Evolution and Human Behavior 35 (2014) 161–168

Contents lists available at ScienceDirect

Evolution and Human Behavior

journal homepage: www.ehbonline.org

Original Article

Fostering relations: first sex and marital timings for children raised by kin and non-kin carers☆☆

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ARTICLE INFO

Article history:
Initial receipt 12 September 2013
Final revision received 6 December 2013

Keywords:
Kinship fostering
Kin selection
Sexual behavior

ABSTRACT

Kinship fostering is generally preferred to non-kin fostering by policy makers in the U.S. and elsewhere. Researchers and policy makers alike tend to provide several proximate reasons for why this may be, generally neglecting an ultimate evolutionary framework. However, kin selection theory predicts that in the absence of genetically related parents, care from kin will result in the most similar life history outcomes. In low-fertility settings, parents typically favour increased investment in embodied capital and thus delayed reproductive life history strategy. Using archival data from the original Kinsey survey, collected in the U.S. from 1938 to 1963, we used survival analyses to compare the effects of living with kin and non-kin fosterers in childhood on timings of first sex and marriage. Our results support a kin selection hypothesis showing that while fostered children have accelerated life histories compared to children from "intact families", kin fosterers buffer children from early sexual and reproductive behaviors, compared to children cared for by non-kin.

1. Introduction

Fostering by kin – genetically related family – is often assumed to be preferable to fostering by non-kin, despite inconsistent evidence of the superiority of either method (Carpenter, Clyman, Davidson, & Steiner, 2001; Sakai, Lin, & Flores, 2011; Services, 2013; though policy preferences in the US have changed in the past century: Daly & Perry, 2011). Policy makers and non-evolutionary researchers have suggested a variety of proximate reasons for why this may be the case: continuity for foster children (in their community, school, culture, etc.) (Cuddeback, 2004); greater opportunity for contact with children's genetically related parents and families (although, in some cases this could also be considered a problematic aspect of kin care); reduced separation anxiety for children (Carpenter et al., 2001); and the belief that, on average, foster parents are likely to care more for related children (Vanschoonlandt, Vanderfaeillie, Van Holen, De Maeyer, & Andries, 2012). Several recent studies have measured the outcomes of fostering by kin versus non-kin carers, with no clear trends indicating a superiority of either fostering method (Cuddeback, 2004). Studies have considered outcomes including foster children's behavior (Sakai et al., 2011; Vanschoonlandt et al., 2012), mental health (Sakai et al., 2011; Vanschoonlandt et al., 2012), adolescent sexual behavior (Carpenter et al., 2001), first pregnancies (Carpenter et al., 2001; Sakai et al., 2011), contact frequency with parents (Vanschoonlandt et al., 2012), education attainments (Del Valle, Lázaro-Visa, López, & Bravo, 2011), and placement stability (Perry, Daly, & Kotler, 2012). Yet, these studies are primarily descriptive, and lack a clear theoretical framework from which predictions may be formed and results understood, though Daly and Perry (2011) provide a compelling case for the utility of evolutionary perspective in child welfare. Evolutionary theory provides a more comprehensive ultimate explanation as to why we could expect genetically related foster parents to improve children's developmental, behavioral, and health outcomes.

In the current study, we are interested in understanding the effects of fostering by kin and non-kin on males' and females' reproductive life history strategies, specifically, their progressions to sexual debut (first sexual intercourse) and first marriage. In the absence of genetic parents, we expect kin carers to more closely represent the adaptive interests of genetic parents than non-kin carers. According to kin selection theory, genetically related individuals are expected to act more altruistically towards, and invest more heavily in, one another than less closely or unrelated individuals (Hamilton, 1964). By helping family members, individuals are able to enhance their own inclusive fitness.

☆☆ Author note: Data from the original Kinsey surveys are archived and available at The Kinsey Institute for Research in Sex, Gender, and Reproduction, at Indiana University, Bloomington. Those interested in using these data should contact User Services at The Kinsey Institute Library to obtain current application materials for use of archives and special collections.

