Prevention of pedestrian accidents

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Abstract

Child pedestrian accidents are the most common road traffic accident resulting in injury. Much of the existing work on road traffic accidents is based on analysing clusters of accidents despite evidence that child pedestrian accidents tend to be more dispersed than this. This paper analyses pedestrian accidents in 573 children aged 0–11 years by a locally derived deprivation score for the years 1988–90. The analysis shows a significantly higher accident rate in deprived areas and a dose response relationship between degree of deprivation and accident rates. At the level of individual deprivation zones a strong correlation between accident rates and the degree of deprivation has been demonstrated. It is suggested that area wide engineering and educational schemes should be targeted at areas with high accident rates. Environmental improvements based on analysis of clusters of accidents may not be the most suitable method for reducing child pedestrian accidents.

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Childhood pedestrian accidents are the most common road traffic accident resulting in injury, accounting for 46% of all road traffic casualties to children. One in four child pedestrians involved in an accident will be killed or seriously injured. In 1990, 48 000 children were reported to the police as injured in a road traffic accident, of which 23 000 were pedestrian casualties.[1] As under reporting occurs to a large extent[2–4] the number of accidents is undoubtedly much greater.

There has been much interest recently in planning multiagency road traffic accident prevention at a local level.[1,5,6] Much of the existing work on road traffic accidents is based on analysing 'clusters' of accidents, despite evidence that child pedestrian accidents tend to be more widely dispersed than this.[4] Although home accidents in children have been analysed by deprivation areas,[7] this is not the case for road traffic accidents. The social class gradient of childhood road traffic accidents is well described[4,8,9] but little work exists using an index of deprivation by which to analyse accidents, with the existing research focusing on prosperity at a parliamentary constituency level based on overcrowding and availability of toilet facilities obtained from census data in Sheffield in 1984.[10] The ability of deprivation indices to describe geographical areas homogeneous in social and economic characteristics that may be associated with childhood road traffic accidents is important as they may have the potential to define areas with discrete accident rates. Such information could then be used for prioritising planning and targeting traffic management schemes and multiagency accident prevention work.

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Methods

Child pedestrian accidents (aged 0–11 years) were obtained from the police stats 19 forms for the Greater Nottingham area for the three years 1988–90. They were mapped using Ordnance Survey grid references and superimposed on a map of the Greater Nottingham area showing deprivation zones as calculated by the Nottinghamshire County Council deprived area study.[11] In this study deprivation scores are calculated based on low income, unemployment, lack of skills, poor housing, poor health, and family problems. Scores are calculated for zones based on aggregated enumeration districts comprising approximately 3000 people. To increase homogeneity, zone boundaries have been drawn to cover areas that are likely to contain populations with similar social and economic characteristics. Zones are then categorised into areas of extreme, serious, moderate, and below average disadvantage. The number of accidents over the three year period have been counted in each deprivation zone. Population figures were obtained from the Nottinghamshire County Council based on the mid-year population estimate for 1989.[12] Three year age specific accident rates were then calculated for children aged 0–4 years and 5–11 years for each deprivation zone and for each deprivation area (that is extreme, serious, moderate, and below average). When calculating child pedestrian accident rates based on information on stats 19 forms, the numerator consists of the number of accidents occurring in a given area. In view of

*Table 1 Child pedestrian accidents by age in deprived and non-deprived areas of Greater Nottingham 1988–90**

	0–4 years		*5–11 years*	
	Deprived area	*Non-deprived area*	*Deprived area*	*Non-deprived area*
Accident	90	23	324	136
No accident	13 115	14 805	21 139	25 929
	χ^2 with 1 df $p<0{\cdot}0001$		χ^2 with 1 df $p<0{\cdot}0001$	

*Deprived area = extreme, serious, and moderate disadvantage and non-deprived area = below average disadvantage.

Table 2 Child pedestrian accidents by age and level of deprivation in Greater Nottingham 1988–90

	0–4 years		*5–11 years*	
Deprivation	*Accident*	*No accident*	*Accident*	*No accident*
Below average	23	14 805	136	25 929
Moderate	20	4 472	82	7 966
Severe	32	4 198	188	6 795
Extreme	32	4 449	120	6 382
	χ^2 test for trend $p<0{\cdot}0001$		χ^2 test for trend $p<0{\cdot}0001$	

