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ORIGINAL ARTICLE

Juvenile Involvement in Fratricide and Sororicide: An Empirical Analysis of 32 Years of U.S. Arrest Data

Jennifer H. Peck · Kathleen M. Heide

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Abstract Despite the interest in juvenile homicide offenders, few studies have systematically examined their involvement in incidents involving specific victims. This study focused on one victim type, the killings of siblings. To date, siblicide research has been based primarily on case studies. Bivariate and multivariate techniques were used to systematically investigate offender, victim, and incident characteristics associated with fratricides and sororicides committed by juvenile homicide offenders in single victim, single offender incidents over a 32-year period (1976–2007), as recorded in the Supplementary Homicide Report data base. Juvenile sororicide offenders, relative to juvenile fratricide offenders, were significantly more likely to be female and to kill younger victims. The article concludes with a discussion of the findings in terms of past research, their implications for intervention and prevention, and directions for future research.

Keywords Juvenile homicide · Siblicide · Sororicide · Fratricide · Female juvenile homicide offenders · Juvenile murderers

Killings within the family by youths under 18 generate widespread interest. A substantial literature is available on youths who kill parents (Heide 1992, 1993a, b; Heide and Frei 2010; Heide and Petee 2007a, 2007b; Hillbrand et al. 1999; Malmquist 2010). In contrast, little scientific information exists on another type of family violence, juveniles who kill their brothers (fratricides) and sisters (sororicides). As noted in two recent studies, siblicide (the killing of a brother or sister) is an area of family homicide that is understudied (Diem and Pizzaro 2010; Faccini and Saide 2010). Although these types of offenders often receive national attention for the crimes they commit (e.g., Curnutte 2010; "Brother indicted," 2007; Prieto and Mariano 2007; Sullivan and Ford 2009; Wright 2009; Yeebo 2007), research has yet to determine characteristic details associated with sibling homicide.

Underwood and Patch (1999) used the Uniform Crime Reports (UCR) to examine the trend in sibling homicide arrests in the United States (U.S.) from 1984 to 1995. They noted that siblicide arrests made up approximately 1 % of all homicide arrests during the 12-year time frame. Table 1 extends Underwood and Patch's analysis of the occurrence of sibling homicides in the U.S. by looking at siblicides that have occurred since their analysis ended in 1995. Over the 12-year-period 1996–2007, there was an average of 14,320 homicides in the U.S. Consistent with earlier analyses by Underwood and Patch, siblicides made up less than 1 % of all arrests (0.796 %). More than three out of four siblicides involved the killings of brothers. An average of 0.628 % of all siblicides were recorded as fratricides; the remaining 0.167 % were sororicides.

These data indicate that, on the average, more than 100 siblings are killed by their brothers and sisters in the U.S. every year. Studies on this topic largely consist of clinical studies and case research. A handful of empirical publications primarily focus on adult siblicide victims and offenders. Very little is known about siblings killed by juvenile homicide offenders (JHOs).

Most of the research has centered on siblicide in general, not differentiating the characteristics between fratricides and sororicides committed by JHOs. The present study uses the UCR Supplemental Homicide Reports (SHR), a national sample of homicide data from 1976 to 2007, to examine the characteristics associated with killings of brothers and sisters by juveniles in the U.S. The present study builds on two empirical studies that also used SHR data (Gebo 2002;

J. H. Peck · K. M. Heide (✉)
Department of Criminology, University of South Florida,
4202 E. Fowler Avenue, Social Sciences Room 107,
Tampa, FL 33620-8100, USA
e-mail: kheide@usf.edu

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Table 1 Number and percent of siblicides of total homicides, 1996–2007

Year	Fratricides *N* (% total)	Sororicides *N* (% total)	Total siblicide *N* (% total)	Total number of homicides
1996	98 (0.618)	19 (0.120)	117 (0.738)	15,848
1997	120 (0.785)	20 (0.131)	140 (0.916)	15,289
1998	88 (0.625)	25 (0.177)	113 (0.802)	14,088
1999	78 (0.616)	26 (0.205)	104 (0.822)	12,658
2000	90 (0.695)	23 (0.178)	113 (0.873)	12,943
2001	73 (0.531)	26 (0.190)	99 (0.720)	13,752
2002	87 (0.619)	20 (0.142)	107 (0.761)	14,054
2003	87 (0.604)	27 (0.187)	114 (0.791)	14,408
2004	86 (0.609)	31 (0.216)	117 (0.829)	14,121
2005	100 (0.673)	21 (0.141)	121 (0.814)	14,860
2006	80 (0.534)	22 (0.147)	102 (0.680)	14,990
2007	93 (0.627)	26 (0.175)	119 (0.802)	14,831
Average (1996–2007)	90 (0.628)	24 (0.167)	114 (0.796)	14,320

Extracted from Uniform Crime Reports (1997–2008)

Underwood and Patch 1999) and that are considered foundational studies for siblicide research. These previous studies focused on offender, crime-related, and victim variables over shorter time periods (3 years and 18 years, respectively). In contrast to these earlier studies, the present research effort is designed to identify the specific characteristics associated with these two types of siblicide.

