Child road safety in rural areas: literature review and commentary (No.32)

Contents

Summary

Background

This report presents the findings of a literature review, consultations with a number of localauthorities and secondary analysis of data which aimed to:

- provide a critical review of research and literature on child road safety in rural areas;
- quantify the trends in child safety on rural roads and, combined with a review ofexisting evidence, identify high risk groups;
- identify policies that have, or may have, an impact on child road safety in rural areasand assess any evaluations undertaken; and
- identify any gaps in existing knowledge and research.

This review has found that there is limited literature focusing on road safety interventionsfor children living in rural areas, a conclusion also reached by the OECD *It is quiteevident that the current knowledge and expertise about how to improve rural road safety isnot sufficient.* Similarly research for the Scottish Executive noted *Throughout the reviewof the literature a major gap in informative research emerged relating to comparison ofurban and rural risk factors for road traffic accidents. This is particularly key to any furtherwork on social in/exclusion*. In particular it was argued in that research that studies of thebehavioural and travel patterns of **children** in urban compared to rural communities shouldbe carried out to inform this issue. However, although the evidence is limited and oftenindirect it does indicate areas for further research and potential policy development.

Rural road safety has been looked at in terms of rural areas principally defined in terms ofpopulation density and in terms of non-built up roads; that is, roads with a speed limitgreater than 40mph. The incompatibility between definitions makes it difficult to compareresearch findings and derive estimates of relative risk with accident data as numerator andexposure data as denominator.

It is also evident that different authors use different definitions of children, encompassingvarious age groups, and this may also cause difficulties in making comparisons. Theanalysis of police-reported road accident data, for example, defines children for thesepurposes as up to the age of fifteen whilst elsewhere an older top age limit has been used.

Road Accidents amongst Children in Rural Areas

Analysis of police accident statistics indicates that there were considerably fewer accidentsto children in non-built up areas compared with built up areas. The overwhelming majorityof child casualties in non built-up areas were car passengers. In some respects they faredbetter than adult passengers, for example in their fatal and serious injury rate. The most likely reasons are higher seat-belt wearing and lower impact speeds in accidents wherechildren are involved as passengers. Pedestrian and cyclist casualties were much fewer bycomparison. There was little difference in the accident rate amongst children in the front andrear seats of vehicles but injuries amongst children in rear seats would be likely to be moreserious had they been seated in the front. Danger spots for child pedestrians and cyclists innon-built up areas are T, Y or staggered junctions, and there is an apparent tendency forchildren to walk along the carriageway with their backs to the traffic, which is hazardous inhigh-speed traffic. Child pedal cyclists appear to be at some risk near driveways.

Children from rural areas may be more likely to be exposed to the risk of accidents as carpassengers because car ownership amongst residents in rural areas is higher, trip lengths arelonger and more children travel to school by car. Exposure as a child pedestrian to busyroads is lower in rural areas.

Accidents in rural areas tend to be fewer and more scattered making remedial interventionsmore difficult. There is little evidence about the pattern of accidents in rural areasspecifically involving children.

Children in rural areas are more likely to travel by car and are less likely to have access topublic transport. High car dependency and the fact that children in rural areas make a higherproportion of journeys by car suggest that in-car safety interventions may be important.Therefore educational interventions, which improve restraint use and focus on the behaviourof the driver especially with regard to speed and alcohol use, may be particularly important.

Driver behaviour is a key factor related to accidents on rural roads, especially with regard tospeed. Speeding behaviour can be tackled by education, engineering and enforcementwhether by speed cameras or police activity. However, the scattered nature of manyaccidents on rural roads suggests that educational interventions should focus on the driversresponsibility for the safety of child passengers.

Driver impairment has been implicated in accidents on rural roads but it is not clear howthis affects the road safety of children aged under fifteen.

Road geometry and topography on rural roads in terms of bends may be hazardous forpedestrians and cyclists as drivers may experience reduced sight lines. Drivers may also bemore likely to lose control on bends. Engineering measures that reduce the speed of driverscoming into bends may be useful. Education interventions may have a role to play inalerting the driver to hidden hazards.

Policy and Interventions

Government policy on rural road safety is evident in the Rural White Paper *OurCountryside: The Future: A Fair Deal for Rural England* and The Ten Year Transport Plan.These identify measures to minimise the impact of traffic in rural areas, improve travelchoice (including safer cycling and walking) and reduce reliance on the car.

The Countryside Agency, through the Rural Transport Partnerships, is designed to bringtogether local community interests to develop new ideas for transport co-operation and fundschemes which meet local transport needs.

Guidelines have been developed by the Institute of Highways and Transportation for safetymanagement of rural roads. The guidelines include details of different techniques to applyaccording to the road classifications to influence road user behaviour and improve safety.

Local Transport Plans can be used to identify and highlight best practice in addressing ruraltransport issues. For cycling and walking the Ten Year Transport Plan states that allhighways authorities in England and Wales are to include cycling and walking strategies intheir local plans. The Lottery funded national cycle Network launched in June 2000 aims tohelp promote cycling in rural areas by linking town and country. Also the CountrysideAgency is due to launch a good

practice guide so that local authorities, operators andcommunity groups can be better informed about what works, and can benefit from lessonslearnt elsewhere.

Ways to improve rural road speed management and safety are being developed. The workhas been commissioned to address the fact that the present speed limits of 60 or 70mphcover a range of road types including major inter-urban routes and quiet country lanes, butthere is no guidance to distinguish between them and develop the appropriate speedmanagement interventions. Little is known about the actual speeds on these roads or driversperception of appropriate speed limits for the road, and these are within the scope of thework being undertaken.

The national roll out of the safety camera netting-off scheme has been in progress sinceAugust 2001. This will enable all areas to benefit from better speed enforcement. Many ofthe areas joining the scheme are predominantly rural.

On faster rural roads at locations where collisions are most common, such as junctions andbends, the DfT is developing measures for reducing vehicle speeds and implementingvehicle activated warning signs.

The aim of the Quiet Roads project is to make selected country lanes more attractive forwalking, cycling and horse riding in the interests of a more attractive rural environment.Local Authorities will be able to designate roads as quiet lanes and make orders affectingthe way they are used and providing for speed reduction measures in them. Long termmonitoring is in place to assess the effect the project has on local use and driver behaviourbut, as yet, the evaluation is incomplete.

An attempt has been made to study the impacts of low cost engineering measures on vehiclespeeds and injury accident frequencies in villages. However, it was difficult to assess theimpact of these measures because of the relatively small numbers of accidents involved.Intervention evaluations of this nature may be unlikely to find significant differences inaccident rates in the short term.

The issue of police enforcement in rural areas is particularly difficult. Police enforcement isneeded to address the issue of excessive speed in rural road crashes but difficult to put intopractice due to the length of the network. However, publicity campaigns coupled with targetedenforcement may prove successful in changing driving norms, and automated enforcementtechnologies (e.g. speed cameras) may have a particular role to play in rural areas.

Consultations with a number of local authorities were conducted as part of this study, andthese identified a variety of initiatives in operation. However there was no evidence ofpolicies or interventions that are specifically targeted at improving road safety amongstchildren in rural areas. Decisions concerning the location of engineering measures usuallyrelate to schools or accident blackspots rather than whether the sites under consideration arein a rural or urban setting.

The more recent policy initiatives which were identified have yet to come to fruition. Manyof these are likely to impact on the exposure and safety of children living in rural areasthough serious consideration needs to be given as to how these can be evaluated given therelatively small numbers of accidents involved.

Gaps in Research

At the outset of this review a range of key questions was identified, for investigation, andthese are listed below. The amount of relevant evidence that has been found to be availableis small, and most

of the literature relates to rural areas per se and not to the specificproblems children face. This means that relatively few of these questions can be answeredcompletely or adequately, and many gaps in our knowledge remain. A brief summary andcritique of the evidence found on each issue is set out in the next two pages.

Issue	**Evidence summary Issue**
How good is the data on road accidents involving children in rural areas?	Stats19 national accident data can provide some useful contrasts between accidents involving children living in rural areas compared to urban areas. Children in rural areas are more likely to be injured as car passengers compared to children living in urban areas.
What is meant by the term rural and is this congruent with accident data descriptions?	There are a number of different definitions of the term rural. Population size is a common criterion and is not compatible with the speed limit definition used in national accident data. Development of a rural road hierarchy and its use in accident classification may help resolve the incompatibility between data sources.
Are road accidents involving children in rural communities more likely to be under-reported compared to urban areas?	There is some evidence that accidents in rural areas are not under reported generally, but it is not known whether this applies to children as vulnerable users.
What is the nature of the accident liability of children living in rural areas?	More research is needed on the accident liability of children in rural areas especially as vulnerable road users.
How does the exposure of children in rural environments differ to that of children living in urban environments?	National Travel Surveys and ad hoc research studies suggest that children in rural areas are more likely to travel by car on longer journeys compared to their urban counterparts. There is little evidence on rural childrens exposure during leisure activities. Interestingly the Stats19 analysis carried out as part of this study indicates that child casualties in nonbuilt up areas were less likely to be on journeys to or from school which suggests that exposure during leisure time needs further investigation.
What is the relative risk of being involved in a road accident as a child living in a rural environment compared to an urban one?	Very little is known about the relative road accident risk of children travelling on different types of rural road, using different modes in different types of rural areas. Detailed information exists for children especially pedestrians in urban areas. However, more research is required to enable an urban rural

	comparative analysis.
How are road accidents involving children in rural areas different to those in urban areas in terms of individual, environmental and socioeconomic characteristics?	Whilst there is a significant body of research that has looked into socio-economic and environmental factors in pedestrian accidents in urban areas, there is not a comparable body of research for children living in rural areas.
What role does exposure play?	The pattern of exposure for children in rural areas compared to urban areas is quite different, there being higher car travel among children in rural areas. However, there is little evidence on how this impacts on safety.
What role do socio-economic factors play?	There is widespread poverty in rural areas but little is known about the relationship between this and child safety.
What role do topographical factors play in rural safety?	Some general evidence points to the influence of limited sight lines near bends and junctions but there is little information on topographical risk factors for vulnerable road users.
How does transport accessibility impact on childrens safety?	Little is known about the relationship, if any, between accessible transport and safety for children in rural areas.
What role does vehicle speed play in the accident involvement of children?	Speed has been highly implicated in accidents in rural areas per se however little is known about the relationship between speed and child safety in rural areas.
What can be learned about the development, implementation and evaluation of road safety initiatives aimed at children living in rural areas?	No published information was identified on the interventions directly aimed at rural safety issues.
Have any road safety interventions been specifically targeted at children living in rural areas?	As above
What type of interventions (e.g. speed cameras; provision of crossings; conspicuity; environmental modification; training and education) are effective in rural areas?	There is some limited information on low cost engineering measures on rural roads but these have proved difficult to evaluate because of the small numbers of accidents.

What are the difficulties in implementing safety interventions in rural areas?	There is limited data on the safety of children in rural areas, and the scarce and scattered nature of accidents in rural areas lead to difficulties in targeting and evaluating interventions.

Further Research for Policy Development

Although the literature on child safety on rural roads is sparse and indirect, it does flag up anumber of issues that point to potential interventions and further research requirements.

Geodemographic analyses of those involved in accidents involved in accidents in rural areasmay give a clearer picture of the target audience for interventions. Postcode data is availableon Stats 19 and ways of using this to identify target groups could be explored. A clear andconsistent definition of rural using postcode data will be necessary in such analyses andvaluable in developing appropriate interventions.

It is likely that the lack of evidence on the safety of children in rural areas will only beresolved by in-depth research which profiles the relative risk of children as car occupants,cyclists and pedestrians in terms of their exposure to risk in the environment and the socioeconomicfactors which influence this risk. There are many examples of this kind ofapproach in urban areas for child pedestrian accidents (Ward *et al* 1994, Christie 1995 andTight 1987). Such methods could be applied to children in rural areas to provide a holisticpicture of their relative accident risk.

The interrelationship between rural poverty and childrens road safety is complex. High carownership even among low income households may mean that children in rural areasare less likely to be at risk as vulnerable road users. More research is required toexamine the relationship between poverty and exposure to road traffic risk in ruralareas amongst children.

There is scope for the evaluation of policy through the monitoring of engineering, educationand enforcement interventions that are in place, often at a local level (and including SafeRoutes to School schemes). This would attempt to compare, where appropriate, theirimpacts on children in urban and rural situations. Such research should be capable of providing additional evidence on strategies that are appropriate within rural settings, to help guide and inform future policy formulation.

