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Toward a More Holistic Understanding of Filicide: A Multidisciplinary Analysis of 32 Years of U.S. Arrest Data

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Abstract

Filicide is the killing one or more children by a parent, stepparent, or other parental figure. This study presents the first comprehensive analysis of U.S. filicide, drawn from 94,146 filicide arrests tabulated over a 32-year period in the U.S. Federal Bureau of Investigation's Supplementary Homicide Reports (SHR). Filicides comprised 15% of all murders during this period. Modal victim age was less than one year old. One-third of victims were under a year old; over two-thirds were age six or less. Fathers were as likely as mothers to kill infants. The mean age of offenders was 32 years with a mode of 22 years, and nearly three-quarters were age 18 to 45. Female offenders were notably younger than their male counterparts. Black (or African American) offenders were significantly overrepresented in filicide compared to Whites. Most common killing methods included using hands and feet, strangulation, beating, asphyxiation, drowning, and defenestration. Stepparents were not at higher risk of filicide than genetic parents, but were twice as likely to kill using firearms. Synthesizing these results with studies from other fields, we propose three transdisciplinary, empirically-informed filicide categories primarily defined by effects of (1) psychopathology associated with neurotransmitter disturbances, (2) gender and sex hormones, and (3) evolutionary motives. Approaching filicide using this proposed hypothetical framework for future research may help identify at-risk populations and improve prevention and treatment.

Keywords

filicide; infanticide; neonaticide; Supplementary Homicide Reports; transdisciplinary filicide categories; forensic psychiatry

Introduction

In human society, filicide—the killing of offspring by parents—is a crime that science and society have struggled to comprehend. The dearth of research, methodological problems in

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existing research, and overall lack of theoretical progress has been lamented [1, 2]. Filicide can be broadly defined as the killing of a child of any age by a parent, stepparent, or other established parental figure. As defined by Resnick in 1969, filicide was applicable to the murder of a son or daughter older than 24 hours and did not have an upper age limit [3]. Common subdivisions of filicide by victim age are neonaticide (newborn victims less than a day old) and infanticide (infant victims less than a year old [4, 5]. Historically, the term filicide did not exclude adult offspring victims; however, present day scholars routinely focus their research on juvenile victims under age 18. We have been unable to find published data addressing adult filicide victims beyond case studies.

There is a notable international literature on fatal child abuse [6–8]. The World Health Organization has estimated there are 31,000 deaths of children under age 15 annually [8]. In comparing homicide rates among 26 countries, the Center for Disease Control found that the U.S. child homicide rate of 2.6 per 100,000 children under age 15 far exceeded the rate for other industrialized countries, yet was well below the rate given for some underdeveloped countries. [9]. U.S. Department of Justice data [10] reported that parents killed 11,000 children between 1976 and 1997. Given investigative and reporting challenges, scholars justifiably presume that databases on fatal child abuse are gross underestimates of the true scope of this global problem [11–14]. Moreover, high quality death registration data on fatal child maltreatment is only available in a small minority of countries worldwide [15].

Filicides are believed to account for roughly two-thirds of fatal child abuse cases [4, 16], although extensive international analyses have been lacking [13]. The age of greatest risk for dying by child homicide is in infancy, especially during the first few months of life; of infants killed, almost 10% die within the first week of life [17]. For younger infants, genetic mothers are the most common perpetrators [1, 18]. On the whole, however, stepparents are believed to be at higher risk of committing filicide than genetic parents [1].

Various explanations for filicide exist. In *The Descent of Man*, Darwin suggested that infanticide was a check on human population growth [19]. An evolutionary approach [1] found that “parental investment theory” best explained filicide. In this model, filicidal parents kill to control reproduction outcomes by manipulating resource allocation or reproductive behavior of mates. Other motives include psychosocial stress (such as financial hardship, housing difficulties, marital difficulties, and social isolation), substance abuse or dependence, and children considered difficult to care for due to factors such as excessive crying [4, 20–22]. Additionally, in paternal filicide, a father may misinterpret a child’s behavior as threatening and overreact [4, 22], perhaps impulsively [14].

Resnick divided the reasons for committing filicide into five distinct groups [3, 4]. In *altruistic* filicide, the parent believes that he or she is relieving real or imagined suffering by killing the child and that dying is in the child’s best interests. It is the most commonly cited form of filicide [4]. The *acutely psychotic* parent kills a child in response to psychosis and not to a rational motive. *Unwanted child* filicide involves a parent killing a child perceived to be a hindrance. *Fatal maltreatment*—or accidental filicide—is the unintentional death of a child resulting from parental abuse or neglect. *Spouse revenge* filicide is the killing of a child by a parent in order to make the other parent suffer.

