NATIONAL REPORT

LEAD IN NEW ENAMEL HOUSEHOLD PAINTS IN THE PHILIPPINES

November 2013

Eco Waste Coalition

European Union

IPEN
a toxics-free future

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Abbreviations

Organizations and Other Entities

AIHA	American Industrial Hygiene Association
BHDT	Philippine Bureau of Health Devices and Technology
CDC	United States Centers for Disease Control and Prevention
CPSC	United States Consumer Product Safety Commission
DENR	Philippine Department of Environment and Natural Resources
DOH	Philippine Department of Health
DTI	Philippine Department of Trade and Industry
EFSA	European Food Safety Authority
EMB	Philippine Environmental Management Bureau
EPA	United States Environmental Protection Agency
EU	European Union
GAELP	Global Alliance to Eliminate Lead Paint
ICCM	International Conference on Chemicals Management
IPEN	International POPs Elimination Network
NGO	Non-Governmental Organization
NSO	Philippine National Statistics Office
PAPM	Philippine Association of Paint Manufacturers, Inc.
SPIK	Samahan sa Pilipinas ng mga Industriyang Kimika
SSNC	Swedish Society for Nature Conservation
UNEP	United Nations Environmental Programme
WHO	World Health Organization

Technical Terms

AO	Administrative Order
CCO	Chemical Control Order
CPH	Census of Population and Housing
ELPAT	Environmental Lead Proficiency Analytical Testing
HNO_3	Nitric Acid
H_2O_2	Hydrogen Peroxide
ICP-AES	Inductively Coupled Plasma – Atomic Emission Spectrophotometer
LTO	License to Operate
PCL	Priority Chemical List
PNS	Philippine National Standards
ppm	part per million
XRF	X-ray Fluorescence

Lead in New Enamel Household Paints in the Philippines

Foreword

This report presents new data on the lead content of household enamel paints that are offered for sale in the Philippine market. This is the third time that the Ecological Waste Coalition of the Philippines, Inc. (EcoWaste Coalition) has analyzed paints sold in the Philippines for their lead content. Previous studies were conducted in 2008 (25 samples, including 15 enamel paints) and 2010 (35 samples, of which 26 were enamel paints), representing a total of over 15 brands. The studies were conducted to determine the extent of lead paints in local commerce, and determine whether or not policy initiatives to eliminate lead paint are needed. By “lead paint,” we mean a product where lead or lead compounds have been added to create a desired color, to make the paint dry fast, or to allow the paint to reduce corrosion on metal surfaces.

In this report, we present and discuss the findings from our latest and most extensive analysis of household enamel paints for lead content and compare these latest results with those from the previous studies. The report describes global efforts to eliminate lead paint, as well as parallel efforts by the Government of the Philippines, local industry and civil society to establish an effective regulation banning or restricting the manufacture, importation, distribution, sale and use of lead paints.

The report presents background information on why the present and former use of household enamel 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.

The report was prepared by the EcoWaste Coalition with support and assistance from the Asian 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 household enamel paints, particularly on the health of children under six years old.

The Asian Lead Paint Elimination Project is being implemented by IPEN over a period of three years in seven countries (Bangladesh, India, Indonesia, Nepal, Philippines, Sri Lanka and Thailand) with funding from the European Union (EU) totaling €1.4 million. While this publication has been produced with the assistance of the European Union, the contents of the publication are the sole responsibility of the EcoWaste Coalition together with IPEN and can in no way be taken to reflect the views of the European Union. In addition, this document was produced with financial contributions from the Swedish Environment Protection Agency, Swedish public development co-operation aid through the Swedish Society for Nature Conservation (SSNC). The views herein shall not necessarily be taken to reflect the official opinion of any of these donors, including SSNC or its donors.

EcoWaste Coalition is a national network of more than 150 public interest groups working on waste, climate, chemical, social justice and development issues. It envisages a zero waste and toxics-free Philippines and strives to attain such a vision by fostering and supporting activism around priority concerns in line with the people's constitutional rights to health and to a balanced and healthful ecology.

IPEN is an international NGO network of over 700 health and environmental organizations from all regions of the world in which the EcoWaste Coalition participates. IPEN is a leading global organization working to establish and implement safe chemicals policies and practices to protect human health and the environment. Its mission is a toxics-free future for all. IPEN helps build the capacity of its member organizations to implement on-the-ground activities, learn from each other's work, and work at the international level to set priorities and achieve new policies.

The European Union is made up of 28 Member States who have decided to gradually link together their know-how, resources and destinies. Together, during a period of enlargement of 50 years, they have built a zone of stability, democracy and sustainable development, while maintaining cultural diversity, tolerance and individual freedom. The European Union is committed to sharing its achievements and its values with countries and people beyond its borders.

Manila, Philippines, November 2013

Manny C. Calonzo
Regional Specialist
Asian Lead Paint Elimination Project

Executive Summary

The Philippine paint manufacturing business is a booming industry, producing some 250 million liters of various paint products per year and enjoying at least a 5 percent growth rate as the nation's economy steadily flourishes. With an overall economic growth rate greater than 7 percent during the last four quarters, Philippine demand for coatings and paints is sure to grow as residential and commercial construction projects continue to expand.

As part of the seven-country European Union-funded Asian Lead Paint Elimination Project, the EcoWaste Coalition, from November 2012 to January 2013, bought 122 cans of enamel decorative paints from retailers in Metro Manila, Cebu City and Davao City and had them analyzed for total lead content by Certottica Scarls, an independent, private laboratory in Italy.

This sampling of enamel paints commonly used in homes and other places frequented by young children is the third and most extensive study of lead in paint conducted by the EcoWaste Coalition. As part of its advocacy for chemical safety, clean production and zero waste, EcoWaste Coalition has conducted three studies of lead in paint (2008, 2010 and 2013) in collaboration with IPEN and other public interest groups in order to determine the availability of lead paint in the domestic market and examine the need for an expedited phase out of lead paint.

Childhood Lead Exposure

A complete phase out of lead paint would protect millions of Filipino children from a highly preventable source of childhood lead exposure. According to the latest data from the Census of Population and Housing (CPH), there are over 10 million Filipino children aged 0-5 years old and another 10 million children aged 5-9 years old (NSO, 2012). As explained in the Global Alliance to Eliminate Lead Paint (GAELP) brochure, "children can be severely affected by eating lead-based paint chips, chewing on objects, including toys painted with lead-based paint, or from exposure to dust or soil that contains lead from paint."

Lead poisoning, described by the World Health Organization (WHO) in its report "Childhood Lead Poisoning" as a "scourge to human health for millennia," is known to cause adverse health impacts to developing fetuses and young children that are "irreversible and untreatable by modern medicine," (WHO, 2010).

According to the WHO, "at high levels of acute exposure, lead attacks the brain and central nervous system to cause coma, convulsions and even death," and that "children who survive acute lead poisoning are typically left with grossly obvious mental retardation and behavioral disruption," (WHO, 2010).

"At lower levels of exposure that cause no obvious symptoms and that previously were considered safe, lead is now known to produce a spectrum of injury that causes loss of cognition, shortening of attention span, alteration of behavior, dyslexia, attention deficit disorder, hypertension, renal impairment, immunotoxicity and toxicity to the reproductive organs," the WHO further said (WHO, 2010).

The term ***"decorative paint,"*** as used in this report, refers to paints that are produced for use on the inside or outside walls and surfaces of homes, schools, commercial buildings and similar structures. Decorative paints are frequently used on fixtures such as doors, gates and windows, and to repaint household furniture such as cribs, playpens, tables and chairs. The term "enamel," as used in this report, refers to oil-based paints.

Study Results

Out of the 122 paints, 75 products (61 percent) were found to contain lead above the recommended regulatory limit of 90 parts per million (ppm, dry weight), and if exported would be illegal to sell in the U.S. and in other developed economies. The highest recorded lead content from all the sampled paints was 156,000 ppm, while the average lead content for all 122 paint samples was 18,500 ppm.

