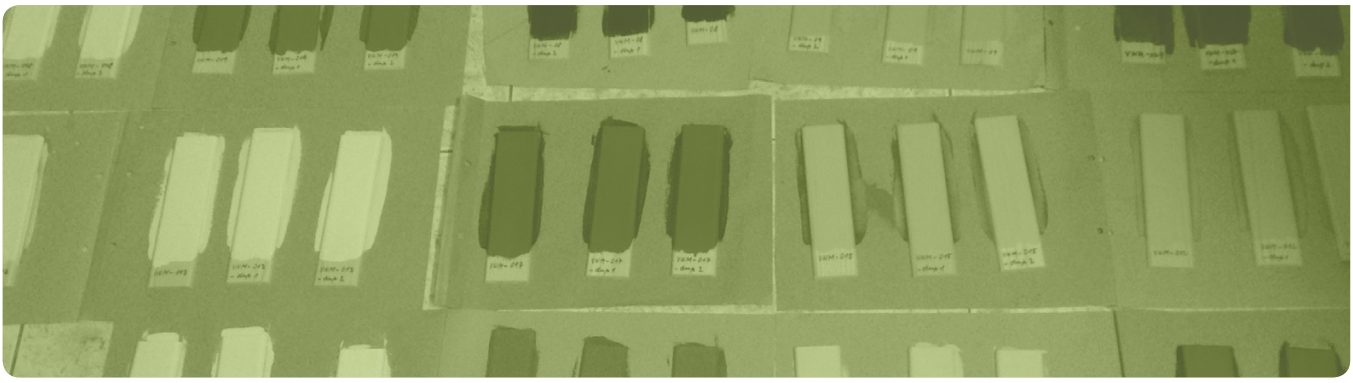

LEAD IN SOLVENT-BASED PAINTS FOR HOME USE IN VIETNAM

October 2016

Trung tâm Nghiên cứu Giới, Gia Đình và Môi trường trong Phát triển

CGFED

Chọn Công bằng Trọn Yêu Thương

IPEN

a toxics-free future

a toxics-free future

National Report

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Acknowledgements

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

This study was undertaken as part of the IPEN Global Lead Paint Elimination Campaign. The Campaign 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 by IPEN in Vietnam through the Research Center for Gender, Family and Environment in Development (CGFED) with funding from the Swedish International Development Cooperation Agency (SIDA) and New York Community Trust (NYCT).

While this study was undertaken with the assistance of SIDA and NYCT, its contents are the sole responsibility of CGFED together with IPEN, and can in no way be taken to reflect the views of the SIDA and NYCT.

CGFED is non-government organization research for Gender, Family and Environment in Development. Its mission is acting for gender equality based on freedom and human rights. Beside the vision, by 2020, CGFED will be the strong cornerstone and creatively inspiration for all actions for gender equity, CGFED have been trying constantly to protect people and children especially from toxic chemical compounds, protect environment.

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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 40 low- and middle-income countries.

This report presents new data on the total lead content of solvent-based paints for home use available on the market in Vietnam. 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 Vietnam. Finally, it proposes action steps by different stakeholders to protect children and others from lead paint.

This study was conducted by CGFED in partnership with IPEN.

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

CGFED, a non-government organization founded in 1993, acts for gender equality based on freedom, diversity and human rights. Main issues addressed include gender, sexual and reproductive health rights; the empowerment of minorities; poverty; and the protection of the people, especially children, and the environment from toxic chemical compounds. Activities include action research, environmental education, community development support, training and consultation and advocacy. It envisions that "by 2020, CGFED will be a strong cornerstone and creative inspiration for all actions for gender equality."

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, in this report, used as defined in the U.S. Consumer Product Safety Act, as any paint or other similar surface coating materials containing lead or lead compounds and in which the lead content is in excess of 0.009 percent by weight of the dried paint film.

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

On October 28 and 31, 2015 CGFED purchased a total of 26 cans of solvent-based paint intended for home use from stores in Hanoi, Vietnam. The paints represented 11 different brands produced by 11 manufacturers. All paints were analyzed by an accredited laboratory in the United States of America for their total lead content, based on dry weight of the paint. The laboratory participates in the Environmental Lead Proficiency Analytical Testing (ELPAT) program operated by the American Industrial Hygiene Association (AIHA), assuring the reliability of the analytical results.

