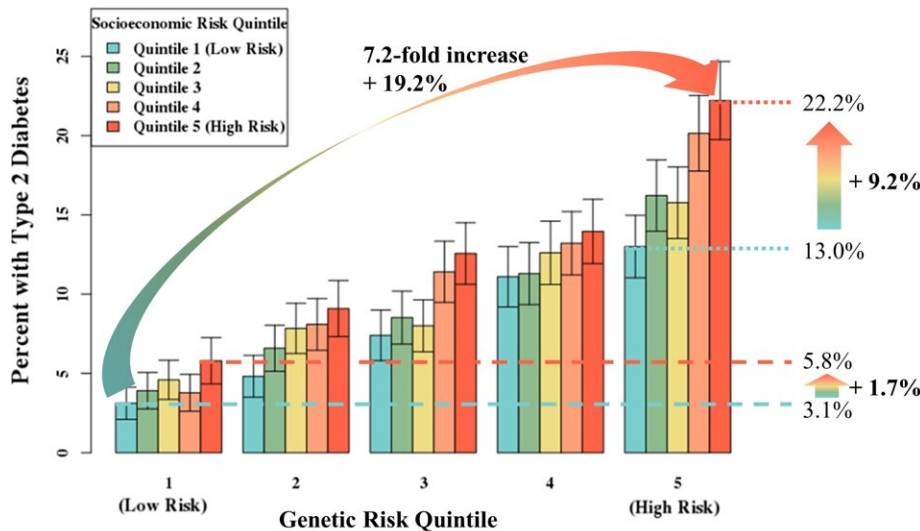


# Genetic and socioeconomic factors interact to affect risk of type 2 diabetes and obesity

March 7 2023, by Noah Brown

What is the combined effect of genetic and socioeconomic risk on the prevalence of type 2 diabetes (T2D) and obesity?



Combined high genetic and socioeconomic risk, compared to combined low risk, was associated with a 7-fold and 3-fold increase, respectively, in T2D and obesity prevalence.

Increasing socioeconomic risk is associated with a greater absolute increase in T2D and obesity prevalence among those at high genetic risk compared to those at low genetic risk.

Credit: *Diabetes Care* (2023). DOI: 10.2337/dc22-1954

New research led by investigators at Massachusetts General Hospital (MGH), a founding member of Mass General Brigham (MGB), indicates that socioeconomic and genetic factors likely interact in an additive way to affect people's risks of developing obesity and type 2 diabetes. The findings, which are published in *Diabetes Care*, suggest that interventions to improve socioeconomic deprivation may decrease metabolic diseases

at the individual and community levels, especially among people with concomitant high genetic risk.

Genetic and [socioeconomic factors](#)—one intrinsic and unmodifiable and one extrinsic and potentially modifiable—have both been shown to increase the risk of [metabolic diseases](#), but the relative contributions of the two and the degree to which they may interact to impact a person's risk are poorly understood. To investigate, scientists examined the independent and additive effects of genetic and socioeconomic risk in 26,737 and 223,843 participants of European genetic ancestry from the Mass General Brigham Biobank and the UK Biobank, respectively, as well as in 3,468 and 7,459 participants of non-European ancestry in the respective biobanks.

The team examined individuals' genetic data at millions of points across the genome as well as information related to education, income, and employment from their area of residence. Because [educational attainment](#) had the strongest association with [type 2 diabetes](#) and [obesity](#) out of all area-level socioeconomic variables examined, this was used as the primary socioeconomic risk measure.

Results indicated that people in the highest quintile of both genetic and socioeconomic risk had a more than seven-fold higher prevalence of type 2 diabetes (22.2% vs. 3.1%) and a more than three-fold higher prevalence of obesity (69.0% vs. 20.9%) compared with those in the combined lowest risk quintiles.

There was a significant positive interaction between genetic and socioeconomic risk on an additive scale. This suggests that the absolute increase in metabolic disease prevalence with unfavorable socioeconomic risk was much greater for those at higher genetic risk than for those at lower genetic risk.

For example, adverse area-level socioeconomic risk was associated with increased type 2 diabetes prevalence across the spectrum of genetic risk, but the absolute increase in prevalence was greatest in those at highest genetic risk: +9.2% in the highest genetic risk quintile vs. +1.7% in the lowest genetic risk quintile. Overall, the additive effects of genetic and socioeconomic factors accounted for 13.2% and 16.7% of type 2 diabetes and obesity prevalence, respectively.

"We believe that this research calls for a whole-person approach to metabolic disease prevention and that public health interventions may be most impactful if targeted to those who also have elevated genetic risk," says lead author Sara Cromer, MD, an Endocrinologist in the Department of Medicine at MGH and an Instructor at Harvard Medical School.

"The next steps in this research include expanding models to include more risk factors (such as lifestyle factors and behaviors), improving models for individuals of non-European ancestry, exploring the predictive value of area-level socioeconomic measures in diverse populations, and examining the gene-socioeconomic status interplay in regards to other outcomes."

Senior author Miriam Udler, MD, Ph.D., an endocrinologist in the department of Medicine at MGH, an investigator in the MGH Center for Genomic Medicine, and an assistant professor at Harvard Medical School, adds that the study highlights not only the high prevalence of metabolic disease among individuals with both genetic and socioeconomic [risk factors](#), but also that genetic risk for these diseases is not deterministic. "People at high genetic risk who live in low-risk socioeconomic regions have similar rates of type 2 diabetes and obesity as those with low genetic risk living in certain socioeconomic risk regions," she says. "More research is needed to understand exactly why this is."

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**More information:** Sara J. Cromer et al, Association and Interaction of Genetics and Area-Level Socioeconomic Factors on the Prevalence of Type 2 Diabetes and Obesity, *Diabetes Care* (2023). [DOI: 10.2337/dc22-1954](https://doi.org/10.2337/dc22-1954)

Provided by Massachusetts General Hospital

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