TABLE OF CONTENTS

Acknowledgements

The team extends grateful thanks to all members of the review group, the community interviewees, the Department of Human Services and the international reviewers. Many people assisted in informing us of key reports and evaluations and we acknowledge their contribution in Appendix A of the report. Contributors to the review and the development of this report are as follows:

Systematic review

Dr. Elizabeth Waters
Dr. Michelle Haby
Dr. Clara Mwbili-Muleya
Jan Shield

Community consultation

Kerry Haynes
Kerry Phelan
Sharon Scott
Melinda Barker

Synthesis

Dr Jane Elkington
Jerry Moller
Kate Hunter

Editorial team

Dr Elizabeth Waters
Julie Green
Jan Shield
Professor Terry Nolan
Helen Boyce

Abbreviations

COAG	Council of Australian Governments
CRC	Child resistant closure
ECIPP	Early Childhood Injury Prevention Program
MCHN	Maternal and child health nurse
NPHP	National Public Health Partnership
RCH	Royal Children's Hospital
SAFE	Safe Accident Free Environment
TIPP	The Injury Prevention Program

Glossary

Case-control study is one in which the case community receives a program or intervention of interest and the control community does not.

Cost-benefit analysis provides an assessment of the return on investment in monetary terms.

Randomised controlled clinical trial is where people or communities are randomly assigned to an experimental group and a control group. These groups are followed up for the outcomes of interest.

Risk ratio (RR) is the ratio of risk in the intervention group to the risk on the control group. RR is used in randomised trials and cohort studies.

Cross-sectional study is the observation of a defined population at a single point in time or time interval. Exposure and outcome are determined simultaneously.

Cohort study involves identification of two groups (cohorts), one of which did receive the exposure of interest and one which did not, and following these cohorts either forward (prospective cohort) or back through time (retrospective) for the outcome of interest.

Executive Summary

Summary of the project

The project described within this report addresses the aim of developing guidelines or recommendations to inform purchasing and planning of evidence based practice in the field of injury prevention for young children. This project has used a systematic approach to collate, review and analyse evidence-based approaches to the prevention of injury to children aged 0-5 years. The types of intervention that are efficacious and cost-effective in preventing injury are of particular interest for their potential to inform the development of injury prevention planning and purchasing frameworks. Conventionally, child health outcomes have focused on deaths, hospitalisations and diagnoses of morbidity associated with injury. This project aimed to seek evidence of outcomes more broadly and to be inclusive of issues such as the impact of injury on the family, overall health and wellbeing. It consisted of three major stages to develop a set of recommendations which are more likely to be effective and able to be implemented by those involved with policy and purchasing injury prevention programs:

1. a systematic review of the published and unpublished literature

2. a structured program of community consultation

3. involvement of injury experts to synthesise the evidence base and consultation outcomes together into a summary of recommendations.

Summary of main findings

1. An overview of the review of the literature

There are relatively few child injury prevention interventions that are the subject of well-designed and well-reported studies. Burns, scalds and poisoning are the best-researched areas. A significant number of studies present a range of evidence that makes a case for intervention development and coinciding effectiveness measurement. Conclusions about what is effective are hampered by inadequate description of the interventions employed or by the process of selection of the study subjects, small sample sizes, the absence of comparison groups or statistical significance testing.

Many injury prevention interventions have not been assessed for their impact on injuries. Evaluation is commonly confined to interim outcomes such as changes in knowledge or behaviour. In some instances there are reasonably strong findings from individual studies, but these may lack confirmation from other studies, leaving us uncertain about the generalisability of the findings reported.

The availability of cost data within studies is poor, and as a result only limited analysis of the cost effectiveness of programs has been possible. Very few studies have considered the benefit-cost ratios of injury prevention initiatives thus generally leaving this aspect of the intervention decision making process still uninformed.

Interventions that are “recommended” are few. Many other interventions have been demonstrated but on a very limited basis. The majority of trialled interventions carry no recommendation, simply because the studies reported on their implementation and are not sufficiently strong to be conclusive about the direction and extent of effectiveness.

The most definitive successes in childhood injury prevention relate to engineering or design changes to hazards or hazardous products that are uniformly applied through the use of legislation

or enforcement, for example child resistant containers for medications and modifications to children's sleepwear.

A mix of approaches or large scale campaigns which encompass educational, environmental and legislative strategies have been found to be effective in reducing specific injuries (such as scalds, or respiratory injuries) or child injuries generally.

There appears to be merit in consideration of:

- careful targeting of programs, such as funding socio-culturally appropriate programs to those at greatest risk, and
- attending to public areas, because of the capacity to enforce or monitor safety compliance.

Education (whether media-based, individual or group counselling) on its own, with or without print material, has not been found to impact injury outcomes measured in conventional ways.

Education is more likely to be associated with a reduction in injuries if:

- it is coupled with enhancing access to safety devices (such as discounts or give-aways) particularly for low SES groups,
- it is coupled with regulation or enforcement,
- it is delivered over several occasions and/or is extended counselling (30 minutes or more).

2. A summary of evidence for each major injury cause according to the level of evidence

Poisoning

- The strongest evidence on poisoning prevention rests with child resistant closures.
- There appears to be some promise in changing the palatability of a product, increasing the of medical treatment for cases requiring treatment and decreasing use of medical resources for cases not requiring treatment.
- Education strategies may be more effective if targeting a select audience. Otherwise, little evidence exists of the effectiveness of educational campaigns, in the absence of other strategies.

Falls

- Few studies have examined the effectiveness of strategies to reduce falls in children. The emphasis has mainly been on older children and injuries in playgrounds. This prevents conclusions being made regarding successful strategies, particularly in the Australian setting. A better understanding of how they fall and what causes the injuries is needed in order to target interventions effectively.
- The potential for regulatory approaches in settings where enforcement strategies are feasible has not been systematically assessed, giving rise to the need for further research in the prevention of injuries caused by falls.

Respiratory

- There is scant evidence of what works in preventing "respiratory" injuries (choking and suffocation) in young children. The one study with strong findings in this area suggests the value of a campaign, or mix of community-wide strategies, encompassing media and individual educational strategies, warning labels on products and complementary policies in child care centres.
- Safe feeding and sleeping practices appear to have potential.

Immersion

- The introduction of pool fencing significantly decreases the incidence of immersion injuries in children.
- More work is required to improve compliance rates both from a government perspective and a parental perspective, for example investigating leaving pool gates open and fences in disrepair, for the full effectiveness of this strategy to be realised.
- Swimming and water safety programs offer promise for increasing swimming ability and safe behaviour around water but evidence of links to reducing immersion injury by these approaches has not yet been provided, particularly for the age group at greatest risk i.e. 1-3 year olds.
- Awareness-raising education programs or campaigns may work, if appropriate for the age group at risk, but no significant impact has been found. (The Brisbane experience suggests that educational and media campaigns underpin the success of other approaches.)

Burns and scalds

- Legislation requiring flame resistant material and sleepwear design has proven to be successful in decreasing the incidence of burn injury involving children's sleepwear.
- Few studies on the effectiveness of smoke alarms have isolated children as a target group so the current review does not reflect the evidence available on this approach to reduce house fire related burns to children. Building codes that require smoke detectors to be installed in new houses appear to increase the use of such devices.
- Changes in legislation regarding acceptable temperatures for home hot tap water are effective in: decreasing injuries from scalds and achieving lower hot tap water temperatures. Resource-intensive, large-scale campaigns that encompass a mix of strategies (education, product modification, and regulations concerning hot water temperatures) are associated with significant reductions in scald injuries among young children, particularly the more severe injuries. Cost-benefit ratios of this approach are still needed, although preliminary estimates suggest that such campaigns at least may return many times their cost in health care savings.
- Educational efforts, on their own, have not been linked with significant changes in burn injuries. There are greater signs of outcome effect if such campaigns are coupled with product promotion (such as anti-scald devices) either by way of assistance in purchasing or installation.

General

✓ The most promising approach to address all injuries in children is the community-wide "safe communities" approach. The literature on the evidence concerning programs that address child injuries in general suggests three possible factors to increase the chances of desired effect via educational strategies:

- Timing - the timing of the education may be important, people may be more responsive at different times, for example.
- Integrated campaigns - educational efforts need to be integrated with other strategies in a community, such as regulation, enforcement and product modification or enhancing access to products, such as discounts or give-aways.
- Infrastructure - if developing a community based program, it is apparent that program planners need to obtain commitment, agreement on a project's objectives, and an open line of communication with the existing community infrastructure.

3. Community consultation

Interviews with key stakeholders have shown a commitment to injury prevention in early childhood and firm support for a number of interventions by child health practitioners, despite some of those interventions being of doubtful effectiveness. Injury prevention initiatives are viewed as complementing other preventive health care strategies and fitting well with the mode of health care service delivery used.

Difficulties are perceived to be directly related to the inability to measure the effectiveness of programs in the short term. Changes are much more likely to be able to be amenable to assessment of longer term outcomes. Short-term funding detracts from sustainability of programs and adequate evaluation.

A lack of knowledge and training about the preventability of injury is perceived. This informed the recommendation for development of the injury prevention workforce, particularly in light of the evidence that key participants in the injury prevention workforce, maternal and child health nurses and health promotion professionals, are receptive to taking a more active role in injury prevention.

Sustainability of injury prevention programs is more likely to be achieved with a combination of strategies and involvement of a variety of groups using existing community networks and information sharing, legislative changes and leadership in policy direction.

There is a need to improve the infrastructure, training and research required for effective injury prevention implementation in childhood across the community. Funding plans for injury prevention should therefore be structured over a five year cycle with emphasis on building the foundation of knowledge and skill, developing and testing socio-culturally appropriate interventions in the first two years and on implementing interventions that have been shown to be effective in the subsequent three years.

4. Implications for policy and funding: best investments

It is recommended that methods be developed to identify the costs and returns of injury prevention programs, at least at a broad level, in order to make a more rational case for intervention funding and to determine how the benefits of interventions are distributed.

The large volume of relatively low severity injuries unlikely to result in disability drives the total cost while the more severe injuries drive the disability impact. Clear priorities for action have emerged. These are:

- falls
- striking or crushing injuries
- flame burns and scalds
- poisoning
- cutting and piercing injuries
- other unintentional injuries

5. Implications for research and evaluation of injury prevention programs

The current review highlights that the area of childhood injury prevention is certainly in need of a far greater number of well conducted, well reported studies about specific interventions. These are required in almost all injury cause areas, in order to improve the quality of public health, health promotion and preventive care research available for firm decisions based on adequate robust evidence. Particular attention in future research needs to be paid to:

measurement of injury, disability and functional status outcomes using standardised, reliable and valid measures (including the details of reliability and validity)

inclusion of cost:benefit analyses where possible

greater use of comparison groups

greater use of process evaluation – to aid interpretation of outcome evaluation

clear injury definition and study design (particularly sample selection)

greater attention to sample sizes required for significance testing, and conducting significance testing where possible

measurement period which allows adequate time for an intervention to reasonably be expected to impact injury rates

use of appropriate denominators and cluster trial designs where possible

controlling or measuring, where possible, biases related to reporting, recall and measurement; and

clear reporting on the intervention delivered.

6. Proven interventions

This review has highlighted the need to implement thoroughly those interventions that have been demonstrated to be effective, to identify promising methods and pilot them with sufficient resources allocated for high quality evaluations wherever possible.

Areas of injury prevention requiring state level implementation:

Poisoning

- Increasing coverage of child resistant closures
- Developing and testing logic based child resistant closures that selectively increase child resistance while increasing ease of use by the elderly

Areas of injury prevention requiring local level implementation:

Burns and scalds

- Scalds reduction through wider implementation of household water temperature controls
- Monitoring of smoke alarm use and impact of battery failure in non mains alarms

7. Intervention development

Areas of injury prevention requiring national level implementation:

- National support must be complementary to state initiatives and contribute to harmonisation, in line with COAG agreements.

8. Generic injury prevention programs

Areas of injury prevention requiring state level implementation:

- Develop an effective broad-spectrum injury prevention strategy, combining age-appropriate parental guidance, supportive home visits and inspections and supply of safety items, implemented systematically across the community. This should be built on the evidence of success and failure of this type of project reflected in the literature, piloted and in quarantined areas with a high quality effectiveness and cost-effectiveness evaluation, before consideration is given to broader implementation.

- Develop and extend codes of practice on nursery furniture and apply a similar approach to other goods used by children utilising the guidelines in *ISO 50 Safety Guidelines for Children's Goods* and evaluate the impact on levels of hazard in the community and eventually injury rates among children under three years of age.

Areas of injury prevention requiring local level implementation:

- Development of injury hazards analysis skills, injury prevention theory, and critical appraisal skills to examine the evidence available in the literature.
- Training to consistently implement interventions as they are specified and to effectively participate in evaluation of interventions.

9. Research

Areas of injury prevention requiring national level intervention:

- Develop intervention programs and negotiate national support for adequate research into their effectiveness and efficiency.

Areas of injury prevention requiring state level implementation:

- A pilot generic education and environmental change injury prevention strategy is required, targeted at injuries in the homes of children under five years of age. Development should include a strictly controlled pilot intervention with adequate controls and high quality evaluation of impact on knowledge, attitude, beliefs, environmental change and possibly injury rates.
- Research is needed on the timelines of parent training and delivery of anticipatory guidance (pre- and post-natal).
- Injury surveillance has been shown to be an important tool in identifying causes and prevention strategies. Cost controls in the health sector have tended to limit the level of detail available through Emergency Department surveillance systems and resources for in- depth follow up studies to identify and develop intervention strategies. Continuation and development of the Victorian Injury Surveillance System (VISS) is needed, including support for more detailed data collection and adequate follow-up research of children and families.
- Fall causes in children 18 months to three years are poorly understood. Injury surveillance with adequate follow-up is needed to develop intervention proposals.

Areas of injury prevention requiring local level implementation:

- Local cooperation is required to implement pilot programs and research including acting as a control area for interventions.

Implementation

This document identifies the priority areas for action on injury prevention for young children in Victoria and can form the strategic base for negotiation of a Commonwealth commitment. The majority of interventions outlined in this report are the responsibility of the health sector. Investments should therefore be made by a number of stakeholders at national, state and local government levels.

It is recommended that one agency should take the leadership role and provide sufficient core funding to establish a longer-term commitment to injury prevention.

It is clear that a core structure is needed that develops and negotiates an injury prevention agenda, assists with program development, training and research, and that ensures program evaluation.

Funding for injury prevention should therefore be planned over a five year cycle with emphasis on building the foundation of knowledge and skill and testing interventions in the first two years and on implementing interventions that have been show to be effective in the subsequent three years. To this end, a five-year investment plan follows this executive summary. This pays particular attention to:

(i) poisoning, setting out an expansion of the coverage of child resistant closures (CRCs) to medications and household poisons identified as the common causes of poisoning among children under four years of age;

(ii) burns and scalds, to reduce the rate of childhood burns and hot water scalding in domestic settings and to identify and evaluate possible interventions to reduce scalding from hot beverages; and

(iii) generic infant injury prevention, by looking to upgrade generic anticipatory guidance based injury prevention strategies, achieving quality assured evidenced based programs within five years and improving children's home environments by implementing child safety standards.

To facilitate injury prevention moving forward more immediately, however, the development of an action plan is recommended. This is likely to secure future gains in injury prevention and enable targets and progress to be monitored.

It is foreseeable that the action plan includes the investigation of a statewide program, developed or coordinated by centres of excellence such the Centre for Community Child Health and the Safety Centre (Royal Children's Hospital). This would include the involvement of maternal and child health nurses and childbirth educators, and the investigation of interventions such as home inspection and a loan scheme for safety devices.

Investment plan for injury prevention in children 0-4 years of age

This investment plan outlines funding for injury over a five-year cycle for poisoning, burns and scalds, and generic childhood injury prevention. It provides an emphasis on building the foundation of knowledge and skill and testing interventions in the first two years and on implementing interventions that have been show to be effective in the subsequent three years. The amount to be invested in each of the areas should be determined as part of the response to this report overall.

Investment area	Poisoning
Objectives	✓ Expand the coverage of child resistant closures to medications and household poisons identified as the common causes of poisoning among children under 5
Actions Yr1	✓ Identify the classes of substance requiring uniform packaging in child resistant closures ✓ Identify international advances in CRC and determine if new packaging types would enable increased protection of young children ✓ Notify the relevant national authorities of the intent to ask for nationally uniform action on childhood poison packaging ✓ Commence public information and media briefing to raise the profile of the issue of childhood poisoning
Actions Yr2	✓ Work with national authorities, manufacturers and other state authorities to finalise a list of substances requiring CRC from 1 January 2001 ✓ Gain public support through media campaign for increasing use of CRC. ✓ Work to reduce concerns of pressure groups representing the elderly Maintain high public profile for the issue
Actions Yr3	✓ Implement national uniform CRC packaging in Victoria
Actions Yr4	✓ Monitor impact on hospitalisation rates for childhood poisoning
Actions Yr5	✓ Monitor impact on hospitalisation rates for childhood poisoning

Investment area	Burns and scalds
Objectives	4. Reduce the rate of childhood burns and hot water scalding in domestic settings ✓ Identify and evaluate possible interventions to reduce scalding from hot beverages
Actions Yr1	✓ Monitor the use of water tempering devices and smoke alarms in Victoria ✓ Identify geographic areas, community groups, housing types etc where coverage is limited and or maintenance is poor ✓ Initiate qualitative research to identify the knowledge of and attitudes to beverage scalds among parents and decision makers and develop a list of possible intervention strategies
Actions Yr2	✓ Develop strategies to increase installation and maintenance of water tempering devices and smoke alarms in areas and groups identified as having limited coverage ✓ Work with relevant partners (e.g. city & country fire services) to resource interventions to increase coverage and maintenance standards in year 3 ✓ Assess the need for regulation to improve coverage in low coverage housing types ✓ Seed development and impact measurement of one or two environmental and one or two behavioural interventions to reduce beverage scalds
Actions Yr3	✓ Implement interventions to achieve uniform high use of functioning water tempering devices and smoke alarms ✓ Assess feasibility of introducing strategies to combat beverage scalds injuries and if feasible develop strategic plan for implementation
Actions Yr4	✓ Implement interventions to achieve uniform high use of functioning water tempering devices and smoke alarms ✓ If feasible implement program to reduce beverage relate scalds
Actions Yr5	✓ Monitor outcomes

Investment area	Generic childhood injury prevention
Objectives	✓ To upgrade generic anticipatory guidance based injury prevention strategies targeted at children aged 0 to 36 months ✓ To achieve quality assured evidenced based programs of generic injury prevention within five years ✓ To improve children's home environments by implementing the provisions of ISO-50 Child safety standards
Actions Yr1	✓ Critically evaluate current generic injury prevention programs for young children in Victoria ✓ Draw together detailed evidence of strategies and clusters of strategies for generic injury prevention programs ✓ Initiate a program of design and testing of components of a new generic injury prevention programs ✓ Identify the need for different strategies for high-risk groups, families with different cultural backgrounds etc. ✓ Review ISO-50 and determine implications for codes of practice, regulations and enforcement of these standards with respect to goods used by children
Actions Yr2	✓ Fully develop a draft new generic injury prevention program ✓ Design a pilot implementation capable of providing clear evaluation of impacts on attitudes, behaviour, environment and outcomes (control areas or regression discontinuity design is essential) ✓ Develop a strategic plan for involvement of all relevant sectors in responding to ISO-50 ✓ Consult with manufacturers, importers and retailers concerning the implications of responding to ISO-50
Actions Yr3	✓ Implement pilot program with full training and quality assurance in a limited geographic area ✓ Evaluate the impact of the program ✓ Provide incentives to manufacturers, importers and retailers and other sectors of government to actively respond to ISO-50 ✓ Negotiate changes to codes of practice and regulations relating to goods used by children

Actions Yr4	✓ Modify program in light of the evaluation ✓ Design and commence implementation of a state-wide implementation program including training, quality assurance and program monitoring ✓ Negotiate and implement changes to codes of practice and regulations relating to goods used by children
Actions Yr5	✓ Complete implementation and monitor impacts ✓ Fully implement changes to codes of practice and regulations relating to goods used by children

Section 1: Setting the scene

1.1 Background to the project

Injury is the leading cause of preventable morbidity and mortality for children aged 0-5 years in Australia (Moon et al 1998). Opportunities to reduce this burden are known to be extensive and have incorporated community awareness campaigns, legislative changes that target a range of environmental factors and activities known to be associated with injury causation (Nolan & Penny 1992). Injury prevention and control is one of the five National Health Priority Areas, which is an indication of the importance attributed to making injury an area where there is potential for improvement in child health. The importance of understanding effective interventions, both in terms of the impact on length and quality of life, the impact on children and their families and costs involved, is essential for public health planning.

There have been increasing financial and political imperatives to base health care decision-making on all the available research evidence in the last decade. Efforts to rigorously collate and review research from both published and unpublished literature have intended to minimise the bias that may be associated with decisions based on individual opinion, commonly adopted practice, or influential stakeholders. This field of work, namely systematic reviews of the evidence, has concentrated on collating studies on a single topic using comparable study designs, commonly randomised or controlled trials.

There has been a longer history of statistical research on minimising the impact of bias in studies of effectiveness (using randomised controlled trials) than in other areas or study designs for health research. In public health decision making, the decision questions are often broader than those in clinical or pharmaceutical research, and the use of trials is less common. However, public health decisions need to be based on the best possible evidence as with other areas of health care, and this necessitates a more comprehensive approach in the collation of 'evidence'. The inclusion of a wider variety of studies and other forms of evidence e.g. community consultations, and cost data, is an emerging science. Nonetheless, in order for public health practice to change, it is vital to consider the experience of the practitioners and to involve the practitioner community in the change process.

The aim of this project was to develop guidelines or recommendations to inform purchasing and planning of evidence based practice in the field of injury prevention for young children. We aimed to combine the science of systematic reviewing with community consultation and cost data to develop a set of recommendations which are more likely to be effective and able to be implemented for those involved with policy and the purchasing of injury prevention programs.

1.2 Scale of the problem: injury morbidity and mortality in children 0-4 years in Victoria

Injury in childhood is a major public health problem because it is the leading cause of death in children aged 1-14 years in Australia (Moon et al 1998). Infant mortality due to injury shows a marked increase with the degree of remoteness, with marginally higher rates in rural areas compared to metropolitan areas but a twofold increase in remote areas of Australia (AIHW Mortality Database, cited by Moon et al 1998). Injury is the second most common reason for childhood admission to hospital, and many more injuries are treated in hospital accident and emergency departments and by private medical practitioners.

Childhood injuries vary a great deal according to the age of children. Burns, scalds, poisonings and immersion (drowning or near-drowning) occur much more frequently in children under five years of age, while fall injuries become more common with increasing age, as children are developing and becoming more physically mobile (Moon et al 1998). Poisoning (pharmaceutical

or other) is one of the leading causes of presentations to emergency departments in Australia, requiring hospitalisation for the 0-4 years age group in particular (DHS 1998).

1.3 Costs

Information on the cost effectiveness of potential interventions is essential for public health planning, yet due to the severe limitation in available analyses of cost effectiveness, previous reviews have not addressed this element. Cost data can contribute to the development of injury prevention planning and purchasing frameworks. We particularly wanted to investigate which particular types of intervention are cost-effective in preventing injury, however, we were simultaneously cognisant of the fact that the inclusion of cost data into studies is still an emerging science, with relatively few studies considering the benefit-cost ratios of injury prevention initiatives.

1.4 National and state policy context

A number of initiatives relevant to injury prevention are occurring at the state and national levels. The National Injury Prevention Advisory Council (NIPAC) has drafted a *National Injury Prevention Action Plan: Priorities for 2000-2002 (January 2000),* to be considered by the National Public Health Partnership. The draft action plan aims to focus research and prevention efforts by health portfolios nationally, using a broad framework for activity in areas of high priority. The areas for immediate action relevant to the 0-4 years age groups are falls in children, poisoning and drowning. The action plan is to be presented to Health Ministers by July 2000.

The NHMRC Research Committee's commissioned report, *Paradigm Shift – Injury: from problem to solution* (1999), provides direction and priorities based on an assessment of existing injury research. This has begun to facilitate discussion on the need to develop the evidence base on injury prevention, involving contributions from a wide range of disciplines. This report discusses the need for a wider range of research paradigms than have traditionally been accepted within the core health research paradigms in order to make adequate progress in the area of injury prevention.

In Victoria, *Taking Injury Prevention Forward – Children's Injury Prevention Action Plan (1997)* provided a framework to facilitate progress in injury prevention in a bid to reduce death and morbidity due to injury among children. Planning is currently underway for a statewide development plan for injury prevention during 2000.

1.5 Project design and methodology

The aims of the project were to collate, review, analyse and disseminate advice on evidence-based approaches to the prevention of injury for children aged 0-4 years. We particularly wanted to investigate which particular types of intervention are efficacious and cost-effective in preventing injury. This information is to be used to advise on the development of injury prevention planning and purchasing frameworks. Conventionally, child health outcomes have focused on deaths, hospitalisations and diagnoses of morbidity associated with injury. This project aimed to seek evidence of broader outcomes such as the impact of injury on the family, overall health and wellbeing, and quality of life if possible. Finally, the project aimed to consult the relevant health agencies and practitioners regarding their experience and expertise with projects that had been conducted in their local communities and to collate their views on injury prevention in practice.

An overall framework for the project was developed by reviewing the Victorian injury-related mortality and morbidity data to determine the priority injury areas that would be included in the review. The project included three major stages. Firstly, a systematic review of the published and unpublished literature; secondly, a structured program of community consultation; and thirdly, the employment of injury experts to draw the evidence base and consultative outcomes together into a program of recommendations.

The systematic review involved a variety of methods. These methods are described in general here and are also documented in detail, in appendices as indicated. The methods included systematic searches of computerised databases of published literature and report evaluations, reviews of the reference lists of other reviews and the articles themselves, scanning of conference proceedings and communication with key informants who provided recommendations for reports and evaluated projects. Copies of each relevant paper and evaluation reports were obtained. A complete list of these can be found in the References section, both alphabetically and numerically. A data extraction sheet was completed for each project. Two researchers independently reviewed each study and the evaluation reports were reviewed by one researcher.

We systematically extracted the data from the forms into a database and summarised selected information into tables. A narrative review is provided, as the studies were drawn from a heterogeneous range of injury types, study designs, each incorporating a range of statistical analyses. The availability of cost data within studies was poor, and only limited analysis of the cost effectiveness of programs has been able to be conducted, confirmed by the advice of health economists. The complete protocol for the systematic review (Appendix B) details:

- the search strategy
- the selection criteria
- the databases searched
- the web sites searched
- study eligibility
- data extraction; and
- final selection.

The data extraction sheets for the first and second reviewers are detailed in Appendices C and D respectively.

The community consultation and qualitative research component of the project was undertaken simultaneously with the systematic review. This enabled us to conduct structured interviews with key Australian injury practitioners and identify any local projects that had an evaluation component able to be included in the review. Structured personal or telephone interviews were conducted with state government departmental representatives, injury prevention advisers and practitioners, industry, and local government (Appendix E). This element of the project was essential in obtaining comprehensive information from professionals working in the injury prevention field, in relation to effective injury prevention strategies and barriers to successful programs in the 0-4 age group. Questionnaires were provided to maternal and child nurses and health promotion practitioners (Appendices F & G respectively), and additional focus groups were conducted with maternal and health nurses who are involved in the special interest group of their Victorian professional association (Appendix H). This group was selected specifically for a focus group discussion because they are the primary contact point and the principal providers of health promotion and injury prevention materials for mothers with children less than 5 years of age. The special interest group is an active group of maternal and child health nurses who contribute regularly to government programs and policy, and recognise the benefits of consultation with community providers in achieving changes to public health decision making.

Thirdly, two experts in injury prevention and injury morbidity and mortality were provided with the results of the earlier stages and the requirements for the project. In collaboration with each other, and in the context of initiatives concurrently occurring at a national level, they synthesised the results and constructed the range of recommendations that conclude the report.

1.6 Definitions

The project question

The project addresses the aim of developing guidelines or recommendations to inform purchasing and planning of evidence based practice in preventing injuries to young children. Injury prevention strategies are targeted to various populations through a wide variety of strategies. The intervention could have been targeted, for example, to parents, community, industry and educators.

Injury was defined as a condition "directly resulting from a physical or chemical object or substance external to the body of the person concerned" (AIHW & DHFS 1997 cited by Moon et al 1998). This definition also classifies poisoning as an injury.

We reduced the breadth of injuries to exclude traffic-related injuries, as they are the common focal point and responsibility of organisations such as the VicRoads in Victoria. We therefore included injuries where prevention efforts could be addressed through public health strategies involving the health department in collaboration with other sectors. The scope of the injuries included is detailed in Table 1.

Table 1: Content areas included in the review

Injury topic	**Subsets**	**Settings/aetiology**
Immersion injuries	Drowning Near drowning	Swimming pools, bathtubs/buckets, waterways (dams, irrigation channels)
Thermal injuries	Scalds Flame burns	Hot beverages, tap water House fires, wood stoves, BBQs, fire lighting fluid Flammable nightwear and other clothing
Respiratory injuries	Choking Suffocation Asphyxiation	Food, small parts including toys
Chemical injuries	Over-medication Poisoning	Medications, household chemicals
Fall injuries		Residential, playground
Animal bites		Dog bites
Transport (non-road)		Driveways
Entrapment		Nursery furniture, doorway (finger jams), exercise bikes, playground equipment etc.

We based the conduct of the systematic review component of the project on the Centre for Reviews and Dissemination guidelines (Deeks et al 1995) and the Cochrane Handbook (Cochrane Collaboration 1999).

We employed the following explanatory definition of a systematic review: a *systematic* review, as it differs from just a review in itself, is a valuable method of synthesising existing evidence from previous studies to serve as a basis for rational decision making. A systematic review explicitly states its objectives, materials and methods and is conducted according to reproducible methods that improve precision surrounding the effect of a practice or intervention, particularly in instances where there is a large amount of research information (Cochrane Collaboration 1999). In short, systematic reviews are an effort to make available information on effective strategies on health topics, in this case, injury prevention.

1.7 Age group

The definition of young children we used were children less than 5 years of age. As with other injury reviews of children (Towner et al 1996), this age is grouped together as they are a relatively homogenous group: the type of accidents children have and where they occur reflects their age and stage of development. Their exposure to risk (of different hazards in different environments) at different ages remains relatively homogenous in this pre-school, mostly home-based age group.

1.8 Project scope

Researchers and governments around the world require information on the cost effectiveness as well as the effectiveness of potential interventions. Due to the severe limitation in available analyses of cost effectiveness and even the costs incurred with both injury interventions and morbidity and mortality however, previous reviews have not addressed this element. Likewise, to the best of our knowledge at the commencement of the review, a similar approach, which incorporated community practitioner consultation and the synthesis of qualitative and quantitative data, had not been previously undertaken.

The systematic review component of the project does build upon a previous review entitled *Health promotion in childhood and young adolescence for the prevention of unintentional injuries* commissioned by the NHS Centre for Reviews and Dissemination, the University of York, and the Health Education Authority which was undertaken by Towner et al (1996). We sought to ensure that the studies included were applicable to the Australian setting, but this did not limit our inclusion of overseas studies.

The review examines the role of education, environmental modification, behavioural change, legislation and policy and the combinations of two or more of these. Programs targeted to individuals and communities are included.

Section 2: Results of the systematic review

2.1 Summary of systematic review search

A total of 112 studies were included in the systematic review. A breakdown by date of publication and country of origin is seen in Appendix I. Of the *published* studies, 58% pre-dated 1990 and 42% were from 1990 or later. All of the *unpublished* studies date from 1990 and all were from Australia. The majority of studies were conducted in the United States of America.

Analysis of studies by injury topic, the age of the target group, study type, study quality, the setting and type of intervention can be seen in Appendix J. The majority of published and unpublished studies were targeted to cover general injury (Appendix K, Tables K1 & K2), followed by studies that focused only on thermal or chemical injuries. Far fewer studies focused on falls, respiratory, and immersion injuries. (Appendix K, Tables K1 & K2)**.** The vast majority of studies were before and after study designs [51/104 (49%)]; though 44/104 (42%) were controlled trials with or without randomisation. The quality of the studies was generally rated "good/reasonable" or "reasonable". More studies were rated "reasonable/weak" than "good". (Appendix K, Table K3.)

The complete results of the main injury cause areas included in the systematic review are located in Appendix L as follows:

Systematic review of Poisoning:	Table 2
Systematic review of Falls:	Table 3
Systematic review of Respiratory:	Table 4
Systematic review of Immersion:	Table 5
Systematic review of Burns and Scalds:	Table 6
Systematic review of General injuries:	Table 7.

A summary of the main findings is provided below.

2.2 Synthesis of the evidence from the systematic review

The current review of the literature indicates that there are few child injury prevention interventions that are the subject of well-designed and well-reported studies. A few injury cause areas have studies with impressive findings, or sound evaluation methodologies, with burns and scalds and poisoning being the best-researched areas. While there is a larger number of studies reporting on injury prevention approaches that target all or some different causes of injuries, the quality of these studies is quite variable.

Conclusions about what works are hampered by many reports having inadequately described the interventions employed or the process of selection of study subjects, having small sample sizes, not using comparison groups or statistical significance testing. Furthermore, many interventions have not been assessed for their impact on injuries. What is apparent is that evaluation is currently confined to interim outcomes such as changes in knowledge or behaviour. In some instances there are fairly strong findings from individual studies, but they may lack confirmation from other studies, leaving us still uncertain about the generalisability of the findings reported. Very few studies have considered the benefit-cost ratios of injury prevention initiatives thus generally leaving this aspect of the intervention decision making process still uninformed.

On the basis of the current review, the interventions that are "recommended" are few. Many others fall into the "promising" category – where their success has been demonstrated but on a very limited basis. The majority of trialed interventions carry no recommendation, "promising" or otherwise, simply because the studies reported on their implementation and are not sufficiently strong to enable conclusions to be drawn. In a few areas, a number of studies indicate that certain strategies do not impact on the problem and resources should not be devoted to these approaches.

The following pages provide a summary of the evidence for each of the major injury cause areas.

2.2.1 Poisoning Summary

A synopsis of the studies addressing poisoning, according to the level of evidence available and the recommendations for their implementation are tabled below.

Table 8: Poisoning summary

Strategy	No. of qualifying studies	Outcome effect	Strength of evidence (Ref nos)	Recommended (Y/N) Comments
Child resistant closures (CRCs)	5	45-60% reduction in death rate. 60-90% reduction in ED presentations. 70% reduction in poisons centre enquiries relative to number of packages sold. 25-35% reduction in reported ingestions.	Good (54,55,57, 73, 89)	Yes – current limitations in application exist with the limited number of substances covered and children's access to substance once lid has been removed (i.e. container left open).
Accessibility/ palatability: (fewer in pack, bitter tasting/ too large to swallow)	2	100% reduction in admissions. (25 pre intervention to 0 post), 25-66% reduction in proportion children tasting it more than once and 64-83% reduction in amount swallowed.	Reasonable (73, 77)	Promising - particularly for younger group (under 2 years) but also significant effect for 2-4years– strong evidence but on very limited scale (one study group for outcomes and one study on behaviour)
Educational campaigns	4	Indication of increased knowledge but translation to practice only established in one study. No study assessed impact on injuries. Some approaches included advocacy for CRCs* and regulation for safe storage in public housing – impact of these not separately measured.	Reasonable/ Weak (46,66, 74,90, F)	Inconclusive – evidence on outcomes such as ED attendance or hospitalisation has not been tested or not significant. May serve as appropriate adjunct strategy to legislative measures.
Medi-dump campaign and educational messages	1	Adequate process evaluation to link campaign to outcome – of reduction of annual number of admissions from 38 to 28.	Reasonable (H)	Inconclusive – one study only and no rates or significance testing provided.
Labelling targeting children (e.g. Mr YUK stickers)	2	Increased handling of containers with warning stickers, no significant impact on incidents of poisonings (either treated at home or medically).	Good (17,48)	No – evidence suggests that while limited to a testing situation – stickers targeting children may increase interest in harmful substance.
Counselling/ informational	4	Some evidence of significant improvements in	Reasonable (27.30, 49,	Inconclusive – evidence on outcomes such as ED

handouts		knowledge, having Poisons No. by telephone, reduced time to contact Poisons Centre after event, and having childproof medicine cabinet (though use of cabinet not measured) – no links with injury outcomes.	68, 69)	attendance or hospitalisation not tested. May serve as appropriate adjunct strategy.
Use of Poison Control Centre	1	24% reduction in number of medically treated cases of poisoning admitted and not admitted. No change in control area. Estimated savings $350 million (US) or each call saved $175 in other medical spending.	Good/ Reasonable (61)	Promising – very encouraging results but limited to one study. Model has been widely duplicated but no other studies reported.
Distribution of syrup of Ipecac	3	Nett improved knowledge score among 32% of target group	Reasonable (27, 30, 49)	Inconclusive – significance testing not done, links to outcome (including severity of poisoning) not reported.

The strongest evidence on poisoning prevention rests with child-resistant closures. The scope for further advancing this intervention, currently in place to a large degree, would seem to lie in extending the list of poisons or chemicals to which the current Poisons Act applies. Additional strategies to address situations where the CRC has been left off, or the child is gaining access at other points in the pattern of use, need to be considered. There appears to be some promise in:

1. Changing the palatability of a product - inclusion of a distasteful chemical (e.g. denatonium benzoate) may minimise the ingestion of the substance (e.g. of detergents); and

2. Infrastructure (poison control centres) - decrease use of medical resources for cases not requiring medical treatment; increase speed of medical treatment for cases requiring further treatment rather than waiting for symptoms to appear.

There are suggestions from the literature to exercise caution in the consideration of educational strategies. There is little evidence of the effectiveness of educational campaigns on their own, though there are indications that educational strategies may be more effective if targeting a select audience, those at high risk or at a more "teachable moment" (e.g. pre-natally). The following sections further discuss these aspects of educational approaches in relation to particular aspect of injury prevention.

2.2.2 Falls Summary

A synopsis of the studies addressing falls, according to the level of evidence available and the recommendations for their implementation, is tabled below.

Table 9: Falls summary

Strategy	No. of qualifying studies	Outcome effect	Strength of evidence (Ref nos)	Recommended (Y/N) Comments
Falls in the home - counselling and print material	1	Falls presenting to doctor's office (where counselling done) were significantly lower (about half) for intervention group than control group but hospitalised falls were higher.	Reasonable (39)	Inconclusive – potential study biases may complicate interpretation of findings.
Falls from windows - legislation – guards on apartment windows, counselling, media campaign	2	Reduction of hospitalised falls by 96% - expected admission number of 16 (based on pre-law data) but only 1 fall in post-legislation period. Reduction of deaths from falls out windows by 35% over two years of the multi-strategy intervention.	Good/ Reasonable (41, 47)	Promising – dramatically positive results in one study and another indicated a reduction in deaths over several years – but no pre-intervention baseline provided and contribution of different elements of the program not identified.
Falls – day care centres – presence of regulatory and enforcement procedures	1	No difference reported on fall injury rates between centres with and without regulatory and enforcement procedures.	Reasonable/ Weak (45)	Inconclusive - study biases make interpretation difficult.
Falls- council play equipment – training package	1	Minor changes to equipment measured after training program and materials implemented. Compliance with recommendations remained very low.	Good/ Reasonable (D)	Inconclusive – one study only. No injury outcomes measured.

