Psychological Medicine (2012), **42**, 727–741. © Cambridge University Press 2011
doi:10.1017/S0033291711001747

ORIGINAL ARTICLE

Shared characteristics of suicides and other unnatural deaths following non-fatal self-harm? A multicentre study of risk factors

H. Bergen[1], K. Hawton[1]*, N. Kapur[2], J. Cooper[2], S. Steeg[2], J. Ness[3] and K. Waters[3]

[1] *Centre for Suicide Research, Department of Psychiatry, University of Oxford, UK*
[2] *Centre for Suicide Prevention, University of Manchester, UK*
[3] *Derbyshire Healthcare NHS Foundation Trust, UK*

Background. Mortality, including suicide and accidents, is elevated in self-harm populations. Although risk factors for suicide following self-harm are often investigated, rarely have those for accidents been studied. Our aim was to compare risk factors for suicide and accidents.

Method. A prospective cohort ($n = 30\,202$) from the Multicentre Study of Self-harm in England, 2000–2007, was followed up to 2010 using national death registers. Risk factors for suicide (intentional self-harm and undetermined intent) and accidents (narcotic poisoning, non-narcotic poisoning, and non-poisoning) following the last hospital presentation for self-harm were estimated using Cox models.

Results. During follow-up, 1833 individuals died, 378 (20.6%) by suicide and 242 (13.2%) by accidents. Independent predictors of both suicide and accidents were: male gender, age $\geqslant 35$ years (except accidental narcotic poisoning) and psychiatric treatment (except accidental narcotic poisoning). Factors differentiating suicide from accident risk were previous self-harm, last method of self-harm (twofold increased risks for cutting and violent self-injury *versus* self-poisoning) and mental health problems. A risk factor specific to accidental narcotic poisoning was recreational/illicit drug problems, and a risk factor specific to accidental non-narcotic poisoning and non-poisoning accidents was alcohol involvement with self-harm.

Conclusions. The similarity of risk factors for suicide and accidents indicates common experiences of socio-economic disadvantage, life problems and psychopathology resulting in a variety of self-destructive behaviour. Of factors associated with the accidental death groups, those for non-narcotic poisoning and other accidents were most similar to suicide; differences seemed to be related to criteria coroners use in reaching verdicts. Our findings support the idea of a continuum of premature death.

Received 13 April 2011; Revised 25 July 2011; Accepted 9 August 2011; First published online 13 September 2011

Key words: Accidental death, poisoning, risk factors, self-harm, suicide.

Introduction

Compared to the general population, individuals who have self-harmed have an increased risk of premature death, especially from 'unnatural' or external causes of death (ICD-10 codes V01–Y98), namely intentional self-harm, events of undetermined intent, and accidents (Ostamo & Lönnqvist, 2001; Owens *et al*. 2002; Hawton *et al*. 2003*b*, 2006; Cooper *et al*. 2005; Karasouli *et al*. 2010). There is ongoing debate concerning the classification of unnatural deaths by coroners' courts and medical examiners (Linsley *et al*. 2001; Stanistreet *et al*. 2001; Crepeau-Hobson, 2010; Hill & Cook, 2011) and the high level of proof required for a suicide verdict in the UK (O'Donnell & Farmer, 1995). Many deaths of undetermined intent are probable suicides, thus the standard practice in suicide research and prevention policy in the UK is to combine intentional self-harm deaths with those of undetermined intent (hereafter called suicide) (Linsley *et al*. 2001; Department of Health, 2002). In addition, there is evidence that some deaths classified as accidental may be probable suicides. For instance, deaths where there is no direct evidence of suicidal intent 'beyond reasonable doubt', and where alcohol is involved, and poisonings with therapeutic drugs, such as analgesics and antidepressants, or with illicit and recreational drugs are all likely to be given accidental verdicts (O'Donnell & Farmer, 1995; Stanistreet *et al*. 2004).

* Address for correspondence: Professor K. Hawton, Centre for Suicide Research, University of Oxford, Department of Psychiatry, Warneford Hospital, Headington, Oxford OX3 7JX, UK.
(Email: keith.hawton@psych.ox.ac.uk)

A small proportion of single vehicle car accidents (Peck & Warner, 1995) and falls (Surtees, 1982) may also be probable suicides. Further misclassification of probable suicides may occur because of the increasing use of narrative verdicts in England and Wales, and the convention that where there is uncertainty about what cause of death should be assigned then accidental death is recorded (Hill & Cook, 2011).

Previous investigations of non-suicide deaths following self-poisoning found little overlap between risk factors for accidents and death by natural causes (Carter *et al*. 2005). Others had study populations too small to identify factors for accidental death alone (Owens *et al*. 2005; Karasouli *et al*. 2010). Most studies have investigated risk factors for all-cause and accidental death combined, rather than as distinct outcomes (Reith *et al*. 2003; Christiansen & Jensen, 2007). It seems important to investigate risk factors for suicide and for different categories of accidental death separately to determine their commonalities and differences. This is the focus of the study. Accidental deaths can be subdivided into categories that are qualitatively different, such as injury *versus* poisoning. The latter can also be categorized according to type of substance taken. For instance, many poisoning deaths involving narcotic substances are likely to be related to illicit drug use or addiction, making this group substantially different from other accidental deaths (and suicide) (Vento *et al*. 2011). Thus, the groups of accidental death chosen for this study were self-poisoning with narcotic substances, self-poisoning with non-narcotic substances, and non-poisoning accidents. Closely matching risk profiles between categories may indicate either misclassification of a majority of deaths or shared characteristics of the individuals involved.

The timing of death in relation to previous self-harm is also likely to be different for suicide and accidental death (Hawton *et al*. 2006). Repetition of self-harm is common (Owens *et al*. 2002), and risk of suicide increases with repetition (Zahl & Hawton, 2004). We have focused on individuals' self-harm more proximate to their death than is standard practice. Studies of risk factors for suicide have generally used the first episode of self-harm in the study period ('index episode') to identify individuals involved, who are then followed up for a further time period with respect to mortality (Hall *et al*. 1998; Ostamo & Lönnqvist, 2001; Hawton *et al*. 2003*b*, 2007; Carter *et al*. 2005; Antretter *et al*. 2009; Karasouli *et al*. 2010). Risk factors in these studies were determined from exposure variables at the index episode, that is an arbitrary point in time, not necessarily the first-ever episode for the individual. It is therefore useful to consider an alternative method in which all self-harm episodes by an individual are identified within the study period, and the last episode of self-harm and time to subsequent death or end of follow-up are used for estimation of magnitude of risk and investigation of risk factors. It is likely that, for instance, precipitating problems at the last episode of self-harm and current or previous psychiatric treatment are more relevant to subsequent death than problems or treatment status at the index episode. The method of self-harm at the last episode may also have more relevance than methods used in earlier episodes.

The aim of this study was therefore to identify risk factors for suicide, and for different categories of accidental death (narcotic poisoning, non-narcotic poisoning, and non-poisoning accidents), determined from an individual's last episode of self-harm. Timing of death and risk profiles were compared to identify discriminating and shared characteristics for suicide and different categories of accidental death. Accidental poisoning with non-narcotic substances was expected to be similar to suicide.

Method

Setting and sample

The study was undertaken in three centres currently involved in the Multicentre Study of Self-harm in England (Hawton *et al*. 2007; Bergen *et al*. 2010). Data were collected on all individuals who presented with non-fatal self-harm to general hospital emergency departments (EDs) in Oxford (one), Manchester (three) and Derby (two) during the 8-year period from 1 January 2000 to 31 December 2007. Non-fatal self-harm was defined as intentional self-poisoning or self-injury, irrespective of motivation (Hawton *et al*. 2003*a*). Following self-harm, the majority of patients received a psychosocial assessment by specialist psychiatric clinicians (and some by ED staff). Demographic, clinical and hospital management data on each episode were collected by clinicians using standardized forms or were entered directly into a computerized system. Patients not receiving an assessment were identified through scrutiny of ED and medical records, from which more limited data were extracted by research clerks.

