



Homicide-suicide

Postmortem study from the Institute of Legal Medicine in Frankfurt/Main from 1994 to 2014

Introduction

Homicide-suicide is defined as the commitment of homicide involving killing one or more persons with the subsequent suicide of the perpetrator. Homicide occurs against the will of the victim and the suicide of the perpetrator takes place within 1 week after the homicide [26]. The term homicide-suicide has to be differentiated from the term double suicide, when the partner has agreed to be killed [18, 30]. In the German literature, the term extended suicide is used for cases in which the perpetrator has planned the suicide before committing homicide [15, 22, 30]; however, it is often impossible to reconstruct the motive in retrospect. Additionally, due to the drama of these incidents the homicide has to be more emphasized and the term homicide-suicide will be used in the present study.

The occurrence of homicide-suicide is relatively rare and the analysis of these incidents is often based on speculation on the background of the act. Nonetheless, it is a phenomenon that includes extreme consequences for the persons involved, such as loss of life of the victim or the legal consequences of a failed suicide for the perpetrator. In most cases, family tragedies are found in the context of a homicide-suicide [17]. In addition, two forms of violence should be distinguished: so-called family tragedies are often committed in a highly emotional situation. Violence often occurs, for example, affectively in a jealous rage or a break-up conflict. In contrast, inci-

dents, such as a school shooting, a terrorist attack or a shooting rampage occur as target-orientated violence. The perpetrators commit the incident with a specific attack against the victims. Meloy described these forms of violence as affective and predatory [27]. In everyday terms these different forms of violence are used as “hot angeriness” and “cold angeriness” [33]. The transitions of a terroristic attack, a school shooting and a gun rampage are not static and, in a broader sense, are all defined as a homicide-suicide [3]. Additionally, the German Wings aircraft crash forced by the copilot in 2015, the school shooting in Winnenden in Germany in 2009 and the school shooting in Erfurt in Germany in 2002, are incidents that were highly discussed not only in the German press but stimulated discussions about the concept of these events.

Disregarding the incidents of school shootings, terroristic attacks and gun rampages that could be added to the concept of homicide-suicide and considering national and international studies carried out on homicide-suicide, the literature provides similar results when analyzing these events. The offenders are mainly males, the victims mostly females, victim and offender are often in a close relationship and the use of firearms is a popular method of committing homicide-suicide. The source of information used for the analysis of the incidents is a striking feature in different studies. Newspaper reports or those from the death reporting system could be used as sources, but they would

not provide reliable information and are mainly based on speculation [2, 8, 24, 31, 39]. The number of cases is often high but lack evidenced information.

Triggered by the variety of these incidents and the recurring presence in the press, the questions is raised: “how often do these events occur in the Hesse region and what is the real background of these acts?” As a result, the aim of this study was to analyze the homicide-suicide incidents that occurred in Frankfurt and the southern Hesse region in Germany in the years 1994–2014.

Material and methods

A literature search was carried out in the medical database PubMed and the medical electronic library of the University of Frankfurt, Germany. The research primarily contained all journals of Web of Science/Thomson Reuters which were listed under the category “legal medicine”. The keywords, homicide-suicide, murder-suicide, familicide, filicide and extended suicide were used. Inclusion criteria for article selection were national and international studies on homicide-suicide, systematic reviews, articles including the definition of a homicide-suicide and relevant articles including discussion on the background of homicide-suicide events. A summary of homicide-suicide studies conducted is given in **Table 1**.

In a retrospective study, the database Forensic of the Institute of Legal Medicine in Frankfurt/Main was searched for cases

