safekids
Aotearoa

CHILDHOOD BURNS IN AOTEAROA 2020
AN OVERVIEW

Table of Contents

Summary of Data

- In this report, mortality data from 2007 – 2016 and hospitalisation data from 2009 – 2018 were analysed.
- 2 children were killed each year due to unintentional burn-related injuries, particularly by exposure to fire, flames or smoke.
- 260 children were admitted to hospital each year for an unintentional burn injury.
- Most burns occurred in the home, especially in the kitchen.
- Between 2009 and 2018, the rate of hospital admissions for childhood burns decreased by 26 percent.
- Māori and Pacific Island children were 3 times more likely to be hospitalised from a burn-related injury compared to European children.
- Children aged 0 to 4 years old accounted for the majority of all hospitalisations for burn-related injuries (78%).
- 89 percent of hospital admissions for childhood burns were due to contact with a hot object or substance.
- The leading cause of burns for children was contact with hot drinks, food, fats and cooking oil.
- Childhood burn injuries cost the ACC scheme approximately $3.5 million every year.
- The majority of childhood burns are preventable. There is a wealth of evidence on effective measures for preventing burns.

1. Introduction

Children have thinner skin that burns faster, deeper and at lower temperatures compared to adults [1]. For example, it has been shown that it would only take between 1 and 3 seconds for a child to sustain a full thickness burn from hot tap-water at 60°C [1,2]. It has also been said that because of their small size, spilling a hot drink over a baby is comparable to a bucketful of boiling water being tipped over an adult [3].

Depending on the severity, childhood burns can cause death or be a debilitating condition with intense pain and longer-term physical and psychological impacts that creates more suffering for the child and their family [4]. Recent literature indicates that burn injuries are associated with a number of secondary conditions (e.g. cancer, cardiovascular disease, nervous system disorders, diabetes, infections, anxiety and depression), many of which may arise long after the initial injury has healed [5]. It has therefore been suggested that burn injuries be understood as a chronic disease [5].

While assessing the total cost of burns is difficult, it is evident that it costs a significant amount to both health services and the families of the affected children [4]. There are also other costs incurred by the family associated with hospitalisation, rehabilitation, loss of school days and possibly future employment and other psychosocial issues [4].

Poverty and age have been highlighted as particular risk factors for childhood burns [4]. Children living in lower socioeconomic and urban areas are more likely to be killed and injured by burns, as are children under the age of five years [4,6].

The majority of childhood burns are preventable. Over the past few decades, research and action on the prevention of burns has greatly improved [4]. There is now a wealth of evidence on effective measures for preventing burns, for example the enforcement of smoke alarms [4] and regulation of the temperature of hot tap-water [2, 4]. A simple intervention like lowering hot tap-water temperatures to 54°C could decrease the severity of a burn, as it would take about 10 seconds of exposure to cause a full thickness burn in a child [1,2]. There is a huge potential to reduce the costs associated with childhood burns by focusing on carrying out effective burn prevention interventions [4].

In this overview, childhood burn fatalities between 2007 – 2016 and childhood burn hospitalisations between 2009 – 2018 are analysed [10]. A section on burn prevention follows which details Safekids Aotearoa's safety tips for families, outlines some key pieces of legislation and product standards, as well as a brief section on interventions that provide good evidence for preventing childhood burns. Burn injuries in this report are classified according to the International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10):

Burn Injuries:

(i) X00 – X09 = Fire/flame type burns

(ii) X10 – X19 = Hot object/substance type burns [11].

(It does not include data pertaining to chemical or electrical burns).

2. Fatalities

Over the period 2007 – 2016, on average, 2 children per year aged 0-14 were killed due to an unintentional burn injury [10]. Most of these deaths occurred in the 5 to 9 year old age group and were mainly due to exposure to an uncontrolled fire in the home [6]. Māori and Pacific Island children were disproportionately affected [10].

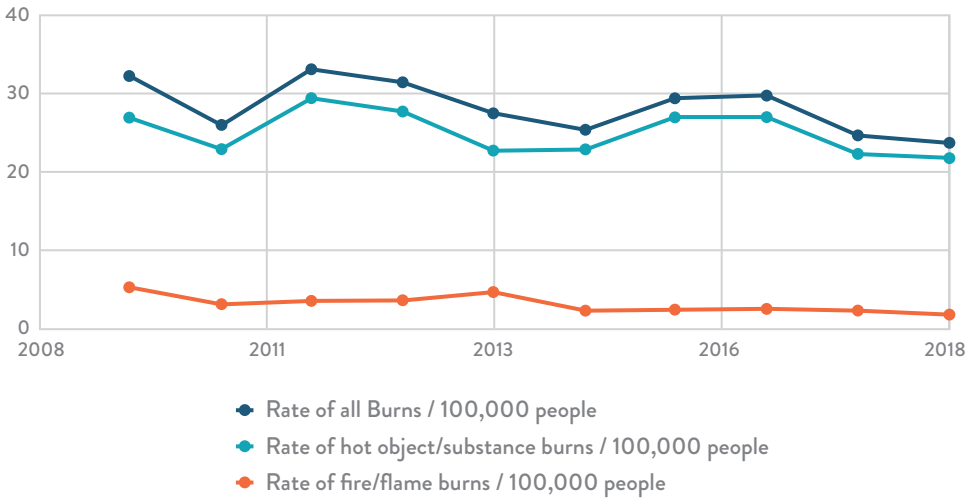
3. Hospitalisations

The following section concerns unintentional burn related hospitalisations for children aged 0 to 14 years in New Zealand over a 10-year period (2009 to 2018). It excludes day patients or those re-admitted for the same event, or who died in hospital as a result of their injury [10].

Burn Rate Trends

On average, approximately 260 children aged 0 to 14 years were admitted to hospital for an unintentional burn injury per year [10] (see Appendix 1). The rate for burn-related hospital admissions has decreased by 26 percent over the decade 2009 to 2018 (see Figure 1).

FIGURE 1: Rate of Child Burn Injury Hospitalisations, Aged 0-14 Years, 2009 - 2018 [6]



Source: IPRU, University of Otago. Accessed 2020. Analysis by Safekids Aotearoa.

Leading Causes of Burn Injuries

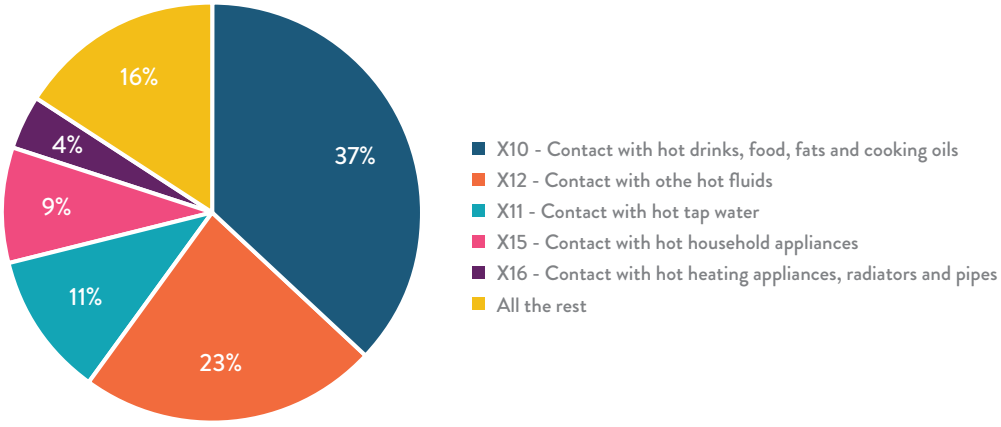
Contact with hot objects or substances (X10 – X19) was the main cause of burns hospitalisations for children aged 0 to 14 years (89%) (See Figure 8 below) [10]. The top five specific causes of hospital admissions for burns overall fell within this category and accounted for 84 percent of admissions (see Figure 2 and Table 1 for further detail).

Top 5 causes of child burn injury hospital admission, aged 0-14:

1. Contact with hot drinks, food, fats and cooking oils
2. Contact with other hot fluids (e.g. water heated on stove or kettle)
3. Contact with hot tap-water
4. Contact with hot household appliances
5. Contact with hot heating appliances, radiators and pipes

Exposure to fire, flames or smoke (X00 – X09) accounted for the other 11 percent of burn hospitalisations (see Figure 8 below) [10]. The leading causes of fire or flame type burn injuries that required hospitalisations were exposure to fire, flames or smoke in a building, structure (e.g. fireplace/ stove) or elsewhere; and through the ignition of clothing or other highly flammable materials (refer to Appendix 1) [10].

