

Evidence Summary: Public health interventions to prevent unintentional injuries among the under 15s

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Evidence Summary:

Public health interventions to prevent unintentional injuries among the under 15's

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2. Strategies to prevent unintentional injuries among under-15s
3. Preventing unintentional injuries in the home among the under-15s
4. Preventing unintentional road injuries among under -15s

Introduction

The rationale and process for identifying and summarising evidence of effectiveness

Evidence of effectiveness from research studies helps us to identify areas for effective action. While the outcomes of individual primary outcome studies are important, these may be atypical, and potentially biased. Such issues may only become apparent when studies are repeated or interventions rolled out on a wider scale. Evidence and evidence informed recommendations from systematic reviews and reviews of reviews seek to reduce bias by providing an overview of the findings of a number of studies. These form the basis of 'highly processed evidence', for example practice guidelines, produced by organisations such as the National Institute for Health and Clinical Excellence (NICE). While we acknowledge that other sources of evidence may be available, because of time constraints and in the interests of quality assurance, the evidence presented here is primarily 'highly-processed evidence' as opposed to primary outcome studies. There may also be instances where the outcomes of a Scottish evaluation are considered important in assessing what action is required. An indication of the evidence around cost effectiveness is included.

When considering the included evidence, the following points should be noted:

- The evidence provides an overview of what is currently known from these selected highly processed sources. However, it is apparent that the evidence base identified and included within some reviews has limitations, such as there is a lack of robust, relevant primary outcome studies in several areas of intervention e.g. for key vulnerable groups.
- Throughout the evidence summaries, issues pertinent to the interpretation of the evidence are highlighted. For instance, attention is drawn to methodological issues relating to the evidence, such as much of the included studies being undertaken in the USA, and so the extent to which the findings are transferable/generalisable to Scotland is open to question. We also highlight when it has not been possible to reach definitive conclusions as to what constitutes an effective intervention, because of the lack of evidence of effectiveness. By highlighting these issues, our intention is not to detract from the quality of the included reviews, but rather to support full consideration of the evidence and its appropriate use by the intended audience.
- It must be recognised that much of the NICE evidence is only part of the material that they consider to inform recommendations for action as part of the NICE Public Health Guidance. Expert opinion is central as to how evidence informs decisions about new action to be taken.

Due to inevitable gaps in strong scientific evidence, the feasibility and desirability of adopting a purely evidence-based approach to health improvement and reducing health inequalities are limited. Activities that lack a strong evidence base may have important contributions to make to overall impact as part of a package of interacting activities. In judging whether to include certain possible activities it may be useful to draw on the NHS Health Scotland approach whereby plausible theory and ethical principles are used to guide decision-making, in addition to available evidence (see Tannahill, A. 'Beyond evidence – to ethics: a decision-making framework for health promotion, public health and health improvement.' *Health Promotion International* 2008;23:380-90 at www.heapro.oxfordjournals.org/cgi/reprint/23/4/380).

Context (specific to topic)

This evidence summary presents a summary of highly processed evidence related to public health interventions to prevent unintentional among children and young people aged less than 15 years. Additionally, evidence highlighting risk factors for unintentional injury is considered. Within the evidence the term unintentional injury is used in preference to the term accident; accident implies that such injuries may be unavoidable, but a large proportion of these are potentially preventable.

Unintentional injury is one of the main causes of death and emergency hospital admission in children and young people under 15 in Scotland. In 2009, one in 16 deaths was attributable to unintentional injury. Further information and statistics relating to unintentional injuries among the under-15s in Scotland are available from: <http://www.isdscotland.org/Health-Topics/Emergency-Care/Publications>

The evidence presented here has been extracted from the following key sources:

- 8 reviews of evidence informing the development of NICE public health guidance:
 - Strategies to prevent unintentional injuries among under-15s (PHG 29)
 - Preventing unintentional injuries in the home among under-15s (PHG 30)
 - Preventing unintentional road injuries among under-15s: road design (PHG 31)
- 3 reviews of cost effectiveness or economic modelling

The evidence is grouped by sub headings taken from the evidence reviews or from themes from the related NICE guidance. The evidence statements included have been copied from the full review. In some cases the text in the main body of full review has been accessed to obtain a deeper understanding of the evidence, and this has been incorporated into the summary as appropriate to form part of the conclusions.

Other key sources of information and guidance which contextualise the evidence include:

- Scottish Briefings on NICE Public Health Guidance: <http://www.healthscotland.com/scotlands-health/evidence/NICE.aspx>
- Scottish Government (2008) *Good Places, Better Health: A New approach to the Environment and Health in Scotland: Implementation Plan* www.scotland.gov.uk/Publications/2008/12/11090318/0
This strategy focuses on the influence of the physical environment on health. The implementation plan includes unintentional injuries among children as one of the child health priorities. This will include an evidence assessment relating to specific types of unintentional injury and will identify a range of key actions and recommendations to address these within the Scottish context.
- *Child Safety Strategy: Preventing Unintentional Injuries to Children and Young People in Scotland* (2007) www.injuryobservatory.net/scotland.html

Consideration of the evidence cited should take account of the existing policy context, legislation and current practice in Scotland.

Evidence Summaries

1. RISK FACTORS FOR UNINTENTIONAL INJURIES AMONG UNDER-15S

While the pattern of risk factors associated with unintentional injury in children from 0-15 years is dependant on the setting in which the injury occurs and the type of injury, across injury types, increasing age, gender (male) and low socioeconomic status are associated with an increased risk of unintentional injuries

Nature of Included evidence

The evidence is derived from 92 multivariable and multivariate studies published from 2007.

[See corresponding evidence statement: [ES1](#), ([Pearson et al, 2009](#))]

Road-Related Injury

In terms of road-related injuries, socio-economic and family characteristics are associated with all forms of road-related injury (passenger in a car, pedestrian, cyclist, injuries of undefined cause). In particular, there is a strong association between injury as a pedestrian or cyclist and low socioeconomic status and weak to moderate associations with social deprivation and non-professional parental occupation. Finally the evidence suggests a weak to moderate association between injuries as a car passenger and lower parental income, educational status and socio-economic status.

[See corresponding evidence statements: [ES2](#), [ES3](#), [ES4](#); ([Pearson et al, 2009](#))]

The evidence is mixed in relation to the influence of ethnicity. A strong association is identified between pedestrian injury and being of Native American origin and for all road related injury of being an African American. However, the specific ethnic populations considered by the evidence base are of very limited relevance to the UK. One UK study found no association between ethnicity and child passenger injury.

[See corresponding evidence statement: [ES3](#); ([Pearson et al, 2009](#))]

There is a strong association between injuries in this age group as a passenger in a car driven by a non-sibling teenager and a weak to moderate association with travelling in a car with a female driver. However, it is acknowledged that this latter outcome may reflect the increased proportion of time children spend in the presence of women.

[See corresponding evidence statement: [ES2](#); ([Pearson et al, 2009](#))]

Strong associations are identified between injury as a pedestrian or cyclist and the following factors: hyperactivity/ behavioral difficulties; and having parents who were migrants. In addition, a strong association was found between injuries and specific cycling behaviors for instance riding slowly or only on the pavement. Weak to moderate associations were found between pedestrian or cyclist injury and being male, having a behavioral disorder or living in a rural and mixed urban environment.

[See corresponding evidence statement: [ES3](#); ([Pearson et al, 2009](#))]

Injury in the Home

There is a strong association between a child's age and injury type within the home; specifically burn or fire-related injury (<1year), falls (>1year) and poisoning (1-4 years).

No evidence is available regarding variables associated with drowning.

[See corresponding evidence statements: [ES5](#), [ES6](#), [ES7](#), [ES8](#); (Pearson et al, 2009)]

Certain socio-economic and family characteristics are strongly associated with injury. Burns and fire-related injury are strongly associated with low mother education and age, areas of low socio-economic status or high poverty concentration.

[See corresponding evidence statement: [ES5](#); (Pearson et al, 2009)]

Burns/fire-related injuries and poisoning are associated with low parental education, low household income and a large number of children in the home (weak to moderate level). Similarly, falls are associated with lower educational status of parents, lower income and more than one child in the household (weak to moderate level). For injuries of undefined cause, there is an association between injuries and lower educational status of parents and lower family income (weak to moderate level).

[See corresponding evidence statements: [ES5](#), [ES7](#), [ES8](#), [ES9](#); (Pearson et al, 2009)]

Other family characteristics associated with injury include: younger age of mother at childbirth which is associated with falls and poisoning (weak to moderate level) and the birth of a sibling within the previous 12 months. This is associated with iron supplement poisoning (weak to moderate level).

[See corresponding evidence statements: [ES7](#), [ES8](#), (Pearson et al, 2009)]

Living in a non-owned home, older housing, flat or farmhouse, or being a migrant is associated with injury from falls (weak to moderate level).

[See corresponding evidence statements: [ES7](#), (Pearson et al, 2009)]

Ethnicity is weakly to moderately associated with burns (Maori, African American), falls (African American) and poisoning (Native American), however these populations have little relevance to the current UK context.

[See corresponding evidence statement: [ES5](#); (Pearson et al, 2009)]

Burns/fire-related injury, falls and poisoning are all associated with being male (weak to moderate level). Behavioural problems are strongly associated with poisoning, as is autism. In addition, behavioural problems and a poor reading score are associated with burns/fire-related injuries (weak to moderate association).

[See corresponding evidence statements: [ES5](#), [ES7](#), [ES8](#); (Pearson et al, 2009)]

Environments other than the home or the road.

Falls

There is a strong association between using public playgrounds and fall injuries. Other environmental characteristics associated with falls include location of school within an urban area, schools with larger numbers of classes (≥ 24), longer school hours and levels of physical activity engaged in outside of school (all weak to moderate association).

[See corresponding evidence statement: [ES10](#); (Pearson et al, 2009)]

All environments and all injury types

Many included studies report on injury outcomes as a whole and do not provide a differentiation of the environments in which the injury occurred or between the types of unintentional injury.

Burns/Fire-related Injury

There is a strong association between burn/fire-related injuries and the most economically deprived families, those living in a house with 1 or ≥ 3 bedrooms and ADHD.

[See corresponding evidence statement: [ES11](#); (Pearson et al, 2009)]

Drowning

No relevant UK evidence is identified.

[See corresponding evidence statement: [ES12](#); (Pearson et al, 2009)]

Falls

There is very limited evidence (based on the outcome of one study) of a strong association between a child being dropped by a carer and subsequently being injured in the same way. A weak to moderate association between injuries and the presence of behavioural disorders exists, along with mixed evidence regarding the association of injuries and socio-economic status and deprivation.

[See corresponding evidence statement: [ES13](#); (Pearson et al, 2009)]

All injuries

Characteristics of the child associated with unintentional injuries are increasing age and increasing age amongst children with a disability (weak to moderate), being male (weak to moderate association with all injuries, including fatalities). There is mixed evidence regarding the influence of ethnicity with child injuries. Whilst there is an association with injuries and being of Native American or African American descent, this was not found for other ethnicities and these populations have little relevance to the current context.

[See corresponding evidence statements: [ES14a](#), [ES14b](#), [ES14c](#); (Pearson et al, 2009)]

A number of studies report on the relationship between unintentional injuries and the behavioural characteristics of the child. There is evidence of an association of injuries with life events, ADHD, psychopathology (strong) borderline ADHD, high emotional symptoms, conduct disorder and behavioural difficulties (weak to moderate). There is evidence of weak to moderate association of injuries with children's consumption of alcohol, illness in the past month, the period of time 10-90 days after unintentional injury occurring in a sibling, greater physical development and physical activity, and emotional and behavioural problems.

[See corresponding evidence statement: [ES14d](#), [ES14e](#); (Pearson et al, 2009)]

There is a weak to moderate association between injuries and families socio-economic deprivation and mixed evidence regarding the impact of parental education attainment and household income with injuries. There is also a weak to moderate association of injuries with unmarried parents (but not single parents) and a greater number of children in the household.

[See corresponding evidence statements: [ES14f](#), [ES14g](#) (Pearson et al, 2009)]

Weak to moderate associations exist between injuries and the following parental characteristics: mental illness, postnatal or maternal depression, adverse life events, parental substance misuse, mother aged under 20 years at time of child's birth and below average consistency parenting.

[See corresponding evidence statement: [ES14h](#); (Pearson et al, 2009)]

There is evidence of a weak to moderate association between injuries and neighbourhoods which are socio-economically deprived. There is mixed evidence regarding the association between an urban/rural location and the occurrence of injuries. [See corresponding evidence statements: [ES14i](#), [ES14j](#); (Pearson et al, 2009)]

There is evidence of a weak to moderate association between a reduction of injuries (in children aged 1-6 years) and implementation of municipality (i.e. local government area) level safety measures. However there was no evidence of an association between reduction in injuries and the time spent by children in child or family day care centres or of a reduction in injuries in those aged 7-15 years. [See corresponding evidence statement: [ES14k](#); (Pearson et al, 2009)]

2. STRATEGIES TO PREVENT UNINTENTIONAL INJURIES AMONG UNDER-15S

International comparative analyses of injury prevention policies, legislation and other activities

There is a lack of comparable international evidence, thereby limiting analysis of the differential impact of legislative, regulatory, enforcement and compliance interventions. The available evidence is unable to establish an association between international variations in child morbidity and mortality rates and differential environment modification, regulation, enforcement and compliance for road, home and leisure environment interventions.

[See corresponding evidence statement: [ES1](#); (Park et al, 2009)]

Road Safety

In countries with better performance in terms of reducing road injuries there is a trend towards greater road environment modification and road design measures. Differences in severe injury and mortality rates between the UK and two other European nations may be explained by differential exposure, in particular amount of time spent near busy roads. There is no identified evidence providing international comparison of specific interventions relating to road design/ modification.

[See corresponding evidence statements: [ES2](#), [ES3](#), [ES4](#); (Park et al, 2009)]

Home safety equipment and home safety assessments

There are no identified international studies comparing specific home safety equipment (smoke alarms, hot water temperature restrictors, stair gates; oven, window and door locks) or legislative/regulatory provision of home safety assessments across countries.

[See corresponding evidence statement: [ES5](#); (Park et al, 2009)]

Leisure and sporting activities

Few international studies have compared legislation, regulation, enforcement and compliance pertaining to leisure or sporting activities. Available evidence is very limited, relating to all-terrain vehicles (quad bikes) and snowmobiles. Weak evidence suggests that death rates were lower in states with use of some safety legislation (all terrain vehicle usage) and that legislation may influence safety behaviour such as helmet usage.

[See corresponding evidence statement: [ES6](#); (Park et al, 2009)]

Surveillance and monitoring systems

No international studies considering the role of monitoring and surveillance systems in influencing legislation, regulation and enforcement activities were identified. International databases have provided injury data used in studies; with information systems used to assist in setting and monitoring injury reduction targets.

[See corresponding evidence statement: [ES7](#); (Park et al, 2009)]

Workforce development

No international comparator studies considered the relationship between international differences in legislation and regulation of professional qualifications/training and rates of childhood injury.

[See corresponding evidence statement: [ES8](#); (Park et al, 2009)]

Strategies and frameworks to prevent unintentional injuries among under 15s – road design

Impact on road safety of speed enforcement devices

There is moderate evidence that speed enforcement devices (cameras, lasers or radar) reduce road injuries and serious/fatal injury crashes/collisions in their vicinity. There is variation between the size of reductions between studies and between different locations included within studies. The evidence is considered to be relevant to the UK context but is of limited utility when considering reduction of road injuries within urban environments as evaluations largely considered rural environments or high speed roads.

