National Report

LEAD IN HOUSEHOLD DUST IN THE PHILIPPINES

October 2014

European Union

EcoWaste Coalition

IPEN
a toxics-free future

NATIONAL REPORT

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Prepared by:

Manny C. Calonzo
Jeiel G. Guarino
Moresa John Rome S. Tolibas
Aileen G. Lucero
Dr. Sara Brosché
Dr. Scott Clark, Professor Emeritus
Valerie Denney
Jack Weinberg

National Report
Lead in Household Dust in the Philippines

October 2014
Produced as part of the Asian Lead Paint Elimination Project
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Disclaimer
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.

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Abbreviations

Organizations and Other Entities

AIHA	American Industrial Hygiene Association
ASTM	American Society for Testing and Materials
CDC	United States Centers for Disease Control and Prevention
CDHS	California Department of Health Services
DENR	Philippine Department of Environment and Natural Resources
DepEd	Philippine Department of Education
DOH	Philippine Department of Health
EPA	United States Environmental Protection Agency
EU	European Union
HUD	United States Department of Housing and Urban Development
IPEN	International POPs Elimination Network
NGO	Non-Governmental Organization
NIOSH	National Institute for Occupational Safety and Health
NVLAP	National Voluntary Laboratory Accreditation Program
SSNC	Swedish Society for Nature Conservation
WHO	World Health Organization

Technical Terms

AAS	Atomic Absorption Spectrophotometry
CCO	Chemical Control Order
ELPAT	Environmental Lead Proficiency Analytical Testing
GDP	Gross Domestic Product
$\mu g/ft^2$	microgram per square foot
ppm	part per million
XRF	X-ray Fluorescence

FOREWORD

This report presents the results from an analysis of lead in dust at 21 locations in the Philippines. The locations include homes, day-care centers and preparatory schools where children spend much time, and might be exposed to high levels of lead.

This report is the second in a series of three reports on lead in paint in the Philippines prepared by the EcoWaste Coalition as part of the IPEN Asian Lead Elimination Project. The first, *Lead in New Enamel Household Paints in the Philippines,* released in 2013, showed that 61 percent of paint brands for sale in the Philippines contained levels of lead above the regulatory limit of 90 parts per million (ppm) set by the Department of Environment and Natural Resources (DENR). A third report, due out in 2015, will follow up on the brands found containing high levels of lead in the 2013 study to determine whether or not paint manufacturers are beginning to reduce lead levels in their paint. In addition, the EcoWaste Coalition conducted two studies on lead in paint in 2008 and 2010, which revealed that nearly 70 percent of the sampled paints contained lead beyond 90 ppm.

Lead contaminated dust and soil is the major pathway by which lead in paint contributes to childhood lead exposure. *Lead in Household Dust in the Philippines* presents documented examples of the presence of lead in dust on floors of houses, day-care centers and schools, demonstrating why the use of household paints with high lead content is a source of serious concern, especially for children's health. It also proposes recommendations for taking action to protect children and others from lead in paint.

Lead in Household Dust in the Philippines 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 property owners, painters, business entrepreneurs and consumers about the adverse human health impacts of lead-based decorative 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.

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The 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, October 2014

Manny C. Calonzo
Regional Specialist
IPEN-Asian Lead Paint Elimination Project

INTRODUCTION

Despite being banned in most industrialized countries decades ago, lead paints continue to be a major source of potential lead poisoning for young children worldwide as some paint companies, mostly small and medium-sized, still manufacture and sell paints with lead compounds as pigments and drying agents. During the 1970s and 1980s, most highly industrial countries adopted laws, regulations or mandatory standards to control the lead content of decorative paints—paints used on the interiors and exteriors of homes, schools, and other child-occupied facilities. Many countries also imposed controls on the lead content of paints used on toys and 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.

Recent data collected by the EcoWaste Coalition showed that a majority of solvent-based, enamel decorative paint brands sold in the Philippines contained high levels of lead (above 90 parts per million, ppm) and could not be legally sold in most industrialized countries. In fact, 61 percent (75 of 122) of analyzed paints in 2013 exceeded the 90 ppm threshold limit set by the Philippines' Department of Environment and Natural Resources (DENR), the highest of which was an orange-colored paint with a lead content of 156,000 ppm. Moreover, bright-colored paints were found to contain the highest levels of lead. Of the 48 paints found to contain dangerously high lead levels greater than 10,000 ppm, 34 were yellow, 9 were orange, 4 were red, and 3 were green.

These findings are consistent with other studies documenting the availability of lead paints in developing countries. Since 2007, NGOs associated with the IPEN network have collected and analyzed decorative paints for sale on the market in 30 developing countries and countries with transitional economies. In every one of these countries, if there was no national law or regulation in force to control the lead content of paints, the majority of the enamel decorative paints for sale on the market contained lead levels above 90 ppm and would be prohibited for sale or use in most highly industrial countries. Many of the paints contained more than 10,000 ppm lead. The concentration of lead in some paints was less than 90 ppm, indicating that lead was not intentionally used in the manufacturing process. In almost all cases, however, there was no way for the consumer to distinguish which enamel decorative paints for sale contained added lead and which did not.

