Lead Emissions from the Hillsboro Airport and Public Health: An Overview of the Issue and Options for Further Characterization of Risks

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Executive Summary

Lead is an environmental pollutant that has negative and potentially irreversible health effects even at low levels of exposure. Identification of sources of lead and prevention of exposure are key interventions to address lead poisoning (ACCLP 2012). This paper outlines what is currently known about the health effects of lead, blood lead levels locally, and lead emissions from the Hillsboro Airport, and reviews public health approaches that can be used to evaluate health risks.

Lead Poisoning in Oregon

The prevalence of lead poisoning is low in Oregon and has declined along with national trends. In Washington County, population lead poisoning statistics are not comprehensive. Approximately 3% of young children receive tests each year, leaving many at risk children untested. From 2009-2014, there were on average six cases per year of young children with confirmed elevated blood levels (RAID 2015). There continue to be many sources of lead exposure in the environment, and some sources are a greater threat to public health than others due to factors that contribute to the degree of exposure. Lead based paint in older homes remains a major source and area of concern for public health.

Lead Emissions at the Hillsboro Airport

Efforts to model the ambient concentrations of lead in the air at and around Hillsboro Airport have yielded results well below the National Ambient Air Quality Standard of 0.15 µg/m3. Environmental sampling data (air, soil and water) for the Hillsboro Airport is limited. Sampling data from other aviation facilities is rarely generalizable due to site-specific dynamics such as prevailing wind patterns and the location and duration of flight operation stages, such as run-up. The available data specific to the Hillsboro Airport indicates the presence of lead at levels below health-based standards.

Conclusion

Public health has processes, tools and techniques to assess environmental health hazards, which include health risk assessments, health impact assessments, and rapid health impact assessments. Based on the searches and information reviewed for this paper, it is clear that a rapid health impact assessment is unlikely to yield additional literature to further our understanding of the health impact of the Hillsboro Airport. If there is a proposed action, then a health impact assessment would be an appropriate approach to assess the impact of the policy, project or plan on the health of a population.

A health risk assessment with an environmental sampling component could be used to determine if lead has accumulated in the local environment and whether this leads to human lead exposure in those on or around the Hillsboro airport grounds. While there are limitations in the environmental data and local blood lead level data, the available data about lead emissions from the Hillsboro Airport do not suggest that it presents an environmental health threat to the community adjacent to the airport.

With ongoing efforts by the Federal Aviation Administration and the Environmental Protection Agency to phase out leaded aviation gasoline, emissions from the Hillsboro Airport are expected to decline or cease in the coming years. Public health is supportive of these efforts to further reduce lead emissions.

Introduction

Lead is an environmental pollutant that has negative health effects even at low levels of exposure. Fortunately, lead poisoning in the children living in the United States (U.S.) has declined due to the policies prohibiting the continued use of leaded gasoline in automobiles, lead-based paint, and lead solder in plumbing. Despite these changes, an estimated 450,000 children in the U.S. have blood lead levels above the reference value. Because there is no safe level of lead exposure and the effects of lead may be irreversible, identification of sources of lead and prevention of exposure are key interventions (ACCLP 2012).

Hillsboro Airport is a known source of environmental lead due to the use of leaded gasoline in piston engine aircraft. However, it is currently unclear to what degree aviation gas lead emissions contribute to human lead exposure. There continue to be many sources of lead exposure in the environment, and some sources are a greater threat to public health than others due to factors that contribute to the degree of exposure. Lead based paint in older homes remains a major source and area of concern for public health.

This paper outlines what is currently known about the health effects of lead, blood lead levels locally, lead emissions from the Hillsboro Airport, and reviews public health approaches that can be used to evaluate health risks. It is not intended to be an exhaustive review of available literature and data. Rather, the intent of this paper is to summarize what is known and to discuss where, from a public health perspective, data gaps exist.

