

Suicide and Related Behaviour from River Bridges A Clinical Perspective

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A survey was conducted of 47 suicides, 16 failed suicides, and 24 attempted suicides that occurred from Brisbane river bridges over 15 years. Compared with findings from other suicide surveys, subjects of bridge suicides and failed suicides had a much higher rate of schizophrenia (46%), with hallucinations often precipitating the jump. They also had extensive histories of previous self-harm. Those who attempted suicide by jumping had a higher rate of personality disorder (58%) compared with findings from other attempted suicide surveys, and had very extensive histories of previous self-harm which tended to continue beyond the bridge incident. Both groups had histories of extensive previous psychiatric care.

Jumping from high places is an uncommon method of suicide, accounting for 3% of male and 4% of female suicides in Australia. There has been a reported increase in suicide by jumping in recent years in Australia (Australian Bureau of Statistics (ABS), 1983a, 1987), the UK (McClure, 1984), the USA (Seiden, 1978), and Switzerland (Haanel, 1985). The Golden Gate Bridge in San Francisco is reported to be the world's leading site of self-destruction, with 625 officially confirmed deaths and possibly 200 unconfirmed deaths between 1937 and 1976 (Seiden, 1978).

Studies of suicide in general have revealed psychiatric illness in over 90% of cases; depression and alcoholism are found in the majority, with schizophrenia in only approximately 6% (Hawton, 1987; Rich *et al*, 1986; Chynoweth *et al*, 1980; Barraclough *et al*, 1974; Dorpat & Ripley, 1960; Robins *et al*, 1959). Studies of people who commit suicide by jumping have suggested that they suffer from higher rates of schizophrenia, but research is hampered by problems of selection bias and sample size (Sims & O'Brien, 1979; Prasad & Lloyd, 1983; Pounder, 1985; Goldney, 1986). In January 1986 a bridge 65 metres high - The Gateway - was opened over the Brisbane River. In the ensuing 12 months the incidence of actual and attempted jumping from bridges rose alarmingly. To understand the nature of this problem, a broad-based inquiry was launched. The present study aims to determine the psychopathology of those engaging in suicidal behaviour from river bridges.

Method

Case identification

Individuals engaging in suicidal behaviour from eight Brisbane river bridges over 15 years (1972-87) were

identified. Most used the Gateway (65 m) and Story (30 m) bridges, with fatality rates of 93% and 75% respectively. Subjects included:

- (a) Suicides: identified from records of the coroner and the Department of Births, Deaths and Marriages. Coroners' verdicts were not relied on, as records were searched for all deaths from river bridges
- (b) Failed suicides: those who jumped with self-destructive intent without fatal injury. Subjects were identified from police and hospital records. Police files were not as reliable for case identification as coroners' records. Hospital cases were identified by word of mouth by health-care workers. The majority of subjects were identified by both sources, suggesting that a substantial sample of the total population had been identified. One subject, who jumped from the Sydney Harbour Bridge (59 m) and came to the clinical attention of one author (CHC), was also included in pertinent parts of the analyses
- (c) Attempted suicides: cases meeting all the following criteria:
 - (i) the subjects were sighted on a river bridge
 - (ii) there was unequivocal evidence that the purpose of their being there was to contemplate suicide
 - (iii) they were brought to the attention of the police or Health Department seemingly against their will. Attempted suicides were selected from police and hospital records
- (d) Pathological 'pranks': those who jumped with pathologically reckless, but not overtly suicidal, intent. A parachute stunt was not included. Pranks were identified from coroners' records.

All identified cases were included.

Data retrieval and definitions

Demographic and clinical data were retrieved from records of the coroner, the Police Department and major Brisbane state health institutions (the regional long-stay hospital, four

acute psychiatric units, seven general hospitals, five community psychiatric services and all sections of the alcohol and drug dependency services). This information was supplemented by data from a health department computerised psychiatric case register. General and private practitioners were approached in cases where the principal sources had revealed little information. Because of unreliability, data relating to hospital admissions outside Brisbane were not used. In the absence of reliable data for diagnoses based on research criteria, judgements were made about the prevailing diagnosis at the time of the act, and expressed in DSM-III-R terminology (American Psychiatric Association, 1987) for uniformity of description. As broad diagnostic categories (e.g. mood disorders) were used, this presented few problems, although the approach has limitations. Axis III diagnoses were made arbitrarily when physical disorder was deemed relevant to the suicidal act. In-patients included subjects on brief leave and those who had absconded from hospital in the previous 48 hours. Out-patients included those receiving psychiatric care within the previous four months. Follow-up data were retrieved from both clinical and Coroners' files.

