Non-occupational/unknown source of lead absorption notifications

This factsheet presents a national indicator, which allows us to monitor non-occupational or unknown source of lead absorption. The low number of lead absorption notifications in 2020 may have been impacted by COVID-19 nationwide lockdown.

Key facts

Pb

The non-occupational/unknown source of lead absorption notification rate has decreased from 2.1 per 100,000 (94 notifications) in 2014 to 1.2 per 100,000 (62 notifications) in 2020.

Over 80% of the non-occupational/unknown source of lead absorption cases were males. Only boys in the 0–4 year age group had higher blood lead levels than girls of the same age group.

Non-occupational/unknown source of lead absorption notification rate among European/Other ethnicity is over three times the rate among Māori.

People living in the most deprived areas (NZDep2018 quintile 5) have a higher lead absorption rate than those in less deprived (NZDep2018 quintile 2) areas in 2014–20.

Lead-based paint has remained the most common source of non-occupational lead absorption since 2014.

People exposed to lead-containing cosmetics or traditional medicines have relatively higher blood lead levels.

The Wairarapa District Health Board (DHB) had the highest reported non-occupational/unknown source of lead absorption rate. The Public Health Unit (PHU) with the highest reported rate was Taranaki DHB Public Health Unit.

Lead is still a public health issue and children are most at risk

Lead (Pb) is a common pollutant found in a variety of environmental sources. These include lead-based paint used in pre-1980s houses, roof rainwater tanks contaminated by lead-based paint, soldering or flashing, lead pipes or plumbing fittings in older homes, and soil and household dust contaminated by lead. It can also be found in alternative medicines such as Ayurvedic and some traditional Chinese medicines.

Risks to children

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

- 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).

Children with pica (a serious eating disorder characterised by repetitive consumption of non-food items) are more at risk than other children from lead exposure, especially if eating lead-contaminated soil or paint flakes.

Risks in adults

Lifestyle activities such as indoor rifle range shooting are one of the most common sources of non-occupational lead exposures. 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 firearm use (Russell et al 2019).

Lead can cause 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 0.24 µmol/L. The notifiable threshold reduced from 0.48 µmol/L to 0.24 µmol/L on 9 April 2021. At and above this level, public health intervention is required for children and non-occupationally exposed adults.

This factsheet presents non-occupational lead absorption notifications based on a blood lead notification threshold of ≥0.48 µmol /L.

The non-occupational/unknown source of lead absorption rate has decreased since 2014

In 2020, there were 62[1] non-occupational/unknown source of lead absorption notifications out of 110 lead notifications from all exposure sources. The non-occupational/unknown source of lead absorption notification rate has decreased from 2.1 per 100,000 in 2014 to 1.2 per 100,000 in 2020. The nationwide lockdown from COVID-19 may have contributed to the low rate in 2020.

