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Kin influences on fertility in Thailand: Effects and mechanisms ☆

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ABSTRACT

It has been suggested that human mothers are cooperative breeders, as they need help from others to successfully raise offspring. Studies working under this framework have found correlations between the presence of kin and both child survival and female fertility rates. This study seeks to understand the proximate mechanisms by which kin influence fertility using data from the 1987 Thailand Demographic and Health Survey (DHS), a nationally representative sample of 6775 women. Kin influence is measured by the length of time couples live with the husband's or wife's parents after marriage. Event history analysis, multilevel modeling and structural equation modeling are used to investigate both fertility outcomes and potential pathways through which postnuptial residence may influence fertility outcomes, including employment status, maternal and child outcomes, contraceptive use, breastfeeding duration, and age at marriage. We show that living virilocally (with husband's kin after marriage) increases total fertility by shortening time from marriage to first birth, and increasing the likelihood of progression to each subsequent birth. These effects are mediated through correlations between virilocal residence and earlier age at marriage as well as delayed initiation of contraceptive use. We find no influence of husband's kin on maternal or child outcomes. Living uxorilocally (with wife's kin after marriage) also reduces age at marriage, shortens time from marriage to first birth and (marginally) improves child survivorship, but has no effect on other child and maternal outcomes or progression to subsequent births and results in a similar number of living children as women living neolocally.

1. Introduction

Human reproduction is unique compared to our closest living relatives because of short birth intervals and an extended period of offspring dependence, which lead to multiple dependent offspring of differing ages (Galdikas & Wood, 1990; Kramer, 2005). While non-human primates typically do not begin another bout of reproduction until the previous offspring is an independent food producer, human females supplement the needs of many offspring. To support many dependent offspring, humans may breed cooperatively, allowing females to receive help from other individuals (Hrdy, 1999). Evidence suggests that helpers include partners (Kaplan et al., 2000), unrelated adult males (Hill & Hurtado, 2009), parents (Sear et al., 2003; Tymicki, 2004), older children (Kramer, 2005) and other kin (reviewed by Sear & Mace, 2008). This evidence largely takes the form of correlations between the presence of potential helpers and either child survival rates or fertility rates (Sear & Coall, 2011). However, such analyses frequently do not attempt to determine *how* helpers influence these components of reproductive success (with some exceptions, see e.g. Gibson & Mace, 2005). Here we use a rich source of data, a Demographic and Health Survey, to investigate not just whether there is an association between the presence of potential helpers and female fertility, but also the pathways through which such an association might be brought about.

Kin may influence female fertility, including age at first birth, total number of children born, and length of birth intervals, but it is likely that different relatives have distinct effects on fertility, which may vary further under different ecological conditions. While the cooperative breeding hypothesis and inclusive fitness considerations suggest that kin will broadly support one another's reproductive success (Hamilton, 1966; Hrdy, 2005), under conditions of resource stress, local resource competition may become important, resulting in the presence of kin reducing reproductive success (Sear, 2008; Strassmann, 2011). Further, even if the reproductive goals of women and their kin are in harmony, there is the opportunity for sexual conflict between partners which may result in a woman's fertility reflecting her partner's optimum fertility rather than her own (Leonetti et al., 2007; Sear et al., 2003). Some research has shown that men may want more children than their wives do (Ratcliffe et al., 2000; Bankole & Singh, 1996) since the potential costs of reproduction are greater for women. Kin may try to support the reproductive desires of the individual they are genetically related to: for example, the husband's kin may encourage the reproductive desires of the husband (which would promote higher fertility) while the wife's kin may try to encourage the wife's desired fertility. A review of kin effects on fertility shows that correlations between the availability of kin and

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fertility can vary substantially between populations, though broadly the presence of husband's kin is more likely to be correlated with increased fertility than that of the woman's own kin (Sear & Coall, 2011). Both theory and empirical observation therefore reinforce the need for research on the mechanisms through which kin influence fertility, in order to understand exactly why such kin influences exist. Below we describe the hypotheses for pathways of kin influence which we are able to test on our data.

1.1. Hypothesis 1: Kin reduce the costs of reproduction

This is the assumption behind the 'humans are cooperative breeders' hypothesis: that alloparents are critically important for parents to obtain the necessary resources and care required for their growing brood of children. We test the hypothesis that kin reduce the costs of reproduction in two ways: 1) kin affect a woman's time allocation and 2) kin influence maternal and child outcomes.

In both traditional and modern societies, the presence of helpful kin may allow mothers with young children to optimize their time allocation. In many societies today, childcare is incompatible with work, so when kin members provide childcare, women may be able to achieve higher fertility (Bereczkei, 1998; Thompson, 1965). Alternatively, having additional resources may allow a woman to forgo employment and focus on providing childcare for her offspring. Even in traditional societies, there will be some trade-off between food-producing work, domestic work and childcare. Helpful kin may alleviate some of the burden of this workload (see e.g. Gibson & Mace, 2005).

