

## ZAMBIA

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### A. Regulation on sources

Source of lead	Relevant legislation/regulation	Government agencies	Data source
1. Used lead-acid battery recycling	1. No information on specific ULAB recycling regulation found		
2. Standards for lead in food	<p>1. The Zambian government is a member of the Codex Alimentarius Commission, a joint FAO/WHO food standards program. The Commission set limits of no more than 0.1 mg of lead per kg of pulses (such as lentils and dried beans), 0.4mg/kg for jams, jellies and marmalades, and 0.05 mg/kg for preserved tomatoes, amongst other maximum levels for processed fruits and vegetables.</p> <p>2. No other specific set of regulations found.</p>	a. Ministry of Health	1. <a href="#">FAO</a> . 2019. "General Standard for Contaminants and Toxins in Food and Feed."
3. Standards for lead in cookware	1. No specific set of regulations around cookware found so far		
4. Standards for occupational exposure	<p>1. The Factories Act (1994) includes lead poisoning in the list of industrial diseases.</p> <p>2. The Act further states that employees in processes in which a lead compound or other poisonous substance is used should be provided with adequate and suitable facilities for washing.</p>	a. Ministry of Labour and Social Security	<p>1. <a href="#">ILO</a>. 2014. "Database of National Labour, Social Security and Related Human Rights Legislation."</p> <p>2. <a href="#">The Factories Act 1994</a></p>
5. Lead in paint	1. Does not currently have a lead paint law		1. <a href="#">UNEP</a> . 2019. Update on the Global Status

Source of lead	Relevant legislation/regulation	Government agencies	Data source
			of Legal Limits on Lead in Paint September 2019.
6. Waste generated from smelting or mining	<ol style="list-style-type: none"> <li>1. Copperbelt Environment Project (CEP), followed by the Zambia – Mining and Environmental Remediation and Improvement Project (ZMERIP), both with the the World Bank implemented for environmental remediation.</li> <li>2. According to the Mines and Minerals development Act (2015), mining operations are not allowed to create an unsafe working environment or uncontrollable pollution of the area and small-scale mining licenses can be granted only after the approval Environmental Management Agency.</li> <li>3. No comprehensive regulatory framework on waste from lead from mining and smelting found.</li> </ol>	<ol style="list-style-type: none"> <li>a. Ministry of Labour and Social Security</li> <li>b. Ministry of Mines and Minerals Development</li> <li>c. Ministry of Water Development, Sanitation and Environmental Protection</li> </ol>	<ol style="list-style-type: none"> <li>1. <a href="#">Human Rights Watch</a>. 2019. “We Have to Be Worried.” <i>Human Rights Watch</i>.</li> <li>2. <a href="#">The Mines and Minerals Development Act 2015</a></li> </ol>

## B. International Agreements

Agreement	Year Ratified
1. Common Market for Eastern and Southern Africa	1981
2. Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal	1994 (Accession)
3. Rotterdam Convention on the Prior Informed Consent Procedure for certain hazardous Chemicals and Pesticides in international trade	2011 (Accession)
4. Stockholm Convention on Persistent Organic Pollutants	2006

### C. Blood lead-level monitoring programs

Details	Data source
<p>1. As part of the Zambia – Mining and Environmental Remediation and Improvement Project (ZMERIP) with the World Bank, there are plans for testing and treating at least 10,000 children, pregnant women, mothers, and other individuals between 2016-2021.</p>	<p><a href="#">Human Rights Watch</a>. 2019. “We Have to Be Worried.” <i>Human Rights Watch</i>.</p>

### D. Inventory of toxic sites (Toxic Sites Identification Program (TSIP), Pure Earth)

Site	Province/Region	Details (all data comes from the <a href="#">TSIP website</a> )
<p>1. Kabwe lead mining site</p>	<p>Northern</p>	<p>A closed mine in Kabwe has contaminated the soil and water of the region with lead. Massive tailings from the mine loom over the town, where winds often blow particles through the town. Dangerously high levels of the contaminant have been found in the blood of residents, including children, from soil, air, and water transmission routes. Effects of blood lead levels above the recommended level are muscle spasms, nausea and eventual death.</p>

**E. Scientific papers on lead exposure (Please contact [info@gahp.net](mailto:info@gahp.net) for information on studies not in the public domain)**