As seen above, there are relatively few studies that have examined the effectiveness of strategies to reduce falls in children. Our inability to form firm conclusions about what works in this area clearly lies in the paucity of studies on each intervention type. The strongest evidence is in the area of reducing falls from high-rise apartment windows, based on legislation and educational efforts in New York City. The returns for this approach would clearly not be as great in Australia. The potential for regulatory approaches in settings where enforcement strategies are feasible (i.e. day-care centres, schools and public playgrounds) has simply not been systematically assessed, with only two studies reported in this area. Both of these studies had their methodological limitations in terms of study biases or not measuring the impact of the intervention on injury outcomes. Clearly further research is needed in this area.

No studies addressed the effectiveness of harnesses in preventing falls from equipment such as high chairs, strollers, change tables or supermarket trolleys. This approach may be insightful.

2.2.3 Respiratory Summary

A synopsis of the studies addressing respiratory injuries, such as choking and suffocation; and the recommendations for their implementation, is tabled below.

Table 10: Respiratory summary

Strategy	No. of qualifying studies	Outcome effect	Strength of evidence (Ref nos)	Recommended (Y/N) Comments
Educational campaign – mix of media and individual strategies, increased warning labels, policies in child care	2	One study indicated 36% reduction, nationwide, in cases of foreign body asphyxiation ($p<0.01$) after 30 months. The other study only measured knowledge among parents.	Reasonable (15, G)	Promising – significant nationwide change, but no control group/area and limited to one study. Other study only addressed knowledge.
Product design changes and labelling requirements	2	Reduction in in-humation death rates (result of cave-ins) but not crib related strangulations. One study looked only at intent to purchase based on labelling – some evidence of reduced intent with specific instructions on warning label.	Reasonable/ Weak (104, 105)	Insufficient evidence – some directional indication of the effects of the interventions but limited number and quality of studies. Scope for further studies.

There is scant evidence of what works in preventing respiratory injuries in young children. The one study (15) with strong findings in this area, while lacking a control group, suggests the value of a campaign, or mix of community-wide strategies, encompassing media and individual educational strategies, warning labels on products and complementary policies in child care centres.

2.2.4 Immersion Summary

A synopsis of the studies addressing immersion, according to the level of evidence available and the recommendations for their implementation, is tabled below.

Table 11: Immersion summary

Strategy	No. of qualifying studies	Outcome effect	Strength of evidence (Ref nos)	Recommended (Y/N) Comments
Swim safe education – training and adjunct strategies	2	Change in swimming ability and safety behaviour around water, including wearing safety devices while boating.	Good/ Reasonable (12, 24)	Promising. Evidence of increased safety skills and behaviour and wearing safety devices (only among younger children). Most initiatives multi-strategy without measuring contribution of individual strategies. Links to drowning not established.
Media campaigns	1	Mortality – young children (non significant reduction from 10 cases to 4 cases)	Reasonable/ Weak (13)	Inconclusive. Evidence limited by small numbers of events. One study only.
Environmental – pool fencing	5	Mortality – young children: attributable risk of not having adequate fencing identified as 19-67% (i.e. % of cases that would be expected to be avoided if all pools had adequate fencing). Odds ratio (OR) of an unfenced pool ranged from 2.06 to 4.83 for drowning and 3.76 for near drownings and drownings (ED attended). One study was a cost-benefit analysis and reported $4.9million cost (95%CI $2.4 - 7.9m); per life saved, or $252,200 per life year saved.	Good/ Reasonable (14, 62, 63, 80, 103)	Yes. Weight of evidence in direction of fencing a significant protective effect against children downing in domestic pools. Variable quality of studies – low response rates, small numbers of events and inadequate definition of pool fencing in three of the studies. Cost consideration of this strategy given the low number of cases in any one area.

Multi-strategy – legislation, environmental modification and education	1	Signs of decreasing rate of deaths (from 0.21 to 0.02/100,000) and immersions (from .86 to .06/100,000) over 10 years – but significance testing not done. Observed decrease was limited to public areas, not private pools (under less control).	Good/ Reasonable	Promising – particularly for public swimming areas where compliance can more easily be enforced. Note that these results are limited to one study only.

It has been shown that the introduction of pool fencing (whether it is 3-sided or 4-sided fencing) significantly decreases the incidence of immersion injuries in children. What comprises 'fencing' was generally poorly defined in many articles, making it difficult to compare results. More work needs to be performed to improve compliance rates both from a government perspective (95) and a parental perspective, investigating leaving pool gates open and fences in disrepair for example (63), for the full effectiveness of this strategy to be realised.

Swimming and water safety programs offer promise for increasing swimming ability and safe behaviour around water but evidence of links to reducing immersion injury by these approaches has not yet been provided. Awareness-raising education programs or campaigns may work, if appropriate for the age group at risk, but no significant impact has been found. This may be due to the studies having too short a follow-up period and too few numbers to give power when mortality is used as the outcome measure.

2.2.5 Burns Summary

A synopsis of the studies addressing burns, according to the level of evidence available and the recommendations for their implementation, is tabled below.

Table 12: Burns summary

Strategy	No. of qualifying studies	Outcome effect	Strength of evidence (Ref nos)	Recommended (Y/N) Comments
Legislation – nightwear or clothing standards	4	A significant decline post legislation in hospital admissions & proportion of burns associated with sleepwear from 12% to 3% (P<0.02) & proportion of flame burns associated with sleepwear (from ~ 30% to ~ 5% several data years – but no trend analysis done).	Reasonable (8, 58, 84, 86)	Yes – recommended. While some studies lacked rigour or sufficient number of cases, all were in a positive direction and of a significant magnitude.
Legislation – home hot water temperatures	2	Hospital admission rates suggest 50% reduction over five years – no significance testing. Home hot water temperatures non-significant reduction in intervention and control groups, significant decrease in temperature over time from 61oC pre-law to 50oC post-law.	Reasonable/ Weak (3,4)	Promising. Studies not strong but some indications of risk reduction (lower hot water temperatures) and signs of decrease in burns injury.

Legislation – smoke alarms	1	Five year follow-up of alarm installation and working rates. No significant difference in positioning and working order of smoke alarms between intervention (required of all homes) and control (required of only new homes).	Reasonable (53)	Inconclusive – effect of differential enforcement and education or "word of mouth" effects in the two communities may have diminished the difference between the two legislative approaches.
Product modification-burns associated with vacuum cleaners.	1	Reduction in number of mouth burns due to vacuum cleaner plug – no rates or significance testing.	Reasonable (91)	Insufficient evidence – one study and not strong. Promise lies in "logic" of removing hazardous element from product that causes harm.
Education – group and mixed media strategies	6	Variety of outcomes measured including some significant knowledge gains (among children in school-based programs). Increased temperature testing (with distribution of testing cards). No program resulted in a significant reduction in the incidence or severity of burns.	Weak/ Reasonable (2, 28, 59, 34, 50, E)	Insufficient evidence – no links with burns reduction established and fairly weak evidence of interim indicators.
Large scale campaigns - educational, environmental and legislative strategies, and in some cases improved burn treatment	3	Significant reduction in mortality and hospitalisation due to burns - especially among children.	Good/ Reasonable (23, 60, C)	Yes. Several studies, even though of variable quality, have indicated a significant impact on actual cases of scald injuries resulting in death and/or hospitalisation. No clear set of strategies identified – but an indication of a large-scale concerted effort encompassing multiple interventions will significantly reduce the rate of serious burn injuries.
Education – scalds prevention one to one counselling/ home visits	3	Significant increase in proportion of homes with safe temperatures (from 9% to 42%) after 30 minute counselling. Results with 1-minute counselling, pamphlet +/- thermometer card, suggested the only significant difference between the groups was the proportion that tested hot water temperature.	Weak/ Good (18, 32, 34)	Inconclusive – links to injury reduction not established. May be that longer counselling required to result in improved proportion of homes with safety features.
Education (or campaign) – and home modification/	4	Mixed findings from slight reduction in burns admissions (in study with small numbers) to significant reduction in	Weak/ Good (19, 26, 29, 35)	Promising – one strong study and several weaker ones. Findings generally in a positive

product promotion/ installation		intervention group only. Other studies reported interim outcomes: an increase in proportion of homes with smoke alarms and proportion correctly installed. Some devices appeared to be removed after time.		direction with indications that installing and giving away safety devices, though cost-intensive, leads to greater proportion of homes with safety devices.

Legislation for the use of flame-resistant material and sleepwear design has proven to be successful in decreasing the incidence of burn injury involving children's sleepwear (as seen with decreased hospital admissions for such a burn injury).

Few of the studies in the literature on the effectiveness of smoke alarms have isolated children as a target group. Consequently, the current review does not reflect the evidence available on this approach to reduce housefire-related burns to children. Building codes that require smoke detectors to be installed in new houses appears to increase the use and compliance of such devices. Community wide education campaigns, unaccompanied by free smoke detectors, have shown little effect on the incidence of burn injury (28, 59). Multi-faceted community based education programs appear to have the most favourable effect in decreasing burn injuries, however, it is not possible to determine which strategy is the more powerful (60, 23, 19).

Overall, changes in legislation regarding acceptable temperatures for home hot tap water have been shown to be effective in decreasing injuries from scalds and achieving lower hot tap water temperatures. There is evidence that resource-intensive, large-scale campaigns that encompass a mix of strategies (education, product modification, regulations concerning hot water temperatures) are associated with significant reductions in scald injuries among young children, particularly the more severe injuries (23, 60, C). Cost-benefit ratios of this approach are still needed, although preliminary estimates suggest that such campaigns at least may return many times their cost in health care savings (C).

Consideration could be given to the potential for lobbying manufacturers to alter the designs of certain products, as evidenced by one study that found an association between a particular type of vacuum cleaner and children's burns to the mouth (91).

Educational efforts, on their own, have not been linked with significant changes in burn injuries (2, 28, 59, 34, 50, E). There are greater signs of outcome effect if such campaigns are coupled with product promotion (such as anti-scald device) either by way of assistance in purchasing or installation (19, 26, 29, 35).

2.2.6 General injuries summary

A synopsis of the studies addressing general injuries, according to the level of evidence available and the recommendations for their implementation, is tabled below.

Table 13: General injuries summary

Strategy	No. of qualifying studies	Outcome effect	Strength of evidence (Ref nos)	Recommended (Y/N) Comments
Education - group or individual session and print material	5	Some self-reported changes in behaviour in some studies. Studies that examined injury outcomes showed no evidence of positive impact on injury rates that could be linked to program.	Good/ Reasonable (1, 21, 94, 98, J)	Not recommended. Available evidence, while limited, suggests as stand-alone strategies, group education and handouts are not effective.
Expos/safety fairs	1	Some signs of short-term attitude shift. Impact on behaviours and injuries not measured.	Reasonable (16)	Inconclusive – insufficient evidence. One study only and injuries not measured.
Education – one-on one (typically maternal/child health nurse, GP) with or without product promotion/give away	16	Increased parental knowledge. There were some (short-term or small scale) or no signs of increased safety features in home with counselling. Significant increase in safety device use/installation was noted if counselling was accompanied by increased product access (such as given away or offered at a reduced price). Greater improvement in outcomes was apparent with lower SES groups (from lower baselines, programs facilitated "catching up"). Studies that examined injury outcomes often had methodological limitations – making results difficult to interpret. Two studies showed statistically significant declines in ED attended injuries (range: 8-35% reduction). Both used more intensive counselling: either 30 minutes or spread over numerous visits. Two studies (one a review of 4 programs of up to four sessions, and one longer counselling during home visit) indicated evidence of positive benefit-cost ratios (medical care) or family expenses and quality of life.	Weak/Good (20, 25, 33, 36, 40, 44, 51, 64, 71, 72, 79, 83, 85,100, 102, K)	Inconclusive – mixed findings and generally methodological limitations and no or unclear links with injury outcomes. Some signs that beginning education prenatally, or focusing on higher risk groups/areas is more likely to result in significant gains. Greater success may be linked with parental education over many occasions and longer counselling sessions. Enhancing access to products, particularly for low SES groups appears to assist home modification.
Education via media strategies plus individual counselling and	9	Some knowledge gains. Links to behaviour change were less strong, except one study which suggested that individual counselling and	Reasonable (6, 9, 31, 42, 43, 81, 81a, 82, 92)	Not sufficient evidence to recommend. Fairly resource intensive strategy without measurable gains. There

home visits/home inspections		home hazard assessment followed by 10 minute broadcast TV safety series was more effective in prompting changes than a letter and followed by the TV series. No evidence of links to targeted injury rates except in one large program (SCIPP) where paediatrician counselling backed by media efforts appeared to be linked with 15% reduction in injuries over 2 years, than just media efforts alone.		were signs that if media efforts are not linked back to the community/ or individualised assessment of risk, then media/counselling approach will not effect change. Some indications that learning has to be participatory to result in significant behaviour change. Most studies did not provide evidence of impact on targeted injuries.
Education of professionals (pre-school teachers, GPs)	4	Significant decrease in injuries (but some data limitations). None to some signs of promotion of minor environmental change. No sign of GPs increasing safety counselling.	Reasonable/ Weak (11, 37, 52, 87)	Insufficient evidence – but limitation of study methodologies prevents firm conclusions.
Community-wide strategies (safe communities)	5	Approximately 45% reduction in child injuries in the home, 17- 32% of all child injuries (significant) and 14% (not significant) decline in hospital admissions. One study had much less success (about 2% reduction) – but numbers of injuries were small and program may have filtered to control communities. One Australian report indicated increased parental knowledge and stocking of safety products by retail outlets, other reported significant reduction in ED attended injuries and estimated $272 spent on the intervention per injury saved.	Good/ Reasonable (5, 10, 99. "I", D)	Promising – three studies (including one Australian study) showed considerable success but control groups not used in child injury analysis. One study with very marginal improvements and one Australian report did not discuss selection of study subjects or use a control group – and limited measures to knowledge and retail supplies.
All strategies (education, enforcement, engineering and combination)	2	One study compared the impact of each strategy as delivered by a city Sanitary Code inspector (able to enforce as well as educate, provide required safety devices) on items on a checklist relating to the relevant strategy. Proportion of homes with identified hazards pre and post were: Education strategy = 28 vs 21%, regulation = 17 vs 0% Environmental modification = 63 vs 10%, combination = 27 vs 17%; $p<0.005$ for all strategies. Other study	Reasonable (93, B)	Insufficient evidence - limited to two studies and difficult to compare strategies with each other since they related to different hazards in the home (i.e. not same motivation to change each one) or public place. Some promise in that significant change in environment was achieved with every approach (home based) – suggested value of the "vehicle" of the city inspector – and signs of

		indicated 6% reduction in injuries, no evidence of change in knowledge of hazards by parents.		injury reductions in playground related injuries.

The most promising approach identified in the literature to address all injuries in children is the community-wide "safe communities" approach. Three studies of comprehensive, multiple strategies community-wide approach (including one Australian study) showed considerable success when comparing pre- and post-intervention injury rates in children, although there were some limitations in study design, such as the non-use of a control group in the analysis of injury outcomes in children. The Australian study has provided the estimates of $272 spent on the intervention for each Emergency Department attended injury avoided.

While available evidence is limited, it suggests that stand-alone strategies, group or individual education with or without handouts are not effective (1, 21, 94, 98, J). Where people were visited in the home, it was found that the number of hazards in the home decreased (72, 82, 81, 9, 36) as did the number of children requiring in-patient care for major illnesses or accidents (83, 33). In most instances, provision of safety devices (smoke detectors, poison centre telephone numbers, ipecac syrup, electric outlet covers) increased the use of those devices in the home (81, 9, 44, 20, 36).

The literature on evidence concerning programs addressing child injuries in general suggested three possible factors to increase the chances of desired effect via educational strategies:

Timing - the timing of the education may be important, people may be more responsive at different times, with one study indicating that: education begun pre-natally versus post-natally was found to be more effective (100).

Integrated campaign - an analysis of the most effective strategies suggested that educational efforts need to be integrated with other strategies in a community, such as regulation and enforcement (93) and product modification or enhancing access to products, such as discounts or give-aways (81; 9; 44; 20; 36).

Infrastructure - if developing a community based program, and plan to work with existing community infrastructure, then it is apparent that program planners need to obtain commitment, agreement on project's objectives, and an open line of communication (42).

2.3 Themes across injury cause areas

The current review highlights that the area of child injury prevention is certainly in need of a far greater number of well-conducted, well-reported studies about specific interventions. More studies are needed on almost all injury cause areas, and particular attention in future research needs to be paid to:

- Measurement of injury outcomes
- Inclusion of cost-benefit analyses where possible
- Greater use of comparison groups
- Greater use of process evaluation – to aid interpretation of outcome evaluation
- Clear injury definition and study design (particularly sample selection)
- Greater attention to sample sizes required for significance testing, and conducting significance testing where possible
- Measurement period to allow adequate time for intervention to reasonably be expected to impact injury rates
- Use of appropriate denominators where possible
- Controlling or measuring, where possible, biases related to reporting, recall and measurement; and
- Clear reporting on the intervention delivered.

Consideration also needs to be given to ensure that the injury prevention workforce has the necessary skills to recognise and deal with the list above.

While many of the interventions are fairly specific to the injury cause area to which they apply (and are covered in the preceding tabes), some general findings have been noted about the weight of evidence for certain approaches across all injury areas. In general, it seems that:

5. The most definitive successes in child injury prevention relate to engineering or design changes to hazards or hazardous products, that are uniformly applied through the use of legislation or enforcement, for example:
    - child resistant containers for medications or poisonous substances
    - modifications to children's sleepwear
    - swimming pool fencing
    - bars on windows in high-rise apartments
    - reduction of maximum hot water temperatures in the home.
6. A mix of strategies, community-wide approaches or large scale campaigns which encompass educational, environmental, legislative strategies and in some cases improved treatment or medical response, has been found to be effective in reducing specific injuries (such as scalds, or respiratory injuries) or child injuries generally (as in the safe communities approach).
7. There appears to be merit in consideration of:
    - careful targeting of programs, such as targeting those at greatest risk, and
    - attending to public areas, because of the capacity to enforce or monitor safety compliance.

8. Education (whether media-based, individual or group counselling) with or without print material on its own has not been found to impact injury outcomes.

9. Education is more likely to be associated with a reduction in injuries if:

    - coupled with enhancing access to safety devices (such as discounts or giveaways) particularly for low SES groups,
    - it is coupled with regulation or enforcement,
    - It is delivered over several occasions and/or is extended counselling (30 minutes or more).

Section 3: Results of the community consultation

This section describes the results of the structured program of community consultation:

1. the structured interviews with key injury prevention stakeholders

2. questionnaires from maternal and child health nurses and health promotion officers and

3. a focus group with maternal and child health nurses.

3.1 Synthesis of structured interviews

Eighteen people working in the area of injury prevention were interviewed according to structured interview questions (Appendix E). Interviewees comprised a majority from the state government health department's regional offices, injury prevention advisers and practitioners. Other interviewees were representative if industry and local government. In order to protect their confidentiality, precise breakdown of interviewees' backgrounds is not provided.

Recorded interviews were transcribed in preparation for analysis and summaries of the main points were collated into a table. In order to synthesise the information collected, responses were divided into those concerning design, development, delivery and decision making of injury prevention programs. Implications for funding of injury prevention programs and implications for program implementation were drawn from the consultations. These classifications are described below.

3.1.1 Design of injury prevention programs

The majority of respondents believed that a combination of techniques was necessary for effective injury prevention programs for the 0-4 year old age group. Respondents believed legislative changes and engineering and environmental design changes to be particularly effective strategies. Education and behaviour modification strategies were also mentioned by some as effective, particularly when combined with other techniques. Other injury prevention techniques that were thought to be effective included practical exercises, developing safety as a design tool for marketing, policy change and facilitating socio-cultural attitude changes towards injury prevention.

Two main measures of effectiveness were suggested:

10. various forms of injury data; and

11. qualitative measurement of awareness, attitude and behaviour change.

Interviewees highlighted the difficulties inherent in measuring effectiveness of programs in the short term with the widely held belief that noticeable changes can often only be measured in the long term. Interviewees also questioned whether it is possible, or necessary, always to measure effectiveness of injury prevention strategies for the 0-4 year old age group in terms of outcomes. Some respondents believed process information to be an appropriate measure of effectiveness.

Each person interviewed was familiar with examples of programs they considered to be successful. Some were also able to mention successful programs for hard-to-reach groups. Common suggestions of programs which were considered successful included the 'Hot Water Burns Like Fire' campaign, pool fencing legislation, child restraint programs and farm safety projects. SAFE and multilingual information brochures were mentioned as successful programs for hard-to-reach groups.

The most commonly mentioned measure of success was that the program incorporated a coordinated and collaborative approach, gaining support from a variety of groups e.g. industry, manufacturers, health professionals, media, parents. Other measures were that the problem or need was established, made clear to the target group which assisted acceptance, and that long term programs should be sustainable.

3.1.2 Development of injury prevention programs

Interviewees believed that gaining support by identifying key players and actively involving a variety of groups are the key to building sustainability. Achieving legislative change and increasing workers' skill levels in the area of injury prevention were effective strategies that help build sustainability.

Several interviewees identified that leadership in policy direction is also required to build sustainability. Long term direction, planning and funding is needed in the area of injury prevention for the 0-4 year old age group.

The predominant opinion on establishing networks was to utilise existing groups and community systems. In addition, the majority of respondents reinforced that the necessity to work actively on building networks, by sharing information, involving a variety of players with vested interests and establishing inter-agency partnerships.

3.1.3 Delivery of programs

The main factors that assisted in implementing injury prevention programs were those associated with cost: who is responsible, how much money is available and whether commitment exists between funders and service providers. Program design features, as previously discussed, were again raised as factors that assist in implementing programs. Several respondents cited using available research and people with specific injury prevention knowledge as factors that facilitate the implementation of programs. Commitment from both the funding body and the service provider assisted implementation of injury prevention programs.

The most common response to barriers working against the implementation of injury prevention programs was problems associated with competitiveness and short term funding allocations. The short-term nature of many projects limits evaluation opportunity detracts from sustainability and fragments injury prevention efforts.

Another barrier is a dominant community attitude that injuries are not preventable. Lack of knowledge and training was also identified, as was the diversity of the target group, and that injury prevention is not on the agenda, culturally or politically.

Policy change to establish injury prevention as a priority for action was considered a crucial factor in the delivery of injury prevention programs and can be achieved from both the top-down and the bottom-up approaches. It was considered important that policy change be driven by the needs of the community. In general, respondents believed policy change could be achieved by constant advocacy using a collaborative approach.

3.1.4 Decision making

When asked to comment on funding for injury prevention, those interviewed all responded that insufficient money is allocated to this area. Funding is required to develop an injury prevention infrastructure given the high incidence of injury in the community. Short-term funding detracts from sustainability, and the ability to evaluate programs.

The following is a summary of what components may be required for a program to be allocated funding:

- comprehensive, incorporating research and identifying key priority areas rather than buying projects ad hoc
- existing organisations with established networks
- well researched and based on evidence
- specifically targeted and able to demonstrate how target groups would be accessed
- demonstrate cost effectiveness
- incorporate a collaborative effort and use a range of strategies
- potential to be sustainable
- adequate provision for quality evaluation.

3.2 Synthesis of questionnaires: maternal and child health nurses & health promotion officers

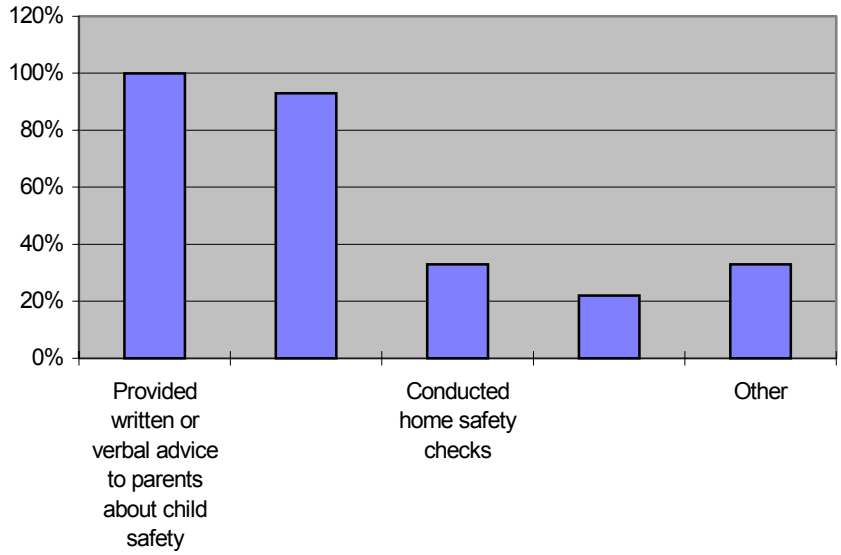
As maternal and child health nurses play a key role in the delivery of population based, public health surveillance and early identification and intervention for health concerns, as well as providing maternal and family support, questionnaires were disseminated to elicit MCHNs' injury prevention training needs and effective injury prevention strategies (Appendix E). Similar questionnaires were completed by health promotion officers (Appendix F). Twenty-seven of the 250 members of the Australian Nursing Federation's (ANF) MCHN special interest group and 26 health promotion officers (from sixty-four local government areas) returned completed questionnaires.

The implications of the poor response rate from MCHNs are that these data are of limited value. MCHN respondents may have been more likely to be more motivated toward injury prevention or to have ideas about injury prevention, so it is possible that we are likely to see patterns not necessarily representative of MCHNs more generally. Data from both questionnaires were calculated as percentiles where possible and qualitative results were summarised.

3.2.1 Design of childhood injury prevention strategies:

Maternal and child health nurses

Figure 1: Injury prevention strategies used by MCHNs

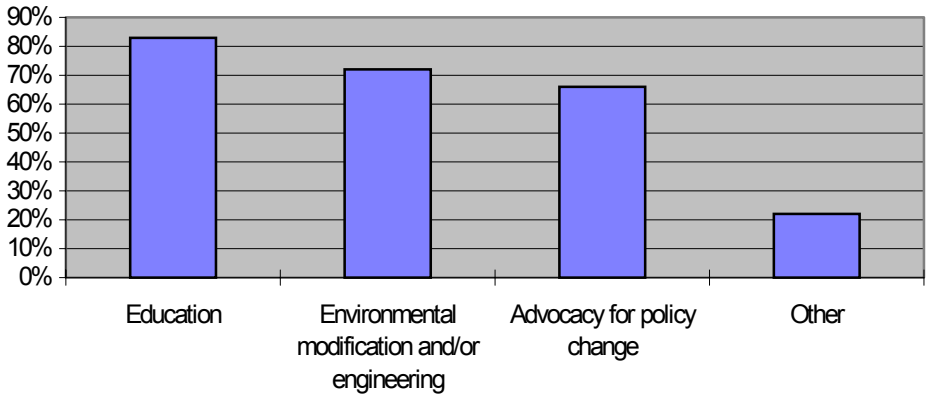


All the MCHNs nominated providing written or verbal advice about safety. The sources of this written information were not clear but are likely to include information from the Victorian child health record, the RCH Safety Centre information booklets and Early Childhood Injury Prevention Program (ECIPP) sheets. Over 90% of MCHNs conducted group sessions with new parents. Other activities included conducting home safety checks and recommending environmental changes.

'Other' strategies included referral to services, displaying safety news items, videos and various brochures for parents, organising workshops with celebrities and safety audits. The major thrust of MCHN activity was an individual approach.

Health promotion officers

Figure 2: Intervention strategies used by health promotion officers



Health promotion officers used more global approaches than MCHNs, with a wider spread of strategies across education, environmental models and advocacy. For health promotion officers 'other' strategies included policy development, injury prevention planning and responding to children's services regulations.

3.2.2 Effective strategies

Maternal and child health nurses

The majority of maternal and child health nurses questioned nominated educational strategies as the most effective. They also noted that a combination of strategies is very effective. There was a belief that allowing parents to discuss issues of child safety allows parents to explore the issues that are relevant to them and reinforces learning.

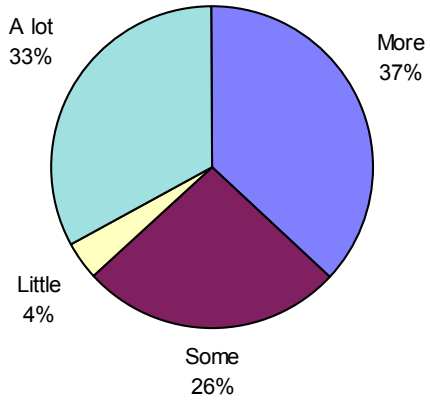
Health promotion officers

Half of those surveyed nominated educational injury prevention strategies to be most effective. Six per cent named environmental modification and/or engineering as most effective, whilst the remaining 44% believed a combination of strategies to be most effective. Reasons offered as to why these strategies are the most effective focussed upon parents, particularly new parents, being an interested audience for education strategies. A combination of strategies was considered effective, as different elements need to support and complement the others.

3.2.3 Experience of delivery of childhood injury prevention strategies

Maternal and child health nurses

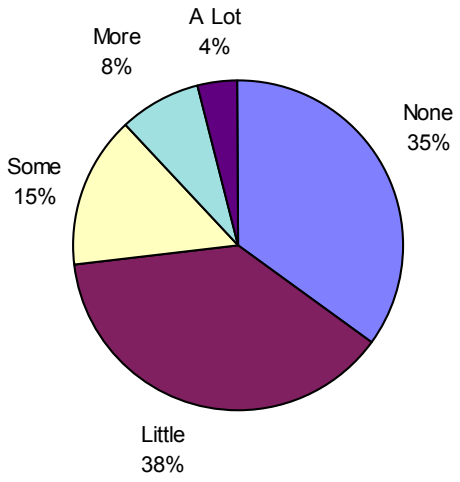
Figure 3: MCHNs injury prevention experience



Maternal and child health nurses were asked to rate their experience with program delivery on a Likert scale from 1 (no experience) to 5 (a lot of experience). All nurses had some degree of experience (Figure 3).

Health promotion officers

Figure 4: Health promotion officers' injury prevention experience



Few health promotion officers had experience in program delivery, 27% nominating some experience to a lot of experience. 73% had little or no experience in program delivery.

3.2.4 Factors facilitating implementation of childhood injury prevention strategies

Maternal and child health nurses

- ECIPP program
- Awareness weeks organised by other groups
- Safety video
- Visiting and use of the RCH Safety Centre
- Research and statistics on injuries
- Various safety information brochures

Health promotion officers

- new mothers are keen to learn
- quantitative and qualitative analysis
- local government willing to fund
- parent community involvement
- statistics support injury as a priority

3.2.5 Barriers inhibiting implementation of childhood injury prevention strategies

Maternal and child health nurses

- attitudes of parents that accidents are inevitable
- difficult for parents in rental accommodation to implement safety design modifications; dependant on attitude of landlords
- inadequate resources
- difficult for families to attend group sessions
- some groups difficult to access
- cost of safety products and design modification

Health promotion officers

- time availability for parents to attend information sessions
- lack of time and resources devoted to injury prevention, as injury prevention is not core business
- lack of information on model programs
- lack of awareness about the particular issues and approaches to child injury prevention
- injury prevention is not part of the tender contract and funding is not available to work on programs

3.2.6 Allocation of funding

Maternal and child health nurses

- public education campaigns including television advertisements
- more accessible static displays, speakers, other languages
- more easy access to products, product availability and price listings

Health promotion officers

- more funding
- local government to include injury in municipal public health plans
- better local area analysis of the risk and protective factors for communities
- commitment of more funding and for longer periods to allow for structural and sustainable change
- provision of packaged programs to support a state-wide message.

3.3 Summary results of maternal and child health nurse focus group

An informal discussion was held with representatives of the ANF Maternal and Child Health Special Interest Group using structured questions as a guide only (Appendix H). The focus group comprised 15 participants. The discussion was recorded and a transcription was taken from the audio recording. For the purposes of this section, the main themes of the discussion are divided according to those relating to delivery of injury prevention programs and those relating to decision making in regard to injury prevention.

3.3.1 Delivery of injury prevention programs

The sample of the special interest group believed that maternal and child health nurses have a key role to play in the implementation of injury prevention strategies for the 0-4 year age group. Maternal and child health nurses are actively involved in municipal health plans at local government level and feel they are the main group to address injury prevention with the 0-4 year age group. Although maternal and child health groups have performed roles in injury prevention and quality improvement projects, they feel that they are given little opportunity to identify issues and lobby for change.

The focus group expressed that their ability to be involved in community development is limited by a shortage of resources and that they are poorly resourced for ongoing programs. An example that was discussed illustrated that MCHNs lack the funding to provide quality materials such as information brochures to clients. Participants believed this contributes to the unsustainability of programs. Employment of MCHNs on short-term contracts was identified by the focus group as detracting from the work of maternal and child health nurses. Within the allocation of funding assigned to maternal and child health, injury prevention has not been recognised as a priority. The focus group raised the point that they require funding for training, updating skills and resources in relation to injury prevention for the 0-4 year age group.

3.3.2 Decision making

The MCHN special interest group offered suggestions on how to improve their ability to implement injury prevention strategies for the 0-4 year age group. The group asked for injury prevention priorities to be planned, rather than being introduced as a response to an incident. This point was illustrated by participants who said that, in one region, playground safety was put on the agenda as a result of a highly publicised accident on local playground equipment.

The group also requested that approaches to child safety be more coordinated. One suggestion was for a comprehensive information booklet to be available for parents, to replace the several varied brochures, which are currently used. In consideration of people from non-English speaking backgrounds, the booklet could give the safety message in pictures only. Another suggestion from the group was that commitment be given from both those funding and those servicing injury prevention. This would ensure that information is continually updated, promoting program sustainability.

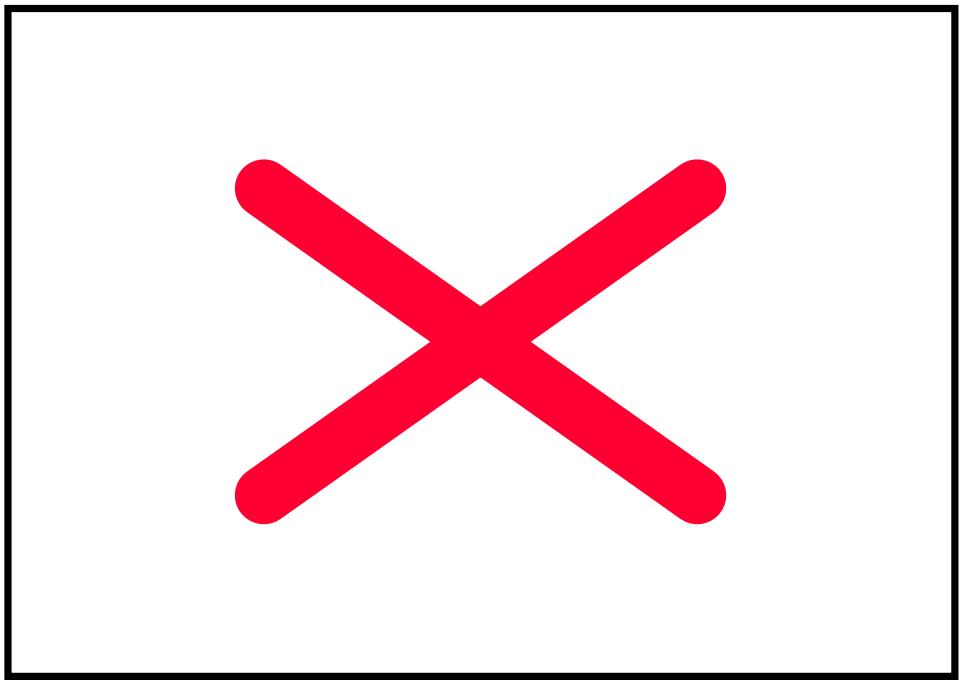
One area of injury prevention the focus group identified as important was the safety of products available in the marketplace. It was a common experience of the group that parents often purchase furniture and other products that are considered unsafe for children aged 0-4 years. The group felt that there is little they can do in this area, as parents often purchase such items prior to speaking with MCHNs.

The group asked for a collaborative approach to injury prevention by working with manufacturers and retailers and for standards to be introduced that require products to be quality- and safety-approved. An additional suggestion was for a system to be established whereby money is allocated for grants for families to improve child safety in their homes. MCHNs visiting families could assist them in identifying safety issues and help them to apply for funds to purchase modifications. In general, it was believed MCHNs should be better resourced. It was considered more advantageous to resource nurses who are active in the existing system rather than employing specialist injury prevention officers.

Section 4: Injury prevention as an investment

The prevention of injury reduces costs to the health sector through decreased absolute demand for treatment and through reduction in the complexity of treatment by reducing the severity of the injury. Nationally, injury-related child death has decreased by 50% since 1979 with major successes in road traffic safety, poisoning, scalds and nightwear related burns (Figure 5). Unfortunately, an investment has not been made in measuring the benefit-cost of these changes.

Figure 5: Decreasing trend in all injury death, Victoria 1979-1994



Hospitalisation trend data has only recently become available. Changes in admission practices, brought about by case mix management of costs, make it difficult to accurately measure the trends in the true incidence of injury. Nevertheless, a distinct downward trend in many causes of injury among children can be identified (Watt 1995). There is no mechanism for returning the value of savings achieved to fund prevention. Resources resulting from decreased loads on the clinical system are rapidly and invisibly transferred to meet other needs.

The road traffic sector has developed a clear policy of identifying gains and reinvesting a substantial proportion of those gains in further prevention. Systematic assessment of costs and benefits is standard in this sector and permits continuing support for preventive interventions. The health sector would benefit from a better understanding of the returns that have, and are still being achieved, from injury prevention. It will be somewhat more difficult than in the road sector, however, to determine cause and effect relationships between interventions and effects.

Injury prevention initiatives targeted at children are often delivered as a unitary package to develop synergy between the interventions. This effect which is so useful to injury prevention presents a minefield of confounding factors to researchers attempting to tease out causes, effects, costs and benefits.

It is, therefore, recommended that the Victorian Department of Human Services develop methods for identifying the costs and returns of injury prevention programs, at least at a broad level, in order to make the case for intervention funding more rational and to determine how the benefits of interventions are distributed.

