Annual Hazardous Substances Injury Report
2017

Report to the Ministry of Health

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Author

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Executive Summary

This 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 present in everyday domestic situations.

The following is a summary of key findings.

Key Findings

- There were 41 hazardous substances-related deaths registered in 2014 compared to 44 deaths in 2013
- 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 2014 due to hazardous substances exposure
- Toxic effects of carbon monoxide contributed to 379 deaths between 2006 and 2014, of which 362 were intentional exposures or suicides. Death from carbon monoxide exposure was most common in the 25-44 year (139 deaths) and 45-64 year (150 deaths) age groups
- On average, 14 deaths from exposure to a hazardous substance are referred to the coroner every year
- There were 689 hazardous substances-related hospital discharges in 2016 compared to 631 in 2015
- 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
- Between 2006 and 2016, solvents, hydrocarbons and corrosive substances (377 discharges) were the most common cause of hazardous substances-related hospital discharges for children under the age of five years
- Māori had a higher hospital discharge rate from hazardous substances injuries than non-Māori for each of the last 11 years
- From 2006-2016, over half (4009 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 106 lead absorption notifications in 2016, six of which were for children under 15 years old
- Painters (29 notifications) were the occupational group most exposed to lead in 2016
- Lead-based paint was the most common source of non-occupational/unknown lead exposure for both children and adults
- There were 104 hazardous substances notifications in 2016, eight of which were for children under five years old
- Fire and Emergency New Zealand attends over 1200 hazardous substances incidents each year. Ammonia, chlorine, and methane gas were the most common substances involved in the more serious (level 2, 3 or 4) incidents
- Half (2147/4297) of the hazardous substances-related calls to the National Poisons Centre in 2016[1] involved children less than five years of age
- Calls regarding exposure to household agents, and more specifically household cleaners (372 calls) and detergents (151 calls), most frequently involved children. Of all agricultural agents, fertilisers (28 calls) were the most commonly reported product involving children.

[1] Data was available for five 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 requirement[2] 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 environment[3]. 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

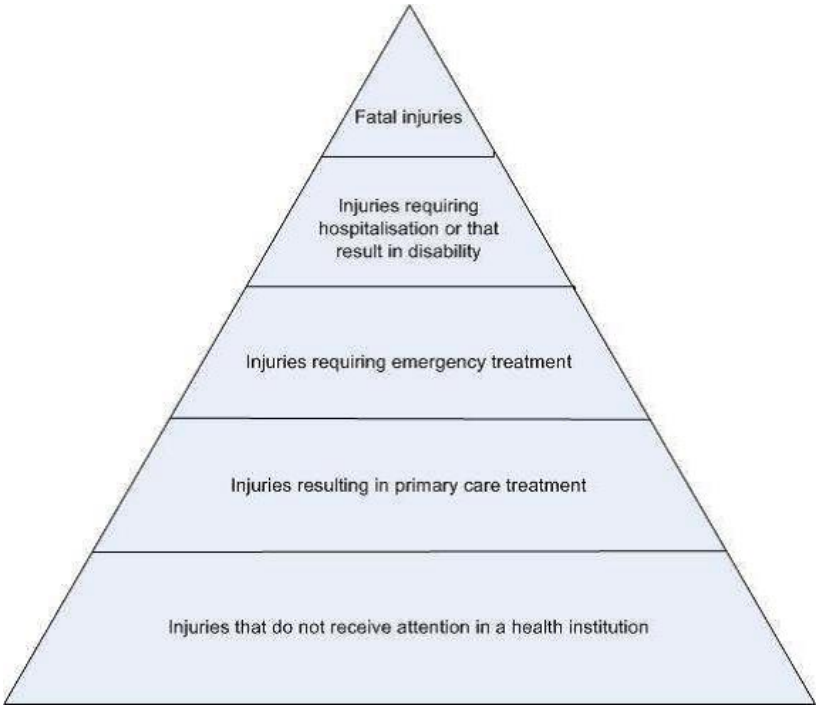
The HSSS monitors data from several different sources which capture hazardous substances injuries of different severity. These include:

- 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)
- Fire and Emergency New Zealand
- 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 is 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[4], 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.

Hazardous substances as defined in the HSNO Act exclude poisonings from medicines in fixed dose form, alcohol, and drugs.

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

Carbon monoxide (CO) is a product of incomplete combustion and not a hazardous substance under the HSNO Act (section 2). However, cases involving carbon monoxide, excluding intentional exposure to CO from vehicle

[4] section 2 HSNO Act

exhaust, are included in the HSSS as Health Act (poisoning arising from chemical contamination of the environment) cases.

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	2006-2014
	National Minimum Dataset (hospital discharges)	2006-2016
New Zealand National Coronial Information System	Coroners' findings	2007-2015
Hazardous Substances Disease and Injury Reporting Tool	Primary Care notifications[5]	2014-2016
Fire and Emergency New Zealand	Hazardous substances incidents	2009-2016
National Poisons Centre	Hazardous substances calls	2009-2016
Statistics New Zealand	Population estimates	2006-2013
	Population projections	2014-2016

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 included in the data set.

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 are 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 (eg, males and females, or Māori and non-Māori) and data from different years. Age-sex-specific rates are calculated to measure the frequency of hazardous substances-related deaths, hospital discharges, or notifications for specific groups.

[5] Cases from some Emergency Departments are also included.

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 2016 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 NZDep2013[6] 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.

[6] NZDep2006 was applied to year 2006 to 2009 and NZDep2013 was applied to year 2010 to 2016.

National Mortality Collection (2006-2014)

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.

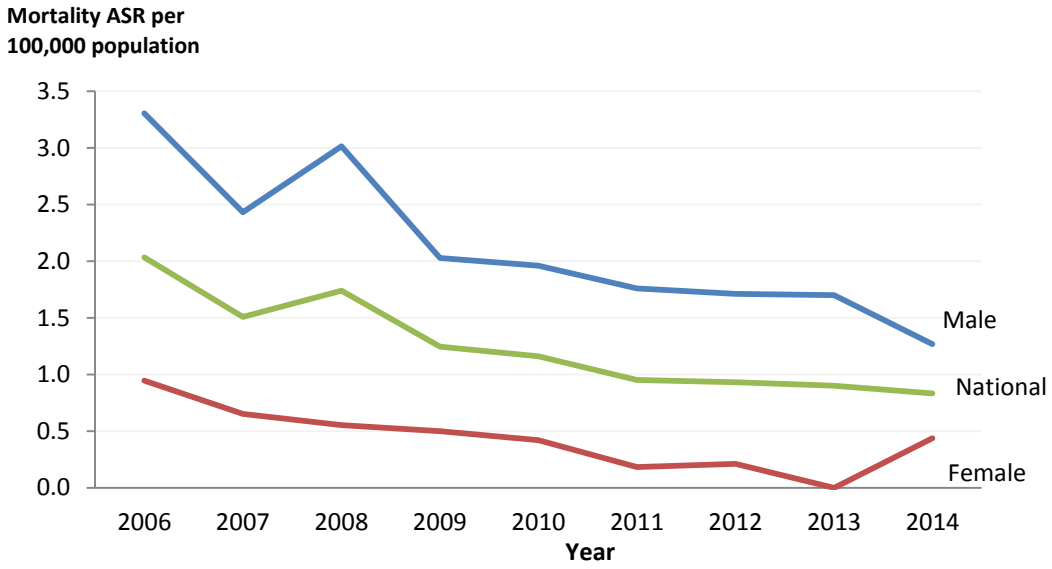
Key findings

- There were 41 hazardous substances-related deaths registered in 2014. The number of deaths has sigificantly 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 (425/525) of deaths between 2006 and 2014
- From 2006-2014, there were no hazardous substances-related deaths of children less than five years old
- Toxic effects of carbon monoxide contributed to 379 deaths between 2006 and 2014.

Deaths from hazardous substances are decreasing in New Zealand

There were 41 hazardous substances-related deaths registered in 2014 compared to 44 deaths in 2013. This represents a 55 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 sex, 2006-2014



Note: The female ASR was not calculated for 2013 as the count was less than five.
Source: National Mortality Collection

Deaths from hazardous substances are more common in males than females

In 2014, there were 11 female deaths compared to 30 male deaths in New Zealand. Between 2006 and 2014, the male age-standardised mortality rates from a hazardous substance were three to nine times greater than

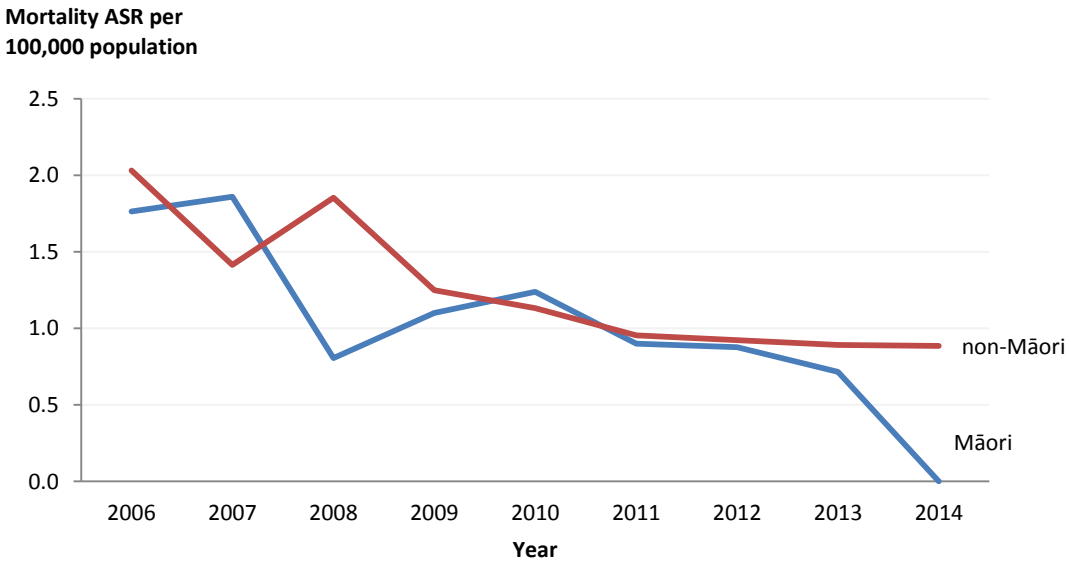
the female rates (Figure 2). These results are similar to those previously found (Peiris-John, Kool, & Ameratunga, 2014). While the rate for males has steadily declined over time, there were some fluctuations between 2006 and 2009.The number and rate of female deaths from a hazardous substance has declined over time.

