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Article

Is the relationship between men's age at first birth and midlife health changing? Evidence from two British cohorts

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ABSTRACT

Becoming a father, particularly for the first time, is a central transition in men's lives, and whether this transition takes place early or later in life may have important ramifications on the whole later life course. Previous research has shown that men who father their first child early in life have poorer later-life health than men who postpone having children. However, it is not known how selection by cognitive ability and other childhood characteristics confound the association between the timing of fatherhood and later-life health, or how the association is changing over time as parenthood is postponed to an older age. We investigate the association between men's age at the birth of their first child and midlife self-rated health in two British cohorts born in 1958 and 1970. The study employs logit models. Relative to men who had their first child when they were between 25 and 29 years old, men who had their first child before the age of 20 have the poorest health, followed by men who had a child when they were 20–24 years old. This result was observed in both cohorts. Childhood cognitive ability, which previous research has not analyzed, strongly contributed to this association, and to a greater extent than other childhood characteristics. For the 1970 cohort, those who became fathers at age 35 or older had the best health. This advantage was not found for the 1958 cohort. These findings suggest that the relationship between young age at fatherhood and midlife health is strongly confounded by cognitive ability, and that in recent cohorts a new pattern of advantage among older fathers has emerged.

Introduction

Becoming a father, particularly for the first time, is a central transition in men's lives, and whether this transition takes place early or later in life may have important ramifications on the whole later life course. Fatherhood brings with it rights and responsibilities that may be transformative, changing the incentives and disincentives for further human capital investment, labor market choices and opportunities, and health behaviors. However, the mechanisms and selective forces that link the timing of fatherhood to later-life health may be context dependent, as parenthood is being postponed to older ages and the expectations and social norms regarding fatherhood and its timing are also changing (Nilsen, Waldenstrom, Rasmussen, Hjelmstedt, & Schytt, 2013; Paavilainen, Bloigu, Hemminki, Gissler, & Klemetti, 2016).

Previous studies have shown that young fathers are more likely to have poorer health and higher mortality rates than men who delay fatherhood (Barclay, Keenan, Grundy, Kolk, & Myrskyla, 2016; Einiö, Nisen, & Martikainen, 2015; Grundy & Kravdal, 2010; Grundy & Read, 2015; Grundy & Tomassini, 2006; Heath, Mckenry, & Leigh, 1995; Mirowsky, 2002; Mirowsky & Ross, 2002; Pudrovska & Carr, 2009; Read, Grundy, & Wolf, 2011; Read & Grundy, 2017; Sigle-Rushton, 2005). These findings are consistent, regardless of the health outcomes studied or methodological differences between the studies, including differences in defining young fathers, their comparison groups, and age at health assessment. In contrast, the studies analyzing older first-time fathers have delivered mixed results; advantages and no advantages have both been suggested for older fathers, as compared to on-time fathers who had their first child at standard ages (Barclay et al., 2016; Einiö et al., 2015; Grundy & Kravdal, 2010; Hank, 2010; Mirowsky, 2002; Mirowsky & Ross, 2002). The mixed results may be partially attributed to the fact that previous research has assessed the association between the timing of fatherhood and later-life health in different contexts, and for different birth cohorts. One earlier study that compared the association in various contexts focused on the consequences

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of early – but not late – fatherhood (Grundy & Foverskov, 2016). The authors found that family and socioeconomic characteristics, other than education, in adulthood contribute to the association to a greater extent in Western than Eastern European countries.

The present study makes two main contributions to the analysis of the timing of fatherhood and later-life health. First, we assess whether the association between men's age at birth of first child and poorer self-rated health in midlife is similar in the 1958 and 1970 British cohorts. To our knowledge, no prior study has analyzed whether and how the association between age at first birth and men's midlife health might be changing over time. Second, we assess whether the association is confounded by childhood characteristics, including cognitive ability, low birth weight, and parents' socioeconomic characteristics. In addition, we assess whether it is mediated by adulthood educational attainment, marital status, and health-related behaviour, including body mass index (BMI), smoking, and drinking. Health behaviors have seldom been considered in previous studies that analyzed the association between fatherhood timing and later-life health, and the confounding influence of childhood cognitive ability has never been taken into account. However, it is likely that the association between age at first birth and later-life health may be spurious in the sense that both are affected by childhood cognitive ability and socioeconomic background (Batty et al., 2009; Calvin et al., 2011; Elo, Martikainen, & Myrskyla, 2014; Gottfredson & Deary, 2004; Hemmingsson, Melin, Allebeck, & Lundberg, 2006; Meincke et al., 2014; Shearer et al., 2002; Sipsma, Biello, Cole-Lewis, & Kershaw, 2010; Sorberg, Allebeck, Melin, Gunnell, & Hemmingsson, 2013; Wraw et al. 2015, 2016).

Background

Qualitative research on the timing of motherhood suggests that later parenthood is beneficial for the mothers – they feel more ready to have and raise children than they would have been at a younger age, and are consequently less stressed about the challenges of parenthood (Gregory, 2007). Similarly, research on fathers has suggested that although becoming a father in general increases subjective well-being, the association is weak and potentially negative among young fathers (Myrskyla & Margolis, 2014). This is possibly because early fatherhood may cause stress and economic strain resulting from interruptions in educational pathways and career developments (Einiö et al., 2015; Grundy & Foverskov, 2016; Sigle-Rushton, 2005). Stress can cause coping responses that involve changes in health behaviors, including increases in smoking, drinking, or unhealthy eating; these may serve as mechanisms linking stress and health outcomes (Umberson, Liu, & Reczek, 2008). It has been suggested that chronic stress interferes with cognitive processes such as self-regulation and executive function (Tomiyama, 2018) and may cause changes in weight (Block, He, Zaslavsky, Ding, & Ayanian, 2009).

Mirowsky and Ross (2002) have characterized possible reasons why the association between age at first birth and later depression may occur in both men and women. These include problems associated with family formation, socioeconomic status, and physical health. They argue that all three of these reasons suggest benefits of delaying parenthood. However, due to physical health problems in particular, there may be a limit to the benefits of delay, especially among women. Specifically, their empirical findings for men showed that fathers appeared to benefit psychologically from becoming parents later, while there was a limit to the benefits of delay for women after the age of 30 (Mirowsky & Ross, 2002). Similarly, in another study of men in the US, Health et al. (1995) found that men who fathered a first child before age 20 had more depressive symptoms than those who had a first child between ages 20 and 30 (Heath et al., 1995). However, first-time fathers older than 30 were excluded from their analyses.

