

Investigating Genetic Confounding of the Education-Health Relationship

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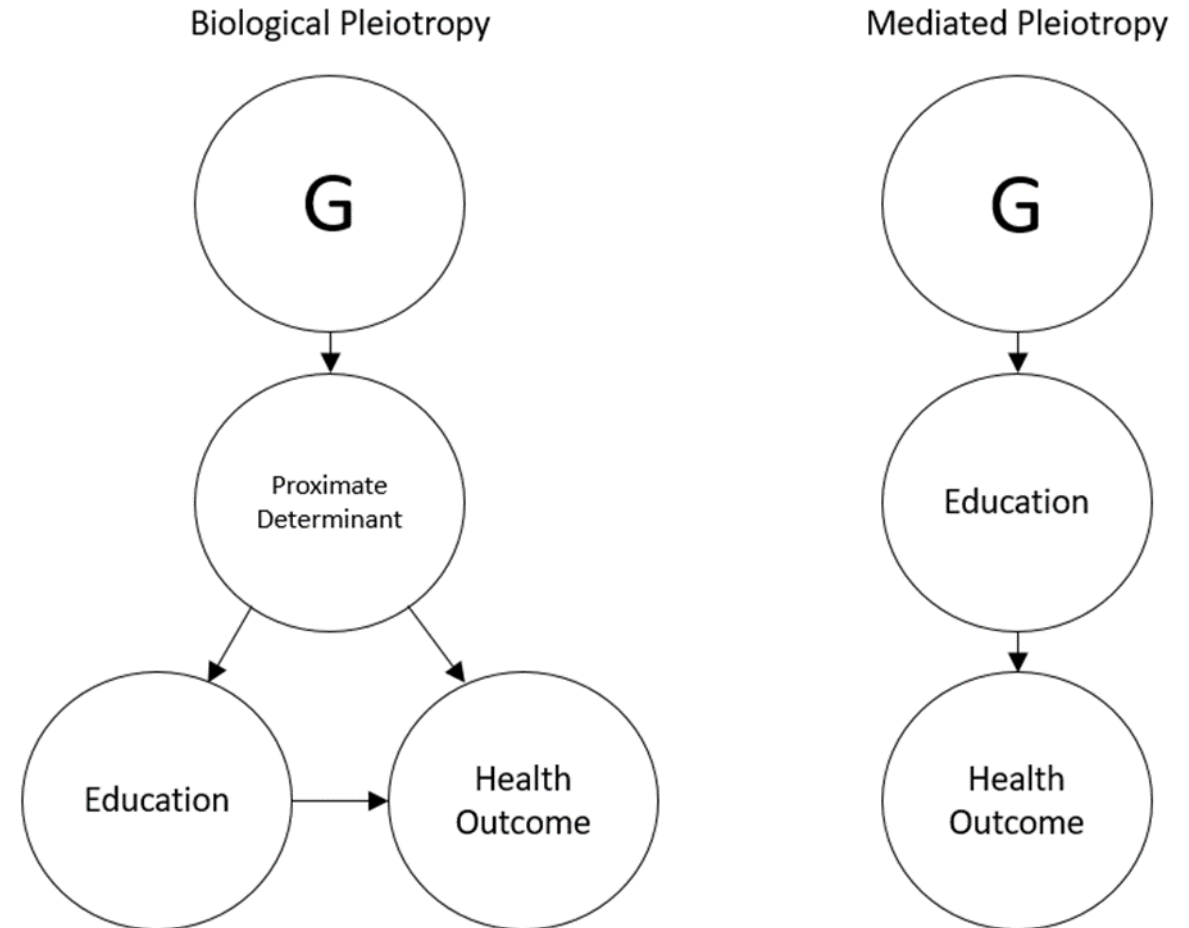
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What do we know?

- Educational attainment is associated with many different health outcomes, including depression, BMI, and self-rated health.
- Non-zero genetic correlations have been discovered between educational attainment and various health outcomes, including depression, BMI, and self-rated health (Wray et al. 2018; Okbay et al. 2016; Boardman et al. 2015).
- Because genotype is determined at birth, genetic factors are possible confounders in studies that attempt to interpret the effect of education on health outcomes.

