Regulatory Institutions, Immigration, and “Gentefication”: The Social-Ecological Context

Shaping Responses to Soil Lead Contamination in Southeast Los Angeles

Note. This manuscript is a work in process, and I look forward to the feedback of the Ostrom Workshop community. One area to highlight—this was my first attempt to begin transforming what was one part of my dissertation into a manuscript for publication. So, on that note, if you find that there are gaps in information—something that may have made a concept or the manuscript’s narrative arch clearer—that would be particularly helpful in addition to all other areas of feedback. Thank you!

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Abstract

In an embedded case study exploring the impact of the most notorious case of widespread soil lead contamination in the United States, we critically examine the social-ecological context shaping residents’ behavioral responses across seven communities in Southeast Los Angeles. Employing a multi-pronged data collection strategy including an embedded survey coupled with interviews, documentation, archives, observation-based data, we illuminate the institutional factors that influenced adoption of protective health behaviors, or more accurately, the lack thereof. While quantitative survey results indicated that neither objective nor subjective measures of soil lead contamination were associated with protective health behaviors, they can be contextualized within other forms of evidence that demonstrated how intersecting vulnerabilities such as fragile immigration status and a local housing crisis, as well as diminished trust in and efficacy of bureaucratic institutions, reduced most residents’ resistive, adaptive, and mitigative responses.

Key Acronyms

**DTSC** – Department of Toxic Substance Control. A unit of the State of California’s Environmental Protection Agency, DTSC’s (2020) mission includes “restoring contaminated resources, enforcing hazardous waste laws, reducing hazardous waste generation, and encouraging the manufacture of chemically safer products.” Its headquarters are located in Sacramento, California.

**PIA** – Preliminary Investigation Area. Also known as the Exide PIA, this is a geographic area determined by the DTSC as the largest area possibly affected by the Exide facility in Vernon. It is approximately 1.7 miles in radius from the former Exide facility. Roughly 10,000 properties are located within the PIA.

**PHB** – Protective Health Behavior. “Any activity undertaken by an individual, regardless of actual or perceived health status, for the purpose of promoting, protecting, or maintaining health, whether or not such behavior is objectively effective towards that end” (Nutbeam, 1998, p. 355).

**RSLC** – Representative Soil Lead Concentration. The DTSC defines RSLC as “the 95 percent Upper Confidence Level (UCL) calculated for the property or decision unit” (p. 9-4). In turn, the UCL reflects a conservative, adjusted mean of soil lead samples on the property so as account for uncertainty.

**SELA** – Southeast Los Angeles
Background

One of my questions when I would go to these meetings was, “Can you eat what we are growing?” And they were like, “Ah, kind of, like sure… well if it's grown on a tree or off the ground, yes, cause it's kind of magically purified, but if it's a herb or something growing in the ground, don't.” So, I literally had to stop. I have a little square back there where I would grow all my herbs and ground stuff. I had to stop doing that with my kids. You know, that was unfortunate. But it is what it is, I guess. Better safe than sorry.

This excerpt, reflecting an interview with a resident of Southeast Los Angeles, suggests a complex phenomenon at the intersection of public health and environmental justice. Across much of the Southeast Los Angeles region, thousands of residential properties near a former Exide Technologies battery recycling facility have been found to be contaminated with high levels of soil lead. In this case study, we seek to quantify the behavioral responses to this environmental hazard and critically examine the social-ecological context shaping residents’ adaptations to soil lead across seven communities.

Hazard underfoot: Soil lead in urban communities

As a neurotoxin, lead impacts nearly every system of the body and is particularly toxic to children; whereas adults absorb 8% of lead ingested, children retain approximately 50% (Mielke, Blake, Burroughs, & Hassinger, 1984). The nervous system represents the most prone organ system; even at low blood lead levels (≤5 µg/dL), outcomes include hearing loss, memory loss, hyperactivity (e.g. ADHD), and reduced academic performance, among others (Braun, Kahn, Froehlich, Auinger, & Lanphear, 2006; Flora, Gupta, & Tiwari, 2012; Lanphear, Dietrich, Auinger, & Cox, 2000). Additionally, relationships between blood lead levels and adverse societal outcomes have also been identified, including increased prevalence of behavioral or learning designations among children, decreased likelihood of graduating from high school, and criminal arrests into adulthood (Kauffman, 2013; Wright et al., 2008).
While lead is often associated with household elements (e.g. water, paint), decades of lead emissions deriving from industrial sites and historic use of tetraethyl gas in automobiles have resulted in the accumulation of lead outdoors in soil, which can also be carried indoors through airborne dust or via shoes, clothing, and pets. While outdoor emissions have greatly reduced, the lead deposited over several decades has remained in the soil, particularly in densely populated urban areas. Due to its geochemical immobility, lead in topsoil can persist long after its source has been eliminated and can become resuspended in the air, particularly in dry seasons and climates, representing an overlooked public health concern (Harris & Davidson, 2005).

Furthermore, the relationship between blood lead levels and soil lead concentrations at the community level has been supported for several decades (Aschengrau, Beiser, Bellinger, Copenhafer, & Weitzman, 1994; Morrison et al., 2013; von Lindern, Spalinger, Petroysan, & von Braun, 2003; Weitzman et al., 1993). More recently, Zahran et al. (2010) used the Hurricanes Katrina/Rita flooding to examine changes in children’s blood lead levels as a result of changes in topsoil composition, finding that blood lead levels decreased significantly in tandem with declines in soil lead concentrations.

**Southeast Los Angeles and Exide**

Consequently, the individual and community responses to soil lead represents the phenomenon of focus of this case study, which centers the seven communities around a former Exide Technologies lead battery recycling facility located approximately seven miles southeast of downtown Los Angeles. The facility had been a site of controversial lead smelting activities for decades, operating with a capacity to produce more than 100,000 tons of lead annually, or the equivalent of approximately 11 million automobile batteries (Johnston & Hricko, 2017; "Lead Smelter," 1976). While the Exide facility faced oppositions and charges of illegal emissions for
years, ultimately the publication of a 2013 regional air quality monitoring assessment—which estimated that as many as a quarter million residents had been exposed to lead and other chemical substances from the Exide facility and that these substances had deposited onto nearby residential soils—spurred its closure (Johnston & Hricko, 2017).

