Pre-marital sexual activity and marital fertility in the first demographic transition in England and Wales

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Abstract

This paper examines the influence of pre-marital sexual activity and marriage patterns on pre-nuptial pregnancy, age-specific marital fertility and illegitimacy between 1851 and 1911 in England and Wales. This period witnessed the start of the first demographic transition: fertility was declining both within and outwith marriage: rates of marital fertility started to decline from the 1870s or 1880s, and illegitimate fertility from 1851 or before. Delayed marriage also contributed to declines in overall fertility. Of all of these factors, falling marital fertility contributed most to lower overall fertility, and fertility declined among all ages of women older than the mean age at marriage (mid-20s). Among women in their early twenties, however, marital fertility rates increased sharply. We hypothesise that increasing marital fertility rates among young women were due to the increasing selection of pre-nuptially pregnant women into marriage. Two factors contribute to this; first, the increasing demands of Victorian respectability increased the likelihood that any girls who did fall pregnant would marry before the birth of their child, transforming potentially illegitimate births into pre-nuptially conceived but legitimate births. Secondly, as the average age of marriage increased, these women will have formed a higher proportion of married women in their early twenties. Our paper explores plausible levels of exposure to pre-nuptial sexual activity and marriage chances of unmarried pregnant women which would be consistent with observed patterns and changes in illegitimacy, nuptiality and age-specific marital fertility in England and Wales. We test our theories using longitudinal data from Kilmarnock, Scotland 1861-1901.

Introduction

This paper was inspired by our estimates of age-specific marital fertility in England and Wales calculated by applying the Own Child Method to nineteenth-century census data (Reid et al 2019). These estimates, shown in Figure 1, demonstrated that, as expected during the early stages of the fertility decline, fertility was declining among women above the average age at marriage (which was age 25 to 26 for women in this period). However somewhat surprisingly it was increasing among women in their early twenties. We suspected that these increasing rates of marital fertility were due to the increasing selection of already pregnant women into marriage. This would have meant that exposure to the risk of pregnancy amongst recently married women would have been underestimated, and would also mean that highly fecund or highly sexually active women were being selected into early marriage. Additionally, while age at marriage within the population was increasing, if the age at pregnancy of those women who became pre-maritally pregnant was not, or

was increasing at a slower rate, then the inflation of fertility rates in the youngest ages would have been exacerbated by an increasing share of married women being pre-maritally pregnant.

Theoretically then, we could use the age-specific marital fertility schedules to produce estimates of pre-marital pregnancy, and this is the first task of this paper. However we also wanted to examine how our results fit in with long-run patterns of sexual activity, the marriage process, and fertility, and whether there are any implications for our interpretation of the nineteenth and early twentieth century fertility decline. The first part of our paper therefore sets the scene with a brief examination of the history of pre-marital fertility in England and Wales and elsewhere. Subsequent sections introduce our data and methods, produce estimates of pre-marital pregnancy, and test them using a smaller but richer dataset for Kilmarnock in Scotland.
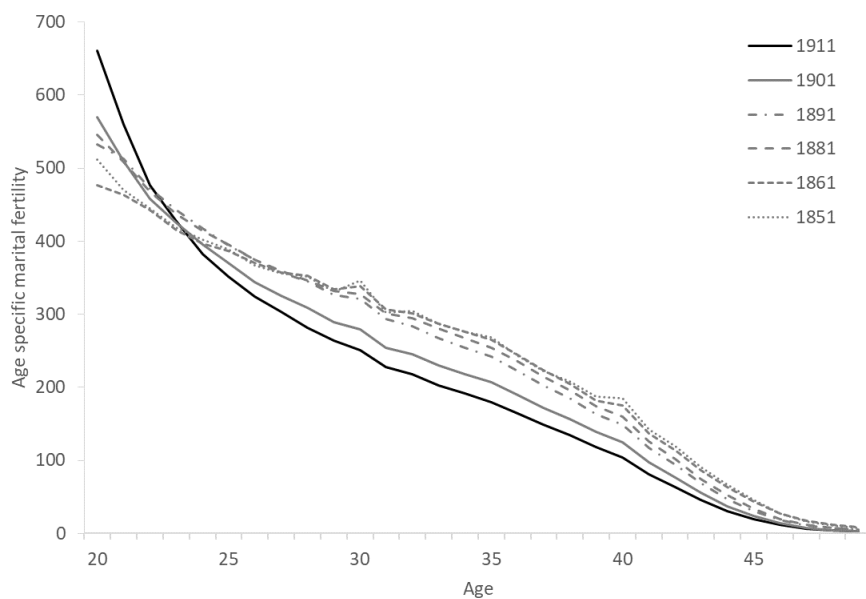

Figure 1: Age-specific marital fertility rates (single years of age) for women with spouse present in the household: England and Wales, 1851-1911

Premarital sexual activity, marriage and fertility: the European historical context

Many historical demographers have argued that pre-marital pregnancy should be considered alongside illegitimacy, age at marriage and marital fertility as part of the marriage and child-bearing process. Figure 2 shows long term trends in Total Marital Fertility (TMFR), the illegitimacy ratio, and prenuptial pregnancy (where available) on the left hand axis. Note that pre-marital fertility estimates have been divided by five to allow them to be shown on a similar scale to illegitimacy and fertility. The right-hand axis shows the age at first marriage among women.

Since about 1970 in Britain, as in most of Europe, North America and other places, there has been a strong *positive* relationship between age at marriage and illegitimacy. The spread of 'second demographic transition values' has accompanied a dissociation of childbearing and marriage; sexual

intercourse outside marriage is very common, and not dependent on engagement or the expectation of marriage. As marriage becomes less popular and the average age at first marriage increases, more births take place outside marriage.

Before 1970, however, there was quite a different relationship between illegitimacy and marriage. Apart from spikes in illegitimacy during the first and second world wars, when age at marriage increased, illegitimacy fell, and when people married earlier, the proportion of births which were illegitimate increased. In other words there was a *negative* relationship between age at marriage and illegitimacy. Up until about 1837, good data on pre-nuptial pregnancy also exist, and for this period there is a clear positive relationship between pre-nuptial pregnancy and illegitimacy, and a negative one between prenuptial pregnancy and age at marriage. The illegitimacy/pre-marital fertility trend is also faintly echoed in marital fertility rates, although secular decline in the marital fertility rate after 1850 makes it less easy to identify this.
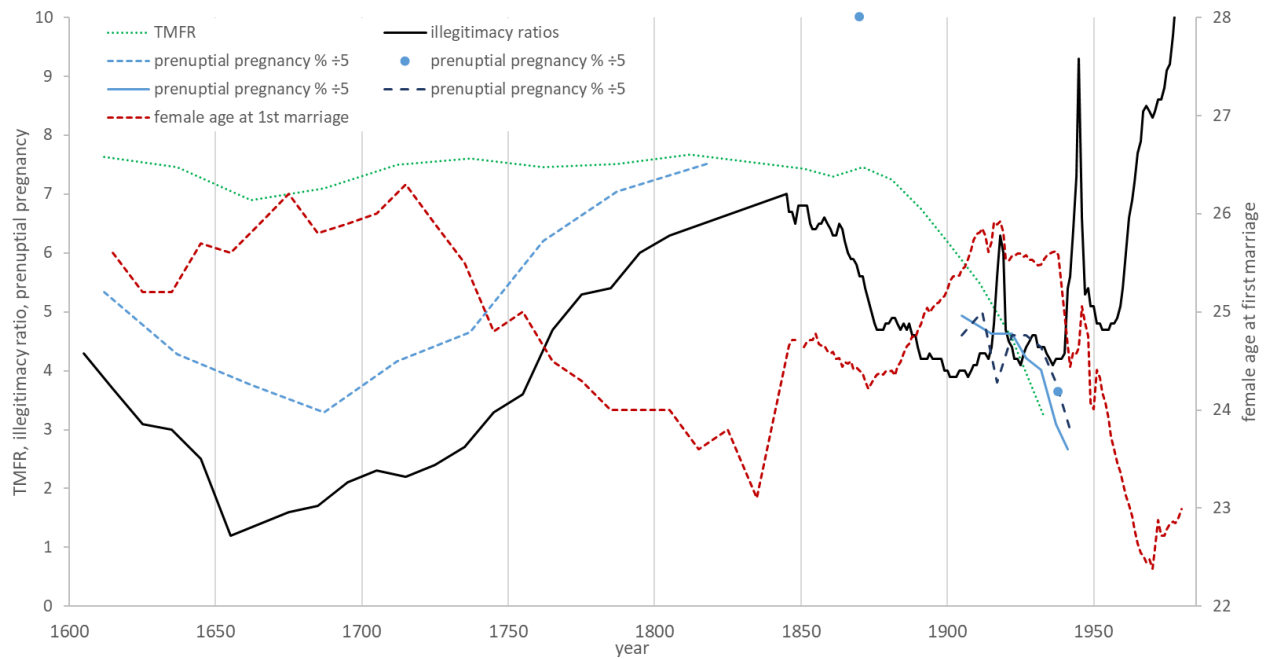