4.1 Investment and return: the costs

Injury to children under five years costs approximately $80 million in Victoria each year, while the direct health care costs are $46 million (Watson & Ozanne-Smith 1997). A summary of these costs by broad injury categories is provided in Table 14 while Table 15 shows the leading causes of injury cost and disability [ranked by disability life years (YLD)] for children aged 0-4 years.

Table 14: Lifetime cost of injury ($million) per annum for children under 5 years, Victoria 1993-94

Males

Cause	Total	Direct Morbidity	Indirect Morbidity	Mortality	Rank
Falls	12.648	8.706	3.942	0	1
Poisoning	6.577	4.197	2.38	0	2
Other unintentional	5.708	3.448	2.26	0	3
Fire flames, scalds	4.758	3.854	0.904	0	4
Hit struck crush	4.175	2.473	1.411	0.291	5
Motor vehicle traffic	3.273	1.09	0.357	1.827	6
Cutting piercing	2.515	1.41	1.105	0	7
Drowning	1.698	0.208	0.007	1.483	8
Other transport	1.618	0.67	0.384	0.564	9
Interpersonal violence	0.745	0.384	0.026	0.344	10
Asphyxia	0.678	0.337	0.028	0.313	11
Unknown intent	0.044	0.041	0.003	0	12
Suicide self harm	0.014	0.012	0.002	0	13
All causes	44.451	26.83	12.809	4.822	

Females

Cause	Total	Direct Morbidity	Indirect Morbidity	Mortality	Rank
Falls	9.778	6.231	3.547	0	1
Poisoning	5.057	3.114	1.943	0	2
Other unintentional	4.574	2.693	1.882	0	3
Fire flames scalds	3.243	2.316	0.604	0.323	4
Hit struck Crush	2.689	1.582	1.107	0	5
Drowning	2.494	0.162	0.003	2.33	6
Cutting piercing	1.497	0.808	0.689	0	7
Other transport	1.092	0.427	0.02	0.645	8
Motor vehicle Traffic	1.07	0.741	0.027	0.301	9
Interpersonal violence	0.422	0.396	0.026	0	10
Asphyxia	0.213	0.202	0.011	0	11
Unknown intent	0.044	0.041	0.002	0	12
Suicide self harm	0.012	0.011	0.026	0	13
All causes	32.185	18.724	9.887	3.599	

TOTAL All Cause Costs	76.636	45.554	22.696	8.421

Table 15: Leading causes of injury cost and disability male and female aged 0-4 years, Victoria

	Top five causes of injury ranked by lifetime cost		Top five causes of injury ranked by YLD	
	Males	**Females**	**Males**	**Females**
1	Falls	Falls	Striking or crushing	Striking or crushing
2	Poisoning	Poisoning	Fire and scalds	Fire and scalds
3	Other unintentional	Other unintentional	Falls	Falls
4	Fire flames scalds	Fire flames scalds	Cutting and piercing	Cutting and piercing
5	Hit struck crush	Hit struck crush	Road traffic	Road traffic

While males experience higher rates of injury, even at this age, the rank order of impact for both cost and disability is identical.

Table 15 reflects how the large volume of relatively low severity injuries, unlikely to result in disability, drives the total cost while the more severe injuries drive the disability impact. Clear priorities for action emerge, however, when the two indicators are combined. These are:

- falls
- striking or crushing
- fire and scalds
- poisoning
- cutting and piercing
- road traffic
- other unintentional injuries

4.2 Possible yields

Based on the fatality reduction achieved over the last 20 years, an annual average reduction in injury death rates of 2.5% would seem achievable. Trends in hospitalisation have not shown a similar reduction. Hospitalisation rates are very sensitive to policy settings and do not reflect true injury incidence.

It is likely that the overall rate of injury reduction would be somewhat lower than reflected by the death rate changes, and somewhat better than those reflected by the hospitalisation trends. With effective prevention, there would also be a downward shift in severity. Using a 6% discount over five years, the Net Present Value of a cumulative one per cent per annum reduction is $9.72 million. A conservative estimate for change would be 1.25% ($12.2) and an optimistic estimate 2.5% ($24.3).

4.3 Ability to implement effective interventions

Reports by the National Health Priority Advisory Committee and the Strategic Research and the NHMRC have argued that there are weaknesses in the research and implementation workforce for injury prevention (NHMRC 1999). Our literature review has shown that there are few interventions

where effectiveness has been demonstrated in a rigorous manner, but a significant number where there is a range of evidence that makes a case for intervention development and coinciding effectiveness measurement.

Interviews with key stakeholders have shown a commitment to injury prevention in this 0-4 age group and support for a number of interventions, some of which are of doubtful effectiveness. This is not surprising given the level of interest in injury prevention at the local level and the failure, nationally and internationally, to support injury intervention research.

There is a need to improve the infrastructure, training and research for effective injury prevention implementation in this age group. Funding for injury prevention should therefore be planned over a five year cycle, with emphasis on building the foundation of knowledge and skill and testing interventions in the first two years and on implementing interventions that have been show to be effective in the subsequent three years.

4.4 Where should the investment be made?

4.4.1 A brief overview of the evidence for preventive strategies in priorities areas

The more clearly definable problems with a limited range of primary causes, specifically fire, poisoning, burns and scalds, are the best researched. Each of these interventions have been proposed and tested and it is clear that a combination of educational and environmental strategies can be recommended. These strategies have not yet been fully implemented in Victoria.

Burns and scalds

Literature reflecting the success of changes to hot water delivery temperatures for reducing scalds is now emerging. There is clear biomedical evidence for reducing the temperature of hot water in ablution areas to 50 degrees Celsius. While resources available for evaluation have limited the methodological rigor of many studies, a consistent reduction has been identified. This has been limited where coverage has been limited e.g. to new houses only and where standards and regulation of these has not been part of the overall project.

The other major hazard identified is scalding by hot beverages. Hot drinks held by a parent or visitor are hot enough and voluminous enough to result in scalds over large body surface areas including the face, resulting in disfigurement and expensive cosmetic surgery. No satisfactory intervention has yet been tested although changing cup design or reducing the volumes of hot liquids has been suggested.

Poisoning

While poisoning death has been dramatically reduced in this age group since the 1970's and disability impact is low, a significant problem remains in the load placed on emergency departments and through hospitalisations. Non-critical poisoning is still occurring and there are some suggestions that its rate is increasing. Many poisoning incidents occur when medications or poisonous household products are not supplied in child resistant packaging or when an adult has removed these from that packaging.

Child resistant closures are clearly identified as the most effective intervention in controlling poisoning. It is likely that poisoning could be further reduced by selectively increasing the coverage of child resistant closures and the development and use of closures that do not restrict access to medications by the elderly. A better public understanding of the poisoning problem among young children needs to be developed so that they do not by-pass the protective strategies.

Falls

Falls have a wide range of causes and the literature is somewhat fragmented. Playgrounds have received the most attention, but the emphasis has mainly been on older children. Some studies in day care and child care facilities and kindergartens suggest that injury reductions in the younger age groups may be possible, but few of these come from Australian settings. Climbing and falling in a range of settings are a constant part of the lives of young children. A better understanding of how they fall and what causes the injuries is needed in order to target interventions effectively.

There is clear evidence that many products sold for the use of young children are not designed or sized to meet their developmental needs and thus result in falls, striking and crushing injuries. The recent mandatory cot standard in Australia is expected to produce a reduction in injuries associated with these items. Current activities to develop a code of practice for nursery furniture aim at achieving similar gains but no evaluation of these activities is available. As yet, there is no evaluation of the impact of these strategies. Such strategies contribute to safety through environmental changes and through raising awareness of the possibility of reducing injury risk through simple modifications at home. They offer promise and need to be properly documented and evaluated.

Other unintentional injuries, including striking crushing, cutting and piercing

Striking and crushing, and cutting and piercing have not been well studied in the literature. They tend to come under the generic injury prevention programs. Door jam injuries, access to knives and other sharp objects and cuts caused when striking against the edges of furniture have been identified as particular problems. Behavioural change programs have had very varied success in obtaining environmental changes such as door jam guards, safety locks on cupboards and protection of furniture edges and corners. The most successful environmental changes have been included in home inspections and provision of safety items as part of the service.

Despite the importance and cost of the injury problem, support for research and the evaluation of interventions has been poor. The success of interventions is strongly affected by cultural attitudes that shape the home environment and the expectation of the developing child. The majority of injuries to young children occur in the home, which in Australia is an important bastion of privacy and individual rights. Regulatory changes to the home environment have been resisted or have experienced only part implementation, lowering their effectiveness.

Generic injury prevention programs

Generic anticipatory guidance programs (e.g.TIPP) conducted by paediatricians in the United States have produced some changes in knowledge, behaviours and environment. The Australian adaptation of this method ECIPP has not been well evaluated. A limited evaluation using pre- and post-testing methods in South Australia concluded that there were no changes in injury rates associated with the program. The study found positive changes in the environment especially for poison storage, smoke alarms and earth leakage devices.

Guidance programs targeted to non-English speaking families and lower socio-economic families appear in the literature. Generally sample sizes are small and there has been no opportunity for a controlled research study. The programs have been developmental in nature and have frequently described good client acceptance. There are indications that environmental changes to lower risk have been made.

The lack of firm evidence concerning the generic education and voluntary environmental change programs seems due to the lack of resources for an adequate evaluation with a large enough sample size and adequate controls. The nature of the injury problems in this age group, and the need to determine effective strategies for reducing injury in the home setting lead to the conclusion that effective programs of this nature are needed. The evidence suggests some important sub strategies,

including home visits, to identify particular changes to be made that require regular follow-up and the ready availability of safety devices.

There is firm support for programs of this nature among child health practitioners. They view them as complementing other preventive health care strategies and fitting well with the mode of health care service delivery used. This acceptance has meant that programs have spread widely before adequate evaluation has been undertaken. Given the state of evidence, it would be unwise to withdraw these programs on the basis of evidence of no effect. The evidence is unclear. Resources should be targeted at review of the existing programs and the development of a new program that is implemented as a pilot with suitable control areas and thoroughly evaluated.

Traffic

Table 16 presents an overview of the amount of literature and its relative strength in defining the problems and possible interventions.

Table 16: The volume and strength of literature in the identified priority areas.

Cause	Literature volume	Literature strength
Fire and scalds	Moderate	Moderate
Poisoning	High	High
Falls	Moderate	Limited
Other unintentional injuries	Low	Low
Road traffic	High	High

In this context is important to:

put in place firmly and thoroughly those interventions that have been demonstrated to be effective wherever it is politically possible.

actively seek to change knowledge and attitudes of the public and decision-makers to make it possible to implement other effective measures fully and properly

12. identify promising methods and pilot them with sufficient resources for high quality evaluations so that they may be spread more widely once their efficacy is confirmed or withdrawn without fuss if they prove ineffective.

13.

4.5 Proven interventions

Requiring national level implementation

Poisoning

Increasing coverage of child resistant closures

- Developing and testing logic based child resistant closures that selectively increase child resistance while increasing ease of use by the elderly

Requiring state level implementation

Burns and scalds

Scalds reduction through wider implementation of household water temperature controls

- Monitoring of smoke alarm use and impact of battery failure in non mains alarms

Poisoning

Increasing coverage of child resistant closures

- Developing and testing logic based child resistant closures that selectively increase child resistance while increasing ease of use by the elderly

Requiring local level implementation

Burns and scalds

Scalds reduction through wider implementation of household water temperature controls

- Monitoring of smoke alarm use and impact of battery failure in non mains alarms

Intervention development

Requiring national level implementation

- See below. National support must be complementary to state initiatives and contribute to harmonisation in line with COAG agreements, complementary to state initiatives.

Requiring state level implementation

Generic injury prevention programs

Develop an effective broad-spectrum injury prevention strategy, combining age appropriate parental guidance, home inspections and supply of safety items in a systematic manner. This should be built on the evidence of success and failure of this type of project reflected in the literature, piloted in quarantined areas as part of a high quality evaluation before consideration is giving to broader implementation.

- Develop and extend codes of practice on nursery furniture and apply a similar approach to other goods used by children utilising the guidelines in ISO 50 Safety Guidelines for Children's goods and evaluate the impact on levels of hazard in the community and eventually injury rates among children under three.

Requiring local level implementation

Development of injury hazards analysis skills, injury prevention theory and skills to critically examine the evidence in the literature.

- Training to consistently implement interventions as they are specified and to effectively participate in evaluation of interventions.

Research

Requiring national level implementation

Resources for injury research have been identified as inadequate (SRDC 1998)

- Develop intervention programs and negotiate national support for adequate research into their effectiveness and efficiency.

Requiring state level implementation

Injury surveillance has been shown to be an important tool in identifying causes and prevention strategies. Cost controls in the health sector have tended to limit the level of detail available through Emergency Department surveillance systems and resources for in-depth follow up studies to identify and develop intervention strategies. Continuation and development of the VISS system including support for more detailed data collection and adequate follow up research is needed.

Fall causes in children 18 months to three years are poorly understood. Injury surveillance with adequate follow-up is needed to develop intervention proposals.

- A pilot generic education and environmental change injury prevention strategy targeted at injuries in the homes of children under 5 is required. Development should include a strictly controlled pilot intervention with adequate controls and high quality evaluation of impact on knowledge, attitude, beliefs, environments and possibly injury rates.

Requiring local level implementation

- Local cooperation is required to implement pilot programs and research including acting as a control area for interventions.

4.6 Who should make the investment?

Injury prevention involves a number of key stakeholders. Their roles are often not clear and, as a result, funding gaps occur for important problems. The roles of commonwealth, state and local governments are considered briefly below.

Commonwealth investments

Several interventions outlined above require a national approach in line with the mutual recognition principles and the arrangements under COAG. Mandatory standards for hot water and smoke alarms and their extension to cover existing dwellings for example will require a national commitment. Intervention developments that can be shared with other states need to be encouraged by national health authorities and other sectors such as consumer affairs. This will minimise duplication of effort. Present arrangements under the National Health Priority Area initiatives and the National Public Health Partnership need to be translated into resources targeted at agreed priority areas. This document identifies the priority areas for action on injury prevention for young children in Victoria and can form the strategic base for negotiation of a commonwealth commitment.

State health sector investments

The majority of interventions outlined above are clearly the responsibility of the health sector. The majority of injuries occur in the home and can only be adequately addressed through the health prevention and protection networks established for the physical and social well being of young children. Injury prevention is just as important as immunisation during the first 5 years of life. It should be expected, therefore, that the major investment in this age group would come from state health funded organisations. The benefits of lower treatment rates and costs will accrue to the health system.

Investments from other sectors

Road traffic

Traffic safety investments are made mainly through VicRoads and the Transport Accident Commission (TAC). Continuing investment is required to ensure that child restraints are fitted properly and used universally. The health sector has important links to families with young children and can form a partnership with road safety authorities, linking road initiatives to other injury prevention strategies.

Consumer affairs

The safety of consumer products is the responsibility of the Office of Fair Trading at state level and the joint responsibility of the Consumer Affairs Unit in Treasury and the Australian Competition and Consumer Commission nationally. While consumer products have been identified as a major cause of injury to young children, the resources available to identify the nature of the problem and provide effective interventions have to date rested with health authorities in Victoria through the VISS system. Inadequate resources are provided by consumer affairs agencies for data collection and development of strategies for increased product safety.

Local government

Each local government prepares a public health plan. Injury among young children is an essential component in this plan especially in areas where young families predominate. Resources of local government can be applied to environmental health issues such as hot water temperature control, smoke alarm fitting and maintenance as well as supporting overall commitment to community development processes that increase safety across all ages.

Sharing arrangements

It is clear that costs of injury prevention should be shared by a number of stakeholders at national, state and local level. During the interviews, it became clear that most resource sharing was being done on a short term and, often, an informal level. While top level frameworks for injury prevention had been developed as part of the state plan and intersectoral communication had taken place, the injury interventions were often fragmentary in nature and there was no systematic mechanism for longer term cost sharing.

It is clear that one agency should take the leadership role and provide sufficient core funding to establish a longer-term commitment to a program of injury prevention. From this point of strength it should then be able to negotiate the resource commitments of other agencies. This has been done in the traffic safety field by the TAC, which has obtained considerable co-operation from the health and local government sectors.

An effective approach to injury among young children will require the leadership of the state health sector. Injury prevention is a logical part of the child health program already in place but the need for negotiation of standards, resource sharing with other sectors and influencing national decision making mean that it cannot be totally decentralised to be a part of child health service delivery.

Critical comment from the child health nurses indicates dissatisfaction with an ad hoc approach and shifting directions as a result of crises or short-term directives. It is clear that a core structure that develops and negotiates the agenda, assists with program development and ensures program evaluation is needed. There is a desire to deliver an evidence-based service that is effective in reducing injury.

A five-year plan of action is needed with resources committed to the intervention and research strategies outlined above. The plan should be initiated with Department of Human Services funding with a view to increasing cost sharing with other sectors as the five-year plan progresses.

APPENDICES

APPENDIX A: KEY INFORMANTS

Key informants A, B and C.

A: Early contact persons consulted regarding reports and additional contact people regarding evaluated projects

Agency	Person
Victorian State Government.	Catherine Thompson
NSW State Government	Pam Albany Dr Michael Henderson
Queensland State Government	Jeff Allen Cheryl Hutchins Colleen Loos
Tropical Public Health Unit	Doug Gladman
ACT Government	Sue Minter
Northern Territory Government	Dr John Condon
South Australian State Government	Dr Ron Somers Peter Thompson
West Australian Health Department	Marilyn Lyford
West Australian State Government	Dr Margaret Stevens Nicole Bennett Denise Loughlin
Tasmanian State Government	Jennifer Ejlak
Commonwealth Government	Dr Margaret Dorsch Chris Rhodes
Queensland University	Shirley Williams Dr Jim Nixon David Craig Dr Kevin Balanda
Mater Hospital	Dr Rob Pitt
Kidsafe NT	Dr Karen Edmond Carmel Bates
Kidsafe ACT	Judith Vaughan
Royal Lifesaving Society WA	Greg Tate
Kidsafe Tasmania	Andrea Rumph
Other members NIPAC	Dr Jane Elkington
Agriculture Health Unit, Moree, NSW	Dr Lyn Frager Andrew Page
Work Cover South Australia	Megan Sheldon Sandy McCallister
La Trobe Shire	Henk Harberts
Flinders University	A/Prof. James Harrison
Central Public Health Unit Rockhampton	Fran McFadzen

South Australia	Jerry Moller
Royal Children's Hospital, Melbourne	A/Prof. Terry Nolan
Monash University Accident Research Centre (MUARC)	Dr Lesley Day Prof Joan Ozanne-Smith
Office of Fair Trading, Victoria	Arlene Franklin
Kidsafe	Ian Scott

B: Acknowledgements of additional informants working in the field

Agency	**Contact person**
Illawarra Safe Communities	Barbara Bonaface Catherine Van Weedenberg
Henessy Services	Mark Hennessy
City of Hume	Lynne Galanti
Central Sydney H.P. Unit	Myna Hua
Hornsby Safe Communities	Astrid King
Glenelg Safe Communities	John Williams
Portland CHC	Michelle Hayden
Parkes Safe Communities, Noarlunga Safe Communities	Steve Parker
SA Country Fire Service, Metropolitan Fire Brigade	
Country Fire Authority	Penny Wolf
Ryde HP Unit	Mary Potzaramatus
Northern Beaches Safe Communities	Wendy Star
Health Promotion Foundation SA	Janet Hayden
Darling Downs PH Unit	Liz Davies
Vic Health	Trish Mundy
Playgrounds & Recreation Assoc. Vic	Wayne Johnson
New Children's Hospital, NSW	Michelle Maxwell
New Children's Hospital, NSW	Peter Serrao
Women's and Children's Hospital SA	Ann Johnson
NSW Central Coast Area Health Service	Annie Warn
Kidsafe WA	Mary Davie
City of Wanneroo	Leanne Lundy
Eastern PH Unit WA	Lisa Bayley
Innisfail District CHC	Jan Naismith
Illawarra Div GPs	Trudi Edgar
Southern Queensland Rural Div GPs	Pam Brown

East Gippsland Div GPs	Christine Prendergast
Central Australia Div GPs	Dr Ben Ewald
Scalds Prevention Qld	Jane Grey
Plumbers Board Vic	John McBride
The Centre (Wangaratta)	Adele Davies
Kidsafe Vic	Catherine Power
Melton M&CHS	Myffanwy Wilkinson
Casterton Memorial Hospital	Sheila Bramell
Welcoming Women's Health Service (Horsham)	
North Eastern Division GPs	
Wyndham City Council	Sue Christo, Helen Rowe
City of Maribyrnong	Anne D'vries
Ballarat CHC	Pat McCarthy
Victorian Farmers Fed.	Alicia McGrath
Royal Life Saving Society Vic	Warwick Waters
Loddon Mallee DHS	Jill Moloney, Dianne Barbas
Mildura Base Hospital	Chris Godkin
Sunraysia CHC	Anne Watts
Northern District CHC	Elaine Carter
Barwon SW DHS	Helen Walsh
Grampians	Tom Nierdele
Hume DHS	Sandy Geddes
Gippsland DHS	Greg Blakely
Western Metro DHS	Murray Franks
Eastern Metro DHS	Natasha Pearce
Southern Metro DHS	Monica Bensberg
MCHNs Special Interest Group ANF	Carol Friday

C: Interviews with those working in the field re: enablers and barriers

Agency	**Contact**
Health Promotion Staff in Local Govt.	John Edwards, City of Ballarat
Loddon/Mallee DHS	
Barwon SW DHS	
Grampians DHS	
Western Metro DHS	
Eastern Metro DHS	
Hume DHS	
Gippsland DHS	
Southern Metro DHS	
La Trobe Safe Communities	Henk Harberts
Royal Children's Hospital Safety Centre	Jan Shield
Support & Evaluation Resource Unit Centre for Health & Program Evaluation, University of Melbourne	Lucio Naccarella
General Practice Division of Victoria	Bill Newton
Women's and Children's Hospital, Adelaide	Ann Johnson

APPENDIX B: PROTOCOL FOR THE SYSTEMATIC REVIEW

Review of the literature and identification of best practice and evidence-based interventions

This part of the project identified childhood injury prevention interventions that have been shown to be effective, with an emphasis on interventions relevant to the Victorian setting.

Search strategy

Search strategy for identification of studies

Quality search strategies for collecting and identifying evidence were developed and refined under the direction of Phillippa Middleton, Deputy Director, Australasian Centre for Evidence-based Practice and General Practice.

Searches were made of titles, abstracts and key words, combining search terms from the three categories below. These articles were obtained, and the bibliographies of studies relevant to the review were hand searched for additional articles. Bibliographies of relevant narrative and systematic reviews were also hand searched for additional articles (see section of Reviewing Existing Reviews). Only papers written in English were included. The databases and World Wide Web sites of relevant agencies and libraries searched are listed below. The terms used for searching web sites were: child, injur*, accident*, prevent*. Very few web sites listed original articles.

Subjects	**Intervention**	**Injury type**
Child	injury prevention	accident*
Infant	accident prevention	injur*
Preschool	health promotion	wounds and injuries
Newborn	prevent*	accidental falls
Neonate	early intervention	drowning
Toddlers	health education	strangulation
young children	safety	choking
	program evaluation program development government policy health care policy legislative processes costs and cost analysis educational program evaluation effectiveness cost effect* cost benefit	overdose poisons falls finger jam* burns* anoxia toxic disorders animal aggressive behaviour home accidents

Selection criteria

Studies were required to meet the criteria for subjects, intervention, study type and outcomes for inclusion in the study.

Information was categorised according to the subjects for whom the intervention was intended, the intervention itself, the study type and the outcomes measured.

Subjects

The intervention must have applied to children aged 0-4 years but could have been targeted, for example, at parents, community, industry and educators.

Intervention

Must have related to the prevention of unintentional injury (includes the 8 content areas from Table 1) but not intentional or transport injuries, and must have been applicable to the Australian situation. The intervention could have included aspects such as environmental modification

Study type

Must include an evaluation of an injury prevention intervention. The study types may therefore include: controlled clinical trial, randomised controlled trial, cluster randomised trial, controlled trial with historical controls, case-control or before and after. Outcomes may be measured using qualitative or quantitative methods, and may also be measure at more than two points in time (before and after), i.e. time series.

Outcomes

Must include at least one of the following:

- morbidity data eg hospital emergency attendance, hospital admission, self-reported injury, injury associated disability
- mortality data
- changes in knowledge, attitudes or behaviour
- changes made to make environments/products safer
- impact to functional health status/quality of life
- cost of injury or intervention
- changes to community networks, policies, procedures, organisational capacity

Databases searched

Cochrane Library, Issue 1, 1998
ACP Journal Club 1991-1997
Evidence Based Medicine (journal) 1995-1997
Medline 1970-1998
Embase 1974-1998
PsycInfo 1970-1998
Sociofile 1974- 1998
ERIC 1970-1998
Current Contents mid-1997-1998
HEAPS 1980-1997
Health and Society 1980-1998
Australian Medical Index (AMI) 1970-1998
APAIS Health 1978-1998

World Wide Web Sites searched (in alphabetical order)

The following web sites were searched. Terms used were: child, injur*, accident*, prevent*.

World Wide Web Sites

• Evidence-Based Medicine (online journal)	• ACP Journal Club (online journal)

• Health Information Research Unit - McMaster University Canada	• AHCPR - Agency for Health Care Policy and Research
• ARIF - Aggressive Research Intelligence Facility	• NHS CRD - Centre for Reviews and Dissemination (York, U.K)
• Multiple database search at National Library of Medicine	• IDEA TOPICS LIST (OHSU)
• CliniWeb	• DARE York Universitv
• ScHARR-Lock's Guide to the Evidence	• ATTRACT database (NHS UK)
• TRIP database (NHS UK)	• National Institutes of Health (NIM
• National Library of Medicine (NLM)	• Academic Index (full text)
• MedFinder Smart Medical Web Search	• Centre for Evidence-Based Medicine
• Centers for Disease Control and Prevention	• FDA (Food and Drug Administration - US Govt)
• Health Canada	• Bandolier wwwjr2.ox.ac.uk:80/Bandolier/
• NEED - NHS Economic Evaluation Database	• Neonatology on the Web
• Centre for Evidence Based Child Health	• HSTAT - Health Services/Technology Assessment Text
• AETS - Health Technology Assessment Agency	• HealthSTAR
• KAROLINSKA INSTITUTET	• UPRIN - Injury- and Safety Promotion
• Child Safety - The Mining Co.	• Injury Control Resource Information Network -ICRIN
• Injury Prevention www.trauma.org/injury	• Morbiditv & Mortality Weekly Report
• National Center for Injury Prevention and Control (NCIPC) Home Page	• Public Health Association Of Australia Inc
• American Academy of Pediatrics Web Site	• Medical College of Georgia Pediatrics OnLine
• CDC State Injury Mortality Data	• Accident Prevention in Canadian Children - Canadian Paediatric Society
• HIPRC - Harborview Injury Prevention Research Center	• Children's Safety Network (CSN) National Injury and Violence Prevention Resource Center
• International Societv for Child and Adolescent Injury Prevention	• Harborview Systematic Review of Childhood Injury Prevention Interventions
• Kindergeneeskunde (Netherlands)	• Pediatric Evidence Based Medicine Home Page
• CHILD SAFETY FORUM	• KidSource OnLine
• HyperTox	• SLACK Pediatric Internet Directory
• PEDINFO	• ICRIN - Injury Control Resource Information Network

• U.S. Department of Health and Human Services	• World Health Organization
• University of Albany Injurv Prevention Internet Library	• Resources – Health Promotion (Technical University Berlin, Germany) Great On-nond Street Hospital for Children NES Trust and the Institute of Child Health Centre for Evidence-Based Child Health
• HotBot search engine Internet search	• Injury Prevention Research Unit (NZ)

Australian Sites

- Australian Injury Prevention Network
- Royal Children's Hospital homepage (Melbourne)
- Injury Control Program - WA Public Health
- Australian Community Health Association
- ANZWERS Australian search engine Internet search
- NISU

Study eligibility

The titles and abstracts, where available, identified by the search strategy were checked by two reviewers. Studies that did not satisfy all four of the selection criteria were excluded. The remaining studies definitely satisfied or appeared likely to satisfy all four selection criteria. For these studies, the complete article was retrieved and assessed by two reviewers. Studies definitely satisfying all four selection criteria were include in the review. Uncertainty regarding articles satisfying the selection was solved by discussion and consensus between the two reviewers.

Data extraction and assessment of study quality

Data was extracted and entered directly into an Access database by one reviewer. The data extraction help sheet is detailed in Appendix C. The database forms that describe the study characteristics, subject details, details of intervention and study results are included in Appendix C.

Details of any issues of study design that may have affected the results of the study, for example selection bias, confounding, measurement error and blinding, were recorded. Using these details as a guide, reviewers then gave the study a rating using a five point scale: 1 = Good, 2 = Good/Reasonable, 3 = Reasonable, 4 = Reasonable/Weak, 5 = Weak (Towner, HEA, 1996).

The second reviewer (from a pool of three reviewers) extracted the following data using a second data extraction sheet (Appendix D) and checked these against the results of the first reviewer:

> Study type, injury topic, quality issues, quality of study, target of intervention, outcomes assessed in, number enrolled, number followed up, setting of intervention, intervention by, intervention strategies, outcomes, how measured, when measured, unit of measure, results.

Discrepancies in the data extracted between the two reviewers, including study quality, were solved by discussion and consensus between the two reviewers.

In addition to the primary studies that looked at various aspects of the effectiveness of interventions to prevent unintentional injury to children aged 0-4 years, a number of reviews of these studies had already been undertaken. None of these reviews fit exactly the scope and inclusion criteria of the current systematic review. A new systematic review of the primary studies was consequently warranted in order to answer the research question. In the course of conducting the search for primary studies for this systematic review, relevant narrative and systematic reviews were identified. These reviews were incorporated in the following way: Narrative reviews

The reference list of narrative reviews that matched the inclusion criteria, excluding the study type category, was checked for primary studies. Studies that satisfied the inclusion criteria were included in the systematic review.

Systematic reviews

Only the systematic reviews that satisfied this study's inclusion criteria, excluding the study type category, were included. These reviews were used as a source of primary studies for this review.

Final selection

The search identified more than 500 titles and/or abstracts that were screened to yield 224 potentially relevant studies of unintentional injury prevention interventions applicable to children aged 0-4 years. Full text version of the papers were independently assessed by two reviewers who agreed upon the inclusion of 110 papers in this review. The tables that follow throughout this report describe the results of approximately 104 studies. Some studies are the subject of more than one paper.

APPENDIX C: DATA EXTRACTION FORMAT FOR FIRST REVIEWER

Study Characteristics F1

Study ID – use consecutive numbers; **Author:** Use first surname only ; **Title:** First word of title;

Year of publication

Secondary studies: include Study ID number (eg: 5a, 5b), first author, first word of title and year of publication

Country of study: choose from list, add new ones to "country of study" table

Country of study

Country ID	Country	Country ID	Country	Country ID	Country
1	Australia	6	UK	11	Denmark
2	England	7	USA	12	Netherlands
3	Israel	8	Wales	13	Italy
4	New Zealand	9	Canada	14	Greece
5	Sweden	10	Norway	15	South Africa

Year/s of study

Study type: choose from list

Only studies which have included an evaluation of an intervention should be included. Cohort, case series and cross-sectional studies do not include an evaluation of an intervention and are therefore not applicable to the research question. Case-control studies are only relevant if effect of exposure to an intervention has been compared in injured versus non-injured subjects.

Thus, the relevant study types can be split into two main groups (abbreviations in brackets):

1. Those that include a control group or in which two interventions were compared:

- Randomised controlled trial – individual subjects randomly allocated to intervention or control groups
- Cluster randomised trial – groups of subjects (eg: communities, classrooms) randomised to intervention or control
- Controlled clinical trial – intervention compared to control group but subjects or groups of subjects not necessarily randomised. These should be split into trials which used:
- Pseudo-randomisation, eg: birth dates, day of week, medical record no.; or
- No randomisation
- Historical controls – data collected for control group before intervention group
- Case-control study

2. Those that don't include a control group:

Before and after – outcomes measured before and after implementation of intervention. (This may be referred to as a pre- and post- study.)

Study type ID	Study type
1	Randomised controlled trial
2	Cluster randomised controlled trial
3	Controlled trial with psuedo-randomisation
4	Controlled trial with no randomisation
5	Historical controls
6	Case-control study
7	Before and after study
8	Cohort study

Qualitative / Time series

These studies can be further classified according to whether:

- outcomes were measured using qualitative or quantitative methods (tick qualitative if applies), and
- outcomes were measured before and after or at more than two points in time - time series (tick time series if this applies)

Injury Topic/s – choose from the 9 topics below (a-i). Choose General if more than one of these or if not specific.

Injury topic	Subsets	Settings/aetiology
a. Immersion	Drowning Near drowning	Swimming pools, Bathtubs/buckets, Waterways (dams, irrigation channels)
b. Thermal	Scalds Flame burns Chemical burns	Hot beverages, Tap water, House fires, wood stoves, BBQs, fire lighting fluid, Flammable nightwear and other clothing
c. Respiratory	Choking Suffocation Asphyxiation	Food, Small parts including toys
d. Chemical	Over-medication Poisoning	Medications, Household chemicals
e. Falls		Residential, Playground
f. Animal bites		Dog bites
g. Transport (non-road)		Driveways
h. Entrapment		Nursery furniture, Doorway (finger jams), exercise bikes, playground equipment etc.
i. General (non-specific)		
j. Cuts and bruises		

Injury topic list: If more than one, list all using a letter for each category, eg: abe (a-j)

Injury topic comment: If topic not specific, describe

Injuries targeted

Be more specific than recorded above for the 9 topic areas, i.e. classify according to subset and setting/aetiology. Ensure that the definition of injury is specified, including severity, inclusions/exclusions. Describe clearly.

Quality issues

Give details of any issues of study design which may have affected the results of the study, eg: selection bias, confounding, measurement error, allocation concealment, blinding etc. Use critical appraisal sheet as a guide. Examples of bias include:

- selection of subjects from study population – non-random (eg: volunteers)
- regrouping of subjects for analysis
- loss to follow-up; different between control and intervention groups
- missing data; different between control and intervention groups

Quality rating: choose one of the 5 categories, using previous description and critical appraisal help sheet as a guide. Quality of study will be within study type

1. Good
2. Good / Reasonable
3. Reasonable
4. Reasonable / Weak
5. Weak

Subject Details F2

Study ID – same as above

Injury target group:

If child, write age range eg: '6-9 years'. If no age range, write 'children'. Otherwise write 'general population'.

Target of intervention

Choose from list, can add to list if necessary in 'Target' table.
eg: Child, parents, care-givers, health professionals, population / community-wide, educators, industry, policy makers, etc

Target ID	Target of intervention	Target ID	Target of intervention
1	Child	6	Health professionals
2	Mother	7	Industry
3	Father	8	Legislators
4	Parents	9	Policy makers
5	Child care workers	10	Population / Community
		11	Parents and children

Outcomes assessed in:

Choose from list, can add to list if necessary in 'Subjects' table.

Subjects

Subject ID	Subjects of Study	Subject ID	Subjects of Study
1	Children	5	Health professionals
2	Parents	6	Child facility
3	Household	7	Population/community
4	Families		

If outcomes assessed in child: give **Mean age, range and SD** (in years) if available
Special characteristics of population – e.g.: SES, ethnicity, gender
Details of Intervention F3

Study ID – same as above
Intervention Number: Allocate numbers 1… Use one record for each intervention in the study, repeat the Study ID for each.
Fill in these numbers for the relevant intervention and control groups:
Number enrolled – this should be number randomised to group if an RCT
Number followed up - i.e. in whom outcomes were measured
Setting of intervention - i.e. implementation setting

Choose from list, can add to list if necessary in 'Setting' table, eg: home, preschool/kindergarten, child care centre, maternal and child health centre, etc.

Setting ID	Setting	Setting ID	Setting
1	Home	6	General practice
2	Preschool or kindergarten	7	Hospital
3	Child care centre	8	Community wide
4	Maternal and child health centre	9	Public place / amenity
5	Community group	10	Laboratory setting

Intervention by

Choose from list, can add to list if necessary in 'Intervention by' table, eg: health professional (specify), child care worker, fire service, police, researcher etc

Intervention by: ID	Intervention by:	Intervention by: ID	Intervention by
1	General Practitioner	9	Police service
2	Maternal and child health nurse	10	Legislators
3	Other type of nurse	11	Policy makers

4	Paediatrician	12	Safety Officers
5	Medical practitioner	13	Health authority
6	Researcher	14	Group of people
7	Child care worker	15	Instructors
8	Fire service	16	Inspectors

Intervention strategies

Choose from one of these broad categories:
1. environmental modification & engineering
2. legislation, regulation & enforcement
3. education, including media campaigns, safety promotion, and provision of information
4. combination of any of the first three.

Describe the intervention – summarise what was done and how.
Length of intervention (months)

This is the time from implementation of the intervention to its conclusion or until the time of follow-up of subjects (whichever comes first).

Partnerships / collaboration

This refers to partnerships / intersectoral collaboration, healthy alliances, eg: police and child care centre workers. List these.

Cost of intervention

Include cost of products, people etc, if stated. If this is one of the outcome measures used, detail should also be given in the outcomes section.

Resources / personnel required

Types of personnel and resources needed eg, health visitors and numbers if given.

Any other information

Add anything about the intervention that you think is useful but not included in previous categories.

Describe the control group/s

Give details of intervention, if any, and how this group was different from the intervention group.

Results F4

Study ID – same as above ; **Intervention Number** - same as above; **Unique ID** – automatic number

Outcomes - only include outcomes for which data given. Choose from list, do not change this list without discussion.

Outcome ID	Outcome	Outcome ID	Outcome
1	Mortality	9	Change to environment
2	Injury - general	10	Change to products
3	Hospital emergency attendance	11	Functional health status or quality of life
4	Hospital admission	12	Cost of injury
5	Disability	13	Change to community networks
6	Knowledge	14	Policy change
7	Attitude	15	Change to procedures
8	Behaviour	16	Change to organisational capacity

Describe outcome – can include additional detail if appropriate

How measured

Choose from list, can add to list if necessary in 'How measured' table. eg: questionnaire, A&E records

How measured ID	How measured
1	Hospital records
2	Questionnaire
3	Checklist
4	Doctor or nurse records
5	Instrument
6	Inspection
7	Interview
8	Observation

When measured - This should be relative to the implementation of the intervention and should be number of months, eg: 2.5 months.

Unit of measure – eg: % , number, rate.

Results - Include all outcomes measured, all time points at which they were measured, and in all categories (except if outside age range). Also include all figures, i.e:

- For results with dichotomous outcomes include no. of cases observed and total no. in group if possible.
- For results with continuous outcomes include mean, SD and number in group if possible.
- For before and after study designs, without a control group, include difference (and SD / confidence intervals) following intervention.
- For all outcomes, include details of significance of results, eg: P values.

