



A Small Country's Big Fight

Georgia's National Response to Childhood Lead Exposure

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Abstract

Lead exposure remains a major but underrecognized threat to children's health and development globally. In 2018, the Republic of Georgia became the first country to include blood lead level (BLL) testing in UNICEF's Multi-Indicator Cluster Survey, revealing that 41 percent of children aged two to seven had BLLs above the World Health Organization's threshold of 5 µg/dL, with no child testing at zero. This case study was built on 20 semi-structured interviews with government, international, nongovernmental, and academic stakeholders, alongside a review of published evidence to document Georgia's response: building domestic laboratory capacity, identifying adulterated spices as a major source of exposure, and enforcing existing food safety laws, and creating a national surveillance program. Follow-up data shows substantial declines in BLL, though 15 to 20 percent of children remain above the threshold. Georgia's example shows what is possible once lead exposure becomes a political priority.

A Small Country's Big Fight: Georgia's National Response to Childhood Lead Exposure

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1. Introduction

Lead is a highly toxic substance that affects multiple systems in the human body. It impairs neurological development, contributes to cardiovascular disease and chronic kidney disease, and is associated with a range of other serious health conditions.¹ These health effects translate into significant societal costs: lead exposure has been linked to more than 20 percent of the learning gap between high-income countries (HICs) and low- and middle-income countries (LMICs)², and estimates suggest it is responsible for more deaths than HIV and malaria combined. It is also estimated to account for IQ losses amounting to 8.3 percent of GDP in low-income countries (LICs).³ Taken together, these impacts make lead exposure a critical barrier to human capital formation and economic development. Measuring exposure levels and identifying sources of contamination are essential steps toward improving health, well-being, and economic outcomes in LMICs.

Lead exposure has declined in HICs but remains a significant challenge in many LMICs, largely due to gaps in regulation, enforcement, and institutional and laboratory capacity. Exposure is driven by a mix of legacy materials, ongoing industrial practices, and contaminated consumer products. Lead paint continues to pose risks, particularly in older buildings, and in some settings, products with unsafe lead levels are still available on the market.⁴ At the same time, informal industrial activities, including the recycling of used lead-acid batteries (ULABs), can release substantial amounts of lead into surrounding environments.⁵ Everyday exposure can also occur through household items and food: lead-glazed ceramics may leach into food and drink,⁶ while adulterated spices in some regions are intentionally contaminated to enhance their color.⁷ Drinking water can be an additional pathway, especially where infrastructure or components introduce lead into supply systems.⁸ Strengthening regulation and enforcement, as well as monitoring and surveillance across these pathways is critical to reducing exposure as evidenced by the Republic of Georgia.

In the 2010s, the New York City Department of Health and Mental Hygiene and researchers working in Iashvili Children's Central Hospital in Tbilisi gathered evidence of a serious case of lead poisoning that

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- 1 "Lead Poisoning," Cleveland Clinic, July 16, 2026, <https://my.clevelandclinic.org/health/diseases/11312-lead-poisoning>.
 - 2 Lee Crawford et al., "The Effect of Lead Exposure on Children's Learning in the Developing World: A Meta-Analysis," *The World Bank Research Observer* 40, no. 2 (2025): 229–60, <https://doi.org/10.1093/wbro/lkae010>.
 - 3 Bjorn Larsen and Ernesto Sánchez-Triana, "Global Health Burden and Cost of Lead Exposure in Children and Adults: A Health Impact and Economic Modelling Analysis," *The Lancet Planetary Health* 7, no. 10 (2023): e831–40, [https://doi.org/10.1016/S2542-5196\(23\)00166-3](https://doi.org/10.1016/S2542-5196(23)00166-3).
 - 4 "Database of IPEN Country Studies on Lead in Paint (October 2024)," 2024, <https://ipen.org/publication/database-ipen-country-studies-lead-paint-october-2024/>.
 - 5 Dimas A. Pincay-Pilay and Eugenio F. Carrasco, "Environmental Impact of Lead-Acid Batteries: A Review of Sustainable Alternatives for Production and Recycling Based on Life Cycle Analysis," *Sustainability* 17, no. 23 (2025): 10815, <https://doi.org/10.3390/su172310815>.
 - 6 Taiwo Adedoyin Aderemi et al., "High Level Leaching of Heavy Metals from Colorful Ceramic Foodwares: A Potential Risk to Human," *Environmental Science and Pollution Research* 24, no. 20 (2017): 17116–26, <https://doi.org/10.1007/s11356-017-9385-7>.
 - 7 Jenna E. Forsyth et al., "Turmeric Means 'Yellow' in Bengali: Lead Chromate Pigments Added to Turmeric Threaten Public Health across Bangladesh," *Environmental Research* 179 (December 2019): 108722, <https://doi.org/10.1016/j.envres.2019.108722>.
 - 8 Michael Fisher et al., "Occurrence of Lead and Other Toxic Metals Derived from Drinking-Water Systems in Three West African Countries," *Environmental Health Perspectives* 129, no. 4 (2021), <https://doi.org/10.1289/EHP7804>.

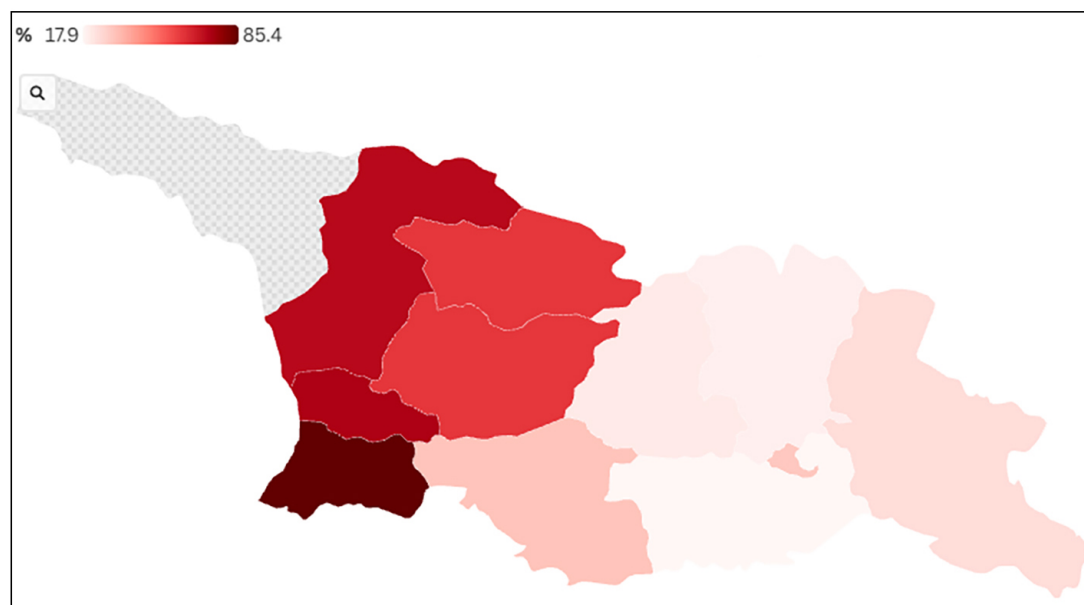
caught the attention of the National Centers for Disease Control of Georgia (NCDC) and the Georgian Embassy in the United States. This warning prompted efforts from individuals at the NCDC and United Nations International Children's Emergency Fund (UNICEF) to lobby for a blood lead level (BLL) monitoring module to be incorporated into the sixth Multi-Indicator Cluster Survey (MICS6) in Georgia.