Sources of Lead and Health Effects of Exposure

Lead

Lead is a naturally occurring metal, found in various ores in the Earth's crust. It is dense, durable, resistant to corrosion, malleable and has multiple industrial uses. The amount of lead in the environment (outside of ore deposits) increased over the past three hundred years as a result of human use in paint, gasoline, mining, and commercial operations (ATSDR 2007). Lead is very stable and can accumulate in the environment (ATSDR 2012).

Lead exists by itself as a metal or combined with other elements as a variety of compounds. Two major groups of compounds are organic and inorganic lead. Inorganic lead (e.g. lead oxide, lead chloride) is the most commonly found form, which is the form found in old paint, soil, and various products. Organic lead is lead combined with carbon (e.g. tetraethyl lead, tetramethyl lead). Leaded gasoline contains organic lead, and past use of leaded gasoline in automobiles has caused contamination of soils, especially along roadways. The form of lead can affect the pathways of exposure and amount of absorption by humans (ATSDR 2012).

Sources of Lead

While lead is a naturally occurring metal, high levels found in the air, water, soil, and dust are primarily due to human activities. Important sources of environmental contamination include mining, smelting, manufacturing, recycling, incineration, leaded paints, and leaded gasoline. Lead is also used in many products, for example pigments, solder, stained glass, crystal vessels, ammunition, ceramic glazes, jewelry, toys, and in some cosmetics and traditional medicines. Lead pipes or pipes joined with lead solder, present in older construction, may contaminate drinking water (ATSDR 2007).

Lead does not degrade and will persist in the environment. Lead introduced into the air is removed by rain and by falling to land or into surface water. Lead falling on soil is strongly absorbed and remains in the upper layer of soil. In the U.S., the amount of lead emitted into the air has decreased substantially since leaded gasoline was banned for highway transportation in 1996. Important sources of lead in dust and soil include ongoing and past air emissions and weathering of lead-based paints applied to structures before the use in paints was banned in 1978. In general, very little lead is found in surface or groundwater used for drinking water (ATSDR 2007).

Health Effects of Lead

Lead exposure is a significant health concern because even low levels of lead in the body can have negative effects that may be irreversible. Exposure to lead can occur through ingestion, inhalation, and dermal contact. Most human exposure occurs through ingestion or inhalation. Organic lead may be absorbed across the skin so dermal contact is a pathway of exposure to organic lead, but is less likely for inorganic lead. Since the elimination of lead from automobile gasoline, dermal exposure is not a significant pathway of lead exposure for the general population (ATSDR 2012).

Adults absorb about 20% of ingested lead, except organic lead, which is almost completely absorbed. Almost all lead inhaled into the lower respiratory tract is absorbed. Once in the body, lead is distributed to organs, tissues, and bone. Lead is primarily stored in the mineralizing tissues (bone and teeth), and stored lead can mobilize and reenter blood and organs. Lead that is not stored in the body will be excreted in urine or feces. Adults are better able to clear lead than children. Continued exposure to lead will lead to accumulation in the body and is associated with negative impact on health (ATSDR 2007).

Clinical manifestations of lead poisoning vary depending on the dose and duration of exposure as well as the age of the exposed individual. Lead poisoning can affect any organ system in the body. Acute poisoning can result in disorders of the digestive system, kidney damage, anemia, and a range of neurological problems including cognitive deficits, peripheral neuropathy, seizures, and encephalopathy. Exposure to large amounts of lead can be lethal. Chronic exposure in adults is associated with hypertension, increases in all cause mortality and cardiovascular disease mortality, decline in neurocognitive function, psychiatric symptoms (phobic anxiety, depression, and hostility), peripheral neuropathies, and hearing problems. Lead also has effects on the reproductive system and chronic lead exposure can lead to changes in male endocrine function and sperm production. In pregnant women, it is associated with miscarriage, stillbirths, and preterm delivery. Lead can easily cross the placenta and can affect neurological development of the fetus (Goldman 2015). Lead affects the neurological development of children, resulting in cognitive problems such as decreased learning, memory, verbal ability, and intelligence quotient (IQ). It is also associated with behavioral problems such as hyperactivity or Attention Deficit and Hyperactivity Disorder (ADHD). The neurological and behavioral effects of lead are believed to be irreversible (Hurwitz 2014).

