Suicidal behaviours in vulnerable adolescents

Time trends and their correlates

ERIC FOMBONNE

Background Suicide rates have increased over the past three decades, especially in young men. Depression, conduct disorder, crime and substance misuse have also increased. This study tested hypotheses on the possible links between the secular increase in the rates of these behaviours.

Method A data set on 6091 subjects aged 8–18 years (58.4% boys) referred to psychiatric services over a 21-year period (1970–1990) was used. A detailed analysis of a random sample of 80 case notes was conducted.

Results Suicidal behaviours increased significantly among pubertal male adolescents only (n=1313). In this subsample, substance misuse accounted for the increase over time. The rates of both suicidal behaviours and of substance misuse almost doubled between 1979 and 1990 in this patient group. The case note analysis showed that solvent and alcohol misuse had also increased over the study period. Moreover, among the subjects misusing substances, alcohol was the only substance with a strong and positive association with suicidal behaviours. Substance misuse pre-dated suicidal behaviours in most patients.

Conclusions A link has been found between the increase over time of suicidal behaviours in adolescent boys and a contemporaneous increase in substance misuse. The strength and direction of the association suggests that alcohol misuse is the causal factor.

Suicide rates have gone up during the past three decades, especially in young males (Diekstra, 1993). Male gender, disrupted family background, past suicide attempts and psychiatric disorders, especially comorbid presentations, consistently predict suicide (Shaffer *et al*, 1996). Although rates of psychiatric disorders have also gone up during the same period (Fombonne, 1998), few studies have examined connections between secular changes in rates of suicide and of psychiatric disorders (Rutter & Smith, 1995). Correlational studies and time series analyses of suicide rates have yielded inconsistent results, due to methodological limitations. Only one study relying on person-based data suggested however a stronger association of suicide with depression and alcohol misuse over time (Carlson *et al*, 1991). To investigate the secular increase in suicide, one strategy is to focus on high-risk subjects for whom person-based data are available both on correlates of suicidal behaviours and over time. Since psychiatric disturbances and past suicidal behaviours are strong risk factors for completed suicide (Hawton *et al*, 1993; Shaffer *et al*, 1996), the study of suicidal psychiatric patients provides an obvious opportunity. Psychiatric disorders predict seriousness (Fergusson & Linskey, 1995; Beautrais *et al*, 1996*a*), repetition of suicide attempts (Hawton *et al*, 1989) and subsequent suicide following an initial attempt (Hawton *et al*, 1993), with comorbidity between mental disorders being an additional risk factor (Suominen *et al*, 1996). The specific aims of this study were: (a) to investigate whether or not suicidal behaviours in adolescents referred for psychiatric treatment had increased over a 21-year period, and (b) if (a) were true, to identify factors explaining the secular increase.

METHOD

Subjects

All patients attending out-patient and in-patient services of the Child and Adolescent Psychiatry Department of the Bethlem and Maudsley Hospitals (south London) between the years 1970 and 1990 included in the database were studied (n=7589). The joint hospitals provide a local catchment area service and also serve as a tertiary referral centre for the Greater London area and beyond. After exclusion of subjects younger than eight years or older than 18 years, and of patients with a diagnosis of autism or moderate to profound learning disabilities, the sample available comprised 6091 subjects (58.4% boys) with a mean age of 12.7 years (s.d.=2.5) at presentation.

Data

Psychiatric assessments were conducted by registrars or consultants and involved a separate interview of the child and of the parents, a review of family history, family circumstances and interactions, psychosocial stressors, a physical examination and an inspection of school reports. After the initial assessment, a summary sheet containing data on psychiatric symptoms (0=not present; 1=minimal; 2=definitely present), psychological, medical and sociodemographic characteristics and family circumstances, has been systematically completed by psychiatric registrars and senior medical staff. The resulting data set is unique in providing one of the longest run of data on child and adolescent psychiatric patients.