The MICS collects data on indicators of the well-being of children and their families primarily in LMICs. MICS6 revealed that 41 percent of Georgian children between the ages of two and seven had BLLs over 5 µg/dL, the level at which the World Health Organization (WHO) recommends intervention.⁹ Over 15 percent of the sample of 1,578 children who participated in MICS6 had BLLs over 10 µg/dL.¹⁰ Georgia's prevalence of lead exposure, policy response, and fieldwork to identify sources of exposure and monitor BLLs provide valuable lessons learned for other regions and countries dealing with significant lead exposure. This paper aims to document and share Georgia's experience.

This case study includes a thorough review of available literature, as well as an analysis of 20 interviews conducted by our team with key stakeholders from government, international organizations, non-governmental organizations (NGOs), and academia involved in Georgia's MICS and its response to lead exposure.

2. The problem: Lead exposure in Georgia

FIGURE 1. Prevalence of children tested in MICS with elevated blood lead levels >5 µg/dL



9 "WHO Guidance to Reduce Illness Due to Lead Exposure," World Health Organization, October 27, 2021, <https://www.who.int/news/item/27-10-2021-who-guidance-to-reduce-illness-due-to-lead-exposure>.

10 2018 Georgia MICS (Multiple Indicator Cluster Survey), Survey Findings Report (UNICEF, 2018), https://www.unicef.org/georgia/media/3501/file/Georgia_MICS_2018_en.pdf.

The Republic of Georgia is home to over 3.9 million people¹¹, 87 percent of whom identify as ethnically Georgian. Most Georgians practice Eastern Orthodox Christianity and share similar cultural traditions with some distinctions between regions.¹² One third of the country lives in Georgia's capital city, Tbilisi, and about two-thirds of the total population live in urban settings.¹³ The country is divided into nine provinces with two occupied territories and two autonomous republics. Georgian cuisine is an important part of the country's cultural heritage, including its distinctive use of spices unique to Georgia.

Lead poisoning was first discovered as an issue for the Republic of Georgia in New York City. The NYC Department of Health and Mental Hygiene mandates BLL testing for children at age one and then again at age two. Pregnant individuals and workers who may be at risk of lead exposure can also be tested.¹⁴ In the mid-to-late 2000s, analysis of this data revealed patterns of higher-than-average BLLs amongst individuals with Georgian ancestry living in New York City. Follow up investigations and market surveillance suggested spices purchased in Georgia and hand-carried back to New York City were adulterated with lead. Specifically, surveillance in New York City revealed that Georgian spices such as *khmeli suneli* (or *kharcho suneli*), *kviteli kvavili*, and *svanuri marili* (or *svaneti salt*) had toxic levels of lead. For Georgian spice samples tested by the NYC Department of Health and Mental Hygiene, lead was detected in 90 percent of cases and exceeded two ppm lead (the reference level of permissible lead in food products) in 70 percent of cases.¹⁵

In parallel, researchers from the NCDC, the American Clinic in Tbilisi, the Iashvili Children's Central Hospital, Emory University, and the Georgia Poison Center conducted a cross-sectional pilot study at Iashvili Children's Central Hospital in Tbilisi measuring BLLs. The study involved 254 children aged two to five and ran between November to December 2015. Using venous blood analyzed by LeadCare II (detection limit 3.3 µg/dL), the results revealed a geometric mean BLL of 5.7 µg/dL—with the highest level reported from an individual with 57 µg/dL.¹⁶ The authors never published this study as shortly after LeadCare II was recalled for inaccurate reporting. However, this study, along with warnings about adulterated spice levels from NYC Department of Health and Mental Hygiene were used by stakeholders at UNICEF and the NCDC to lobby for the inclusion of BLL testing in Georgia's upcoming MICS—the first time a BLL module would be piloted in the survey.

11 *Number of Population* (National Statistics Office of Georgia, 2026). <https://www.geostat.ge/media/78328/Number-of-Population-as-of-January-1%2C-2026.pdf>.

12 Ronald Grigor Suny, "People of Georgia," Britannica, June 9, 2026, <https://www.britannica.com/place/Georgia/People>.

13 *Number of Population* (National Statistics Office of Georgia, 2026), <https://www.geostat.ge/media/78328/Number-of-Population-as-of-January-1%2C-2026.pdf>.

14 "Lead Poisoning," NYC Health, <https://www.nyc.gov/site/doh/health/health-topics/lead-poisoning-prevention.page>.

15 Hore, P., Alex-oni, K., Sedlar, S., & Nagin, D. (n.d.), "A Spoonful of Lead: A 10-Year Look at Spices as a Potential Source of Lead Exposure," *Journal of Public Health Management and Practice* 25 (2019), https://journals.lww.com/jphmp/fulltext/2019/01001/a_spoonful_of_lead__a_10_year_look_at_spices_as_a.11.aspx.

16 Shengelia L, Gabelaya L, Demetrashvili N, Katsitadze G, Chkhaidze I, Sturua L, Kazzi ZN. "Childhood Lead Screening in Tbilisi, Republic of Georgia." Unpublished conference poster. National Center for Disease Control and Public Health, Tbilisi, Georgia; Emory University and the Georgia Poison Center, Atlanta, Georgia. 2015. Available at: <https://test.ncdc.ge/Handlers/GetFile.ashx?ID=99a5c9b1-c82f-4afd-87e7-10bfacca3244>.

The results were grim. Forty-one percent of Georgian children had high BLLs. In response, the Georgian government instituted a variety of interventions to help children with high BLLs and to prevent further exposure. While the process is ongoing, initial data and reporting suggests that the interventions programs have helped. Follow-up testing of children who participated in the MICS revealed that levels fell from a median of 9.6 µg/dL in 2018 to 6.8 µg/dL by late 2019.¹⁷ For a sample of pregnant and breastfeeding women from Adjara, longitudinal data from 2020 to 2023 shows that BLLs fell by 59 percent.¹⁸ Another study from the port city Poti in Samegrelo Zemo Svaneti region monitoring children's BLLs revealed a significant decrease in the geometric mean BLL—from 7.5 µg/dL in 2018 to 2.05 µg/dL in 2023.¹⁹ These studies demonstrate the success of interventions programs but also reveal that persistent sources of exposure remain. There is no safe level of lead and even low BLL can result in chronic diseases such as cardiovascular and chronic kidney disease.²⁰ Despite early wins, Georgia must continue to address a variety of sources of lead exposure. Currently dust, soil, and paint are being prioritized in sampling as potential sources of exposure.

