How much does family matter?
Cooperative breeding and the demographic transition

Rebecca Sear[1]
London School of Economics

&

David Coall
University of Western Australia
and
Edith Cowan University

[1] Corresponding author: Department of Social Policy, London School of Economics, Houghton St, London WC2A 2AE, UK
Tel: +44 20 7955 7348
Email: r.sear@lse.ac.uk

Abstract

In this paper we review the empirical evidence that women receive help from family members in raising children, by drawing together published research which has explicitly investigated the impact of kin on child well-being. It is clear from this review that in both pre- and post-demographic transition societies family matters: the presence of certain relatives improves child survival and well-being, though which relatives matter differs between populations. This provides support for the hypothesis that humans are cooperative breeders: mothers cannot raise children alone but need help from other individuals to support their reproduction. We then go on to review the evidence that relatives matter for women's fertility outcomes. The picture here is less clear cut, but again suggests that the presence of parents or parents-in-law affects outcomes such as age at first birth and length of birth intervals. Overall this survey suggests that women are influenced by, and reliant on, their kin during their reproductive lives, so that changing patterns of association with kin may have a causal role to play in the demographic transition. The implications of these still changing patterns of kin association and child-raising relate not only to the effect they may have on future demographic change, but also to how children are socialised and what effect this may have on future social change.

Introduction

Hillary Clinton may have popularised the proverb 'it takes a village to raise a child' in her 1996 book, but interest in who raises children had been widespread among both demographers and anthropologists for some time by the late 1990s. Part of this interest stems from the potential effects of child-rearing patterns on fertility rates. Women who can rely on others for support in caring for children during their reproductive years can spare more time and energy for giving birth to more children. Support from others may therefore be critical for high fertility rates. While both demographers and anthropologists have acknowledged this to some degree, the two disciplines have tended to focus on different helpers. The contribution of older children to the household economy has long been of interest to the demographic community, arising particularly from Caldwell's influential wealth flows hypothesis: he argued that when children contribute to the household economy fertility is high, but fertility falls as modernisation results in children becoming an economic burden rather than an economic asset (Caldwell 1978). Research in the 1970s demonstrated that children do indeed contribute substantial labour to the household economy in high fertility societies (Cain 1977). A recent resurgence of interest in this topic convincingly argued that parents may only be able to sustain high fertility rates by making use of the labour of older children, even though each child is overall a net drain on the household economy (Lee and Kramer 2002; Kramer 2005).

Evolutionary anthropologists, taking a comparative cross-species perspective, were typically more interested in men, and for a long time argued that contributions from fathers are the key factor which distinguish human child-rearing from that of closely related primate species (Lovejoy 1981). More recently, however, evolutionary researchers have broadened their focus, and over the last decade or so have begun to develop the hypothesis that humans are

cooperative breeders, a relatively unusual breeding system in which mothers receive help from many other individuals in raising offspring (Hrdy 2009). While this help may sometimes come from fathers, or other men (Hill and Hurtado 2009), more reliable helpers are likely to be relatives of the woman, particularly her own mother and older children (Hawkes, O'Connell, and Blurton Jones 1989; Turke 1988). Overall, however, the cooperative breeding hypothesis suggests that the best strategy is a very flexible one, whereby women co-opt a wide range of other individuals, including men, her own kin and her husband's kin into helping raise children, depending on who is available and willing to help (Hrdy 2005). This cooperative breeding hypothesis suggests that where women receive little help in raising offspring, they will reduce family size, since they cannot rear large families alone – thus potentially contributing part of the explanation for the demographic transition (Draper 1989, Turke 1989). This hypothesis dovetails with (and indeed built on) earlier work by demographers, who observed that fertility tends to be higher in couples living in extended families, compared to those living without the support and influence of kin in nuclear family households (e.g. Davis and Blake 1956: see Burch 1970 for a critical review of this early literature on family structure and fertility).

This paper will review the evidence that humans do receive important help from other individuals in raising children, by drawing together empirical evidence that the availability of family members affects child health and well-being, and female fertility rates. The first section of the paper will concentrate on the evidence for the effects of kin on child survival in pre-demographic transition societies. The second section will tackle the effects of kin on children in post-transition societies. The third will present evidence that kin may affect fertility rates.

Kin effects in pre-transition societies

If family members are helping women to raise children, then there should be evidence that the presence of family members improves child health and well-being. Since child survival is a fairly unambiguous signal of health and well-being, we have focussed here on studies which have investigated the effects of relatives on child survival. We concentrate on studies which look at the effects of named family members on the probability of child survival, since, as well as the fact of help itself, we are also interested in finding out who helps. We have drawn together all published studies which have investigated the effects of fathers, maternal and paternal grandmothers, maternal and paternal grandfathers, and older siblings of the child on child survival. We found 37 populations where the effect of the presence of at least one relative, apart from the mother, has been correlated with child survival rates (Tables 1-3, Figure 1: all tables slightly updated from Sear and Mace 2008, where a more detailed discussion of this dataset can be found). All are populations with high mortality and fertility rates. These studies are divided into two groups. Table 1 shows those studies where at least reasonably sophisticated statistical analysis was used to examine these correlations: at a minimum these studies used multivariate analysis so that potentially confounding factors could be controlled for. Table 2 shows studies which only demonstrated a simple bivariate correlation between the presence of relatives and children. Table 3 provides a summary of Tables 1 and 2. A '+' in Tables 1 and 2 indicates that the presence of that relative improved child survival, 'none' indicates no effect, a '–' indicates the presence of that relative reduced child survival.

We include fathers in the table, since there is debate in the literature about exactly how much men help and what they do for children (see e.g. Winking 2006). In a previous study, we also collated published data on the 32 studies which have investigated the effects of the presence

of the mother on child survival. All 32 found, unsurprisingly, that the absence of the mother was correlated with lower child survival (summarised in Table 3: see Sear and Mace 2008 for more details; the additional studies not included in Sear and Mace 2008 are Oris, Derosas and Breschi 2004, Penn and Smith 2007, van Bodegom et al 2010 and Willführ 2009). However, this mother effect declined with the age of the child in all populations where an age interaction was investigated, and older children often appeared to have rather high survival chances even in the absence of the mother. A number of these studies found that children as young as two years old apparently suffered no higher mortality in the absence of the mother, suggesting that other individuals must be stepping in to help these motherless children out (Sear, Mace, and McGregor 2000; Zaba et al. 2005; Masmas et al. 2004; Andersson, Högberg, and Åkerman 1996). The data presented in Tables 1 and 2 suggest who those other individuals might be.

The first thing to note from these data is the number of '+'s that appear in the tables. In the majority of the studies at least one relative appears to be positively correlated with child survival (in fact, in all cases where the presence of two or more relatives was examined, at least one relative was found to be important – the exceptions which found no correlations were studies which only looked at the effect of either the father or the paternal grandmother). Which relatives are correlated with higher child survival differs between populations, however. One of the most reliable helpers is the maternal grandmother: in more than two-thirds of cases her presence improved child survival rates. Paternal grandmothers were also often associated with positive survival outcomes, though somewhat less consistently: in just over half of cases they improved child survival. Numerically, the most consistently positive relative were older siblings of the child (beneficial in over 80% of cases). However, there were rather few studies in this category (n=6) because we used a fairly restricted definition of

older siblings: only older siblings we thought were potential 'helpers-at-the-nest' were included, that is, siblings several years older than the child (exact definition depends on study). Siblings close in age are more likely to be in competition with one another for household resources, and several studies find a detrimental effect of having elder siblings on child mortality when all siblings are considered (e.g. Muhuri and Menken 1997).

Fathers were rather unimportant: in only just over a third of all cases did they improve child survival, though this proportion rises to half if only statistically sophisticated studies were included. Grandfathers on the whole made little difference. Maternal grandfathers showed few correlations with child survival. Paternal grandfathers were roughly evenly split between those studies where a difference was found and those where they had no effect. But in those studies where paternal grandfathers did matter, in more than half of cases they actually reduced, rather than improved, child survival rates. It is also worth noting that not even grandmothers or fathers were always beneficial to children. One study found the presence of fathers increased the mortality of girls (rural Ethiopia: Gibson 2008); one found a detrimental effect of maternal grandmothers (rural Malawi: Sear 2008); and two found detrimental effects of paternal grandmothers (historical studies in Germany and Japan: Beise 2002; Sorenson Jamison et al. 2002). Family relationships may sometimes be characterised by conflict, rather than cooperation.

