ESCI 250

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Lead in Springfield's Promise Neighborhood: A Service Project

Abstract

Springfield, Ohio is one of many communities effected by lead contamination. Many of the houses in Springfield are older, build prior to 1960, and still contain lead based paints and pipes. Paints and lead water pipes can leach into soils to create unsafe gardening conditions causing any produce grown at home to be unsafe alternatives to those in supermarkets. The effects of lead can range from minimal to critical. The distribution of lead contamination intensity in these areas is potentially due to housing policies and practices that impacted neighborhood investment and divestment. For example redlining neighborhoods established by the Home Owner's Loan Corporation (HOLC) correspond to modern day areas with high vacancies and code violations. These were often established by race and so inequities and injustices today remain. The research done through this course has shown that "C" and "D" HOLC areas contain the greater lead contamination across all three sampling points (drip line, mid yard and street) than exclusionary "A" and "B" neighborhoods.

To involve the community, members of the class canvassed door-to-door flyers about the annual Promise Fest event, and asked homeowners to bring three samples to the event to be tested. Included with this were all the tools necessary for safe sampling: three zip lock bags and a how-to guide. The turnout was low, with only one person bringing a sample. However, a few kids stopped by to test the soil at the event, and flyers on how to minimize lead poisoning distributed. Later in the course, we went into the community again and asked for permission to take our own samples, explained why lead was a harmful toxin, and sent the individual results from each home back to the owner if they requested. (Fawcett, S. B., et. Al). Canvassing the neighborhood turned out to be a much more efficient method of raising awareness, creating empowerment in the community and also getting data (Gerber, A. S., et. Al).

Introduction

The Environmental Research Methods Course offered at Wittenberg University has essentially been a service-based learning class project centered around lead and its effects on human health. The area of study is Springfield's Promise Neighborhood and surrounding areas, which is located in the 110 blocks of Springfield, Ohio (Figure 1). This was chosen as our study site due to historical redlining practices, which has affected the quality of housing for decades. Redlining is when an area of interest is segregated into different areas, which are assigned based on the race, ethnicity and financial stability of those living in each subsection. A is the best, B is the second best, C is undesirable and D is considered the worst area to live in. These areas are also referred to as HOLC areas, short for Home Owners Loan Corporation (Figure 1).

