



Date: 13/08/2015

Background

The WA *Occupational Safety and Health Regulations (1996)* (“the Regulations”) require that health surveillance, including blood lead level tests, is provided to workers undertaking lead risk work. Medical practitioners providing health surveillance are required to report results consistent with exposure to the WorkSafe Commissioner.

Blood lead level (BLL), is a measure of lead in the blood. It is measured in micrograms of lead per deciliter of blood ($\mu\text{g}/\text{dL}$).

Blood lead level results provided to the Commissioner are recorded in a database called the WorkSafe Information Systems Environment (WISE). This report summarises these results by calendar year for the period 1 January 1994 – 15 May 2015 (date of test).

The Regulations pertaining to lead are based on the *National Standard for the Control of Inorganic Lead at Work [NOHSC: 1012(1994)]* (“the National Standard”), however until 2008 there was a different blood lead level for removal from lead work under the Regulations compared with the National Standard. The Regulations specified a removal level of 60 $\mu\text{g}/\text{dL}$ for all men and for women not of reproductive capacity (30 $\mu\text{g}/\text{dL}$ for women of reproductive capacity), and the National Standard specified a removal level of 50 $\mu\text{g}/\text{dL}$ (20 $\mu\text{g}/\text{dL}$) for the same groups of workers. The Regulations were amended in 2008 to reduce the removal levels to those in the Standard.

Most Australian jurisdictions regulate workplace lead using Work Health and Safety legislation, which includes removal levels consistent with the WA requirements. Safe Work Australia¹ has announced a review into the regulated blood lead levels and the lead workplace exposure standard.

Data inclusions and limitations

Efforts have been made to remove duplicate records from the source data set; however an insignificant amount of duplication may still exist. The database does not have a gender field so gender analysis is not included. However, lead risk work in WA is highly male dominated.

Industry codes in the database are limited and industry analysis is not included. However lead risk work in WA is most common in industries such as fire assay and radiator repair, and less commonly involves work with lead based paint such as monumental works or other lead work.

Data relates to workplaces over which WorkSafe has jurisdiction, which excludes mine sites and workplaces under Comcare jurisdiction. Data relates to workplaces where employers have complied with the Regulations by providing health surveillance. Possibly some employers who should provide health surveillance have not done so.

This data relates to results where the medical practitioner has complied with their duty to report levels consistent with exposure to the WorkSafe Commissioner; it is possible that in some cases health surveillance has occurred and has not been so reported.

The data may include baseline data (data relating to workers new to lead risk work, prior to undertaking lead risk work).

1. Safe Work Australia. (2014). *Review of hazards and health effects of inorganic lead information sheet*. Retrieved from <http://www.safeworkaustralia.gov.au/sites/SWA/about/Publications/Documents/872/inorganic-lead-information-information-sheet.pdf>

Blood lead level interpretation

Table 1 provides a guide to understanding blood lead levels in the context of the Regulations and the National Standard.

Table 1: Guide to interpreting blood lead levels

Blood lead level ($\mu\text{g}/\text{dL}$)	Guidance and requirements under the Regulations and National Standard
0 to < 5	Background (non-occupational) exposure
5 to < 10	Elevated background (non-occupational) or low occupational exposure
10 to < 20	A result above 10 $\mu\text{g}/\text{dL}$ for a woman of reproductive capacity requires more frequent blood lead tests under the National Standard. A result of 15 $\mu\text{g}/\text{dL}$ on 3 consecutive occasions for women of reproductive capacity requires review of control measures under the National Standard.
20 to < 30	20 $\mu\text{g}/\text{dL}$ is the post-2008 removal level* for women of reproductive capacity. (Note that pregnant or breastfeeding women must be removed from lead risk work under the Regulations).
30 to < 40	Meets the definition of a lead risk job for all males and for females not of reproductive capacity. 30 $\mu\text{g}/\text{dL}$ is the pre-2008 removal level for women of reproductive capacity.
40 to < 50	For men and for women not of reproductive capacity, blood lead levels in this range on 3 consecutive occasions require controls be reviewed, under the National Standard. Blood lead levels above 40 $\mu\text{g}/\text{dL}$ for all men and for women not of reproductive capacity require more frequent blood lead tests under the National Standard.
50 to < 60	Exceeds post-2008 removal level for all males and for females not of reproductive capacity. Exceeds removal level for all males and for females not of reproductive capacity under the National Standard.
≥ 60	Exceeds pre-2008 removal level for all males and for females not of reproductive capacity

Note: The term “removal level” indicates the legal requirement under the Regulations to remove the worker from lead risk work until their blood lead levels attain a specified lower value.