Figure 2: Long-term series of illegitimacy, pre-nuptial pregnancy, female age at first marriage and marital fertility, England (and Wales) 1600-1980

This means that certainly up until 1837, forces pushing towards higher overall fertility were all working in tandem: when marriage age was high, the duration of marriage was shorter so women could not accumulate as many children, there was also less illegitimacy, less pre-nuptial pregnancy, and even marginally lower fertility at each age within marriage. However when women married earlier and therefore had more chance to accumulate children within marriage, they were also more likely to have children before marriage and to be pregnant at marriage. This has led to the general acceptance of Peter Laslett's 'courtship intensity' theory of illegitimacy, which sees illegitimacy and

pre-marital pregnancy as an integral part of the courtship and marriage process. The hypothesis maintains that at some stage in the courtship process, possibly when there was an understanding that the relationship was heading towards marriage, sexual relations commenced. Some couples became pregnant before the marriage took place, and for the majority of these, the marriage did indeed take place as planned, usually at some point between the pregnancy and the birth. However for a minority of couples where the girl fell pregnant something intervened to prevent an anticipated marriage taking place: perhaps the prospective husband was never serious about marriage, one couple's parents objected, or between them the couple had not managed to save enough to set up a new home. According to Laslett's theory, the majority of illegitimate births were the result, not of casual liaisons, but of such frustrated 'engagements'.

Laslett argues that the long-term cycles in these processes were linked to the European Marriage Pattern, according to which marriage in North-Western Europe involved a couple setting up a new household on marriage. This generally meant they had to work and save in order to build up the necessary resources, and therefore their ability to marry might be affected by the general economic situation. Wrigley and Schofield (1981, p.425) have elegantly shown that when times were good and wages were high, women and men married at younger ages, and vice versa. Laslett argued that it was not just that marriages took place earlier when the prospects for marriage were favourable, but that the whole courtship process was engaged in more intensively, with couples become engaged sooner, moving more quickly from kissing, cuddling and mutual masturbation to penetretive sex, and with penetrative sex taking place more frequently among those couples who engaged in it. This meant that there were more pre-marital conceptions – both those which were 'translated' into marital births, but also those which remained illegitimate. Conversely when wages were low and the prospects for marriage were more dismal, courtships were entered into later and with less 'enthusiasm'.
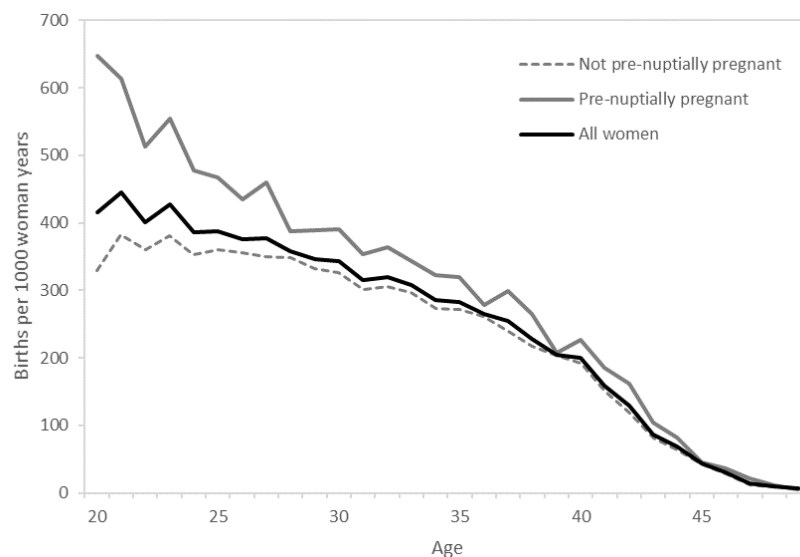

Figure 3: Age-specific marital fertility rates for women who were and were not pre-nuptially pregnant, England 1580-1837

Studies which are based on family reconstitution include dates of marriage and either birth or baptism (and therefore generate a relatively good indication of the extent of premarital conception), indicate that one consequence of pre-nuptial pregnancy is inflated marital fertility among young women. Figure 3 shows data from the 26 English family reconstitutions, distinguishing between women who were premaritally pregnant and those who were not, with the former having higher fertility at every age. This is partly because women who were pregnant on marriage were more fecund, in other words they were more likely to conceive, and this is indicated by their higher fertility throughout the child-bearing age range. The particularly high marital fertility rates among pre-maritally pregnant women in their early twenties, however, are due to the fact that such women's exposure is underestimated because their dates of marriage do not reflect the ages at which they first became exposed to the risk of getting pregnant. Wilson (1984), when examining a sub-sample of these reconstitutions, estimated that women pregnant on marriage should have a year added to their duration of marriage to account for the underestimation in exposure (see also Knodel and Wilson 1981 who also found that the addition of a year was appropriate for German village populations). In other words, pre-nuptially pregnant women contribute births, but not enough exposure to the risk of pregnancy, and high proportions of pre-nuptially pregnant women inflate levels of marital fertility.

Courtship, pre-marital sexual activity, illegitimacy, pre-nuptial pregnancy and age at marriage were therefore all part of the marriage and family formation process before the First Demographic Transition. Now, however, the situation is very different. The Second Demographic Transition (SDT) attributes the new norms of high levels of cohabitation, extra-marital fertility, divorce, and re-partnering to fundamental changes in ideational values towards individual fulfillment (Lestheghe 2010). This paper is not the place to delve into the hows and whys of the SDT, but we note that the characteristic demographic patterns of the SDT illustrate that a complete breakdown of the pre-industrial relationship between the marriage process and illegitimacy has now taken place. The question is, however, when did this breakdown take place? Was it at the outset of the SDT when illegitimacy and age at marriage started to increase in tandem from the 1970s and 1980s, or were the seeds of this change sown earlier, during the first demographic transition and its aftermath?

The first demographic transition was marked by a change from the control of fertility BY marriage to the control of fertility WITHIN marriage. In what is traditionally seen as the first part of the transition, between 1870 and the early years of the 20th century, this was bolstered by an increase in marriage age and a decrease in illegitimacy – which would fit the traditional story of restrained courtship: fewer couples having sex before marriage and those that did having sex less often. However this change followed a brief period of about 50 years where marriage age and illegitimacy seem to have moved in the same direction. Is this evidence of a change in the relationship between age at marriage and illegitimacy? What would that say about the courtship and marriage process and its relationship to the current economic and social climate?

