



Port Pirie Blood Lead Levels

Analysis of blood lead levels for the first half
of 2021
(1 January – 30 June 2021)



Government
of South Australia

SA Health

Background

Situated 230 km north of Adelaide in South Australia, Port Pirie is the location of one of the world's largest lead and zinc smelters.

The smelter has been in continuous operation since 1889. Over time, airborne lead-contaminated dust produced during smelter operations has contaminated the local environment. Even small amounts of lead can be toxic when ingested or inhaled. Lead-contaminated dust continues to be emitted by the smelter and these ongoing emissions, together with legacy lead from past operations, are a persistent source of exposure for the Port Pirie community. SA Health has provided voluntary blood lead screening through the Port Pirie Lead Implementation Program that has been delivered by the Port Pirie Environmental Health Centre since 1984. This Program monitors and helps the local community reduce the amount of lead that children absorb by providing lead exposure-reduction advice, education and interventions for families.

This paper reports the analysis of blood lead levels of Port Pirie children aged 0-4 years (0-1824 days of age i.e. up to the date of a child's fifth birthday) for each year since 2012. Reports summarising blood testing data from years prior to 2012 are available on request.

Australian Lead Guidelines

The National Health and Medical Research Council (NHMRC) provides health advice and health guidelines for the Australian community, governments and health professionals. One of the NHMRC's tasks is to advise the Australian community about lead exposure and the health effects of lead and how they can be managed.

Guideline for investigating lead exposure

The NHMRC recommends that if a person has a blood lead level greater than 5 micrograms per decilitre ($\mu\text{g}/\text{dL}$), the source of lead exposure should be investigated and reduced, particularly if the person is a child or pregnant woman. See the [Frequently Asked Questions: NHMRC Review of blood lead level guidelines](#).

The NHMRC advises it is well established that exposure to lead at blood lead levels above 10 $\mu\text{g}/\text{dL}$ can have harmful effects on a number of body functions and organs in both adults and children. Research now shows that blood lead levels below 10 $\mu\text{g}/\text{dL}$ may also be associated with some health effects ([NHMRC 2015. Evidence on the effects of lead on human health](#)). At this stage, the NHMRC has concluded that the evidence is not strong enough to show that lead is the cause of these effects.

In line with NHMRC's guidance, the blood lead levels of children living in Port Pirie are reported against the exposure investigation level of 5 $\mu\text{g}/\text{dL}$. This is in addition to the target level of 10 $\mu\text{g}/\text{dL}$ that has been reported each year since 2000 and was the target level of the Targeted Lead Abatement Program when it commenced in 2014.

Port Pirie results

Blood tests indicate that the average blood lead level (geometric mean) of the children tested in the first six months of 2021 was 5.7 $\mu\text{g}/\text{dL}$. This average has increased by 0.2 $\mu\text{g}/\text{dL}$ compared to the same reporting period last year.

