transport, while patients with severe injuries did better with helicopter services.[13] The striking similarity to our results does suggest that there is uncertainty about the overall benefits of helicopters in terms of survival, and in contrast with the American results we found no evidence at all that the London helicopter emergency medical service was improving chances of survival for the whole group of patients with trauma that it attends.

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Incidence of and mortality from acute upper gastrointestinal haemorrhage in the United Kingdom

T A Rockall, R F A Logan, H B Devlin, T C Northfield on behalf of the steering committee and members of the national audit of acute upper gastrointestinal haemorrhage

Royal College of Surgeons of England, London WC2A 3PN
T A Rockall, *research fellow*
H B Devlin, *director of surgical epidemiology and audit unit*

Department of Public Health Medicine, Queen's Medical Centre, Nottingham NG7 2UH
R F A Logan, *senior lecturer in clinical epidemiology*

Department of Biochemical Medicine, St George's Hospital Medical School, London SW17 0RE
T C Northfield, *professor of gastroenterology*

Members of the steering committee are listed at the end of the article.

Correspondence to: Mr Rockall.

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Abstract

***Objective*—To describe the current epidemiology of acute upper gastrointestinal haemorrhage.**

***Design*—Population based, unselected, multicentre, prospective survey.**

***Setting*—74 hospitals receiving emergency admissions in four health regions in the United Kingdom.**

***Subjects*—4185 cases of acute upper gastrointestinal haemorrhage in which patients were aged over 16 years identified over four months.**

***Outcome measures*—Incidence and mortality.**

***Results*—The overall incidence of acute upper gastrointestinal haemorrhage in the United Kingdom is 103/100 000 adults per year. The incidence rises from 23 in those aged under 30 to 485 in those aged over 75. At all ages incidence in men was more than double that in women except in elderly patients. 14% of the haemorrhages occurred in inpatients already in hospital for some other reason. In 27% of cases (37% female, 19% male) patients were aged over 80. Overall mortality was 14% (11% in emergency admissions and 33% in haemorrhage in inpatients). In the emergency admissions, 65% of deaths in those aged under 80 were associated with malignancy or organ failure at presentation. Mortality for patients under 60 in the absence of malignancy or organ failure at presentation was 0·8%.**

***Conclusions*—The incidence of acute upper gastrointestinal haemorrhage is twice that previously reported in England and similar to that reported in Scotland. The incidence increases appreciably with age. Although the proportion of elderly patients continues to rise and mortality increases steeply with age, age standardised mortality is lower than in earlier studies. Deaths occurred almost exclusively in very old patients or those with severe comorbidity.**

Introduction

Acute upper gastrointestinal haemorrhage remains a common reason for admission to hospital, and in north east Scotland in 1967-8 it was responsible for 8% of all emergency admissions to adult medical wards.[1] A large district general hospital with a catchment population of 300 000 might expect to admit one such case each working day of the year. It is also not uncommon in patients already in hospital, contributing significantly to overall mortality.[1]

Current knowledge of the epidemiology of acute upper gastrointestinal haemorrhage in the United Kingdom and worldwide mostly comes from hospital based studies of under 1000 cases,[1,2] larger retrospective studies,[3] studies without any defined population base,[4] and indirect methods of calculation and estimation.[5] No population based studies have been undertaken for 25 years, during which time endoscopy for acute upper gastrointestinal bleeding has become routine. In the population based studies that have been undertaken in the United Kingdom incidence has varied from 47 per 100 000 in Oxford[3] to 116 in north east Scotland,[1] and mortality has been reported as about 10%. We report the results of a large, prospective, population based study and discuss the current epidemiology of the condition, the relation between patient characteristics and outcome, and the prospects for reducing mortality.