FIGURE 2: Top 5 Leading Causes of Child Burn Injury Hospital Admissions, Aged 0-14 Years, 2009-2018 [10]



Source: IPRU, University of Otago. Accessed 2020. Analysis by Safekids Aotearoa.

Age

Children aged between 0-4 years accounted for 78 percent of all burn injury-related hospitalisations between 2009 and 2018, followed by children aged 5-9 years (13%) and children aged 10-14 years (9%) (see Figure 3 below). One year olds were most at risk and accounted for 44 percent of burn related hospitalisations (see Figure 4 below). Refer to Table 1 for further detail into specific causes of admissions due to burns by 5-year age group [10, 11].

FIGURE 3: Percentage of Child Burn Injury Hospitalisations by Age Group, Aged 0-14 Years, 2009-2018 [10]

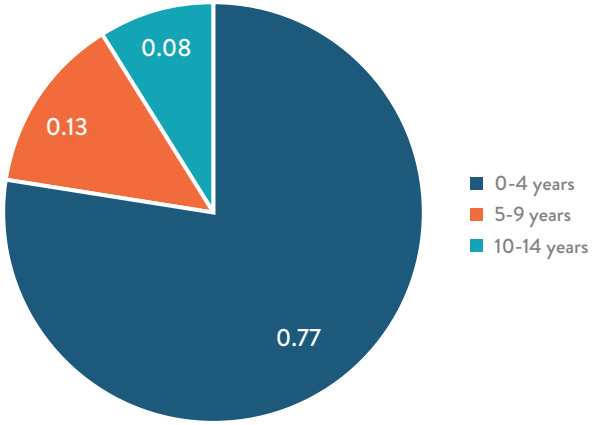
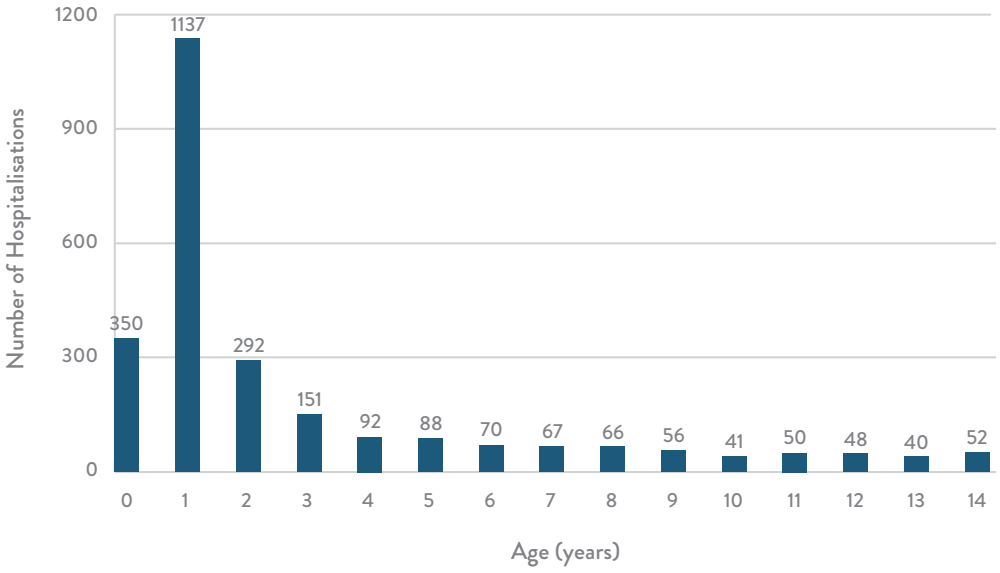


FIGURE 4: Number and Percentage of Hospitalisations due to Burns, Aged 0-14 Years, 2009-2018 [10]



Source for figures 3 & 4: IPRU, University of Otago. Accessed 2020. Analysis by Safekids Aotearoa.

Hot Object or Substance Burns

Children aged 0-4 years old were at most risk for hot object or substance type burns (see Figure 5 below). On average 190 children (82%) aged 0-4 years were hospitalised each year from burn injuries caused by contact with a hot object or substance (see Figure 3 below) [10]. The leading causes of hot substance or object burns for this age group are spilt hot drinks, food, fats and cooking oils (44%), other hot liquids including water heated on a stove or kettle (24%), contact with hot tap water (13%) and contact with hot household appliances (10%) (see Figure 6 below). A similar pattern of burns is found in children aged 5 – 9 years old, although the leading cause of burn hospitalisations in this age group is contact with other hot fluids (e.g. water heated on a stove or kettle) (see Table 1).

FIGURE 4: Percentage of Child Burn Injury Hospitalisations from 'Hot Object/ Substance' Type Burns by Age Group, Aged 0-14 Years, 2009-2018 [10]

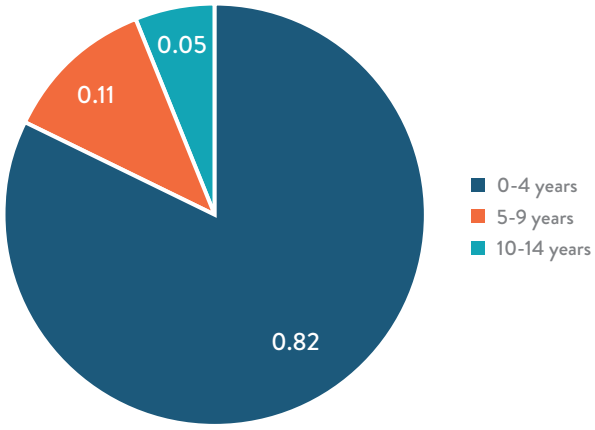
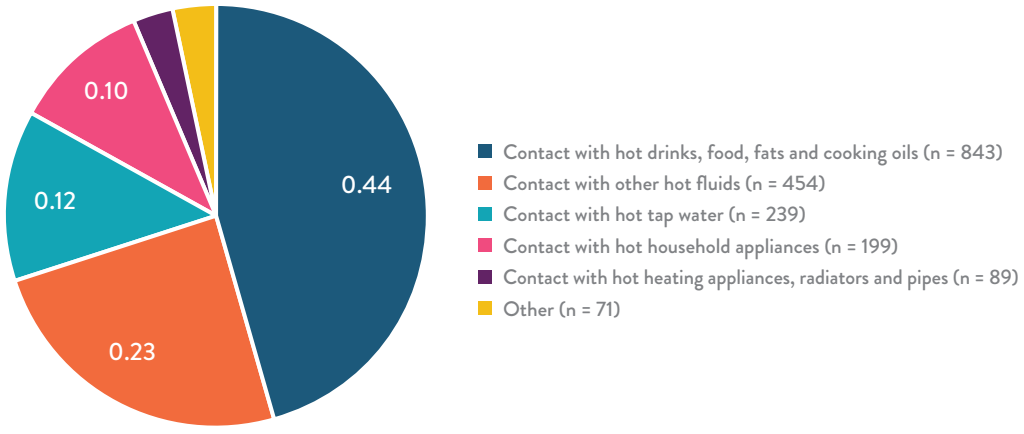


FIGURE 6: Leading Causes of 'Hot Object/Substance' Hospitalisations for Children, Aged 0-14 Years, 2009-2018 [10, 11]



Source for figures 5 & 6: IPRU, University of Otago. Accessed 2020. Analysis by Safekids Aotearoa.

Fire, Flame or Smoke Burns

Children aged 0-4 years old are also at higher risk of a fire, flame or smoke type burn [10]. On average 13 children (43%) aged 0-4 are hospitalised every year from burn injuries caused by exposure to fire, flame or smoke (see Figure 7 below). The leading cause of a fire, flame or smoke type burn in this age group is exposure to a controlled fire in a building or structure (e.g. a fireplace or stove) (refer to Appendix 2).

Children aged 10- 14 years old experienced a higher proportion of fire, flame or smoke type burns (41%) than hot object or substance burns (59%) when compared to other age groups (see Figure 8) [10]. A notable difference in this age group is that exposure to the ignition of highly flammable material (e.g. petrol or kerosene) is the third leading cause of burn injuries (15%) (see Table 1).

