Injury In Children

A RESEARCH BRIEFING PAPER, March 2004

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Authors:

David H Stone
Professor of Paediatric Epidemiology

&

Susanne Jeffrey
Research Assistant

Paediatric Epidemiology and Community Health (PEACH) Unit
Department of Child Health
Division of Developmental Medicine
University of Glasgow

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Contents

contd >

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List of tables

List of figures

Summary

Background

The purpose of this report is to inform health promotion policy making in the field of child injury prevention in Scotland. Its specific objectives are:

1. To provide background information about the frequency of injury, both unintentional and intentional, among children aged 0 – 14 years in Scotland.
2. To present a breakdown of injury statistics by appropriate demographic and other variables.
3. To compare injury frequency in Scotland with other parts of the UK, Europe and beyond.
4. To provide an overview of the policy context for Scotland and to compare this with other parts of the UK, Europe and the wider international context.
5. To discuss the implications of the findings from objectives 1 – 4 for future activity around childhood injury prevention.
6. To make recommendations about stages of activity (i.e. priorities) and to suggest potential partnerships for undertaking these.

Methods

There are various routine sources of data on injury frequency in Scotland. Most are deeply problematic due to their unknown validity, limited coverage and incompatible classification systems. The three sources that are most robust are mortality (General Register Office for Scotland), hospitalisation (Scottish Morbidity Record) and road casualty (Stats 19) data. We have drawn primarily on these three sources in order to provide the reader with an overview of the epidemiology of child injury in Scotland.

We attempted to compare, as far as possible, injury frequency in Scotland with the other home countries of the United Kingdom, the European Union and other parts of the world. The main source of data for this purpose was the WHO Mortality Database.

We reviewed major public health and other relevant policy documents relating to Scotland, the UK and elsewhere.

We sought to identify key messages for prevention through an interpretation of two sets of data: epidemiological and research (the evidence base).

We formulated 30 prioritised recommendations based on the foregoing findings. In particular, we sought to explore the gap – and how it might be filled – between epidemiology and evidence, taking account of feasibility, cost and policy context.

Results

1. There are no currently available data on the incidence of injury in children in Scotland. Estimates based on parental recall suggest that around a fifth of children aged 2 – 15 years experience an unintentional injury requiring medical attention each year. Information is routinely available on injury mortality (a reflection of the interaction of incidence and outcome), injury hospitalisations (a supply influenced and often inaccurate source), and road traffic injuries recorded by the police (known to suffer substantially from underreporting of pedestrian and cycle injuries).
2. The largest single cause of child death due to injury is road traffic accidents, followed by those occurring in the home. The latter predominate in young (pre-school) children, the former in older children.
3. In common with all other countries, the available data suggest that male children in Scotland are at higher risk of injury than female children.
4. When specific causes of injury are considered, however, the male-female ratio is variable.
5. Child injury mortality rates in Scotland have been falling steadily since 1980, with male rates falling more strikingly than female rates for all causes and most specific causes (a notable exception being fire and flames, deaths from which have declined in both boys and girls).
6. Against this overall declining trend, child injury mortality rates appear to have stabilised in the mid-1990s and started to rise thereafter.
7. In contrast with unintentional injury, mortality from intentional injury in children has been stable or rising, with the result that intentional injury is becoming steadily more important in proportional terms.
8. Explanations for all of the above trends are not based on firm evidence and should therefore be regarded as highly speculative.

Conclusions

Scotland has arguably reached a crossroads in terms of its response to the injury challenge. There can be little doubt that our past record has been disappointing. While other parts of the UK and the EU have followed the lead of other countries such as the USA, Sweden and Australia, the Scottish approach has been tentative and unimaginative. Because injury prevention is a multi-agency, multi-disciplinary task, fragmentation and duplication of effort is inevitable in the absence of an over-arching strategy. Injury has not been ignored in the UK generally or in Scotland in particular. It has regularly featured within the broader public health agenda. Yet Scotland now lags well behind Wales and England in its approach to injury prevention policy, lacking any initiative remotely comparable to either CAPIC or the AITF. This continuing policy neglect of injury, at a strategic level, poses an indirect but nevertheless real threat to the health and well-being of Scottish children.

We know, from experience elsewhere, the basic ingredients or principles of a successful injury prevention policy. They are:

- a comprehensive, population based strategic approach to addressing the problem of injury
- a sound knowledge base, whether of the epidemiology, aetiology and outcome of injury, or of the efficacy of countermeasures
- an integrated, co-ordinated, focused, multi-disciplinary, multi-agency approach to injury prevention
- a well-trained, highly motivated workforce of injury prevention professionals and academics
- leadership that tirelessly raises awareness of injury among professionals, politicians and the public, and that advocates sustained and effective preventive action
- resources, financial and human, dedicated to the task of preventing injury.

Recommendations

We offer a series of recommendations designed to help fill the gap in strategic policy making. Our most important recommendation is that a national strategy for child injury prevention in Scotland should be developed as a matter of urgency.

Introduction

The purpose of this report is to inform health promotion policy making in the field of child injury prevention in Scotland. To this end, we have attempted to review, summarise and interpret the large amount of literature that has emanated from academic researchers, professionals, specialist organisations and governments over the past few decades from the UK and abroad.

In no sense should this exercise by regarded as a rigorous systematic literature review of the kind advocated by the Cochrane Centre and similar enterprises. Because of limitations of time and resources, combined with the vast and complex nature of the topic, we have inevitably had to be highly selective in the presentation of concepts, data and ideas relating to the occurrence and prevention of this distressing and ubiquitous phenomenon. Nevertheless, we have sought to adhere strictly to the principles of evidence-based public health in approaching the voluminous literature on the childhood injury. The interested reader seeking further enlightenment is referred to the relatively brief bibliography of key papers and documents that are listed at the end of the report.

Injury poses a huge public health challenge. Throughout the industrialised world, injury is the leading cause of death in the first half of the life cycle and a major contributor to disability. Injury also causes significant health inequalities and results in huge health and lost productivity costs. Its prevention is now recognised as a central objective of most enlightened governments. Children are peculiarly vulnerable to injury because of their small stature, immature neuromuscular systems and their dependence on adults for care and protection. This is reflected in the epidemiological data in that injury is the single largest contributor to mortality in children and young people in all industrialised countries and an increasing number of developing countries.

Yet, despite a formidable research effort to elucidate the causes, consequences and prevention of injury, the effective control of the current pandemic of trauma seems as elusive as ever. The World Health Organisation estimates that over 5 million people die annually from injury, the majority from road traffic accidents (RTAs). Murray and Lopez (1997) have predicted that that injury or trauma will rise steadily up the league table of the global burden of mortality in the coming decades and will become the third leading cause of death by 2020, by which time over eight million deaths are expected.

Some countries have made remarkable progress in reducing injury mortality though precisely how this has been achieved is unclear. In Europe, Sweden and the UK are often cited as outstanding injury prevention success stories. In the latter case, national statistics may disguise marked variations between the four home countries. In the UK as a whole, injuries kill around 20,000 people each year and lead to 30 million annual presentations for medical attention.

Scotland's injury experience has historically compared badly with other parts of the UK, especially England, thereby exacerbating geographical inequalities in health. Paradoxically, Scotland has tended to lag behind other UK countries in its strategic response to injury. Both Wales and England have recently published specific injury prevention policies while Scotland has been content to date to include injury as merely one of several elements in its overall approach to public health. There are some signs, however, of a recent change of heart prompted in part by the publication of the Department of Health's Accidental Injury Task Force Report (Department of Health, 2002).

The present Briefing Paper was commissioned by the Children and Families Programme of Health Scotland, (formerly the Health Education Board for Scotland, and the Public Health Institute of Scotland), in the early part of 2003 as part of its information gathering activities around child injury prevention.

Aims and objectives

The aim of the Briefing Paper is to offer an overview of childhood injury in Scotland.

Its specific objectives are:

1. To provide background information about the frequency of injury, both unintentional and intentional, among children aged 0 – 14 years in Scotland;
2. To present a breakdown of injury statistics by appropriate demographic and other variables;
3. To compare injury frequency in Scotland with other parts of the UK, Europe and beyond;
4. To provide an overview of the policy context for Scotland and to compare this with other parts of the UK, Europe and the wider international context;
5. To discuss the implications of the findings from objectives 1 – 4 for future activity around childhood injury prevention;
6. To make recommendations about stages of activity (i.e. priorities) and to suggest potential partnerships for undertaking these.

Note: The paper covers both unintentional and intentional injury in the age range 0 – 14 years. At the request of Health Scotland, however, particular emphasis is placed on unintentional injury in children aged 0 – 5 years.

Methods

Terminological note

The term 'accident' is used as sparingly as possible throughout this paper for three reasons. First, some have claimed that it has connotations of randomness or inevitability and induces a fatalistic attitude that undermines preventive efforts. Second, differentiating intentional from unintentional injuries is often problematic and misclassification between the two is believed to be common. Third, the preventive response to unintentional and intentional injury is often identical rendering their attempted separation somewhat academic.

The issue of terminology has been debated for several years and an international consensus has emerged that the term 'injury' is preferable. Nevertheless, the use of the term 'accident' remains ubiquitous in many publications and routine data sources, and is widely used in the media and non-professional settings. We have therefore retained the term wherever its substitution with an alternative is judged inappropriate.

Background information on injury frequency – Objective 1

The descriptive epidemiology of childhood injury in the UK and elsewhere has been presented in a variety of reports emanating from government department, professional organisations and scientific journals. These sources have been drawn upon and are referenced where appropriate.

There are various routine sources of data on injury frequency in Scotland. Most are deeply problematic due to their unknown validity, limited coverage and incompatible classification systems (Chishti, 2002). The three sources that are most robust are mortality (General Register Office for Scotland), hospitalisation (Scottish Morbidity Record) and road casualty (Stats 19) data. These three sources are the ones predominantly cited in this report.

Demographic breakdown of injury statistics – Objective 2

The purpose of this series of analyses was to provide a more detailed breakdown of injury data by demographic and other variables such as age, gender, social class, deprivation category of home address, whether urban or rural residence, region of residence, proximity to acute care and type of injury. Routine sources of data, however, varied in the extent to which they included these variables. Accordingly, we adopted a pragmatic approach whereby the more detailed analyses were confined to those variables that were a) readily available from routine data sources, and b) helpful in providing additional useful insights into the epidemiology of childhood injury in Scotland.