Data analysis

Dependent variables containing nominal data were analysed by χ^2 tests of homogeneity or independence, as appropriate. Differences between subject categories (independent variables) for extent of deliberate self-harm (DSH)

were established with the Mann-Whitney test. Psychiatric treatment variables (which displayed a wide range of values) were analysed by one-way analysis of variance (ANOVA) following log-transformation of the data, in order to stabilise variance independently of the cell means.

Results

Sample

The sample included 90 subjects, comprising four categories: 47 suicides, 16 failed suicides, 24 attempted suicides, and 3 pranks. Of 47 suicides, 20 were seen or heard to have jumped; of the remainder, there was strong evidence supporting a suicidal jump (e.g. subject found in river with multiple injuries and car abandoned on bridge). Analysis revealed that, for most dimensions, failed suicides were not significantly different from suicides. Where there was no significant difference statistically the term 'jump category' has been used to denote both categories. Most suicide attempts appeared to be of serious intent, with some subjects suspended in mid-air as their rescuers grappled with them.

Demography

Demographic characteristics are presented in Table I. In all categories males predominated and the mean age was 34.5 years. Although 66.5% of attempted suicides had

TABLE I
Demographic characteristics of subjects studied

	Attempted suicides (n = 24)	Jump category fatal/non-fatal (n = 16 + 47 = 63)	Failed suicides (n = 16)	Suicides (n = 47)
Sex ¹				
Male	18(75%)	53(84%)	13	40
Female	6(25%)	10(16%)	3	7
Male:female	3:1	5.3:1	4.3:1	5.7:1
Age: years				
Range	18-66	17-66	21-55	17-66
Mean	34.3	34.8	32.1	35.8
Median	33	31	28.5	31
Marital status ²				
Never married (28.1%)	8(33%)	43(68%)	12	31
Married/ <i>de facto</i> (58.0%)	3(12.5%)	8(13%)	3	5
Separated (2.8%)	8(33%)	8(13%)	1	7
Divorced (4.7%)	4(17%)	3(5%)	-	3
Widowed (6.4%)	1(4%)	-	-	-
Unknown	-	1(1.5%)	-	1
Employment status ³				
Employed	10(42%)	22(35%)	5	17
Unemployed	9(37.5%)	13(20.5%)	7	6
Invalid pensioner	5(21%)	25(40%)	3	22
House duties/unknown		3(4.5%)	1	2

1. Odds ratio, male increased risk of fatal jump = 1.76.

2. Never married v. All other categories, $\chi^2 = 7.9$, d.f. = 1, $P < 0.01$, Yates' correction.

3. $\chi^2 = 5.1$, d.f. = 3, NS.

married, most (50% of the total) had separated from their spouse by the time of the incident (1981 census figure for separation from spouse: 7.5%). In contrast, 68% of the jump category had never married (1981 census figure for those never married: 28.1% (ABS, 1983b)). Of those in the jump category who had married (31%), more than half (18%) had separated from their spouse. Unemployment rates were high in all categories (1986 census unemployment rate: 8.36%). Of the jump category, 40% were invalid pensioners.