SUMMARY OF RESULTS

Fourteen out of 26 analyzed solvent-based paints for home use (54 percent of paints) contained total lead concentrations above 600 parts per million (ppm)—the regulatory total lead limit in countries like Singapore, South Korea and Sri Lanka. Moreover, 5 paints (19 percent of paints) contained dangerously high lead concentrations above 10,000 ppm. Four paint brands out of the 11 brands analyzed (36 percent of paint brands) had at least one paint with a total lead concentration above 10,000 ppm.

On the other hand, 12 out of 26 solvent-based paints for home use (46 percent of paints) contained total lead concentrations below 600 ppm, suggesting that the technology to produce paint with low lead concentrations exists in Vietnam.

Red and yellow paints most frequently contained dangerously high lead concentrations above 10,000 ppm. Three out of nine red paints (33 percent of red paints), and two out of eight yellow paints (25 percent of yellow paints) contained lead levels above 10,000 ppm.

No paint provided information about lead on their labels and most paints carried little information about any ingredients on can labels. 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 22 out of 26 paints (85 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 Vietnam since the paints included in this study are brands commonly sold in retail stores all over the country. However, the fact that 12 out of 26 paints (46 percent of paints) contained lead concentrations below 600 ppm indicates that the technology to produce paints with low lead levels exists in Vietnam. 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, at par with the most restrictive regulations in the world today.

RECOMMENDATIONS

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

Government and Government Agencies

The Ministry of Science and Technology of Vietnam 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.

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 lead content. Household and institutional consumers should ask for, consciously buy, and apply only paints with no added lead in places frequently used by children such as homes, schools, day care centers, parks and playgrounds.

Organizations and Professional Groups

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

All Stakeholders

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

1. BACKGROUND

1.1 HEALTH AND ECONOMIC IMPACTS OF LEAD EXPOSURE

The term lead paint is in this report used as defined in the U.S Consumer Product Safety Act, as any paint or other similar surface coating materials containing lead or lead compounds and in which the lead content is in excess of 0.009 percent by weight of the dried paint film.

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

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

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

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

The younger the child, the more harmful lead can be and the health effects are generally irreversible and can have a lifelong impact. The human fetus is the most vulnerable, and a pregnant woman can transfer lead that has accumulated

in her body to her developing child.[4] Lead is also transferred through breast milk when lead is present in a nursing mother.[5]

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

The term lead paint is in this report used as defined in the U.S Consumer Product Safety Act, as any paint or other similar surface coating materials containing lead or lead compounds and in which the lead content is in excess of 0.009 percent by weight of the dried paint film.

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[1] 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**: $134.7 billion of economic loss, or 4.03% of Gross Domestic Product (GDP)
- **Latin America and the Caribbean**: $142.3 billion of economic loss, or 2.04% of GDP
- **Asia**: $699.9 billion of economic loss, or 1.88% of GDP.

Country estimates used in this study can be accessed at a publically available website, http://www.med.nyu.edu/pediatrics/research/environmentalpediatrics/leadexposure, and shows that economic loss in Vietnam is estimated to $7.72 billion of economic loss, or 2.56 percent of Gross Domestic Product (GDP).

1.2 THE USE OF LEAD IN PAINT

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

The leaded compounds most commonly added to paints are pigments. Pigments are used to give the paint its color, make the paint opaque [so it covers well], and protect the paint and the underlying surface from degradation

1 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..

caused by exposure to sunlight. Lead-based pigments are sometimes used alone, and sometimes used in combination with other pigments.

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

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

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

The use of lead in production of decorative paint is prohibited in the European Union through regulations related to safety of consumer products and specific prohibitions for most leaded raw materials. In the U.S., Canada, Australia and other countries with regulations restricting the use of leaded ingredients in decorative paint, standards specifying a maximum lead limit are in place. The current standard for household paints in the U.S., Canada, the Philippines, and Nepal is 90 ppm total lead, and adherence to this ensures that a manufacturer can sell its paint anywhere in the world. Some other countries such as Singapore, South Korea and Sri Lanka have established standards of 600 ppm total lead.

1.3 PAINT MARKET AND REGULATORY FRAMEWORK IN VIETNAM

Paint Market in Vietnam

The domestic paint sector saw substantial growth, averaging 20 percent a year from 2000 to 2012, according to the Viet Nam Paint and Printing Ink Association (VNPIA). In 2011 alone, paints and coatings production reached 345 mil-

lion liters amounting to US$ 994 million US dollars. The industry is growing at a rate of 6-8 percent a year.