We conclude from this survey that the evidence does support the hypothesis that humans are cooperative breeders. Children do better in the presence of certain relatives, including grandmothers, older siblings and, occasionally, fathers. Data on kin effects on the survival rates of children may even underestimate the effects of relatives since mortality is an extreme indicator of child well-being. For example, in the Spanish study included in Table 2, though

fathers had little effect on the survival of their young children, teenage boys were shorter in the absence of fathers (Reher and González-Quiñones 2003). We note some caveats, however. First, a review such as this based on published literature inevitably runs the risk that studies which find positive associations between relatives and child survival may be more likely to be published than those which find no associations. We hope this problem is not too severe in this case, at least partly because many authors have included a wide range of relatives in their analysis and published the results whether positive or null. A second problem is that the studies we have presented show correlations between the presence of relatives and child survival, not necessarily causal relationships. The studies in Table 1, at least, attempt to control for some potentially confounding factors (e.g. maternal age, which is likely to be correlated both with child survival and the probability that a child has a living grandparent; a number also control for heterogeneity between mothers in child survival). But many studies use the survival status of relatives as a proxy for whether they are available to help mothers, and it is possible that shared genes or shared environment might result in positive associations between the survival of children and their relatives. Such a possibility is difficult to exclude entirely, but many of the studies in Table 1 have demonstrated that only some relatives are correlated with child survival and not others. If shared genes or environment were the explanation then one might expect to see positive correlations with all relatives not just some. Further, some studies investigated whether the effects vary by age or by sex of child. In the Gambia (Sear, Mace, and McGregor 2000; Sear et al. 2002), historical Germany (Beise 2002) and Canada (Beise 2005), grandmaternal effects are age-specific. In Ethiopia (Gibson and Mace 2005), Malawi (Sear 2008) and Japan (Sorenson Jamison et al. 2002), the effects of paternal grandmothers are sex-specific (see Fox et al 2010 for a hypothesis to explain why grandmaternal effects are sex-specific). Again, if shared genes or

environment were the explanation, these effects might be expected to be seen at all ages and for both sexes.

More convincing evidence that kin do indeed help would be detailed research on what exactly it is that relatives do within the household. A handful of studies in Table 1 also collected additional data which supports the hypothesis that kin are actively helping mothers out. Usefully, the study in rural Ethiopia collected time-budget data on what individuals within the household were actually doing (Gibson and Mace 2005). This research found that grandmothers were contributing household labour, though maternal grandmothers tended to help out with heavy domestic tasks, paternal grandmothers with agricultural labour. The productive nature of grandmothers has been confirmed in other African agricultural (Bock and Johnson 2008) and hunter-gatherer societies (Hawkes, O'Connell, and Blurton Jones 1989) Similarly, recent empirical work, including a reanalysis of Cain's original data, has confirmed that children do contribute both domestic and productive labour to the household (Robinson, Lee, and Kramer 2008; Kaplan 1994).

Relatives may also help out directly with childcare. Earlier research in the Gambian population included in Table 1 demonstrated that maternal grandmothers have an important role in childcare when children are weaned: mothers send children away to a relative during this period so that they will 'forget the breast', and the majority of children are sent away to their maternal grandmother (Thompson and Rahman 1967). It is notable therefore, that the effect of maternal grandmothers in this population was seen around the time of weaning, but not before. Several other behavioural studies by anthropologists have confirmed that individuals other than the mother are frequently heavily involved in caring for children. Among two different forager groups in Central Africa (Ivey 2000; Fouts and Brookshire

2009), infants actually spend more time in allomaternal care than maternal care; one of these studies found infants were cared for, on average, by 24 individuals (Ivey 2000). In an agro-pastoralist African population, the quality of allomaternal care was found to be high whether or not the mother was present, such that the distress of the infant did not increase during the mother's absence (Borgerhoff Mulder and Milton 1985). That kin are the most important helpers is suggested by further studies among both Martu aborigines in Australia and Hadza hunter-gatherers in Tanzania finding that the degree of genetic relatedness affected both the probability of caring for infants, and the intensiveness of care: more closely related individuals do more care and more intensive care (Scelza 2009; Crittenden and Marlowe 2008).

Qualitative research has also demonstrated that grandmothers, in particular, seem to have influential roles around the perinatal period and in child feeding practices, by giving advice and practical support, which may provide a mechanism for affecting child survival rates. Douglass and McGadney-Douglass (2008) found that Ghanian grandmothers (usually, though not always, paternal) played an important role in improving child survival rates from Kwashiorkor, by recognising illness and ensuring the child's parents complied with the daily regime of nutritional treatment. In Northern Malawi (Bezner Kerr et al. 2008) and Nepal (Masvie 2007) paternal grandmothers are influential in perinatal care (for example, assisting delivery) and child feeding practices. A community health programme in Senegal demonstrated that including grandmothers in programmes aimed at improving nutritional practices related to pregnancy and infant feeding was successful in improving these practices among reproductive-aged women (Aubel, Toure, and Diagne 2004, in whose population "A home without a grandmother is like a house without a roof"). Sharma and Kanani (2006) found that grandmothers appeared to improve the calorie and nutrient intake of children

(especially aged 6-11 months) leading to improvements in nutritional status. Such helpful practices surrounding child feeding may be part of the reason why the positive effects of relatives on child survival in both Ethiopian and Gambian studies in Table 1 were mirrored by positive effects on nutritional status (Sear and Mace 2009; Sear, Mace, and McGregor 2000; Gibson and Mace 2005).

Grandparental effects in post-transition societies

In our survey of kin effects in post-transition societies, we have chosen to focus on the effects of grandparents. There is a large literature on the involvement of fathers and their impact on child well-being, overall suggesting fathers may be more important in post- than many pre-transition societies, however this large literature requires a separate review (see Amato and Rivera 1999; Sigle-Rushton and McLanahan 2004). It is also difficult to analyse the effects of older siblings in post-transition societies since, by definition, far fewer siblings are available to provide care in low fertility societies. Moreover, siblings tend to be close in age, thereby violating our principle of only analysing the effects of potential helpers at the nest (who are rather older than the focal child), and both social and legal prohibitions, together with universal and extended education, make sibling contributions to the household economy much less likely. So we focus here solely on grandparental effects on child well-being. Low fertility rates and low childhood mortality rates in post-transition societies make grandparental influences on classic fitness indicators difficult to assess. Rather, because of the low fertility rate and ever increasing investment per child, it is likely grandparental influences, if they exist at all, will be found in measures of child development such as psychological adjustment, mental health, cognitive ability and well-being (see Coall and Hertwig 2010).

Extending a previous review (Coall and Hertwig 2010) to include grandparental effects across a range of family types, we identified 19 articles that examined the influence grandparents have on grandchild outcomes in post-transition societies: 13 examining grandchildren's psychological adjustment (see table 4), three examining depression (Botcheva and Feldman 2004; Ruiz and Silverstein 2007; Silverstein and Ruiz 2006), two examining academic achievement (Falbo 1991; Scholl-Perry 1996), and one examining mental and physical development (Tinsley and Parke 1987). The 13 studies exploring grandparental influences on grandchildren's psychological, social and emotional adjustment form a relatively homogeneous group and will be the focus of this review.