FIGURE 7: Percentage of Child Burn Injury Hospitalisations from 'Fire/Flame' Type Burns by Age Group, 2009-2018 [10]

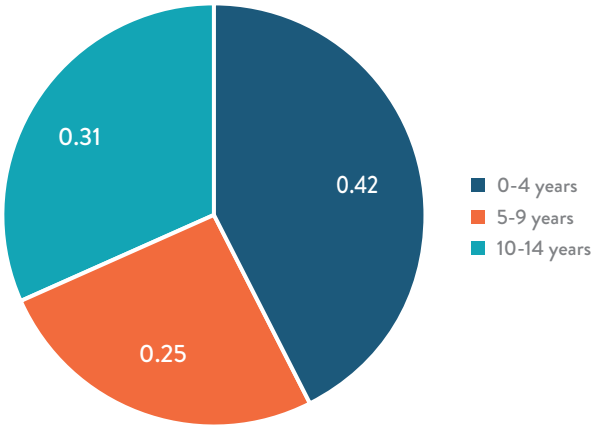
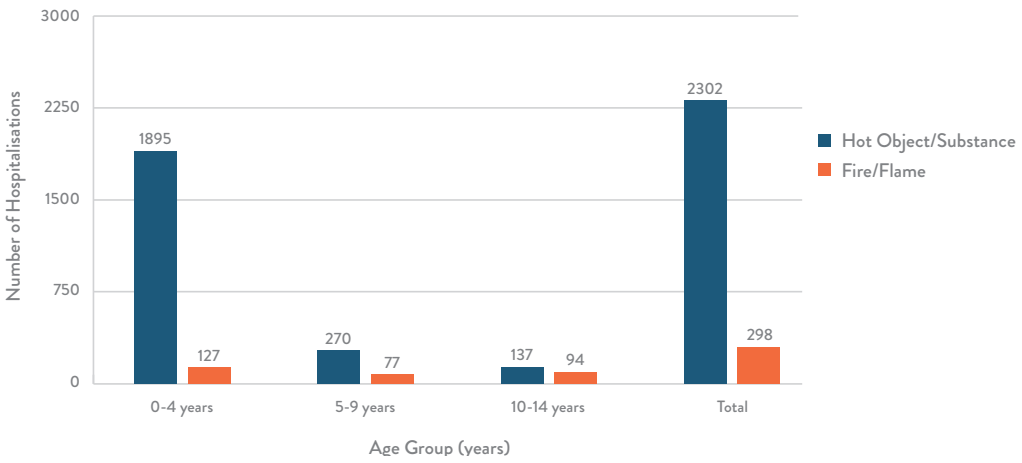


FIGURE 8: Number and Percentage of Child Burn Injury Hospitalisations by External Cause and Age Group, Aged 0-14 Years, 2009-2018 [10]



Source for figures 7 & 8: IPRU, University of Otago. Accessed 2020. Analysis by Safekids Aotearoa.

TABLE 1: Leading Causes of Child Burn Injury Hospitalisations by Age, 2009-2018 [10, 11]

0 to 4 Years

Cause	Number	Number per year	Rate	%
X10_Contact with hot drinks, food, fats and cooking oils	843	84.3	27.2	42%
X12_Contact with other hot fluids	454	45.4	14.7	22%
X11_Contact with hot tap water	239	23.9	7.7	12%
X15_Contact with hot household appliances	199	19.9	6.4	10%
X16_Contact with hot heating appliances, radiators and pipes	89	8.9	2.9	4%
All the rest	198	19.8	6.4	10%
Total	**2022**	**202.2**	**65.3**	**100%**

5 to 9 Years

Cause	Number	Number per year	Rate	%
X12_Contact with other hot fluids	117	11.7	3.8	34%
X10_Contact with hot drinks, food, fats and cooking oils	66	6.6	2.1	19%
X11_Contact with hot tap water	33	3.3	1.1	10%
X15_Contact with hot household appliances	20	2	0.7	6%
X08_Exposure to other specified smoke, fire and flames	14	1.4	0.5	4%
All the rest	97	9.7	3.2	28%
Total	**347**	**34.7**	**11.3**	**100%**

10 to 14 Years

Cause	Number	Number per year	Rate	%
X10_Contact with hot drinks, food, fats and cooking oils	48	4.8	1.6	21%
X12_Contact with other hot fluids	39	3.9	1.3	17%
X04_Exposure to ignition of highly flammable material	35	3.5	1.2	15%
X08_Exposure to other specified smoke, fire and flames	18	1.8	0.6	8%
X03_Exposure to controlled fire, not in building or structure	17	1.7	0.6	7%
All the rest	74	7.4	2.5	32%
Total	**231**	**23.1**	**7.7**	**100%**

0 to 14 Years

Cause	Number	Number per year	Rate	%
X10_Contact with hot drinks, food, fats and cooking oils	957	95.7	10.4	37%
X12_Contact with other hot fluids	610	61.0	6.6	23%
X11_Contact with hot tap water	283	28.3	3.1	11%
X15_Contact with hot household appliances	224	22.4	2.4	9%
X16_Contact with hot heating appliances, radiators and pipes	108	10.8	1.2	4%
All the rest	418	41.8	4.6	16%
Total	**2600**	**260**	**28.3**	**100%**

Source: IPRU, University of Otago. Accessed 2020. Analysis by Safekids Aotearoa.

☐ Shaded fields indicate X00-X09 - Fire/flame type injuries
☐ Unshaded fields indicate X10-X19 - Hot object/substance injuries

Ethnicity

Pacific Island and Māori children are approximately 3 times as likely to be hospitalised from a burn related injury compared to European children, while children classified as "Other/ MELAA" (Middle Eastern, Latin American and African) are about twice as likely (see Table 2 and Figure 9 below).

It is worth noting that the rate of hospital admissions due to contact with hot drinks, food, fats and cooking oils for children in the "Other/MELAA" category (39 per 100,000 children) is similar to the rate for Pacific Island children (44 per 100,000 children), and higher than for Māori children (31 per 100,000 children) (see Table 3 below).

TABLE 2: Hospitalisations, Rate (per 100,000 children) and Rate Ratio of Child Burn Injuries by Ethnicity, Aged 0-14 Years, 2009-2018 [10]

Ethnicity	Number Per Year	Rate	RR
Pacific Island	51	43.6	3.03
Māori	89	39.2	2.73
Other/MELBA	7	27.2	1.89
Asian	26	21.8	1.51
European	87	14.4	1.00

FIGURE 9: Hospitalisations and Rates (per 100,000) of Child Burn Injury Hospitalisation by Ethnicity, Aged 0-14 Years, 2009-2018 [10]

Sources: IPRU, University of Otago; and Stats NZ for population numbers. Accessed 2020. Analysis by Safekids Aotearoa.

TABLE 3: Rate (per 100,000 children) of Top Three Leading Causes of Child Burn Injury Hospital Admissions by Ethnicity and Age, Aged 0-14 Years, 2009-2018 [10, 11]

Ethnicity	ICD10 Cause	0-4 Years	5-9 Years	10-14 Years	Total
Pacific Island	X10_Contact with hot drinks, food, fats and cooking oils	44.2	5.0	3.5	18.0
	X12_Contact with other hot fluids	24.2	5.7	1.6	10.8
	X15_Contact with hot household appliances	14.5	2.5	0.3	5.9
Others incl. MELAA	X10_Contact with hot drinks, food, fats and cooking oils	38.9	2.1	0.9	14.9
	X12_Contact with other hot fluids	11.6	3.2	1.8	6.0
	X15_Contact with hot household appliances	6.3	0.0	0.0	2.2
Māori	X10_Contact with hot drinks, food, fats and cooking oils	31.3	1.5	2.2	11.8
	X12_Contact with other hot fluids	23.0	3.6	1.3	9.4
	X11_Contact with hot tap-water	14.4	1.2	0.6	5.5
Asian	X10_Contact with hot drinks, food, fats and cooking oils	24.5	5.0	1.4	11.2
	X12_Contact with other hot fluids	12.5	2.8	1.1	5.9
	X11_Contact with hot tap-water	5.3	1.5	0.3	2.6
European	X10_Contact with hot drinks, food, fats and cooking oils	5.9	2.5	0.9	3.1
	X12_Contact with other hot fluids	44.2	5.0	3.5	18.0
	X11_Contact with hot tap-water	3.5	0.6	0.2	1.4

Sources: IPRU, University of Otago; and Stats NZ for population numbers. Accessed 2020. Analysis by Safekids Aotearoa.