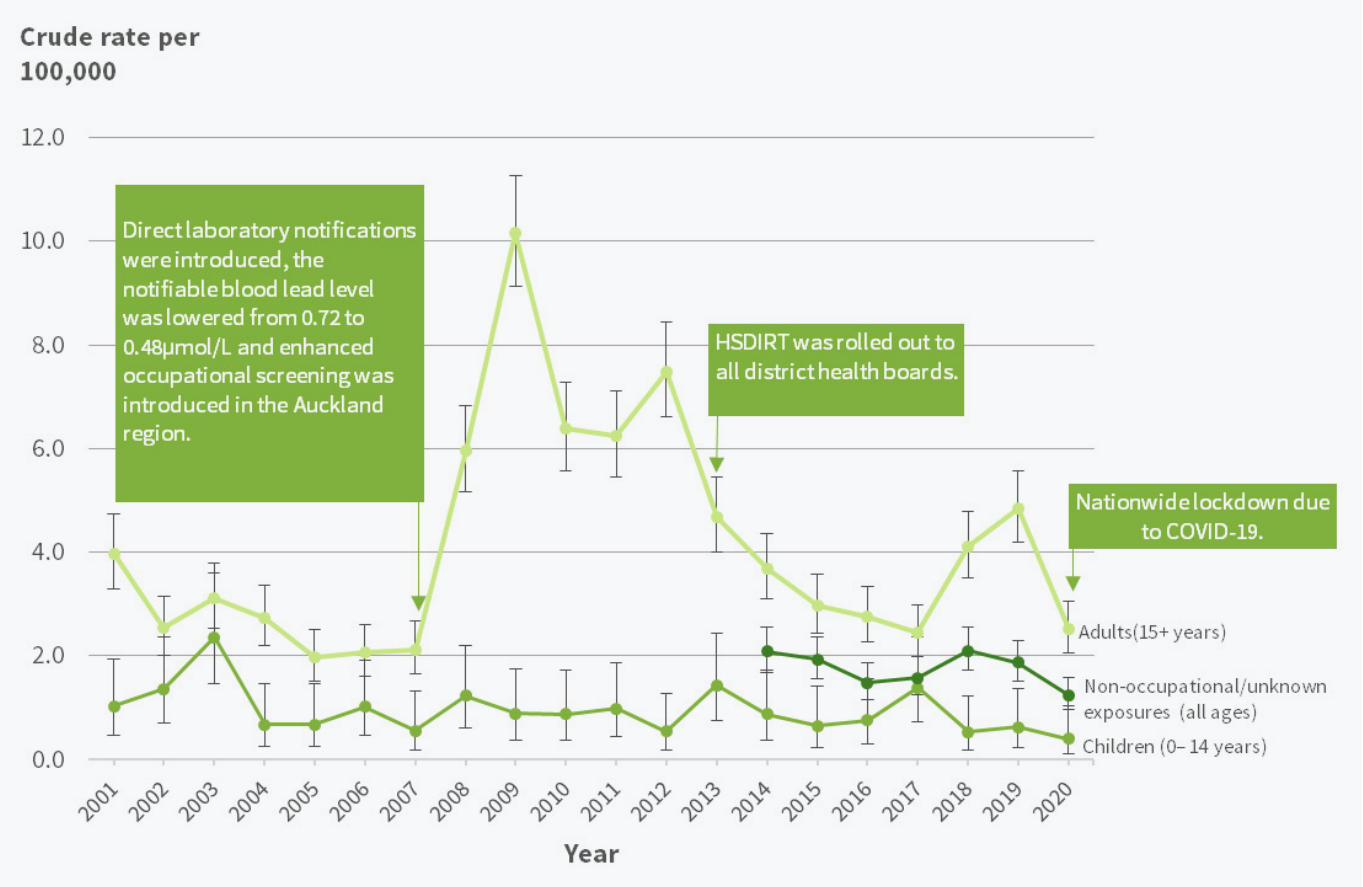
In children aged 0–14 years, apart from a peak rate (2.4 per 100,000; 21 notifications) in 2003, the rate has remained fairly steady between 2004 and 2020 (Figure 1).

The adult lead absorption notification rates were stable from 2001–2007. The marked increase in 2008 and 2009 were due to:

- direct laboratory notifications were introduced in 2007
- the notifiable blood lead level was lowered from 0.72 to 0.48 µmol/L in 2007
- a cluster associated with repainting the Auckland Harbour Bridge in 2009.

The lower rates between 2013–2017 may be due to the introduction of the Hazardous Substances Disease & Injury Reporting Tool (HSDIRT) in 2013. From then, repeat blood lead results within 12 months of the original notification were excluded. The rate has doubled from 2017 to 2019 (2.4 per 100,000 vs 4.8 per 100,000).