Literature Review

Long standing rivalries, stress, and conflicts between siblings have been posited as reasons why brothers and sisters murder. This struggle typically begins in early childhood when siblings vie for parental affection and attention (Adler 1959). This early rivalry stems into a status, power, and space struggle between siblings in the home environment. Adler believed that "no child likes to be the smallest" (p. 150) and, in turn, strives for power within the familial relationship. There is also evidence of both older siblings being violent toward younger siblings, and vice versa (Cicirelli 1995; Straus 1974). In most cases, juveniles who are raised in dysfunctional, abusive, and neglectful families (Ewing 1997) and those who have a hatred for their parents (Adam and Livingston 1993) are at higher risk of killing their siblings than youths raised in healthier family situations. Juvenile siblicide offenders have been diagnosed with Conduct Disorder (Ewing 1997) and other underlying psychopathological traits such as antisocial, narcissistic, and obsessive. They have been found to have a need for control and minimal shame and remorse (Adam and Livingston 1993).

Sulloway (1996) argued from an evolutionary perspective that sibling rivalry and strife stem from the Darwinian formula of natural competition, and are familial forms of social conflict. Patterns of murder among family members are proved though Darwinian principles, especially that "fratricide is a tactic of last resort because it eliminates a substantial portion of the killer's genes from the population" (Sulloway 1996, p. 274).

Research on juvenile siblicide mostly consists of clinical reports with unknown generalizability. Ewing (1990, 1997) reviewed case studies investigating the characteristics associated with juvenile fratricides and sororicides. Juvenile sororicide offenders (JSOs) profiled typically are males (Ewing 1997; Lennings 2002; Leong 1989; Patterson 1943; Russell 1984; Schmideberg 1973; Woods 1961). Cases of sisters killing sisters are also reported in the literature (Adam and Livingston 1993; Bender 1959; Mukaddas and Topcu 2006). For the most part, juvenile fratricide case studies have focused on male offenders (Carek and Watson 1964; Ewing 1997; MacDonald 1986; Medlicott 1970; Petti and Wells 1980; Russell 1984).

Dawson and Langan (1994) examined survey data from State prosecutors' files to examine the occurrence of different types of familial homicide. The authors focused on basic demographic arrest information from a sample population of 33 counties believed to be a representative sample of the 75 largest urban counties in the U.S. The results indicated that 8.7 % of all victims in the sample who were murdered by a sibling were younger than 12 years old, and 2.0 % were between 12 and 19 years old.

The available empirical data on juvenile siblicide has provided some insight on the characteristics associated with fratricide and sororicide, yet the systematic examination of differences between these two types of victims has been limited. Underwood and Patch (1999) did pioneering research that addressed victim variables (age, gender, race, victim offender relationship), offender variables (age,

gender, race), and case-related variables (circumstances of siblicide, weapon type, substance abuse) in single victim, single offender (SVSO) siblicide incidents using SHR data from 1993 to 1995. They reported that 9.7 % (n=50) of the victims and 13.0 % (n=67) of the offenders were less than 18 years old. For most of their analyses, the authors combined all reported cases of siblicide. In addition, they did not control for the effect of offender age. Instead, they combined juvenile and adult offenders in their analyses.

Underwood and Patch (1999) contributed to siblicide research in five major ways. First, the majority of siblicides occurred during early and middle adulthood. Second, males were more likely to be both offenders (87.7 %) and victims (84.4 %). Other researchers have also found male overrepresentation as siblicide offenders and victims. Michalski et al. (2007) used a sample of juvenile and adult siblicides that occurred in Chicago from 1870 to 1930. They reported that 96.3 % and 81.3 % of offenders and victims were male. Russell et al. (2007) examined the Chicago Homicide Database and analyzed 232 cases of siblicide. They found that 81.0 % of siblicide victims and 82.3 % of their killers were male. In contrast to Underwood and Patch, Michalski et al. and Russell et al. compared siblicide occurrences between full siblings, half-siblings, step-siblings, and siblings-in-laws in their analyses of siblicides.

In Underwood and Patch's study, brothers killed brothers in 76.1 % (n=391) of siblicide incidents, brothers killed sisters in 11.9 % (n=61), sisters killed brothers in 8.2 % (n=42), and sisters killed sisters in the remaining 3.9 % (n=20). Underwood and Patch's results were also consistent with findings by Dawson and Langan (1994), where brothers killed brothers in 74 % of siblicide incidents. Underwood and Patch found offender gender differences in victim gender: brothers were more likely to kill brothers (76.1 %) than sisters (11.9 %), and sisters were more likely to murder brothers (8.2 %) than sisters (3.9 %).

Third, Black (47.9 %) and White offenders (40.8 %) had fairly similar percentages of siblicide involvement, despite striking differences in their racial composition of the U.S population in the 1990s. Whites comprised 80.3 % of the United States population, while Blacks comprised 12.1 % (U.S. Census Bureau 2010). Fourth, siblicides occurred most frequently as a result of an interpersonal argument between the offender and victim. Finally, siblings were more likely to be killed by firearms than any other weapon. Female offenders, however, were more likely than their male counterparts to use a knife or cutting instrument as a weapon.

Although Underwood and Patch's (1999) results do indicate some distinctions between fratricides and sororicides, they did not investigate differences between adult and juvenile fratricide and sororicide cases. The authors recommended that future research specifically examine juveniles as a subgroup of offenders.

In a more recent study, Gebo (2002) disaggregated adult and juvenile siblicide cases, expanding on previous research by comparing age, gender, and race differences between juvenile and adult siblicide victims and offenders. She found that the majority of all siblicides occurred when both the offender and victim were adults (78 %). Important differences emerged when the effect of offender age was controlled. When both individuals were adults, younger siblings were more likely to murder older siblings. When analyses were restricted to offenders under 18, Gebo found that older juvenile siblings were more likely to kill younger siblings (65 %).

