

MOROCCO



LEAD IN SOLVENT-BASED PAINTS FOR HOME USE IN MOROCCO



October 2017

NATIONAL REPORT

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ACKNOWLEDGMENTS

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

Sincere thanks to the Global Environment Facility for the financial support that allowed us to carry out this study. We would like to express our gratitude and appreciation to IPEN for its involvement and support for the realization of this work, very relevant to our country. Many thanks to all IPEN staff for the support and follow-up of the study.

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 Morocco by the Société Marocaine de Toxicologie Clinique et Analytique (SMTCA) or the Moroccan Society of Clinical and Analytical Toxicology in partnership with IPEN.

This report was developed by SMTCA 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 Moroccan society of clinical and analytical toxicology. The GEF, UN Environment and the Government of Sweden do not necessarily share the expressed views and interpretations.



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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 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 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 Morocco. 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 Morocco. Finally, it proposes action steps by different stakeholders to protect children and others from lead paint.

This study was conducted by Moroccan Society of Clinical and Analytical Toxicology or the Société Marocaine de Toxicologie Clinique et Analytique (SMTCA) in partnership with IPEN.

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

SMTCA, a non-profit society, aims to:

- Bring together all natural and legal persons active in the various fields of clinical, environmental, analytical and experimental toxicology;
- Promote any awareness and information activities related to toxic risk;
- Facilitate and promote the exchange of technical and theoretical knowledge;
- Undertake regular inventory of new developments in these areas;
- Disseminate and stimulate new research in toxicology; and
- Actively contribute to continuing vocational training and the exchange of know-how through national and international meetings.

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 Morocco, there is currently no regulation in place limiting the amount of lead in paint for household and decorative use.

From November 2016 to February 2017, SMTCA purchased a total of 33 cans of solvent-based paint intended for home use from stores in Rabat, Salé, Kenitra and Oujda, Morocco. The paints represented 16 different brands produced by 11 manufacturers. All 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 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

Thirteen out of 33 analyzed solvent-based paints for home use (39 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, Philippines, and the United States of America. Moreover, six paints (18 percent of paints) contained dangerously high lead concentrations at or above 10,000 ppm. The highest lead concentration detected was 140,000 ppm in a yellow paint sold for home use. This paint is locally manufactured by a manufacturer based in the city of Oujda, East of Morocco.

On the other hand, 20 out of 33 solvent-based paints for home use (61 percent of paints) contained lead concentrations below 90 ppm, suggesting that the technology to produce paint without lead ingredients exists in Morocco.

Eight out of 16 analyzed brands (50 percent of paint brands) sold at least one lead paint, i.e., a paint with lead concentration above 90 ppm. Five out of 16 analyzed brands (31 percent of paint brands) sold at least one lead paint with dangerously high lead concentrations at or above 10,000 ppm.

Among decorative paints, yellow paints most frequently contained dangerously high lead concentrations at or above 10,000 ppm. Of eight yellow paints, five (63 percent of yellow paints) contained lead levels at or above 10,000 ppm, and of two green paints, one (50 percent green paints) contained lead levels above 10,000 ppm.

Among anticorrosive paints, all five red paints (100 percent of red anticorrosive paints) contained lead concentrations below 90 ppm.

In general, paint can labels did not carry meaningful information about lead content or the hazards of lead paint. Only two out of 33 paints (six percent of paints) provided information about lead on their labels and most paints carried little information about any ingredients on can labels. However, one paint contained 57,000 ppm lead despite advertisement or claim on its product label that it is “unleaded paint.” 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 8 out of 33 paints (24 percent of paints) included in this study. Most warning symbols on the paint cans indicated the flammability of the paints, but had no precautionary warnings on the effects of lead dust to children and pregnant women were provided.

