Lead absorption notifications

This factsheet presents a national indicator, which allows us to monitor lead absorption.

Key facts

- There were 204 lead absorption notifications in 2019, an increase since 2017. The increase was driven by growth in notifications among adults.
- Painters remain the most notified occupational group with lead absorption.
- In 2019, gunshot wound ranked as one of the most common sources of non-occupational/unknown lead exposure.
- Pacific people were most affected by lead exposure from their occupation in 2014–19
- Due to certain manual labour work dominated by males, there have been more notifications for males than for females every year since 2014, and males tend to have higher blood lead levels than females.
- The lead absorption notification rate was higher in the most deprived areas (NZDep 2018 quintile 5) than other quintiles in 2014–19.
- Taranaki and Auckland public health units have the highest lead notification rates in 2019.
- Wairarapa and Whanganui district health boards (DHBs) have the highest notification rates in 2019.

Environmental lead exposure is a public health problem

Lead (Pb) is a persistent environmental pollutant, and the World Health Organisation (WHO) ranks lead among the 10 chemicals of major public health concern (WHO 2020).

The use of lead in paint since ancient times, and its massive mobilisation into the environment, has resulted in increased exposure to lead that poses a major threat to human health in several aspects (Jacobs et al 2009).

Young children, particularly under six years are much more at risk from lead exposure than adults because of:

- their activities and behaviour (eg, hand-to-mouth) result in greater exposure
- their developing nervous system is sensitive to lead
- they absorb approximately 50% of ingested lead compared to 10–15% in adults
- their diet may be low in calcium or iron thus increasing lead absorption in the body (Armstrong et al 2014)

Recent findings from the Dunedin cohort study showed that each 0.24 micromoles per litre (µmol/L) higher level of blood-lead in children was associated with a 1.61-point lower IQ score in adults, as well as poorer academic achievement, and greater rates of child behaviour problems, particularly inattention, hyperactivity, and antisocial behaviour (Reuben et al 2019).

Lead also causes long-term health effects in adults, including increased risk of high blood pressure and kidney damage (WHO 2020). Exposure of pregnant women to high levels of lead can cause miscarriage, stillbirth, premature birth and low birth weight.

Although no safe level of exposure to lead has been found, the levels of blood lead which are required to be notified in New Zealand are lead absorption equal to or in excess of 0.48 µmol/L. At this level, public health intervention is required for children and non-occupationally exposed adults (Ministry of Health 2012).

Despite controls on other sources of lead contamination, such as food and petrol, lead in paint is still a significant public health and occupational health issue (Ministry of Health et al 2013). A recent Official Information Act request revealed that more than 80% of Housing NZ properties – approximately 52,000 homes – have lead-based paint in some form (Clent 2019).

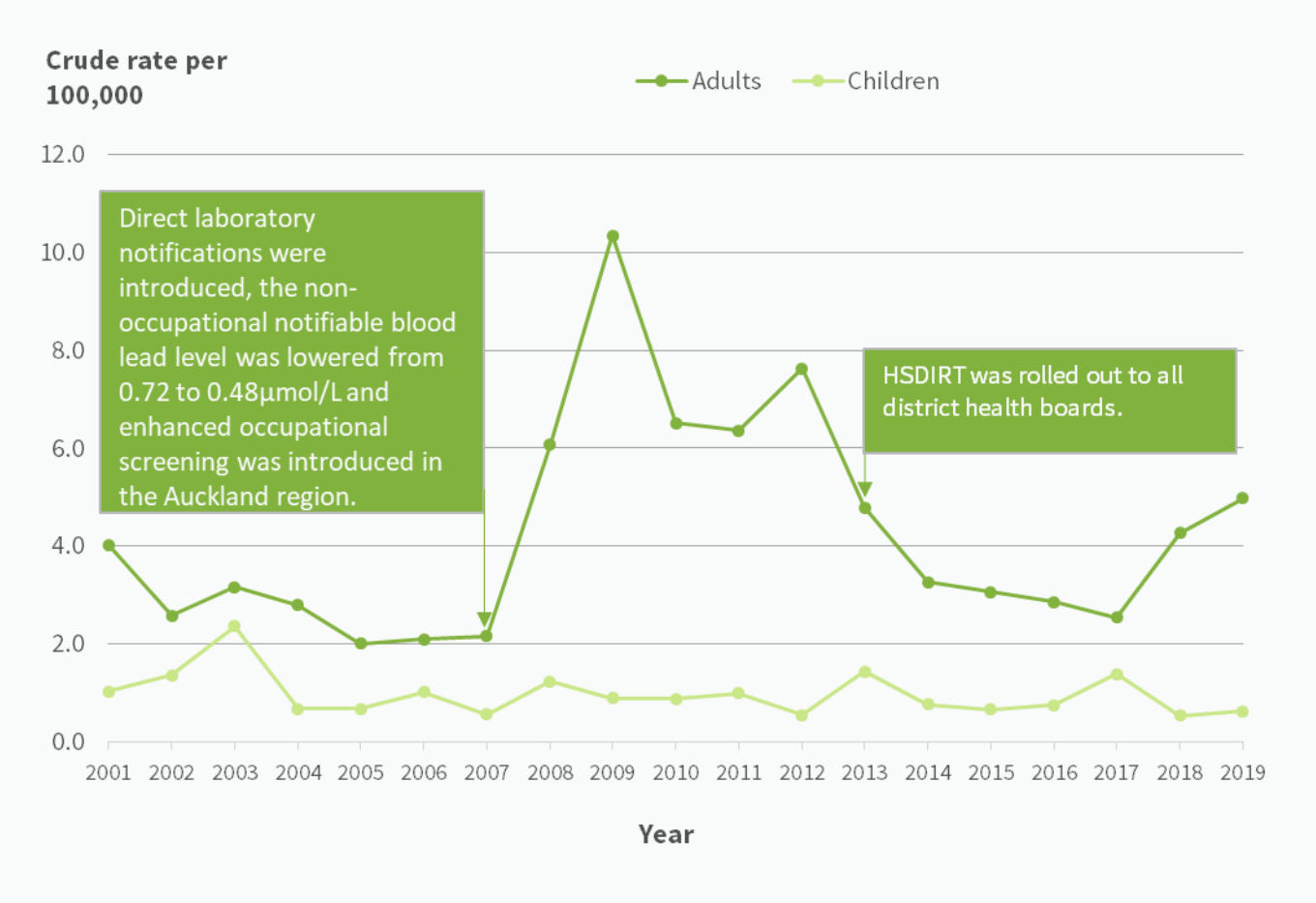
While lead-based paint on older buildings is generally well recognised as a source of lead exposure in New Zealand, there is less awareness of the risk of lead exposure from firearms use (Russell et al 2019).

