CHILDLESSNESS PREDICTS HELPING OF NIECES AND NEPHEWS IN UNITED STATES, 1910

THOMAS V. POLLET* AND ROBIN I. M. DUNBAR†

Centre for Behaviour and Evolution, Newcastle University, UK and †Institute of Cognitive & Evolutionary Anthropology, University of Oxford, UK

Summary. The 'helpers at the nest' hypothesis suggests that individuals who are not currently reproducing often help kin by caretaking and thereby increase their inclusive fitness. Using a large scale historical dataset (Integrated Public Use Microdata Series sample of 1910; *n*=13,935), the hypothesis is tested that childless couples are more likely to fulfil such a role by taking care of a niece or nephew, but not a parent, than couples with children. Childless couples were significantly more likely to take care of a niece or nephew than couples with children. In contrast, couples with children and childless couples did not differ in caretaking of parents. Childless couples were also more likely to have more and younger nieces/nephews in their home than couples with children.

Introduction

Studies from behavioural ecology have shown that, in a wide variety of species, individuals of low current reproductive value often help a (related) breeding pair (for example: scrub jays: Woolfenden, 1975; striped mouse (*Rhabdomys pumilio*): Schradin & Pillay, 2004; for review: Emlen, 1984). In line with Hamilton's rule (1964), this helping behaviour is predicted to increase their inclusive fitness. In humans, similar effects appear to exist: kin often help by providing childcare (for example Turke, 1988, 1989; Sear & Mace, in press). For instance, maternal grandmothers, in traditional societies as well as in historical populations, provide help which has beneficial effects on their inclusive fitness (Hawkes *et al.*, 1997; Sear *et al.*, 2000, 2002, 2003; Voland & Beise, 2002; Beise, 2004; Lahdenperä *et al.*, 2004). Older siblings have also been thought to fulfil similar helper roles (Weisner & Gallimore, 1977; but see Crognier *et al.*, 2001; Bereczkei & Dunbar, 2002). Among the Toba of Argentina for instance, girl helpers were shown to significantly reduce the workload of the mother by helping and caretaking (Bove *et al.*, 2002; but see Hames & Draper, 2004). However, surprisingly little research has examined similar helping behaviour by childless individuals.

For modern societies, Essock-Vitale and McGuire (1985) have shown that childless women are more likely to give and receive help from kin. Childless women are also more likely to have had recent contact with their siblings and nieces/nephews than mothers (Pollet, 2005; Pollet *et al.*, 2006). Yet, no such difference between childless women and mothers was found in their relationships with uncles and aunts. This suggests that childless women might be taking reproductive value (i.e. the beneficiary's capacity to reproduce in the future, and thus contribute to the carer's fitness: Hughes, 1988) into account. Here, helping behaviour by childless couples in a historical population sample – American households from 1910 – is examined. Early in the twentieth century, the American population was declining and there was further migration towards the West of the United States (Hobbs & Stoops, 2002). Households were also becoming progressively smaller (Kobrin, 1976). Childlessness was rising, although there were considerable differences between regions (Morgan, 1991). Therefore, the American population in the early twentieth century is an interesting study population to test the consequences of childlessness on caretaking behaviour. No other studies have thoroughly investigated the possible effect of childlessness on caretaking decisions using a large demographic sample. The hypothesis tested here is that childless couples will be more likely to take care of nieces and nephews than couples with children. A possible alternative hypothesis is that childless couples would help any genetic relative, regardless of that relative's reproductive value, as they have more resources. In order to rule out this alternative, the role of childlessness for the frequency of caretaking of nieces and nephews will be compared with frequency of caretaking of parents (who, being older, will typically have lower reproductive value). In addition, resource availability is controlled for by coding the occupational prestige of the male household head and ownership of the dwelling. In addition, possible interaction effects on caretaking of nieces and nephews will be tested for: for example, couples should be more inclined to take care of a niece or nephew, if the spouse's age is high and the couple is childless.

Methods

The Integrated Public Use Microdata Series (IPUMS) sample of 1910 contains data on demographics and household composition (Ruggles *et al.*, 1997). It was a 1 in 250 random sample of the total population of the USA.

