LEAD IN SOLVENT-BASED PAINTS FOR HOME USE IN BANGLADESH

October 2021

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NATIONAL REPORT

LEAD IN SOLVENT-BASED PAINTS FOR HOME USE IN BANGLADESH

OCTOBER 2021

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We take this opportunity to thank all those who were instrumental in compiling and shaping this paint study.

We want to sincerely show our gratitude to Prof. Dr. Abu Zafar Mahmood, Adviser & Head of ESDO's Technical Committee and Former Chairman of the Department of Chemistry at University of Dhaka for his constant guidance and technical support throughout the study.

This report was undertaken as part of IPEN's Global Lead Paint Elimination Campaign and funded by GiveWell, Affinity Impact, and the Swedish Government. It was conducted in Bangladesh by the Environment and Social Development Organization (ESDO) in partnership with IPEN.

While this study was undertaken with funding assistance from GiveWell, Affinity Impact, and the Swedish Government, responsibility for the content lies entirely with IPEN and ESDO. GiveWell, Affinity Impact, and the Swedish Government do not necessarily share the expressed views and interpretations.

IPEN
for a toxics-free future

IPEN is a network of over 600 non-governmental organizations working in more than 120 countries to reduce and eliminate the harm to human health and the environment from toxic chemicals.

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ESDO

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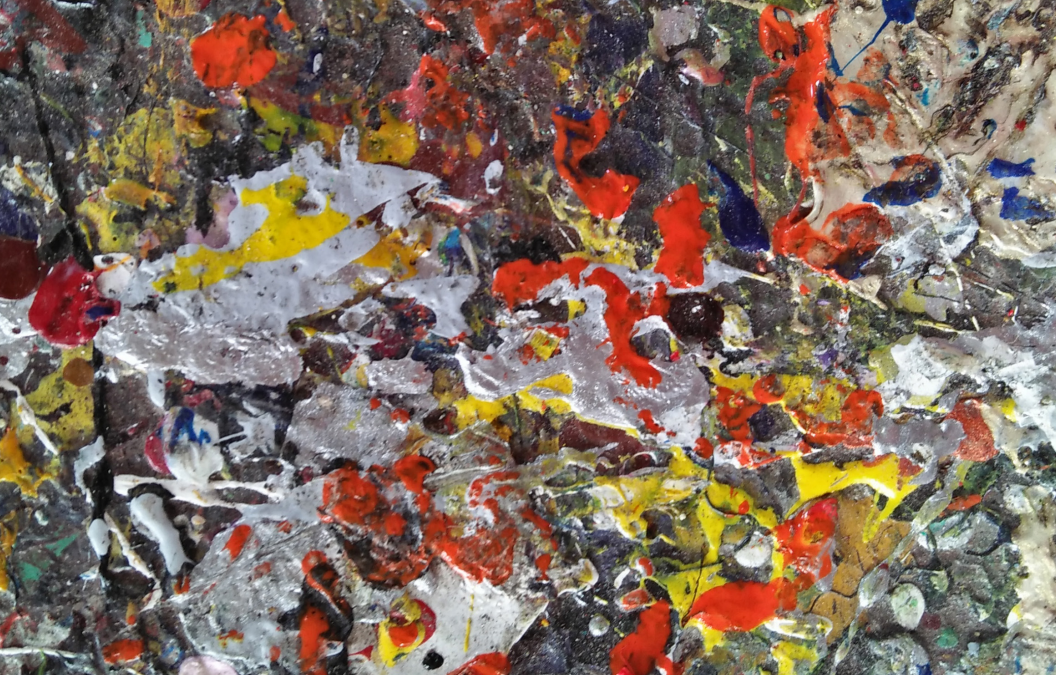

PREFACE

Lead paints for home use continue to be widely produced, sold, and used in developing countries despite the fact that most highly industrial countries banned lead paints for household use more than 40 years ago. IPEN and Participating Organizations are part of the global movement to eliminate lead paint by 2020 to protect children's health.

In 2007 and 2008, NGOs in the IPEN network collected and analyzed decorative (home use) paints on the market in 11 developing countries, and in countries with economies in transition. The results were startling. In every one of these countries, many of the paints contained extremely high lead levels. In response, IPEN launched its Global Lead Paint Elimination Campaign, which seeks to eliminate lead in paint and raise widespread awareness among business entrepreneurs and consumers about the adverse human health impacts of lead paint, particularly on the health of children. Since then, IPEN-affiliated NGOs and others have sampled and analyzed paints on the market in more than 50 low- and middle-income countries.

This report presents new data on the total lead content of solvent-based paints for home use available on the market in Bangladesh. It also presents background information on why the use of lead paint is a source of serious concern, especially to children's health; a review of national policy frameworks that are in place to ban or restrict the manufacture, import, export, distribution, sale and use of lead paint, and provides a strong justification to adopt and enforce further regulatory controls in Bangladesh. Finally, it proposes action steps by different stakeholders to protect children and others from lead paint.

This study was conducted by ESDO in partnership with IPEN.

IPEN is an international NGO network of health and environmental organizations from all regions of the world of which ESDO is a member. IPEN is a leading global organization working to establish and implement safe chemicals policies and practices to protect human health and the environment. Its mission is a toxics-free future for all. IPEN helps build the capacity of its member organizations to implement on-the-ground activities, learn from each other's work, and work at the international level to set priorities and achieve new policies.

The Environment and Social Development Organization (ESDO) is a non-profit and non-government organization for conserving nature and the environment. Since the official formation of ESDO in 1990, the organization has focused on generating knowledge amongst the wider community about how human activity can negatively impact the environment in Bangladesh. ESDO strives to improve the livelihoods, the socio-economic status, and simultaneously the environmental education of some of the most vulnerable communities in Bangladesh. ESDO invests in the people to care for the environment by providing essential inputs and capacity building. ESDO wants to ensure self-reliant rural communities live in harmony with their environment.

EXECUTIVE SUMMARY

Lead is a toxic metal that causes adverse effects on both human health and the environment. While lead exposure is also harmful to adults, lead exposure harms children at much lower levels, and the health effects are generally irreversible and can have a lifelong impact.

The younger the child, the more harmful lead can be, and children with nutritional deficiencies absorb ingested lead at an increased rate. The human fetus is the most vulnerable, and a pregnant woman can transfer lead that has accumulated in her body to her developing child. Lead is also transferred through breast milk when lead is present in a nursing mother.

