



# burns

**A review of evidence for prevention**  
from the UK focal point for violence and injury prevention

**S. Wood, M. A. Bellis, J. Atherton**

## About the UK focal point for violence and injury prevention

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The 49th World Health Assembly (1996) declared violence a major and increasing global public health problem. In response, the World Health Organization (WHO) published the *World Report on Violence and Health* and initiated a major programme to support and develop violence and injury prevention work globally. As part of this programme, each member state has designated a national focal point for violence and injury prevention. The network of focal points works with the WHO to promote violence and injury prevention at national and international levels, develop capacity for prevention, and share evidence on effective prevention practice and policy.

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# A summary of evidence: successful or promising interventions to prevent accidental burns

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**Safety education programmes:** Safety education programmes implemented in clinical, home, school, community and societal settings have achieved some success in increasing safety behaviours and the use of safety devices among parents and children (e.g. having functional smoke alarms or safe hot water temperatures, and knowing what to do in the event of a fire). Less is known about the impacts on burn injury, but there is some evidence that injuries can be reduced through multi-component community-based programmes, and through home-based programmes such as home fires risk check schemes. Education programmes are more effective when they also provide discounted or free safety equipment.

**Provision of safety equipment:** The provision of safety equipment can also be used as a stand-alone intervention, such as smoke alarm giveaway schemes. Although some positive effects have been reported, in general, the effectiveness of these schemes in preventing burn injuries is unclear and can depend on whether safety equipment is installed properly by the householder and kept in good working order (e.g. regularly testing smoke alarm batteries).

**Other safety measures:** Internationally, the inclusion of home sprinkler systems for newly built houses has been found to reduce deaths from fires, although effects on burn injuries specifically have not been measured. In the UK, there is recognition that sprinklers can be an effective means to create safer premises. However, due to their high costs, only installations in residential care homes or tall blocks of flats are estimated to be cost-effective. Furthermore, their effectiveness is reliant on the systems being regularly maintained.

Burns are a commonly experienced injury in the UK. For instance, in 2008/09, burns caused over 87,000 emergency attendances and over 11,000 hospital episodes in England and Wales alone (1). Burns can be caused by a wide variety of factors, including contact with: hot liquids (scald burns); hot surfaces (contact burns); fire (flame burns); chemicals; or electricity. However, the majority of cases seen in Accident and Emergency departments are for scald, contact and flame burns (2,3). Most cases are accidental, but small percentages are known to be self-inflicted (3) or intentional forms of abuse (e.g. child maltreatment [4]).

While any individual can experience a burn, certain people appear to be more at risk, including males (5), young children and older people (2,5) and those living in deprived areas (6). While minor burns can be relatively easy to manage and quick to heal, the impacts of experiencing a severe burn can be problematic and even fatal. Physical impacts can include scarring, disability and restriction in motion (10,11). Adjusting to life following a burn can also be difficult, causing depression and anxiety, worries over appearance, sleep disruption and stress. For some, the injuries sustained can hinder employment, requiring a change in job status (11).

The majority of burn injuries are preventable and a number of strategies have been used to reduce the accidents that cause them, particularly among young children. This review examines some of the initiatives that have been used, along with evidence for their effectiveness. It includes programmes to prevent the commonest accidents associated with burn injuries, such as home fires and contact with hot water and hot surfaces. The majority of evaluated interventions focus on reducing childhood injuries and home fires.

## Burns in the UK: some facts

- In a study of burn injuries at an A&E department in Bradford, the most common sites for injury were wrist and hand (36%), upper limb (21%), lower limb (16%), and face, head and neck (9%). Around a tenth of patients had multiple injury sites (2).
- A large proportion (29%) of people attending the A&E had received no first aid for their injuries before visiting the hospital (2).
- The incidence of burns seen at A&E peaks in November, coinciding with bonfire night (2).
- In 2007, there were 443 fire-related deaths in the UK, the lowest number since 1959. A quarter of these deaths were caused by burns alone; 20% by both burns and being overcome by gas/smoke, and 44% by being overcome by gas/smoke alone (8).
- The majority of fire-related deaths occur in homes, where the main cause is misuse of smoking products (8).
- The use of alcohol increases the risk of a house fire injury (7), as well as the severity of a fire burn (9).

## 1. Safety education

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Safety education programmes can be based in the clinic/hospital, home, school or community, or targeted at society at large. They aim to teach individuals safety measures that can help protect themselves and others from a range of accidents and injuries, including burns. While content differs from programme to programme, they usually include information on the importance of using safety equipment (e.g. smoke alarms, water thermometers for children's baths and cooker guards), safety behaviours (e.g.

keeping cooking appliances and cords out of reach of small children, lowering temperatures on water heaters, making a plan for an escape route in the event of a fire) and delivering first aid to those suffering from a burn. Programmes are often combined with the provision of safety devices or home safety checks and targeted at the most vulnerable, including the elderly and families with young children, or those living in deprived areas.