Ethical approval

The monitoring systems in Oxford and Derby have approval from local Health/Psychiatric Research Ethics Committees to collect data on self-harm for local and multicentre projects. Self-harm monitoring in Manchester is part of a clinical audit system, and has been ratified by the local Research Ethics Committee. All three monitoring systems are fully

compliant with the Data Protection Act of 1998. All centres have approval under Section 251 of the National Health Service (NHS) Act 2006 (formerly Section 60, Health and Social Care Act 2001) to collect patient identifiable information without patient consent. The centres also had ethical approval to release patient details to the Medical Research Information Service (MRIS) of the NHS for the retrieval of mortality information on these individuals.

Mortality

Mortality information was supplied by the MRIS, which traced and flagged individuals using the Central Health Register Inquiry System for patients in the UK, and equivalent sources in Scotland. Data used for tracing individuals included name, sex, date of birth, NHS number and postcode of last address. ICD-10 codes for the underlying cause of death were grouped as follows: intentional self-harm, X60–X85; undetermined intent, Y10–Y34; accidental, V01–X59 (narcotic poisoning, X42; non-narcotic poisoning, X40, X41, X43–X49; non-poisoning accidents, V01–V99, W00–W99, X00–X39, X50–X59); and all other causes (all other codes). The text of coroners' verdicts (including 29 narrative verdicts) was cross-checked against ICD-10 codes for underlying cause of death. In one case an ICD-10 code was missing, and in another case the ICD-10 code (W761) did not match the stated verdict. We used information from the associated narrative description to recode cause of death for these two cases as intentional self-harm by hanging (X70). In this study suicide was defined as death where the underlying cause of death was intentional self-harm or undetermined intent (Linsley *et al*. 2001). Individuals were followed up from 1 January 2000 to 31 December 2010; thus the minimum follow-up period was 3 years and the maximum was 11 years.

Statistical analyses

Potential risk factors were investigated for five outcomes: suicide, all accidental deaths combined, accidental narcotic poisoning, accidental non-narcotic poisoning, and non-poisoning accidents (Table 1). Hazard ratios (HRs) were estimated from Cox proportional hazard models. All individuals who were traced by the MRIS for any length of time were included. Observation time was censored when the individual died or embarked overseas. Censoring did not occur when an individual had a non-fatal repeat episode of self-harm.

Age, gender, unemployment/sickness/disability status, self-reported previous self-harm, alcohol involvement at the time of self-harm or within 6 h of self-harm, method of self-harm, current or previous psychiatric treatment, psychosocial assessment, and precipitating problems were coded according to information known at the last episode of self-harm. Precipitating problem variables were coded in three categories (no, yes, unknown), the 'unknown' category being used where information was not available because the person was not assessed. This method of coding maximized inclusion of all cases in multivariate models.

Univariate models were determined initially. Independent predictors were estimated from multivariate models using entry of variables significant in univariate models at $p<0.2$). Gender interactions with variables of interest were not significant. Clustering by centre was adjusted for using the 'vce(cluster)' option of the 'stcox' command in Stata (Stata Corporation, USA). Nelson–Aalen cumulative hazard estimates were used for Fig. 1. Proportional hazards assumptions were tested and upheld. Analyses were conducted using Stata version 10.0.

Results

The sample

During the 8-year study period from 1 January 2000 to 31 December 2007, 30 950 individuals presented with self-harm to the six hospitals in the three study centres. Some individuals ($n=328$) included in the original sample (Bergen *et al*. 2010) were excluded from the current study because their single episode of self-harm resulted in death, or they were duplicate cases. Of the 30 950 remaining individuals, 748 (2.4%) could not be traced by the MRIS and were also excluded from the analyses.

Of the 30 202 individuals for whom follow-up information was available, 1833 (6.1%) died during the follow-up period ($n=446$, 6.2% of the Oxford cases; $n=865$, 5.9% in Manchester; and $n=522$, 6.2% in Derby), 88 (0.3%) left the UK, and the remainder were living at the end of the follow-up period. There were 17 709 females (58.6%), with a median age of 27 years [interquartile range (IQR) 17–37], and 12 474 males (41.3%), with a median age of 31 years (IQR 21.5–40.5); for 19 (0.1%) individuals the gender was not known. There were 50 332 episodes of non-fatal self-harm by these 30 202 individuals during the study period. The method of self-harm used at the last episode was 81.5% self-poisoning, 11.8% self-injury by cutting alone, 3.5% both self-poisoning and self-injury, 2.8% other self-injury, and 0.4% type of self-injury unknown. This varied by gender ($\chi^2=475.36$, df = 4, $p<0.001$), with cutting alone being more common in males than females (15.5% *v.* 9.9%, $\chi^2=148.51$,

https://doi.org/10.1017/S0033291711001747 Published online by Cambridge University Press

Table 1. *Underlying cause of death for suicide (intentional self-harm and undetermined intent) and accidents, for individuals (n = 30 202) in the study sample, years 2000–2007 followed up to the end of 2010*

	Number (%) of all deaths		
Cause of death	Males	Females	Combined
Suicides[a]			
Self-poisoning with			
Antidepressants/tranquillizers	14 (5.8)	23 (16.9)	37 (9.8)
Narcotics/hallucinogens	19 (7.9)	15 (11.0)	34 (9.0)
Analgesics	9 (3.7)	5 (3.7)	14 (3.7)
CO/other gas	8 (3.3)	3 (2.2)	11 (2.9)
Alcohol/solvents	2 (0.8)	0 (0.0)	2 (0.5)
All other substances	18 (7.4)	23 (16.9)	41 (10.8)
Total self-poisoning	70 (28.9)	69 (50.7)	139 (36.8)
Self-injury by			
Hanging/suffocation	94 (38.8)	39 (28.7)	133 (35.2)
Drowning	12 (5.0)	4 (2.9)	16 (4.2)
Jumping from height	12 (5.0)	4 (2.9)	16 (4.2)
Lying before moving object	9 (3.7)	4 (2.9)	13 (3.4)
Firearms/fire related	10 (4.1)	2 (1.5)	12 (3.2)
Sharp/blunt object	6 (2.5)	2 (1.5)	8 (2.1)
All other self-injury	29 (12.0)	12 (8.8)	41 (10.8)
Total self-injury	172 (71.1)	67 (49.3)	239 (63.2)
Total suicide deaths	242	136	378
Accident[b]			
Poisoning with			
Narcotics/hallucinogens	45 (27.4)	11 (14.1)	56 (23.1)
Poisoning with other			
Antidepressants/tranquillizers	17 (10.4)	4 (5.1)	21 (8.7)
Alcohol/solvents	8 (4.9)	6 (7.7)	14 (5.8)
Analgesics	5 (3.0)	5 (6.4)	10 (4.1)
CO/other gas	2 (1.2)	0 (0.0)	2 (0.8)
All other substances	24 (14.6)	14 (17.9)	38 (15.7)
Total poisoning	101 (61.6)	40 (51.3)	141 (58.3)
Other (non-poisoning)			
Falls	16 (25.4)	14 (36.8)	30 (29.7)
Road traffic accidents	18 (28.6)	4 (10.5)	22 (21.8)
All other accidents	29 (46.0)	20 (52.6)	49 (48.5)
Total other accidents	63 (38.4)	38 (48.7)	101 (41.7)
Total accidental deaths	164	78	242

CO, Carbon monoxide.

[a] ICD-10 codes X60–X85, Y10–Y34.

