Cross sectional survey of socioeconomic variations in severity and mechanism of childhood injuries in Trent 1992-7

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Abstract

Objective To determine the relation between morbidity from injury and deprivation for different levels of injury severity and for different injury mechanisms for children aged 0-14 years.
Design Cross sectional survey of routinely collected hospital admission data for injury 1992-7.
Setting 862 electoral wards in Trent Region.
Subjects 21 587 injury related hospital admissions for children aged 0-4 years and 35 042 admissions for children aged 5-14.
Main outcome measures Rate ratios for hospital admission for all injuries, all injuries involving long bone fracture, and all injuries involving long bone fracture requiring an operation; rate ratios for hospital admission for six types of injury mechanism divided by quintiles of the electoral wards' Townsend scores for deprivation. Rate ratios calculated by Poisson regression, with adjustment for distance from nearest hospital admitting patients with injuries, rurality, ethnicity, and percentage of males in each electoral ward.
Results Both total number of admissions for injury and admissions for injuries of higher severity increased with increasing socioeconomic deprivation. These gradients were more marked for 0-4 year old children than 5-14 year olds. In terms of injury mechanisms, the steepest socioeconomic gradients (where the rate for the fifth of electoral wards with the highest deprivation scores was ⩾3 times that of the fifth with the lowest scores) were for pedestrian injuries (adjusted rate ratio 3.65 (95% confidence interval 2.94 to 4.54)), burns and scalds (adjusted rate ratio 3.49 (2.81 to 4.34)), and poisoning (adjusted rate ratio 2.98 (2.65 to 3.34)).
Conclusion There are steep socioeconomic gradients for injury morbidity including the most common mechanisms of injury. This has implications for targeting injury prevention interventions and resources.

Introduction

Children from social classes four and five have a death rate from injury five times that of children from social classes one and two, and this difference is increasing.[1] Similar differences also exist for deaths from most injury mechanisms, most notably for fire, pedestrian and cyclist injuries, falls, and poisoning.[2]

While much research has focused on death from injury, there is also considerable morbidity related to injury. There is conflicting evidence about socioeconomic gradients in injury morbidity in childhood. Some studies measuring use of health services have found higher rates of injury among children living in disadvantaged areas,[3–9] but others have failed to find an association.[10–14] However, factors other than injury occurrence are likely to influence use of health services, such as proximity to hospital,[10 12] admission policies, and deprivation.[3 4] To overcome confounding by these factors, some analyses have been limited to more severe injuries,[3 4 10 11] but even these analyses have produced conflicting results. For example, one study found increasing admission rates, severe injury rates, and death rates as deprivation increased.[3] Later work by the same authors found strong correlation between rates of hospital attendance and admission and deprivation but that the association progressively weakened as the injury severity increased.[4] Lyons and colleagues undertook two studies of fracture and found no relation between fractures and deprivation.[10 11] Possible explanations of this include differential ascertainment of injuries (some studies identified or ascertained a greater proportion of injuries than others) and differential gradients by injury severity masked by including injuries of a range of severity.

There are some important gaps in our knowledge about socioeconomic gradients for injury mechanisms leading to morbidity. These need to be filled, not only for health service planning but also to inform the targeting of injury prevention strategies and to prevent widening inequalities.[1]

The aim of our study was to determine (*a*) whether there is a socioeconomic gradient for injury morbidity and whether this changes as injury severity and case ascertainment increases, and (*b*) whether there is a socioeconomic gradient for different injury mechanisms. To test the first aim, we used three measures of health service use that are likely to reflect increasing injury severity[6] and increased case ascertainment. The

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Table 1 Mechanisms of injury and ICD-9 and ICD-10 codes for external causes of injury