Figure 1: Non-occupational/unknown source of lead absorption notification rate, by year



Note 1: The adult lead notification peak in 2009 was due to a cluster associated with repainting the Auckland Harbour Bridge. This cluster involved around 50 notified lead cases.
Note 2: 95% confidence intervals have been presented as error bars. See Metadata for more information on how to interpret this graph.
Note 3: The collection of non-occupational/unknown source of lead notifications data from the HSDIRT system rolled out progressively throughout 2013; therefore the 2013 data is not complete. Consequently, non-occupational/unknown lead data were reported from 2014 onwards.
Source: Institute of Environmental Science and Research; Hazardous Substances Disease and Injury Reporting Tool (HSDIRT) 2021.

[1] There were 11 cases reported in both occupational and non-occupational/unknown categories. Therefore, these cases can add to more than the total number of lead notifications.

Over 80% of the non-occupational/unknown source of lead absorption cases were males

In 2014–20, 81% of the non-occupational/unknown source of lead absorption notifications were males (474 out of 587 non-occupational lead notifications), while 18% (105 notifications) were females and for 1% (8 notifications) sex was unknown.

Boys in the 0–4 year age group had higher blood lead levels than girls of the same age group

In 2014–20, out of all the age groups, only boys in the 0–4 year age group had higher blood lead levels than girls of the same age group. Other than that, there were no significant differences in blood lead levels from non-occupational exposures between sexes (Table 1).

Table 1: Median blood lead level, interquartile range and number of non-occupational/unknown source of lead notifications by age group and sex, 2014–20

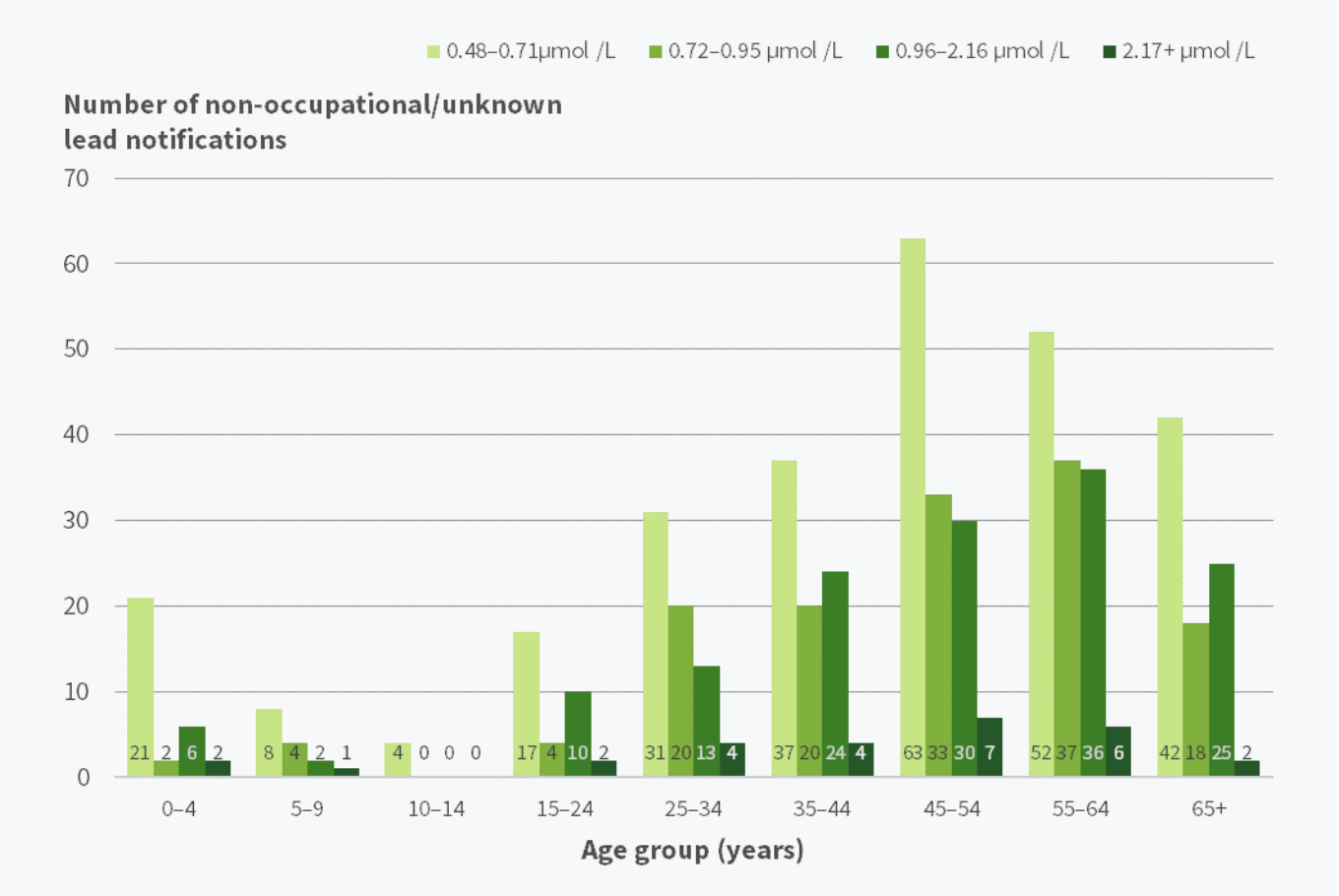
	Median blood lead levels (µmol /L, interquartile range)		Number of non-occupational/ unknown lead notifications	
Age group in years	**Male**	**Female**	**Male**	**Female**
0–4	0.75 (0.53–1.09)	0.60 (0.55–0.71)	10	20
5–9	0.68 (0.50–0.85)	0.70 (0.63–1.83)	10	4
10–14	–	–	2	2
15–24	0.73 (0.58–1.15)	–	30	3
25–34	0.76 (0.56–0.88)	0.68 (0.54–0.88)	57	10
35–44	0.81 (0.60–1.06)	0.83 (0.53–1.03)	68	16
45–54	0.74 (0.60–1.02)	0.70 (0.57–0.90)	110	23
55–64	0.78 (0.62–1.08)	0.82 (0.70–0.91)	112	16
65+	0.79 (0.55–1.12)	0.70 (0.57–0.90)	75	11
Total	**–**	**–**	**474***	**105***