Subjects and methods

The data presented were collected over four months as part of a national audit of the management and outcome of acute upper gastrointestinal haemorrhage. Four health regions in England (North West Thames, South West Thames, Trent, and West Midlands) were recruited to this prospective study. In 1993 these regions had 77 hospitals that received emergency admissions. Of these hospitals 74 participated in the initial audit, which lasted from June to October 1993. The total population served by these hospitals was 15·5 million. The population over the age of 16 years was 12·5 million.[6] At each site a "lead" consultant (usually a member of the British Society of Gastroenterology) represented the project locally. At each hospital an audit coordinator identified subjects daily in the accident and emergency department, the wards, the endoscopy unit, the operating theatre, and from blood transfusion records and admission data. The questionnaire was generally completed by medical staff, and the audit coordinator was then responsible for checking and returning a completed questionnaire for each patient correctly identified. Data collected included known risk factors, management (including the use of endoscopy), endoscopic findings, details of surgery, diagnosis, complications, and mortality.

The data were entered into a computer database with a validated optical scanning device.[7] Analysis was undertaken with the software SPSS[8] and CIA.[9] We report most analyses as simple descriptive statistics with 95% confidence intervals. The Mann-Whitney U test was used for non-parametric analysis of the distribution of unpaired data.

QUALITY OF DATA

Validation of the completeness of patient identification was assessed by investigating the hospital discharge codes consistent with acute upper gastrointestinal haemorrhage (see box) for patients admitted during the first month of the audit at three hospital and contrasting this information with the register of cases prospectively identified for this period of the study.

Of the 60 cases identified by the audit, 37 had a discharge code consistent with acute upper gastrointestinal haemorrhage. Twenty three cases of upper gastrointestinal haemorrhage had therefore been identified that were not subsequently coded as an upper gastrointestinal bleed as a primary or secondary diagnosis. A further 30 cases had a discharge code consistent with an acute upper gastrointestinal bleed but were not included in the audit. Of these, 21 had a diagnosis of oesophagitis or carcinoma of the upper gastrointestinal tract but had not had an acute bleed, and seven had been prospectively identified but had failed to satisfy the entry criteria; the notes could not be found in one case, leaving one case in which acute upper gastrointestinal haemorrhage was subsequently confirmed from the notes but which the audit had failed to identify.

Primary and secondary ICD 9 codes searched

530.1	Oesophagitis, Barret's oesophagitis, ulcerative oesophagitis
530.2	Oesophageal ulcer
530.7	Mallory-Weiss syndrome
530.8	Haemorrhage of oesophagus
531.0	Gastric ulcer—acute with haemorrhage
531.2	Gastric ulcer—acute with haemorrhage and perforation
531.4	Gastric ulcer—chronic, non-specified with haemorrhage
531.6	Gastric ulcer—chronic, non-specified with haemorrhage and perforation
532.0	Duodenal ulcer—acute with haemorrhage
532.2	Duodenal ulcer—acute with haemorrhage and perforation
532.4	Duodenal ulcer—chronic, non-specified with haemorrhage
532.6	Duodenal ulcer—chronic, non-specific with haemorrhage and perforation
533.0	Peptic ulcer—acute with haemorrhage
533.2	Peptic ulcer—acute with haemorrhage and perforation
533.4	Peptic ulcer—chronic, non-specified with haemorrhage
533.6	Peptic ulcer—chronic, non-specified with haemorrhage and perforation
578.0	Haematemesis
578.1	Melaena
578.9	Gastrointestinal bleed, non-specified
150.9	Carcinoma of oesophagus
151.9	Carcinoma of stomach
456.0	Oesophageal varices with haemorrhage
447.2	Aortoduodenal fistula

MISSING DATA

Small numerical discrepancies in the totals and denominators in the data presented result from missing data. Of the total 4185 cases examined, we had no recorded data on the variable for age in six (0·1%) cases, rebleeding in 66 (1·6%) cases, the presence or absence of comorbidity in 74 (1·8%) cases, or mortality in 43 (1·0%) cases.

DEFINITIONS

Patients were included in the study if they were aged 16 years or older and had clinical evidence of acute upper gastrointestinal bleeding on admission, a history of having experienced such a bleed up to 10 days before the date of admission, or clinical evidence of acute upper gastrointestinal bleeding while an established inpatient for any other reason.