[b] ICD-10 codes V01–X59 (all accidents including poisoning with narcotics/hallucinogens, X42; and poisoning with non-narcotics X40, X41, X43–X49).

$p < 0.001$) and self-poisoning less common in males than females (76.7% *v.* 85.0%, $\chi^2 = 331.38$, $p < 0.001$).

Mortality in the follow-up period

For the 1833 individuals who died in the follow-up period, cause of death was suicide in 20.6% [including intentional self-harm (13.4%) and undetermined intent (7.2%)], accidental in 13.2%, and other causes in 66.2%. Underlying causes of death for suicide and accidents are shown in Table 1.

Suicide

Approximately half (50.7%) the suicides by females involved self-poisoning, compared to 28.9% by males ($\chi^2 = 17.81$, $p < 0.001$) (Table 1). Nearly three-quarters of suicides by males (71.1%) involved self-injury. The

https://doi.org/10.1017/S0033291711001747 Published online by Cambridge University Press

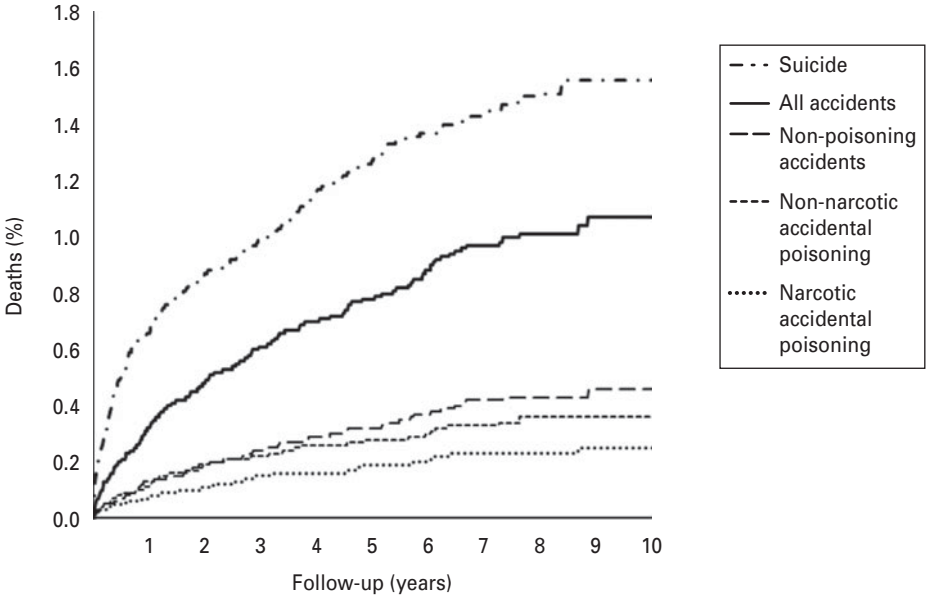

Fig. 1. Cumulative hazard for time to suicide and accidental death following the last episode of non-fatal self-harm.

most commonly used method was hanging or suffocation, which was more frequent in males ($n=94$, 38.8%) than females ($n=39$, 28.7%; $\chi^2=3.95$, $p=0.047$).

Accidental death

Approximately half the accidental deaths by females involved poisoning (51.3%), compared to 61.6% by males ($\chi^2=2.31$, $p=0.129$) (Table 1). The most frequently used class of substance for accidental poisoning was narcotics/hallucinogens, which was used more often by males ($n=45$, 27.4%) than females ($n=11$, 14.1%; $\chi^2=5.296$, $p=0.021$).

Non-fatal self-harm in the study period

The number of episodes of self-harm for each individual during the study period varied from one to 213. The majority (76.6%) had one episode, 19.4% had two to four episodes, and the remaining 4.0% had five or more episodes. The number of episodes for individuals who eventually died by suicide ($n=378$) varied from one to 39, and by accidents ($n=242$) from one to 32. There was no difference in number of repeat episodes of self-harm in those who died by suicide and by accidents (1 episode, 65.9% *v.* 61.6%; 2–4 episodes, 26.2% *v* 26.9%; and $\geqslant 5$ episodes, 7.9% *v* 11.6%, $\chi^2=2.53$, df = 2, $p=0.282$).

Cox regression models estimating risk factors for death

Associations between sociodemographic, individual and clinical factors identified throughout the individual's self-harm history, and death by suicide, were examined in univariate and multivariate models (Table 2). Univariate models for death by all accidents combined, and for accidental narcotic poisoning, accidental non-narcotic poisoning, and non-poisoning accidents, are shown in Table 3, and multivariate models in Table 4.

Summary of risk factors

Risk factors common to suicide and accidents

Independent predictors of increased risk of both suicide and accidents were male gender, older age and previous self-harm, current or previous psychiatric treatment [such as in-patient, out-patient, community mental health or day-patient treatment but excluding general practitioner (GP) care] (Tables 2 and 4). Exceptions for which there were no significant associations were older age and psychiatric treatment with death by accidental narcotic poisoning (Table 4). Individuals with relationship problems at their last episode of self-harm had a decreased risk of suicide and of accidental death.

Risk factors for suicide but not accidents

Independent predictors of increased risk of suicide but not accidents were previous self-harm, 'both self-poisoning and self-injury', 'self-cutting' and also 'other type of self-injury' (relative to self-poisoning) at the last method of self-harm, and mental health problems that may have precipitated the last episode of self-harm (Table 2). Individuals who received a

https://doi.org/10.1017/S0033291711001747 Published online by Cambridge University Press

Table 2. *Cox proportional hazards models for time to death by suicide from the last episode of self-harm*

Independent variables at last episode of self-harm	Total ($n=30\,202$)	Suicide ($n=378$)		Univariate		Multivariate	
	n	*n*	%	HR (95% CI)	*p*	HR (95% CI)	*p*
Gender							
Female	17 573	136	0.77	1		1	
Male	12 232	242	1.94	2.27 (1.82–2.86)	<0.001	2.25 (1.62–3.12)	<0.001
Age							
<35 years	18 436	164	0.88	1		1	
⩾35 years	11 345	214	1.85	2.22 (1.81–2.72)	<0.001	1.86 (1.56–2.30)	<0.001
Unemployed/sick/disabled							
No	13 433	131	0.97	1		1	
Yes	8313	137	1.62	1.71 (1.34–2.17)	<0.001	1.03 (0.66–1.62)	0.890
Unknown	8078	110	1.34	1.50 (1.16–1.93)	0.002	1.59 (0.97–2.59)	0.065
Previous self-harm							
No	8078	72	0.82	1		1	
Yes	13 870	234	1.66	2.13 (1.63–2.77)	<0.001	1.49 (1.26–1.76)	<0.001
Unknown	7246	72	0.98	1.29 (0.93–1.79)	0.130	1.07 (0.71–1.62)	0.734
Alcohol involved in last episode							
No	10 078	120	1.18	1		–	
Yes	12 961	172	1.31	1.12 (0.89–1.42)	0.328	–	
Unknown	6785	86	1.25	1.14 (0.87–1.51)	0.348	–	
Method of last self-harm							
SP only	24 370	254	1.03	1		1	
Both SP and SI	1022	24	2.29	2.29 (1.51–3.48)	<0.001	2.24 (1.85–2.70)	<0.001
Cutting only	3494	70	1.96	1.94 (1.49–2.53)	<0.001	1.76 (1.39–2.24)	<0.001
Other SI	831	29	3.37	3.45 (2.35–5.07)	<0.001	2.60 (1.85–3.65)	<0.001
Unknown SI	107	1	1.25	0.98 (0.13–7.02)	0.985	0.86 (0.54–1.37)	0.524
Psychiatric treatment							
None	10 910	88	0.80	1		1	
Current or previous	11 742	221	1.85	2.41 (1.88–3.08)	<0.001	1.60 (1.17–2.18)	0.003
Unknown	7172	69	0.95	1.27 (0.93–1.75)	0.131	0.87 (0.51–1.47)	0.599
Psychosocial assessment at last episode							
No	12 590	143	1.12	1		1	
Yes	17 234	235	1.35	1.19 (0.97–1.47)	0.098	1.32 (1.30–1.35)	<0.001