The Exide facility was located Vernon, California, a nearly entirely-industrial municipality, with fewer than 300 residents (Johnston & Hricko, 2017). However, the California Department of Toxic Substance Control (DTSC) defines the site’s greater Preliminary Investigation Area (PIA) to include approximately 10,000 properties of “sensitive land use” such as residential properties, parks, schools, and childcare centers across seven communities in the densely-populated Southeast L.A. (SELA) region, including neighboring Boyle Heights (L.A.), Maywood, Huntington Park, Commerce, Bell and unincorporated Los Angeles County (“East L.A.”) (URS, 2017). However, within SELA, the Exide facility does not represent the sole source of environmental hazards; the area has been burdened by (1) distributive forms of environmental injustice, in which the geographic distribution of hazardous and polluting sites consistently and disproportionately burden low-income communities and (2) procedural injustice wherein land use decision-making disenfranchise local residents, for decades. Consequently, the region has been characterized as one of the nation’s most egregious “human sacrifice zones” among environmental justice scholars (Bullard, 1993). Yet SELA communities have not been silent or inactive in response to these environmental health threats. The region is home to one of the most historically, highly-celebrated environmental advocacy groups, Mothers of East Los Angeles (MELA), which—among other initiatives—famously fought the siting of a hazardous waste incinerator during the late 1980s. More recently, community organizations such as East Yard Communities for Environmental Justice (EYCEJ) and Communities for a Better
Environment (CBE) have emerged as leaders in community organizing, activating against Exide and other polluting entities (Valdez, 2016). Nevertheless, decision-making authority at state and federal levels frequently limits efforts to achieve procedural justice.

The City of Vernon (Figure 1) largely exists to serve industry; its slogan is “Exclusively Industrial”. In 1949, while the cities of Los Angeles and Huntington Park set taxes at $1.63 and $0.92 per $100 of assessed property value, respectively, Vernon’s was set at $0.10. As a result, scholars and journalists have long characterized the city’s government as corrupt and solely responsible to its industries and the growth of its own tax base, rather than service to its small residential population (who are generally employees of the city), its thousands of workers who are employed in Vernon but live elsewhere, and surrounding communities.

![Figure 1](image_url)

**Figure 1.** Exide facility location and surrounding communities. From “Removal Action Plan (Cleanup Plan): Offsite Properties within the Exide Preliminary Investigation Area,” Prepared by URS for the California Department of Toxic Substance Control, p. 1-3. Reprinted with permission.
The residents of these communities have experienced direct effects of their proximity to Exide. Among the population surrounding the facility, a significant relationship has been identified between soil lead levels and levels of lead in children’s teeth, wherein prenatal lead tooth concentrations increased by 3.58 units and postnatal lead tooth concentrations increased 1.91 units for every 100ppm increase in soil lead, indicating an early footprint of environmental lead during prenatal and infant life stages (Johnston, Franklin, Roh, Austin, & Arora, 2019). Additionally in another report published by California state Childhood Lead Poisoning Prevention Branch (2016), 2.4% of the 11,702 children tested in the Exide vicinity indicated blood lead levels above 4.5μg/dL, and children in close proximity to the Exide facility were 50% more likely to have elevated blood lead levels than those living more than one mile away.

**Approaches to soil lead: Protective behaviors and cleanup**

Since 2016, local public health departments and regulatory agencies active in SELA have sought to stymy the effect of soil lead contamination through communication efforts targeting protective health behaviors and soil lead cleanup interventions. The federal EPA recommends several protective health behaviors for families to adopt to protect themselves from soil lead including removing or wiping shoes upon entry into one’s home, covering lead-contaminated, bare soil by planting grass, and refraining from ingesting soil that contains lead (Environmental Protection Agency, 2019). To better manage indoor dust, including that derived from outdoor sources, it is recommended to clean surfaces like windowsills and floors weekly with a damp sponge or mop. Other protective behaviors include frequently washing hands, washing objects that frequently come in contact with young children’s mouths (pacifiers, toys, stuffed animals), and maintaining healthy diets. Additionally, the Pennsylvania State report (2010) recommends protective actions while gardening in less contaminated soils (less than
400ppm), such as locating gardens away from roadways and older structures and washing plants for consumption carefully. At higher levels between 400-1,000ppm, mulching, restricting access, and growing fruiting crops (e.g. peppers, peas) is recommended. Above 1,000ppm of lead in soil, refraining from gardening as well as disallowing children’s or pets’ access to those areas is recommended. These represent individually focused, secondary interventions, targeting the adoption of protective health behaviors.

In contrast to interventions targeting individual behavioral change, other interventions to reduce the threat of elevated soil lead levels feature systemic solutions. In several urban communities, particularly those associated with EPA Superfund status, widespread, resource-intensive action has been taken, e.g. evacuation and demolishment of an affected site (Lyons, 2018). In other cases, the relevant regulatory agency has elected to remove and replace up to two feet of soil (Lyons, 2018). However, these interventions can cost tens of millions of dollars or more, prompting some researchers to point to interventions that have proven effective but less costly, such covering or capping contaminated yard soils with approximately six inches of lead-free soil (Filippelli & Laidlaw, 2010).

Within the Exide PIA, a series of protective health behaviors had been recommended over several years. Public health outreach and documentation identified flyers and other materials suggesting protective health behaviors from agencies such as the County of Los Angeles Public Health department. Additionally, as part of an intensive effort to conduct soil lead cleanup, as of January 2020, DTSC had sampled soil from 8,832 residential properties, notifying the property owner and/or resident of the results in a detailed packet. Of those sampled properties, DTSC had removed and replaced soil from 1,519 residences, targeting those households with the highest level of soil initially (e.g. >1,000ppm). Still as of that time,
1,130 households remained contaminated with Representative Soil Lead Concentration levels (RSLC) exceeding that of the federal EPA’s threshold for residential play spaces (400 ppm) (State of California, 2020).

The communities of the Exide PIA have been burdened by proximity to urban industrial zones for nearly a century. Additionally, lead-based air emissions have compounded the burden placed upon residents of the Exide PIA for decades, further exacerbating the region’s status as an environmental sacrifice zone. Consequently, this study seeks to determine the impact of objective and subjective measures of soil lead contamination on residents’ everyday protective health behaviors. Through examining relationships between 1) real and perceived levels of soil lead contamination and 2) protective health behaviors, this study seeks to shed light on the efficacy of secondary and tertiary intervention efforts, which scholars have suggested to be incongruous with health equity-oriented initiatives. Then, by illustrating residents’ daily life within the context of the political and social institutions that wield power in the Exide PIA, it seeks to illuminate the societal factors that have shaped life within SELA communities.