Differences have been reported between filicides committed by mothers and those committed by fathers [1, 5]. Mothers who killed their children more often did so at younger ages and had younger victims than did filicidal fathers [5]. Younger filicidal mothers also commonly were poor, had limited resources, were under psychosocial stress, and lacked family and community support, whereas older filicidal mothers were often noted to suffer from mental illness and lack criminal histories [1, 2, 23]. The latter may also have received

mental health care predating their homicidal acts [2, 5]. In contrast, the motivation of filicidal fathers more often hinged upon such factors as anger, jealousy, and marital and life discord, and most had not previously sought psychiatric help [5]. Fathers were more likely than mothers to kill their spouses when committing a filicidal act [1, 5]. Additionally, fathers tended to use more violent means of causing death than did mothers, including firearms, stabbing, head injury, hitting, or kicking [4].

In ancient times, fathers were not necessarily punished for killing infants. Currently, fathers in western culture may face harsher punishments than mothers for killing their children. This is partly because some legal systems in Europe have infanticide laws, which hold women less accountable for their filicidal actions due to maternal stress factors [24]. Also, there is evidence that judges, juries, and even investigators perceive women as less responsible than men who commit infanticide [25]. Finally, women are more likely to be successful in using the insanity defense to avoid criminal responsibility [26].

These gender differences add to the supposition that there are genetic, hormonal, evolutionary, and other biological factors that influence and shape the commission of filicide. Studies using animal models—primarily rodents—have examined these putative factors. They have found evidence suggesting that pup-killing may be predatory in nature [27] and increased by either serotonergic depletions [27–29] or administration of testosterone [30–33]. Evolutionary studies have also proposed a host of strategies and counterstrategies for and against filicide in many species [1, 34]. These studies, although at times plagued by mixed results and methodological inconsistencies, are a natural scientific step given the observation that virtually all animals have certain inherited and relatively predictable parenting behaviors.

In light of the above background, the aims of the present work will be twofold. First, we will present the first comprehensive study of U.S. filicide data using a national representative sample of over 630,000 homicide arrests. Our definition of filicide is simply the killing of a child of any age by a parent. Given that filicide and parent-child relationships do not end when offspring reach age 18, we have included all victim ages to portray the epidemiology of this phenomenon most accurately. Secondly, we will review relevant studies from other disciplines (such as animal studies and evolutionary approaches) to determine what evidence exists to elucidate the biological underpinnings of human filicide and suggest future areas of translational research. Specifically, we will investigate the role serotonin may play in affective and psychotic filicide, the role of sex hormones in sexual dimorphism and its relationship to filicidal behavior, and how evolutionary effects may partially explain unwanted child filicide. We will then discuss how these different approaches to studying filicide—from the biological to the epidemiological—might be merged to provide a broader understanding of this behavior in humans.

Material and Methods

The data used in this study were derived from the U.S. Federal Bureau of Investigation's (FBI) Supplementary Homicide Reports (SHR) for a period of 32 years from 1976 to 2007 [35]. The SHR database consists of demographic information on the offender and victim characteristics and circumstances for homicides reported to the FBI by participating local and state law enforcement agencies across the United States. Sample subjects included in this study were individuals arrested for homicide committed against their biological or stepchildren. Out of a total of 632,017 individuals arrested—but not convicted—for homicides during the period of 1976 to 2007, 94,146 (14.9%) of cases were able to be classified as filicides.

Victims of filicide in this study were divided into three primary groups based on their age: (1) victims less than one year of age (infants), (2) victims aged 1–17 years (children and adolescents), and (3) victims aged 18 years and above (adults).

Similar to past studies that analyzed the SHR data [36–40], five distinct categories were created for the murder weapon used in filicide: (1) personal weapon (killing with hands and feet, strangulation, beating, asphyxiation, drowning, and defenestration), (2) contact weapon (blunt object), (3) edged weapon (knife), (4) firearm (handgun, rifle, shotgun, and other guns), and (5) other weapons (drugs, poison, fire, explosives, etc.).

Three different cross-tabular analyses were performed to examine the different types of murder weapon used by different sex, status, and age of the filicide offenders. Significance level was set at 0.05. It is not uncommon to obtain significant findings when examining populations with large samples, as in this study. Hence, measures of association (Phi and Cramer's *V* coefficients) were also used to analyze significant findings for the strength of the relationships and, most importantly, for meaningful patterns; a relationship of 1.00 designates a perfect relationship. The effect size of Phi (i.e., between two binary variables) and Cramer's *V* (i.e., between two variables with at least three levels on one variable) were interpreted in terms of degrees of freedom. Using Cohen's standards for cross-tabular effect size interpretation, the effect size of 0.16 and below was considered as weak, between 0.17 and 0.28 as moderate, and 0.29 and above as strong [41].

