

Appendix A – Technical note for Workstream A2/A3

Information Note

Project Title:	Child Road Safety and Poverty Research
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1 Introduction and overview

Introduction

- 1.1.1 This review builds on the literature review carried out on deprivation and child pedestrian casualties by Colin Buchanan and Partners LTD (2010), and on the conclusions and recommendations for possible interventions identified in this research, and focuses on interventions to reduce child road casualties as pedestrians, cyclists and car occupants.
- 1.1.2 All people are exposed to the risk of injury on the road as part of their everyday lives, but the burden of these injuries is not evenly spread. Road traffic casualties disproportionately affect some groups more than others. Disadvantaged people and those living in deprived neighbourhoods are much more affected than those living in more affluent areas; some age groups of vulnerable road users, such as children, young adults and older people, bear a greater burden. There is considerable potential for improvement and intervention (Hayes et al., 2008).
- 1.1.3 The risk factors for children are multiple and include economic, social and environmental factors. Overall, the evidence suggests that the elevated risk of road traffic injury among people in disadvantaged communities is linked to them:
- **living in more hazardous environments**, such as older style developments, which give rise to higher vehicle speeds and high levels of on street parking;
 - **living in areas with high levels of hazardous and illegal driving behaviour**, such as driving whilst impaired, without a seat belt and driving without entitlement or insurance;
 - **having lifestyles with higher levels of exposure to environmental risk**, such as being more likely to walk and less likely to be able to afford access to a car;
 - **not having access to safe spaces and supervised facilities** for children and young people, meaning there are fewer alternatives to the street as places to socialise and play outside the home;

- **having low levels of understanding about the risks**, perhaps because the current provision of advice in local areas may not be appropriately targeted or the messages are not reaching those most at risk or that they are not being acted upon; and
- **not accessing information about facilities and services** (especially parents), which may mean that they do not have information about ways in which children can engage in safe and supervised activities in their free time.

(Christie and Whitfield, in Lowe et al 2010)

Overview of this technical note

- 1.1.4 This review first examines how interventions can mitigate these risk factors for children as they walk, cycle or travel in cars and how preventive measures can be used to reduce road traffic casualties. This review considers both primary and secondary preventive measures. In relation to road traffic injury primary prevention aims to prevent the crash that causes the injury (eg providing safe places to cross the road, road safety skills training, speed limits). Secondary prevention reduces the severity of the injury (e.g. cycle helmets, car design to protect the occupants);
- 1.1.5 In the sections on primary and secondary interventions (sections 3 and 4), we examine the literature in terms of the “three E’s”, representing *Educational*, *Engineering* and *Enforcement* strategies. Educational strategies focus on changing behaviour (e.g., pedestrian training), influencing policy through advocacy (e.g., campaigns highlighting the extent of the problem and possible solutions) and changing social attitudes (e.g., campaigns targeted at increasing willingness for environmental change). Engineering strategies involve changing the environment (e.g. separated walking paths). Enforcement strategies rely on legislation and ensuring compliance through imposing penalties to control behaviour and other measures. These approaches have been implemented separately or together in multi-agency initiatives attempting to address the principal determinants of health including individual, social and environmental factors.
- 1.1.6 Relatively few interventions have been conducted in more deprived areas and even fewer have been robustly evaluated. The limited evidence base on road safety in deprived areas can provide useful insights and thus this review uses important case studies to illustrate its theme. Section 5 therefore focuses on the evidence of how road safety interventions have been implemented in deprived areas, but also adopts a broader approach and discusses those interventions which have generally been found to be effective in improving child road safety.
- 1.1.7 Special attention is given in the case studies to recent reports on the Evaluation of the Neighbourhood Road Safety Initiative and the Road Safety and Disadvantage project. These projects were funded by the Department for Transport to provide an in-depth understanding of causal factors of the link between poverty and casualties and how practitioners can address them. These are referred to under the section entitled ‘case studies’. The section on case studies also includes recent guidance from the National Institute for Health and Clinical Excellence (NICE) on the importance of road design to reduce road traffic injuries among children and on workforce development, as this has implications for the delivery of intervention approaches in disadvantaged areas.
- 1.1.8 Finally, we set our conclusions based on the evidence we have examined during this review.

2 Methods

2.1.1 We used several methods to identify relevant publications for inclusion in the literature review. We searched international academic databases (e.g. OVID, PsychINFO, etc) and Safety Lit for English language publications using search terms related to pedestrian injuries and deprivation. We also conducted web searches to identify other literature such as government reports that may not have been published in academic journals. These included general web searches, as well as searches of specific websites known to be likely to include relevant work (e.g. Transport Research Laboratory, AA Foundation for Road Safety Research, Department for Transport, UK and Ireland Injury Observatory etc.). In addition, we reviewed reference lists of identified publications to identify other relevant articles.

3 Primary Preventative Measures

3.1 Education

3.1.1 The most *effective* child pedestrian safety education programmes tend to include practical, interactive training in the road environment, and parental involvement (Klassen et al., 2000; Schieber & Vegaga, 2002).

Children's traffic clubs (3-4 year olds)

3.1.2 Children's Traffic Clubs (<http://www.trafficclub.co.uk>), aimed at 3 to 4 year olds and their parents, are currently organised in many parts of Britain. Parents are provided with 6 traffic safety books to work through with their children. In one study, parents from higher income families appeared to be more likely to be members than were parents from lower income families (71% v 53%); however, use of the material did not appear to differ with different socio-economic groups (Bryan-Brown & Harland, 1999). Evaluations of Traffic Club activities showed increased carers' road safety education of their children, increases in the number of teaching methods used, and increased road safety behaviour among children and carers (Bryan-Brown, 1994). Effects on injury rates were not as clear, although evaluations of Traffic Clubs in Norway found club members had a 20% lower casualty rate than did non-members.

Kerbcraft (5-7 year olds)

3.1.3 The Kerbcraft child pedestrian training programme is scheme designed to teach children aged 5 to 7 years old three skills that will help them in future independent travel:

- recognising safe versus dangerous roadside locations;
- crossing safely between parked cars; and
- crossing safely near junctions. (www.kerbcraft.org.uk; Thomson et al., 2002).

3.1.4 Children are taken out into the local streets near schools and are guided by community volunteers to find "safer" places. Training is progressive, with each phase building on the foundation laid in previous phases. In sessions lasting 20 to 30 minutes, children are taught in groups of two or three and receive training sessions once a week for four to six weeks for each skill. Complete Kerbcraft training can be condensed into 12 to 16 weeks or extended over 12 to 18 months.

- 3.1.5 Evaluation of the pilot scheme in Drumchapel, a highly deprived area in Glasgow, found that in the three targeted skills, the judgements and road safety behaviours of trained children improved substantially and were sustained two months post training. Differences between trained and untrained children were statistically significant. Importantly, these differences were present only if trained children received at least four training sessions for each skill. (Thomson & Whelan, 1997). The evaluation of the National Child Pedestrian Training Pilot Project (Kerbcraft) involved 115 schemes in 75 authorities across England and Scotland, in areas with high child pedestrian accident rates and high levels of deprivation. Each scheme was funded for three years and employed a co-ordinator to recruit, manage and train volunteers and liaise with schools. The results showed improved and sustained behavioural changes among an intervention group compared to a control group with regard to identifying safe places to cross, and dealing with parked cars and junctions. There were also wider benefits for the volunteers and schools who participated by providing “opportunities to develop social contacts, take advantage of educational and employment opportunities and encourage greater participation in local schools.” (Whelan et al 2008).

Computer based learning

- 3.1.6 One study evaluated a computer-based programme in schools designed to train children in the safe use of designated crossings (Tolmie, Thomson, et al., 2003). The safe use of designated crossings is highly complex, involving 14 to 19 distinct behaviours, and a computer-based package allows children to experience both a diversity of settings and types of crossings in a more manageable way. In this pilot study, children from four primary schools in West Dunbartonshire and Gateshead were trained and tested. Three of the schools were located in socially deprived areas and the fourth in a more socially mixed area. The evaluation demonstrated that the training programme was successful, producing improvements in behaviour, especially observation skills, and in conceptual understanding for three types of designated crossing pelicans, zebras and junction traffic lights with a pedestrian phase.

