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Authors

Gracner, Tadeja

Boone, Claire

Gertler, Paul J

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

Tadeja Gracner^{1,2,*}, Claire Boone^{3,4}, Paul J. Gertler^{5,6}

¹University of Southern California; Los Angeles, CA 90089, United States

²RAND Corporation; Santa Monica, CA 90401, United States

³McGill University; Montreal, QC, H3A 0G4, Canada

⁴University of Chicago; Chicago, IL 60637 United States

⁵University of California, Berkeley; Berkeley, CA 94720, United States

⁶National Bureau of Economics Research; Cambridge, MA 02138, United States

Abstract

We examined the impact of exposure to sugar restrictions within 1000 days after conception on type 2 diabetes and hypertension, leveraging quasi-experimental variation from the end of the United Kingdom's sugar rationing in September 1953. Rationing restricted sugar intake to levels within current dietary guidelines, and consumption nearly doubled immediately after rationing ended. Using an event study design with UK Biobank data comparing adults conceived just before or after rationing ended, we found that early-life rationing reduced type 2 diabetes and hypertension risk by about 35 and 20% and delayed disease onset by 4 and 2 years, respectively. Protection was evident with in utero exposure and increased with postnatal sugar restriction, especially after 6 months, when eating of solid foods likely began. In utero sugar rationing alone accounted for about one-third of the risk reduction.

*Corresponding author. gracner@usc.edu.

Author contributions:

Conceptualization: Gracner

Methodology: Gracner, Boone, Gertler

Investigation: Gracner, Boone, Gertler

Visualization: Gracner, Boone

Funding acquisition: Gracner

Project administration: Gracner

Supervision: Gracner, Gertler

Writing – original draft: Gracner

Writing – review & editing: Gracner, Boone, Gertler

Competing interests: Authors declare that they have no competing interests.

Supplementary Materials

Materials and Methods

Figs. S1 to S13

Tables S1 to S6

References (48–50)

INTRODUCTION

The first 1000 days after conception – from gestation until age 2 (early life) - is a critical window during which poor diet can negatively affect adult health.(1, 2) Current dietary guidelines recommend zero added sugars during this period,(3) but in the United States, many children are exposed to excessive sugar through maternal diet in utero and while breastfeeding and then, directly, by consuming infant formula and solids.(4) 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.(6)

We estimated how exposure to added sugar restrictions in the first 1000 days after conception affects the onset of type 2 diabetes mellitus (T2DM) and hypertension decades later. Although ample causal evidence from rodent experiments demonstrated lasting adverse effects of excessive sugar intake in early life,(7–9) rigorous evidence from humans is limited at best.(10, 11) For humans, previous research on dietary shocks early in life was primarily focused on extreme in-utero caloric restrictions such as famine(12) or on changes in risk factors for T2DM and hypertension such as maternal gestational weight gain(13) and hyperglycemia.(14) Thus, even though there is broad agreement on the correlations between excessive added sugar and metabolic dysfunction generally,(15–18) the lack of cohorts randomized to varying levels of added sugar early in life limits our understanding of the causal long-term effects of excessive sugar on human health.

This study leveraged a natural experiment: the end of a decade-long sugar and sweets rationing in the United Kingdom in September 1953, which led to quasi-experimental variation in sugar exposure in early life. During rationing, the sugar allowance for everyone – including pregnant women and children – was comparable to today’s dietary guidelines of around <40 g for adults or <15 g for children, and assumed little to no sugar offerings to children under 2 years.(3, 19–21) The cessation of rationing in 1953 led to an immediate, nearly twofold increase in the consumption of sugar and sweets.(22)

To assess the effects of early-life sugar exposure on T2DM and hypertension, we used an event study approach to compare adults conceived shortly before rationing ended, with probable lower early-life sugar intake, against those conceived shortly after, with likely exposure to excessive sugar early in life. We hypothesized that exposure to sugar rationing in utero and early childhood reduced the risk and delayed the onset of T2DM and hypertension, with longer exposure having stronger effects.