Acute upper gastrointestinal haemorrhage was defined as a haematemesis or the passage of melaena or other firm clinical or laboratory evidence of blood loss from the upper gastrointestinal tract.

Haematemesis was defined as vomiting of blood or blood clots. Coffee ground vomit was acceptable only if witnessed by nursing or medical staff.

Melaena was defined as passage of dark, tarry stools or fresh blood as witnessed by nursing or medical staff or discovered on rectal examination.

Rebleeding and continued bleeding were defined as signs of bleeding, as outlined below, recurring within 10 days of the presenting bleed or continuing for more than 24 hours.

- High pulse and low blood pressure without other obvious cause
- Further haematemesis
- Passage of fresh melaena
- Falling haemoglobin concentration—more than could be explained by haemodilution.

Shock was defined as a systolic blood pressure <100 mm Hg.

Results

INCIDENCE

In all, 4486 cases were identified and subsequently registered. In 4201 (94%) of these cases completed data forms were returned from the participating hospitals for analysis. Sixteen cases were classified as definitely not being acute upper gastrointestinal haemorrhage despite being managed as such initially. The calculations were therefore based on 4185 cases.

In all, 3508 (84%) cases were emergency admissions, 584 (14%) were haemorrhages in inpatients, and 93 (2%) were in transfers from other hospitals. Overall incidence (per 100 000 adults/year) was 103 (table I). The incidence of emergency admissions was 87 (95% confidence interval 84 to 89). The overall incidence varied slightly between regions: North West Thames, 91; South West Thames, 99; Trent, 107; West Midlands, 102.

INCIDENCE BY AGE AND SEX

The sample population was elderly, with a median age of 71 years (mean 66; interquartile range 54 to 80). Overall, 57% (2404/4185) of all cases were male, but the proportion declined from 71% (925/1302) in those aged under 60 to 44% (738/1670) in those aged 75 or over.

The incidence for emergency admissions was more than double in all age groups in men compared with women except in those aged 75 or over (table I). Haemorrhage in inpatients showed a similar pattern, although numbers in the younger age groups were small. The incidence for both emergency admissions and haemorrhage in inpatients also showed a pronounced increase with age. Even in those aged 65 or over the incidence was more than double in those aged 75 or over compared with those aged 65-74 (table I).

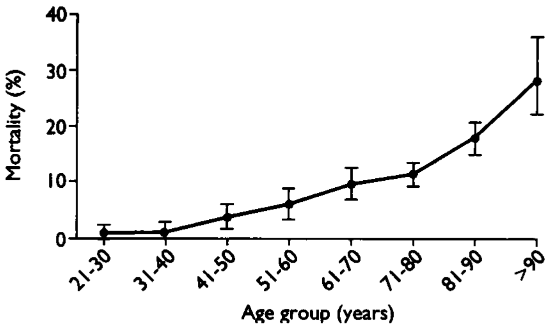
MORTALITY BY AGE AND SEX

Mortality in women (15·4% (272/1764)) was higher than in men (13·2%, 313/2378). The difference was not significant, however, once mortality was standardised for age. Age standardised mortality for men was 13·4% (95% confidence interval 11·7% to 15·0%) and for women was 14·8% (13·1% to 16·5%).

Overall mortality was 14% (585/4142), but mortality was 33% (191/578) for the inpatient group compared with 11% (365/3472) for emergency admissions. There was a non-linear relation between age and mortality for emergency admission. The figure shows mortality for emergency admissions by age group with 95% confidence intervals. No relation between age and mortality is evident for haemorrhage in inpatients, mortality being about 30% in all age groups, although the 95% confidence intervals are wide.

DIAGNOSES

Table II shows diagnosis and mortality by age and type of admission. Positive diagnoses were made in



Mortality for emergency admissions by age group with 95% confidence intervals

3123/4137 (75%) cases. In all, 46% (1448/3123) of diagnoses were of peptic ulceration, of which 113 (8%) were oesophageal, 507 (35%) gastric, 768 (53%) duodenal, and 60 (4%) mixed. The distribution of diagnoses was similar for inpatients and emergency admissions except that Mallory-Weiss lesions were more common in those admitted urgently, and more patients died or left hospital without a diagnosis in the inpatient group. Mortality was substantially higher in the inpatient group for all diagnostic categories except upper gastrointestinal malignancy, in which the mortality was 38% (50/132) for emergency admissions and 35% (7/20) for haemorrhage in inpatients.

