

POLICY BRIEF FOR STATE LEADERS AND ADVOCATES:
Recommendations to Prevent and Mitigate the Effects of Lead Poisoning



Preventing lead exposure from all sources for all children born in 2018 could generate \$84 billion in future benefits,* including \$9.6 billion for state and local governments.¹

In August 2017, the Health Impact Project, a collaboration between the Robert Wood Johnson Foundation and Pew Charitable Trusts, released a report: *Ten Policies to Prevent and Respond to Childhood Lead Exposure*. The Trust for America's Health, National Center for Healthy Housing, Urban Institute, Altarum Institute, Child Trends and many researchers and partners contributed to the report.

The report notes that, in 2016, about 500,000 children ages 1 to 5 years had dangerously elevated blood lead levels.² And, while every child can be at risk and no level of lead in blood is safe,³ low-income and minority populations are more likely to live in older homes with lead paint, contaminated soil and lead pipes that leach into the drinking water.⁴

Lead poisoning is devastating for children and can lead to lifelong problems, including decreased IQs and poor academic

performance, memory and executive function. Even at very low levels, lead exposure affects impulse control and the ability to grasp information, making children more likely to struggle in school, drop out, get into trouble with the law and, later, underperform at work.⁵

Much can be gained from preventing lead poisoning, mitigating the effects and addressing disparities, but state and federal efforts have been largely fragmented and underfunded.⁶

* Cost data are not available for all the interventions that contribute to total prevention of lead poisoning. However, cost-benefit ratios are provided in the report for several strategies, including lead water line replacement, lead paint eradication, and lead-safe renovation and repair practices.

Societal Benefits of Prevention

Preventing lead exposure from all sources for the 2018 birth cohort could generate \$84 billion in future benefits, including \$9.6 billion for state governments. More children would thrive, resulting in improved high school and college graduation rates and leading to greater employment, higher lifetime earnings and significant savings in present and future healthcare, special education and criminal justice.

The report also found specific state interventions would have significant positive results.

The \$2.7 billion total includes health and education savings and increased tax revenue of \$250 million for states and municipalities

Total benefits equal \$320 million in state and local health and education savings and increased revenue.

Increased enforcement results in \$500 million in state and local health and education savings and increased revenue.

- **Removing Lead Water Pipes** from homes would protect more than 350,000 children and yield \$2.7 billion in future benefits (about \$1.33 per \$1 invested), including \$250 million for states and municipalities. The total includes health and education savings and increased tax revenue of \$250 million for states and municipalities
- **Eradicating Lead-Paint Hazards** from the homes of children from low-income families would protect more than 311,000 children and provide \$3.5 billion in future benefits (approximately \$1.39 per \$1 invested). The total benefits include \$320 million in state and local health and education savings and increased revenue.
- **Lead-Safe Contractor Practices:** Increasing enforcement of the Environmental Protection Agency's (EPA) Renovation, Repair and Painting (RRP) Rule would protect about 211,000 children in 2018 alone and provide future benefits of \$4.5 billion (about \$3.10 per \$1 spent). This includes \$500 million in state and local health and education savings and increased revenue.
- **Airplane Fuel:** In 2018, 226,000 children will be born and live near airports. Curtailing lead emissions from airplane fuel would generate \$262 million in future benefits and remove roughly 450 tons of lead from the environment every year.
- **Targeted Interventions:** Providing the roughly 1.8 million children with past lead exposure with targeted, evidence-based interventions could increase their lifetime family incomes by more than \$100,000.⁷

Ten State Level Policy Recommendations

1. Reduce lead in drinking water in homes built before 1986 and other places children frequent.

Removing lead drinking water pipes would protect more than 350,000 children and yield \$2.7 billion in future benefits, or about \$1.33 per dollar invested.⁸ Replacing lead service lines (LSLs) is the only permanent method to remove lead from drinking water.

