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The recent decline in period fertility in England and Wales: Differences associated with family background and intergenerational educational mobility

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During 2010–20, period fertility in England and Wales fell to its lowest recorded level. The aim of this paper is to improve our understanding of the decline in period fertility in two dimensions: differentials by the education of a woman's parents (family background) and by a woman's education in relation to that of her parents (intergenerational educational mobility). The analysis finds a substantial decline in fertility in each education group, whether defined by a woman's parents' education alone or by a woman's own education relative to her parents' education. Considering parents' and women's own education together helps differentiate fertility further than analysing either generation's education in isolation. Using these educational mobility groups more clearly shows a narrowing of TFR differentials over the decade, but timing differences persist.

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Introduction

Between 2010 and 2020 the total fertility rate (TFR) in England and Wales declined from 1.94 to 1.58 (ONS 2020, Table 1), its lowest level ever recorded. This trend in period fertility during 2010–20 was common among many European countries (e.g. France, Italy, and Sweden) and the United States (US). Beyond noting these similar country trends, our understanding of the fertility decline in England and Wales can be enhanced by studying fertility differentials between social groups and how they have changed during the decade. This study adds to the literature on recent period fertility trends in England and Wales (Ermisch 2021) and the US (Kearney et al. 2022). It also contributes to the literature on social differentials in fertility.

The contribution of this paper is to improve our understanding of recent period fertility in England and Wales in two related dimensions: fertility differentials by the education of a woman's parents (family background) and fertility differentials by a woman's own education relative to that of her parents (intergenerational educational mobility). These cannot be studied using the English and Welsh birth registration data (ONS 2020) alone. This study uses individual-level, annual panel data collected over the last decade by the UK Household Longitudinal Study, known as Understanding Society. It is, however, important to check the extent to which fertility measured from the latter is consistent with the registration data. To do so, the paper introduces a measure of the closeness of age-specific fertility measures estimated from the panel data (which condition on wave-to-wave retention in the panel) to unconditional age-specific fertility rates in the registration data. Fortunately, the panel-data fertility rates perform relatively well on that measure.

Family background and fertility

There are many studies of differences in fertility by mother's own education (e.g. Kravdal 2007; Kravdal and Rindfuss 2008; Meisenberg 2008; Sigle 2008; Andersson et al. 2009; Musick et al. 2009; Rendall et al. 2010; Nisén et al. 2013; Amin and Behrman 2014; Basten et al. 2014; Wood et al. 2014; Berrington et al. 2015; Tropf and Mandemakers 2017; Jalovaara 2019; Zang 2019; Impicciatore and Tomatis 2020; Wood et al. 2020; Nisén et al. 2021). These studies differ in how educational differences are delineated and in the fertility measure being examined. For England and Wales (Sigle 2008; Rendall et al. 2010; Berrington et al. 2015), common findings include more childlessness, later childbearing, and lower completed fertility for women with a university degree. Many other low-fertility countries share these features.

These associations may, however, be in part artefacts of the influences of a woman's family of origin on both her education and her fertility. Some, if not most, of the association between own education and fertility reflects family background, as evidenced by much smaller fertility differences by education between twin sisters than between families (Rodgers et al. 2008; Nisén et al. 2014; Tropf and Mandemakers 2017 and Kramarz et al. 2021). Here I focus directly on one measured aspect of family background that is associated with parenting activities and children's outcomes during childhood and into adulthood (Ermisch et al. 2012): the education of a woman's parents (hereafter *parents' education* for short). I also study fertility differences by a woman's own education relative to that of her parents.

The first question addressed is the extent to which a woman's fertility differs with respect to the education of her parents, which is predetermined in the case of her fertility decisions. This does not necessarily mean that parents' education directly *causes* different fertility patterns among their daughters, in the sense that if parents' education increased through some exogenous change (e.g. raising the school-leaving age) their daughters' fertility would respond. Rather it means that many family background factors correlated with parents' education may affect their daughters' fertility behaviour. One of these is women's parents' own fertility, which is correlated with both their education and their daughters' fertility (Murphy 2013; Beaujouan and Solaz 2019). For instance, the Understanding Society data confirm that in England and Wales, daughters' fertility is correlated with their mother's fertility, and parents with higher education have smaller completed families. Perhaps more importantly, parents' education is correlated with their daughters' education (Hertz et al. 2007; Ermisch and Pronzato 2011; Fleury 2018), and the latter may have a causal impact on daughters' fertility (e.g. Fort et al. 2016 and Breen and Ermisch 2017).

Intergenerational mobility and fertility

The second question is whether fertility varies with a woman's own education relative to that of her parents. The idea that intergenerational social mobility plays a role in explaining fertility behaviour has a long history (Berent 1952; Greenhalgh 1988; Dalla Zuanna 2007). Indeed, the idea has been traced back to Dumont in 1890 (quoted in Greenhalgh 1988) and is related to Davis' (1963) theory of multiphasic response in demographic behaviour to 'maximize their new opportunities and to avoid relative loss of status' (p. 362).

Three specific reasons why social mobility may affect or be correlated with fertility are prominent. First, the disruption of social and family ties experienced by the socially mobile may be associated with stress and lower support for childbearing, which directly reduces the fertility of this group (a 'social disruption' hypothesis; e.g. see Durkheim 1951, pp. 252–3; Sorokin 1927, pp. 522–3). Second, early childbearing may reduce opportunities for social or educational mobility: a 'selection effect' producing higher fertility among the downwardly mobile and lower fertility among the upwardly mobile. Third, and most simply, a socially mobile person may be socialized within both their antecedent and their current social strata (a 'dual socialization' hypothesis). It appears that Berent (1952, p. 252) had the third hypothesis in mind in interpreting the findings of his study of England and Wales when he concluded that:

> the only plausible explanation of the fertility pattern [in relation to intergenerational social mobility] … is the effect of social environment, which manifests itself in the maintenance of the social characteristics of the class of origin as well as in the acquisition of the fertility habits of the social class subsequently reached.

Subsequent evidence supporting an association of intergenerational mobility with a couple's fertility is, however, mixed (Westoff 1981; Zimmer 1981; Sobel 1985).

The present intergenerational analysis distinguishes four groups, defined by the level of the woman's own education (university degree or not) and the level of her parents' education (post-school education or not). It does not aim to test specific behavioural theories relating social mobility to fertility but rather to use the ideas to help interpret the variation in period fertility between groups. The analysis finds a substantial decline in period fertility during the decade 2010–20 in each education group. It also finds that considering parents' education and a woman's own education together better differentiates fertility variation during the decade.

The next section describes the fertility data from the survey used to address these questions and considers their consistency with birth registration data. The following two sections address differential fertility by parents' education and by educational mobility, respectively. Finally, I present the main conclusions.

