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SC Environmental Public Health Tracking

SOUTH CAROLINA
ENVIRONMENTAL PUBLIC HEALTH TRACKING PROGRAM

Putting tracking to work for you

Occupational Health

Most people spend the majority of their waking hours at work. As a result, potential exposures to occupational hazards are a large part of overall public health. The objective of this report was to examine if elevated blood lead levels (BLL) in adults were higher for certain industrial categories in South Carolina (SC).

Introduction

Lead is a naturally occurring element that is used in a variety of industrial processes. Chronic and acute exposure to lead can cause a variety of health effects including memory loss, abdominal pain, and even death at very high concentration exposure. Although there is concern about lead in homes or the environment from the historical use of lead-based paints and leaded gasoline, the workplace may pose the greatest risk of potential for exposure.

Recognizing the health risks associated with workplace exposures, the South Carolina Environmental Public Health Tracking (SC EPHT) Program partnered with the South Carolina Occupational Safety and Health Administration (SC OSHA) in 2012. SC EPHT tracks adult (state residents aged 16+) BLLs in SC with our Heavy Metals Database and shares elevated (≥25 µg/dL) BLLs and acquired North American Industry Classification System (NAICS) information with SC OSHA to facilitate their inspection, enforcement and abatement activities related to lead exposure in the workplace. SC EPHT has compiled a data set of elevated BLLs across several industry types and individual demographics including age and gender. SC EPHT investigated if mean elevated BLLs were significantly different for various industrial categories.

Methods

The Heavy Metals Database contains record level data of BLLs along with demographics of individuals. Data for all adults (16+) with elevated (≥25 µg/dL) BLLs from 2011 to 2015 that were shared with SC OSHA were used for this study (n=300). Demographics of the study population included age at time of test and gender. During SC EPHT's follow-up with the BLL testing facilities of the study population, the individual's place of work was determined. Using this information, industrial categories from the NAICS were obtained and the following were used: painting/wall covering contracting, steel wire drawing, secondary smelting/refining of nonferrous metal, other metal valve/pipe fitting manufacturing, storage battery manufacturing, remediation services and amusement/recreation industries (specifically firing ranges). An "other" category included industry types with less than 10 elevated BLL records. Frequencies of records by gender, age (5-year groupings) and industry type were examined, and mean BLLs were calculated for these categories. Mean BLLs were then compared by industrial category to determine if any statistically significant differences in mean BLLs were present. A p-value of <0.05 was used to determine statistical significance.

Results

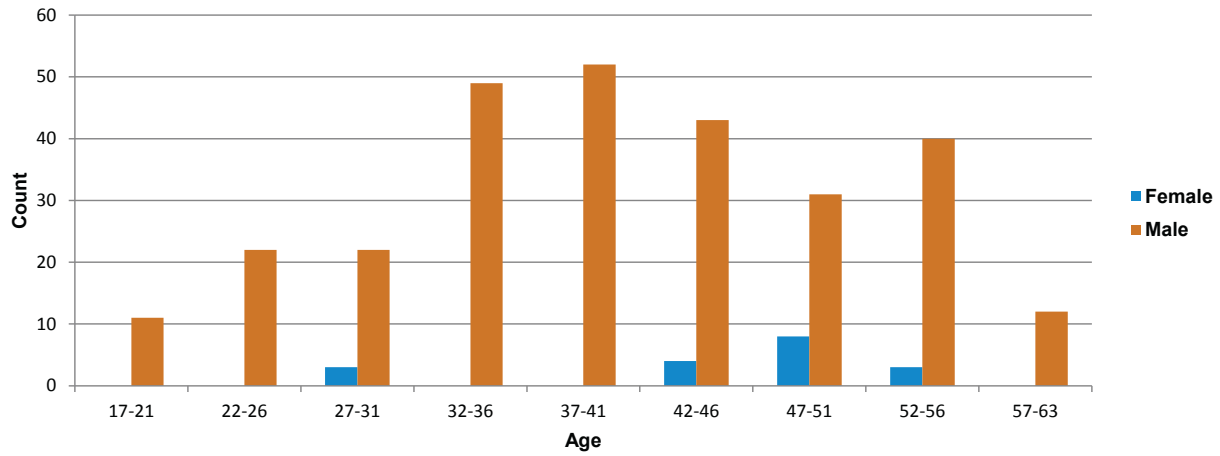

Figure 1. Frequency of age at test date by gender.

The study population consisted primarily of males who were between the ages of 17 and 63 when tested.

