Adolescent suicidal behaviours: a population-based study of risk

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ABSTRACT

Background. Reports of adolescent suicidal behaviour have generally derived from clinical settings but population-based studies are likely to provide a clearer epidemiological view.

Methods. Non-fatal suicidal behaviours were studied in 1699 Australian 15- to 16-year-old secondary school students at 44 schools in the state of Victoria, Australia. Self-reported episodes of self-harm were characterized using items from the Beck Suicide Intent Scale.

Results. The 12 month weighted prevalence estimate for deliberate self-harm was 5·1%. The commonest forms were self-laceration (1·7%), self-poisoning (1·5%) and deliberate recklessness (1·8%). Self-poisoning and self-laceration were commoner in girls. The prevalence of 'true suicide attempts' was 0·2%. Most self-harmers did not perceive death as likely, plan self-harming episodes at length or inform others of the episodes. Psychiatric morbidity had the strongest association with self-harm, an association which held for all subtypes. Antisocial behaviour and substance abuse were associated with self-harm in girls but not boys. Sexual activity was independently associated with self-harm in both genders.

Conclusions. Deliberate self-harm was common but the great majority of episodes were not 'true suicide attempts'. It is, therefore, possible that attributable mortality and morbidity may be greater in self-harmers without definite suicidal intent.

INTRODUCTION

The emergence of suicide as a leading cause of death in the young in many Western countries has brought the epidemiology of suicidal behaviours to the forefront of public health challenges (Borges *et al.* 1995). Important epidemiological distinctions between completed suicide and non-fatal suicidal behaviours have now become evident. Suicide is a comparatively rare event that differs from non-fatal self-harm in its patterns of injury, gender ratio and age distribution. Nevertheless, clear links exist between non-fatal suicidal behaviour and completed suicide. Controlled retrospective studies have demonstrated high rates of previous non-fatal suicidal behaviour in young suicide victims

(Gould *et al.* 1990). Prospective studies have similarly emphasized the high subsequent suicide rates in clinically presenting suicide attempters (Hawton *et al.* 1993; Nordentoft *et al.* 1993).

This evidence linking non-fatal self-harm to later completed suicide has brought a particular focus on the study of non-fatal deliberate self-harm (Shaffi *et al.* 1985; Martunnen *et al.* 1992; Nordentoft *et al.* 1993). Suicide attempters presenting to emergency hospital departments have been the usual subjects in epidemiological studies of non-fatal suicidal behaviour in adolescents (Platt *et al.* 1988; Pfeffer *et al.* 1991; Brent *et al.* 1993; Kienhorst *et al.* 1995*a*). However, recent population-based data have indicated that a majority of suicide attempters do not present to clinical services, considerably weakening conclusions about putative risks for suicidal behaviour derived from casualty or inpatient settings (Harkavy-friedman *et al.* 1987;

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Diekstra, 1993). This may account for discrepancies evident in the literature on the relative importance of particular risk factors. Depression has, for example, often been implicated in the development of adolescent suicidal behaviour (Pfeffer *et al.* 1993). Many clinical reports have instead documented strong associations with conduct disorder, aggression and substance abuse (Apter *et al.* 1988; Shaffer, 1988; Brent *et al.* 1993). Such characteristics may be associated with a likelihood of inclusion in clinical samples and thus with potential bias in the estimation of risk. This study, therefore, examined suicidal behaviour in a community sample of Australian adolescents. In addition to detailing patterns of self-harm, this paper examines putative individual risk factors for single and multiple episodes of self-harm.

METHOD

Procedure and sample

Data were collected from subjects in the third wave of a statewide cohort study of adolescent health in Victoria, Australia between August and November 1993. This state has a population of 4·4 million of whom 63% live in the capital city Melbourne (Australian Bureau of Statistics, 1991). A two-stage cluster sampling procedure was used to define the study population. At stage one, forty-five schools were selected from a stratified frame of Government, Catholic and Independent schools using a probability sampling method based on school size and the number of schools in each educational sector (total student numbers 60905). At stage two, two single intact classes were selected at random, one at the first wave of data collection and the other 6 months later at the second wave of data collection when the sampling frame had moved into year 10. One school from the initial sample was unavailable for the cohort study leaving a total sample of 44 schools. Of these, 24 were government, 11 Catholic and nine independent private.

