Exploring the characteristics of homicide-suicide.

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THESIS PORTFOLIO: CANDIDATE DECLARATION

Title of degree programme	**Professional Doctorate in Clinical Psychology**
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Declaration and signature of candidate
I confirm that the thesis submitted is the outcome of work that I have undertaken during my programme of study, and except where explicitly stated, it is all my own work. I confirm that the decision to submit this thesis is my own. I confirm that except where explicitly stated, the work has not been submitted for another academic award. I confirm that the work has been conducted ethically and that I have maintained the anonymity of research participants at all times within the thesis. Signed: J.Kenworthy Date: 14/07/2025

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Contents

Thesis Abstract

In partial fulfilment of the requirements of the Professional Doctorate in Clinical Psychology, this thesis was written to explore the characteristics of homicide-suicide. Homicide-suicide involves the murder of another person followed by the perpetrator themselves dying by suicide. Understanding the clinical, as well as wider sociodemographic and criminal contexts, could help services to support individuals with challenges and effectively manage risk. This may reduce the risk of loss of life.

Paper one presents a review of the literature exploring the mental health characteristics associated with homicide-suicide perpetrators. A previous review of the literature was conducted in 2012, providing an initial description of the presence of mental health factors in homicide-suicide. This literature review aimed to provide an up-to-date description of mental health characteristics in homicide-suicide. 16 papers were identified, and the findings from these were critically appraised, analysed and a narrative synthesis produced. Five key areas for discussion were identified: the presence of mental health problems; mental health treatment; mental health diagnosis; suicidal ideation/attempts; psychosocial stressors.

Paper two presents two quantitative matched case studies. Study 1 examines the sociodemographic, clinical, and care characteristics of homicide-suicide, and compares these with the sociodemographic, clinical, and care characteristics of suicide in patient populations. Study 2 examines the sociodemographic, criminal, and victim characteristics of homicide-suicide, and compares these with the sociodemographic, criminal, and victim characteristics of homicide in the general population. In both studies, the two groups were compared via matched-case control in a conditional logistic regression. Common, and differing, characteristics were identified between those who die by homicide-suicide, suicide, and who commit homicide.

Paper three presents an executive summary of the findings described in paper two, in an accessible format. The summary is targeted at services who work with clients who may be at risk of committing homicide-suicide, homicide, or dying by suicide and anybody with an interest in this area.

Word count: 310

Paper One: Literature Review. The Role of Mental Health in Homicide-Suicide: A Systematic Review of studies between 2013-2023.

Target journal: Clinical Psychology Review

(This paper has been prepared and submitted in accordance with author guidelines for the above selected journal [Appendix A].)

Word count: 7962

Abstract

Homicide-Suicide (HS) is an incident wherein an individual kills one or more people, then subsequently takes their own life. Reported incidences of HS are relatively uncommon but are associated with social, psychological, and economic costs. Research has identified characteristics that are associated with HS, such as perpetrators typically being male, and victims typically being female and the current or ex-spouse of the perpetrator. A previous review provided an initial examination of the prevalence of mental health characteristics in HS (Roma et al., 2012). The aim of this review is to provide an updated and more in-depth examination of the mental health characteristics associated with HS. A database search was conducted to identify eligible studies. A synthesis and appraisal of methodological quality of the primary studies was conducted. Sixteen studies were eligible for inclusion. Overall, study quality was assessed as moderate. This review highlighted several risk factors which may be indicative of increased risk of HS incidents. Depressive disorders were the most reported mental health diagnosis in HS perpetrators, but suicidal thinking, psychosis, and psychosocial and socioeconomic problems were also reported. These factors should be prioritised for preventative intervention and increased support.

Keywords: Homicide-Suicide, Murder-Suicide, Dyadic-Death, Mental Health, Psychopathology, Mental Illness

Introduction

Homicide-Suicide (HS) is an incident wherein an individual commits homicide and then takes their own life (Rouchy et al., 2020). There is significant variance across studies in this area regarding the timeframe used to qualify a HS, ranging from within 24 hours to within a 30-day window of the homicide (Wood Harper & Voigt, 2007; Liem, 2010). This inconsistency has significant implications in terms of categorising HS, making it difficult to compare research findings. Marzuk et al. (1992) recommended a timeframe of one week between the homicide and the suicide when categorising a HS. Recent recommendations suggest a 72-hour 'cut-off point' as the perpetrators mental state and motivation for suicide may change if measured over a longer timeframe (Barraclough & Harris, 2002; Shaw & Flynn, 2003).

In England and Wales there are an average of 14 cases per year of HS (National Confidentiality Inquiry into Suicide and Safety in Mental Health [NCISH], 2023). In the USA, there are a reported 11-17 HS incidents per week (Joiner, 2014), more than twice the average global rate of 0.14 events per 100,000 people (Large et al., 2009).

There are complex financial, social, interpersonal, and psychological factors associated with HS (Kennedy-Kollar & Charles, 2010). HS is predominantly perpetrated by middle-aged (i.e., approximately 45 years old) males[1] (NCISH, 2023; Rouchy et al., 2020; Flynn et al., 2023). In most cases, victims of HS are female and most commonly, the perpetrators are a current or ex-partner (Barber et al., 2008; Bossarte et al., 2006; Saleva et al., 2007). The next most common victim type is children of the perpetrator (Barraclough & Harris, 2002; Rouchey et al., 2020; Felthous & Hempel, 1995).

Recent research has explored the relationship between mental health and HS. Studies have reported a large variation in the prevalence of mental health difficulties in HS, ranging from 18% to 91% (Bourget & Gagne, 2002; Milroy et al., 1997). An early study reported that depressive disorders represented the largest category of mental illness in HS perpetrators, reported in 36% of cases (West, 1965). More recent research has supported this, and depressive disorders appear to be the most reported mental illness in HS incidents (Roma et al., 2012; Rouchy et al., 2020). Psychosis has been identified in some research studies examining HS, but findings are inconsistent. In a UK study, 11% of HS perpetrators who had been in contact with mental health services had been diagnosed with schizophrenia or other delusional disorders (Flynn et al., 2009). Conversely, in Iceland a case series showed a 75% rate of psychosis in perpetrators of HS (Gudjonsson & Peturrson, 1982). More recent research has not found an association between psychotic disorders and HS (Rouchy et al., 2020).

[1] Males and females are referred to within this review in terms of sex assigned at birth.

Alcohol and substance abuse have also been associated with incidents of HS and have been reported in around 20% of perpetrators in some studies (Saleva et al., 2007; Roma et al., 2012). Marzuk et al. (1992) found that alcohol was present at autopsy in 12-50% of perpetrators. An early history of adversity during childhood and exposure to traumatic events prior to the HS have been identified as associated factors (Rouchy et al., 2020).

Marzuk et al. (1992) was the first to attempt to categorise HS incidents and identified five types of HS perpetrators: Spousal (revenge), Spousal (declining health), Filicide-Suicide, Familicide-Suicide, and Extrafamilial. This has since been expanded to include mass-murder categories, and the presence of psychiatric illness, as a co-factor to HS (Hanzlick & Koponen, 1994; Felthous et al., 2023).

Rationale for current review

Research has examined the epidemiology of HS. It has been argued that to robustly understand HS, the mental health characteristics including mental health diagnoses, motives, and pre-existing suicidal ideation should be examined (Marzuk et al., 1992). Roma et al. (2012) conducted a literature review, providing an initial description of the presence of mental health factors in HS. They reported significant variability in terms of the presence of mental illnesses across studies (4%-100%) and identified that depression, substance misuse, and psychosis were the most frequently reported mental illnesses (Roma et al., 2012). Rouchy et al. (2020) recommended that future research should continue to explore psychopathological factors including mental health diagnoses and characteristics in more detail to aid the development of possible preventative strategies and interventions. A robust understanding of these characteristics will help to identify possible prevention measures in addition to potentially reducing the significant impact of HS on an individual and societal level.

Data regarding HS are often collected unsystematically due to small incidence and prevalence rates. There is no universal, standardised approach to collecting information of mental health states prior to HS incidents, which precludes a comprehensive picture of the complete characteristics associated with HS (Flynn et al., 2009). Despite considerable methodological heterogeneity of studies on HS, and the lack of a systematic and universal method of recording factors associated with HS, this systematic literature review aims to review the mental health characteristics that are associated with HS.

Aims and Objectives

This review aims to: 1) update Roma et al.'s (2012) review and provide an up-to-date description of mental health characteristics associated with HS including prevalence, incidence, diagnoses, and treatment of mental illnesses in perpetrators of HS; 2) review incidence and prevalence of substance

use disorders in this population; 3) identify additional psychosocial stressors, such as employment problems, in perpetrators of HS; 4) provide a narrative synthesis of findings; 5) evaluate the methodological quality of studies; and 6) provide recommendations for future research investigating the mental health characteristics in HS perpetrators.

Method

Search Strategy

Searches were conducted in January 2024 in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidance (Moher et al., 2009). Three electronic databases were searched: PubMed, PsychInfo, and SCOPUS. The search terms used to identify relevant articles were based on those used by Roma et al. (2012). The following search strings were used: "homicide-suicide", "homicide suicide", "murder-suicide", "dyadic-death", mental*", "psych", "psychopathology", "mental illness", and "mental health".

Criteria used for searches included identifying research published in the English language, and journal or peer reviewed articles only. Roma et al. (2012) conducted searches on August 2011 and published their review in 2012. This review searched for articles published from 01/01/2013 to 27/11/2023, ensuring previous research were not included which had already been explored in detail.

Unpublished literature was searched using ProQuest to mitigate the possibility of publication bias (Joober et al., 2012). To ensure eligible studies were not missed, additional searches of reference lists of eligible studies were undertaken, and relevant titles screened. No further studies were identified via this method.

Article selection process

The study selection process is illustrated in Figure 1. A total of 278 articles were identified from the database searches. Six papers were identified as duplicates and removed. Titles and abstracts of the remaining 272 articles were screened for eligibility by the first author (JK). If papers were deemed appropriate and relevant to the review, the full text was retrieved and independently assessed by the first author (JK) according to the inclusion and exclusion criteria. Once ineligible studies were removed, 63 full-text articles were independently assessed by the first author. Sixteen studies met full eligibility criteria. Searches were updated in November 2024 and no further studies were identified.

Data from eligible studies were extracted using an electronic customised data extraction form, based on the relevant sociodemographic characteristics, study design/methodology, and main outcomes. Meta-analysis was not conducted due to the significant methodological heterogeneity across the studies reviewed. As such, the current review narratively synthesises the studies which met inclusion eligibility.

Quality appraisal

The methodological quality of studies was assessed using the Mixed Methods Appraisal Tool (MMAT) Version 2018 (Hong et al., 2018). The MMAT can used to review quantitative, qualitative, and mixed design studies. Methodological quality is assessed according to study design across five categories: (1) qualitative; (2) randomised controlled trials (RCT); (3) non-randomised studies (e.g., case series); (4) quantitative descriptive studies (e.g., cross-sectional studies); and (5) mixed methods studies.

The MMAT recommends a sensitivity analysis to better inform the quality of the included studies. For this review, a sensitivity analysis was performed by appraising studies using a traffic light system: Red, Amber, Green as shown in Appendix B. Studies scored as 'green' were deemed to be of high quality, whereas papers which scored 'red' were deemed to be of lower quality. For 'non-randomised' studies, the fifth criteria were not deemed relevant: "During the study period, is the intervention administered (or exposure occurred) as intended", and were not included in the rating.

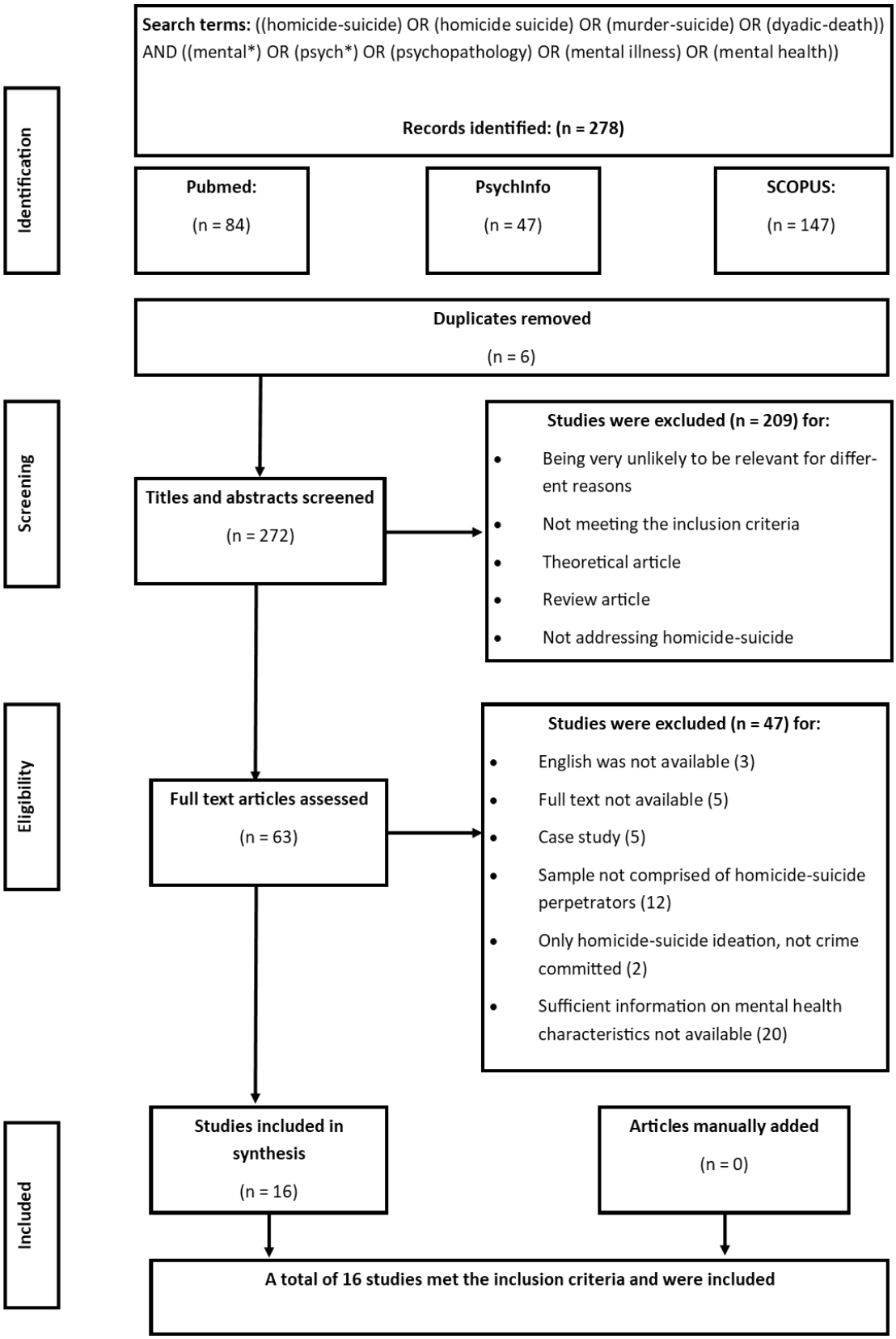

Figure 1: PRISMA flow diagram of article selection process.