Evidence of reduced intelligence caused by childhood exposure to lead has led the World Health Organization (WHO) to list "lead-caused mental retardation" as a recognized disease. WHO also lists it as one of the top ten diseases whose health burden among children is due to modifiable environmental factors.

Lead paint is a major source of childhood lead exposure. The term lead paint is used in this report to describe any paint to which one or more lead compounds have been added. The cut-off concentration for lead paint used in the report is 90 parts per million (ppm, dry weight of paint), the strictest legal limit enacted in the world today. All lead concentrations in the report are total lead levels, unless otherwise specified.

Most highly industrial countries adopted laws or regulations to control the lead content of decorative paints—the paints used on the interiors and exteriors of homes, schools, and other child-occupied facilities—beginning in the 1970s and 1980s. In Bangladesh, ESDO has been working with key government agencies since 2010 to establish a specific regulation on lead in paint. ESDO has prepared a draft regulatory framework and guideline, and submitted it to the Department of Environment (DOE). As a result, the Bangladesh Standard and Testing Institute (BSTI) in 2018 has finalized a standard for the paint manufacturing industry, setting a maximum limit of harmful lead content at 90 parts per million (ppm) for household paints including **enamel paints, synthetic paints, exterior paints for undercoating and finishing, and emulsion paints**.

From February to April 2021, ESDO purchased a total of 63 cans of solvent-based paint sold for home use from stores in Dhaka, Bangladesh. The paints represented 26 different brands produced by 21 manufactur-

ers. All collected sample paints were analyzed by an accredited laboratory in the United States of America for their lead content, based on dry weight of the paint. The laboratory has also participated in the Environmental Lead Proficiency Analytical Testing (ELPAT) program operated by the American Industrial Hygiene Association (AIHA), assuring the reliability of the analytical results.

RESULTS

Twenty out of 63 analyzed solvent-based paints for home use (32 percent of paints) were lead paints, i.e., they contained lead concentrations above 90 parts per million (ppm, dry weight of paint). This is also the regulatory limit for lead in decorative paint in e.g., India, the Philippines, and the United States of America. Moreover, six paints (10 percent of paints) contained extremely high lead concentrations above 10,000 ppm. The highest lead concentrations detected were 190,000 ppm in a yellow industrial paint and 52,000 ppm in a yellow decorative paint sold for home use. Both paints were manufactured in Bangladesh.

On the other hand, 43 out of 63 solvent-based paints for home use (68 percent of paints) contained lead concentrations below 90 ppm, suggesting that the technology to produce paint without leaded ingredients exists in Bangladesh.

Twelve out of 26 analyzed brands (46 percent of paint brands) sold at least one lead paint, i.e., a paint with lead concentration above 90 ppm. Six out of 26 analyzed brands (23 percent of paint brands) sold at least one lead paint with extremely high lead concentrations above 10,000 ppm.

This study shows that yellow paints most frequently contained extremely high lead concentrations above 10,000 ppm. In fact, all six paints which contained lead levels above 10,000 ppm were yellow paints (43 percent of yellow paints).

In general, most of the Bangladeshi paint cans' labels did not carry meaningful information about lead content or the hazards of lead paint. Only 19 out of 63 analyzed paints (30 percent of paints) provided information about lead on their labels and most paints carried little information about any ingredients on can labels. Two paints from one brand contained 70,000 ppm and 500 ppm lead levels despite having "Lead Safe Paint" claims on its labels, while another paint labeled "Lead Free" contained 22,000 ppm lead. Most paints were merely labeled as "solvents, pigments and resin," with no further details on the type of solvents and pigments (organic or inorganic) provided on paint can labels. Manufacturing dates or batch numbers were included on the labels of 42 out of 63 paints (67

percent of paints) included in this study. Most warning symbols on the paint cans indicated the flammability of the paints, but no precautionary warnings on the effects of lead dust to children and pregnant women were provided.

In this study, lead levels among decorative paints have improved from the results of a similar paint study conducted by ESDO in 2015. In the previous study, 56 solvent-based decorative paints from 24 brands were purchased and analyzed, wherein 43 of 56 paints (77 percent of paints) contained lead levels above 90 ppm (down to 31 percent in 2021), and 19 of 56 paints (34 percent of paints) contained lead levels above 10,000 ppm (down to six percent in 2021). The percentage of paints with lead levels below 90 ppm increased thrice as much from 23 percent in 2015 to 69 percent in 2021. This demonstrates that many paint manufacturers have already reformulated their paints without using lead ingredients.

CONCLUSIONS

This study demonstrates that solvent-based paints with high concentrations of lead are still available in Bangladesh since paints included in this study are sold in retail stores all over the country. However, the fact that 43 out of 63 paints (68 percent of paints) contained lead concentrations below 90 ppm indicates that paint manufacturers in Bangladesh are capable and technologically able to produce paints without added lead. Nonetheless, these study findings showed a strong justification to adopt and enforce a regulation that will ban the manufacture, import, export, distribution, sale and use of all paints with total lead concentrations greater than 90 ppm in the near future.

RECOMMENDATIONS

To address the problem of lead in paint, the ESDO and IPEN propose the following recommendations:

Government and Government Agencies

Since lead paint standards on decorative household paints are already adopted, the Bangladesh Standard and Testing Institution (BSTI) should now draft additional standards that will ban the manufacture, import, export, distribution, sale and use of other types of paints, including industrial paints, that contain total lead concentrations exceeding 90 ppm, the standard recommended in the *Model Law and Guidance for Regulating Lead Paint*, * developed by the Global Alliance to Eliminate Lead

* https://www.unenvironment.org/resources/publication/model-law-and-guidance-regulating-lead-paint

Paint (GAELP) and published by the UN Environment Programme. They should also require paint companies to display sufficient information indicating harmful content on paint can labels such as solvents and provide a warning on possible lead dust hazards when disturbing painted surfaces.[†,‡]

Paint Industry

Paint companies that still produce paints with lead above the regulated standard of 90 ppm should expeditiously stop the use of leaded paint ingredients in paint formulations. Paint companies that have shifted to non-lead paint production should get their products certified through independent, third-party verification procedures to increase the customer's ability to choose paints with no added lead. The Bangladesh Paint Manufacturers Association (BPMA) can play a strong role to ensure that their paint manufacturer members comply with the law.

