hospital inpatients may also promote identification and referral of substance misusers. Regular medical audits of histories of substance use as a method of quality control may also improve rates of identification and referrals.

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1 Brown BB. Professionals' perceptions of drug and alcohol abuse among the elderly. *Gerontologist* 1982;22:519-25.
2 Tobias CR, Turns DM, Lippman S, Pary R, Embry CK. Psychiatric disorders in the elderly. *Postgrad Med* 1988;83:313-9.
3 Cadieux RJ. Drug interactions in the elderly. *Postgrad Med* 1989;86:179-86.
4 Colt HG, Shapiro AP. Drug-induced illness as a cause for admission to a community hospital. *J Am Geriatr Soc* 1989;37:323-6.
5 Learoyd BM. Psychotropic drugs and the elderly patient. *Med J Aust* 1982;ii:1131-3.
6 Foy A, Drinkwater V, March S, Mearrick P. Confusion after admission to hospital in elderly patients using benzodiazepines. *BMJ* 1986;293:1072.
7 Bienenfeld D. Alcoholism in the elderly: clinical issues. *Clinical Gerontologist* 1987;7:3-13.
8 Curtis JR, Geller G, Stokes EJ, Levine DM, Moore RD. Characteristics, diagnosis and treatment of alcoholism in elderly patients. *J Am Geriatr Soc* 1989;37:310-6.
9 Gorbien MJ. Alcoholism in the elderly. *Geriatric Medicine Today* 1989;8:115-8.
10 Glantz M. Predictions of elderly drug abuse. *J Psychoactive Drugs* 1981;13: 117-26.
11 Sherin KM, Piotrowski ZH, Panek SM, Doot MC. Screening for alcoholism in a community hospital. *J Fam Pract* 1982;15:1091-5.
12 Powell J, McInnes E. *Alcohol and medication use in older people.* Sydney: Royal Albert Hospital, 1993. (Research Into Drug Abuse Report.)
13 Krejcie RV, Morgan DW. Determining sample sizes for research activity. *Educational and Psychological Measurement* 1970;30:607-10.
14 National Health and Medical Research Council. *Recommendations regarding responsible drinking behaviour.* Canberra: Australian Government Publishing Service, 1987.
15 National Health and Medical Research Council. *Recommendations regarding benzodiazepines.* Canberra: Australian Government Publishing Service, 1991.
16 American Psychiatric Association. *Diagnostic and statistical manual of mental disorders.* 3rd ed. Washington: APA, 1987.
17 World Health Organisation. *Tobacco alert: WHO programme on tobacco or health.* Geneva: WHO, 1991.

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Low blood pressure and depression in older men: a population based study

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Abstract

***Objective*—To determine if an association exists between low blood pressure and depressive symptoms in older men living in the community.**

***Design*—Cross sectional, population based study.**

***Setting*—Town of Rancho Bernardo, California, United States.**

***Subjects*—846 men aged 60-89 years. Comparisons between hypotensive, normotensive, and hypertensive groups were limited to 594 men not taking drugs for hypertension.**

***Main outcome measures*—Mean scores on Beck depression inventory and prevalence of scores ≥ 13.**

***Results*—Men with diastolic blood pressure <75 mm Hg had significantly higher depression scores (mean scores 6·35 *v* 4·96; $P<0·001$) and more categorical depression (7·6% *v* 1·8% with scores ≥ 13; $P<0·01$) than men with diastolic blood pressure levels between 75 and 85 mm Hg. Men with diastolic blood pressure levels >85 mm Hg had higher depression scores than men with intermediate blood pressure levels (mean scores 5·85 *v* 4·96; $P<0·05$). Men with diastolic hypotension scored significantly higher on both affective and somatic item subscales of the Beck depression inventory and on individual measures of fatigue, pessimism, sadness, loss of appetite, weight loss, and preoccupation with health. Low diastolic blood pressure was a significant predictor of both mean depression score and prevalence of categorical depression, independent of age and change in weight since the baseline visit. The presence of several chronic diseases was associated with depressed mood and higher blood pressure but not with low blood pressure.**

***Conclusion*—The association of relatively low diastolic blood pressure with higher depressive symptom scores and rates of categorical depression was independent of age or weight loss. Since fatigue is a prominent symptom of depression, any association of low blood pressure with fatigue could reflect depressive disorders or clinically important depression.**