Diagnosis

Of the jump category, 46% were recorded as suffering from schizophrenia, in contrast to only 8% of attempted suicides (Table II). Of eight schizophrenic failed suicides, clinical records immediately after the event revealed that in six cases hallucinations instructing the jump had been present. In one other case, while there was no record of hallucinations, the possibility that they were a factor cannot be dismissed

TABLE II
Principal diagnosis¹ of mental illness and disorders in subjects studied

Diagnosis (DSM-III-R code)	Attempted suicides (n = 24)	Jump category fatal/non-fatal (n = 16 + 47 = 63)	Failed suicides (n = 16)	Suicides (n = 47)
Schizophrenia (295.1-295.9)	2(8.3%)	29(46%)	8	21
Mood disorders ² (296.2-7, 300.40)	2(8.3%)	10(15.9%)	4	6
Personality disorders (301.00-301.90)	14(58.3%)	8(12.7%)	2	6
Alcohol abuse/dependency (305.00 and 303.90)	3(12.5%)	5(7.9%)	2	3
Alcohol-induced organic mental disorder (291.10 and 291.30)	0	3(4.8%)	0	3
Adjustment disorders (309.00-309.90)	2(8.33%)	0	0	0
V-codes (V62.89)	1(4.15%)	0	0	0
No recorded diagnosis retrieved	0	8(12.7%)	0	8

1. Test of homogeneity, attempted suicides v. jump category: $\chi^2 = 26.34$, d.f. = 4, $P < 0.001$; cases with V-code or adjustment disorder dropped.

2. Mood disorders are probably under-represented in the suicide group (estimated to lie between 20 and 25% when cases with no recorded diagnosis are taken into account).

TABLE III
Alcohol status of subjects studied

	Attempted suicides (n = 24)	Jump category fatal/non-fatal (n = 16 + 47 = 63)	Failed suicides (n = 16)	Suicides (n = 47)
Intoxicated	7(29%)	9(14%)	3	6
Abuse/dependence (current or past)	8(33%)	14(22%)	3	11
Intoxicated + abuse	1(4%)	0	0	0
Any of above ¹	16(66%)	23(36.5%)	6	17
Nil alcohol ¹	5(21%)	31(49%)	9	22
Unknown	3(12.5%)	9(14%)	1	8
Post-mortem blood (or urine) alcohol ²				
> 100 mg/100 ml	-	-	-	6
> 50 mg/100 ml	-	-	-	8

1. Alcohol abuse/intoxication v. nil alcohol, $\chi^2 = 5.6$, d.f. = 1, $P < 0.05$, Yates' correction.

2. Of 44 subjects where blood (or urine) alcohol estimates were done.

since the subject stabbed himself two weeks later in response to command hallucinations. Only one case was found where command hallucinations did not appear relevant.

Of attempted suicides, 58% were diagnosed as suffering from personality disorders, compared with 13% of the jump category. Of those suffering from personality disorders, attempted suicide incidents tended to occur by day, with jump category incidents tending to occur by night ($P < 0.05$). Of eight suicides with no recorded diagnosis, information from general medical files and general practitioners suggested undiagnosed depression in at least four. Of the jump category, 36%, and of attempted suicides, 29% were deemed to have had a physical illness of relevance.

Alcohol

Of the attempted suicide category, one-third were intoxicated at the time of the incident and a third had a past or current alcohol problem (Table III). Of the jump category, alcohol was found to be a possible factor in only 36% (figures are conservative because of missing data). Only six (14%) suicides had post-mortem blood (or urine) alcohol levels greater than 100 mg/100 ml, a crude cut-off point for intoxication (eight (18%) if 50 mg/100 ml is the cut-off point).

Psychiatric care

Previous psychiatric care was extensive and similar for all categories of subject (Table IV). Only 12 subjects (19%)

in the jump category and 5 (21%) attempted suicides had never previously been admitted to a Brisbane state institution. Two subjects in the jump category and two attempted suicides had received other psychiatric care. Of jump category subjects who had received in-patient care, 50% had four or more admissions, accounting for 111 or more in-patient days. Mean scores were higher, reflecting the influence of subjects who had extensive in-patient contact. For attempted suicides the mean number of admissions, 9.3, was not significantly greater than that for jump category subjects, 5.8. Approximately 25% of all cases had previously been in-patients at the regional long-stay hospital. A mean of six years had elapsed between initial care and the incidents. At the time of the incident, 19 subjects (30%) in the jump category were in-patients and 19 (30%) were out-patients, leaving 25 (40%) not in care. Figures for attempted suicides were remarkably similar (29%, 29%, and 42% respectively). Of jump category subjects, 44% had been seen clinically in the previous month.