In parallel with these early signals, Georgia was already engaged in a formal effort to strengthen its environmental health system. The EU–Georgia Twinning Project (2017–2019), funded by the European Commission and implemented by the NCDC in collaboration with public health institutions from Italy, the United Kingdom, and Poland, aimed to modernize Georgia's environmental health governance, approximate its legislation with European Union (EU) standards, and build laboratory and surveillance capacity at the NCDC. Lead was identified as a national priority within the project, and the project contributed directly to the design of the blood lead sampling protocol and questionnaire used in the MICS survey. A Memorandum of Understanding²¹ signed between the Italian National Institute of Health and the NCDC formalized the Italian laboratory partnership that would prove critical to the MICS's feasibility.²²

17 Ekaterine Ruadze et al., "Reduction in Blood Lead Concentration in Children across the Republic of Georgia Following Interventions to Address Widespread Exceedance of Reference Value in 2019," *International Journal of Environmental Research and Public Health* 18, no. 22 (2021), <https://doi.org/10.3390/ijerph182211903>.

18 Charlotta Rylander et al., "Time-Trends of Blood Lead Levels from 2020 to 2023 in Pregnant and Breastfeeding Women from Adjara, Georgia—A Birth Registry-Based Study," *International Journal of Hygiene and Environmental Health* 263 (October 2024): 114482, <https://doi.org/10.1016/j.ijheh.2024.114482>.

19 Milena Bainduri et al., "Assessment of Blood Lead Levels in 2–7 Year-Old Children in Poti, Georgia, 2023: A Pilot Study of Environmental Lead Exposure Sources," *Environmental Research* 278 (August 2025): 121708, <https://doi.org/10.1016/j.envres.2025.121708>.

20 "Lead Poisoning," Cleveland Clinic. (n.d.), July 16, 2026, <https://my.clevelandclinic.org/health/diseases/11312-lead-poisoning>.

21 ISS, 8 NCDC&PH. (n.d.). "MoU for Educational and Scientific Cooperation Between the Istituto Superiore Di Sanità of the Italian Republic and the National Center for Disease Control and Public Health of Georgia." https://ambtbilisi.esteri.it/wp-content/uploads/resource/doc/2018/08/mou_iss_con_action_plan-ridimensionato.pdf.

22 Lauriola, Paolo, and Amiran Gamkrelidze. 2019. *Institutional Strengthening of Environmental Health System of Georgia*. Twinning Project ENI/2015/037-862 GE/22, Final Report. Brussels: European Commission.

3. Methods

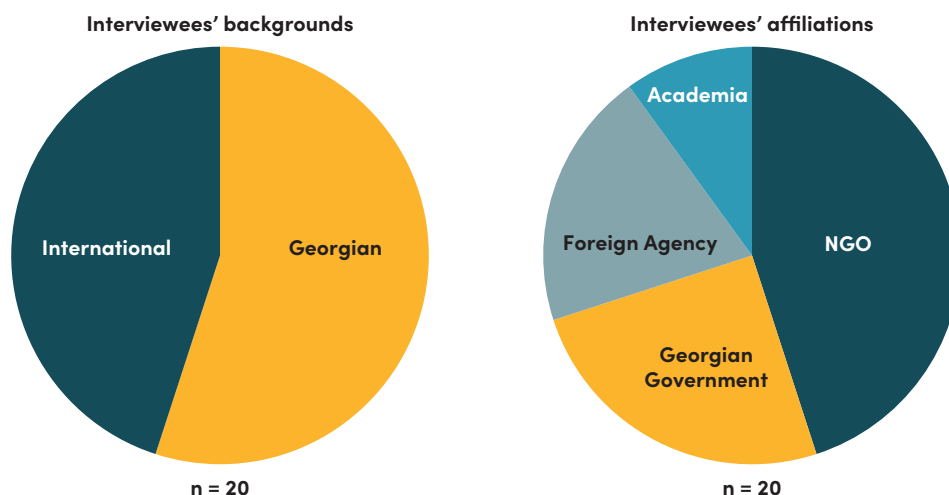
This study employed a qualitative research design to examine Georgia's approach to lead exposure reduction. Data were collected through multiple methods, including semi-structured interviews, a scoping literature review, and collection of documents and materials shared by interviewees.

A total of 20 semi-structured interviews were conducted with key informants representing a range of stakeholders involved in or affected by Georgia's lead exposure prevention programs. Participants were selected purposively and through snowball sampling to ensure diversity of perspective across relevant sectors, institutional types, and phases of the program. The sample includes representatives from:

- Georgian national public health authorities, including current and former staff of the NCDC,
- UNICEF Georgia Country Office,
- international NGOs,
- international scientific and technical partners,
- medical and toxicological experts,
- former senior Georgian government leadership,
- the New York City Department of Health and Mental Hygiene.

Initial contacts were drawn from co-authors' professional networks and publicly available program documentation. Subsequent participants were identified through referrals from earlier interviewees. All interviews were conducted remotely.

FIGURE 2. Interviewee demographics



The interview sample was deliberately constructed to capture the perspectives of those directly involved in designing and implementing Georgia's lead prevention program, and as a result is weighted toward program insiders. Perspectives that are less represented include spice vendors, affected families, healthcare workers, and independent scientists. This is a limitation of the purposive design.

