

The North Staffordshire Suicide Study: a case–control study of suicide in one health district

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ABSTRACT

Background. The aim of the study was to identify sociodemographic and clinical risk factors for death from suicide and undetermined injury in residents of one health district.

Method. Data were collected on all cases of suicide (ICD-9 E950–959) and undetermined injury (ICD-9 E980–989) for residents in North Staffordshire Health District between 1991 and 1995. Controls, identified from the Coroner's inquest register, who died from other causes, were matched for age and sex.

Results. Two hundred and twelve pairs of cases and matched controls were identified. Multivariate analysis (conditional logistic regression) showed that the risk of death due to suicide and undetermined death was associated with: recent separation, relationship difficulties, experience of financial difficulties, history of past criminal charges or contact with the police, a past history of deliberate self-harm, being on psychotropic medication at the time of death and a diagnosis of bipolar affective disorder. For sociodemographic variables, a univariate analysis found associations between the cases and being separated, living alone, having a past history of criminal charges and unemployment. Cases were more likely to have a psychiatric disorder, past history of deliberate self-harm and a past history of psychiatric contact for themselves or a family member. Controls were more likely to have a current medical disorder. Cases were more likely than controls to be on any form of medication at the time of death and to have received a prescription for psychotropic or non-psychotropic medication in the week and month before death. Cases were more likely than controls to have had contact with medical services in the week and month before death, with the general practitioner in the week before death and with psychiatric services at any time in the year before death. Strong associations were found between suicide and undetermined injury and life events such as recent separation and bereavement, and financial and relationship difficulties.

Conclusions. The study provides an analytical investigation utilizing a dead control group, data gathered from several sources and adequate numbers of cases. It confirms many of the risk factors identified in other studies and highlights the high proportion of suicides who have been in recent contact with the criminal justice system or have been prescribed medication shortly before death.

INTRODUCTION

Personal, social and clinical factors associated with suicide in the general population have been detailed in a range of studies (Durkheim, 1952;

Monk, 1987; Allebeck & Allgulander, 1990; Diekstra, 1993; Hawton *et al.* 1993; Retterstol, 1993; Vassilas & Morgan, 1993; Brent *et al.* 1994; Heikkinen *et al.* 1994; Nordstrom *et al.* 1995; Pritchard, 1995; DeMoore & Robertson, 1996). In addition, several studies have indicated that many people who commit suicide have had contact with medical services in the weeks or

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months before their death (Barraclough *et al.* 1974; Appleby, 1992; Vassilas & Morgan, 1993; King, 1994; Mathews *et al.* 1994; Geddes & Juszcak, 1995).

King & Barraclough (1990) have published data on the number of unnatural deaths in a single catchment area of one psychiatric provider unit to examine the deaths of individuals who had contact with psychiatric services. They did not report on factors associated with suicide in the geographical area population nor did they use a matched control group.

The aim of our present study was to identify risk factors for suicide and undetermined injury in the residents of one health district by comparing these individuals to an age and sex matched group of persons, identified from the Coroner's register, who died from other causes. The main groups of variables examined were: sociodemographic, clinical and service contact. The study technique was exploratory and aimed to identify single (univariate) and multiple (multivariate) characteristics that discriminate between cases and controls. In addition, we wished to illustrate a reliable and reproducible methodology.

The general hypotheses examined in the present study were that persons dying from suicide or undetermined injury are significantly more likely than other age-sex matched members of the same population dying from other causes to: live alone; be widowed, divorced or separated, but less likely to be single; be unemployed or retired; have a history of police contact; have a history of recent life events and difficulties; have a psychiatric disorder; have a history of deliberate self-harm; be in receipt of a prescription in the month before death; have contact with general medical services in the year before death; and have contact with psychiatric services in the year before death.

METHOD

Study setting

North Staffordshire Health Authority is situated between Manchester and Birmingham. It covers an area of 340 square miles and has a population of 470971 (1991 census). Four-fifths of the population live in the urban conurbation of Stoke-on-Trent and Newcastle-under-Lyme and

the remainder in the rural area of the Staffordshire Moorlands. There is one main provider of mental health services in the district.

