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Trends in Elevated Blood Lead Levels in Adults – Illinois, 2005-2014



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Trends in Elevated Blood Lead Levels in Adults — Illinois, 2005-2014

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Abstract

Lead is a known toxin to the human body that can cause multisystem adverse effects. Acute exposure can be estimated through blood lead levels. In efforts to monitor the number of individuals in Illinois who are exposed to lead and to reduce the burden associated with lead exposure, the Illinois Adult Blood Lead Registry tracks cases of elevated blood lead as mandated by the Illinois Health and Hazardous Substances Registry Act [410 ILCS 525]. The objective of this report is to analyze the trends in the prevalence of elevated blood lead (≥ 25 $\mu\text{g}/\text{dL}$) cases and the prevalence of very high blood lead levels (≥ 40 $\mu\text{g}/\text{dL}$) cases reported to the Illinois Adult Blood Lead Registry from 2005 to 2014. A significant downward trend was found in the prevalence of elevated blood lead, but not in the prevalence of very high blood lead. This report also attempts to explain these trends by describing the change in distribution of cases by industry among those with known work exposures.

Introduction

Lead is a naturally occurring inorganic metal found in the soil and is used in many commercial products. Because of the long human history of using lead for many purposes, lead can be found everywhere and everyone is potentially exposed. Lead can be absorbed through the skin, by ingestion, or through inhalation. Inhalation is the most efficient method by which the body absorbs lead, and the most common in occupational settings.¹

Exposure to lead has been well established to cause toxic and multisystem adverse effects.² High doses of ≥ 40 $\mu\text{g}/\text{dL}$ are well recognized as being associated with adverse effects on multiple systems³ such as increased blood pressure, impaired renal function, and cancer.⁴ Even low doses of ≤ 10 $\mu\text{g}/\text{dL}$, which previously were thought to be safe, have been shown to have negative health effects, such as increasing all-cause, cardiovascular, and cancer mortality. According to Menke et al, blood lead as low as 2 $\mu\text{g}/\text{dL}$ has been associated with an increase in cardiovascular mortality.⁴ Some studies suggest that low doses may also have neurological effects in adults - a 5 $\mu\text{g}/\text{dL}$ increase in blood lead was found to be the equivalent of 1.05 years increase in age on several cognitive tests, as determined by Schwartz et al⁵.

While individuals can be exposed during non-occupational activities, such as remodeling, painting, shooting firearms, or eating food which has lead in it, adult lead exposure is primarily occupational which accounts for approximately 95% of reported exposures.⁶ The Occupational Health and Safety Administration (OSHA) has set regulations that the private sector must follow. All employees who are exposed to 30 $\mu\text{g}/\text{m}^3$ for 30 days or more per year must be tested at least every six months to determine blood lead levels. If a worker is found to have a blood lead level of ≥ 40 $\mu\text{g}/\text{dL}$, they are to be notified in writing and given an exam by a physician.

Any worker who has a single test which shows blood lead level ≥ 60 $\mu\text{g}/\text{dL}$ must be removed from the work place with continued pay and seniority.²

Since 1990, the Illinois Adult Blood Lead Registry (ABLR) has conducted surveillance on the prevalence of elevated blood lead levels in adults as part of the Illinois Health and Hazardous Substances Registry. This database collects lab reports of elevated blood lead levels of adults, defined at least 16 years of age on the date of the blood draw, for Illinois residents or those who were exposed in Illinois. While not often on the blood lab results, demographic and occupational information is collected through a follow up survey and was included in this analysis when available. ABLR was also a participant in the Center for Disease Control's (CDC) Adult Blood Lead Epidemiological Surveillance (ABLES) program from 1990 through 2013. Since 1990, the definition of elevated blood lead has been ≥ 25 $\mu\text{g}/\text{dL}$,⁷ but was changed in May 2012 to ≥ 10 $\mu\text{g}/\text{dL}$.⁸ This change was in response to the CDC's 2010 recommendation. Until this point in time, labs were only mandated to report those who had levels of ≥ 25 $\mu\text{g}/\text{dL}$.⁷

In an effort to reduce the number of individuals who are exposed to lead and to improve the environment in which employees are exposed, employers, who have at least one case in the database with a blood lead level of ≥ 40 $\mu\text{g}/\text{dL}$, are referred to OSHA by ABLR on a quarterly basis. Employers are notified within 24 hours of receiving the lab report, of any case which is ≥ 60 $\mu\text{g}/\text{dL}$ in order to promptly remove these individuals from exposure.