On the other hand, 47 paint products (39 percent) had low levels of lead and were compliant with the proposed 90 ppm limit for lead in paint. Twenty-three of these samples were white enamel paints with three of the white paints registering the lowest amount of lead at less than 8 ppm.

Other salient findings include:

- Out of the 75 paint samples with lead content higher than 90 ppm, 48 products (64 percent) were found to have dangerously high lead levels exceeding 10,000 ppm.

- Of the 73 bright-colored paints, 57 (78 percent) yellow, red and orange-colored paints had lead levels greater than 90 ppm.

With respect to product labeling, the study showed that current labeling practices are inconsistent and insufficient to help consumers make informed purchasing decisions with essential information such as lead content and lead dust hazards lacking on most labels.

Comparing the results from the 2013 paint sampling with those conducted in 2008 and 2010 showed that lead content in paints sold in the Philippines has not dramatically changed since 2008, and that significant concentrations of lead are still commonly added to these products. In all three studies, approximately 60 to 70 percent of samples had lead content above 90 ppm (Table 1).

Table 1. Comparison of Results from Paint Analyses Performed in 2013, 2010 and 2008.

Year	No. of Paints Analyzed	No. of Paints with Lead Levels Over 90 ppm	No. of Paints with Lead Levels Over 600 ppm	No. of Paints with Lead Levels Over 10,000 ppm	Highest Lead Level Detected
2013	122 enamel paints	75 (61%)	63 (52%)	48 (39%)	156,000
2010	35 enamel paints	24 (69%)	23 (66%)	17 (49%)	161,700[1]
2008	15 enamel paints	10 (67%)	9 (60%)	6 (40%)	189,163.5[2]

[1] EcoWaste Coalition, 2010. PH Paint Samples Tested Positive for High Lead Content.

[2] Kumar, 2009. Lead in New Decorative Paints, p. 17-20.

Conclusions and Recommendations

As no level of lead exposure is considered safe for children – a fact that Department of Health (DOH) Secretary Enrique T. Ona himself confirmed through his letter to the EcoWaste Coalition on 24 October 2011 – the high percentage of paints with lead exceeding the 90 ppm limit at 61 percent is undeniably disturbing.

However, the fact that samples from 39 percent of the paints, mostly locally manufactured, had lead content below 90 ppm, indicates that producing paints with no or low levels of lead is economically viable, technically feasible and practically achievable.

To stop the current practice of adding lead or lead compounds to paint products, support an industry shift to non-lead paint formulations, and ultimately protect the health of children, women of child-bearing age, workers and the environment at large, the EcoWaste Coalition recommends the following:

- For the government and relevant agencies: Fast track the approval and enforcement of a strong regulation that will ban the manufacture, importation, distribution, sale and use of household paint products with total lead content (dry weight) above 90 parts per million (ppm). Provide incentives for paint companies to swiftly transition from lead to non-lead paint production. Require standard paint container labeling on lead content and lead dust hazards. Strengthen enforcement mechanisms to prevent the entry of paints, toys and other consumer products not compliant with lead restrictions.

- For the paint industry: Discontinue the use of lead as driers or pigments and other purposes in paint formulations, shift to non-lead substitutes and commit to an expedited switch to non-lead paint products, starting with enamel decorative paints, to “prevent children’s exposure to paints containing lead and to minimize occupational exposures to lead paint.”

- For individual, household and institutional consumers: Seek out and buy unleaded paints for safer homes and facilities, adopt lead-safe procurement policies and contribute to increasing market demand for paint products with no lead added.

- For doctors and other health professionals: Support policy measures that will reduce, if not eliminate, childhood lead exposure from all sources, and join the ongoing efforts to inform the public about childhood health and occupational health risks linked with lead paints and lead dust.

- For all stakeholders: Cooperate in establishing a reliable third-party certification program to ensure that paints sold in the market meet the proposed regulatory standard of 90 ppm. Support the Global Alliance to Eliminate Lead Paint (GAELP) and strengthen the national partnership among stakeholders to phase out lead paints and subsequently eradicate the risks that such products present to human health and the environment.

Introduction and Background to the Lead Paint Issue

Lead is a toxic metal, which can be found in paints when a paint manufacturer intentionally adds one or more lead compounds to the paint for some purpose. The lead compounds most commonly added to paint are pigments that give the paint its color. Lead compounds commonly used as paint pigments include: lead chromates, lead oxides, lead molybdates and lead sulfates. These are added to produce bright colors such as yellow, red, orange and green. Lead compounds may also be added to paint to serve as drying agents and catalysts in oil-based paints. These make the paint dry faster and more evenly. Lead-based corrosion resistance agents are sometimes added to paints that are used on metal surfaces in order to inhibit rust and corrosion. The most common of these is lead tetroxide, sometimes called red lead or minium.

Good, cost-effective substitutes for all the lead compounds that are used in making household enamel paints have been widely available since the 1980s and even before. Paint manufacturers that currently produce household enamel paints with added lead compounds could easily reformulate their paints using these substitutes with very little, if any, impact on the characteristics and prices of the paints they produce. There is no good reason for paint manufacturers to continue producing paints with added lead compounds, especially since the childhood health hazards associated with lead paint are very serious and well-documented.

When a paint manufacturer does not intentionally add lead compounds in the formulation of his paints, the lead content of the paint will be very low – almost always less than 90 ppm (total lead, dry weight). If a paint manufacturer cautiously selects ingredients without lead as a contaminant, the lead content of the paint will often be as low as 10 ppm or less.

EcoWaste Coalition and IPEN suggest 90 ppm as a realistic and achievable international standard for lead in paint. Although several health experts worldwide have not determined a level of lead exposure that is deemed safe, 90 ppm total lead is the existing standard for household paints in the U.S. and Canada, and is currently being adopted by other countries as well.

In almost all cases where recent studies have been made, water-based paints (also called latex or acrylic paints) do not contain added lead. On the other hand, in most developing countries and countries with transitional economies where paints have recently been analyzed for their lead content, many of the oil-based paints (also called enamel paints) contain high lead content. For this reason, the current study, *Lead in New Enamel Household Paints in the Philippines,* selected only oil-based paints for total lead content analysis.

Lead Exposure to Children and Its Health Effects

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

Painted surfaces age, weather, and chip with time. Any lead that is in the paint then enters indoor and outdoor dusts and soils in and around the painted home or building. Children have an innate curiosity to explore their world and engage in developmentally appropriate hand-to-mouth behavior. When playing in lead-contaminated environments, the dust and soil that they ingest will carry lead. Children six years and under are especially the group most easily harmed by exposure to lead. For example, a typical one to six year old child ingests approximately 100 milligrams of house dust and soil each day (WHO, 2010).

Ingesting paint chips can be especially harmful since their lead content can be much higher than what is typically found in dust and soils. In some cases, children may pick up paint chips and put them into their mouth. In addition, when toys or other articles are painted with lead paint, children may chew on them and directly ingest the lead-contaminated dried paint. However, the most common way in which children ingest lead is through lead-containing dust.

Children and workers are especially at risk when surfaces that were previously painted with lead paint are repainted or disturbed by construction or other activities. Workmen may sand, dry scrape, grind, or in other ways, disturb the old painted surface and produce large quantities of dust with very high lead content.

Exposure to lead is much more harmful to children than adults, and the health effects are generally irreversible and can have a lifelong impact (WHO, 2010). The younger the child, the more harmful lead exposure can be. The human fetus is the most vulnerable and a pregnant woman can transfer lead that has accumulated in her body to that of her developing child. That means that lead can poison several generations, and not only one person during active exposure.

