CHAPTER 5
Health Education

5.1 Introduction to Health Education

Exposure to lead contamination in the environment may cause adverse health effects, particularly in young children and the fetuses of pregnant women (ATSDR 2020, Harrington et al. 2014, NTP 2012). The goal for addressing lead contamination is to reduce overall exposures and associated adverse health outcomes. Remediating residential lead sites is a complex multiphase process that can take decades to complete (von Lindern et al. 2016). The CDC recommends primary prevention to remove lead hazards from the environment before exposure can occur as the most effective way to ensure that vulnerable and/or overburdened populations do not experience the harmful health effects of lead.[50] Health education and other secondary prevention strategies may mitigate lead exposure in combination with exposure reduction measures. In the recent EPA publication, *Superfund Cleanups and Children's Lead Exposure* (Klemick et al. 2020), EPA recommends supplementing engineering approaches that remove or stabilize contaminants with community outreach and health education, particularly at sites with lead-contaminated residential areas. Education by itself has not been shown to lower BLLs (Nussbaumer-Streit et al. 2020, Yeoh et al. 2012, 2008). This chapter will discuss the benefits and limitations of health education at Superfund lead sites.

5.2 Benefits of Health Education

Elevated soil lead levels can be predictive of elevated BLLs in populations, which can be reduced through effective remediation of lead contamination in soil (Ye et al. 2022). As noted in other chapters of this Handbook, soil excavation and/or alternative cleanup methods are the prominent health-protective strategies for addressing lead-contaminated soil at residential sites. However, there may be circumstances where this option is not feasible or timely. For example, due to the extent of the contamination, there may be a need to leave residual lead at depth and implement ICs to prevent or limit exposures, or there may be a situation where exposure to lead is from multiple sources, not all of which may be addressed under CERCLA authorities. At sites with an extensive history of lead mining, milling, and smelting operations, evaluation and cleanup have multiple steps that can result in a lengthy process to address the various lead-contaminated media (U.S. EPA 2020b). In these situations, health education may be the primary interim health-protective approach.

[50] https://www.cdc.gov/nceh/lead/prevention/default.htm.

The objectives of health education are to provide information to impacted communities about the risks associated with lead contamination, ways to reduce exposure to lead, and ways to alleviate health outcomes associated with lead exposures. Education can be targeted to residents, communities, and local health officials who may or may not be familiar with EPA's Superfund risk assessment and risk management processes. There are several tools and resources that families can use to address both Superfund and non-Superfund sources of lead (see Sections 3.2, 4.4, and 4.5).

Community education conducted in association with site cleanup activities can contribute to the decline of blood lead concentrations, although health education alone may not be sufficient to achieve major health benefits (Table 5-1 and Appendix E). Remedial activities may be performed in conjunction with health education and/or blood lead monitoring, as appropriate, and can contribute to the success of the project (ATSDR 2002). Once the public and local health officials are made aware of the potential risks present at the site, cleanup and other health-protective activities may be more effective, more widely understood by the community, and easier to implement when the citizens understand the hazards and believe that the community is at risk (ATSDR 2022).

Table 5-1. Review of Sites where Community Education Supported Reductions in Blood Lead Levels

Site	Agency/ Organization	Education/Outreach Program	Comments	Reference
Milwaukee, Wisconsin (effort to lower BLLs in a specific neighborhood)	Milwaukee Health Department	• Enrollment in an intervention program of prevention education and environmental cleanup. • Identification of children 6 months to 6 years old with BLLs 10-19 µg/dL. • Education home visits over a 4-year period.	Comparisons of BLLs from the targeted community versus the city-wide averages showed a 1.6-fold decrease. For those children starting with BLL 10-19 µg/dL, average BLLs were 12.9, 10.8, 10.3, and 9.8 µg/dL each year of the study, indicating a steady decrease.	Schlenker et al. (2001)
Oronogo-Duenweg Mining Belt, Missouri (Jasper County)	ATSDR	Lead poisoning awareness in school curricula, site-specific coloring/story books, merit badge for local Girl Scouts chapter, presentations at grand rounds in area hospitals, fliers, magnets, and other awareness materials.	Programs were associated with a mean BLL decline of 2.42 µg/dL; while the significant reductions were attributed to soil remediation, health education was provided as a compliment to remedial actions at the site.	ATSDR (2002)