According to the VNPIA, decorative paints accounted for 66 percent of Vietnam's total paint and coatings market in 2011 in terms of volume, followed by wood coatings at 16 percent, marine and protective coatings 7 percent, powder paint 4 percent, roofing paints 4 percent, and other paint and coatings 3 percent. Per capita coatings consumption is around 3.7 liter/person/year. Geography-wise, southern Vietnam dominates when it comes to consumption taking a 50 percent cut of the market, while central and northern Vietnam consumes 15 percent and 35 percent, respectively.

Large multinational corporations, including 4 Oranges, AkzoNobel, PPG, Sherwin-Williams, Dupont, Valspar, and Nippon, dominate the country's paint and coatings sector. In 2014, Nippon built its third factory in the northern Province of Vinh Phuc. Jotun has increased its investment capital to $16.1 million dollars to expand the factory and raise the production capacity to 25 million liters per annum. Also in 2013, 4 Oranges announced plans to set up 2,000 color blending centers throughout the country, while AkzoNobel said it invested additional € 13 million euros in a factory in Binh Duong to optimize paint production. AkzoNobel Vietnam output currently stands at 30,000 tonnes per year.

While foreign paint manufacturers control as much as 65 percent of the market share, domestic paint manufacturers are pursuing strategies to improve their

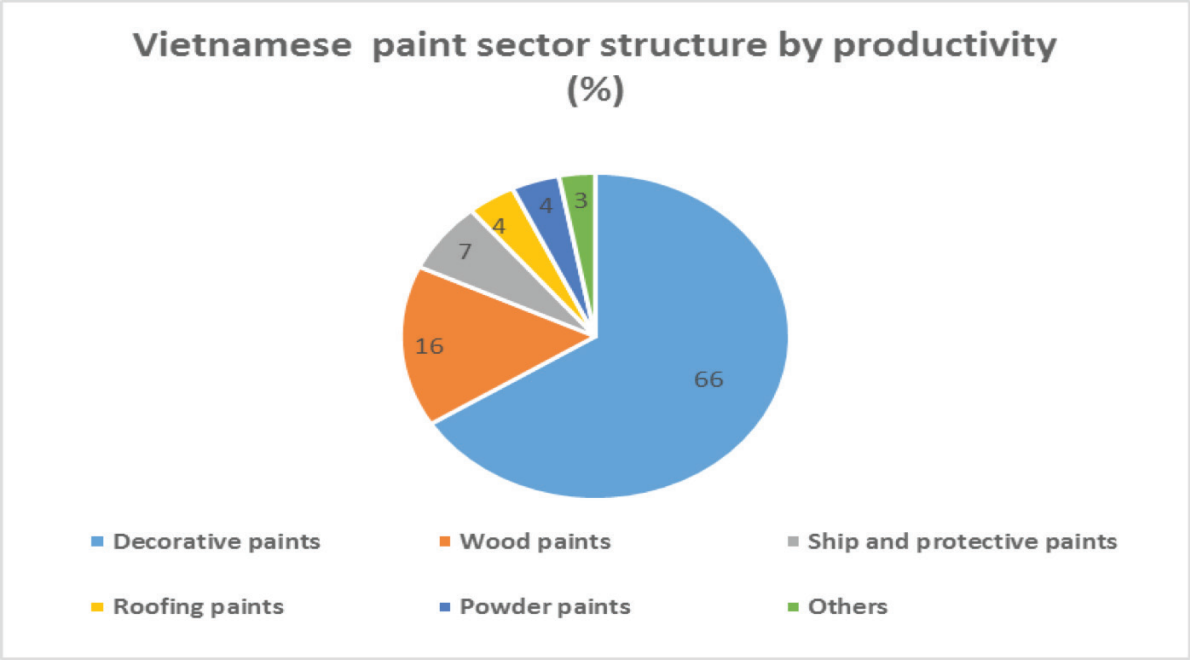

Figure 1. Vietnamese paint sector structure by productivity (2011).

share with local brands such as Kova, Nero Dong Tam and Hoa Binh introducing unique product lines. Local companies also seem to have an edge in non-decorative paints, including the Hoa Binh paints for coastal environments and Kova's waterproofing, heat and nano paints. Also, local paint companies are reportedly focusing on rural-based customers as the urban market is controlled by foreign paint makers. To improve sales, "many domestic companies have offered big discounts for investors and contractors, and launched promotion programmes for agents."

