

## Gujarat Rapid Market Survey Report

Gujarat State's Rapid Market Screening program was made possible through grants from Global Jewellery Pvt Ltd Unit-G49, Gem & Jewellery Complx-1, Andheri(E), Seepz, Mumbai—400096. Pure Earth is grateful to Global Jewellery Pvt Ltd for supporting research that helps fill knowledge gaps around lead poisoning and its drivers in Gujarat. We would like to thank you for your generous support and for making this important initiative possible.

### Executive Summary

The magnitude of childhood lead poisoning is alarming, as evidenced by the findings of the 2020 report titled "The Toxic Truth" by Pure Earth and UNICEF, which revealed that approximately 800 million children globally, or one in every three, are impacted by lead exposure. This widespread prevalence highlights the persistent threat of lead exposure in children's daily lives. To address this issue, Pure Earth, with the support of Global Jewellery Pvt Ltd initiated the Rapid Market Screening Program (RMS) in Gujarat to deepen our understanding of these exposure sources and empower stakeholders to implement effective solutions.

In this project, we conducted assessments on a total of 389 product samples collected from six districts. Our analysis revealed that 113 samples, representing 29% of all samples, had concentrations of lead exceeding the relevant reference levels based on Portable X-ray fluorescence (XRF) readings. Notably, 95% of metallic foodware samples, 77% of ceramic foodware samples, and 51% of paint samples surpassed the reference levels. Conversely, samples of toys, cosmetics, plastic foodware, spices, and staple dry foods were rarely found to contain lead adulteration.

### Using This Report and Data

Pure Earth suggests readers pay special attention to the report sections titled Methodology, Study Limitations, and Decisions Made for This Report, and to the accompanying annexes, as each of these contains important information regarding the findings, how they are communicated, and how they should be understood and used. Pure Earth recommends that the RMS findings be viewed as suggestive of state and district trends, not as conclusive or representative of all similar products in the state or these districts. Where the RMS suggests a pattern of contamination within a product class, Pure Earth recommends that such findings be substantiated through more robust and targeted surveys or monitoring programs.

### Key Recommendations from Pure Earth

- **Blood Lead Level Testing:** Advocate for large-scale surveys or ongoing monitoring of children's blood lead levels to gauge the prevalence, severity, and geographic distribution of lead poisoning, facilitating appropriate resource allocation and progress measurement.
- **Home-Based Source Assessments:** Along with blood lead level surveys conduct in-home source analyses to establish correlations between contaminated products and incidents of lead poisoning, aiding in the identification of significant local contributors to lead poisoning.

- **Research into Foodware Leachability and Use:** Address the urgent need for research into the leachability and use of contaminated metallic and ceramic foodware to understand potential health risks better.
- **Establishing Recommended Limits for Total Lead in Foodware:** Advocate for the establishment of maximum allowable concentrations for total lead in foodware, considering leachability limits and ensuring regulatory compliance.
- **Enact and Enforce Lead Paint Laws:** Invest in monitoring and enforcement capacities to ensure strict compliance with existing lead paint regulations in India.

### Notable Findings and Recommendations in Detail

The RMS data suggest a variety of trends that Pure Earth finds particularly notable, and which could inform follow-up programs and policies to identify further and mitigate lead exposure sources. The following findings and recommendations are organized by product type and include an “observation” (data that stood out), a “comment” (an explanation or discussion to add context), and a “recommendation” based on the observation. The “reference levels” cited for each product type are used to provide context regarding how the measured lead concentrations in products correspond to available public health guidelines or regulatory standards. Reference levels are discussed in greater detail in the section titled Decisions Made for This Report.

Out of 389 product samples from 6 districts, 113 samples had concentrations of lead exceeding the relevant reference level based on XRF readings, representing 29% of all samples. As shown in the table below, Metallic foodware, Ceramic foodware, and Paints most frequently exceeded the relevant reference levels.

