

Annual Hazardous Substances Injury Report 2016

Report to the Ministry of Health

21 November 2016

Author

This report was written by Fei Xu, Analyst, Environmental Health Indicators Programme, Centre for Public Health Research (CPHR), Massey University.

Suggested citation: Environmental Health Indicators Programme. (2016). *Annual Hazardous Substances Injury Report*. Wellington, Centre for Public Health Research, Massey University.

Disclaimer: The data analysed in this report were supplied to the Environmental Health Indicators team, Centre for Public Health Research, Massey University by the New Zealand National Coronial Information System, Ministry of Health, New Zealand Fire Service, and the National Poisons Centre. For more information on the data sources see <http://www.health.govt.nz/nz-health-statistics>, <http://www.ncis.org.au/>, <http://www.fire.org.nz/About-Us/Facts-and-Figures/Pages/Statistics-Data-Fields.html>, <http://www.poisons.co.nz/>.

The Environmental Health Indicators team makes no warranty, express or implied, nor assumes any legal liability or responsibility for the use of the Report or its contents by any other person or organisation.

For any enquiries about these data please contact Fei Xu, (04) 979 3381, f.xu@massey.ac.nz.

Table of Contents

Executive Summary	4
Key Findings.....	4
Introduction.....	5
The Hazardous Substances Surveillance System (HSSS).....	5
Degrees of injury severity	5
What's in this report?.....	7
Definitions	7
Data sources.....	8
Statistical Notes.....	8
National Mortality Collection (2006-2013).....	10
Coronial data (2007-2014).....	14
National Minimum Dataset (2006-2015).....	17
Primary care notifications (2014-2015)	24
Lead notifications	24
Hazardous substances notifications.....	28
Agrichemical spray-drift notifications	30
Hazardous substances incidents (2009-2015)	31
Hazardous substance-related telephone calls (2009-2015)	34
Conclusion	37
References	38
Appendix 1: Technical Notes	39
Appendix 2: External cause codes (E-code)	40
Appendix 3: Diagnosis/Nature of injury codes	41
Appendix 4: Map of District Health Boards	48
Appendix 5: Age-standardised rate per 100,000 population of hospital discharges from hazardous substances injuries by DHB, 2015	49

Executive Summary

The report presents data from the Hazardous Substances Surveillance System (HSSS), initiated in 2010 by the Centre for Public Health Research (CPHR), on the health effects of exposure to hazardous substances.

Deaths and injuries continue to occur from hazardous substance exposures that appear to be entirely preventable. A high proportion of these incidents is caused by hazardous substances used in everyday domestic and workplace situations.

The following is a summary of key findings on the health effects of hazardous substances.

Key Findings

- There were 44 hazardous substances-related deaths registered in 2013 compared to 46 deaths in 2012
- Males had higher rates of mortality than females from hazardous substances
- There were no deaths of children less than five years old from 2006 to 2013 due to hazardous substances exposure
- Toxic effects of carbon monoxide contributed to 354 deaths between 2006 and 2013, of which 337 were intentional exposures or suicides. Death from carbon monoxide exposure was most common in the 25-44 year (131 deaths) and 45-64 year (139 deaths) age groups
- On average, 15 deaths from exposure to a hazardous substance are referred to the coroner every year
- There were 632 hazardous substances-related hospital discharges in 2015 compared to 677 in 2014
- Children under five years old and young adults (15-24 years) had the highest rates of hospital discharges from hazardous substances injuries in New Zealand. For children under five years, 347 (39%) of these injuries were from solvents, hydrocarbons and corrosive substances
- Māori had a higher hospital discharge rate from hazardous substances injuries than non-Māori for each of the last 10 years
- From 2006-2015, over half (3665 discharges) of all hazardous substances-related hospital discharges were from injuries that occurred in the home
- Hospital discharges due to hazardous substances exposure increased with socio-economic deprivation
- There were 121 lead absorption notifications in 2015, seven of which were for children under 15 years old
- Painters (16 notifications) were the occupational group most exposed to lead in 2015
- Lead-based paint was the most common source of non-occupational/unknown lead exposure for both children and adults
- There were 61 hazardous substances notifications in 2015, five of which were for children under five years old
- The New Zealand Fire Service attends over 1200 hazardous substances incidents each year. Ammonia, methane, and chlorine were the most common substances involved in the more serious (level 2, 3 or 4) incidents
- Over half (4395/8220) of the hazardous substances-related calls to the National Poisons Centre in 2015¹ involved children less than five years of age
- Calls regarding exposure to household agents, and more specifically household cleaners (813 calls) and detergents (387 calls), most frequently involved children. Of all agricultural agents, rodenticides (61 calls) were the most commonly reported product involving children.

¹ Data were available for nine months only

Introduction

The Hazardous Substances Surveillance System (HSSS)

The HSSS was established in 2010 by the Centre for Public Health Research (CPHR), Massey University Wellington, with funding from the Ministry of Health. The HSSS was developed to meet a legal requirement² for medical practitioners to notify injury caused by hazardous substances to a Medical Officer of Health. Separate legislation requires medical practitioners to notify elevated blood lead levels, and cases of poisoning arising from chemical contamination of the environment³. Although there is no legal requirement to report deaths, the HSSS includes deaths as they are the most severe form of hazardous substances injury.

The HSSS has four goals:

- To describe the distribution and characteristics of exposure to hazardous substances.
- To describe the morbidity and mortality experienced by workers and the general public (including children) as a result of exposure to hazardous substances.
- To provide high-quality information on outcomes, exposures, and hazards for monitoring, policy development, measuring compliance and control.
- To identify strategies that might reduce future morbidity and mortality resulting from exposure to hazardous substances.

Degrees of injury severity

The HSSS monitors data from several different sources which capture hazardous substances injuries of different severity. These include:

- mortality data
- coroners' reports
- hospital discharges
- primary care notifications
- hazardous substance incident reports
- National Poisons Centre calls.

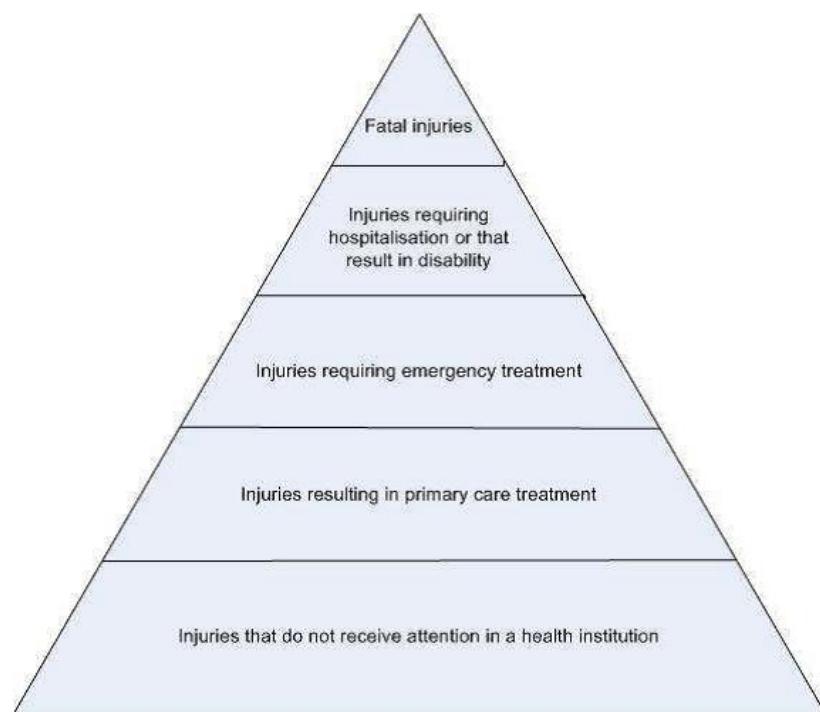
To obtain robust and meaningful data on the incidence and prevalence of hazardous substance injuries and deaths, data capture has to be extended to all five levels of the 'injury pyramid' (Figure 1). The injury pyramid reflects the relationship between injury severity and the number of injuries that occur. Deaths are the most severe form of hazardous substances injury. They are fewer in number, but more easily ascertained.

Conversely, the bottom of the pyramid represents injuries that do not require formal medical care. However, this is where the greatest number of injuries occur. Reviewing data from different levels of injury severity (mortality data through to National Poisons Centre call logs) enables more complete surveillance of hazardous substances injuries and deaths, and ultimately helps to prevent future disease and injury.

² Hazardous Substances and New Organisms Act 1996, s 143.

³ Health Act 1956, Schedule 2.

Figure 1: Injury Pyramid



Source: Adapted from (Espitia-Hardeman and Paulozzi, 2005)

What's in this report?

The report provides evidence for agencies (eg, government departments) involved in policy development and decision-making about hazardous substances, and provides information for researchers, health practitioners, regional and community organisations, and the wider public.

It presents findings on hazardous substances-related injuries from the following data sources:

- National Mortality Collection
- National Coronial Information System (NCIS)
- National Minimum Dataset (NMDS)
- Hazardous Substances Disease and Injury Reporting Tool (HSDIRT)
- New Zealand Fire Service
- National Poisons Centre (NPC).

Results are presented to answer three guiding questions from each source.

- What is the current level of injury from hazardous substances in the population?
- How has it changed?
- Who are more at risk from diseases and injuries from hazardous substances?

This report presents key statistical information through graphs and tables, with short comments about the noteworthy results. Trends over time are presented where possible.

Definitions

What is a hazardous substance?

The Hazardous Substances and New Organisms (HSNO) Act 1996 regulates all substances that are classified as hazardous in New Zealand. In HSNO terms, a substance is considered hazardous if it triggers any one of the threshold levels for any of the following properties:

- explosiveness
- flammability
- oxidising capacity
- corrosiveness
- toxicity
- ecotoxicity.

Hazardous substances can, however, have more than one hazardous property such as methylated spirits and petrol which are both toxic and flammable. A substance is also considered hazardous if it generates a substance with any or more of these hazardous properties when it comes into contact with air or water.

The report therefore only includes injuries by hazardous substances as defined in the HSNO Act. It excludes poisonings from medicines in fixed dose form, alcohol, drugs, and cases where the substance was carbon monoxide and the source was not from the combustion of gas from a cylinder.

The HSNO Act was designed to protect people from the everyday use of hazardous substances, therefore, does not manage suicide. However, intentional harm has been included in this report as it is an important cause of deaths from hazardous substances in New Zealand.

Data sources

Numerators

Details on the data obtained, their sources and time periods are presented in Table 1.

Table 1: Sources of data

Source	Data	Period
Ministry of Health	Mortality	2006-2013
	National Minimum Dataset (hospital discharges)	2006-2015
New Zealand National Coronial Information System	Coroners' findings	2007-2014
Hazardous Substances Disease and Injury Reporting Tool	Primary Care notifications	2014-2015
New Zealand Fire Service	Hazardous substances incidents	2009-2015
National Poisons Centre	Hazardous substances calls	2009-2015
Statistics New Zealand	Population estimates	2006-2013
	Population projections	2014-2015

National Minimum Dataset (NMDS)

A 'hospital discharge' includes a person that has been admitted to hospital and later discharged. However, this does not include those who have been discharged home directly from the emergency department.

It is important to note that hospital events recorded in the NMDS represent individual events rather than individual people. The number of events will be higher than the number of people because one person can contribute numerous unique hospital events to the dataset.

Readmissions have been excluded from the data set. In this report, a 'readmission' is defined as the unintended acute readmission of a patient from any injury within 30 days of discharge. Patients dying in hospital are also included.

Further information on the NMDS and the National Mortality Collection can be found in Appendix 1.

Causes of injury were assigned using the external-cause and nature-of-injury codes. External causes reflect the mechanism of the injury. The nature of injury reflects the clinical diagnosis. A full list of external-cause (E code) and diagnosis/nature-of-injury codes is provided in Appendix 2.

Statistical Notes

Age-specific and age-standardised rates

Data is presented primarily as numbers and rates. All age-standardised rates account for differences in population structure, and can be used to compare groups with different age structures (e.g., males and females, or Māori and non-Māori) and data from different years. Age-gender-specific rates are calculated to measure the frequency of hazardous substances-related deaths, hospital discharges, or notifications for specific groups.

In this report, age-standardised rates are standardised to the World Health Organization (WHO) world standard population. Rates are presented per 100,000 population (Ahmad et al., 2001).

Denominators

Mid-year population estimates from 2006 to 2013 and population projections from 2014 to 2015 were the denominators for mortality, hospitalisation, and primary care notification rates. Denominators for the non-Māori rates were constructed by subtracting the Māori population estimates from the total New Zealand population estimates for each year.

Area deprivation

The NZDep2006 and NZDep2013⁴ index of small area deprivation were used to examine patterns by socioeconomic status. It ranks small areas from the least deprived (decile 1) to the most deprived (decile 10). Deprivation quintiles are used in this report. Each NZDep quintile contains about 20 percent of small areas in New Zealand. Quintile 1 represents people living in the least deprived 20 percent of small areas. Quintile 5 represents people living in the most deprived 20 percent of small areas.

⁴ NZDep2006 was applied to year 2006 to 2009 and NZDep2013 was applied to year 2010 to 2015.

