Child homicides by stepfathers: A replication and reassessment of the British evidence

Gavin Nobes and Georgia Panagiotaki

University of East Anglia

Kenisha Russell Jonsson

University of Essex

Author note

Gavin Nobes, School of Psychology, University of East Anglia; Georgia Panagiotaki, Norwich Medical School, University of East Anglia; Kenisha Russell Jonsson, Department of Sociology, University of Essex.

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Correspondence concerning this article should be addressed to Gavin Nobes, School of Psychology, University of East Anglia, Norwich Research Park, Norwich, NR4 7TJ, UK.

Email: g.nobes@uea.ac.uk

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Abstract

Daly and Wilson report that rates of fatal assaults of young children by stepfathers are over 100 times those by genetic fathers, and they explain the difference in evolutionary terms. Their study was replicated using updated homicide data, and population data from three surveys. The risk to young stepchildren was approximately 16 times that to genetic children, and stepfathers were twice as likely to kill by beating. However, when father's age was controlled for, the risk from cohabiting fathers was approximately six times. Above 4 years, stepchildren were at no greater risk than genetic children. Children are at risk from fathers primarily when both are young and they do not live together; stepfathers' apparent overrepresentation results largely from their relative youth, and from many non-residential perpetrators being labelled stepfathers. Other factors are also influential, but if these include stepparenthood, its impact is considerably less than previous researchers have claimed.

Keywords: Stepfather; child homicide; evolutionary psychology; genetic relatedness; child maltreatment

Child homicides by stepfathers: A replication and reassessment of the British evidence

In a population of 55.7 million in England and Wales, which includes 12.25 million children (Office for National Statistics, 2012, 2013), approximately 20 child homicides by fathers are recorded each year. If the incidence of this tragic phenomenon is to be reduced, it is vitally important to investigate and hence improve our understanding of its causes. Moreover, because this most extreme form of maltreatment often results from the same or similar factors that help explain non-fatal forms of abuse, research in this area can shed light on the causes of child abuse in general. A particular advantage of researching homicide is that, as child deaths are almost always detected, and suspicious cases always investigated, there can be little doubt that child homicide data – though by no means flawless – are considerably more accurate and less biased than most maltreatment data. For example, child injuries are disproportionately reported as resulting from abuse when children have low-income, ethnic minority and lone parents (e.g., Hampton & Newberger, 1985; Krase, 2015), and such disparities are unlikely to occur to the same extent in the homicide data. But there remains considerable debate among researchers concerning the etiology of child homicide.

Evolutionary psychologists' explanations of violence to stepchildren, including homicide, focus on the lack of genetic relatedness between parent and child (Archer, 2013; Buss, 2014; Daly & Wilson, 1994, 1998, 2005, 2008; Harris, Hilton, Rice, & Eke, 2007; Pinker, 1997; Weekes-Shackelford & Shackelford, 2004). They contend that, because altruism towards stepchildren does not contribute to their inclusive fitness (Hamilton, 1964), stepparents tend to be less warm and caring, and hence more prone to frustration and irritation in their interactions with their stepchildren. A number of hypotheses arise from this theory of *discriminative parental solicitude* (Daly & Wilson, 1980, 2008), primarily that rates of abuse and filicide by stepparents will be higher than those by genetic parents.

Daly and Wilson (1985, 1994) have been key proponents of this approach and have conducted several studies that appear to strongly support their claims. These include analyses of national-level homicide data in Canada and Britain (1994). They report that:

> … in several countries, stepparents beat very young children to death at per capita rates more than 100 times higher than do genetic parents… In England and Wales, for example, 117 children under 5 years of age were beaten to death by putative genetic fathers and 103 by stepfathers in 1977–1990 (Daly & Wilson, 1994); as in Canada, fewer than 1% of age-matched British children dwelt with stepfathers and over 90% with putative genetic fathers, and so, as in Canada, the difference in per capita rates of such fatal assaults is well over 100-fold. (Daly & Wilson, 2008, p. 385)

On these grounds they claim that "Having a stepparent has turned out to be the single most powerful predictor of severe child maltreatment yet discovered" (Daly & Wilson, 1998, p. 441), a view echoed by, for example, Pinker (1997) and Buss (2014).

Daly and Wilson (1994) and recent replications. Daly and Wilson (1994) analyzed data from the Homicide Index, which is the official record of all homicides recorded by the police in England and Wales. These indicated that between 1977 and 1990 there were 247 children below 5 years who were killed by their genetic fathers, and 131 by stepfathers, a ratio of 1.89:1.

To calculate the relative risk to children from their genetic and stepfathers, this ratio must be compared with the proportions of these two father types[1] in the general population. Daly and Wilson referred to Clarke's (1992) analyses of the British General Household Surveys, according to which in 1985 84% of 0-4 year-olds lived with both natural parents,

[1] 'Father' refers here to genetic and step fathers only, regardless of marital status. 'Stepfather' is used as in the studies and datasets discussed, despite its sometimes referring to non-cohabiting casual partners of genetic mothers. A 'child' is either a genetic or a step child.

and 5% with their natural mother and stepfather, a ratio of 16.8:1. If correct, Daly and Wilson's ratio of 1.89 indicates an 'increased risk' (Archer, 2013) odds ratio (OR) to stepchildren relative to genetic children of 8.89 (16.8/1.89).

Daly and Wilson (1994) conducted a similar study of homicides in Canada of children. Between 1974 and 1990 there were 178 children aged between 0 and 4 killed by genetic fathers, and 67 by stepfathers, a ratio of 2.66:1. According to Daly and Wilson, 91% of children of these ages lived with their genetic fathers, and fewer than 0.6% with their stepfathers. This equates to an increased risk of at least 57.09.

More recently, Harris et al. (2007) used a Canadian police database to analyze homicides of children below 12 years of age between 1996 and 2002. They report that the perpetrators included 86 genetic fathers and 62 stepfathers, and that "Canadian children were at least 10 times as likely to live with genetic parents as with stepparents" (p. 90). This indicates an increased risk of at least 7.21. Of the children aged below 5 years, 51 were killed by their genetic fathers, and 53 by their stepfathers, an increased risk of at least 10.39.

Weekes-Shackelford and Shackelford (2004) also replicated Daly and Wilson's (1994) filicide studies using the equivalent, but much larger, US national-level database of Supplementary Homicide Reports (SHR; Fox, 1996) collected by the FBI. Between 1976 and 1994 there were 1741 cases of genetic fathers and 309 of stepfathers who killed their children below the age of 5 years. Comparisons of these figures with population estimates of genetic and stepfathers from the Survey of Income and Program Participation (SIPP; U.S. Census Bureau, 1996) indicated filicide rates of 60.0 per million children by stepfathers, and 7.0 per million children by genetic fathers, an increased risk of 8.57.

Methods of perpetration. Daly and Wilson (1994) reported that British stepfathers were much more likely than genetic fathers to have 'beaten' (hit or kicked) their young[2] children to

[2] Following Daly and Wilson (1994) and Weekes-Shackelford and Shackelford (2004), 'young' refers to children below the age of 5 years.

death (78.6% vs. 48.0%), as opposed to, for example, suffocated or strangled them, or used a sharp or blunt instrument. Assuming an overall increased risk of 8.89, this represents an increased risk of beating to death by stepfathers of at least 14.56.

Regarding child homicides in Canada, Daly and Wilson (1994) reported that, among perpetrators, 82.1% of the stepfathers and 41.8% of the genetic fathers had beaten their children to death. Assuming that stepfathers were 57 times more likely to kill their children by all methods, this indicates an increased risk of fatal beating of 112.13. Both in Britain and Canada, higher proportions of genetic fathers than of stepfathers killed their children by suffocation or strangulation.