Problems at last episode							
Alcohol problem							
No	13 343	149	1.10	1		1	
Yes	2928	43	1.45	1.35 (0.96–1.91)	0.080	1.06 (0.65–1.73)	0.817
Unknown	13 553	186	1.35	1.20 (0.97–1.49)	0.102	1.38 (1.16–1.63)	<0.001
Illicit drug problem							
No	15 275	176	1.14	1		–	
Yes	915	15	1.61	1.43 (0.85–2.42)	0.181	–	
Unknown	13 634	187	1.35	1.16 (0.94–1.42)	0.164	–	
Mental health problem							
No	19 392	2112	1.08	1		1	
Yes	3782	85	2.20	2.17 (1.69–2.79)	<0.001	1.53 (1.36–1.73)	<0.001
Unknown	6650	81	1.20	1.25 (0.97–1.62)	0.086	2.56 (2.22–2.95)	<0.001
Relationship problem							
No	9703	158	1.60	1		1	
Yes	13 514	142	1.04	0.64 (0.51–0.80)	<0.001	0.80 (0.72–0.90)	<0.001
Unknown	6607	78	1.17	0.80 (0.61–1.05)	0.111	0.39 (0.22–0.69)	0.001
Financial problem							
No	20 327	259	1.26	1		–	
Yes	2662	33	1.22	0.98 (0.68–1.41)	0.919	–	
Unknown	6835	86	1.24	1.11 (0.87–1.42)	0.409	–	
Bereavement problem							
No	21 142	272	1.27	1		–	
Yes	1773	20	1.12	0.90 (0.57–1.42)	0.654	–	
Unknown	6909	86	1.23	1.09 (0.86–1.39)	0.483	–	
Consequences of previous abuse							
No	21 744	280	1.27	1		–	
Yes	1188	13	1.08	0.88 (0.50–1.54)	0.651	–	
Unknown	6892	85	1.22	1.08 (0.85–1.38)	0.541	–	

SP, Self-poisoning; SI, self-injury; HR, hazard ratio; CI, confidence interval; –, variable not significant in univariate model at $p<0.2$, therefore not included in multivariate analysis.

Table 3. *Univariate Cox proportional hazards models for time to accidental death from the last episode of self-harm*

Independent variables at last episode of self-harm	Total ($n=30\,202$)	Accidents ($n=242$)		All accidents combined ($n=242$)		Poisoning with narcotics ($n=56$)		Poisoning with non-narcotics ($n=85$)		Non-poisoning accidents ($n=101$)	
		n	%	HR (95% CI)	*p*	HR (95% CI)	*p*	HR (95% CI)	*p*	HR (95% CI)	*p*
Gender											
Female	17 631	78	0.44	1		1		1		1	
Male	12 310	164	1.31	3.03 (2.31–3.96)	<0.001	5.89 (3.04–11.38)	<0.001	2.78 (1.78–4.35)	<0.001	2.39 (1.60–3.57)	<0.001
Age											
<35 years	18 502	98	0.53	1		1	1	1		1	
⩾35 years	11 415	144	1.25	2.53 (1.96–3.27)	<0.001	1.19 (0.70–2.05)	0.507	3.49 (2.22–5.47)	<0.001	3.00 (2.00–4.50)	<0.001
Unemployed/sick/disabled				1							
No	13 516	48	0.35	1		1		1		1	
Yes	8345	105	1.24	3.58 (2.54–5.03)	<0.001	5.37 (2.31–12.51)	<0.001	5.44 (2.85–10.38)	<0.001	2.37 (1.48–3.81)	<0.001
Unknown	8099	89	1.09	3.36 (2.38–4.77)	<0.001	6.74 (2.97–15.31)	<0.001	4.93 (2.55–9.52)	<0.001	1.90 (1.14–3.16)	0.014
Previous self-harm											
No	8742	38	0.43	1		1		1		1	
Yes	13 960	144	1.02	2.52 (1.76–3.60)	<0.001	4.52 (1.77–11.51)	0.002	3.47 (1.82–6.60)	<0.001	1.58 (0.96–2.61)	0.072
Unknown	7258	60	0.82	2.07 (1.38–3.12)	<0.001	4.47 (1.65–12.07)	0.003	1.88 (0.88–4.06)	0.105	1.63 (0.93–2.87)	0.090
Alcohol involved in last episode											
No	10 149	49	0.48	1		1		1		1	
Yes	13 013	120	0.91	1.93 (1.38–2.68)	<0.001	1.50 (0.72–3.11)	0.274	2.40 (1.34–4.30)	0.003	1.81 (1.11–2.96)	0.017
Unknown	6798	73	1.06	2.42 (1.69–3.48)	<0.001	3.55 (1.73–7.28)	0.001	2.57 (1.35–4.86)	0.004	1.79 (1.01–3.16)	0.046
Method of last self-harm											
SP only	24 435	189	0.77	1		1		1		1	
Both SP and SI	1043	3	0.29	0.39 (0.12–1.21)	0.103	Excluded[a]		1.04 (0.33–3.31)	0.946	Excluded[a]	
Cutting only	3523	41	1.15	1.54 (1.10–2.16)	0.012	2.99 (1.67–5.35)	<0.001	1.11 (0.59–2.10)	0.748	1.23 (0.70–2.17)	0.476
Other SI	851	9	1.05	1.45 (0.75–2.84)	0.272	1.61 (0.38–6.67)	0.514	0.43 (0.06–3.11)	0.405	2.28 (0.99–5.22)	0.051
Unknown SI	108	0	0.0	Excluded[a]		Excluded[a]		Excluded[a]		Excluded[a]	
Psychiatric treatment											
None	10 961	37	0.34	1		1		1		1	
Current or previous	11 825	138	1.15	3.62 (2.52–5.20)	<0.001	2.80 (1.32–5.96)	0.007	3.85 (2.05–7.24)	<0.001	3.90 (2.25–6.75)	<0.001
Unknown	7174	67	0.93	3.00 (2.01–4.48)	<0.001	3.87 (1.79–8.36)	0.001	3.41 (1.73–6.76)	<0.001	2.20 (1.15–4.22)	0.018
Psychosocial assessment at last episode											
No	12 620	113	0.89	1		1		1		1	
Yes	17 340	129	0.74	0.83 (0.64–1.07)	0.141	0.58 (0.35–0.99)	0.046	0.99 (0.64–1.52)	0.952	0.87 (0.58–1.28)	0.470

