KENYA

LEAD IN SOLVENT-BASED PAINTS FOR HOME USE IN KENYA

June 2017

Centre for Environment Justice and Development
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NATIONAL REPORT

LEAD IN SOLVENT-BASED PAINTS FOR HOME USE IN KENYA

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

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The analytical study providing data to this report was undertaken as part of the Lead Paint Elimination Project in Africa, funded by the Global Environment Facility (GEF), implemented by UN Environment and executed by IPEN. The Lead Paint Elimination Project in Africa was established to eliminate lead in paint and raise widespread awareness among business entrepreneurs and consumers about the adverse human health impacts of lead-based household enamel paints, particularly on the health of children under six years old. The study was conducted in Kenya by Centre for Environment Justice and Development (CEJAD) in partnership with IPEN.

This report was developed by CEJAD and IPEN as part of IPEN's Global Lead Paint Elimination Campaign and funded by the Swedish Government.

While this study was undertaken with the assistance of the Global Environment Facility and UN Environment, and the report financed by the Swedish Government, responsibility for the content lies entirely with IPEN and CEJAD. The GEF, UN Environment and the Government of Sweden do not necessarily share the expressed views and interpretations.

Established in 1998, IPEN is currently comprised of over 500 Participating Organizations in 116 countries, primarily developing and transition countries. IPEN brings together leading environmental and public health groups around the world to establish and implement safe chemicals policies and practices that protect human health and the environment. IPEN's mission is a toxics-free future for all.

Centre for Environment Justice and Development (CEJAD)

P. O Box 24464 – 00100 Nairobi, Kenya

www.cejadkenya.org

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PREFACE

Lead paints for home use continue to be widely produced, sold, and used in developing countries even though 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 dangerously 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 approximately 40 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 Kenya. 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 Kenya. Finally, it proposes action steps by different stakeholders to protect children and others from lead paint.

This study was conducted by Centre for Environment Justice and Development (CEJAD) in partnership with IPEN.

IPEN is an international NGO network of health and environmental organizations from all regions of the world of which CEJAD 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.

Centre for Environment Justice and Development (CEJAD) is a not-for-profit Non-Governmental Organization promoting rural development and environmental justice in Kenya, through sound chemicals management and sustainable use of natural resources by: advocating and lobbying for pro-sustainability policy and legal frameworks; educating and advising the public on available technologies and practices that improve human and environmental health; and conducting and/or participating in research that generate knowledge for influencing sound policies and actions.

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.

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 Kenya, the Kenya Bureau of Standards (KEBS) has developed and adopted two standards for paints, varnishes and related products to control the manufacture and Importation of leaded paints. These are: (1) KS 2661-1:2016: Determination of total lead—Part 1: Preliminary examination of samples and sampling procedure; and (2) KS 2661-2:2016: Determination of total lead—Part 2: Maximum permissible content of total lead based on dry weight. These standards limit the permissible total lead concentration of paint to 90 ppm and will control the manufacture and importation of leaded paints.

From July to September 2016, CEJAD purchased a total of 51 cans of solvent-based paint intended for home use from stores in Nairobi, Kenya. The paints represented 21 different brands produced by 19 manufacturers. All paints were analyzed by an accredited laboratory in the United States of America for their

total lead content, based on dry weight of the paint. The laboratory participates 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

35 out of 51 analyzed solvent-based paints for home use [69 percent of paints] were lead paints, i.e., they contained a total lead concentration above 90 parts per million (ppm, dry weight of paint). This is above the limit of the paint standards adopted in Kenya, and should they come into force, such paints would not be allowed for sale on the Kenyan market. This is also the regulatory limit for lead in decorative paint in India, Philippines, and the United States of America. Moreover, 17 paints [33 percent of paints] contained dangerously high lead concentrations above 10,000 ppm. The highest total lead concentration detected was 160,000 ppm in a yellow Molar Enamel Paint sold for home use.

On the other hand, 16 out of 51 solvent-based paints for home use [31 percent of paints] contained total lead concentrations at or below 90 ppm, suggesting that the technology to produce paint without lead ingredients exists in Kenya.

19 out of 21 analyzed brands [90 percent of paint brands] sold at least one lead paint, i.e., paint with total lead concentration above 90 ppm. 15 out of 21 analyzed brands [71 percent of paint brands] sold at least one lead paint with dangerously high lead concentrations above 10,000 ppm.