The presence of nieces/nephews or parents for two-headed households was analysed. Two-headed households form the large majority of the sample (>80%). In the sample, parents and nieces/nephews are defined as being related only to the *male* household head for two-headed households ($n=14,037$). For this sample, the presence of nieces and nephews related to the woman in a two-headed household is far less common (niece or nephew of spouse present <0·05% ($n=5$) vs niece or nephew from husband present 2·2% ($n=313$); Fisher's Exact test: $p=0·005$). Women who did not have any surviving (biological) children at the time of the survey were coded as 'childless'. Cases where the wife was coded as childless but the husband still had genetic children living with them were excluded (0·7%; final sample: 13,935).

Caretaking is measured as being part of the household at the time of the survey. Co-residence can be seen as a cost. Having a parent or a niece/nephew in one's

Table 1. Descriptive statistics of the variables (*n*=13,935, unless stated otherwise)

Variables	Categories	Frequencies/means
Childlessness	Has children	*n*=11,603
	Childless (no surviving children)	*n*=2332
Occupational status of male household head	(interval; ranges from 0 to 100)	25·82 (SD=22·21)
House ownership	Owns or being bought	*n*=6252
	Rents	*n*=7418
	Unknown	*n*=265
Urbanization	Urban	*n*=6493
	Rural	*n*=7442
Age of woman	(interval)	38·12 years (SD=12·71)
'Caretaking' (dependent)	No niece/nephew or parent in household	*n*=13,274
	Niece/nephew in household	*n*=294
	Parent in household	*n*=348
	Niece/nephew and parent in household	*n*=19
Number of nieces/nephews present	(interval; dependent; *n*=13,935)	0·03 (SD=0·22)
Mean age niece/nephew	(interval; dependent; *n*=309)	14·21 years (SD=8·16)
Mean age niece/nephew (≤18)	(interval; dependent; *n*=224)	10·36 years (SD=5·13)

household represents a (net) cost, not only in space but probably financially since this extra person has to eat. The IPUMS is a cross-sectional set on household composition, so no data are available on the length of stay with the family. All the parents staying with a couple were out of the labour force and thus did not provide a direct financial benefit. While the net cost of having a parent might differ from having a niece or nephew, in both cases having a relative in the household would produce a (net) cost. Therefore, in both cases temporarily having a relative in the household can be seen as 'helping'.

Besides ownership of the house, the occupational prestige of the male household head was scored in terms of the Duncan SEI score of 1950 (see Haug, 1977) to control for resource availability. In addition, the age of the woman and urbanization were controlled for (Table 1). Squared age of the woman was also tested. Additional information about the IPUMS set can be obtained from Ruggles *et al.* (1997).

As a first step, the role of childlessness for the presence of a niece or nephew or a parent was examined. Backward stepwise multinomial logistic regression (MLR) was used to obtain parameter estimates (Menard, 1995; Pampel, 2000), as this is a more cautious way of testing hypotheses than forward stepwise. For these logistic regression models, the likelihood ratio tests and Wald statistics for individual parameters are reported. Nineteen cases where both a parent and a niece/nephew were present were excluded from this analysis (fifteen couples with children and four without children) because this category is problematic for obtaining parameter

Table 2. Parameter estimates for variables in logistic regression model with reference category 'no parent or niece or nephew present'

		λ	SE	Wald	df	p_{Wald}	Exp(λ)	p_{LLR}
Niece/nephew present								
	Intercept	-7.88	0.7	128.58	1	<0.001		
Childlessness	Childless	1.3	0.13	102.5	1	<0.001	3.66	<0.001
Age woman	(increase by one year)	0.198	0.03	35.5	1	<0.001	1.22	<0.001
(Age woman)^2		-0.002	0.0003	29.65	1	<0.001	0.998	<0.001
Urbanization	Urban	-0.341	0.124	7.59	1	0.006	0.7	0.006
House ownership	Unknown	-0.01	0.47	0.001	1	0.98	0.99	<0.001
	Rents	0.16	0.13	1.48	1	0.24	1.12	
	Owns or being bought	0	—	—	0	—	—	
Parent present								
	Intercept	-4.24	0.66	41.1	1	<0.001		
Childlessness	Childless	0.19	0.14	0.33	1	0.188	1.21	<0.001
Age woman	(increase by one year)	0.11	0.04	8.8	1	0.003	1.11	<0.001
(Age woman)^2		-0.002	0.0005	16.37	1	<0.001	0.998	<0.001
Urbanization	Urban	-0.19	0.11	2.64	1	0.1	0.81	0.006
House ownership	Unknown	-0.03	0.34	0.01	1	0.936	1.02	<0.001
	Rents	-0.58	0.12	32.24	1	<0.001	0.56	
	Owns or being bought	0	—	—	0	—	—	