Generally, the majority of studies (77%) reviewed here suggest grandparents continue to have a beneficial impact on grandchild development in post-transition societies (see Table 4). Grandparental involvement and contact with their grandchildren and the quality of their relationships appear to influence grandchild well-being, specifically psychological adjustment. In family situations where fewer parental resources are available (e.g., step and single parent families) the resources grandparents bring appear to have a stronger positive association with grandchild well-being (Henderson et al. 2009; Lussier et al. 2002). Having a custodial grandparent seems to result in poorer grandchild outcomes, however, this is likely to be a result of the preceding family situation that resulted in the grandparent assuming that role (Pittman 2007). Perhaps surprisingly, three studies have found weak negative associations between grandparental childcare and grandchild outcomes (Cherlin and Furstenburg 1986; Fergusson, Maughan, and Golding 2008; Hetherington 1989). Unfortunately, none of these studies have been able to consider the quality of childcare provided to establish whether it is grandparental childcare or underlying familial factors that contribute to this association. It is considered more likely that in difficult financial or

behavioral situations parents are more likely to turn to grandparents for help, rather than grandparental childcare having a negative influence on grandchildren (Cherlin and Furstenburg 1986; Hetherington 1989; Pittman 2007).

Like the role of fathers, in contrast to pre-transition societies, grandfathers in post-transition societies appear to have an equal if not larger impact on grandchild development than grandmothers. Interestingly, grandfathers appear to have a more positive impact even though they have less contact with grandchildren than grandmothers. This finding may, in part, be due to the availability of family members. For example, in the studies that explicitly chose families with a biological mother present and biological father absent, a resident grandfather had a large influence on grandchild development. This may reflect the grandfather assuming the father figure role while the grandmother, usually the maternal grandmother, has a smaller role beyond that of the mother (Oyserman, Radin, and Benn 1993; Radin, Oyserman, and Benn 1991). It must be noted, however, that studies focusing on grandmothers, especially co-residing grandmothers, find consistent beneficial influences (e.g., Henderson et al. 2009). There is some evidence that maternal grandparents have a more beneficial effect than paternal grandparents (Bridges et al. 2007; Lussier et al. 2002), however, a clear limitation in the post-transition literature is the lack of distinction between grandparent types, which seems to be influential in pre-demographic transition societies.

The effects grandparents have on grandchild development are generally of a small size (but see Henderson et al. 2009; Radin et al. 1991). The fact that these associations are found across grandchild ages, study designs and diverse populations, and generally take into account a range of potential confounding variables adds strength to these findings. At this point it must be emphasized again that the direction of the causal association cannot be

established from these correlational studies. From the current literature it cannot be establish whether grandparental investments specifically improve grandchild outcomes. Rarely, is it possible to rule out the alternative explanation that grandparents are more attracted to friendly, caring, happy, responsive grandchildren and their increased investment is purely a side effect of this interaction. Likewise, it may be that grandchildren live with custodial grandparents when the most difficult of circumstances have befallen a family and these conditions, not the grandparents' investment, influence grandchild development. However, the ability in longitudinal studies to adjust for earlier measures of the grandchild's environment and development are showing promise (see Coall and Hertwig 2010). For example, in a longitudinal analysis that controlled for earlier psychological adjustment, Pittman and Boswell (2007) found that grandchildren who moved into custodial grandparent households demonstrated improved psychological adjustment. Moreover, like the ethnographic data, these findings are supported by qualitative analyses that show it is not the grandparent-grandchild relationship *per se* that makes a difference, rather it is what grandparents actually do with their grandchildren that is crucial (see Alawad and Sonugabarke 1992; Botcheva and Feldman 2004; Griggs et al. 2010; Coall and Hertwig 2010; Kennedy and Kennedy 1993).

The burgeoning field of grandparental investment in post-transition societies does suggest grandparents play a crucial supportive role to mothers and grandchildren reminiscent of that found in many pre-transition societies. With the demographic transition the child outcomes have changed, however, the evidence that grandparents have a positive influence on grandchild development, especially in the trying times of divorce, re-marriage and economic hardship, are growing.

Kin effects on fertility

So, kin appear to help women out in both pre- and post-demographic transition societies, but do kin also affect fertility rates? Such help reducing the costs of child-raising may plausibly affect fertility rates in both pre- and post-demographic. In pre-transition, poorly-nourished societies, relieving some of the energetic burden of reproduction from women may result in faster conceptions and higher birth rates. In both types of population, women may be more inclined to have children, and have more children, when they are surrounded by supportive kin networks, since such support will reduce the costs, or perceived costs, of child-rearing. Newson has also proposed that kin may have an active role in encouraging child-bearing, at least when conditions are suitable for successfully raising children, so that social norms may be more pro-natal in situations where women are surrounded by kin (Newson et al. 2007). Here, we review those studies which contribute empirical data to the question of whether kin influence fertility (a more detailed description of this dataset is in preparation: Sear and Mathews in prep). We restrict our review to published studies which have investigated the impact of the presence of parents or parents-in-law on women's fertility. We do not include the many studies which have investigated whether sibship size influences fertility, since we are keen to restrict our analysis to those kin known to be available to influence a woman's fertility during her reproductive years. We have also only included those studies which indicated whether named relatives were available to the woman, rather than including the several studies which have analysed the effects of family form or household composition on female fertility (such as living in a nuclear versus extended family), since such analyses also do not provide precise data on which kin are available to influence fertility. We argue that it is important to know exactly *who* is available to women, since different relatives may have different roles to play within the household.

We identified 39 populations in which the effects of parents and parents-in-law on female fertility has been statistically investigated (Tables 5 and 6 for multivariate and univariate studies respectively, substantially updated from Mace and Sear 2005, and summarised in Table 7). Each row in these tables represents a different sample of women: in some cases more than one row relates to the same national population, but the sample of women is different in each case; where clearly distinct populations of women were identified in the same study (such as ethnic groups with different postmarital residence patterns) and analysed separately a separate row is devoted to each distinct sample of women. These tables and figure should therefore be interpreted with caution, since this dataset may both over- and under-estimate the effects of kin on fertility (for example, because different samples from the same national population are not necessarily independent datapoints; and because analysing large national populations may hide kin effects if they are only found in some sections of the population). A variety of fertility outcomes are included – mostly age at first birth (in some studies proxied by teenage birth), length of birth intervals and total number of children born (which may or may not be restricted to post-reproductive women). A '+' in Tables 5 and 6 represents an increase in fertility in the presence of kin (so that + means an earlier age at first birth, shorter birth intervals and higher total number of children born), a '-' a decrease in fertility and 'none' no effect. In this case the relationship of each kin category refers to the woman herself, so that 'mothers' in this table are equivalent to 'maternal grandmothers' in Tables 1 and 2, etc. Since these studies include both pre- and post-demographic societies, we have divided up Tables 5 and 6 into 'high' (top panels: fairly arbitrarily defined as TFR $\geq$3) and 'low' (bottom panels: TFR < 3) fertility populations.

This preliminary survey should be interpreted with due caution: as with the data on child well-being, a review of published empirical findings such as this may be distorted if studies

which find significant effects are more likely to get into print, and these studies only demonstrate correlation not causation. The picture for female fertility is a little less clear-cur than that for child survival: Table 5 suggests that the effects of kin on fertility are not always consistent across all measures of fertility. Some conclusions may perhaps be tentatively drawn, however. First, kin effects are again common – in only 5 (13%) of the 39 populations was there no evidence that parents or parents-in-law influenced fertility. But which relatives are important differs somewhat from those important for improving children's well-being (compare Figures 1 and 2). The direction of the effect is also more variable than for child mortality: a woman's parents, in particular, seem to if anything rather more likely to reduce than increase her fertility. Many, but not all, of these parental anti-natal effects can be attributed to the protective effects of living with both parents against teenage childbearing in low fertility societies. A woman's parents-in-law almost invariably increase her fertility, though note here the few studies including parents-in-law in low fertility societies (since many such studies focus on teenage childbearing, which is frequently outside marriage). If we focus on high fertility societies (see Table 7), we can still perhaps very tentatively conclude that a woman's parents-in-law tend to have pro-natal effects, where the effects of a woman's own parents may be more variable. More data really need to be collected, however, before such a conclusion can be drawn with any confidence.