Results

Characteristics of Filicide Offenders and Victims in the U.S. over the 32-Year Period

Analyses of sample characteristics were based on the available SHR data for victim age ($N = 94,146$), victim sex ($N = 94,056$), victim race ($N = 94,056$), offender age ($N = 94,146$), offender sex ($N = 93,384$), offender's race ($N = 92,622$), victim's relationship to the offender ($N = 94,146$), offender-victim relationship ($N = 93,384$), murder weapon used ($N = 94,146$), and 5-year block filicide incidence trends ($N = 94,146$).

Victims

Overall, the modal victim age was less than one year old (range: 0–70 years), as shown in Table 1. The largest victim age group was infants, those below one year of age (0–11 months); they accounted for one-third of all filicidal deaths. Nearly two-fifths of victims fell into the age group of one- to six-years-old (specifically, 13,302 victims aged one [14.0%], 9,846 victims aged two [10.5%], 5,424 victims aged three [5.8%], 3,762 victims aged four [4.0%], 2,448 victims aged five [2.6%], and 1,560 victims aged six [1.7%]). The next largest victim group was adult victims aged 18 to 40 years. The remaining age groups (7–12, 13–17, 41–60, and 61 or more years old) each accounted for less than 10% of the overall victim population.

More than one-half of victims were males. This finding held for the child/adolescent victim and infant victim groups. Interestingly, gender effects appeared more pronounced in adult victims; more than three quarters of victims age 18 years and above were males.

Higher percentages of White victims (which included Hispanics) were found in the overall sample and across different age groups (57.0% of adult victims, 58.1% of adolescent/child victims, and 62.3% of infant victims). Black (or African American) victims were the next most frequently murdered (38.2% of the overall sample; 41.5% of adult victims, 39.1% of adolescent/child victims, and 35.2% of infant victims). Victims from other races (e.g. American Indian, Asian and Pacific Islander) were rare, accounting for only about 2.5% of the total sample.

Offenders

Filicide offenders had a mean age of 31.56 years ($SD = 13.44$; mode: 22.00 years; range: 14–98 years), as shown in Table 2. Female offenders were younger, with a mean age of 27.16 years ($SD = 10.20$); male offenders had a mean age of 34.80 years ($SD = 14.57$). Although both male and female offenders largely killed victims with a modal age less than one year old, such victims were more common with female (41%) than male (29%) offenders. However, the victim age range was similar (less than a year to 68 years for female offenders, less than a year to 70 years for male offenders). Adult victims were killed by offenders with a mean age of 50.95 years ($SD = 15.54$); while adolescent/child victims and infant victims were murdered by those with a mean age of 29.52 years ($SD = 8.78$) and 24.14 years ($SD = 6.27$), respectively. Nearly three-quarters of offenders were between 18 and 40 years (55.5% between 18 and 30 years and 18.0% between 31 and 40 years). Similarly, a large majority of both adolescent/child and infant victims were killed by offenders aged 18 to 40 years. Half of the adult victims were killed by parents aged between 41 and 60 years.

Slightly more than half of the filicide offenders were males. However, the number of males involved was found to decrease as the age of the victims decreased (i.e., 78.3% of male offenders murdered adult victims, 55.6% of male offenders killed adolescent/child victims, and 48.8% of male offenders murdered infant victims). Thus, infants were about as likely to be killed by a mother as a father. Similar to past studies, females who murdered their children in this study were found to be younger than their male counterparts. Furthermore, the percentage representation of children (up to 12 years of age) killed by female offenders was larger (91%) than for male offenders (72%).

Regarding race, most offenders and victims were White. This trend was consistent across different victims' age groups (57.0% for adults, 58.5% for adolescents and children, and 62.5% for infants). Black offenders and victims were the next most common groups. Black offenders and victims were significantly overrepresented compared to Whites based upon observed versus expected mean race percentages for Whites and Blacks during the study period (83% and 12% of population respectively [42]) ($\chi^2 = 64.48$, $df = 1$, $p < 0.001$). Offenders and victims from other races were uncommon, each comprising less than 3% of their respective categories.