Comments - use to put detail that has not been included in other fields, but is important in interpreting the results.

APPENDIX D: DATA EXTRACTION SHEET FOR SECOND REVIEWER

Study Characteristics

STUDY ID			
AUTHOR		**YEAR OF PUBLICATION**	
STUDY TYPE – choose from list			
INJURY TOPIC – choose from list			
QUALITY ISSUES			
QUALITY RATING			

Subjects

TARGET OF INTERVENTION – choose from list	
OUTCOMES ASSESSED IN – choose from list	

Intervention

STUDY ID		**INTERVENTION NUMBER**	

The next questions apply to the subjects of the study, i.e. in whom outcomes were assessed:

	Intervention group	***Control group 1 (if applicable)***	***Control group 2 (if applicable)***
NUMBER ENROLLED			
NO. FOLLOWED UP (outcomes measured)			
SETTING OF INTERVENTION – choose from list			
INTERVENTION BY – choose from list			
INTERVENTION STRATEGIES – choose from list			

STUDY ID		**INTERVENTION NUMBER**	

The next questions apply to the subjects of the study, i.e. in whom outcomes were assessed:

	Intervention group	***Control group 1 (if applicable)***	***Control group 2 (if applicable)***
NUMBER ENROLLED			
NO. FOLLOWED UP (outcomes measured)			
SETTING OF INTERVENTION – choose from list			
INTERVENTION BY – choose from list			
INTERVENTION STRATEGIES – choose from list			

Outcomes

STUDY ID		**INTERVENTION NUMBER**	
OUTCOME NUMBER		**OUTCOME** – choose from list	
DESCRIBE OUTCOME			
HOW MEASURED – choose from list			
WHEN MEASURED (months)		**UNIT OF MEASURE**	

INTERVENTION RESULT	**CONTROL RESULT 1**	**SIGNIF. 1**	**CONTROL RESULT 2**	**SIGNIF. 2**
COMMENTS				

STUDY ID			**INTERVENTION NUMBER**	
OUTCOME NUMBER			**OUTCOME – choose from list**	
DESCRIBE OUTCOME				
HOW MEASURED – choose from list				
WHEN MEASURED (MONTHS)			**UNIT OF MEASURE**	

INTERVENTION RESULT	**CONTROL RESULT 1**	**SIGNIF. 1**	**CONTROL RESULT 2**	**SIGNIF. 2**
COMMENTS				

APPENDIX E: STRUCTURED INTERVIEW QUESTIONS

1. What do you see as the most effective injury prevention strategies for the 0-5 age group eg legislation, education/behaviour modification, design/engineering/environmental modification?

2. How would you measure effectiveness ie what outcome measures would you use?

3. Could you give some examples of successful programs?

4. What about programs for hard to reach groups?

5. Why do you think they were successful?

6. What are the main factors that assist in implementing injury prevention programs?

7. What are the barriers?

8. How do you build sustainability?

9. How do you establish networks?

10. How important is policy change? How do you achieve it?

11. What skills and training are needed for injury prevention practitioners?

12. Comment on funding for injury prevention.

13. What do you think are the best buys? If you worked in state government how would you use your injury prevention budget?

14. The final report for this project will be widely disseminated. What information and format would be most useful to you?

APPENDIX F: QUESTIONNAIRE COMPLETED BY MATERNAL AND CHILD HEALTH NURSES

1. How much experience have you had in implementing childhood injury prevention strategies or programs? *(please circle one number)*

None				**A lot**
1	2	3	4	5

If none, please go to Question 5

2. Which of the following childhood injury prevention strategies have you used?
(please tick one or more boxes)

- ☐ Provided written or verbal advice to parents about child safety
- ☐ Conducted group sessions with parents about child safety
- ☐ Conducted home safety checks
- ☐ Made recommendations for environmental changes in the local community eg changes to playgrounds etc.
- ☐ Other *(please specify)*.....

3. Which strategies have you found to be the most effective?
Please explain some of your reasons for this.

4. What were the factors that assisted you to implement injury prevention programs, particularly for the 0-4 age group?

5. What difficulties have you experienced in implementing injury prevention programs, particularly for the 0-4 age group?

6. Have you undertaken any specific training in injury prevention? *(please tick one box)*
☐ Yes ☐ No

7. Do you feel you need further training in injury prevention? *(please tick one box)*
☐ Yes ☐ No

8. How could the allocation of funding for injury prevention programs be improved?

9. The results of this project will be distributed to those working in the field of injury prevention. What type of report would be most useful to you? *(please tick one or more boxes)*

- ☐ Detailed report
- ☐ Written summary of findings
- ☐ Table of findings
- ☐ Case studies of best practice
- ☐ Where to go for further information or resources
- ☐ Other *(please describe)*.....

Thank you for taking the time to complete this questionnaire.

Please take this questionnaire to the next ANF MCH Special Interest Group meeting on 21 September. If you are unable to attend this meeting, or would prefer to return the questionnaire by mail, please mail it to: Ms Kerry Haynes, Centre for Community Health & Ambulatory Paediatrics, Royal Children's Hospital, Flemington Rd, Parkville 3052.

APPENDIX G:QUESTIONNAIRES COMPLETED BY HEALTH PROMOTION OFFICERS

1. How much experience have you had in implementing childhood injury prevention programs? *(please circle one number)*

None				**A lot**
1	2	3	4	5

If none, please go to Question 5

2. Which of the following childhood injury prevention strategies have you used? *(please tick one or more boxes)*

☐ Education
☐ Environmental modification and/or engineering
☐ Advocacy for policy change
☐ Other *(please specify)*.....

3. Which strategies have you found to be the most effective? *(please tick one box)*

☐ Education
☐ Environmental modification and/or engineering
☐ Advocacy for policy change
☐ A combination of the above
☐ Other *(please specify)*.....
Please explain some of your reasons for this

4. What were the factors that assisted you to implement injury prevention programs, particularly for the 0-4 age group?

5. What are the barriers in implementing injury prevention programs, particularly for the 0-4 age group?

6. Have you undertaken any specific training in injury prevention? *(please tick one box)*
☐ Yes ☐ No

7. Do you feel you need further training in injury prevention? *(please tick one box)*
☐ Yes ☐ No

8. How could the allocation of funding for injury prevention programs be improved?

9. The results of this project will be distributed to those working in the field of injury prevention. What type of report would be most useful to you? *(please tick one or more boxes)*

☐ Detailed report
☐ Written summary of findings
☐ Table of findings
☐ Case studies of best practice
☐ Where to go for further information or resources
☐ Other *(please describe)*.....

Thank you for taking the time to complete this questionnaire.
Please take this questionnaire to the next Local Government Health Promotion Network meeting on 18 August at VicHealth. If you are unable to attend this meeting, or would prefer to return the questionnaire by mail, please mail it to Ms. Kerry Haynes, Centre for Community Child Health & Ambulatory Paediatrics, Royal Children's Hospital, Flemington Road, Parkville, 3052.

APPENDIX H: OCUS GROUP WITH MATERNAL AND CHILD HEALTH NURSES

- What types of injury prevention strategies do maternal and child health nurses use? Eg groups, one to one consultations, home safety checks, visits to RCH Safety Centre, videos
- What do you think works the best?
- Any suggestions for involving hard to reach groups in injury prevention programs?
- What are the main factors that assist in implementing injury prevention programs?
- What are the barriers?
- Do you work with other agencies on injury prevention programs?
- How do you get information about injury prevention? Is it supplied from DHS? Is it supplied by Kidsafe? Are there coordinated campaigns?
- What sort of training do MCHNs need in injury prevention?
- Have any of the injury prevention programs that you have been involved in been evaluated?
- Comment on funding for injury prevention.
- What do you think are the best buys? If you worked in state government how would you use your injury prevention budget?
- Any other comments about injury prevention from a MCHN perspective?

APPENDIX I: CHARACTERISTICS OF INJURY PREVENTION STUDIES INCLUDED IN THE REVIEW

	N	%	10. References
Published	101	90	1 – 105
Unpublished	11	10	A – K
Total	112	100	
Date of report			
Before 1990	57	51	1, 2, 8, 13, 14, 17, 18, 21, 23, 26, 27, 28, 29, 30, 31, 32, 39, 40, 41, 46, 47, 48, 49, 50, 51, 53, 55, 56, 57, 58, 59, 62, 65, 66, 67, 69, 71, 73, 74, 75, 76, 77, 78, 81, 83, 84, 85, 87, 90, 91, 93, 96, 98, 99, 100, 102, 104
1990 onwards	55	49	3, 4, 5, 6, 9, 10, 11, 12, 15, 16, 19, 20, 24, 25, 33, 34, 35, 36, 37, 42, 43, 44, 45, 52, 54, 60, 61, 63, 64, 68, 70, 72, 79, 80, 82, 86, 88, 89, 92, 94, 95, 101, 103, 105, A, B, C, D, E, F, G, H, I, J, K
Total	112	100	
Country of study			
Australia	18	16	10, 13, 14, 46, 63, 92, 103, A, B, C, D, E, F, G, H, I, J, K
New Zealand	5	4	8, 17, 34, 62, 86
UK	6	5	1, 44, 65, 67, 74, 81
Other European country & Israel	13	12	5, 6, 15, 19, 21, 23, 42, 64, 79, 82, 89, 91, 99
USA	67	60	2, 3, 4, 9, 11, 12, 16, 20, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 35, 36, 37, 39, 40, 41, 43, 45, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 66, 68, 69, 70, 71, 72, 73, 75, 76, 77, 78, 80, 83, 84, 85, 87, 90, 93, 94, 95, 96, 98, 101, 102, 104, 105
Canada	2	2	18, 100
Africa	1	1	88
Total	112	100	

APPENDIX J

Published and unpublished studies: injury topic, injury target group, target of intervention, setting of intervention and intervention strategy (N=112 studies and 131 interventions).

For reference to definitions, please see data extraction help sheet in Appendix C.

	N	%	References
Total	112	100	
Injury topic			
Immersion	9	8	12, 13, 14, 24, 62, 63, 80, 95, 103
Thermal	24	21	2, 3, 4, 8, 18, 19, 23, 26, 28, 29, 32, 34, 35, 50, 53, 58, 59, 60, 84, 86, 91, 101, C, E
Respiratory	4	4	15, 104, 105, G
Chemical	29	26	17, 27, 30, 46, 48, 49, 54, 55, 56, 57, 61, 65, 66, 67, 68, 69, 70, 73, 74, 75, 76, 77, 78, 88, 89, 90, 96, F, H
Falls	5	4	39, 41, 45, 47, D
Animal bites	0		
Transport (non road)	0		
Entrapment	0		
General (non-specific or multiple topics)	41	37	1, 5, 6, 9, 10, 11, 16, 20, 21, 25, 31, 33, 36, 37, 40, 42, 43, 44, 51, 52, 64, 71, 72, 79, 81, 82, 83, 85, 87, 92, 93, 94, 98, 99, 100, 102, A, B, I, J, K
Injury target group			
Child - 0-4 years only	36	32	2, 11, 17, 19, 20, 25, 27, 33, 34, 39, 42, 48, 49, 57, 65, 67, 69, 71, 72, 75, 77, 79, 80, 81, 83, 85, 90, 91, 92, 96, 98, 100, 103, 105, F, G
Child – under 15 years (includes 0-4 years)	81	72	1, 3, 5, 6, 8, 9, 10, 12, 13, 14, 15, 16, 18, 30, 31, 35, 36, 37, 40, 41, 43, 44, 45, 46, 47, 51, 52, 54, 55, 56, 62, 63, 64, 68, 70, 73, 74, 76, 78, 84, 86, 88, 89, 93, 94, 102, 104
Children – any age (includes 0-4 and <15 yr categories)	97	87	26, 32, 58, 66, 82, 87, B, C, D, E, H, I, J, K
General population	15	13	4, 21, 23, 24, 28, 29, 50, 53, 59, 60, 61, 95, 99, 101, A
Target of intervention			
Child	17	15	12, 16, 17, 48, 54, 55, 56, 57, 65, 67, 73, 75, 77, 78, 89, 96, 98
Mother	11	10	27, 33, 36, 39, 40, 51, 69, 71, 72,

			83, 100
Parents	28	25	2, 6, 9, 18, 26, 30, 32, 34, 42, 43, 44, 49, 64, 66, 68, 70, 79, 81, 85, 92, 93, 94, 102, C, E, F, I, K
Parents and children	2	2	35, 76
Child care workers	3	3	37, 45, 52
Health professionals	1	1	11
Industry	8	7	8, 58, 84, 86, 91, 95, 104, 105
Policy makers	1	1	D
Population / Community	41	37	1, 3, 4, 5, 10, 13, 14, 15, 19, 20, 21, 23, 24, 25, 28, 29, 31, 41, 46, 47, 50, 53, 59, 60, 61, 62, 63, 74, 80, 82, 87, 88, 90, 99, 101, 103, A, B, G, H, J
Setting of intervention			
Education/child care			
Preschool or kindergarten	6	5	28, 56, 59
Child care centre	8	6	37, 45, 52, 75, 78, 98, G
Health care			
Maternal and child health centre	9	7	11, 25, 26, 64, 69, 71, 79, 85, K
General practice	7	5	27, 39, 40, 43, 44, 51, 102
Hospital	6	5	30, 32, 49, 68, 73
Community/Home			
Home	24	18	2, 3, 4, 6, 9, 17, 18, 20, 34, 35, 36, 70, 71, 72, 83, 88, 92, 93, 100, H, J
Community wide	60	46	1, 5, 8, 10, 13, 14, 15, 19, 21, 23, 24, 28, 29, 31, 33, 41, 42, 46, 47, 50, 53, 54, 55, 57, 58, 59, 60, 61, 62, 63, 65, 66, 67, 74, 76, 80, 81, 82, 84, 86, 89, 90, 91, 94, 96, 99, 101, 103, 104, A, B, C, E, F, G, I
Public place / amenity	9	7	12, 16, 73, 87, 95, 105, A, B, D
Industry/Manufacturing			
Laboratory setting	2	2	48, 77
Total	131	101	
Intervention strategy			
Environmental modification & engineering	8	6	62, 73, 77, 80, 89, 91, A
Legislation, regulation & enforcement	10	8	3, 4, 8, 53, 54, 55, 57, 58, 84, 86
Education, including media campaigns, safety promotion, and provision of information	68	52	1, 2, 5, 6, 9, 10, 11, 12, 13, 15, 16, 17, 18, 21, 24, 25, 27, 28, 30, 31,

			32, 33, 34, 37, 39, 40, 42, 46, 48, 49, 50, 51, 59, 61, 64, 66, 68, 69, 71, 72, 74, 75, 78, 79, 81, 82, 83, 85, 90, 94, 98, 100, A, B, E, F, G, I
Combination	45	34	14, 19, 20, 23, 26, 29, 35, 36, 41, 43, 44, 45, 47, 52, 56, 60, 63, 65, 67, 70, 73, 76, 87, 88, 92, 93, 95, 96, 99, 101, 102, 103, 104, 105, B, C, D, H, J, K
Total	131	100	

APPENDIX K: INJURY TOPIC BY STUDY TYPE

Table K1 Number of published papers:

Injury topic	Total Of Study ID	1	2	3	4	6	7	8	9	12
Chemical	41	3	9	8	5	8		7		1
Falls	6	1	4		1					
General	61		7	15	5	6	1	13	13	1
Immersion	13	5	1	1				5		1
Respiratory	6	4			1			1		
Thermal	38	1	4	6	7	6		2	12	

Table K2 Number of unpublished reports:

Injury topic	Total Of Study ID	3	4	6	8	9
Chemical	4		1	1	1	1
Falls	1					1
General	10	3	1	2	2	2
Respiratory	2			2		
Thermal	5		2	2		1

Study type by study quality

Table K3 Number of published papers:

Study type	**Total Of Study ID**	**Good**	**Good / Reasonable**	**Reasonable**	**Reasonable / Weak**	**Weak**
Benefit-cost study	1				1	
Cross-sectional survey	1			1		
Randomised controlled trial	17	1	8	4	4	
Cluster randomised	2		1		1	
Controlled trial with psuedo-	7	3	1	2	1	
Controlled trial with no	16	1	8	4	3	
Historical controls	2			1	1	
Case-control study	5		2	1	2	
Before and after study	51	1	17	19	12	2
Cohort study	3		1		2	

Number of unpublished reports:

Study type	**Total Of Study ID**	**Good / Reasonable**	**Reasonable**	**Reasonable / Weak**
Before and after study	11	3	6	2

APPENDIX L: The systematic review tables: results and interpretation

In all tables:

Strategy: Legislation

Strategy: Environmental modification

Strategy: Education

APPENDIX L: Table 2 - Poisoning

Study ID **Author (year) Country**	**Study type** **Quality rating**	**Target group** **Setting of intervention**	**Intervention**	**Outcome**	**Description of outcome**	**Key results**	**Interpretation/ comments**
Strategy - Education							
54 Rodgers (1996) USA	Before and after study Good / Reasonable	0 - 5 years Community wide	Legislation implemented in 1974 requiring oral prescription drugs to be in child-resistant packaging/closures (CRC). CRC requires that 80% of children aged less than 5 years cannot open the container in a given time period.	Mortality	Reduction in the crude child mortality rate ratio associated with the use of child-resistant packaging for oral prescription drugs. Oral prescription drugs excludes aspirin and acetaminophen Includes about 12.8% of the deaths in the analysis that may be a result of ingestion of multiple substances, some of which did not have CRCs. (Analyses involving this 12.8% of deaths did not affect results).	Pre-regulatory period had roughly twice the mortality rate of the post-regulatory period [mortality rate ratio for the pre-law (1964-73) and post-law (1974-92) = 2.01 (95%CI 1.80 -2.24)]. After 1973, mortality rate dropped by about 1.82 deaths/million children (95%CI 1.54- 2.10). Estimated that most of these (1.40 deaths /million) were associated with the introduction of the CRC requirements. Analyses suggested a reduction of about 460 child deaths from 1974-1992, a reduction of about 45% from levels projected without the CRCs.	Strong evidence that CRC regulation is associated with less mortality due to ingestion of prescription drugs. Suggests further decrease in mortality if CRCs are used correctly (not left open) and CRCs be developed that are child-resistant yet can be opened by elderly/disabled people. Strengths: Allows for expected trends in mortality (e.g. improvements in emergency medical care; increased parental awareness); changes in consumption of oral prescription drugs; and changes in diagnoses. Weaknesses: Fails to examine which CRCs are more effective; unknown if any other aspect of the Poisoning Prevention Packaging Act (1970) may have affected the results.
57 Walton (1982) USA	Before and after study Reasonable	0 - 4 years Community wide	Poison Prevention Packaging Act (1970). (The Act became effective in the	Mortality	Death rate measured as the number of deaths per year per 100,000 children by poisoning from	The number of deaths (death rate) declined from 149 (0.9) in 1973 to an estimated 80 (0.5) in 1978. From 1973-1978 ingestion rates/1,000 children: no decline in	Suggests that use of CRCs is effective in reducing the number of deaths from poisoning. Strengths: Attempts to adjust for

			period 1973 to 1978 and included the regulation of 15 substances, including aspirin, acetaminophen, prescription drugs and household chemicals. All these substances required **child-resistant closures (CRCs)**.	Hospital emergency attendance	drugs, medicaments and other solid & liquid substances. Hospital emergency room treatment of children for poisoning (rates per 1,000 children in the general population). [Products were divided into four categories: (1) unregulated, (2) partially regulated, (3) fully regulated and (4) drug (prescription/non-prescription) products. Regulated products were then analysed to include groups 2, 3 & 4].	ingestion rates of unregulated products (1.8 to 1.9); decline in regulated products (5.7 to 3.4) The estimated number of ingestions prevented for the period was 193,750 since 1973.	fluctuations of general population Weaknesses: No statistical significance testing. Inconsistent terminology of measurement – poisoning versus ingestion. (Unclear if products were actually ingested). Other issues: Reservations on using NEISS data prior to 1983 are cited in Rodgers et al. (1996). These reservations included sporadic participation of centres, size of population being served by the various centres varied but was not measured.
55 Clarke (1979) USA	Before and after study Good / Reasonable	0 - 5 years Community wide	Poison Prevention Packaging Act implemented in 1970. However, 1969 was selected as the beginning of the impact period because in that year the 2 largest manufacturers of baby aspirin had converted their products to **safety closures.**	Reports per centre of aspirin and non-aspirin ingestion. (Aspirin ingestion divided into baby and adult (non-baby)	Measured as the percentage change per year in incidence of <u>baby</u> aspirin ingestion for children under 5-years. Measured as the percentage change per year in incidence of <u>non-baby</u> aspirin	For ingestion of baby aspirin: Trend shows that ingestion rates were decreasing over the 10-year study period. The greatest % change from the previous year was seen between 1969 and 1970 (there were 34.7% less aspirin ingestion reports in 1970 compared with those in 1969). For ingestion of adult aspirin: trend shows that ingestion rates were decreasing over the study period. The two greatest % changes occurred between 1965	Implies use of CRCs may be effective in reducing the number of children being reported for ingestion of baby aspirin and adult aspirin. Strengths: Accounts for: population changes in 0-5 year olds; changes in exposure due to change in demand for aspirin; interventions other than safety packaging. *Recognises* the shortcomings of the database (i.e. centres' voluntary reporting of ingestion; differences in centres' reporting

				aspirin). Child mortality involving salicylates and their derivatives.	ingestion for children under 5-years. Measured as rate/million child population (Data obtained from National Center for Health Statistics).	and 1966 and 1973 and 1974 (a decrease in ingestion rates of 27% and 25% respectively). Significant decrease was shown in the 1972-1973 period, the mortality rate dropped from 2.7 deaths/million in 1972 to 1.6 deaths/million in 1973).	criteria; possibly less reporting of mild-moderate ingestions). Weaknesses: Fails to take into account improved medical information/treatment; no significance testing; fails to define non-aspirin ingestion; inadequately discusses the differences in the degree of change between baby and non-baby aspirin; inadequate trend analysis.
Strategy – Environmental modification							
89 Assargård (1995) Sweden	Before and after study Reasonable	0 - 5 years Community wide	Introduction, in 1992 of **child resistant closures** by the pharmaceutical industry for 60ml bottles of liquid paracetamol.	Enquiries concerning paracetamol overdoses	The number of enquiries concerning paracetamol accidental overdoses involving the 60ml bottle recorded by the poison centre, relative to the number of packages of the drug sold during study period.	Pre-intervention = 0.00033 Post = 0.00007, 70% reduction. Absolute number of incidents: Pre = 90, Post = 20.	Suggests that use of CRCs in 60ml bottles of paracetamol may reduce number of enquiries concerning accidental overdoses of the medicine. Strengths: Attempts to control for seasonal variations, trends in the sales of paracetamol. Weaknesses: Fails to take into account concurrent related issues that may affect the results (changes in public education, increased awareness of correct storage). Does not include all hospitalisations due to paracetamol ingestion or state if the transition to CRCs was immediate, i.e. if all packages sold were CRCs. Unclear indication if range provided in the results was 95% confidence

							interval; inadequate follow-up period.
77 Berning (1982) USA	Randomised controlled trial Good	18 months - 4 years Laboratory setting	An environmental strategy conducted in research conditions, to determine whether or not the **bitter tasting** substance, denatonium benzoate, when added to liquid detergents would effectively reduce the ingestion of large quantities of such products by young children. The control group was offered the drink without the denatonium benzoate under similar conditions as the treatment group.	Behaviour (ingestion) Behaviour (behavioural reaction to taste)	Proportion of subjects tasting liquid only once. Amount (g) of drink ingested (cups were weighed).	Intervention vs control: [18-23 month group] = 100% vs 33%, $p<0.005$; [24-47 month] = 95.5% vs 72.5%; $p<0.005$. [18-23 month group] = 2.08g vs 12.23g, $p<0.05$ [24-47 month] = 2.46g vs 6.85g, $p<0.05$. The intervention group also showed significantly ($p<0.05$) more behavioural indications of aversion, eg made a face.	Shows that in controlled conditions, children aged 18 months - 4 years were less likely to ingest detergents that contained a deterrent (denatonium benzoate), than a detergent without the distasteful flavour. This *may* translate to fewer ingestions in the natural setting. Strengths: Gives statistical significance testing; states that the experimenter & parent/guardian were unaware if they were part of the intervention or control group; attempts to take into account such issues as thirst (no drinks 2 hours prior to experiment), parental reaction (asked to keep reactions/facial expressions neutral); separation of analysis of the type of drinking vessel (18-23 months analysed separately from the older children) Weaknesses: Fails to discuss if the assessors were aware of which group (intervention or control) they were assessing. Unknown details of recruitment of participants.
73 Scherz (1968) USA	Before and after study Reasonable	0 - 5 years (Assumed – age not specified.) Hospital	The Obstetric Service of the hospital discontinued the routine use of ferrous tablets in November 1966.	Admission of children to the Madigan General Hospital.	Poisoning in children from ferrous sulfate tablets dispensed by the hospital.	Pre-intervention (18 months) = 20 – 25 admissions; Post-intervention (20 months) = 0 admissions.	Appears that: decreasing the number of tablets/capsules in a container; making the capsules/tablets large and unpalatable to young children may decrease the incidence of ferrous sulfate poisoning.

			Each mother was instead given a container of 30 ferrous fumerate capsules, which were **flavourless and too large** for a child to swallow without chewing, and the semi-liquid ferrous fumerate **inside was distasteful**.				Weaknesses: No statistical significance testing; no use of comparison groups (which would have increased the validity of the results); unspecified target population. Other issues: The study population is very specific and therefore generalisability may be limited. Only 1 hospital was included - unsure if this is the only place poisoning victims can go.
73 Scherz (1968) USA	Before and after study Reasonable	0 - 7 years Hospital	The hospital introduced the dispensing of **child-resistant containers** for all prescription tablets/capsules in May 1967.	Hospital emergency attendance	Poisoning in children from tablet or capsules dispensed in child-resistant containers.	Pre = 49; Post = 5. The poisoning / prescription ratio for the 14 months pre-intervention was 1 to 5,000; compared to 1 / 62,000 post intervention.	Appears that the use of CRCs is effective in reducing the rate of poisoning in children. The five cases recorded were either from aspirin sold before the test period or without attached child-resistant containers.
Strategy - Education							
61 Miller (1997) USA	Before and after study Good / Reasonable	General population Community wide	**Use of Poison Control Centres.** The centres provide 24hr free hotline services staffed by toxicology professionals. The callers receive immediate information and treatment advice regarding suspected toxic exposures to drugs, chemicals, plants and other	Cost of poisoning Injury - poisoning	Benefits, measured as reductions in medical spending attributable to use of poison control centres for treated non-hospitalised & hospitalised cases. The reduction in the number of cases medically treated for poisoning in 1992, in areas serviced by a Poison	1992 US Dollars saved = $350 million (from $3,315M to $2,960M). Each call prevented $175 in other medical spending. Non-hospitalised = 350 000 cases (24% reduction); hospitalised = 40 000 (12% reduction).	Supplies evidence that poison control centres are an excellent societal investment. It also highlights the discrepancy existing between those who benefit from the centres and those who pay for the services. Estimated that for every dollar spent on the Poison Control Centres, $6.50 was saved in medical care payments (from medical insurers). Other issues: Study limited by scarcity of credible studies assessing Poison

			substances; as well as appropriate referral to a hospital if necessary.		Control Centre compared with areas not serviced by a Poison Control Centre.		Control Centre effectiveness in reducing unnecessary medical visits or preventing poisoning.
48 Vernberg (1984) USA	Randomised controlled trial Reasonable	1 - 2.5 years Laboratory setting	The intervention children received 5 minutes of education about the meaning of "Mr Yuk" poison warning stickers and that the child was not to touch anything with "Mr Yuk". The control children did not get any education on "Mr Yuk". Instead, they were read stories.	Behaviour	Measured by the mean number of manipulations of labelled ("Mr Yuk") vs non-labelled containers. Comparisons were before and after the 5-minute education session. (Classified manipulations as "touches, holds, mouthings, and attempted openings.")	Intervention children showed a statistically significant ($p<0.02$) preference for labelled containers after, but not before, education. That is, following education, the toddlers were *attracted* to the containers with "Mr Yuk" stickers on them. Control children showed no statistically significant preference for labelled containers.	Toddlers may not be deterred from manipulating containers labelled with poison-warning stickers and in fact may be attracted *to* such containers. Strengths: Provides significance testing; allows for effect of parental response to child's behaviour (parent instructed to remain passive). Weaknesses: Has small sample size (20), therefore the results may have little clinical significance; tests for results in an unnatural setting; unsure where the participants were selected from; unsure if the observers were aware of which group they were assessing. *Other Issues*: the age of the children may have needed a longer education period and reinforcement of the message. The evaluation method did not appear to have been pre-tested or validated.
66 Alpert (1967) USA	Before and after study Reasonable	Children Community wide	The intervention was an annual **Poison Prevention Week** and included the distribution of **educational** material and 1oz	Knowledge	Knowledge on use of ipecac syrup by telephone respondents by age of youngest child and social class before and after	By age of children in the household, Pre vs Post: <6 years = 47.2% vs 58.3%; 6-18 years = 40.5% vs 51.5%. By Social Class, Pre vs Post: I (professional) =52.2% vs	Unable to confidently give implications from this study. Strengths: Identifies limitations using a sample of telephone subscribers e.g. selection against low-income families so have attempted to

			bottles of ipecac syrup. The program sponsored by the Massachusetts Pharmaceutical Association, sought to improve families' knowledge and management of poisoning, including the **use of ipecac syrup.**	Behaviour	Poison Prevention Week. Percentage of telephone respondents who possessed ipecac syrup.	60.3%; II-III (white-collar) = 40.7% vs 44.5%; IV-V (blue-collar) = 25.6% vs 42.3%. By age of children in the household, Pre vs Post: <6 years = 17.0% vs 10.9% 6-18 years = 10.9% vs 7.9%. By Social Class, Pre vs Post: I = 13.3% vs 14.5% II-III = 14.6% vs 9.0% IV-V = 2.1% vs 3.0%.	compensate for this by including an independent sample of low income families in the same area participating in another study as a comparison intervention group. Weaknesses: No significance testing; unknown length of interview; inadequate description of the information and delivery of information during the Week; only short-term effects.
46 O'Connor (1982) Australia	Before and after study Reasonable	0 -14 years Community wide (Data obtained from hospital attendances)	The National Safety Council of Australia mounted a Poisoning Prevention Week. This study addresses the impact of the South Australian Poisoning Prevention Week. Activities included media coverage, promotion of Ipecac syrup; poster competitions for school children, and public displays at the Museums and State library.	Hospital emergency attendance Knowledge	Number of poisoning attendances at Adelaide Children's Hospital. Questionnaire examining the children's guardians' knowledge and behaviour concerning poison prevention and management.	Decrease in year following intervention of 16%. However, this decrease may not be due to PPW because number of poisonings was already decreasing by about 16% per year. (159 poisoning events before PPW in the 0-5 years compared to 108 poisonings after the intervention) (Not statistically significant). 80% of parents reported taking no precautionary measures because of PPW (n=94).	Suggests that the PPW may not have been effective. Contains no cost-analysis of the program. Strengths: Has good home visit follow-up rate of 70%. Weaknesses: No trend analysis to accommodate the present trend of decreased poisoning; weak sample base for gauging changes in attitudes and behaviour (subjects obtained through treatment for poisoning); unknown if the severity of those presenting to hospital after PPW was the same as those before PPW; possible selection bias when only about half potential respondents (ie. does not discuss if responders differed from non-responders).
30	Controlled	0 - 5 years	Intervention:	Knowledge	The outcome was	Intervention vs control 1	Authors believe that a brief

Woolf (1987) USA	trial with pseudo-randomisation Reasonable	Hospital	Parents attending a hospital emergency clinic completed a brief baseline questionnaire. After medical attention they were given **handouts on poisoning prevention** and a sticker with the number to the Poison centre. They were also given a **free bottle of ipecac** with correct usage instructions if they did not have one on hand. The counselling lasted less than 5-minutes. Control 1: completed questionnaire Control 2: recruited later, did not complete baseline questionnaire.	Behaviour	measured by percent of parents with knowledge of: safe storage of poisons; their preparedness in the event of a poisoning incident; the correct use of Ipecac syrup. Proportion of families with Ipecac syrup in the home; proportion of families with a sticker on their telephone with the Massachusetts Poison Center's telephone number on it.	vs control 2: Storing ipecac = 68 vs 47 vs 36%, p=0.005. Correct use = 40 vs 25 vs 23%, p=0.04. Poison Center phone number. = 62 vs 49 vs 55%, p=0.13. Phone sticker = 42 vs 25 vs 20%, p=0.03.	intervention such as counselling on poison prevention can be introduced, and be effective, even in an ER. Strengths: States that interviewers were unaware to which group their participants belonged. Weaknesses: Low follow-up rate (59%); unmonitored quality of the counselling; unknown reason for their attendance in the emergency room (the severity of the sickness of the child may impact the results).
27 Dershewitz (1983) USA	Before and after study Reasonable	0 - 1 year General practice	Mothers attending a 9-month well-baby clinic at a Health Maintenance Organisation received a **safety counselling session**, specifically limited to poisoning in the home and the appropriate use of	Knowledge	The outcome was measured as the mean score (maximum 8) for correct knowledge on the use of ipecac by mothers in the event of ingestion poisoning.	Mean score to the 5 questions: Pre = 5.78, Post = 6.90, P< 0.001 51% of mothers had improved scores at the post-test, 19% performed worse and 29% were unchanged. Of the 29% with unchanged scores, 83% retained their initial score of 8 (8 was the highest score attainable).	Mothers attending a well-baby clinic may be receptive to receiving poison prevention information. Strengths: Discusses internal validity of the measurement; allows for consistency of measurement (only one interviewer and use of predetermined written criteria). *Weaknesses*: fails to discuss the

			ipecac syrup and correct management in the event of ingestion. Each mother was given a **free bottle of ipecac.** Middle class population; safety counselling provided by paediatrician.				quality, length of education of intervention; low sample size (n=78), middle class; no use of a control (study could be stronger with a control group). Other issues: Mothers could react differently in real life situations than in the proxy situations used in the questionnaires. The study population was very specific therefore a threat to generalisability of the findings.
69 Dershewitz (1984) USA	Before and after study Reasonable	0 - 1 year General practice	As above (Study 27, Dershewitz 1983) but in a lower socioeconomic status population, and **safety counselling** provided by paediatric nurse practitioner.	Knowledge	The outcome was measured as the mean score (maximum 8) for correct knowledge on the use of ipecac by mothers in the event of ingestion poisoning.	Mean score: Pre =5.45, Post = 6.07, p=0.051. 56% of mothers had improved scores at the post-test, 22% performed worse and 22% were unchanged.	Findings were not statistically significant, although the knowledge scores did improve. This study stresses the need to be familiar with the target audience. Other issues: A controlled trial with the same population may have produced more significant results for "gains in knowledge".
17 Fergusson (1982) New Zealand	Controlled trial with pseudo-randomisation Good	2 - 3 years Home	Intervention: Researchers introduced "**Mr Yuk" stickers**, poisoning prevention information and instructions to families when the child was 2 years old and attended the annual interview. Follow-up stickers and instructions were sent after 3 - 6 months.	Behaviour Injury - poisoning	The outcome was measured by the mean number of poisons in child's reach (assessed by: maternal recall, reviewing maternal diaries and hospital records). Rate of all poisoning incidents (that is, treated at home as well as requiring medical treatment) per 100	Intervention vs control = 14.70 vs 14.80, NS. All incidents: = 10.81 (intervention) vs 11.05 (control), NS. Incidents involving medical treatment:= 6.52 (intervention) vs 6.26 (control).	The distribution of "Mr Yuk" stickers had no significant effect on rates of poisoning or hazards in the home. Compliance did not influence outcomes. "The method may be effective with older children or as part of an integrated poisoning prevention campaign". Strengths: Has good follow-up rates and sample size (1156 children); shows that there were no significant demographic differences between the control and intervention groups.

			Control: Taken from the same cohort but received neither the stickers nor the instructions.		children. Those incidents that required medical treatment were also analysed separately.		Other issues: Block randomisation was used instead of random allocation to reduce contamination between the 2 groups. The use of an existing cohort made the introduction of the intervention more cost effective.
49 Cooper (1988) USA	Controlled trial with no randomisation Reasonable / Weak	Newborns at time of intervention (Cases were all children aged 3-16 months whose guardians contacted the Rhode Island Poison Center for the 4 months from 1 year after the distribution program began.) Hospital	Intervention: Parents of newborns received 1-oz **bottles of ipecac** with a set of **instructions on "poison proofing" their homes** before their discharge from Women & Infants Hospital of Rhode Island over a nine month period. Control: parents of newborns (born at other hospitals in the area) during the same study period received no ipecac or instructions.	Injury - poisoning	Measured as the time to contact Control Centre.	Intervention vs control: Mean time between exposure and contacting Poison Centre = 5±3 minutes (n=6) vs 12±4 minutes (n=2), P<0.01. All intervention parents reported childproof medicine cabinets whereas only 8 of 22 (22%) control group parents reported the same (P< .01).	Suggests that parents may be receptive to education the day before discharge from hospital following birth as well as within a month of reporting a poisoning incident. *Strengths*: Provides some information on the cost of the program *Weaknesses*: Not very powerful results as the incidence of poisoning recorded during evaluation period were small. *Other issues*: The quicker reaction time of the intervention group may not have any clinical effect on the outcome of the poisoning.
74 Harris (1979) England	Before and after study Reasonable / Weak	0 - 14 years Community wide (Serving a population of 1.05 million people).	**Health-education campaign** held over 3-weeks, which included a returned-medicine activity for the whole district.	Hospital admission	Number of admissions from childhood accidental poisoning for the study period.	Pre-intervention = 12 per week; During intervention = 10 to 11 per week; Post-intervention 13-14 per week, NS. From a population of 1.05 million, 362 000 tablets and capsules were returned in 11 400 containers. Only about 3% of unwanted medicines returned.	It appears the impact of intervention was minimal. *Weaknesses*: unknown population of children at risk .