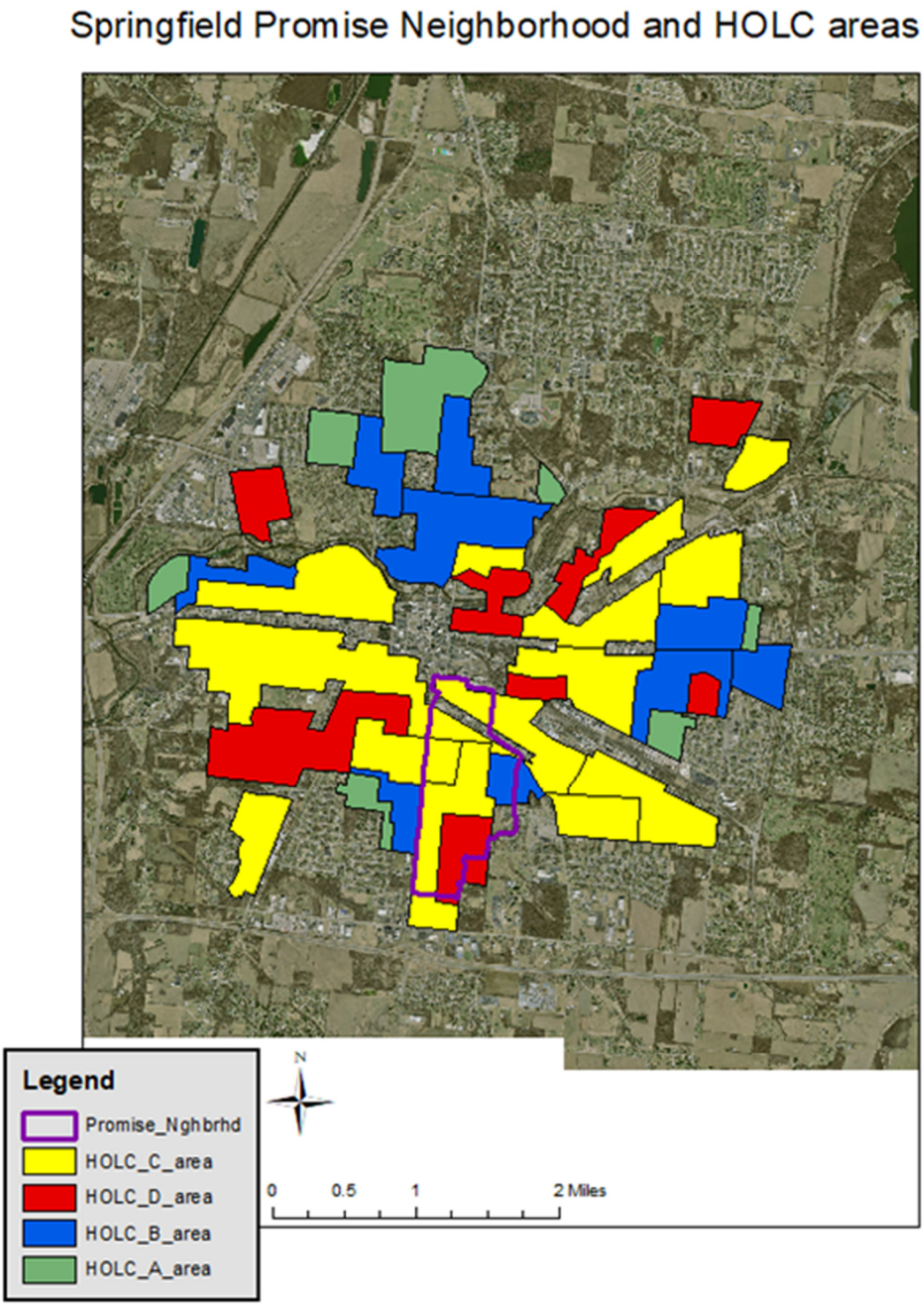

Figure 1: Map demonstrating the HOLC areas and Springfield's Promise Neighborhood. "A" areas are considered the best and are coded in green, "B" areas are coded in blue, "C" areas which are undesirable are yellow and the worst areas, "D", are coded in red.

The practice of redlining began in 1930's and maps of subsections were consulted until the 1960's. The HOLC maps were used to dictate who could live where and at what cost. The "worst" of these areas, C and D, would receive little to no financial support. This is because banks deemed these areas a financial risk and thus would offer little to no loans or insurance opportunities. These homes often belonged to African Americans, Jews, Mexicans and foreigners in general (Hillier, A. E.). These C and D areas also experienced expulsive zoning at times, which is when undesirable land uses would be placed in these neighborhoods rather than the higher class, A and B ones. Examples of undesirable land uses include factories, landfills, correctional facilities, airports and water treatment plants. Undesirable land uses tend to affect the appearance of neighborhoods, as well as the smells around it and sounds within it. Thus, to be an undesirable use of land it should negatively impact the sight, smell and hearing of the residents in the area. One would expect abundant foul odors near a landfill, and disruptive sounds from an airport or factory, and the sight of fencing, buildings and trucks to be much less appealing than trees or natural areas, to compare to a higher-class neighborhood (Farber, S.). Having a home near an undesirable land uses makes it harder to enjoy the area, raises the types and intensity of various pollutants, diminishes the properties worth and can lead to increases in crime (Farber, S). The "best" areas, A and B, would receive the upmost support, oftentimes were described as the safer and more prospering neighborhoods, and were racially exclusive. Anyone in the A and B areas is deemed financially better off and had much more opportunity for home improvement projects to remove the lead-based paints and fixtures from their houses in favor of safer alternatives. Overall, urban environments were labeled as more risky and lower quality than suburban environments with desirable land uses and natural areas.