- State governments should require all properties be tested for drinking water lead risks before sale or lease.
- States and EPA should require water utilities to submit plans for identifying and replacing all LSLs by 2019, including ways to reduce the costs for low-income customers.
- School districts and state child-care facilities should partner with the U.S. Department of Agriculture (USDA) to provide safe water.
- State Medicaid agencies should use the Children's Health Insurance Program (CHIP) funding to test and remedy lead in water in children's homes and child-care facilities.
- States should require schools and licensed childcare providers to

The EPA's Drinking Water State Revolving Loan Fund (DWSRF) offers one potential means of offsetting expenses. The program provides infrastructure grants for projects, such as facility upgrades to improve drinking water quality and installation of water storage tanks. Grant awards are based on the most recent Drinking Water Infrastructure Needs Survey and Assessment, and states must provide 20 percent in matching funds. As water systems repay loans, the principal and interest are directed back into the fund. In total, the DWSRF has provided over \$32 billion to water systems through nearly 13,000 grants.⁹

test for lead in drinking water and release findings. California and Rhode Island already require such tap testing, mandatory testing is in the works in Illinois, and Massachusetts appropriated \$2 million for voluntary testing.¹⁰



In November 2016, the Centers for Medicare & Medicaid Services (CMS) authorized an amendment to allow **Michigan's** Children's Health Insurance Program to pay for the replacement of water pipes and fixtures from the homes of low-income families with children, marking the first such approval. Eligible activities include initiatives targeted at improving the health of children, outreach, translation or interpretation services, payments for other child health assistance such as specialty care not included in the benefit package, and other reasonable administrative costs.¹¹ Properties in Flint with contaminated water receive first priority, and any property in the state with a resident under 19 who qualifies for Medicaid or CHIP is eligible.

2. Remove lead paint hazards from low-income housing built before 1960 and other places children spend time



Maryland requires owners of rental residences built before 1978 to register their properties with the state Department of the Environment each year to show that they are free of chipping, peeling paint and lead-contaminated dust. Since the law's enactment, in 1994, the rate of high blood lead levels in children has dropped by 98 percent.¹⁴ **New York** and **Rhode Island** have similar laws.¹⁵

More than half of the homes built in the United States before 1978 have some lead-based paint, and the share jumps to more than three-quarters for houses built before 1960. Nationwide, roughly 23 million houses have lead hazards such as peeling paint, contaminated dust or toxic soil, and about 1.1 million of these are home to children under six from low-income households. Minority children and those living in poverty have significantly higher average blood lead levels than their peers because they often live in dilapidated rental housing, which carry the greatest lead risks.¹²

By eradicating lead-paint hazards from the homes of children in low-income families, the nation would receive \$3.5 billion in future benefits, protect more than 311,000 children and generate \$1.39 for every \$1 invested.¹³

- States should work with the U.S. Department of Housing and Urban Development (HUD), EPA and the Center for Disease Control and Prevention (CDC) to replace windows coated with lead paint, fix peeling paint, clean up contaminated dust and treat toxic soil in and around affected homes.
- States and the U.S. Department of Energy should encourage lead-painted

windows to be replaced with energy-efficient models by including the benefits of preventing lead exposure in cost-effectiveness calculations.

- State governments should make lead-paint hazard control financially accessible by offering low-interest loans, tax credits and incentives to property owners.
- States should require housing inspections at regular intervals and the repair or removal of lead-paint hazards before a home is sold, rented or financed.
- State laws should mandate that all apartments in a building must be inspected if one apartment unit is found to have a lead hazard.
- State Medicaid agencies should pay for state health department environmental hazard testing of homes in high-risk neighborhoods. States should establish additional permanent sources of funding, other than Medicaid, for lead testing when affected children are ineligible for other state or federal funds.
- EPA and state and local governments should offer funding to schools and child-care providers to support lead-paint hazard identification and mitigation.