Subjects were in the latter part of year 10 at the third study wave, equivalent to the 11th year of full-time schooling. The study was presented as dealing with important health issues for adolescents and included questions on a broad range of health risk behaviours and mental health problems. Active consent for partici-

pation, including written parental permission had been sought at entry into the study. Twenty-eight laptop computers were used to administer the questionnaire to each class. Laptop computers offer a capacity to collect detailed data on variables of interest through the use of branched questionnaires. They offer enhanced confidentiality, a reduced influence of social desirability and defensiveness on responses, a capacity to correct mistakes and efficiency in data management (Hibbert *et al.* 1996).

Measures

Deliberate self-harm

This was evaluated using a modified version of the Beck Suicide Intent Scale (Beck *et al.* 1974) and a subject's description of self-harming episodes. In order to reduce exposure to unnecessary questions a stem question was used: 'In the LAST YEAR have you ever deliberately hurt yourself or done anything that you knew might have harmed you or even killed you?'. The stem was chosen to be over-inclusive and subjects who responded positively were then asked to describe nature and timing of the episode and were presented with self-report items derived from the Beck Suicide Intent Scale and which covered suicidal intent, planning, perceived lethality, perceived likelihood of recovery, timing and repetition. The description of self-harming events was post-coded into four subtypes corresponding to descriptions of self-harm in the clinical literature:

(*i*) self-laceration included cutting, piercing and burning (excluded self-decoration);

(*ii*) self-poisoning included deliberate overdose on therapeutic medication or consumption of other potentially toxic substances;

(*iii*) deliberate recklessness included risk taking with cars and trains, jumping from heights and reckless overuse of illicit drugs (reported self-harm involving the use of either alcohol or marijuana alone was not included);

(*iv*) self-battery included beating fists and hands into walls and other objects with evidence of significant bruising or cutting.

Description of self-harm involving restriction of eating, overuse of alcohol or marijuana alone were not included. Descriptions were independently rated by two child and adolescent psychiatrists (G.P. and M.S.). In instances of disagreement a consensus rating was used.

Responses judged to be outside these categories were not considered to be self-harming behaviours in the analysis. True suicide attempters were those who reported both a clear episode of self-harm and responded on the Beck Suicide Intent Scale that they had been 'Seriously trying to end their life at that time'.

Measures of risk associations
Psychiatric morbidity

This was evaluated using a computerized form of the CIS-R (Goldberg *et al*. 1970; Lewis *et al*. 1988; Lewis & Pelosi, 1992) a structured psychiatric interview designed for assessing symptoms of depression and anxiety in non-clinical populations. The CIS has previously been used a criterion measure for the definition of psychiatric caseness in teenage groups (Mann *et al*. 1983; Monck *et al*. 1994) and has an ease of reading consistent with its suitability for a teenage group (Flesch Reading Ease 78·5, Flesch Grade Level 7·1). These were summarized into a total score and stratified into four levels of psychiatric morbidity: level 1 (0–5), level 2 (6–11), level 3 (12–17) and level 4 ($\geqslant 18$). The stratification incorporates a suggested threshold of 12 for 'caseness', corresponding to the point where a general practitioner might be concerned about an adult subject's mental health (Lewis & Pelosi, 1992; Lewis *et al*. 1988).

Antisocial behaviours

These were evaluated with ten items selected from the self-report scale of Moffitt and Silva (Moffitt & Silva, 1988) to cover antisocial behaviours related to property damage (vandalism, car damage, making graffiti), interpersonal conflict (fighting, carrying weapons, running away from home, expulsion from school) and theft (stealing property from other, from parents, stealing cars). Antisocial behaviours were stratified on three levels to distinguish subjects with more global antisocial behaviours; two or more behaviours each reported on at least two occasions in previous 6 months, one behaviour on at least two occasions in the previous 6 months and no behaviour on more than one occasion in the past 6 months.

Alcohol and marijuana consumption

These were assessed using self reported frequency of use in the previous 6 months. This was followed by a 7-day retrospective diary for those who reported being at least occasional drinkers. The alcohol diary used a beverage specific approach and detailed types of drinks (e.g. low alcohol beer, normal beer, wine, spirits, mixed drinks) as well as the quantities consumed on each drinking day (Hilton, 1989).