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1090-5138
http://dx.doi.org/10.1016/j.evolhumbehav.2013.12.002

Abundant evidence has shown that children who grow up in homes with their genetic parents are physically safer than those children not raised in such "intact families" (Daly & Wilson, 1985). Children raised in non-intact homes are also more likely to partake in risky behavior, sexual (Lenciauskiene & Zaborskis, 2008) and otherwise (Daly & Wilson, 1985). The presence of genetic parents appears to have a protective effect on children, in terms of both physical well-being and decision-making. Despite frequent and often substantial parenting effort, stepparents (non-kin) have on average been associated with more negative consequences for children's' health (Case & Paxson, 2001) and safety (Wilson, Daly, & Weghorst, 1980). This literature suggests that while any caregivers are better than none and, regardless of genetic relation, attentive caregivers are better than inattentive ones, on average intact genetically related families are best at buffering against childhood harm. In line with kin selection theory, we therefore predict that in the absence of genetic parents, kin should confer a similar, though not as strong, buffering effect on foster children's outcomes, when compared with those children who are fostered by unrelated carers. In other words, the outcomes of children in kin care should look more like those of children from intact families, compared to children in non-kin care.

Two previous studies focusing specifically on the effects of kin versus non-kin fostering during childhood on subsequent sexual and reproductive behavior have found that those placed in kin care experience earlier pregnancies both compared to children in non-kin foster care (Sakai et al., 2011) and compared to other sexually active non-fostered youth (Carpenter et al., 2001). One of these studies also found that individuals raised in kin care experience younger ages at first consensual sex compared to non-fostered individuals (Carpenter et al., 2001). Not all of these results are perhaps what we would expect assuming kin fostered children should be more similar to those raised by intact families (i.e., non-fostered children) than those fostered by non-kin.

While informative, these two studies (Carpenter et al., 2001; Sakai et al., 2011) suffer from several methodological shortcomings, possibly accounting for the unexpected direction of these findings. Sakai et al. (2011) thoroughly consider the effects of kin versus non-kin foster care on children's behavior and mental health while controlling for baseline behavioral problems and mental health. Their study, however, captures only a three year period after placement, and with only about 20% of the sample over age 11 years at the time of baseline assessment, few participants had reached sexual maturity by the follow up three years later, making this a less than ideal sample for studying first sex and first births. On the other hand, Carpenter et al. (2001) use multiple linear regressions to predict both age at first consensual sex and age at first birth, but only use data for females and exclude all individuals who are not sexually active at time of interview (i.e. they ignore censored cases), introducing a bias towards females whose first sexual activity occurs at younger ages. Additionally, Carpenter and colleagues (2001) run models for the effects of kin and non-kin fostering separately. In each model, females in foster care (kin or non-kin) are compared to females in the comparison group of not being in foster care. This analysis makes the results difficult to interpret as the two fostering groups are not compared to one another directly.

The methodological complications outlined above are problems common in much of the literature on the effects of fostering on children. Orme and Buehler (2001) reviewed 34 studies on effects of fostering on a variety of outcomes – home environment, family functioning, temperament, mental health, etc. – and also note the concerns we raise here, in addition to several others. At the time of their review, the studies reviewed primarily used cross-sectional data and lacked meaningful comparison groups for those in foster care. Additionally, few studies differentiated between kin and non-kin fostering despite, as Orme and Buehler (2001) note, substantial rates of kin fostering in past decades as well as concerns raised regarding the quality of kin fostering environments (Berrick, 1997; Sakai et al., 2011).

1.1. Current Study

The current study attempts to examine the effects of kin versus non-kin care on children, while also addressing several of the described methodological problems found in earlier studies. We use discrete-time event history analyses, a technique which allows us to include censored cases – those for whom events (first sex or marriage) have not yet occurred – leading to more accurate prediction of timings of each event (Singer & Willett, 1993). Our sample includes both males and females aged 18 years and over, an ideal sample to consider sexual and reproductive behavior. Children fostered by kin and non-kin are compared directly in our models, and we also compare kin and non-kin fostered children to those from intact families. Family composition (intact, kin fostered, non-kin fostered) is measured from ages six to 14 years for theoretical and data-related reasons (see Methods). We also consider the status of participants' parents (whether alive, dead, or divorced) before age six, in order to control for other family disruption prior to when the fostering arrangement came about. We do not have available information on the circumstance that led to the child being placed in foster care, but by controlling for death or divorce of the child's natural parents we are able to partly eliminate the known confounding effects of family stress in general on both males' and females' sexual and reproductive timings (Alvergne, Faurie, & Raymond, 2008; Amato & Kane, 2011). The current study is designed within an evolutionary framework, allowing for a theory-driven approach to the observed patterns of fostering effects on males' and females' sexual and reproductive behavioral strategies. The aim of this research is to not only further our understanding of evolutionary behavioral responses to early life environments, but also add to an important body of literature exploring the practical consequences of fostering on child development.