CONCLUSIONS

This study demonstrates that solvent-based paints for home use with high concentrations of lead are widely available in Morocco since the paints included in this study are brands commonly sold in retail stores all over Morocco. However, the fact that 20 out of 33 paints (61 percent of paints) contained lead concentrations below 90 ppm indicates that the technology to produce paints without added lead exists in Morocco. 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, SMTCA and IPEN propose the following recommendations:

Government and Government Agencies

The Ministry of Industry, Trade, Investment and Digital Economy (Ministère de l'Industrie, du Commerce, de l'Investissement et de l'Economie Numérique) should immediately draft a regulation that will ban 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 harmful content on paint can labels such as solvents and provide a warning on possible lead dust hazards when disturbing painted surfaces as mandated under Law No. 31-08 on consumer protection.

Paint Industry

Paint companies that still produce lead paints 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 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 Morocco.

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

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.



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. 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: Intl\$134.7 billion of economic loss, or 4.03 percent of Gross Domestic Product (GDP);

Latin America and the Caribbean: Intl\$142.3 billion of economic loss, or 2.04 percent of GDP; and

Asia: Intl\$699.9 billion of economic loss, or 1.88 percent 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 Morocco is estimated at Intl\$5.65 billion, or 3.45 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. 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 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 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 lead limit are in place. The

current standard for household 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. 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 MOROCCO

In 2008, the annual production of the paint market in Morocco was about 85,000 tons and the annual revenue was estimated at \$131 million USD. The Moroccan Association of Paint, Inks and Glues Industries (AMIPEC) is composed of about ten paint manufacturers, which account for 90 percent of the paint market's total sales. Architectural, decorative and household paints used mainly in the construction of residential and office buildings account for 95 percent of the market, while the remaining 5 percent is shared between industrial and automotive paints. More than 300 different raw materials, all of which are imported from other countries, are used by local manufacturers in paint production. The product packaging is locally made and account for 10 percent of the average cost of the paint.

The majority of manufacturers in Morocco are located in the Casablanca-Rabat axis. A few companies have also been established in the north and eastern parts of the country. In addition, according to an AMIPEC official, there are currently manufacturing units inside urban districts and even under residential buildings.

The main paint manufacturers identified in Morocco are: Akzo Nobel Coatings (Astral), Sadvel, Atlas, Prodec, Colorado, Chimicolor, Arcol, Midi-peinture, O'dassia, Facop and Jafep.

There are plenty of regulations on environmental protection and sustainable development. In the framework of Law No. 11-03 on the protection and the development of the environment, draft standards of liquid discharges by sectors, are in the process of being promulgated. A draft law on the management and control of chemicals is being prepared by the Ministry of the Environment.

The regulatory texts concerning lead and its compounds are scattered among different ministerial departments, some of which are listed below.

Ministry of Crafts, Social Economy and Solidarity Standard 5384 (Official Bulletin of 5 January 2006) addresses the lead content in ceramic articles in contact with food. A certification (MADMOUN brand) is put in place for items that comply with the standard.

Ministry of Employment and Occupational Integration

- The importation of white lead and other lead compounds intended for professional use, with the exception of lead oxide such as minium (Pb_3O_4) and litharge (PbO), is subject to an authorization issued by the Ministry of Employment and Occupational Integration. The use of white lead, lead sulphate, plum-bearing linseed oil, and all specialty products containing lead sulphate or lead in any paintwork of any kind carried out either inside or outside buildings is prohibited. This prohibition is extended to the painting of cars.
- The standard “NM EN 71-3 (NM 21.8.003): Safety of Toys - Part 3, concerning the migration of certain elements,” sets the maximum migration of lead to 90 mg/kg (equivalent to 90 ppm) from the toy material.
- The standard “NM 21.8.010: Felt Pencils for Children - Safety Requirements and Tests,” limits the maximum level of lead to 250 mg/kg (equivalent to 250 ppm) in the coating of the body or the plastic constituting the body of the felt pen and 100 mg/kg (equivalent to 100 ppm) in inks.
- The standard “NM 09.0.000: Labeling of Textile and Apparel Products,” sets the limit value for lead in baby items at 0.2 ppm and in other articles at 1.0 ppm.
- By-law No. 4575.14 of 24 December 2014, laying down the conditions governing the use of lead or its compounds (Official Bulletin No. 6454 of 7 April 2016). This Decree, which is made in pursuance to Articles 27 and 105 of Decree No. 2-12-431, prohibits the use of lead hydrocarbonate or lead sulphate in all painting works and of any preparation containing any of these substances, in accordance with the provisions of Article 5 of the White Lead (Painting) Convention No. 13, ratified by Morocco in 1956. In particular, it sets 400 micrograms of lead per liter of blood for men and 300 micrograms of lead per liter of blood for women.
- Order of the Minister of Employment and Social Affairs No. 4576.14 of 24 December 2014, fixing the occupational exposure limit values for certain dangerous chemicals (Official Bulletin No 6454 of 7 April 2016). This decree, which is taken in application of the provisions of Article 27 of Decree No. 2-12-431, sets occupational exposure limits of more than 80 chemicals to be of pathologies due to pollutants present in the workplace. The occupational exposure limit value for metallic lead and its compounds is set at 0.1 mg/m³.

