Testing the Cinderella Effect: Measuring Victim Injury in Child Abuse Cases

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Abstract

Past research finds that stepparents harm and kill their partner's children at higher rates than biological parents do to their own children, a phenomenon called the "Cinderella effect." Yet one major limitation of these studies is that reporting biases may account for a large share of the effect observed if reporting rates differ based on the victim-offender relationship. As abuse cases with serious injuries are more likely to be disclosed to police than ones with no injuries or minor injuries, using cases where the victim is seriously injured allows us to minimize the impact of differential reporting. Using data from the FBI's National Incident-Based Reporting System (NIBRS) which covers over 500,000 cases of child abuse from 1991 through 2019, we find that, relative to biological parents, unmarried partners, but not stepparents, are significantly more likely to seriously injure the child, partially supporting the Cinderella effect.

Keywords
Child abuse, Cinderella effect, Reporting bias, NIBRS

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1 Introduction

The Cinderella effect is a phenomenon in which stepparents abuse and kill their spouse's biological children at higher rates than they do of their own children (Sariola & Uutela, 1992; Weekes-Shackelford & Shackelford, 2004; Daly & Wilson, 2007).[1] Empirical studies have captured evidence of the Cinderella effect across different places (Sariola & Uutela, 1992; Alexandre et al., 2010) and over time (Daly & Wilson, 1985; Weekes-Shackelford & Shackelford, 2004; Nobes et al., 2019). Overall, this body of research has consistently found that children in stepfamilies have a significant increased risk of being physically abused or killed compared to children in families with only biological parents (Daly & Wilson, 1985, 1994; Sariola & Uutela, 1992; Weekes-Shackelford & Shackelford, 2004; Harris et al., 2007; Radhakrishna et al., 2001; Daly & Wilson, 2007; Turner et al., 2007; Nobes et al., 2019). In fact, some researchers argue that the presence of a stepparent in the home is the most paramount risk factor for serious child abuse (Daly & Wilson, 2007).

Past research has consistently supported the existence of the Cinderella effect, particularly in cases where the child is killed (Daly & Wilson, 1985, 1994; Sariola & Uutela, 1992; Weekes-Shackelford & Shackelford, 2004; Harris et al., 2007; Radhakrishna et al., 2001; Daly & Wilson, 2007; Turner et al., 2007; Nobes et al., 2019). While murders are, of course, the most extreme acts of child abuse, they make up only a small subset of all acts of child physical abuse. According to the FBI's Supplementary Homicide Report data, under 400 people under the age of 18 were murdered by a parent or stepparent in 2019 (Kaplan, 2019). This is about 0.06% of the estimated 650,000 children in the United States who were abused or neglected in 2019 according to the National Child Abuse and Neglect Data System (NCANDS), which is itself an undercount of the true number of abused children (U.S. Department of Health & Human Services, 2020). Because non-fatal child abuse is far more widespread, and is predictive of abuse that may be fatal (Johnson, 2000), it is important to understand whether the trend of non-biological parents being more abusive holds for these less serious offenses.

A number of studies have addressed this and indeed found that the Cinderella effect holds when it comes to non-fatal instances of child physical abuse (Daly & Wilson, 2005; Hilton et al., 2015; Radhakrishna et al., 2001). However, these studies have a serious flaw as reporting biases may lead to findings of a Cinderella effect where none exists. Consider, for example, a man who hits his biological

[1] The Cinderella effect is widely represented in popular culture - with its name originating from the 1950 Disney movie *Cinderella*, though stories of abusive stepparents far predate this movie. In particular, stepmothers, have often depicted as negative and abusive in the media (Hall, 1904; Waley, 1947; Disney et al., 1950; Whalley, 1972; Claxton-Oldfield & Butler, 1998).

child and a man who hits his girlfriend's child. If the former is less likely to be reported for the incident than the latter, then mechanically there would be more evidence of the Cinderella effect even though rates of abuse are the same for both groups. Given the high levels of underreporting of child abuse (Font & Maguire-Jack, 2020), even in victimization surveys (Tjaden & Thoennes, 1998), and differences in state laws that outline reporting guidelines (Child Welfare Information Gateway, 2019) the degree and direction of any reporting bias - that is, whether certain groups are more or less likely to be reported for the same action - may have a profound effect on any studies examining the Cinderella effect.

In this study we use an approach that we argue both minimizes the effect of reporting bias *and* examines cases which are most likely to lead to future harm. Namely, we examine child physical abuse cases where the victim suffered a *serious injury*. This study examines whether physically abusive biological parents seriously injure their children at differential rates than abusive stepparents and abusive unmarried partners of parents. Whereas abuse incidents that result in no injury or a minor injury such as a bruise may be ignored or explained away, serious injuries including broken bones or severe lacerations are far harder to hide or ignore. In fact, Flaherty et al. (2008) found that physicians were more likely to report suspected child abuse when the child suffered a serious injury than when they suffered a minor injury. If this pattern holds true for our data, then cases that result in a serious injury are likely less impacted by reporting biases than incidents with a minor injury or no injury, allowing for an assessment of the Cinderella effect that is less marred by reporting problems. We find that unmarried partners of biological parents, but not stepparents, are significantly more likely to injure their victims than biological parents are, partially supporting the Cinderella effect.

2 Literature Review

Child abuse is a prevalent and ongoing problem that occurs throughout the United States and the world. Approximately 18% of adults in the United States reported being a victim of physical abuse at some time in their childhood (Font & Maguire-Jack, 2020). According to the National Child Abuse and Neglect Data System (NCANDS), over 650,000 US children were victims of child abuse or neglect in 2019 (U.S. Department of Health & Human Services, 2020). However, because the NCANDS is a voluntary reporting system, the true number of abused and neglected children is likely much higher (Azar & Wolfe, 2006; Kim et al., 2017). Globally, the World Health Organization estimates that up to one billion

children over the age of two are abused or neglected in a given year (World Health Organization, 2020).

Child abuse is an important and pressing problem because of both high prevalence rates and the short-term and long-term consequences that result from it (Arata et al., 2005; Currie & Spatz Widom, 2010; Sousa et al., 2011; Al Odhayani et al., 2013; World Health Organization, 2020). Short-term consequences for the victim include physical injury, mental distress, poor parent-child relationships, lower academic achievement, and increased anger (Al Odhayani et al., 2013; World Health Organization, 2020). Child abuse can also result in lifelong consequences including increased unemployment, poverty, mental and physical health problems, and engagement in risky behaviors including drug use and crime (Arata et al., 2005; Currie & Spatz Widom, 2010; Sousa et al., 2011; World Health Organization, 2020). Research on the "cycle of violence" has consistency found that while most victims of child abuse do not grow up to become abusers themselves, experiencing abuse as a child is among the strongest predictors of violent perpetration - including both intimate partner violence and child abuse - as well as other crimes when the child victim becomes an adult (Curtis, 1963; Silver et al., 1969; Widom, 1989; Heyman & Slep, 2002; Milaniak & Widom, 2015; Myers et al., 2018).