Risk Factors for Lead Poisoning

Children have greater vulnerability to lead because of increased risk of exposure and differences in lead absorption and excretion. Compared with adults, children are more likely to have contact with contaminated surfaces due to playing on the ground and increased ingestion as a result of behaviors like mouthing and hand-to-mouth contact. Once ingested or inhaled, children absorb a larger fraction of lead than adults. There are excretion differences as well, with children younger than two years of age retaining approximately one-third of absorbed lead compared with adults that retain only one percent (ATSDR 2007). Children younger than six years of age have an incomplete blood-brain barrier, which leads to greater lead entry into the nervous system. Nutritional deficiencies, such as iron deficiency, can further compound the risk by causing more lead absorption from the gastrointestinal system (Hurwitz 2014).

Due to the sources of lead exposure and the distribution of these sources, additional risk factors for lead poisoning include:

- minority race/ethnicity
- urban residence
- low income
- low educational attainment
- older (pre-1950) housing
- recent or ongoing home renovation or remodeling
- pica exposure[1]
- use of ethnic remedies
- use of certain cosmetics
- exposure to lead-glazed pottery
- occupational and para-occupational exposures
- recent immigration (USPSTF 2006).

Detection of Lead Poisoning

Lead poisoning can be detected by testing blood lead levels (BLL), either through a venous blood sample or capillary blood sample. BLL is a measure of recent or ongoing exposures but does not measure the

[1] Pica: abnormal craving and eating of nonfood substances that can occur in nutritional deficiency states or in some forms of mental illness

total body burden of lead since lead is distributed throughout the body and primarily stored in the bone (ATSDR 2012).

In 2012, the CDC revised its terminology and recommendations for elevated blood lead levels in children. This was done in recognition of the evidence that lead is associated with harmful effects on neurodevelopment and health at levels less than 10 micrograms per deciliter (µg/dL), which had previously been the "level of concern". The CDC stated that no safe blood lead level has been identified for children. In 2012, the threshold for public health action was set based on the distribution of blood lead levels in the U.S. population. Five micrograms per deciliter is the 97.5th percentile based on the 2007-2010 National Health and Nutrition Examination Survey's (NHANES) blood lead distribution in children (CDC 2012).[2]

The prevalence of childhood lead poisoning has been declining (CDC 2013), and as a result, there has been a movement away from universally screening children to a more targeted approach based on community and individual risk factors (Wengrovitz 2009). Universal screening may still be appropriate for communities in the U.S. that have a high percentage of housing built before 1950 and a significant percentage of young children with BLLs ≥10 µg/dL (ACCLP 2012). It is also recommended for children who are recent immigrants, foreign adoptees, or refugees (CDC nd).

In Oregon, it is recommended that all children be assessed for risk of lead poisoning by administration of the Oregon Lead Risk Assessment Questionnaire at ages one and two years, and between three and five years of age if not previously screened. A "yes" or "don't know" response indicates that a blood lead level should be done. The questions include:

- Has your child lived in or regularly visited a home, child care, or other building built before 1950?
- Has your child lived in or regularly visited a home, child care, or other building built before 1978 with recent or ongoing painting, repair, and/or remodeling?
- Is your child enrolled in or attending a Head Start program?
- Does your child have a brother, sister, other relative, housemate or playmate with lead poisoning?
- Does your child spend time with anyone that has a job or hobby where they may work with lead? Examples: painting, remodeling, auto radiators, batteries, auto repair soldering, making sinkers, bullets, stained glass, pottery, going to shooting ranges, hunting or fishing.
- Do you have pottery or ceramics made in other countries or lead crystal or pewter that are used for cooking, storing or serving food or drink?
- Has your child ever taken any traditional home remedies or used imported cosmetics? Examples: Azarcon, Alarcon, Greta, Rueda, Pay-loo-ah, or Kohl.
- Has your child been adopted from, lived in, or visited another country?
- Do you have concerns about your child's development or behavior?