Deliberate self-harm

Of attempted suicides, 92% had a previous history of DSH (mean of 6.5 incidents), compared with 54% of jump category subjects (mean 1.8 incidents) (Table V). Overdosing and wrist-cutting were the most common modes of DSH. Seven (29%) attempted suicides made more than

TABLE IV
Extent of state psychiatric care received by subject prior to incident¹

	Attempted suicides (n = 24)	Jump category fatal/non-fatal (n = 16 + 47 = 63)	Failed suicides (n = 16)	Suicides (n = 47)
In-patient admissions²				
Mean	9.3	5.8	5.3	6.0
s.d.	(10.6)	(5.7)	(3.5)	(6.3)
Median	4	4	4	3
Range	1-44	1-30	1-12	1-30
n	17	46	11	35
Period of care³: years				
Mean	7.3	6.3	6.2	6.4
s.d.	(7.1)	(4.8)	(4.3)	(5.0)
Median	6	5	4	5
Range	1-20	1-24	1-12	1-24
n	17	48	11	37
In-patient days⁴				
Mean	219.2	300.5	418.9	263.3
s.d.	(349.5)	(387.3)	(559.0)	(317.2)
Median	88	121	132	111
Range	5-1184	1-1809	1-1809	2-1036
n	17	46	11	35

1. Data exclude subjects with zero care in order to provide a profile typical of those who had received care.

2. ANOVA log-transformed data $F(1,61) = 1.1$, NS.

3. ANOVA log-transformed data $F(1,63) = 0.7$, NS.

4. ANOVA log-transformed data $F(1,61) = 1.0$, NS.

TABLE V
Those with a history of previous deliberate self-harm cross-classified according to category of subject

	Attempted suicides (n = 24)	Jump category fatal/non-fatal (n = 16 + 47 = 63)	Failed suicides (n = 16)	Suicides (n = 47)
History of previous self-harm	22(92%)	34(54%)	12	22
Total DSH incidents	138	111	33	78
Mean DSH incidents ¹	6.5	1.8	2.2	1.66

1. Jumps v. attempted suicides, Mann-Whitney, $P < 0.001$.

one attempt to jump from a bridge. Follow-up over a mean period of 28 months for 24 attempted suicides revealed 12 (50%) engaged in further DSH. Suicide occurred in four cases; two subjects, both psychotic, jumped from the bridge from which they had previously been rescued. Two deaths occurred within two weeks of previous rescue. Follow-up over a mean period of 69 months for 16 failed suicides revealed 7 (44%) subjects engaged in further DSH. Suicide occurred in two cases – both subjects were psychotic – one by a repeated jump from a bridge.

Pranks

Only one of the three 'pranks' had received prior psychiatric care, for alcohol dependency. All three jumped in full view of other persons and had post-mortem blood alcohol levels greater than 100 mg/100 ml. One 'prank' had a history of two previous skull fractures, considered himself an indestructible dare-devil, and rehearsed high dives at a swimming pool before making his jump. His friends nicknamed him 'Suicide'.

Discussion

In the psychopathology of individuals jumping from bridges, it is evident from the analysis that schizophrenia predominates, having been diagnosed as present in 46% of subjects prior to their jump. Most schizophrenic failed suicides jumped in response to auditory hallucinations. Mood disorders, where adjustment is made for those with no recorded diagnosis, accounted for 20–25% of the jump category, and personality disorders for a further 13%. Of attempted suicides, 58% had received a primary diagnosis of personality disorder, while a further 12.5% were suffering from adjustment disorders and were experiencing marital problems.

To contrast the current findings with those from other studies, 46% of the jump category suffered from schizophrenia, compared with 3.7% in a survey of all Brisbane suicides during a 12-month period (1973–74) (Chynoweth *et al*, 1980), and figures ranging from 2% to 12% in studies elsewhere

(Barraclough *et al*, 1974; Dorpat & Ripley, 1960; Robins *et al*, 1959). Whereas Roy (1982) found hallucinations of threatening voices to be a factor in only 2 of 30 schizophrenic suicides, current findings suggest that those hallucinations may be important determinants of some types of suicidal behaviour. It is of interest that the well documented differences in suicide and attempted suicide populations held true for attempts to jump from a bridge. However, whereas in Kessel's (1965) study of 165 male self-poisoners, personality disorders were found in 32%, in the current study a considerably higher proportion of personality disorders (58%) was found.