From the summary item sheet, one item (suicidal ideas, attempt or threat) was used to select patients with suicidal behaviours at referral, defined as definitely present for this item. Data were available for 51 further psychiatric symptoms, tapping different domains of disturbance (11 emotional and six somatic; 12 speech, language and motor; 12 conduct symptoms; seven disturbed relationships; and three other). In addition, variables on pubertal status (prepubertal *v.* pubescent/pubertal), family history of suicide or psychiatric contact on either side (positive or not), family circumstances (living with both parents *v.* other situations), police contact or court attendance (yes or no) were used as covariates. For the covariates, codings of minimal and definitely present were collapsed into a single category (present). All these variables had been recorded with a stable format throughout the study period; other data recorded only since 1978 on abnormal psychosocial situations could not be used for this investigation. Psychiatric diagnoses were recorded

https://doi.org/10.1192/bjp.173.2.154 Published online by Cambridge University Press

throughout the period in a format consistent with ICD-9 (World Health Organization, 1978); broad diagnostic groupings were used to describe the sample.

Statistical analysis

Logistic regression analysis was used to identify factors predictive of suicidal behaviours. Time trends were assessed using period of referral defined by seven bands of three years each, from 1970–1972 to 1988–1990. Odds ratios associated with this variable correspond therefore to the change in the risk of the outcome for every increase of three years (one unit) on the time scale. Throughout, a P value of 0.05 was retained as the level of statistical significance.

RESULTS

Developmental factors and time trends

In the entire sample (n=6091), suicidal behaviours were significantly and independently associated with pubertal maturity, gender and age. Subsequently, the sample was divided in four groups according to gender and pubertal status. Separate logistic regression models were fitted to each subset with suicidal behaviours as the dependent variable and period of referral as a predictor. No significant effect of period of referral was found for prepubertal girls (odds ratio=0.96; 95% CI: 0.80–1.16; NS) and boys (odds ratio=1.06; 95% CI: 0.93–1.21; NS). Similarly, no increase over time was found for pubertal girls (odds ratio=1.02; 95% CI: 0.96–1.09; NS). By contrast (see Fig. 1), a significant effect of period of referral was found for adolescent boys (odds ratio=1.12; 95% CI: 1.02–1.23; P=0.014).

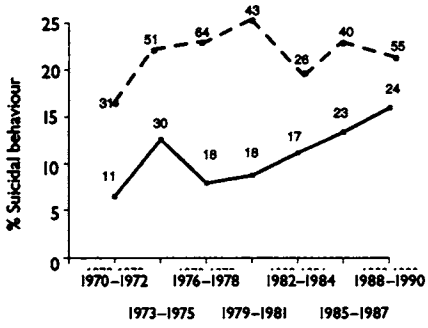


Fig. 1 -

Suicidal behaviours in adolescents: time trends for boys (n=1313; odds ratio=1.12/3 years; P=0.014) and girls (n=1439; odds ratio=1.02/3 years; NS). -■-, boys; --■--; girls.

Table 1 Sample characteristics

	Not suicidal (n=1172)	Suicidal (n=141)
Mean age, years (s.d.)	14.3 (1.5)	14.6 (1.4)
Psychiatric diagnosis (%)		
Conduct disorder	30.7	14.9
Mixed disorder of conduct and emotions	13.2	12.1
Emotional/neurotic disorder	21.3	37.6
Development disorder	2.3	1.4
Psychosis	4.3	11.3
Other diagnosis	16.5	15.7
No diagnosis or missing	11.6	7.1

Analyses were subsequently restricted to the subsample of 1313 male adolescents (see Table 1). Although the proportion of patients with pure conduct disorders was higher at the beginning of the study period, it remained steady (average 26.5%) from 1973 to 1990 (χ^2=9.5; d.f.=5; NS) when the increase took place. In order to detect other possible referral biases, analyses were repeated excluding in turn each clinical team, and the results were essentially unchanged. The time trend also remained the same when analyses were restricted to subjects with either a Greater London (n=774; odds ratio=1.12; P=0.07) or a local (n=435; odds ratio=1.11; P=0.32) address, the variation in statistical significance merely reflecting decreasing sample size.