Table 1 Summary of national and international homicide-suicide studies

Homicide-suicide (no.)	Publication	Sources of cases	Place	Time period	Victim (gender in %)	Offender (gender in %)	Victims mean age (years)	Offenders mean age (years)	Use of firearms (%)
662	Roma et al. 2012 [31]	Newspaper	Italy	1985–2008	Female 68.4	Male 84.6	n.a.	n.a.	n.a.
203	Flynn et al. 2009 [14]	Office for national statistics	England and Wales	1996–2005	n.a.	Male 86.0	37.0	44.0	n.a.
265	Stack 1997 [35]	Police files	Chicago, USA	1965–1990	Female 78.5	Male 97.0	35.0	39.7	n.a.
209	Bossarte et al. 2006 [6]	Reporting system	USA (13 states)	2003–2004	Female 74.6	Male 91.9	n.a.	n.a.	81.6
103	Liem et al. 2009 [24]	Newspaper	Netherlands	1992–2006	Female 68.0	Male 90.0	30.0	44.0	n.a.
75	Grabherr et al. 2010 [17]	Files of forensic institutes	Switzerland	1981–2004	Female 66.0	Male 88.0	33.0	47.0	67.0
73	Comstock et al. 2005 [8]	Death reporting system	Oklahoma, USA	1994–2001	Female 79.8	Male 93.2	42.0	34.0	97.3
53	Hannah et al. 1998 [19]	Virginia Department of Health	Central Virginia, USA	1980–1984 1990–1994	Female 78.0 Female 80.0	Male 91.0 Male 97.0	32.3 36.8	41.0 42.5	94.0 91.0
50	Adinkrah 2014 [2]	Newspaper	Ghana	1990–2009	Female 71.0	Male 96.0	29.3	40.4	58.0
40	Geiger 1991 [16]	Files of forensic institute	Germany (Tübingen)	n.a.	n.a.	Male 80.0	n.a.	n.a.	40.0
39	Milroy et al. 1997 [28]	Forensic institute	Australia	1985–1999	Female 100.0	Male 85.0	n.a.	44.0	76.0
37	Travis et al. 2007 [36]	n.a.	England	1991–2005	n.a.	Male 100.0	n.a.	46.8	n.a.
31	Dubbert 2013 [12]	Police report	Germany (Kassel)	1994–2006	Female 74.4	Male 86.8	n.a.	n.a.	55.8
30	Wood and Voigt 2007 [39]	Newspaper	New Orleans, USA	1989–2001	Female 96.6	Male 96.6	29.0	29.6	n.a.
23	Shiferaw et al. 2010 [34]	Files forensic institute	Switzerland (Geneva)	1956–2005	n.a.	Male 83.0	38.0	43.0	96.0
19	Verzeletti et al. 2014 [37]	Files of forensic institute	Northern Italy	1987–2012	Female 100.0	Male 100.0	37.0	42.0	74.0
17	Rosenbaum 1990 [32]	Police report	New Mexico	1978–1987	n.a.	Male 98.0	33.4	42.3	n.a.
16	Campanelli and Gilsen 2002 [7]	Death records	USA	1995–200	Female 88.0	Male 94.0	38.0	34.0	69.0
12	Hanzlick and Koponen 1994 [20]	Fulton County Examiner Atlanta	Georgia, USA	1988–1991	Female 71.0	Male 100.0	n.a.	n.a.	92.0

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Homicide-suicide. Postmortem study from the Institute of Legal Medicine in Frankfurt/Main from 1994 to 2014**Abstract**

Background. Extended suicide (also known as homicide-suicide) is an incident in which the perpetrator kills one or more people against their will and subsequently commits suicide. Victim and offender are often in a close relationship. In the case of a failed suicide, the offender has to anticipate extensive penal consequences (§ 211 ff. of the German criminal code).

Objective. The aim of this study was to analyze homicide-suicide cases that occurred during a 21-year period (1994–2014) and to gain further information about the background of these incidents.

Material and methods. In a retrospective study, 58 cases of homicide-suicide investigated at the Institute of Legal Medicine, Goethe

University in Frankfurt/Main, Germany were analyzed. Information about the incidents was obtained from the autopsy reports and from prosecution investigation files, as far as these were provided in accordance with data protection regulations. A literature survey and a homicide-suicide classification system were conducted and descriptive and statistical data analyses were performed.

Results. In 58 cases a total of 74 victims were involved in which 93% of the offenders were male and 7% female. Of the victims 76% were female, 20% male and 4% remained unknown. Victims involved 17 children and 66% of the incidents included a spouse or intimate partner relationship. In 71% the crime scene took place in the domestic environment.

The main triggering factors of the acts were marriage conflicts and financial problems. In 57% of the cases shooting was the method of choice.

Conclusion. Due to the severity and consequences of the act, the term homicide-suicide rather than extended suicide should be employed in German linguistic usage because it is a homicide with subsequent suicide. The emphasis should be placed on the development of prevention.

Keywords

Retrospective study · Murder · Firearms · Domestic violence · Classification

Erweiterter Suizid. Postmortem-Studie am Institut für Rechtsmedizin Frankfurt am Main von 1994 bis 2014**Zusammenfassung**

Hintergrund. Beim erweiterten Suizid (Homizid-Suizid) tötet der Täter ein oder mehrere Opfer und nimmt sich anschließend selbst das Leben. Opfer und Täter stehen oft in einer engen Beziehung zueinander. Im Falle eines misslungenen Suizids hat dies weitreichende strafrechtliche Folgen für den Täter (§§ 211 ff. StGB).

Ziel. Ziel dieser Studie war die Analyse erweiterter Suizide in einem Zeitraum von 21 Jahren (1994–2014), um einen tieferen Einblick in die Hintergründe dieser Taten zu bekommen.

Material und Methoden. In einer retrospektiven Studie wurden 58 Fälle des erweiterten Suizids am Institut für Rechtsmedizin Frankfurt/Main analysiert. Informationen

der Fälle wurde aus den dazugehörigen Obduktionsprotokollen und staatsanwalt-schaftlichen Akten entnommen, sofern diese bereit waren, die Akten basierend auf ein Datenschutzkonzept zur Verfügung zu stellen. Ein Literaturüberblick und eine Homizid-Suizid-Klassifikation wurden erstellt. Die Daten wurden deskriptiv und statistisch analysiert.

