cphr | hsss Hazardous Substances Surveillance System

Annual Hazardous Substances Injury Report 2014

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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 are caused by hazardous substances used in everyday domestic and workplace situations.

This report will also present findings on two new data sources – primary care notifications and hazardous substance incidents.

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

Key Findings

- There were no deaths of children less than five years old from 2006 to 2011.
- Huffing[1] continues to be an issue in the 15-24 year age group.
- Children under five years old had the highest rates of hospital discharges in New Zealand.
- Māori have higher discharge rates for poisoning than non-Māori.
- Since the Hazardous Substances Disease and Injury Reporting Tool (HSDIRT) was rolled out nationally, there were 180 lead notifications and 63 hazardous substances notifications in 2013.
- Over half (99 cases) of all lead notifications were non-occupational lead exposures of which 13 were children under 15 years old.
- The New Zealand Fire Service attends approximately 1000 hazardous substances incidents each year. There were no level four or five incidents reported since 2009.
- Over half of the hazardous substances-related calls to the National Poison Centre in 2013 involved children less than five years of age.

[1] The practice of inhaling toxic fumes from glue and other household products for their intoxicating effects.

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

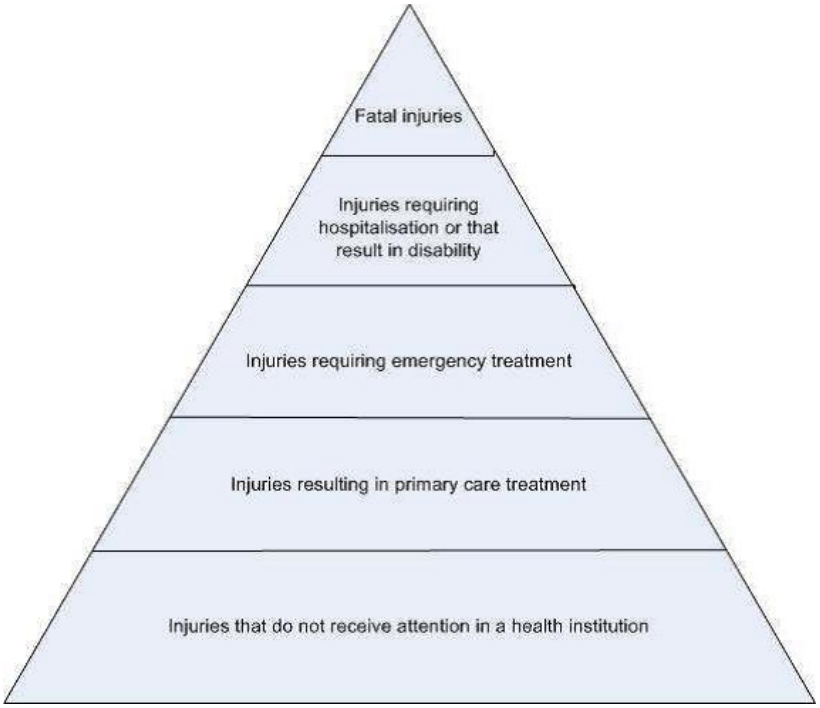
The HSSS monitors data from several different sources (inlcuding the latest addition of primary care notifications and hazardous substance incident reports) which capture poisoning injuries of different severity. These include:

- Mortality data.
- Hospital discharges.
- Primary care notifications.
- Hazardous substance incident reports.
- National Poison Centre calls.

To obtain a 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 which 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) will enable more complete surveillance of hazardous substances injuries and deaths, and ultimately help 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)

Poisoning: a major public health problem

Poisoning continues to be an important public health problem. It accounts for a global burden of disease of approximately 1.2 million deaths which corresponds to two percent of the total deaths and 1.7 percent of the total burden of disease globally (Pruss-Ustun, Vickers et al. 2011). The New Zealand Burden of Disease Study reported that 2709 years of healthy life were lost as a result of poisoning, accounting for four percent of the injury-related health loss in New Zealand (Ministry of Health, 2013). The study also showed ethnic inequalities in the burden of injury. For example, Māori females experienced more than twice the level of health loss through poisoning compared to non- Māori females.

Previous studies undertaken in New Zealand have also shown the annual rate of poisoning fatalities to be comparable to other industrialised countries (McDowell, Fowles et al. 2005). However, deaths due to unintentional poisoning were lower (Yates 2003).

Hazardous substances have the potential to cause considerable harm, hence there is legislation in New Zealand (Hazardous Substances and New Organisms Act 1996) which aims to protect both people and the environment from harm. It is important to know the size of the problem and who is affected, so this information can be directed to those who can take preventive action.

The majority of poisonings are considered acute rather than chronic events. Chronic harm from hazardous substances is hard to measure because it is often difficult to determine what caused the harm, and is a major data gap.

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 about poisoning-related injuries from the following data sources:

- National Mortality Collection
- Coronial Services Office (CSO)
- National Minimum Dataset (NMDS)
- Primary Care notifications
- 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 poisoning 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 contains key statistical information through graphs and tables, with short comments about the noteworthy results. Trends over time are presented where possible.

Definitions and Methods

What is a hazardous substance?

The Hazardous Substances and New Organisms Act 1996 (HSNO Act) 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 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 poisoning deaths in New Zealand.

National Minimum Dataset (NMDS)

The HSSS hospital discharge data are provided by calendar year from 2006-2013. A 'hospital discharge' is defined as a person that has remained in hospital for more than 24hours, and 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.

Re-admissions for the same injury event have been excluded from the data set. A 're-admission' is defined as the unintended acute re-admission of a patient within 30 days of discharge.

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. A full list of external-cause (E code) and diagnosis/nature-of-injury codes is provided in Appendix 2.

National Mortality Collection (2006-2011)

This section provides key findings on poisoning 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.

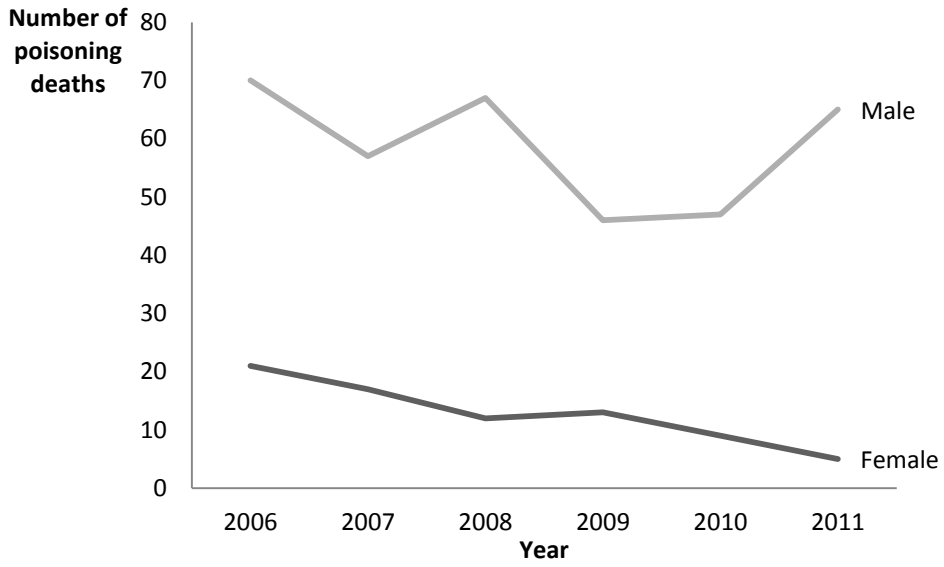
Key findings

- Nearly 80 percent of deaths were male.
- Intentional poisoning accounted for the majority of poisoning fatalities.
- There were no deaths of children less than five years old from 2006 to 2011.
- Huffing continues to be an issue in the 15-24 year age group.

Poisoning fatalities are more common in males than females

Between 2006 and 2011, males account for nearly 80 percent of all poisoning deaths in New Zealand (Figure 2). These results are similar to those previously found (Peiris-John, Kool et al. 2014). The number of females who died from acute poisoning has declined over time with only five fatalities reported in 2011, the lowest since 2006. In contrast, the number of poisoning deaths among males has fluctuated over the seven year period.