RESULTS

Dietary patterns during and after sugar and sweets rationing

Fig. 1A describes percentage changes in average daily consumption of sugar in the UK from quarter 1 of 1950 (1950 q1) to 1958 q4, compared with average consumption levels during rationing, along with the intake of produce (fruits and vegetables), and total protein and fats over the same period. A vertical line marks the end of sugar rationing in September 1953. For an average adult, daily sugar consumption sharply increased from 41 g in 1953 q1 to

about 80 g by 1954 q3; this similarly high level was sustained for several years. These data are for adults, but other research has shown that sugar intake for children more than doubled post rationing and that their oral health deteriorated as well.(21, 23). Relatively higher added sugar consumption for those conceived post rationing was maintained into the sixth decade of life.(24)

After sugar rationing ended, total calorie intake sharply increased. Figures S1, A and B, shows quarterly fluctuations in sugar and total calorie consumption, and Figure S1C details their absolute changes relative to baseline levels during rationing (1950 q1-1953 q2). These data indicate that on average 77% of the increase in calorie intake post rationing was due to higher sugar consumption. The actual percentage was likely even higher: While data on sugar consumption exclude the intake of sweets and purchases outside the home, total calorie consumption includes a 10% adjustment for potential wastage and food bought outside the home.(25) Figure S2 describes annual changes in sugar and sweets sales, which increased sharply after rationing ended.

Although sugar was not the only food derationed during our study period, and all rationing had ended by July 1954, the consumption of foods and nutrients other than sugar remained largely unchanged or showed minor changes during our study period (Figure 1A). Butter was de-rationed in May 1954. This caused households to largely revert to butter from margarine, likely leading to only a minor adjustment in overall fats consumption (Figures 1A and S3A). Similarly, despite the end of cheese rationing in December 1953, Figure S3B shows a relatively constant consumption of cheese and milk including that provided to children in schools or on welfare. Figure S3C indicates a steady consumption of fresh fruits and vegetables but a notable increase in canned and dried fruit intake, especially after September 1953. This may have contributed to higher added sugar intake, as a 15 oz can of fruit in syrup contains between 30 and 40 g of added sugars and processed dried fruits often have added sugar.(26) Cereals were derationed in July 1954, yet their consumption remained relatively stable (Figure S3D). We observed a minor decline in fish consumption and only a gradual increase in meat consumption despite its derationing in July 1954 (Figure S3E). This is consistent with protein substitution, as protein intake remained steady throughout our study (Figure 1A). Figure S4 shows a relatively constant food affordability over time, proxied with food prices adjusted for general inflation and wage growth.

In summary, the quick and sharp response in consumption and sales of sugar and sweets consumption immediately after the derationing, unlike for other foods, strengthens our research design. We examined whether there are differences in outcomes among individuals born within a few months of each other – specifically, cohorts conceived or born just before compared to just after sugar and sweets rationing ended.

Study population characteristics

The sample included 60,183 participants born between October 1951 and March 1956, aged 51 to 66 when surveyed. Adults conceived in the 1000 days before September 1953 were classified as “rationed” (born October 1951 to June 1954, $n=38,155$), and adults conceived after were classified as “never-rationed” (born July 1954 to March 1956, $n=22,028$). Figure

1B shows a timeline of exposure to rationing by calendar birth month. See Table S1 for a sample distribution of births.

Table 1 shows balance in time-invariant characteristics between rationed and never-rationed cohorts, including sex (male 43.91% vs 43.73%), race (White 93.17% vs 93.16%), family history of diabetes (16.83% vs 18.03%), cardiovascular disease (62.69% vs 63.22%), and calculated genetic risk for obesity. Rationed adults were slightly more likely to be born in England (85.82% vs 85.09%, $p < 0.05$).

Association between early-life sugar-rich diet and risk for T2DM and hypertension

A total of 3,936 participants were diagnosed with T2DM, and 19,644 with hypertension. The risk of disease diagnosis increased with age for everyone, but it increased faster among adults with little or no exposure to rationing. Disease risk started to diverge when participants were in their mid 50s, and the largest differences were observed after age 60 (Figure 2A–B). See Figure S5 for estimated cumulative hazard. Unadjusted Kaplan-Meier survival curves (Figure S6) show that 92.2% and 65.4% of adults exposed to rationing in utero and postnatally had a higher chance of living without T2DM and hypertension to age 60, respectively, compared to those unexposed (89.1% and 61.4%). Log-rank tests confirmed significant survival curve differences at $p < 0.001$.