While child abuse can occur to any child at any point in time (Laskey et al., 2012), some children are more likely to be victims of abuse than others. There are individual-level, community-level, and family-level risk factors for child abuse (Sedlak, 1997; Brown et al., 1998; Ethier et al., 2004; Stith et al., 2009; White et al., 2015). While some risk factors vary by type of abuse or neglect, there are several risk-factors that apply to child abuse more broadly (White et al., 2015). For instance, parents who are less involved with their children, are dissatisfied with their children, have poor relationships with their children, have mental health problems, or engage in substance abuse are more likely to commit child abuse (Brown et al., 1998; Stith et al., 2009; White et al., 2015). Additionally, families who live in urban areas, have low household incomes, are welfare dependent, who have high levels of family conflict, or who have large numbers of children are more likely to have a history of child abuse (Sedlak, 1997; Brown et al., 1998; Ethier et al., 2004). Children who live in certain types of family structures are also more likely to be abused. In particular, children who live with stepparents are more likely to be abused than children who live with one or both biological parents, a finding referred to as the "Cinderella effect" (Turner et al., 2007; Temrin et al., 2011; Nobes et al., 2019).

There are two main theoretical perspectives that help explain why the Cinderella effect occurs: the evolutionary perspective and stress theory. According to the evolutionary perspective, living organisms,

including humans, are biologically predisposed to want to ensure the survival of their genetic material by having offspring (Daly & Wilson, 2007). This perspective also argues that biological parents are less likely to abuse their own child because they are incentivized to continue their genetic line. Because stepparents and unmarried partners of children's parents do not share genes with these children, and caring and investing in them does not contribute to reproductive success, these groups of parental figures may prefer their own biological children to those of their spouse (Burgess & Drais, 1999). Supporting research has found that when stepparents live in a home with both their biological children and their stepchildren, and thus when they have the opportunity to abuse both, they are more likely to abuse their stepchildren (Hilton et al., 2015). The evolutionary perspective posits that working to ensure the survival of non-biologically related children is accompanied with high costs, such as sacrificing time, money, and other resources, and low benefits because stepparents are not helping their own genetic line survive. Accordingly, many studies examining the Cinderella effect support the evolutionary perspective (Daly & Wilson, 1985; Radhakrishna et al., 2001; Weekes-Shackelford & Shackelford, 2004; Daly & Wilson, 2007).

The second theory proposed to explain the Cinderella effect, stress theory, states that stepfamilies experience more stress than other types of families, such as single-parent or two biological parent families. Stress theory also posits that this additional stress is related to the perpetration of child abuse and maltreatment (Giles-Sims & Finkelhor, 1984). There is ample evidence that stepfamilies feel more stressed, on average, than other family types. For example, a survey of Australian families found that stepfamilies are perceived as more conflicted and negative than biological families (Planitz & Feeney, 2009). Survey research has found that children in stepfamilies are more likely to be abused than children living with two biological parents, even when the abuser is their biological parent (Turner et al., 2007). With regard to stepparents, research finds that stepparents are seen as being less caring (Planitz & Feeney, 2009) and experience more stress and difficulty in raising their partner's children than their own (MacDonald & DeMaris, 1996; Shapiro, 2014).

The literature on child abuse consistently find that non-biological parents are more likely to abuse their partner's children than they are for their own children, and with varying support for each theory. An issue with these studies - and with all studies of the Cinderella effect that measure crimes less serious than murder - is that even minor differences in reporting rates by victim-offender relationship can drastically change findings. The ideal study of the Cinderella effect would measure the rate of child abuse by parental figure group and compare that to the share of children in these relationships. If, for

example, the share of children being abused by stepparents was greater than the share of children living with stepparents, that would be evidence in favor of the Cinderella effect. Given perfect reporting - that is, all instances of child abuse are included - this simple calculation would be sufficient for evaluating a Cinderella effect. As with all crime data, however, reported data is far from perfect.

Past research has found child abuse data is underreported, including in victimization surveys, meaning that any measure would undercount child abuse prevalence (Tjaden & Thoennes, 1998; Font & Maguire-Jack, 2020). Even an undercounted measure of child abuse could be used to examine the Cinderella effect as long as there is no difference in reporting by victim-offender relationship. If there is reporting bias by the relationship then any results could be simply due to differences in reporting rates rather than true differences in abuse. For example, if abuse rates are the same but biological parents are less likely to be reported then we would see evidence of the Cinderella effect in the data even though the effect is not real. One reason why reporting rates may differ based on the perpetrator's relationship to the child is because state laws outlying mandatory reporting of suspected child abuse differ. For example, in Oklahoma, an individual is, at minimum, only required to report suspected child abuse when the alleged perpetrator is a "person responsible for the child" which is a parent or legal guardian, a person over age 18 who lives in the same home as the child, or an official employee of a residential center, daycare, or day treatment program operator (Child Welfare Information Gateway, 2019). Notably, this definition does **not** include a non-habituating unmarried partner of the child's biological parent. However, in Pennsylvania, suspected child abuse must be reported if the alleged perpetrator is in any of the aforementioned groups or is a "A paramour or former paramour of the child's parent" or "A person age 14 or older and responsible for the child's welfare" (Child Welfare Information Gateway, 2019).

2.1 Current Study

In this study we address the issue of reporting bias by looking only at child abuse incidents reported to the police and seeing how the degree of victim injury changes based on the victim-offender relationship. We examine the likelihood that a child abuse case results in three different levels of injury severity: no victim injury, minor injury only, and serious injury. We expect that, relative to biological parent abusers, stepparents and unmarried partners are more likely to seriously injure their victim. We analyze no injury and minor injury as a test of reporting bias. If non-biological parents are truly more likely to injure their victim, we expect there to be a *lower* likelihood of no injury and minor injury and a *higher* likelihood of

serious injury relative to when the abuser is a biological parent. We argue that findings in the opposite direction suggests a reporting bias, where abusive non-biological parents are less likely to be reported in these instances compared to an otherwise similarly situated biological parent. The current study offers an important contribution to the literature because results will add robustness to past research on the Cinderella effect. As reporting bias is a potentially large and widespread problem in past research, our study reduces the likelihood that results are just due to this bias. Therefore, our study can provide evidence that non-biological parental figures *severely* physically abuse their victims at higher rates than biological parents, while largely avoiding reporting bias that may have affected past research. Additionally, from a practical standpoint, if child abuse results in differential rates of bodily injury based on the caregiver's relationship to the child then victim service agencies can better focus their limited resources on families in which these injuries are more likely to occur in order to better protect the physical well-being of the child.

Although most research on the Cinderella effect focuses on parents or stepparents, these are not the only parental figures present in a child's life. Unmarried partners of parents, such as short- or long-term boyfriends or girlfriends of the child's biological parents may have a substantial parental role in the child's life, including living in the same home as the child. As marriage rates have steadily declined in recent decades, particularly among young couples (United States Congress, 2020) - a recent study found that up to 25% of parents were unmarried (Livingston, 2018) - this group is increasingly important and merits further study. Most studies include biological parents, stepparents, and "other adults" as perpetrator groups, leaving out this specific and potentially large group of child abusers. Just like biological parents and stepparents, unmarried partners of parents may spend significant amounts of time with their partner's children and may even hold a parental role. However, unlike the other two parental groups, this group may not have close or trustworthy relationships with their partner's children, potentially making abuse and subsequent injuries more likely. For these reasons, the current paper also examines unmarried partners of the child's parent as an outcome group alongside biological parents and stepparents.

To formalize our expectations, we present two hypotheses:

(1) We hypothesize that stepparents and unmarried partners are more likely to seriously injure their victim when compared to biological parent abusers.

(2) We hypothesize that there will be a lower likelihood of no injury or minor injury when stepparents and unmarried partners are the abusers relative to when the abuser is a biological parent.