Injury Minimisation Programme for Schools (IMPS) (10-11 year olds)

- 3.1.7 The Injury Minimisation Programme for Schools (IMPS) is operating in many deprived areas in England and focuses on training children in safety skills, risks and injury minimisation (www.impsweb.co.uk). IMPS targets children aged 10 to 11 years and provides primary school teachers with lesson material on a variety of safety themes. Children are taught traffic safety skills through practical experiences and interactive videos. The evaluation showed a significant change in attitudes and behaviours related to risk and dangers and increased knowledge in post-injury first-aid. In addition, participating children identified safety hazards in 53% of schools and 26% of homes (Frederick, et al., 2000).

Interactive learning – Lifeskills centres (10-11 years old)

- 3.1.8 The ‘Lifeskills – Learning for Living’ programme is an interactive approach to teaching general safety skills to children aged 10 to 11 years, which involves a one-off visit to a designated activity centre. It is set in a realistic village that includes roads, houses, railway lines and other typically encountered settings. One focus of the village is road safety, including understanding pedestrian visibility and car braking distances. An evaluation showed that three months post-visit, children were more knowledgeable regarding car braking distances than were children in a control sample that had not visited the centre (Oxford Evaluation Team, 2003).

Crucial Crew (8-11 year olds)

- 3.1.9 Similar to the Lifeskills Centre, temporary and virtual interactive sets have been developed, many under the banner of Crucial Crew (<http://www.crucial-crew.org/>). Crucial Crew is held all over Britain targeted at children aged 8 to 11 years. Temporary sets are built that allow children to role-play and interact with the material and learn to manage the situations. It is run in partnership with local businesses and public sector agencies such as police, ambulance and fire. In addition, Crucial Crew's website includes a virtual, interactive version. While rigorous long-term evaluations of Crucial Crew have not been done, evaluation of one Crucial Crew event indicated knowledge regarding reflective clothing was higher for children that had attended the event compared to those that had not (Neath Port Talbot, 2002).

3.2 Engineering

- 3.2.1 A study by Christie et al. (2004) on OECD countries' traffic safety policy identified important characteristics of countries with the lowest child pedestrian fatality rates (i.e., "top performers"). The majority of top performers reported having speed reduction measures and signalised crossings in most local authorities or municipalities, having these measures outside many schools, and having outside play areas in most residential areas. There is strong evidence to support the use of engineering measures to reduce pedestrian casualties, such as pedestrian priority walking routes and improved crossing facilities, speed humps and 20 mph speed zones (Tester et al., 2004; Towner et al., 2001). A systematic review of area-wide traffic-calming measures (e.g. changes in road layout, road narrowing, speed humps, etc.) indicated a 15% reduction in road traffic injuries (Bunn et al., 2003). Webster and Mackie (1996) found 20 mph zones reduced child pedestrian injuries by 70% though the effects of displacement of traffic were not examined.
- 3.2.2 Sweden has the lowest child pedestrian injury rates in the world. Their 'Vision Zero' policy specifies, "...no foreseeable accident should be more severe than the tolerance of the human, in order not to receive an injury that causes long term health loss" (Tingvall, 1998). Importantly, the Swedish government places a greater priority on life and health than other benefits, including greater mobility. In fact, local communities are encouraged to use 30 km/h as a speed limit in built up areas, with the possibility that this may be mandatory in all built up areas.

Traffic calming

- 3.2.3 Jones et al. (2005) specifically examined the effects of traffic calming on reducing inequalities in pedestrian injuries among children aged 4 to 16 years in two British cities. Both cities had considerably more traffic-calming measures in deprived than in affluent areas (e.g. 4.8 times more in deprived areas in City A). When comparing pedestrian injury rates from 1992-4 with those from 1998-2000, there were significant decreases in City A (2.14 per 1000) and non-significant decreases in City B (0.8 per 1000). Notably, the inequalities gap in child pedestrian injury rates dropped significantly in City A from 3.2 to 2.0 but there was no significant change in the inequalities gap in City B. Changes in injury rates were strongly correlated with density of traffic-calming features ($r = -0.77$, $p < .05$), indicating the importance of traffic-calming measures in reducing child pedestrian injury.
- 3.2.4 One concern regarding traffic calming relates to the pedestrian skill development of children living in calmed areas compared with children living in untreated areas. A study by Chinn et al.,

2004 attempted to address the issue of whether children living in traffic calmed areas were at a disadvantage when negotiating traffic environments in untreated areas. Children aged 7 to 9 years old from four schools, two schools from traffic-calmed areas and two from untreated areas, participated in the research. Students were tested on two tasks; 'visual timing and gap selection,' and 'safe place crossing location.' The results indicated little difference in the road safety skills of children from each of the areas. Chinn et al. (2004) felt that individual differences in skill were more likely to be affected by parental attitudes and differences between schools, than by living in calmed or un-treated traffic environments.

Home zones

3.2.5 The Home Zones concept was pioneered in the Netherlands in the 1970s. Home Zones aim to improve quality of life in residential areas by reducing the dominance of motor traffic (<http://www.homezones.org/>). In the UK, pilot sites were established in nine areas, one of which was at Methleys in Leeds. This site included:

- gateway treatments (with road narrowing, 20 mph zones, and home zone signage);
- new road surfaces with coloured block paving containing bricks designed by local residents;
- extensive planting of trees, shrubs and perennials to encourage street-based activity; and
- other traffic-calming measures.

3.2.6 An evaluation of the Methleys home zone showed support from local residents, who expressed a positive view on appearance of the area, walking within the home zone, speeding vehicles, and danger from traffic (Layfield, Chinn & Nicholls, 2003). In addition, the area was seen as safer for older children to play in unsupervised. However, few children felt that their outside play behaviour and journeys to and from school had changed with the home zone. The staggered planting and speed cushions reduced mean speeds by 6mph and 15 mph, respectively. Traffic speed on neighbouring streets remained the same. Traffic flow within the home zone was reduced by 10%. Reduction of traffic injuries was difficult to assess given the small area covered, however, none were reported in the year following the implementation of the home zone.

NICE Public health guidance on road design and prevention of unintentional injuries to children aged 0-15

3.2.7 The National Institute for Health and Clinical Excellence has recently (2010) commissioned a systematic review of studies of the effectiveness of interventions for reducing road traffic casualties among children aged 0-15. The intervention approaches included 24 studies covering:

- area wide traffic-calming (5 UK studies);
- single road traffic-calming (3 UK studies);
- 20mph zones (4 UK studies);
- home zones (3 UK studies);
- mixed priority route schemes (3 UK studies); cycle route (1 UK study);

- Safe Routes to Schools programmes (2 US studies); and
- other (single component) traffic-calming measures (2 studies; 1 US, 1 Germany); and one evaluated a programme which combined several interventions encompassing engineering and education measures (1 study from Sweden).

3.2.8 NICE judged that there is evidence of a:

- moderate quality that rates of child casualties are reduced by area wide traffic-calming (Cloke et al, 1999; Mackie et al, 1990 ;Wheeler & Taylor 2000; .Jones et al, 2005);
- weak quality that single road traffic-calming reduce child casualties (Chorlton, 1990; Jones & Farmer, 1993; Mountain et al 2005);
- moderate quality that that 20mph zones may reduce child road casualty rates overall, and for child pedestrians and child pedal cyclists when analysed separately (Grundy et al, 2008; Webster & Layfield, 2003, Grayling et al, 2002; Webster & Mackie, 1996; Layfield et al, 2005 ; Tilly et al, 2005; Webster et al, 2005);
- moderate quality that significant reduction in child casualty rate associated with mixed priority route schemes (WSP Development and Transportation 2008a; 2008b; 2008c); and
- moderate quality that in the USA, that Safe Routes to School (SRTS) programmes based on engineering measures may reduce rates of child injury road accidents as pedestrians or cyclists. (Gutierrez et al., 2008; Blomberg et al., 2008).

3.2.9 For single component measures:

- weak quality from the US that living on or near speed humps reduce the risk of injury (Tester et al 2004);
- weak quality that living in an area with up to 5 streets with a 30kph limit v 15kph limit or more were associated with less risk of injury (von Kries et al 1998);
- weak quality that the implementation of cycle routes and child road safety outcomes had no effect on casualties (Dean 1993); and
- weak evidence from Sweden that combined traffic-calming, safe routes to schools and education may reduce child road casualty rates but not significantly (Lindqvist et al 2001).

