High maternal age at first and subsequent child births in Denmark in the mid-1800s—Letter to the editor

Dear Editor,

It is often assumed that a main reason for current widespread infertility and low fertility rates in Western countries is that couples postpone family formation [1]. However, we have previously shown that more than a century ago high average maternal age was not a limiting factor for achieving total fertility rates way above replacement level [2]. So, is the age when initiating childbearing the limiting factor? In this study we utilize unique historical data from Danish archives to assess average age at first childbirth in the mid-1800s where fertility was high.

In 1824 a law was introduced in Denmark prohibiting marriage until being able to financially support your family with the consequence that women became older when they married and had children. In most parts of the Danish island, Bornholm, the mother's age at childbirth was registered in the church records from 1851, enabling this study where Bornholm served as a "miniature Denmark" as demographics, size of shires and their population mimicked the rest of the country. Besides a peninsula, Denmark consists of many islands of which approximately 150 were inhabited in the mid-1800s and with Bornholm being among the larger of them. One parish from each of the four shires on Bornholm was selected for data collection based on the parish being among the largest in the shire and including a mixed population of farmers, landless people and fishermen. For many people, especially amongst those with a lower income, moving around was necessary at this time, but in Bornholm they were more easily followed in the records than elsewhere in the country as people may often change parish but more rarely moved from the island. Thus, the mothers could be found in several comparative records throughout the island to obtain information on marriage and childbirth. Names and ages at birth were transcribed from period church records by experts. Besides church records, the mothers were followed in the Danish censuses, in the archives' database of births in Bornholm from 1814 and in probate records books. Both dead and live births (but not abortions) were included to avoid a bias due to the large decrease in still births. In the four selected parishes, we observed 1179 births in 1851 to 1855 (material A), of which 360 were the first birth, and the average age at all births and first birth was calculated and results compared to more recent data from Statistics Denmark covering the whole country (material B) [3].

The study reveals an average age of 32.1 years (median: 32.0 years) for women giving birth in the mid-1800s, which is slightly higher than the average age of 31.0 years of Danish women giving birth in 2018. However, also the age at first birth was almost as high in the historic data, 27.9 years (median: 27.0 years), as today (29.3 years), and much higher than the average of 22.9 years observed in the beginning of the 1960'ies, where we have the first publicly available data for age at first birth in Denmark (Fig. 1). Thus, the historic curve for maternal age at delivery is U-shaped illustrating that high maternal age at first birth is not *per se* a limitation for high fertility. Sub-analyses showed only minor variations in the average age between the included parishes with a difference below one year across the four parishes for both first birth and all births. Furthermore, test samples from single years through the 1800s in both Bornholm as well as from the Danish peninsula of Jutland and the larger island Zealand showed a similar pattern of high maternal age. The behavioral impact of the law restricting marriage was clear as maternal age was generally lower among unmarried than married women.

While based on data from a five-year period only in a single Danish island we present unexpected historical findings of high maternal age for women delivering their first child in 1851-55. This raises the questions: Why is it often not possible today for women in their thirties to get the number of children they desire without the use of assisted reproductive techniques? And why was this possible more than a century ago despite the structural influence on timing of marriage and family formation resulting in an only slightly lower age at first childbirth compared to today? Although we clearly acknowledge the impact of socioeconomic factors such as high maternal age for fertility rates we submit the hypothesis that impact of environmental factors of our modern societies may play a role for the biological fertility potential, and that increasing male reproductive problems in combination with high female age may contribute significantly to the reduced fertility rates [4,5].

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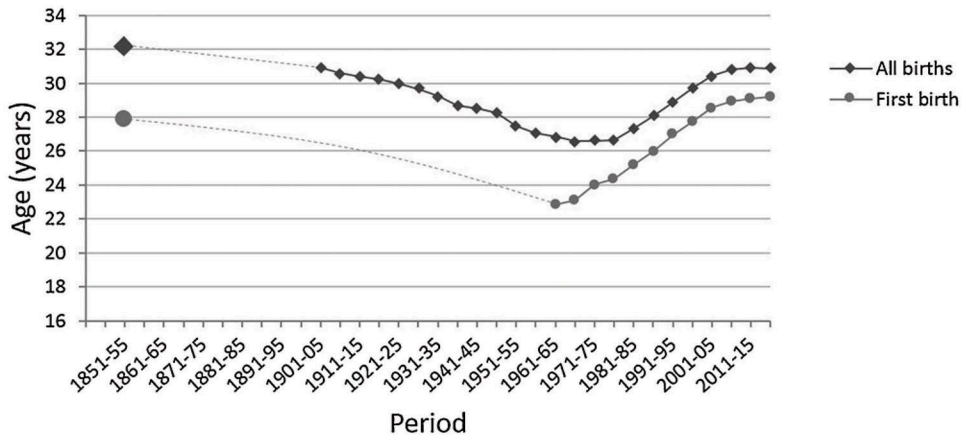

Fig. 1. Mean maternal age at child birth, Denmark, 1851–2018, based on historical material from church records from 1851 to 1855 (material A) and data from Statistics Denmark covering the whole country in the period 1901–2018 (material B [3]). Note that ages at all births and first birth are shown. The period is divided into 5-year intervals, but the last period only includes the three years from 2016 to 2018.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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