Data and Methods

Design and Data Collection

This study features an embedded multi-method case study design. Generally, case studies seek to analyze a phenomenon within its real-life context and rely on multiple sources of information. An embedded case study design incorporates “holistic data collection strategies for studying the main case and then call[s] upon surveys or other quantitative techniques to collect data about the embedded unit(s) of analysis”; a benefit of the embedded unit is that it facilitates sampling or cluster techniques which prevent “slippage” of the case, aiding to narrow a case study’s data collection (Yin, 2017, p. 66). Qualitative data included interview, documentation,
archival, and observation-based evidence. These multiple forms of qualitative data were employed to complement and provide greater context to the results of the embedded survey rather than solely seeking convergence. A summary of each form of data collected is outlined in Table 1.

Table 1

<table>
<thead>
<tr>
<th>Summary of data collection strategy</th>
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<tbody>
<tr>
<td>Data Type</td>
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<tr>
<td>Survey instrument</td>
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<tr>
<td>Interviews</td>
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<td>Archival records</td>
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<td>Direct Observation</td>
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</table>

Quantitative data collection was facilitated via a survey questionnaire which included questions regarding socio-demographic attributes, perceptions regarding local soil lead
environmental hazards, and protective health behaviors. Survey items were derived from previously published and validated scales, such as the National Kid Study (Larson, Green, & Cordell, 2011; Veitch, Salmon, & Ball, 2009). Environmental hazard perception items collected respondents’ perceptions regarding three levels of soil lead concern at (1) community hazard (2) property-level hazard and (3) household health risk perception levels. Protective health behavior items reflected household behavioral adaptations recommended by the state DTSC (2019) and County of Los Angeles Public Health department, sources that PIA residents may have come in contact with in order to identify ways to minimize soil lead exposure. After a process of expert review, six cognitive interviews were conducted which further refined the survey instrument (Dillman, Smyth, & Christian, 2014).

A stratified random sample was used to collect data from non-remediated properties within the PIA. This sampling strategy allows for more equal distribution of surveys to households within four RSLC categories and three child statuses. The sampling frame consisted of a random selection of residents representing properties who have undergone soil lead testing per their inclusion in the DTSC table of sampled properties. Among those properties listed, sampling from properties who (1) are coded as residential (2) were tested for lead in the soil, and (3) had not undergone cleanup were included. The 400 surveys, as outlined in Table 2, represent 5.6% of the properties in the sampling frame. A match was attempted to be made between all non-remediated residential properties listed in the DTSC soil sampling table and the name of the property’s resident; a best practice in establishing authenticity and reducing distance between participant and researcher (Dillman & Smith, 2014). Marketing Systems Group was contracted to provide this service; they also appended an indicator representing
whether the matched residence was believed to include a child between ages 0-6 or 7-17 to facilitate the stratified sampling strategy.

Survey data collection utilized a multimodal strategy, including in-person, door-to-door data collection, requesting that the questionnaire be completed in situ or returned via mail, as well as mailed survey packets which included postage-paid return envelopes. Surveys were distributed in English and Spanish and were developed under a process of translation and backtranslation to ensure meaning accuracy. During the first five days of data collection, 177 survey instruments were distributed according to this plan, resulting in 29 initial responses. However, by mid-March of 2020, data collection was adjusted to minimize person-to-person contact as a result of the Spring 2020 novel coronavirus pandemic. Consequently, the remaining 223 survey instruments packets were distributed through first-class mail, which resulted in an additional thirty-three surveys returned as of mid-April 2020.

Table 2

<table>
<thead>
<tr>
<th>RSLC Level</th>
<th>Households with no child present</th>
<th>Presence of child less than 6 years old</th>
<th>Presence of child 6-17 years old</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>RSLC ≥ 1,000ppm</td>
<td>42</td>
<td>6</td>
<td>3</td>
<td>51</td>
</tr>
<tr>
<td>RSLC 400-999ppm</td>
<td>53</td>
<td>46</td>
<td>19</td>
<td>118</td>
</tr>
<tr>
<td>RSLC 80-399ppm</td>
<td>51</td>
<td>52</td>
<td>52</td>
<td>155</td>
</tr>
<tr>
<td>RSLC &lt; 80ppm</td>
<td>51</td>
<td>13</td>
<td>12</td>
<td>76</td>
</tr>
<tr>
<td>Total Surveys</td>
<td>197</td>
<td>117</td>
<td>86</td>
<td>400</td>
</tr>
</tbody>
</table>

Seeking to further understand the lived experience of PIA residents, particularly families with children, three groups of initial interviewees were selected through theoretical sampling that initially incorporated criterion-based selection: Adults representing households with children, adults representing households without children, and institutional representatives.
Institutional representatives were recruited from organizations including local research institutions, government entities and contractors, and well as environmental advocacy groups. However specific organizations were not identified by name to protect confidentiality of participants. Additionally, in this manuscript, we use the term “institutional representative” rather than “stakeholder,” as the latter designation suggests that an individual, such as a PIA resident, may or may not be a key “stakeholder.” Instead, the former seeks to indicate that an individual can represent an institution through formal or informal membership (e.g. a church, a workplace) while also holding other identities or affiliations.

Residents and individuals representing PIA institutions were initially recruited with the help of local informants. This process resulted in eight initial interviews, five with local residents living in the PIA and three individuals representing institutions. Additional individuals representing eleven institutions, such as the medical community and lead-acid battery recycling industry, were solicited via email or phone call; ultimately three consented to and participated in an interview. Community members and local residents were also recruited for interviews during an initial pilot survey (that had been sent to 100 households) and personal connections made with individuals during participant observations within the PIA. As a whole, this multi-pronged strategy has resulted in 16 interviews meeting the outlined criteria. Most interviews reflected a semi-structured interview format; questions represented each dimension of the four-level socio-ecological model of factors affecting health (Department of Health and Human Services, 2013). However, the order and exact wording of questions differed in each interview; and some questions were omitted, others added. Interview protocols with individuals representing institutions adopted a bespoke approach, customized to each institution.
Three additional forms of qualitative data were collected to augment the survey and interview data: Observation, archives, and documentation. Non-intrusive observation of daily activities and facilities within the PIA were conducted. Informal observations took place along urban streets and designated public recreation spaces (i.e., public parks) on weekdays and weekends as well as at various times of day (mid-afternoon, and evening). Some observations reflect informal observations, based on field notes reflecting locations such as local dining establishments, church service attendance, and at invited social gatherings. Additionally, door-to-door recruitment of participants for the survey instrument facilitated neighborhood observations throughout the PIA. Several forms of archival evidence (generally quantitative, inaccessible files and records) were employed in the initial design and subsequently study; these included public health and demographic reports published by government entities, as well as documents requested through public record requests. Documentation evidence representing (1) news media publications and (2) publicly available updates, reports, and resources of government agencies were employed to corroborate other forms of evidence (Yin, 2017).