Topic	Authors	Year	Title	Abstract/ description
Childhood exposure	Bose-O'Reilly, Stephan, John Yabe, Joseph Makumba, Paul Schutzmeier, Bret Ericson, and Jack Caravanos	2018	Lead intoxicated children in Kabwe, Zambia	<p><b>Background:</b> Kabwe is a lead contaminated mining town in Zambia. Kabwe has extensive lead contaminated soil and children in Kabwe ingest and inhale high quantities of this toxic dust. The aim of this paper is to analyze the health impact of this exposure for children.</p> <p><b>Method and Results:</b> Health data from three existing studies were re-analyzed. Over 95% of children living in the most affected townships had high blood lead levels (BLLs) &gt; 10 µg/dL. Approximately 50% of those children had BLLs ≥ 45 µg/dL. The existing data clearly establishes the presence of a severe environmental health crisis in Kabwe which warrants immediate attention.</p>
Childhood exposure	Yabe, John, Shouta M. M. Nakayama, Yoshinori Ikenaka, Yared B. Yohannes, Nesta Bortey-Sam, Balazs Oroszlany, Kaampwe Muzandu, Kennedy Choongo, Abel Nketani Kabalo, John Ntapisha, Aaron Mweene, Takashi Umemura, and Mayumi Ishizuka	2015	Lead poisoning in children from townships in the vicinity of a lead-zinc mine in Kabwe, Zambia	<p><b>Background:</b> Childhood lead poisoning is a serious public health concern worldwide. Blood lead levels exceeding 5 µg dL<sup>-1</sup> are considered elevated. In Kabwe, the capital of Zambia's Central Province, extensive Pb contamination of township soils in the vicinity of a Pb-Zn mine and posing serious health risk to children has been reported.</p> <p><b>Method and Results:</b> We investigated BLLs in children under the age of 7 years in townships around the mine; where blood samples were collected and analyzed using an ICP-MS. All of the sampled children had BLLs exceeding 5 µg dL<sup>-1</sup>. Children in these areas could be at serious risk of Pb toxicity as 18% of the sampled children in Chowa, 57% (Kasanda) and 25% (Makululu) had BLLs exceeding 65 µg dL<sup>-1</sup>. Eight children had BLLs exceeding 150 µg dL<sup>-1</sup> with the maximum being 427.8 µg dL<sup>-1</sup>. We recommend that medical intervention be commenced in the children with BLL exceeding 45 µg dL<sup>-1</sup>.</p>

Topic	Authors	Year	Title	Abstract/ description
Environmental exposure	Yabe, John, Shouta MM. Nakayama, Hokuto Nakata, Haruya Toyomaki, Yared B. Yohannes, Kaampwe Muzandu, Andrew Kataba, Golden Zyambo, Masato Hiwatari, Daiju Narita, Daichi Yamada, Peter Hangoma, Nosiku Sipilanyambe Munyinda, Tiza Mufune, Yoshinori Ikenaka, Kennedy Choongo, and Mayumi Ishizuka	2020	Current Trends of Blood Lead Levels, Distribution Patterns and Exposure Variations among Household Members in Kabwe, Zambia	<p><b>Background:</b> Childhood lead (Pb) poisoning has devastating effects on neurodevelopment and causes overt clinical signs including convulsions and coma. Health effects including hypertension and various reproductive problems have been reported in adults. Historical Pb mining in Zambia’s Kabwe town left a legacy of environmental pollution and childhood Pb poisoning. The current study aimed at establishing the extent of Pb poisoning and exposure differences among family members in Kabwe as well as determining populations at risk and identify children eligible for chelation therapy.</p> <p><b>Method:</b> Blood samples were collected in July and August 2017 from 1190 household members and Pb was measured using a portable LeadCare-II analyser. Participants included 291 younger children (3-months to 3-years-old), 271 older children (4-9-years-old), 412 mothers and 216 fathers from 13 townships with diverse levels of Pb contamination.</p> <p><b>Results:</b> The Blood Lead Levels (BLL) ranged from 1.65 to 162 µg/dL, with residents from Kasanda (mean 45.7 µg/dL) recording the highest BLL while Hamududu residents recorded the lowest (mean 3.3 µg/dL). Of the total number of children sampled (n = 562), 23% exceeded the 45 µg/dL, the threshold required for chelation therapy. A few children (5) exceeded the 100 µg/dL whereas none of the parents exceeded the 100 µg/dL value. Children had higher BLL than parents, with peak BLL-recorded at the age of 2-years-old. Lead exposure differences in Kabwe were attributed to distance and direction from the mine, with younger children at highest risk. Exposure levels in parents were equally alarming. For prompt diagnosis and treatment, a portable point-of-care device such as a LeadCare-II would be preferable in Kabwe.</p>