National Mortality Collection (2006-2013)

This section provides key findings on hazardous substances deaths from the National Mortality Collection, which is maintained by the Ministry of Health. The delay in finalising the mortality data is due primarily to the release of the coroners' reports once an investigation has been completed.

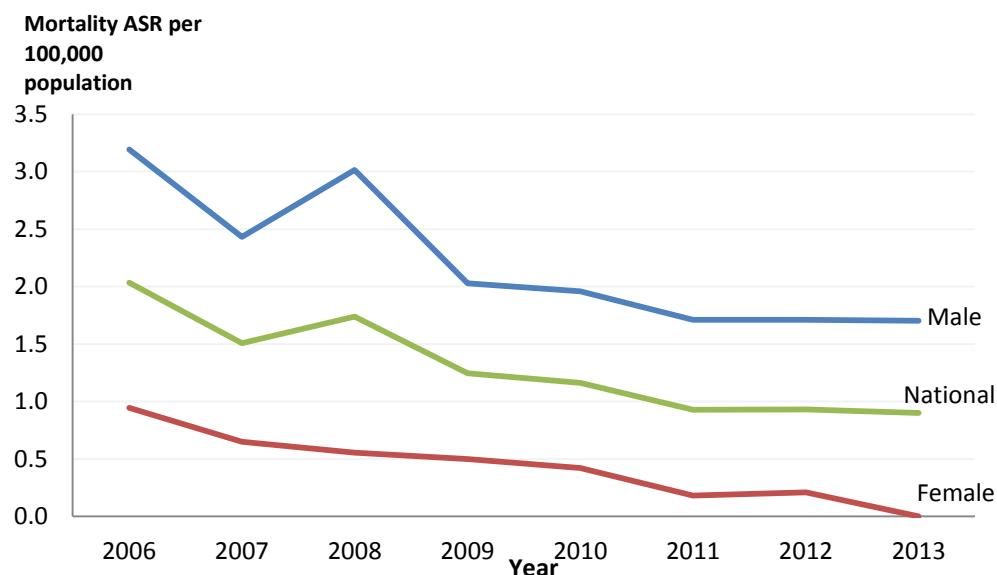
Key findings

- There were 44 hazardous substances-related deaths registered in 2013. The number of deaths has significantly decreased since 2006
- Males continue to have higher rates of mortality than females from hazardous substances
- Intentional exposure to hazardous substances accounted for 81 percent (391/483) of deaths between 2006 and 2013
- From 2006-2013, there were no hazardous substances-related deaths of children less than five years old
- Toxic effects of carbon monoxide contributed to 354 deaths between 2006 and 2013.

Deaths from hazardous substances are decreasing

There were 44 hazardous substances-related deaths registered in 2013. This represents a 52 percent decrease in the number of hazardous substances deaths since 2006 (91 deaths). Figure 2 shows a downward trend in the national mortality rate.

Figure 2: Age-standardised rate (ASR) per 100,000 population of hazardous substances deaths by gender, 2006-2013



Source: National Mortality Collection

Note: ASR was not calculated for counts smaller than five.

Deaths from hazardous substances are more common in males than females

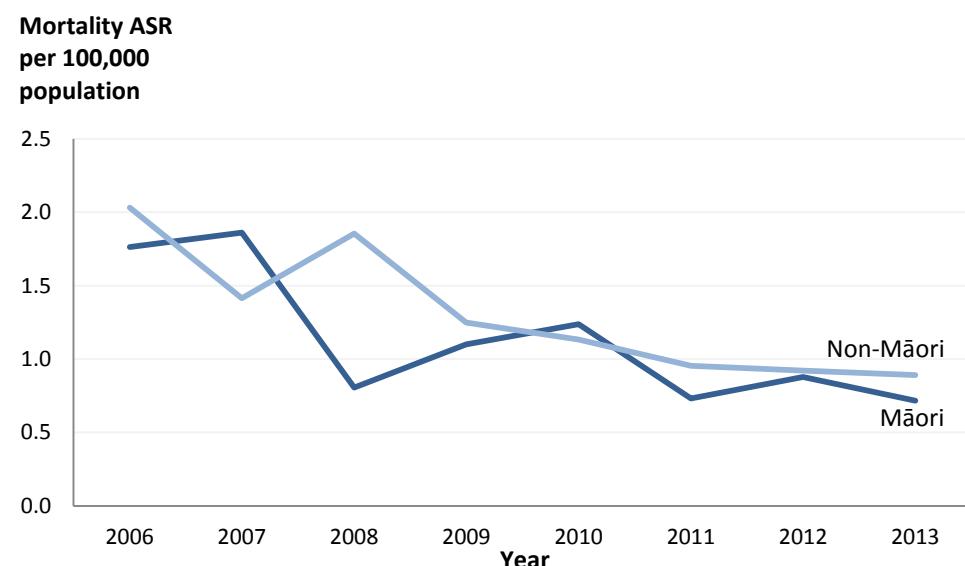
Between 2006 and 2013, the male age-standardised mortality rates from a hazardous substance were three to nine times greater than the female rates (Figure 2). These results are similar to those previously found (Peiris-John, Kool, & Ameratunga, 2014). While the rate for males has steadily declined over time, there were some fluctuations between 2006 and 2009. The number and rate of female deaths from a hazardous substance has declined over time. In 2013, only four female deaths were reported, the lowest since 2006.

No clear ethnic difference in deaths from hazardous substances

The age-standardised mortality rates from a hazardous substance for Māori and Non-Māori fluctuated from 2006 to 2013 with a decreasing trend (Figure 3). The Māori death rate from a hazardous substance was 0.71 per 100,000 population in 2013, the lowest since 2006.

Overall, there were no clear ethnic differences in deaths from a hazardous substance for Māori and Non-Māori.

Figure 3: Age-standardised rate (ASR) per 100,000 population of hazardous substances deaths by ethnicity, 2006-2013

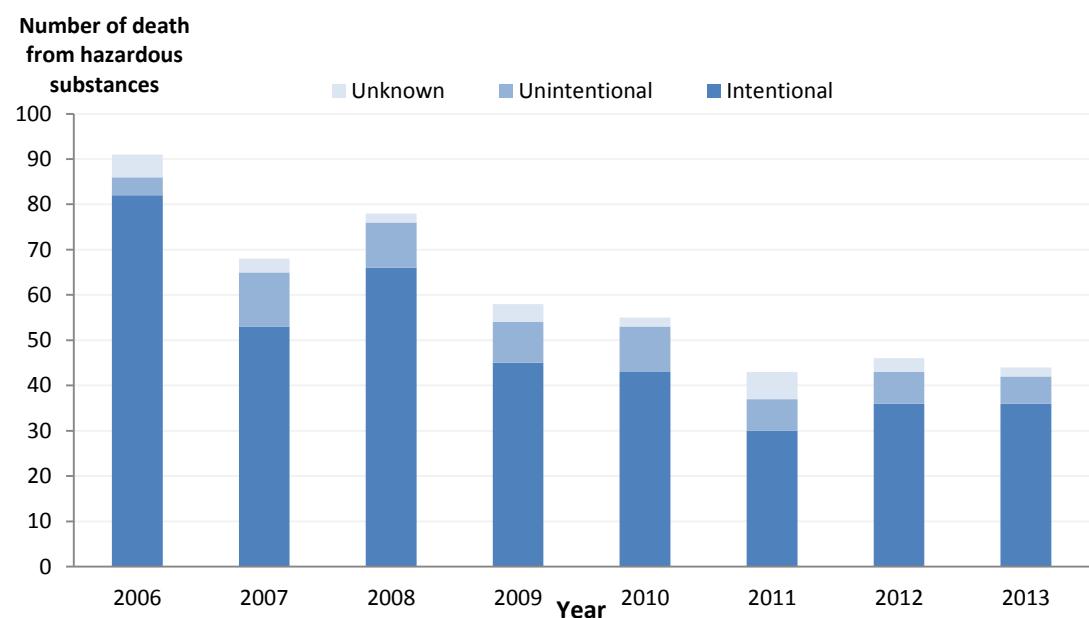


Source: National Mortality Collection

Four out of five of hazardous substances deaths were due to intentional exposure

Between 2006 and 2013, there were 483 deaths from hazardous substances, of which 391 (81%) were attributed to intentional exposure, 65 (13%) were unintentional, and the intent was unknown for 27 deaths (6%) (Figure 4).

Figure 4: Number of hazardous substances-related deaths by intent, 2006-2013



Source: National Mortality Collection

There were no hazardous substances-related deaths of children less than five years old

From 2006 to 2013, there were no reported hazardous substances-related deaths of children less than five years old (Table 2). The youngest death occurred in a child in the 5-14 years old age group due to exposure to petroleum products. The 45-64 and 25-44 year age groups contributed to 35 and 33 percent of all hazardous substances deaths respectively.

There were eight deaths in the 5-14 year age group, of which five were due to inhaling butane and three⁵ were petrol-related. The remaining child suffered burns from an explosion. Six of the eight deaths in the 5-14 year age group were from the most deprived areas (NZDep06 and NZDep13 quintile 5⁶).

Table 2: Number of deaths from hazardous substances, by age group and cause of death, 2006-2013

Cause of death	Age groups (years)					
	05-14	15-24	25-44	45-64	65+	Total
Pesticides				2	1	9
Organic solvents and halogenated hydrocarbons and their vapours	2	5	7	3		17
Other and unspecified chemicals and noxious substances		2	9	3	3	17
Explosion of other materials	1	2	1	4	1	9
Exposure to ignition of highly flammable material		1		1	3	5
Explosion and rupture of gas cylinder		1		3		4
Explosion and rupture of other specified pressurized devices			1			1
Explosion and rupture of pressurized tyre, pipe or hose					1	1
Other gases and vapours	5	63	142	148	53	411
Total	8	76	161	171	67	483

Source: National Mortality Collection

⁵ One case was exposed to both butane and petrol

⁶ NZDep2006 was applied to year 2006 to 2009 and NZDep2013 was applied to year 2010 to 2015.

Toxic effects of carbon monoxide contributed to the majority of deaths

Toxic effects of carbon monoxide contributed to 354 deaths between 2006 and 2013, of which 337 deaths were intentional exposures or suicides. Death from carbon monoxide exposure was most common in the 25-44 (131 deaths) and 45-64 (139 deaths) year age groups. Common sources of carbon monoxide include running a vehicle in a confined space such as a garage, unflued gas heaters, burning fuel in a confined space, gas stoves not working properly, or broken or blocked chimneys (WorkSafe New Zealand, 2010).

Coronial data (2007-2014)

This section summarises key findings on hazardous substances deaths from the National Coronial Information System (NCIS). The NCIS is a data repository for mortality data from all Australian and New Zealand coroners. It includes all deaths reported to a coroner since July 2007. All deaths that result from acute hazardous substances injury are deemed to be suspicious; therefore, a coroner's inquest should be completed. New Zealand case information is only available on the NCIS once the coroner has completed the investigation.

Key findings

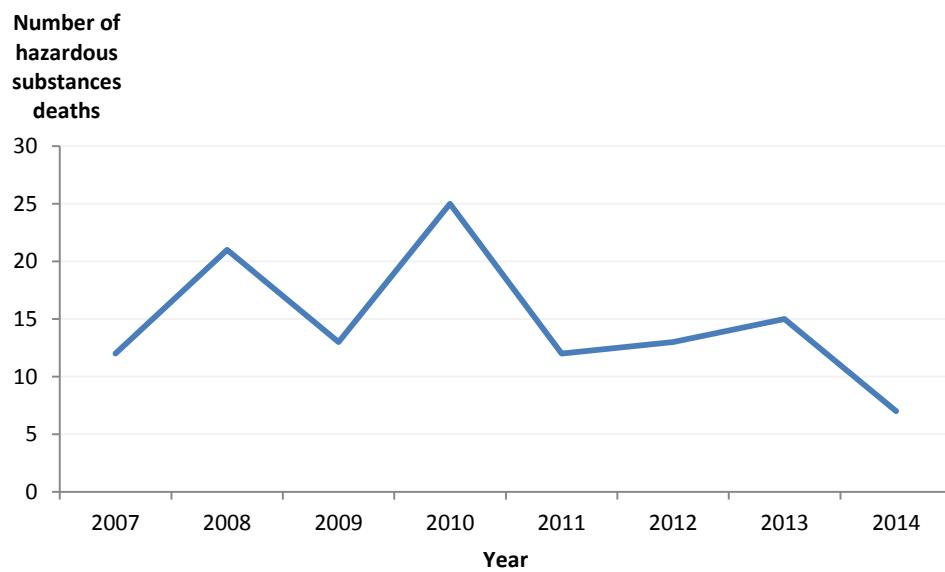
- On average, 15 deaths are referred to the coroner due to hazardous substances exposure every year
- Males outnumbered females in both unintentional and intentional causes of death from hazardous substances
- There were no deaths from hazardous substances that were reported to the coroner for children less than five years old between 2007 and 2014
- Toxic gases (e.g. liquid petroleum gas (LPG), butane, propane and methane) were the most common substances causing death, especially in the 15-24 year age group.

Approximately 15 deaths from hazardous substances are referred to the coroner each year

There were 118 hazardous substances deaths referred to the coroner from 2007 to 2014, which equated to approximately 15 deaths per year on average (Figure 5). There were seven deaths reported to the coroner in 2014 due to hazardous substances, compared to 15 deaths in 2013.