- The law of 9 May 1931 regulating the importation, sale, purchase, transport and use of white lead and other lead compounds intended for professional use as amended and supplemented (Official Bulletin No. 1073 of June 30, 1933 and Official Bulletin No. 1163 of March 22, 1935).

These provisions may be strengthened by the inclusion of all leaded paint ingredients in already existing prohibitions, adoption of other regulations as appropriate, and prohibition or setting limits on the content of hazardous chemicals, including lead, in industrial products and paint.

2. MATERIALS AND METHODS

From November 2016 to February 2017, 33 cans of solvent-based paint intended for home use were purchased by SMTCA from various stores in Rabat, Salé, Kenitra and Oujda, Morocco. The paints represented 16 different brands produced by 11 manufacturers.

In most cases, one white paint and one or more bright-colored paint such as green, orange, red, or yellow were selected. Additionally, five anticorrosive 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 SMTCA 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 SMTCA 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, resealable 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



Figure 1. Sample Preparation by the Staff of SMTCA.

an independent quality 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:

- 13 out of 33 analyzed solvent-based paints (39 percent of paints) were lead paints, i.e., they contained lead concentrations above 90 parts per million (ppm), dry weight. In addition, six paints (18 percent of paints) contained dangerously high lead concentrations at or above 10,000 ppm.
- eight out of 16 analyzed brands (50 percent of paint brands) sold at least one lead paint, i.e., a paint with lead concentration above 90 ppm. Also, five out of 16 analyzed brands (31 percent of paint brands) sold at least one lead paint with dangerously high lead concentrations at or above 10,000 ppm.
- 12 out of 25 bright-colored paints (48 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 five out of 8 paints (63 percent of yellow paints) containing lead concentrations greater than 10,000 ppm, and one out of two green paints (50 percent of green paints) also contained dangerously high lead concentrations above 10,000 ppm.
- The highest lead concentration detected was 140,000 ppm in a yellow paint sold for home use.
- Only two out of 33 paints (six percent of paints) provided information about lead on their labels. A yellow paint contained 57,000 ppm lead despite the “unleaded paint” mark on its label. Most paints carried little information about ingredients and 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 LEAD CONTENT ANALYSIS

Thirteen out of 33 analyzed solvent-based paints (39 percent of paints) were lead paints, i.e., contained a lead concentration above 90 ppm—six paints of these contained dangerously high lead concentrations at or above 10,000 ppm (18 percent of paints).

A yellow paint contained the highest concentration of lead at 140 000 ppm, while the lowest concentration of lead less than 60 ppm was detected in 18 paints.