Alcohol problems were noted in one-third of jump category subjects, similar to the rate previously reported for Brisbane suicides (Chynoweth *et al*, 1980). Given this, it is surprising that only one-sixth of the jump category showed post-mortem blood or urine alcohol levels consistent with intoxication. It appears that subjects in this group tended to jump to their deaths in relatively sober states.

The issue of pre-morbid functioning was approached in terms of health care utilisation and previous DSH. Figures for in-patient care are conservative since data relate only to Brisbane state psychiatric services, routine interviews of relatives were not conducted, and, in situations of doubt, variables (days of care and incidents of DSH) were rated conservatively. Nevertheless, the data support a picture of extensive psychiatric care of subjects. Surprisingly, the picture for attempted suicides was similarly bleak. In addition, more than 50% of suicides and 90% of the attempted suicides had previously harmed themselves – the latter often repeatedly. High rates of invalid pensioners and unmarried subjects in the jump category and unemployment and marital separation in the attempted suicide category support this picture of social dysfunction. Kessel (1965) emphasised the relative lack of psychiatric disorder in his sample of attempted suicides, 26% having no psychiatric disorder. The current findings, while supporting a predominance of

personality and adjustment disorders among subjects, found levels of psychiatric care (median 88 in-patient days) consistent with serious disturbance. In addition, studies of attempted suicide have generally revealed previous DSH in only 35–43% of subjects, although one report from New Zealand found that 60% had previously harmed themselves (Adam *et al*, 1983). The current finding that 90% of attempted suicides from bridges had previously harmed themselves appears to be exceptional.

The prognosis for attempted and failed suicides was assessed in terms of subsequent non-fatal DSH and suicide. Previously, a suicide rate of 1% per annum following suicide attempts has been suggested (Weissman, 1974). Paerregaard (1975) found that after ten years 11% of 484 attempted suicides had died by suicide, the period of highest risk being immediately after the index attempt. A follow-up study of 515 persons restrained from jumping from the Golden Gate Bridge, San Francisco between 1937 and 1971 found that 10% had later died by accident, suicide or homicide (Seiden, 1978). Two studies from New Zealand reported rates for further DSH of 29% and 35% and cited three early British studies with rates of around 25% (Adam *et al*, 1981; Adam *et al*, 1983). The present study found a continuation of the unusually high rates of DSH found before the incident, with no less than 50% of attempted suicides engaging in further DSH, and a fatal outcome in 16.5% (four) cases. A similar pattern emerged for failed suicides. These findings stand in marked contrast to a follow-up report on failed suicides from the Golden Gate, which suggested a good outcome (Rosen, 1976).

Almost one-third of all incidents occurred while subjects were in-patients and another third when they were out-patients, suggesting that detection of pathology was more successful than the subsequent interventions. Of jump category subjects, 44% had been seen by a doctor in the previous month – the majority by a psychiatrist. This finding is consistent with that of Murphy (1975*a, b*) who found that for 91% of deaths by overdose and 71% of suicides by other means subjects had been under the care of a physician, within the previous six months.

The three 'pranks' deserve brief mention. The exhibitionistic aspect of their behaviour was markedly different from that of the suicides. Their use of alcohol was not consistent with a serious intention to survive, and the possibility exists that some types of seriously reckless behaviour can occur that are on a par with suicide.

In conclusion, this study presents a different picture from previous studies of heterogeneous types of suicidal behaviour. The outstanding features of the subjects described are the severity of their psycho-

pathology, their high contact rates with care-givers and the unusually poor prognosis for failed and attempted suicides. If the figures for suicide by jumping contain an excess of very severely mentally ill subjects, it must be asked, which modes of suicide are associated with less disordered populations? Further studies of specific types of suicidal behaviour may provide insights previously obscured in studies examining more heterogeneous populations.

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