Figure 2: Number of poisoning deaths by gender, 2006-2011

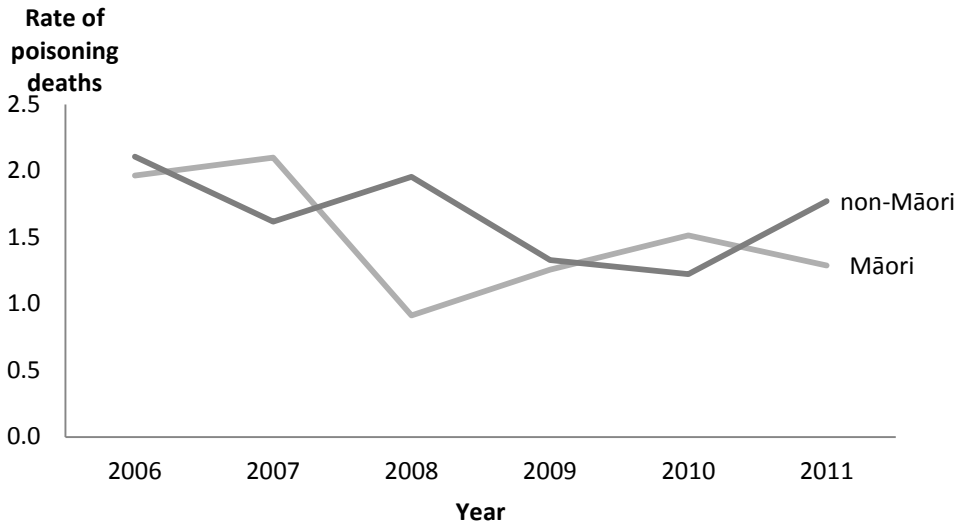


No clear ethnic difference in deaths from poisoning

The rate of poisoning deaths for both Māori and non- Māori have fluctuated between 2006 and 2011(Figure 3). The Māori population experienced its lowest rate (0.9 per 100,000) in 2008.

Overall, there were no clear ethnic differences in deaths from poisoning.

Figure 3: Age standardised rate per 100,000 of poisoning deaths by ethnicity, 2006-2011

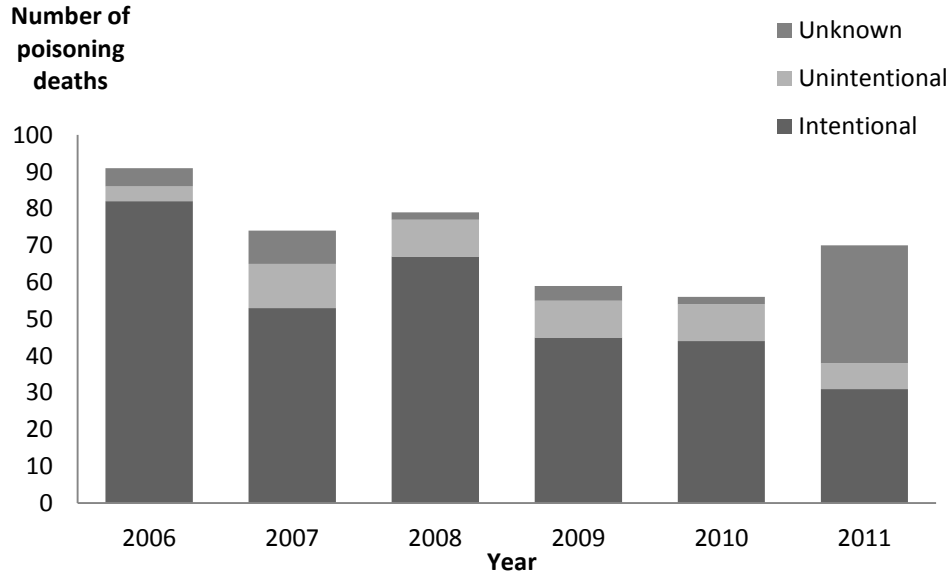


Intentional poisoning account for 75 percent of poisoning deaths

There were 70 deaths attributed to acute poisoning in 2011 - an increase of 25 percent from the previous year (Figure 4). Between 2006 and 2011, there were 429 poisoning deaths of which 75 percent (322 cases) were attributed to intentional poisoning, 12 percent (53 cases) were unintentional, and for 13 percent (54 cases) the intent was unknown. Eighty-seven percent (281 cases) of all intentional deaths were from carbon monoxide toxicity.

The number of unknown poisonings increased substantially from two in 2010 to 32 deaths in 2011. Further examination of the data revealed that this was due to the Pike River mine disaster.

Figure 4: Number of poisoning deaths by intent, 2006-2011



No poisoning deaths of children less than five years old

From 2006 to 2011, there were no reported poisoning deaths of children less than five years old (Table 1).

The 25-44 year age group experienced 36 percent of all poisoning deaths.

Huffing continues to be an issue in the 15-24 year age group

Of the seven deaths in the 5-14 year age group, five were related to huffing, while the remaining two cases suffered burn injuries. There were 24 cases of huffing in the 15-24 age group.

Table 1: Number of poisoning deaths, by age group and cause of death, 2006-2011

Cause of death	Age Group (years)					
	5-14	15-24	25-44	45-64	65+	Total
Other gases and vapours	4	57	123	114	47	345
Explosion of other materials	1	5	18	9	1	34
Organic solvents and halogenated hydrocarbons and their vapours	2	5	5	3	0	15
Pesticides	0	2	0	6	4	12
Explosion and rupture of gas cylinder	0	1	0	3	0	4
Exposure to ignition of highly flammable material	0	1	0	0	3	4
Explosion and rupture of other specified pressurized devices	0	0	1	0	0	1
Other and unspecified chemicals and noxious substances	0	1	7	3	3	14
Total	7	72	154	138	58	429

Coronial data (2007-2012)

This section summarises key findings about poisoning deaths from the Coronial Services Office (CSO). Coronial data is maintained by the Coronial Services Unit (CSU) and stored in the Case Management System (CMS), a national internet-based database. The CMS includes all deaths reported to a coroner since July 2007. All deaths that result from acute chemical injury are deemed to be suspicious; therefore, a coroner's inquest should be completed.

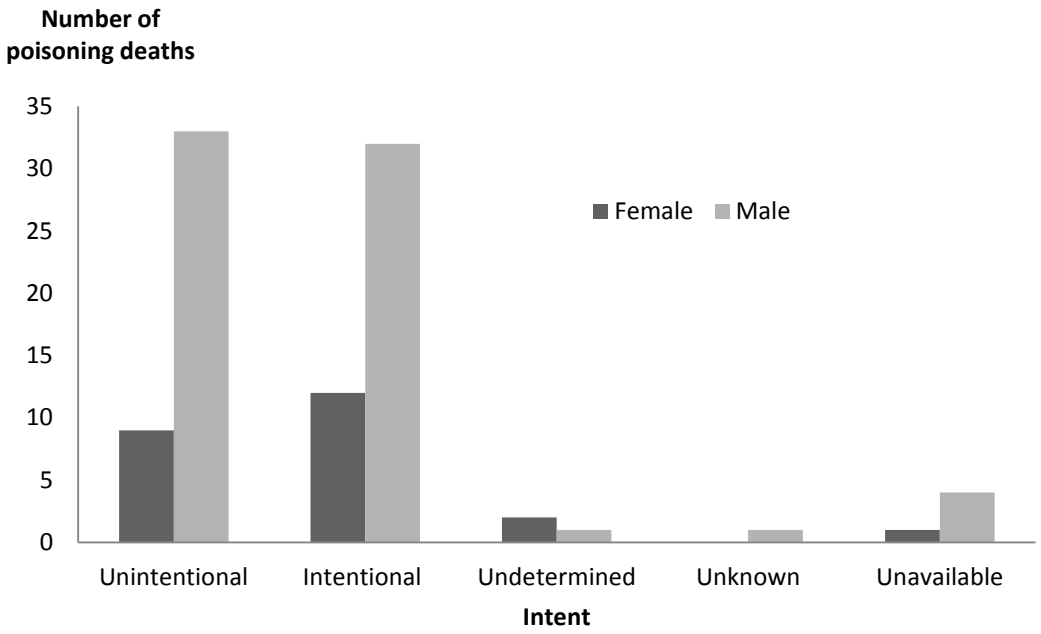
Key findings

- There were 95 poisoning deaths reported to the coroner from 2007 to 2012, of which 75 percent were males.
- There was an equal proportion of poisoning deaths that were attributed to both unintentional and intentional cause of death.
- Males outnumber females in unintentional and intentional cause of deaths.
- There were no deaths reported to the coroner of children less than five years of age.
- Toxic gases (e.g. liquid petroleum gas (LPG), butane, propane, methane) were the most common substances causing death especially in the 15-24 year age group.