COMORBIDITY AND MORTALITY IN EMERGENCY ADMISSION

Table III shows the comorbidity and mortality by age for emergency admissions. One or more comorbidities were noted at the time of presentation in 1874/3508 (53%) of emergency admissions. In the absence of any comorbidity, acute upper gastrointestinal haemorrhage was associated with a mortality of 62/1617 (4%) overall and 1/766 (0·1%) in the patients aged under 60 (one postoperative death from a pulmonary embolus).

In all, 303/365 (83%) deaths among the emergency admissions were associated with one or more major comorbidities. Malignancy (disseminated, non-disseminated, or haematological), organ failure (cardiac, renal, or hepatic), and respiratory disease (chronic obstructive airways disease or pneumonia) were associated with the poorest outcome (table III).

Discussion

Comparisons with previous studies are confounded by variations in methodology, definitions, and entry criteria as well as by real differences between the regions and countries from which reliable data have been collected. Some comparisons can be made, however, and the incidence of 103/100 000 adults per year is at the upper end of the range of the two previous reports (range 47-116).[1 3]

Such a pronounced increase in incidence with age

TABLE I—*Incidence of acute upper gastrointestinal haemorrhage by age, sex, and type of admission (per 100 000 adults/year). Values are numbers (incidence) of cases unless stated otherwise*

	Emergency admissions		Haemorrhage in inpatients		
Age (years)	Male	Female	Male	Female	All cases (incidence)
16-29	178 (30)	66 (13)	10 (2)	3 (1)	23
30-44	301 (57)	114 (21)	18 (4)	8 (1)	41
45-59	371 (87)	152 (36)	36 (9)	22 (6)	69
60-64	166 (138)	72 (55)	26 (22)	6 (5)	109
65-74	440 (229)	322 (137)	87 (46)	64 (27)	214
≤75	574 (485)	752 (346)	144 (126)	160 (72)	485
Overall	2030 (103)	1478 (71)	321 (17)	263 (13)	101*
Mean age	60	70	70	75	66
Median age	64	75	73	78	71

Median age in emergency admissions *v* haemorrhage in inpatients is 70 *v* 75 years. All median ages $P<0.00005$.
*A further 93 patients were classified as transfers from other hospitals. Inclusion of this group gives overall incidence of 103 (95% confidence interval 100 to 107).

TABLE II—*Diagnosis and mortality by age and type of admission*

	Emergency admissions						Haemorrhage in inpatients						Transfers from other hospitals (all ages)		Totals	
	Age <60		Age 60-79		Age ≥80		Age <60		Age 60-79		Age ≥80					
Diagnosis	No (%)	Mortality (%)	No (%)	Mortality (%)	No (%)	Mortality (%)	No (%)	Mortality (%)	No (%)	Mortality (%)	No (%)	Mortality (%)	No (%)	Mortality (%)	No (%)	Mortality (%)
None	274 (23)	3	279 (20)	13	246 (28)	29	21 (22)	29	90 (31)	33	79 (43)	49	25 (27)	44	1014 (25)	20
Peptic ulcer	341 (29)	2	579 (41)	9	315 (36)	16	26 (27)	23	97 (33)	28	57 (31)	38	33 (36)	27	1448 (35)	12
Malignancy	12 (1)	17	83 (6)	34	37 (4)	54	2 (2)	100	10 (3)	40	8 (4)	13	3 (3)	33	155 (4)	37
Varices	91 (8)	13	53 (4)	28	10 (1)	10	10 (10)	60	7 (2)	86	2 (1)	0	7 (8)	14	180 (4)	23
Mallory-Weiss syndrome	148 (13)	0	40 (3)	5	15 (2)	13	3 (3)	0	6 (2)	33	1 (1)	0	1 (1)	0	214 (5)	3
Erosive disease	153 (13)	4	150 (11)	1	85 (10)	9	11 (12)	27	26 (9)	27	15 (8)	13	4 (4)	25	444 (11)	7
Oesophagitis	114 (10)	4	151 (11)	8	101 (12)	7	10 (10)	10	37 (13)	16	9 (5)	33	7 (8)	29	429 (10)	8
Other diagnosis	43 (4)	5	86 (6)	12	63 (7)	18	13 (14)	54	22 (8)	33	14 (8)	36	12 (3)	33	253 (6)	18
Total	1176	3	1421	11	872	20	96	32	295	30	185	39	92	32	4137	14