### **1.1 Clinical-based programmes**

Programmes based in a clinical setting use one-to-one counselling by a GP, nurse or other health professional, or group-based education (e.g. parenting groups). Among families with young children, there is evidence that these programmes can increase smoke alarm ownership, the likelihood of having an installed and functional smoke alarm, and having safe hot tap water temperatures (12,13). Interventions are most effective when they combine a number of different strategies, including health education, behaviour change strategies, demonstrations, and the provision of discounted safety equipment (12). However, it is unclear whether clinical-based programmes can subsequently affect fire-related injuries.

## Interventions in the clinical setting: an example

In Nottingham, an intervention was implemented in 47 general practices to reduce unintentional injuries among children, including burns. The initiative was targeted at families living in deprived areas with children under the age of five years. Health visitors undertook individual safety consultations in dedicated clinics, or in the patient's home, that were specific to the age of the children in the family. At the same time, a range of safety equipment was offered and installed free of charge to families (including smoke alarms and fire guards). Participating families were followed up two years after the consultation. Compared to those receiving standard care, participating families were more likely to possess smoke alarms (and display other safety behaviours related to other types of injury). However, participation in the intervention did not reduce levels of unintentional injuries that required medical care (14).

### 1.2 Home-based programmes

Some safety education programmes use home visits by a health or other professional to provide safety advice and home checks, often with free or discounted safety equipment and installation. They can be attached to other programmes or schemes that provide regular home visits (e.g. Head Start; provides home visits to parents living in deprived areas), thus minimising the effort needed to participate. Among families with children, there is evidence that home safety education can increase: possession of a functional smoke alarm; use of fire guards; and the use of safe hot tap water temperatures (15-17). Effects on the possession of fire extinguishers, keeping hot drinks out of reach of children, and the safe storage of matches is less clear (12). Furthermore, less is known about whether changes in safety practices can affect subsequent accident or injury rates among children. Programmes are more effective if they provide safety equipment alongside education sessions (12).

## Interventions in home settings: an example

In the UK, many fire services run free home fire risk checks (HFRCs) for residents in their area. These are available to any household, but are often targeted at neighbourhoods or groups of people thought to be at higher risk of experiencing a fire (e.g. deprived neighbourhoods or older people). During the home check, residents are visited by a representative from the fire service, who provides advice on what can be done to increase protection, and provides free or discounted (and installed) safety equipment such as smoke alarms. Between 2004 and 2008, the Government provided £25 million in funding to English Fire and Rescue services to stimulate HFRCs activity under the HFRC programme. An evaluation of the initiative in 2009 reported that it resulted in the installation of over two million smoke alarms nationwide, an estimated reduction in home fires by 13,670 per year, an estimated 888 fewer non-fatal casualties, and an estimated reduction in home fire deaths of 53 per year. The economic benefits of the initiative were valued at £926m to £1,943m (18).

### 1.3 School-based programmes

Schools can play an important role in child injury prevention, through educating children about hazards and safety behaviours and teaching them how to deal with fires or burns if they occur. Education is delivered through a variety of methods, including role-play, group work and written exercises. Some programmes include homework to be completed with the wider family unit, which can reach parents indirectly (19). Some promising effects of school-based programmes have been reported in terms of improving children's knowledge (e.g. hazards in the home), safety behaviours (e.g. keep pan handles facing inwards, place hot drinks in the middle of the table), and skills (e.g. understand what to do in the event of a fire) (19-21). There is

also some evidence that including homework and family exercises can lead to adoption of safety behaviours by parents (20). However, effects on burns specifically is unknown.

### **Interventions in the school setting: an example**

In Nottingham, the Risk Watch programme aimed to improve a range of safety behaviours among school children, including fire and burns safety. Targeted at seven to ten year olds, the programme was delivered by teachers who had received training by Fire Service personnel. For fire and burn safety, children worked in small groups to create “infomercials”, which presented a safety message to the wider class and opportunities for discussion. Lessons included: how to act if a house fire was started; devising a safety plan for escaping in the event of a fire; learning about the hazards of outdoor fire safety (e.g. outdoor cooking fires, fireworks, electricity towers); and learning safe cooking methods. Children’s knowledge and self-reported safety behaviours were measured before the intervention and between two and five months after. At follow up, participating children had better knowledge of fire and burn prevention than a control group (e.g. knew what action should be taken in a house fire), reported slightly higher levels of some safety behaviours (e.g. never playing with matches) and had better fire and burn prevention skills (e.g. could demonstrate correct procedures if clothing caught fire) (20).