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 2014 with a decreasing trend (Figure 3).

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, 2006-2014

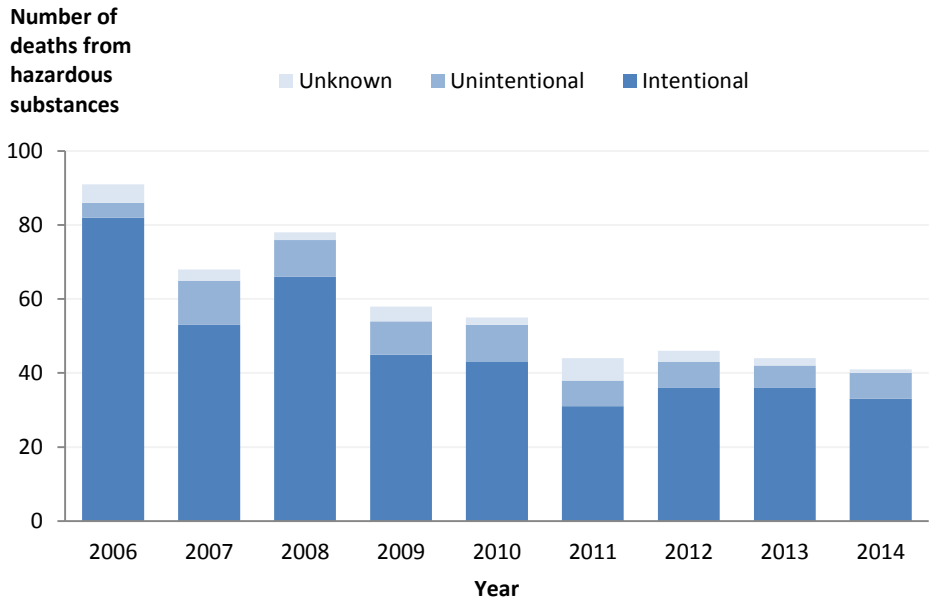


Note: The Māori ASR was not calculated for 2014 as the count was less than five.
Source: National Mortality Collection

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

Between 2006 and 2014, there were 525 deaths from hazardous substances, of which 425 (81%) were attributed to intentional exposure, 72 (14%) were unintentional, and the intent was unknown for 28 deaths (5%) (Figure 4).

Figure 4: Number of hazardous substances-related deaths by intent, 2006-2014



Source: National Mortality Collection

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

Since 2006, there were no reported hazardous substances-related deaths of children less than five years old (Table 2). There were also no deaths reported in the 5-14 year age group in 2014. Over the nine-year period, the youngest death occurred in a child in the 5-14 year old age group from exposure to petroleum products. The 45-64 and 25-44 year age groups contributed to 36 and 34 percent of all hazardous substances deaths respectively.

From 2006 to 2013, there were eight deaths in the 5-14 year age group, of which five were due to inhaling butane and two 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 5[7]).

[7] NZDep2006 was applied to year 2006 to 2009 and NZDep2013 was applied to year 2010 to 2014.

Table 2: Number of deaths from hazardous substances, by age group and cause of death, 2006-2014

Cause of death	Age groups (years)					
	5-14	15-24	25-44	45-64	65+	Total
Organic solvents and halogenated hydrocarbons and their vapours	2	6	8	5		21
Pesticides		2	3	9	7	21
Explosion of other materials	1	2	1	5	1	10
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 and unspecified chemicals and noxious substances		2	10	3	3	18
Other gases and vapours	5	67	153	161	58	444
Total	8	81	176	187	73	525

Source: National Mortality Collection

Toxic effects of carbon monoxide contributed to the majority of deaths

Toxic effects of carbon monoxide contributed to 379 deaths between 2006 and 2014, of which 362 deaths were intentional exposures or suicides. Death from carbon monoxide exposure was most common in the 25-44 (139 deaths) and 45-64 (150 deaths) year age groups. According to WorkSafe New Zealand (2010), 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.

Coronial data (2007-2015)

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

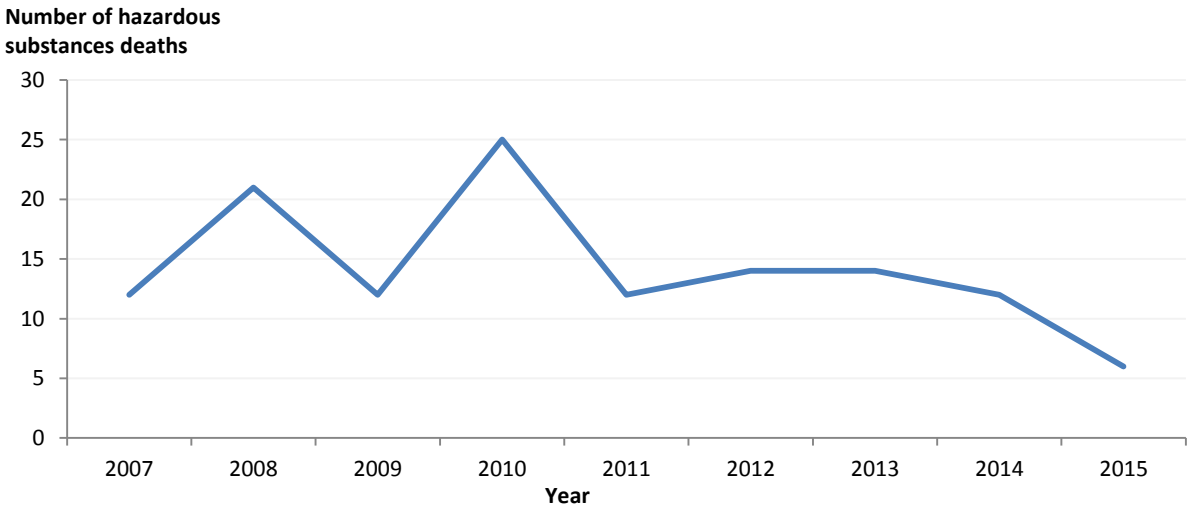
- On average, 14 deaths are referred to the coroner due to hazardous substances exposure every year
- Males outnumbered females in both unintentional and intentional causes of death from hazardous substances
- There were no deaths from hazardous substances that were reported to the coroner for children less than five years old between 2007 and 2015
- Toxic gases (eg, liquid petroleum gas (LPG), butane, propane and methane) were the most common substances causing death, especially for the age group 15-24 years
- Most deaths from hazardous substances exposure were not work-related.

Approximately 14 deaths from hazardous substances are referred to the coroner each year

There were 128 hazardous substances deaths referred to the coroner from 2007 to 2015, which equated to approximately 14 deaths per year on average (Figure 5). There were six deaths reported to the coroner in 2015 due to hazardous substances, compared to 12 deaths in 2014.

The 2016 HSSS report reported seven deaths for 2014 – this number has increased due to the completion of additional coronial investigations.

Figure 5: Number of hazardous substances deaths reported to the coroner, 2007-2015



Note:

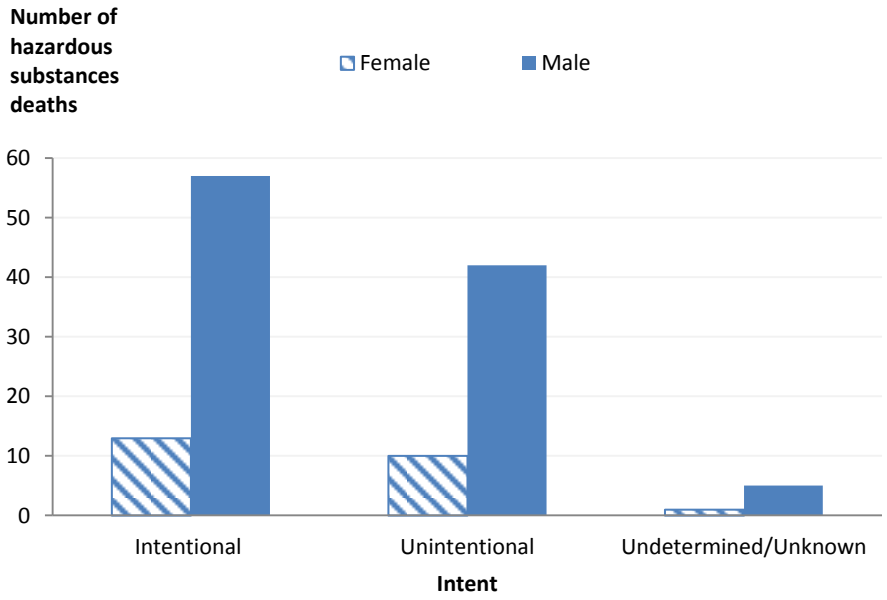
1. Only cases that were closed by coroners were included in this report.
2. This report is based on information recorded in the NCIS as at 9 November 2017. Any updates or additions made to the coronial dataset after this date are not reflected in this report.

Source: National Coronial Information System

Males had more deaths from hazardous substances exposure than females

From 2007 to 2015, the majority of hazardous substances deaths were from males (104/128 deaths) (Figure 6). Intent was recorded according to the judgement of the coroner. During 2007-2015, more than half (70/128) of deaths from hazardous substances were intentional, and 52 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 sex, 2007-2015



Source: National Coronial Information System

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

There were no deaths of children less than five years old between 2007 and 2015. Deaths from exposure to hazardous substances were more common in the 25-44 (40 deaths) and 15-24 (37 deaths) year age groups.

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

From 2007 to 2015, 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, 2007-2015

Substance causing injury	Age group (years)					Total
	5-14	15-24	25-44	45-64	65+	
LPG, natural gas, methane, propane, butane	4	22	3	2	1	32
Other sources of carbon monoxide		2	12	12	5	31
Ethylene glycol, antifreeze		2	3	3		8
Cyanide		1	5	1	1	8
Weed killer, herbicide			1	4	3	8
Petrol, diesel, gasoline	1	4	2			7
Other specified non-pharmaceutical chemical substance			4	1		5
Paraquat			1	3		4
Other specified pesticide herbicide[8]		1	1		1	3
Other insecticide		1		1	1	3
Hydrogen sulphide				1	2	3
Alcohol, methanol NEC		1	2			3
Paint, varnish, stain		1	1			2
Methylated spirits		1	1			2
Organophosphate NEC				1	1	2
Lubricating oils, motor oil		1				1
Toluene			1			1
Sodium hydroxide, caustic soda				1		1
Helium gas			1			1
Drain cleaners					1	1
Epoxies			1			1
Unspecified fuel or solvent			1			1
Total	**5**	**37**	**40**	**30**	**16**	**128**

Source: National Coronial Information System

The majority of deaths from hazardous substances exposure were not work-related

Of the 128 hazardous substances-related deaths that were referred to the coroner, 123 were not work-related, three were work-related and the remaining two were unknown.