[see corresponding evidence statement: [ES1](#); [Anderson and Moxham, 2009](#)]

Impact on road safety of intensified and/or rationalised police enforcement activities, convictions and reports for traffic offences, increased financial penalties for speeding and driver penalty points systems

There is weak evidence that increased or rationalised police enforcement of traffic speeds reduces accidents and collisions resulting in injury or fatalities. Inconsistent evidence (derived from two non-UK studies) suggests that higher levels of traffic convictions may reduce rates of fatal road accidents; no evidence is presented relating to non-fatal road accidents. The evidence is judged as partly applicable to road safety policy in the UK. Inconsistent evidence from two studies (neither UK) suggests that increasing fines for speeding offences reduces speeding. There is weak evidence, limited to one study, that the introduction of a penalty point based system reducing the rate of hospitalised road traffic injury cases. As the UK already operates such a system the evidence is regarded as inapplicable.

[see corresponding evidence statements: [ES2](#), [ES3](#), [ES4](#), [ES5](#); [Anderson and Moxham, 2009](#))]

Impact of methods for communicating traffic infringements, media campaigns and national road safety targets

Moderate evidence suggests that 'appropriately worded letters to communicate traffic offences (or high accident records)' can affect subsequent speeds or accident rates. Inconsistent evidence suggests that media campaigns conducted alongside speed enforcement may help reduce fatalities or fatal crashes. Inconsistent evidence suggests that having national quantified road safety targets helps to reduce road injuries. The evidence is judged as only partially applicable to the UK, due to legislative and cultural

differences.

[see corresponding evidence statements: [ES6](#), [ES7](#), [ES8](#); (Anderson and Moxham, 2009)]

Strategies and frameworks to prevent unintentional injury in under 15s – home

Laws relating to smoke detectors, window guards, hot water temperature and swimming pool fencing

There is very limited evidence (from one dated USA study) that legislation requiring the installation of smoke detectors increases the number of houses with a functioning smoke detector and that this may potentially reduce fatalities related to fires. Similarly there are findings from one study (USA) to suggest that window guard legislation may reduce child injury related to falls. The evidence regarding the impact of hot water tap temperature legislation is mixed, with studies reporting both increases and decreases in burn injuries post-legislation. Finally, there is mixed evidence about the effectiveness of swimming pool fencing legislation; with structured and comprehensive approaches to inspection resulting in a higher rate of compliance. Two studies suggest that this is ineffective when fencing is required on three sides only. Due to legislative and cultural differences, the direct transferability of findings relating to smoke detectors, window guards, hot water temperature and swimming pool regulation to the UK context are poor.

[see corresponding evidence statements: [ES1](#), [ES2](#), [ES3](#), [ES4](#); (Garside and Moxham, 2009)]

Strategies, frameworks and mass media to prevent unintentional injuries among under 15s – outdoor play and leisure.

Impact of legislation and/or mass media campaigns on bicycle helmet use and head injury

There is moderate evidence that legislation requiring the compulsory use of bicycle helmets increases compliance with helmet use and decreases head injuries. Similarly, there is moderate but very limited evidence (from one study) that enforcement of legislation can increase compliance with cycling helmet use. The evidence presently lacks applicability to the UK context as there is no current legislative requirement to wear cycling helmets. It may be relevant should any such legislation be implemented. There is weak to moderate evidence that mass media campaigns (in conjunction with a broader non-legislative strategy to encourage bicycle helmet use) are effective in increasing compliance with bicycle helmet use and reduce the rate of head injuries.

[see corresponding evidence statements: [ES1](#), [ES2](#), [ES3](#); (Khalid et al, 2009)]

Effect of compliance with playgrounds standards on injury rates among children during play/leisure

There is limited, but mixed evidence that removal and replacement of unsafe equipment is an effective strategy for preventing playground injuries.

[see corresponding evidence statement: [ES4](#); (Khalid et al, 2009)]

Impact of fireworks legislation on fireworks-related injuries among children during outdoor play and leisure

There is weak, mixed evidence from two studies suggesting that legislation is potentially effective in reducing firework-related injuries.

[see corresponding evidence statement: [ES5](#); (Khalid et al, 2009)]

Impact of drowning prevention campaign on life vests use and ownership among children

There is weak and very limited evidence (one USA study) that a comprehensive community based campaign increased the use of life vests.

[see corresponding evidence statement: [ES6](#); ([Khalid et al, 2009](#))]

Economic Evidence

A review of the cost-effectiveness of strategies to prevent unintentional injury among the under-15s covers legislation to increase use of bicycle helmets, laws to set temperatures on the thermostats of hot water systems, laws to increase the use of smoke detectors and road speed enforcement programmes. Very little of the included evidence originates from the UK and consequently findings may be of limited relevance.

There is inconsistent evidence that national laws to make the wearing of bicycle helmets compulsory would be cost-effective from a societal perspective. The measure is likely to be highly cost-effective from a public sector point of view (leaving out the cost to individuals or families of purchasing bicycle helmets). Bicycle helmet laws would be more cost-effective in younger (age 5-12 years) than older children (age 13-18), and it is estimated that costs would probably exceed benefits in older children and adults (again, from a societal perspective).

Very limited cost-effectiveness evidence suggests that legislation to restrict the thermostat temperature on hot water systems (newly manufactured) may be both cost-saving and more effective in terms of scalds prevented, compared with no legislation. Implementing legislation to make the fitting of smoke detectors compulsory may produce net savings alongside saving lives.

Cost-benefit analyses of speed enforcement programmes suggest that within a year of the implementation of a programme of automated speed camera sites, benefits exceeded costs. Evaluation of the national safety camera programme estimates an annual estimated economic benefit of £258 million. ([Anderson and Moxham, 2010a](#))

Economic modelling of two strategic interventions included 1. Legislation or regulations to promote the wider and earlier implementation of mandatory 20mph zones in high casualty residential areas 2. Regulations supported by enforcement, promotion and monitoring activities to promote the wider and earlier installation of thermostatic mixer valves (TMV) in family social housing where there are children aged less than 5 years.

The main factor determining cost effectiveness of regulation of 20mph zones is the cost effectiveness of the implementation of the initial scheme. The cost effectiveness of regulation to promote the installation of TMVs is influenced by the number of eligible households, the eventual level (expected) of take-up/installation; the number of years to reach the eventual level of take-up/installation, cost of monitoring and enforcement of compliance with the regulations. ([Anderson and Moxham, 2010b](#))

3. PREVENTING UNINTENTIONAL INJURIES IN THE HOME AMONG THE UNDER-15S

Impact of interventions on injury rates

Free or discounted supply (and/or installation) of home safety equipment or smoke alarms, with or without home safety education

No evidence considers the impact of the free or discounted supply of home safety equipment (as the sole intervention component) on injury outcomes. Evidence relating to the provision and installation of free or discounted smoke alarms on fire-related hospitalisations and death is limited and inconsistent. One study suggests that the intervention had no significant impact on the incidence of fire-related hospitalisations and death. Another study found a decrease in fire-related injuries following free supply and installation of smoke alarms. There is no evidence that free or discounted home safety equipment (alone or with installation) in combination with safety education has any impact on injury outcomes.

[see corresponding evidence statements: [ES1a](#), [ES2a](#), [ES3a](#), [ES4a](#); (Pearson, Garside et al, 2009)]

Home risk assessment and free or discounted supply of home safety equipment (and/or installation) with or without home safety education

There is no evidence regarding the impact of home risk assessment alone on injury outcomes, one low quality study suggests that it may increase the use of smooth table top corners. There is mixed evidence that following home risk assessment and free or discounted supply of home safety equipment, rates of 'medically attended' injuries decrease at 12 months but not 25 months post-intervention. Similarly, home risk assessment combined with discounted supply and installation of home safety equipment shows a mixed effect on injury outcomes. The impact is unclear from one study and the other suggests that the intervention may reduce scalds; however the outcomes of this study may be unreliable. Finally, there is no evidence relating to the impact on injury outcomes of home risk assessment and discounted supply of home safety equipment combined with education.

[see corresponding evidence statements: [ES5a](#), [ES6a](#), [ES7a](#), [ES8a](#) (Pearson, Garside et al, 2009)]

Impact of all interventions on the presence of correctly installed safety equipment

Free or discounted supply of home safety equipment or smoke alarms, with or without safety education

Supplying cupboard locks to families who had experienced a poisoning incident had a significant impact on the installation of these locks (weak evidence from one RCT). The effect of free supply and installation of smoke alarms on smoke alarm installation *and* functioning is inconsistent. One study suggests that this has no significant effect, in contrast another suggests that supplying and installation of smoke alarms does have a significant effect; with higher levels of functioning smoke alarms 6-12 months post intervention.

There is moderate evidence that provision of free or discounted smoke alarms in conjunction with safety education increases their rate of installation. The impact of supply of other types of home safety equipment (buffers, electrical outlet covers, cupboard locks and latches), in combination with home safety education is mixed. A

sole study reports that fire guards were more likely to be reported as present post-intervention. Weak evidence from one RCT suggests that free or discounted supply of home safety equipment in combination with safety education increases the rate of installation of home safety equipment as a whole. One good quality RCT where the intervention, offering free equipment with installation and education increased the use of smoke alarms (at 12 and 24 months post-intervention), had no impact on the use of fireguards but increased the use of stair gates and window locks (at 12 but not 24 months). The intervention also increased the safe storage of cleaning products and sharp objects at 12 months, but the effect on sharp object storage was not apparent at 24 months. The intervention reduced socio-economic inequalities in the uptake and continued use of stair gates but not smoke alarms.

[see corresponding evidence statements: [ES1b](#), [ES2b](#), [ES3b](#), [ES3c](#), [ES3d](#), [ES4b](#), [ES4c](#); Pearson, Garside et al, 2009]

Provision of home risk assessment and free or discounted supply of home safety equipment, with or without education

Installations of smoke alarms show a mixed effect, with two studies indicating an increased rate and one no effect. Similarly, the evidence is mixed in relation to outcome rates for electrical outlet covers, cupboard locks and stair gates. There is very limited evidence (one study) which suggests that this intervention strategy does not increase the presence and use of home safety equipment (smoke alarms, stair gates, cupboards locks/latches or use of a children's safety centre)

[see corresponding evidence statements: [ES6b](#), [ES6c](#), [ES8b](#) (Pearson, Garside et al, 2009)]

Impact of interventions on home safety knowledge and behaviour

Free or discounted supply of home safety equipment or smoke alarms, with or without education or home risk assessment

There is very limited evidence (one RCT) suggesting that postal provision of an information leaflet and free cupboard locks to families who had recently experienced a poisoning event has no significant impact on home safety knowledge or behaviour. Evidence is unavailable with regard to the impact of free or discounted supply and installation of smoke alarms.

Strong evidence indicates that free or discounted supply of home safety equipment increases knowledge about the prevention of poisoning and scalds. The evidence in relation to increased knowledge about the prevention of fires, falls and wounds is inconsistent. There is no evidence that the intervention increases knowledge about drowning. Finally, there is weak and limited evidence that the intervention increases knowledge about the prevention of suffocation.

There is weak evidence, limited to one study, which suggests that free home safety equipment in combination with installation and safety education increases the safe storage of cleaning products and sharp objects at 12 months but not 24 months post-intervention.

There is no evidence to suggest that home risk assessment alone has any impact on knowledge or behaviour. Combined with free or discounted supply of home safety equipment there is limited evidence that it may improve knowledge and behaviour as a whole. There is evidence that such interventions have no impact on knowledge or behaviour about prevention of fires, falls or drowning; improve knowledge concerning

scald prevention and have a mixed effect on knowledge about the prevention of poisoning (no effect or improved). A controlled before-and-after study suggests a significant improvement in parent's perception of self-efficacy six weeks post intervention; however one RCT suggests that it is not improved at 12 months follow up.

Evidence regarding the impact of home risk assessment in conjunction with free or discounted supply and installation of home safety equipment on knowledge and behaviour is mixed. Fire escape planning was positively affected, hot water temperature negatively effected (temperature increased), and no impact on the number of scald risks or medications with child-proof caps. There is no available evidence to suggest that home risk assessment and discounted or free supply of equipment in combination with education has any impact on knowledge or behaviour.

[see corresponding evidence statements: [ES1c](#); [ES2c](#), [ES4d](#), [ES3e](#), [ES3f](#), [ES3g](#), [ES3h](#), [ES5c](#), [ES6d](#), [ES6e](#), [ES6f](#), [ES6g](#), [ES6h](#), [ES7c](#), [ES8c](#) (Pearson, Garside et al, 2009)]

Barriers and facilitators to preventing unintentional injury in the home

Barriers

Barriers linked to external factors (legal/policy/health service, information and communication, socio-economic circumstances)

Evidence of mixed quality suggests that there are legal and policy barriers to unintentional injury prevention programmes. The majority of studies are non-UK based therefore the direct relevance to the UK context is questionable. The evidence highlights issues related to implementing fire safety interventions. In particular 'the short-term and fragmented' work programmes, occurring in a context lacking a centralised organisation for home safety. Weak legislation relating to rented accommodation can result in lack of compliance with regulations on the part of landlords. Similarly, weak legislation affecting containers can result in the sale of toxic products in non child-proof containers. Lack of information / knowledge about existing policy or home safety support services is identified as a barrier. Timing of communication of relevant safety information is also viewed as important, with reports that information provided in a community situation is retained more than that provided post-birth within the hospital environment.

[see corresponding evidence statements: [ES1](#), [ES2](#), (Smithson, Moxham and Garside, 2009)]

Barriers linked to physical and environmental factors (poor quality/rented accommodation, equipment, cost, training)

Evidence of mixed quality identifies living in accommodation you are unable to modify as a major barrier to implementing home safety. This applies to rented accommodation and circumstances in which young parents live in extended family homes. One UK study noted that landlords did not respond to requests to install or maintain safety equipment. Rapid turnover of tenants within cheap rented accommodation may also impair effective installation and maintenance of home safety equipment. Faulty or poor equipment is identified as a barrier to interventions to reduce unintentional injuries. Evidence of mixed quality suggests that people consider the immediate and long term risks when disabling faulty smoke alarms; balancing these against the negative impact of their malfunction. Cost is also a barrier, in particular the perceived cost of installing or repairing equipment and of less relevance to the UK, the perceived cost of help when a child had been injured.

[see corresponding evidence statements: [ES4](#), [ES5](#), [ES6](#), [ES8](#); (Smithson, Moxham and Garside, 2009)]

Barriers linked to individual factors (understanding risk, cultural differences, social and relational factors)

Limited evidence suggests that young or poorly educated mothers can experience difficulty in anticipating their child's rate of development; however evidence also indicates that mothers are good at anticipating developmental milestones and adapting their environment appropriately. There is very limited evidence (one study) which suggests some adolescent mothers experience difficulty in attributing responsibility or blame for accidents. Helping mothers to identify risks to their child in a specific environment may be an effective intervention. Studies conducted with low income mothers in North America suggest that mistrust of officials is a major barrier, in particular that asking about child injury or taking an unintentionally injured child to hospital would raise child protection issues and that they would be viewed as abusive or neglectful.

Studies undertaken within the USA suggest that differing cultural practises may act as a barrier. Practices which may have been adequate in a country of origin may be risky within a new cultural context. Issues of relevance are a lack of understanding of risks in a host nation and health official's lack of understanding of child safety norms and practices within immigrant's cultures. Another potential major barrier are situations where mothers lack of autonomy to make major household or financial decisions,

[see corresponding evidence statements: [ES9](#), [ES11](#), [ES13](#), [ES14](#), [ES15](#) (Smithson, Moxham and Garside, 2009)]

Facilitators

Facilitators linked to external factors (legal/policy/health service, information and communication, socio-economic circumstances)

Facilitators to prevention programmes include strong policy drivers or legislation. Three studies, two of which were undertaken within the UK also suggest that partnerships and collaboration between service providers facilitates the effectiveness of interventions within low income communities. The importance of adapting language and advice to address the specific needs of the target community is highlighted.

