

# Are Polygenic Scores for Economic Deprivation Associated with Wealth Accumulation?

Kamil Sicinski, Lauren Schmitz, Orgul Ozturk, Jeremy Freese and Pamela Herd



## BACKGROUND

- The polygenic score for education predicts wealth at retirement even after accounting for educational attainment.
- This residual genetic gradient in wealth has been linked to risk aversion, extreme beliefs, portfolio choices and planning horizon.
- Sibling studies indicate that between 30 and 50 percent of variation in financial distress, investment biases and saving propensity is influenced by genetic factors.

## RESEARCH QUESTION

Can we learn more about mechanisms linking genetic endowment to wealth from a polygenic score based on neighborhood-level economic insecurity?

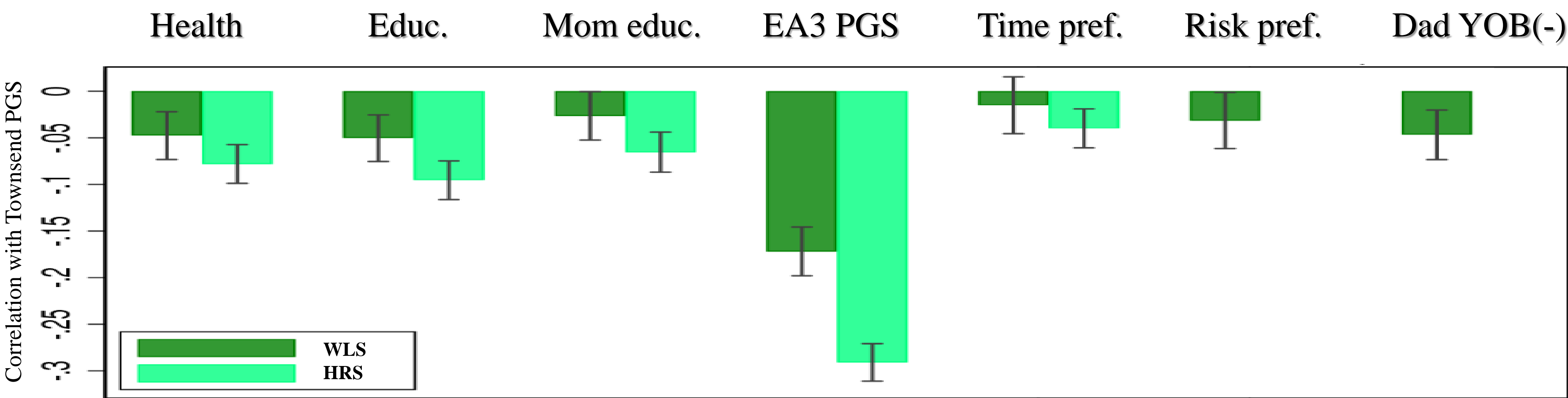
## DATA

- Wisconsin Longitudinal Study (WLS)
- Health and Retirement Study (HRS)
- Rapid GWAS Of Thousands Of Phenotypes For 337,000 Samples in the UK Biobank

## MEASURES

- Polygenic score based on Townsend deprivation GWAS.
- The Townsend deprivation index is based on four components: unemployment, non-car ownership, non-home ownership and household overcrowding. In the UK Biobank the Townsend score is available at the level of national census output areas, which have a target size of 125 households.

## TOWNSEND DEPRIVATION PGS – ZERO ORDER CORRELATIONS



## ASSOCIATIONS WITH WEALTH

Coefficient Values for the Townsend Deprivation Polygenic Score in OLS Models											
Sex	Data	Outcome	No covariates	Education	EA3 PGS	Edu+PGS	Health	Time preference	Risk preference	All covariates	Observations (Edu+PGS)
MEN	WLS	Net worth age 53 (ihs)	-2.237**	-1.894*	-1.064	-1.192	-1.831*	-2.498*	-2.411*	-1.880	2406
		Net worth age 65 (ihs)	-5.071***	-4.373***	-4.113***	-4.057***	-4.369***	-5.367***	-5.316***	-5.000***	2308
		Lifetime earnings at age 55 (log)	-0.051	-0.038	-0.041	-0.038	-0.042	-0.080**	-0.065	-0.066*	1759
	HRS	Net worth age 65 (ihs)	-5.391***	-3.626***	-3.212**	-2.756*	-4.253***	-4.962***		-1.920	2118
		Net worth in 2010 (ihs)	-5.231***	-3.817***	-2.816**	-2.944**	-4.082***	-4.762***		-2.267*	3041
		Lifetime earnings at age 55 (log)		-0.043**	-0.037*	-0.031*				-0.031*	3388
WOMEN	WLS	Net worth age 53 (ihs)	-1.671*	-1.378	-1.422	-1.362	-1.379	-2.055*	-2.223*	-1.314	2675
		Net worth age 65 (ihs)	-3.439***	-3.117***	-2.956**	-2.941**	-2.991***	-3.922***	-3.910***	-2.896**	2558
		Lifetime earnings at age 55 (log)	-0.005	0.002	0.022	0.020	-0.001	0.003	0.004	0.038	1939
	HRS	Net worth age 65 (ihs)	-5.556***	-3.162**	-3.143**	-2.564*	-4.104***	-5.289***		-2.425*	2639
		Net worth in 2010 (ihs)	-5.600***	-3.378***	-3.073***	-2.970**	-3.763***	-5.237***		-2.483**	4045
		Lifetime earnings at age 55 (log)		-0.006	-0.005	-0.001				-0.000	4446

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

Note 1: All polygenic scores are residualized for 10 principal components of the genomic data and for cohort in the HRS.

Note 2: Coefficients are OLS estimates with robust standard errors.

Note 3: All HRS models include birth cohort indicators.

## PENETRANCE ACROSS BIRTH COHORTS (HRS)

Incremental R2 of Townsend PGS by Sex and Cohort in Lifetime Earnings Models							
	All	Coda	HRS 1	HRS 2	War Babies	Early Boomers	Mid Boomers
Men	-0.063***	-0.006	-0.082	-0.083***	-0.060**	-0.083**	-0.025
Women	-0.035	0.201	-0.015	-0.062	-0.159**	-0.088*	-0.153**

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

Note: Cohort was not residualized out of the PGS for these models.

## SUMMARY OF FINDINGS

- The Townsend deprivation PGS (TPGS) is strongly correlated with the educational attainment PGS, but the latter does not fully attenuate the association between wealth and TPGS in most models.
- Health emerges as the second most important pathway through which TPGS affects wealth accumulation.
- TPGS is more strongly associated with wealth than lifetime earnings, suggesting links to saving and investing behavior. For women the correlation with earnings is absent altogether.
- The predictive power of TPGS varies by cohort (HRS) and the score is associated with parental age at birth (WLS).
- The TPGS-wealth gradient disappears in sibling models, opening the possibility of mediation by yet unidentified family characteristics.

## CONCLUSIONS

- The Townsend deprivation score is far from ideal as a phenotype, but the associated polygenic score nonetheless appears to correlate with determinants of wealth that are distinct from those captured by the education polygenic score and available survey measures.
- The recently released UK Biobank income GWAS will likely deliver further insights into the mechanisms underlying wealth accumulation.

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