The risk of T2DM or hypertension decreased with the duration of exposure to rationing (Figure 3). Each point on Figure 3 is a hazard ratio (HR) estimate; the cohort's HR relative to the reference group of never-rationed adults born between July and December 1954. Compared with this reference group, adults exposed to rationing only in utero had about a 15% lower risk of T2DM (HR 0.84; 95% confidence interval (CI) 0.75 to 0.95) (Figure 3A, Table S2 **Column 1**). Risk was further reduced with longer exposure to rationing, particularly beyond 6 and 12 months postnatally. HRs remained relatively stable at around HR 0.62 (95%CI 0.55 to 0.69) for adults exposed for at least 19 months. A similar pattern was observed for hypertension, although with a smaller risk reduction. The HR decreased from 0.94 (95%CI 0.88 to 1.00) for adults exposed in utero only, to HR 0.79 (95%CI 0.74 to 0.85) if exposed from conception through at least 19 months postnatally (Figure 3B, Table S2).

The HR estimates for T2DM and hypertension in never-rationed adults remained constant after December 1954, with all postrationing HRs statistically indistinguishable from 1 (p -value at 0.498 for T2DM, and 0.511 for hypertension) (Figure 3). This supported our assumption of a similar disease risk trajectory between rationed and never-rationed cohorts independent of rationing. It also mitigated concerns about improvements in diagnostics or other events, such as improved access to medical care, over time, influencing the age of initial diagnosis, or regarding simultaneous exposure to sugar or other foods among adults who were never exposed to sugar rationing. For instance, butter went off-ration in May 1954. If fat rather than sugar alone affected these adults' health, we would expect that adults conceived after butter derationing (post-May 1954) would fare differently than adults conceived prior (between October 1953 and April 1954), and that disease risk would increase for younger cohorts. However, we find no significant differences in T2DM and hypertension risk among adults conceived at different points after sugar rationing ended.

We further addressed potential concerns about time trends influencing our findings by analyzing conditions unlikely to be affected by sugar intake: type 1 diabetes, trauma-triggered depression, menarche, and myopia or hyperopia. Despite having similar diagnostic trends and requirements to T2DM or hypertension, these conditions showed no significant differences in HRs between cohorts (Figure S7).

Guided by HRs suggesting a similar disease risk between cohorts in the absence of rationing, and to increase statistical power, we combined never-rationed adults into one group and compared them with adults exposed to rationing in utero, in utero and up to age 1, and in utero and beyond age 1. In utero exposure alone explained about a third of the total reduction in T2DM and hypertension risk compared with exposure in utero and beyond age 1 (Table 2A). T2DM risk reduction due to in utero exposure (0.87, 95%CI 0.81 to 0.94) differed from in utero and postnatal exposure of up to a year ($p<0.01$) and beyond ($p<0.001$). Hypertension risk reduction due to in utero exposure (HR 0.92, 95%CI 0.88 to 0.97) differed from postnatal exposure of up to a year ($p<0.001$) and beyond ($p<0.001$). Table S3 shows that disease risk especially declines with exposure beyond 6 months postnatally (at $p<0.001$ for T2DM and hypertension). Among those with more than one year of postnatal exposure to rationing, the T2DM risk reduction was significantly larger for women than for men ($p<0.01$) (Figure S8).

Early-life exposure to sugar rationing increased the time to the first T2DM or hypertension diagnosis (Table 2B). Adults rationed in utero experienced a 1.46 (95%CI 0.45 to 2.48) year delay in T2DM onset and a 0.53 (95%CI 0.07 to 1.00) year delay in hypertension onset. Those exposed in utero and beyond 1 year postnatally experienced approximately a 4- and 2-year delay in diagnosis of T2DM and hypertension, respectively.

Figure S9 illustrates a roughly 30% decrease in risk of obesity as first diagnosed in primary care from exposure to rationing in utero and beyond the first year (HR 0.69, 95%CI 0.60 to 0.80). Figure S10 and Table S4 also show that adults exposed to in utero and early postnatal rationing had about 2 percentage points lower prevalence of high waist-to-height ratios (WHRs), with no meaningful differences in continuous WHR or blood pressure outcomes between cohorts. The lack of differences may be due to improved disease management after long-standing diagnoses of T2DM or hypertension and because sugar rationing delayed but did not prevent them.

Figure S11 and Table S5 describe goodness of fit for parametric hazard models with Gompertz baseline parametrization and the criteria for these findings. Figure S12 presents a test of proportionality assumptions. Results remained robust across various model specifications (Table S6) including adjusting models for changes in food affordability (Figure S13).