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	Country of Manufacturer	Color	Lead Content (ppm)
1	MOR-11	Brand 5	Morocco	yellow	140 000
2	MOR-27	Brand 10	Morocco	yellow	57 000
3	MOR-02	Brand 1	Morocco	yellow	56 000
4	MOR-04	Brand 1	Morocco	green	33 000
5	MOR-34	Brand 13	Spain	yellow	17 000
6	MOR-16	Brand 6	Morocco	yellow	10 000
7	MOR-01	Brand 1	Morocco	red	8 100
8	MOR-12	Brand 5	Morocco	green	5 200
9	MOR-31	Brand 12	Morocco	red	4 000
10	MOR-23	Brand 9	Morocco	yellow	3 800

3.3 PAINT BRAND ANALYSIS

Eight out of 16 analyzed brands (50 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 paint (Brand 5) contained the highest concentration of lead at 140 000 ppm. On the other hand, at least one paint from 9 out of 11 decorative paint brands (82 percent of decorative paint

brands) contained lead below 90 ppm. This indicates that the technology to produce paints without added lead exists in Morocco.

All anticorrosive paints from five brands (100 percent of anticorrosive paint brands) contained concentrations of lead less than 60 ppm.

3.4 PAINT COLOR ANALYSIS

Twelve out of 25 bright-colored paints (48 percent of bright-colored paints) such as yellow, red, green and orange contained lead concentrations above 90 ppm, six paints of which contained dangerously high lead concentrations at or above 10,000 ppm (24 percent of bright-colored paints).

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

Among bright-colored decorative paints, six out of eight yellow paints (75 percent of yellow paints) contained lead concentrations above 90 ppm, five paints of which exceeded more than 10,000 ppm of lead (63 percent of yellow paints); and two green paints (100 percent of green paints) contained lead concentrations above 90 ppm, one paint of which exceeded more than 10,000 ppm of lead (50 percent of green paints). In addition, three out of nine red paints (33 percent of red paints) and one orange paint (100 percent of orange paints) contained lead concentrations above 90 ppm.

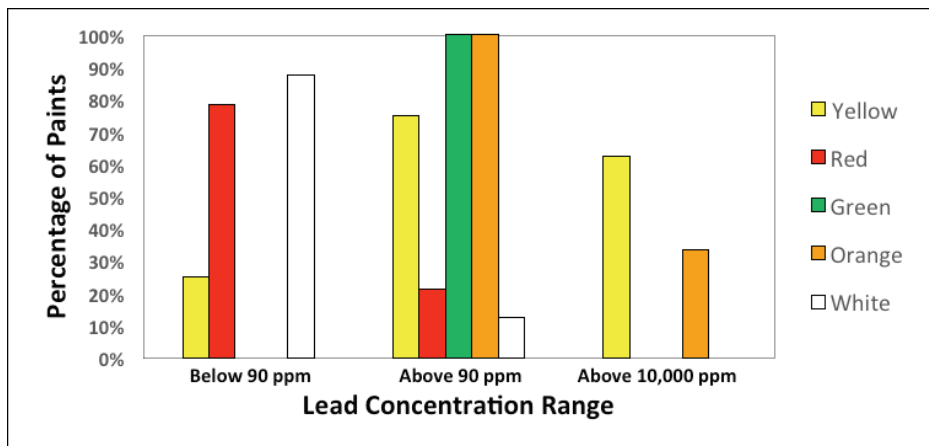


Figure 2. Distribution of lead concentrations in home-use solvent-based paints by color.

Among anticorrosive paints, all five red paints (100 percent of red paints) contained lead levels below 90 ppm.

The distribution of lead concentrations in different colors is shown in Figure 2.

3.5 LABELING

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

Only two out of 33 paints (six percent of paints) provided information about lead on their labels. A yellow paint contained 57,000 ppm lead despite the “unleaded paint” mark on its label. Most paint can labels carried little information about any ingredients and 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. No paints contained manufacturing dates on paint can labels, while eight out of 33 paints (24 percent of paints) contained batch or lot numbers on paint can labels 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.

4. CONCLUSIONS AND RECOMMENDATIONS

This study demonstrates that solvent-based paints for home use with high concentrations of lead are widely available in Morocco since the paints sampled for this study are brands commonly sold in retail stores all over Morocco. However, the fact that 20 out of 33 paints (61 percent of paints) contained lead concentrations below 90 ppm indicates that the technology to produce paints without added lead exists in Morocco. 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, SMTCA and IPEN propose the following recommendations:

For the Ministry of Industry, Trade, Investment and the Digital Economy to immediately draft a regulation that will ban the manufacture, import, export, distribution, sale and use of lead paints, i.e., 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 as mandated under Law No. 31-08 on consumer protection.