3.3 Multi-agency approaches

3.3.1 There is considerable evidence to suggest that multi-agency approaches are more effective in reducing injuries than those using a narrow approach (Crombie 2002). In the broader health field, Mackenbach et al. (2003, p.1411) believe that, “[a]ny one policy or intervention is unlikely to substantially reduce socio-economic inequalities in health”, but instead packages of policies and interventions of a more comprehensive nature are needed. No blueprint exists for tackling inequalities in health that can be replicated in another setting and there is a relative lack of incorporation of more evidence-based approaches (Brussoni et al *in press*). This is also true for the field of road safety and socio-economic inequalities.

3.3.2 A systematic review of community-based injury prevention programmes highlights the complexity of ingredients required for successful interventions (Nilsen, 2004). Programmes showing strong effects on injury rates relied on a mixture of interventions with predominance of

passive measures (e.g. environmental improvements), but without negating active measures (e.g. training). Nilsen (2004) points out that intervention programmes cannot be treated as standardised 'kits' to be implemented in different contexts. They require reference to the environment of implementation and community contexts (e.g. in relation to demographic characteristics such as age, gender and ethnicity). In addition, they require community readiness for the intervention that can often not be easily stimulated. Finally, the importance of basic ingredients such as time, effort, organisation and resources was clear. Interventions are more effective when they are tailored to the unique characteristics of the community and involve community members in programme development and implementation (Ward 1991; Klassen et al., 2000).

3.3.3 A survey of 34 social inclusion partnerships in the most disadvantaged 10% of Scotland offers some recommendations for addressing the inequalities in road traffic injuries (Graham, 2002). They include:

- interventions targeted at specific communities and neighbourhoods;
- increased role, profile and partnership working on the part of Road Safety Units;
- linkages and partnership working with other agencies with shared agendas;
- greater community involvement in all stages of road safety programmes; and
- increasing awareness among road safety and social inclusion professionals about each other's potential roles and contribution.

3.3.4 Hostile road environments, such as those with greater traffic volume and speed are associated with reduced pedestrian activity (Crombie, 2002) and speeding is more widespread in disadvantaged areas (MacGibbon, 1999). Community-based prevention programmes can be particularly effective in deprived neighbourhoods. The premise is that those most able to tackle problems within the community are community members (Coggan et al., 2000). Such approaches enable injury prevention messages to be delivered often and in multiple contexts and can succeed in promoting a culture of safety in the community (Towner et al., 2005). Van Houten and Malenfant (2004) compared the effectiveness of a multi-agency programme designed to affect drivers' yielding behaviour that included educational, enforcement and engineering components in three Canadian cities with implementation of only the enforcement component of the programme in an American city. While their results showed significant changes in driver yielding behaviour in the enforcement only condition, greater gains were observed in the multi-faceted strategy.

3.3.5 The Safe Kids/Healthy Neighbourhoods' Injury Prevention Programme took place in central Haarlem in New York. A partnership of 26 organisations was involved in a programme to reduce outdoor injuries and assaults to children. A range of interventions were involved, including playground renovation, promotion of safety equipment, supervised activities and health education (Davidson, Durkin, et al., 1994; Kuhn, Davidson, et al., 1994). Over 10,000 children participated in specific programmes and there was a 44% reduction in targeted injuries.

3.3.6 The Children's Pedestrian Injury Prevention Project in Perth, Australia is an example of a community-based mixed approach, focusing on strengthening the individual and the community (Cross et al., 2000). The aim was to increase the road safety knowledge and road crossing behaviour of 6 to 9 year olds, as well as modify risks in the road environment (Stevenson et al., 1999).

- 3.3.7 In the school-based and home-based education intervention, children were presented with nine developmentally appropriate 40-minute pedestrian safety lessons and nine home activities focusing on:
- knowledge;
 - attitudes;
 - interpersonal skills; and
 - practical pedestrian practice in the road environment.
- 3.3.8 For the environmental intervention, a community advisory committee decided on educational and engineering strategies for injury prevention, which included:
- lowering of speed limits in school zones and on local streets;
 - community education campaigns;
 - establishment of Safe-Routes-To-School programmes;
 - additional footpaths;
 - safer parking/drop-off areas for parents;
 - markings to indicate safer crossing areas; and
 - traffic calming measures.
- 3.3.9 The evaluation compared three areas with similar childhood pedestrian injury rates, and socio-demographic characteristics. Community 1 received the school-based and community-based interventions, Community 2 only the school-based intervention, and Community 3 did not receive either intervention.
- 3.3.10 Children in both the intervention groups reported more adult accompanied road crossing and fewer risky road playing behaviours than the comparison group (Cross et al., 2000). Community 1 had significantly less traffic volume on local access roads over a two-year period when compared to the other two communities with traffic reduced by approximately 9%. The level of community involvement in Community 1 was 2.3 and 5 times greater than Communities 2 and 3, respectively (Stevenson et al., 1999).
- 3.3.11 The World Health Organisation (WHO) Safe Community model for injury prevention has been adopted in a number of communities around the world. One example is the Waitakere Community Injury Prevention Project in New Zealand in which the community incorporated a focus on childhood road safety (Brewin & Coggan, 2002; Coggan et al., 2000). The project included the development of a Maori culturally relevant road safety resource. An evaluation observing participant children indicated that they followed correct road safety practices. General injury rates for the community declined significantly, despite an increase in rates in a comparison community (Brewin & Coggan, 2002).
- 3.3.12 The WHO Safe Community Waitakere is an example of a multi-faceted approach. The project increased awareness of injury prevention among the general community, organisations and policy makers. Compared with a comparison community, significantly more Waitakere residents had obtained targeted safety equipment. In addition, the city council adopted guidelines that

required all newly proposed projects and programmes to state how they meet or furthered safety, and initiated environmental changes to promote safety in the community (Coggan et al., 2000).

- 3.3.13 Other Safe Communities include a focus on injuries in other age groups. The Motala Injury Prevention Programme in Sweden focused on all injuries among children, teenagers and older people, as well as traffic, sports and recreation and workplace injuries specifically. Interventions related to traffic safety included removing hazards from footpaths and traffic calming in residential areas. Pedestrian education focused on children and teenagers and a falls prevention programme was run for older people. The risk of pedestrian injury decreased significantly for moderate injuries and remained unchanged for minor and severe injuries (Lindqvist et al., 2001).
- 3.3.14 The 'Courtesy Promotes Safety Programme', a multi-faceted programme in three Canadian cities included educational, enforcement and engineering components (Malenfant & Van Houten, 1989). The educational component consisted of:
- flyers sent to households in the targeted community in their utility bills, with safety tips and common causes of crashes;
 - a classroom package for children aged 5 to 14 years in the target community with a summary of the programme, an information pamphlet, an "I YIELD TO PEDESTRIANS" bumper sticker, and a 20-minute practical lesson on crossing streets safely;
 - posters explaining correct crossing behaviours sent to senior high schools and senior citizens facilities; and
 - a 2-hour training session for crossing guards, along with pins to hand out to children observed crossing the street correctly.
- 3.3.15 The enforcement components consisted of:
- a civilian employee who would cross the street when no other pedestrians were present;
 - a spotter who radioed failure to yield violations; and
 - officers who gave violators a flyer with information on pedestrians killed or injured, and either a verbal warning or a ticket (depending on the severity of the violation).
- 3.3.16 The engineering components included:
- pavement markings and signs encouraging drivers to yield farther back from the crossing (advance stop lines 50 feet ahead of crossings marked with "STOP HERE FOR PEDESTRIANS" signs;
 - signs prompting pedestrians to signal their intention to cross the street by extending their arm and to thank drivers who yield; and
 - signs that posted the percentage of drivers yielding to pedestrians during the past week along with the record.
- 3.3.17 For the evaluation, crossings previously identified as particularly problematic were observed. During pre-treatment, yielding behaviours averaged 54%, 44% and 9% in the three cities. Data collected from 23 to 40 weeks after the end of the programme indicated yielding

behaviours of 81%, 68%, and 71%, respectively. Most importantly, pedestrian injuries in crossings decreased by 50%.

