

REPLY

Daly and Colleagues Have Overestimated the Magnitude of the “Cinderella Effect” in Lethal Child Abuse, and Underestimated the Role of Confounding Variables in Its Explanation: A Reply to Daly (2022)

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Nobes et al. (2019) used updated data from the same source—the British Home Office’s Homicide Index—as that used by Daly and Wilson (1994) to investigate the Cinderella effect (increased risk to stepchildren), and in particular their claim (e.g., Daly, 2022; Daly & Wilson, 1994, 2001, 2008) that stepfathers fatally assault their young children at rates more than 100 times those of genetic fathers. Nobes et al. reported much lower—though still substantial—increased risk to young stepchildren, and little or none to older children, particularly when they took the mislabeling of noncohabiting perpetrators into account. In his Commentary, Daly (2022) largely accepts this analysis, but does not acknowledge its implications for his own findings and claims. Nobes et al. also reported that controlling for father’s age accounted for much of the remaining increased risk, and argued that this and other confounding variables are likely to explain most or all of the Cinderella effect. Daly says very little about this too, but instead responds with a series of criticisms, many of which misrepresent Nobes et al.’s account, and most of which are incorrect. Young stepchildren are at increased risk, but if stepparenthood per se (i.e., lack of genetic relatedness) contributes to the explanation, its influence is considerably less than Daly claims.

Public Significance Statement

Young children are much more likely to be injured or killed by stepfathers than by genetic fathers. We discuss the research concerning the extent to which stepchildren are at greater risk, at what ages, and why. We argue that the causes are more complex than stepfathers and children being genetically unrelated—the main explanation proposed by evolutionary psychologists—and more likely reflect adversities that are more commonly experienced by stepfathers and stepfamilies, including parental youth, poor education and mental health, and parents’ own histories of violence.

Keywords: stepfathers, stepchildren, child homicide, filicide, Cinderella effect

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In their extensive output on stepparents’ violence to children over four decades (e.g., Daly & Perry, 2020; Daly & Wilson, 1998a; Wilson et al., 1980), Daly and colleagues have focused on two main issues. The first concerns the *magnitude* of the so-called “Cinderella effect,” that is, the extent to which stepchildren are at greater risk than are children who live with both genetic parents.

Regarding child homicide, they have often reported that stepfathers are more than 100 times as likely to beat their young children to death as are genetic fathers (e.g., Daly, 2022; Daly & Wilson, 1994, 2001, 2008). On these grounds they assert that “Having a stepparent has turned out to be the single most powerful predictor of severe child maltreatment yet discovered” (Daly & Wilson, 1998b, p. 441), and “elevated risk to stepchildren is the most extensively documented fact in the family violence literature” (Daly & Perry, 2020, p. 484).

The second main issue concerns the *explanation* of the Cinderella effect. According to Daly and colleagues’ theory of discriminative parental solicitude, stepparents are more likely than genetic parents to abuse and kill their children because they are less invested in, and therefore less caring towards, genetically unrelated children. They claim that the Cinderella effect cannot be explained by confounding factors, such as poverty or parental age: “all such hypotheses have failed ... Stepparenthood per se is apparently the relevant risk factor” (Daly & Wilson, 1994, p. 208).

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If these claims were correct, they would support Daly and colleagues' evolutionary explanation of stepparental violence to children, as opposed to ecological accounts of child maltreatment, that often make little or no mention of stepparenthood as a risk factor (e.g., Cicchetti & Toth, 2016; Stith et al., 2009). There would also be significant implications for child protection and for our understanding of family processes and the etiology of abuse. It is therefore vitally important to scrutinize and expand the evidence base and to test the claims and explanations.

In our study in the *Journal of Experimental Psychology: General* (Nobes et al., 2019), we did this by analyzing updated British data from the same source as that used by Daly and Wilson (1994), the Home Office's Homicide Index. We concluded that, although young stepchildren are indeed at increased risk, the magnitude of the Cinderella effect was substantially overestimated by Daly and Wilson, and older stepchildren (above about 5 years) are at no increased risk. Regarding its explanation, stepparenthood per se (i.e., genetic relatedness) is much less influential than they claim. Instead, confounding factors such as father's age, mental health, and personality are likely in combination to explain much or all of the increased risk to stepchildren.