3 Data

This study uses data from the National Incident-Based Reporting System (NIBRS), an incident-level dataset compiled by the FBI which provides detailed information about every criminal incident reported to the police (Kaplan, 2021b). This includes information about the victim, the offender, the relationship between these people, and whether the victim was injured during the crime. We use each of these variables in this study to assess how the victim-offender relationship in cases of child physical abuse affects the likelihood of the victim suffering a serious injury. We use Kaplan (2021a)'s concatenated NIBRS data for the years 1991 through 2019 which is every year of data available before the Covid-19 pandemic.[2]

A commonly used alternative data set for measuring crime in the United States is the National Crime Victimization Survey which asks respondents whether they have been victimized and details about the victimization such as their relationship to the offender and their degree of injury. However, this data groups together parental figure abusers into a single category of "parent or step-parent," preventing its use to analyze differences in abuse between biological parents and other parental figures.

As this study examines child physical abuse by a parent or parental figure, we subset NIBRS to only incidents that match the following requirements. First, the victim must be under age 18 to limit the sample to children who likely live with their parent or a parental figure. Second, the offender must be the victim's biological parent, their stepparent, or the boyfriend or girlfriend of the child's biological parent.[3] NIBRS relationship categories are mutually exclusive, meaning that unmarried partners cannot also be the victim's biological parent. These relationships are based on information known to the police at the time of making the report. This means that men who believe themselves to be the victim's biological father but are in fact not the father - which a systematic review of research finds occurs to approximately 4% of fathers (Bellis et al., 2005) - would be misidentified as the victim's biological parent.

Finally, NIBRS allows for up to 10 offenses to be recorded for a single incident. We consider an incident to be a case of child physical abuse if at least one of these offenses are simple or aggravated assault. Incidents where other crimes are involved are included as long as the incident also has simple or aggravated assault as an offense. In practice, however, most victims only have a single offense reported

[2]While NIBRS 2020 data is available from the FBI, we do not include 2020 due to possible changes in crime and reporting patterns due to the Covid-19 pandemic.

[3]NIBRS data does not differentiate between biological or adopted children. As only 1.2% of children live with an adoptive parent, including those who live with one biological parent (Anderson et al., 2022), this variable is likely largely biological parents. However, if adoptive parents are more likely to be abusive than biological parents this would capture a higher rate of adoptive parents than in the general public. For simplicity, in this paper we refer to this group as "biological parents."

in the incident (Kaplan, 2021a). In the present data nearly 99% of victims only have one offense - simple or aggravated assault - recorded. Fewer than 0.1% of these incidents have a sexual offense co-occurring alongside the physical abuse.

In approximately 12% of these incidents there is a second offender involved, and about half of these second offenders are parents or parental figures. As the data do not indicate exactly which offender caused the injury, having multiple offenders may lead to incidents where the same victim had both biological and non-biological offenders. In effect, these victims would be both treated (i.e., abuser is a biological parent) and not treated (i.e., abuser is a stepparent or unmarried partner) at the same time which would prevent proper analysis. To prevent this we exclude any incident where there was more than one offender.

Finally, we control for several victim and offender demographics. In approximately 6.4% of incidents, at least one of these variables is missing. We remove incidents with any missing variable. We used Chi-squared tests to determine if missingness for sex or race for both victim and offender were related to whether the victim was seriously injured. Serious injury was significantly related to missingness for offender sex ($p<0.01$) but not for offender race, victim sex, or victim race. As the data was not missing completely at random we include controls for victim and offender race and sex.

The final sample in this study is 502,121 victims of child physical abuse between 1991 and 2019 with nearly 20,000 of these victims suffering a serious injury. These data come from 7,389 police agencies in 45 states and Washington DC that reported at least one incident that met the study criteria within the time period studied. The victims included are not necessarily unique victims. NIBRS does not provide any identifier for either victims or offenders that allow for matching across incidents. Therefore, we cannot tell if the same victims or offenders are in the data multiple times.

3.1 Dependent Variable

For each victim, NIBRS provides up to five categories of injuries that the victim suffered during the incident. These injuries are based on either the responding police officer's observations or based on what the victim told the police he or she experienced and are not based on official medical examinations (Kaplan & Goh, 2020). There are eight possible injury categories available in NIBRS: "none," "apparent minor injuries," "other major injury," "possible internal injury," "apparent broken bones," "severe laceration,"

"unconsciousness," and "loss of teeth."[4] Following Kaplan & Goh (2020), we classify an injury as serious if the victim suffered any injury other than "apparent minor injuries." We classify these as serious as they are ones that are likely to be severe and potentially cause lasting or permanent damage to the victim.

Out of concern that even some of these types of injuries may fall victim to reporting biases or be overlooked, we rerun our analysis redefining serious injury as one where the victim suffered an "apparent broken bone" or a "possible internal injury."

3.2 Independent Variable

The variable of interest in this study is the relationship between the victim and his or her abuser. NIBRS has 27 possible relationship categories which are all mutually exclusive. As with other variables in NIBRS, this information is based on what is known to the police at the time they submit data to NIBRS. It is not, for example, based on the findings of a court. We use the following three categories which are the only parental figures available in NIBRS: biological parent, stepparent, and boyfriend or girlfriend of the child's biological parent, which we term "unmarried partner of the parent" for simplicity.[5] As biological parent is both the most common category and the variable of theoretical interest, we use it as the reference group and see how other groups compare. Since we subsetted the data to only incidents with a single offender, we are able to know who committed the crime and injured the child.

3.3 Control variables

For each victim and offender, we control for the three demographic variables that are available in NIBRS data for both groups: sex, age (in years), and race.[6] Past research has found that these variables are related to the rate at which crime victims report the crime to the police (Rand & Robinson, 2011). Sex is only available in NIBRS as female or male, there is no category for transgender or any other gender identity. Race categories are limited to American Indian or Alaskan Native, Asian, Black, Native

[4]The FBI defines severe laceration as "one that should receive medical attention" and says that the loss of consciousness "must be the direct result of force inflicted on the victim by the offender."

[5]NIBRS data provides the relationship in terms of relationship from the view of the victim. These categories are specifically "victim was child," "victim was step-child," and "victim was child of boyfriend/girlfriend."

[6]In cases where the offender's age is unknown the police can report an estimated age range, and the average of this range is provided in NIBRS data (Kaplan, 2021b). Given the personal relationship between each victim and offender, the ages provided in NIBRS for these incidents are likely the exact age of the offender. Ethnicity is available for victims but not for offenders, and a substantial share of victim ethnicity is reported as "unknown."

Hawaiian or other Pacific Islander, and White. This variable is based on the officer's perception of each individual's race and does not allow for mixed raced individuals to be identified as such (Kaplan, 2021b).

While NIBRS data is a national dataset run by the FBI, agencies can report either to the FBI directly or to a state-level agency in their home state, which then sends the data to the FBI. There are considerable differences in agency participation to NIBRS across states with some states having zero agencies participate while others have every agency in the state participate (Kaplan, 2021b). Past research has also found differences in reporting behavior across states, such as South Dakota which reported zero serious injuries - among any relationship group - in 2006 (Kaplan & Goh, 2020). Participation to NIBRS has also grown over time meaning that there may be differences in behavior or reporting over time. To control for potential differences in reporting over time or between states, we include control variables for the agency's home state and the year of the incident.