Data and methods

Age-specific fertility information among women in England and Wales from Understanding Society

Understanding Society (the UK Household Longitudinal Study) is a longitudinal survey of the members of approximately 40,000 households in the UK. Households recruited at the first round of data collection (2009–11) were visited each year to collect information on changes to their household and individual circumstances. Annual interviews are conducted face to face in respondents' homes by trained interviewers. All members of the households selected at the first wave, and their descendants (who become full members of the panel when they reach age 16), constitute the core sample who are followed wherever they move within the UK. All others who join their households in subsequent waves do not become part of the core sample, but they are interviewed as long as they live with at least one core sample member. Thus, the sample is refreshed with younger members annually. Understanding Society is designed to be representative of the UK population at each wave, representing all ages and all educational and social backgrounds (for more details, see Understanding Society 2021a, 2021b).

The analysis here uses data collected during the first 11 waves from women aged 16–44, who were born since 1970 and residing in England and Wales (the 11th wave was collected during 2019–21). Births are inferred from changes in a woman's number of natural children and their ages between annual waves of the panel survey, and every available pair of waves is used in the estimation.

A recent paper used the first 10 waves of Understanding Society to estimate a model of age- and parity-specific period fertility rates and associated parity progression ratios (Ermisch 2021). Here I focus on age-specific fertility rates. This provides higher power in detecting variation in fertility across social groups (as defined by the education of a woman and her parents) than is possible when calculating age- *and* parity-specific fertility rates, and it allows more flexible modelling of age-specific fertility over time. The paper also examines first-birth rates separately, as parity one was found to be the most important in accounting for the fertility decline during 2010–20 (Ermisch 2021).

There is, of course, panel attrition (and rejoiners) between waves. After 25 per cent attrition between the first two waves in the general population sample (Understanding Society 2019, section 2.3.4), attrition fell steadily to 14 per cent at Wave 5; it rose to 18 per cent at Wave 6, and then fell again to 15 per cent at Wave 7 and 12 per cent at Wave 8, after which it fluctuated around this value. Whether attrition can be ignored depends on the specific parameters and statistics that are the focus of a particular study (Washbrook et al. 2014; Mohan and Pearl 2021). The primary issue in this regard is whether panel retention is correlated with the fertility event, which cannot be tested directly. This makes it important to cross-validate the estimated fertility model with registration data, as discussed later in this section.

Modelling age-specific fertility

In order to use the survey data more efficiently, this analysis 'smooths' the age-specific rates using a model with a relatively small number of parameters. More specifically, an age-specific function for the annual birth probability is estimated. Each probability is assumed to depend on age, interview year (grouped into 'survey periods'), and an interaction between age and survey period. The age-specific equations I estimate take the following form:.

$$\ln\left(\frac{p_{iw}}{1-p_{iw}}\right) = \alpha_0 + \alpha_1 age_{iw} + \alpha_2 age_{iw}^2 + \mu_1 year13\_16 + \mu_2 year17\_20 + \delta_1 year13\_16 \times age_{iw} + \delta_2 year17\_20 \times age_{iw}, \quad (1)$$

where p_{iw} is the probability of woman i having a birth between waves $w\text{–}1$ and w; age_{iw} is the woman's age in years; *year*13_16 is a binary variable which is unity if the interview year at wave w is between 2013 and 2016, and zero otherwise; similarly, *year*17_20 equals unity if the interview year is between 2017 and 2020, and zero otherwise. The remaining variables are interactions between age and survey period, allowing for different slopes of the age-specific fertility rates in different years. The model in equation (1) imposes two restrictions (no interactions of survey period and age squared) relative to a saturated model in which all the age parameters vary between time periods. Although the restrictions are rejected by a likelihood ratio test at the 0.01 level, the Bayesian Information Criterion favours the restricted model. Furthermore, the mean values of the synthetic fertility statistics, such as the TFR, are almost identical, and their standard deviations (SDs) calculated from a bootstrapping exercise are usually lower in the restricted model.

The sample consists of up to 10 pairs of consecutive years during which a birth could occur for each woman. There are no off-the-shelf weights to assure the representativeness of such a sample for computing estimates of population means such as fertility rates, but the sample can be used to estimate the model parameters on the assumption that these are constant across women. The parameter estimates are, therefore, based on unweighted data. This can, however, present a problem for the interpretation of the year-specific parameters μ_j and δ_j. They could reflect both sample composition effects and 'true' period influences. I observe 4,611 births during the period, based on 69,078 woman-year observations (from 14,611 women contributing between one and 10 pairs of waves).

All the parameters are precisely estimated (the smallest z value is 4.88, for one of the age–survey period interaction terms) and produce the expected shape of age-specific birth probabilities. These parameters reflect the processes of partnering (particularly for first births), partnership dissolution, and births outside live-in partnerships.

Consistency of panel data and birth registration data

The estimated model in equation (1) is used to predict age-specific fertility rates (for six age groups), which are compared with fertility rates calculated from birth registration data (ONS 2020). The differences between the two are illustrated in Figure 1. Of course, sampling variation in the model-based predicted rates affects these comparisons: for example, the point estimate for women aged 25–29 during 2010–12 is 0.133, with a 95 per cent confidence interval of 0.126–0.140. The model does a relatively good job of replicating the registration-based rates, but there are age groups and survey periods in which they are less close. For example, the modelled rate overstates the registration-based rate by nearly 0.03 among women aged 25–29 during 2010–12 and understates fertility for women aged 20–24 by nearly 0.02 during 2017–20.

In order to explain how model-based estimates from the survey data relate to the birth registration data, I define for woman i with covariates X_i the probability $P[B_i = j|X_i]$, where $B_i = 1$ indicates a birth between panel waves, and 0 if no birth occurs. Also, I define the probability $P[R_i = j|X_i]$, where $R_i = 1$ if the person remains in the panel between waves, and 0 if they do not. Because we do not know the value of B_i if they drop out of the panel, the probability of a birth can only be estimated *conditional* on remaining in the sample, $P[B_i = 1|R_i = 1, X_i]$. But the objective is to estimate how the variables affected the unconditional probability of the event, $P[B_i = 1|X_i]$, which can be observed from the registration data (where X_i indicates age). Appendix 1 in the supplementary material derives the following equation from Bayes Theorem:.

$$P[B_i = 1|X_i] = \frac{P[B_i = 1|R_i = 1, X_i]q_i}{1 - P[B_i = 1|R_i = 1, X_i](1 - q_i)}, \qquad (2)$$

where $q_i = \frac{P[R_i = 1|B_i = 0, X_i]}{P[R_i = 1|B_i = 1, X_i]}$. If, conditional on X_i, remaining in the panel to the subsequent wave is independent of the event, then $q_i = 1$ and the conditional and unconditional probabilities of the event coincide. When $q_i \neq 1$, we cannot infer $P[B_i = 1|X_i]$ from the observed data on $P[B_i = 1|R_i = 1, X_i]$ and must rely on an approximation based on equation (2).

We do not observe q_i, but we can obtain an estimate of a 'weighted average' q_i, denoted $\hat{q}$, by estimating equation (2) using non-linear least squares across age groups, either globally or for discrete groups (e.g. survey period); $\hat{q}$ is a measure of how close the unconditional probability is to its conditional counterpart. It gives more weight to age groups for which the difference between the conditional and unconditional birth probabilities is larger (e.g. women aged 25–29 during 2010–12).