Individual, Household and Institutional Consumers

Paint consumers should demand paints with no added lead from paint manufacturers and retailers, as well as full disclosure of a paint product's content. Household and institutional consumers should ask for, consciously buy, and apply only paints with no added lead in places frequently used by children such as homes, schools, day care centers, parks and playgrounds. For these kinds of activities, mass awareness and social media campaigns will be necessary otherwise people will not properly understand the harmful human impacts of lead in paint.

Organizations and Professional Groups

Public health groups, consumer organizations and other concerned entities should support the elimination of lead paint, and conduct activities to inform the public and protect children from lead exposure through lead paint, lead in dust and soil, and other sources of lead.

All Stakeholders

All stakeholders like BPMA, academicians, BSTI, technical advisors from chemical divisions, key government ministries, and regulatory bodies should come together and unite in promoting a strong policy that will eliminate lead paint in Bangladesh.

† http://bdlaws.minlaw.gov.bd/act-62/section-19213.html
‡ http://bdlaws.minlaw.gov.bd/act-details-333.html

1. BACKGROUND

1.1 HEALTH AND ECONOMIC IMPACTS OF LEAD EXPOSURE

Children are exposed to lead from paint when lead-containing paint on walls, windows, doors or other painted surfaces begins to chip or deteriorate, since this causes lead to be released to dust and soil. When a surface previously painted with lead paint is sanded or scraped in preparation for repainting, very large amounts of lead-contaminated dust is produced, which, when spread, can constitute a severe health hazard.[1]

Children playing indoors or outdoors get house dust or soil on their hands, and then ingest it through normal hand-to-mouth behavior. If the dust or the soil is contaminated with lead, the children will ingest lead. Hand-to-mouth behavior is especially prevalent in children aged six years and under, the age group most easily harmed by exposure to lead. A typical one- to six-year-old child ingests between 100 and 400 milligrams of house dust and soil each day.[2]

In some cases, children pick up paint chips and put them directly into their mouths. This can be especially harmful because the lead content of paint chips is typically much higher than what is found in dust and soils. When toys, household furniture, or other articles are painted with lead paint, children may directly ingest the lead-contaminated, dried paint when chewing on them. Nonetheless, the most common way that children ingest lead is through lead-contaminated dust and soil that gets onto their hands.[3]

While lead exposure is also harmful to adults, lead exposure harms children at much lower levels. In addition, children absorb up to five times as much of ingested lead than adults. Children with nutritional deficiencies absorb ingested lead at an even increased rates.[2]

The younger the child, the more harmful lead can be, and the health effects are generally irreversible and can have a lifelong impact. The human fetus is the most vulnerable, and a pregnant woman can transfer lead that has accumulated in her body to her developing child.[4] Lead is also transferred through breast milk when lead is present in a nursing mother.[5]

Once lead enters a child's body through ingestion, inhalation, or across the placenta, it has the potential to damage several biological systems and pathways. The primary target is the central nervous system and the brain,

but lead can also affect the blood system, the kidneys, and the skeleton.[6] Lead is also categorized as an endocrine-disrupting chemical (EDC).[7]

It is generally agreed that one key element in lead toxicity is its capacity to replace calcium in neurotransmitter systems, proteins, and bone structure, altering function and structure and thereby leading to severe health impacts. Lead is also known to affect and damage cell structure.[8]

According to the World Health Organization (WHO): "Lead has no essential role in the human body, and lead poisoning accounts for about 0.6 percent of the global burden of disease."[2] Evidence of reduced intelligence caused by childhood exposure to lead has led WHO to list "lead-caused mental retardation" as a recognized disease. WHO also lists it as one of the top ten diseases whose health burden among children is due to modifiable environmental factors.[9]

In recent years, medical researchers have been documenting significant health impacts in children from lower and lower levels of lead exposure.[2, 6] According to the factsheet on Lead Poisoning and Health from WHO: "There is no known level of lead exposure that is considered safe."[10]

When a young child is exposed to lead, the harm to her or his nervous system makes it more likely that the child will have difficulties in school and engage in impulsive and violent behavior.[11] Lead exposure in young children is also linked to increased rates of hyperactivity, inattentiveness, failure to graduate from high school, conduct disorder, juvenile delinquency, drug use, and incarceration.[2] Lead exposure impacts on children continue throughout life and have a long-term impact on a child's work performance, and—on average—are related to decreased economic success.

A recent study investigating the economic impact of childhood lead exposure on national economies in all low- and middle-income countries estimated a total cumulative cost burden of $977 billion international dollars* per year.[12] The study considered the neurodevelopmental effects on lead-exposed children, as measured by reduced IQ points, and it correlated lead exposure-related reductions in children's IQ scores to reductions in lifetime economic productivity, as expressed in lifelong earning power.

* An International dollar is a currency unit used by economists and international organizations to compare the values of different currencies. It adjusts the value of the U.S. dollar to reflect currency exchange rates, purchasing power parity (PPP), and average commodity prices within each country. According to the World Bank, "An international dollar has the same purchasing power over GDP as the U.S. dollar has in the United States." The international dollar values in this report were calculated from a World Bank table that lists GDP per capita by country based on purchasing power parity and expressed in international dollars.

LEAD PAINT TERMINOLOGY

As used in this booklet:

- "Paint" includes varnishes, lacquers, stains, enamels, glazes, primers, or coatings used for any purpose. Paint is typically a mixture of resins, pigments, fillers, solvents, and other additives.
- "Lead paint" is paint to which one or more lead compounds have been added.
- "Lead pigments" are lead compounds used to give a paint product its color.
- "Lead anti-corrosive agents" are lead compounds used to protect a metal surface from rusting or other forms of corrosion.
- "Lead driers" are lead compounds used to make paint dry more quickly and evenly.
- "Decorative paint" refers to paints that are produced for use on inside or outside walls, and surfaces of homes, schools, commercial buildings, and similar structures. Decorative paints are frequently used on doors, gates, and windows, and to repaint household furniture such as cribs, playpens, tables, and chairs.
- "Solvent-based, enamel decorative paint" or "enamel decorative paint" refers to oil-based paints.
- "PPM" means parts per million total lead content by weight in a dried paint sample. All lead concentrations in the report are total lead levels, unless otherwise specified.

The study identified many different sources of lead exposure in children, with lead paint as one major source. Broken down by region, the economic burden of childhood lead exposure as estimated by this study was:

- **Africa:** $134.7 billion of economic loss, or 4.03 percent of Gross Domestic Product (GDP);
- **Latin America and the Caribbean:** $142.3 billion of economic loss, or 2.04 percent of GDP; and
- **Asia:** $699.9 billion of economic loss, or 1.88 percent of GDP.