Individual correlates of suicidal behaviours

Of the 1313 male patients, 141 subjects (10.7%) had exhibited definite suicidal behaviours during the initial assessment; the rate of suicidal behaviour was 6.5% (n=11/170) in the 1970–1972 period and 16% (n=24/150) in the 1988–1990 period. Univariate analyses were performed to identify psychiatric symptoms and background characteristics which were statistically associated with suicidal behaviours. Of the 55 predictors examined, 29 variables were retained based on a large P value <0.25 (Hosmer & Lemeshow, 1989), including age, family circumstances, court/police contacts and 26 psychiatric symptoms (10 emotional, three somatic, five conduct, five relationships and three other). Logistic regression analysis was then conducted with a stepwise selection of candidate variables. Three predictors remained in the final model: morbid depression, sadness, unhappiness, tearfulness (odds ratio=6.6; 95% CI: 3.9–11.2; $P<0.001$), disturbance of sleeping (odds ratio=4.0; 95% CI: 2.6–6.1; $P<0.001$), and taking drugs (odds ratio=3.5; 95% CI: 1.9–6.2; $P<0.001$). The model fit to the data was good (Hosmer–Lemeshow goodness-of-fit statistic: C=4.7; d.f.=3; P=0.19).

Explaining the time trend

The significance of the time trend was reassessed in order to identify which, if any, of these three predictors accounted for the increase of suicidal behaviour over the study period (Table 2). First, we fitted a model containing the three predictors and added period of referral as an additional explanatory variable. Period of referral was no longer significant (odds ratio=1.08; 95% CI: 0.98–1.20; P=0.13) once the effect of the three psychiatric symptoms was already taken into account, suggesting therefore that the increase over time had been captured by the psychiatric correlates of suicidal behaviour. We then fitted three separate models to the data, each of them being based on only two out of the three predictive psychiatric symptoms, and reassessed at each step the significance of period of referral. When taking drugs was removed from the model, period of referral became significant again whereas this was not observed when the other two predictors were deleted from the model (Table 2).

Table 2 Predicting suicidal behaviours: effect of period of referral in different logistic regression models

Sets of predictors	Period of referral		
	OR	95% CI	P
No other predictor	1.12	1.02–1.23	0.014
Full model (depression+ sleep disturbances+ taking drugs)	1.08	0.98–1.20	0.13
Full model minus			
Depression	1.08	0.98–1.19	0.12
Sleep disturbances	1.09	0.98–1.20	0.10
Taking drugs	1.12	1.01–1.23	0.029

https://doi.org/10.1192/bjp.173.2.154 Published online by Cambridge University Press

These results suggested that the increased rate of suicidal behaviours could be attributed either to increased rates of substance misuse over the study period or to changes in the strength of the association between suicidal behaviours and substance misuse. In order to test the latter hypothesis, we fitted an additional model with period of referral × taking drugs; the results for this interaction term were non-significant, suggesting that no modification had occurred over time in the strength of the association between suicidality and substance misuse and that the rate of drug misuse had indeed increased. A graphical display of the data confirmed that substance misuse significantly increased from 4.1% in 1970–1972 to 14% in the last period among referred adolescent boys (see Fig. 2). It is of interest that family breakdown, which significantly increased from 28% in 1970–1972 to 46% in 1988–1990 (χ^2=33.8; d.f.=6; P<0.001), was not predictive of suicidality in this sample; similarly, it is worth noting that depression, although strongly associated with suicidality, did not account for the secular increase of suicidal behaviours.