Comparison of injury frequency in Scotland with elsewhere – Objective 3

We attempted to compare, as far as possible, injury frequency in Scotland with the other home countries of the United Kingdom, the European Union and other parts of the world since 1980. The main source of data for this purpose was the WHO Mortality Database.

Overview of policy context – Objective 4

We reviewed major public health and other relevant policy documents published over the past decade or so on public health, child health or injury prevention relating to Scotland, the UK and elsewhere.

Implications of findings for prevention – Objective 5

We sought to identify key messages for prevention through an interpretation of two sets of data: epidemiological and research (the evidence base). While we recognise that this involves a substantial degree of subjective judgement, we have drawn wherever possible on recent consensus statements or expert reports.

Formulation of recommendations – Objective 6

We formulated a series of prioritised recommendations based on the foregoing findings. In particular, we sought to explore the gap – and how it might be filled – between epidemiology and evidence, taking account of feasibility, cost and policy context.

Results

Objective 1. Background information on injury frequency

Injury has been the leading cause of death in children in Scotland since the country underwent the 'epidemiological transition' about half a century ago. At that time, the pattern of disease in the population shifted from one dominated by infection to one in which chronic disease and trauma are the major killers.

There are no currently available data on child injury incidence in Scotland. The periodic Scottish Health Survey, however, does permit the calculation of estimates of incidence from parental reports of 'accidents' to children requiring medical attention over the previous 12 months (Laiho and Purden, 2001). The 1998 survey suggested that just over a fifth of children aged 2 – 15 years had at least one accident in the course of a year (25% of boys and 17% of girls). The youngest children (aged 2 – 3 years) experienced most of their accidents (80%) in the home or garden, a proportion that decreased rapidly with age (for children aged 13 – 15 years the figure was 12%). Over three-quarters of children with injuries visited hospital for attention. Time was taken off school for 44% of accidents to children aged 4 – 15 years. Across all age groups, the accident rates for children were significantly higher in social classes IV and V. These data exclude fatalities, injuries to children living in institutions and some injuries causing long-term hospitalisation.

Injury mortality rates in children (0 – 14 years) fell by over 40% between 1981 and 1995 in Scotland but seemed to plateau thereafter for reasons that are unclear (Stone *et al*, 2001). A combination of safety policies (such as drink driving laws and consumer product regulation) and more effective health care (Roberts *et al,* 1996) may have played a part. Virtually all the decline was due to falling unintentional injury rates. The relative importance of injury as a contributor to mortality in children did not diminish, however over this time period as the proportion of all child deaths attributable to injury remained almost static at around 14% (Morrison *et al*, 1999). Intentional injury mortality rates, by contrast, have been relatively stable with the result that their relative contribution to (falling) all injury mortality has been steadily increasing over time (Stone *et al,* 2000).

The topic of unintentional injury was recently highlighted by the Chief Medical Officer for Scotland (CMO, 2003). In 2001, there were 1,350 deaths and 80,251 discharges due to unintentional injury. Of these, 41 deaths and 13,193 hospital discharges were in children under 15 years old.

Table 1: Injury deaths and hospital discharges in Scotland, 2001

	Age in years		
	0 – 14	>14	Total
Numbers			
Deaths	41	1,309	1,350
Discharges	13,193	67,058	80,251
Per 100,000 population			
Deaths	5	31	27
Discharges	1,458	1,612	1,585

Injury places a huge financial burden on victims, their families and society as a whole. The financial costs to the country that are attributable to injury are extremely high. The estimated cost of injury (all ages) to the NHS in England in 2000 – 1 was £2.2 billion, the total costs to society being more than 10 times that figure (Department of Health 2002). At a conservative estimate, the equivalent costs in Scotland would be £200 million and £2 billion respectively, of which approximately one fifth (£40 million and £400 million respectively) relate to children.

Objective 2. More detailed breakdown of injury statistics by demographic and other variables

The latest available data on accidental death and hospital admissions in children in Scotland, are shown in Table 2 *(source: ISD/SHOW website 2003)*.

Table 2: Unintentional injury in Scottish children (0 – 14 years) – emergency hospital admissions, by age group and cause of injury, year-ending 31 March 2002[P]

	Discharge rate per 100,000 population				
Cause of Injury	**Age group**				
Both sexes	0 – 14	Under 1	1 – 4	5 – 9	10 – 14
Total	**1302.4**	**1230.1**	**1654.1**	**1159.9**	**1204.9**
Road traffic accident	98.6	21.1	52.6	113.5	128.8
Poisoning	102.5	78.8	317.5	18.3	36.9
Home	81.3	71.1	272.0	14.7	13.6
Others	21.2	x	45.5	3.6	23.2
Falls	636.7	703.5	687.2	642.5	585.3
Home	187.0	547.8	363.9	136.7	53.6
Others	449.7	155.7	323.3	505.9	531.7
Drowning/submersion	1.9	x	3.6	x	x
Home	0.8	x	2.2	–	–
Others	1.1	–	1.3	x	x
Choking	2.1	17.3	2.2	x	x
Home	1.4	13.5	2.2	–	x
Others	0.7	x	–	x	x
Other	460.7	405.6	590.9	384.2	451.5
Home	178.2	292.2	396.0	115.1	68.4
Others	282.4	113.4	194.9	269.1	383.1

[P] provisional

x numbers less than 5, so no rate calculated

Source: ISD Scotland (SMR01)

Cause

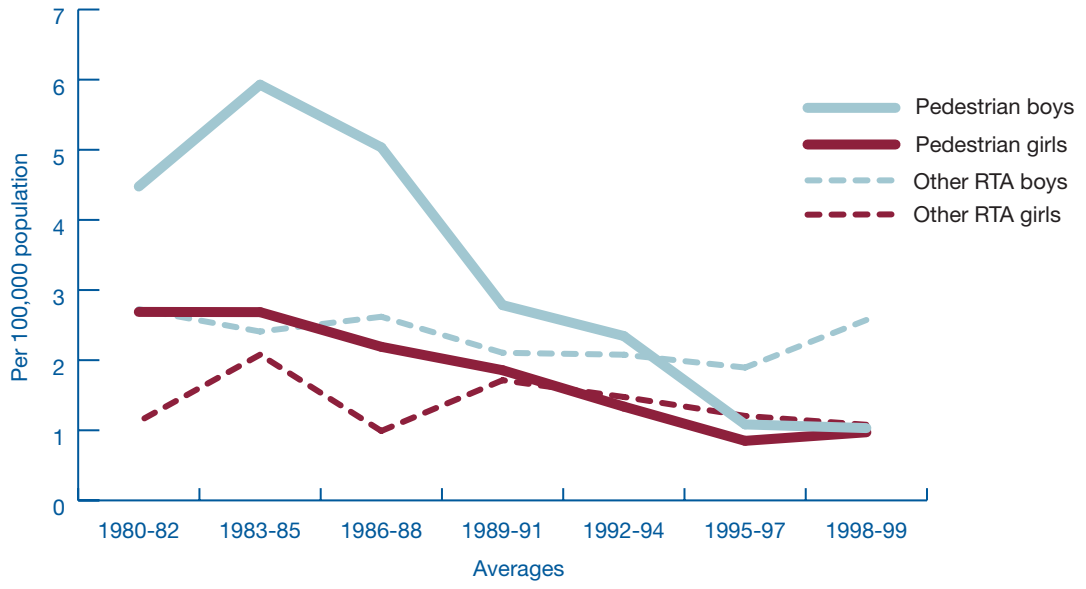
The risk of injury in the population is influenced by a wide range of personal, environmental, socio-economic and lifestyle factors. Of these, risk-taking lifestyle is probably the least important for the very young age groups.

Around 40 – 50% of accidental deaths in children are caused by road traffic accidents followed by injuries in the home (around one quarter). In 2002, 4,596 children under 16 were killed or seriously injured on British roads. Of these, 2,828 (62%) were pedestrians *(Road Casualties in Great Britain 2002: Annual Report)*. In 1998, 666 children were killed or seriously injured on Scottish roads and 525 in the year 2002 *(Road Accidents in Scotland 2002)*. These are conservative estimates as many injuries where no motor vehicle is involved, are not reported to the police (Jarvis *et al*, 2000). The decline in RTA mortality over the past two decades is largely due to the decline in pedestrian fatalities (see Figure 1).

On average 842 children (under 16) were killed or seriously injured on Scottish roads each year in the period 1994 – 98. By 2002, the figure was substantially less at 525 (*Road Accidents in Scotland 2002, Annual Report*).

Figure 1

Road traffic mortality rates in children (0 – 14 years), Scotland, 1980 – 99



By contrast, home accidents (due mainly to falls and house fires) are the largest single contributor (38%) to hospitalisations in children with RTAs accounting for only 8%. Since 1980, downward trends in injury mortality have been reported for all causes, RTAs, fire and flames, choking and drowning (Morrison *et al*, 1999).

Age

The infant age (under 1 year) suffers the highest mortality from injury (average per year over 1995 – 99 was 12.8 per 100,000 pop of which almost a third was due to intentional injury). The age group 1 – 4 has similar rates per 100,000 pop. compared to the other age groups (1 – 4 = 5.9, 5 – 9 = 5.8 and 10 – 14 = 7.1). All age groups have experienced a decline in injury mortality in recent years. The reasons for these trends are unclear.

Although RTAs (notably involving pedestrians) are the leading cause of death throughout childhood, children of pre-school age are especially prone to being fatally

injured in the home (Figure 2). This is not surprising. Indeed the epidemiological pattern of injuries reflects the development of children. Young infants are largely passive recipients of adult care and are especially vulnerable to neglect and abuse i.e. both unintentional and injury (Figure 3). As children mature, they explore their environment to a greater extent and become progressively more adventurous as they approach adolescence. Infants and young children of pre-school age are therefore more likely to suffer falls, burns and scalds in the home, while older children become injured at play, going to and from school and on the roads.