The 2015 HSS report reported 13 deaths for 2013 – this number has increased due to the completion of additional coronial investigations.

Figure 5: Number of hazardous substances deaths reported to the coroner, 2007-2014



Source: National Coronial Information System

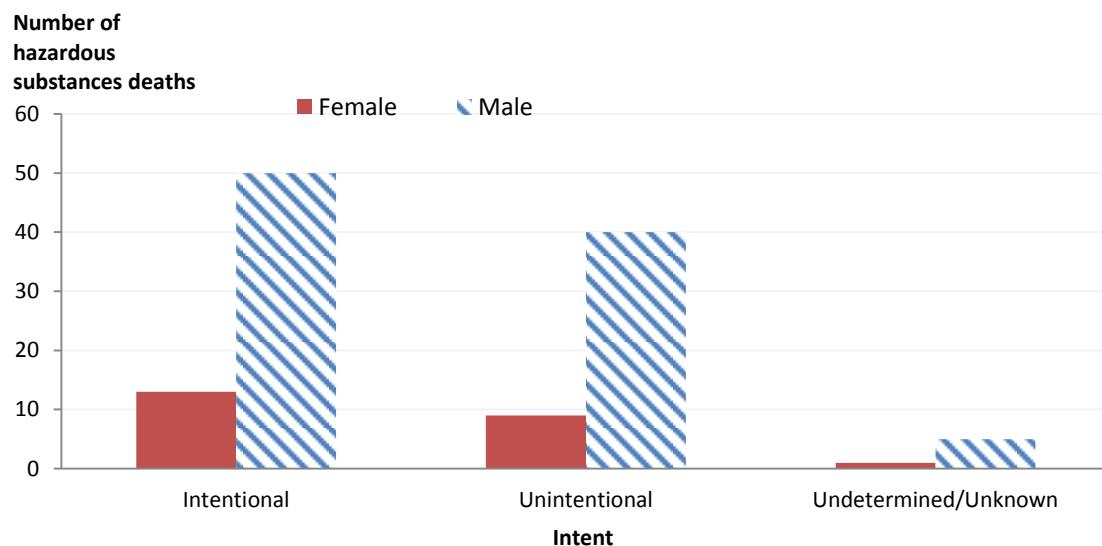
Note:

1. Only cases that were closed by coroners were included in this report.
2. This report is based on information recorded in the NCIS as at 27 October 2016. Updates or additions made to the coronial dataset are not reflected in this report.

Males had more deaths from hazardous substances exposure than females

From 2007 to 2014, the majority of hazardous substances deaths were from males (95/118 deaths) (Figure 6). Intent was recorded according to the judgement of the coroner. During 2007-2014, more than half (63/118) of deaths from hazardous substances were intentional, and 49 deaths unintentional. Males outnumbered females in both intentional and unintentional cause of deaths.

Figure 6: Number of hazardous substances deaths reported to the coroner, by intent and gender, 2007-2014



Source: National Coronial Information System

Toxic gases were the leading causes of exposure among 15-24 years olds

From 2007 to 2014, toxic gases such as liquid petroleum gas (LPG), methane, propane, and butane were the most common substances causing death, with the 15-24 year age group the most affected (Table 3). Carbon monoxide was the second most common cause of deaths.

Table 3: Number of hazardous substances deaths reported to the coroner, by substance group and age group, 2007-2014

Substance causing injury	Age groups (years)					Total
	5-14	15-24	25-44	45-64	65+	
LPG Gas, Natural Gas, Methane Gas, Propane Gas, Butane Gas	4	21	3	2	1	31
Other Sources of Carbon Monoxide		2	7	11	2	22
Cyanide		1	5	1	1	8
Weed Killer, Herbicide			1	4	3	8
Ethylene Glycol, Antifreeze		1	3	3		7
Petrol, Diesel, Gasoline	1	4	2			7
Other Specified Non-Pharmaceutical Chemical Substance			4	1		5
Methylated Spirits		1	1	1		3
Other Insecticide		1		1	1	3
Paraquat			1	2		3
Alcohol, Methanol NEC		1	1			2
Explosive			1	1		2
Hydrogen Sulphide					2	2
Organophosphate NEC				1	1	2

Other Specified Pesticide Herbicide	1	1		2
Barbeque, Weber Grill, Outdoor Cookers/Griller, Outdoor Clay Oven		1		1
Drain Cleaners			1	1
Epoxy		1		1
Helium Gas		1		1
Lubricating Oils, Motor Oil	1			1
Other Specified Object/Substance		1		1
Paint, Varnish, Stain		1		1
Plant Food or Fertiliser, Plant Hormones		1		1
Sodium Hydroxide, Caustic Soda		1		1
Toluene		1		1
Unspecified Fuel or Solvent		1		1
Total	5	34	36	31
			12	118

Source: National Coronial Information System

National Minimum Dataset (2006-2015)

The following section presents key findings on publicly funded hospital discharges involving hazardous substances injuries. This is derived from the National Minimum Dataset (NMDS) which is maintained by the Ministry of Health.

Key findings

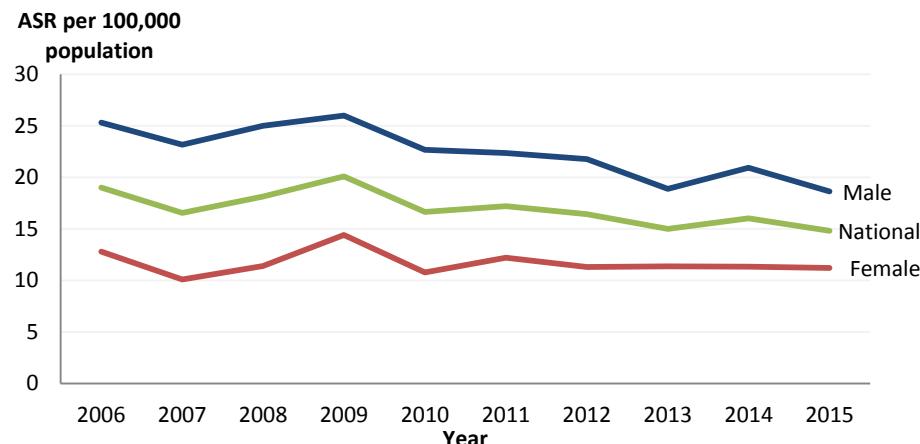
- There were 632 hazardous substances-related hospital discharges in 2015
- On average, there were approximately 700 hospital discharges from exposure to hazardous substances every year from 2006 to 2015
- Each year more males were hospitalised from exposure to hazardous substances than females
- Children under five years old and young adults (15-24 years) had the highest rates of hospital discharges from hazardous substances injuries in New Zealand
- Māori had higher hospital discharge rates from hazardous substances than non-Māori
- The most common cause of hazardous substances injury for children under the age of five years was solvents, hydrocarbons and corrosive substances
- From 2006 to 2015, over half (3665 hospital discharges) of all hazardous substances injuries occurred in the home
- Hospital discharges due to hazardous substances exposure generally increased with socio-economic deprivation.

There were 632 hazardous substances-related hospital discharges in 2015

In 2015, there were 632 hazardous substances-related hospital discharges. During the ten-year period reviewed (2006 to 2015), there were 6971 hospital discharges attributed to hazardous substances exposure, an average of 697 per year.

Each year males had a higher hospital discharge rates compared to females (Figure 7). While hospital discharges can be regarded as an indicator of severity, it is a major undercount of exposure to hazardous substances as not all diseases and injuries will require hospitalisation.

Figure 7: Age-standardised rate (ASR) per 100,000 population of hospital discharges from hazardous substances by gender, 2006-2015



Source: National Minimum Dataset

More males were hospitalised from exposure to hazardous substances than females

Males had doubled the female hospitalisation rate for unintentional hazardous substances injury (Table 4). However, males and females had similar rates for intentional exposure. These rates have not changed markedly since 2006. The rate of undetermined exposure discharges among males has decreased from 10.7 to 5.9 per 100,000 population from 2006 to 2015.

Table 4: Hospital discharges from hazardous substances, numbers and gender-specific rates per 100,000 population, 2006-2015

Year	Intentional exposure				Unintentional exposure				Undetermined				Total			
	Number		Rate		Number		Rate		Number		Rate		Number		Rate	
	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male
2006	88	63	4.1	3.1	126	203	5.9	9.9	39	220	1.8	10.7	253	486	11.8	23.7
2007	70	65	3.2	3.1	100	193	4.6	9.3	35	196	1.6	9.5	205	454	9.5	22.0
2008	87	63	4.0	3.0	115	245	5.3	11.8	33	186	1.5	8.9	235	494	10.8	23.7
2009	88	66	4.0	3.1	152	302	6.9	14.4	52	158	2.4	7.5	292	526	13.3	25.0
2010	81	79	3.6	3.7	106	239	4.8	11.2	43	141	1.9	6.6	230	459	10.3	21.6
2011	80	73	3.6	3.4	146	224	6.5	10.5	31	163	1.4	7.6	257	460	11.5	21.5
2012	92	71	4.1	3.3	117	232	5.2	10.8	27	148	1.2	6.9	236	451	10.5	20.9
2013	83	66	3.7	3.0	111	213	4.9	9.8	38	113	1.7	5.2	232	392	10.2	18.0
2014	111	86	4.8	3.9	91	238	4.0	10.8	31	120	1.3	5.4	233	444	10.1	20.1
2015	101	66	4.3	2.9	106	204	4.5	9.1	23	132	1.0	5.9	230	402	9.8	17.9

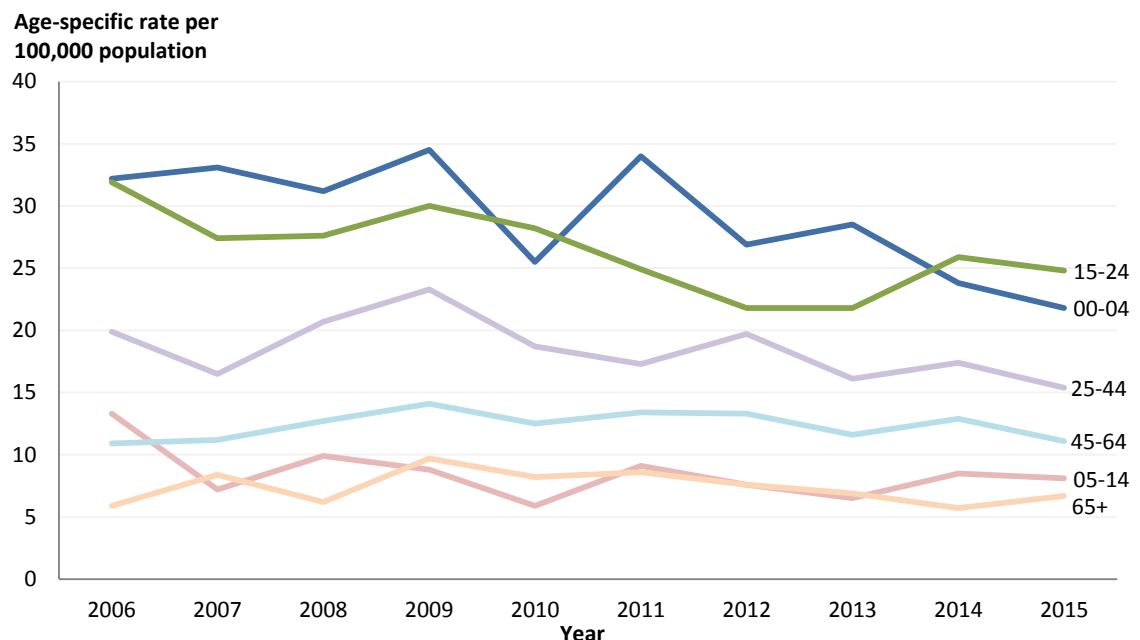
Source: National Minimum Dataset

Children under five years old had the highest rates of hospital discharge from hazardous substances exposure

From 2006 to 2015, marked differences were evident in age-specific hazardous substances-related discharge rates (Figure 8). Compared to all other age groups, children under five years old continued to have higher discharge rates from hazardous substances. However, in 2010, 2014 and 2015, rates were the highest in the youth age group (15-24 years).

The 5-14 and 65+ year age groups had the lowest rates of hospital discharges over this ten-year period.