- 3.3.18 Notably, the enforcement component of the programme was tested in Miami Beach to determine whether it would be sufficient to affect drivers' yielding behaviours (Van Houten & Malenfant, 2004). A 2-week enforcement period was followed by a maintenance phase in which police conducted enforcement once every six weeks and occasional media stories appeared. The results indicated increases from 3.3% to 27.6% in drivers yielding to pedestrians in one corridor, and from 18.2% to 33.1% in another corridor. These increases were sustained for a period of a year with maintenance enforcement. The effects also generalised somewhat to untreated crossings, as well as to crossings with traffic signals. However, the authors note that the effects of the enforcement programme were considerably less pronounced than those resulting from the enforcement and engineering programme in the Canadian cities, suggesting the importance of multi-faceted interventions (Van Houten & Malenfant, 2004).
- 3.3.19 The Harborview Injury Prevention and Research Centre (HIPRC) in Seattle, United States provides a good example of education and advocacy in action. This programme aimed to cause cultural attitudinal shifts regarding pedestrian safety in order to mobilise political and community action (Bergman, Gray, et al., 2002). The focus was on environmental modification of the street environment, specifically the creation of crossing islands – raised islands in the centre for major roads that allow pedestrians to stop in a safe place half way across a street. The campaign sought to influence decision-makers within an American county to construct crossing islands. It focused on three main elements:
- broadening the constituency for pedestrian safety from simply traffic safety officials and engineers to the general public;
 - compiling and publicising local pedestrian injury statistics indicating that the county in question had one of the highest rates in the state; and
 - publicising victim stories in order to promote an emotional link between the public and accident victims.
- 3.3.20 Aware that the media responded to late-breaking news, the coalition (consisting of HIPRC and local and state traffic and transportation officials) waited for a serious pedestrian injury to occur in order to launch the campaign. The resulting press conference included photographs of the site of the recent tragedy showing the difficulties that would be encountered in crossing the road. It also included a victim statement by the mother of another child who had sustained serious injury under similar circumstances. At the press conference, a senior policy-maker announced funding for a coordinator for the Improvements for Pedestrians Project.
- 3.3.21 A pedestrian safety summit was convened which included politicians, planners, engineers, and other relevant decision-makers. The summit highlighted the effectiveness of traffic calming, not only for pedestrian safety but also to revitalise neighbourhood business districts. Ten sites were chosen for modification and a local task force was appointed for each jurisdiction, responsible for developing preliminary designs and grant applications submitted to government. Members of the task force included local business owners, police, fire and safety staff, school transport coordinators, state or county transportation agency staff, health coordinators, elected officials, transit staff and the project coordinator. All ten sites were funded. No information is available about outcomes.

3.3.22 The Seattle Advocacy Initiative included four key elements:

- promoting pedestrian safety as a general health and liveability issue;
- organising a coalition for pedestrian safety including representatives from health, safety, traffic engineering, environmental enhancement and victim groups - advocacy was a key role of the coalition;
- including policy makers in the initial stages of planning and ensuring they were regularly updated; and
- raising awareness among the public and politicians through emotional testimonies from injured pedestrians and their families.

3.3.23 The PROMISING project was an initiative funded by the European Commission to develop measures to reduce the risk of injury to four target groups: pedestrians, cyclists, motorised two-wheelers, and young car drivers (Wittink, 2001). Measures considered safety and mobility as a package, not improving one at the expense of the other. For pedestrians, recommended measures included:

- area-wide speed reduction or traffic calming schemes to reduce road speeds;
- availability of an integrated walking network to reduce pedestrian-vehicle conflicts and allow for safer road crossing; and
- acceptance of pedestrians as equal road users.

3.3.24 As part of the project, cost-benefit analyses were undertaken on various road safety schemes, including integrated area-wide speed reduction measures. British data showed a reduction in traffic volume, a 34-36% reduction in speed in residential roads and town centres, and a 50% reduction in injury accidents.

3.3.25 Despite the fact that cost-benefit analyses included the addition of commuting time as a cost and did not include benefits from the perspective of pedestrians and local residents, results still indicated that benefits outweighed costs. General conclusions from the cost-benefit analyses included:

- measures that reduced driving speed and improved safety and mobility for pedestrians are cost beneficial;
- the benefits stemming from facilities for pedestrians and cyclists far outweighed the costs; and
- measures that improve conspicuity and visibility were cost effective.

3.4 Transport policy and land use

3.4.1 Transport policies and land use have an important part to play in reducing childhood injuries on the roads (Towner & Ward, 1997). The location of schools, houses, health, shopping and leisure facilities all affect how people travel around. In addition, there is evidence to illustrate the enormous impact public policies can have on pedestrian injuries. For example, increased school size is associated with increased journey times on school journeys and a corresponding increase in child casualties (Preston, 1972). This is particularly important in deprived areas where fewer people have cars and are more dependent on walking.

- 3.4.2 Transport policies can influence accessibility and safety. Any transport mechanism which lessens the dominance of the car is likely to be associated with reduced casualties and the role of these policies must be considered in deprived areas. In London removal of subsidies from public transport led to increased traffic volumes and analysis indicated that if the subsidies had remained in place several thousands fewer casualties would have been expected than actually occurred. Most of the differences would have been seen being among cyclists and users of cars or taxis (Allsop & Turner, 1986).
- 3.4.3 While past research has shown an increase in injuries at times when there are more pedestrians and cyclists, a more in-depth examination indicates that the relationship is not as straightforward as one might expect. For example, walking and cycling represent 6% of all trips in the US, but 46% in the Netherlands (Jacobsen, 2003). Yet the death rate due to pedestrian and cycling injuries is lower in the Netherlands than the US (1.9 versus 2.1 per 100,000). Jacobsen (2003) compared five data sets (three population level and two time series) from California, Denmark, the Netherlands, the UK, and combined data from several European countries to investigate this issue. Regardless of data source, the results indicate that the likelihood of a given person walking or cycling being struck by a motorist decreases as the number of pedestrians and cyclists increases. More precisely, pedestrians in a community that doubles walking can expect to reduce the rate of injury by 66%. Jacobsen (2003) explains this result through adaptations in drivers' behaviours – motorists decreasing speed when they see more cyclists and pedestrians.
- 3.4.4 ADONIS, a European project to promote walking and cycling, examined factors affecting transport choice (EU Transport RTD Programme, 1998). Findings indicated that one of the major concerns affecting transport choice was safety. Both ADONIS and the PROMISING project include similar recommendations for walking promotion and transport safety measures:
- ensuring that amenities are easily accessible by foot;
 - ensuring adequate lighting in pedestrian areas;
 - improving home delivery services;
 - area wide speed reduction apart from roads with a flow function for motorised traffic;
 - a separate network of direct routes for pedestrians and another for cyclists;
 - priority rules and regulations for cyclists and pedestrians in urban areas and technical measures that support priority and stimulate perception and anticipation;
 - education that focuses on a considerate and respectful attitude to other road users;
 - infrastructure design standards for pedestrians;
 - injury protection by design of cars and heavy vehicles;
 - increase awareness of contributions individuals can make towards creating a sustainable society; and
 - increase the status of walking through the media.
- 3.4.5 These measures could be targeted on deprived areas, where there is more dependence on walking compared to more affluent areas.
- 3.4.6 Many studies support the measures to increase walking listed above, indicating that pedestrians living in compact, mixed-use communities make more journeys by foot and fewer journeys by

car than those living in sprawling areas (Chinn et al., 2004; Frank et al., 2006). In addition, urban growth policies that consider the needs of pedestrians and cyclists and seek to reduce per capita motor vehicle mileage will increase traffic safety for all road users (Frank et al., 2006). The Audit Commission report 'Changing Lanes' (Audit Commission 2007) suggests that road safety needs to be considered as a key quality of life issue. If walking and cycling are perceived by members of the community as being too risky, more adults and children are likely to use cars.

3.5 Drivers

- 3.5.1 Research on characteristics of drivers involved in child pedestrian injuries indicates that more male drivers and drivers aged 17 to 20 years and 31 to 40 years are involved in these accidents than would be anticipated by the number of drivers registered nationally (Thompson et al., 2003). In addition, over half (52%) the pedestrian injuries involved a child and driver living in the same postcode area. These results suggest that interventions targeted at male drivers of these age groups and focused on local community safety may prove fruitful.
- 3.5.2 In addition we know that pedestrians and cyclist may be exposed to high levels of reckless driving in deprived areas. Analysis of UK national fatality data shows that drivers from more deprived areas are over-represented in crashes involving reckless driving (driving at speed) and alcohol (Clarke et al., 2008). They are also much more likely to drive unlicensed, untaxed and uninsured which are also predictors of collision involvement (Knox et al., 2003). This finding underlines the importance of including enforcement in the intervention.