The finding that older juveniles were more likely to kill younger siblings was consistent with Sulloway's (1996) hypothesis that firstborns are more siblicidal. Gebo (2002) did not control for victim gender, so it is not known whether killings by older juveniles would hold in cases of both fratricide and sororicide. Other siblicide studies have had mixed results applying Sulloway's hypothesis (Marleau 2005); his prediction has been supported in certain cases of juvenile siblicide (Daly et al. 2001), but not in others (Marleau and Saucier 1998).

Results reported by Gebo (2002) also replicated findings by Underwood and Patch (1999) that males were more likely to kill their brothers, followed by brothers killing their sisters, sisters killing their brothers, and then sisters killing their sisters. This pattern applied to both juvenile and adult siblicides. Similar to Underwood and Patch's finding, Gebo found that African Americans were overrepresented as offenders and victims in siblicides compared to the general population. Gebo reported that Native Americans were the most disproportionately represented racial group in both juvenile and adult siblicides. The involvement of Native Americans in siblicides was 2.4 times higher compared to other races. Gebo suggested that this disparity could be due to Native Americans having many siblings, or more social contact than other races. Gebo's results corroborated previous research on siblicides in several respects. Importantly, she disaggregated juvenile and adult siblicide offenders to examine age, gender, and race differences. It does not appear, however, that she limited her analyses to SVSO incidents. Inclusion of multiple offender and multiple victim data would affect her findings in unknown ways.

In summary, our review indicated that the literature on juvenile fratricide and sororicide cases is limited. Clinical studies that have focused on juvenile siblicide have often provided valuable insight. Given their small sample sizes, however, they are limited with respect to their generalizability. Findings from many studies are not clear because the researchers addressed siblicide without controlling for the effect of offender age (Bourget and Gagne 2006), or have included other types of family homicides within certain analyses (Diem and Pizzaro 2010).

The present study is designed to expand existing knowledge of siblicide research through the analysis of 32 years of national data involving youths under 18 arrested for killing their brothers or sisters. Our research design builds on previous research in five ways. First, we use SHR data to analyze juvenile siblicides from 1976 to 2007, the longest time period to date, and significantly larger than the periods used by other researchers (Gebo 2002; Underwood and Patch 1999). Second, the present study, unlike earlier efforts, disaggregates juvenile fratricide and sororicide incidents. Third, our research moves beyond a descriptive analysis of results and tests for significant differences between individuals under 18 arrested for killing brothers and sisters based on findings suggested by previous studies. Fourth, unlike some previous efforts using SHR data, we restricted analyses to SVSO incidents to avoid confounding of the data due to limitations in the SHR data set. Fifth, we used multivariate analyses to determine whether certain variables distinguished juvenile offenders who killed sisters from those who killed brothers. To our knowledge, no study has used bivariate and multivariate techniques with SHR data to systematically investigate offender, victim, and incident characteristics associated with fratricides and sororicides committed by JHOs in SVSO incidents.

Methods

The UCR SHR database is currently the best source of information on total U.S. murders and those arrested for murder or nonnegligent homicide (hereafter referred to as murder). The SHR offender data set of murder arrests from 1976 to 2007 (Fox and Swatt 2009) was used to examine victim, offender, and offense correlates of JHOs arrested for killing their brothers or sisters. The SHR offender data set was used rather than the victim data set because our main focus of interest was on juvenile offenders who kill their siblings. Although results are reported in terms of JHOs killing their siblings, it should be noted that these are arrest data, and that these offenders have not been convicted.

During the 32-year time period, 801 of the 44,147 juveniles arrested for homicide (1.8 %) reportedly killed their siblings. Approximately 70 % of the juvenile siblicide offenders killed brothers (n=562); the remaining 30 % killed sisters (n=239). Given the construction of the SHR data set, analyses of siblicides were restricted to SVSO incidents. Multiple victims siblicides (n=81; 11.1 %) were eliminated because the offender data set is not able to link multiple victims to one offender. It is best suited for SVSO homicide incidents because, assuming the data are entered correctly by law enforcement, it accurately links the one victim killed by the one offender. Consistent with decisions made by researchers investigating siblicide and parricide situations (Heide 1993a, 1993b; Underwood and Patch 1999), multiple offender situations were also excluded because inclusion of these cases risks inflating the number of victims. To avoid introducing confusion and unnecessary complexity into the reporting of results, we eliminated 42 (5.2 %) multiple offender situations in which one victim was killed. Our final sample consisted of 678 offenders, or 84.6 % of the total cases, of JHOs arrested for killing a brother or sister over the 32-year period.

Restricting analyses to SVSO incidents has an additional benefit. It gives flexibility in the reporting of results because offenders and victims are directly linked. Accordingly, results can be reported both in terms of offenders who killed brothers or sisters, and brothers and sisters killed by offenders.

As shown in Table 2, in examining siblicide situations, significant differences were found and worth noting before the analyses focus exclusively on SVSO incidents. JHOs arrested for killing brothers were significantly more likely than JHOs arrested for killing sisters to kill them in SVSO incidents (88.3 % vs. 76.2 %). Juvenile offenders who killed their sisters were more likely than those who killed brothers to kill them with other offenders (7.1 % vs. 4.4 %), to kill multiple victims during the incident (14.2 % vs. 6.4 %), and to kill multiple victims with other offenders during the incident (2.5 % vs. 0.9 %).