Ergebnisse. Unter den 58 Fällen befanden sich 74 Opfer. Die Täter waren in 93 % der Fälle männlich und in 7 % weiblich. Von den Opfern waren 76 % weiblich, 20 % männlich und 4 % blieben unbekannt. Unter den Opfern waren 17 Kinder, Ehe- oder Lebenspartner waren in 66 % der Fälle involviert. In 71 % der Fälle wurde der erweiterte Suizid zu Hause verübt. Hauptmotive der Tat waren Konflikte

in der Partnerschaft und finanzieller Ruin. Erschießen war in 57 % der Fälle Methode der Wahl.

Schlussfolgerung. Auf Grund der Schwere der Tat sollte der Begriff Homizid-Suizid anstelle von erweitertem Suizid in den deutschen Sprachgebrauch integriert werden. Dieser fokussiert sich mehr auf das Tötungsdelikt als auf den Suizid und berücksichtigt somit die Schwere der Tat und die Opfer deutlicher als das Tötungsdelikt. Der Fokus sollte im Weiteren auf die Prävention dieser Ereignisse gerichtet werden.

Schlüsselwörter

Retrospektive Studie · Mord · Schusswaffe · Häusliche Gewalt · Klassifikation

of “non-natural death” within the subcategory “extended suicide”. Additionally, the corresponding reports of autopsies performed in the Institute of Legal Medicine Frankfurt/Main, which is responsible for the southern Hesse region (approximately 1.9 million inhabitants, update from September 2015, Hessian statistical regional authorities) during 1994–2014, were evaluated. Permission for using records of the homicide-

suicide cases was obtained from the prosecution authorities (permission by the state public prosecution, prosecution services of Frankfurt/Main, Hanau, Offenbach, Darmstadt and Wiesbaden). The documents were provided based on a data privacy statement and 36 files were received and examined. Included were cases when the homicide was performed against the will of the victim and a maximum time interval of 3 days between

homicide and suicide was chosen [14]. In cases of no distinct evidence of a motive of the incident, we assessed the situation of the incident and either included or excluded these cases. Cases that included either a failed homicide or a failed suicide were also taken into account. Excluded were double suicide cases, where the homicide and suicide was performed by mutual consent. In these cases distinct references of the common will of the in-

Table 1 Summary of national and international homicide-suicide studies (Continued)

Homicide-suicide (no.)	Publication	Sources of cases	Place	Time period	Victim (gender in %)	Offender (gender in %)	Victims mean age (years)	Offenders mean age (years)	Use of firearms (%)
10	Dogan et al. 2010 [11]	Files of forensic institute	Turkey	2000–2007	Female 66.0	Male 90.0	26.0	32.0	80.0
10	Hellen et al. 2014 [22]	Files of forensic institute	Germany (Düsseldorf)	2006–2011	Female 100.0	Male 100.0	49.0	56.0	60.0
6	Dettling et al. 2003 [10]	Files of forensic institute	Germany (Essen)	1991–2001	n.a.	Male 50.0	n.a.	n.a.	n.a.

n.a. not available

volved persons in the form of a farewell letter or an act announcement prior to the event was included in the records. Data on gender, age, nationality and profession of the offender and victims, method of the homicide-suicide incident, circumstances of the act, information about date and place and any other valid additional information were collected from the autopsy records and files of the prosecution authorities and were listed in Excel (Microsoft Office 365). Additionally, a list of categories including homicide-suicides and their potential offender-victim combination based on the system of Marzuk et al. [26] and Hanzlick and Koponen [20] was introduced (Table 2). A descriptive and statistical data analysis was performed using Excel and biometric analysis of samples (*Biometrische Analyse von Stichproben, BiAS*) [1].

Results

The analysis of the Forensic database of the Institute of Legal Medicine in Frankfurt/Main led to 71 autopsy cases. We excluded 11 cases, because they were defined as double suicide, 2 cases were excluded because of indefinability of homicide-suicide or double suicide and 58 cases of homicide-suicide were finally included and analyzed. Among the 58 cases of homicide-suicide that occurred between 1994 and 2014 in Frankfurt and the southern Hesse region in Germany, there were 13 cases of failed homicide-suicide. In 7 cases the homicide of 1 victim failed and in 6 cases the suicide of the perpetrator failed. Table 3 demonstrates the distri-

bution of male and female offenders and of male and female victims. The 58 incidents resulted in 74 victims, including 17 children (7 boys, 8 girls and 2 with no gender data mentioned in the files). In 3 out of 4 cases committed by a female offender, children were involved. In 1 of the 58 cases a dog was additionally killed and in another case a guinea pig. In 46 cases (79%) there was 1 victim, in 9 cases (16%) 2 victims, in 2 cases (3%) 3 victims and 1 case (2%) 4 victims.