3.6 Child and Youth involvement

- 3.6.1 An example where young people have participated in a road safety initiative is Birmingham City Council's "Streets Ahead on Safety" project (Kimberlee, R. 2008, Sethi et al., 2008). This set out to improve road safety and the quality of life in the inner city. Alum Rock is a deprived area in Birmingham, inhabited by people from largely Asian immigrant backgrounds. The area has a poor record of RTIs involving children. This project encouraged a highway authority, engineers and road safety officers to provide local young people with opportunities to participate in decision-making on issues relating to their safe use of the roads and engineering plans for their local community. The project included 405 young people aged 9–11 years in 5 schools, who conducted environmental audits in the areas near their schools, taking photographs of hazards to pedestrians. Other elements included interactive training in road-safety awareness and citizenship. Road-safety engineers made a video of specific plans for the areas immediately outside schools and the children were able to study maps of the plans. Highway engineers visited the schools, where pupils questioned them on their plans. The children then voted for the plan they thought would be best for their area. Young people were thus encouraged to be stakeholders in their own safety and actively to engage with highway engineers and road-safety officers in developing engineering proposals.

3.7 Cost effectiveness

- 3.7.1 The systematic review of economic studies included 12 studies, which analysed cost-benefits whereby the cost of implementing the road infrastructure is deducted from the value of casualties or accidents saved.
- 3.7.2 Moderate quality evidence that first year rate of returns benefits exceeded costs for:

- area wide measures, (Elvik 2003; Gorrell and Tootill 2007; Mackie et al 1990);
- 20mph zones (Grundy et al 2008);
- mixed priority routes (Cheshire County Council and JE Jacobs; Manchester County Council and JE Jacobs; Norfolk County Council and JE Jacobs);
- single route measures (Gorrell and Tootill 2007); and
- rural traffic calming (using gateways, signing, physical measures and new road markings).

4 Secondary prevention: Child safety restraints and bicycle helmets

4.1 Child safety restraints

- 4.1.1 The use of seat-belts and child safety seats has been widely proven to be effective and to lead to economic savings (Sethi et al., 2008). Cost-effectiveness studies show that every euro spent on child restraints saves €32 in health care spending (Miller & Levy, 2000). The use of child restraints in cars can be maximised through legislation and enforcement, accompanied by educational campaigns. Legislation, parental knowledge, availability, cost and accessibility influence the use of child restraints. Community-based approaches, consisting of educational initiatives and loan schemes or subsidisation, ensure the inclusion of lower income families. Proper use of restraints according to children's height or age may be a problem even in countries with high usage, and appropriate instruction is required (Sethi et al., 2008).

4.2 Helmets

- 4.2.1 Cycle helmets are of proven efficacy in reducing head injury (Sethi et al. 2008). Estimates show that each euro spent on cycle helmets leads to a saving €29 in health care spending (Miller & Levy 2000). A range of measures in different contexts has been used to promote cycle-helmet use, including both non-legislative and legislative approaches. A review was undertaken by Royal et al. (2005) of non-legislative interventions focused on encouraging children to wear helmets, as distinct from compelling them to do so through laws. The reviewers set out to discover which sort of campaigns work best – particularly with children from poor families, who are less likely to own helmets. They found 22 helmet promotion campaigns that had been studied. The campaigns varied widely with regard to where they were carried out, age of the children, campaign methods etc. The results were also very varied but overall, after a campaign, children were more likely to wear helmets than were other children. More research is still needed but it seems likely that the best schemes are based in the community and involve both education and providing free, or possibly subsidised, helmets. Promotion of helmets in schools also seems to be effective. The reviewers could not identify the best way of reaching poorer children. The studies reviewed did not look at the impact of the campaigns on injury rates, or assess whether the promotion campaigns had any negative effects.
- 4.2.2 Karkhaneh et al. (2006) conducted a systematic review to evaluate the scientific evidence for helmet use following legislation to identify the effectiveness of legislative interventions to increase bicycle helmet use among all age groups. Twelve studies were included in the review. Helmet wearing proportions increased less than 10% in one study, 10–30% in four studies, and more than 30% in seven studies. While the effectiveness of bicycle helmet legislation varied, all

studies demonstrated higher proportions of helmet use following legislation, particularly when the law was targeted to a specific age group. The authors concluded that legislation increased helmet use among cyclists, particularly younger age groups and those with low pre-intervention helmet wearing proportions and that the results support legislative interventions in populations without helmet legislation.

- 4.2.3 There is very little information on the differential effects of legislation in different social groups. Macpherson et al (2006) conducted a study of the effectiveness of bicycle helmet legislation by observations of helmet wearing in children in different income areas in Toronto up to six years after legislation was passed. Helmet wearing increased in all the three income areas (low, mid and high) immediately after legislation, but six years after legislation the proportion of helmeted cyclists had returned to pre-legislation levels in low and mid income areas and only remained high in high-income areas. Thus over the long term the effectiveness of bicycle helmet legislation appears to vary by income area, with high income areas obtaining the greatest benefit.
- 4.2.4 The World Health Organisation has developed a road safety manual for decision-makers and practitioners on helmet use, drawing on the experience of countries which have achieved high levels of helmet use (WHO, 2006).

5 Case Studies

5.1 Case study 1: the Neighbourhood Road Safety Initiative (NRSI) (Christie et al 2010)

- 5.1.1 It has been argued that only through neighbourhood approaches are innovative ways to address health inequalities being addressed. The importance of this approach is that it is at the neighbourhood level that the effects of social exclusion and inequality are most visible (Blackman 2006). According to a survey of European policy responses to health inequalities it is through neighbourhood or Area Based Initiatives (ABI) that the most innovative actions to address these inequalities are being developed (Mackenbach 2006). The Neighbourhood Road Safety Initiative provides a case study of such an approach.

Aims and objectives of NRSI

- 5.1.2 The Department for Transport (DfT) established the NRSI in 2002 as part of the government's national target to reduce road casualties among children and address the greater burden on the most disadvantaged communities. Fifteen Local Authorities (LAs) in England were allocated funds to develop innovative schemes to reduce road casualties in their most disadvantaged areas. The major focus of the NRSI was to develop a holistic approach to road safety in disadvantaged areas. LAs were encouraged to identify and treat root causes rather than symptoms with targeted interventions. They were also encouraged to include a variety of solutions: a mix of engineering, education, enforcement, and health promotion activities. In order to achieve this, emphasis was placed on partnership working within the areas served by the LAs and on the inclusion of a range of local stakeholders.
- 5.1.3 A multi-professional Central Team was established, whose role was to support and inform the LAs and undertake programmes in conjunction with groups of LAs. This team had the ability to provide small grants to the LAs to help with the development of initiatives.

5.1.4 The aims of the NRSI were:

- to reduce the level of risk and number of casualties;
- to have a wider impact on community views and engagement and the way people travel and their quality of life;
- create multi-agency partnerships to help reduce the level of risk and improve the quality of life for deprived communities; and
- create greater understanding of the causal factors of the high risks of road traffic injury for deprived communities.

Funding

5.1.5 On 20 June 2003, the Secretary of State announced that authorities would receive a total of up to £17.3 million to implement approved projects until March 2006. This included £3.5 million to set up and run a Central Team to co-ordinate collaborative projects across the 10 authorities. Included in the funding for each LA was £50,000 for an NRSI coordinator to facilitate partnership working.

Delivery

5.1.6 It was hoped that LAs would engage with their Local Strategic Partnership (LSP) which brings together public, private, voluntary and community sectors, especially to address health inequalities. Moreover the initiatives involved a number of stakeholders which were expected to facilitate partnership working these included:

- The Department for Transport - leading the initiative at a strategic level;
- Fifteen local councils, not just their traffic and road safety departments but the councils in a corporate sense;
- Management consultants managing the performance of the councils on behalf of the DfT; and
- The Central Team established to act as a central source of expertise, advice and networking for the authorities, with guidance from a steering group comprising LAs' representatives and governance from a Project Board. The team also produced publicity campaign and education materials (www.nrsi.org.uk).