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Site	Agency/ Organization	Education/Outreach Program	Comments	Reference
Bunker Hill Superfund site, Idaho	U.S. EPA	• Intervention and education program implemented by the Panhandle Health District, utilizing lead screening and health education materials. • Annual door-to-door blood survey and nursing follow-up. • Public education modules aimed at local schools, parent and service groups, and health care providers.	A reduction in blood lead (3.9 µg/dL average) in 2-year-old children was found at non-remediated yards; this reduction was associated with the implemented intervention and education program. Lead soil replacement at the neighborhood scale was twice as effective at reducing blood lead concentrations as cleaning up a single yard.	Sheldrake and Stifelman (2003)
Minneapolis, Minnesota (pregnant women and mothers of infants; inner-city, economically disadvantaged, ethnically diverse subpopulation)	University of Minnesota	• Blood samples drawn regularly from all children and homes were assessed for lead contamination. • Participants received state health department brochures about lead in their own language. • Knowledge of lead risks and prevention techniques was assessed periodically throughout study. • Intensive educational intervention was delivered to intervention groups only. Teachers met individually with intervention group participants in their homes to improve their knowledge and increase their capacity to reduce lead exposure in their children.	Higher education level in the mother promoted lower blood lead concentrations in children (<10 µg/dL on average and reduced the risk of a BLL greater than or equal to 10 µg/dL by about 34%). Education as primary prevention may not be sufficient to prevent lead burden in high-risk, low-income subpopulations (intervention not 100% effective). Certain factors can make an educational approach more effective: • intensity/duration of educational process • focus on a range of prevention strategies beyond housecleaning, tailoring the educational curriculum and delivery approach to specific ethnicities • facilitating a rapport between a consistent and dedicated peer teacher	Jordan et al. (2003)

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Site	Agency/ Organization	Education/Outreach Program	Comments	Reference
St. Francois and Jasper Counties Missouri	Multiple authors/ Missouri Department of Health and Senior Services	Combined tailored education, lead dust removal by trained cleaners, and family follow-up visits were compared to conventional health education programs.	BLLs decreased overall 1.54 µg/dL (12.1%) during the study.	Sterling et al. (2004)
East Helena Superfund site, Montana	ATSDR	Community outreach: Lead Education and Abatement Program.	Program's effectiveness was reviewed in 1999 and 2005.	ATSDR (2008a)

5.3 ATSDR Involvement and Other Health Education Partners

Additional benefits can be achieved through partnerships with local health districts that are better equipped to provide health education to benefit exposed community members. Local health districts will be knowledgeable about outreach methodologies that are best utilized in the area and other lead-related concerns that may be present in the community. Through collaboration with these local health districts (*e.g.*, county and state health departments), EPA can focus on cleanup activities while local health departments address health education at the site. The community can benefit from working with health agencies on further follow-up and understanding of other health concerns.

The EPA Superfund program does not conduct most health education activities. The project manager/site team (*e.g.*, RPM or OSC) often coordinates with the ATSDR and other various health agencies to establish health education programs on the risks of lead exposure and ways to prevent it (ATSDR 2022, 2008a, 2008b, Sheldrake and Stifelman 2003, ATSDR 2002). Health education programs are often implemented by local health districts that, in turn, may coordinate with schools and other community groups working with families and children. These education programs can be specific to affected residences or can be more community-wide around the site and may be part of a broader IC program. Initial tasks typically include educating the community regarding their lead exposure and associated health risks. The ATSDR ToxFAQ Fact Sheet on lead can be useful.[51] This work can take the form of risk communication, where the technical aspects of EPA's lead education program can be explained to the public. This can include explanations for the need to sample soil and indoor dust, characterize soil lead

[51] https://semspub.epa.gov/work/05/950630.pdf.

bioavailability, discuss specific risks with residents based on results, and generally describe hygiene in the home to reduce risks (ATSDR 2022).[52]

ATSDR, administered by the CDC, is the main federal agency that EPA Superfund collaborates with for health activities, including health education. ATSDR has a statutory role for evaluating health at Superfund sites through CERCLA and should be consulted for health education activities. ATSDR has developed relationships with many state and local health departments that may have blood lead screening and health education programs. In addition, ATSDR partners with academic institutions, non-profit agencies, and community groups. Increased collaboration among the involved agencies and engagement of local partners is critical to properly implement a health education program. ATSDR also has fact sheets to help educate the community on reducing risks from yards, gardening, home, etc., and has developed several fact sheets specifically for use at lead sites.[53]

5.4 Health Education Lessons Learned

The Advisory Committee on Childhood Lead Poisoning Prevention (ACCLPP) released its report to CDC in 2007 (ACCLPP 2007). The report was targeted to clinicians to help identify gaps in knowledge concerning blood lead levels <10 µg/dL. The report concluded that providing low-income parents with lead-related education was effective in increasing knowledge of lead in homes and helping families comply with lead preventative activities. The report concluded that education alone will not reduce BLLs. In another paper (Wasserman 2002), educational interventions via caregivers were examined to determine if BLLs could be lowered. The findings showed a significant difference in the BLLs between the first and second visit to the clinic. This helped to show that not only was lead education beneficial, but that clinician knowledge of lead poisoning prevention was additionally effective.