4 Methods

The current paper uses logistic regression to examine how the relationship between the child victim and their adult abuser affects their likelihood of the victim experiencing one of three injury outcomes: no injury, serious injury, and serious injury using our more stringent definition. We do not analyze minor injury here because comparing minor injury against receiving either no injury or a serious injury would in effect be comparing it against two opposite sides of the potential injury spectrum.[7] As minor injury is an important outcome, we analyze it in the multinomial logistic regression discussed below. For these logistic regression analyses we use the following estimation:

$$log\frac{p(injury)}{1-p(injury)}_{its} = \beta_0 + \beta_1 Relationship_i + \eta Victim_i + \tau Offender_i + \zeta Year_t + \lambda State_s$$

where *injury* is a binary variable with a value of 1 if the victim experienced that outcome and a value of 0 otherwise. *Relationship* is the variable of interest and indicates if the offender was the child's biological parent (reference category), their stepparent, or their biological parent's unmarried partner

[7] Given the skew of the data this analysis would primarily be comparing against no injury as serious injury is relatively rare in comparison. Nonetheless, we believe it would be illogical to include the logistic regression comparing a middle injury group against each injury severity extremes.

(e.g. mother's boyfriend or father's girlfriend). As past research has found that victim and offender characteristics are related to domestic violence and victim injury, we include variables to control for sex, age, and race for both victims and offenders, as noted by *Victim* and *Offender*, respectively. (Tang & Davis, 1996; Hampton & Newberger, 1985; Sedlak, 1997; Fluke et al., 2003; Trocmé et al., 2003; Hussey et al., 2006; Stith et al., 2009; Merritt, 2009). $\zeta Year$, and $\lambda State$ are the year and state fixed effects, respectively, to control for differences over time or between states. All models are run using robust standard errors. We prefer logistic regression as it is generally not sensitive to skew, particularly in cases such as this study where there is a large sample to analyze (Pohar et al., 2004).

We then run a multinomial logistic regression with the outcome being the three injury severities - no injury (base category), minor injury, and serious injury. We include the same covariates as before and use robust standard errors. As a final robustness check we rerun the logistic regression model predicting serious injury out of all incidents that lead to an injury, excluding those without any victim injury. As incidents with an injury are likely more frequently reported than ones without an injury, this is another test against reporting bias.

In our main analyses we define child using the legal definition of a minor in the United States, which is anyone under the age of 18 according to the policies of nearly every state (Cornell Law School: Legal Information Institute, n.d.). However, as it is common in criminological literature to define a child using age cutoffs younger than 18 (Kemp et al., 2008; Seddighi et al., 2021; Zeanah & Humphreys, 2018), we also re-run our logistic regression analyses for a subset of incidents where the victim was younger than 12. We do this as an exploratory analysis to see if the definition of "child" affects our results. As this is exploratory we caution readers against interpreting the results of these analyses too strongly without confirmation from other studies.

5 Results

Table 1 shows summary statistics for each variable included in this study, for both all incidents and for incidents that led to a serious injury. For each variable other than age, this table shows the number and percent of individuals for each possible category. For age of victim and offender, this table shows the mean and standard deviation of these variables. Column 1 shows the variable category while column 2 shows each possible value in the category. Columns 3 and 4 show results for all incidents while columns 5 and

6 show only incidents that led to a serious injury. Victims can suffer multiple injuries so the values in the Injury Type rows do not sum up to the total number of incidents. Though rare, victims may be reported to have both minor and serious injuries. In these cases we consider the victim to experience a serious injury.

When considering the victim-offender relationship, there is relatively little difference between all incidents and serious injury incidents. In both cases the biological parent is the most common offender, at about 81% of incidents. Stepparents and unmarried partners make up approximately 12% and 8% of all incidents, respectively, and are both about 9.5% of the offenders of serious injury incidents. While the share of biological parents remain the same, this suggests that, at baseline and without controlling for anything else, unmarried partners are overrepresented - and stepparents are underrepresented - in serious injury incidents relative to all incidents. There are also differences among both victim and offender demographic variables between all incidents and serious injury incidents. Serious injury victims are more male, about four years younger, slightly more likely to Black and less likely to be White than all incident victims. Among offenders, those involved in a serious injury incident are more likely to be Black, less likely to be White, and about four years younger than offenders in all incidents. There is almost no difference in offender sex between all incidents and serious injury incidents.

Turning to the regression results, Table 2 presents the results of the logistic regression examining the effect of victim-offender relationship on the odds that the victim suffered a serious injury in a case of child physical abuse, controlling for victim and offender demographics and time and place variables.[8] Column 1 shows each variable included in the analysis while column 2 shows the odds ratios which are the percent change in the odds of an injury to occur, relative to the reference category. The reference category for victim-offender relationship is biological parent. Column 3 shows the 95% confidence interval while column 4 gives the p-values.

The results suggest that, compared to biological parents, unmarried partners of biological parents have significantly higher odds of injuring the child in cases of abuse, holding other variables constant while stepparents are statistically similar to biological parents. More specifically, stepparents have an odds ratio of 1.045, or 4.5% higher odds of seriously injuring their victims (95% CI [0.991, 1.102]). Considering the base rate of about 3.7% of victims suffering a serious injury, this is approximately 4.7% increase in the rate of seriously injured victims relative to victims of biological parents. This result is not statistically

[8]For each variable we chose the most common value as the reference category. The VIF coefficients are all smaller than 6.5 while the Tolerance coefficients (1/VIF) are greater than 0.15, suggesting little multicollinearity.

significant with a p-value of 0.101. Unmarried partners of the child's biological parent have about 2.5 times the increase in the odds of causing a serious injury than stepparents with an odds ratio of 1.118 (95% CI [1.060-1.178]). This is slightly less than a 12% increase in the rate of seriously injured victims relative to the biological parents. This result is statistically significant with a p-value of lower than 0.001.

As found in past research, there are also differences in the demographics of victims for serious injuries. Female victims and younger victims are significantly less likely to be seriously injured relative to male and older victims. Black victims are significantly more likely to be seriously injured relative to White victims, with no significant difference among other victim race groups relative to White victims. There are also significant differences among offender demographics with increased odds of victim serious injury when offenders are female, when they are younger, and when they are Black relative to being White.

Table 3, which follows the same format as Table 2, shows results of logistic regression again predicting serious injury but now using our more stringent definition including only cases where the victim suffered either a broken bone or a suspected internal injury. Results shown here are similar to using the broader definition. Relative to a biological parent, stepparents are again not significantly (p=0.167) more likely to serious injure their victim with an odds ratio of 1.064 (95% CI [0.974, 1.163]). Unmarried partners have a statistically significant (p=0.006) odds ratio of 1.118 (95% CI [1.033, 1.210]). These results suggest that our finding that unmarried partners are more likely to seriously injure their victim exists regardless of how we define serious injury and that stepparents are consistently statistically similar to biological parents.

Before turning to the remaining regression results, we reiterate how we test for reporting bias. If the Cinderella effect holds then we expect that non-biological parents are more likely to injure their partner's child in cases of child abuse than a biological parent is to their own child in a similar situation. Likewise, non-biological parents should be less likely to have cases where the victim did not suffer any injury. To test this we examine cases where the victim experiences the two other possible injury outcomes: no injury and minor injury. As we find evidence that unm are more likely to seriously injure their victim, we expect that they are also less likely to lead to minor or no injury, relative to a biological parent abuser. Findings otherwise are, we argue, evidence of reporting bias in which these offenders are less likely to be reported compared with a biological parent who commits the same act. We find partial support for a reporting bias.

