Prevention Institute

LEAD EXPOSURE FROM SOIL REMAINS A PROBLEM FOR RESIDENTS OF BOSTON’S OLDER HOMES.

In the heart of Boston’s “lead belt,” children playing in their own yards are unwittingly exposed to lead in amounts that could result in developmental delays, learning disabilities, or behavioral disorders. While achievements in the removal of lead from paint and gasoline have been an extraordinary public health success story, lead-contaminated soil that surrounds older homes remains a significant source of lead exposure that has not yet received widespread attention. A pilot project of the US Environmental Protection Agency’s (EPA) Environmental Monitoring for Public Access and Community Tracking (EMPACT) program is working to change that with a project called the Boston Lead-Safe Yard Project (LSYP).

The Boston LSYP team uses low-cost landscaping techniques to reduce lead contamination in the Boston metropolitan area. In addition, the project informs residents about the risks of lead exposure among children and provides timely data on lead levels in soil. The Boston LSYP has raised awareness about lead dangers and helps individuals, community organizers, and local government mitigate the risks of lead poisoning from residential soil in neighboring communities.

THE PLACE

Boston properties typically have soil lead levels well in excess of EPA standards, both in play areas and along house foundations. Elevated lead levels in soil result primarily from the chipping and peeling of exterior lead paint and also from leaded gasoline. Although many Boston houses have been de-ledged, few yards have undergone soil lead abatement for several reasons: the cost of full-scale removal of soil has historically been prohibitive to both families and the city ($6,000 to $10,000 for a typical triple-decker property); public funding has not been available; and the dangers of elevated lead levels in soil are not widely recognized.

When EMPACT program investigators went looking for a spot to launch the Lead-Safe Yard Project, two areas in Boston’s “lead belt” stood out. The initial target community selected for the pilot project was a several block area in the Bowdoin Street neighborhood, consisting of approximately 150 mostly older, wood-
framed houses in the North Dorchester section of Boston. Efforts later expanded into Roxbury, another high-risk, low-income area that also contained a lot of old homes whose chipping paint contributed to unhealthy lead levels in the soil of surrounding yards. Both neighborhoods were chosen because they had:

- high incidences of lead poisoning,
- large concentrations of older wood homes (most built before 1978) that had been painted with lead-based paint,
- a large low-income, multi-racial and immigrant population,
- contiguous yards that increased the potential for neighborhood-wide impact,
- a local community environmental health organization, and
- a history of established neighborhood environmental activities upon which the EMPACT project could build.

**THE PROJECT**

It is well established that exposure to lead during early developmental years is one of the most significant environmental health concerns for inner-city youth, especially for those who live in poorly maintained housing in older urban neighborhoods. According to the Centers for Disease Control and Prevention, one in every four to six children may have elevated lead levels in inner cities, based on current blood lead data. The link between learning disabilities and elevated blood lead levels in preschool children is also well documented, particularly for those under the age of six. Lead poisoning is more prevalent in low-income, minority, and immigrant communities and is compounded by additional environmental hazards such as indoor air contaminants, deteriorating infrastructures, housing demolition, abandoned housing, congested roadways, industrial land uses, and vacant land.

H. Patricia Hynes, a professor of Environmental Health at Boston University, School of Public Health and the co-director of the Boston LYP team, is committed to using community-based participatory approaches to eliminating the hazardous conditions related to lead that disproportionately exist in older, low-income housing. The team’s research is action-oriented, pairing the root of the problem with solutions that are practical and applicable for community members. The Boston LYP team documents the presence of serious environmental lead contamination in a timely fashion and presents solutions that the community can use. When project investigators found that high levels of lead in soil and heavily traveled roadways are a significant contributor to lead exposure and poisoning among Boston area residents, they wanted to develop affordable ways to mitigate lead exposure to improve the health and well-being of community members. In conjunction with residents and community-based institutions, the Boston LYP developed a series of low-cost, low-technology measures to reduce exposure to lead contaminated soil.