Data Sources and Methods

Data for this analysis were extracted from the Adult Blood Lead Registry's database and were limited to cases which were exposed or resided in Illinois with known blood test dates and blood lead levels. All blood samples were collected through venous puncture and tested by a CLIA certified laboratory. Blood lead is a good measurement of acute exposures due to lead's short half life of approximately 35 days in the blood.¹ Based on the definition in 2005, ≥ 25 $\mu\text{g}/\text{dL}$ in whole blood is defined as elevated blood lead and very high blood lead is defined as ≥ 40 $\mu\text{g}/\text{dL}$. Because cases of 10-25 $\mu\text{g}/\text{dL}$ were only available for 2013 to 2014, the 2005 definitions were used for this report to ensure all 10 years could be used in the analysis.

Laboratories submit test results to ABLR electronically or on paper. Once the test result is electronically or manually entered, patients are matched by date of birth and then on name. Other information, such as sex, race, address, and telephone number, are utilized if necessary. For the purposes of this analysis, only the highest test result for each year was used for each patient. Prevalence rates for each year were calculated for both elevated and very high levels utilizing the number of employed individuals in Illinois for that year as a denominator, as extracted from the Bureau of Labor Statistics.⁹ The trend was assessed using simple linear regression and was conducted using SAS version 9.4 (SAS Institute, Inc., Cary, North Carolina).

The change in industries was calculated as a three-year average for the first (2005, 2006, and 2007) and last three years (2010, 2011, and 2012). This assessment was limited to individuals who had a known work related exposure and had a known industry with a present North American Industry Classification System (NAICS) or Standard Industrial Classification (SIC) code.

Industries were grouped using the most general classifications in NAICS. The differences between the first three years and the last three years were assessed using a two-tailed chi-squared statistic.

Results

From 2005 to 2014, there were 1,869 individuals who had at least one reported elevated blood lead test, with 441 of these individuals having at least one test that was very high blood lead level ($\geq 40 \mu\text{g}/\text{dL}$). The majority of these individuals were male and between the ages of 25 and 64 years old (Table 1).

The prevalence for those with elevated blood lead ranged from 6.44 per 100,000 employed individuals in 2006 to 4.47 per 100,000 employed individuals in 2011 (Table 2). The temporal trend of prevalence was found to be statistically significant and decreased by an average of 0.21 persons per 100,000 employed individuals each year (Figure 1). The prevalence for those with very high blood lead ranged from 1.23 per 100,000 employed individuals in 2012 to 0.69 per 100,000 employed individuals in 2011 (Table 3). No clear trend of the prevalence could be determined (Figure 2).

Information about whether the exposure was work-related was available for approximately 66.4 percent of patients. Those who did not have information for this variable were not included in further analyses. For those cases with a blood lead level greater than or equal to $25 \mu\text{g}/\text{dL}$, 94.76 percent of individuals with a known exposure at work, while only 85.84 percent of individuals with blood lead levels greater than $40 \mu\text{g}/\text{dL}$ had a known exposure at work. Of the 1,176 individuals who had a known work exposure, industry data was available for 89.88 percent. For the purpose of this analysis, only those who had industry data were included to calculate a three year average of the work exposure distribution by industry. For those who had elevated blood lead, the following were found to be significantly different from the first three years to the last three years (Table 4): agriculture (3.47 percent vs. 11.87 percent), mining (4.01 percent vs. 10.03 percent), manufacturing (73.80 percent vs. 55.76 percent), retail (0.2 percent vs. 6.65 percent), arts, entertainment, and recreation (0.10 percent vs. 0.61 percent), and public administration (8.91 percent vs. 3.11 percent). For those who had very high blood lead, the following were found to have a significant difference between the first three years and the last three years (Table 5): agriculture (2.02 percent vs. 9.82 percent), manufacturing (60.25 percent vs. 31.17 percent), and retail (0.83 percent vs. 24.2 percent).