Previous sexual activity

This was initially assessed with a question 'Have you ever had sex (gone all the way or had sexual intercourse)?' and further detailed in terms of age of initiation, frequency and number of partners.

Analysis

Data analysis was undertaken in the SAS (SAS Institute Inc. 1989) and Stata (Stata Corp, 1995) programs. Prevalence estimates were weighted by geographic areas to allow for chance under-sampling in particular areas of the state and adjusted for cluster sampling using estimation procedures in Stata that allow for complex survey design. Stratum weights for the overall estimation of prevalence rates were less than 1·5 for all but two of the 12 geographic regions of Victoria (weights of 2·0 in metropolitan west Melbourne, 2·2 in rural north) indicating a satisfactory geographical distribution of schools across the state. Prevalence estimates, odds ratios and kappa values are presented with 95 % confidence intervals (95 % CI). Logistic regression models, including tests of trend, were compared using the likelihood ratio χ^2 statistic.

RESULTS
Sample characteristics (Table 1)

From the total selected sample at outset of 2066 students, 1947 (94·2 %) had completed the questionnaire at least once by the third wave of data collection. At wave 3 1699 subjects completed the questionnaire, a response rate of 82·2 % of the total population originally selected for participation or 87·3 % of those who completed the survey at either of the two previous waves of data collection. Fifty-three (2·6 %) assessments of school-leavers were carried out at home or at another place of the student's choice. Of those not tested 64 (3 %) were absent on the day of testing, 94 (4·6 %) refused participation, 43 (2·1 %) had not returned consent forms and

Table 1. *Prevalence estimates (weighted) for deliberate self-harm in the previous* 12 *months in* 1699 *Victorian adolescents*

% (95% confidence intervals)	Male ($N = 811$)	Female ($N = 888$)	Total
Self-cutting ($N = 30$)	0·7 (0·1–1·2)	2·6 (1·5–3·6)*	1·7 (1·1–2·3)
Overdose ($N = 24$)	0·4 (0–0·8)	2·5 (1·4–2·5)†	1·5 (0·9–2·1)
Deliberate recklessness ($N = 27$)	2·1 (1·1–3·1)	1·6 (0·8–2·4)	1·8 (1·2–2·5)
Self-battery ($N = 12$)	1·1 (0·4–1·8)	0·4 (0·0–0·9)	0·7 (0·3–1·1)
Definite self-harm ($N = 86$)	4·0 (2·6–5·3)	6·4 (4·8–8·0)‡	5·1 (4·2–6·3)
True suicide attempt ($N = 5$)	0	0·4 (0–0·9)§	0·2 (0–0·5)

* Significant gender difference $\chi^2_1 = 7\cdot3$ $P = 0\cdot007$ (unweighted comparison); † significant gender difference Fisher's exact two tailed $P < 0\cdot001$ (unweighted comparison); ‡ significant gender difference, $\chi^2_1 = 6\cdot0$, $P = 0\cdot014$ (unweighted comparison); § gender difference Fisher's exact (2-tailed) $P = 0\cdot063$ (unweighted comparison).

Table 2. *Characteristics of deliberate self-harm subtypes given as a percentage of each group*

% of group	Perceived likelihood of death	Suicidal intent	Planning > 3 h	Repeated attempts ($\geqslant 3$)	Reported intention to another	Reported afterwards
Self-laceration ($N = 30$)	3	7	3	39	23	27
Self-poisoning ($N = 24$)	8	12	25	25	13	27
Deliberate recklessness ($N = 27$)	8	10	12	35	12	19
Self-battery ($N = 12$)	0	0	0	25	8	17
Definite self-harm ($N = 86$)	6	6	11	30	14	25
True suicide attempt ($N = 5$)	40	100	40	20	40	20
Insufficient information ($N = 41$)	5	9	11	27	9	13

145 (7·1%) subjects had left or changed school and contact information was not available at the time of survey. A further nine (0·4%) completed only part of the questionnaire and were excluded from the analysis. The mean age of the sample was 15·9 years (S.D. 0·5). The gender ratio (males 47·0%) was similar too that in Victorian schools (Australian Bureau of Statistics 1993*a*. A comparison of 254 (74%) non-participants with participants demonstrated no significant difference on gender, parental education, place of birth or ethnic background. There was significantly higher non-participation in those living in metropolitan Melbourne ($\chi^2_1 = 9\cdot1$, $P < 0\cdot003$) and those with higher rates of parental divorce ($\chi^2_1 = 27$, $P < 0\cdot001$).