Inclusion and exclusion criteria

Studies were required to meet pre-determined inclusion criteria and were not included if they met certain exclusion criteria (see Figure 1.). Roma et al. (2012) included studies which reported data on mental illness in HS cases, and accepted studies which used newspaper surveillance as a research methodology. This review replicated the inclusion criteria in addition to the following: (1) written in the English Language (due to lack of translation facilities); (2) full text article available; (3) peer reviewed; (4) conducted in any country; and (5) published between 2013-2023.

Studies where several cases presented as a case series were deemed relevant for inclusion. Studies were included regardless of the timeframe in which HS cases occurred (e.g., 24hrs to a week or more) due to the possibility that important insights might be missed if cases were excluded due to occurring outside of a specified time window. Studies which considered complete incidents of HS (the perpetrator completed suicide after committing a homicide) as well as incomplete incidents of HS (suicide following homicide was attempted but not completed) were examined as researchers were able to conduct interviews or gather more complete information on the mental state and circumstances leading to the incomplete-HS. Categories of HS incidents relevant for inclusion included: intimate-partner HS; HS involving child victims; and later-life HS (aged 65 years and over).

Roma et al. (2012) excluded studies which did not clearly report on the percentage of perpetrators who were psychiatric patients[2] at the time of the HS and did not clearly report which psychiatric diagnosis HS perpetrators had. This was replicated in this review, in addition to the following: (1) systematic /literature reviews; (2) study only addresses homicide *or* suicide; (3) samples not comprised of HS perpetrators; (4) HS ideation only; and (5) single case studies. Studies addressing HS in which the perpetrators committed mass-murder followed by suicide in acts of terrorism were not deemed relevant for inclusion, as the motivations for HS in the context of terrorism deviate from HS incidents perpetrated against individuals (Höflinger et al, 2020).

[2] Not defined within the paper.

Results

Overview of included studies

Table 1 provides an overview of the key characteristics and findings of eligible studies. All studies within this review were retrospective and comprised of qualitative (*n* = 3), quantitative (*n* = 9), and mixed methods (*n* = 4) designs. Data from studies included in this review were drawn from clinical databases such as NCISH or the National Violent Death Reporting System (NVDRS), medical autopsy reports, media and newspaper, and narrative information from psychological autopsies[3]. Just over half of the studies were undertaken in the USA (*n* = 9).

Four studies examined HS incidents where perpetrators were aged 18 or over, and one study focused on perpetrators aged 65 and over (Cheung et al., 2016). Five studies focused specifically on HS with child victims, whilst one study examined intimate-partner HS (Logan et al., 2019). Three studies compared HS incidents with an additional group, such as those who committed homicide only (Larchet et al., 2023) or suicide only (Caretta et al., 2015; Logan et al., 2019). McPhedran et al. (2015) compared HS incidents to suicide-only and homicide-only groups. One study compared military HS to civilian HS incidents (Patton et al., 2015). Oya et al. (2023) compared complete incidents of HS with incomplete incidents of HS, while Sun et al. (2021) examined only incomplete incidents of HS.

Most studies categorised HS as occurring within a 24-hour period of each other (*n* = 9), others included incidents of suicide that occurred within three or seven days following the homicide (*n* = 5). Two (Caretta et al., 2015; Sun et al., 2021) did not specify the timeframe in which the suicide occurred after the homicide. Most studies analysed male and female perpetrators within their samples (*n* = 11), whilst others focused only on male perpetrators (*n* = 4). One study looked only at female perpetrators (D'Argenio et al., 2013).

Studies were appraised as being fair- to high-quality: Nine studies were rated 'amber' in the quality appraisal. Seven were rated 'green'. No studies were rated 'red' (see Appendix B). Studies often failed to meet full criteria due to using retrospective designs and basing findings on secondary data. However, the original data were not always comprehensively reported or was missing, limiting the conclusions or detail that could be drawn relating to research questions. Furthermore, there lacks a universal database for collecting information on HS, suggesting that findings may not be representative

[3] A thorough retrospective investigation into the intention of an individual who has died by suicide (Leenars, 2010).

of the population of HS perpetrators. The full quality appraisal documents with accompanying comments detailing the rationale for scores can be found in Appendix C.

Table 2: Key characteristics and findings of studies included within the review.

Author(s)	Time Period in which data was collected	Country/State	*N*	Timeframe of HS	Population	Gender of HS perpetrators	Data drawn from	Methodology	Key Findings	Traffic light quality appraisal rating
Carretta et al. (2023)	2001-2011	California	432 (suicide-only); 193 (HS)	Unspecified	Suicide-only and HS perpetrators	Male (*n* = 177; 91.7%); female (*n* = 16; 8.3%)	Autopsy reports	Quantitative	32% (*n* = 61) of HS perpetrators left a suicide note; 6% (*n* = 12) had a prior suicide attempt. Anti-depressants were present in 11.9% of cases, anti-anxiety in 14.9%, and antipsychotics in 4.5% of cases.	Amber
Cheung et al. (2016)	2007-2012	New Zealand	4	Within 72 hours	Later-life (aged 65 years or	Male	Coroners' reports	Qualitative	Mental illness was reported in 75% (*n* = 3) of cases: late-onset bipolar disorder; manic	Green

					older) HS perpetrators				episodes, psychotic depression, dementia, history of depression, and alcohol misuse.	
Coorg and Tournay. (2012)	1982-2010	USA	21	Within 24 hours	Filicide-suicide incidents involving children with disabilities	Male (*n* = 11; 50%); female (*n* = 11; 50%)	Newspaper search conducted to identify cases reported between 1982 and 2010	Quantitative	38% (*n* = 8) of perpetrators had a reported mental illness. Most reported conditions were depression (*n* = 3), psychosis (*n* = 3), and bipolar disorder (*n* = 3).	Amber
D'Argenio et al. (2013)	1992-2010	Italy	36	Within one week	Mothers in filicide-suicide incidents	Female	Media/Newspaper search of cases reported between 1992 and 2010	Quantitative	16.7% (*n* = 6) of perpetrators had regular psychiatric treatment. 6 were reported to be suicidal prior to the incident. All perpetrators were reported by relatives and acquaintances in	Amber

									media reports to be "undergoing psychological unrest and depression".	
Flynn et al. (2016)	2006-2008	England and Wales	60	Within 72 hours	HS incidents	Male (*n* = 53; 88%); female (*n* = 7; 11.6%)	NCISH[a] database, coroner's records, police files, general practice, and specialist mental health records, and newspaper articles	Mixed design	62% (*n* = 33) had a diagnosis and prior treatment for mental illness. 53% (*n* = 28) had a primary diagnosis of depressive disorder.	Green
Holland et al. (2018)	2003-2011	USA – 18 states	175	Within 24 hours	HS with child victims	Male (*n* = 133; 76%); female (*n* = 42; 24%)	NVDRS[b]	Qualitative	29% (*n* = 50) of perpetrators had a mental illness. 7% (*n* = 12) had a known substance abuse or alcohol problem, of which 75% (*n* = 9) also had a comorbid mental	Green

									illness such as depression.	
Knoll and Hatters-Friedman. (2015)	3-yr period; unspecified	Dallas, Texas	18	Within 24 hours	HS incidents	Male (n = 15; 83%); female (n = 3; 16.6%)	Autopsy records, police reports and narratives, interviews of relatives of deceased perpetrators and victims	Mixed design	Almost all (94%; *n* = 17) perpetrators met criteria for a diagnosis of depression. 56% (*n* = 10) were reported to have had active substance abuse or dependence. 22% (*n* = 4) had a family history of suicide, and 17% (*n* = 3) previously attempted suicide.	Green
Larchet et al. (2023)	2019-2020	France	203 (HS); 1622 (Homicide)	Within 24 hours	HS incidents (n = 203) including familial, intimate-partner, and extra-familial	Male (*n* = unspecified); female (*n* = unspecified)	Operational information collected by a French judicial police service	Quantitative	Familial HS perpetrators were more likely to have a psychiatric history (60%) than familial homicide only perpetrators (39%).	Green

					victims; Homicide incidents (*n* = 1622)				Intimate-partner HS perpetrators were less likely to have a psychiatric history (11%) than intimate-partner homicide perpetrators (22%).	
Logan et al. (2019)	2003-2015	USA – 27 states	1,504 (HS); 28,755 (suicide-only)	Within 24 hours	Intimate-partner HS incidents	Male	NVDRS	Mixed design	11.6% (*n* = 174) of HS perpetrators had a mental illness, 10% (*n* = 151) had a current depressed mood, and 9.5% (*n* = 143) had a history of mental health or substance abuse treatment.	Amber
Logan et al. (2013)	2003-2009	USA – 16 states	129	Within 24 hours	HS involving child victims	Male (n = 98; 75.9%); female (n = 31; 24%)	NVDRS	Quantitative	Mental health difficulties in perpetrators included having a current depressed mood (18.6%; *n* = 24), a current mental	Amber

									illness (16.3%; *n* = 21), alcohol use immediately before the incident (16.3%; *n* = 21), employment (11.6%; *n* = 15), and financial problems (9.3%; *n* = 12).	
McPhedran et al. (2015)	Not reported	Australia	60 (HS); 251 (homicide-only); 8,014 (suicide-only)	Within 72 hours	HS incidents	Male	Australian Homicide Project, involving structured face-to-face interviews; Queensland Suicide Register	Quantitative	31.3% (*n* = 5) of HS perpetrators were in contact with mental health professionals in the 3 months prior to the HS incident. 13.3% (*n* = 2) of HS perpetrators attempted suicide within 12 months prior to their death.	Amber
Murfree, et al. (2022)	2013-2015	USA – 32 states	76	Within 24 hours	Filicide-suicide incidents	Male (*n* = 57; 75%); female (*n* = 19; 25%)	NVDRS	Qualitative	58% (*n* = 11) of female perpetrators and 28% (*n* = 16) of male	Green

									perpetrators had a mental health problem.	
Oya et al. (2023)	2008-2020	Japan	77	Within 72 hours	Complete (*n* = 52; 67.5%) and incomplete (*n* = 25; 32.5%) HS incidents	Male (*n* = 52; 67.5%); female (*n* = 25; 32.5%)	Forensic autopsy records	Quantitative	28.6% (*n* = 22) of perpetrators were described to have an "unstable mental state". 24.7% (*n* = 19) cases had a history of psychiatric consultation, and 24.7% (*n* = 19) cases were prescribed psychotropic medications.	Amber
Patton et al. (2015)	2003-2010	USA – 17 states	259 (Military HS); 259 (Civilian HS)	Within 24 hours	Military versus civilian HS perpetrators	Male	NVDRS	Quantitative	Military HS perpetrators were more likely to have a history of suicide attempts (military: 3.5%, *n* = 9; civilian: 2.7%, *n* = 7); history of mental health treatment	Green

									(military: 9.3%, *n* = 24; civilian: 8.5%, *n* = 22); and a current mental health problem (military: 12%, *n* = 31; civilian: 10.4%, *n* = 27). Civilian HS perpetrators were more likely to have current substance abuse (military: 4.6%, *n* = 12; civilian: 9.3%, *n* = 24); current use of anti-depressants (military: 4.2%, *n* = 11; civilian: 5.4%, *n* = 14); and to have disclosed suicidal intent (military: 11.2%, *n* = 29; civilian: 18.9%, *n* = 29).	

Schwab-Reese et al. (2021)	2013-2016	USA – 42 states	528 (young adult [18-44 years]); 433 (middle-aged adult [45-64 years]); 179 (older age adult [65 years and over])	Within 24 hours	HS incidents	Male (*n* = 1065; 93.4%); female (*n* = 75, 6.6%)	NVDRS	Mixed design	Recent interpersonal stressors were the most common contributing factor to HS (young adult: 60%, *n* = 317; middle-aged adult: 60%, *n* = 259; older-aged adult: 57%, *n* = 96). Other contributing factors included recent mental health issues (young adult: 24%, *n* = 125; middle-aged adult: 22%, *n* = 94; older-aged adult: 36%, *n* = 65); and recent drug/alcohol issues (young adult: 23%, *n* = 123; middle-aged adult: 21%, *n* = 92; older-aged adult: 10%, *n* = 18).	Amber

Sun et al. (2021)	2010-2019	China	125	Not specified	Surviving perpetrators of HS	Male (*n* = 76; 60.8%); female (*n* = 49; 39.2%)	Forensic archives	Quantitative	89.6% (*n* = 112) of perpetrators had diagnoses of mental illnesses: major depression (41.6%, *n* = 52), schizophrenia (24.8%, *n* = 31), and bipolar (8%, *n* = 10). 28.8% (*n* = 36) had suicidal ideation, and 17.6% (*n* = 22) previously attempted suicide.	Amber

[a]: *National Confidential Inquiry into Suicide and Safety in Mental Health.*

[b]: *National Violent Death Reporting System.*

Presence of MH problems

In studies that took place within the USA, the presence of mental health difficulties in HS perpetrators was similar. Holland et al. (2018) reported that 29% of perpetrators had a formally diagnosed mental illness, and commonly experienced difficulties for extended periods (e.g., chronic depression) rather than for acute episodes. Schwab-Reese et al. (2021) identified recent mental illnesses in 36% of older adults (defined as aged 65 years or older), 22% of middle-aged adults (defined as 45 – 64 years), and 24% of young adults (defined 18 – 44 years). Logan et al. (2013) found that 30% of perpetrators committed HS because of mental health difficulties, with 16% experiencing a current mental health concern, and 15% having a recorded history of mental illnesses. Murfree et al. (2022) found gender differences in the presence of mental health in filicide-suicide. Mental health was a contributing factor in 58% of female perpetrators, and 28% of male perpetrators. Coorg and Tournay (2012) identified 38% of perpetrators of filicide-suicide of children with disabilities had a reported mental illness. However, Logan et al. (2019) reported that only 11.6% of male intimate-partner-HS perpetrators had a mental illness in their study.

