The Influence of Relatives on the Timing of First Birth: Evidence from a Low Fertility Population

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Introduction

1. Social science's interest in particular relationships is subject to fashions. The relationship between kin and reproduction is no exception. In the immediate post war period until the 1970s substantial attention was given to this area, for example (Davis and Blake 1956; Young and Wilmott 1957). Interest then decreased, partly due to methodological and conceptual problems (Burch and Gendell 1970). However, two areas of research have returned to this relationship. First, seminal work in the 1980s on models of social networks and cultural diffusion established the importance of individual level social interactions on macro-level outcomes (Boyd and Richerson 1985) (Cleland and Wilson 1987). Advances in social network models have improved our empirical understanding of social influence and social learning. Secondly, increasing interactions between evolutionary biology and demography have directly led raised interest in the effects of kin on reproduction. Evolutionary biology's theory of inclusive fitness predicts that genetic relatives have more reproductive interests in common than non-relatives (Hamilton 1964) Evolutionary demographers are therefore specifically interested in kin, since these are the members of a social network who theoretically should have the most influence on reproductive behaviour. There is a small but rapidly growing body of empirical evidence testing inclusive fitness based predictions in humans.

2. In the UK there appears to have been limited quantitative research on whether kin orientation within relationships influences fertility behaviour. Results from a systematic review of kin influence on fertility found only four relevant quantitative studies for the UK, and these were focused on early reproduction / teenage pregnancy (Sear and Mathews 2009). This paper has two aims; primarily to see if the timing of first birth across the full reproductive age range is influenced by kin orientation, and secondarily to consider different ways kin influence may manifest itself.

Social networks and fertility

3. In recent years there has been increasing attention in demography and related fields on understanding the effect of social network characteristics on various reproductive attitudes and behaviours (Montgomery and Casterline 1993) (Kohler 1997) (Montgomery and Chung 1999) (Kohler, Behrman et al. 2000) (Kohler, Behrman et al. 2001) (Behrman, Kohler et al. 2002) (Madhavan, Adams et al. 2003) (Bernardi 2003) (Rindfuss, Choe et al. 2004; Sandberg 2005) (Helleringer and Kohler 2005) (Musalia 2005) (Avogo and Agadjanian 2008) (Mace and Colleran 2009) (Keim, Klarner et al. 2009). Relatively little of this social network orientated research has focused on actualised fertility outcomes: an exception being (Madhavan, Adams et al. 2003). Instead, most interest has been on the diffusion of contraceptive knowledge and reproductive social norms. In Madhanvan et al's study relatives influenced fertility and contraceptive use quite differently; conjugal kin seemingly

decreased the number of children ever born but surprisingly also decreased the likelihood of using contraceptives.

4. Most of the above studies have investigated the spread of information (social learning) (Montgomery and Casterline 1996). This requires measurement and analysis of a social network's density; how closely tied others individuals (alters) are to one another. Less attention has been paid to the composition of the network and how genetically related alters are to the measured individual (ego). Though there are exceptions, often coming from an evolutionary perspective (Mace and Colleran 2009), (Borgerhoff Mulder 2009) (Madhavan, Adams et al. 2003) (Musalia 2005) (Bernardi 2003) (Keim, Klarner et al. 2009). The quantitative social network research we have found has solely used Less Economically Developed Countries (LEDCs) populations, where substantial changes in fertility regulation are taking place. Much less is known about social networks and reproductive behaviour in low fertility contexts. The UK is a high contraceptive prevalence society and therefore there is limited capacity for social learning about contraceptives, except perhaps at very young reproductive ages. On the other hand the UK's low fertility and late age at first birth reduces the number of alters from who an individual could learn about child raising. Relatives are normally more heterogeneous in age than friends, and some relatives will have had actual experience raising children. Of the two studies set within low fertility populations (Italy - (Bernardi 2003) and (Germany - (Keim, Klarner et al. 2009) both used small non-representative qualitative samples. However, both studies highlighted the potential for kin to substantially influence fertility preferences.

What effect should kin composition of a social network have on fertility, and why?

5. Inclusive fitness theory predicts that relatives will be interested in increasing one another's reproductive success, provided that the costs of increasing that relative's reproductive success do not outweigh the benefits obtained (weighted by the coefficient of relatedness – the probability that any gene will be shared between the two relatives). A superficial prediction of this theory might therefore be that the presence of a relative might increase one's fertility. But this is unlikely to always be the case. As noted previously, our systematic review (Sear and Mathews 2009) showed that the empirical research already undertaken in the UK (as well as in most other MEDCs) has seemingly only looked at kin influence on early reproduction and teenage pregnancy (Kiernan 1992) (Russell 1994) (Kiernan and Hobcraft 1997) (Manlove 1997). Here the presence of both parents is associated with a delay in first birth, whereas the absence of a parent through separation, divorce or death correlates with a younger age for first birth, though the actual causal pathway for this association remains debateable (Ni Bhrolchain 2001). The absence of a parent in a modern, developed country may be an indicator of a relatively poor environment, in which an early start to reproduction is favoured. In contrast, in the few pre-demographic transition, developing world contexts where the absence of the father has been studied, father absence delays first birth. (Mace and Sear 2005) Context therefore matters.