What do we not know?

- Estimates of r_G do not explain the source of genetic correlation, the potential for confounding depends on the type of pleiotropy.
- Understanding this is important because it tells us whether the failure to condition on common genetic contributions to education and health outcomes will result in biased estimates of the effect of education on health.



Note: Figure adapted from Wedow et al. (2018)

What did we find?

Data

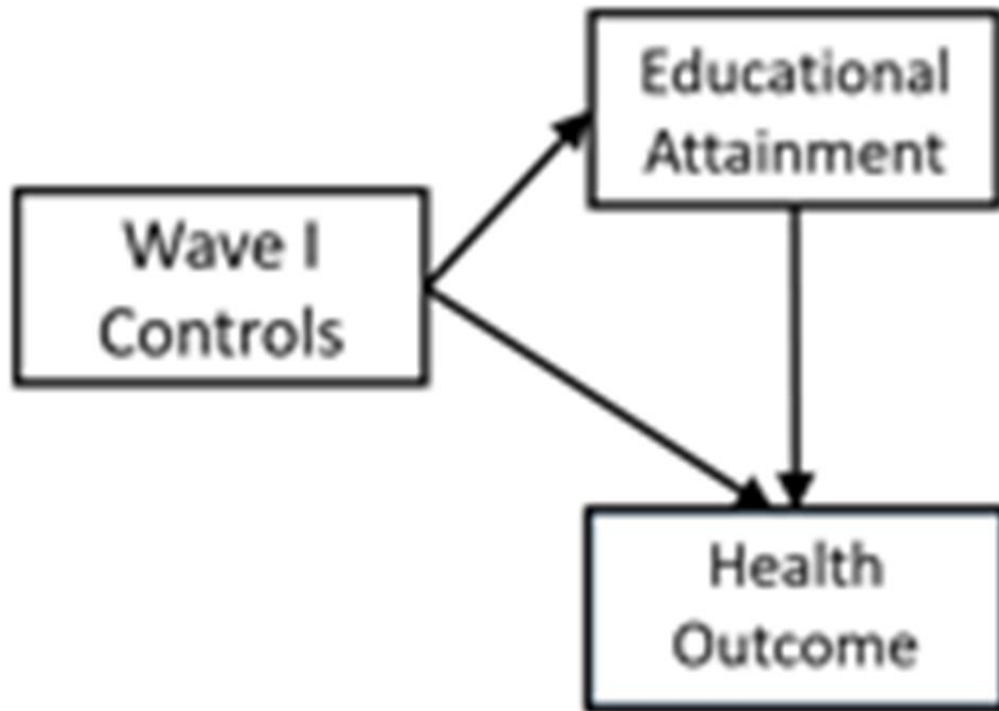
- National Longitudinal Study of Adolescent to Adult Health (Add Health)
- Analyses restricted to individuals of European ancestry with genetic data, N=5,728