Weekes-Shackelford and Shackelford (2004) too found that higher proportions of stepfathers and genetic fathers in the US beat their children to death (93.2% vs. 79.9%). Assuming an increased risk of 8.57, this translates to stepfathers being exactly 10 times as likely as genetic fathers to beat their children to death. However, there were no substantive differences in their rates of suffocating or strangling.

Harris et al. (2007) reported a 'beating death score' and came to a similar conclusion: Stepfathers were twice as likely as genetic fathers to have used their own body to cause the death (*M*s = 1.3 vs. 0.59). This indicates an increased risk to 0-11 year-olds of being beaten to death of 15.86, and to children aged less than 5 years, 22.89. In contrast, stepfathers were less likely to have used a weapon or instrument (39% vs. 69%).

Daly and Wilson (1994) interpret these differences as indicating that stepfathers kill children "in different ways, and for different reasons" (p. 216), namely from hostility and rage towards the children. In contrast, and consistent with discriminative parental solicitude, they suggest that genetic fathers tend to kill their children relatively quickly and painlessly, indicating a lack of antipathy towards their victims. Archer (2013) agrees: "Killings by stepparents are much more likely to involve actions indicating hostile (rather than instrumental) aggression than are killings by two genetic parents" (p. 410), as do Harris et al.

(2007), according to whom "anger, rage, ongoing abuse, and death by beating…– rather than quicker and more intentional means of causing death (e.g., weapon, drowning, and poison…) – characterized filicides by stepparents." (pp. 91-92). This explanation is supported by Harris et al.'s finding that stepfathers' 'anger/rage score' ("the number of distinct terms reflecting a perpetrator's anger (revenge, anger, and rage) that was noted by investigators as a motive", p. 90) was higher than genetic fathers' (*M*s = 0.85 vs. 0.58).

Problems with the data. The British, American and Harris et al.'s (2007) Canadian estimates of increased risk are similar (8.89, 8.57 and 7.21, respectively). However, they contrast substantially with that of Daly and Wilson's (1994) earlier Canadian estimate of 57.09. This discrepancy does not arise from the roughly comparable ratios of homicides perpetrated by genetic and stepfathers (1.89:1 in Britain, 5.63:1 in the US, and in Canada 1.39:1 according to Harris et al. and 2.66:1 according to Daly and Wilson). Rather, their much higher Canadian figure results from their estimate of the proportions of stepfathers of 0-4 year-olds in the population (0.6%) being lower than the estimates of 5% in Britain, approximately 2% in the US, and Harris et al.'s maximum of 10% in Canada.

To some extent these differences in population estimates might reflect variations between countries and over time. In addition, Harris et al. included older children (0-11 years) than did Daly and Wilson or Weekes-Shackelford and Shackelford (both 0-4 years), and, because children are increasingly likely to have stepparents as they grow older, it is to be expected that the relevant population estimate for Harris et al. would be greater than Daly and Wilson's.

However, there are a number of problems with these population statistics. As Daly and Wilson (1994) point out, Clarke's (1992) estimate of 5% of young British children living with a stepfather is probably a substantial overestimate because it includes genetic fathers who married the mother after the child was born. Though their justification for doing so is unclear, Daly and Wilson (2008) revised this estimate to "fewer than 1%", in which case the

estimate of increased risk to young stepchildren rises to at least 52.38, and, specifically concerning beating, to at least 86.64.

According to Daly and Wilson (2008), there is a similar problem with the SHR data used by Weekes-Shackelford and Shackelford. While genetic fathers were defined as such regardless of marital status, stepfathers were only included if they were married to the victim's mother. This indicates that these researchers also underestimated the increased risk to stepchildren.

However, another (previously unrecognized) problem with all four studies suggests that increased risk might have been *over*estimated. The estimated proportions of genetic fathers and stepfathers in the population data are from household surveys, and so include only those fathers who lived in the same household as the children. In contrast, the perpetrator data includes both cohabiting and non-cohabiting fathers. Unfortunately, none of the homicide studies nor the population surveys reviewed here reported the proportions of stepfathers who did, and who did not, live with the children. But the true proportions of children with stepfathers (cohabiting and non-cohabiting) must be higher than the population data (cohabiting only) indicate, and therefore the actual increased risk from stepfathers must be correspondingly lower.

Underlying this issue is the fundamental problem of the definition of 'stepfather': while it might be assumed that this term refers to someone who lives with and has a meaningful relationship with their stepchild, in the homicide data this is not always the case. As we explain below, so-called stepfathers are sometimes defined in terms of their relationships with the victims' mothers rather than with the victims themselves. That is, some of the perpetrators who are classified as 'stepfathers' in the homicide data might only have had short-term, casual relationships with the mothers, and might hardly have known their victims at all. As with non-cohabiting perpetrators, such individuals would not be recorded as

stepfathers in the population surveys. For this reason, too, comparisons of the homicide and population data must give rise to overestimates of the increased risk to stepchildren.

Possible confounding variables. Daly and Wilson (1994) point out that "the fact that differential risk was both predicted and confirmed does not prove that it is a consequence of the hypothesized differences in solicitude. It might instead be an artifact of some correlate (or "confound") of stepparental relationships" (p. 208). For example, if it were the case that stepfathers tend to have lower incomes than genetic fathers, and that fathers with lower incomes are more prone to abuse their children, then to the same extent stepfathers would be overrepresented in the abuse figures owing to their relative poverty, rather than to their lack of genetic relatedness to their children. Daly and Wilson (1994) did not analyze the homicide data to investigate this possibility. However, they dismiss it on the grounds that "all such hypotheses have failed" (p. 208).

Despite their extensive output on this issue over three decades, Daly and Wilson tested for only three possible confounding variables, in only one study (1985). First, they reported similar proportions of stepfamilies living in low- and high-income districts, which suggested no great disparity in wealth, and hence that much increased risk from stepparents is unlikely to occur for socioeconomic reasons. Second, they found that average family size was no different in stepfamilies and genetic families. And third, they reported that mothers' relative youth in stepfamilies accounted for only 13% of the increased risk to stepchildren.

Similarly, Weekes-Shackelford and Shackelford (2004) did not control for any potentially confounding variables. Neither did Harris et al. (2007), despite the fact that genetic fathers in their Canadian dataset were on average 7 years older than stepfathers (*M*s = 34 vs. 27 years), their victims were also older (*M*s = 49 vs. 33 months), and they were less likely to have a criminal history (3.7 vs. 13.4 on the Cormier-Lang scale of frequency and severity of criminal conduct).

Daly and Wilson (1994) reported on victims below the age of 5. Weekes-Shackelford and Shackelford (2004) and Harris et al. (2007) also limited their analyses to children aged below 5 and 12 years, respectively. Because, of course, genetic relatedness does not vary with age, if the evolutionary psychologists are correct about young stepchildren being at increased risk, so should older children. Daly and Wilson (1994, 1999) explained that they focused on young children because "these cases clearly cannot be construed as matters of mutual combat or self-defense." (p. 208). Since killings of older children *could* be construed in these ways, the implication is that the increased risk to older stepchildren should be even *greater* than to younger stepchildren. However, this prediction remains to be tested.

