How Much Does Family Matter? Cooperative Breeding and the Demographic Transition

Rebecca Sear
David Coall

Hillary Clinton may have popularized 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 childrearing 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 additional children. Support from others may therefore be critical for high fertility rates. While both demographers and anthropologists have acknowledged this fact, 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 modernization results in children becoming an economic burden (Caldwell 1978). Research in the 1970s demonstrated that children contribute substantial labor to the household economy in high-fertility societies (Cain 1977). More recent research on this topic convincingly argued that parents may only be able to sustain high fertility rates by making use of the labor of older children, even though each child is 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 that distinguishes human childrearing from that of closely related primate species (Lovejoy 1981). More

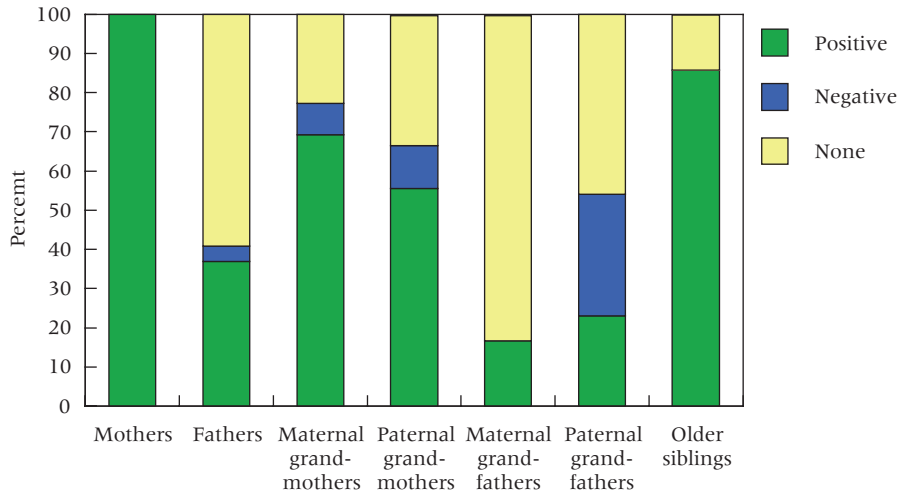
recently, however, evolutionary researchers have broadened their focus, and over the last decade or so have begun to develop the hypothesis that humans are "cooperative breeders," a relatively unusual childrearing system in which mothers receive help from many other individuals in raising offspring (Hrdy 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 mother, 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 flexible one, whereby a woman co-opts a wide range of other individuals, including men, her own kin, and her husband's kin into helping raise her children, depending on who is available and willing to help (Hrdy 2005). This hypothesis suggests that where women receive little help in raising offspring, they will reduce family size—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 among couples living in extended families, compared to those living in nuclear family households without the support and influence of kin (e.g., Davis and Blake 1956; see Burch and Gendell 1970 for a critical review of this early literature on family structure and fertility).

This chapter reviews the evidence that humans 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. In the first section we will concentrate on the evidence for the effects of kin on child well-being in pre–demographic transition societies. In the second section we will tackle the effects of kin on children in post-transition societies. Finally, in the third section we will present evidence that kin may affect fertility rates.

Kin effects on child well-being in pre-transition societies

If family members are helping women to raise children, then we should find evidence that the presence of family members improves child health and well-being. Since child survival is an unambiguous signal of health and well-being, we concentrate on studies that look at the effects of specific family members on the probability of child survival. We have drawn together all published studies that have investigated the effects of fathers, maternal and paternal grandmothers, maternal and paternal grandfathers, and the child's older siblings 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 (see Tables 1–3 and Figure 1: all tables slightly updated from Sear and Mace 2008, which discusses this dataset). All are populations

FIGURE 1 Percent of studies in which a particular relative had a positive, negative, or no effect on child survival



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 to control for potentially confounding factors. Table 2 shows studies that demonstrated only a simple bivariate correlation between the presence of relatives and child survival. 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, and "–" indicates the presence of that relative reduced child survival. Parentheses indicate that the effect was of borderline significance ($0.05>p<0.1$), or was only seen in children of certain ages or one sex.

We include fathers in the table, since there is debate in the literature about 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 those studies that investigated the effects of the presence of the mother on child survival. All 32 such studies found, unsurprisingly, that the absence of the mother was correlated with lower child survival (summarized in Table 3: see Sear and Mace 2008 for 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 positive effect for mothers declined with the child's age in all populations where an age interaction was investigated, and older children often appeared to have high survival chances even in the mother's absence. 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 helping

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 grand-mothers	Effect of paternal grand-mothers	Effect of maternal grand-fathers	Effect of paternal grand-fathers	Effect of older siblings
Gambia (4 villages) 1950–74	Sear et al. 2000, 2002	0–5	none	+	none	none	none	+
Canada (Quebec) 1680–1750	Beise 2005	0–5	+	+	+	+	(+)	+
Malawi (Chewa) 1992–97	Sear 2008	0–5	none	(–)	(+)	none	none	+
Kenya (Kipsigis) 1945–90	Borgerhoff Mulder 2007	0–5	none	none	+	none	none	
Poland (Bejsce) 1737–68	Tymicki 2009	0–5	(+)	+	+	+	+	
Japan (Central) 1671–1871	Sorenson Jamison et al. 2002	1–16	none	+	–	none	–	
Germany (Ludwigshafen) 1700–1899	Kemkes-Grottenthaler 2005	0–2		none	+	none	–	
Ethiopia (Oromo) 1993–2003	Gibson 2008; Gibson and Mace 2005	0–5	+/–	(+)	(+)	none	none	
Germany (Krummhörn) 1720–1874	Beise 2002; Voland and Beise 2002; Willführ 2009	0–5	+	+	–	none	none	
Italy (Venice) 1850–69	Derosas 2002; Breschi et al. 2004	0–10	none	none	(+)	none	(–)	
India (Khasi) 1980–2000	Leonetti et al. 2004, 2005	0–10	none	+				
Bolivia (Tsimane) 1930s–2000s	Winking et al. 2006	0–10	none					
Italy (Casalguidi) 1819–59	Breschi and Manfredini 2002; Breschi et al. 2004	0–14	none					
Italy (Madregolo) 1800–83	Breschi et al. 2004	0–14	+					

Sweden (Sundsvall) 1800–95	Andersson et al. 1996	0–15	none				
Belgium (Sart) 1812–99	Oris et al. 2004	0–10 days	none				
Japan (NE) 1716–1870	Tsuya and Kurosu 2002, 2004	1–14	+		(+)	(–)	
Netherlands (Woerden) 1850–1930	Beekink et al. 1999, 2002	0–12	+				
Utah (Mormons) 1860–95	Penn and Smith 2007	0–18	+				
India (Bengali) 1980–2000	Leonetti et al. 2005	0–10			+		
India (Uttar Pradesh) 1990–93	Griffiths et al. 2001	0–2			+		
India (Tamil Nadu) 1990–93	Griffiths et al. 2001	0–2			none		
India (Maharashtra) 1990–93	Griffiths et al. 2001	0–2			none		
NE India (8 states) 1994–99	Ladusingh and Singh 2006	0–5			none		
Bolivia (Aymara) 1960s–90s	Crognier et al. 2002	0–15					+
Morocco (Berber) 1930–80	Crognier et al. 2001	0–15					+
Finland (5 communities) 18th and19th C	Lahdenpera et al. 2004[a]	0–15		(+)			
Ghana (NE) 2003–7	van Bodegom et al. 2010[a]	0–18		none			
Paraguay (Ache) 1890–1971	Hill and Hurtado 1996[a]	0–9	+	none		none	none
China (NE) 1749–1909	Campbell and Lee 1996, 2002, 2004, 2009[a]	~1–15	(+)	none		–	

NOTE: For definitions, details of other effects, and further supplementary information, see «http://www.dur.ac.uk/anthropology/staff/profile/?id=8827».
[a]These studies did not distinguish between maternal and paternal grandmothers or grandfathers but considered grandmothers or grandfathers together.

