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HIGHER INTELLIGENCE AND LATER MATERNAL AGE: WHICH WAY DOES THE CAUSAL DIRECTION GO?*

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HIGHER INTELLIGENCE AND LATER MATERNAL AGE: WHICH WAY DOES THE CAUSAL DIRECTION GO?

In a recent article published in the *Journal of the American Geriatrics Society*, Karim et al.[1] made a causal claim that estrogen and other beneficial hormones from pregnancy later in life and extended use of the contraceptive pill significantly increased women's cognitive function. Yet their data were entirely correlational; they assessed menopausal women's reproductive history and length of pill use, and measured their intelligence, all at one point in time. Thus their discovery of positive correlations between women's later pregnancy and extended use of the pill, on the one hand, and their intelligence, on the other, does not unequivocally establish the causal effect of the former on the latter. Establishment of causality requires experimental or (less ideally) prospectively longitudinal data.

Given that general intelligence is highly heritable – roughly 80% of the variance in adult intelligence across individuals is determined by their genes at the moment of conception[2] – and, as a result, intelligence is very stable throughout life after the age of 11,[3] Karim et al.'s [1] claim that later maternal age and extended use of the pill increases women's intelligence in mid- to late life is highly implausible. It is more likely that higher childhood intelligence increases the probability of later maternity and using the pill, because more intelligent individuals are known to engage in evolutionarily novel behavior, such as giving birth at a later age or using modern means of contraception. [4,5]

The analysis of prospectively longitudinal data on a nationally representative population sample – National Child Development Study (NCDS) in the UK (n = 17,419) – shows that women who give birth later were already more intelligent as young girls. Figure 1 shows the monotonic positive association between intelligence at Age 7 (measured by four cognitive tests) and mean age at last child (measured at Age 55) both among women and men. Girls whose IQ was above 125 at 7 eventually had their last child at a mean age of 32.5

a quarter of a century later, while girls whose IQ at 7 was below 75 eventually had their last child at a mean age of 28.6.

More importantly, Figure 1 also shows that the identical monotonically positive association between intelligence at 7 and later parental age holds *among men*. Boys whose IQ at 7 was above 125 had their last child at a mean age of 35.0, while boys whose IQ at 7 was below 75 had their last child at a mean age of 31.9. NCDS data also show that there is a significant positive association between women's childhood intelligence at 7 and their pill use later in life, and *men's* childhood intelligence at 7 and whether their *female partner* uses the pill in adulthood.

The NCDS data therefore strongly suggest that the direction of causality likely goes from higher intelligence to later maternal age and extended pill use, not the other way around, as Karim et al.[1] claimed. Women who had later age at last child and who used the pill were already more intelligent than their counterparts as early as Age 7, years before their reproductive life began and decades before their last childbirth. The fact that the same positive association between childhood intelligence, on the one hand, and later parental age and pill use, on the other, holds among men, who are never exposed to the supposedly beneficial surge of hormones from pregnancy and the pill, further suggests that higher intelligence is not the result of hormone exposure experienced only by women. Karim et al.'s[1] incorrect causal inference points to the difficulty of establishing causal order with cross-sectional correlational data and the need for experimental or prospectively longitudinal data for causal inference.

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Figure legends:

Figure 1. The effect of IQ at Age 7 on the age at last child