Summary of results

- 11,972 health tests form the basis of the results analysis which was carried out over approximately 20 years (1 January 1995 to 15 May 2015).
- Average blood lead levels reported to WorkSafe have more than halved since 1995, from 33 µg/dL to 11 µg/dL in 2014 – down 67%.
- Blood lead levels ranged from zero to 126 µg/dL during the reporting period.
- Overall, the proportion of results with levels of 10 µg/dL or less increased over the reporting period, as did the proportion of results with levels of 50 µg/dL or less.
- 35 people tested were aged 18 years or under and their blood lead levels ranged from 0.7 to 41 µg/dL (the age of 29 participants is unknown).
- The mean blood lead level is 18 µg/dL; the standard deviation is 14.
- 68% of unit test levels are +/- 1 standard deviation from the mean (4 and 33 µg/dL).
- 95% of unit test levels are +/- 2 standard deviations from the mean (between 8 and 66 µg/dL).
- The median is 16 µg/dL.
- 99.8% of 2014 results are under the removal level of 50 µg/dL; 99.2% are under 40 µg/dL and 93.4% are under 30 µg/dL.

Discussion

Improvements in lead exposure control have been implemented by industry over the last twenty years. Effective controls such as eliminating lead from some products, and installing local extraction ventilation have been implemented at some workplaces. There have also been improvements in informing and training lead workers, and providing facilities that enable higher standards of personal hygiene.

Changes in industry have also occurred over the time of this dataset; for example changes in radiator construction have reduced lead use in radiator repair. Changes in employment structures, such as the use of casual or labour hire employees, may also influence blood lead levels.

Conclusion

The data indicates that there is a healthy downward trend in blood lead levels among lead risk workers in the jurisdiction of WorkSafe WA. Whilst there are various limitations in terms of this data set, it may be used by stakeholders in considering future regulation or management of lead risk work.

Chart 1: Test results by (µg/dL) unit group (deciles) from 1995 to 2015 (part year)

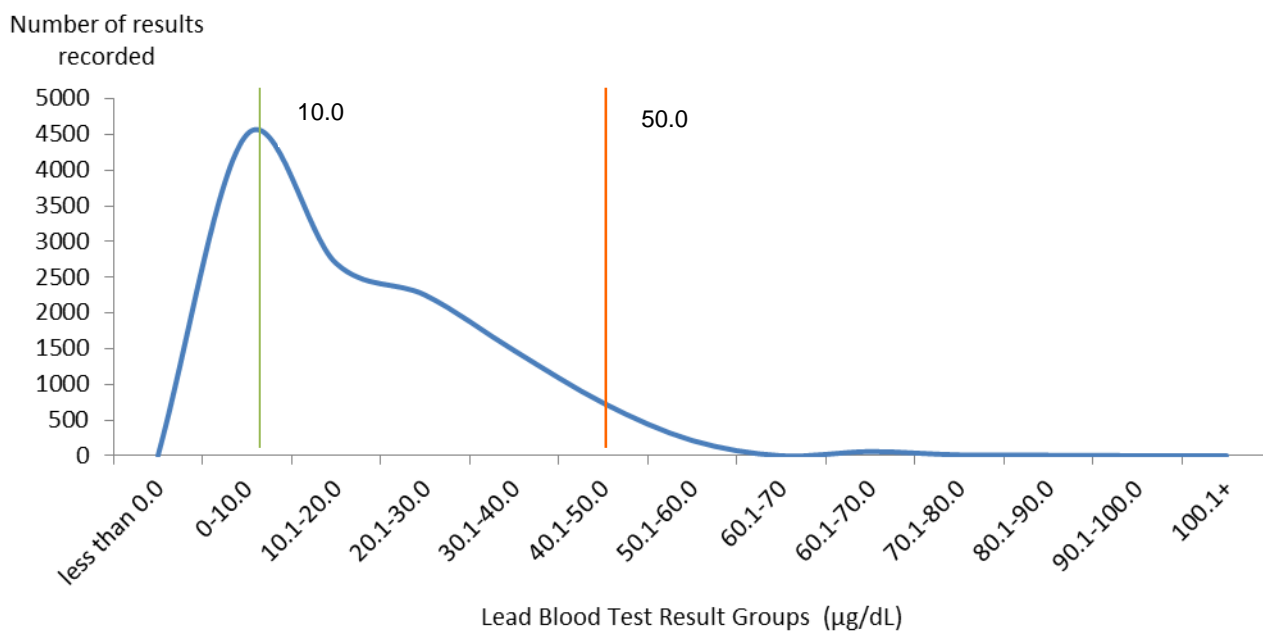
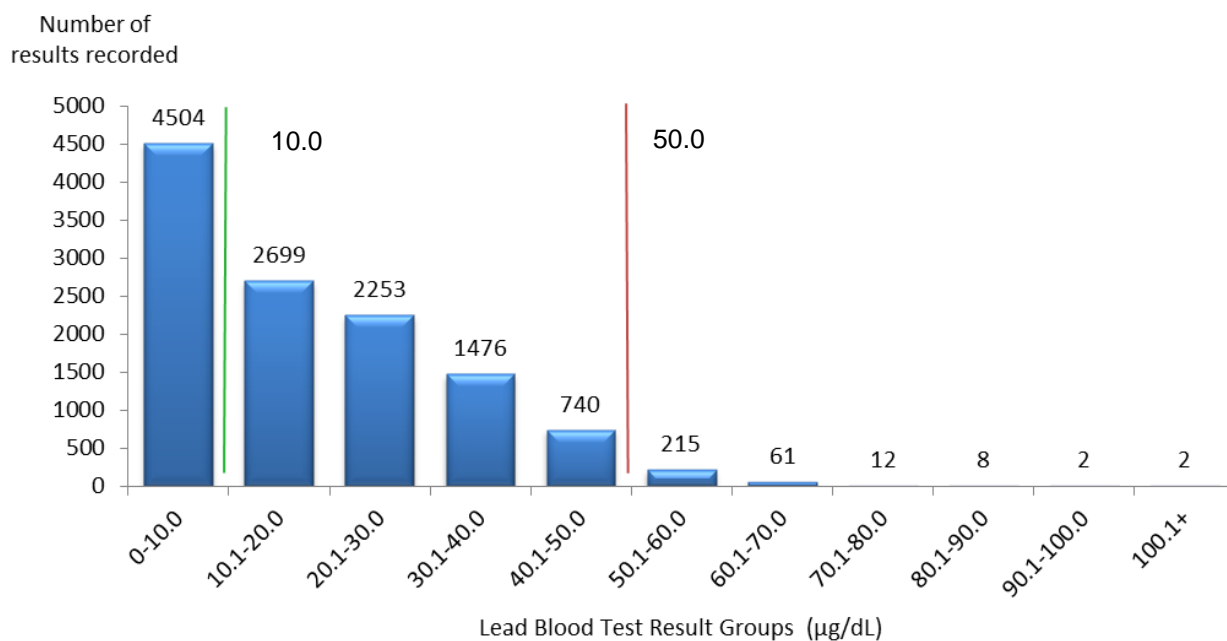