Country estimates used in this study shows that economic loss in Bangladesh is estimated at $15.9 billion, or six percent of its Gross Domestic Product (GDP).†

† http://www.med.nyu.edu/pediatrics/research/environmentalpediatrics/leadexposure

1.2 THE USE OF LEAD IN PAINT

Paints contain high levels of lead when the paint manufacturer intentionally adds one or more leaded compounds to the paint for some purpose. A paint product may also contain some amount of lead when paint ingredients contaminated with lead are used, or when there is cross-contamination from other product lines in the same factory. Leaded paint ingredients are most commonly intentionally used in solvent-based paint due to their chemical properties, and solvent-based paints have been found to have high lead content in many countries.[13-15]

The leaded compounds most commonly added to paints are pigments. Pigments are used to give the paint its color, make the paint opaque (so it covers well), and protect the paint and the underlying surface from degradation caused by exposure to sunlight. Lead-based pigments are sometimes used alone, and sometimes used in combination with other pigments.

Leaded compounds may also be added to enamel paints for use as driers (sometimes called drying agents or drying catalysts). Leaded compounds are also sometimes added to paints used on metal surfaces to inhibit rust or corrosion. The most common of these is lead tetroxide, sometimes called red lead or minium.

Non-leaded pigments, driers, and anti-corrosive agents have been widely available for decades and are used by manufacturers producing the highest quality paints. When a paint manufacturer does not intentionally add lead compounds in the formulation of its paints and takes care to avoid the use of paint ingredients that are contaminated with lead, the lead content of the paint will be very low—less than 90 parts per million (ppm) lead by dry weight, and frequently down to 10 ppm or less.

Most highly industrial countries adopted laws or regulations to control the lead content of decorative paints beginning in the 1970s and 1980s. Many also imposed controls on the lead content of paints used on toys and for other applications likely to contribute to lead exposure in children. These regulatory actions were taken based on scientific and medical findings that lead paint is a major source of lead exposure in children, and that lead exposure in children causes serious harm, especially to children aged six years and under.

The use of lead in production of decorative paint is prohibited in the European Union through regulations related to safety of consumer products and specific prohibitions for most leaded raw materials. In the U.S., Canada, Australia and other countries with regulations restricting the use of leaded ingredients in decorative paint, standards specifying a maximum

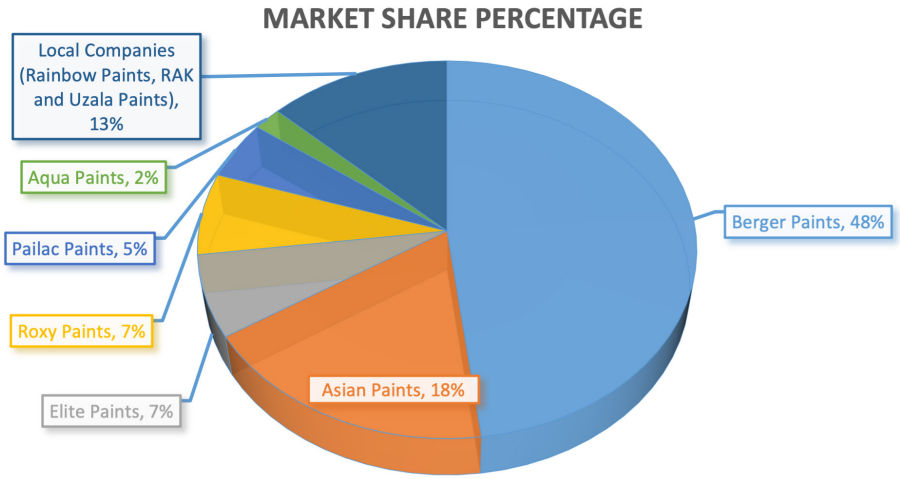

Figure 1. Major paint brands in Bangladesh (by market share).

lead limit are in place. The current standard for decorative paints in e.g., the U.S., the Philippines, and India is a total maximum lead content of 90 ppm, and adherence to this ensures that a manufacturer can sell its paint anywhere in the world. This standard is also recommended in the *Model Law and Guidance for Regulating Lead Paint*,* which was developed by the Global Alliance to Eliminate Lead Paint (GAELP) and published by the UN Environment Programme.

1.3 PAINT MARKET AND REGULATORY FRAMEWORK IN BANGLADESH

1.3.1. Paint Market in Bangladesh

The size of the Bangladesh paint industry is more than BDT 40,000 million, (approx. $471 million USD). Forty-three formal/structured and over 20 non-structured paint manufacturers sell paints in Bangladesh. Foreign-owned brands including Berger, Asian, Elite, Roxy, Pailac, and Aqua are the major players and control an almost 90 percent market share (Figure 1). Berger Paints alone holds 48 percent market share, followed by Asian Paints with 18 percent market share, Elite Paints 7 percent, Roxy 7 percent, Pailac 5 percent, and Aqua 2 percent. Other, small and medium-sized enterprises (SMEs) like Rainbow Paints, RAK Paints, and Uzala

* https://www.unenvironment.org/resources/publication/model-law-and-guidance-regulating-lead-paint

Paints, altogether take up 13 percent of market share. The country's paint and coating market has attracted a slew of international paint and coating producers in recent years. Japanese Kansai Paint invested $7 million (BDT 572.6 million) in 2018 for a 55 percent stake of RAK Paints through its Indian subsidiary Kansai Nerolac Paints. Together, all these companies produce 180,000 MT of paints annually, although the demand of the country is nearly 220,000 MT. The sector recorded an over 6 percent year-on-year growth in recent times thanks to the rapid urbanization in a country of around 167.8 million people.[*,†] The per capita paint consumption of the country is approximately 1.07 Kg.

1.3.2. Lead Paint Regulatory Framework in Bangladesh

In 2018, the Bangladesh Standards and Testing Institution (BSTI) under the Ministry of Industry (MoI) developed three standards on various types of paints such as enamel, synthetic, and exterior paints for undercoating and finishing applications (BDS 1423:2018); emulsion paints (BDS 1827:2018); and economy emulsion paints or distempers (BDS 1833:2018). These paints are commonly used in household and home decorations. According to the Statutory Regulatory Order (**SRO**) **No. 221-Law/2018**, the three standards set a mandatory total lead limit of **90 ppm** (**parts per million**) in paint manufacturing.