All protocols were approved by and are on file through the Indiana University’s Institutional Review Board (Protocol #1909049024).

Framework & Variables

This study employs The Department of Health and Human Services’ (2013) four-level social-ecological framework; those levels consider and examine individual, relationship, community, and societal factors that shape health outcomes. The application of the four-level socio-ecological model aligned well with a critical paradigm that seeks to understand how reality has been “shaped by congeries of social, political, cultural, economic, ethnic, and gender factors” (Guba & Lincoln, 1994, p. 110). The practice of developing health-promotive interventions using
a social-ecological framework contrasts with the field of public health’s more recent shift in the past fifty years to a focus on individual behaviors (Markowitz & Rosner, 2014; Stokols, 1992).

Data collected via the embedded survey instrument reflects that which were analyzed quantitatively; predictor variables included objective and subjective measures of soil lead, i.e., RSLC level and the three soil lead perception measures in addition to select socio-demographic variables. The latter three perception measures collected data on a 6-pt very low to very high scale in response to (1) “I think that the seriousness of the soil lead contamination in my community is…” (2) “I think that the seriousness of the soil lead contamination of my household’s property is…” and (3) “I think that the risk of soil lead pollution on my household’s health” is…”. The dependent variable reflects a score of respondents’ self-reported Protective Health Behaviors, coined PHB Score. While the survey instrument inquired regarding sixteen behavioral practices, seven were ultimately included in the summative PHB Score; the first five represent (1) Removal of shoes when entering the home, (2) washing hands after coming indoors, (3) washing hands prior to eating or drinking (4) cleaning floors with a wet mop, and (5) cleaning interior surfaces with a damp cleaning material. An additional two items each reflected a maximum score of several items, e.g. (6) the maximum score on gardening-related items and (7) the maximum score on treatment of bare soil items.

**Analysis**

Prior to analysis, results were screened for outliers and evaluated based on the relevant assumptions. Then, descriptive data was summarized, with emphasis on the reported frequency of each individual protective behavior. Bivariate correlations were examined to identify relationships between the PHB score and each of the objective and subjective contamination measures. Additionally, inferential analysis of the PHB dependent variable used univariate
ANOVA and independent sample t-tests—or the applicable nonparametric test—to determine if differences occurred in PHB scores based on socio-demographic variables. Finally, a multiple linear regression evaluated the relationship between the summative household protective behavior score (dependent variable) and (1) RSLC level, (2) subjective soil lead health perception and (3) select socio-demographic factors.

In a continuous process, organization of interview transcripts was completed with the aid of Dedoose software. Then, a heuristic approach of identifying segments, or units, in the data was initiated. These units were developed during a process of open coding, which categorized units based on a (1) inductive approach and (2) a deductive approach which labeled units of data according to the four levels of the theoretical framework. This was followed by a process of grouping the open codes, i.e. axial coding, to reflect interpretation and meaning and ultimately identify themes. Documentation, archival, and observation-based data were employed to further substantiate and illuminate context and meaning derived from the survey and interview results.

**Results**

Results of survey data reflect no statistically significant relationship between objective or subjective measures of soil lead contamination and protective health behaviors. However, this lack of relationship does not imply that residents, through an informed, cognitive process, intentionally do not adopt protective health behaviors in light of an environmental hazard, as survey results also indicated that only nine percent (n = 5) were able to correctly identify their property’s RSLC range value when provided a list of options, sixteen percent (n = 9) incorrectly identified their property’s RSLC range value, and seventy-nine percent (n = 44) were uncertain, selecting “I don’t know.” Providing crucial context to these results, multiple forms of qualitative
data indicated that inadequacies in regulatory agencies’ testing and communications, fragile tenancy and housing options, as well as residents’ immigration status contextualized the lack of clear behavioral adaptations to soil lead, which further sheds light on the efficacy of secondary and tertiary intervention efforts.

Among survey responses, 56/500 (14%) responded with a complete survey questionnaire. Respondents represented properties with a range of RSLC levels (representing objective soil lead levels): Eighteen percent (n = 10) of respondents represented properties with an RSLC between 0-79ppm, forty-six percent (n = 26) represented households with an RSLC of 80-399ppm, twenty-seven percent (n=15) represented households with an RSLC of 400-999ppm and nine percent (n=5) represented households with an RSLC greater than 1,000ppm. After identification of one outlier (RSLC of 23,222ppm), and replacement via winsorization, the average RSLC of respondents was 451.9ppm (SD = 555.7).

**Protective Health Behaviors in the Exide PIA**

Descriptive analysis of each self-reported PHB response represented a range of behavioral adoption rates (Table 3). Notably, hand-washing behaviors, food washing behaviors, and cleaning behaviors (e.g. wiping surfaces and mopping floors) were amongst the most-frequently reported behaviors, each with a mean self-reported frequency response greater than 4 on a 5-pt scale.
<table>
<thead>
<tr>
<th>Protective Health Behavior</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wipe off shoes when entering the home</td>
<td>1</td>
<td>5</td>
<td>3.46</td>
<td>1.51</td>
</tr>
<tr>
<td>Remove shoes when entering the home</td>
<td>1</td>
<td>5</td>
<td>1.98</td>
<td>1.23</td>
</tr>
<tr>
<td>Keep pet(s)’ feet clean</td>
<td>1</td>
<td>5</td>
<td>2.86</td>
<td>1.36</td>
</tr>
<tr>
<td>Wash hands after coming in from outside</td>
<td>3</td>
<td>5</td>
<td>4.55</td>
<td>0.69</td>
</tr>
<tr>
<td>Wash hands prior to eating or drinking</td>
<td>1</td>
<td>5</td>
<td>4.75</td>
<td>0.81</td>
</tr>
<tr>
<td>Avoid eating vegetables or fruits from your garden or those produced locally</td>
<td>1</td>
<td>5</td>
<td>2.16</td>
<td>1.48</td>
</tr>
<tr>
<td>Grow fruits and vegetables in containers¹</td>
<td>1</td>
<td>5</td>
<td>2.37</td>
<td>1.61</td>
</tr>
<tr>
<td>Buy soil for gardening instead of using soil in your yard¹</td>
<td>1</td>
<td>5</td>
<td>3.04</td>
<td>1.41</td>
</tr>
<tr>
<td>Wash fruits and vegetables that are grown in my yard before eating¹</td>
<td>2</td>
<td>5</td>
<td>4.90</td>
<td>0.50</td>
</tr>
<tr>
<td>Avoid areas of bare soil around the property²</td>
<td>1</td>
<td>5</td>
<td>2.96</td>
<td>1.62</td>
</tr>
<tr>
<td>Cover areas of bare soil²</td>
<td>1</td>
<td>5</td>
<td>2.98</td>
<td>1.52</td>
</tr>
</tbody>
</table>