Analyses of siblicide arrestees over the 32-year period proceeded in three steps consistent with the study's objectives. The first set of analyses was designed to describe the characteristics of JHOs who kill brothers and sisters more completely than has been done previously using a national sample over a more expansive time frame. The second set was planned to test four hypotheses of differences between sororicides and fratricides based on previous research findings pertaining to adult and JHOs arrested for siblicide. The third set of analyses used logistic regression to determine whether certain variables distinguished JHOs who killed brothers from those who killed sisters.

Seven variables in two broad classes were used with the aim of describing juvenile siblicide offenders in general and those who kill brothers and sisters specifically. These included variables pertaining to the offender and his/her arrest (age, race, region, urban, year, time period) and victim variables (race). In addition, four hypotheses derived from previous studies of siblicide offenders that examined differences between fratricidal and sororicidal incidents with respect to four additional variables (victim age, weapons used, offender gender, and homicide circumstance) were tested.

- H_1: JSOs will be more likely to kill younger victims than juvenile fratricide offenders (JFOs).
- H_2: JSOs will be more likely than JFOs to use knives and personal weapons to kill; JFOs will be more likely than JSOs to kill using guns.

Table 2 Homicide situation type by siblicide offender type, 1976–2007

Situation	Fratricide offender	Sororicide offender	Total siblicide offender
Single victim, single offender	496 (88.3 %)	182 (76.2 %)	678 (84.6 %)
Single victim, multiple offenders	25 (4.4 %)	17 (7.1 %)	42 (5.2 %)
Multiple victims, single offender	36 (6.4 %)	34 (14.2 %)	70 (8.7 %)
Multiple victims, multiple offenders	5 (0.9 %)	6 (2.5 %)	11 (1.4 %)
Total arrests	562 (100 %)	239 (100 %)	801 (100 %)

χ^2 (3)=20.116, Cramer's V=.158 (95 % CI=0.09–0.0224), $p<.001$

H_3: JFOs will be more likely to be male than JSOs.
H_4: JSOs will be more likely than JFOs to kill during crime-related circumstances.

All known arrests were used rather than imputed data (see Fox and Swatt 2009) for two reasons. First, using known arrests made it easier to compare findings from this study with previous studies that used known arrests before imputed data techniques had been developed. Second, data were available for between 99 % and 100 % of the cases for 10 of the 11 variables examined, making the use of imputed data unnecessary. The remaining variable, homicide circumstance, could be coded into crime-related or conflict-related homicides for only 67 % of siblicide cases. Cases with missing data were removed only from the specific analysis affected.

Chi square analyses were used to test for significant differences between characteristics associated with the fratricides and sororicides committed by JHOs. Significance level was set at 0.05. Phi and Cramer's V were selected due to the nominal nature of the variables. Phi and Cramer's V values of 0.2 were considered small effects; those at 0.5, moderate effects; and those at 0.8, strong effects (Ferguson 2009). The strength of the relationships is discussed in text; the Chi Square statistics and measures of association are presented in the tables.

The third set of analyses used logistic regression to determine whether certain variables distinguished JHOs who killed brothers from those who killed sisters. To our knowledge, offender siblicide type as the dichotomous dependent variable in binary logistic regression has not been used in SHR data analyses of JHOs. Differentiating between types of offenders (e.g., males and females) has been used successfully in analyses of adolescent/young adult parricide offenders (Walsh et al. 2008), juvenile sex offenders (Vandiver and Teske 2006), and JHOs (Heide et al. 2012; Sellers and Heide 2012).

Results

Fratricide and Siblicide Offenders Described

As shown in Table 3, approximately 60 % of siblicide offenders were 15 to 17 years old. Significant differences emerged when offender age was examined by victim gender. JSOs tended to be significantly younger than JFOs (Cramer's V=.197). Nearly 40 % (38.5 %) of sororicide offenders were under the age of 14, compared to approximately one fifth of fratricide offenders. More than two thirds of sororicide offenders (68.7 %) were 15 years of age or younger, compared to 53.0 % of fratricide offenders. JFOs were correspondingly older than JSOs. Approximately 47 % of all fratricide offenders were 16 and 17 year old offenders, compared to 31.3 % of sororicide offenders.

In 98 % of SVSO incidents, offenders who killed siblings were White (55.9 %) or Black (41.8 %). Less than 3 % of the JHOs who killed their siblings were American Indian and Asian and Pacific Islanders. Significant racial differences between fratricide and sororicide offenders were not found within the four racial categories used by the FBI. However, with the removal of American Indian, Asian, and Pacific Islander groups from the analysis, significant racial differences were found between juveniles who killed brothers and sisters (Phi=−.077). Sororicide offenders were significantly more likely than fratricide offenders to be White (62.1 % vs. 53.6 %). Juveniles who killed brothers were significantly more likely those who killed sisters to be Black (44.0 % vs. 35.7 %).

About 45 % of arrests of JHOs in SVSO siblicide incidents occurred in the South. About 40 % more occurred in the Midwest (20.9 %) or West (20.1 %). Less than one in seven arrests of juvenile siblicide offenders occurred in the Northeast (13.6 %). Significant victim gender differences were found between JHOs who killed brothers and sisters with respect to region (Cramer's V=.111). There were noticeable differences between the percentages of juveniles arrested for fratricide and sororicide in the South (47.8 % vs. 39.0 %) and West (17.5 % vs. 26.9 %), while only slight differences in the percentages of JFOs and JSOs arrested in the Midwest (20.8 % vs. 21.4 %) and Northeast (13.9 % vs. 12.6 %).