To achieve the class goal of increasing awareness of lead, there have been many canvassing events as well as partnership with Springfield promise neighborhood and local school districts. The methods include sampling soil analyzing the samples organizing the data into GIS systems in making graphs and interpretations based upon the results of the graphs. The soil samples were taken specifically to test the presence of lead at the drip line of the house, in the mid-yard, and near the road. The samples were designed to target areas which would have the highest presence of lead such as near roadways or the base of older homes which may or may not contain lead-based paints and the samples were only taken from. Another reason for choosing these areas is that it is likely a high traffic area where kids and animals are coming into frequent contact with the soil. For sampling methods, the top of the soil was exposed by removing all grass, leaves, trash and other debris present. Then the top one to two inches of the soil were collected in plastic zip lock bags. Only the top inches were taken because soil is a slow forming resource taking many years to form and thus lead would only be within the first one or two inches of the soil. It would be very unlikely that soil tested both any deeper would contain lead from man-made materials, such as paint. The zip lock bags were then labeled with the street address, the HOLC zone (A, B, C or D) and whether it was a drip line sample, a mid-yard sample or a near road sample. Upon returning to the lab, the zip locks were left open to allow the samples to dry, and once dry, measured and weighed. Finally, the samples were then tested for lead content. After that, all data was compiled into Microsoft Excel spreadsheets and used to make various graphs, such as the one seen in figure 2.

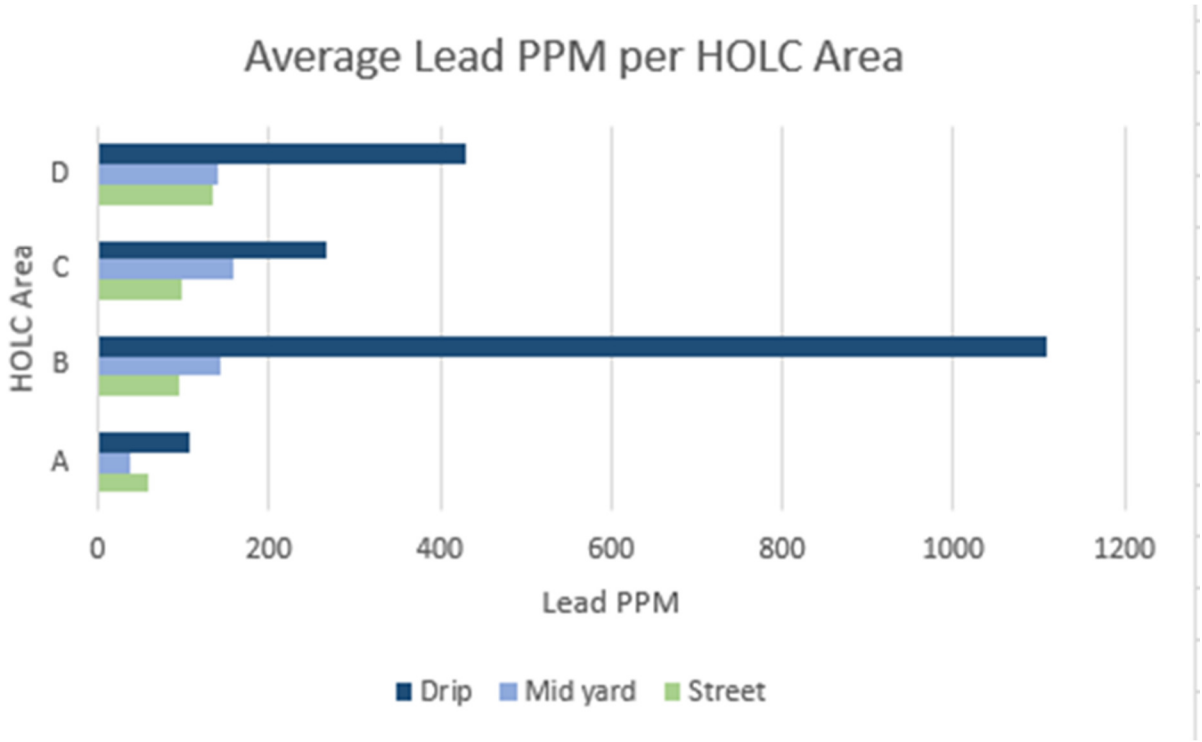

Figure 2: The average PPM of lead sampled across the HOLC areas of Springfield, Ohio. The samples consist of drip line, mid-yard and street.