Often multiple cases of lead poisoning are tracked back to the same address. A study found that **Massachusetts** and **Ohio**,¹⁶ which mandate inspection and treatment of units with hazards, were 79 percent less likely than Mississippi, which lacks such a requirement, to have residential addresses that repeatedly contributed to high lead levels in children.¹⁷

3. Enforce the federal Renovation, Repair, and Painting Rule, requiring contractors to control the amount of lead dust and debris created by workers.

If the RRP were fully enforced, 211,000 children would be protected from lead poisoning in 2018 alone and the nation would reap \$4.5 billion in future benefits or about \$3.10 per dollar spent.¹⁸

- States and their EPA agency partners should ramp up investigations to ensure contractors comply with federal regulations and that contractors have the proper training and certification to minimize lead dust and debris. The EPA is responsible for enforcement in 36 states and has delegated this responsibility to 14 states— other states should follow suit so that they can enforce the EPA rule.
- Rhode Island¹⁹ and the District of Columbia require proof of appropriate EPA-compliant lead-remediation training before issuing a permit for work that is likely to disturb paint in housing built before 1978.²⁰
- States should apply for EPA funding to support compliance with the RRP Rule, including educating businesses and consumers about federal requirements and the dangers of unsafe renovation.
- States and EPA should emphasize enforcement for work at child-care facilities and housing built before 1960.

The return for every \$1 invested in safe renovation practices enforcement is \$3.10



4. Remove lead from food and consumer products.

Certain ethnic groups are at greater risk of exposure to lead in health remedies and consumer products than others. Lead and other heavy metals are sometimes added to traditional Chinese and Ayurvedic medicines used to treat ailments such as arthritis, upset stomach, teething and colic. Lead has also been found in some candies and spices, such as chili powder and tamarind, from Mexico.²¹

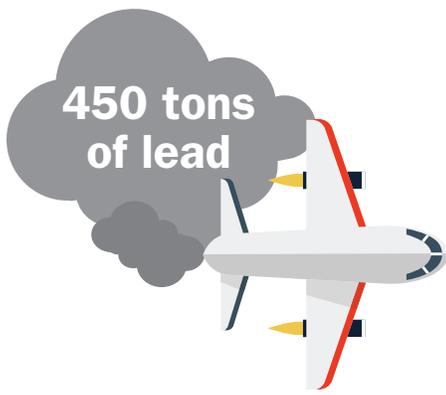
States and local agencies should take action in areas where local surveillance data show children are being exposed to lead from candy or other consumer goods. States should target education and outreach in at-risk neighborhoods and increase investigation and enforcement of small retailers.



“Companies need to stop making toys with lead.”

– Health Impact Project Focus Group Participant, Baltimore, Maryland.

Amount of lead emissions generated by piston engine aircraft per year



5. Reduce air lead emissions.

Aviation gas used by piston-engine aircraft (PEAs) is the nation's largest source of lead emissions into the air, at about 450 tons a year.²² Recently, the EPA found that about half of emissions remain in the vicinity of the airport—with approximately 16 million people living near airports and 3 million children attending school near an airport.²³

If the nation lowered lead emissions from aviation fuel, 226,000 children would be protected in 2018 alone and the nation would generate \$262 million in future benefits.²⁴

State and local governments should impose fees on airports serving aircrafts that use leaded gas and use the revenue to pay for the cleanup of soil in nearby neighborhoods, parks and school districts.

6. Clean up contaminated soil.

Children, who play in parks and around homes, even at schools and child-care facilities, come into contact with lead through soil. If there are elevated levels of lead in the soil, children can ingest it directly or track it into their homes. Soil can be contaminated from prior industrial uses, prior use of lead in motor vehicle gas, industrial emissions, leaded aviation gas, and lead paint dust from buildings.