Most studies that analyze physical and mental aspects of health show that young fatherhood is associated with poorer health and higher mortality (Barclay et al., 2016; Einiö et al., 2015; Grundy & Foverskov, 2016; Grundy & Kravdal, 2010; Grundy & Read, 2015; Heath et al., 1995; Lacey, Kumari, Sacker, & McMunn, 2017; Mirowsky, 2002; Mirowsky & Ross, 2002; Read et al., 2011; Read & Grundy, 2017; Sigle-Rushton, 2005). In some of these studies, men were older, and they were younger in other studies when their health was measured. For example, in the Nordic mortality studies, deaths were observed from age 45 until age 55 (Einiö et al., 2015) or until ages 52–80 (Barclay et al., 2016) or ages 46–68 (Grundy & Kravdal, 2010), depending on the cohort's age at the end of the study. The studies based on the English Longitudinal Study of Ageing assessed health at ages older than 50 or 52 (Grundy & Read, 2015; Read & Grundy, 2017), whereas other studies assessed health at ages younger than 40 (Heath et al., 1995) or already at age 30 (Sigle-Rushton, 2005). Despite these differences in the timing of health assessment, young first-time fathers appeared to experience poorer health in most studies.

On the other hand, studies on older fatherhood yield more varied results. For example, some studies indicate advantages for fathers who had their first (Einiö et al., 2015; Grundy & Kravdal, 2010; Keenan & Grundy, 2019; Mirowsky, 2002; Mirowsky & Ross, 2002; Pudrovska & Carr, 2009) or last (Grundy & Tomassini, 2006) child at older ages. Other studies indicate that men who had their first (Barclay et al., 2016; Hank, 2010) or last (Read et al., 2011; Read & Grundy, 2017) child late have very similar health and mortality than fathers who had children at normative ages. However, one study from the United Kingdom indicates that late fatherhood is associated with an increased risk of limiting long-term illnesses years later (Grundy & Read, 2015), and a recent cross-sectional study from Norway showed that first-time fathers of advanced age (35–39 years) and very advanced age (40 years or more) had more depressive symptoms and physical health problems, compared with other new fathers aged 25 and older who had a first child in the same period (Nilsen et al., 2013). The mixed results for the older fathers may be partially attributed to methodological differences between the studies, or to the context and the outcomes studied. It is also possible that the association between fatherhood timing and health is changing with the rising secular trend in the age at first birth. For example, the association between older first-time fatherhood and health might depend on the most prevalent reasons for postponement and on the meaning of fatherhood and its postponement for men.

Despite relatively similar findings across studies on health and mortality among young fathers, it is still possible that the association between fatherhood timing and health is spurious, in the sense that timing and health simply appear to be associated because both are determined by family background, childhood morbidity and cognitive abilities. Few studies have employed a sibling design to allow controls for social and genetic characteristics common to brothers (Barclay et al., 2016; Einiö et al., 2015; Pudrovska & Carr, 2009). These studies from Sweden, Finland, and the US showed higher mortality rates and a greater number of chronic illnesses in the young fathers. However, same-sex siblings can still differ from one another with regard to important characteristics that are related to both the timing of fatherhood and health, such as cognitive ability. To the best of our knowledge, no studies have tested whether the association between fatherhood timing and midlife health is confounded by cognitive ability in childhood, although measures of early life intelligence are known to be associated with later health (Batty et al., 2009; Calvin et al., 2011; Gottfredson & Deary, 2004; Hemmingsson et al., 2006; Meincke et al., 2014; Sorberg et al., 2013; Wraw et al. 2015, 2016) and indicated to be associated with early parenthood (Shearer et al., 2002).

Cognitive ability may affect the age at birth of a first child in several ways. First, young persons with lower cognitive abilities may choose earlier family formation if investing in education and career building appear less rewarding (Schoon, 2010; Shearer et al., 2002). Second, higher cognitive ability may decrease the likelihood of unintentional pregnancies by improving problem-solving skills and by delaying the initiation of sexual activity during adolescence (Halpern, Joyner, Udry, & Suchindran, 2000). Early initiation of sexual activity has been linked

with unintentional pregnancies and nonuse or gaps in contraceptive use (Ma et al., 2009; Magnusson, Masho, & Lapane, 2012). It is therefore important to control for the confounding influences of cognitive ability at a younger age in order to distinguish its effect from that of disrupted educational paths occurring because of young fatherhood.

The first aim of this study was to compare the midlife self-rated health of men who fathered their first child at different ages (< 20, 20–24, 30–34, 35–42 years) with that of men who fathered at ages 25–29 in two British cohorts born in 1958 and 1970. The second aim was to assess the extent to which men's childhood and adulthood characteristics explain the association between fatherhood timing and self-rated health in these cohorts.

Materials and methods

Study populations

The analyses were based on two British cohorts: the 1958 National Child Development Study (1958 NCDS), and the 1970 British Cohort Study (1970 BCS). The cohort studies are well suited for studying childhood social circumstances, cognitive ability, reproductive histories, and health behaviors (Elliott & Shepherd, 2006; Goisis, Schneider, & Myrskyla, 2017; Kneale & Joshi, 2018; Power & Elliott, 2006). We restricted the data to men who had at least one child by the age of 41 or 42 in the 1958 cohort, and by the age of 42 in the 1970 cohort. For the 1958 cohort, we used variables from the birth survey, the age 11 survey, and the adulthood surveys collected at ages 23, 33 and 41–42. For the 1970 cohort, we used data from the birth survey, the age 10 survey, and the adulthood surveys collected at ages 26, 29–30, 34–35, 38–39, and 42.

The 1958 NCDS originally enrolled 17,415 individuals born in Britain during one week in March 1958. Of these individuals, 51.7% (9001) were males, 76.1% (6851) of which had complete information on the childhood characteristics needed for the analysis and cognitive ability at age 11 in 1974. Of these boys, 67.5% (4624) participated in the follow-up interview thirty years later at the age of 41 or 42 in 1999–2000. Approximately 99.7% (4611) of these participants evaluated their self-rated health, 78.1% (3601) of which reported having had a child, and had enough information to allow a calculation of age at first birth using the adulthood sweeps carried out at ages 23, 33, and 41–42 (1981, 1991, 1999–2000). We excluded one person due to an implausible calculated fatherhood age. In total, the 1958 analytical sample included 3600 men who had become fathers by the age of 41 or 42.