TABLE 2 Bivariate studies of 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 grand-mothers	Effect of paternal grand-mothers	Effect of maternal grand-fathers	Effect of paternal grand-fathers	Effect of older siblings
UK (Cambridgeshire) 1770–1861	Ragsdale 2004	0–15	none	+	none	none	none	
Utah (Mormons) 19th century	Heath 2003	0–1		+	none	none	(+)	
Tanzania (Hadza) 1980s–90s	Blurton Jones et al. 2000	0–5	none					
Venezuela (Hiwi) ~1980s	Hurtado and Hill 1992	0–5	none					
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 and González-Quiñones 2003	0–9	none					

NOTE: For definitions, details of other effects, and further supplementary information, see «http://www.dur.ac.uk/anthropology/staff/profile/?id=8827».

TABLE 3 Summary of kin effects on child survival (figures in parentheses are percentages)

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

[a]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.

these children (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. 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 relatives were older siblings of the child (beneficial in over 80 percent of cases). However, there were only six studies in this category 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 and not those close in age to 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 older siblings on child mortality when all siblings are considered (e.g., Muhuri and Menken 1997).

Fathers were rather less important: in just over a third of all cases did they improve child survival, though this proportion rises to half if only multivariate 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 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 child survival rates. Not even fathers or grandmothers were always beneficial to children. One study found that 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 characterized by conflict, rather than cooperation.

We conclude that the evidence supports 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 study of Spain included in Table 2, though fathers had little effect on the survival of their young children, teenage boys had shorter stature in the absence of fathers (Reher and González-Quiñones 2003). We note some caveats, however. First, a review 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 the case of this particular review, 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, but not necessarily causal relationships, between the presence of relatives and child survival. The studies in Table 1 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 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 result from detailed research on what relatives do within the household. A handful of studies in Table 1 collected additional data to support the hypothesis that kin actively help mothers. 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 labor, with maternal grandmothers tending to help with heavy domestic tasks and paternal grandmothers with agricultural labor. 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 work has confirmed that children contribute both domestic and productive labor to the household (Lee and Kramer 2002; Kaplan 1994).

Relatives may also help directly with childcare. Earlier research in the Gambian population included in Table 1 demonstrated that maternal grand-

mothers play 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"; the majority of children are sent 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 observational studies by anthropologists have confirmed that individuals other than the mother are frequently heavily involved in caring for children. Among two forager groups in Central Africa (Ivey 2000; Fouts and Brookshire 2009), infants spend more time in allomaternal care than maternal care; one of these studies found that 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 infant did not experience increased distress 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, which find that the degree of genetic relatedness affected both the probability of caring for infants and the intensiveness of care: more closely related individuals provide 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 grandmothers in Ghana (usually paternal) may have a vital role to play in improving children's rates of survival from kwashiorkor, by recognizing 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"). In a study in Gujarat, India, 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 related to child feeding may be part of the reason why the positive effects of relatives on child survival in the 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 on child well-being in post-transition societies

In our survey of kin effects in post-transition societies, we focus on the effects of grandparents. A large literature on the involvement of fathers and their impact on child well-being suggests they may be more important in post-transition 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 analyze 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 analyzing only the effects of potential helpers at the nest; and universal and extended education makes sibling contributions to the household economy much less likely. Low rates of fertility and childhood mortality in post-transition societies make grandparents' influences on classic fitness indicators difficult to assess. Rather, because of low fertility and ever-increasing investment per child, it is likely that grandparental influences, if they exist at all, will be found in measures of child development such as psychological adjustment, mental health, and cognitive ability (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 of grandparents 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 are the focus of the discussion that follows.

The majority of studies (77 percent) included in Table 4 and reviewed here suggest grandparents continue to have a beneficial impact on grandchild development in post-transition societies. Grandparental involvement 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 provide appear to have a stronger positive association with grandchild well-being (Henderson et al. 2009; Lussier et al. 2002). Although having a custodial grandparent seems to result in poorer grandchild outcomes, this is likely to be a consequence of the family situation that resulted in the grandparent assuming that role (Pittman 2007). Perhaps surprisingly, three studies have found weak negative associations between

TABLE 4 Studies of the effects of grandparents on grandchild's psychological adjustment

Population/ location	Authors	Sample	Age of grandchild (years)	Grandparental involvement measure	Grandchild's psychological adjustment
England and Wales	Attar-Schwartz et al. 2009	1,515 children	11–16	Grandparental involvement (summed across 6 items)	Strengths and difficulties questionnaire
England and Wales	Griggs et al. 2010	1,596 children	11–16	Grandparental involvement across 9 individual items	Strengths and difficulties questionnaire
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
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
Bristol (England) (140 from above study)	Bridges et al. 2007	385 children	7–22	Closeness to grandparent rated by grandchild	Child behavior checklist
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
Khartoum (Sudan)	Al Awad and Sonuga-Barke 1992	210 families	4–9	Grandmother involvement in everyday child care	Childhood psychological adjustment questionnaire
Boston, Chicago, and San Antonio (US)	Pittman 2007	514 children	10–14	Grandmother's child care responsibility and co-residency	Child behavior checklist
Chicago (US)	Kellam, Ensminger, and Turner 1977	1,387 families	6	Co-residence with mother and grandchild	Adequacy of social role performance in classroom (teacher rated)
Virginia (US)	Hetherington 1989	144 families	4	Contact with grandparents	Psychological adjustment
US national	Cherlin and Furstenburg 1986	510 grandparents	13–17	Grandparental involvement	Social and psychological adjustment (parent, teacher, and child rated)
Detroit (US)	Radin, Oyserman, and Benn 1991	66 multigenerational teen mother families (biological father absent)	1 or 2	Grandparent involvement Grandparent nurturance	Socio-emotional functioning
Detroit (US)	Oyserman, Radin, and Benn 1993	As above	As above	As above	As above

NOTE: For definitions, details of other effects, and further supplementary information, see «http://www.dur.ac.uk/anthropology/staff/profile/?id=8827».

grandparental childcare and grandchild outcomes (Cherlin and Furstenburg 1986; Fergusson, Maughan, and Golding 2008; Hetherington 1989). Unfortunately, none of these studies considered the quality of childcare provided to establish whether it is grandparental childcare or underlying familial factors that contribute to this association. It appears more likely that in difficult financial or behavioral situations, parents are more likely to turn to grandparents for help, rather than that grandparental childcare has a negative influence on grandchildren (Cherlin and Furstenburg 1986; Hetherington 1989; Pittman 2007).

In contrast to pre-transition societies, grandfathers in post-transition societies appear to have an equal if not greater 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 be due, in part, 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 indicate that the grandfather assumed the father figure role while the grandmother, usually the maternal grandmother, had a smaller role since the mother was present (Oyserman, Radin, and Benn 1993; Radin, Oyserman, and Benn 1991). It must be noted, however, that studies focusing on grandmothers, especially coresiding 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, a distinction that seems to be influential in pre-transition societies.