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Introduction

The dangers of high blood pressure are well recognised, but the clinical importance of low blood pressure is controversial. Several recent large studies reported an increased prevalence of fatigue, crying, or psychological dysfunction associated with low blood pressure.[1-3] Although a hypotensive syndrome manifested by subjective symptoms has been accepted in Europe, it has been dismissed in the United Kingdom and United States.[4,5]

Depressive symptoms have been described in hypertensive subjects and have been variously ascribed to antihypertensive drugs or the effect of labelling of patients.[6,7] To our knowledge no one has previously used a standard depression inventory to study the relation of depressive symptoms to low blood pressure in a population. We report here a cross sectional study of low blood pressure, depression, fatigue, and other somatic complaints in 594 older men living in the community.

Methods

In 1972-4, 82% (5052) of 6155 eligible adult residents of Rancho Bernardo, California, a geographically defined community, participated in a baseline evaluation which included a measurement of weight with subjects wearing light clothing and no shoes. The population is stable, white, and relatively homogeneous for social class and education. In 1984-7, all 1070 surviving non-institutionalised men aged 60 and older were invited to a clinic visit; 79% participated, and these 846 men form the basis of this report.

Participants completed a standardised medical questionnaire, which included questions about cigarette smoking, alcohol use, and exercise. Each subject was asked whether he had ever been diagnosed as having or had been treated for any of 17 common conditions (heart disease; high blood pressure; lung, liver, kidney, gallbladder, or prostate disease; cancer; arthritis; gall stones; thyroid disorders; stomach or duodenal ulcers; diverticulitis; emphysema; chronic constipation; stroke; or hip fracture). Current use of drugs was recorded by a trained interviewer and validated by drugs and prescriptions brought to the clinic for that purpose. Weight was measured according to the same protocol used at baseline. Blood pressure was measured twice by technicians certified for the hypertension and detection follow up programme protocol,[8] using a standard sphygmomanometer in seated resting

subjects. The means of the two systolic and diastolic readings were used for analysis.

Information on depressed mood at the time of the visit was obtained from responses to 18 of the 21 items of a self administered Beck depression inventory.[9] In accordance with the criteria described by Shrout and Yager,[10] three of the original 21 items (guilt, expectation of punishment, self hate) were excluded from the questionnaire in an effort to reduce the length of the scale without compromising its reliability in this population. Total scores were proportionally adjusted to correspond to scores and cut points established for the full 21 item scale. In addition, two subscales comprised of affective or non-physical and somatic or physical symptoms were calculated on the basis of the classification of items described by Plumb and Holland.[11]

The original 21 item Beck depression inventory and a shortened 13 item version have been tested and validated in elderly subjects. Internal consistency was shown in the Rancho Bernardo cohort by a Cronbach's α of 0·69. A cut point of 13 was used to define cases of mild to severe depression among study subjects on the basis of its use as a reliable indicator of mild to severe depression in populations at risk for chronic disease and disability.[12]

STATISTICAL METHODS

Men with normal blood pressure (defined before any analyses as 75-84 mm Hg diastolic or 120-139 mm Hg systolic) were used as the comparison group in all bivariate analyses. Risk factor distribution and mean depressive symptom scores and prevalence rates were determined separately for men not taking drugs for blood pressure. Mean depressive symptom scores were adjusted for age and compared by using an analysis of covariance procedure.[13] Prevalence rates were adjusted for age with the direct method,[14] with the total sample comprising the standard population. The Mantel-Haenszel age adjusted χ^2 test was used to compare the age adjusted prevalence rates.[15] However, no adjustment was made for multiple comparisons, and caution should be exercised in interpreting results.

Non-parametric tests (Spearman's r) were used to assess the association between depressive symptoms, chronic diseases, and other factors. Each independent variable found to be significantly correlated with depressive symptoms and diastolic blood pressure was then entered into a stepwise multiple regression model.

Results

Among the 846 men aged 60-89 years in this cohort, 252 (30%) were using antihypertensive drugs at the time of the study. Blood pressure was not associated with depression score or categorical depression in these men, and they were excluded from further consideration as the purpose of this study was to examine the relation of naturally occurring low blood pressure to depressed mood and fatigue.