6. It is also important to note that simply increasing total fertility does not necessarily increase reproductive success. Having too many closely-spaced children may result in maternal depletion; those children also need to be raised successfully to

adulthood. Relatives should therefore only increase fertility if the conditions are right for any child produced to become a successful adult.

7. It has been argued that the demographic transition from high to low fertility was at least partly caused by an absence of kin and a decline in 'kin influence' (Turke 1989) (Newson, Postmes et al. 2005). During the demographic transition familial systems fragment which leads to a decreased capacity for kin to encourage and assist the reproduction of their relatives. This approach can also be used to examine the variance fertility at an individual level. Human behavioural ecologists, primarily evolutionary anthropologists, have been examining the association between kin and reproductive success for more than two decades (see reviews by (Mace and Sear 2005) and (Sear and Mace 2008). This literature does have limitations. Nearly all the studies have taken place in natural fertility populations, measurement of kin is often constructed simply as the presence (or absence) of a relative in the community and sample sizes are often small. The literature nevertheless repeatedly demonstrated that in human societies the presence of kin does increase the reproductive success of their relatives in manner in keeping with Hamilton's theory

8. Whilst kin in general should encourage reproduction different relatives will have different interests in each others the fertility. Due to variations in relatedness, context, and comparative life course positions some kin may be expected to be more or less helpful, indeed some relatives might even hinder reproduction. Relatives should not be considered as simply a homogenous group. We therefore tested the influence of both relatives in general and the influence of specific relatives.

Proximate mechanisms through which kin may influence fertility

9. Inclusive fitness theory explains *why* relatives have an interest in improving each others reproductive success, but it does not explain *how* this is done. Research in this field is less well developed and our arguments will necessarily be more speculative. There are two main branches of proximate mechanisms.

10. First, relatives can assist reproduction through the provision of resources. In the context of the demographic transition (Turke 1989) set out that a decline in kinship within social networks would decrease kin provided 'reproductive resources' and fertility, even if resources in general increase. The provision of resources is of substantial importance in the natural fertility and resource poor populations studied by behaviour ecologists. An increase in resources can improve the health and fecundity of a relative and thus can fairly directly affect fertility. However, it would be very wrong to suggest that kin provided resources are not relevant in contemporary Western societies. Childcare can be very costly if purchased directly, or indirectly through reduced (normally female) employment and career opportunities. If childcare is provided for 'free' by a relative this will lower the barriers to childbearing. Whilst not motivated by human behaviour ecology (Hank and Kreyenfeld 2003) found in Germany that having parents in the same town increased the likelihood of having a first birth, a results they attributed to the potential availability of childcare. There may be other resources provide by kin such as emotional support, post-natal advice and financial assistance which also work to reduce the burden of childbearing.

11. The second mechanism is that kin will communicate information to their relatives that encourages optimal reproduction (Newson, Postmes et al. 2005). We will refer to this mechanism as 'kin priming.' Such priming could consist of everything from direct attempts at persuasion to more subtly influences on conversational topics and outcomes. The latter may well be extremely difficult to measure, being formed of perhaps thousands of small and, in isolation, seemingly insignificant instances, yet when applied repeatedly over many years producing a substantial impact. There has been limited empirical investigation into kin priming, though using experimental manipulation of role playing scenarios it was found in a small UK sample that kin communicate more pro-natal advice in conditions favourable to reproduction (Newson, Postmes et al. 2007). Newson et al argued that the influence of these conversational biases will operate through the production of macro level 'social norms' conducive to higher fertility, and that kin influence will not be substantial at the individual level. Whilst accepting the importance of the wider social context of reproductive decision making, there is also capacity for kin priming to have influence at the individual level.

12. Whilst we have referred to this influence as kin priming we could also have called it 'absence of non-kin priming'. Newson et al argue that 'the members of modern nonkinship based social networks do not spitefully encourage each other to behave in ways that detract from reproductive success' (2005, page 370). It is difficult to draw a line on when non-kin influence turns from ambivalence into negative interference. We can only speculate, but it is relatively easy to imagine circumstances in which conversations with non-kin colleagues or friends are orientated to encourage career or social life participation ahead of reproduction. As evolution is marked by competitive selection it is possible that humans have evolved communication mechanisms to discourage the reproduction of their non-kin competitors. Regardless of whether or not such an adaptation exists, the aggregate positive pro-natal messages of kin suggested by Newson's theory are only pro-natal *in contrast* to the aggregate messages of non-kin.