In his recent Commentary in the *Journal of Experimental Psychology: General*, Daly (2022) makes many criticisms of our study, which we respond to in the [online supplemental materials](#). In this reply, we focus on the substantive issues on which we agree and disagree regarding the magnitude and explanation of the Cinderella effect.

The Magnitude of the Cinderella Effect

Daly and Wilson's (1994) and Nobes et al.'s (2019) Findings Compared

Our first main finding was that population data from three sources indicated that the proportions of British children who have stepfathers increases from near zero at birth by approximately 1% during each year of childhood. Daly (2022) accepts this: "The age trajectories of children residing with a stepfather portrayed in that figure (Nobes et al., 2019, Figure 1) are similar to those seen in other countries" (p. 2971).

Comparisons of these population data with the number of children killed by step and genetic fathers enabled us to accurately calculate their relative per capita rates of child homicide, by child age. Our second main finding was that young children (i.e., below 5 years of age) were considerably more likely to be killed by men who were labeled in the data set as "stepfathers" than by genetic fathers, but the disparity was much lower than Daly and Wilson (1994) reported ($OR = 15.74$). Daly (2022) accepts the findings of these initial analyses and considers them to be broadly consistent with his own: "Comparing the results reported by Nobes et al. (2019) with those of Daly and Wilson (1994), what is perhaps most striking is the evidence for substantial declines in both filicide rates and the magnitude of the Cinderella effect between the 1970s and 2015" (p. 2973). He suggests that the declines reflect "variability" (pp. 2973–2974) in the magnitude of Cinderella effects.

Noncohabiting "Stepfathers" and Overestimation of the Cinderella Effect

Nobes et al. (2019) also pointed out that many noncohabiting perpetrators were labeled "stepfathers" in the Homicide Index data, and,

because the population data with which they are compared when calculating increased risk do not include noncohabitees, their inclusion in the calculations exaggerates the magnitude of the Cinderella effect. Daly (2022) accepts that he had been unaware of this problem, and that stepfathers had indeed been mislabeled: "Nobes et al. (2019) were correct with respect to the data for England and Wales, and this is valuable new information" (p. 2970).

However, Daly does not acknowledge the overestimation of the Cinderella effect that inevitably results when noncohabiting stepfathers are not excluded from the analyses: our third main finding was that, when only cohabitees were included, the OR for 0- to 4-year-olds reduced from 15.74 to 11.08. Neither does Daly acknowledge the fact that, since the same issue applied to his own (Daly & Wilson, 1994) analysis of data from the same source, his estimate of stepchildren's increased risk based on that analysis must be revised downwards, too. That is, the discrepancy between our and his estimates of increased risk to British stepchildren reflected not only "variability," but also an important omission in Daly and Wilson's (1994) calculations.¹

Our fourth main finding was that older children (5 years and above) were no more likely to be killed by stepfathers than by genetic fathers (OR for cohabiting children aged 5–17 years = 1.00). Daly (2022) agrees: "Whereas the proportion of children who reside with stepfathers rises with age, filicide rates decline steeply. Newborns are most at risk, and a large majority of victims are not yet of school age" (p. 2971).

Age-Matching in the Calculation of Increased Risk to Stepchildren

Daly's (2022) only substantive criticism of our analyses of the recent Homicide Index data concerns the children's age at which proportions of step and genetic fathers in the homicide data should be compared with those in the population to calculate the increased risk to stepchildren. Daly and Wilson (1994) reported only the records of victims aged 0–5 years, and to estimate the proportion of children in the population, both they (Daly & Wilson, 1994, 2001) and—because we replicated their methods—we based comparisons on the midpoint, that is, 2.5 years.

However, as Daly points out (p. 2972), the mean age of victims in the 0–5 age group is lower than this 2.5-year midpoint. He claims that we should have used this mean age as the age at which to calculate stepchildren's increased risk. If he were correct, our estimates of the increased risk to young stepchildren should be revised upwards.

Daly's revised method of age-matching is problematic because the children killed by stepfathers tend to be older than victims of genetic fathers, and many more young children are killed by genetic than by stepfathers. As a result, the overall mean age is unrepresentative of the victims of stepfathers whose increased risk is being calculated.