Lead absorption notifications have increased since 2017 for adults

The national prevalence rate of lead absorption notifications increased from 2.3 per 100,000 (110 notifications) in 2017 to 4.1 per 100,000 (204 notifications) in 2019. This growth was driven by an increase in notifications among adults. For adults, the notification rate of lead absorption has increased by 100% from 2017 (2.5 per 100,000) to 2019 (5.0 per 100,000), while the notification rate for children (0 to 14 years) has remained relatively constant (Figure 1).

Note that there were changes in lead absorption reporting during 2007 and 2013. From 2001 to 2007, the rate of lead absorption stayed fairly stable for both adults and children. However, when direct laboratory notification, the lowering of the notifiable blood lead level, and enhanced occupational screening in the Auckland region were introduced in 2007, there was a significant increase in adult notification in 2008 and 2009. Then, the introduction of the Hazardous Substances Disease & Injury Reporting Tool (HSDIRT) in 2013 for cases of disease and injury related to exposure to hazardous substances, including lead absorption resulted in a slight decrease in the number of notifications between 2013–2017.

Figure 1: Lead absorption notification rate, by year



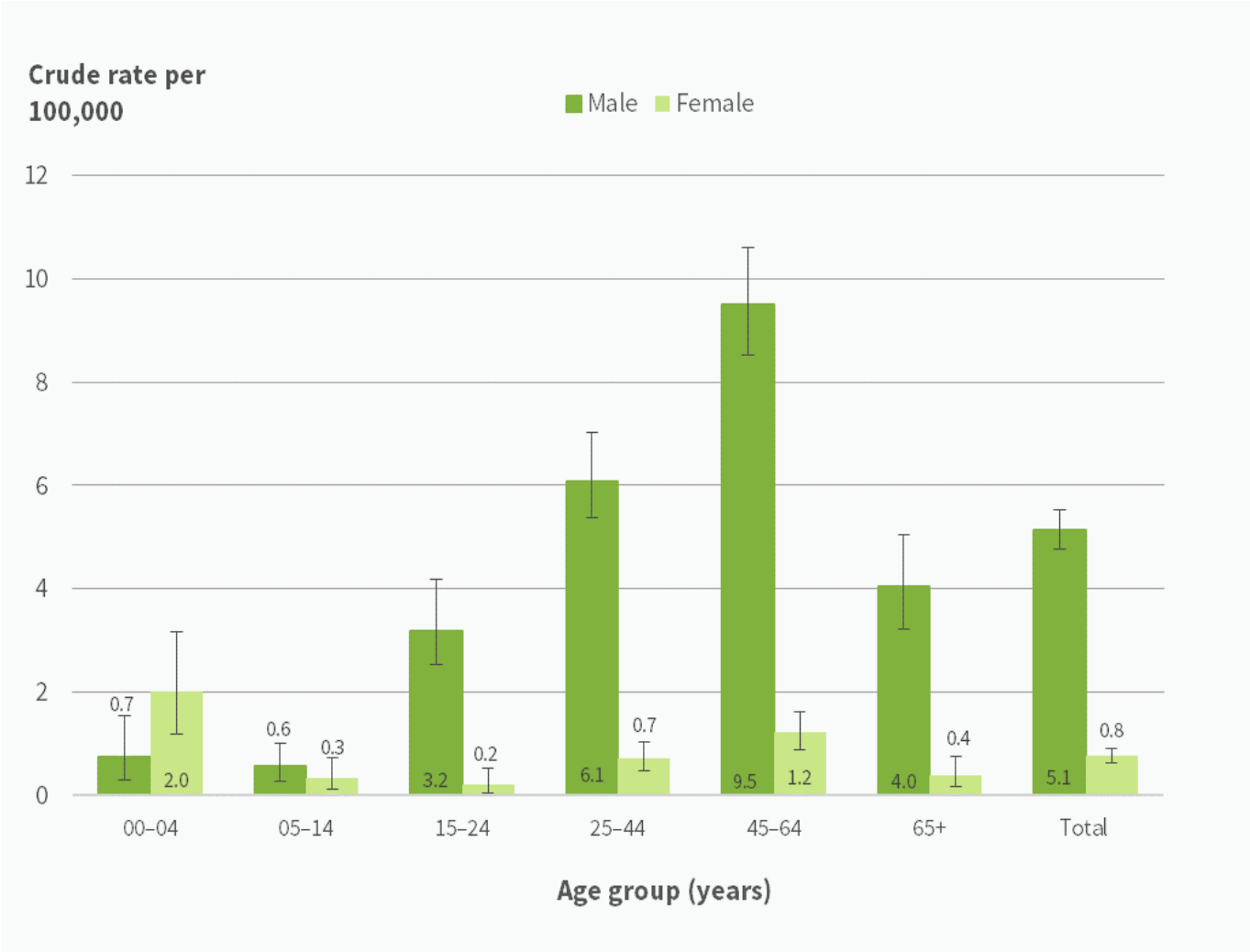
Source: Institute of Environmental Science and Research; Hazardous Substances Disease and Injury Reporting Tool (HSDIRT).