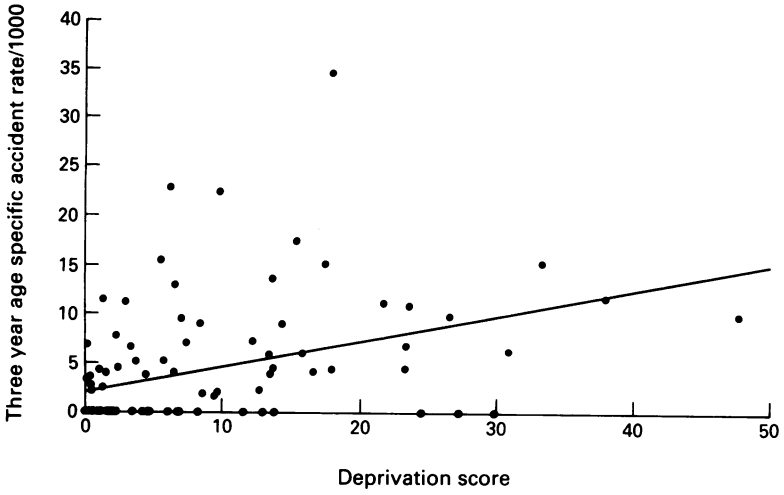
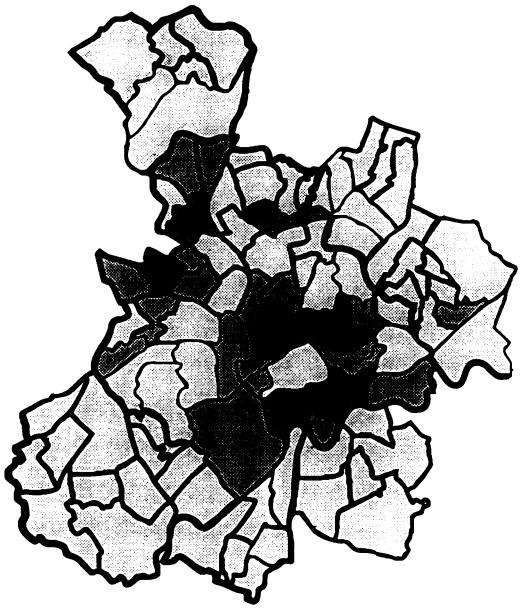


Figure 1 Pedestrian accidents by deprivation: age 0–4 years, 1988–90; r_s=0·61, 95% confidence interval 0·47 to 0·73, p<0·001.



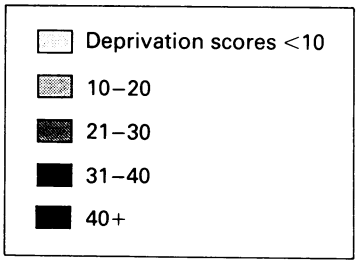


Figure 3 Deprivation scores for the Greater Nottingham area. Source: Nottinghamshire County Council deprived area study.

Preston's study, which demonstrated that the majority of child pedestrian accidents occurred close to home for children under 11 years (90% occurred within a quarter of a mile from home for children aged under 5 years, 78% for children aged 5–7 years, and 68% for children aged 8–10 years[9]) the resident child population in each deprivation area was considered a suitable denominator. Accidents to children aged over 11 years were not included as they are much more widely dispersed, so precluding the use of the resident population as the denominator. The χ^2 test was used to test whether an association existed between deprivation area and the proportion of children having accidents and also to test for trend. In order to estimate the number of repeated accidents, all child pedestrian accidents for 1988 were examined. There were no repeated accidents during that time period. Spearman rank correlation coefficients and 95% confidence intervals were calculated for deprivation zone scores and three year age specific child pedestrian accident rates, using the Confidence Interval Analysis computer programme (S B Gardner, P D Winter, M J Gardner, 1989).

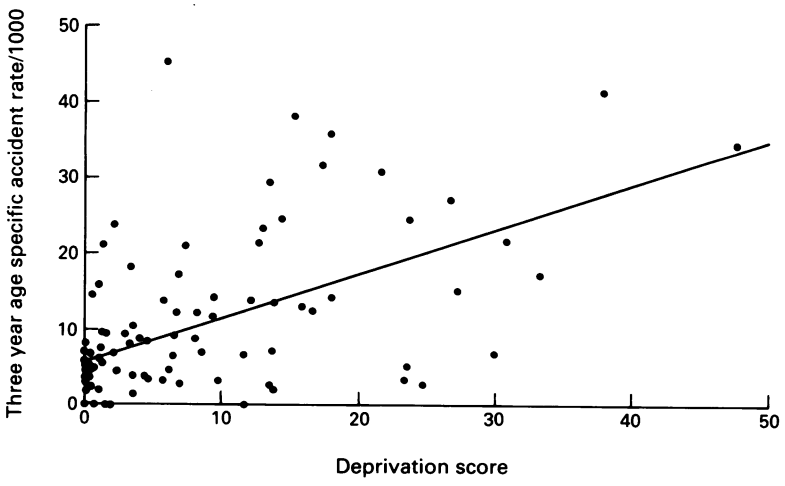


Figure 2 Pedestrian accidents by deprivation: age 5–11 years, 1988–90; r_s=0·68, 95% confidence interval 0·55 to 0·77, p<0·001.