Chapter 1
Introduction

1.1 Background and Objectives

1.1.12 It is recognised that most child road accidents occur in urban areas. However, theDepartment for Transport (DfT) is also concerned about the safety of children inrural areas and required a critical review of the evidence on child rural safety inorder to assist in formulating future policy and research decisions.

1.1.2 This report presents the findings of a literature review and secondary analysis ofdata commissioned with the following specific objectives:

- to provide a critical review of research and literature on child road safety inrural areas;
- to quantify the trends in child safety on rural roads and, combined with a reviewof existing evidence, identify high risk groups;
- to identify policies that have, or may have, an impact on child road safety in ruralareas and assess any evaluations undertaken; and
- to identify any gaps in existing knowledge and research.

1.2 Methodology

1.2.1 The study consisted of the following elements:-

1.2.2 **A review of published literature** on the rural road safety of children aged underfifteen over the past fifteen years. Searches were carried out on the followingdatabases:

IRRD;

Educational Resources Information Centre (ERIC);

MEDLINE (US National Library of Medicine);

PsycINFO;

Bath Information and Data Services (BIDS); and

Cumulative Index to Nursing and Allied Health (CINAHL).

1.2.3 Key words such as rural, countryside, child, road safety, non-built uproads, traffic accidents, education, engineering, police, countermeasures,interventions, pedestrians, cyclists, horse-riders and vehicle occupants.The central focus of the review was British based research, although literature fromother developed countries is also included.

1.2.4 The study has attempted to focus on research and literature that is concerned withroad safety amongst children **and** road safety in rural areas. There is however littleevidence of direct research exclusively addressing the safety of children on ruralroads that would help answer the questions identified above. Instead, a number ofresearch reports have been identified that cover rural safety for general road usergroups such as drivers, pedestrians or cyclists from which messages about

childsafety can be inferred. However, it should be borne in mind that the inferences madefrom these research reports may not necessarily apply to children.

1.2.5 **Secondary statistical analysis** of Stats 19 data (police road accident records) andexposure data from the European Child Pedestrian Exposure and Accident Surveyundertaken for the DfT by MVA and the University of Leeds Institute of TransportStudies (DETR, 1999).

1.2.6 **Consultation with local authorities** to identify policy and practice on road safetyapplicable to children in rural areas. A total of nine interviews were undertaken withRoad Safety Officers and other relevant personnel in County or Regional authoritieswith a substantial rural area. Authorities included were:- The Highland Council,Clackmannanshire Council, Norfolk County Council, Herefordshire County Council,Gloucestershire County Council, Derbyshire County Council, Dorset CountyCouncil, Cumbria County Council and Cornwall County Council. In the course ofthese discussions any education, engineering and enforcement policies and strategiesspecifically aimed at rural road safety and/or the safety of children were identified.Evidence of any evaluations carried out by local authorities of these initiatives wasalso identified.

1.3 Structure of Report

1.3.1 The report incorporates the above into the following six chapters. In chapter two theissue of how rural is defined is examined. Chapter three looks at the evidence ofaccidents on rural roads in the literature and by analysis of Stats 19 data. Thefollowing section examines evidence of different levels of exposure amongst childpedestrians in rural settings, towns and cities. Evidence of policy initiatives andinterventions are detailed in chapter five, including evidence from the consultationwith local authorities. In the final chapter some conclusions from the review aredrawn including the identification of gaps in knowledge, potential interventions andfurther research requirements.

Chapter 2
Rural Definition

2.1 Introduction

2.1.1 One of the questions identified was what it meant by the term rural and is this congruent with accident data descriptions? This issue is explored in the review of the literature.

2.2 Evidence from the literature

2.2.1 Many different uses can be found in the literature and understanding what is meantby rural is key to understanding the risks associated with it. Indeed, it has beenrecognised by the OECD (1999) that the understanding of rural road safety ishampered because:

No formal accepted international definition exists to classify rural roads.

2.2.2 The research evidence base has mainly looked at rural road safety in two ways:-first in terms of living in a rural community and second in terms of the safety ofnon-built up roads. The literature on road safety in rural communities defines ruralin terms of countryside, agriculture, open spaces, remoteness and low populationdensity (i.e. small settlements), the latter being a key factor.

2.2.3 In terms of road safety research, the concept of a rural road has been operationallydefined in terms of speed limit. A rural road was defined in 1977 by the Departmentof Transport where built-up roads had speed limits 40 mph or less, and non-built uproads had speed limits of greater than 40mph. This definition did not take account ofthe area through which the road was passing. Non-built up roads encompasses awide range of road types and it is important to address this diversity. As Gardner andGray (1997) note:

Many journeys on rural roads take place on the urban fringe.

2.2.4 More recently, the DfTs speed review (DETR 2000c) has attempted to classify ruralroads to reflect these differences. The review followed the publication of theGovernments White Paper A New Deal for Transport: Better for Everyone to takeinto account

The contribution of reduced speeds to environmental and social objectives as well as road safety.

2.2.5 The review comprised three stages:

- a review of existing research on traffic speeds and its effects and an analysis ofcurrent practice and legislation in Britain and abroad;
- a wide process of consultation including environmentalists, motorists, localauthorities and the police; and
- analysis of the results from both the review and consultation process to providerecommendations and conclusions.

2.2.6 The review divides rural areas into three categories: main roads, villages andcountry lanes. DfT acknowledge that defining a rural village is difficult in relationto settlement size and that achieving a workable definition will require localconsultation, as well as research and discussion at a national level betweendepartments and local authority associations.

2.2.7 The national road traffic accident database (Stats 19) defines rural only in terms ofthe speed limit of the road. A rural road is defined as having a speed limit greaterthan 40mph. The divide between urban and rural on the basis of speed limit innational accident data is confounded by the fact that many of the main roads throughvillages have been changed from greater than 40mph to 30mph speed limit in orderto address the problem of high vehicle speeds. This will make it increasinglydifficult to make urban and rural comparisons on this basis in the future.

Chapter 3
Accidents amongst Children onRural Roads

3.1 Published Accident Research on Rural Safety

3.1.1 In the UK much of the current understanding about rural safety comes from the analysis of the national police recorded Stats 19 data where a rural road is defined asone with a speed limit greater than 40mph. It should be noted that most of thisunderstanding of rural road safety does not specifically consider children.

3.1.2 Pickering *et al* (1986) examined accident data for 1979-1983 samples of 300 Tjunctionson rural carriageways in 40 English counties. The aim of the analysis wasto investigate frequency and character of accidents in relation to traffic flow,geometric layout and other factors such as traffic speed and gradient. Junctiondimensions measured included:

- road width;
- lane width;
- length and width of ghost islands; and
- location and width of islands on minor arm.

3.1.3 Key measures included:

- traffic signs and lighting;
- location type kerbs and edge marking, speed limits;
- gradient and visibility gradient of each approach;
- stopping sight distance to the junction (the distance away from the junction thatan approaching driver can first see a car at the junction);
- the visibility from the minor arm (the distance each major arm that a driver onthe minor road can first see oncoming vehicles);
- traffic speeds: free flow spot speeds of 200 vehicles at locations 200m inadvance of the junction on each major arm (inbound) and at the middle of thejunction; and
- traffic and pedestrian counts: a four-hour classified turning count 2-6 and a countof pedestrian movements over the same period.

3.1.4 They looked at accidents per junction and traffic flow data. 75% of pedestrianinvolved accidents within 0-20 metres of a junction were serious or fatal. Pedalcyclists accounted for 3% of vehicles involved in accidents but only 0.3% of flow.

3.1.5 The research by Pickering *et al* is useful in describing the characteristics of roadjunction accidents in rural areas but does not specifically address the issue ofaccidents amongst children.

3.1.6 Barker *et al* (1998) carried out a detailed analysis of all the reported injury accidentsoccurring in 1994/95 on rural single carriageway roads (RSCR) in Britain. Fromtheir analysis of Stats 19 data they found that compared with accidents in built upareas those on rural single carriageways were:

- more severe;
- only about half as likely to be at a junction;
- almost one sixth as likely to involve a pedestrian; and
- a quarter as likely to involve a pedal cycle, but they are three times as likely toinvolve a single vehicle (with no pedestrian).

3.1.7 Barker *et al* (1998) found that accidents on RSCRs that involved the fastermanoeuvres such as going ahead and overtaking were more likely than otheraccidents to involve young drivers, male drivers, two-wheeled motorised vehicles, apedestrian, skidding on leaving the carriageway and be more severe. Only 4% of allaccidents involved a pedestrian. High performance cars driven by male drivers agedbetween 25-39 were disproportionately involved in non-junction accidents . Twopercent of all RSCR accidents, and 6% of fatal RSCR accidents, involved apedestrian and a single vehicle going ahead away from a junction.

3.1.8 Barker *et al* (1998) also found that more than half of all fatal casualties are found onrural roads and the proportion of fatalities increases over the past decade from 0.48per 100000 population in 1985 to 0.59 per 100000 population in 1995. Whilstabsolute numbers have decreased the rate of decrease is slower in rural areascompared to urban roads. They also argued that rural villages face real problems ofdriver compliance with speed limits. the differential between the speed limitsinside and outside the village can be large, and so speed observed through suchvillages can be particularly high compared to what is appropriate for the conditions.Thus potential for conflict between pedestrians, cyclists and motor vehicles can begreat. Specific analysis by age of road casualty was not undertaken but thisinformation suggests that speed is a major factor.

3.1.9 In terms of main roads, Barker *et al* (1998) found that accidents in rural singlecarriageways are not well clustered in terms of their location or characteristics.Further work by Barker *et al* (1999) suggests that topographical features of ruralroads such as bendiness were particularly correlated pedestrian accidents. Theyargued that bends might be more likely than junctions to have hidden hazards(i.e. unsigned or not visible on the approach).

3.1.10 The risks for cyclists on non-built up roads in Britain has also been investigated.Gardner and Gray (1997) commented that accidents on non-built up roads accountfor only 9% of all cyclist casualties, but almost one half (45%) of all cyclist deaths.The rate of fatal accidents per 100 million vehicles on a non-built up road is almostthree times higher than on a built up road. Few clusters are observed which makespot treatment and route treatment difficult, expensive and hard to justify investmentin rural areas where fewer people benefit from them.

3.1.11 Gardner and Gray also comment that the mix of traffic in rural communities mayalso be an important issue for safety. Heavy goods vehicles (HGV) are essential tothe economic efficiency of rural areas because of agriculture and the dispersedsettlement pattern. However, the chances of a cyclist being killed are around 30%with a car and 50% for collision with an HGV greater than 1.5 tons.

3.1.12 Gardner and Grays research provides evidence of cycle accidents on non-built uproads but again does not specifically profile accidents in which children areinvolved.

3.1.13 Research suggests that Stats 19 data under represents some types of accidentsespecially those involving vulnerable road users such as pedestrians, pedal cyclistsand motorcyclists and those with minor injuries. This, it is argued, is because theyare less likely to be reported to the police and therefore be recorded on a Stats 19accident report form (Tunbridge *et al* 1988). This would tend to result in underreportingof accidents on urban roads.

3.1.14 Simpson (1997) carried out a hospital survey to provide more comprehensiveinformation about casualties attending an Accident and Emergency department in asample of 17 hospitals between 1992-1995. As part of the analysis, road types wereclassified as motorway (A/M roads), urban (non-motorway roads 40mph or less) orrural roads (non-motorway with greater than 40mph

limit). Simpson found that thedistribution of pedestrian and pedal cyclist casualties in the hospital data on differenttypes of roads compared to national police data were the same suggesting that therewere not significant under reporting biases related to road type. It was interesting tonote that over the sampling period there was an increase in the proportion ofcasualties on rural roads compared to a decrease in casualties on urban roads.

3.1.15 There is some evidence to suggest that the casualties in rural accidents are less likelyto be treated as quickly as those occurring in urban areas. This may be because lowertraffic densities in rural areas means that the accident may not be notified as quicklyas those in urban areas and emergency medical services may have longer journeys(Evanco 1999).

3.1.16 In the United States Blatt and Furman (1998) looked at whether crashes on ruralroads involved people who live in rural areas or residents of urban areas travellingon rural roads. Data from the 1988-1992 Fatal Accident Reporting System (FARS)maintained by the National Highway Traffic Administration (NHTSA) were analysedto determine the residence location of several sub-groups of drivers in fatal crashes.

3.1.17 Geodemographic analysis tools were used to determine relative involvement of ruraland urban residents. This involved matching the postcode or zip code to informationon the degree of urbanisation of residence location. In the US, postcode data forroad crashes has been available since 1988. The database included the drivers age,gender, blood alcohol concentration (BAC) and whether a child of five or less diedin the crash. Geodemographic software was used to classify the drivers place ofresidence in terms of 1 of 5 levels of urbanisation:

- rural;
- small town;
- second city (on the urban fringe);
- suburban; and
- urban.