Figure 2

Mean annual child (0 – 14 years) injury mortality rates by age group and location, Scotland, 1995 – 99

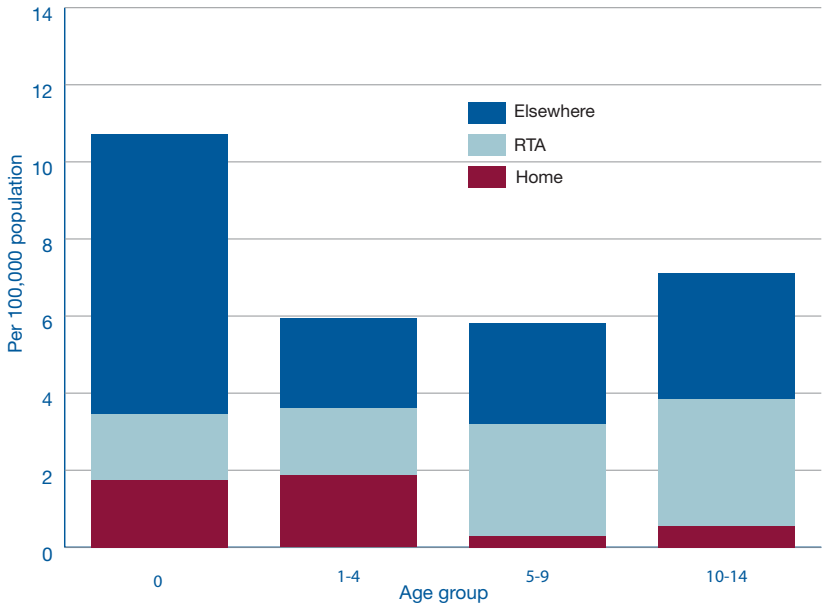
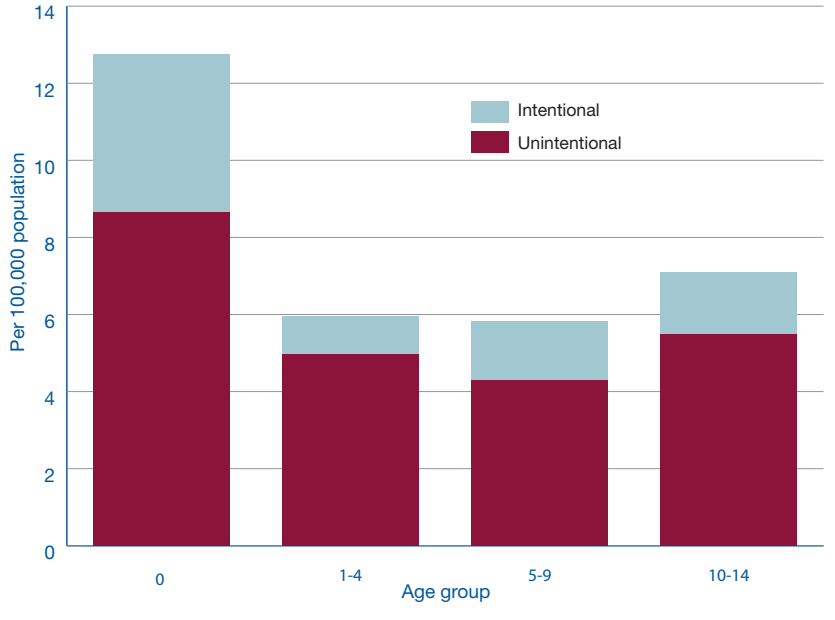


Figure 3

Mean annual child (0 – 14 years) injury mortality rates by age group and intention, Scotland, 1995 – 99

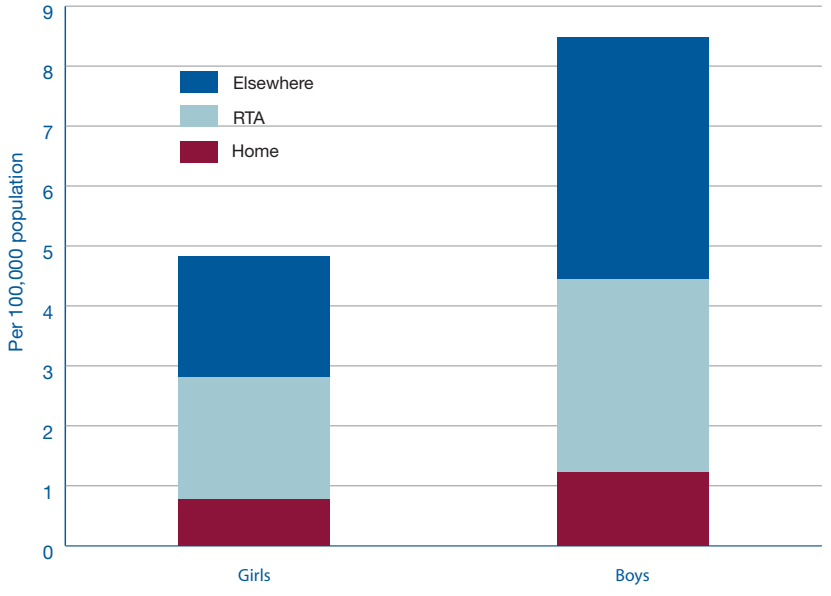


Gender

Boys seem to be at higher risk of fatal injury from about one year of age throughout childhood (Figure 4). The excess ratio of male to female injury deaths (around 2:1) is remarkably consistent across age groups and circumstances of injury (with the partial exception of fire related injuries) for reasons that are unclear. Possibly, fine motor co-ordination is more advanced in girls (Langley *et al,* 1980) and behavioural factors, such as risk-taking or greater parental supervision of female children may also play a role. Boys especially, though not exclusively, have benefited from the recent temporal decline in mortality due to injury.

Figure 4

Mean annual child (0 – 14 years) injury mortality rates by gender and location, Scotland, 1995 – 99



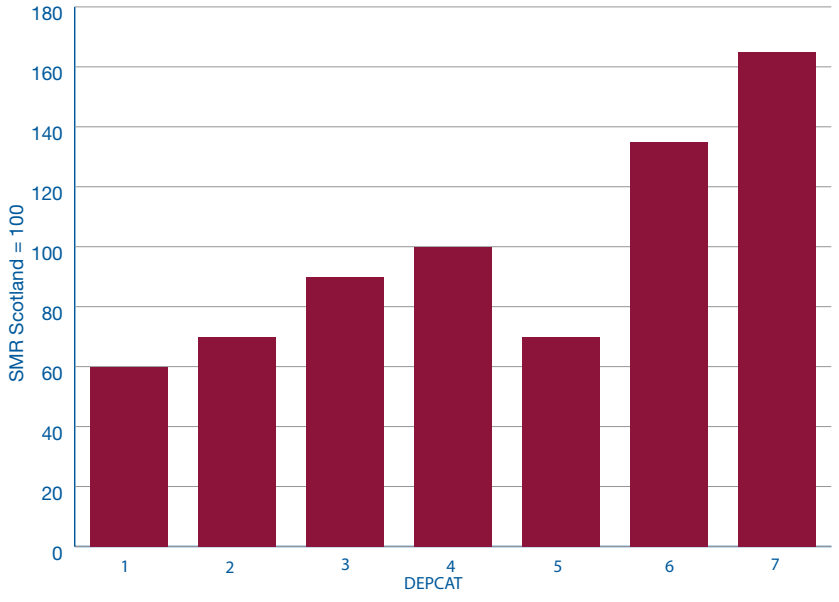
Deprivation

As shown in Figure 5, children residing in areas of relatively high socio-economic deprivation experience substantially higher risk of traumatic death than those residing in relatively affluent areas (Morrison *et al*, 1999).

Scottish children living in the most socially deprived circumstances suffered more than double the risk of dying from injury as those living in the most affluent conditions in the period 1981 – 95, with minimal variation in the extent of the decline in mortality across deprivation categories. In other words, there is no evidence of a widening 'social inequality gap' with regard to injury in Scottish children. These findings contrast with those from England and Wales where a widening of injury mortality inequalities between social classes appears to have occurred (Roberts and Power, 1996). No comparable analyses of injury morbidity data have been published.

Figure 5

Mortality from accidents in children (0 – 14 years), Scotland, 1997 – 2001, by Carstairs deprivation category (Health in Scotland 2002, Scottish Executive)



Geography

The geographical pattern of child injuries across Scotland is inconsistent. The data are difficult to interpret partly because of small numbers in rural and island areas. For the years 1997 – 2001, NHS Boards with standardised mortality ratios (SMR) higher than the average for all Scotland (100) were Highland (149), Tayside (131), Greater Glasgow (125), Lanarkshire (113), Grampian (106) and Borders (101). The lowest SMRs were found in Ayrshire and Arran (46), Fife (65) and Lothian (84).

For hospitalisations, using provisional emergency hospital admission data for the year ending 31 March 2002, the standardised discharge ratios suggest that the highest risk Boards are Grampian (144), Ayrshire and Arran (105) and Lothian (101). The reasons for these patterns are unknown and are a matter for speculation. They may reflect 'supply' (hospital facilities) or 'demand' (referrals and admissions to hospital) or 'need' (the incidence of injury) or some combination of these factors.

Time trends

In the last two decades, childhood injury mortality in Scotland has fallen steeply, notably in boys, until the mid-1990s (Figure 6) and thereafter has appeared to increase slightly. The decline was however, well beyond the 33% target since 1980 – 85. The reduction in child injury mortality has been virtually confined to unintentional injury (Stone *et al*, 2000). During this period, hospitalisations for injuries to children rose. In the late 1990s a change occurred – child injury mortality rates reached a plateau and hospitalisations started to decline. The reasons for these patterns are unknown.