Children are more biologically susceptible to lead exposure than adults for several reasons including:

- A child's brain undergoes very rapid growth, development and differentiation and lead interferes with this process. Brain damage caused by chronic, low-level exposure to lead during early years 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; and

- 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). In those children who suffer from nutritional deficiencies, ingested lead is absorbed at an even more increased rate.

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 (WHO, 2006).

In recent years, medical researchers have been documenting significant health impacts on children from lower lead exposures (Needleman, 2004). In response, the U.S. Centers for Disease Control and Prevention (CDC) and other authorities have concluded that there is no known acceptable lead exposure level for children (EFSA, 2010).

Global Lead Paint Elimination Efforts

The use of lead in household enamel paints is a matter of global concern. At an International Conference on Chemicals Management (ICCM) held in 2009, lead paints were identified by consensus to be international priority issues of concern. Representatives of the Government of the Philippines, particularly from the Department of Environment and Natural Resources, participated in this conference and its decisions.

In response to the ICCM decision, the United Nations Environmental Programme (UNEP) and the 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), and its overall goal is to prevent children's exposure to lead via paints containing lead and to minimize occupational exposures to lead in paint. 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.

At the third ICCM assembly in 2012, conference participants and representatives from various governments including that of the Philippines agreed by consensus to call upon governments, civil society organizations, and the private sector to support GAELP's objectives by:

- Raising awareness about lead in paint's toxicity to human health including young children, paint users and the workers in paint production facilities;
- Filling information gaps by analyzing paints for their total lead content in countries where little or no data is available;
- Promoting national regulatory frameworks, as appropriate, to stop the manufacture, import, export, sale and use of lead paints and products coated with lead paints;
- Encouraging paint manufacturing companies to substitute lead compounds added to paint with safer alternatives; and
- Establishing prevention programs to reduce exposure in and around housing, childcare facilities, schools and other buildings where lead paint has been used in the past.

Philippines' Framework for Eliminating Lead Paint

Regulations

During the 1970's and 1980's, most highly industrialized countries enacted laws, regulations or mandatory standards on lead in paint to protect the health of their people. These policies generally prohibit the manufacture, import, sale or use of lead paint for interiors or exteriors of homes, schools and commercial buildings. In recent years, these regulations have become increasingly stringent. The standard adopted by the United States imposes an upper limit of 90 ppm on total lead (dry weight) for household enamel paints, as well as other types of paints. Other countries have adopted mandatory limits in the range of 90 to 600 ppm total lead (dry weight). The EcoWaste Coalition and other NGOs associated with the IPEN network generally promote a standard threshold of 90 ppm total lead (dry weight) as one that is totally achievable and significantly important in reducing toxic exposure.

For decades, highly industrialized countries have already turned to safer alternatives to lead compounds in their production of household enamel paints. However, this is not the case in developing countries like the Philippines where many small and medium-sized paint companies still manufacture and sell household enamel paints with lead compounds as pigments and drying agents.

The lack of a specific regulation that bans or restricts the use of lead paint is putting millions of Filipino children at risk for lead exposure and poisoning. According to the 2010 Census of Population and Housing (CPH), the Philippine household population reached over 92 million, of which there are over 10 million Filipino children (11 percent) in their golden years of development (0-5 years old) and another 10 million (11 percent) children aged 5-9 years old (NSO, 2012).

Recognizing the problem, the Philippine government through the Department of Environment and Natural Resources (DENR) has put lead and its compounds in the country's First Priority Chemicals List. These are chemicals that the DENR has determined to "potentially pose unreasonable risk to public health, workplace and the environment."

Efforts to craft a Chemical Control Order (CCO) on lead and lead compounds began in 2007, but did not move forward until the EcoWaste Coalition drew the attention of the media, industry leaders and lawmakers to the issue with its studies on lead paint in the local market.

Starting in 2011, the EcoWaste Coalition also discovered and publicized outrageous levels of lead in toys and other children's articles, playground equipment, vinyl flooring materials, beverage and food containers, cosmetics, and seasonal products such as Chinese New Year lucky charms, Christmas lights, candles, fireworks, and election campaign materials, which all contributed to amplifying the problem with lead in paint and consumer products.

In 2011 and 2012, the Environmental Management Bureau (EMB) responded to the clamor from public interest groups for a strong health-based policy and called for a series of stakeholders' meetings, which resuscitated the dormant process of crafting a CCO for lead and lead compounds.

In its letter to the DENR-EMB in February 2013, the EcoWaste Coalition pointed out that the nation will suffer the dire consequences of having no effective policy to curb lead exposure. The group warned that the country will:

- "End up with more people, especially young children, women of child-bearing age and workers, unsuspectingly exposed to lead and falling victims to the often irreversible neurological, reproductive, developmental and behavioral problems caused by lead exposure;"
- "End up with more lead-tainted homes, day care centers, schools, playgrounds and other facilities frequented by children that will require costly remediation to make these facilities safe, especially for young children and pregnant women;"

- “End up with more lead-containing consumer products such as toys and cosmetics entering our ports and markets without restraint, and thereby making our nation a dumping ground for unsafe goods;” and

- “End up with more hazardous lead-contaminated waste stream, making waste collection, recycling and disposal more risky for waste workers and recyclers.”

In September 2013, the DENR-EMB developed a final version of the CCO for lead and lead compounds that is now awaiting final approval. The scope and coverage of the CCO will apply to the importation, distribution, manufacture and use of lead and lead compounds, as well as the storage, transport and disposal of its wastes.

Once the CCO is approved, it will specifically prohibit lead compounds in all types of paints regardless of whether they are used as pigments, drying agents or for some other intentional uses beyond the allowable limit of 90 ppm. In addition, the CCO proposes different phase-out periods for lead-containing household and industrial paints. For architectural and decorative household paints, the phase-out period will be three years, while for automotive, aviation and industrial paints, the phase-out period will be six years upon the approval and issuance of the CCO.

Table 2 shows the existing relevant regulations and policies associated with lead and lead compounds. These regulations, however, cover a wide array of applications of lead paint and are not specific to the use of lead compounds in the production of paints.

Table 2. Philippine Regulations and Policies on Lead and Lead Compounds.

Regulations and Policies	Description
DENR Administrative Order (AO) No. 1998-58 or the “Priority Chemical List (PCL)”	Recognizes lead compounds as one of the priority chemicals that needs regulation Requires users, importers, distributors and manufacturers of lead compounds to comply with specific requirements before the issuance of the PCL compliance certificate
DENR AO No. 2007-23 “Prescribing Additional Requirements for the Issuance of the PCL Compliance Certificate”	Redefines procedural guidelines and requirements to be followed in securing the PCL certification for lead compounds Guides the DENR in monitoring the importation, handling, use, distribution and disposal of toxic lead compounds
Department of Trade and Industry (DTI) – Philippine National Standard (PNS) 1408-3:1998 / IDT:ISO 8124-3:1997(E) – Safety of Toys – Migration of Certain Elements – Specification	Sets an allowable limit of 90 ppm for lead compounds in toys
Department of Health (DOH) – Bureau of Health Devices and Technology (BHDT) AO No. 2007-0032 or the “Regulations on the Issuance of a License to Operate (LTO) to Companies that Manufacture, Import or Distribute Toys for the Philippine Market”	Requires establishments engaged in the manufacture of toys to secure an LTO and to register their products in compliance with the DTI-PNS for Safety of Toys Requires all toys in the market to bear correct information labeling such as the duly registered business name and address of the manufacturer and/or distributor; place, country, and date of manufacture; LTO number; warning and/or precautionary indications; and instructions on toy’s usage, functions, features, and assembly
DOH-BHDT AO No. 2009-0005 or the Revised Policies and Guidelines on AO No. 2007-0032	Establishes, innovates and improves the procedures and the health and safety requirements for toys marketed in the Philippines
DOH-BHDT AO No. 2009-0005-B or the Addendum to AO No. 2009-0005	Includes indoor and outdoor playground toys/equipment such as slides, swings

The Philippine Paint and Coatings Industry

The paint manufacturing industry in the Philippines was established in 1911.