The 1970 BCS data included 17,196 persons born in Britain during one week in April 1970. Of these individuals, 51.8% (8906) were males, 66.6% (5930) of which had complete information on childhood characteristics needed and cognitive ability at age 10 in 1980. Of these males, 57.7% (3421) participated in the interview over thirty years later at the age of 42 in 2012. Approximately 99.7% (3409) of the male respondents in 2012 evaluated their self-rated health, of which 74.9% (2552) reported having had a child, and had enough information to allow a calculation of age at first birth using adulthood sweeps carried out at ages 26, 29–30, 34–35, 38–39, and 42. Only 13 persons born in 1970 who reported ever having had a child by 2012 were excluded because of not having accurate information to calculate age at first birth. In total, the 1970 analytical sample included 2552 men who reported having fathered a child by the age of 42.

Age at first birth

In order to construct the variable for age at first birth, we used all adulthood surveys carried out at ages 26, 29–30, 34–35, 38–39, and 42 for the 1970 cohort, and at ages 23, 33 and 41–42 for the 1958 cohort. The variable was categorized as follows: under 20, 20–24, 25–29, 30–34 and 35–42 years. Previous studies have shown that in women, the proportions of individuals entering parenthood in the 1958 and 1970 cohort studies are relatively close to the national statistics (Kneale & Joshi, 2018). The age distribution of fatherhood and the proportions entering fatherhood are shown in Supplementary Figs. 1 and 2. The mean age of becoming a first-time father was 27.4 years for the 1958 analytical sample, and 29.1 years for the 1970 sample.

Self-rated health

Self-rated health was assessed with a single question asking for assessment of general health status in a face-to-face interview at an age of 41 or 42. For the 1970 cohort members, it was assessed by asking the following: “In general, would you say your health is excellent, very good, good, fair, or poor?” In the 1958 cohort, the responses were originally categorized as excellent, good, fair, or poor. We combined the response categories poor and fair as one category, referred to as poorer self-rated health in our analyses. Similarly, responses rating from good to excellent were used as the reference category, referred to as better health in our study.

Childhood and adulthood characteristics

The association between age at first birth and poorer self-rated health was adjusted for the confounding influences of low birth weight, mother's education, father's low social class, and childhood cognitive ability, and for the mediating influences of the highest educational qualification, marital status, and health-related behaviour, including BMI, smoking, and alcohol drinking.

Information on childhood characteristics (i.e. the confounders) was taken from the birth and age 10/11 surveys. Information on low birth weight was derived from the birth survey completed by the midwife. The cohort members were categorized as being born with low birth weight if they weighed less than 2.5 kg at birth. We used low birth weight as a marker for childhood health because it has been shown to be associated with child morbidity (Boardman, Powers, Padilla, & Hummer, 2002; McCormick, 1985). We also controlled for mother's education beyond the minimum school leaving age and father's low social class based on the Registrar General Social Class. These variables were used as binary indicators of low socioeconomic background. These variables were used as binary to allow better comparison between the two cohorts. Parents' socioeconomic status was adjusted for because of its links with early fatherhood and poorer health (Elo et al., 2014; Sipsma et al., 2010).

The scores of verbal cognitive ability were collected at age 11 for the 1958 cohort, and at age 10 for the 1970 cohort. In the 1958 cohort, verbal cognitive ability was assessed based on the verbal score of the General Ability Test (Douglas, 1964). Children were tested individually by their teachers who recorded the answers for the test that consisted of 40 items. In the 1970 cohort, verbal cognitive ability was assessed based on the first edition of the Word Similarity subscale of the British Ability Scale (Elliot, Murray, & Pearson, 1985). This test consisted of 21 items and, like the General Ability Test, was administered by a teacher. Prior work claims there is a close relationship between children's performances in these tests and IQ scores (Douglas, 1967; Elliott et al. 1978). These test scores have previously been used in several studies that compare cognitive ability across the two cohorts (Breen & Goldthorpe, 2001; Goisis et al., 2017; Schoon, 2010). Therefore, we are confident that the meaning of these cognitive ability measures is relatively similar across the two cohorts. Nevertheless, since different tests were administered in the two cohort studies, we standardized cognitive ability to have a mean of zero and a variance of one in both of our analytical samples in order to further increase the comparability across cohort studies.

Information on adulthood characteristics (i.e. the mediators) was collected from the surveys carried out at the age of 41 or 42. We used information on the highest educational qualification, marital status,

BMI, smoking status, and the frequency of drinking alcohol. Marital status was adjusted for because young fatherhood has previously been shown to be associated with a higher likelihood of experiencing divorce, which is known to be associated with poorer health (Amato, 2000; Einiö et al., 2015). Marital status was categorized as married, divorced, separated or widowed, and never married. There were two persons in the 1970 cohort whose marital status was unknown, and they were combined with the never married. The highest educational qualification was categorized according to a broad classification of academic and vocational qualifications, based on a scale related to the National Vocational Qualifications (NVQ) (Schoon, 2010). The categories were as follows: left school with no qualifications, NVQ levels 1–2, NVQ level 3, and NVQ levels 4–5. The highest educational attainment was adjusted for, because it has been shown to be associated with both fatherhood timing and health (Mirowsky & Ross, 2008; Nisen, Martikainen, Silventoinen, & Myrskyla, 2014), although the direction of causality between education and fatherhood timing is ambiguous (Kravdal & Rindfuss, 2008).

We also adjusted for BMI, smoking, and drinking, since early fatherhood can be a stressful experience resulting in changes in health-related behaviors, including increases in smoking, drinking, or unhealthy eating; these may serve as mechanisms linking stress and health outcomes. BMI was calculated as weight (in kilograms) divided by height-squared (in meters) and categorized as less than 18.5 (underweight), 18.5–24.9 (normal weight), 25.0–29.9 (overweight), 30.0 or more (obese), and unknown (Flegal, Kit, & Graubard, 2014). Measures of weight and height used to calculate BMI were self-reported. Smoking status was categorized as never smoked, has stopped, smokes occasionally, and smokes every day. Two respondents who did not answer were categorized as smoking occasionally. Respondents were also asked about the frequency of drinking alcohol. The original response categories were somewhat different for the two cohorts. We categorized the responses of the 1970 cohort members as follows: drinks three or fewer times a week, drinks four or more times a week, never drinks, and not answered. The response categories for the 1958 cohort members were as follows: drinks on three or fewer days a week, drinks on most days, and never drinks. One respondent of the 1958 cohort who did not answer was assigned to the first category.