TABLE III—*Comorbidity and mortality by age for emergency admissions*

Comorbidity	No (%) of deaths			
	Age <60	Age 60-79	Age ≥80	Total
Malignancy	10/42 (24)	55/142 (39)	28/79 (35)	93/263 (35)
Organ failure	21/94 (22)	40/154 (26)	47/144 (33)	108/392 (28)
Respiratory disease	0/13 (0)	10/96 (10)	14/64 (22)	24/173 (14)
Ischaemic heart disease	0/26 (0)	8/173 (5)	13/90 (14)	21/289 (7)
Other major comorbidity	7/235 (3)	25/335 (7)	25/169 (15)	57/739 (8)
None	1/766 (0·1)	18/525 (3)	43/326 (13)	62/1617 (4)
Total	39/1176 (3)	156/1425 (11)	170/872 (19)	365/3473 (11)

Where multiple comorbidities were recorded, each case was categorised by the comorbidity with worst prognosis.

TABLE IV—*Previous British series of more than 500 cases since 1940, excluding clinical trials, showing age structure, mortality, and age standardised mortality*

Series	Year	No of cases	% Of cases		Mortality emergency admissions	Age standardised mortality ratio (95% confidence intervals)*
			Age >60	Age >80		
Jones[14]	1940-47	687	33	2	9·9	147 (109 to 195)
Schiller *et al*[3]	1953-67	2149	48	8	8·9	110 (95 to 126)
Johnston *et al*[1]	1967-68	817	49	9	10·6	122 (100 to 146)
Mayberry *et al*[15]	1972-78	583	NA	NA	10·3	—
Katchinski *et al*[12]	1984-86	1017	63	18	11·8	91 (73 to 112)
Present study	1993	4185	68	27	11·0	100 (Reference value)

NA=Not available.
*Calculated for emergency admissions with age structure data from previous studies. Where clear differences in the studies exist, factors such as excluded diagnostic groups or inclusion of episodes of haemorrhage occurring in established inpatients have been taken into account in the calculations.

has not been previously noted and indicates that the problem is likely to increase as the proportion of elderly people in the United Kingdom rises. As well as reflecting the natural course of the condition the increase may partly be the result of the peptic ulcer cohort effect of those born before 1920.[10]

Many researchers have documented the increasing age of the population presenting with acute upper gastrointestinal bleeding, which is partly a reflection of the increasing age of the whole population. In this series 27% of all patients were aged over 80, compared with 12% (aged over 70) in north east Scotland 1941-8,[11] 8% in Oxford 1953-67,[3] 9% in north east Scotland 1967,[1] 10% (1975-9) and 18% (1984-6) in Nottingham.[12] Over the same period (1941-91) the age structure of the population has changed considerably such that the proportion aged over 60 has risen from 15% in 1941 to 21% in 1991, and the proportion aged over 80 has risen from 1% to 4% (personal communication, the population estimates unit, Office of Population Censuses and Surveys).

The age of 60 has usually been taken as a rather arbitrary cut off point between high and low risk, and it may be that this cut off is less appropriate as the health profile of the elderly population improves.[13]

Key messages

- Acute upper gastrointestinal haemorrhage is a common reason for admission to hospital
- This study found a pronounced increase in the incidence of acute upper gastrointestinal haemorrhage with age
- The incidence is likely to increase as the proportion of elderly people in the population continues to rise
- Death after an acute upper gastrointestinal haemorrhage occurs mostly among elderly people or those with severe comorbidity
- These facts militate against reduction of overall mortality

There is a non-linear relation with mortality that is well demonstrated in this series (figure), although age is not an entirely independent risk factor because of its association with comorbidity.