For the three survey periods, the estimates of $\hat{q}$ are 0.86 (0.05), 0.98 (0.04), and 1.06 (0.06) for 2010–12, 2013–16, and 2017–20, respectively

Figure 1 Age-specific fertility rates: difference between rates based on registration data and rates predicted by the estimated model: England and Wales, 2010–12, 2013–16, and 2017–20
Note: Differences show the registration rate *minus* the model rate.
Source: Author's analysis of data from Understanding Society 2010–20 and birth registration data (ONS 2020).

(robust standard errors (SEs) in parentheses). With the exception of 2010–12, the 95 per cent confidence interval for $\hat{q}$ contains unity. It appears that sample attrition related to fertility is not a large problem for estimated fertility probabilities based on conditional rates beyond 2012, but the estimate of $\hat{q}$ =0.86 for 2010–12 suggests that women having a birth are more likely to remain in the panel than those who do not, leading to an overstatement of age-specific fertility rates in 2010–12 from the survey data.

The TFRs estimated from the model for the three survey periods are 2.13 (0.05), 1.83 (0.04), and 1.57 (0.04), respectively (bootstrapped SEs in parentheses); for comparison, the corresponding TFRs from registration data are 1.94, 1.83, and 1.67. The standardized mean ages at childbirth calculated from the estimated model are 29.4 (0.15), 30.4 (0.13), and 31.2 (0.15), respectively (SEs in parentheses), compared with the standardized mean ages at childbirth of 29.7, 30.2, and 30.6, respectively, calculated from the registration data (ONS 2020, Table 1). The estimated $\hat{q}$ could be used to adjust the age-specific rates estimated from the survey data using equation (2). For instance, this would lead to estimated TFRs from the survey data of 1.84 (0.05), 1.77 (0.04), and 1.65 (0.04), respectively (note that the reported SEs do not allow for uncertainty in the adjustment factor $\hat{q}$, making them conservative). This adjustment changes the estimated mean age at childbirth only marginally.

Although not perfect, particularly regarding the TFR in 2010–12, the model estimated from the survey data appears to replicate the registration data well enough to use as the basis for calculating fertility differences between education groups, defined either by parents' education only or by women's own education relative to their parents' education. We could also adjust the differences using $\hat{q}$ if we assumed it does not differ by family background, an untestable assumption. In this respect, it is somewhat reassuring that analysis of the probability of selection into the sample containing wave-on-wave fertility information in Appendix 2 (supplementary material) indicates only small differences in the selection probability in relation to parents' education. It also shows that the selection probability is higher for women with a partner (particularly compared with women living with parents), which may help account for the overstatement of fertility during 2010–12. Re-estimation of the model after reweighting the data by the inverse of the probability of selection predicted from observed covariates produced very small changes to the age-specific fertility predictions in each survey period.

Differences and changes in fertility by the education of a woman's parents

Information on women's parents' education is obtained from respondents, not directly from their parents. The question is: Thinking first about your father's (mother's) educational qualifications, which of these best describes the type of qualifications your father (mother) gained? Possible answers are as follows: 1. He (she) did not go to school at all; 2. He (she) left school with no qualifications or certificates; 3. He (she) left school with some qualifications or certificates; 4. He (she) gained post-school qualifications or certificates (e.g. City & Guilds); 5. He (she) gained a university degree or higher degree; 6. Other; 7. Don't know. The variable in the Understanding Society data is labelled pa(ma)edqf.

Here I focus on parents' education in two groups: (1) women for whom *at least one* parent had gained some qualification or degree beyond secondary school (categories 4 and 5 in the answers; 'post-school education' for short), representing 56 per cent of women in the sample (55, 56, and 57 per cent, respectively in the three survey periods); and (2) women for whom this was not the case (i.e. both parents left school with no qualifications or some qualifications). This dichotomous educational indicator of family background is preferred to parents' occupational group, to retain statistical power and to facilitate intergenerational educational comparisons in the next section.

The model in equation (1) is estimated separately for these two education groups. Figure 2 illustrates the estimated profile of age-specific fertility rates in each group for the earliest and latest of the three survey periods.

Total fertility and fertility timing

It appears from Figure 2 that women with more educated parents start childbearing more slowly and end up with fewer children. The chart also suggests that within each of the two parental education groups there has been increasing fertility postponement and lower fertility over time.

The magnitude of these changes in age-specific fertility profiles is clearer from some synthetic summary measures of fertility: TFR, the proportions of total fertility achieved by specific ages and the standardized mean age at childbirth. Although it is easier to think about the results using these measures rather than parameter estimates, we need some idea of the precision of the estimates of these quantities, namely their SEs. These are not straightforward to calculate for the summary measures other than via bootstrapping, the method I use.

Table 1 shows bootstrapped estimates of the mean summary measures (and their SEs) for each survey period, including changes between 2010–12 and 2017–20. Note that the reported SEs reflect sampling error in estimating the parameters of the model used to calculate the TFR and other summary statistics and are conditional on the model being a valid representation of the age-specific birth processes, some evidence for which was provided in the previous section. A benchmark for these period estimates comes from analysis of cohort completed fertility from Understanding Society (Appendix 3, Table A4, supplementary material): for women aged 40–50 born in the 1970s, the estimated completed fertility was 2.06 (SE = 0.04) among women whose parents were not educated beyond secondary school and 1.78 (SE = 0.03) among those whose parents had a post-school qualification, a difference of 0.29 (SE = 0.05), similar to the estimated TFR difference of 0.25 for 2010–12 in Table 1.

During 2010–12, women whose parents did not have post-school education displayed a higher TFR and had their children sooner than women with better educated parents (Table 1). The analysis in the previous section strongly suggested that the survey data overstate age-specific rates in this period, which could mean that differences between groups in the TFR and its change over time are also overstated. Appendix 1 (Table A1, supplementary material) recalculates the age-specific rates and TFR for 2010–12 using the adjustment factor $\hat{q} =$ 0.85. The difference in the TFR between groups is indeed smaller (0.22, SE = 0.10), but not substantially so, and its decline between 2010–12 and 2017–20 is smaller but still substantial. Neither the mean nor SD of the other summary statistics are affected by the adjustment.