Centers for Medicare and Medicaid Service recommend that officials use a blood lead test to screen children when they reside in an older home, when they receive services through Medicaid or the Supplemental Food Program for Women, Infants, and Children (WIC), or when parents or guardians self-identify potential hazards through the administration of a risk questionnaire (Aoki and Brody 2018). Ideally, CERCLA risks are included in risk questionnaires, but experience shows that this is not always the case. Incorporating health provider education as part of the remedial process prevents potential oversight of CERCLA risks and helps ensure improved screening, surveillance, and risk identification.

[52] See also https://panhandlehealthdistrict.org/institutional-controls-program and https://thep.ca.
[53] https://www.cdc.gov/nceh/lead/prevention/sources.htm.

As discussed in this Handbook, LBP hazards, while generally not considered CERCLA releases, contribute significant risk to childhood lead poisoning. Discussion of LBP hazards can also be addressed in health education materials. Partnerships with federal and state partners like HUD and state health departments can augment health education by identifying the appropriate resources needed in the impacted community. Health disparities and inequities impact a community's ability to address comprehensive health risks (*CDC Environmental Justice Demonstration Index factsheet*[54]). For example, HUD's *Lead-Based Paint* and *Lead Hazard Reduction Grant Programs* are the country's largest programs that address LBP hazards. However, both programs require grantees to match funds at 10% and 25%, respectively. The minimum award is $1,000,000, which would require a community to match $100,000.[55] This can be a barrier in economically distressed or rural communities. Health education, combined with remediation activities, can be a useful tool in helping to reduce risk at lead sites in these communities.

5.5 Resources/Tools

- ATSDR's *Community Engagement Playbook* is a useful resource and tool that can be used throughout the community engagement process.[56] The Playbook describes various phases of the process and engagement activities that build community capacity by facilitating environmental health learning and community connections with other organizations.

- ATSDR's *Environmental Health and Medicine* education and training resources provide training for medical providers and other public health and environmental professionals. ATSDR's environmental medicine education products are accredited and free.[57]

- ATSDR also provides community environmental health presentations developed for general use and designed for health educators to use in face-to-face sessions with community members to increase environmental health literacy. Chemical-specific resources are available for lead and other environmental health topics.[58]

- ATSDR's *Environmental Health Resources Self Learning Modules* provide educational resources on a variety of topics including risk communication, risk assessment, toxicology, and land reuse.[59]

[54] https://www.atsdr.cdc.gov/placeandhealth/eji/fact_sheet.html.
[55] See HUD Office of Lead Hazard Control and Healthy Homes website, https://www.hud.gov/lead.
[56] https://www.atsdr.cdc.gov/ceplaybook/index.html.
[57] https://www.atsdr.cdc.gov/emes/index.html.
[58] https://www.atsdr.cdc.gov/emes/public/health_presentations.html.
[59] https://www.atsdr.cdc.gov/environmentaleducation.html.

- ATSDR's *Community Stress Resource Center* provides a framework and resources for reducing stress and building resilience as part of the public health response to environmental contamination.[60]

- ATSDR ToxFAQs, ToxZine, and Public Health Statements are useful tools that provide easy to understand information on the health effects of hazardous substances.[61]

- CDC's *Blood Lead Levels in Children* provides information on blood lead testing in children.[62]

- CDC's *Recommended Actions Based on Blood Lead Level* provides recommendations for follow-up and case management of children based on confirmed BLLs.[63]

[60] https://www.atsdr.cdc.gov/stress/index.html.
[61] https://wwwn.cdc.gov/TSP/ToxFAQs/ToxFAQsLanding.aspx, https://www.atsdr.cdc.gov/sites/toxzine/index.html, and https://wwwn.cdc.gov/TSP/PHS/PHSLanding.aspx.
[62] https://www.cdc.gov/nceh/lead/prevention/blood-lead-levels.htm.
[63] https://www.cdc.gov/nceh/lead/advisory/acclpp/actions-blls.htm.