Note: parameter estimates are set to zero for reference category of ownership. This model contains the baseline effects only.

estimates in the MLR. In a second model, all possible interaction effects between independent variables were tested for.

Subsequently, backward stepwise linear regression models were constructed to determine whether childlessness independently affects both the number of nieces/nephews in the household and the mean age of nieces/nephews in the household. As for the MLR analysis, linear regression models in which all possible interaction effects were tested were consequently also tested.

Results

The descriptive statistics of the variables are presented in Table 1. A simple χ^2 test showed that childless couples are much more likely to have a niece or nephew present: 201 couples out of 11,603 couples with children had a niece/nephew versus 112 out of 2332 childless couples ($p=0.0001$). This remains the case if only the presence of nieces and nephews younger than 18 years is considered (χ^2 test; $p<0.0001$).

The MLR model had a Nagelkerke R^2 of 0.045 (-2LogLikelihood$=3665.06$; $\chi^2=222.53$; $p<0.0001$; Table 2). All proposed variables (age, age^2, childlessness, urbanization and house ownership), with the exception of occupational prestige of the male household, proved to be significant predictors (at $a=0.05$) of caretaking patterns.

Parameter estimates are best interpreted in terms of odds ratios ($\exp(\lambda)$). For couples with no surviving children the odds (niece/nephew in household versus no niece or nephew or parent in the household) were 3·66 times larger than for couples that did have children, even when controlling for other variables in the model (Table 2). However, childless couples were not significantly more likely than couples with children to have a parent in their household ($p_{Wald}=0·18$). By substituting the reference category of the dependent variable, whether childless couples are more likely to take care of a niece/nephew or of a parent can be examined. The odds for taking care of a niece/nephew versus a parent are 3·04 times larger for childless couples than for couples with children ($p_{Wald}<0·0001$; Table not shown).

The model with interaction effects showed an age × childlessness interaction effect and socioeconomic status × ownership on caretaking of a parent or a niece or nephew (Table 3). The model has a Nagelkerke R^2 of 0·048 (-2LogLikelihood$=$ 3647·43; $\chi^2=240·61$; $p<0·0001$; Table 3). This model shows that childless couples are more inclined to take care of a niece or nephew, instead of having neither a parent nor a niece or nephew in their household, if the spouse was older (odds ratio (childlessness × age of spouse): 1·03; $p_{Wald}=0·006$). The model also shows an interaction effect between house ownership and household head socioeconomic status on caretaking of nieces and nephews. Couples where the husband has a high socioeconomic status but who rented their house were less likely to take care of a niece or nephew than couples where the husband has a high socioeconomic status and who owned (or were buying) their house (odds ratio (household head SEI × rents): 0·989; $p_{Wald}=0·04$).

If the analysis is limited to the presence of younger niece(s) or nephew(s), i.e. with a mean age of 18 years or younger, similar results are found. The odds for having a niece or nephew versus neither having neither a niece or nephew nor a parent in the household are 4·02 larger for childless couples than for couples with children ($p_{Wald}<0·0001$; model with baseline effects only; table not shown). The model with interaction effects, limited to the presence of younger niece(s) or nephew(s), shows similar effects as those described above (table not shown).

Childless couples also have significantly more nieces and nephews in their household than couples with children (final model R^2: 0·009; Table 4). The model with interaction effects shows that childless couples where the spouse is older have more nieces and nephews in their household than childless couples where the spouse is younger (Table 5). Childless couples in rural areas were also more likely than childless couples in urban areas to have more nieces and nephews in their household.