Discussion

From 1994-2007, the CDC reported a decline in the prevalence of adult individuals with elevated blood lead level of $\geq 25 \mu\text{g}/\text{dL}$ from 14.0 per 100,000 to 7.8 per 100,000 employed individuals.⁶ A second report extended this study to show that the prevalence, once again, decreased to 6.9 per 100,000 employed individuals in 2009.² Similar to the CDC's report, the prevalence of individuals with elevated blood lead levels in Illinois from 2005 to 2012 has shown a significant decline from 6.13 per 100,000 in 2005 to 4.52 per 100,000 in 2012. This trend was found to be equal to approximately 1 person less per 100,000 for every five years.

The decline can certainly be attributed to changes in industries and/or increased prevention and control of lead exposure. As the economy changed, the industries may have experienced a decline in the number of jobs in which workers were exposed.⁶ Manufacturing, which employs the majority of individuals who have elevated blood lead levels, is a prime example of this. As more companies continue to reduce the number of jobs with potential lead exposure, fewer individuals would become exposed due to being employed in these industries.

Efforts by public health agencies and by regulating bodies contributed to this decline by increasing lead education, interventions, and enforcement activities. In 2008, OSHA changed lead exposure to a point of emphasis and collaborated with CDC's Adult Blood Lead Epidemiology and Surveillance to identify problematic industries. With the change in CDC's definition of elevated blood lead levels from $\geq 25 \mu\text{g}/\text{dL}$ to $\geq 10 \mu\text{g}/\text{dL}$ ¹⁰ and an amendment to the Illinois Health and Hazardous Substances Registry Administrative Code, which lowered the level at which tests are mandated to be reported to IDPH to $\geq 10 \mu\text{g}/\text{dL}$, it is likely that there was an increase in number of individuals tested, and this increase may likely have resulted in increased awareness. Over time, the number of cases for elevated blood lead levels may have dropped due to earlier detection of exposure (detected at a lower blood lead levels) and earlier remediation.⁸

Although unlikely, it is possible that the decline is due to non-compliance of testing by companies and reporting by laboratories. In order to explain this downward trend, the non-compliance would need to be increasingly severe over time. There is no evidence of this type of non-compliance with the data in the registry.

An analysis of the trend for blood lead level of $\geq 40 \mu\text{g}/\text{dL}$ was also conducted, but found not to be significant. With such a small number of individuals who tested at this level, it is likely that this portion of the analysis lacked sufficient sample size to identify a trend or accurately estimate the prevalence.

With approximately 95 percent of the known exposures being work related, industries likely played a major role in the decline on blood lead levels over this time period. Of individuals with recorded industries information, between 2005 and 2007, manufacturing, public administration, agriculture, mining, and construction account for 95.57 percent of individuals with elevated blood lead level from work, but only 88.2 percent from 2012 to 2014. All, except construction, were found to be significantly different from the first three years to the last three years. Only exposures from agriculture and mining increased significantly, while exposures from manufacturing, the predominant sector where most of the lead exposures occurred, and public administration dropped significantly. Construction stayed relatively stable between the two time periods.

For very high blood lead level ($\geq 40 \mu\text{g}/\text{dL}$), only manufacturing, agriculture, and retail showed a significant difference between the two periods. Similar to the pattern seen with those who had blood lead level of $\geq 25 \mu\text{g}/\text{dL}$ and above, exposures in agriculture increased, and exposures in manufacturing decreased. While the exact reason is currently unknown, it may be due to the fact that the manufacturing industry is highly regulated, while, in comparison, agriculture is

more loosely regulated. Also, in both cases, retail's significant change could be related to the level of regulation as well as the low number of individuals who have elevated blood lead in this industry sector.

This report has limitations. The prevalence estimated could underestimate the true prevalence in the Illinois adult working population if not all cases tested are reported or those who should be tested are not tested. On the other hand, due to ABLR's incomplete collection on occupation and industry, some of cases may not be occupation related, but were included in the prevalence estimates, resulting in overestimation.

Further studies are suggested to quantify ABLR's data completeness and quality. ALBR should also conduct follow up surveys to gain more information regarding exposure and demographic information which was also found missing in a substantial number of cases.