[8] As reported by the National Coronial Information System

National Minimum Dataset (2006-2016)

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

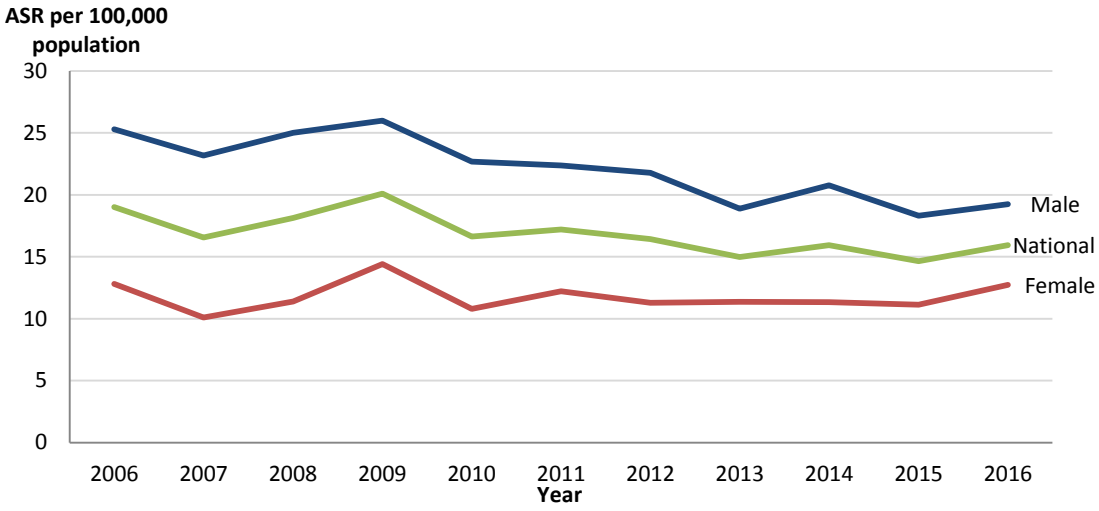
- There were 689 hazardous substances-related hospital discharges in 2016
- On average, there were approximately 700 hospital discharges from exposure to hazardous substances every year from 2006 to 2016
- Each year more males were hospitalised from exposure to hazardous substances than females
- Children 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 2016, over half (4009 hospital discharges) of all hazardous substances injuries occurred in the home
- Tairawhiti DHB had the highest rate of hospital discharges from hazardous substances in 2016
- Hospital discharges due to hazardous substances exposure increased with socio-economic deprivation.

There were 689 hazardous substances-related hospital discharges in 2016

In 2016, there were 689 hazardous substances-related hospital discharges compared to 631 in 2015. During the eleven-year period reviewed (2006 to 2016), there were 7659 hospital discharges attributed to hazardous substances exposure, an average of 696 per year.

Each year between 2006 and 2016, males had a higher hospital discharge rate than 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 sex, 2006-2016



Source: National Minimum Dataset

More males were hospitalised from exposure to hazardous substances than females

Males had about double the female hospitalisation rates for unintentional hazardous substances injury (Table 4). However, for intentional hazardous substances injury, females had slightly higher hospitalisation rates than males. These rates have not changed markedly since 2006. The rate of undetermined exposure discharges among males has decreased from 10.7 to 4.8 per 100,000 population from 2006 to 2016.

Table 4: Hospital discharges from hazardous substances, numbers and sex-specific rates per 100,000 population, 2006-2016

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	14.3	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	10.4	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	9.0	23	131	1.0	5.8	230	401	9.8	17.8
2016	112	87	4.7	3.8	134	224	5.6	9.7	21	111	0.9	4.8	267	422	11.2	18.3

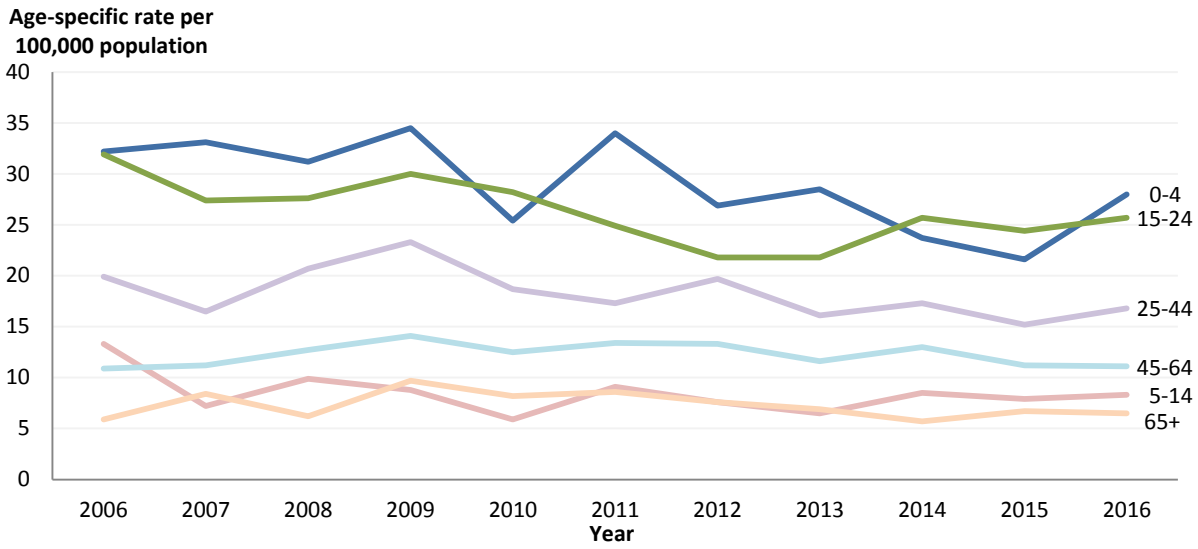
Source: National Minimum Dataset

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

From 2006 to 2016, there were marked differences 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 highest in the 15-24 years age group.

The 5-14 and 65+ years age groups had the lowest rates of hospital discharges over this 11-year period.

Figure 8: Age-specific rates per 100,000 population of hospital discharges from hazardous substance injuries, by age group, 2006-2016

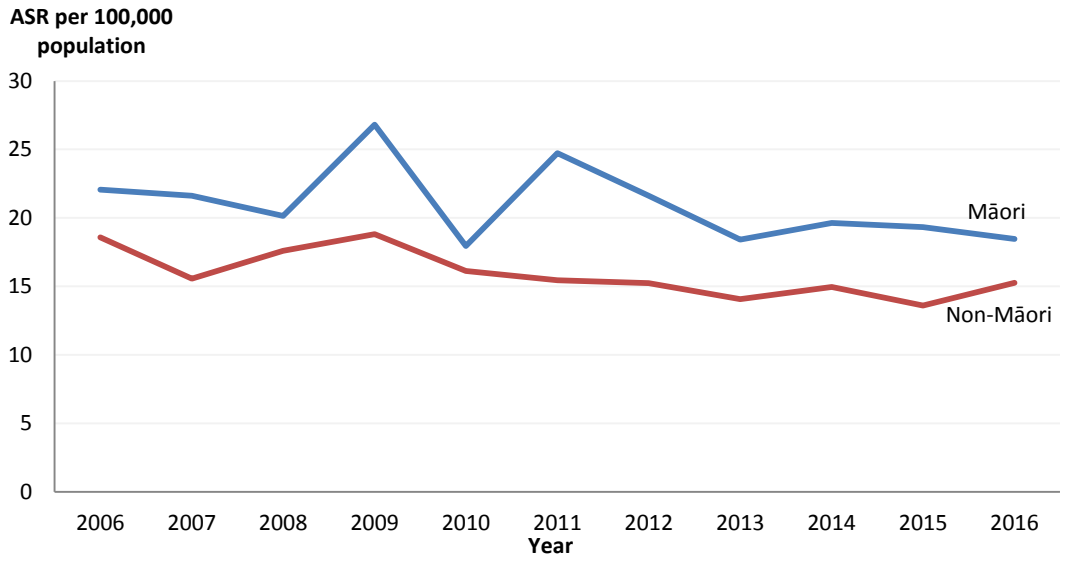


Source: National Minimum Dataset

Māori had higher hospital discharge rates from hazardous substances exposure compared to non-Māori

During the period 2006-2016, the age-standardised rate (ASR) for Māori hospital discharges from hazardous substances injuries was higher than non-Māori for each of the 11 years (Figure 9). Hospital discharge rates for Māori fluctuated between 2008 and 2013 while the rate for non-Māori has held relatively steady over this period.

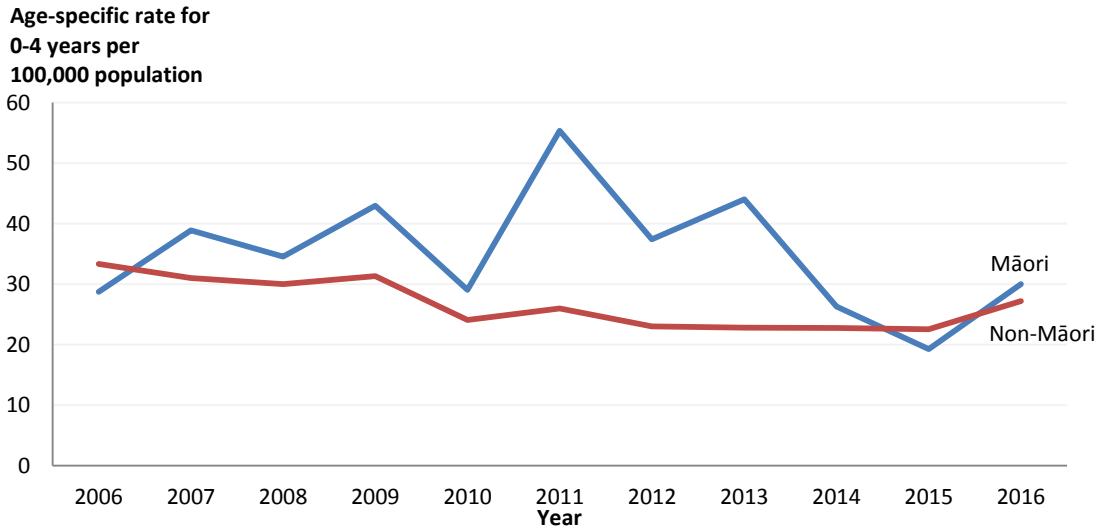
Figure 9: Age-standardised rate (ASR) per 100,000 population of hospital discharges from hazardous substances injuries by ethnicity, 2006-2016



