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TITLE: The Nature of Nurture Revisited: Estimating the Effect of Vertical Transmission using Structural Equation Modeling

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ABSTRACT:

Although the role of parental effects— both genetic and non-genetic— on offspring phenotypes has long been a primary focus of behavioral genetics research, family studies have struggled to disentangle variance due to shared genetic factors from variance due to shared environmental factors. As a result, much remains unknown about the extent to which parental phenotypes directly influence offspring phenotypes (a process known as “vertical transmission”). A recent paper by Kong et al. (2018) sought to address this gap by examining the effect of parents’ non-transmitted alleles on their child’s phenotypes. Here, we introduce a path analysis of Kong et al.’s basic idea that (1) Builds on Kong et al. (2018) by properly accounting for assortative mating at equilibrium; (2) Provides an unbiased estimate of phenotypic variance due to vertical transmission, even when a trait’s polygenic risk score accounts for only a small fraction of total genetic variance; (3) Easily allows for extensions of the basic model, such as modeling phenotypic covariance between relative types and allowing unequal familial environmental effects between

mothers and fathers. In utilizing principles of structural equation modeling, this method greatly simplifies the math used by Kong et al. (2018) and allows for direct comparisons between our model and other classic family models used in behavioral genetics research.

Kong, A., Thorleifsson, G., Frigge, M. L., Vilhjalmsón, B. J., Young, A. I., Thorgeirsson, T. E., ... & Gudbjartsson, D. F. (2018). The nature of nurture: Effects of parental genotypes. *Science*, 359(6374), 424-428.

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