Gender

Boys (n = 1535, 59%) are approximately one and a half times more likely to be hospitalised from a burn-related injury compared to girls (n = 1065, 41%) [10]. The majority of fire or flame type injuries occurred in boys (n=208, 70%), and the majority of hot object or substance type burns also occurred in boys (n = 1327, 58%) (see Table 4 below).

TABLE 4: Number and Percentage of Hospital Admissions for Burns by Gender and Age Group, Aged 0-14 Years, 2009-2018 [10]

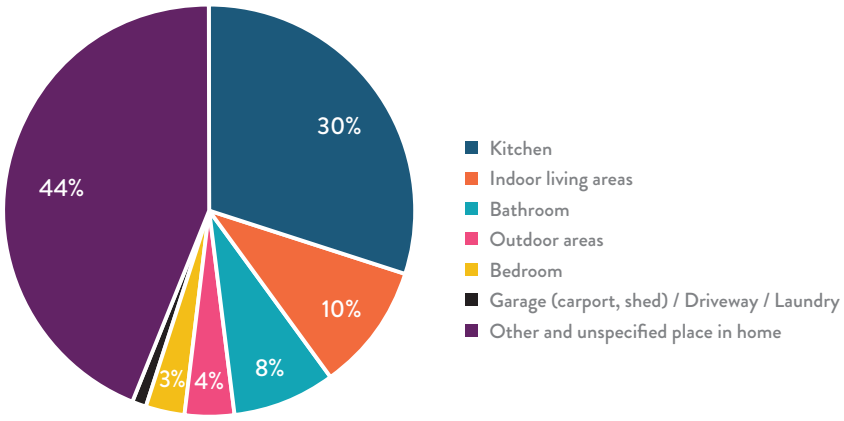
Hot Object/Substance Burns	Girls		Boys		Total
	Number	%	Number	%	
0-4 years	798	42%	1097	58%	1895
5-9 years	131	49%	139	51%	270
10-14 years	46	34%	91	66%	137
Total Hot Object/Substance Burns	**975**	**42%**	**1327**	**58%**	**2302**
Fire/Flame Burns					
0-4 years	54	43%	73	57%	127
5-9 years	23	30%	54	70%	77
10-14 years	13	14%	81	86%	94
Total Hot Object/Substance Burns	**1065**	**41%**	**1535**	**59%**	**2600**

Source: IPRU, University of Otago. Accessed 2020. Analysis by Safekids Aotearoa.

Scene

Most burn injuries occurred in the home (n=2032, 78%) [10]. Within the home, the kitchen was the most common location for burn injuries (30%) (see Figure 10 below).

FIGURE 10: Location of burn injury within the home, Aged 0-14 Years, 2009-2018 [10]



Source: IPRU, University of Otago. Accessed 2020. Analysis by Safekids Aotearoa. Note: In many cases the scene of the burn injury is not confirmed or is unknown. In this instance they are included as "other and unspecified place in home".

ACC Data

Child burn injuries cost the ACC scheme approximately $3.5 million every year and some $3 million of this is spent on burn injuries that occurred specifically in the home (see tables 4 and 5 below) [12].

TABLE 5: Child Burn Injuries, All Settings, Aged 0-14 Years, 2013/14 - 17/18 [12]

Financial Year	New Claims (All Burns)	Active Claims (All Burns)	Total Cost (All Burns)
Jul 2013 - Jun 2014	7084	6989	$3,828,084
Jul 2014 - Jun 2015	6840	6703	$3,536,101
Jul 2015 - Jun 2016	6966	6800	$3,624,746
Jul 2016 - Jun 2017	6948	6886	$3,507,557
Jul 2017 - Jun 2018	6612	6492	$3,739,175

TABLE 6: Child Burn Injuries, Home Setting, Aged 0-14 Years, 2013/14 - 17/18 [12]

Financial Year	New Claims (Home)	Active Claims (Home)	Total Cost (Home)
Jul 2013 - Jun 2014	5940	5886	$2,985,789
Jul 2014 - Jun 2015	5734	5613	$2,938,469
Jul 2015 - Jun 2016	5763	5649	$3,139,080
Jul 2016 - Jun 2017	5769	5723	$2,987,058
Jul 2017 - Jun 2018	5517	5396	$3,140,992

Source for Tables 5 and 6: ACC unpublished data. Accessed 2020. Note: New claims are the count of claims that were registered in the specific period. This may have been after the injury occurred. Active claims are those that generated a payment in the relevant calendar year. These claims were not necessarily registered, or had the accident occur, in the same calendar year. A claim may be active in multiple periods, and will be counted in each period it is active.

4. Burn Prevention

Safekids Safety Tips for Whānau

Families are able to prevent unintentional burn injuries by implementing some simple measures in the home. The following safety tips are suggested by Safekids Aotearoa to keep children safe from hot object or substance burns and fire or flame burns:

Around the house

- Every house should have a working fire alarm on every level and in each bedroom, living area and hallway. Make a note to check them monthly and to change the battery twice a year.
- Children are inquisitive and will play with matches and lighters so keep them locked away.
- Use protective screens to stop children getting too close to fireplaces. These will also prevent their clothes from accidentally catching on fire.
- It's tempting to eat and drink or even cook while holding children but these are the most common reasons for burns and scalds. Try serving cold drinks when children are present and to have a tea break when they are sleeping.
- Tablecloths and large placemats can easily be pulled by little kids, bringing hot food and drinks down with them. To prevent this from happening, avoid using tablecloths and use only small placemats, and always put hot drinks in the middle of the table so they can't be reached.
- It takes only 1 second for a child to suffer a full thickness burn with hot tap water at 60°C. Set your hot water tap to between 50-55°C.
- Make sure you place hot appliances such as the iron and hair straighteners out of reach after they have been used.
- Put safety covers on all electrical outlets as kids love to explore and will readily put a fork or keys into a wall socket.

In the kitchen

- If you have small children around you while you are cooking, remember they love to reach, so turn pot handles towards the back and block access to the stove. Keep hot foods and drinks away from the edge of the counter.
- Before you start to cook, organise your children with activities so that you know where they are and what they are doing, or place them somewhere safe such as in a playpen or secured in a highchair for a short time.
- Include older kids in cooking so you can use the opportunity to teach them how to cook safely. Only let them use the microwave when they are tall enough to reach inside safely and remind them to always use oven gloves when taking food off the stove and out of the oven.

In the bathroom

- When you are filling the bath or sink, turn on the cold water first and turn it off last. Check your child's bath water with your wrist before letting them get in.

At the playground

- The sun can heat up playground equipment quickly and burn a child's thin skin. If it's a very hot day only use the play equipment in the morning and in the evening when it has had a chance to cool down.

Burn First Aid

Immediate cooling is critical after a burn injury, but only 70 percent of children receive good burn first aid [13]. If a burn injury occurs, the size and depth of the burn can be minimised by implementing the correct burn first aid [13] as follows:

- Run cool water from a tap or shower over the burn for up to 20 minutes or until an ambulance arrives. Use lukewarm water for babies as they can develop hypothermia.
- If your child has a serious burn or scald that is causing a lot of pain or involves their eyes, call 111 immediately.
- When the burn has cooled, carefully remove clothing from the area. Cut around the fabric if it is stuck.
- To prevent infection, loosely cover the burn (except when on the face) with a clean non-fluffy material such as a sheet (or plastic wrap), and avoid touching the burn.
- If the burn is causing on-going pain or involves the eyes, see your doctor as soon as possible.
- Call Healthline on 0800 611 116 if you are unsure what to do for ongoing treatment.

Relevant New Zealand Legislation and Standards

The following section, adapted from Craig et al. [14]] outlines key points of legislation and standards currently in place in New Zealand aimed at preventing fatalities and hospitalisations due to burns [15-20], a number of which are specifically relevant to children.