90 Maisel (1967) USA	Before and after study Reasonable	0 - 4 years Community wide	A **mass, intensive, educational campaign** incorporating many information and communication techniques. There were radio and TV spot announcements, newspaper advertisements, and panel group discussions as well as interviews. A guide for teaching kindergarten on poison prevention was developed.	Hospital admission Questionnaire	The number of under-5 children hospitalised >= 1 day for poisoning during the study period, the calendar years 1962-1964. Knowledge of safe storage of chemicals in the home.	Number and % decline from baseline: Pre-intervention, 1960-61 = 90 Post: 1962= 66 (-27%); 1963= 69 (-23%); 1964= 64 (-29%). There were 604 respondents to the survey questionnaires pre-intervention, and 1129 post intervention. For the 164 respondents who reported having made changes in storage practices for hazardous products, 85.4% of them did so after the exposure to the project.	Unable to draw strong conclusions due to lack of significance testing and failure to allow for other interventions (e.g. CRCs). The use of a control may have strengthened the study. From the survey results there do not appear to be any significant changes in the behaviour of the respondents. Weaknesses: No trend analysis; no statistical significance testing; no details of population base; fails to take into account changes in purchasing behaviour.
68 Schnell (1993) USA	Before and after study Good	0 - 5 years Hospital	Information to families from a written script on ipecac, its use and the function of the ER/ poison centre and phone number. A "**poison information package**" was then mailed out to each family, and confirmation of delivery was done after 1 week.	Knowledge	The difference (%) in the number of participants with pre- versus post-intervention knowledge as measured by the telephone survey.	Pre vs Post: heard of ipecac = 71% vs 92%; know its use = 51% vs 92%; have it = 47% vs 94%. Poison Centre No. = 39% vs 85%; All significant, P<0.0005.	Providing ipecac increases availability in the home and knowledge of its use for at least three months. Strengths: Has a 90% follow-up, however 8 of 90 were contacted by mail; identifies the absence of a control group (not given ipecac) as a possible design weakness, but refers to other studies to validate it; recognises that generalisability was a threat due to the "self-select" sample used as well as special characteristics in terms of higher education and access to a telephone. Mailing each pack cost U.S. $1.60.
78	Before and	2 ½ - 5	An **educational**	Knowledge	Measured as the	Pre vs Post test %:	From this study one can

Krenzelok (1981) USA	after study Reasonable	years Child care centre	**program** to teach poison prevention to preschool children in day care centres was designed. Day care centre instructors were orientated to the poison prevention concepts and program presentation techniques in 3-hour seminars. They then presented a series of 10 slide-cassettes and numerous teaching aides to their children, using a different slide-cassette every 4 days over 8 weeks.		proportion of post-tested children giving the correct responses compared to the pre-test children.	Understand meaning of "Mr Yuk" = 41 vs 99.5, P<0.05; Meaning of word POISON=1.5 vs 75, P<0.0005; Recognise colours = 4 vs 55, P<0.0005; Containers = 13 vs 74, P<0.0005. Could answer the question "what is a poison?" = 62% vs 87%, NS.	conclude, with some reservations, children aged 30-60 months can retain their knowledge concerning poison prevention for up to 6 weeks after an education program in a child care setting. A corresponding change in behaviour is not supported by this study. Strengths: Has a reasonable study base (3,285 children) – used a total of 393 children for analysis. Weaknesses: Unknown if pre- and post-test groups were representative of the whole sample; unknown if presentations were monitored to ensure uniformity; fails to describe any instructions to day care centres re post-program teaching behaviour. Other issues: The effect of a short- term educational program without continuity in this age group is still an issue. The author seems to suggest that by teaching the centre educators they will be able to continue the program as a centre activity. The long- term effects should then be translated into reductions in the poisoning rates in those areas with the program for it to be deemed successful.
75 Braden (1979)	Randomised controlled trial	3 - 4 years Child care centre	An **educational strategy** designed to assess the	Knowledge	The percent of poisonous products visually identified	Pre vs Post T1 education = 66.4% vs 75%; T2 warning label = 70.2% vs	The authors conclude that, in a group of children aged 3-4 years, 2 weeks after the conclusion of

USA	Reasonable / Weak		effectiveness of an empirically designed poison warning label and an educational program on poisoning prevention. Intervention 1 (T1 **education**): children were *exposed* to the educational program and were post-tested *without* warning labels. Intervention 2 (T2 warning label): no education, children post-tested *with* **warning labels** attached to all poisonous containers. Intervention 3 (T3 Educ. & warning label): Education and post-tested *with* warning labels on the containers. Control group children (C) were *not exposed* to the educational program and were post-tested *without* the warning		correctly across the pre-test and post-test conditions by the groups. The proportion of poisonous products verbally identified correctly across the pre-test and post-test conditions by the groups.	79.8%; T3 Educ. & warning label = 59.5% vs 86.2%. C = 64.6% vs 65.5%. T1 education = 64.1% vs 80%; T2 warning label = 70.8% vs 73%; T3 Educ. & warning label = 62.7% vs 83.4%. C = 72.7% vs 75.5%.	the program, the warning label appeared to improve visual discrimination of poisons, while the educational program appeared to improve intellectual (verbal) awareness of poisons, and found "the combination of the two to have the greatest overall impact." Strengths: Provides information of the programs used (or how to access them more fully); provides statistical significance testing for analysis of variance. Weaknesses: Unknown details of follow-up, randomisation, blinding, administration of questionnaire; no significance testing for pre-post-test of the groups; confounding from contamination between groups; unknown if testing of the questionnaire to determine its validity occurred. Other issues: Longer term effectiveness of the intervention questionable due to developmental stage of the children. Pre-test scores vary significantly across groups - suggest inadequate randomisation or variability of the measurement tools.

			labels.				
Strategy – Education and environmental modification							
88 Krug (1994) South Africa	Controlled trial with no randomisation Good / Reasonable	>5 years Home	A health education and environmental modification strategy aimed at reducing the incidence of accidental paraffin ingestion in children under 5. Intervention: specifically designed child-resistant containers (**CRC**) distributed free of charge to mothers of young children. The containers had opening instructions and a health **education** message on **poison prevention** printed on them. Other education took place at health care facilities. Control: received all the poison prevention educational campaigns but not the CRCs.	Hospital emergency attendance	Mean monthly incidence rates (IR) / 100,000 population of new paraffin poisoning cases in the periods before and after CRC distribution.	Intervention: Pre: IR = 8.63 (SD 4.87); Post: IR = 4.54 (SD 3.46). Decrease of 47.4%, P=0.02. Control: Pre: IR = 7.94 (SD 4.26); Post: IR = 9.80 (SD 5.63) Not significant Intervention vs control: Pre: NS; Post: P= 0.015	Use of CRCs appears to be effective in reducing the incidence rate of paraffin poisoning in a South African district. It appeared that not all CRCs were used appropriately (some left open, some lost or broken). "13 out of the 69 poisoning cases which occurred in the study area during the 14 months studied, ingested paraffin from CRC containers." Strengths: Good coverage: CRCs distributed to 20,000 homes (67% of all homes) in the study area; indicates the cost in rand per CRC bottle. Weaknesses: Unknown child population base (uses total population as the base); fails to analyse the differences in the households in the study area with and without the CRCs; potential bias caused by loss to follow-up as only 62% of the questionnaires for cases were completed. Other issues: "Only 43% of the total households still had an intact CRC being used 6 months after their distribution- thus some of the reduction in injuries may have

							been due to factors other than the CRC, such as education."
76 Wester (1985) USA	Before and after study Reasonable	0 -5 years Community wide	A 1oz bottle of **syrup of ipecac**, along with **instructions and educational** materials, was provided to each household in the county (0-5 year child population not given) with a preschool child.	Hospital emergency attendance Hospital admission Cost of injury	The number of ER visits for ingestion poisoning during the six months. Hospital admissions for poison ingestion six months from start of program. Reduced cost of hospital admissions because of the program compared with cost of the program.	Pre =20, compared to 15 Post (about 25% reduction). Pre = 9; Post = 4; (almost 50% reduction). A savings in hospital admissions of $10,000, due to 50% reduction. The total cost of the program was $11,475. In the following years, it is estimated that the program would cost $2,200 per year, yielding a 4:1 savings to cost ratio each year.	This paper gives rudimentary information, but appears that, assuming calculations are correct over the long-term, free distribution of syrup of ipecac to households with preschoolers may reduce the cost of poisoning due to reduced hospital admissions of preschoolers for poisoning events. Strengths: Gives some guidelines on calculation of target populations; gives cost of intervention and future cost estimates. *Weaknesses*: fails to give figures of children population used in the study; possible confounding effects. Other issues: Further analysis is needed to see if the poisoning trend is maintained over a longer period. A comparison group would add value to the results.
Strategy – Legislation and environmental modification							
65 Sibert (1977) Wales	Before and after study Good / Reasonable	0 - 4 years Community wide	A combined regulatory followed by environmental modification strategy. By Jan. 1976, all children's aspirin and paracetamol preparations were	Hospital admission	Number of children 0-4 years admitted for accidental aspirin poisoning over the study period.	Pre (1975) = 129; Post (1976) = 48, P<0.001.	Child-resistant packaging was effective in reducing the incidence of accidental poisoning in 0 to 4-year-old children. Weaknesses: Unknown child populations for either area; unknown if the two areas used in the study are comparable in socio-economic or

			required to be in **child-resistant containers** or dark-tinted unit packaging.				demographic terms.
56 Done (1971) USA	Randomised controlled trial Good	2 - 5 years Preschool or kindergarten	A Safety Packaging Act was passed in 1970 affecting numerous drugs and household chemicals. This study evaluated about **7 types of safety packaging** for medication drugs over a few years. STUDY 1 experimented with the following packages (P):- Screw cap (P1); Snap cap 1(P2); and transparent Strip-pack 1(P3). The packages contained 50 small, hard candies of various colours.	Ingestion	The median number of tablets ingested from each package per study group in 30 minutes.	Screw-cap (P1)= 100%; Snap-cap 1(P1)= 68%; Strip-pack 1(P3)= 14%, P<0.05.	Screw cap essentially provided no protection. Strengths: Uses a ""quasi cross-over"" approach which adds strength to the design; tackles the issues of bias and confounding in great detail; emphasises the need to use statistical methods that do not make assumptions about normality of distribution of the data in such a design; highlights the use of 10 candies/ tablets ingested equating "failure of the packaging" as being an arbitrary number (in terms of toxicity, ingestion of just one dose of some products maybe unacceptable). Weaknesses: Fails to give details of dropouts post-randomisation.
			STUDY 2 experimented with the following packages (P):- Snap cap 2 (P4); Blister pack (P5); and transparent Strip-pack 1(P3). The packages contained 50 small, hard	Ingestion	The median number of tablets ingested from each package per study group in 30 minutes.	Strip-pack 1(P3)= 60%; Snap-cap 2 (P4)= 100%; Blister-pack (P5)= 22%, P<0.05.	Other issues: The snap-cap had only a limited protective value.

			candies of various colours.				
			STUDY 3 experimented with the following packages (P):- Snap cap 2 (P4); Blister-pack (P5); opaque Strip-pack 2 (P6); and Press-release Palm-N-Turn (7a), & Screw-Lock (7b). The packages contained mock flavoured children's aspirin.	Ingestion	The median number of tablets ingested from each package per study group in 30 minutes.	Snap-cap 2 (P4)= 100%; Blister-pack (P5)= 33%; Strip-pack 1(P3)= 50%; Press-release (7a & b) = 0%, P<0.05.	The press-release types of caps, especially the Screw Loc, were the most effective in completely preventing access to the contents. The press-release cap also performed best for number of candies ingested in 10 minutes and median number of minutes required to obtain 10 tablets.
67 Sibert (1985) UK	Before and after study Reasonable	0 –4 Community wide	In March 1981 the government and the pharmaceutical profession agreed to place all solid dose, prescribable medications in **child resistant containers** or blister packs, with exceptions for the elderly and infirm who specifically request them.	Hospital admission	Number of children under 5 years admitted to South Glamorgan hospitals per year for accidental poisoning.	Prescribable solid drugs: Pre (1980)= 47 children; Post (1984)= 45, NS.	Although the results show that there was no significant difference in ingestion admissions from prescribable medications during 1980 to 1984, most children admitted had taken the medicine from ordinary, non-child resistant containers (74% of 1983 ingestion admissions and 58% of 1984 ingestion admissions). Weaknesses: Fails to give the population of children in the area; fails to take into account purchasing trends of medications (that is availability of the medication). Other issues: Longer study period to determine a trend may affect the results.
96	Before and	0 - 4 years	The Poison	Hospital	Change in national	Unregulated = +7924;	Fully regulated products (means

Howes (1978) USA	after study Good / Reasonable	Community wide	Prevention Packaging Act (PPPA) of 1970 enabled the establishment of packaging requirements for hazardous substances. This function was transferred to the Consumer Product Safety Commission (CPSC) in 1973. This study evaluated the **effectiveness of 11 regulations issued between 1972 and 1974** by the Food and Drug Administration (FDA). The products were partially, substantially or fully regulated over the 3-year study period.	emergency attendance	estimates of hospital emergency room poisoning injuries in 0-4 year olds associated with packageable products between 1973 and 1976.	Part reg. = -18538; Fully reg: = -15264. All significant at P<0.05. Ingestion in the unregulated product group increased by 20%; the ingestion incidence in the partially regulated group decreased by 33%; and the fully regulated decreased by 38%.	that they have CRCs) had the lowest ingestion incidence rates. Strengths: Acknowledges areas of possible confounding (e.g. some products in conventional packaging prior to the effective regulation date will still be on the market shelves after this date); identifies the issues around product coding used in the NEISS where some category codes include products that are both regulated and unregulated by the PPPA. Weaknesses: No data on population changes, injury reporting changes, sales and exposure of products.
Strategy – Education and environmental modification							
70 Woolf (1992) USA	Randomised controlled trial Good / Reasonable	0 - 5 years Hoe	Families with children under 5 years who had experienced a poisoning, and had called the Massachusetts Poison Control Centre, and did not	Behaviour	The behaviour and practices of parents after receiving the intervention compared to those who did not.	Intervention vs control: % using sticker = 78 vs 39%, P=0.0001; using slide locks = 59 vs 40%, P=0.001 storing ipecac = 57 vs 52%, NS.	The provision of a coupon did not provide the necessary incentive to procure the ipecac in this study population. Furthermore, this study demonstrated no improvements in parental poison prevention practices 3 months after receipt of the poison prevention package. There were

			have ipecac. Intervention: Families received a low-cost, mailed **poisoning prevention packet** consisting of telephone stickers, a $1 coupon for syrup of ipecac, 1 slide-style cabinet lock, a 9-step checklist for poison proofing the home, pamphlets and a cover letter which had been pre-tested. Control: Families did not receive the poison prevention packs.				no differences in the interval of subsequent poisonings between the two groups (the overall recurrence rate was 3.7%). Strengths: Gives total cost of the package sent to participants ($US2.87); good follow-up rates (90% retention). Weaknesses: Fails to consider the characteristics of people who contact the poison centre (see *other issues* below); no verification of responses; unclear if chemicals were subsequently stored behind slide-locked doors. Other issues: Possible selection bias as participants were only those who called the poison centre, which threatens the generalisability of the study. The follow-up period was not long enough to demonstrate a decrease in subsequent poisonings.
73 Scherz (1968) USA	Before and after study Reasonable	0 - 5 years Public place / amenity	A strategy aimed at reducing the incidence of poisoning due to orange flavoured aspirin sold in the local Post Exchange. In February 1968, the local Post Exchanges began	Hospital emergency attendance	Number of poisonings from children's aspirin sold by the local Post Exchange.	Pre-intervention = 27, Post = 5.	Appears that provision of CRCs for aspirin at point of sale was associated with a decrease in the number of aspirin poisonings presented to the hospital. (The five cases recorded were either from aspirin sold before the test period or without attached child-resistant containers.) Weaknesses: No statistical significance testing;

			selling the children's aspirin with a **child-resistant container** taped to the box. Instructions were posted in the stores requesting that the buyer transfer the aspirin to the child-resistant container.				no use of comparison groups (which would have increased the validity of the results); does not specify target population; no analysis of the level of compliance (e.g. what proportion of aspirin sold at the local Post Exchange was actually poured into the attached CRCs; no detail as to the type of CRC used. Other issues: Generalisability is difficult due to inadequate description of study base.

APPENDIX L: Table 3 - Falls

Strategy – Education							
39 Kravitz (1973) USA	Controlled trial with no randomisation Reasonable	0 - 1 year General practice	Parents visiting a private paediatric practice received counselling (specific **oral and written instructions**) about preventing falls in infancy. Also, signs and posters were placed over every examining table for the full year of the study. The control group were recruited the year before and received no counselling.	Injury - general	The number of total prospectively measured falls and retrospectively measured falls in infants under-1 year recorded over a 1-year study period.	Intervention vs control: Total falls per year: 43 (13.4%) vs 101 (30%), P<.001; Prospective = 33 (10.3%) vs 58 (17.2%), P<.01. Retrospective = 10 (3.1%) vs 43 (12.2%), P<.001 There were more hospitalisations for falls in the counselled (11.6%) than in control group (4.9%). The 3 most common objects from which children fell were: the infant dressing table, 26.7% in control group (C) and 30.2% in intervention group (I); the adult bed, 21.8% in C and 23.2% in I; and from the crib, 20.8% in C and 11.6% in I. The largest percentage of falls occurred between 5 and 10 months of age in both groups.	Strengths: Informs that there were no specific demographic differences of the mothers between the intervention and control groups. Weaknesses: Potential recall bias; potential measurement bias (mothers in the intervention group may be more likely to report a fall); no detail on the quality, uniformity and content of the information provided. Other issues: Possible recall bias for retrospective falls in the intervention group. Systematic allocation to groups with possibility of selection bias. Specific sample population, therefore generalisability limited. Relied on parental report only and didn't validate, even where possible. Also not clear what the intervention involved.

Strategy – Legislation, environmental modification and education							
47 Barlow (1983) USA	Before and after study Good / Reasonable	0 - 15 years Community wide	A **law** was passed in 1976 requiring owners of dwellings to provide **window guards in apartments** where children 10 years or younger resided. Landlords were to comply by 1979. The program also included media campaigns, continuing education, reporting of falls from heights by police and emergency rooms, and initial provision of window guards.	Hospital admission	The number of children 0-15 admitted with injuries due to falls from heights before and after the law.	Expected number of admissions for window falls for the period, based on the previous 9 years = 16; Observed window falls admissions = 1, 96% reduction	Fair study, may indicate that compulsory guarding of apartment windows may decrease the incidence of falls from windows. Weaknesses: Unknown cost of the window guards and reporting network; unknown if there was any change in reporting and treatment for falls; no long-term follow-up period to determine if the trend continues; fails to take into account fluctuations in population. Other issues: Mostly descriptive study with a small evaluation of the effect of legislation on falls from heights, as observed from hospital data. The effect of the education intervention prior to the law could have influenced the results in the current study.
Strategy – Environmental modification and education							
41 Spiegel (1977) USA	Before and after study Good / Reasonable	0 - 15 years Community wide	The intervention had 4 main components: a **public media campaign** on safety hazards; **door-to-door community education** by voluntary groups and outreach	Mortality	The number of children's deaths due to falls from windows during the study period and determined by death certificates.	Total fatalities in the city per year: 1973= 57deaths; 1974 = 45 deaths; 1975 = 37 deaths, from 1973 to 1975 decreased by 35%.	Suggests that the "Children Can't Fly" program may be effective in reducing mortality due to falls from windows. Unable to determine *which* aspects of the program were most effective. Strengths: Provides a cost for the window guard ($3 each for about 16,000 guards distributed per study

			workers; the provision of **window guards** to families with young children; and the **reporting of falls** by hospitals and police precincts, which was followed by counselling, referral and data collection by public health nurses. The program began in 1972 in one borough and expanded to four other boroughs in 1974-5.				year). Weaknesses: Fails to take into account changes in population; short follow-up period; no statistical significance testing of the results. Other issues: The design makes it difficult to presume a causal effect of the individual activities due to their concomitant implementation; however the paper mentions that there was no fall from a window with a guard. A comparison group could have increased the significance of the result.
				Injury - general	The number of children falling from windows in the borough with highest risk during the study period as recorded by the study's reporting system.	Total number of falls in borough 1: 1973 = 108 falls; 1974 = 64 falls; 1975 = 54 falls (50% decline in the number of falls reported over two years). Also, no falls were reported from windows where guards had been installed.	Children fell from bedrooms more frequently than other rooms; more falls in afternoon hours; males > females 2:1.
Strategy – Legislation and environmental modification							
45 Briss (1995) USA	Cohort study Reasonable / Weak	0 – 5 Child care centre	1740 day care centres in the USA were randomly selected. For 8-weeks trained interviewers telephoned day care centre directors and	Injury - general	Medically attended injuries due to playground falls in relation to whether the centre regulations specified resilient surfaces or not.	With regulation (n=819) Injury rate = 0.29/ 100 000 child hours in day care. No regulation (n=921); Injury rate = 0.19/ 100 000 child hours in day care, NS. With regulation (n=1490) Injury rate = 0.26/ 100 000 child hours in day care. No regulation	Follow-up inspections to determine if centres were adhering to the regulations was associated with a decrease in incidence of medically attended injuries. Neither regulations addressing playground safety or surfaces, nor enforcement

			asked about characteristics of the centres and the injuries among the attendees. Centres with regulatory and enforcement procedures were compared to those centres without these.		Medically attended injuries due to playground falls in relation to whether the centre had regulations addressing playground safety or not.	(n=250); Injury rate = 0.14/ 100,000 child hours in day care, NS. An important risk factor for injury was height of climbing equipment on the playground in both bivariate (P=.01) and multivariate analyses (P=.02). During the study period a weighted total of 89.2 injuries (0.25/ 100 000 child-hours in day care) occurred. Of the enforcement variables only whether follow-up inspections were announced (sometimes/always vs never) significantly contributed to the model (P=.03; Wald test).	patterns were associated with lower injury rates. The height of the climbing equipment was identified as an important risk factor. Strengths: Has good sample size (1740 day care centres, which was 85% of original study base); uses trained interviewers. Weaknesses: Fails to consider centres' policies regarding criteria for requiring medical attention; fails to specifically measure the duration of exposure to the playgrounds (therefore the calculated injury rates may have under-estimated the risk of falls); unknown how the heights of playground equipment were measured. Other issues: Incidence of injury is used to evaluate the effectiveness of regulation and enforcement of playground safety. However this should be considered as baseline data as the paper does not give the incidence rates before the interventions. It is possible that there may have been a change in injury rates at centres where they have been introduced. The injury events and centre facilities were based on directors' recall and reports, rather than direct measurement or inspection.

APPENDIX L: Table 4 - Respiratory

Study ID **Author (year) Country**	**Study type** **Quality rating**	**Target group** **Setting of intervention**	**Intervention**	**Outcome**	**Description of outcome**	**Key results**	**Interpretation/ comments**
Strategy – Education							
15 Sadan (1995) Israel	Before and after study Good / Reasonable	0 - 13 years Community wide	A **nation wide educational** campaign to prevent injuries due to aspiration of foreign bodies (FBA). Campaign included television and radio broadcasts, newspaper articles and interviews, medical educational programs in the community paediatric care centres.	Hospital admission	Total number of children 0-4 years admitted with FBA nation wide, measured at 30 months and 9 years post-intervention.	Pre = 220/ 467 800; Post = 144/ 474 100. A 36% reduction in cases, P < 0.01 at 30 months. No further reduction at 9 yrs.	The follow-up evaluation after 9 years showed a non-significant decrease, however as there was no increase in the FBA cases. It is possible to conclude the effect was sustained. Recommends mandatory labelling of nuts and seed packages to warn of danger of choking for children under 5 years. Strengths: There was a good follow-up of 95% to 100% response rate to the questionnaires administered to all Departments of Paediatrics. Weaknesses: No control group. Limited generalisability.
Strategy – Legislation and environmental modification							
104 Kraus (1985) USA	Before and after study Reasonable	0 - 14 years Community wide	**Legislative and environmental modification** strategies implemented in California to prevent unintentional deaths	Mortality	The number of crib related deaths in children 0-4 years from 1960 to 1981.	No significant changes. Infants between 6 and 8 months of age are at greatest risk of crib strangulation. Males are more frequently involved than females (ratio of 1.4 to 1, p= .05).	Although not conclusive, the study offers some directional indication of the effects of the interventions and scope for further experimental studies. Strengths: The authors acknowledge the limitations of obtaining

			from suffocation, strangulation (freezers, cribs, plastic bags) and inhumation (burial). Legislation affected freezer and refrigerator design, warning labels on plastic bags (e.g. mattress covers) and changes to acceptable crib design.		The number of inhumation related deaths in children 0-14 years from 1960 to 1981.	Death rates fell from ≈ 0.56 to 0.3 /100,000 children for period 1964-67 to 1981.	information from pre-existing sources. They have provided good data on the incidence of deaths due to these injuries in the State of California. Weaknesses: Data analysis was appropriate but presentation of findings could have been clearer.
					The number of plastic bag suffocation in children 0-14 years from 1960 to 1981.	Deaths from plastic bag suffocation fell from ≈ 2.3 to 0.8 /100,000 children, P=.005; plastic sheeting from 0.5 to 0.3 / 100,000 children .	
					The number of refrigerator / freezer related deaths in children 0-14 years from 1960 to 1981.	Refrigerator entrapment deaths fell from ≈ 1.2 to 0.4 /1,000,000 children, P=0.05.	The ratio of fatal entrapment events per million refrigerator/freezer units sold has declined significantly from the 1969-71 period to 1981(P=0.025).
105 Langlois (1991) USA	Cross-sectional Reasonable / Weak	0 - 3 years Public place / amenity	**Age labels on toys** – 3 different labels tested as a deterrent to buying toys with small parts for children less than 3 years.	Behaviour	Toy buyers' response to Age specific labels during the survey, i.e. whether they would buy the toy for a child aged 2-3 years (hypothetical estimation of behaviour).	Label 3 “Not recommended for below 3 - small parts” 5%; Label 2 “Not recommended for below 3” 8%; Label 1 “Recommended for 3 and up” 44%.	Shows that toy buyers may be more likely to avoid purchasing a dangerous toy that carries a more explicit warning label. Authors acknowledge that the subjects interviewed may not be representative of all toy buyers. Weaknesses: Actual purchase was not measured.

APPENDIX L: Table 5 - Immersion

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
Strategy – Education							
12 Asher (1995) USA	Randomised controlled trial Good / Reasonable	2-6 years Public place / amenity	12 **week water safety training program** which consisted of biweekly water safety and swimming lessons based on the American Red Cross program (intervention) vs 8 week program (control).	Behaviour	Scores were used to assess swimming ability, deck behaviour, water recovery, and "jump and swim" skills over time.	Swimming ability, deck behaviour, water recovery, and jump and swim skills improved over baseline levels in both groups, but there was no difference between groups in level of improvement. Note: higher scores indicate riskier behaviour. Both groups improved from T1 to T4, $P<0.03$.	In a self-selected sample of middle to high socioeconomic status, both the intervention and control groups improved swimming ability, water recovery and deck behaviour from beginning to end of study, yet the type of swim program appeared to have no effect. *Strengths*: Randomly assigned to the 2 swim programs. *Weaknesses*: The study sample may be biased as parents volunteered their children to the program. There was no limit on time spent in the water outside the intervention time therefore could have positive bias on effectiveness of the program. Long term effect not assessed. 67% follow up rate. *Other issues*: Participants received $50 upon completion of the last measures. Funded by a Maternal and Child Health grant from the US Department of Health and Human Services. The 8-week group started off with a

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
							higher swimming ability score.

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
24 Treser (1997) USA	Before and after study Reasonable	General population Community wide	A 2 year **educational and boating safety campaign** to prevent boating-related drowning resulting from non-usage of a **Personal Flotation Device** (PFD) whilst on a small boat. It included boating safety videos for elementary schools, a life-jacket loan program for beaches, community events and printed material focusing on drowning prevention.	Behaviour Behaviour	Number of boaters, aged 0-4 yrs observed wearing PFDs during a boating activity. The number of children (0-15) with PFDs when adults were present and wearing PFDs.	Pre-intervention = 7/12 (58.3%); Post = 46/ 53 (86.8%), P<0.022 Pre-intervention = 20/ 21(95.2%); Post = 51/ 53 (96.2%), NS.	Community based education campaign to increase the use of PFDs was effective in children aged 0-4 years. Strengths: Took into account weather conditions when comparing the results. Weaknesses: Absence of a comparison group reduces the strength of the study intervention. Change in observation protocol over time may affect measurement. Intervention not described in sufficient detail. Authors recognise that reproducibility and generalisability of the data may be difficult without further confirmation studies. Other issues: Not necessarily the same boaters at before and after measurements.
13 Lawson (1978) Australia	Before and after study Reasonable / Weak	<8 years Community wide	**Public education campaign** using cost free communication means to prevent near drowning or drowning in domestic pools. There was also a request to local governments to use	Mortality	Number of children dying from accidental drowning in domestic pools and reported to the Coroner's Court.	Pre-intervention (1976-77) = 10; Post intervention (1977-78) = 4, NS.	There was no statistical significance achieved from the numbers recorded, however the reduction in drowning occurred despite a 6% increase in the number of domestic pools in the area during the same period. Only a minority of councils complied with the request to implement pool fencing. Weaknesses:

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
			their powers to require fencing for new pools.				Short intervention period for desired outcomes and the intervention not adequately described. Other issues: A very small number of cases. Free advertising space through State instrumentalities.
Strategy - Environmental modification							
80 Logan (1998) USA	Case-control study Reasonable / Weak	0 - 4 years Community wide	Adequate vs inadequate **fencing** around domestic outdoor pools.	Mortality	Percentage of pool-related drowning in children less than 5 years that may have been prevented by adequate fencing of all domestic pools in the USA.	For 1994, population attributable risk (PAR) % = 19% (PAR sensitivity analysis = 17% to 43%).	Authors believe that "even if all … pools in the US were properly fenced, most drownings among children < 5years of age would not be prevented" (p.1). Strengths: Good numbers despite a response rate of 56%. Weaknesses: There was over-representation of the higher income and highest education group, which in this study of swimming pool access could bias the results upwards. The definition of pool fencing was not adequate and the study did not differentiate between pool ownership and access to a pool. Other issues: The response rate was 56% but consideration given to the fact that this was a telephone survey. This is an estimate with data on the relative risk of drowning

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
							extrapolated from other studies. Of the 18.5 million households with access to an outdoor domestic pool, 13.9 (76%) appeared to have had adequate fencing. Conclusions not supported by methodology.
62 Fergusson (1984) New Zealand	Case-control study Reasonable / Weak	0 - 5 years Community wide	Fenced vs unfenced pool. Fencing promoted by regulation or by regulation and enforcement.	Mortality	The probability of drowning in an unfenced domestic pool compared to one that is fenced.	Relative risk of drowning in an unfenced pool ranges from 2.06 to 4.83. Pool fencing would reduce drowning by 40% to 67% with a mean of 55%.	Suggests introduction of pool fencing would reduce drowning by 40%-67% based on relative risks and percentage reduction in pool drownings for 4 methods of estimation. That is, this paper presents the formulae for estimating: The probability of drowning in a (i) fenced pool and (ii) unfenced pool. The relative risk of drowning in an unfenced pool (compared to a fenced pool) Percentage reduction in number of drownings following introduction of universal pool fencing. These formulae are based on the available data (cited in previous studies) of: Proportion of fenced pools in the community. Proportion of children who drown in fenced pools. Weaknesses: The age group distributions are

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
							not given and nor are the proportion of children exposed to unfenced pools. No definition of 'fencing'. Other issues: Results are based on extrapolated data, which does not necessarily imply similar savings would inevitably follow. The estimations were done with 2 estimations of fenced pools (34-46 %) and 2 different proportions of drownings (15-20%).
Strategy – Legislation and environmental modification							
63 Pitt (1991) Australia	Case-control study Good / Reasonable	0 -13 years Community wide	Fenced vs unfenced pool. Cases - presentation to ED for immersion; controls from community based stratified random selection.	Hospital emergency attendance	Drowning and near drowning attending the ER and involving unintended access to an unfenced vs fenced pool.	RR= 3.76 (95%CI 2.14- 6.62) The risk of drowning or near drowning involving unintentional access to an unfenced pool is 3.76 times higher than the risk associated with a fenced pool. Conclusion based on data obtained from: Prospective hospital-based injury surveillance. Community survey to describe pool fencing.	Strongly significant result suggested that pool fencing greatly reduces the risk of drowning and near drowning in children aged 0-13. (The comparative relative risks between 3- and 4-sided fencing were not analysed.) No child scaled the gate to reach the pool but all gained access through an open or unlatched pool gate or house door. Strengths: A random telephone sample of the population was used to identify 204 households with pools in the 1024 households interviewed. Both controls (unfenced pools) and cases were

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
							personally interviewed. These 204 pools were inspected, as were 72 pools from the "cases". Good definitions of characteristics of pool fencing. Weaknesses: Information on whether the households in the control group had children is not given.

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
14 Milliner (1980) Australia	Controlled trial with no randomisation Reasonable	0 – 14 Community wide	A comparative study of two neighbouring shires, one with pool fencing legislation (intervention) and one without pool **fencing legislation (control)**.	Mortality	Number of child drownings and near-drownings during the 10 year study period in freshwater (pools, rivers etc), intervention vs control.	Drowning = 2/ 26,000 (1 was in an unfenced pool) vs 5/ 35,000 (all in unfenced pools). Near-drowning = 4/ 26,000 vs 5/ 35,000.	Caution when interpreting these results due to low numbers and no statistical significance testing. No children drowned in a fenced pool in 10 years post legislation. Most near-drownings were in caravan park pools. Weaknesses: The small number of cases and statistical powers not given. There is inadequate data on the comparison shire; eg data on the child population and the number of pools is missing thus threatening the results of the analysis.
103 Harris (1995) Australia	Case-control study Good / Reasonable	0 - 4 years Community wide	**Economic analysis** of mandatory **isolation fencing** around domestic swimming pools in Western Australia.	Cost of injury	Cost effectiveness ratios of mandatory isolation fencing.	Cost-effectiveness per life saved = $4.9m (95%CI $2.4 - 7.9m); per year of life saved = $252,200 ($123,900-402,900) per quality adjusted life year = $192,100 ($106,900- 289,000).	The study estimates that isolation fencing could reduce the annual drowning rate by between 23% and 83% depending on the level of enforcement. In Western Australia this translates to 2 to 3 children a year. Strengths: More than one cost measurement was considered Cost of a fence = $1000-2500; discount rate = 0-10%; probability of inspection/ year = 0.25-1; period of analysis = 100-10 years; analysed data from 1975-1988. Other issues: Good attempt at sensitivity analysis considering this is not a primary study and is thus vulnerable to any biases and

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
							flaws in the original data. The authors suggest that it would be more cost effective to consider regulation (or subsidy) only on "at risk" pools and households, that is with children under 5 years of age.
Strategy – Legislation, environmental modification and education							
95 Quan (1990) USA	Before and after study Good / Reasonable	General population Public place / amenity	Prevention of swimming pool submersions. The Seattle-King County Dept Public Health (SKCDPH) program utilises **education, develops legislation (1981) and enforcement,** and provides for re-evaluation of standards to mitigate four factors that contribute to submersion injuries: inadequate supervision, lack of barriers, poor water clarity, and failure to execute timely and competent rescue.	Mortality Submersion events	Number of drowning deaths in lifeguarded pools, spas and beaches per 100,000 population. The number of submersion victims under 20 years at pool sites in the County between 1974 to 1983.	Number (rate/ 100,000): 1975-76= 10 (.21); 1977-78= 7 (.15); 1979-80= 9 (.18); 1981-82= 2 (.04); 1983-84 = 0; 1985-86= 1 (.02). Number (rate/ 100,000 people): 1974-75= 13 (.86); 1977-78= 8 (.56); 1978-79= 5 (.35); 1980-81= 8 (.56); 1982-83= 2 (.14); P=.06. "Decrease occurred in semi-public and public pools & spas under the ordinances developed by the SKCDPH. In contrast, the numbers & rates of submersions in private home pools, not under health department jurisdiction, did not change during that time" (p.6). An association between CPR trained lifeguards and submersions is made.	Although the rates up to 1983 were not statistically significant, public and semi-public swimming pool submersions did show a downward trend. Rates did not vary over time for private pools. Strengths: Has good process evaluation measurements. Weaknesses: Absence of a comparison group reduces the strength of the findings. The small number of cases makes it difficult to obtain statistically significant outcomes; but the trend appears to be of clinical significance.

APPENDIX L: Table 6 - Burns and scalds

Study ID **Author (year) Country**	**Study type** **Quality rating**	**Target group** **Setting of intervention**	**Intervention**	**Outcome**	**Description of outcome**	**Key results**	**Interpretation/ comments**
Strategy – Legislation							
8 McLoughlin (1986) New Zealand	Before and after study Reasonable / Weak	1-14 Community wide	New Zealand passed the **Safety of Children's Night Clothes Act** in 1977 and it was effected in 1980.	Hospital admission	Number of children admitted for burns due to clothing ignition over 3 periods: pre debate on law, during debate and post law.	Period I = 168, Period II = 187, Period III = 138. Since 1981 there was a linear downward trend for all clothing ignition burns (Chi-sq slope = 4.05; p = 0.04). Of the 493 ignition burns, 49% involved nightwear, 28% daywear and 23% unspecified.	Suggests that legislation may be effective in decreasing burns from clothing ignition in children. (It is suggested that up to 20% of actual cases may have been missed in this study). Weaknesses: Diagnosis description notes were missing on some records. No information was available on whether nightwear involved in the burns was home sewn or manufactured. Fabrics were not all tested, only visually inspected.
				Knowledge	Survey of sales assistant fabric knowledge and retail fabric content labelling. Percent of sales assistants with correct knowledge.	(n=38); Flammability risk: H=high, L=low; Cotton 100% (H)= 33; Wool 100% (L) = 53; Polyester 100% (L)= 6; Cotton/Polyester (H)= 60, Cotton/Wool (H)= 11	Other issues: The sales assistants interviewed often admitted ignorance about fabric flammability and this was reflected in their fabric recommendations to parents.
				Knowledge	Questionnaires were used to measure knowledge of fabric flammability and home-sewing practices of Plunket clinic attendees.	(n=476); Flammability risk : H = High, L = low; Cotton 100% (H) = 34; Wool 100% (L) = 78; Polyester 100% (L) = 11; Cotton/Polyester (H) = 60.	