Regulatory Framework in Vietnam

In Vietnam, there is no specific legislation to control the use of lead in decorative paints and even in toys for children.

2. MATERIALS AND METHODS

On October 28 and 31, 2016, 26 cans of solvent-based paint intended for home use were purchased by CGFED from various stores in Hanoi, Vietnam. The paints represented 11 different brands produced by 11 manufacturers.

In most cases, one white paint and one or more bright-colored paint such as red or yellow were selected. 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 CGFED 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, labelled wood pieces using different unused, single-use paintbrushes by a researcher of CGFED as shown in Figure 2.

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 labelled, resealable plastic bags and shipped for analysis of total lead content to Forensic Analytical Laboratories, Inc. in the United States of America. The laboratory participates in the Environmental Lead Proficiency Analytical Testing (ELPAT) Program operated by the American Industrial Hygiene Association. In the laboratory selection process, IPEN further assessed the reliability of the laboratory results by conducting an independent quality assurance testing. This was made by sending paint

Figure 2. Preparation of Paint Samples.

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 10 ppm, but if only a small amount of paint is available, the detection limit increases. Therefore, the detection limit was higher (up to 200 ppm) for some of the samples.

The paint samples were analyzed using method EPA3050B/7420, 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:

- 14 out of 26 of the analyzed solvent-based paints (54 percent of paints) contained total lead concentrations above 600 parts per million (ppm), dry weight. In addition, five paints (19 percent of paints) contained dangerously high lead concentrations above 10,000 ppm.
- Five out of 11 analyzed brands (45 percent of paint brands) sold at least one lead paint with total lead concentration above 600 ppm. Also, four out of 11 analyzed brands (36 percent of paint brands) sold at least one lead paint with dangerously high lead concentrations above 10,000 ppm.
- 10 out of 19 bright-colored paints (53 percent of bright-colored paints) contained a total lead concentration above 600 parts per million (ppm), dry weight. Red-colored paints were the most hazardous with three out of nine paints (33 percent of red-colored paints) containing total lead concentrations greater than 10,000 ppm; two out of 8 yellow-colored paints (25 percent of yellow-colored paints) also contained dangerously high lead concentrations above 10,000 ppm.
- The highest lead concentration detected was 21,000 ppm in a red-colored Jimmy paint sold for home use.
- No paint provided information about lead on their labels and most paints carried little information about ingredients. Most paints were merely labeled as "solvents, pigments and resin," with no further details on the type of solvents and pigments (organic or inorganic) provided. Most warning symbols on the paint cans indicated the flammability of the paints, but no precautionary warnings on the effects of lead dust to children and pregnant women were provided.

3.2 TOTAL LEAD CONTENT ANALYSIS

Fourteen out of 26 analyzed solvent-based paints (54 percent of paints) contained total lead concentrations above 600 ppm, five paints of which contained dangerously high lead concentrations above 10,000 ppm (19 percent of paints).

A red Jimmy paint contained the highest concentration of lead at 21,000 ppm, while the lowest concentration of lead less than 10 ppm was detected in a red Valspar paint.

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 Manufacture	Color	Lead Content (ppm)
1	VNM-003	Jimmy	Vietnam	red	21,000
2	VNM-021	Nishu Deluxe	Vietnam	red	18,000
3	VNM-001	Jimmy	Vietnam	yellow	14,000
4	VNM-012	Dai bang	Vietnam	yellow	14,000
5	VNM-006	Lobster	Vietnam	red	11,000
6	VNM-015	Nippon Bilac	Vietnam	yellow	8,900
7	VNM-020	Nishu Deluxe	Vietnam	yellow	7,900
8	VNM-004	Lobster	Vietnam	yellow	5,100
9	VNM-016	Nippon Bilac	Vietnam	white	3,300
10	VNM-017	Nippon Bilac	Vietnam	red	3,200

3.3 PAINT BRAND ANALYSIS

Four out of 11 analyzed brands (36 percent of paint brands) sold at least one paint with dangerously high lead concentration above 10,000 ppm.