### Summary of Results from Ahmedabad in Order of % Exceeding Reference Levels

S.No	Item Type	# Samples Collected	Mean Lead Conc.(ppm)	% above reference
1	Ceramic Foodware	18	1037.17	77
2	Cosmetics	62	1.76	3
3	Metallic Foodware	19	12327.62	95
4	Paint	60	4142.85	51
5	Plastic Foodware	54	3.52	2
6	Spices	97	ND	0
7	Staple dry Foods	18	ND	0
8	Toys	61	202.54	11

### Metallic Foodware

- **Observation:** Out of 19 samples of metallic foodware (mostly aluminum & brass), 95% had lead concentrations exceeding the reference level of 100 ppm. All study districts had samples that exceeded the reference level by at least 2X. In 4 districts, the maximum value exceeded 10,000 ppm.
- **Comment:** The RMS results suggest that lead is common in metallic foodware across all districts. Most samples in this category were made primarily of aluminum, although some items were also made from brass, copper, and iron alloys.
- **Recommendation:** There is an immediate need to understand if metallic pots used to prepare food in schools, hospitals, and other locations with high concentrations of children contribute to lead poisoning. If so, this would represent an urgent but also a highly concentrated and solvable problem. Interventions to replace contaminated foodware in schools and other locations with safe alternatives could have large impacts at low cost. Additional research is needed to determine if there are ways to reduce the leachability of lead from pots through the introduction of an additive, coating, or other means.

### Ceramic Foodware

- **Observation:** RMS results suggest that elevated lead levels in ceramic coatings (glazes and paints) are widespread. Out of 18 samples of ceramic foodware, 77% had lead concentrations exceeding the reference level of 100 parts per million (ppm), the maximum lead level was more than 10 times the reference level.
- **Comment:** The RMS has revealed a higher prevalence and wide distribution of lead in ceramic foodware. However, this does not necessarily mean that all these foodware contribute equally to exposure. As with all forms of foodware, a high lead concentration on exterior surfaces does not tell us how much lead is leaching into food. The type of glaze, temperature in which it is fired, types of food prepared or served, and ways in which the item is used can all affect leachability and thus, exposure.
- **Recommendation:** Governments should establish appropriate regulations and enforcement capacities to prevent the manufacture and sale of ceramic foodware that is prone to leaching lead into food. Governments and civil society groups should collaborate to help ceramic producers transition to lead-free production.

### Plastic Foodware

- **Observation:** Concentrations of lead in plastic foodware were generally much lower than in ceramic or metal foodware. Out of 54 samples, only one sample had concentrations of lead exceeding the reference level.
- **Comment:** Without a better understanding of potential doses per use through leaching tests, we remain unsure about risks associated with the lead concentrations that we have observed.
- **Recommendation:** Research is needed to better understand the relationship between total lead concentrations in plastic foodware and lead doses per use.

### Cosmetics

- **Observation:** Out of 62 cosmetics samples, only 2 samples exceeded the reference level of 2 ppm.
- **Comment:** Further targeted sampling can assist in get better understanding of localized trends. Priority should be given to products produced locally.
- **Recommendation:** While only a few samples exceeded the reference level, it is imperative to implement stringent controls and enhance monitoring of existing as well as new products to mitigate the distribution and exposure of lead through these items.

### Toys

- **Observation:** Among the 61 toy samples analyzed, 11% exhibited lead levels surpassing the reference level of 100 ppm.
- **Comment:** Although a smaller proportion of toy samples exceeded the relevant reference level compared to some other product categories; the potential risk of exposure is heightened due to children's tendency to put toys in their mouths.
- **Recommendation:** Given children's heightened susceptibility to lead poisoning and their inclination to bite toys, we advocate for the enactment and enforcement of stringent limits on lead concentrations in toys. Additionally, government should collaborate with development partners to bolster monitoring capabilities and enforce regulatory measures effectively.

### Paints

- **Observation:** Among the 60 samples of paint categorized as "intended for large surfaces," 51% exhibited lead levels surpassing the reference level of 90 ppm.
- **Comment:** As of March 2023, 48% of countries worldwide had legally binding controls on lead concentrations in paints, with regulations often based on a model law establishing a maximum lead concentration of 90 ppm. However, many of the paint samples analyzed in this RMS that exceeded this threshold were collected from districts with a 90 ppm regulatory limit.
- **Recommendation:** It is imperative for all government to enact and rigorously enforce regulations limiting lead in paint. Additionally, state and development partners should allocate resources to enhance monitoring and enforcement capacities.