Statistical analysis

The study employed logistic regression models to analyze the association between the age at the birth of a first child and poorer midlife self-rated health. If the respondents rated their health as poor or fair, they were given a value of 1 in our analyses; those with a better self-rated health status were given a value of 0. Model 1 was an unadjusted model of the association, without any controls. Model 2 included possible confounders of the association, including low birth weight, mother's education, father's low social class, and childhood cognitive ability. Model 3 was a fully adjusted model including possible mediators of the association, such as the highest educational qualification, marital status, and health-related behaviors, including BMI, smoking status, and the frequency of drinking alcohol.

The results from the nested logistic models are presented in terms of odds ratios, corrected for the rescaling problem using the KHB method (Table 3, models 1–3). The KHB method allows comparison of odds ratios across nested logistic models, net of rescaling (Karlson, Holm, & Breen, 2012; Kohler, Karlson, & Holm, 2011). The method also allows assessment of the magnitude of confounding that is attributable to each childhood characteristic, including mother's education, father's social class, cognitive ability scores, and birth weight (Table 4). Similarly, the magnitude of confounding attributable to adulthood mediating factors is also assessed (Supplementary Table S1).

To test whether the association between age at first birth and poorer self-rated health was different for the two cohorts, we pooled the data and included interactions of the cohort dummy with age at first birth (Supplementary Table S2). Men who had their first child at ages 25–29 years were used as the reference group in all models.

Results

Characteristics of men by the timing of fatherhood

Tables 1 and 2 show the characteristics of men by their age at the birth of a first child, and the age distribution of fatherhood for both cohorts, respectively. Of the fathers born in 1958, approximately 31% fathered a first child by the age of 25, while in the 1970 cohort it was less than 24%. Older first-time fatherhood became more common in the 1970 cohort, as approximately 19% of the fathers born in 1970 had their first child at age 35 years or older, compared with 10% of the fathers born in 1958. The mean age of having a first child rose from 27.4 years (SD = 5.3) in the 1958 cohort to 29.1 years (SD = 5.7) in the 1970 cohort.

For both cohorts, age at first birth was positively associated with having had a mother who stayed at school after the minimum leaving age, and with cognitive ability scores in childhood (Tables 1 and 2). Men who had a first child before the age of 20 or at ages 20–24 were more likely to have lower cognitive ability scores, whereas older fathers who had a first child at age 35 or older had higher cognitive ability scores. For the 1970 cohort, age at first birth was negatively associated with having had a father with a low social class, whereas in the 1958 cohort only men who had a first child at ages 20–24 were disadvantaged in terms of father's social class. Low birth weight was not associated with the age at entry into parenthood, although low birth weight appeared somewhat more common among males born in 1970 who later became adolescent fathers.

Tables 1 and 2 display adulthood characteristics and lifestyle patterns of the fathers. In both cohorts, younger fathers who had a first child by age 20 or at ages 20–24 were more likely to have lower educational qualifications, to be divorced or separated in midlife, and to smoke every day than men who had their first child at ages 25–29. Conversely, men who had a first child at age 30 or older were more likely to have higher educational qualifications, and less likely to be divorced or separated. Never having smoked was more likely among older fathers who had their first child at ages 35 or over in the 1970 cohort. For the 1958 cohort members, smoking patterns were relatively similar at paternal ages above 25. Age at first birth was negatively associated with midlife obesity for the 1970 cohort, while for the 1958 cohort, obesity was associated with adolescent fatherhood in particular. For the 1970 cohort, never drinking in midlife was more likely among adolescent fathers, whereas for the 1958 cohort, it was more likely among young fathers who had their first child at ages 20–24.

Self-rated health by the timing of fatherhood

Fig. 1 shows the unadjusted associations between age at first birth and poorer self-rated health for the two cohorts. The results are presented in terms of percentages of men in poorer health (Fig. 1A), and as unadjusted odds ratios (Fig. 1B). The findings show that young age at first birth was significantly associated with poorer health in both cohorts. Men who had their first child before age 20 had the highest odds of poorer health, followed by men who had their first child at ages 20–24, compared to those who fathered a first child at ages 25–29. In the 1970 cohort, men who had their first child at age 35 years or older were less likely to have poorer health than men who had their first child at ages 25–29. In the 1958 cohort, a corresponding advantage of being an older first-time father was not found. We tested for differences in estimates using pooled data (Supplementary Table S2). The results indicate that between men who had their first child at age 35 years or older and those who had their first child at ages 25–29, the difference in having poorer health was larger in the 1970 cohort than in the 1958 cohort (P-value = 0.05).

Table 1
Sample characteristics by the age at birth of a first child, 1958 British cohort of men, *N = 3600*.

Cohort 1958	Age at birth of first child						
	Under 20	20–24	25–29	30–34	35–42	Total	P-value
Age distribution of parenthood (%)	4.5	26.9	35.6	22.8	10.3	100.0	
Poorer midlife self-rated health (%)	29.8	22.3	15.8	14.2	14.8	17.7	< 0.01
Childhood characteristics							
Low birth weight (%)	3.7	4.0	2.8	4.2	3.2	3.5	0.45
Mother stayed in school after minimum leaving age (%)	12.4	16.8	27.6	28.9	36.6	25.2	< 0.01
Parental low social class (%)	9.9	11.5	7.5	6.5	7.3	8.4	< 0.01
Cognitive ability z-score (mean)	−0.447	−0.251	0.064	0.155	0.288	0.000	< 0.01
Cognitive ability z-score (standard deviation)	0.975	0.978	0.975	1.014	0.925	1.000	
Adulthood characteristics							
Educational qualifications (%)							
None	28.0	22.2	11.2	11.2	12.9	15.1	< 0.01
NVQ1-2	49.1	47.7	39.5	35.3	30.4	40.2	
NVQ3	13.7	14.7	19.4	17.3	17.7	17.2	
NVQ4-5	9.3	15.4	29.8	36.1	39.0	27.4	
Marital status (%)							
Married	72.7	76.7	84.0	80.5	78.5	80.1	< 0.01
Divorced/separated/widowed	21.1	21.2	12.9	13.1	10.2	15.2	
Never married	6.2	2.2	3.1	6.5	11.3	4.6	
Body mass index (%)							
Normal weight	28.6	31.8	35.5	41.8	40.1	36.1	< 0.01
Overweight	45.3	50.4	48.0	45.1	46.0	47.7	
Obese	23.6	15.8	14.3	11.7	12.4	14.3	
Underweight	0.0	0.5	0.4	0.2	0.5	0.4	
Unknown	2.5	1.4	1.7	1.2	1.1	1.5	
Smoking status (%)							
Never smoked	29.8	34.6	47.7	45.4	46.0	42.7	< 0.01
Have stopped	24.8	28.0	27.9	24.8	28.8	27.2	
Smokes occasionally	5.0	4.0	4.2	5.4	6.2	4.7	
Smokes every day	40.4	33.4	20.2	24.4	19.1	25.5	
Frequency of drinking alcohol (%)							
On 3 or fewer days a week	74.5	72.6	72.9	68.4	71.8	71.8	0.011
On most days	23.0	22.5	24.8	28.3	25.3	25.0	
Never	2.5	4.9	2.3	3.3	3.0	3.3	
Total	100.0	100.0	100.0	100.0	100.0	100.0	
N	161	968	1280	819	372	3600	

P-value from a chi-square test for all variables except for childhood cognitive ability, for which the P-value was obtained by testing the age coeffiecients jointy in a linear regression model.