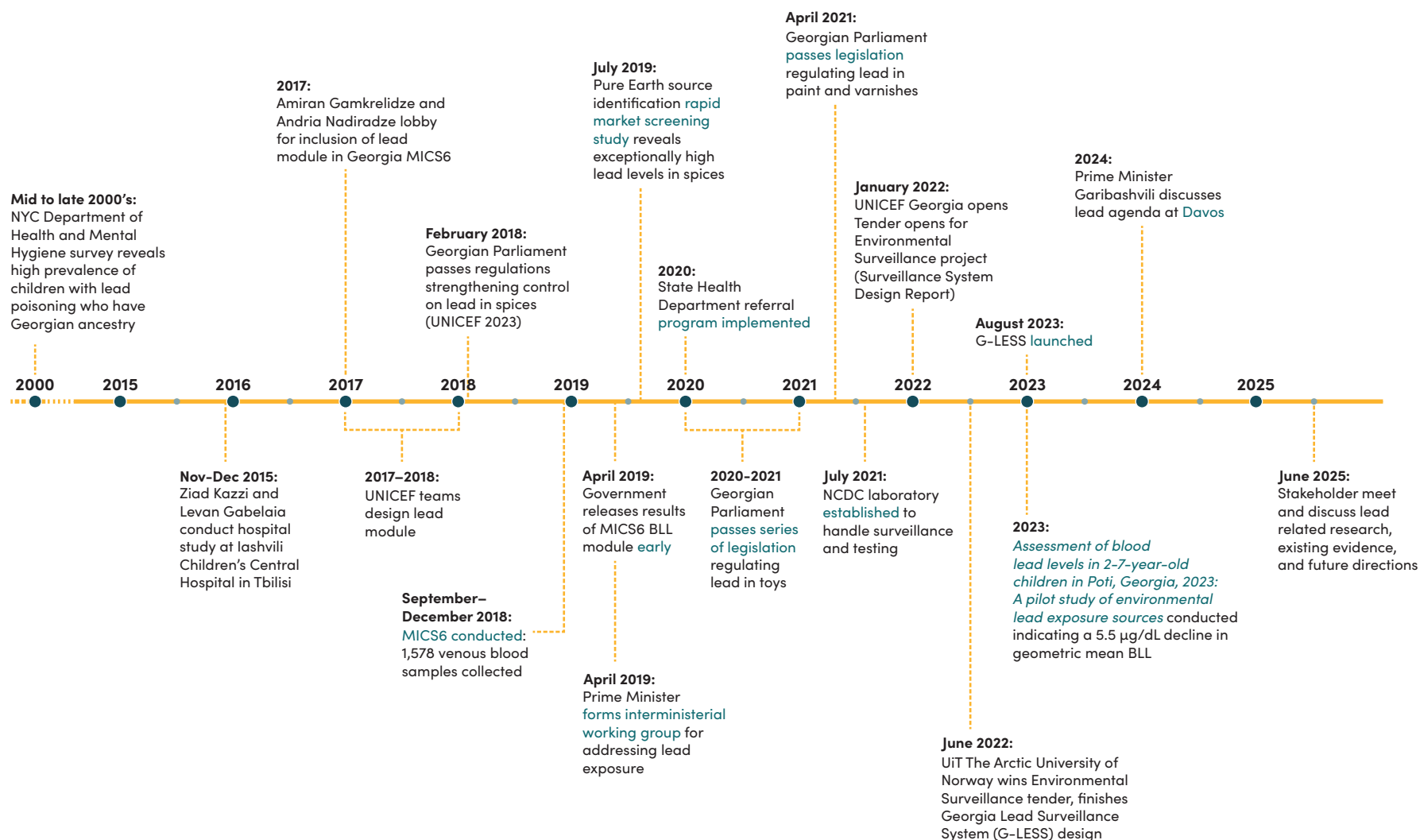
Interview guides were developed in advance and structured around five thematic areas: program implementation and methods, financing and resources, public awareness and social response, success factors and structural conditions, and future directions. Guides were designed to elicit detailed accounts of program design, implementation, and outcomes, while allowing flexibility for participants to raise issues beyond the scope of predefined questions. Interviews lasted approximately 45 to 60 minutes and were recorded and subsequently transcribed with participants' verbal consent for analysis purposes.

A scoping literature review was also conducted to identify existing evidence on Georgia's lead exposure prevention programs, including peer-reviewed publications, grey literature, and relevant policy documents. Additionally, participants were invited to share any materials, data, or documentation they considered relevant to the study, which were reviewed and incorporated into the analysis where appropriate. Interview findings were triangulated against published peer-reviewed studies, program reports, policy documents, and any shared materials where available. Specific claims were corroborated by documentary or published sources.

Data analysis followed a thematic analysis approach. Two researchers independently reviewed the transcripts and identified initial codes, which were subsequently discussed and reconciled to produce a final set of themes.

4. Georgia's response

FIGURE 3. Timeline of Georgia's lead exposure progress



Georgia's 41 percent prevalence of children with elevated BLLs prompted Prime Minister Mamuka Bakhtadze to organize an interministerial working group, reflecting the complex multidimensional issue of lead poisoning. The group yielded two important, short-term outputs: 1) The State Health program and 2) a communications campaign.

The State Health program first identified children from the MICS with high BLLs. These children received follow-up testing and their siblings under 18-yearsold and pregnant family members were also offered testing.²³ Individuals with high BLLs revealed by the State Program were offered supplements of iron, calcium, and multivitamins which can help reduce the body's absorption of lead.²⁴ Source identification was also performed in households of individuals with high BLL using X-ray fluorescent analyzers (XRFs) as well as isotopic ratios. After addressing the poisoned MICS sample, the program, which remains active, was expanded so that now all children exhibiting symptoms of lead poisoning can be referred to the program by a doctor. If the patient has high BLLs, they will be given supplements and offered cleaning and hygiene training to instill basic behaviors such as diligent handwashing and proper mopping.

In tandem, a communications campaign was conducted to raise awareness about lead poisoning. One vector of the campaign was the use of print resources. Pamphlets were developed by NGOs and disseminated at markets selling spices sharing information about lead such as exposure pathways, health effects, and a warning from the Criminal Code of Georgia that food adulteration is punishable by fines or imprisonment. This aimed to reach and educate parents and their children on how to spot lead poisoning and mitigate exposure, but also alert sellers of the health and legal risks of adulterating spices.²⁵ Another key medium used for the awareness campaign was social media, such as the Pure Earth Georgia Facebook page which shares content on toxic environmental exposures.²⁶ Several interviewees mentioned the TV programming they remembered featuring public service announcements by the NCDC about the results of the MICS and the action items the government was taking on.

Over the longer term, Georgia invested in building domestic laboratory capacity which could enable national BLL surveillance without the need for outsourcing blood lead tests. To continue biomonitoring and surveillance, which are key to reducing the risks of lead exposure, the Republic of Georgia fundraised for and developed its laboratory capacity. Donations from UNICEF, the Clarios Foundation, the United States Agency for International Development (USAID),

23 *Ending Childhood Lead Poisoning in Georgia* (UNICEF, 2023), <https://www.unicef.org/media/148986/file/Ending-Childhood-Lead-Poisoning-in-Georgia-Progress-and-lessons-learned-between-2017-and-2023.pdf>.

24 Lee Crawford and Theo Mitchell. 2026. "Iron and Calcium Supplementation for Reducing Blood Lead Levels: A Systematic Review and Meta-Analysis." CGD Working Paper 746. Washington, DC: Center for Global Development. <https://www.cgdev.org/publication/iron-and-calcium-supplementation-reducing-bloodlead-levels-systematic-review-and-meta>.