Note 1: Interquartile range are given in brackets. A total of 8 non-occupational/unknown lead exposures with unknown sex were excluded.
Note 2: *More than one lead exposure source can be recorded for a single notification. Therefore, the number can add to more than the total notifications.
Note 3: – indicates the median blood lead levels and the interquartile range were not calculated due to low numbers of notifications reported.
Source: Hazardous Substances Disease and Injury Reporting Tool (HSDIRT) 2021.

Adults aged 45 years and over were most affected by non-occupational/unknown source of lead exposures

In 2014–20, adults aged 45–54 years had the highest number of non-occupational/unknown source of lead notifications (133 notifications), closely followed by the 55–64 (131 notifications) and 65+ (87 notifications) year age groups (Figure 2).

Figure 2: Non-occupational/unknown source of lead absorption notifications, by age group and blood lead level, 2014–20



Source: Hazardous Substances Disease and Injury Reporting Tool (HSDIRT) 2021.

In 2020, the highest non-occupational lead absorption blood level was 5.10 µmol/L. This high lead level was a child under five years with pica and lead contamination at home.

Non-occupational/unknown source of lead absorption notification rate among European/Other ethnicity is over three times the rate among Māori

In 2014–20, people of European/Other ethnicity were 3.3 times as likely to have non-occupational/unknown source of lead absorption as Māori. European/Other ethnic group had the highest reported non-occupational/unknown lead absorption notification rate (1.7 per 100,000; 372 notifications), followed by Pacific Peoples (1.3 per 100,000; 28 notifications). However, 20% of the notifications listed ethnicity as 'unknown' (Table 2).