Over the decade, differences by parents' education in the proportions of their TFR achieved by ages 30 and 35 widened, as did the difference in the mean age at childbirth (Table 1, lowest panel). For instance, in 2017–20 the percentage of the TFR achieved by age 30 was 52 per cent for the low parental education group compared with 39 per cent

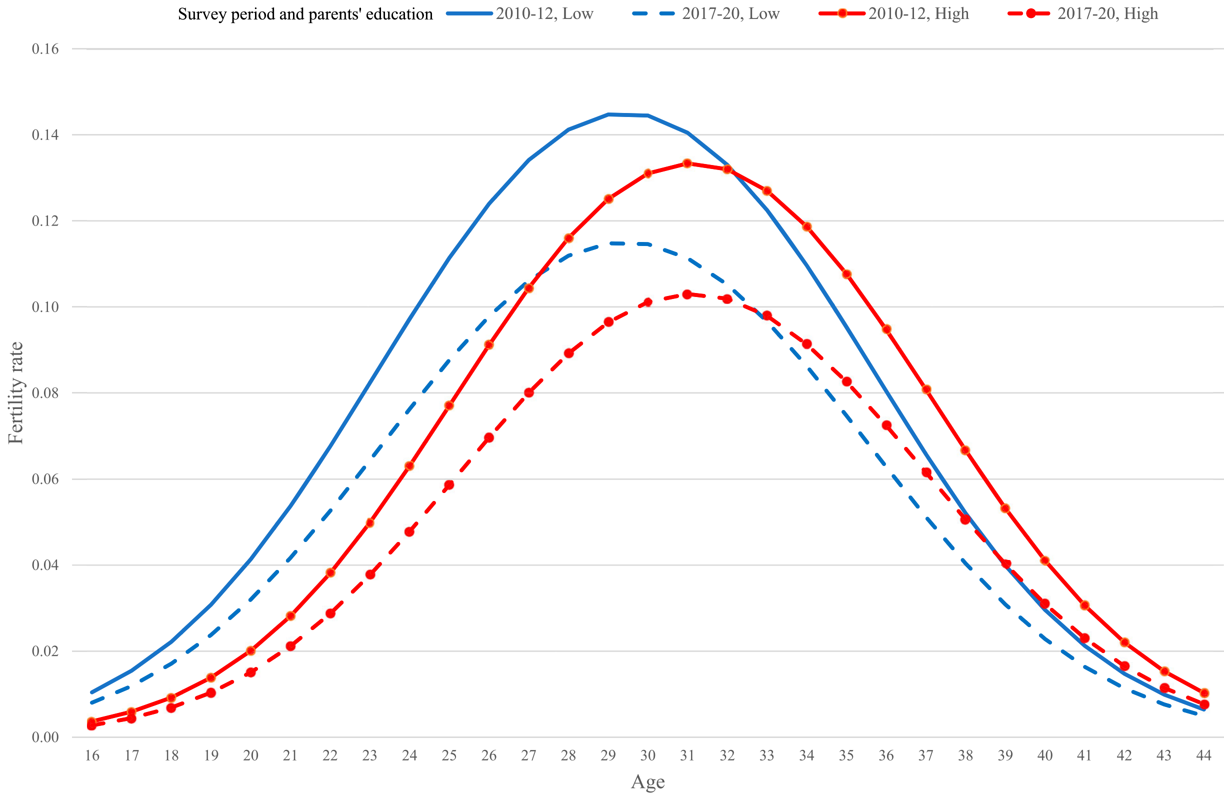

Figure 2 Estimated age profiles of fertility rates by educational level of a woman's parents: England and Wales, 2010–12 and 2017–20
Source: Author's analysis of data from Understanding Society 2010–20.

for the high parental education group, in contrast to 60 and 50 per cent, respectively, in 2010–12. Within each survey period, the birth timing differences by parents' education are relatively precisely estimated, as are the estimated changes over time within groups. This is not true for the 'difference in differences' in the bottom right corner of Table 1, which report the differences by parents' education in the changes between 2010–12 and 2017–20. Even with relatively large samples, it is not possible to estimate these with any reasonable precision.

For a parity perspective, Appendix 4 (Table A7, supplementary material) reports estimates of period parity progression ratios (PPRs) by parents' education group. These indicate that the higher TFR in the lower parental education group arises because this group's PPRs are all higher other than the progression from first to second birth, but the precision of the estimates does not allow firm conclusions about the differences in PPR between the two groups. There is, however, evidence of statistically significant declines (at the 0.05 level) between 2010–12 and 2017–20 in progression to first and second births and in the TFR, and these are of similar magnitude within both parental education groups.

First-birth rates

Changes in the first-birth rate appear to have played an important role in the 2010–20 fertility decline in England and Wales (Ermisch 2021), and Berrington et al. (2015) found that the gradient in completed fertility by women's own education was accounted for almost entirely by educational differences in the proportions remaining childless and the age distribution of mothers at entry into motherhood. Table 2 focuses on the period first birth progression ratio (PPR0), the proportion of women having their first birth by age 30, and the mean age at first birth.

During the recent decade, there was a decline in the PPR0 for both parental education groups, with the decline being larger for women with less educated parents. Indeed, the parental education difference in the PPR0 disappeared between 2010–12 and 2013–2016. By the end of the decade, it was 76 per cent for both groups (with Normal-based 95 per cent confidence intervals of 69–84 per cent for the low education group and 71–82 per cent for the high group). The proportion having a child by age 30 fell by more than the overall first birth parity progression ratio and by

Table 1 Total fertility rate and fertility timing measures by parents' education group (bootstrapped estimates with 1,000 replications): England and Wales, 2010–12 to 2017–20

	Mean (SE)			
	2010–12	2013–16	2017–20	Change 2010–12 to 2017–20 (SE of difference)[1]
Low education (parents')				
TFR	2.17	1.82	1.59	**−0.58**
	(0.09)	(0.09)	(0.10)	(0.14)
p30	0.60	0.56	0.52	**−0.08**
	(0.02)	(0.02)	(0.03)	(0.03)
p35	0.87	0.85	0.82	**−0.05**
	(0.01)	(0.01)	(0.02)	(0.02)
Mean age	29.1	29.7	30.2	**1.1**
	(0.02)	(0.3)	(0.4)	(0.4)
High education (parents')				
TFR	1.93	1.69	1.39	**−0.53**
	(0.07)	(0.07)	(0.07)	(0.10)
p30	0.50	0.45	0.39	**−0.11**
	(0.02)	(0.02)	(0.02)	(0.03)
p35	0.82	0.78	0.74	**−0.08**
	(0.01)	(0.01)	(0.02)	(0.02)
Mean age	30.5	31.2	31.9	**1.4**
	(0.3)	(0.2)	(0.3)	(0.4)
Parental educational difference, Low minus *High*[1]				
TFR	**0.25**	0.13	0.20	−0.05
	(0.12)	(0.11)	(0.13)	(0.17)
p30	**0.10**	**0.11**	**0.13**	0.03
	(0.03)	(0.03)	(0.03)	(0.04)
p35	**0.05**	**0.07**	**0.09**	0.03
	(0.02)	(0.02)	(0.02)	(0.03)
Mean age	**−1.5**	**−1.5**	**−1.7**	−0.3
	(0.4)	(0.4)	(0.5)	(0.1)

[1]Entries in bold are at least twice their standard error (SE).

Notes: p*j* indicates the proportion of the TFR achieved by age *j*; mean age is the standardized mean age at childbirth. Standard errors are shown in parentheses. The sample of women for whom we have information on their parents' education may not accurately represent the distribution of parents' education in the population. As a consequence, the predicted overall TFR from the samples used in Table 1 may not match the prediction from a sample which does not distinguish by parents' education. For example, for 2017–20 the predicted TFR for the low and high parental education groups are 1.59 and 1.39 respectively, implying an overall mean TFR of 1.48, but a sample not confined to those for whom we know their parents' education predicts a TFR of 1.57.

Source: Author's analysis of data from Understanding Society 2010–20.

similar amounts for the two parental education groups, leaving a gap of 15 percentage points between the women with low and high educated parents at the end of the decade. However, the gap in mean age at first birth widened.