Mechanism of injury	ICD-9 codes	ICD-10 codes
Included in study		
Falls	E880-E888	W00-W19
Injuries to pedal cyclists	E810-E819 (with 4th digit .6) E826-E829 (with 4th digit .1)	V10-V19
Injuries to pedestrians	E810-E819 (with 4th digit .7) E826-E829 (with 4th digit .0)	V01-V09
Other transport injuries	E800-E807, E810-E819 (with 4th digit .0-.5, .8-.9) E820-E825, E826-E829 (with 4th digit .2-.4, .8-.9) E830-E848	V20-V99
Injuries from fire, smoke, and hot objects or fluids	E890-E899 E924 (with 4th digit .0, .8)	X00-X19
Poisoning or contact with corrosive substances	E850-E858 E860-E869 E924 (with 4th digit .1)	X40-X49
All other unintentional injury mechanisms	E900-E923 E924 (with 4th digit .9) E925-E928 E980-E989	W20-W45 W49-W60 W64-W94 W99, X20-X39 X50-X59 Y10-Y34 Y90-Y98
Excluded from study		
Misadventures to patients during surgical and medical care or complications of medical and surgical care	E870-E879	Y40-Y84
Late effects of unintentional injury or sequelae of external causes of injury	E929	Y85-Y89
Drugs, medicines, and biological substances causing adverse effects in therapeutic use	E930-E949	—
Suicide and self inflicted injury or intentional self harm	E950-E959	X60-X84
Homicide and injury purposely inflicted by other people or assault	E960-E969	X85-Y09
Legal intervention or legal intervention and operations of war	E970-E978	Y35-Y36

measures were hospital admission rates for all injuries, hospital admission for long bone fracture, and hospital admission for long bone fracture requiring an operation.[15]

Subjects and methods

Sample

Approval for the study was obtained from the Multi-Centre Research Ethics Committee and all the local research ethics committees in Trent. Our sample consisted of all admissions for unintentional injury from the 862 electoral wards in Trent between 1 April 1992 and 31 March 1997 for children aged 0-4 years and 5-14. We excluded the South Humber area as it was not part of Trent Region for the whole study period. We identified admissions from Trent NHS regional admissions databases by using the diagnosis codes and codes for external causes of injury from the ICD-9 and ICD-10 (international classification of diseases, ninth and 10th revisions) as well as relevant OPCS (operative procedure coding scheme) codes.

We allocated each patient to his or her respective electoral ward and aggregated the patient level data at electoral ward level in three ways: by the total number of admissions, by admissions for long bone fracture, and by admissions for long bone fracture requiring an operation (representing different measures of severity). This was done for children aged 0-4 years and for those aged 5-14.

We identified those mechanisms of injury known to have a socioeconomic gradient for mortality in children[2] and aggregated them to produce totals for each electoral ward for all admissions of children aged <15 years during the five year study. The mechanisms were pedal cyclist and pedestrian injuries, other transport injuries, falls, burns and scalds, and poisoning and chemical burns. Table 1 lists the ICD-9 and ICD-10 codes for external causes of injury that we included in the study and those that we excluded.

Census data

We used the Townsend score associated with each electoral ward as a proxy for material deprivation, with high scores being associated with greater deprivation. The Townsend score contains the variables unemployment, overcrowding, lack of a car, and non-owner occupation.[16] The score is recognised as a good measure of material deprivation, although it is subject to the ecological fallacy. The population data for electoral wards were obtained from the 1991 census. We used percentages of Asian and black residents in each electoral ward to adjust for confounding due to ethnic differences. We coded the rurality of the ward using Carstair's rurality index,[17] with the highest of the six categories representing the most rural locations. We calculated the distance from the centroid of each ward to the nearest hospital admitting patients with injuries during the study period using the appropriate grid references. We obtained the grid references for the ward centroids from MapInfo Professional (version 6.0).