There are also other possible confounding variables, such as the father's history of abuse as a child, his education and mental health, and the quality of his relationship with the mother. In addition, some mothers with, for example, mental health problems, might be more likely both to separate from their children's genetic fathers and to form new relationships with violent men. These and other factors have been found to be associated with both child abuse and stepparenthood (Berger, Paxson, & Waldfogel, 2009; Giles-Sims & Finkelhor, 1984; Malvaso, Delfabbro, Proeve, & Nobes, 2015; Nobes, Panagiotaki, & Malvaso, 2018; Temrin, Nordlund, Rying, & Tullberg, 2011), and to at least partially explain the disparities between risks to genetic and step children.

Hypotheses. The first three hypotheses stemmed directly from the selectionist theory and empirical findings discussed above. Support for them would further substantiate the discriminative parental solicitude account of child homicide by stepparents:

1. The risk of young children being killed by their stepfathers is substantially greater than that of being killed by their genetic fathers
2. Stepfathers predominantly beat their children to death, whereas genetic fathers more often use other methods such as strangulation and suffocation

3. The substantially increased risks both of being killed, and specifically of being fatally beaten, applies also to older stepchildren

The fourth and fifth hypothesis stemmed from the untested proposals that stepfathers' overrepresentation in the homicide data might to some extent result from previous studies' failure to take account of a) fathers' residential status (cohabiting or not cohabiting with the child), and b) confounding variables. Owing to limitations of the homicide data, we were able to consider only father's age as such a variable:

4. Estimates of the increased risk to stepchildren are reduced when only cohabiting fathers are considered
5. Estimates of the increased risk to stepchildren are reduced when father's age is controlled for

Support for these two hypotheses would challenge the extent to which stepparenthood per se, and hence the discriminative parental solicitude account, explains child homicide by stepparents.

Methods

Daly and Wilson's (1994) study of child homicides by fathers in Britain was replicated using updated (2000-2015) data from the same source, the Home Office's Homicide Index. Following Daly and Wilson, we calculated the increased risk to stepchildren by comparing the relative proportions of genetic and step fathers in the homicide data with those in the population, and their methods of perpetration. Unlike previous researchers, we were able to make accurate estimates by using data from three surveys of family composition in the general population: ALSPAC (Golding & ALSPAC Study Team, 2017), The Millennium Cohort Study (Centre for Longitudinal Studies, 2017), and Understanding Society (Institute for Social and Economic Research, 2016)[3].

[3] See Supplementary Material for information on the Homicide Index and the population surveys.

These population data also enabled us for the first time to investigate how the posited increased risk to stepchildren, and the use of different methods by stepfathers and genetic fathers, changed with the children's age from birth to 17 years. Also for the first time, we explored the influence of father's residential status and age on increased risk to stepchildren.

Throughout the analyses, when considering the population data, we use the term 'stepfather' as it is used in the population surveys. Mothers and, in the Millennium Cohort Study, resident father-figures, described the relationship between the cohabiting father-figure and the study child; mothers' non-cohabiting or casual partners were therefore not recorded as stepfathers.

When considering the homicide data in the initial stage of analysis, we use the term as in the Homicide Index, that is, as recorded by reporting police officers. This included non-cohabitees, and, in the absence of a more appropriate classification (see Supplementary Material), is likely also to have included mothers' short-term and casual partners who hardly knew their victims. The definition of 'stepfather' therefore differs markedly between datasets.

In subsequent stages of analysis the definition of stepfather was more closely aligned across datasets – and, indeed, with common usage of the term – by including only cohabiting perpetrators. However, even these probably included some mothers' casual partners who would not have been recorded as stepfathers in the population surveys.

Analysis

Stage 1 of the analysis examined the extent to which children were at increased risk from stepfathers compared with genetic fathers when the children were aged 0-4 years (Hypothesis 1) and older (Hypothesis 3). First, data from the three population surveys were compared to derive estimates of the ratios of children in the population who lived with their genetic fathers to those who lived with their stepfathers, by child age. Next, data from the Homicide Index were used to calculate the ratios of children killed by their genetic fathers to those killed by their stepfathers, by child age. Increased risk at each of three age-groups (0-4,

5-9, and 10-17 years) was then calculated by comparing these ratios: higher ratios of stepfathers to genetic fathers in the homicide data than in the population data indicated increased risk.

As the Homicide Index data include both cohabiting and non-cohabiting 'stepfathers', and the population data includes only cohabitees and no information on mothers' non-cohabiting partners, the only way to compare like with like, i.e., to more closely align definitions of 'stepfather' across the homicide and population data (and with common usage of the term), was to include only cohabiting perpetrators. Stage 2 of the analysis therefore tested Hypothesis 4 – that increased risk would be reduced when only cohabiting fathers were considered – by repeating stage 1, except that only the co-habiting stepfathers in the Homicide Index were included.

Stage 3 of the analysis tested Hypothesis 5, that increased risk to stepchildren results in part from stepfathers being younger than genetic fathers. Father's age was dichotomized (younger or older than the perpetrators' median age within each child age-group) and included in logistic regressions with father type (genetic or step father) to test the independent effect of each of these factors, first with all fathers included, and second with only cohabiting fathers, by child age-group.

Stage 4 tested Hypothesis 2, that stepfather perpetrators tended to beat their children to death, whereas genetic fathers more often used other methods, such as strangulation. The Homicide Index was examined for methods used to kill children aged 0-4 years and 5-17 years, by father type, with a particular focus on beating and shaking.

Results

Population data. Figure 1 shows the percentages of children in 2-parent families with stepfathers, according to the three surveys. It indicates general consistency in their data, especially during middle childhood. The mean percentage of children with stepfathers at 0-4

years was 1.77%, at 5-9 years 6.37%, at 10-17 years 12.46%, and across all ages (0-17 years) 7.96%.

Figure 1 also indicates that the increase in proportions of stepfathers in the population is largely linear. Between the ages of 2.5 and 13 years it increases at almost exactly 1% per year. This linearity allowed us to interpolate values within and between surveys with some confidence.

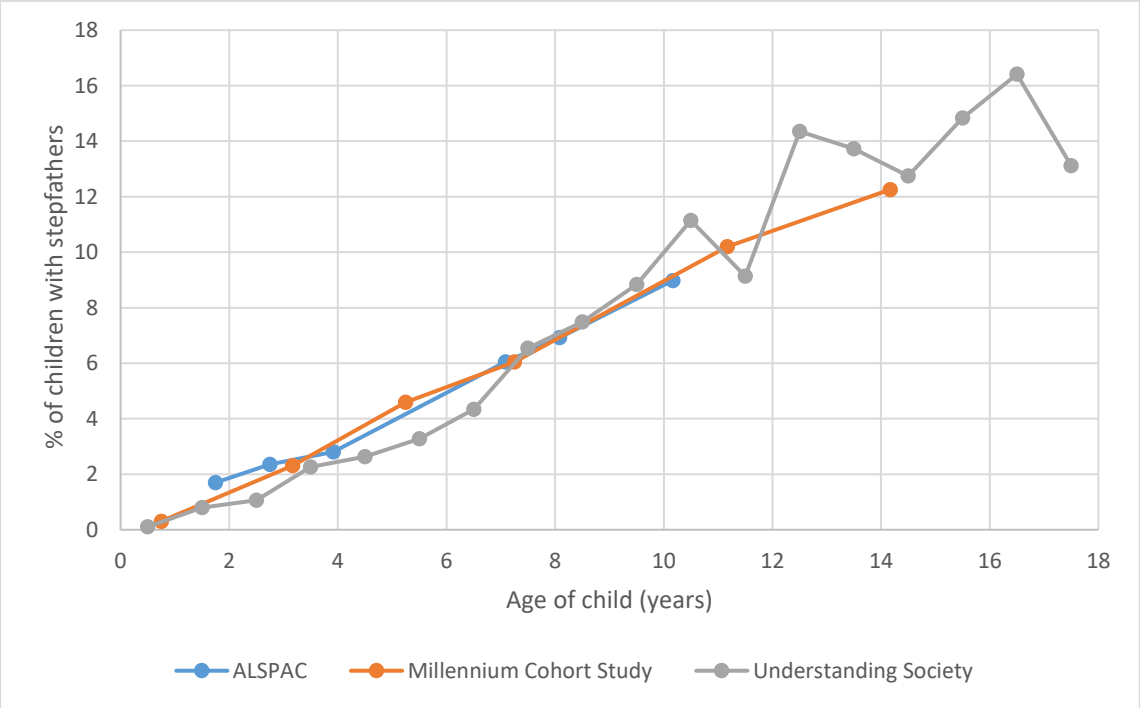

Figure 1. Percentages of children in 2-parent families who lived with their stepfathers in the population by child age reported by ALSPAC, Millennium Cohort Study, and Understanding Society.