References

1. Hu H, Shih RA, Rothenberg S, Schwartz BS. The Epidemiology of Lead Toxicity in Adults: Measuring Dose and Consideration of other Methodologic Issues. Environmental Health Perspectives March 2007; 455-462.
2. Agency for Toxic Substances and Disease Registry. Lead Toxicity. Atlanta, GA: United States Agency for Toxic Substances and Disease Registry; 2007. Available at <http://www.atsdr.cdc.gov/csem/csem.asp?csem=7&po=0>
3. [Adult Blood Lead Epidemiology and Surveillance—United States, 2008—2009. MMWR 2011; 60\(25\); 841-845.](#)
4. Menki A, Munter P, Batuman V, Silbergeld EK, Guallar E. Blood Lead Below 0.48 μ mol/L (10 μ g/dL) and Mortality Among United States Adults. Circulation 2006;1388–1394.
5. Schwartz BS, Lee BK, Stewart WF, Lee SS, Hwang KY, et al. 2001. Association of blood lead, dimercaptosuccinic acid-cheatable lead, and tibia lead with neurobehavioral test scores in South Korean lead workers, American Journal of Epidemiology 2001; 153(5); 453-464
6. [Adult Blood Lead Epidemiology and Surveillance—United States, 2005—2007. MMWR 2009;58 \(14\); 365-369.](#)
7. Adult Blood Lead Registry Procedure Manual. IDPH 2009. Version 1; 1-2
8. Illinois Health and Hazardous Substances Registry Act. 77 Ill. Admin. Code 840 Subchapter P § 840.10 & 840.305,(as amended May 18, 2012).

9. United States Department of Labor, Bureau of Labor and Statistics, States: Employment status of the civilian non-institutional population by sex, race, Hispanic or Latino ethnicity, marital status, and detailed age, annual averages for 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, and 2014. Washington, DC. Available at <http://data.bls.gov/search/query/results?cx=013738036195919377644%3A6ih0hfrgl50&q=employed+population>. Accessed July 1, 2014.

10. Data into action. NIOSH blood lead surveillance program contributes to a decline in national prevalence rates. Atlanta, GA: Departments of Human and Health Services. CDC; 2012. Available at <http://www.cdc.gov/niosh/docs/2012-164/>

Table 1: Demographics of individuals in Illinois, aged ≥ 16 years who had at least one elevated blood lead level, by year — Adult Blood Lead Registry, Illinois, 2005-2014

Demographics	N	%
Sex		
Male	1740	93.10
Female	113	6.05
Unknown	16	0.85
Age at First Test		
16-19	24	1.28
20-24	131	7.01
25-34	387	20.71
35-44	460	24.61
45-54	501	26.81
55-64	267	14.29
65+	89	4.76
Unknown	10	0.54
Race		
White	398	21.29
Non-White	139	7.44
Unknown	1332	71.27
Exposure		
Work Related	1176	62.92
Not work related	65	3.48
Unknown	628	33.60

Source: Illinois Department of Public Health, Adult Blood Lead Registry, 2005-2014, data as of July 1, 2015.

Table 2: Prevalence of persons per 100,000 employed individuals, in Illinois, aged ≥ 16 years who had at least one elevated blood lead level (≥ 25 $\mu\text{g}/\text{dL}$), by year — Adult Blood Lead Registry, Illinois, 2005-2014

Year	≥ 25 $\mu\text{g}/\text{dL}$	95% Confidence interval
2005	6.13	(5.51, 6.76)
2006	6.44	(5.81, 7.06)
2007	6.19	(5.57, 6.80)
2008	5.43	(4.85, 6.01)
2009	4.76	(4.20, 5.31)
2010	4.59	(4.05, 5.13)
2011	4.47	(3.93, 5.01)
2012	5.28	(4.70, 5.86)
2013	4.75	(4.20, 5.30)
2014	4.52	(3.99, 5.06)