It is unfortunate that the parish register sources which yield such good data on pre-nuptial pregnancy in the pre-industrial era become less reliable in the nineteenth century, and civil

registration, although of high quality, is very rarely available in a form which allows calculation of such rates. Little, therefore, is known about pre-nuptial pregnancy over the period of the first demographic transition. However Robin's reconstitution of mid-nineteenth century Colyton indicated that rates of pre-nuptial pregnancy continued to increase 1851-1881 and by the latter date over half of all first births within marriage occurring in the parish were pre-nuptially conceived (Robin 1986), but this may be an over-estimate. The next reliable estimates for anywhere in England are sourced from the 1938 Registrar General's statistical review for 1938 and 1939, when it seems that the proportion had fallen somewhat: in England and Wales as a whole 18 per cent of brides were definitely pregnant in 1938, but up to 30 per cent of first births could have been conceived out of wedlock (Registrar General 1947 p.193-5). The RG further showed that between 40 and 50 per cent of brides under the age of 20 were pregnant (p.194), noting that 'the highness of the proportion here should be regarded as a sign of grace rather than a matter for reproach, since it is, in the main, a reflection of the willingness on the part of the parents concerned to legitimate their offspring by marriage before birth takes place' (p.194). [NB the RG found that of total births 'irregularly' conceived, nearly 70 percent were regularised by the marriage of the parents before the birth occurred; where the bride was in the 20-24 age group 78 per cent of such births occurred after marriage (p.195)]. There is little evidence for the interim period, but 23 per cent of Lewis-Faning's sample of women married between 1900 and 1924 admitted to being pregnant on marriage (Lewis-Faning p.94). Glass and Grebenik's analysis of data from the Family Census of 1946 shows very similar trends for the early twentieth century (Glass and Grebenik 1954).

While the late nineteenth century figure for Colyton may be atypical, or subject to data biases, early twentieth century figures are likely to be more robust. It seems that the tendency of brides to be pregnant on marriage may have risen into the late ninteenth century and then declined towards the middle of the twentieth. The relationship between pre-nuptial preganancy and illegitimacy just before the first world war seems to have been similar to that in the pre-industrial era, but this is less clear in the interwar period and we should be aware that estimation methods may make it inadvisable to draw too much inference from fine temporal patterns.

What, however, was happening to pre-nuptial pregnancy during the second half of the nineteenth century? On the one hand the early twentieth century information about prenuptial pregnancy suggests that a positive relationship between pre-marital pregnancy and illegitimacy persisted over this period. However if inflated levels of age-specific marital fertility among young women can be attributed to high levels of premarital fertility (as in Figure 3), then the distinct increase in the age-specific fertility of young married women (shown in Figure 1) would suggest increasing pre-nuptial pregnancy and therefore a break in the long-standing relationship between pre-marital pregnancy and illegitimacy, and possibly the breakdown of the pre-industrial courtship and marriage system. Our aim in this paper is to investigate the interpretation of the inflated marital fertility rates among young women in greater detail, and to consider the implications for continuities or changes in the interlinked processes of courtship, sexual activity, marriage and fertility.

Data and methods

Although the civil registration of births, deaths and marriages started was established in England and Wales in 1837, only the summary tables published in the Registrar General's annual and decennial publications are currently available for academic analysis. Even if the individual level birth

certificates were available, they record neither birth order nor marriage date, so complex nominal linkage procedures would be needed to generate estimates of pre-nuptial pregnancy for the later nineteenth century. Instead we have turned to indirect estimates from the decennial censuses taken between 1851 and 1911. The Own Children Method (OCM) uses data on children enumerated with their mothers to estimate fertility rates (Cho et al 1986). Although the method is generally used for overall fertility, it may be used to calculate marital fertility by estimating the length of time women of particular ages have been married and therefore (it is assumed) exposed to the risk of pregnancy using proportions married (Reid et al 2019). This paper uses data from an enhanced version of the Integrated Census Microdata (I-CeM) – a full-count individual level census dataset for England and Wales for the decennial censuses 1851 to 1911 (excluding 1871) (ref). We present results for England and Wales as a whole, and also divided into eight different types of place.

The census data allow us to look at the shape of the age-specific marital fertility curve over time, and to estimate changes in prenuptial fertility, but they don't allow us to actually measure pre-nuptial fertility. Therefore we use a much smaller dataset for the Scottish lowland town of Kilmarnock, 1851-1901, containing linked census and civil registers of birth, death and marriage, to compare census estimates with indicators computed from birth and marriage data. This data has both pros and cons as a test data set. In favour of the data is that it is data from the British Isles, covering most of the time period covered by our English and Welsh census data, and combining both the type of data we use for England and Wales (census data) with reconstitution-type of data (linked births, deaths and marriages) that allow direct measurement of pre-nuptial pregnancy. The census data allows us calculate marital fertility rates for Kilmarnock in exactly the same way as was done for England and Wales, while the linked event data can be used to explore issues of pre-marital conception and fecundity. However the data do not provide an ideal comparison. Kilmarnock is just one, relatively small town, so numbers are small. The data cover a slightly shorter time span, lacking both the 1850s (civil registration did not start until 1855 in Scotland and the dataset starts with the 1861 census) and the 1911 census and decade of births, deaths and marriages leading up to this. This means that less of the fertility decline is captured. Although Scotland's fertility broadly followed a similar decline to that in England and Wales (Anderson 2018, chapter 12), there were also significant differences, with Scotland having higher rates of marital fertility but lower rates of marriage, and more substantial regional variation (Anderson 2018, chapter 13), and this means that the demographic system(s) operating North of the Scottish border may have been different from those to the South. However it is likely that the direction of relationships between pre-marital sexual activity, illegitimacy, age at marriage and marital fertility will be similar.

Age specific marital fertility in England and Wales

Figure 1 has already shown the age-specific marital fertility rates for women enumerated with their husband in the same household calculated for single years of age using our new variant D of the Own Children Method from the available individual level decennial censuses of England and Wales (Reid et al. 2019). It should be remembered that although these are derived from data for census years, they actually depict fertility in the five years leading up to each census. For convenience, however, we refer to the census years. These fertility schedules show little change in fertility between 1851 and 1881, but perhaps a slight increase in marital fertility among the youngest age groups and a very slight decrease among the oldest. Between 1891 and 1911, however, there was a significant decline in fertility across all ages of women except those in their early twenties, but

fertility among the youngest women remained unchanged and even increased in 1911. Elsewhere we have shown that this increase is not a consequence of the particular way we have calculated exposure to marriage: results for 1911 using reported marital duration are very similar. We are confident that this increase in fertility among young women is real, but we are not entirely sure why it took place, and how it should be interpreted. We will return to the issues of data and methods later.

Indications of pre-nuptial pregnancy from the census of England and Wales

Based on the observations that pre-nuptially pregnant women contribute births, but not enough exposure, and therefore inflate levels of marital fertility, it should be possible to estimate the amount of pre-marital pregnancy by calculating the amount of exposure needed to be added to yield the sort of marital fertility curve one would expect if there was no pre-nuptial pregnancy. This is fairly straightforward once we have identified what our expected curve might be. Figure 3 above showed age-specific fertility schedules calculated for all women, pre-maritally pregnant and not pre-maritally pregnant women from the Cambridge reconstitution dataset. Figure 4 shows the same curves with the addition of two commonly used standard marital fertility schedules, those calculated by Coale and Trussell (1974) and by Hinde and Woods (1884). Hinde and Woods argued that the Coale and Trussell schedules did not represent nineteenth-century English (or Belgian or Scandinavian) fertility patterns very well, so they developed their 'English' alternative. Unsurprisingly, given that it is based heavily on the reconstitution data (but also Scottish data for 1855) this fits the English reconstitution data particularly well. However the graph suggests that it also incorporates the average levels of pre-nuptial pregnancy in the English reconstitutions, which lay at 26.4 per cent of first births born within 8 months of marriage for the period 1538-1837 (Wrigley et al. p.421). Here we use the non-prenuptially pregnant English reconstitution data as a standard, mainly because they exclude prenuptially pregnant women, but also because they are available for single year age groups (although we smooth them using a three year moving average to reduce fluctuations at the youngest ages). In order to avoid over-estimating pre-nuptial pregnancy among the very young, we remove the effect of sub-fecundity and entry-to-marriage sterility among non-prenuptially pregnant women by assuming that fertility rates amongst all age groups below the age of 22 were the same as those of 22 year olds.
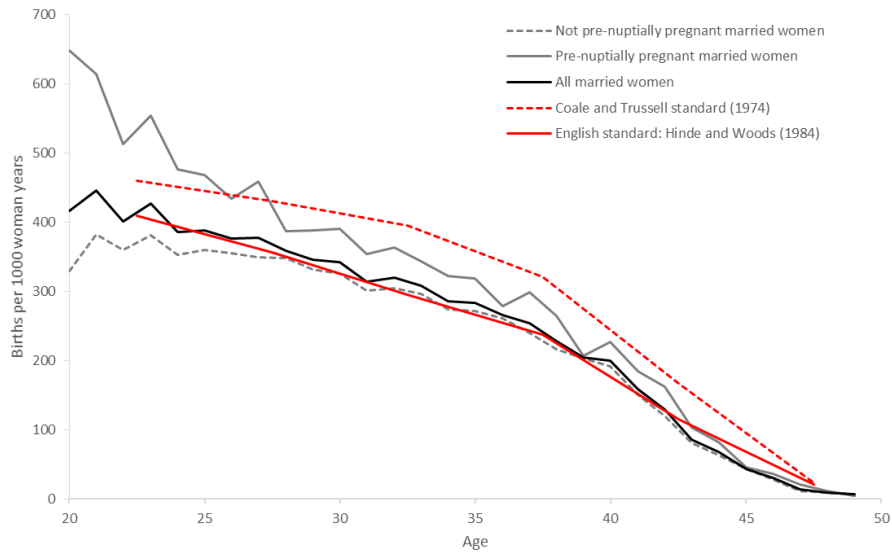
Figure 4: Age specific marital fertility rates from English reconstitutions, and two standard marital fertility schedules.