Homicide data. According to the available information in the Homicide Index, 325 children were killed by their fathers in England and Wales between 2000 and 2015. Genetic fathers were the principal perpetrators in 256 cases, and stepfathers in 69, a ratio of 3.71:1[4]. A slightly higher proportion of the genetic fathers than of the stepfathers were employed

[4] In addition, two 1-year-olds were victims of their adoptive fathers.

(49.52% vs. 41.67%), but self-reported ethnicity was similar (82.05% vs. 80.77% white; 6.83% vs. 3.85% Asian; 6.83% vs. 15.38% Black).

Among victims below the age of 5 years, 176 were killed by genetic fathers, and 50 by stepfathers (3.52:1). When children were aged 5-9 and 10-17 years the ratios were 8.00:1 and 2.46:1, respectively.

Figure 2 shows the numbers of victims of genetic fathers and stepfathers, by child age. During children's first year, 111 were killed by genetic fathers and 11 by stepfathers. In contrast, 21 of the 43 1-year-olds were victims of their stepfathers.

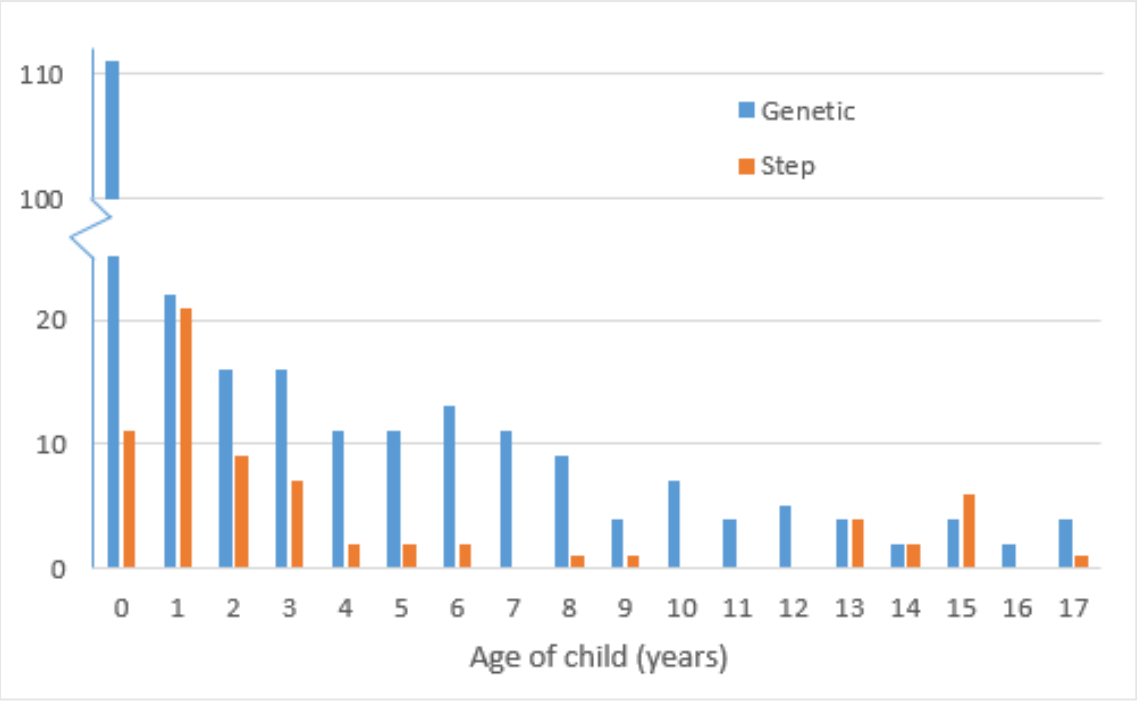

Figure 2. Frequencies of child victims of genetic fathers and stepfathers, by child age.

Increased risk to stepchildren. These frequencies were translated into estimates of increased risk (odds ratios) by comparing the ratios of children with genetic and step fathers in the Homicide Index with those in the population data. Among children aged 0-4 years the increased risk to stepchildren was 15.74, that is, the odds of being killed by a stepfather rather than a genetic father were almost 16 times the odds of living with a stepfather rather than a

genetic father. In contrast, the increased risk to stepchildren at 5-9 years was 1.60, at 10-17 years 2.85, and across all ages (0-17 years) 4.27.

Increased risk to cohabiting stepchildren. When only those father-child dyads in the Homicide Index who lived together were considered (so that 'stepfathers' in the homicide data and population data – which only included cohabitees – were more similarly defined), the increased risk of stepfathers to 0-4 year-olds was 11.08, to 5-9 year-olds 1.05, and to 10-17 year-olds 1.41. Across all ages, this represents an increased risk to stepchildren of 2.05, that is, the risk from fathers to stepchildren was approximately twice that to genetic children.

Father's age. The population data show that stepfathers are younger than genetic fathers, and the homicide data that filicidal fathers were younger than other fathers (Table 1). Filicidal stepfathers were particularly young, and the difference between genetic and stepfathers was greatest among fathers who did not live with the children.

Table 1

Fathers' mean age (years) in the population and among child homicide perpetrators, by father type, residential status, and child age (years)

		Population[a]		Perpetrators					
	Child age	Fathers' mean age		Fathers' mean age (*n*)		Age difference	*t*	*df*	*p (2-tailed)*
		Genetic	Step	Genetic	Step	(Gen – step)			
Live together	0-4	35.5	31.7	29.0 (55)	24.6 (11)	4.4	1.70	64	.09
	5-17	43.3	39.3	45.0 (24)	35.7 (3)	9.4	2.57	25	.07
	0-17	38.4	35.0	33.9 (79)	27.0 (14)	6.9	3.29	91	.003
Live apart	0-4	NK	NK	32.8 (38)	23.6 (11)	9.2	4.71	47	<.001
	5-17	NK	NK	46.8 (15)	38.0 (2)	8.8	1.84	15	.09
	0-17	NK	NK	36.8 (53)	25.8 (13)	11.0	4.70	64	<.001

Note: [a]Population data from Understanding Society (Institute for Social and Economic Research, 2016). Genetic fathers *n* = 13388; stepfathers *n* = 1092. NK = not known

Table 2

Logistic regression: Father type (step vs. genetic) and father age (< vs. > step median) as predictors of filicide, by child age-group

2a. All father-child dyads (cohabiting, non-cohabiting and unknown)