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[2] CDC conducts NHANES, which is a continuous, cross-sectional, representative survey of the noninstitutionalized U.S. civilian population.

Oregon requires that all elevated blood lead levels (EBLL) be reported to the state and local health departments. The purpose of this is to ensure abatement of a lead source, appropriate treatment and follow-up of EBLLs, and education of the patient or parents. In addition, all tests performed are required to be reported regardless of result. However, the use of the Oregon Lead Risk Assessment Questionnaire is not reportable, so it is impossible to track how often the questionnaire is used and influences lead testing activity.

Lead Poisoning Statistics in Oregon and Washington County

The prevalence of lead poisoning is low in Oregon and has declined along with national trends. Between 2004-2008, approximately 3.8% of Oregon's population under age six (10,677 children) was screened annually, and about 0.5% of children screened had elevated blood levels[3] (OCLPPP 2010).

In Washington County, population lead poisoning statistics are not comprehensive and many at risk children are not being tested. Of the 45,000 children under the age of six in Washington County, approximately 3% (on average 1260 children) are tested for elevated blood lead levels per year. From 2009-2014, there were on average six cases per year of young children with confirmed elevated blood levels (BLL >5 µg/dL) (RAID 2015).

Concern for under testing is based on known presence of potential sources of lead in the community and of at risk populations. Pre-1979 housing is a major risk factor for lead poisoning due to the use of lead paint. Based on the 2009-2012 American Community Survey, there are 87,641 housing units in Washington County that were built in 1979 or before (41% of all housing units) and 21,450 housing units were built in 1959 or before (10% of all housing units). Living in poverty is another risk factor associated with childhood lead poisoning. About 15% of families with children under the age of five years old live in poverty in this county. Using this statistic, an estimated 6,800 children under the age of six in Washington County live in poverty (RAID 2015).

Lead Emissions from Hillsboro International Airport

Review of Relevant Literature

The body of epidemiological literature suggesting a link between leaded aviation gas and childhood blood lead levels is compelling, albeit limited. Published in 2011, *A Geospatial Analysis of the Effects of Aviation Gasoline in Childhood Blood Lead Levels* is the most comprehensive attempt at assessing the relationship between residential proximity to general aviation operations and elevated blood lead levels in children. The study compared the blood lead levels of children living near airports in Six North Carolina Counties to those living farther away from airports in the same counties. Several factors were controlled for, including age of home and season of blood lead testing. The study demonstrated a small, but statistically significant, impact on blood levels for children living within 1000 meters of an airport (Miranda 2011).

[3] Defined prior to 2012 as less than or equal to 10 µg/dL

The study's authors note several limitations including:

- The study did not account for prevailing wind patterns
- Because the authors categorized residential proximity to the airport (0-500m, 500-1000m etc.), the results do not consider how ambient concentrations may differ on a micro-scale. This notion of detecting the presence and impact of air pollution "hot-spots" is difficult to assess but is often of high concern to communities perceiving an impact.

The work by Dr. Miranda suggests that continued research about exposure to leaded aviation gas is warranted.

Review of Environmental Data

The Environmental Protection Agency (EPA) maintains National Ambient Air Quality Standards for several pollutants, including lead. The current standard for lead is a three-month average not exceeding 0.15 μg/m3 (EPA 2008). Oregon complies with the standard throughout the state (DEQ 2015). EPA requires lead monitoring at airports that emit one or more tons of lead per year. The Oregon Department of Environmental Quality is responsible for managing the state's air quality monitoring network but is not required to monitor for lead at Hillsboro Airport, because annual emissions are estimated to be below the one ton per year monitoring threshold (DEQ 2015). EPA emission inventories suggest Hillsboro Airport emissions of approximately 0.58 tons per year.