Results

Over the three year period a total of 573 children aged 0–11 years had a pedestrian accident reported to the police. The accident rate in deprived areas was significantly greater than in non-deprived areas (table 1), and increasing levels of deprivation were associated with an increasing proportion of the child population being involved in an accident as a pedestrian (table 2). At an individual deprivation zone level, a strong correlation existed between the three year age specific child pedestrian accident rates and the deprivation score (figs 1 and 2); this relationship could be clearly seen by mapping accident rates by deprivation scores (figs 3, 4, and 5).

Discussion

Using local child pedestrian accident data and a locally derived deprivation score it has been possible to demonstrate significantly higher accident rates in deprived areas, a dose response relationship between accident frequency and level of deprivation, and at the level of individual deprivation zones a strong correlation between deprivation scores and age specific child pedestrian accident rates. These relationships have been demonstrated both for children aged 0–4 years and children aged 5–11 years.

Finding a denominator for child pedestrian accident rates is difficult. What is needed is a

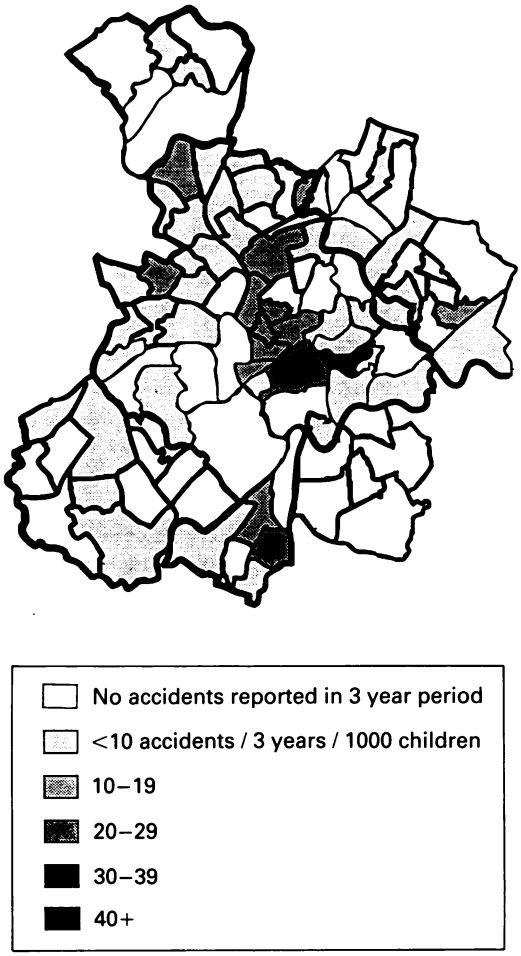


Figure 4 Three yearly child pedestrian accident rates: age 0–4 years, 1988–90.

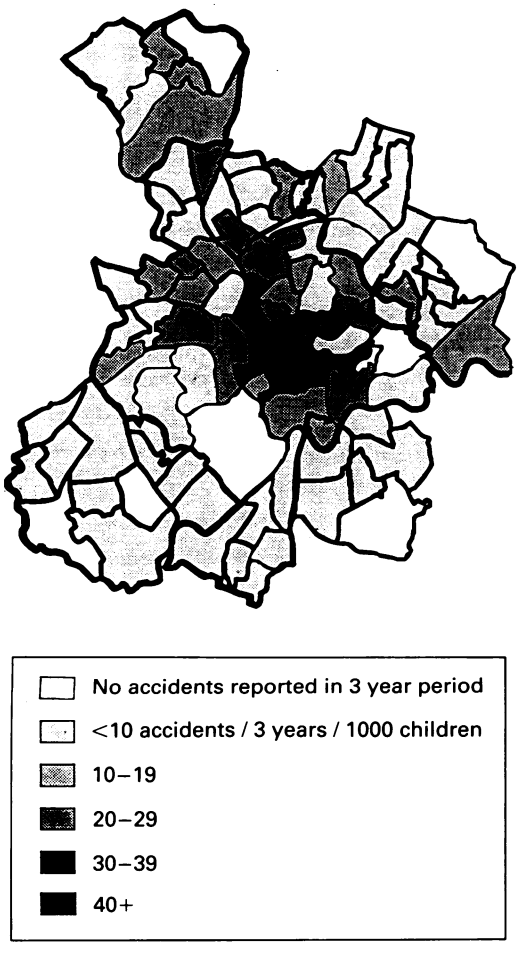


Figure 5 Three yearly child pedestrian accident rates: age 5–11 years, 1988–90.