FLAMMABILITY OF CLOTHING

Children's Nightwear and Limited Daywear Having Reduced Fire Hazard (AS/NZS 1249:2014)

This product safety standard aims to help prevent injuries to children if their nightwear catches on fire. It requires that clothing suitable for children to wear as nightwear must be made of fabric less likely to burn or to have a fire hazard information label. It specifies the design, flammability performance and labelling requirements for four categories of children's nightwear garments, together with some daywear/underwear items that may be commonly used as nightwear [15,16].

Product Safety Standards (Children's Nightwear and Limited Daywear Having Reduced Fire Hazard) Regulations 2016

This regulation made under Section 29 of the Fair Trading Act 1986 stipulates that children's sleepwear and limited daywear must conform to Product Safety Standard AS/NZS 1249:2014 [17].

FLAMMABILITY OF UPHOLSTERY

Furniture - Assessment of the Ignitability of Upholstered Furniture (AS/NZS 3744:1988 reconfirmed 2013)

Ignitability characteristics of furniture can affect the ignition and spread of fires, especially when the furniture provides initial fuel for the fire (e.g. cigarette butt on couch; chair too close to a heater). This standard specifies the testing and performance requirements for the ignitability of upholstered furniture based on different ignition sources [15], (AS/NZS 3744.1.1998, 3744.2.1998 and 3744.3.1998 pertain to standards for different ignition sources i.e. smouldering cigarette, match-flame equivalent and a nominal 160mL/min gas flame and nominal 350mL/min gas flame respectively [15].

Upholstery Materials for Domestic Furniture - Smouldering Ignitability (AS/NZS 4088.1.1996 (reconfirmed 2013)

This Standard specifies testing and performance requirements for upholstery materials for domestic furniture use. While indicative of the likely ignitability characteristics of furniture items made from tested materials, variable outcomes may arise from different production methods and designs [15].

SMOKE ALARMS

Fire Detection and Alarm Systems in Buildings (NZS 4512:2010)

The Standard provides specifications for the design, manufacture, installation and maintenance of fire detection and alarm systems, whether operated manually or automatically, in the event of fire, enabling a fire warning from a fire alarm system in a building to operate at the earliest practicable moment to facilitate appropriate emergency measures. It is intended that this revised and updated Standard be used as an integral part of the Acceptable Solutions of the Compliance Documents to the New Zealand Building Code (NZBC), and also to facilitate New Zealand Fire Service approval of evacuation schemes under the Fire Safety and Evacuation of Buildings Regulations [15].

Interconnected Smoke Alarms for Single Household Units (NZS 4514:2009)

This standard sets out the requirements for the installation and commissioning of externally powered interconnected smoke alarms. It also provides information on the selection, installation, and maintenance of smoke alarms. Additional guidance has been provided for the selection of smoke alarms, and their location to avoid nuisance activations [15].

CIGARETTE LIGHTERS

The Product Safety Standards (Cigarette Lighters) Regulations 1998

These regulations demand that disposable lighters (and cheap refillable ones) are child resistant. This means that they are harder to use, not that a child cannot use them. Under the Product Safety Standards (Cigarette Lighters) Regulations 1998, cigarette lighters must comply with specific sections of 2 standards:

- ISO 9994:1995E (sets out safety performance requirements in relation to flame height, extinguishing of flame, etc.; updated to ISO 9994:2018 so regulation update likely) and
- American Standard 16 C.F.R. Part 1210 Safety Standard for Cigarette Lighters (sets out tests to establish that the lighter cannot be easily operated by a child under 5) [17].

NZ BUILDING ACT (2004) AND ASSOCIATED COMPLIANCE DOCUMENTS AND STANDARDS

Electricity Act (1992) and Gas Act (1992)

They are designed to protect the health and safety of members of the public in relation to gas and electricity use. They make provision for the regulation, supply and use of electricity and gas in New Zealand. It regulates the provision of electricity and gas, details the certification of electricians and gas fitters and enables the regulation of Standards for associated appliances. See the WorkSafe website for further information: https://worksafe.govt.nz/laws-and-regulations/acts/ [18].

HOT WATER TEMPERATURES

Building Regulations 1992 (SR 1992/150) (as at 01 January 2017)

"G12.3.6 states "If hot water is provided to sanitary fixtures and sanitary appliances used for personal hygiene, it must be delivered at a temperature that avoids the likelihood of scalding." The code requires all new and modified existing hot water systems to have hot water delivered to personal hygiene fixtures and appliances at a maximum temperature of 45°C in early childhood centres, schools and old people's homes and 55°C in all other buildings [17, 19].

It also requires that domestic hot water is stored at a minimum temperature of 60°C to prevent the growth of legionella bacteria, recommending that a tempering valve is used to control delivery temperatures [17, 19]. (Tempering valves mix hot and cold water to achieve a lower delivery temperature than the storage temperature). For further detail see: https://www.building.govt.nz/assets/Uploads/building-code-compliance/g-services-and-facilities/g12-water-supplies/asvm/g12-water-supplies-3rd-edition-amendment-9.pdf

Education (Early Childhood Services) Regulations 2008 (SR 2008/204)

Pursuant to regulation 41 of these Regulations, Licensing Criteria for Early Childhood Education and Care Centres 2008 have been set regarding the temperature of hot water that is accessible to children to prevent scalding. Criteria HS13 (Temperature of hot water from taps children can access) of the Licensing Criteria specify that the temperature of warm water delivered from any taps that children can access independently is no higher than 40°C [17,20]. For further detail see: https://www.education.govt.nz/early-childhood/licensing-and-regulations/the-regulatory-framework-for-ece/licensing-criteria/centre-based-ece-services/health-and-safety/hazards-and-outings/hs13-temperature-of-hot-water-from-taps-children-can-access/

Selection of Good Practice Interventions

A number of interventions have been shown to help prevent unintentional burn injuries in children. Below is a selection of such interventions that have been trialled and/or currently used in New Zealand and other countries, adapted from a previous Safekids publication [8].

ENGINEERING

Intervention	Evidence
Production Modification can be a primary prevention strategy to reduce risk of injuries to children [4, 21-23]	**Cigarette Lighters:** The New Zealand mandatory Product Safety Standards (Cigarette Lighters) Regulations 1998 stipulates tests to ensure that disposable lighters (and cheap refillable ones) cannot easily be operated by most children [24]. **Flammability of upholstered materials:** Modifying products associated with fire-related burn is a promising approach [4]. Bedding, mattresses, and upholstered furniture can be made with fire-retardant materials and some countries require this [4].
Smoke Alarms which are correctly installed and charged with working batteries are effective early warning devices [4,25,26]	**Working smoke alarms:** A systematic review found that death rate in households with working smoke alarms to be half the death rate of households without working smoke alarms when house fires were ignited [26]. **Hard wired and interconnected** smoke alarms are recommended by Fire and Emergency New Zealand (FENZ) wherever possible [27]. If this is not possible then photoelectric alarms are recommended [27] **Photoelectric** smoke alarms which use a light beam to detect smoke are more effective in detecting smouldering fires and have the longest functional life across battery types when operated with lithium batteries [28]. **Specialised smoke alarms for deaf** and hearing-impaired people have also been created [27]. **Maternal voice smoke alarms** have been found to be effective in waking 5 to 12 year olds and prompting them to perform a fire escape plan [29].
Fire Sprinkler systems have been proved to be highly effective at reducing deaths and property damage from fires [4, 25].	**Fire sprinklers** that are working correctly in the home have been shown to reduce death rate per fire by 82% [30]. In the US, a study of fires between 2010 and 2014 showed that the death rate per 1000 reported fires was 87% lower in properties with sprinklers than in properties with no automatic extinguishing systems [31]. Sprinklers both operated and were effective in 88% of the fires large enough to operate them [31] According to FENZ, a sprinkler installation for a new home costs on average about 2% of the build price and can reduce the amount of damage and protect occupants by containing the fire to just one room in most cases [32].