Among solvent-based decorative paints, a red Jimmy paint contained the highest concentration of lead at 21,000 ppm. On the other hand, a red Valspar paint had the lowest concentration of lead at less than 10 ppm. Samples from the following brands contained lead below 90 ppm: Jotun Gardex (red, yellow, white), Mandarin Duck (red, yellow, white), Maxilite (yellow) and Valspar (red,

white). This indicates that the technology to produce paint without added lead exists in Vietnam.

3.4 PAINT COLOR ANALYSIS

10 out of 19 bright-colored paints (53 percent) of bright-colored paints such as red and yellow contained lead concentrations above 600 ppm. Five of these paints contained dangerously high lead concentrations above 10,000 ppm (26 percent of bright-colored paints).

This study included nine red paints, eight yellow paints, seven white paints, one green paint, and one orange paint. Red and yellow paints contained the highest total lead concentrations.

Five out of nine red-colored paints (56 percent of red paints) contained lead concentrations above 600 ppm, three of which exceeded more than 10,000 ppm of lead. A red Jimmy paint contained the highest lead concentration at 21,000 ppm, while a red Valspar paint contained the lowest lead concentration of less than 10 ppm.

Five out of eight yellow-colored paints (62 percent of yellow paints) contained lead concentrations above 600 ppm, two of which exceeded more than 10,000

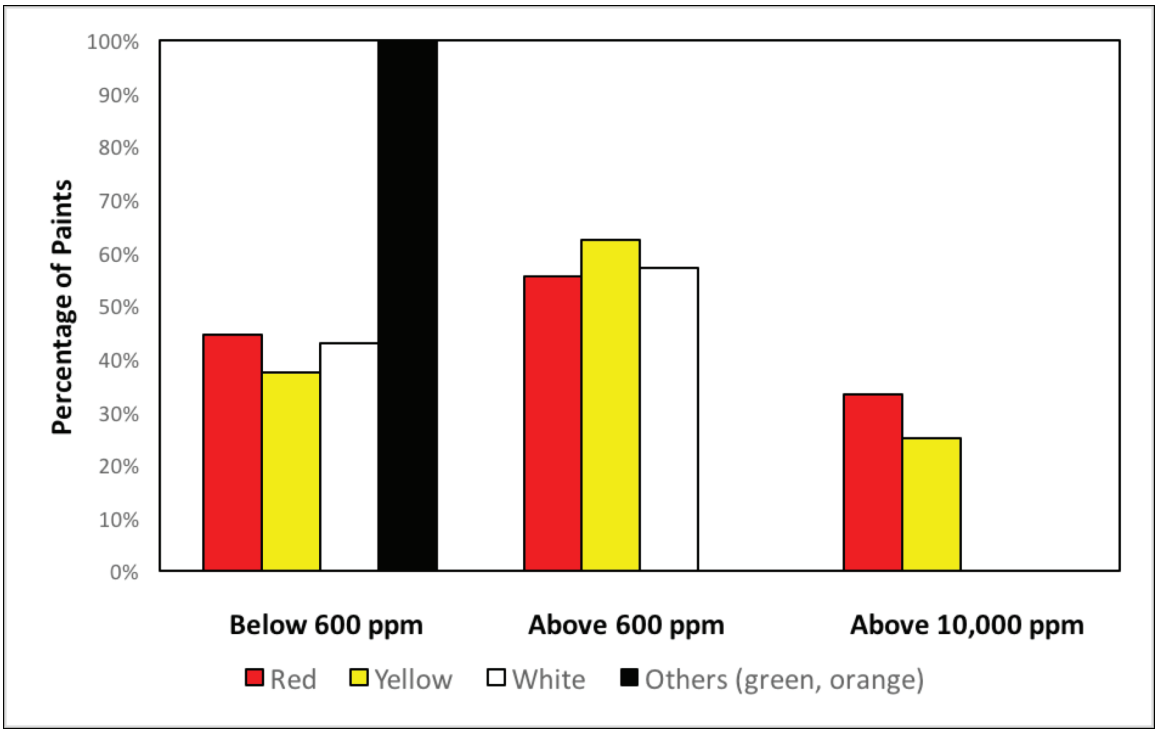

Figure 3. Distribution of Lead Concentrations by Color.

ppm of lead. A yellow Jimmy and a yellow Dai bang paints contained the highest lead concentration at 14,000 ppm each, while a yellow Mandarin Duck and Jotun Gardex contained the lowest lead concentration of less than 60 ppm.