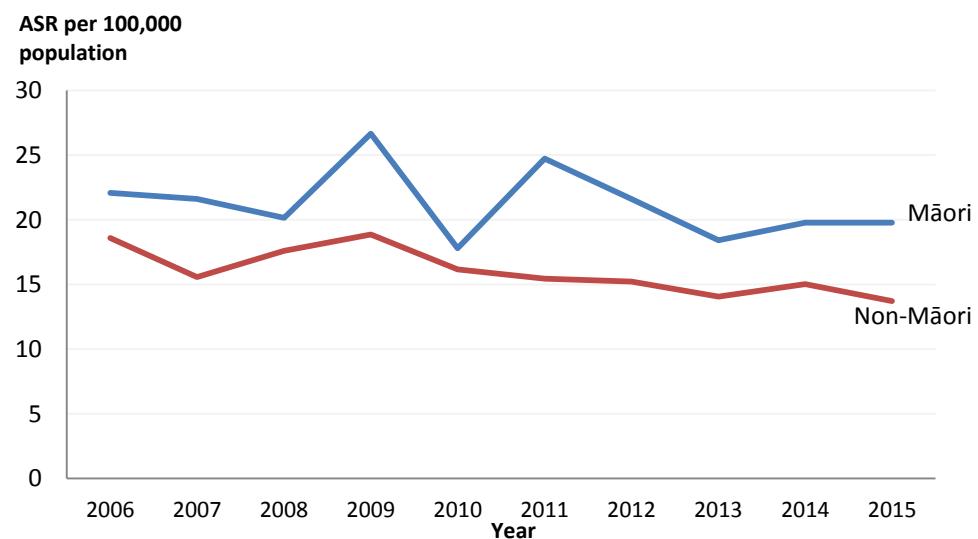
Figure 8: Age-specific rates per 100,000 population of hospital discharges from hazardous substance injuries, by age group, 2006-2015



Source: National Minimum Dataset

Māori had higher hospital discharge rates from hazardous substances exposure compared to non-Māori
 During the period 2006-2015, the age-standardised rate (ASR) for Māori hospital discharges from hazardous substances injuries was higher than non-Māori for each of the last 10 years (Figure 9). Hospital discharge rates for Māori fluctuated between 2008 and 2013 while the rate for non-Māori has held steady over this period.

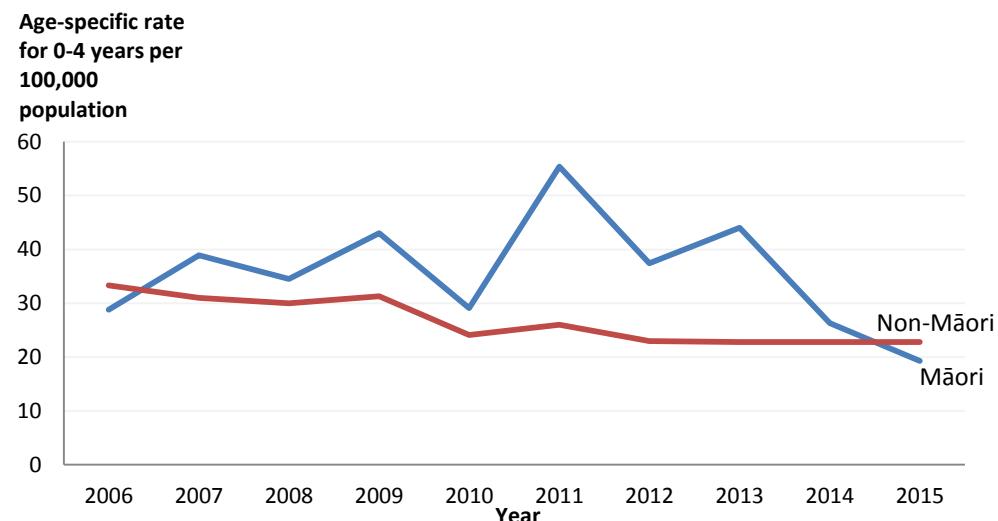
Figure 9: Age-standardised rate (ASR) per 100,000 population of hospital discharges from hazardous substances injuries by ethnicity, 2006-2015



Source: National Minimum Dataset

From 2006 to 2015, for children under five years old, Māori children had higher rates of hazardous substances-related hospital discharges than non-Māori children, except for the years 2006 and 2015 (Figure 10).

Figure 10: Age-specific rate per 100,000 population of hospital discharges from hazardous substances injuries, 0-4 years, by ethnicity, 2006-2015

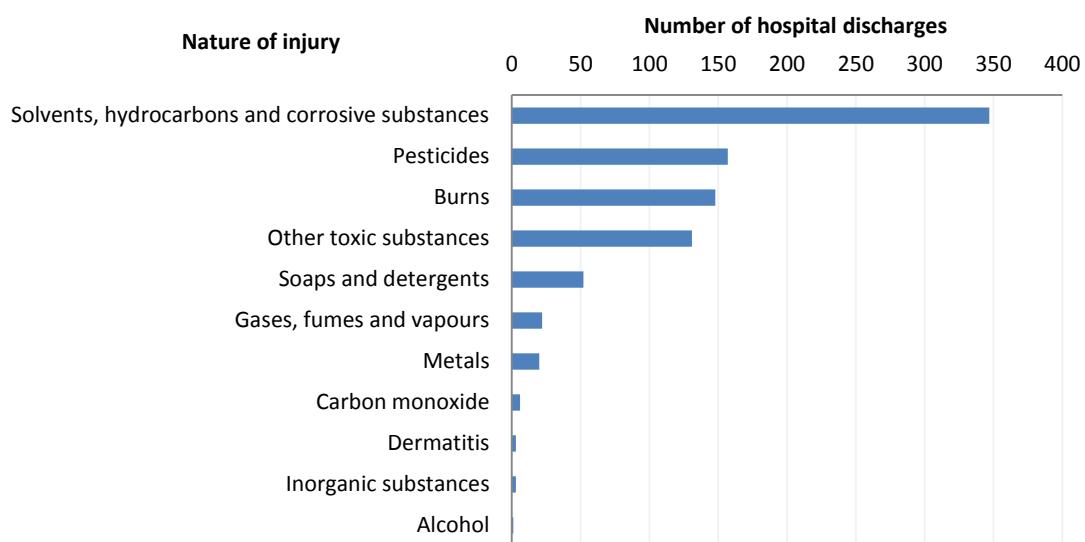


Source: National Minimum Dataset

Solvents, hydrocarbons and corrosive substances was the most common diagnostic group among children 0-4 years old

Of the 890 hospital discharges among children aged 0-4 years between 2006 and 2015, 347 were due to solvents, hydrocarbons and corrosive substance exposures and 157 from exposures to pesticides (Figure 11). In contrast, burns from hazardous substances were the most common injury across all age groups followed by injuries from solvents, hydrocarbons and corrosive substances.

Figure 11: Number of hospital discharges from hazardous substances injuries in children 0-4 years, by diagnostic group, 2006-2015

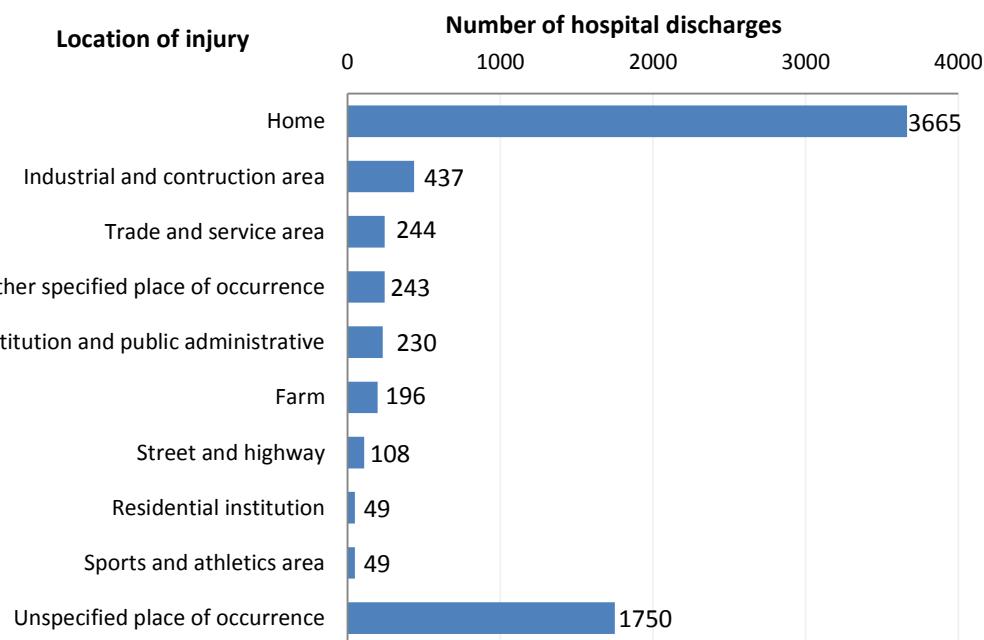


Source: National Minimum Dataset

Most hazardous substances injuries occurred in the home

Between 2006 and 2015, of the 6971 hazardous substances-related hospital discharges, over half (3665 discharges) were from injuries that occurred in the home environment (Figure 12), followed by injuries which occurred at a 'Industrial and construction area' (437).

Figure 12: Number of hospital discharges from hazardous substances injuries, by injury location, 2006-2015



Source: National Minimum Dataset

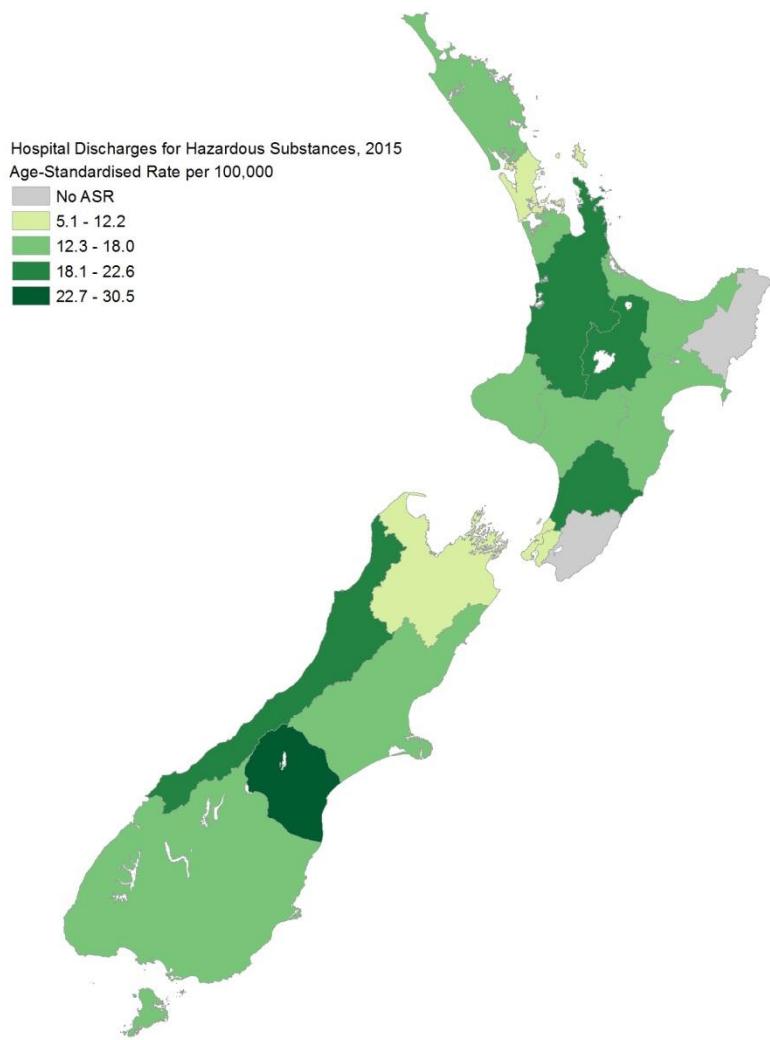
Eighty-two percent (731/890) of hazardous substances injuries in children under five years old occurred at home. Children are great explorers, and preschool children spend much of their time exploring at home. This can lead to children unintentionally being exposed to a number of hazardous substances.

South Canterbury had the highest rate of hospital discharges

In 2015, South Canterbury District Health Board (DHB) had the highest age-standardised rate of hospital discharges (30.5 per 100,000 population) for hazardous substances injuries (Figure 13). Hutt DHB had the lowest rate of hospital discharges (7.7 per 100,000 population).

Overall, 11 out of the 20 DHBs had higher hospital discharge rates than the national rate (14.8 per 100,000 population) for 2015 (see Appendix 5).

Figure 13: Age-standardised rates per 100,000 population of hospital discharges from hazardous substances injuries by DHB, 2015



Source: National Minimum Dataset

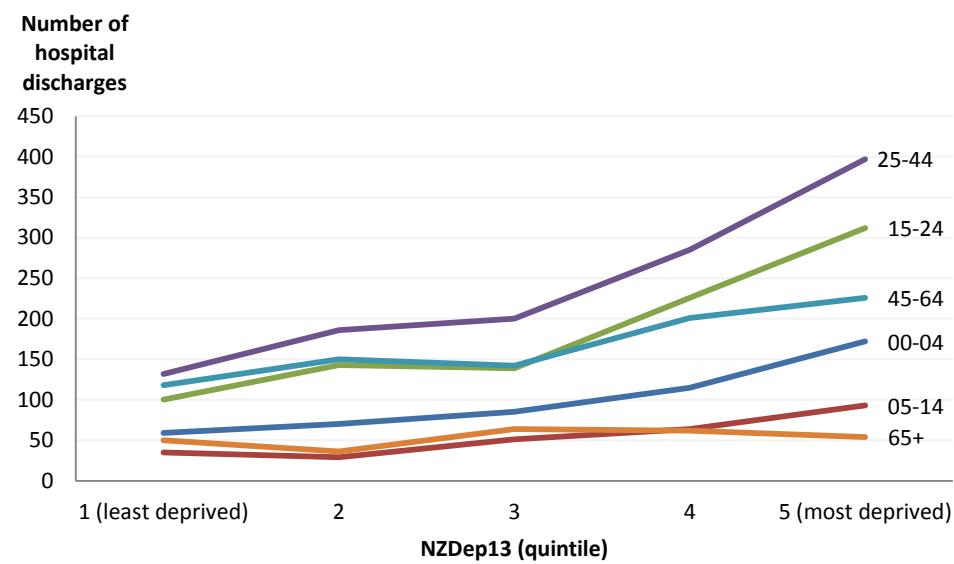
Note: Rates are not calculated for counts smaller than five

Hospital discharges due to hazardous substances exposure increased with socio-economic deprivation

From 2010 to 2015, the number of hospital discharges increased with socio-economic deprivation for all age groups (Figure 14). The number of hospital discharges was highest among those who resided in deprivation quintiles 4 and 5 (most deprived), and lowest in quintile 1 (least deprived).