Table 4 shows results for the logistic regression predicting that the victim did not suffer any injury. Stepparents are less likely than biological parents to have a victim without injury (OR=0.992, 95% CI [0.974, 1.010], though this result is not statistically significant with a p-value of 0.392. Unmarried partners have

an effect in the opposite direction as would be believed under a lack of reporting bias. For this group, their odds ratio is 1.080 (95% CI [1.056, 1.104]) and is statistically significant with a p-value of lower than 0.001.

As a robustness check, and to measure minor injury against no injury - rather than against both no injury and serious injury - we use multinomial logistic regression with the outcomes being the three levels of victim injury (excluding the more stringent definition of serious injury). Results for this analysis are shown in Table 5. Panel A shows the effect of each variable on the relative risk of a victim suffering a minor injury, relative to suffering no injury (the base category) while Panel B shows the effect on the victim suffering a serious injury.

Panel A shows that stepparents have a small, non-significant (p=0.341) increase in minor injury relative to biological parents with an relative risk ratio (RRR) of 1.009 (95% CI [0.990, 1.028]. Unmarried partners have a significant decrease (p<0.001) with an RRR of 0.917 (95% CI [0.897, 0.938]), indicating that they are less likely to cause minor injury relative to biological parents. Panel B shows results for serious injury and has similar trends to the logistic regression for the same outcome with a non-significant increase for stepparents and a significant increase for unmarried partners. The difference, however, is that the effect size is smaller for unmarried partners than in the prior analysis (RRR = 1.069, 95% CI [1.013, 1.128]) and has a larger p-value at 0.015. Given these consistent outcomes, our results suggest a robust finding that unmarried partners are more likely than biological parents to seriously injure their victim. Stepparents are also more likely to seriously injure their victim, however this finding is never statistically significant. These findings also provide evidence that lower levels of injury may fall victim to reporting bias.

Taken together, these findings suggest that, relative to biological parents, unmarried partners are significantly more likely to seriously injure their victim, and are less likely to minorly injure their victim, which we argue, is evidence of a reporting bias. However, unmarried partners are more likely to have an abuse case without any injury relative to biological parents, which does not conform to our hypothesis about reporting bias. Stepparents are not significantly different from biological parents for any outcome or model. While these results may in fact reflect reality, we consider this to be evidence that these cases, where the outcome is less severe than serious injury, are prone to reporting bias and that these findings are evidence of such bias, at least for unmarried partners. Given findings that non-biological parents are more likely to murder their partner's children (Daly & Wilson, 1985, 1994; Sariola & Uutela, 1992; Weekes-Shackelford & Shackelford, 2004; Harris et al., 2007; Radhakrishna et al., 2001; Daly & Wilson, 2007; Turner et al., 2007; Nobes et al., 2019), and the evidence shown in this study that unmarried partners are

also more likely to seriously injure their victims, it is unlikely that these groups would both be more likely to seriously injure their victim but less likely to inflict less severe levels of injury, including no injury at all.

As our final robustness check we rerun our primary model, the logistic regression predicting serious injury, now out of all incidents that suffered any degree of injury. As, we argue, incidents leading to injury are more likely to be reported, removing incidents without any injury means our comparison is less likely to be marred by reporting bias. As shown in Appendix Table A1, results are similar in both size and direction for unmarried partners. Relative to biological parents, this group has higher odds (OR=1.101) of inflicting a serious injury (95% CI [1.043, 1.163]) and this result is statistically significant with a p-value of less than 0.001. Stepparents now show a decrease relative to biological parents but now the effect size is very close to zero (OR=0.991, 95% CI [0.939, 1.045]) and the result is not statistically significant (p=0.734). As an alternative definition of child, Appendix Tables A2 and A3 show results for the serious injury and no injury, respectively, for only victims under the age of 12. Whereas our analysis for all victims showed a non-significant decrease for stepparents, in this analysis both stepparents and unmarried partners have a significant increase, relatively to biological parents, with a nearly identical odds ratio at 1.289 (95% CI [1.197, 1.389]) and 1.282 (95% CI [1.206, 1.362]), respectively. Both of these results are statistically significant with a p-value of less than 0.001. For no injury, unmarried partner moves from a significant increase for all victims to a non-significant decrease with an OR of 0.990 when examining only victims under the age of 12. Stepparents remains a decrease but now moves from a non-significant OR of 0.992 to a significant decrease of 0.840 ($p<0.001$, 95% CI [0.814, 0.867]).

6 Discussion

A large body of research reports evidence of the Cinderella effect – that stepparents abuse and kill their partner's children at higher rates than biological parents kill their own children. However, abuse less severe than homicide likely suffers from a large degree of reporting bias where some offenders, such as non-biological parents, are more likely to be reported to the police for the same behavior as other offenders. This may lead to the appearance of a Cinderella effect in these cases purely due to differences in reporting. We address this issue by looking at victims who suffered a serious injury as these injuries are the hardest to conceal or ignore, making it far more likely that they will be reported to authorities than victims with no injuries or only minor injuries. This study found partial support

for the Cinderella effect, extending the literature on this topic to include abuse cases that lead to serious injuries. It examined unmarried partners of the child's biological parent in addition to stepparents, and found support for the Cinderella effect for only unmarried partners. There are a number of key findings as well as theoretical and policy implications to this research that warrant additional discussion.

We found that unmarried partners were significantly more likely to seriously injure their partner's child during a physical abuse incident than biological parents were to their own child. Stepparents were also more likely to seriously injure their victim though this result was not statistically significant. In percent terms, stepparents were about 4.7% more likely to seriously injure the child relative to the biological parents, while unmarried partners were substantially more likely to do so - 12% more than biological parents. For unmarried partners, these findings are robust to different model specifications and when subsetting data to only incidents where the victim was injured. For stepparents, however, results are non-significant in every analysis. Therefore, we consider these findings robust. These findings partially support the Cinderella effect and our first hypothesis as only unmarried partners were significantly more likely to seriously injure their victim than a biological parent. That we found a stronger effect - both in terms of percent difference and whether the result was statistically significant - among unmarried partners than for stepparents, relative to biological parents, provides evidence that the Cinderella effect exists on a continuum.

Our second hypothesis, that there will be a lower likelihood of no injury or minor injury for non-biological parents compared to biological parents, is also partially supported. When looking at no injury in our logistic regression we find the opposite result, with a significant increase for unmarried partners and a non-significant decline for stepparents. In the multinomial regression, however, there is more support for this hypothesis with a significant decrease for unmarried partners relative to biological parents when analyzing minor injury. Again, there is no significant change for stepparents.

When examining the subset of incidents including only victims younger than 12, results were more in line with our hypotheses. Both stepparents and unmarried partners had significantly higher odds of serious injury than biological parents, supporting hypothesis 1. For hypothesis 2, both groups had lower odds of no injury than biological parents though this finding was non-significant for unmarried partners. These findings, in comparison to including children of all ages, suggests that there are heterogeneous effects of the Cinderella effect when examining different victim age groups.

The present study did not attempt to determine the precise mechanisms for why there are differences between biological parents, stepparents, and unmarried partners in their rates of inflicting serious injury.