13. Neither party will necessarily be consciously aware of this kin priming influence. Numerous social psychological studies show that individual actors are often not consciously aware of the stimulus for their behaviour or attitudes (Nisbett and Wilson 1977) (Zajonc 2000). Qualitative research (Rotkirch 2007) (Bernardi 2003) (Keim, Klarner et al. 2009) has shown that some individuals do suddenly change from explicitly not wanting children to desiring them, this perhaps suggests some sub-conscious influences upon fertility decision making.

14. Without detailed information on the content of conversations, or on an individual's expectations of childcare support, it is difficult to make strong persuasive arguments on whether potential kin support or kin priming is driving any effect. But as a secondary question compared the geographic proximity of kin and the frequency of contact with them. If geographic distance has a greater effect then this would suggest the potential for kin provided childcare, as childcare has to be provided in situ. Similarly kin priming requires communication with kin, so more frequent contact would increase the capacity for priming.

Confounding factors

15. Socio-Economic Status (SES) could confound the relationship between the timing of first birth and kin orientated social network. SES is a multi-faced latent concept and (Braveman, Cubbin et al. 2005) argue that it should be considered a combination of many factors; including education, occupation and income. This study will control for these three elements. We will briefly review the relationship between SES and first birth and the relationship between SES and kin orientation.

16. There has been considerable research on the relationship between SES and fertility. Using one or other of the SES indicators nearly all the research on contemporary British females has shown that higher SES is associated with delayed childbearing, increases childlessness and reduced lifetime fertility (Ekert-Jaffe, Joshi et al. 2002) (Ratcliffe and Smith 2006) (Kneale and Joshi 2008). (Berrington 2004), (Nettle and Pollet 2008) (Rendall and Smallwood 2003; Portanti and Whitworth 2009) (Nettle and Pollet 2008) (Rendall, Ekert-Jaffé et al. 2009) (Portanti and Whitworth 2009). Though there are exceptions and (Kiernan 1989) using the 1946 birth cohort study did not find any significant effect for either education or occupation on the likelihood of females being childless at age 36.

17. However, income, education and occupation may affect the timing of fertility differently. Continued education will delay childbearing somewhat independently of raising socio-economic position. (Becker and Lewis 1973) have argued that childcare can be purchased more easily by wealthier families, thus reducing its opportunity costs. There is some evidence for a positive relationship between male income and fertility controlling for education in the UK (Nettle and Pollet 2008) and also in the US (Hopcroft 2006) and Sweden (Fieder and Huber 2007)

18. Whilst there has been limited recent research into the influence of kin on fertility, there has been substantial research into the continuing role of kin in western societies. Prominent sociologist have argued that the role of the family in Western societies is in secular decline (Popenoe 1988) (Giddens 1991), a view that can be traced back to Durkheim (Giddens 1972). Rising education and employment opportunities increase social and geographic mobility, and access to non-kinship networks. Therefore higher socio-economic groups (with more education and employment opportunities) are likely to be less kin oriented (Pahl and Pevalin 2005). It has also been suggested by some sociologists that in contemporary society individuals are increasingly forming ‘families of choice,’ whereby non-kin social networks can replace those formerly occupied by relatives (Weeks, Heaphy et al. 2001) (Roseneil and Budgeon 2004). We included the level of social interaction separately from kin orientation.

19. Recent empirical research in the UK does show a negative association between SES and contact with kin, though the magnitude of this effect is often quite weak. (Owen, Mooney et al. 2004), (Pahl and Pevalin 2005), (Nolan and Scott 2006) (Grundy and Murphy 2006) (Murphy 2008). Moreover these studies shows that across all socio-economic strata kin still form an important part of an individual’s social network.

20. We also attempted to control for several other confounding factors such as religious or ethnic background, geographic mobility and whether specific relatives

lived within or outside the household i.e. some individuals will not have siblings or living parents.

Data and Methods

21. For our analysis we used the nationally representative British Household Panel Study[1] (BHPS). The panel started in 1991 with 5,500 households and by 2007 had expanded to around 10,000 households. Information is collected in annual waves on each individual in the household. The analysis is restricted to females who are aged 16 to 40 at the time of the interview. This is because we would expect differences between males and females in the age of first birth, fertility reporting errors, SES interactions, as well as the overlapping nature of couples' social networks.

22. There are two important considerations when using panel data to analyse fertility. First, there will be substantial censoring within the panel from individuals who have neither had a first birth nor reached menopause. Restricting the analysis solely to those females who have had a first birth would bias the results. Secondly, there is a substantial potential for 'life course' changes to mask or confound any effect. It is vital to account not just for age but how all the variables of interest will be changing over time. We therefore decided to employ discrete event history analysis (Allison 1984) (Box-Steffensmeier and Jones 2004). Unlike standard regression models where the unit of analysis is an individual, in discrete event history analysis each occasion that an individual is observed within the dataset is split into a separate period or spell. Regression models are then fitted using maximise likelihood for an event (in this case first birth) occurring in relation to each spell. As the event is a dichotomous outcome, standard binary logistic regression can be used. Key assumptions of this method are that the likelihood of the event is equal across the duration of each spell, and that the explanatory variables have a proportional hazard across all ages.