Yellow paints most frequently contained dangerously high lead concentrations above 10,000 ppm. Of 17 yellow paints, 13 [76 percent of yellow paints] contained lead levels above 10,000 ppm, and of 14 red paints, 4 [29 percent of red paints] contained lead levels above 10,000 ppm.

In general, paint can labels did not carry meaningful information about lead content or the hazards of lead paint. Only 3 out of 51 paints [6 percent of paints] provided information about lead on their labels and most paints carried little information about any ingredients on can labels. All three paints contained more than 90 ppm lead, one paint of which contained as high as 160,000 ppm lead, despite advertisement or claim on its product label that they are “lead free.” 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 21 out of 51 paints [41 percent of paints] included in this study. Most warning symbols on the paint cans indicate the

flammability of the paints, but had no precautionary warnings on the effects of lead dust to children and pregnant women were provided.

Lead levels in this study are consistent with the results of a similar paint study conducted by iLima in 2012. In that study, 31 solvent-based paints from 11 brands were purchased and analyzed. In the previous study, 27 of 31 paints [87 percent of paints] contained total lead levels above 90 ppm, and 9 of 31 paints [29 percent of paints] contained total lead levels above 10,000 ppm.

CONCLUSIONS

This study demonstrates that solvent-based paints for home use with high concentrations of lead are widely available in Kenya since the paints included in this study are brands commonly sold in retail stores all over Kenya. However, the fact that 16 out of 51 paints [31 percent of paints] contained lead concentrations below 90 ppm indicates that the technology to produce paints without added lead exists in Kenya. The study results provide a strong justification to adopt and enforce a regulation that will ban the manufacture, import, export, distribution, sale and use of paints with total lead concentrations greater than 90 ppm.

RECOMMENDATIONS

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

Government and Government Agencies

The Kenya Bureau of Standards should fast track the gazettement of the paint, varnishes and related products standards, and its integration into Kenya's regulatory system to control the manufacture, import, export, distribution, sale and use of paints that contain total lead concentrations exceeding 90 ppm—the strictest threshold limit and most restrictive standard in the world. 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 lead paint 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.

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 lead 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.

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 and protect children from lead exposure through lead paint, lead in dust and soil, and other sources of lead.

All Stakeholders

All stakeholders should come together and unite in promoting a strong policy that will eliminate lead paint in Kenya.

The Media

The media groups in Kenya should create and raise awareness among citizens and households on the hazardous effects of lead in paints that contaminate their surroundings and majorly impact the health of children under the age of six.

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 a number of biological systems and pathways. The primary target is the central nervous system and the brain, but

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.

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 neurodevelopment 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. 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% of Gross Domestic Product [GDP]

Latin America and the Caribbean: $142.3 billion of economic loss, or 2.04% of GDP

Asia: $699.9 billion of economic loss, or 1.88% of GDP

Country estimates used in this study can be accessed at a publically available website, **http://www.med.nyu.edu/pediatrics/research/environmentalpediatrics/leadexposure**, and shows that economic loss in Kenya is estimated at $3.76 billion, or 5.26 percent of Gross Domestic Product (GDP).

* 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.

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. Water-based paints are rarely contaminated with lead, but 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 also may 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 minimum.

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] total 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 lead limit are in place. The current standard for household paints in the U.S., the Philippines, and India is

90 ppm total lead, and adherence to this ensures that a manufacturer can sell its paint anywhere in the world. Some other countries such as Brazil, South Africa, and Sri Lanka have established standards of 600 ppm total lead.

1.3 PAINT MARKET AND REGULATORY FRAMEWORK IN KENYA

Kenya is experiencing increased demand for paints, driven by the booming construction industry, which is projected to continue an upward trend as the country moves towards becoming a middle-income economy by 2030.

The paint giants in Kenya include Crown Paints, Basco Paints, Sadolin Paints and Solai Paints. Crown Paints is the leader in this industry, with an annual revenue of about KSh6.2 billion. Crown Paints control an estimate of about 65 percent of the Kenyan market. It is well established in Kenyan cities and in the whole East Africa.*

Kenya has not yet established a paint regulation but the process is underway as the National Environment Management Authority (NEMA) in Kenya has policies and regulations against chemical waste in the Environment but nothing specific on lead or mercury for that matter.