Figure 5 shows the smoothed non-prenuptially pregnant curve calculated from the reconstitution data as a standard curve, together with the asmfrs calculated from the I-CeM census data, 1851-1911. For women in their late twenties and over, the 1851 I-CeM curve is very similar to the standard, and although fertility among women in their 30s appears to drop marginally between 1851 and 1891, fertility among those in their late twenties and early thirties remains very stable over the intervening decades. 1901 and 1911 show a remarkably different picture: in these years fertility had dropped among all ages from the mid-twenties onwards.
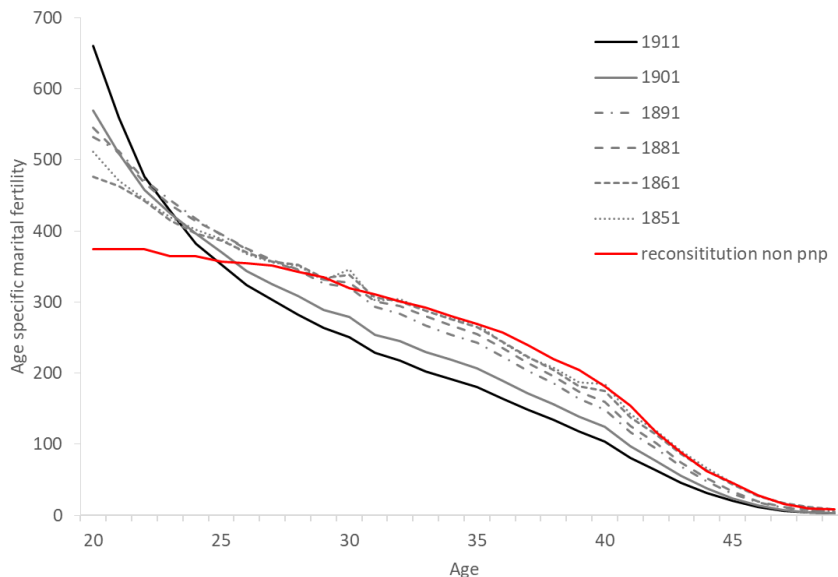

Figure 5: Age-specific fertility curves, 1851-1911 and reconstitution non prenuptially pregnant standard

It is easy to calculate the additional amount of exposure necessary to achieve the standard fertility rate for each age, by multiplying the number of children born to women of that age by the reciprocal

of the standard age specific fertility rate and subtracting the exposure to risk of pregnancy calculated using proportions married. We calculate rates using 5 years-worth of exposure and of births; we therefore divide by 5 to get single years worth of additional exposure. We can then do two alternative things with this additional exposure. On the one hand we can assume that all newly marrying women had started sexual intercourse before marriage. In this case we can divide the additional exposure by the number of newly married women (estimated for each age by subtracting the proportion married from the proportion married at the previous age and multiplying by the total number of women) to yield an estimate of the average length of exposure before marriage. On the other hand we can recognise that not all newly marrying women were having sexual intercourse, and we can estimate what proportion were doing so under different assumptions of how long before marriage, on average, those who were having intercourse did so. In the latter case, for example, if we assume, following Wilson (1984), that each prenuptially pregnant bride should have her exposure increased by one year, we can derive the proportion of brides that were pre-maritally pregnant by dividing the additional exposure by the number of brides. Similarly we can assume that pregnant brides were exposed for 1.5 or two years and derive the corresponding proportion of brides who were pre-maritally pregnant.

Table 1: Percentage of women premaritally pregnant, assuming 1.5 extra years exposure, by age

Age	1851	1861	1881	1891	1901	1911
18	109.2	108.2	104.1	138.0	143.4	197.3
19	92.2	91.4	101.0	107.1	112.8	151.6
20	41.0	30.8	56.6	46.0	59.1	85.8
21	49.0	53.1	71.5	74.9	61.6	78.9
22	43.7	47.1	59.6	59.4	47.0	53.4
23	45.7	45.8	65.3	65.9	46.2	44.4
24	41.4	37.1	57.0	53.6	28.7	14.0
25	52.6	52.8	65.6	53.8	17.1	-

Note: The value for women aged 25 in 1911 was negative, but close to zero

Table 1 shows, for women aged 18-25, the proportion pre-maritally pregnant on the assumption that each premaritally pregnant woman had started sexual relations one and a half years before the start of her marriage. Women under the age of twenty are very highly likely, according to these measures, to have been pre-maritally pregnant, and increasingly so in the last three census years. Obviously it is impossible for more than 100% of women to be pre-nuptially pregnant, but those women in the youngest ages who did become pregnant and marry may have started sexual activity earlier than older women, or engaged in intercourse more frequently. From 1851 to 1881 there was little difference by age in the proportion premaritally pregnant, but in 1901 and particularly in 1911, a strong age gradient had emerged with younger women much more likely to have been premaritally pregnant than those closer to the average age at marriage. We return to this below.

As a summary measure we show the proportions of all newly marrying women aged 16-29 who were pre-maritally pregnant, under assumptions of different durations of exposure prior to marriage. These were calculated from the single year of age groups, and we assume that if the implied

percentage of premaritally pregnant women in an age group was over 100% (as for some ages in Table 1) then all newly marrying women in that age group were pre-maritally pregnant. Table 2 shows these values, together with the calculated additional months of exposure per newly-wed, and the age of first marriage for women, and illegitimacy rates and ratios for comparison.

Table 2: Pre-marital pregnancy and illegitimacy statistics, England and Wales 1851-1911

	1851	1861	1881	1891	1901	1911
additional months exposure per newly wed	8.20	8.00	11.27	10.61	7.79	8.14
% of newly weds pnp assuming different levels of extra exposure						
1 year	59.74	61.99	81.66	73.11	50.45	42.32
1.5 years	42.71	44.80	59.21	52.79	36.02	32.60
2 years	32.50	34.18	44.92	40.81	28.08	25.76
female age at first marriage	24.64	24.59	24.40	24.87	25.31	25.81
illegitimacy ratio	6.82	6.36	4.88	4.24	3.90	4.09
illegitimacy rate	18.96	18.04	13.53	10.20	8.04	7.45

The figures in Table 2 show that, as broadly predicted, while the relationship between illegitimacy and premarital pregnancy continued over this time period, levels of both declined considerably in the final decades of the nineteenth century. The increase in exposure between 1851 and 1881 is less expected, and may benefit from further exploration.