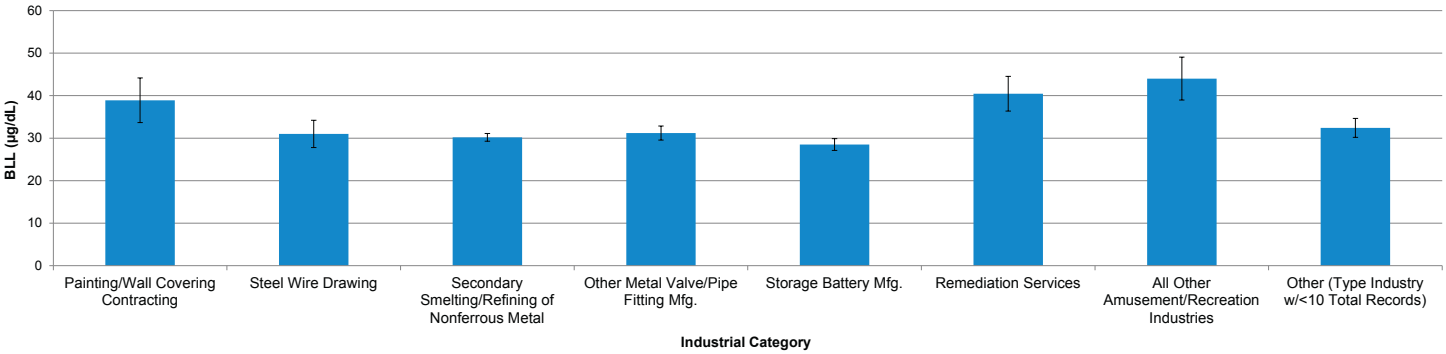

Figure 2. Mean blood lead level (BLL) with 95% confidence interval by industrial category.

The all other amusement/recreation industrial category had the highest mean BLL.

Industrial Category Comparisons			
	p-value		p-value
Steel Wire vs Remediation Services	0.001	Other Metal Valve vs All Other Amusement/Recreation	p<0.0001
Steel Wire vs All Other Amusement/Recreation	p<0.0001	Storage Battery vs Remediation Services	0.0002
Secondary Smelt vs Remediation Services	p<0.0001	Storage Battery vs All Other Amusement/Recreation	p<0.0001
Secondary Smelt vs All Other Amusement/Recreation	p<0.0001	Remediation Services vs Other	0.0002
Other Metal Valve vs Remediation Services	p<0.0001	All Other Amusement/Recreation vs Other	p<0.0001

Table 1. Significant differences (p-value < 0.05) in mean blood lead level (BLL) for pair-wise comparisons between industrial categories.

Overall, the mean elevated BLL for employees working in remediation services and other amusement/recreation categories were significantly higher than all other industrial categories in pair-wise comparisons with the exception of painting/wall covering industrial category.

Conclusions

Working within certain industries can place an individual at a greater risk of exposure to lead. Per this study, the industrial categories of other amusement/recreation and remediation services presented the greatest risk to individuals for higher elevated BLLs. It is theorized that these two industrial categories put the individual at a greater risk due to more direct and prolonged contact to lead. At firing ranges, lead is found in bullets as well as the explosive that ignites gunpowder. Consequently, employees can potentially breathe in lead particles as well as ingest lead dust that settles on their body and clothes (National Research Council, 2013). Additionally, information acquired to determine industry category for such individuals indicated that some conduct self-testing to monitor their BLLs. Remediation services incorporate lead abatement which potentially places the employee in direct contact with lead particles subjecting them to inhalation, ingestion and dermal contact for an extended period of time. The sole company with BLL testing associated with the remediation services category in this study has historically conducted range cleaning and lead recovery activities at indoor/outdoor shooting ranges. Therefore, those that work at shooting ranges, or who participate in that recreation activity, are at the highest risk for lead exposure in the study population.

There were several limitations to this study that should be noted. For one, only individuals working in specific type of industries require testing; therefore, the results are not necessarily applicable to the general population of workers in SC for the time period examined. Additionally, only those individuals that choose to self test due to their amusement and recreational exposures are represented in the database. Finally, only elevated BLLs were examined as these are the only records with associated NAICS information. By understanding which industries in SC have a higher risk for occupational exposure to lead, interventions to improve personal protective equipment or increase monitoring of employees could be implemented to reduce exposure.

For additional information about this fact sheet, please contact H. Reed Corley, Environmental Epidemiologist, of the SC EPHT Program at corleyhr@dhec.sc.gov or (803) 898-1422.

References

National Research Council. (2013). Potential Health Risks to DOD Firing-Range Personnel from Recurrent Lead Exposure. Washington, D.C.: National Academy Press. Retrieved July 22, 2015, from http://www.nap.edu/catalog/18249/potential-health-risks-to-dod-firing-range-personnel-from-recurrent-lead-exposure

More Information

Workplace Safety - Lead (NIOSH)
Adult Blood Lead Epidemiology & Surveillance (ABLES) (NIOSH)
Reducing Exposure to Lead and Noise at Outdoor Firing Ranges (NIOSH)
Occupational Health (SC EPHT)