Measured on 1-5 Likert scale (Never, Rarely, Sometimes, Very Often, Always)

<table>
<thead>
<tr>
<th></th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clean floors with a broom or vacuum</td>
<td>3</td>
<td>5</td>
<td>4.73</td>
<td>0.49</td>
</tr>
<tr>
<td>Clean floors with a wet mop</td>
<td>4</td>
<td>5</td>
<td>4.57</td>
<td>0.50</td>
</tr>
<tr>
<td>Clean interior surfaces with dry dusting materials</td>
<td>1</td>
<td>5</td>
<td>3.85</td>
<td>1.13</td>
</tr>
<tr>
<td>Clean interior surfaces with damp materials</td>
<td>1</td>
<td>5</td>
<td>4.09</td>
<td>0.96</td>
</tr>
<tr>
<td>Wash children’s toys</td>
<td>1</td>
<td>5</td>
<td>3.30</td>
<td>1.22</td>
</tr>
</tbody>
</table>

¹The maximum of these values (up to a value of 5) was used in the summative scale.
²The maximum of these values (up to a value of 5) was used in the summative scale.

Items in italics represent items not included in the summative household behavior score. They represent items that will be used for descriptive comparison. Grey shading reflects value of cell (higher mean Likert score is represented by darker shading).
The summative PHB score was calculated in accordance with the outlined protocol, wherein the maximum possible PHB score was 35. The mean PHB score among survey respondents was 28.0 (SD = 3.31). Following this, relationships between the summative PHB scores and objective soil lead levels were evaluated. Initially, a Pearson correlation between PHB and RSLC (in ppm) indicated essentially no significant relationship ($r = 0.053$, $p = 0.946$).

However, given that many residents and institutional representatives made meaning out of specific RSLC level cut-offs, PHB score was also evaluated based on the four substantive RSLC levels: 0-79 ppm ($M = 27.4$, $SD = 3.31$), 80-399 ppm ($M = 28.2$, $SD = 3.56$), 400-999 ppm ($M = 27.7$, $SD = 3.20$), and 1000 ppm and greater ($M = 29.2$, $SD = 3.42$). A one-way ANOVA evaluated differences in PHB summative scores by RSLC level of the property. Similar to the results of the bivariate correlation, results of the one-way ANOVA did not indicate a statistically significant difference in PHB score across the four RSLC levels $F_{3,55} = 0.397$, $p = 0.755$, $\eta^2 = 0.022$. In addition to determining if significant differences in the summative PHB score occurred between objective soil lead levels (via RSLC), bivariate relationships between the summative PHB score and the four three subjective, perception-based soil lead measures were evaluated. Those results, indicating negative but non-significant relationships between PHB scores and all objective and subjective soil lead measures, are outlined in Table 4.
Table 4

Bivariate correlations between PHB and objective and subjective soil lead measures, n = 56

<table>
<thead>
<tr>
<th></th>
<th>PHB score</th>
<th>RSLC level (in ppm)</th>
<th>Community hazard perception</th>
<th>Property hazard perception</th>
<th>Household health risk perception</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHB score</td>
<td>1</td>
<td>0.053</td>
<td>-0.043</td>
<td>-0.126</td>
<td>-0.004</td>
</tr>
<tr>
<td>RSLC level (in ppm)</td>
<td>1</td>
<td>0.164</td>
<td>0.074</td>
<td>-0.042</td>
<td></td>
</tr>
<tr>
<td>Community hazard perception</td>
<td>-</td>
<td>1</td>
<td>0.573**</td>
<td>0.534**</td>
<td></td>
</tr>
<tr>
<td>Property hazard perception</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>0.785**</td>
<td></td>
</tr>
<tr>
<td>Household health risk perception</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
</tbody>
</table>

** indicates p < 0.01

Then, a series of tests were run to evaluate between-group differences for the five, independent socio-demographic factors, to determine if significant differences occurred in summative PHB scores. No statistically significant difference in PHB score was identified based on education, gender identity, presence of child ages 0-5 or 6-17; however, there was a statistically significant difference in PHB score based on language ($t_{54} = 1.368$, $p = 0.018$, $g = 0.657$), wherein Spanish-language respondents had a significantly higher PHB score ($M = 29.08$, $SD = 2.86$) than English-language respondents ($M = 27.03$, $SD = 3.33$).

A series of bivariate regression models between several independent variables and PHB was conducted to further inform the selection of predictor variables in a multivariate model (Table 5). Five variables were selected for the combined model: RSLC objective level, household health risk perception, as well as education level, language of survey, and presence of child age 0-5. While community hazard and property hazard perceptions indicated stronger correlations (albeit, not significant) with PHB score, household health risk perception was
included in the combined model based on substantive reasons: This subjective measure reflected respondents’ perceived household health risk, which aligned with the outcome variable of PHB score. Additionally, its inclusion (in comparison with the other two subjective measures) neither influenced model outcomes (significance of predictor variables) nor improved fit markedly.

Results of the multivariate model further substantiated that completing the survey in Spanish rather than English results in an approximate 3-point increase in summative PHB score, after controlling for other factors ($p = 0.010$). Additionally, respondents representing households with at least one child ages 0-5 corresponded with an approximate 2-point increase in PHB score ($p = 0.039$), holding all else constant. The overall model fit indicated that the five variables analyzed accounted for 19.3% of the variance in PHB ($R^2 = 0.193$, $F_{50,5} = 2.388$, $p = 0.051$).