DISCUSSION

We examined the impact of exposure to sugar restrictions during the first 1000 days after conception on T2DM and hypertension, leveraging quasi-experimental variation from the UK's end of sugar and sweets rationing in September 1953. Derationing nearly doubled

sugar consumption. We found that early-life exposure to sugar rationing led to a reduction in T2DM and hypertension risk by about 35 and 20% and delayed the onset of these diseases by about 4 and 2 years, respectively. In utero sugar rationing alone was protective, but most risk reduction occurred when rationing lasted beyond the age of six months.

Restricting early-life sugar intake could affect health by altering physiological programming in utero, as supported by evidence from the “fetal origins hypothesis”.(2, 11, 27) We found that exposure to in utero rationing alone contributed to about one-third of the overall reduction in T2DM and hypertension risk and accounted for approximately a quarter of the delay in disease onset. Our findings on in utero sugar effects are consistent with animal studies demonstrating that high-sugar diets during pregnancy increase risk factors for T2DM and hypertension, such as insulin resistance and glucose intolerance in adulthood,(8, 9) and with studies on humans demonstrating an association between sugar-rich diet during pregnancy and lactation with increased obesity risk in offspring.(28)

Furthermore, early-life sugar exposure may affect health by intensifying a lifelong preference for sweetness. Infancy and toddlerhood in particular are critical periods for developing a taste for sweets (or even addiction) that can elevate sugar consumption throughout life.(24, 29–31) More than 70% of foods marketed to infants or toddlers contain added sugars in formula, foods, or beverages.(4) By age two, many children consume the adult-recommended 7 teaspoons of sugar daily, nearly tripling it by their teens.(6) We identified improved health from restricting sugar beyond gestation; postnatal rationing accounted for the majority of the reduction in disease risk, especially for T2DM. Its protective effects increased especially when extended past 6 months – the typical age for introducing solids.(32) Women showed greater postnatal health benefits than men in terms of reduced T2DM risk, reflecting findings from animal studies that females in high-sugar settings are more susceptible to sugar addiction and disrupted glucose regulation, both of which elevate T2DM risk.(33, 34) Postnatal rationing also reduced obesity risk and high WHR prevalence; known markers for increased cardiometabolic risk.(35) Although not necessarily a primary cause,(35) obesity suggests a biological pathway as it correlates with elevated sugar intake and metabolic disease.(36, 37) Disease effects stabilized by age 1; the benefits of restricting sugar intake beyond age 2 remain uncertain.

Our findings provide insights beyond the context of rationing, because the sugar allowance then aligned with today’s limits set by the United States, World Health Organization, and American Heart Association dietary guidelines.(17, 38) Although we did not directly evaluate these guidelines, our findings imply that adhering to them early in life could provide substantial health benefits. The magnitudes of our results are comparable to the 2.8-year-long National Diabetes Prevention Program that decreased T2DM risk by 34% and delayed its onset by about 4 years a decade later,(39) potentially extending life expectancy by about 1 to 1.5 years.(40)

Dietary guidelines on added sugar intake have been criticized for relying on moderate- to low-quality short-term evidence focused on obesity and dental health, on observational studies and on short-term clinical trials that studied T2DM or hypertension or their markers. (17, 41) None were focused on the first 1000 days after conception. As conversations

intensify regarding policies such as taxing sugar or sugar-sweetened beverages,(42) or the regulation of added sugars in infant or toddler foods and their marketing,(43) understanding the direct link between early-life sugar consumption and chronic disease is critical. Our results add to this discussion by not only linking sugar to health but also underscoring the importance of early-life diet in managing long-term metabolic disease risk.

This study has limitations, but we have taken various steps to ensure the robustness of our results.

One concern was the potential for unobservable differences between cohorts conceived during and after rationing (aside from early-life sugar exposure), particularly without a contemporaneous control group. We addressed this in several ways: (i) We used a narrow time window around the end of rationing and observed similar early-life and parent disease characteristics between cohorts. (ii) We provided evidence that diet in the 1950s was similar between cohorts, except for sugar. (iii) Our results controlled for several early-life characteristics and food prices and are robust to excluding them. Additionally, we observed no differences in disease risk between cohorts for conditions likely unrelated to diet. Finally, equivalent to testing pretrends in outcomes between rationed and never-rationed adults, HRs among older and younger non-rationed adults showed no significant differences irrespective of birth date.