Mental health rates in HS perpetrators in non-USA based studies were higher. Flynn et al. (2016) reported that 62% of UK HS perpetrators had a formal diagnosis and prior treatment for mental illness. Similarly, Sun et al. (2021) and Larchet et al. (2023) reported that 90% and 60% of HS perpetrators had a psychiatric history, respectively. Conversely, Oya et al. (2023) reported that an 'instability of mental state' was recorded in 29% of cases.

Overall, studies suggest that between 15 – 90% of HS perpetrators had a history of mental illnesses (Logan et al., 2013; Flynn et al., 2016; Sun et al., 2021; Larchet et al., 2023), while 11.6% – 58% of HS perpetrators were experiencing poor mental health or mental illness at the time of the incident.

Mental health treatment

A history of mental health treatment was recorded in 9.3% of military HS perpetrators and 8.5% of civilian HS perpetrators (Patton et al., 2015). Logan et al. (2019) reported that 9.5% of HS perpetrators had a history of mental health and/or substance abuse treatment. However, 41.5% of HS perpetrators in a UK sample had contact with services for mental illnesses within 12 months of the HS (Flynn et al., 2016). Similarly, in a Chinese sample, 44.8% of HS perpetrators had a history of consultation with a mental health professional, 44% of which had a history of mental health treatment (Sun et al., 2021). Oya et al. (2023) reported that 25% of perpetrators in Japan had previously had a psychiatric

consultation and were prescribed psychotropic medication at the time of the HS, though it was not clear which mental illness(es) the medication was prescribed for.

Holland et al. (2018) showed that 24% of US HS perpetrators who had mental illnesses had sought treatment prior to the incident. Other USA studies found that 10% of perpetrators were undergoing mental health and/or substance abuse treatment at the time of the HS (Logan et al., 2013; 2019). In the UK, 28% of HS perpetrators had been in contact with mental health services for psychological problems within one month of committing the HS (Flynn et al., 2016), and 31% of perpetrators had a consultation with a mental health professional within three months prior to the incident (McPhedran et al., 2015). In D'Argenio et al.'s (2013) study, 10% of mothers who perpetrated filicide-suicide were receiving psychiatric treatment at the time of the offence.

Mental health diagnoses

Mood disorders. Depressive disorders were reported in 77% of USA studies. Most of these reported similar rates of current or recent depression. A current depressed mood was present in 10%, 12%, 14%, and 19% of HS perpetrators, respectively (Logan et al., 2019; Patton et al., 2015; Coorg & Tournay et al., 2012; Logan et al., 2013). Anti-depressant medications were present in 12% of cases in one study (Caretta et al., 2015), and in 4.2% – 5.4% in another study (Patton et al., 2015). In a study comparing age groups of HS perpetrators, 21% of older adults (defined as 65 years and older), 12% of middle-aged adults (defined as 45 to 64 years), and 13% of young adults (defined as 18 – 44 years) experienced recent depressed moods (Schwab-Reese et al. 2021). Conversely, Knoll and Hatters-Friedman (2015) reported that 94% of perpetrators met criteria for a diagnosis of depression, major depressive disorder, or depressive disorder not otherwise specified in their USA study.

Outside of the USA, depression was reported at similar rates. 47% of UK HS perpetrators had a primary diagnosis of depressive disorder (Flynn et al., 2016), and major depression was the most common diagnosis (42%) in HS perpetrators in China (Sun et al., 2021). Two qualitative studies indicated the possible presence of depressive disorders in HS perpetrators. D'Argenio et al. (2013) did not report on formally diagnosed depression; however, relatives and acquaintances close to female HS perpetrators were reported in interviews as experiencing 'psychological unrest and depression'. More recently, 50% of HS perpetrators had histories suggestive of depression (Cheung et al., 2016).

Bipolar disorder was reported in three studies (Coorg & Tournay, 2012; Cheung et al., 2016; Sun et al., 2021). Prevalence rates varied. Sun et al. (2021) reported that 8% of perpetrators were formally diagnosed with bipolar disorder, whilst Coorg and Tournay (2012) reported a rate of 14% and

Cheung et al. (2016) reported that 25% had late onset bipolar disorder, defined as developing symptoms of bipolar disorder after the age of 50 years (Montes et al., 2013).

Psychotic disorders. Diagnoses of psychotic disorders were reported in 14% of HS perpetrators in Coorg and Tournay's (2012) study, whilst Knoll and Hatters-Friedman (2015) found that 12% of perpetrators were experiencing psychosis at the time of the HS. Carretta et al. (2023) showed that 4.5% of HS perpetrators in their study were prescribed anti-psychotic medication, indicating the presence of a formally diagnosed psychotic disorder. Flynn et al. (2016) reported that only 2% of perpetrators in their UK study had a primary diagnosis of schizophrenia and other delusional disorders. Conversely, Sun et al. (2021) identified that schizophrenia was the second most common diagnosis in their sample of HS perpetrators (25%), two of whom were diagnosed with acute and transient psychosis. 23% of HS perpetrators were motivated by hallucinations or delusional symptoms.

Overall, psychotic disorders were not commonly reported, and rates differed from 2% - 25%. In USA studies, rates were between 4.5% - 14% (Caretta et al., 2015; Knoll and Hatters-Friedman, 2015; Coorg & Tournay, 2012) while in the UK rates were extremely low at 2%. However, in China, psychotic disorders were present in 25% of perpetrators (Sun et al., 2021).

Substance use disorders. In USA studies, substance abuse was more common than alcohol abuse (Logan et al., 2013; 2019; Murfree et al., 2022; Knoll & Hatters-Friedman, 2015; Patton et al., 2015; Caretta et al., 2015). Rates of substance abuse problems were low in most studies, occurring in less than 10% of cases of HS (Logan et al., 2013; 2019; Patton et al., 2015), however one study (Knoll & Hatters-Friedman, 2015) reported that 56% of perpetrators were actively abusing substances or dependent at the time of the incident. The presence of substances such as 'illegal drugs' were confirmed via toxicology reports in two studies (Murfree et al., 2022; Caretta et al., 2015).

Excluding the USA, substance misuse and dependence were less commonly reported in perpetrators of HS. In a UK study, 22% of perpetrators had a history of drug misuse but only 1.6% reported having a drug dependence (Flynn et al., 2016). McPhedran et al. (2015) reported that opiates were present in blood alcohol content in 5% of cases, whilst cannabis was present in 3% of cases, and opiates in 1.7% of cases. Sun et al. (2021) reported that two perpetrators were diagnosed with mental illnesses due to psychoactive substances.

Problematic alcohol use was reported in three USA studies (Logan et al., 2013; 2019; Caretta et al., 2015). 7% of HS perpetrators had a known alcohol problem (Logan et al., 2019). In studies which examined toxicology reports, the presence of alcohol ranged between 10% to 37% in perpetrators (Logan et al., 2013; 2019; Caretta et al. 2015). Outside of the USA, McPhedran et al. (2015) reported

that 31% of perpetrators had alcohol problems and 20% had used alcohol immediately prior to the HS. Flynn et al. (2016) reported that 25% of perpetrators had a history of alcohol misuse but only 1.6% had an alcohol dependence. However, Larchet et al. (2023) reported that only 8% of perpetrators had alcoholic dependence.

Schwab-Reese et al. (2021) reported in their USA study using the NVDRS that "recent drug/alcohol" issues, as opposed to distinguishing between drugs and alcohol, were present in 10% of older adults (aged 65 years and over), 21% of middle-aged adults (aged between 44 and 65), and 23% of young adults (aged younger than 45 years). 7% of HS perpetrators reportedly had a substance abuse or alcohol problem in filicide-suicide incidents using the NVDRS (Holland et al., 2018). Caretta et al. (2015) found substances and alcohol reported in toxicology reports in 22.5% of perpetrators.

Suicidal ideation / attempts

In the UK, Australia, and China, rates of suicidal ideation in HS perpetrators varied between 23%, 18%, and 13% respectively (Flynn et al., 2016; Sun et al., 2021; McPhedran et al., 2015). In most USA samples, rates of previous suicide attempts were lower. Logan et al. (2013; 2019) reported that between 2.6% - 3% of perpetrators had a history of suicide attempts, consistent with Patton et al. (2015) who reported a 3.5% rate in military perpetrators and a 3% rate in civilian perpetrators. Carretta et al. (2023) reported their NVDRS data showed a history of suicide attempts in 2.6% of HS cases occurring in 20 states of the USA. However, their study of HS perpetrators in California had a 6% rate of previous suicide attempts. Knoll and Hatters-Friedman (2015) reported higher rates in their USA study and showed that 22% of perpetrators had a family history of suicide whilst 17% had a history of suicide attempts. Schwab-Reese et al. (2021) reported that 20% of perpetrators had a history of suicide attempts.

Suicidal ideation—defined as thinking about, considering, or planning suicide (Klonsky et al., 2016)—was reported in studies from the USA (Holland et al., 2018; Logan et al., 2013; Patton et al., 2015), Japan (Oya et al., 2023), and China (Sun et al., 2021). In the USA rates varied between 50% (Holland et al., 2018), 12.4% (Logan et al., 2013), and 11% (military perpetrators) and 19% (civilian perpetrators) (Patton et al., 2015). In Japan, rates were 13% (Oya et al., 2023), whereas in China rates of suicidal ideation were 29% (Sun et al., 2021).

Psychosocial stressors

Intimate-partner problems were present in 44% of USA studies, with prevalence remaining reasonably consistent, varying between 61% to 78% (Holland et al., 2018; Murfree et al., 2022; Logan et al., 2013; Patton et al., 2015). Whilst intimate-partner problems were also recorded in non-USA based studies

(Cheung et al., 2016; Sun et al., 2021; McPhedran et al., 2015; Oya et al., 2023), rates were lower. Rates varied between 12% and 34% (Oya et al., 2023; Sun et al., 2021). Domestic violence was commonly reported as a key preceding factor to HS (Sun et al., 2021; McPhedran et al., 2015; Cheung et al., 2016; Flynn et al., 2016). In USA studies which used the NVDRS, there is a variable which codes 'other relationship problems' to capture relationships beyond those of intimate-partners. 'Other relationship problems' were present in 9.7% of civilian perpetrators and 12.7% of military perpetrators (Patton et al., 2015), 7.2% of male intimate-partner HS perpetrators (Logan et al., 2019), 12.2% of male filicide-suicide perpetrators and 19.4% of female filicide-suicide perpetrators. Relationship breakdowns were cited as important preceding factors to HS (Cheung et al., 2016; Sun et al., 2021; Flynn et al., 2016).

Additional common characteristics reported were financial problems (Patton et al., 2015; Logan et al., 2013; 2019; Sun et al., 2021; McPhedran et al., 2015), employment problems (Patton et al., 2015; Logan et al., 2013; 2019), legal problems (Patton et al., 2015; Logan et al., 2019; McPhedran et al., 2015), and physical health problems (Logan et al., 2013; 2019; Cheung et al., 2016; Sun et al., 2021; Caretta et al., 2015). Cheung et al. (2016) reported that threatened losses such as plans to sell their home preceded HS in older adult (defined as aged 65 years or over) perpetrators.

In research examining HS incidents involving child victims, the child's chronic illness appeared to be a common factor in female perpetrators' mental health states preceding filicide-suicide (Coorg & Tournay et al., 2012; D'Argenio et al., 2013; Murfree et al., 2022). Conversely, the NVDRS recorded that male perpetrators of filicide-suicide were impacted by family financial or social stressors as well as legal and job issues (Murfree et al., 2022). Coorg and Tournay (2012) found that 36% of parents of children with a disability had a reported mental illness.

Discussion

Recent research has indicated an improved understanding of the role of mental health in HS is needed (Rouchy et al., 2020). This review updated and expanded the previous examination of mental health characteristics associated with HS to more fully understand the psychopathological factors that may contribute to HS globally. Research in a 10-year period was reviewed, examining mental health and associated factors such as substance misuse and psychosocial stressors in HS.

Prevalence and incidence rates of mental health conditions varied significantly across studies. Mental illnesses were present in approximately 30% of HS perpetrators in the USA, and approximately 60% in non-USA based studies. Mental health difficulties were commonly described as chronic and enduring rather than being a first episode, though studies typically did not report timeframes nor duration of illness. Studies suggest that perpetrators were more likely to have a history of consultation and treatment than to be undergoing treatment at the time of the incident. Generally, studies did not adequately report the specific types of treatment for mental illnesses. In the USA, perpetrators were reported to seek help for their mental health less frequently than in other countries such as the UK and China (Flynn et al., 2016; Oya et al., 2023) despite the average number of HS incidents being twice as high compared with the global rate (Large et al., 2009). It is possible there are additional factors contributing to HS incidents in the USA outside of those related to mental health. Furthermore, it is possible that there are barriers to seeking support and treatment for mental illness in the USA, which may not be present in other countries.

This review found that the most reported mental health diagnosis in perpetrators of HS was depression or depressive disorders, consistent with previous research (West, 1965; Roma et al., 2012; Rouchy et al., 2020). This review highlights some variation across countries in the rates of depression in HS perpetrators. Presentations of depressive disorder in USA perpetrators were reported between 10% and 20% of cases. Rates outside of the USA were much higher and recorded between 40-50%. Suicidal ideation was high in perpetrators across studies outside of the USA. This may indicate one possible motivation for HS, namely ‘altruistic or extended suicides’ (Marzuk et al., 1992). In cases where depressive disorders and/or suicidal ideation are present, it is possible that the HS takes place as an extension of the perpetrators own suicidal ideation, or to ‘save’ close ones from perceived problems.

Few papers reported on the presence of psychosis or psychotic disorders. Three USA studies indicated the rates of psychotic disorders were not dissimilar to the recorded rates of depressive disorders. These USA studies were the only ones that did not use the NVDRS. The NVDRS collects

comprehensive details on violent deaths from numerous sources including coroner and medical examiner reports, death certificates, toxicology reports, and law enforcement reports. It is possible that the NVDRS does not comprehensively record information relating to psychotic disorders, and as such, the rates of psychotic disorder may be under-reported in HS. Psychotic disorders were only recorded as present in two studies outside of the USA, with rates varying between 1.6% (Flynn et al., 2016) and 25% (Sun et al., 2021). This wide range is consistent with previous conflicting reports on the rates of psychosis in HS (Flynn et al., 2009; Rouchy et al., 2020; Gudjonsson & Petursson, 1982). Additionally, there may be cultural differences relating to the identification and treatment of psychotic disorders, which impacts on the recording of psychotic disorders in HS perpetrators.

Substance abuse problems were present in less than 10% of cases across most studies, though toxicology reports indicated much higher rates in perpetrators at the time of the commission of HS incidents. It is possible that the presence of substances in perpetrators suggests a deterioration in mental state, which may precede HS. Overall, alcohol use was higher than substance misuse in HS, though this may reflect the availability of alcohol and cultural acceptability of drinking as opposed to using substances.