Examining caretaking of nieces and nephews more closely, childless couples were found not to be significantly more likely to have younger nieces and nephews in their household than couples with children ($\beta=-0·08$; $t=-1·57$; $p=0·117$; table not shown). This conclusion was not altered for the model with interaction effects (Table not shown).

However, when examining caretaking of nieces/nephews with a mean age of 18 years or younger, childless couples are significantly more likely than parents to take care of younger nieces/nephews (final model $R^2=0·14$; Table 4). The model with interaction effects showed that childless women who were older were more inclined to take care of older rather than younger nieces and nephews (Table 5).

Table 3. Parameter estimates for variables in logistic regression model with reference category 'no parent or niece or nephew present'

Variables	Categories	λ	SE	Wald	df	p_{Wald}	$\text{Exp}(\lambda)$	p_{LLR}
Niece/nephew present								
	Intercept	−7·43	0·72	106·29	1	<0·001		
Childlessness	Childless	0·147	0·44	0·11	1	0·74	1·15	0·94
Age of woman	(increase by one year)	0·178	0·03	28·4	1	<0·001	1·2	<0·001
(Age of woman)^2		−0·002	0·0005	27·06	1	<0·001	0·998	<0·001
Urbanization	Urban	−0·34	0·13	6·73	1	0·01	0·72	0·006
Ownership	Unknown	−0·13	0·75	0·03	1	0·86	0·8	<0·001
	Rents	0·44	0·19	5·33	1	0·02	1·55	
	Owns or being bought	0	—	—	0	—	—	
Household head SEI	(increase by one unit)	0·006	0·004	2·26	1	0·13	1·006	na
Age of woman × childless	(increase by one unit)	0·03	0·01	7·45	1	0·006	1·03	0·024
Ownership × household head SEI	Unknown × SEI	0·003	0·017	0·029	1	0·87	1·003	0·047
	Rents × SEI	−0·01	0·005	4·06	1	0·04	0·989	
	Owns/being bought × SEI	0	—	—	0	—	—	
Parent present								
	Intercept	−4·04	0·7	33·57	1	<0·001		
Childlessness	Childless	−0·04	0·5	0·005	1	0·941	0·96	<0·001
Age of woman	(increase by one year)	0·1	0·04	7·61	1	<0·001	1·105	<0·001
(Age of woman)^2		−0·002	0·0005	14·36	1	<0·001	0·998	<0·001
Urbanization	Urban	−0·23	0·13	3·48	1	0·06	0·8	0·006
House ownership	Unknown	0·65	0·46	1·91	1	0·16	1·92	<0·001
	Rents	−0·73	0·18	16·43	1	<0·001	0·48	
	Owns or being bought	0	—	—	0	—	—	
Household head SEI	(increase by one unit)	0·001	0·003	0·04	1	0·85	1·001	na
Age woman × childless	(increase by one unit)	0·007	0·015	0·202	1	0·65	1·007	0·024
Ownership × household head SEI	Unknown × SEI	−0·03	0·02	2·23	1	0·14	0·97	0·047
	Rents × SEI	0·006	0·005	1·32	1	0·25	1·006	
	Owns/being bought × SEI	0	—	—	0	—	—	

Note: Parameter estimates are set to zero for reference category of ownership. This model includes interaction effects. The likelihood ratio test for household head SEI is not calculated as the degrees of freedom are set to 0 for this variable in this model.