Siblicide offenders were most likely to be arrested in large cities, followed by suburban areas, and then rural areas. They were least likely to be arrested in small cities. No significant differences in location emerged when examined within categories of offenders who killed brothers and those who killed sisters.

Arrests of juveniles for killing siblings appear to be declining since the mid 1970s when examined across three time periods (1976–1985, 1986–1995, and 1996–2007). The smallest percentage of siblicide arrests (20.2 %) occurred during the most recent 12-year period (1996–2007). Significant differences emerged between JFOs and JSOs across the three time frames

Table 3 Offender-related variables by siblicide offender type, 1976–2007

	Fratricide offender	Sororicide offender	Total siblicide offender
Offender age			
Under 14	102 (20.6 %)	70 (38.5 %)	172 (25.4 %)
14	72 (14.5 %)	29 (15.9 %)	101 (14.9 %)
15	89 (17.9 %)	26 (14.3 %)	115 (17.0 %)
16	116 (23.4 %)	32 (17.6 %)	148 (21.8 %)
17	117 (23.6 %)	25 (13.7 %)	142 (20.9 %)
Total arrests	496 (100 %)	182 (100 %)	678 (100 %)
	χ^2 (4)=26.267, Cramer's V=.197(95 % CI=0.124–0.268), $p<.001$		
Offender race			
White	263 (53.6 %)	113 (62.1 %)	376 (55.9 %)
Black	216 (44.0 %)	65 (35.7 %)	281 (41.8 %)
American Indian	9 (1.8 %)	3 (1.6 %)	12 (1.8 %)
Asian & Pacific Islander	3 (0.6 %)	1 (0.5 %)	4 (0.6 %)
Total arrests	491(100 %)	182 (100 %)	673 (100 %)
	(W/B/Other) No significant differences		
	(W/B) χ^2 (1)=3.900, Phi=−.077 (95 % CI=−0.152–0.001), $p<.05$		
Region			
South	237 (47.8 %)	71 (39.0 %)	308 (45.4 %)
Midwest	103 (20.8 %)	39 (21.4 %)	142 (20.9 %)
West	87 (17.5 %)	49 (26.9 %)	136 (20.1 %)
Northeast	69 (13.9 %)	23 (12.6 %)	92 (13.6 %)
Total arrests	496 (100 %)	182 (100 %)	678 (100 %)
	χ^2 (3)=8.286, Cramer's V=.111 (95 % CI=0.037–0.184), $p<.05$		
Location			
Large city	217 (43.8 %)	65 (35.7 %)	282 (41.6 %)
Suburban	135 (27.2 %)	51 (28.0 %)	186 (27.4 %)
Rural	93 (18.8 %)	44 (24.2 %)	137 (20.2 %)
Small city	51 (10.3 %)	22 (12.1 %)	73 (10.8 %)
Total arrests	496 (100 %)	182 (100 %)	678 (100 %)
	No significant differences		
Period			
1976–1985	230 (46.4 %)	61 (33.5 %)	291 (42.9 %)
1986–1995	172 (34.7 %)	78 (42.9 %)	250 (36.9 %)
1996–2007	94 (19.0 %)	43 (23.6 %)	137 (20.2 %)
Total arrests	496 (100 %)	182 (100 %)	678 (100 %)
	χ^2 (2)=8.982, Cramer's V=.115 (95 % CI=0.041–0.188), $p<.05$		

(Cramer's V=.115). Inspection of Table 3 reveals that the largest percentage of juveniles arrested for killing their brothers (46.4 %) occurred between 1976 and 1985. In contrast, the largest percentage of juveniles arrested for killing their sisters (42.9 %) occurred during the middle decade (1986–1995).

Given the blood relationships between victims and offenders, the racial distribution of the siblicide victims was very similar to the offenders. As shown in Table 4, approximately 97 % of both sororicide and fratricide victims killed by juveniles were either White or Black. Less than 3 % of siblicide victims killed by juveniles were American Indian, Asian, and Pacific Islander. Victim racial differences between fratricide and sororicide offenders were not significant when examined by all four groups or recoded in two or three racial variables.

In summary, significant differences were found between JHOs who killed brothers and sisters on four of the five offender

Table 4 Victim race by siblicide offender type, 1976–2007

Victim race	Fratricide offender	Sororicide offender	Total siblicide offender
White	263 (53.3 %)	110 (60.4 %)	373 (55.3 %)
Black	217 (44.0 %)	67 (36.8 %)	284 (42.1 %)
American Indian	10 (2.0 %)	3 (1.6 %)	13 (1.9 %)
Asian & Pacific Islander	3 (0.6 %)	2 (1.1 %)	5 (0.7 %)
Total arrests	493 (100 %)	182 (100 %)	675 (100 %)

No Significant Differences

(W/B/Other)—No Significant Differences

(W/B)—No Significant Differences

characteristics examined. JFOs differed from JSOs on offender age and offender race (Black/White values only), and region of country and time period arrested. However, with the one exception of offender age, the strength of these relationships was very weak (less than 0.2) suggesting little practical significance. The effect size of only one variable, offender age (Cramer's V=.197), although small, was a meaningful finding as it indicated JSOs were younger than JFOs. The one victim demographic characteristic initially examined (victim race) was not significant when analyzed by two, three, or four values of race.