The results prove that the A and B areas have the lowest lead contamination with the exception of the drip line for area B. Overall, the street samples across all zones were the lowest, followed by the mid-yard samples and then ending with drip line being the most heavily contaminated samples. The C zone had the highest mid-yard lead reading, followed by the B and D area. The B zone had the highest drip line lead contamination followed by D, C and then A. Finally, the D area had the highest street lead contamination, followed by the C, B and then A areas. All of our results were as expected except the high drip reading for the B area. This could be due in part to calculation or sampling error.

Course Attributes

This class aimed to increase awareness of lead present in the community, why it is still prevalent in Springfield and how lead effects human health, all while learning about the effectiveness of various methods of canvassing the community. Lead is still present in part due to a lack of funding available for home improvement and in part due to historical redlining through HOLC maps. Many of Springfield homes are older (built prior to 1960), still contain lead based pains, and lead water pipes, which are costly to upgrade but at the same time allow the toxic metal to leach into soils and into water when it is accessed (Jacobs, D. E., et. al). Because of the presence of this metal, soils become contaminated when paint falls onto the ground, and eventually leached into soils where a community member may be growing vegetables. Any values above 400 PPM of lead (EPA standard) creates and unsafe gardening experience, in which people would be exposed to lead by eating the produce as well as coming into contact with the soil while gardening (Singh, R. P. et. Al.). However, lead can only enter the body through cuts or ingestion, so if homeowners wear gardening gloves they can avoid contamination through contact with soil. However, the threat is still pervasive when it comes to ingesting the vegetables or fruits (Singh, R. P. et. Al.). When homeowners are unable to grow their own food, it adds another expense further pushing back the possibility of home renovations.

The effects of lead poisoning range from minimal to severe, and mostly affect children, the elderly or those with illnesses. Examples of minimal effects include appetite loss abdominal pain, constipation, fatigue, sleeplessness, irritability and headache (Koller, K. et. Al.). Examples of effects on children and severe effects include ADHD, lowering IQ, hypertension, and memory problems, all of which affect school performance and success later in life (Koller, K. et. Al.). It is also worth noting that for children, there is no safe blood lead level, and levels as low as 5 µug/dL

(micrograms per deciliter) have been documented to cause cognition decrease as well as performance deterioration (Centers for Disease Control and Prevention). Children will be exposed in a variety of ways at all stages of their lives. The most common exposure methods include breathing in particles or ingesting them. One can breathe in lead from dust particles and from fumes if they are near a metal processing plant. Ingestion of lead is more common than breathing it in. Common examples are from playing outside and not washing hands before eating or from directly eating soil, which is common in toddlers and babies. From chewing on objects such as toys that have lead paint, on food that has not been properly washed before it has been served, and even if lead dust settles on clothes and the child touches his or her mouth. (Koller, K., et. Al.).

Synthesis/discussion/conclusions

The research gathered has suggested that the C and D HOLC zones have significantly higher concentrations of lead in the soil around the home than compared to the A and B HOLC zones. However, the research also suggests that the B zones have significantly higher lead in the drip line samples than any of the other HOLC zones (Figure 2). This seems unlikely based on the mid yard and street samples form the B zones as well as comparing the value to the other HOLC zone samples. This high value and skew in the data is most likely from sampling, measuring and/or calculation error. In the future, it would be beneficial to test very carefully, even more so than the class did, and possibly retest samples seeming to have very high values as to avoid errors.