Statistical analysis

We used Poisson regression (STATA version 7.0) to determine univariate and multivariate rate ratios with 95% confidence intervals for admission rates by electoral ward. We used the mid-year population of each ward as the denominator term. Our main explanatory variable was the Townsend score associ-

Table 2 Rates of hospital admission for different levels of injury severity for children aged <15 years in Trent Region for 1992-7 by Townsend deprivation score. (Values are median rates (interquartile range) per 10 000 children)

	Townsend score*				
Injury severity	**Lowest fifth**	**2nd**	**3rd**	**4th**	**Highest**
Children aged 0-4 years					
Total admissions	456.3 (304.4 to 581.3)	434.8 (251.0 to 610.0)	533.9 (328.8 to 757.6)	649.0 (506.4 to 837.5)	896.4 (696.4 to 1064.1)
Long bone fractures	37.4 (0.0 to 95.7)	44.6 (0.0 to 102.4)	64.5 (0.0 to 123.5)	81.0 (37.3 to 122.3)	94.3 (64.9 to 127.6)
Long bone fractures needing operation	0.0 (0.0 to 70.8)	9.6 (0.0 to 75.8)	37.2 (0.0 to 842.2)	48.7 (16.9 to 91.7)	63.2 (36.0 to 96.6)
Children aged 5-14 years					
Total admissions	465.0 (329.7 to 581.3)	450.5 (321.3 to 560.4)	512.1 (377.2 to 633.2)	634.0 (473.4 to 767.8)	769.9 (641.9 to 917.1)
Long bone fractures	174.1 (108.5 to 250.1)	173.9 (97.4 to 236.1)	191.9 (120.7 to 252.4)	207.7 (151.4 to 260.8)	252.2 (203.4 to 298.9)
Long bone fractures needing operation	156.6 (91.7 to 227.3)	148.2 (87.0 to 204.8)	154.9 (100.1 to 219.9)	182.4 (126.0 to 237.0)	211.0 (168.3 to 265.4)

*Townsend scores divided by quintiles, with the highest fifth representing the most deprived electoral wards.

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Table 3 Rate ratios of hospital admission for different levels of injury severity for children aged <15 years in Trent Region for 1992-7 by Townsend deprivation score

Townsend scores*	Children aged 0-4 years				Children aged 5-14 years			
	Unadjusted		Adjusted†		Unadjusted		Adjusted†	
	Rate ratio (95% CI)	P value‡	Rate ratio (95% CI)	P value‡	Rate ratio (95% CI)	P value‡	Rate ratio (95% CI)	P value‡
Total admissions								
Lowest fifth	1.00		1.00		1.00		1.00	
2nd	1.04 (0.98 to 1.11)	0.22	1.06 (0.99 to 1.13)	0.09	1.02 (0.97 to 1.07)	0.462	1.03 (0.98 to 1.08)	0.240
3rd	1.28 (1.21 to 1.36)	<0.0001	1.27 (1.20 to 1.35)	<0.0001	1.18 (1.13 to 1.23)	<0.0001	1.17 (1.12 to 1.22)	<0.0001
4th	1.48 (1.40 to 1.57)	<0.0001	1.41 (1.33 to 1.49)	<0.0001	1.44 (1.39 to 1.50)	<0.0001	1.38 (1.32 to 1.43)	<0.0001
Highest	1.96 (1.86 to 2.06)	<0.0001	1.88 (1.78 to 1.99)	<0.0001	1.71 (1.65 to 1.77)	<0.0001	1.66 (1.59 to 1.72)	<0.0001
Admissions with long bone fractures								
Lowest fifth	1.00		1.00		1.00		1.00	
2nd	1.10 (0.92 to 1.33)	0.29	1.13 (0.94 to 1.35)	0.20	0.98 (0.91 to 1.06)	0.615	0.99 (0.92 to 1.07)	0.810
3rd	1.28 (1.09 to 1.52)	0.004	1.29 (1.09 to 1.53)	0.004	1.08 (1.01 to 1.16)	0.027	1.07 (1.00 to 1.15)	0.047
4th	1.46 (1.25 to 1.71)	<0.0001	1.45 (1.23 to 1.70)	<0.0001	1.21 (1.14 to 1.29)	<0.0001	1.17 (1.09 to 1.25)	<0.0001
Highest	1.69 (1.46 to 1.96)	<0.0001	1.70 (1.45 to 1.99)	<0.0001	1.37 (1.30 to 1.46)	<0.0001	1.37 (1.28 to 1.46)	<0.0001
Admissions with long bone fractures needing operations								
Lowest fifth	1.00		1.00		1.00		1.00	
2nd	1.20 (0.96 to 1.50)	0.11	1.23 (0.98 to 1.53)	0.07	0.96 (0.89 to 1.04)	0.340	0.97 (0.90 to 1.05)	0.456
3rd	1.30 (1.05 to 1.59)	0.02	1.32 (1.07 to 1.63)	0.01	1.04 (0.96 to 1.12)	0.336	1.03 (0.96 to 1.11)	0.433
4th	1.51 (1.25 to 1.83)	<0.0001	1.52 (1.24 to 1.85)	<0.0001	1.18 (1.11 to 1.27)	<0.0001	1.14 (1.06 to 1.22)	<0.0001
Highest	1.73 (1.45 to 2.08)	<0.0001	1.83 (1.51 to 2.22)	<0.0001	1.32 (1.24 to 1.41)	<0.0001	1.33 (1.24 to 1.43)	<0.0001