Source: National Minimum Dataset

From 2006 to 2016, 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, 2006-2016

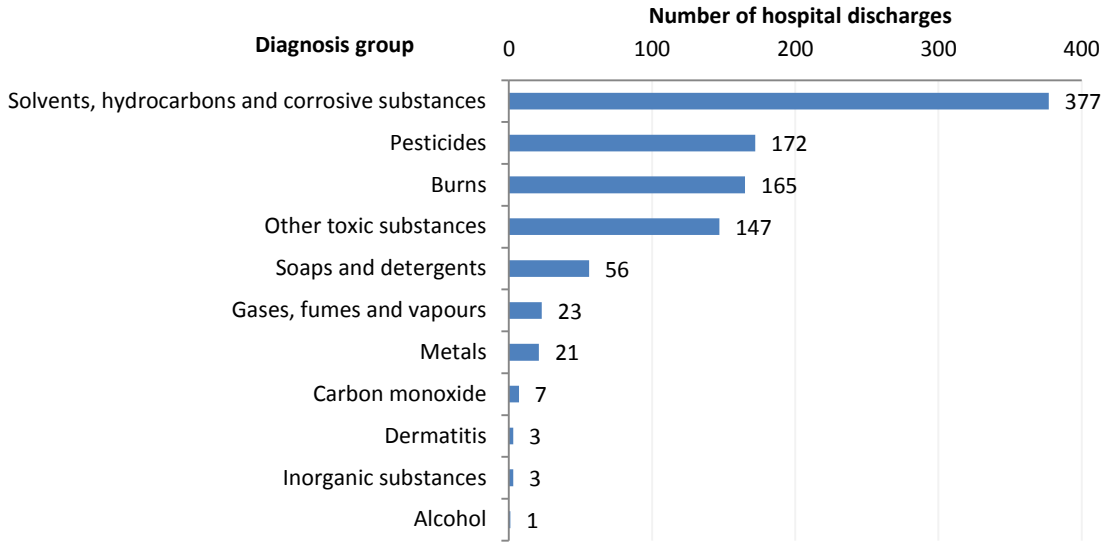


Source: National Minimum Dataset

Solvents, hydrocarbons and corrosive substances were the most common cause of hazardous substances injury for children under five years

Of the 975 hospital discharges among children aged 0-4 years between 2006 and 2016, 377 were due to solvents, hydrocarbons and corrosive substance exposures and 172 were due to pesticides exposures (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 diagnosis group, 2006-2016

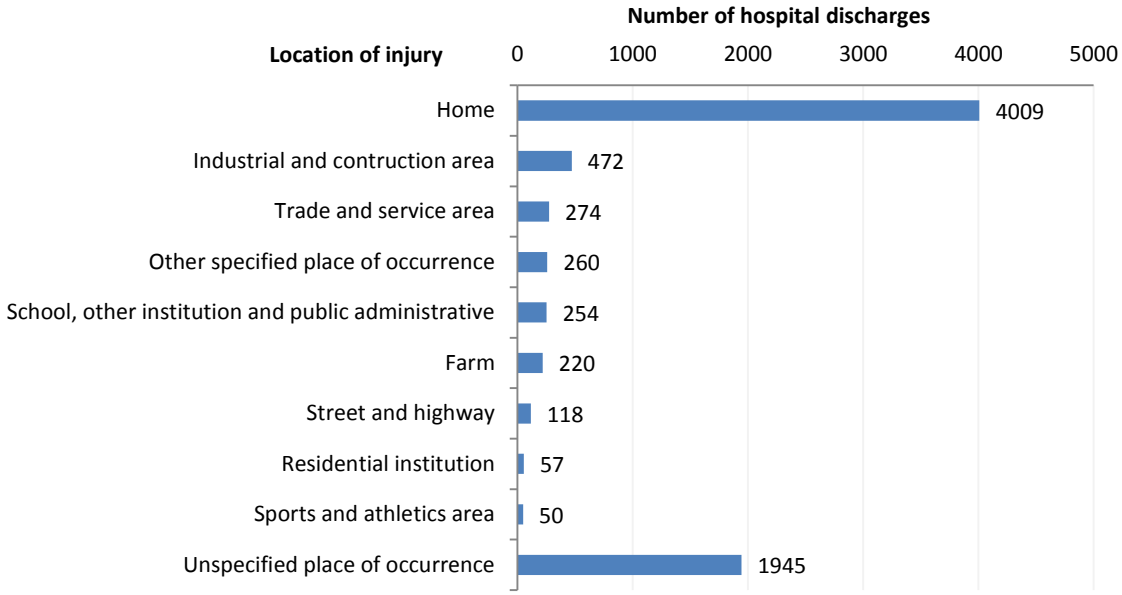


Source: National Minimum Dataset

Most hazardous substances injuries occurred in the home

Between 2006 and 2016, of the 7659 hazardous substances-related hospital discharges, over half (4009 discharges) were from injuries that occurred in the home environment, followed by injuries which occurred at an 'Industrial and construction area' (472 discharges) (Figure 12).

Figure 12: Number of hospital discharges from hazardous substances injuries, by injury location, 2006-2016



Source: National Minimum Dataset

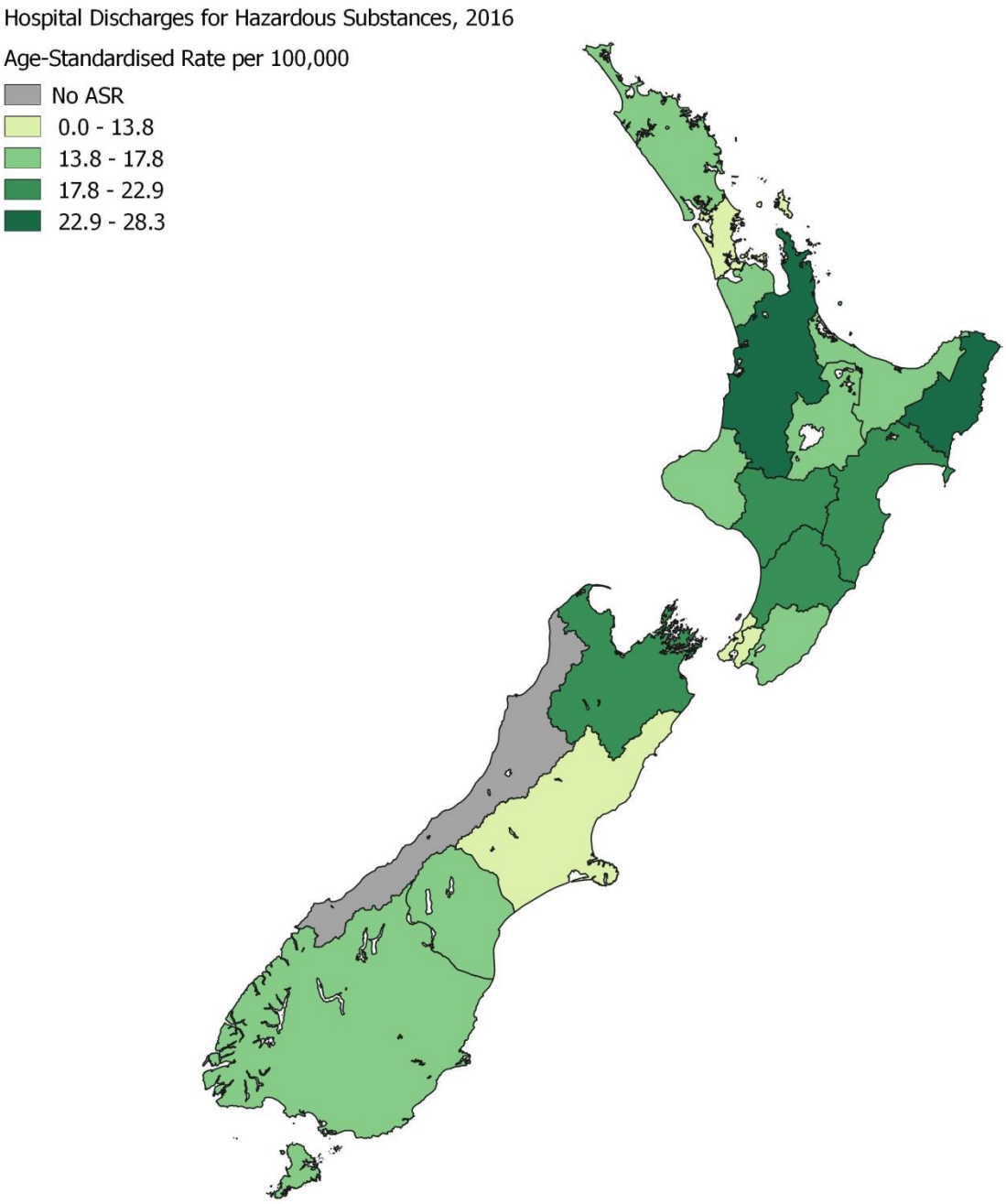
For children under five years old, 82 percent (795/975) of hazardous substances-related hospital discharges occurred at home.

Tairawhiti DHB had the highest rate of hospital discharges in 2016

In 2016, Tairawhiti District Health Board (DHB) had the highest age-standardised rate of hospital discharges (28.3 per 100,000 population) from hazardous substances injuries (Figure 13). Auckland DHB had the lowest rate of hospital discharges (10.9 per 100,000 population).

Overall, 11 out of the 20 DHBs had higher hospital discharge rates than the national rate (15.9 per 100,000 population) in 2016 (see Appendix 5).