measure of the number of children at risk in a geographical area and the number having accidents in that same area. The stats 19 data collected by the police does not routinely contain the postcoded home address of the child involved in the accident. Preston extracted this data from police files in an analysis of child pedestrian accidents in Manchester and Salford. This data was then used to calculate the distance from the home to the site of the accident. It was found that the majority of accidents to children under 11 years occur within one quarter of a mile from home.[9] Following on from this, a collaborative project established between the police authority and the University of Newcastle upon Tyne incorporated the postcoded home address into the routine data collected by the police, so allowing accurate denominator data to be collected (S S M Walsh, S N Jarvis, W Clarke, S Raybould. Presented at 34th annual scientific meeting of Society of Social Medicine, Glasgow 12–14 September 1990). This project, however, is concerned with making the best use of data routinely available to county councils, which unfortunately does not include the home address of the child having an accident. For this reason and because of the small distances between home address and site of accident in children under 11,[9] the population of deprivation zones has been used as the denominator. Even more appropriate denominators might be the number of pedestrian journeys per unit time or the distance travelled as a pedestrian per unit time. Neither of these are readily available to county councils who are currently making decisions regarding where to intervene to reduce the number of child pedestrian accidents.

The opportunities for introducing bias by using deprivation zone population figures are twofold; firstly the population at risk could be over estimated, so artificially reducing the accident rate. This is unlikely as all the children resident in an area will be at risk in that area, as well as in other areas. The second possibility is of under estimating the population at risk, so artificially inflating the accident rate. This would be possible in areas such as those surrounding schools where many children pass through the area and are temporarily at risk in it. Comparing the actual number of accidents in an area with the accident rate could be used to guard against any unnecessary intervention.

Several important issues arise from this study. Firstly, whether it is useful to examine child pedestrian accidents on the basis of a geographical area larger than the commonly used accident 'cluster'. Early work in the 1970s demonstrated the potential for reducing accidents on an area wide basis.[13] As a result of this the Transport and Road Research Laboratory undertook an urban safety project in five British towns. This work demonstrated a significant reduction in accidents (in the order of 13% across in all five towns) including those in residential areas that do not usually benefit from the traditional 'black spot' treatments.[14] As area wide measures have been shown to reduce accidents in residential areas, it is likely that they will be effective in reducing child pedestrian accident rates.

Other studies examining the relationship

between the socioeconomic conditions in an area and child pedestrian accident rates have suggested that the existence of safe play areas is the major environmental difference between areas with high and low accident rates.[9 10] The use in this study of a deprivation score, which was designed by the local county council to identify areas with a lack of access to sources and amenities, may therefore by identifying areas without safe play areas as deprived areas. Without further research on this issue to elucidate whether deprived areas do lack safe play facilities, and on the related issue of safe routes to play areas, no further conclusion regarding the provision of safe play areas can be drawn at present.

The second important issue concerns the use of deprivation scores to define geographical areas. This was considered appropriate as they relate to areas homogeneous with respect to social and economic characteristics. They are therefore likely to reflect differences in local environments, opportunities for safe play, and possibly in levels of supervision. As these are important factors in child pedestrian accidents the use of deprivation scores is likely to define areas with large differences in accident rates. Areas chosen purely on a geographical or population basis may be less homogeneous and therefore less able to demonstrate differences in accident rates. The deprivation index used in this study includes three of the four indicators used in the Townsend score – namely unemployment, overcrowding, and lack of a car. It also includes single parent families and children on the child protection register, both of which may be associated with child accidents. For this reason and because the deprivation score is locally applicable, it was chosen for this work. The Townsend score would be a suitable alternative for similar work in other parts of the country.

These findings have implications for traffic management and road safety and health education. Environmental improvements based on traffic engineering methods designed around accident clusters do not involve the calculation of accident rates, consequently the population at risk is not considered. As child pedestrian accidents tend to be scattered diffusely rather than cluster,[4] areas with high accident rates may be missed using 'blackspot' or cluster analyses, while area wide interventions will have a greater potential to reduce such accidents. Further work is needed to address the issue of whether there is adequate provision of safe play areas in deprived areas and to address the issue of safe routes to play areas.

The demonstration of a relationship between the deprivation in a relatively small geographical area and the child pedestrian accident rate suggests that child pedestrian accidents could be tackled on a locality basis. Several recent reports have recommended combined approaches of education and engineering measures using collaborative working between agencies responsible for health, road safety education and engineering.[1 5 6] This paper describes the type of information that can be useful to prioritise geographical areas for investigation of accidents and subsequent engineering and educational intervention within a health district or local authority area. Such information could also be used to raise the awareness regarding child pedestrian accidents in local communities and for encouraging community participation in designing a road traffic accident prevention strategy.

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