One cross-sectional study of four inner-city child care facilities in New Orleans, which involved testing the hands of 40 children before and after they played outside, found that greater outdoor lead dust levels were correlated with higher levels on the children's hands.²⁹

State agencies should develop and fund a coordinated cleanup effort for contaminated neighborhoods. With



A lead-acid battery recycling plant in Boyle Heights, **California**, purchased by Exide Technologies in 2000, ran seven days a week, processing 25,000 batteries a day and emitting lead, arsenic and other cancer-causing pollutants.²⁵ In 2014, EPA found that Exide had violated the Clean Air Act emissions standards more than 30 times and was subject to fines of up to \$37,500 a day per violation, resulting in the plant's second temporary closure.²⁶ Under criminal investigation, Exide agreed to avoid prosecution in exchange for permanent closure and \$50 million to tear it down and clean the site, including \$9 million for removing lead from nearby homes.²⁷ In April 2016, California appropriated an additional \$177 million to cleanup about a 2-mile radius surrounding the plant and plans to seek reimbursement from Exide.²⁸

EPA, states should investigate lead levels in neighborhoods near former lead smelter sites and other industrial and hazardous waste facilities and convey their findings and in partnership with local, trusted organizations. According to EPA, more than 80,000 people

experienced elevated health threats from 15 secondary lead smelters located in 10 states and Puerto Rico.³⁰ These communities typically have a higher proportion of people of color and more Latino and Hispanic residents than the population as a whole.³¹

7. Improve blood lead testing among children at high-risk of exposure and find and remediate the sources of their exposure.

- State health departments should offer blood lead testing at clinics and schools and through mobile health units to improve access for at-risk families. The results should be shared with children’s pediatricians and other state agencies. Ten states and the District of Columbia require that every child be tested for lead.³²
- State Medicaid agencies should work with the Centers for Medicare & Medicaid Services to increase blood lead testing of Medicaid-enrolled children.
- State Medicaid agencies should pay healthcare providers an increased reimbursement rate for Early and Periodic Screening, Diagnostic and Treatment only if required blood lead testing is done.
- State Medicaid agencies should use CHIP funding to inspect the homes of lead-exposed children and to remediate identified paint, dust, soil and water hazards.
- States, in partnership with local agencies, should make available all information on leaded drinking water pipes, lead-contaminated water, dust, paint and soil in homes, schools, child-care facilities and other places children spend time.

Just 10 states require that every child be tested for lead.

8. Ensure access to developmental and neuropsychological assessments and appropriate high-quality programs for lead-exposed children.

By providing the roughly 1.8 million children with a history of lead exposure with targeted, evidence-based interventions, the nation could increase their lifetime family incomes by more than \$100,000.³³

Providing the roughly 1.8 million children with past lead exposure with targeted, evidence-based interventions could increase their lifetime family incomes by more than \$100,000.



- State agencies should partner with HHS and the U.S. Department of Education to improve access to high-quality education programs for children with a history of lead exposure.
- State education agencies should work with local health departments to identify children with a history of lead exposure or high blood lead levels and ensure they receive supports and services.
- State education agencies should modify programs under Part B of the Individuals with Disabilities Education Act (IDEA) to help local education agencies identify and provide interventions and accommodations for children affected by lead.
- State education services should presume that children with a history of lead exposure are eligible for early intervention services.
- State education agencies should modify their IDEA Part C programs so neurocognitive and developmental deficits of lead exposure qualify for services and should presume that children with a history of lead exposure are eligible for services.

9. Improve public access to local data.

States should require laboratories to submit all blood lead test results to state health departments so the information can be aggregated to assist with prevention and response efforts. States should also be required to report blood lead surveillance data to CDC.

And, states should, in partnership with local health agencies and their municipalities, make available property-specific information on leaded drinking water pipes and lead in water, dust, paint and soil of homes, schools, child-care facilities and other places where children spend time.

10. Fill research gaps to better target state prevention and response efforts.

States, along with federal and local agencies and philanthropic groups, should conduct small-area

population-based studies to identify risks and compare the findings to the general population.



Conclusion

Childhood lead poisoning is preventable.