It may at first sight seem surprising that the levels of pre-nuptial pregnancy are lower in 1901 and 1911 than in other years in Table 2, when the age-specific marital fertility curves in Figure 5 for these two years are so much higher at the younger ages, but we have to remember that the average age at marriage was increasing and fewer and fewer women were marrying at these younger ages: as older, less likely to be pre-nuptially pregnant women became a larger proportion of newly-weds, the percentage of new brides overall being premaritally pregnant decreased. Those younger women who did become pregnant, however were more highly selected for their fecundity and premarital pregnancy – it became increasingly likely that women would not marry before the age of 20 unless they had to do so because they found they were pregnant.

So the trend is broadly as expected. However the rates shown are rather higher than those calculated using the reconstitutions and also those based on Lewis-Faning and Glass and Grebenik figures for the twentieth century: they imply that if each women pregnant on marriage was exposed for one year longer than those not pregnant on marriage, around sixty percent brides were pregnant on marriage in 1851 and 1861, 80 percent in 1881, dropping to about 40% in 1911. On the basis of a constant relationship between illegitimacy and pre-marital pregnancy we would have expected a high of no more than 40 or 50 percent, dropping to something in the region of 20 percent. If we assume each pre-maritally pregnant woman had 1.5 years of exposure in the mid-nineteenth century, increasing to 2 by 1911, then our calculations fit rather better with what might be expected given the other estimates.

Rather than long durations of exposure, these effects on marital fertility could be achieved by an increase in the 'fecundity' of pregnant brides and newly-weds, and here 'fecundity' is used broadly to cover all aspects of the probability of conception, including coital frequency, fecundability, and

deliberate attempts to aid or hinder conception. It is virtually impossible to know if there was an increase in fecundity, let alone such a considerable increase. However evidence from elsewhere suggests that some increase in fecundity is not implausible, and could be due either to nutritional improvements - which would have led to a higher chance of conception or of a conception resulting in a live birth; to increases in coital frequency; or to reductions in breast-feeding. Knodel and Wilson (1981) argued that there is evidence for a secular increase in fecundity in German village populations between 1750 and 1899. However they also found evidence for increasing pre-marital pregnancy which contributed to a rise in marital fertility among young women (Knodel and Wilson 1981, p.58).

Greater survival of conceptions to live-births would be expected to be accompanied by reductions in neonatal mortality, but this appears to have been fairly constant at this time. Reductions in breast-feeding would have had no effect on the speed at which women proceeded to the birth of their first child and would therefore have had a greater effect on the fertility of older rather than younger age groups, as first births form a larger proportion of births to the latter. This leaves nutritional improvements and increased coital frequency as candidates for any increase in fecundity.

It is, of course, also possible that there is something wrong with our calculations and interpretations, and so the next section tests our method using data from Kilmarnock in Scotland.

Testing the method using data from Kilmarnock, Scotland

We have no access to data which could allow us to corroborate levels of pre-marital pregnancy or fecundity anywhere in England or Wales for the second half of the nineteenth century. However we do have a small data set for Kilmarnock in Scotland. This contains both census data which allow us to calculate age-specific fertility rates in exactly the same was as for England and Wales, and linked births and marriages, which permit the calculation of direct measures of pre-nuptial pregnancy and fecundity.

First we calculated age-specific marital fertility for women with their husbands present, as we did for England and Wales, and these are shown in Figure 6.
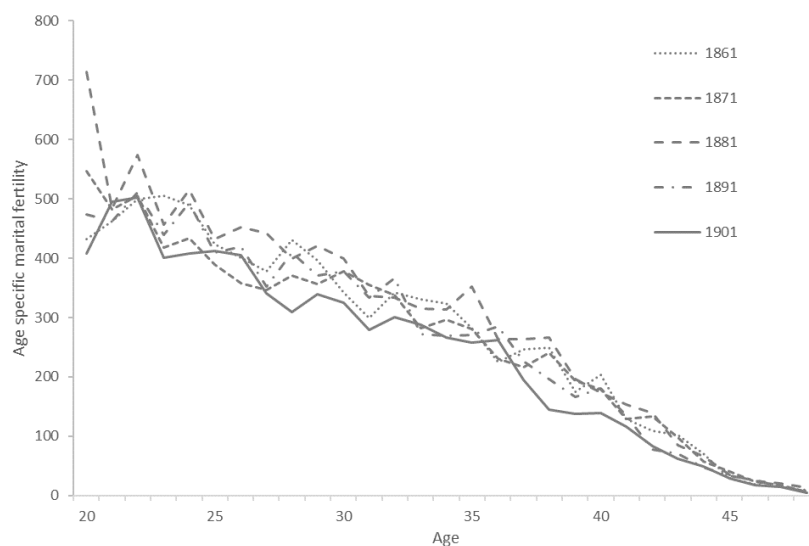

Figure 6: Age specific marital fertility rates, Kilmarnock, 1861-1901

Disappointingly there is little evidence that women in Kilmarnock started to reduce their fertility as early as those in England and Wales. Neither a discernible decline at older age is visible, nor an increase in marital fertility at young ages. However it is likely that any real trends are obscured by the relatively small numbers and consequent variability of the single-year-of-age estimates. Nevertheless, we can still calculate the amount of pre-nuptial pregnancy that these curves imply. To do this, and because of the lack of trend in fertility, we have combined all five census years to increase numbers, with the result implying that 56 percent of new brides were pre-nuptially pregnant if they each had one additional year of exposure (44 percent and 34 percent if they each had one and half and two additional years of exposure respectively).

We can also calculate the actual levels of pre-nuptial pregnancy from the gap between the date of marriage and the date of the first birth. Table 3 presents four calculations for levels of pre-nuptial pregnancy using these data: A and B show the percentages of first births which were born within either 8 or 8.5 months of the marriage respectively (historical sources tend to use 8 months, but they are generally based on the date of baptism rather than birth; the Registrar General, Lewis-Faning and Glass and Grebenik all use 8.5 months). As the denominator we use women who married in the town and had a birth with their husband in the following 5 years, in order to exclude women who married in Kilmarnock but did not continue to live there and also those who migrated away for a period and then returned (who might erroneously appear to have had very long marriage-to-first-birth intervals). These provide direct comparisons with the pre-industrial series. However for the twentieth century, Lewis-Faning and Glass and Grebenik calculated the percentage of brides who were pregnant, and this will always be smaller than the percentage of marital first births conceived prenuptially, as there will also have been women who married and remained in the town but did not have children (or children within 5 years).

Calculation C in Table 3 is a simple division of prenuptially conceived births by the total number of marriages, and this produces a very low figure. However as already noted, it is likely that there will have been marriages contracted in the town to couples who bore some or all of their children elsewhere, and these marriages distort the denominator. Therefore calculation D used only those marriages which produced a live birth within 5 years of marriage (as in calculations A and B), and inflated this by 6.5% to account for the number of marriages which did not produce a live birth (Anderson 2018, p.271). The percentages of marriages which involved a premarital conception (calculation D) are about 2.5% lower than the percentages of first births born outside marriage (calculation B). At 38% across the whole period this matches the estimates from age-specific marital fertility rates remarkably well, based on an assumption of between 1.5 to 2 years additional exposure per pre-nuptially pregnant bride.

Table 3: Prenuptial pregnancy, illegitimacy and fecundity in Kilmarnock, 1861-1901

	1861-70	1871-80	1881-90	1891-1900	ALL
Percentage of first births conceived before marriage*					
A: <8 months since marriage	40.97	38.92	36.67	34.97	38.60
B: <8.5 months since marriage	43.20	40.63	39.11	36.20	40.57
Premarital conceptions (birth <8.5 months since marriage) as a percentage of marriages					
C: All marriages	21.55	21.78	19.48	17.12	19.81
D: Marriages with a birth, adjusted for 6.5% childlessne	40.57	38.15	36.72	33.99	37.76
illegitimacy ratio	8.51	6.53	6.04	5.09	6.93
% of un-married conceptions marrying before birth of child	34.30	41.51	42.60	47.84	40.99
female age at first marriage	23.42	23.46	23.96	24.47	23.87
extra exposure for pre-maritally pregnant**	13.35	13.11	13.46	12.72	13.15
fecundity					
first birth interval***	0.46	0.43	0.43	0.42	0.44
non-susceptible period****	9.08	7.81	8.38	7.95	8.32

*excluding birth-intervals longer than 5 years, and last time period 1891-1896 only.