3.1.18 Rural and small towns were sparsely populated. The analysis compared the numberof drivers involved in a particular activity of a particular population sub group by thenumber in the particular population sub group for the population as a whole. Driversinvolved in crashes resulting in the death of a child; drivers involved in crashes inwhich alcohol was involved and young drivers were analysed.

3.1.19 Rural residents were over involved in crashes in which a child aged five years orunder died. Irrespective of whether a child was wearing a restraint, they were morelikely to be killed in rural areas. Rural residents were involved in 34% of theseaccidents but represented only 17% of the population. In terms of BAC 59% of allfatal crashes with alcohol present involved drivers living in rural areas. Young ruraladults were over represented by a factor of two compared to the base population.The authors examined potential biases caused by using population figures comparedto licence holding figures but found little difference in findings when using licenceholding figures. Similarly, they hypothesised that the effect could be attributable tothe greater exposure to risk by people living in rural areas but also found that takingexposure into account did not explain the observed differences.

3.1.20 Blatt and Furman proposed a number of reasons for the greater likelihood andseverity of crashes on rural roads. This includes the design of rural roads withnarrow or non-existent shoulders and limited sight distance due to hills and curvesand high speed 40% of all 1992 fatal crashes

occurred on rural roads with speedlimits of 55mph or higher. They also suggest that economic and behavioural factorsplay a role with lower rates of seat belt use and child safety use by rural residents.Delays in the response of emergency medical services may also be factor with thelengthy travel time decrease the likelihood of surviving serious crashes in a remotearea. They argued that geo-demographic information would help target interventionsat rural communities.

3.1.21 The association between accident rates amongst children and disadvantaged areashas also been examined. White, Raeside and Barker (1999) carried out a detailedreview of the literature on this issue and concluded that in understanding the factorsinfluencing road accident rates in children it is difficult to separate the effects of thehousehold in which they live from the area where they live. However, theyconcluded that the balance of research evidence suggests that higher rates indisadvantaged areas are due more to household than area characteristics. Risks arehighly class related and associated with lack of supervision and greater exposure.White, Raeside and Barker (1999) noted that:

Throughout the review of the literature a major gap in informative researchemerged relating to comparison of urban and rural risk factors for road trafficaccidents. This is particularly key to any further work on social in/exclusion.

3.1.22 They argued that studies of the behavioural and travel patterns of children in urbancompared to rural communities should be carried out to inform this issue.

3.2 Child Rural Accident Analysis

3.2.1 In this section the main features of accidents involving child casualties in rural areasfrom the police reported road accident data (Stats 19) are examined. After examiningthe general trends in child casualties, the distinguishing features of accidents in ruralareas have been considered, contrasting these with the more numerous accidentsoccurring in urban areas. Further analyses then examined in more detail accidentsinvolving child car occupants, pedestrians and pedal cyclists, and comparisons aremade with the corresponding accidents involving adult road users. Finally the scopefor analyses using the casualty postcode data now available is considered. The tablesand graphs that are presented generally show where the differences are significantand these are highlighted in the commentary. In the Stats 19 the location of theaccident is recorded on the attendant circumstances record. This record provides*inter alia* the road-class, the national grid reference of the site, and an indication ofthe speed limit. The latter is used to designate sites as being within built-up areas(speed limits 40 miles/hour or less) or non built-up (speed limits higher than 40miles/hour). As discussed previously, this designation is not synonymous with abreakdown between urban and rural areas; for example, there will be built-upsections of road within villages in rural areas, and there are some sections of highspeedroad passing through urban settlements. However, the built-up/non built-upbreakdown is generally more useful in distinguishing the key circumstancesaffecting road safety: built-up roads being generally associated with lower speeds,greater pedestrian activity, higher junction density, higher levels of parking, andaccess to houses, shops and workplaces adjoining the road. Therefore examination ofaccidents on non built-up roads will tend to highlight many of the problemsparticularly associated with rural areas.

3.2.2 In the analyses that follow the built-up/non built-up breakdown has been used toestablish the main distinguishing features of child casualties. However, in the finalsection the options for alternative locational analyses are considered including amore conventional urban/rural breakdown.

3.3 Trends in Child Casualties

3.3.1 The trends in child casualties according to type of area are shown in Figures 3.1 and 3.2.

Figure 3.1 Child Casualties by Type of Area: 1990 to 2000

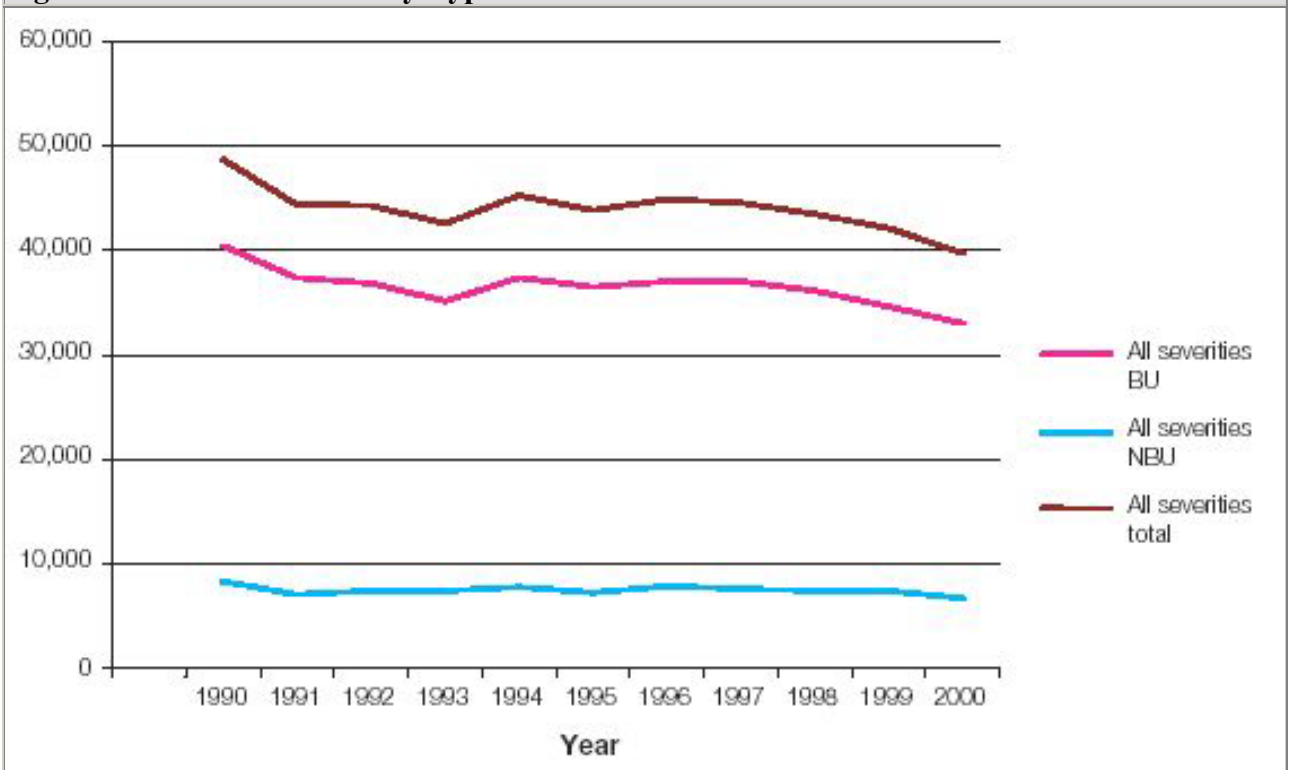
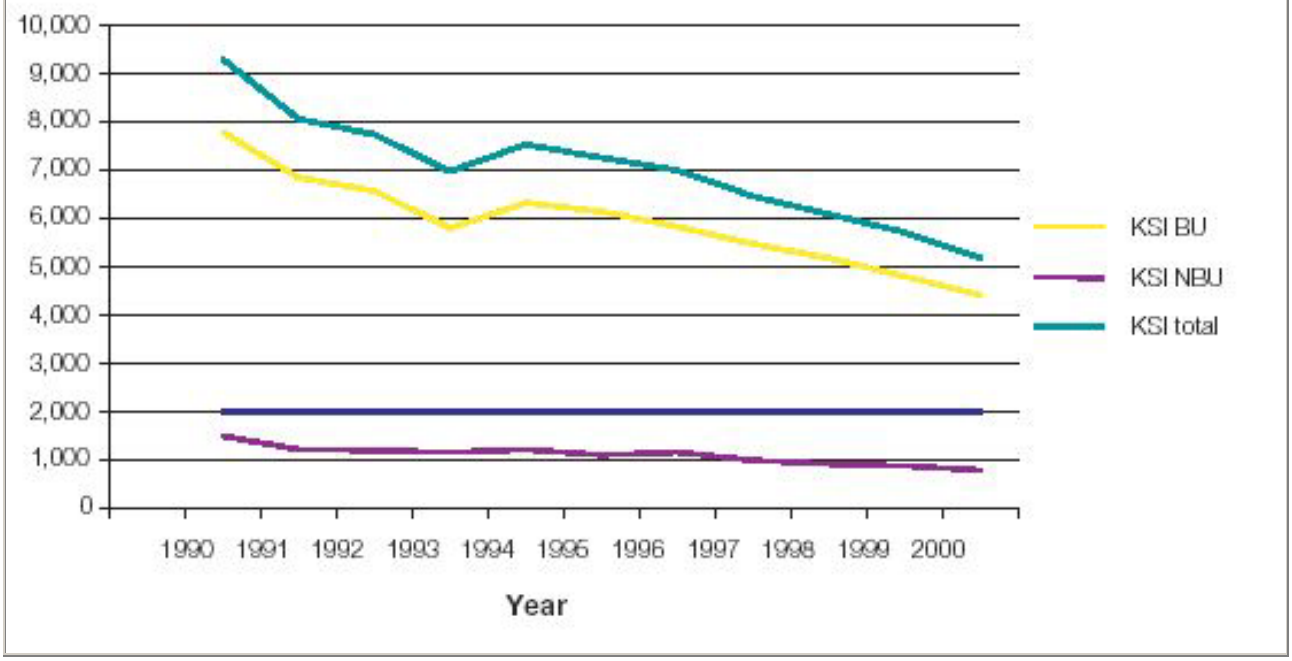


Figure 3.2 Child KSI Casualties by Type of Area: 1990 to 2000



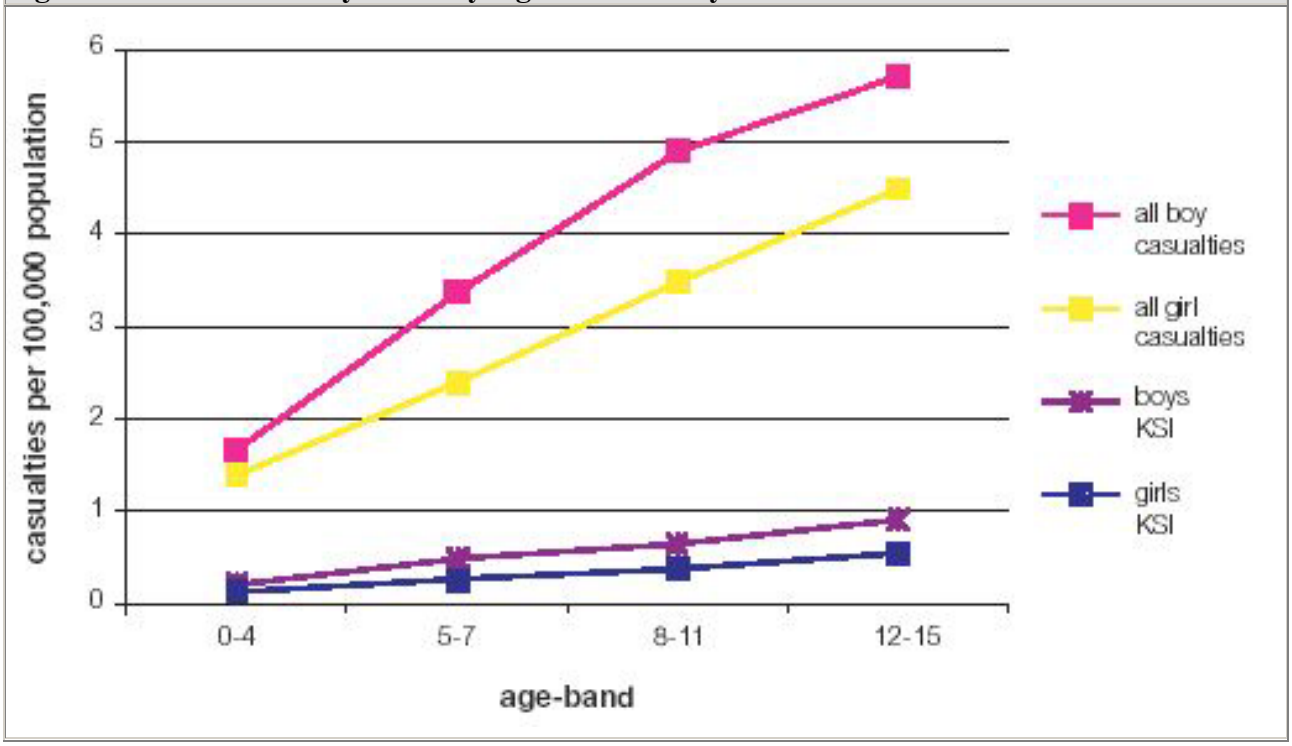
3.3.2 Child casualties, defined for current purposes as those aged up to fifteen, fell by18% between 1990 and 2000. For much of this period child casualties remainedfairly constant; the reductions occurred mainly at the beginning and the end of thedecade (Figure 3.1).