Males had more notifications than females

In 2019, the notification rate for males was 7.5 per 100,000 (181 notifications, 95% confidence interval [CI] 6.4–8.7), which is significantly higher than the rate for females, 0.8 per 100,000 (21 notifications, [0.5–1.3]).

Due to certain manual labour work dominated by males, there have been more notifications than for females every year since 2014, especially for the 25–44 years and 45–64 years age groups (Figure 2).

Figure 2: Lead absorption notification rate, by age group and sex, 2014–19



Source: Hazardous Substances Disease and Injury Reporting Tool (HSDIRT).

Males had higher blood lead levels than females

In 2014–19, males had higher blood lead levels than females, especially in the 0–4 year age group, while adults in the 25–44 year age group had comparable blood lead levels (Table 1). Higher blood lead levels in males may be explained by a number of factors including differences in:

- occupational exposures
- absorption, metabolism, storage and excretion
- diet and lifestyle (Haines & Murray 2012)

Table 1: Median blood lead level, interquartile range by age group and sex, 2014–19

	Median blood lead levels (µmol/l, Interquartile range)	
Age group in years	Male	Female
00–04	0.98 (0.72–1.40)	0.62 (0.55–0.71)
05–14	0.69 (0.60–0.85)	0.61 (0.50–0.70)
15–24	0.78 (0.62–1.24)	0.62 (0.59–0.74)
25–44	0.76 (0.59–1.08)	0.78 (0.54–0.99)
45–64	0.77 (0.60–1.05)	0.75 (0.59–0.96)
65+	0.79 (0.56–1.12)	0.60 (0.56–0.83)

Notes for table 1: Interquartile range are given in brackets.
Source: Hazardous Substances Disease and Injury Reporting Tool (HSDIRT).

People of Pacific ethnicity had the highest notification rate

In 2019, Pacific people had the highest notification rate – 10.8 per 100,000 (35 notifications), followed by European/Other with 3.1 per 100,000 (93 notifications).

For the six-year period 2014–19, Pacific people had the highest lead absorption notification rate (4.1 per 100,000; 75 notifications), followed by European/Other (2.7 per 100,000; 483 notifications). However, a large number of notifications listed ethnicity as 'unknown' (Table 2).

Table 2: Lead absorption notification rate, by ethnic group (prioritised), 2014–19

Ethnicity	Number (% of total notifications)	Crude rate per 100,000 (CI)
Māori	62 (7.4)	1.3 (1.0–1.7)
Pacific	75 (8.9)	4.1 (3.1–5.1)
Asian	50 (5.9)	1.3 (1.0–1.7)
European/Other	483 (57.2)	2.7 (2.5–3.0)
Unknown	174 (20.6)	-
Total	**844**	**-**

Source: Hazardous Substances Disease and Injury Reporting Tool (HSDIRT).

Highest occupational lead absorption notification rate among Pacific people

Pacific people also had the highest occupational lead absorption notification rate (3.9 per 100,000) (Table 3).

Table 3: Occupational lead exposure vs non-occupational lead exposure, by ethnic group (prioritised), 2014–19

Ethnicity	Occupational related lead exposure		Non-occupational related lead exposure	
	Number (% of total notifications)	Crude rate per 100,000 (CI)	Number (% of total notifications)	Crude rate per 100,000 (CI)
Māori	36 (9.5)	1.2 (0.8–1.6)	16 (5.5)	0.3 (0.2–0.6)
Pacific	51 (13.5)	3.9 (2.9–5.1)	4 (1.4%)	0.2 (0.1–0.6)
Asian	22 (5.8)	0.7 (0.4–1.1)	17 (5.8%)	0.4 (0.3–0.7)
European/Other	200 (52.9)	1.3 (1.1–1.5)	219 (75.3%)	1.2 (1.1–1.4)
Unknown	69 (18.3%)	–	35 (12.0%)	–