	0-4 years (*n* = 226)				5-17 years (*n* = 99)				0-17 years (*n* = 325)			
	Unadjusted		Adjusted		Unadjusted		Adjusted		Unadjusted		Adjusted	
	OR	95% CI	*OR*	95% CI	*OR*	95% CI	*OR*	95% CI	*OR*	95% CI	*OR*	95% CI
Father type	16.08**	[11.47, 22.54]	9.69**	[6.72, 13.98]	1.90*	[1.15, 3.14]	1.79*	[1.05, 3.06]	4.45**	[3.39, 5.83]	2.93**	[2.18, 3.94]
Father age	7.75**	[5.83, 10.31]	5.39**	[3.96, 7.33]	1.44	[0.85, 2.44]	1.20	[0.69, 2.10]	4.09**	[3.20, 5.23]	3.03**	[2.32, 3.96]

2b. Cohabiting father-child dyads only

	0-4 years (*n* = 66)				5-17 years (*n* = 27)				0-17 years (*n* = 93)			
	Unadjusted		Adjusted		Unadjusted		Adjusted		Unadjusted		Adjusted	
	OR	95% CI	*OR*	95% CI	*OR*	95% CI	*OR*	95% CI	*OR*	95% CI	*OR*	95% CI
Father type	11.32**	[5.85, 21.88]	5.82**	[2.88, 11.76]	1.00	[0.30, 3.32]	1.04	[0.30, 3.64]	2.92**	[1.65, 5.17]	1.71†	[0.92, 3.15]
Father age	9.52**	[5.76, 15.72]	7.48**	[4.41, 12.70]	0.82	[.26, 2.89]	0.87	[0.25, 3.00]	4.46**	[2.86, 6.97]	3.93**	[2.44, 6.33]

Note. *OR* = odds ratio; CI = confidence intervals. † $p < .10$, * $p < .05$; ** $p < .001$ (all 2-tailed). The 5-9 years and 10-17 years age-groups were collapsed owing to low numbers of filicides above 4 years.

The odds ratios of father type and father age as predictors of filicide are shown in Table 2. This analysis used the frequencies of younger and older genetic and step fathers of younger and older children among perpetrators (from the Homicide Index) and among the general population (from the Millennium Cohort Study). Father age was dichotomized to below or above the stepfather perpetrators' median ages, i.e., 24, 29 and 37 years among fathers of 0-4, 5-9 and 10-17 year-olds, respectively.

The unadjusted odds ratios for cohabiting fathers (Table 2b) indicate that, across all child ages, the risk to children from stepfathers was three times (*OR* = 2.93) the risk from genetic fathers (the ratio of genetic to step fathers in the population was 16.50:1, and among perpetrators 5.64:1). In addition, the risk to children from younger fathers was more than four-fold (*OR* = 4.46) that from older fathers (older fathers outnumbered younger fathers by 10.36:1 in the population, and by 2.32:1 among perpetrators). Because the ratios of older to younger fathers was higher among genetic fathers (13.06:1 in the population; 2.95:1 among perpetrators) than among stepfathers (1.73:1 in the population; 0.75:1 – i.e., there were more younger than older stepfathers – among the perpetrators), the marginally significant adjusted *OR* of 1.71 indicates an increased risk to stepchildren of less than 2 when father's age was controlled for.

The risk to younger children from cohabiting stepfathers was more than 11 times (*OR* = 11.32) the risk from genetic fathers (ratios of 56.59:1 in the population and 5.00:1 among perpetrators), and from younger fathers almost 10 times (*OR* = 9.52) the risk from older fathers (ratios of 15.61:1 in the population and 1.64:1 among perpetrators). Since genetic fathers were more likely to be older (16.64:1 in the population; 2.06:1 among perpetrators) than were stepfathers (2.85:1 in the population; 0.57:1 among perpetrators), father's youth accounted for much of the increased risk to young stepchildren: when father's age was controlled for the risk to young stepchildren was approximately six times (adjusted OR = 5.82) the risk to young genetic children.

Methods of perpetration. When fathers killed their young children, stepfathers were more than twice as likely to do so by beating, hitting or kicking than were genetic fathers, $\chi^2(1) = 6.93$, $p = .008$ (Figure 3). They also used blunt instruments more often, $\chi^2(1) = 4.07$, $p = .04$. However, stepfathers were (non-significantly) *less* likely than genetic fathers to have shaken their young victims to death, such that, when shaking was included in beating, the difference between stepfathers and genetic fathers was no longer significant, 55.56% vs. 40.91%, $\chi^2(1) = 2.46$, $p = 0.12$. There were no other significant differences between father types.

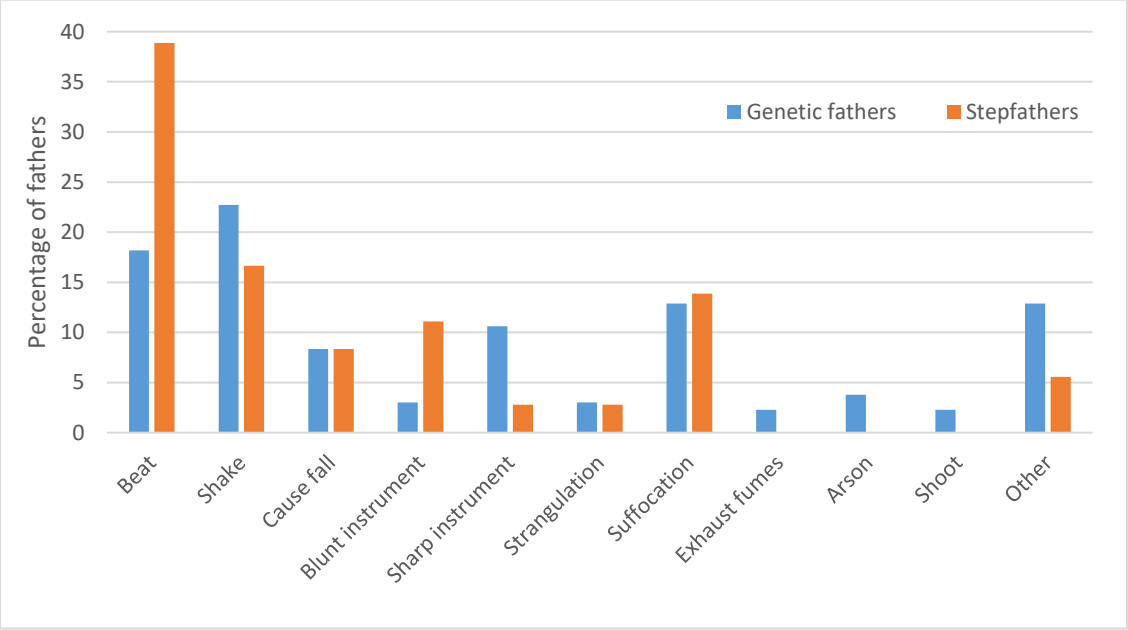

Figure 3. Methods of killing children aged 0-4 years by genetic fathers and stepfathers.