Problems at last episode										
Alcohol problem										
No	13 409	83	0.62	1		1		1		1	
Yes	2935	36	1.21	2.05 (1.39–3.04)	<0.001	1.74 (0.77–3.89)	0.181	2.36 (1.18–4.69)	0.015	2.08 (1.15–3.72)	0.015
Unknown	13 616	123	0.90	1.41 (1.07–1.87)	0.015	1.13 (0.64–1.99)	0.680	1.96 (1.21–3.20)	0.007	1.23 (0.80–1.90)	0.339
Illicit drug problem											
No	15 357	94	0.61	1		1		1		1	
Yes	907	23	2.47	4.11 (2.61–6.50)	<0.001	12.83 (6.23–26.4)	<0.001	2.90 (1.12–7.49)	0.028	1.75 (0.70–4.39)	0.235
Unknown	13 696	125	0.90	1.44 (1.10–1.89)	0.007	1.66 (0.90–3.06)	0.108	1.92 (1.22–3.03)	0.005	1.08 (0.72–1.61)	0.712
Mental health problem											
No	19 478	126	0.64	1		1		1		1	
Yes	3825	42	1.09	1.84 (1.29–2.61)	0.001	0.71 (0.25–2.03)	0.528	2.06 (1.13–3.72)	0.018	2.31 (1.42–3.76)	0.001
Unknown	6657	74	1.10	1.99 (1.49–2.65)	<0.001	2.29 (1.32–3.97)	0.003	2.49 (1.55–4.00)	<0.001	1.44 (0.88–2.36)	0.145
Relationship problem											
No	9756	105	1.06	1		1		1		1	
Yes	13 592	64	0.47	0.43 (0.32–0.59)	<0.001	0.28 (0.14–0.59)	0.001	0.53 (0.31–0.90)	0.019	0.44 (0.28–0.70)	<0.001
Unknown	6612	73	1.09	1.16 (0.86–1.56)	0.329	1.40 (0.79–2.49)	0.251	1.49 (0.90–2.44)	0.119	0.81 (0.49–1.34)	0.414
Financial problem											
No	20 436	150	0.73	1		1		1		1	
Yes	2677	18	0.67	0.93 (0.57–1.51)	0.757	0.72 (0.22–2.36)	0.592	0.60 (0.22–1.67)	0.331	1.27 (0.67–2.40)	0.465
Unknown	6847	74	1.07	1.70 (1.29–2.25)	<0.001	2.26 (1.31–3.91)	0.004	1.99 (1.27–3.12)	0.003	1.21 (0.75–1.94)	0.443
Bereavement problem											
No	21 263	151	0.71	1		1		1		1	
Yes	1776	17	0.95	1.39 (0.84–2.29)	0.198	1.16 (0.35–3.79)	0.809	2.10 (0.99–4.44)	0.053	1.03 (0.45–2.37)	0.944
Unknown	6921	74	1.06	1.75 (1.32–2.31)	<0.001	2.34 (1.35–4.05)	0.002	2.23 (1.41–3.53)	0.001	1.16 (0.72–1.87)	0.538
Previous abuse											
No	21 864	160	0.73	1		1		1		1	
Yes	1193	8	0.67	0.96 (0.47–1.95)	0.902	1.16 (0.28–4.84)	0.834	1.10 (0.34–3.51)	0.876	0.77 (0.24–2.43)	0.652
Unknown	6903	74	1.06	1.70 (1.29–2.24)	<0.001	2.34 (1.36–4.02)	0.002	2.08 (1.33–3.28)	0.001	1.15 (0.71–1.84)	0.568

HR, Hazard ratio; CI, confidence interval.

[a] Data excluded as not estimable (no deaths in this category).

Table 4. *Multivariate Cox proportional hazards models for time to accidental death from the last episode of self-harm*

Independent variables at last episode of self-harm	All accidents combined ($n=242$)		Poisoning with narcotics ($n=56$)		Poisoning with non-narcotics ($n=85$)		Non-poisoning accidents ($n=101$)	
	HR (95% CI)	p	HR (95% CI)	p	HR (95% CI)	p	HR (95% CI)	p
Male (*v.* Female)	2.37 (1.77–3.18)	<0.001	4.26 (1.06–17.06)		2.14 (1.51–3.05)	<0.001	1.96 (1.37–2.81)	<0.001
Age ⩾35 years (*v.* <35)	2.06 (1.40–3.00)	<0.001	–		2.58 (1.79–3.72)	<0.001	2.25 (1.51–3.35)	<0.001
Unemployed/sick/disabled								
Yes (*v.* no)	1.98 (1.34–2.92)	<0.001	2.71 (1.68–4.38)	<0.001	2.87 (1.09–7.52)	0.032	1.44 (0.73–2.84)	0.299
Unknown (*v.* no)	1.87 (1.27–2.75)	0.001	2.82 (2.73–2.91)	<0.001	3.00 (1.03–8.75)	0.045	1.17 (0.44–3.11)	0.756
Previous self-harm								
Yes (*v.* no)	1.29 (0.96–1.75)	0.096	2.40 (0.67–8.59)	0.177	1.60 (0.42–6.13)	0.490	0.86 (0.39–1.91)	0.716
Unknown (*v.* no)	0.92 (0.72–1.18)	0.531	1.37 (0.53–2.50)	0.513	0.65 (0.22–1.94)	0.444	1.26 (0.65–2.45)	0.501
Alcohol involved in last episode								
Yes (*v.* no)	1.52 (1.39–1.67)	<0.001	–		1.74 (1.45–2.09)	<0.001	1.53 (1.17–2.00)	0.002
Unknown (*v.* no)	1.64 (1.13–2.39)	0.009	–		1.41 (1.32–1.52)	<0.001	1.55 (0.68–3.52)	0.295
Method of self-harm at last episode								
Both SP and SI (*v.* SP only)	0.41 (0.08–2.10)	0.283	Excluded[a]		–		Excluded[a]	
Cutting only (*v.* SP only)	1.26 (0.98–1.62)	0.067	1.98 (0.98–4.00)	0.057	–		1.11 (0.82–1.50)	0.489
Other SI (*v.* SP only)	1.08 (0.43–2.71)	0.862	1.08 (0.33–3.58)	0.899	–		1.77 (0.58–5.42)	0.318
Unknown SI (*v.* SP only)	Excluded[a]		Excluded[a]		–		Excluded[a]	
Psychiatric treatment								
Current or previous (*v.* none)	2.12 (1.95–2.31)	<0.001	1.33 (0.47–3.78)	0.591	1.96 (1.62–2.37)	<0.001	2.74 (1.60–4.71)	<0.001
Unknown (*v.* none)[b]	1.49 (1.24–1.80)	<0.001	1.40 (0.44–4.47)	0.574	1.76 (0.80–3.87)	0.157	1.22 (0.77–1.92)	0.401
Psychosocial assessment								
Yes (*v.* no)	1.16 (0.88–1.52)	0.288	0.84 (0.69–1.03)	0.098	–		–	
Alcohol problem at last episode								
Yes (*v.* no)	1.14 (0.68–1.91)	0.617	–		1.13 (0.45–2.86)	0.794	1.51 (0.59–3.82)	0.387
Unknown (*v.* no)[b]	0.58 (0.47–0.72)	<0.001	–		0.33 (0.17–0.66)	0.002	1.21 (0.73–1.99)	0.460
Illicit drug problem at last episode								
Yes (*v.* no)	3.58 (1.86–6.88)	<0.001	10.48 (6.16–17.82)	<0.001	2.61 (0.93–7.38)	0.069	–	
Unknown (*v.* no)[b]	2.01 (1.57–2.57)	<0.001	0.78 (0.46–1.34)	0.373	4.28 (3.38–5.44)	<0.001	–	
Mental health problem at last episode								
Yes (*v.* no)	1.20 (0.73–1.97)	<0.001	–		1.37 (0.64–2.96)	0.421	1.56 (0.55–4.45)	0.405
Unknown (*v.* no)[b]	2.28 (1.54–3.37)	<0.001	–		2.86 (2.60–3.14)	<0.001	1.59 (0.68–3.72)	0.281
Relationship problem at last episode								
Yes (*v.* no)	0.56 (0.49–0.64)	<0.001	0.41 (0.18–0.93)	0.033	0.70 (0.67–0.73)	<0.001	0.60 (0.43–0.82)	0.001
Unknown (*v.* no)[b]	0.58 (0.43–0.79)	<0.001	1.81 (1.24–2.65)	0.002	0.51 (0.31–0.84)	0.008	0.65 (0.38–1.10)	0.109

SP, Self-poisoning; SI, self-injury; HR, hazard ratio; CI, confidence interval.