3.3.3 Over the same period the number of fatal and serious casualties (KSI) fell by 44%.Apart from a temporary upturn in 1994, KSI casualties fell steadily throughout thedecade (Figure 3.2).

3.3.4 The fall in casualties was similar between built-up and non built-up areas. In 200017% of child casualties (and 15% of KSI casualties) were in non built-up areas.

3.3.5 It is helpful to express child casualties as rates per 100,000 population. These areshown for the different age groups in Figure 3.3.

Figure 3.3 Child Casualty Rates by Age and Severity: 2000



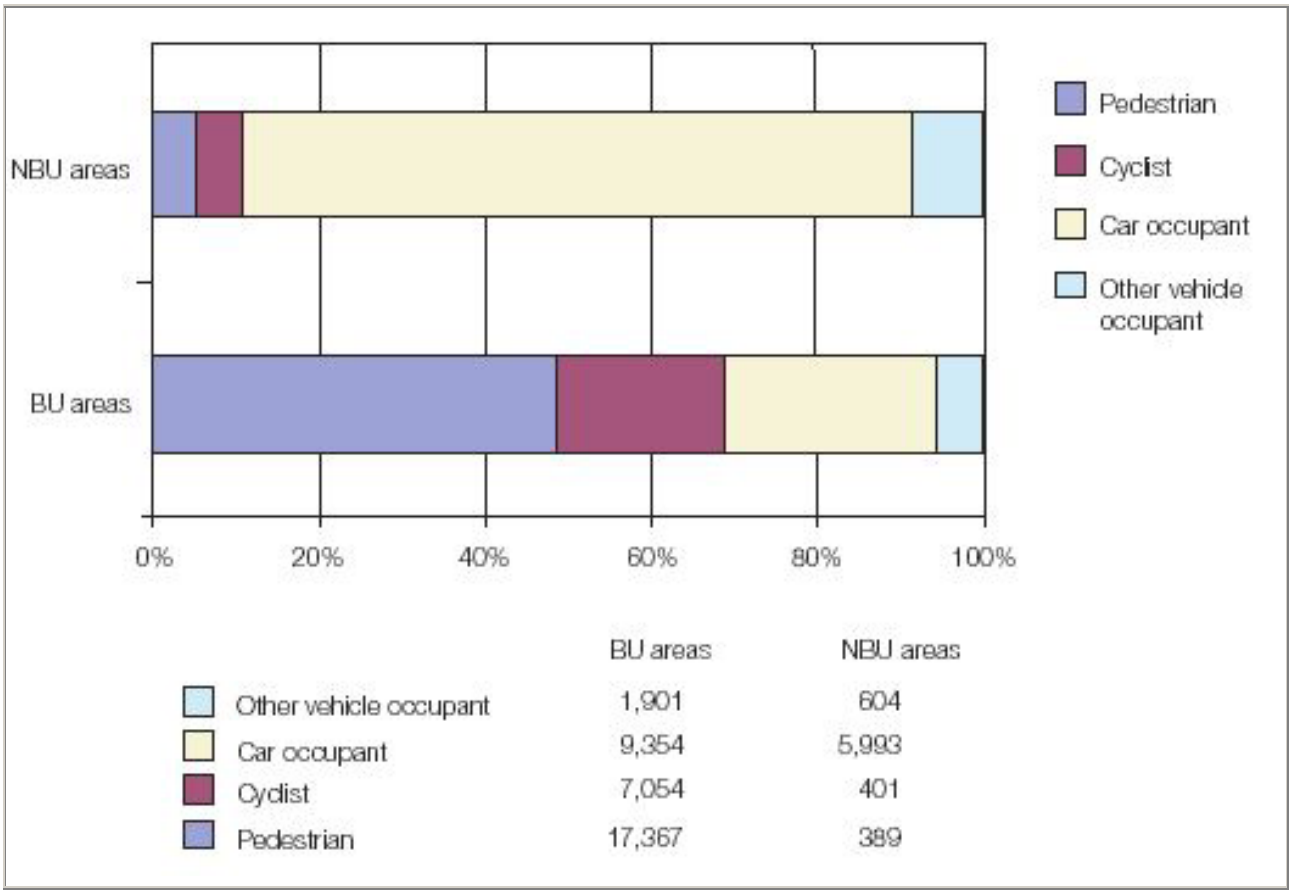
3.3.6 It can be seen that casualty-rates increased steadily with age and that casualty-ratesfor boys were consistently higher than those for girls. Over the period 1990 to 2000the total child population increased, so that the overall child casualty rate decreasedmore sharply than the actual numbers of casualties.

3.4 Child Casualties in Built-up and non built-up Areas

3.4.1 It is helpful to compare the characteristics of child casualties in non built-up areaswith those in built-up areas, to assess the extent to which there are commonproblems related to all child road users and the extent to which there are particularproblems for children in non built-up areas.

Comparisons by type of road user are shown in Figure 3.4.

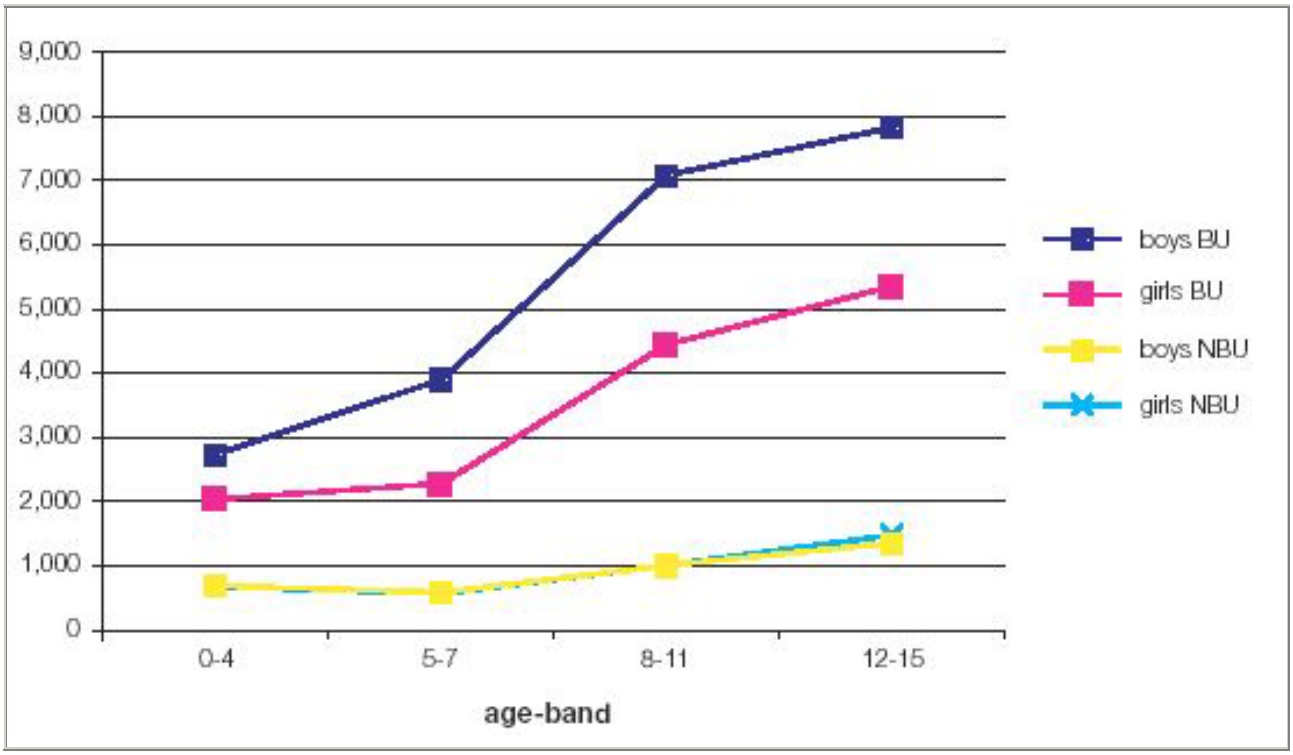
Figure 3.4 Child Casualties by Type of Road User and Area Type: 1995-2000 Average



3.4.2 Whereas in built-up areas the largest single group of child casualties waspedestrians, in non built-up areas the overwhelming majority of casualties (83% ofall casualties and 70% of KSI) were car passengers. This reflects the fact that nearlyall walking and cycling by children takes place near to homes and schools, whichare normally situated on built-up roads.

3.4.3 Comparisons by age and gender are shown in Figure 3.5.

Figure 3.5 Child Casualties by Age, Gender and Type of Area: 1995-2000



3.4.4 In built-up areas a clear majority (60% of all casualties and 66% of KSI) were boys,whereas in non built-up areas the split was more even (49% boys amongst allcasualties and 55% amongst KSI). Figure 3.4 shows that in all areas the casualtyratesare highest amongst the 12-15 age group, reflecting the greater mobility atthese ages and the generally greater distances involved in travel to secondary schoolcompared with primary school. The contrast between the age groups is noticeablysharper in built-up areas; this might arise because there was more autonomous travel(i.e. walking and cycling) by children in built-up areas, whereas in non built-upareas there was proportionately more car travel. This is considered later in the report.

3.4.5 Comparisons by road-type are shown in Table 3.1.

Table 3.1

Child Casualties by Road Type and Type of Area: 1995 2000 Average		
All Casualties	**Percentage**	
	Built-up Areas	**Non built-up areas**
Motorway	0%	12%
A	29%	51%
B	11%	13%
Other road class	60%	23%
All roads	100%	100%
% minor roads	71%	36%

KSI	Percentage	
	BU	NBU
Motorway	0%	7%
A	27%	54%
B	11%	14%
Other road class	62%	25%
All roads	100%	100%
% minor roads	73%	39%

3.4.6 In built-up areas the vast majority of child casualties (71% of all severities and 73%of KSI) occur on minor roads (roads other than class A or motorway), whereas onnon built-up roads the position is reversed with only 36% of all severities and 39%of KSI casualties occurring on minor roads. This also reflects the differences in roaduser type noted earlier. Children will tend to walk and cycle on minor roads,whereas child car passengers will be driven on all classes of road.

3.4.7 Comparisons of accidents at junctions are shown in Table 3.2.

Table 3.2

Child Casualties by Junction Type and Area Type: 1995-2000 Average		
All Casualties	Percentage	
	Built-up Areas	Non built-up areas
Not at junction or within 20 metres	38%	62%
Roundabout	3%	5%
Mini roundabout	1%	0%
T, Y or staggered junction	39%	17%
Slip road	0%	3%
Crossroads	11%	5%
Multiple junction	1%	1%
Private drive/entrance	4%	5%
Other junction	3%	2%
All junctions	62%	38%
Total	100%	100%

3.4.8 In built-up areas the majority of child casualties (62%) occur at or near to junctions.By contrast in non built-up areas the proportion falls to 38%, reflecting the lowernetwork density in rural areas.