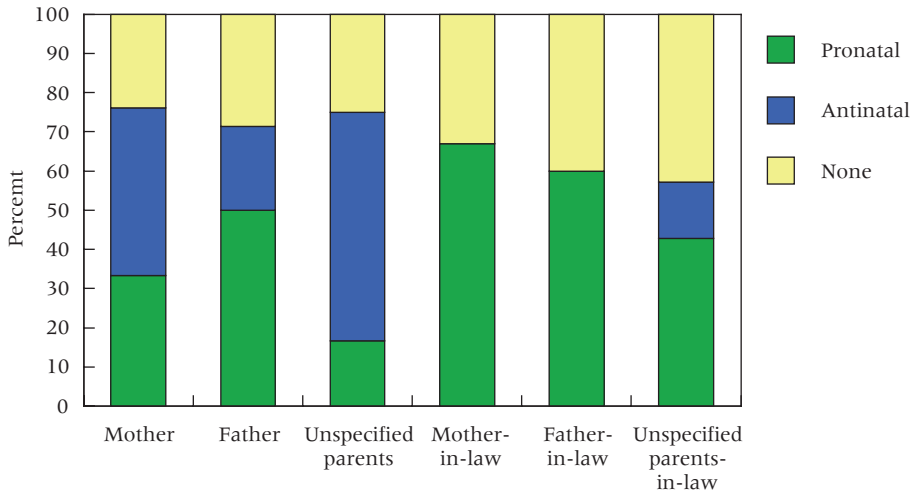
The effects grandparents have on grandchild development are generally small (but see Henderson et al. 2009; Radin et al. 1991). The fact that these associations are found across grandchild ages, study designs, and diverse populations, and generally take into account a range of potential confounding variables, adds strength to these findings. We reiterate that the direction of the causal association cannot be established from these correlational studies. From the current literature we cannot establish whether grandparental investments specifically improve grandchild outcomes. Rarely is it possible to rule out the alternative explanation that grandparents are more attracted to happy and responsive grandchildren and that their increased investment is purely a side effect of this interaction. Likewise, it may be that grandchildren live with custodial grandparents when very difficult circumstances have befallen a family and that 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 is 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 how grandparents care for their grandchildren that is crucial (see Al Awad and Sonuga-Barke 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, is growing.

Kin effects on female fertility

We have seen that kin help mothers in both pre- and post-transition societies, but do their presence and assistance also affect fertility rates? Such help in reducing the costs of childrearing may plausibly affect fertility rates in both pre- and post-transition societies. In pre-transition, poorly nourished societies, relieving some of women's energetic burden of reproduction may result in more frequent conceptions and higher birth rates. In both types of societies, women may be more inclined to have children, and to have more children, when they are surrounded by supportive kin networks. Kin may also take an active role in encouraging childbearing, at least when conditions are suitable for successfully raising children, so that social norms may be more pronatal in situations where women are surrounded by kin (Newson et al. 2007). Here, we review studies that 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 that 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 analyzed 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.

FIGURE 2 Percent of studies in which a particular relative had a pronatal, antinatal, or no effect on fertility



We identified 39 populations in which the effects of parents and parents-in-law on female fertility have been statistically investigated (Tables 5 and 6 for multivariate and bivariate studies respectively, substantially updated from Mace and Sear 2005, and summarized 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 analyzed separately, a separate row is devoted to each distinct sample of women. These tables and Figure 2 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 analyzing large national populations may hide kin effects if they are only found in some sections of the population). In some cases more than one row relates to the same national population, but the sample of women is different in each case. A variety of fertility outcomes is 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, as indicated by earlier age at first birth, shorter birth intervals, and higher total number of children born; "–" represents a decrease in fertility, and "none" indicates no effect. In this case the relationship of each kin category refers to the woman herself, so that "mothers" in these tables are equivalent to "maternal grandmothers" in Tables 1 and 2. Because these

TABLE 5 Multivariate studies of the effects of parents and parents-in-law on fertility

Population[a]	Authors	Fertility[b]	Fertility outcome studied[c]	Effect of mothers	Effect of fathers	Effect of mothers-in-law	Effect of fathers-in-law
Paraguay (Ache)	Hill and Hurtado 1996 Waynforth 2002	High	IBI AFB	none	none +	none	none
Gambia (4 villages)	Sear et al. 2003 Allal et al. 2004	High	IBI AFB	none none	none +	+ none	+ none
Dominica	Quinlan 2001	High	AFB		none		
India							
Bengali	Leonetti et al. 2005	High	IBI			+	
Khasi	Leonetti et al. 2005 Leonetti et al. 2008	High	IBI AFB	none –			
Finland 1702–1823	Lahdenpera et al. 2004, 2007	High	AFB IBI TCH Span	+ + + +	+ + none none		
Poland							
<1900	Tymicki 2004	High	IBI TCH	+/–[d] +	+ +	+ +	none +
>1900	Tymicki 2004	High	IBI TCH	+ +	+ +	+ +	none +
Germany 1720–1874	Voland and Beise 2002	High	IBI	none	none	none	none
Utah <1900	Hawkes and Smith 2009	High	TCH	+			
Tanzania	Ainsworth et al. 1998	High	Recent birth	+	none		
Malaysia							
Malays	Morgan and Rindfuss 1984[e]	High	First birth interval	+		none	
Chinese	Morgan and Rindfuss 1984[e]	High	First birth interval	none		none	
Indians	Morgan and Rindfuss 1984[e]	High	First birth interval	none		–	
South Korea	Morgan and Rindfuss 1984[e]	High	First birth interval	–		none	
Turkey	Gökçe et al. 2007	Low	Teenage pregnancy	none		none	
South Africa Cape Town	Vundule et al. 2001	Low	Teenage pregnancy	none	–		

Taiwan							
Taichung	Lee 2001	Low	Teenage birth	–			
Southern	Wang and Chou 1999	Low	Teenage birth	–			
UK (NCDS) Nat. rep.[f]	Kiernan 1992	Low	Teenage birth	–/none[g]	none/–[g]		
Finland Nat. rep.	Vikat et al. 2002	Low	Teenage birth	–			
Australia Nat. rep.	Parr 2005	Low	Childlessness	none	+		
Australia	Chisholm et al. 2005	Low	AFB	–	–		
Taiwan Nat. rep.							
1980 KAP	Thornton et al. 1986[e]	Low	TCH				+
1999–2000 PSFD	Tsay and Chu 2005[e]	Low	IBI				+
1990 THRS	Chi and Hsin 1996[e]	Low	TCH IBI				+ +/none[h]
West Germany Nat. rep.	Hank and Kreyenfeld 2003[e]	Low	AFB IBI		+ none		
Canada Nat. rep.	Wu and Schimmele 2003[e]	Low	AFB TCH		–		
US Nat. rep.							
HSB	Astone and Washington 1994[e]	Low	Teenage pregnancy		–		
1995 NSFG	Manlove, Terry et al. 2000[e]	Low	Teenage birth		–		
1982 NSFG	McLanahan and Bumpass 1988[e]	Low	Teenage birth		–		
NELS	Lopoo 2004[e]	Low	Teenage birth		–		
US, NW Teenage mothers	Gillmore et al. 1997[e]	Low	IBI		none		
US Teenage mothers	Manlove, Mariner, and Papillo 2000[e]	Low	IBI		–		

NOTE: For definitions, details of other effects, and further supplementary information, see «http://www.dur.ac.uk/anthropology/staff/profile/?id=8827». NCDS: National Child Development Survey; KAP: Knowledge, Attitude, Practice; PSFD: Panel Study of Family Dynamics; THRS: Taiwan Human Resources Survey; HSB: High School and Beyond; NSFG: National Survey of Family Growth; NELS: National Educational Longitudinal Study.

[a]Unless otherwise stated, data were collected in recent decades. [b]High = TFR ≥ 3; Low = TFR < 3. [c]AFB = age at first birth; IBI = length of birth intervals; TCH = total number of children born; span = length of reproductive span. [d]Reproductive-aged mother –; post-reproductive mother +. [e]These studies did not distinguish between mothers and fathers or mothers-in-law and fathers-in-law but considered parents or parents-in-law together. [f]Nationally representative sample. [g]Parental absence due to death/divorce. [h]Significant effect for second IBI but not third.

TABLE 6 Bivariate studies of the effects of parents and parents-in-law on fertility

Population[a]	Authors	Fertility[b]	Fertility outcome[c]	Effect of mothers	Effect of fathers	Effect of mothers-in-law	Effect of fathers-in-law
Trinidad	Flinn 1986, 1989	High	TCH	–/+[d]			
Costa Rica 1500s–1900s	Madrigal and Meléndez-Obando 2008	High	TCH	–			
Hungary							
Gypsies	Bereczkei 1998, Bereczkei and Dunbar 2002	High	TCH	+			
Non-Gypsies	Bereczkei 1998, 2002 Bereczkei and Dunbar 2002	Low	TCH	none			
Hungary	Bereczkei and Csandaky 1996	Low	Total conceptions		+		
			TCH		none		

NOTE: For definitions, details of other effects, and further supplementary information, see «http://www.dur.ac.uk/anthropology/staff/profile/?id=8827».
[a]Unless otherwise stated, data were collected in recent decades.
[b]High = TFR ≥ 3; Low = TFR < 3 .
[c]AFB = age at first birth; IBI = length of birth intervals; TCH = total number of children born.
[d] – for women 18–21 years; + 22–29 years.