Several steps were then undertaken to ascertain the validity of this association and assess its possible causal nature. First, we predicted that, if there was a true association between increasing rates of substance misuse and of suicidal behaviours among males, no increase of substance misuse should be found among females for whom no increase in suicidal behaviours had been detected. Indeed, taking drugs did not show an increase over time among females (odds ratios=0.98; 95% CI: 0.89–1.07; NS), although the average rates over the study period were comparable for girls and boys (8.3% *v.* 7.3%; χ^2=0.87; d.f.=1; NS). Second, inspection of the graphs indicated that the timing of the increase was similar for both behaviours and most evident after 1978. Thus, male suicidal behaviours increased steadily from 8.8% in 1979–1981 to 16% in 1988–1990 with a close similarity for substance misuse which rose from 7.8 to 14% during the same interval. The two time series of behavioural problems were differenced and cross-correlation plots were produced. No significant correlation was found for all lags, indicating that both behaviours had gone up in parallel. Further, in order to examine the validity of the computerised data, a case note study was conducted. We also wanted to obtain insights on the number and nature of the substances misused by these vulnerable adolescents.

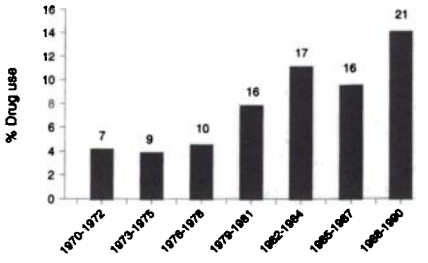


Fig. 2 Drug use among adolescent boys (n=1308) odds ratio=1.29/3-year period (P<0.001). The numbers above the bars correspond to the numbers of patients.

Case note study

A set of 88 medical notes were randomly selected among the 210 subjects with an entry of either of the target behaviours (141 with suicidal behaviours, 91 with substance misuse, 22 with both). Notes could not be found for eight subjects, leaving a sample of 80 notes which were subsequently examined by two raters, blind to the database information. Suicidal behaviours were considered to be present if there was evidence of either a suicide attempt or a report by any informant of suicidal ideas/plans in the psychiatric history of the patient. Substance misuse was scored whenever there was mention in the notes of a maladaptive pattern of substance use leading to adverse consequences, and the type noted. Substance misuse was not scored if misuse only occurred as part of a suicide gesture. Dependency could not be assessed with accuracy and appeared to be unfrequent. Whenever it was possible, the age of onset of both behaviours was noted.

Interrater reliability on the presence of suicidal behaviour or substance misuse was high (κ>0.85). All notes with a computer code of suicidal behaviour (n=63) contained evidence of suicidality, consisting of 37 suicide attempts (59%) and of suicidal ideation or plans for the remaining 26 subjects (41%). In the 39 notes with taking drugs as an entry, clear-cut evidence of drug or alcohol misuse was found in 38 cases (97%). Suicidality and substance misuse were reported in three and five medical summaries respectively where it had not been recorded. After exclusion of one case with no details of either behaviour, the sample available for further analysis contained 79 subjects (66 suicidal patients and 43 patients misusing substances, 30 patients having both behaviours).

Alcohol was the most frequently misused substance (74%), followed by cannabis (60%), solvents (39%), amphetamines (28%), medical drugs such as diazepam or barbiturates (21%) and lysergic acid diethylamide (LSD) (11.6%). Heroin, cocaine and other products were used by less than 10% of the sample. For each substance, the rate of misuse was then compared for the periods 1970–1979 and 1980–1990 (Table 3). A significant decline was observed for medical drugs, amphetamines and LSD. Rates remained steady for cannabis. An increase was found both for solvents and alcohol misuse, the latter falling just short of statistical significance. In order to test the possible contribution of these two substances to the increase over time of suicidal behaviours, we assessed the extent to which their misuse was predictive of suicidality among those misusing them, and of suicidal severity among suicidal patients. Among suicidal subjects, severity (defined as suicidal attempts as opposed to suicidal ideas or plans) was significantly associated with alcohol misuse (odds ratio=4.2; 95% CI: 1.3–13.3; P=0.015). However, other types of substance misuse (amphetamines, heroin, cocaine, medications) had a similarly positive association with suicidal severity, albeit not significant owing to the lower number of subjects misusing each drug. The misuse of any substance was strongly predictive of suicidal severity in suicidal patients (odds ratio=4.8; 95% CI: 1.6–14.6; P=0.006). Among patients misusing substances, alcohol misuse was found with significantly higher rates among suicidal subjects compared to non-suicidal subjects (83.3% *v.* 53.8%; χ^2=4.1; d.f.=1; P=0.04) whereas no other substance had a significant or even positive association with suicidality in this group (Table 3).