It may be helpful to provide a cohort context for the figures in Table 2. Appendix 3 (Table A5, supplementary material) shows that among women aged 40–50 born in the 1970s, the estimated first birth progression ratio was 0.88 (SE = 0.01) for women with less educated parents and 0.85 (SE = 0.01) for those with better educated parents, a difference of 0.03 (SE = 0.01), slightly smaller than the difference in the period PPR0 measure for 2010–12. In this same cohort, the mean age at first birth among women having a child was 23.2 for the lower parental education group and 24.3 for higher parental education group (Table A6), a smaller group difference than for the estimated period mean ages in 2010–12 of 26.9 and 28.9, respectively.

As suggested in the Introduction, parents' education is positively associated with their daughters' education. In the Understanding Society data, the probability of obtaining a university degree was 0.2 higher for women whose parents had post-school education than for those with less educated parents within each of the survey periods. Women's own education may have a causal impact on fertility (e.g. see Fort et al. 2016 and Breen and Ermisch 2017 for evidence) and will certainly be correlated with it. The next section considers the educational levels of women and their parents together.

Table 2 Period first birth progression ratio, proportion having first birth by age 30, and mean age at first birth by parents' education group (bootstrapped estimates with 1,000 replications): England and Wales, 2010–12 to 2017–20

	Mean (SE)			
	2010–12	2013–16	2017–20	Change 2010–12 to 2017–20 (SE of difference)[1]
Low education (parents')				
PPR0	0.91	0.81	0.76	**−0.15**
	(0.02)	(0.03)	(0.04)	(0.04)
PPR0 to 30	0.65	0.49	0.42	**−0.23**
	(0.02)	(0.04)	(0.05)	(0.06)
Mean age at first birth	26.9	28.4	29.0	**2.1**
	(0.4)	(0.5)	(0.6)	(0.8)
High education (parents')				
PPR0	0.87	0.81	0.76	**−0.11**
	(0.02)	(0.02)	(0.03)	(0.03)
PPR0 to 30	0.49	0.38	0.27	**−0.22**
	(0.03)	(0.03)	(0.03)	(0.04)
Mean age at first birth	28.9	30.1	31.6	**2.6**
	(0.4)	(0.4)	(0.4)	(0.6)
Parental educational difference[1]				
PPR0	0.04	−0.01	−0.00	−0.04
	(0.03)	(0.04)	(0.05)	(0.05)
PPR0 to 30	**0.16**	**0.11**	**0.15**	−0.01
	(0.04)	(0.05)	(0.05)	(0.07)
Mean age at first birth	**2.0**	**1.7**	**2.6**	0.5
	(0.6)	(0.6)	(0.8)	(0.9)

[1]Entries in bold are at least twice their standard error (SE).
Notes: PPR0 is the proportion of women ever having a first birth from a period perspective; PPR0 to 30 is the proportion having a first birth by age 30; and Mean age is the mean age at first birth.
Source: As for Table 1.

Intergenerational educational mobility and fertility

Data on a woman's own education are self-reported in Understanding Society and updated at each wave as necessary. 'High' education for a woman is indicated by her having obtained a university degree (or equivalent) by her last interview in the panel. If she obtained a degree, it happened after being at risk of a birth for a number of years, but the purpose here is purely descriptive, and having a time-invariant education variable for each woman is convenient for classification. The shift in the education distribution between the two generations justifies using different attainment thresholds to distinguish 'high' (H) and 'low' (L) education in the current and parental generations.

Table 3 indicates that across all survey periods, 54 per cent of women of childbearing age had obtained a degree and 56 per cent of their parents were educated beyond secondary school. As the decade progressed, more women came from the persistently high (HH) group (both generations better educated) and fewer from the persistently low (LL) group (both generations less well educated). Overall, among women whose parents had low education, about 40 per cent were upwardly mobile (LH) in the sense of obtaining a degree, while among women whose parents were better educated, 36 per cent were downwardly mobile (HL; did not obtain a degree). Within the mobile group, the proportion of women moving upward increased over the decade (i.e. LH / (LH + HL)) from 0.46 to 0.50.

To assess the impact on recent period fertility, equation (1) is estimated separately for these four intergenerational educational mobility groups. Table 4 shows the estimated TFR, the proportion of the TFR achieved by age 30, and the standardized mean age at childbirth for the four groups for the three survey periods. The last column indicates that all four groups exhibited a significant decline in their TFR, and over the decade all groups delayed childbearing further, with the largest increases in postponement being in the educationally mobile groups in contrast to the persistent ones.

Table 5 shows the differences in total fertility and its timing across the educational mobility groups. Differences in the TFR (panel A) are usually not precisely estimated (i.e. the SEs of the differences are large), but many of the birth timing differences

Table 3 Intergenerational distribution of education by survey period: England and Wales, 2010–12 to 2017–20

	2010–12		2013–16		2017–20		All years	
	Own education		Own education		Own education		Own education	
Parents' education	Low	High	Low	High	Low	High	Low	High
Low	0.27	0.18	0.25	0.18	0.24	0.19	0.26	0.18
High	0.21	0.34	0.20	0.36	0.19	0.38	0.20	0.36

Note: For parents' education, High indicates post-school education; for children's generation (own education), High indicates degree or higher.
Source: As for Table 1.

(panels B and C) are estimated with reasonable precision. The TFR exception is the LL group, which displayed significantly higher fertility than all other groups in 2010–12 and also significantly higher fertility than the LH and HH groups in 2013–16, but otherwise the TFR differences are not precisely estimated. For 2017–20 the precision is such that no group differed significantly from any other.

Regarding birth timing, the group slowest in achieving their final fertility consisted of women with degrees and better educated parents, whereas the fastest group were the less educated with less educated parents. Also, the upwardly mobile postponed significantly longer than the downwardly mobile. The downwardly mobile achieved a very similar proportion of fertility by age 30 and their mean age at childbirth was similar to that of the persistently low group during 2010–12, with the downwardly mobile emerging as slower than the persistently low group in achieving their fertility during the period 2013–20. The upwardly mobile group of women became increasingly similar to the persistently high group in

Table 4 Changes over time in fertility and its timing within educational mobility categories (bootstrapped estimates with 1,000 replications): England and Wales, 2010–12 to 2017–20