[see corresponding evidence statements: [ES1](#), [ES3](#); (Smithson, Moxham and Garside, 2009)]

Facilitators linked to physical and environmental factors (poor quality/rented accommodation, equipment, cost and training)

Understanding the reasons that people fail to comply with using safety equipment is viewed as a facilitator. Evidence of mixed quality suggests that training in installation and equipment use/replacement may possibly be a facilitator to reducing unintentional injuries in the home.

[See corresponding evidence statements: [ES6](#), [ES7](#) (Smithson, Moxham and Garside, 2009)]

Facilitators linked to individual factors (understanding risk, cultural differences, mothers safeguarding, social and relational factors)

Education and information about general child development may facilitate reduction of unintentional injuries in the home. The role of mothers in preventing unintentional injuries in the home is highlighted as a major facilitator in reducing unintentional injuries in the

home. Raised awareness of unintentional poisoning through real life or media exposure increased awareness and motivation to implement safety measures. Interventions need to consider automatic targeting of mothers particularly in populations where fathers or in-laws make decisions about household purchases.

[see corresponding evidence statements: [ES10](#), [ES11](#), [ES12](#), [ES15](#), ([Smithson, Moxham and Garside, 2009](#))]

Economic Evidence

There is inconsistent, limited, cost effectiveness evidence in relation to smoke alarm giveaway schemes (in combination with educational materials) targeted at potentially high risk areas/households. One study suggests that the intervention was more costly and less effective than no scheme; in contrast another study suggests the intervention is cost saving and highly effective. There is no evidence from non-urban schemes or those targeting areas other than high risk or of low socio-economic status. [See corresponding evidence statement: [ES10](#), ([Pearson, Garside et al, 2009](#))]

In relation to cost effectiveness of home risk assessments, one study provides weak evidence that a single home visit involving information, discount vouchers and home-specific risk-reduction advice is cost effective for the health service. However these findings should be interpreted with caution as they are derived from a single, dated Canadian study.

[See corresponding evidence statement: [ES11](#), ([Pearson, Garside et al, 2009](#))]

Economic modelling has explored the cost-effectiveness of the following home-based interventions 1. Supply and installation of free smoke alarms vs. no intervention 2. General home safety consultation and equipment provision vs. no intervention.

Good quality and data to inform this economic modeling was lacking, consequently the economic modelling presented is exploratory, examining the relative importance of different factors in determining cost-effectiveness.

The economic model of a give-away smoke alarm scheme suggested that this was probably cost-effective but the effectiveness evidence relating to such schemes is inconsistent. Cost effectiveness of home safety equipment schemes is influenced by the efficacy of the included safety devices.

Cost utility of programmes is viewed to be dependant on 'programme reach' (existing prevalence of safety devices, proportion of participating households, proportion of correctly installed and used devices); duration of effectiveness of the device, costs of programmes relative to the number of households, number of people in a household (and their age), relative risk reduction due to installation and use of a safety device (or improved safety behaviour). ([Pitt, Anderson and Moxham, 2009](#))

4. PREVENTING UNINTENTIONAL ROAD INJURIES AMONG UNDER 15S

Children and young people's knowledge and behaviour

The evidence suggests that whilst children and young people are aware of potentially risky behaviour in relation to road safety, this does not influence their behaviour (even if

they had had a previous accident/near miss). Risky behaviour is highlighted as a potential cause of accidents; such behaviour can either take the form of common behaviours (not using crossings, crossing between parked cars) or more 'extreme' behaviour (i.e. playing chicken). Boys are more likely to engage in more extreme risk taking behaviour. Peer influence can have both a positive and negative impact either encouraging safety conscious behaviour or risky behaviour. Alcohol may increase risk taking behaviour and teenagers are more likely to take risks than younger children.

[see corresponding evidence statements: [ES1a](#), [ES1b](#), [ES2a](#), [ES2b](#), [ES2c](#), [ES2d](#), [ES2e](#), [ES2f](#), (Garside, Ashton et al, 2009)]

The evidence suggests that in the absence of suitable or affordable leisure facilities, children and young people may play in the street. This may also occur where parks are perceived as dangerous locations i.e. due to alcohol and drug use.

[see corresponding evidence statement: [ES2g](#); (Garside, Ashton et al, 2009)]

Evidence statements 3, 4, 5, and 6 relate to drivers as the cause of accidents, structural causes of accidents, attitudes to road safety, and interventions of little relevance to the current work. Therefore they have not been summarised here.

References

| 1. RISK FACTORS FOR UNINTENTIONAL INJURIES AMONG UNDER 15S |
|---|
| Details of Studies |
| Review 2: Pearson, M.; Hewson, P.; Moxham, T.; Taylor, R (2009) <i>A systematic review of risk factors for unintentional Injuries among children and young people aged under 15 years. Quantitative correlates review of unintentional injury in children.</i> Peninsula Technology Assessment Group (PenTAG), Peninsula Medical School, Exeter. Commissioned by the NICE Centre for Public Health Excellence. This review is available from: http://www.nice.org.uk/guidance/index.jsp?action=download&o=48631 : |
| 2. STRATEGIES TO PREVENT UNINTENTIONAL INJURIES AMONG UNDER-15S |
| Details of Studies |
| Review 1: Park, A.; McDaid, D.; Liu, Z.; Moxham, T.; Anderson, R. (2009): <i>Current practice and innovative approaches to prevent childhood unintentional injuries: An overview and synthesis of international comparative analyses and surveys of injury prevention policies, legislation and other activities An overview and synthesis of international current practice to prevent unintentional injury in children.</i> Personal Social Services Research Unit (PSSRU), London School of Economics & Political Science with Peninsula Technology Assessment Group (PenTAG), Peninsula Medical School, Exeter. Commissioned by the National Institute of Clinical Excellence. Available from: www.nice.org.uk/guidance/index.jsp?action=download&o=45873 |
| Review 3: Anderson, R.; Moxham, T. (2009) <i>Strategic and regulatory frameworks for guiding, enforcing or promoting activities to prevent unintentional injury to children and young people in the road environment.</i> Peninsula Technology Assessment Group (PenTAG), Peninsula Medical School, Exeter. Commissioned by the NICE Centre for Public Health Excellence. Available from: www.nice.org.uk/nicemedia/live/11882/48632/48632.pdf |
| Review 4: Garside, R.; Moxham, T. (2009) <i>Strategic and regulatory frameworks for guiding, enforcing or promoting activities to prevent unintentional injury in children and young people in the home environment.</i> Peninsula Technology Assessment Group (PenTAG), Peninsula Medical School, Universities of Exeter and Plymouth. Commissioned by the NICE Centre for Public Health Excellence. Available from: www.nice.org.uk/guidance/index.jsp?action=download&o=48636 |
| Review 5: Khalid, A.; Yahaya, I.; Uthman, O.; Bayliss, S. Fry-Smith, A.; Anderson, R (2009) <i>Strategies, policies and regulatory or legal frameworks and/or mass media campaigns to prevent unintentional injury to children during play and leisure in the external environment.</i> West Midlands Health Technology Assessment Collaboration. University of Birmingham (Outsourced to WMHTAC on a consultancy basis by the PenTAG CPHE Collaborating Centre). Commissioned by the NICE Centre for Public Health Excellence. Available from: www.nice.org.uk/guidance/index.jsp?action=download&o=48637 |
| Economic evidence |
| Anderson R, Moxham T (2010a) <i>PREVENTING UNINTENTIONAL INJURIES IN CHILDREN: Systematic review to provide an overview of published economic</i> |

evaluations of relevant legislation, regulations, standards, and/or their enforcement and promotion by mass media Peninsula Technology Assessment Group (PenTAG), Peninsula Medical School, Universities of Exeter and Plymouth. Commissioned by the NICE Centre for Public Health Excellence. Available from: www.nice.org.uk/guidance/index.jsp?action=download&o=48638

Anderson R, Moxham T (2010b) *STRATEGIES TO PREVENT UNINTENTIONAL INJURY IN CHILDREN: Economic modelling of legislation/regulations and related national strategies to promote the wider use of: 20mph zones in residential areas, and TMVs in social housing for families*. Peninsula Technology Assessment Group (PenTAG), Peninsula Medical School, Universities of Exeter and Plymouth. Commissioned by the NICE Centre for Public Health Excellence. Available from: www.nice.org.uk/guidance/index.jsp?action=download&o=48639

3. PREVENTING UNINTENTIONAL INJURY IN THE HOME AMONG THE UNDER 15S

Details of Studies

Review 1: Pearson, M.; Garside, R.; Moxham, T.; Anderson, R (2009) *PREVENTING UNINTENTIONAL INJURIES AMONG UNDER-15s IN THE HOME. Report 1: Systematic reviews of effectiveness and cost-effectiveness of home safety equipment and risk assessment schemes*. Peninsula Technology Assessment Group (PenTAG), Peninsula Medical School, Universities of Exeter and Plymouth. Commissioned by the NICE Centre for Public Health Excellence. Available from: www.nice.org.uk/guidance/index.jsp?action=download&o=46010

Review 2: Smithson, J.; Moxham, T.; Garside, R. (2009) *Preventing unintentional injury in children in the home. Report 2: Barriers to, and facilitators of unintentional injury in the home: a systematic review of qualitative research*. Peninsula Technology Assessment Group (PenTAG), Peninsula Medical School, Universities of Exeter and Plymouth. Commissioned by the NICE Centre for Public Health Excellence. Available from: www.nice.org.uk/guidance/index.jsp?action=download&o=46011

Economic evidence

Pitt, M.; Anderson, R.; Moxham, T. (2009) *PREVENTING UNINTENTIONAL INJURIES AMONG UNDER-15s IN THE HOME Report 3: Cost-effectiveness modelling of home based interventions aimed at reducing unintentional injuries in children*. Peninsula Technology Assessment Group (PenTAG), Peninsula Medical School, Universities of Exeter and Plymouth. Commissioned by the NICE Centre for Public Health Excellence Available from: <http://www.nice.org.uk/guidance/index.jsp?action=download&o=46012>

4. PREVENTING UNINTENTIONAL ROAD INJURIES AMONG THE UNDER-15S -

Details of Studies

Review 2: Garside, R.; Ashton, K.; Moxham, T.; Anderson, R. (2009) *INTERVENTIONS TO PREVENT UNINTENTIONAL INJURY IN CHILDREN ON THE ROAD. Report 2: Barriers to, and facilitators of, the prevention of unintentional injury in children on the road*. Peninsula Technology Assessment Group (PenTAG), Peninsula Medical School, Universities of Exeter and Plymouth. Commissioned by the NICE Centre for Public Health Excellence. Available from: www.nice.org.uk/guidance/index.jsp?action=download&o=46034

Evidence statements

1.. RISK FACTORS FOR UNINTENTIONAL INJURIES AMONG UNDER-15S

Evidence Statements

([Pearson et al. 2009](#))

Evidence statement 1 (ES1): Nature of included evidence

The most important quality factor in studies examining associations is likely to be control for confounding. Therefore it was agreed with NICE that only multivariable (i.e. >1 risk factor examined) and multivariate (i.e. reported measure of association adjusted for confounders) were included for review. However, across the 92 included studies, there was little consistency in the choice of confounders used in the adjusted analysis. Furthermore, few studies used formal multilevel methods to deal with the mix of variables across child, family and neighbourhood level characteristics.

The risk of selection and case ascertainment bias in the included studies is likely to be relatively low. Most studies used large regional or national databases (e.g. birth cohorts or registries or censuses) to identify the population of children to be studied and identified injuries using existing institutional databases, such as hospital records or insurance claims, categorising injury type according to individual ICD codes.

Evidence statement 2 (ES2): Road - Passenger

There is evidence from 10 studies (1 UK). There is evidence of a strong association (i.e. relative risk equivalent of >2.0) of injuries being associated with travelling in a car driven by a non-sibling teenager. There is evidence of weak to moderate association (i.e. relative risk equivalent of >1.0 to <2.0) of injuries with lower parental income, employment status, educational status, socio-economic status, and with travelling in a car with a female driver (when the injured child was appropriately restrained). The increased risk in females may well reflect their longer periods of time in the presence of children. There is mixed evidence regarding the association of injuries with ethnicity.

Evidence statement 3 (ES3): Road – Pedestrian and cyclist

There is evidence from 18 studies (5 UK). There is evidence of a strong association between the lowest socio-economic quintiles, being of Native American descent (for pedestrians), having parents who were migrants, hyperactivity, behavioural difficulties, or bicycle riding (riding slowly or only on the pavement) and injuries. There is evidence of weak to moderate association of injuries with membership of the 2nd socio-economic quintile, social deprivation, non-professional parental occupation, rural and mixed-urban environments, being male, or behavioural disorders. There was no statistical evidence of injuries being associated with social fragmentation or ethnicity (for cyclists).

Evidence statement 4 (ES4): Road – Undefined cause of injury

There is evidence from 7 studies (1 UK). There is evidence of weak to moderate association of injuries with socio-economic deprivation and being African-American. There is mixed evidence regarding the association of socio-economic status (measured by parental occupation) with injuries. There was no statistical evidence of injuries being associated with autism.

Evidence statement 5(ES5): Home – Burns/fires

There is evidence from 6 studies (1 UK). Two studies reported burn-related deaths.

There is evidence of a strong association between child's age (< 1 year), low mother education and age, and areas of concentrated poverty (and high numbers of African American population) and injuries. There is evidence of weak to moderate association of burn injuries with children being male, from an ethnic minority, having behavioural problems and a poor reading score, low parental education, lower home income, a larger number of children in the home, and rural location. There was no statistical evidence of burn injuries being associated with type of home ownership.

Evidence statement 6 (ES6) : Home - Drowning

No multivariate evidence was found that examined risk factors for drowning.

Evidence statement 7(ES7): Home - Falls

There is evidence from 3 studies (0 UK). There is evidence of a strong association between greater child's age (once older than 1 year) and injuries. There is evidence of weak to moderate association of injuries with being male, being of African-American descent, families being in receipt of social welfare benefits, lower educational status of parents, lower income, single parent households, lower mother's age at childbirth, non-owner housing occupancy, living in a flat or farmhouse, older housing and being a migrant. Being lone parent status, neighbourhood poverty and urbanity were not statistically associated with falls.

Evidence statement 8(ES8): Home - Poisoning

There is evidence from 7 studies (1 UK). There is evidence of a strong association between child's age (from age 1 to 4 years), behavioural problems, and autism and injuries. There is evidence of weak to moderate association of injuries being associated with being male, having a lower reading score, lower educational status of parents, lower income, larger families, being in receipt of social welfare benefits, younger age of mother at childbirth, being of Native American descent, rurality, and the birth of a sibling within 12 months (for iron tablet poisoning). There was no statistical evidence of injuries being associated with single parent households, family size, overcrowding, or house type.

Evidence statement 9 (ES9): Home – Undefined cause of injury

There is evidence from 2 studies (1 UK). There is evidence of weak to moderate association of injuries with lower educational status of parents and lower family income. There was no statistical evidence of injuries being associated with parental marital status or of being in receipt of social welfare benefits.

Evidence statement 10 (ES10): Other Environments - Falls

There is evidence from 4 studies (0 UK). There is evidence of a strong association between the use of public playgrounds or being of African-American descent and injuries. There is evidence of weak to moderate association of injuries being with being of Latin American descent, location of a school within an urban area, schools with larger numbers of classes (≥ 24), longer school hours, and the levels of physical activity engaged in outside of school. There was no statistical evidence of injuries being associated with the levels of physical activity engaged in within school.