The officially derived local figures and trends are in line with the national data (Charlton *et al.* 1992). The average rate of deaths per year from suicide and undetermined injury between 1988 and 1992 was 11.5 per 100000 representing 1.0% of the total number of local deaths. The rates in males were consistently higher than in females. Sex-specific rolling rates between 1983 and 1992 show a diverging pattern that is mainly due to the increasing numbers of young males (25–44 years) taking their own lives. Analysis of the descriptive data generated the hypotheses for the current analytical study.

Definition and identification of cases

Residents of North Staffordshire district dying from suicide (ICD-9 E950–959) or undetermined injury (ICD-9 E980–989) over a 5-year period from 1 January 1991 to 31 December 1995 were identified using the anonymized Office of Population Census and Surveys (OPCS) Regional Death Tapes. Individuals were identified by matching dates of birth, death and postcode with the Coroner's inquest register and death registration returns to the Department of Public Health Medicine. Persons who committed suicide in North Staffordshire but who lived outside the district were excluded. Residents of North Staffordshire who killed themselves outside the district were included.

The Coroner's inquest records were scrutinized by members of the research team. Those cases with an ICD-9 E988.8 or E988.9 code were excluded if a final verdict of homicide or reckless driving was returned against the case or if the circumstances appeared unrelated to self-harm and the possibility of suicide had been investigated but dismissed by the Coroner.

Definition and identification of controls

Identification of an appropriate control group for dead subjects, particularly those who may have taken their own lives, is problematical. The control group chosen represented another group of 'unnatural' deaths identified from the Coroner's records. This choice has the advantage of reducing the cost of the study, as a psychological autopsy method was not employed. It also allows for comparability of information

sources as the Coroner's records, together with the medical and psychiatric records, provide a rich source of information for the types of data we wished to collect. The main disadvantage of this control group is that it may not be representative of the general population as a whole. Thus, while the use of a dead control group drawn from the Coroner's register may reduce potential information bias, care must be exercised in interpreting some findings as a number of factors may differentiate the controls from the general population, for example the presence of physical illness or frequency of medical contact. The study findings should be interpreted in this light.

Individuals dying for other reasons between 1991 and 1995 whose deaths were investigated by the Coroner were identified from the inquest register. These controls were matched by age and sex to individual cases. Age matching was performed within a 5-year age band either side of the age of each case. Exact matching for year of death was attempted but proved only to be feasible for 172 (81%) of the pairs. In those pairs for which exact year matching could not be achieved an adjacent year was taken.

Data collection

It is possible that a greater depth of information was available for cases than controls owing to a more thorough investigation of certain details by the Coroner, e.g. if a suicide is suspected then information regarding recent life events or psychiatric history may be sought more vigorously for the cases. This source of bias was reduced by the use of multiple sources of information. Errors in obtaining information from case records were reduced by using rigorous definitions and coding procedures for each variable.

Data were collected from three main sources, as follows.

1 *Coroner's inquest records* These consisted of a range of types and sources of information (witness statements, medical and post mortem reports, other legal documents, e.g. birth certificate, suicide note(s), photograph(s) of the scene of death).

2 *General practitioner (GP) records* These were obtained from the Family Health Services Authority (FHSA). The written notes were examined along with the contents of any letters.

3 *Hospital records* All hospital records were examined. These consisted of general medical records, psychiatric records from the two psychiatric hospitals and other records from satellite clinics such as mental health centres and day hospitals. Hospital notes were supplemented by use of the hospital computer database.

On the completion of data collection, an initial examination of the data showed 2% of cases and 5% of controls had neither GP nor hospital records. Seventy-five per cent of cases were given a verdict of suicide and 25% an open verdict. Of the controls, 40% were given a verdict of accidental death, 32% of death by misadventure, and 28% were given other verdicts.

Psychiatric diagnoses

The psychiatric diagnoses were made in four stages. A suspected diagnosis highlighted by the Coroner was confirmed by the use of medical evidence in the inquest file or casenotes. Specific diagnoses were based on medical or therapeutic evidence and if this was not present the diagnosis was coded in a 'most-like' category. Final diagnoses were made in broad categories corresponding to those of ICD-10 agreed by the clinical members of the research team. Multiple diagnoses were allowed.