23. The BHPS collected social network information starting in 1992 and at alternate years thereafter. We used the first six occasions when this social network information was collected (we will refer to these collections as 'waves'). The dependent 'event' variable was operationalised as a first birth to the respondent within a 9-27 month period after a wave. This lagged period was necessary to avoid the influence of pregnancy on kin ties. The models were also run slightly changing the threshold for the lag to 6-24 months, with minimal effect on the results (not shown). Females were removed from the dataset where the specific date of first birth was not known. Each model included categorical variables for the wave of data collection, though these were consistently non-significant, and are not reported. The age of the respondent at the time of the interview was included as a quadratic function. The birth history information was obtained from the consolidated family history file as produced by Chiara Daniela Pronzato (Pronzato 2007)

24. For our explanatory variables we considered individuals with greater kin orientation to be those with a higher proportion of kin in their close social network. In this study the social network is very emotionally close to the respondent, consisting of

[1] Full question wording, methodology and other documentation available at http://www.iser.essex.ac.uk/survey/bhps

the three individuals they would choose as their *'closest friends.'* The BHPS question wording includes the caveat that they *'should not include people who live with you but they can include relatives.'* As a matter of convenience we will refer to the three closest individuals as the respondent's 'friendship group.'

25. The respondent was then asked, for each member of the friendship group *'is this person a relative?'* The key explanatory variable was calculated as the number of relatives in the friendship group. Respondents only rarely answered that all three members of their friendship group were relatives, so the variable was capped at two and treated as a linear scale with units 0, 1 and 2.

26. We also looked at responses to three other questions about the friendship group. First, we assessed the frequency of interaction from answers to the question '*How often do you see or get in touch with your friend either by visiting, writing or by telephone?'* For each individual we calculate the number of friendship groups members who where at that point in time contacted 'most days' (set as a scale from zero to three). The number of relatives who where contacted 'most days' was also calculated, again being capped at two.

27. For our second research question we considered the geographic proximity of the friendship group using responses to the question '*About how many miles away does your friend live?'* We assume that it will be harder for a relative to provide childcare when they live over 50 miles away (the furthest answer category). Kin priming will be more determined by the frequency of communication between the individuals. Respondents seldom reported being in frequent contact with a relative who lived over 50 miles away. We constructed three variables for whether the friendship group contained i) a relative living over 50 miles away, ii) a relative living closer than 50 miles but contacted infrequently and iii) a relative living close by and contacted 'most days'. Finally, we checked to see the effect of respondents including specific relatives (i.e. mother, sister etc) within the friendship group. Unfortunately this and the geographic proximity question were not asked in wave F of the BHPS (1996). The models shown that use these variables do not include data from this wave.

28. Where appropriate the models where also run using simple dichotomised versions of the explanatory variables e.g. whether the respondent had *any* relatives in the friendship group. We also checked the frequency of contact variable set at different thresholds. These operationalisations provided similar results to the scale versions and are not reported here. All results not shown are available on request from the authors.

Control variables

29. We controlled for SES by including time-varying covariates for education, income and occupation. Education was operationalised using two dichotomous variables on whether the individual had (or was in training towards) A level qualifications or tertiary qualifications. Income was adjusted for inflation using the Consumer Price Index and both individual income and the proportion of household income were included. Occupation was constructed using four dichotomous variables based on the Registrar General's Social Class classification of the current or most recent employment.

30. The BHPS is relatively ethnically homogenous. It was only viable to construct a single dichotomous variable to indicate ethnic minority status. Religiosity was dichotomised as whether the respondent had ever reported being a member of a religious group. Internal migration was operationalised as whether a respondent had moved from a different BHPS defined region (broadly similar to the Government Office Regions) in the wave prior to the measurement of the friendship group.

31. It was important to control for the composition of the respondent's household at the time they where reporting the characteristics of their friendship groups. Due to the complexity of household living arrangement this was operationalised as whether or not a specific type of relative (i.e. father, mother etc) was present in the household. Several more refined versions of these categories (e.g. splitting siblings into younger and older categories) were also constructed but had limited effects and are not reported. The total number of individuals in the household was included as a scale variable capped at six.

32. A final potentially important confounder was the actual availability of relatives outside the household who could be included in the friendship group. Unfortunately information on the family outside the household information was only collected at the very end of our study period. This meant it was not possible to consider whether or not an individual's parents were alive outside the household at each wave. Problems were also encountered with the number of siblings outside the household. Unlike parental survival this less likely to vary over time but it was not possible to match 18% of spells with a measure of sibship size, particular those spells from earlier waves of data collection. When sibship size was included in the model as a linear variable (capped at 5) the result was somewhat confusing. The explanatory variables remained similar, the main effect of sibship size was not significant but a dummy variable indicating that sibship size was missing was statistically significant. Therefore sibship size has not been included in the models presented due difficulties in interpreting these results.