Characteristics of perpetrators and victims

Age

The mean age of the male offenders was 57 years (min = 30 years max = 87 years; median = 56 years; $n = 1$: age unknown). The mean age of the female offenders was 28 years (min = 21 years max = 35 years; median = 28 years; $n = 2$: age unknown). The mean age of the 74 victims was 42 years (min = 0.5 years max = 88 years; median = 43 years; $n = 5$: age unknown). The 17 children (23%) had a mean age of 7.4 years (min = 0.5 years max = 16 years; median = 8 years; $n = 2$: age unknown).

Profession

In 60% of the cases ($n = 35$) information about profession, retirement or unemployment of the offender was included in the files. Of the offenders 49% ($n = 17$) were retired at the time of incident, 20% ($n = 7$) were unemployed, 9% ($n = 3$) were sales agents, 3% ($n = 1$) were estate agent, 3% ($n = 1$) brothel owner, 3% ($n = 1$) businessman, 3% ($n = 1$) lawyer, 3% ($n =$

1) chemist, 3% ($n = 1$) policeman and 3% ($n = 1$) worked for a security service. Of the retired offenders 18% ($n = 3$) were also hunters. Analyzing the profession, retirement or unemployment of the victims, information was provided in 38% of the victims ($n = 28$), 25% ($n = 7$) were retired, 14% ($n = 4$) were pupils, 14% ($n = 4$) were employed (unknown profession), 11% ($n = 3$) were housewives, 7% ($n = 2$) prostitutes, 4% ($n = 1$) shop assistant, 4% ($n = 1$) sales agent, 4% ($n = 1$) teacher, 4% ($n = 1$) secretary, 4% ($n = 1$) gambling hall owner, 4% ($n = 1$) pedagogue, 4% ($n = 1$) post office assistant, and 4% ($n = 1$) hairdresser.

Nationality

Nationalities of the offenders were 60% ($n = 35$) German, 26% ($n = 15$) not specified, 3% ($n = 2$) Yugoslavian, 2% ($n = 1$) Polish, 2% ($n = 1$) Austrian, 2% ($n = 1$) Croatian, 2% ($n = 1$) Turkish, 2% ($n = 1$) Iranian and 2% ($n = 1$) Italian. Nationalities of the victims were 60% ($n = 44$) not specified, 35% ($n = 26$) German, 1% ($n = 1$) Yugoslavian, 1% ($n = 1$) Croatian, 1% ($n = 1$) Turkish and 1% ($n = 1$) Italian.

Psychological disorder, blood alcohol level and other drugs

Psychological disorders of the offenders were mentioned in 10 cases whereby 5 suffered from depression, 3 from hallucinations and in 2 cases previous suicide attempts were reported.

The blood alcohol level of the offenders was taken at the time of autopsy and was included in the autopsy protocol of 39 (67%) of the offenders. The mean blood alcohol level resulted 0.41%

Table 2 Classification categories homicide-suicide

	Homicide-suicide type	Victims	Offender (<18 years old, >18 years old)
1	Children constellation: – Homicide of child/children with subsequent suicide of offender – Newborn: ≤1 day old – Infant : ≤1 year old – Toddler/child: ≥1 year to ≤18 years	Biological child stepchild	Biological parent stepparent life partner of parent Other family member
2	Family constellation: – Homicide of several family members with subsequent suicide of offender	Marriage partner biological child stepchild other family member pet	Marriage partner biological child stepparent stepchild other family member
3	Intimate partner/marriage partner constellation: – Homicide of intimate partner or marriage partner with subsequent suicide of offender	Marriage partner fiancé life partner love affair ex-marriage partner ex-intimate partner	Marriage partner fiancé life partner love affair ex-marriage partner ex-life partner
4	Extrafamilial constellation: – Homicide of non-family member with subsequent suicide of offender	Friend/acquaintance child of friend stranger others (e. g. doctor, lawyer, therapist)	Female male
5	Running amok: 1. With subsequent suicide 2. Without subsequent suicide 3. Provoked suicide (by police) 4. Simultaneous homicide and suicide	In airplane in car in train/bus in court in political institutions in agency others	Female male
6	Terrorist background: 1. Simultaneous homicide and suicide 2. With subsequent suicide 3. Without subsequent suicide	Female male	Female male
7	School shooting: 1. With subsequent suicide 2. Without subsequent suicide 3. Provoked suicide (by police)	Lecturer teacher student pupil other staff members	Female male
8	Wrong-way driver: 1. With suicidal intent 2. With non-suicidal intent 3. Driver dead 4. Driver and codriver dead 5. Codriver dead 6. No dead people	Female male	Female male
*	Failed constellations: 1. Failed homicide + suicide attempt 2. Homicide + suicide attempt 3. Pseudo attempt 4. Failed homicide + suicide attempt 5. Realistic attempt 6. Injured 7. Badly injured	Female male	Female male

(min = 0.00‰ max = 1.70‰; median = 0.07‰). In 20 of the 39 determined offender blood alcohol levels (51%) the amount was below 0.10‰. Drugs detected in blood samples of the offenders were flunitrazepam ($n = 1$), bromazepam

in combination with propranolol ($n = 1$), cannabinoids ($n = 2$) and lamotrigine ($n = 1$).