Over a third (255/594) of the men not receiving antihypertensive treatment had a diastolic blood pressure <75 mm Hg. The prevalence of both diastolic hypotension and depressed mood increased with age (r=0·18, P=<0·001 and r=0·15, P<0·001, respectively). As shown in Table I, in age adjusted analyses men with low diastolic blood pressure had significantly higher depression scores (P<0·001) and more categorical depression (P<0·01) than men who had intermediate diastolic blood pressure (75-85 mm Hg). Men with diastolic blood pressures >85 mm Hg also had higher depression scores (P<0·05) than men with intermediate levels. Low systolic blood pressure, defined as <120 mm Hg, was much less common and was only marginally associated with depression symptom scores or depression (p<0·1).

As shown in Table II, men with diastolic hypotension scored significantly higher on both the affective and somatic item subscales of the Beck depression inventory and on individual measures of fatigue, pessimism, sadness, loss of appetite, weight loss, and preoccupation with health. Men with systolic hypotension did not differ in overall depressive symptom scores although they did score significantly higher in fatigue, pessimism, and lack of satisfaction.

TABLE I—*Relation of mean scores on Beck depression inventory scores (adjusted for age) and of prevalence of scores ⩾13 to diastolic and systolic blood pressure in men aged 60-89 not receiving drug treatment for high blood pressure, Rancho Bernardo, California*

Blood pressure	No	Depression scores: Mean score	Depression scores: % With scores ⩾13
Diastolic:			
<75	255	6·35**	7·6**
75-84	238	4·96	1·8
⩾85	101	5·85*	4·8
Systolic:			
<120	86	6·34†	11·2†
120-139	237	5·35	3·4
⩾140	271	5·82	3·9

*P<0·05; **P<0·01; ***P<0·001 compared with intermediate group.

TABLE II—*Relation of mean Beck depression inventory scores (adjusted for age) by question and blood pressure, 60-89 year old men, Rancho Bernardo, California, 1984-7*

Item	Diastolic blood pressure <75	Diastolic blood pressure 75-84	Diastolic blood pressure ⩾85	Systolic blood pressure <120	Systolic blood pressure 120-139	Systolic blood pressure >140
Sadness	0·05*	0·01	0·03	0·04	0·02	0·04
Pessimism	0·09**	0·02	0·05	0·09*	0·03	0·06
Sense of failure	0·07	0·05	0·00	0·10	0·06	0·02
Lack of satisfaction	0·13	0·09	0·08	0·16*	0·08	0·10
Self accusations	0·15	0·19	0·26	0·14	0·18	0·20
Suicidal ideation	0·02	0·02	0·06	0·01	0·01	0·04
Crying spells	0·06	0·04	0·00	0·06	0·04	0·04
Irritability	0·40	0·29	0·26	0·39	0·32	0·33
Social withdrawal	0·19	0·13	0·16	0·19	0·15	0·15
Indecisiveness	0·15	0·10	0·17	0·06	0·12	0·15
Body image distortion	0·16	0·10	0·12	0·22	0·12	0·11
Work retardation	0·64	0·55	0·61	0·61	0·56	0·63
Insomnia	0·66	0·55	0·69	0·60	0·60	0·64
Fatiguability	0·84**	0·72	0·79	0·87*	0·73	0·78
Loss of appetite	0·17**	0·07	0·14*	0·11	0·12	0·13
Weight loss	0·34*	0·19	0·29	0·30	0·22	0·32
Loss of libido	1·06	0·93	0·98	1·06	0·89	1·06
Somatic preoccupation	0·32**	0·18	0·25	0·24	0·27	0·25
Total affective items	1·68*	1·23	1·38	1·63	1·32	1·51
Total somatic items	4·19***	3·28	3·87*	3·99	3·52	3·91

*P<0·05; **P<0·01; ***P<0·001 compared with intermediate group.

As shown in Table III, only age and weight loss since the baseline visit were associated with both depressive symptom scores and low diastolic blood pressure. Several other plausible covariates of depression and low blood pressure did not explain these associations. Thus, although depression scores were significantly higher in men who reported chronic conditions (emphysema, arthritis, gall stones, ulcers, diverticulitis, constipation, cancer, stroke, and prostate surgery), constipation was the only chronic condition associated with low blood pressure. As Table III shows, the number of chronic conditions was associated with the mean score on the Beck depression inventory but not with low blood pressure.