The revised method is also problematic because it is arbitrarily limited to 0- to 5-year-olds, above which there is little or no increased risk to stepchildren. Had Daly and Daly and Wilson (1994) chosen to limit their analyses to, say, 0- to 3-year-olds, the mean ages of all children—genetic and step—within this age group would, of course, have been lower, the proportion of same-aged children in the population with

¹ Daly (2022) responds by claiming that the same omission does not apply to the Canadian and U.S. data. We discuss this response in [Sections 1.1 and 2.2.1 of the online supplemental materials](#).

stepfathers would have decreased, and so the apparent increased risk to them would have risen. On the other hand, if they had chosen, say, a 0–8 years or 0–17 years age group, the mean ages of victims would have risen, as would the proportions of stepchildren of these ages in the population, and so the apparent increased risk to stepchildren would have declined.

While we agree that Daly and Wilson's (1994) and our age-matching is problematic, so too is Daly's (2022) revised method. We suggest that a better approach is to present and analyze findings in age groups that are as narrow as data sets allow; the added detail should show more accurately the relative rates of filicides at each child age. In addition, to avoid the impression that age groups are sometimes selected to support one side of the debate, data from children of all ages should be reported, rather than from only those ages at which stepchildren are at substantially greater risk (cf., Daly & Wilson, 1988a, 1994; Weekes-Shackelford & Shackelford, 2004²).

The Explanation of the Cinderella Effect

Confounding Factors

Despite the frequency with which Daly and colleagues have discussed the possibility of confounding factors (e.g., Daly, 2022; Daly & Wilson, 1985, 1988a, 1988b, 1998a, 2001, 2008; Wilson & Daly, 1987), to our knowledge they have tested only four—socioeconomic status, family size, maternal age, and personality traits—in one study (Daly & Wilson, 1985), and for a fifth—marital status—in one other (Daly & Wilson, 2001). Moreover, they have never referred to any other evidence regarding family size or maternal age, and to only three other studies regarding socioeconomic status: Bachrach (1983) and Sweet (1974) indicated that stepfamilies are little or no poorer than families with two genetic parents, and Creighton and Noyes (1989) reported that they were poorer.³ The frequent claim that all “confound hypotheses... have been tested and rejected” (Daly & Wilson, 2008, p. 387) is, then, based on remarkably little evidence.

Owing to limitations of the Homicide Index data, in Nobes et al. (2019) we were able to test for only one possible confounding variable, father's age. The population and perpetrator data indicated that stepfathers tend to be younger than genetic fathers (by 3.4 years in the general population, and 6.9 years among perpetrators),⁴ and, regardless of genetic relatedness, young fathers are much more likely to kill their children than are older fathers. Our fifth main finding was that stepfathers' relative youth explained much of the increased risk to stepchildren (adjusted *OR* for cohabiting children aged 0–4 years = 5.82). Daly (2022) does not challenge this point, calling it “a useful first attempt to control for the partial confound of father age” (p. 2968).

However, Daly does not acknowledge that father age is likely to account for much of the Cinderella effect. Since Daly and colleagues have never adjusted for this factor when estimating the increased risk to stepchildren, their accounts of its causes are very likely to be inaccurate.

Moreover, Daly omits to mention any of the other potentially confounding variables we proposed (Nobes et al., 2019, pp. 1093, 1100), including father's history of violence, mental health, education, and quality of relationships, despite there now being a strong body of evidence that these and other variables account for much of the Cinderella effect (e.g., Berger et al., 2009; Malvaso et al., 2015; Nobes et al., 2019, 2022; Temrin et al., 2011; Turner et al., 2007).