TABLE 7 Summary of kin effects on female fertility (figures in parentheses are percentages)

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

[a]A population was counted as having "No effect" only if there was no correlation between any fertility outcome in that population and the relative in question.
[b]Percentages do not always sum to 100 because some studies find both positive and negative effects .

studies include both pre- and post-transition societies, we divide Tables 5 and 6, somewhat arbitrarily, into high-fertility populations (top panels: defined as TFR ≥3) and low-fertility populations (bottom panels: TFR < 3).

This preliminary survey should be interpreted with caution: as with the data on child survival, a review of empirical findings may be distorted if studies that find significant effects are more likely to be published, and these studies only demonstrate correlation not causation. The picture for female fertility is less clear-cut than for child survival. Table 5 suggests that the effects of parents and parents-in-law on fertility are not always consistent across all measures of fertility. We may draw some tentative conclusions, however. First, kin effects are again common: in only five (13 percent) 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 survival (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 if anything more likely to reduce than increase her fertility. Many of these parental antinatal effects can be attributed to the protective effects against teenage childbearing of living with both parents in low-fertility societies. A woman's parents-in-law almost invariably increase her fertility, although few studies include parents-in-law in low-fertility societies. If we focus on high-fertility societies (see Table 7), we can still tentatively conclude that a woman's parents-in-law tend to have pronatal effects, while the effects of a woman's own parents may be more variable. More data need to be collected, however, before such a conclusion can be drawn with confidence.

A further caveat is that it is more difficult to interpret these fertility results than results for child survival. While all family members should be interested in improving child health and well-being once a child is 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 wish 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 want more children 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 optimizing 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 Figures 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, Ageing 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 in 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 influences parents' fertility decisions (Hank and Kreyenfeld 2003). Importantly, grandparental childcare in countries 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 countries provide any childcare ($r = .82$; and for grandfathers $r = .66$). This suggests that grandparents in the lower fertility Mediterranean countries are less likely

FIGURE 3 Association between total fertility rate and percentage of grandmothers providing regular grandchild care for ten European countries

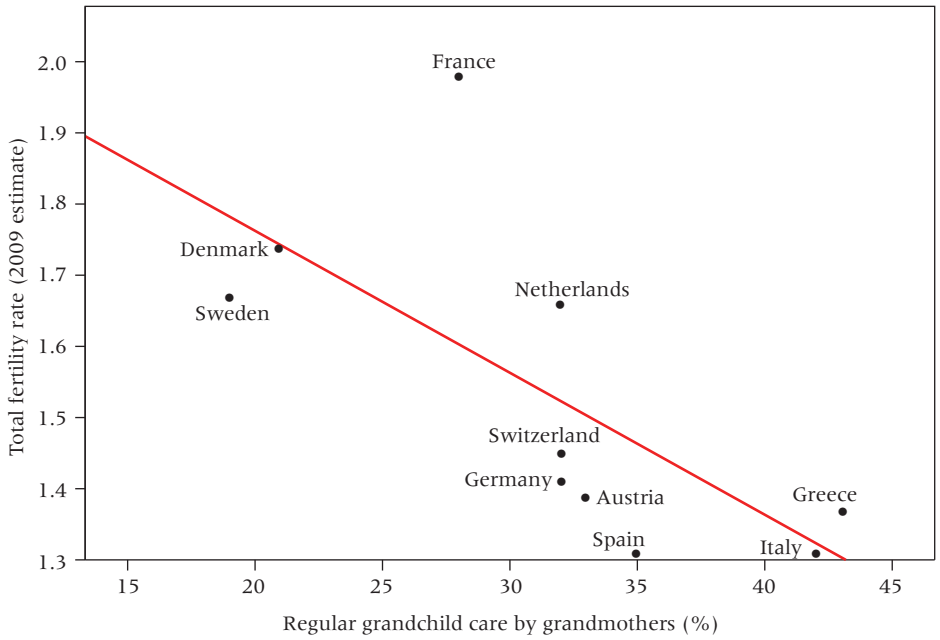
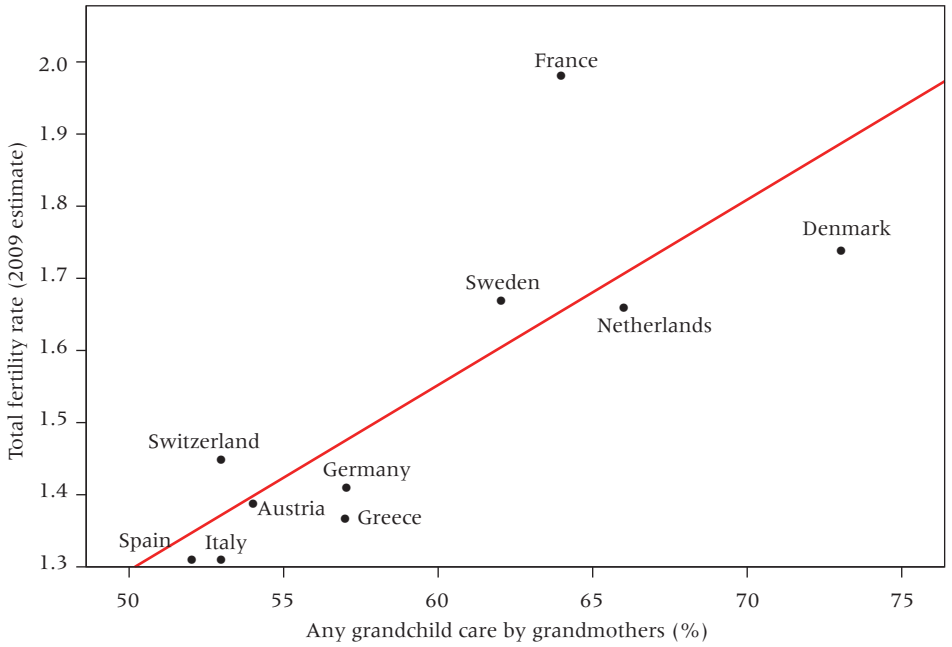


FIGURE 4 Association between total fertility rate and percentage of grandmothers providing any grandchild care for ten European countries



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.

Implications for the demographic transition—past and future

This survey suggests that relatives are clearly beneficial to mothers in raising children in pre-transition societies. Evidence from post-transition societies also broadly suggests that the presence of grandparents confers benefits on children. We also found tentative evidence that kin affect fertility—sometimes by increasing it, other times by lowering it. Do these findings have any relevance for the demographic transition? The demographic transition tends to follow economic development. As societies move from a subsistence economy to an industrial wage-based economy, fertility declines. This shift in subsistence strategy tends to be accompanied by changing social networks: individuals associate more often with non-kin and may physically move away from kin to enhance their prospects of work. This does not mean that kin become unimportant, rather that the relative significance of, and frequency of interactions with, non-kin increase. This reduction in kin-based social support may raise the perceived costs of childrearing, since mothers and parents have to shoulder far more of the burden of childcare in the absence of helpful kin. In post-transition societies, the shift from an emphasis on the quantity of children to their quality means that parents still invest heavily in their children (Becker 1991; Mace 2007). But parents may instead have to rely on non-kin-based help. Such help, whether purchased in the market or provided by the state, may be less reliable, of lower quality, or less readily available compared to help provided by a supportive network of kin.