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
				Behaviour	Survey of children's nightwear in retail outlets to measure their compliance with the law	(n=9669); 912 garments not complying: 712 due to label, 200 due to fabric	Of the 741 bolts of cloth inspected 68% had no fibre content labelling. Not all 200 garments were tested for fabric content but visual expertise by Trade and Industry Investigators used.
3 Erdmann (1991) USA	Before and after study Reasonable/ Weak	Under 15 years Home	A Washington State **law** requiring new **water heaters to be preset** at 49^{o}C.	Hospital admission	Admission for unintentional tap water burns.	50% reduction in admission rates noted over five years – from previous study - no significance testing.	Non significant findings.
4 Erdmann (1991) USA	Controlled trial with no randomisation Reasonable / Weak	General population Home	A Washington State **law** requiring new **home water heaters** to be preset at 49^{o}C. Houses with heaters installed after the law was passed (intervention) were compared with those installed before the law was passed (controls).	Change to environment Change to environment	Temperature of tap water after hot water run for 120s. Number of homes with current temperature setting of water heater <54^{o}C. Mean hot water temperature pre and post law and campaign.	Intervention: Mean = 49.5 ^{o}C, SD 8.5, Control: Mean 50 ^{o}C, SD 5.5, NS, P>0.1. Intervention: 42/50 (84%), Control: 35/50 (70%), NS, P>0.05. 61^{o}C (+/- 14^{o}C) pre-law (reported from earlier study) and 50^{o}C (+/- 14^{o}C) post-law, ($p < 0.001$).	Small sample sizes or confounding by the concurrent education campaign may have resulted in the lack of significant findings. Strengths: Objective measurement of water temperature. *Weaknesses*: Non-random selection of houses. Non-random allocation to intervention or control (self-selection). Small sample (100). Response rate about 65% but don't know anything about non-responders. Strong possibility of confounding because cases were those who installed a new heater after the law. Other issues: Controls didn't have a new heater, which could imply a different

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
							SES. An education campaign preceded the law, which may have diminished the impact of the law alone.
53 McLoughlin (1985) USA	Controlled trial with pseudo-randomisation Good / Reasonable	General population Community wide	The intervention group, County E, passed a **law requiring a smoke detector** for each separate sleeping area and in stairways leading to occupied areas, in September 1976 with an effective date of July 1978. The control group (C) was a similar County in the same metropolitan region but which required that smoke detectors be fitted only in new constructions.	Change to environment	The measure was the status of the dwelling with regard to 1 of 5 smoke detector protection categories, 5 years later. The 5 categories were: EVERY LEVEL: Detector for each separate sleeping area & on every level of the dwelling (National Fire Protection Association current 1978 code). YES by code: dwelling conforms to previous code requiring a detector for each separate sleeping area & in stairways leading to occupied areas (current County E code). WORKING: dwelling has at least	Intervention vs Control: n=359 vs n=287. % of homes with detectors: Intervention vs control: EVERY level = 15% vs 20%, NS; YES by code = 27% vs 24%, NS; WORKING = 41% vs 26%, NS;	Following legislation, there was a close association between homes built after 1975 that complied with either code. A higher proportion of dwellings in the control county had no working detectors, which the authors suggest may be indicative of differences in enforcement of the codes. There were substantial reductions in fatal fires and in the number of deaths in the post-law period for the intervention county compared with the control county (does not state how this was measured). *Strengths*: Random sample of all owner-occupied, single family homes in each county. *Weaknesses*: Generalisability to other population groups could be limited, as the groups were affluent and owner-occupied single family's homes, with low risk of death from fires. Other issues: The result on "no working detectors" reported as significant in the abstract does not tally with

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
					1 working detector, but not in sufficient number or location to comply with either code. NONE Working: dwelling has detectors in the home, but these are either not working or not installed. NO detector: dwelling has no detectors.	NONE Working = 11% vs 13%, NS; NO detectors = 6% vs 16%, S.	the data in the paper. Also the figures given for comparisons in fire deaths seems to contradict the shown graph.
58 Knudson (1979) USA	Before and after study Reasonable / Weak	0 - 16 years Community wide	Federal standards were established governing the flammability of general wearing apparel including sleepwear, under the **Flammable Fabrics Act (1972).** Two sleepwear standards were adopted; the first one effective July 1973 covered children's sleepwear sizes 0-6X. To evaluate the effectiveness of this standard, a review of all acute admissions to the	Hospital admission Sleepwear burns	Number burn admissions to the Shriners Burns Unit admitted per year. Percentage of children's burns that were sleepwear related.	PRE-law (1966-73) = 95; POST-law =127, P<0.025. Pre: 1966-1973 = 12%. Post: 1974-1977 = 3%, P<0.025.	Authors state that the "data suggest that the regulation of flammability of children's sleepwear successfully reduced burn injuries due to ignition of sleepwear in children" (p.255). Weaknesses: Reliability of the results is uncertain due to the absence of national incidence data on sleepwear injuries for baseline comparisons. Only 15 cases in post-intervention group from one hospital included in the study. The study was unable to distinguish injuries involving flame-retardant fabrics from those that didn't during the post standard period. Confounding factors not controlled for.

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
			unit between 1966 and 1977 was done.				Other issues: The difference in the means for the severity of the burns was not statistically significant for the pre- and post standard periods. The percentage of total body surface area burned was 34.9% (SD 2.2) vs 31.7% (SD 5.8); and for 3rd degree burns it was 25.3% (SD 2.1) vs 16.7% (SD 6.4), NS, P<0.10.
84 McLoughlin (1977) USA	Before and after study Reasonable / Weak	0 - 14 years Community wide	A law was passed in Massachusetts effective December 1973, which made illegal the sale of children's sleepwear sizes 0 to 14 that did not comply with **federal flammability standards**.	Hospital admission	The percentage of flame burns injuries involving sleepwear during study period (admissions were to the one burn unit).	Sleepwear burns: PRE-law, 1971= 34% (17/50), 1972= 28% (15/54), 1973= 24% (11/46); POST-law: 1974= 21% (10/47), 1975= 9% (3/32), 1976= 3% (1/35).	It is probable that the decline of sleepwear-related injuries at the Burns unit was due to lower fabric flammability. Strengths: Provided some estimates of possible cost of injury: the potential cost savings for preventing a burn admission was estimated at $500 a day which is the cost of treatment, and would equal $36,500 per child for the study. Weaknesses: Power of study seems low - actual number of flame burns involving sleepwear is between 1 and 20 per year. The Burns Institute is not the only burns facility serving the catchment area. Statistical significance testing is not evident. Other issues: The pre-legislation discussions on

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
							the hazards of clothing ignition in the community, probably also contributed to changes in safety behaviours.
86 Laing (1991) New Zealand	Before and after study Reasonable / Weak	0 – 14 years Community wide	A legislative strategy involving the implementation of **the Safety of Children's Nightclothes Act 1977** in 1980.	Injury - general	The linear trend for burns injuries attributable to clothing ignition for post law period.	Rate per 100,000 and downward trend (1979-88) for: All clothing = 5.5 to 3, P<0.001; Nightwear = 4 to 1, P<0.001.	The significant downward trend observed following implementation of the Safety of Children's Nightclothes Act 1977, may have been due to a combination of factors, including the law, debate about the law, education and changes in recording of burns post-law. Weaknesses: No child population figures are given for the period. Some of the figures quoted do not show the comparison pre-law figures or statistical significance eg number of burn admissions. Other issues: Between 1985-8 there were 95 burn injury discharges.
Strategy – Environmental modification							
91 Sørensen (1976) Denmark	Before and after study Good / Reasonable	0 - 4 years Community wide	After determining that a large number of mouth burns were caused by a particular **vacuum cleaner**, the author of the study (a medical practitioner) lobbied	Hospital emergency attendance	Number of children attending a hospital or a burns unit with mouth burns from electric cords.	PRE-campaign: 1959-63 = 22; 1964-68 = 23. POST: 1969-73 = 3 children. After the intervention only 1 out of the 3 children with mouth burns was from a vacuum cleaner cord.	After the intervention of replacing the cords, only 1 of the 3 children with mouth burns was from a vacuum cleaner cord. Strengths: Discussed the potential cost to the firm for replacement of 20 000 cords. Weaknesses:

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
			the company to **replace** the plugs.				No tests for statistical significance given. No details given about population base served by the Deaconess Institution Hospital and Burns Unit, from whom patients were identified.
Strategy – Education							
28 Mackay (1982) USA and 59 McLoughlin (1982) USA	Controlled trial with no randomisation Good / Reasonable	General population Community wide	Intervention 1: A **school-initiated educational program** about burn safety plus a mass media campaign via TV, radio and newspaper. Intervention 2: A **community outreach activity** for adults through workshops and forums to discuss burn prevention plus a mass media campaign via TV, radio and newspaper. Intervention 3: A **mass media** campaign via TV, radio and newspaper.	Hospital emergency attendance	The incidence rate ratio (90% confidence interval) for all burns during & after educational program relative to rates before interventions.	Intervention 1: During = 1.0 (0.9, 1.2), Post = 1.1 (1.0, 1.2). Intervention 2: During = 0.8 (0.7, 1.0); Post = 0.9 (0.8, 1.1). Intervention 3: During = 1.2 (1.0, 1.4); Post = 1.0 (0.9, 1.3). Control: During = 1.0 (0.8, 1.2); Post = 1.0 (0.8, 1.1).	The incidence rates and rate ratios for the school-initiated program had no large effect, and the community campaign results show only a marginal effect. That is, the program did not result in a significant reduction in the incidence or severity of burns. Strengths: Recognises the fluctuations in burn incidence may be due to random variation of the injury. Weaknesses: Possible overlap of interventions between intervention areas. Study didn't discuss changes in hospital admission policy. Attendance problems with student group led to significant losses to post test period. Also, there was substantial attrition of adult pre-test sample. Other issues: Perhaps a longer implementation period could have yielded more

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
			Control: 2 communities, 100 miles away, received none of the interventions.	Knowledge Percentage of classrooms or individuals achieving mastery on children's post-test.		Significant increases in knowledge were only shown with intervention 1 (direct intervention).	significant results. Due to the number of interventions being applied at the same time and the relatively short implementation period, it was difficult to distinguish which activity had the most impact.
34 Waller (1993) New Zealand	Randomised controlled trial Reasonable	0 - 3 years Home	In conjunction with a **national media campaign, an educational intervention to lower the temperature of home hot tap water** was conducted in households with young children. The intervention was a half-hour home visit including intensive discuss-ions on hot water dangers and general safety measures in the home. The water temperature was measured and recorded. House-holds were also given the option for free plumbing	Change to environment Change to environment Behaviour	Percent (%) of households with a hot tap water temperature < 60^{o}C. Mean water temperatures in the homes before and after the intervention. Percent (%) of households who reported turning down setting on thermostat	Intervention: Pre: 9.3%; Post: 41.9%, P=0.001. Control 1: Post: 30.6%, no significant difference between groups at follow-up. Intervention: Pre = 67.4^{o}C; Post = 61.3^{o}C, P= 0.0001. C1: Pre = 67.4^{o}C; Post = 63.7^{o}C, P= 0.009). C2: Pre =53.9 ^{o}C; Post = 57.6 ^{o}C. NS difference between groups at follow-up. Intervention: 41%, C1: 21%, C2: 8%, NS. Actual decrease in thermostat setting for: Intervention: 4.7^{o}C, C1: 1.1 ^{o}C, P=0.02.	The intervention group had the greatest increase in the proportion of homes with safe temperatures - 9.3% at baseline to 41.9% at follow-up (Z= 3.25, P = 0.001). Strengths: Details the intervention. Weaknesses: 50% lost prior to random allocation to safe, intervention and control groups (n=144). Response rate therefore could influence the generalisability of the results. Other issues: Nurse interview was too long to be practicable and impact of the intervention difficult to distinguish from the media campaign.

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
			advice to achieve safe temperatures in their homes. The home visits coincided with a 4-month national media campaign on the dangers of hot water in the home. Only households with a hot water temperature ≥ 60°C at baseline were randomised to intervention or control (C1). A second control group (C2) were those households with a hot water temperature < 60°C at baseline and no wetback system.				
32 Katcher (1989) USA	Controlled trial with pseudo-random-isation Reasonable	0 – 17 Hospital	The intervention group received 1 minute of counselling and a pamphlet on safe tap water temperatures plus a **free liquid-crystal thermometer** for testing the tap water temperature. The	Knowledge	The differences in knowledge between the 2 groups as measured by the questionnaire on scalds, temperature settings and lowering thermostat on heater.	Intervention vs Control: Percentage of parents retaining or gaining scald knowledge: 72.6 vs 72.5%, NS; % testing water temperature: 46.4 vs 23%, P<0.001; % lowering thermostat: 14.1 vs 8.8%, NS.	The study found that reading the pamphlet and receipt of the thermometer (in the intervention group) was associated with greater temperature testing. Study questions the reliability of the general public self-reporting the temperature of their water heaters. Strengths: The bulk cost of the

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
			control group received only the counselling and pamphlet on safe tap water temperatures.				thermometers was $0.70 each. Weaknesses: Loss to follow-up about 24% with no discussion about differences between respondents and non-respondents. Other issues: The home visit was used as a reliability study: At the time-2 (1-month follow-up) of 40 homes later visited and with access to the hot water heater, 30 (75%) self-reported safe water temperatures. At the 1-year home visit 50% (20/ 40) were measured to have safe water temperatures and the rest were dangerously hot.

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
2 Thomas (1984) USA	Randomised controlled trial Good / Reasonable	0-12 months Home	Intervention: **Information** (including pamphlets) and discussion about burn prevention at well-baby class (90 min duration); **coupons for purchase of smoke detectors** plus standard information and discussion. Control: Standard information and discussion for well-baby class (90 min duration).	Change to environment Knowledge	Number of homes with safe water temperature. Number of homes with correctly installed smoke detector after class. Fire safety knowledge – mean score	Intervention vs Control: 22/29 homes (76%) vs 6/26 homes (23%), P=0.01. Numbers not given, but no significant difference. 20.28 (SD 0.75) vs 18.58 (SD 1.70), P=0.0001.	Information about burn prevention may increase the likelihood of residents ensuring the hot water temperature is safe. Provision of a coupon to purchase smoke detectors may not increase the likelihood of correctly installing them. Strengths: 100% follow-up. Home inspection improved the validity of the study. Weaknesses: Generalisability to other population groups may be an issue as subjects volunteered for classes and were employed couples. Actual numbers for each group were not reported. Other issues: Price of alarm discounted $US7 with coupon.
50 Katcher (1987) USA	Before and after study Good / Reasonable	General population Community wide	A 4-**week educational multimedia program** aimed at increasing knowledge on hot water safety and to encourage residents to measure their tap water temperatures, as well as to lower thermostats when temperatures exceeded 54.4^{o}C. The electricity	Change to environment Knowledge	Lowered thermostat if water temperature >=54.4^{o}C. Percent with an increase in knowledge and awareness of the dangers of hot tap water.	Of those who requested the thermometer, tested temperature (61.5%), found it too high (43%), and had access to water heater (N=71), 52.1% lowered it. Pre = 72%; Post = 89.2%, Difference = 17.1%, 95%CI= 14.1- 20.1%.	Strengths: Discussed some of the costs of the intervention: the cost of sending bills, media adverts and programs plus the thermometers was about $200,000. Added to this was $10,000 for the evaluation expenses ie telephone surveys and analysis. Weaknesses: Responses were self-reported thus reducing their validity. Less than half of the households were eligible, but authors don't

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
			company offered a **free tap water testing thermometer** with an educational brochure, made available via toll-free telephone lines and through doctors' rooms, hospitals and social service agencies.				define eligibility criteria. *Other issues*: The residents volunteered to receive thermometers and therefore could have been different from those who did not, maybe in their knowledge or interest in the topic.
18 Webne (1989) Canada	Before and after study Reasonable / Weak	0 -9 years Home	The intervention included provision of **educational pamphlets** and instructions on how to adjust the water temperature setting at a home visit.	Change to environment	Reduction of hot water temperature.	No statistically significant decrease in hot water temperature occurred as a result of the intervention. There was a tendency to maintain post-intervention settings at 1-month follow-up.	No statistically significant decrease in hot water temperature occurred as a result of the intervention. The authors report on subjects' obstacles to compliance eg gender, family size and inadequate tank size. Author suggests that the findings may be a case for installing heaters at pre-set temperatures. *Strengths*: Researchers used more than 1 non-parametric method for their data analysis to avoid a Type II error. *Weaknesses*: Small sample size (n=12) *Other issues*: Practicability for large-scale intervention questionable. Results could have been more clearly reported.

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
Strategy – Legislation, environmental modification and education							
60 Clark (1992) USA	Before and after study Good / Reasonable	General population Community wide	A statewide system for burn treatment and prevention, using **educational, environmental and legislative strategies**. Prevention efforts included **smoke detector legislation** and the establishment of a Foundation for Burn Treatment and Prevention.	Mortality Hospital admission	Number of deaths per million persons per year from fire and burn-related injuries. Number of hospital admissions per million persons per year from fire and burn-related injuries.	PRE (1973-80) = 41/ 1000 000 people; POST (1981-88) = 25/ 1000 000 people; P<0.001. PRE (1973-80) = 401/ 1000 000 people; POST (1981-88) = 301/ 1000 000 people per year. Note: the greatest reduction in deaths and admissions was in children.	Analysis by age showed the greatest reduction in deaths and admissions was in children. Strengths: The authors tried to use all possible sources of data in their analysis in order to validate their results. They also acknowledge that national data on admissions was probably incomplete and there could have been an overestimation due to the many sources of data collected. Weaknesses: Intervention not clearly defined. Other issues: The data include burns injuries from all causes, intentional and unintentional. Author suggested that interpretation of diagnosis coding for burns might be difficult.
Strategy – Legislation							
23 Elberg (1987) Denmark	Before and after study Reasonable	General population Community wide	An intensive **national campaign** for the prevention of injuries especially in children. It involved the media and Governmental **revision of laws and regulations** as well as	Hospital admission	All patients hospitalised based on >10 % estimated area of burn.	Mean incidence / year- for 0 - 5 yrs:- Pre (1968-77) = 37; Post (1978-84) = 13, P <0.05. The study showed a statistically significant annual decrease of 3% over 17 years.	A prospective study measuring incidence over the study period found that there was a statistically significant decrease in all patients hospitalised based on more than 10% estimated area of burn. Strengths: Used data from over a 17- year period. Weaknesses:

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
			improvements in the safety of products for at least 6 years.				Multi-interventional therefore difficult to distinguish which intervention had the most impact. Perhaps person-years could have been used as a denominator since the study was continuous. Denominator for this study not known. Not clear whether all burns in this area report to the burns unit. Other issues: The number of severe burns over 17 years has not decreased - data not available by age breakdown.
Strategy – Education and environmental modification							
35 Fallat (1993) USA	Before and after study Reasonable / Weak	0 - 5 years Home	**Educational intervention** to prevent scald burns. The intervention included inspection of the **home's water temperature, the hot water heater setting and smoke detectors**; a handout and discussion on burns prevention; and a bath thermometer. Twenty of the 80 homes with 2 or more children under 5 years were randomly selected to have **anti-scald**	Hospital admission Change to environment	Number of 0-5 year old children from the target area admitted to hospital for scald burns before and after the program. Presence of scalding safety devices	Pre = 15; Post = 12. At nine months, all but 3/20 devices had been removed.	A slight reduction in cases but numbers small. Also stresses the need for a functional trauma registry to target demographic areas most requiring intervention. Discrepancies found between setting on water heater and actual bath water temperature may indicate need to coordinate with local authorities to upgrade safety standards. Weaknesses: No statistical analysis possible due to small patient numbers and mechanical failure of the anti-scald device. No sample characteristics were provided. Other issues: At the initial visit 90% of the homes had water heaters set at

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
			devices fitted in the bathtub faucet.				48.8°C but the actual bathtub temperature was over 54.4°C for 71% of the homes. The removal of the anti-scald devices was mostly due to the sediment build-up, which reduced water flow.
26 Miller (1982) USA	Historical controls Reasonable	Children Maternal and child health centre	Intervention: Received routine **counselling** concerning home fires and smoke detectors; a waiting room pamphlet, an extra 1-min educational message and an **offer to purchase a smoke detector from the consulting room** (at cost). Control: Received routine counselling concerning home fires and smoke detectors.	Change to environment	Status of smoke detectors during the home inspection.	Intervention vs control: Correctly installed: Pre = 46 vs 56; Post = 65 vs 56. No detector: Pre = 55 vs 41; Post = 29 vs 41.	Following a brief educational and purchase program concerning home fires and smoke detectors, parents of well children were more likely to correctly install the smoke detectors than were parents who did not receive any such information or devices. Strengths: No noted demographic differences were found between the intervention and control groups. Weaknesses: Systematic allocation of subjects rather than random. Not clear when the pre-intervention inspection of the detectors was done. Unsure of generalisability to other SES groups. It appears that the measurement differed between pre and post, ie questionnaire pre (?) and inspection post. Other issues: Difficult to determine which activity had the most impact. No family in the control group had installed a smoke detector

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
							subsequent to their health visit compared to 19 homes in the intervention group who had done so.
19 Ytterstad (1995 & 1998) Norway	Controlled trial with no random-isation Good / Reasonable	0 - 4 years Community wide	Intervention: A **community-based educational and environmental modification** strategy. Child injury prevention campaigns through parental counselling, educational material and the local media were used. Two control areas were used. C1: a distant city was used as a reference area to indicate national injury trends. C2: the 6 neighbouring municipalities were used as reference areas for treatment diffusion.	Hospital emergency attendance (data obtained from hospital based injury recording system).	Changes in the burn injury rates for children 0-4 years, measured as number of burn injuries / 10 000 person years, measured before (pre) and at 7 and 10 years since intervention began.	Intervention: Pre = 52.4, 7 years = 24.7, 10 years = 25.4, P=0.04. C1: Pre = 61.9, 7 years = 68.0, 10 years = 73.1, NS. C2: Pre = 26.2, 7 years = 22.5, 10 years = 15.7, NS. Burn injury rates decreased 51.5% ($p<.05$) in the intervention area, 40.1% in C1 (NS) and increased by 18.1% in C2 (NS).	Interventions with passive strategies were more effective, while active strategies were less effective. Medical records from the hospital showed rate reductions from the pre to post intervention period for admittance of burn cases, hospital bed-day consumption and number of surgical procedures requiring general anaesthesia for children 0-4 years. Strengths: Good practical and theoretical basis for the selected interventions. Weaknesses: From study 2 (1998) a weakness in the overall study was the lack of process evaluation information and therefore there was no verification of the adoption of passive strategies. Other issues: Threats to validity such as non-registration of some injuries in the ER could lead to a decrease in the injury rate. Random checks were used to counter this effect. Also the national historical trend for child burn rates was unknown so distant larger city was used as

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
							a reference. The mean burn injury rate decreased significantly by 52.9% in the intervention area.
29 Gorman (1985) USA	Before and after study Good / Reasonable	General population Community wide	A **smoke detector giveaway** campaign initiated by the City Fire Department. They delivered 3720 detectors and also installed 900 of these.	Change to environment	Outcome was the number of households that had installed the requested detector and the number of these that were operational.	Homes with installed detectors 212/ 231 (92%). Operational detectors = 187/ 212 (88%).	The households that requested smoke detectors were indeed at higher risk from fire. Strengths: Did not rely on self-reporting for presence and functioning capabilities of smoke detectors. A random sample of the study population was used. Weaknesses: The State law was passed during the study period and may have also influenced some homes to install their detectors. Other issues: There was a positive correlation between the likelihood of receiving a smoke detector and the prior rate of injury or death from fire (r= 0.90, P<.001).

APPENDIX L: Table 7 - General injuries

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
Strategy – Education							
85 Kelly (1987) USA	Randomised controlled trial Good / Reasonable	0 – 1 year Maternal and child health centre	Intervention: Parents received a **3-part individualised course** in child safety that required active parental participation. The 3 sessions of the courses were given at the 6, 9 and 12 month well-child visits, and lasted about 15 minutes. Control: Parents received the routine safety education only at the well-child clinics of 6, 9 and 12 months.	Injury – general Hospital emergency attendance Knowledge	Number of accidents and hospital visits for accidents reported by parents for the period. Number of accidents reported in hospital records. The mean number of hazards recognised by parents in each group at the assessment (maximum 13).	Intervention vs Control: Accidents: 16 vs 19, NS; ER visits: 9 vs 6, NS; Hospitalisations: 1 vs 1, NS. ER or primary care clinic visit for accidents: 15 vs 11, NS. Accidents requiring treatment: 3 vs 4; NS. Hospitalisations for accidents: 1 vs 1, NS. 9.4 vs 8.4, P<0.05.	Shows that 'age-appropriate' safety education performed during routine well child visits over 12 months increase parental knowledge regarding general home safety. Effects on injury rates are unknown due to too short a follow-up. Strengths: Blind observers assessed outcomes. Weaknesses: Low follow-up - 63%. The intervention and follow-up periods were probably too short to produce an effect on the injury rates. Other issues: 90% of respondents received welfare. Compliance by the parents could have been difficult due to the many prevention behaviours addressed in the intervention over the short period; however knowledge was increased.

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
71 Olds (1986) USA and 72 Olds (1994) USA	Randomised controlled trial Good	0 - 2 years Home	A health promotion program of prenatal and infancy home visitation by nurses was tested as a method of preventing a wide range of health and developmental problems. Controls: The control group was a combination of 2 groups, who had similar results: T1: Screening for sensory and developmental problems at 1 and 2 years of age. T2: As for T1 as well as free transportation for regular prenatal and well child care visits. Interventions: T3: As for T2 as well as nurse home visits during pregnancy in addition to screening and transportation services. T4: As for T3 but also nurse home visits during the	Hospital emergency attendance Hospital emergency attendance Behaviour	Mean number of emergency room visits for accidents and poisonings in 1st and 2nd year of life. Mean number of emergency room and physician visits for injuries and ingestions from age 25 to 50 months. Mean number of hazards identified in the home at 34 and 46 months assessment.	T4 vs Control (T1+T2): 1st year: T4 = 0.12 vs 0.06, NS. 2nd year: T4 = 0.15 vs 0.34, P<0.05. T3 vs Control (T1+T2): 1st year: T3 = 0.12 vs 0.06, NS. 2nd year: T3 = 0.32 vs 0.34, NS. T3 vs Control (T1+T2): Physician records: 0.56 vs 0.57; ER visits: 0.46 vs 0.61, NS. T4 vs Control (T1+T2): Physician records: 0.34 vs 0.57; P<0.05 ER visits: 0.47 vs 0.61, NS. T3 vs Control (T1+T2): 34 mths: 0.23 vs 0.38 P<0.05; 46 mths: 0.31 vs 0.46 P<0.01. T4 vs Control (T1+T2): 34 mths: 0.22 vs 0.38, P=0.04; 46 mths: 0.21 vs 0.46, P=0.003.	In a group of predominantly young, primiparous, poor women, it was found that: In the short term, although many of the differences between the treatment (T4) group and the control groups did not reach statistically significant changes, the trend appeared in the expected direction. “In the comparison group, the incidence of abuse and neglect increased as the number of risk factors accumulated, but in the nurse-visited groups, the incidence remained relatively low” despite increasing risk factors (p.71). In the longer-term (2 years after the completion of the program) there were no differences in the rate of child abuse and neglect or on children’s intellectual functioning. Other effects of the study were found: nurse-visited families were found to have fewer hazards in the home. “Treatment differences for emergency room visits, child abuse and neglect were more significant among women who had a lower sense of control over their lives." There were no program influences on the extent to which mothers reported that poisonous substances were kept out of their children's reach. Strengths: Fairly thorough study. Good

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
			child's first 2 years.				description of sample base. No differences in age, marital status and education between those people who participated in the study and those who declined. Sample was stratified by marital status, race & geographic region and then randomly assigned to a group. Assessed reliability of medical record review procedure regularly. Medical record data collection & interviews performed by staff unaware of families' treatment group. Good inter-observer agreement (82%-100%) for the Caldwell Home Observation checklist and interview. Weaknesses: Unsure from paper if medical records were examined for all possible hospitals attended. Other issues: The follow-up to second year was 64 to 66% and to fourth year was 72% for all groups. From enrolment those in the intervention group reported more control than their comparison groups, which may have affected the results, however, the effect may be attenuated as those dropping out were said to have had more control over their lives. The program required that the nurses form a rapport with the families and therefore the number of visits given during the

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
							intervention phase could be costly on a broader scale and also limits generalisability to other groups. Nurse visited children had 40% fewer injuries and ingestion problems noted in physician records; and 35% fewer visits to ERs than did children in the comparison group families.
51 Dershewitz (1977) USA and 40 Dershewitz (1979) USA	Randomised controlled trial Good / Reasonable	0 - 5 years General practice	Intervention: Mothers received various easy-to-install plastic locking devices that obviate the need for a lock and key ('Kindergards') and electric outlet covers plus **general health education** on home safety proofing. This was an individual 20-min instruction on child safety, a task-oriented booklet designed for the study, a colouring book, and a reinforcement consisting of a follow-up telephone call. Control: Mothers received 'Kindergards', electric outlet covers and the same	Change to environment Change to environment Change to environment	Number of mothers from each group using 'Kindergards' at the end of the study. Number of mothers not using electric outlet covers at the beginning versus at the end of the study. The mean number of hazards per household as measured by the Household Hazard Scale.	Intervention vs control: 67/ 101 (66.34%) vs 72/ 104 (69.23%), NS. Intervention: 29/101 vs 9/ 101, p<0.05. Control: 34/104 vs 24/104, p<0.05. 53.2 vs 52.99, NS.	This study questions the use of home safety education as a means of changing behaviour. There were more mothers in both groups using electric outlet covers (mean number of covers in intervention group was 5.58; and in Control group was 4.75, P<0.05). There was no significant decrease in mothers not using "Kindergards" (P>.05). The Household Hazard Scale found no difference in final scores, both in the number of individual hazards and in the total household safety scores for each of the 11 items given in the safety booklet. Strengths: There appears to have been 100% home visit follow-up. The cost of safety devices was included. Home assessors did not know to which group the family belonged. Weaknesses: Although the researchers reported an increase in the use of electric outlet covers, they were not able to determine if the safety devices in use at the time were those

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
			1-minute instructions and information that the intervention group received.				provided free or if they were installed before the study. The control and intervention groups differed on number of children under 1 year and 2 years. Other issues: A longer intervention period may have improved the impact of the inter-vention as it was targeting a change of behaviour through improved know-ledge. There was the possibility of group contamination. The validity of the Hazard Scale was not tested or reported (did have inter-observer reliability of 83%). Of the 101 mothers in the E group only 4 completed all the recommendations in the booklet and 22 did not use it at all.
100 Larson (1980) Canada	Controlled trial with pseudo-random-isation Good	0 - 18 months Home	Intervention (Group A): Mothers received a **home visit starting prenatally** at 7 months, followed by about 9 visits until the child was 15 months. The visits consisted of counselling and advice related to 4 topics:- general caretaking, mother-infant interaction, social status, and child development. General caretaking	Hospital emergency attendance	The cumulative ER visit rate and cumulative accident rate per child.	Intervention vs Control 1 vs Control 2: ER visits = 0.95 vs 1.14 vs 1.05, NS. Accidents = 0.86 vs 1.26 vs 1.55, P<0.01.	Suggests services providing home safety information beginning prenatally are more effective in reducing child injuries than education that begins 6 weeks after the child's birth. Weaknesses: Relatively small sample sizes. Generalisability to other population groups could be limited. Other issues: The authors acknowledge the need for more relevant assessment measuring criteria as the child develops; and the need for longer follow-up periods with a larger population sample, for

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
			covered accident prevention and encouragement to follow appropriate well-child care. Control 1 (Group B): Mothers received home visits from the child's 6th week through to the 15th month of age. Control 2 (Group C): no visits.				long term effects. Groups A and B were significantly different in several areas of general caretaking eg the average time required for a visit in group B was almost double that in A (60 vs 30 min.). Group B did not benefit from the home visits when compared to the control group.
79 Vineis (1994) Italy	Controlled trial with pseudo-random-isation Reasonable / Weak	0 - 2 years Maternal and child health centre	Intervention: An educational program consisting of 15-minute counselling sessions by a nurse to intervention couples. They also received booklets on injury prevention in the home and smoking related effects on children. Control: no intervention.	Behaviour	Changes in the cumulative index concerning preventive behaviours before and after the intervention; stratified by education level and job of father. This is presented in the form of an Odds Ratio (OR) which measures the "relative odds of a change in the cumulative index in those undergoing intervention compared with those in the comparative group".	There was an association between the occurrence of injuries and educational level of the fathers (school years completed: odds ratio of 1.7 for 6-12 years vs >= 13; and OR of 1.9 for <6 years vs >= 13 years).	The intervention had limited (not significant) effectiveness, greater among white-collar families and those with a higher paternal educational level. *Strengths*: The study was population-based with reasonable follow up rates of 89% at 1st questionnaire to 65% at the 2nd. *Weaknesses*: The counselling sessions may have been too short, and there is no evidence that the distributed booklets were actually read by the target population. The measurement of the outcome, i.e. change in index of preventive behaviours, may not be valid and appears to be arbitrary. Analysis is questionable, due to exclusion of those scoring high before the study.
83 Hardy	Controlled trial with	0 - 2 years Home	Intervention: Home visits by a	Hospital emergency	The number of children with closed	Intervention vs control: 8 (6%) vs 15 (11%), NS.	In a group of inner-city mothers of poor infants, recruited from

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
(1989) USA	pseudo-random-isation Good		trained community/peer educator. She made home visits to the family 7 to 10 days after the birth and then regularly until the 24-month visit. The visits lasted about 40 to 60 minutes and she was available by phone. Her role was to address issues of the child's well and sick care, feeding, and safety. Control: Did not receive the home visits.	attendance Hospital admission Cost of injury	head injury, severe enough to be seen in ER or clinic. Number of children requiring in-patient care for major illness or accidents. Cost of hospital admissions.	8 (6.1%) vs 20 (15.2%), P<0.01. Total: $18,854 vs $67,381 Average cost per child: $1301 vs $1899 When adjusted for a 24 month follow-up period, the averted costs for the 131 study children was $85,862 minus the home visitor's salary and other administrative and overhead costs amounting to about $60,000.	within 2 Child & Youth modules (unsure of how representative this is of the community it expects to serve, that is poor children in inner-city), it was shown that a program involving regular home visits to mothers of infants resulted in substantially fewer children requiring in-patient care and fewer instances of child abuse & neglect (suspected or proven). Strengths: Good follow-up rates. Randomisation of participants to intervention or control groups. Weaknesses: Generalisability to other social classes limited. Other issues: "For the study period, the all-inclusive cost per visit averaged $53, and the paediatric ER visit was about $112." The cost estimates do not include savings in the department of human services for investigations etc of averted abuse cases." Data on injuries only relates to falls or other trauma –related injuries. Poisoning would have also been a good indicator of effectiveness in this age group.

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
6 Sundelin (1996) Sweden	Controlled trial with no random-isation Reasonable	0-6 years Home	Intervention: Childhood injuries campaign using **TV broadcast** of eight 10-minute child safety programs. Pre-intervention information letter about the series sent to all families and advice given by pre-school, child care and health centre staff. Control: Childhood injuries campaign using TV broadcast of eight 10-minute child safety programs. No pre-intervention letter or advice.	Behaviour	Mean number of TV programs watched. Proneness of parents to protect child against risks – Beta estimate from multiple linear regression equation.	Intervention vs Control 1.7 vs 0.9, significant. 0.48 (95% CI 0.26-1.21), NS.	Local campaign increased parents' inclination to follow the programs, however, there appeared to be no change in parental behaviour. Strengths: Interviews done by professional telephone interviewers. Weaknesses: Assessment done a month after intervention and recall bias may be an issue. The questionnaire used to assess attitudes to risk was untested therefore may be invalid. There were many different outcome measures. Other issues: Compliance with safety measures was already high (i.e. before intervention) so hard to detect significant change. Other outcomes measured were attitudes to causes of injuries, safety measures taken in the home, proneness to protect child against injury but comparison data for control group missing. Further, there was no significant association between number of programs viewed and safety measures adopted as a result of watching the programs or with parents' attitudes towards risks.

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments

98
Parcel (1984)
USA
	Controlled trial with no random-isation
	Good / Reasonable
		2 - 4 years
		Child care centre
			Intervention:
			Preschool Health Education Program (PHEP): a health education curriculum structured around age-appropriate types of behaviour that enable children to assume more responsibility for their own health. It was taught to children attending an early childhood learning centre (ECLC) when they reached 4 years of age.
			
			Control:
			Children at ECLC aged 4 years who did not receive the curriculum.
				Behaviour
				
				Behaviour
					Children's health locus of control and health and safety behaviour preferences at age 4-years - score.
					
					Mother's reports on health and safety behaviours that children perform on their own at 4-years of age – percentage of children.
						Intervention vs Control:
						8.0 (SD 2.7) vs 7.3 (SD 2.5), NS.
						
						Stays away from sharp objects = 72 vs 55%, P<.004;
						stays away from matches = 76 vs 57%, P<0.01;
						from hot objects = 74 vs 69%, NS;
						from poisons = 78 vs 65%, NS;
						from electrical outlets = 73 vs 68%, NS.
							The findings indicate that the curriculum contributed to learning in some areas and may have the potential to influence health related behaviour, however it is not possible to determine from the findings the precise contribution of PHEP to the observed changes. The teachers' observations on health and safety behaviour at 5 years of age (playing with sharp objects) was statistically significant for the 2 groups of children.
							Strengths:
							An appropriate design for the setting. Measurement instrument field tested and validated in a field trial.
							Weaknesses:
							Loss to follow-up was high in the intervention group. The mothers' reports cannot be validated and therefore the results are threatened with over or under reporting.

42 Wortel (1995) Netherlands	Controlled trial with no random-isation Reasonable	0 - 4 years Community wide	Intervention: 1 year **Educational, community campaign** which included mass media information using posters, leaflets, exhibitions, newspapers etc.; counselling and health education sessions using	Knowledge	The effect of the campaign on the knowledge, beliefs and safety measures of the parents. Measured by: pre-test – post-test control design with four separate groups using a self-administered questionnaire.	Positive safety behaviours reported for: familiarity with spring guards; necessity for stair gates; seriousness of burns from hot gravy; positive effect: the seriousness of not keeping the child in the lap when taking a hot drink. Negative effects in intervention group were for: the necessity of anti-slip devices for the bathroom; and the parent's	Overall the campaign did not result in significant changes in the knowledge, beliefs and adoption of safety measures of the intervention community. Reasons cited for failure of the program were: poor functioning of the committee responsible for the community links (local organisations did not provide the structural platform from which their personnel could develop &

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
			trained local volunteers and the child care and health services. Controls: From another city, no intervention.			capability to keep matches and lighters out of their children's reach. On the effects of the activities at community level, 72% of the intervention group were aware of the campaign but 70% reported not having seen any promotional activities. There was a 25% attendance rate for the volunteer information sessions (713/ 2800) but only 15% reported having received new information.	hold safety education activities); too small a percentage of the community were reached in the safety education activities; parents who did participate tended to be better educated than non participants; and too short an implementation period. Strengths: The study design appears reasonable. Weaknesses: The study population may have been inappropriate for type of intervention due to the high education status. Other issues: The length of the intervention and the use of separate control groups could have biased the result towards a null or chance effect..
31 Guyer (1989) USA	Controlled trial with no random-isation Good / Reasonable	0 - 5 years Community wide	Intervention: 21 months - **Five projects implemented in 9 cities and towns**:- injury counselling for parents by paediatricians; school and community burn prevention education; household injury hazard and safety inspections; community-wide promotion of the	Knowledge Injury - general	SES adjusted mean safety scores, measured on a 0-100 scale. Change in injury rates for children ages 0-5 years. Measured as odds ratio (95%CI) for intervention vs control groups.	Increased from pre- to post-intervention for both groups. Scores for burns- and falls-related behaviours increased to the same extent in both groups. The poisoning safety index showed some effect of exposure. Burns: 1.26 (0.84-1.90) Falls: 0.78 (0.61-1.00) Poisoning: 0.95 (0.57-1.58) Total target injuries: 0.99 (0.83-1.19) None of these is significant.	Safety knowledge and practices increased in both intervention and control communities; however households that reported participatory exposure to the interventions had higher safety knowledge and behaviour scores than those that received other or no intervention activities. There was a statistically significant reduction in motor vehicle occupant injuries in the 0 - 5 years but not in any of the target injuries. Strengths: Analyses allowed for socio-economic status.

