

Establishing the contributions of attained education and the polygenic index for attained education to likelihood of dementia

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Objective

The educational gradient in dementia is well established. Despite this, there are still ambiguities around the role of underlying confounding in terms of genetic influences and gene–environment interplay. **In this study, we investigated the role of educational factors (genetic and attained) on dementia using genetic propensity for educational attainment (PGI_{Edu}) and attained education.**

Results

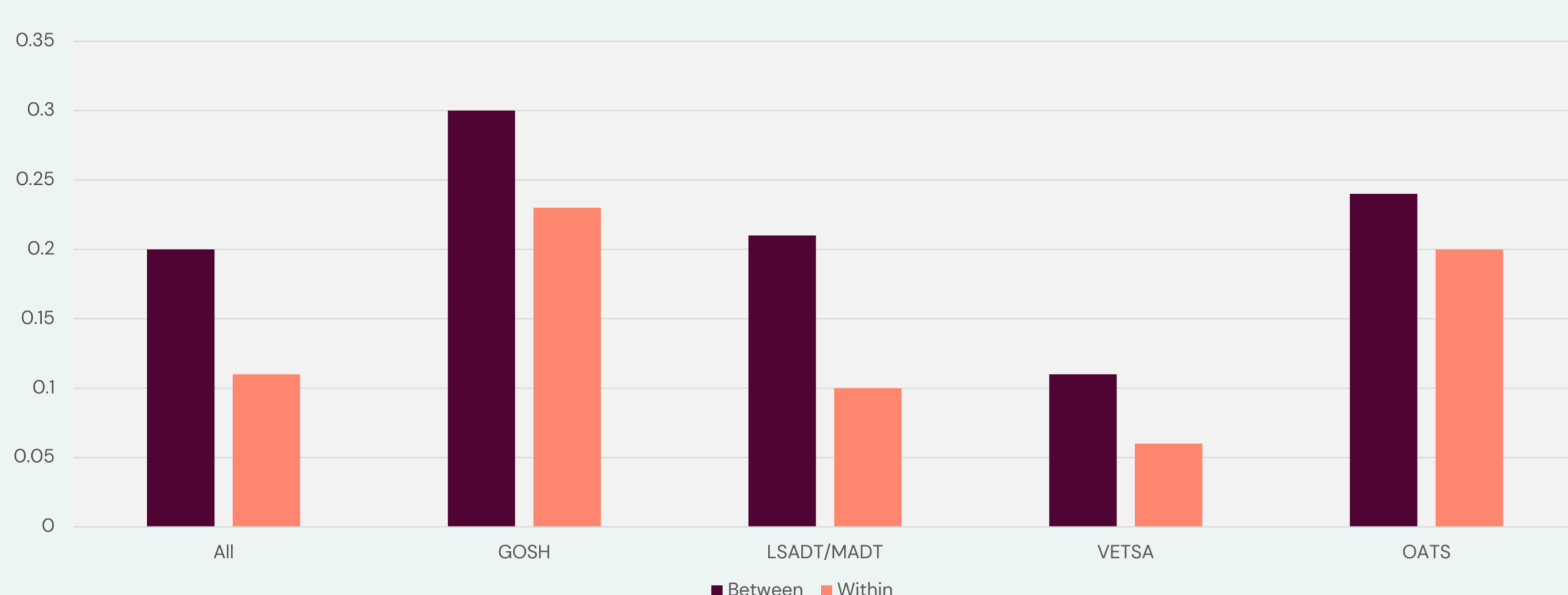


Figure 1. Results of a between–within regression model of attained education predicting LDI (all twin pairs), in the total sample in the different IGEMS samples. Attenuated within–pair estimates indicates familial confounding.