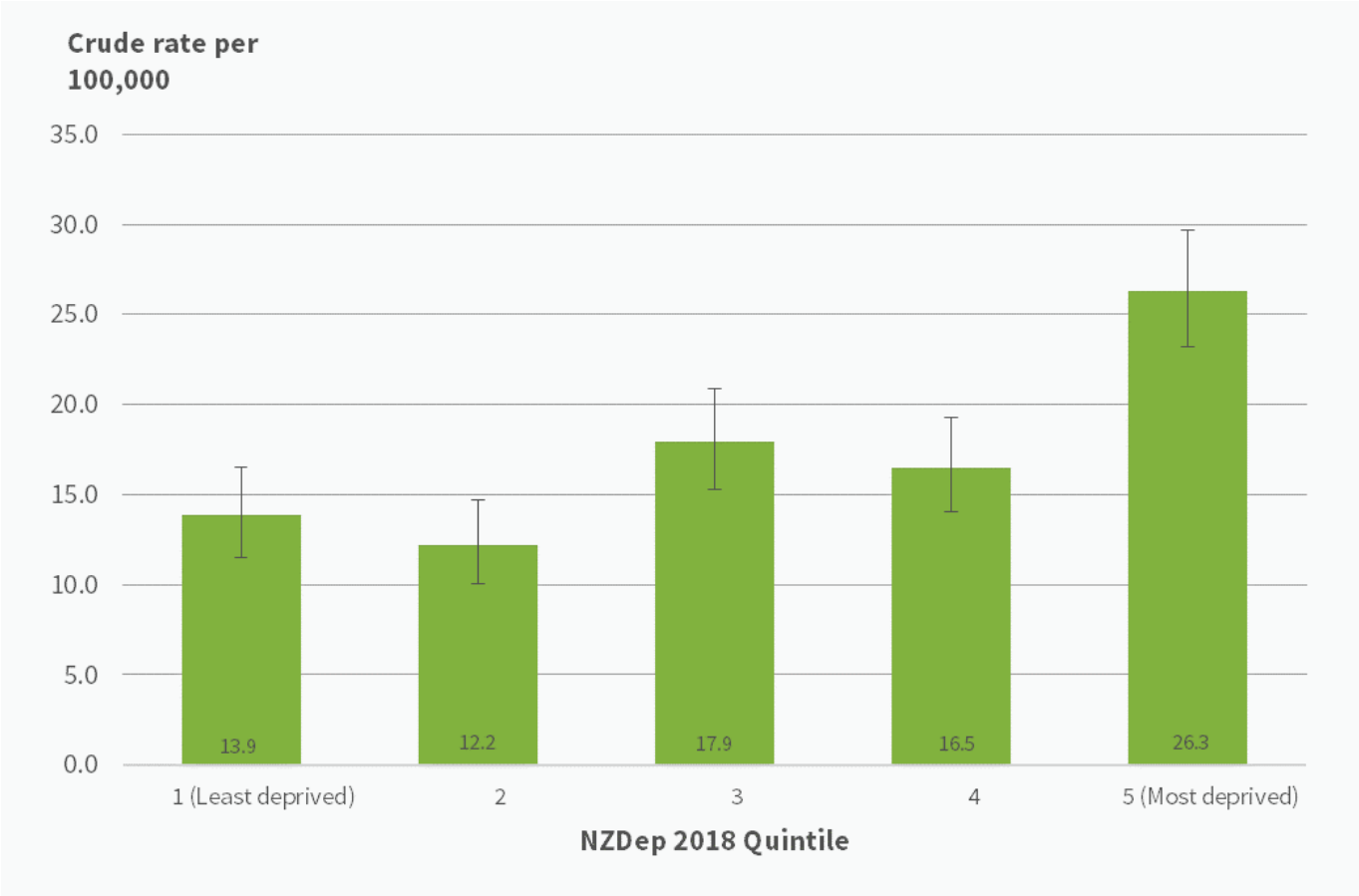
Source: Hazardous Substances Disease and Injury Reporting Tool (HSDIRT).

Higher notifications rates in the most deprived areas

In 2019, the number of lead absorption notifications was highest among those who resided in deprivation quintile 5 (most deprived) areas (85 notifications) and lowest in quintile 2 areas (16 notifications).

Overall, in 2014–19, the lead absorption notification rates were higher in the most deprived areas (NZDep 2013 quintile 5) than in other quintiles (Figure 3).

Figure 3: Lead absorption notification rate, by NZDep 2018 quintiles, 2014–19



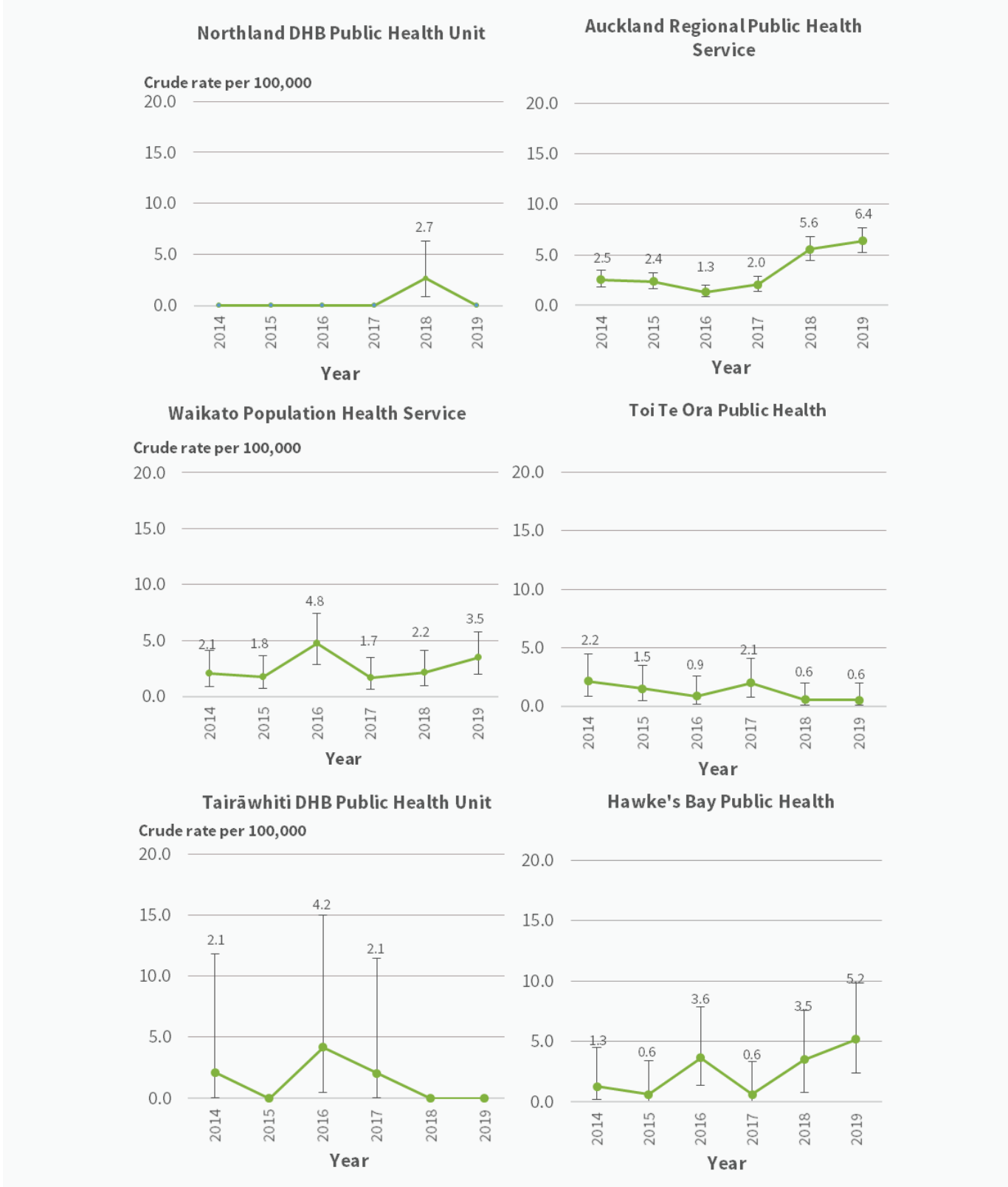
Source: Hazardous Substances Disease and Injury Reporting Tool (HSDIRT).