Biological Children versus Stepchildren

Nearly 90% of victims were biological offspring of the murderers (i.e., 51.6% were biological sons and 37.9% were biological daughters of the murderer), as shown in Table 3. The remaining 10.6% were stepchildren of the murderers (i.e., 6.7% stepsons and 3.9% stepdaughters). When the sample was examined by victim age groups, the proportion of biological children killed was inversely related to victim age (i.e., 78.6% of adult victims, 87.4% of child/adolescent victims, and 98.2% of infant victims were biological offspring).

Victim-Offender Relationship

Table 3 also indicates that the most common filicidal event was fathers killing sons, followed by mothers killing sons. Mother-daughter and father-daughter murders closely followed. A similar killing pattern was noticeable across different victims' age groups, with the exception of the infant victim group, in which mother-son killings nearly equaled father-son events.

Some differences were observed in the subgroup of non-biological (stepparent/stepchild) filicides. The majority of killings were by stepfathers against stepsons, followed by

stepfathers killing stepdaughters. Thus, stepfathers were perpetrators in 92% of such cases. Stepmothers rarely killed stepsons or stepdaughters.

Incidence by 5-Year Blocks of Time

The incidence of filicide, as examined by 5-year data blocks, has remained relatively stable over the past three decades, with perhaps a slight downward trend overall (see Table 4). An average of 2942 filicides occurred annually during the 32-year study period. A peak in filicide cases was shown for the period 1991–1995, when an average of 3223 filicides occurred yearly. This finding was congruent with the peak observed for murders of all types during this period [43]. For 2001–2005, the yearly average number of filicides dropped to 2668. Some incidence value differences emerged when considering victim age. The highest filicide incidence for adult victims was in 1976–1980; for adolescent/child victims it was 1991–1995, and for infant victims it was 1986–1990.

Murder Weapon

In terms of the murder weapon used in killing offspring (Table 5), personal weapons were the most commonly reported type of weapons in this sample, followed by firearms, and other weapons. Overall, contact and edged weapons were used infrequently. Firearms were most commonly used by offenders who murdered adult victims. Personal weapons were the most likely murder weapon used against child/adolescent and infant victims.

As shown in Table 6, the types of weapon used by male and female filicide offenders differed significantly [$\chi^2(4) = 7404.16, p < .001$]. Among all murder weapons, personal weapons were the most frequently used by both male (45.5%) and female (54.1%) offenders in killing their offspring. Firearms and other types of weapons were the next frequently used murder weapon for male and female offenders, respectively. Fathers were three times as likely to use a firearm as mothers (32.8% vs. 10.9%). Contact and edged weapons were rarely used by parents to murder their children. Bonferroni correction revealed that the offender's sex differences for personal weapons, edged weapons, firearms, and other weapons were statistically significant. The strength of the relationship between offender sex and weapon use was marginally strong (Cramer's $V = 0.28$).

Significant differences in types of weapon used according to the biological versus nonbiological status of the offenders were found [$\chi^2(4) = 2307.18, p < 0.001$]. Overall, personal weapons (50.3%) were most frequently used by biological parents in murdering their offspring; in only 21% of cases were firearms employed. However, a different preference for murder weapon was evident among non-biological filicide offenders, with firearms (40.3%) and personal weapons (39.3%) being equally likely to be used in murdering their stepchildren. Edged weapons were least likely to be used by both biological (5.3%) and non-biological (6.4%) filicide offenders in killing their victims. Bonferroni correction indicated that the offender's status differences for all weapon types examined were statistically significant. The strength of this overall model was marginally moderate (Cramer's $V = 0.16$).

Significant differences also emerged in the types of weapon used by filicide offenders across offender age groups [$\chi^2(12) = 31294.56, p < 0.001$]. Personal weapons were the most frequently used weapon in killing juveniles (aged 17 years and below; 66.3%) and young-adults (aged 18 to 40 years; 59.1%). In contrast, most middle-aged (aged 41 to 60 years; 69.2%) and older (age 61 years and above; 60.8%) filicide offenders used firearms as their murder weapon. Overall, the least preferred murder weapon was the firearm (0.6%) for juvenile offenders, the edged weapon (4.6%) for young-aged offenders, the contact weapon (3.1%) for middle-aged offenders, and the personal weapon (2.8%) for old-aged offenders.

Bonferroni correction showed that the differences across all offender age groups for personal weapon, firearm, and other weapons were statistically significant. The strength of the offender's age-weapon relationship was strong (Cramer's $V = 0.33$).

Discussion

Fatal child abuse is an underreported crime that transcends international borders. Filicide comprises the largest fraction of cases, and most victims are the very young. To date, empirical study of human filicide has been scarce, and understanding of this homicidal phenomenon is limited. The present study examined 32 consecutive years of empirical filicide information using the largest U.S. homicide dataset available. Of the over 600,000 individuals arrested for homicide during this time, 15% were classified as filicides. Not unexpectedly, based on preceding research, victims were quite young. In fact, the majority were of preschool age, and most often infants. An unanticipated finding was that fathers and mothers were equally likely to kill their infants.