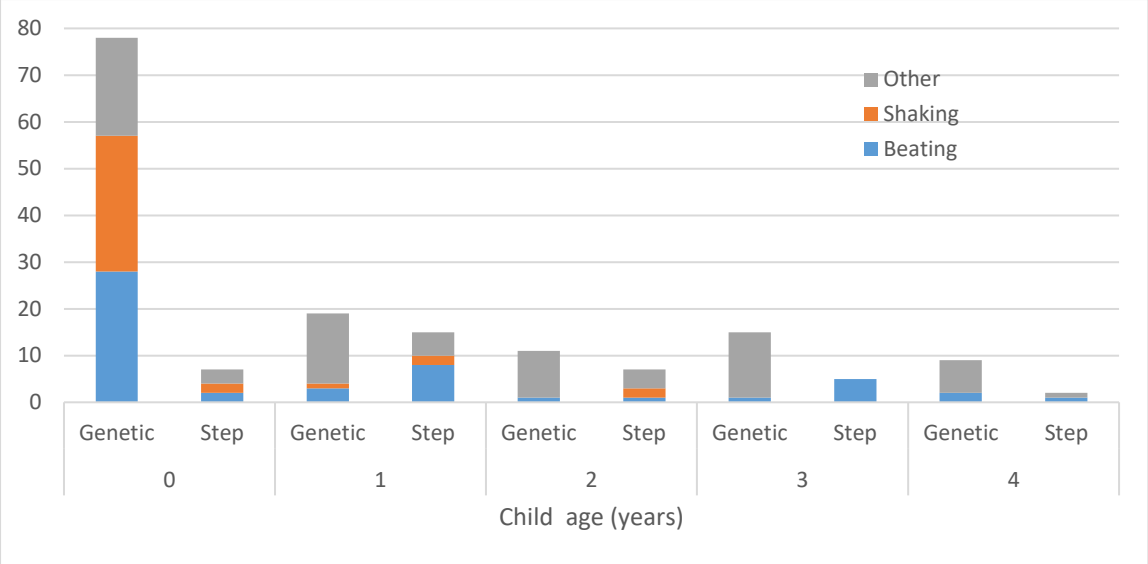

Figure 4. Frequencies of homicides of 0-4 year-olds by beating, shaking and other methods by genetic and stepfathers, by child age.

The large majority (86.1%) of child homicides by shaking took place during the victims' first year, when genetic fathers were the perpetrators in 29 cases of shaking and 28 of beating, and stepfathers in two cases of each (Figure 4). Beyond the first year, just one genetic father killed by shaking (in the child's second year), and four stepfathers (two in the child's second year, two in the third). From the second year onwards, both genetic and stepfathers used beating more often than shaking, except that only one stepfather fatally beat a 2-year-old.

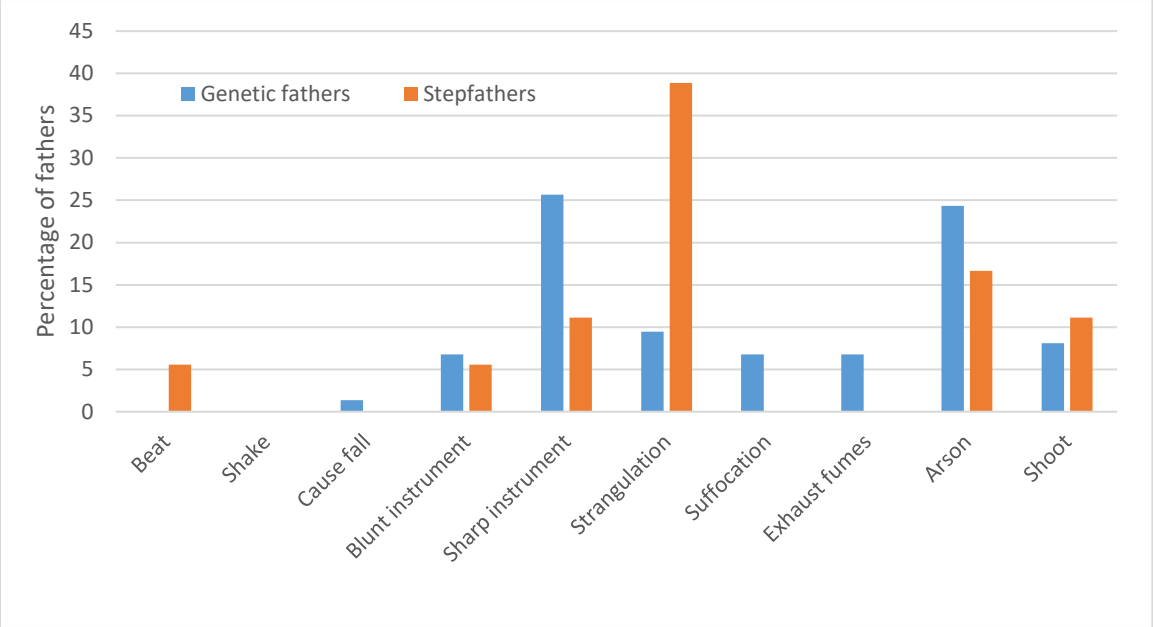

Figure 5. Methods of killing children aged 5-17 years by genetic fathers and stepfathers.

Among older victims (5-17 years) the picture was very different (Figure 5). Only one child was fatally beaten, whereas 21 children were the victims of arson (18 by genetic fathers, three by stepfathers, n.s.), and 21 were killed by fathers using sharp instruments (19 vs. 2, n.s.). The only significant difference was that seven genetic fathers (9.5%) compared with seven stepfathers (38.9%) strangled their children, $\chi^2(1) = 9.72$, $p = .002$.

Discussion

Daly and Wilson's (1994) study of British child homicides was replicated by comparing the proportions of genetic and step fathers in the Homicide Index (2000-2015) with those in population data from three large surveys. The first three hypotheses stemmed from Daly and Wilson's theory of discriminative parental solicitude, according to which, because they lack genetic relatedness, stepfathers pose a far greater threat to children than do genetic fathers.

The first hypothesis – that young stepchildren would be at substantially greater risk – was supported. Among children aged 0-4 years, the increased risk odds ratio was 16. The

second hypothesis was that the young victims of stepfathers were more likely to have been fatally beaten, rather than strangled or suffocated, than were young victims of genetic fathers. We found that the young victims of stepfathers were more than twice as likely to have been hit or kicked to death as were the victims of genetic fathers, and so to this extent the second hypothesis was also supported.

We also predicted that similar findings would apply to older children. This third hypothesis was not supported. The recent Homicide Index data indicate that, from 5 years of age, the increased risk to stepchildren was about 2, and across all ages (0-17 years) approximately 4 (Table 2a). Moreover, only one child over the age of 4 was fatally beaten.

The fourth hypothesis arose from the previously unacknowledged point that, while large proportions of perpetrators did not live with their victims, the population data included only *cohabiting* father-child dyads. The implication is that it is only appropriate to include cohabiting perpetrator-victim dyads in the analyses. When we did this, we found that the increased risk to young stepchildren was 11, and that stepfathers posed no greater risk than genetic fathers to their older children (Table 2b). These reductions in odds ratios are consistent with the fourth hypothesis.

The fifth hypothesis was that father's age was a confounding variable that accounted for some of the increased risk to stepchildren. Perpetrating stepfathers were on average 6 years younger than the genetic fathers, which is consistent with both Harris et al. (2007), who reported a difference of 7 years, and with the population data, which show relative youth to be a feature of stepfathers in general. In addition, especially when children are young, young fathers – regardless of genetic relatedness to their victims – are considerably overrepresented in the child homicide data. When father's age was controlled for, the increased risk to young stepchildren fell to 5.82, and to all stepchildren (0-17 years) to 1.71 (Table 2b). This hypothesis was therefore also supported.

At first sight, much of the evidence reported here seems to be consistent with Daly and Wilson's and other evolutionary psychologists' (Archer, 2013; Buss, 2014; Daly & Wilson, 1994, 1998, 2005, 2008; Harris et al., 2007; Pinker, 1997; Weekes-Shackelford & Shackelford, 2004) claims. The increased risk to young children was 16 when all methods of killing were considered, and, because Daly and Wilson referred specifically to beating, the finding that stepfathers of young children hit or kicked twice as much as did genetic fathers suggests that an estimate of increased risk of fatal beating of more than 32 (i.e., at least 16 x 2) is justified.