## **1.4 Community-based programmes**

Community-based programmes combine individual safety education and counselling with community-based media campaigns and other community activities to promote safety behaviours. Although research is limited (22), these types of programmes have been associated with decreased rates of burn injuries (23). Important elements of community-based prevention programmes in general include: taking a long-

term strategy; having effective focused leadership; multi-agency collaboration; tailoring to the needs of the local community; the use of injury surveillance; and time to co-ordinate existing, as well as develop new, networks (24).

### **Community interventions: an example**

In Norway, a long-term community-based programme was designed to reduce the incidence of burns among young children. A number of different strategies were used over a period of ten years, including individual counselling and media campaigns. Activities included the promotion of: lower tap water temperatures; the purchase and installation of cooker safeguards; the availability of cooker safeguards in stores selling electric stoves; parental vigilance in burn-risk situations; and parental skills in giving first aid. Individual counselling was carried out by public health nurses during pre-natal home visits and infant health assessments. In addition, child safety was promoted generally through local private and public organisations, and the problem of childhood burns brought to light through media and the distribution of burn injury data. There were regular press releases reporting on the intervention progress to sustain promotion. Long-term evaluation of the programme reported that it had been effective in preventing the most serious burns among children caused by stove and tap injuries. Rates of burn injury decreased over the intervention period compared to a control area, and there was a shift from severe injuries caused by stove and tap water scalds to less severe contact injuries. There was also a decrease in the number of hospital admissions for burns (23).

## **1.5 Society-wide safety campaigns**

Media campaigns aim to promote behaviour change at a societal level through television, radio and newspaper advertising. In the UK, campaigns relating to fires and burns have included: increasing smoke alarm ownership and encouraging householders to regularly test their alarms (25);

increasing awareness of firework safety (26); the dangers of burning candles, smoking in the home, and cooking (25); and the dangers of smoking and cooking after drinking alcohol (27). Although evaluations of these campaigns are difficult to implement, some promising results have been reported (e.g. the Fire Kills smoke alarm maintenance campaign).

### **Society-wide campaigns: an example**

In England, the Fire Kills smoke alarm maintenance campaign used materials such as TV adverts, printed information and a website to highlight the importance of regularly testing fire alarms and the consequences of not having a working alarm. The campaign was backed by music, entertainment and sporting celebrities, who pledged to check their fire alarms each week. The campaign was evaluated in 2009 and found:

- Between four and ten lives were estimated to have been saved as a result of each burst of campaign advertising;
- The estimated lives saved delivered a gross benefit of between £5.5m to £15m per advertising burst;
- The estimated injuries saved delivered between £280,000 and £2.8m value per advertising burst (28).

With on average two bursts of advertising per year, this meant the campaign saved an estimated 21 lives per annum and made a saving of £37.1m to the economy (28).

## 2. Provision of home safety devices

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Home safety devices, such as thermometers to test hot water temperatures, anti-scald devices in hot water taps, fire guards and smoke alarms can offer some protection against burns arising in the home. Devices can be distributed free of charge, loaned, or offered at a reduced cost to households. Such schemes are offered by a range of agencies, including the Fire and Rescue service, and are often targeted at families living in disadvantaged areas. The provision of home safety devices is often combined with safety education programmes. However, they can also be used as stand-alone interventions.

The most commonly evaluated initiative is the free or discounted provision (and sometimes installation) of smoke alarms. Although these initiatives can increase the number of homes protected by smoke alarm devices, their ability to affect levels of fires or fire-related injuries is unclear (13). Here, smoke alarms can only offer protection if they are used and kept in good working order (e.g. batteries are tested and changed regularly). In the US, a smoke alarm giveaway project distributed over 10,000 smoke alarms in an area at high risk for residential fires, providing written information on how to install and maintain alarms and how to prevent and escape from home fires. The initiative was cost-saving and prevented an estimated 20 fatal and 24 non-fatal fire-related injuries over the following five years (29). However, not all smoke alarm giveaways are effective. In the UK, a similar initiative (Let's Get Alarmed!) was delivered in highly deprived areas of London where smoke alarm ownership was low (30). Compared to control areas, the mean number of fires and injuries in the following two years was higher in

the intervention areas, and the number of functioning smoke alarms identical in both control and intervention households. Evaluation of this initiative concluded that too few smoke alarms had been installed and maintained over the study period by the householders (31).