ENFORCEMENT

Intervention	Evidence
Legislation and effective enforcement can reduce the risk of burns and scalds from fire, hot water, injuries from fireworks and flammable clothing [4,25]	**Hot water temperatures:** Legislation to reduce thermostat settings, coupled with annual education notices to households would generate significant cost savings and reduce tap water burns [33,34]. Legislation regulating the temperature of household hot water from taps by requiring a safe pre-set temperature for all hot water cylinders is effective in reducing burns and more effective than educational interventions alone [4,34-36]. **Smoke alarms:** Legislation requiring the installation of smoke detectors in new and existing housing is an effective way to increase smoke detector use when combined with installation and education [37]. **Flammability of upholstery:** In addition to a mandatory smoke alarm standard in New Zealand, a mandatory standard for ignition resistance of upholstered furniture and mattresses would save an estimated extra four lives annually [38]. **Flammability of clothing:** Legislation regulating the flammability of sleepwear is effective in reducing burn injuries when enforced [4,39,40]. **Fireworks:** Legislation banning the manufacture and sale of fireworks is effective in reducing burn injuries when enforced [4, 41-44]. In New Zealand legislation around fireworks was tightened in 2008, to prohibit the sale of fireworks outside of the period 2 November to 5 November and to minors (less than 18 years old); these regulations limit the type of fireworks available, limits sparkler sales to fireworks packages of a limited number and requires testing certificates for available fireworks [45]. Countries with legislation restricting or banning the sale of fireworks have shown an 87% post-legislation reduction in the incidence rate of firework-related ophthalmic trauma [46]. One study showed a 50% reduction in number of firework related eye injuries after bottle rockets were banned in 2008 [47]. Education and advocacy campaigns around fireworks are useful as supplemental efforts to support legislation [23,42].
Reducing ignition and burning behaviour of dwellings: **Safe installations of potential hazards: solid fuel heaters** **Safe installation of gas/ electricity**	**NZ Legislation and Associated Compliance Documents and Standards:** In NZ there are legal regulations which address risks identified from analyses of fires. Enforcement is through the NZ Building Act (2004) and associated Compliance Documents and Standards, and the Electricity Act (1992) and Gas Act (1992) which detail certification requirements and licensing of trade personnel (see previous section) [15-20].

EDUCATION

Intervention	Evidence
Community school and home-based interventions may increase burn and scald prevention knowledge and reduce injury [4,55] however, educational programmes appear to be more successful when coupled with improved access to safety products or changes in legislation [4].	**Smoke Alarms:** Community and home-based smoke alarm interventions increase the proportion of households with functional smoke alarms [48-52]. Smoke alarm installation interventions are more successful when they originate from a community identifying burns prevention as an area of community interest, support a trust relationship with householders from high-risk communities, involve an education component and are embedded into wider health programmes [53,54]. **Hot water temperature reduction:** A New Zealand community injury prevention intervention including a media campaign and home-based educational programme on hot tap water temperature led to significant reduction in hot tap water temperature [56]. A combination of education, home safety checks along with thermometers or thermostatic mixing-valves are more successful than education alone in reducing hot water temperature [34].
Technology based interventions: Though still in early stages of research and evaluation of effectiveness, trials have shown technology based educational interventions to have positive effects for increasing knowledge and safety behaviour around injury prevention [57,58].	**Scald injuries:** An app-based intervention to increase knowledge of childhood burn risk (particularly hot beverage scalds) and correct burn first aid among mothers of young children in Australia was shown to be effective. It also highlighted the benefit of combining gamification elements in the intervention with real life rewards [57].
Fire safety skills training increases child and parent knowledge and fire safety behaviour [59].	**School intervention:** An evaluation of FENZ's fire safety education programme in schools, kura and early childhood education (ECE) centres including kōhanga reo showed that participating students have a greater awareness of what to do in case of a fire. Almost half of the respondents interviewed (46%) said parents/whānau also had greater awareness of fire safety messages through the programme [60]. **Home intervention:** An evaluation the Home Fire Safety Check (HFSC) program in New Zealand found it to be mostly successful at engaging at-risk groups, primarily through partnering with community organisations. The extent to which the programme was successfully delivered was however highly dependent on individual deliverers' skill sets. Overall the HFSC programme contributed to increasing fire-safety for households receiving HFSC, however the impact on high-risk groups specifically was not clear [61]. 'Risk Watch' programme in the USA and Canada, which is delivered by fire service public educators, effectively increased short term knowledge in early elementary students and improved safety skills and behaviours in school-age children [59].

Appendix One - Causes of Child Burn Injury Hospitalisations by Age, 2009-2018 [10,11]

0 to 4 Years

Cause	Number	Number per year	Rate	%
X10_Contact with hot drinks, food, fats and cooking oils	843	84.3	27.2	42%
X12_Contact with other hot fluids	454	45.4	14.7	22%
X11_Contact with hot tap water	239	23.9	7.7	12%
X15_Contact with hot household appliances	199	19.9	6.4	10%
X16_Contact with hot heating appliances, radiators and pipes	89	8.9	2.9	4%
X02_Exposure to controlled fire in building or structure	45	4.5	1.5	2%
X19_Contact with other heat and hot substances	41	4.1	1.3	2%
X08_Exposure to other specified smoke, fire and flames	23	2.3	0.7	1%
X17_Contact with hot engines, machinery and tools	18	1.8	0.6	1%
X03_Exposure to controlled fire, not in building or structure	14	1.4	0.5	1%
X09_Exposure to unspecified smoke, fire and flames	14	1.4	0.5	1%
X00_Exposure to uncontrolled fire in building or structure	13	1.3	0.4	1%
X06_Exposure to ignition or melting of other clothing and apparel	10	1	0.3	0%
X18_Contact with other hot metals	6	0.6	0.2	0%
X04_Exposure to ignition of highly flammable material	5	0.5	0.2	0%
X13_Contact with steam and other hot vapours	5	0.5	0.2	0%
X01_Exposure to uncontrolled fire, not in building or structure	2	0.2	0.1	0%
X05_Exposure to ignition or melting of nightwear	1	0.1	0.0	0%
X14_Contact with hot air and other hot gases	1	0.1	0.0	0%
Grand Total	**2022**	**202.2**	**65.3**	**100%**

- Shaded fields indicate X00-X09 - Fire/flame type injuries
- Unshaded fields indicate X10-X19 - Hot object/substance injuries

5 to 9 Years

Cause	Number	Number per year	Rate	%
X12_Contact with other hot fluids	117	11.7	3.8	34%
X10_Contact with hot drinks, food, fats and cooking oils	66	6.6	2.1	19%
X11_Contact with hot tap water	33	3.3	1.1	10%
X15_Contact with hot household appliances	20	2	0.7	6%
X08_Exposure to other specified smoke, fire and flames	14	1.4	0.5	4%
X16_Contact with hot heating appliances, radiators and pipes	13	1.3	0.4	4%
X03_Exposure to controlled fire, not in building or structure	12	1.2	0.4	3%
X19_Contact with other heat and hot substances	12	1.2	0.4	3%
X02_Exposure to controlled fire in building or structure	11	1.1	0.4	3%
X06_Exposure to ignition or melting of other clothing and apparel	11	1.1	0.4	3%
X09_Exposure to unspecified smoke, fire and flames	10	1	0.3	3%
X04_Exposure to ignition of highly flammable material	9	0.9	0.3	3%
X17_Contact with hot engines, machinery and tools	8	0.8	0.3	2%
X00_Exposure to uncontrolled fire in building or structure	5	0.5	0.2	1%
X05_Exposure to ignition or melting of nightwear	3	0.3	0.1	1%
X01_Exposure to uncontrolled fire, not in building or structure	2	0.2	0.1	1%
X18_Contact with other hot metals	1	0.1	0.0	0%
X13_Contact with steam and other hot vapours	0	0	0.0	0%
X14_Contact with hot air and other hot gases	0	0	0.0	0%
Grand Total	**347**	**34.7**	**11.3**	**100%**

- Shaded fields indicate X00-X09 - Fire/flame type injuries
- Unshaded fields indicate X10-X19 - Hot object/substance injuries