Figure 13: Age-standardised rate per 100,000 population of hospital discharges from hazardous substances injuries by DHB, 2016



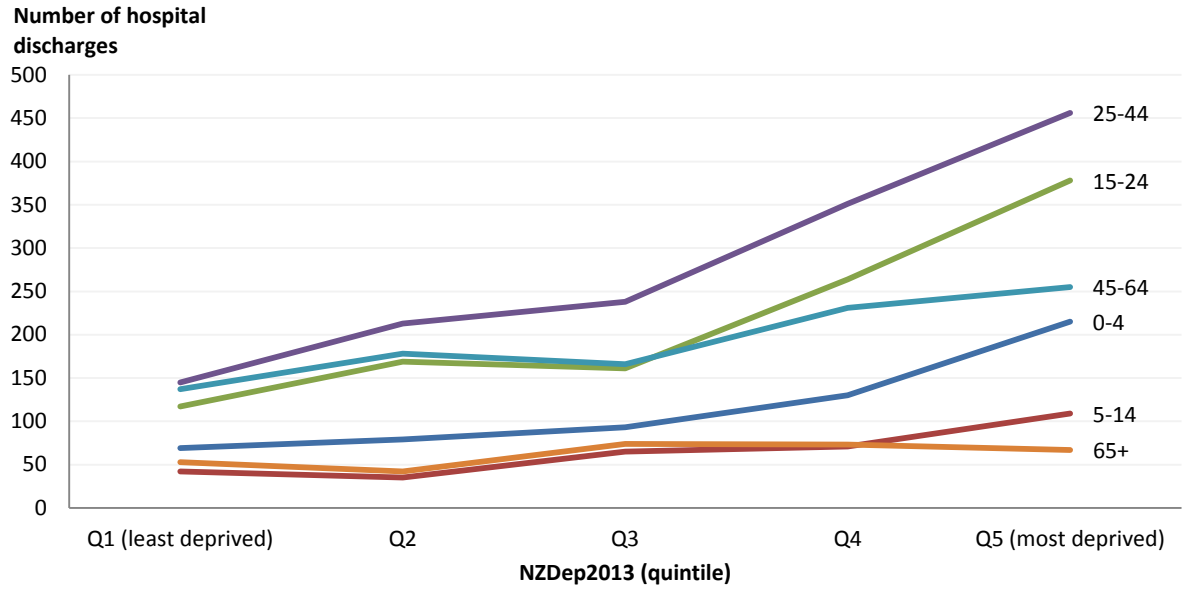
Note: Rates are not calculated for counts smaller than five
Source: National Minimum Dataset

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

From 2010 to 2016, the number of hospital discharges from hazardous substances injuries increased with socio-economic deprivation. The number of hospital discharges was highest among those who resided in deprivation quintile 5 (most deprived) areas, and lowest in quintile 1 (least deprived) areas.

The relationship between the deprivation level and the number of hazardous substances injuries was more apparent in the age groups 0-4, 15-24 and 25-44 years (Figure 14). In those age groups, the numbers of hazardous substances-related hospital discharges in quintile 5 areas were more than three times as high as the number in quintile 1 areas.

Figure 14: Number of hospital discharges from hazardous substances injuries, by deprivation quintile and age group, 2010-2016



Note: NZDep2013 scores were not allocated to 38 hospital discharges and they were excluded from this figure.
Source: National Minimum Dataset

Primary care notifications (2014-2016)

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 ≥0.48µmol/l
- injuries and diseases due to hazardous substances
- poisoning arising from chemical contamination of the environment.

Key findings

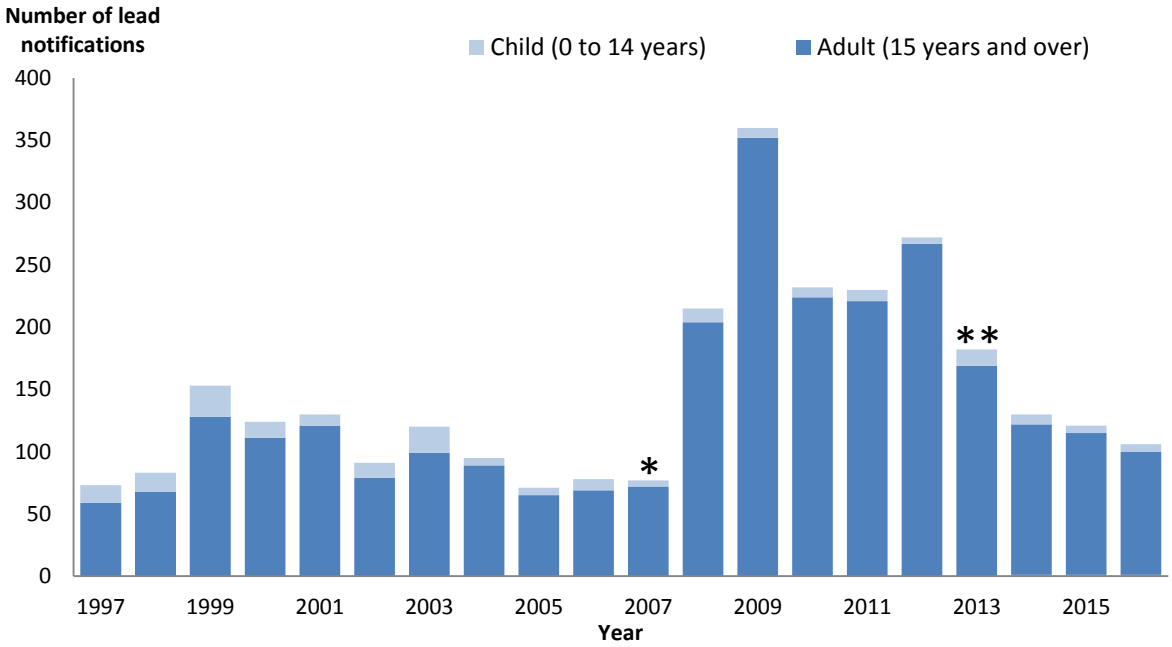
- There were 106 lead absorption notifications in 2016, compared to 121 notifications in 2015
- There were six lead absorption notifications for children under 15 years in 2016
- Wairarapa DHB (16.1 per 100,000 population) had the highest rate of lead notifications in 2016
- Painters (29 notifications) were the occupation most exposed to lead in 2016
- Lead-based paint was the most common source of non-occupational/unknown lead exposure for both children and adults
- There were 104 hazardous substances notifications in 2016, compared to 61 notifications in 2015
- There were eight hazardous substances notifications for children under five years old
- Seventy-seven percent (80 notifications) of hazardous substances notifications were due to unintentional exposures
- Industrial chemical (46 notifications) was the most common substance category
- The number of lead and hazardous substances notifications generally increased with socio-economic deprivation
- There were five agrichemical spray-drift notifications in 2016.

Lead notifications

There were 106 lead absorption notifications in 2016 compared to 121 notifications in the previous year

There were 106 notifications (2.3 per 100,000 population) of lead absorption in 2016, compared with 121 notifications (2.6 per 100,000 population) in 2015 (Figure 15).

Figure 15: Number of lead absorption notifications in children and adults by year, 1997-2016



***** In 2007, direct laboratory notification was introduced, the non-occupational notifiable blood lead level was lowered from 0.72 to 0.48µmol/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 (2013-2016)

There were six child lead notifications in 2016

Of the 106 lead absorption notifications in 2016, six children under the age of 15 were reported (Table 5). In 2015, there were also six notifications for children under 15 years old.

In 2016, 88 percent (93 out of 106 notifications) of all lead notifications were males, and the most common age group was 45-64 years (51 notifications), followed by 25-44 years (31 notifications) (Table 5).

Table 5: Lead absorption notifications by age group and sex, 2016

Age group (years)	Female	Male	Total
0-4	2		2
5-14		4	4
15-24	1	2	3
25-44	2	29	31
45-64	8	43	51
65+		14	14
Unknown		1	1
Total	**13**	**93**	**106**

Source: HSDIRT

Wairarapa DHB had the highest rate of lead absorption notifications in 2016

Wairarapa District Health Board (DHB) had the highest rate of lead absorption notifications (16.1 per 100,000 population) in 2016, followed by Taranaki DHB (8.6 per 100,000 population) (Table 6). In 2015, Taranaki DHB had the highest rate of lead notifications (11.2 per 100,000 population), followed by MidCentral DHB (4.1 per 100,000 population).

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

DHB	2015		2016	
	Number	Rate	Number	Rate
Northland	0		0	
Waitemata	12	2.1	5	0.9
Auckland	18	3.7	10	2.0
Counties Manukau	6	1.2	6	1.1
Waikato	7	1.8	18	4.5
Lakes	1		2	
Bay of Plenty	4		2	
Tairawhiti	0		2	
Taranaki	13	11.2	10	8.6
Hawke's Bay	1		6	3.7
Whanganui	2		5	7.9
MidCentral	7	4.1	8	4.6
Hutt Valley	5	3.5	3	
Capital and Coast	10	3.3	7	2.3
Wairarapa	3		7	16.1
Nelson Marlborough	3		0	
West Coast	0		0	
Canterbury	18	3.4	11	2.0
South Canterbury	4		0	
Southern	4		2	
Unknown	3		2	
New Zealand	**121**	**2.6**	**106**	**2.3**

Note:

1. 2015 and 2016 population projections were used for the denominator
2. Crude rates were not calculated for counts less than five
3. Spatial analysis was based on an individual's residential address.

Source: HSDIRT

Painters were the most exposed to lead

In 2016, there were 51[9] lead absorption notifications (48% of all lead notifications) where occupation was recorded as the source of exposure, compared to 37 notifications (31% of all lead notifications) in 2015.

[9] Three notifications were recorded with both occupational and non-occupational/unknown exposures. Those three cases were included in both occupational and non-occupational/unknown cases analyses.

Painter (29 notifications) was the most commonly reported occupation for occupational lead absorption notifications (Table 7). Painter was also the most commonly reported occupation in 2015 and 2014, accounting for 16 and 20 notifications respectively.

Table 7: Number of occupational lead absorption notifications, by occupation, 2016

Occupation	Number of notifications
Painter	29
Foundry worker	3
Scrap metal worker	3
Radiator technician	2
Brick layer	1
Car radiator manufacturer	1
Caretaker	1
Electrical soldering transformer	1
Cleaner	1
Fibreglass grinder	1
Lead lighter	1
Panel Beater	1
Roofer	1
Sandblaster	1
Sinker maker	1
Turner Fitter	1
Builder	1
Welder	1
Unknown	1
Total	**52***

*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

In 2016, there were 58 lead absorption notifications where a non-occupational/unknown source of exposure was recorded. This compares to 87 non-occupational/unknown lead absorption notifications in 2015. The most common source of lead exposure for both children (<15 years) and adults (15+ years) was lead-based paint (Table 8).

