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Repetition of accidents in young children

C JANE EMINSON,[1] HARJINDER JONES,[2] AND MICHAEL GOLDACRE[2]

From the Department of Social Medicine,[1] University of Birmingham, and Unit of Clinical Epidemiology,[2] Department of Community Medicine and General Practice, University of Oxford

SUMMARY Data from the Oxford Record Linkage Study have been used to describe rates of accident repetition for children aged under 5 years. As reflected by hospital admissions, accident rates for children who have already had one accident were approximately twice those of children of the same age and sex who had previously been accident free.

There has been much debate on the subject of accident repetition in general and repeated accidents to children in particular. The psychological and psychiatric literature, based on reports of case series, has provided the impetus behind this discussion, concentrating on particular personality characteristics of the child ('accident proneness') which combine with family and environmental factors to make him or her liable to repeated accidents.[1–3] From an epidemiological perspective much of this work is easily criticised for lack of a control group, retrospective assessment of risk factors, and failure to realise that a random distribution of accidents would result in some children having more than others.

Two case-control studies found no difference between children admitted to hospital for head injuries and age and sex matched controls in their previous history of accidents as reported by parents.[4 5] A study of in- and out-patient consultations for injuries found, however, that children aged 4 to 18 years with three or more injuries in one four year period had in the next four years average injury rates 75 to 100% higher than children who were accident free in the first period.[6] This suggests that some children are at particularly high risk, although it has been shown that such associations are neither stable nor independent of the length of interval between periods.[7] Two recent cohort studies have described child accident frequency but not published data on repeat accident rates specifically. Forty-four per cent of the 11 981 children followed by the Child Health and Education Study had one accident (of any severity) before age 5 and 28% of these had two or more.[8] Comparable figures from a New Zealand study of 991 births followed for five years are 49% having one accident and 33% of these experiencing two or more.[9]

Accident rates vary considerably with age during the first five years of life.[9] The hypothesis that some children have a consistently high accident risk must therefore be tested by comparing rates of second (or more) accidents with first accident rates for children of the same age and sex. Hospital admission rates following childhood accidents have been declining rapidly in recent years;[10] time-specific, as well as sex- and age-specific rates therefore need to be studied. The linked data of the Oxford Record Linkage Study (ORLS) allow such comparisons to be made for hospital admissions following accidents. A cohort study is described comparing first and second hospital admission rates for accidents to children under the age of 5.

Methods

The methods of collection and linkage of data for the ORLS have been described elsewhere.[11] Hospital admissions with a discharge diagnosis indicative of an accident (coded N800 to N989 inclusive or N996) were selected for children aged under 5 born in 1971–73 and resident in the original ORLS area or West Berkshire DHA at the time of admission.

Person years at risk of a first accident at each age were calculated by assuming that all children born in Oxfordshire and West Berkshire were alive and still resident there until age 5 and then subtracting the time after deaths and first accidents when children (wherever they were born) were no longer at risk. Children were at risk of a second accident from the date of the first accident until the second accident, death or age 5, whichever came soonest. First and second accident rates were then calculated. Second accident rates were divided by first accident rates to give relative rates. These therefore compare the rate of hospital admissions for accidents among children

who had previously been admitted following an accident with the rate among children of the same age and sex with no such admission previously recorded.

This approach assumes that migration in of children was equalled by migration out. There was actually a modest level of net in-migration of under 5 year olds to the area during the period studied. (In 1972 the estimated one year net migration of children aged 0 to 4 between Oxfordshire and the UK outside the Oxford Record Linkage area was 34 per 1000 for males and 37 per 1000 for females.[12]) If accidents were unrelated to migration, the overall migration trend would have affected person years at risk of first and second accidents to the same extent. Both rates would therefore be overestimates, but the relative rate should have remained the same. Migration will, however, have led to a few second accidents being classified as first ones (the first having happened outside the area) and some second accidents being missed. Thus the calculated second accident rates are underestimates. This effect will slightly decrease the relative rates which will therefore also be underestimated.

If some children are at a consistently high accident risk, their first accident rates would also be higher. Inclusion of these children would raise the first accident rates and artificially decrease the relative rate. A comparison was therefore also made of second accident rates against rates of first accidents excluding children who went on to have another (that is, including only 'non-repeaters'). For these 'non-repeater' rates person years at risk were calculated by excluding from the first accident years at risk those children who went on to have another (that is, excluding the repeaters' years at risk).

Results

The number of hospital admissions for accidents to children aged under 5 are shown in table 1. The male second accident rates are significantly higher than the first accident rates at ages 0, 1, and 4 years (tables 2 and 3). The non-repeater rates are lower than the first accident rates, and the comparison of second accidents with these is significant at all ages in males. Female second accident rates are higher at all ages but significantly so only at ages 0, 1 and 3 years (tables 4 and 5). The relative rates are raised for the same ages when the comparison is with non-repeaters. For both males and females the second accident rates are approximately seven times higher at age under 1 year, three times higher at age 1, and twice as high from 2 to 4 years of age.