We hypothesize that kin care buffers the effects of fostering by serving as a close proxy for being raised by genetically related parents. Specifically, we expect kin carers to slow males' and females' progressions to sexual debut relative to non-kin carers; this has several health implications, as earlier age at first sex is on the whole associated with more risk due to associations with sexually transmitted infections, unintended pregnancies, and higher probability of the first sexual experience occurring under duress (Wellings et al., 2001). Something important to note, however, is that while early sexual and reproductive behavior is often considered unfavorable by policy makers, healthcare practitioners, and families, from an evolutionary life history theory viewpoint, early reproduction can be a logical (though not necessarily conscious) fitness-enhancing strategy under certain environmental conditions (Coall, Dickins, & Nettle, 2011).

As there is strong cultural sentiment within the U.S. for sexual and reproductive behaviors to most favorably occur within the context of a marital relationship (Laumann, Gagnon, Michael, & Michaels, 1994; Finer, 2007; Kantor, Santelli, Teitlet, & Balmer, 2008; Garcia & Kruger, 2010), we would expect kin to promote a later age at marriage and slower progression to birth. In this perspective, marriage is an institutional contract intended to signal reductions in mate search and to formalize romantic pair-bonds, the context within which most sexual and reproductive behaviors historically and cross-culturally occur (Gray & Garcia, 2013). Kin may encourage delayed sexual and reproductive behavior to be able to invest in the embodied capital of their foster children, much as intact families tend to do in high income, low fertility societies (Anderson, Kaplan, & Lancaster, 1999). Embodied capital concerns investment in physical growth and health, but also includes investment in skills and education which are important in a wage-market economy for giving young adults a competitive advantage, particularly in the mating market (Kaplan,

Lancaster, Johnson, & Bock, 1995; Kaplan, Lancaster, Tucker, & Anderson, 2002). In contemporary industrialized settings, highly invested-in children will therefore not only postpone marriage (due to social and career advancement), but also be able to acquire a higher quality mate before investing their own embodied capital in reproduction (Hill & Kaplan, 1999). Considerable research in high income countries has shown that parental absence in childhood results in earlier age at first sex (Ellis et al., 2003; Quinlan, 2003; Alvergne et al., 2008), earlier age at marriage (Michael & Tuma, 1985), and earlier first birth (Kiernan, 1992; Pesonen et al., 2008; Sheppard & Sear, 2012).

2. Methods

2.1. Data

In the current study, we use historical data from the original Kinsey survey collected in the United States from 1938 to 1963, by the then named Institute for Sex Research at Indiana University. Kinsey and colleagues interviewed participants for several hours about detailed aspects of their sexual lives, resulting in the initial publication of The Kinsey Reports (Kinsey, Pomeroy, & Martin, 1948; Kinsey, Pomeroy, Martin, & Gebhard, 1953). Detailed information on demographics, socioeconomics, childhood family structure, health, and education was also amassed from individuals during this survey: for full details of the survey questions, see Gebhard and Johnson (1979). Here we analyze data from the 6518 males and 5334 females who were aged eighteen years or older at the time of interview.

2.2. Variables and Analysis

We performed two sets of discrete-time event history analyses to determine the influence of foster care on subsequent reproductive outcomes: one for the timing of first sex (here defined as first sexual intercourse), and the second for the timing of first marriage. In this historical population timing of first marriage is used as a measure of institutionally formalizing romantic pair-bonds, and as such, a proxy measure for timing of reductions in mate search and initiation of family formation. For the timing of first sex model, time was measured as years since age ten. Cases were censored after the age at which 90% of first sex occurred (age 27 years for females and age 25 years for males), to reduce the amount of data from 'long-term survivors' (i.e. individuals who reported never having sexual intercourse, or who have an atypically late sexual debut), the inclusion of which can cause problems for this particular statistical method. Progression to first marriage was modeled from age 12 years, and cases were censored at age of interview or the ninetieth percentile (age 31 years for males and age 30 years for females). For both models, both time and time squared were included to account for the non-linear relationship between age and sexual and reproductive behaviors.