The Philippine Association of Paint Manufacturers, Inc. (PAPM), a privately operated, non-stock, non-profit, non-sectarian, and non-political organization formed in 1961, is currently composed of 72 companies, of which 21 are paint manufacturers and 51 are suppliers and associates (PAPM 2012).

The majority of Philippine paint manufacturers have offices and plant facilities located within metropolitan Manila and nearby provinces where construction and industrial activities are centered and where there is good access to raw materials and developed systems of power, transport and communication facilities (SPIK, 2010).

According to the PAPM, 50 percent of coatings consumed in the Philippines are oil-based, 48 percent are water-based, and the remaining 2 percent are other types of coatings. The country’s paint manufacturers, based on PAPM’s calculations, are capable of producing approximately the equivalent of 250 million liters of finished products per annum. An annual growth rate of 5 percent is predicted for architectural coatings as building activity expands and the economy grows at a modest rate (PAPM, 2012).

Leading the pack is Pacific Paint (Boysen) Philippines, Inc. Founded in 1953, Boysen claims a 70 percent market share and is the largest domestic exporter of architectural paints in South East Asia. With the biggest and most modern paint production plant in the region, Boysen is the only local paint manufacturer capable of producing its own raw materials (Boysen Paints, 2013). Boysen announced that all paint products coming out of its factories, whether water or oil-based, are lead free and voluntarily phased out its lead-containing products starting in 2007 (Murao and Ono, 2012).

In its July 2013 issue, Coatings World ranked Pacific Paint (Boysen) Philippines, Inc. as the 52nd largest paint company in the world with an estimate income of $230 million in 2012. It is also the second highest Southeast Asian paint company in terms of annual revenue, next only to Thailand’s TOA Group (ranked 45th), which recorded an estimate sales of $290 million last year (Pianoforte, 2013).

A paint market survey conducted by the EcoWaste Coalition of various retail paint outlets in the country identified 50 types of oil-based paints from 29 paint manufacturers. Among the major paint brands are Boysen and Nation (Pacific Paint (Boysen) Philippines, Inc.); Davies, Coat Saver and E-Z Coat (Charter Chemical and Coating Corp.); Dutch Boy (United Paints, Inc.); and Welcoat (Asian Coatings Philippines, Inc.).

Other paint brands in the market include Olympic (Century Chemical Corp.); A-Plus (FH Colors and Coatings Corp.); Canadian, Manor and Sphero (Globesco, Inc.); Universal and Popular (H-Chem Industries, Inc.); Challenger (Mayon Industrial Corp.); Triton, Rosco and Lotus (Roosevelt Chemical Industries, Inc.); Domino (Super Globe, Inc.); Minnesota (Sycwin Coating and Wires, Inc.); Master and Weiser (Times Paint Corp.); and Island (Treasure Island Industrial Corp.).

Larger paint companies such as Charter Chemical and Coating Corp. and Pacific Paint (Boysen) Philippines, Inc., with an estimated combined market share of about 80 percent, have voluntarily eliminated the use of lead-based raw materials. Many smaller paint companies, according to the PAPM, have also stopped using lead as drying agents.

Guided by the theme “Technological Innovations for a More Environmentally Sustainable Paint Industry,” the PAPM has participated in policy consultations for the phase out of lead paints and conducted technical courses and activities in line with its “green” initiatives.

The PAPM has likewise collaborated with the EcoWaste Coalition and IPEN to raise awareness of its corporate members about the hazards of lead, build knowledge and transfer skills on lead paint abatement and remediation, and create consensus for a third-party certification program for no lead added paint.

Materials and Methods of Paint Analysis

From November 2012 to January 2013, the EcoWaste Coalition, with help and support from its staff and volunteers, purchased 122 cans of enamel decorative paints and 17 repacked enamel paints from various stores in Metro Manila, Cebu City and Davao City. These paints from 34 different brands were produced by 24 manufacturers. In most cases, the EcoWaste Coalition selected one white paint and another bright-colored paint such as red, orange or yellow. 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.

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 EcoWaste Coalition 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 the EcoWaste Coalition as shown in Figure 1.

Figure 1. Preparation of Paint Samples.

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 resealable plastic bags and shipped to the Certottica Laboratory in Italy for analysis.

Certottica is accredited by ACCREDIA – the Italian Accreditation System, which is the Italian National Accreditation Body appointed by the State. This laboratory participates in the Environmental Lead Proficiency Analytical Testing (ELPAT) program operated by the AIHA under a program established by the US EPA.

The laboratory removed a quantity of paint off the wood pieces by abrasion. The paint chips were then weighed into a hot block digestion tube and were subsequently digested according to the test method CPSC-CH-E1003-09.1, which is the standard operating procedure for determining lead in paint and other similar surface coatings (US CPSC, 2011).

The process of digestion began as scraped paint chips were placed in a borosilicate glass beaker, in which 3 mL of HNO_3 and 1 mL of 30 percent H_2O_2 were added. The beaker was first covered with a watch glass and was subsequently heated on a hotplate (from an initial temperature of 85 °C, the surface temperature gradually increases until it reaches approximately 140 °C) until most of the acid evaporated. This treatment was repeated twice. The beaker containing the sample was removed from the hotplate and was allowed to cool to room temperature.

The watch glass was then rinsed with approximately 3 to 5 mL of 10 percent HNO_3 and the solution was subjected to low heat to ensure slow evaporation and prevent complete vaporization of the solution. The digested solution was then allowed to cool to room temperature, after which 1 mL of HNO_3 was added to the residue, to dissolve any remaining soluble species. The walls of the beaker and the bottom of the watch glass were rinsed with deionized water and the resulting solution was transferred into a volumetric flask and was brought to volume using deionized water.

Lead in the digestates was analyzed by an Inductively Coupled Plasma – Atomic Emission Spectrophotometer (ICP-AES), Thermo Scientific iCAP 6000 Series, using yttrium (2 mg/L) as an internal standard.

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, for 100 mg of paint scraped off the wood pieces the lowest detection limit is 8 ppm, but for a smaller amount of paint the detection limit increases. Therefore, the lead content in the samples from three of the paints is reported as below 8 ppm and below 9 ppm in samples from seven of the paints.

Results and Discussion

Summary of Results

75 household enamel paints (61 percent) contained lead above 90 ppm, putting young children and pregnant women at risk of lead poisoning. All of these paints will not be permitted for sale in most of the international markets.

48 household enamel paints (39 percent) had dangerously high lead content greater than 10,000 ppm, and can be considered a particular problem.

47 household enamel paints (39 percent) contained lead below 90 ppm, 23 of which were white enamel paints.

An orange-colored tinting paint showed the highest total lead concentration of 156,000 ppm, 1,730 times the draft CCO threshold limit of 90 ppm.

The ***average lead concentration*** of the sampled household enamel paints is ***18,500 ppm***, 206 times greater than the recommended standard limit of 90 ppm.

57 out of 73 bright-colored paints (78 percent) such as red, orange and yellow were found to have lead levels greater than 90 ppm.

Paint labels were found to contain insufficient information as product ingredients, including whether the product contained lead, were not fully disclosed, manufacturing and expiration dates were not explicitly displayed, and warning signs indicating that lead dust are hazardous to children and pregnant women were not specified.

There is no conclusive correlation between the price of household enamel paints and the amount of lead in them. The highest-priced paint – 1 L white-colored basecoat paint – costs PhP 769.82 and contained only 9 ppm of lead. On the other hand, one of the two lowest-priced paints – 60 mL yellow-colored quick-dry enamel paint – costs PhP 15.00 and contained 89,000 ppm of lead. The 60 mL orange-colored tinting paint which registered the highest lead content of 156,000 ppm costs PhP 55.00.