Despite the differences mentioned above, the diagnostic case mix is remarkably similar in all major series published to date. Where positive diagnoses are made, peptic ulcer disease consistently accounts for about half of the cases, duodenal ulcer being more common than gastric ulcer. Our finding that upper gastrointestinal malignancy was the cause in 4% of cases is higher than in most previous reports (1% to 2%), possibly reflecting the completeness of case ascertainment. Variceal haemorrhage is still more uncommon in the United Kingdom than in other countries, being the cause of 4% of haemorrhages in this series. Rebleeding is most likely to occur in these high risk diagnostic groups and in cases of peptic ulcers with stigmata of recent haemorrhage.

Previous studies have usually excluded inpatients with haemorrhage. Johnston, however, showed that 10% of acute upper gastrointestinal haemorrhage in one Scottish region were haemorrhage in inpatients, with a mortality of 44%; this increased the overall mortality from 11% to 14%. Similarly, in our series the mortality of 33% among inpatients with haemorrhage increased the overall mortality from 11% to 14%. The two populations have distinct characteristics. Inpatients with haemorrhage of course usually have appreciable comorbidity. In this study they were also older, and, although there was little difference in the distribution of diagnoses, the severity of the haemorrhage (defined by the number presenting with shock or having a high transfusion requirement) was higher.

Since the 1940s the overall mortality in the larger British series has changed little. The increasing numbers of elderly patients, however, may have had a disproportionate effect on overall mortality. With available data it is possible to adjust partly for the differences in age distribution of previous studies (table IV). The standardised mortality ratio obtained is greater than 100 for most of the previous studies, indicating that the changing age structure of the patients presenting with acute upper gastrointestinal haemorrhage has probably been instrumental in maintaining the high mortality. Nevertheless, the more recent papers quoting mortality of 2-6%[2,16-18] are at odds with the figures presented here. There are undoubtedly many factors contributing to this discrepancy: case selection, publication bias, the small size of some series, and the fact that the studies are usually undertaken at specialised or interested centres are probably the biggest issues.

Although the evidence suggests that the established advances that have been made at specialised centres have not yet resulted in the same measurable improvement in outcome in the United Kingdom as a whole, it may also underline the fact that with such a large number of elderly and sick patients the proportion of truly preventable deaths is too small for unselected studies to detect beneficial change. Previously studies have noted that a large proportion of deaths occur in those with severe comorbidity in whom even minor haemorrhage is poorly tolerated.[12,15,17,19,20] It is difficult to establish what is and what is not a preventable death, without invoking value judgments. However, the fact that most deaths occur in the very old people or those with severe comorbidities may limit potential further reduction in overall mortality despite improved management of selected groups.

Members of the steering committee: Professor T C Northfield (chairman), St George's Hospital Medical School, London; Mr H B Devlin and Mr T A Rockall, Royal College of Surgeons of England, London; Dr R F A Logan, Queen's

Medical Centre, Nottingham; Dr J Levi, Northwick Park Hospital, London; Dr K Bardhan, Rotherham District General Hospital, Rotherham; Dr A Hamlyn, Wordsley Hospital, Wordsley, Staffordshire; Mr G Gillespie, Victoria Infirmary, Glasgow; Dr R McCloy, Manchester Royal Infirmary, Manchester; Mr D Watkin, Leicester Royal Infirmary, Leicester; Mr M Crisp, Lederle Pharmaceuticals UK, Gosport, Hampshire.