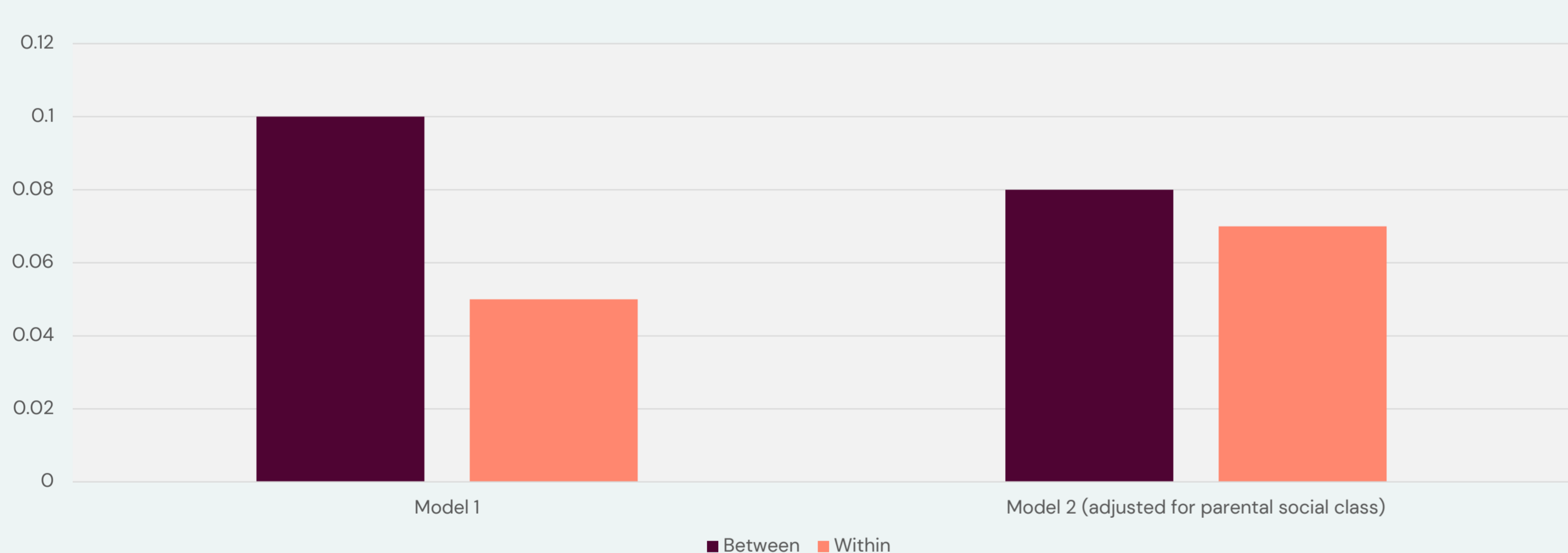


Figure 2. Results of a between–within analysis of PGS_{Edu} predicting LDI in DZ twins (SS and OS). The attenuated within–pair estimates indicates presence of passive gene–environment correlation.

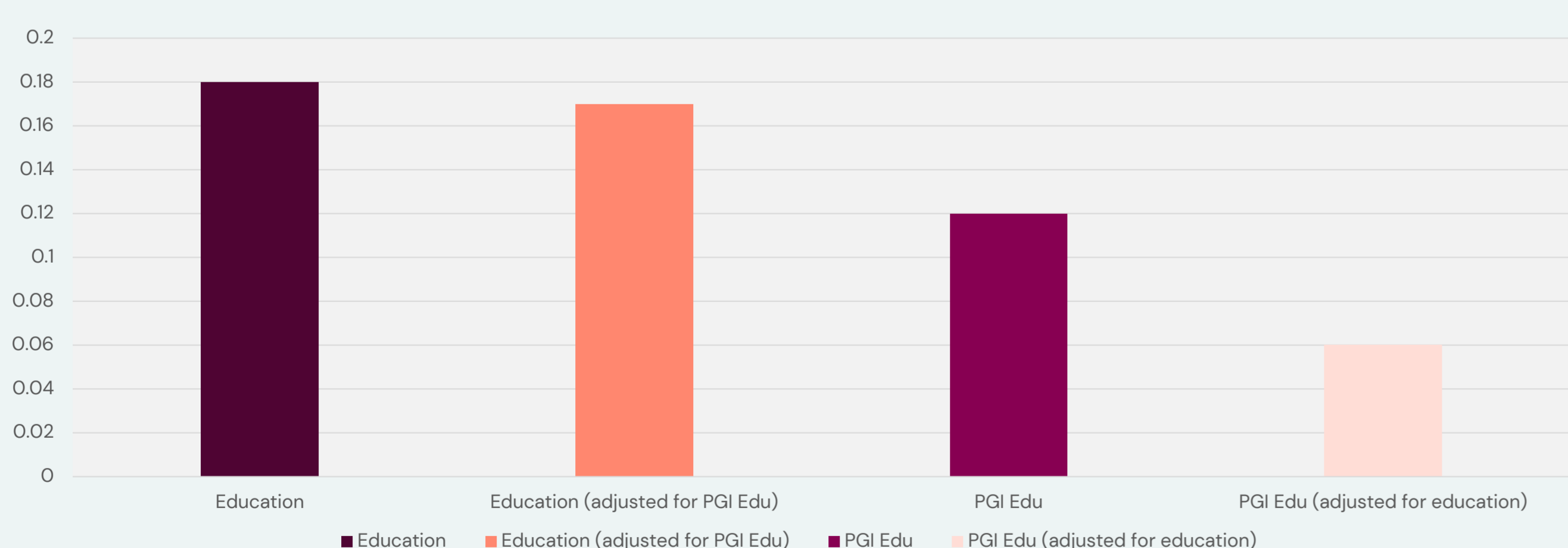


Figure 3. Results from linear regression models investigating the influence of attained education and PGS_{Edu} on LDI. Both education and PGI_{Edu} independently predicted the LDI when included separately, with higher education and higher PGS_{Edu} being associated with lower likelihood of dementia. After being mutually adjusted, the predictive power of both predictors remained, although attenuated due to the overlap between the two measures.

Conclusions

- Both attained education and measured genetic propensities for education are independently related to dementia, with higher genetic propensities and higher level of education predicting a lower likelihood of dementia.
- These results lend further support for a causal education–health relationship but also raise the importance of independent genetic contributions and gene–environment interplay.