Figure 6

Unintentional v intentional child mortality rates in Scotland by gender, 1980 – 99

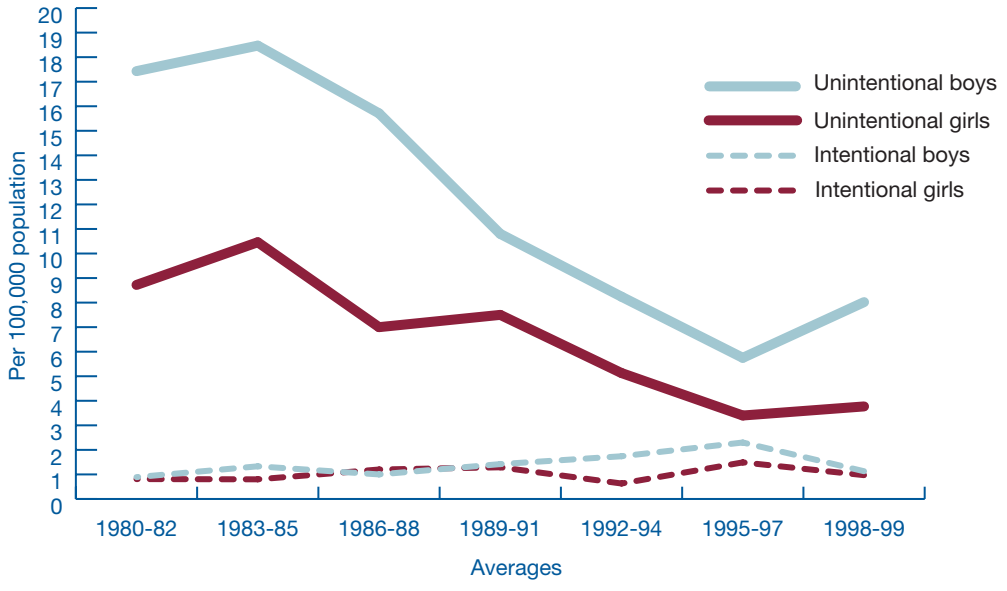


Table 3 shows the interaction of gender, type (i.e. cause) of injury and time period along with the statistical significance of the temporal trends.

Table 3: Interaction between gender and type of injury over time

	Mean rates per 100,000 population					
	80–84	85–89	90–94	95–99	Trend gradient	Statistical significance
Both sexes						
All injuries	14.71	12.73	8.99	6.71	-0.537	***
Other transport accidents	0.19	0.17	0.06	0.06	-0.007	NS
Poisoning	0.26	0.45	0.23	0.10	-0.015	*
Falls	0.75	0.50	0.50	0.19	-0.029	**
Fire	1.88	1.99	1.20	0.71	-0.078	**
Suffocation and drowning	3.60	2.15	1.41	1.00	-0.176	***
Other accidents	1.02	0.88	0.54	0.42	-0.044	**
Pedestrian	3.87	3.61	1.99	0.98	-0.199	***
Motor vehicle traffic accidents excluding pedestrian	2.14	1.79	1.91	1.67	-0.024	NS
Intentional[a]	0.99	1.20	1.16	1.57	0.035	NS
Male						
All injuries	19.09	15.78	11.37	8.50	-0.710	***
Other transport accidents	0.29	0.24	0.08	0.12	-0.011	NS
Poisoning	0.43	0.68	0.32	0.20	-0.022	*
Falls	1.28	0.69	0.77	0.20	-0.055	***
Fire	2.08	2.12	1.21	0.98	-0.078	*
Suffocation and drowning	4.75	2.87	1.94	1.31	-0.237	***
Other accidents	1.35	1.16	0.61	0.61	-0.053	*
Pedestrian	5.03	4.80	2.51	1.06	-0.275	***
Motor vehicle traffic accidents excluding pedestrian	2.73	2.21	2.22	2.17	-0.034	NS
Intentional[a]	1.14	1.00	1.70	1.84	0.054	*
Females						
All injuries	10.10	9.53	6.50	4.84	-0.354	***
Other transport accidents	0.08	0.09	0.04	0.00	-0.004	NS
Poisoning	0.08	0.21	0.13	0.00	-0.009	NS
Falls	0.20	0.30	0.21	0.17	-0.001	NS
Fire	1.66	1.86	1.19	0.43	-0.078	***
Suffocation and drowning	2.40	1.39	0.85	0.69	-0.111	***
Other accidents	0.69	0.58	0.47	0.21	-0.035	*
Pedestrian	2.65	2.36	1.44	0.90	-0.119	***
Motor vehicle traffic accidents excluding pedestrian	1.51	1.35	1.57	1.15	-0.013	NS
Intentional[a]	0.84	1.40	0.59	1.28	0.015	NS

[a] Intentional injury includes fatalities that were undetermined as to whether intentional or not.

* sig at 5% level
** sig at 1% level
*** sig at 0.1% level

Long-term consequences

There are few good quality data on the long-term consequences of injury and none for children in Scotland. A study of (mainly adult male) survivors of major trauma in England (Airey *et al*, 2001) found that 10% suffered severe disability to the point of being dependent on carer support and around one in two suffered post-traumatic stress disorder.

Summary of key features of epidemiology of child injury in Scotland

1. There are no currently available data on the incidence of injury in children in Scotland though estimates suggest that just over a fifth of children aged 2 – 15 years suffer at least one unintentional injury in the course of a year (25% of boys and 17% of girls). Some information is available on injury mortality (a reflection of the interaction of incidence and outcome), injury hospitalisations (a supply influenced and often inaccurate source), and road traffic injuries recorded by the police (known to suffer substantially from underreporting of pedestrian and cycle injuries).
2. The largest single cause of child death due to injury is road traffic accidents, followed by those occurring in the home.
3. In common with all other countries, the available data suggest that male children in Scotland are at higher risk of injury than female children.
4. When specific causes of injury are considered, however, the male-female ratio is variable.
5. Child injury mortality rates in Scotland have been falling steadily since 1980, with male rates falling more strikingly than female rates for all causes and most specific causes (a notable exception being fire and flames, deaths from which have declined in both boys and girls).
6. Against this overall declining trend, child injury mortality rates appear to have stabilised in the mid-1990s and started to rise thereafter.
7. In contrast with unintentional injury, mortality from intentional injury in children has been stable or rising with the result that intentional injury is becoming steadily more important in proportional terms.
8. Explanations for all of the above trends are not based on firm evidence and should therefore be regarded as highly speculative.

Objective 3. Comparison of injury frequency in Scotland with other parts of the UK, Europe and elsewhere

There are considerable variations in injury mortality between the four countries of the UK. Scotland and Northern Ireland report substantially higher rates of injury than England and Wales though the differences are less striking for children than older age groups.

Although child injury mortality in the UK compares favourably with other EU countries, complacency should be avoided, as there remains much scope for further reductions. One study estimated that if the UK could achieve the lowest European death rate for each injury type, child injury deaths (in the UK) could be reduced by 35 – 40% (Petridou, 2000). Moreover, child pedestrians in Britain are twice as likely to be killed on the road as the European average, probably because of British children's greater exposure to busy main roads (Towner *et a*l, 1996).

Scotland's overall child injury rates compare relatively favourably with other developed countries (Department of Transport, 2002), though this does not hold true for some specific causes. Scotland's child road casualty rate in 2000 was 21 per million population, the tenth lowest of 28 European countries. When pedestrian casualties are considered separately, Scotland's ranking slips further (though it is difficult to identify figures relating to children).

Table 4: Injury mortality, rates per 100,000 in children (0 – 14 years), international comparison, 1999

All children	Age 0 – 14
Singapore	2.28
England and Wales	3.61
Sweden	3.77
Scotland	4.97
Germany	5.02
Northern Ireland	5.19
Japan	5.81
France	6.54
Finland	6.75
Portugal	6.92
Australia	7.32
Greece	7.69
Chile	8.55
Poland	9.22
USA	10.16
Ukraine	20.96

Source: WHO database

Objective 4. Overview of policy context – approaches to injury prevention

Injuries are not random events. They are predictable and avoidable, perhaps to a greater extent than most other causes of mortality and morbidity in childhood.

Over the past few decades, a formidable amount of research evidence has accumulated that is available to guide practitioners and policy makers. Although more research is always required, the full implementation of the existing body of evidence could reduce the incidence and impact of injury substantially. In a study of child injury mortality in the United States, Rivara and Grossman (1996) estimated that a further third of all childhood injury deaths could be avoided were interventions of known efficacy implemented across the country. The extent of this implementation gap has never been accurately computed in Scotland though there it seems reasonable to assume that a similar proportion of injuries to children in Scotland might be avoidable.

Primary, secondary and tertiary prevention

Applying the classical model of preventive medicine, injury prevention may be primary, secondary or tertiary. These three levels are defined in relation to the stage of the natural history of the condition.

Primary prevention: the removal of circumstances, risks and hazards that lead to injury. Examples are traffic speed reduction, the manufacture of fireproof nightwear and the fitting of hot water thermostats.

Secondary prevention: the reduction of injury severity in incidents that do happen. Examples are the fitting of seat belts, the wearing of motorcycle helmets and the use of absorbent playground surfaces.

Tertiary prevention: the optimal treatment and rehabilitation of the injured person to minimise the impact of injury. Examples are the administration of effective first aid, acute surgery for trauma and the provision of services for the disabled.

The Three Es or Six Es?

The traditional rule-of-thumb designation of injury prevention has been the three Es – education, enforcement (of legislation) and environmental modification. While this has proved helpful in the UK and elsewhere, it is also somewhat limited in scope.

A more comprehensive approach would expand the three Es to six, namely:

- **Encouragement.** Everyone needs encouragement or awareness raising when it comes to safety. Policy makers and professionals will tend to prioritise topics according to their perceived importance so there is much scope for lobbying.
- **Education.** Unless people are educated about safety, it is unreasonable to expect them to avoid injury through intuition or guesswork. Education may be directed at various groups – children, parents or carers, professionals and politicians.
- **Enforcement.** Passing legislation that is not enforced, for whatever reason, is pointless. Enforcement, however, is labour intensive and requires sustained commitment on the part of the statutory agencies.

- **Engineering.** Advances in technology, building (including home design), road design, consumer product safety and other forms of engineering, in the broadest sense, all play a role in preventing injury. Conversely, failure to set and enforce standards in all these areas throughout both the private and public sector increases the risk to children.
- **Environment.** The wider environment – physical, social, emotional – is crucial to the generation or avoidance of injury risk. An important environmental dimension is poverty since the social patterning of child injury mortality is especially marked. In other words, the gradient of risk across children of different social classes is steeper for injury mortality than for other causes of death in childhood, a finding that may reflect the more hazardous environment of poorer localities.
- **Empowerment.** Safety knowledge, equipment and other measures are only effective if individuals and communities are empowered – through education, support and resources – to make use of them.