Finally, the temporal sequence between suicidal behaviours and substance misuse was assessed among the 30 patients with both behaviours. In 18 cases where this sequence could be evaluated unequivocally, substance misuse had preceded suicidal behaviours in 16 cases (89%). To summarise, alcohol misuse was the only behaviour showing both an increase over the study period and a strong and positive association with suicidality. Taken in conjunction with the high rate of alcohol misuse among substance misusers, this finding points towards the likely causal effect of alcohol misuse on the secular increase of suicidality in this sample.

https://doi.org/10.1192/bjp.173.2.154 Published online by Cambridge University Press

Table 3 Types of substance misuse: association with suicidality and period of referral among 43 misusers

	Suicidality			Period of referral		
	OR	95% CI	P	1970–1979 (n=21), %	1980–1990 (n=22), %	P[1]
Alcohol	4.3	1.0–18.3	0.05	61.9	86.4	0.088
Cannabis	0.6	0.1–2.3	NS	61.9	59.1	NS
Solvents	0.4	0.1–1.6	NS	28.6	50.0	0.15
Medications	0.5	0.1–2.0	NS	42.9	–	0.001
Amphetamines	0.5	0.1–2.0	NS	42.9	13.6	0.045
Lysergic acid diethylamide	0.6	0.1–4.2	NS	23.8	–	0.021

1. Fisher's exact tests.

DISCUSSION

Secular increase in suicidality

This investigation provides strong evidence that suicidal behaviours have increased over time among vulnerable male adolescents referred for psychiatric services. Although the behaviour studied here encompasses suicidal ideas, plans and attempts, and as such is different from completed suicide, the increase over time is strikingly convergent with UK epidemiological trends for suicide both for their male specificity and their timing (McClure, 1994). Since past suicidal attempts and psychiatric disorder are the strongest predictors of completed suicide (Hawton *et al*, 1993; Shaffer *et al*, 1996), similar trends for suicidal behaviours in high-risk subjects and for suicide rates were indeed expected. The correlates of the secular changes observed in our sample are therefore highly relevant to an understanding of population trends in suicide rates.

Referral biases and internal validity

The findings could be regarded as spurious since they derive from a dataset based on routinely collected clinical information. However, there are four main reasons to dismiss that argument. First, although reliance on a high number of raters could indeed result in imprecise data, the fact that raters were obviously blind to the study design and hypothesis is a particular strength of this investigation. In addition, measurement errors for each behaviours are bound to have occurred independently; therefore, non-differential misclassification could only have attenuated relationships between variables but it could not have resulted in a spurious positive association. Second, the case note analysis showed that the validity of the item sheet data was excellent. Third, the fact that the association was specific to males and that, to a large extent, the increase for both suicidal behaviours and substance use was confined to a segment only of the study period, also argues against pervasive measurement error as a source of bias. Last, subgroup analyses showed that the secular increase was not attributable to referral to particular teams or to changes over time in the diagnostic composition of the sample, and that it applied as well to patients living in the catchment area, thus ruling out particular referral biases to a tertiary centre.