Evidence statement 11 (ES11): All Environments – Burns/fire

There is evidence from 6 studies (1 UK). There is evidence of a strong association between the most socio-economically deprived families, living in a house with 1 or ≥ 3 bedrooms, Attention Deficit Hyperactivity Disorder, and being of Native American descent and injuries. There was no statistical evidence of injuries being associated with

autism, having previously endured an unintentional burn/fire injury, parental employment status, entitlement to Medicaid, or order of sibling birth.

Evidence statement 12 (ES12): All Environments - Drowning

There is evidence from 3 studies (0 UK). There is evidence of weak to moderate association of injuries with entitlement to Medicaid (in 5 to 14 year olds) and with non-entitlement to Medicaid (in 0 to 4 year olds). There was no statistical evidence of injuries being associated with being of Native American descent or the presence of behavioural disorders.

Evidence statement 13 (ES13): All Environments - Falls

There is evidence from 9 studies (1 UK). There is evidence of a strong association between a child being dropped previously by a carer and subsequently being injured again in the same way. There is evidence of weak to moderate association of injuries with the presence of behavioural disorders. There was mixed evidence regarding the association of socio-economic status and deprivation, and entitlement to Medicaid and injuries. There was no statistical evidence of injuries being associated with children's age or sex, autism, social fragmentation, or being of Native American descent.

Evidence statement 14a (ES14a): All Environments – All Injuries – Child age

There is evidence from 12 studies (4 UK). There is evidence of a strong association (compared with newborns aged up to 6 weeks) between children aged 7-24 months and injuries. There is evidence of weak to moderate association of injuries with increasing age (≥ 4 years versus < 4 years), children aged 15-54 months (versus < 6 months), and increasing age amongst children with a disability, There was no statistical evidence of injuries being associated with increasing age in the case of head injuries.

Evidence statement 14b (ES14b): All Environments – All Injuries – Sex of child

There is evidence from 16 studies (4 UK). There is evidence of weak to moderate association of injuries (of all severities, including fatalities) with being male.

Evidence statement 14c (ES14c): All Environments – All Injuries – Child ethnicity

There is evidence from 8 studies (1 UK). There is mixed evidence regarding the association of child ethnicity with injuries. There is evidence of weak to moderate association of injuries with being of Black or Native American descent. There was no statistical evidence of injuries being associated with being of Asian descent or a wide range of other ethnicities.

Evidence statement 14d (ES14d): All Environments – All Injuries – Child behavioural factors

There is evidence from 9 studies (5 UK). There is evidence of weak to moderate association of injuries with borderline hyperactivity, high emotional symptoms, high conduct disorder, and behavioural difficulties.

Evidence statement 14e (ES14e): All Environments – All Injuries – Other Behavioural Characteristics

There is evidence from 9 studies (1 UK). There is evidence of a strong association between life events (such as exams), Attention Deficit Hyperactivity Disorder, and psychopathology and injuries. There is evidence of weak to moderate association of injuries with children's consumption of alcohol, being ill in the past month, the period of time 10 to 90 days after an unintentional injury occurring to a sibling, greater physical

development and physical activity, and emotional and behavioural problems. There was no statistical evidence of injuries being associated with autism, medical problems, or developmental issues.

Evidence statement 14f (ES14f): All Environments – All Injuries – Family’s Socio-Economic Status

There is evidence from 27 studies (6 UK). There is evidence of weak to moderate association of injuries with socio-economic deprivation. There is no statistical evidence of injuries (reported in some studies) being associated with socio-economic deprivation within certain age categories. There is mixed evidence regarding the association of parental educational attainment and household income with injuries.

Evidence statement 14g (ES14g): All Environments – All Injuries – Household Members

There is evidence from 14 studies (3 UK). There is evidence of weak to moderate association of injuries with unmarried parents and a greater number of children in the household. There was no statistical evidence of injuries being associated with presence of either single parents, two parents, biological or step-parents, female head of households, or a higher number of household members.

Evidence statement 14h (ES14h): All Environments – All Injuries – Parental Characteristics

There is evidence from 22 studies (6 UK). There is evidence of weak to moderate association of injuries with mental illness, maternal perception of locus of control, community social support, post-natal or maternal depression, adverse life events, parental substance misuse, mother’s age of <20 years at time of child’s birth, and below average consistency parenting. There was no statistical evidence of injuries being associated with parental unemployment, family functioning or positive parenting. There is mixed evidence regarding the association of mother’s age at the time of child’s injury with the occurrence of injuries.

Evidence statement 14i (ES14i): All Environments – All Injuries – Neighbourhood Characteristics – Socio-Economic Status

There is evidence from 8 studies (4 UK). There is evidence of weak to moderate association of injuries with socio-economic deprivation, but no evidence of association between other indicators of neighbourhood disadvantage and the occurrence of unintentional injuries.

Evidence statement 14j (ES14j): All Environments – All Injuries – Neighbourhood Characteristics – Urban/Rural

There is evidence from 4 studies (0 UK). There is mixed evidence regarding the association of urban or rural location with the occurrence of injuries.

Evidence statement 14k (ES14k): All Environments – All Injuries – Institutional Characteristics

There is evidence from 2 studies (0 UK). There is evidence of weak to moderate association of a *reduction* in injuries (in children aged 1-6 years) with the implementation of municipality level safety measures. There was no statistical evidence of injuries being associated with the time spent by children in child or family day care centres or of a *reduction* in injuries (in children aged 7-15 years) with the implementation of municipality level safety measures.

2. STRATEGIES TO PREVENT UNINTENTIONAL INJURIES AMONG UNDER-15S

Evidence statements

International comparative analyses of injury prevention policies, legislation and other activities (Park et al. 2009)

Evidence statement 1 (ES1):

There remains a lack of comparable and in depth exposure to risk information to help in analysis of the relative impact of different legislative, regulatory, enforcement and compliance interventions (Towner and Towner 2002 +; Christie 2007 +; Christie et al 2004 +).

Evidence Statement 2 (ES2):

Two ecological studies (Mackay and Vincenten 2007 +; ENHIS 2007-) in high income countries were unable to associate variations in child morbidity and/or mortality rates across countries to differences in legislation, regulation, enforcement and compliance for road environment modification, road design, home and leisure environment interventions. However for road safety, evidence from two ecological studies, one of moderate quality and the other strong, (Christie et al 2004+; Bly et al 1999 ++) suggest a weak trends towards better performing countries (in terms of child fatality rates) having more road environment modification and road design measures in place.

Evidence Statement 3 (ES3):

Evidence from one well-conducted ecological study (Bly 1999 ++) indicates that differences in the distribution of exposure in the road environment for child pedestrians (in particular relating to time spent near busy main roads) can explain some of the difference in severe child injury and fatality rates between Great Britain and two other northern European countries, France and the Netherlands.

Evidence statement 4 (ES4):

No international comparative studies of specific road design and road modification interventions that focused on child injury prevention were identified; area wide comparative studies at a local level were identified but excluded from this review process.

Evidence statement 5 (ES5):

No international comparative studies of specific home safety equipment were identified; area wide comparative studies at a local level were identified in some areas but excluded from this review. No international comparative studies looking at the role of regulation and legislation for home safety assessments could be identified

Evidence statement 6 (ES6):

Few international comparative studies looking at the role of legislation, regulation, enforcement and compliance in preventing specific leisure related injuries could be identified. One area where studies were identified referred to all terrain vehicles (ATVs). Weak evidence from one ecological study (Helmkamp 2000) suggests that US states

with legislation to reduce the risk of injury from all-terrain-vehicles have lower rates of fatal accidents than US states without legislation. Evidence from another ecological study (Keenan et al 2004 +) suggests that helmet wearing when using ATVs is significantly greater in one US state with a long standing law than in another state without any legislation. ATV related studies are of some relevance to the UK where quad bikes are used and child injuries have been reported. Weak evidence from one ecological study (Rice 2001 -) indicates that legislation in US states with high childhood fatality rates from snowmobiling does not comply with longstanding guidelines which recommend a ban on the use of snowmobiles by the under 17s. Snowmobiles are of very limited direct relevance to the UK, although they are used in the winter in parts of Scotland, while children from the UK may use them elsewhere if on winter holidays.

Evidence statement 7 (ES7)

No international comparative studies looking at the role of surveillance and monitoring systems in influencing the use of legislation, regulation, enforcement and compliance interventions could be identified. International databases had though been used as a source of injury data in studies identified (Christie 2004 +; Bly 1999 ++; Mackay and Vincenten 2007 ++). Other reports indicate the use of international surveillance systems to assist in determining and monitoring progress on targets for injury prevention (International Transport Forum, 2008, Petridou, 2000).

Evidence statement 8 (ES8):

No international comparative studies looking at the association between the use of legislation and regulation in respect of professional qualifications and ongoing training for professionals who come into contact with children and rates of childhood injury were identified in this review.

Strategies and frameworks to prevent unintentional injuries among under 15s – road design (Anderson and Moxham, 2009)

Evidence Statement 1 (ES1). Impact on road safety of speed enforcement devices

There is moderate evidence from 3 recent systematic reviews that speed enforcement devices (cameras, lasers or radar) will often reduce road injuries, and serious/fatal injury crashes/collisions in the vicinity of the devices (Pilkington & Kinra 2005[+]; Thomas, Srinivasan, Decina, & Staplin 2008[+]; Wilson, Willis, Hendrikz, & Bellamy 2006[+]). The Pilkington and Kinra 2005 review also concluded that similar size of speed reduction effects were observed over wider geographical areas around the enforcement device sites. The size of the observed reductions in different studies, and in different localities within studies, varies considerably. Similarly, in those studies where enforcement devices were temporarily placed at certain locations, the duration of speed reductions after removal of the devices (the time halo) varied from 1 day to 8 weeks (Wilson et al, 2006[+]). However, none of the systematic reviews were able to identify factors which were consistently associated with higher injury or crash reductions (such as automated vs non-automated detection, mobile vs fixed, covert vs overt, urban vs motorway, or on roads with different speed limits). Nor did included studies consistently state what the penalties or fines would be for detected speeding, although the Cochrane review implied there was a relationship between size of pre-/post- reduction in speeding vehicles and the speed threshold set (Wilson et al, 2006[+]).

This evidence is judged as directly applicable to the UK. This is because some of the

studies were from the UK, and the results from these studies were generally consistent – in direction of effect, if not always size of effect – with the studies from other developed countries in the reviews. However, where reported (e.g. Wilson et al, 2006[++]), it seems that most evaluations of the effectiveness of speed enforcement devices have been conducted either in rural or semi-rural areas, or on roads with speed limits of 60kph or over. Therefore the relevance of this evidence for reducing road injuries in environments where children are likely to be pedestrians is probably limited.

Evidence Statement 2 (ES2). Impact on road safety of intensified and/or rationalised police enforcement activities

There is weak evidence from 3 controlled before and after studies (in Australia, Israel and California) that increased or rationalised police enforcement of traffic speeds reduces injury crashes ([+] Newstead et al. 2001), car accidents ([+]Hakkert et al. 2001) and collisions, injury collisions, fatalities and speed-related fatalities ([-]Davis et al. 2006). There is also weak evidence from 3 multivariate analyses of longitudinal road accident/injury data (in New Zealand, California and Greece) that increased levels of police enforcement of traffic speeds reduces injury crashes and all injuries ([-]Povey et al. 2003), fatal accidents ([+]McCarthy 1999), and injury accidents ([+]Yannis et al. 2008). There is also moderate evidence from 1 controlled before and after study, on motorways in the Netherlands, that increasing the intensity of enforcement – from apprehending 1 in 100 speeding offenders, to 1 in 25, to 1 in 6 – produces statistically significant ($p < 0.05$) reductions in mean speed (1kmh for 1:25 vs 1:100; and 3.5kmh for 1:6 vs 1:25) ([+]De Waard&Rooijers 1994).

This evidence is judged as partially applicable to road safety policy in the UK. This is because in the included studies there are a number of differences in the way police forces are organised and contribute to speed enforcement. Also, in the role of the police in enforcing speed limits through speed traps and mobile cameras/radar needs to be considered in the context of the widespread use of fixed site automated cameras around the UK road network.

Evidence Statement 3 (ES3). Impact on road safety of convictions and reports for traffic offences

There is inconsistent evidence from 1 case cross-over study and 1 multivariate regression-based analyses of longitudinal data (from Canada, and Israel respectively), that higher rates of issuing traffic convictions reduces fatal road accidents ([+]Beenstock et al. 2001;[++] Redelmeier et al. 2003). The case cross-over study found a short-term effect on the future risk of fatal accidents, but the multivariate regression analysis found no effect on fatal road accidents. It should be noted that: the accident risk reduction effects of the conviction on the convicted driver appear to last less than 4 months ([++] Redelmeier, Tibshirani, & Evans 2003); that speeding convictions with penalty points were associated with a larger relative risk reduction than those without (51% vs 0%, $p = 0.011$); that a 1% increase in convictions is estimated to cause accidents (fatal and non-fatal) to fall by only 0.00358% ([+]Beenstock, Gafni, &Goldin 2001); and that only large scale increases in enforcement have a measurable effect on road accidents ([+]Beenstock, Gafni, &Goldin 2001). Neither of these two studies separately reported any estimates of effectiveness in relation to non-fatal injuries or non-fatal road accidents. Apart from the different effectiveness result relating to receiving penalty points (Redelmeier et al 2003, above) neither of the studies reported any other impact of different possible punishments following conviction or apprehension (e.g. different levels

of fines or points, or attendance at speed awareness courses); in fact, most studies about speed enforcement gave no details of the range of consequences of being caught speeding.

This evidence is judged as partially applicable to road safety policy in the UK. This is because in the UK the specific balance of fines and penalty points for speeding, and the more widespread network of fixed speed cameras may alter the responsiveness of British drivers to mobile police-administered speed enforcement. In addition, for various reasons, these 2 studies were only judged as partially [+] and poorly applicable [-] within their own country.

Evidence Statement 4 (ES4). Impact on road safety of increasing financial penalties for speeding

There is inconsistent evidence from 1 regression-based analyses of longitudinal vehicle speed data (from Norway), and 1 uncontrolled before and after study (from Pennsylvania USA), that increasing fines for speeding offences reduces speeding ([+] Babusci et al. 2006;[+] Elvik & Christensen 2007). In the Norwegian study of over 60 speed-monitored road sections around the country, gradual but substantial increases in fines over a 9-year period produced either no increase, or both increases and decreases in the percentage of drivers complying with the speed limits (at the two types of sites, and with alternative regression models)([+]Elvik& Christensen 2007). However, in the USA study, the combination of introducing a doubling of fines and improved signing about the “double fine zone” on 5 designated Highway Safety Corridors achieved statistically significantly lower percentages of drivers exceeding the speed limit (-2% to -15%) and lower percentages exceeding the speed limit by more than 10mph (-1% to -21%), at 1 month and 6 months after the introduction of double fines and new signing.

This evidence is judged as partially applicable to road safety policy in the UK. This is because in the UK the existing balance and perceived cost of fines and impact of penalty points for speeding, together with the perceived risks of apprehension, may be quite different to those in Norway in the 1990s and the USA. In addition, for various reasons, these 2 studies were only judged as partially applicable within their own countries.