The Haddon Matrix

Another important theoretical model for the analysis and prevention of injury is the so-called Haddon Matrix (Figure 7). This was an attempt to introduce a more systematic approach the investigation of the causes and consequences of injury and has been found to be especially useful in the field of road safety in the United States.

Fig.7: The Haddon Matrix

	Host	Agent	Environment
Pre-injury			
Injury			
Post-injury			

Haddon (1972) proposed a two dimensional approach to road safety whereby measures are considered in relation to three phases – pre-injury, injury and post-injury – interacting with three categories of factors roughly analogous to the host (human), agent (microbe) and environment (community) triad of classical infectious disease epidemiology.

The Matrix is narrowly focused on the period around the time of the injury itself but the principle may be extended to include earlier and later phases in the 'natural history' of the injury. Further, the triad can be extended (Runyan, 1998) to embrace broader socio-economic, service and other factors that may be relevant.

Active and passive safety

The active approach to safety requires individuals to take positive actions or to change behaviour. The passive approach requires neither but creates the conditions where safety is promoted regardless of human judgement or behaviour. Examples of the former are: avoiding drink driving supervising children at play and using seat belts. Examples of the latter are: domestic water thermostats, automatic sprinklers attached to smoke detectors and energy absorbent playground surfaces. In general, passive approaches to injury prevention have been found to be more effective than active ones presumably because it minimises the necessity for human decision-making. This finding has important implications for preventive policy making.

Need for a strategic approach

Fragmentation and duplication of efforts in injury prevention is the rule rather than the exception for a variety of reasons. Because no single professional discipline encompasses all the skills necessary to promote safety, effective injury prevention demands multi-agency working. That presents a major obstacle to progress because of the way government departments are organised i.e. vertically rather than horizontally. Moreover, both hazards and people cross national borders and that obliges the injury prevention community to work at international as well as national and local levels. For these reasons, a co-ordinated, integrated, strategic approach to injury prevention policy is necessary at every level of government.

Injury prevention policy internationally

Few countries or organisations have addressed injury prevention specifically in children. Most policies are, however, relevant to children as they usually contain several elements that are likely to impact on all age groups.

International approaches to injury prevention and control were surveyed by the BMA Board of Science and Education for their report (BMA, 2001). Their key findings were:

1. The World Health Organisation (WHO) has adopted an integrated approach to safety incorporating violence, self-harm and unintentional injury, in particular promoting the establishment of 'safe communities' – areas where co-ordinated action on injury is pioneered. In 1999, the WHO's Violence and Injury Prevention Unit launched *Injury: a leading cause of the global burden of disease* (WHO website) which concluded: *'The time has come to develop effective injury prevention strategies that will decrease the impact of injuries on the health of the world's population.'*
2. Other international bodies have only recently begun to take an interest in injury prevention. UNICEF devoted its second 'Innocenti Report Card' to the topic (Towner and Towner, 2001) concluding: *'For most of the causes of child injury deaths there are now proven strategies for prevention, In most industrialised countries, those strategies have yet to be implemented in a comprehensive and consistent way and with a well-informed emphasis on those most at risk.'*
3. The European Union promotes safety in a number of ways, especially through directives in the occupational health and safety field. Funding of programmes, such as the European Home and Leisure Accident Surveillance System (now part of the Injury Prevention Programme) are intended to encourage co-operation and sharing of best practice across Europe. Controls on the import and sale of products, the European system of standard setting and their enforcement have had a major impact on product safety in the member states. Trans-European organisations, such as the European Consumer Safety Organisation and the European Child Safety Alliance, hold meetings and publish reports in an attempt to maintain injury prevention high on the EU political and public health agenda.
4. In the United States of America, injury prevention operates at Federal, State and local levels. The National Center for Injury Prevention and Control was established in 1992 within the Centers for Disease Control to provide: *'a focal*

point for the establishment and implementation of national policy related to the prevention and control of non-occupational injuries and violence.'

The NCIPC also holds the lead responsibility for injury surveillance that has reached an unparalleled level of sophistication. The National Electronic Injury Surveillance System, under the direction of the Consumer Product Safety Commission, collects data from 101 hospital emergency departments. The National Highway Traffic Safety Administration runs the Fatality Analysis Reporting System on all road traffic fatalities, and the CDC collates and analyses the State returns on all standardised hospital discharge summaries. In addition, at least 10 multi-disciplinary injury research and policy centres have been created at universities across the country.

5. In 1986, Australia designated injury prevention as a national health priority (Australian Government Publishing Service, 1986). The Commonwealth Department of Health & Aged Care has the responsibility for developing national policy responses to all types of injury other than those within the remit of the Australian Transport Safety Bureau and the National Occupational Health and Safety Commission. The National Injury Surveillance Unit engages in all aspects of surveillance in parallel with the Australian Bureau of Statistics that reports injury mortality information. An Injury Research Committee of the National Health and Medical Research Council promotes injury prevention research in various agencies including the Monash Accident Research Centre and the recently founded Injury Risk Management and Prevention Research Centre of the University of New South Wales.

6. New Zealand established the Accident Compensation Commission – later to become the Accident Compensation Corporation (ACC) – in the 1980s to provide no fault compensation for injuries, whether they occurred in the home, on the road or at work. The ACC helps fund two highly reputable injury prevention research centres at the Universities of Auckland and Otago and is involved in a range of other injury prevention activities.

7. Sweden holds the enviable position of having the lowest injury mortality rate in Europe. The reasons are complex (Bergman *et al*, 1991) and are rooted in a strong ethos of safety that has been nurtured over half a century by the campaigning efforts of enthusiastic professionals working closely with voluntary organisations. A small but influential Child Accident Committee, formed in the 1950s with minimal government support, paved the way for the creation in the 1980s of a standing official committee within the National Child Environment Council. Key factors in Sweden's success include support for injury surveillance and research, ensuring safer environments and products through legislation and regulation, and the building of coalitions of organisations sharing similar aims.

UK policy on injury prevention

Within the UK, the position is extremely complex. Much official activity revolves around safety though it tends to be notable for its lack of integration and evaluation. Around a dozen separate government or government-supported departments or agencies[1] have a remit for safety, though some attempt and greater inter-departmental co-operation has been made since the mid-1990s. At the same time, devolved administrations in the various home countries have created further difficulties in that some functions (consumer safety and occupational health) are retained at UK level while others (health services, health education, environmental and local government matters, crime prevention and community safety) are devolved. No specific, separate policy for child as opposed to adult injury prevention has been formulated in any of the four home countries of the UK. And because child injury prevention policy has been so rudimentary, evaluation and monitoring has been almost non-existent, with the arguable exception of road safety.

Throughout the UK, responsibilities for intentional and unintentional injury are separate; with the former regarded as a social care rather than a health matter. According to the BMA (2001), intentional injury receives higher priority and more dedicated resources than unintentional injury. An example of this is the way that the 'child protection' field has been radically overhauled in recent years with the issuing of national guidelines and the creation of Area Child Protection Committees in every local authority.

The Welsh experience: CAPIC

One of the most impressive recent initiatives in the UK to develop a coherent policy on injury prevention is CAPIC – the Collaboration on Accident Prevention and Injury Control in Wales (see CAPIC website). CAPIC has been funded by the Welsh Assembly Government to co-ordinate injury prevention activities in Wales and to develop a Wales Injury Prevention Network. CAPIC was initiated in 1996 to bring together representatives from a wide variety of organisations interested in injury prevention including public health bodies, local authorities, clinicians, emergency services, academics, and voluntary and charitable bodies. CAPIC acts as an umbrella body which has representation from a variety of groups with more specific mandates, e.g. Child Safe Wales, RoSPA, but does not replicate their activities.

CAPIC is a virtual network, which is open to all, and is 'co-ordinated' by a steering group. Its role is to promote injury prevention through:

- the development of injury surveillance to provide information on the scale of the injury problem
- providing a multidisciplinary and multi-agency collaboration to form effective partnerships
- holding educational seminars and disseminating information through its website (www.capic.org.uk)
- supporting the research evaluation of injury prevention initiatives
- development of a National Injury Prevention Strategy for Wales.

[1] For example, Department of Health, Department of Trade and Industry, Department for Education and Science, Department for Transport, RoSPA, Child Accident Prevention Trust, Health and Safety Executive, Health Development Agency, Home Office, Institute of Home Safety, Department for Culture, Media and Sport, local authorities.

A spate of White Papers (Welsh Office, 1998; Department of Health, 1999; Scottish Office, 1999) in the 1990s highlighted the problem of unintentional injury and several national targets were either set or reiterated for the reduction in death and serious injury rates. The targets are controversial both conceptually and in practice, and have been variously criticised as too challenging and too easy. Recently, the UK government initiated a comprehensive review of unintentional injury prevention that attempted to redefine key policy objectives for the future. The subsequent report of the so-called Accidental Injury Task Force was a seminal document in the annals of UK injury prevention and deserves detailed consideration.

The Accidental Injury Task Force 2000 – 2002

Taking its cue from an earlier White Paper on public health, the Department of Health established in 2000 a multi-disciplinary Accidental Injury Task Force (AITF) to advise the Chief Medical Officer for England on the most important priorities for action. Its report (Department of Health, 2002) contained several recommendations that related directly to children.

In 1999, the White Paper *Saving Lives: Our healthier nation* set national targets for the reduction in injury death rates (by at least one fifth) and serious injury rates (by at least one tenth) in England by 2010. A year later *The NHS Plan* was published but this focused on cancer, coronary heart disease and mental health. The Accidental Injury Task Force was widely seen as a vehicle for taking forward the injury prevention policy agenda.

The Task Force identified two population groups for priority attention – young people (children and young adults) and older people. Two parallel working groups were set up to consider what action was needed to protect these groups from accidental injury. They concluded that much could be done to address the major causes of injury – namely falls, road accidents and dwelling fires – across all age groups.

The AITF recommendations for action in the short-term relevant to children were as follows:

Falls at or near home:

Home safety checks

Road accidents:

- 20mph speed limits in areas of higher pedestrian activity
- local child pedestrian training schemes and safe travel plans
- systematic road safety intervention in inner city areas.