–, not significant in univariate model at $p<0.2$, therefore not included in multivariate analysis.

[a] Data excluded as not estimable (no death in this category).

[b] Note that 'unknown *v.* none' or 'unknown *v.* no' may indicate a factor related to non-assessment such as self-discharge.

psychosocial assessment at their last episode of self-harm were also at increased risk of suicide.

Risk factors for accidents but not suicide

Independent predictors of increased risk of accidents but not suicide were unemployment or sickness/disability status, illicit drug problems at the last episode of self-harm, predominantly for narcotic poisoning; and alcohol involvement during the self-harm history, predominantly for non-narcotic poisoning and other accidents (Table 4).

Time from last episode of self-harm to death

The proportions of deaths that occurred at various times after the last episode of self-harm were: (i) within 5 days (17/378) 4.5% [95% confidence interval (CI) 2.6–7.2] of suicides and (4/242) 1.7% (95% CI 0.4–4.2) of accidents; (ii) within 30 days (61/378) 16.1% (95% CI 12.3–20.7) of suicides and (22/242) 9.1% (95% CI 5.7–13.8) of accidents; and (iii) within 1 year (199/378) 52.6% (95% CI 45.6–60.5) of suicides and (95/242) 39.3% (95% CI 31.8–48.0) of accidents (39.3% narcotic poisoning, 38.8% non-narcotic poisoning, 39.6% non-poisoning accidents) (Fig. 1).

Discussion

In this study we investigated risk factors for suicide and accidental death separately, following the last hospital presentation for non-fatal self-harm in a large population ($n = 30\,202$) in three centres in England, 2000–2007. This novel approach has revealed important similarities and differences in proximal risk factors for suicide and accidents (all accidents combined, narcotic poisoning, non-narcotic poisoning, non-poisoning accidents) following self-harm.

Common risk factors for suicide and accidental death

Previous studies have shown that male gender and older age are strong risk factors for suicide and death from all causes following self-harm (Ostamo & Lönnqvist, 2001; Reith *et al*. 2003; Christiansen & Jensen, 2007). We also found greater risk in males, and in those aged 35 years or more for suicide and accidents with the exception of narcotic poisoning, the latter being a relatively homogeneous group of younger age, perhaps consistent with earlier findings regarding accidental death following self-poisoning (Carter *et al*. 2005).

Approximately 40% of the individuals in the study were in current psychiatric treatment or reported previous treatment. Importantly, psychiatric treatment was independently associated with both suicide and accidental death with the exception of accidental narcotic poisoning. The latter group showed an association in univariate analyses that disappeared when other more strongly related factors such as drug problems were taken into account. This association has been noted previously for accidental death and substance-related disorders (Carter *et al*. 2005), and also suicide (Cavanagh *et al*. 1999).

Risk factors for suicide but not accidental deaths

Repetition of self-harm is a well-known risk factor for death by suicide (Zahl & Hawton, 2004) and all causes (Ostamo & Lönnqvist, 2001). In our study, the frequency of non-fatal self-harm in those who died by suicide was remarkably similar to those who died by accidents, with approximately two-thirds of each group having one episode, one-quarter having two to four episodes, and the remainder more than five episodes in the study period. However, when follow-up time and other factors were taken into account using survival analysis, we found that individuals who reported previous self-harm had an increased risk of suicide only and not accidental death.

Another important independent predictor of suicide (but not accidental death) was the method used at the last hospital presentation for non-fatal self-harm, where self-injury and self-poisoning used concurrently, self-cutting and other self-injury had approximately twofold increased risks compared to self-poisoning alone. This is consistent with the predominance of relatively lethal and violent methods of self-injury used for suicide in this study. This association was expected, as the index method of self-harm also predicts suicide, often with use of the same method for the attempt as in the fatal act (Runeson *et al*. 2010). Further investigation of this association, including method switching between repeat episodes, is warranted. Another reason for the correlation between violent forms of non-fatal self-injury and suicide, but not accidents, may be that self-harm involving methods with seemingly higher suicidal intent are more likely to be classified as suicide by coroners, due to the nature of the method (Linsley *et al*. 2001). By contrast, self-poisoning is more likely to be given an open or accidental coroner's verdict, especially in the absence of evidence of suicidal intent (Linsley *et al*. 2001). Furthermore, self-poisoning is a method where, depending on the substance used, there is time for the person to change their mind and to seek help. The relative lethality of self-poisoning is lower than most self-injury (Shenassa *et al*. 2003).

Mental health problems reported at the last episode of self-harm also increased risk of suicide (but not accidental death), even after accounting for psychiatric

https://doi.org/10.1017/S0033291711001747 Published online by Cambridge University Press

treatment. Both psychiatric disorders (Foster *et al*. 1997; Cavanagh *et al*. 1999; Qin *et al*. 2003; Reith *et al*. 2003; Christiansen & Jensen, 2009) and self-reported mental health problems (Bramness *et al*. 2010) are strongly associated with suicide. This may also explain the increased risk of suicide found in individuals who received a psychosocial assessment at their last episode of self-harm, possibly indicating the extent of their distress at that time, or the severity of their psychiatric disorder.

Risk factors for accidental deaths but not suicide

It is well known that socio-economic disadvantage and especially unemployment increase risk of suicide in self-harm populations (Gunnell *et al*. 1995; Beghi & Rosenbaum, 2010) and in general populations (Qin *et al*. 2003; Kim *et al*. 2010), having a stronger effect in males than females (Crombie, 1990). However, we found a significant association between suicide and unemployment and sickness/disability status at the last episode of self-harm only at the univariate level. After controlling for other factors, this association was no longer statistically significant. Non-poisoning deaths comprised a broad range of accidents, such as falls, drowning, fires and traffic-related accidents, and these also were not associated with socio-economic disadvantage when other factors were taken into account. By contrast, we found that unemployment and sickness/disability status independently predicted increased risk of accidental poisoning. The non-significant findings are difficult to explain. They may be due to a high correlation between socio-economic status and other factors under consideration in the statistical model, the latter contributing more strongly to the outcomes.

A problem with recreational or illicit drug use that precipitated the last episode of self-harm was strongly associated with accidental death, predominantly narcotic poisoning, with a 10-fold increased risk. Narcotics were the most frequently used class of substance in accidental poisoning deaths in both males and females in our study. Our finding is consistent with studies showing an association of substance use/abuse with accidental death following self-poisoning (Carter *et al*. 2005; Bjornaas *et al*. 2009), and with a UK study where accident victims were more likely than suicide victims to have had positive blood toxicological results for illicit drugs, alcohol and methadone at the time of death (Vento *et al*. 2011). There was no association of illicit drug problems with suicide in our study, unlike the strong relationship of substance-use disorder with suicide found elsewhere (Suominen *et al*. 2004; Stenbacka *et al*. 2010).

We found that alcohol involvement during the self-harm history increased risk of fatal accidental poisoning with non-narcotic substances, as well as other non-poisoning accidents. It is probable that alcohol was involved in the fatal act if it was prevalent in previous non-fatal attempts. Perhaps the disinhibiting effect of alcohol may have induced carelessness, making accidental poisoning or other accidents more likely. Or if suicidal intent was present, alcohol may have been used in overdoses to increase toxicity (Boenisch *et al*. 2010). In either case, criteria guiding coroners' verdicts in relation to intoxication may explain our findings for accidental death, as deaths are less likely to be classified by coroners as intentional self-harm if alcohol is involved (Linsley *et al*. 2001).