*Townsend scores divided by quintiles, with the highest fifth representing the most deprived electoral wards.
†Adjusted for rurality, percentage males, percentage Asian, percentage black, and distance from nearest hospital.
‡Compared with value for lowest fifth of Townsend scores.

ated with electoral ward where each patient lived; wards were ranked by Townsend score and divided by quintiles with the top fifth representing the most deprived electoral wards. Confounding factors included in the multivariate analysis were the proportion of males in each age group in the ward, rurality, percentages of Asian and black residents, and distance from nearest hospital (categorised into fifths). We chose a significance level of 0.01 (two tailed).

Sample size calculation

A post-hoc sample size calculation showed that we had a power of 87% at the 0.01 significance level (two tailed) to determine a rate ratio of 1.2 between the top and bottom fifths of deprivation by ward for all admissions in children aged 0-4 years, with a coefficient of variation of 0.35.[18]

Results

Characteristics of the study population

We identified 21 587 admissions for unintentional injury for children aged 0-4 years, of whom 21 481 (99.5%) could be linked to one of the 862 electoral wards in Trent. We identified 35 042 admissions for injury to children aged 5-14, of whom 34 888 (99.6%) could be allocated to an electoral ward. Of the 21 481 admissions for children aged 0-4 years, 2517 (11.7%) were for long bone fractures, and 1721 (68.4%) of these required an operation. Of the 34 888 admissions for children aged 5-14, 12 007 (34.4%) were for long bone fractures, of which 10 455 (87.1%) required an operation. Table 2 shows the various admission rates by Townsend deprivation score.

Socioeconomic gradients for injury severity

Table 3 shows the unadjusted and adjusted rate ratios for each of the three categories of admission by Townsend score. We found a significant gradient for all admissions in children aged 0-4 by Townsend score, with those in the top fifth (most deprived) having a 96% higher admission rate (95% confidence interval 86% to 106%) compared with the bottom fifth on univariate analysis. The admission rate was 88% higher (78% to 99%) on multivariate analysis, when distance from hospital, rurality, percentages of Asian and black residents, and percentage of males in the ward were taken into account. Similar gradients occurred in the same age group for admissions for long bone fracture (adjusted rate ratio 1.70 (95% confidence interval 1.45 to 1.99) for top *v* bottom fifth of deprivation) and for long bone fracture requiring an operative procedure (1.83 (1.51 to 2.22)).