The relationship between deprivation level and hazardous substances injuries was more apparent in the age groups 0-4, 15-24, 25-44 and 45-64 years. The same trend was less evident in age groups 5-14 and 65+ years.

Figure 14: Number of hospital discharges from hazardous substances injuries, by deprivation quintile and age group, 2010-2015



Note: There were 30 hospital discharges unable to be assigned a deprivation score.

Source: National Minimum Dataset

Primary care notifications (2014-2015)

The Hazardous Substances Disease and Injury Reporting tool (HSDIRT) is an electronic form that simplifies notification of hazardous substances injuries, from primary health care to Medical Officers of Health. It was developed by the CPHR in conjunction with bestpractice Decision Support (BPAC), and funded by the Ministry of Health. The HSDIRT has been designed to allow notification of:

- lead absorption $\geq 0.48\mu\text{mol/l}$
- injuries and diseases due to hazardous substances
- poisoning arising from chemical contamination of the environment.

Key findings

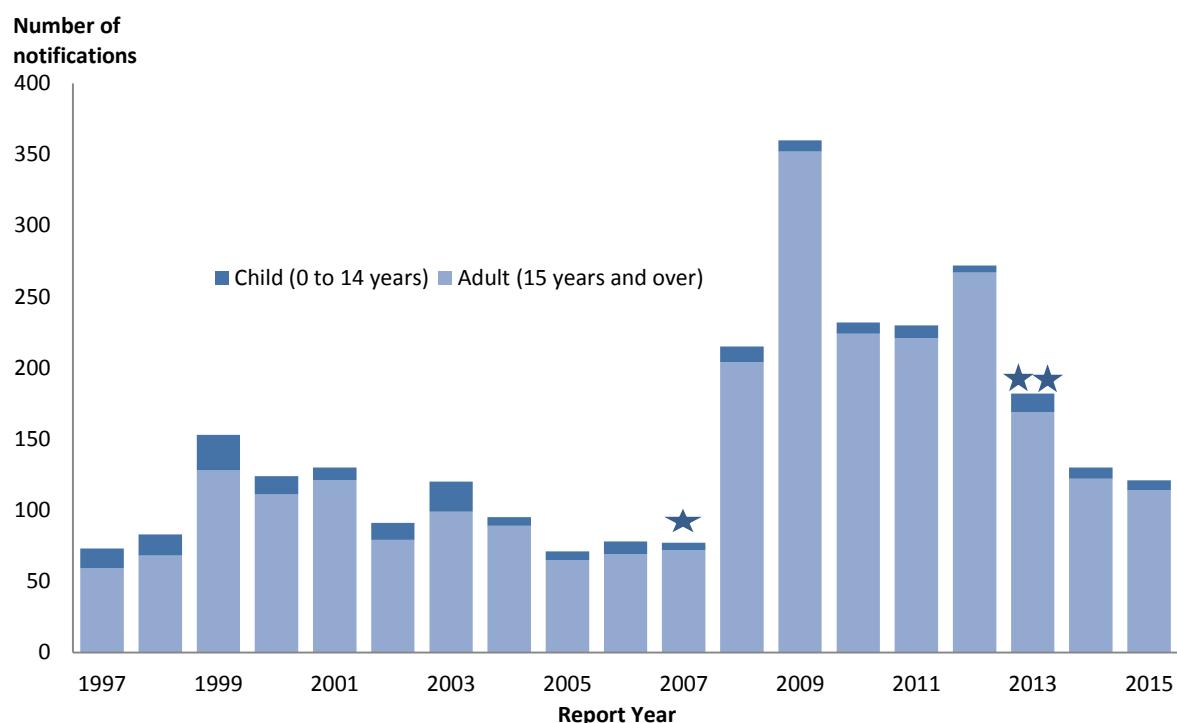
- There were 121 lead absorption notifications in 2015, compared to 130 notifications in 2014
- There were seven lead absorption notifications for children under 15 years in 2015
- Taranaki DHB had the highest rate of lead notifications in 2015
- Painters (16 notifications) were the occupation most exposed to lead in 2015
- Lead-based paint was the most common source of non-occupational/unknown lead exposure for both children and adults
- There were 61 hazardous substances notifications in 2015, five of which were for children under five years old
- Eighty-four percent (51 notifications) of hazardous substances notifications were unintentional exposures
- Industrial chemical was the most common substance category (25 notifications)
- The number of hazardous substances notification generally increased with socio-economic deprivation
- There were four agrichemical spray-drift notifications in 2015.

Lead notifications

There were 121 lead absorption notifications in 2015 compared to 130 notifications in the previous year

There were 121 notifications of lead absorption in 2015 (2.6 per 100,000 population) compared with 130 notifications in 2014 (2.9 per 100,000 population) (Figure 15).

Figure 15: Number of lead absorption notifications in children and adults by year, 1997-2015



* In 2007, direct laboratory notification was introduced, the non-occupational notifiable blood lead level was lowered from 0.72 to 0.48 $\mu\text{mol/l}$ and enhanced occupational screening was introduced in the Auckland region.

** In 2013, the Hazardous Substances Disease and Injury Reporting Tool (HSDIRT) was rolled out to all health districts. Repeat blood lead level tests taken within a year of the original test has been excluded from this data unless further investigation has resulted.

Sources: Institute of Environmental Science and Research (1997-2012) and HSDIRT (2013-2015).

There were seven child lead notifications in 2015

Of the 121 lead absorption notifications in 2015, seven were children under the age of 15 years (Table 5). In 2014, there were eight child lead notifications. In 2015, 84 percent (102/121) of all lead notifications were males, and the most common age groups were 45-64 years (56 notifications), followed by 25-44 years (33 notifications).

Table 5: Lead notifications by age group and gender, 2015

Age group (years)	Female	Male	Unknown	Total
00-04	6			6
05-14		1		1
15-24		9		9
25-44	7	26		33
45-64	3	52	1	56
65+	2	14		16
Total	18	102	1	121

Source: HSDIRT

Taranaki DHB had the highest rate of lead absorption notifications

Taranaki District Health Board (DHB) had the highest rate of lead notifications (11.2 per 100,000 population) in 2015, followed by MidCentral DHB (4.1 per 100,000 population) (Table 6). In 2014, Wairarapa DHB had the highest rate of lead notifications, followed by MidCentral DHB (Table 6).

Table 6: Number and crude rate (per 100,000 population) of lead absorption notifications by DHB and year

DHB	2014		2015	
	Notifications	Rate	Notifications	Rate
Northland	0		0	
Waitemata	7	1.2	12	2.1
Auckland	24	5.1	18	3.7
Counties Manukau	8	1.6	6	1.2
Waikato	8	2.1	7	1.8
Lakes	2		1	
Bay of Plenty	4		4	
Tairawhiti	1		0	
Taranaki	3		13	11.2
Hawke's Bay	2		1	
Whanganui	3		3	
MidCentral	16	9.4	7	4.1
Hutt Valley	5	3.5	4	
Capital and Coast	9	3.0	10	3.3
Wairarapa	6	14.0	3	
Nelson Marlborough	1		3	
West Coast	4		0	
Canterbury	7	1.4	19	3.6
South Canterbury	4		4	
Southern	7	2.3	4	
Unknown	9		2	
Total	130	2.9	121	2.6

Note:

1. Crude rates were not calculated for counts less than five
2. Spatial analysis was based on an individual's residential address.

Source: HSDIRT

Painters were the most exposed to lead

In 2015, there were ⁷ 37 lead absorption notifications (31% of all lead notifications) where occupation was recorded as the source of exposure. Painter (16 notifications) was the most commonly reported occupation for occupational lead exposure, followed by radiator repairer (5 notifications) (Table 7). In 2014, painter (20 notifications) and metal worker (5 notifications) were the most commonly reported occupations.

⁷ Three cases were recorded as both occupational and non-occupational/unknown exposure. Those three cases were included in both occupational and non-occupational/unknown cases analyses.

Table 7: Number of lead notifications with occupation recorded as the source of exposure, 2015

Occupation	Notifications
Painter	16
Radiator repairer	5
Builder	3
Metal worker	3
Glazier	2
Sandblaster	2
Engineer	1
Port worker	1
Renovator	1
Machinery mechanics and fitters	1
Cabinet maker	1
Student	1
Unknown	1
Total	38*

Note: More than one occupation can be reported for a single notification. Therefore, the sum of notification for each occupation may be higher than the total notifications.

Source: HSDIRT

Lead-based paint was the most common source of non-occupational/unknown lead exposure

There were 87 lead absorption notifications where a non-occupational/unknown source of exposure was recorded. The most common source of lead exposure for both children and adults (15+ years) was lead-based paint (Table 8).

Table 8: Sources of non-occupational/unknown lead exposure, 2015

Non-occupational/unknown lead sources	Notifications
Lead-based paint	26
Indoor rifle range	20
Bullet/sinker manufacturer	5
Pica (an eating disorder)	2
Close contact with people who were exposed to lead	2
Occupation involved lead exposure	2
Traditional medicine or cosmetic	2
Leadlighting	1
Bullet	1
Lead-based solder	1
Unknown/other	33
Total	95*

Note: More than one source of lead exposure can be selected for a single notification, therefore the total can add to more than the number of notifications.

Source: HSDIRT

There was no clear trend between NZDep13 level and the number of lead absorption notifications.

Hazardous substances notifications

Hazardous substances notifications have decreased since 2014

There were 61⁸ notifications related to hazardous substances in 2015, compared to 95 in 2014 (Table 9). Over half of the notifications (33 notifications) were from males.

Forty-one percent (25 notifications) of the hazardous substances notifications were from the 25-44 year age group, followed by 26 percent (16 notifications) from the 45-64 year age group (Table 9).

Nearly one third (19 notifications) of the hazardous substances notifications were admitted to hospital.

Table 9: Hazardous substances notifications by age group and gender, 2015

Age group (years)	Female	Male	Unknown	Total
00-04	4	1		5
05-14	2	2		4
15-24	4	1		5
25-44	9	16		25
45-64	4	11	1	16
65+	4	1		5
Unknown		1		1
Total	27	33	1	61

Source: HSDIRT

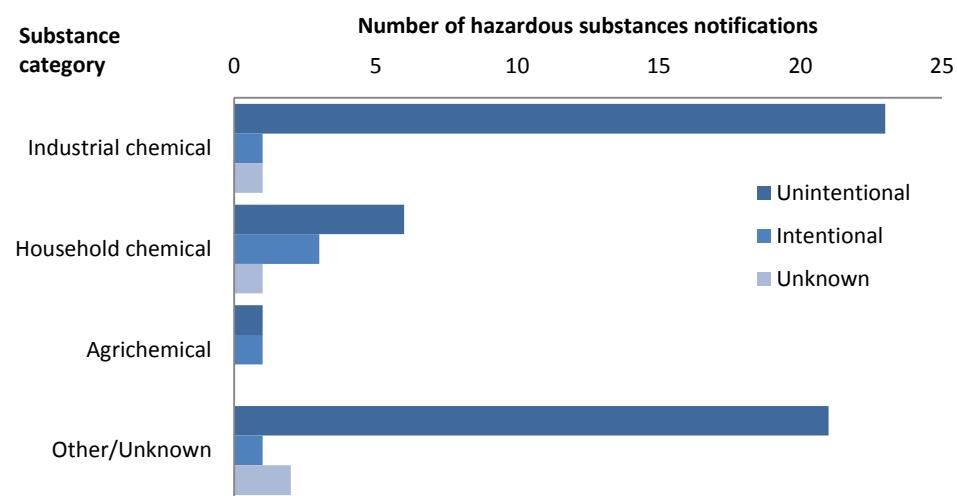
Majority of hazardous substances notifications were due to unintentional exposures

Eighty-four percent (51 notifications) of hazardous substances notifications were from unintentional exposures and the most common substance category was industrial chemical (25 notifications) (Figure 16).

Nearly half (29 notifications) of the hazardous substances notifications occurred at home. Over one third (21 notifications) of the notifications occurred at workplaces. Two notifications were exposed to hazardous substances in public places.

⁸ Nineteen notifications have been excluded from this analysis as they were either recorded as 'Not a case' or they were exposed to substances not subject to the HSNO act.