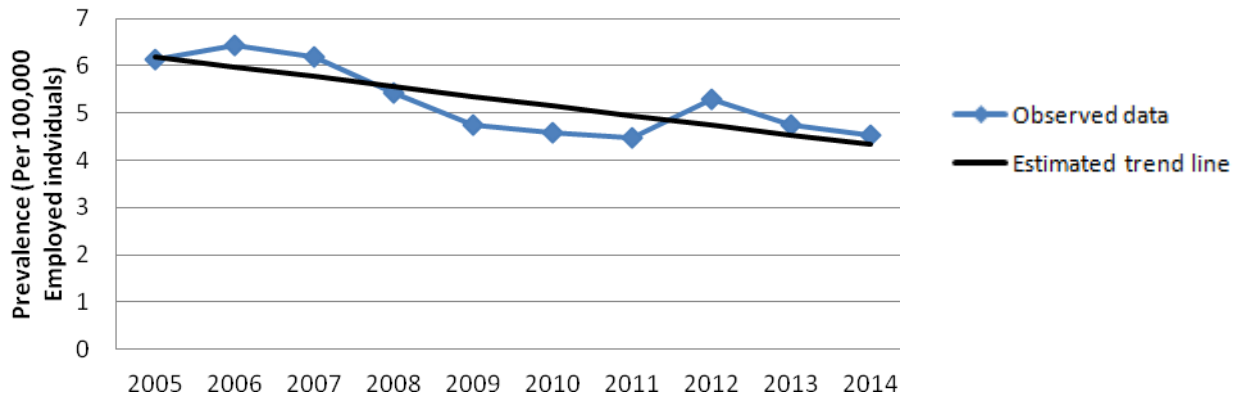
Source: Illinois Department of Public Health, Adult Blood Lead Registry, 2005-2014, data as of July 1, 2015; and United States Department of Labor, Bureau of Labor and Statistics, States: Employment status of the civilian non-institutional population by sex, race, Hispanic or Latino ethnicity, marital status, and detailed age, annual averages for 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, and 2014. Washington, DC. Available at <http://data.bls.gov/search/query/results?cx=013738036195919377644%3A6ih0hfgrl50&q=employed+population>.

Table 3: Prevalence of persons per 100,000 employed individuals, in Illinois, aged ≥ 16 years who had very high blood lead level (≥ 40 $\mu\text{g/dL}$), by year — Adult Blood Lead Registry, Illinois, 2005-2014

Year	≥ 40 $\mu\text{g/dL}$	95% Confidence Interval
2005	1.13	(0.86, 1.40)
2006	1.17	(0.91, 1.44)
2007	0.90	(0.67, 1.13)
2008	0.94	(0.70, 1.19)
2009	0.81	(0.58, 1.04)
2010	0.70	(0.49, 0.92)
2011	0.69	(0.48, 0.90)
2012	1.23	(0.95, 1.51)
2013	1.01	(0.75, 1.26)
2014	0.91	(0.67, 1.15)

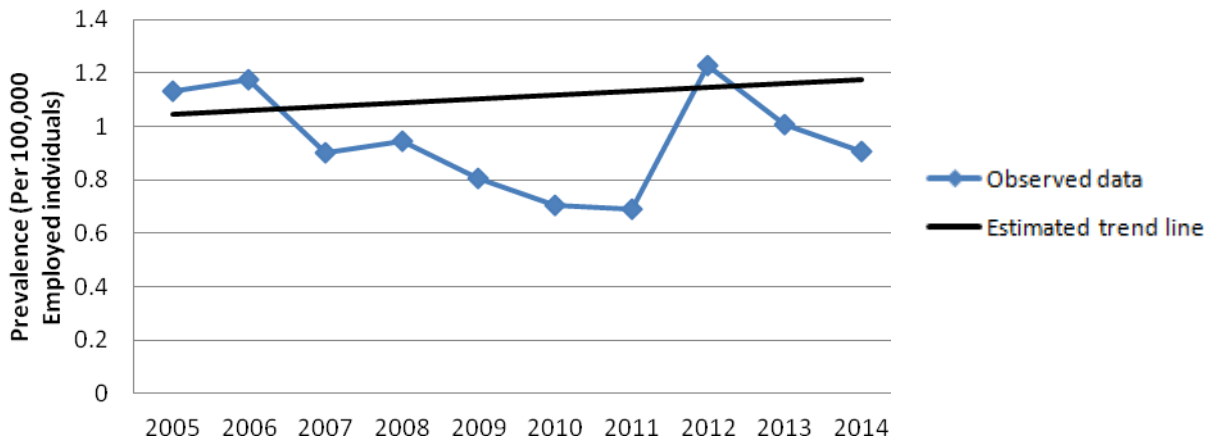
Source: Illinois Department of Public Health, Adult Blood Lead Registry, 2005-2014, data as of July 1, 2015; and . United States Department of Labor, Bureau of Labor and Statistics, States: Employment status of the civilian non-institutional population by sex, race, Hispanic or Latino ethnicity, marital status, and detailed age, annual averages for 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, and 2014. Washington, DC. Available at <http://data.bls.gov/search/query/results?cx=013738036195919377644%3A6ih0hfgrl50&q=employed+population>

Figure 1: Prevalence of Individuals with Elevated Blood Lead Levels ($\geq 25 \mu\text{g/dL}$)