The blood alcohol level collected in 29 (39%) victims revealed a mean level of 0.23‰ (min = 0.00‰ max = 1.98‰; me-

dian = 0.02‰). In 21 samples (72%) the level was below 0.10‰. Drugs found in blood samples of the victims consisted of an antidepressant ($n = 1$), flunitrazepam ($n = 2$) and cannabinoids ($n = 1$).

Table 3 Genders of offenders and victims

Gender	Male (n)	Female (n)	Unknown (n)
Offender	54 (93%)	4 (7%)	0 (0%)
Victim	15 (20%)	56 (76%)	3 (4%)

Circumstances of the homicide-suicide incident

Methods of homicide and suicide

■ Fig. 1 shows the different methods of offenders (male and female combined) selected for the homicide and the methods offenders used to kill themselves. In 57% ($n = 33$) of the 58 cases shooting was the method of choice for homicide and in 52% ($n = 30$) of the cases shooting was also the method of committing suicide. Most, i. e. 91% ($n = 30$), of the offenders who killed their victims by a gunshot, also committed suicide by shooting themselves. Cases that involved several victims included the same homicide method for each victim. Only male offenders used shooting for committing homicide and suicide. Of the 4 female offenders 2 committed homicide and suicide by jumping from the balcony holding a child in the arms, another administered an overdose of insulin to the victim and herself. In the latter case the suicide failed and the offender survived. The fourth female offender suffocated her son with a pillow and hanged herself afterwards.

An identical homicide and suicide method was also seen in cases of carbon monoxide intoxication ($n = 1$), jumping from a balcony ($n = 2$), sleeping pills ($n = 1$), overdose of insulin ($n = 1$), stabbing ($n = 5$) and electric shock ($n = 1$). In 27% of the cases ($n = 16$) homicide and suicide method varied and 1 suicide method was unknown.

Placement of gunshot type homicide and suicide

In 11 cases (33%) the offender placed the shot to the head of the victim(s) and in 8 cases (24%) both to the chest and head. In 4 cases (12%) the perpetrator shot the victim(s) in the chest, in 1 case in the chest, the leg and the stomach and in another case in the stomach and the head. In 8 cases (24%) the placement of the shot was not recorded in the files. In 20 cases (67%) the offender shot himself

in the head (temple left/right), in 8 cases (27%) through the mouth in the head and in 2 cases (6%) in the left chest.

Gun possession offender and gun type used

Of the offenders 4 were in illegal possession of a gun, whereas 3 were hunters possessing a gun legally. These were the only cases where the authorities confirmed the possession of a gun. In the other 26 cases that were committed by gunshot, information about the possession of a gun was not mentioned in the reports. In 25 out of 33 (75%) cases the gun type used to commit the act was mentioned in the files. Guns with a caliber of 7.65 mm were used in 7 cases, with 9 mm caliber in 6 cases. Sport guns with a caliber of 22 mm were used in 4 cases, a revolver in 2 cases, a pump gun of caliber 12/70 in 2 cases, caliber .38, caliber 6.35 mm, a .357 magnum and caliber 3.35 mm each in 1 case.

Relationship of offender and victim

The different relationships of offender and victim are shown in ■ Fig. 2. In 38 (66%) cases an intimate/marriage partner relationship (including 5 ex-partners, classification category 3), in 8 (14%) cases family (classification category 2), in 6 (10%) cases children (classification category 1) and 6 (10%) cases extrafamilial relationships were present (classification category 4). Category 5, 6, 7 and 8 were unrepresented (■ Table 2).

Motives of the homicide-suicide

■ Fig. 3 summarizes the diverse motives of the homicide-suicide cases, which were evaluated as far as they were included in the police report of the prosecution files or the autopsy reports. Motive combinations such as financial problems and break-up conflicts were mentioned 3 times. In 12 cases (20%) financial problems were the main motive for committing homicide-suicide.

Announced eviction from house or apartment was mentioned in 6 of these cases.

Timeline homicide-suicide and crime scene

In 55 cases (95%), the commitment of homicide and suicide occurred on the same day. In 3 cases the offenders committed suicide on the next day. The incidents occurred in all seasons of the year, 24% ($n = 14$) took place in summer, 29% ($n = 17$) in spring, 33% ($n = 19$) in autumn, 12% ($n = 7$) in winter and 1 exact date was unknown.

Site of crime

In 41 cases (71%) the crime scene took place in the privacy of a home, 6 (15%) even in the marital bed. Other crime scenes were in a gambling hall ($n = 2$), bar ($n = 1$), prison cell ($n = 1$), in a forest ($n = 1$) and in a public swimming pool ($n = 1$). Of the cases 11 (19%) showed different crime sites for homicide and subsequent suicide.