Chart 2: Number of recorded test results by (µg/dL) unit group (deciles) from 1995 to 2015 (part year)



As charts 3 to 10 illustrate, lower blood lead levels make up an increasingly large proportion of results over time. The proportion of results of 30 µg/dL or less has noticeably increased, from 54% in 1995-1999 to 91% in 2010-2015 (part year). Conversely levels above 50 µg/dL have decreased over the same period from 7% to 1%.

Chart 3: Proportion of blood lead results by decile (µg/dL): 5yr period from 1995 to 1999

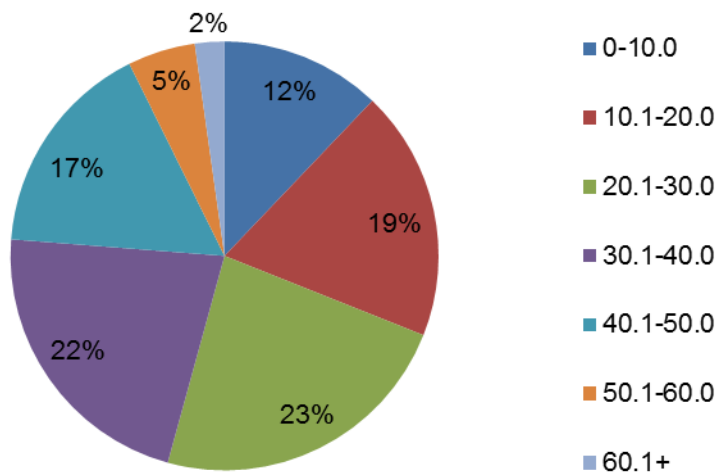


Chart 4: Proportion of blood lead results by decile (µg/dL): 5yr period from 2000 to 2004

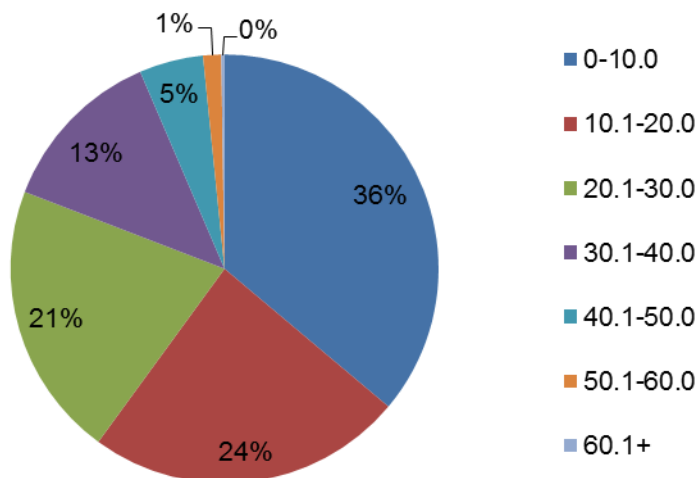


Chart 5: Proportion of blood lead results by decile ($\mu\text{g}/\text{dL}$): 5yr period from 2005 to 2009