25 Pure Earth, UNICEF, and Clarios. "Health Hazards of Toxic Spices: Lead Chromate Chrome Yellow." Awareness pamphlet. Tbilisi, Georgia. 2019.

26 "Pure EARTH-Georgia," Facebook, <https://www.facebook.com/Pureearth.ge>.

the Swedish Development Agency, and the Estonian Embassy enabled Georgia to purchase its own inductively coupled plasma mass spectrometry (ICPMS), as well as other equipment such as Graphite Furnace Atomic Absorption Spectrometry (GFAAS), and handheld portable XRFs. Researchers and lab technicians from the United Kingdom's Health Security Agency, as well as from the National Institute of Public Health of Quebec trained domestic scientists how to use these instruments so Georgia could conduct biomonitoring domestically.

This laboratory capacity then allowed for UNICEF Georgia to release a tender for the “Establishment of a National System for Environmental Health Surveillance in Georgia.”²⁷ Surveillance is essential for detecting exposure trends, identifying at-risk populations, and generating the evidence needed to drive targeted public health interventions. A team of researchers at the UiT The Arctic University of Norway in partnership with National Institute of Public Health of Quebec won the tender and developed the Georgia lead surveillance program: a universal surveillance program that tests children ages five to seven, and has been implemented in a phased approach across the country. Stage 1 was conducted between September 2023 to April 2024 that covered Adjara and Imereti.²⁸ Stage 2 expanded surveillance to Tbilisi. Stage 3 included Adjara, Imereti, Tbilisi, Guria, Samegrelo-Zemo Svaneti and Kakheti. The next round will be nationwide expansion by the end of 2026.

5. What made the difference in Georgia

Georgia's response to childhood lead exposure is easy enough to describe. The harder question is why it succeeded when similar efforts in other settings often stall. There was no single turning point or intervention that explained the outcome; progress emerged from a combination of factors that aligned over time.

Five stand out in particular: (1) credible data that elevated lead exposure into a national political issue, (2) sustained government engagement that converted concern into action, (3) the fact that a dominant exposure source was identifiable and relatively feasible to address, (4) extensive support from international partners, and (5) institutional conditions that allowed different parts of government to coordinate effectively. These elements were mutually reinforcing, the absence of any one of them would likely have weakened the overall response.

Some of these factors resulted from deliberate strategic choices and may offer lessons for other countries designing lead programs, while others reflected conditions specific to Georgia.

27 “The Georgian Lead Surveillance System (G-LESS),” August 30, 2022, *The Arctic University of Norway*.

28 Rylander Charlotta et al., “Blood Lead Levels in Children 5 to 7 Years of Age from the Republic of Georgia: A Feasibility Study on Lead Surveillance Using Volumetric Absorptive Microsampling,” *Environmental Health Perspectives* 133, no. 5 (n.d.): 057003, <https://doi.org/10.1289/EHP15788>.

5.1 Evidence as catalyst

“The MICS data were the most compelling blood lead level data anywhere. There was a puzzle to be solved” – Bret Ericson, Programme Specialist, UNICEF

Across all 20 interviews, the 2018 UNICEF MICS6 was identified as the single most consequential event in Georgia’s lead prevention programs. Prior to the MICS, awareness of Georgia’s lead problem existed only as a collection of fragmented signals: elevated BLLs observed in Georgian-American residents by the NYC Department of Health and Mental Hygiene, a case report linking imported Georgian spices to a lead-poisoned child in the United States,²⁹ and a small convenience-sample study at the Iashvili Children’s Central Hospital in Tbilisi. Each of these signals raised suspicion, but the MICS converted suspicion into proof.

The results of MICS6, that 41.1 percent of Georgian children had BLLs above 5 µg/dL and that no tested child had zero detectable lead, was an undeniable cause for action. Interviewees consistently described it as the moment that made inaction impossible.

“There was no child with a zero result—every single child had some level of lead in their blood. That finding was just as significant as the 41% above the threshold. It told us this was not a problem of a few exposed children. It was a problem of an entire country”—Giorgi Kalakashvili, Child Rights Monitoring Specialist at UNICEF Georgia

The importance of this finding extends beyond its content. The lead module’s inclusion in the MICS was itself a deliberate advocacy achievement requiring approximately a year of sustained effort which required coordinated advocacy from UNICEF Georgia, NCDC leadership, and individual champions working through parliamentary committees, donor coordination forums, and institutional channels simultaneously.

A decisive logistical breakthrough was the Italian National Institute of Health’s agreement to analyze MICS blood samples free of charge. Interviewees credited the research director of the institute for his donated time and resources. Without a laboratory capable of processing the samples to the necessary standard, the module would not have been operationally feasible given the budget constraints and absence of domestic laboratory infrastructure and know-how.

The communication of findings was equally deliberate. UNICEF and NCDC released the lead results seven months ahead of the full MICS Georgia report, giving this issue undivided media attention. They paired the announcement with an immediate declaration of a government response, so that the public received alarming data alongside evidence of action.

29 Alan D. Woolf and Nicholas T. Woolf, “Childhood Lead Poisoning in 2 Families Associated With Spices Used in Food Preparation,” *Pediatrics* 116, no. 2 (2005): e314–18, <https://doi.org/10.1542/peds.2004-2884>.

Georgia's blood lead testing methods have since been adopted in other country surveys globally, including in Bangladesh which incorporated the module into its MICS7 in 2025.³⁰ Multiple interviewees described this as one of Georgia's most significant contributions to global lead policy: not only a national public health success but a methodological template that other countries can follow to establish population-level lead exposure baselines at relatively low marginal cost within an existing survey infrastructure.

5.2 Multisectoral political will

"The government recognized this as one of the leading public health problems in the country and started the response immediately. The response was multi-sectoral from the very beginning."—Amiran Gamkrelidze, Director and Professor of Institute for Global and European Health Education and Studies (GEHES), University of Georgia

Strong epidemiological data are a necessary but rarely sufficient condition for policy action. What distinguished Georgia was the speed and scope of the government's response. Within weeks of the release of the MICS results in early 2019, then Prime Minister Bakhtadze convened an interministerial working group, the lead state health program had been designed, and a multi-sectoral response was underway.

Political commitment extended beyond the Ministry of Internally Displaced Persons to the occupied territories, labor, health and social affairs ministries. The response engaged the Ministry of Environmental Protection and Agriculture, the National Food Agency, customs authorities, municipalities, and Parliament's Healthcare and Social Issues and Environment Protection and Natural Resources committees. This multi-ministerial architecture was not merely symbolic: it meant that enforcement mechanisms (market surveillance, customs inspection, and/or the criminal investigation authority) could be activated without requiring new legislation or extensive inter-agency negotiation. The Parliamentary Committee on Healthcare and Social Issues sustained periodic oversight hearings on lead, creating an accountability mechanism that outlasted individual ministerial tenures and has now survived government transition.