33. Three methods where used to examine control for missing data. First, separate categorical dummy variables when the value was missing were included or assumptions where made on the basis of missingness (normally imputing the measure into the reference category). These are the results that are presented here. Complete case analysis and imputation by chained equations were also conducted with the data in the spell level 'long' format. These methods produced very similar results to those presented. It was not possible to specify a valid chained equation imputation model in the individual level 'wide' format.

34. Interactions were run between all control variables and the friendship group variables. Virtually all of these interactions proved to be non-significant or have non-credible odds ratios (due to small cell sizes). We confirmed the assumption of proportional hazards across ages by considering interactions between a continuous age specification, a categorical age specification and finally by analysing separately those older and younger than 26.

35. All analysis was conducted using STATA 10.

Results

36. The final dataset consisted of 1,555 female respondents who contributed at total of 4,208 spells. There where 307 (7.3%) occasions where the spell was followed by a first birth. The distribution of the numbers of individuals in each of the key explanatory friendship group variables is set out in table one, descriptive statistics for categorical control variables in table two and continuous control variables in table three.

37. Table four shows a clear association so that those spells were there is a birth in the period afterwards are more often preceded by having family members in the friendship group (chi-square value $p<0.000$) However bivariate analysis is only of limited causal utility due to the strong potential for confounding from age and the other control variables.

38. Table five shows the multivariate models. The results are presented as odds ratios whereby a unit increase in the explanatory variable multiplies the risk of first birth at any age by this amount. Model 1 includes just the number of relatives in the friendship group, age, age squared and the wave of data collection. This model shows that those individuals who have more relatives in their friendship group have a higher risk of first birth across all ages. This effect is strongly statistically significant at the 1% level. Unsurprisingly the age terms indicate that the risk of first birth increases and then decreases with age. Model 2 includes the number of friendship group members contacted 'most days' as the sole explanatory variable. Unlike the composition of the friendship group this frequency of contact measure has a very modest and non-significant influence on the risk of first birth.

39. Model 3 includes both of the above explanatory variables as well as controls for household composition. The influence of number of relatives in the friendship group decreases in magnitude, though the odds ratio remains above one and significant at the 5% level. The frequency of contact with the friendship group variable remains non-significant. Model 4 shows that when only the relatives who are frequently contacted are included in an explanatory variable the effect becomes slightly stronger.

40. Living with a partner unsurprisingly has a strongly significant effect in increasing the risk of a first birth. The effect of a mother in the household has a marginally significant effect, though it is likely that this variable (controlling for father presence in the household) reflects that the respondents' mother is a single parent (or has re-partnered) and thus might be associated with SES. Once SES controls are introduced in models 5 and 6 whether or not the respondent lives with their mother becomes non-significance. Living with 'other relatives' increases the risk of first birth in all the remaining models. This category is very heterogeneous consisting of grandparents, uncles, aunts, half siblings etc and there were insufficient occasions to allow meaningful analysis of these relatives separately.

41. Models 5 and 6 include all the socio-economic and other controls variables. There is a decrease in the effect size of both kin orientation explanatory variables remain in the same direction and significant at the 5% level. The general frequency of contact with the friendship group again has an extremely modest effect. Of the socio-

economic controls education has the strongest effect, with increasing education substantially delaying first birth. It is interesting to note that in this sample income does not have a significant effect, controlling for other SES variables. It is also females employed in skilled manual occupations, rather than professional / managerial ones, who have the lowest risk of first birth.

42. Our secondary research question considered geographic proximity or frequency of contacted had a greater effect. Figure 1 shows the effect of having a relative in the friendship group at various geographic and frequency of contact levels. These results show that it is only when the respondent has a relative in the friendship group who lives within 50 miles *and* this relative is seen frequently that their effect on the risk of first birth is (just) statistically significantly.

43. Finally, we checked whether specific relatives in the friendship group (i.e. mother, sister etc) where driving the aggregate kin orientation effect. We did this by running the models separately including only the instances when the specific individual had been named within the friendship group as the explanatory variable. The results are shown in figure 2. All specific relative categories had a non-significant effect, except for the 'other relative' and 'female other relatives' categories. Similar to household controls these latter groups are very heterogenous and the BHPS coding allows very limited additional analysis of the individuals who fall within it. We tested whether it was just these 'other relatives' driving the aggregate kin orientation effect by running the models again, this time removing all 235 spells where the respondent included a female 'other relative' within the friendship group. In this reduced subset the kin orientation variables remain in the predicted direction, though only frequently contacted relatives remain significant at the 5% level (not shown).

Discussion

44. This research shows that in the UK relatives significantly influence reproduction; the more relatives that a female reports within her friendship group the greater the risk that she will have a first birth, controlling for numerous potentially confounding factors. This is particular the case for frequently contacted relatives. There does not appear to be any association between frequent contact with the friendship group in general and risk of first birth.