**difference (months) between average marriage to first birth interval for pre-nuptially pregnant women and average marriage to first birth interval for non-pre-nuptially pregnant women. Excludes birth-intervals longer than 5 years.

***percentage of brides, not pregnant on marriage (and excluding intervals over 5 years), giving birth 9, 10 or 11 months after marriage

****difference (months) between 1st-2nd birth interval, and marriage to first birth interval, women not pregnant on marriage, and with at least 3 live births.

Table 3 also shows a variety of other measures based on births and marriages. One of these is the difference between the average marriage-to-first-birth interval for pre-nuptially pregnant women and those who were not pre-nuptially pregnant (excluding those whose first birth interval was over 5 years). According to Wilson (1984) this can be interpreted as the additional exposure for pre-maritally pregnant women. For the England in the pre-industrial period he found this to be around one year, and this seems about right for Scotland in the late nineteenth century too.

Although there was no discernible decrease in marital fertility, the indicators of premarital pregnancy, fecundity and illegitimacy based on linked births and marriages do show clear trends over time, and these are also shown in Table 3.

Illegitimacy ratios, as in Scotland generally, were slightly higher than in England and Wales, but like those south of the border, they were steadily declining over the second half of the nineteenth century. Age at marriage was similarly increasing. In terms of fecundity, an increase can be measured by a decrease in the non-susceptible period following a previous birth (waiting time to

pregnancy), and a decrease in the difference between the first birth interval and the marriage to first birth interval. These measures suggest that although there may have been an increase in fecundity between the 1860s and the 1870s, there is little evidence for a sustained increase over time. However, as in England and Wales, pre-marital conceptions appear to have been decreasing in tandem with illegitimacy. This fits the pre-industrial courtship intensity hypothesis: as people put off getting married to older ages, fewer people engaged in sexual activity in anticipation of marriage – or did so less frequently, with the consequence that both illegitimacy and prenuptial pregnancy reduced. However it is notable that the percentage of unmarried conceptions that were legitimised by marriage before the birth was increasing over time: if this was also happening in England and Wales it would certainly have contributed to the increase in marital fertility among young women.

This section has used the Kilmarnock data to test our calculation of prenuptial pregnancy from age-specific fertility data, and examined the evidence for an increase in fecundity which would support the upswing in marital fertility amongst 20-24 year olds in England and Wales during the late nineteenth and early twentieth century. This suggests that our use of age-specific marital fertility data to estimate pre-nuptial pregnancy is reasonable: although there is probably not enough data to generate time trends in pre-nuptial pregnancy using age-specific fertility, the direct measurements of pre-nuptial pregnancy show declines over time in Scotland, as in England and Wales. This is consistent with declining illegitimacy and increasing age at first marriage in both places. However the estimates of pre-nuptial pregnancy from age-specific fertility do give rather higher estimates than the direct measurements. Appendix 1 examines possible measurement and data causes of this, but concludes that these are unlikely to make much difference. We are continuing to check our calculations and data to establish a reason for this overestimation.

Pre-nuptial pregnancy estimates for social classes and types of place

It seems therefore, that our method is robust, even if it produces estimates pf pre-nuptial pregnancy which are on the high side. Our estimates indicate that the pre-industrial marriage and courtship patterns remained intact over the first half of the demographic transition. It is well, established, however, that the fertility transition started with the higher social classes, and in certain localities. It is therefore particularly interesting to investigate the implied levels of pre-nuptial pregnancy for different social classes and types of place.

Figure 7 shows estimates of the percentages of brides who were pre-nuptially pregnant (assuming 1.5 years additional exposure) by social class, between 1851 and 1911, and Figure 8 shows equivalent percentages for eight different types of place.
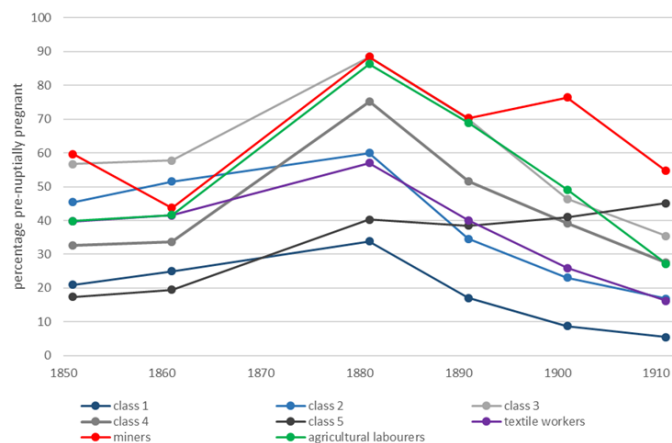
Figure 7: Percentages of brides pre-nuptially pregnant (assuming 1.5 years additional exposure) by social class of husband
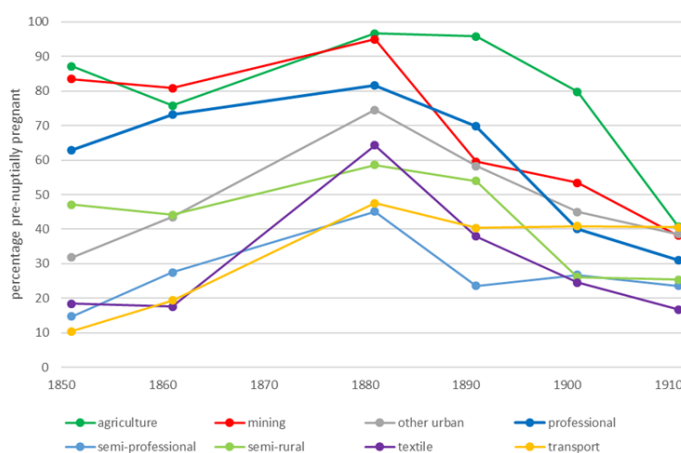

Figure 8: Percentages of brides pre-nuptially pregnant (assuming 1.5 years additional exposure) by type of place

Figure 7 shows that there was a strong social class gradient, particularly by 1911, when social class 5 (manual labourers) had gradually moved from their rather unexpected position of low pre-nuptial pregnancy. Apart from this anomalous group, all social classes experienced declines in levels of pre-nuptial pregnancy between 1880 and 1911. A similar decline was witnessed in almost types of place (here 'transport' places were the anomaly, but this group was growing strongly over the period and probably changing in character), although in contrast to the social class picture, there was a notable convergence in rates. What is particularly interesting, however, is examination of the relationship between pre-marital pregnancy, illegitimacy and the female age at marriage. Because social class can only be measured from the occupation of husbands and because we don't have access to marriage certificates, we cannot estimate illegitimacy or the female age at marriage for social classes. Therefore these comparisons are only possible for types of place, and are shown in Figure 9.
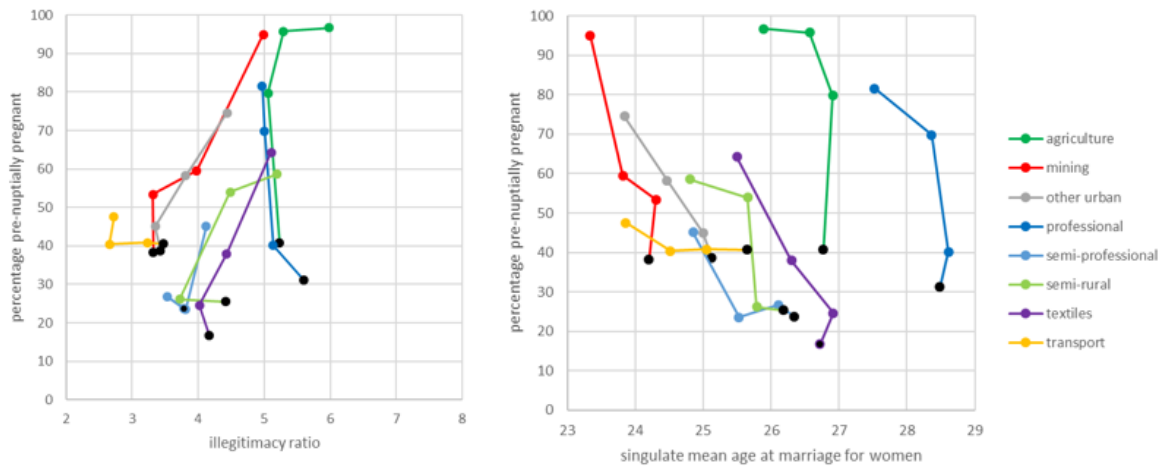
Figure 9: Pre-nuptial pregnancy, illegitimacy and age at marriage by type of place, 1881-1911 (the black dot is always 1911)