Table 3 displays associations between age at first birth and poorer self-rated health in nested logistic models, generated by sequentially adding characteristics in childhood and adulthood. The results are presented in terms of odds ratios, net of rescaling using the KHB method (Karlson et al., 2012; Kohler et al., 2011). The results show that in both cohorts, adjustment for childhood characteristics has a relatively large effect on the estimates (Table 3, model 1 vs. model 2). In the 1958 cohort, approximately one third of the excess odds of poorer health among adolescent fathers (under age 20), and almost 40% among young fathers (ages 20–24) relates to their childhood characteristics (e.g., (1.59–1.36)/(1.59–1.00)*100 = 39%). In the 1970 cohort, the corresponding reductions are 28% and 37%, respectively. However, the effect of controlling for childhood characteristics on the association between later fatherhood and health is modest. In the 1958 cohort, the odds ratios for ages 30–34 and 35 or older stay close to 1 and statistically non-significant in model 2. In the 1970 cohort, approximately 16–20% of the lower odds of poorer health among older fathers relates to their childhood characteristics.

Which of the childhood characteristics are most important in explaining the association between the timing of fatherhood and midlife self-rated health? Table 4 decomposes the overall change in odds ratios between model 1 and model 2 into individual contributions attributable to each of the covariates. The reduction in odds ratios of poorer health among adolescent and young fathers is mainly attributable to childhood cognitive ability (Table 4), which was lower among younger fathers and associated with poorer midlife health (Supplementary Tables S3 and S4). Of all the childhood characteristics, cognitive ability score contributes most to attenuating the estimates of adolescent and young fathers, with a reduction of 65–77%. The next most influential characteristic was mother's education, with a reduction of 23–32%. The effect of controlling for father's social class varied, but was generally modest for both cohorts. Birth weight had little impact. Higher cognitive ability and mother's education contributed to partially explain the lower odds of poorer health among older fathers born in 1970.

The set of mediators, including educational attainment, marital status, and health-related behaviors, including BMI, smoking, and drinking further contributed to explain the association between age at first birth and midlife health (Table 3, model 2 vs. model 3). For the 1958 cohort, the mediators explained approximately half of the association between younger-age fatherhood and poorer self-rated health. For the 1970 cohort, the role of the mediators was even stronger, as they explained almost all of the association between becoming a father by age 25 and poorer health. The mediators also partially explained the advantage that was associated with older fatherhood for the 1970 cohort, suggesting that delaying fatherhood is beneficial for educational attainment and health behaviors.

Supplementary Table S1 further decomposes the change in odds ratios between models 2 and 3 into individual contributions of the mediators. The reduction in odds ratios among adolescent and other young fathers is mainly related to their health behaviors and education, but the role of marital status is modest. The higher odds of poorer health among adolescent and young fathers is attributable in part to the higher likelihood of being obese and to smoke every day, which are associated with poorer health in both cohorts (Supplementary Tables S3 and S4). The effect of controlling for midlife drinking varied, but was generally modest for both cohorts. In the 1970 cohort, the lower odds of

Table 2
Sample characteristics by the age at birth of a first child, 1970 British cohort of men, *N = 2552*.

Cohort 1970	Age at birth of first child						
	Under 20	20–24	25–29	30–34	35–42	Total	P-value
Age distribution of parenthood (%)	3.9	19.7	29.0	28.8	18.6	100.0	
Poorer midlife self-rated health (%)	28.0	19.5	13.5	9.9	8.0	13.2	< 0.01
Childhood characteristics							
Low birth weight (%)	9.0	4.4	4.6	4.9	4.4	4.8	0.37
Mother stayed in school after minimum leaving age (%)	15.0	21.5	32.6	42.4	50.3	35.8	< 0.01
Father's low social class (%)	10.0	9.3	5.9	3.3	2.9	5.4	< 0.01
Cognitive ability z-score (mean)	−0.439	−0.393	−0.008	0.182	0.240	0.000	< 0.01
Cognitive ability z-score (standard deviation)	0.948	1.054	0.924	0.924	0.969	1.000	
Adulthood characteristics							
Educational qualifications (%)							
None	20.0	13.3	6.8	3.5	5.5	7.4	< 0.01
NVQ1-2	36.0	45.5	34.7	28.5	24.2	33.2	
NVQ3	22.0	20.1	19.3	13.4	15.4	17.1	
NVQ4-5	22.0	21.1	39.2	54.6	54.9	42.3	
Marital status (%)							
Married	56.0	64.2	72.6	78.7	77.1	72.9	< 0.01
Divorced/separated/widowed	21.0	17.5	13.5	9.1	5.1	11.8	
Never married	23.0	18.3	13.9	12.1	17.9	15.4	
Body mass index (%)							
Normal weight	14.0	25.4	27.4	28.7	33.5	28.0	< 0.01
Overweight	36.0	39.2	42.4	44.7	43.4	42.4	
Obese	38.0	29.4	23.8	19.1	17.1	22.8	
Underweight	0.0	0.6	0.3	0.4	0.6	0.4	
Unknown	12.0	5.4	6.1	7.1	5.5	6.3	
Smoking status (%)							
Never smoked	33.0	33.8	48.2	50.5	52.2	46.2	< 0.01
Have stopped	19.0	26.0	26.9	28.7	27.8	27.1	
Smokes occasionally	2.0	6.6	5.0	5.6	6.5	5.6	
Smokes every day	46.0	33.6	19.9	15.1	13.5	21.0	
Frequency of drinking alcohol (%)							
3 or fewer times a week	60.0	59.8	64.7	61.6	60.8	62.0	0.013
4 or more times a week	10.0	16.7	17.7	19.8	21.5	18.5	
Never	11.0	5.8	4.3	5.3	4.0	5.1	
Not aswered	19.0	17.7	13.2	13.4	13.7	14.5	
Total	100.0	100.0	100.0	100.0	100.0	100.0	
N	100	503	740	734	475	2552	

P-value from a chi-square test for all variables except for childhood cognitive ability, for which the P-value was obtained by testing the age coeffiecients jointy in a linear regression model.