The EPA recently conducted an airport lead monitoring study to determine whether airports that emit less than 1.0 ton per year have the potential to cause surrounding areas to exceed the National Ambient Air Quality Standard for lead. The study included airports with emissions between 0.5 ton to 1.0 ton per year. Initial results from the study indicated exceedances of the national standard at only two of the 17 airports: San Carlos Airport and McClellan-Palomar Airport, both in California (EPA 2013a). These facilities emit 0.53 (EPA 2015a) and 0.59 (EPA 2015b) tons per year, respectively.

Between 2012 and 2015 DEQ operated an air-toxics monitor capable of sampling for lead at Hare Field. Hare Field is a recreational sports facility approximately one mile from Hillsboro Airport. Monitored concentrations of lead consistently remained substantially below the National Ambient Air Quality Standard of 0.15 μg /m3 throughout the monitoring period, less than 5% of the standard (DEQ 2014). It is important to note that this monitoring effort was not intended to measure "fence line" exposure to emissions associated with the airport. Levels of lead detected at the Hare Field monitor may not be representative of concentrations present in closer proximity to Hillsboro Airport (DEQ 2013a).

Although there is a lack of data from air quality monitoring, both the DEQ and the Port of Portland have engaged in efforts to model concentrations of lead in the air at and around Hillsboro Airport:

- **DEQ Model:** In 2010 DEQ conducted a series of comprehensive regional models estimating concentrations of 15 toxic air pollutants, including lead. This modeling effort included two phases, one to establish a baseline and one to project concentrations for the year 2017. Data refinements occurred between the two phases to fill gaps, remove emissions that no longer existed, improve the position of emission sources, update model assumptions, and improve emission factors. Specifically, the second model better represented the vertical distribution of emissions based on takeoff and landing patterns of general aviation operations. The model results yielded ambient concentrations of lead below the national standard at and around Hillsboro Airport (DEQ 2012a).

- **Port of Portland Model:** The Port commissioned its own modeling to fulfill requirements related to assessing the environmental impacts of adding a third runway at Hillsboro Airport. The results of this modeling also found concentrations at and around Hillsboro Airport to be below the national standard (CDM Smith 2010).

Neither model includes emissions from aircraft "run-up", a stage of the flight operation where a pilot performs a series of engine operational and safety checks prior to takeoff. It should be noted that the Port of Portland (and its contractor) are required by the Federal Aviation Administration to use the model it did. In the development and evaluation of air quality modeling techniques for aviation lead emissions, the EPA found that single-engine run-up was the most important source contribution to the maximum Pb concentration. Sensitivity analyses found that the time spent on run-ups had the greatest impact on the spatial dispersion of lead emissions. EPA notes that in assessing lead emissions from other airports (EPA research was limited to the Santa Monica Airport), resources should be dedicated to "conduct an on-site survey of the duration and location of LTO [landing and takeoff phases] modes for piston-engine aircraft, with particular emphasis on the duration of run-up times and location(s)" (EPA 2010).

As part of their 1200-Z stormwater discharge permit, the Port of Portland is required to routinely sample for the presence of lead (among other contaminants) in stormwater runoff at the Hillsboro Airport. Data shared by the Port show that of the 91 samples collected between 1994 and 2014, 25 had detectable levels of lead and two of those samples found lead at levels exceeding the state benchmark (0.04 mg/L) (Port of Portland 2015). In 2014, after six years of sampling showed no detectable levels of lead, the Port of Portland was granted a stormwater monitoring waiver. Sampling will resume in 2017 when their permit is renewed. No guidance was identified related to the interpretation of stormwater sampling results in the context of assessing concentrations of lead in the ambient air.

Although the Port is not required to routinely sample for lead in the soil and groundwater at Hillsboro Airport, samples were taken in 2007. Lead was undetected in the groundwater samples. Lead was detected in soil samples (Port of Portland 2015), but at levels well below Oregon's Risk Based Concentration of 400 µg /m3 (DEQ 2012b) and below the regional background level of 79 µg/m3 (DEQ 2013b). Oregon's lead-in-soil risk based concentration is consistent with guidance from the EPA which states that lead above 400 µg/m3 in "play areas" presents a serious health hazard to children (EPA 2001).