### Spices

- **Observation:** Among the 97 spice samples analyzed, no lead concentration was detected in any of the samples collected during the survey.
- **Comment:** The absence of lead concentration in any of the collected spice samples is an encouraging finding.
- **Recommendation:** Pure Earth recommends regular testing of spices in the state to promptly identify and prevent potential lead exposure from spices in Gujarat. Regular monitoring will help maintain the safety and quality of spice products in Gujarat and safeguard it population from lead exposure through spice lead adulteration.

### Staple Dry Foods

- No lead concentration was detected in any of the 18 staple dry foods samples analyzed during the survey.

## Findings by Districts

### Ahmedabad

Pure Earth analyzed a total of 68 samples from Ahmedabad, and of these, 26 % exceeded the relevant reference levels. As with other districts, a high percentage of Metallic foodware exceeded the reference level (100%).

#### Summary of Results from Ahmedabad in Order of % Exceeding Reference Levels

Item Category	No of samples	Min Value (ppm)	Mean Value (ppm)	Maximum value (ppm)	% above reference
Ceramic Foodware	3	ND	458	1376	33
Metallic Foodware	4	255	401	518	100
Plastic foodware	5	ND	ND	ND	0
Cosmetics	9	ND	ND	ND	0
Spices	16	ND	ND	ND	0
Toys	10	ND	48.93	2916	10
Paint	10	ND	4819	16300	70
Staple dry Foods	3	ND	ND	ND	0

### Vadodara

Pure Earth analyzed a total of 65 samples from Vadodara, and of these, 26 % exceeded the relevant reference levels. A high percentage of samples of foodware and paints exceeded the reference levels.

#### Summary of Results from Vadodara in Order of % Exceeding Reference Levels

Item Category	No of samples	Min Value (ppm)	Mean Value (ppm)	Maximum value (ppm)	% above reference
Ceramic Foodware	3	39	1425	4172	66
Metallic Foodware	3	ND	1213	3344	66

Plastic foodware	10	ND	ND	ND	0
Cosmetics	10	ND	1.4	14	10
Spices	10	ND	ND	ND	0
Toys	10	ND	1.5	15	10
Paint	10	ND	3623	15600	60
Staple dry Foods	3	ND	ND	ND	0

### Rajkot

Pure Earth analyzed a total of 63 samples from Rajkot, and of these, 30 % exceeded the relevant reference levels. A high percentage of samples of Metallic foodware, Ceramic foodware and paints samples exceeded the reference levels.

### Summary of Results from Vadodara in Order of % Exceeding Reference Levels

Item Category	No of samples	Min Value (ppm)	Mean Value (ppm)	Maximum value (ppm)	% above reference
Ceramic Foodware	2	75	178	336	50
Metallic Foodware	3	847	20316	60300	100
Plastic foodware	10	ND	19	190	10
Cosmetics	10	ND	ND	ND	0
Spices	13	ND	ND	ND	0
Toys	10	ND	1043	2917	10
Paint	10	ND	6144	28400	70
Staple dry Foods	3	ND	ND	ND	0

### Patan

Pure Earth analyzed 65 samples from Patan, of which 19 % exceeded the relevant reference levels. A high percentage of Paints, Metallic foodware, and Ceramic foodware samples exceeded the reference levels.

### Summary of Results from Vadodara in Order of % Exceeding Reference Levels

Item Category	No of samples	Min Value (ppm)	Mean Value (ppm)	Maximum value (ppm)	% above reference
Ceramic Foodware	3	20	176	512	33
Metallic Foodware	3	ND	20634	60300	33
Plastic foodware	10	ND	ND	ND	0
Cosmetics	10	ND	ND	ND	0
Spices	17	ND	ND	ND	0
Toys	10	ND	418	5618	20
Paint	10	ND	4265	14000	70
Staple dry Foods	3	ND	ND	ND	0

### Palanpur

Pure Earth analyzed 65 samples from Palanpur, of which 25 % exceeded the relevant reference levels. A high percentage of Metallic and Ceramic foodware samples exceeded the reference levels.