Approximately 16 poisoning deaths are referred to the coroner each year

Figure 5 presents data on the number of deaths, by intent and gender, where the underlying cause of death as identified by the coroner was due to exposure to hazardous substances. There were eight poisoning deaths reported to the coroner in 2012, compared to 12 deaths the previous year. In total, there were 95 poisoning deaths from 2007 to 2012 which equates to 16 per year on average.

Figure 5: Poisoning deaths by intent and gender, 2007-2012



Males have more deaths by poisonings than females

Intent was recorded according to the judgement of the coroner, and during that time, there was an equal proportion (Unintentional: 44% and Intentional: 46%) of poisoning deaths that were attributed to both unintentional and intentional cause of death. However, males outnumber females in intentional and unintentional cause of deaths.

Toxic gases are the leading causes of unintentional poisoning among 15-24 year olds

Toxic gases such as LPG, methane, propane, and butane were the most common substances causing death, with the 15-24 year age group the most affected. These substances were also the leading causes of unintentional poisoning within this age group (Table 2). This has a similar trend to that reported in the previous year.

Table 2: Poisoning deaths by substance group and age group, 2007-2012

Substance Causing Injury	Age group (years)					
	5-14	15-24	25-44	45-64	65+	Total
LPG Gas, Natural Gas, Methane Gas, Propane Gas, Butane Gas	4	17	2	2	1	26
Other Specified Non-Pharmaceutical Chemical Substance		1	7	4		12
Other Sources of Carbon Monoxide			6	5		11
Petrol, Diesel, Gasoline	1	4	3	2		10
Weed Killer, Herbicide				5	3	8
Other Specified Fuel or Solvent		1	2		1	4
Methylated Spirits		1	1	1		3
Other Specified Pesticide Herbicide		1	1		1	3
Other Insecticide		1			1	2
Other Specified Cleaning Agent			1	1		2
Gas Cylinder				1	1	2
Helium Gas			1			1
Heavy Metal nec			1			1
Carbon Dioxide nec			1			1
Nitrogen				1		1
Alcohol nec		1				1
Drain Cleaners					1	1
Lubricating Oils, Motor Oil		1				1
Other Specified Explosive Material or Flammable Object/Substance			1			1
Bleach, Soaking Agent			1			1
Paint, Varnish, Stain			1			1
Unspecified Fuel or Solvent			1			1
Unavailable		1				1
Grand Total	5	29	30	22	9	95

Source: Coronial Services Office (2013)

National Minimum Dataset (2006-2013)

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

Key findings

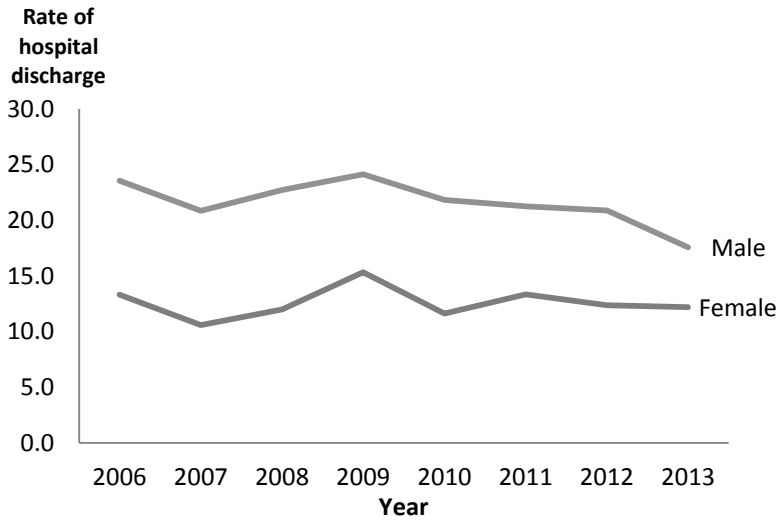
- There has been a steady decline in the rates of hospital discharges over the period 2006-2013.
- About half of poisonings were unintentional in 2013.
- Children under five years of age had the highest rates of hospital discharges in New Zealand.
- Māori have higher discharge rates for poisoning than non-Māori.
- The most common diagnostic group for children under the age of five was solvents, hydrocarbons and corrosive substances.

Hospital discharge rates steadily declined over 2006-2013

Between 2006 and 2013, there has been a steady decline in the rate of hospital discharges (Figure 6). 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.

Males continue to outnumber females in both poisoning deaths and discharges (Figure 6 and Table 3).

Figure 6: Age standardised rate per 100,000 population of hospital discharges for acute poisoning by gender, 2006-2013



Over half of all hospital discharges were unintentional poisonings

In 2013, 51 percent of hospital discharges were recorded as unintentional, 24 percent as intentional and 25 percent of the intent was undetermined (Table 3). There was a similar pattern in 2012.

Males outnumber females in discharges for unintentional poisonings

Males continue to outnumber females in discharges for unintentional injury. However, males and females had similar rates of discharges for intentional poisoning which have not changed markedly since 2006. The rate of undetermined poisoning discharges among males has decreased from 10.7 per 100,000 in 2006 to 5.3 per 100,000 in 2013.

Table 3: Hospital discharges for acute poisoning, numbers and gender-specific crude rates per 100,000, 2006-2013

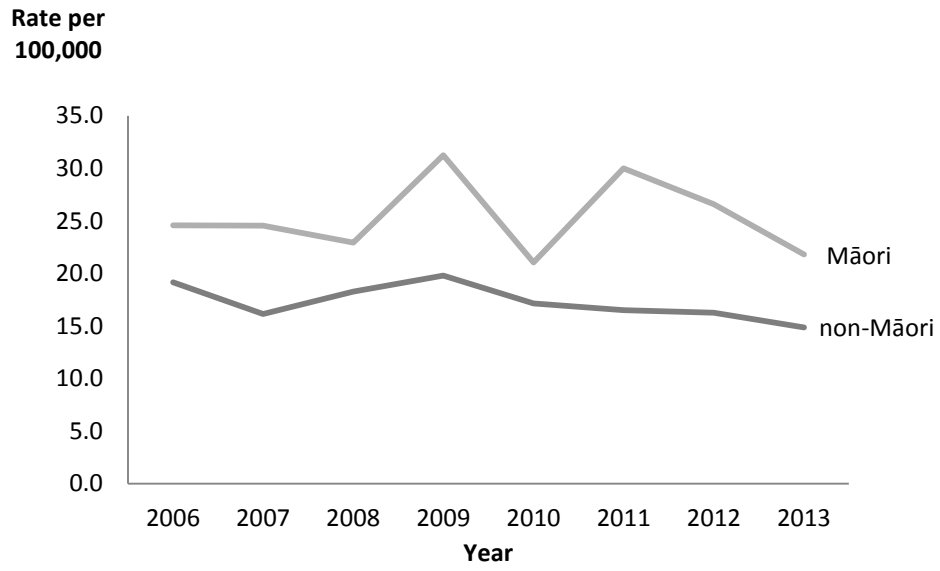
Year	Intentional poisoning				Unintentional poisoning				Undetermined				Total			
	Number		Rates		Number		Rates		Number		Rates		Number		Rates	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
2006	63	88	3.1	4.1	202	126	9.8	5.9	221	39	10.7	1.8	486	253	23.6	11.8
2007	65	70	3.1	3.2	193	100	9.3	4.6	196	35	9.4	1.6	454	205	21.9	9.5
2008	63	87	3.0	4.0	244	114	11.7	5.2	186	34	8.9	1.6	493	235	23.6	10.7
2009	66	88	3.1	4.0	302	152	14.3	6.9	158	52	7.5	2.3	526	292	24.8	13.2
2010	81	81	3.8	3.6	239	105	11.2	4.7	141	43	6.6	1.9	461	229	21.6	10.2
2011	72	80	3.3	3.6	222	146	10.3	6.5	165	31	7.7	1.4	459	257	21.3	11.4
2012	71	92	3.3	4.1	232	117	10.7	5.2	148	27	6.8	1.2	451	236	20.8	10.4
2013	66	82	3.0	3.6	207	111	9.5	4.9	115	37	5.3	1.6	388	230	17.7	10.1

Māori have higher discharge rates for poisoning than non-Māori

During the period 2006 and 2013, Māori poisoning discharge rates were higher compared to non-Māori (Figure 7). Discharge rates for Māori fluctuated between 2008 and 2011 while the rate of hospital discharge for non-Māori has held steady over this period.