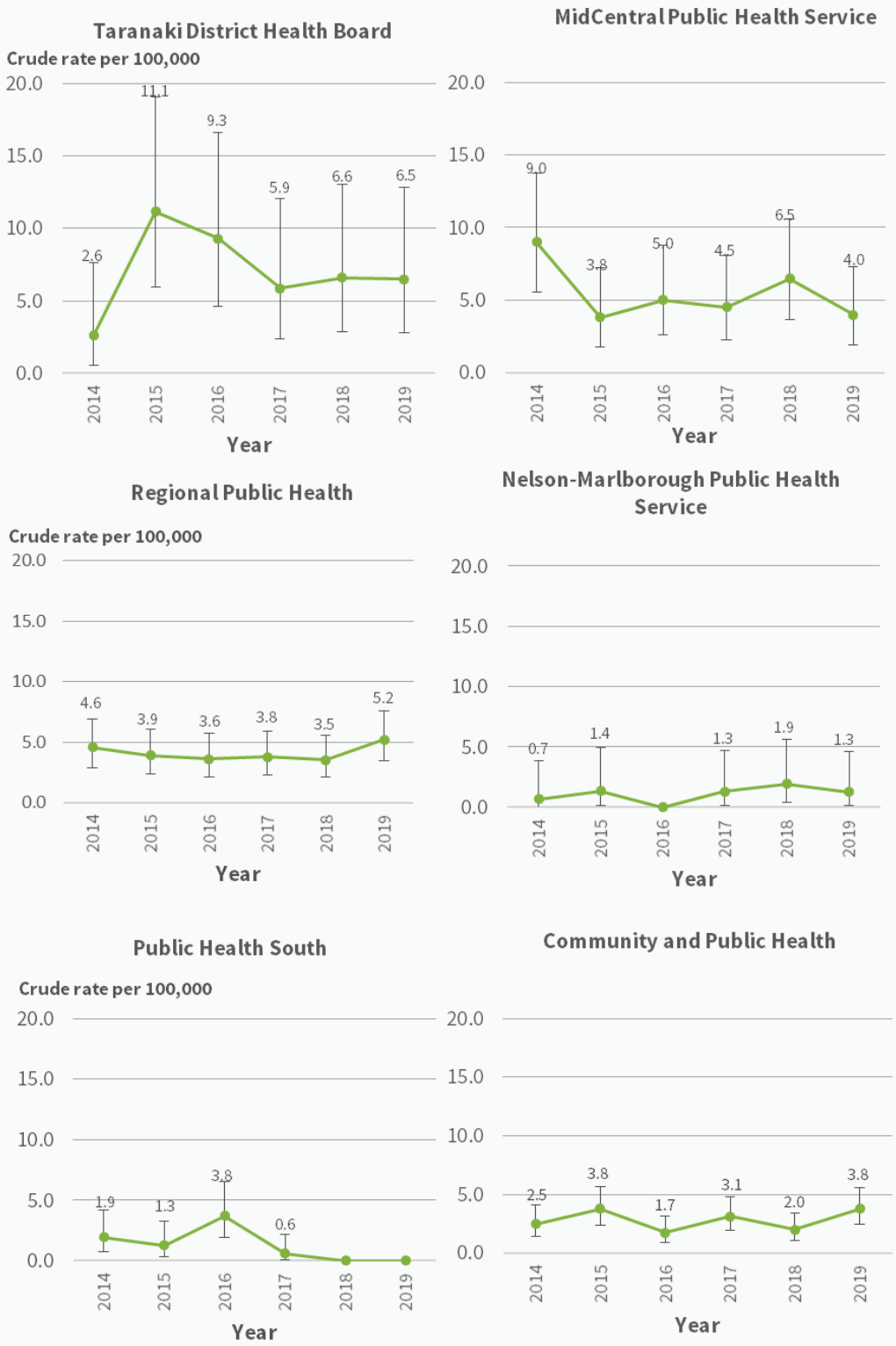
Highest notification rates in Taranaki Public Health Unit and Auckland Regional Public Health Service

In 2019, Taranaki Public Health Unit (6.5 per 100,000; 8 notifications) and Auckland Regional Public Health Service (6.4 per 100,000; 106 notifications) had higher notification rates than other public health units.

There were geographical differences in notification rates between 2014 and 2019 (Figure 4).

Figure 4: Lead absorption notification rate, by PHU, 2014–2019 (per 100,000)





Source: Hazardous Substances Disease and Injury Reporting Tool (HSDIRT).