Table 2: Non-occupational/unknown source of lead absorption notifications and rates, by prioritised ethnic group, 2014–20

Ethnic group (prioritised)	Number (% of non-occupational/ unknown notifications)	Crude rate per 100,000 (95% CI)
Māori	30 (5.1)	0.5 (0.4–0.8)
Pacific Peoples	28 (4.8)	1.3 (0.8–1.8)
Asian	39 (6.6)	0.8 (0.6–1.1)
European/Other	372 (63.4)	1.8 (1.6–2.0)
Unknown	118 (20.1)	–

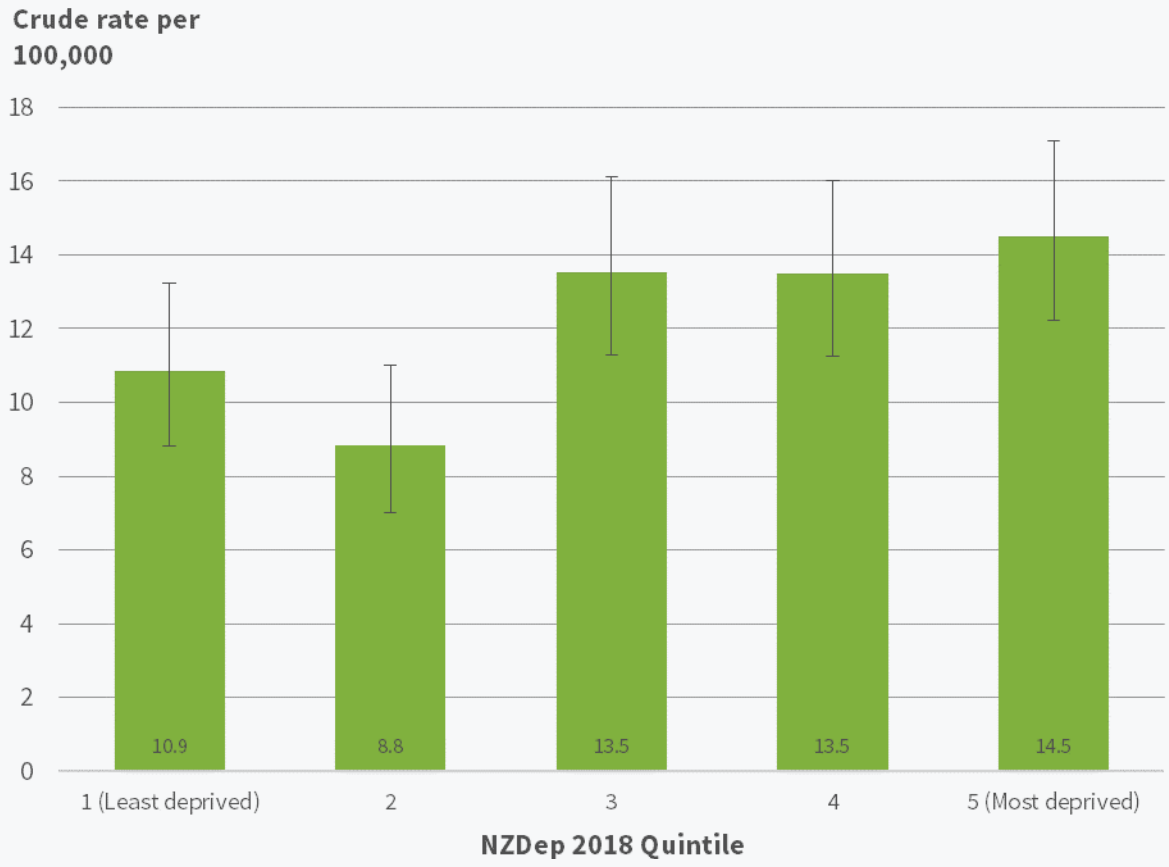
Note 1: A person can be exposed to more than one source of lead exposure (occupational, non-occupational or unknown); therefore, the number can add to more than the total notifications.
Source: Hazardous Substances Disease and Injury Reporting Tool (HSDIRT) 2021.

In 2020, European/Other ethnicity accounted for 68% (42 notifications) of all non-occupational/unknown lead absorption, Asian for 15% (9 notifications), Pacific Peoples for 5% (3 notifications) and Māori for 3% (2 notifications). There were six notifications (10%) that had an unknown ethnicity.