Data on the accumulation of lead in soils from aviation emissions is limited. When sampling data does exist, it is rarely generalizable due to site-specific dynamics such as prevailing wind patterns and the location and duration of flight operation stages, including run-up (M. Pedde, Personal Communication, August 27 2015). Deposition of lead in soils is an important consideration, the EPA notes in its most recent Integrated Science Assessment of lead that "The primary contribution of ambient air Pb to young children's blood Pb concentrations is generally due to ingestion of Pb following its deposition in soils and dusts rather than inhalation of ambient air" (EPA 2013b). More data on the presence (or absence) of lead contamination in the soils in and around the Hillsboro Airport would allow for a more comprehensive exposure assessment.

<u>Review of Health Surveillance Data</u>

In 2011 the Oregon Health Authority conducted a study modeled after the work of Dr. Miranda et al. The study attempted to assess what, if any, relationship exists between elevated blood lead levels and residential proximity to Hillsboro Airport. The final report from the Oregon Health Authority notes several limitations in the available data including (OHA 2011):

- Variability across testing equipment to detect concentrations of lead below 5 µg/dL
- The inappropriate coding of low values as "0"
- The small number (seven) of elevated blood-lead level cases included in the analysis
- The causes of elevated blood levels are multi-factorial and in many cases are unknown due to the lack of comprehensive case investigations

Because of these limitations no assertions can be made about the presence or absence of a correlation between residential proximity to Hillsboro Airport and elevated blood-lead levels.

Public Health Approaches

The Public Health System uses a variety of processes, techniques and tools to assess and address environmental health hazards. The following is a list of approaches that may aid in better understanding any public health risk associated with lead emissions from Hillsboro Airport.

<u>Health Risk Assessment</u>

Also known as epidemiological investigations, health risk studies, and exposure investigations, these processes aim to identify and assess the public health impacts of an exposure to a particular public health threat. The EPA maintains guidance on assessing the health risks of lead contamination in the environment (EPA 2014). The guidance is organized into four steps, consistent with most risk assessment processes:

1. **Data Collection and Data Evaluation:** This step involves developing, implementing and evaluating an environmental sampling plan and collecting health effect/outcome data, in this case blood lead levels.
2. **Exposure Assessment:** Exposure assessment is the process of determining the frequency, duration and route of exposure to a contaminant.

3. **Toxicity Assessment:** Toxicity assessment involves estimating the potential for adverse health outcomes. The toxicity of environmental lead contamination can be expressed by the percentage of the target population with blood levels that exceed CDC's level of concern.
4. **Risk Characterization:** Risk characterization is the culmination of information from the previous steps and can result in recommended mitigation or intervention strategies. Risk characterization can also serve to identify limitations or uncertainties in the available information.

Health Impact Assessment (HIA)

Health Impact Assessments are defined by the National Research Council as, "A systematic process that uses an array of data sources and analytic methods, and considers input from stakeholders to determine the potential effects of a proposed policy, plan, program, or project on the health of a population and the distribution of those effects within the population. HIA provides recommendations on monitoring and managing those effects." (National Research Council 2011). Although the specific methods vary, most HIAs follow a uniform process of six steps:

1. **Screening:** Determine the value and need for HIA
2. **Scoping:** Clarify and prioritize issues to focus on in the HIA, methods for analysis, and a work plan;
3. **Assessment:** Two parts that include: a) Conducting research on existing conditions; b) Identifying the effects of the project, plan, or policy on health;
4. **Recommendations:** Identify actions to address any harms identified
5. **Reporting:** Write a report and communicate its findings and recommendations
6. **Monitoring**: Track how the HIA affected decision-making processes, the actual decision, and effects of the project on health

HIAs differ from Health Risk Assessments in that they are not intended to assess the health impacts/effects of a current situation or past exposure, but rather identify potential health impacts resulting from a proposed change in the environment (policy, project or plan).