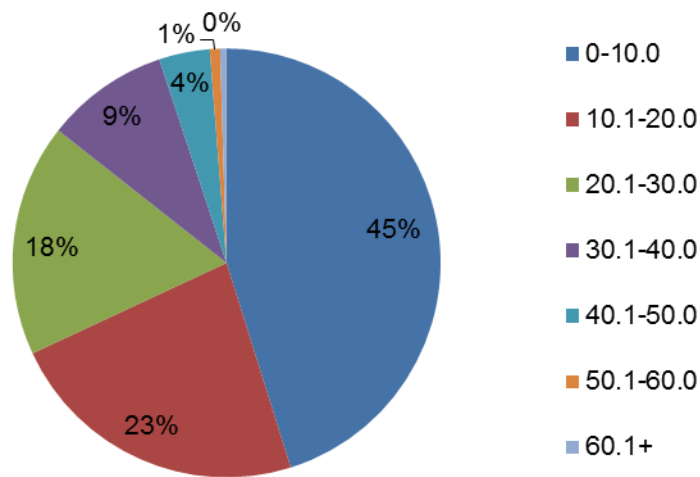


Chart 6: Proportion of blood lead results by decile ($\mu\text{g}/\text{dL}$): 5yr period from 2010 to 2014 plus 2015 (part year)

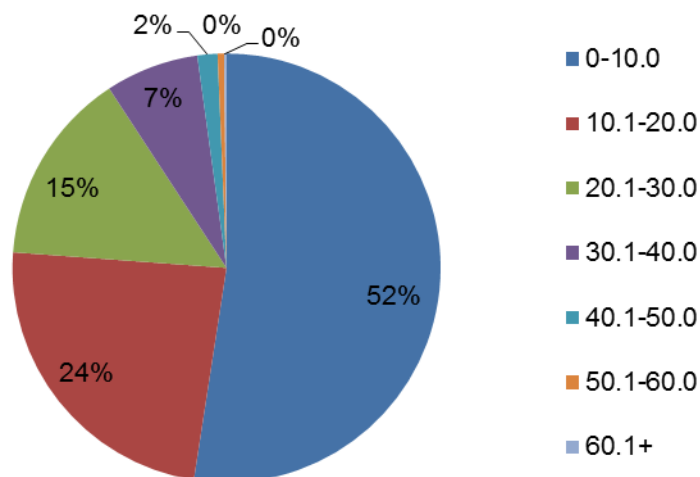


Chart 7: Breakdown of blood lead level results ($\mu\text{g}/\text{dL}$) by (deciles) from 1995 to 2015 (part year)

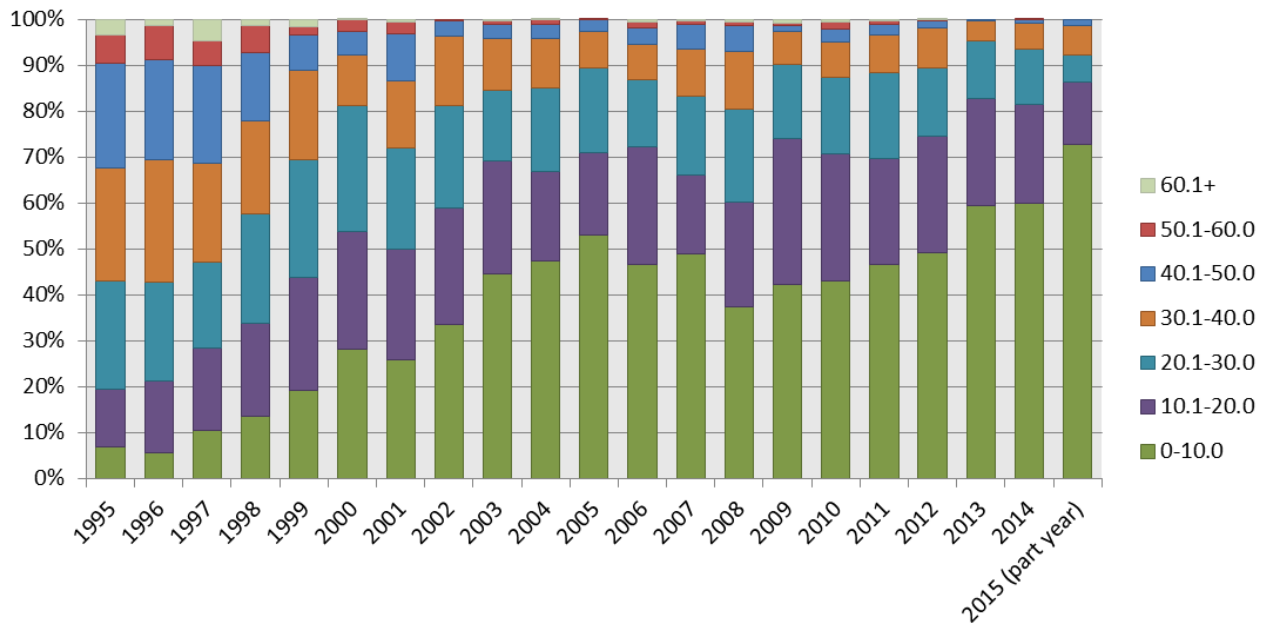


Chart 8: Proportion of blood lead level results from zero to 50 $\mu\text{g}/\text{dL}$