A further caveat we should note is that it is more difficult to interpret these fertility results than those on child well-being. While all family members should be interested in improving child health and well-being once they are born (with certain exceptions), whether family members are interested in increasing or decreasing the number of children produced is more difficult to determine. Giving birth to many, closely spaced children may not be in a woman's best interest, for example, since it can lead to maternal depletion (Jelliffe and Maddocks

1964). Her husband, however, may be keen to have many children and may desire a higher fertility than is optimal from the woman's point of view (since he does not bear the same costs of reproducing that she does). Studies of fertility preferences in men and women tend to show that, where they differ (and mostly they don't), men are more pro-natal than women (Ratcliffe, Hill, and Walraven 2000; Gebreselassie 2008). A woman's husband and his family may therefore encourage high fertility, whereas a woman's own family may attempt to protect her from the high fertility demands of her husband and in-laws, and not encourage rapid childbearing (Mace and Colleran 2009; Sear, Mace, and McGregor 2003). Evidence for this hypothesis comes from a recent study in rural Africa which found that a woman's kin may actually assist her uptake and use of modern contraception, thereby potentially reducing her fertility (Borgerhoff Mulder 2009), but perhaps optimising the total output of children to maintain her own health.

Grandparental childcare and fertility – post-transition societies

As with the analysis of child survival, correlations between the availability of relatives and fertility do not necessarily demonstrate causal relationships. We have argued that one potential pathway through which parents could influence their children's fertility is by providing practical help with raising grandchildren, and data collected from post-transition societies suggests that grandparents still play a pre-eminent role as childcare providers in post-transition societies (see Hank and Buber 2009). Despite this, surprisingly few studies have examined in detail these grandparental influences on fertility. Using population-level data Coall and Hertwig (2010) examined the association between total fertility rate and grandparental childcare across ten European countries; we extend their analysis and present it graphically here (see Figure 3 and 4). The percentage of grandparents who took care of their grandchildren, without the presence of their parents, *regularly* (almost weekly or more often)

or at all (*any*) over the last 12 months was taken from Hank and Buber's analysis of the Survey of Health Aging and Retirement in Europe. If grandparents rated frequency of child care for more than one of their children, the child who received the most frequent care was counted. Total fertility rates are the 2009 estimates from the CIA's world fact book (Central Intelligence Agency 2009). Figure 3 shows a strong negative association between *regular* childcare by grandmothers and total fertility rate across Europe (r = -.90) with a slightly weaker association for grandfathers (r = -.88 not shown). Perhaps surprisingly this means that countries where grandparents provide *less* regular care fertility is higher and where a higher proportion of grandparents provide regular care the fertility rates are lower. In line with Hank and Buber's interpretation we suggested this reflects the inadequate provision of institutional childcare and support for women to return to work after having a family in countries such as Greece and Italy. In these countries it would appear that if women want a career and a family, grandparents must step up to provide regular childcare. Evidence from a German study suggests when state-funded childcare provisioning is inadequate it is this informal childcare that impacts parents' fertility decisions (Hank and Kreyenfeld 2003). Importantly, grandparental childcare in nations with adequate state-funded childcare has not been crowded out it has merely changed. As Figure 4 shows, a higher proportion of grandmothers from the higher fertility nations provide any childcare (r = .82; and for grandfathers r = .66). This suggests that grandparents in the lower fertility Mediterranean countries are less likely to care for their grandchildren *at all*. A range of cultural, demographic and historical factors could conceivably explain this association. However, Hank and Buber (2009) show this association holds after adjustment for, among other things, grandparental age, health, lineage, partner status, employment status, and distance to child's residence. These analyses suggest that even in post-demographic transition societies grandparents still influence classic fitness indicators such as fertility.

Conclusion: implications for the demographic transition – past and future

This survey suggests that relatives are clearly beneficial in raising children in pre-transition societies. Investigating kin effects in post-transition societies is less easy, but the evidence available also broadly suggests having grandparents around does improve child outcomes. Tentatively, there is also evidence that kin affect fertility, though not always by increasing fertility. Does this have any relevance for the demographic transition? The demographic transition tends to follow economic development. As societies move away from a subsistence economy into an industrial wage-based economy, fertility declines. This shift in subsistence strategy tends to be accompanied by changing social networks: individuals often associate more with non-kin and may physically move away from kin to enhance their prospects of work. This doesn't mean that kin become unimportant, just that the relative significance of, and frequency of interactions with, non-kin increase. This reduction in kin-based social support networks may increase the perceived costs of childrearing, since mothers and parents have to shoulder far more of the burden of childcare than when a large network of helpful kin is available. In post-demographic transition societies, it seems that parents still need help to raise children: though they may be raising fewer children, a shift from an emphasis on the quantity of children to the quality of children means that parents are still investing very heavily in their children (Becker 1991; Mace 2007). But in post-demographic societies, parents may instead have to rely on non-kin help, such as that bought in or provided by the state, which may be less reliable, of lower quality, or less available compared to a supportive network of kin.

The availability of kin will also change as societies move through the demographic transition. Grandparents may well become more available, as mortality rates decline, but in the later

stages of the demographic transition at least, may also spend a longer period of time in ill-health and therefore require help from their children rather than being able to provide it. As fertility declines, older children will be less available as helpers, and the overall size of kin networks will also decline, reducing the availability of siblings, cousins, aunts and uncles. The demographic transition undoubtedly has many contributing factors, not all of which will necessarily apply in any one case, but a loosening of kin ties, which increases the costs and perceived costs of raising children, is a plausible contributing factor.

It has recently been suggested that these changing patterns of kin association and childcare, along with demographic changes, may affect more than just future demography. Children in contemporary developed populations now require much less intense care in order to survive, since child mortality is so low in such societies. They also tend to receive care from a different set of individuals than was typical in the past. Hrdy (2009) has proposed that it was the evolution of a cooperative breeding strategy which was responsible for our cognitive divergence from other apes. One of the hallmarks of our species is our ability to 'read minds', and empathise with and understand the intentions of others (Tomasello 1999), a characteristic which, according to Hrdy's model, arose through the needs of infants to acquire care from a variety of individuals, not just the mother. But Hrdy's suggestion is that now contemporary, low fertility populations are no longer raising children in cooperative kin networks, our cognitive abilities may not develop in the same way, so that our ability to understand and cooperate with others may begin to decline (Hrdy 2009). We'll leave the last, rather gloomy, word on the long-term implications of demographic and child-rearing changes to her:

> *"To all the reasons people might have to worry about the future of our species…add one more having to do with just what sort of species our descendants millennia hence might belong to. If empathy and understanding develop only under particular rearing*

conditions, and if an ever-increasing proportion of the species fails to encounter those conditions but nevertheless survives to reproduce, it won't matter how valuable the underpinnings for collaboration were in the past. Compassion and the quest for emotional connection will fade away as surely as sight in cave-dwelling fish."

Hrdy, 2009, p293

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Table 1: Multivariate studies of the effects of fathers, grandparents and older siblings on child survival

Population	Authors	Age of child (yrs)	Effect of fathers	Effect of maternal gms	Effect of paternal gms	Effect of maternal gfs	Effect of paternal gfs	Effect of older sibs	Other effects and notes
Gambia (4 villages) 1950-74	Sear et al. 2000; 2002	0-5	none	+	none	none	none	+	Elder sisters only increase survival (not brothers), and only at 24-59 mths; divorce -
Canada (Quebec) 1680-1750	Beise 2005	0-5	+	+	+	+	(+)	+	Fathers improve survival 1-23 mths; pgms in first month; mgms 12-35 mths; mgfs 36-59 mths; pgfs 36-59 mths but only for girls
Malawi (Chewa) 1992-1997	Sear 2008	0-5	none	(-)	(+)	none	none	+	Mgms borderline, but sig at $p<0.05$ for girls only; mat aunts – in families where women own resources, + where men do; divorce -
Kenya (Kipsigis) 1945-90	Borgerhoff Mulder 2007	0-5	none	none	+	none	none		Mat and pat uncles +; pgm and mat uncle effects stronger in poor households; pat uncle effect stronger in rich households
Poland (Bejsce) 1737-1968	Tymicki 2009	0-5	(+)	+	+	+	+		Loss of father decreases child survival in first year of life for earliest cohorts (<1918)
Japan (Central) 1671-1871	Sorenson Jamison et al. 2002	1-16	none	(+)	(-)	none	(-)		Mgm effect borderline; pgm effect only seen for boys; pgfs only for girls
Germany (Ludwigshafen) 1700-1899	Kemkes-Grottenthaler 2005	0-2		none	+	none	-		Pgm effect only in first year
Ethiopia (Oromo) 1993-2003	Gibson 2008; Gibson & Mace 2005	0-5	+/-	(+)	(+)	none	none		Father effect only investigated 0-1 yr, + for boys and - for girls; mgm effect borderline; pgm effect only seen for girls
Germany (Krummhörn) 1720-1874	Beise 2002; Voland & Beise 2002; Willführ 2009	0-5	+	+	-	none	none		Pgm effect seen in first month; mgm effect esp pronounced 6-12 mths; Loss of father only increases mortality if it occurs before child's first birthday
Italy (Venice) 1850-69	Derosas 2002; Breschi et al. 2004	0-10	none	none	(+)	none	(-)		Pgm effect only seen in orphaned children; pgf effect only <1yr; both effects borderline; no effect aunts/uncles; father effect tested 0-14 yrs; no effect of presence of brother 8+ yrs, tested 0-23 mths
India (Khasi) 1980-2000	Leonetti et al. 2004, 2005	0-10	none	+					Mgm effect seen in first yr only

