CÔTE D'IVOIRE

NATIONAL REPORT:
LEAD IN ENAMEL DECORATIVE PAINTS IN CÔTE D'IVOIRE

2015

Développement Durable en Côte d'Ivoire

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NATIONAL REPORT
LEAD IN ENAMEL DECORATIVE PAINTS IN CÔTE D'IVOIRE

July 2015

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This report was produced as part of the Africa Lead Paint Elimination Project. The Africa Lead Paint Elimination Project carries out focused activities to eliminate lead in paint in four project countries – Cameroon, Côte d'Ivoire, Ethiopia and Tanzania.

The project is funded by the Global Environment Facility; the United Nations Environment Programme (UNEP) is the Project Implementing Agency; and IPEN is the Project Executing Agency. The contents of this report, however, are the sole responsibility of IPEN and JVE Côte d'Ivoire.

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Jeunes Volontaires pour 'Environnement (JVE) Côte d'Ivoire was established in February 2008 and has its headquarter in Riviera-Faya at the opposite of the 1st Infantry Battalion of Akouedo. Our activities areas are climate change, chemical safety and biodiversity, community development, environmental education and renewable energy. In the field of chemical safety, JVE Côte d'Ivoire has a particular interest for heavy metals, including lead.

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PREFACE

Leaded paints for home use continue to be widely produced, sold, and used in developing countries despite the fact that most highly industrial countries banned leaded paints for household use more than 40 years ago. IPEN, the United Nations Environment Programme (UNEP), the World Health Organization (WHO), and others are cooperating to raise awareness that childhood lead exposure remains a serious problem, and have catalyzed national activity in a number of developing countries to eliminate lead paint and protect children.

In 2007 and 2008, NGOs in the IPEN network collected and analyzed solvent-based, enamel decorative 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 had dangerously high lead content. In response, IPEN launched a worldwide lead paint elimination campaign. Since then, IPEN-affiliated NGOs and others have sampled and analyzed paints on the market in approximately 40 low- and middle-income countries.[1] Twelve of these studies were carried out with UNEP support.[2]

This report presents new data on the lead content of solvent-based, enamel decorative paints that are offered for sale in the Côte d'Ivoire market. This is the second time that Jeunes Volontaires pour l'Environnement (JVE) has analyzed paints sold in Côte d'Ivoire for their lead content. Previous studies were conducted in 2013 (30 paints from 7 brands of which 20 were solvent-based, enamel decorative and 10 were anticorrosive paints). In the 2013 study, fourteen of the 20 enamel decorative paints (70%) had lead concentrations higher than 90 parts per million (ppm); thirteen enamel decorative paints (65%) had lead concentrations higher than 600 ppm. Five of the decorative paints (25 percent) had lead concentrations above 10,000 ppm. The enamel decorative paint with the highest concentration had a lead content of 42,000 ppm.

Eight (80%) of the ten anticorrosive paints had lead concentrations higher than 90 ppm; eight (80 per cent) paints had lead concentrations higher than 600 ppm. One of the anticorrosive paints had a lead concentration of 260,000 ppm.

This report presents the results of a new analysis of 53 paints sold in Côte d'Ivoire. It also includes background information on why the present and former use of enamel decorative paints with high lead content is a source of serious concern, especially to children's health. It also proposes action steps by different stakeholders to protect children and others from lead paint and lead dust.

1 Information about the indicated countries and studies is provided in Annex A of this report.
2 Ibid.

The report was prepared by Jeunes Volontaires pour l'Environnement with support and assistance from the African Lead Paint Elimination Project, which 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 paints, particularly on the health of children under six years old.

EXECUTIVE SUMMARY

While lead exposure is also harmful to adults, lead exposure harms children at much lower doses, and the health effects are generally irreversible and can have a lifelong impact.[3] The younger the child, the more harmful lead can be, and children with nutritional deficiencies absorb ingested lead at an increased rate.[4] 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.

According to WHO, "Lead has no essential role in the human body, and lead poisoning accounts for about 0.6% of the global burden of disease."[5] 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.[6]

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. 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. Exposure to lead also harms adults, especially those working in occupations associated with high lead exposure. Lead in paint can contribute to high occupational lead exposure in painters, auto body shop workers, construction workers involved in building renovations, and others.

In 2014-2015, staff at Jeunes Volontaires pour l'Environnement collected 53 samples of solvent-based, enamel decorative paint sold on the market in Côte d'Ivoire as part of the African Lead Paint Elimination Project. The Côte d'Ivoire paint market is led by 4 major paint manufacturers; TISA (Ikarlac and Jaline brands); INDUSTRAP (Delux and Trapline brands); DROCOLOR (Topline, Ultralac, Autolac brands); and IPL (Eurekalac and Pantinox brands).

3 Ibid, page 12
4 Ibid, page 48
5 World Health Organization, Childhood Lead Poisoning, 2010, page 11: http://www.who.int/ceh/publications/leadguidance.pdf
6 A. Prüss-Üstün and C. Corvalán, World Health Organization, Preventing Disease Through Healthy Environments: Towards an estimate of the environmental burden of disease, 2006, page 12: http://www.who.int/quantifying_ehimpacts/publications/preventingdisease.pdf

The Africa Lead Paint Elimination Project carries out focused activities to eliminate lead in paint in four project countries – Cameroon, Ethiopia, Ivory Coast, and Tanzania. The project is funded by the Global Environment Facility; the United Nations Environment Programme (UNEP) is the Project Implementing Agency; and IPEN is the Project Executing Agency.

FINDINGS

In 2014-15, Jeunes Volontaires pour l'Environnement purchased a total of 53 paints from stores located in Abidjan especially in the districts of Cocody, Treichville, Koumassi, and Marcory in Côte d'Ivoire. The paints were from 19 paint brands.

Of the total 53 paints that were purchased from retail shops in Côte d'Ivoire:

- Forty-four were solvent-based, enamel decorative paints.
- Five were anticorrosive paints intended for use on metal doors and windows in housing, metal toys, playground equipment and other domestic uses.
- Three were mixed enamel decorative paints, i.e., colored, solvent-based, enamel paints mixed with a white acrylic base paint, a common practice among painters in Côte d'Ivoire.
- In addition, the white acrylic paint used as a base for the mixed paints was analyzed for its lead content.

All paints were analyzed by an accredited laboratory in the United States for their total lead content, (parts per million, ppm, dry weight).

Lead Levels in Paint

Most of the paints analyzed would not meet regulatory standards established in most industrialized countries.

- Thirty-three of the 44 solvent-based, enamel decorative paints (75%) had lead concentrations higher than 90 ppm and 600 ppm. Sixteen (16) paints (36%) contained lead at levels higher than 10,000 ppm. The highest lead concentration detected was 190,000 ppm.
- Four of the 5 anticorrosive paints (80%) had lead concentrations above 90 ppm and 3 anticorrosive paints (60%) had lead content higher than 600 ppm. The highest lead concentration detected in the anticorrosive paints was 2,200 ppm.

- The white acrylic base paint had a lead concentration below 90 ppm, but 1 of the 3 mixed paints had a lead content higher than 90 ppm. The lead concentration in the green mixed paint was 17,000 ppm.

Lead Levels by Brand

- The brands with highest lead content were ULTRALAC, AUTOLAC, DE-LUX, PEROLAC, TRAPLINE, KIMILAC, EMAIL BRILLANT, KIMIMAT, SPECIAL 7, TOPLINE and TOPFER.
- Of these brands, the most popular and commonly used for domestic purposes are DELUX, KIMILAC and PEROLAC.