### 3. Other safety measures

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#### 3.1 Sprinkler systems

A further safety measure is the use of sprinkler systems, which can be used alongside smoke detection devices to address fires. Sprinkler systems are triggered by the surge in heat generated by a fire and automatically spray water into the affected area to suppress the flames. In the UK, there are regulations for the use of sprinkler systems in certain commercial, industrial or residential buildings (e.g. new high-rise residential blocks and care homes [Scotland]), but not residential houses, where they are rarely used. This is in contrast to some localities (e.g. certain areas of the US), where there are requirements for all new residential builds to install sprinkler systems. Sprinkler systems can be effective in tackling fires and preventing fatalities. In the US for example, it has been estimated that when sprinklers are present and in correct working order, the fire death rate per 1,000 reported fires is 80% lower for home fires (32). In the UK, although research finds sprinkler systems to be effective in some residential settings, their cost-effectiveness is a major consideration, with only those in residential care homes or tall blocks of flats estimated to be currently cost-effective (33). Their effectiveness is also reliant on the systems being regularly maintained.

### **3.2 Fire safe cigarettes**

In 2007, over 3,000 accidental dwelling fires in the UK were started by smoking materials, killing 102 and injuring over 1,000 people (8). One suggested method of addressing this is through the use of fire safe cigarettes, which are designed to self extinguish if left unattended. The most common approach used by manufacturers is to wrap cigarettes with two or three thin bands of less-porous paper that act as 'speed bumps' to slow down the burning cigarette. If a fire safe cigarette is left unattended, the burning tobacco will reach one of these speed bumps and extinguish, unlike traditional cigarettes which are designed to smoulder down to the filter. The use of fire safe cigarettes therefore offers a potentially cost-effective method of reducing smoking-related home fires, and are known to reduce the risk of ignition or smouldering on a variety of materials in the home (e.g. bed sheets, cushions, mattresses [34]). However, as yet, there is little research available measuring their effectiveness in preventing domestic fires in the community. The European Commission is currently developing a harmonised technical standard and test method for fire safe cigarettes.

## Legislation relating to the prevention of burns

**Laws on the use of safety devices:** In the UK, under the Smoke Detectors Act 1991, all new homes built are required to be fitted with smoke alarms. By law, some countries require all homes (new or old) to have at least one working smoke alarm installed (e.g. some areas of Australia and the US). In the US, state legislation that required all homes to have a smoke alarm was associated with a higher percentage of working smoke alarms and a lower percentage of homes with no smoke alarm at all (35).

**Laws on the design of appliances:** Addressing the fact that many childhood scalds are caused by hot tap water, some localities (e.g. parts of the US) have passed laws on water heaters that require safe temperatures (below 125°F to 130°F/52°C to 54°C) to be pre-set by the manufacturer before sale (36). In the US, such legislation has been associated with an increase in the percentage of homes with tap water temperatures less than 54°C, and a lower hospital admission rate for burns. Mortality from burns, grafting, scarring and length of hospital stay also reduced (37).

**Laws on the sale of items that may cause burns:** In the UK, under various legislative acts, it is illegal to sell a firework to anyone under the age of 18, and illegal for those under 18 to be in possession of a firework in a public place. With the exception of licensed suppliers, the sale of fireworks is also restricted to certain times of the year, such as the period leading up to bonfire night. Additionally, in Northern Ireland, under the Explosives (Fireworks) regulations (Northern Ireland) 2002 Act, individuals wishing to purchase, possess and use fireworks (with the exception of indoor fireworks and sparklers) must apply for a licence, specifying when and who will be using them. The effectiveness of firework legislation is mixed, however there have been some reports of reductions in paediatric firework-related burns injuries (38).

## 4. Summary

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The main types of intervention that have been used in the prevention of burns are safety education programmes and the provision or use of home safety equipment. Often these two types of intervention are delivered together. In terms of preventing injury, there is some evidence that:

- Safety education programmes provided in community settings, using a range of different strategies, can prevent burn injuries. Similarly, home fire risk checks combined with safety advice and the provision and installation of safety equipment can prevent fires, casualties and deaths;
- Internationally, the use of home sprinkler systems can prevent fires and fire-related deaths (although little is known about burn injuries specifically). However, due to high costs, only installations in residential care homes or tall blocks of flats are estimated to be cost-effective in the UK.

In terms of safety behaviours and knowledge, there is evidence that across all settings, safety education programmes can improve adults' and children's knowledge of hazards and safety behaviours (e.g. owning a smoke alarm, having safe hot water temperatures). Although some positive effects have been reported for smoke alarm giveaway schemes, in general, the effectiveness of these schemes in preventing injury is unclear and can depend on whether safety equipment is installed properly by the householder and kept in good working order (e.g. regularly checking smoke alarm batteries). Although there is little

evidence as yet on the effects of fire safe cigarettes on fires in the community, and fire-related injuries and deaths, evidence suggests that these products can reduce the risk of ignition or smouldering on materials in the home, and have the potential to offer protection against cigarette-related fires and subsequent injuries.

All references are included in the online version of this document, available from:

**[www.preventviolence.info](http://www.preventviolence.info) and [www.cph.org.uk](http://www.cph.org.uk)**

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