Bolivia (Tsimane) 1930s-2000s	Winking et al. 2006	0-10	none						Child's risk of murder was increased if father was dead, but not overall mortality
Italy (Casalguidi) 1819-59	Breschi & Manfredini 2002; Breschi et al. 2004	0-14	none						No effect loss of father alone, but increased mortality if both parents absent; death of father increased risk of emigration; no effect presence of brother 8+ yrs, tested 0-23 mths
Italy (Madregolo) 1808359	Breschi et al. 2004	0-14	+						Father effect 2-14 yrs only; presence of brother 8+ yrs + 0-11mths, NS 12-23 mths
Sweden (Sundsvall) 1800-95	Andersson et al. 1996	0-15	none						Stepmother +
Belgium (Sart) 1812-1899	Oris et al 2004	0-10 days	none						
Japan (NE) 1716-1870	Tsuya & Kurosu 2002, 2004	1-14	+		(+)		(-)		Father effect 2-14yrs; presence of 'grandmother/.father' tested, but patrilineal so likely to be paternal; pgf effect on males 2-14 yrs; only older sisters improve survival males 2-14 yrs
Netherlands (Woerden) 1850-1930	Beekink et al. 1999, 2002	0-12	(+)						Fathers only had effect within 1 mth of their deaths
Utah (Mormons) 1860-1895	Penn & Smith 2007	0-18	+						
India (Bengali) 1980-2000	Leonetti et al. 2005	0-10			+				Pgm effect only seen in children 1-9 yrs
India (Uttar Pradesh) 1990-3	Griffiths et al. 2001	0-2			+				Pgm effect only in first mth
India (Tamil Nadu) 1990-3	Griffiths et al. 2001	0-2			none				
India (Maharashtra) 1990-3	Griffiths et al. 2001	0-2			none				
NE India (8 states) 1994-9	Ladusingh & Singh 2006	0-5			none				
Bolivia (Aymara) 1960s-90s	Crognier et al. 2002	0-15						+	Elder brothers and sisters improve survival
Morocco (Berber) 1930-80	Crognier et al. 2001	0-15						+	Elder brothers and sisters improve survival
Finland (5 communities)	Lahdenpera et al.	0-15		(+)					Pat and mat gms not distinguished; effect only seen 2-15 yrs, and only for

18th &19th C	2004						gms <60 yrs old
Ghana (NE) 2003-2007	van Bodegom et al. 2010	0-18		none			
Paraguay (Ache) 1890-1971	Hill & Hurtado 1996	0-9	+	none	none	none	Mat and pat grandparents not distinguished; elder sibs only include adult sibs; no effect aunts or uncles
China (NE) 1749-1909	Campbell & Lee 1996, 2002, 2004, 2009	~1-15	(+)	none	-		Papers report diffferent samples and results. Father effect only in girls in 1996 paper; in all other papers father effect NS; pat and mat grandparents not distinguished; presence of 'adult women' increases mortality but presence 'elderly' (56+ yrs) women reduced mortality for boys if no mother or stepmother present (2002); stepmother +; no effect older bros or sis

Table 2: Univariate studies on the effects of fathers, grandparents and older siblings on child survival (not statistically controlled for confounding factors)

Population	Authors	Age of child (yrs)	Effect of fathers	Effect of maternal gms	Effect of paternal gms	Effect of maternal gfs	Effect of paternal gfs	Effect of older siblings	Other effects and notes
UK (Cambridgeshire) 1770-1861	Ragsdale 2004	0-15	none	+	none	none	none		
Utah (Mormons) 19th century	Heath 2003	0-1		+	none	none	(+)		Pgf effect borderline; mat aunts, mat uncles and pat aunts +
Tanzania (Hadza) 1980s-90s	Blurton Jones et al. 2000	0-5	none						Father absence tested (including death and desertion)
Venezuela (Hiwi) ~1980s	Hurtado & Hill 1992	0-5	none						Father absence tested (including death and divorce)
Uganda (Rakai) 1994-2000	Bishai et al. 2003	0-6	none						
Bangladesh (Matlab) 1983-85	Over et al. 1992	0-9	none						
Spain (Aranjuez) 1870-1950	Reher & González-Quiñones 2003	0-9	none						Fathers improve nutritional status

Table 3: summary of kin effects on child survival (figures in brackets represent percentages)

	Multivariate				Univariate				Total			
	Number of studies	**+ve effect**	**-ve effect**	**No effect**	**Number of studies**	**+ve effect**	**-ve effect**	**No effect**	**Number of studies**	**+ve effect**	**-ve effect**	**No effect**
Mothers	20	20 *(100)*	0	0	12	12 *(100)*	0	0	32	32 *(100)*	0	0
Fathers[2]	20	10 *(50)*	1 *(5)*	10 *(50)*	6	0	0	6 *(100)*	26	10 *(38)*	1 *(4)*	16 *(61)*
Maternal gms	11	7 *(64)*	1 *(9)*	3 *(27)*	2	2 *(100)*	0	0	13	9 *(69)*	1 *(8)*	3 *(23)*
Paternal gms	16	10 *(62)*	2 *(12)*	4 *(25)*	2	0	0	2 *(100)*	18	10 *(55)*	2 *(11)*	6 *(33)*
Non-specific gms	4	1 *(25)*	0	3 *(75)*	0	0	0	0	4	1 *(25)*	0	3 *(75)*
Maternal gfs	10	2 *(20)*	0	8 *(80)*	2	0	0	2 *(100)*	12	2 *(17)*	0	10 *(83)*
Paternal gfs	11	2 *(18)*	4 *(36)*	5 *(45)*	2	1 *(50)*	0	1 *(50)*	13	3 *(23)*	4 *(31)*	6 *(46)*
Non-specific gfs	2	0	1 *(50)*	1 *(50)*	0	0	0	0	2	0	1 *(50)*	1 *(50)*
Older sibs	6	5 *(83)*	0	1 *(17)*	0	0	0	0	6	5 *(83)*	0	1 *(17)*

[2] Percentages do not sum to 100 in this row because one study found a positive effect of fathers on the survival of sons and a negative effect on the survival of daughters

Table 4: Studies of the effects of grandparents on grandchild psychological adjustment