Dwelling fires:

- installation of smoke alarms by fire brigades
- home fire risk assessments, safety checks and escape plans
- target deprived groups, particularly children in privately rented and temporary accommodation, and households in which people smoke.

Play and recreation:

- increase number of children undertaking cycle training and wearing cycle helmets
- produce guidelines for safety in children's sports
- strengthen risk and safety education in schools.

For the longer term, the AITF identified the following priority areas:

Young car passengers:

- better speed management including use of safety cameras at accident sites
- increase use of rear seat safety belts.

Sports injuries:

Creation of a comprehensive sports injury database, that includes injuries arising from school sports.

Home and leisure injuries:

- information campaigns on DIY and garden safety
- good practice initiatives.

The Task Force also offered a number of ideas under the heading of a 'framework of delivery':

- While the creation of a new agency to co-ordinate injury prevention would be difficult to justify, the development and promulgation of a more united approach across Government and the NHS should be a priority.
- Given that accidental injuries affect the health of many and have a considerable impact on the NHS, the Department of Health is ideally placed to co-ordinate the delivery of cross-Government action.
- Since Regional Directors of Public Health (in England) will shortly be located in Government Offices of the Regions, they should lead on co-ordinating the delivery of accidental injury prevention.
- Public Health Observatories, together with their counterparts in local government, should play a key role in the surveillance of accidental injury.
- Local authorities, primary care trusts and other local organisations should come together through Local Strategic Partnerships to deliver accidental injury prevention, co-ordinated by local directors of public health.
- Delivery is more likely to be achieved where it is made the task of an identifiable individual working to a local implementation plan.

Finally, the Task Force identified the following ten specific steps to help deliver successful local implementation:

1. Use data collected in a common format to show where action is needed most.
2. Adapt key interventions to specific local needs where they will have the greatest impact.
3. Develop and disseminate good practice to show what can be done.
4. Show how these interventions can help deliver other programmes and meet targets elsewhere (e.g. Health Inequalities, Sure Start).
5. Involve all stakeholders in producing a local action plan.
6. Develop a well-trained workforce with capacity to undertake injury prevention work.
7. Recruit high-level support.
8. Recruit support from the voluntary sector.
9. Identify sources of additional funding.
10. Identify indicators to monitor performance.

Action on Injury 1998

In 1998, the British Medical Association, in conjunction with three medical Royal Colleges and the Department of Health, launched a policy-makers' briefing document *Action on Injury* (Pless and Towner eds, 1998). Inspired by the experience of the United States, where a groundbreaking report *Injury in America* had been published in 1985, the UK conference was hailed at the time as an historic occasion.

Among its general conclusions were, that:

- a dedicated UK national agency for injury prevention should be established
- injury surveillance should be co-ordinated nationally
- standing committees for injury prevention and control should be established in each of the four countries
- the academic research capacity in prevention and control should be rapidly expanded.

Among the specific conclusions relating to children, the following evidence-based interventions were enumerated as requiring more widespread implementation:

- area wide urban safety measures, notably traffic speed reduction to reduce pedestrian and cycle injury
- promoting the wearing of seat belts and use of child restraints (including adequately fitted baby seats) in cars
- promoting the wearing of bicycle helmets through legislation, if necessary
- provision of smoke alarms

- the use of child resistant closures to prevent poisoning
- fitting window guards to prevent falls
- improving domestic product design.

BMA Policy Statement on Injury Prevention (2001)

Following the Action on Injury conference, the BMA issued a policy report *Growing up in Britain: Ensuring a healthy future for our children* (BMA, 1999). This pointed out that the UK had no single agency with responsibility for injury prevention and recommended a 'national framework' that would be the responsibility of government, health authorities and local authorities.

Its Board of Science and Education subsequently pursued the same theme of the need for an integrated approach in its report Injury Prevention (BMA, 2001). The authors made several recommendations covering injury surveillance, research and development, implementation and strategic policy development. The most far-reaching of these was that, in each of the four home countries, a single overarching national agency for injury prevention be established with the remit to:

- co-ordinate initiatives across all forms of injury, age groups and at all levels
- be responsible for establishing national injury surveillance systems
- commission several multi-disciplinary academic research centres
- develop a national strategic plan for injury prevention
- be answerable to a single responsible government minister.

Road safety

The Government set UK wide targets for the reduction in road casualties in *Tomorrows Roads – Safer for Everyone* (Department of Environment Transport and Regions, 2000). The targets have a baseline of 1994–1998 to be attained by 2010. They are a:

- 40% reduction in the number of people killed or seriously injured
- 50% reduction in the number of children (under 16 years) killed or seriously injured
- 10% reduction in the slight casualty rate.

Other UK policies

We have chosen, for reasons of space, not to offer a detailed consideration of the extremely wide range of policies relating to transport, the environment, fire, police, consumer affairs and other statutory agencies. An awareness of these is, however, relevant to an enhanced understanding of the broader policy context within which injury prevention should be viewed.

Injury prevention policy in Scotland

In the early 1990s, accident prevention received considerable government attention. The Scottish Office policy statement *Scotland's Health: A challenge to us all* (Scottish Office, 1992) listed five priority areas for national action to improve Scotland's health. These were coronary heart disease, cancers, HIV/AIDS, dental and oral health, and accidents. This was a reaffirmation of an earlier statement entitled *Health Education in Scotland: A national policy statement* (Health Education Board for Scotland, 1991).

By the late 1990s, there were signs that the momentum was being lost. The public health White Paper *Towards a Healthier Scotland* (Scottish Office, 1999) identified child health as a priority, within which accidents were mentioned.

Accidents featured in a short list of health topics for action with the following undertakings being promised:

- the Information and Statistics Division of the NHS Common Services Agency will work with health boards and other interests to develop national criteria for data collection
- health boards will be encouraged to foster, and participate in, local inter-agency accident prevention work
- the Government will commission and fund and initiative to deliver a web-site database of best practice in home safety for use by local authorities and others; and to help establish information networks to inform the development of co-ordinated local strategies
- a new target for reducing road accident casualties will be set up for the period 2010 and published, together with a strategy for its achievement.

Yet, accidents did not feature in the list of 12 target indicators for monitoring progress in health improvement in the years following the publication of the white paper.

In November 2002, the Chief Medical Officer for Scotland held a consensus seminar for invited participants to seek to agree the strategic direction and priorities for NHS Scotland in injury prevention. According to a summarised report of the meeting circulated to participants, the main points of agreement were:

- injury has such a major impact on the public health, particularly the health of children and older people, that it deserves a high priority in Scotland's Health Improvement Programme
- injury is a major cause of years of life lost and many hospital bed days are used up caring for those injured
- we should focus our preventive strategy on a limited number of key priorities initially in children and older people
- there appears to be a consensus in favour of some kind of national co-ordinating centre to ensure work is more joined up and focused
- an early priority is to use existing data more effectively, whilst considering the gaps in our current data and planning to fill some of these

- existing networks of agencies and individuals need strengthened and public attitudes to safety need to be addressed to move toward a safety culture.

Injury should be an important priority for those agencies responsible for health promotion, health protection and/or health improvement and for those concerned to reduce unnecessary suffering and avoidable impact on health services.

Some years after the appearance of the public health white paper, a health promotion strategy document entitled *Improving Health in Scotland: The challenge* was published (Scottish Executive, 2003). The 'first phase' of the strategy identified five risk factors (tobacco, alcohol, low fruit and vegetable intake, physical activity levels, obesity) and four specific areas (early years, teenage transition, workplace, communities). There were only three specific references to injury prevention. The first (reducing accidents inside and outwith the home) was ninth on a list of 10 health improvement actions relating to the early years. The second was an assertion that progress was being maintained in preventing accidents and injuries in the workplace. The third was a commitment to support a national suicide prevention strategy in Scotland. Again, the indicators and targets for follow up included no explicit mention of injury other than suicides among young people aged 10 – 24 years.

The broader policy context relevant to injury prevention in Scotland

Several other relevant policies and programmes are worthy of mention as they all include reference, explicit or implicit, to the importance of protecting children from environmental dangers.

Starting Well: a demonstration project based in Glasgow that targets the most vulnerable children and seeks to improve the life circumstances and parental support of these children in an evidence-based manner.

Sure Start Scotland: £61 million has so far been distributed to local authorities in an effort to support vulnerable families building on and complementing universal social care, health and education programmes for the early years. Sure Start Scotland supports a range of programmes for very young (0 – 3 years) children such as centre-based support, childcare, outreach services, peer support groups, parenting skills classes, nursery and day care services.

Early Years Strategy: this recent initiative is in the process of development with a draft strategy document out for consultation at the time of writing. The strategy is designed to integrate as far as possible the various initiatives relating to young children in various government departments (see http://www.scotland.gov.uk/consultations/social/isey.pdf for the consultation document). Among the set of outcome indicators identified is a reduction in the level of child injuries (including fatalities) and a reduction in infant mortality.

National Physical Activity Strategy: its goal is to ensure that 80% of all Scotland's children meet recommended levels of physical activity by 2022. In part, this will involve encouraging parents and children to walk to school rather than use cars and buses. If successful, the strategy may simultaneously promote two apparently conflicting outcomes – a reduction in the risk of cardiovascular and related diseases in later life while exposing children to an increased short-term risk of pedestrian injuries from road traffic.

Community Planning: the aim of this policy is to encourage the development of multi-agency planning across Scotland. It ended formally in March 2003 although the Scottish Executive has indicated that there will be a successor. In the spirit of a community based approach are two other relevant developments: the creation of numerous community safety groups around the country, and the proposed replacement of local health care co-operatives by community health partnerships in accordance with the aims of the restructuring of the NHS in Scotland announced in April 2003.

Children's Services Plans: Section 19 of the Children's (Scotland) Act 1995 requires local authorities to produce, in consultation with other statutory and voluntary organisations, plans for the provision of 'relevant services' for children within their areas. The Plans aim to promote the welfare of children, clarify strategic objectives in relation to services, and develop an integrated approach.