The top 10 new enamel household paints with the highest amounts of lead are summarized in Table 3.

Table 3. Top Ten Household Enamel Paints with the Highest Lead Concentrations.

Rank	Brand	Country of Origin	Color	Lead Content (ppm)
1	B-30	Philippines	Orange	156,000
2	B-01	Philippines	Lemon Yellow	126,000
3	B-15	Philippines	Yellow	114,000
4	B-15	Philippines	Lemon Yellow	103,000
5	B-13	Philippines	Yellow	94,000
6	B-13	Philippines	Yellow	89,000
7	B-22	Philippines	Lemon Yellow	84,000
8	B-30	Philippines	Red	83,000
9	B-11	Philippines	Yellow	77,000
10	B-22	Philippines	Lemon Yellow	68,000

Results and Discussion

Total Lead Content Analysis

The majority of paints analyzed had a total lead content above 90 ppm and could not be sold in most industrialized countries.

A total of 122 cans of household enamel paints representing 34 different brands by 24 manufacturers were purchased in the Philippines. Appendix 1 shows the complete sampling details of these household paints clustered and ranked according to their total lead content.

- ***75 or 61 percent of the 122 household enamel paints were found to have a total lead content greater than 90 ppm.*** The remaining 47 household enamel paints (39 percent) had a lead content below the 90 ppm recommended limit. The total lead content distribution of household enamel paints is shown in Figure 2.

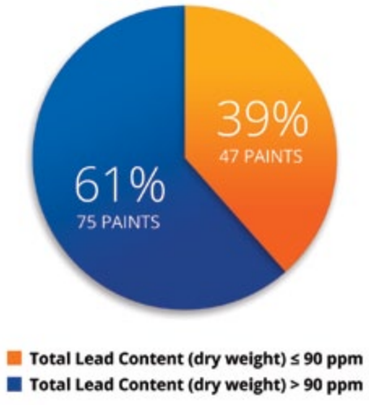

Figure 2. Total Lead Content Distribution of Household Enamel Paints.Range.

- ***The average concentration of all analyzed paints was 18,500 ppm or 206 times greater than the recommended standard limit of 90 ppm***. An orange-colored tinting paint showed the highest total lead concentration of 156,000 ppm. On the other hand, one white and one delft-blue quick-dry enamel paints, as well as a white-colored flat wall enamel paint registered the lowest total lead concentration of <8 ppm. The distribution of household enamel paints grouped according to their lead concentration range is shown in Table 4.

- ***More than a third of paints (48 samples, or 39 percent of 122 samples) analyzed had extremely high lead concentrations above 10,000 ppm***. High lead concentrations from 600 ppm to 10,000 ppm were detected in 15 paint samples (12 percent) and moderately high lead concentrations from 90 ppm to 600 ppm were identified in 12 paint samples (10 percent). In total, 75 household enamel paints contained lead above 90 ppm, which may render young children and pregnant women at risk of lead poisoning. If exported, these paints will not qualify for sale in the US and in other developed countries. On the other hand, 47 paint samples (39 percent) had low lead concentrations below the recommended standard limit of 90 ppm.

Table 4. Distribution of Household Enamel Paints According to Lead Concentration Range.

Concentration Range	Concentration Level	No. of Samples	Lowest Lead Content (ppm)	Highest Lead Content (ppm)	Average Lead Content (ppm)
x* ≤ 90 ppm	Low	47 (38%)	<8	81	27
90 ppm < x* ≤ 600 ppm	Moderately High	12 (10%)	113	510	258
600 ppm < x* ≤ 10,000 ppm	High	15 (12%)	680	6,000	2,662
x* > 10,000 ppm	Extremely High	48 (39%)	10,600	156,000	46,115

*"x" pertains to the total lead concentration (dry weight) of household enamel paints.

Results and Discussion

Lead Concentration by Brand

More than three quarters of paint brands sampled sell paints with lead content above 90 ppm. Lead above 90 ppm was detected in paints from 26 out of the 34 analyzed paint brands. An enamel paint, B-30, registered the highest total lead concentration of 156,000 ppm. The distribution of lead concentration by brand is summarized in Table 5.

Table 5. Distribution of Lead Concentration by Brand of Household Enamel Paints Purchased in the Philippines.

Brand	No. of Samples	No. of Samples Below 90 ppm	No. of Samples Above 90 ppm	No. of Samples Above 600 ppm	No. of Samples Above 10,000 ppm	Minimum Lead Conc. (ppm)	Maximum Lead Conc. (ppm)
B-01	2	0	2	1	1	380	126,000
B-02	9	8	1	0	0	<8	113
B-03	2	1	1	1	0	28	720
B-04	4	2	2	2	2	17	40,000
B-05	3	3	0	0	0	10	39
B-06	3	3	0	0	0	19	55
B-07	6	4	2	2	0	19	4,600
B-08	2	1	1	1	1	75	57,000
B-09	7	4	3	1	1	<8	11,000
B-10	1	1	0	0	0	60	60
B-11	5	1	4	4	4	13	77,000
B-12	9	0	9	7	3	230	39,000
B-13	4	0	4	4	3	740	94,000
B-14	5	3	2	1	1	25	18,000
B-15	6	0	6	5	5	169	114,000
B-16	1	1	0	0	0	17	17
B-17	1	0	1	1	1	23,000	23,000
B-18	4	1	3	3	2	42	29,000
B-19	7	3	4	4	4	13	32,000
B-20	2	0	2	2	2	17,500	27,000
B-21	1	0	1	1	1	21,000	21,000
B-22	4	0	4	4	3	950	84,000
B-23	4	4	0	0	0	<9	14
B-24	1	1	0	0	0	<9	<9
B-25	1	1	0	0	0	<9	<9
B-26	4	3	1	1	1	24	49,000
B-27	4	1	3	3	3	12	49,000
B-28	1	0	1	0	0	186	186
B-29	1	0	1	0	0	460	460
B-30	8	0	8	6	5	135	156,000
B-31	1	1	0	0	0	27	27
B-32	1	0	1	1	1	34,000	34,000
B-33	1	0	1	1	0	4,000	4,000
B-34	7	0	7	7	4	3,500	24,000

- 12 of the 26 paint brands with lead levels above 90 ppm included paints that contained lead below 90 ppm, suggesting that these brands have the capability to produce paints with lead content below 90 ppm.

- A majority of sampled brands had paints that are above and below the proposed 90 ppm lead limit.

Table 6. Top Ten Brands with the Highest Lead Concentrations.

Rank	Brand	Country of Origin	Color	Lead Content (ppm)
1	B-30	Philippines	Orange	156,000
2	B-01	Philippines	Lemon Yellow	126,000
3	B-15	Philippines	Yellow	114,000
4	B-13	Philippines	Yellow	94,000
5	B-22	Philippines	Lemon Yellow	84,000
6	B-11	Philippines	Yellow	77,000
7	B-08	Philippines	Lemon Yellow	57,000
8	B-26	Philippines	Lemon Yellow	49,000
9	B-27	Philippines	Yellow	49,000
10	B-04	Philippines	Lemon Yellow	40,000

The top 10 brands with paints containing the highest amounts of lead are listed in Table 6, while the top 10 brands with the lowest amounts of lead are enumerated in Table 7.

Tables 6 and 7 show that brands B-04, B-11 and B-27 included paints with both extremely high and relatively low concentrations of lead.

Table 7. Top Ten Brands with the Lowest Lead Concentrations.