3.4.9 Further comparisons of child casualties between built-up and non built-up areas areshown in Tables 3.3 to 3.7.

Table 3.3

Child Casualties by Time of Day, Day of Week and Area Type:1995-2000 Average								
Hours	**0-3**	**4-7**	**8-11**	**12-15**	**16-19**	**20-23**	**All**	**Number**
Monday Friday								
Built-up areas	0%	2%	19%	28%	42%	8%	100%	26,434
Non built-up areas	1%	1%	15%	39%	35%	9%	100%	9,242
Saturday Sunday								
Built-up areas	2%	3%	24%	26%	34%	12%	100%	4,596
Non built-up areas	3%	2%	21%	35%	30%	10%	100%	2,792
Percentage of weekday/weekend casualties								
	Week-day	Week-end	All					
Built-up areas	85%	15%	100%					
Non built-up areas	77%	23%	100%					

Table 3.4

Child Casualties by Weather Conditions and Type of Area: 1995 to 2000 Average		
	Built-up	**Non built-up**
Fine, no high winds	84%	76%
Raining, no high winds	11%	15%
Snowing, no high winds	0%	1%
Fine + high winds	1%	2%
Raining + high winds	1%	2%
Snowing + high winds	0%	0%
Fog or mist	0%	1%

Other	1%	2%
Unknown	1%	1%
All weather conditions	100%	100%

Table 3.5

Child Casualties by Lighting Conditions and Area Type: 1995-2000 Average		
	Built-up	**Non built-up**
Daylight	83%	79%
Darkness lights lit	15%	6%
Darkness lights unlit	1%	1%
Darkness no lighting	1%	13%
Darkness lighting unknown	1%	1%
All darkness	17%	21%
All lighting conditions	100%	100%

Table 3.6

Child Casualties by School Pupil Status and Area Type: 1995-2000 Average		
	Built-up	**Non built-up**
Not to/from school	80%	89%
On way to/from school	20%	11%

Table 3.7

Child Pedestrian Casualties by Pedestrian Movement and Area Type: 1995-2000 Average		
	Built-up	**Non built-up**
Crossing the road		
From nearside	38%	38%
From nearside masked	17%	8%
From offside	21%	24%
From offside masked	12%	6%
All crossing movements	88%	77%

In carriageway		
Stationary	3%	4%
Stationary masked	1%	0%
Walking facing traffic	1%	4%
Walking back to traffic	1%	7%
Unknown	6%	8%
All pedestrian movements	100%	100%

3.4.10 These comparisons show the following contrasts:

- A greater proportion of non built-up casualties were at weekends. Whereas inbuilt-up areas on weekdays there was a sharp peak in casualties between 1600 and1900, following the end of the school day, this peak was less marked in non builtupareas. (See Table 3.3).
- A greater propensity for non built-up casualties to occur in rain and other adverseweather conditions. This may reflect the generally longer journeys occurring inrural areas; in urban areas it may also be easier to postpone a journey until theweather improves. (See Table 3.4).
- A greater propensity for non built-up casualties to occur in darkness. Notsurprisingly, amongst the non built-up accidents in darkness there wereproportionately fewer at sites with lighting than amongst the built-up accidents.(See Table 3.5).
- Child casualties in non built-up areas were less likely to be on journeys to or fromschool. (See Table 3.6).

3.4.11 Child pedestrian casualties in non built-up areas were more likely to be walkingalong the carriageway, but less likely to be crossing the road, than those in built-upareas. For those walking along the carriageway, there were nearly twice as manycasualties walking with their backs to the traffic as there were facing the on-comingtraffic (the latter being recommended by the Highway Code). When crossing theroad, they were less likely to be masked by other vehicles. (See Table 3.7).

3.4.12 In summary, the main feature distinguishing child casualties in non built-up areasfrom child casualties in built-up areas is the predominance of car passengercasualties. This means that a large proportion of non built-up area child casualtieswill have occurred as a result of the behaviour of other road users, most notably thedriver of the vehicle they are riding in. By contrast, within built-up areas there areclear features associated with child behaviour and exposure, notably the tendency ofboys and young teenagers to adopt more risky behaviour, the inherent risks involvedin crossing roads or riding pedal cycles in busy traffic and their greater exposure asvulnerable road users The behavioural features are still present amongst non built-upcasualties, but the effects are less marked.

3.5 Comparisons between Child and Adult Casualties in NonBuilt-up Areas

3.5.1 Figure 3.4 shows that the overwhelming majority of child casualties in non built-upareas (83%) were car passengers. The other main groups were pedestrians, pedalcyclists and bus passengers, each of which accounted for about 5% of all casualties.

3.5.2 It is helpful to compare the involvement of children amongst the different types ofaccident with the involvement of adults. Where the profile of involvement is similar,this indicates *prima facie* that there are common features affecting both children andadults. Where the profiles differ, this points to special factors affecting children: forexample, greater exposure to certain sorts of accident, or greater vulnerability whencertain accidents occur.

3.5.3 For child casualties in cars, the main factors at work are likely to be:

- The relative speed at impact, and the type of location where the accident occurred;and
- The seating position of the child within the car and whether he/she was wearing aseat-belt (or whether an air-bag was fitted) where the child was seated.

3.5.4 The Stats 19 form does not record all of these items explicitly, but there are anumber of aspects that can be examined:

- Type of road (which might be used as a proxy for speed);
- Whether the accident occurred at a junction and if so the type (this will influencethe type and speed of impact);
- Whether the child was in the front or back seat.

3.5.5 Table 3.8 provides a comparison of child and adult accidents in non built-up areas.

Table 3.8

Child and Adult Passenger Casualties in Non Built-Up Areas by Road-Type: 1995-2000 Average						
Percentage by road class						
	All Casualties		**KSI**		**Percentage**	**KSI**
	Child	**Adult**	**Child**	**Adult**	**Child**	**Adult**
Motorway	14%	14%	10%	9%	7%	9%
Class A	53%	55%	57%	58%	11%	17%
Class B	13%	13%	14%	15%	12%	19%
Other Roads	20%	19%	19%	18%	10%	15%
All Roads	100%	100%	100%	100%	11%	16%
% Minor Roads	33%	31%	34%	33%		

3.5.6 This shows that in non built-up areas 33% of child casualties (34% of KSI) occurredon minor roads, compared with 31% of adult casualties (33% of KSI). Thedifference is clearly not very large, but possibly reflects a tendency for journeys withchildren to be shorter and on more minor roads, and hence involving lower speeds.Whereas 16% of adult car passenger casualties were killed or seriously injured, theproportion for child car passengers was only 11%.

3.5.7 This is explored further by accident location and seating position in Tables 3.9and 3.10.

Table 3.9

Child and Adult Car Passenger Casualties in Non Built-Up Areas by Junction Type: 1995-2000 Average						
Percentage by road class						
	All Casualties		**KSI**		**Percentage KSI**	
	Child	**Adult**	**Child**	**Adult**	**Child**	**Adult**
Not at Junction orwithin 20 metres	62%	62%	71%	70%	12%	18%
At Junction						
Roundabout	6%	7%	2%	2%	3%	5%
Mini-Roundabout	0%	0%	0%	0%	2%	7%
T, Y or Staggered Junction	17%	16%	14%	15%	9%	15%
Slip Road	3%	3%	2%	2%	8%	11%
Crossroads	5%	5%	5%	5%	10%	16%
Multiple Junction	1%	1%	1%	1%	9%	13%
Private Drive/Entrance	5%	5%	4%	4%	8%	12%
Other Junction	2%	2%	1%	1%	9%	14%
All Junctions	38%	38%	29%	30%	8%	13%
All Locations	100%	100%	100%	100%	11%	16%

Table 3.10

Child and Adult Car Passenger Casualties in Non Built-Up Areas by Seating Position: 1995-2000 Average		
	Numbers	
	Child	**Adult**
All Casualties		

Front Seat Passengers	9,978	102,224
Rear Seat Passengers	25,849	38,771
All Passengers	35,831	141,001
% Rear Seat	72%	27%
Killed and Seriously Injured (KSI)		
Front Seat Passengers	1,130	15,966
Rear Seat Passengers	2,639	7,093
All Passengers	3,769	23,059
% Rear Seat	70%	31%
Percentage KSI		
Front Seat Passengers	11%	16%
Rear Seat Passengers	10%	18%
All Passengers	11%	16%

3.5.8 Table 3.9 shows that the profile of accident locations for child car casualties is verysimilar to that for adult car casualties. Some 62% of all casualties, and around 70%of KSI, did not occur at or near a junction. Some 16 to 17% occurred at T, Y orstaged junctions, and 5% at crossroads and at private drives or entrances.

3.5.9 Table 3.10 shows the seating position of child and adult car casualties. Some 72% ofchild casualties and 27% of adult casualties were in the rear seat. The proportion ofKSI amongst all casualties was lower for child casualties than for adults, whicheverseat they occupied; the overall proportions were 11% for child casualties and 16%for adult casualties. The proportions of children KSI were very similar for both frontand rear seats (11% and 10% respectively). However, this ignores the fact thatinjuries amongst children in rear seats would be likely to be more serious had theybeen positioned in the front.

3.5.10 No details of seat-belt wearing are now given on Stats 19, but since 1995 rear seatwearing-rates amongst car users in general (recorded by DfT monitoring surveys)have been higher for children (in the range 76-91%) than for adults (in the range43-59%); wearing rates for front-seat passengers were around 90%, and it is likelythat the rates for children exceeded those for adults. (It is, of course, compulsoryfor both children and adults to wear seat belts, with some rare exceptions). Thishigher seat belt wearing rate provides a partial explanation for the lower severitylevels for children. Being seated in the rear may also have helped, given thepreponderance of front-impact accidents. Another beneficial influence is the factthat accidents involving child passengers tended to occur in circumstances whereimpact speeds would be expected to be lower; however, other explanations are ofcourse possible.

3.5.11 For child pedestrian casualties, Table 3.11 shows that 53% occurred on minor nonbuilt-up roads, compared with 38% of adult pedestrian casualties. It is likely thatchild pedestrians are involved in accidents on local roads close to their homes andschools, rather than on the busier roads involving longer journeys. Table 12 showsthat proportionately more child pedestrian accidents occurred at junctions, againsuggesting that the journeys were more local. Most of the junction accidentsinvolving child pedestrians were at T, Y or staggered junctions.

Table 3.11

Child and Adult Pedestrian Casualties in Non Built-Up Areas by Road Type: 1995-2000		
	Child	**Adult**
Motorway	1%	6%
Class A	47%	56%
Class B	16%	14%
Other Roads	37%	24%
All Roads	100%	100%
% Minor Roads	53%	38%

Table 3.12

Child and Adult Pedestrian Casualties in Non Built-Up Areas by Junction Type: 1995-2000		
	Child	**Adult**
Not at Junction or within 20 metres	69%	75%
Roundabout	3%	3%
Mini-Roundabout	0%	0%
Y or Staggered Junction	16%	11%
Slip Road	2%	4%
Crossroads	4%	3%
Multiple Junction	0%	0%
Private Drive/Entrance	4%	3%
Other Junction	2%	1%
All Junctions	31%	25%
All Locations	100%	100%

3.5.12 Table 3.13 shows that 87% of child pedestrian accidents occurred in fine weather,compared with 78% of adult pedestrian accidents. This may simply reflect thereluctance of children to venture out in bad weather, rather than a tendency to copebetter with traffic conditions in bad weather.

Table 3.13

Child and Adult Pedestrian Casualties in Non Built-Up Areas by Weather Conditions: 1995-2000		
	Child	**Adult**
Fine No High Winds	87%	78%
Raining No High Winds	8%	11%
Snowing No High Winds	0%	1%
Fine and High Winds	1%	3%
Raining and High Winds	1%	2%
Snowing and High Winds	0%	0%
Fog or Mist	1%	2%
Other	1%	2%
All bad weather conditions	13%	21%
Unknown conditions	1%	1%
All weather conditions	100%	100%

3.5.13 Table 3.14 shows that nearly 80% of child pedestrian casualties occurred in daylight,compared with slightly less than half of adult pedestrian casualties in non built-upareas. This reflects the hourly profiles in Table 3, and the fact that children are lesslikely to be out in the evening and at night.

Table 3.14

Child and Adult Pedestrian Casualties in Non Built-Up Areas by Lighting Conditions: 1995-2000		
	Child	**Adult**
Daylight	79%	49%
Darkness Lights Lit	10%	14%
Darkness Lights Unlit	1%	2%
Darkness No Lighting	9%	34%
Darkness Lighting Unknown	1%	2%

All Darkness Casualties	21%	51%
All weather conditions	100%	100%

3.5.14 Table 3.15 shows the breakdown of movements by child and adult pedestriancasualties in non built-up areas. Children were twice as likely as adults to have beencrossing the road, whereas adults were more likely to have been in the carriageway,either walking along it or standing. Both children and adults had higher proportionsinjured when walking with their backs to the traffic than those injured facing theoncoming traffic.