Population/ Location	Authors	Sample	Age of grandchild (yrs)	Grandparental involvement measure	Grandchild's psychological adjustment	Methodology notes	Effects
England and Wales	Attar-Schwartz et al. 2009	1515 children	11-16	Grandparental involvement (summed across 6 items)	Strengths and Difficulties Questionnaire	Nationally representative sample Only "closest" grandparent	Overall - GP involvement ↑ psychological adjustment Some effects only in step families and single parent families.
England and Wales	Griggs et al. 2010	1596 children	11-16	Grandparental involvement across 9 individual items	Strengths and Difficulties Questionnaire	Qualitative and quantitative Same sample as Attar-Schwartz et al. 2009	Grandparental involvement in hobbies/interests, school, career planning and who were respected ↑ psychological adjustment Financial support ↓ psychological adjustment.
Bristol, (England)	Fergusson et al. 2008	8,752 families	4	Regular grandparental childcare (i.e., at 8, 15 and 24 months of age)	Strengths and Difficulties Questionnaire	Longitudinal (Avon Longitudinal Study of Parents and Children; ALSPAC)	Grandchildren who received regular care from grandparents at all 3 time points ↑ likelihood of scoring high on hyperactivity sub-scale
Bristol (England)	Lussier et al. 2002	155 children	7 or older	Sum of closeness to and importance of grandparent as rated by grandchild	Composite measure including Child Behavior Checklist	Avon Brothers and Sisters Study England. Caucasian only (sub-sample of ALSPAC)	Generally across different family types, closeness to maternal (but not paternal) grandparents ↑ psychological adjustment.
Bristol (England) (140 from above study)	Bridges et al. 2007	385 children	7-22	Closeness to grandparent rated by grandchild	Child Behavior Checklist	5-year follow up from Lussier et al. (2002)	Only for biological mother and stepfather families – closeness to MGM ↓ internalizing and ↓ externalizing scores

Texas, US	Henderson et al.2009	324 high school and university students	17-20	Maternal grandmother-grandchild relationship quality (Inventory of Parent and Peer Attachment)	Relationship competence, self-efficacy, and psychological symptoms	SEM Only maternal grandmothers GC from intact and divorced families	MGM-GC relationship quality ↓ psychological symptoms, ↑ relational competence and ↑ self-efficacy Effect was stronger in divorced families.
Khartoum (Sudan)	Al Awad & Sonuga-Barke 1992	210 families	4-9	Grandmother involvement in everyday child care	Childhood psychological adjustment questionnaire	Nuclear family analysis – no control variables.	In both extended and nuclear families ↑ GM involvement ↑ psychological adjustment GM involvement ↑ breast-feeding rates and weaning age
Boston, Chicago, and San Antonio (US)	Pittman 2007		10-14 (at time 1)	Grandmother's child care responsibility and co-residency or not	Child Behavior Checklist	Longitudinal Adjusted for CBCL at time-1 Welfare, Children, and Families: A Three-City Study	Co-residing grandmother ↑ psychological adjustment Non co-residing but care giving grandmothers no effect (same as non-care giving) Custodial grandmother ↓ psychological adjustment
Chicago (US)	Kellam, Ensminger & Turner 1977		6	Co-residence with mother and grandchild	Adequacy of social role performance in classroom (teacher rated)	No control variables Urban, high density, black, poor community	In both 1964 and 1966 1st graders mother/father and mother/grandmother families had ↑ rates of adapting children
Virginia (US)	Hetherington 1989	144 families	4	Contact with grandparents	Psychological adjustment	The Virginia Longitudinal Study of Divorce and Remarriage	No effect of grandparents Weak negative association (NS)

US national	Cherlin & Furstenburg 1986	510 grandparents	13-17	Grandparental involvement	Social and psychological adjustment (parent, teacher and child rated)	Nationally representative Telephone interviews	No effect of grandparents Weak negative association (NS)
Detroit (US)	Radin, Oyserman, & Benn 1991	66 multi-generational teen mother families (biological father absent)	1 or 2	Grandparent involvement Grandparent nurturance	Socio-emotional functioning	Adjusted for race Moderate effect sizes	No grandmother effects **Total sample:** ↑ grandfather nurturance associated with ↑ grandchild compliance and ↑ grandfather involvement associated with ↓ grandchild negative affect
Detroit (US)	Oyserman, Radin & Benn 1993	As above	As above	As above	As above	Adjusted for SES, grandmother's occupation, hours of grandmother employment, grandfather's age, hours of grandfather employment	No grandmother effects ↑ grandfather nurturance and ↑ child compliance with maternal requests Grandfather involvement ↓ grandchild's negative affect

Table 5: multivariate studies of the effects of parents and parents-in-law on fertility outcomes

Population[3]	Authors	Fertility[4]	Fertility outcome[5]	Effect of mothers	Effect of fathers	Effect of mothers-in-law	Effect of fathers-in-law	Other effects and notes
Paraguay (Ache)	Hill & Hurtado 1996	High	IBI	none	none	none	none	Adult brothers and sisters -
	Waynforth 2002		AFB		+			
Gambia (4 villages)	Sear et al. 2003	High	IBI	none	none	+	+	Brothers –
	Allal et al. 2004		AFB	none	+	none	none	Brothers +
Dominica	Quinlan 2001	High	AFB		none			Co-resident sisters –
India (Bengali)	Leonetti et al. 2005	High	IBI			+		Mothers-in-law + via parity progression
India (Khasi)	Leonetti et al. 2005	High	IBI	none				
	Leonetti et al. 2008		AFB	-				
Finland 1702-1823	Lahdenpera et al. 2004, 2007	High	AFB	+	+			Fertility of both males and females analysed; effect gm on births intervals only seen at parities <4
			IBI	(+)	+			
			TCH	+	none			
			Span		none			
Poland <1900	Tymicki 2004	High	IBI	+/-	+	+	none	"natural fertility" population. Reprod-aged mother -; post-reprod +; complicated sib effects on parity progression and TCH
			TCH	+	+	+	+	
Poland >1900	Tymicki 2004	High	IBI	+	+	+	none	"controlled fertility population" Complicated sib effects on parity progression and TCH
			TCH	+	+	+	+	

[3] Unless otherwise stated, data were collected in recent decades
[4] High = TFR ≥ 3; Low = TFR < 3
[5] AFB = age at first birth; IBI = length of birth intervals; TCH = total number of children born; span = length of reproductive span

Germany 1720-1874	Voland & Beise 2002	High	IBI	none	none	none	none	Mothers and mothers-in-law + on parity progression
Utah <1900	Hawkes & Smith 2009	High	TCH	(+)				Longevity of mothers +vely associated with daughter's fertility (10% level)
Tanzania	Ainsworth et al. 1998	High	Recent birth	+	none			Recent death of mother reduces recent fertility; no effect death of father
Malaysia Malays	Morgan & Rindfuss 1984	High	First birth interval	+		none		Residence with parents or parents-in-law after marriage
Malaysia Chinese	Morgan & Rindfuss 1984	High	First birth interval	none		none		Residence with parents or parents-in-law after marriage
Malaysia Indians	Morgan & Rindfuss 1984	High	First birth interval	none		-		Residence with parents or parents-in-law after marriage
Korea	Morgan & Rindfuss 1984	High	First birth interval	-		none		Residence with parents or parents-in-law after marriage
Turkey	Gokce et al. 2007	Low	Teenage pregnancy	none	none			Living with both parents, only mother or neither not sig diff from one another; not enough data for only father
South Africa Cape Town	Vundule et al. 2001	Low	Teenage pregnancy	none	-			Black population; living with parents vs not living with parents
Taiwan, Taichung	Lee 2001	Low	Teenage birth	-				Living outside home or in single-parent family vs with both parents
Taiwan Southern	Wang & Chou 1999	Low	Teenage birth	-				Living with parents vs not
UK (NCDS) Nat. rep. [6]	Kiernan 1992	Low	Teenage birth	-/none	none/-			National Child Development Survey. Parental absence due to death/divorce; living in step-family +. See also Manlove et al. 1997 on same dataset who report later AFB if living with both parents 0-11 yrs
Finland Nat. rep.	Vikat et al. 2002	Low	Teenage birth	-				Living with parents vs not
Australia Nat. rep.	Parr 2005	Low	Childlessness	none	+			40-54 yr old women only