Table 8: Sources of non-occupational/unknown lead exposure, 2016

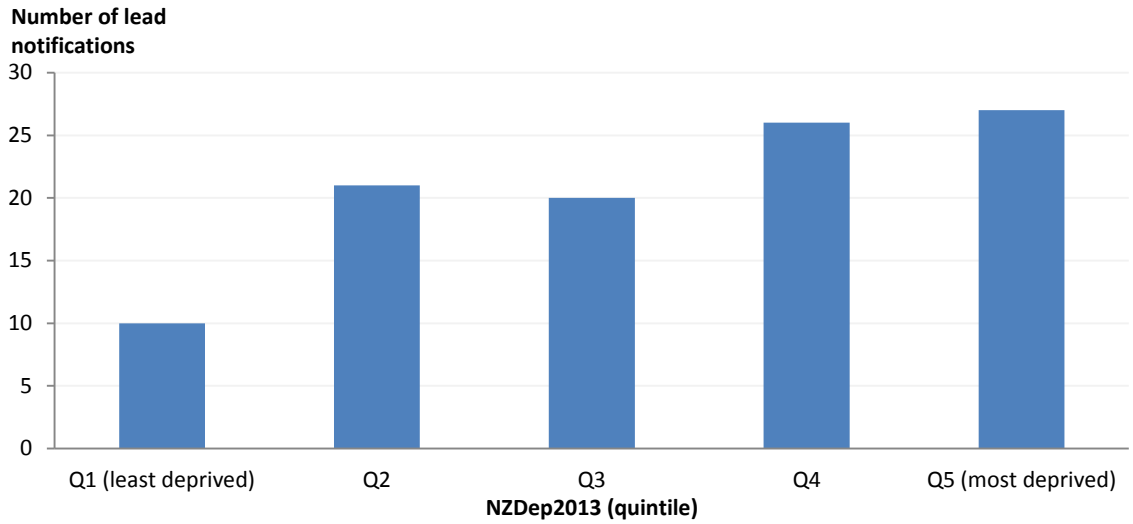
Non-occupational/unknown Lead source	Number
Lead-based paint	24
Indoor rifle range	12
Bullet/sinker	6
Traditional medicine or cosmetic	3
Pica	3
Ceremonial incense and dietary spices	1
Gunpowder	1
Restoration of lino casting machine	1
Unknown	13
Total	**64***

*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

The number of lead absorption notifications generally increased with socio-economic deprivation

In 2016, the number of lead absorption notifications was highest among those who resided in deprivation quintile 5 (most deprived) areas, and lowest in quintile 1 (least deprived) areas (Figure 16).

Figure 16: Number of lead absorption notifications, by deprivation quintile, 2016



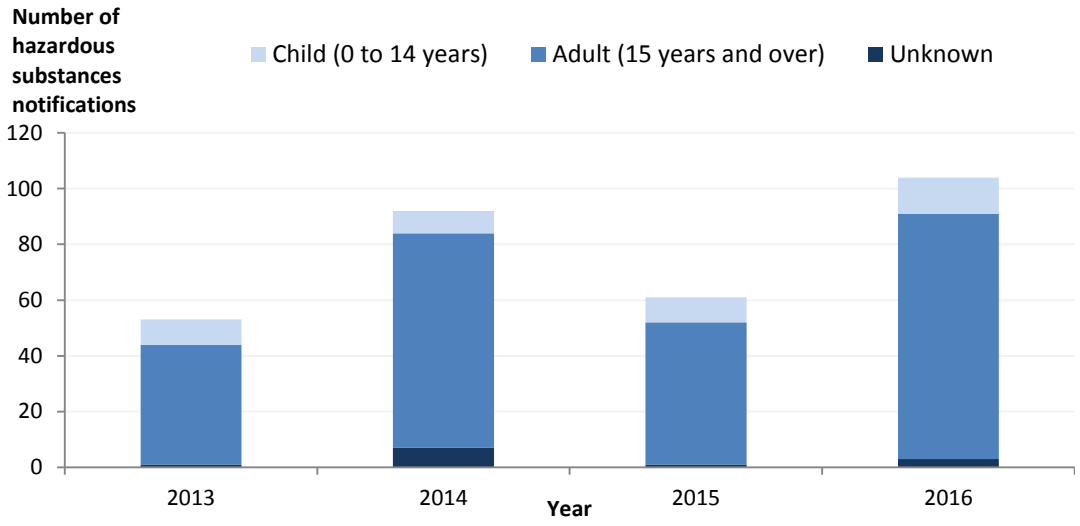
Note: NZDep2013 score is based on an individual's residential address. NZDep2013 scores were not allocated to two notifications and they were excluded from this figure.
Source: HSDIRT

Hazardous substances notifications

Hazardous substances notifications have increased significantly in 2016

There were 104[10] notifications that were related to hazardous substances in 2016, this was a significant increase ($p<0.05$) compared to 61 notifications in 2015 (Figure 17).

Figure 17: Number of hazardous substances notifications in children and adults by year, 2013-2016.



Note: National rollout of HSDIRT occurred progressively throughout 2013. Therefore data in 2013 were not complete.
Source: HSDIRT

There were eight child hazardous substances notifications in 2016

Of the 104 hazardous substances notifications in 2016, eight children under the age of five years were reported (Table 9).

In 2016, 64 percent (67 notifications) of the hazardous substances notifications were males. Thirty-eight percent (39 notifications) of the hazardous substances notifications were from the 25-44 year age group, followed by 20 percent (21 notifications) from the 45-64 year age group (Table 9).

Twenty-four notifications required hospital admission, including two children under 15 years old.

[10] Thirty-eight hazardous substances notifications were excluded from the 2016 analysis as they were either recorded as 'not a case' or exposed to substances not subject to HSNO controls or did not constitute poisoning arising from chemical contamination of the environment.

Table 9: Hazardous substances notifications by age group and sex, 2016

Age group (years)	Female	Male	Unknown	Total
0-4	2	6		8
5-14	1	4		5
15-24	7	10	1	18
25-44	10	28	1	39
45-64	9	12		21
65+	3	6	1	10
Unknown	2	1		3
Total	**34**	**67**	**3**	**104**

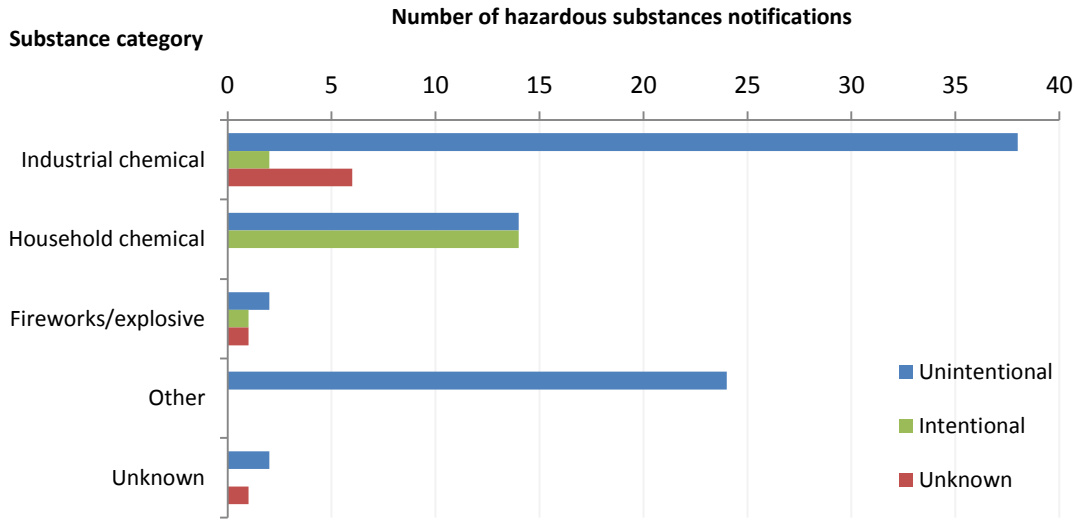
Source: HSDIRT

Majority of hazardous substances notifications were due to unintentional exposures

Seventy-seven percent (80 notifications) of hazardous substances notifications were from unintentional exposures in 2016. The most common substance category reported was industrial chemical (46 notifications), followed by household chemical (28 notifications) (Figure 18).

Over 40 percent (42 notifications) of the hazardous substances notifications occurred at home, followed by 30 percent (31 notifications) that occurred at workplaces. There were five notifications that were exposed to hazardous substances in public places and one in a school.

Figure 18: Number of hazardous substances notifications, by substance category and intent, 2016

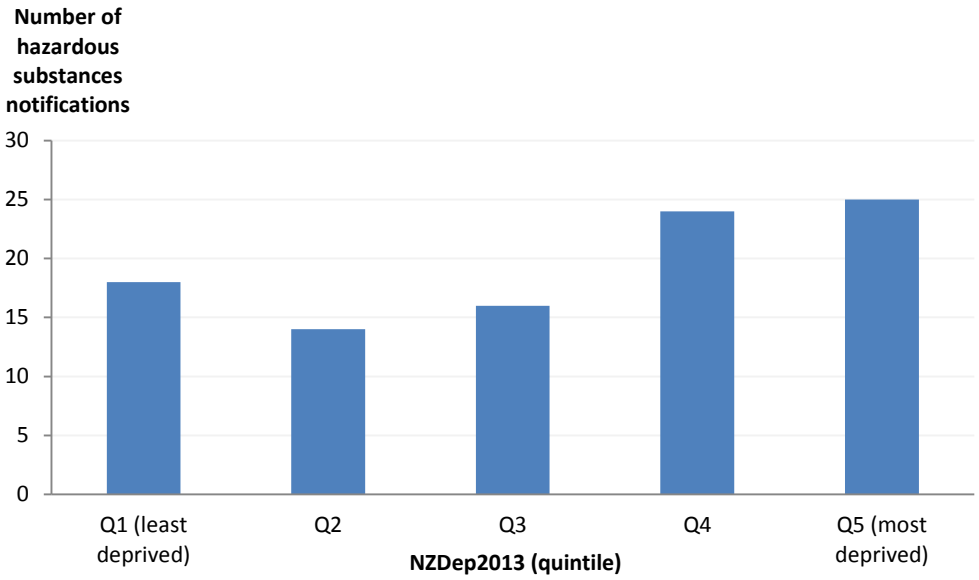


Note: More than one hazardous substance category can be reported for a single notification.
Source: HSDIRT

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

In 2016, the number of hazardous substances notifications was highest among those who resided in deprivation quintile 5 (most deprived) areas, and lowest in quintile 2 areas (Figure 19).

Figure 19: Number of hazardous substances notifications, by deprivation quintile, 2016



Note: NZDep2013 score is based on an individual's residential address. NZDep2013 scores were not allocated to seven notifications and they were excluded from this figure.
Source: HSDIRT

Agrichemical spray-drift notifications

There were five agrichemical spray-drift notifications in 2016, compared to four notifications in 2015. Four out of the five notifications were females. The ages ranged from 4 to 63 years.