Lead absorption notification rates differ across District Health Boards

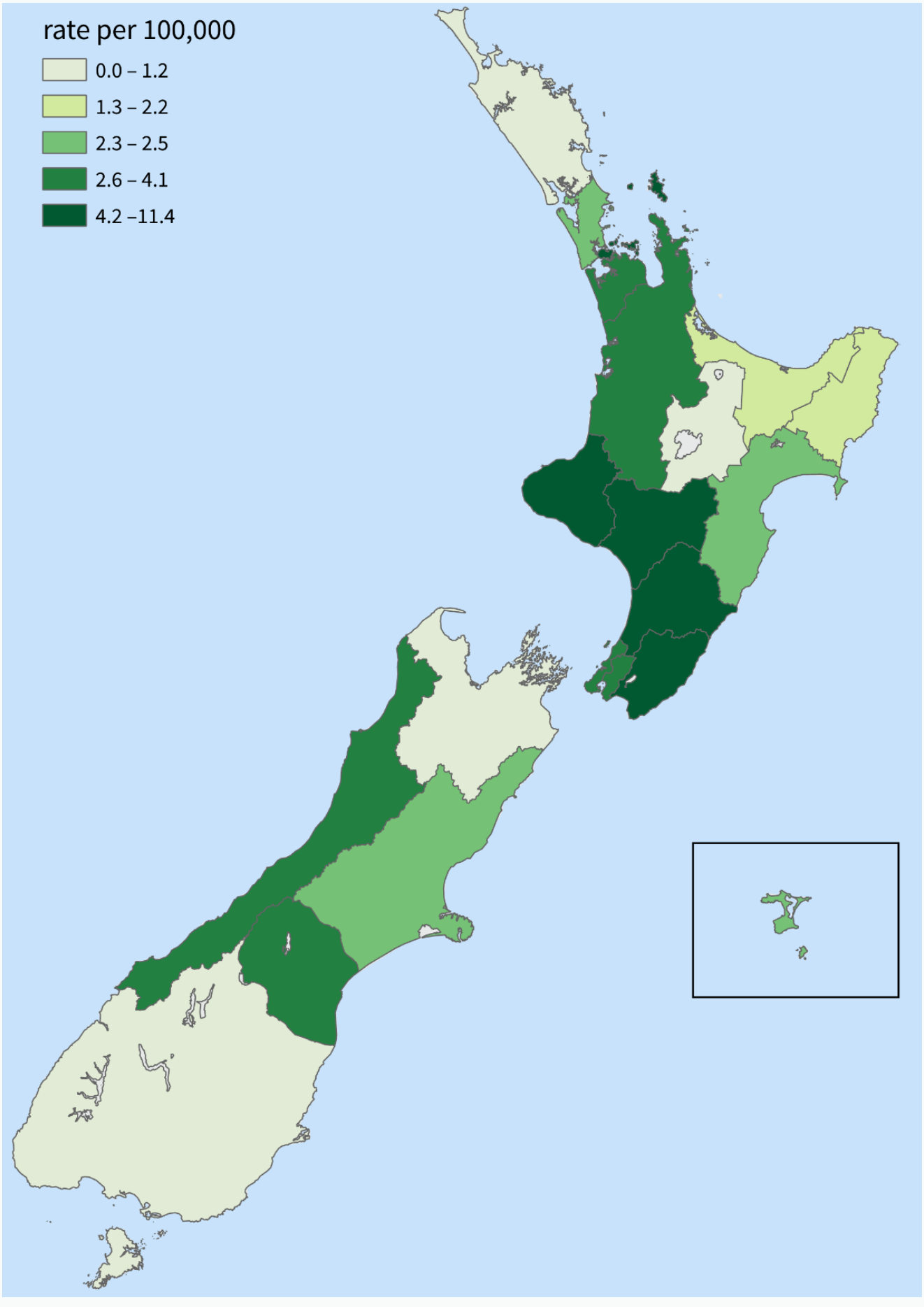
In 2019, the following DHBs had relatively high lead absorption notification rates compared to other DHBs:

- Wairarapa 12.6 per 100,000 (6 notifications)
- Whanganui 8.9 per 100,000 (6 notifications)
- Auckland 8.0 per 100,000 (39 notifications)
- Counties Manukau 8.0 per 100,000 (45 notifications)

For 2014–19, the following DHBs had relatively high lead absorption notification rates compared to other DHBs (Figure 5):

- Wairarapa 11.4 per 100,000 (31 notifications)
- Taranaki 7.0 per 100,000 (50 notifications)
- Whanganui 6.9 per 100,000 (27 notifications)
- MidCentral 5.1 per 100,000 (54 notifications)

Figure 5: Lead absorption notification rate, by DHB, 2014–19



Source: Hazardous Substances Disease and Injury Reporting Tool (HSDIRT).

Occupational lead notifications

Painters remain the most notified occupational group with lead absorption

In 2019, there were 120 occupational lead absorption notifications (59% of all lead notifications), compared to an average of 52 notifications per year from 2014 to 2018. Of the 2019 notifications, 49 were painters, who are the most common occupational group identified since 2014 (Table 4).

In 2014–19, there were 378 lead absorption notifications where occupation was recorded as the source of lead exposure.

Table 4: Number of occupational lead absorption notifications, 2014–19

Rank	2014	2015	2016	2017	2018	2019
1	Painter (19)	Painter (16)	Painter (31)	Painter (27)	Painter (37)	Painter (49)
2	Unknown (9)	Radiator (5)	Metal worker (8)	Radiator (3)	Unknown (19)	Unknown (44)
3	Metal worker (5)	Builder (3)	Radiator (3)	Metal worker (1)	Metal worker (3)	Metal worker (9)
Total*	**52**	**36**	**54**	**41**	**75**	**120[1]**

Note: [1] Four cases were recorded as both occupational and non-occupational exposure and four cases were recorded as both occupational and unknown exposure.
*Totals include categories outside of the 3 rankings listed.
Source: Hazardous Substances Disease and Injury Reporting Tool (HSDIRT).