Intergenerational educational mobility group	2010–12 Mean (SE)	2013–16 Mean (SE)	2017–20 Mean (SE)	Change 2010–12 to 2017–20 Mean[1] (SE)
			TFR	
Low to Low (LL)	2.33	1.97	1.64	**−0.69**
	(0.13)	(0.12)	(0.16)	(0.21)
Low to High (LH)	1.89	1.62	1.44	**−0.45**
	(0.12)	(0.11)	(0.13)	(0.18)
High to Low (HL)	1.97	1.75	1.31	**−0.66**
	(0.12)	(0.12)	(0.13)	(0.18)
High to High (HH)	1.82	1.59	1.39	**−0.43**
	0.09	(0.07)	(0.09)	(0.13)
		Proportion of TFR achieved by age 30		
Low to Low (LL)	0.66	0.64	0.61	−0.04
	(0.02)	(0.02)	(0.42)	(0.04)
Low to High (LH)	0.47	0.41	0.35	**−0.12**
	(0.03)	(0.03)	(0.03)	(0.04)
High to Low (HL)	0.65	0.61	0.51	**−0.14**
	(0.02)	(0.03)	(0.04)	(0.05)
High to High (HH)	0.37	0.33	0.32	−0.05
	(0.02)	(0.02)	(0.02)	(0.03)
			Mean age at childbirth	
Low to Low (LL)	28.1	28.4	28.8	0.7
	(0.3)	(0.4)	(0.6)	(0.6)
Low to High (LH)	30.9	31.6	32.3	**1.4**
	(0.3)	(0.3)	(0.4)	(0.5)
High to Low (HL)	28.4	29.0	30.4	**2.0**
	(0.4)	(0.4)	(0.6)	(0.7)
High to High (HH)	32.1	32.7	32.7	0.6
	(0.3)	(0.2)	(0.3)	(0.4)

[1]Entries in bold are at least twice their standard error (SE).
Note: For parents' education, High indicates post-school education; for children's generation (own education), High indicates degree or higher.
Source: As for Table 1.

Table 5 Tests of fertility differences between intergenerational educational mobility groups, (bootstrapped estimates with 1,000 replications): England and Wales, 2010–12 to 2017–20

A. Tests for differences in TFR

Parents' education	2010–12		2013–16		2017–20	
	Own education		Own education		Own education	
	Low	High	Low	High	Low	High
Low	2.33	1.89	1.96	1.62	1.64	1.44
High	1.97	1.82	1.75	1.59	1.31	1.39
Comparison between intergenerational mobility groups	Difference[1]	SE of difference	Difference[1]	SE of difference	Difference[1]	SE of difference
LL vs HH	**0.51**	*0.16*	**0.37**	**0.14**	*0.25*	*0.18*
LL vs LH	**0.44**	*0.18*	**0.34**	**0.17**	*0.20*	*0.20*
HL vs LH	−0.08	*0.17*	−0.13	0.16	*0.13*	*0.18*
LH vs HH	0.07	*0.15*	0.04	0.13	*0.05*	*0.15*
HL vs HH	0.15	*0.15*	0.17	0.14	*−0.08*	*0.16*
LL vs HL	**0.36**	*0.18*	0.21	0.17	*0.33*	*0.21*

B. Tests for differences in proportion of TFR achieved by age 30

Parents' education	2010–12		2013–16		2017–20	
	Own education		*Own education*		*Own education*	
	Low	High	Low	High	Low	High
Low	0.66	0.47	0.64	0.41	0.61	0.35
High	0.65	0.37	0.61	0.33	0.51	0.32
Comparison between intergenerational mobility groups	Difference[1]	SE of difference	Difference[1]	SE of difference	Difference[1]	SE of difference
LL vs HH	**0.28**	*0.03*	**0.31**	*0.03*	**0.29**	*0.04*
LL vs LH	**0.19**	*0.04*	**0.23**	*0.04*	**0.26**	*0.05*
HL vs LH	**−0.18**	*0.04*	**−0.20**	*0.04*	**−0.16**	*0.05*
LH vs HH	**0.09**	*0.04*	**0.08**	*0.03*	0.03	*0.04*
HL vs HH	**0.28**	*0.03*	**0.28**	*0.03*	**0.18**	*0.05*
LL vs HL	0.01	*0.03*	0.03	*0.04*	**0.11**	*0.05*

C. Tests for differences in the mean age at childbirth

Parents' education	2010–12		2013–16		2017–20	
	Own education		*Own education*		*Own education*	
	Low	High	Low	High	Low	High
Low	28.1	30.9	28.4	31.6	28.8	32.3
High	28.8	32.1	30.0	32.7	30.4	32.7
Comparison between intergenerational mobility groups	Difference[1]	SE of difference	Difference[1]	SE of difference	Difference[1]	SE of difference
LL vs HH	**−3.9**	0.4	**−4.2**	0.4	**−3.9**	0.6
LL vs LH	**−2.8**	0.5	**−3.1**	0.5	**−3.5**	0.7
HL vs LH	**2.1**	0.5	**1.6**	0.5	**1.9**	0.7
LH vs HH	**−1.2**	0.4	**−1.1**	0.4	−0.4	0.5
HL vs HH	**−3.3**	0.5	**−2.7**	0.4	**−2.3**	0.6
LL vs HL	−0.6	0.5	**−1.6**	0.5	**−1.6**	0.8

[1]Entries in bold are at least twice their standard error.

Note: For parents' education, High indicates post-school education; for children's generation (own education), High indicates degree or higher. LL = Low to Low; LH = Low to High; HL = High to Low; HH = High to High.

Source: As for Table 1.

terms of mean age. Thus, the educational mobility categories help to differentiate fertility timing beyond a classification based solely on parents' education.

The results in Table 5 are broadly consistent with the 'dual socialization' hypothesis, as represented, for example, in Duncan's (1966) 'square additive

Table 6 Square additive baseline model for fertility (r = 2)

Parents' education	Own education: Low	Own education: High
Low	$\mu + \alpha_L + \beta_L$	$\mu + \alpha_L - \beta_L$
High	$\mu - \alpha_L + \beta_L$	$\mu - \alpha_L - \beta_L$

Source: Author's own.

baseline model'. This has additive parameters representing each origin and destination state: $y_{ij} = \mu + \alpha_i + \beta_j + \varepsilon_{ij}$, where i indexes origin education and j indexes destination education; $\sum_{i=1}^{r} \alpha_i = 0$; μ is the grand mean of fertility measure y_{ij}; and ε_{ij} is a residual error term. For example, in a 2 × 2 mobility table, the matrix of fertility measures y_{ij} is shown in Table 6. Each cell of fertility outcomes depends on both the origin and destination 'socialization parameters', and the values in the off-diagonal cells lie between those on the diagonal, as is also generally the case in Table 5. For example, estimation of the square additive baseline model for the mean age at childbirth (based on the simulated data sets for 2013–16, which generated panel C in Table 5), yields estimates $\widehat{\alpha_L} = -0.4$, $\widehat{\beta_L} = -1.7$, $\hat{\mu} = 30.4$, suggesting a larger influence of destination than origin social environment, a pattern also evident for the TFR: $\widehat{\alpha_L} = 0.064$, $\widehat{\beta_L} = 0.128$ $\hat{\mu} = 1.73$.

The mean age at childbirth among educationally mobile women is, however, higher than predicted by the additive model, whereas the TFR is lower (results not shown). This might be a consequence of lower childbearing support because of mobility-related social disruption. There is little evidence for the selection hypothesis (e.g. exceptionally high fertility among the downwardly mobile); indeed for 2017–20 the TFR was lower among the downwardly mobile than the upwardly mobile (Table 5). But it is impossible to distinguish clearly between theories, particularly with the two-group educational classification.