Table 3
Odds ratios (OR) from logistic models of poorer self-rated health by the age at birth of a first child (A), 1958 and 1970 British cohorts of men.

	Model 1		Model 2		Model 3	
1958 Cohort						
Age at first birth	OR_1	95% CI	OR_2	95% CI	OR_3	95% CI
Under 20	2.41	(1.63–3.55)	1.92	(1.30–2.83)	1.46	(0.99–2.17)
20-24	1.59	(1.27–1.98)	1.36	(1.09–1.70)	1.15	(0.92–1.45)
25–29 (ref.)	1.00		1.00		1.00	
30-34	0.86	(0.67–1.11)	0.89	(0.69–1.15)	0.88	(0.68–1.14)
35-42	0.92	(0.66–1.29)	1.03	(0.73–1.44)	1.00	(0.71–1.40)
1970 Cohort						
Age at first birth						
Under 20	2.73	(1.62–4.59)	2.25	(1.33–3.80)	1.30	(0.76–2.21)
20-24	1.61	(1.16–2.22)	1.38	(1.00–1.92)	1.05	(0.76–1.46)
25–29 (ref.)	1.00		1.00		1.00	
30-34	0.68	(0.48–0.95)	0.74	(0.53–1.04)	0.82	(0.58–1.15)
35-42	0.53	(0.35–0.80)	0.61	(0.40–0.92)	0.69	(0.45–1.04)

(A) Odds ratios from nested logistic models based on KHB method.
Model 1 is unadjusted.
Model 2 adjusted for childhood characteristics, including low birth weight, mother's education, father's low social class, and cognitive ability in childhood.
Model 3 adjusted for childhood characteristics and adulthood characteristics, including educational qualifications, marital status, body mass index, smoking, and drinking alcohol.

poorer health observed among older fathers who had a first child at age 35 or older was attributable in part to the higher likelihood of having higher educational qualifications, and to the lower likelihood of being obese and smoking daily. Older fathers were advantaged in terms of not being divorced, which also contributed to the association for the 1970 cohort.

Discussion

Using the 1958 and 1970 British birth cohort studies, we investigated the association between men's age at birth of their first child and midlife self-rated health. We extended previous work by analyzing how childhood characteristics confound the association between age at first birth and health, and by analyzing how the association changes between birth cohorts. Consistent with prior work, our results showed that adolescent and young fathers had poorer later-life health than older fathers (Barclay et al., 2016; Einiö et al., 2015; Grundy & Kravdal, 2010; Grundy & Read, 2015; Heath et al., 1995; Mirowsky & Ross, 2002; Read & Grundy, 2017). Importantly, we found that childhood cognitive ability – which previous research has not analyzed – strongly contributed to this association, and to a greater extent than other childhood characteristics. The disadvantage of younger fathers was markedly similar for both cohorts born in 1958 and 1970, suggesting that young fathers continue to be a risk group that might benefit from policy interventions. For example, young fathers and their children could benefit from support provided by professionals working in social and health care. In contrast, the relationship between age at first birth

Table 4
Percentage of the indirect effect of each childhood characteristic to the association between the age at birth of a first child and poorer self-rated health (Model 1 vs. Model 2), 1958 and 1970 British cohorts of men.

	1958 Cohort	1970 Cohort
Age at birth of first child	Model 1 vs. 2	Model 1 vs. 2
Under 20	OR_1 = 2.41, OR_2 = 1.92	OR_1 = 2.73, OR_2 = 2.25
Cognitive ability (%)	73.2	65.4
Mother stayed in school after minimum leaving age (%)	22.8	32.0
Father's low social class (%)	3.3	−1.5
Low birth weight (%)	0.8	4.1
Total (%)	100.0	100.0
20–24	OR_1 = 1.59, OR_2 = 1.36	OR_1 = 1.61, OR_2 = 1.38
Cognitive ability (%)	66.7	75.6
Mother stayed in school after minimum leaving age (%)	23.9	26.2
Father's low social class (%)	7.9	−1.6
Low birth weight (%)	1.5	−0.3
Total (%)	100.0	100.0
25–29 (ref.)	–	–
30–34	OR_1 = 0.86, OR_2 = 0.89	OR_1 = 0.68, OR_2 = 0.74
Cognitive ability (%)	84.9	63.5
Mother stayed in school after minimum leaving age (%)	13.4	39.3
Father's low social class (%)	9.0	−2.1
Low birth weight (%)	−7.3	−0.6
Total (%)	100.0	100.0
35+	OR_1 = 0.92, OR_2 = 1.03	OR_1 = 0.53, OR_2 = 0.61
Cognitive ability (%)	70.43	54.51
Mother stayed in school after minimum leaving age (%)	29.62	46.83
Father's low social class (%)	0.71	−1.57
Low birth weight (%)	−0.76	0.23
Total (%)	100.0	100.0

and midlife health may have changed at the upper end of the age distribution. Specifically, our study showed that older fathers born in 1970 who had their first child at age 35 years or older had the best midlife health. This advantage was not found for the 1958 cohort. The findings suggest that the relationship between young age at fatherhood and midlife health is strongly confounded by cognitive ability, and that in recent cohorts a new pattern has emerged in which older fathers have an advantage of better later-life health.

Older first-time fathers

There are several possible reasons for the lower likelihood of poorer self-rated health among men born in 1970 who postponed having children. First, it is possible that their better health is attributable to the rapidly changing norms and attitudes towards postponing fatherhood. As the age of fathers at birth of a first child rises (Nilsen et al., 2013; Paavilainen et al., 2016), older fatherhood becomes more common and is more likely to reflect a planned timing of fatherhood. It has been suggested that postponing fatherhood relates to growing individualisms that lead people to prioritize their own intentions, to act less in accordance with traditional norms, and to wait until education has been completed and mental maturity reached before having children (Paavilainen et al., 2016). All of these factors could promote later-life health of older first-time fathers in contemporary societies. Empirical evidence for women suggests that those who have wanted timings for their first births at age 30 years and older are less likely to be depressed in later years than those with unwanted first births at the same age (Rackin & Brasher, 2016).