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 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 Morocco.

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APPENDIX

TABLE 2. SOLVENT-BASED PAINTS FOR HOME USE INCLUDED IN THE STUDY.

Sample No.	Brand	Color	Volume (L)	Price (DH)	Date of Manufacture (y/m/d)	Batch No.	Date of Purchase (y/m/d)	Is there website on label?
MOR-01	Brand 1	red	1 kg	43.32 DH	N/A	19668618	2016-11-19	Yes
MOR-02		yellow	1 kg	43.32 DH	N/A	19668613	2016-11-19	Yes
MOR-03		white	1 kg	35.00 DH	N/A	22198419	2017-08-01	Yes
MOR-04		green	1 kg	37.24 DH	N/A	20466073	2016-11-19	Yes
MOR-06	Brand 2 (anticorrosive)	red	1 kg	59.00 DH	N/A	P16150406101	2017-02-01	No
MOR-07	Brand 3	white	1 kg	45.00 DH	N/A	P16162112203	2017-02-01	No
MOR-08		yellow	1 kg	116.62 DH	N/A	P16154401002	2017-02-01	No
MOR-09		red	1 kg	134.86 DH	N/A	P16160306601	2017-02-01	No
MOR-10	Brand 4 (anticorrosive)	red	0.86 kg	25.00 DH	N/A	N/A	2016-11-18	Yes
MOR-11	Brand 5	yellow	0.5 kg	18.00 DH	N/A	N/A	2016-11-19	Yes
MOR-12		green	0.5 kg	18.00 DH	N/A	N/A	2016-11-19	Yes
MOR-13		red	0.5 kg	18.00 DH	N/A	N/A	2016-11-19	Yes
MOR-14	Brand 6	red	1 kg	30.00 DH	N/A	N/A	2017-04-01	Yes
MOR-15		white	0.9 kg	30.00 DH	N/A	N/A	2017-04-01	Yes
MOR-16		yellow	0.9 kg	30.00 DH	N/A	N/A	2017-04-01	Yes
MOR-17	Brand 7	yellow	0.85 kg	96.38 DH	N/A	N/A	2017-02-01	Yes
MOR-18		red	0.85 kg	117.88 DH	N/A	N/A	2017-02-01	Yes
MOR-19		white	0.85 kg	50.00 DH	N/A	N/A	2017-02-01	Yes
MOR-22	Brand 8 (anticorrosive)	red	1 kg	21.90 DH	N/A	N/A	2017-01-27	Yes

Sample No.	Brand	Color	Volume (L)	Price (DH)	Date of Manufacture (y/m/d)	Batch No.	Date of Purchase (y/m/d)	Is there website on label?
MOR-23	Brand 9	yellow	0.85 kg	30.00 DH	N/A	N/A	2017-04-01	No
MOR-24		red	0.85 kg	30.00 DH	N/A	N/A	2017-04-01	No
MOR-25		white	0.85 kg	30.00 DH	N/A	N/A	2017-04-01	No
MOR-26	Brand 10	white	1 kg	35.00 DH	N/A	N/A	2017-08-01	No
MOR-27		yellow	1 kg	40.00 DH	N/A	N/A	2017-02-01	No
MOR-28	Brand 11	red	1 kg	40.00 DH	N/A	N/A	2017-04-01	Yes
MOR-29		white	0.25 kg	13.00 DH	N/A	N/A	2017-02-01	Yes
MOR-31	Brand 12	red	0.5 kg	30.00 DH	N/A	N/A	2017-01-14	No
MOR-32		orange	0.5 kg	30.00 DH	N/A	N/A	2017-01-14	No
MOR-33	Brand 13	white	0.7 L	35.00 DH	N/A	N/A	2017-08-01	Yes
MOR-34		yellow	0.7 L	40.00 DH	N/A	N/A	2017-08-01	Yes
MOR-35	Brand 14 (anticorrosive)	red	0.5 kg	16.00 DH	N/A	N/A	2017-02-01	No
MOR-36	Brand 15	red	0.4 kg	35.00 DH	N/A	N/A	2017-01-14	No
MOR-37	Brand 16 (anticorrosive)	red	0.75 L	88.31 DH	N/A	N/A	2016-11-19	Yes