Act announcement

Of the offenders 10 (17%) left a farewell letter announcing their act, which was addressed to the bereaved, 4 (7%) offenders announced their act in advance by telephoning to a friend or a family member and 2 (3%) offenders called the police and ambulance service after completing the homicide. In the other cases, it was unknown or not mentioned in the file if an announcement of the act had been made.

Failed homicide and suicide

In 6 (10%) of the 58 cases a victim survived the homicide attempt. Methods that led to the failure of the homicide were a shot to the head in 3 cases, the administration of sleeping pills in 1, suffocation with a plastic bag in 1 and stabbing with a knife in 1 case. In 7 (12%) of the 58 cases the suicide of the perpetrator failed, such as stabbing with a knife in 2, attempting suicide by cutting the wrist in 2, a shot into the head also in 2 and the administration of an insulin overdose in 1 case. In 3 of the failed suicide cases the files included the court judgement.

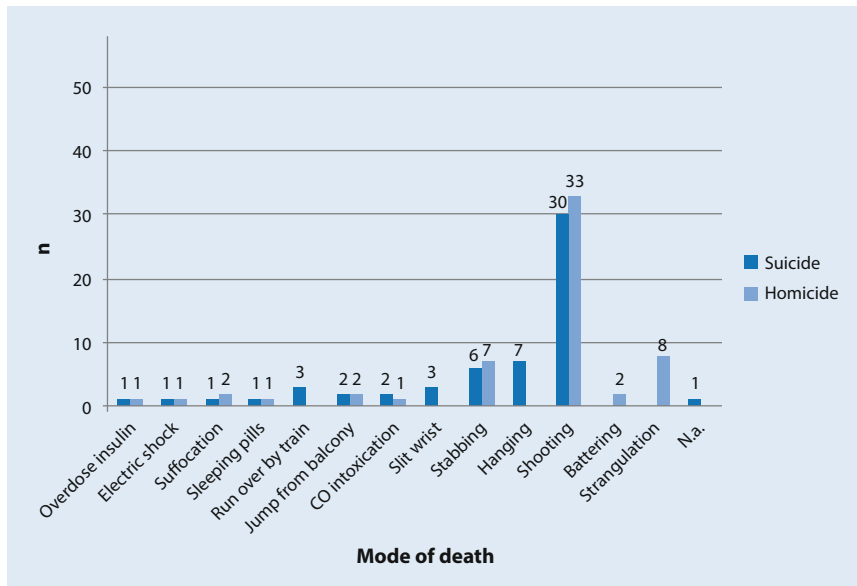


Fig. 1 ▲ Diagram showing the modes of death by homicide and suicide (*n.a.* not available)

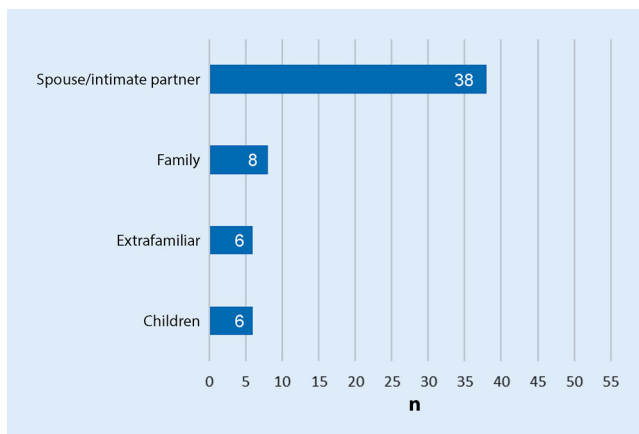


Fig. 2 ◀ Relationship of offenders and victims

One judgement resulted 7 years imprisonment (§§ 212, 21, 49 of the German Criminal Code StGB) with probation after 3 years, because of no criminal record. The second judgement included 11 years imprisonment (§ 212 StGB) because of homicide attempt and illegal gun possession and the third judgement resulted in 3.5 years imprisonment (§ 212 StGB) because of homicide attempt and a full confession.

Discussion

Our study investigated homicide-suicide incidents in the southern Hesse region that were predominantly committed by male offenders. Victims were mainly female and often younger than the offender. Shooting was the main method for both

homicide and suicide. Offender and victim were mostly in a close relationship and financial problems or break-up conflicts were the major motives. Other studies on homicide-suicide in Germany [10, 12, 16, 22] also confirmed that males are mostly the perpetrators and females the victims, which is in accordance to other international homicide-suicide studies [19, 22, 24, 35]. In accordance with Flynn et al., in cases including a female offender, it was usually the mother of the victim [14]. In the present study, 17 children were involved in 14 cases: 8 were a familicide-suicide and 6 a filicide-suicide and 3 filicide-suicides were committed by females and 3 by a male perpetrator. In a homicide-suicide analysis performed in New Orleans [39] 3 filicide-suicides and 3 familicide-sui-

cides are reported. All 3 filicide-suicide cases were committed by females and 2 of the familicide-suicide cases by male perpetrators. In accordance with the present study, Hatters Friedmann et al. [21] reported a mean age of 7.1 years of the children, but in contrast to the present study, they found a rate of 65% girls and 35% boys. In an Italian study of D'Argenio et al. [9] the children were slightly younger (mean age = 6.2 years). The age difference between the offender and victim is a frequently observed phenomenon [2, 8, 17, 35] and confirms our results that victims are on average younger than the perpetrators.