The same predictor variables were used in both models. The key independent variable of interest is a categorical variable indicating respondents' living situation from age six to 14 years: either raised by intact family, fostered by kin, or fostered by non-kin. We chose to use children from intact families (families with two genetic parents) as a reference rather than all non-fostered children, as our research is aimed at specifically understanding kin effects. Although not part of the current analyses, the data set includes non-fostered children from a variety of home situations (single parent, step-parent, adoptive parent, etc.) thus presenting too many confounding factors to interpret (but see Sheppard, Garcia, & Sear (n.d.) for a detailed analysis of how growing up in step-parent and single parent families influence subsequent sexual and reproductive behaviors in this sample).

We chose individuals who had been in the same living situation for the full nine year period from age six to 14 years (though the period could be longer if children began their living situation before age six) in order to ensure that the kin and non-kin fostered groups were as similar as possible, and to gauge the effects of kin versus non-kin fostering rather than potentially measuring effects driven by general disruption to family circumstances, which have themselves been linked to the development of faster life history strategies (Donahue et al., 2011; Nettle, Coall, & Dickins, 2011). We used 14 years as the maximum age, as after this point the children began to move away from their childhood living situations as well as begin engaging in sexual behavior. To further this end, we also included a categorical variable for family disruption prior to age six years. This variable had three categories: parental death (one or both), parental divorce, and a reference category of neither disruption. While death and divorce are not the usual initiates of fostering, we were unable to control for other factors as such information was unavailable in the current dataset. Initially, all models were also run with a categorical variable controlling for when the child entered foster care (between birth and age two years, between age three years and age five years, or from age six years) to further control for childhood instability. With the inclusion of this control several of the models did not converge as the data were severely fragmented (only seven females who were fostered between the ages of six and 14 years began fostering from age six to eight years, for example). For the models that did successfully run, our results were similar to the models run without this control, so we only present models without this control for age at fostering.

Table 1
Descriptive statistics for men and women by early family context.

	Women			Men		
	Intact Family	Non-Kin Fostered	Kin Fostered	Intact Family	Non-Kin Fostered	Kin Fostered
Sample size	5181	50	98	6304	61	146
Median years (incl. censored cases):						
Age at first sex	22	17	17	19	16	16
Age at marriage	26	26	23	26	26	23
Median values:						
SES categories	5	4	4	5	4	4
Puberty years	12	12.17	12	13.33	13.67	13.67
Years of education	15	9	10	15	10	10
Number of siblings	2	1	1	2	1	1
Birth order	2	1	1	2	1	1
Age at interview (IQR)	25 (20–35)	23.5 (18–28)	30 (22–36)	26 (22–36)	29 (25–42)	28 (23–37)
Proportions: % (n)						
White	93.36 (4837)	80 (40)	57.14 (56)	91.53 (5770)	81.97 (50)	62.33 (91)
Non-White	6.64 (344)	20 (10)	42.86 (42)	8.47 (534)	18.03 (11)	37.67 (55)
No Disruption	100 (5177)	18.42 (7)	17.89 (17)	100 (6288)	25 (9)	24.44 (33)
Divorce	0	39.47 (15)	24.21 (23)	0	16.67 (6)	25.19 (34)
Death	0	42.11 (16)	57.89 (55)	0	58.33 (21)	50.37 (68)

IQR = interquartile range

Table 2
Results from event history analyses for first sex and marriage.