Interventions

5.1.7 The range of interventions implemented by LAs is shown in Table 1.

Table 1: Types of interventions implemented by local authorities

Type of intervention	Budget	%
Engineering and traffic calming	£5,347,000	48
Play schemes including traffic calming in vicinity	£2,030,000	18
Education, publicity and training	£1,510,500	13
Pedestrian/ cyclist facilities safer access	£1,327,000	12
Home Zone	£431,000	4

Automatic speed advice messages	£341,200	3
Diversionary activities (clubs)	£119,000	1
Car seat schemes	£85,000	1
Research/ consultation	£21,800	<1
	£11,200,500	100

5.1.8 The specific intervention projects included:

- engineering interventions:
 - safer pedestrian crossing facilities especially PUFFIN¹ and TOUCAN² crossings to improve accessibility; use of anti-skid surfaces near crossings and pedestrian refuges. Introduction of pedestrian phases in signal-controlled junctions;
 - traffic calming round and flat top speed humps; 20mph zones in residential areas and around school zones;
 - safer routes using footway markings; cycle lanes, path construction and lighting;
 - junction realignments; signing and lighting improvements;
 - road closures; provision of parking facilities off road;
 - improvement and provision of play facilities; skateboard parks, sports courts areas; and
 - extension of Home Zones³.
- education and publicity interventions:
 - children’s traffic club via child care organisations;
 - Construction of street scenes for play and learning about road safety via child care organisations;
 - School drama projects and theatre company delivery of road safety messages and workshops challenging attitudes towards road safety among young people;
 - School programmes to involve young people in the identification of road safety issues and the development of proposals for intervention;
 - Walking buses to and from school;
 - Free car seats or car seat vouchers for mums-to-be supported by road safety champions via the health care setting;
 - Community based initiatives with young driver offenders programme aimed at unlawful use of vehicles - this initiative involved young people and parents/carers;
 - Accredited courses for community volunteers to set up other volunteer-led road safety clubs;
 - Community clubs providing cycles, cycle maintenance and training for children;

¹ <http://www.dft.gov.uk/pgr/roads/tpm/tal/walking/puffinpedestriancrossing>

² <http://www.dft.gov.uk/pgr/roads/tpm/tal/cyclefacilities/toucananunsegregatedcrossing4087?version=1>

³ <http://www.homezones.org/>

Community road safety advice centres;

Community training of volunteers for Kerbcraft⁴ pedestrian skills training; and

Community cycle training including the provision of free helmets and lights.

■ enforcement interventions:

“traffic management system⁵ and passive enforcement using vehicle activated signs and automatic number plate recognition; and

Police enforcement of seat belt and child restraint use to support parallel education programmes.

5.1.9 In addition staff resources, training and development were funded by some authorities particularly the provision of NRSI coordinator training, training for project workers for peer education dissemination, linking with the Injury Minimisation Programme⁶ involving health workers and for conducting stakeholder workshops and strategy development.

5.1.10 The levels of funding, the approaches adopted and types of intervention adopted by LAs varied considerably. Around £11 million of the funding was awarded to LA schemes. Of this funding a large proportion (48%) was directed at environmental change such as pedestrian crossings and traffic calming, and 18% on improved play facilities. Thirteen percent of the overall funds was spent on education, training and publicity. In some cases LAs through partnership working had managed to secure matched funding for some schemes, and this is detailed in the report from the management consultants.

5.1.11 The central team created a number of mass media campaigns to support the objectives of the NRSI <http://www.dft.gov.uk/pgr/roadsafety/dpp/neighbourhoodroadsafety/>

Evaluation

5.1.12 The four key aims of the evaluation were to:

- measure the impact of NRSI on reducing road traffic casualties;
- measure the wider impacts of the intervention on quality of life in terms of safety, mobility and accessibility;
- assess the role that local multi-agency partnerships have had on influencing reducing risk and improving quality of life for deprived communities; and
- develop a more thorough understanding of the road safety problems of disadvantaged communities including BAME groups, children, older people, and those with a disability.

5.1.13 To meet these objectives six distinct types of surveys and/or analyses were undertaken involving

- casualty analysis to understand casualty patterns in deprived areas and explore the impact of NRSI against comparison areas;

⁴ <http://www.kerbcraft.org/>

⁵ <http://www.roadtraffic-technology.com/enquiry.asp?CompanyID=30352&ProductSubGroupID=1695>

⁶ <http://www.impsweb.co.uk/projects/imps/default.asp>

- quantitative Community and school based surveys to explore the impact of the NRSI on attitudes and behaviour regarding safety, mobility and quality of life;
- focus groups to explore the impact of NRSI on local families;
- partnership working surveys were carried out among the NRSI LAs and among the partners responsible for the leadership and management of the initiative; and
- in-depth casualty hospital based survey enabled data to be collected on ethnicity and socio-economic status which are not routinely collected when police record details of casualties.

Key findings for children: impact on casualties

- 5.1.14 Where children go and what they do has a strong influence on their casualty patterns. In the case of children (1-15 years) about one third of their injuries occur on residential roads but a similar proportion also occurs where the road is near an area of outdoor recreation, shops, cafes, and takeaways. Whilst most children were injured on residential roads, which were about 80 per cent of the road length in the NRSI areas. When this is accounted for the risk to the children is highest on the main roads.
- 5.1.15 The Neighbourhood Road Safety Initiative (NRSI) incorporated a package of interventions designed to reduce socio-economic inequalities in road traffic injuries in a range of the most deprived wards in England. The evaluation showed how a range of interventions can contribute to the significant reduction in casualties observed during the NRSI, over and above national trends and trends in comparable areas, though the causal relationship is difficult to demonstrate
- 5.1.16 The NRSI was shown to have had a positive effect on the number of casualties occurring across the 15 areas. This reduction was estimated to be 9% in the After period compared with what might have been expected if the NRSI had not taken place. This was on the basis of the performance of the Comparison areas and taking into account the strong downward trend. The observed reduction in casualties in the NRSI areas may have been due to the package of education, publicity and engineering measures focused in these areas though the causal relationship is difficult to demonstrate. Within the picture for all casualties, there were different effects on certain road user types and ages. In the case of children (1-15 years) the reductions were about 15% for child casualties of all types, In the case of all children and child pedestrians at least some of the improvement appeared to have arisen due to deterioration in child safety in the Comparison areas and for which the evaluation had no explanation.
- 5.1.17 From the community and school surveys there were improvements in reported road safety behaviour such as seat belt wearing with reported seat belt wearing generally lower in the back of the car compared with the front.

Delivery

- 5.1.18 It was clear that tackling the issue of deprivation and road traffic injury was challenging for many road safety professionals given that many had not been asked to target deprived communities in the past. The NRSI provided a mechanism for delivery by establishing the role of NRSI coordinator and an incentive in terms of funding. It is clear that there is still much more work to be done.

5.1.19 The partnership surveys showed that interventions needed to be led in sustainable structures and need political support at a central and local level. The roles and responsibilities of partners should have been clearly defined at the outset in order to avoid poor working relationships. Partnerships needed time to develop. Practitioners need time and support to develop work on a complex social problem requiring a multi-agency approach. Partnership working was supported and actively undertaken though most people involved with NRSI had received very little training in partnership working. The barriers to partnership working included insufficient funding, failure to share data and resources, poor understanding of the roles and responsibilities and poor communication. Facilitators to partnership working are having a good prior relationship, transparent relationships, funding, a common aim and having something to bring to the partnership. Communities were engaged in innovative ways but only 3% of partners said they had directly engaged with the community with on determining local priorities and resources.

5.1.20 The evaluation suggested that the important stakeholders were:

- the government department responsible for transport to ensure that there is an inequality performance indicator to drive delivery in partnership at a local level;
- the government department responsible for safeguarding children and young people especially involving those agencies at a local level such as Children's Centres, Sure Start and Safeguarding Boards;
- the government department responsible for health and health professionals such as health visitors who have access to young families in deprived areas;
- local agencies with a remit for injury prevention to work in partnership to deliver behaviour change at a local level (eg publicity);
- neighbourhood renewal partners, especially regeneration experts who know how to work with community groups in deprived areas;
- school travel plan coordinators to understand how best to plan safe journeys to school;
- youth development officers because there is a need to provide safe and secure places for recreation and leisure for young people;
- police and community safety because crime and disorder partnerships need to understand and address the links between anti-social behaviour, safety and security; and
- Community leaders and groups – they know the problems and can help with solutions.