People living in the most deprived areas (NZDep 2018 quintile 5) have higher lead absorption rate than those in less deprived (NZDep 2018 quintile 2) areas in 2014–20

In 2014–20, people living in the most deprived areas (NZDep2018 quintile 5) have a higher lead absorption rate than those in less deprived (NZDep 2018 quintile 2) areas (Figure 3).

Figure 3: Non-occupational/unknown source of lead absorption notification rate, by NZDep 2018 quintiles, 2014–20



Note 1: A total of nine non-occupational/unknown cases with unknown address were excluded from this graph.
Note 2: 95% confidence intervals have been presented as error bars. See Metadata for more information on how to interpret this graph.
Source: Hazardous Substances Disease and Injury Reporting Tool (HSDIRT) 2021.

Lead-based paint remained the most common source of non-occupational lead exposure since 2014

In 2020, there were 62[2] non-occupational/unknown lead absorption notifications. Since 2014, the most common sources of non-occupational lead exposure were lead-based paint, indoor rifle range and bullet/sinker manufacture (Table 3). Sixteen notifications had an unknown lead source in 2020. Other common non-occupational sources identified in 2014–20 were pica, gunshot wound, bullet/sinker manufacture and traditional medicines or cosmetics.

Table 3: Number of non-occupational or unknown lead absorption notifications, 2014–20

Rank	2014	2015	2016	2017	2018	2019	2020
1	Lead-based paint (26)	Unknown (36)	Lead-based paint (29)	Lead-based paint (30)	Lead-based paint** (52)	Lead-based paint (34)	Lead-based paint (22)
2	Indoor rifle range (25)	Lead-based paint (26)	Unknown (18)	Unknown (22)	Unknown (27)	Unknown (21)	Unknown (16)
3	Unknown (24)	Indoor rifle range (19)	Indoor rifle range (11)	Indoor rifle range (12)	Indoor rifle range (16)	Indoor rifle range (15)	Indoor rifle range (10)
4	Bullet/sinker manufacture (11)	Bullet/sinker manufacture (5)	Bullet/sinker manufacture (6)	Pica (4)	Bullet/sinker manufacture (5)	Gunshot wound*** (11)	Bullet/sinker manufacture (7)
Total*	**94**	**89**	**70**	**76**	**103**	**93**	**62**

Note 1: *Totals include categories outside of the 4 rankings listed.
Note 2: **31 notifications resulted from a Housing NZ study.
Note 2: ***11 gunshot wound cases were due to the Christchurch mosque attack.
Note 3: More than one lead exposure source can be recorded for a single notification. Therefore, the number can add to more than the total notifications.
Source: Hazardous Substances Disease and Injury Reporting Tool (HSDIRT) 2021.

Identifying people with potential lead exposure can be challenging, especially through recreational activities or hobbies, where signs and symptoms do not appear until dangerous amounts have accumulated (BPAC 2021). However, the primary source of lead exposure, especially for young children, is in their home. In 2020, there were four lead exposure notifications involving children aged under 15 years. Three of them had pica and had lead contamination in their homes.

> There is no 'safe' level of lead exposure. Lead can be harmful to people of all ages, but the health risk is highest for unborn babies, infants and young children.

(BPAC 2021)

[2] There were 11 cases reported in both occupational and non-occupational/unknown categories. Therefore, these cases can add to more than the total number of lead notifications.

People exposed to lead-based cosmetics or traditional medicines have relatively higher blood lead levels

In 2014–20, among those who were notified, people exposed to lead-based cosmetics or traditional medicines (eg, Ayurvedic remedies) had relatively higher blood lead levels compared to other sources of non-occupational/unknown source of exposures (Table 4).