Source: Illinois Department of Public Health, Adult Blood Lead Registry, 2005-2014, data as of July 1, 2015; and United States Department of Labor, Bureau of Labor and Statistics, States: Employment status of the civilian non-institutional population by sex, race, Hispanic or Latino ethnicity, marital status, and detailed age, annual averages for 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, and 2014. Washington, DC. Available at <http://data.bls.gov/search/query/results?cx=013738036195919377644%3A6ih0hfrgl50&q=employed+population>

Figure 2: Prevalence of Individuals with Very High Blood Lead Levels ($\geq 40 \mu\text{g/dL}$)



Source: Illinois Department of Public Health, Adult Blood Lead Registry, 2005-2014, data as of July 1, 2015; and United States Department of Labor, Bureau of Labor and Statistics, States: Employment status of the civilian non-institutional population by sex, race, Hispanic or Latino ethnicity, marital status, and detailed age, annual averages for 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, and 2014. Washington, DC. Available at <http://data.bls.gov/search/query/results?cx=013738036195919377644%3A6ih0hfrgl50&q=employed+population>

Table 4: Distribution (3-year average) of selected industries among individuals with an elevated blood lead levels ($\geq 25 \mu\text{g}/\text{dL}$) from a known work exposure

Industry	2005-2007 (percent)	2012-2014 (percent)
Agriculture**	3.47	11.87
Mining**	4.01	10.03
Utilities	0.10	0.00
Construction	5.38	7.43
Manufacturing**	73.80	55.76
Wholesale	0.58	0.82
Retail**	0.20	6.65
Transportation and Warehousing	2.21	1.46
Finance and Insurance	0.00	0.21
Professional, Scientific, Technical Services	0.38	0.83
Education	0.49	0.19
Arts, Entertainment, and Recreation**	0.10	0.61
Other Services	0.39	1.02
Public Administration**	8.91	3.11

** Significant difference based on a chi-squared test ($p > 0.05$)

Source: Illinois Department of Public Health, Adult Blood Lead Registry, 2005-2014, data as of July 1, 2015; and United States Department of Labor, Bureau of Labor and Statistics, States: Employment status of the civilian non-institutional population by sex, race, Hispanic or Latino ethnicity, marital status, and detailed age, annual averages for 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, and 2014. Washington, DC. Available at <http://data.bls.gov/search/query/results?cx=013738036195919377644%3A6ih0hfrgl50&q=employed+population>

Table 5: Distribution (3-year average) of selected industries among individuals with an very high blood lead levels ($\geq 40 \mu\text{g/dL}$) from a known work exposure

Industry	2005-2007 (percent)	2012-2014 (percent)
Agriculture**	2.02	9.82
Mining	7.61	12.48
Utilities	0.00	0.00
Construction	10.19	9.33
Manufacturing**	60.25	31.17
Wholesale	2.63	0.95
Retail**	0.83	24.20
Transportation and Warehousing	5.78	4.21
Finance and Insurance	0.00	0.88
Professional, Scientific, Technical Services	0.00	0.88
Education	1.18	0.95
Arts, Entertainment, and Recreation	0.62	0.00
Other Services	0.62	0.00
Public Administration	8.28	5.13

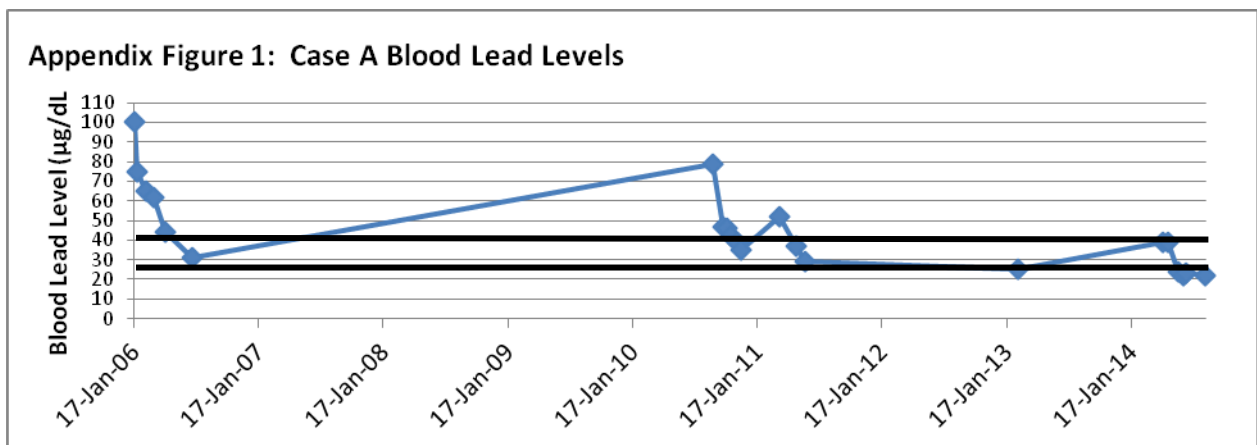
* **Significant difference based on a chi-squared test ($p > 0.05$)