	Progression to first sex (Model 1)						Progression to marriage (Model 2)					
	Women			Men			Women			Men		
	OR	95%	CI	OR	95%	CI	OR	95%	CI	OR	95%	CI
Foster situation ages 6–14:												
Ref: intact family												
Non-kin fostered	2.75**	1.26	6.04	2.62**	1.36	5.07	3.10**	1.34	7.18	2.60*	1.22	5.53
Kin fostered	1.47	0.73	2.99	1.51	0.80	2.86	2.14*	1.01	4.51	1.14	0.54	2.40
Prior family disruption:												
Ref: no disruption												
Divorce	0.84	0.37	1.91	0.59	0.26	1.33	0.45	0.19	1.10	1.04	0.40	2.71
Death of parent(s)	1.34	0.61	2.92	0.58	0.29	1.15	0.45	0.19	1.04	0.50	0.23	1.13
Controls:												
Age	0.99	0.98	1.01	0.99	0.99	1.01	0.99	0.98	1.01	1.01	0.99	1.01
White	0.43***	0.36	0.51	0.36***	0.31	0.43	0.86	0.70	1.05	0.66***	0.55	0.79
Socioeconomic status	0.97	0.93	1.01	1.01	0.98	1.04	1.01	0.97	1.05	0.97	0.93	1.01
Age at puberty	0.94**	0.90	0.97	0.91***	0.88	0.94	0.95**	0.91	0.99	0.93***	0.89	0.97
Years of education	0.83***	0.81	0.84	0.89***	0.87	0.89	0.93***	0.82	0.85	0.96***	0.95	0.98
Number of siblings	1.02*	1.00	1.06	1.04**	1.02	1.07	0.99	0.97	1.03	1.04*	1.01	1.06
Birth order	0.91*	0.85	0.98	1.00	0.93	1.07	0.95	0.87	1.04	0.95	0.87	1.04
Birth order^2	1.01***	1.00	1.02	0.99	0.99	1.01	1.01	0.99	1.01	1.01	0.99	1.01
Time	3.34***	2.96	3.76	3.85***	3.43	4.32	4.24***	3.70	4.87	4.64***	3.97	5.41
Time^2	0.98***	0.97	0.98	0.97***	0.97	0.97	0.97***	0.96	0.98	0.97***	0.96	0.98
Std. year of birth	1.08	0.91	1.30	1.01	0.90	1.12	0.90	0.90	0.09	1.01	0.88	1.16
Intercept	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Note: OR = odds ratios, CI = confidence intervals.
* $p < 0.050$.
** $p < 0.010$.
*** $p < 0.001$.

Additionally, we controlled for age at pubertal onset in all models as other studies have shown that puberty is positively correlated with age at first sex (Belsky, Steinberg, Houts, & Halpern-Felsher, 2010; Gaudineau et al., 2010). Models were run separately for males and females, as the puberty variable is calculated using different measurements and thus not comparable between sexes. For females, an age of pubertal onset score was derived by averaging (summing and dividing by three) age at menarche, age at breast development, and age at onset of pubic hair. For males, we used the same method of calculating age of pubertal onset score but the pubertal age was derived by averaging age at voice breaking, age at onset of pubic hair, and age at first ejaculation.

Additionally, the number of siblings each respondent had is included in our models to account for heritable fecundity as best possible, as this may influence age at first birth. The sibling variable, however, includes both genetically related siblings and surrogates if raised with the respondent (Gebhard & Johnson, 1979). We were not able to discern, however, whether children in foster care actually lived with their genetic siblings within the foster care arrangement. Moreover, we included respondents' birth order and birth order squared (measured when respondents were aged 14 to 17 years—the only time period data were collected for in the original Kinsey survey), age at time of interview, race (dichotomously as white or non-white, consistent with original data collection, as non-white sample sizes became too small to analyze separately), years of completed education, and a standardized measure of birth year (mean = 0, std. dev. = 1). Socioeconomic status was also included in our models, derived by interviewers based on questions regarding the perceived financial security of the respondent's family (whether genetic or not) between the ages of 14 to 17 years, on a 1-to-8 scale with 1 being the poorest category and 8 the wealthiest category. Where socioeconomic status was unclear, the interviewers probed for more detail and then estimated the respondent's socioeconomic class (see Gebhard & Johnson, 1979). Table 1 shows descriptive statistics for the substantive variables in our models.

3. Results

Table 2 presents the results of our statistical models. Odds ratios above 1 indicate faster progression to the event (first sex or first

Table 3
Results: testing for statistical differences between the effects of early family context.

	Progression to first sex (Model 1)						Progression to marriage (Model 2)					
	Women			Men			Women			Men		
	OR	95%	CI	OR	95%	CI	OR	95%	CI	OR	95%	CI
Foster situation ages 6–14:												
Ref: intact family												
Non-kin fostered	2.75**	1.26	6.04	2.62**	1.36	5.07	3.10**	1.34	7.18	2.60*	1.22	5.53
Kin fostered	1.47	0.73	2.99	1.51	0.80	2.86	2.14*	1.01	4.51	1.14	0.54	2.40
Ref: kin fostered												
Intact family	0.87	0.33	1.37	0.66	0.35	1.26	0.47*	0.22	0.98	0.87	0.42	1.83
Non-kin fostered	1.87	0.98	3.56	1.74	0.91	3.33	1.44	0.69	3.03	2.27*	1.10	4.77