Table 4. Models and parameter estimates for stepwise ordinary least squares regression models (final models, baseline effects only)

		R^2	β	t	p
Number of nieces/nephews					
Intercept		—	—	2·52	0·011
Childlessness	Childless	0·006	0·09	10·47	<0·001
Urbanization	Urban	0·001	−0·03	−4·02	<0·001
Age of woman	(increase by one SD)	0·0003	0·24	4·96	<0·001
(Age of woman)^2	(increase by one SD)	0·001	−0·22	−4·6	<0·001
Mean age of niece/nephew ($\leq$18)					
Intercept		—	—	0·142	0·84
Childlessness	Childless	0·021	−0·43	−3·51	0·001
Household head SEI	(increase by one SD)	0·058	0·21	3·34	0·001
Age of woman	(increase by one SD)	0·048	0·91	2·41	0·017
(Age of woman)^2	(increase by one SD)	0·014	0·82	−2·18	0·031

Table 5. Models and parameter estimates for ordinary least squares regression models (final models, with interaction effects)

		R^2	β	t	p
Number of nieces/nephews					
Intercept		—	—	−3·24	0·77
Childlessness	Childless	0·006	−0·08	−2·14	0·032
Urbanization	Urban	0·001	−0·02	−2·14	0·032
Age of woman	(increase by one SD)	0·001	0·11	2·1	0·036
(Age of woman)^2	(increase by one SD)	0·001	−0·11	2·07	0·039
Age × childless		0·001	0·62	4·68	<0·001
Age^2 × childless		0·001	−0·3	−4·14	<0·001
Urban × childless		0·001	−0·12	−4·00	<0·001
Mean age of niece/nephew ($\leq$18)					
Intercept		—	—	0·142	0·84
Childlessness	Childless	0·021	−0·43	−3·51	0·001
Household head SEI	(increase by one SD)	0·058	0·21	3·34	0·001
Age of woman	(increase by one SD)	0·048	0·91	2·41	0·017
(Age of woman)^2	(increase by one SD)	0·014	0·82	−2·18	0·031
Age^2 × childless		0·021	0·34	2·62	0·009

Discussion

In line with the hypothesis that individuals of low current reproductive value should generally be more inclined to help kin with high reproductive value, childless couples are indeed found to be significantly more likely to take care of a niece/nephew than

couples with children. It appears that these results cannot be explained by a simpler mechanism, namely helping any genetic relative. Additionally, it was found that if the couple was childless and the spouse was older, the couple was especially more likely to take care of a niece or nephew. The couple was also more likely to have more nieces and nephews present if they were childless and older. There was also an interaction effect between urbanization and childlessness on the number of nieces and nephews in the household. Childless couples in rural areas were more likely than childless couples from urban areas to have a niece or nephew in their household. This is in line with the idea that kinship obligations are typically stronger in rural areas than in urban areas (see Tönnies, 2002).

One of the limitations of the analyses is that there are no data available on the fitness consequences of household presence. Moreover, household composition is a rather crude measure of caretaking and no data are available on how long nieces/nephews or parents remained in a given household. Yet, it is likely that in many cases nieces/nephews as well as parents were permanent members of the household who received help from the couple they were staying with. There are also no data available on whether nieces and nephews provide a benefit in terms of labour in the household. However, childless couples were significantly more likely than couples with children to have younger nieces and nephews in their household, and these are less likely to provide such a benefit. It was also not possible to determine whether childless couples were more likely than couples to take the parent of the niece or nephew – their sibling – in their household. Possibly further confounding variables, such as the overall number of siblings or birth order (for example: Pollet & Nettle, 2007), might influence caretaking patterns of nieces and nephews. Unfortunately, these historical data on household composition do not allow these variables to be controlled for. Yet, it is unlikely that these variables would fully explain how childlessness influences (relative) caretaking patterns of individuals with high reproductive value.

The Nagelkerke R^2 of the model for presence of nieces/nephews or parents is low, indicating that a large amount of variance is unaccounted for. Nonetheless, there is a strong and significant difference between childless couples and couples with children in caretaking of nieces/nephews (odds ratio: 3·6), while controlling for other variables. Childless couples were also more likely to have both more and younger nieces/nephews in their home than couples with children. These findings are consistent with kin selection theory, namely, individuals of low *current* reproductive value, such as childless individuals, should be more inclined to help related individuals with high reproductive value, all else being equal. In line with Essock-Vitale & McGuire (1985) and Pollet *et al.* (2006), significant differences between childless individuals and individuals with children in patterns of caretaking of kin with high reproductive value were found. However, further research is necessary to investigate if these differentials in caretaking, between childless individuals and individuals with children, have measurable effects on an individual's inclusive fitness.

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