The small or essentially non-existent relationships are not particularly surprising given that there are no theoretical reasons or previous empirical findings to suggest that juvenile siblicide offenders should have differed on the offender and victim characteristics examined. In contrast, prior research has suggested that offenders who kill brothers and sisters will differ significantly with respect to victim age, murder weapon, offender gender, and homicide circumstances. These hypotheses are tested individually below.

Hypothesis 1: Victim Age and Siblicide Offender Type

Roughly 85 % of all victims killed by JSOs were between the ages of 6 and 24. Less than 9 % were under age 5; the remaining 6 % were age 25 and older. Inspection of Table 5 reveals further that nearly two thirds (65.7 %) of siblings were killed in two victim age categories (13–17 and 18–24). Close examination of the data, however, reveals dramatic differences related to the ages of victims killed by JFOs versus JSOs. As predicted, JSOs were significantly more likely to kill younger victims than JFOs (Cramer's V=.303). The percentage of victims under the age of 5 years old killed by sororicide offenders was three times the percentage killed by fratricide offenders (17.1 % vs. 5.4 %). Victims of JSOs were also more likely than those of JFOs to be between the ages of 6–12 (32.6 % vs. 14.9 %). In contrast, victims of JFOs were twice as likely as those of JSOs to be between the ages of 18–24 (37.0 % vs. 17.1 %). Accordingly, our first hypothesis that JSOs would be more likely than JFOs to kill younger victims was supported. The effect size of this relationship, although small, is meaningful.

Table 5 Victim age by siblicide offender type, 1976–2007

Victim age	Fratricide offender	Sororicide offender	Total siblicide offender
Under age 1	4 (0.8 %)	4 (2.2 %)	8 (1.2 %)
1–5	23 (4.6 %)	27 (14.9 %)	50 (7.4 %)
6–12	74 (14.9 %)	59 (32.6 %)	133 (19.7 %)
13–17	177 (35.8 %)	53 (29.3 %)	230 (34.0 %)
18–24	183 (37.0 %)	31 (17.1 %)	214 (31.7 %)
25–34	30 (6.1 %)	6 (3.3 %)	36 (5.3 %)
35–49	4 (0.8 %)	1 (0.6 %)	5 (0.7 %)
Total arrests	495 (100 %)	181 (100 %)	676 (100 %)

χ^2 (6)=62.193, Cramer's V=.303 (95 % CI=0.233–0.369), $p<.001$

Hypothesis 2: Murder Weapon Type and Siblicide Offender Type

As shown in Table 6, guns and knives comprised 87 % of the types of weapons used in juvenile siblicide incidents. JFOs and JSOs were both most likely to use guns followed by knives to kill. Significant gender differences between fratricide and sororicide offenders were found with respect to weapon selection (Cramer's V=.210). JFOs were more likely than JSOs to use guns (65.0 % vs. 55.9 %) and knives (26.2 % vs. 19.6 %) to kill. In contrast, JSOs were more likely than JFOs to employ personal weapons (5.0 % vs. 2.0 %) and other means (blunt object, poison, drugs, drowning, explosion, pushed out window, fire, strangulation, and asphyxiation) (19.6 % vs. 6.7 %).

Our second hypothesis is only partially supported. As predicted, JSOs were more likely to use personal weapons than JFOs; and JFOs, relative to JSOs, were more likely to use guns. However, contrary to predictions, JFOs were more likely to kill using knives than JSOs. The effect size, although again small, indicates another meaningful finding.

Table 6 Weapon type by siblicide offender type, 1976–2007

Weapon	Fratricide offender	Sororicide offender	Total siblicide offender
Gun	320 (65.0 %)	100 (55.9 %)	420 (62.6 %)
Knife	129 (26.2 %)	35 (19.6 %)	164 (24.4 %)
Personal weapon	10 (2.0 %)	9 (5.0 %)	19 (2.8 %)
Other[a]	33 (6.7 %)	35 (19.6 %)	68 (10.1 %)
Total	492 (100 %)	179 (100 %)	671 (100 %)

[a] blunt object, poison, drugs, drowning, explosion, pushed out window, fire, strangulation, asphyxiation

χ^2 (3)=29.682, Cramer's V=.210 (95 % CI=0.137–0.281), $p<.001$

Hypothesis 3: Offender Gender and Siblicide Offender Type

As shown in Table 7, more than 85 % of juveniles arrested for killing siblings were male. As predicted, JHOs who killed brothers were significantly more likely to be male than those who killed sisters (87.7 % vs. 79.1 %) (Phi=.108). JSOs, relative to JFOs, were significantly more likely to be females (20.9 % vs. 12.3 %). The effect size in this case, however, was weak.

Hypothesis 4: Homicide Circumstances (Cornell's Typology) and Siblicide Offender Type

Consistent with prior research by Loper and Cornell (1996) and Roe-Sepowitz (2009), the authors recoded the FBI's Circumstance Codes into two of the three categories in the typology proposed by Cornell et al. (1987): crime-related and conflict-related. Crime-related circumstances included known or suspected crimes that coincided with the homicide and comprised less than 6 % of all siblicides committed by JHOs. Conflict-related circumstances included arguments coinciding with the homicide (lover's triangle, brawl under alcohol, brawl under drugs, argument over money, or other argument) and made up more than 94 % of siblicides.

As shown in Table 8, significant gender differences emerged (Phi=−.157). As predicted, JSOs were more likely than JFOs to kill during crime-related circumstances (12.9 % vs. 3.9 %). These crime-related circumstances involved rape, other sex offenses, arson, and nonspecified felony situations. Juveniles who killed brothers, relative to those who killed sisters, were more likely to kill in conflict-related situations (96.1 % vs. 87.1 %). The effect size was weak.