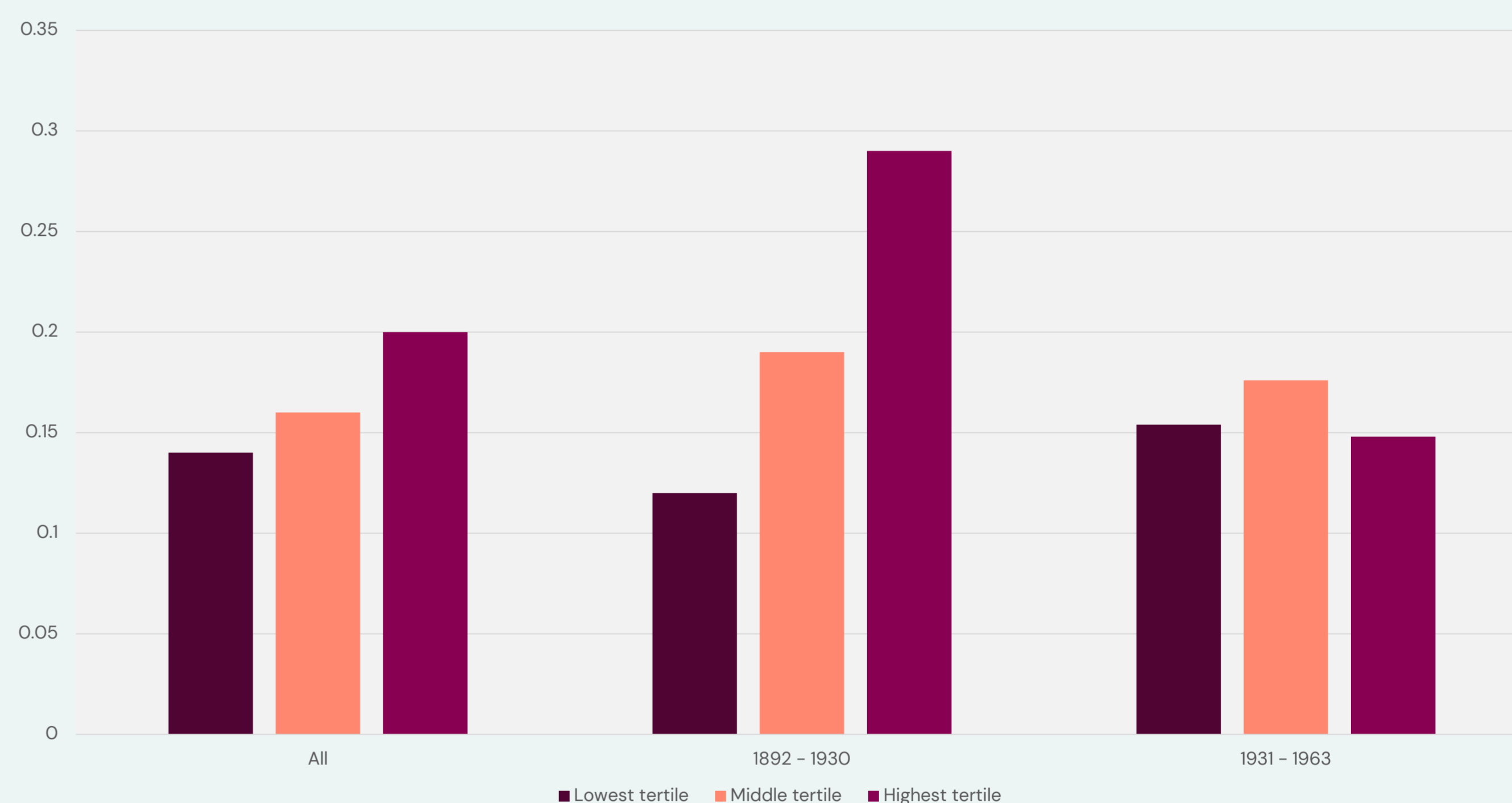


Figure 4. Results show effect of educational attainment on LDI as interaction with tertiles of PGS_{Edu} . This shows educational effects at low, medium, and high levels of genetic propensity for education in the total sample and by birth cohort. The protective effect of education was most noticeable among those with high PGI_{Edu} in the older cohorts while little difference could be observed in the more recent cohorts.

Material and methods

Analyses were based on twin data retrieved from eight studies from the Consortium on Interplay of Genes and Environment Across Multiple Studies (IGEMS). The final sample included twins born 1892–1963 ($n=5\,366$). The Latent Dementia indicator (LDI) was used to estimate likelihood of dementia (a higher LDI score corresponds to a lower likelihood of dementia). Educational factors were educational attainment (ISCED) and PGS_{Edu} (EA4). Covariates: sex, birth year, age at interview, zygosity, study, and the first 10 pc's.

Linear and mixed regression models were applied to estimate the influence of genetic propensity and attained education on likelihood of dementia (LDI). Between–within analyses were performed to investigate familial confounding (Fig 1.) and presence of passive gene–environment correlation (Fig 2). To investigate if the association between education and LDI differs depending on genetic propensities for education, we added an interaction term between attained education and tertiles of PGS_{Edu} to the model.