In 2013, age-specific rates of hospital discharges among Māori children 0-4 years old was higher (55.7 per 100,000) than non-Māori children (24.9 per 100,000).

Figure 7: Age standardised rate per 100,000 population of hospital discharges for acute poisoning by ethnicity, 2006-2013



Young children have the highest rates hospital discharge for poisoning

Marked differences are evident in age-specific poisoning-related discharge rates (Table 4). Compared to all other age groups, children under five years old continue to have higher discharge rates of poisoning from 2006-2013.

The 65+ age group had the lowest rate of hospital discharges over this eight year period.

Table 4: Age-specific rates per 100,000 population of hospital discharges for acute poisoning, by age, 2006-2013

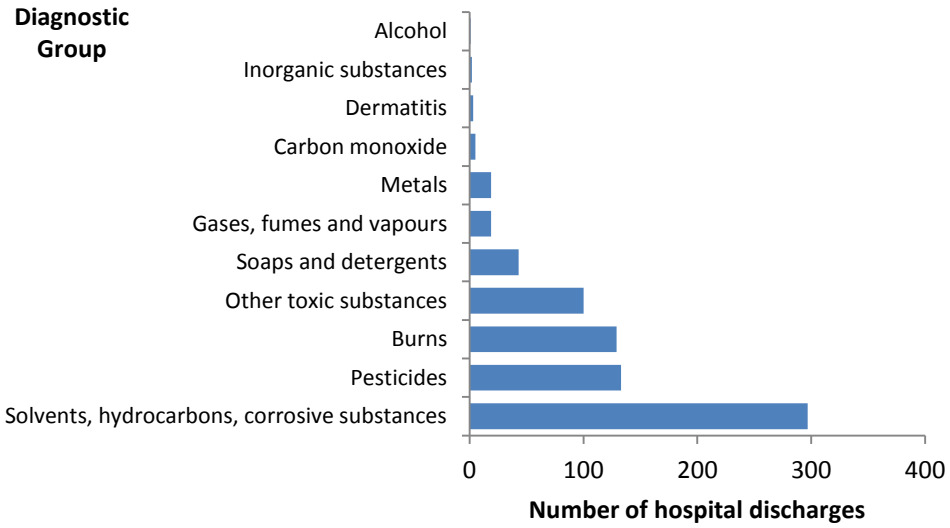
Year	Age Group (years)					
	0-4	5-14	15-24	25-44	45-64	65+
2006	31.9	13.3	31.8	19.9	10.8	5.8
2007	32.6	7.2	27.4	16.5	11.1	8.3
2008	30.9	9.9	27.5	20.6	12.6	6.1
2009	34.1	8.8	29.8	23.3	13.9	9.5
2010	25.3	5.7	28.0	18.8	12.4	8.0
2011	34.0	9.1	24.8	17.4	13.3	8.5
2012	27.0	7.6	21.8	19.7	13.2	7.5
2013	28.7	6.5	21.6	15.8	11.3	6.7

Solvents, hydrocarbons and corrosive substances is the most common diagnostic group among 0-4 year olds

Of the 751 hospital discharges among children 0-4 years old, 40 percent were due to solvents, hydrocarbons and corrosive substance exposure and 18 percent from expsoure to pesticide (Figure 8). Petroleum product was the most common substance under the solvents group.

Eighty percent of all poisoning injuries in children 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.

Figure 8: Hospital discharges due to acute poisoning in children 0-4 years old, by diagnostic group, 2006-2013

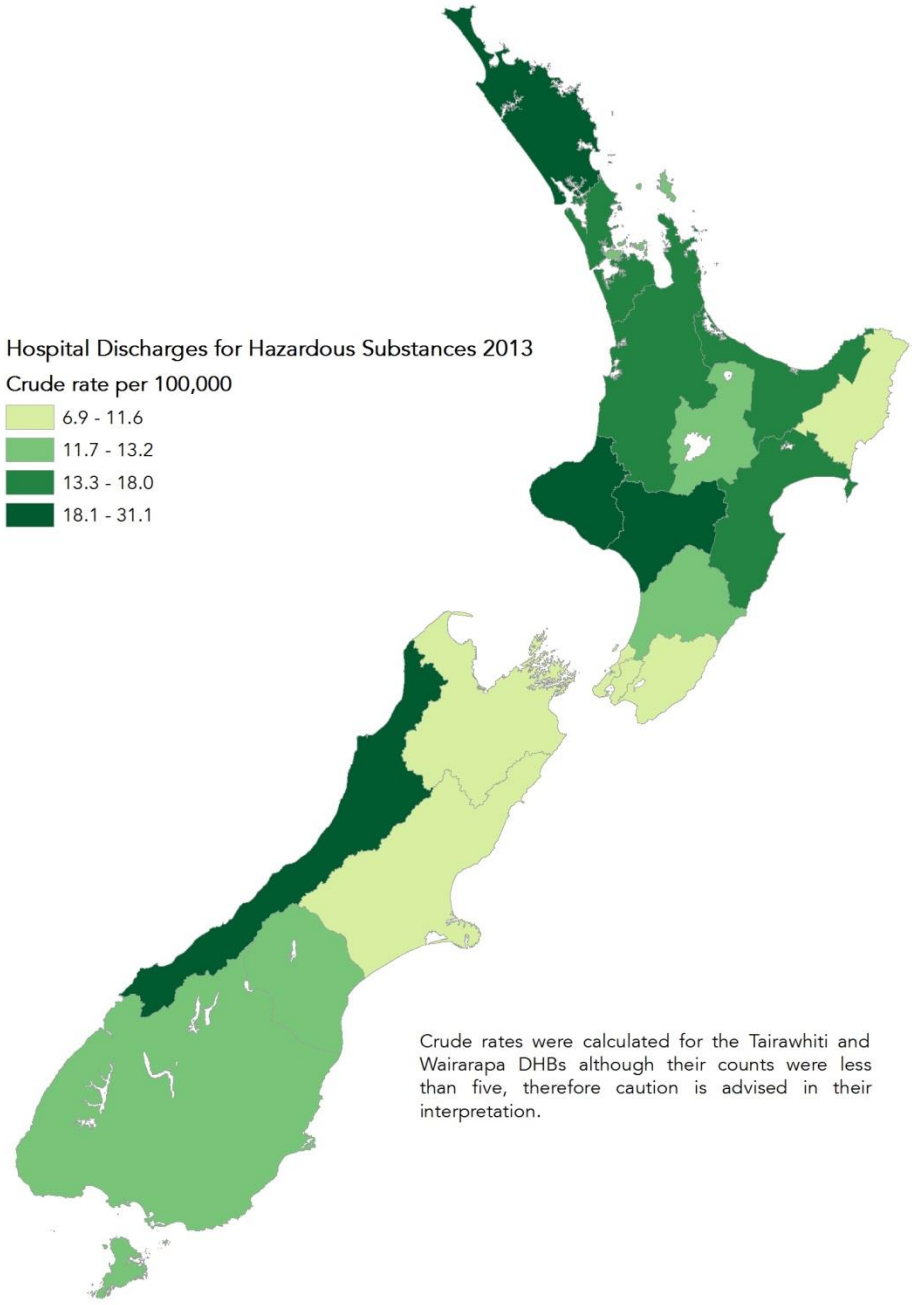


West Coast and Whanganui had the highest rates of hospital discharges

In 2013, West Coast (31.1 per 100,000 population) and Whanganui (29.9 per 100,000 population) District Health Boards (DHBs) had the highest rates of hospital discharge for acute poisoning (Figure 9). Nelson Marlborough DHB had the lowest rate[4] of hospital discharges (10.2 per 100,000 population).