Note: OR = odds ratios, CI = confidence intervals. All models control for: age, race, socioeconomic status, age at puberty, years of education, number of siblings, birth order, birth order squared, time, time squared, and standardized year of birth.
* $p < 0.050$.
** $p < 0.010$.

marriage), and odds ratios below 1 indicate slower progressions. As predicted, for both males and females we found that fostering by kin had a weaker effect on progression to first sex than did fostering by non-kin compared to the reference category of "intact family". While both fostering situations were associated with faster progressions to first sex compared with those who lived with an intact family, the odds ratios were higher and only statistically significant for non-kin fostered children. Similarly, the odds of progressing to marriage were higher for those fostered by both non-kin and kin compared with those living in an intact family, and only consistently statistically significant for non-kin fostered children. For this outcome, females fostered by kin were also significantly different from children from intact families, though they were still slower to progress than children from non-kin foster homes. In order to directly compare the effects of non-kin fostering and kin fostering, we also ran models in which kin fostering was the reference category to which non-kin fostering and intact families were compared (kin effects from the models in Tables 3). Compared to kin fostering, non-kin fostering consistently results in faster progressions to first sex and marriage for both males and females; however, the difference between kin and non-kin fostered children is only statistically significant for age at marriage for males.

Early death or divorce of parents does not appear to be correlated with the progressions we have modeled, in contrast to previous research (Ellis et al., 2003; Amato & Kane, 2011). As expected, individuals with more years of completed education delay first sex and marriage. Additionally, larger family size (more siblings) appears to speed up progression to first sex and marriage.

4. Discussion

The current study examines the role of intact family, kin, and non-kin care on the development of children's reproductive life history strategies, and aims to extend the existing literature on kinship fostering. We predicted that the presence of both genetic parents (i.e. growing up in an intact family) would result in the greatest buffer against accelerated development with respect to earlier first sex, and earlier age at first marriage. We then predicted that, of children fostered by carers other than genetic parents, reproductive life history development outcomes of those raised by kin as compared to raised by non-kin, would most closely resemble those raised by intact families. Again, this is based on the evolutionary principles of kin selection theory, as genetic kin relatives share genetic interests in the children's survival and reproduction, and thus their reproductive life history strategies.

In high-income countries where investment in embodied capital is important to be competitive in the labor and marriage markets, children surrounded by kin are expected to avoid early sexual and reproductive behavior (sex and marriage) more than those with less kin support. Additionally, early sexual debut is generally conceptualized as risky behavior due to its correlation with increased overall number of sexual partners and resultant higher risks of sexually transmitted infections and unintended pregnancies (Lenciauskiene & Zaborskis, 2008). Absence of kin networks during development may lead to greater participation in high-risk behaviors. Growing up in intact families has previously been found to shield children from a variety of risk behaviors, including premature sexual activity (Lenciauskiene & Zaborskis, 2008), and heavy alcohol and other drug use (Ledoux, Miller, Choquet, & Plant, 2002; Hemovich, Lac, & Crano, 2011). Further, growing up in intact families has been associated with better self-control (Phythian, Keane, & Krull, 2008), and fewer negative mental health outcomes (Garnefski & Diekstra, 1997; Kessler et al., 2010).

One potential mechanism that may contribute to delayed sex, at least for girls, is what is known as daughter-guarding (Flinn, 1988). Acquisition of embodied capital, promoted through reproductive delay, may lead to a greater ability to attract an investing mate, thus helping explain genetically related parents' delaying effects on sexual debut. Another potential mechanism may involve children indirectly (and, again, not necessarily consciously) assessing their social environment and regulating their reproductive life history strategy based on challenge and disruption (Nettle, 2010; Ellis, Boyce, Belsky, Bakermans-Kranenburg, & Van Ijzendoorn, 2011; Cameron & Garcia, 2013; Hochberg & Belsky, 2013); thus with diminishing parental and kin support, children may accelerate development of sexual and reproductive behavior to more quickly begin investment in their own reproductive fitness (Hill & Kaplan, 1999).

We found that children from intact families progressed more slowly to first sexual intercourse than those who lived with non-kin foster carers. Children from kin fostered families fall somewhere in between (statistically different from neither the intact family nor non-kin fostered groups). Likewise, children from intact families progressed significantly slower to marriage compared to children fostered with non-kin (who had earlier ages at first marriage), while kin fostered children progressed to first marriage at rates intermediate to children in intact families and non-kin fostered families. In this case, kin fostered females did progress significantly more quickly than those in intact families (though the effect was smaller than for non-kin fostered females). It is important to note that because births were likely to occur largely within marriage during the period of data collection in the United States (1938 to 1963), we cautiously interpret the progression to marriage outcome as a proxy for progression to the beginning of family formation. If this is the case, then those fostered by non-kin are also likely to begin family formation earlier than those fostered by kin and those from intact families. We are unable to test this directly in our dataset as detailed birth histories were not available.