Rates of deliberate self-harm

One hundred and thirty-seven subjects answered yes to the stem question concerning episodes of self-harm in the previous 12 months. Initial inter-rater agreement, using kappa as an index of agreement, for inclusion in the category of self-harm was 0·79 (95% CI 0·75–0·84) for those who responded positively to the initial stem question. Inter-rater agreement for the four

subcategories of self-harm was as follows: self-laceration 0·91 (95% CI 0·85–0·97), self-poisoning 0·86 (0·75–0·98), deliberate risk-taking 0·59 (0·43–0·76) and self-battery 0·87 (0·72–1·0). Forty-one subjects gave an insufficiently detailed description of the episode and were not included in the self-harming group but rather in a category of insufficient information and were considered separately in the data analysis. Subjects who reported probable true accidents ($N = 4$) and those who gave fatuous answers ($N = 6$) were categorized as non-harmers.

There remained therefore 86 subjects (30 male, 56 females) who gave a clear description of an episode of deliberate self-harm (Table 1). This corresponds to a 12-month weighted prevalence estimate of 4·0% of males and 6·4% of females. The overall prevalence estimate for the population was 5·1%. Females reported significantly higher overall rates of self-harm. 'True suicide attempts' were by comparison relatively uncommon with five subjects only, all female, falling into this group, giving an overall prevalence of 0·2%. If those in the category of insufficient information who indicated that they were seriously trying to end life are included,

Table 3. *Odds ratios* (*unadjusted and adjusted*) *from multiple logistic regression models of relationship of psychiatric morbidity to deliberate self harm* (N = 86) * *in year* 10 *Victorian secondary school students*

	Males (*N* = 811)		Females (*N* = 888)	
	Unadjusted odds ratio	Adjusted odds ratio	Unadjusted odds ratio	Adjusted odds ratio
Age in months	1·0 (0·5–1·9)	1·0 (0·4–2·1)	1·1 (0·6–2·0)	0·8 (0·3–1·8)
CIS				
0–5	1·0	1·0	1·0	1·0
6–11	2·2 (0·7–6·6)	1·7 (0·5–5·6)	2·6 (0·8–8·6)	2·4 (0·7–8·5)
12–17	7·8 (2·7–22)	6·2 (1·9–19·6)	9·2 (3·2–27)	7·1 (2·2–23)
⩾ 18	13 (4·9–33)	12 (4·1–35)	22 (8·5–58)	15 (5·1–42)
Antisocial behaviour				
No frequent behaviour	1·0	1·0	1·0	1·0
1 behaviour	0·9 (0·3–3·2)	0·6 (0·2–2·2)	5·3 (2·7–11)	2·2 (0·9–5·1)
Multiple behaviours	4·4 (2·0–9·7)	1·2 (0·4–3·6)	12 (5·8–26)	5·4 (2·0–15)
Weekly marijuana use	1·8 (0·5–5·9)	0·8 (0·17–3·7)	18 (7·8–40)	5·3 (1·7–17)
Frequent alcohol use				
⩾ 3 days in past week	6·6 (2·7–17)	2·5 (0·73–8·2)	6·1 (2·5–152)	1·8 (0·5–6·9)
Sexually active†	5·0 (2·4–10)	3·9 (1·6–9·6)	7·1 (4·0–12)	4·9 (2·4–10·1)
Parental divorce‡	0·4 (0·1–1·4)	0·3 (0·1–1·4)	1·8 (1·2–2·6)	1·4 (0·9–2·3)

* Analysis excluded subjects who reported self-harm but who gave insufficient information.
† Report of having had sexual intercourse.
‡ Report of parental divorce or separation at entry to the cohort.

this prevalence for suicidal self-harm increases to 0·5 %. Self-laceration and deliberate recklessness were the commonest subtypes of self-harm reported with prevalence estimates of 1·7 % and 1·8 % respectively. Both self-laceration and self-poisoning were significantly more common in females.