Four out of seven white-colored paints (57 percent of white paints) contained lead concentrations above 600 ppm, none of which exceeded more than 10,000 ppm of lead. Nippon Bilac contained the highest lead concentration at 3,300 ppm among the white-colored samples, while white Mandarin Duck and Jotun Gardex paints contained the lowest lead concentration of less than 60 ppm.

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

3.5 LABELING

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

No paint provided information about lead on their labels and most paints carried little information about any ingredients on can labels. 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 22 out of 26 paints (85 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 provide.

4. CONCLUSIONS AND RECOMMENDATIONS

This study demonstrates that solvent-based paints for home use with high concentrations of lead are widely available in Vietnam since the paints sampled for this study are brands commonly sold in retail stores all over Vietnam. However, the fact that 12 out of 26 paints (46 percent of paints) contained lead concentrations below 600 ppm indicates that the technology to produce paints with low lead levels exists in Vietnam. 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, at par with the most restrictive regulations in the world today.

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

For the Ministry of Science and Technology of Vietnam 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.

For paint companies that still produce lead paints to expeditiously stop the use of leaded paint ingredients in paint formulations. Paint companies that have shifted to non-lead paint production should get their products certified through independent, third party verification procedures to increase the customer's ability to choose paints with no added lead.

For paint consumers to demand paints with no added lead from paint manufacturers, as well as full disclosure of a paint product's lead content. Household and institutional consumers should ask for, consciously buy, and apply only paints with no added lead in places frequently used by children such as homes, schools, day care centers, parks and playgrounds.

For public health groups, consumer organizations and other concerned entities to support the elimination of lead paint, and conduct activities to inform and

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

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

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APPENDIX

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

Sample No.	Brand	Color*	Volume (L)	Price (VND)	Date of Manufac-ture (d/m/y)	Batch No.	Date of Purchase (d/m/y)	Is there website on label?
VNM-001	Jimmy	Y	0.8	100,000	14 July	EU00062	28/10/15	No
VNM-002	Jimmy	W	0.8	100,000	14 August	QU00115	28/10/15	No
VNM-003	Jimmy	R	0.8	100,000	12 March	HE00006	28/10/15	No
VNM-004	Lobster	Y	0.28	30,000	30/06/14	None	28/10/15	No
VNM-005	Lobster	W	0.28	30,000	30/06/14	None	28/10/15	No
VNM-006	Lobster	R	0.28	30,000	30/06/14	None	28/10/15	No
VNM-007	Som Ta	O	0.5	40,000	30/06/15	None	28/10/15	No
VNM-008	Kim son	G	0.8	120,000	18/05/15	150420. SD003	28/10/15	No
VNM-009	Mandarin Duck	Y	0.8	100,000	15 January	327687	28/10/15	No
VNM-010	Mandarin Duck	W	0.8	100,000	15 May	328134	28/10/15	No
VNM-011	Mandarin Duck	R	0.8	100,000	14 July	325952	28/10/15	No
VNM-012	Dai bang	Y	0.75	70,000	9/5/15	AKTDV-02	28/10/15	No
VNM-013	Dai bang	W	0.75	70,000	24/08/15	AKT-DTR-02	28/10/15	No

Sample No.	Brand	Color*	Volume (L)	Price (VND)	Date of Manufac-ture (d/m/y)	Batch No.	Date of Purchase (d/m/y)	Is there website on label?
VNM-014	Dai bang	R	0.75	70,000	28/07/15	AKD-BDO-01	28/10/15	No
VNM-015	Nippon Bilac	Y	1.0	160,000	12/14/2012	5029992	28/10/15	No
VNM-016	Nippon Bilac	W	1.0	160,000	28/11/14	5038397	28/10/15	No
VNM-017	Nippon Bilac	R	1.0	160,000	8/10/14	5038090	28/10/15	No
VNM-018	Maxilite	Y	0.8	130,000	18/05/15	52101201	28/10/15	No
VNM-019	Maxilite	R	0.8	130,000	5/12/14	44903801	28/10/15	No
VNM-020	Nishu Deluxe	Y	0.8	160,000	26/11/13	EC0002	28/10/15	No
VNM-021	Nishu Deluxe	R	0.8	160,000	12/8/15	CU0015	28/10/15	No
VNM-022	Jotun Gardex	Y	0.8	200,000	2/6/14	736425-1*-1:2	31/10/15	No
VNM-023	Jotun Gardex	W	0.8	200,000	21/05/15	947170-1-*-1:3	31/10/15	No
VNM-024	Jotun Gardex	R	0.8	200,000	2/6/14	736425-1-*-1:2	31/10/15	No
VNM-025	Valspar	W	0.8	160,000	29/4/15	V15-04-214	28/10/15	No
VNM-026	Valspar	R	0.8	160,000	29/4/15	V15-04-215	28/10/15	No