The results included several types of homicide-suicide relationships (intimate partner/spouse $n = 38$, family $n = 8$, children $n = 6$, extrafamiliar $n = 6$), where the spouse/intimate partner relation was by far the most frequent. Marzuk et al. [26] proposed a clinical classification of homicide-suicide that additionally included the motive of the act. Based on that classification system, Hanzlick and Koponen [20] added even more motives to their classification system and to the different methods used to commit homicide-suicide. In 66% of our cases, offender and victim were in a spouse/intimate partner relationship. Marzuk et al. [26] reported that the “spousal murder-suicide” was most frequent with one half to three quarters of all murder-suicide cases in the United States. The study distinguished the spousal murder-suicide into uxoricidal (the killing of a spouse) and consortial (the killing of a lover). Verzeletti et al. [37] described a spousal relationship in all incidents. In the present study, 33 uxoricidal cases and 5 ex-partner relationships are reported. In 91% of cases Travis et al. [36] mentioned that the assailant was related to or in a relationship with the victim. The literature confirms the spouse/intimate partner relationship to be the most frequent one in several other studies [11, 34]. Based on the classification system of Marzuk et al. [26] and Hanzlick et al. we added categories that can possibly be added to the definition of a homicide suicide, but were not contained within the cases of the present study [20].

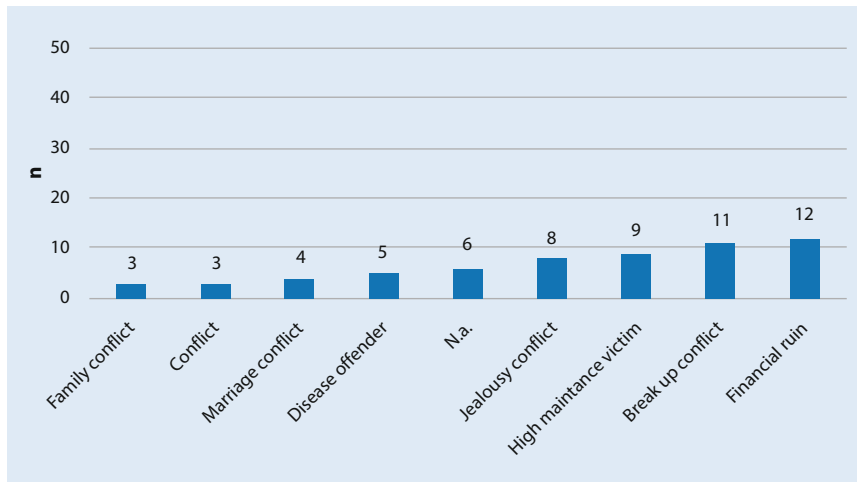


Fig. 3 ▲ Motives for homicide-suicide (*n.a.* not available)

Regarding the motives leading to the incidents and based on the classification system of Marzuk et al. [26], the present study showed that spouse/intimate partner break-up and financial problems predominated. This seems to be a common observation in national and international studies. Milroy et al. [28] reported the breakdown of a relationship with jealousy components to be the most frequent reason. The difficulty of the analysis of acts such as a terroristic suicide or running amok, especially the psychopathology behind these acts, is also shown in other studies [4, 5, 23, 29].

Shooting was the method of choice for killing (57%) followed by strangulation (14%) and stabbing (12%). In a study done in Geneva 98% of the offenders used firearms [34]. Comstock et al. [8], Dogan et al. [11], Hannah et al. [19] and Hanzlick and Koponen [20] all described a rate of over 80% for the use of firearms. Our study showed that female perpetrators tend to select other methods than shooting. Jumping from a balcony as method for both homicide and suicide was observed in 2 cases, suffocation with a pillow in 1 case for killing the child, followed by hanging for committing suicide. Hanging was also a common method in an autopsy study in Frankfurt/Main where only 3 out of 41 suicides by shooting were committed by females [13]. Evaluating the placement of the different shooting types, our study revealed that the head was the most frequent target for the suicides. The placement of the shot in

the homicides varied between multiple shots to the head, the chest, the stomach and the legs. Bossarte et al. indicated the head, face, or neck as the most frequent (901%) location of the wound for the suicides and most of them had only one wound location (98%) [6]. According to our results Bossarte et al. also observed a much greater percentage of homicide wounds in multiple locations (22.2%) [6]. Viero et al. even used microtomography (microCT) to reproduce the shooting type [38].

