Differential vulnerability to neighborhood disorder: A gene x environment interaction study

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Problem / Question

Do perceptions of neighborhood disorder 'trigger' genetic risk for Type II Diabetes (T2D)?

Hypothesis

- Genetic risk for T2D will be heightened among individuals living in neighborhoods perceived as having higher levels of disorder.

Project Overview

- T2D is increasing in prevalence and is a major risk factor for cardiovascular disease.
- Although T2D is heritable, the disease is also preventable and treatable with lifestyle management.
- However, neighborhood features constrain peoples' ability to engage in healthy lifestyles.
- Neighborhoods perceived as having high levels of disorder are associated with a greater prevalence of T2D.
- Few researchers have examined interactions between genetic characteristics and neighborhood features on residents' health.

Variables / Research

Independent Variables	Dependent Variable	Covariates
• Perceptions of neighborhood disorder (environment) • Type II Diabetes polygenic score (gene)	• Self-reported diagnosis with T2D	• Self-reported levels of physical activity • Years of education • Age • Gender

Descriptive Statistics

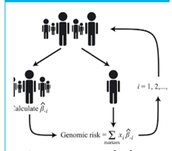
Materials (detailed list)	Mean (sd)
Perceived neighborhood disorder, (1-7)	2.36 (0.02)
Standardized T2D Polygenic Score	0.00 (1.00)
T2D Positive	19%
Physical Activity, (9-45)	24.02 (0.11)
Years of Schooling	13.88 (0.07)
Age	66.53 (0.11)
Female	53.58%

Procedure

Step 1

DNA samples collected in 2006/2008 combined

Step 2

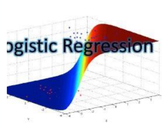


Genotyped data used to construct polygenic scores

Step 3

Participants' report on neighborhoods and T2D in 2012

Step 4



Weighted logistic regression of T2D on GxE interaction, physical activity, education, age, and gender

Data

- We used data from the Health and Retirement Study (HRS).
- HRS is a national survey examining economic, physical, mental, and cognitive well-being among United States men and women 50 years and older since 1992.
- In the core HRS interviews, respondents report any chronic health conditions they have, including T2D (2010/2014 in the present study).
- DNA was collected via Buccal swabs from a random half of households in 2006, and was collected via Oragene kits from the other half in 2008.
- HRS staff used combined and genotyped samples to construct standardized T2D polygenic scores.
- Participants completed psychosocial questionnaires in 2010/2012 including four items assessing neighborhood disorder (vandalism, vacant houses, trash, and safety).
- The analytic sample is 12,090 non-Hispanic white individuals with T2D polygenic scores

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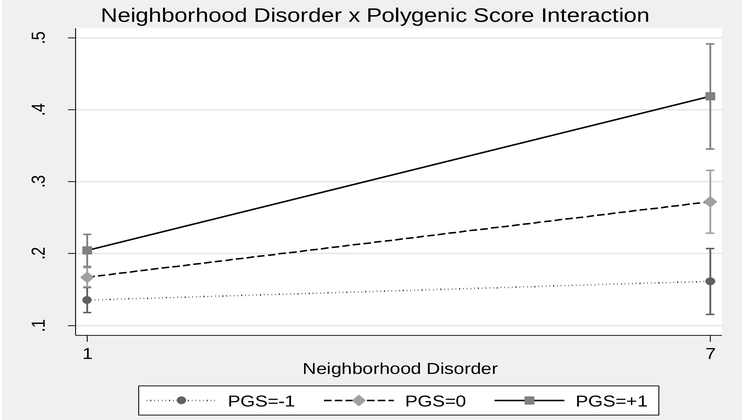
Results



- People living in neighborhoods perceived as having higher disorder were more likely to report a diagnosis with T2D.
- Higher polygenic scores for T2D increased the likelihood of a T2D diagnosis.
- Adjusting for levels of physical activity, years of schooling, age, and gender, there was a significant GxE interaction
- Perceptions of neighborhood disorder heighten genetic risk for T2D

Conclusion

- Consistent with the 'trigger' GxE typology, perceptions of neighborhood disorder trigger T2D genetic risk.
- Neighborhood effects on T2D may be underestimated in analyses that average over large samples of individuals
- The present results suggest that neighborhood disorder is a modifiable T2D risk factor, and inform community-level iterventions

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