An unexpected finding was the reduction in child homicides – particularly by stepfathers – that seems to have occurred in England and Wales between Daly and Wilson's (1994) study and ours. They reported that 131 young stepchildren were killed between 1977 and 1990, compared with 50 reported here between 2000 and 2015, a reduction of 61.83%. The reduction in homicides by genetic fathers during the same period was less marked (from 247 to 176, a reduction of 28.74%). This suggests that the increased risk to young stepchildren of fatal beating in 1977-1990 might therefore have been twice that in 2000-2015, (i.e., at least 32 x 2) that is, it might have approached the "well over 100-fold" claimed by Daly and Wilson (2008, p. 385).

But there are several problems with such claims. First, they refer only to young children. It is not clear why Daly and Wilson (1994) (and Weekes-Shackelford and Shackelford (2004)) limited their analyses to children aged 4 and below: there seem to be no selectionist grounds for predicting any substantive change in stepparents' increased risk with child age. Indeed, the only explanation they offer implies that the increased risk to older children would be even *greater* than to 0-4 year-olds. But the findings that the increased risk to older children was substantially *less* than to younger children, and that fatal beatings all but ceased by age 5, do not support Daly and Wilson's account.

A second problem is that the recent Homicide Index data raise a number of questions concerning stepfathers' supposedly greater use of beating (Archer, 2013; Daly & Wilson, 2008; Harris et al., 2007; Weekes-Shackelford & Shackelford, 2004). One is that none of the previous studies (Daly & Wilson, 1994; Harris et al., 2007; Weekes-Shackelford & Shackelford, 2004) reported homicides by shaking, which, at least according to the Homicide Index, is the single most frequent means of killing children in by far their single most hazardous year – their first. If shaking were included as a form of beating (and it seems likely that it was in the previous studies both because it was not otherwise reported, and because the proportions of children killed by beating reported in those studies were considerably higher than those reported here[5]), then the difference between father types' use of beating was much reduced and non-significant. In addition, Daly and Wilson's (1994) finding that genetic fathers tended to use suffocation and strangulation was not replicated: very similar proportions of young stepchildren were killed in these ways. Indeed, *higher* proportions of older children were suffocated or strangled by stepfathers than by genetic fathers. We therefore question on empirical grounds the evolutionary theorists' claim that, whereas stepfathers tend to beat their children to death, genetic fathers more often use weapons, strangulation, suffocation, drowning and poison. We also question on intuitive grounds their claim that these methods are actually more intentional, quick and painless than beating. Our analyses do not support Daly and Wilson's assertion that, consistent with discriminative parental solicitude, stepfathers' methods of killing reflect their hostility towards their children, whereas genetic fathers' methods indicate their lack of antipathy.

Third, none of the previous studies (Daly & Wilson, 1994; Harris et al., 2007; Weekes-Shackelford & Shackelford, 2004) took account of the high proportions of non-residential perpetrators. This means that the true proportion of 'stepfathers' – at least, as far as this term

[5] For example, Daly and Wilson (1994) reported that 78.6% of young stepchildren, and 48.0% of young genetic children, were killed by beating, compared with 38.89% and 18.18% in these more recent data.

is used in the Homicide Index – in the population must have been underestimated, and hence the apparent increased risk to stepchildren must have been overestimated.

In the absence of population data on non-residential stepfathers, we can only speculate on whether they pose any increased risk to children compared with non-residential genetic fathers. However, according to ALSPAC (Golding & ALSPAC Study Team, 2017), when children were 33 months old (near the mid-point of the 0-4 years age-group), 9.6% of mothers did not live with the children's genetic fathers. Also, approximately 2.3% of mothers reported that they had non-cohabiting partners. While it is possible that some of these 2.3% were genetic fathers who had never moved in with their partners and children, it seems likely that the majority were not the genetic fathers, but had become partners of the genetic mothers since the birth of the child. These men would be labelled 'stepfathers' if they appeared in the Homicide Index. If so, there are several implications: the true proportion of 'stepfathers' in the population – including both cohabitees and non-cohabitees – is considerably higher than the population data indicate; the proportion of stepfathers among non-residential fathers is much higher than among cohabiting fathers; non-cohabiting genetic fathers are overrepresented by at least four times in the homicide data (i.e., 40% of perpetrators, compared with 9.6% in the population); the increased risk to stepchildren must be lower than the previous studies (Daly & Wilson, 1994; Harris et al., 2007; Weekes-Shackelford & Shackelford, 2004) indicate; and, among non-cohabiting fathers, stepfathers may pose little or no increased risk even to young children.

A fourth problem with their claims is that the population data used by Daly and Wilson – and hence their estimates of increased risk – were inaccurate. They justifiably dismissed Clarke's (1992) figure of 5% of young children living with a stepfather, though they did not substantiate their 2008 revision to "fewer than 1%". In this study we used data from three large surveys to arrive at probably the most accurate available estimates of the relative proportions of genetic and stepfathers in British families.

The apparent reduction in the frequencies of child homicides by fathers between 1977-1990 and 2000-2015 might result from Daly and Wilson's (1994) possible inclusion of fathers who appeared in the Homicide Index as suspects but were not convicted of homicide. However, this would not explain why the reduction in numbers of homicides by stepfathers was greater than by genetic fathers. Instead, it might be accounted for by the proportion of stepfamilies in the population decreasing, or the characteristics of stepfathers changing, or both. According to the ONS (2014) there was a moderate (14%) reduction in the proportion of stepfamilies in Britain between 2001 and 2011, which they suggest might result from people having children later in life, and so being less likely to have children from previous relationships. The implication would be that stepfathers in the period 1977-1990 were more numerous (which seems unlikely), and / or even younger – and therefore posed a greater threat to children – than in 2000-2015. If so, Daly and Wilson's (2008) estimate of the proportion of children with stepfathers should actually be higher, not lower, than the estimates reported here; and / or the need to control for father's age would have been even greater.

A fifth issue concerns the definition of 'stepfather'. If accurate estimates are to be calculated concerning the putative increased risk to stepchildren, it is necessary to apply the same definitions when considering the perpetrator and population data. As in previous research (Daly & Wilson, 1994; Weekes-Shackelford & Shackelford, 2004) this was not possible in the present study. A police officer recording the murder of a child by the mother's recent casual partner would be likely to describe the child as a stepchild because no more accurate description is available on the Homicide Return Form[6]. In contrast, a mother reporting to a survey such as Understanding Society (Institute for Social and Economic Research, 2016) would make no mention of a non-resident partner (because only household members are included), and would probably call such a casual partner an 'Other non-relative'

[6] See Supplementary Material

rather than a stepparent to the child. Comparing the proportions of ‘stepfathers’ in the Homicide Index and the survey population data is, then, comparing apples and oranges because the same individual would often be described as a stepfather in the former, but not the latter. The implication is that any comparison of the two will result in – possibly substantial – overestimates of the increased risk to children from stepfathers.

And sixth, Daly and Wilson (1994) did not consider the role of confounding variables. Owing to limitations of the dataset, in this study we included only one – father’s age – and found that this alone accounted for much of the overrepresentation of stepfathers among the perpetrators. But there are many other possible confounds that are likely to explain still more – perhaps all – of stepfathers’ apparent increased risk to children (Berger et al., 2009; Giles-Sims & Finkelhor, 1984; Malvaso et al., 2015; Nobes et al., 2018; Temrin et al., 2011). For example, Nobes et al. (2018) report in their analysis of Colombian data that factors such as parents’ conflict and histories of abuse, and father’s stress, all accounted for considerably more of the variance of child physical abuse than did father’s age.