The lead consultants (representing the projects locally) were: North West Thames region: Drs I Barrison, G Bevan, J Callam, L Farrow, G Holdstock, S Jain, S Kane, J Levi, P McIntyre, N McNeil, G Misiewicz, A Pearson, J Saunders, Professor J Summerfield, Drs D Westaby, J Willoughby. South West Thames region: Drs D Barnado, H Bull, P Finch, S Gould, K Hine, R Holman, J Horner, Professor T C Northfield, Drs R Orchard, I Paterson, E Phillips, M Smith, I Strickland, A Theodossi, J Thirkettle. Trent region: M Ashton, K Bardhan, G Birnie, R Bolton, D Caesteker, C Corbett, D Dawson, M Fairman, J Freeman, C Holdsworth, G Holmes, R Leigh, R Logan, R Long, J Mayberry, I Morris, D Preston, B Rathbone, I Ross, B Scott. West Midlands region: Drs S N Booth, G V Bradby, P Brown, I M Chesner, N H Dyer, J A Gibson, A N Hamlyn, P Hawker, P Hillenbrand, G D Kerr, L J Libman, D E Loft, T N Miller, R J Polson, E T Swarbrick, D B Trash, R P Walt, G M Wood.

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Relation between parasuicide, suicide, psychiatric admissions, and socioeconomic deprivation

David J Gunnell, Tim J Peters, Robert M Kammerling, Jane Brooks

Department of Social Medicine, University of Bristol, Canynge Hall, Bristol BS8 2PR
David J Gunnell, *lecturer in public health medicine and epidemiology*
Tim J Peters, *senior lecturer in medical statistics*
Jane Brooks, *NHS data analyst*

Avon Health, Bristol BS2 8EE
Robert M Kammerling, *consultant in public health medicine*

Correspondence to: Dr Gunnell.

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Abstract

***Objective*—To examine the relations between parasuicide, suicide, psychiatric inpatient admissions, and socioeconomic deprivation.**

***Design*—Ecological analysis with data from routine information systems and the 1991 census.**

***Setting*—24 localities in the area covered by the Bristol and District Health Authority (population 817 000), consisting of aggregations of neighbouring wards, with an average population of 34 000.**

***Subjects*—6089 subjects aged over 10 years admitted to hospital after parasuicide between April 1990 and March 1994; 997 suicides occurring 1982-91; 4763 subjects aged 10-64 years admitted with acute psychiatric illness between April 1990 and March 1994.**

***Results*—Localities varied significantly in standardised admission ratios for parasuicide and standardised mortality ratios for suicide ($P < 0.001$). Spearman's rank correlation coefficient between the standardised mortality ratio for suicide and standardised admission ratio for parasuicide was 0·73 (95% confidence interval 0·46 to 0·88). Correlation between parasuicide and Townsend score was 0·86 (0·70 to 0·94) and between suicide and Townsend score 0·73 (0·46 to 0·88). The partial correlation coefficient between suicide and parasuicide after the Townsend score was adjusted for was 0·29 (−0·13 to 0·62). The correlation between standardised admission ratio for parasuicide and standardised admission ratio for psychiatric illness was 0·76 (0·51 to 0·89) and between standardised mortality ratio for suicide and standardised admission ratio for psychiatric illness was 0·72 (0·45 to 0·87).**

***Conclusion*—A strong ecological association exists between suicide and parasuicide, with socioeconomic deprivation accounting for much of this relation. This strong association provides supporting evidence for the importance of social policy measures in attaining Health of the Nation targets on mental health.**

Introduction

The relation between parasuicide and suicide has been the subject of much debate.[1] There are distinct demographic differences between those committing these two acts: parasuicide occurs more commonly in women and in younger age groups; suicide occurs more commonly in men, with the highest rates occurring among those aged over 75.[2] The incidence of parasuicide is 10-20 times higher than that of suicide. Recently, however, suicide rates have increased in young men, and this rise has been accompanied by increases in the number of male parasuicide admissions.[3,4] In addition, in 30-47% of cases of suicide the individual has a history of parasuicide, and 3-10% of individuals who commit parasuicide commit suicide within 10 years of their attempted suicide.[5-8]

The government's document *Health of the Nation* set targets for the reduction of suicide,[9] although the choice of suicide as an outcome indicator for mental illness services has been questioned.[10,11] Suicide is a rare event, and suicide rates may be a poor indicator of