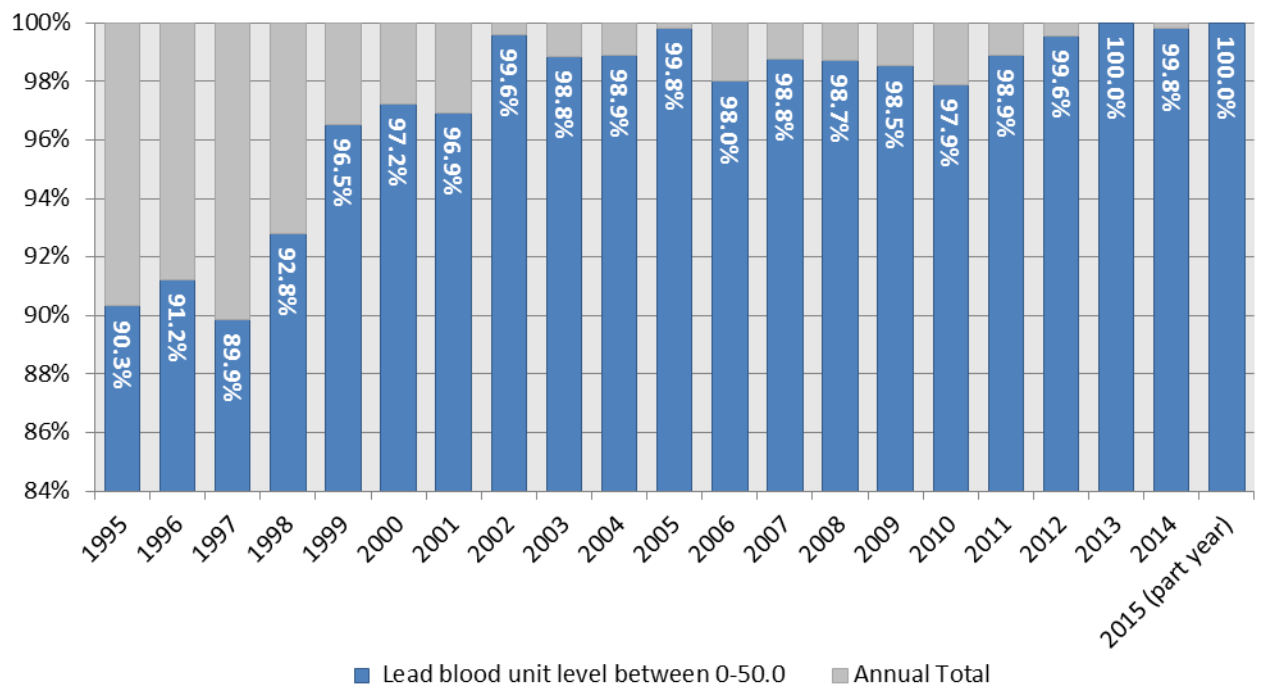


Chart 9: Proportion of blood lead level results from zero to 40 µg/dL

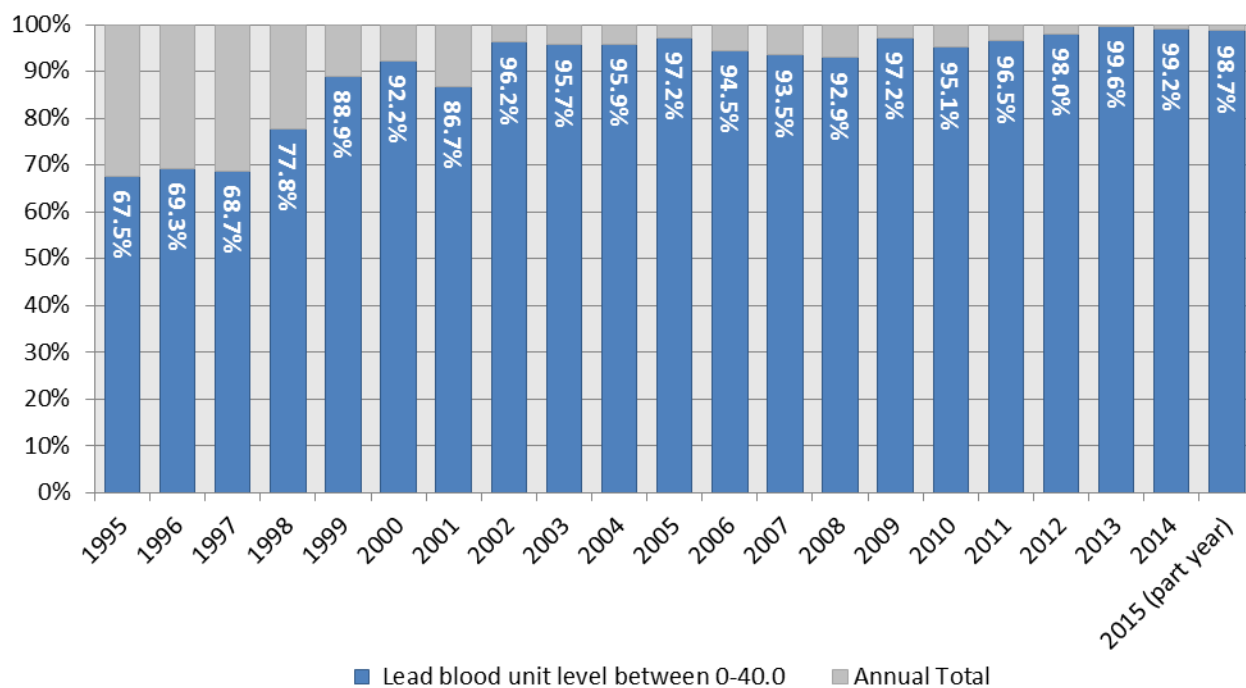