Hazardous substances incidents (2009-2016)

This section presents data from the hazardous substances incidents database maintained by the Fire and Emergency New Zealand. Fire and Emergency New Zealand 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. Incidents are categorised on a scale (alarm level) from 1 to 5 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 by Fire and Emergency New Zealand. 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 2016, Fire and Emergency New Zealand attended 1286 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, chlorine, and methane gas were the most common hazardous substances involved in level 2 or 3 incidents between 2009 and 2016.

Fire and Emergency New Zealand attends over 1200 hazardous substances incidents every year

From 2009 to 2016, Fire and Emergency New Zealand attended 9918 hazardous substances incidents (Table 10), an average of 1239 incidents every year. The highest number of incidents (1436) was reported in 2010 followed by 1354 incidents in 2015. There were 1286 hazardous substances incidents in 2016 – a five percent decrease since 2015.

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

Table 10: Number of hazardous substances incidents attended by Fire and Emergency New Zealand, by alarm level, 2009-2016

Alarm Level	Year								Total
	2009	2010	2011	2012	2013	2014	2015	2016	
1	1142	1413	988	1093	1302	1234	1321	1265	9758
2	10	22	11	18	19	17	30	18	145
3		1	1	1	1	5	2		11
4							1	3	4
Total	**1152**	**1436**	**1000**	**1112**	**1322**	**1256**	**1354**	**1286**	**9918**

Note: Alarm level indicates the severity of an incident where 1=low and 5=very high.
Source: Fire and Emergency New Zealand

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

There have been no level 5 (very high alarm) hazardous substances incidents since reporting began in 2009. Of the 9918 incidents, four were level 4, 11 were level 3, 145 were level 2, and the vast majority (9758) were level 1 incidents (Table 10).

Fire and Emergency New Zealand attended one level 4 hazardous substances incident in 2015, involving anhydrous ammonia and three incidents in 2016. Of the three level 4 incidents in 2016, one was caused by the improper mixing of hydrogen peroxide and sodium chlorite while the remaining two were liquid gas leak/spill incidents involving petrol and ethyl methyl ketone.

There were no level 3 incidents in 2016. Between 2009 and 2015, the substances involved in level 3 incidents were 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 2016, 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. The number of incidents involving liquid gas leak/spill with no fire, gas liquid spills from a vehicle accident, and chemical emergencies has decreased by five to eight percent between 2015 and 2016.

Table 11: Number of hazardous substances incidents attended by Fire and Emergency New Zealand by incident type, 2009-2016

Incident type	2009	2010	2011	2012	2013	2014	2015	2016	Total
Liquid gas leak or spill: no fire	639	827	593	678	781	753	821	759	5851
Gas liquid spill: vehicle accident	150	166	127	128	138	105	151	139	1104
Chemical emergency	117	146	97	109	110	127	107	102	915
Gas liquid spill: no vehicle accident	108	144	85	85	110	116	111	102	861
Miscellaneous hazardous condition - NC	81	93	67	77	130	110	122	142	822
Mobile property hazardous incident - NC	13	7	5	3	14	6	8	16	72
Attempted burning	14	16	6	9	6	5	8	7	71
Biohazard emergency	6	8	3	8	12	12	4	8	61
Chemical spill: vehicle accident	10	11	7	7	6	7	8	5	61
Gas liquid spill: incorrect vehicle loading	7	7	6	4	8	7	5	3	47
Explosive present	6	7	2	3	5	3	2	2	30
Chemical spill: incorrect vehicle loading	1	3	2	1	1	5	7		20
Radioactive condition[11]		1			1			1	3
Total	**1152**	**1436**	**1000**	**1112**	**1322**	**1256**	**1354**	**1286**	**9918**

Note: NC (Not classified)

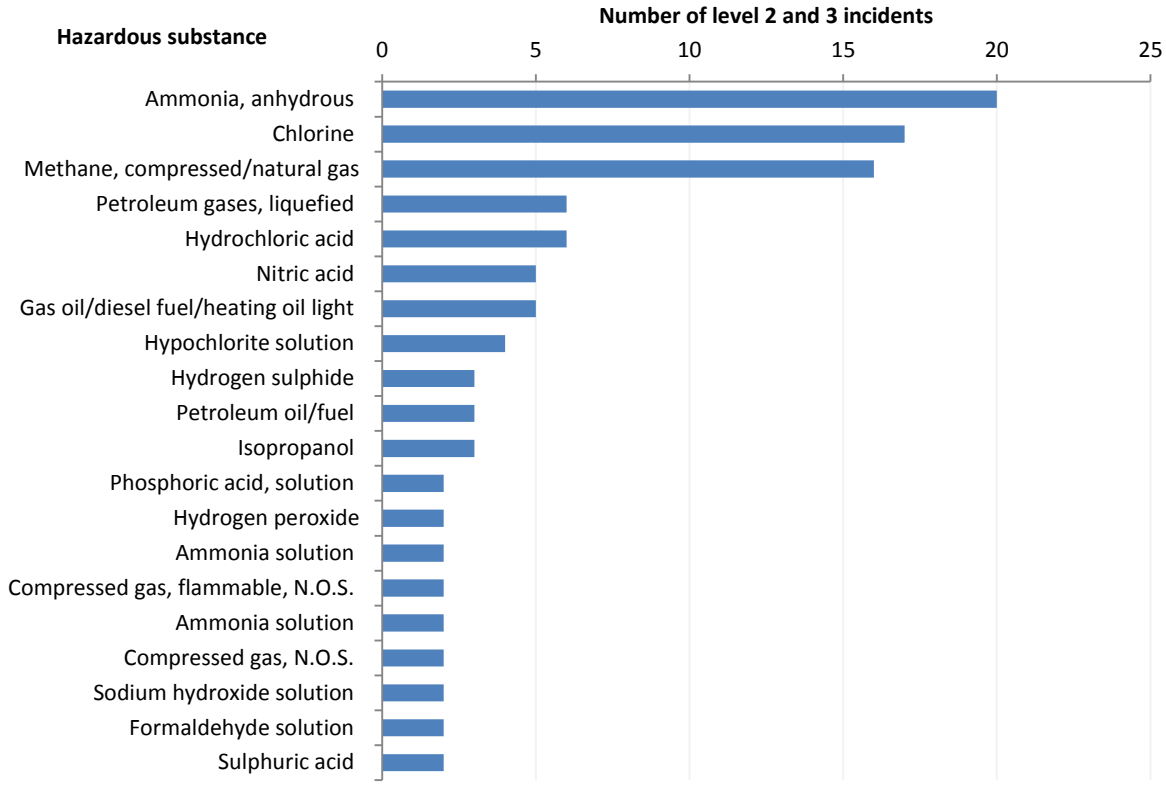
Source: Fire and Emergency New Zealand

[11] The HSNO Act does not include radioactive substances

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

From 2009 to 2016, the top three most common hazardous substances involved in level 2 or 3 incidents were anhydrous ammonia, chlorine, and methane gas (Figure 20).

Figure 20: Hazardous substances most frequently involved in level 2 or 3 incidents, 2009-2016



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: Fire and Emergency New Zealand

Hazardous substance-related telephone calls (2009-2016)

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 from 2013 to 2015 is based on summary tables rather than raw data, therefore, numbers may differ from previous years. Only poisoning/exposures calls are included in this analysis.

Key findings

- The NPC received around 10,000 calls on average each year between 2009-2015
- Half (2147/4297) of the hazardous substances-related calls in 2016 involved children less than six years old
- Household cleaners (372 calls) and detergents (151 calls) were the most common household agents cited for children
- Child exploratory behaviour was responsible for more than half (2358/4297) of all hazardous substances calls in 2016
- Self-treatment (1994 calls) was the most common treatment outcome in 2016.

Approximately 10,000 calls concerning hazardous substances are made to the National Poison Centre each year

From 2009 to 2015, the National Poisons Centre (NPC) received on average 10,000 hazardous susbtances-related calls each year.

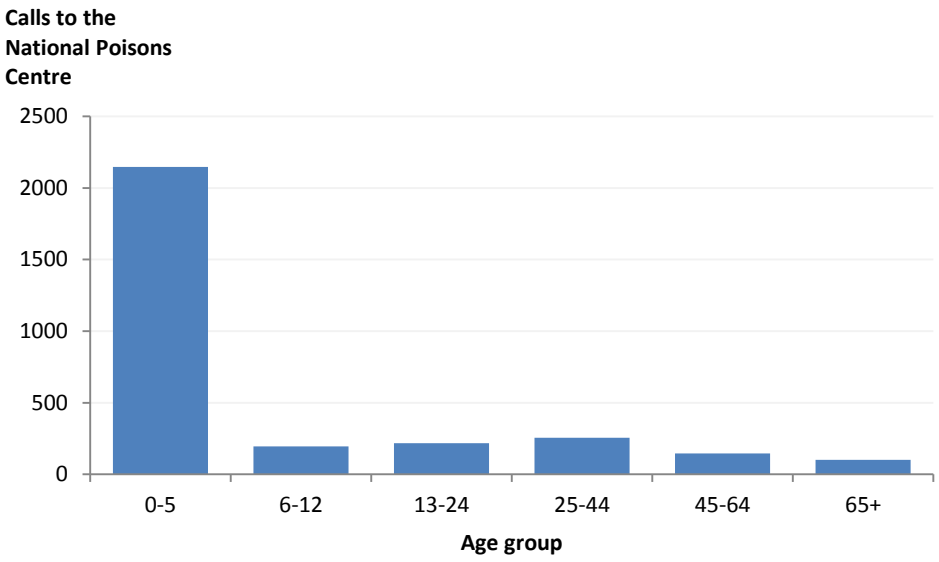
Between August and December 2016, there were 4297[12] calls concerning hazardous substances of which 50 percent (2154 calls) were males and 45 percent (1923 calls) were females.

Half of the hazardous substances-related calls in 2016 concerned children less than six years old

Of the 4297 hazardous substances-related calls made in 2016, half (2147 calls) concerned children less than six years old (Figure 21). A similar trend was reported in previous years.

[12] Data for 2016 is incomplete as it only contains calls from August to December 2016 when the Poisons line was integrated into the new national telehealth service.

Figure 21: Number of hazardous substances-related calls to the National Poisons Centre, by age group, August-December 2016



Note: Calls, where age is recorded as 'Unknown', have been excluded from this figure.
Source: National Poisons Centre

Exposures regarding household products were most frequent among children

Among exposures relating to children aged 0-5 years, household products (1518 calls) and cosmetics (427 calls) were the most frequently reported substances in 2016 (Table 12). These included household agents such as household cleaners (372 calls) and detergents (151 calls). For agricultural agents, fertilisers (28 calls) were the most commonly reported product involving children.