1.3.3. Initiatives to Establish a Lead Paint Standard

The main objective of ESDO is to eliminate lead paint in Bangladesh by supporting the implementation of a mandatory 90-ppm lead limit in paint. From 2018 to 2021, ESDO undertook a number of consultative dialogs and meetings with several stakeholders including paint producers, the paint manufacturers association, and policymakers in Bangladesh to raise awareness about the problem of lead in paint and discuss the importance of developing a regulation that will control its use in all types of paints. The Ministry of Environment, Forest and Climate Change (MoEFCC); Ministry of Health & Family Welfare (MoH&FW); Ministry of Commerce (MoC); Ministry of Industry (MoI); Bangladesh Council of Scientific and Industrial Research (BCSIR); and the Department of Public Health Engineering all expressed support for the establishment of such legislations under Bangladeshi law. However, monitoring and enforcement mechanisms remain challenging so ESDO, together with IPEN, are assessing paint companies' compliance with the law through analysis of paints sold in the market.

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* https://www.coatingsworld.com/issues/2020-10-01/view_india_asia_pacific_reports/the-paint-and-coatings-industry-in-bangladesh/

† https://www.thedailystar.net/business/news/prospects-paint-industry-1772083

1.3.4. Awareness-Raising Initiatives by ESDO

International Lead Poisoning Prevention Week of Action (ILPPW)

ESDO is the first civil society organization that worked on the elimination of lead in paint, specifically, in advocating for a specific regulation on 'lead-free paint' since 2008. As a result, in 2018, the Bangladesh Standard and Testing Institute (BSTI) finalized a standard for the paint manufacturing industry setting a limit of 90 ppm for household paints. Since 2013, ESDO has been observing the International Lead Poisoning Prevention Week (ILPPW) by conducting round table meetings with national stakeholders and international partners led by the Global Alliance to Eliminate Lead in Paint (GAELP) to create awareness and promote actions that will address the human health effects of lead exposure. During the ILPPW, representatives from government, academe, industry, and civil society collaborate to raise awareness on childhood lead poisoning and the highlight the importance of enacting special laws to eliminate lead in paint.

ESDO's other awareness-raising activities included:

- Human chain/peaceful demonstration activities;
- Children's art, poster-making, and essay-writing competitions; and
- Preparation of information, education, and communication (IEC) materials highlighting the impact of lead paint to human health and the environment.

These IEC materials were disseminated to electronic and print media and shared via ESDO's website and social media platforms. ESDO also produced a short documentary that focused on banning the importation, manufacture, and use of lead-based paint and lead pigments in Bangladesh and promotes superior and safer alternatives.

2. MATERIALS AND METHODS

From February to April 2021, 63 cans of solvent-based paint sold for home use were purchased by Environment and Social Development Organization (ESDO) from various stores in Dhaka, Bangladesh. The paints represented 26 different brands produced by 21 manufacturers.

In most cases, one light-based paint (white paint) and one or more bright-colored paint such as red, orange or yellow were selected. Additionally, seven anticorrosive paints and seven industrial paints were also included in this study. The availability of these paints in retail establishments suggested that they were intended to be used within home environments.

During the paint sample preparation, information such as color, brand, manufacturer, country where manufactured, product codes, production dates, and other details as provided on the label of the paint can were recorded. Generic paint colors were recorded, e.g., "yellow" instead of "sunflower." For all colored paints, the protocol called for obtaining "bright" or "strong" red and yellow paints when available.

Paint sampling preparation kits containing individually numbered, untreated wood pieces, single-use paintbrushes and stirring utensils made from untreated wood sticks were assembled and shipped to ESDO by the staff of the IPEN partner NGO, Arnika, in The Czech Republic.

Each can of paint was thoroughly stirred and was subsequently applied onto individually numbered triplicates of untreated, labeled wood pieces using different unused, single-use paintbrushes by a researcher of ESDO as shown in Figure 2.

Each stirring utensil and paintbrush were used only for the same paint, and extra caution was taken to avoid cross contamination. All samples were then allowed to dry at room temperature for five to six days. After drying, the painted wood pieces were placed in individually labeled, resalable plastic bags and shipped for analysis of lead content to Forensic Analytical Laboratories, Inc. in the United States of America. The laboratory participates in the Environmental Lead Proficiency Analytical Testing (ELPAT) Program operated by the American Industrial Hygiene Association. In the laboratory selection process, IPEN further assessed the reliability of the laboratory results by conducting an independent quality

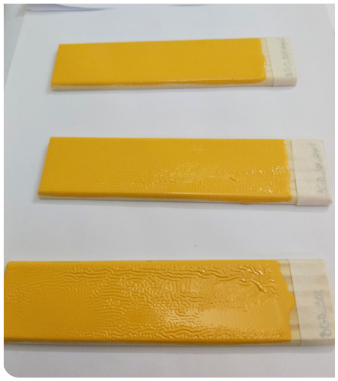
Figure 2. Sample preparation conducted by ESDO.

a) Purchased paint cans

b) Preparation of wooden slides for sample preparation

c) Painting on the wooden slides

d) Final stage of wooden slide preparation



e) Painted wooden slides for drying and dried yellow color samples

f) Dried samples packaged for shipment to an accredited US lab

assurance testing. This was made by sending paint samples with a known lead content to the laboratory, and evaluating the results received.

The laboratory's lower limit of detection for the lead concentration in the paint samples is dependent on the amount of paint in the samples. Generally, the lowest detection limit for the method used is 60 ppm, but if only a small amount of paint is available, the detection limit increases.