The Kenya Bureau of Standards has developed and adopted two Standards: (1) *KS 2661-1:2016* Paints, varnishes and related products — Determination of total lead—Part 1: Preliminary examination of samples and sampling procedure; and (2) *KS 2661-2:2016* Paints, varnishes and related products — Determination of total lead—Part 2: Maximum permissible content of total lead based on dry weight. These Standards will control the manufacture and importation of leaded paints. However, the standards are yet to be published in an official gazette.

* http://building.co.ke/the-paint-market-in-kenya/

2. MATERIALS AND METHODS

From July to September 2016, 51 cans of solvent-based paint intended for home use were purchased by CEJAD from various stores in Nairobi, Kenya. The paints represented 21 different brands produced by 19 manufacturers.

In most cases, one white paint and one or more bright-colored paint such as red, orange or yellow were selected. Additionally, 3 anti-corrosive paints for consumer use 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. Excluded were automotive and industrial paints that are not typically used for domestic housing applications.

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 CEJAD 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 paint brushes by a researcher of CEJAD as shown in Figure 1.

Each stirring utensil and paintbrush was 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, re-sealable plastic bags and shipped for analysis of total 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 assurance testing. This was made by sending paint

Figure 1. CEJAD Staff Participating in the Sample Preparation.

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. Therefore, the detection limit was higher (up to 200 ppm) for some of the samples.

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:

- 35 out of 51 of the analyzed solvent-based paints (69 percent of paints) were lead paints, i.e., they contained lead at a total lead concentration above 90 parts per million (ppm), dry weight. In addition, 17 paints (33 percent of paints) contained dangerously high lead concentrations above 10,000 ppm.
- 19 out of 21 analyzed brands (90 percent of paint brands) sold at least one lead paint, i.e., paint with total lead concentration above 90 ppm. Also, 15 out of 21 analyzed brands (71 percent of paint brands) sold at least one lead paint with dangerously high lead concentrations above 10,000 ppm.
- 26 out of 32 bright-colored paints (81 percent of bright-colored paints) were lead paints, i.e., they contained lead at a total lead concentration above 90 ppm, dry weight. Yellow colored paints were the most hazardous with 13 out of 17 paints (76 percent of yellow-colored paints) containing total lead concentrations greater than 10,000 ppm; and 4 out of 14 red paints (29 percent of red paints) also contained dangerously high lead concentrations above 10,000 ppm.
- The highest lead concentration detected was 160,000 ppm in a yellow Molar Enamel Paint sold for home use.
- Only 3 out of 51 paints (6 percent of paints) provided information about lead on their labels and most paints carried little information about ingredients. All three paints contained more than 90 ppm lead, one paint of which contained as high as 160,000 ppm lead, despite advertisement or claim on its product label that they are "lead free." 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. 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 TOTAL LEAD CONTENT ANALYSIS

35 out of 51 analyzed solvent-based paints (69 percent of paints) were lead paints, i.e., contained a lead concentration above 90 ppm—17 of these contained dangerously high lead concentrations above 10,000 ppm (33 percent of paints).

A yellow Molar Enamel Paint contained the highest concentration of lead at 160,000 ppm, while the lowest concentration of lead less than 60 ppm was detected in 9 paints from the following brands: Apex (white); Dulux (white); Dura Coat (red, white); Duron Paints (white); Galaxy (white); Glory (red); and Sadolin (white, yellow). 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	Manufacturer	Color	Lead Content (ppm)
1	KEN- 35	Molar Paints	Molar Paints	Yellow	160,000
2	KEN- 44	Duron Paints	Duron Paints	Yellow	140,000
3	KEN-51	United Paints	United Paints	Yellow	120,000
4	KEN-30	Apex	Apex	Yellow	110,000
5	KEN- 49	Glory	Glory	Yellow	110,000
6	KEN-16	Solai Paints	Solai Paints	Yellow	100,000
7	KEN-27	Elmco Paints	Elmco Paints	Yellow	97,000
8	KEN- 47	Comet	Comet	Yellow	83,000
9	KEN- 41	Galaxy	Galaxy	Yellow	65,000
10	KEN-13	Vision Paints	Vision Paints	Yellow	59,000

3.3 PAINT BRAND ANALYSIS

15 out of 21 analyzed brands (71 percent of paint brands) sold at least one paint with dangerously high lead concentration above 10,000 ppm.