10 to 14 Years

Cause	Number	Number per year	Rate	%
X10_Contact with hot drinks, food, fats and cooking oils	48	4.8	1.6	21%
X12_Contact with other hot fluids	39	3.9	1.3	17%
X04_Exposure to ignition of highly flammable material	35	3.5	1.2	15%
X08_Exposure to other specified smoke, fire and flames	18	1.8	0.6	8%
X03_Exposure to controlled fire, not in building or structure	17	1.7	0.6	7%
X17_Contact with hot engines, machinery and tools	16	1.6	0.5	7%
X11_Contact with hot tap-water	11	1.1	0.4	5%
X02_Exposure to controlled fire in building or structure	8	0.8	0.3	3%
X19_Contact with other heat and hot substances	8	0.8	0.3	3%
X16_Contact with hot heating appliances, radiators and pipes	6	0.6	0.2	3%
X09_Exposure to unspecified smoke, fire and flames	5	0.5	0.2	2%
X15_Contact with hot household appliances	5	0.5	0.2	2%
X01_Exposure to uncontrolled fire, not in building or structure	4	0.4	0.1	2%
X00_Exposure to uncontrolled fire in building or structure	3	0.3	0.1	1%
X06_Exposure to ignition or melting of other clothing and apparel	3	0.3	0.1	1%
X13_Contact with steam and other hot vapours	2	0.2	0.1	1%
X18_Contact with other hot metals	2	0.2	0.1	1%
X05_Exposure to ignition or melting of nightwear	1	0.1	0.0	0%
X14_Contact with hot air and other hot gases	0	0	0.0	0%
Grand Total	**231**	**23.1**	**7.7**	**100%**

- Shaded fields indicate X00-X09 - Fire/flame type injuries
- Unshaded fields indicate X10-X19 - Hot object/substance injuries

0 to 14 Years

Cause	Number	Number per year	Rate	%
X10_Contact with hot drinks, food, fats and cooking oils	957	95.7	10.4	37%
X12_Contact with other hot fluids	610	61.0	6.6	23%
X11_Contact with hot tap water	283	28.3	3.1	11%
X15_Contact with hot household appliances	224	22.4	2.4	9%
X16_Contact with hot heating appliances, radiators and pipes	**108**	**10.8**	**1.2**	**4%**
X02_Exposure to controlled fire in building or structure	64	6.4	0.7	2%
X19_Contact with other heat and hot substances	61	6.1	0.7	2%
X08_Exposure to other specified smoke, fire and flames	55	5.5	0.6	2%
X04_Exposure to ignition of highly flammable material	49	4.9	0.5	2%
X03_Exposure to controlled fire, not in building or structure	43	4.3	0.5	2%
X17_Contact with hot engines, machinery and tools	42	4.2	0.5	2%
X09_Exposure to unspecified smoke, fire and flames	29	2.9	0.3	1%
X06_Exposure to ignition or melting of other clothing and apparel	24	2.4	0.3	1%
X00_Exposure to uncontrolled fire in building or structure	21	2.1	0.2	1%
X18_Contact with other hot metals	9	0.9	0.1	0%
X01_Exposure to uncontrolled fire, not in building or structure	8	0.8	0.1	0%
X13_Contact with steam and other hot vapours	7	0.7	0.1	0%
X05_Exposure to ignition or melting of nightwear	5	0.5	0.1	0%
X14_Contact with hot air and other hot gases	1	0.1	0.0	0%
Grand Total	**2600**	**260**	**28.3**	**100%**

Shaded fields indicate X00-X09 - Fire/flame type injuries
Unshaded fields indicate X10-X19 - Hot object/substance injuries

Source: IPRU, University of Otago. Accessed 2020. Analysis by Safekids Aotearoa.

References

1. Pike I, Richmond S, Rothman L, Macpherson A (eds). Canadian Injury Prevention Resource. Toronto, ON. Parachute; 2015. Available from https://parachute.ca/wp-content/uploads/2019/08/Canadian-Injury-Prevention-Resource.pdf
2. Barker R, Scott D, Hockey R, Spinks D, Pitt R. Burns and scalds in Queensland toddlers. Queensland Injury Surveillance Unit. Injury Bulletin No. 89; December 2005.
3. Kidsafe Tasmania. Scalds Factsheet. Tasmania. Child Accident Prevention Foundation of Australia; 2015. Available from https://www.kidsafetas.com.au/uploads/NCleanBlue/2015%20Updating%20of%20PDFs/Fact%20Sheets/Home%20Safety/Scalds%20fact%20Sheet.pdf
4. Peden M, Oyegbite K, Ozanne-Smith J, Hyder AA, Branche C, Rahman AF, et al. World report on child injury prevention. Geneva: World Health Organisation, UNICEF; 2008.
5. Barrett LW, Fear VS, Waitham JC, Wood FM and Fear MW. Understanding acute burn injury as a chronic disease. Burns Trauma. 2019; 7:23.
6. Safekids New Zealand. New Zealand Child Injury Statistical Data: Mortality Data 2001 – 2005, Morbidity Data 2003 – 2007. Auckland, NZ. 2009.
7. Safekids Aotearoa. Child Burns Factsheet. Auckland, NZ. Safekids Aotearoa; 2017
8. Safekids Aotearoa. Child Unintentional Deaths and Injuries in New Zealand, and Prevention Strategies. Auckland, NZ. Safekids Aotearoa; 2015.
9. Unpublished ACC data – Child burn injuries. Found at: http://www.acc.co.nz/about-acc/statistics/injury-statistics-tool/. Accessed May 2017.
10. Unpublished Child Burns Data. Injury Prevention Research Unit. Dunedin. University of Otago. Accessed in May 2020.
11. World Health Organisation. International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10)-WHO Version for 2019; Chapter XX - External causes of morbidity and mortality (V01-Y98). [cited May 2020]. Available from: https://icd.who.int/browse10/2019/en#/X10-X19
12. Unpublished ACC data – Child burn injuries. Accessed June 2020.
13. Australia & New Zealand Burn Association. Burn First Aid Factsheet [accessed May 2020]. Available from https://anzba.org.au/assets/ANZBA-Factsheet-First-aid-1.pdf.
14. Craig E, Simpson J, Park J et al. Preventing Home Based Injuries in Preschool Aged Children: An Overview of the Evidence. Dunedin. University of Otago, July 2010
15. Standards New Zealand. Ministry of Business, Innovation and Employment. Wellington, NZ. Cited in May 2020. Available from: https://www.standards.govt.nz/
16. Commerce Commission New Zealand. New Zealand Government. Wellington, NZ. Cited in May 2020. Available from: https://comcom.govt.nz/
17. New Zealand Legislation. Parliamentary Counsel Office. Wellington, NZ. Cited in May 2020. Available from: http://www.legislation.govt.nz/
18. WorkSafe Mahi Haumaru Aotearoa. Laws and Regulations. Wellington: New Zealand Government. Cited in May 2020. Available at: https://worksafe.govt.nz/laws-and-regulations/acts/
19. Ministry for Business, Innovation and Employment. Acceptable solutions and verification methods for New Zealand Building Code Clause G12 Water Supplies. Wellington: New Zealand Government. Cited in May 2020. Available from: https://www.building.govt.nz/assets/Uploads/building-code-compliance/g-services-and-facilities/g12-water-supplies/asvm/g12-water-supplies-3rd-edition-amendment-9.pdf
20. Ministry of Education. Licensing criteria for centre based ECE services. Wellington: New Zealand Government. Cited in May 2020. Available from: https://www.education.govt.nz/early-childhood/licensing-and-regulations/the-regulatory-framework-for-ece/licensing-criteria/centre-based-ece-services/health-and-safety/hazards-and-outings/hs13-temperature-of-hot-water-from-taps-children-can-access/
21. Viscusi WK and Cavallo GO. The effect of product safety regulation on safety precautions. Risk Anal. 2006; 14(6): 917 – 930.
22. Smith LE, Greene MA and Singh HA. Study of the effectiveness of the US safety standard for child resistant cigarette lighters. Inj Prev. 2002; 8(3): 192 – 196.
23. Warda LJ and Ballesteros MF. Interventions to prevent residential fire injury. In: Doll PS, Bonzo SE, Mercy JA and Sleet DA, editors. Handbook of Injury and Violence Prevention. Atlanta, Georgia; 2007. P. 97 – 116.
24. Commerce Commission NZ. Product Safety Standards – Cigarette Lighters. Factsheet July 2018. [cited May 2020]. Available from https://comcom.govt.nz/__data/assets/pdf_file/0019/61372/Product-safety-standards-Cigarette-lighters-Fact-sheet-July-2018.pdf
25. Clarke A, Campbell S and Arnaldo BCD. Chapter 4: Prevention of Burn Injuries. In: Total Burn Care (Fifth Edition), 2018. P. 28-35e2.
26. Rohde D, Corcoran J, Sydes M and Higginson A. The association between smoke alarm presence and injury and death rates: A systematic review and meta-analysis. Fire Saf. J. 2016; 81:58-63.
27. Fire and Emergency New Zealand. Wellington, NZ: FENZ; undated. Smoke Alarms [cited May 2020]. Available from: https://fireandemergency.nz/at-home/smoke-alarms/
28. Peek-Asa C, Yang J, Hamann C et al. Smoke alarm and battery function 42 months after installation. Am J Prev Med 2010; 39: 368-71
29. Smith GA, Chounthirath T and Splaingard M. Effectiveness of a Voice Smoke Alarm Using the Child's Name for Sleeping Children: A Randomized Trial. J Ped, 2019 (205): 250-256.e1
30. Hall JR. The U.S. experience with sprinklers. Quincy, MA: National Fire Protection Association; 2013.
31. Ahrens, M. U.S. Experience with Sprinklers. Quincy, MA: National Fire Protection Association; 2017 [accessed May 2020]. Available from https://www.nfpa.org/-/media/Files/News-and-Research/Fire-statistics-and-reports/Suppression/ossprinklers.pdf