[4] This excludes Tairawhiti and Wairarapa DHBs due to counts less than five.

Figure 9: Crude rates per 100,000 population of hospital discharges due to acute poisoning by DHB, 2013



Primary Care notifications (2013)

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. Medical practitioners are required by law to notify hazardous substances injuries. The HSDIRT has also been designed to allow notification of lead absorption ≥0.48µmol/l, and poisoning arising from chemical contamination of the environment (both notifiable under the Health Act 1956).

Main points

- In 2013, there were 180 lead notifications of which 81 were occupation lead exposures.
- Most common occupations were painter/decorator, scrap metal worker, and foundry worker.
- There were 99 non-occupational lead exposures of which 13 were for children under 15 years old.
- Lead based paint and indoor rifle range were the most common sources of lead exposure for adults.
- There were 63 hazardous substances notifications in 2013.
- Most common substance categories were household and industrial chemicals.
- Household agents were the most common cause of poisoning among children less than five years old.
- There were six cases of poisoning arising from chemical contamination of the environment in 2013.

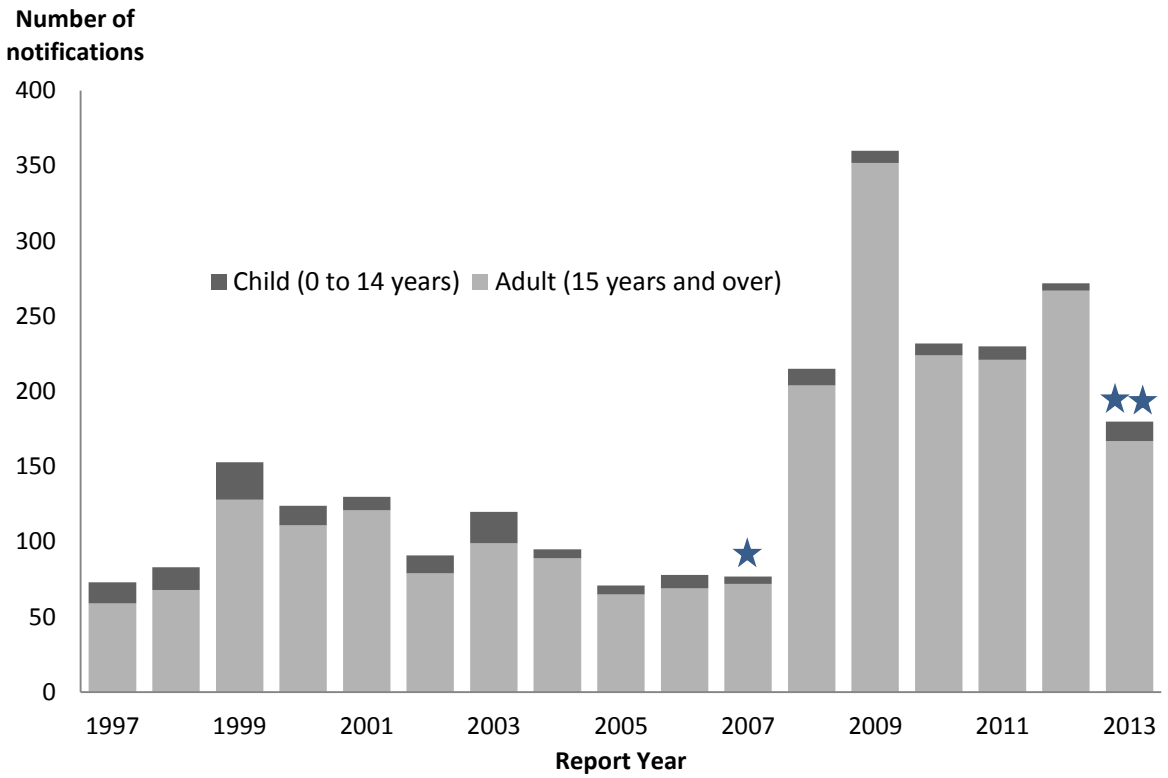
Lead notifications

The number of lead notifications has declined by 34 percent since 2012

There were 180 notifications of lead absorption in 2013 (4.0 per 100 000 population) compared with 272 cases in 2012 (6.1 per 100 000 population) (Figure 10). The removal of blood lead level tests taken within 12 months of the original test may have contributed to the decrease of lead notifications in 2013.

Notifications peaked in 2009. The Department of Labour (now Worksafe NZ) were notified that around 50 lead poisoning cases were associated with repainting the Auckland Harbour Bridge. As a result, the then Department of Labour revised their Guidelines for the Medical Surveillance of Lead Workers in 2011. These guidelines state that employers must ensure that medical surveillance is provided to all workers involved in lead work.

Figure 10: Lead notifications by age, 1997 - 2013



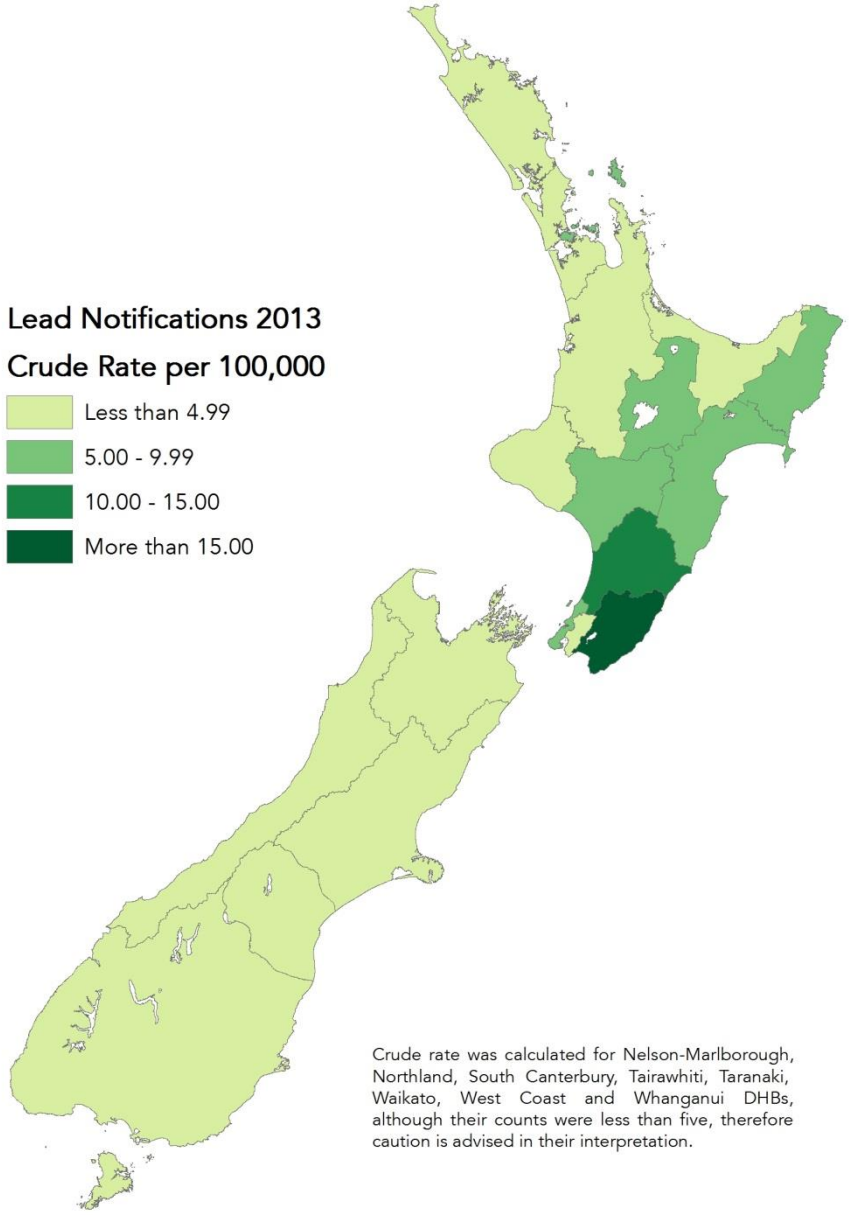
***** In 2007, direct laboratory notification was introduced, the non-occupational notifiable blood lead level was lowered from 0.72 to 0.48µmol/L and enhanced occupational screening was introduced in the Auckland region. ****** In 2013, the Hazardous Substances Disease and Injury Reporting Tool (HSDIRT) 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 (2013) and Hazardous Substances Disease and Injury Reporting Tool (2013).