Without lead exposure, hundreds of thousands of children would be more likely to reach their full potential in school and less likely to become teen parents or incarcerated or underperform in school and/or work.

While prevention of exposure from lead paint, lead water lines, and lead in air, soil, and consumer products is the priority, the best opportunity for children who have already been exposed³⁴ is for clinicians to follow blood lead testing guidelines and for local and state health agencies to eliminate further exposures. And, the nation must make available

evidence-based, high-quality childhood interventions that have been shown to reduce skill deficits and behavioral issues.

Along with social and educational benefits, eliminating lead could also yield \$84 billion in long-term benefits per birth cohort. States and localities would gain approximately \$9.6 billion for children born in 2018 alone.



CALIFORNIA LEADS THE WAY

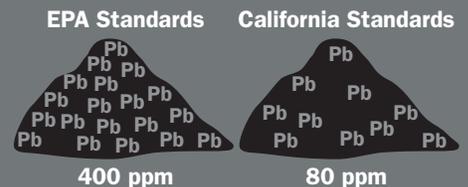
In some instances state laws and guidelines have outpaced the federal government. In the mid-1980s, the California state legislature declared that childhood lead poisoning was the state's most significant environmental health problem and launched a prevention program.³⁵

- In 1993, California began charging an annual fee to manufacturers who produced lead or products that contained lead, and facilities reporting releases of lead into the air. **The fee generated \$20.6 million in fiscal year 2015.**³⁶ **The money collected supports healthcare referrals, assessments of homes for hazards and educational activities.**
- California has led U.S. efforts to ban lead from a range of products beginning with a 1986 law, Proposition 65, which requires manufacturers, retailers and other businesses to notify consumers

when they are being exposed to toxic chemicals, including lead.³⁷

- Federal standards for paint, dust, soil, water and occupational hazards are 15 to 40 years old.³⁸ While EPA's soil lead standard is 400 parts per million (ppm), California's guideline, by comparison, is 80 ppm.³⁹
- California's 2006 Lead-Containing Jewelry Law requires jewelry that is sold, shipped or manufactured for sale in the state to meet specific limits.⁴⁰
- A 2010 California law restricts the use of heavy metals, including lead in motor vehicle brake pads, to no more than 0.1 percent by weight. Five years later, U.S. brake manufacturers agreed that all brake pads sold in the country will meet these California standards.⁴¹
- A 2013 state law required that only lead-free ammunition be used for hunting.⁴²