The paint samples were analyzed using method EPA3050B/7000B, i.e., through acid digestion of the samples, followed by Flame Atomic Absorption Spectrometry, as recognized by the WHO as appropriate for the purpose.[16]

3. RESULTS

3.1 SUMMARY OF RESULTS

This study shows that:

- 20 out of 63 analyzed solvent-based paints (32 percent of paints) were lead paints, i.e., they contained lead concentrations above 90 parts per million (ppm), dry weight. In addition, six paints (10 percent of paints) contained extremely high lead concentrations above 10,000 ppm.
- 12 out of 26 analyzed brands (46 percent of paint brands) sold at least one lead paint, i.e., a paint with lead concentration above 90 ppm. Also, six out of 26 analyzed brands (23 percent of paint brands) sold at least one lead paint with extremely high lead concentrations above 10,000 ppm.
- 18 out of 44 bright-colored paints (41 percent of bright-colored paints) were lead paints, i.e., they contained lead concentrations above 90 parts per million (ppm), dry weight. Yellow paints were the most hazardous with six out of 14 paints (43 percent of yellow paints) containing lead concentrations greater than 10,000 ppm.
- The highest lead concentrations detected were 190,000 ppm in a yellow industrial paint and 52,000 ppm in a yellow decorative paint sold for home use.
- Only 19 out of 63 paints (30 percent of paints) provided information about lead on their labels and most paints carried little information about ingredients. Two paints from one brand contained 70,000 ppm and 500 ppm lead levels despite having "Lead Safe Paint" claims on its labels, while another paint labeled "Lead Free" contained 22,000 ppm lead. Most warning symbols on the paint cans indicated the flammability of the paints, but no precautionary warnings on the effects of lead dust to children and pregnant women were provided.

3.2 LEAD CONTENT ANALYSIS

Twenty out of 63 analyzed solvent-based paints (32 percent of paints) were lead paints, i.e., contained a lead concentration above 90 ppm —six of these contained extremely high lead concentrations above 10,000 ppm (10 percent of paints).

A yellow automotive industrial paint contained the highest concentration of lead at 190,000 ppm, while the lowest concentration of lead less than 60 ppm was detected in 38 paints from 22 brands.

The ten solvent-based paints with the highest amounts of lead are summarized in Table 1.

TABLE 1. TOP 10 SOLVENT-BASED PAINTS WITH THE HIGHEST LEAD CONTENT.

Rank	Sample No.	Brand Name	Type of Paint	Color	Country of Manufacture	Lead Content Label	Lead Content (ppm)
1	BGD-309	Brand 15	Industrial	Yellow	Bangladesh	None	190,000
2	BGD-336	Brand 24	Industrial	Yellow	Bangladesh	None	90,000
3	BGD-332	Brand 7	Industrial	Yellow	Bangladesh	Lead Safe Paint	70,000
4	BGD-311	Brand 18	Decorative	Yellow	Bangladesh	None	52,000
5	BGD-339	Brand 9	Decorative	Yellow	Bangladesh	Lead Free	22,000
6	BGD-315	Brand 13	Decorative	Yellow	Bangladesh	None	20,000
7	BGD-362	Brand 6	Decorative	Red	Bangladesh	None	6,100
8	BGD-345	Brand 11	Decorative	White	Bangladesh	None	5,900
9	BGD-317	Brand 17	Decorative	Yellow	Bangladesh	None	4,600
10	BGD-348	Brand 5	Decorative	Green	Bangladesh	None	4,300

3.3 PAINT BRAND ANALYSIS

Six out of 26 analyzed brands (23 percent of paint brands) sold at least one paint with extremely high lead concentration above 10,000 ppm.

Among 49 solvent-based decorative paints, a yellow synthetic enamel paint contained the highest concentration of lead at 52,000 ppm. On the other hand, 34 paints from 17 brands contained lead concentrations below 90 ppm. This indicates that the technology to produce paints without added lead exists in Bangladesh.

Among the seven anticorrosive paints, a red-and-black oxide primer for metal surfaces contained the highest concentration of lead at 1,500 ppm. On the other hand, six paints from six brands contained lead concentrations below 90 ppm.

Among the seven industrial paints, a yellow automotive lacquer paint contained the highest concentration of lead at 190,000 ppm, followed by another yellow automotive lacquer paint with 90,000 ppm, a yellow epoxy finishes industrial paint labeled "Lead Safe Paint" with 70,000 ppm, and a red automotive lacquer paint with 130 ppm. On the other hand, three paints from two brands contained lead concentrations below 90 ppm.

3.4 PAINT COLOR ANALYSIS

Eighteen out of 44 bright-colored paints (41 percent of bright-colored paints) such as yellow, red, orange, and green contained lead concentrations above 90 ppm, six paints of which contained extremely high lead concentrations above 10,000 ppm (14 percent of bright-colored paints).

This study included 25 red paints, 17 white paints, 14 yellow paints, four green paints, two grey paints, and one orange paint. Yellow paints contained the highest lead concentrations.

Among bright-colored paints, seven out of 14 yellow paints (50 percent of yellow paints) contained lead concentrations above 90 ppm, six paints of which exceeded more than 10,000 ppm of lead (43 percent of yellow paints).

The distribution of lead concentrations in different colors is shown in Figure 3.

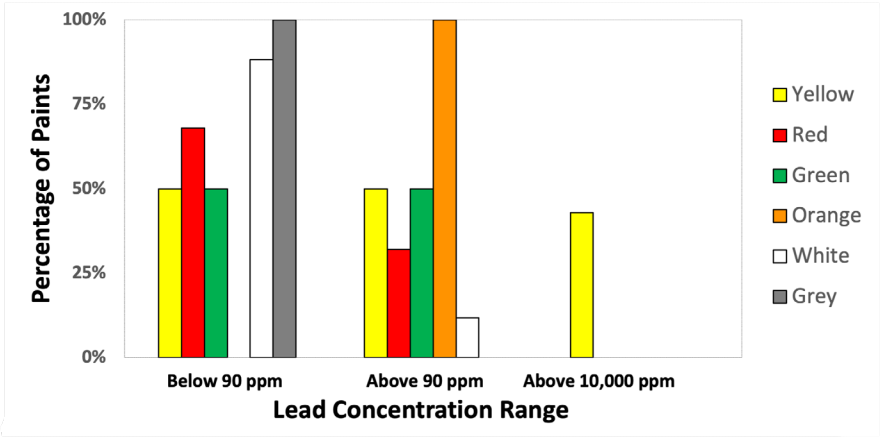


Figure 3. Distribution of lead concentration in solvent-based paints by color.

3.5 LABELING

In general, most paint can label did not carry meaningful information about lead content or the hazards of lead paint.

In this study, only 19 out of 63 analyzed paints (30 percent of paints) provided information about lead on their labels and most paint can labels carried little information about any ingredients. Two paints from one brand contained 70,000 ppm and 500 ppm lead levels despite having "Lead Safe Paint" claims on its labels, while another paint labeled "Lead Free" contained 22,000 ppm lead. Most paints were merely labeled as "solvents, pigments and resin," with no further details on the type of solvents and pigments (organic or inorganic) provided on paint can labels. Manufacturing dates or batch numbers were included on the labels of 42 out of 63 paints (67 percent of paints) included in this study. Most warning symbols on the paint cans indicated the flammability of the paints, but no precautionary warnings on the effects of lead dust to children and pregnant women were provided.