In the current study, we compared the effects of kin and non-kin fostering directly to one another, rather than only to an intact family (or non-fostered) category. In only one case (men's progression to marriage) do we find that the effects of foster context are statistically significantly different from one another. Despite this, we see consistency in the directions of the associations: overall, we see that kin buffer children from participating in relatively earlier sexual (first sex) and reproductive (marriage) behaviors. These delays in sexual and reproductive behavior in kin compared to non-kin fostered children suggest a potentially greater emphasis on development of embodied capital by kin fosterers. One measure of embodied capital is education. In the original Kinsey survey, data are available as to whether each respondent completed an undergraduate degree; note that in their original formulation, Kinsey and colleagues felt level of education had substantive influences on sexuality (Kinsey et al., 1948, 1953). However, there were too few foster children (fostered by kin and non-kin) who completed an undergraduate degree to conduct formal regression analyses, so we are limited in our ability to test whether fostering context affects this form of embodied capital. We see that while 68% of male ($n = 3770$) and 72% of female ($n = 4336$) respondents from intact families had at least begun an undergraduate education, far fewer fostered children had done the same. This unusually high proportion of college attendance for those from intact families is partly due to the sampling methods of the data, which originally focused on university students. Among females, 26.0% ($n = 13$) of those fostered by kin and 19.4% ($n = 19$) fostered by non-kin had a college education. Among males, 21.3% ($n = 13$) of kin fostered and 23.9% ($n = 35$) fostered by non-kin are college educated. With these small sample sizes it is hard to interpret whether fostering context is affecting this measure of embodied capital, though the raw percentages may suggest that any kind of fostering reduces the probability of higher education.

Little of the previous literature takes into consideration the potential effects of other early life disruption (prior to moving to foster care) independent of the presence of kin or non-kin

(Cuddeback, 2004). Previous studies have found that early life disruptions are positively related to faster reproductive strategies (Chisholm, 1993; Nettle et al., 2011). Likewise, kin are known to impact total fertility and birth timings (Hank & Kreyenfeld, 2003; Sear & Coall, 2011; Waynforth, 2011). Our study somewhat teases these two concepts apart by controlling for two types of early life disruption: parental death and divorce. In order to further verify whether children fostered by kin are systematically different from those fostered by non-kin, we tested whether early disruption (death or divorce) predicted type of foster care (results not shown here, but available on request). Neither parental death nor divorce was significantly associated with foster situation. We find then that independent of other early life family disruption, the effects of genetic parents are more similar to those of kin fosterers than non-kin fosterers, as predicted by kin selection theory.

It is perhaps noteworthy that we do not find associations between familial disruption before age six and subsequent sexual and reproductive behaviors, as previous studies have demonstrated such relationships (Ellis et al., 2003; Amato & Kane, 2011). This may be explained by the fact that we have only investigated family disruption in early childhood. However, many studies of familial disruption have in fact found that disruption during early childhood is of primary importance (Donahue et al., 2011; Ermisch & Francesconi, 2012). Though this is not always the case (Ellis, McFadyen-Ketchum, Dodge, Pettit, & Bates, 1999; Alvergne et al., 2008)—some research has shown that the timing of disruptive events can have different effects on children's later outcomes. For example, Shenk and Scelza (2012) found that father absence in contemporary Bangalore had a stronger effect on various child outcomes if the father became absent during later childhood. Quinlan (2003), using data collected from U.S. women between 1973 and 1995, found that parental separation during early childhood (before age five years) was associated with earlier menarche, first sex, and first pregnancy, while parental separation during adolescence was associated with higher numbers of sex partners among female children. Another study found that father absence before age seven was associated with younger age at reproduction while father absence occurring during adolescence was associated with delayed voice-breaking among British males (Sheppard & Sear, 2012). Alternatively, it may be that context affects these relationships, and our data are derived from a historical context (early-mid 20th century U.S.) compared to most studies which have demonstrated that early disruption accelerates life history strategies.