Chart 10: Proportion of blood lead level results from zero to 30 (µg/dL)

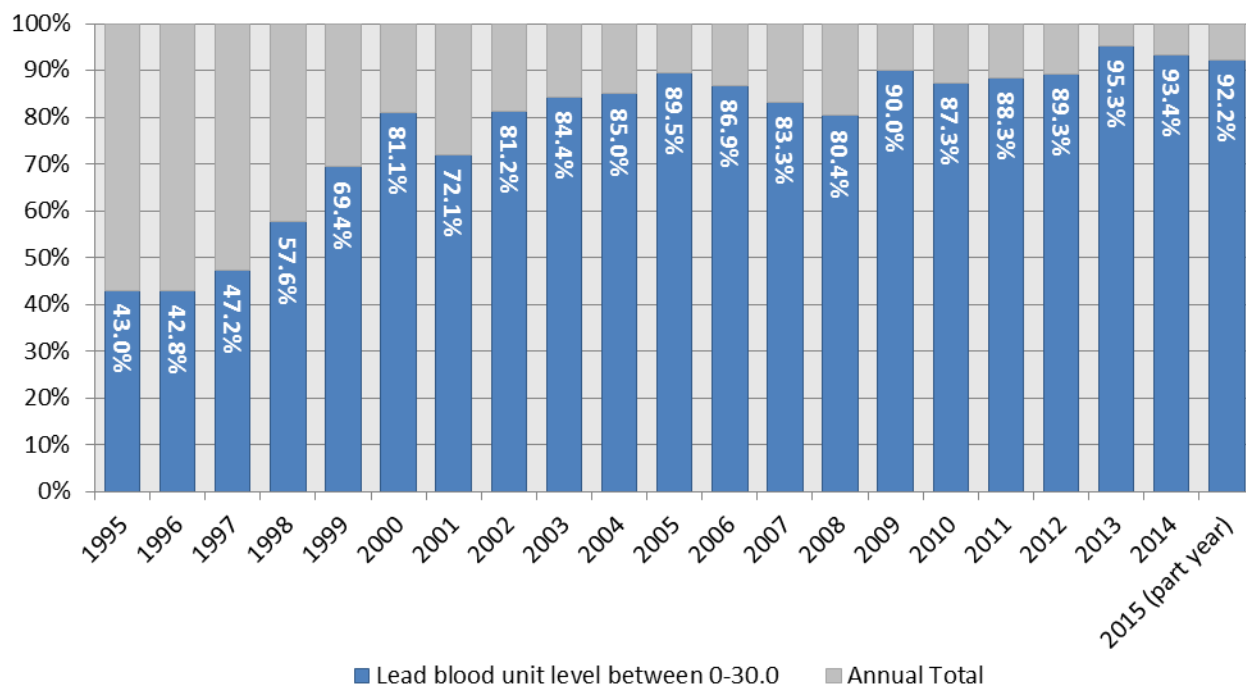


Chart 11: Proportion of blood lead level results from zero to 20 (µg/dL)