### Summary of Results from Vadodara in Order of % Exceeding Reference Levels

Item Category	No of samples	Min Value (ppm)	Mean Value (ppm)	Maximum value (ppm)	% above reference
Ceramic Foodware	3	ND	947	2843	66
Metallic Foodware	3	ND	16900	52900	100
Plastic foodware	8	ND	ND	ND	0
Cosmetics	10	ND	9.5	95	10
Spices	15	ND	ND	ND	0
Toys	11	ND	ND	ND	0
Paint	10	ND	1729	11100	30
Staple dry Foods	3	ND	ND	ND	0

### Bhuj

Pure Earth analyzed 63 samples from Palanpur, of which 28 % exceeded the relevant reference levels. A high percentage of samples of Metallic foodware, Ceramic foodware, and paint exceeded the reference levels.

**Summary of Results from Vadodara in Order of % Exceeding Reference Levels**

Item Category	No of samples	Min Value (ppm)	Mean Value (ppm)	Maximum value (ppm)	% above reference
Ceramic Foodware	4	30	2147	6381	75
Metallic Foodware	3	ND	18586	57300	100
Plastic foodware	8	ND	ND	ND	0
Cosmetics	8	ND	ND	ND	0
Spices	14	ND	ND	ND	0
Toys	10	ND	53	7618	10
Paint	10	ND	3912	11900	40
Staple dry Foods	3	ND	ND	ND	0

**Annexure**

**Reference Levels**

To provide context to the concentrations of lead found in the various products, Pure Earth selected a “reference level” for each product type. These reference levels serve as thresholds indicating where UN agencies or particularly well-resourced regulatory authorities have established public health guidance, a level of concern, or a regulatory limit for lead in each product class. Pure Earth has included a uniform reference level for each product type to facilitate comparisons.. The inclusion of uniform reference levels is not a suggestion that any one guidance value or regulatory standard is superior to any other, or that concentrations below the reference levels are safe. Rather, the reference levels used here are simply an attempt to contextualize concentrations and highlight particularly concerning results. We selected existing regulatory standards and guidance values promulgated by UN agencies, the European Union, and the United States, prioritized in that order. Pure Earth could not identify existing reference levels for total lead in foodware (items used to cook, serve, consume, and store food).

This report uses a reference level of 100 ppm for all types of foodware. Readers should note that this level is not based on an existing regulatory standard, and that lead doses per use likely vary between categories of foodware, and indeed between individual products. The lead dose per use is likely also affected by the type of food prepared, the method and duration of cooking, and other contextual factors.





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In the absence of any available standards for total lead content for these categories of foodware, we used the US Consumer Product Safety Commission total lead standard for “children’s products” (also used in this report for the category of toys).

Reference Levels and measured lead levels in this report are expressed in parts per million of lead (ppm), which is equivalent to milligrams per kilogram (mg/kg). The following reference levels are used in this report:

- Ceramic foodware: 100 ppm\*
- Metal foodware: 100 ppm\*
- Plastic foodware: 100ppmm\*
- Cosmetics: 2 ppm (EU/Germany)\*\*
- Toys: 100 ppm (US)\*\*\*
- Paint: 90 ppm (UNEP)
- Spices: 2 ppm (EU)\*\*\*\*
- Sweets: 0.1 ppm (US)
- Staple Dry Foods: 0.2 ppm (FAO)
- Herbal/traditional medicines: 10 ppm (WHO)

\* As explained in the text above Pure Earth applied 100 pm as reference level for foodware

\*\*EU regulations state that cosmetics cannot contain heavy metals. They provide exceptions for unavoidable concentrations but do not define these. The German Office of Consumer Protection and Food Safety states that for most cosmetics, levels above 2 ppm are avoidable.

\*\*\* The EU has a toy standard, but it is a “migration” standard that measures lead leaching from products during an acid bath and is not applicable to XRF measurements of total lead.

\*\*\*\* The EU has several regulatory levels that apply to various spice types. 2 ppm is the highest.

Note that for items where multiple XRF readings were taken, the highest reading was used in the analyses presented in this report.