Household products and cosmetics were the most common exposures across all age groups.

Table 12: Number of hazardous substances-related exposures, by age group and substance classification, August-December 2016

Substance classification	Age group							Total
	00-05	06-12	13-24	25-44	45-64	65+	Unknown	
Household	1518	137	133	143	76	63	735	2805
Cosmetic	427	23	30	13	5	19	70	587
Agricultural	158	22	31	52	41	17	226	547
Industrial	39	8	47	58	25	13	246	436
Automotive	18			3	1		2	24
Miscellaneous	186	31	26	25	15	7	161	451
Total	2346	221	267	294	163	119	1440	4850

Note:

1. Some calls involved multiple substances and so the total number of exposures can add up to more than the total number of calls.
2. Data only contains classification information and individual substances cannot be identified.

Source: National Poisons Centre

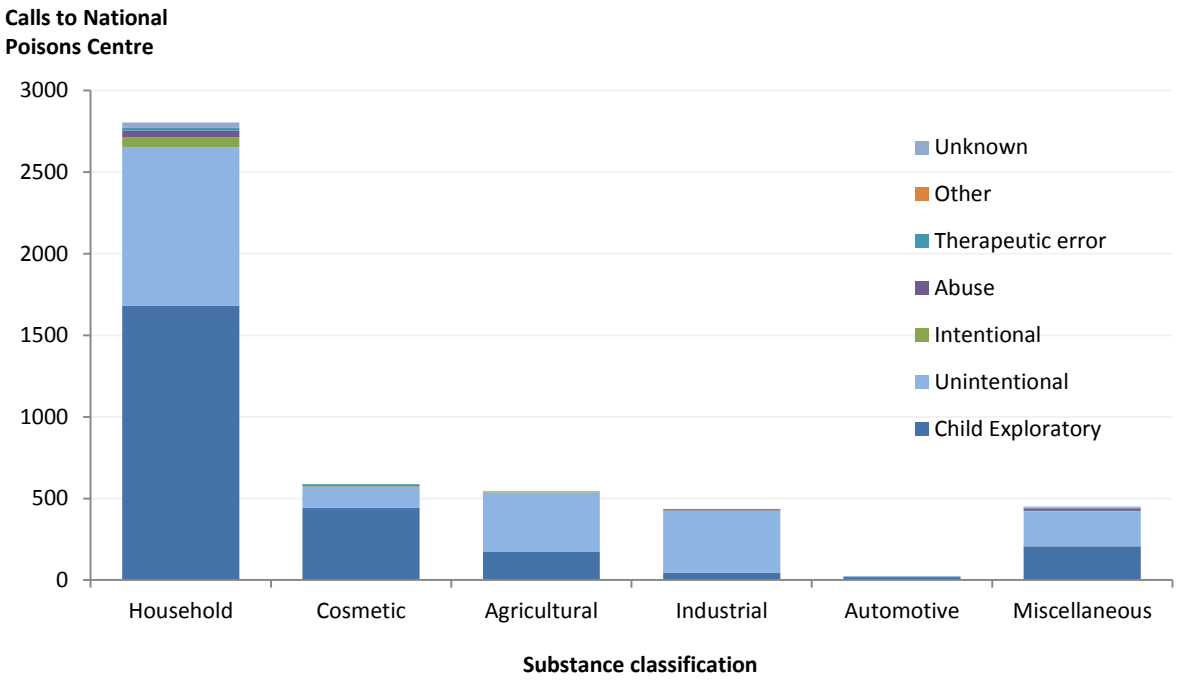
Child exploratory behaviour was responsible for 55 percent of calls

In 2016, 55 percent (2358 calls) of all hazardous substances-related exposures were from child exploratory behaviour, and 41 percent (1758 calls) were from adult unintentional exposures (Figure 22). The majority of exposures concerning household and cosmetic products were from child exploratory behaviour while unintentional exposures were more common in calls concerning household and industrial products.

The most common routes of exposure were through ingestion (2792 calls) followed by inhalation (511 calls) and skin contact (473 calls). For children under the age of six years old, exposures commonly occured via ingestion (1861 calls) and skin contact (138 calls).

Over 85 percent (3671 callls) of calls were from exposures that occurred in the home followed by workplaces (319 calls) and schools (143 calls).

Figure 22: Number of hazardous substances-related calls to the National Poisons Centre by substance classification and intent, August-December 2016



Note: Some calls involved multiple substances and so the number of exposures will add up to more than the total number of calls.
Source: National Poisons Centre

Self treatment was the most common treatment outcome[13]

Of the 4297 calls in 2016, the most common treatment outcomes were self-treatment (1994 calls), no treatment indicated (1056 calls) and medical referral (1012 calls).

[13] Some calls involved multiple substances and whilst each substance is counted as an exposure, only one treatment outcome is given.

Conclusion

Hazardous substance exposure accounted for 41 registered deaths in 2014, the most recent year for which data are available. In 2016, it accounted for 689 hospital discharges, 214 primary care notifications, 1286 Fire and Emergency New Zealand incidents, and 4297 calls (over 5 months) to the National Poisons Centre. Mortality and hospital discharge rates have either declined or remained stable between 2006 and 2016. However, these numbers underestimate the health burden of hazardous substances exposure as not all illness and injuries are fatal or require hospitalisation.

Some population groups are at much higher risk from hazardous substance-relatated 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 hazardous substances-related injury is 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 11 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.

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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 are the most recent data available.
- Hospital discharge and mortality data are presented by calendar year. The mortality data are 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-related injury into occupational and non-occupational disease 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

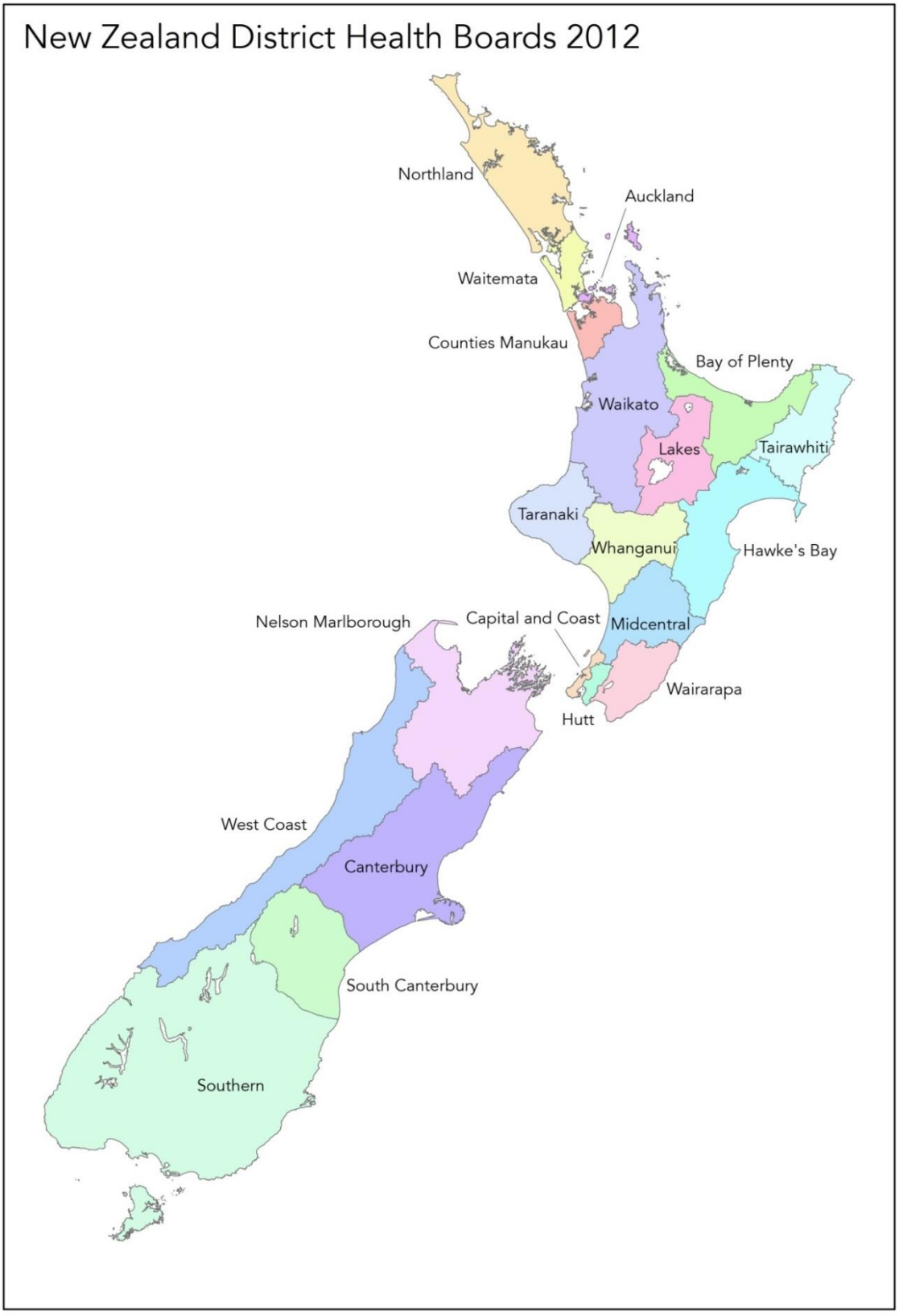
T2212	Erythema of arm (upper) and shoulder region	Burns
T2220	Partial thick [blisters epidermal loss] burn shoulder & upper limb except wrist & hand & unspec site	Burns
T2221	Partial thickness [blisters, epidermal loss] burn of forearm and elbow	Burns
T2222	Partial thickness [blisters, epidermal loss] 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 60-39% 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, with70-79% 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



Appendix 5: Age-standardised rate per 100,000 population of hospital discharges from hazardous substances injury by DHB, 2016

DHB	Age-Standardised rate per 100,000 population
Northland	15.4
Waitemata	13.2
Auckland	10.9
Counties Manukau	17.3
Waikato	24.3
Lakes	16.0
Bay of Plenty	17.8
Tairawhiti	28.3
Taranaki	16.9
Hawke's Bay	20.6
Whanganui	22.9
MidCentral	19.0
Hutt Valley	13.8
Capital and Coast	12.8
Wairarapa	15.7
Nelson Marlborough	20.7
West Coast	-
Canterbury	12.2
South Canterbury	14.8
Southern	16.9
New Zealand Total	**15.9**

Note: Rates are not calculated for counts smaller than five
Source: National Minimum Dataset