Relationship problems with a partner, family or friends that may have precipitated the last episode of self-harm were very common, being reported in more than half the sample. Our findings show a strong association of recent relationship problems with lowered risk of suicide and accidental death after taking other factors into account. This might seem contrary to findings in Ireland, where suicide rates were higher in divorced individuals compared to those married (Corcoran & Nagar, 2010). However, another study in England also found decreased risk of suicide in those with relationship problems, perhaps because these are transient types of problems, more likely to resolve than, for example, physical or mental health problems (Hawton & Fagg, 1988). Our data include relationships with friends, family and partners, so having relationship problems may have broadly indicated positive social integration rather than isolation, the former being protective against suicide (Rojas & Stenberg, 2010).

Comparison of risks for accidents and suicide

Individuals who died by accidental poisoning with non-narcotic substances and by non-poisoning accidents shared some characteristics with those who died by suicide, such as male gender, older age and psychiatric treatment. Mental health problems precipitating the last episode of self-harm were also apparent for those who died by non-narcotic poisoning and other accidents (although these were not significantly related after controlling for other factors). Alcohol was often involved at the time or prior to self-harm, which frequently occurs with self-poisoning (Boenisch *et al*. 2010), although it may be involved in other accidents as well. Individuals who died by accidental narcotic poisoning had a major independent risk factor exclusive to their group, namely a 10-fold increased risk in those who reported illicit drug problems at their last

episode. This is not surprising, given the nature of their deaths. They were of a younger age and were less likely than others who died accidentally to have had mental health problems related to their self-harm or to have had psychiatric treatment.

Considering the timing of death in relation to the last self-harm episode, nearly six times as many suicides as accidents occurred within 5 days, three times as many within 1 month, and twice as many within 1 year, similar to trends found elsewhere (Ostamo & Lönnqvist, 2001). This may be related to suicidal intent, and that a death of questionable intent may be more likely to be classified as a suicide if a non-fatal attempt had taken place shortly beforehand (Stanistreet *et al*. 2001). There was no difference in timing between types of accidents.

To summarize, both shared and distinct risk factors were found for all groups. The risk profiles most similar to suicide were accidental non-narcotic poisoning, as expected, but also non-poisoning accidents, and where differences existed, these were partly related to factors that may have influenced coroners' decisions in favour of an accidental verdict rather than suicide (such as lack of violent method, involvement of alcohol, and longer time since previous self-harm). The dominant risk factor for narcotic poisoning was proximal drug problems.

Strengths and limitations

The follow-up time for individual patients varied considerably, from 2 to 10 years, although the use of survival statistics was able to account for this, and the relatively short period overall ensured reasonably stable social conditions under which the study data were collected (although the worldwide economic financial crisis began towards the end of the follow-up period). The study included a relatively large sample of over 30 000 individuals, with only 2.4% unable to be traced for mortality information. The number of deaths enabled sufficient power to analyse risk factors for categories of accidental death separately. As nearly 30% of patients did not receive a psychosocial assessment, some data were missing for the 'precipitating problem' variables. To overcome this we used a three-category variable (yes, no, unknown), which resulted in some significant associations for unknown *versus* no. Although these associations were included primarily for completeness, they may indicate some possible association between reasons for non-assessment (e.g. self-discharge) and risk of subsequent death.

There was a small inconsistency in sampling for our dataset. In Manchester during the period 1 January 2000 to 31 August 2002, information was collected only on assessed episodes; the proportion of non-assessed episodes being estimated at 30% (Bergen *et al*. 2010). This would have had only a minor impact on the current study.

The risk factors found in this study were not dissimilar to those of studies using the index episode in a study period, possibly because the majority of this sample who died by unnatural causes had only one episode of self-harm in the study period. Analysis of our data using time from the index episode and independent variables related to the index episode resulted in similar sets of risk factors for suicide and accidents. Exceptions were that (*a*) methods of self-cutting and other self-injury at the index episode, and psychosocial assessment at the index episode, were no longer significantly associated with increased risk of suicide; and (*b*) self-cutting at the index episode was significantly associated with increased risk of accidental death, and psychosocial assessment at the index episode with decreased risk of accidental death.

Conclusions

In this study we found both distinct and shared risks for suicide and accidental death following self-harm. Risk factors differentiating suicide and accidental death, of relevance to clinical services, were associations of (i) self-cutting and relatively violent methods of last self-injury, and mental health problems, with suicide; (ii) illicit drug problems with accidental narcotic poisoning; and (iii) alcohol involvement in self-harm with accidental non-narcotic poisoning and non-poisoning accidents. Suicides were also more likely than accidents to have occurred closer in time to the last episode of self-harm.

The risk profiles for accidental non-narcotic poisoning and other accidents were most similar to suicide. Differences were largely in factors also related to the high standard of proof required by coroners to infer suicidal intent (e.g. lack of intoxication, violent method, proximal previous self-harm). This is in keeping with the suggestion that many accidental deaths, especially those involving poisoning, are likely to have been suicidal. The increasing trend in recent years towards use of narrative verdicts (where the 'default' verdict has to be recorded as accidental where there is uncertainty) (Hill & Cook, 2011) may also have contributed to our findings.

The shared risk factors indicate common experiences of socio-economic disadvantage, life problems and psychopathology, perhaps resulting in mental illness or drug dependence, which lead to self-destructive behaviour in the form of suicide or accidental death (Stanistreet *et al*. 2001). Our findings support the proposition of the continuum of

https://doi.org/10.1017/S0033291711001747 Published online by Cambridge University Press

premature death and the commonality of risk factors in the psychosocially vulnerable population (Neeleman, 2001). Regardless of how eventual death may be classified, each episode of self-harm is potentially the patient's last episode before death, and as such it may represent an opportunity to make a life-saving intervention. We endorse recent national guidance (National Collaborating Centre for Mental Health, 2004) that all self-harm patients, regardless of risk and need, who present to the general hospital should receive a psychosocial assessment.

Acknowledgements

We thank A. Powell from the MRIS of the NHS for assistance with mortality information. We also thank our research teams, clinical and administrative staff in Oxford, Manchester and Derby for assistance with self-harm data collection. K.H. is a National Institute for Health Research Senior Investigator. We acknowledge financial support from the Department of Health under the NHS R&D Programme (DH/DSH2008). The Department of Health had no role in study design, the collection, analysis and interpretation of data, the writing of the report, and the decision to submit the paper for publication. The views and opinions expressed herein do not necessarily reflect those of the Department of Health.

Declaration of Interest

None.

References

Antretter E, Dunkel D, Haring C (2009). Cause-specific excess mortality in suicidal patients: gender differences in mortality patterns. *General Hospital Psychiatry* **31**, 67–74.

Beghi M, Rosenbaum JF (2010). Risk factors for fatal and nonfatal repetition of suicide attempt: a critical appraisal. *Current Opinion in Psychiatry* **23**, 349–355.

Bergen H, Hawton K, Waters K, Cooper J, Kapur N (2010). Epidemiology and trends in non-fatal self-harm in three centres in England, 2000 to 2007. *British Journal of Psychiatry* **197**, 493–498.

Bjornaas MA, Teige B, Hovda KE, Ekeberg O, Heyerdahl F, Jacobsen D (2009). Fatal poisonings in Oslo: a one-year observational study. *BMC Emergency Medicine* **10**, 13.

Boenisch S, Bramesfeld A, Mergl R, Havers I, Althaus D, Lehfeld H, Niklewski G, Hegerl U (2010). The role of alcohol use disorder and alcohol consumption in suicide attempts – a secondary analysis of 1921 suicide attempts. *European Psychiatry* **25**, 414–420.

Bramness JG, Walby FA, Hjellvik V, Selmer R, Tverdal A (2010). Self-reported mental health and its gender differences as a predictor of suicide in the middle-aged. *American Journal of Epidemiology* **172**, 160–166.

Carter G, Reith DM, Whyte IM, McPherson M (2005). Non-suicidal deaths following hospital-treated self-poisoning. *Australian and New Zealand Journal of Psychiatry* **39**, 101–107.