Logistic Regression Analysis

In the third stage of the analysis, a logistic regression model was estimated in order to determine which variables predicted fratricides and sororicides. The dependent variable, siblicide offender type, was coded as 0 = JFO and 1 = JSO. Based on the research hypotheses, eight independent variables were initially considered. With two exceptions, the independent variables were coded as 0 = no, 1 = yes. The six dichotomous independent variables included offender sex (1 = female), gun, knife, other weapon, personal weapon, and crime-related homicide. The two remaining variables, both age-related, were treated as continuous variables. Offender age was coded as 1 = under age 14, 2 = 14 years old, 3 = 15 years old, 4 = 16 years old, and 5 = 17 years old; victim age was coded 1 = under age 1, 2 = 1–5 years old, 3 = 6–12 years old, 4 = 13–17 years old, 5 = 18–24 years old, 6 = 25–34 years old, and 7 = 35–49 years old.

Regression diagnostics suggested collinearity issues with gun and other weapon values. Furthermore, Pearson correlations indicated collinearity between gun and knife (r=.736). Accordingly, use of a gun was removed from further analysis. The variable crime-related homicide was also removed from the first regression analysis because its inclusion resulted in the loss of approximately one-third of the cases (221 of the 678 cases).

The results when the six variables were entered into the binary logistic regression are presented in Table 9. Although the overall model was significant for discriminating JSOs from JFOs [$\chi^2(6)=61.690$, $p<.001$; Nagelkerke $R^2=.128$], only two variables were determined to be significant

Table 7 Offender gender by siblicide offender type, 1976–2007

Offender gender	Fratricide offender	Sororicide offender	Total siblicide offender
Male	435 (87.7 %)	144 (79.1 %)	579 (85.4 %)
Female	61 (12.3 %)	38 (20.9 %)	99 (14.6 %)
Total arrests	496 (100 %)	182 (100 %)	678 (100 %)

χ^2 (1)=7.862, Phi=.108 (95 % CI=0.033–0.181), p=.005

Table 8 Cornell et al.'s (1987) typology by siblicide offender type, 1976–2007

Cornell's types	Fratricide offender	Sororicide offender	Total siblicide offender
Crime-related	14 (3.9 %)	12 (12.9 %)	26 (5.7 %)
Conflict-related	346 (96.1 %)	81(87.1 %)	427(94.3 %)
Total Arrests	360 (100 %)	93 (100 %)	453 (100 %)

χ^2 (1)=11.101, Phi=−.157 (95 % CI=−0.245–0.066), p<.005

Table 9 Logistic regression results of juvenile siblicide offenders by siblicide offender type, 1976–2005

Independent variables	B	S.E.	Wald	Significance	Odds ratio
Offender gender	0.626	0.260	5.823	.016	1.871
Personal weapon	0.693	0.507	1.870	.171	2.000
Other weapon	0.367	0.320	1.314	.252	1.443
Knife	−0.114	0.238	0.229	.632	0.892
Victim age	−0.451	0.118	14.681	.000	0.637
Offender age	−0.075	0.076	0.968	.325	0.928
Constant	0.387	0.314	1.516	.218	1;.472

Omnibus Tests of Model Coefficients – χ^2 (6)=61.690, p<.001;

−2 Log likelihood=716.069

Nagelkerke R^2 =.128

N=670

predictors of JSOs: gender of the offender and age of the victim. Adjusted odds ratios were calculated [Exp(B)-1 × 100=adjusted odds ratio] to report the percentage change in the odds for statistically significant effects. Specifically, when the offender was female, the odds that the offender killed a sister rather than a brother increased by 87 %. For every one unit increase in victim's age, the odds that the offender committed sororicide rather than fratricide decreased by 36 %. When an additional logistic regression analysis was estimated with the crime-related variable included, these same two variables remained significant, although the crime-related variable did not reach statistical significance.

Discussion

This study examined multiple characteristics associated with juveniles who commit fratricide and sororicide using 32 years (1976–2007) of national level data from the FBI's SHRs. This study represents the largest effort to date to systematically analyze juveniles arrested for killing brothers and sisters in the United States. The first set of analyses was undertaken to describe demographic characteristics of JFOs and JSOs. With the exception of offender age, these relationships were either weak or not significant, which was not surprising, given that there were no theoretical or empirical reasons to expect differences between the two groups. Offender age and siblicide offender type, in contrast, had a small effect size (Cramer's V=.197) and indicated that JSOs were significantly more likely to be younger than JFOs.

The second set of analyses tested four hypotheses of differences between sororicides and fratricides based on previous research. All of these hypotheses received support. Effect sizes indicated that the relationship was small between siblicide offender type and victim age (Cramer's V=.303) and weapon (Cramer's V=.210). The relationships were weak between siblicide offender type and offender gender (Phi=.108) and homicide circumstance (Phi=−.157).

Regression analysis revealed that when the significant variables were entered into the analysis, the overall model was significant for discriminating JSOs from JFOs. However, only two variables (gender of the offender and age of the victim) were found to be significant predictors. Relative to fratricide offenders, sororicide offenders were almost twice as likely to be female and were more likely to kill younger victims.

Similar to other investigations involving siblicide (Underwood and Patch 1999), this study found that juvenile males were four times more likely than female juvenile offenders to murder their siblings when analyzing all siblicide cases and then more specifically fratricide and sororicide cases. JFOs were also more likely to be older than their female offender counterparts.