Suicidality and substance misuse

Consistent with other studies of adolescent attempted (Deykin & Buka, 1994; Fergusson & Lynskey, 1995; Beautrais *et al*, 1996*b*) and completed (Marttunen *et al*, 1991; Hawton *et al*, 1993; Brent *et al*, 1993; Shaffer *et al*, 1996) suicide, suicidality had a strong and independent association with symptoms of depression and of substance misuse in this large sample of males referred for psychiatric services. Among those misusing substances, polysubstance misuse was the rule; alcohol was both the most frequently misused substance and the only substance to have a strong association with suicidality. Moreover, as found in other studies where the direction of this association was investigated (Fowler *et al*, 1986; Shaffer *et al*, 1996), substance misuse predated suicidal behaviours in most subjects suggesting that substance misuse led to subsequent suicidality. It could nevertheless be argued that, rather than reflecting a direct causal influence of alcohol on the development of suicidal phenomena, these findings merely indicate that alcohol misuse and suicidal propensity share an unmeasured common cause origin. However, the association between substance misuse and suicidality appeared highly specific to alcohol misuse whereas no other substance was predictive of suicidality among substance misusers. Therefore, this discriminate pattern of results makes it less plausible that confounding psychosocial characteristics, which are likely to be shared by all substance misusers irrespective of the type of substance misused, could have accounted for the findings. In addition, findings from other clinical, epidemiological and biological studies provide additional credence to our results. Among adolescents, alcohol misuse has already been shown to predict suicidal severity (Deykin & Buka, 1994; Garrison *et al*, 1993), seriousness of suicidal attempts (Beautrais *et al*, 1996*a*) and completed suicide (Marttunen *et al*, 1991; Hawton *et al*, 1993; Brent *et al*, 1993; Shaffer *et al*, 1996). In adults too, alcohol disorders are associated with an increased mortality by suicide in follow-up studies of patients with alcohol dependency (Black *et al*, 1985), and are correlates of attempted (Hawton *et al*, 1989; Beautrais *et al*, 1996*b*), of repeated suicidal attempts (Hawton *et al*, 1989) and of completed suicide (Conwell *et al*, 1996). Biochemical studies have also shown decreased serotonin turnover in the cerebrospinal fluid and platelets of suicidal (Pandey *et al*, 1995), depressed (Asberg *et al*, 1976) and alcohol dependent (Sellers *et al*, 1992) patients, providing with a plausible biological mechanism underlying the association.

Linking the secular increase in suicidality to alcohol misuse

The key finding of this study consists of the linkage of the increase over time in suicidal behaviours with a similar increase in another psychiatric disorder, namely alcohol misuse. Evidence for a causal association was provided by the close temporal relationship between the two series of rates of problem behaviours, by the specificity of the time trends in relation to gender and by the analysis of case notes which showed that alcohol misuse had increased over time in this sample, predicted suicidal severity and suicidality among subjects misusing substances and had pre-dated suicidal behaviours. Somewhat similar findings of an increased rate of alcohol misuse and depression in recent male suicidal deaths have been reported (Carlson *et al*, 1991); our results, however, indicate that alcohol misuse and not depression or other

https://doi.org/10.1192/bjp.173.2.154 Published online by Cambridge University Press

confounding psychosocial factors, is the mechanism involved in the secular increase and that it applies to a broader class of adolescent suicidal phenomena. Interestingly, Hawton *et al* (1989) have reported an increase over time in the proportion of male suicide attempts associated with alcohol dependency. Positive blood alcohol determinations also rose from 12.9% in 1968 to 46% in 1983 among Pennsylvania suicide victims, with rates for other drugs remaining steady (Brent *et al*, 1987). Furthermore, since the increase in suicide rates has been largely confined to young males (Diekstra, 1993), it was expected that the risk factors underlying these trends would exhibit similar age and gender associations. Prevalence rates of alcohol use increase sharply throughout adolescence, with heavy drinking being a consistent male feature (Johnston *et al*, 1995). Moreover, per capita alcohol consumption has increased during the past 40 years in most countries (Rutter & Smith, 1995) and studies based on aggregate data also point toward a linkage of trends in alcohol consumption and suicide rates (Gruenewald *et al*, 1995; Mäkelä, 1996). Our results derive from individual rather than aggregate data, providing even stronger evidence that increased alcohol misuse has played a causal role in the secular increase in youth suicidality.

Other findings and implications

Some negative findings of this investigation are also worth noting. Changes in patterns of family life and increased rates of crime and depression have been hypothesised as putative factors to explain the increased rates of youth suicide (Diekstra, 1993). However, in this sample of referred male adolescents, symptoms of conduct disturbances and family breakdown were not associated with suicidal behaviours; and although depression was a very strong correlate of suicidality, it did not account for the changes over time. To what extent similar findings would be obtained in a non-referred sample of adolescents requires, nevertheless, further testing.