Another limitation was that UK Biobank is not nationally representative and skews towards wealthier, healthier individuals, although it is useful for studying exposure-outcome relationships (44) and offers a larger sample than comparable surveys. The likelihood of volunteering for surveys was likely unrelated to the end of rationing as both the rationed and never-rationed cohorts were recruited using the same protocols. However, if sugar rationing improved economic well-being,(24) wealthier adults might have received earlier disease diagnostics due to improved access to health care. The single-payer health care system in the UK helps lessen these concerns, as do our results showing no impacts on placebo conditions. A final limitation was right censoring and no prestudy mortality information; the latter concern is small given the similarly low mortality rates in rationed and non-rationed adults.(45)

This study has several strengths. A quasi-experimental assignment to higher or lower early-life sugar exposure strengthens the likely causal nature of our findings. We accounted for confounding factors and consistently observed a protective effect of sugar rationing across various analytical specifications. We provided strong evidence that the health impacts observed were likely due to changes in sugar calorie consumption rather than shifts in consumption of other nutrient consumption. Finally, our large sample enabled separate identification of in utero and in utero/postnatal effects while still using a narrow analytic window, and subgroup analyses by sex.

We conclude that limiting exposure to sugar in utero and in early life can protect against T2DM and hypertension. Further research is needed to understand the optimal levels of added sugar consumption during pregnancy, lactation, and after the introduction of solids, as well as their pathways to influencing long-term health.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Data and materials availability:

UK Biobank data are available to obtain directly through the UK Biobank data application process. UK Biobank data were made available to us under a material transfer agreement with RAND, the University of Southern California, the University of California, Berkeley, and the University of Chicago. STATA code and all other study data, such as data on quarterly food prices, food consumption, and annual sugar and sweet sales, are available in the Dryad and Zenodo repositories.(46, 47)

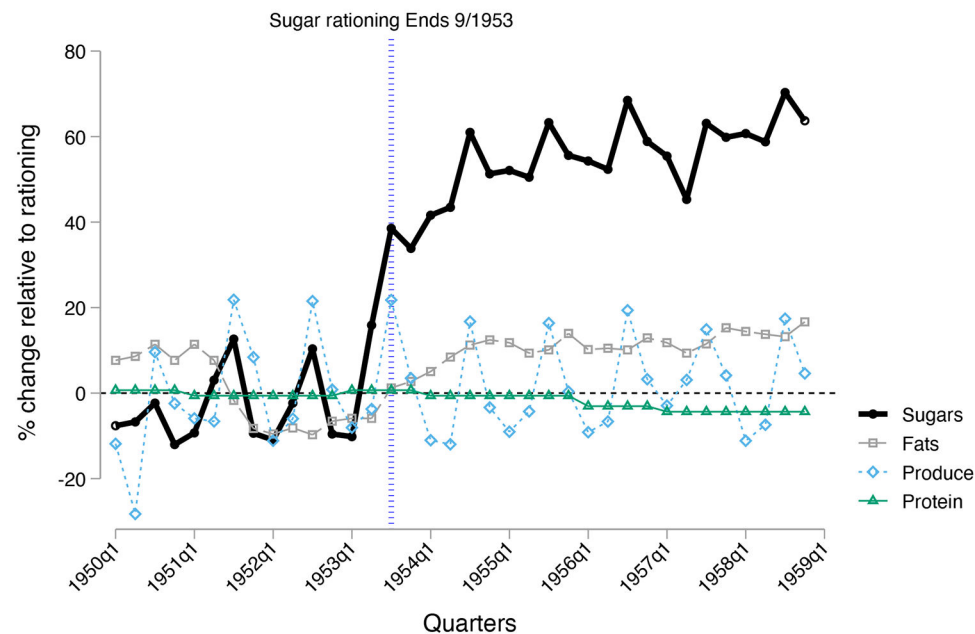
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A) Percent changes in intake of sugars and other food groups relative to diet during rationing



B) Timeline of survey participants' exposure to rationing

		Rationing ends: Sept. 1953										Comparison group in Fig. 3 regression models							
Year	1951	1952				1953				1954		1955				1956			
Month Born	10-12	1-3	4-6	7-9	10-12	1-3	4-6	7-9	10-12	1-3	4-6	7-9	10-12	1-3	4-6	7-9	10-12	1-3	
Exposure	Rationed up to 24 months + in-utero		Rationed up to 18 months + in-utero		Rationed up to 12 months + in-utero		Rationed up to 6 months + in-utero		Rationed in-utero only				Never rationed						
Group	Sugar and sweets rationed during first 1000 days of life										Excessive intake of sugar								

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.