Figure 16: Number of hazardous substances notifications, by substance category and intent, 2015

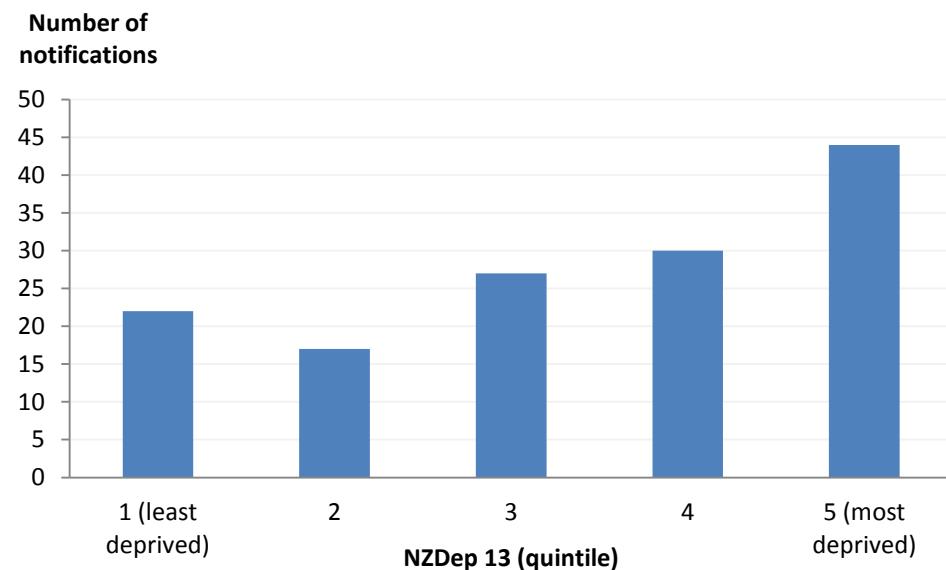


Source: HSDIRT

The number of hazardous substances notifications generally increased with socio-economic deprivation

From 2014 to 2015, the number of hazardous substances notifications was highest among those who resided in deprivation quintile 5 (most deprived), and lowest in quintiles 1 and 2 (least deprived). (Figure 17)

Figure 17: Number of hazardous substances notifications, by deprivation quintile, 2014-2015



Note: NZDep scores were not allocated to 16 notifications. Those notifications were excluded from the figure.

Source: HSDIRT

Agrichemical spray-drift notifications

There were four agrichemical spray-drift notifications in 2015, compared to five notifications in 2014. Half of the notifications were for males and half were for females. All notifications were for adults.

Hazardous substances incidents (2009-2015)

This section presents data from the hazardous substances incidents database maintained by the New Zealand Fire Service. The Fire Service is the primary source of incident information because they attend the majority of call-outs where a hazardous substance is involved. Some incidents will involve more than one hazardous substance. A hazardous substance incident is an unplanned or uncontrolled release of hazardous substances such as fuels, flammable substances, explosives, toxic chemicals, pesticides, radioactive material, or microorganisms, including contaminated waste products. New Zealand Fire Service incidents are categorised on a scale from 1 to 5. This is based on the severity of the incident where 1 is low and 5 very high.

There was a drop in the number of incidents in 2011 and 2012 which is primarily attributed to industrial action in the New Zealand Fire Service. During the period of industrial action, even though the Fire Service continued to respond to all emergencies, incident records did not get fully reported.

Key findings

- In 2015, the New Zealand Fire Service attended 1354 hazardous substances incidents
- There have been no very high (level 5) alarm level hazardous substances incidents reported since 2009
- Nearly sixty percent of all hazardous substances incidents are liquid gas leak/spill incidents without a fire
- Ammonia, methane gas, and chlorine were the most common hazardous substances involved in level 2 or 3 incidents between 2009 and 2015.

The New Zealand Fire Service attends over 1200 hazardous substances incidents every year

From 2009 to 2015, the New Zealand Fire Service attended 8632 hazardous substances incidents (Table 10), an average of 1233 incidents every year. The highest number of incidents (1436) was reported in 2010 followed by 1354 incidents in 2015.

There was a drop in the number of incidents in 2011 and 2012 due to industrial action in the New Zealand Fire Service.

Table 10: Number of hazardous substances incidents attended by the New Zealand Fire Service, by alarm level, 2009-2015

Alarm Level	Year							Total
	2009	2010	2011	2012	2013	2014	2015	
1	1142	1413	988	1093	1302	1234	1321	8493
2	10	22	11	18	19	17	30	127
3		1	1	1	1	5	2	11
4							1	1
Total	1152	1436	1000	1112	1322	1256	1354	8632

Note: Alarm level indicates the severity of an incident where 1=low and 5=very high.

Source: New Zealand Fire Service

No level 5 hazardous substances-related incidents have been reported since 2009

There have been no very high alarm level (level 5) hazardous substances incidents since reporting began in 2009. Of the 8632 incidents, one was level 4, 11 were level 3, 127 were level 2, and the vast majority (8493) were level 1 incidents (Table 10). The first level 4 hazardous substances incident occurred in 2015, involving anhydrous ammonia. Of the 11 level 3 incidents since 2009, seven occurred in 2014 and 2015. The level 3 incidents involved anhydrous ammonia, chlorine, fuel, hydrochloric acid, hydrogen peroxide, petrol, methane gas, and an unnamed corrosive liquid.

Nearly sixty percent of all hazardous substances incidents were liquid gas leak/spill incident without a fire

From 2009 to 2015, 59 percent of hazardous substances incidents were liquid gas leak/spill incidents without a fire, with around 730 incidents per year (Table 11). This was followed by 'gas liquid spill: vehicle accident' incidents, with around 140 incidents per year. Chemical emergency incidents occurred at about 100 to 150 a year.

Table 11: Number of hazardous substances incidents attended by the New Zealand Fire Service by incident type, 2009-2015

Incident Type	2009	2010	2011	2012	2013	2014	2015	Total
Liquid Gas leak or spill: No fire	639	827	593	678	781	753	821	5092
Gas Liquid spill: Vehicle accident	150	166	127	128	138	105	151	965
Chemical emergency	117	146	97	109	110	127	107	813
Gas Liquid spill: No vehicle accident	108	144	85	85	110	116	111	759
Miscellaneous hazardous condition - not classified above	81	93	67	77	130	110	122	680
Attempted burning	14	16	6	9	6	5	8	64
Chemical spill: Vehicle accident	10	11	7	7	6	7	8	56
Mobile property hazardous incident - not classified above	13	7	5	3	14	6	8	56
Biohazard emergency	6	8	3	8	12	12	4	53
Gas liquid spill: Incorrect vehicle loading	7	7	6	4	8	7	5	44
Explosive present	6	7	2	3	5	3	2	28
Chemical spill: Incorrect vehicle loading	1	3	2	1	1	5	7	20
Radioactive condition ⁹					1	1		2
Total	1152	1436	1000	1112	1322	1256	1354	8632

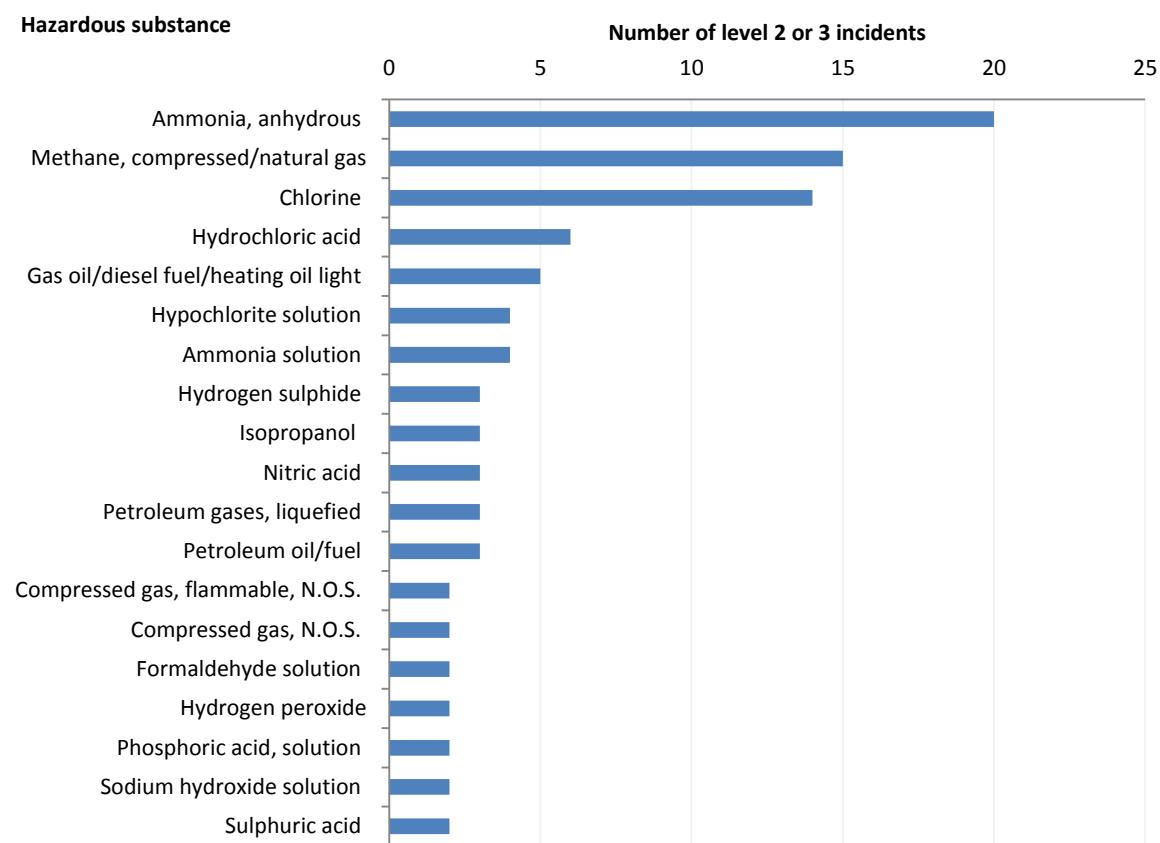
Source: New Zealand Fire Service

Ammonia, methane gas, and chlorine were the most common hazardous substances involved in level 2 or 3 incidents

From 2009 to 2015, the top three most common hazardous substances involved in level 2 or 3 incidents were anhydrous ammonia, methane gas, and chlorine (Figure 18).

⁹ The HSNO Act does not include radioactive substances.

Figure 18: Hazardous substances most frequently involved in level 2 or 3 incidents, 2009-2015.



Note:

1. Some incidents will be reported with more than one hazardous substance.
2. Only hazardous substances involved in more than one level 2 or 3 incidents are presented here.

Source: New Zealand Fire Service

Hazardous substance-related telephone calls (2009-2015)

The National Poisons Centre (NPC) operates a 24-hour telephone service that fields enquiries regarding actual and potential poisoning exposures. Records in this database are from self-reported calls: they reflect only information provided when the public or healthcare professionals report an actual or potential exposure to a substance. There is no follow-up of the callers and confirmation of possible outcomes. Data analysis for 2013 and 2015 is based on summary tables rather than raw data, therefore, numbers may differ from previous years. Only nine months data was available for 2015 due to data quality and a change in NPC reporting format to the Ministry of Health.

Key findings

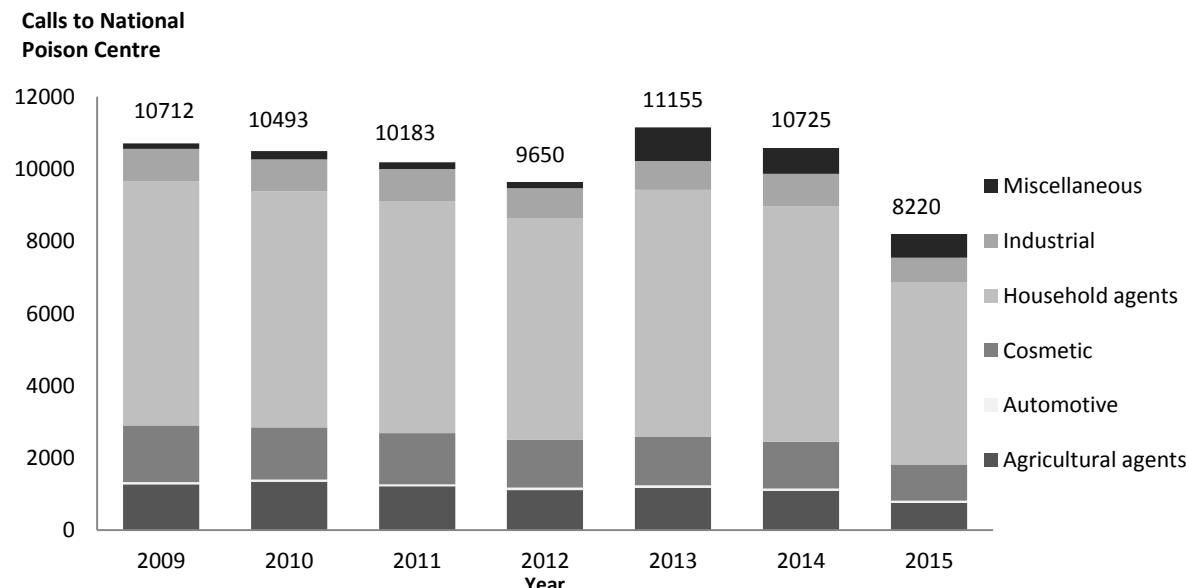
- There were 8220 calls concerning hazardous substances in nine months of 2015
- Over half (4395/8220) of the hazardous substances-related calls in 2015 involved children less than five years old
- Calls regarding household agents, and more specifically household cleaners (813 calls) and detergents (378 calls) most frequently involved children
- Among adults, household cleaners were the most common household product (434 calls) and herbicides (169 calls) the most common agricultural agent cited
- Child exploratory behaviour was responsible for more than half (4646/8220) of all hazardous substances calls in 2015.