The availability of certain kin will also change as societies move through the demographic transition. Grandparents may well become more widely available as mortality rates decline, but, in the later stages of the demographic transition, they may also spend a longer period of time in poor 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 industrial societies now require much less intense care in order to survive to adulthood. 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 empathize with and understand the intentions of others (Tomasello 1999), a characteristic that, according to Hrdy, arose through the needs of infants to acquire care from a variety of individuals in addition to the mother. Hrdy speculates that because contemporary, low-fertility populations no longer raise children in cooperative kin networks, our cognitive abilities may not develop in the same way as in the past, leading perhaps to a decline in our ability to empathize with and cooperate with others. We leave to her the last, rather pessimistic word (p. 293) on the long-term implications of demographic and childrearing changes:

> 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.

Notes

Figures in this chapter are available in color in the electronic edition of the volume.

We thank Monique Borgerhoff Mulder for helpful comments and Ralph Hertwig and Paul Mathews for assistance while writing the manuscript. The review of kin effects on fertility was supported by an LSE STICERD grant. Many thanks to Emma Cardwell, Warren Greig, and Heidi Colleran for research assistance during this project; and to the Social Science Research Unit at the Institute of Education London, particularly Jeff Brunton, Jan Tripney, Mukdarut Bangpan, and Kelly Dickson.

References

Ainsworth, Martha, Deon Filmer, and Innocent Semali. 1998. "The impact of AIDS mortality on individual fertility: Evidence from Tanzania," in M. Montgomery and B. Cohen (eds.), *From Death to Birth: Mortality Decline and Reproductive Change*. Washington, DC: National Academy Press, pp 138–167.

Al Awad, Ahmed M. E. and Edmund J. S. Sonuga-Barke. 1992. "Childhood problems in a Sudanese city: A comparison of extended and nuclear families," *Child Development* 63 (4): 906–914.

Allal, Nadine, Rebecca Sear, Andrew M. Prentice, and Ruth Mace. 2004. "An evolutionary model of stature, age at first birth and reproductive success in Gambian women," *Proceedings of the Royal Society of London, Series B, Biological Sciences* 271 (1538): 465–470.

Amato, Paul R. and Fernando Rivera. 1999. "Paternal involvement and children's behavior problems," *Journal of Marriage and Family* 61 (2): 375–384.

Andersson, T., U. Högberg, and S. Åkerman. 1996. "Survival of orphans in 19th century Sweden: The importance of remarriages," *Acta Paediatrica* 85: 981–985.

Astone, Nan Marie and Mary L. Washington. 1994. "The association between grandparental coresidence and adolescent childbearing," *Journal of Family Issues* 15(4): 574–589.

Attar-Schwartz, Shalhevet, Jo-Pei Tan, Ann Buchanan, Eirini Flouri, and Julia Griggs. 2009. "Grandparenting and adolescent adjustment in two-parent biological, lone-parent, and step-families," *Journal of Family Psychology* 23(1): 67–75.

Aubel, J., I. Toure, and M. Diagne. 2004. "Senegalese grandmothers promote improved maternal and child nutrition practices: The guardians of tradition are not averse to change," *Social Science and Medicine* 59(5): 945–959.

Becker, G. S. 1991. *A Treatise on the Family*. Cambridge, MA: Harvard University Press.

Beekink, E., Frans van Poppel, and A. C. Liefbroer. 1999. "Surviving the loss of the parent in a nineteenth-century Dutch provincial town," *Journal of Social History* 32: 641–670.

———. 2002. "Parental death and death of the child: Common causes or direct effects?," in R. Derosas and M. Oris (eds.), *When Dad Died: Individuals and Families Coping with Distress in Past Societies*. Bern: Peter Lang.

Beise, Jan. 2002. "A multilevel event history analysis of the effects of grandmothers on child mortality in a historical German population, Krummhörn, Ostfriesland, 1720–1874," *Demographic Research* 7(13): 469–497.

———. 2005. "The helping grandmother and the helpful grandmother: The role of maternal and paternal grandmothers in child mortality in the 17th and 18th century population of French settlers in Quebec, Canada," in E. Voland, A. Chasiotis, and W. Schiefenhoevel (eds.), *Grandmotherhood: The Evolutionary Significance of the Second Half of the Female Life*. New Brunswick: Rutgers University Press.

Bereczkei, Tamas. 1998. "Kinship network, direct childcare and fertility among Hungarians and Gypsies," *Evolution and Human Behaviour* 19(5): 283–298.

Bereczkei, Tamas and A. Csanaky. 1996. "Evolutionary pathway of child development: Lifestyles of adolescents and adults from father-absent families," *Human Nature* 7(3): 257–280.

Bereczkei, Tamas and Robin I. M. Dunbar. 2002. "Helping-at-the-nest and sex-biased parental investment in a Hungarian Gypsy population," *Current Anthropology* 43(5): 804–809.

Bezner Kerr, Rachel, Laifolo Dakishoni, Lizzie Shumba, Rodgers Msachi, and Marko Chirwa. 2008. "'We grandmothers know plenty': Breastfeeding, complementary feeding and the multifaceted role of grandmothers in Malawi," *Social Science and Medicine* 66(5): 1095–1105.

Bishai, D. et al. 2003. "Does biological relatedness affect child survival?," *Demographic Research* 8(9).

Blurton Jones, Nicholas G., Frank Marlowe, Kristen Hawkes, and James F. O'Connell. 2000. "Paternal investment and hunter-gatherer divorce rates," in L. Cronk, N. Chagnon, and

W. Irons (eds.), *Adaptation and Human Behaviour: an Anthropological Perspective*. New York: Aldine de Gruyter.

Bock, John and Sara Johnson. 2008. "Grandmothers' productivity and the HIV/AIDS pandemic in sub-Saharan Africa," *Journal of Cross-Cultural Gerontology* 23(2): 131–145.

Borgerhoff Mulder, Monique. 2007. "Hamilton's rule and kin competition: The Kipsigis case," *Evolution and Human Behavior* 28(5): 299–312.

———. 2009. "Tradeoffs and sexual conflict over women's fertility preferences in Mpimbwe," *American Journal of Human Biology* 21(4): 478–487.

Borgerhoff Mulder, Monique and M. Milton. 1985. "Factors affecting infant care in the Kipsigis," *Journal of Anthropological Research* 41: 231–262.

Botcheva, Luba B. and S. Shirley Feldman. 2004. "Grandparents as family stabilizers during economic hardship in Bulgaria," *International Journal of Psychology* 39(3): 157–168.

Breschi, Marco, Renzo Derosas, and Manfredini Matteo. 2004. "Mortality and environment in three Emilian, Tuscan and Venetian communities, 1800–1883," in T. Bengtsson, C. Campbell, and J. Z. Lee (eds.), *Life Under Pressure: Mortality and Living Standards in Europe and Asia 1700–1900*. Cambridge, Massachusetts: MIT Press.

Breschi, M. and M. Manfredini. 2002. "Parental loss and kin networks: Demographic repercussions in a rural Italian village," in R. Derosas and M. Oris (eds.), *When Dad Died: Individuals and Families Coping with Distress in Past Societies*,. Bern: Peter Lang.

Bridges, Laura J., Amy E. C. Roe, Judy Dunn, and Thomas G. O'Connor. 2007. "Children's perspectives on their relationships with grandparents following parental separation: A longitudinal study," *Social Development* 16: 539–554.

Burch, T. K. and M. Gendell. 1970. "Extended family structure and fertility: some conceptual and methodological issues," *Journal of Marriage and Family* 32(2): 227– 236.

Cain, Mead. 1977. "The economic activities of children in a village in Bangladesh," *Population and Development Review* 3(3): 201–227.

Caldwell, John C. 1978. "A theory of fertility: From high plateau to destabilization," *Population and Development Review* 4(4): 553–577.

Campbell, Cameron and James Z. Lee. 1996. "A death in the family: Household structure and mortality in rural Liaoning: life-event and time-series analysis, 1792–1867," *History of the Family* 1(3): 297–328.

———. 2002. "When husbands and parents die: Widowhood and orphanhood in late Imperial Liaoning, 1789–1909," in R. Derosas and M. Oris (eds.), *When Dad Died: Individuals and Families Coping with Distress in Past Societies* . Bern: Peter Lang.