Enamel Decorative paints:

- Amongst the 13 sampled brands of enamel decorative paint, 1 or more paints from 9 brands (69%) had lead content above 90 ppm as well as above 600 ppm. One or more paints from 8 brands (62%) had a lead concentration higher than 10,000 ppm. The brand of enamel decorative paint with the highest lead concentration was Ultralac with a yellow paint containing 190,000 ppm.

Anticorrosive paints:

- The 5 anticorrosive paints were produced by 5 brands. The paints from 4 of 5 brands (80%) had a lead concentration higher than 90 ppm. The paints from 3 brands (60%) had a lead content higher 600 ppm. No paint from any brand of anticorrosive paints had a lead content above 10,000 ppm. The highest lead concentration detected was 2,200 ppm in a paint from the Topfer brand.

Acrylic mixed paints:

- Three colored paints from the brand Special 7 were mixed with an acrylic white paint from the brand Batilo, a common practice among painters in Côte d'Ivoire. The white paint did not contain added lead, but the green colored paint from Special 7 contained high levels of lead (17,000 ppm).

Lead Levels by Color

Of the 44 solvent-based enamel decorative paints, 12 were white paints, 10 were yellow paints, 10 were red paints, 10 were green paints and 2 were blue paints.

In addition, 2 different colors of anticorrosive paints were analyzed: 4 grey paints and 1 red paint. Also, 3 colors (green, yellow and red) of solvent-based enamel decorative paint was mixed with a white acrylic paint and analyzed

Enamel Decorative paints:

Yellow and green enamel decorative paints had the highest average concentrations of 56,100 ppm and 23,700 ppm, respectively. Blue and white colors had the lowest lead concentrations with averages of 3,880 and 2,530 respectively.

Anticorrosive paints:

Lead concentrations in the four rustproof grey paints ranged from 100 to 2,200 ppm. The lowest lead level in anticorrosive paints was below 60 ppm and was found in the red paint. The highest concentration was the grey paint with 2,200 ppm.

Acrylic mixed paints:

While the yellow and red mixed paints had lead content below 90 ppm, the green mixed paint had a lead content of 17,000 ppm. The acrylic paint, by itself, had a lead concentration below 90 ppm.

Consumer Information

Few if any manufacturers include warnings about hazards associated with lead on their labels or other consumer information.

No paint cans from the 53 sampled paint cans offered information about lead content. There also appears to be no standard practice with regard to the availability of other types of consumer information. No paint cans included the website address of the paint manufacturer on the label. However, 6 cans (11 %) included the email address of the paint manufacturer on the label.

Lead Levels compared to the 2013 study

Three decorative paints from the brands TOPLINE and DELUX (white, red and yellow) were analyzed both in 2013 and in the present study. All 6 paints contained high levels of lead in the 2013 study (ranging from 1,600 ppm to 42,000 ppm). A white paint from the brand JALINE shown to contain low levels of lead (below 90 ppm) in the 2013 study was also included in the present study. No decrease in lead levels in the TOPLINE and DELUX paints was seen in the present study, and the JALINE paint still only contained low levels of lead (below 90 ppm).

Also, 1 grey, anticorrosive paint each from the brands SUPER and DELUX EMAIL were analyzed in both studies. A drastic decrease of lead content in both paints was seen between 2013 and 2015. In 2013 the paint from SUPER

contained 260,000 ppm lead, and in 2015 the lead level was decreased to 1,500 ppm. In 2013, the paint from DELUX contained 7,000 ppm lead, and in 2015 this was decreased to 100 ppm lead.

RECOMMENDATIONS

Lead paint is a serious human health hazard, especially when the paint is used in applications likely to expose children to lead. Decorative paints and paints for use on children's products can be easily produced without the use of lead pigments, lead driers, and lead anticorrosive agents. Manufacturers can reformulate their decorative paints to avoid the use of leaded ingredients without any significant sacrifice to the quality of the paint, and with very little, if any, increase in their total cost of production. Paint manufacturers that currently produce lead decorative paints and lead paints for other applications likely to contribute to childhood lead exposure are encouraged to reformulate these paints to avoid the use of leaded ingredients.

This study shows that many decorative paints on the market in Cote d'Ivoire contain high levels of lead, and this study finds no improvement in lead levels of the decorative paints included in both this and the 2013 study. In fact, this study found even higher lead levels than in 2013 in a brand not previously analyzed. Therefore, a strong effort needs to be undertaken by all the involved stakeholders to achieve lead paint elimination in Cote d'Ivoire.

Regulatory frameworks

National efforts should be encouraged to promote the establishment of appropriate national regulatory frameworks to control the manufacture, import, export, sale and use of lead paints and products coated with lead paints. In setting priorities and timeframes for implementation, special attention should be given to the elimination of lead decorative paints and lead paints for other applications most likely to contribute to childhood lead exposure.

Public Awareness

Given the serious impact childhood lead poisoning has on both an individual and a nation's future, there is a need for public information campaigns in countries where results show the presence of lead paint on the market. These campaigns should inform the public about the hazards of lead exposure, especially in children; the presence of lead household paints for sale and use on the national market; lead paint as a significant source of childhood lead exposure; and the availability of technically superior and safer alternatives.

Voluntary Action and Labeling

All paint manufacturers in countries that lack a well-enforced national lead paint control regime should be encouraged to act voluntarily to eliminate lead compounds in the formulation of their paints – particularly, their solvent-based, enamel decorative paints and paints for other applications likely to contribute to lead exposure in children and others.

CHAPTER ONE

BACKGROUND ON LEAD IN PAINT

Lead is a toxic metal that is found in some paints.

Paints contain lead when the paint manufacturer intentionally adds one or more lead 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.

The lead 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.

Lead compounds also may be added to enamel (oil-based) paints for use as driers (sometimes called drying agents or catalysts). Enamel paints dry to a hard and smooth surface through a process that involves chemical reactions in which paint ingredients called binders polymerize and crosslink. The driers serve as catalysts that speed up the process and make paints dry faster and more evenly. When lead compounds are used as driers, they are generally not used alone, but are usually combined with other driers, including compounds of manganese, cobalt, and others.

Lead 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.

Inorganic pigments, fillers, and possibly some other ingredients used in the manufacture of paints may be derived from natural, earth-based materials, and may be more or less contaminated with lead depending on geological characteristics at the location where they were mined. When lead-contaminated ingredients are used in the manufacture of paints, this will contribute to the lead content of the paint.

Finally, when a paint manufacturer uses lead-containing compounds in the manufacture of some of its paints (such as industrial paints), other paints produced in the same facility might become contaminated with lead when proper housekeeping and cleanup procedures are not followed.

Non-leaded pigments, driers, and anti-corrosive agents have been widely available for decades, and are used by manufacturers producing the highest quality paints. In most cases, by avoiding the use of lead pigments, lead driers, and other intentionally added lead compounds, a paint manufacturer will produce paints with lead content well below 90 ppm that can be sold in any country in the world.

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. Many also imposed controls on the lead content of paints

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.

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.

CHAPTER TWO

LEAD EXPOSURE AND ITS HEALTH EFFECTS

Children are not generally exposed to lead from paint while the paint is still in the can or when the paint is being newly applied to a previously unpainted or uncoated surface. Rather, lead exposure generally occurs after the lead paint has already dried on a painted wall or object.