Study of repetition rates by type of accident would be interesting but was not possible because of the

Table 1 *Number of accidents per child*

Number of accidents per child	*Males*		*Females*	
	No.	%	*No.*	%
1	1069	93·4	820	94·5
2	64	5·5	47	5·4
3	10	0·9	1	0·1
4	2	0·2	0	0·0
Totals	1145	100·0	868	100·0

Table 2 *Male accident rates**

	Age at accident (years)					
	0	*1*	*2*	*3*	*4*	*Total*
First accidents†						
Number	143	347	314	192	149	1145
Rate	7·6	18·6	17·2	10·7	8·4	12·5
'Non-repeater' accidents†						
Number	123	319	295	185	147	1069
Rate	6·5	17·2	16·1	10·3	8·3	11·7
Second accidents‡						
Number	3	18	18	16	21	76
Rate	49·3	59·1	28·4	18·6	20·7	26·4

*Rates are calculated per 1000 person years at risk as appropriate to each accident category (see text).
†Age refers to age at first accident.
‡Age refers to age at second accident.

Table 3 *Male age-specific relative rates*

	Age (years)				
	0	*1*	*2*	*3*	*4*
2nd: First accidents					
Relative rate	6·5*	3·2***	$1·7^{ns}$	$1·7^{ns}$	2·5***
95% confidence limit†					
Upper	19·1	5·0	2·6	2·8	3·8
Lower	1·3	1·9	1·0	1·0	1·5
2nd: 'non-repeater' accidents					
Relative rate	7·6*	3·4***	1·8*	1·8*	2·5***
95% confidence limit†					
Upper	22·1	5·4	2·8	2·9	3·8
Lower	1·6	2·0	1·0	1·0	1·6

†Calculated from the Poisson probability of finding the observed number of second accidents in a distribution with mean equal to the second accidents expected from first accident/'non-repeater' rates.
Significance levels
ns not significant ** p<0·01
* p<0·05 *** p<0·001

Table 4 *Female accident rates**

	Age at accident (years)					
	0	*1*	*2*	*3*	*4*	*Total*
First accidents†						
Number	150	259	219	123	117	868
Rate	8·3	14·6	12·6	7·1	6·8	9·9
'Non-repeater' accidents†						
Number	138	240	206	122	114	820
Rate	7·7	13·6	11·8	7·1	6·6	9·4
Second accidents‡						
Number	4	10	10	14	10	48
Rate	62·0	37·8	19·2	21·1	13·1	21·1

*Rates are calculated per 1000 person years at risk as appropriate to each accident category (see text).
†Age refers to age at first accident.
‡Age refers to age at second accident.

Table 5 *Female age-specific relative rates*

	Age (years)				
	0	*1*	*2*	*3*	*4*
2nd: First accidents					
Relative rate	8·0**	2·8*	1·6ns	3·0***	2·0ns
95% confidence limit†					
Upper	20·6	5·1	3·0	3·8	3·6
Lower	2·2	1·3	0·8	1·6	1·0
2nd: 'non-repeater' accidents					
Relative rate	7·4*	2·6*	1·5ns	3·0***	1·9ns
95% confidence limit†					
Upper	18·9	4·8	2·8	5·0	3·5
Lower	2·0	1·2	0·7	1·6	0·9

†Calculated from the Poisson probability of finding the observed number of second accidents in a distribution with mean equal to the second accidents expected from first accident/'non-repeater' rates.
Significance levels
ns not significant ** p<0·01
* p<0·05 *** p<0·001

small numbers of poisonings and burns (table 6). Accident rates were broken down by calendar year. The second accident rates were then based on very small numbers, but within age groups, there was no consistent change over the years of the study in first or second accident rates. Secular trends in childhood accidents were therefore not considered further.

Discussion

This study has shown that children who have had one hospital admission for an accident are at approximately twice the risk of a repeat accident admission compared with children of the same age and sex with no previous admissions for accidents. These 'accident repeaters' also had higher first accident rates, indicating that their risk of accident was consistently raised. These findings corroborate those of Manheimer and colleagues even though their study referred to older children and to both in- and out-patient consultations.[6] Criticisms can, however, be levelled at the work concerning assumptions about migration, restriction to hospitalised accidents, and a general lack of utility.

Table 6 *Types of accident*

	Male		Female	
Accident type	*First accident* %	*Second accident* %	*First accident* %	*Second accident* %
Injury (N800–N939, N950–N959, N996)	69	79	67	75
Poisoning (N960–N989)	24	16	27	23
Burns (N940–N949)	7	5	5	2
Totals	100	100	100	100
N	1145	76	868	48

The influence of migration has been discussed. The overall effect will have been to decrease the relative rates. Departures from the assumption of independence of migration and accidents have not been considered but are unlikely to have had an impact sufficient to explain the increases in rates found here.

Only hospital admissions were studied. The raised second accident rates may therefore reflect admission policy or the parents' decision to take the child to hospital rather than the occurrence of accidents. It has been shown that factors predicting hospital admission for accidents differ from those predicting accidents in general.[13] This study cannot separate policy and the 'incidence' of accidents, and it is possible that different presentation and admission practices could have led to relative rates of this order of magnitude.

The final criticism that has been raised concerning studies of accident repetition is lack of utility.[14] Certainly attempts to identify the future accident repeaters at the time of their first accident would have an extremely low predictive value. It is also obvious that repeat accidents contribute little to the overall accident burden. However, children admitted to hospital after an accident have here been shown to be at higher risk of a subsequent accident admission. While acknowledging that a reduction in repeat accidents would have only a small public health impact, it seems pertinent to ask whether more advantage could be taken of the opportunity for preventive action offered by a first hospital admission for an accident.

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