At the World Economic Forum in 2024, on a panel with former Administrator of USAID Samantha Power and Tanzania's Minister of State for Labour, Economic Affairs, and Investment, former Georgian Prime Minister Irakli Garibashvili called attention to the lead poisoning epidemic and Georgia and cited the country's success in implementing interventions. This international stage reinforced both international credibility and domestic political ownership. Several interviewees identified this as a turning point in the visibility and legitimacy of the effort, generating additional

30 Bangladesh Multiple Indicator Cluster Survey 2025—Preliminary Report (UNICEF and Bangladesh Bureau of Statistics, 2025), <https://bangladesh.un.org/en/305457-bangladesh-multiple-indicator-cluster-survey-2025-preliminary-report>.

donor interest and signaling to Georgian institutions that the issue had the highest-level political backing.

Subnational leadership was equally important. The Autonomous Republic of Adjara, wherein 85 percent of children had elevated BLLs, has its own government budget and decision-making authority. Adjara's Ministry of Health launched voluntary free testing for pregnant women and children aged 7 to 14, invested in local media outreach independently of the national program, and developed a community-level communication culture around lead that the rest of the country has not yet fully replicated. Adjara's experience functioned as both a proof of concept by demonstrating that BLLs could be reduced through focused intervention, and a template that informed national scale-up. The ability of a subnational government to act with real autonomy and resources, rather than waiting for central direction, significantly accelerated the program's early momentum.

What enabled this political will is worth examining because political will is often cited as a success factor without explanation of why it existed. Three interrelated reasons emerge from the interviews. First, the *MICS data created undeniable public visibility*: once 41 percent prevalence was reported in the media, inaction would have been politically costly. Second, the *government was already engaged*, the NCDC had initiated the advocacy for the MICS module, signaling institutional ownership before the data were even collected. Third, *Georgia's aspirations toward European Union accession created a political incentive to demonstrate progress* on environmental health standards. Acting on lead poisoning was, in this sense, consistent with a broader political project.

"I've said whole of government a lot, but I really can't emphasize that enough. In Georgia they absolutely had that."—Bret Ericson, Programme Specialist, UNICEF

5.3 Source traceability

"The first goal was to understand the magnitude of the issue. We know the magnitude now. The next goal is to understand the sources. We are not fully there yet. And then the final goal is elimination. We still have a long way to go."
—Giorgi Kalakashvili, Child Rights Monitoring Specialist at UNICEF Georgia

Georgia's initial lead exposure burden was dominated by a source that turned out to be unusually tractable: the intentional adulteration of ground spices with lead chromate, a bright yellow inorganic pigment, to enhance color and apparent weight. In 2019, Pure Earth conducted a source assessment across 25 households and four bazaars using portable XRF analyzers which identified spices as a key exposure pathway.³¹ A subsequent market survey of 765 spice samples collected across 29 cities in Georgia between 2020 and 2022 confirmed a decline in contamination over time.³²

31 Bret Ericson et al., "Elevated Levels of Lead (Pb) Identified in Georgian Spices," *Annals of Global Health* 86, no. 1 (2020): 124, <https://doi.org/10.5334/aogh.3044>.

32 Jenna E. Forsyth et al., "Reductions in Spice Lead Levels in the Republic of Georgia: 2020–2022," *Environmental Research* 250 (June 2024): 118504, <https://doi.org/10.1016/j.envres.2024.118504>.

Qualitative interviews conducted for this study suggest that contamination was concentrated in a small network of suppliers with adulterated products, primarily imported from Asia.

This supply chain structure made intervention feasible in unique ways that are not always structurally possible. For one, a small number of upstream actors could be targeted by enforcement and awareness efforts, rather than requiring behavior change across millions of consumers. Additionally, lead chromate was an add-on adulterant, meaning that eliminating it required no substitution of production inputs or redesign of manufacturing processes.

Regulatory enforcement built on this tractability. Customs inspection was strengthened with random testing at borders. The National Food Agency conducted unannounced market surveillance with seizure authority. The Criminal Code's provisions on causing health damage were invoked against identified adulterators, creating deterrent effects beyond the cases directly prosecuted. Awareness campaigns targeted wholesale suppliers rather than consumers, informing them of the legal consequences of knowingly handling adulterated product. Two successive rounds of spice testing between 2020 and 2022 documented a dramatic decline in contamination, with the maximum lead level falling from 14,233 µg/g in 2020 to 36 µg/g by 2022.

However, the tractability of one of the major sources has not resolved the underlying exposure problem. Approximately 15 to 20 percent of children in surveyed regions have BLLs that still exceed 5 µg/dL despite the near elimination of contaminated spices from markets.³³ The residual burden implicates dust, legacy paint, and industrial contamination as contributors whose relative burdens remain to be determined.

5.4 Collaborative ecosystem

“Without personal dedication, this type of difficult project never succeeds. These people were never hired to deal with all these nitty-gritties. But they did it. Without that personal engagement, whatever the institutional framework, it would not have worked.”—Tamar (Tako) Ugulava, Health and Nutrition Specialist, UNICEF Georgia

Georgia's program succeeded through a dense and carefully complementary network of international and domestic partners. No single actor possessed all the capabilities or resources to successfully implement interventions.

- UNICEF Georgia served as the central coordinating institution: a major advocate, the mobilizer of donor funding, the convener of the MICS, the fundraiser for laboratory procurement, staff capacity building, and surveillance system design, the provider

33 Jenna E. Forsyth et al., “Reductions in Spice Lead Levels in the Republic of Georgia: 2020–2022,” *Environmental Research* 250 (June 2024): 118504, <https://doi.org/10.1016/j.envres.2024.118504>.

of ongoing technical assistance to government, and the institutional anchor through multiple government transitions.

- The NCDC was key in designing the program and was the implementing institution, as well as the locus of domestic ownership, without which no program could have been sustained beyond any given donor cycle.
- There was thorough collaboration of the executive and legislative branches of the authorities.
- The Italian National Institute of Health provided the critical early analytical capability that made the MICS module feasible, a partnership formalized through a Memorandum of Understanding signed during Italian President Sergio Mattarella's state visit to Georgia in 2018 and facilitated by the EU–Georgia Twinning Project.
- Pure Earth brought field assessment methodology and spice market surveillance expertise that no Georgian institution possessed at the time.
- Public Health England, which in 2021 became the UKHSA, and the British Geological Survey led the isotope analysis research program and transferred this advanced methodology to NCDC, a collaboration that grew out of the UK's participation in the EU–Georgia Twinning Project
- The Arctic University of Norway designed and continues to support the surveillance system.
- The Clarios Foundation provided the backbone of laboratory infrastructure funding, as well as support during the surveillance system design phase.
- Emory University contributed medical toxicology expertise and clinical training on a largely pro bono basis.
- The New York City Department of Health was the global sentinel that first identified and documented the problem.