5.1.21 However, the involvement of some of these agencies was highly variable over the course of the initiative.

The views of the community

5.1.22 The picture that emerged from the focus groups was that parents only reluctantly allowed their children to play in the street because there was little else to do, with many club activities being perceived as scarce, expensive, and inaccessible. Many parents felt that they had to keep their children at home and/or restrict their independent mobility. Reasons given were: the streets were dangerous because of the speed and volume of traffic, joyriding, and the threat posed by motorbikes and scooters in the parks and on pavements. Such anxieties were often linked to threats posed to their families and children from low-level criminality and anti-social behaviour in their local community eg car usage for drug dealing in local streets. Parents felt that there

were insufficient open spaces and parks for their children to enjoy. Those that did exist were said to have limited facilities, be poorly maintained and were often seen as an arena for gangs to congregate and places where drug and alcohol abuse and concomitant litter and vandalism endured. Moreover, parents felt that their children would prefer access to facilities and affordable activities rather than play out on the street though acknowledging that children liked to play out near their home with their friends.

- 5.1.23 Parents' views suggested that they felt that police enforcement was often limited and the perpetrators of local problems lacked sufficient discipline and a sense of responsibility. There were mixed views of the effectiveness of speed reduction measures and cameras, with some communities realising that many young people feel they can escape capture and punishment.
- 5.1.24 Unsurprisingly, there was a strong consensus amongst parents that anti-social behaviour was widespread in their community and there should be stronger enforcement to address this issue especially in relation to speeding. Evidence from the focus group suggested that key intervention partners to support engineers could include local service providers like youth services who could be encouraged to provide more accessible and affordable activities for children partnered with those with responsibility for parks and recreational activities. The evaluation suggested that well-supported detached youth services could work with young people in public spaces to ensure they are accessible to all by providing support and stewardship to those who wish to use open spaces. It also suggested that health and social services may also be needed to provide education and support to parents to help them understand the risks children face on the road. Parents overwhelmingly stressed the need for support from the police to help them feel safe in local streets and other public spaces. It was also clear that parents felt that they and their children would like to be partners involved in creating better facilities for young people.
- 5.1.25 The evaluation engaged with people living in deprived areas and their discourses show how the safety of the road environment deeply affected their quality of life, mobility and feelings of safety. There was a strong sense among the community that they felt very isolated from decision makers and service providers and that their demands for safer environments fell on deaf ears. The views of local people participating in the research showed that they felt LAs and police provided poor stewardship over the environment and took a reactive approach to safety. The proposed way forward was to involve local people in local solutions. This was regarded as particularly important because there were differences between communities, especially between BAME groups, which had implications for the development of interventions. The good examples of innovative practice by LAs were enabled by engaging with people in the process of addressing the problem and it was proposed that they should be disseminated widely (see for example Hayes et al 2008).
- 5.1.26 Road traffic injury in deprived areas appeared to be a manifest symptom of the poor quality of life related to the road traffic environment, accessibility to services and facilities, anti-social behaviour and lack of enforcement.
- 5.1.27 One of the major concerns of residents of the NRSI areas was the anti-social behaviour of drivers in their areas. The evaluation proposed that more information on levels of unlicensed and uninsured driving was needed to enable targeting of these behaviours, as they are over-represented in casualty data. It also underlined the importance of targeting enforcement in these areas as ways to reassure the community that everything is being done to improve safety and security in the traffic environment. It was clear that people living in these communities felt

threatened and unsafe in their outside environment and this meant that they did not want to walk or cycle, which may in turn have affected health and opportunities to interact with the rest of the community, thereby affecting social cohesion. In particular the safety and quality of the outside environment was seen as critical to improving safety and increasing mobility.

Workforce capacity

- 5.1.28 The evaluation demonstrated that sufficient attention was not given to training in the early stages of the programme for project co-ordinators and those involved in the component projects. It concluded that both generic training such as in partnership working, evaluation and study design and specific training, such as an understanding of the causes and consequences of social deprivation on injury, would have been useful.

Innovative projects

- 5.1.29 The NRSI illustrated that road safety can reach successfully into those communities with the greatest need and could also influence those who have traditionally proved the hardest to reach. This was achieved in NRSI by innovative methods of working, developing and sustaining partnerships and through the active involvement of statutory and voluntary organisations. Most importantly, these initiatives often involved members of the communities themselves and this involvement occurred at all stages in the development and delivery of projects.
- 5.1.30 The road safety report, 'Widening the Reach of Road Safety' documents a number of innovative projects. This guidance for road safety officers on road safety and deprivation was developed following a series of workshops of practitioners involved in the NRSI. The workshops explored the development and execution of projects, considered the problems that people faced, compared the ways that similar projects were run in different locations, discussed how the specific needs of disadvantaged communities were addressed and examined the roles of senior managers and councillors in the NRSI. Examples of innovative projects include:
- 5.1.31 **Salman and Friends – pedestrian safety** Salman and Friends is an educational resource of story books and DVDs. This project involved families from the south Asian community working with support from a local Children's Centre to produce a resource for families with young children on pedestrian safety. Community members were able to enhance the diversity of these books by advising on different aspects of their culture (eg clothing, faith school time), providing a more inclusive resource that promotes community cohesion as well as road safety.
- 5.1.32 **Blurton Dads' project – cycle training** The child cycle training was run for the community by members of the community. The project involved not only increasing cycle training for children, but also providing a community hub and safe sporting facilities using local schools and the local community infrastructure. As children's leisure time, along with playing on the highways, had been identified as a road safety concern (along with child cycling casualties in the Blurton area), this project allowed the local community to work directly with road safety concerns, but also deal with several deprivation issues at the same time.
- 5.1.33 **Bradford Moor redevelopment** This was an area-wide project to improved road safety. The engineering intervention covered traffic calming, lighting improvements, improved play areas, as well as changes to fencing and footpaths. Pre-existing plans were brought forward as a result of the NRSI. A large-scale consultation of children took place about improvement in

facilities. As a result of the improvements to the park, there has been a massive increase in its popularity, measured by the numbers of children using it.

5.2 Case study 2: The road safety and disadvantage project

- 5.2.1 The DfT also commissioned in-depth research in five case study areas in Wigan, Bradford, Newham, Sunderland and Wolverhampton it involved meetings with stakeholders to look at local policies on traffic safety and meetings with the communities to explore attitudes and behaviour towards traffic in the local area **Lowe et al 2010 (in press)**.
- 5.2.2 The research confirmed many of the risk factors associated with hazardous traffic environments; greater exposure as a pedestrian because they have less access to a car or to safe spaces and supervised facilities for children and young people. The research found that local people have a good understanding of the risks in their neighbourhood and that many people felt that facilities in the local area were “inaccessible, inappropriate for local people’s needs or unaffordable” Similar to the findings of the NRSI, people felt that their safety and security were threatened by dangerous parking and speeding and aggressive driving. Importantly they perceived a lack of enforcement which seemed to lead to a culture of lawlessness on the roads “*the impact of a lack of consistent visible enforcement of the ‘rules of the road’ and the negative impact of this on driver behaviours. That there seemed to be no consequences for drivers who parked their cars on pavements or near junctions, who did not stop at crossings and who drove whilst using mobile phones there was a sense amongst local people that little was being done to improve safety in the area*”.
- 5.2.3 Local practitioners also understood the risks faced by the community and they tried to tackle this with a package of measures including children’s road safety education and training to promote safe behaviour and crossing; publicity campaigns activities engineering and enforcement activity to tackle motoring offences, crime and antisocial behaviour and diversionary activities for young people. Few of these packages were targeted at disadvantaged communities with the exception of *Community Champions*, a government initiative in Wigan.
- 5.2.4 There were some examples of interventions to tackle environmental risks in disadvantaged areas that included spot and route treatments; area wide traffic calming measures; improvements to parks and open spaces including improved play facilities and changes to street furniture, lighting and landscaping to be more pedestrian friendly. In addition there was a social housing provider who provided two parking spaces per dwelling to avoid on-street parking where it could provide risks for children. There were other intervention approaches aimed at changing peoples behaviour. These included
- enforcement of speed and seat belt wearing;
 - subsidised child car seat provision; and
 - local information about local casualty levels to raise awareness also provided in minority ethnic languages.
- 5.2.5 Very little evaluation or monitoring was done of the effectiveness of interventions and this was partly related to lack of resources and lack of skills in evaluation design and how to understand the impact of casualties when numbers were so small.