Over time, paint on a surface will chip, wear, and deteriorate. This happens more quickly when the surface is exposed to sunlight or is subject to friction and impact (such as with windows and doors). Any lead present in the deteriorating paint is released to dust and soil in and around the home, school, or other location where the paint was used. When a surface previously painted with lead paint is sanded or scraped in preparation for repainting, very large amounts of lead-contaminated dusts are produced and spread.

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 house dust or the soil is contaminated with lead, the children 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.[7]

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 chips can be much higher than what is typically found in dust and soils. When toys, household furniture, or other articles are painted with lead paint, children may chew on them and directly ingest the lead-contaminated, dried paint. Nonetheless, the most common way that children ingest lead is through lead-contaminated dust and soil that gets onto their hands.

While lead exposure is also harmful to adults, lead exposure harms children at much lower doses, and the health effects are generally irreversible and can have a lifelong impact.[8] The younger the child, the more harmful lead can be, and

7 "The amount of soil and house dust that a typical 1–6-year-old child ingests is said to be 100 mg/24 h, but a more conservative estimate of 200 mg/24 h with an upper percentile of 400 mg/24 h has also been suggested." World Health Organization, Childhood Lead Poisoning, page 18. http://www.who.int/ceh/publications/leadguidance.pdf (2010)

8 Ibid, page 12

children with nutritional deficiencies absorb ingested lead at an increased rate.[9] 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.

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 can also affect the blood system, the kidneys, and the skeleton.

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.[10]

Children are more sensitive to the harmful effects of lead than adults for several reasons, including:[11]

- A child's brain undergoes very rapid growth, development, and differentiation, and lead interferes with this process. For example, it has been shown that moderate lead exposure (5 to 40 μg/dL) during early childhood is connected to region-specific reductions in adult gray matter volume. Moderate blood levels have been linked to an increased likelihood of impaired cognition and executive function, impulsiveness, aggression, and delinquent behavior. The loss of gray matter in the brain constitutes a potential explanation for cognitive and behavioral problems associated with lead exposure.[12] Brain damage caused by chronic, low-level exposure to lead is irreversible and untreatable.
- Exposure to lead early in life can re-program genes, which can lead to altered gene expression and an associated increased risk of disease later in life. For example, gene alterations caused by prenatal lead exposure have been implicated in the development of Alzheimer's disease.[13]
- Gastrointestinal absorption of lead is enhanced in childhood. Up to 50 percent of ingested lead is absorbed by children, as compared with 10 percent in adults. (Pregnant women may also absorb more ingested lead than other adults.)[14]

9 Ibid, page 48

10 Verstraeten, S.V., et al, Aluminium and lead: molecular mechanisms of brain toxicity, (Archives of Toxicology 82:789–802. DOI 10.1007/s00204-008-0345-3, 2008)

11 World Health Organization, Childhood Lead Poisoning, http://www.who.int/ceh/publications/leadguidance.pdf, 2010

12 Cecil, K.M., et al., Decreased Brain Volume in Adults with Childhood Lead Exposure, (PLOS Medicine (2008) 5(5): e112. DOI:10.1371/journal.pmed.0050112)

13 Mazumdar, M., et al., Prenatal Lead Levels, Plasma Amyloid β Levels, and Gene Expression in Young Adulthood, (Environmental Health Perspectives (2012) 120 (5))

14 World Health Organization, Childhood Lead Poisoning, http://www.who.int/ceh/publications/leadguidance.

Lead Exposure Reduces Intelligence

Lead exposure in children may be measured in micrograms of lead per deciliter of blood (μg/dL) or in micrograms of lead per liter of blood (μg/L). At the low end of the lead exposure spectrum, an increase in blood lead level in a pre-school child from less than 1 μg/dL to 10 μg/dL is associated with a six point decrease in IQ (intellectual quotient) points. For children whose blood lead level is in the range of 10-20 μg/dL, a quarter to a half of an IQ point is lost for each 1 μg/dL increase in the blood lead.[1]

1 World Health Organization, Childhood Lead Poisoning, page 25, 2010

According to WHO: "Lead has no essential role in the human body, and lead poisoning accounts for about 0.6% of the global burden of disease."[15] 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.[16]

In recent years, medical researchers have been documenting significant health impacts in children from lower and lower lead exposures.[17],[18] According to the World Health Organization: "There is no known safe level of exposure to lead."[19]

pdf, 2010

15 World Health Organization, Childhood Lead Poisoning, 2010, page 11: http://www.who.int/ceh/publications/leadguidance.pdf

16 A. Prüss-Üstün and C. Corvalán, World Health Organization, Preventing Disease Through Healthy Environments: Towards an estimate of the environmental burden of disease, 2006, page 12: http://www.who.int/quantifying_ehimpacts/publications/preventingdisease.pdf

17 Herbert Needleman, Lead Poisoning,(Annual Review of Medicine 2004, http://www.rachel.org/files/document/Lead_Poisoning.pdf)

18 World Health Organization, Childhood Lead Poisoning, page 26 (citing the work of Lanphear et al., 2000): http://www.who.int/ceh/publications/leadguidance.pdf, 2010

19 World Health Organization, Frequently Asked Questions,International Lead Poisoning Awareness Campaign, Week of Action, 19-25 October, 2014, page 1: http://www.who.int/ipcs/lead_campaign/faq_lead_poisoning_prevention_campaign_en.pdf?ua=1

CHAPTER THREE

ECONOMIC IMPACTS OF LEAD PAINT EXPOSURE

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.[20] 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.[21] 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 as measured by lifelong earnings.

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[22] per year.[23] 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:** $134.7 billion of economic loss, or 4.03% of Gross Domestic Product (GDP)

20 Mielke, H.W. and Zahran, S., The urban rise and fall of air lead (Pb) and the latent surge and retreat of societal violence (Environment International. 43 (2012) 48-55)

21 World Health Organization, Childhood Lead Poisoning, page 28: http://www.who.int/ceh/publications/leadguidance.pdf, 2010

22 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. The data from the table (at: http://data.worldbank.org/indicator/NY.GDP.PCAP.PP.CD) was accessed by the report's authors in February 2012.

23 Teresa M. Attina and Leonardo Trasande, Economic Costs of Childhood Lead Exposure in Low- and Middle-Income Countries, (Environmental Health Perspectives; DOI:10.1289/ehp.1206424; http://ehp.niehs.nih.gov/1206424/)

- **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

CHAPTER FOUR

GLOBAL LEAD PAINT ELIMINATION EFFORTS

An international convention limiting the use of white lead was adopted by the General Conference of the International Labour Organization and ratified by 63 countries as early as 1921. Many highly industrial countries enacted laws, regulations, or mandatory standards to protect the health of their people in the 1970's and 1980's. These laws generally prohibit the manufacture, import, sale, or use of lead paint for interiors or exteriors of homes, schools, and other child-occupied facilities. The standard adopted by the United States imposes an upper limit of 90 ppm on total lead (dry weight) for decorative paints and many other paint categories. Other countries have adopted mandatory limits such as 90 or 600 ppm total lead (dry weight).

Analytical data from paint studies show that in countries where no national law, binding regulation, or other legal instrument specifically forbids it, some or most of the brands of enamel decorative paints for sale on the national market contain high levels of lead. This suggests that national laws, binding regulations, or other legal instruments are a key tool for controlling the lead content of paints.