The left hand panel of Figure 9 shows pre-nuptial pregnancy against the illegitimacy ratio. There is one line for each type of place, with a dot for each census year starting in 1881 and ending up with the black dot at 1911. The right hand panel shows pre-nuptial pregnancy against the age at marriage for women. Both these panels show clear trends over time: illegitimacy and per-nuptial pregnancy appear to be strongly related with a similar relationship in each place, and declines in illegitimacy accompanied by declines in pre-nuptial pregnancy. Declines in pre-nuptial pregnancy were also accompanied, in each place, by increases in the age at marriage, but there was more variety in the way that age at marriage and pre-nuptial pregnancy were related to each other than for illegitimacy. Agricultural areas and particularly professional areas seem to have had surprisingly high levels of pre-nuptial pregnancy for a given age at marriage, and in general in these two types of place illegitimacy and the age at marriage changed less than did pre-nuptial pregnancy.

More interpretation and discussion will be supplied here.

Conclusions

In this paper we have demonstrated how age-specific marital fertility rates can be used to generate estimates of pre-nuptial pregnancy. It is important to bear in mind that these do not allow us to distinguish between many unmarried women having a little bit of intercourse, or a small number of unmarried women having large amounts. Comparison of census estimates with data from linked marriages and births, and rates for social classes, suggest that trends and differentials are reasonable, although census estimates may be too high.

Our calculations suggest that pre-nuptial pregnancy was declining over the late nineteenth and early twentieth centuries in England and Wales, but it was increasingly concentrated in women in their teens and early twenties. Fewer women were marrying at these ages so the proportions of married

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women who were prenuptially pregnant in these age groups were increasing, and this caused marital fertility rates among those marrying before the average age at marriage to increase sharply.

The relationship between marriage, establishing a new home, illegitimacy, and pre-nuptial pregnancy appears to have remained largely unchanged from the pre-industrial period through the early years of the first demographic transition. In the pre-industrial era there were times when the prospects for marriage and setting up a new home looked poor, and during these times people were slower to start courting, and did so with less intensity and a slower progression to, or less frequent, sexual intercourse, meaning that not only did marriage age increase, but pre-nuptial pregnancy and illegitimacy (produced by frustrated marriage) declined. This appears to have been what was happening across the second half of the nineteenth century.

The data for Kilmarnock suggest that there was a small increase in the proportion of pregnant-but-unmarried women who married before the birth of their child, providing limited support for our first hypothesis – that the increasing demands of Victorian respectability increased the likelihood that unmarried pregnant women would marry before the birth of their child.

The data for England and Wales indicate that although pre-marital pregnancy was declining, it was increasingly concentrated among the women in their teens and early twenties, providing strong support for our second hypothesis: that with increasing marriage age pre-maritally pregnant women will form a higher proportion of married women in their early twenties, increasing age-specific marital fertility rates. This explains the apparently contradictory combination of increasing age-specific marital fertility rates among women in their early twenties, and declining overall pre-nuptial pregnancy.

A further interesting question is the extent to which the declines in illegitimacy and premarital fertility are linked to the first demographic transition. Shorter, Knodel and van de Walle (1971) illustrate that the period 1880 to 1940 in Sweden and other European countries witnessed a large decline in illegitimacy parallel to the decline in marital fertility, and they argue that illegitimacy should be seen as part of the demographic transition (p.376). In England and Wales we see the decline in illegitimacy and pre-marital pregnancy preceding the decline in marital fertility and it would be possible to argue that new contraceptive technologies or ideas were first used among those engaged in extra-marital sexual intercourse, and then continued to be used by those same individuals when they were married, spreading to others. However this does not fit well with the broad (although not unchallenged) consensus that marital fertility decline was achieved mainly through abstinence and withdrawal, and that these had not previously been widely used to restrict fertility within in marriage because although they were well known, it was not considered acceptable to control fertility within marriage. These methods surely had always been used prior to and outside of marriage to minimise the chance of pre-marital conception. Illegitimacy and pre-marital pregnancy had been as low or lower in the mid-seventeenth century as they were at the end of the nineteenth without the transfer of 'fertility control' from the unmarried to the married population.

In the pre-industrial system, marriage prospects were strongly linked to real wages, but real wages were increasing dramatically over the nineteenth century. This raises the question of why, in that case, the age at marriage was increasing, not decreasing? One possible answer is that a growing realization that social mobility was possible increased desired standards of living for couples. This

represented a change, not in absolute prospects, but perceived prospects. Within the European Marriage Pattern, delayed marriage and restrained courtship were established forms of behaviour to try to match expected and desired standards of living. With the growth of education and the advantages it conferred, couples may have realized that their children's prospects were increasingly moulded by their opportunities during childhood, not just what happened when they left home, and this may have led them to introduce restraint into their marriage, after they had 'restrained themselves' during their courtship.

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Appendix 1: Possible reasons for over-estimation of premarital pregnancy in England and Wales

The Own Children Method for the estimation of fertility is well established (refs) and has had independent verification from comparison with other sources. It is less established for use with

marital fertility, however, and there are particular issues connected with the estimation of exposure to marriage, and the associated risk of pregnancy, among young women. Our recent work, however, has developed and tested new variants for use with marital fertility. We have several reasons for having confidence in our methods. The first is that for Kilmarnock the levels of pre-nuptial pregnancy match well with those obtained from linked births and marriages. Similarly for England and Wales 1851-1891 the results look plausible – it is only 1901 and 1911 which might be viewed as implausible. Second, we tested our method by comparing, for the same women in 1911 in England and Wales, exposure calculated using proportions married with exposure calculated using reported marital durations, and found that exposure calculated using these two different types of data was virtually identical (Reid et al. 2019). If there had been an issue with the way that marital durations were calculated, or with calculating marital duration from proportions married, then we would not have obtained the same results from these different calculations.

However it is possible that differences in the way that the census data were transcribed and processed may have affected our results. The own children method relies on identifying mothers and children within the same households, and here we have also used women whose husband has been identified in the same household as them. Women were algorithmically associated with their husbands and children through a combination of relationship to head of household and surname (Higgs et al. 2013, Appendix A). In practice this means that it is straightforward to identify family relationships in simple nuclear households, which usually take the form of head, wife and children, although it is necessary to make the assumption that the head's children will also be his wife's children. This may not necessarily be the case, of course, if the wife was a second wife and the children of the head of household were her step-children. A large increase in young women with young step-children in 1901 and 1911 might contribute to the effect we see, however we think it is unlikely that widowerhood and rapid re-marriage took a sudden upswing for these years as vital statistics show no evidence of either increasing female mortality or of widower remarriage. Adult mortality was, in fact, decreasing from the 1870s, so it is likely that the proportion of women with step-children was falling. Moreover it is unlikely that widowers always married women in their teens and early twenties. It is true that the spousal age gap between widowers and their brides was larger than between bachelors and spinsters, but not large enough to produce this effect, and the mean ages of single women and widows who married widowers were 32 and 44 respectively across this time period, with an upward trend over time (ONS 2011).