We also found a socioeconomic gradient for the three types of admissions in children aged 5-14 years

Table 4 Causes of injury (according to ICD-9 and ICD-10 codes) for hospital admissions of children aged <15 years in Trent Region for 1992-7

Cause of injury	No (%) of admissions	% of admissions with valid ICD codes
Children aged 0-4 years		
Falls	7 758 (36.1)	39.3
Pedal cycle injuries	258 (1.2)	1.3
Pedestrian injuries	293 (1.4)	1.5
Other transport injuries*	324 (1.5)	1.6
Burns and scalds	1 445 (6.7)	7.3
Poisoning and chemical injuries	4 271 (19.9)	21.6
All other injury mechanisms	5 413 (25.2)	27.4
Missing ICD codes	1 719 (8.0)	
Total admissions	21 481 (100)	
Children aged 5-14 years		
Falls	15 669 (44.9)	48.9
Pedal cycle injuries	3 152 (9.0)	9.8
Pedestrian injuries	1 678 (4.8)	5.2
Other transport injuries*	1 446 (4.1)	4.5
Burns and scalds	446 (1.3)	1.4
Poisoning and chemical injuries	1 081 (3.1)	3.4
All other injury mechanisms	8 547 (24.5)	26.7
Missing ICD codes	2 869 (8.2)	
Total admissions	34 888 (100)	

*Excluding pedal cycle and pedestrian injuries.

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Table 5 Rates of hospital admission for different causes of injury for children aged <15 years in Trent Region for 1992-7 by Townsend deprivation score. (Values are median rates (interquartile range) per 10 000 children)

	Townsend score*				
Cause of injury	**Lowest fifth**	**2nd**	**3rd**	**4th**	**Highest**
Falls	205.8 (124.4 to 267.3)	182.7 (122.2 to 253.9)	234.9 (162.3 to 301.0)	267.3 (195.9 to 315.0)	329.4 (268.9 to 409.0)
Pedal cycle injuries	25.6 (0.0 to 48.0)	28.8 (12.5 to 46.1)	28.9 (0.0 to 43.5)	36.8 (19.9 to 60.5)	46.0 (22.2 to 66.1)
Pedestrian injuries	0.0 (0.0 to 14.5)	0.0 (0.0 to 21.4)	7.5 (0.0 to 26.0)	16.6 (0.0 to 32.5)	34.4 (20.4 to 49.1)
Other transport injuries†	17.2 (0.0 to 34.2)	15.0 (0.0 to 32.5)	14.1 (0.0 to 33.2)	16.1 (0.0 to 30.0)	20.8 (12.1 to 29.0)
Poisoning and chemical injuries	25.2 (0.0 to 48.0)	29.8 (0.0 to 51.3)	44.4 (16.6 to 74.2)	52.2 (31.7 to 84.7)	81.4 (51.9 to 114.3)
Burns and scalds	0.0 (0.0 to 13.1)	0.0 (0.0 to 15.9)	4.9 (0.0 to 21.6)	16.0 (0.0 to 32.7)	29.9 (17.6 to 45.7)

*Townsend scores divided by quintiles, with the highest fifth representing the most deprived electoral wards.
†Excluding pedestrian and pedal cycle injuries.

on univariate and multivariate analysis (table 3), although the gradients were less marked than for children aged 0-4. The socioeconomic gradient for all admissions in children aged 5-14 years (adjusted rate ratio 1.66 (1.59 to 1.72) for top *v* bottom fifth of deprivation) was greater than that for admissions for long bone fracture (1.37 (1.28 to 1.46)) and for long bone fractures requiring an operation (1.33 (1.24 to 1.43)).

Table 6 Rate ratios of hospital admission for different causes of injury for children aged <15 years in Trent Region for 1992-7 by Townsend deprivation score

