sugars under 10% of your total daily calories (about 50 grams or 12 teaspoons for a 2,000-calorie diet) according to the U.S. Food and Drug Administration.

•Meal-Based Target: Recent updates advise that individual meals contain no more than 10 grams of added sugars.

•Stricter Organization Limits: The American Heart Association recommends tighter daily caps: no more than 25 grams (6 teaspoons) for women and 36 grams (9 teaspoons) for men.

•Children: Major health organizations advise that children under age 2 avoid added sugars entirely.

https://www.health.harvard.edu/diabetes-and-metabolic-health/the-sweet-danger-of-sugar

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*Pregnant and lactating women consume, on average, more than triple the recommended amount of added sugar, surpassing 80 grams per day,(5) and most infants and toddlers consume sweetened foods and beverages daily.*

Herrick KA, Fryar CD, Hamner HC, Park S, Ogden CL, Added sugars intake among US infants and toddlers. Journal of the Academy of Nutrition and Dietetics 120, 23–32 (2020).

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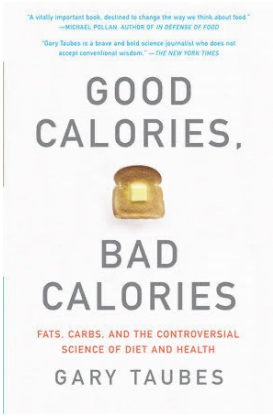
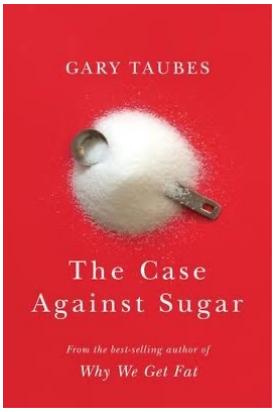
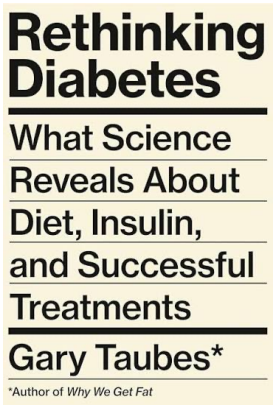
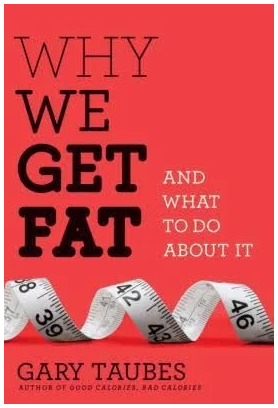

GOOD CALORIES,
BAD CALORIES
FATS, CARBS, AND THE CONTROVERSIAL SCIENCE OF DIET AND HEALTH
GARY TAUBES


GARY TAUBES
The Case Against Sugar
From the best-selling author of
Why We Get Fat


Rethinking Diabetes
What Science Reveals About Diet, Insulin, and Successful Treatments
Gary Taubes*
*Author of Why We Get Fat


WHY WE GET FAT
AND WHAT TO DO ABOUT IT
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