In HS with adult victims, intimate partner problems were the largest contributing social and interpersonal factor. This included domestic violence and separation, supporting the existing evidence base which identifies that perpetrators are most often male, with the victims of the HS being their female current or ex-partner (Barber et al., 2008; Bossarte et al., 2006; Saleva et al., 2007). Other recent stressors which may have affected mental wellbeing included financial, employment, legal, and physical health problems. This is consistent with Marzuk et al.'s (1992) categorisation framework which states that key motivations for incidents of HS include 'amorous jealousy' and 'family, financial, and social stress'.

Filicide-suicide was the next most common type of HS after intimate-partner HS (NCISH, 2003; Rouchy et al., 2020; Felthous & Hempel, 1995; Marzuk et al., 1992). In filicide-suicide, the presence of other stressors may indicate the risk of HS incidents occurring.

Clinical implications

Due to the low prevalence and incidence of HS, it is challenging to identify people most at risk of becoming a victim of homicide or committing a HS. However, by examining commonly reported characteristics, it may be possible to identify those at most risk, supporting services to intervene prior to violence occurring.

Many studies highlighted that HS perpetrators had been in contact with mental health services prior to the incident or had known mental health difficulties. This offers an opportunity to provide intervention and support to those presenting with risk factors associated with HS. Suicidal ideation and depressive disorders are the most reported factors associated with HS. HS is sometimes viewed as an extension of suicide in those that are already suicidal (Marzuk et al., 1992; Hanzlick & Koponen, 1994; Wood Harper & Voigt, 2007). If an individual is affected by additional stressors such as employment or financial stressors, in the context of depression and suicidal ideation, it is possible this could lead to thoughts of 'mercy' or 'rescue' through the act of extended suicide (Felthous et al., 2023). Services should provide signposting and support for psychosocial stressors affecting wellbeing. Further avenues of support might include involving family members and spouses/partners in care, providing psychoeducation on recognising signs of risk, offering crisis helpline numbers, and evidence-based interventions for depressive disorders and suicidal ideation.

Intimate partner problems—particularly, domestic violence and relationship breakdown—were the largest interpersonal factor associated with HS. One in three females experience physical or sexual violence by an intimate partner in their lifetime (World Health Organisation, 2021). Motivations for HS in the context of intimate-partner-HS include 'amorous jealousy', 'retaliation', and 'impending or previously divorced' (Marzuk et al., 1992; Hanzlick & Koponen, 1994). The Domestic Abuse Act (Home Office, 2022) outlines guidelines for agency responses to domestic abuse including risk assessment, social care, health, and housing. A multi-agency response has been identified as critical to identify abuse at an early stage and avoid reaching crisis point.

This review found that in cases of filicide-suicide, females who had children with disabilities or chronic illnesses also experienced mental illnesses such as depression and psychosis (Coorg & Tournay, 2012; Murfree et al., 2022). Research identified that 72% of parents and carers with children with disabilities experience mental ill health such as anxiety, depression, or breakdown (Contact A Family, 2011). Parents and carers with children with disabilities may also experience social isolation, and a lack of support from statutory services such as social care and education services (Contact A Family, 2022). Support should be offered to parents and carers where there are children with physical, developmental, or learning disabilities, or life-altering or life-limiting illnesses to reduce isolation, support financial wellbeing, and provide therapeutic support to families.

Other potential risk factors that were identified within this review were recent substance abuse and substance abuse problems. In HS perpetrators who recently started using substances, or increased their substance and alcohol misuse, this may suggest a deterioration in mental state which could be associated with increased risk of HS. Finally, psychotic disorders were reported less commonly

than other mental health conditions. Nonetheless, the presence of psychotic disorders was identified in several studies (Knoll & Hatters-Friedman, 2015; Caretta et al., 2015; Flynn et al., 2016; Sun et al., 2021) which may be useful for services to consider when considering risk and the required support for individuals and their families.

Limitations

This review examined studies that used a range of designs to enable a robust and detailed examination of the role of mental health characteristics in HS. However, some limitations must be addressed. There is little to no opportunity to undertake a mental health assessment with a HS perpetrator prior to death, and it is therefore particularly challenging to assess mental state. The quality of data on MH characteristics associated with HS across the 16 studies reviewed varied. Quantitative studies which used journalistic sources recorded the presence of mental health conditions through descriptions or non-clinical information compared to clinical diagnoses and /or formal mental health assessments. Some studies only reported the presence of mental health problems without providing adequate detail from which to draw conclusions. Furthermore, all studies commonly reported that data might be missing or not comprehensively reported, which impacts on the conclusions that can be drawn. In many cases, the mental health history of perpetrators was unknown, or data on mental health and associated difficulties were only available for a subsample. As a result, mental health characteristics in HS incidents are likely to be underestimated.

There was large variation in the presence of mental health problems between studies. In the USA, rates of depressive disorders were generally between 10%-20%, however Knoll and Hatters-Friedman (2015) reported that 94% of perpetrators met criteria for depression. Likewise, Sun et al. (2021) reported psychosis in 25% of perpetrators, whilst other studies reported lower rates. Similarly, whilst suicidal ideation was commonly reported, previous suicide attempts were rarely reported in studies outside of the USA. There are several possible reasons for the variations in the presence of mental health conditions between studies. Research taking place globally may be impacted by social and cultural influences. It is possible that incomplete suicide is not routinely recorded or that people who do not complete suicide do not seek medical or mental health support following attempts. Despite variations, there were common mental health characteristics reported across the studies included within this review. Those characteristics may be clinically significant when considering predisposing factors of HS.

Many studies reviewed were based on NVDRS data (Holland et al., 2018; Logan et al., 2013; Murfree et al., 2022; Patton et al., 2015; Schwab-Reese et al., 2021). This is used in many states within the USA, and the studies included within this review varied between including data on HS from

between 16 and 42 states. Whilst some studies might report using NVDRS data, conclusions should be interpreted with caution. The state of California does not use the NVDRS, although one study in this review did analyse data from California, enabling the capture some details of HS in this state (Caretta et al., 2015).

This review examined research conducted between 01/01/2013 and 07/11/2024 as an update to Roma et al's. (2012) review paper. However, Roma et al. (2012) conducted their literature searches in August 2011. This means there is a gap in the literature of 16 months in which relevant articles may have been missed.

Finally, the NVDRS database only includes incidents of suicide which occur within 24 hours of a homicide as a HS. This means incidents of HS taking place over a longer timeframe were not analysed. Likewise, studies which did not use the NVDRS database included HS incidents which occurred within a week. This may be too wide a timeframe and include incidents where the motivation to end their life may have changed.

Future research

Future research would benefit from considering incomplete, as well as complete, incidents of HS. Due to the difficulty of gathering the relevant information relating to perpetrators' mental states prior to HS, this would provide a more comprehensive understanding of HS characteristics.

Many research studies eligible for inclusion in this review were conducted in the USA, which has twice the global rate of HS incidents (Joiner, 2014; Large et al., 2010). However, it would be beneficial for more research to be conducted worldwide, providing a global picture of MH characteristics in HS. Likewise, databases which collect information on a more consistent and global scale would be beneficial to support the ability to draw comparisons and conclusions from the research.

This review examined qualitative, quantitative, and mixed methods studies. Future research would benefit from using mixed designs to better understand these complex phenomena.

Conclusions

This is the first review to identify the specific mental health difficulties present in perpetrators of HS. It is important to identify individuals at risk of perpetrating extreme violent offences, such as HS. People with depressive disorders and suicidal ideation, which co-occur in the context of socioeconomic and familial difficulties, should be prioritised for intervention and support from services. This review also suggests that people with psychotic disorders should be given careful risk assessment and signposting. Future studies could be strengthened by considering the future research and limitations sections of this review.

CRediT author statement

Jessica Kenworthy: Conceptualization; Data curation; Formal analysis; Investigation; Methodology; Validation; Visualization; Writing – original draft; Writing – review and editing.

Michelle Rydon-Grange: Conceptualization; Methodology; Supervision; Writing – review and editing.

Declaration of competing interests

All authors declare that they have no conflicts of interest.

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Paper Two: Empirical paper. What Distinguishes Homicide-Suicide from Homicide and Suicide? A Two-Part Matched Case Control Study.

Target journal: Aggression and Violent Behaviour

(This paper has been prepared for submission in accordance with author guidelines for the above stated journal [Appendix D]. Final formatting edits and modifications will be made prior to submission to the journal).

Word count: 7411

Abstract

Homicide-suicide involves the homicide of another person before taking one's own life. Though closely linked, research has not yet directly compared homicide-suicide to both homicide and suicide incidents. This research conducted two studies. Study 1 examined characteristics of mental health patients who died by suicide and compared these with mental health patients who committed homicide-suicide. Study 2 examined characteristics of homicide perpetrators and compared these with homicide-suicide perpetrators who were not mental health patients. The research aimed to identify similarities and differences in characteristics between groups.

Data over a ten-year period in England and Wales were analysed. Homicide-suicide patients were matched to patients who died by suicide. Likewise, homicide-suicide cases in the general population were identified and matched with homicide perpetrators. Conditional logistic regression analyses were conducted to identify common and differing characteristics between groups.

Homicide-suicide perpetrators are more likely to be male, aged 25-44, unmarried, unemployed, and have a history of self-harm. Victim characteristics and motive differentiate homicide-suicide cases from homicide cases: homicide-suicide perpetrators are more likely to commit homicide on a female spouse following domestic arguments. Homicide-suicide perpetrators were most likely to have depressive disorders and less likely to seek support, while patients who died by suicide had a wider range of identified primary diagnoses.

Examining characteristics of homicide, suicide, and homicide-suicide over a ten-year period offers a robust understanding of at-risk populations, and a means to develop nuanced risk assessment and preventative measures to reduce loss of life.

Key words: Homicide-suicide, homicide, suicide, mental health characteristics, psychopathology

Introduction

Homicide-Suicide (HS) is a phenomenon where an individual commits homicide and proceeds to take their own life (Rouchy et al., 2020). Research has debated when an event is described as a HS, as opposed to the homicide and subsequent suicide being distinguished as separate events. Overall, research suggests that there be a 72-hour 'cut-off point' between events to classify it as a HS, as the perpetrators mental state and motivation for suicide following a homicide may change if the events occur over a longer timeframe, such as a week or more (Barraclough & Harris, 2002; Shaw & Flynn, 2003). There are an average of 14 cases per annum in England and Wales (NCISH, 2023) with a global rate of 0.14 events per 100,000 people (Large et al., 2009). Research has begun identifying common characteristics in incidents of HS. HS is committed predominantly by white men, and risk of HS increases with age (NCISH, 2023; Rouchy et al., 2020; Flynn et al., 2016). Comparably, those who die by suicide are predominantly male and aged over 65 (NCISH, 2023), whereas homicide perpetrators, though similarly are most often male, are typically aged 30 or under when committing homicide (World Health Organization [WHO], 2019; Flynn, 2013).

Research has identified some characteristics associated with HS, suicide, and homicide. Some similarities are identified, with other distinguishing factors. Common associated characteristics in individuals who die by suicide include living alone, being unmarried, self-harm, drug and alcohol misuse, and offending (NCISH, 2023). Economic adversity, unemployment, and financial difficulties such as debt, are also associated with increased risk of suicidal behaviour (Mathieu et al., 2022; NCISH, 2023). Homicide is most associated with being unmarried, unemployed, experiencing disadvantage (e.g., poverty, economic inequality, racial segregation, family disruption), and gang violence (WHO, 2021; Flynn, 2013; Podlogar, 2018; Dobash et al., 2001; Peterson et al., 2000; Messner & Golden, 1992). In comparison, an early history of adversity during childhood, exposure to traumatic events, a history of criminal offences, unemployment, and financial difficulties are associated with HS (Rouchy et al., 2020; Sun et al., 2021; Logan et al., 2013; Patton et al., 2015; McPhedran et al., 2015). Substance use and self-harm have also been associated with HS (Roma et al., 2012; Rouchy et al., 2020).

Though data are not universally or rigorously collected, research has begun examining mental health characteristics associated with HS. Depression is the most associated mental illness (Rouchy et al., 2020; Flynn et al., 2016; West, 1965; Roma et al., 2012), but suicidal ideation and previous suicide attempts have also been recognised as common characteristics (Saleva et al., 2007; Roma et al., 2012; Rouchy et al., 2020). Psychosis has been identified in some studies (Flynn et al., 2009; Gudjonsson & Peturrson, 1982), however others have not found an association (Rouchy et al., 2020).

A high risk of suicide is correlated with psychiatric illnesses (Troister, Links, & Cutliffe, 2008). In examining data of patients under mental health services, these psychiatric illnesses include affective disorders, schizophrenia, and personality disorder (NCISH, 2023).

The media often places an excessive emphasis on violent acts committed by people with mental illnesses (Carpiniello et al., 2007), however only a tenth of people convicted of homicide have been found to be patients under the provision of mental health care within 12 months of conviction (Podlogar, 2018; NCISH, 2023; James & Glaze, 2006). Among those with mental illnesses, substance use disorders and schizophrenia are the most common diagnoses (Flynn et al., 2016).

Among both the general population and patients in the United Kingdom (UK), the most common method of dying by suicide has been recorded as by hanging or strangulation, followed by self-poisoning, or jumping from a height or sustaining multiple injuries (NCISH, 2023). The most common method of homicide in the UK is the use of a sharp instrument, followed by hitting or kicking without the use of a weapon (Allen & Mansfield, 2023). Similarly, the most common method of homicide in HS within the UK is the use of sharp instrument, followed by strangulation, and then with firearms (Flynn et al., 2009). The method of suicide was the same as the method of homicide in less than half of HS cases, with the main methods being hanging, firearms, and carbon monoxide (Flynn et al., 2009).

Most commonly, victims of HS are female, and perpetrators are a current or ex-spouse/partner. The next most common victim type is children of the perpetrator (Flynn et al., 2016; NCISH, 2023; Rouchy et al., 2020; Felthous & Hempel, 1995). Incidents have been associated with domestic violence and are commonly preceded by relationship breakdown and separation (Flynn et al., 2016). In comparison, homicide victims are most commonly male (Allen & Mansfield, 2023; Podlogar, 2018). The most common relationship between perpetrator and victim is friendship or acquaintance, followed by being strangers, then partners or ex-partners (Allen & Mansfield, 2023; Podlogar, 2018). Men are most likely to be killed by a friend or acquaintance, whereas women are most often killed by a partner or ex-partner (Allen & Mansfield, 2023).