It is still possible, however, that increasing age-specific marital fertility among young women may be produced by progressively lower success rates in identifying family relationships between 1891 and 1911, but to produce the observed upswing in fertility, identification would have to be less successful only among women with husbands but no children of their own - in other words if young married women with identified children were more likely to have their husband identified than young married women without identified children. This would underestimate exposure, while not underestimating children. This is theoretically possible, and might carry more weight if the effect was limited to the 1911 census where the transcription is based on the household sheets which were filled in the by householders themselves and therefore have not been in any way 'standardised' by the enumerators when they copied them into their enumerators' books, which were the source of the census transcriptions for previous years. Although 'standardisation' was not part of the enumerators' job, it is clear that many enumerators did do some 'interpreting' of the

responses returned on the completed household sheets as they copied them out. How likely is it that within households, husbands and wives without children were not linked together?

One easy way to examine this is to include women who say they are married but have not been linked to a husband in our calculations of age specific fertility. Figure A1 shows, for 1881-1911, age-specific fertility rates calculated using married-spouse-present-women only, and all married women. We have shown these on two separate graphs to enable the different series to be more easily identified. So far we have presented rates which *exclude* from our calculations women who have *not* been linked to a husband present in the household, and their children. This was done for two reasons: firstly because it allows us to calculate rates by husbands' characteristics (husbands' occupations are the only way to gain a reliable indicator of social status), and secondly because women who say they are married but do not have a husband present are likely to be atypical of married women. We suspect that quite a number of them were not actually married, but said they were in order to appear more respectable, especially if they had a young child. The husbands of some of those who were actually married will have been absent only for a night or two. However there will also have been couples where the husband was absent for considerably longer, because of his job or a stay in prison or hospital, or where one partner had abandoned the other (formal divorce being virtually unknown), and amongst these couples fertility was likely to have been lower than amongst women whose husband was present with them on census night.
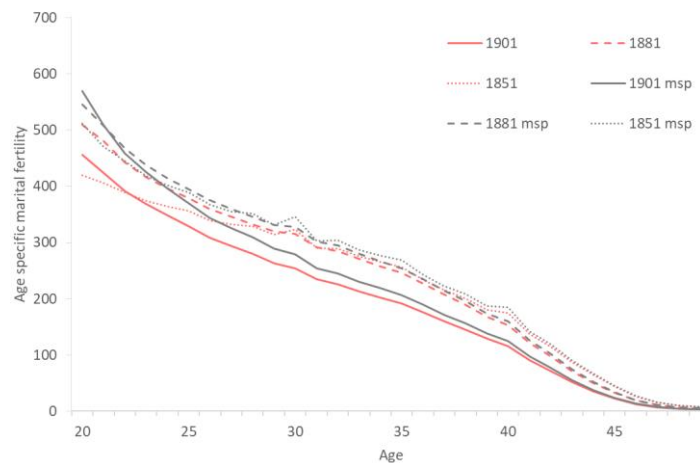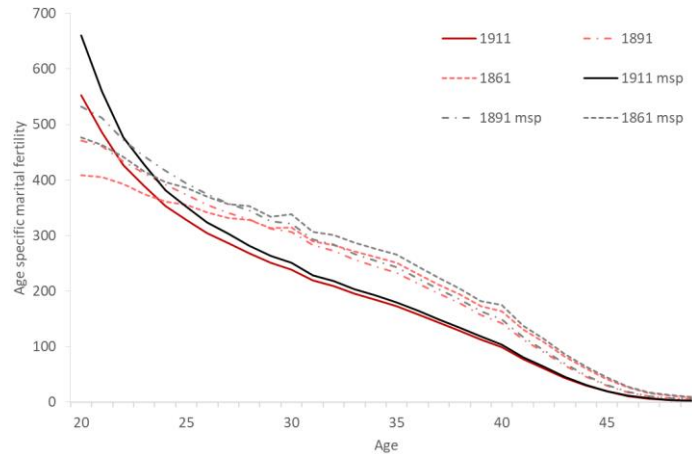
Figure A1: Age-specific fertility rates using women with husbands present only (msp), and using all women, 1851-1911 (top panel shows 1851, 1881 and 1901; bottom panel shows 1861, 1891 and 1911)

Including women without husbands present in our calculations reduces age-specific marital fertility at all ages, particularly among young women, and this confirms our suspicion that women without husbands identified in the household had lower fertility. However it is notable that the reduction in fertility when such women are included is lower for 1881 than for any other year, and this suggests another reason why women without identified husbands have apparently lower fertility. As mentioned above, the machine-readable version of the 1881 census was created by the Church of the Latter Day Saints, and it was double-transcribed with discrepancies checked before being entered onto computer, so transcription quality is likely to be better than that of the other census years (Woollard 2000, p.112-3). It is possible that during this process some 'tidying' of the entries was done. Thus, unlike other years, for example, there are no instances of married women younger than age 16 in the 1881 census dataset: the assumption appears to have been made that any such entry was a mistake and the 'married' description was changed to 'unmarried'. It is also possible that certain relationships were 'tidied' so that they looked more conventional. This means that the identification algorithms, which were applied to all census years, may have identified more married couples, and also mother and child relationships, in 1881 than in other years. For other years, the age-specific marital fertility rates including women whose husbands could not be identified may well be too low, because the children of such women, even if they were living in the same household, were less likely to be identified. In such cases our calculations include 'spouse-absent' married women, but not their children. One solution would be to add children who could not be identified as living with their mothers ('unmatched' or 'non-own' children) into the calculation, and this is in fact the standard procedure for the own children method. However this would entail adding in all illegitimate children too. Such children are likely to have formed a large proportion of those children for whom a mother could not be identified (Reid et al 2019). Adding in the 'unmatched' children raises fertility rates, at every age, above those calculated for married women with husbands present only.

Figure A2 shows age specific marital fertility rates for women with and without a husband identified in the same household. Although married-spouse-absent women indicate very little pre-marital

pregnancy (really only for 1911), their exclusion from the calculation of the 'married-spouse-present' fertility rates will contribute to a slight overestimation of marital fertility and therefore of pre-nuptial pregnancy, but their omission is unlikely to explain the upswing in pre-nuptial pregnancy in 1901 and 1911. In fact, our estimates of pre-marital pregnancy are only a little higher than we would have predicted on the basis of a constant relationship with illegitimacy. We only need to assume that each prenuptially pregnant woman was exposed for 1.5 years prior to marriage for our estimates to be in the right ball park. Given that our estimates may be slightly overestimated, and that the Kilmarnock data suggested that a little over a year additional exposure was likely, an assumption of 1.5 additional year's exposure is not unreasonable.
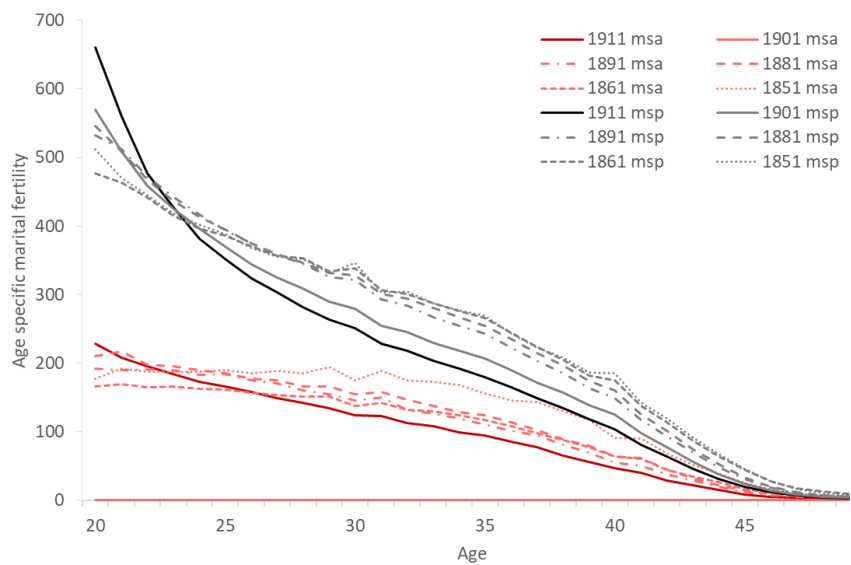

Figure A2: Age specific marital fertility rates for women with (gray) and without (red) a husband identified in the household

NB: no line for 1901 msa – number of children needs correcting