———. 2004. "Mortality and household in seven Liaodong populations," in T. Bengtsson, C. Campbell, and J. Z. Lee (eds.), *Life Under Pressure: Mortality and Living Standards in Europe and Asia 1700-1900*. Cambridge, MA: MIT Press.

———. 2009. "Long-term mortality consequences of childhood family context in Liaoning, China, 1749-1909," *Social Science and Medicine* 68(9): 1641–1648.

Central Intelligence Agency. 2009. *The World Factbook*. Retrieved 20 August 2009 from «https: //www.cia.gov/library/publications/the-world-factbook/rankorder/2127rank.html».

Cherlin, A., and F. F. Furstenburg. 1986. "The influence of grandparents on grandchildren," in A. Cherlin and F. F. Furstenberg (eds.), *The New American Grandparent: A Place in the Family, a Life Apart*. New York: Basic Books.

Chi, P. S. K. and P. L. Hsin. 1996. "Family structure and fertility behavior in Taiwan," *Population Research and Policy Review* 15(4): 327–339.

Chisholm, J. S., J. A. Quinlivan, R. W. Petersen, and D. A. Coall. 2005. "Early stress predicts age at menarche and first birth, adult attachment, and expected lifespan," *Human Nature* 16(3): 233–265.

Coall, David A. and Ralph Hertwig. 2010. "Grandparental investment: past, present and future," *Behavioral and Brain Sciences* 33(1): 1–59.

Crittenden, Alyssa N. and Frank W. Marlowe. 2008. "Allomaternal care among the Hadza of Tanzania," *Human Nature—an Interdisciplinary Biosocial Perspective* 19(3): 249-262.

Crognier, E., A. Baali, and M. K. Hilali. 2001. "Do 'helpers at the nest' increase their parents' reproductive success?," *American Journal of Human Biology* 13(3): 365–373.

Crognier, E., M. Villena, and E. Vargas. 2002. "Helping patterns and reproductive success in Aymara communities." *American Journal of Human Biology* 14(3): 372–379.

Davis, Kingsley and Judith Blake. 1956. "Social structure and fertility: An analytic framework," *Economic Development and Cultural Change* 4(3): 211–235.

Derosas, R. 2002. "Fatherless families in 19th century Venice," in R. Derosas and M. Oris (eds.), *When Dad Died: Individuals and Families Coping with Distress in Past Societies*. Bern: Peter Lang.

Douglass, Richard L. and Brenda F. McGadney-Douglass. 2008. "The role of grandmothers and older women in the survival of children with kwashiorkor in urban Accra, Ghana," *Research in Human Development* 5(1): 26–43.

Draper, Patricia. 1989. "African marriage systems: perspectives from evolutionary ecology," *Ethology and Sociobiology* 10(1-3): 145–169.

Fergusson, Emma, Barbara Maughan, and Jean Golding. 2008. "Which children receive grandparental care and what effect does it have?," *Journal of Child Psychology and Psychiatry* 49(2): 161–169.

Falbo, Toni. 1991. "The impact of grandparents on children's outcomes in China," *Marriage and the Family Review* 16: 369–376.

Flinn, Mark V. 1986. "Correlates of reproductive success in a Caribbean village," *Human Ecology* 14(2): 225–243.

———. 1989. "Household composition and female reproductive strategies in a Trinidadian village," in A. E. Rasa, C. Vogel, and E. Voland (eds.), *The Sociobiology of Sexual and Reproductive Strategies*. London/New York: Chapman and Hall.

Fouts, Hillary N. and Robyn A. Brookshire. 2009. "Who feeds children? A child's-eye-view of caregiver feeding patterns among the Aka foragers in Congo," *Social Science and Medicine* 69(2): 285–292.

Fox, Molly et al. 2010. "Grandma plays favourites: X-chromosome relatedness and sex-specific childhood mortality," *Proceedings of the Royal Society B: Biological Sciences* 277(1681): 567–573.

Gebreselassie, T. 2008. "Spousal agreement on reproductive preferences in sub-Saharan Africa," Calverton, MD: Macro International.

Gibson, Mhairi A. 2008. "Does investment in the sexes differ when fathers are absent? Sex-biased infant survival and child growth in rural Ethiopia," *Human Nature* 19(3): 263–276.

Gibson, Mhairi A. and Ruth Mace. 2005. "Helpful grandmothers in rural Ethiopia: A study of the effect of kin on child survival and growth," *Evolution and Human Behavior* 26(6): 469–482.

Gillmore, Mary Rogers, Steven M. Lewis, Mary Jane Lohr, Michael S. Spencer, and Rachelle D. White. 1997. "Repeat pregnancies among adolescent mothers," *Journal of Marriage and Family* 59(3): 536–550.

Gökçe, Birsen, Aysun Özşahin, and Mehmet Zencir. 2007. "Determinants of adolescent pregnancy in an urban area in Turkey: a population-based case-control study," *Journal of Biosocial Science* 39(2): 301–311.

Griffiths, Paula, Andrew Hinde, and Zoe Matthews. 2001. "Infant and child mortality in three culturally contrasting states of India," *Journal of Biosocial Science* 33(4): 603–622.

Griggs, Julia, Jo-Pei Tan, Ann Buchanan, Shalhevet Attar-Schwartz, and Eirini Flouri. 2010. "'They've always been there for me': Grandparental involvement and child well-being," *Children and Society* 24(3): 200–214.

Hank, Karsten and Isabella Buber. 2009. "Grandparents caring for their grandchildren: Findings from the 2004 Survey of Health, Ageing and Retirement in Europe," *Journal of Family Issues* 30(1): 53–73.

Hank, Karsten and Michaela Kreyenfeld. 2003. "A multilevel analysis of child care and women's fertility decisions in Western Germany," *Journal of Marriage and Family* 65(3): 584-596.

Hawkes, Kristen, James F. O'Connell, and Nicholas G. Blurton Jones. 1989. "Hardworking Hadza grandmothers," in V. Standen and R. A. Foley (eds.), *Comparative Socioecology: The Behavioural Ecology of Humans and Other Mammals*. Oxford: Blackwell.

Hawkes, Kristen and Ken R. Smith. 2009. "Evaluating grandmother effects," *American Journal of Physical Anthropology* 140(1): 173–176.

Heath, Kathleen M. 2003. "The effects of kin propinquity on infant mortality," *Social Biology* 50(3-4): 270–280.

Henderson, Craig E., Bert Hayslip, Jr., Leah M. Sanders, and Linda Louden. 2009. "Grandmother-grandchild relationship quality predicts psychological adjustment among youth from divorced families," *Journal of Family Issues* 30(9): 1245–1264.

Hetherington, E. Mavis. 1989. "Coping with family transitions: winners, losers, and survivors," *Child Development* 60(1): 1–14.

Hill, Kim and A. Magdalena Hurtado. 1996. *Ache Life History: The Ecology and Demography of a Foraging People*. New York: Aldine de Gruyter.

———. 2009. "Cooperative breeding in South American hunter-gatherers," *Proceedings of the Royal Society B: Biological Sciences*.

Hrdy, Sarah B. 2005. "Cooperative breeders with an ace in the hole," in E. Voland, A. Chasiotis, and W. Schiefenhoevel (eds.), *Grandmotherhood: The Evolutionary Significance of the Second Half of Female Life*. New Brunswick: Rutgers University Press.

———. 2009. *Mothers and Others: The Evolutionary Origins of Mutual Understanding*. Cambridge, MA: Belknap Press.

Hurtado, A. Magdalena and Kim R. Hill. 1992. "Paternal effect on offspring survivorship among Ache and Hiwi hunter-gatherers: implications for modeling pair-bond stability," in B. S. Hewlett (ed.), *Father-Child Relations: Cultural and Biosocial Contexts*. New York: Aldine de Gruyter.

Ivey, Paula K. 2000. "Cooperative reproduction in Ituri forest hunter-gatherers: Who cares for Efe infants?," *Current Anthropology* 41(5): 856–866.

Jelliffe, D. B. and I. Maddocks. 1964. "Notes on ecologic malnutrition in the New Guinea Highlands," *Clinical Pediatrics* 3: 432-438.