Rationale

Suicide, homicide, and HS are preventable deaths. It is imperative to identify the most common characteristics within these groups to identify and develop strategies to reduce loss of life. There appears to be a similar emerging profile across the three groups, however, the presence of additional characteristics may lead one of the three fatal acts to occur, as opposed to the others. By identifying

the shared, and differing, characteristics a more nuanced approach may be developed to reduce the risk of loss of life. There is yet to be a direct study analysing the characteristics of HS and directly comparing these to matched case controls of both homicide and suicide events. This research will focus on HS as a key outcome group and will conduct two studies. Together, these will offer a comprehensive, multi-lens understanding of HS by bridging clinical and criminal contexts and offering both mental health population and general population insights.

Study 1 will conduct a matched case-control study on incidences of HS and suicide in people who were involved with mental health services within 12 months of their deaths. This will identify clinical and care characteristics of people who died by suicide and HS, as well as provide an opportunity to consider sociodemographic factors, methods of suicide, and economic factors.

Study 2 will conduct a matched case-control study on incidences of HS and homicide within the general population. As with Study 1, this will provide the opportunity to consider the role of sociodemographic factors between groups, with added context around criminal factors and differences in victimology.

Aims and objectives

Study 1:

This research aims to: 1) To examine the sociodemographic, clinical, and care characteristics of NHS patients in England and Wales between 2010 and 2020 who committed HS *(group A: HS patients);* 2) compare the sociodemographic, clinical, and care characteristics of group A with NHS patients who died by suicide *(group B: Suicide patients);* and 3) identify similarities and differences between group A and group B.

Study 2:

This research aims to: 1) examine sociodemographic factors, victimology, and method of homicide in England and Wales between 2010 and 2020 of those who committed HS (*group C: General-population HS*); 2) compare the sociodemographic factors, victimology, and method of homicide of group C with individuals who perpetrated homicide in the general population (*group D: General-population homicide*); and 3) identify similarities and differences between groups C and D.

Materials and methods

Design

This study was conducted in collaboration with the National Confidential Inquiry into Suicide and Safety in Mental Health (NCISH). NCISH collate and maintain clinical data on homicide and suicide not replicated by any other national or international research group or organisation (Flynn et al., 2016). The NCISH methodology has been described in detail elsewhere (NCISH, 2023). Briefly, data collection consists of: (I) the collection of all deaths receiving a coroner's conclusion of suicide or undetermined intent from national statistics bodies; (II) identifying whether the deceased was in contact with mental health services within 12 months of suicide and (III) the collection of detailed sociodemographic and clinical information via a questionnaire sent to the clinician responsible for the patient's care. As is conventional in suicide research, deaths with undetermined conclusions are included in the suicide sample.

Information for England and Wales on convicted homicides is compiled by the Homicide Index at the Home Office. The Homicide Index was established in 1967 to record every homicide notified to the Home Office by police forces across England and Wales. These data are collected by NCISH, along with homicide data from the Scottish Crown Office, and Greater Manchester Police. Information collected includes names, addresses, dates of birth and death or offence, and cause of death or information related to the offence (NCISH, 2017).

Due to NCISH methodology, comprehensive information is collected on those who died by suicide and were involved with mental health services in the year prior to their death. This includes clinical information such as psychiatric history, diagnoses, and contact with mental health services. This provides the opportunity to examine the clinical and sociodemographic characteristics of those who died by suicide, including homicide-suicide perpetrators who were involved with mental health services prior to their deaths. The information collected from the Homicide Index for convicted homicides does not collate clinical information such as psychiatric history, any diagnoses, or previous contact with mental health services. It is not possible to identify mental health characteristics from homicide groups or homicide-suicide perpetrators who were not involved in mental health services prior to their deaths. However, important contextual information can be collected such as victim characteristics, sociodemographic factors, and previous criminal history.

Therefore, this research used the secondary data from NCISH databases to examine characteristics of homicide, suicide, and HS between 2010 and 2020. Access was granted, as a visiting researcher, to conduct two matched case-control studies, demonstrated in Figure 1.

Study 1 will examine sociodemographic, clinical, and care characteristics within two groups (group A and group B). Study 2 will examine sociodemographic, clinical, care, and victim characteristics within two groups (group C and group D). This will enable a robust and comprehensive examination of the interplay of characteristics involved in homicide-suicide, suicide, and homicide, and provide an examination of the differences between the three groups.

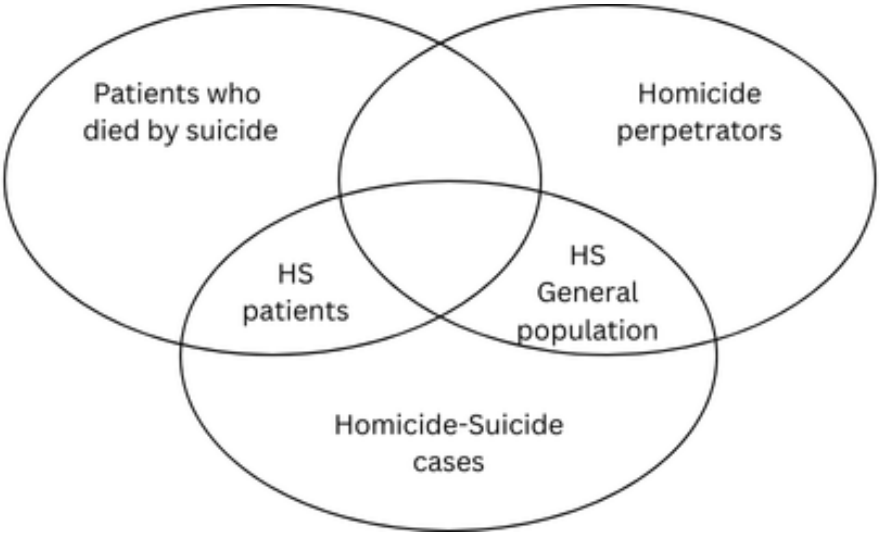

Figure 1. Diagram outlining Studies 1 and 2 within the overall research design.

Sample

Study 1: NHS patients (*Group B: Suicide patients*) aged 18 and over were identified who died by suicide in England and Wales between 2010 and 2020 (*n*=13,828).

Individuals who committed HS in England and Wales between 2010 and 2020 (*n*=285) were identified. Cases were excluded where the timeframe between the homicide and suicide events were greater than three days (*n*=76), as most research agrees that a 72-hour timeframe is the most appropriate to classify a HS (Barraclough & Harris, 2002; Shaw & Flynn, 2003). The total sample was 209 cases, of which 4.8% (*n*=10) were patients in NHS mental health services within a year of their death (*Group A: HS patients*). HS patient cases were matched by age and sex characteristics on a 1:5 basis with suicide cases (*n*=60). Characteristics for both groups can be found in Table 1.

Sex	**Age in categories**							
	18-24		**25-44**		**45-64**		**65+**	
	Suicide	**HS**	**Suicide**	**HS**	**Suicide**	**HS**	**Suicide**	**HS**

Male	668	0	3553	5	3709	3	1280	0
Female	371	0	1567	2	1922	0	758	0
Total	**1039**	**0**	**5120**	**7**	**5631**	**3**	**2038**	**0**

Table 1. Table displaying age groups and sex of patient cases of suicide and HS.

Study 2: Homicide perpetrators (*Group D: General population homicide*) aged 18 and over were identified in England and Wales between 2010 and 2020 (*n*=4794). After excluding cases (*n*=647) due to being under the care of mental health services at the time of the incident, the total sample was 4147.

The HS perpetrators who were not mental health patients (*n*=199, *Group C: General population HS*) were matched by age and sex with the homicide cases, yielding 1,186 total cases. Due to uncommonness in age and sex with some HS perpetrators, age bands were used to match cases. In the oldest age bands, age categories were collapsed for some analysis because of small numbers. Two Group C cases (female, aged 83 years; female, aged 84 years) could only be matched with two homicide cases due to unavailability of female homicide perpetrators in this age category. See Table 2 for matching characteristics.

Sex	**Age in categories**							
	18-24		**25-44**		**45-64**		**65+**	
	Homicide	**HS**	**Homicide**	**HS**	**Homicide**	**HS**	**Homicide**	**HS**
Male	1279	6	1858	69	576	57	94	39
Female	68	5	195	17	65	4	12	4
Total	**1347**	**11**	**2053**	**86**	**641**	**61**	**106**	**41**

Table 2. Table displaying age groups and sex of general population cases of homicide and HS.

Quantitative data analysis

Tests of normality are typically done when using a sample of data to ascertain if the sample drawn from a population is normally distributed (Tsagris & Pandis, 2021). However, this research is examining the complete population of suicide, homicide, and HS cases in England and Wales during the timeframe. As population data rather than sample data were used, tests of normality were not conducted. Data were cleaned and coded to identify and prepare common variables across homicide, suicide, and HS datasets. The Do File[4] can be found in Appendix E. Variables where significant amounts of data were missing were excluded from the analysis. In some existing variables, there were small frequencies of missing data. However, due to the size of the sample it was deemed appropriate to include these. During the analysis, some matched sets[5] consisted of all positive or all negative

[4] A Do File is the file created in Stata software to code data and run analysis.
[5] One matched set is a group of one case (e.g., Homicide-suicide patients) and 5 controls (e.g., suicide patients)

outcomes, i.e., the case and control were all unemployed. An assumption of conditional logistic regression is that each matched set must have variation in the outcome, otherwise it does not contribute any new information to the model. In instances where matched sets do not have variation, they are dropped from the analysis (Hosmer et al., 2013). Within this study, some matched sets were dropped due to all positive or all negative outcomes, indicated in Tables 3 and 4.

Conditional logistic regression analysis is a logistic regression model where cases in different groups have been matched for at least one characteristic (Koletsi & Pandis, 2017). Conditional logistic regression estimates are conditional on cases being linked to controls in a matched case-control study (Koletsi & Pandis, 2017). Matching within a conditional logistic regression is a statistical technique whereby cases and controls are sampled from a population to have similar distributions on variables of interest (Iwagami & Shinozaki, 2022). These variables are typically sex and age, as these characteristics are strong potential confounders. By matching on sex and age, cases and controls have similar distributions of characteristics which improves statistical efficiency and reduces selection bias (Iwagami & Shinozaki, 2022).

To directly compare the two groups in each study, up to five controls (Study 1: Patients who died by suicide; Study 2: Homicide cases) per case (Study 1: Patient HS; Study 2: General population HS) were matched on age/age bands and sex. The age bands were predefined in groups of five years, for example an 85-year-old male would be matched to five other males aged 80-85. This was done when exact matching did not allow for all cases to have five controls. Research has shown that higher numbers of controls per case improves statistical power, but that this plateaus at the ratio of 5:1 and does not improve power further (Hennessy et al., 1999).

Following matching, conditional logistic regression analysis models were conducted to explore differences between the cases and controls on the data available. Conditional logistic regression models the probability of a person being a case within each matched set. Research has found that conditional logistic regression models are unbiased, even with non-exact matching (Wan et al., 2021).

Unadjusted differences are presented using conditional odds ratios (ORs) and 95% Confidence Intervals (CIs). All data analysis was conducted using STATA version 11. See Appendix F for raw output results for Study 1 and Study 2.

Ethical approval

This study was fully approved by the University of Staffordshire research ethics committee January 2024 (Appendix G). NCISH provided the researcher with visiting research status to access anonymised datasets relevant to the research in accordance with their ethical approval status.

Results

Study 1:

Significant results. Living alone was significantly associated with case status, $\chi^2(1, N = 53) = 4.98$, $p < 0.05$. Patients who died by suicide were more likely to live alone compared to HS patients (60% v 20%). Patients who died by suicide had 5.13 times the odds of living alone than HS patients, OR = 5.13, 95% CI = 1.03 – 25.59.

Employment status was significantly associated with case status, $\chi^2(1, N = 54) = 5.33$, $p < 0.05$. 86% of patients who died by suicide were unemployed compared to 50% of HS patients. Patients who died by suicide had 0.15 times the odds of being employed than HS patients, OR = 0.15, 95% CI = 0.27 – 0.83.

A history of alcohol misuse was significantly associated with case status, $\chi^2(1, N = 57) = 4.88$, $p < 0.05$. 68% of patients who died by suicide had a history of alcohol misuse compared to 30% of HS patients. Patients who died by suicide had 0.2 times the odds of not having a history of alcohol misuse than HS patients, OR = 0.2, 95% CI = 0.05 – 0.88.

Non-significant results. Several variables did not reach statistical significance in their group associations. These were: ethnicity, marital status, deliberate self-harm, drug misuse, a history of mental illness, psychiatric diagnoses, recent contact with mental health services, and method of suicide (see Table 3).

	Cases (Group A: HS patients). *N*=10 (%)	**Controls (Group B: Suicide patients). *N*=50[a] (%)**	**Unadjusted OR (95% CI)**
Demographics			
Ethnic minority group (1 group [5 obs] dropped)	3 (6.38)	1 (11.11)	1.66 (1.73 - 16.02)
Unmarried	5 (50.00)	34 (77.27)	0.25 (0.45 - 1.39)
Living alone	2 (20.00)	26 (60.47)	5.13 (1.03 - 25.59)[b]
Unemployed	5 (50.00)	38 (86.36)	0.15 (0.27 - 0.83) [b]
Behaviours			

History of alcohol misuse	3 (30.00)	32 (68.09)	0.20 (0.05 - 0.88) [b]
History of drug misuse	5 (50.00)	25 (55.56)	0.74 (0.18 - 3.10)
Lifetime history of deliberate self-harm	7 (70.00)	31 (64.58)	1.24 (0.27 - 5.71)
Clinical characteristics			
History[c] of mental illness	8 (80.00)	37 (88.10)	0.53 (0.58 - 4.81)
No recent[d] contact with mental health services	8 (80.00)	24 (48.98)	4.24 (0.80 - 22.44)
Primary diagnosis. Overall model: $\chi^2(9, N = 58) = 10.53, p > 0.05$			
Adjustment disorder	1 (10.00)	4 (8.33)	Reference group
Bipolar	1 (10.00)	1 (2.08)	2.44 (0.04 - 150.64)
Depressive	4 (40.00)	7 (14.58)	2.71 (0.17 - 44.54)
Anxiety/phobia	0 (0.00)	4 (8.33)	<0.01 (0.00 – not estimable)
Alcohol dependency	0 (0.00)	3 (6.25)	<0.01 (0.00 – not estimable)
Drug dependency	0 (0.00)	4 (8.33)	<0.01 (0.00 – not estimable)
Personality disorder	1 (10.00)	10 (20.83)	.31 (0.02 - 6.38)
Schizophrenia and other psychotic disorders	1 (10.00)	11 (22.92)	0.34 (0.2 - 6.52)
No mental disorder	1 (10.00)	3 (6.25)	1.81 (0.09 - 6.38)
Other diagnosis	1 (10.00)	1 (2.08)	3.26 (0.10 - 102.51)
Method of suicide. Overall model: $\chi^2(9, N = 60) = 16.34, p > 0.05$			

Hanging	4 (40.00)	21 (42.00)	Reference group
Strangulation	0 (0.00)	2 (4.00)	<0.01 (0.00 – not estimable)
Self-poisoning	1 (10.00)	9 (18.00)	0.53 (0.05 - 5.32)
Drowning	0 (0.00)	2 (4.00)	<0.01 (0.00 – not estimable)
Cutting	0 (0.00)	3 (6.00)	<0.01 (0.00 – not estimable)
Jumping from a height	2 (20.00)	6 (12.00)	2.52 (0.34 - 18.56)
Jumping/lying in front of a vehicle	0 (0.00)	4 (8.00)	<0.01 (0.00 – not estimable)
Burning	3 (30.00)	0 (0.00)	<0.01 (0.00 – not estimable)
Suffocation	0 (0.00)	1 (2.00)	<0.01 (0.00 – not estimable)
Inhalation	0 (0.00)	2 (4.00)	<0.01 (0.00 – not estimable)
CI = Confidence intervals. [a] = matched up to 5 controls per case. [b] = p <0.05. [c]= lifeftime history. [d]= more than 7 days.			