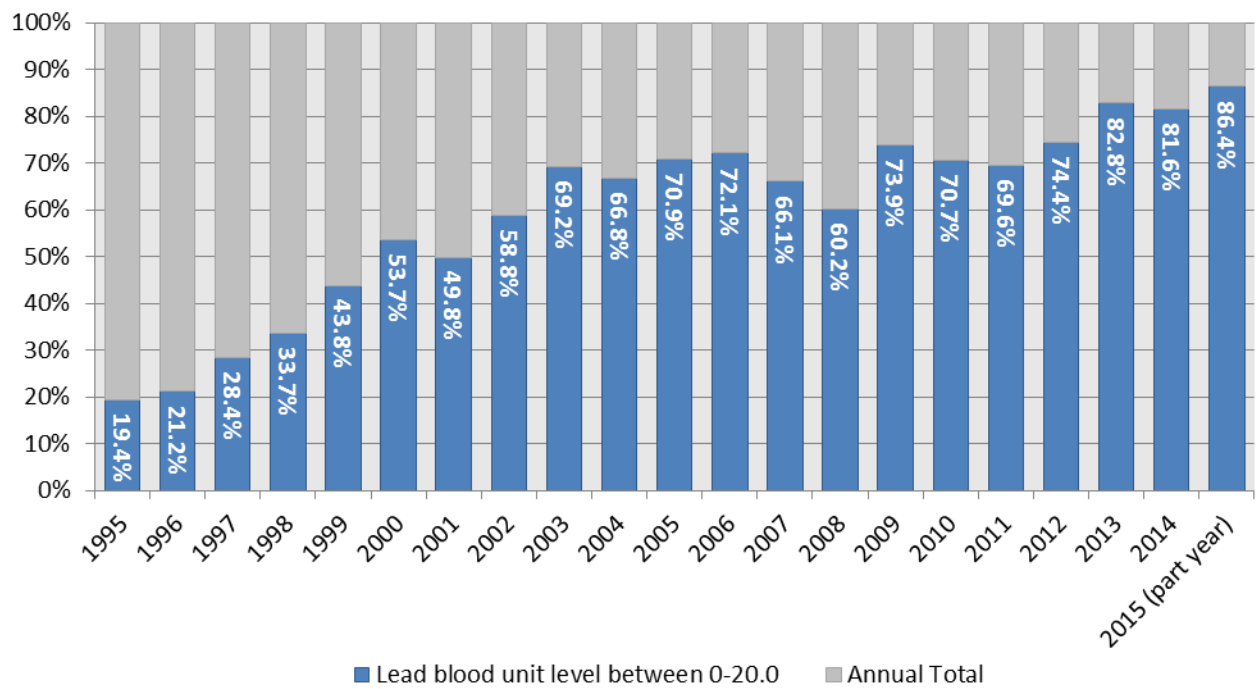
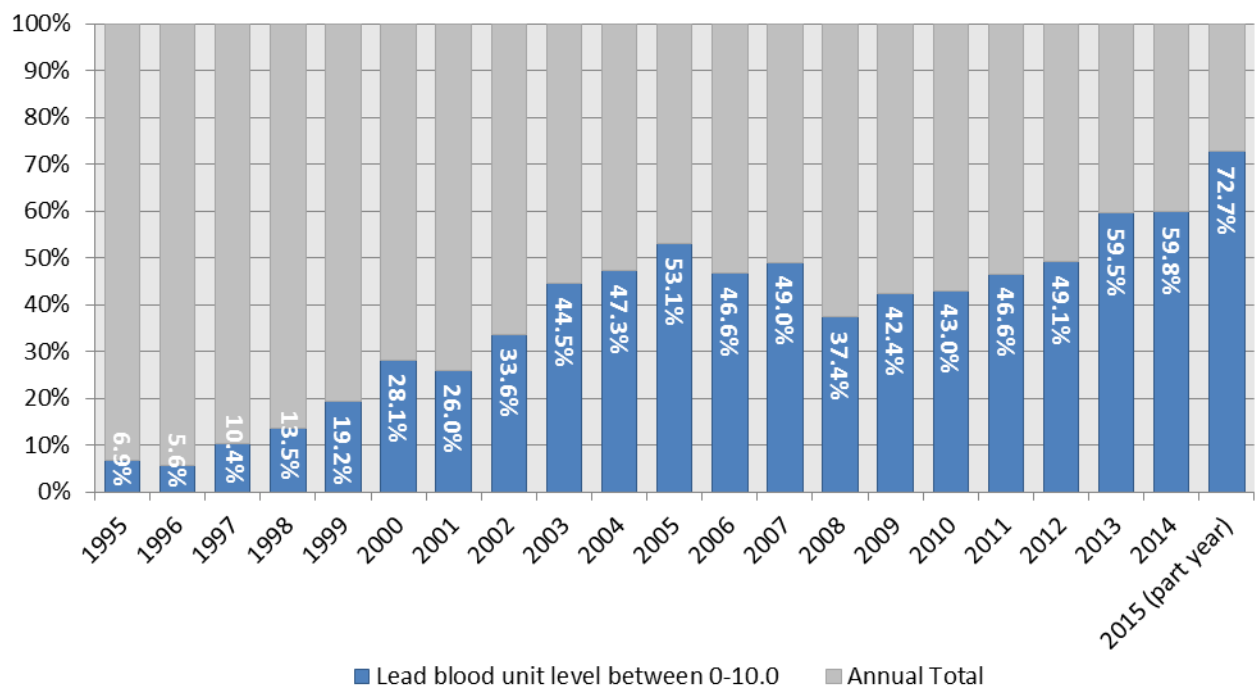


Chart 12: Proportion of results with low blood lead levels from zero to 10 µg/dL



The average blood lead unit level has markedly decreased over the time period from a high of 33.3 µg/dL in 1995 to 10.9 µg/dL in 2014. The lowest average level was recorded in 2013 at 10.3 µg/dL (excludes the part year results of 2015).