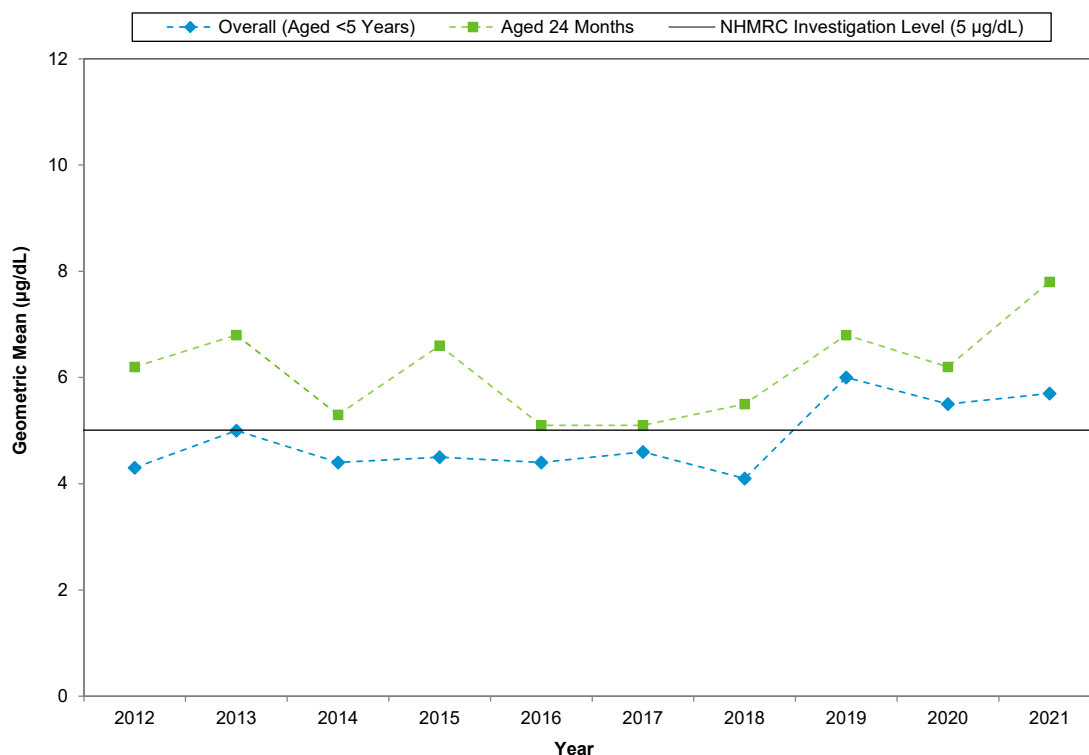
The average blood lead level (geometric mean) of children aged 24 months (tested at the time of their second birthday between 700 and 790 days after their birth) in 2021 was 7.8 $\mu\text{g}/\text{dL}$, which has increased by 1.6 $\mu\text{g}/\text{dL}$ compared to the same reporting period last year. The geometric mean blood lead level for children aged 24 months is considered to be a robust indicator of trends in lead exposure for the whole population (Table 1).



Table 1: Geometric mean of children tested aged under five years (with surrogates) and aged 24 months (700-790 days) for the first half of each calendar year since 2012.

Year	Total number of children tested	Geometric mean of children tested ($\mu\text{g/dL}$)	Number of children aged 24 months tested	Geometric mean of children aged 24 months tested ($\mu\text{g/dL}$)
2012	457	4.3	64	6.2
2013	413	5.0	53	6.8
2014	425	4.4	75	5.3
2015	436	4.5	60	6.6
2016	478	4.4	63	5.1
2017	480	4.6	56	5.1
2018	413	4.1	56	5.5
2019	461	6.0	42	6.8
2020	419	5.5	39	6.2
2021	478	5.7	37	7.8

Figure 1: Geometric mean of children tested aged under five years (with surrogates) and aged 24 months (700-790 days) for the first half of each calendar year since 2012. This is a schematic illustration that represents the trend in geometric mean of children living in Port Pirie – it is not intended to infer that the data is continuous i.e. each data point does not represent the same group of children at each year.



Blood test results indicate that 37.4% of the children tested (together with surrogates) in 2021 had blood lead levels of 5 µg/dL or below (Table 2). This is a 2.0% decrease compared to the same reporting period last year.

These percentages cannot be reported or interpreted to represent the proportion of the Port Pirie population at 5 µg/dL or 10 µg/dL. This is because not every child living in Port Pirie was tested in the first six months of 2021 and therefore their blood results do not appear in this analysis. If every child was tested, the proportion of the entire population with blood lead levels of 5 µg/dL or below falls somewhere between the lower limit of 35.4% and the upper limit of 39.5% (population estimates used to calculate these limits are based on Estimated Resident Population (ERP) data for Port Pirie updated by the ABS on 28 August 2020 using migration and birth rates in addition to 2016 census data).

In the first six months of 2021, 299 children had a reported result greater than 5 µg/dL.

Table 2: Lead Exposure Investigation Level - Frequency of children tested with blood lead levels ≤5 µg/dL (with surrogates) for the first half of each calendar year since 2015.

Year	Total number of children tested	≤5 µg/dL			
		n	Lower limit	%	Upper limit
2015	436	229	49.9	52.5	55.1
2016	478	258	51.6	54.0	56.3
2017	480	248	49.4	51.7	53.9
2018	413	224	51.5	54.2	56.9
2019	461	166	33.7	36.0	38.4
2020	419	165	36.9	39.4	41.9
2021	478	179	35.4	37.4	39.5

Targeted Lead Abatement Program

The Targeted Lead Abatement Program (TLAP) has been designed to identify and intensify community lead exposure reduction. In conjunction with the Port Pirie smelter redevelopment, TLAP will deliver the most significant reduction in lead emissions and community blood lead levels achieved in the life of the smelter. The TLAP blood lead level target was established to increase the number of children under five years of age below 10 µg/dL. This program now also focuses on driving levels below the NHMRC exposure investigation level of 5 µg/dL.