From 1998 to 2001, the project conducted a multi-phase lead-safe yard intervention which included: a) outreach to, and education of, homeowners, b) soil analysis to establish baseline lead levels, c)
development and application of cost-effective landscaping measures to reduce exposure to high lead soil, d) communication with homeowners about design decisions and long-term maintenance, and e) dissemination of project methods to community agencies, local government, and others to encourage program replication.

“Outreach was difficult at first,” said Hynes. “It was hard to attract families into the program. We searched for unique ways such as a model yard, signs, and advertising.” Community partners were hired to conduct outreach to neighbors and community residents through mass mailings, phone calls, door-to-door solicitations, and distribution of lead-safe yard literature at community events. Education materials included culturally appropriate printed materials, a video produced by the Boston Childhood Lead Poisoning Prevention Program, and a quiz to test parents’ knowledge about lead.

Once participants agreed to enroll in the project, outreach staff provided education and coordinated the soil analysis with project team members. A chemist from EPA’s Region 1 Lab and a certified industrial hygienist from the Bowdoin Street Community Health Center in Dorchester analyzed more than 100 yards, testing soil in areas most likely to present sources of lead contamination. A member of the landscape crew then presented the results to homeowners and together they developed a treatment plan tailored to each particular home. A standardized questionnaire documented how the yard was being used, household characteristics, and availability of the homeowner. Landscapers incorporated this information into their recommendations for treatment, creating a “blueprint” for each yard. Homeowners participated in every part of the process.

Using EPA recommendations for residential lead-contaminated soil abatement, the project developed a suite of options that emphasized affordability and replicability. The most common soil remediation techniques included installation of wood framed boxes (to separate food items and play areas from contaminated soil), relocation of fruit/vegetable gardens and children’s play areas, laying stone paths, planting grass, applying landscape cloth, or bringing in groundcover (such as mulches or wood chips to fill-in and reduce direct exposure to leaded soil).

THE PEOPLE

Diverse Partners Collaborate to Build Healthy Environments

From chemists to contractors, the Boston LSYP rallied diverse partners around a single cause: reducing the risk of lead contamination. The project brought together community residents and organizations, local businesses, a neighborhood health center, the Department of Public Health, a housing agency, Boston University School of Public Health, and EPA Region 1.

While the Boston University School of Public Health oversaw outreach and education and coordinated the development of the lead removal toolkit, a chemist from EPA’s New England Regional Laboratory conducted soil analysis. The Dudley Street Neighborhood Initiative and local landscape contractors—including Garden Futures and Dorchester Gardenlands Preserve

From chemists to contractors, the Boston LSYP rallied a range of diverse partners around a singular cause: reducing the risk of lead contamination.
—participated in outreach and yard renovation, and the Bowdoin Street Community Health Center provided a certified industrial hygienist to assist in residential soil analysis. As the project progressed, it expanded to include two city agencies: Boston’s Childhood Lead Poisoning Prevention Program and Lead-Safe Boston, and the National Center for Healthy Housing, which conducted the evaluation in the project’s final phase. Engaging a wide variety of partners lent the project a great deal of organizational support and allowed the work to become institutionalized within city health and housing agencies once the pilot phase ended.

The EPA’s EMPACT program provided the funding, while local businesses provided materials donations.

THE RESULTS

Healthy Change in Local Environments

Between the summer of 1998 and the fall of 2001, the Boston LSYP completed 61 lead-safe yards, the city health department treated an additional six yards, and Lead-Safe Boston completed 22 lead-safe yards. By decreasing children’s exposure to lead, this project has successfully reduced one of the most significant environmental health concerns for inner-city youth. After one year, soil treatments continued to prevent exposure to leaded soil in all properties enrolled in 2000.

The project demonstrated several important results.

1) Lead contaminated soil can be mitigated at a fraction of the cost of conventional methods in ways that increase the ability of residents, community health centers, and others to have a positive impact on their neighborhoods.