Characteristics of episodes of harm

Responses of the self-harming subjects on items from the Beck Suicide Intent Scale were examined by subtypes of self-harm (Table 2). Death was viewed as probable by 6 % of the self-harming group with similar rates in the self-poisoning and recklessness subgroups. Six per cent of self-harmers reported serious intent to end life with corresponding incidents reported in the self-laceration, self-poisoning and recklessness subtypes but not in the self-battery group. Planning for at least 3 h was largely confined to the self-poisoning and recklessness groups with the self-battery group standing out from the other subtypes by a low rate of planning. Thirty per cent of self-harmers reported at least two previous episodes of self-harm with little difference in rates of repetition across subtypes. In all 36 % of self-harmers reported the event to

others either before (14 %) or after (25 %) the self-harming episode. Non-significant trends for higher rates of perceived probability of death (Fisher's exact, 1-sided $P = 0.08$) and planning for more than 3 h (Fisher's exact, 1-sided $P = 0.08$) were found when 'true suicide attempters' were compared to other self-harmers. The group who provided insufficient information on their episode of self-harm reported similar rates of serious intent to kill themselves and planning and a non-significant trend for lower rates of disclosure either before or after the event ($\chi_1^2 = 2.0$, NS).

Multivariable analysis of associations with deliberate self-harm

A multivariable analysis examining the associations between psychiatric disturbance and self-harm was undertaken. Potential demographic confounders included in the model were age, gender and parental marital status. Measures of substance abuse, antisocial behaviour and whether sexually active were also included for this reason. An initial logistic regression analysis indicated effect modification by gender for antisocial behaviour effects and so two separate analyses are presented in Table 3.

Table 4. *Association between subtypes of self-harm and high psychiatric morbidity* ($CIS \geqslant 12$) *in Victorian secondary school students classified by gender. Odds ratios are shown with* 95% *confidence intervals*

	Males	Females	Combined group*
Self-laceration ($N = 30$)	19 (3·5–101)	11 (3·8–34)	13 (4·9–32)
Self-poisoning ($N = 24$)	—	24 (5·4–107)	27 (6·4–115)
Deliberate recklessness ($N = 27$)	4·1 (1·4–13)	3·7 (1·1–11)	3·7 (1·7–8·6)
Self-battery ($N = 12$)	7·4 (1·8–31)	6·8 (0·7–66)	7·2 (2·1–25)
Any self-harm ($N = 86$)	8·3 (3·8–18)	11 (5·3–22)	9·9 (5·8–17)
Insufficient information ($N = 41$)	8·5 (3·4–21)	4·4 (2·0–10)	5·6 (3·0–10)

* MH weighted odds ratio adjusted for gender.

Males

Psychiatric morbidity measured by the CIS held the strongest association with self-harm with 12-fold increase in the risk for the highest stratum. A test of the dose–response relationship with psychiatric morbidity revealed no significant departure from a linear trend (likelihood ratio $\chi^2_2 = 0.74$, NS). In the multivariable model the only other factor clearly independently associated with self-harm was being sexually active. No significant two-way interactions were found between the independent variables.

Females

Psychiatric morbidity held the strongest association with self-harm with a 15-fold increase in rates of self-harm in the highest category after adjusting for other variables. No significant departure from a linear trend was found (likelihood ratio $\chi^2_2 = 0.13$, NS). Frequent and multiple antisocial behaviours were associated with five-fold higher risks for self-harm. Weekly marijuana was similarly associated with an over five-fold rise in risk. Sexually active females carried a five-fold increase in risk for self-harm. No significant two-way interactions were found between the independent variables.

Psychiatric morbidity across subtypes of self-harm

The consistency of the association with high psychiatric morbidity across subtypes of self-harm was examined in separate analyses stratified by gender (Table 4). The high morbidity group (CIS 12 +) had an almost ten-fold higher rate of self-harm with similar size of association in males and females. High psychiatric morbidity carried a consistent significant association with each subtype of self-harm. Although a significant association was evident for all subtypes of self-harm, self-poisoning and self-laceration appeared associated with particularly high levels of psychiatric morbidity. The link with psychiatric morbidity was also evident in the group who reported self-harm but who failed to provide sufficient details of the episode for subtyping.

Associations with repeated self-harm

Self-harmers were divided into repeaters (two or more previous episodes of self-harm) and non-repeaters to examine factors associated with repeated attempts (Table 5). Being sexually active was the clearest associated factor with a three-fold elevation in risk for repetition. High psychiatric morbidity and report of frequent and multiple antisocial behaviours also showed trends for association with repeated harm.