Table 3. Demographic, behavioural, clinical, and mental characteristics of HS patients (cases) and suicide patients (controls).

Study 2:

Significant results. Marital status was significantly associated with case status, $\chi^2(1, N = 1067) = 1.86$, $p < 0.05$. 55% of homicide perpetrators were unmarried, compared with 45% of HS patients. Homicide perpetrators had 0.63 times the odds of being married than HS perpetrators, OR = 0.63, 95% CI = 0.44 – 0.88.

The overall model for relationship to the perpetrator was statistically significant, χ^2 (6, N = 1166) = 181.17, $p < 0.05$. Homicide perpetrators were most likely to have strangers as victims (30%). Homicide perpetrators had 0.23 times the odds of having strangers as victims compared to HS perpetrators, OR = 0.23, 95% CI = 0.09 – 0.60, p < 0.05. This is in comparison to the reference group

for the model of relationship to the perpetrator: parent of the perpetrator. Reference groups were those where rates were the most similar between homicide perpetrators and HS perpetrators. HS perpetrators were most likely to have spouses or ex-spouses as victims. 56% of HS perpetrator victims were spouses or ex-spouses compared with 21% of homicide perpetrators. Homicide perpetrators had 2.39 times the odds of their victims being spouses, OR = 2.39, 95% CI = 1.01 – 5.64, $p < 0.05$.

The sex of the victim was significantly associated with case status, $\chi^2(1, N = 1179) = 49.94$, $p < 0.05$. 67% of HS perpetrators' victims were female, compared with 59% of homicide perpetrators' victims. Homicide perpetrators had 3.38 times the odds of having male victims than HS perpetrators, OR = 3.38, 95% CI = 2.37 – 4.80, $p < 0.05$.

The age of the victim was also significantly associated with case status, $\chi^2(4, N = 1173) = 26$, $p < 0.05$. The most common age group of victims in both homicide perpetrators (34%) and HS perpetrators (33%) was the age range 25-44 years. This was the reference group due to rates between groups being the most similar.

The overall model for the main circumstance of homicide was statistically significant, $\chi^2(9, N = 1065) = 90.25$, $p < 0.05$. A romantic or domestic dispute was the most common circumstance of homicide in both the homicide (30%) and HS groups (38%). HS perpetrators had 1.78 times the odds of committing the act because of a romantic or domestic dispute, OR = 1.78, 95% CI = 0.17 – 18.29, $p > 0.05$. This is in comparison to sexual assault, which was the reference group for the model as this is where rates were the most similar between homicide perpetrators and HS perpetrators.

The overall model for the method of homicide was statistically significant, $\chi^2(11, N = 1185) = 410.01$, $p < 0.05$. Suffocation was the most common method of homicide for homicide perpetrators (46%). Homicide perpetrators had 0.14 times the odds of suffocating their victims, OR = 0.38, 95% CI = 0.14 – 0.99, $p < 0.05$. This is in comparison to causing to fall, which was the reference group for the model as this is where rates were the most similar between homicide perpetrators and HS perpetrators. Alternatively, the most common method of homicide in HS perpetrators was the use of a (sharp or blunt) instrument (48%). HS perpetrators had 28.15 times the odds of using an instrument compared to homicide perpetrators, compared to causing to fall, OR = 28.15, 95% CI = 8.84 – 89.61, $p < 0.05$.

Non-significant results. Several variables did not reach statistical significance in their group associations. These were ethnicity, employment status, a history of drug use, and previous violence towards a victim (see Table 4).

	Cases (Group C: HS general population). *N*=198 (%)	**Controls (Group D: Homicide perpetrators). *N*=987[a] (%)**	**Unadjusted OR (95% CI)**
Demographics			
Ethnic minority group (1 group [5 obs] dropped)	52 (26.26)	217 (21.99)	1.28 (0.09 - 1.83)
Unmarried (23 groups [102 obs] dropped)	79 (44.89)	486 (54.55)	0.63 (0.44 - 0.88)[b]
Unemployed (23 groups [102 obs] dropped)	126 (71.59)	645 (72.39)	0. 977 (0.67 - 1.43)
Behaviours			
History[c] of drug misuse (23 groups [102 obs] dropped)	48 (27.27)	301 (33.86)	0.71 (0.48 - 1.03)
Previous violence towards victim/s (23 groups [113 obs] dropped)	32 (18.18)	183 (18.87)	1.00 (0.66 - 1.51)
Relationship to the perpetrator. Overall model: χ^2 (6, N = 1166) = 181.17, p < 0.05. (3 groups [15 obs] dropped)			
Parent of perpetrator	8 (4.08)	32 (3.25)	Reference group
Child of perpetrator	26 (13.27)	26 (2.64)	5.36 (1.96 - 14.68) [b]
Spouse/ex-partner of perpetrator	111 (56.63)	210 (21.32)	2.39 (1.01 - 5.64) [b]

Other family of perpetrator	7 (3.57)	226 (22.94)	0.14 (0.05 - 0.40) [b]
Friend/acquaintance of perpetrator	23 (11.73)	148 (15.03)	0.61 (0.24 - 1.54)
Other known to perpetrator	2 (1.02)	48 (4.87)	0.22 (0.04 - 1.12)
Stranger to perpetrator	19 (9.69)	295 (29.95)	0.23 (0.09 - 0.60) [b]
Victim age. Overall model: $\chi^2(4, N = 1173) = 26.00$, $p < 0.05$. (13 groups [65 obs] dropped)			
25-44	64 (34.41)	327 (33.13)	Reference group
<18	28 (15.05)	69 (6.99)	2.56 (1.45 - 4.50) [b]
18-24	5 (2.69)	78 (7.90)	0.31 (0.12 - 0.80) [b]
45-64	46 (24.73)	326 (33.03)	0.74 (0.48 - 1.15)
65+	43 (23.12)	187 (18.95)	1.32 (0.77 - 2.24)
Other victim characteristics			
Female victim (7 groups [35 obs] dropped)	129 (67.19)	402 (40.73)	3.38 (2.37 - 4.80) [b]
Method of homicide. Overall model: $\chi^2(11, N = 1185) = 410.01$, $p < 0.05$. (1 group [5 obs] dropped)			
Causing to fall	7 (3.54)	33 (3.34)	Reference group
Hitting or kicking	6 (3.03)	120 (12.16)	0.26 (0.08 - 89.61) [b]
Exhaust fumes/other poisoning	3 (1.52)	25 (2.53)	0.75 (0.16 - 3.53)

Shooting	28 (14.14)	4 (0.41)	33.85 (6.91 – 165.91) [b]
Aborting	0 (0.00)	137 (13.88)	<0.01 (0.00 – not estimable)
Explosion	2 (1.01)	51 (5.17)	0.16 (0.03 - 0.90) [b]
Drowning	1 (0.51)	20 (2.03)	0.31 (0.03 – 3.07)
Sharp/blunt instrument	95 (47.98)	12 (1.22)	28.15 (8.84 – 89.61) [b]
Burning or scalding	1 (0.51)	23 (2.33)	0.25 (0.02 - 2.45)
Suffocation	35 (17.68)	453 (45.90)	0.38 (0.14 - 0.99) [b]
Arson causing death	6 (3.03)	61 (6.18)	0.43 (0.12 - 1.52)
Other/not known	14 (7.07)	48 (4.86)	1.77 (0.55 - 5.69)
Motive. Overall model: $\chi^2(9, N = 1065) = 90.25, p < 0.05$. (23 groups [102 obs] dropped)			
Sexual assault	1 (0.57)	6 (0.67)	Reference group
Escalated child abuse	1 (0.57)	22 (2.47)	0.34 (0.02 - 7.31)
Irrational act	23 (13.07)	72 (8.10)	2.15 (0.20 - 23.09)
Financial gain	1 (0.57)	42 (4.72)	0.17 (0.01 - 3.57)
Robbery/burglary	2 (1.14)	34 (3.82)	0.33 (0.02 - 4.81)
Romantic/domestic	66 (37.50)	266 (29.92)	1.78 (0.17 - 18.29)
Suicide pact/mercy killing	11 (6.25)	20 (2.25)	5.63 (0.48 - 66.27)
Unknown/other	51 (28.98)	157 (17.66)	2.19 (0.21 - 22.83)
Criminal activity	10 (5.68)	19 (2.14)	3.65 (0.31 - 43.34)
Feud/argument	10 (5.68)	251 (28.23)	0.24 (0.02 - 2.67)

CI = Confidence intervals.

[a] = matched up to 5 controls per case.

[b] = p <0.05.

[c] = lifetime history.

Table 4. Demographic, behavioural, clinical, and mental characteristics of HS (cases) and homicide (controls) cases in the general population.

Discussion

These matched case control studies aimed to examine the characteristics of four population groups. It aimed to offer a more holistic understanding of HS by examining clinical and personal risk factors, as well as considering societal, contextual, and environmental factors. This research has examined demographic, behavioural, clinical, and victim characteristics, as well as methods of homicide /suicide, and motives for HS. Similarities between groups, as well as distinguishing characteristics, have been identified.

Study 1:

HS patients were most likely to be male and aged 25-44 years, contradicting previous research which has found that as age increases, the risk of HS increases (Rouchy et al., 2020). This discrepancy in findings could reflect HS profiles in the UK population compared to Rouchy et al's (2020) systematic review which considered HS in a global context. The reasons for this finding are unknown, however, perhaps individuals within the 25–44-year age range in this 10-year period were more at risk of unemployment and financial instability, relationship difficulties, and substance misuse than older adults in the UK.

Significant results. Being unemployed and living alone were significant predictors of HS occurring amongst those involved with mental health services in the 12 months prior to their death. This is consistent with previous research (Patton et al., 2015; Logan et al., 2013; Sun et al., 2021; McPhedran et al., 2015).

The CIs for being unemployed were narrow, suggesting that the results are statistically precise. Narrow CIs combined with a large effect size suggests that there is a meaningful relationship between being unemployed and HS occurring.

Patients who died by suicide were five times more likely to live alone than HS patients. The large effect size suggests there is a strong association with living alone and HS or suicide occurring. However, the CIs for this variable were particularly high, suggesting that the odds of living alone in the suicide group was anything between 1.03 – 25.59 times that of the HS patient group. Very wide confidence intervals can reflect a high degree of uncertainty in the estimate. The population size in this study was low at only ten HS patients matched on a 1:5 basis, which may not be a large enough sample relative to the variability in the data. A larger sample may be more likely to be able to provide more certainty in estimates. Expanding the pool from which the population is drawn, such as including Scotland and Ireland in the research, may enable a greater population to be identified.

A history of alcohol misuse was a significant predictor, and a negative relationship was indicated by the CIs, meaning that HS patients were predicted not to have a history of alcohol misuse. Conversely, most patients who died by suicide had a history of alcohol misuse. Previous research supports these findings (NCISH, 2023; Flynn et al., 2016; McPhedran et al., 2015).

Non-significant results. Within Study 1, only three tests reached statistical significance. This means that all characteristics except unemployment, alcohol misuse, and living alone did not significantly predict HS amongst patients. Despite not reaching statistical significance, there are still some notable findings.

Both HS and suicide groups were likely to have a history of engaging in self-harm. Self-harm has previously been associated with both groups (Rouchy et al., 2020; Roma et al., 2012; NCISH, 2023). The effect size suggests there is a strong association between a history of self-harm and suicide status, however the CIs provide an imprecise estimate.

The model for psychiatric illnesses was not found to be statistically significant. This may be a result of this category being too large. In the 'primary diagnosis' and 'suicide method' models there were 10 variables being analysed, which may be too many predictors for the sample size. In some variables there were no instances of a primary diagnosis (e.g., anxiety/phobia; alcohol dependency; drug dependency) which led to CIs collapsing and being unable to provide a meaningful estimate. In other cases, there was only one case of a HS perpetrator having a primary diagnosis of that variable (e.g., bipolar disorder, other diagnosis). This led to very large CIs which could not offer a precise estimate.

However, large ORs were found when looking at some mental illness characteristics, comparable to others. ORs serve as effect sizes, and they measure the strength and direction of an association between a predictor and the outcome within matched sets (Uanhoro et al., 2019). In patient populations, more information is collected, making it possible to capture and control for variance, or confounding variables. Therefore, though the model with this population did not reach statistical significance it is possible that some mental illnesses are associated factors in HS and patient suicide populations.

Depressive disorder was the most common primary diagnosis in HS patients, corroborating the evidence base which has found similar results (Flynn et al., 2016; Sun et al., 2021; Cheung et al., 2015; Roma et al., 2012; Rouchy et al., 2020). This research confirms and contributes to the evidence base identifying those depressive disorders, combined with other common characteristics is a key risk factor for HS.

Within the ten-year period only $^{1}/_{20}$ HS cases were patients within NHS mental health services in the 12 months prior to their deaths. Previous research suggests that mental health difficulties are common in HS perpetrators (Rouchy et al., 2020; Flynn et al., 2016; Roma et al., 2012), which makes this finding surprising. It may be possible that only a small percentage of HS perpetrators who experience mental health difficulties access mental health services. NCISH does not capture mental health information about previous patients who were not open to services in the period prior to the 12 months before death, so this sample could not capture HS perpetrators who experienced mental health difficulties and previously were patients in the NHS, but did not access services in the year prior to their death.