3.6 COMPARISON WITH RESULTS FROM AN EARLIER STUDY

In this study, lead levels among decorative paints have improved from the results of a similar paint study conducted by ESDO in 2015. In the previous study, 56 solvent-based decorative paints from 24 brands were purchased and analyzed, wherein 43 of 56 paints (77 percent of paints) contained lead levels above 90 ppm (down to 31 percent in 2021), and

19 of 56 paints (34 percent of paints) contained lead levels above 10,000 ppm (down to six percent in 2021). The percentage of paints with lead levels below 90 ppm increased thrice as much from 23 percent in 2015 to 69 percent in 2021. This demonstrates that many paint manufacturers have already reformulated their paints without using lead ingredients.

TABLE 2. COMPARISON OF LEAD CONCENTRATION IN SOLVENT-BASED DECORATIVE PAINTS FROM CURRENT STUDY WITH AN EARLIER STUDY.

Data	2021 Study	2015 Study
Number of solvent-based decorative paints	49	56
Percentage of paints with lead below 90 ppm (number of paints)	69% (34)	23% (13)
Percentage of paints with lead above 90 ppm (number of paints)	31% (15)	77% (43)
Percentage of paints with lead above 10,000 ppm (number of paints)	6% (3)	34% (19)
Maximum concentration, ppm	52,000	85,000

4. CONCLUSIONS AND RECOMMENDATIONS

This study demonstrates that solvent-based paints with high concentrations of lead are still sold for home use and available in Bangladesh since the paints sampled for this study are brands commonly sold in retail stores all over the country. However, the fact that 43 out of 63 paints (68 percent of paints) contained lead concentrations below 90 ppm indicates that the technology to produce paints without added lead exists in Bangladesh. The findings provide a strong justification to adopt and enforce a regulation that will ban the manufacture, import, export, distribution, sale and use of all paints with total lead concentrations greater than 90 ppm.

To address the problem of lead in paint, ESDO and IPEN propose the following recommendations:

Government and Government Agencies

Since lead paint standards on decorative household paints are already adopted, the Bangladesh Standard and Testing Institution (BSTI) should now draft additional standards that will ban the manufacture, import, export, distribution, sale and use of other types of paints, including industrial paints, that contain total lead concentrations exceeding 90 ppm, the standard recommended in the *Model Law and Guidance for Regulating Lead Paint*,* developed by the Global Alliance to Eliminate Lead Paint (GAELP) and published by the UN Environment Programme. They should also require paint companies to display sufficient information indicating harmful content on paint can labels such as solvents and provide a warning on possible lead dust hazards when disturbing painted surfaces.†,‡

Paint Industry

Paint companies that still produce paints with lead above the regulated standard of 90 ppm should expeditiously stop the use of leaded paint ingredients in paint formulations. Paint companies that have shifted to non-lead paint production should get their products certified through independent, third-party verification procedures to increase the customer's

* https://www.unenvironment.org/resources/publication/model-law-and-guidance-regulating-lead-paint

† http://bdlaws.minlaw.gov.bd/act-62/section-19213.html

‡ http://bdlaws.minlaw.gov.bd/act-details-333.html

ability to choose paints with no added lead. The Bangladesh Paint Manufacturers Association (BPMA) can play a strong role to ensure that their paint manufacturer members comply with the law.

Individual, Household and Institutional Consumers

Paint consumers should demand paints with no added lead from paint manufacturers and retailers, as well as full disclosure of a paint product's content. Household and institutional consumers should ask for, consciously buy, and apply only paints with no added lead in places frequently used by children such as homes, schools, day care centers, parks and playgrounds. For these kinds of activities, mass awareness and social media campaigns will be necessary otherwise people will not properly understand the harmful human impacts of lead in paint.

Organizations and Professional Groups

Public health groups, consumer organizations and other concerned entities should support the elimination of lead paint, and conduct activities to inform the public and protect children from lead exposure through lead paint, lead in dust and soil, and other sources of lead.

All Stakeholders

All stakeholders like BPMA, academicians, BSTI, technical advisors from chemical divisions, key government ministries, and regulatory bodies should come together and unite in promoting a strong policy that will eliminate lead paint in Bangladesh.

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ANNEX

TABLE 3. RESULTS OF LABORATORY ANALYSIS OF SOLVENT-BASED PAINTS FOR HOME USE.

All samples were manufactured in Bangladesh.

Types of Paint: A - Anticorrosive Paint; D - Decorative Paint; I - Industrial Paint

Sample No.	Brand Name	Type of Paint	Color	Date of Manufacture	Batch No.	Lead Content Label	Lead Content (ppm)
BGD-301	Brand 10	D	Yellow	7/1/2021-C	1892322	Lead Free	< 60
BGD-302	Brand 10	D	Red	27/10/20	1865115	Lead Free	< 60
BGD-303	Brand 10	D	White	21/12/20	1885807	Lead Free	< 60
BGD-304	Brand 22	A	Red	7/1/21	1892003	None	< 60
BGD-305	Brand 14	D	Red	Not Given	200918	Lead Free	< 60
BGD-306	Brand 14	D	White	Not Given	201066	Lead Free	< 60
BGD-307	Brand 14	D	Yellow	Not Given	200926	Lead Free	< 60
BGD-308	Brand 15	I	White	Not Given	Not Given	None	< 60
BGD-309	Brand 15	I	Yellow	Not Given	Not Given	None	190000
BGD-310	Brand 15	I	Red	Not Given	Not Given	None	< 60
BGD-311	Brand 18	D	Yellow	Not Given	Not Given	None	52000
BGD-312	Brand 18	D	Red	Not Given	Not Given	None	360
BGD-313	Brand 18	D	White	Not Given	Not Given	None	< 60
BGD-314	Brand 13	D	Red	Not Given	Not Given	None	< 60
BGD-315	Brand 13	D	Yellow	Not Given	Not Given	None	20000
BGD-316	Brand 17	D	White	Not Given	864121	None	< 60
BGD-317	Brand 17	D	Yellow	Not Given	344919	None	4600
BGD-318	Brand 17	D	Red	Not Given	6201220	None	220
BGD-319	Brand 17	A	Red	Not Given	Not Given	None	1500
BGD-320	Brand 21	D	White	Not Given	Not Given	None	< 60
BGD-321	Brand 21	D	Red	Not Given	Not Given	None	< 60
BGD-322	Brand 25	D	Red	Not Given	2110321101091	None	80
BGD-323	Brand 25	D	White	Not Given	2010320109131	None	< 60
BGD-324	Brand 25	D	Yellow	Not Given	1910320071131	None	< 60