Wairarapa had the highest rate of lead absorption notifications

The highest lead notification rate was for Wairarapa DHB (24.6 per 100,000 population), followed by MidCentral DHB (13.5 per 100,000 population) (Figure 11). In the previous year, the two DHBs with the highest rates of lead poisoning were Wairarapa (17.2 per 100,000 population) and Whanganui (16.0 per 100,000 population).

Figure 11: Crude rates per 100,000 population of lead notifications by DHB, 2013



Sources: Institute of Environmental Science and Research (2013) and Hazardous Substances Disease and Injury Reporting Tool (2013).

Painters/decorators had the highest number of notifications for lead exposure

There were 81 occupational lead exposures of which one required hospital admission. The most common occupations were painter/decorator (17 cases), scrap metal worker (9 cases), and foundry worker (5 cases).

Lead based paint was the most common source of non-occupational lead exposure for children and adults

Where the source of lead exposure was non-occupational, there were 99 cases reported, of which 13 were children under 15 years old. The most common source of lead exposure for children was lead based paint. The highest blood lead level recorded was 5.5 µmol/l and the case was exposed to ayurvedic medicine.

For adults (15+ years), the most common risk factors for non-occupation lead exposure were lead based paint (24 cases) and indoor rifle range (17 cases).

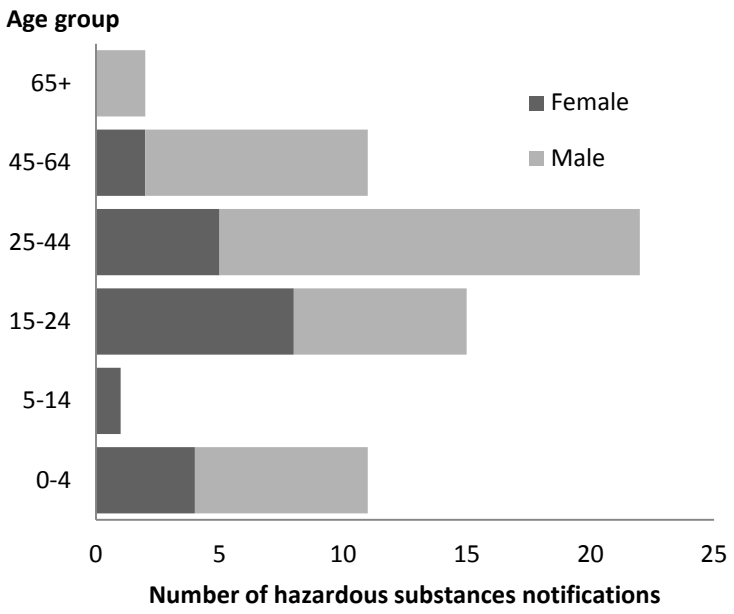
Hazardous substances notifications

Almost 70 percent of notifications are for males

There were 63 notifications related to hazardous substances in 2013 (Figure 12). This represents an average of about five notifications per month. Almost 70 percent of notifications were males and the most common age range was the 25-44 year age group (22 cases).

Six cases required hospital admission including a one year old child who accidentally ingested a household cleaner.

Figure 12: Number of hazardous substances notifications, by gender and age group, 2013

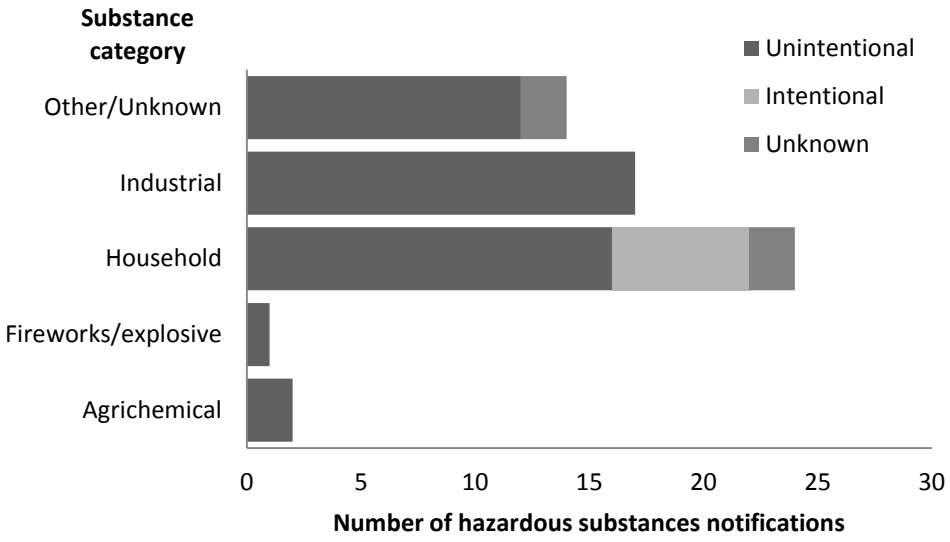


Eighty percent of notifications were unintentional poisonings

Over 80 percent of all notifications were unintentional poisonings and the most common substance categories were household chemicals (41%) and industrial chemicals (31%) (Figure 13).

The majority (48%) of injuries occurred at the home while injuries in the workplace contributed to 41 percent of all hazardous substances notifications.

Figure 13: Number of hazardous substances notifications, by substance category and intent, 2013



Note: Five notifications have been reported as 'Not a case' and have been excluded from the above graph.

Poisoning arising from chemical contamination of the environment

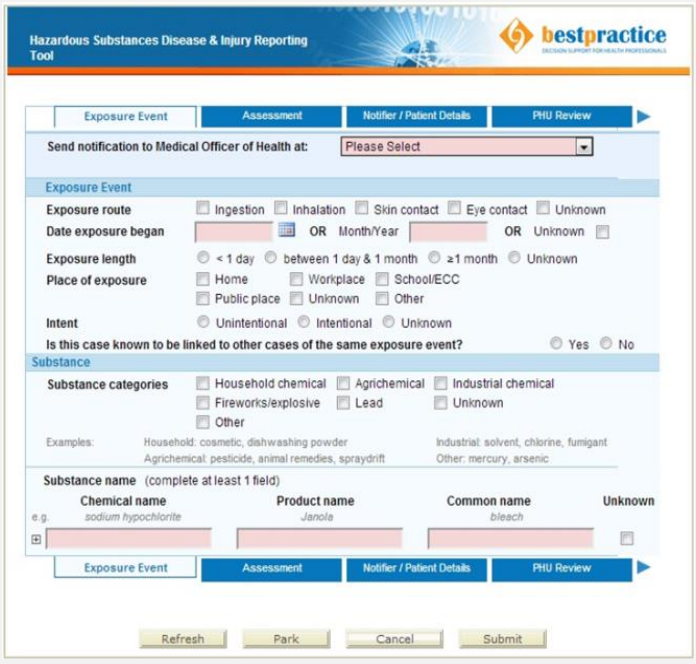
Six poisonings arising from chemical contamination of the environment notifications

Six poisonings arising from chemical contamination of the environment cases were reported in 2013, four of which were hospitalised.

