

Increased odds for type 2 diabetes after prenatal exposure to Ukraine famine of 1932-33

September 3 2015

Men and women exposed in early gestation to the man-made Ukrainian Famine of 1932-33 in regions with extreme food shortages were 1.5 times more likely to be diagnosed with Type 2 diabetes in adulthood. In regions with severe famine there was a 1.3 fold rise in the odds of Type 2 diabetes, and there was no diabetes increase among individuals born in regions with no famine.

Researchers at Columbia University's Mailman School of Public Health, the Komisarenko Institute of Endocrinology and Metabolism in Kiev, Ukraine, and the Cheboratev Institute of Gerontology in Kiev are the first to conduct a large-scale study of the relationship between famine severity during different stages of prenatal development and Type 2 [diabetes](#) risk. Findings are online in the *Lancet Diabetes and Endocrinology*.

Scientists have long known that poor living conditions around the time of birth may have long-lasting effects on health. For Type 2 diabetes, they suspected that nutrition in pregnancy was a possible explanation but studies with reliable measures of the severity and timing of under-nutrition in pregnancy in large representative populations were not yet available.

The new Lancet study included all 43,150 cases of Type 2 diabetes diagnosed at age 40 or over in the Ukraine national diabetes register

between 2000-2008. The researchers matched these records with all 1.4 million individuals in the 2001 census who were born in the selected regions between 1930-1938 and still alive in the year 2000.

"The most important finding of our study is the dose-response relation between the severity of famine exposure in early gestation and the likelihood of later diabetes," said L.H. Lumey, MD, Mailman School of Public Health associate professor of Epidemiology and the study's first author.

Data for the years 1932-1934 show that the odds for diabetes were highest and the birth counts lowest in early 1934, nine months after famine mortality peaked between May to July 1933. Using month of birth, the researchers identified early gestation as a timeframe that appears to be particularly sensitive to long-term effects of prenatal famine. They were able to quantify the impact of prenatal famine on Type 2 diabetes in men and women, accounting for region of birth, seasonal effects, and their possible interactions. Results were the same for both sexes.

According to the researchers, the relation between season of birth and Type 2 diabetes was likely related to seasonal differences in food availability. The authors point out that deficiencies of a low-calorie diet most likely worsen during the winter and spring when food stocks from the previous harvest are depleted. "We show that the strong season of birth effects on late life diabetes among individuals born in the years 1930-1938 in all Ukraine regions were substantially larger for births in the first half year of 1934 in famine regions, especially after famine in early gestation," noted Lumey.

"Epigenetic changes in DNA regulation in early nutrition could provide a causal link with long-term health outcomes but need further investigation," said Lumey. "Our findings to date are very exciting however, and

further expand previous insights on the importance of the early gestation period gained from famine studies in other settings. "

A Commentary article in the same issue of *The Lancet Diabetes and Endocrinology* by Harvard Professor Matthew W. Gillman notes that the study had a large sample size, reasonably precise information about the timing of the famine, geographical variation in the same country, and clinical outcomes - a combination of strengths missing in other famine studies. Findings "raise the possibility that the first trimester of pregnancy holds crucial clues about the development of diabetes in offspring later in life."

Provided by Columbia University's Mailman School of Public Health

Citation: Increased odds for type 2 diabetes after prenatal exposure to Ukraine famine of 1932-33 (2015, September 3) retrieved 3 July 2023 from <https://medicalxpress.com/news/2015-09-odds-diabetes-prenatal-exposure-ukraine.html>

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