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
			Poison Control System's telephone information service; and promotion of use of child automobile restraints. Control: Five comparable cities - no intervention.				Weaknesses: Low levels of exposure to an intervention may result in a null effect. The study did not have adequate power to demonstrate a change in burn injuries due to the low incidence rates of burn from home fires in the target population. The period of implementation could have been too short to reflect a trend in the injury incidence rates. Very costly, although projects said to have been under-funded. Other issues: About 42% of households with children aged 0-5 years were exposed to at least 1 of the interventions.
82 Petridou (1997) Greece	Controlled trial with no random-isation Good / Reasonable	0 - 18 years Community wide	Intervention: 20 month - Conducted on the Greek island of Naxos and focused on home injuries among the under 18 year olds and the over 65 years. The intervention included a **community education campaign**, as well as environmental repairs of pavements and sidewalks. The main intervention focused	Injury – general Change to environment	The incidence of home accidents recorded during the study period by the households - rate ratio (intervention vs control) for 0-18 year olds. Number of safety variables with statistically significant improvement at the home safety assessment.	0.79 (90% CI 0.60-1.06), NS, P= 0.09 There were significant improvements with respect to 11 of the 23 variables studied in the intervention households, compared to only 1 variable in the control group	"An intensive and focused injury prevention intervention has only modest success when injuries themselves were the outcome variable." (p.173) Strengths: Coordination with local authorities to perform several specific safety promotion activities. Weaknesses: Not clear what the follow-up rate was. Confounding from other factors other than ecological ones between the two islands was possible. Subjects were selected in clusters but this was not accounted for in analyses. Other issues:

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
			on 172 households who received weekly **home visits by trained researchers**. The researchers were trained to assess and discuss home safety issues. Control: Conducted on the Greek island of Spetses. 177 households received similar home visits but by untrained research assistants who were neither encouraged nor discouraged to discuss safety issues.				The length of the intervention may not have been long enough to effect a change in injury rates.
94 Schlesinger (1997) USA	Controlled trial with no random-isation Good	0 - 6 years Community wide	Intervention: A public health education project targeting parents. The study group was exposed to an **intensive education program** involving neighbourhood discussion groups, led by lay and professional leaders, meetings and a monthly newsletter. Control: Did not receive the	Hospital emergency attendance	Medically attended injuries (clinic, hospital, dentist) per 1000 children under 7 years during the study period.	The overall accident rate showed no apparent differences in the intervention vs control groups during the 3 years of the project.	The authors conclude that the incidence of medically attended injuries from accidents was not reduced during or after the education program directed specifically at parents. Strengths: Clearly presented design and definitions. Weaknesses: No results data are given except in unquantifiable graphs. Insufficient statistical analysis information. Possible contamination of the control area because it bordered the

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
			education program, but were from bordering housing developments.				intervention area. Other issues: There are more process outcomes reported than end point outcomes. The overall accident rate showed no apparent differences in the study vs control groups during the 3 years of the project.
1 Minchom (1984) Wales	Historical controls Reasonable / Weak	0-14 years Community wide	Intervention: Safety promotion through provision of **printed information** and community/school talks. Control: Historical – no intervention.	Hospital emergency attendance	Hospital emergency attendances for injury	Total number Intervention: increased from 163 pre-intervention to 354 post-intervention. Control: increased from 167 pre to 320 post, NS. Rate of accidents/week Intervention vs control: increased 21% vs 6%, NS.	Too short an implementation period to make strong conclusions other than a "slight increase in trivial injuries suggested an increased willingness to attend hospital" (p.260). Strengths: Did use controls: historical controls in which outcomes were measured at the same time as the intervention group. Weaknesses: The second control group may have had some exposure to the intervention. Short intervention - 2 months. Outcome measured from time 0 to 9 weeks. This is not really a valid comparison due to different time periods pre and post. Other issues: Increased A&E attendances could be a result of increased awareness of injuries. Historical controls. Note: there were more Grade 1 (not treated) injuries following the intervention that supports the view that the increase could be due to heightened awareness.

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
33 Jordan (1993) USA	Cohort study Reasonable / Weak	0 -1.25 years Community wide	Adolescent mothers 17 years or less were enrolled soon after giving birth. They were interviewed in their homes at 3-months postpartum. Information on knowledge of child home safety was obtained and the sources of their information. At a follow-up home visit at 15-months postpartum, mothers were asked for information about child injuries since birth. Exposed mothers are those who **remember receiving safety information** by 3 months postpartum. Unexposed mothers were those that did not remember receiving any information.	Injury - general	Percentage of children with an injury requiring a physician's attention from birth to 15 months of age.	Exposed vs unexposed: 16 vs 26%, P=0.04; RR= 0.63 (95% CI= 0.4 - 0.9).	"The children of mothers who received home safety information from family and community-based sources by 3 months post-partum had significantly lower risk of injury during follow-up than children of mothers who had not received home safety information" (p.481). Weaknesses: There were 96 mothers (27%) without information at 3 months. This may result in a bias in the validity of the results. This group could have acquired safety information between the 3 to 15-month period. This group may also be at higher risk of injury incidence. As the number of information sources increased, the rate of injury decreased (P = .006). Relying on maternal memory to determine exposure will likely bias results. Other issues: Falls and burns predominated as the cause of injury.
81 Colver (1982) UK and 81a	Cluster randomised controlled trial Reasonable / Weak	0 - 4 years Community wide	BBC Television series: 10 programs of 10-minute duration about childhood accidents in the	Hospital admission	Number of admissions for children with severe injuries (fractured femurs, severe burns and scalds)	Pre vs Post Fractured Femurs: 58 vs 62. Serious Burns: 148 vs 150, NS.	Study was based in an inner-city area. Program did not increase parental knowledge concerning skills but families were more likely to make homes safer if they received a home visit before the

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
Williams (1983) UK	Before and after study		home, televised between October and December 1981. A booklet obtainable free from the BBC was also available. Intervention 1: Families received a **home visit** before the television programs. At this visit the homes were assessed, and specific advice given on how to reduce the hazards. Intervention 2: Families were told about the forthcoming series and encouraged to watch the TV programs in a follow-up reminder letter.	Change to environment Knowledge	before and after the campaign. Number of families who made their homes safer. Number of families who increased their score on the Hazard Picture questionnaire	Intervention 1 vs Intervention 2: 22/37 (60%) vs 4 / 43 (9%), P<0.001. 26/37 (70%) vs 24/43 (56%), NS.	TV programs were started. This supports the need for an integrated approach in community wide campaigns. Weaknesses: The design of the study could have resulted in selection bias as parents could attend the clinic or nursery. There was also a high risk of treatment contamination between groups. The physical hazard scores before the programs were assessed retrospectively in group 2 - likely measurement bias. Both groups were warned about the time of, and reason for, the follow-up visit and this could have biased the results. Other issues: A longer intervention period may have increased the number of families watching the programs.

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
16 Solis (1991) USA	Before and after study Reasonable	2 -14 years Public place / amenity	A **Safety Fun Fair** organised by 10 hospital departments and 30 community organisations that encouraged exhibitors to provide safety information targeted at children aged 2 - 14 years.	Attitudes	A survey done before and after the fair was used to measure learning and awareness of safe behaviours in 4-13 year olds.	Mean score range for responses in 4-6 age group: Pre-intervention = 4.33 to 4.56; Post intervention = 4.74 to 4.77. P value range = 0.012 to 0.045.	The authors conclude that Safety Fairs can be an effective way to promote learning and awareness of safe behaviours in children 4-13 years and stress need for an integrated use of local resources. Weaknesses: No comparison group but the questionnaire had been pre-tested. Small homogenous sample. Other issues: Attitudes and not behaviour was measured therefore sustainability over time is questionable. Co-sponsorship plus the hospital administration gave $10,000 to cover staff costs and prizes on the day. All responses in all the age groups measured were statistically significant except for "diving alone".
21 Tellnes (1985) Norway	Before and after study Weak/ Reasonable	General population Community wide	A **health education campaign** organised by the Health Council and administered by the local **GP**. Injury prevention information disseminated through the Maternal and Child Health centre, school and fishermen's health services and the fishing industry union using posters,	Injury - general	Total number of injuries registered by the local GP over the intervention periods 12 months (T1) and 24 months (T2).	For 0 - 4 years: Pre = 14; Post: T1 = 20; and T2 = 7. Significant for T2 for all ages. Home injuries (for all ages): Pre = 50; Post: T1=57; T2=39. (no significance testing evident) Two years after the program injury occurrence had declined by 29% for all ages (fractures had reduced by 40%).	Significant decreases in all injury areas for children aged 0-4 years 24 months following health education campaign. Weaknesses: There was no comparison group for the intervention. The data given is not age-specific but is out of the total population. Only injuries recorded by the GP were included. Does not give age-specific population base for injury rate. Other issues: Due to small incidence, may need longer pre- and post- data to better evaluate the program.

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
			local media and a district TV program.				Evaluated all ages and all injuries (occupational, home traffic).
37 Ulione (1997) USA	Before and after study Good / Reasonable	6 weeks - 5 years Child care centre	The intervention was a **nurse-directed health promotion** program, presented to the staff of the childcare centre over a period of 2-months as in-service with staff credit through the local health department. The program consisted of primary health care information on signs and symptoms of child illnesses, infection control, injury prevention and first aid.	Injury - general	The number of injuries at the centre pre- and post intervention.	Number of injuries: Pre-intervention = 17; Post = 9, P=0.001.	There was a significant decrease in the rate of injuries at the centre from the pre- to the post health promotion program phase following a nurse-directed health education campaign based in child care centres. Staff at the centre implemented an environmental change (containing building blocks in one area). Strengths: Assessed inter-rater reliability was 0.92 (Pearson product-moment reliability). Weaknesses: Small sample size (29 children). The time-series design is threatened by cyclical patterns of injuries. Other issues: Possible Hawthorne Effect by the centre staff. Education program construct is unclear. Author mentions that the cost of a nursing consultant may be expensive for most centres but perhaps maybe not in terms of cost-effectiveness.

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
11 Hansen (1996) USA	Before and after study Reasonable / Weak	0-2 years Maternal and child health centre	The **Framingham Safety Survey** (FSS) was used to improve physician counselling of parents regarding injury prevention.	Behaviour	Mean number of safety issues discussed by the paediatricians.	Pre-intervention = 3.78 ±2.45; During intervention = 3.75 ±2.67, NS.	The FSS did not improve injury prevention counselling efficiency by the physicians, nor did they use it to identify high-risk behaviours and provide more targeted counselling. There were no significant differences between private and faculty physicians. Most physicians said they found the FSS useful. Weaknesses: Indirect assessment on the basis of parent report of physician behaviour - recall/measurement bias. Physicians were not trained in the use of the intervention. Subjects of the study were the physicians but there is little information on their numbers etc. At least 26 physicians responded to the questionnaire unknown response rate. Other issues: Different parents reporting on the physician's behaviour before and after the intervention. Checklists were completed by parents (n=144 before and n=168 during intervention).

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
9 Sullivan (1990) USA	Before and after study Reasonable / Weak	0-5 years Home	A Public Health Nurse made a safety assessment of the injured child's home using a home safety checklist. Recommendations and **information** were given to reduce hazards and left with the parent. **Ipecac, poison control stickers and thermometers also handed out**.	Behaviour	The number of recommendations complied with by parents to reduce hazards identified on 1st visit.	Parents complied with 57 (43.5%) of 131 recommendations; Type of recommendation: Burns = 43.5%; Poison = 36.6%; Other = 19.9%.	Parents of a group of children recognised as at risk for injury (patients at a burn centre) complied with 43.5% of injury prevention recommendations following a home visit from a public health nurse. Strengths: Inspections were made using a checklist. Weaknesses: Small sample size (home safety assessments completed in 21 homes); no control or comparison group; outcomes were assessed by staff who had a vested interest in the outcome (not blind / measurement bias). Other issues: Cost was said to be low as the intervention was integrated into existing maternal and child health services.
64 Sahlin (1990) Norway	Before and after study Reasonable	0 - 6 years Maternal and child health centre	Health promotion and accident prevention strategy by nurses working in the community's health care centres. The intervention consisted of **oral and written information** given during the child's health centre visits, which numbered at least six over the age period.	Hospital emergency attendance	The incidence of accidents in different settings per 1,000 children 0-6 years registered at the hospital's emergency room pre and post-intervention.	Pre vs Post All settings: 125.5 vs 115.6 (8% decrease), P<0.05; In home: 80.3 vs 68.5, P<0.05.	The decrease in incidence could be attributed to the nurses' intervention for the earlier age groups through increased parent awareness and possibly supervision; however the intervention appears to have had little effect for settings outside the home and in older children. The youngest children (0-2 years) showed the most significant decrease in incidence in the home setting (96.1 to 74.6/ 1000, P<0.05); for traffic areas (6.4 to 1.9/ 1000, P<0.05); and for all

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
							settings (121 to 98/ 1000, P<0.05). Strengths: Gives a definition of accidents. Weaknesses: These data may not represent all injuries in the community as only includes hospital presentations. The intervention was not detailed clearly. Other issues: Perhaps other preventive activities would have been more effective in these age groups.
25 Miller (1995) USA	Benefit-cost analysis Reasonable	0 - 4 years Maternal and child health centre	This study is a **benefit-cost** analysis of several health education studies done in the USA as part of The Injury Prevention Program (TIPP), that also measured outcomes using the Framingham Safety Surveys. This study compares the costs and the estimated dollar value of the benefits in 0-4 year old children of physician counselling. The study considers 3 cost-saving categories: medical care; future wage and household	Cost of injury	The cost savings for medical, future work and quality of life from TIPP counselling.	Savings/ visit for child 0 – 4 yrs: Medical = $5.50; Work = $15.50; Quality of life = $59.	Authors conclude that TIPP counselling sessions between ages 0 - 4 years could save $880 per injury saved in future medical, work and quality of life costs. Strengths: Analysis of a number of health education studies – potential to provide good power in findings. Weaknesses: Generalisability to other groups with lower SES maybe limited (used predominantly white middle- and upper-middle class populations). Other issues: None of the studies reviewed had more than 4 visits over a 2-year period. Average TIPP costs are $69 per child counselled. Argued that "each dollar spent on TIPP childhood injury prevention targeting children ages 0-4 years

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
			work; and quality of life.				returns nearly $13" (p.1).
Strategy – Education and environmental modification							
44 Clamp (1998) England	Randomised controlled trial Good / Reasonable	0 - 5 years General practice	Intervention: **Safety promotion advice and leaflets** on smoke alarms, stair gates, fireguards, poisons and other home hazards, during child health consultations or special appointments were made. Families on state benefits were offered **safety equipment at subsidised prices**, and were obtained from the practice office or their local health centre. Control: no safety promotion during child health consultations.	Behaviour	Number of families who possessed and used safety equipment, plus their home safety practices. Reported as relative risk (95% confidence interval).	Intervention vs control: Use of safety device post-interv: fireguard = 1.89 (1.18-2.94); smoke alarm = 1.14 (1.04-1.25); socket cover = 1.27 (1.1-1.48); lock on cupboard for storing cleaning materials = 1.38 (1.02-1.88);door slam devices = 3.6 (2.17-5.97). Families showing safe practice: fireplace = 1.84 (1.34-2.54); smoke alarm = 1.11 (1.01-1.22); socket cover = 1.77 (1.37-2.28); storage of sharp object = 1.98 (1.38-2.83); medicine storage = 1.15 (1.03-1.28); door slams = 7.00 (3.15-15.6); windows = 1.30 (1.06- 1.58).	"General practitioner advice, coupled with access to low cost equipment for low income families, increased use of safety equipment and other safe practices" (p.1576). Strengths: Controlled for low-income families (stratified by receipt of state benefits). Weaknesses: Over reporting by intervention families could have overestimated the effect of the intervention. There was a short follow-up period and therefore the long-term effectiveness of the study is unknown. Other issues: A grant of £500 was obtained for the safety equipment. There was a significantly higher proportion of families receiving state benefits in the intervention group, who were categorised as safe for 5 of the 9 safety practices. Amongst those not receiving benefits, there were more families categorised as safe for 3 of the 9 safety items.
92 Paul (1994) Australia	Randomised controlled trial Reasonable / Weak	0 - 2 years Home – recruited from a local rural	Intervention: Questionnaire to parents and home safety inspection using a checklist.	Change to environment	Mean number of home hazards found given as a score.	Intervention vs Control: Post-test score = 9.39 (2.3SD) vs 9.91 (2.76SD), NS.	The intervention group's post-test knowledge score was found to be significantly higher than the control group score (S= 2515, z=3.6972, p= .0005).

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
		hospital's birth records.	This was complemented with a **tailored safety education booklet** in which the hazards identified in the home were highlighted. Availability of safety devices through local retailers was improved or they were made obtainable through the local hospital. A follow-up house-check was done between 5 and 9 months later with the administration of a post-test. Control: Received only the post-test and post intervention house check.				Strengths: Reliability of the data collection checked by 2 independent coders performed house checks on a random sample of 20% of the participating households. Weaknesses: Low follow-up rate of 48% for pre- and post test. Further losses due to incomplete questionnaires was probably due to interviewer incompetence or possibly due to an untested questionnaire (29 out of 63 home safety checklist items were deleted during analyses due to very low repeatability).

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
52 Sacks (1992) USA	Randomised controlled trial Reasonable / Weak	0 - 5 years Child care centre	Intervention: An **education and environmental** modification strategy on childcare centre **playground safety**. Playgrounds were inspected and each hazard identified at the centre was explained to the centre director and handbooks on playground safety distributed. Control: Baseline hazards identified.	Change to environment	Measured by the number of hazards per centre and playground as an indication of their safety. Persistence of hazards was also measured.	Intervention vs control Mean hazard score per playground: 9.4 ±5.8 vs 8.6 ±5, NS.	This intervention was shown not to be effective. Indeed, results were thought to be conservative, in that true persistence of hazards was under counted due to measurement differences of pre- and post-tests. Strengths: Inspectors were blinded to CCC group allocation. Weaknesses: Inspectors were did not use a standardised inspection tool, which could have resulted in subjective or biased reporting of hazards. Other issues: For the persistence outcome, 150 of 417 hazards (36%) noted at baseline were identified at follow-up. For CCCs with a change in directorship, 48 of 153 hazards (31.4%) persisted, compared with 102 of 264 hazards (38.6) for CCCs without a change. Of 118 intervention playgrounds 47 (39.8%) were deemed very safe/ safe. 42 (35.6%) were average, 29 (24.6%) were hazardous/ very hazardous versus 43 of 127 controls (33.9%); 44 (34.6%) and 40 (31.5%).

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
102 Bass (1985) USA	Controlled trial with no random-isation Reasonable	0 - 6 years General practice	Intervention: Framingham Safety Survey (FSS) used to **individualise counselling of parents** on injury prevention. This counselling was done by the paediatrician, who also used a home safety demonstration board, provided posters and limited injury prevention supplies. Control: Neighbours of intervention families, with children under 6 years, who did not receive the FSS counselling.	Change to environment	The number of homes with 'at-risk' items found in the kitchen.	Intervention vs control: Sharp object within reach of child (<5 ft) = 10 vs 61.5%, P=0.017; Plastic bags and wrappers within reach = 20 vs 69.2%, P= 0.026. For specific household hazards checked in more than 1 room, the control group consistently demonstrated a higher percentage of 'at-risk' items.	Difficult to be confident of results based on small sample size. Indicates that individualised counselling on home safety is effective in reducing home hazards. Strengths: Assessment visits were unannounced (avoiding the opportunity for families to institute last minute changes). Weaknesses: Small sample size (10 intervention & 14 control families). Selection of the control group may lead to some contamination with the intervention group. Other issues: Assignment of patients to the groups was non-random. The counselled group was already receiving injury prevention information through the Massachusetts Statewide Child Prevention Program (SCIPP) project and therefore their change in behaviour may have been due to other factors. Said to be a low cost intervention.
43 Bass (1991) USA	Cluster randomised controlled trial Good / Reasonable	0 - 5 years General practice	Intervention: **Framingham Safety Survey (FSS)** used to individualise counselling of parents on injury prevention. This	Hospital emergency attendance	The injury rate (per 10,000 children 0-5 years) before and during the intervention.	Intervention vs control: Pre = 196 vs 131 Year 1= 176 vs 211 Year 2= 156 vs 177 Control vs intervention: 0 .85 vs 1.49. Ratio of relative risks (control vs	This study suggests a decrease in injury incidence in the context of community-wide intervention. There was an overall reduction of injury incidence in the intervention towns of 15.3%. Strengths: Paediatricians delivering the

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
			counselling was done by the paediatrician, who also distributed free safety materials to 'at-risk' families. A home safety demonstration board was used to demonstrate the use of these materials to parents. The communities were also receiving other community-based educational programs at the same time (SCIPP). Control: community-based educational program only.		The relative risk for injuries in 0-5 year olds requiring hospital visit during intervention compared with before intervention.	intervention): 1.75 (95% CI 0.95-3.19).	information were individually trained and their compliance with the program was monitored. Weaknesses: Possible confounding of intervention from other community activities. Difficult to distinguish if the injured children were exposed or not to the intervention. Other issues: Cost of some safety devices like shock outlets, outlet covers and cabinet locks. Target injuries were motor vehicle (occupant), burns, falls & poisoning.
20 Schwarz (1993) USA	Controlled trial with no random-isation Good / Reasonable	0 – 4 Home	Intervention: There were three components: **home modification** for simple prevention measures; **home inspections** to inform residents about hazards and ways of alleviating them; and **education** (in home and at community meetings) about selected injury prevention	Change to environment	Percent of homes with hazards for correction that maintained the safety modifications and their compliance to the inspectors' recommendations.	A significantly larger proportion of intervention homes than control homes had functioning smoke detectors, syrup of ipecac, safely stored medications, and reduced electrical and tripping hazards. No consistent differences were observed for home hazards requiring major effort to correct.	A comprehensive injury prevention trial in a poor urban African-American community was shown to be effective in increasing safety knowledge & injury prevention controls that require minimal or moderate effort to effect. Intervention homes were found to be safer than control homes for poisoning and fire hazards. Strengths: Intervention performed by trained community outreach people. Analyses controlled for age distribution between the groups.

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
			practices. Safety supplies including smoke detectors, batteries, bath thermometers, a night-light, ipecac syrup, reminder stickers and posters, were distributed. Control: no intervention.				Weaknesses: Assessments of the homes were only done after the intervention in both areas. Knowledge on safety and correction of home hazards could have been acquired by other means other than the intervention. (That is: it was not possible to disaggregate the impact of the home-based interventions from the block-wide educational) campaigns. Other issues: The homes were not randomly allocated to the two groups. Resourcing: safety supplies at $10.34 per home and the hired intervention team.
99 Schelp (1987) Sweden	Controlled trial with no random-isation Good / Reasonable	General population Community wide	Intervention: Conducted in Falkoping, beginning in 1978. The accident prevention program was divided into 4 parts: **information, education, different kinds of supervision, and changes to the physical environment**. The program used a community participation approach by working with existing	Mortlity Injury - general	Number of deaths after accidental injuries per 100,000 of average population / year. The number of child accidents in homes per 1000 children per year before and after the program.	Intervention: 62.2 (pre) to 50.2 (post). Control: 34.5 (pre) to 28.4 (post). Intervention area only: Pre vs Post: 0-3 yr = 81 vs 45, P<0.01;4-6yr = 70.4 vs 45.7, P<0.05.	Found that "the methods of working with accident prevention by community intervention through existing organisations and welfare functions such as child health care, child welfare, pensioner welfare and occupational health care was successful" in decreasing the number of accidents in the home (p.109). Strengths: Being a community-based intervention, cause and effect relationship difficult to assess, but the use of a control area, controls for some confounders. Weaknesses: Injury data for the control group not presented for all outcomes.

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
			organisations and health care services. Control: No intervention, district of Lidkoping.				Other issues: The incidence of home accidents in the study area decreased from 26.4 per 1000/year pre-intervention to 17.2 per 1,000/year post-intervention ($p< 0.001$). The incidence of all child accidents has decreased from 48.6 to 32.2 ($p< 0.001$). From Schelp (reference # 99a), in the study area, the incidence of all registered accidents has decreased from 113.3 to 97.7. Home accidents on farms decreased by about 50%.
5 Svanstrom (1995) Sweden	Controlled trial with no random-isation Good / Reasonable	0-14 years Community wide	Intervention: Conducted in Lidkoping, beginning in 1984. Dealt with injuries affecting children and the elderly. Included **information dissemination; hotline advice; media; training courses for parents,** child care staff and sports participants/ trainers. **Environmental** changes initiated for safer grounds, gyms, cycle lanes, snow ploughing system.	Hospital admission Hospital admission	Percent change per year in incidence of hospital admissions for injury. Incidence of hospitalised injuries in 0-14 year olds (rate / 1000 under 14 years).	Intervention vs control 1 vs control 2: Girls: 2.1% decrease vs 2.2% increase vs 0.3% decrease. Boys 2.4% decrease vs 0.6% increase vs 1.0% decrease. Girls 10.6 vs 8.1 vs 8.7, NS. Boys 14.1 vs 13.2 vs 12.9, NS.	Decrease in children's incidence of injuries could be attributed to the Lidkoping Accident Prevention Program intervention program. Strengths: Recognises limitations and difficulties in assessing community –wide health education campaigns. Weaknesses: Community based trial - possibility that control communities received some of the intervention as they bordered the intervention community. Injuries measured by hospital records and recording of diagnoses is for other purposes and has not been validated. Injury numbers are very small. Other issues: The intervention changed as it

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
			Control 1: Four bordering municipalities - no intervention but access same hospital. Control 2: Whole of Skaraborg County (includes Lidkoping municipality) – no intervention.				progressed, eg: new activities added. Mean incidence measured from start to end of intervention, which was 8 years later. 5a - Critique by Langley uses Poisson model & does not find significant time trends in any of the comparisons, but finds significant time trend differences between intervention & control 1 (P=.041). NS with control 2 (P=.174). Reference # 5b, comment by Hanley, uses all data in 1 analysis rather than by sex & results are not significant. Disagrees with use of Poisson model & points to study design & ecology of area when analysing.
87 Fisher (1980) USA	Before and after study Reasonable / Weak	Children Public place / amenity	A pilot project on prevention of playground injuries. Included 30 standardised, 40-minute **workshops** for 1500 professional leaders involved in the purchase, installation, maintenance and supervision of public playgrounds. Other participants were recreational leaders, teachers from day care centres and schools, parent/teacher	Hospital emergency attendance Change to environment Knowledge	Number of injuries associated with playground equipment treated and or admitted to hospital over a 6-month period. Average number of hazards per playground surveyed. Pre- and post-test scores of participants in 1978	Pre: 1975 = 149; 1976 = 101; Post: 1977 = 73; 1978 =120. Authors took average yearly figures for 1975/76 (n=125) and 1977/78 (n=97) and showed a 22.4% reduction in number of injuries. However, yearly figures show a decrease in 1977, followed by a substantial increase in 1978. Pre = 8.85; Post = 5.11. 42% reduction. Pre-score = 77%; Post = 94%; 17% improvement, P<.05.	A child playground equipment injury prevention project was shown to be successful in reducing injuries, hazards and increasing staff awareness of hazards in New York State. Strengths: The authors acknowledge the limitations of the survey-checklist used to assess playground equipment. Weaknesses: Target population figures not given. Being a pilot project the data are only available for the short-term effects. Other issues: For assessment of playground hazards 34 playgrounds were excluded from analysis because

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
			representatives and nurses. A public information campaign using the local radio and newspaper advertisements was done to convey messages to parents with backyard playground equipment; there were exhibits at shopping centres and a leaflet and colouring book distribution to the general public.		workshops.		they were not surveyed post intervention.
10 Jeffs (1993) Australia	Before and after study Good / Reasonable	0-14 years Community wide	An intersectoral task force of 13 local agencies initiated a **community information campaign**, backyard clean ups and bicycle safety campaigns.	Hospital emergency attendance Hospital admission	Number of child injury attendances at local hospital from 1987 to1991 (rate of injury per 100 000 child residents). Number of serious child injuries needing admission, transfer or died over the period (rate of hospital admissions per 100000 child residents).	Pre-intervention = 20731 Post-intervention = 17288 16.9 % decrease; P<0.001. Pre-intervention = 653 Post intervention = 586 14% decrease, NS, P=0.36. These rates are lower than rates found in Melbourne and Perth studies suggesting that Shellharbour Hospital treated more trivial injuries. Injuries due to backyard junk out of all child injuries fell from 246 (14.2%) pre-intervention to 169 (6.9%) post-intervention.	Strengths: Recognises difficulties in evaluating community-wide interventions. Weaknesses: No comparison group. Intervention prone to confounding from neighbouring communities. Measurement bias is possible due to variable data collection rates. Other issues: Received donations of $10,000 from local council and clubs for clean ups.

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
36 Bablouzian (1997) USA	Before and after study Reasonable	0 -5 years Home	Subjects were high-risk pregnant women enrolled in a home-visiting program as part of the Public Health Commission - Healthy Baby Program. A **home safety assessment** was conducted using a standardised Safe Home Report. After the assessment the team provided **education and counselling** about injury prevention and gave out specific safety supplies.	Change to environment	The percent of home hazards resolved at follow-up assessment	Poison Centre sticker =32%, P<0.01 Outlet plugs = 26%, P<0.05; Safety latches = 24%, P<0.01; Ipecac =40%, P<0.001.	In a group of high-risk pregnant women, the program significantly reduced the 4 home hazards for which safety supplies were provided. Strengths: Used a standard tool (The Safe Home Report) to conduct home safety assessments. Weaknesses: No comparison group possible due to ethical reasons specific to this population. Possible observer bias during reassessment. Short follow-up period. Generalisability of results is limited. Other issues: Need to consider the cost of safety supplies such as ipecac syrup, Poison stickers, outlet plugs, and safety latches that were provided free.

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
Strategy – All							
93 Gallagher (1985) USA	Before and after study Reasonable	0 - 5 years Home	A trial of four strategies aimed at reducing injuries to children in the home, pre and post. **1) regulatory, 2) educational, 3) environmental modification** and 4) a combination of all above. An inspector, with Sanitary Code and injury prevention training carried out an inspection of the home. He also carried supplies of safety devices that he could install or distribute where appropriate after an education session. The inspector had the legal authority to ensure that the Sanitary Code was maintained. The visit lasted about 60 to 90 minutes.	Change to environment Change to environment	The number of hazardous items per program strategy present before and after the program. The number of non-code household hazards seen before and after the program per home inspected.	Pre vs Post: Education strategy = 28 vs 21%, Regulation = 17 vs 0% Environmental modification = 63 vs 10% All = 27 vs 17% P<0.005 for all strategies. The environmental modification strategy (eg: installation or distribution of safety devices) had the most significant change but only the regulation strategy reduced the hazards to 0%. Pre = 13.1; Post = 6.6, P<0.005. Mean water temperature pre-intervention = 133.1^{o}F; post = 122.2^{o}F, P<0.005.	The cabinet latches left in the home had not been installed in the kitchens of most homes, nor were many changes made in the storage and organisation of potentially poisonous cleaning products. Of the inspected homes 15% had a smoke detector but had not installed it (an improvement of 10% or less observed). Strengths: The use of item checklist to distinguish strategy targets was good. Weaknesses: Very low follow-up rate (485 households were approached, with 285 consenting (59%)). Impact on childhood injuries in the homes not evaluated. Generalisability is limited as well as practicability especially in terms of costs and personnel time. Low participation rates [agreement to participate in the study 82/136)] may potentially bias results and highlights limits to generalisability of program/results. Other issues: This is a pilot study. Households volunteered to participate. For the post-intervention inspection, 136

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
							of the 285 were randomly selected, with 82 participating (60%). Those not participating may have had a poorer response to the intervention. Perhaps if inspection were limited to non-code items, more households would have volunteered.
Strategy – Any							
101 Tengs (1995) USA	Cohort study Good / Reasonable	General population Community wide	Any life-saving intervention defined as any behavioural and/or technological intervention, which reduces the probability of premature death due to fatal injury among a specified target population relevant to the USA. (**Cost-effectiveness** was defined as the net resource costs of an intervention per year of life saved).	Injury - general	The median cost per year of life saved by an intervention that reduces fatal injury as a function of a sector of society. The median cost per year of life saved by an intervention that reduces fatal injury as a function of the prevention stage.	All Sectors = $48,000; Residential = $36,000. Primary stage = $48,000.	Strengths: Recognises the limitation of the study. Weaknesses: The analysis is not broken down into age groups. Other issues: The authors identify the following limitations of the study: 1) The accuracy of the data and the assumptions upon which the original analyses were based, limit the accuracy of the results. 2) The life-saving interventions described include fully, partially and unimplemented interventions, (some may therefore only be projected rather than actual savings or investments). 3) Generalisability may be limited, as interventions subjected to economic analysis may not represent a random sample of all life-saving interventions. The median cost-effectiveness estimate for those interventions

Study ID Author (year) Country	Study type Quality rating	Target group Setting of intervention	Intervention	Outcome	Description of outcome	Key results	Interpretation/ comments
							classified as primary prevention was $79,000 (n=373).

REFERENCES: Section 1

Note: * primary evaluated studies, narrative reviews, unpublished reports and sytematic reviews included in the systematic review. These are reproduced in numerical order in References: Section 2, according to the number assigned in the systematic review. Studies that were included in the review as secondary studies are listed in References: Section 3.

* Alpert,J.J., Levine, M.D., Kosa, J. Public knowledge of ipecac syrup in the management of accidental poisonings. *J Pediatr* 1967;71:890-894.

* Asher, K.N., Rivara, F.P., Felix, D., Vance, L., Dunne, R. Water safety training as a potential means of reducing risk of young children's drowning. *Injury Prevention* 1995;1:228-233.

* Assagard, U., Sjoberg, G. The successful introduction of child resistant closures for liquid paracetamol preparations. *Safety Science* 1995;21:87-91.

* Bablouzian, L., Freedman, E.S., Wolski, K.E., Fried, L.E. Evaluation of a community based childhood injury prevention program. *Injury Prevention* 1997;3:14-16.

* Barlow, B., Miemirska, M., Candhi, R.P., Leblanc, W. Ten years of experience with falls from a height in children. *Journal of Pediatric Surgery* 1983;18:509-511.

Bass, J.L., Christoffel, K.K., Widome, M., *et al*. Childhood injury prevention counseling in primary care settings: a critical review of the literature. *Pediatrics* 1993;92:544-550.

* Bass, J.L., Mehta, K.A., Ostrovsky, M., Halperin, S.F. Educating parents about injury prevention. *Pediatric Clinics of North America* 1985;32:233-242.

* Bass, J.L., Mehta, K.A., Ostrovsky, M. Childhood injury prevention in a suburban Massachusetts population. *Public Health Reports* 1991;106:437-442.

* Berning, C.K., Griffith, J.F., Wild, J.E. Research on the effectiveness of denatonium benzoate as a deterrent to liquid detergent ingestion by children. *Fundamental and Applied Toxicology* 1982;2:44-48.

* Braden, B.T. Validation of a poison prevention program. *American Journal of Public Health* 1979;69:942-944.

* Briss, P.A., Sacks, J.J., Addiss, D.G., Kresnow, M., O'Neil, J. Injuries from falls in playgrounds effects of day care centre regulation and enforcement. *Arch Pediatr Adolesc Med* 1995;149:906-911.

City of Wanneroo, E.H. Lundy, L. (editor). *Home-safe*, *Play-Safe*. Project: Final Report. City of Wanneroo, Environmental Health Department. 1996.

* Clamp, M., Kendrick, D. A randomised controlled trial of general practitioner safety advice for families with children under 5 years. *Br Med J* 1998;316:1576-1579.

* Clark, D.E., Katz, M.S., Campbell, S.M. Decreasing mortality and morbidity rates after the institution of a statewide burn program. *Journal of Burn Care & Rehabilitation* 1992;13:261-270.

* Clarke, A.C., Walton, W.W. Effect of safety packaging on aspirin ingestion by children. *Pediatrics* 1979;63:687-693.

Cochrane Collaboration. Cochrane Reviewer's Handbook 4.0, July 1999, http:www.cochrane.dk/ cochrane/handbook/cchb99Systematics_review.htm.

* Colver, A.F., Hutchinson, P.J., Judson, E.C. Promoting children's home safety. *British Medical Journal* 1982;285:1177-1180.

* Cooper, J.M., Widness, J.A., O'Shea, J.S. Pilot evaluation of instructing parents of newborns about poison prevention strategies. *Am J Dis Child* 1988;142:627-629.

Day, L.M., Ozanne-Smith, J., Cassell, E., and McGrath, A. *Latrobe Valley Better Health Project: Evaluation of injury prevention program 1992-1996*. Monash University Accident Research Centre, 1997.

Deeks, J.J., Glanville, J.M., Sheldon, T.A. and Song F. Undertaking systematic reviews of research on effectiveness: CRD guidelines for those carrying out or commissioning reviews CRD report 4, 1995, University of York.

Department of Human Services. *The Health of Young Victorians*. Public Health and Development, Melbourne, Victoria, Australia, October 1998.

* Dershewitz, R.A., Paichel, W. Effectiveness of a health education program in a lower socioeconomic population. *Clinical Pediatrics* 1984;23:686-688.

* Dershewitz, R.A., Posner, M.K., Paichel, W. The effectiveness of health education on home use of ipecac. *Clinical Pediatrics* 1983;22:268-270.

* Dershewitz, R.A., Williamson, J.W. Prevention of childhood household injuries: a controlled clinical trial. *American Journal of Public Health* 1977;67:1148-1153.

* Dershewitz, R.A. Will mothers use free household safety devices? *Am J Dis Child* 1979;133:61-64.

* Done, A.K., Jung, A.L., Wood, M.C., Klauber, M.R. Evaluations of safety packaging for the protection of children. *Pediatrics* 1971;48:613-628.

Dowswell, T., Towner, E.M.L., Simpson, G., Jarvis, S.N. Preventing childhood unintentional injuries: what works? A literature review. *Injury Prevention* 1996;2:140-149.

Duncan T. and Wilshire E. Poisons Lock Up and Away. Healthway and Kidsafe WA. 1997.

* Elberg, J.J., Schroder, H.A., Glent-Madsen, L., Hall, K.V.. Burns: epidemiology and the effect of a prevention programme. *Burns* 1987;13:391-393.