Past research as well as the theoretical underpinnings of the Cinderella effect, however, can shed some light on potential mechanisms behind our results. Two theories in particular - the evolutionary perspective and stress theory - might explain why the Cinderella effect occurs, according to the present study's results, in child abuse cases that result in serious injuries. According to the evolutionary perspective, humans are biologically inclined to ensure the survival of their genetic line by preserving the well-being of their own offspring (Daly & Wilson, 2007). Because non-biological parents do not share genes with their partner's children, and caring and investing in them does not promote reproductive success and costs time, money, and other resources, these parental figures might be more prone to hurting these children, relative to their own biological children. Stress theory states that step-families experience more stress than families than just biological-parent families and that this added stress is associated with child abuse (Giles-Sims & Finkelhor, 1984). Future research on this topic should test these theories and examine the mechanisms behind the Cinderella effect.

Understanding the precise mechanisms will also help in devising effective policies to improve child safety. As unmarried partners are more likely to seriously injury their victims, policies that prioritize abuse cases where an unmarried partners is the aggressor may help reduce further serious injuries or the death of the child. This study's findings are unlikely to be homogeneous. While we did control for victim and offender age, race, and sex, there are important subgroups we were unable to analyze due to data constraints - such as family structure, socioeconomic status, and whether these incidents were chronic or one-off cases - that are important for future research. We recommend that future research attempt to better understand the mechanisms behind this study's findings. Our analysis subsetting to only victims under the age of 12 also demonstrates that there is likely to be considerable heterogeneity in findings by subgroups of victims and offenders. We therefore recommend that future research engage in exploratory analyses to see in which contexts, and for which victim or offender groups, the Cinderella effect most applies.

In particular, while NIBRS data does not include the relevant covariates listed above, the police agencies that reported this data to NIBRS will have many of these variables available. For example, for each incident the police agency will have the address where it occurred, allowing the data to be merged with administrative data such as Census data which has important covariates including average education, household structure, income, education, and demographics at small geographic levels. Police reports may also contain qualitative data such as interviews with the abusers or the victim. This information can help shed light on the precursors to abuse, including how frequently the abuse occurs and any near or long-term

precursors to this incident. It may also include information about the family such as the number of siblings the victim has - both stepsiblings and biological-siblings - and whether the victim was abused by any other person. With appropriate privacy restrictions to protect the child victim, and data sharing agreements with the police agencies, these data may be possible to collect. In cases where the abuse went to criminal court, researchers may be able to obtain transcripts of the hearing, which are a matter of public record.[9]

Data collection should also involve collecting primary data, both quantitative and qualitative, the victim and other people involved in the incident, including the offender, immediate family members, and law enforcement. While secondary data is useful for this research, primary data collection can allow far more questions to be answered by tailoring the data collection directly to these avenues of inquiry. Collecting data only from people involved in a child abuse incident could inadvertently lead to incorrect findings if some variable is correlated with child abuse but is no more common in abusive families than non-abusive families. We therefore recommend that any data collection effort gather data from both families where child abuse was reported and a control group of families without any reported abuse. It would be particularly useful if this was part of a longitudinal data collection and tracked people over a long period of time.

Being able to track victims over time allows for both a deeper understanding of the child abuse incidents that occur and can help address the theoretical perspectives behind the Cinderella effect. For example, the evolutionary theory suggests that adults may harm their partner's child to prioritize the survival of their own children. If, for example, a non-biological parent is abusive toward their partner's child but stops their abusive when they have a child with their partner - at which point the survival of their own genetic line is assured - this lends evidence towards this perspective. Longitudinal data, including interviews with members of the household over time, may also allow studies of the stress perspective as it can determine if abuse happens following increased stress by the abuser.

These avenues for future research can address some of the limitations of this study. This study's use of NIBRS data allows for an analysis of a far larger sample of abuse cases than past research, with slightly over 500,000 incidents in the present study. It includes data from agencies that cover approximately 152 million residents, about 46% of the United States population. As such, this study provides data on child abuse incidents in the United States broadly - though NIBRS does not contain data from the largest agencies in the country - rather than on a limited number of jurisdictions. These advantages,

[9]Protections for juvenile victims may mean that the victim is not identified by their full or actual name, limiting the ability for researchers to combine data from these records from other data sets by victim name.

however, come with tradeoffs. While there may be the same victim or offender present in the data multiple times - and how frequently this occurs may be related to the victim-offender relationship - this is no way to determine when this occurs in the NIBRS data. The data also has relatively limited data on theoretically important family, victim, and perpetrator level characteristics that impact the likelihood of abuse and, therefore, might also affect the association between victim-offender relationship and the odds of an injury occurring. Examples of these characteristics include family size, socioeconomic status, abuser education level, the strength of the relationship between the perpetrator and victim, offender mental health problems, history of abuse, and offender criminal history (Milner & Chilamkurti, 1991; Carrey et al., 1995; Brown et al., 1998; Merritt, 2009; Stith et al., 2009). Future research that is able to incorporate these variables would provide a more precise estimate and allow for better identification for which abuse situations should be a priority for policy makers, law enforcement, and social workers.

This study also defines biological parents as abusers of either their biological or adopted children, with no way in NIBRS data to differentiate between the two. As approximately 1.2% of children in the population are adopted, this is likely a rare occurrence in our data (Anderson et al., 2022). However, if adopted children are abused at higher rates - and if they are abused more severely - than biological children, they may be overrepresented in the data. If this occurs, our estimates will be conservative as we incorrectly treat non-biological parents as biological parents in cases where the child is adopted.

It is also unknown from the present data how much interaction unmarried partners have with the children, including whether they live in the same home as the child or spend time together unsupervised by the child's biological parent. This is problematic because the current paper would be comparing injuries from an abusive unmarried partner with injuries sustained as a result of abusive of parents and stepparents who likely always live with their victims. For an apples-to-apples comparison it is important that each offender has equal opportunity to abuse the child. If unmarried partners do not live with the child then they have more limited opportunities to abuse the child, which means that our results underestimate the effect of unmarried partners.

Simply put, if unmarried partners injure children at higher rates - as this study has found - but have less time to do so, their actual effect relative to biological parents, who likely live with the child, is higher than the present estimates. This issue is also present for biological parents as a divorced parent may not live with their child but is more prevalent in cases of unmarried partners. According to the US Census, in 2019 62.5% of children lived with their biological parents, with 94% of these parents being married.

Approximately 5.5% of children lived with one biological parent and one stepparent, while approximately a quarter of children (25.8%) lived with only one parent, primarily their mother (21.4% of children). This suggests that - entirely separate from any reporting bias - biological parents and stepparents have substantially more time with the child than unmarried partners, and therefore more opportunities to offend. As we find that unmarried partners have higher odds of inflicting serious injury than biological or stepparents, our results for unmarried partners may be conservative as they have more serious injury alongside potentially less opportunity to offend. However, we urge caution against interpreting this too strongly as the data used in the present study is unable to actually measure opportunities to offend - or, put another way, how much contact the offender actually has with the victim.

A second limitation regarding parent's unmarried partners is that it is unknown if parents of the victims break up with their partners after they discover their children's injuries. This is an important policy-relevant limitation because if parents often do break up with their partners after their children sustain abuse-related injuries, it would be difficult to establish policies aimed to target and stop these injuries from occurring. If the partner is the only abusive figure in the child's life, breaking up with them would be an effective way to end the abuse, even without government intervention.