Guidelines for soil lead standards



Endnotes

- 1 Pew Charitable Trusts and Robert Wood Johnson Foundation, “Ten Policies to Prevent and Respond to Childhood Lead Exposure,” accessed June 12, 2017 <http://www.pewtrusts.org/lead>
- 2 William Wheeler and Mary Jean Brown, “Blood Lead Levels in Children Aged 1–5 Years — United States, 1999–2010,” *Morbidity and Mortality Weekly Report* 62, no. 13 (Apr. 5, 2013): 245–48, <https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6213a3.htm>.
- 3 Centers for Disease Control and Prevention, “What Do Parents Need to Know to Protect their Children?” accessed Jan. 27, 2017, https://www.cdc.gov/nceh/lead/acclpp/blood_lead_levels.htm.
- 4 U.S. Department of Housing and Urban Development, “American Healthy Homes Survey: Lead and Arsenic Findings” (2011). http://portal.hud.gov/hudportal/documents/huddoc?id=AHHS_Report.pdf.
- 5 Pew Charitable Trusts and Robert Wood Johnson Foundation, “Ten Policies to Prevent and Respond to Childhood Lead Exposure,” accessed June 12, 2017 <http://www.pewtrusts.org/lead>
- 6 Pew Charitable Trusts and Robert Wood Johnson Foundation, “Ten Policies to Prevent and Respond to Childhood Lead Exposure,” accessed June 12, 2017 <http://www.pewtrusts.org/lead>
- 7 Pew Charitable Trusts and Robert Wood Johnson Foundation, “Ten Policies to Prevent and Respond to Childhood Lead Exposure,” accessed June 12, 2017 <http://www.pewtrusts.org/lead>
- 8 Pew Charitable Trusts and Robert Wood Johnson Foundation, “Ten Policies to Prevent and Respond to Childhood Lead Exposure,” accessed April 26, 2017 <http://www.pewtrusts.org/lead>
- 9 Ronnie Levin et al., “Lead Exposures in U.S. Children, 2008: Implications for Prevention.”
- 10 Pew Charitable Trusts and Robert Wood Johnson Foundation, “Ten Policies to Prevent and Respond to Childhood Lead Exposure,” accessed June 12, 2017 <http://www.pewtrusts.org/lead>
- 11 Lead Service Line Replacement Collaborative, “State and Local Examples,” *Requiring LSL Replacement When Opportunities Arise*, accessed May 25, 2017, <http://www.lslr-collaborative.org/requiring-lsl-replacement.html>.
- 12 U.S. Department of Housing and Urban Development, “American Healthy Homes Survey: Lead and Arsenic Findings” (April 2011), http://portal.hud.gov/hudportal/documents/huddoc?id=AHHS_Report.pdf
- 13 Pew Charitable Trusts and Robert Wood Johnson Foundation, “Ten Policies to Prevent and Respond to Childhood Lead Exposure,” accessed April 26, 2017 <http://www.pewtrusts.org/lead>
- 14 Maryland Department of the Environment, “Lead poisoning cases drop in Baltimore and in Maryland, Department of the Environment moves to reduce potential exposures in more homes,” accessed Jan. 12, 2017, <http://news.maryland.gov/mde/2015/09/03/lead-poisoning-cases-drop-in-baltimore-and-in-maryland-department-of-the-environment-moves-to-reduce-potential-exposures-in-more-homes/>.
- 15 New York State Department of Health, “NYS Regulations for Lead Poisoning Prevention and Control—NYCRR Title X, Part 67,” accessed Jan. 13, 2017, https://www.health.ny.gov/regulations/nycrr/title_10/part_67/#sec67-2-6.