At the second session of the International Conference on Chemicals Management (ICCM), held in 2009, several chemical issues were identified by consensus to be international priority issues of concern. One of these was lead in paints, and there was a decision to establish it as an international emerging policy issue.[24] In response to the ICCM decision, the United Nations Environment Programme (UNEP) and the World Health Organization (WHO) jointly initiated a global partnership to eliminate the use of lead compounds in paints in order to protect public health and the environment. This partnership is called the Global Alliance to Eliminate Lead Paint (GAELP).[25] GAELP's broad objective is to phase out the manufacture and sale of paints containing lead, and eventually to eliminate the risks from such paints.[26]

24 http://www.saicm.org/images/saicm_documents/iccm/ICCM2/ICCM2%20Report/ICCM2%2015%20FINAL%20REPORT%20E.doc)

25 http://www.unep.org/hazardoussubstances/LeadCadmium/PrioritiesforAction/LeadPaints/tabid/6176/Default.aspx

26 http://www.unep.org/hazardoussubstances/LeadCadmium/PrioritiesforAction/GAELP/GAELPObjectives/tabid/6331/Default.aspx

In establishing a national legislative or regulatory framework to control the lead content of paints, the Global Alliance to Eliminate Lead Paint proposes the objectives should include the following:

- Prevention of the manufacture, import, use, and export of lead paint;
- Development of a system with effective means of enforcement and compliance;
- Establishment of institutional responsibilities and arrangements for management and enforcement of legislation and/or regulation.[27]

27 Ibid

CHAPTER FIVE

CÔTE D'IVOIRE FRAMEWORK FOR ELIMINATING LEAD PAINT

Currently, there are no existing laws or regulations that limit the manufacture, import or use of paint with high lead content in Côte d'Ivoire.

Potential texts or processes that might be used to regulate or limit lead in paint include:

- Article 19 of the Ivoirian Constitution (2000), which mentions that "the right to a safe environment is recognized for all";
- The Environment Code from October 3rd, 1996 which consolidates and promotes a safe management of chemicals and wastes;
- The law #98 651 of 7th July 1998 on public health and environmental protection from industrial wastes, toxic, nuclear and hazardous substances;
- The Labour Code which promotes the chemical safety for workers in manufacturing;
- The decree #67-321 from 21st July 1967 related to chemical safety of workers in application of the Labour Code;
- Articles 328, 429, 433 and 434 of the Penal Code, which condemns pollution by chemicals and hazardous wastes.

In Côte d'Ivoire, the Environment Ministry, or the Health Ministry or the Ministry of Industry and Mines may have the authority to issue a regulation, a decree or a control order that controls the lead content of paints. The organization in charge of Standards, called "CODINORM", may take the lead in the elaboration of standards dealing with lead content in manufactured or sold paints in this country.

In October 2014, the Ministry of Environment adopted a national strategy on chemicals management. In the Axis 2, which deals with the evaluation and management of risks related to chemicals, it states that: "the government make lead paints reduction a priority" and that "The Environment Ministry will work

from 2015 to 2017 with the Ministry of Industry, customs services and NGOs to achieve this goal."

CHAPTER SIX

LEAD PAINT MARKET CÔTE D'IVOIRE

Total number of paint brands sold in the country

In this study, Jeunes Volontaires pour l'Environnement identified 21 brands of paint sold in the country. Of these 21 brands, 13 brands manufacture solvent-based, enamel decorative paints and 5 manufacture enamel anticorrosive paints.

Percentage of total sales by multinational paint companies

Five brands included in this study are manufactured by 2 multinational paint companies. Pantinox, Eurekalac and Antirouille SR (anticorrosive) are produced by the manufacturer Ivoirenne de Peintures et Lacques (IPL), which is an affiliate of the American company, PPG. Two others, Ikarlac and Jaline are from the manufacturer TISA.

Percentage of total sales by local manufacturers

Fourteen of the paint brands included in this study are manufactured by 3 local manufacturers. The first of these manufacturers is INDUSTRAP, with its brands "Delux, Delux Email (anticorrosive) and Trapline. The second is DROCOLOR, with the brands Topline, Ultralac, Autolac; the anticorrosive paints Ultrafer and Topfer; and the brand – Special 7 – used to mix colors with the acrylic paint. The acrylic paint from the brand Batilo is also manufactured by DROCOLOR. The third manufacturer is SNPC, with its brands Kimimat, Kimilac, Perolac and its anticorrosive paint brand Super+.

Annual paint sales in Côte d'Ivoire

The paint market in Côte d'Ivoire is dominated by 4 manufacturers: TISA, INDUSTRAP, DROCOLOR and IPL. In 2014, the annual sales of these manufacturers were as follows:[28]

- TISA : 22,551,296,408 CFA or $ USD 45,102,592.81

28 PME Magazine N°47 Oct. Nov. 2014, p.64, 66, 76, 82

- INDUSTRAP: 14,750,287,081 CFA or $ USD 29,500,574.16
- DROCOLOR: 6,229,528,564 CFA or $ USD 12,459,057.12
- IPL: 4,601,479,513 CFA or $ USD 9,202,959.026

Where local paint producers are largely located

Local manufacturers of the brands included in this study are all based in Abidjan, the economic capital city of Côte d'Ivoire. However, they have showrooms and retail stores in all other cities of the country and are also represented in some Western Africa sub-region countries, especially Mali and Burkina Faso.

CHAPTER SEVEN

MATERIALS AND METHODS

From December 2014 to March 2015, Jeunes Volontaires pour l'Environnement purchased 53 cans of solvent-based, enamel decorative paint, anticorrosive paint and colored paint to be mixed with white acrylic paint from various stores in different districts in Abidjan. These paints from 19 different brands were produced by 5 manufacturers. In most cases, Jeunes Volontaires pour l'Environnement selected 1 white paint and another bright-colored paint such as red, green and yellow. For three brands (Ikarlac, Delux and Trapline), a blue color paint was also sampled.

For one brand (Special 7), prepared colored enamel paints are not manufactured anymore. However, colors from this brand are still manufactured and sold for painters to mix with white acrylic paint. In this way, painters themselves can prepare the color they want to use in the desired quantity. JVE purchased the colors from Special 7 and mixed 50 mL of each color in 500 g of an acrylic white paint from the brand Batilo.

The anticorrosive paints were grey or brown. 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 or for painting toys.

During the sampling, information such as color, brand, country where manufactured, purchase details, date manufactured as provided on the label of the paint can was recorded. The formats used for date of manufacturer varied with some companies providing day, month and year and others providing only month and year. In addition, some paint companies used only a single word to describe some colors, such as "red," while others used "bright red." Colors were recorded as provided on the can. For the red green, blue and yellow paints the protocol called for obtaining "bright" or "strong" red and yellow paints when available. Dates of purchase were recorded in the day/ month/year format in most cases.

All paints were purchased from paint stores in local markets and communities, hardware stores, building supply stores and larger retail establishments used by the general public. In other words, paints that could reasonably presumed to be intended for home use. Excluded were automotive and industrial paints that are not typically used for domestic housing applications or to paint toys or household articles.

Figure 1: Testing paint samples.

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 the Jeunes Volontaires pour l'Environnement 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 wood pieces using different unused single-use paintbrushes by the staff of Jeunes Volontaires pour l'Environnement as shown in Figure 1.

Each stirring utensil and paintbrush was used only once, 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 individual resalable plastic bags and shipped to Forensic Analytical Laboratories in the US. Paint samples were analyzed using method EPA 3050B/7420 (atomic absorption), a method recognized as suitable by WHO.[29]

29 WHO (2011). Brief guide to analytical methods for measuring lead in paint. http://www.who.int/ipcs/assessment/public_health/lead_paint.pdf

CHAPTER EIGHT

RESULTS

A total of 53 cans of new solvent-based, enamel decorative paints were purchased in Abidjan in, Côte d'Ivoire and analyzed for their lead content. Results are given in parts per million (ppm) lead, dry weight.