It should be noted that the filicides presented in this study were restricted to arrest cases and thus may underreport the true incidence and prevalence of U.S. filicide. No data on subsequent convictions are available. The SHR is limited in that it contains only offender, victim, and incident data. Corresponding psychiatric evaluation or diagnosis is not included. With only these basic data, exploring interpersonal dynamics of filicide offending patterns is hindered, and the dataset's utility for offender profiling is limited [38]. Furthermore, Table 2 shows that a small minority of filicides had adult victims but had offenders who were under 17 years of age. These curious cases perhaps reflect the coding challenges brought about by law enforcement personnel having to categorize offenders and victims from nontraditional marital relationships or marriages with large spousal age differences [44]. Nonetheless, this study offers longitudinal representative data on human filicide from a national perspective, an approach not adequately explored to date, especially in terms of victim-offender relationship.

Beyond reporting our findings and analysis of over three decades of filicide in the U.S., we have also attempted to synthesize the insights gained from this national dataset with pertinent literature from other fields, such as animal behavioral research, evolutionary perspectives, and the forensic sciences. In turn, we propose three transdisciplinary, empirically-informed filicide categories to motivate future study. These theoretical divisions should not be considered immutable or mutually exclusive. Rather, they comprise a framework that aims to combine the biological underpinnings of filicidal behavior with psychosocial factors. As such, any particular filicide case might include contributions from one or more of these categories. It should be emphasized that because these categories are theoretical, future clinical research is still needed to provide the necessary primary clinical evidence. An enhanced multidisciplinary understanding of filicide can assist in prevention efforts by health and law enforcement communities.

Psychopathology Associated with Neurotransmitter Disturbances (with a Focus on Serotonin)

Disruptions in the serotonergic system in humans have been linked to myriad psychiatric conditions, including depression, schizophrenia, personality disturbances, violence, and suicide [45]. A potential role for serotonin in homicide and filicide has been suggested [46]. We propose that a portion of filicides are associated with affective, psychotic, and personality disorders influenced in part by CNS serotonergic disturbances. Animal research has demonstrated that decreasing whole-brain serotonin seems to increase filicidal behavior and that administering serotonin or serotonin agonists seems to reduce such behavior [29, 47]. However, these experiments used non-biological offspring, so the results are not

analogous to human filicide [4, 5]. Interestingly, animals pre-exposed to surrogate offspring showed a reduction in filicide after depleting serotonin [48]. Additionally, cohabitation with a mate, copulation with a mate, and habituation to surrogate offspring can reduce or suppress filicidal behavior in some animals [47, 49, 50], suggesting that these activities may in part counteract the effects of serotonergic depletion. These results suggest that psychiatric or other medical disorders that reduce serotonin levels may increase the risk of filicide, and that this risk may be reduced by exposure to offspring. Viewed differently, parents with less exposure to their offspring (such as new parents, parents who are often away from the home, or stepparents caring for stepchildren) might be more susceptible to committing filicide were a serotonergic disruption to occur.

Although the SHR data lack any psychiatric or medical diagnoses of the offenders, indirect evidence for conditions linked to psychopathology associated with serotonergic disruptions can be gleaned from the demographic analysis. The majority of offenders were between 18 and 30 years old, corresponding to the prime age at which individuals are afflicted by psychiatric conditions such as depression or schizophrenia. Victims also tended to be quite young, with the plurality being under a year old. Parents of these young victims necessarily have had less exposure to their offspring. Combining clinical and law enforcement data will likely yield direct insights regarding the role of mental disorders, as suggested by a small study noting that psychotic filicidal mothers were more likely to use guns or knives than their non-psychotic counterparts [51].

Gender and Sex Hormonal Influences – A Sexual Dimorphism

The SHR data show clear differences in maternal and paternal filicide. Our second proposed category attempts to relate this dimorphism to sex hormones, which have both organizational effects during perinatal development and activational effects in adulthood [19]. Hormonal influences on filicide are already a research target, with a small study of institutionalized filicidal mothers demonstrating elevated adrenocorticotrophic hormone levels [52]. Multiple animal studies have demonstrated an increase in filicidal behavior after artificially raising testosterone levels in females [30–32]. In males, however, artificially raising testosterone levels increased filicidal behavior only if they were castrated neonatally [53], suggesting that testosterone shortly after birth has a lasting effect on behavior. Genetic studies also suggest a critical period for testosterone early in life [54].