TABLE III—*Correlations between Beck depression inventory score, diastolic blood pressure, and demographic and health status measures, 60-89 year old men, Rancho Bernardo, California, 1984-7*

Variable	Mean (SD)	Correlation coefficient (Spearman's r): Score on Beck depression inventory	Correlation coefficient (Spearman's r): Diastolic blood pressure
Score on Beck depression inventory	5·70 (4·32)		−0·15*
Diastolic blood pressure†	1·57 (0·50)	−0·15*	
Systolic blood pressure†	1·86 (0·35)	−0·02	0·26*
Age (years)	73·51 (7·30)	0·18*	−0·15*
Alcohol (No of ounces in past week)	2·55 (3·08)	−0·05	0·07
Alcohol (frequency‡)	1·50 (0·50)	0·05	−0·04
Cigarette smoker§	1·10 (0·30)	0·02	0·02
Body mass index	25·59 (3·32)	−0·04	0·18*
Weight loss (pounds)	−3·34 (13·80)	−0·17*	0·14*
Antidepressants§	0·06 (0·24)	0·21*	−0·06
No of chronic diseases	1·85 (0·35)	0·18*	−0·03
Regular exercise§	1·25 (0·43)	−0·17*	0·04

†Low=1, high=2.
‡Daily=1; 3-4 times a week=2; 1-2 times a week=3; 1-2 times a month=4; less than once a month=5; never=6.
§No=1, yes=2.
*P<0·001.

The use of antidepressant drugs also did not explain the association. Only 35 of the 594 men were taking antidepressants. The prevalence of categorical depression was associated with antidepressant use (17·1% (6/35) *v* 3·8% (20/528) not taking antidepressants; $\chi^2=13·3$, $P<0·001$) but was not associated with the prevalence of low systolic or diastolic blood pressure. The Beck depression inventory score was significantly associated with use of antidepressant drugs, but low blood pressure was not associated with use of antidepressants (table III). Similarly, lack of regular exercise was associated with depressive symptom score but not with low blood pressure.

Low diastolic blood pressure, age, and change in weight since the baseline visit were entered into a stepwise multiple regression model to test their independent effects on depressive symptom scores. Each of these three variables was significantly and independently associated with the depressive symptom score (table IV). Additional evidence for an independent association between low diastolic blood pressure and depressive symptoms was provided by logistic regression analysis to test the effects of low diastolic blood pressure, age, and change in weight since the first visit on the likelihood of a Beck depression inventory score ≥ 13. The log adjusted odds ratio of categorical depression in men with low diastolic blood pressure compared with men with a diastolic blood pressure ≥ 75 mm Hg was 2·92 (95% confidence interval 1·25 to 6·86). Age (60-74 *v* 75-89 years; odds ratio 2·33 (0·94 to 5·73)) and change in weight (loss or no change *v* gain; 1·41; (0·81 to 3·67)) were not significant independent predictors of categorical depression in this model.

TABLE IV—*Regression of Beck depression inventory score on low diastolic blood pressure, age, and weight loss since baseline visit, 60-89 year old men, Rancho Bernardo, California, 1984-7*

	Unstandardised regression coefficient (*b*)	Standard error of unstandardised regression coefficient (*b*)	P value
Age	0·0693	0·0252	<0·01
Low diastolic blood pressure	−0·9711	0·3559	<0·01
Weight loss	−0·0360	0·0132	<0·01
Constant	1·9743	1·9899	

Discussion

In this cohort, men who had relatively low diastolic blood pressure in the absence of drugs for hypertension had significantly higher symptom scores for depression and more categorical depression than men with intermediate levels of blood pressure. The prevalence of both depression and hypotension increased with age, but age did not explain the association. This association was also not explained by weight loss, other chronic disease, or the use of antidepressants. Beck depression scores and categorical depression were more strongly associated with low diastolic than low systolic blood pressure, but low systolic pressure was present in only 22 men who did not also have low diastolic blood pressure.

The individual items on the Beck depression inventory were disaggregated and fatigue and other somatic items were looked for as determinants of depression scores; fatigue, loss of appetite, weight loss, and preoccupation with health (somatic complaints) were found to be significantly higher in men with diastolic hypotension. Fatigue was also significantly higher in men with systolic hypotension. Overall, eight (of eight) somatic and eight (of 10) affective items on the Beck depression inventory were higher in hypotensive men, and seven of these differences were significant at the 5% level.