4.1. Limitations and Future Directions

A primary limitation of our study is our lack of information on potential confounding factors associated with being in different types of fostering situations. We are not able to eliminate the possibility that our results are due to the systematic differences in the characteristics of kin and non-kin foster parents and fostered children. In recent years, the characteristics of kin fosterers appear to be less favorable than non-kin fosterers, which would not necessarily help to explain our results. Fostering by kin is associated with lower levels of acceptance by foster children's genetically related parents, which is in turn related to poor adjustment to fostering by children (Vanschoonlandt et al., 2012). Kin fosterers tend to be older, less educated, and more likely to be single compared to non-kin fosterers (Vanschoonlandt et al., 2012). Additionally, kin fosterers tend to receive more government financial support (interpreted as greater financial need), less parental training, and fewer opportunities for formal parenting support than non-kin foster parents (Cuddeback, 2004; Sakai et al., 2011). Alternatively, informal kin fostering may be the result of a strategic choice by a genetic parent (see Judge & Sanders, 2013 for an example from a low-income context). Until the 1980s the U.S. government favored formal foster placements with non-kin (Daly & Perry, 2011). The kin placements in our sample (which are the majority) are therefore likely to be informal arrangements. In this case, it is reasonable to assume that genetic parents may not only have consented to the fostering, but sought it out as a strategic choice. Genetically related parental consent in fostering situations is key in shaping children's acceptance of fostering and thus an important correlate with children's outcomes (Vanschoonlandt et al., 2012). In this case, a handpicked kin fosterer may actually present a better living situation for a child than the one offered by their genetic parents.

Kin-fostered children themselves may also represent a unique set of children compared to non-kin fostered individuals, with at least some recent evidence suggesting that kin-fostered children may be more similar to children from intact families than non-kin fostered children. Sakai et al. (2011) found that lower proportions of children in kin fostering have behavioral problems or have experienced physical abuse than children in non-kin fostering situations. Children fostered by kin are more likely to enter the foster situation due to parental substance abuse than non-kin fostered children who most often are placed in care due to parental mental health problems (Cuddeback, 2004).

Another limitation of our study is that we are unable to control for the degree of genetic relatedness between kin fostered children and their carers. For example, it is expected that more closely and more certainly related kin would behave more like genetic parents than less closely or certainly related kin (Euler & Weitzel, 1996). Along with relatedness to carers, the number of other dependents in a household is likely to affect the quality of care provided by parents (genetic or otherwise) (Lawson & Mace, 2011). With more children in a household, parental investments are expected to decrease. While we are able to control for respondents' number of siblings (genetic and co-resident surrogates), we do not have information on co-residence with the genetic siblings.

Due to these limitations and confounders we remain cautious about interpretation of such findings in terms of positive or negative child outcomes. The consequence of controlling for some of these confounding influences, were we to have the data, is not clearly positive or negative. For example, kin foster parents may be more disadvantaged financially and educationally than non-kin carers, but these placements may offer more stability for children and garner greater acceptance of genetic parents. These conflicting characteristics of kin care may either strengthen or weaken the effects we find here.

5. Conclusion

While policy makers' and non-evolutionary social scientists' assumptions regarding the benefits of kinship care are not inconsistent with evolutionary theory, they present only proximate explanations for the predicted patterns of investments. As Daly and Perry (2011) nicely state, their assumptions are based on "an intuition that the non-relative is providing a service to someone else, whereas the kin caretaker is somehow serving her own interests" (p 364). Evolutionary theory validates this intuition and unifies broad assumptions of policy makers by providing an ultimate level explanation for expected patterns of care. Our results support evolutionary predictions regarding the influence of kin on the development of reproductive strategies in high-income countries. We find that independent of childhood instability due to parental death or divorce, the presence of kin in early life results in sexual and reproductive behavioral trajectories more similar to those raised by genetic parents than by non-kin carers when considering progressions to first sex and marriage. Our study has improved upon some of the methodological weaknesses of previous studies, and demonstrated the intellectual benefit of an overarching theoretical framework within which to understand humans' behavioral responses to their environment.

Acknowledgments

The authors thank the European Research Council and the Economic and Social Research Council for funding that helped make this research possible. We would also like to thank Kristin Snopkowski, Cristina Moya, and Sandra Virgo for their helpful comments and suggestions. Finally, we are indebted to The Kinsey Institute, Thomas Albright, and the respondents of the original Kinsey survey.

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