Social Justice: the Social Justice Report, published in 1999, set out targets and milestones for achieving social justice, defined in a broad sense, including poverty and other forms of inequality. A related policy objective recently announced is the achievement of 'environmental justice' that seeks to improve the quality of the environment in for all social strata in all geographical locations.

Health Improvement Fund: this was established in 2000 and aims to support initiatives designed to prevent disease and promote health. The bulk of the funds have been channelled through health boards and have been used to support a range of child health promotion programmes, many designed to improve nutrition.

Health Scotland: this new health improvement agency has been created by merging the Health Education Board for Scotland and the Public Health Institute of Scotland. Its strategic orientation has yet to be confirmed but is likely to include a strong emphasis on child health.

Discussion

Objective 5. Discussion of implications of findings for future activity around prevention

This report has so far revolved around two interrelated themes:

1. The need for data to identify needs, target high-risk populations and monitor progress (Objectives 1 – 3).
2. The need to implement effective interventions selected in accordance with scientifically sound evidence and delivered within a supportive policy framework (Objective 4)

Each of these themes deserves more detailed exploration.

Theme one: the need for data

Given the copious volume of information on injury from a variety of sources, the assertion that 'we need more data' may seem surprising. Yet that is such a frequent call from professionals, academics and voluntary organisations, that is has come to be regarded as almost axiomatic.

On reviewing the existing data on injury in Scotland, however, a number of serious problems are evident. These include the variable quality and reliability of most routine data, an absence of integration of routine injury data, a relative lack of data on incidence, causes and consequences of injury, and a paucity of injury surveillance systems.

1. Variable quality and reliability of most routine data.

Routine data sources on injury in Scotland have been comprehensively reviewed recently by Chishti (2002) who identified 16 separate sources. Only three sources met the criteria of being population based, being available annually and relating to children. The three sources were mortality statistics (General Register Office for Scotland), hospital discharge data (Information and Statistics Division of the Scottish Health Service) and police statistics (STATS 19) on road traffic casualties (Scottish Executive). Even these are not perfect. While the fact of death is not open to debate (in most cases), the true cause of traumatic death may be difficult to determine, especially if no witnesses are involved. Hospitalisation data are partly service driven, in that the availability of beds and admission policies, rather than the occurrence of injury, will influence the extent to which injured children are admitted. Finally, police reporting of road casualties is known to underestimate pedestrian and cycle injuries as well as being subject to a somewhat arbitrary classification of injury severity.

2. Absence of integration of routine injury data.

The multiplicity of data sources renders any attempt to describe the pattern of injury in the population fraught with difficulty. The various sources employ different terminology, definitions, classification systems, time scales, geographical units and reporting variables. Cross-comparison between sources is hazardous and linkage non-existent even when two sources (e.g. SMR 01 and STATS 19) are describing the same phenomenon (people injured on the roads requiring hospital care). The absence of a one-stop-shop for the retrieval of injury data in the population is arguably one of the most damaging yet potentially avoidable obstacles to injury prevention in the UK today.

3. A lack of data on incidence, causes and consequences of injury.

Despite the plethora of sources of injury data, we have virtually no information about the incidence of injury in the population of Scotland other than estimates derived from parental recall. Mortality is the outcome of a complex interaction of at least three variables – incidence, severity and prognosis. Hospitalisation data, being dependant upon people presenting to the health care system, is distorted by service factors as described above. STATS 19 require the involvement of a police officer.

There is a similar dearth of information about causes. An injury is the outcome of a series of events or a process and routine data sources are, in the main, incapable of recording such events. The somewhat crude characterisation of 'external causes' that is enshrined in the International Classification of Diseases (Ninth and Tenth Editions) throws only limited light on causation.

Another striking information gap relates to the long-term consequences of injury. Although the General Household Survey and the Scottish Health Survey (both of adults) contain questions on disability and longstanding illness, the data are extremely broad-brush and cannot be linked to data about specific incidents. Even less is known about the burden of psychological and emotional disturbance, such as posttraumatic stress disorder, or of the impact of injury on later social, educational, occupational and economic wellbeing.

4. Absence of injury surveillance systems.

The establishment of specially designed databases to monitor the incidence and pattern of injuries are often regarded as an important part of the solution to the injury data problem (Stone *et al*, 2001; BMA, 2001). Undoubtedly, their absence is unhelpful to the planning, implementation and monitoring of preventive measures. On the other hand, they are not a panacea. Collecting injury data is a means to an end and excessive focus on the process may be counterproductive (Stone *et al,* 1999). In Scotland, the only firmly established, long-term paediatric injury surveillance system is CHIRPP (Children's Hospital Injury Reporting and Prevention Programme), imported form Canada to the A&E department of the Royal Hospital for Sick Children, Yorkhill, Glasgow, in the early 1990s (Stone and Doraiswamy, 1996). Until recently, Monklands Hospital, Lanarkshire, participated in the UK-wide Home and Leisure accident Surveillance System (HASS/LASS) run by the Department of Trade and Industry but that has now been discontinued.

Theme two: the need to implement effective interventions

The main obstacles to progress towards implementing effective injury prevention measures include an incomplete evidence base with which to guide preventive policy making, a lack of strategic thinking in the development of policy nationally and locally, an absence of appropriate delivery structures for implementing injury prevention measures, and an inadequate capacity for injury prevention.

1. Inadequate evidence base to guide preventive policy making

Towner and Ward (1998), while acknowledging the major increase in research into injury prevention in the last decade or so, have identified several serious gaps in the evidence base. These include interventions targeting the adolescent age group, sports and leisure injuries and social deprivation. The lack of investment in UK injury research generally, relative to the burden of injury as a cause of death and disability, is remarkable and suggests that injury prevention remains grossly neglected as a topic worthy of research. The Medical Research Council, for example, spent £18.1 million on heart disease in 1999 – 2000 compared to £59,100 (sic) on unintentional injury prevention (BMA, 2001) – despite injuries being responsible for more premature deaths and long-term disability than cancer. (No similar data are available for Scotland).

2. Lack of a strategic approach to policy nationally and locally

Because injury prevention is a multi-agency, multi-disciplinary task, fragmentation and duplication of effort is inevitable in the absence of an over-arching strategy. Injury has not been ignored in the UK generally or in Scotland in particular. It has regularly featured within the broader public health agenda. Yet Scotland now lags well behind Wales and England in its approach to injury prevention policy, lacking any initiative remotely comparable to either CAPIC or the AITF.

3. Absence of appropriate delivery structures for implementing preventive measures

Towner *et al* (1998) listed 25 local government, health and voluntary organisations with a remit for local child accident prevention. A review of child injury prevention activities among local government, voluntary sector, health service, and emergency services in Scotland (Smith and McIntosh, 1994) highlighted the lack of co-ordination and evaluation. The UK has not followed the path of other countries such as the USA where a national agency is the focal point for injury prevention. The *Action on Injury Conference*, the BMA, (2001), and others (Stone *et al*, 2001) have urged the creation of an adequately resourced, dedicated national agency (or agencies, ideally one for each of the home countries) to implement injury prevention and control programmes. The Department of Health's AITF decided that this was not feasible and the Scottish Executive has not taken a formal position on the proposal.

4. Inadequate capacity for injury prevention

There is widespread agreement that a well-trained and highly motivated workforce is essential to address the challenge of injury. Training programmes dedicated to injury prevention are rare in the UK and virtually non-existent in Scotland. A related issue is that of leadership, or rather its lack thereof. Leaders can only emerge from the ranks of practitioners and policy makers if the capacity exists to understand, promote and evaluate injury prevention activity locally and nationally. Lack of opportunities for acquiring knowledge and skills in the field may therefore explain, in part at least, the current dearth of leadership in injury prevention in Scotland.

Research and development: the need for infrastructure

Injury research is a complex, heterogeneous activity covering epidemiology, systematic literature reviews, aetiological studies and evaluations of interventions. This requires a formidable array of research skills and expertise.

Ward and Christie (2000) undertook a review of research priorities for the Department of Health. They concluded that:

- the information infrastructure to describe the size and nature of the problem of injury is poor
- injury research is grossly under funded relative to the burden on the NHS and on other services
- there are large gaps in our knowledge about which preventive interventions do and do not work
- there are extensive research programmes that address particular injury types and settings (e.g. road traffic accidents) since they are the responsibility of government departments, while other injuries, for which no single department is responsible, tend to 'fall through the gaps'
- ownership of the injury problem in Britain is fragmented
- international experience has shown that progress in reducing injuries is slowest when the problem falls under the responsibility of several different government departments
- there is a need for more collaborative injury research at all levels and across all types of injury, from causation right through to the rehabilitation of the injured.

Among solutions to the above may be included more funding, greater political commitment and the formation of new multidisciplinary research centres. The latter could develop the academic research capacity, promote methodological and other research and offer training, advice and information to practitioners and policy makers.

What next for Scotland?

Scotland has arguably reached a crossroads in terms of its response to the injury challenge. There can be little doubt that our past record has been disappointing. While other parts of the UK and the EU have followed the lead of other countries such as the USA, Sweden and Australia, the Scottish approach to strategic policy making – as opposed to local initiatives – has been tentative and unimaginative. This continuing policy neglect of injury poses an indirect but nevertheless real threat to the health and wellbeing of Scottish children.

We know, from experience elsewhere, the basic ingredients or principles of a successful injury prevention policy. They are:

- a comprehensive, population based strategic approach to addressing the problem of injury
- a sound knowledge base, whether of the epidemiology, aetiology and outcome of injury, or of the efficacy of countermeasures
- an integrated, co-ordinated, focused, multi-disciplinary, multi-agency approach to injury prevention
- a well-trained, highly motivated workforce of injury prevention professionals and academics
- leadership that tirelessly raises awareness of injury among professionals, politicians and the public, and that advocates sustained and effective preventive action
- resources, financial and human, dedicated to the task of preventing injury.

The key question for Scotland's policy makers is this: in the light of the above principles, does real political commitment and determination exist to translate them into practice? If not, how will we explain to future generations our collective failure to protect large numbers of Scottish children and their families from avoidable death, disability and suffering?