- 16 Chinaro Kennedy et al., “Primary Prevention of Lead Poisoning in Children: A Cross-Sectional Study to Evaluate State Specific Lead-Based Paint Risk Reduction Laws in Preventing Lead Poisoning in Children,” *Environmental Health* 13 (2014): 93. <http://dx.doi.org/10.1186/1476-069X-13-93>.
- 17 Chinaro Kennedy et al., “Primary Prevention of Lead Poisoning in Children: A Cross-Sectional Study to Evaluate State Specific Lead-Based Paint Risk Reduction Laws in Preventing Lead Poisoning in Children,” *Environmental Health* 13 (2014): 93. <http://dx.doi.org/10.1186/1476-069X-13-93>.
- 18 Pew Charitable Trusts and Robert Wood Johnson Foundation, “Ten Policies to Prevent and Respond to Childhood Lead Exposure,” accessed April 26, 2017 <http://www.pewtrusts.org/lead>
- 19 Lead Safe Renovation, Repair, and Painting,” Rhode Island Department of Health, accessed Jan. 13, 2017, <http://www.health.ri.gov/healthrisks/poisoning/lead/about/renovationrepairandpainting/>.
- 20 “All about Lead,” District of Columbia Department of Energy and Environment, accessed Jan. 13, 2017, <http://doe.dc.gov/lead>.
- 21 US Food and Drug Administration, “Kohl, Kajal, Al-Kahal, Surma, Tiro, Tozali, or Kwalli: By Any Name, Beware of Lead Poisoning,” accessed Mar. 6, 2017, <https://www.fda.gov/Cosmetics/ProductsIngredients/Products/ucm137250.htm>.
- 22 Unleaded AVGAS Transition Aviation Rulemaking Committee, “FAA UAT ARC Final Report Part I: Unleaded AVGAS Findings & Recommendations” (Washington, DC: Federal Aviation Administration, U.S. Department of Transportation, Feb. 17 2012), accessed January 27, 2017, <http://apbq.com/documents/FAA%20Final%20Report.pdf>.
- 23 Proposed Rulemaking on Lead Emissions From Piston-Engine Aircraft, 75 Fed. Reg. 81, (Apr. 28, 2010), <https://www.gpo.gov/fdsys/pkg/FR-2010-04-28/pdf/2010-9603.pdf>.
- 24 Pew Charitable Trusts and Robert Wood Johnson Foundation, “Ten Policies to Prevent and Respond to Childhood Lead Exposure,” accessed April 26, 2017 <http://www.pewtrusts.org/lead>
- 25 Tony Barboza, “How a Battery Recycler Contaminated L.A.-Area Homes for Decades,” *Los Angeles Times*, Dec. 21, 2015, <http://www.latimes.com/local/lanow/la-me-exide-cleanup-story-so-far-20151121-story.html>.
- 26 Jessica Garrison and Kim Christensen, “Vernon Plant Closed Over Toxics,” *Los Angeles Times*, Apr. 25, 2013, <http://articles.latimes.com/2013/apr/25/local/la-me-exide-arsenic-20130425>. Tony Barboza, “How a Battery Recycler Contaminated L.A.-Area Homes for Decades,” *Los Angeles Times*, Dec. 21, 2015, <http://www.latimes.com/local/lanow/la-me-exide-cleanup-story-so-far-20151121-story.html>.
- 27 Haley Branson-Potts, “Vernon Battery Recycler Cited by EPA for Excessive Lead Emissions,” *Los Angeles Times*, May 23, 2014, <http://www.latimes.com/local/la-me-0524-epa-exide-20140524-story.html>; Environmental Protection Agency, “Annual Air Quality Monitoring Network Plan,” Jul. 2015, <https://www3.epa.gov/ttn/amtic/files/networkplans/CASCAQMDPlan2015.pdf>.
- 28 “\$177 Million for Exide Cleanup Signed into Law,” *Southern California Public Radio*, Apr 20, 2016, <http://www.scpr.org/news/2016/04/20/59806/177-million-for-exide-cleanup-signed-into-law/>.