Although having a family and becoming a father are important for most males, it is likely that postponing fatherhood was a more central quality of a valued life for the 1970 cohort than for the 1958 cohort. Empirical information based on the 1958 NCDS 16-year questionnaire indicates that very few boys born in 1958 thought that it would be ideal for them to postpone having children up to age 31 or older (2.7%), or to become adolescent fathers already at ages 16–19 (2.7%) (Supplementary Table S5). The vast majority of the boys thought that the best age range to start a family was from age 22–25 years (43%), or from age 26–30 years (24%). However, many boys were still uncertain about the ideal timing of starting a family (12.4%). Despite the fact that fatherhood ideals may mature and change over the life course, it seems reasonable to assume that the majority of males born in 1958 considered both late and adolescent fatherhood as non-normative. If late fatherhood was still considered non-normative among the 1958 cohort members, it may have served to offset the health benefits of accumulating various types of resources before having the first child. The findings of our study provide some support for this hypothesis, as older first-time fathers in both cohorts were advantaged in terms of higher educational qualifications. However, only older fathers born in 1970 had better self-rated health in midlife. Older fathers who were born in

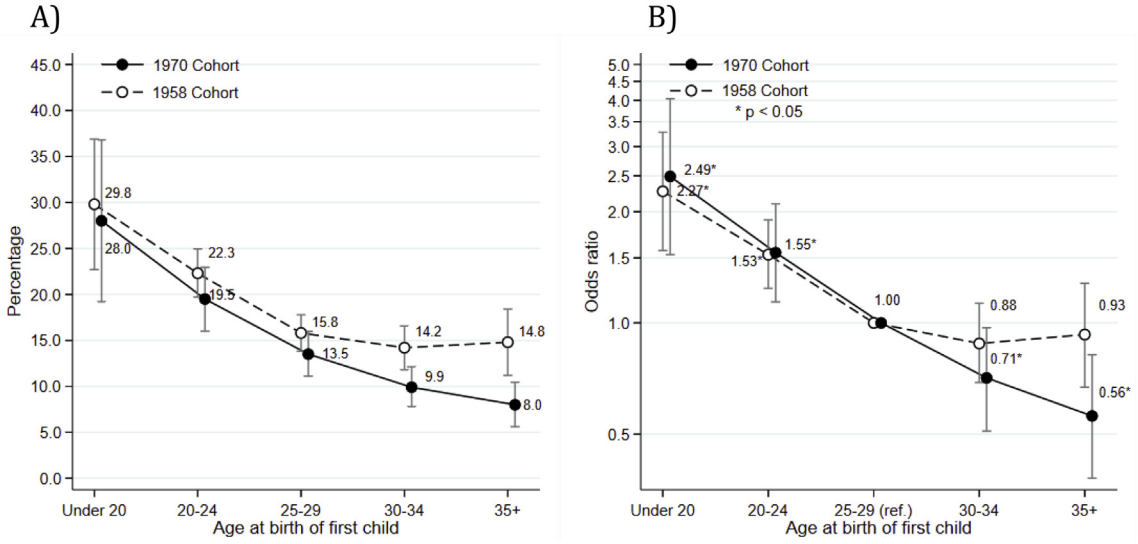

Fig. 1. Association between the age at birth of a first child and poorer midlife self-rated health in the 1958 and 1970 British cohorts of men, (A) unadjusted percentages, (B) unadjusted odds ratios.

1958 had less healthy smoking habits, despite their high educational attainment.

Unfortunately, comparative information on the best age range for starting a family was not available for the 1970 cohort members. At age 16, they were asked more generally about things they thought would matter to them as adults. For example, approximately 19% of all 16-year-old boys in the 1970 BCS thought that having children of their own would not matter to them as adults (Results available on request).

It is noteworthy that men born in 1970 who postponed fatherhood up to age 35 or older had healthier life style patterns than their younger counterparts. Their lower likelihood of being obese and daily smokers helped to partially explain their lower odds of poorer self-rated health. In contrast, all of the first-time fathers born in 1958 who had a child at age 25 or older had relatively similar health behaviors. There are several possible reasons for the differences in health behaviors among older fathers between the cohorts. First, men born in 1958 who delayed fatherhood to older ages had their first child in 1993–2000, while their counterparts born in 1970 experienced late fatherhood in 2005–2012. The latter cohort may have been more aware of the consequences of passive smoking for their child and hence may have avoided daily smoking. Furthermore, they might have experienced less stress related to late parenthood and its consequences for the child (Klemetti, Gissler, Sainio, & Hemminki, 2016), given that obstetric medicine as well as prenatal screening and diagnosis have improved over time (Ashoor Al Mahdi & Nicolaides, 2019; Jakes, Watt-Coote, Coleman, & Nelson-Piercy, 2017; Snijders, Noble, Sebire, Souka, & Nicolaides, 1998). Given that older first-time fathers often have their first child with older women (Nilsen et al., 2013), the role of obstetric medicine for the well-being of the entire family is not negligible.

We cannot exclude the possibility that the selective forces related to late first-time fatherhood might have changed. It is possible that for men who were born in 1970, postponing fatherhood was a marker of an individualistic lifestyle (i.e. a choice) rather than an indicator of having difficulties in starting a family. This lifestyle could have co-existed not only with high educational ambitions but also with beneficial health behaviours. This argument is partly supported by a Finnish study showing that being an older first-time father in 1987–1999 was still more common among those with a lower education, whereas in 2005–2009 it had become more common among highly educated men (Paavilainen et al., 2016). In our study, however, late fathers were on average more highly educated than other fathers in both cohorts, but those born in 1970 had healthier lifestyle patterns. Nevertheless, some previous studies have provided conflicting results on lifestyle patterns and health. For example, one study from Norway indicated that first-time fathers of advanced age had more depressive symptoms and negative health behaviors, including obesity and smoking, compared to all other first-time fathers aged 25–34 who had a child in the same period (2005–2008) (Nilsen et al., 2013). Associations with socioeconomic factors were mixed, as both those with a high income and those without employment were overrepresented among older fathers. More studies are needed on the health of late first-time fathers in different countries and time periods; these men are likely to be a highly heterogeneous group, whose composition depends on the most prevalent reasons for postponement and eventually having the child.