32. Fire and Emergency New Zealand. Wellington, NZ: FENZ; undated. Home Sprinklers [cited May 2020]. Available from: https://fireandemergency.nz/at-home/home-sprinklers/
33. Han RK, Ungar WJ and Macarthur C. Cost-effectiveness analysis of a proposed public health legislative/educational strategy to reduce tap water scald injuries in children. Inj Prev. 2007, 13(4): 248 – 253.
34. Zou K, Wynn PM, Miller P, et al. Preventing childhood scalds within the home: Overview of systematic reviews and a systematic review of primary studies. Burns. 2015;41(5):907-924.
35. Clouatre E, Pinto R, Banfield J and Jeschke MG. Incidence of hot tap water scalds after introduction of regulations in Ontario. J Burn Care Res. 2013; 34(2): 243 – 248.
36. Harvey LA, Poulos RG, Finch CF, Oliver J and Harvey JG. Hospitalised hot tap water scald patients following the introduction of regulation in NSW, Australia: Who have we missed? Burns. 2010; 36(6): 912 – 919.
37. Ballesteros MF, Jackson ML, Martin MW. Working towards the elimination of residential fire deaths: The Centre for Disease Control and Prevention's smoke alarm installation and fire safety (SAIFE) program. J Burn Care Rehabil. 2005; 26:434 - 439.
38. Wade CA, Duncanson M, O'Dea D and Duncan CR. Costs and benefits of regulating fire safety performance of upholstered furniture in New Zealand. New Zealand Fire Service Commission Research Report Number 35. Porirua: Building Research Association of New Zealand, New Zealand Fire Service Commission 2003.
39. World Health Organisation. Burn Prevention: Success stories and lessons learned. 2011. Geneva: WHO. Available from https://www.who.int/violence_injury_prevention/publications/other_injury/burn_success_stories/en/
40. Laing RM and Bryant V. Prevention of burn injuries to children involving nightwear. NZ Med J. 1991; 104(918): 363 – 365.
41. Edwin AF, Cubison, TC, Pape SA. The impact of recent legislation on paediatric fireworks injuries in the Newcastle upon Tyne region. Burns. 2008; 34(7):953-964.
42. Scottish Government. Fireworks legislation and impacts: International evidence review 2019. Accessed 21/05/2020. Available from: https://www.gov.scot/publications/fireworks-legislation-impacts-international-evidence-review/pages/6/
43. Bull N. Legislation as a tool to prevent firework related eye injuries. Acta Ophthalmol. 2011; 89(8): e654 – e655.
44. Espitia-Hardeman V, Borse NN, Dellinger AM, Betancourt CE, Caicedo LD and Portillo C. The burden of childhood injuries and evidence-based strategies developed using the injury surveillance system in Pasto, Colombia. Inj Prev. 2011; 17 (Suppl I): i38 – i44.
45. New Zealand Government. Hazardous Substances (Fireworks) Regulations 2001. Reprint as at 1 December 2017. Accessed 21/5/2020. Available from: http://www.legislation.govt.nz/regulation/public/2001/0121/latest/DLM42471.html
46. Wisse, RPL, Bijlsma WR and Stilma JS. Ocular firework trauma: a systematic review on incidence, severity, outcome and prevention. Br J Ophthalmo. 2010; 94(12): 1586 – 1591.
47. Jeyabal P, Davies L, Rousselot A. et al. Fireworks: boon or bane to our eyes. Int Opthalmol. 2019; 39(10): 2407 – 2411.
48. Istre GR, McCoy MA, Moore BJ et al. Preventing deaths and injury from house fires: an outcome evaluation of a community-based smoke alarm installation programme. Inj Prev. 2014;20(2):97-102.
49. Tannous WK, Whybro M, Lewis C, Ollerenshaw M, Watson G, Broomhall S, Agho K. Using a cluster randomized controlled trial to determine the effects of intervention of battery and hardwired smoke alarms in New South Wales, Australia: Home fire safety checks pilot program. J Safety Res. 2016; 56: 23-27.
50. Miller TR, Bergen G, Ballesteros MF, Bhattacharya S, Gielen AC and Sheppard MS. Increasing smoke alarm operability through theory-based health education: a randomised trial. J Epidemiol Public Health Rev. 2014; 68(12), 1168-1174.
51. Wang Y, Glelen AC, Magder LS, Hager E, Black M. A randomised safety promotion intervention trial among low-income families with toddlers. Inj Prev. 2018; 24(1): 41 – 47.
52. Kendrick D, Young B, Mason-Jones AJ, Ilyas N, Achana FA, Cooper NJ et al. Home safety education and provision of safety equipment for injury prevention. Cochrane Libr. 2012.
53. Kelly S and Campin M. Home Fire Safety Checks Evaluation Phase 2 Final Report. Wellington, NZ: New Zealand Fire Service Commission 2015. Research Report Number 145.
54. Pearson M, Garside R, Moxham T and Anderson R. Prevention unintentional injuries to children in the home: a systematic review of the effectiveness of programmes supplying and/or installing home safety equipment. Health Promot Int. 2011; 26(3): 376 – 392.
55. Turner C, Spinks A, McClure R and Nixon J. Community-based interventions for the prevention of burns and scalds in children. Cochrane Database Syst Rev. 2012.
56. Waller AE, Clarke JA and Langley JD. AN evaluation of a program to reduce home hot tap water temperatures. Aust J Public Health. 1993; 17(2): 116 – 123.
57. Burgess J, Watt K, Kimble RM and Camerson CM. Combining Technology and Research to prevent scald injuries (the Cool Runnings Intervention): Randomized Controlled Trial. J Med Internet Res. 20(10): e10361, p1.
58. Omaki E, Rizzuti N, Shields W, Zhu J, McDonald E, Stevens MW, Gielen A. A systematic review of technology-based interventions for unintentional injury prevention education and behaviour change. Inj Prev. 2017; 23: 138 - 146.
59. Klas KS, Vlahos PG, McCully MJ, Piche DR, Wang SC. School-based prevention program is associated with increased short- and long-term retention of safety knowledge. J Burn Care Res. 2015; 36(3):387-93.
60. New Zealand Council for Education Research. Fire Safety in Schools, Kura, ECE Centres and Kōhanga Reo: Looking to the Future. Wellington: Fire and Emergency New Zealand, 2018. Cited May 2020. Available from: https://fireandemergency.nz/assets/Documents/Files/Report-163-Fire-safety-in-schools-kura-ECE-centres-and-kohanga-reo.pdf
61. New Zealand Fire Service. Home Fire Safety Checks Evaluation Phase 2. Evaluation Consult Research Report Number 145. 2015. Cited May 2020. Available from: https://fireandemergency.nz/assets/Documents/Research-and-reports/Report-145-Home-Fire-Saftey-Checks-Evaluation-Phase-2.pdf

safekids
Aotearoa

5th Floor, Cornwall Complex
40 Claude Road, Epsom, Auckland 1023, New Zealand
PO Box 26488, Epsom, Auckland 1344, New Zealand

P +64 9 630 9955
E infocentre@safekids.org.nz

www.starship.org.nz/safekids /SafekidsAotearoa /SafekidsNZ /SafekidsNZ

Safekids Aotearoa's mission is to reduce the incidence and severity of unintentional injuries to children in New Zealand aged 0-14 years.