Table 4: Median blood lead level, interquartile range by non-occupational/unknown source of exposures and number of notifications, 2014–20

Non-occupational/unknown source of exposures	Median blood lead levels (µmol /L, interquartile range)	Number of notifications
Traditional medicine or cosmetics	1.91 (0.69–4.38)	19
Gunshot wound	1.02 (0.68–1.39)	20
Lead-based paint	0.76 (0.59–1.09)	219
Bullet/sinker manufacture	0.69 (0.54–0.93)	40
Indoor rifle range	0.68 (0.56–0.91)	110
Pica	0.60 (0.55–0.96)	15
Unknown source	0.80 (0.59–1.00)	162

Note: Interquartile range are given in brackets.
Source: Hazardous Substances Disease and Injury Reporting Tool (HSDIRT) 2021.

Wairarapa DHB and Taranaki DHB Public Health had the highest reported rate of non-occupational/unknown lead absorption

In 2014–20, the Wairarapa DHB (6.5 per 100,000; 21 notifications) and Taranaki DHB Public Health Unit (4.6 per 100,000; 39 notifications) had the highest reported rate of non-occupational/unknown source of lead absorption among DHBs and PHUs respectively (Table 5).

Table 5: Non-occupational/unknown source of lead absorption notification rate and number of notifications, by DHB and PHU, 2014–20

DHB	Crude rate (per 100,000)	Number of notifications	PHU	Crude rate (per 100,000)	Number of notifications
Northland	*	2	Northland	*	2
Waitematā	1.2	51			
Auckland	2.3	79	Auckland Regional Public Health Service	1.6	184
Counties Manukau	1.4	53			
Waikato	1.4	41	Waikato Population Health Service	1.5	42
Lakes	0.8	6			
Bay of Plenty	1.1	19	Toi Te Ora Public Health	1.0	25
Tairāwhiti	*	4	Tairawhiti DHB Public Health Unit	*	4
Hawkes Bay	2.0	24	Hawke's Bay Public Health Unit	2.0	24
Taranaki	4.6	39	Taranaki District Health Board	4.6	39
MidCentral	3.5	44			
Whanganui	4.6	21	MidCentral Public Health Service	3.9	66
Capital & Coast	2.0	43			
Hutt Valley	1.7	18	Regional Public Health	2.4	84
Wairarapa	6.5	21			
Nelson Marlborough	0.8	9	Nelson Marlborough	0.8	9
West Coast	2.6	6			
Canterbury	1.8	71	Community	1.9	85
South Canterbury	1.2	5			
Southern	1.0	23	Public Health South	1.0	24

Note 1: DHB is based on individual spatial address. PHU is based on the locality of the notification reported.
Note 2: *The rate is suppressed due to an unreliable estimate with small numbers. See Metadata for more information on how to interpret this table.
Source: Hazardous Substances Disease and Injury Reporting Tool (HSDIRT) 2021.

Data for this indicator

This indicator reports HSDIRT non-occupational/unknown source of lead absorption notifications from 2014 to 2020. The data was extracted from the HSDIRT system on 5 March 2021. Updates or additions made to HSDIRT after this date are not reflected in this factsheet.

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.

Crude rates presented in this factsheet do not take into account varying age distributions when comparing between populations.

For additional information, see the metadata link below.

References

Armstrong R, Anderson L, Synnot A, et al. 2014. Evaluation of evidence related to exposure to lead. Canberra: National Health and Medical Research Council. URL: **www.nhmrc.gov.au/guidelines-publications/eh58** (accessed 13 October 2021).

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Reuben A, Schaefer JD, Moffitt TE, et al. 2019. Association of childhood lead exposure with adult personality traits and lifelong mental health. JAMA psychiatry, 76(4), 418-425.

World Health Organization. 2020. Lead poisoning and health, URL: **https://www.who.int/news-room/fact-sheets/detail/lead-poisoning-and-health** (accessed 13 October 2021).

Other related topics include:

Hazardous substances notifications

Unintentional hazardous substances exposures in children (0–14 years)

Occupational lead absorption notifications

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Further information

For descriptive information about the data **Metadata Sheet**

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