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Investigating Hazardous Substance Exposures Associated with Mining or Smelting in U.S. Communities

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Communities across the United States face potential exposures to hazardous substances that originate from a variety of sources, including active and historic industrial facilities and hazardous waste sites. For communities living near sites associated with current or former mining or smelting operations, residents are at risk of exposure to toxic metals that have the potential to harm human health. (Eckel, Rabinowitz, & Foster, 2001; United States Environmental Protection Agency)

The Agency for Toxic Substances and Disease Registry (ATSDR) partners with government, academic, and community organizations to conduct hazardous waste exposure investigations (EIs) in U.S. communities. By characterizing environmental exposures to community members, ATSDR provides critical information to stakeholders that guides public health action including risk mitigation.

This article describes common themes and highlights best practices from ATSDR EIs conducted between 2010–2017 at current or former mining or smelting sites. Common themes were identified via review of final reports and unstructured interviews with staff who led or participated in the EIs.

Four EI sites met inclusion criteria (Table). All sites were located in rural areas and three were in the mountain states. One site had ongoing mining and smelting activity. Environmental sampling revealed elevated concentrations of heavy metals in air, soil, and/or water at all sites, with the most common contaminants being arsenic and lead. The primary routes of exposure were inhalation and ingestion. Vulnerable populations identified during the investigation included children, women of childbearing age, pregnant women, and persons with certain preexisting medical conditions.

Investigators employed a variety of strategies to overcome common barriers across sites, examples of which included scarce public health and community resources, socioeconomic disadvantage, and lack of stakeholder interest. Community engagement before, during, and after investigations was instrumental in promoting awareness, participation, and trust in ATSDR's findings. Effective communication strategies included hosting community meetings, conducting outreach through local media, and meeting individually with concerned citizens. Partnering with state and local officials, community leaders, school administrators, medical professionals, and other influential community members helped EI teams overcome logistical and other challenges. Finally, multi-agency collaboration in which

roles were clearly defined facilitated protocol implementation and the generation of timely reports.

Though the primary purpose of EIs is to provide information on human exposure to hazardous substances, examples from these investigations demonstrate their potential to impact public health beyond characterizing human exposure. EI findings stimulated public health surveillance activities, including residential lead inspections at one site and follow-up biomonitoring at another. One community used biomonitoring results to guide their decision on whether to pursue having their site listed on the National Priorities List. In another example, biomonitoring results were used to support a successful grant application for $5 million dollars to mitigate environmental hazards.

ATSDR exposure investigations provide a valuable service to communities whose exposure to contaminants from neighboring National Priority List sites is incompletely understood. Investigations that prioritize community engagement, partnership, and multi-agency collaboration are most likely to succeed in delivering meaningful results to stakeholders. By informing and supporting the need for community-level public health intervention, findings from exposure investigations have the potential to generate public health benefits for communities beyond their primary goal of exposure characterization.

References:

Eckel WP, Rabinowitz MB, & Foster GD (2001). Discovering unrecognized lead-smelting sites by historical methods. Am J Public Health, 91(4), 625–627. [PubMed: 11291377]

United States Environmental Protection Agency. (June 4, 2018). Superfund: National Priorities List (NPL) Retrieved August 1, 2018, from www.epa.gov/superfund/superfund-national-priorities-list-npl

Figure 1:
As of 2013, a slag pile measuring an estimated 21 million cubic-feet and containing hazardous levels of arsenic and lead sat within 200 feet of residences in Pueblo, Colorado.

Table:

ATSDR Exposure Investigation sites associated with mining or smelting activities – United States, 2010–2017

	Flat Creek Iron Mountain Mine and Mill[*]	Colorado Smelter[†]	Asarco Hayden Plant[§]	Former United Zinc and Associated Smelters[¶]
Location	Superior, MT	Pueblo, CO	Hayden and Winkelman, AZ	Iola, KS
Population within area of concern	893[**]	3,830[**]	Hayden 662, Winkelman 353[†]	5,875[††]
Dates of on-site investigation	Jul 2010	Sep and Nov 2013	Apr 2015	Dec 2016 and Oct 2017
Site history	Mine: 1888–1954	Smelter: 1883–1908	Mine: 1880-present Smelter: 1912-present	Smelter: 1902–1925
Contaminants	Antimony, arsenic, and lead	Arsenic and lead	Arsenic, cadmium, chromium, copper, and lead	Arsenic and lead
EPA National Priorities List (NPL) status	NPL: Sep 2009	NPL: Dec 2014	Superfund Alternative Process: Preliminary Assessment in 1988[§§]	NPL: May 2013

[*] www.atsdr.cdc.gov/HAC/pha/SuperiorMTEIReport/SuperiorMTHCEIReport03312011.pdf

[†] www.atsdr.cdc.gov/HAC/pha/ColoradoSmelter/ColoradoSmelter_%20HC-EI%20(final)_%2009–10-2015_508.pdf

[§] www.atsdr.cdc.gov/HAC/pha/AsarcoHaydenSmelterSite/AsarcoHaydenSmelterSite_HC_EI_03272017_508.pdf

[¶] www.atsdr.cdc.gov/HAC/pha/FormerUnitedZinc/Former_United_Zinc_EI-508.pdf

[**] 2000 U.S. Census

[††] 2010 U.S. Census

[§§] Draft Report: Remedial Investigation Report for the ASARCO LLC Hayden Plant Site: semspub.epa.gov/work/09/100005516.pdf.