In humans, there is a clear sexual dimorphism in filicidal tendencies. Previous literature has reported filicidal mothers to be younger, more often mentally ill, and users of less violent means of killing than filicidal fathers. They receive less harsh punishments than do filicidal fathers, who tend to be older, not seekers of psychiatric help, and predisposed to use violence [4, 5]. Fathers were more likely to engage in *fatal maltreatment* filicide [4, 5].

In the SHR dataset, men comprised the preponderance of offenders, were older, and were more likely to use firearms, whereas women tended to use means that excluded wounding violence. In contradiction, however, the SHR data showed that women were more likely to use edged weapons, but the difference was slight despite statistical significance. Interestingly, the SHR data also showed that older offenders tended to use firearms whereas younger offenders tended to use personal or other weapons, which may supply further proof of a sexual dimorphism as the literature indicates that these younger offenders were more likely to be women with mental illness. They may also simply reflect a relative lack of availability of firearms to such a group due to legal or societal reasons, or the fact that older parents may have older children less easily killed by other means.

Considering the SHR empirical findings in concert with the published research literature, the striking filicidal sexual dimorphism may suggest a distinct role for sex hormones, chiefly

testosterone. Sex hormones exert direct effects on brain development soon after birth and on the expression of aggression. These effects may then be modulated indirectly by societal gender stereotypes.

Evolutionary Effects – The Unwanted Child

Our final proposed category considers filicide in an evolutionary context. At its most basic, evolution by natural selection allows for the healthiest offspring to survive into adulthood and reproduce, thereby assuring the propagation of their genetic material. Filicide may therefore at first seem counterintuitive [1, 4]. However, killing one's biological children or stepchildren can confer certain evolutionary advantages. For example, very young children and children in poor health are more likely to be victims of filicide, which could reflect a selectivism that concentrates resources on the most healthy offspring [1, 4] as a form of resource competition [34]. The SHR dataset showed that infants are at greatest risk of filicide, which tended to be perpetrated by biological mothers. Relatively few resources have been invested in an infant relative to an older child [1, 5], so this type of filicide may reflect resource competition. It may also reflect an "adaptive reproductive disinvestment," as termed by Italian researchers who found that neonaticide was consistent with an evolutionary drive to increase fitness [55].

Previous research has indicated that stepchildren were more likely to be killed and to suffer more violent deaths than biological children [1, 56]. The SHR data set revealed that stepparents tended to use blunt objects, firearms, and edged weapons. Biological parents more commonly used personal and other weapons. The higher lethality of the means used by stepparents to kill suggests that they may have been more committed to causing the death of their victims, which may be consistent with the adoption avoidance or sexual selection filicide strategies [34].

However, not consistent with previous literature is the finding in the present study that only 11% of victims were stepchildren. It is estimated that 10–20% of U.S. children over the past three decades were living in stepfamily households [57]. If stepchildren are indeed at greater risk of death by homicide, then the percentage of SHR stepchildren victims would have been expected to exceed the percentage of stepchildren in the general population. This unanticipated finding from a longitudinal national sample deserves further investigation and raises a number of questions. Possibly, previous studies' findings to the contrary may have been skewed by biased or nonrepresentative samples. Or perhaps the effect of stepchildren spending fewer total years on average in blended families [58]—as compared to biological children in natural families—reduced their risk exposure time to stepparent violence, and thus the overall number of filicides for them as a class does not reflect an actual greater risk for filicide.

As previously discussed, fathers tended to use more violent means of death than mothers [4, 5]—though less so than stepparents [1]—perhaps reflecting a sexual dimorphism due to the role of testosterone. In addition, it may reflect a sexual selection strategy of filicide. Specifically, it may be a maladaptive over-elaboration of the naturally-selected tendency of males to exhibit proprietary behavior towards females in an effort to control mating and maximize the spread of genetic material [1].

Conclusions

Human filicide is a tragic and complex event with manifold influences that are only partially understood. The current study has presented the first comprehensive analysis of U.S. filicides, which comprised 15% of homicide arrests over a 32-year period. Three empirically-informed transdisciplinary filicide categories have been proposed: (1) filicide due to

psychopathology associated with disturbances of neurotransmitters such as serotonin, (2) filicide influenced by gender and sex hormones, which may in part explain the significant sexual dimorphism in filicide, and (3) filicide related to evolutionary motives including Darwinian drives, although stepchildren were not overrepresented as victims. Various narrow models of filicide have been proposed by animal, evolutionary, and other researchers primarily using the perspective of their own field. Animal studies have provided information about the physiological underpinnings of filicide in certain species, and are rigorous in that they benefit from controlled laboratory conditions not available when reviewing human cases. However, while useful, they cannot address the rich complexity of emotional, cognitive, and behavioral factors that drive filicide in humans. This gulf is evidenced by the various and only partially overlapping filicide motivation subtypes described by scholars over time [3, 59, 60]. Our categorization of filicide has attempted to bridge the findings of these sundry scientific fields and suggest areas of future research. Moreover, research findings in the upcoming years may raise the plausibility of other transdisciplinary filicide categories.