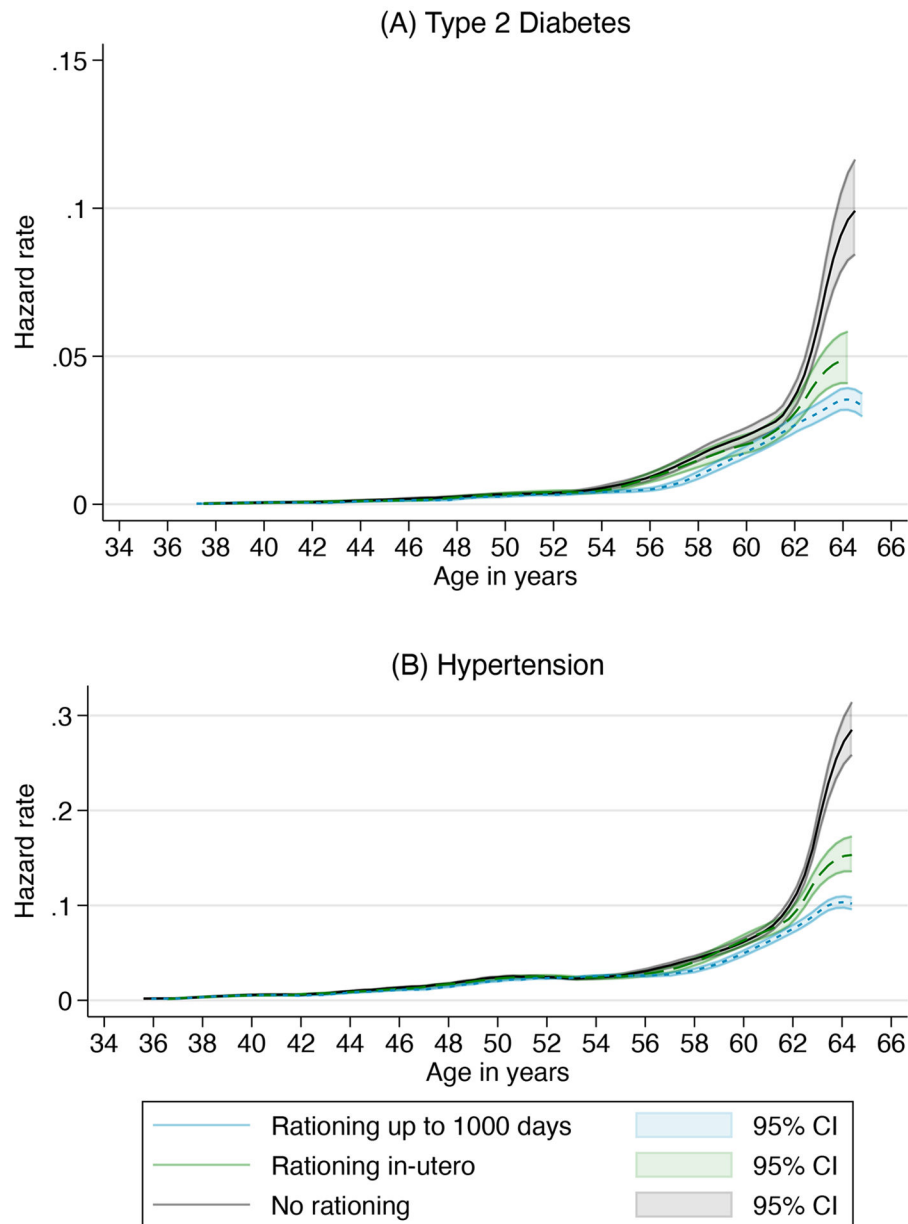


Fig. 2. Smooth hazard functions for type 2 diabetes and hypertension by exposure to rationing. (A) Hazard function for T2DM by rationed in utero or longer versus never-rationed. (B) Hazard function for hypertension by rationed in utero or longer versus never-rationed. Log-rank test confirmed significant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