Table 3.15

Child and Adult Pedestrian Casualties in Non Built-Up Areas by Pedestrian Movement: 1995-2000		
	Child	**Adult**
Crossing		
Crossing from Nearside	38%	18%
Crossing from Nearside-Masked	8%	2%
Crossing from Offside	24%	14%
Crossing from Offside-Masked	6%	2%
In Carriageway		
In Carriageway Stationary	4%	14%
In Carriageway Stationary-Masked	0%	3%
Walking In Carriageway Facing Traffic	4%	9%
Walking in Carriageway with Back to Traffic	7%	21%
Unknown	8%	17%
All Pedestrian Movements	100%	100%

3.5.15 For child pedal cyclist casualties, Table 16 shows that 62% were on minor roads,compared with 41% of adult casualties. This suggests that the child cyclists weremore likely to be on local trips (or perhaps playing in the road).

Table 3.16

Child and Adult Cyclist Casualties in Non Built-Up Areas by Road Type: 1995-2000 Average		
	Child	**Adult**

Motorway	0%	0%
Class A	38%	58%
Class B	17%	15%
Other Roads	45%	27%
All Roads	100%	100%
% Minor Roads	62%	41%

3.5.16 Table 3.17 shows that about half the child and adult cyclist casualties were involvedin junction accidents. It is noteworthy that child pedal cyclists were disproportionatelyinvolved in accidents at private driveways and at T, Y or staggered junctions,whereas adult pedal cyclists were more involved at roundabouts. The involvementat private driveways again reflect the localised nature of child cyclist behaviour; itwould not be surprising to find that many of the casualties were emerging from theirhomes onto relatively high-speed roads.

Table 3.17

Child and Adult Pedal Cyclist Casualties in Non Built-Up Areas By Junction Type: 1995-2000 Average		
	Child	**Adult**
Not At Junction or within 20 metres	52%	51%
Roundabout	4%	16%
Mini-Roundabout	0%	0%
T, Y or Staggered Junction	22%	18%
Slip Road	1%	4%
Crossroads	6%	4%
Multiple Junction	0%	0%
Private Drive/Entrance	12%	5%
Other Junction	3%	2%
All Junctions	48%	49%
All Locations	100%	100%

3.5.17 Tables 3.18 and 3.19 show that, by comparison with adult pedal cyclists, a greaterproportion of child pedal cyclists were involved in fine weather accidents and indaylight accidents.

Table 3.18

Child and Adult Pedal Cyclist Casualties in Non Built-Up Areas by Weather Conditions: 1995-2000 Average		
	Child	**Adult**
Fine No High Winds	89%	83%
Raining No High Winds	7%	9%
Snowing No High Winds	0%	0%
Fine and High Winds	1%	2%
Raining and High Winds	1%	2%
Snowing and High Winds	0%	0%
Fog or Mist	0%	1%
Other	1%	2%
All bad weather conditions	10%	16%
Unknown conditions	1%	1%
All weather conditions	100%	100%

Table 3.19

Child and Adult Pedestrian Cyclist Casualties in Non Built-Up Areas by Lighting Conditions: 1995-2000		
	Child	**Adult**
Daylight	90%	76%
Darkness Lights Lit	3%	9%
Darkness Lights Unlit	1%	1%
Darkness No Lighting	5%	13%
Darkness Lighting Unknown	1%	1%
All Darkness Casualties	10%	24%
All weather conditions	100%	100%

3.6 Summary of Accident Analysis

3.6.1 To summarise, the overwhelming majority of child casualties in non built-up areaswere car passengers. In some respects they fared better than adult passengers, forexample in their fatal and serious injury rate. The most likely reasons are higherseat-belt wearing, and possibly lower impact speeds in accidents where childrenare involved as passengers.

3.6.2 Pedestrian and cyclist casualties were much fewer by comparison. Danger spotsfor child pedestrians and cyclists are T, Y or staggered junctions, and there is anapparent tendency for

children to walk along the carriageway with their backs to thetraffic, which is hazardous in high-speed traffic. Child pedal cyclists appear to be atsome risk near driveways.

Chapter 4
Childrens Exposure to Risk in Rural Areas

4.1 Exposure Evidence in the Literature

4.1.1 Basic information of the exposure of children in rural areas is available from theNational Travel Survey (www.transtat.dft.gov.uk). The National Travel Survey is ahousehold survey-covering residents of GB administered by the Office for NationalStatistics on behalf of the DFT..

4.1.2 Every household member in the sample is asked to keep a seven-day travel diary.Adult carers keep a diary for young children. The diary covers journey purpose,mode of transport, time taken, journey origin and destination. The data are presentedas three-year averages and the current report covers 1998-2000. The sample coversover 9,000 fully responding households and just fewer than 22,000 people. Typically,the yearly number of children included in the sample is between 1500-1700. The1998-2000 sample survey comprised over 4600 children.

4.1.3 The sample is representative at a regional level and can also identify residents ofurban and rural areas. The definition of urban and rural areas is based on a six partclassification system developed in 1991 which reflects population settlement size:

- London boroughs;
- built up areas of former metropolitan counties;
- large cities (> 250,000 population);
- medium urban areas (over 25,000 but < 250,000);
- small urban areas (>3000 but <25,000);
- rural areas (< 3000 population).

4.1.4 Information from the travel survey indicates that residents in rural areas are morelikely to own a car or possess a licence to drive and spend a longer time per tripcompared to London and the metropolitan areas. Trip length is about 5 miles forLondoners, 8.5 miles for small urban areas and 8.9 miles in rural areas.

4.1.5 Moreover, people in rural areas whilst not making any more trips, make longer tripsand travel further with a higher proportion of these being made by car. Use of othermodes of transport such as buses is much greater in London and metropolitan areascompared to rural areas probably because they are less likely to have access to busservices, other than for the journey to school, in rural areas.

4.1.6 Analysis of the National Travel Survey data on childrens journeys to schoolindicates that primary school children aged between 5 and 10 years in rural areastravelled over 2.5 miles to school, on average, compared to metropolitan areas wherethe average trip to school was one mile. Secondary school pupils (11-16) in ruralareas on average had to travel over seven miles to school, more than three timesfurther than those in metropolitan areas who on average had to travel two miles.55% of school trips by 11 to 16 year olds in rural areas are made by bus nearlydouble the national average of 32%. Walking to school is greater among 5-10 yearold children living in metropolitan areas (66%) whereas travel by car was the mostused form of transport in rural areas (42%). For secondary school children walkingwas the most used form of school travel except in small urban, London boroughsand rural areas where bus use was higher (see Table 4.1).

Table 4.1

Trips to and from school by main mode and area type:1998/2000 percentage of trips/miles											
5-10 year olds						**11-16 year olds**					
	Walk	Car	Other	All modes	Average length (miles)	Walk	Car	Bus	Other	All modes	Average length (miles)
London											
Boroughs	60	33	7	100	1.4	32	17	36	15	100	3.1
Metropolitan											
built up areas	66	28	6	100	1.0	49	20	29	2	100	2.1
Large urban	55	37	7	100	1.0	43	22	30	5	100	2.6
Medium urban	55	39	6	100	1.3	51	20	25	5	100	2.4
Small medium											
urban	47	43	10	100	1.7	49	18	31	3	100	2.9
Small urban	60	29	12	100	2.0	35	17	46	3	100	3.8
Rural	39	42	19	100	2.6	19	21	55	5	100	7.2
All areas	56	36	8	100	1.5	43	19	32	5	100	3.0

Source: National Travel Survey DTLR.

4.1.7 Childrens exposure is likely to be influenced by socio-economic factors. Researchinvestigating the influence of socio-economic and environmental factors on childpedestrian accidents in urban areas (Christie 1995) showed that children from lowsocio-economic groups were significantly more likely not to have access to cartravel; be more likely to play out in the streets and live in higher risk environments.

4.1.8 In rural areas there are high levels of poverty. Recent guidance to the RegionalDevelopment Agencies from the DfT (DTLR 1999) indicates that often rural poverty..goes unnoticed because it is seldom concentrated in small areas as in towns andbecause many official indicators of deprivation (e.g. the Index of Local Deprivation)are designed to measure aspects of deprivation which tend to be urban rather thanrural (e.g. overcrowding). The guidance note describes a research study funded bythe Economic and Social Research Council, DfT and the Rural DevelopmentCommission which found that 9 of its 12 case study areas contained 20% or more ofhouseholds living in or on the margins of poverty (defined by an income of less than140% of

income support entitlement). However, whilst low car ownership is anindicator of deprivation in urban areas it is not a good indicator of deprivation inrural areas: *Despite lower incomes, car ownership is higher in rural areas becausethe car is essential to get to work or to shop. This is forced car ownership-it is20-30 per cent higher than for people on the same income in urban areas*(AA 2000). Therefore, despite high poverty levels it is likely that children in ruralareas may be less likely to be at risk as vulnerable road users though their in carsafety may be a more important research priority. More research is required toexamine the relationship between socio-economic factors and exposure to roadtraffic risk in rural areas.

4.1.9 A report by the Childrens Society (1997) suggests that children in ruralcommunities are increasingly geographically and socially isolated through theirreliance on dwindling or non-existent public transport services. The report alsofound that narrow roads, lack of pavements and street lighting and distancesbetween settlements all militate against utility cycling (The Childrens Society).

4.2 Child Pedestrian Exposure and Accident Survey

4.2.1 The Child Pedestrian Exposure and Accident Survey (1999) undertaken for the DfTby MVA and Leeds University ITS provides evidence of different levels of exposureamongst children according to the type of area that they live in. In Great Britain itwas possible to classify the areas surveyed according to whether they were primarilyin a large city, a medium sized town or essentially rural. Exposure, but notaccident risk, can be compared between these different area types.

4.2.2 In Britain child pedestrians across all types of area spend the highest proportion oftime exposed to local residential roads. Children in rural areas are less likely to beexposed to main through routes as pedestrians and more likely to be exposed to localnon-residential roads compared with children from other areas (Table 4.2).

Table 4.2

Exposure of Children to Different Types of Road by Area type			
Road Type	**City % of time exposed**	**Town % of time exposed**	**Rural % of time exposed**
Main through route	34	27	14
Local distributor	12	12	28
Local residential	42	41	34
Local non-residential	7	17	22
Other	5	3	3
Total (mins)	6,628	10,813	7,383

4.2.3 Child pedestrians in cities and towns are much more likely to be exposed to highervolumes of traffic. Almost one third of exposure time amongst children in city areasis characterised by cars

passing all the time compared with just 15% in rural areas.On the other hand, the majority (70%) of time spent by child pedestrians in ruralareas has no or occasional cars passing compared with 40% for children from citiesand 50% for those living in towns (Table 4.3).

Table 4.3

Exposure of Children to Different Types of Road by Area type			
Traffic Volume	**City % of time exposed**	**Town % of time exposed**	**Rural % of time exposed**
Occasionally/not at all	40	50	70
Most of the time 1 or 2 cars	20	20	13
Car passing all time	32	26	15
Missing	8	4	2
Totals (mins)	6,628	10,813	7,383

4.2.4 The profile of child pedestrians across different area types indicates that a higherproportion of children from lower socio-economic groups live in cities(64% C2DE) compared with 34% in rural areas (Table 4.4). Research elsewhere(White, Raeside and Barker) has indicated that accidents are class related.

Table 4.4

Socio-Economic Group of Child Pedestrians by Area Type			
SEG	**City % of time exposed**	**Town % of time exposed**	**Rural % of time exposed**
AB	15	38	41
C1	21	19	25
C2	36	26	20
DE	28	18	14
Totals (minutes)	6,628	10,813	7,383

4.2.5 Table 4.5 indicates that there is no real difference between the different area types interms of their direct exposure to the road. The majority of the time amongst all childpedestrians is spent either on the pavement or footpath. However, three per cent oftime exposed to traffic amongst rural and town children is on the road.

Table 4.5

Use of Footpaths by Area Type			
Footpaths	**City % of time exposed**	**Town % of time exposed**	**Rural % of time exposed**
Pavement	91	84	76
Footpath	2	7	18
Other	0	3	2
On road	0	3	3
Missing	7	2	1
Totals (minutes)	6,628	10,813	7,383

4.2.6 Table 4.6 suggests that there is no real difference between the traffic speeds thatchild pedestrians in urban and rural environments are exposed to.