Kaplan, Hillard. 1994. "Evolutionary and wealth flows theories of fertility: empirical tests and new models," *Population and Development Review* 20(4): 753–791.

Kellam, Sheppard G., Margaret E. Ensminger, and R. Jay Turner. 1977. "Family structure and the mental health of children," *Archives of General Psychiatry* 34: 1012–1022.

Kemkes-Grottenthaler. A. 2005. "Of grandmothers, grandfathers and wicked step-grandparents: Differential impact of paternal grandparents on grandoffspring survival," *Historical Social Research* 30(3): 219–239.

Kennedy, Gregory E. and C. E. Kennedy. 1993. "Grandparents: A special resource for children in stepfamilies," *Journal of Divorce & Remarriage* 19(3): 45–68.

Kiernan, Kathleen E. 1992. "The impact of family disruption in childhood on transitions made in young adult life," *Population Studies* 46(2): 213–234.

Kramer, Karen L. 2005. "Children's help and the pace of reproduction: cooperative breeding in humans," *Evolutionary Anthropology* 14(6): 224–237.

Ladusingh, L. and C. H. Singh. 2006. "Place, community education, gender and child mortality in North-East India," *Population, Space and Place* 12(1): 65–76.

Lahdenperä, Mirkka, Virpi Lummaa, Samuli Helle, Marc Tremblay, and Andrew F. Russell. 2004. "Fitness benefits of prolonged post-reproductive lifespan in women," *Nature* 428(6979): 178–181.

Lahdenperä, Mirkka, Andrew F. Russell, and Virpi Lummaa. 2007. "Selection for long lifespan in men: Benefits of grandfathering?," *Proceedings of the Royal Society B: Biological Sciences*.

Lee, Meng-Chih. 2001. "Family and adolescent childbearing," *Journal of Adolescent Health* 28(4): 307–312.

Lee, Ronald D. and Karen L. Kramer. 2002. "Children's economic roles in the Maya family life cycle: Cain, Caldwell, and Chayanov revisited," *Population and Development Review* 28(3): 475-499.

Leonetti, Donna L., Dilip C. Nath, and H. S. Hemam. 2008. "In-law conflict: Women's reproductive lives and the roles of their mothers and husbands among the matrilineal Khasi." *Current Anthropology* 49(2): 861–890.

Leonetti, Donna L., Dilip C. Nath, N. S. Hemam, and Dawn B. Neill. 2004. "Do women really need marital partners for support of their reproductive success? The case of the matrilineal Khasi of NE India," *Research in Economic Anthropology* 23: 151–174.

———. 2005. "Kinship organisation and the impact of grandmothers on reproductive success among the matrilineal Khasi and patrilineal Bengali of Northeast India," E. Voland, A. Chasiotis, and W. Schiefenhoevel (eds.), in *Grandmotherhood: The Evolutionary Significance of the Second Half of Female Life*. New Brunswick: Rutgers University Press.

Lopoo, Leonard M. 2004. "The effect of maternal employment on teenage childbearing," *Journal of Population Economics* 17(4): 681–702.

Lovejoy, C. Owen. 1981. "The origin of man," *Science* 211(4480): 341–350.

Lussier, Gretchen, Kirby Deater-Deckard, Judy Dunn, and Lisa Davies. 2002. "Support across two generations: Children's closeness to grandparents following parental divorce and remarriage," *Journal of Family Psychology* 16: 363–376.

Mace, Ruth 2007. "The evolutionary ecology of human family size," in R. I. M. Dunbar and L. Barrett (eds.), *The Oxford Handbook of Evolutionary Psychology*. Oxford: Oxford University Press.

Mace, Ruth and Heidi Colleran. 2009. "Kin influence on the decision to start using modern contraception: A longitudinal study from rural Gambia," *American Journal of Human Biology*.

Mace, Ruth and Rebecca Sear. 2005. "Are humans cooperative breeders?," in E. Voland, A. Chasiotis, and W. Schiefenhoevel (eds.), *Grandmotherhood: The Evolutionary Significance of the Second Half of Female Life*. New Brunswick: Rutgers University Press.

Madrigal, Lorena and M. Meléndez-Obando. 2008. "Grandmothers' longevity negatively affects daughters' fertility," *American Journal of Physical Anthropology* 136(2): 223–229.

Manlove, Jennifer. 1997. "Early motherhood in an intergenerational perspective: The experiences of a British cohort," *Journal of Marriage and Family* 59(2): 263–279.

Manlove, Jennifer, Carrie Mariner, and Angela Romano Papillo. 2000. "Subsequent fertility among teen mothers: Longitudinal analyses of recent national data," *Journal of Marriage and Family* 62(2): 430–448.

Manlove, Jennifer, Elizabeth Terry, Laura Gitelson, Angela Romano Papillo, and Stephen Russell. 2000. "Explaining demographic trends in teenage fertility, 1980–1995," *Family Planning Perspectives* 32(4): 166–175.

Masmas, T. N. et al. 2004. "Survival among motherless children in rural and urban areas in Guinea-Bissau," *Acta Paediatrica* 93(1): 99–105.

Masvie, H. 2007. "The role of Tamang grandmothers in perinatal care, Makwanpur District, Nepal," in P. Liamputtong (ed.), *Childrearing and Infant Care Issues: A Cross-Cultural Perspective*. Nova Publishers.

McLanahan, Sara and Larry Bumpass. 1988. "Intergenerational consequences of family disruption," *The American Journal of Sociology* 94(1): 130–152.

Morgan, S. P. and R. R. Rindfuss. 1984. "Household structure and the tempo of family formation in comparative perspective," *Population Studies* 38(1): 129–139.

Muhuri, P. K. and J. Menken. 1997. "Adverse effects of next birth, gender and family composition on child survival in rural Bangladesh," *Population Studies* 51(3): 279–294.

Newson, Lesley et al. 2007. "Influences on communication about reproduction: the cultural evolution of low fertility," *Evolution and Human Behavior* 28(3): 199–210.

Oris, Michel, Renzo Derosas, and Marco Breschi. 2004. "Infant and child mortality," in T. Bengtsson, C. Campbell, and J. T. Lee (eds.), *Life Under Pressure: Mortality and Living Standards in Europe and Asia 1700–1900*. Cambridge, MA: MIT Press.

Over, M., R. P. Ellis, J. H. Huber, and O. Solon. 1992. "The consequences of adult ill-health," in R. A. Feachem, T. Kjellstrom, C. J. L. Murray, M. Over, and M. A. Phillips (eds.), *The Health of Adults in the Developing World*. Oxford: Oxford University Press.

Oyserman, Daphna, Norma Radin, and Rita Benn. 1993. "Dynamics in a three-generational family: Teens, grandparents, and babies," *Developmental Psychology* 29(3): 564–572.

Parr, N. J. 2005. "Family background, schooling and childlessness in Australia," *Journal of Biosocial Science* 37(2): 229–243.

Penn, Dustin J. and Ken R. Smith. 2007. "Differential fitness costs of reproduction between the sexes," *PNAS* 104(2): 553–558.

Pittman, Laura D. 2007. "Grandmothers' involvement among young adolescents growing up in poverty," *Journal of Research on Adolescence* 17(1): 89–116.

Pittman, Laura D. and Michelle K. Boswell. 2007. "The role of grandmothers in the lives of preschoolers growing up in urban poverty," *Applied Developmental Science* 11(1): 20–42.

Quinlan, Robert J. 2001. "Effect of household structure on female reproductive strategies in a Caribbean village," *Human Nature* 12(3): 169–189.

———. 2003. "Father absence, parental care, and female reproductive development," *Evolution and Human Behavior* 24(6): 376–390.

Radin, Norma, Daphna Oyserman, and Rita Benn. 1991. "Grandfathers, teen mothers and children under two," in P. K. Smith (eds.), *The Psychology of Grandparenthood*. New York: Routledge.