Rank	Brand	Country of Origin	Color	Lead Content (ppm)
1	B-09	Philippines	White	<8
2	B-02	Philippines	White	<8
3	B-23	USA	Ultra White	<9
4	B-24	Philippines	White	<9
5	B-25	Malaysia	White	<9
6	B-05	USA	White	10
7	B-27	Philippines	White	12
8	B-19	Philippines	White	13
9	B-11	Philippines	White	13
10	B-04	Philippines	White	17

Lead Concentration by Color

The vast majority of orange and yellow paints had high lead levels, and a majority had extremely dangerous levels of lead, while white paints had the lowest levels.

Among the 122 analyzed household enamel paints were 46 yellow-colored paints, 33 white-colored paints, 16 red-colored paints, 11 orange-colored paints, 6 green-colored paints, as well as 10 other paints of assorted colors such as aluminum, black, blue, brown, clover honey, gray, ivory and raw sienna.

- 91 percent of orange-colored paints and 80 percent of yellow-colored paints exceeded the recommended 90 ppm standard.

- 82 percent of orange-colored paints and 70 percent of yellow-colored paints had extremely high concentrations of lead beyond 10,000 ppm as illustrated in Figure 3.

- Moreover, an orange-colored paint had the highest amount of lead with 156,000 ppm, while 8 of the top 10 paints with the highest lead content were yellow in color as shown in Table 3. In general, white-colored paints contain the lowest amounts of lead. Indeed, 70 percent of white-colored paints contained lead below 90 ppm, including all the top 10 brands with the lowest concentrations of lead as presented in Table 7.

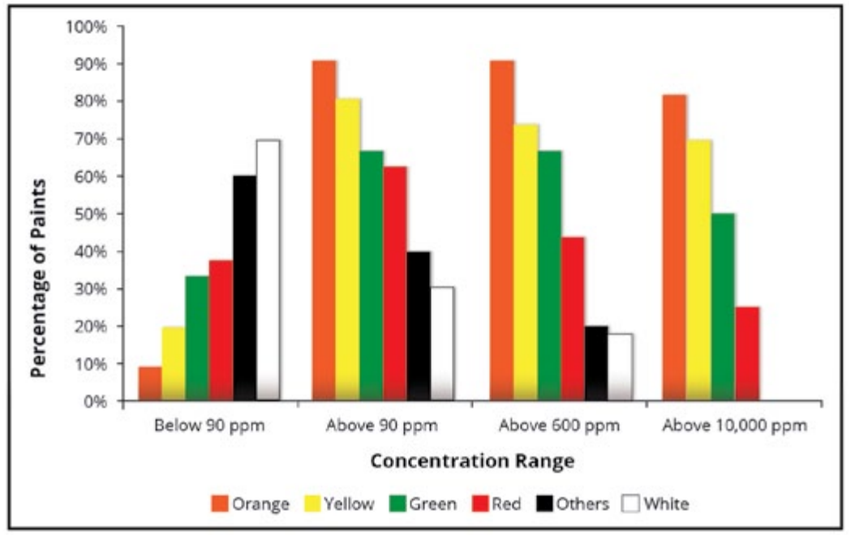

Figure 3. Lead Concentrations in Analyzed Household Enamel Paints Arranged According to Color.

The distribution of lead concentration by color is summarized in Table 8.

Table 8. Distribution of Lead Concentration by Color of Household Enamel Paints Purchased in the Philippines.

Color	No. of Samples	Average Lead Conc. (ppm)	No. of Samples Below 90 ppm	No. of Samples Above 90 ppm	No. of Samples Above 600 ppm	No. of Samples Above 10,000 ppm	Minimum Lead Conc. (ppm)	Maximum Lead Conc. (ppm)
Green	6	9,600	2	4	4	3	14	25,000
Orange	11	30,700	1	10	10	9	16	156,000
Red	16	10,800	6	10	7	4	27	83,000
White	33	455	23	10	6	0	<8	4,700
Yellow	46	45,700	9	37	34	32	<9	126,000
Others[1]	10	1,060	6	4	2	0	<8[2]	6,000[3]

[1]*Other colors include aluminum, black, blue, brown, clover honey, gray, ivory and raw sienna.*

[2]*Delft Blue*

[3]*Ivory*

Labeling

Most of the sampled paints do not contain adequate information on their labels to help consumers identify and distinguish paints with lead levels below 90 ppm and paints with high lead levels. Only the cans for 43 of the 122 paint samples describe the product composition. In cases where the product composition is described, the specific product ingredients are not listed. For example, some labels indicate the percentage of pigment present on a product, but not the particular pigment used.

Moreover, most product labels do not contain clear and understandable manufacturing codes that could also assist consumers in making informed choices. While most paint cans contain information on proper application and basic personal protection, no precautionary warning is stated that would have alerted consumers about the hazards of lead dust that is produced when surface paints deteriorate or are disturbed.

Of the 122 paint samples, 85 had manufacturing codes, 43 had product composition descriptions, and only 11 had precautionary warning labels pertaining to lead – seven of which stated that these paints had “No Added Lead.”

The seven paint samples with “No Added Lead” information on the labels were found to have lead levels ranging from <9 ppm to 39 ppm.

Comparative Analysis of the 2013, 2010 and 2008 Paint Sampling Studies

In comparing results in the studies conducted in 2013, 2010 and 2008, it is clear that lead paint is still widely available in the Philippines despite the commercial availability of good substitutes for lead driers and pigments.

Comparing the results from the 2013 paint sampling with those conducted in 2008 and 2010 showed that lead content in paints sold in the Philippines has not dramatically changed since 2008, and that significant concentrations of lead are still commonly added to these products. In all three studies, approximately 60 to 70 percent of samples had lead content above 90 ppm.

Repacked Paints

On top of the 122 sampled paints, 17 repacked paints were also procured and sent to Italy for laboratory analysis. Repacked paints as shown in Figure 4 are paints originally stored in bigger volumes (4 L cans) that are transferred into smaller containers such as tin cans or glass bottles for retail. Consumers usually go for repacked paints when their paints of choice are not available in smaller quantities.

Figure 4. Repacked Household Enamel Paints Purchased in the Philippines.

Out of the 17 repacked household enamel paints, nine samples contained amounts of lead greater than 90 ppm. Both a yellow-colored epoxy enamel paint and a lemon yellow-colored quick-dry enamel paint contained the highest total lead concentration of 83,000 ppm. On the other hand, a white-colored epoxy enamel paint contained the lowest total lead concentration of <8 ppm.

The average lead concentration of the analyzed repacked paints was 21,800 ppm or 242 times greater than the recommended standard limit of 90 ppm. Since these paints were transferred into unlabeled containers, some important information such as the manufacturer’s name and contact details, manufacturing date, manufacturing codes and country of origin were unavailable. Please see Appendix 2 for pertinent details.

Conclusions and Recommendations

As no level of lead exposure is considered safe for children – a fact that Department of Health (DOH) Secretary Enrique T. Ona himself confirmed through his letter to the EcoWaste Coalition on 24 October 2011 – the high percentage of paints with lead exceeding the recommended 90 ppm limit at 61 percent is undeniably disturbing.

However, the fact that samples from 39 percent of the paints, mostly locally manufactured, had lead content below 90 ppm indicates that producing paints with no or low levels of lead is economically viable, technically feasible and practically achievable.

To stop the current practices of adding lead or lead compounds to paint products, support industry shift to non-lead paint formulations and ultimately protect the health of children, women of child-bearing age, workers and the environment at large, the EcoWaste Coalition recommends the following:

- For the government and relevant agencies: Fast track the approval and enforcement of a strong regulation that will ban the manufacture, importation, distribution, sale and use of household paint products with total lead content (dry weight) above the maximum limit of 90 ppm. Provide incentives for paint companies to swiftly transition from lead to non-lead paint production. Require a standard paint container labeling on lead content and lead dust hazards. Strengthen enforcement mechanisms to prevent the entry of paints, toys and other consumer products not compliant with lead restrictions.