45. The results show that relatives do positively influence reproduction in a modern low fertility population. This is a useful addition to the behavioural ecology literature as previous work has only looked at this effect in traditional high fertility populations. From an inclusive fitness perspective this result is very much in the expected direction. It has been argued that the high levels of female childlessness in contemporary Europe are partially due to 'perpetual postponement' (Berrington 2004). As we set out earlier, our results could be interpreted as non-kin encouraging the postponement of childbearing. It is possible that there is an adaption for non-kin to actively discourage childbearing, though we are not yet fully convinced. Qualitative work in this area has shown that in other European settings some non-kin female friends, who have children, actively try to persuade their female friends to become parents and join the 'motherhood club' (Bernardi 2003) (Keim, Klarner et al. 2009). The extent that non-kin are actively discouraging childbearing, or are just relatively less pro-natal, would be a very interesting avenue for future research.

46. There is limited evidence to support conclusions to our secondary research question. It is difficult to say whether kin priming or the potential for childcare has a greater effect. We can compare between a frequently and infrequently contacted relative who lives within 50 miles of the respondent. Both relatives would be available for childcare, however it is only having a frequently contacted relative that significantly increases the risk of first birth. This would tentatively suggest a greater role of kin priming. It was also only frequently contacted relatives who statistically influenced the risk of first birth after excluding female 'other relatives.'

47. However, it would be very wrong to conclude that in modern societies kin assistance only has a limited influence on fertility. Frequently contacted relatives could be seen as more likely to provide 'free' childcare. Similarly other kin support, such as post-natal emotional support, advice (particularly from parents) or financial assistance does not require geographic proximity At a more psychological level, as 'cooperative breeding' has probably long been a critical factor in the human evolutionary trajectory (Hrdy 2009) the level of contact with kin could have a deeper psychological impact on a female's assessment of her reproductive resources, over and above the actual financial savings of kin supplied childcare. What matters is the *perceived* level of social support. Having children is a life changing, and potentially risky, decision. Some females may require assurances from others before starting childbearing. In addition to her partner, the traditional safety net for a post-natal female would be her relatives. This may well make their assurances particularly influential. It is also quite possible, indeed probable, that the support provided by kin could be a critical factor in the progression to later births, when the difficult task of combing childcare and other aspects of a female's life has become a practical reality.

48. It is also worth noting the somewhat surprising finding that no effects were found for specific relatives, unlike other behavioural ecology work. Though this might well be due to an insufficient number of observations for each relative to truly measure their effect.

49. The friendship group used in this study constitutes a social network operationalised at a very close ego-centric level. Defined as just the three closest non-household individuals it lies within, and is not directly comparable to, the 'support clique' (Dunbar and Spoors 1995) the 'personal community' (Pahl 2005) or other such network classifications. It would not necessarily be appropriate to assume that the kin orientation of this stratum of the network would be reflected outwards at wider levels, though (Dunbar and Spoors 1995) have argued that this is likely to be the case.

50. Our study has other limitations. We were not able to look in detail at the characteristics of the friendship group members. An interesting aspect would have been whether or not these members had had children themselves, and thus the extent to which the respondents were conforming to wider childbearing patterns. It was also not possible to truly control for the pool of relatives outside the household from whom the respondent could have picked when deciding upon their friendship group. Part of the effect could also be explained in terms of inter-generational transition of fertility norms, as those respondents with more siblings will be from high fertility families of origin, they will also have more relatives who could fall into the friendship group. Finally, there remains a capacity for reverse causation as adult females become closer

to their relatives, especially perhaps to their parents, in preparation for the onset of childbearing. Whilst this is possible the substantial time lag, up to 18 months between measurement of the family group and conception, would indicate a level of forward planning not normally seen in the qualitative descriptions of fertility decision making (Rotkirch 2007 (Bernardi 2003) (Keim, Klarner et al. 2009) Moreover it would also remain consistent with the central theme of this paper: family remain important for childbearing and childraising.

51. Kinship is a fundamental cornerstone of human society, and has been throughout our evolutionary history. Even in a complex contemporary society its influence is felt on one of the most important questions an individual faces in their adults lives: when and whether to become a parent.

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Table 1 Percentage of spells where the individual has the following number of individuals in their friendship group

Number of	**0**	**1**	**2 or 3**
... relatives in friendship group	60.65	29.68	9.67
... friendship group members contacted 'most days'	25.43	33.37	41.2
... relatives who are seen most days in friendship group	82.39	14.45	3.16

Table 2: Descriptive statistics of other categorical explanatory and control variables