[6] nationally representative sample

Australia	Chisholm et al. 2005	Low	AFB	(-)	-			Mother effect significant at 10% level
Taiwan (1980 KAP) Nat. rep.	Thornton et al. 1986	Low	TCH				+	Sample survey conducted by Taiwan Provincial Institute of Family Planning. Postmarital residence with husband's parents. See also Weinstein et al. 1990 for descriptive data showing same effect in Taiwan
Taiwan (1999-2000 PSFD) Nat. rep.	Tsay & Chu 2005	Low	IBI				+	Panel Study of Family Dynamics. Residence with parents- in-law.
Taiwan (1990 THRS) Nat. rep.	Chi & Hsin 1996	Low	TCH IBI				+ +/none	Taiwan Human Resources Survey. Living with husband's parents at time of marriage; sig for second IBI but not third
West Germany Nat. rep.	Hank & Kreyenfeld 2003	Low	AFB IBI		+ none			Parents living in same town Second IBI only
Canada Nat. rep.	Wu & Schimmele 2003	Low	AFB TCH		-			Women 45+ only; growing up with both parents vs not
US (HSB) Nat. rep	Astone & Washington 1994	Low	Teenage pregnancy		-			High School and Beyond. Living with both parents vs neither parent (effect for Latinos, African Americans & Whites); vs single parent family (Lat and Af Am but not W)
US (1995 NSFG) Nat. rep.	Manlove, Terry et al. 2000	Low	Teenage birth		(-)			National Survey of Family Growth. Living with both biological parents – effect for teens 1980-86 and 87-91, not 92-95. See also Quinlan 2003 on same dataset who reports mother absent girls more likely to have early pregnancy than father absent
US (1982 NSFG) Nat. rep.	McLanahan & Bumpass 1988	Low	Teenage birth		-			Parental absence, holds for widowhood and separation, both Whites and Blacks (stronger in W).
US (NELS) Nat. rep.	Lopoo	Low	Teenage birth		(-)			National Educational Longitudinal Study. Separation of parents has effect but not widowhood
US, NW Teenage mothers	Gillmore et al. 1997	Low	IBI		none			Living with parents; progression to subsequent births following teenage birth
US Teenage mothers	Manlove, Mariner & Papillo 2000	Low	IBI		-			Living with parents; teen mothers identified from nat. rep. survey (NELS); no effect having grandparents provide childcare

Table 6: univariate studies of effects of parents and parents-in-law on fertility outcomes

Population	Authors	Fertility	Fertility outcome	Effect of mothers	Effect of fathers	Effect of mothers-in-law	Effect of fathers-in-law	Other effects and notes
Trinidad	Flinn 1986 Flinn1989	High	TCH	-/+				- for women 18-21 yrs; + 22-29 yrs; sibs <10 in household – effect on AFB; daughters >17 – on age last birth; daughters >9 + on TCH
Costa Rica 1500s-1900s	Madrigal & Meléndez-Obando 2008	High	TCH	-				Longevity of mother assoc with reduction in daughter's fertility.
Hungary Gypsies	Bereczkei 1998, 2002	High	TCH	+				Having mother who lived beyond 50; sisters +; brothers none
Hungary Non-Gypsies	Bereczkei 1998, 2002	Low	TCH	none				Having mother who lived beyond 50; low SES population; no effect of siblings
Hungary	Bereczkei 1996	Low	Total conceptions TCH		(+) none			Different sample to above; divorced father results in more conceptions but not births; no effect dead father No effect divorce or widowhood

Table 7: summary of kin effects on female fertility (figures in brackets represent percentages)

	High				Low				Total			
	Number of studies	**+ve effect**	**-ve effect**	**No effect[7]**	**Number of studies**	**+ve effect**	**-ve effect**	**No effect[7]**	**Number of studies**	**+ve effect**	**-ve effect**	**No effect[7]**
Mothers[8]	12	7	4	3	9	0	5	4	21	7	9	7
		(58)	*(33)*	*(25)*			*(56)*	*(44)*		*(33)*	*(43)*	*(33)*
Fathers	8	5	0	3	6	2	3	1	14	7	3	4
		(63)		*(38)*		*(33)*	*(50)*	*(17)*		*(50)*	*(21)*	*(29)*
Unspecified parents	4	1	1	2	8	1	6	1	12	2	7	3
		(25)	*(25)*	*(50)*		*(13)*	*(75)*	*(13)*		*(17)*	*(58)*	*(25)*
Mothers-in-law	6	4	0	2	0	0	0	0	6	4	0	2
		(67)		*(33)*						*(67)*	*(0)*	*(33)*
Fathers-in-law	5	3	0	2	0	0	0	0	5	3	0	2
		(60)		*(40)*						*(60)*		*(40)*
Unspecified parents-in-law	4	0	1	3	3	3	0	0	7	3	1	3
			(25)	*(75)*		*(100)*				*(43)*	*(14)*	*(43)*

[7] A population was only counted as 'No effect' if there was no correlation between any fertility outcome in that population and this relative
[8] Percentages do not always sum to 100 because some studies find both positive and negative effects

Figure 1: percentage of studies in which each relative had a positive, negative or no effect on child survival

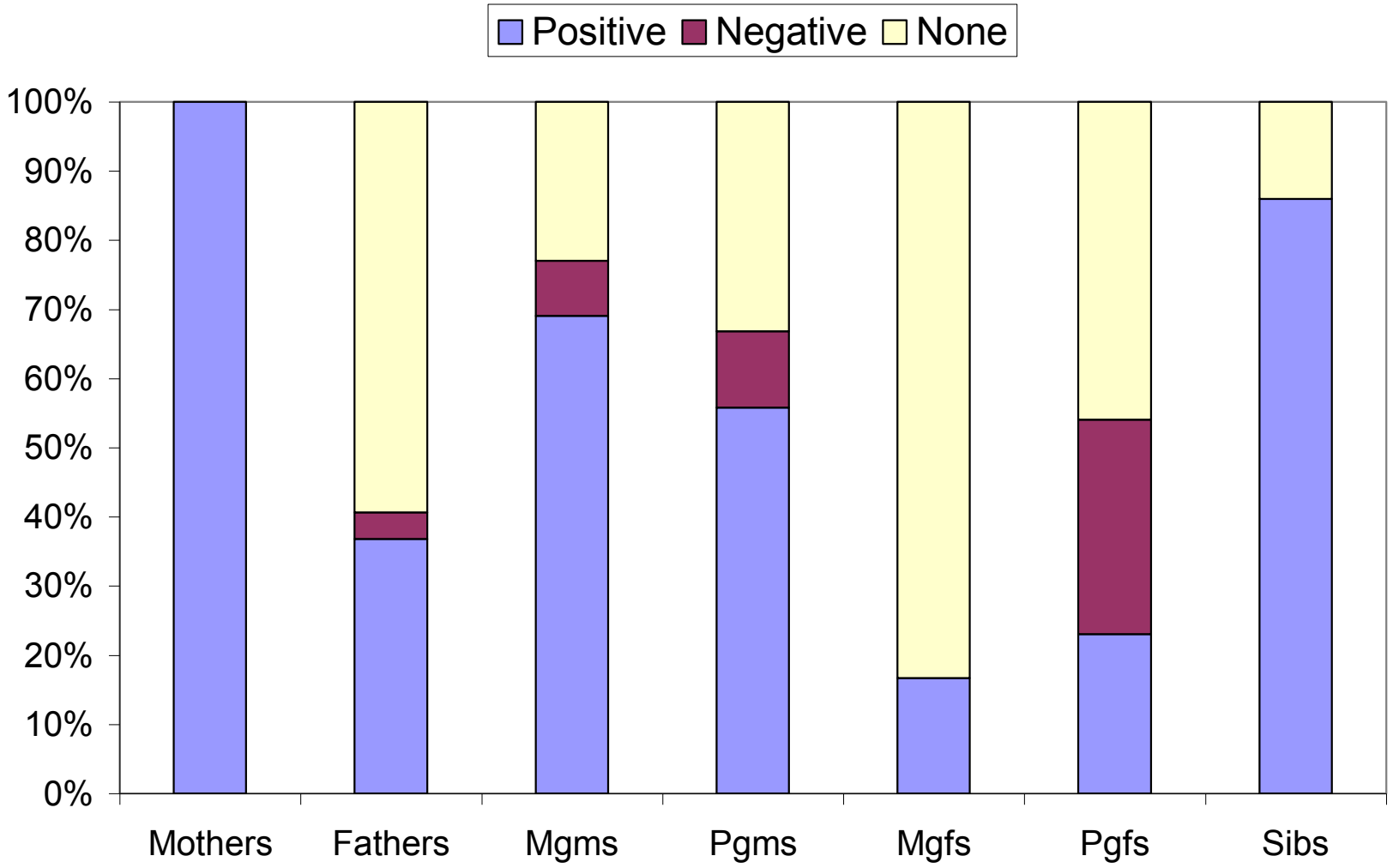

Figure 2: percentages of studies in which each relative had a pro-natal, anti-natal or no effect on fertility