Table 5

| Regression analysis of predictors of PHB Score, n = 56 |
|-----------------------------------|-------------------|-------------------|-------------------|-------------------|
|                                   | Univariate        | Response Variable: PHB | Multivariate       |
|                                   | $\beta$           | $p$                | $\beta$           | CI (95%)          | $p$              |
| RSLC objective level (in ppm)$^1$ | 0.053             | 0.697              | 0.093             | (-0.001 - 0.002)  | 0.478            |
| Community hazard perception       | -0.043            | 0.755              |                   |                   |                  |
| Property hazard perception        | -0.126            | 0.353              |                   |                   |                  |
| Household health risk perception$^1$ | 0.004             | 0.974              | 0.106             | (-0.401 - 0.910)  | 0.439            |
| Education level (some college or more)$^1$ | -0.146             | 0.284              | 0.186             | (-1.273 - 3.676)  | 0.334            |
| Gender (female)                   | 0.016             | 0.905              |                   |                   |                  |
| Language of survey (Spanish)$^1$  | 0.316             | 0.018              | 0.506             | (0.824 – 5.722)   | 0.010*           |
| Presence of child Age 0-5$^1$     | 0.212             | 0.117              | 0.276             | (0.123 – 4.361)   | 0.039*           |
| Presence of child Age 6-17        | -0.029            | 0.833              |                   |                   |                  |

$^1$ Included in multivariate model


Institutional Communication and Soil Sampling Efficacy

Interview and other supporting data substantiated and added key context to results of the survey instrument data. As noted previously, a large majority of respondents did not know their property’s RSLC level when presented with a list of ranges, and approximately 20% misidentified their property’s RSLC level, indicating that PHBs were unlikely to have been influenced by residents’ understanding of their property’s soil lead hazard. Interview evidence substantiated quantitative results: Among residents interviewed, most had not heard of the Exide soil lead contamination issue or could not recall their property’s sampling results.

To that end, the complexity of information shared in the sampling packets by the DTSC may have played a role in the inability of respondents to correctly identify their property’s RSLC level when prompted with a range of options. Upon review of two redacted sampling reports acquired through a public records request, their length and structure appear to have contributed to residents’ lack of understanding. One sampling report was 112 pages long, and the other was 79 pages long. In each, a property’s 95% UCL—a term frequently used interchangeably with RSLC—was obscured approximately halfway through the document. Furthermore, no interpretation connecting the 95% UCL value to the “RSLC” term/acronym—which was how DTSC prioritized and communicated homes for cleanup—was identified in the reports, illustrating an important gap in communication. Additionally, the sampling packets recommended that residents review the maps which indicated individual soil sample locations collected in in their yard, suggesting that residents minimize exposure to or avoid those areas associated with specific sampling results. However, given the heterogeneity of soil lead, this guidance is incongruent with general understanding of soil lead properties (Schwarz, Cutts, London, & Cadenasso, 2016).
Additionally, lack of understanding or knowledge of the contamination sometimes contributed to the complexity of the soil sampling results. This was reflected in one conversation with a PIA resident who had been hired as part of a contractor team to conduct soil sampling. In that role he also recruited properties for sampling. He described these conversations with fellow PIA residents as,

There were people like, “yeah, I have my packet, but nobody has come to explain what the stuff says.” …Because not a lot of people who like live in the community, know what 400 ppm is, or 800 ppm is, so they're like, “I have this number, but I don't really know what to do with it.”

This description of the community’s soil lead knowledge contrasted with the description of outreach efforts provided by a public health official, who characterized the community as,

Definitely fatigued and saturated. That's what they say. They're tired of us coming to their door. They're tired of talking about it. They're tired of hearing how overburdened they are. Like they just kind of want to live their life. Right? …But they also don't want to feel like they're in this dangerous, contaminated place. So it's trying to find that balance in that community.

Indeed, Los Angeles County’s public health department has deployed several resources within the Exide PIA during the past five years, ranging in breadth from distribution of physical pamphlets to the facilitation of 93 outreach events providing free blood lead testing (Los Angeles County, 2019). Notably, the one survey conducted by Los Angeles County Department of Public Health found that 65% of respondents had not received, or were uncertain whether they have received, soil testing results, compared to the 91% in this study—surveyed two years later—who did not know or incorrectly identified their result (Los Angeles County, 2017). The county’s public health survey also reported that nearly three-quarters of residents knew about the Exide contamination and clean-up efforts (Los Angeles County, 2017); these findings are incongruous with our interview data which generally indicated a lack of knowledge or understanding about
Exide. It is possible that several factors have resulted in this discrepancy. First, resident turnover in the community may result in a lack of knowledge; one interviewee who had bought property within the PIA during the past three months had no knowledge of Exide or the soil lead issue. Additionally, this survey found that households were generally large (46% of those surveyed reported more than 5 people living on the property). It is possible, then, that while one household member may have received or understood the soil sampling results, this knowledge may not have been shared. These forms of evidence indicate weakness in public health approaches that prioritize adoption of protective health behavior, rather than interventions focused on primary prevention.

Among the subset of interviewees who did understand the soil lead issue associated with Exide, nuances were illustrated with regard to adoption of PHB. One resident shared that while they received multiple mailed flyers updating their household on general funding and cleanup efforts taking place, they received no literature with respect to protective health behaviors. Furthermore, in conversation with the PIA resident who had been hired to conduct soil samples, he noted that the protective behaviors required while working were incongruent with his longstanding, everyday behavior,

There was a special restroom just for cleaning yourself [at the end of a shift] …They tried to keep us safe. They gave us [plastic] booties [to wear over boots]. In my head, it wouldn't make sense, because I live here, I run around the yard all the time, so it's like [stepping] into another neighbor's yard. But I have to wear these plastic bags on my boots because they want to take precautions, and that's good. But I was raised here, so it's a different mentality.

Still, a smaller subset of PIA residents interviewed specifically expressed concern regarding the impact of the contamination on children’s health and wellbeing. One PIA resident, who frequently provided childcare for two young children, explained, “I’ve always been worried about washing their hands, even though I know that that's something that kids should do often.”
Furthermore, other socio-demographic characteristics may well support the quantitative data results, such as the role of language (Spanish) in predicting more frequent adoption of PHBs (Table 5). Among PIA residents interviewed, two individuals who were interviewed in Spanish noted that cleaning was a routine part of their morning, before many other tasks.