Where recorded, sources of exposure included chlorine powder which occurred at the workplace (1 case) and chemical fumes from an unknown source (1 case). Two cases did not have any information regarding exposure source. There were two notifications involved in a single food poisoning event. Food sampling results tested positive for methamphetamine. Both cases were hospitalised for unintentional poisoning.

Notification of hazardous substances injuries

Any injury or disease caused by hazardous substances must be notified to the Medical Officer of Health, under the Hazardous Substances and New Organisms Act 1996. However, some medical practitioners may be unaware of this requirement. An electronic notification form is located on the bestpractice dashboard (log in at www.bestpractice.org.nz or go directly through MedTech) and look for "Hazardous Substances & Lead Notifications". Primary care practices that do not use bestpractice Decision Support software, should inform their Medical Officer of Health of any notifications manually.



Hazardous substances incidents (2009-2013)

This section presents data from the hazardous substances incidents database maintained by the New Zealand Fire Service. Fire Service roles and responsibilities relate to scene management, containment and management of any released hazardous substance, and decontamination of individuals at the scene, working in co-operation with the Ambulance Service.

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.

Key findings

- The New Zealand Fire Service attends approximately 1000 hazardous substances incidents every year.
- There were no level four or five incidents reported since 2009.
- Over 60 percent of all incidents involved a flammable liquid or gas incident.

The New Zealand Fire Service attends around 1000 hazardous substances incidents every year

From 2009 to 2013, the New Zealand Fire Service attended 5484 hazardous substances incidents (Table 5), an average of about 1000 incidents every year. The highest number of incidents (1314) was reported in 2010 followed by 1176 incidents in 2013.

There was a drop in the number of level 1 incident in 2011 which is primarily attributed to industrial action in the NZ Fire Service during August 2011 - April 2012. The Fire Service is the primary source of incident information because they attend the majority of call-outs where a hazardous substance is involved. During the period of industrial action, even though the Fire Service continued to respond to all emergencies, incident records did not get fully reported.

Table 5: Number of hazardous substances incidents for each alarm level, 2009-2013

Alarm level	Year					
	2009	**2010**	**2011**	**2012**	**2013**	**Total**
1	1040	1293	911	1005	1160	5409
2	8	20	11	18	15	72
3		1	1		1	3
Total	1048	1314	923	1023	1176	5484

Note: Alarm level indicates severity of incident where 1=low and 5=very high.
Source: New Zealand Fire Service (2014)

There were no level 4 or 5 incidents reported since 2009

There were no high level 4 or 5 incidents since 2009. Of the 5484 incidents, three were level 3 incidents involving petrol, aviation fuel, and hydrogen peroxide. Three people were rescued from the incident involving aviation fuel although the extent of their injuries is unknown.

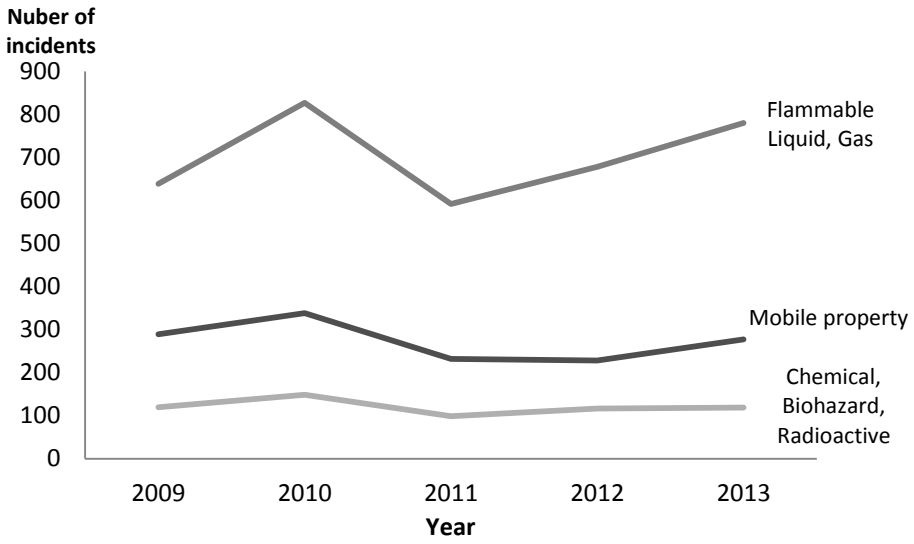
There were 72 level 2 incidents from 2009 to 2013 of which seven people were rescued from a single chlorine exposure incident and sent to the hospital in 2013. In 2012, one person was rescued from intentional exposure to anhydrous ammonia.

The majority of incidents involved a flammable liquid or gas

Over 60 percent of all hazardous substances incidents involved a flammable liquid or gas incident, with petrol and LPG a significant factor (Figure 14). United States data shows that fixed facilities such as factories and storage plants generate about

70 to 75 percent of all reported hazardous substances release events, with transportation-related events making up the remainder (Ministry of Health, 2005).

Figure 14: Number of hazardous substances incidents, by incident type, 2009-2013



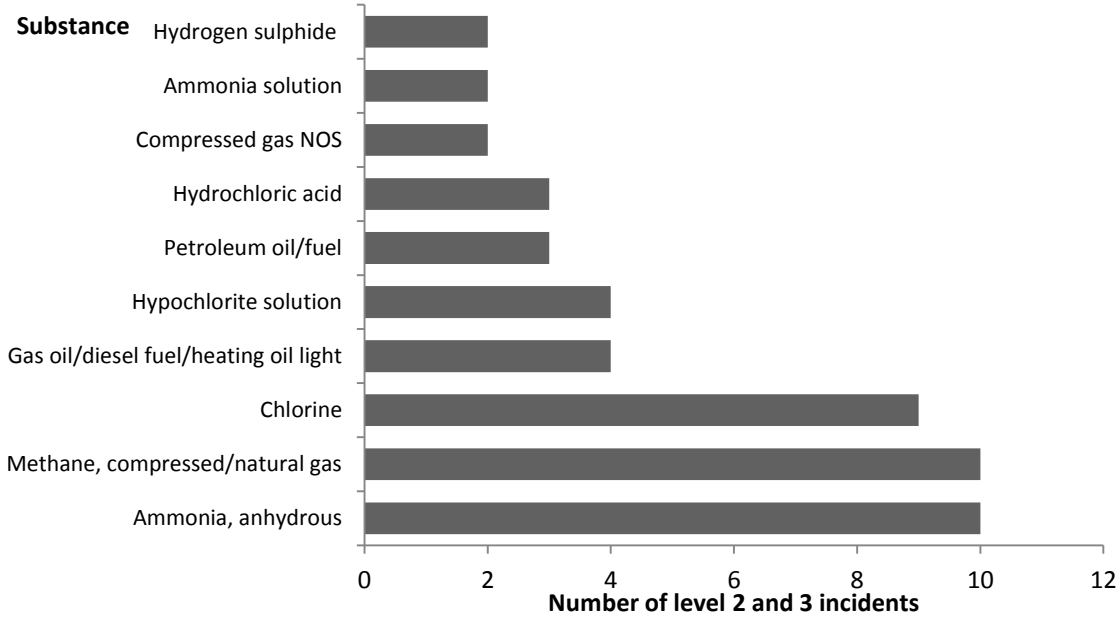
Source: New Zealand Fire Service (2014)

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

From 2009 to 2013, the top three most common substances involved in more than one level 2 and 3 incidents were anhydrous ammonia, methane compressed gas, and chlorine (

Figure **15**).

Figure 15: Hazardous substances involved in more than one level 2 or 3 incidents, 2009-2013



Note: Some incidents will involve more than one hazardous substance.
Source: New Zealand Fire Service (2014)

Hazardous substance-related telephone calls (2009-2013)

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 is based on summary tables rather than raw data therefore numbers may differ from previous years.