Table 4.6

Roadside Traffic Speed Children Exposed to by Area Type			
Traffic Speed (Roadside)	**City % of time exposed**	**Town % of time exposed**	**Rural % of time exposed**
Faster than most traffic in towns	13	10	9
Slower than most traffic in towns	12	17	14
About the same speed	49	46	49
Unable to respond no traffic	16	21	23
Missing	10	6	5
Totals (minutes)	6,628	10,813	7,383

4.2.7 The Child Exposure and Accident Survey also looked at the numbers of roadcrossings of different types made by children. Child pedestrians in rural areas makea higher proportion of crossings at T-junctions (86% of all junction crossings).They are less likely than children resident in city areas to make crossroad crossings(Table 4.7).

Table 4.7

Junction Type of Crossings Made by Area Type			
Junction Type	**City % of time exposed**	**Town % of time exposed**	**Rural % of time exposed**
T-junctions	69	84	86
Crossroads	18	6	6
Roundabouts	6	5	3
Others	6	5	6
Totals (no of crossings)	838	1,642	1,025

4.2.8 Table 4.8 indicates that there was no notable difference between the position wherechildren make crossings at junctions between different types of area. Most childrenin all areas crossed on or right next to the junction.

Table 4.8

Junction Position of Crossings Made by Area Type			
Junction Position	**City % of crossings**	**Town % of crossings**	**Rural % of crossings**
On/right next to	65	60	61
Near (20m)	10	13	14
Between	25	28	25
Total (no of crossings)	1,154	1,438	2,220

4.2.9 The survey also provides data on pedestrian exposure for children in rural areas inFrance that can be compared with Britain (Table 4.9). Children in rural areas inBritain are more likely to be on local residential roads and far less likely to be onlocal distributor roads compared with children in rural areas in France. There wasevidence of exposure to a lower volume of traffic amongst rural British children 49% of those in France had one or two cars passing most of the time or cars passingall the time compared with 28% in Britain. The French rural children had a higherSEG profile almost all (97%) were in categories ABC1 whereas just under threequartersof the British children were in this category. French rural children werethree times more likely to be exposed directly to the road 9% compared to 3% inBritain. The survey found evidence of exposure to different speeds of traffic. If themissing and no traffic cases are excluded, it is evident that 13% of roadside trafficthat children are exposed to in Britain is estimated to be travelling faster than mosttraffic in town- nearly twice as much as in France (7%). In contrast, 51% of roadsidetraffic in France is estimated to be travelling slower than most traffic in townscompared with just 19% in Britain. British rural children were more likely to beexposed to T-junctions whereas in France they were equally likely to encountercrossroads.

Table 4.9

Exposure of Rural Children by Country (Britain & France)		
	Britain % of time exposed	**France % of time**
Road type		
Main through route	14	18
Local distributor	28	46
Local residential	34	15
Local non-residential	22	20
Other	3	2
Traffic Volume		
Occasionally/not at all	70	45
Most of the time 1/2 cars	13	35
Car passing all time	15	14
Missing	2	6
SEG		
AB	41	33
C1	25	64
C2	20	3
DE	14	0
Footpaths		
Pavement	76	79
Footpath	18	8
Other	2	1
On road	3	9
Missing	1	3
Traffic Speed (roadside)		
Faster than most traffic in towns	9	6
Slower than most traffic in towns	14	43
About the same speed	49	36

Unable to respond no traffic	23	13
Missing	5	1
Junction type of crossings		
T junctions	86	44
Crossroads	6	44
Roundabouts	2	3
Other	6	9
Junction Position of crossings		
On/right next to	60	63
Near (20m)	13	20
Between	27	16
Total exposure time (mins)	7,383	10,075

Chapter 5
Rural Road Safety Policy Initiativesand Interventions

5.1 Policy Initiatives

5.1.1 In 1999, a report entitled Safety Strategies for Rural Roads was published by anOECD Expert Group that comprised 13 countries[1]. The aim of the group was toexamine the problems and propose strategies for improving safety on rural roads.A central conclusion of the review was that:

there is currently insufficient information available on rural road safety problemto adequately support appropriate policy and investment decisions. In the reviewthere was no mention of the rural road safety of children.

5.1.2 This situation is not completely surprising. In absolute terms, most road accidentsinvolving children occur in urban environments. As a consequence, most researchon the safety of children in the road environment has been carried out in urbanareas. However, whilst accidents on rural roads are fewer than on urban roads theytend to be more severe and therefore more costly. The development of interventionsaimed at reducing child casualties on rural roads will therefore help to meet DfTsambitious target to reduce the number of children killed or seriously injured by50% in 2010 compared with the average for 1994-98 published in Tomorrowsroads: safer for everyone The Governments road safety strategy and casualtyreduction targets for 2010 (DETR 2000a).

5.1.3 Rural transport and safety are also on the governments agenda to provide anequitable and inclusive transport policy. DfTs Ten Year Plan for Transportacknowledges that levels of traffic are increasing faster on rural roads than on urbanroads and although casualty rates are falling nationally, this happening at a slowerrate on rural roads (DETR 2000a). The Rural White Paper Our Countryside: TheFuture: A Fair Deal for Rural England (DETR 2000b) sets out plans for rural roadsafety identifying measures to minimise the impact of traffic in rural areas and tofacilitate cycling and walking.

5.1.4 The Ten Year Transport Plan (DETR 2000a) made provision for some 50 newbypasses to take traffic out of towns and villages; and for investment to providesafer roads with less impact on the environment. For rural areas the Commissionfor Integrated Transport (CfIT) believes transport policies should seek to reducethe reliance on the car by improving the availability of travel choice, including saferconditions for walking and cycling. The Countryside Agency, through the RuralTransport Partnerships is designed to bring together local community interests todevelop new ideas for transport co-operation.

5.1.5 For cycling and walking the plan states that all highways authorities in England andWales are to include cycling and walking strategies in their local plans. The Lotteryfunded national cycle Network launched in June 2000 aims to help promote cyclingin rural areas by linking town and country.

5.1.6 The Institution of Highways and Transportation (IHT) has published guidelineswhich present procedures for the safety management of rural roads. The guidelinesinclude details of different techniques to apply according to the road classificationsto influence road user behaviour and improve safety.

5.1.7 New parish funds will provide the means for parishes to develop and run their ownprojects. Parish councils will be able to apply to the Countryside Agency for grantsof up to £10,000 to fund schemes which meet local transport needs. The TransportBill (1999) encourages local authorities to co-operate with local educationauthorities and authorities with social service responsibilities.

5.1.8 Local Transport Plans (LTPs) are the transport strategy statement of the localhighway authority and a bid to Government for five year capital transport funding.LTPs can be used to identify and highlight best practice in addressing rural transportissues. The Countryside Agency will launch a good practice guide so that localauthorities, operators and community groups can be better informed about whatworks, and can benefit for lessons learnt elsewhere.

5.1.9 Babtie Ross Silcock was commissioned by the DfT to examine how to develop arural road hierarchy (RRH) to facilitate the management of vehicle speed and reducecasualties. Silcock *et al* (2001) have recently reported progress to the DfT. The aimof the RRH is reduce casualties by producing a framework for vehicle speeds inlocations where they are inappropriately high. The review has been commissionedto address the fact that the present speed limits of 60 or 70mph cover a range of roadtypes including major inter-urban routes and quiet country lanes but there is noguidance to distinguish between them and develop the appropriate speedmanagement interventions. Silcock *et al* comment that little is known about actualspeeds on these roads or drivers perception of appropriate speed limit for the road.

5.1.10 The report suggests that the hierarchy may take into account a number of differentfactors such as the quality of the road as developed by TRL which takes into accountgeometric and topographic factors such as hilliness; bends, junction access densityas well as traffic speed. Although this work is still in the development phase it islikely to provide a useful tool for rural road safety management.

5.1.11 .Since August 2001 the national roll out of the safety camera netting-off scheme willenable all areas to benefit from better speed enforcement. Many of the areas joiningthe scheme are predominantly rural.

5.1.12 On faster rural roads at locations where collisions are most common such asjunctions and bends the DfT is developing measures for reducing vehicle speeds andimplementing vehicle activated warning signs.

5.1.13 The European Conference of Ministers of Transport noted that it is clear that speedis an important factor but the focus of research should not be just on speed.concomitant factors must not be forgotten: the absence of an infrastructurereserved for pedestrians, a more acute visibility problem, the even more negativeeffects of drinking and driving, etc (ECMT 2000).

5.1.14 The Quiet Roads project an initiative of the Countryside Agency- has pilotedschemes in Norfolk and Kent following consultation with local communities usingexisting legislative powers. The aim is to make selected country lanes more attractivefor walking, cycling and horse riding in the interests of a more attractive ruralenvironment. A clause will be added to the Transport Bill, which will give legalstatus to quiet lanes. Local Authorities will be able to designate roads as quiet lanesand make orders affecting the way they are used and providing for speed reductionmeasures in them. Long term monitoring is in place to assess the effect the projecthas on local use and driver behaviour but as yet the evaluation is incomplete.

5.2 Rural Road Safety Interventions

5.2.1 The OECD Expert Group made the following conclusion about rural road safetyinterventions:

From all appearances, the rural road safety problem has been neglected over theyears in comparison to the high level of attention that has been given to the safetyproblems on motorways, and urban/residential roads and streets. This is evidencedby the general lack of explicit safety policies or targets for rural roads in mostOECD countries. Given this state of affairs, the rural road safety problem deserves ahigher priority in future road safety policies, without neglecting the urban roadsafety problem.

5.2.2 The OECD concluded that rural road safety is completely different from motorwayor urban road safety and required a separate management approach.

5.2.3 This is consistent with the fact that no direct studies on road safety interventionsdesigned for children using rural roads could be identified in the literature. However,speed on rural roads is clearly a central safety issue. Arguably, any intervention thathelps to reduce excessive speed on rural roads may influence the safety of childrenas vulnerable road users. There is a large body of research in this area (e.g. DETR2000c; Slower Speeds Initiative 2001). Much of this research has focused onengineering measures to reduce vehicle speeds in urban areas or at entry points intovillages.

5.2.4 In the UK rural sites have rarely been identified as priorities for remedial treatmentas accidents in rural areas tend to be scattered and not concentrated at specificlocations. Some intervention research has tried to address the specific geometric andtopographic characteristics of rural roads.

5.2.5 For example, Barker (1997) studied the impact of low cost engineering measures tochange vehicle speed and injury accident frequency as outcome measures invillages. In particular the engineering measures were designed to help driversnegotiate bends and reduce speed on entry into villages. The measures included:

- **Channelisation markings** on bends designed to encourage drivers to slow downand guide them in their path through the bend and reduce the numbers of head oncollisions and loss of control accidents.
- **Rib lines** thermoplastic transverse road markings that slow drivers down andalert them to the presence of a village not only visually but also through noise andvibration generated by travelling across them.
- **Vehicle activated warning signs** interactive signs activated by the vehicle if itexceeds set threshold providing hazard and speed limit information to the driver.
- **Speed limit countdown and roundel markings** road surface markingsreminding the driver of the speed limit.

5.2.6 However, it was difficult to assess the impact of these measures because of therelatively small numbers of accidents involved. Therefore, interventions evaluation isunlikely to show significant differences in accident rates in the short term.

5.2.7 These types of initiatives are recommended by the OECD Expert Group becausethey are low cost and have high benefit-cost ratios.

5.2.8 Other infrastructure intervention approaches suggested by the group include:

- ensuring that safety has explicit attention at every process from the decision tobuild or rebuild a road to the planning and design stages, through construction andduring operation and maintenance;
- the need to separate slow and fast moving traffic on rural roads by physicallyseparating vulnerable users from fast moving traffic.

5.2.9 The issue of police enforcement in rural areas is particularly difficult. Policeenforcement is clearly needed to address the issue of excessive speed in rural roadcrashes. However, the OECD Expert Group concludes that

.. due to the great length of the network, enforcement by conventional means is verylimited and one cannot rely only on strategies based on improving behaviour onthe spot by spending police manpower alongside the road.

5.2.10 The Group concludes that publicity campaigns with targeted enforcement maychange driving norms though recommends that automated enforcement technologies(e.g. speed cameras) may have a particular role to play in rural areas.