- For the paint industry: Discontinue the use of lead as driers or pigments and other purposes in paint formulations, shift to non-lead substitutes and commit to an expedited switch to producing paint products with lead content below 90 ppm, starting with enamel decorative paints, to “prevent children’s exposure to paints containing lead and to minimize occupational exposures to lead paint.”

- For individual, household and institutional consumers: Seek and patronize unleaded paints for safer homes and facilities, adopt lead-safe procurement policy and contribute to increasing market demand for paint products with no lead added.

- For doctors and other health professionals: Support policy measures that will reduce, if not eliminate, childhood lead exposure from all sources, and join the ongoing efforts to inform the public about childhood health and occupational health risks linked with lead paints and lead dust.

- For all stakeholders: Cooperate in establishing a reliable third-party certification program to ensure that paints sold in the market meet the proposed regulatory standard of 90 ppm. Support the Global Alliance to Eliminate Lead Paint (GAELP) and strengthen the national partnership among stakeholders to phase out lead paints and subsequently eradicate the risks that such products present to human health and the environment.

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Appendices

Appendix 1. Details of Household Enamel Paints Purchased in the Philippines.

Table 9. Household Enamel Paints with Low Lead Content (≤90 ppm).

Rank	Sample No.	Country of Origin	Type	Color	Volume (mL)	Price (PhP)	Lead Content (ppm)
1	PLP-144	Philippines	Quick-Dry Enamel	White	250	55.20	<8
2	PLP-217	Philippines	Quick-Dry Enamel	Delft Blue	250	40.00	<8
3	PLP-111	Philippines	Flat Wall Enamel	White	1,000	169.75	<8
4	PLP-214	USA	Enamel	Clover Honey	1,000	550.00	<9
5	PLP-211	USA	Enamel	Ultra White	1,000	650.00	<9
6	PLP-215	Philippines	Quick-Dry Enamel	White	1,000	113.00	<9
7	PLP-109	Philippines	Quick-Dry Enamel	Yellow	1,000	168.00	<9
8	PLP-216	Malaysia	Oil-based Basecoat	White	1,000	769.82	<9
9	PLP-108	Philippines	Quick-Dry Enamel	Lemon Yellow	250	75.00	<9
10	PLP-141	Philippines	Quick-Dry Enamel	Lemon Yellow	250	40.00	<9
11	PLP-212	USA	Enamel	Yellow Blast	1,000	550.00	9
12	PLP-125	USA	High Gloss Oil-based	White	1,000	695.00	10
13	PLP-224	Philippines	Quick-Dry Enamel	White	80	23.00	12
14	PLP-188	Philippines	Quick-Dry Enamel	White	250	55.00	13
15	PLP-148	Philippines	Quick-Dry Enamel	White	250	79.75	13
16	PLP-213	USA	Enamel	Ultra White	1,000	550.00	14
17	PLP-140	Philippines	Quick-Dry Enamel	Green	250	49.00	14
18	PLP-115	Philippines	Quick-Dry Enamel	Orange	1,000	235.00	16
19	PLP-122	Philippines	Quick-Dry Enamel	White	80	25.00	17
20	PLP-176	Philippines	Quick-Dry Enamel	White	4,000	400.00	17
21	PLP-135	Philippines	Quick-Dry Enamel	White	1,000	182.50	19
22	PLP-128	Philippines	Quick-Dry Enamel	White	250	40.00	19
23	PLP-114	Philippines	Flat Wall Enamel	White	1,000	175.00	19
24	PLP-189	Philippines	Quick-Dry Enamel	White	1,000	120.00	19
25	PLP-126	USA	High Gloss Oil-based	Yellow Blast	1,000	695.00	19
26	PLP-107	Philippines	Quick-Dry Enamel	Lemon Yellow	250	65.00	21
27	PLP-221	Philippines	Quick-Dry Enamel	Gray	1,000	188.50	24
28	PLP-167	Philippines	Quick-Dry Enamel	White	250	45.00	25
29	PLP-166	Philippines	Quick-Dry Enamel	White	250	50.00	25
30	PLP-121	Philippines	Quick-Dry Enamel	White	80	25.00	26
31	PLP-238	Philippines	Rubber Base Coating	Red	1,000	345.00	27
32	PLP-118	Philippines	Enamel	Aluminum	4,000	446.00	28
33	PLP-136	Philippines	Red Oxide Primer	Red	1,000	114.00	29
34	PLP-219	Philippines	Tinting Color	Thalo Green	250	144.74	30
35	PLP-218	Philippines	Color in Oil	Raw Sienna	250	94.75	35
36	PLP-201	Philippines	Quick-Dry Enamel	Yellow	250	50.00	39
37	PLP-124	USA	High Gloss Enamel	Lemon Zest Yellow	1,000	695.00	39
38	PLP-127	Philippines	Quick-Dry Enamel	Brown	250	44.75	40
39	PLP-187	Philippines	Quick-Dry Enamel	White	250	55.00	40
40	PLP-181	Philippines	Red Oxide Primer	Red	1,000	92.31	42
41	PLP-133	Philippines	Red Oxide Primer	Red	1,000	129.75	55
42	PLP-199	Philippines	Quick-Dry Enamel	White	250	55.00	55
43	PLP-146	Philippines	Red Oxide Primer	Red	1,000	83.00	60
44	PLP-116	Philippines	Red Oxide Primer	Red	1,000	145.00	72
45	PLP-139	Philippines	Quick-Dry Enamel	White	1,000	130.00	75
46	PLP-134	Philippines	Quick-Dry Enamel	Lemon Yellow	1,000	185.00	77
47	PLP-106	Philippines	Flat Wall Enamel	White	1,000	150.00	81

Table 10. Household Enamel Paints with Moderately High Lead Content (91 – 600 ppm).

Rank	Sample No.	Country of Origin	Type	Color	Volume (mL)	Price (PhP)	Lead Content (ppm)
48	PLP-110	Philippines	Red Oxide Primer	Red	1,000	120.00	113
49	PLP-235	Philippines	Tinting Color	Hanza Yellow	60	55.00	135
50	PLP-168	Philippines	Quick-Dry Enamel	Yellow	1,000	140.00	148
51	PLP-173	Philippines	Quick-Dry Enamel	White	250	100.00	169
52	PLP-228	Philippines	Quick-Dry Enamel	Caterpillar Yellow	4,000	445.00	186
53	PLP-143	Philippines	Quick-Dry Enamel	Royal Blue	250	50.00	190
54	PLP-151	Philippines	Marine Coating	Black	1,000	114.00	230
55	PLP-157	Philippines	Quick-Dry Enamel	White	1,000	179.75	280
56	PLP-145	Philippines	Red Oxide Primer	Red	1,000	106.60	300
57	PLP-103	Philippines	Quick-Dry Enamel	White	1,000	168.75	380
58	PLP-229	Philippines	Flat Wall Enamel	White	4,000	420.00	460
59	PLP-237	Philippines	Red Oxide Primer	Red	250	50.00	510

Table 11. Household Enamel Paints with High Lead Content (601 – 10,000 ppm).