2) Government agencies, universities, residents, and community-based organizations can work together effectively to reduce lead exposures from soil.

3) A lead-safe yard program can be replicated and institutionalized by municipal home de-leading programs and other community organizations.

Removing lead from inner-city soil or reducing exposure to contaminated soil has typically been too expensive or technologically challenging for residents to undertake. But the Boston LSYP has demonstrated techniques that low-income households can utilize at low costs. To assist other groups to replicate their efforts, project leaders created a toolbox, available at: www.epa.gov/region01/leadsafe/tool2.html.

The evaluation of this project reflects what health improvements research has demonstrated in other regions. For example, a major EPA intervention study found that when soil is a significant source of lead in a child’s environment, lead abatement in soil will result in reduced exposure and consequently a reduction in blood lead levels. The EPA research team found that a soil reduction of 2,060 ppm was associated with a 2.25 to 2.70 μg/dl decline in blood lead levels. Other research estimating that interior house dust is comprised of anywhere from 30% to 50% of soil dust further reveals the health importance of soil lead abatement programs.

By tackling lead contamination yard by yard, the Boston LSYP has made significant strides toward promoting community health within the city’s “lead belt,” and has provided a model other communities can follow.

WISDOM FROM EXPERIENCE

Cost was a crucial factor in determining yard treatment recommendations. For example, off-site removal and disposal of soil was not feasible because of high costs and logistical barriers. Unfortunately, despite creative treatment solutions, the project operated over budget. Even with donations of free gravel, wood
chips, and compost by a local company, the average per yard cost far exceeded the project’s goal of $750, and cost approximately $2,100 per yard. The breakdown of costs included $300 for materials, and $1,800 for landscape and construction labor. Project management added about $900 per yard to the overall cost. However, despite these cost issues and the fact that the team was not able to meet their ambitious goal of $750 per yard, the personal, social and economic costs of the damage from lead poisoning far exceed the expenditures. Not only is the project ensuring the health and safety of current community members, but it is protecting that of future members as well, saving money across the board.

Hynes shared some of her observations about the project: “Hiring community partners to do the outreach made for project success. We trained community partners using slide shows to build their skills in presenting the project to residents. They would also give talks about the program in community forums. Because they were in contact with the community, our partners were critical to planning, outreach, and evaluation of the project. This relationship built the skills of community partners and also enhanced follow-up and communication with community members. We developed EMPACT materials that document the process, provide a “how-to” workbook and describe all of the inexpensive ways to reduce lead exposure in urban yards. We believe these products will provide others interested in implementing a similar effort with a template and a road map for success.”

**LOOKING AHEAD**

Building upon the success of their creative, relatively low-cost, low-technology treatment approach, the Boston LSYP is looking to expand its array of treatment options. The project plans to conduct feasibility assessments of other strategies such as installing turf, planting species of plants that take up lead in open sunny areas, or in portable growing bins in more shaded areas. Project stakeholders would also like to explore the use of central, municipally-managed treatment sites to treat and recycle contaminated soil, thereby granting urban communities more permanent solutions.

Now that they have proven that affordable remediation techniques can reduce urban lead exposure, project members are working to ensure that their successes will translate into increased efforts by governments, community organizations, and private enterprises to apply these effective lead-safe yard techniques in neighborhoods across the country.

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This is one in a series of 11 profiles that reveal how improvements to the built environment can positively influence the health of community residents. The examples illustrate how changes to the built environment can be particularly meaningful in communities that have historically lacked important features such as pedestrian infrastructure, services and institutions, or public art. Taken more broadly, the profiles demonstrate how improvements to the built environment have the potential to reduce health disparities.

The profiles were written and produced by Prevention Institute. Funding and guidance were provided by the Centers for Disease Control and Prevention’s National Center for Environmental Health. It is our hope that these profiles will stimulate and inspire partnerships between community residents and practitioners from multiple fields and sectors to design solutions and take action to improve the built environment for the health and well-being of all.