“It was a mutual, beneficial triangle of collaboration—the Georgian team, the donors, and the international scientific partners. We all learned from each other. That mutual investment, not just financial but intellectual, is what made it sustainable.”—Ekaterine Ruadze, Monitoring and Evaluation Officer, National Center for Disease Control and Public Health of Georgia

What made this partnership network effective was not merely the number of partners but their genuine complementarity. Partners brought capabilities that did not substantially overlap, reducing competition and enabling a division of labor that matched each actor's comparative advantage.

Individual champions were as important as institutional frameworks. Attention to lead in Georgia traces back in part to a US-based medical toxicologist with family ties to Georgia who pursued the lead problem in Georgia with energy and creativity, connecting different stakeholders into a network that had not previously existed. A UNICEF officer connected an air pollution conversation to existing NYC Department of Health and Mental Hygiene data about Georgian spices, turned this into an institutional advocacy campaign, and held it together through the MICS's design and

execution phases. These individuals were operating beyond their formal roles, using personal relationships and persistence to bridge institutional worlds that did not naturally connect.

5.5 Structural conditions specific to Georgia

Georgia's structural conditions—including its history, geography, and culture—enabled the program's success in ways that cannot be straightforwardly replicated in other settings.

Country size and compactness were a significant accelerant. Georgia's population of approximately 3.9 million, spread across a relatively compact geographic area with a centralized health system meant that a nationally representative survey of 1,578 children was achievable, that market surveillance of a modest number of wholesale suppliers was sufficient to characterize the primary supply chain, and that social networks disseminated awareness rapidly and free of charge. In a larger country with more heterogeneous supply chains and weaker social connectivity, the same strategies would be far more resource intensive.

Institutional capacity at NCDC was a second structural advantage. The NCDC entered this program with established partnerships with the US CDC, WHO, UNICEF, and European institutions; staff with the scientific literacy to engage productively with foreign research partners; and functioning public health infrastructure including a disease surveillance system and a national birth registry. Much of this foundation had been actively strengthened in the years immediately preceding the MICS through the EU–Georgia Twinning Project (2017–2019), a collaboration between the NCDC and public health institutions from Italy, the United Kingdom, and Poland that modernized Georgia's environmental health governance, approximated its legislation with EU standards, and built laboratory capacity.³⁴

Georgia's political orientation toward EU membership created a background regulatory driver that shaped several important outcomes. Lead paint content regulations, toy safety standards, and food additive restrictions all moved toward EU alignment during the program period, driven partly by the political aspiration to accession rather than by lead-specific advocacy alone.

Finally, Georgia's political will enabled the sustained multi-year institutional commitment that this program required. Budget cycles were predictable enough to sustain a long-term health program.

6. Remaining challenges

Georgia's program has achieved great progress, but some challenges remain. BLLs have declined significantly, regulatory enforcement has effectively eliminated a key source of exposure, and there is now a surveillance system in place as a primary prevention measure. However, other challenges remain that will determine whether these gains can be sustained.

³⁴ Lauriola, Paolo, and Amiran Gamkrelidze. 2019. *Institutional Strengthening of Environmental Health System of Georgia*. Twinning Project ENI/2015/037-862 GE/22, Final Report. Brussels: European Commission.

The most pressing gap is the incomplete characterization of exposure sources. Despite significant reductions, a substantial proportion of children continue with high BLLs. Dust, paint, and pollution from industrial sites are suspected contributors, but without clear source attribution, remediation efforts for the remaining sources of exposure cannot be appropriately targeted. Closely related is the question of what happens to children whose blood tests with high lead levels: clinical management protocols exist, but the consistency with which identified children receive effective follow-up and are removed from exposure varies considerably by region.

“Unless we identify these major sources of exposure, we will not be able to eliminate them, and children will face the threat of being exposed all the time. The surveillance shows us we are heading in the right direction. But until we know exactly where all the lead is coming from, we cannot finish the job.”

—Nino Dzotsenidze, Environmental Health Officer, UNICEF Georgia

Interviewees conducting surveillance rollout training in 2024 and 2025 found awareness of lead exposure to be very low among health workers outside Adjara, including in the capital, with direct consequences for surveillance participation rates: some parents declined testing on the advice of physicians who were themselves unfamiliar with the program. Healthcare worker education on lead remains an active gap not only in Georgia, but globally.

Two structural challenges also remain. First, surveillance data is not yet publicly accessible in ways that would enable independent accountability or attract new scientific partnerships. Second, the program’s financial sustainability remains uncertain. Georgia’s government has maintained a consistent domestic budget allocation, but that allocation was designed around an earlier, different model. Sustaining full national surveillance coverage and completing the source identification work needed to address residual exposure will require additional resources. How Georgia navigates this transition will be as instructive for other countries as its earlier successes.

7. Lessons for governments

Georgia’s experience offers a useful model for other countries seeking to address lead exposure. While the specifics of Georgia’s context may not be replicable, the broader approach is transferable: generating evidence, building institutional capacity, and translating technical findings into policy action. Several key lessons emerge from this experience:

1. Start with evidence

“The surveillance system we helped introduce is a primary prevention measure. You cannot treat your way out of lead poisoning—there is no good treatment. The only thing that works is not being exposed in the first place. Surveillance tells you where that is happening.”

—Nino Dzotsenidze, Environmental Health Officer, UNICEF Georgia

Population-level evidence is essential for action on lead exposure. Local studies may suggest a problem, but they rarely generate sustained political attention on their own. In Georgia, the turning point came with the nationally representative data collected through the MICS. Once the scale of the problem was quantified at the national level, inaction became politically difficult to justify.

For other countries, the first priority should be generating evidence. If this reveals significant exposure levels, it cannot easily be ignored. This can be done through existing national surveys, routine child health screenings, or new surveillance systems, depending on the context and available infrastructure. What matters most is that the data is credible, representative, and difficult to dismiss.

How evidence is communicated matters just as much as how it is generated. Publishing alarming findings alongside a clear response plan helps build public trust and political momentum while reducing the risk of panic or backlash. Transparent communication and visible action are more likely to sustain support.

2. Build domestic capacity

One of the most important decisions Georgia made was to build domestic laboratory and surveillance capacity as an explicit program objective, rather than treating external laboratory support as a permanent solution. Before 2018, Georgia had no nationally accredited laboratory capable of measuring lead in blood. By the end of the program's first phase, it had a laboratory stocked with an ICPMS, XRFs, and Atomic Absorption Spectrometers; a nationally accredited surveillance system; and trained personnel in isotope ratio analysis. These outputs make the program more sustainable and likely of succeeding.