Topic	Authors	Year	Title	Abstract/ description
Environmental exposure	Yamada, Daichi, Masato Hiwatari, Peter Hangoma, Daiju Narita, Chrispin Mphuka, Bona Chitah, John Yabe, Shouta M. M. Nakayama, Hokuto Nakata, Kennedy Choongo, and Mayumi Ishizuka	2020	<a href="#">Assessing the population-wide exposure to lead pollution in Kabwe, Zambia: an econometric estimation based on survey data</a>	This study quantitatively assessed the population-wide lead poisoning conditions in Kabwe, Zambia, a town with severe lead pollution. While existing data have reported concerning blood lead levels (BLLs) of residents in pollution hotspots, the data representing the entire population are lacking. Further, selection bias is a concern. Given the lack of compulsory testing schemes, BLLs have been observed from voluntary participants in blood sampling surveys, but such data can represent higher or lower BLLs than the population average because of factors simultaneously affecting participation and BLLs. To illustrate the lead poisoning conditions of the population, we expanded the focus of our surveys and then econometrically estimated the BLLs of individuals representing the population, including those not participating in blood sampling, using background geographic, demographic, and socioeconomic information. The estimated population mean BLL was 11.9 µg/dL (11.6–12.1, 95% CI), lower than existing data because of our wide focus and correction of selection bias. However, the scale of lead poisoning remained immense and 74.9% of residents had BLLs greater than 5 µg/dL, the standard reference level for lead poisoning. Our estimates provide a deeper understanding of the problem and a foundation for policy intervention designs
Food exposure	Ngoma, Idah, and Samuel Mutiti	2019	<a href="#">QUANTIFYING LEAD EXPOSURE THROUGH DUST, VEGETABLES AND FRUITS IN KABWE, ZAMBIA</a>	<b>Background:</b> Lead pollution is one of the major global environmental problems that affects both highly industrialized and less industrialized countries. While urban gardening has become increasingly popular, in places contaminated with lead, these gardens can be a potential risk for lead exposure through contaminated produce. This study aimed to evaluate the potential health risk due to the consumption of vegetables and fruits grown in residential gardens contaminated with lead and compare that to the exposure risk from contaminated dust and dermal contact. The study also establishes the relationship between lead concentrations in soils and the crops grown in them. <b>Methods:</b> Soil, dust, fruits and vegetable samples were collected over two seasons from Kabwe, Zambia and tested for lead using Atomic Absorption Spectrometry and X-ray Fluorescence. The most common

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				<p>vegetables sampled were Brassica napus, Brassica rapa and sweet potatoes (leaves).</p> <p><b>Results:</b> Lead concentrations in all sampled fruits were below detection limit, while all leafy vegetables had significant amounts of lead. The vegetables did not show any statistical difference (from each other) in the amount of lead taken up (<math>p = 0.22</math>). All the vegetables were above the tolerable consumption limit per week (0.025 mg/kg body weight). Plant lead uptake was directly related to soil concentrations. Average dermal contact exposure was 0.006 and 0.044 mg/kg.day in children and adults respectively. Average lead in indoor dust was above 40 <math>\mu\text{g}/\text{ft}^2</math> which is a cause for concern. Vegetables, dust and dermal contact are significant exposure pathways in this area. These results imply that, in environments contaminated with lead, dust and diets that rely on home grown leafy vegetables will substantially contribute to a person’s lead burden and impact individual and community health. Thus, there exists a great need for testing lead levels in gardens and homes to develop site-specific strategies to ensure safety.</p>

## F. Blood testing in National Health Surveys

National Health Survey	Zambia Demographic and Health Survey (ZDHS)	Source
Purpose	The objective of the survey was to provide reliable estimates of demographic and health indicators including fertility, marriage, sexual activity, fertility preferences, family planning methods, breastfeeding practices, nutrition, childhood and maternal mortality, maternal and child health, domestic violence, and HIV/AIDS.	<a href="#">Zambia Statistics Agency, Ministry of Health (MOH) Zambia, and ICF</a> . 2019. Zambia Demographic and Health Survey 2018.
Sample size	The nationally representative sample consists of 13,683 women (age 15 to 49) and 12,132 men (age 15 to 59) from 12,831 households.	
Blood sample testing	Blood specimens were collected from children (age 6 and 59 months) and women respondents who consented to testing for anaemia.	
Latest round	2018-19	
Next round	Unknown	