Measures

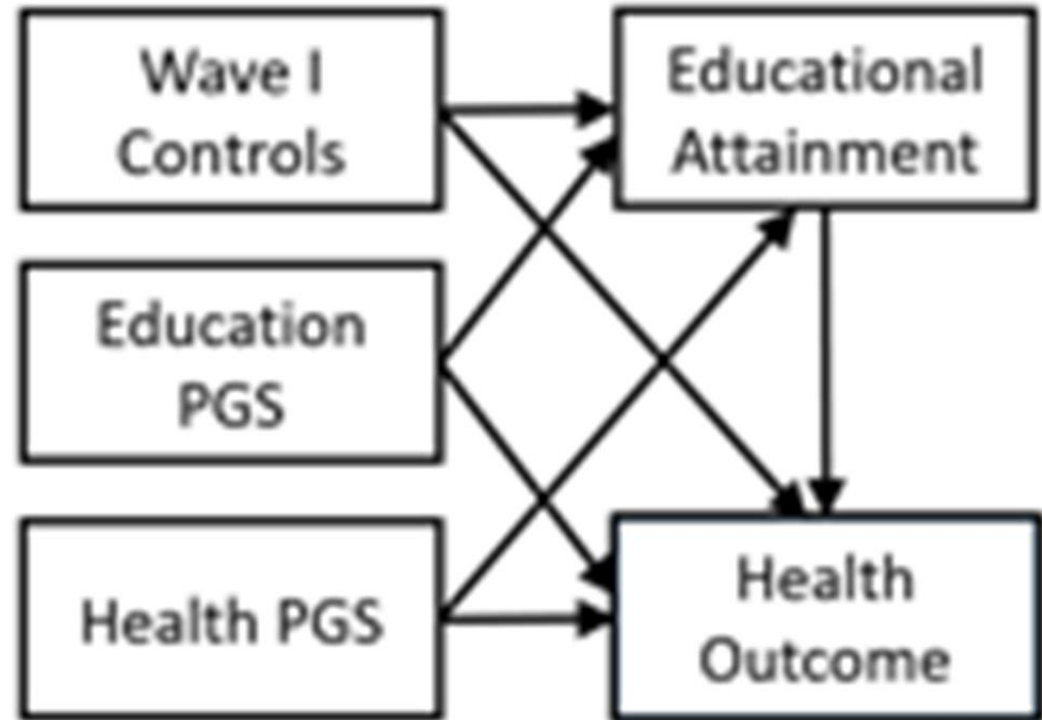
- Educational attainment and health outcomes measured in Wave IV
- Depression measured using a measurement model with four indicators
- Control variables measured at Wave I
- Genetic factors measured using polygenic scores (PGSs) for education, BMI, and depression (Braudt and Harris 2018; Lee et al. 2018; Locke et al. 2015; Wray et al. 2018)

What did we find?

Model 1 (Baseline Model)



Model 2 (Test for Confounding)



What did we find?

Structural Equation Models Predicting BMI

Dependent Variable	Model 1		Model 2	
	Education Coef. (SE)	BMI Coef. (SE)	Education Coef. (SE)	BMI Coef. (SE)
Years of Education		-0.221*** (.050)		-0.168** (0.049)
Polygenic Scores				
Education PGS			0.383*** (0.024)	0.023 (0.099)
BMI PGS			-0.064* (0.027)	1.795*** (0.099)
N	5728		5728	

Note: Standard errors are clustered at the school level. All models control for age, sex, resident mother and father's level of education, resident mother and father's occupations, family income, and whether the respondent had health insurance.

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

What did we find?

Structural Equation Models Predicting Self-rated health.

Dependent Variable	Model 1		Model 2	
	Education Coef. (S.E.)	SRH Exp. Coef. (S.E.)	Education Coef. (S.E.)	SRH Exp. Coef. (S.E.)
Years of Education		1.188*** (0.014)		1.178*** (0.015)
Polygenic Scores				
Education PGS			0.383*** (0.024)	1.042 (0.027)
BMI PGS			-0.064* (0.027)	0.840*** (0.018)
N		5728		5728

Note: Standard errors are clustered at the school level. Equations predicting self-rated health are estimated with an ordinal logit link function. All models control for age, sex, resident mother and father's level of education, resident mother and father's occupations, family income, and whether the respondent had health insurance.

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

What did we find?

Structural equation models predicting depression.

Dependent Variable	Model 1		Model 2		Model 3	
	Education Coef. (SE)	Depression Coef. (SE)	Education Coef. (SE)	Depression Coef. (SE)	Education Coef. (SE)	Depression Coef. (SE)
Years of Education		-0.079*** (0.007)		-0.078*** (0.007)		-0.078*** (0.007)
Polygenic Scores						
Education PGS			0.390*** (0.027)	0.005 (0.015)	0.387*** (0.028)	
Depression PGS			-0.032 (0.026)	0.052*** (0.015)		0.054*** (0.015)
N		5726		5726		5726

Note: Standard errors are clustered at the school level. All models control for age, sex, resident mother and father's level of education, resident mother and father's occupations, family income, and whether the respondent had health insurance.

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

Conclusions

- Including PGSs for education and BMI attenuates the effect of educational attainment by 24%, 95% CI [6.95%, 41.57%]
- Including PGSs for education and BMI attenuates the effect of educational attainment by 5.37%, 95% CI [1.99%, 8.75%]
- I find no evidence of genetic confounding of the education-depression relationship.
- Future Directions: Comparing results with propensity score approaches