These results were obtained in a sample of youths referred for psychiatric services and their replication in epidemiological samples is clearly needed. However, the findings provide an important lead in several domains of research into suicide and they are also relevant to public health issues, particularly with the increased popularity of 'designer' drinks among youths (Newcombe *et al*, 1994; Hughes *et al*, 1997). Two targets of the Health of the Nation initiative are to reduce suicide rates and excessive drinking among men. The recognition of an overlap between these two targets might help to improve public policies and recommendations addressing these problem behaviours. Efforts should be deployed to screen child psychiatrists' patients more systematically and to educate these vulnerable subjects about the detrimental effects of alcohol misuse.

CLINICAL IMPLICATIONS

- Suicidal male adolescents should be systematically screened for drug and alcohol misuse.
- Suicide prevention programmes should target specifically youths who misuse drugs and alcohol.
- Psychiatric services should include information and educational packages focusing on the dangers of substance misuse, particularly with suicidal adolescents.

LIMITATIONS

- The link between alcohol misuse and increasing rates of suicidal behaviour applies to suicidal ideas and attempts, and it remains to be established that a similar link applies to completed suicide.
- The findings derived from adolescents referred to one London hospital and replication of the findings at other sites and in epidemiological samples is necessary.
- Owing to the retrospective nature of the data, there were limitations in the measurement of risk factors and confounding variables available for the analysis.

ERIC FOMBONNE, MRCPsych, Medical Research Council Child Psychiatry Unit, Institute of Psychiatry, Denmark Hill, De Crespigny Park, London SE5 8AF. Tel: 0171-919-3474; Fax: 0171-708-5800; e-mail: e.fombonne@iop.bpmf.ac.uk

(First received 20 November 1997, final revision 8 April 1998, accepted 21 April 1998)

ACKNOWLEDGEMENT

I thank Rachel Lattal for her contribution to the case note analysis.

REFERENCES

Asberg, M., Thoren, P., Traskman, L., *et al* (1976) Serotonin depression: a biochemical subgroup within the affective disorders? *Science*, **191**, 478–480.

Beautrais, A. L., Joyce, P. R. & Mulder, R. T. (1996*a*) Risk factors for serious suicide attempts among youths aged 13 through 24 years. *Journal of the American Academy of Child and Adolescent Psychiatry*, **35**, 1174–1182.

—, —, —, *et al* (1996*b*) Prevalence and comorbidity of mental disorders in persons making serious suicide attempts: a case-control study. *American Journal of Psychiatry*, **153**, 1009–1014.

Black, D. W., Warrack, G. & Winokur, G. (1985) The Iowa record-linkage study. I. Suicides and accidental deaths among psychiatric patients. *Archives of General Psychiatry*, **42**, 71–75.

Brent, D. A., Perper, J. A. & Allman, C. J. (1987) Alcohol, firearms, and suicide among youth: Temporal trends in Allegheny County, Pennsylvania, 1960 to 1983. *Journal of the American Medical Association*, **257**, 3369–3372.

—, —, Moritz, G., *et al* (1993) Psychiatric risk factors for adolescent suicide: case–control study. *Journal of the American Child and Adolescent Psychiatry*, **32**, 521–529.

Carlson, G. A., Rich, C. L., Grayson, P., *et al* (1991) Secular trends in psychiatric diagnoses of suicide victims. *Journal of Affective Disorders*, **21**, 127–132.

Conwell, Y., Duberstein, P. R., Cox, C., *et al* (1996) Relationships of age and axis I diagnoses in victims of completed suicides: a psychological autopsy study. *American Journal of Psychiatry*, **153**, 1001–1008.

Deykin, E. Y. & Buka, S. L. (1994) Suicidal ideation and attempts among chemically dependent adolescents. *American Journal of Public Health*, **84**, 634–639.