Mental health professionals, law enforcement workers, and other professionals asked to interview, evaluate and/or treat filicide offenders can benefit from considering the myriad social, biological, psychopathological, and evolutionary forces that contribute to this form of homicidal behavior. Hopefully, future research will continue to improve society's ability to identify, manage, and treat populations at risk.

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Table 1

Victim demographic characteristics.

Variables	All Sample		Infant Victims (<1)		Child/Adolescent Victims (Age 1-17)		Adult Victims (18+)	
	N	Percent	N	Percent	N	Percent	N	Percent
Age of victim	(N = 94,146)							
Under one year	31,164	33.1%						
One to 6 years	36,342	38.6%						
7 to 12 years	6,012	6.4%						
13 to 17 years	4,002	4.3%						
18 to 40 years	12,594	13.4%						
41 to 60 years	1,644	1.7%						
61 years and above	2,388	2.5%						
Sex of victim	(N = 94,056)		(N = 31,158)		(N = 46,332)		(N = 16,566)	
Male	54,846	58.3%	16,944	54.4%	25,230	54.5%	12,672	76.5%
Female	39,210	41.7%	14,214	45.6%	21,102	45.5%	3,894	23.5%
Race of victim	(N = 94,056)		(N = 30,792)		(N = 46,020)		(N = 16,500)	
White (including Hispanic)	55,350	59.3%	19,194	62.3%	26,754	58.1%	9,402	57.0%
Black (or African American)	35,688	38.2%	10,854	35.2%	17,982	39.1%	6,852	41.5%
Others (American Indian & Asian and Pacific Islander)	2,274	2.5%	744	2.4%	1,284	2.8%	246	1.4%

Table 2

Offender demographic characteristics.

Variables	All Sample		Infant Victims (<1)		Child/Adolescent Victims (Age 1-17)		Adult Victims (18+)	
	N	Percent	N	Percent	N	Percent	N	Percent
Age of offender	(N = 94,146)		(N = 31,164)		(N = 46,356)		(N = 16,626)	
17 years and below	3,792	4.0%	2,796	9.0%	810	1.7%	186	1.1%
18 to 40 years	69,210	73.5%	26,712	85.7%	39,192	84.5%	3,306	19.9%
41 to 60 years	14,142	15.1%	480	1.5%	5,286	11.4%	8,376	50.4%
61 years and above	7,002	7.4%	1,176	3.8%	1,068	2.3%	4,758	28.6%
Sex of offender	(N = 93,384)		(N = 31,164)		(N = 46,134)		(N = 16,536)	
Male	53,586	57.4%	15,000	48.8%	25,632	55.6%	12,954	78.3%
Female	39,798	42.6%	15,714	51.2%	20,502	44.4%	3,582	21.7%
Race of offender	(N = 92,622)		(N = 30,402)		(N = 45,726)		(N = 16,494)	
White (including Hispanic)	55,140	59.5%	19,008	62.5%	26,730	58.5%	9,402	57.0%
Black (or African American)	35,142	37.9%	10,632	35.0%	17,670	38.6%	6,840	41.5%
Others (American Indian & Asian and Pacific Islander)	2,340	2.6%	762	2.5%	1,326	2.9%	252	1.5%

Table 3

Victim-offender relationship.