Blood tests indicate that 75.1% of children tested (together with surrogates) had blood lead levels below 10 µg/dL. This is a 0.1% decrease compared to the same reporting period last year (Table 3).

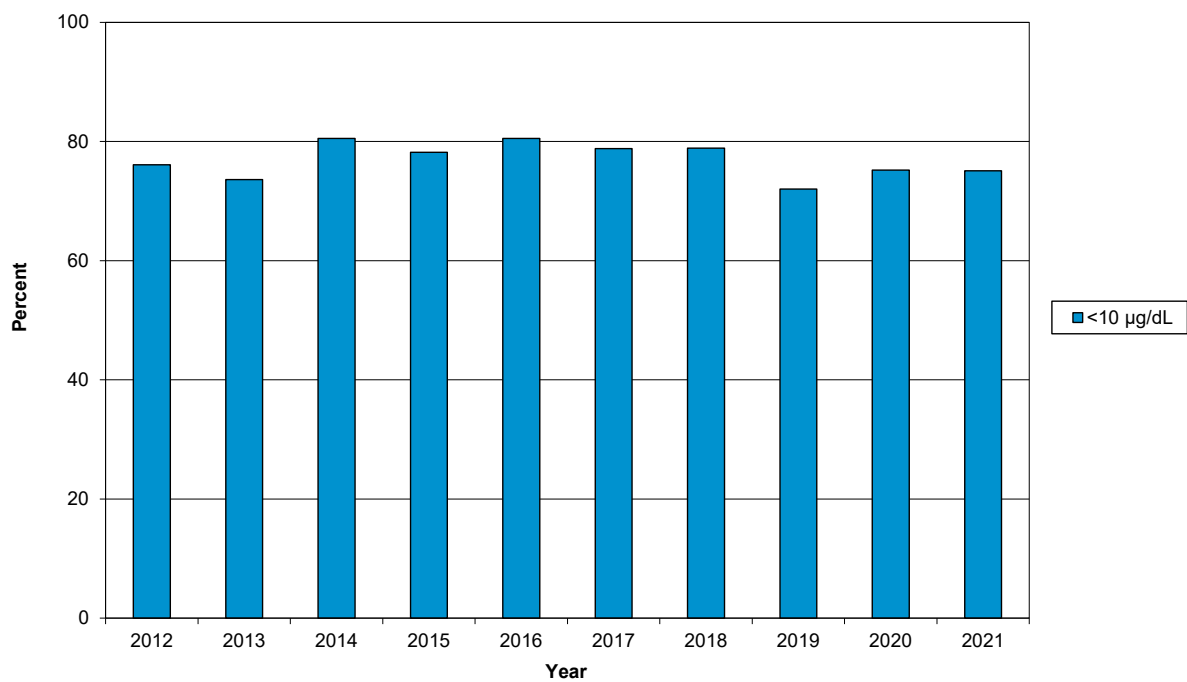
The number of children with blood lead levels equal to or exceeding 20 µg/dL (9 children) is greater than reported for the same period last year (8 children were reported in the second quarter 2020 report, but routine audit identified a subsequent confirmational test of one of these children shortly after finalising the report, which returned a level below 20 µg/dL such that 7 children exceeded 20 µg/dL for the reporting period in 2020).



Table 3: Frequency of children tested with blood lead levels <10 µg/dL with surrogates for the first half of each calendar year since 2012.

Year	Total number of children tested	<10 µg/dL			
		n	Lower limit	%	Upper limit
2012	457	348	73.8	76.1	78.3
2013	413	304	71.0	73.6	76.1
2014	425	342	78.2	80.5	82.6
2015	436	341	76.0	78.2	80.3
2016	478	385	78.6	80.5	82.3
2017	480	378	76.9	78.8	80.5
2018	413	326	76.6	78.9	81.1
2019	461	332	69.8	72.0	74.1
2020	419	315	72.9	75.2	77.4
2021	478	359	73.2	75.1	76.9

Figure 2: Percentage of children tested with blood lead levels <10 µg/dL with surrogates for the first half of each calendar year since 2012.