Sample No.	Brand Name	Type of Paint	Color	Date of Manufacture	Batch No.	Lead Content Label	Lead Content (ppm)
BGD-325	Brand 25	A	Red	Not Given	1910321207071	None	< 60
BGD-326	Brand 7	D	White	Not Given	J2801477R	Lead Safe Paint	< 60
BGD-327	Brand 7	D	Yellow	Not Given	A2100144S	Lead Safe Paint	< 60
BGD-328	Brand 7	D	Red	Not Given	G1100951R	Lead Safe Paint	500
BGD-329	Brand 12	D	Yellow	1/11/20	Not Given	Lead Safe Paint	< 60
BGD-330	Brand 12	D	Red	Not Given	Not Given	Lead Safe Paint	< 60
BGD-331	Brand 26	A	Red	15/11/2020	Not Given	Lead Safe Paint	< 60
BGD-332	Brand 7	I	Yellow	1/11/20	Not Given	Lead Safe Paint	70000
BGD-333	Brand 3	D	Red	28/11/19	B119110002	None	< 60
BGD-334	Brand 3	D	White	29/12/20	B120120004	None	< 70
BGD-335	Brand 3	D	Yellow	30/01/20	B120010004	None	< 60
BGD-336	Brand 24	I	Yellow	Not Given	Not Given	None	90000
BGD-337	Brand 24	I	Red	Not Given	Not Given	None	130
BGD-338	Brand 9	D	Red	Not Given	SBK15021718	Lead Free	< 60
BGD-339	Brand 9	D	Yellow	Not Given	SBA1502819	Lead Free	22000
BGD-340	Brand 9	D	White	Not Given	SBL09024818	Lead Free	< 60
BGD-341	Brand 1	D	Red	Not Given	Not Given	Lead Free; "US, EU & WHO Approved Lead Standards"	< 60
BGD-342	Brand 1	D	Green	Not Given	Not Given	Lead Free; "US, EU & WHO Approved Lead Standards"	< 70
BGD-343	Brand 2	D	Red	Not Given	Not Given	None	1400
BGD-344	Brand 2	D	White	Not Given	Not Given	None	3200
BGD-345	Brand 11	D	White	Not Given	Not Given	None	5900
BGD-346	Brand 8	D	White	Not Given	RA130037GE	None	< 60

Sample No.	Brand Name	Type of Paint	Color	Date of Manufacture	Batch No.	Lead Content Label	Lead Content (ppm)
BGD-347	Brand 8	D	Grey	Not Given	RE121439GE	None	< 60
BGD-348	Brand 5	D	Green	Not Given	H01768-I	None	4300
BGD-349	Brand 5	D	White	Not Given	A00032-U	None	< 60
BGD-350	Brand 5	D	Red	Not Given	I02027-T	None	2000
BGD-351	Brand 23	D	White	Not Given	CS01212610	None	< 60
BGD-352	Brand 23	D	Green	Not Given	CS089407	None	790
BGD-353	Brand 23	D	Orange	Not Given	Not Given	None	970
BGD-354	Brand 20	A	Red	Not Given	KS06200408	Lead Free	< 60
BGD-355	Brand 19	D	Yellow	Not Given	201222P925	None	< 60
BGD-356	Brand 19	D	Red	Not Given	210201P855	None	< 60
BGD-357	Brand 19	D	White	Not Given	210224P002	None	< 60
BGD-358	Brand 16	A	Red	Not Given	210114P883	None	< 60
BGD-359	Brand 4	I	Grey	Not Given	Not Given	None	< 70
BGD-360	Brand 6	D	White	1/12/20	Q14406	None	< 60
BGD-361	Brand 6	D	Green	1/7/20	Q14058	None	< 60
BGD-362	Brand 6	D	Red	1/7/20	Q14062	None	6100
BGD-363	Brand 6	A	Red	1/9/17	Q11235	None	< 70

TABLE 4. DISTRIBUTION OF LEAD CONCENTRATION BY BRAND.

Brand	No. of Samples	No. of Samples Above 90 ppm	No. of Samples Above 10,000 ppm	Minimum Lead Content (ppm)	Maximum Lead Content (ppm)
Brand 1	2	0	0	< 60	< 70
Brand 2	2	2	0	1400	3200
Brand 3	3	0	0	< 60	< 70
Brand 4	1	0	0	< 70	< 70
Brand 5	3	2	0	< 60	4300
Brand 6	4	1	0	< 70	6100
Brand 7	4	2	1	< 60	70000
Brand 8	2	0	0	< 60	< 60
Brand 9	3	1	1	< 60	22000
Brand 10	3	0	0	< 60	< 60
Brand 11	1	1	0	5900	5900
Brand 12	2	0	0	< 60	< 60
Brand 13	2	1	1	< 60	20000
Brand 14	3	0	0	< 60	< 60
Brand 15	3	1	1	< 60	190000
Brand 16	1	0	0	< 60	< 60
Brand 17	4	3	0	< 60	4600
Brand 18	3	2	1	< 60	52000
Brand 19	3	0	0	< 60	< 60
Brand 20	1	0	0	< 60	< 60
Brand 21	2	0	0	< 60	< 60
Brand 22	1	0	0	< 60	< 60
Brand 23	3	2	0	< 60	970
Brand 24	2	2	1	130	90000
Brand 25	4	0	0	< 60	80
Brand 26	1	0	0	< 60	< 60

TABLE 5. DISTRIBUTION OF LEAD CONCENTRATION BY COLOR.

Color	No. of Samples	No. of Samples Above 90 ppm	No. of Samples Above 10,000 ppm	Minimum Lead Content (ppm)	Maximum Lead Content (ppm)
White	17	2	0	< 60	5900
Yellow	14	7	6	< 60	190000
Orange	1	1	0	970	970
Red	25	8	0	< 60	6100
Green	4	2	0	< 60	4300
Grey	2	0	0	< 60	< 70

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