Together, the findings reported here provide little or no support for the theory of discriminative parental solicitude as an explanation of child homicide by stepfathers. They indicate that lack of genetic relatedness between father and child is a considerably weaker independent predictor of child homicide than Daly and Wilson and others have argued (Archer, 2013; Buss, 2014; Daly & Wilson, 1994, 1998, 2005, 2008; Harris et al., 2007; Pinker, 1997; Weekes-Shackelford & Shackelford, 2004). Instead, both child age and father age have a greater impact: the large majority of victims are below the age of 5, the most dangerous year for children is their first; and the large majority of perpetrators are young fathers. (Of course, child age and father age are not orthogonal: younger children tend to have younger fathers.) Also important is residential status: children who do not live with their fathers are at considerably greater risk from those fathers. However, some findings are not wholly explained by these factors alone.

One such finding is that, whereas genetic fathers killed their children far more in their children's first year than in any other, homicides by stepfathers occurred more in their children's second year (Figure 2). This difference meant that, in their children's second year, stepfathers perpetrated almost as many homicides as did genetic fathers (21 vs. 22), despite only about 1.5% of cohabiting fathers being stepfathers.

We propose that children are most at risk from fathers during the first 12 months of their relationship. This might be because – at least in families in which there is a high risk of abuse – it takes this long for the father to form a caregiving bond to the child (Bowlby, 1969/1982; George & Solomon, 2008). For genetic fathers, this period begins at birth, so that by the second year their children are relatively safe. But stepfathers can be acquired at any time, and the population data reported here indicate that children are approximately equally likely to become a stepchild in their first year as in any other. For a stepfather-stepchild dyad, then, the critical first 12-month period can occur at any time. The increased risk to stepchildren during their second year therefore reflects both the dramatic *reduction* in risk from genetic fathers – perhaps because most had formed protective bonds by then – and the *increase* in risk from stepfathers because, during this time, twice as many are in the critical first 12 months of their relationships with their children as in their children's first year[7].

This demographic account might explain the higher rates of fatal beating by stepfathers and (non-significantly) of fatal shaking by genetic fathers. Because small babies are much more vulnerable to shaking than are older children, genetic fathers – who kill primarily during their children's first year – often do so by shaking. In contrast, because stepfathers kill more frequently in subsequent years – when their children are less vulnerable to shaking – they more often fatally beat their victims instead. It is also consistent with non-cohabiting

[7] A stepfather-stepchild relationship established during any given year of the child's life will still be within its first 12 months for part of the child's subsequent year. Since these relationships cannot be formed before the child's birth, and the proportion of children with stepfathers increases linearly with age, during the child's second and all subsequent years twice as many stepfather-stepchild dyads will be within their first 12 months as in the child's first year.

fathers – whether genetic or step – posing a greater threat to children than cohabiting fathers, because living apart is likely to delay or prevent the father's formation of a caregiving bond to the child, and the child's formation of an attachment to the father. The child's resultant insecurity would be expressed through behaviors such as crying and fearfulness that could elicit abuse by the father (for a discussion of caregiving, attachment, affiliative and sexual behavioral systems, see Furman & Wehner, 1994).

Unfortunately the Homicide Index does not record how long stepfathers had known their victims and so it is not possible to test this account adequately. Future researchers are encouraged to test the prediction that, regardless of relatedness, fathers are most likely to commit filicide during the first year of their relationship with their child.

Another limitation of this study is that, following Daly and Wilson (1994), we investigated only principal perpetrators. Many children were killed by more than one person. Examination of cases in which victims' genetic and step parents colluded is likely to shed further light on the role of genetic relatedness in the etiology of child abuse and homicide.

This study was also limited by the Homicide Index data including few potentially confounding variables, and – somewhat ironically – fewer than five child homicides by stepfathers each year. This meant that, although like Daly and Wilson's (1994) the dataset covered a period of 15 years, the frequencies of relevant homicides were too low to allow inclusion of further possible confounds in the multivariate analyses. This was particularly the case when the victims were older than four years, and when father's residential status was taken into account.

A message for policy and practice regarding the prevention of abuse is to identify and support families when both the father and child are young – particularly in the first year of their relationship – and when the father, or mother's partner, does not live with the child. The claims of previous researchers that the problem is stepparenthood per se, rather than, say, parental age or education, are not supported by our findings.

An implication for researchers is that it is important to use the same definitions in both the perpetrator data and the population data with which they are compared. Until this is done we cannot accurately estimate the relative risk of stepfathers and genetic fathers, especially when they do not live with their children. Another is that child abuse is a complex, multi-faceted phenomenon, the explanation of which is multi-level and multi-factorial (Belsky, 1993; Cicchetti & Valentino, 2006; Stith et al., 2009). It is very unlikely that any single factor – for instance, genetic relatedness – could independently account for much of the variance. To better understand the etiology of child abuse, it is necessary to create large datasets with many potentially associated variables.

The picture that emerges from this study is that stepfathers are, indeed, more likely to kill children than are genetic fathers. However, we have identified a number of problems with the evolutionary psychologists' claims (Archer, 2013; Buss, 2014; Daly & Wilson, 1994, 1998, 2005, 2008; Harris et al., 2007; Pinker, 1997; Weekes-Shackelford & Shackelford, 2004): they considered only 0-4 year-olds, yet above this age stepchildren are at no greater risk from fathers than are genetic children; their findings concerning increased risk apply specifically to differences in rates of fatal beating, which we have questioned and only partially replicated, and for which we have proposed an alternative account; their estimates of the proportions of stepchildren in the population were inaccurate; they compared these with proportions of all stepchildren in the homicide data instead of including only those who lived with their fathers; and they failed to test for confounding variables, such as father's age.

When all these points were taken into account, we found that stepfathers posed little or no greater risk to their children than did genetic fathers. When, like Daly and Wilson, we considered only young children, the risk from stepfathers was about six times the risk from genetic fathers. But even this figure is likely to be a substantial overestimate because stepparents are defined and reported very differently in the Homicide Index and the population data, and because there are likely to be many other confounding variables (Berger

et al., 2009; Giles-Sims & Finkelhor, 1984; Malvaso et al., 2015; Nobes et al., 2018; Temrin et al., 2011).

Regardless of their genetic relatedness, children are at increased risk from fathers when both are young, when they do not live together, and, we propose, during the first few months of their relationship. Other factors, such as the parents' histories of abuse, education, and mental health, probably play substantial roles in the etiology of child homicide and in any increased risk to young stepchildren. If stepparenthood per se is one of these factors, its influence does not approach that repeatedly asserted by Daly and Wilson and their adherents.

Context

Evolutionary psychologists (e.g., Buss, 2014; Daly & Wilson, 1999, 2008) have frequently claimed that "… stepparenthood is the strongest risk factor for child abuse ever identified" (Pinker, 1997, p. 434). Yet in the child maltreatment and homicide literature there is remarkably little mention of stepparents among the many factors that have been shown to contribute to its etiology (e.g., Cicchetti & Toth, 2016; Stith et al., 2009). Quite simply, both sides cannot be right: either stepparenthood is a very strong risk factor, or it is not. While investigating child physical abuse by fathers, the first author was struck by this anomaly and its significant implications both for theory regarding violence, family processes, and the relevance to them of evolutionary perspectives, and for child protection policy and practice. Our approach is to investigate possible reasons for the anomaly by replicating key studies. In this article we report a replication of probably the single most influential of the evolutionary psychologists' studies of stepparents and child abuse (Daly & Wilson, 1994) to test possible alternative explanations of their findings.

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