Source: Illinois Department of Public Health, Adult Blood Lead Registry, 2005-2014, data as of July 1, 2015; and United States Department of Labor, Bureau of Labor and Statistics, States: Employment status of the civilian non-institutional population by sex, race, Hispanic or Latino ethnicity, marital status, and detailed age, annual averages for 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, and 2014. Washington, DC. Available at <http://data.bls.gov/search/query/results?cx=013738036195919377644%3A6ih0hfrgl50&q=employed+population>

Appendix A
Selected Case Studies

Case A:

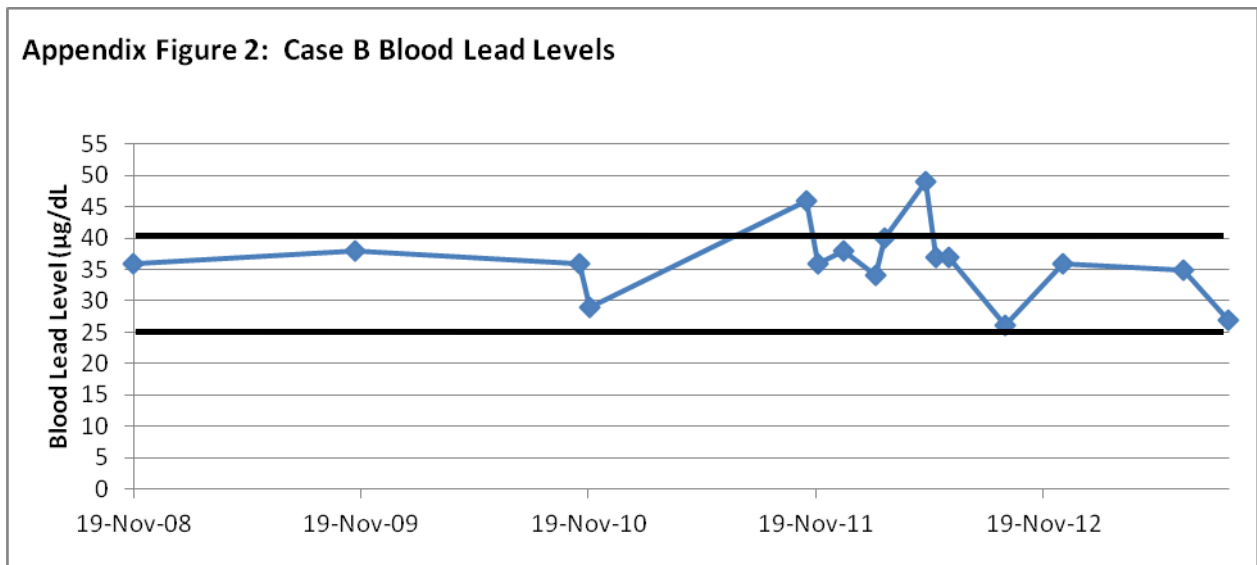
Case A is a middle aged, male from western Illinois. According to the reports, he has a known occupational exposure and works in the painting and wall covering contractor industry. Over the past 10 years, 21 blood lead tests have been submitted to ABLR, 9 of which have been ≥ 40 $\mu\text{g}/\text{dL}$. From 2005-2014, his blood lead levels have ranged from 22 $\mu\text{g}/\text{dL}$ to 100 $\mu\text{g}/\text{dL}$. His initial blood test in 2006 would have made him a candidate for chelation, which would explain the rapid drop in his blood lead level. It is likely this is also an explanation for the drop from 79 $\mu\text{g}/\text{dL}$ in 2010. Based on OSHA regulations, both of these times he should have been removed from the work environment in which he was being exposed to lead and returned only once he had 2 blood tests which showed a blood lead level below 40 $\mu\text{g}/\text{dL}$.² Case A is an example of the cyclical nature of some individuals in the database. While his drop in blood lead levels is likely due to some kind of treatment and work place intervention, it does show how blood lead levels rise again.