Evidence Statement 5 (ES5). Impact of driver licence penalty points systems

There is weak evidence from 1 small uncontrolled before and after study (in Ireland), that introducing a driver licence Penalty Points System reduces the number of hospital-treated road traffic trauma cases ([-]Donnelly et al. 2005). Although the number of Road Traffic Accident injuries in the 6-month period after the introduction of the Penalty Points System (70) was nearly half that in two 6-month periods before its introduction (124, 125), this could be due to a range of other background changes in traffic safety or hospital admissions (and the statistical significance of the changes is not assessed). There is suggestive evidence of an even greater relative reduction in serious head injuries (from 29 and 34, down to 18) and thoracic injuries (from 29 and 26, down to 13) This evidence is judged as not applicable to national road safety policy in the UK since a driver licence penalty point system already exists here. Also, because most of the data came from only one hospital in one region of Ireland, the study was judged as only partially applicable to the rest of Ireland.

Evidence Statement 6 (ES6). Impact of methods for communicating traffic infringements

There is moderate evidence from 1 RCT with survival analysis and 1 controlled before,

during and after study of longitudinal data (in Oregon USA, and The Netherlands), that the use of appropriately worded letters to communicate traffic offences (or high accident records) can affect subsequent speeds or accident rates ([+]De Waard & Rooijers 1994;[++]Jones & Jones 1997). In the study in Oregon ([++]Jones & Jones 1997), amongst a large sample of speeding offenders and those with a recent poor accident record, on average those randomly assigned to receive the standard letter (including a list of recent accidents and violations, and clearer threat of further sanctions) had fewer subsequent accidents over the next 2 years than those who received the „soft sell □ letter; however, there were age and gender differences in responsiveness to each letter type, with women and those older than 44 more likely to have relatively fewer accidents following the soft sell letter). In the study on motorways in The Netherlands ([+]De Waard & Rooijers 1994), the road section where people received a mailed fine preceded by a feedback letter reduced mean speeds by 3.1kmh, and without the letter by 2.0kph (but the statistical significance of the difference between the two reductions was not reported).

This evidence is judged as partially applicable to road safety policy in the UK. This is because in the UK the existing balance and perceived financial cost of fines and penalty points and social stigma for speeding offences may be quite different to those in the USA or in the Netherlands. In addition, for various reasons, these 2 studies were only judged as partially applicable within their own country.

Evidence Statement 7 (ES7). Impact of media campaigns alongside speed enforcement

There is inconsistent evidence from 2 regression-based analyses of longitudinal data (from Australia, and New Zealand), that having media campaigns alongside speed enforcement helps reduce casualty crashes or crash severity (Cameron et al. 2003[+]) or reduce fatalities or fatal crashes (Guria & Leung 2004[+]).

This evidence is judged as partially applicable to national road safety policy in the UK. This is because in the UK and its constituent countries there may be different responsiveness to new road safety media campaigns in the light of the effectiveness of past media campaigns. Also, the UK has a denser road network with higher traffic volumes, and there is a probably a different background level of automated and other speed enforcement activity which may alter the potential gains of media campaigns.

Evidence Statement 8 (ES8). Impact of having quantified national road safety targets

There is inconsistent evidence from 3 international before and after studies, that having national quantified road safety targets helps reduce road injuries (Elvik 2001[+]; Elvik 1993[+]; Wong et al. 2006[+]).

This evidence is judged as partially applicable to national road safety policy in the UK. This is because in the UK and its constituent countries there are already a number of national road safety targets, so to add more (or prematurely change those already set) may have less of an impact than in countries where (a) no or very few quantified road safety targets exist and (b) there is more progress to be made in achieving the road injury rates of those countries with the best road safety performance.

Strategies and frameworks to prevent unintentional injury in under 15s – home (Garside and Moxham, 2009)

Evidence statement 1 (ES1): Smoke detector law

There is evidence from one controlled before and after study (+) in the USA that law requiring the installation of smoke detectors, increases the number of houses which have at least one functioning smoke detector and that this may reduce fatalities related to fires in targeted properties (McLoughlin et al, 1985).

Knowledge of the law and the penalty for non-compliance may be associated with greater smoke detector installation than knowledge of the law only.

The law assessed required smoke detectors in all bedroom areas of one-, two- and multi-family dwellings, applied retrospectively to homes built prior to the law, and can be enforced by a fine or jail time. In addition, sale of a property is contingent on appropriate smoke detectors being present.

Given the differences in legal systems, responsibilities and enforcement between the USA and the UK, and the high socioeconomic status of the studies communities, the applicability of this finding has been assessed as poor. However, the observations that systems of enforcement which involve regular inspection, with a system of warnings prior to prosecution are effective; that laws which reflect societal laws are effective and that media campaigns to support the introduction of new laws may be important, may be applicable across other settings.

Evidence statement 2 (ES2): Window guard law

There is evidence from one comparative study in the USA (+) that window guard legislation in New York city reduces child injury related to falls from buildings by about half, despite greater numbers at risk as residents of multi family dwellings (1.5/100,000 children aged 0-18 compared with an average of 2.81/100,000 in 27 state other US states without legislation, and 3.0/100,000 in Massachusetts which introduced interventions without legislation) (Pressley & Barlow, 2005).

The law assessed required owners of multiple-family dwellings to provide window guards in apartments where children, aged 10 or under, live (half the injuries recorded in NYC were in those aged 11-18). Compliance is subject to annual enforcement. The introduction of the law was accompanied by a coordinated education and advertising programme (Children Can't Fly) which involved outreach, dissemination of literature, a media campaign and the distribution of free window guards.

Given the differences in legal systems, responsibilities and enforcement between the USA and the UK, and the differences in housing stock and management, the applicability of this finding has been assessed as poor. However, the observation that effective enforcement is a key element of legislative success may be applicable across a range of settings.

Evidence statement 3 (ES3): Hot water tap temperature law

There is mixed evidence from four uncontrolled before and after studies about hot water tap temperature legislation (Erdmann et al, 1991, USA, [+]; Leahy et al, 2007, USA, [+]; NSW Health 1998 Australia, [+]; Spallek et al, 2007 Australia, [+]).

Two studies reported that the annual incidence of burn injuries in children increased after the introduction of legislation (Leahy et al, 2007, New York, [+]; in children aged 0-4years; Spallek et al, 2007, Queensland, [+]; in children aged 4-13 years), and a further study (Erdmann et al, 1991, Washington state, [+]) found that injury rates were raised compared to the period immediately prior to legislation being introduced but fell in relation to an earlier comparator time-period (Erdmann et al 1991, [+]). Only the study by Spallek et al (2007, [+]) reported p-values, but this was a significant increase (p=0.01).

One study (New South Wales) suggested there may be a decrease in the number of scald injuries however, the reported differences were non-significant ($p=0.57$) (NSW Health, 1998, [+]; in children aged 0-4).

The legislation assessed by the Australian studies was Hot Water Burns Like Fire which was a campaign to promote building code regulations introduced in 1994 (in New South Wales) and 1998 (in Queensland). These regulations require all new homes, and those undergoing major renovations, to install a tempering valve which limits bathroom hot water temperature to 50°C (122°F). This had been preceded in NSW by social marketing campaigns which focused on increasing awareness of the dangers of scalding for children and, in particular, the dangers of hot tap water, among parents, relevant industry and trade groups.

The USA studies assessed two different pieces of legislation. From 1997, title 27 of the New York City Administrative Code was amended to require water heaters in all newly built or renovated multi-unit dwellings to have a maximum temperature setting of 49°C (120°F). While in Washington state since 1983, all new water heaters have been required to be set at a maximum temperature of 49°C (120°F) and water heaters in rental properties must be reset to this temperature each time a new tenant moves in and warning labels must be displayed. The law is supported by the annual notices to gas and electric customers warning of the danger of hotter water and promoting lower temperature as safer providing energy savings. It is permitted, however, for home owners and tenants to turn up the thermostat if they prefer.

Given the differences in legal systems, responsibilities and enforcement between the USA and Australia and the UK, and the differences in housing stock and management, the applicability of these findings have been assessed as poor. However, the observation that legislation aimed at safety in the home may be limited in its effectiveness where it is implemented only in that housing stock where access and enforcement is easier (such as in rented or newly built accommodation only), may be applicable across a range of settings.

Evidence statement 4 (ES4): Swimming pool fencing law

There is mixed evidence from four studies (2 case control, and 2 comparative) about swimming pool fencing legislation (Morgenstern et al, 1990, USA [+]; Morrison et al, 1999, New Zealand [-]; Stevenson et al, 2003, Australia [+]; Van Weerdenburg et al, 2006, Australia [-]).

2 studies (1 USA and 1 Australia) suggest that legislation is ineffective where it only requires 3-sided fencing. The US study suggests no impact of such legislation on drowning in children aged <10 years old compared to no legislation (OR 1.27 95% CI 0.72, 2.25) (Morgenstern et al, 2000 [+]). The Australian study found the incident rate ratio of drowning in children aged <5 years old living in houses with three sided rather than four sided pool fencing was 1.78 (95% CI 1.14, 1.79) (Stevenson et al, 2003 [+]).

3 studies (2 Australia, 1 New Zealand) report on outcomes related to legislative management and compliance (Morrison et al, 1999 [-]; Stevenson et al, 2003 [+]; Van Weerdenburg et al 2006 [-]).

The New South Wales study found that a more structured and comprehensive approach to inspection (including a register of owners, annual inspections, and enforcement of the act including fines) resulted in twice the level of compliance as those with less structured/ detailed approaches (Van Weerdenburg et al, 2006 [-]). Key informant interviews also suggest that lack of clarity in the fencing act, and failure to detail how

councils should ensure compliance, including how it should be funded, hampered effective implementation.

The Western Australia study suggests that compliance is highest immediately after legislation is introduced, and falls off thereafter, although regular inspection enhances compliance (Stevenson et al, 2003 [+]).

The New Zealand study found no association with compliance rates and: local authorities having written policies about locating and inspecting pools; a re-inspection programme; or advertising of pool owners obligations under the relevant act (Morrison et al, 1999 [-]). The USA study is set in Los Angeles county, which has had an ordinance in place since 1967 requiring a 1.5m (5") fence or barrier with self-latching gates around all domestic swimming pools. The ordinance was interpreted by the Building and Safety Department to allow a residence wall, including doors and windows, to form part of the barrier (three-sided fencing). Until 1988, most cities in the county enacted their own locally enforced fencing ordinances for residential pools; however, all apply to in-ground and above-ground pools at least two feet.

Strategies, frameworks and mass media to prevent unintentional injuries among under 15s – outdoor play and leisure (Khalid et al, 2009)

Evidence statement 1 (ES1): Impact of legislation (with minimal or no enforcement) on bicycle helmet use and head injury

There is moderate evidence from five controlled before-and-after studies to show that legislation mandating the use of bicycle helmets for children (without enforcement) can increase compliance with helmet use and also decrease head injuries related to riding bicycles, which is the ultimate goal of such legislation (Ji et al 2006 [+]; Lee et al. 2005 [+]; Macpherson et al. 2002 [+]; Cote et al. [+]; Hagel et al. [+]).

In terms of compliance with the legislation, three CBA studies – 2 from the USA, 1 from Canada (Cote et al. 1992 [USA]; Hagel et al. 2006 [Canada]; Ji et al. 2006 [USA]) found that the rate in increase in helmet use for children over the study periods ranged from between 43% (Cote et al. 1992) and 84% (Ji et al. 2006) per year. In the studies by Ji et al. (2006) and Hagel et al. (2006), helmet use by adults served as comparators, while two counties without legislation served as comparators in the Cote et al. (1992) study. In the Ji et al. (2006) study, helmet use as reported by injured cyclists post-injury increased significantly amongst children post legislation (OR 1.84, 95% CI 1.48 – 2.28), with a concurrent smaller trend amongst adult controls for increased helmet wearing (OR 1.17, 95% CI 1.00 – 1.38). Results of Cote et al. showed that in crude helmet use in Howard County (intervention) was 4% at baseline and rose to 47% at follow-up, while in Montgomery County (control – educational campaign), helmet use at baseline was 8% and rose to 19% at follow-up; and in Baltimore County (no intervention), helmet use was 19% at baseline and 4% at follow-up. Results of the Hagel et al. (2006) study showed that the prevalence of helmet use amongst children increased significantly (Prevalence Ratio 2.96, 95% CI 2.22-3.94) and remained unchanged in the adult population.

Three CBA studies that assessed the impact of helmet legislation on bicycle-related head injuries - 2 from the USA, 1 Canada (Ji et al. 2006 [USA]; Macpherson et al. 2002 [Canada]; Lee et al. 2005 [USA]) all reported a significant protective effect of helmet laws on head injuries.

Applicability: The studies are deemed to only be partially applicable to the UK. This is

because none of the studies was carried out in the UK and there are environmental and legislative differences between the UK and Canada/USA such as differences in cycling rates, design of bicycle paths, etc.

Evidence statement 2 (ES2): Impact of police enforcement of existing legislation on bicycle helmet use

There is moderate evidence from one controlled before and after study to show that enforcement of existing legislation can increase compliance with helmet use (Gilchrist et al. 2002 [+]).

The study was conducted in rural Georgia, USA, and revealed that without enforcement, the state and local laws did not prompt helmet use in the community, as none of the 97 observed riders (adults and children) wore a helmet before the programme started. However, active police enforcement, coupled with helmet give-away and education was effective, as during the next five months, helmet use among 358 observed children averaged 45%, a significant increase ($p = 0.001$) in all race and gender groups. In contrast, adult use (which served as control) did not change significantly.

The effect of programme was not only sustained (two years after its initiation, 54% of child bicycle riders (21/39) were observed to be wearing a helmet) but may also have improved general safety behaviour/norm (during the 2-year follow-up, children were seen to be wearing bicycle helmets while participating in other activities that did not mandate them to wear them: 2 children rollerblading, all 3 children jumping on a trampoline, as well as 3 children walking along a street without bicycles).

However, it is difficult to tell if the addition of the helmet give-away and educational programmes had any confounding effects on the enforcement component; or if indeed enforcement alone motivated helmet use.

Although both the UK and the US, where this study was conducted, are at par, in terms of economic development, the evidence was judged not to be applicable to the UK scenario as bicycle helmet legislation or their enforcement do not apply in this country. Applicability: The evidence is deemed as currently not applicable to the UK setting (as bicycle helmet legislation does not apply in the UK); however it might become applicable if bicycle helmet legislation were brought in.

Evidence statement 3 (ES3): Impact of mass media campaigns on bicycle helmet use and head injury

There is moderate-to-weak evidence from two controlled before-and-after studies to show that mass media campaigns, employed as part of a broader non-legislative strategy (that involved educational programmes and purchase subsidies) were effective in increasing compliance with bicycle helmet use (Bergman et al. 1990 [+]; Lee et al. 2000 [-]). There was also moderate evidence from uncontrolled before-and-after data from one of the studies (Lee et al. 2000) that such programmes helped to reduce the rates of bicycle-related head injuries in the intervention area.

In the US study by Bergman et al. (1990), the sales of one brand of a youth helmet in the Seattle area (intervention area) rose from 1500 to 22,000 over a 3-year period (no figures stated for the control area) while observed helmet usage rate among school-age children increased from 5% to 16% compared with a rise of only 1% to 3% in a control community, Portland, Oregon, over the same period (Bergman et al. 1990)

In the UK study (Lee et al. 2000) self-reported helmet use among 11-15 years olds living in the campaign area increased from 11% at the start of the campaign to 31% after five years ($p < 0.001$), with no significant change in the control group. Hospital casualty figures in the campaign area (Reading) for cycle related head injuries in the under 16 years age group, fell from 112.5/100 000 to 60.8/100 000 (from 21.6% of all cycle injuries to 11.7%; $p < 0.005$). No injury data were provided for Basingstoke, the control (Lee et al. 2000) Applicability: The evidence is judged to be directly applicable to the UK – one of the studies (Lee et al. 2000) was carried out in the UK and although the Bergman study was carried out in the US, it was embarked upon and completed before the introduction of a bicycle helmet legislation, so in a sense the settings reflected what is currently obtainable in the UK, a country without mandatory helmet wearing legislation. Furthermore, both countries are similar in terms of living standards and economic development.