Daly and colleagues' approach regarding potentially confounding variables is exemplified by their frequent references (e.g., Daly,

2022; Daly & Wilson, 1985, 1988a, 1988b, 1998a, 2001; Wilson & Daly, 1987) to Bachrach's (1983) finding that there were no substantial differences between the incomes of families with step and genetic fathers; this indicates that income is unlikely to account for much, if any, of the Cinderella effect. However, Daly and colleagues have never mentioned that Bachrach also reported several ways in which these families *did* differ, and that, therefore, *could* contribute to its explanation: mothers in stepfamilies were more likely than other mothers to be employed full-time (which might account for their relatively good family incomes, and suggests that the stepfathers had to provide more childcare than genetic fathers); they were considerably worse educated; and stepfamilies tended to be much larger than two genetic parent families. This last point contradicts Daly and colleagues' frequent claim that “such differences [in parental age and family size] are in fact small and make negligible contributions to Cinderella effects” (Daly & Wilson, 2008, p. 387),⁵ and suggests that, despite having similar incomes, they had more money problems.⁶

Daly (2022) provides other examples of his and colleagues' approach to confounding factors, one of which is Scott (1973), who found that, of 29 fathers who killed their young children, only 14 were genetic fathers. This is indeed strong evidence of a Cinderella effect. However, neither here nor when citing the same study elsewhere (e.g., Daly & Wilson, 1987a, 1987b, 1988a, 1988b, 1988c, 1991, 1998a) does Daly refer to any factor apart from stepparenthood itself that might explain the overrepresentation of stepfathers. He does not mention, for example, that Scott also reported that three-quarters (22/29) of the perpetrators had personality disorders, most were stressed, and almost two-thirds (19/29) were themselves the victims of parental violence or hostility. Many of these fathers had violent or other criminal convictions, and, just as we reported, they were very young (on average 24.3 years, more than 10 years younger than fathers of similarly young children in the general population in 2003). They also had poor accommodation, debts, and high levels of conflict with neighbors and partners. It is very possible that several of these eight factors are experienced more by stepfathers than by genetic fathers, in which case they are likely to be confounding variables that in combination account for much of the Cinderella effect.

While the very large majority of stepfathers pose no risk to their children, a greater proportion of them than of genetic fathers face

² Weekes-Shackelford and Shackelford (2004) began their abstract with “Stepparents commit filicide at higher rates than do genetic parents” (p. 75), but did not mention that this applies mainly or solely when children are very young. Data from older victims were available, but they explained that they limited their analyses to 0–5-year-olds “to replicate the work of Daly and Wilson (1994)” (p. 76).

³ Daly (2022, p. 2973) also cites Wilson and Daly (2001) regarding socioeconomic status as a possible confound, but that article includes no relevant information on this point. Elsewhere (e.g., Daly & Wilson, 1988c, 1996, 2008) cite Wilson et al. (1980) and Wilson and Daly (1987), but neither study tested for relevant confounds.

⁴ Similarly, Harris et al. (2007) reported that, among Canadian perpetrators, stepfathers were 7 years younger than genetic fathers.

⁵ More recent British data also indicate that stepfamilies are considerably larger than families with two genetic parents (Office for National Statistics, 2014).

⁶ Nobes et al. (2022) also reported no difference in the incomes of families with and without stepchildren. However, stepfathers reported more financial problems, perhaps owing to many having children from previous relationships. Debt is likely to be a greater stressor than low income.

substantial adversities which combine to increase their risk to children. Our hypothesis is that, within a group of similarly young, violent, stressed, poorly educated, abused (and so on) men, the stepfathers are little or no more likely to abuse their children than are genetic fathers. That is, stepparenthood is a predictor, but not a cause, of child abuse and homicide. If so, the increased risk to stepfathers is largely or wholly explained by these confounding factors, and Daly and colleagues' explanation of the Cinderella effect must be largely or wholly wrong.

Child's Age

The decline in the magnitude of the Cinderella effect as children approach school age poses a considerable challenge to the theory of discriminative parental solicitude because, of course, stepfathers are genetically unrelated to their children, regardless of the children's ages. If, as [Daly and Wilson \(2001\)](#) claim, "steprelationship per se is the relevant risk factor, rather than some correlate thereof" (p. 288), then the Cinderella effect should persist reasonably consistently throughout childhood. Either steprelationship (i.e., genetic relatedness) has much less of an effect than they claim, or there must be another factor, or set of factors, that counteracts it by mid-childhood.

