

## COMMENTS


## COMMENT ON: GERIATRICIANS: THE SUPER SPECIALIST

*To the Editor:* In a recent publication, John Morley highlights how geriatric medicine has improved the quality of life of older persons through the development of wide ranging interprofessional programs.<sup>1</sup> Despite evidence that geriatricians are the most satisfied of physicians and enormous demand for geriatricians that the aging of the population is bringing about, there has been a decline in board-certified geriatricians in the United States since 1996. Morley proposes a number of strategies to reverse this trend, including electronic referral systems; advertising on prime time television, radio, and social media; and a return to a 2-year fellowship program.<sup>1</sup>

Faced with a similar shortfall of geriatricians and recruitment of trainees into the geriatric medicine program in Victoria, Australia, the Australian and New Zealand Society for Geriatric Medicine adopted a different approach. All stakeholders involved in specialist training in Victoria agreed to collaborate to form a statewide geriatric medicine training program. Rather than competing for a limited number of trainees, the focus shifted to expanding the number of trainees. All hospitals agreed to release trainees for half a day per week for statewide training and other educational activities that could be delivered at a higher standard than any single hospital could provide. Professional-quality training was embedded in the scientific curriculum. Satisfied trainees became ambassadors for recruitment of junior doctors into the 3-year training program.

The number of trainees in Victoria increased from 26 in 2007 to 89 in 2017. The number of specialist geriatricians in Victoria, with a population of 6 million people, increased from 99 to 209 over this time.

The model of the Victorian Geriatric Medicine Training Program has now been successfully adopted in other Australian states and also by other specialties that had been experiencing difficulty recruiting.

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## ACKNOWLEDGMENTS

The Victorian Geriatric Medicine Training Program was established by the Australian and New Zealand Society for Geriatric Medicine and is fully funded by the Victorian

Department of Health. St Vincent's Hospital Melbourne is the lead hospital.

**Conflict of Interest:** None.

**Author Contributions:** Benny Katz is the sole author.

**Sponsor's Role:** None.

## REFERENCE

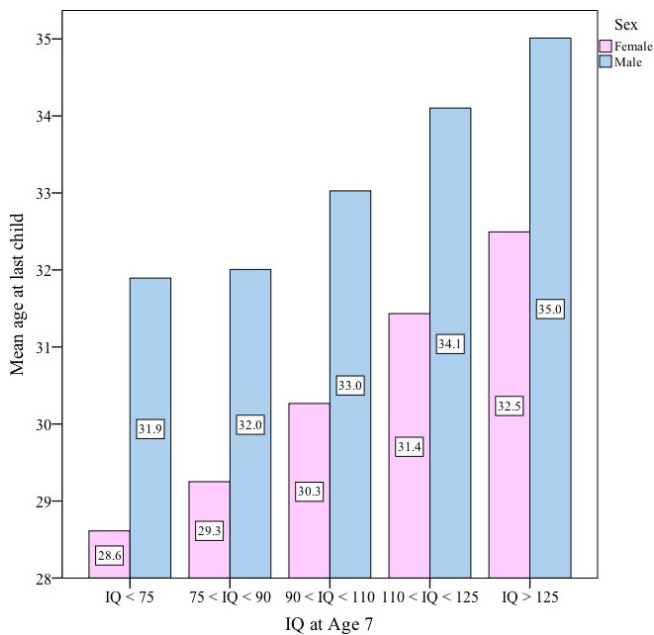
Morley JE. Geriatricians: The super specialists. *J Am Geriatr Soc* 2017; doi: 10.1111/jgs.14702 [Epub ahead of print].

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

*To the Editor:* In a recent article published in the *Journal of the American Geriatrics Society*, Karim and colleagues<sup>1</sup> made a causal claim that estrogen and other beneficial hormones from pregnancy later in life and extended use of oral contraceptives significantly increased women's cognitive function. Yet their data were entirely correlational; they assessed menopausal women's reproductive history and length of oral contraceptive 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 oral contraceptives, 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—with one's genes at the moment of conception determining roughly 80% of the variance in adult intelligence between individuals<sup>2</sup>—and, as a result, it is stable throughout life after the age of 11,<sup>3</sup> Karim and colleagues<sup>1</sup> claim that older maternal age and extended use of oral contraceptives increase 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 oral contraceptives, because more intelligent individuals are known to engage in evolutionarily novel behavior, such as giving birth at an older age and using modern means of contraception.<sup>4,5</sup>

The analysis of prospectively longitudinal data from a nationally representative population sample—National Child Development Study (NCDS) in the United Kingdom (N = 17,419)—shows that women who gave birth later were already more intelligent as girls. Figure 1 shows the monotonic positive association between intelligence at Age 7 (measured using four cognitive tests) and mean age at last child (measured at Age 55) for women and men. Girls whose intelligence quotient (IQ) was greater than 125 at Age 7 had their last child at a mean age of 32.5, whereas



**Figure 1.** Effect of intelligence quotient at age 7 on Age at last child. [Color figure can be viewed at [wileyonlinelibrary.com](http://wileyonlinelibrary.com)]

girls whose IQ at Age 7 was less than 75 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 Age 7 and older parental age holds for men. Boys whose IQ at Age 7 was greater than 125 had their last child at a mean Age of 35.0, whereas boys whose IQ at Age 7 was less than 75 had their last child at a mean Age of 31.9. NCDS data also show that there is a significant positive association between a woman's intelligence at Age 7 and her oral contraceptive use later in life and between a man's intelligence at Age 7 and whether his female partner used oral contraceptives in adulthood.

The NCDS data therefore strongly suggest that the direction of causality goes from higher intelligence to older maternal age and extended oral contraceptive use, not the other way around, as Karim and colleagues<sup>1</sup> claimed. Women who were older when they had their last child and who used oral contraceptives were more intelligent than their counterparts as early as Age 7, years before their reproductive life began and decades before their last child-birth. The fact that the same positive association between childhood intelligence, on the one hand, and older parental age and oral contraceptive use, on the other, holds in men, who are never exposed to the supposedly beneficial surge of hormones from pregnancy and oral contraceptives, further suggests that higher intelligence is not the result of hormone exposure experienced only by women. Karim and colleagues<sup>1</sup> 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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## ACKNOWLEDGMENTS

**Conflict of Interest:** None.

**Author Contributions:** Satoshi Kanazawa wrote the letter.

**Sponsor's Role:** None.

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

*To the Editor:* In reference to our article,<sup>1</sup> Kanazawa asserts that we concluded from our cross-sectional analyses that hormone-related reproductive factors (including later age at last pregnancy and use of oral contraceptives) are causally associated with later-life cognition.<sup>2</sup> Kanazawa further uses unique longitudinal data from the U.K. National Child Development Study, demonstrating a positive association between childhood intelligence quotient and age at last pregnancy. He concludes from these data that any directionality of association may more likely lie in the direction of cognition to age at pregnancy.

Because our report of associations between reproductive factors and cognitive performance in mid- to late life was based on cross-sectional analyses, Kanazawa is entirely correct that causal statements cannot be made. We intended not to imply causation but instead to highlight such associations, going on to speculate that such associations may in part be related to hormonal levels and fluctuations associated with reproductive events. We appreciate that the association may lie in the opposite direction, as the National Child Development Study data presented on age at last pregnancy suggest.<sup>2</sup>

In conducting our analyses and reporting results, we shared Kanazawa's concern that the associations found