Diekstra, R. (1993) The epidemiology of suicide and parasuicide. *Acta Psychiatrica Scandinavica Supplementum*, **371**, 9–20.

https://doi.org/10.1192/bjp.173.2.154 Published online by Cambridge University Press

Fergusson, D. M. & Lynskey, M. T. (1995) Suicide attempts and suicidal ideation in a birth cohort of 16-year-old New Zealanders. *Journal of the American Academy of Child and Adolescent Psychiatry*, **34**, 1308–1317.

Fombonne, E. (1998) Increased rates of psychosocial disorders in youth. *European Archives of Psychiatry and Clinical Neuroscience*, **248**, 14–24.

Fowler, R. C., Rich, C. L. & Young, D. (1986) San Diego suicide study. II: Substance use in young cases. *Archives of General Psychiatry*, **43**, 962–965.

Garrison, C. Z., McKeown, R. E., Valois, R. F., *et al* (1993) Aggression, substance use, and suicidal behaviors in high school students. *American Journal of Public Health*, **83**, 179–184.

Gruenewald, P. J., Ponicki, W. R. & Mitchell, P. R. (1995) Suicide rates and alcohol consumption in the United States, 1970–89. *Addiction*, **90**, 1063–1075.

Hawton, K., Fagg, J. & McKeown, S. P. (1989) Alcoholism, alcohol and attempted suicide. *Alcohol and Alcoholism*, **24**, 3–9.

——, ——, Platt, S., *et al* (1993) Factors associated with suicide after parasuicide in young people. *British Medical Journal*, **306**, 1641–1644.

Hosmer, D. W. & Lemeshow, S. (1989) *Applied Logistic Regression*. New York: Wiley and Sons.

Hughes, K., MacKintosh, A. M., Hastings, G., *et al* (1997) Young people, alcohol, and designer drinks: quantitative and qualitative analysis. *British Medical Journal*, **314**, 414–418.

Johnston, L. D., O'Malley, P. M. & Bachman, J. G. (1995) *National Survey Results on Drug Use From the Monitoring the Future Study, 1975–1994. Volume I: Secondary School Students*. NIDA-NIH Publication 95–4026. Washington, DC: US DHHS.

McClure, G. M. G. (1994) Suicide in children and adolescents in England and Wales 1960–1990. *British Journal of Psychiatry*, **165**, 510–514.

Mäkelä, P. (1996) Alcohol consumption and suicide mortality by age among Finnish men, 1950–1991. *Addiction*, **91**, 101–112.

Marttunen, M. J., Aro, H. M., Henriksson, M. M., *et al* (1991) Mental disorders in adolescent suicide: DSM–III–R axes I and II diagnoses in suicides among 13- to 19-year-olds in Finland. *Archives of General Psychiatry*, **48**, 834–839.

Newcombe, R., Measham, F. & Parker, H. (1994) A survey of drinking and deviant behaviour among 14/15-year-olds in North-West England. *Addiction Research*, **2**, 319–341.

Pandey, G. N., Pandey, S. C., Dwivedi, Y., *et al* (1995) Platelet serotonin-2A receptors: a potential biological marker for suicidal behavior. *American Journal of Psychiatry*, **152**, 850–855.

Rutter, M. & Smith, D. (1995) *Psychosocial Disorders in Young People: Time Trends and Their Causes*. Chichester: Wiley and Sons.

Sellers, E. M., Higgins, G. A. & Sobell, M. B. (1992) 5-HT and alcohol abuse. *Trends in Pharmacological Sciences*, **13**, 69–75.

Shaffer, D., Gould, M. S., Fisher, P., *et al* (1996) Psychiatric diagnosis in child and adolescent suicide. *Archives of General Psychiatry*, **53**, 339–348.

Suominen, K., Henriksson, M., Suokas, J., *et al* (1996) Mental disorders and comorbidity in attempted suicide. *Acta Psychiatrica Scandinavica*, **94**, 234–240.

World Health Organization (1978) *Mental Disorders: a Glossary and Guide to their Classification in Accordance with the Ninth Revision of the International Classification of Diseases* (ICD–9). Geneva: WHO.

https://doi.org/10.1192/bjp.173.2.154 Published online by Cambridge University Press