

Advanced maternal age and offspring outcomes

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Abstract

Postponing fertility to older ages improves child outcomes. This is because older age means later birth cohort, and later birth cohorts live in a better socio-epidemiological macro environment. This macro environment is more important for child outcomes than maternal reproductive ageing.

Introduction

Fertility is being postponed to higher and higher ages across. The mean age at first birth has increased in each of the 23 OECD countries since 1970, now averaging 28. In Germany and the UK, the mean age at first birth exceeds 30 years (OECD 2014). Advanced-age fertility has also been increasing: in Sweden in 2013, a quarter of all births were to mothers aged 35 or older.

Fertility postponement may come with a high cost. The potential consequences of postponement are numerous, including decreasing period fertility (Bongaarts and Feeney 1998) and negative health outcomes for the children due to reproductive ageing (Jacobsson et al. 2004). Although parental socioeconomic resources typically increase with age (Powell, Steelman and Carini 2006), advanced maternal age is associated with increased risks of Down syndrome, child-

hood cancer, and autism (for a review see Myrskylä and Fenelon 2012).

The research documenting these negative outcomes, however, neglects the potential benefits of being born at a later date. For a prospective parent, delaying parenthood means that the child is born in a later birth cohort. This is beneficial, as for many important outcomes the secular trends are positive. For example, being born 10 years later is associated with an increase in life expectancy of 2-3 years.

We illustrate this general principle by reviewing recent research that uses Swedish administrative data and sibling-comparison design to minimize residual confounding. The research shows that the macro level contextual trends outweigh the individual-level risk factors and as a result, fertility postponement even up to ages beyond 40 is associated with positive long-term outcomes for the children. These results are likely to generalize to other contexts in which health has been improving, and educational access has been expanding, such as the United States and much of Europe.

Maternal age, education and cognitive ability

It has been suggested that parental age may be an important determinant of off-

spring cognitive ability, or IQ (Zybert, Stein et al. 1978; Malaspina, Reichenberg et al. 2005; Saha, Barnett et al. 2009; Edwards and Roff 2010). Increasing maternal age is associated with pregnancy complications (Heffner 2004), accumulation of DNA damage in the germ cells (Kaytor, Burrig et al. 1997), and decreasing oocyte quality (Eichenlaub-Ritter 1998; Armstrong 2001), all of which may influence offspring IQ. On the other hand, older parents tend to have greater economic and social resources, which may offset or even reverse the parental age-IQ association (Powell, Steelman et al. 2006; Liu, Zhia et al. 2011). Indeed, some report positive associations between IQ and advanced maternal age (Zybert, Stein et al. 1978; Saha, Barnett et al. 2009), but the overall evidence is mixed (Malaspina, Reichenberg et al. 2005).

Myrskylä et al. (2013) analyzed parental age-IQ associations among 565,433 Swedish males, from birth cohorts 1951–1976, with IQ measured at conscription examination at ages 17–20 years. The focus of the analysis was to understand how secular trends in IQ influence the association between parental age and offspring IQ. When the IQ time trend was accounted for by adjustment for birth year, advanced paternal age showed no association with offspring IQ, but maternal ages above 30 years were inversely associated with offspring IQ. Maternal ages 40–44 were associated with 0.07 of a standard deviation lower IQ than ages 25–29 ($p < .001$). However, the IQ time trend more than offset the age effect; that is, without adjustment for birth year, advanced maternal age was positively associated with IQ. The results confirm a small negative independent maternal-age effect. However, for mothers who had more than one male offspring during the observation period, delaying parenthood resulted in

higher offspring IQ scores, due to the IQ test-score time trend, which offsets the maternal-age effect. An obvious limitation of these analyses, however was that they covered only men.

Barclay and Myrskylä (2016) used Swedish population register and examined multiple educational and health related outcomes with several birth cohort groups and found similar results for educational attainment, height and physical fitness. In these analyses the total effect of increasing maternal age – which includes individual level factors such as reproductive ageing and changing social resources, as well as the positive impact of improving macro level conditions – was consistently positive so that older maternal age was associated with better offspring outcomes. This is true even in cases where the individual level effect was negative, as the macro level positive trends are strong enough to more than offset the negative effect.

Conclusions

Ceteris paribus – other things equal – postponing fertility to higher ages may have adverse effects on the child outcomes. However, in real life other things do not stay constant at the same time that a person ages. It is trivially true that time passes by. It is less trivial, but still most of the time true, that at the same time the overall socio-epidemiological context changes. This matters. The results by Myrskylä et al. (2013) and Barclay and Myrskylä (2016) show that the older the mother is at the time of birth, the higher are the educational attainment and cognitive ability outcomes of the child. This is because the macro level socio-epidemiological positive trends dominate the individual ageing effect. For any prospective parent, older age

means that the child is born to a later birth cohort, and later is most of the time better.

Are these results relevant beyond the specific Swedish cohorts analysed in this study? For at least the past 60 years, secular changes in educational access and public health conditions have been positive in Sweden. More and more individuals have spent longer in the educational system, and rates of morbidity and mortality have decreased. If these secular changes were to plateau, or to reverse, the advantage of delayed childbearing for the offspring of older mothers would no longer exist, or would turn into a disadvantage. While that point is

important to bear in mind, gradual secular improvements in educational access and public health conditions appear set to continue not only in Sweden but also across the developed world.

Prior research has overlooked the fact that, at the individual level, advancing parental age entails that children are born at a later date, which may benefit those children. Expectant parents are often well aware of the risks associated with late pregnancy, but they are less aware of the fact that when period conditions are improving, the effects of fertility postponement may be strongly positive.

Translated by the author

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