The National Environmental Protection Act and similar state statues require that Environmental Impact Statements (EIS) include consideration and analysis of health effects of certain policies or projects. Although these requirements rarely call them out by name, HIAs can be an appropriate way to expand on the somewhat limited practice of health analysis in the EIS. While health analyses in EISs typically assess the discrete relationship between a particular contaminant and particular health outcome, HIAs afford the opportunity to consider broader impacts to health (Human Impact Partners 2013). This might include the health effects resulting from changes to the physical, social and economic environment, the potential to mitigate or magnify existing health disparities and an analysis of cumulative impacts.

Rapid Health Impact Assessment

Rapid HIAs are designed to meet the same goal; understand the health impacts of a policy, plan, or project and recommend actions to mitigate or prevent those impacts. Rapid HIAs occur over a shorter period of time and are generally a less resource-intensive alternative to a full HIA. It has been reported that in order for a rapid HIA to be successful, certain conditions must be present (Furber et al 2007). These include:

- The health agency has experience in conducting HIAs.
- An existing relationship between the health agency and the proponent of the policy, project or plan.
- There is not a need to collect new data. The necessary data exists and is in an accessible form.
- A literature review on the health determinants and outcomes is available.

Conclusion

Lead is a toxin that is linked to many negative health effects, including neurodevelopmental disorders in children. Notable decreases in blood lead levels in children over recent decades have resulted from changes in the use of lead-containing products like gasoline, paint, and solder. However, lead continues to be used in products, industry, and prevail in the environment due to historical uses, resulting in human exposures.

In Washington County, the Hillsboro Airport is a source of lead emissions and the question has been raised whether or not it is a significant source of human lead exposure. Emissions inventories, emission dispersion modeling, and direct monitoring are means to assess whether an industry is in attainment of the standards set by the Environmental Protection Agency. These standards are established to be protective of public health, including sensitive populations. Two separate modeling studies (one performed by the Department of Environmental Quality and one conducted by an environmental consultancy) were conducted to determine if levels of lead in the air exceeded the National Ambient Air Quality Standard of 0.15 µg/m3. Both studies found levels of lead significantly below the standard on airport grounds and in adjacent residential communities. Blood lead levels are a means to detect whether a population is being significantly exposed to a source of lead. The prevalence of lead poisoning is low in Washington County and Oregon overall, though testing rates are also low.

Public health has processes, tools and techniques to assess environmental health hazards, which include health risk assessments, health impact assessments, and rapid health impact assessments. Based on the searches and information reviewed for this paper, it is clear that a rapid health impact assessment is unlikely to yield additional literature to further our understanding of the health impact of the Hillsboro Airport. If there is a proposed action, then a health impact assessment would be an appropriate approach to assess the impact of the policy, project or plan on the health of a population. However, at this time we are trying to understand if there is a public health problem, and for this purpose, a health risk assessment may be the most helpful strategy. A health risk assessment framework can be used to develop a stepwise plan of gathering and assessing data. Each step can inform the need to investigate further. For example, an environmental sampling plan and exposure risk assessment could inform the need to collect health effect/outcome data, in this case blood lead levels. Health risk assessments and health impact assessments can be resource intensive to conduct but are helpful in defining a problem and identifying strategies to mitigate or eliminate health risks.

A health risk assessment could address questions left outstanding due to limitations in existing data. Namely, if lead has accumulated in the local environment and whether this leads to human lead exposure in those on or around the Hillsboro airport grounds. While there are limitations in the environmental data and local blood lead level data, the available data about lead emissions from the Hillsboro Airport do not suggest that it presents an environmental health threat to the community adjacent to the airport.

With ongoing efforts by the Federal Aviation Administration and the Environmental Protection Agency to phase out leaded aviation gasoline, emissions from the Hillsboro Airport are expected to decline or cease in the coming years. Public health is supportive of these efforts to further reduce lead emissions.

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