Despite these limitations, the current study's findings offer important contributions to the literature on the Cinderella effect and offers avenues for future research both on the Cinderella effect and child abuse more generally. There are also a few policy-relevant implications of this study. While all children deserve the utmost attention and protection, because of resource constraints law enforcement and child protection agencies must prioritize cases that have the greatest possibility to injure the child victim. This study provides one way to triage cases and help determine which lead to the most serious outcomes. As assault against children cases had the highest levels of serious injury when the abuser was an unmarried partner of the victim's parents, relative to when the abuser was the child's biological parent, law enforcement and child protective services should prioritize these kinds of cases. Though this study is unable to examine repeat victimizations, past research has found that when victims are seriously injured they are more likely to be murdered by that abuser (Brewster et al., 1998; Cavanagh et al., 2007). As such, these findings suggest that agencies that prioritize these cases may save these children's lives.

This study expands on the current body of knowledge about the Cinderella effect by including parent's unmarried partners as an offender group in addition to stepparents and biological parents. By examining victims that suffered a serious injury we can largely mitigate reporting biases that affect abuse cases with

less serious injuries or no injuries. The key finding in this study is that, relative to biological parents, only unmarried partners are significantly more likely to seriously injure the child. By analyzing serious injuries, which we argue are more likely to be reported than minor or no injury, we can largely sidestep reporting bias that has affected past research. These findings extend support of the Cinderella effect to unmarried partners who likely have even fewer social bonds with the child than stepparents do and found that injuries that do not lead to the victim's death are more likely from this group than from biological parents. In response to this study's findings, law enforcement and child protective agencies should prioritize incidents in which the suspected abuser is an unmarried partner of the victim's biological parent.

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Table 1: Descriptive statistics about incidents studied

		All Incidents		Serious Injury	
Variable	Description	N (Mean)	% (SD)	N (Mean)	% (SD)
# of Incidents	-	502,121	100.00	18,536	3.69
Injury Type	Apparent Minor Injuries	253,920	50.57	1,109	5.98
	None	230,774	45.96	0	0.00
	Other Major Injury	8,087	1.61	8,087	43.63
	Apparent Broken Bones	3,887	0.77	3,887	20.97
	Possible Internal Injury	3,914	0.78	3,914	21.12
	Severe Laceration	3,280	0.65	3,280	17.70
	Unconsciousness	969	0.19	969	5.23
	Loss of Teeth	274	0.05	274	1.48
Offender Relationship	Biological Parent	405,383	80.73	15,048	81.18
	Stepparent	58,906	11.73	1,748	9.43
	Boyfriend/Girlfriend of Parent	37,832	7.53	1,740	9.39
Sex of Victim	Male	253,625	50.51	10,738	57.93
	Female	248,496	49.49	7,798	42.07
Race of Victim	White	355,447	70.79	12,138	65.48
	Black	137,427	27.37	6,041	32.59
	Asian/Pacific Islander	4,668	0.93	173	0.93
	American Indian/Alaskan Native	4,387	0.87	168	0.91
	Native Hawaiian/Pacific Islander	192	0.04	16	0.09
Age of Victim	-	10.2	5.31	6.93	6
Sex of Offender	Male	332,324	66.18	12,072	65.13
	Female	169,797	33.82	6,464	34.87
Race of Offender	White	356,832	71.06	12,140	65.49
	Black	135,998	27.08	6,020	32.48
	Asian/Pacific Islander	4,805	0.96	182	0.98
	American Indian/Alaskan Native	4,218	0.84	175	0.94
	Native Hawaiian/Pacific Islander	268	0.05	19	0.10
Age of Offender	-	36.17	8.81	32.34	9

*Note: Injury type percent is out of all victims that suffered an injury, not all victims total. These percents do not sum to 100% because victims may suffer multiple injuries.

Table 2: Logistic regression results for predicting serious victim injury

	OR	[CI]	P-value
Victim-Offender Relationship			
Stepparent	1.045	[0.991, 1.102]	0.101
Unmarried Partner of Parent	1.118**	[1.060, 1.178]	<.001
Age of Victim	0.900**	[0.897, 0.904]	<.001
Victim Gender			
Female	0.824**	[0.800, 0.850]	<.001
Victim Race			
Black	1.102*	[1.021, 1.190]	0.013
American Indian/Alaskan Native	0.919	[0.732, 1.154]	0.467
Asian	1.019	[0.816, 1.274]	0.866
Native Hawaiian or Other Pacific Islander	2.198	[0.954, 5.061]	0.064
Age of Offender	0.986**	[0.984, 0.988]	<.001
Offender Gender			
Female	1.065**	[1.030, 1.101]	<.001
Offender Race			
Black	1.163**	[1.077, 1.256]	<.001
American Indian/Alaskan Native	1.218	[0.978, 1.516]	0.079
Asian	1.027	[0.825, 1.278]	0.814
Native Hawaiian or Other Pacific Islander	1.514	[0.733, 3.127]	0.263

Reference categories are the most common value in each variable. The reference categories are as follows: victim-offender relationship: biological parent; victim sex: male; victim race: White; offender sex: male; offender race: White. Each model includes year and state fixed effects and uses robust standard errors.

*p<0.05

**p<0.01

Table 3: Logistic regression results for predicting serious victim injury including only broken bones or possible internal injuries

	OR	[CI]	P-value
Victim-Offender Relationship			
Stepparent	1.064	[0.974, 1.163]	0.167
Unmarried Partner of Parent	1.118**	[1.033, 1.210]	0.006
Age of Victim	0.849**	[0.843, 0.854]	$<.001$
Victim Gender			
Female	0.889**	[0.848, 0.932]	$<.001$
Victim Race			
Black	0.897	[0.791, 1.017]	0.090
American Indian/Alaskan Native	0.940	[0.695, 1.271]	0.688
Asian	1.066	[0.746, 1.524]	0.725
Native Hawaiian or Other Pacific Islander	1.503	[0.535, 4.223]	0.440
Age of Offender	0.982**	[0.979, 0.986]	$<.001$
Offender Gender			
Female	0.913**	[0.866, 0.962]	0.001
Offender Race			
Black	0.979	[0.863, 1.109]	0.736
American Indian/Alaskan Native	1.116	[0.832, 1.498]	0.464
Asian	0.753	[0.523, 1.086]	0.129
Native Hawaiian or Other Pacific Islander	2.489*	[1.061, 5.838]	0.036

Reference categories are the most common value in each variable. The reference categories are as follows: victim-offender relationship: biological parent; victim sex: male; victim race: White; offender sex: male; offender race: White. Each model includes year and state fixed effects and uses robust standard errors.
*p<0.05
**p<0.01

Table 4: Logistic regression results for predicting no victim injury

	OR	[CI]	P-value
Victim-Offender Relationship			
Stepparent	0.992	[0.974, 1.010]	0.392
Unmarried Partner of Parent	1.080**	[1.056, 1.104]	<.001
Age of Victim	0.972**	[0.971, 0.973]	<.001
Victim Gender			
Female	1.163**	[1.150, 1.177]	<.001
Victim Race			
Black	1.179**	[1.141, 1.217]	<.001
American Indian/Alaskan Native	1.309**	[1.201, 1.427]	<.001
Asian	1.138**	[1.040, 1.245]	0.005
Native Hawaiian or Other Pacific Islander	0.715	[0.470, 1.087]	0.116
Age of Offender	1.011**	[1.010, 1.012]	<.001
Offender Gender			
Female	1.163**	[1.150, 1.177]	<.001
Offender Race			
Black	0.873**	[0.845, 0.901]	<.001
American Indian/Alaskan Native	1.038	[0.951, 1.133]	0.402
Asian	0.859**	[0.786, 0.939]	0.001
Native Hawaiian or Other Pacific Islander	1.072	[0.756, 1.522]	0.696

Reference categories are the most common value in each variable. The reference categories are as follows: victim-offender relationship: biological parent; victim sex: male; victim race: White; offender sex: male; offender race: White. Each model includes year and state fixed effects and uses robust standard errors.