	Percentage of spells
Distance and frequency of contact to relatives in the friendship group	
Respondent had a relative in the friendship group who lived over 50 miles away	10.8
Respondent had a relative in the friendship group who lived under 50 miles away and was infrequently contacted	15.2
Respondent had a relative within 50 miles and this relative was contacted 'most days'	14.5
Individual relatives in the friendship group	
Mother	15.6
Sister	16.18
Brother	3.4
'other relative'	7.8
Female 'other relative'	6.8
Control variables	
Household contains Partner	33.48
Household contains Mum	42.44
Household contains Dad	34.17
Household contains One or more sisters	16.28
Household contains One or more brothers	19.75
Household contains One or more non-relatives	12.79
Household contains One or more other relatives	2.83
Degree or in education towards (ref: below A level not in education)	32.15
A levels or in education towards (ref: below A level not in education)	36.17
Professional Managerial (ref: Manual)	28.47
Skilled Non-Manual (ref: Manual)	38.26
Never had a job (ref: Manual)	6.94
Occupation of last job missing (ref: Manual)	1.95
Where the respondent has ever attendance at a religious organisation	13.85
Non-white ethnicity (ref: white ethnicity)	3.26
Internal migration from last wave	5.82
Internal migration missing	4.87

Table 3: Descriptive statistics of continuous control variables

	Mean	**Standard Devi**
Age at time of interview	24.6	6.23
Individual income (thousand pounds adjusted by CPI)	10.084	9.83
Proportion of household income earned by the respondent	0.375	0.32
Number of individuals in the household (capped at 6)	2.8	1.3

Table 4: Crosstab between number of family in friendship group and whether or not the event ends in a birth.

	Reporting no relatives in friendship group	Reporting one relative in friendship group	Reporting two or three relatives in friendship group
Spells with no birth 9-27 months afterwards	62%	29%	9%
Spell with a birth 9-27 months afterwards	42%	40%	18%

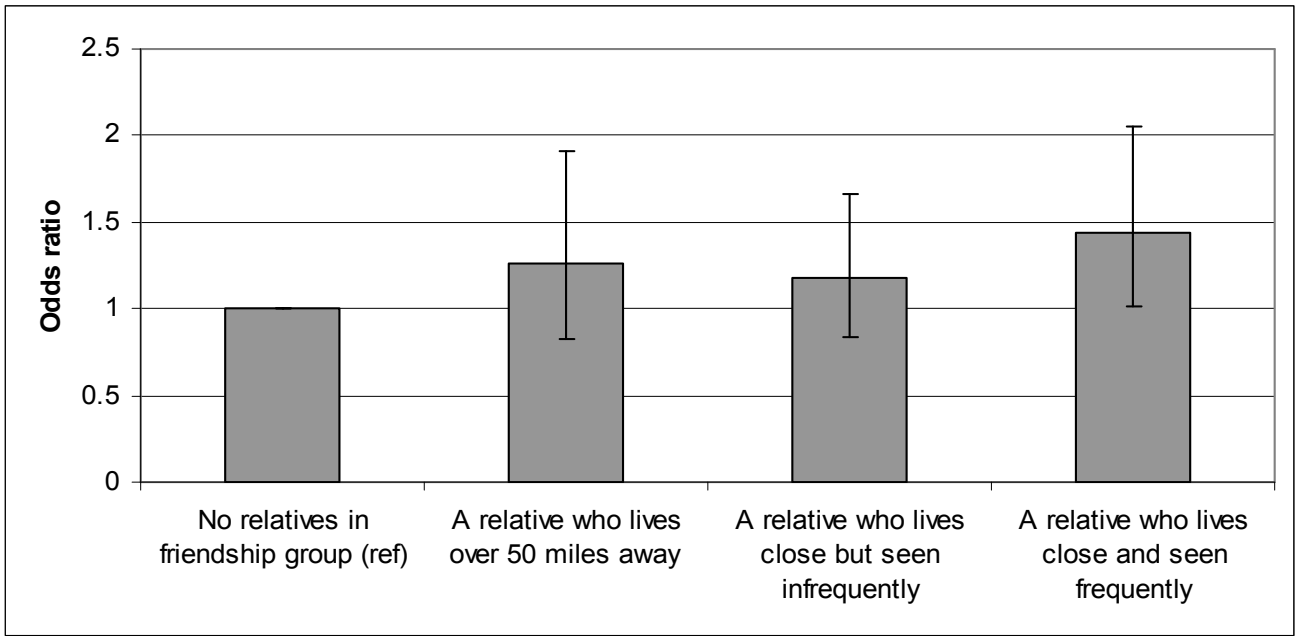
Table 5: Odds ratios for the risk of first birth from multivariate discrete event history analysis models