Daly and colleagues ([Daly, 2022](#); [Daly & Wilson, 1988c, 1994](#)) seek to explain the age pattern in terms of stepfathers feeling the most resentment, obligation, and social pressure when children are very young. A problem with this account is that it does not explain the rapidity of the decline in increased risk, since even stepfathers of 5-year-olds—by which age there is little or no increased risk to stepchildren—must still feel much of the same resentment and pressure as stepfathers of infants.

A more plausible explanation is that it is not stepparenthood per se that accounts for the increased risk to young stepchildren, but another factor, or set of factors, that, unlike genetic relatedness, changes during children's first few years. One candidate is father's age because, of course, parents become 5 years older between their child's birth and fifth birthday. As we reported ([Nobes et al., 2019](#), pp. 1095–1097), in the general population and among perpetrators, stepfathers are on average several years younger than genetic fathers, and so during the first few years of children's lives the issue of stepfathers' extreme youth largely disappears as they reach the age at which genetic fathers typically first become parents.

In addition, we have speculated (though at this stage we cannot be sure) that the most dangerous men who are labeled "stepfathers" in the perpetrator data are actually those who do not live with the children, presumably many of whom are the mothers' casual partners, and who hardly know their victims ([Nobes et al., 2019](#), p. 1099). These perpetrators must be among the least invested in the children, and feel very little pressure and resentment. If Daly's account of the age pattern were correct, they would therefore be expected to pose the least threat to young children, not the most.

Summary

Points of Agreement

There are many points on which [Daly \(2022\)](#) and we agree. In fact, despite his numerous criticisms—to which we respond in the [online supplemental materials](#)—he does not challenge any of [Nobes et al.'s \(2019\)](#) main findings. Neither does he reject the significant implications of our analyses of the Homicide Index data for his views

concerning the magnitude (see the section "Noncohabiting 'Stepfathers' and Overestimation of the Cinderella Effect") and explanation (see the section "Confounding Factors") of the Cinderella effect.

We also agree that there are problems with the method of age-matching used by [Daly and Wilson \(1994\)](#) and [Nobes et al. \(2019\)](#). However, the revised method of age-matching that Daly advocates would inevitably exaggerate the magnitude of the Cinderella effect (see the section "Age-Matching in the Calculation of Increased Risk to Stepchildren").

The most significant point on which we agree is that the Cinderella effect is real and substantial: young (but not older) children are at considerably increased risk of being fatally beaten (but not killed by other means) by men who, rightly or wrongly, are labeled "stepfathers" in the homicide data.

Points of Disagreement

Although young stepchildren are at increased risk, Daly and colleagues have often overestimated the magnitude of the Cinderella effect. One reason for this overestimation is that, in [Daly and Wilson's \(1994\)](#) analyses of the British data—and probably in other studies, too—noncohabiting "stepfathers" were included. When we excluded noncohabiting perpetrators, the increased risk to young children reduced to an *OR* of about 11, which is similar to most other estimates (e.g., [Hilton et al., 2015](#); [Nobes et al., 2022](#); [Temrin et al., 2004](#); for a review, see [Archer, 2013](#)), but approximately an order of magnitude less than the "100-fold or more" claimed by Daly and colleagues. This issue is further complicated by the possibility that the most dangerous men might be mothers' nonhabiting partners, some of whom could, rightly or wrongly, be classified as "stepfathers" in the perpetrator data.

Our principal criticisms of Daly and colleagues' work in this area concern the explanation of the Cinderella effect. In particular, they have not adequately tested or addressed the extent to which the Cinderella effect is accounted for by confounding factors (see the section "Confounding Factors"). [Daly \(2022\)](#) provides many examples of the approach that he and his colleagues have often taken regarding this issue: he does not acknowledge the implications of [Nobes et al.'s \(2019\)](#) finding that father's age is a strong confounding factor; he rejects the possibility of a socioeconomic confound on the basis of only two studies; when referring to studies such as [Bachrach \(1983\)](#) and [Scott \(1973\)](#) he reports only the findings that support the evolutionary account—in particular, that stepfathers are overrepresented, and that incomes in the two family types are similar—while saying nothing about other characteristics of stepfamilies and filicidal fathers, reported in the same studies, that are likely to be confounding variables; and he omits to mention any of the recent research (e.g., [Berger et al., 2009](#); [Malvaso et al., 2015](#); [Nobes et al., 2019, 2022](#); [Temrin et al., 2011](#); [Turner et al., 2007](#)) that shows that controlling for factors such as mental health, chronic stress, alcoholism, antisociality, history of abuse, and family resources substantially attenuates the increased risk to stepchildren.