Evidence statement 4 (ES4): Effect of compliance with playgrounds standards on injury rates among children during play/leisure

There is mixed evidence from two controlled before and after studies that removal and replacement of unsafe equipment is an effective strategy for preventing playground injuries (Howard et al. 2005; Sibert et al. 1999).

The Canadian study (Howard et al. 2005) demonstrated statistically non significant reduction in equipment-related injury rate in the intervention schools after replacement of equipment using the new Canadian Standards Association standards (RR=0.82 to 0.66 to 1.03). This translated into 177 equipment-related injuries avoided during the study period. The comparable equipment-related injury rate in the non-intervention schools increased by about 15% after the study period, although not statistically significant (RR=1.15; 95% CI 0.96 to 1.37). The overall injury rate reduced in the intervention schools (RR= 0.70; 95% CI 0.62 to 0.78) and increased in the non-intervention schools (RR=1.40; 95% CI 1.07 to 2.53) after the study period. However, in the UK study, injury rate per observed child was significantly reduced in the five playgrounds where changes (use of greater depth of bark and replacement of over head horizontal ladders with rope climbing frame) had been made compared to the control playgrounds without changes (Sibert et al. 1999). Applicability: The non-UK study (Howard et al. 2005), (Canada) is only partially applicable to the current UK context due to similarities in level of economic development, nature of the playgrounds, as well as targeted populations. The Sibert et al.1999 (UK) findings are directly applicable.

Evidence statement 5 (ES5): Impact of fireworks legislation on fireworks related injuries among children during outdoor play and leisure

There is weak evidence from two before and after studies (from UK and Italy) and one retrospective time series (from UK) on the effect of fireworks legislation and enforcement activities on firework related injuries.(D'Argenio et al. 1996; Edwin et al. 2008; Fogarty & Gordon 1999)

One study in Italy reported that a comprehensive, multifaceted programme, comprising the combination of enforcement of fireworks law, media campaign and education reduced the rate of fireworks related injury from 10.0/100 000 before the intervention programme to 6.1/100 000 after it was implemented (D'Argenio et al. 1996), and a time-series based study found that amendments to restrictive fireworks

legislation led to a reduction of firework related injury in children (Edwin et al. 2008).

The other study from Northern Ireland, however (Fogarty & Gordon 1999), did not find a significant increase in fireworks related injuries requiring hospital admission following liberalisation of the law on fireworks sale (incidence of admissions before: 0.38/100000; after: 0.43/100000). However, the annual number of injuries in this study was already very small relative to annual variations. Applicability: The Italian study (D'Argenio 1996, Italy) is partially applicable to current UK context while the Fogarty & Gordon 1999 and Edwin et al 2008 (UK) findings are directly applicable. However, the Northern Ireland study (Fogarty & Gordon 1999, UK) may not be directly applicable to the rest of UK because of the civil unrest reported in that part of the kingdom.

Evidence statement 6 (ES6): Impact of drowning prevention campaign on life vests use and ownership among children

There is weak evidence from one before and after study (Bennett et al. 1999; Fogarty & Gordon 1999)[-] in the USA that comprehensive, community based campaign programme (coalition support and involvement, community partnerships, sponsor relationships, news reporting and public service advertising, educational materials and interactive displays) with a focus on increasing the use of life vests, increase the use of life vest.

One study from USA found a significant, although modest, increase in self reported life vest use (OR=1.6; 95% CI 1.1 to 2.5) and ownership (pre-campaign=69%; post-campaign=75%) among children aged 1 to 14 years at beaches, pools, or docks after three year drowning prevention campaign. Programmes targeting life vest use may want to consider multiple strategies that could include targeted audiences and messages by water site, increasing parent confidence in fitting a life vest, and life vest availability through discount and loan programmes. During the three years before the campaign, 12 children aged 1-14 years drowned in King County, compared with eight deaths in the campaign. Applicability: The study is deemed to be partially applicable to the UK as it was carried out in the USA a country of similar economic development and probable exposure of children to leisure activities by lakes, sea, rivers and other waterways.

3. PREVENTING UNINTENTIONAL INJURIES IN THE HOME

Evidence Statements

([Pearson, Garside et al, 2009](#))

Evidence statement 1 (ES1): Free or discounted supply of home safety equipment

There is evidence from 1 RCT (Woolf et al 1992 [+], USA) about interventions with free or discounted supply of home safety equipment. This evidence is only partially applicable as it was not conducted in the UK. (1)

Injuries

1a. There is no evidence presented on injury outcomes in the report evaluating the free or discounted supply of home safety equipment (Woolf et al 1992).

Installation of home safety equipment

1b. There is weak evidence from 1 RCT (Woolf et al 1992 [+]) to suggest that mailing cupboard locks free-of-charge (to families where a child had recently experienced a poisoning incident) had a statistically significant effect on the installation of such locks ($p=.001$).

Home safety knowledge and behaviour

1c. There is weak evidence from 1 RCT (Woolf et al 1992 [+]) to suggest that the mailing of a safety information leaflet with free cupboard locks (to families where a child had recently experienced a poisoning incident) had no statistically significant effect on the home safety behaviour of parents.

Evidence statement 2 (ES2): Free or discounted supply and installation of smoke alarms

There is evidence from two cluster RCTs (DiGuseppi et al 2002 [++], UK; Harvey et al 2004 [+], USA) and two CBAs (Douglas et al 1998 [+]; Mallonee et al 1996 [+], both USA) about interventions with free or discounted supply and installation of smoke alarms. This evidence is only partially applicable to the UK as only one study was conducted in the UK.

Injuries

a. There is inconsistent evidence about impact on injury from one cluster RCT (DiGuseppi et al 2002 [++]) and one CBA (Mallonee et al 1996 [+]). There is evidence from the better quality cluster RCT (DiGuseppi et al 2002) that the free supply and installation of smoke alarms had no significant effect on the incidence of fire-related hospitalisations and deaths. (Rate ratio 1.0 (95% CI 0.5, 2.0)). However, the CBA study (Mallonee et al 1996) suggests that the free supply and installation of smoke alarms decreased the incidence of fire-related injuries (within-group pre-post intervention comparison: 0.2 (95% CI 0.1, 0.4) for the intervention group and 1.1 (95% CI 0.7, 1.7) for the remainder of the city).

Installation of home safety equipment

b. There is inconsistent evidence about impact on rates of installation of home safety equipment from two cluster RCTs (DiGuseppi et al 2002 [++]; Harvey et al 2004 [+]) and one CBA (Mallonee et al 1996 [+]). There is evidence from the better quality cluster RCT (DiGuseppi et al 2002) that the free supply and installation of smoke alarms had no significant effect on the installation or functioning of smoke alarms within households (Rate ratio 1.0 (95% CI 0.4, 2.4)). However, there is evidence from another cluster RCT that the free supply and installation of smoke alarms had a significant effect on the installation and functioning of smoke alarms: OR 4.82 (95% CI 3.97, 5.85) (Harvey et al 2004). Mallonee et al (1996) reported that 51% of intervention households (identified as being without a smoke alarm prior to the intervention) had a correctly installed and functioning smoke alarm at 12 months follow-up.

Home safety knowledge and behaviour

c. There is no evidence presented on home safety knowledge and behaviour outcomes in the reports evaluating the free or discounted supply and installation of smoke alarms (DiGuseppi et al 2002; Douglas et al 1998; Harvey et al 2004; Mallonee et al 1996).

Evidence statement 3 (ES3): Free or discounted supply of home safety equipment with safety education

There is evidence from four RCTs (Clamp & Kendrick 1998 [++], UK; Posner et al 2004

[++], USA; Sangvai et al 2007 [-], USA; Sznajder et al 2003 [+], France) about interventions with free or discounted supply of home safety equipment in conjunction with safety education. This evidence is only partially applicable to the UK as only one study was conducted in the UK.

Injuries

a. There is no evidence presented on injury outcomes in the reports evaluating the free or discounted supply of home safety equipment in conjunction with safety education (Clamp & Kendrick 1998; Posner et al 2004; Sangvai et al 2007; Sznajder et al 2003).

Installation of home safety equipment

b. There is moderate evidence from three RCTs (Clamp & Kendrick 1998 [++]; Sangvai et al 2007 [-]; Sznajder et al 2003 [+]) that the free or discounted supply of **smoke alarms** in conjunction with safety education **increases the rate of installation** of these devices (OR 1.14 (95% CI 1.04, 1.25) (Clamp & Kendrick 1998); 16.0 (95% CI 1.50, 171.21) (Sangvai et al 2007); 2.57 (95% CI 1.77, 3.75) (Sznajder et al 2003)).

c. There is weak evidence from two RCTs (Clamp & Kendrick 1998 [++]; Sznajder et al 2003 [+]) about interventions with free or discounted supply of home safety equipment in conjunction with safety education. Outcomes about three types of **home safety equipment** (buffers, electrical outlet covers, and cupboard locks/ latches) are reported, showing **mixed evidence** of effect. Outcomes about other types of home safety equipment (non-slip bathroom items, window locks, fire guards, and stair gates) are presented in one report (Clamp & Kendrick 1998), with only fire guards reported as being more likely to be present post-intervention (based on self-report).

d. There is weak evidence from 1 RCT (Posner et al 2004 [++]) that the free or discounted supply of a range of safety equipment in conjunction with safety education **increases the rate of installation of safety equipment as a whole** (MD 21.1 (95% CI 13.90, 28.30) (Posner et al 2004)) (based on self-report).

Home safety knowledge and behaviour

e. There is strong evidence from four RCTs (Clamp & Kendrick 1998 [++]; Posner et al 2004 [++]; Sangvai et al 2007 [-]; Sznajder et al 2003 [+]) that the free or discounted supply of a range of safety equipment in conjunction with safety education **increases knowledge** about the prevention of **poisoning** (Clamp & Kendrick 1998; Posner et al 2004; Sangvai et al 2007); Sznajder et al 2003) and **scalds** (Clamp & Kendrick 1998; Posner et al 2004).

f. There is inconsistent evidence from three RCTs (Clamp & Kendrick 1998 [++]; Posner et al 2004 [++]; Sznajder et al 2003 [+]) about the effect of free or discounted supply of a range of safety equipment in conjunction with safety education upon **knowledge about**: the prevention of **fires** (Clamp & Kendrick 1998 (increased); Posner et al 2004 (no effect); Sznajder et al 2003 (increased)), **falls** (Clamp & Kendrick 1998 (no effect); Posner et al 2004 (no effect); Sznajder et al 2003 (increased)), and **wounds** (Clamp & Kendrick 1998 (increased); Posner et al 2004 (increased); Sznajder et al 2003 (no effect)).

g. There is weak evidence from one RCT (Posner et al 2004 [++]) that the free or discounted supply of a range of safety equipment in conjunction with safety education **does not increase knowledge** about the prevention of **drowning** (Posner et al 2004).

h. There is weak evidence from one RCT (Sznajder et al 2003 [+]) that the free or

discounted supply of a range of safety equipment in conjunction with safety education **increases knowledge** about the prevention of **suffocation** (Sznajder et al 2003).

Evidence statement 4 (ES4): Free or discounted supply and installation of home safety equipment with safety education

There is evidence from one RCT (resulting in two study reports: Kendrick et al, 2009 [++]; Watson et al 2005 [++], UK) about an intervention with free or discounted supply and installation of home safety equipment (in conjunction with safety education). This evidence is judged as highly applicable as it is recent and from the UK.

Injuries

a. There is moderate evidence from one RCT that free home safety equipment (or its delivery) and installation with safety education has **no statistically significant impact on serious injury rates** in children as measured by secondary care attendance (IRR 1.02 95% CI 0.90, 1.13), hospital admission (IRR 1.02 95% CI 0.70, 1.48), the abbreviated injury scale (OR 1.14 95% CI 0.76, 1.71) or the minor injury severity score (OR 0.98 95% CI 0.75, 1.27) (Watson et al 2005). Primary care attendance appeared to increase (IRR 1.37 95% CI 1.11, 1.70) (Watson et al 2005).

Installation of home safety equipment

b. There is weak evidence from one RCT that free home safety equipment (or its delivery) and installation with safety education **increases the use of smoke alarms at 12 months** (OR 1.83 95% CI 1.33, 2.53) and **24 months** (OR 1.67 95% CI 1.21, 2.32) (Watson et al 2005). The intervention **did not have a statistically significant impact on reducing socioeconomic inequalities** in the uptake and continued use (12 months post-intervention) of **smoke alarms** (Kendrick et al 2009).

c. There is weak evidence from one RCT about free home safety equipment (or its delivery) and installation with safety education. Outcomes showed mixed evidence of effect: **no impact on fire guards being fitted** and always used after 12 or 24 months, and **increased use of stair gates and window locks** at 12 months, but not 24 months (Watson et al 2005).

The intervention **had a statistically significant impact on reducing socio-economic inequalities** in the uptake and continued use (12 months post-intervention) of **stair gates** (Kendrick et al 2009).

Home safety knowledge and behaviour

d. There is weak evidence from one RCT that free home safety equipment (or its delivery) and installation with safety education **may increase the safe storage at 12 months** of cleaning products and sharp objects, but that these effects are **no longer seen after 24 months** for safe storage of sharp objects (Watson et al 2005).

Evidence statement 5 (ES5): Home risk assessment only

There is evidence from one RCT (Paul et al 1994 [-], Australia) about an intervention with home risk assessment only. This evidence is of low applicability to the UK as the intervention is not recent and took place in a rural Australian setting.

Injuries

a. The study about home risk assessments only did not report injury outcomes.

Installation of home safety equipment

b. There is weak evidence from one RCT suggesting that an intervention with home risk assessment only may **increase the use of smooth table top corners** at 5-9 months after the intervention. However, the study does not report the other measured results which do not favour the intervention.

Home safety knowledge and behaviour

c. There is weak evidence from one RCT suggesting that an intervention with home risk assessment only **does not affect knowledge and behaviour around nine out of the 13** measured safety items at 5-9 months.

Evidence statement 6 (ES6): Home risk assessment and free or discounted supply of home safety equipment

There is evidence from two RCTs (Babul et al 2007 [+], Canada; King et al 2001; 2005 [++], Canada), one cluster RCT (Kendrick et al 1999 [++], UK), two CBAs (Hendrickson 2005 [+], USA; Johnston et al 2000 [+], USA), and two BAs (Bablouzian et al 1997 [-], USA; Metchikian et al 1999 [-], USA) about interventions with a home risk assessment and free or discounted supply of home safety equipment. This evidence is partially applicable to the UK as only one of the studies was conducted in the UK.

Injuries

a. There is inconsistent evidence from one RCT (King et al 2001; 2005 [++]) and one cluster RCT (Kendrick et al 1999 [++]) about the effect of a home risk assessment and free or discounted supply of home safety equipment on the **occurrence of medically attended injuries**. There is evidence that injury rates decreased at **12 months** following the intervention (OR 0.75 (95% CI 0.58, 0.96) (King et al 2001)) (outcomes self-reported), but not at **25 months** following the intervention (OR 0.97 (95% CI 0.72, 1.30) (Kendrick et al 1999)). There is evidence that injury rates were decreased (at borderline statistical significance) at **36 months** (OR 0.80 (95% CI 0.64, 1.00) (King et al 2005)) (outcomes self-reported).

