Prenatal exposure to famine heightens risk for later being overweight

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An analysis of historical medical records found that men who were prenatally exposed during early gestation to the Dutch famine of 1944-1945 were 30 percent more likely to be overweight with a Body

Mass Index of 25 or over at age 19, compared to a similar group not exposed to the famine. Professor L. H. Lumey at Columbia University Mailman School of Public Health led the study, which is published in the *International Journal of Obesity*. The study confirms evidence on the health risks of prenatal famine exposure, which also includes diabetes and schizophrenia.

The mechanism by which famine exposure raises the risk for later excess weight is still unknown. The researchers speculate that famine exposure could lead to changes in DNA methylation that stimulate being overweight. Or that surviving babies might have genetic profiles enabling them to thrive on fewer calories. "If so, it is tragic and ironic that surviving the famine would increase one's risk for obesity," says first author L. H. "Bertie" Lumey, MD, Ph.D., professor of epidemiology at Columbia Mailman School. "A slower metabolism that would have helped them survive the pandemic, in times of plenty could also contribute to weight problems and related health issues."

The researchers studied heights and weights of 371,100 men in the Netherlands born between 1943 and 1947 and examined for military service at age 19, including men with and without prenatal exposure to the Dutch famine. They found that a heightened overweight risk was present in men with famine exposure starting at the very beginning of gestation, not with exposure starting in the middle or at the end of gestation—a finding they say points to the start of pregnancy as a sensitive period of fetal development.

The study shows that the heightened overweight risk was limited to sons of manual workers born in the large cities of Western Netherlands, consistent with historical evidence on the socioeconomic and geographic populations known to be most affected by the famine.

Not surprisingly, excess weight presented its own risks. Those who were

overweight at age 19 had a 30 percent greater mortality risk through age 63 relative to those with a BMI in the normal range. This was independent of famine exposure.

Further development of a 1976 Paper

The new paper extends and refines a 1976 study by Columbia researchers using current definitions of overweight. Contrary to the earlier paper, current analytic approaches show no weight changes in sons of non-manual workers exposed in early gestation in the famine cities. The researchers note that the military examinations did not include waist or hip circumference or other measures of body mass distribution which could be even better indicators of chronic disease risk.

The new study also looked at whether or not a decline in birthrates among manual workers during the famine explained the relationship between prenatal famine exposure and risk for excess weight. It didn't.

"Our study builds on the rigorous science behind the original research in the 1970s led by Columbia epidemiologists Mervyn Susser and Zena Stein," says Lumey.

About the Dutch Famine

The Dutch famine (Hunger Winter) of 1944-45 was a period of civilian famine under German occupation at the end of World War II. Contemporary reports show that the famine was concentrated in the large cities of the Western Netherlands. It was limited to the last months of the war in the period between November 1944 and the surrender of the German forces to the Allies in May 1945. After Liberation, food supplies were rapidly distributed across the country. The food crisis

provides an opportunity to study the relationship between maternal nutrition in pregnancy and offspring health.

Previous research, beginning shortly after the end of the war found a link between famine-exposed mothers and birth weight. Subsequent research established links between famine exposure and risk for obesity, diabetes, and schizophrenia, as well as the specific genomic pathways involved. Importantly, the research also ruled out a link between famine exposure and mental retardation.

More information: L. H. Lumey et al, Overweight and obesity at age 19 after pre-natal famine exposure, *International Journal of Obesity* (2021). DOI: 10.1038/s41366-021-00824-3

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