Elkington, J. and Gaffney, D. *Hot Water Burns Like Fire: The NSW Scalds Prevention Campaign*. Phases One and Two: 1992-1994 (Draft). NSW Health Department. 1998.

* Erdmann, T.C., Feldman, K.W., Rivara, F.P., Heimbach, D.M., Wall, H.A. Tap Water Burn Prevention: The Effect of Legislation. *Pediatrics* 1991;88:572-577.

* Fallat, M.E., Rengers, S.J. The effect of education and safety devices on scald burn prevention. *The Journal of Trauma* 1993;34:560-564.

* Fergusson, D.M., Horwood, L.J., Beautrais, A.L., Shannon, F.T. A controlled field trial of a poisoning prevention method. *Pediatrics* 1982;69:515-520.

* Fergusson, D.M., Horwood, L.J. Risks of drowning in fenced and unfenced domestic swimming pools. *NZ Med J* 1984;97:777-779.

* Fisher, L., Goddard Harris, V., VanBuren, J., Quinn, J., DeMaio, A. Assessment of a pilot child playground injury prevention project in New York State. *American Journal of Public Health* 1980;70:1000-1002.

* Gallagher, S.S., Hunter, P., Guyer, B.. A home injury prevention program for children. *Pediatric Clinics of North America* 1985;32:95-112.

* Gorman, R.L., Charney, E., Holtzman, N.A., Roberts, K.B. A successful city-wide smoke detector giveaway program. *Pediatrics* 1985;75:14-18.

* Guyer, B., Gallagher, S.S., Chang, B., Azzara, C.V., Cupples, L.A., Colton, T. Prevention of childhood injuries: evaluation of the Statewide Childhood Injury Prevention Program (SCIPP). *American Journal of Public Health* 1989;79:1521-1527.

Hanley and Choy 1996

* Hansen, K., Wong, D., Young, P.C. Do the Framingham Safety Surveys improve injury prevention counseling during pediatric health supervision visits? *J Pediatr* 1996;129:494-498.

Harberts, H.J. Report on the Injury Prevention Program 1992-1996. Community Cooperation Toward a Safer Future. La Trobe Shire Safe Communities. 1997;

* Hardy, J.B., Streett, R. Family support and parenting education in the home: an effective extension of clinic-based preventive health care services for poor children. *J Pediatr* 1989;115:927-931.

* Harris, A., Warchivker, I., de Klerk, N., Harris, A.(editors). Economics and Health: 1994. Proceedings of the Sixteenth Australian Conference of Health Economists. Sydney: School of Health Services Management, University of New South Wales; 1995; 10. *Isolation fencing and the prevention of toddler drowning in backyard pools: an economic analysis*. pp.259-79.

* Harris, D.W., Karandikar, D.S., Spencer, M.G., Leach, R.H., Bower, A.C., Mander, G.A. Returned-medicines campaign in Birmingham, 1977. *Lancet* 1979;599-601.

* Howes, D.R. *An evaluation of the effectiveness of child-resistant packaging*. Washington D.C., Consumer Product Safety Commision, Office of Strategic Planning; 1978.

* Jeffs, D., Booth, D., Calvert, D. Local injury information, community participation and injury reduction. *Aust J Public Health* 1993;17:365-372.

Johnson, A. *Safe Eating in Young Children Project*. Women's and Children's Hospital, Adelaide. 1996.

Jolly, D.L., Volker, R.E., Mavromatis, C., and Wright, H. Evaluation of the Early Childhood Injury Prevention Project (ECIPP) in South Australia. *Child and Youth Health*. 1996.

* Jordan, E.A., Duggan, A.K., Hardy, J.B. Injuries in children of adolescent mothers: home safety education associated with decreased injury risk. *Pediatrics* 1993;91:481-487.

* Katcher, M.L., Landry, G.L., Shapiro, M.M. Liquid-crystal thermometer use in pediatric office counseling about tap water burn prevention. *Pediatrics* 1989;83:766-771.

* Katcher, M.L. Prevention of tap water scald burns: evaluation of a multi-media injury control program. *American Journal of Public Health* 1987;77:1195-1197.

* Kelly, B., Sein, C., McCarthy, P.L. Safety education in a pediatric primary care setting. *Pediatrics* 1987;79:818-824.

Kidsafe NSW. Withaneachi, D. (editor). *Phase II: Evaluation - Local Government Playground Safety Study*. Kidsafe NSW and NSW Health Department. 1998.

Klassen,, T.P. *The effectiveness of injury control interventions*. MSc, McMaster University; 1995.

* Knudson, M.S., Bolieu, S.L., Larson, D.L. Children's sleepwear flammability standards: have they worked? *Burns* 1979;6:255-260.

* Kraus, J.F. Effectiveness of measures to prevent unintentional deaths of infants and children from suffocation and strangulation. *Public Health Reports* 1985;100:231-240.

* Kravitz, H., Grove, M.. Prevention of accidental falls in infancy by counseling mothers. *Illinois Medical Journal* 1973;144:570-573.

* Krenzelok, E.P., Garber, R.J. Teaching poison prevention to preschool children, their parents, and professional educators through child care centers. *American Journal of Public Health* 1981;71:750-752.

* Krug, A., Ellis, J.B., Hay, I.T., Mokgabudi, N.F., Robertson, J. The impact of child-resistant containers on the incidence of paraffin (kerosene) ingestion in children. *S Afr Med J* 1994;84:730-734.

* Laing, R.M., Bryant, V. Prevention of burn injuries to children involving nightwear. *NZ Med J* 1991;104:363-365.

* Langlois, J.A., Wallen, B.A.R., Teret, S.P., Bailey, L.A., Hershey, J.H., Peeler, M.O. The impact of specific toy warning labels. *JAMA* 1991;265:2848-2850.

* Larson, C.P. Efficacy of prenatal and postpartum home visits on child health and development. *Pediatrics* 1980;66:191-197.

Laughlin, D. *Home Safety Parties Training Manual*. Coastal and Wheatbelt Public Health Unit, Health Department of WA. 1997.

* Lawson, J.S., Oliver, T.I. Domestic swimming pool drowning in children: positive results of a practical prevention program. *Australian Paediatric Journal* 1978;14:275-277.

* Logan, P., Branche, C.M., Sacks, J.J., Ryan, G., Peddicord, J. Childhood drownings and fencing of outdoor pools in the United States, 1994. *Pediatrics* 1998;101:E3

* MacKay, A.M., Rothman, K.J. The incidence and severity of burn injuries following project burn prevention. *American Journal of Public Health* 1982;72:248-252.

* Maisel, G., Langdoc, B.A., Jenkins, M.Q., Aycock, E.K. Analysis of two surveys evaluating a project to reduce accidental poisoning among children. *Public Health Reports* 1967;82:555-560.

* McLoughlin, E., Clarke, N., Stahl, K., Crawford, J.D. One pediatric burn unit's experience with sleepwear-related injuries. *Pediatrics* 1977;60:405-409.

* McLoughlin, E., Langley, J.D., Laing, R.M. Prevention of children's burns: legislation and fabric flammability. *NZ Med J* 1986;99:804-807.

* McLoughlin, E., Marchone, M., Hanger, S.L., German, P.S., Baker, S.P. Smoke detector legislation: its effect on owner-occupied homes. *American Journal of Public Health* 1985;75:858-862.

* McLoughlin, E., Vince, C.J., Lee, A.M., Crawford, J.D. Project burn prevention: outcome and implications. *American Journal of Public Health* 1982;72:241-247.

* Miller, R.E., Reisinger, K.S., Blatter, M.M., Wucher, F. Pediatric counseling and subsequent use of smoke detectors. *American Journal of Public Health* 1982;72:392-393.

* Miller, T.R., Galbraith, M. Injury prevention counseling by pediatricians: a benefit-cost comparison. *Pediatrics* 1995;96:1-4.

* Miller, T.R., Lestina, D.C. Costs of poisoning in the United States and savings from poison control centers: a benefit-cost analysis. *Annals of Emergency Medicine* 1997;29:239-245.

* Milliner, N., Pearn, J., Guard, R.. Will fenced pools save lives? A 10 year study from Mulgrave Shire, Queensland. *Med J Aust* 1980;2:510-511.

* Minchom, P.E., Newcombe, R.G., Sibert, J.R., Bowley, M.A. Does health education prevent childhood accidents? *Postgraduate Medical Journal* 1984;60:260-262.

Moller, J. Paradigm Shift: Research From Problem To Solution. Canberra: NHMRC, 1998.

Moon, L., Rahman, N. and Bhatia, K. *Australia's Children: Their Health And Wellbeing*. AIHW Cat. No. PHE 7. Canberra: AIHW, 1998.

Nolan, T. and Penny, T. Epidemiology of on-intentional injuries in an Australian urban region: results from injury surveillance. *Journal Paediatric Child Health*, 1992;28:27-35.

*O'Connor, P.J. Poisoning prevention: results of a public media campaign. *Australian Paediatric Journal* 1982;18:250-252.

O'Donnell, G. *SAFE: Working Towards a Safe Accident Free Environment*. VicHealth and Safety Centre. 1995; Report of Phase 1.

* Olds, D.L., Henderson, C.R.J., Chamberlin, R., Tatelbaum, R. Preventing child abuse and neglect: a randomised trial of nurse home visitation. *Pediatrics* 1986;78:65-78.

* Olds, D.L., Henderson, C.R.J., Kitzman, H. Does prenatal and infancy nurse home visitation have enduring effects on qualities of parental caregiving and child health at 25 to 50 months of life? *Pediatrics* 1994;93:89-98.

* Parcel, G.S., Bruhn, J.G., Murray, J.L. Preschool Health Education Program (PHEP): analysis of educational and behavioral outcome. *Health Education Quarterly* 1984;10:149-172.

* Paul, C.L., Sanson-Fisher, R.W., Redman, S., Carter, S. Preventing accidental injury to young children in the home using volunteers. *Health Promotion International* 1994;9:241-249.

* Petridou, E., Tolma, E., Dessypris, N., Trichopolous, D. A controlled evaluation of a community injury prevention project in two Greek islands. *International Journal of Epidemiology* 1998; 26,1: 173-176.

* Pitt, W.R., Balanda, K.P. Childhood drowning and near-drowning in Brisbane: the contribution of domestic pools. *Med J Aust* 1991;154:661-665.

* Quan, L., Gomez, A. Swimming pool safety: an effective submersion prevention program. *Journal of Environmental Health* 1990;52:344-346.

Roberts, I., Kramer, M.S., Suissa, S. Does home visiting prevent childhood injury? A systematic review of randomised controlled trials. *British Medical Journal* 1996;312:29-33.

* Rodgers, G.B. The safety effects of child-resistant packaging for oral prescription drugs: two decades of experience. *JAMA* 1996;275:1661-1665.

Royal Children's Hospital, Clinical Epidemiology and Biostatistics Unit and Centre for Community Child Health. *Evidence-based child health care: a short course*, 4-5 November 1999, Melbourne.

* Sacks, J.J., Brantley, M.D., Holmgreen, P., Rochat, R.W. Evaluation of an intervention to reduce playground hazards in Atlanta child-care centers. *American Journal of Public Health* 1992; 82:429-431.

* Sadan, N., Raz, A., Wolach, B. Impact of community educational programmes on foreign body aspiration in Israel. *Eur J Pediatr* 1995;154:859-862.

* Sahlin, Y., Lereim, I. Accidents among children below schoolage: changes of incidence after intervention. *ACTA Paediatr Scand* 1990;79:691-697.

* Schelp, L. Community intervention and changes in accident patterns in a rural Swedish municipality. *Health Promotion* 1987;2:109-125.

* Scherz, R.G. Childhood poisonings from medications: three prevention programs that worked. *Military Medicine* 1968; Nov: 911-913.

* Schlesinger, E.R., Dickson, D.G., Westaby, J.R., Lowen, L., Logrillo, V.M., Maiwald, A.A. A controlled study of health education in accident prevention: the Rockland County Child Injury Project. *Injury Prevention* 1997;3:218-223.

* Schnell,L.R., Tanz, R.R. The effect of providing ipecac to families seeking poison-related services. *Pediatric Emergency Care* 1993;9:36-39.

* Schwarz, D.F., Grisso, J.A., Miles, C., Holmes, J.H., Sutton, R.L. An injury prevention program in an urban African-American Community. *American Journal of Public Health* 1993;83:675-680.

* Sibert, J.R., Clarke, A.J., Mitchell, M.P. Improvements in child resistant containers. *Archives of Disease in Childhood* 1985;60:1155-1157.

* Sibert JR, Craft AW, Jackson RH. Child resistant packaging and accidental child poisoning. Lancet 1977;2:289-290.

Slinger, S. and Rowlands, N. *Hot Water Burns Like Fire*. Healthway and Kidsafe WA. 1995.

* Solis, G.R. Evaluation of a children's safety fair. *Pediatric Nursing* 1991;17:255-258.

* Sorensen, B. Prevention of burns and scalds in a developed country. *J Trauma* 1976;16:249-258.

* Spiegel, C.N., Lindaman, F.C. Children Can't Fly: a program to prevent childhood morbidity and mortality from window falls. *American Journal of Public Health* 1977;67:1143-1147.

* Sullivan, M., Cole, B., Lie, L., Twomey, J. Reducing child hazards in the home: a joint venture in injury control. *Journal of Burn Care Rehabilitation* 1990;11:175-179.

* Sundelin, C., Rasmussen, F., Berfenstam, R., Troedsson, K. Information through television: does it promote child safety? *Injury Prevention* 1996;2:36-40.

* Svanstrom, L., Ekman, R., Schelp, L., Linstrom, A. The Lidkoping Accident Prevention Programme: A community approach to preventing childhood injuries in Sweden. *Injury Prevention* 1995;1:169-172.

* Tellnes, G. An Evaluation of an injury prevention campaign in General Practice in Norway. *Family Practice* 1985;2:91-93.

* Tengs, T.O., Adams, M.E., Pliskin, J.S., *et al*. Five-hundred life-saving interventions and their cost-effectiveness. *Risk Analysis* 1995;15:369-390.

* Thomas, K.A., Hassanein, R.S, Christophersen, E.R. Evaluation of group well-child care for improving burn prevention practices in the home. *Pediatrics* 1984;74:879-882.

Thompson, D.C., Rivara, F.P. The Cochrane Library, Issue 3. Oxford: Update Software; 1998. *The evaluation of the effectiveness of pool fencing to prevent drowning in children*.

Towner, E., Dowswell, T., Simpson, G., and Jarvis, S. *Health Promotion In Childhood And Young Adolescence For The Prevention Of Unintentional Injuries*. London: Health Education Authority, 1996; 2.

* Treser, C.D., Trusty, M.N., Yang, P.P. Personal flotation device usage: do educational efforts have an impact? *Journal of Public Health Policy* 1997;18:346-356.

* Ulione, M.S. Health promotion and injury prevention in a child development center. *Journal of Pediatric Nursing* 1997;12:148-154.

* Vernberg, K., Culver-Dickinson, P., Spyker, DA. The deterrent effect of poison-warning stickers. *Am J Dis Child* 1984;138:1018-1020.

* Vineis, P., Ronco, G., Ciccone, G., Gogliani, F. Home injuries in children: a population-based intervention trial. *Epidemiology* 1994;5:349-351.

* Waller, A.E., Clarke, J.A., Langley, J.D. An evaluation of a program to reduce home hot tap water temperatures. *Aust J Public Health* 1993;17:116-123.

* Walton, W.W. An evaluation of the poison prevention packaging act. *Pediatrics* 1982;69:363-370.

Watson, W. and Ozanne-Smith, J. *The Cost Of Injury To Victoria*. Monash University Research Centre, Report No. 124, 1997.

* Webne, S., Kaplan, B.J., Shaw, M. Pediatric burn prevention: an evaluation of the efficacy of a strategy to reduce tap water temperature in a population at risk for scalds. *J Dev Behav Pediatr* 1989;10:187-191.

* Wester, T.B. Project Ipecac: an accident prevention program of the Robeson County Department of Health. *North Carolina Medical Journal* 1985;46:425-426.

* Woolf, A., Lewander, W., Filippone, G., Lovejoy, F. Prevention of childhood poisoning: efficacy of an educational program carried out in an emergency clinic. *Pediatrics* 1987;80:359-363.

* Woolf, A.D., Saperstein, A., Forjuoh, S. Poisoning prevention knowledge and practices of parents after a childhood poisoning incident. *Pediatrics* 1992;90:867-870.

* Wortel, E., de Vries, H., de Geus, G.H. Lessons learned from a community campaign on child safety in The Netherlands. *Fam Community Health* 1995;18:60-77.

* Ytterstad, B., Sogaard, A.J. The Harstad injury prevention study: prevention of burns in small children by a community-based intervention. *Burns* 1995;21:259-266.

Zoeller, R. Accidental Poisonings: Reflections On The Lock Up Poisons Campaign. Central Coast Area Health Service, 1993.

REFERENCES: Section 2

Numerical order of primary studies included in the systematic review

#1 Minchom, P.E., Newcombe, R.G., Sibert, J.R., Bowley, M.A. Does health education prevent childhood accidents? *Postgraduate Medical Journal* 1984;60:260-262.

#2 Thomas, K.A., Hassanein, R.S., Christophersen, E.R. Evaluation of group well-child care for improving burn prevention practices in the home. *Pediatrics* 1984;74:879-882.

#3/#4 Erdmann, T.C., Feldman, K.W., Rivara, F.P., Heimbach, D.M., Wall, H.A. Tap Water Burn Prevention: The Effect of Legislation. *Pediatrics* 1991;88:572-577.

#5 Svanstrom, L., Ekman, R., Schelp, L., Linstrom, A. The Lidkoping Accident Prevention Programme: a community approach to preventing childhood injuries in Sweden. *Injury Prevention* 1995;1:169-172.

#6 Sundelin, C., Rasmussen, F., Berfenstam, R., Troedsson, K. Information through television: does it promote child safety? *Injury Prevention* 1996;2:36-40.

#8 McLoughlin, E., Langley, J.D., Laing, R.M. Prevention of children's burns: legislation and fabric flammability. *NZ Med J* 1986;99:804-807.

#9 Sullivan, M., Cole, B., Lie, L., Twomey, J. Reducing child hazards in the home: a joint venture in injury control. *Journal of Burn Care Rehabilitation* 1990;11:175-179.

#10 Jeffs, D., Booth, D., Calvert, D. Local injury information, community participation and injury reduction. *Aust J Public Health* 1993;17:365-372.

#11 Hansen, K., Wong, D., Young, P.C. Do the Framingham Safety Surveys improve injury prevention counseling during pediatric health supervision visits? *J Pediatr* 1996;129:494-498.

#12 Asher, K.N., Rivara, F.P., Felix, D., Vance, L., Dunne, R. Water safety training as a potential means of reducing risk of young children's drowning. *Injury Prevention* 1995;1:228-233.

#13 Lawson, J.S., Oliver, T.I. Domestic swimming pool drowning in children: positive results of a practical prevention program. *Australian Paediatric Journal* 1978;14:275-277.

#14 Milliner, N., Pearn, J., Guard, R. Will fenced pools save lives? A 10 year study from Mulgrave Shire, Queensland. *Med J Aust* 1980;2:510-511.

#15 Sadan, N., Raz, A., Wolach, B. Impact of community educational programmes on foreign body aspiration in Israel. *Eur J Pediatr* 1995;154:859-862.

#16 Solis, G.R. Evaluation of a children's safety fair. *Pediatric Nursing* 1991;17:255-258.

#17 Fergusson, D.M., Horwood, L.J., Beautrais, A.L., Shannon, F.T. A controlled field trial of a poisoning prevention method. *Pediatrics* 1982;69:515-520.

#18 Webne, S., Kaplan, B.J., Shaw, M. Pediatric burn prevention: an evaluation of the efficacy of a strategy to reduce tap water temperature in a population at risk for scalds. *J Dev Behav Pediatr* 1989;10:187-191.

#19 Ytterstad, B., Sogaard, A.J. The Harstad injury prevention study: prevention of burns in small children by a community-based intervention. *Burns* 1995;21:259-266.

#20 Schwarz, D.F., Grisso, J.A., Miles, C., Holmes, J.H., Sutton, R.L. An injury prevention program in an urban African-American Community. *American Journal of Public Health* 1993;83:675-680.

#21 Tellnes, G. An Evaluation of an injury prevention campaign in General Practice in Norway. *Family Practice* 1985;2:91-93.

#23 Elberg, J.J., Schroder, H.A., Glent-Madsen, L., Hall, K.V. Burns: epidemiology and the effect of a prevention programme. *Burns* 1987;13:391-393.

#24 Treser, C.D., Trusty, M.N, Yang, P.P. Personal flotation device usage: do educational efforts have an impact? *Journal of Public Health Policy* 1997;18:346-356.

#25 Miller, T.R., Galbraith, M. Injury prevention counseling by pediatricians: a benefit-cost comparison. *Pediatrics* 1995;96:1-4.

#26 Miller, R.E., Reisinger, K.S., Blatter, M.M,, Wucher, F. Pediatric counseling and subsequent use of smoke detectors. *American Journal of Public Health* 1982;72:392-393.

#27 Dershewitz, R.A., Posner, M.K., Paichel, W. The effectiveness of health education on home use of ipecac. *Clinical Pediatrics* 1983;22:268-270.

#28 MacKay, A.M., Rothman, K.J. The incidence and severity of burn injuries following project burn prevention. *American Journal of Public Health* 1982;72:248-252.

#29 Gorman, R.L., Charney, E., Holtzman, N.A., Roberts, K.B. A successful city-wide smoke detector giveaway program. *Pediatrics* 1985;75:14-18

#30 Woolf, A., Lewander, W., Filippone, G., Lovejoy, F. Prevention of childhood poisoning: efficacy of an educational program carried out in an emergency clinic. *Pediatrics* 1987;80:359-363.

#31 Guye,r B., Gallagher, S.S., Chang, B., Azzara, C.V., Cupples, L.A., Colton, T. Prevention of childhood injuries: evaluation of the Statewide Childhood Injury Prevention Program (SCIPP). *American Journal of Public Health* 1989;79:1521-1527.

#32 Katcher, M.L., Landry, G.L., Shapiro, MM. Liquid-crystal thermometer use in pediatric office counseling about tap water burn prevention. *Pediatrics* 1989;83:766-771.

#33 Jordan, E.A., Duggan, A.K., Hardy, J.B. Injuries in children of adolescent mothers: home safety education associated with decreased injury risk. *Pediatrics* 1993;91:481-487.

#34 Waller, A.E., Clarke, J.A., Langley, .JD. An evaluation of a program to reduce home hot tap water temperatures. *Aust J Public Health* 1993;17:116-123.

#35 Fallat, M.E., Rengers, S.J. The effect of education and safety devices on scald burn prevention. *The Journal of Trauma* 1993;34:560-564.

#36 Bablouzian, L., Freedman, E.S., Wolski, K.E., Fried, L.E. Evaluation of a community based childhood injury prevention program. *Injury Prevention* 1997;3:14-16.

#37 Ulione, M.S. Health promotion and injury prevention in a child development center. *Journal of Pediatric Nursing* 1997;12:148-154.

#39 Kravitz, H., Grove, M. Prevention of accidental falls in infancy by counseling mothers. *Illinois Medical Journal* 1973;144:570-573.

#40 Dershewitz, R.A., Williamson, J.W. Prevention of childhood household injuries: a controlled clinical trial. *American Journal of Public Health* 1977;67:1148-1153.

#41 Spiegel, C.N., Lindaman, F.C. Children Can't Fly: a program to prevent childhood morbidity and mortality from window falls. *American Journal of Public Health* 1977;67:1143-1147.

#42 Wortel, E., de Vries, H., de Geus, G.H. Lessons learned from a community campaign on child safety in The Netherlands. *Fam Community Health* 1995;18:60-77.

#43 Bass, J.L., Mehta, K.A., Ostrovsky, M. Childhood Injury Prevention in a Suburban Massachusetts Population. *Public Health Reports* 1991;106:437-442.

#44 Clamp, M., Kendrick, D. A randomised controlled trial of general practitioner safety advice for families with children under 5 years. *Br Med J* 1998;316:1576-1579.

#45 Briss, P.A., Sacks, J.J., Addiss, D.G., Kresnow, M., O'Neil, J. Injuries from falls on playgrounds Effects of day care centre regulation and enforcement. *Arch Pediatr Adolesc Med* 1995;149:906-911.

#46 O'Connor, P.J. Poisoning prevention: results of a public media campaign. *Australian Paediatric Journal* 1982;18:250-252.

#47 Barlow, B., Miemirska, M., Candhi, R.P., Leblanc, W. Ten years of experience with falls from a height in children. *Journal of Pediatric Surgery* 1983;18:509-511.

#48 Vernberg, K., Culver-Dickinson, P., Spyker, D.A. The deterrent effect of poison-warning stickers. *Am J Dis Child* 1984;138:1018-1020.

#49 Cooper, J.M., Widness, J.A., O'Shea, J.S. Pilot evaluation of instructing parents of newborns about poison prevention strategies. *Am J Dis Child* 1988;142:627-629.

#50 Katcher, M.L. Prevention of tap water scald burns: evaluation of a multi-media injury control program. *American Journal of Public Health* 1987;77:1195-1197.

#51 Dershewitz, R.A. Will mothers use free household safety devices? *Am J Dis Child* 1979;133:61-64.

#52 Sacks, J.J., Brantley, M.D., Holmgreen, P., Rochat, R.W. Evaluation of an intervention to reduce playground hazards in Atlanta child-care centers. *American Journal of Public Health* 1992;82:429-431.

#53 McLoughlin, E., Marchone, M., Hanger, S.L., German, P.S., Baker, S.P. Smoke detector legislation: its effect on owner-occupied homes. *American Journal of Public Health* 1985;75:858-862.

#54 Rodgers, G.B. The safety effects of child-resistant packaging for oral prescription drugs: two decades of experience. *JAMA* 1996;275:1661-1665

#55 Clarke, A.C., Walton, W.W. Effect of safety packaging on aspirin ingestion by children. *Pediatrics* 1979;63:687-693.

#56 Done, A.K., Jung, A.L., Wood, M.C., Klauber, M.R. Evaluations of safety packaging for the protection of children. *Pediatrics* 1971;48:613-628.

#57 Walton, W.W. An evaluation of the poison prevention packaging act. *Pediatrics* 1982;69:363-370.

#58 Knudson, M.S., Bolieu, S.L., Larson, D.L. Children's sleepwear flammability standards: have they worked? *Burns* 1979;6:255-260.

#59 McLoughlin, E., Vince, C.J., Lee, A.M., Crawford, J.D. Project burn prevention: outcome and implications. *American Journal of Public Health* 1982;72:241-247.

#60 Clark, D.E., Katz, M.S., Campbell, S.M. Decreasing mortality and morbidity rates after the institution of a statewide burn program. *Journal of Burn Care & Rehabilitation* 1992;13:261-270.

#61 Miller, T.R., Lestina, D.C. Costs of poisoning in the United States and savings from poison control centers: a benefit-cost analysis. *Annals of Emergency Medicine* 1997;29:239-245.

#62 Fergusson, D.M, Horwood, L.J. Risks of drowning in fenced and unfenced domestic swimming pools. *NZ Med J* 1984;97:777-779.

#63 Pitt, W.R., Balanda, K.P. Childhood drowning and near-drowning in Brisbane: the contribution of domestic pools. *Med J Aust* 1991;154:661-665.

#64 Sahlin, Y., Lereim, I. Accidents among children below schoolage: changes of incidence after intervention. *ACTA Paediatr Scand* 1990;79:691-697.

#65 Sibert, J.R., Craft, A.W., Jackson, R.H. Child resistant packaging and accidental child poisoning. *Lancet* 1977;2:289-290.

#66 Alpert, J.J., Levine, M.D., Kosa, J. Public knowledge of ipecac syrup in the management of accidental poisonings. *J Pediatr* 1967;71:890-894.

#67 Sibert, J.R., Clarke, A.J., Mitchell, M.P. Improvements in child resistant containers. *Archives of Disease in Childhood* 1985;60:1155-1157.

#68 Schnell, L.R., Tanz, R.R. The effect of providing ipecac to families seeking poison-related services. *Pediatric Emergency Care* 1993;9:36-39.

#69 Dershewitz, R.A., Paichel, W. Effectiveness of a health education program in a lower socioeconomic population. *Clinical Pediatrics* 1984;23:686-688.

#70 Woolf, A.D., Saperstein, A., Forjuoh, S. Poisoning prevention knowledge and practices of parents after a childhood poisoning incident. *Pediatrics* 1992;90:867-870.

#71 Olds, D.L., Henderson, C.R.J., Chamberlin, R., Tatelbaum, R. Preventing child abuse and neglect: a randomised trial of nurse home visitation. *Pediatrics* 1986;78:65-78.

#72 Olds, D.L., Henderson, C.R.J., Kitzman, H. Does prenatal and infancy nurse home visitation have enduring effects on qualities of parental caregiving and child health at 25 to 50 months of life? *Pediatrics* 1994;93:89-98.

#73 Scherz, R.G. Childhood poisonings from medications: three prevention programs that worked. *Military Medicine* 1968;

#74 Harris, D.W., Karandikar, D.S., Spencer, M.G., Leach, R.H., Bower, A.C., Mander, G.A. Returned-medicines campaign in Birmingham, 1977. *Lancet* 1979;599-601.

#75 Braden, B.T. Validation of a poison prevention program. *American Journal of Public Health* 1979;69:942-944.

#76 Wester, T.B. Project Ipecac: an accident prevention program of the Robeson County Department of Health. *North Carolina Medical Journal* 1985;46:425-426.

#77 Berning, C.K., Griffith, J.F., Wild, J.E. Research on the effectiveness of denatonium benzoate as a deterrent to liquid detergent ingestion by children. *Fundamental and Applied Toxicology* 1982;2:44-48.

#78 Krenzelok, E.P., Garber, R.J. Teaching poison prevention to preschool children, their parents, and professional educators through child care centers. *American Journal of Public Health* 1981;71:750-752.

#79 Vineis, P., Ronco, G., Ciccone, G., Gogliani, F. Home injuries in children: a population-based intervention trial. *Epidemiology* 1994;5:349-351.

#80 Logan, P., Branche, C.M., Sacks, J.J., Ryan, G., Peddicord, J. Childhood drownings and fencing of outdoor pools in the United States, 1994. *Pediatrics* 1998;101:E3

#81 Colver, A.F., Hutchinson, P.J., Judson, E.C. Promoting children's home safety. *British Medical Journal* 1982;285:1177-1180.

#82 Petridou, E., Tolma, E., Dessypris, N., Trichopolous, D. A controlled evaluation of a community injury prevention project in two Greek islands. *International Journal of Epidemiology* 1998; 26,1: 173-176.

#83 Hardy, J.B., Streett, R. Family support and parenting education in the home: an effective xtension of clinic-based preventive health care services for poor children. *J Pediatr* 1989;115:927-931.

#84 McLoughlin, E., Clarke, N., Stahl, K., Crawford, J.D. One pediatric burn unit's experience with sleepwear-related injuries. *Pediatrics* 1977;60:405-409.

#85 Kelly, B., Sein, C., McCarthy, P.L. Safety education in a pediatric primary care setting. *Pediatrics* 1987;79:818-824.

#86 Laing, R.M., Bryant, V. Prevention of burn injuries to children involving nightwear. *NZ Med J* 1991;104:363-365.

#87 Fisher, L., Goddard Harris, V., VanBuren, J., Quinn, J., DeMaio, A. Assessment of a pilot child playground injury prevention project in New York State. *American Journal of Public Health* 1980;70:1000-1002.

#88 Krug, A., Ellis, J.B., Hay, I.T., Mokgabudi, N.F., Robertson, J. The impact of child-resistant containers on the incidence of paraffin (kerosene) ingestion in children. *S Afr Med J* 1994;84:730-734.

#89 Assagard, U., Sjoberg, G. The successful introduction of child resistant closures for liquid paracetamol preparations. *Safety Science* 1995;21:87-91.

#90 Maisel, G., Langdoc, B.A., Jenkins, M.Q., Aycock, E.K. Analysis of two surveys evaluating a project to reduce accidental poisoning among children. *Public Health Reports* 1967;82:555-560.

#91 Sorensen, B. Prevention of burns and scalds in a developed country. *J Trauma* 1976;16:249-258.

#92 Paul, C.L., Sanson-Fisher, R.W., Redman, S., Carter, S. Preventing accidental injury to young children in the home using volunteers. *Health Promotion International* 1994;9:241-249.

#93 Gallagher, S.S., Hunter, P., Guyer, B. A home injury prevention program for children. *Pediatric Clinics of North America* 1985;32:95-112.

#94 Schlesinger, E.R., Dickson, D.G., Westaby, J.R., Lowen, L., Logrillo, V.M., Maiwald, A.A. A controlled study of health education in accident prevention: the Rockland County Child Injury Project. *Injury Prevention* 1997;3:218-223.

#95 Quan, L., Gomez, A. Swimming pool safety: an effective submersion prevention program. *Journal of Environmental Health* 1990;52:344-346.

#96 Howes, D.R. *An evaluation of the effectiveness of child-resistant packaging*. Washington D.C. Consumer Product Safety Commision, Office of Strategic Planning; 1978.

#98 Parcel, G.S., Bruhn, J.G., Murray, J.L. Preschool Health Education Program (PHEP): analysis of educational and behavioral outcome. *Health Education Quarterly* 1984;10:149-172.

#99 Schelp, L. Community intervention and changes in accident patterns in a rural Swedish municipality. *Health Promotion* 1987;2:109-125.

#100 Larson, C.P. Efficacy of prenatal and postpartum home visits on child health and development. *Pediatrics* 1980;66:191-197.

#101 Tengs, T.O., Adams, M.E., Pliskin, J.S, *et al*. Five-hundred life-saving interventions and their cost-effectiveness. *Risk Analysis* 1995;15:369-390.

#102 Bass, J.L., Mehta, K.A,, Ostrovsky, M., Halperin, S.F. Educating parents about injury prevention. *Pediatric Clinics of North America* 1985;32:233-242.

#103 Harris, A., Warchivker, I., de Klerk, N., Harris, A., (editors). Economics and Health: 1994. Proceedings of the Sixteenth Australian Conference of Health Economists. Sydney: School of Health Services Management, University of New South Wales; 1995;10,259-79.. *Isolation fencing and the prevention of toddler drowning in backyard pools: an economic analysis*.

#104 Kraus, J.F. Effectiveness of measures to prevent unintentional deaths of infants and children from suffocation and strangulation. *Public Health Reports* 1985;100:231-240.

#105 Langlois, J.A., Wallen, B.A.R., Teret, S.P., Bailey, L.A., Hershey, J.H., Peeler, M.O. The impact of specific toy warning labels. *JAMA* 1991;265:2848-2850.

#I City of Wanneroo, E.H. Lundy, L. (editor). *Home-safe, Play-safe.* Project: Final Report. City of Wanneroo, Environmental Health Department. 1996;

#A Day, L.M., Ozanne-Smith, J., Cassell, E., and McGrath, A. *Latrobe Valley Better Health Project: Evaluation Of Injury Prevention Program 1992-1996*. Monash University Accident Research Centre. 1997;

#F Duncan, T. and Wilshire, E. *Poisons Lock Up and Away*. Healthway and Kidsafe WA. 1997;

#C Elkington, J. and Gaffney, D. *Hot Water Burns Like Fire*: The NSW Scalds Prevention Campaign. Phases One and Two: 1992-1994 (Draft). NSW Health Department. 1998;

#A1 Harberts, H.J. Report on the Injury Prevention Program 1992-1996. *Community Cooperation Toward a Safer Future*. La Trobe Shire Safe Communities. 1997;

#G Johnson, A. *Safe Eating in Young Children Project*. Women's and Children's Hospital, Adelaide. 1996;

#K Jolly, D.L., Volker, R.E., Mavromatis, C., and Wright, H. Evaluation of the Early Childhood Injury Prevention Project (ECIPP) in South Australia. *Child and Youth Health*. 1996;

#D Kidsafe NSW. Withaneachi, D. (editor). *Phase II: Evaluation - Local Government Playground Safety Study*. Kidsafe NSW and NSW Health Department. 1998;

#J Laughlin, D. *Home Safety Parties Training Manual*. Coastal and Wheatbelt Public Health Unit, Health Department of WA. 1997;

#B O'Donnell, G. *SAFE Working Towards A Safe Accident Free Environment.* VicHealth and Safety Centre. 1995; Report of Phase 1.

#E Slinger, S. and Rowlands, N. *Hot Water Burns Like Fire.* Healthway and Kidsafe WA. 1995;

#H Zoeller, R. Accidental Poisonings: Reflections On The Lock Up Poisons Campaign. Central Coast Area Health Service. 1993;

REFERENCES: Section 3

References which were included in the review as secondary studies

*1 Bruhn, J.G., Parcel, G.S. Preschool Health Education Program (PHEP): an analysis of baseline data. *Health Education Quarterly* 1982;9:20-33.

Reference for study # 98 and 98a.

*2 Dickson, D.G., Schlesinger, E.R., Westaby, J.R., Lowen, L. Medically attended injuries among young children: observations in a suburban area. *Injury Prevention* 1997;3:214-223.

Reference for study # 94.

*3 Fergusson, D.M., Horwood, L.J., Shannon, F.T. The safety standards of domestic swimming pools 1980-1982. *NZ Med J* 1983;96:93-95.

Reference for study # 62B.

*4 Hanley, J., Choi, S. Commentary: statistical perspectives on the Lidkoping papers. *Injury Prevention* 1996;2:133-134.

Reference for study # 5B.

*5 Horwood, L.J., Fergusson, D.M., Shannon, F.T. The safety standards of domestic swimming pools. *NZ Med J* 1981;94:417-419.

Reference for study # 62

*6 Langley JD, Alsop JC. Lidkoping Accident Prevention Programme: what was the impact? *Injury Prevention* 1996;2:131-134.

Reference for study # 5A.

*7 Parcel ,G.S., Bruhn, J.G., Cerreto, M.C. Longitudinal analysis of health and safety behaviors among preschool children. *Psychological Reports* 1986;59:265-266.

Reference for study # 98A.

*8 Pearn, J., Nixon, J. Prevention of chilhood drowning accidents. *Med J Aust* 1977;1:616-618.

Reference for study # 80.

*9 Schelp, L. The role of organizations in community participation - prevention of accidental injuries in a rural Swedish municipality. *Soc Sci Med* 1988;26:1087-1093.

Reference for study # 99A.

*10 Williams, H., Sibert, J.R. *British Medical Journal* 1983;286:1893

Reference for study # 81A.

*11 Ytterstad, B., Smith, G.S., Coggan, C.A. Harstad injury prevention study: prevention of burns in young children by community based intervention. *Injury Prevention* 1998;4:176-180.

Reference for study # 19A.