*p<0.05

**p<0.01

Table 5: Multinomial regression results for predicting victim injury type (no injury is base outcome)

	RRR	[CI]	P-value
Victim-Offender Relationship			
Stepparent	1.009	[0.990, 1.028]	0.341
Unmarried Partner of Parent	0.917**	[0.897, 0.938]	<0.001
Age of Victim	1.038**	[1.037, 1.039]	<0.001
Victim Gender			
Female	0.866**	[0.855, 0.876]	<0.001
Victim Race			
Black	0.838**	[0.811, 0.866]	<0.001
American Indian/Alaskan Native	0.760**	[0.696, 0.830]	<0.001
Asian	0.874**	[0.797, 0.958]	0.004
Native Hawaiian or Other Pacific Islander	1.305	[0.851, 2.000]	0.222
Age of Offender	0.990**	[0.989, 0.991]	<0.001
Offender Gender			
Female	1.085**	[1.071, 1.099]	<0.001
Offender Race			
Black	1.139**	[1.102, 1.176]	<0.001
American Indian/Alaskan Native	0.946	[0.865, 1.034]	0.222
Asian	1.170**	[1.069, 1.281]	0.001
Native Hawaiian or Other Pacific Islander	0.896	[0.627, 1.281]	0.548

(a) Panel A: Minor Injury

	RRR	[CI]	P-value
Victim-Offender Relationship			
Stepparent	1.051	[0.996, 1.109]	0.071
Unmarried Partner of Parent	1.069*	[1.013, 1.128]	0.015
Age of Victim	0.918**	[0.915, 0.922]	<0.001
Victim Gender			
Female	0.765**	[0.742, 0.789]	<0.001
Victim Race			
Black	1.005	[0.929, 1.087]	0.897
American Indian/Alaskan Native	0.803	[0.638, 1.011]	0.062
Asian	0.948	[0.754, 1.190]	0.643
Native Hawaiian or Other Pacific Islander	2.580*	[1.070, 6.219]	0.035
Age of Offender	0.981**	[0.978, 0.983]	<0.001
Offender Gender			
Female	1.111**	[1.074, 1.149]	<0.001
Offender Race			
Black	1.246**	[1.152, 1.348]	<0.001
American Indian/Alaskan Native	1.186	[0.948, 1.482]	0.135
Asian	1.117	[0.892, 1.397]	0.335
Native Hawaiian or Other Pacific Islander	1.411	[0.663, 3.001]	0.372

(b) Panel B: Serious Injury

Reference categories are the most common value in each variable. The reference categories are as follows: victim-offender relationship: biological parent; victim sex: male; victim race: White; offender sex: male; offender race: White. Each model includes year and state fixed effects and uses robust standard errors.

*p<0.05

**p<0.01

Appendix Table A1: Logistic regression results for predicting serious victim injury for incidents with any injury

	OR	[CI]	P-value
Victim-Offender Relationship			
Stepparent	0.991	[0.939, 1.045]	0.734
Unmarried Partner of Parent	1.101**	[1.043, 1.163]	0.001
Age of Victim	0.881**	[0.878, 0.885]	$<.001$
Victim Gender			
Female	0.901**	[0.873, 0.930]	$<.001$
Victim Race			
Black	1.239**	[1.146, 1.340]	$<.001$
American Indian/Alaskan Native	1.111	[0.881, 1.400]	0.374
Asian	1.096	[0.875, 1.373]	0.425
Native Hawaiian or Other Pacific Islander	2.047	[0.806, 5.198]	0.132
Age of Offender	0.992**	[0.990, 0.994]	$<.001$
Offender Gender			
Female	0.994	[0.961, 1.028]	0.723
Offender Race			
Black	1.129**	[1.044, 1.220]	0.002
American Indian/Alaskan Native	1.284*	[1.024, 1.609]	0.030
Asian	0.967	[0.775, 1.207]	0.770
Native Hawaiian or Other Pacific Islander	1.607	[0.700, 3.690]	0.263

Reference categories are the most common value in each variable. The reference categories are as follows: victim-offender relationship: biological parent; victim sex: male; victim race: White; offender sex: male; offender race: White. Each model includes year and state fixed effects and uses robust standard errors.

*p<0.05

**p<0.01

Appendix Table A2: Logistic regression results for predicting serious victim injury, for victims under the age of 12

	OR	[CI]	P-value
Victim-Offender Relationship			
Stepparent	1.289**	[1.197, 1.389]	<0.001
Unmarried Partner of Parent	1.282**	[1.206, 1.362]	<0.001
Age of Victim	0.822**	[0.816, 0.828]	<0.001
Victim Gender			
Female	0.847**	[0.816, 0.878]	<0.001
Victim Race			
Black	1.041	[0.949, 1.141]	0.399
American Indian/Alaskan Native	0.975	[0.745, 1.276]	0.855
Asian	1.050	[0.803, 1.374]	0.722
Native Hawaiian or Other Pacific Islander	3.391**	[1.444, 7.959]	0.005
Age of Offender	0.983**	[0.980, 0.985]	<0.001
Offender Gender			
Female	1.212**	[1.164, 1.261]	<0.001
Offender Race			
Black	1.074	[0.978, 1.178]	0.134
American Indian/Alaskan Native	1.075	[0.828, 1.396]	0.588
Asian	0.913	[0.700, 1.192]	0.504
Native Hawaiian or Other Pacific Islander	0.689	[0.287, 1.654]	0.404

Reference categories are the most common value in each variable. The reference categories are as follows: victim-offender relationship: biological parent; victim sex: male; victim race: White; offender sex: male; offender race: White. Each model includes year and state fixed effects and uses robust standard errors.

*p<0.05

**p<0.01

Appendix Table A3: Logistic regression results for predicting no victim injury, for victims under the age of 12

	OR	[CI]	P-value
Victim-Offender Relationship			
Stepparent	0.840**	[0.814, 0.867]	<0.001
Unmarried Partner of Parent	0.990	[0.961, 1.019]	0.489
Age of Victim	0.964**	[0.962, 0.967]	<0.001
Victim Gender			
Female	1.243**	[1.223, 1.264]	<0.001
Victim Race			
Black	1.273**	[1.219, 1.328]	<0.001
American Indian/Alaskan Native	1.334**	[1.189, 1.498]	<0.001
Asian	1.134	[0.999, 1.286]	0.051
Native Hawaiian or Other Pacific Islander	0.828	[0.443, 1.547]	0.553
Age of Offender	1.014**	[1.013, 1.015]	<0.001
Offender Gender			
Female	0.905**	[0.889, 0.922]	<0.001
Offender Race			
Black	0.898**	[0.860, 0.937]	<0.001
American Indian/Alaskan Native	1.107	[0.986, 1.243]	0.084
Asian	0.885	[0.782, 1.001]	0.052
Native Hawaiian or Other Pacific Islander	0.880	[0.509, 1.520]	0.646

Reference categories are the most common value in each variable. The reference categories are as follows: victim-offender relationship: biological parent; victim sex: male; victim race: White; offender sex: male; offender race: White. Each model includes year and state fixed effects and uses robust standard errors.

*p<0.05

**p<0.01