Consistent with previous research involving juvenile siblicide (Gebo 2002) and juvenile homicide research in general (Heide 1999), Blacks were over-represented as victims and offenders based on their proportion in the U.S. population, while Whites were under-represented. Approximately 56 % of all juvenile siblicide offenders were White and nearly 42 % were Black. Comparing these results to the racial composition of the U.S population, 71.5 % of the U.S population is White; Blacks make up only 12.3 % (U.S. Census Bureau 2010). Not surprisingly, given the family nature of these homicides, racial patterns among victims were similar.

Males, once again, were overwhelmingly represented as siblicide victims. However, differences between JFOs and JSOs in terms of victim age were among our strongest findings. It is interesting to note that victims killed by JSOs were significantly younger than those killed by JFOs. JSOs were three times more likely than JFOs to kill victims aged five and under (17.1 % vs. 5.4 %). These findings suggest that female juveniles in particular may need more supervision with respect to young sisters than brothers. The finding that more than 40 % of victims killed by JFOs are over age 18 suggests that long-lasting sibling rivalry may lead to later lethal violence.

The higher percentages of fratricides and sororicides occurring in large cities and suburban areas likely can be attributable to the population size of each location. To the authors' knowledge, location has yet to be thoroughly studied within siblicide research. Underwood and Patch (1999) stated that siblicide research concerning regional differences needs to be addressed. Guns and knives were the weapons predominately used by both JFOs and JSOs. These results are also consistent with past siblicide research of "firearms…as the weapon of choice" (Underwood and Patch 1999, p. 345). Differences, however, were found pertaining to gender. JFOs were more likely to use guns and knives, while JSOs were more likely to use blunt objects, personal weapons, fire, and "other" weapons.

The present study reveals that males and females of varying age and racial groups are susceptible to being victims of siblicide. Results from these analyses suggest, however, that preliminary profiles of JFOs and JSOs can be tentatively drawn. JFOs are typically male, white, and between 15 and 17 years old, and they are likely to kill victims between the ages of 13 years and older and to use guns. JSOs are typically male, white, and 15 years of age and younger, and they are likely to kill victims 17 years of age and younger and to use guns.

Long standing rivalries, stress, and confrontations have been shown to lead to lethal family violence. Almost all siblicide offenders killed brothers or sisters during conflict-related situations (96 % and 87 %). This finding, as many others highlighted above, have important treatment and preventional implications.

Treatment and Prevention Implications

Based on previous research and the results from the current analyses, recommendations can be made for treatment and prevention implications for at-risk juveniles. First, the availability of guns in a volatile home environment can quickly change an argument between two siblings into a deadly confrontation. Siblings who are in the midst of a power struggle or confrontation may impulsively shoot if guns are readily available. Consistent with recommendations made by the American Medical Association, we recommend that pediatricians and mental health professionals inquire about firearms, particularly in homes when there has been serious strife and physical confrontation among siblings (Walker 2011). In circumstances such as these, parents should seriously consider removing firearms from the home or at least securing them within the household.

Second, parents should get help when conflict between siblings seems extreme, or when one child is angry and acting out toward others in the family. Mental health professionals should be consulted if sibling rivalry starts to rise to abnormal levels, as they can train parents on how to address rivalries and arguments, as well as how to focus on each child's strengths (Kashani et al. 1997). In addition, individual and family therapy can be helpful in facilitating cognitive and behavioral change in children at risk and the family unit as a whole.

Third, the need for increased supervision among youth is also important, especially with respect to young children. For example, the present results indicated that girls under age 5 were at the most risk of becoming sororicide victims. Some, if not all of these deaths, could have been prevented with better parental supervision of young children.

Directions for Future Research

This study focused on SVSO incidents. Preliminary analyses revealed significant gender differences in situation type. Sororicides were more likely to involve multiple offenders and multiple victims than fratricides. Future investigators might focus on siblicides involving multiple offenders and multiple victims, and compare them with findings restricted to SVSO incidents. Research on siblicide also needs to move beyond analyses of SHR data. Although it has many advantages, the SHR dataset has some limitations. Coding of the data by law enforcement, for example, is not always accurate (Gebo 2002). In addition, and more importantly, factors that are important to the study of siblicide are not available in this dataset. These variables include family violence history, mental health status and criminal history of the offender, history of substance abuse by the parent and other family members, and parental involvement between siblings (Underwood and Patch 1999).

Continued research on this population is crucial for understanding lethal family violence. Issues like sibling bonding, rivalry, competition, abuse, parental involvement, and age comparisons between victims and offenders should be studied with the aim of understanding and preventing juvenile siblicides. Investigations of juvenile and adult siblicide situations within multidisciplinary research frameworks (psychology, criminology, psychiatry, and biology) are needed. Qualitative research including in-depth interviews with siblicide offenders and their family members could help to elucidate common pathways to murderous violence between siblings if sample sizes were sufficiently large.

Lastly, existing longitudinal studies of juveniles, such as the Pittsburgh Youth Study (Loeber et al. 2002), Rochester Youth Study (Thornberry et al. 2003), and the Denver Youth Study (Huizinga et al. 2003) should be mined to explore the antecedents of sibling violence (and sibling deaths if any occur). These data sets contain multiple data sources of interest including explanatory, behavioral risk, measures of criminal behavior, and interventions. In short, numerous approaches and investigations are needed to help decrease the occurrence of these tragic family crimes. Siblicide, unlike many other types of homicide, would seem to be among the types most preventable.

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