- 29 Latonia Viverette et al., “Environmental Health in Minority and Other Underserved Populations: Benign Methods for Identifying Lead Hazards at Day Care Centers of New Orleans,” *Environmental Geochemistry and Health* 18 no. 1 (1996): 41–45, <https://dx.doi.org/10.1007/BF01757218>; Howard W. Mielke et al., “The Urban Environment and Children’s Health: Soils as an Integrator of Lead, Zinc, and Cadmium in New Orleans Louisiana, USA.”
- 30 EC/R Inc., Memo, Prepared for EPA OAQPS, “Risk and Technology Review – Final Analysis of Socio-Economic Factors for Populations Living Near Secondary Lead Smelting Facilities,” memo (Chapel Hill: U.S. Environmental Protection Agency, December 2011), <http://earthjustice.org/sites/default/files/Leadsmltersocioeconomicanalysis.pdf>.
- 31 EC/R Inc., Memo, Prepared for EPA OAQPS, “Risk and Technology Review – Final Analysis of Socio-Economic Factors for Populations Living Near Secondary Lead Smelting Facilities,” memo (Chapel Hill: U.S. Environmental Protection Agency, December 2011), <http://earthjustice.org/sites/default/files/Leadsmltersocioeconomicanalysis.pdf>.
- 32 Jennifer Dickman, “Children at Risk: Gaps in State Lead Screening Policies,” (Washington, DC: Safer Chemicals, Healthy Families, January 2017), accessed Jan. 21, 2017, http://saferchemicals.org/sc/wp-content/uploads/2017/01/saferchemicals.org_children-at-risk-report.pdf.
- 33 Pew Charitable Trusts and Robert Wood Johnson Foundation, “*Ten Policies to Prevent and Respond to Childhood Lead Exposure*,” accessed April 26, 2017 <http://www.pewtrusts.org/lead>
- 34 Aaron Reuben et al., “Association of Childhood Blood Lead Levels With Cognitive Function and Socioeconomic Status at Age 38 Years and With IQ Change and Socioeconomic Mobility Between Childhood and Adulthood,” *The Journal of the American Medical Association* 317, no. 12 (Mar. 28, 2017):1244-1251, <http://dx.doi.org/10.1001/jama.2017.1712>.
- 35 Pew Charitable Trusts and Robert Wood Johnson Foundation, “*Ten Policies to Prevent and Respond to Childhood Lead Exposure*,” accessed June 12, 2017 <http://www.pewtrusts.org/lead>
- 36 S.K. Egan et al., “U.S. Food and Drug Administration’s Total Diet Study: Intake of nutritional and toxic elements,” *Food Additives and Contaminants* 19, no. 2 (2002):103–125.
- 37 Pew Charitable Trusts and Robert Wood Johnson Foundation, “*Ten Policies to Prevent and Respond to Childhood Lead Exposure*,” accessed June 12, 2017 <http://www.pewtrusts.org/lead>
- 38 U.S. Environmental Protection Agency, “Review of the National Ambient Air Quality Standards for Lead,” *Federal Register* 81, no. 201, Oct. 18, 2016, accessed March 9, 2017, <https://www.gpo.gov/fdsys/pkg/FR-2016-10-18/pdf/2016-23153.pdf>; U.S. Environmental Protection Agency, “Lead; Identification of Dangerous Levels of Lead; Final Rule,” 40 CFR Part 745, *Federal Register* 66, no. 4 (Jan. 5, 2001): 1206-1240, accessed Apr. 17, 2017, <https://www.gpo.gov/fdsys/pkg/FR-2001-01-05/pdf/01-84.pdf>; Code of Federal Regulations, Protection of Environment, title 40, part 141 (1991), <http://www.ecfr.gov/cgi-bin/text-idx?SID=531617f923c3de2cbf5d12ae4663f56d&mc=true&node=sp40.23.141.i&rgn=div6>; Department of Health and Human Services, National Institute for Occupational Safety and Health, “Occupational Safety and Health Guideline for Inorganic Lead,” 1988, accessed Apr. 17, 2017, <https://www.cdc.gov/niosh/docs/81-123/pdfs/0368.pdf>; “Citizen Petition to EPA Regarding the Paint and Dust Lead Standards,” (August 10, 2009): http://www.nchh.org/Portals/0/Contents/EPA_Lead_Standards_Petition_Final.pdf.
- 39 Pew Charitable Trusts and Robert Wood Johnson Foundation, “*Ten Policies to Prevent and Respond to Childhood Lead Exposure*,” accessed June 12, 2017 <http://www.pewtrusts.org/lead>
- 40 Center for Disease Control and Prevention, “Lead Poisoning Associated with Use of Litargirio – Rhode Island, 2003,” *Morbidity and Mortality Weekly Report*, March 11, 2005, <https://www.cdc.gov/mmwr/preview/mmwrhtml/mm5409a5.htm>.
- 41 California Department of Toxic Substances Control, “Brake Pad Legislation,” accessed Jan. 12, 2017, <http://www.dtsc.ca.gov/SCP/BrakePadLegislation.cfm>; U.S. Environmental Protection Agency, *Copper Mitigation in Watersheds and Waterways*, accessed Jan. 12, 2017, https://www.epa.gov/sites/production/files/2015-11/documents/copper_brakepads_mou.pdf.
- 42 California Fish and Game Commission, “Prohibition on the Use of Lead Projectiles and Ammunition Using Lead Projectiles for the Take of Wildlife,” accessed Jan. 12, 2017, http://www.fgc.ca.gov/regulations/current/mammalregs.aspx#250_1.



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