- 5.2.6 The success of partnerships was often dependent on whether a local 'champion' took interest in the road safety issues and promoted them at a strategic planning level and brought other organisations on board.
- 5.2.7 Both the 'Neighbourhood Road Safety Initiative' and 'The road safety and disadvantage project' demonstrated the importance of partnership working. Key ingredients of local partnerships were:
- they are embedded in strategic level planning;
 - they share data to guide planning;
 - they have a clear goal;
 - they have dedicated leadership and the commitment of senior staff to work across organisational boundaries;
 - clear roles and skills are required;
 - there is a need for jointly fund posts; and
 - they effectively engage with local stakeholders including practitioners and the wider community
- 5.2.8 The research noted that the community were rarely involved in development and delivery of road safety interventions which meant that the interventions were often, "not grounded in the experience and perceptions of people living in the local community"
- 5.2.9 The key finding of this research was that, "environmental and planning issues and community involvement need to be at the heart of comprehensive cross-government road safety strategy if the numbers of road injuries in disadvantaged areas are to be significantly reduced from the current levels. "...and that in the context of such a dangerous physical environment education were "unlikely in themselves to reduce the level of incidents to any great extent".
- 5.2.10 The research studies indicated that road injuries might be reduced by:
- **Environmental measures**
 - planning measures to avoid further intensification of housing and to avoid major developments without provision for access or on-site parking by users;
 - 20mph zones, parking restrictions particularly around schools and pedestrian crossings;
 - the provision of safe access to safe open spaces;
 - traffic management to reduce the volume and speed of traffic in disadvantaged areas and so reduce the risks for child pedestrians. eg parking enforcement to particularly around schools; and
 - enforcement of speed limits and seat belt wearing.
 - **Multifaceted approaches** including education, engineering and enforcement strategies i.e. a holistic approach
 - **Partnership working** - linking the police, fire and emergency services, community safety, community development, health, children's services, regeneration, housing and neighbourhood management, recreation management and planning. It was important

that all partners understood their role and how it directly or indirectly could contribute to reducing road casualty levels and injury inequalities.

- 5.2.11 These findings endorse the findings of Edwards et al (2006) and Graham and Stephens (2008), which identify the need for a holistic approach to road safety and the need to link safety considerations with urban regeneration plans.

5.3 NICE Guidance on workforce capacity and delivery of injury prevention⁷

- 5.3.1 NICE states that in order to improve road safety in deprived areas the workforce needs to ensure that they have the skills and knowledge to enable them to deliver successful evidence - based interventions. NICE recommends that there needs to be professional standards for unintentional injury prevention taking into account the different roles and responsibilities of professionals and practitioners. NICE proposes that the educational organisations should be funded to develop professional development curricula on how to prevent unintentional injuries for everyone who works with (or cares for and supports) children, young people and their families. The aim of this training would be develop an understanding of the importance of preventing unintentional injuries and their consequences and the preventive measures available. NICE also states that any specialist curricula need to be monitored and evaluated to see what effect they have on practitioner performance and that training approaches should be revised if they are ineffective.
- 5.3.2 NICE also calls for formal road safety partnerships to be maintained or established to manage road safety activities and should include the road safety team, fire and rescue services, the injury prevention coordinator, the NHS, police, local education authorities and local safeguarding children boards. The partnerships should have a member of staff responsible for road safety partnership work and there need to be policies developed with the community; secure funding for local projects that makes best use of local data to understand the demographics and risk-exposure data of those involved in injuries and **"reflect the increased risks facing children and young people from disadvantaged areas and communities."**
- 5.3.3 The guidance calls for "more evaluation using a range of outcome measures, including road injury data and a variety of evaluation methods should be used, such as controlled trials, 'stepped-wedge' trials (sequential rollout to all participants) and process evaluations". Once again this likely to require training practitioners to carry out such evaluations

⁷ Strategies to prevent unintentional injuries among children and young people aged under 15.
<http://www.nice.org.uk/nicemedia/live/13272/51621/51621.pdf>

6 Key conclusions

6.1.1 The specific intervention approaches identified in the early report by Colin Buchanan and Partners (2010) included:

- a national “traffic club” scheme;
- road crossing training for children (Kerbcraft);
- complementary speed enforcement devices and speed management programmes;
- improvements to infrastructure (including traffic calming and 20mph zones);
- road safety inputs to the master planning of regeneration projects;
- local transport plans should include pedestrian casualty reduction targets; and
- a distribution of road safety measures which targets socio-economic environments.

6.1.2 The first four of the bullet points above are specific interventions. Section Four of this review has provided evidence relating to the effectiveness of each of these measures, in addition to many others. The last three bullet points above can be described as strategic approaches. Section Five of this review provides evidence relating to the importance and effectiveness of these approaches. This review also suggests that whilst each of these is important, other approaches such as community engagement, multi-agency delivery, targeted enforcement and practitioner development are also required.

6.1.3 Specific interventions which this literature highlights as of particular importance are as follows:

- **Education.** In terms of specific educational interventions there is an opportunity to provide road safety interventions using a life course approach working with parent and teachers to offer progressive, interactive education and training from the age of 3 using the Traffic Club (3-4) and Kerbcraft (5-7) models of delivery. This will establish skills that can be reinforced by public service advertising for older age groups up to the age of 15.
- **Environment.** Area wide traffic calming with 20 mph zones is likely to reduce child pedestrian and cyclist casualties and for older pedestrians too. However, it is essential that any environmental change plan involves and engages the local community to help them ‘own’ the safety of their neighbourhood and to ensure that the plan takes account of their needs. Community engagement will also identify where children travel and where access to open spaces can be improved through the provision of crossings.
- **Enforcement.** The antisocial behaviour of drivers and riders is a local problem in deprived communities and a threat to the safety of children as pedestrians and cyclists. Enforcement targeted at driver and rider behaviour (particularly male drivers and riders aged 17-20 and 31-40) at the times when children play and travel, particularly after school, at the weekends and during holiday periods, is a key requirement to improving neighbourhood safety and the quality of life of people living in disadvantaged communities. Targeted enforcement campaigns aimed at detection of unlicensed, untaxed and uninsured drivers and riders may also reduce casualty rates.

- **Delivery.** The evidence from the case studies suggests that delivery is enhanced by having a dedicated coordinator or champion that can organise multi-agency partnerships which include the community.
- **Practitioner development.** The relationship between disadvantage and road traffic injuries is complex. Professional development can be offered to practitioners in three key areas: 1. Understanding causal factors in the relationship between disadvantage and injury 2. Evidence based practice: learning from the evidence about intervention design, and evaluation; and 3. Partnership working and community engagement. In England, the Child Accident Prevention Trust has been delivering the “Making the Link” programme on behalf of the Department of Education, the programme is aimed at practitioners who are involved in child injury prevention and has covered some of the key training issues identified here and by the NICE guidance (<http://www.makingthelink.net/>).
- **Targets.** The evidence from the NRSI suggests that political support in terms of a target is a key lever for change as long as this is supported by funding. In 2002, The UK was unique in the world in setting a national target to reduce the number of road traffic casualties among the most disadvantaged communities. This in turn led to the development of the NRSI. Recent evidence suggests that there is strong support among road safety professionals and practitioners for targets in reducing road casualties (Besley, 2010)

6.1.4 In addition this literature review has shown that interventions are more likely to be successful in disadvantaged areas if they include:

- **Comprehensive approaches that address broader problems.** Factors at many different levels influence health and injury, including individual, social and environmental factors. Interventions that address multiple levels are more likely to be successful than interventions tackling only one level.
- **Multi-agency approaches.** Approaches that include educational, engineering and enforcement strategies are more likely to be successful in reducing injuries. In order to adequately address the many factors impacting on pedestrian injuries, multi-sectoral and multi-disciplinary partners are required. No one agency or area is likely to have the expertise and ability to address all aspects. Multi-agency approaches are enhanced by having a dedicated partnerships officer who can lead the initiative.
- **Engagement and involvement of the community.** Interventions are more effective when they are tailored to the unique characteristics of the community and involve community members (including children and young people) in programme development and implementation.
- **Development of local information systems.** Data at the local level are important to identify patterns in pedestrian exposure (ie travel patterns) and injuries and target interventions to “hotspots” - areas of high risk. Local data also enable evaluation of progress to determine whether implemented interventions are having the desired effect.
- **Educational interventions which have been developed using good practice** e.g. Kerbcraft.
- **Environmental change.** Environmental change needs to be a strong element of the intervention and offers a cost effective approach.

- **Skilled Practitioners.** Practitioners need training in order to understand the links between road safety and deprivation; taking evidence based approach to intervention design and evaluation and how to run effective partnerships and engage with the community.

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