Finally, a weakness rooted in secondary and tertiary prevention is the inability of regulatory agencies to right a wrong equitably, particularly the most vulnerable community members. Our study only surveyed residents who had their soil tested, omitting the responses of property owners who had not consented to testing. Under this system, vulnerable groups such as all residents of public housing units (Housing Authority of the City of Los Angeles, HACLA) had not undergone testing or cleanup, as HACLA still had not yet reached an agreement with the DTSC regarding soil testing access as of March 2020, several years after soil sampling had begun. As a result, it is likely that many public housing residents were unaware of the proximate hazard.

**Fragile Tenancy and Housing Options**

Flaws in the soil sampling strategy align a second weakness in DTSC’s soil sampling approach, wherein property ownership status was identified as a contributing factor to the degree of access to soil lead information. One resident who rented a duplex did not recall receiving the soil sampling results, instead suggesting that their landlord received the results. Another PIA resident identified the role of power in the landlord/resident relationship represented a barrier to soil sampling itself, suggesting that many members of the community were fearful of consenting to the sampling in the first place, out of concern of angering a landlord, and consequently, losing their affordable housing:
They [don’t] want to get in trouble with the, with the homeowner. I think a lot of people are scared that they will be kicked out and that they'll have to search somewhere else if they do something wrong. So, they will always, you know, think about the homeowner first.

This role of fragile tenancy, coupled with tenuous immigration status among many residents of Southeast Los Angeles, was a recurrent theme. Coupled with the inequitable industrial burden in Southeast Los Angeles is a systemic housing crisis in Los Angeles County, a crisis that has worked in tandem with PIA residents’ immigration statuses to reduce the effectiveness of soil lead mitigation and community outreach efforts. Respondents’ inability to recall their property’s soil lead sampling results is likely—in part—attributable to the inaccessibility of the sampling results for many residents. Another interview succinctly characterized the augmented fear of displacement as:

I think one of the issues…is that some people [in the area] are tenants, they're not the owners, so they're afraid of having the house tested. Here in California, they said, ‘Okay, you have a right to have it tested, even if you're a tenant.’ But some people were still scared. So some people refused because of that…

[Also] it's getting expensive and, some people have lived here for so many years that they were grandfathered in, so a lot of their prices are probably low because they've been there for so long. So they might be afraid that if they have to go search somewhere else, that the prices will be so elevated, that it's out of their reach. You know, in Maywood, there's not a lot of people who are high-income…. A lot of people are first-generation immigrants, so, uh, they take very low paying jobs and that's one of the concerns that tied into the, I believe, the Exide project.

Immigration Status and “Gentefication”

The above interview excerpt illuminates several socio-ecological structures that wield power in the PIA, including the role of immigration status in increasing vulnerability amongst residents and increasing gentrification, which fuels rent growth. Data from the Los Angeles County Department of Public Health (n.d.) indicates that approximately 45% of residents in several PIA communities are foreign-born, possibly reducing their ability to navigate formal
systems and seek recourse with the same ease as natural-born citizens. Furthermore, approximately 60% of households within PIA communities experience housing burden (spending 30% or more of income on housing) and approximately one-third experience severe housing burden (spending 50% or more of income on housing), further illustrating the precarity of affordable housing within the PIA. Concomitantly, housing values continue to increase in Los Angeles County, a topic that arose in most interviews with residents, who highlighted increasing rent prices or the city’s housing crisis. In January of 2020, the median price of a single-family home in Los Angeles was $650,000, an 8.5% increase than one year prior (Chiland, 2020). Consequently, home ownership has become inaccessible, trapping many residents in high-rent housing, reducing their ability to save, and limiting their ability to build equity.

With rising housing costs, concerns of gentrification are rising in much of East Los Angeles, and particularly Boyle Heights. As researchers, this was experienced this first-hand. While standing on a street corner preparing survey materials, two individuals in a nearby stopped car looked our way, and while turning the corner, shouted, “Stop Gentrification!” in our direction. This one anecdotal experience is representative of the intensity of anti-gentrification sentiment. Activists within the Boyle Heights community have sought to stymy gentrification, which they associate with the growth of new businesses like art galleries, coffee shops, and bars and characterize as institutions that influence rent increases and do not respond to community needs (Hurtado, 2019). While once a culturally diverse community and now predominantly Latino, even Latino businesses has not been spared from criticism, and even “gentefication” efforts have been opposed by community activists who have successfully closed art galleries and expelled businesses, including a coffeeshop founded by a Latino immigrant (Hurtado, 2019). Furthermore, local environmental activists have adopted anti-gentrification as a parallel
initiative; in the description of a community bike toxic tour organized by East Yard Communities for Environmental Justice, event information concludes with “***COMMUNITY WELCOME! GENTRIFIERS AND REAL ESTATE DEVELOPERS, STAY HOME***” (2019).

**Discussion**

Our purpose was to illuminate the impact of one form of environmental injustice—soil lead contamination—on the daily lives and protective health behaviors of those burdened by urban industrial activity. While our results did not indicate a documented statistical association between soil lead contamination and behaviors at the individual level, a key component of this case study was to identify the social-ecological structures that shape PIA residents’ adaptations in both overt and covert ways. These included initial reliance on secondary prevention efforts which prioritized behavioral change; complex communication efforts that reduced residents’ ability to decipher and apply information; and systemic vulnerabilities associated with immigration status and affordable housing availability, which exacerbated distrust of formal institutions early.

Results of the quantitative data analysis can be placed in the context of extant literature on the relationship between relevant socio-demographic factors, risk perceptions, and heavy metal soil contamination. Results herein support Vandermoere (2008)’s work in Belgium, which did not identify a relationship between subjective risk perception levels and objective, assessed soil pollution levels. Our results are further contextualized by the work of Garlock, Shirai, and Kissel (1999), which found that, in comparison to a representative national sample comparison group, those living in closer proximity to a site with contaminated soils were more likely to engage in three behaviors (gardening, other yard work, and repairs/digging) than their comparison group. Furthermore, those residents were not more likely to report washing their
hands, a protective health behavior, after engaging in those activities. These cases, and our results, illustrate gaps in adoption of protective health behaviors as well as environmental health knowledge with regards to soil lead. However, while the work of Harclerode, Lal, Vedwan, Wolde, and Miller (2016) and Grasmück and Scholz (2005)’s did not identify a relationship between presence of children in a household and participants’ risk judgements, the results here indicated that presence of a child age 0-6 was associated with a significantly higher degree of summative health behaviors, whether a result of the soil lead risk or general protective practices in light of a young child in the household.