A majority of the paints (38 paints, 72%) had lead concentrations above 90 ppm lead. Thirty-seven paints (70%) contained more than 600 ppm lead. Seventeen of the 53 paints (32%) exceeded 10,000 ppm lead. The highest lead concentration was 190,000 ppm detected in 2 paints from 2 brands.

- Among the forty-four solvent-based, enamel decorative paints, 33 paints, (75%) had lead concentrations higher than 90 ppm, as well as above 600 ppm. Lead content in 16 paints (36%) exceeded 10,000 ppm. The highest lead concentration detected was 190,000 ppm.
- Four anticorrosive paints (80%) had lead concentration above 90 ppm. Three anticorrosive paints (60%) had lead content higher than 600 ppm. The highest lead concentration detected in an anticorrosive paint was 2,200 ppm.
- One of the three colored paints mixed with a white acrylic paint had a lead content higher than 90 ppm. The green colored paint had a lead concentration of 17,000 ppm.

In a previous study conducted in 2013 (30 paints from 7 brands of which 20 were solvent-based, enamel decorative paints and 10 were anticorrosive paints), 14 enamel decorative paints (70 percent) had lead concentrations higher than 90 parts per million (ppm); 13 enamel decorative paints (65 percent) had lead in concentrations higher than 600 ppm. Five of the enamel decorative paints (25 per cent) contained lead in excess of 10,000 ppm. The enamel decorative paint sample with the highest concentration had a lead content of 42,000 ppm.

In the current study, 7 paints had a lead content higher than 42,000 ppm (the highest concentration in the previous study), and more paints were found to have high lead levels, suggesting that the lead content in paints may be increasing in paints manufactured in Côte d'Ivoire.

Anticorrosive paints:

Four of 5 brands (80%) had a lead concentration higher than 90 ppm. Three brands (60%) had a lead content higher 600 ppm. No anticorrosive paint

brand had a lead content above 10,000 ppm. The highest lead concentration was 2,200 ppm from Topfer.

Acrylic mixed paints:

Three colored paints from the brand Special 7 were mixed with an acrylic white paint from the brand Batilo, a common practice among painters in Côte d'Ivoire. The white paint did not contain added lead, but the green colored paint from Special 7 contained high levels of lead (17,000 ppm).

Lead Concentrations by Brand

- The brands with highest lead content were ULTRALAC, AUTOLAC, DE-LUX, PEROLAC, TRAPLINE, KIMILAC, EMAIL BRILLANT, KIMIMAT, SPECIAL 7, TOPLINE and TOPFER.
- Of these brands, the most popular and commonly used for domestic purposes are DELUX, KIMILAC and PEROLAC.

Enamel decorative paints:

Amongst the 13 sampled brands of enamel decorative paint, one or more paints from nine brands (69%) had lead content above 90 ppm as well as above 600 ppm. One or more paints from eight brands (62%) had a lead concentration higher than 10,000 ppm. The brand of enamel decorative paint with highest lead concentration was Ultralac with a yellow paint containing 190,000 ppm.

Three decorative paints each from the brands TOPLINE and DELUX (white, red and yellow) were analyzed both in 2013 and in the present study. All the six paints contained high levels of lead in the 2013 study (ranging from 1,600 ppm to 42,000 ppm). A white paint from the brand JALINE shown to contain low levels of lead (below 90 ppm) in the 2013 study was also included in the present study. No decrease in lead levels in the TOPLINE and DELUX paints was seen in the present study, and the JALINE paint still only contained low levels of lead (below 90 ppm).

Anticorrosive paints:

Four of five brands (80%) had a lead concentration higher than 90 ppm. Three brands (60%) had a lead content higher 600 ppm. No anticorrosive paint brand had a lead content above 10,000 ppm. The highest lead concentration was 2,200 ppm from Topfer.

Acrylic mixed paints:

Three colored paints from the brand Special 7 was mixed with an acrylic white paint from the brand Batilo, a common practice among painters in Côte d'Ivoire. The white paint did not contained added lead, but the green colored paint from Special 7 contained high levels of lead (17,000 ppm).

Lead Concentrations by Color

Of the 44 solvent-based decorative paints, 12 were white paints, 10 were yellow paints, 10 were red paints, 10 were green paints and 2 were blue paints. In addition, 2 different colors of anticorrosive paints were analyzed: 4 grey paints and 1 red paint. Also, 3 colors (green, yellow and red) of solvent-based enamel decorative paint were mixed with a white acrylic paint and analyzed.

White paints had the lowest lead content

The white enamel decorative paints had the lowest average lead content of 2,530 ppm, and 5 of the 12 analyzed white paints (42% of white enamel decorative paints) contained lead levels below 90 ppm. The highest lead concentration of the 12 white paints was 8,200 ppm lead in 1 sample from "Trapline" brand followed by 1 sample from "Delux" brand with 7,800 ppm lead content. These 2 brands were manufactured by INDUSTRAP. No white paint contained lead above 10,000 ppm, which is consistent with a hypothesis that white lead pigments are now rarely used in decorative paints.

Yellow, red and other brightly colored paints had the highest lead content

The yellow decorative enamel paints had the highest lead content, with an average of 56,100 ppm. Out of the 10 yellow, enamel decorative paints analyzed, 7 paints (70% of yellow enamel decorative paints) contained lead above 10,000 ppm. Most startling were 2 yellow paints with lead content of 190,000 ppm (ULTRALAC and AUTOLAC), which are used to paint metallic children's toys.

The 10 red, enamel decorative paints analyzed contained an average of 17,600 ppm lead. Three of the 10 paints (30% of red enamel decorative paints) analyzed contained lead at levels above 10,000 ppm. The highest lead concentration detected in a red enamel decorative paint was 91,000 ppm.

The ten green enamel decorative paints included in the study had an average lead concentration of 23,700 ppm. Six of these (60% of green enamel decorative paints) contained more than 10,000 ppm lead. The highest lead concentration detected in a green enamel decorative paint was 75,000 ppm.

TABLE A: SUMMARY OF TOTAL LEAD CONCENTRATION DATA FOR SOLVENT-BASED, ENAMEL DECORATIVE PAINTS ANALYZED IN CÔTE D'IVOIRE

Solvent-Based Decorative Enamel Paint

Name of manufacturers	*Name of Brands*	*Number of paints*	*Percent Greater than 90 ppm*	*Percent greater than 600 ppm*	*Percent greater than 10,000 ppm*	*Minimum lead concentration (ppm)*	*Maximum lead concentration (ppm)*
DROCOLOR	AUTOLAC	4	75% (3)	75% (3)	75% (3)	< 60	190,000
	TOPLINE	4	100% (4)	100% (4)	50% (2)	2,300	34,000
	ULTRALAC	4	100% (4)	100% (4)	75% (3)	4,100	190,000
INDUSTRAP	DELUX	5	100% (5)	100% (5)	40% (2)	7,700	57,000
	TRAPLINE	5	100% (5)	100% (5)	20% (1)	760	27,000
SNPC	EMAIL BRILLANT	1 (red)	100% (1)	100% (1)	0% 0	6,000	-
	KIMALAC	3	100% (3)	100% (3)	66% (2)	3,800	35,000
	KIMIMAT	4	100% (4)	100% (4)	25% (1)	1,400	11,000
	PEROLAC	4	100% (4)	100% (4)	50% (2)	2,200	40,000
IPL (SEIGNEURIE)	EUREKALAC	1 (white)	0% (0)	0% (0)	0% (0)	< 60	-
	PANTINOX SR 9	4	0% (0)	0% (0)	0% (0)	< 60	-
TISA	IKARLAC	4	0% (0)	0% (0)	0% (0)	< 60	-
	JALINE	1 (white)	0% (0)	0% (0)	0% (0)	< 60	-