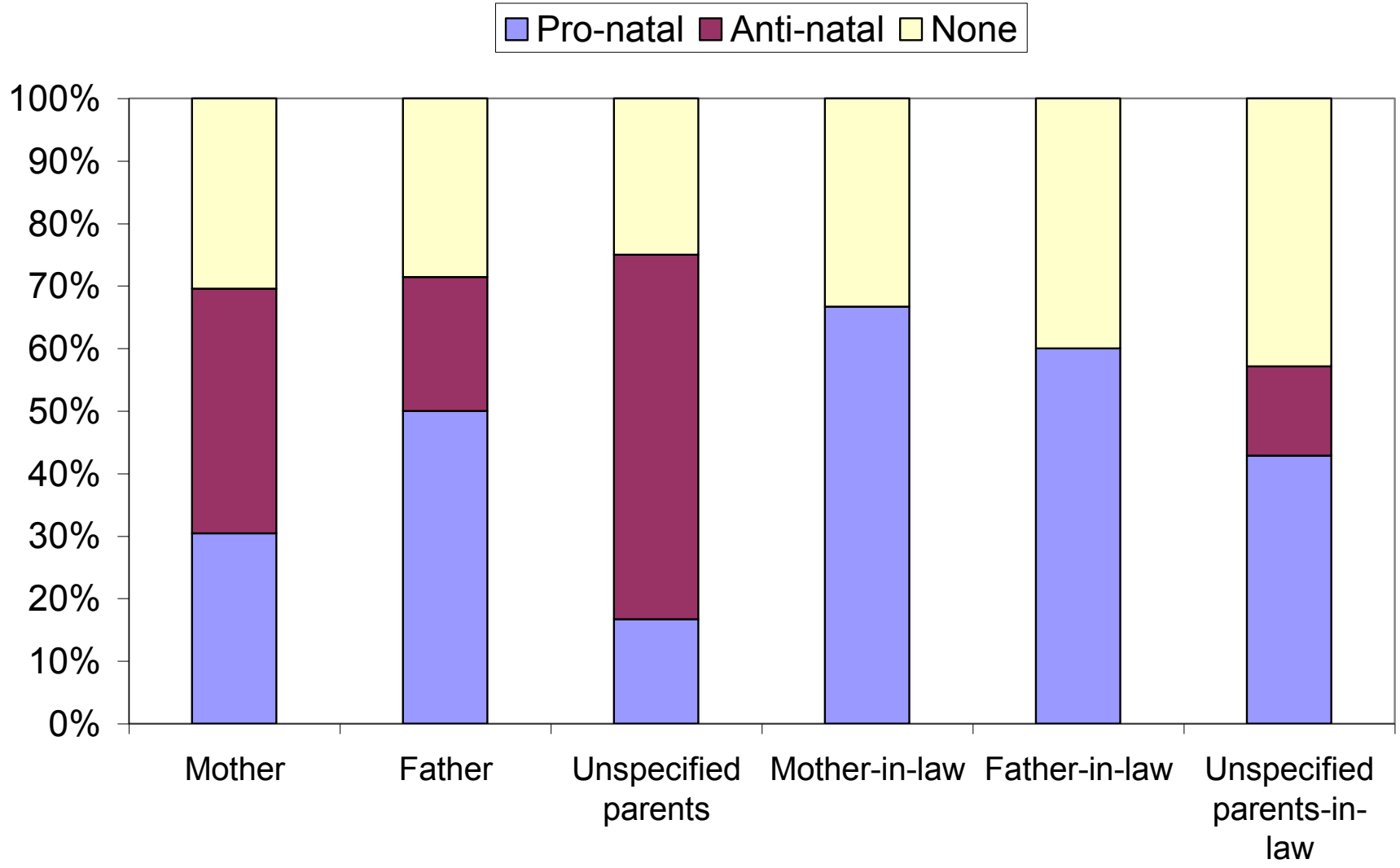

Figure 3: association between total fertility rate and percentage of grandmothers providing regular grandchild care for ten European countries

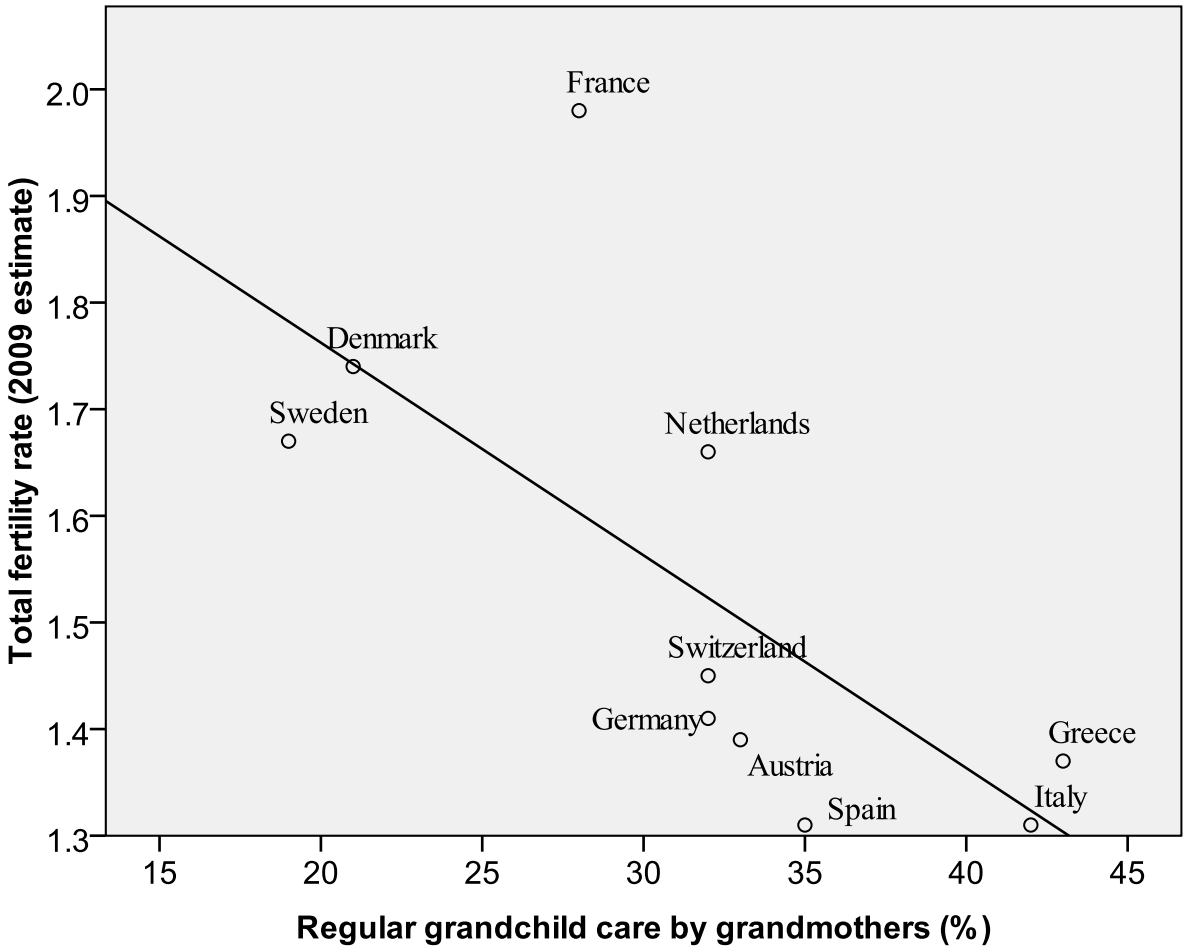

Figure 4: association between total fertility rate and percentage of grandmothers providing any grandchild care for ten European countries