Although low blood pressure has long been thought to be a cause of tiredness and dizziness, relatively few studies with appropriate comparison groups have been conducted outside of clinical settings. Their findings are generally concordant with those of the present study. Bengtsson *et al* reported an increased prevalence of fatigue, dizziness, and readiness to cry in a population based study of 1302 women with a systolic blood pressure below 120 mm Hg.[1] Wessley *et al* found a linear relation between tiredness and low blood pressure unexplained by psychological illness in 7382 adults aged 18 and older.[2] In a study of 10 314 civil servants aged 33-55 Pilgrim *et al* also reported an excess of tiredness in those in the lowest fourth of systolic blood pressure; they concluded that this difference was entirely explained by psychological dysfunction but found no evidence of a particular specific condition.[3] Interestingly, Pemberton, who most effectively challenged the concept that low blood pressure was associated with morbidity, found a significant negative trend for both systolic and diastolic blood pressure in women with tiredness.[5] Unlike the present study, these earlier studies did not examine elderly people and did not examine depression by using a standard instrument. Other attempts to relate blood pressure to depressive symptoms have focused on patients with hypertension[6 16] or psychiatric illness.[17]

No mechanism for the association of low blood pressure with depressed mood is known. We cannot exclude the possibility that low blood pressure leads to fatigue, anorexia, and depressed mood. Since fatigue is a prominent symptom of depression, clinically important depression should be considered in patients with low blood pressure and fatigue. This association is found with sufficient consistency to be credible and to merit further attention.

Clinical implications

- The dangers of high blood pressure are well recognised, but the clinical significance of low blood pressure is controversial
- Patients with low blood pressure often complain of being tired and crying easily
- In this study, older men with low diastolic blood pressure (<75 mm Hg) were more likely to be depressed and experience fatigue than men with normal (75-85 mm Hg) diastolic blood pressure
- This association was not explained by age, weight loss, presence of chronic disease, or use of antihypertensive or antidepressant drugs
- As fatigue is a prominent symptom of depression, clinically important depression should be considered in patients with low blood pressure who complain of fatigue

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1 Bengtsson C, Edstrom K, Furunes B, Sigurdsson JA, Tibblin G. Prevalence of subjectively experienced symptoms in a population sample of women with special reference to women with arterial hypertension. *Scand J Prim Health Care* 1987;5:155-62.
2 Wessely S, Nickson J, Cox B. Symptoms of low blood pressure: a population study. *BMJ* 1990;301:362-5.
3 Pilgrim JA, Stanfeld S, Marmot M. Low blood pressure, low mood? *BMJ* 1992;304:75-8.
4 Robbins JM, Korda H, Shapiro MF. Treatment for a nondisease: the case of low blood pressure. *Soc Sci Med* 1982;16:27-33.
5 Pemberton J. Does constitutional hypotension exist? *BMJ* 1989;298:660-2.
6 Goldberg EL, Comstock GW, Graves CG. Psychosocial factors and blood pressure. *Psychol Med* 1980;10:243-55.
7 Dimsdale JE. Reflections on the impact of antihypertensive medications on mood, sedation, and neuropsychologic functioning. *Arch Intern Med* 1992;152:35-9.
8 Hypertension Detection and Follow-up Program Cooperative Group. The hypertension detection and follow-up program. *Prev Med* 1976;5:207-15.
9 Beck AT, Ward CH, Medelson M, Mock J, Erbaugh J. An inventory measuring depression. *Arch Gen Psychiatry* 1961;4:53-63.

10 Shrout PE, Yager TJ. Reliability and validity of screening scales: effect of reducing scale length. *J Clin Epidemiol* 1989;42:69-78.
11 Plumb MM, Holland J. Comparative studies of psychological function in patients with advanced cancer. I. Self-reported depressive symptoms. *Psychosom Med* 1977;39:264-76.
12 Nielsen AC, Williams TA. Depression in ambulatory medical patients. *Arch Gen Psychiatry* 1980;37:999-1004.
13 Kleinbaum DG, Kupper LL. *Applied regression analysis and other multivariate methods*. North Scituate, MA: Duxburg, 1978.
14 Fleiss JL. *Statistical methods for rates and proportions*. New York: Wiley, 1981.
15 Mantel N, Haenszel W. Statistical aspects of the analysis of data from retrospective studies of disease. *J Natl Cancer Inst* 1959;22:719-48.
16 Nakagawara M. Hypertension in depression. *Psychiatry Res* 1987;21:85-6.
17 Pilgrim JA, Crawford M. Low blood pressure and wellbeing. *BMJ* 1993;306:655.