Among solvent-based decorative paints, a yellow-colored Molar Paint contained the highest concentration of lead at 160,000 ppm. On the other hand, at least one paint from each of the following brands contained lead below 90 ppm:

Apex (white); Dulux (white); Dura Coat (red, white); Duron Paints (white); Galaxy (white); Glory (red); and Sadolin (white, yellow). This indicates that the technology to produce paints without added lead exists in Kenya.

Among the 3 anti-corrosive paints, Dulux, Galaxy, and Sadolin all contained the same concentration of lead at less than 60 ppm.

3.4 PAINT COLOR ANALYSIS

26 out of 32 bright-colored paints (81 percent of bright-colored paints) such as yellow and red contained lead concentrations above 90 ppm, 17 paints of which contained dangerously high lead concentrations above 10,000 ppm (53 percent of bright-colored paints).

This study included 19 white paints, 17 yellow paints, 14 red paints, and 1 orange paint. Yellow and red paints contained the highest total lead concentrations.

16 out of 17 yellow paints (94 percent of yellow paints) contained lead concentrations above 90 ppm, 13 paints of which exceeded more than 10,000 ppm of lead, while 10 out of 14 red paints (71 percent of red paints) contained lead concentrations above 90 ppm, 4 paints of which exceeded more than 10,000 ppm lead. In addition, 9 out of 19 white paints (47 percent of white paints) contained lead concentrations above 90 ppm.

3.5 LABELING

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

Only 3 out of 51 paints (6 percent of paints) provided information about lead on their labels and most paint can labels carried little information about any ingredients. All three paints contained more than 90 ppm lead, one paint of which contained as high as 160,000 ppm lead, despite advertisement or claim on its product label that they are "lead free." 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 21 out of 51 paints (41 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

Lead levels in this study are consistent with the results of a similar paint study conducted by iLima in 2012. In that study, 31 solvent-based paints purchased in Nairobi, Kenya were sampled and analyzed. 12 percent of the earlier paints contained less than 90 ppm lead compared to 31 percent in the current study. Similarly, a somewhat lower percentage of the paints in the former study (29 percent) contained more than 10,000 ppm lead compared to 33 percent in the current study.

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

	Current Study	Previous Study
Number of Paints	51	31
Percentage of paints with lead ≥ 90 ppm (number of paints)	69 (35)	87 (27)
Percentage of paints with lead ≥ 10,000 ppm (number of paints)	33 (17)	29 (9)
Maximum Concentration, ppm	160,000	69,000

4. CONCLUSIONS AND RECOMMENDATIONS

This study demonstrates that solvent-based paints for home use with high concentrations of lead are widely available in Kenya since the paints sampled for this study are brands commonly sold in retail stores all over Kenya. However, the fact that 16 out of 51 paints (31percent of paints) contained lead concentrations below 90 ppm indicates that the technology to produce paints without added lead exists in Kenya. The study results provide a strong justification to adopt and enforce a regulation that will ban the manufacture, import, export, distribution, sale and use of paints with total lead concentrations greater than 90 ppm.

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

The Kenya Bureau of Standards should fast track gazettement and enactment of the paint, varnishes and related products standards, and its integration into the country's regulatory system to control the manufacture, import, export, distribution, sale and use of paints that contain total lead concentrations exceeding 90 ppm, the most restrictive standard in the world. They should also require paint companies to display sufficient information indicating toxic content on paint can labels and provide a warning on possible lead dust hazards when distributing painted surfaces.

For paint companies that still produce lead paints to 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.

For paint consumers to demand paints with no added lead from paint manufacturers, as well as full disclosure of a paint product's lead 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 public health groups, consumer organizations and other concerned entities to support the elimination of lead paint, and conduct activities to inform and

protect children from lead exposure through lead paint, lead in dust and soil, and other sources of lead.

For all stakeholders to come together and unite in promoting a strong policy that will eliminate lead paint in Kenya.

Efforts are needed to increase awareness of the hazards of lead dust produced when surfaces that have already been coated with lead paints are repainted, and of the techniques that can be used to greatly reduce these hazards.

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APPENDIX

TABLE 3. SOLVENT-BASED PAINTS FOR HOME USE INCLUDED IN THE STUDY.