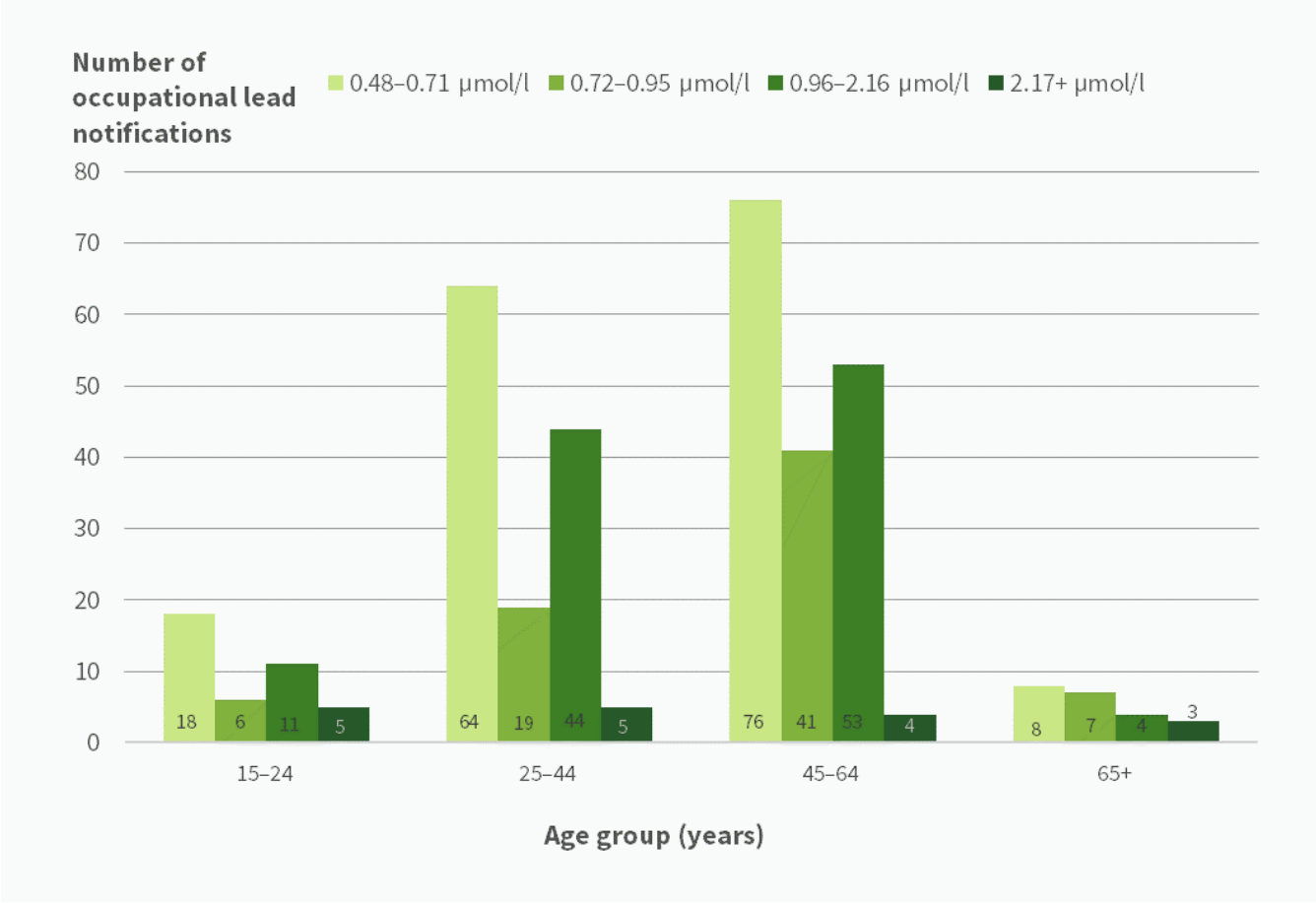
[1]Note: A suspension level is used to suspend workers from working with lead until the lead in their bodies reduces to 1.93 µmol/L or less.

The 45–64 year age group was most affected by occupational exposures

In 2014–19, the age group with the highest number of occupational lead notifications was the 45–64 years age group (174 notifications); this group accounted for 47% of the total occupational exposures. The majority of the occupational lead notifications were below the 1.50 µmol/l Biological Exposure Index blood lead level for occupational exposure (Figure 6).

In 2019, there were four notifications with a blood lead level that exceeded the Biological Exposure Index and six notifications that exceeded the suspension level , including a painter whose blood lead level was 2.92 µmol/l.

Figure 6: Number of occupational lead absorption notifications, by age-group and blood lead level, 2014–19



Source: Hazardous Substances Disease and Injury Reporting Tool (HSDIRT).

Gunshot wound was one of the most common identified non-occupational sources of lead exposure in 2019

In 2019, gunshot wound ranked as one of the most common sources of non-occupational/unknown lead exposure with 11 notifications (Table 5). The marked increase of gunshot wound in 2019 was due to the Christchurch mosque attack. Lead absorption cases from gunshot injury with retained bullet fragments are rarely reported. When they occur, symptoms are often non-specific and can appear years after suffering a gunshot wound (Weiss et al 2017). Symptoms may include abdominal cramping, altered mental status, anemia, anorexia, diarrhea, fatigue, headache and hypertension (Quail 2018).

In 2019, there were 84 lead absorption notifications with a non-occupational or unknown source of exposure. Of the 84 notifications, six were children under the age of 15 years. Since 2014, frequent sources of exposure were lead-based paint, indoor rifle range and bullet/sinker manufacture.

While the risk of lead absorption from lead-based paint is well known there is far less awareness of the risk from firearms use.