Anticorrosive Paints

Name of manufacturers	*Name of Brands*	*Number of paints*	*Percent Greater than 90 ppm*	*Percent greater than 600 ppm*	*Percent greater than 10,000 ppm*	*Minimum lead concentration (ppm)*	*Maximum lead concentration (ppm)*
DROCOLOR	TOPFER	1 (Grey)	100% (1)	100% (1)	0% 0	2,200	
	ULTRAFER	1 (Grey)	100% (1)	100% (1)	0% 0	1,100	
INDUSTRAP	DELUX EMAIL	1 (Grey)	100% (1)	0% (0)	0%	100	
SNPC	SUPER +	1 (Grey)	100% (1)	100% (1)	0% 0	1,500	-
IPL (SEIGNEURIE)	ANTIROUILLE SR	1 (Red-Brown)	0% (0)	0% (0)	0 % (0)	< 60	-

Acrylic Mixed Paints

Name of manufacturers	*Name of Brands*	*Number of paints*	*Percent Greater than 90 ppm*	*Percent greater than 600 ppm*	*Percent greater than 10,000 ppm*	*Minimum lead concentration (ppm)*	*Maximum lead concentration (ppm)*
DROCOLOR	BATILO	1 (White)	0% (0)	0% (0)	0% (0)	80	-
	Batilo + Special 7 *	3	33% (1)	33% (1)	33%	< 60	17,000

The above findings are consistent with the results from the 2013 study, in which – on average – white enamel decorative paints had the lowest lead content, yellows had the highest lead content and reds had high lead content but lower than yellows. The findings are also consistent with the hypothesis that most of the yellow, red and green decorative paints contain lead-based pigments in their formulations

Some colored acrylic and anticorrosive paints contain lead

The green colored paint mixed with a white acrylic paint contained high levels of lead of 17,000 ppm. The lead content observed in the mixed acrylic paints was a function of the color intensity, i.e., the more color that was added, the more the lead content increased. Thus we can conclude that some paints classified as acrylic paints in Côte d'Ivoire are, in fact, a mixture of solvent-based enamel decorative paint and white acrylic paints and are not safe for children since the colors used to mix them contain lead components.

One grey, anticorrosive paint from the brands SUPER and DELUX EMAIL were analyzed in both studies. A drastic decrease of lead content in both paints was seen between 2013 and 2015. In 2013 the paint from SUPER contained 260,000 ppm lead, and in 2015 the lead level was decreased to 1,500 ppm. In 2013, the paint from DELUX contained 7,000 ppm lead, and in 2015 this was decreased to 100 ppm lead.

Consumer Information

No information about lead content was given on the label of any of the 53 paint cans sampled. Nor was the website address of the paint manufacturer provided on any of the cans. Only 6 paint cans (11%) had the email address of the manufacturer on their label.

There was also no standard practice with regard to the availability of other types of consumer information.

As mentioned above, the following information was noted for all manufacturers: manufacturer name, postal address, telephone and fax numbers, the manufacturing date, the quantity and the color.

CHAPTER NINE

CONCLUSIONS AND RECOMMENDATIONS

This new analysis of solvent-based, enamel decorative paints in Côte d'Ivoire shows that solvent-based enamel decorative paints with high lead content are widely produced and a serious problem. Moreover, even more enamel decorative paints were found to have high lead levels in this study than in a similar study conducted in 2013. Brightly colored paints contain the highest lead levels — yellow colored paints contain the highest lead levels followed by green and red paints. White paints contain the lowest lead levels

Most worrisome is the fact that the public is unaware of the problem and cannot be sure if the product they are purchasing is safe because paint companies fail to provide any information about lead on paint can labels.

Regulatory Framework

Industry, government and civil society should engage in national efforts to promote the establishment of appropriate national regulatory frameworks to control the manufacture, import, export, sale, and use of lead paints and products coated with lead paints. In setting priorities and timeframes for implementation, special attention should be given to the elimination of lead in enamel decorative paints and paints for other applications most likely to contribute to childhood lead exposure. The regulatory framework should establish an appropriate lead paint standard, such as 90 ppm, and consideration should be given to the inclusion of provisions for compliance, monitoring, and enforcement.

Public Awareness

Given the serious impact childhood lead poisoning has on both an individual's and the nation's future, there is a need for public information campaigns in Côte d'Ivoire and other countries where results show the presence of lead paint on the market. These campaigns should inform the public about the hazards of lead exposure, especially in children; the presence of lead decorative paints for sale and use on the national market; lead paint as a significant source of childhood lead exposure; and the availability of technically superior and safer alternatives. There is also a need to raise awareness of the need to take special precautions when preparing a previously painted surface for repaint-

ing; the need for training in lead-safe work practices for painters and others working on previously-painted surfaces; and the need for resources to conduct such training.

Government agencies, NGOs and other organizations of civil society, as well as health professionals and others, are encouraged to carry out awareness-raising in the above-mentioned areas. Stakeholders are encouraged to foster voluntary initiatives by paint manufacturers, importers, and vendors to phase out the use of lead compounds in their products, even before any national legal instrument is adopted or enters into force.

Voluntary Action and Labeling

In some countries, some paint manufacturers have acted voluntarily to eliminate lead compounds in the formulation of their paints. Paint manufacturers in countries that lack a well-enforced national lead paint control regime, such as Côte d'Ivoire, should be encouraged to act voluntarily to eliminate lead compounds in the formulation of their paints – particularly, their enamel decorative paints and paints for other applications likely to contribute to lead exposure in children and others. This can be done before and after the national lead control legal instruments are in-place. Voluntary action is important in reinforcing the enforcement of the legal instruments especially in countries where enforcement is poor.

Paint manufacturers are also encouraged to consider voluntary participation in programs that provide third-party certification of no added lead, and product labeling to enable consumers to identify paints that do not contain added lead. In addition, paint manufacturers could provide information on paint can labels warning of the serious risk that may arise from lead dust when preparing a previously painted surface for repainting.

APPENDIX A

TABLE 1. SOLVENT-BASED, ENAMEL DECORATIVE PAINTS PURCHASED AND ANALYZED FOR LEAD CONTENT IN CÔTE D'IVOIRE

Sample Number	Brand Name	Color of Paint	Paint Can Size	Purchase Price Per Litre (CFA)	Date Manufactured	Batch Number	Date of Purchase	Website on Label
YVE-40	EUREKA-LAC[M1]	White (Enamel)	1 kg	5492	22/01/2015	-	19/02/2015	No
YVE-41	PANTINOX SR9[M1]	Yellow (Enamel)	1 kg	6975	22/01/2015	-	19/02/2015	No
YVE-42	PANTINOX SR9[M1]	Green (Enamel)	1 kg	6975	22/01/2015	-	19/02/2015	No
YVE-43	PANTINOX SR9[M1]	Red (Enamel)	1 kg	6975	22/01/2015	-	19/02/2015	No
YVE-44	PANTINOX SR9[M1]	White (Enamel)	1 kg	6606	22/01/2015	-	19/02/2015	No
YVE-45	ANTIROUILLE SR[M1]	Red-Brown (Anti-corrosive)	1 kg	3980	August -14	201302004/ 302010	19/02/2015	No
YVE-46	DELUX[M2]	White (Enamel)	1 kg	2500	-	-	31/12/2014	No
YVE-47	DELUX[M2]	Yellow (Enamel)	1 kg	2500	-	-	31/12/2014	No
YVE-48	DELUX[M2]	Red (Enamel)	1 kg	2500	-	-	31/12/2014	No
YVE-49	DELUX[M2]	Blue (Enamel)	1 kg	2500	-	-	31/12/2014	No
YVE-50	DELUX EMAIL[M2]	Rustproof Grey (Anti-corrosive)	1 kg	500	-	-	31/12/2014	No
YVE-51	PEROLAC[M3]	White (Enamel)	1 kg	2500	06/01/2015	37974	16/012015	No
YVE-52	PEROLAC[M3]	Yellow (Enamel)	1 kg	2500	31/12/2013	24404	16/012015	No