Sample No.	Brand	Color	Volume (L)	Price (Currency)	Date of Manufacture (d/m/y)	Batch No.	Date of Purchase (d/m/y)	Is there web-site on label?
KEN-01	Dura Coat	white	1	4L@ KSHs 2,050 (1L@ 550)	MAY/2016	656985	none	www.bascopaints.com
KEN-02	Dura Coat	yellow	1	4L@KSHs 2,850 (1L@ 700)	JUNE/2016	657499	none	www.bascopaints.com
KEN-03	Dura Coat	red	1	4L@ KSHs 2,050 (1L@ 550)	OCT/2015	643198	none	www.bascopaints.com
KEN-04	Basco Value	white	½	½ L@ KSHs 150 (1L@225)	JUL/2015	634714	22/07/2016	www.bascopaints.com
KEN-05	Berger	white	½	none	26/04/2016	none	none	www.bergerpaints.com
KEN-06	Crown	white	½	4L@ KSHs2150	FEB/2015	none	none	www.crownpaints.co.ke
KEN-07	Crown	yellow	½	none	APRL/2012	none	none	www.crownpaints.co.ke
KEN-08	Crown	red	½	none	NOV/2013	none	none	www.crownpaints.co.ke
KEN-09	Shamco	white	¼	1L@ KSHs150	JUL/2016	1607057	none	www.shamco-paints.com
KEN-10	Shamco	yellow	¼	1L@ KSHs 150	JUL/2016	1607035	none	www.shamcopaints.com

Sample No.	Brand	Color	Volume (L)	Price (Currency)	Date of Manufacture (d/m/y)	Batch No.	Date of Purchase (d/m/y)	Is there web-site on label?
KEN-11	Shamco	orange	¼	1L@ KSHs150	APRL/2016	1604024	none	www.shamcopaints.com
KEN-12	Vision Paints	white	¼	1L@ KSHs 200 (1/4L@100)	none	none	22/07/2016	www.visionpaints.com
KEN-13	Vision Paints	yellow	¼	1L@ KSHs200 (1/4L@100)	none	none	22/07/2016	www.visionpaints.com
KEN-14	Vision Paints	red	¼	1L@ KSHs 200 (1/4L@100)	none	none	22/07/2016	www.visionpaints.com
KEN-15	Solai Paints	white	¼	¼ L@ KSHs 80	none	none	22/07/2016	NO
KEN-16	Solai Paints	red	¼	¼ L@ KSHs 80	none	none	22/07/2016	NO
KEN-17	Solai Paints	yellow	¼	¼ L@ KSHs 80	none	none	22/07/2016	NO
KEN-18	Fastchem Paints	white	¼	4L@ KSHs 650 (¼L@80)	none	none	22/07/2016	NO
KEN-19	Fastchem Paints	yellow	¼	4L@ KSHs 650 (¼L@80)	none	none	22/07/2016	NO
KEN-20	Fastchem Paints	red	¼	4L@ KSHs 650 (¼L@80)	none	none	22/07/2016	NO
KEN-21	Grand Paints	white	¼	4L@ KSHs900	none	none	none	NO
KEN-22	Grand Paints	yellow	¼	4L@ KSHs900	none	none	none	NO
KEN-23	Reliance Extra	white	½	1L@ KSHs250 (½L@150)	none	none	22/07/2016	NO

Sample No.	Brand	Color	Volume (L)	Price (Currency)	Date of Manufacture (d/m/y)	Batch No.	Date of Purchase (d/m/y)	Is there web-site on label?
KEN-24	Reliance Extra	yellow	½	1L@ KSHs250 (½L@ 150)	none	none	22/07/2016	NO
KEN-25	Reliance Extra	red	½	1L@ KSHs250 (½L@ 150)	none	none	22/07/2016	NO
KEN-26	Elmco Paints	white	¼	¼L@ 80 (1L@ KSHs 230)	JUL/2016	none	22/07/2016	NO
KEN-27	Elmco Paints	yellow	¼	¼L@ 80 (1L@ KSHs 230)	JUN/2016	none	22/07/2016	NO
KEN-28	Elmco Paints	red	¼	¼L@ 80 (1L@ KSHs 230)	MAR/2016	none	22/07/2016	NO
KEN-29	Apex	white	¼	½L@ KSHs 100 (1L@ 250)	10/04/016	none	none	NO
KEN-30	Apex	yellow	¼	½L@ KSHs 100 (1L@ 250)	22/07/2015	none	none	NO
KEN-32	Dulux	white	1	1L@ KSHs 719	none	none	12/08/2016	www.sadolin.co.ke
KEN-33	Silvar Shine	white	1	1L@ KSHs250	none	none	11/08/2016	NO
KEN-34	Molar Paints	white	¼	¼L@ KSHs 90 (1L@ 250)	none	none	11/08/2016	NO
KEN-35	Molar Paints	yellow	¼	¼L@ KSHs 90 (1L@ 250)	none	none	11/08/2016	NO
KEN-36	Molar Paints	red	¼	¼L@ KSHs 90 (1L@ 250)	none	none	11/08/2016	NO