Townsend scores*	Unadjusted		Adjusted†	
	Rate ratio (95% CI)	**P value‡**	**Rate ratio (95% CI)**	**P value‡**
Falls				
Lowest fifth	1.00		1.00	
2nd	0.97 (0.92 to 1.03)	0.38	0.99 (0.93 to 1.05)	0.69
3rd	1.17 (1.11 to 1.23)	<0.0001	1.14 (1.08 to 1.20)	<0.0001
4th	1.37 (1.31 to 1.44)	<0.0001	1.28 (1.21 to 1.34)	<0.0001
Highest	1.62 (1.55 to 1.70)	<0.0001	1.53 (1.46 to 1.61)	<0.0001
Pedal cycle injuries				
Lowest fifth	1.00		1.00	
2nd	1.05 (0.91 to 1.21)	0.50	1.06 (0.92 to 1.22)	0.45
3rd	1.07 (0.94 to 1.23)	0.30	1.08 (0.94 to 1.24)	0.26
4th	1.37 (1.21 to 1.55)	<0.0001	1.38 (1.21 to 1.57)	<0.0001
Highest	1.46 (1.30 to 1.64)	<0.0001	1.61 (1.42 to 1.82)	<0.0001
Pedestrian injuries				
Lowest fifth	1.00		1.00	
2nd	1.65 (1.28 to 2.12)	<0.0001	1.68 (1.30 to 2.16)	<0.0001
3rd	2.11 (1.67 to 2.67)	<0.0001	2.03 (1.60 to 2.57)	<0.0001
4th	2.55 (2.05 to 3.18)	<0.0001	2.32 (1.85 to 2.91)	<0.0001
Highest	4.30 (3.49 to 5.28)	<0.0001	3.65 (2.94 to 4.54)	<0.0001
Other transport injuries				
Lowest fifth	1.00		1.00	
2nd	0.89 (0.74 to 1.07)	0.21	0.87 (0.73 to 1.05)	0.14
3rd	0.89 (0.75 to 1.06)	0.20	0.92 (0.78 to 1.10)	0.38
4th	0.94 (0.81 to 1.11)	0.48	1.05 (0.89 to 1.25)	0.55
Highest	1.03 (0.89 to 1.19)	0.74	1.25 (1.06 to 1.47)	0.008
Poisoning and chemical injuries				
Lowest fifth	1.00		1.00	
2nd	1.26 (1.10 to 1.44)	0.001	1.26 (1.10 to 1.45)	0.001
3rd	1.51 (1.34 to 1.72)	<0.0001	1.55 (1.36 to 1.76)	<0.0001
4th	1.94 (1.72 to 2.17)	<0.0001	1.92 (1.70 to 2.17)	<0.0001
Highest	2.75 (2.47 to 3.07)	<0.0001	2.98 (2.65 to 3.34)	<0.0001
Burns and scalds				
Lowest fifth	1.00		1.00	
2nd	1.15 (0.89 to 1.50)	0.29	1.14 (0.87 to 1.49)	0.33
3rd	1.68 (1.33 to 2.12)	<0.0001	1.63 (1.29 to 2.07)	<0.0001
4th	2.39 (1.92 to 2.96)	<0.0001	2.37 (1.89 to 2.96)	<0.0001
Highest	3.68 (3.01 to 4.51)	<0.0001	3.49 (2.81 to 4.34)	<0.0001

*Townsend scores divided by quintiles with the highest fifth representing the most deprived electoral wards.
†Adjusted for rurality, percentage males, percentage Asian, percentage black, and distance from nearest hospital.
‡Compared with value for lowest fifth of Townsend scores.

Socioeconomic gradients for injury mechanism

Table 4 shows the distribution of admissions according to the ICD-9 and ICD-10 codes for external causes of injury. Of the admissions that could be linked to an electoral ward, 19 762/21 481 (92%) of those for children aged 0-4 and 32 019/34 888 (91.8%) of those for children aged 5-14 had an external cause of injury recorded. The commonest cause of injury in both age groups was falls. The second most common causes were poisonings in children aged 0-4 and pedal cycle injuries in older children.

Table 5 shows the median admission rate per 10 000 children aged <15 years for each injury mechanism by Townsend score, and table 6 shows the unadjusted and adjusted rate ratios for each injury mechanism by Townsend score. We found increasing admission rates with increasing deprivation for all mechanisms of injury except for other transport injuries (which excluded pedestrian and cycle injuries). The steepest socioeconomic gradient was for pedestrian injuries, where the most deprived fifth of wards had more than four times the admission rate than the most affluent fifth (unadjusted rate ratio 4.30 (3.49 to 5.28)). This persisted after adjustment for possible confounders in the multivariate analysis (adjusted rate ratio 3.65 (2.94 to 4.54)). Similarly, rates of admission for burns and scalds and poisoning injures were three times higher in the most deprived fifth of wards compared with the most affluent fifth.