Statistical analysis

All predictors were transformed to binary variables to help with interpretation of the results. Statistical analysis was carried out using STATA (Stata Corp, 1997). Case and controls were compared in a pairwise fashion using McNemar's test in order to identify any significant association with individual predictor. Odds ratios and 95% confidence intervals in the univariate and multivariate analyses are presented in the results as well as significance levels. Variables from the univariate analysis with an odds ratio of two or more were entered into a Stepwise Multiple Linear Conditional Logistic Regression analysis. Composite variables that were included in the univariate analysis, e.g. 'any psychiatric contact', were not included in the regression to ensure that the variables are independent explanatory variables. The regression procedure initially included all the selected variables and then removed unimportant variables from the regression with the

P value > 0.05. At each step, the variable with the smallest contribution to the regression (or largest P value) was removed until the remaining variables all achieve significance at the 5% level.

RESULTS

Of the cases, 167 (79%) were male and 45 (21%) were female (male:female ratio of 3.7:1). The median age was 43 years, range of 14–89 years: 58.1% of men and 44.4% of women were aged under 45 years ($\chi^2 = 2.666$, $df = 1$, $P = 0.1025$). The commonest causes of death in males was by hanging (32%) or motor-vehicle exhaust (26%). In women the commonest cause was an overdose of medication (47%). For all of the suicide cases 43% left a note.

Univariate analysis

These are shown in Tables 1 and 2. For sociodemographic variables, the strongest associations were found with having a history of a criminal charge and being separated. Being a control was associated with being single or being married. Being retired was not significantly associated with being a case. Cases were more likely to have been reported to experience a recent life event or difficulty before death.

For clinical variables there was a strong association between self-inflicted death and psychiatric disorder (Table 1). Of the specific diagnoses only that of depression differentiated cases and controls. Cases were much more likely to have a past history of deliberate self-harm, a

Table 1. Comparison of cases and matched controls – sociodemographic and clinical variables, life events and difficulties

	No. of cases ($N = 212$)	No. of controls ($N = 212$)	McNemar test P	Odds ratio (95% confidence interval)
Sociodemographic				
Living alone	83	39	0.0001	2.75 (1.70–4.59)
Single (no known relationship)	37	57	0.0158	0.51 (0.29–0.89)
Married	66	88	0.0235	0.60 (0.38–0.95)
Separated	43	8	0.0001	5.86 (2.60–15.5)
Divorced	13	18	0.5708	0.75 (0.32–1.69)
Widowed	25	15	0.0890	2.11 (0.91–5.30)
Dependants	79	53	0.0064	1.79 (1.12–2.93)
Unemployed	42	21	0.0029	2.75 (1.38–5.85)
Retired	13	18	0.4576	0.71 (0.31–1.57)
Armed service history (any)	39	33	0.4510	1.32 (0.69–2.53)
Armed service history (not in WWII or National Service)	15	11	0.5413	1.40 (0.578–3.52)
Previous prison sentence	21	11	0.1374	1.90 (0.84–4.57)
Past criminal charges/arrest by police	38	7	0.0001	6.17 (2.58–17.9)
Life events and difficulties				
Recent bereavement	61	28	0.002	2.65 (1.56–4.68)
Recent separation	85	17	0.0001	7.18 (3.8–15.0)
Financial difficulties	41	6	0.0001	6.83 (2.88–19.7)
Relationship difficulties	107	28	0.0001	8.18 (4.36–17.0)
Work stress	26	0	0.0001	*
Clinical variables				
Any confirmed psychiatric diagnosis	151	94	0.0001	3.48 (2.16–5.80)
Depression only	79	43	0.0001	2.80 (1.65–4.93)
Bipolar affective disorder	3	1	0.6250	3.0 (0.24–158)
Schizophrenia	7	3	0.3438	2.33 (0.53–14.0)
Alcohol abuse	40	34	0.5186	1.22 (0.71–2.11)
Drug abuse	11	10	1.000	1.10 (0.42–2.89)
Organic brain disorder	3	6	0.5078	0.5 (0.09–2.34)
Personality disorder	28	16	0.0744	1.92 (0.95–4.09)
Past contact with psychiatric services	88	24	0.0001	5.27 (3.01–9.85)
Past history of deliberate self-harm	110	27	0.0001	11.5 (5.60–27.40)
Family history of psychiatric disorder	39	19	0.0072	2.33 (1.24–4.60)
Family history of suicide	11	3	0.0574	3.67 (0.97–20.5)
Current medical disorder	117	150	0.0006	0.48 (5.6–27.4)