There were 8220 calls concerning hazardous substances in 2015

There were 8220 calls concerning hazardous substances in nine months of 2015. In 2014, there were 10725 calls concerning hazardous substances (Figure 19).

From 2009 to 2015, household products were the most common (62%) exposure reported to the NPC, followed by cosmetics (13%) and agricultural agents (11%).

Figure 19: Number of hazardous substances-related calls to the National Poisons Centre, by substance classification, 2009-2015

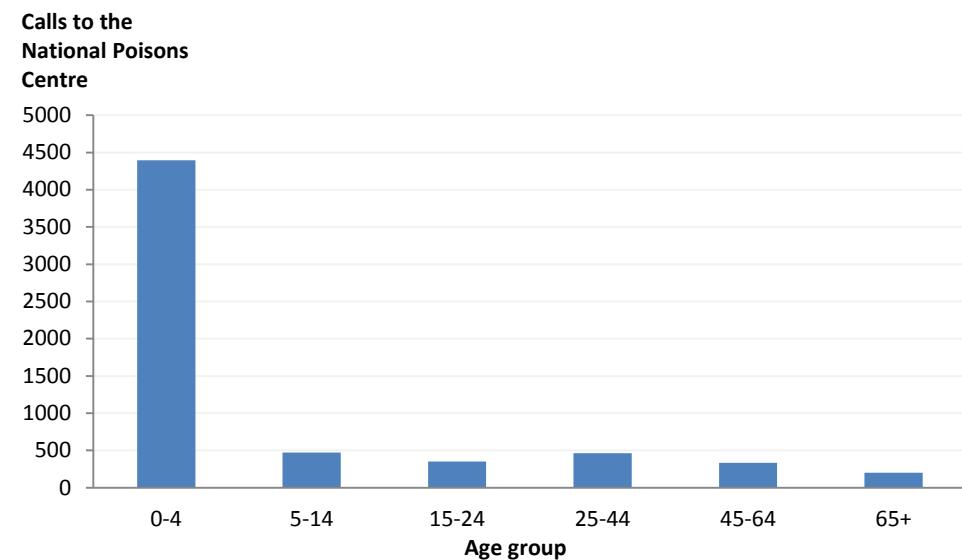


Source: National Poison Centre

Note: Only nine months of data was included in 2015. Data from June, November and December 2015 were not included.

Over half of the hazardous substances-related calls in 2015 concerned children less than five years old
Of the 8220 hazardous substances-related calls made in 2015, over half (4395 calls) concerned children less than five years old (Figure 20). A similar trend was reported in previous years.

Figure 20: Number of hazardous substances-related calls to the National Poisons Centre, by age group, 2015



Source: National Poisons Centre

Note:

1. Calls, where age is recorded as 'Unknown', have been excluded from this graph.
2. Only nine months of data was included in 2015. Data from June, November and December 2015 were not included.

Calls regarding household products were most frequent among children

Among calls relating to children aged 0-4 years, household products (2982 calls) and cosmetics (772 calls) were the most common exposure in 2015 (Table 12). Of all household agents recorded, household cleaners (813 calls) and detergents (378 calls) were the most common exposure regarding children. For agricultural agents, rodenticides (61 calls) were the most common product involving children.

Among adults, household cleaners (434 calls) was the most common household product and herbicides (169 calls) was the most common agricultural agent recorded.

Table 12: Number of hazardous substances-related calls to the National Poisons Centre, by age group and substance category, 2015

Substances Classification	Age group								Total
	0-4	5-14	15-24	25-44	45-64	65+	Child (Age unknown)	Adult (Age unknown)	
Agricultural	253	35	40	79	72	27	15	229	3 753
Cosmetic	772	49	36	13	7	21	23	87	0 1008
Household	2982	283	179	253	180	114	103	944	9 5047
Industrial	86	23	66	83	52	21	9	328	7 675
Miscellaneous	277	75	28	30	23	15	19	205	2 674
Automotive	25	7	1	6	2	5	0	16	1 63
Total	4395	472	350	464	336	203	169	1809	22 8220

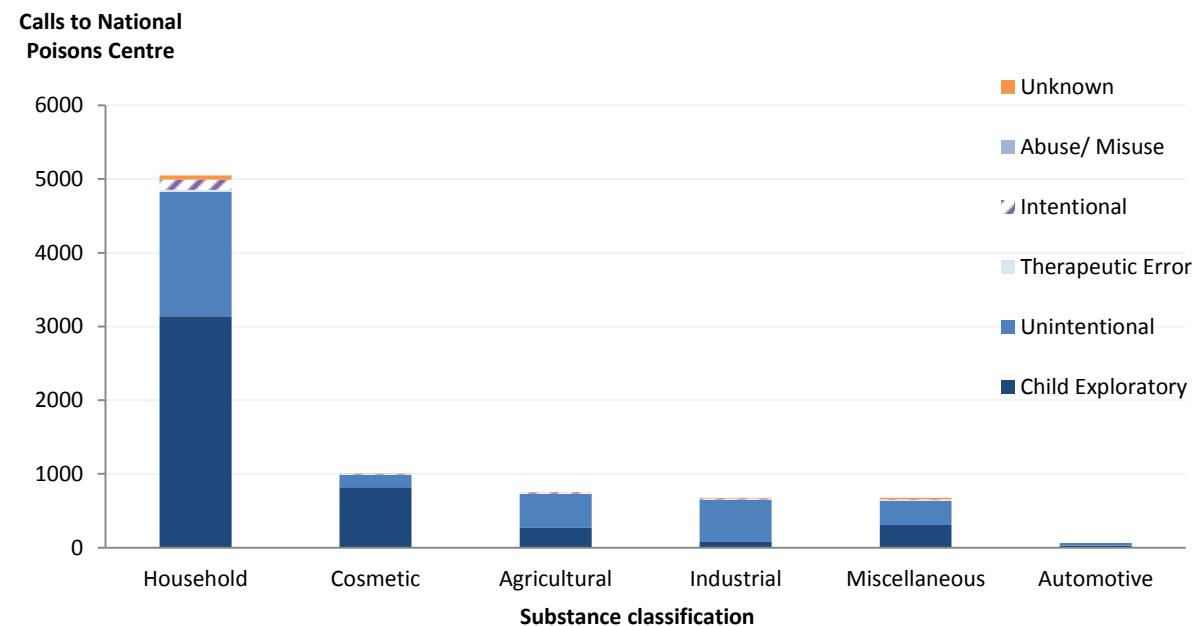
Source: National Poisons Centre

Note: Only nine months of data was included in 2015. Data from June, November and December 2015 were not included.

Child exploratory behaviour was responsible for 57 percent of calls

In 2015, 57 percent (4646 calls) of all hazardous substances-related calls were from child-exploratory behaviour, and 40 percent (3248 calls) were from adult unintentional exposures (Figure 21). The majority of calls concerning household and cosmetic products were from child exploratory behaviour while unintentional exposures were more common in calls concerning agricultural and industrial products.

Figure 21: Number of hazardous substances-related calls to the National Poisons Centre by substance classification and intent, 2015



Source: National Poisons Centre

Note: Only nine months of data was included in 2015. Data from June, November and December 2015 were not included.

Conclusion

Hazardous substance exposure accounted for 44 registered deaths from the National Mortality Collection in 2013 (the most recent year for which data were available). In 2015, it accounted for 632 hospital discharges, 186 primary care notifications, 1354 Fire Service hazardous substances incidents, and 8220 calls to the National Poisons Centre. Most of these injuries could have been prevented. Mortality and hospital discharge rates have either declined or remained stable between 2006 and 2015. However, these numbers are a major undercount of exposure to hazardous substances as not all illness and injuries are fatal or require hospitalisation.

Some population groups are at much higher risk from exposure to a hazardous substance that results in illness or injury, particularly children under five years old, Māori and people who live in more deprived areas.

Even though there have been no reported deaths of children less than five years old since 2006 due to hazardous substance exposure, this age group continues to have the highest hospital discharge rate. The high rate for this age group is of concern because illness and injuries from hazardous substances are largely preventable. The number of hospital discharges also generally increased with socio-economic deprivation in almost all age groups.

While there were no clear ethnic differences in deaths from hazardous substances between Māori and non-Māori, the Māori population experienced a higher hospital discharge rate compared to non-Māori for each of the last 10 years.

The findings from this report will help inform policy makers about the adverse health effects of hazardous substances in New Zealand. It is important that preventive strategies are put in place to reduce future disease and injury, particularly among the most vulnerable population groups.

References

- Ahmad, O. B., Boschi-Pinto, C., Lopez, A. D., Murray, C. J., Lozano, R., & Inoue, M. (2001). Age standardization of rates: a new WHO standard. *Geneva: World Health Organization*, 9.
- Peiris-John, R., Kool, B., & Ameratunga, S. (2014). Fatalities and hospitalisations due to acute poisoning among New Zealand adults. *Internal medicine journal*, 44(3), 273-281.
- Worksafe New Zealand. (2010). *Carbon monoxide—Invisible and deadly*. Retrieved from <http://www.business.govt.nz/worksafe/information-guidance/all-guidance-items/carbon-monoxide-factsheet-invisible-and-deadly>. Accessed: 20 July 2015

Appendix 1: Technical Notes

Coronial Services Office data

- The main limitation associated with the coronial data is timelines. It is estimated that by the end of a given year, approximately 50-60 percent of cases for that year are available. By the end of the following year, it is estimated that 90-95 percent of cases for the preceding year will have files readily accessible.

National Mortality Collection and National Minimum Dataset

- The Ministry of Health maintains the national mortality and hospital discharge databases. The data provided in this report is the most recent data available.
- Hospital discharge and mortality data are presented by calendar year. The mortality data is based on the date of registration rather than the date of death.
- Readmissions have been excluded from the data set. In this report, a ‘readmission’ is defined as the unintended acute readmission of a patient from any injury within 30 days of discharge.
- Morbidity data are primarily based on hospitalisations from public hospitals. Day cases and patients dying in hospital are included but attendances at emergency departments and outpatient clinics are not.
- These data do not adequately capture chronic disease from hazardous substances as in most cases the cause of chronic disease cannot be identified.
- Prioritised ethnicity has been used in the mortality and hospital discharge datasets

Limitations of datasets

- There is insufficient information to determine the work-related nature of a case from most of the datasets used in the report. Therefore, it is difficult to reliably breakdown hazardous substances illness and injuries into occupational and non-occupational illness and injuries.

Appendix 2: External cause codes (E-code)

This table gives the external cause codes used in the mortality and hospital discharge data.

E-code	Description
X66	Organic solvents and halogenated hydrocarbons and their vapours
X67	Other gases and vapours
X68	Pesticides
X69	Other and unspecified chemicals and noxious substances
X75	Intentional self-harm by explosive material
X46	Organic solvents and halogenated hydrocarbons and their vapours
X47	Other gases and vapours
X48	Pesticides
X49	Other and unspecified chemicals and noxious substances
W36	Explosion and rupture of gas cylinder
W37	Explosion and rupture of pressurised tyre, pipe or hose
W38	Explosion and rupture of other specified pressurised devices
W39	Discharge of firework
W40	Explosion of other materials
X04	Exposure to ignition of highly flammable material
Y25	Contact with explosive material
Y16	Organic solvents and halogenated hydrocarbons and their vapours
Y17	Other gases and vapours
Y18	Pesticides
Y19	Other and unspecified chemicals and noxious substances

Appendix 3: Diagnosis/Nature of injury codes

Diag Codes	Substance	Group
T511	Methanol	Alcohol
T512	2-Propanol	Alcohol
T513	Fusel oil	Alcohol
T520	Petroleum products	Solvents, hydrocarbons and corrosive substances
T521	Benzene	Solvents, hydrocarbons and corrosive substances
T522	Homologues of benzene	Solvents, hydrocarbons and corrosive substances
T523	Glycols	Solvents, hydrocarbons and corrosive substances
T524	Ketones	Solvents, hydrocarbons and corrosive substances
T528	Other organic solvents	Solvents, hydrocarbons and corrosive substances
T529	Organic solvent, unspecified	Solvents, hydrocarbons and corrosive substances
T530	Carbon tetrachloride	Solvents, hydrocarbons and corrosive substances
T531	Chloroform	Solvents, hydrocarbons and corrosive substances
T532	Trichloroethylene	Solvents, hydrocarbons and corrosive substances
T533	Tetrachloroethylene	Solvents, hydrocarbons and corrosive substances
T534	Dichloromethane	Solvents, hydrocarbons and corrosive substances
T535	Chlorofluorocarbons	Solvents, hydrocarbons and corrosive substances
T536	Other halogen derivatives of aliphatic hydrocarbons	Solvents, hydrocarbons and corrosive substances
T537	Other halogen derivatives of aromatic hydrocarbons	Solvents, hydrocarbons and corrosive substances
T539	Halogen derivative of aliphatic and aromatic hydrocarbons, unspecified	Solvents, hydrocarbons and corrosive substances
T540	Phenol and phenol homologues	Solvents, hydrocarbons and corrosive substances
T541	Other corrosive organic compounds	Solvents, hydrocarbons and corrosive substances
T542	Corrosive acids and acid-like substances	Solvents, hydrocarbons and corrosive substances
T543	Corrosive alkalis and alkali-like substances	Solvents, hydrocarbons and corrosive substances
T549	Corrosive substance, unspecified	Solvents, hydrocarbons and corrosive substances
T55	Toxic effect of soaps and detergents	Soaps and detergents