This approach is likely to create the false impression that there is a great deal of evidence for his explanation of the Cinderella effect, and none for possible alternative accounts. In fact, support for Daly and colleagues' frequently repeated contention that confounding factors cannot explain the Cinderella effect is remarkably sparse, and there is already a good deal of evidence that points to numerous factors

collectively accounting for much of the increased risk to young stepchildren.

A plausible explanation of the Cinderella effect must account not only for stepfathers' greater risk to young children, but must also be consistent with their relative desistance from filicide and abuse as children approach school age (see the section "Child's Age"). It is difficult to square this rapid decline with the claim that "Steprelationship itself remains the single most important risk factor for severe child maltreatment yet discovered" (Daly & Wilson, 1996, p. 79). Daly (2022, p. 2973) proposes possible explanations that focus on diminishing resentment and social pressure felt by stepfathers, and on the methods with which they kill children. We suggest that stepparents' relative youth is an example of a factor which becomes less relevant as both stepfathers and children grow older. But more research is required to test these and other hypotheses.

The Way Forward

Daly and colleagues' discovery of the Cinderella effect has profound, but still often unrecognized, implications for child protection. Debate continues about its magnitude, but there can be little doubt that young stepchildren are at considerably greater risk of abuse and filicide than are children who live with both genetic parents.

If this risk is to be mitigated, we need to understand its causes, and hence possible solutions. Daly and colleagues' explanation of the Cinderella effect focuses on a single, nonmodifiable factor—genetic relatedness. If they are right, the prospects for prevention and intervention are bleak. On the other hand, researchers who take an ecological perspective have shown that the etiology of child abuse is complex, multilevel, and multifactorial (e.g., Belsky, 1993; Cicchetti & Toth, 2016; Sidebotham et al., 2006; Stith et al., 2009). In our view, these same factors are likely to explain much or all of the Cinderella effect; stepfathers are just more likely than genetic fathers to have, for example, poor mental health, education, and relationships, to misuse substances, and to be young, impulsive, and violent. Moreover, several of these factors—notably father's youth—change as children grow older, and so they are likely to help explain the dramatic reduction in relative risk by the time children reach school age. Since many of these factors are at least partially modifiable, there is substantial scope for optimism.

The evolutionary and ecological approaches are not necessarily mutually exclusive. Indeed, along with parent and child characteristics and interactional processes, Belsky (1993) included the evolutionary context as one of the multiple levels of analysis that contribute to the understanding of the etiology of child maltreatment. It is possible, for example, that genetic relatedness is one of many factors that contribute to the Cinderella effect.

The way forward is three-pronged. First, researchers must investigate the true identities of the "stepfathers" who are overrepresented in the perpetrator data. Are they, as Daly and colleagues (e.g., Daly, 2022; Daly & Wilson, 1988a, 1994) propose, stepfathers in the traditional sense in that they live and are involved with their victims, and who are resentful and feel social pressure to be caring and paternal? Or are they, as we (Nobes et al., 2019, pp. 1099–1100) tentatively suggest, more likely to be relatively uninvolved, perhaps noncohabiting mothers' partners, who hardly know their victims and have not formed caregiving bonds to them?

Second, although progress has been made in identifying some of the main factors that cause the Cinderella effect (e.g., Berger et al., 2009; Malvaso et al., 2015; Nobes et al., 2019, 2022; Temrin et al., 2011;

Turner et al., 2007), substantially more research is required before it is properly understood. We must investigate not only what goes wrong in perpetrators' lives, but also what goes (relatively) right by the time their children start school. The diminution of the Cinderella effect with child age is likely to provide vital clues to its causes and possible mitigation.

And third, the messages from this research must be widely and clearly communicated so that child protection policymakers, professionals, and researchers become more aware of the Cinderella effect, and better informed about why it happens, to whom, and how it can be prevented. It should be possible to identify potential perpetrators more accurately, address their individual, family, and community problems more effectively, and thereby save the lives of many more young children.

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