5.3 Local Authority Policy and Strategy

5.3.1 Local authority policy and strategy was examined by undertaking direct consultationwith local authorities to identify policy and practice on road safety applicable tochildren in rural areas. A number of authorities were consulted representing thosewith a substantial rural area. (The Highland Council, Clackmannanshire Council,Norfolk County Council, Herefordshire County Council, Gloucestershire CountyCouncil, Derbyshire County Council, Dorset County Council, Cumbria CountyCouncil and Cornwall County Council). The consultation aimed to identifyeducation, engineering and enforcement policies and strategies specifically aimed atrural road safety and/or the safety of children as well as any evidence of evaluationsof these initiatives. The consultation indicated a number of common safety policiesand strategies which are relevant to child road safety although none are targeted at,or exclusive to children in rural areas. This included:-

Education

Education and Training

- road safety education including classroom based education incorporated into theNational Curriculum; parent education and roadside (Kerbcraft) currently at thefirst stage of implementation;
- theatre in Education campaign against speeding involving newly qualifieddrivers;
- road safety information for young children including the Childrens Traffic Clubfor 3 to 4 year olds to raise awareness amongst young children and their parents ofdangers associated with using and living near roads and road safety informationpacks distributed via Health Visitors at three year old health checks;
- young driver education courses;
- Crucial Crew a multi-agency events incorporating road safety education intoa broader event on safety targeted at 10-11 year olds;
- cycle training.

Journey to School/Green Travel

- Safe(r) Routes to School/Better Ways to School aimed at reducing car journeys toschool and providing safe and secure alternatives walking, cycling and publictransport. The Better Ways to School initiative, for example, is a ten yearprogramme in one authority targeted at 63 schools to promote travel awarenessand modal shift from the car. These strategies will be incorporated into LocalTransport Plans (LTPs);
- provision of school transport;
- Walk to School week including sharing of best practice;
- walking buses;
- school crossing patrols;
- introduction of bicycle racks/safety helmets at schools to promote cycling.

Engineering

- traffic calming outside schools and elsewhere in both urban and rural areas.In one case physical measures were introduced as a result of child safety auditscarried out over a three year period. These are primarily aimed at reducingspeeding but also to prevent inappropriate stopping and parking;
- speed restrictions outside schools (often 20mph);
- traffic islands for pedestrians on some roads;
- flashing amber lights outside schools;
- annual reviews of speed and traffic flow;
- engineering measures implemented in response to casualty rates or accidentblackspots;
- 30 mph speed limit for all villages;
- additional/upgraded street lighting.

Enforcement

- close liaison with the Police to enforce speed restrictions outside schools andwearing of seat-belts.

Evaluation

5.3.2 Local authorities commonly evaluate their road safety strategies overall by lookingat trends in casualty figures, establishing local casualty reduction targets andmonitoring actual accident rates against these targets. Evaluation of physicalmeasures introduced on roads may also be undertaken although not specificallywith regard to measuring the impact on road safety for rural children. The BetterWays to School scheme is subject to continuous evaluation although again notspecifically with reference to rural road safety. Similarly the young driver educationcourses have been evaluated.

5.3.3 One authority had an on-going evaluation of their Safer Routes to Schoolprogramme on a countywide basis. This involved analysis of the modal split,catchment densities, accidents and deprivation levels. The evaluation has directedresources towards urban primary schools including pedestrian crossings, new cycleroutes, improved lighting and improved parking for school buses.

5.3.4 Other than this evaluation is often informal. Road Safety Officers may, for example,meet with headteachers to discuss road safety issues.

5.3.5 The consultation with local authorities is broadly supportive of the findings in theliterature. There are various initiatives in operation but there was no evidence of policies or interventions that are specifically targeted at improving road safetyamongst children in rural areas. The location of engineering measures relates toschools or accident blackspots rather than whether it is in a rural or urban setting.The example of an evaluation that was given reflected the fact that more accidentsoccur in urban situations and, as a result, resources will be directed there.

[1] Australia, Belgium, Canada, Czech Republic, Denmark, Israel, Finland, France, Japan, Netherlands,Switzerland, UK and US.

Chapter 6
Conclusions

6.1 Key Findings

6.1.1 The small amount of evidence available on rural travel and safety of childrensuggests that few of the questions identified at the outset of this review can beanswered adequately and there are many gaps in our knowledge (see summarybelow). Most of the literature relates to rural areas per se and not to the specificproblems children face so messages have been inferred. Further information isrequired to establish whether these inferences are correct

Summary of Issues and Evidence

Issue	Evidence summary
How good is the data on road accidents involving children in rural areas?	Stats 19 national accident data can provide some useful contrasts between accident involving children living in rural areas compared to urban areas. Children in rural areas are more likely to injured as car passengers compared to children living in urban areas.
What is meant by the term rural and is this congruent with accident data descriptions?	There are a number of different definitions of the term rural. Population size is a common criterion and is not compatible with the speed limit definition used in national accident data. Development of a rural road hierarchy and its use in accident classification may help resolve the incompatibility between data sources.
Are road accidents involving children in rural communities more likely to be under-reported compared to urban areas?	Some evidence that accidents in rural areas are not under reported generally, but not known with respect to children as vulnerable users.
What is the nature of the accident liability of children living in rural areas?	More research is needed on the accident liability of children in rural areas especially as vulnerable road users.
How does the exposure of children in rural environments differ to that of children living in urban environments?	National Travel Surveys and *ad hoc* research studies suggest that children in rural areas are more likely to travel by car on longer journeys compared to their urban counterparts. There is little evidence on rural childrens exposure during leisure activities. Interestingly the Stats 19 analysis carried out as part of this study indicates that child casualties in non-

	built up areas were less likely to be on journeys to or from school which suggests that exposure during leisure time needs further investigation
What is the relative risk of being involved in a road accident as a child living in a rural environment compared to an urban one?	Very little is known about the relative road accident risk of children travelling on different types of rural road, using different modes in different types of rural areas. Detailed information exists for children especially pedestrians in urban areas. However, more research is required to enable an urban rural comparative analysis.
How are road accidents involving children in rural areas different to those in urban areas in terms of individual, environmental and socio-economic characteristics?	Whilst there is a significant body of research that has looked into socio-economic and environmental factors in pedestrian accidents in urban areas, there is not a comparable body of research for children living in rural areas.
What factors explain the accident risk of child pedestrians and cyclists living in rural areas?	Danger spots for child pedestrians and cyclists are T, Y or staggered junctions, and there is an apparent tendency for children to walk along the carriageway with their backs to the traffic, which is hazardous in high-speed traffic. Child pedal cyclists appear to be at some risk near driveways.
What role does exposure play?	The pattern of exposure for children in rural areas compared to urban areas is quite different, there being higher car travel among children in rural areas. However, there is little evidence on how this impacts on safety.
What role do socio-economic factors play?	There is widespread poverty in rural areas but little is known about the relationship between this and child safety.
What role do topographical factors play in rural safety?	Some general evidence with respect to bends and junction sight lines but little information on vulnerable users.
How does transport accessibility impact on childrens safety?	Little is known about the relationship between accessible transport and its impact on safety for children in rural areas.
What role does vehicle speed play in the accident involvement of children?	Speed has been highly implicated in accidents in rural areas *per se* however little is known about the relationship between speed and child safety in rural areas.
What can be learned about the development, implementation	No published information was identified on the interventions directly aimed at rural safety issues.

and evaluation of road safety initiatives aimed at children living in rural areas?	
Have any road safety interventions been specifically targeted at children living in rural areas?	As above
Have any road safety interventions been specifically targeted at children living in rural areas?	As above
What type of interventions (e.g. speed cameras; provision of crossings; conspicuity; environmental modification; training and education) are effective in rural areas?	There is some limited information on low cost engineering measures on rural roads but these have been proved difficult to evaluate because of the low numbers of accidents. There is limited data on the safety of children in rural areas, and the scarce and scattered nature of accidents in rural areas lead to difficulties in targeting and evaluating interventions.
What are the implications of the Ten Year Transport Plan (e.g. rural transport development; rural partnerships) on the safety of children living in rural areas?	The proposed plan may improve the travel options for children living in rural areas but it is too early to assess its impact.
What are the implications of a rural road speed limit/hierarchy for child safety?	A rural road hierarchy is required to understand fully differences in risk associated with living and travelling in a rural area.

6.2 Further Research for Policy Development

6.2.1 Although the literature on child safety on rural roads is sparse and indirect it doesflag up a number of issues that point to potential interventions and further researchrequirements.

6.2.2 Geodemographic analyses of those involved in accidents involved in accidents inrural areas may give a clearer picture of the target audience for interventions.Postcode data is available on Stats 19 and ways of using this to identify targetgroups could be explored. A clear and consistent definition of rural using postcodedata will be necessary in such analyses and valuable in developing appropriateinterventions.

6.2.3 The analyses carried out in this study concentrated on identifying child casualties inrural areas using the distinction between built-up and non built-up roads. Thisdistinction is generally effective in exposing the contrasting characteristicsassociated with road accidents: notably the generally lower speeds and greaterdensity of junctions in built-up areas, combined with the greater likelihood ofencountering pedestrians, parked cars and vehicles entering the carriageway fromdriveways.

However, some built-up area accidents do occur in areas that wouldnormally be characterised as rural, and for residents of rural areas there may bedistinct safety problems as they encounter a range of different types of trafficconditions in the course of a day.

6.2.4 There are a number of ways of identifying rural areas. Two examples are

- the use of urban sprawl boundaries observed by satellite. These representcontinuous areas observed to be dominated by buildings of some kind. Eachsprawl can be classified by its surface area. Points that are not in any sprawl,and points which lie within small sprawls below (say) 0.5 square kilometresmight be described as rural. Any point in Great Britain can be assigned to aparticular size of sprawl, using point-in-polygon techniques, and can therefore becharacterised by its degree of urbaness, ranging from the large London sprawl,through the other sprawls associated with conurbations and towns of differentsizes, down to rural;
- the use of data from the Population Census. It is standard practice to construct defacto urban areas from adjoining enumeration districts where the population oremployment density is above a particular threshold. The resultant boundaries canbe used in a similar way to the urban sprawl data above, to define rural areas oralternatively a degree of urbaness for any point in GB.

6.2.5 Both the above methods are able to identify the character of an area in a way that asimple dichotomy based upon road speed limits cannot. Another approach is toclassify postcodes (at various levels) as urban or rural, based upon certaincharacteristics. All postcodes are digitised.

6.2.6 With the Stats 19 data two sorts of analysis are now possible using the locationaldata on the attendant circumstances and casualty records:

- the accident location grid reference could be used, with the urban sprawl or otherurban area boundary data, to determine the degree of urbaness of the site. Thiswould enable us to classify child casualties in greater locational detail than thesimple built-up/ non built-up dichotomy. There may be, for example, differencesbetween accident circumstances in conurbations and other types of town;
- the casualty postcode of residence available on Stats 19 from 2000 onwardscould be used to identify the degree of urbaness of the place of residence. Thiswould allow comparisons between child casualties by area type. For example, itwould be possible to derive age specific casualty rates for urban and ruralresidents, where the numerators were the numbers of casualties who had urban orrural residence and the denominators were the populations of the same age groupliving within urban and rural areas.

6.2.7 Of particular interest would be a simultaneous breakdown between area of residenceand accident location as described above. This would show, for example, whether,for accidents in large conurbations, children who lived in rural areas fared better ofworse in terms of injury severity than children who lived in urban areas. If theyfared worse, this might point to unfamiliarity with urban traffic conditions and theneed for greater road safety training for children in rural areas.

6.2.8 All of these analyses are feasible provided that the appropriate datasets are availabledefining urban areas are available. At present it is not known what proportion ofcasualties in the year 2000 have postcodes recorded.

6.2.9 It is likely that the lack of evidence on the safety of children in rural areas will onlybe resolved by in-depth research which profiles the relative risk of children as caroccupants, cyclists and pedestrians in terms of their exposure to risk in theenvironment and the socio-economic factors which influence this risk. There aremany examples of this kind of approach in urban areas for child pedestrian accidents(Ward *et al* 1994; Christie 1995, Tight 1987). Such methods could be applied tochildren in rural areas to provide a holistic picture of their relative accident risk. Interms of research prioritisation, car occupancy would seem to be a key area. Furtherresearch is needed to examine driver behaviour with child passengers and childrestraint use. Interventions that focus on the behaviour of the driver, especially withregard to speed and alcohol use may be particularly important.

6.2.10 It is not known how important socio-economic factors are in the road accident riskof children in rural areas. Whilst there is widespread poverty in rural areas there isalso high car ownership and lower traffic density which may mean that even childrenfrom poor families may be more protected from risk than their urban counterpartsi.e. they travel less frequently as vulnerable road users. Further research is requiredto examine the interrelationships between these factors.

6.2.11 There is considerable scope for the evaluation of policy and engineering, educationand enforcement interventions that are in place, some at a local level including SafeRoutes to School, comparing where appropriate the impact on children in urban andrural situations. This would provide clear evidence of appropriate strategies to assistfuture policy formulation.

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