Study 2:

HS and homicide groups were most likely to be male and aged 25-44years. These characteristics are representative of previous research (WHO, 2021; Flynn, 2016; Podlogar, 2018; Dobash et al., 2001; Messner & Golden, 1992).

Significant results. Being unmarried was a significant predictor of HS occurring in the general population. A moderate to large effect size with narrow CIs suggests that there is a meaningful relationship between being unmarried and HS occurring. This is supported by previous research (Rouchy et al., 2020; Sun et al., 2021; Patton et al., 2015).

Victim characteristics such as their sex, age, and relationship to the perpetrator were also significant predictors of HS. Victims of HS perpetrators were most likely to be female. The OR for sex of the victim was the largest within the study, suggesting that there is a large association between the predictor (victim sex) and the outcome (HS). The narrow CIs add strength and certainty to the findings. These findings support the evidence base which has consistently found that victims of HS are most often female (Flynn et al., 2016; Rouchy et al., 2020). Comparably, in the homicide group, victims were most often males. This also supports previous research findings (Allen & Mansfield, 2023; Podlogar, 2018).

Victims of HS perpetrators were significantly associated with being spouses or ex-spouses or the perpetrator. Intimate-partner HS is widely identified as the most common form of HS (Rouchy et al., 2020; Roma et al., 2012; Flynn et al., 2016; Felthous & Hempel, 1995). The second most common victim group after spouse/ex-spouse was children of HS perpetrators, in line with previous research (NCISH, 2023; Rouchy et al., 2020; Felthous & Hempel, 1995). This research found that the most common victim group amongst homicide perpetrators were strangers. This is similar to previous research which found that strangers were the second most common victim group amongst homicide

perpetrators, with friends or acquaintances being the most common (Allen & Mansfield, 2023; Podlogar, 2018). In this research, strangers were most common, followed by spouses, and then 'other family members'. It is unknown why there is a discrepancy between friendship being the most common victim group in previous research and being fourth most common in this study, but further exploration of this may be useful in future research.

In both groups, the most common victim age was 25-44 years. The findings suggest that both HS and homicide perpetrators are most likely to commit homicide within their age groups. Relationship breakdown, domestic violence, and other relationship problems have frequently been recognised as a contributing factor to HS (Logan et al., 2013; Patton et al., 2015; Holland et al., 2018; Murfree et al., 2022).

The method of homicide was a significant predictor of HS in the general population. The use of a sharp or blunt instrument was the most common method amongst HS perpetrators, consistent with previous research (Flynn et al., 2009). There was a particularly large effect size for the use a sharp or blunt instrument, however there was also an extremely large confidence interval, which means that a precise estimate could not be provided. Suffocation was the most common method of homicide amongst homicide perpetrators, and the use of sharp or blunt instrument was the second least likely method. This finding is not supported by previous research which found that the most common method of homicide is the use of a sharp instrument (Allen & Mansfield, 2023). Most CIs within this model were particularly small or null due to the low numbers for certain variables within the model (e.g., explosion; burning; aborting), except for shooting and the use of an instrument. Therefore, despite the overall model being statistically significant, the associations may be very small or have minimal impact on the outcomes (e.g., HS or homicide).

Non-significant results. Within this study, most tests reached statistical significance. For tests that did not, missing data may have limited the results. The population size in this study was significantly larger than in Study 1, therefore this may have been sufficient relative to the variability in the data. Nonetheless, the non-significant findings may have important implications.

Both groups were most often White British and did not commonly have a history of drug misuse. Being unemployed was common in both groups, consistent with previous research into both groups (Rouchy et al., 2020; Roma et al., 2012; McPhedran et al., 2015; WHO, 2021; Podlogar, 2018). However, a small effect size was found.

A history of criminal offences has been associated with HS perpetrators (Rouchy et al., 2020), however previous violence towards the victims was not significantly associated with HS perpetrators

in this research. A small percentage of HS cases were criminally motivated, such as in robbery/burglaries or for financial gain. This research did not capture previous non-violent convictions, however from the findings it seems possible that criminal behaviour in perpetrators of HS would be for interpersonal reasons, such as fights or towards spouses.

Clinical implications:

According to the biopsychosocial model of health (Engel, 1977), it is essential to consider mental and physical health from a multi-lens perspective to understand the full context in which an individual is living and being influenced. Often, assessments in mental health services consider presenting difficulties and other factors which might influence these e.g., living circumstances, physical health, family and relationships, and any history of abuse or adverse life events. The biopsychosocial model recognises that a holistic approach to treatment which considers and addresses the full context of a person's difficulties, rather than focusing only on symptoms of depression, is more effective in aiding recovery (Santos et al., 2018). This research provides information on the clinical, contextual, and victim characteristics associated with suicide, homicide, and HS. Mental healthcare workers such as Clinical Psychologists should conduct thorough clinical assessments to understand the presenting difficulties, factors which may be exacerbating these, and risk factors. This research can then inform the identification of individuals at particular risk of dying by suicide, committing homicide, or HS. Holistic interventions, risk assessments, and safety planning, can inform treatments which reduce risk.

Across HS and homicide groups, most were males and were aged between 25-44 years. In the suicide group, being male and aged 45-64 years was most common. In Study 1 (patient populations), individuals were statistically more likely to be unemployed. Though not statistically significant in Study 2 (general population), the findings show that unemployment was common across both groups. Likewise, being unmarried was common across all groups, though this did not reach statistical significance in Study 1.

Patient populations. Though statistical significance was not reached, those who were patients commonly shared a history of mental illness, history of drug misuse, and history of self-harm. Being unemployed indicates financial instability and difficulty. Stressful life events are risk factors contributing to suicide or lethal acts, however reducing or resolving one situational stressor can have a meaningful impact and increase motivation to address other issues (Finnegan et al., 2024). Supporting unemployed males with these shared characteristics to successfully gain and maintain employment, thereby reducing financial difficulties, may improve wellbeing. This could increase motivation to address other issues and reduce overall risk.

Those known to services may not be able to work because of mental illness. In periods of economic recession and cost of living crises, service users may find it challenging to seek financial support. Services who can signpost or support with accessing financial aid until employment can be attained may increase wellbeing and reduce symptoms of mental illness, reducing risk.

Patients most commonly died by hanging. Where individuals are known to services it is important to create detailed holistic risk management plans and address areas of risk such as having access to materials and the means to die by hanging.

Older men who live alone and have a history of alcohol misuse were more likely to die by suicide than to commit HS. Up to 50% of people aged 60 and over are at risk of being socially isolated (Landeiro et al., 2017), and adverse consequences are associated (Hawkley & Capitanio, 2015). Previous findings have showed that increasing community and social engagement in suicidal adults improved overall wellbeing and reduced suicidal ideation (Finnegan et al., 2024). Where these individuals are known to services, programmes or signposting to services which aim to reduce isolation and increase social engagement may be crucial in reducing risk. Involving family members or close ones in individuals' care to provide a more systemic approach, such as by involving them in appointments or treatment, may enable or empower service users to involve others in their experience and find opportunities to reduce isolation.

Supporting service users to develop more helpful coping strategies and reduce alcohol misuse may contribute to overall increased wellbeing and reduce risk. Self-poisoning was identified as a common method of suicide for this population; this is important to consider when risk planning and considering access to substances which individuals may be able to ingest as a means of dying by suicide.

Despite the presence of mental health difficulties in HS patients, 80% had not had recent contact with mental health services prior to their deaths. There may be barriers to accessing support amongst this population, for example stigma amongst young men for seeking support, or less access to timely services within their area. These may have prevented members of the general population who committed HS from being open to services and accessing much needed support for mental health difficulties. Identifying barriers which prevent this population from accessing mental health support may be lifesaving. Risk assessing patients already within mental health services that share these characteristics and having appropriate risk and treatment plans which ensure regular contact and treatment, may prevent or reduce the risk of violence occurring.

Though not statistically significant, depressive disorders were more common in HS perpetrators than suicide perpetrators, and this is recognised as the most common mental illness across previous research (Rouchy et al., 2020; Roma et al., 2012). Depressive disorders are common, and therefore multiple treatment options are available (Gautam et al., 2020). Cognitive Behavioural Therapy (CBT) is one of the most evidence-based treatments for depressive disorders, and CBT combined with medication such as antidepressants have been shown to be highly effective (Fennell et al., 2012). Short-term CBT has also been found effective to reduce rates of depression in primary care (Bogucki et al., 2021). Therefore, in high-risk populations timely treatment can be offered to reduce risk factors associated with lethal acts.

General populations. When homicide occurs, this is more likely to be committed by younger men, and most often following a dispute of some kind. There may be additional psychosocial characteristics not explicitly identified in this research which contribute to interpersonal difficulties in forming and maintaining relationships.

In the general population, personality and clinical characteristics were not captured and therefore could not be included within the research. However, the profile of HS and homicide populations may be indicative of interpersonal or complex emotional needs. Overall, homicide methods involving greater violence or force were more frequently observed among HS perpetrators, which may be indicative of extreme levels of rage or distress which individuals are not able to tolerate or manage without resorting to lethal levels of violence. Those known to services for previous violent offences that share the observed characteristics should be offered emotion regulation support to understand and be aware of emotional dysregulation and equipped with strategies to manage challenging emotions. This may reduce the risk of arguments and of being so overwhelmed and dysregulated that homicide or HS occurs.

Victimology differs between homicide and HS populations. In homicide populations, male strangers are most commonly victims. In cases of HS, victims are most commonly female ex-/spouses following a romantic or domestic dispute. Around one in three women will experience physical or sexual violence by an intimate partner in their lifetime (WHO, 2021). Where an individual with the identified characteristics is known to services, has a spouse that is a female aged 25-44years and a romantic or domestic dispute has occurred, it is crucial for clinicians and services to respond effectively. The Domestic Abuse Act (Home Office, 2022) has identified that a multi-agency response is critical to identify abuse early and avoid reaching crisis.

Limitations:

This research used an extensive database of information available on individuals who died by suicide, HS, or committed homicide over a ten-year period in England and Wales. However, due to data collection laws and differences in processes, the data were not available for Scotland and Northern Ireland. Therefore, it is not possible to confidently assert that these results are representative of the UK. Future research would benefit from accessing and analysing data relating to all regions of the UK.

Furthermore, within this research there were missing data. This meant that in Study 2, due to the extent of the missing data, it was not possible to include some variables for analyses within the conditional logistic regression. This included whether the groups had a history of alcohol misuse and their living circumstances. Within the variables that were analysed, there were cases of missing data. This was not to the extent that the variables could not be included, however, it means that the full sample could not be analysed, and this may have affected some results. As a retrospective study, it is not possible to access participants to ensure all data is collected. It may be beneficial in future for routine data collection, particularly relating to homicide perpetrators, to be more robust to reduce the chances of missing data for research purposes.

This research involved the retrospective secondary analysis of existing data. Analysis could only be conducted with the data available, as opposed to analysing variables the researcher deemed relevant and important to the research question. The insights gained with the data available are useful and important, however additional information on the sociodemographic and personality factors of the cases would have been valuable. In the homicide and HS general population groups, much less data had been collected than in the patient (HS /suicide) groups. As patients, data is more routinely collected than is the case for those in the general population. A mixed methods design may be appropriate to capture a more comprehensive picture of these populations. For example, a combination of the quantitative data and qualitative data such as interviews or psychological autopsies[6].

The findings from this data provide rich insight into risk factors for the three phenomena being analysed. While most tests were statistically significant in Study 2, only three tests within Study 1 reached statistical significance. This means that for Study 1, there is insufficient evidence in all but three characteristics ('living alone', 'unemployed', and 'history of alcohol misuse') that a correlation exists in the real world. However, the effect sizes of some other variables within the study indicate that

[6] A thorough retrospective investigation into the intention of an individual who has died by suicide (Leenars, 2010).

a relationship exists between the predictor and the outcome. A larger sample may provide the power needed to the statistical analysis, and more models may reach statistical significance. Additionally, revising the conditional logistic regression models so that there are not too many categories compared to the number of cases and controls may provide a better model fit, and improve the chance of tests reaching statistical significance. This would make it possible to effectively identify commonalities and differences in characteristics of suicide and HS in patient populations which meet statistical significance.

Conclusion

Homicide, suicide, and HS are avoidable tragedies. The profiles of the individuals who commit homicide, HS, or die by suicide have similarities, but there also distinct differences. By completing direct comparisons between these populations, it is possible to identify factors that are predictive of death of individual/s and/or other/s. Accessing and analysing large data over a recent period has allowed a comprehensive and robust understanding of characteristics and risk factors of at-risk populations. This research has identified that over a ten-year period, unmarried and unemployed males aged 25-44 were at greater risk of committing HS, particularly if they were experiencing a depressive disorder and difficulties with intimate relationships. In future, a more comprehensive collection of data from the Homicide Index would allow greater power and analysis in research to identify risk factors. It would also be beneficial to collect standardised data from all parts of the UK to gain a greater representation and understanding of risk in the UK. Furthermore, mixed methods research which incorporates quantitative data with qualitative data such as psychological autopsies would allow a more in-depth analysis of characteristics and risk factors in HS.

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Paper Three: Executive Summary. What Distinguishes Homicide-Suicide from Homicide and Suicide? A Two-Part Matched Case Control Study.

Word count: 1990

Target audience

This report is a summary of a research project investigating the characteristics of homicide-suicide, homicide, and suicide. This summary has been written for services who work with clients who may be at risk of committing homicide-suicide, homicide, or dying by suicide and anybody with an interest in this area. This summary was written with feedback from an experts-by-experience group attached to the Suicide, Risk, and Safety Research Unit (SSRU) at the University of Manchester who meet to discuss research related matters, and a copy shared with them.

Background to the research

Homicide-suicide

Homicide-suicide is an event where an individual commits homicide and then takes their own life (Rouchy et al., 2020). There are around 14 cases of homicide-suicide per year in England and Wales (National Confidential Inquiry into Suicide and Safety in Mental Health [NCISH], 2023). Homicide-suicide is most often committed by older, white males (NCISH, 2023; Rouchy et al., 2020).

Other characteristics (the features or traits that identify a person) include: being unemployed, having financial difficulties, exposure to traumatic events, substance use, and self-harm (Roma et al., 2012; Rouchy et al., 2020; Sun et al., 2021; Patton et al., 2015). There are some mental health characteristics associated with homicide-suicide, including depression, suicidal ideation, and previous suicide attempts (Rouchy et al., 2020; Roma et al., 2012).

Suicide.