Within parents' education groups, a woman's possession of a degree is associated with later fertility than for women without a degree, which is consistent with educational differences in women's fertility in England and Wales from previous studies (Sigle 2008; Rendall et al. 2010; Wood et al. 2014; Berrington et al. 2015). Among women with a degree who were interviewed before 2017, those whose parents were also more highly educated (i.e. beyond secondary school) had their children later, but this difference virtually disappeared in 2017–20. Another characterization of the results for 2017–20 in Table 5 is that if a woman had a degree, her parents' education was irrelevant, but if she did not, then her parents' education mattered: those whose parents did not have post-school education reported higher and earlier fertility. This contrasts with the period 2010–16, in which among women with a degree, those with less educated parents had their children sooner.

Analysis of first births found that the PPR0 was not estimated with sufficient precision to indicate any significant differences among educational mobility groups (results not shown). With respect to the timing of motherhood, the only difference that emerged was later entry among the persistently high education group during 2010–16, and even that disappeared by the 2017–20 period, in which early motherhood among the persistently low education group was the only exception.

Conclusions

The contributions of the current study are fourfold. First, in contrast to earlier studies of fertility differentials by women's own education, it also investigated differences defined by the education of a woman's parents, which has the advantage of being predetermined with respect to a woman's fertility and is an important indicator of family background. Second, it studied fertility in relation to intergenerational educational mobility, which, despite theoretical reasons for doing so, has rarely been studied. This aspect of the study came closest in conception to an English study of completed fertility in relation to intergenerational occupational mobility from over 70 years ago (Berent 1952). Third, it focused on period fertility during its steep decline during the decade 2010–20 to the lowest TFR ever observed in England and Wales. Finally, it proposed a method to check for and quantify non-ignorable attrition in survey data when there are comparable population data on marginal distributions of fertility with respect to age.

The substantial recent decline in period fertility was experienced irrespective of education group, whether defined by education of a woman's parents alone or by a woman's own education relative to her parents' education. Women with parents not educated beyond secondary school had their children quicker than those with better educated parents. Differences in the TFR by parents' education appear to have declined during the decade 2010–20, although estimates of the TFR were too imprecise to be conclusive on that score.

Considering parents' education and women's own education together, thereby forming intergenerational educational mobility groups, helps to differentiate women's TFRs and the timing of their children throughout the decade compared with distinguishing only parents' education or only women's own education. For instance, upwardly mobile women (in educational terms) delayed their childbearing much more than downwardly mobile women, and indeed by the end of the decade the upwardly mobile differed very little in this respect from better educated women whose parents were also more highly educated. The analysis also showed more clearly a narrowing of TFR differentials over the decade, but timing differences persist. It appears possible to replicate this study of the relationship between fertility and intergenerational educational mobility in the Nordic countries with intergenerational register data (Sweden, Norway, Denmark, and Finland). The analysis could also be extended to occupational or social class mobility.

In broad terms, the intergenerational results were consistent with the dual socialization hypothesis, which contends that membership of both origin and destination education groups influences fertility goals and behaviour. There was, however, evidence of additional mobility effects beyond the baseline model, which may reflect less support for childbearing among the educationally mobile. But these data did not allow me to distinguish well between theories, particularly because of the two-group educational classification in which I could not gauge the distance of social mobility.

In relation to the previous literature on fertility differentials by women's own education, possession of a degree was associated with later fertility compared with not having a degree, even within parents' education groups. But a woman's parents' education also matters. During 2010–16, among women with a degree, those whose parents were not post-school educated had their children sooner. This changed for 2017–20, when having a degree made a woman's parents' education irrelevant, but in the absence of a degree, women with less educated parents experienced earlier and higher fertility.

The decline in fertility in England and Wales during 2010–20, which occurred across social groups defined by parents' and own education, and reflected substantial postponement of fertility in women's lives, is broadly consistent with the similar declines in aggregate period fertility measures seen across many countries with relatively low fertility. The results suggest that the factors operating to reduce period fertility were not confined to particular social groups defined by family background or educational mobility but operated more broadly in society.

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References

Amin, V., and J. R. Behrman. 2014. Do more-schooled women have fewer children and delay childbearing? Evidence from a sample of US twins, *Journal of Population Economics* 27: 1–31. https://doi.org/10.1007/s00148-013-0470-z

Andersson, G., M. Rønsen, L. B. Knudsen, T. Lappegård, G. Neyer, K. Skrede, K. Teschner, et al. 2009. Cohort fertility patterns in the Nordic countries, *Demographic Research* 20: 313–352. https://doi.org/10.4054/DemRes.2009.20.14

Basten, S., T. Sobotka, and K. Zeman. 2014. Future fertility in low fertility countries, in W. Lutz, W. P. Butz and K.C. Samir (eds), *World Population and Human Capital in the Twenty-First Century*. Oxford: Oxford University Press, pp. 39–149.

Beaujouan, Eva, and Anne Solaz. 2019. Is the family size of parents and children still related? Revisiting the cross-generational relationship over the last century, *Demography* 56(2): 595–619. https://doi.org/10.1007/s13524-019-00767-5

Berent, J. 1952. Fertility and social mobility, *Population Studies* 5(3): 244–260. https://doi.org/10.1080/00324728.1952.10416679

Berrington, Ann, Juliet Stone, and Eva Beaujouan. 2015. Educational differences in timing and quantum of childbearing in Britain: A study of cohorts born 1940–1969, *Demographic Research* 33: 733–764. https://doi.org/10.4054/DemRes.2015.33.26

Breen, R., and J. Ermisch. 2017. Educational reproduction in Great Britain: A prospective approach, *European Sociological Review* 33(4): 590–603. https://doi.org/10.1093/esr/jcx061

Dalla Zuanna, Gianpiero. 2007. Social mobility and fertility, *Demographic Research* 17: 441–464. https://doi.org/10.4054/DemRes.2007.17.15

Davis, Kingsley. 1963. The theory of change and response in modern demographic history, *Population Index* 29: 345–366. https://doi.org/10.2307/2732014

Duncan, Otis Dudley. 1966. Methodological issues in the analysis of social mobility, in N.J. Smelser and S.M. Lipset (eds), *Social Structure and Mobility in Economic Development*. Chicago: Aldine, pp. 51–97.

Durkheim, Emile. 1951. *Suicide*. J. A. Spaulding and G. Simpson (trans.). Glencoe: Ill.: Free Press.

Ermisch, J. and Chiara Pronzato. 2011. Causal effects of parents' education on children's education. In: *Persistence, Privilege, and Parenting* (Tim Smeeding, Robert Erikson and Markus Jäntti, editors). New York: Russell Sage Foundation. pp. 237–260.

Ermisch, J., M. Jäntti, and T. Smeeding. 2012. *From Parents to Children: The Intergenerational Transmission of Advantage*. New York: Russell Sage.