Cavanagh JTO, Owens DGC, Johnstone EC (1999). Suicide and undetermined death in south east Scotland. A case-control study using the psychological autopsy method. *Psychological Medicine* **29**, 1141–1149.

Christiansen E, Jensen BF (2007). Risk repetition of suicide attempt, suicide or all deaths after an episode of attempted suicide: a register-based survival analysis. *Australian and New Zealand Journal of Psychiatry* **41**, 257–265.

Christiansen E, Jensen BF (2009). A nested case-control study of the risk of suicide attempts after discharge from psychiatric care: the role of co-morbid substance use disorder. *Nordic Journal of Psychiatry* **63**, 132–139.

Cooper J, Kapur N, Webb R, Lawlor M, Guthrie E, Mackway-Jones K, Appleby L (2005). Suicide after deliberate self-harm: a 4-year cohort study. *American Journal of Psychiatry* **162**, 297–303.

Corcoran P, Nagar A (2010). Suicide and marital status in Northern Ireland. *Social Psychiatry and Psychiatric Epidemiology* **45**, 795–800.

Crepeau-Hobson F (2010). The psychological autopsy and determination of child suicides: a survey of medical examiners. *Archives of Suicide Research* **14**, 24–34.

Crombie IK (1990). Can changes in the unemployment rates explain the recent changes in suicide rates in developed countries? *International Journal of Epidemiology* **19**, 412–416.

Department of Health (2002). *National Suicide Prevention Strategy for England*. Department of Health: London.

Foster T, Gillespie K, McClelland R (1997). Mental disorders and suicide in Northern Ireland. *British Journal of Psychiatry* **170**, 447–452.

Gunnell D, Peters T, Kammerling R, Brooks J (1995). Relation between parasuicide, suicide, psychiatric admissions, and socioeconomic deprivation. *British Medical Journal* **311**, 226–230.

Hall DJ, O'Brien F, Stark C, Pelosi A, Smith H (1998). Thirteen-year follow-up of deliberate self-harm, using linked data. *British Journal of Psychiatry* **172**, 239–242.

Hawton K, Bergen H, Casey D, Simkin S, Palmer B, Cooper J, Kapur N, Horrocks J, House A, Lilley R, Noble R, Owens D (2007). Self-harm in England: a tale of three cities. Multicentre study of self-harm. *Social Psychiatry and Psychiatric Epidemiology* **42**, 513–521.

Hawton K, Fagg J (1988). Suicide, and other causes of death, following attempted suicide. *British Journal of Psychiatry* **152**, 359–366.

Hawton K, Harriss L, Hall S, Simkin S, Bale E, Bond A (2003*a*). Deliberate self-harm in Oxford, 1990–2000: a time of change in patient characteristics. *Psychological Medicine* **33**, 987–996.

Hawton K, Harriss L, Zahl D (2006). Deaths from all causes in a long-term follow-up study of 11 583 deliberate self-harm patients. *Psychological Medicine* **36**, 397–405.

Hawton K, Zahl D, Weatherall R (2003*b*). Suicide following deliberate self-harm: long-term follow-up of patients who

presented to a general hospital. *British Journal of Psychiatry* **182**, 537–542.

Hill C, Cook L (2011). Narrative verdicts and their impact on mortality statistics in England and Wales. *Health Statistics Quarterly* **49**, 81–103.

Karasouli E, Owens D, Abbott RL, Hurst KM, Dennis M (2010). All-cause mortality after non-fatal self-poisoning: a cohort study. *Social Psychiatry and Psychiatric Epidemiology* **46**, 455–462.

Kim MH, Jung-Choi K, Jun HJ, Kawachi I (2010). Socioeconomic inequalities in suicidal ideation, parasuicides, and completed suicides in South Korea. *Social Science and Medicine* **70**, 1254–1261.

Linsley KR, Schapira K, Kelly TP (2001). Open verdict *v*. suicide – importance to research. *British Journal of Psychiatry* **178**, 465–468.

National Collaborating Centre for Mental Health (2004). *Self-Harm: The Short-Term Physical and Psychological Management and Secondary Prevention of Self-Harm in Primary and Secondary Care*. National Institute for Clinical Excellence (NICE) Guideline 16. British Psychological Society: London.

Neeleman J (2001). A continuum of premature death. Meta-analysis of competing mortality in the psychosocially vulnerable. *International Journal of Epidemiology* **30**, 154–162.

O'Donnell I, Farmer R (1995). The limitations of official suicide statistics. *British Journal of Psychiatry* **166**, 458–461.

Ostamo A, Lönnqvist J (2001). Excess mortality of suicide attempters. *Social Psychiatry and Psychiatric Epidemiology* **36**, 29–35.

Owens D, Horrocks J, House A (2002). Fatal and non-fatal repetition of self-harm. Systematic review. *British Journal of Psychiatry* **181**, 193–199.

Owens D, Wood C, Greenwood DC, Hughes T, Dennis M (2005). Mortality and suicide after non-fatal self-poisoning: 16-year outcome study. *British Journal of Psychiatry* **187**, 470–475.

Peck DL, Warner K (1995). Accident or suicide? Single-vehicle car accidents and the intent hypothesis. *Adolescence* **30**, 463–472.

Qin P, Agerbo E, Mortensen PB (2003). Suicide risk in relation to socioeconomic, demographic, psychiatric, and familial factors: a national register-based study of all suicides in Denmark, 1981–1997. *American Journal of Psychiatry* **160**, 765–772.

Reith DM, Whyte I, Carter G, McPherson M (2003). Adolescent self-poisoning: a cohort study of subsequent suicide and premature deaths. *Crisis* **24**, 79–84.

Rojas Y, Stenberg SA (2010). Early life circumstances and male suicide – a 30-year follow-up of a Stockholm cohort born in 1953. *Social Science and Medicine* **70**, 420–427.

Runeson B, Tidemalm D, Dahlin M, Lichtenstein P, Långström N (2010). Method of attempted suicide as predictor of subsequent successful suicide: national long term cohort study. *British Medical Journal* **341**, c3222.

Shenassa ED, Catlin SN, Buka SL (2003). Lethality of firearms relative to other suicide methods: a population based study. *Journal of Epidemiology and Community Health* **57**, 120–124.

Stanistreet D, Gabbay M, Jeffrey V, Taylor S (2004). Are deaths due to drug use among young men underestimated in official statistics? *Drugs: Education, Prevention and Policy* **11**, 229–242.

Stanistreet D, Taylor S, Jeffrey V, Gabbay M (2001). Accident or suicide? Predictors of coroners' decisions in suicide and accident verdicts. *Medicine, Science and the Law* **41**, 111–115.

Stenbacka M, Leifman A, Romelsjö A (2010). Mortality and cause of death among 1705 illicit drug users: a 37 year follow up. *Drug and Alcohol Review* **29**, 21–27.

Suominen K, Isometsä E, Haukka J, Lönnqvist J (2004). Substance use and male gender as risk factors for deaths and suicide – a 5-year follow-up study after deliberate self-harm. *Social Psychiatry and Psychiatric Epidemiology* **39**, 720–724.

Surtees SJ (1982). Suicide and accidental death at Beachy Head. *British Medical Journal* **284**, 321–324.

Vento AE, Schifano F, Corkery JM, Pompili M, Innamorati M, Girardi P, Ghodse H (2011). Suicide verdicts as opposed to accidental deaths in substance-related fatalities (UK, 2001–2007). *Progress in Neuro-Psychopharmacology and Biological Psychiatry* **35**, 1279–1283.

Zahl D, Hawton K (2004). Repetition of deliberate self-harm and subsequent suicide risk: long-term follow-up study in 11,583 patients. *British Journal of Psychiatry* **185**, 70–75.