T560	Lead and its compounds	Metals
T561	Mercury and its compounds	Metals
T562	Chromium and its compounds	Metals
T563	Cadmium and its compounds	Metals
T564	Copper and its compounds	Metals
T565	Zinc and its compounds	Metals
T566	Tin and its compounds	Metals
T567	Beryllium and its compounds	Metals
T568	Other metals	Metals
T569	Metal, unspecified	Metals
T570	Arsenic and its compounds	Inorganic substances
T571	Phosphorus and its compounds	Inorganic substances
T572	Manganese and its compounds	Inorganic substances
T573	Hydrogen cyanide	Inorganic substances
T578	Other specified inorganic substances	Inorganic substances
T579	Inorganic substance, unspecified	Inorganic substances
T58	Toxic effect of carbon monoxide	Carbon monoxide
T590	Nitrogen oxides	Gases, fumes and vapours
T591	Sulfur dioxide	Gases, fumes and vapours
T592	Formaldehyde	Gases, fumes and vapours
T593	Lacrimogenic gas	Gases, fumes and vapours
T594	Chlorine gas	Gases, fumes and vapours
T595	Fluorine gas and hydrogen fluoride	Gases, fumes and vapours
T596	Hydrogen sulfide	Gases, fumes and vapours
T597	Carbon dioxide	Gases, fumes and vapours
T598	Other specified gases, fumes and vapours	Gases, fumes and vapours
T599	Gases, fumes and vapours, unspecified	Gases, fumes and vapours
T600	Organophosphate and carbamate insecticides	Pesticides
T601	Halogenated insecticides	Pesticides

T602	Other insecticides	Pesticides
T603	Herbicides and fungicides	Pesticides
T604	Rodenticides	Pesticides
T608	Other pesticides	Pesticides
T609	Pesticide, unspecified	Pesticides
T650	Cyanides	Other toxic substances
T651	Strychnine and its salts	Other toxic substances
T653	Nitroderivatives and amino derivatives of benzene and its homologues	Other toxic substances
T654	Carbon disulfide	Other toxic substances
T655	Nitroglycerin and other nitric acids and esters	Other toxic substances
T656	Paints and dyes, not elsewhere classified	Other toxic substances
T658	Toxic effect of other specified substances	Other toxic substances
T659	Toxic effect of unspecified substance	Other toxic substances
T2123	Partial thickness [blisters, epidermal loss] burn of abdominal wall	Burns
T2124	Partial thickness [blisters, epidermal loss] burn of back [any part]	Burns
T2125	Partial thickness [blisters, epidermal loss] burn of genitalia [external]	Burns
T2129	Partial thickness [blisters, epidermal loss] burn of other sites of trunk	Burns
T2130	Full thickness burn of trunk, unspecified site	Burns
T2131	Full thickness burn of breast	Burns
T2132	Full thickness burn of chest wall, excluding breast and nipple thorax [external]	Burns
T2133	Full thickness burn of abdominal wall	Burns
T2134	Full thickness burn of back [any part]	Burns
T2135	Full thickness burn of genitalia [external]	Burns
T2139	Full thickness burn of other sites of trunk	Burns
T2200	Burn of unspecified thickness of shoulder and upper limb, except wrist and hand, unspecified site	Burns
T2201	Burn of unspecified thickness forearm and elbow	Burns
T2202	Burn of unspecified thickness arm (upper) and shoulder region	Burns
T2210	Erythema of shoulder and upper limb, except wrist and hand, unspecified site	Burns
T2211	Erythema of forearm and elbow	Burns

T2212	Erythema of arm (upper) and shoulder region	Burns
T2220	Partial thick [blisters epidermal loss] burn shoulder & upper limb except wrist & hand & unspec site	Burns
T2221	Partial thickness [blisters, epidermal loss] burn of forearm and elbow	Burns
T2222	Partial thickness [blisters, epidermal loss] burn of arm (upper) and shoulder region	Burns
T2230	Full thickness burn of shoulder and upper limb, except wrist and hand, upper limb, unspecified site	Burns
T2231	Full thickness burn of forearm and elbow	Burns
T2232	Full thickness burn of arm (upper) and shoulder region	Burns
T230	Burn of unspecified thickness of wrist and hand	Burns
T231	Erythema of wrist and hand	Burns
T232	Partial thickness [blisters, epidermal loss] burn of wrist and hand	Burns
T233	Full thickness burn of wrist and hand	Burns
T240	Burn of unspecified thickness of hip and lower limb, except ankle and foot	Burns
T241	Erythema of hip and lower limb, except ankle and foot	Burns
T242	Partial thickness [blisters, epidermal loss] burn of hip and lower limb, except ankle and foot	Burns
T243	Full thickness burn of hip and lower limb, except ankle and foot	Burns
T250	Burn of unspecified thickness of ankle and foot	Burns
T251	Erythema of ankle and foot	Burns
T252	Partial thickness [blisters, epidermal loss] burn of ankle and foot	Burns
T253	Full thickness burn of ankle and foot	Burns
T260	Burn of eyelid and periocular area	Burns
T261	Burn of cornea and conjunctival sac	Burns
T262	Burn with resulting rupture and destruction of eyeball	Burns
T263	Burn of other parts of eye and adnexa	Burns
T264	Burn of eye and adnexa, part unspecified	Burns
T270	Burn of larynx and trachea	Burns
T271	Burn involving larynx and trachea with lung	Burns
T272	Burn of other parts of respiratory tract	Burns
T273	Burn of respiratory tract, part unspecified	Burns
T280	Burn of mouth and pharynx	Burns

T281	Burn of oesophagus	Burns
T282	Burn of other parts of alimentary tract	Burns
T283	Burn of internal genitourinary organs	Burns
T284	Burn of other and unspecified internal organs	Burns
T290	Burns of multiple regions, unspecified thickness	Burns
T291	Burns of multiple regions, no more than erythema burns mentioned	Burns
T292	Burns of multiple regions, no more than partial thickness burns mentioned	Burns
T293	Burns of multiple regions, at least one burn of full thickness mentioned	Burns
T300	Burn of unspecified body region, unspecified thickness	Burns
T301	Erythema, body region unspecified	Burns
T302	Burn of partial thickness, body region unspecified	Burns
T303	Burn of full thickness, body region unspecified	Burns
T3100	Burns involving less than 10% of body surface with less 10 % or unspecified full thickness burns	Burns
T3110	Burns involving 10-19% of body surface, with less than 10 % or unspecified full thickness burns	Burns
T3111	Burns involving 10-19% of body surface, with 10-19% full thickness burns	Burns
T3120	Burns involving 20-29% of body surface, with less than 10 % or unspecified full thickness burns	Burns
T3121	Burns involving 20-29% of body surface, with 10-19% full thickness burns	Burns
T3122	Burns involving 20-29% of body surface, with 20-29% full thickness burns	Burns
T3130	Burns involving 30-39% of body surface, with less than 10 % or unspecified full thickness burns	Burns
T3131	Burns involving 30-39% of body surface, with 10-19% full thickness burns	Burns
T3132	Burns involving 30-39% of body surface, with 20-29% full thickness burns	Burns
T3133	Burns involving 30-39% of body surface, with 30-39% full thickness burns	Burns
T3140	Burns involving 40-49% of body surface, with less than 10 % or unspecified full thickness burns	Burns
T3141	Burns involving 40-49% of body surface, with 10-19% full thickness burns	Burns
T3142	Burns involving 40-49% of body surface, with 20-29% full thickness burns	Burns
T3143	Burns involving 40-49% of body surface, with 30-39% full thickness burns	Burns
T3144	Burns involving 40-49% of body surface, with 40-49% full thickness burns	Burns
T3150	Burns involving 50-59% of body surface, with less than 10% or unspecified full thickness burns	Burns
T3151	Burns involving 50-59% of body surface, with 10-19% full thickness burns	Burns

T3152	Burns involving 50-59% of body surface, with 20-29% full thickness burns	Burns
T3153	Burns involving 50-59% of body surface, with 30-39% full thickness burns	Burns
T3154	Burns involving 50-59% of body surface, with 40-49% full thickness burns	Burns
T3155	Burns involving 50-59% of body surface, with 50-59% full thickness burns	Burns
T3160	Burns involving 60-69% of body surface, with less than 10 % or unspecified full thickness burns	Burns
T3161	Burns involving 60-69% of body surface, with 10-19% full thickness burns	Burns
T3162	Burns involving 60-69% of body surface, with 20-29% full thickness burns	Burns
T3163	Burns involving 60-69% of body surface, with 30-39% full thickness burns	Burns
T3164	Burns involving 60-69% of body surface, with 40-49% full thickness burns	Burns
T3165	Burns involving 60-69% of body surface, with 50-59% full thickness burns	Burns
T3166	Burns involving 60-69% of body surface, with 60-69% full thickness burns	Burns
T3170	Burns involving 70-79% of body surface, with less than 10% or unspecified full thickness burns	Burns
T3171	Burns involving 70-79% of body surface, with 10-19% full thickness burns	Burns
T3172	Burns involving 70-79% of body surface, with 20-29% full thickness burns	Burns
T3173	Burns involving 70-79% of body surface, with 30-39% full thickness burns	Burns
T3174	Burns involving 70-79% of body surface, with 40-49% full thickness burns	Burns
T3175	Burns involving 70-79% of body surface, with 50-59% full thickness burns	Burns
T3176	Burns involving 70-79% of body surface, with 60-69% full thickness burns	Burns
T3177	Burns involving 70-79% of body surface, with 70-79% full thickness burns	Burns
T3180	Burns involving 80-89% of body surface, with less than 10% or unspecified full thickness burns	Burns
T3181	Burns involving 80-89% of body surface, with 10-19% full thickness burns	Burns
T3182	Burns involving 80-89% of body surface, with 20-29% full thickness burns	Burns
T3183	Burns involving 80-89% of body surface, with 30-39% full thickness burns	Burns
T3184	Burns involving 80-89% of body surface, with 40-49% full thickness burns	Burns
T3185	Burns involving 80-89% of body surface, with 50-59% full thickness burns	Burns
T3186	Burns involving 80-89% of body surface, with 60-69% full thickness burns	Burns
T3187	Burns involving 80-89% of body surface, with 70-79% full thickness burns	Burns
T3188	Burns involving 80-89% of body surface, with 80-89% full thickness burns	Burns
T3190	Burns involving 90% or more of body surface, with less than 10% or unspecified full thickness burns	Burns

T3191	Burns involving 90% or more of body surface, with 10-19% full thickness burns	Burns
T3192	Burns involving 90% or more of body surface, with 20-29% full thickness burns	Burns
T3193	Burns involving 90% or more of body surface, with 30-39% full thickness burns	Burns
T3194	Burns involving 90% or more of body surface, with 40-49% full thickness burns	Burns
T3195	Burns involving 90% or more of body surface, with 50-59% full thickness burns	Burns
T3196	Burns involving 90% or more of body surface, with 60-69% full thickness burns	Burns
T3197	Burns involving 90% or more of body surface, with 70-79% full thickness burns	Burns
T3198	Burns involving 90% or more of body surface, with 80-89% full thickness burns	Burns
T3199	Burns involving 90% or more of body surface, with 90% or more of body surface full thickness burns	Burns
L230	Allergic contact dermatitis due to metals	Dermatitis
L231	Allergic contact dermatitis due to adhesives	Dermatitis
L232	Allergic contact dermatitis due to cosmetics	Dermatitis
L234	Allergic contact dermatitis due to dyes	Dermatitis
L235	Allergic contact dermatitis due to other chemical products	Dermatitis
L240	Irritant contact dermatitis due to detergents	Dermatitis
L241	Irritant contact dermatitis due to oils and greases	Dermatitis
L242	Irritant contact dermatitis due to solvents	Dermatitis
L243	Irritant contact dermatitis due to cosmetics	Dermatitis
L245	Irritant contact dermatitis due to other chemical products	Dermatitis
L250	Unspecified contact dermatitis due to cosmetics	Dermatitis
L252	Unspecified contact dermatitis due to dyes	Dermatitis
L253	Unspecified contact dermatitis due to other chemical products	Dermatitis

Appendix 4: Map of District Health Boards

New Zealand District Health Boards 2012



Appendix 5: Age-standardised rate per 100,000 population of hospital discharges from hazardous substances injuries by DHB, 2015

DHB	Age-Standardised Rate per 100,000 population
Northland	15.8
Waitemata	12.2
Auckland	11.9
Counties Manukau	18.0
Waikato	18.8
Lakes	22.6
Bay of Plenty	16.8
Tairawhiti	-
Taranaki	16.3
Hawke's Bay	17.7
Whanganui	13.7
MidCentral	18.8
Hutt Valley	7.7
Capital and Coast	9.2
Wairarapa	-
Nelson Marlborough	10.9
West Coast	22.0
Canterbury	13.3
South Canterbury	30.5
Southern	17.0
New Zealand Total	14.8

Source: National Minimum Dataset