Rank	Sample No.	Country of Origin	Type	Color	Volume (mL)	Price (PhP)	Lead Content (ppm)
60	PLP-232	Philippines	Quick-Dry Enamel	White	250	50.00	680
61	PLP-119	Philippines	Quick-Dry Enamel	Lemon Yellow	4,000	580.00	720
62	PLP-163	Philippines	Quick-Dry Enamel	White	60	15.00	740
63	PLP-206	Philippines	Quick-Dry Enamel	White	250	60.00	950
64	PLP-130	Philippines	Quick-Dry Enamel	Dark Green	250	44.00	1,540
65	PLP-154	Philippines	Flat Wall Enamel	White	1,000	155.00	1,600
66	PLP-160	Philippines	Red Oxide Primer	Red	1,000	104.75	2,000
67	PLP-161	Philippines	Red Oxide Primer	Red	1,000	106.00	2,100
68	PLP-152	Philippines	Red Oxide Primer	Red	1,000	107.00	2,300
69	PLP-244	Philippines	Quick-Dry Enamel	California Orange	1,000	195.00	3,500
70	PLP-242	Philippines	Quick-Dry Enamel	Sky Blue	1,000	155.00	4,000
71	PLP-247	Philippines	Quick-Dry Enamel	White	1,000	195.00	4,500
72	PLP-131	Philippines	Quick-Dry Enamel	Lemon Yellow	250	57.00	4,600
73	PLP-246	Philippines	Quick-Dry Enamel	White	250	58.00	4,700
74	PLP-179	Philippines	Fast Dry Enamel	Ivory	250	51.50	6,000
75	PLP-147	Philippines	Quick-Dry Enamel	Orange	250	79.75	10,600

Table 12. Household Enamel Paints with Extremely High Lead Content (>10,000 ppm).

Rank	Sample No.	Country of Origin	Type	Color	Volume (mL)	Price (PhP)	Lead Content (ppm)
76	PLP-142	Philippines	Quick-Dry Enamel	Nile Green	250	50.00	11,000
77	PLP-245	Philippines	Quick-Dry Enamel	Lemon Yellow	250	57.00	14,800
78	PLP-186	Philippines	Quick-Dry Enamel	Orange	250	65.00	14,900
79	PLP-194	Philippines	Quick-Dry Enamel	Moly Orange	1,000	130.00	17,500
80	PLP-184	Philippines	Quick-Dry Enamel	Lemon Yellow	1,000	130.00	17,800
81	PLP-169	Philippines	Quick-Dry Enamel	Yellow	250	45.00	18,000
82	PLP-249	Philippines	Red Lead Primer	Red	250	65.00	19,900
83	PLP-230	Philippines	Quick-Dry Enamel	Nile Green	250	46.00	20,000
84	PLP-195	Philippines	Quick-Dry Enamel	Lemon Yellow	4,000	480.0	21,000
85	PLP-197	Philippines	Quick-Dry Enamel	Lemon Yellow	250	57.00	21,000
86	PLP-156	Philippines	Quick-Dry Enamel	Orange	1,000	169.75	22,000
87	PLP-178	Philippines	Quick-Dry Enamel	Yellow	1,000	140.00	23,000
88	PLP-248	Philippines	Red Lead Primer	Red	250	60.00	24,000
89	PLP-231	Philippines	Quick-Dry Enamel	Orange	250	46.00	24,000
90	PLP-172	Philippines	Quick-Dry Enamel	Medium Yellow	1,000	143.00	24,000
91	PLP-171	Philippines	Quick-Dry Enamel	Emerald Green	250	65.00	25,000
92	PLP-180	Philippines	Fast Dry Enamel	Sunshine Yellow	250	51.50	27,000
93	PLP-162	Philippines	Quick-Dry Enamel	Orange	250	20.00	27,000
94	PLP-193	Philippines	Quick-Dry Enamel	Lemon Yellow	1,000	130.00	27,000
95	PLP-183	Philippines	Quick-Dry Enamel	Lemon Yellow	250	55.00	28,000
96	PLP-182	Philippines	Quick-Dry Enamel	Orange	250	50.00	29,000
97	PLP-185	Philippines	Quick-Dry Enamel	Lemon Yellow	1,000	120.00	32,000
98	PLP-158	Philippines	Quick-Dry Enamel	Yellow	1,000	154.00	33,000
99	PLP-223	Philippines	Quick-Dry Enamel	Moly Orange	80	25.00	33,000
100	PLP-239	Philippines	Quick-Dry Enamel	Lemon Yellow	4,000	420.00	34,000
101	PLP-123	Philippines	Quick-Dry Enamel	Yellow	80	25.00	37,000
102	PLP-159	Philippines	Red Lead Primer	Red	1,000	119.75	39,000
103	PLP-120	Philippines	Quick-Dry Enamel	Lemon Yellow	80	20.00	40,000
104	PLP-225	Philippines	Quick-Dry Enamel	Yellow	80	45.00	48,000
105	PLP-222	Philippines	Quick-Dry Enamel	Lemon Yellow	80	25.00	49,000
106	PLP-220	Philippines	Quick-Dry Enamel	Lemon Yellow	1,000	290.00	49,000
107	PLP-149	Philippines	Quick-Dry Enamel	Yellow	125	29.75	51,000
108	PLP-233	Philippines	Quick-Dry Enamel	Lemon Yellow	250	55.00	54,000
109	PLP-138	Philippines	Quick-Dry Enamel	Lemon Yellow	1,000	130.00	57,000
110	PLP-175	Philippines	Quick-Dry Enamel	Yellow	80	38.00	65,000
111	PLP-200	Philippines	Quick-Dry Enamel	Yellow	250	79.75	66,000
112	PLP-203	Philippines	Quick-Dry Enamel	Lemon Yellow	1,000	140.00	66,000
113	PLP-205	Philippines	Quick-Dry Enamel	Lemon Yellow	1,000	135.00	68,000
114	PLP-150	Philippines	Quick-Dry Enamel	Yellow	250	79.75	77,000
115	PLP-234	Philippines	Red Lead Primer	Red	250	75.00	83,000
116	PLP-204	Philippines	Quick-Dry Enamel	Lemon Yellow	250	60.00	84,000
117	PLP-165	Philippines	Quick-Dry Enamel	Yellow	60	15.00	89,000
118	PLP-164	Philippines	Quick-Dry Enamel	Yellow	80	25.00	94,000
119	PLP-198	Philippines	Quick-Dry Enamel	Lemon Yellow	250	48.00	103,000
120	PLP-174	Philippines	Quick-Dry Enamel	Yellow	250	100.00	114,000
121	PLP-102	Philippines	Quick-Dry Enamel	Lemon Yellow	1,000	177.50	126,000
122	PLP-236	Philippines	Tinting Color	Orange	60	55.00	156,000

Appendix 2. Details of Repacked Paints Purchased in the Philippines Ranked According to Total Lead Content.

Rank	Sample No.	Country of Origin	Type	Color	Volume (mL)	Price (PhP)	Lead Content (ppm)
1	PLP-191	Philippines	Epoxy Enamel	White	250	70.00	<8
2	PLP-177	Philippines	Epoxy Enamel	White	250	75.00	16
3	PLP-227	Philippines	Quick-Dry Enamel	Brown	500	50.00	27
4	PLP-226	Philippines	Quick-Dry Enamel	White	250	50.00	27
5	PLP-112	N/A	Quick-Dry Enamel	Green	250	80.00	39
6	PLP-190	N/A	Red Oxide Primer	Red	250	40.00	47
7	PLP-240	N/A	Epoxy Enamel	White	250	75.00	61
8	PLP-153	Japan	Quick-Dry Enamel	Aluminum	250	100.00	90
9	PLP-243	Philippines	Quick-Dry Enamel	White	1,000	50.00	98
10	PLP-137	N/A	Quick-Dry Enamel	Violet	250	80.00	3,800
11	PLP-132	N/A	Quick-Dry Enamel	Yellow	250	40.00	8,800
12	PLP-196	Philippines	Quick-Dry Enamel	Yellow	250	50.00	30,000
13	PLP-113	N/A	Quick-Dry Enamel	Yellow	250	150.00	47,000
14	PLP-241	N/A	Epoxy Enamel	Yellow	250	80.00	55,000
15	PLP-170	N/A	Quick-Dry Enamel	Moly Orange	250	35.00	59,000
16	PLP-155	Philippines	Quick-Dry Enamel	Lemon Yellow	250	80.00	83,000
17	PLP-192	Philippines	Epoxy Enamel	Yellow	250	70.00	83,000

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