Sample No.	Brand	Color	Volume (L)	Price (Currency)	Date of Manufacture (d/m/y)	Batch No.	Date of Purchase (d/m/y)	Is there web-site on label?
KEN-37	Sadolin	white	1	1L@ KSHs 777	29/07/2016	160703636	19/08/2016	www.sadolin.co.ke
KEN-38	Sadolin	yellow	1	1L@ KSHs 777	08/12/015	none	19/08/2016	NO
KEN-39	Sadolin	red	1	1L@ KSHs 777	none	none	19/08/2016	www.sadolin.co.ke
KEN-40	Galaxy	white	1	1L@ KSHs579	15/08/016	none	23/08/2016	NO
KEN-41	Galaxy	yellow	1	1L@ KSHs579	16/08/016	none	23/08/2016	NO
KEN-42	Galaxy	red	1	1L@ KSHs579	19/07/016	none	23/08/2016	NO
KEN-43	Duron Paints	white	½	½L@ KSHs150	none	none	16/09/2016	NO
KEN-44	Duron Paints	yellow	½	½L@ KSHs150	none	none	16/09/2016	NO
KEN-45	Duron Paints	red	½	½L@ KSHs150	none	none	16/09/2016	NO
KEN-46	Comet	white	½	½L@ KSHs100	none	none	16/09/2016	NO
KEN-47	Comet	yellow	½	½L@ KSHs100	none	none	16/09/2016	NO
KEN-48	Comet	red	½	½L@ KSHs100	none	none	16/09/2016	NO
KEN-49	Glory	yellow	1	1L@KSHs500	none	none	23/09/2016	www.glorypaints.com
KEN-50	Glory	red	1	1L@KSHs500	none	none	23/09/2016	www.glorypaints.com
KEN-51	United	yellow	1	4L@KSHs800	none	none	none	www.unitedpaintstd.com

Sample No.	Brand	Color	Volume (L)	Price (Currency)	Date of Manufacture (d/m/y)	Batch No.	Date of Purchase (d/m/y)	Is there web-site on label?
KEN-52	United	red	1	4L@KSHs800	none	none	none	www.unitedpaintstd.com

TABLE 4. RESULTS OF LABORATORY ANALYSIS OF SOLVENT-BASED PAINTS FOR HOME USE.

Sample No.	Brand	Color	Lead Content, Dry Weight (ppm)	Country of Brand Headquarters	Country of Manufacture	Is there information on can about lead content of paint?
KEN-01	Dura Coat	white	<60	Kenya	Kenya	No
KEN-02	Dura Coat	yellow	420	Kenya	Kenya	No
KEN-03	Dura Coat	red	<60	Kenya	Kenya	No
KEN-04	Basco Value	white	110	Kenya	Kenya	No
KEN-05	Berger	white	<80	Kenya	Kenya	No
KEN-06	Crown	white	<200	Kenya	Kenya	No
KEN-07	Crown	yellow	15,000	Kenya	Kenya	No
KEN-08	Crown	red	80	Kenya	Kenya	No
KEN-09	Shamco	white	<80	Kenya	Kenya	No
KEN-10	Shamco	yellow	49,000	Kenya	Kenya	No
KEN-11	Shamco	orange	<70	Kenya	Kenya	No
KEN-12	Vision Paints	white	<80	Kenya	Kenya	No
KEN-13	Vision Paints	yellow	59,000	Kenya	Kenya	No
KEN-14	Vision Paints	red	5,500	Kenya	Kenya	No
KEN-15	Solai Paints	white	<70	Kenya	Kenya	No
KEN-16	Solai Paints	red	100,000	Kenya	Kenya	No
KEN-17	Solai Paints	yellow	100	Kenya	Kenya	No
KEN- 18	Fastchem Paints	white	4,500	Kenya	Kenya	No
KEN- 19	Fastchem Paints	yellow	230	Kenya	Kenya	No
KEN-20	Fastchem Paints	red	21,000	Kenya	Kenya	No
KEN-21	Grand Paints	white	6,300	Kenya	Kenya	No
KEN- 22	Grand Paints	yellow	27,000	Kenya	Kenya	No