Analysis Methods

Children included in this report were less than five years of age (0-1824 days of age i.e. up to the date of a child's fifth birthday) and lived in Port Pirie at the time the blood test was taken (i.e. this is their age at the time the test was taken - not their current age). If more than one blood test was taken in the reporting period, the most recent test result was used in this analysis. This analysis can include a child's test result that may have been collected any time up to 364 days prior to the preparation of this report. For this reason, a child's most recent test result may not represent the child's current blood lead level. Results are reported with surrogates, where surrogate data (the mother's blood lead level) represents a child's blood lead level at birth. The mother's result is included until either their child's first test at age six months replaces it in the dataset or if the child has not had a test by age nine months, the mother's result is removed from the dataset.

Data in this analysis cannot be compared with data from historical reports because different analysis methods were used. For example, prior to 2005 a child's maximum test was used in the analysis whereas now a child's most recent test result is used. For this reason, trends are not comparable with published reports in the 2004 and 1984 program reviews. From 2007-2010, the number of children with blood lead levels above 10 µg/dL, using a five-year cohort of children was reported; again this trend indicator cannot be compared with the one-year cohort of children that is reported now.

All blood samples included in this report are analysed by Australian laboratories accredited for blood lead analysis by the National Association of Testing Authorities (NATA Australia). Blood testing service providers for the Port Pirie community blood lead screening program changed on 1 January 2019, allowing for more advanced analytical methods to be utilised.

A new blood-lead results database was commissioned in 2017 and operated concurrently with the existing database until 31 March 2018. Results of blood tests collected from 1 January 2018 have been extracted from the new database. Blood tests collected prior to 2018 will continue to be extracted from the old database. Routine data audit occurs when each analysis is undertaken and will continue to identify small numbers of data collection and entry anomalies (e.g. clients reporting incorrect family details). Correction of these anomalies can result in a minor variation in the number of test results included in the dataset when compared to reports prepared in previous years but does not have significant impact on reported proportions.

True population proportions may vary between reports as they are adjusted from year to year for the estimated population size based on ABS census data. The population projection used to calculate this indicator is based on a linear extrapolation of the Estimated Resident Population (ERP) compiled by the ABS, updated quarterly between censuses and completely revised each time a population census is conducted. While the ABS states that the ERP is the most accurate estimate of the population, there is inherent inaccuracy involved in estimating population, with the largest margin of error recorded with small population sizes such as the population of children aged less than five years living in Port Pirie. Any minor change in determinants of population size such as migration and birth rate can cause a substantial change in population estimates as a result of the small population size.

These results cannot be interpreted to represent the entire population because test results for every child are not in every report. The reasons for this are:

- > The blood lead screening program is voluntary and parents have the right to choose not to have their child tested.
- > Not all children are tested by each report date. For example, for the first quarter report, approximately one quarter of the children enrolled in the screening program have been tested.



- > Some children have a history of consistently low blood lead levels and have been assessed to remain at a low risk of lead exposure and developing lead-related health effects. These children will not benefit from ongoing testing beyond three years of age as part of their lead exposure management strategy. However, children at high risk of lead exposure are always encouraged to be regularly tested.
- > Results pending re-test for confirmation are not included in this dataset but will appear in the next report.

These reports are considered very reliable for reporting the proportion of the population with blood lead levels above 10 micrograms per decilitre (the children at highest risk). However, children with low blood lead levels are under-represented i.e. there is inherent bias in this analysis (for the reasons given above). There is no ethical way to correct this bias as testing cannot be mandated.

Further information about the analysis methods used in this paper is available at [Frequently Asked Questions Testing and Reporting Port Pirie Children's blood lead levels](#).

Report prepared by: Scientific Services Branch, Health Protection and Licensing Services

August 2021

Doc. no. A293697

File no. 2021-05423

For more information

**Scientific Services Branch
Health Regulation & Protection
11 Hindmarsh Square
Adelaide 5000
Telephone: 8226 7100
www.sahealth.sa.gov.au**

Public-I1-A1



www.ausgoal.gov.au/creative-commons