Building domestic capacity takes longer and costs more upfront, but it is the only approach that produces a surveillance system that outlasts the initial emergency and can adapt to new threats as they emerge. Plan for sustainability from the beginning.

3. Identify sources

"The laboratory we built is not just for lead. It can test all elements on the periodic table. The capacities built are not lead-specific. They allow the government to address existing hazards and deal with whatever hazards come in the future."

—Andria (Andy) Nadiradze, Technical Advisor, Pure Earth

Georgia's ability to achieve rapid, measurable reductions in children's BLLs depended critically on identifying a major source of exposure early and targeting enforcement there. This allowed the government to direct regulatory enforcement at a concentrated, upstream supply chain rather than diffusing effort across multiple hypothetical sources simultaneously.

Not every country will have sources as concentrated or as tractable as Georgia's adulterated spices, but investing in source identification early is key, because the appropriate response

depends entirely on what the sources turn out to be. Countries that measure BLLs without investing in source identification know that children are exposed but not how to stop it. Countries that skip prevalence measurement and go straight to source investigation lack the population-level data needed to prioritize. Both are needed, and they should be designed to inform each other from the start.

Georgia's experience also illustrates the danger of assuming the source problem is solved. Three rounds of spice market testing confirmed near-complete elimination of contaminated product by 2023, yet 15 to 20 percent of children in surveyed regions still have elevated BLLs. The residual burden requires a longer timeline. Countries should know that the most likely scenario is not having only one source of lead exposure and that abating the primary source will not eliminate lead exposure; continued efforts are needed to do so.

4. Enforcement is as important as regulation

While new regulations were created, some regulatory frameworks were already in place in Georgia, what changed was how they were enforced. Customs inspection was strengthened with random testing at borders. The National Food Agency conducted unannounced market surveillance with seizure authority. Criminal code provisions on intentional food adulteration were invoked against identified suppliers. Some countries might not need new laws, but they may need to work on enforcement.

In most LMIC settings, the primary challenge lies not in existing regulatory frameworks, but in enforcement capacity, inter-agency coordination, and the political will to act against commercial interests. Georgia's experience suggests that supplier-targeted awareness campaigns can effectively complement enforcement efforts.

5. Political will

Political commitment needs to be built throughout the different phases; it does not happen spontaneously.

In Georgia, political will did not appear spontaneously after the MICS results were published. The NCDC had been involved in generating the data and was primed to act on it. Parliamentary committees had been briefed during the advocacy phase for including the lead module. The Prime Minister's office was engaged before the results were released. By the time the 41 percent finding became public, the government was positioned to respond.

8. Guidance for organizations

"Nonprofits and bilaterals and international NGOs like UNICEF are not the solvers of lead poisoning. Governments have a mandate to protect their people. The Government of Georgia was incredibly proactive at a time when proactiveness was rare in the lead world."—Andrew McCartor, President, Pure Earth

Georgia's program would not have happened without international support. The MICS blood lead module was made possible by UNICEF's coordinating role and the Italian National Institute of Health's laboratory partnership. The source identification work was led by Pure Earth. The laboratory infrastructure was funded primarily by the Clarios Foundation. The surveillance system was designed by the UiT The Arctic University of Norway in partnership with the National Institute of Public Health of Quebec. The isotope methodology was transferred by the UK HSA.

The role of international organizations supporting countries on lead exposure is to create the enabling conditions for action and to address gaps that existing national efforts and external engagement do not cover. Georgia's experience highlights three areas where such support is particularly important:

1. Fund the evidence base that makes everything else possible

The most leveraged investment international organizations can make is in nationally representative blood lead surveillance. Without population-level data, lead poisoning remains invisible to policymakers. Yet generating this data is the kind of investment that governments in LMICs often cannot or will not prioritize without external support, because the problem has not been proven to exist.

International organizations should fund biomonitoring proactively, without requiring countries to first demonstrate they have a problem. This means supporting survey modules where national household surveys exist, standalone monitoring programs where they do not, and the integration of blood lead testing into routine child health visits where the health system infrastructure allows. It also means funding communication and advocacy work that ensures data reaches decision-makers and generates a response.

2. Help build domestic capacity

The most common failure mode in international health programming is funding activities rather than systems. A donor funds blood lead testing for three years, the project ends, and the country has data from three years ago but no capacity to generate new data.

Grants for ICPMS equipment, XRF analyzers, laboratory accreditation processes, and staff training create assets that remain with the country after the project ends. They are more expensive upfront and harder to attribute to specific outputs, which makes them less attractive within conventional project financing frameworks. But they are the only form of support that produces sustainable surveillance capacity. Donors should be explicit with themselves and their boards about this trade-off and be willing to make it.

The same logic applies to human capital. Training programs for laboratory technicians, epidemiologists, toxicologists, and public health officials are investments in people who will still be working in the country's health system long after any given project has closed. International organizations should fund training as a core program cost.

Investments in domestic capacity create a legacy that extends beyond any single intervention. A laboratory equipped to measure lead can measure any toxic element; a surveillance system designed for lead can be adapted for other environmental health threats. When international organizations fund capacity rather than services, they leave behind infrastructure that governments can deploy against other hazards, which makes investments a foundation for a broader environmental health monitoring system.

3. Support source identification

One of the clearest gaps in global lead policy is the shortage of rigorous source identification research in LMIC settings. Knowing that children have elevated BLLs is not sufficient for effective action, however source identification requires specialized expertise and equipment that most LMIC health systems do not have.

International organizations are well positioned to fill this gap, both by funding source identification research directly and by supporting the transfer of relevant methodologies to domestic institutions.

9. Conclusion

Over the course of a decade, Georgia identified a public health threat, created a coordinated national response, and achieved measurable progress. While some of Georgia's circumstances were unique, most factors that made this possible are not: reliable population-level data, political commitment, an identifiable major source of exposure, and strong collaboration between domestic institutions and international partners. The main lesson is not that other countries should copy Georgia's exact approach, but that the core principles are transferable and that the obstacles to reducing childhood lead exposure can be overcome.

Important challenges remain. Other sources of lead exposure need to be fully identified, all healthcare workers need to be trained, and maintaining long-term funding will require active commitment. Regardless, Georgia has established a strong backbone for the future, including a nationally accredited laboratory, a representative surveillance system, a trained workforce, and international partnerships that extend beyond single funding cycles. For the hundreds of millions of children worldwide who are still exposed to lead, Georgia's experience demonstrates that progress is possible. Childhood lead exposure is not an unsolvable problem, with sustained commitment from domestic political forces and the international community; it can be identified, addressed, and significantly reduced.

“Lead poisoning is one of those issues where if you pick it, you can expect to make a significant impact. It is not hopeless. Georgia proved that.”—Adam Laycock,
Principal analytical toxicologist at the UK Health Security Agency (UKHSA)

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