DISCUSSION

Deliberate self-harm was reported by one in 20 adolescents in the previous 12 months with self-laceration, self-poisoning and deliberate risk-taking the behaviours most commonly reported. True suicide attempts were rare and reported by under one in 200 in this study. Psychiatric morbidity held the strongest associations with self-harm with males in the highest morbidity category reporting a 12-fold higher likelihood of self-harm and females a 15-fold increase. This substantial association between self-harm and psychiatric morbidity held across all subtypes of self-harming behaviour.

There has been no previous report of the prevalence of deliberate self-harm in a community sample of Australian adolescents. Comparison of these findings with reports from other

Table 5. *Odds ratios from comparison of repeated* *(N = 25) v. *non-repeating* (N = 58)
self-harmers

	Males (*N* = 30)	Females (*N* = 53)	Combined group†
High psychiatric morbidity (CIS ⩾ 12)	1·8 (0·97–3·4)	1·4 (0·76–2·4)	1·5 (1·0–2·4)
Frequent antisocial behaviours	1·6 (0·3–8·2)	3·3 (0·9–13)	2·5 (0·9–6·9)
Frequent drinking	0·7 (0·3–1·4)	2·1 (1·1–4·0)	1·3 (0·8–2·1)
Frequent marijuana use	0·9 (0·5–1·6)	1·2 (0·9–1·7)	1·1 (0·86–1·5)
Sexually active	1·4 (0·3–6·8)	4·9 (1·2–20)	2·9 (1·1–8·1)

* Repeating defined as two or more previous attempts.
† MH weighted odds ratio adjusted for gender.

countries is difficult because of variability in definitions of deliberate self-harm and suicide attempts. 'Parasuicide', a term commonly used by European researchers, has no agreed definition (Diekstra *et al.* 1995). 'Suicide attempt', commonly used in North American studies varies in the extent to which suicide intent is required for case definition (Spirito *et al.* 1989). This study's 12-month period prevalence rates for deliberate self-harm, nevertheless, fall between recent North American estimates for suicide attempts which range from 8 to 18 % (Smith & Craword, 1986; Anonymous 1991; Garrison *et al.* 1991) and the generally lower estimates of between 2·2 and 5 % in European studies (Garnefski *et al.* 1992; Skodol *et al.* 1994). The presence of suicidal intent has generally received little attention raising a possibility these suicidal behaviours are equivalent to the general category of deliberate self harm reported in this paper. Only Garrison *et al.* (1991) have reported on rates of suicidal self-harm and indeed those point estimates are the closest to this study's rate for suicidal self-harm.

The measurement strategy for suicidal behaviour adopted in this study differs from that employed in earlier epidemiological surveys. In most earlier studies respondents have reported the recent occurrence of self-defined suicide attempts using a stem question of the kind 'Have you attempted suicide in the past twelve months?'. In contrast the present study used a stem question which addressed the occurrence of deliberate self-harm without requiring a subject's initial judgement about suicidal intent. This strategy is consistent with reports that factors other than suicidal intent, such as a wish to escape from difficult circumstances or distressing mental states commonly underlie self-harming behaviours in the young (Kienhorst *et*

al. 1995*b*). This strategy should have raised the likelihood of reporting episodes of self-harm. It may also have extended the range of reported self-harming behaviours beyond self-poisoning to include self-laceration, deliberate recklessness and self-battery which have received little attention in previous reports.

Ethical considerations, specifically the wish to avoid suggesting potentially hazardous behaviours to a vulnerable subgroup of adolescents, determined the use of an open-ended rather than fixed format response for categorizing subtypes of self-harm. Comparison of ratings between two independent psychiatrists indicated satisfactory agreement both for an overall rating of self-harm as well as for subcategories. Nevertheless it is likely that some true self-harmers have been excluded from analysis as they provided insufficient information on the self-harming episode with a consequent lowering of estimated prevalence. A final measurement consideration arises from the different time frames for the measures of psychiatric morbidity and antisocial behaviour, leaving uncertainty as to whether risks reported in this paper have an equivalent temporal relationship to the self-harming episode.