* Unable to calculate owing to empty cells.

Table 2. Comparison of cases and controls – health service contact and medication prescribed before death

	No. of cases (<i>N</i> = 212)	No. of controls (<i>N</i> = 212)	McNemar test <i>P</i>	Odds ratio (95% confidence interval)
Health service contact				
Any medical contact in week before death	78	39	0.0001	2.80 (1.65–4.93)
Any medical contact in month before death	133	108	0.0339	1.58 (1.03–2.44)
Contact with GP				
Week before death	59	31	0.0007	2.56 (1.45–4.68)
Month before death	111	101	0.3428	1.25 (0.81–1.94)
1 year before death	184	169	0.0684	1.68 (0.97–2.99)
Psychiatric in-patient contact				
Week before death	13	2	0.0074	6.5 (1.47–59.3)
Month before death	18	4	0.0043	4.5 (1.48–18.3)
12 months before death	38	8	0.0001	6.0 (2.50–17.4)
Psychiatric out-patient contact				
Week before death	13	2	0.0074	6.5 (1.47–59.3)
Month before death	25	2	0.0001	12.5 (3.12–109)
12 months before death	59	14	0.0001	6.0 (2.9–13.8)
Any psychiatric contact				
Week before death	25	3	0.0001	8.33 (2.54–43.1)
Month before death	39	6	0.0001	6.05 (2.73–18.8)
12 months before death	76	20	0.0001	5.0 (2.79–9.61)
Medication prescribed				
On any type of medication at death	149	130	0.0455	1.61 (1.01–2.61)
Given prescription in month before death	104	79	0.0119	1.76 (1.13–2.78)
Given prescription in week before death	49	31	0.0336	1.78 (1.04–3.11)
On psychotropic medication at death	103	38	0.0001	6.08 (3.36–11.9)
Given prescription for psychotropic medication in month before death	81	28	0.0001	5.08 (2.77–10.0)
Given prescription for psychotropic medication in week before death	46	11	0.0001	6.67 (2.81–19.2)

history of psychiatric contact and a family history of psychiatric disorder. Controls were more likely to be suffering from a current medical disorder.

Cases were more likely to receive a prescription for any form of medication in the week or month before death (Table 2). There was a strong association between self-inflicted death and being on psychotropic medication. Cases were more likely to receive a prescription for psychotropic medication in the week or month before death.

In the week before death 37% of cases had a medical contact (Table 2). Over half of these final contacts in this time period were with a general practitioner and a quarter with psychiatric services. Cases were more likely than controls to have a medical contact or contact with a GP in the week before death.

Cases were more likely than controls to have any psychiatric contact, in-patient or out-patient, in the year before death for all time periods (Table 2). For 15 of the suicide cases the

last admission to hospital was in response to an act of deliberate self-harm (DSH) and in eight cases the last out-patient contact was similarly associated. Of the 13 cases with out-patient contact in the week before death, none of the contacts was associated with a recent act of DSH. However, of the 13 suicides who had in-patient contact in the last week before death six (46%) of these admissions were associated with DSH. Eight of these 13 cases died while still in-patients (five died while on leave and three in the hospital) and five died within 1 week of discharge (two had committed suicide the day after discharge). In addition, four individuals died within 1–2 weeks of discharge. The median time interval between discharge and death for the 38 suicides who died within a year of discharge was 4 weeks (range 0 to 45 weeks). The two controls who had in-patient contact within a week of death both died while still psychiatric in-patients (one died of a pulmonary embolus unrelated to his psychiatric condition, the other had Huntington's chorea and choked on his food).