Installation of home safety equipment

b. There is inconsistent evidence from two RCTs (Babul et al 2007 [+]; King et al 2001 [++]) and one CBA (Johnston et al 2000 [+]) about interventions with a home risk assessment and free or discounted supply of home safety equipment that included a smoke alarm. Outcomes about the rates of **installation of smoke alarms** (all self-reported) show **mixed evidence of effect** (Babul et al 2007 (no effect); King et al 2001 (increased); Johnston et al 2000 (increased)).

c. There is inconsistent evidence from two RCTs (Babul et al 2007 [+]; King et al 2001 [++]) and two BAs (Bablouzian et al 1997 [-]; Metchikian et al 1999 [-]) about interventions with a home risk assessment and free or discounted supply of home safety equipment. Outcomes about three types of **home safety equipment** (electrical outlet covers, cupboard locks/ latches, and stair gates) are reported, showing **mixed evidence of effect**.

Home safety knowledge and behaviour

d. There is moderate evidence from two RCTs (Babul et al 2007 [+]; King et al 2001 [++]) and one BA (Bablouzian et al 1997 [-]) that a home risk assessment and free or discounted supply of home safety equipment **does not improve home safety knowledge** and behaviour about preventing **fires** or **falls** (Bablouzian et al 1997; Babul et al 2007; King et al 2001 (fires only)).

e. There is inconsistent evidence from two RCTs (Babul et al 2007 [+]; King et al 2001 [++]), one CBA (Johnston et al 2000 [+]) and one BA (Bablouzian et al 1997 [-]) about the effect of a home risk assessment and free or discounted supply of home safety equipment on home safety knowledge. Knowledge about preventing **scalds was improved** (Babul et al 2007; King et al 2001), however there was mixed evidence of effect upon knowledge about the prevention of **poisoning** (Babul et al 2007 (no effect); Johnston et al 2000 (improved); King et al 2001 (no effect)).

f. There is weak evidence from one RCT (Babul et al 2007 [+]) that a home risk assessment and free or discounted supply of home safety equipment **does not improve home safety knowledge** and behaviour about preventing **drowning** (Babul et al 2007).

g. There is inconsistent evidence from one RCT (King et al 2001 [++]) and one CBA (Hendrickson 2005 [+]) about the effect of a home risk assessment and free or discounted supply of home safety equipment on parents' perceived **self-efficacy**. There is evidence from one CBA that there was a significant difference between intervention and control groups in self-efficacy at **6 weeks** follow-up (Hendrickson 2005). However, there is evidence from one RCT that self-efficacy did not improve at **12 months** follow-up (King et al 2001).

h. There is evidence from one BA (Metchikian et al 1999 [-]) that a home risk assessment and free or discounted supply of home safety equipment improves home safety knowledge and behaviour (as a whole) at **4-6 months** follow-up (descriptive data only).

Evidence statement 7 (ES7): Home risk assessment and free or discounted supply and installation of home safety equipment

There is evidence from one CBA (Schwarz et al 1993 [+], USA) and three BAs (Cagle et al 2006 [-], USA; Carman et al 2006 [-], UK; Klitzman et al 2005 [+], USA) about an intervention with a home risk assessment and free or discounted supply and installation of home safety equipment. This evidence is partially applicable as only one of the studies was conducted in the UK.

Injuries

a. Two studies report injury outcomes after home risk assessment and free or discounted supply and installation of home safety equipment (Cagle et al 2006; Carman et al 2006). Carman only presents descriptive statistics, making impact unclear. Cagle suggests that scald injuries are significantly reduced post-intervention, however this conclusion may be unsound due to lack of control group and contamination issues.

Installation of home safety equipment

b. Three studies report on the continued presence and use of installed equipment after home risk assessment and free or discounted supply and installation of home safety equipment (Cagle et al 2006; Klitzman et al 2005; Schwarz et al 1993). There is mixed evidence about the impact on continued working equipment. One study found that 60% of installed hot water tempering valves remained in situ after 6-9 months (Cagle et al 2006). One study found significant improvements in the numbers of households with working window guards and fire extinguishers post-intervention (Klitzman et al, 2005).

Finally, two studies showed significantly more smoke alarms installed and working post intervention (Klitzman et al 2005 $p < 0.0001$; Schwarz et al 1993 OR 0.30 95% CI 0.24, 0.38: showing less alarm absence in the intervention group).

Home safety knowledge and behaviour

c. There is mixed evidence from 2 studies about the impact of home risk assessment and free or discounted supply and installation of home safety equipment on safety knowledge and behaviour. Of the four safety knowledge and behaviour outcomes (reduced hot water temperature, number of scald risks, fire escape plan and medications with child proof caps) reported by these 2 studies, one was positively affected by the intervention (fire escape plan), one negatively affected (hot water temperature increased in intervention group), and the others were not significantly affected.

Evidence statement 8 (ES8): Home risk assessment and discounted supply of home safety equipment with education

There is evidence from one RCT about an intervention with a home risk assessment and discounted supply of home safety equipment (in conjunction with education) (Gielen et al 2002 [++], USA). This evidence is of low applicability to the UK as it is from the USA.

Injuries

a. The study about home risk assessments and discounted supply of home safety equipment with education did not report injury outcomes.

Installation of home safety equipment

b. There is weak evidence from one RCT suggesting that home risk assessments and discounted supply of home safety equipment with education **do not increase** the presence and use of smoke alarms, stair gates, or cupboard locks or latches or the use of a specially built children's safety centre (Gielen et al 2002).

Home safety knowledge and behaviour

c. The RCT does not report on differences in behaviour between the control and intervention groups in terms of safety knowledge and behaviour. It does suggest that those who had visited a safety centre took more action to prevent injury, but no more people from the intervention arm visited the centre than from the control arm.

Summary evidence statement 9 (ES9): Overall impact of home based interventions on rates of injury and installation of safety equipment Injuries

Of the 22 included studies, seven report on the impact of interventions on injury rates.

a. There is inconsistent evidence about impact on injury rate from seven studies: four found no significant reduction in injury with any intervention (three RCTs – DiGuseppi et al 1999, 2000, [++] UK; Kendrick et al, 1990 [+] UK; Watson et al, 2005, [++] UK; and one uncontrolled before and after study – Carmen et al, 2006 [-] UK). The three that *did* suggest injury rates were reduced have limitations due to difficulty in attributing the change to the intervention (Cagle et al, 2006 USA [-], BA) the use of self-reported outcomes and high attrition rates (King et al, 2001, 2005 Canada [++], RCT) and the use of unadjusted analyses, and an atypical high risk setting (Mallonee et al, 1996 USA [+], RCT). The applicability of these findings is partial, with all the studies finding no impact being set in the UK, and those suggesting positive results in North America.

Installation of smoke alarms

Of the 22 included studies, 14 provide information about the installation of smoke detectors post intervention, however, only six used robust designs which both reported observed outcomes and had a control group.

b. There is inconsistent evidence from six robust studies (which use both observed

outcome measures and a controlled study design) about the presence of functional smoke alarms. Four suggest that the intervention increased functioning presence (Harvey et al, 2004 RCT [+] USA; Mallonee et al, 1996 CBA [+] USA; Sangvai et al 2007 RCT [-] USA; Schwarz et al, 1993 CBA [+] USA) and two suggest that no significant impact was seen on smoke alarms (DiGuseppi et al, 1999; 2002 RCT [++] UK; Gielen et al, 2002 RCT [++] USA).

Installation of other home safety equipment

Of the 22 included studies, 19 provide information about the installation of home safety equipment post intervention, however, only one used a robust design which both reported observed outcomes and had a control group.

c. There is evidence from one RCT that home risk assessments with free or discounted supply of home safety equipment with safety education does not increase the functional presence of safety equipment (Gielen et al, 2002, RCT [++]USA).

Evidence statement 10(ES10): Cost-effectiveness of smoke alarm giveaway schemes

There is inconsistent evidence from 2 cost-effectiveness analyses of smoke alarm giveaway schemes with education materials, that such schemes when targeted at high risk areas and households may be cost-effective from a societal perspective (Ginnelly et al. 2005 [+];Haddix et al. 2001 [+]). The UK-based alarm giveaway programme (Ginnelly et al. 2005) was found to be both less effective and more costly than no giveaway programme, whereas the USA based programme (Haddix et al. 2001) was found to be both highly effective and costsaving, compared with no programme. In addition to the fact that one study was in inner-city London (UK) and the other was in a large US city, there were a number of other differences in the characteristics of the intervention, the targeted intervention areas and analysis methods which may explain the directly opposite effectiveness and cost-effectiveness results. In particular, the UK study was based on effectiveness data from an RCT whereas the US study was based on an uncontrolled before and after study; also, the US study included the value of productivity losses associated with fire-related injuries (and for each fatal injury these were over \$0.75 million). The evidence from the UK-based cost-effectiveness study is judged as directly applicable to UK urban settings (Ginnelly et al. 2005). However, the evidence from the older USA-based study (Haddix et al. 2001) is judged as only partially applicable to UK urban settings. There was no evidence from non-urban settings, or of schemes which did not target high risk and low socio-economic status areas.

Evidence statement 11 (ES11) : Cost-effectiveness of home risk assessments

There is weak evidence from one cost-effectiveness study based on a randomised controlled trial in Canadian cities, that a single home visit involving an information package, discount vouchers, and home-specific risk-reduction advice (based on a previous risk assessment) is cost-effective from a health system perspective (King et al. 2001 [-]). This cost-effectiveness conclusion either relies on the assumption that avoiding such injuries to children is worth over C\$372 to society, and/or that the value of other benefits to families and carers (e.g. gained leisure or earnings not lost caring for the injured child) exceeds C\$372. Assessment of the quality of this study was highly compromised by the very small amount of space devoted to describing it within the effectiveness paper. The evidence is from a Canadian study which uses 15-year old data and is therefore judged as only partially applicable to UK family homes; the generalisability of the study's findings beyond Canada is also hindered by the absence

of sensitivity analyses.

Preventing unintentional injuries among under 15s in the home – review of qualitative evidence ([Smithson, Moxham and Garside, 2009](#))

Evidence statement 1 (ES1) : Legal and policy barriers and facilitators to unintentional injury prevention programmes

Five studies (Brannen, 1992, US, [-]; Carr, 2005, UK, [-]; Brussoni et al, 2006, UK, [-]; Gibbs et al. 2005 Australia, [+]; and Mull et al, 2001 US [+]) explicitly cited perceived legal or policy barriers to unintentional injury prevention programmes. Particular weaknesses identified in carrying out fire safety interventions included work being too short-term and fragmented due to lack of coordination of home safety in one central organisation (Brussoni et al, 2006), Weak legislation for landlords of rented accommodation meant that recommendations were not necessarily implemented effectively (Gibbs et al, 2005; Brussoni et al, 2006). Weak regulation on containers of toxic products was a barrier to reducing unintentional injury in the home, as consumer choice allowed toxic products not always to be sold in child resistant containers (Gibbs et al, 2005). Facilitators for prevention programmes aimed at reducing unintentional injuries to children in the home included strong policy drivers or legislation – for example, an obligation under the Fire Services act to councils or landlords to implement services, and the provision of funding to enable this (Brussoni et al, 2006).

Evidence statement 2 (ES2): Provision and timing of information

Three studies (Brannen, 1992, US, [-]; Bennett Murphy, 2001, US, [-]; Brussoni et al, 2006, UK, [-]) found that parents felt there was a lack of information or knowledge about existing policies or supports. Examples included lack of knowledge of poison centre telephone number (Brannen, 1992), and lack of “direct information” on poisoning prevention (Brannen, 1992).

A lack of communication about programs to install smoke alarms limited uptake, especially for the most high-risk families (those in rented accommodation with a rapid turnover of tenants) (Brussoni et al, 2006).

Timing of information was shown to be important. One study (Brannen, 1992) found that parents given information in hospital at the time of a child’s birth did not retain this, while information provided subsequently in a community or physician setting was better retained.

Evidence statement 3 (ES3): Targeting local community to carry out intervention

Three studies (Brannen 1992, USA [-]; Brussoni et al 2006, UK, [-]; Carr 2005 UK [-]) found that partnerships and collaborations between different service providers facilitated the effectiveness of interventions to reduce unintentional injuries to children in low income communities.

Collaborations perceived as useful included multi-agency partnerships between different agencies, and between agencies and hard-to-reach groups, which aided the effectiveness of a UK smoke alarm installation programme (Brussoni et al, 2006), and a partnership between health officials and low income mothers in home safety visits offering advice and provision of safety equipment (Carr, 2005).

The importance of devising information and advice in ways that suit the target community (in terms of language, style, examples used) was noted in both of these

papers dealing with low income populations with many ethnic minorities.

Evidence statement 4 (ES4): Limitations on effectiveness of home safety initiatives due to disempowering effects of living in rented or overcrowded living conditions

Eight studies (Bennett Murphy, US, 2001 [-]; Brannen, 1992, UK, [-]; Brussoni et al, 2006, UK, [-]; Carr, 2005, UK, [-]; Gibbs et al, 2005, Australia, [+], Hendrickson, 2008, US, [+]; Mull et al, 2001, US, [+]; Olsen et al, 2008, Canada, [++]; Roberts et al, 2004, UK, [+];) found that a major barrier to implementing safety equipment and childproofing a home was living in a home one was not free to modify.

The studies found that mothers particularly found a lack of control over their home environment due to living in rented accommodation, and/or with extended family (Mull et al, 2001; Olsen et al, 2008). In rented accommodation, landlords were reported as unresponsive to requests for installation or maintenance of safety equipment (Brussoni et al, 2006). In extended family homes, often in overcrowded situations, young parents often did not have a say in how the home was arranged.

Two studies noted that high turnover of tenants in cheap rented accommodation limited the effectiveness of projects to organise effective installation and maintenance (Carr, 2005; Brussoni et al, 2006). In two studies (Olsen et al, 2008; Hendrickson, 2008), having landlords with the ability and eagerness to make repairs led to more effective interventions.

Evidence statement 5 (ES5): Provision of appropriate and durable equipment

Four studies (Bennett Murphy, 2001, US, [-]; Roberts et al, 2004, UK, [+]; Gibbs et al, 2005, Australia, [+], Brussoni et al, 2006, UK, [-]) found that faulty or poor quality equipment was a barrier to interventions to reduce unintentional injuries to children in the home. For example, mothers resorted to taping over electric sockets when safety plugs were not provided or did not work.

The four studies made recommendations for different or better equipment. Brussoni et al (2006) recommended the provision of tamper-proof smoke alarms with 10 year batteries, and alternatives of sprinkler systems for some populations (Brussoni et al, 2006), Roberts et al recommended smoke alarms with longer lasting batteries.

Brussoni et al suggested help for fitting alarms, or simpler systems, for older residents. Gibbs et al (2005) recommended more systematic provision of childresistant containers. Suspicion by those in vulnerable communities of strangers coming into their homes to assess or install property, and suspicion of “free” offers, needs to be mitigated in successful interventions (Roberts et al, 2004).

Evidence statement 6 (ES6): Weighing up of risks against inconvenience

The two studies on smoke alarm installation (Roberts et al, 2004 [+]; Brussoni et al, 2006 [-]) both found that people balance immediate and longer term risks to health and wellbeing when they disable alarms. They were aware that it was less than ideal to disable smoke alarms, but weighed this against other factors, especially the inconvenience and stress of malfunctioning alarms.

The reviewers’ conclusion is that not only does care have to be taken to provide appropriate, and good quality, equipment in interventions and programmes, but also, there needs to be consideration of how to provide ongoing support and maintenance with using the equipment. Not only do participants need clear support on use of

equipment, but interventions would be facilitated if providers were aware of the reasons people fail to comply.

Evidence statement 7 (ES7): Training in installation and equipment use/replacement

Three studies (Roberts et al, 2004, UK, [+]; Carr, 2005, UK, [-]; Brussoni et al, 2006, UK, [-]) based on evaluation of specific interventions all found that training in installation and equipment use/replacement was a facilitator to reducing the incidence of unintentional injuries to children in the home.