One way that relatives can help mothers is by improving the likelihood of survival for her children. Since mortality is quite low in post-demographic transition societies, most studies on kin availability and child survival have been conducted in pre-transitional societies. Positive correlations between the presence of kin and child survival rates are now well established (see Sear & Mace, 2008). Such correlations may potentially be brought about by the provision of resources and high quality childcare by these available kin. Additional resources may improve the health of offspring, as well as their survival rates, and in food stressed environments, additional resources can lead to beneficial effects on child weight, height, and other indicators of health. Evidence has shown that maternal grandmothers may have a beneficial effect on child height (Sear & Mace, 2008; Sear et al., 2000) and improve nutrient intake (Sharma & Kanani, 2006). Kin may improve maternal outcomes as well. If individuals are providing calories to supplement mothers, we may see an increase in mother's body mass index (BMI).

1.2. Hypothesis 2: Kin influence contraceptive uptake

The hypothesis above is an indirect mechanism by which kin may influence fertility: by changing the costs of reproduction. But kin may have interests in directly influencing a woman's fertility, because they actively desire her to produce more children, or perhaps to protect her own well-being by slowing her rate of reproduction. In controlled fertility populations, individuals commonly control their fertility through the use of contraceptives. There is some evidence that kin may influence contraceptive use (Madhavan et al., 2003, but see Mace & Colleran, 2009) or its' effectiveness (Borgerhoff Mulder, 2009).

1.3. Hypothesis 3: Kin influence breastfeeding duration

Breastfeeding duration is correlated with birth interval length among natural fertility populations (Ellison, 2001). One route by which kin may impact birth intervals is by promoting the extension or cessation of breastfeeding. Kin effects may either be direct, the influence of older women on the nutrition of young children and nursing mothers may directly contribute to breastfeeding cessation (Hawkes et al., 1997; Sear et al., 2000) or indirect, when help allows women the time to continue breastfeeding a child they might have to wean without such help.

1.4. Hypothesis 4: Living with kin allows couples to marry at younger ages

A fourth hypothesis is that individuals can marry at a younger age if they live with family postnuptially. Age at marriage has a direct effect on fertility if there is little sexual activity outside of marriage. Following Morgan and Rindfuss (1984), anticipated post-nuptial residence may influence one's ability to marry. There is some evidence that having available kin correlates with earlier age at marriage, particularly in low socio-economic status contexts (Johow & Voland, 2012) or when couples live with the husband's kin postnuptially (Morgan & Rindfuss, 1984).

1.5. Hypothesis 5: Individuals with high desired fertility live with kin

Finally, we aim to test whether desired family size is correlated with kin presence. It is possible that individuals who desire high fertility are more likely to maintain close ties with family members in order to utilize their help to achieve their reproductive goals. If this hypothesis is true, then kin do not influence fertility, but instead fertility goals influence individuals' proximity to kin. Regardless of the causal arrow, if individuals choose to live with kin because of higher desired family size, we can still understand their choice as needing help from kin to successfully raise offspring.

This paper aims to answer two questions. First, do kin influence fertility in Thailand? If yes, in which ways do kin influence fertility? This research focuses on understanding the proximate mechanisms by which kin affect fertility in a nationally representative survey where there is large variation in postnuptial residences. This allows for different potential mechanisms to be compared.

2. Data and methods

Data are derived from the Thailand Demographic and Health Survey (DHS), a nationally representative household survey which includes data on a wide range of topics including fertility, health and contraceptive use. Interviews were conducted in 1987 with 6775 ever-married women between 15 and 49 years old. While the DHS dataset is constrained by the sampling criteria (only ever-married women), it has the advantage of sampling a large number of women across Thailand. The dataset contains questions regarding which set of parents the couple resided with after marriage, and for how long that residence lasted. This allows us to investigate the potential differing effects of wife's kin and husband's kin on fertility outcomes. In the analyses that follow, we use uxorilocal and virilocal residence to refer to postmarital residence with the wife's or husband's parents (respectively); and neolocal to refer to couples that lived with neither set of parents after marriage.

Thailand has experienced a significant fertility decline over the past 50 years. Data show that the total fertility rate for Thailand in the early 1960s was approximately seven births per woman (Hirschman et al., 1994), but dropped to 2.3 between 1985 and 1990 (United Nations, 2011). At the same time, Thailand experienced rapid economic growth (Chayovan et al., 1988) and declining infant mortality rates (United Nations, 2011). Most respondents were currently married at the time of the survey and had only been married once (90%). About 65% of women sampled resided in rural areas. The majority of reproduction occurs within marriage, as only 15 women (0.2%) reported the birth of their first child before marriage.

Variables recorded in the DHS include a reproductive history, with information on children's birth dates, gender, survival status, and for children under three years old, height and weight. Information on the