The class has also found that the HOLC zones and corresponding redlining has had an impact on which areas of Springfield, Ohio have higher concentrations of lead than others have. For example, the C and D zones have higher lead values than the A and B zones, which were considered better areas to live in at the time the HOLC maps were designed (Figure 1). It is also possible that the funding associated with these zones is responsible for the higher lead

concentrations. It is also worth noting that the dripline samples have the highest lead concentration values across all HOLC zones than the mid yard and street samples. This could be due to the presence of lead water pipes in the buildings or from paint near these sample sights contaminating the soil. (Figure 2)

For the methods of involving the community in the sampling and empowerment process, there were some canvassing methods that worked far better than others, based on participation and awareness. For Promis Fest groups of students went door to door with information about the lead sampling event and handed out supplies. This was done without interaction from homeowners as the flyers and supplies were left near the mailbox. At the event, turnout was remarkably low, with only one person bringing in a sample form their yard. In terms of awareness, a few flyers on how to limit individual exposure to lead and its effects on human health were distributed. Comparing this with the in neighborhood student sampling, there was far less participation. When the class collected samples on our own, we were required to get permission and a signature from the homeowner before sampling their soil. Before this would happen, students had to explain what lead was and how it affected health and gardening standards. Some homeowners requested their sample results through the mail as well, pointing out their interest in their health and environmental health. We were able to collect multiple samples from each HOLC zones, and at times used vacant homes and businesses to collect samples. Thus, by having face-to-face interactions and conversations about the issues at hand, participation and awareness increased simultaneously. (Gerber, A. S. et. Al.)

To continue this project, various steps should be taken. The first would be to reevaluate the methods used, and aim for the most effective (such as face-to-face interaction vs. leaving things at residents) in order to be efficient with time and resources (Gerber, A. S. et. Al.). It

would be beneficial to the communities involved if the results were shared with them in a confidential, format. One method of achieving this is returning results of ours study to community members in a no name, no-address format to protect individual interests and reinforce confidentiality. Allowing all community members to see the results would not only increase the awareness of lead toxicity issues, but would also empower them by giving them scientific results that could be used to effect policy and housing management.

The next steps would be to continue increasing awareness of lead and its effects by organizing events at community centers, schools, businesses and other frequented areas such as social media. Getting the message out about the harms and effects of lead poisoning could encourage people to take action against lead and its presence in the Springfield community (Fawcett, S. B. et. Al.). It would be beneficial to all involved to also share tips about how to limit exposure and the possibility of poisoning when one knows lead is already present in their home, school or workplace.

Examples include limiting contact with contaminated soils by either not using it for gardening, wearing gloves each time you garden, or by washing your hands well with soap and water immediately after gardening. It is also wise to wash and produce grown in these soils before consumption, as lead dust particles could be sitting on the outside flesh of these foods. Another simple and effective method of reducing contamination and exposure is to allow water to run for about two minutes before using it for dishes, bathing, washing, or drinking. This is because lead in pipes can build up overnight while the water is not being used, and allowing the water to flow gives it time to be washed out of the pipes. Another effective solution with lead water lines is to clean or replace the facet aerator as well, as it can trap particles behind the mesh screen that can’t be removed by the water alone.

More costly but efficient methods of eliminating lead in homes is to replace all lead water lines in the house and scrape off old lead based paints and repaint with safer alternatives. Alternatives would be easy to find as lead based pain is no longer produced or sold. However, this is very costly and difficult to organize, and sometimes not possible based on location of lines or other circumstances such as shared lines between split homes. One could also cover their topsoil with gravel or stone to prevent any contact with the soil at all. However, this does not solve the problem, rather than limits the likelihood of contamination. Other limiting factors include those who rent their home or residence and cannot make such changes without the property owner's approval.

Overall, the lead issue in Springfield, Ohio and all over the nation is complicated. Much more testing, advocating and research will need to be done before children are safegaurded. Communities and homeowners should be well informed of lead, where it comes from, why it is still present in the environment, its effects on human health, and how they can limit their contact with it in efficient and cost effective methods.

Acknowledgements

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