People who die by suicide are more commonly male and aged over 65 (NCISH, 2023). Research has identified common characteristics of suicide including financial difficulties, unemployment, being unmarried, having a history of self-harm, and drug and alcohol misuse (Mathieu et al., 2022; NCISH, 2023). Suicide is also associated with mental illnesses including affective disorders and schizophrenia (NCISH, 2023).

Homicide.

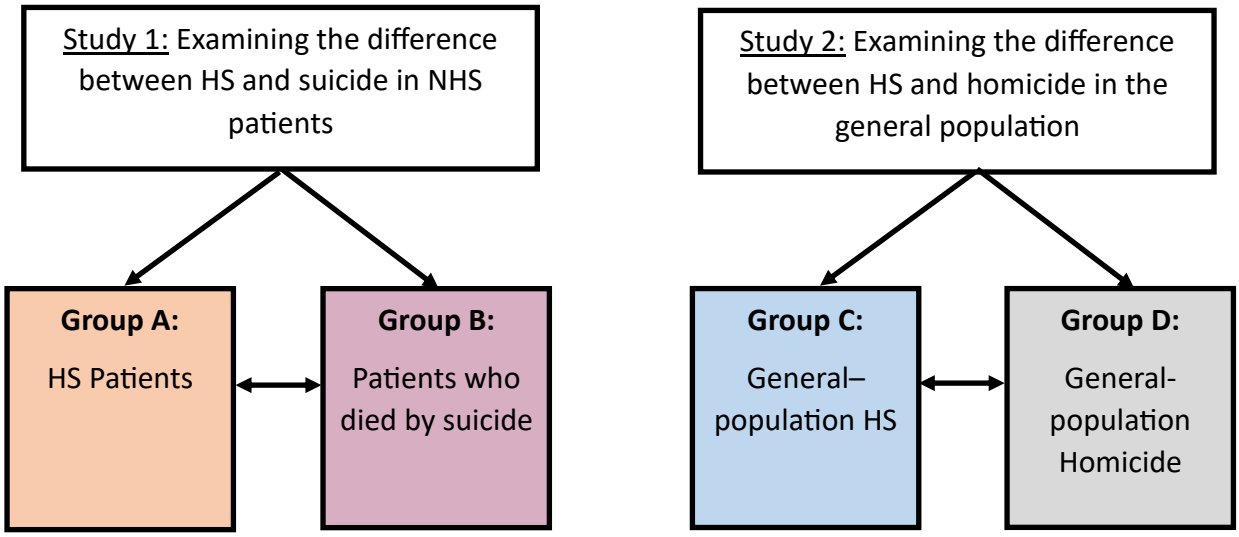
Homicide perpetrators are most commonly male and aged 30 or under (World Health Organization [WHO], 2021; Flynn, 2013). Homicide is most associated with being unemployed, unmarried, experiencing disadvantage (e.g., poverty and family disruption), and gang violence (WHO, 2021; Flynn, 2013; Podlogar, 2018; Dobash et al., 2001; Peterson et al., 2000; Messner & Golden, 1992). Mental health is not typically associated with homicide, and research has found that only a tenth of people convicted of homicide have been involved with mental health care prior to conviction (Podlogar, 2018;

NCISH, 2023; James & Glaze, 2006). Among those with mental illnesses, substance use disorders are the most common (Flynn et al., 2016).

What did we hope to find?

Between those who die by homicide-suicide, suicide, or commit homicide, there appear to be some shared characteristics. However, something causes individuals to fall into one of the three categories, and not the others. By developing our understanding of the differing characteristics between groups we hope to provide suggestions for strategies which could prevent the loss of life.

We conducted two studies within this project. Within these studies, cases of homicide-suicide were compared to suicide and homicide cases to look in-depth at the characteristics between homicide-suicide, suicide, and homicide groups.



In Study 1 we aimed to:

- Examine the sociodemographic, mental health, and treatment characteristics of NHS patients in England and Wales between 2010 and 2020 who committed homicide-suicide ("homicide-suicide patients").
- To compare these characteristics with NHS patients who died by suicide.
- To identify distinguishing characteristics between homicide-suicide patients and patients who died by suicide.

In Study 2 we aimed to:

- Examine sociodemographic factors, victim characteristics, criminal characteristics, and methods of homicide in England and Wales between 2010 and 2020 of those who committed homicide-suicide.

- Compare these characteristics with individuals who perpetrated homicide in the general population.
- Identify distinguishing characteristics between homicide-suicide perpetrators and homicide perpetrators.

What did we do?

This research project was a collaboration between NCISH and Staffordshire University. NCISH collects detailed information on homicide cases, and individuals who have died by suicide in the UK (NCISH, 2023; NCISH, 2017). We used NCISH databases, which were anonymised to protect confidentiality, to examine characteristics of homicide-suicide, suicide, and homicide which occurred between 2010 and 2020.

Homicide-suicide cases:

209 individuals aged 18 and over who committed HS within a timeframe of three days in England and Wales between 2010 – 2020 were identified.

10 individuals had been under the care of mental health services in the 12 months prior to their deaths.

199 had been members of the general population.

Suicide cases:

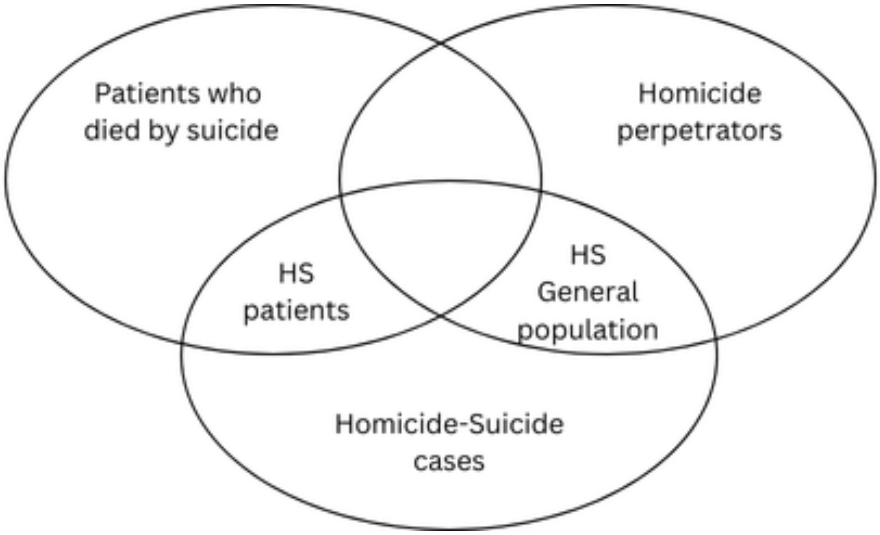
13,828 patients were identified in England and Wales who died by suicide between 2010 – 2020.

Homicide cases:

There was a total sample of 4147 homicide perpetrators aged 18 and over in the general population between 2010 – 2020.

Two matched-case control studies were conducted to compare characteristics between groups. "Matching" is a statistical technique that takes cases (in this study, our homicide-suicide groups) and matches them with controls (our suicide or homicide group) based on certain variables. We chose to match on age and sex variables because this was most likely to mean our cases and controls would have similar characteristics. This meant we could then see how other factors (e.g., unemployment) might affect the chances of committing homicide-suicide compared to dying by suicide or committing homicide.

In Study 1, each homicide-suicide patient was "matched" to five patients who died by suicide. For instance, if one homicide-suicide patient was 21 and male, this case would be matched with five patients who died by suicide who had also been 21 and male. There was a total of 60 cases for Study 1. Likewise in Study 2, each homicide-suicide general population case was matched with up to five homicide cases with the same age and sex. In some cases, age bands were used (e.g., 80 – 85 years) where exact matching could not be completed. There was a total of 1,186 cases for Study 2.



Conditional logistic regression analyses were conducted to explore the differences between groups in both studies. This provides us with the probability of a person committing homicide-suicide compared to dying by suicide or committing homicide when looking at different factors. "Statistically significant results" suggest that we have some confidence that a 'predictor' (e.g., unemployment) has a meaningful relationship with an outcome (e.g., homicide-suicide). If there is a result that is not statistically significant, it does not mean that there is not a relationship, just that we don't have the confidence to say this relationship definitely exists in the real world.

What did we find?

Study 1:

More likely in homicide-suicide patients:	More likely in those who died by suicide:
Deliberate self-harm	Living alone*
Depressive, bipolar, and adjustment disorder	Alcohol misuse*
More likely to have not had recent contact with mental health services	Unmarried
	Anxiety and phobias, drug dependency, alcohol dependency

Likely factors in both homicide-suicide and suicide groups:
Unemployment*
History of mental illness
Death by hanging was the most common method of suicide

** = a statistically significant result.*

Study 2:

More likely in the homicide-suicide general population group:	More likely in those who died by homicide:
Victims more likely to be spouses or ex-spouses*, or children*	Unmarried*, living alone*
Victims more likely to be female*	Victims more likely to be family members* or friends*
Homicide method most likely to be the use of a sharp or blunt instrument*.	Suffocation most likely homicide method*
	Drug misuse

Likely factors in both homicide-suicide and homicide groups:
Victims aged between 25 – 44 years*
Romantic or domestic dispute most common reason for homicide*
Unemployment

** = a statistically significant result.*

What does this mean?

Though not all the tests were statistically significant, the most common characteristics across all groups (homicide-suicide, homicide, and suicide) were:

- Being white
- Male

- Unemployed
- Unmarried
- In those who had a history of mental illness, self-harm was common.

These are our *base characteristics*, each group has them and additional ones that make the groups unique. We'll look at the additional characteristics when thinking about each group.

Additional characteristics on top of base characteristics:

Suicide cases:

- Males tend to be older
- Live alone
- Have a history of alcohol misuse

Homicide cases:

- Males tend to be younger
- Homicides tend to follow an argument or dispute
- Victims are more commonly male strangers

Homcide-suicide cases:

- Victims most often female spouses or ex-spouses
- Most had not been in contact with mental health services, despite a history of mental illness
- Depressive disorders were most common

Considerations for Clinical Psychology practice

It is important for Clinical Psychologists and mental healthcare professionals to look at an individual's mental and physical health from all angles, taking into consideration the biological, social, and psychological factors that impact them. They can then tailor treatments to be person-centred and flexible to the individual's needs. Treating the whole context instead of the symptoms of mental health difficulties may be more effective (Santos et al., 2018). This research considers the clinical, criminal, and victim characteristics of suicide, homicide, and homicide-suicide. It will support mental health professionals when completing assessments to identify individuals that present with characteristics associated with these populations. This can inform risk and safety planning, whilst also providing a framework for intervention planning to address the whole context to improve mental health and reduce risk of suicide, homicide, or homicide-suicide occurring.

Limitations

- Data were not available to collect from Scotland and Northern Ireland. Therefore, we cannot confidently say that the results found in this study represent the United Kingdom (UK) as a whole.

- Within this research there were missing data. In Study 2 this was more impactful because less routine data is collected from homicide perpetrators. This may have affected some results.
- Analysis within this research could only be conducted with the data available because it was using data that already exists instead of collecting new data based on the research question. It would have been helpful to have more information, such as on sociodemographic and personality factors.
- While most tests were statistically significant in Study 2, only three tests within Study 1 reached statistical significance. This means that for Study 1, there is insufficient evidence in all but three characteristics that a correlation exists in the real world. This might be due to the small numbers available of homicide-suicide patients within the timeframe used, and in future, a larger number of cases may mean that statistical significance is found.

Recommendations for future research

- Collect data from all parts of the UK, not just England and Wales, to gain a greater understanding of homicide-suicide, homicide, and suicide in the UK.
    - Making this data standardised would also help improve the analysis.
    - Greater numbers would also make the analysis stronger and more reliable.
- Collect more detailed data from the homicide index to complete a more thorough analysis and better understand the factors associated with homicide and homicide-suicide.
- Mixed methods research which incorporates questionnaires with interviews would allow a more in-depth analysis of characteristics and risk factors in homicide-suicide, suicide, and homicide.

Conclusions

There are similarities between the characteristics of suicide, homicide, and homicide-suicide, however there are also key differences. This project looked at data over 10 years (2010 – 2020) and found that unmarried and unemployed males aged 25-44 who have a history of self-harm are at greater risk of committing homicide-suicide, particularly if they are experiencing a depressive disorder and difficulties with interpersonal relationships. By understanding which characteristics are associated with homicide-suicide, and how they differ from suicide and homicide, this can help develop strategies to prevent homicide-suicide occurring.

Dissemination

This research project has been written up and will be shared with the NCISH research department, the Suicide Risk and Safety Research Unit and their experts-by-experience group. The research paper will be submitted and, if accepted, published in the Journal of Aggression and Violent behaviour.

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Appendices

Appendix A: Author guidelines for Clinical Psychology Review.

Guide for authors - Clinical Psychology I

Appendix B: Literature review. Traffic light system developed to appraise the quality of included studies within the review.

	Qualitative	Quantitative		Mixed Design
		Cross-Sectional	Non-Randomised	
Red	Score of < 3	Score of < 3	Score of 1	Score of < 9
Amber	Score of 3	Score of 3	Score of 2	Score of 9 – 12
Green	Score of > 3	Score of > 3	Score of 3 - 4	Score of > 12

Figure 3: Traffic light rating system for quality appraisal of papers for inclusion within the literature review.

Appendix C: Literature review. Quality appraisal of articles included within the review.

Appendix C Quality Appraisal.pdf

Appendix D: Author guidelines for the Journal of Aggression and Violent Behavior

Guide for authors - Aggression and Viol

Appendix E: Empirical paper. Do File for datasets.

Do file for matched case control and cor

Appendix F: Empirical paper. Regression model outputs.

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Appendix G: Empirical paper. Letter confirming ethical approval.

School of Health, Science and Wellbeing

ETHICAL APPROVAL FEEDBACK

Researcher name:	Jessica Kenworthy
Title of Study:	What distinguishes homicide-suicide from homicide and suicide? A two-part matched case control study.
Status of approval:	Approved

Thank you for addressing the committee's comments. Your research proposal has now been approved by the Ethics Panel and you may commence the implementation phase of your study. You should note that any divergence from the approved procedures and research method will invalidate any insurance and liability cover from the University. You should, therefore, notify the Panel of any significant divergence from this approved proposal. This approval is only valid for as long as you are registered as a student at the University.

You should arrange to meet with your supervisor for support during the process of completing your study and writing your dissertation.

When your study is complete, please send the ethics committee an end of study report. A template can be found on the ethics BlackBoard site.

Signed: **Date: 10.01.2024**

Dr. Edward Tolhurst
Ethics Co-ordinator – Health, Science and Wellbeing