Evidence statement 8 (ES8): Actual and perceived cost of safety equipment

Cost emerged as a theme in five of the studies, always as a barrier to reducing accidents to children in the home, or of obtaining help if a child had been injured (Brannen, 1992, UK, [-]; Bennett Murphy, US, 2001 [-]; Mull et al, 2001, US, [+]; Roberts et al, 2004, UK, [+]; Olsen et al, 2008, Canada, [++]).

Three studies (Bennett Murphy, 2001); Roberts et al, 2004; Olsen et al, 2008) found that the perceived cost of installing safety devices or making repairs was a major barrier in the correct use of smoke alarms (in Roberts et al, 2004) and in general for safety equipment (Bennett Murphy, 2001; Olsen et al 2008).

However, in one study (Roberts et al, 2004) the provision of free safety equipment, in this case a smoke alarm, led to the equipment being rejected due to suspicions precisely because it was free, which suggests that making equipment or installations totally free may not always be appropriate.

Evidence statement 9 (ES9): Difficulties experienced by young or poorly educated parents in understanding child development

Four studies (Bennett Murphy, 2001, US, [-]; Mull et al, 2001, US, [+]; Gibbs et al, 2005, Australia, [++]; Hendrickson, 2008, US, [+]) found that young or poorly educated mothers found it hard to anticipate the child's rate of development in terms of ability to climb, open containers or locks, light fires.

One study, in contrast, found that mothers were good at anticipating developmental milestones and adjusting the home environment in advance of changes, thereby reducing the rate of unintentional injuries in the home (Olsen et al, 2008, Canada, [+]). A reviewer conclusion is that education and information about general child development would facilitate the reduction of unintentional injuries to children in the home.

Evidence statement 10 (ES10): Raised awareness of the risk of unintentional poisoning

One study (Gibbs et al, 2005, Australia, [++]) found that exposure to a child poisoning incident, either in real life or in the media, increased awareness of that particular danger and was a motivator for implementing safety measures. This suggests that providing information on unintentional poisoning via media outlets might be an effective facilitator in raising awareness of risk.

Evidence statement 11(ES11): Fatalism about the nature of unintentional injuries

One study (Bennett Murphy, US, 2001, [-]) found that adolescent mothers found it hard to deal with issues of blame oscillating between ideas of the **accident-prone child** who would have accidents whatever you did, and the **negligent adult** who was responsible for their child's accidents.

Bennett Murphy (2001) recommends that care providers approach the topic of injury in a forthright manner when working with adolescent mothers, challenging the idea that injuries are unavoidable while not assigning blame to the mother for injury to the child. Bennett Murphy (2001) suggests that “helping mothers identify risks to their specific child in their specific environment may be the most effective intervention”.

Evidence statement 12 (ES12): Mothers’ safeguarding work

Five studies (Brannen, 1992, UK, [-]; Bennett Murphy, US, 2001 [-]; Mull et al, 2001, US, [+]; Hendrickson, 2008, US, [+]; Olsen et al, 2008, Canada, [++]) noted the large and constant amount of work which mothers put into preventing unintentional injuries in the home as a major facilitator of reducing unintentional injuries in the home.

Authors picked up on several main components of this maternal safeguarding work – commonsense safeguarding (Olsen et al, 2008) constant vigilance (Bennett Murphy, 2001; Mull et al, 2001; Olsen et al, 2008; Hendrickson, 2008), and teaching children about safety (Hendrickson, 2008; Olsen et al, 2008).

While these maternal safeguarding activities do act as a short term facilitator to accident reduction, it is important to note that they are time and energy intensive and, that for this reason, need supplementing with other forms of unintentional injury prevention.

Evidence statement 13 (ES13): Cultural and environmental differences in understanding of safety

Three studies (Mull et al, 2001, US, [+]; Hendrickson, 2008, US, [+]; Olsen et al, 2008, Canada, [++]) noted cultural practices which, while they may have been adequate safety measures in the parents’ culture of origin, were risky in a new cultural context. There were two aspects to this theme; lack of experience of the particular risks of a host context, and lack of understanding by health officials about different child safety norms and expectations in immigrants’ cultures.

Mull (2001) found that the Mexican mothers in her US study mostly came from rural and semi-rural backgrounds, so had less experience with urban hazards such as multi-story buildings and hot water taps which could cause falls or sc. Mexican mothers were also more likely to use Mexican products, which were more likely to come without safety warnings/packaging.

Two US studies (Hendrickson, 2008; Mull et al, 2001), found significant cultural differences in experience and expectations which led to health visitors classing behaviour as risky because of a lack of understanding of immigrants’ perception of safety and risk.

Evidence statement 14 (ES14): Mistrust of officials, especially regarding accusations of neglect or abuse

Five studies (Brannen, 1992, US, [-]; Bennett Murphy, 2001, US, [-]; Mull et al, 2001, US, [+]; Hendrickson, 2008, US, [+]; Olsen et al, 2008, Canada, [++]) found that a major barrier to child safety in the home was mothers’ worry that asking about child injury in any context, including unintentional injury prevention, or taking an unintentionally hurt child to hospital would result in child being removed/seen as at risk, that they would be accused of abuse or neglect. All of these studies were in the US or Canada and focused on low income mothers, and additionally, most were adolescent mothers or immigrant mothers.

Evidence statement 15 (ES15): Barriers due to relationship with partner in

patriarchal cultures

Two studies (Mull et al, 2001. US, [+]; Olsen et al, 2008, Canada, [++]) found that a major barrier to child safety in the home was mothers' lack of autonomy to make household or financial decisions. Policies/interventions might need to reconsider the often automatic targeting of mothers about safety equipment or behaviour, especially in populations where the fathers (or parents-in-law) traditionally make decisions about household purchases.

4. PREVENTING UNINTENTIONAL ROAD INJURIES AMONG UNDER-15S

Evidence Statements

(Garside, Ashton et al, 2009)

Evidence statement 1 (ES1): Children and young people's knowledge and behaviour

1a. Three UK based studies discuss children's and young people's knowledge and behaviour about accidents (Lupton & Bayley, 2006 [-]; Sawyer, 1998 [-]; Steinbach et al 2007 [-]).

1b. While these three studies suggest that children and young people are well informed about what constitutes risky behaviour and how to avoid it (Lupton & Bayley, 2006; Sawyer, 1998; Steinbach et al 2007), two studies found this did not influence their actual behaviour, even if they had experienced a previous near miss or actual accident.

Evidence statement 2 (ES2) : Children and young people as the causes of accidents

2a. Five studies, four UK and one USA based, discuss risk-taking behaviour among children and young people as a potential cause of accidents (Christie et al, 2007 [+]; Frattaroli et al, 2006 [+]; Lupton & Bayley, 2006 [-]; Sawyer, 1998 [-]; Steinbach et al., 2007 [-]).

2b. Like adults, children and young people often engage in "common" risk behaviours, which are seen as part of everyday life, such as not always using crossings, crossing between parked cars or in traffic etc. (Sawyer, 1998)

2c. One UK study (Lupton & Bayley, 2006) reports that teenagers were more likely to take risks on the road than younger children (aged 8+).

2d. Three UK studies (Christie et al, 2007; Lupton & Bayley, 2006; Sawyer, 1998) suggest that a minority of children and young people engage in "extreme" risks – playing chicken in the road, holding onto the back of buses etc, and that boys are more likely to do this, and to encourage such behaviour in each other. Such behaviours are regarded in a similar way to thrill-seeking sports.

2e. Peer issues were seen as important in two UK studies (Lupton & Bayley; Sawyer 1998). This could be positive if it gave children and young people the confidence to use crossings safely and if some adopted a minder role, preventing risky behaviour in their friends. However it could also be negative where it encouraged "ritual showing off" and dares.

2f. Two UK studies report that drinking alcohol may increase risk taking among young people, whilst in adults, may encourage less supervision of their children (Christie et al,

2007; Sawyer, 1998).

2g. Three UK studies suggest that children and young people play in the street where there other suitable facilities are lacking or pricey, or where parks are seen as dangerous due to their use for drinking and drug-taking (Christie et al, 2007; Sawyer et al 1998; Steinbach et al, 2007).

Evidence statement 3 (ES3): Drivers as the cause of accidents

3a. Five studies, three from the UK, one from the USA and one from New Zealand, discuss drivers as the cause of accidents (Christie et al, 2007 [+]; Frattaroli et al, 2006 [+]; Lupton & Bayley, 2006 [-]; Sawyer, 1998 [-]; Tranter & Pawson, 2001 [-]).

3b. Key identified responsibilities were identified as obeying speed and other traffic laws, stopping for pedestrians, not driving recklessly and parking safely and legally, especially around schools and places children and young people play (Christie et al, 2007; Frattaroli et al, 2006; Lupton & Bayley, 2006; Sawyer, 1998; Tranter & Pawson, 2001).

3c. One study suggests that young people did not necessarily understand that it might be difficult for drivers to stop quickly (Sawyer 1998).

3d. One study found that younger children are worried that drivers might not see them waiting to cross the road because they are small and might be considered unimportant (Lupton & Bayley, 2006). These fears led to indecisiveness at crossings which children thought made drivers impatient – something they were very anxious to avoid.

Evidence statement 4 (ES4): Structural causes of accidents

4a. Four studies (three UK, one USA) discuss structural causes of accidents, although these received less attention than child or driver causes (Christie et al, 2006 [+]; Frattaroli et al, 2006 [+]; Sawyer, 1998 [-]; Steinbach et al, 2007 [-]).

4b. One UK study suggests that older, narrow streets not designed for contemporary traffic volume, exacerbate traffic and parking problems (Christie et al, 2007).

4c. One UK study suggests that more signs are needed to alert drivers to areas where children and young people congregate play (Christie et al, 2007).

4d. One study among USA stakeholders highlights the volume of traffic, its speed and congestion, as well as poor walking areas which are inadequately defined or signed or in poor repair (Frattaroli et al, 2006).

4e. One UK study suggests there is a need for more central islands to help crossing (Steinbach et al, 2007).

4f. Two UK studies suggest that the placement of crossings need to be carefully considered to accommodate how people actually use the roads, taking into account “line of desire” (Sawyer, 1998; Steinbach et al, 2007).

4g. One UK study suggests that underpasses may not be considered safe to use (Sawyer, 1998).

4h. One UK study reports that lollipop people are seen as for younger children and older children and young people did not want to use them (Sawyer, 1998).

Evidence statement 5 (ES5): Attitudes to road safety – priorities and awareness

5a. Five studies, three from the UK, one from the USA and one from New Zealand, suggest that road safety for children and young people is given low priority by local communities (Baslington, 2008 [-]; Christie et al 2006 [+]; Frattaroli et al, 2006 [+];

Steinbach et al, 2007 [-];Tranter &Pawson, 2001 [-]).

5b. Five studies suggest that, particularly in urban areas, they may be competing safety related issues which are seen as more serious by children and young people, parents and other stakeholders, such as violence and crime, local neighbourhood concerns (including drug dealing, local rivalries or better facilities for young people), education and “stranger danger” (Baslington, 2008; Christie et al 2006; Frattaroli et al, 2006; Steinbach et al, 2007;Tranter &Pawson, 2001).

5c. One US study suggests that as a result, a more holistic approach to local safety and enhanced community environments might be more effective (Frattaroli et al, 2006).

5d. Two studies (one UK, one New Zealand) suggest there is an implicit cultural understanding car use as “good parenting”, offering their children safety – the negative consequences of this are described as a “social trap”, whereby road conditions become less safe generally, due to parental desire for their children to be more safe (Baslington, 2008; Tranter &Pawson, 2001).

5e. Two studies (one UK one USA) consider community engagement with plans for road safety interventions with either lack of structures, or lack of genuine consultation found in both cases (Green and Edwards, 2008 [+]; Frattaroli et al 2006 [+]). Unintended negative consequences, traffic speeding more after the replacement of a zebra crossing with traffic lights are reported.

5f. One study suggests that there is an inherent tension between meaningful community involvement in planning and an environment requiring interventions to be “evidence based” (Green & Edwards, 2008).

5g. Three studies, one USA and two UK – the latter based on the same data-set, suggest that there is low political priority for road safety (Frattaroli et al, 2006 [+]; Green & Edwards, 2008 [+]; Steinbach et al, 2007 [-]). The UK studies qualify this as relating to the difficulties of differentially allocating resources to address inequalities in injury risk among some minority groups.

5h. Two UK studies (based on the same dataset) suggest that there is a lack of community awareness about differential road injury risk among children and young people from some ethnic minority groups (Green & Edwards, 2008; Steinbach et al, 2007).

5i. Two UK studies (based on the same dataset) suggest that there are difficulties about interpreting data on differential road injury risk among children and young people from some ethnic minority groups, due to the way it is collected and its relevance to actual communities and locations, making targeting inequalities difficult (Green & Edwards, 2008; Steinbach et al, 2007).

Evidence statement 6 (ES6): Suggested solutions to child injury on the road

6a. Six studies, five UK and one USA, discuss possible solutions to preventing child injury on the road (Baslington, 2008; Christie et al, 2007 [+]; Frattaroli et al, 2006 [+]; Green & Edwards, 2008 [+]; Steinbach et al [-]).

6b. Suggested structural solutions to reduce injuries included broad remits such as greater investment in the causes of deprivation and improved education (Green & Edwards, 2008); more compulsory measures (Lupton & Bayley, 2006) and better enforcement of existing traffic regulations (Christie et al, 2007; Lupton & Bayley, 2006).

6c One UK study reports that children and young people sometimes misunderstood the

purpose of street furniture – tending to assume that items such as railings and bollards were intended to enhance pedestrian safety, and being dismayed to see that they were not strong enough for this purpose (Lupton & Bayley, 2006).

6d. One UK study suggests restricted vehicular access to schools and “Park and Stride” might address congestion at the school gates (Baslington, 2008).

6e. Two UK studies (based on the same dataset) suggest that road safety officers favour empiricist solutions to injury rates – for example using accident histories to prioritise bids for interventions (Green & Edwards, 2008; Steinbach et al 2007).

6f. Two UK studies suggest that there was pressure on interventions to be targeted, however lack of appropriate data might limit the effectiveness of this and lead to proxy targets being used – for example, geographical definitions of deprivation replacing possible cultural or community characteristics related to higher risk – or professional’s relying on personal experience rather than data (Green & Edwards, 2008; Steinbach et al 2007).

6g. Young people and professionals were sensitive to the possibility that data about differential risk among some ethnic communities needed to be used sensitively to avoid victim blaming (Steinbach et al, 2007).

Evidence statement 7 (ES7): School Travel Plans

7a. One UK study explicitly discussed School Travel Plans and found that promotional material tended to focus on health benefits and empowerment rather than their safety aspects (Baslington, 2008 [-]).

7b. It may be difficult to recruit parent volunteers to assist with aspects of School Travel Plans, such as walking buses, due to competing priorities, including work. Some may feel it inappropriate for such schemes to rely on such free, usually female, labour (Baslington, 2008).

Evidence statement 8 (ES8): Quiet Lanes

8a. Two UK studies assess Quiet Lanes (Kennedy et al, 2004 I & II, both [-]).

8b. While locals were aware of the scheme, visitors were not, and signs were thought too small and too uninformative to assist with this.

8c. It was felt that the Lanes were not safe for children to use as pedestrians or cyclists – conflict between vehicles and other road users was seen as inevitable, and exacerbated by heavy vehicles including buses using the Lanes, which did not have speed limits.

8d. Better publicity and more informative signs were recommended, as were enhanced links with existing leisure and village routes.