Table 3. Results from the final step of the conditional logistic regression analysis

Variable	Regression coefficient	P	Odds ratio (95% confidence interval)
Recent separation	2.515	< 0.001	12.4 (3.6–42.4)
Past criminal charges/arrest by police	3.638	0.003	38.0 (3.3–436.6)
Recent bereavement	1.241	0.021	3.5 (1.2–9.9)
Financial difficulties	1.667	0.038	5.3 (1.1–25.6)
Relationship difficulties	1.521	0.006	4.6 (1.6–13.4)
Past history of deliberate self-harm	1.784	0.003	5.9 (1.8–19.2)
On psychotropic medication	1.447	0.004	4.2 (1.6–11.5)
Bipolar affective disorder	–4.004	0.030	0.02 (0.0004–0.67)

Multivariate analysis

A total of 28 variables with odds ratios greater than two were entered into the analysis and eight of these were found to be significant (Table 3). The variable having bipolar affective disorder has the largest confidence interval, which is caused by a low frequency of positive outcomes (cases $N = 3$, controls $N = 1$). The variable of having past criminal charges/contact with police has the highest odds ratio value of 38.0. The same variable also has a large odds ratio value in the univariate analysis (Table 1) confirming its significance in both analyses. Again, the width of the confidence interval is broad due to the small frequency in the control group ($N = 4$).

DISCUSSION

Factors associated with suicide

Many of the factors that were found to be associated with suicide have been documented in other studies. However, the particularly strong relationship between suicide and the presence of past criminal charges or recent arrest appears to be a new finding. Almost 18% of those who committed suicide had police contact in the period before death, a finding that was higher in men (23%) than women (11%). The exact relationship between this contact and the final act of suicide is not clearly apparent but it is unlikely to be due to a methodological anomaly and is worth exploration in future studies.

In the univariate analysis some socio-demographic factors such as living alone, having dependants and being unemployed significantly discriminated between cases and controls but did not contribute to the final model in the multivariate analysis. This does not mean that they are unimportant in terms of risk of suicide

since the association between social isolation and suicide is well documented (Heikkinen *et al.* 1995) as is that between suicide and unemployment (Pritchard, 1995). The fact that these variables were not significant in the multivariate analysis may be attributed to the association between many of the variables analysed together. In the multivariate analysis, the significance of individual variables is explored in the presence of others.

The presence of physical illness and retirement did not achieve significance, which was unexpected. However, both of these factors may be prevalent in the control group, many of whom died as a result of a physical illness and may have retired on grounds of ill-health. None of the service contact factors contributed significantly to the multivariate results despite being significant in the univariate analysis. Individuals dying from suicide and undetermined injury have more contact with general medical services than individuals dying from other causes. However, this appears only to be the case for contact with the GP in the week before death. The control group used provides a stringent test of this as many of them had physical illnesses, which would raise their contact with medical services, and they were found to have increased contact with hospital-based services.

Applicability of the findings

We employed a dead control group and data gathered from multiple accessible sources. To our knowledge no other published study has used this methodology. The approach is readily replicable and can be used to supplement descriptive data collection and monitoring.

As with King's (1994) study the data refer to the catchment area of one provider unit and in line with the Southampton study produced data

of local relevance. The strengths and weaknesses of this approach lie in its parochial nature. Its major use is as an addition to local audit and descriptive studies and can be used to inform local policy. In addition, it provides a sound database, which can be added to in the future. Its potential weakness relates to the generalizability of the findings. It should be emphasized that the risks calculated are those relative to deaths from other causes identified by the Coroner and not the population as a whole. Despite this, the results are consistent with those from a range of other studies suggesting that those dying from other unnatural deaths may be more like the general population than are suicides. A logical extension to the present study is to generalize the regression by applying it to other data sets from different health districts using a similar study design. Since the rates of suicide in North Staffordshire are in keeping with the national picture, it may be expected that the regression will generalize successfully, but this remains to be empirically verified.

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