Sample Number	Brand Name	Color of Paint	Paint Can Size	Purchase Price Per Litre (CFA)	Date Manufactured	Batch Number	Date of Purchase	Website on Label
YVE-53	PEROLAC[M3]	Red (Enamel)	1 kg	2500	08/01/2014	24690	16/012015	No
YVE-54	PEROLAC[M3]	Green (Enamel)	1 kg	2500	17/11/2014	36002	16/012015	No
YVE-55	KIMIMAT[M3]	White (Enamel)	1 kg	5650	22/09/2014	33158	28/01/2015	No
YVE-56	KIMIMAT[M3]	Yellow (Enamel)	1 kg	5650	22/09/2014	33158 / -	28/01/2015	No
YVE-57	KIMIMAT[M3]	Green (Enamel)	1 kg	5650	22/09/2014	33158 / -	28/01/2015	No
YVE-58	KIMIMAT[M3]	Red (Enamel)	1 kg	5650	22/09/2014	33158 / -	28/01/2015	No
YVE-59	ULTRALAC BL[M4]	White (Enamel)	1 kg	3925	03/06/2014	14060794	04/03/2015	No
YVE-60	ULTRALAC RAL 1021[M4]	Yellow (Enamel)	1 kg	4601	09/03/2015	15020540	04/03/2015	No
YVE-61	ULTRALAC RAL 6032[M4]	Green (Enamel)	1 kg	4601	05/03/2015	15018020	04/03/2015	No
YVE-62	ULTRALAC RAL 3000[M4]	Red (Enamel)	1 kg	4601	05/03/2015	15022387	04/03/2015	No
YVE-63	ULTRAFER[M4]	Grey (Anti-corrosive)	1 kg	3013	18/02/2015	15022118	04/03/2015	No
YVE-64	AUTOLAC[M4]	White (Enamel)	1 kg	5712	24/02/2015	15022321	04/03/2015	No
YVE-65	AUTOLAC RAL 1021[M4]	Yellow (Enamel)	1 kg	5712	05/03/2015	15020540	04/03/2015	No
YVE-66	AUTOLAC RAL 6032[M4]	Green (Enamel)	1 kg	5712	05/03/2015	15018020	04/03/2015	No
YVE-67	AUTOLAC RAL 3000[M4]	Red (Enamel)	1 kg	5712	05/03/2015	15022387	04/03/2015	No
YVE-68	TOPLINE[M4]	White (Enamel)	1 kg	1695	08/09/2014	14090271	15/01/2015	No

Sample Number	Brand Name	Color of Paint	Paint Can Size	Purchase Price Per Litre (CFA)	Date Manufactured	Batch Number	Date of Purchase	Website on Label
YVE-69	TOPLINE[M4]	Yellow (Enamel)	1 kg	1695	14/11/2014	11110551	15/01/2015	No
YVE-70	TOPLINE[M4]	Green (Enamel)	1 kg	1695	31/10/2013	13091462	15/01/2015	No
YVE-71	TOPLINE[M4]	Red (Enamel)	1 kg	2000	24/09/2013	13090989	15/01/2015	No
YVE-72	TOPFER[M4]	Rustproof Grey (Anti-corrosive)	1 kg	1695	12/06/2013	13060028	15/01/2015	No
YVE-73	TRAPLINE[M2]	White (Enamel)	1 kg	2000	-	-	31/12/2014	No
YVE-74	TRAPLINE[M2]	Yellow (Enamel)	1 kg	2000	-	-	31/12/2014	No
YVE-75	TRAPLINE[M2]	Green (Enamel)	1 kg	2000	-	-	31/12/2014	No
YVE-76	TRAPLINE[M2]	Red (Enamel)	1 kg	2000	-	-	31/12/2014	No
YVE-77	KIMALAC (GLYCERO PHTALIQUE) [M3]	White (Enamel)	1 kg	3300	01/09/2014	32711	28/01/2015	No
YVE-78	KIMALAC (GLYCERO PHTALIQUE) [M3]	Yellow (Enamel)	1 kg	3250	26/11/2014	36418	28/01/2015	No
YVE-79	KIMALAC (GLYCERO PHTALIQUE) [M3]	Green (Enamel)	1 kg	3250	20/10/2014	22227	28/01/2015	No
YVE-80	SUPER+[M3]	Rustproof Grey (Anti-corrosive)	1 kg	3000	20/10/2014	34960	28/01/2015	No

Sample Number	Brand Name	Color of Paint	Paint Can Size	Purchase Price Per Litre (CFA)	Date Manufactured	Batch Number	Date of Purchase	Website on Label
YVE-81	EMAIL BRILLANT[M3]	Red (Enamel)	1 kg	850	-	-	28/01/2015	No
YVE-82	IKARLAC (MAESTRIA E-25-3) [M5]	Red (Enamel)	1 kg	5349	14/01/2015	1410TI148	31/12/2014	No
YVE-83	IKARLAC (MAESTRIA E8-4) [M5]	Yellow (Enamel)	1 kg	5349	14/01/2015	1410TI150	31/12/2014	No
YVE-84	IKARLAC (MAESTRIA BLANC) [M5]	White (Enamel)	1 kg	3723	14/01/2015	1410TI149	31/12/2014	No
YVE-85	IKARLAC (MAESTRIA RAL 3020) [M5]	Blue (Enamel)	1 kg	5349	14/01/2015	1410TI151	31/12/2014	No
YVE-86	JALINE [M5]	White (Enamel)	1 kg	6000	-	14063018	18/02/2015	No
YVE-87	BATILO [M4]	White (Acrylic)	4 kg	4130		15020354	06/03/2015	No
YVE-88	SPECIAL 7+ BATILO [M4]	Yellow (Acrylic)	1 kg	1761	-	-	06/03/2015	No
YVE-89	SPECIAL 7+ BATILO [M4]	Green (Acrylic)	1 kg	2384	-	-	06/03/2015	No
YVE-90	SPECIAL 7+ BATILO [M4]	Red (Acrylic)	1 kg	2384	-	-	06/03/2015	No
YVE-91	DELUX [M2]	Green (Enamel)	1 kg		-	-		No
YVE-92	TRAPLINE [M2]	Green (Enamel)	1 kg		-	-		No

M1

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M2

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M3

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M4

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M5

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TABLE 2: RESULTS OF LEAD ANALYSIS FOR SOLVENT-BASED ENAMEL DECORATIVE PAINTS PURCHASED IN CÔTE D'IVOIRE