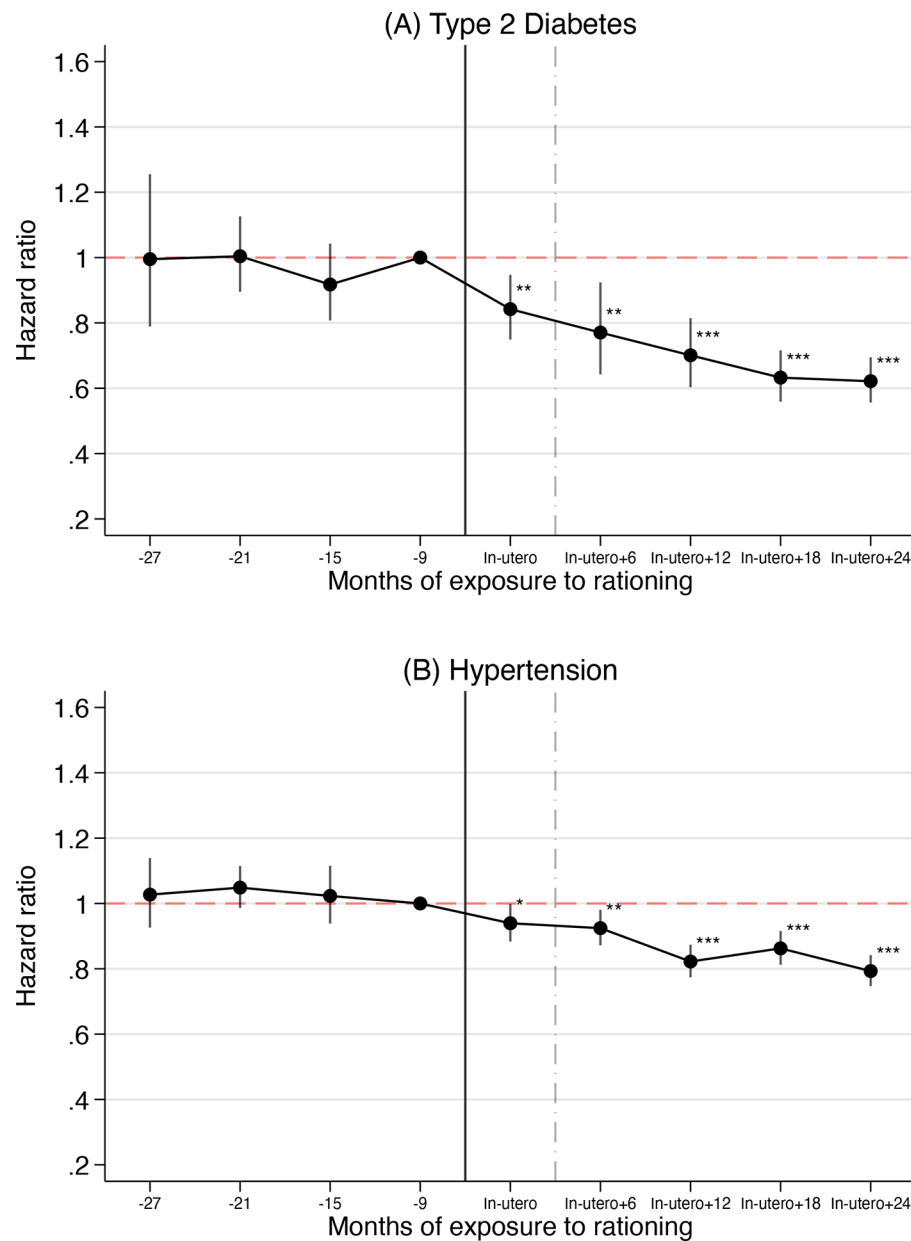


Figure 3: Hazard ratios comparing the hazard rates at various levels of rationing exposure to the hazard rate of never-rationed adults born between July and December 1954.

(A) Hazard ratios at various durations of rationing exposure for T2DM. (B) Hazard ratios at various durations of rationing exposure for hypertension. Each point represents a hazard ratio, comparing the hazard rate of adults exposed to rationing in utero, in utero plus 6, 12, 18, or 24 months after birth, or not at all, to the hazard rate of the reference group of never-rationed adults born between July and December 1954 (>9 months after rationing). Adults never exposed to rationing were also those born between January and June 1955 (>15 months after rationing), July to December 1955 (>21 months after rationing), and January to March 1956 (>27 months after rationing). The HR estimates for adults born between January 1955 and April 1956, who were never rationed, were neither individually nor jointly significantly different from the HR estimate of adults born in the reference group of July to

December 1954 (at $P = 0.498$ for T2DM and $p = 0.511$ for hypertension). All regressions include indicators for calendar month of birth, survey year, birthplace (England versus Wales versus Scotland), deciles of north and east place-of-birth coordinates, self-reported sex, race (white versus not), and parental cardiovascular disease (hypertension, heart disease, stroke), or diabetes indicator. Asterisks indicate significance as follows: $^+p < 0.1$, $*p < 0.05$, $**p < 0.01$, $***p < 0.001$. See Table S2 for results supporting this figure.