Ragsdale, Gillian. 2004. "Grandmothering in Cambridgeshire, 1770–1861," *Human Nature* 15(3): 301–317.

Ratcliffe, A. A., A. G. Hill, and G. Walraven. 2000. "Separate lives, different interests: Male and female reproduction in the Gambia," *Bulletin of the World Health Organization* 78(5): 570–579.

Reher, David S. and F. González-Quiñones. 2003. "Do parents really matter? Child health and development in Spain during the demographic transition," *Population Studies* 57(1): 63–75.

Robinson, Rachel Sullivan, Ronald D. Lee, and Karen L. Kramer. 2008. "Counting women's labour: A reanalysis of children's net production using Cain's data from a Bangladeshi village," *Population Studies* 62(1): 25–38.

Ruiz, Sarah A. and Merril Silverstein. 2007. "Relationships with grandparents and the emotional well-being of late adolescent and young adult grandchildren," *Journal of Social Issues* 63(4): 793–808.

Scelza, Brooke A. 2009. "The grandparental niche: critical caretaking among Martu Aborigines," *American Journal of Human Biology*.

Scholl Perry, Kristin. 1996. "Relationships among adolescents' ego development, their academic achievement, and the amount of their contact with and social distance from grandparents," ETD Collection for Pace University, Paper AAI9701161. New York.

Sear, Rebecca. 2008. "Kin and child survival in rural Malawi: Are matrilineal kin always beneficial in a matrilineal society?," *Human Nature—An Interdisciplinary Biosocial Perspective* 19(3): 277–293.

Sear, Rebecca and Ruth Mace. 2008. "Who keeps children alive? A review of the effects of kin on child survival," *Evolution and Human Behavior* 29(1): 1–18.

———. 2009. "Family matters: Kin, demography and child health in a rural Gambian population," in G. R. Bentley and R. Mace (eds.), *Substitute Parents: Alloparenting in Human Societies.* Berghahn Books, pp. 50–76

Sear, Rebecca, Ruth Mace, and Ian A. McGregor. 2000. "Maternal grandmothers improve the nutritional status and survival of children in rural Gambia," *Proceedings of the Royal Society of London, Series B, Biological Sciences* 267: 461–467.

———. 2003. "The effects of kin on female fertility in rural Gambia," *Evolution and Human Behavior* 24: 25–42.

Sear, Rebecca and Paul Mathews. In prep. "The impact of kin on fertility: A systematic review."
Sear, Rebecca, Fiona Steele, Ian A. McGregor, and Ruth Mace. 2002. "The effects of kin on child mortality in rural Gambia," *Demography* 39(1): 43–63.
Sharma, M. and S. Kanani. 2006. "Grandmothers' influence on child care," *Indian Journal of Pediatrics* 73(April): 295–298.
Sigle-Rushton, Wendy and Sara McLanahan. 2004. "Father absence and child well-being: A critical review," in D. P. Moynihan, T. Smeeding, and L. Rainwater (eds.), *The Future of the Family*. New York: Russell Sage Foundation.
Silverstein, Merril and Sarah Ruiz. 2006. "Breaking the chain: How grandparents moderate the transmission of maternal depression to their grandchildren," *Family Relations* 55(5): 601–612.
Sorenson Jamison, Cheryl, L. L. Cornell, P. L. Jamison, and H. Nakazato. 2002. "Are all grandmothers equal? A review and a preliminary test of the 'Grandmother Hypothesis' in Tokugawa Japan," *American Journal of Physical Anthropology* 119: 67–76.
Thompson, Barbara and A. K. Rahman. 1967. "Infant feeding and child care in a West African village," *Journal of Tropical Pediatrics* 13: 124–138.
Thornton, Arland, Ronald Freedman, Te-Hsiung Sun, and Ming-Cheng Chang. 1986. "Intergenerational relations and reproductive behavior in Taiwan," *Demography* 23(2): 185–197.
Tinsley, Barbara J. and Ross. D. Parke. 1987. "Grandparents as interactive and social support agents for families with young infants," *International Journal of Aging and Human Development* 25(4): 259–277.
Tomasello, Michael 1999. *The Cultural Origins of Human Cognition*. Cambridge, MA: Harvard University Press.
Tsay, Wen-Jen and C. Y. Cyrus Chu. 2005. "The pattern of birth spacing during Taiwan's demographic transition," *Journal of Population Economics* 18(2): 323–336.
Tsuya, Noriko O. and Satomi Kurosu. 2002. "The mortality effects of adult male death on women and children in agrarian households in early modern Japan: Evidence from two Northeastern villages, 1716–1870," in R. Derosas and M. Oris (eds.), *When Dad Died: Individuals and Families Coping with Distress in Past Societies*. Bern: Peter Lang.
———. 2004. "Mortality and household in two Ou villages, 1716–1870," in T. Bengtsson, C. Campbell, and J. Z. Lee (eds.), *Life Under Pressure: Mortality and Living Standards in Europe and Asia 1700–1900*. Cambridge, MA: MIT Press.
Turke, Paul W. 1988. Helpers at the nest: Childcare networks on Ifaluk," in L. Betzig, M. Borgerhoff Mulder, and P. Turke (eds.), *Human Reproductive Behaviour: A Darwinian Perspective*. Cambridge: Cambridge University Press.
———. 1989. "Evolution and the demand for children," *Population and Development Review* 15(1): 61–90.
Tymicki, Kryzstzof. 2004. "The kin influence on female reproductive behaviour: The evidence from the reconstitution of Bejsce parish registers, 18th–20th centuries, Poland," *American Journal of Human Biology* 16(5): 508–522.
———. 2009. "The correlates of infant and childhood mortality: A theoretical overview and new evidence from the analysis of longitudinal data from Bejsce parish register reconstitution study 18th–20th centuries, Poland," *Demographic Research* 20(23): 559–594.
Vikat, A., A. Rimpelä, E. Kosunen, and M. Rimpelä. 2002. "Sociodemographic differences in the occurrence of teenage pregnancies in Finland in 1987–1998: A follow up study," *Journal of Epidemiology and Community Health* 56(9): 659–668.
Voland, Eckart and Jan Beise. 2002. "Opposite effects of maternal and paternal grandmothers on infant survival in historical Krummhörn," *Behavioural Ecology and Sociobiology* 52(6): 435–443.
Vundule, C., F. Maforah, R. Jewkes, and E. Jordaan. 2001. "Risk factors for teenage pregnancy among sexually active black adolescents in Cape Town: A case control study," *South African Medical Journal* 91(1): 73–80.

Wang, Chong-Shan and Pesus Chou. 1999. "Risk factors for adolescent primigravida in Kaohsiung County, Taiwan," *American Journal of Preventive Medicine* 17(1): 43–47.

Waynforth, David. 2002. "Evolutionary theory and reproductive responses to father absence: Implications of kin selection and the reproductive returns to mating and parenting effort," in C. S. Tamis-LeMonda and N. Cabera (eds.), *Handbook of Father Involvement: Multidisciplinary Perspectives.* Lawrence Erlbaum Associates.

Weinstein, Maxine, Te-Hsiung Sun, Ming-Cheng Chang, and Ronald Freedman. 1990. "Household composition, extended kinship, and reproduction in Taiwan: 1965–1985," *Population Studies* 44(2): 217–239.

Willführ, Kai P. 2009. "Short- and long-term consequences of early parental loss in the historical population of the Krummhörn (18th and 19th century)," *American Journal of Human Biology* 21(4): 488–500.

Winking, Jeffrey. 2006. "Are men really that bad as fathers? The role of men's investments," *Social Biology* 53(1-2): 100–115.

Wu, Zheng and Christoph M. Schimmele. 2003. "Childhood family experience and completed fertility," *Canadian Studies in Population* 30(1): 221–240.

van Bodegom, David et al. 2010. "When grandmothers matter: A debate," *Gerontology* 56(2): 214–216.

Zaba, Basia J. 2005. "HIV and mortality of mothers and children: Evidence from cohort studies in Uganda, Tanzania, and Malawi," *Epidemiology* 16(3): 275–280.