Key findings

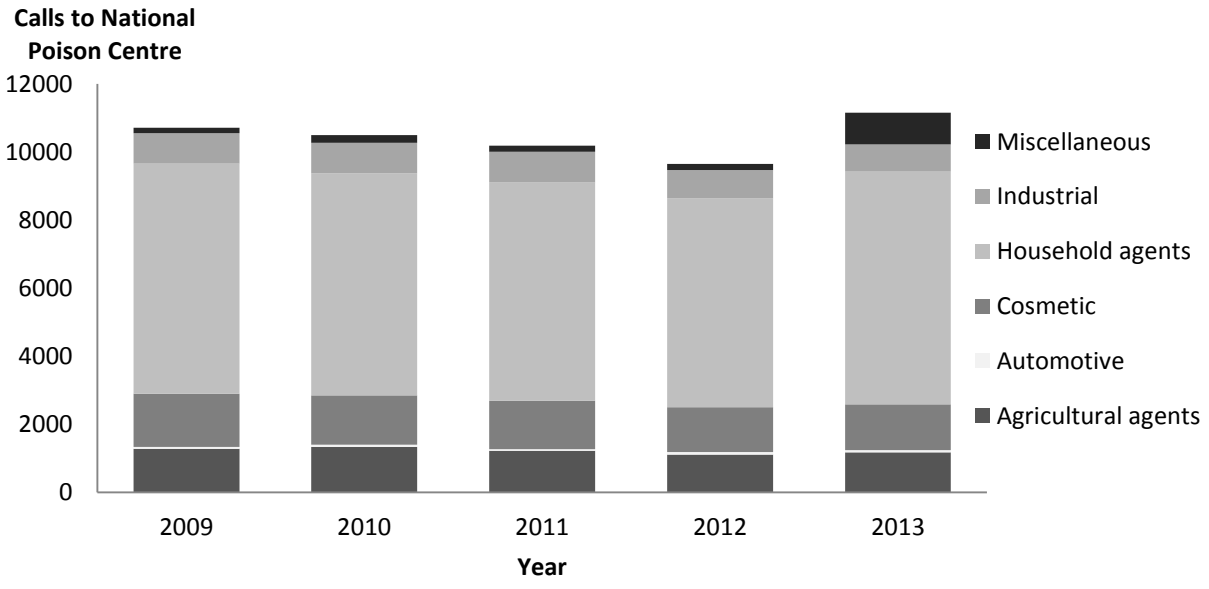
- Calls have increased by 16 percent between 2012 and 2013.
- Over half of the hazardous substances-related calls in 2013 involved children less than five years old.
- Calls regarding household agents were most frequent.
- Unlabelled containers contribute to poisoning incidents.

Calls have increased by 16 percent between 2012 and 2013

The number of hazardous substances-related calls made to the NPC has increased by 16 percent between 2012 and 2013 (Figure 16). Over half (55%) of the calls in 2013 involved children less than five years old.

Household products were the most common (61%) exposure reported to the NPC followed by cosmetics (12%) and agrcultural agents (11%). The number of miscellaneous prodcuts were substantially higher than previous years since analysis is based on summary tables rather than the raw data.

Figure 16: Calls to the National Poison Centre by substance classification, 2009-2013



Source: National Poison Centre (2014)

Calls regarding household products were most frequent among children

Among children aged 0-4 years, calls regarding household products (68%) and cosmetics (17%) were the most common exposure in New Zealand (Table 6). Of all household agents recorded, cleaners (1075 calls) and detergents (649 calls) were the most common source of enquiries regarding children. These products have highly variable toxicity and packaging in terms of safety.

Table 6: Number of calls to the National Poison Centre, by age group and substance category, 2009-2013

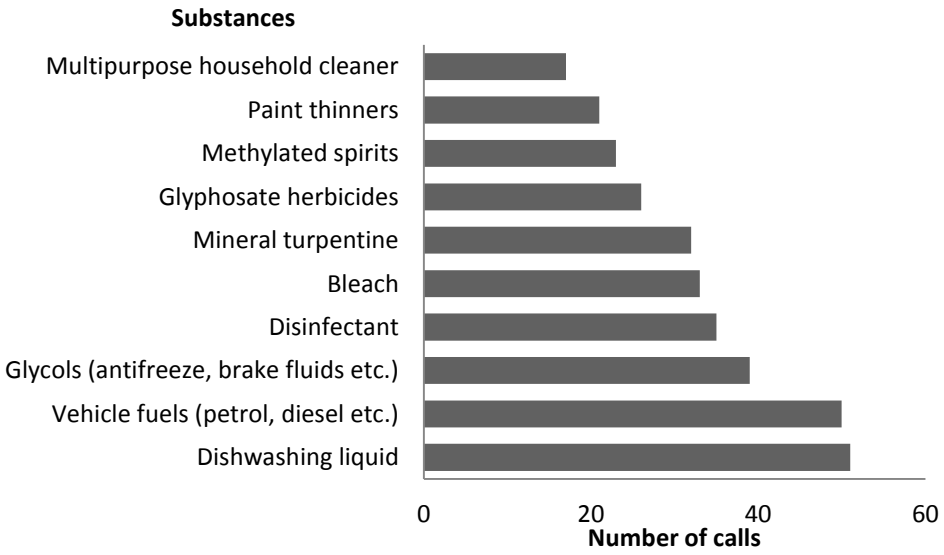
Substance Classification	Age Groups									Total
	0-4	5-14	15-24	25-44	45-64	65+	Child (unknown)	Adult (unknown)	Unknown	
Household	4081	422	268	421	296	132	158	1050	8	6836
Cosmetic	1033	60	39	37	25	17	29	103	0	1343
Agricultural	348	57	67	148	129	48	28	346	1	1172
Industrial	88	30	85	125	75	19	14	358	6	800
Automotive	29	0	4	6	11	3	1	17	0	71
Miscellaneous	400	107	54	48	28	11	33	250	2	933
Total	5979	676	517	785	564	230	263	2124	17	11155

Source: National Poison Centre (2014)

Unlabelled or mislabelled containers contribute to poisoning incidents

From 2003 to 2012, the NPC received 324,411 calls, 31 percent related to chemical exposures and 757 cases were exposed to products in unlabelled on non-original containers (Millard, Slaughter et al. 2014). Children less than five years and adults aged between 18 and 49 years (particularly male) were at greater risk for poisoning. Household cleaners, vehicle fuels, and glycol based products were among the most common substances involved (Figure 17).

Figure 17: Top 10 most common substances involved in unlabelled or mislabelled, 2003-2012



Source: Millard et al (2014)

Conclusion

Each year during 2006-2013, hazardous substances poisonings were responsible for over 70 deaths, 700 discharges, and 249 primary care notifications in New Zealand. Most of these injuries could have been prevented. While hospital discharge rates have steadily declined over 2006 and 2013, it is a major undercount of exposure to hazardous substances as not all diseases and injuries will require hospitalisation.

This report has shown that even though there were no reported deaths of children less than five years of age since 2006, this age group did have the highest hospital discharge rates for unintentional poisoning. A large number of poisonings for children were due to solvents, particularly petroleum products.The high injury rate for this age group is of concern because exposure to hazardous substances is largely preventable.

Huffing continues to be an issue in the 15-24 year age group. Butane is readily and cheaply available, and most of the other substances used are household items, so access to the substances cannot easily be controlled.

Finally, while there were no clear ethnic differences in deaths from poisoning between Māori and non-Māori, the Māori population experienced higher hospital discharge rates (particularly in the 0-4 age group) compared to non-Māori.

The findings from this report will help inform about the adverse health effects of hazardous substances in New Zealand. The lastest addition of notifications from general practitioners and hazardous substances incidents from the New Zealand Fire Service to the HSSS will enable more complete surveillance of hazardous substances injuries. It is important that preventive strategies are put in place in order to help to prevent future disease and injury particularly among the vulnerable 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 is the most recent data available.
- Hospital discharge and mortality data are presented by calendar year.
- Morbidity data are primarily based on hospitalisations from public hospitals. Day cases 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.

Appendix 2: External cause codes (E-code)

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 pressurized tyre, pipe or hose
W38	Explosion and rupture of other specified pressurized 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 2: 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 aminoderivatives 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 thicknes, 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 3: Map of District Health Boards