Even though the possession of firearms is strictly controlled in Germany (Law on Firearms, last update 18.07.2016, Federal Ministry of Justice and Consumer Protection), 4 offenders in the present study were in illegal possession of a gun. This phenomenon was seen in 50% of the offenders in New Hampshire in the study of Campanelli and Gilson [7]. Grabherr et al. [17] criticized the Swiss weapons law in their study on homicide-suicide. In Switzerland every citizen joining the military service is obliged to keep his personal military weapon at home and can also be kept after completion of the service.

According to Verzeletti et al. [37], Campanelli and Gilson [7] and Roma et al. the homicide-suicide events often took place in the domestic surrounding [31]. In 71% of our cases, both the homicide and suicide took place in the home of the persons involved. Hellen et al. [22] observed that incidents committed at home also took place in the marital

bed. We observed this phenomenon in 6 of our incidents.

The time of homicide and subsequent suicide and the distribution over the year revealed that the incidents were committed almost equally spread over the seasons. Roma et al. showed no seasonal variation in their cases [31]. Most of our cases only included 1 victim and the homicide and suicide took place on the same day (93%). Flynn et al. reported the involvement of more than one victim in 19% of their cases and the occurrence of homicide and suicide on the same day in 42% [14].

The analysis of mental disorders or former psychological treatment of the offender is a striking subcategory in the procedure of homicide-suicide studies. Depression and hallucinations of 8 of the offenders were mentioned in the autopsy or prosecution files. In accordance to Bossarte et al. [6] and Rosenbaum [32], mental illness and current depression were also shown in the perpetrators of their study. Rosenbaum [32] reported a rate of 75% of depressive disorders. Campanelli and Gilson [7] described a rate of 38% of offenders affected by depression. It needs to be emphasized that information on the mental disorder history and medical treatment are essential to prevent these incidents. Nevertheless, precise investigation of the mental health background of the offenders is hard to perform due to the lack of psychiatric consultation and reports. Adding the proof of alcohol or drug abuse at the time of incident to the analysis, the literature matches with our results [7]. Alcohol blood levels were measured in 67% of the offenders and in 39% of the victims and in most cases showed a level under the intoxicating level and only a couple of offenders and victims showed abuse of other drugs.

The act announcement of the perpetrators is an important evidence for the background and severity of these events. The present results showed that 24% of the offenders announced their plan prior to the event in terms of a farewell letter or an act announcement on the telephone and 3% of the offenders called the ambulance service or police after committing homicide. Dogan et al. reported that

none of the offenders left a suicide note [11]. In 13 (22%) of the present cases either the homicide or the suicide was unsuccessful. The penal consequences were different and the severity of the penalty was obviously dependent on the regret of the perpetrator. Liem and Koenraadt [25] found out that 23% of their 95 study cases resulted in a failed suicide. Wood and Voigt [39] report one mistaken homicide-suicide among 42 cases.

Limits of the study

The homicide-suicide cases were analyzed using autopsy reports and police investigation files; however, a limiting factor of the study was the collection of these police investigation files. Not all involved prosecution agencies were willing to provide the files requested or the files had been deleted. Cases had therefore to be analyzed only using information included in the autopsy files. Furthermore, the information about each case is dependent on the completeness of the autopsy reports and investigation files. Incomplete files offer the chance for speculation.

Conclusion

To understand homicide-suicide events it needs complete information about the environment in which these events occur, the role played in the relationship between the perpetrator and victim, and the personality and mental status of the perpetrator. The source of this information is an important factor. Newspaper reports or death reporting systems do not provide reliable information on the incidents and the background of these events often lead to speculation. A full understanding of the background of homicide-suicide events and ways of prevention requires detailed information on the perpetrators mental health status and other medical issues. This aim of research is extremely hard to conduct, due to the fact that in many cases not much is known about the psychological history of the offenders. This also makes it difficult to determine the motive behind the acts in retrospect. Much is known because of police investigation files and informa-

tion from bereaved ones, but the events might still offer room for speculation. The possible homicide-suicide constellations and the inclusion of events, such as school shootings, running amok and terrorist suicide make it difficult to define a common expression for these events in the German linguistic usage. The term "extended suicide" ("erweiterter Suizid") used in the German literature does not emphasize the premeditated homicide of the victim(s) but mainly on the suicide of the offender [15, 22]. Pointing to the homicide instead of focusing on the suicide in these events is obvious considering the dramatic consequences for the bereaved ones. The term homicide-suicide and not the term extended suicide should be, therefore, preferably used in Germany and the focus should further be put on the prevention of these events.

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Compliance with ethical guidelines

Conflict of interests. A. Siems, B. Flaig, H. Ackermann, M.A. Verhoff and M. Parzeller declare that they have no competing interests.

Ethical standards of autopsies and the statistical analysis comply with the current laws of the Federal Republic of Germany. This study did not include any investigations on humans or animals carried out by the authors.

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