TABLE 3. 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?
MOR-01	Brand 1	red	8 100	Morocco	Morocco	No
MOR-02		yellow	56 000	Morocco	Morocco	No
MOR-03		white	Below 60	Morocco	Morocco	No
MOR-04		green	33 000	Morocco	Morocco	No
MOR-06	Brand 2 (anticorrosive)	red	Below 60	Netherlands	Morocco	No
MOR-07	Brand 3	white	Below 60	Netherlands	Morocco	No
MOR-08		yellow	Below 60	Netherlands	Morocco	No
MOR-09		red	Below 70	Netherlands	Morocco	No
MOR-10	Brand 4 (anticorrosive)	red	Below 60	France	Morocco	No
MOR-11	Brand 5	yellow	140 000	France	Morocco	No
MOR-12		green	5 200	France	Morocco	No
MOR-13		red	Below 60	France	Morocco	No
MOR-14	Brand 6	red	Below 60	Morocco	Morocco	No
MOR-15		white	Below 60	Morocco	Morocco	No
MOR-16		yellow	10 000	Morocco	Morocco	No
MOR-17	Brand 7	yellow	Below 60	Morocco	Morocco	No
MOR-18		red	Below 60	Morocco	Morocco	No
MOR-19		white	Below 60	Morocco	Morocco	No
MOR-22	Brand 8 (anticorrosive)	red	Below 60	Morocco	Morocco	No
MOR-23	Brand 9	yellow	3 800	Morocco	Morocco	No
MOR-24		red	Below 60	Morocco	Morocco	No
MOR-25		white	Below 60	Morocco	Morocco	No

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?
MOR-26	Brand 10	white	Below 60	Morocco	Morocco	Yes. "Unleaded Paint"
MOR-27		yellow	57 000	Morocco	Morocco	Yes. "Unleaded Paint"
MOR-28	Brand 11	red	2 100	Morocco	Morocco	No
MOR-29		white	Below 60	Morocco	Morocco	No
MOR-31	Brand 12	red	4 000	Morocco	Morocco	No
MOR-32		orange	1 900	Morocco	Morocco	No
MOR-33	Brand 13	white	960	Spain	Spain	No
MOR-34		yellow	17 000	Spain	Spain	No
MOR-35	Brand 14 (anticorrosive)	red	Below 60	Morocco	Morocco	No
MOR-36	Brand 15	red	Below 70	Morocco	Morocco	No
MOR-37	Brand 16 (anticorrosive)	red	Below 60	Spain	Spain	No

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 14 (anticorrosive)	1 (red)	0	0	< 60	< 60
Brand 10	2	1	1	< 60	57 000
Brand 12	2	2	0	1 900	4 000
Brand 7	3	0	0	< 60	< 60
Brand 6	3	1	1	< 60	10 000
Brand 11	2	1	0	< 60	2 100
Brand 1	4	3	2	< 60	56 000
Brand 15	1 (red)	0	0	< 70	< 70
Brand 4 (anticorrosive)	1 (red)	0	0	< 60	< 60
Brand 9	3	1	0	< 60	3 800
Brand 5	3	2	1	< 60	140 000
Brand 8 (anticorrosive)	1 (red)	0	0	< 60	< 60
Brand 16 (anticorrosive)	1 (red)	0	0	< 60	< 60
Brand 13	2	2	1	960	17 000
Brand 2 (anticorrosive)	1 (red)	0	0	< 60	< 60
Brand 3	3	0	0	< 60	< 70

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)
Green	2	2	1	5 200	33 000
Orange	1	1	0	1 900	1 900
Red	14	3	0	< 60	8 100
White	8	1	0	< 60	960
Yellow	8	6	5	< 60	140 000



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