Discussion

We found a socioeconomic gradient for admission for injury of external causes in children aged <15, particularly in those aged <5, that persisted with different levels of injury severity. The socioeconomic gradient was steepest for pedestrian injuries, burns and scalds, and poisoning related injuries.

Limitations and merits of study

This study is based on routinely collected data on NHS hospital admissions, which we have not been able to validate. However, a recent systematic review showed a median accuracy of 91% for diagnostic codes and 69.5% for procedure codes.[19] We have no reason to suspect that injuries would be coded any less accurately or less completely for subjects according to their postcode of residence; hence the chance of bias because of this is small. Indeed, the role of routine NHS data in monitoring and promoting equity in primary care has been advocated,[20] as has a role in identifying areas of concern needing further study.[21] In terms of complete-

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ness, the data in many cases were more than 95% complete,[21] and accuracy for specific conditions such as fractured femurs has been shown to be good.[22]

We did not include injury related deaths as these have been reported elsewhere. Data were not available for private admissions, although we expect that the vast majority of patients are admitted to NHS hospitals. Finally, our use of routinely collected data limited us to an area, rather than an individual, measure of deprivation. As with all ecological studies, caution must be exercised in drawing conclusions concerning individual deprivation and injury morbidity.

The strengths of our study are that we have incorporated the possible confounding effects of proximity to hospital, ethnicity, and rurality.[10 12] Our sample included more then 50 000 admissions to all hospitals in Trent from a population of over 860 000 during a five year period. This makes our study the largest study in the subject and one of the most robust since it is less subject to local variations in a single area or hospital unit. Our sample is more than 20 times the size of that in a recent study that showed no socioeconomic gradient for the incidence of fractures in children, which the authors themselves found surprising.[11] Given recent reports on the important lack of injury morbidity data, particularly in relation to social inequalities,[23] and the importance of injuries as a national priority,[24] we believe our finding are worth reporting with due caution.

Implications of our findings

We found a steep socioeconomic gradient for all injury admissions for children under 5 years. This is unlikely to be explained by thresholds for admission that differ by social group, as the gradient persists for long bone fractures requiring an operative procedure, where we would expect virtually all cases to be admitted irrespective of social group.[15]

The socioeconomic gradient for all injury admissions for children aged 5-14 was also significant, although less steep for long bone fracture requiring an operative procedure. This suggests factors other than injury severity may play a part in the decision to admit children in this age group.

Why might the gradient in injury morbidity be steeper for younger children? This may partly be explained by the changes in injury mechanism with age. After falls, the leading cause of injury related admissions is poisoning in younger children and transport related injuries in older children. Younger children also spend more time at home, and the Townsend score, which includes non-owner occupation and overcrowding, may better reflect the quality of the home environment than that of the environment in schools, play areas, or leisure facilities where older children spend more of their time.

This is the first study to have examined socioeconomic gradients for injury mechanisms resulting in morbidity. We found particularly steep gradients, mirroring those for mortality,[2] for pedestrian injuries, burns and scalds, and poisoning, with injury rates over three times higher in the most deprived wards compared with the least deprived. This implies that targeting deprived areas with interventions that are known to be effective for these injury mechanisms—such as traffic calming and smoke alarms—may reduce these inequalities. If primary care organisations are to undertake injury prevention in line with national priorities, then their budgets need to reflect local levels of injury morbidity.

What is already known on this topic?

There is a steep socioeconomic gradient for injury related mortality

There is conflicting evidence regarding the socioeconomic gradient for injury morbidity, particularly with respect to different injury severity and injury mechanisms

What this study adds

A socioeconomic gradient for injury morbidity exists in children aged < 15 years, particularly in those aged < 5, which persist for different measures of injury severity

The socioeconomic gradient for injury mechanisms is steepest for pedestrian injuries, burns and scalds, and poisoning, which has implications for targeting injury prevention strategies

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