Table 1: Characteristics of survey participants born between October 1951 and March 1956.

A total of 2699 and 1667 observations were missing for parental history of rationed and never-rationed adults, respectively; their calculations of *n* are adjusted accordingly. Differences in means were expressed in percentage points for all variables except age at the latest survey and were adjusted for parents being alive.

	Rationed (n=38,155)	Not Rationed (n=22,028)	Total n = 60,183
Characteristic	n (Mean in %)	n (Mean in %)	Difference (percentage points)
Age at the latest survey	57.24 (SD=3.24)	55.04 (SD=3.37)	2.19 *** (years)
Sex			
<i>Male</i>	16,754 (43.91)	9,633 (43.73)	0.19
<i>Female</i>	21,401 (56.09)	12,395 (56.28)	-
Place of birth			
<i>England</i>	32,745 (85.82)	18,743 (85.09)	0.73 *
<i>Wales</i>	1,927 (5.05)	1,082 (4.91)	0.14
<i>Scotland</i>	3,483 (9.13)	2,203 (10.00)	-
Race/Ethnicity			
<i>Non-white</i>	2,606 (6.83)	1,507 (6.84)	-0.01
<i>White</i>	35,549 (93.17)	20,521 (93.16)	-
BMI polygenic z-score (SD)	0.000 (SD=1.003)	0.002 (SD=0.996)	-0.00
Parents diagnosed with CVD ¹	22,227 (62.69)	12,872 (63.22)	-0.53
Parents diagnosed with diabetes	5,967 (16.83)	3,671 (18.03)	-1.20

Asterisks indicate significant difference as follows: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Romano-Wolf step-down adjusted *p* values. Because of rounding, reported percentages may not total 100. BMI, body mass index.

¹Parents diagnosed with CVD (cardiovascular disease) is a self-reported indicator after respondents answered the question "Was your biological mother/father ever diagnosed with stroke/heart disease/hypertension?"

Table 2. The effect of rationing on disease risk and age of disease onset by duration of exposure to rationing.

A: Hazard ratios are expressed relative to the hazard rate of those never exposed to rationing (born after July 1954). Parametric hazard models were estimated using the Gompertz distribution, although results were not sensitive to the choice of the distribution function, like Weibull. B: Time-to-event models assume Weibull distribution and are estimated using the “stteffects, ra” command in STATA.

	Type 2 diabetes (n=60,183)	Hypertension (n=60,183)
A: Disease Hazard Ratio		
	1954 m7–1956 m3	1954 m7–1956 m3
<i>Rationing exposure:</i>	(reference group)	(reference group)
In utero vs 0	0.87 ***	0.92 **
<i>SE</i>	(0.03)	(0.02)
<i>95% CI</i>	0.81 – 0.94	0.88 – 0.97
<i>p-value</i>	(0.000)	(0.001)
In utero + up to 1 year vs 0	0.75 ***	0.85 ***
<i>SE</i>	(0.04)	(0.02)
<i>95% CI</i>	0.68 – 0.84	0.81 – 0.89
<i>p-value</i>	(0.000)	(0.000)
In utero + up to 2 years vs 0	0.64 ***	0.81 ***
<i>SE</i>	(0.02)	(0.02)
<i>95% CI</i>	0.60 – 0.69	0.77 – 0.84
<i>p-value</i>	(0.000)	(0.000)
B: Delay in age of onset (years)		
<i>Rationing exposure:</i>		
In utero vs 0	1.46 **	0.53 *
<i>SE</i>	(0.52)	(0.24)
<i>95% CI</i>	0.45– 2.48	0.07 – 1.00
<i>p-value</i>	(0.005)	(0.028)
In utero + up to 1 year vs 0	2.80 ***	1.47 ***
<i>SE</i>	(0.61)	(0.28)
<i>95% CI</i>	1.61 – 4.00	0.93 – 2.01
<i>p-value</i>	(0.000)	(0.000)
In utero + up to 2 years vs 0	4.17 ***	2.12 ***
<i>SE</i>	(0.55)	(0.24)
<i>95% CI</i>	3.10 – 5.24	1.65– 2.60
<i>p-value</i>	(0.000)	(0.000)

Asterisks indicate significance as follows: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.