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Measuring exposure to injury risk in schoolchildren aged 11-14

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Abstract

***Objective*—To apply a measure of exposure to injury risk for schoolchildren aged 11-14 across a population and to examine how risk factors vary with sex, age, and affluence.**

***Design*—Self completion questionnaire survey administered in schools in May 1990.**

***Setting*—24 schools in Newcastle upon Tyne.**

***Subjects*—5334 pupils aged 11-14, of whom 4637 (87%) completed the questionnaire.**

***Results*—Boys were exposed to greater risk than girls in journeys to places to play outdoors: they took longer trips and were more likely to ride bicycles (relative risk 5·30 (95% confidence interval 4·23 to 6·64)) and less likely to travel by public transport or car. Younger pupils (aged 11-12) were less exposed to traffic during journeys to and from school: their journeys were shorter, they were less likely to walk (trip to school, relative risk 0·88 (0·83 to 0·94)), and they were more likely to travel by car (trip to school, relative risk 1·33 (1·13 to 1·56)) or school bus (1·33 (1·10 to 1·62)). Poorer children were exposed to greater risk than affluent children (from families that owned a car and a telephone): they were less likely to travel to school by car (relative risk 0·26 (0·20 to 0·33)) or to be accompanied by an adult (0·39 (0·32 to 0·48)).**

***Conclusion*—Injury risk data can provide useful information on child injury prevention and can be used to identify priorities and target resources for injury prevention on a citywide scale or for an individual school.**

Introduction

The government's strategy document *Health of the Nation* identifies the reduction of "the death rate among children aged under 15 by at least 33% by 2005" (from the baseline rate in 1990) as one of its key targets and calls for the development of local targets.[1] In England childhood unintentional injury is a major public health problem, but injuries are both predictable and preventable.[2]

In order to set local targets good data are needed to build up local pictures of injury problems. For most district health authorities the only information routinely available is that for deaths, but death is too rare an event to provide information on which to base local campaigns. Clearly data on non-fatal injuries are also required. Unfortunately admission to hospital for injury does not accurately reflect the community distribution of injury: selection biases such as bed supply and social class influence admission of all but the most severe injuries.[3] Setting a criterion of severe injury admissions, however, reduces the available data by three quarters.[3] To obtain detailed information at a local level other sources of material are required. Not every child in a community has an injury event, but every child carries some degree of injury risk. Population surveys can thus produce risk profiles for small populations.

We have tried to address the problem of unintentional injury at a local scale in Newcastle by collecting risk data from schoolchildren aged 11-14. We chose this age group because we had recent local evidence that injury rates were highest in this group,[3] because Britain has one of the poorest records in Europe for child pedestrian deaths in the 10-14 age group,[4] and because it is feasible to collect complex material with direct self completion questionnaires. The results provide a baseline profile of injury risk in a community from which a set of achievable goals can be devised.

Subjects and methods

With the cooperation of the local education authority we approached the 24 comprehensive, middle, and special schools in Newcastle, and all took part in the questionnaire survey. All pupils in the relevant classes (years six and eight in middle schools and years seven and nine in the other schools) were involved. Private schools were not included in the survey, but 95% of Newcastle's children attend state schools.

Our survey of injury risk was conducted in 1990 as part of a randomised controlled trial of an injury prevention initiative. This comprised an initial survey of injury risk, a period of intervention when the survey findings were fed back to schools, and an outcome survey of injury risk. Pupils completed the questionnaires during a school lesson supervised by a teacher. Feedback of the data was provided for individual schools by means of tables, bar charts, maps, and pupils' verbatim comments. From these it was possible to compare the individual school's profile with that for the city overall.

We analysed the data with the statistical package, SPSSX and calculated relative risks for different groups according to sex, age, and affluence with the EPIINFO package to identify the most vulnerable groups for different types of risk.[5] The affluence of a pupil's household was assessed by ownership of a car and telephone; households with both were considered affluent, while those with only one or neither were considered deprived. Full tables of the relative risks are available from the authors.

SURVEY QUESTIONNAIRE

The questionnaire was developed to measure children's exposure to causes of fatal and serious injuries and of less severe but common injuries. We consulted teachers and pupils and convened an expert panel (see acknowledgements) to advise on the questionnaire contents. We conducted extensive piloting of the questionnaire in schools. The questionnaire explored exposure to risk from traffic and during leisure activity. It contained seven main sections: biographical details, the trip to school, the trip home

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