Sample No.	Brand	Color	Lead Content, Dry Weight (ppm)	Country of Brand Headquarters	Country of Manu-facture	Is there information on can about lead content of paint?
KEN-23	Reliance Extra	white	3,000	Kenya	Kenya	No
KEN-24	Reliance Extra	yellow	2,300	Kenya	Kenya	No
KEN-25	Reliance Extra	red	1,500	Kenya	Kenya	No
KEN-26	Elmco Paints	white	2,700	Kenya	Kenya	No
KEN-27	Elmco Paints	yellow	97,00	Kenya	Kenya	No
KEN-28	Elmco Paints	red	53,000	Kenya	Kenya	No
KEN-29	Apex	white	<60	Kenya	Kenya	No
KEN-30	Apex	yellow	110,000	Kenya	Kenya	No
KEN-32	Dulux	white	<60	Kenya	Kenya	No
KEN-33	Silvar Shine	white	5,400	Kenya	Kenya	No
KEN-34	Molar Paints	white	110	Kenya	Kenya	Yes "LEAD FREE"
KEN-35	Molar Paints	yellow	160,000	Kenya	Kenya	Yes "LEAD FREE"
KEN-36	Molar Paints	red	2,300	Kenya	Kenya	Yes "LEAD FREE"
KEN-37	Sadolin	white	<60	Kenya	Kenya	No
KEN-38	Sadolin	yellow	<60	Kenya	Kenya	No
KEN-39	Sadolin	red	30,000	Kenya	Kenya	No
KEN-40	Galaxy	white	<60	Kenya	Kenya	No
KEN-41	Galaxy	yellow	65,000	Kenya	Kenya	No
KEN-42	Galaxy	red	9,700	Kenya	Kenya	No
KEN-43	Duron Paints	white	<60	Kenya	Kenya	No
KEN-44	Duron Paints	yellow	140,000	Kenya	Kenya	No
KEN-45	Duron Paints	red	80	Kenya	Kenya	No

Sample No.	Brand	Color	Lead Content, Dry Weight (ppm)	Country of Brand Headquarters	Country of Manu-facture	Is there information on can about lead content of paint?
KEN-46	Comet	white	100	Kenya	Kenya	No
KEN-47	Comet	yellow	83,000	Kenya	Kenya	No
KEN-48	Comet	red	55,000	Kenya	Kenya	No
KEN-49	Glory	yellow	110,000	Kenya	Kenya	No
KEN-50	Glory	red	<60	Kenya	Kenya	No
KEN-51	United	yellow	120,000	Kenya	Kenya	No
KEN-52	United	red	1,700	Kenya	Kenya	No

TABLE 5. 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)
Dura Coat	3	1	0	<60	420
Basco Value	1	1	0	110	110
Berger	1	1	0	<80	<80
Crown	3	2	1	80	15,000
Shamco	3	1	1	<70	49,000
Vision Paints	3	2	1	<80	59,000
Solai Paints	3	2	1	<70	100,000
Fastchem Paints	3	3	1	230	21,000
Grand Paints	2	2	1	6,300	27,000
Reliance Extra	3	3	0	1,500	3,000
Elmco Paints	3	3	2	2,700	97,000
Apex	2	1	1	<60	110,000
Dulux	1	0	0	<60	<60
Silvar Shine	1	1	0	5,400	5,400
Molar Paints	3	3	1	110	160,000
Sadolin	3	1	1	<60	30,000
Galaxy	3	2	1	<60	65,000
Duron Paints	3	1	1	<60	140,000
Comet	3	3	2	100	83,000
Glory Paints	2	1	1	<60	110,000
United Paints	2	2	1	1,700	120,000

TABLE 6. 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	19	9	0	<60	6,300
Yellow	17	16	13	<60	160,000
Orange	1	0	0	<70	<70
Red	14	10	4	<60	55,000

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