In addition, the mechanisms linking age at first birth and health are likely to depend on current life circumstances and the time since the birth of a first child. For example, better self-rated health observed in midlife among older first-time fathers in our study could relate to them having a small child in the household, which may reduce unhealthy behaviors and promote feelings of happiness and well-being. This argument is in line with previous research from Germany showing that although happiness generally increases temporarily in the years around fatherhood, the positive impact of parenthood is stronger among older than young fathers from 3 to 18 years following the first birth (Myrskyla & Margolis, 2012). In our study, the self-rated health of older fathers (35–42 years) was measured from 0 to 7 years after the first birth and therefore reflects the relatively short-term effects of having the first child. The long-term effects of older first-time fatherhood might be different than those observed in the short run, however. For example, older first-time fathers might not experience grandparenthood until they are approaching their 60s or 70s. It would therefore be useful to further examine the association between older first-time fatherhood and health throughout the entire life course up to older ages.

Young fathers

Our study is the first to show that poorer midlife health observed among men who had their first child before 20 or at ages 20–24 is partly related to selection by childhood cognitive ability. Of all childhood characteristics in our study, cognitive ability scores contributed most to explaining the differences in midlife health among adolescent and young fathers, compared to fathers who had their first child at ages 25–29 in both cohorts. Since our study is the first to include a measure of childhood cognitive ability in the analysis of the relationship between fatherhood timing and midlife health, the results obtained for cognitive ability cannot be directly compared with those of previous studies. In contrast, our study confirms previous findings based on sibling designs suggesting that the relationship between young fatherhood and health is not entirely driven by childhood background (Barclay et al., 2016; Einiö et al., 2015).

In our study, the large contribution of cognitive ability in explaining the differences between the fathers is relatively similar for both cohorts. There are several possible reasons for this, as cognitive ability may affect age at first birth in several ways. First, young men with lower cognitive abilities may choose earlier family formation if investing in education and career building appear less attractive. Second, cognitive ability may also influence the likelihood of unintentional pregnancies. However, studying the role of intentional or unintentional pregnancies fell beyond the scope of the study due to data limitations.

Methodological considerations

The main strength of the study was the two nationally representative samples of British men born in 1958 and 1970, which allowed us to analyze the changing relationship between men's age at first birth and poorer midlife health. These exceptional datasets include information on age at first birth for men, and also comprise information on cognitive ability collected in childhood. To our knowledge, no other dataset provides equally comprehensive information across the life course up to midlife; this enabled us to test for the first time whether the relationship between male age at first birth and midlife health is confounded by childhood cognitive ability – a well-known predictor of later-life health (Hemmingsson et al., 2006). In addition, both datasets include socioeconomic characteristics of the family of origin. This is important because a disadvantaged background is known to be associated with both young fatherhood and adulthood health (Elo et al., 2014; Sipsma et al., 2010).

There are both strengths and limitations in using self-rated health as the outcome. We decided to use self-rated health as our health measure because it can be interpreted to reflect subjective experience of physical symptoms (Bailis et al. 2001, 2003), and it is known to be associated with both the risk of death across individuals and with the time to death within individuals (Idler & Benyamini, 1997; Mossey & Shapiro, 1982; Stenholm et al. 2014, 2016). Furthermore, it has been suggested that self-rated health might capture pathological changes in the body before and beyond clinical diagnoses, in particular with regard to cardiovascular diseases (Stenholm et al., 2016). Nevertheless, as a subjective measure, self-rated health has limitations, because it is measured with a single question that asks how an individual evaluates his or her own general health. For instance, Delpierre, Lauwers-Cances, Datta, Lang, and Berkman (2009) have suggested that the impact of objective health problems on self-rated health may be stronger among better-educated

individuals (Delpierre et al., 2009). Therefore, men who father a first child early in life and who are less educated may underestimate their health problems more often than better-educated men who father a first child later. However, testing this hypothesis fell beyond the scope of our study. Despite its limitations, self-rated health adequately reflects individuals' own perception of their general health status. In our study, we analyzed the lower end of the health distribution, focusing on a combined category of poor and fair self-rated health. The main reason for focusing on poorer health is related to comparability of the surveys carried out in 1999–2000 and 2012. By studying poorer self-rated health, however, we lost some of the more detailed information about the upper end of the health distribution (e.g., excellent health). The loss of information, however, was not critical to the power of the study, as important associations were still estimated precisely enough that conclusions could be drawn.

There were several reasons why we used the age range from 35 to 42 for older first-time fatherhood. First, at the time of this study, the 2012 sweep was the latest one available for the 1970 cohort members who then were aged 42 years. Second, the 2012 sweep for the 1970 cohort and the 1999–2000 sweep for the 1958 cohort were well suited for a comparative analysis of the relationship between fatherhood timing and poorer self-rated health at ages 41–42. It must be noted, however, that a follow-up beyond age 42 would have allowed an analysis of men who became first-time fathers at a very advanced age. For example, in the 1958 cohort, approximately 1.3 percent of all men went on to have a first live-born child between ages 42 and 50. The corresponding figure for the 1970 cohort is likely to become higher. Studying very old first-time fathers fell beyond the scope of our study, however, and deserves further attention in future work.

We used complete datasets for the childhood characteristics, including cognitive ability, and for the outcome measured at ages 41–42. These inclusion criteria reduced the original sample sizes markedly. It is therefore possible that our estimates for the relationship between young age at first birth and poorer midlife health is conservative, in the sense that young fathers are more likely to be lost to follow-up by their early 40s than those who had their first child at standard ages. However, there is no reason to believe this relative attrition would have been different for the cohorts studied. Another limitation of our study is that health-related behaviors, including BMI, smoking, and alcohol drinking, were measured at ages 41–42. It is therefore possible that the association between health-related behaviors and midlife health is bidirectional, in the sense that poorer health could also have an effect on health-related behaviors, and not only vice versa. However, despite the possibility of a bidirectional association between health-related behaviors and health, our results clearly show that young fathers in both cohorts are disadvantaged in terms of poorer health and health-related behaviors in midlife.

Conclusions

In a study of two British cohorts born in 1958 and 1970, it was shown that in both cohorts, young fathers have poorer midlife self-rated health than older fathers. Older fatherhood showed associations with better health, but only in the 1970 cohort. To our knowledge, no previous studies have examined whether the association between fatherhood timing and midlife health has changed as parenthood has become postponed to an older age. These findings confirm that young fathers experience a disadvantage that may warrant policy interventions, and that the health gap between older and younger fathers has grown over time.

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Conflicts of interest

None declared.

Ethics approval

We are grateful to the Centre for Longitudinal Studies at the UCL Institute of Education for the permission to use the cohort data and to the UK Data Service for making them available for this study.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ssmph.2019.100458.

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