While the survey instrument evaluated behavioral changes associated with soil lead, specifically, analysis of the multiple forms of qualitative data indicated a broader adjustment to environmental hazards, generally. The sampling worker who contrasted wearing booties while conducting soil sampling with typical daily behavior walking in his own community is representative of the cognitive adjustment made by communities in relation to toxic exposure (Edelstein, 2018). After asking residents about the community’s reaction to the Exide contamination, one resident explained, “If that’s all they know, they’re not going to move [despite an environmental hazard]. You get used to your surroundings and just let it go.” Another resident succinctly described community concern as, “it was a small group [of activists] …just like anything else, [the issue] just kind of went away.”

One way in which adjustment to the area’s industrial activities was illustrated was through multiple interview references to a nighttime odor that was frequently prevalent. One conversation between two residents described an odor deriving from the presence of a Vernon-based animal rendering facility, a conversation between two residents described the odor:

Resident 1: “You get this really weird smell like around midnight, 1 a.m. It’s disgusting.”
Resident 2: “Yeah, that's when they're burning the bodies, the carcasses of dead animals. So that's the kind of stuff that we have to live with here.”

Resident 1: “You can't sleep with your windows open because you had that smell.”

Resident 2: “It's nasty.”

At the same time, demonstrating some acclimation to the area’s industrial activity, the first resident shared an anecdote in which the odor triggered a memory with positive associations,

I hadn't been on that side of town for like probably like a month, and we came out of the restaurant. And I was like (makes a smelling noise), it was like this weird, nasty smell. But it was like “this is home.”

However, despite the general sense of adjustment perceived within the community, several PIA residents interviewed expressed concern about the long-term and cumulative impact of the area’s industrial activity. One, a local environmental activist, highlighted that “people should look at the question of pollution…not in isolation, but rather look at the cumulative impacts… not chemical by chemical. Another PIA resident, a parent, expressed the difficulty with attributing health concerns to a specific environmental hazard, “You hear these families that have had family members or kids that develop, you know, either cancers or some other stuff. And…the chances of it coming from that, we don't know.” Among other residents, worry was expressed regarding the long-term impacts of the soil lead. One interviewee, who had worked at a factory near the Exide facility, worried whether he transported dangerous dust on his clothes when he returned home each day, greeting his young infant daughter upon arrival.

Still, examining the Exide case cannot be done without contextualizing it within the historic, industrial burden placed on the PIA communities. The southeast Los Angeles region has long a region burdened by industrial activity, an undue byproduct of systematic industrial pollution (Bullard, 1993). In one 1995 *Los Angeles Times* article, Aurora Castillo, the declared
“doña” of the environmental justice movement in East Los Angeles, succinctly described the cruel characterization and treatment of her community as an “uneducated, low-income...dumping ground” (Quintanilla). We hope that the findings identified herein spur continued questions regarding the structures that enable functional sovereignty over land use and permitting decisions, particularly regarding distributive justice efforts, and instead direct attention to procedural justice—in that communities should have access to and the ability of self-determination. Without questioning those structures that result in procedural injustice, the social, economic, and historical contexts inherent in capitalist geographies are dangerously ignored, and corrective efforts of residents and community organizations become structurally limited.

Several limitations and de-limitations should be recognized in the context of this study. First, quantitative data collection resulted in a smaller sample size and consequently reduced statistical power; this was influenced by several factors including a low response rate, and—particularly—canceled data collection plans due to the COVID-19 pandemic, among others. Determination of the case’s boundaries and participant criteria were also sources of de-limitations of the study. While the case was bounded by the geographic and conceptual unit of the Exide PIA, air emissions do not adhere to politically designated lines. To that end, one community representative expressed concern that the true impact of Exide may expand beyond the PIA’s designated range. Additionally, survey participant recruitment was limited to properties that had had their soil tested, omitting the responses of residents who had not consented to testing or whose properties had already undergone cleanup.

Furthermore, a key assumption of the Exide soil lead cleanup efforts, and consequently—to some degree—this case study, is that large scale soil lead remediation is an appropriate solution to the hazards faced within the Exide PIA, yet several scholars have questioned the
efficacy of this response, particularly given the psychological, social, and ecological disturbances
associated with such a strategy (Cutts, London, Meiners, Schwarz, & Cadenasso, 2017; Schwarz
et al., 2016). Additionally, advocates for environmental interventions that focus on interpersonal,
organizational, political, and community-level factors argue that primary interventions are more
effective than secondary or tertiary interventions that require voluntary and long-lasting
adherence to individual behavioral change (McLeroy, Bibeau, Steckler, & Glanz, 1988; Stokols,
1992). Furthermore, attention to individual lifestyle interventions has been criticized as a victim-
blaming practice (McLeroy et al., 1988). This critique may be particularly relevant in cases of
environmental injustice, where the individuals’ whose health is at risk are generally not the party
responsible for the environmental contamination.

The Exide PIA case brought to light several next steps that warrant consideration. In
these Southeast Los Angeles communities ineffective bureaucratic systems, operating within and
between regulatory agencies, stymied timely action; these inefficient systems will likely persist
without dramatic reform. At the community level, empowering and providing security to low-
income, immigrant populations in Southeast Los Angeles (and elsewhere) is important so that
when future injustices arise—whether a result of environmental hazard or housing—the people
have a voice without fear of retribution. Still, the Exide PIA represents one case within a larger,
free-market economy that externalizes costs inequitably. Any solution to prevent future
“Exides,” then, must acknowledge this systemic failing. Making dramatic change will likely
require continued activism, resistance, and reform across social-ecological levels to avoid
perpetuating the same, slow “business as usual” systems of the past. Todas las personas que
compartimos esta nave que habitamos no merecenmos menos.
Figure 2. Image found in documentation from the Mothers of East Los Angeles archives at CSU Northridge.


Filippelli, G., & Laidlaw, M. (2010). The elephant in the playground: Confronting lead-contaminated soils as an important source of lead burdens to urban populations. *Perspectives in Biology and Medicine, 53*(1), 31-45. doi:10.1353/pbm.0.0136