This study sample was drawn from a representative frame of Victorian secondary schools but is potentially open to selection bias at three points. Time limitations at the initial survey reduced the number of participating schools from 60 to 44. Despite findings that the study sample conformed to an expected school type, gender and geographic distribution, the possibility of selection bias in schools cannot be totally excluded. Secondly, there is evidence that early school leavers, not included in this study's sampling frame, have higher levels of psychiatric morbidity (Anonymous 1994). School retention

rates of 98 % to year 9 for Victoria in the year of initial sampling should have minimized this bias (Australian Bureau of Statistics, 1993*b*). A third, potentially more important, source of bias arises from non-participation in the targeted sample. Although study response rates were high, non-participants differed significantly on some demographic characteristics leaving open a possibility of some bias in estimates of prevalence rates and associations.

Risks for deliberate self-harm

Psychiatric morbidity as measured by the CIS held a strong, independent and linear association with deliberate self-harm in both genders. This finding is consistent with the similar strong relationships reported between suicide attempts and major depression in North American samples (Garrison *et al.* 1991; Andrews & Lewinsohn, 1992). A further examination of the association between psychiatric morbidity and self-harm found a substantial association for each subtype. These findings are consistent with a view that mental disorders characterized by high rates of depression and anxiety are a major risk factor for adolescent suicidal behaviours.

Previous evidence of an association between antisocial and suicidal behaviour has been contradictory (Garrison *et al.* 1991; Andrews & Lewinsohn, 1992; Jeanneret, 1992). In the present study, a clear association between self-harm and frequent multiple antisocial behaviours was found for females, where this group reported a five-fold higher rate after adjustment for confounding factors. No significant association was found for males. Independent associations with frequent substance use were similarly evident only for females. These findings appear to contradict a suggestion that suicidal behaviour is more likely to be associated with antisocial behaviour in boys and depressive symptoms in girls, though it remains possible that a different pattern of association may be found in other age groups or in self-harmers with definite suicidal intent (Shaffer, 1988).

Sexually active adolescents reported high rates of self-harm with a four-fold rise in males and a five-fold rise in females. Although previously suspected in clinically presenting suicide attempters, this striking association with sexual activity has not hitherto been the subject of close scrutiny (Adcock *et al.* 1991). The mediation of this association is not immediately clear. It is possible that sexual activity carries with it a higher risk for adverse life events, an association with suicidal behaviour noted previously (Garrison *et al.* 1991). Alternatively this association may reflect unmeasured personality (e.g. impulsivity) or psychosocial characteristics (e.g. familial discord) which lead to both early sexual activity and higher rates of self-harm.

Concepts of suicidal behaviour

Thorny conceptual and definitional problems remain in the study of adolescent suicidal behaviours (Borges *et al.* 1995). Self-laceration has generally been viewed as distinct from other suicidal behaviour in its likelihood of repetition, presence of suicidal intent and associated psychopathology (Pattison & Kahan, 1983). However, this view derives from work with small clinical samples and has received little attention in population-based studies. Deliberate recklessness and risk taking have also been viewed as distinct from clinically presenting suicide attempts but supportive data have been scant (Clark *et al.* 1990). In the present study similarities between subtypes of self-harm were more striking than differences. Rates of suicidal intent, perceived likelihood of death or repetition differed little between self-laceration, self-poisoning and recklessness subtypes. In all subtypes psychiatric morbidity held a strong association. Taken in conjunction with the finding that self-poisoning was not the commonest reported form of self-harm there appears to be a case for extending the study of suicidal behaviour to these other forms of self-harm.

It has been suggested that both a limited understanding of the lethality of different means of self-harm as well as limited access to means may affect the choice of self-harming method in the young (Kienhorst *et al.* 1995). Deliberate self-harm took a variety of different forms in this study and the means of self-harm revealed little of the seriousness of the episode. The overlap between deliberate recklessness and other forms of suicidal behaviour may provide an explanation for high rates of accidental death in clinically presenting suicide attempters (Nordentoft *et al.* 1993). Trends for death to be perceived as more likely and planning to be commoner in the group of 'true suicide attempters' provides cautious support for the

validity of the distinction between suicidal and non-suicidal self-harm (Harkavy-friedman *et al.* 1987). As a result of the comparatively low prevalence of 'true suicide attempts', there nevertheless remains a question of whether attributable morbidity and mortality may eventually prove greater in adolescent self-harmers without suicidal intent.

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