(Russell et al 2019)

Table 5: Number of non-occupational or unknown lead absorption notifications, 2014–19

Rank	2014	2015	2016	2017	2018	2019
1	Lead-based paint (23)	Unknown (31)	Lead-based paint (25)	Lead-based paint (27)	Unknown (60)	Lead-based paint (32)
2	Unknown (21)	Lead-based paint (25)	Unknown (13)	Unknown (24)	Lead-based paint (18)	Unknown (21)
3	Indoor rifle range (19)	Indoor rifle range (22)	Indoor rifle range (10)	Indoor rifle range (10)	Indoor rifle range (14)	Indoor rifle range (15)
4	Bullet/Sinker manufacture (6)	Bullet/Sinker manufacture (5)	Bullet/Sinker manufacture (5)	Pica (4)	Bullet/Sinker manufacture (4)	Gunshot wound (11)
Total*	**73**	**83**	**61**	**69**	**96**	**84[3]**

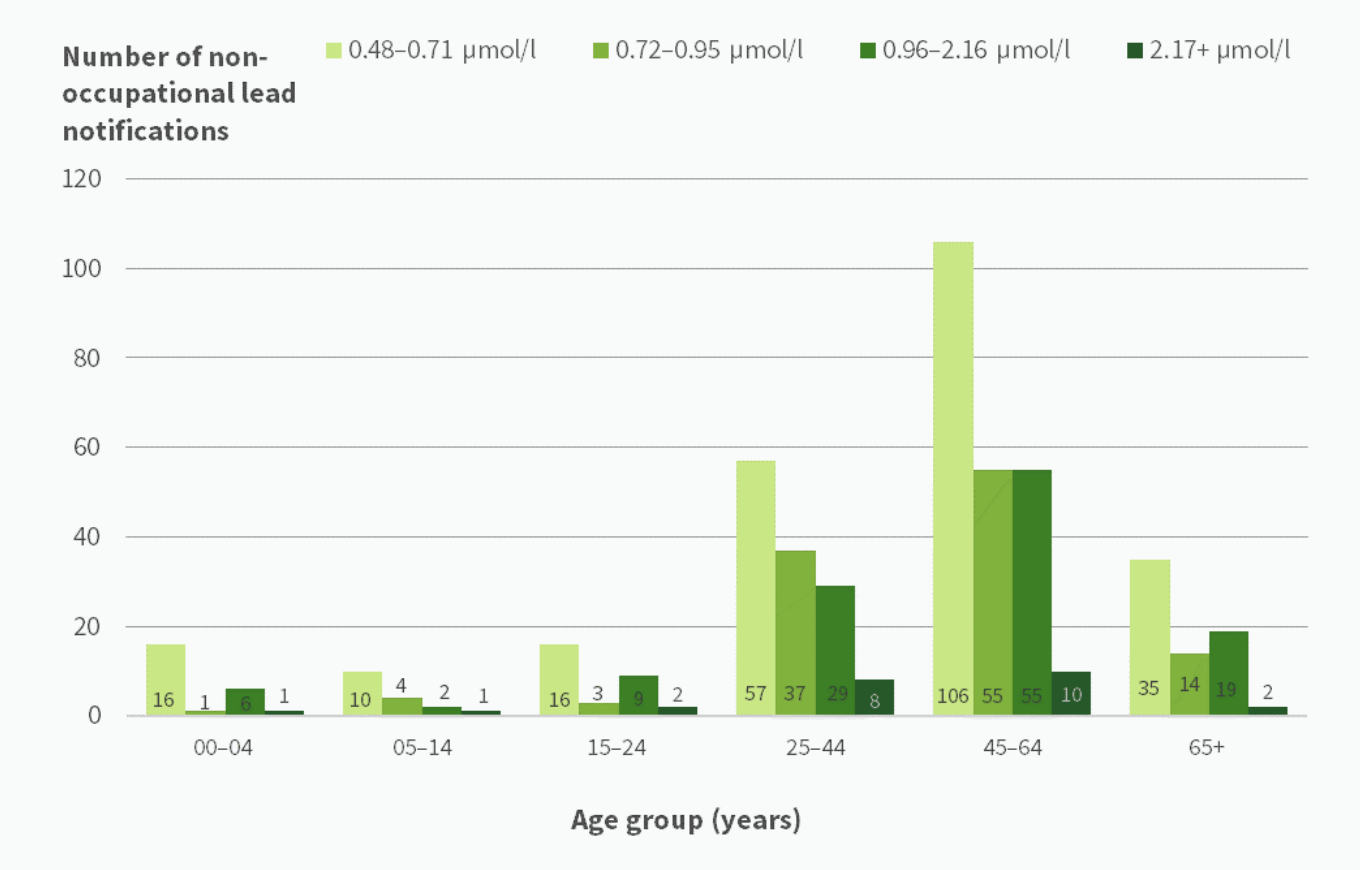
Note: [3]Four cases were recorded as both occupational and non-occupational exposure.
*Totals include categories outside of the 4 rankings listed.
Source: Hazardous Substances Disease and Injury Reporting Tool (HSDIRT).

Blood lead levels reached up to 4.48 µmol/l for non-occupational exposure in 2019

In 2019, non-occupational lead exposure blood lead levels reached up to 4.48 µmol/l. This level was due to exposure from traditional medicine containing lead.

In 2014–19, most non-occupational blood lead levels ranged from 0.48–0.71 µmol/l, with most notifications being adults aged 45–64 years (Figure 7).

Figure 7: Number of non-occupational lead absorption notifications by age-group and blood lead level, 2014–19



Source: Hazardous Substances Disease and Injury Reporting Tool (HSDIRT).

Data for this indicator

This indicator reports HSDIRT lead exposure notifications from 2014 to 2019. Data have sometimes been pooled to give sufficient numbers for analysis. Repeat blood lead tests taken within a year of the original test have been excluded from this data unless further investigation has resulted.

95% confidence intervals have been presented as error bars on graphs. Unless otherwise stated, all differences mentioned in the text between two values are statistically significant at the 5% level or less.

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Other hazardous substances topics include

Hazardous substance notifications

Author

For more information, please contact Shunnie Xie **ehinz@massey.ac.nz**

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