Sample Number	Brand Name	Color of Paint	Lead Content of Paint (ppm)	Country of Brand Headquarters	Country Where Manufactured	Is there information on can about lead content of paint?
YVE-40	EUREKALAC	WHITE	<60	USA	RCI	No
YVE-41	PANTINOX SR9	YELLOW	<60	USA	RCI	No
YVE-42	PANTINOX SR9	GREEN	<60	USA	RCI	No
YVE-43	PANTINOX SR9	RED	<60	USA	RCI	No
YVE-44	PANTINOX SR9	WHITE	<60	USA	RCI	No
YVE-45	ANTIROUILLE SR	RED-BROWN	<60	USA	RCI	No
YVE-46	DELUX	WHITE	7800	RCI	RCI	No
YVE-47	DELUX	YELLOW	57000	RCI	RCI	No
YVE-48	DELUX	RED	9700	RCI	RCI	No
YVE-49	DELUX	BLUE	7700	RCI	RCI	No

Sample Number	Brand Name	Color of Paint	Lead Content of Paint (ppm)	Country of Brand Headquarters	Country Where Manufactured	Is there information on can about lead content of paint?
YVE-50	DELUX EMAIL	RUSTPROOF GREY	100	RCI	RCI	No
YVE-51	PEROLAC	WHITE	2200	RCI	RCI	No
YVE-52	PEROLAC	YELLOW	40000	RCI	RCI	No
YVE-53	PEROLAC	RED	11000	RCI	RCI	No
YVE-54	PEROLAC	GREEN	3200	RCI	RCI	No
YVE-55	KIMIMAT	WHITE	1600	RCI	RCI	No
YVE-56	KIMIMAT	YELLOW	11000	RCI	RCI	No
YVE-57	KIMIMAT	GREEN	1400	RCI	RCI	No
YVE-58	KIMIMAT	RED	1800	RCI	RCI	No
YVE-59	ULTRALAC BL	WHITE	4100	RCI	RCI	No
YVE-60	ULTRALAC RAL 1021	YELLOW	190000	RCI	RCI	No
YVE-61	ULTRALAC RAL 6032	GREEN	61000	RCI	RCI	No
YVE-62	ULTRALAC RAL 3000	RED	50000	RCI	RCI	No
YVE-63	ULTRAFER	GREY	1100	RCI	RCI	No
YVE-64	AUTOLAC	WHITE	<60	RCI	RCI	No
YVE-65	AUTOLAC RAL 1021	YELLOW	190000	RCI	RCI	No
YVE-66	AUTOLAC RAL 6032	GREEN	75000	RCI	RCI	No
YVE-67	AUTOLAC RAL 3000	RED	91000	RCI	RCI	No
YVE-68	TOPLINE	WHITE	2300	RCI	RCI	No
YVE-69	TOPLINE	YELLOW	34000	RCI	RCI	No

Sample Number	Brand Name	Color of Paint	Lead Content of Paint (ppm)	Country of Brand Headquarters	Country Where Manufactured	Is there information on can about lead content of paint?
YVE-70	TOPLINE	GREEN	11000	RCI	RCI	No
YVE-71	TOPLINE	RED	5200	RCI	RCI	No
YVE-72	TOPFER	RUSTPROOF GREY	2200	RCI	RCI	No
YVE-73	TRAPLINE	WHITE	8200	RCI	RCI	No
YVE-74	TRAPLINE	YELLOW	4100	RCI	RCI	No
YVE-75	TRAPLINE	GREEN	9700	RCI	RCI	No
YVE-76	TRAPLINE	RED	760	RCI	RCI	No
YVE-77	KIMALAC (GLYCERO PHTALIQUE)	WHITE	3800	RCI	RCI	No
YVE-78	KIMALAC (GLYCERO PHTALIQUE)	YELLOW	35000	RCI	RCI	No
YVE-79	KIMALAC (GLYCERO PHTALIQUE)	GREEN	12000	RCI	RCI	No
YVE-80	SUPER+	RUSTPROOF GREY	1500	RCI	RCI	No
YVE-81	EMAIL BRILLANT	RED	6000	RCI	RCI	No
YVE-82	IKARLAC (MAESTRIA E-25-3)	RED	<60	RCI	RCI	No
YVE-83	IKARLAC (MAESTRIA E8-4)	YELLOW	<60	RCI	RCI	No
YVE-84	IKARLAC	WHITE	<60	RCI	RCI	No

Sample Number	Brand Name	Color of Paint	Lead Content of Paint (ppm)	Country of Brand Headquarters	Country Where Manufactured	Is there information on can about lead content of paint?
YVE-85	IKARLAC	BLUE	<60	RCI	RCI	No
YVE-86	JALINE	WHITE	<60	RCI	RCI	No
YVE-87	BATILO	WHITE	80	RCI	RCI	No
YVE-88	SPECIAL 7+ BATILO	YELLOW	<60	RCI	RCI	No
YVE-89	SPECIAL 7+ BATILO	GREEN	17000	RCI	RCI	No
YVE-90	SPECIAL 7+ BATILO	RED	70	RCI	RCI	No
YVE-91	DELUX	GREEN	37000	RCI	RCI	No
YVE-92	TRAPLINE	GREEN	27000	RCI	RCI	No

TABLE 3. DISTRIBUTION OF LEAD CONCENTRATION BY BRAND OF SOLVENT-BASED, ENAMEL DECORATIVE PAINTS PURCHASED IN CÔTE D'IVOIRE

Brand	Number of Paints	Number of Paints >90 ppm Lead	Number of Paints >600 ppm Lead	Number of Paints >10,000 ppm Lead	Minimum Lead Concentration (ppm)	Maximum Lead Concentration (ppm)
Autolac	4	75% (3)	75% (3)	75% (3)	< 60	190,000
Delux	5	100% (4)	100% (4)	100% (4)	7,700	57,000
Eurekalac	1	0%	0%	0%	< 60	-
Ikarlac	4	0%	0%	0%	< 60	-
Jaline	1 (white)	0%	0%	0%	< 60	-
Kimilac	4	100% (4)	100% (4)	100% (4)	3,800	35,000
Kimimat	4	100% (4)	100% (4)	100% (4)	1,400	11,000
Pantinox	4	0%	0%	0%	< 60	-
Perolac	4	100% (4)	100% (4)	100% (4)	2,200	40,000
Topline	4	100% (4)	100% (4)	100% (4)	2,300	34,000
Trapline	4	100% (4)	100% (4)	100% (4)	760	27,000
Ultralac	4	100% (4)	100% (4)	100% (4)	4,100	190,000
Special 7 *	3	25% (1)	25% (1)	25% (1)	< 60	17,000

** When calculating the averages, levels < 60 ppm were approximated to 60 ppm*

TABLE 4. LEAD CONCENTRATION BY COLOR OF SOLVENT-BASED, ENAMEL DECORATIVE PAINTS PURCHASED IN CÔTE D'IVOIRE

Color	Number of Samples	Average Lead Concentration (ppm)	Number of Samples >90 ppm Lead	Number of Samples >600 ppm Lead	Number of Samples >10,000 ppm Lead	Minimum Lead Concentration (ppm)	Maximum Lead Concentration (ppm)
Blue	2	3,850	1	1	0	< 60	7,700
Green	11	23,100	10	10	7	< 60	75,000
Red	11	16,000	8	8	3	< 60	91,000
White	12	2,530	7	7	0	< 60	8,200
Yellow	11	51,000	8	8	7	< 60	190,000
Anticorrosive Paints							
Grey	4	1,225	4	3	0	100	2,200
Red	1	< 60	0	0	0	< 60	-

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