Recommendations

Objective 6. Recommendations: priorities and partnerships in Scotland

On the basis of the evidence and policies outlined above, we offer a series of recommendations designed to fill the gap in strategic policy making in Scotland. Although these are presented in a somewhat prescriptive fashion, we recognise that several of our proposals are likely to require further debate and discussion before definitive action is taken.

Priorities for prevention

General

A key component of successful injury prevention is the acceptance of responsibility for action on the part of an existing or new national agency.

We recommend that the multi-disciplinary public health community in Scotland should adopt a strong collective leadership and advocacy role for child injury prevention.

A comprehensive, integrated and sustained approach to child injury prevention is currently hindered by the lack of in-depth strategic thinking on this topic both nationally and locally.

We recommend the development of a national strategy for child injury prevention in Scotland as a matter of urgency.

Although much routine child injury information is available from a variety of sources, there are gaps, including a paucity of detailed information on child injury circumstances, causes, incidence and outcomes. Moreover, there is no integration and little comparability across sources.

We recommend that all currently available routine statistical information on child injury in Scotland should be improved in quality and quantity, aligned to a central information base, and be made available on an accessible single site.

There are no specific structures for focused co-ordinated and integrated multi-agency implementation of injury prevention programmes.

We recommend the establishment of a dedicated administrative structure – a Scottish Injury Prevention Centre – to ensure that effective and efficient child injury prevention in Scotland is implemented.

Injuries constitute the single largest contributor to mortality and a major cause of acute morbidity and long-term disability in children. It is paradoxical that more resources, in the form of grants, specialist centres and other forms of infrastructure, are allocated to other causes of ill health in children such as infectious and malignant diseases.

We recommend that resources commensurate with their public health importance be allocated to injuries and their prevention by central and local government, voluntary organisations and other relevant organisations.

Specific

As described earlier, several major and rigorous literature reviews have been conducted recently to identify the most efficacious child injury prevention measures. This evidence base is relevant to the selection of appropriate child injury preventive measures in Scotland.

We recommend the immediate implementation of the following evidence based interventions:

To prevent falls at or near home

- home safety checks to identify and remove hazards that increase the risk of falls.

To prevent injuries on the road

- better speed management in inner city areas including use of safety cameras at accident sites and 20mph speed limits in areas of higher pedestrian activity
- local child pedestrian training schemes and safe travel plans
- increase use of rear seat safety belts.

To prevent dwelling fires

- installation and maintenance of smoke alarms by fire brigades
- home fire risk assessments, safety checks and escape plans
- target deprived groups, particularly children in privately rented and temporary accommodation, and households in which people smoke.

To promote safe play and recreation

- increase number of children undertaking cycle training and wearing cycle helmets
- produce guidelines for safety in children's sports
- strengthen risk and safety education in schools.

Priorities for research

General

We currently lack a critical mass of researchers in Scotland who have the motivation, knowledge and skills to generate the new information and insights that policy makers, professionals and managers require to take forward the injury prevention agenda. Part of the reason is the perceived low priority attached to injury prevention by research funding agencies.

We recommend a substantially increased allocation of research funding to injury prevention commensurate with other major public health problems. As a first step, we urge the undertaking of an audit to provide a baseline of all ongoing injury prevention activity in Scotland.

We are sceptical that a sufficiently focused and appropriately resourced research effort is likely to be mounted on the basis of ad hoc research funding decisions made on a response mode basis. Unless addressed adequately, the lack of a robust academic infrastructure for injury prevention is liable to obstruct progress for many years to come.

We recommend that a multidisciplinary injury research centre should be established in Scotland to act as a focal point of knowledge, expertise, training and innovation.

Specific

We recommend that a future programme of injury research should include both quantitative and qualitative elements covering the entire natural history of injury from predisposing risk to long-term outcome, including psychological and physical disability.

We further recommend that the following areas of research be accorded high priority:

- hypotheses should be generated and tested relating to the numerous unexplained epidemiological patterns of child injury – notably the male excess in risk, time trends and social variation
- economic aspects of injury should be investigated – by cost-benefit and cost-effectiveness analyses – in greater depth.

Despite recently published literature reviews, there remains substantial uncertainty about what works in child injury prevention.

We recommend that research be conducted to improve the evidence base for effective prevention by continuous systematic literature reviews, the identification of gaps in knowledge about the efficacy of countermeasures, and the commissioning of new research to develop and evaluate interventions.

We further recommend that innovative preventive measures be designed to reduce the incidence and/or outcome of all forms of childhood injury – but especially those occurring on the roads and in the home – and that these should be implemented and evaluated using appropriate methodologies.

Priorities for education and training

General

Effective injury prevention demands the application of specialised skills that are in short supply in Scotland and throughout the UK. Educational programmes and in-service training schemes require to be introduced. These should be multidisciplinary, in terms of both content and participants.

We recommend that steps be taken to nurture, through new education and training schemes, a skilled workforce, able to champion, co-ordinate and lead action on child injury prevention.

Specific

Academic departments are probably best placed to help develop specialised injury prevention training courses though this would require the injection of pump-priming funding in the early stages. One such course has been recently developed jointly by the University of Newcastle and the Child Accident Prevention Trust.

We recommend that academic departments of public health or health promotion be invited to develop a multidisciplinary child injury prevention course modelled on the one pioneered, and currently undergoing evaluation, by the University of Newcastle.

We recognise that injury prevention must take its place alongside a range of competing priorities within the training curricula of health and other professionals. We submit, however, that provision of specific injury prevention skills training should be made available both professionals and policy makers in Scotland.

We recommend that undergraduate and postgraduate medical and nursing education courses include a specific module on the theory and practice of injury prevention.

We further recommend that health visitors, general practitioners, health promotion officers, local authority staff, and voluntary organisations involved in child health and indeed all others working in child safety, be offered skills training via a Diploma or Certificate course.

Partnerships and leadership

General

In developing local or national injury prevention plans, all stakeholders should be involved at an early stage. Advocates and leaders of injury prevention should be recruited from clinical and academic departments as well as public health, health promotion departments, local authorities and voluntary organisations. Local and national organisations with a community safety remit should be encouraged to address injury prevention as vigorously as crime prevention. The importance of securing the support of both voluntary and commercial sectors should not be underestimated.

We recommend that all concerned with child injury prevention seek the involvement and, where possible, the explicit support of senior professionals, academics, politicians, business leaders, voluntary organisations and community agencies.

We further recommend that the NHS in Scotland and its sub-divisions adopt a leadership role promoting child injury prevention activities throughout the country.

Specific

Within NHS Scotland, several agencies and individuals have a remit for health promotion, health protection and safety. These include Health Scotland, the Scottish Centre for Infection and Environmental Health, the new Health Protection Agency, the Scottish Executive Health Department and NHS boards. There is therefore a danger that child injury prevention will suffer from duplication or even slip through the net entirely as it appears to be the responsibility of all – and thus potentially none – of these bodies.

We recommend that the Chief Medical Officer for Scotland or their named representative, working in a multidisciplinary fashion with colleagues in related departments, should assume the major responsibility for leading and co-ordinating child injury prevention activities in the country as a whole.

We further recommend that Directors of Public Health (either personally or via a named public health consultant), working in a multidisciplinary fashion with colleagues within and outwith the NHS, should assume the major responsibility for leading and co-ordinating child injury prevention activities in their localities.

Recapitulation: list of recommendations

Prevention

We recommend that the multi-disciplinary public health community in Scotland should adopt a strong collective leadership and advocacy role for child injury prevention.

We recommend the development of a national strategy for child injury prevention in Scotland as a matter of urgency.

We recommend that all currently available routine statistical information on child injury in Scotland should be improved in quality and quantity and be made available on an accessible single site.

We recommend the establishment of a dedicated administrative structure – a Scottish Injury Prevention Centre – to ensure that effective and efficient child injury prevention in Scotland is implemented.

We recommend that resources commensurate with their public health importance be allocated to injuries and their prevention by central and local government, charitable organisations and other relevant organisations.

We recommend the immediate implementation of the following evidence based interventions:

To prevent falls at or near home

Home safety checks

To prevent injuries on the road

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To promote safe play and recreation

- increase number of children undertaking cycle training and wearing cycle helmets
- produce guidelines for safety in children's sports
- strengthen risk and safety education in schools.

Research

We recommend a substantially increased allocation of research funding to injury prevention commensurate with other major public health problems.

We recommend that a multidisciplinary injury research centre should be established in Scotland to act as a focal point of knowledge, expertise, training and innovation.

We recommend that a future programme of injury research should include both quantitative and qualitative elements covering the entire natural history of injury from predisposing risk to long-term outcome, including psychological and physical disability.

We recommend that the following areas of research be accorded high priority:

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We recommend that research be conducted to improve the evidence base for effective prevention by continuous systematic literature reviews, the identification of gaps in knowledge about the efficacy of countermeasures, and the commissioning of new research to develop and evaluate interventions.

We recommend that innovative preventive measures be designed to reduce the incidence and/or outcome of all forms of childhood injury – but especially those occurring on the roads and in the home – and that these should be implemented and evaluated using appropriate methodologies.

Education and training

We recommend that steps be taken to nurture, through new education and training schemes, a skilled workforce, able to champion, co-ordinate and lead action on child injury prevention.

We recommend that academic departments of public health or health promotion be invited to develop a multidisciplinary child injury prevention course modelled on the one pioneered by the University of Newcastle.

We recommend that undergraduate and postgraduate medical and nursing education courses include a specific module on the theory and practice of injury prevention.

We recommend that health visitors, general practitioners, health promotion officers and others in working in child safety be offered skills training via a Diploma or Certificate course.

Partnerships and leadership

We recommend that all concerned with child injury prevention seek the explicit support of senior professionals, academics, politicians, business leaders, voluntary organisations and community agencies.

We recommend that the NHS in Scotland and its sub-divisions adopt a leadership role in promoting child injury prevention activities throughout the country.

We recommend that the Chief Medical Officer for Scotland or their named representative, working in a multidisciplinary fashion with colleagues in related departments, should have the principle responsibility for leading and co-ordinating child injury prevention activities in the country as a whole.

We recommend that Directors of Public Health (either personally or via a named public health consultant), working in a multidisciplinary fashion with colleagues within and outwith the NHS, should have the principle responsibility for leading and co-ordinating child injury prevention activities in their localities.

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