Variables	All Sample		Infant Victims (< 1)		Child/Adolescent Victims (Age 1–17)		Adult Victims (18+)	
	N	Percent	N	Percent	N	Percent	N	Percent
Victim's relationship to the offender	(N = 94,146)		(N = 31,164)		(N = 46,356)		(N = 16,626)	
Son	48,540	51.6%	16,632	53.4%	22,038	47.5%	9,870	59.4%
Daughter	35,652	37.9%	13,968	44.8%	18,486	39.9%	3,198	19.2%
Stepson	6,300	6.7%	294	0.9%	3,198	6.9%	2,808	16.9%
Stepdaughter	3,654	3.9%	270	0.9%	2,634	5.7%	750	4.5%
Victim-offender relationship	(N = 93,384)		(N = 30,714)		(N = 46,134)		(N = 27,156)	
Father-Son	27,534	29.5%	8,094	26.4%	11,676	25.3%	7,764	28.5%
Mother-Son	20,592	22.1%	8,274	26.8%	10,260	22.2%	2,058	7.6%
Father-Daughter	16,914	18.1%	6,360	20.7%	8,790	19.1%	6,360	23.4%
Mother-Daughter	18,408	19.7%	7,422	24.2%	9,588	20.8%	7,422	27.3%
Stepfather-Stepson	5,808	6.2%	282	0.9%	2,820	6.1%	2,706	10.0%
Stepmother-Stepson	480	0.5%	12	0.07%	372	0.8%	96	0.4%
Stepfather-Stepdaughter	3,330	3.6%	264	0.9%	2,346	5.1%	720	2.7%
Stepmother-Stepdaughter	318	0.3%	6	0.03%	282	0.6%	30	0.1%

Table 4

Filicide incidence in 5-year blocks.

Variables	All Sample		Infant Victims (< 1)		Child/Adolescent Victims (Age 1–17)		Adult Victims (18+)	
	N	Percent	N	Percent	N	Percent	N	Percent
5-year block filicide incidence trend	(N = 88,674)		(N = 29,154)		(N = 43,728)		(N = 15,792)	
1976 to 1980	14,994	16.9%	4,164	14.3%	7,524	17.2%	3,306	20.9%
1980 to 1985	15,444	17.4%	4,584	15.7%	7,734	17.7% ¹	3,126	19.8%
1986 to 1990	15,288	17.2%	5,508	18.9%	6,858	5.7%	2,922	18.5%
1991 to 1995	16,116	18.2%	5,466	18.7%	8,220	18.8%	2,430	15.4%
1996 to 2000	13,494	15.2%	4,998	17.1%	6,768	15.5%	1,728	10.9%
2001 to 2005	13,338	15.0%	4,434	15.2%	6,624	15.1%	2,280	14.4%

Table 5

Murder weapon used.

Variables	All Sample		Infant Victims (< 1)		Child/Adolescent Victims (Age 1–17)		Adult Victims (18+)	
	N	Percent	N	Percent	N	Percent	N	Percent
Weapon used	(N = 94,146)		(N = 31,164)		(N = 46,356)		(N = 16,626)	
Personal weapon	46,302	49.2%	21,510	69.0%	23,124	49.9%	1,668	10.0%
Contact weapon	5,370	5.7%	1,416	4.5%	3,552	7.7%	402	2.4%
Edged weapon	5,136	5.5%	846	2.7%	2,742	5.9%	1,548	9.3%
Firearm	21,972	23.3%	780	2.5%	9,174	19.8%	12,018	72.3%
Other weapons	15,366	16.3%	6,612	21.2%	7,764	16.7%	990	6.0%

Table 6

Cross-tabular analyses of murder weapon used by offender sex, status, and age.

Variables	Personal % (N)	Contact % (N)	Edged % (N)	Firearm % (N)	Others % (N)	Total % (N)	Chi-Square	Cramer's V
<i>Offender sex (N = 93,384)</i>								
Male	45.5 (24,390)	5.7 (3,054)	5.3 (2,832)	32.8 (17,592)	10.7 (5,718)	57.4 (53,586)	7404.16	0.28 ***
Female	54.1 (21,516)	5.7 (2,250)	5.7 (2,274)	10.9 (4,338)	23.7 (9,420)	42.6 (39,798)		
<i>Offender status (N = 94,146)</i>								
Parent	50.3 (42,390)	5.5 (4,644)	5.3 (4,494)	21.3 (17,958)	17.5 (14,706)	89.4 (84,192)	2307.18	0.16 ***
Stepparent	39.3 (3,912)	7.3 (726)	6.4 (642)	40.3 (4,014)	6.6 (660)	10.6 (9,954)		
<i>Offender age (N = 94,146)</i>								
17 years and below	66.3 (2,514)	4.0 (150)	4.1 (156)	0.6 (24)	25.0 (948)	4.0 (3,792)	31294.56	0.33 ***
18 to 40 years	59.1 (40,914)	6.6 (4,566)	4.6 (3,162)	11.4 (7,914)	18.3 (12,654)	73.5 (69,210)		
41 to 60 years	11.0 (1,560)	3.1 (438)	9.9 (1,398)	69.2 (9,780)	6.8 (966)	15.0 (14,142)		
61 years and above	2.8 (1,314)	3.1 (216)	6.0 (420)	60.8 (4,254)	11.4 (798)	7.4 (7,002)		

 $p < .001$