Ermisch, J. 2021. English fertility heads south: Understanding the recent decline, *Demographic Research* 45: 903–916. https://doi.org/10.4054/DemRes.2021.45.29

Fleury, N., and F. Gilles. 2018. The intergenerational transmission of education. A meta-regression analysis, *Education Economics* 26: 557–573. https://doi.org/10.1080/09645292.2018.1517863

Fort, M., N. Schneeweis, and R. Winter-Ebmer. 2016. Is education always reducing fertility? Evidence from compulsory schooling reforms, *The Economic Journal* 126(595): 1823–1855. https://doi.org/ 10.1111/ecoj.12394

Greenhalgh, S. 1988. Fertility as mobility: Sinic transitions, *Population and Development Review* 14(4): 629–674. https://doi.org/10.2307/1973627

Hertz, Tom, Tamara Jayasundera, Patrizio Piraino, Sibel Selcuk, Nicole Smith, and Alina Veraschchagina. 2007. The inheritance of educational inequality international comparisons and fifty-year trends, *The B.E. Journal of Economic Analysis and Policy* 7(2 (Advances)): Article 10. https://www.degruyter.com/document/doi/10.2202/1935-1682.1755/html

Impicciatore, R., and F. Tomatis. 2020. The nexus between education and fertility in six European countries, *Genus* 76: 35. https://doi.org/10.1186/s41118-020-00104-4

Jalovaara, M., G. Neyer, G. Andersson, J. Dahlberg, L. Dommermuth, P. Fallesen, and T. Lappegård. 2019. Education, gender, and cohort fertility in the Nordic countries, *European Journal of Population* 35: 563–586. https://doi.org/10.1007/s10680-018-9492-2

Kearney, M. S., P. B. Levine, and L. Pardue. 2022. The puzzle of falling US birth rates since the Great Recession, *Journal of Economic Perspectives* 36(1): 151–176. https://doi.org/10.1257/jep.36.1.151

Kramarz, F. Rosenqvist, and O. N. Skans. 2021. How family background shapes the relationship between human capital and fertility, *Journal of Population Economics*, https://doi.org/10.1007/s00148-021-00834-5

Kravdal, Øystein. 2007. Effects of current education on second-and third-birth rates among Norwegian women and men born in 1964: Substantive interpretations and methodological issues, *Demographic Research* 17(9): 211–246. https://doi.org/10.4054/DemRes.2007.17.9

Kravdal, Ø, and R. R. Rindfuss. 2008. Changing relationships between education and fertility: A study of women and men born 1940 to 1964, *American Sociological Review* 73: 854–873. https://doi.org/10.1177/000312240807300508

Meisenberg, G. 2008. How universal is the negative correlation between education and fertility?, *Journal of Social, Political and Economic Studies* 33: 205–227.

Mohan, K., and J. Pearl. 2021. Graphical models for processing missing data, *Journal of the American Statistical Association* 116(534): 1023–1037. https://doi.org/10.1080/01621459.2021.1874961

Murphy, Michael. 2013. Cross-national patterns of intergenerational continuities in childbearing in developed countries, *Biodemography and Social Biology* 59(2): 101–126. https://doi.org/10.1080/19485565.2013.833779

Musick, Kelly, Paula England, Sarah Edgington, and Nicole Kangas. 2009. Education differences in intended and unintended fertility, *Social Forces* 88(2): 543–572. https://doi.org/10.1353/sof.0.0278

Nisén, J., P. Martikainen, J. Kaprio, and K. Silventoinen. 2013. Educational differences in completed fertility: A behavioral genetic study of Finnish male and female twins, *Demography* 50: 1399–1420. https://doi.org/10.1007/s13524-012-0186-9

Nisén, J., M. Myrskylä, K. Silventoinen, and P. Martikainen. 2014. Effect of family background on the educational gradient in lifetime fertility of Finnish women born 1940–50, *Population Studies* 68: 321–337. https://doi.org/10.1080/00324728.2014.913807

Nisén, J., S. Klüsener, J. Dahlberg, L. Dommermuth, A. Jasilioniene, M. Kreyenfeld, T. Lappegård, et al. 2021. Educational differences in cohort fertility across sub-national regions of Europe, *European Journal of Population* 37: 263–295. https://doi.org/10.1007/s10680-020-09562-0

ONS, Office of National Statistics. 2020. Births in England and Wales (14 October 2021) https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/livebirths/bulletins/birthsummarytablesenglandandwales/2020.

Rendall, M., E. Aracil, C. Bagavos, C. Couet, A. DeRose, P. DiGiulio, T. Lappegård, et al. 2010. Increasingly heterogeneous ages at first birth by education in Southern European and Anglo-American family-policy regimes: A seven-country comparison by birth cohort, *Population Studies* 64(3): 209–227. https://doi.org/10.1080/00324728.2010.512392

Rodgers, J. L., H. P. Kohler, M. McGue, J. R. Behrman, I. Petersen, P. Bingley, and K. Christensen. 2008. Education and cognitive ability as direct, mediating, or spurious influences on female age at first birth: Behavior genetic models fit to Danish twin data, *American Journal of Sociology* 114(S1): S202–S232. https://doi.org/10.1086/592205

Sigle-Rushton, W. 2008. England and Wales: Stable fertility and pronounced social status differences, *Demographic Research* 19: 455–502. https://doi.org/10.4054/DemRes.2008.19.15

Sobel, Michael E. 1985. Social mobility and fertility revisited: Some new models for the analysis of the mobility effects hypothesis, *American Sociological Review* 50(5): 699–712. https://doi.org/10.2307/2095383

Sorokin, Pitrim A. 1927. *Social Mobility*. New York: Harper and Brothers.

Tropf, F. C., and J. J. Mandemakers. 2017. Is the association between education and fertility postponement causal? The role of family background factors, *Demography* 54: 71–91. https://doi.org/10.1007/s13524-016-0531-5

Understanding Society. 2019. *Understanding Society: The UK Household Longitudinal Study Waves 1–9 User Guide*. Colchester (UK): Institute for Social and Economic Research.

Understanding Society. 2021a. *About the Study* https://www.understandingsociety.ac.uk/about/about-the-study).

Understanding Society. 2021b. *Main Survey User Guide* https://www.understandingsociety.ac.uk/documentation/mainstage/user-guides/main-survey-user-guide/.

Washbrook, E., P. S. Clarke, and F. Steele. 2014. Investigating non-ignorable dropout in panel studies of residential mobility, *Journal of the Royal Statistical Society: Series C (Applied Statistics)* 63(2): 239–266. https://doi.org/10.1111/rssc.12028

Westoff, C. F. 1981. Another look at fertility and social mobility, *Population Studies* 35(1): 132–135. https://doi.org/10.2307/2174839

Wood, J., K. Neels, and T. Kil. 2014. The educational gradient of childlessness and cohort parity progression in 14 low fertility countries, *Demographic Research* 31: 1365–1416. https://doi.org/10.4054/DemRes.2014.31.46

Wood, J., S. Klüsener, K. Neels, and M. Myrskylä. 2020. Shifting links in the relationship between education and fertility, *Population, Space and Place* 26(8): e2342. https://doi.org/10.1002/psp.2342

Zang, Emma. 2019. Women's educational attainment and fertility among generation X in the United States, *Population Studies* 73(3): 335–351. https://doi.org/10.1080/00324728.2019.1658799

Zimmer, B. G. 1981. The impact of social mobility on fertility: A reconsideration, *Population Studies* 35(1): 120–131. https://doi.org/10.2307/2174838