	Model 1	Model 2	Model 3	Model 4	Model 5	Mo
Number of family in friendship group	1.59***		1.22**		1.20**	
Number of friendship group seen most days		0.99	1.06		1.02	
Number of family seen most days in friendship group				1.31***		1.
Household contains Partner			6.51***	6.57***	7.00***	7.
Household contains Mum			1.85*	1.82*	1.76	1
Household contains Dad			0.69	0.71	0.77	0
Household contains One or more sisters			0.68	0.68	0.63	0
Household contains One or more brothers			1.07	1.07	1.01	1
Household contains One or more non-relatives			0.57	0.58	0.64	0
Household contains One or more other relatives			3.14***	3.20***	2.88**	2.
Household size (capped at 6)			0.96	0.96	1.03	1
Degree or in education towards (ref: below A level not in education)					0.50***	0.
A levels or in education towards (ref: below A level not in education)					0.64***	0.
Professional Managerial (ref: Manual)					0.88	0
Skilled Non-Manual (ref: Manual)					0.59***	0.
Never had a job (ref: Manual)					0.66	0
Occupation of last job missing (ref: Manual)					1.42	1
Income individual (per £1000 adjusted via CPI to 2005)					1.00	1
Income as proportion of household income					1.62	1
Ever attendance at a religious organisation					1.25	1
Non-white ethnicity (ref: white ethnicity)					1.39	1
Internal migration from last wave					1.00	1
Internal migration missing					0.58	0
Age	1.86***	2.01***	1.33***	1.32***	1.32**	1.
Age^2	0.99***	0.99***	0.99***	0.99***	0.99***	0.

Controlling for wave of collection (non-significant in all models)

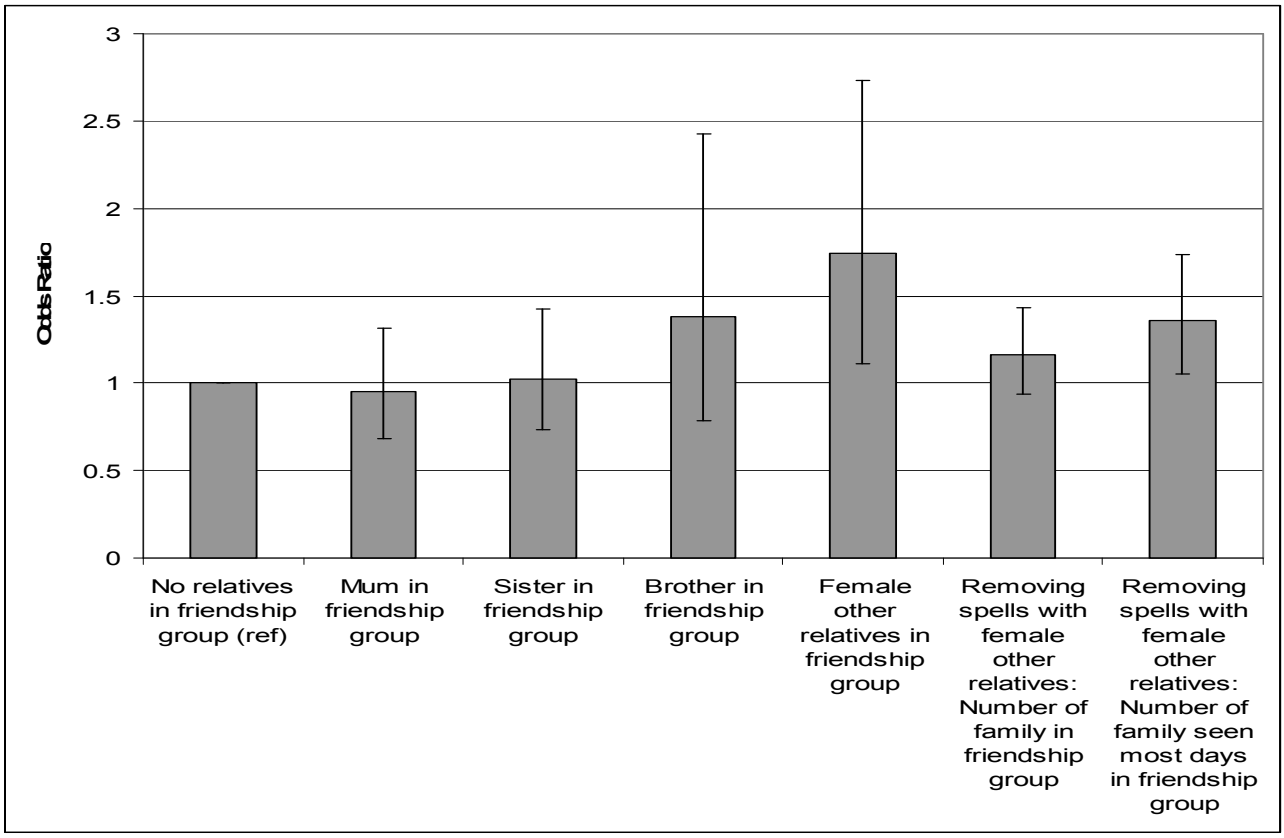
***p <0.01; **p <0.05; *p <0.1

Figure 1: Effect of have one or more relatives in the friendship groups on the risk of first birth by frequency of contact and geographic distance, with a 95% confidence intervals indicated by the error bar.



Controlling for: frequency of contact, SES, migration, religiosity, household composition and size, occupation and migration missing, age, age^2 and wave data collected.

Figure 2: Effect of have specific relatives in the friendship groups on the risk of first birth, with a 95% confidence intervals indicated by the error bar.



Controlling for: frequency of contact, SES, migration, religiosity, household composition and size, occupation and migration missing, age, age^2 and wave data collected.