Source: Illinois Department of Public Health, Adult Blood Lead Registry, 2005-2014, data as of July 1, 2015

Case B:

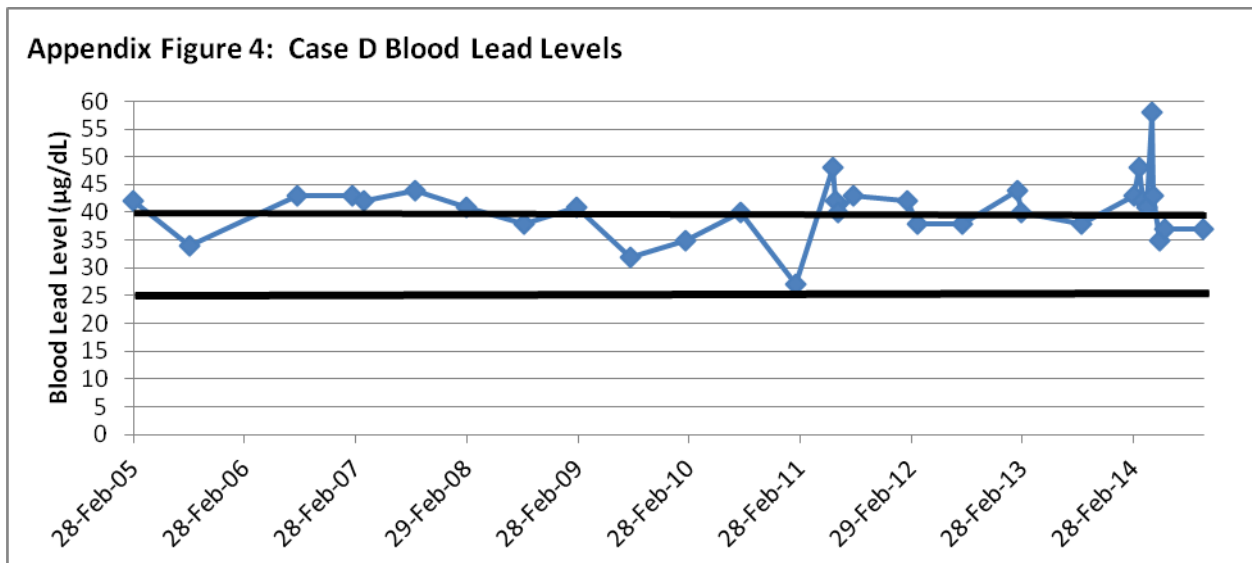
Case B is an older male from the Chicagoland area who has no occupational exposure. As confirmed by a doctor, Case B is an active shooter and was exposed while at a shooting range. Eighteen test results were received for him between 2008 and 2013 with two results ≥ 40 $\mu\text{g}/\text{dL}$. His blood lead levels have ranged from 27 $\mu\text{g}/\text{dL}$ to 49 $\mu\text{g}/\text{dL}$. While not subject to OSHA regulations and guidelines, this individual should show a pattern of testing frequency similar to those who were occupational exposures. From end of 2011 to the end of 2012, this individual was receiving the recommended follow up tests every one to two months. This is likely because of his previous high test results.²



Source: Illinois Department of Public Health, Adult Blood Lead Registry, 2005-2014, data as of July 1, 2015

Case D:

Case D is a middle aged, white male from Chicagoland area. The individual has a known occupational exposure of working in storage battery manufacturing, but the last three test results list his occupation as nursery and tree production, a occupation in which he is less likely to be exposed. Over the course of the 10 years of the study, 32 blood tests, ranging from 27 $\mu\text{g}/\text{dL}$ to 48 $\mu\text{g}/\text{dL}$, have been reported to ABLR with 21 of these tests having a blood lead level of $\geq 40 \mu\text{g}/\text{dL}$. These very high test results have occurred in all 10 years present. Case D is an example of the persistently high blood lead levels even after the worker has left the initial job because of the accumulated lead in the body (mainly bone).



Source: Illinois Department of Public Health, Adult Blood Lead Registry, 2005-2014, data as of July 1, 2015