** W – white, R – red, Y – yellow, G - green.*

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 Manufac-ture	Is there information on can about lead content of paint?
VNM-001	Jimmy	Yellow	14,000	Vietnam	Vietnam	No
VNM-002	Jimmy	White	2,800	Vietnam	Vietnam	No
VNM-003	Jimmy	Red	21,000	Vietnam	Vietnam	No
VNM-004	Lobster	Yellow	5,100	Thailand	Vietnam	No
VNM-005	Lobster	White	1,100	Thailand	Vietnam	No
VNM-006	Lobster	Red	11,000	Thailand	Vietnam	No
VNM-007	Son Ta	Orange	440	Vietnam	Vietnam	No
VNM-008	Kim son	Green	100	Vietnam	Vietnam	No
VNM-009	Mandarin Duck	Yellow	<60	Thailand	Vietnam	No
VNM-010	Mandarin Duck	White	<60	Thailand	Vietnam	No
VNM-011	Mandarin Duck	Red	<20	Thailand	Vietnam	No
VNM-012	Dai bang	Yellow	14,000	Vietnam	Vietnam	No
VNM-013	Dai bang	White	950	Vietnam	Vietnam	No
VNM-014	Dai bang	Red	990	Vietnam	Vietnam	No
VNM-015	Nippon Bilac	Yellow	8,900	Japan	Vietnam	No
VNM-016	Nippon Bilac	White	3,300	Japan	Vietnam	No

Sample No.	Brand	Color	Lead Content, Dry Weight (ppm)	Country of Brand Headquarters	Country of Manufac-ture	Is there information on can about lead content of paint?
VNM-017	Nippon Bilac	Red	3,200	Japan	Vietnam	No
VNM-018	Maxilite	Yellow	<80	Netherlands	Vietnam	No
VNM-019	Maxilite	Red	<200	Netherlands	Vietnam	No
VNM-020	Nishu Deluxe	Yellow	7,900	Vietnam	Vietnam	No
VNM-021	Nishu Deluxe	Red	18,000	Vietnam	Vietnam	No
VNM-022	Jotun Gardex	Yellow	<60	Norway	Vietnam	No
VNM-023	Jotun Gardex	White	<60	Norway	Vietnam	No
VNM-024	Jotun Gardex	Red	<40	Norway	Vietnam	No
VNM-025	Valspar	White	<90	USA	Vietnam	No
VNM-026	Valspar	Red	<10	USA	Vietnam	No

TABLE 4. DISTRIBUTION OF LEAD CONCENTRATION BY BRAND

Brand	No. of Samples	No. of Samples Above 600 ppm	No. of Samples Above 10,000 ppm	Minimum Lead Content (ppm)	Maximum Lead Content (ppm)
Jimmy	3	3	2	2,800	21,000
Dai bang	3	3	1	950	14,000
Lobster	3	3	1	1,100	11,000
Nippon Bilac	3	3	0	3,200	8,900
Nishu Deluxe	2	2	1	7,900	18,000
Son Ta	1 (white)	0	0	440	440
Kim son	1 (green)	0	0	100	100
Jotun Gardex	3	0	0	<40	<60
Mandarin Duck	3	0	0	<20	<60
Maxilite	2	0	0	<80	<200
Valspar	2	0	0	<10	<90

TABLE 5. DISTRIBUTION OF LEAD CONCENTRATION BY COLOR

Color	No. of Samples	No. of Samples Above 600 ppm	No. of Samples Above 10,000 ppm	Minimum Lead Content (ppm)	Maximum Lead Content (ppm)
Red	9	5	3	<10	21,000
Yellow	8	5	2	<60	14,000
White	7	4	0	<60	3,300
Green	1	0	0	100	100
Orange	1	0	0	440	440

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