Chart 13: Time series of average blood lead unit level test results

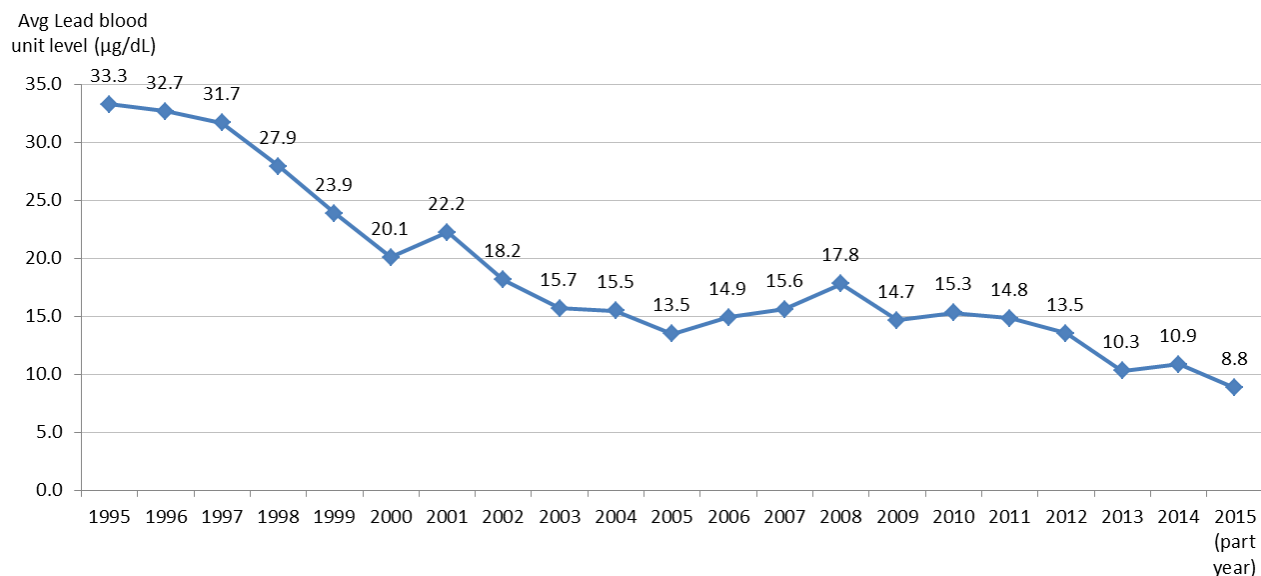


Table 2: Number of people tested

Year	Total people tested
1995	465
1996	411
1997	345
1998	724
1999	660
2000	540
2001	616
2002	767
2003	770
2004	533
2005	505
2006	549
2007	490
2008	693
2009	472
2010	474
2011	721
2012	896
2013	704
2014	483
2015*	154
Total	11972

* part year 1 Jan to 15 May only

Table 3: Number of test results per (µg/dL) group by year

Test Result Group	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015*	Total
0-10.0	32	23	36	98	127	152	160	258	343	252	268	256	240	259	200	204	336	440	419	289	112	4504
10.1-20.0	58	64	62	146	162	138	147	193	190	104	90	140	84	158	149	131	166	227	164	105	21	2699
20.1-30.0	110	89	65	173	169	148	137	172	117	97	94	81	84	140	76	79	135	133	88	57	9	2253
30.1-40.0	114	109	74	146	129	60	90	115	87	58	39	42	50	87	34	37	59	78	30	28	10	1476
40.1-50.0	106	90	73	109	50	27	63	26	24	16	13	19	26	40	6	13	17	14	3	3	2	740
50.1-60.0	29	30	19	42	13	14	16	3	6	5	1	8	4	5	3	7	6	3	0	1	0	215
60.1-70.0	12	6	10	7	6	0	3	0	2	1	0	2	0	4	3	3	1	1	0	0	0	61
70.1-80.0	2	0	2	1	2	1	0	0	1	0	0	1	1	0	1	0	0	0	0	0	0	12
80.1-90.0	1	0	2	2	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	8
90.1-100.0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2
100.1+	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Total	465	411	345	724	660	540	616	767	770	533	505	549	490	693	472	474	721	896	704	483	154	11972

* part year 1 Jan to 15 May only