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Lead Paint Terminology

As used in this report, the term *"decorative paint"* refers to paints that are produced for use on the interior or exterior surfaces (e.g., walls, windows, doors and floors) of homes, schools, commercial buildings and similar structures. Decorative paints are frequently used on areas such as walls, doors, gates and windows, as well as household furniture such as cribs, playpens, tables and chairs. The term *"enamel"* as used in this report refers to solvent-based paints. The term *"ppm"* means parts per million total lead by weight in the dried paint sample.
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HOUSEHOLD DUST AND CHILDREN'S EXPOSURE TO LEAD

Children are not generally exposed to lead from new paint while the paint is still in the can or when the paint is being newly applied to a previously unpainted or uncoated surface. However, as paint on household surfaces chips, wears and deteriorates over time, lead present in the deteriorating paint is released and contaminates surrounding surfaces. In this way, lead in the paint will end up in the household dust and soil surrounding the house. Surfaces that are subjected to a lot of wear and tear, such as wooden windows, are major sources of lead contamination in dust (Dixon, et al., 2007). Even homes with intact lead paint are known to have higher dust lead levels. Very large amounts of lead-contaminated dust can also be produced when a surface that was previously painted with lead paint is sanded or scraped in preparation for repainting or remodeling without applying proper safety measures.

Children playing indoors or outdoors get house dust or soil on their hands and then ingest it through normal hand-to-mouth behavior (Lanphear, et al., 2002, and references therein). When the dust or soil is contaminated with lead, the children ingest lead, and lead contaminated dust and soil is the major pathway by which lead in paint contributes to childhood lead exposure (Lanphear, et al., 2002; Lanphear, et al., 1998). Hand-to-mouth behavior is especially prevalent in children aged six years and under, the age group most easily harmed by exposure to lead. It is estimated that a typical one- to six-year-old child ingests approximately 110 milligrams of house dust and soil each day (US EPA, 2008).

Several studies have shown that the presence of lead paint on the interior or exterior of a home and the lead content of the household dust are both strongly linked to children´s blood lead level (Clark, et al., 1985; Gaitens, et al., 2009; Lanphear, et al., 1998). This implies that lead paint remains a significant source of lead exposure to children for many years after it has been applied, even if the more recent coats of paint does not contain lead.

Please see Appendix 3 for additional information on how to reduce exposure to lead dust in your homes.

HEALTH IMPACTS OF EXPOSURE TO LEAD

The health impacts of long-term low level lead exposure in young children are lifelong, irreversible and untreatable. Studies conducted over the last decades have shown harmful effects of lead at much lower blood lead levels, and no safe blood lead level in children has been identified (Bellinger, 2008). As a result, the U.S. Centers for Disease Control and Prevention (CDC) and other authorities have concluded that there is no known acceptable blood lead exposure level for children (CDC, 2013). 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 (Prüss-Üstün and Corvalán, 2006).

Once lead enters a child's body through ingestion or 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 it can also affect the blood system, the kidneys and the skeleton.

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

- A child's brain undergoes very rapid growth, development and differentiation and lead interferes with this process. For example, it has been shown that moderate blood lead exposure (5 to 40 µg/dL) during early childhood is connected to region-specific reductions in adult gray matter volume (Cecil, et al., 2008).

- 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 (WHO, 2010; Mazumdar, et al., 2012).

- 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 addition, children are more likely to have nutritional deficiencies that lead to increased absorption of lead (WHO, 2010).

COSTS OF CHILDHOOD EXPOSURE TO LEAD

Though the economic costs associated with childhood exposure to lead are substantial, they are completely avoidable. Low cost, safe, high quality alternatives to lead have been produced and used for decades in industrialized countries. Eliminating lead in paint in developing countries and countries in transition is particularly important because paint sales in most countries are growing rapidly. Failure to address this problem now will have high social and economic costs later.

Reduced lifelong earnings. When a young child is exposed to lead, the damage to the nervous system makes it more likely that the child will have difficulties in school and may engage in impulsive and violent behavior (Mielke and Zahran, 2012). For example, it has been shown that blood lead levels as low as 2 μg/dL at an early age can cause an impact on end-of-grade tests in elementary school (Miranda, et al., 2007). This impact continues throughout life, has a long-term impact on the child's work performance, and—on average—causes decreased economic success as measured by lifelong earnings.

***Higher social and development costs*.** Widespread lead exposure harms society as a whole by placing an extra burden on the national education system; raising national costs associated with increased crime and incarceration rates; and reducing the overall national productivity of labor. A recent study that investigated 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 (Attina and Trasande, 2013). 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; and
- Asia: $699.9 billion of economic loss or 1.88% of GDP.

***Legacy cleanup costs*.** Current experiences in industrial countries illustrate the significant costs that occur when widespread use of lead paint is allowed. Despite being banned in 1978, three-quarters of homes in the United States still contain leaded paints, and leaded paint remains the primary source of childhood lead poisoning, particularly among children living in poverty (WHO, 2010).

Removing lead paint safely in the average U.S. house can cost anywhere from USD $10,000 to $45,000, a cost usually borne by owners, taxpayers and/or government agencies. The cost to business can also be high. In California, three paint companies were recently required to pay the state USD $1.15 billion to abate lead paint from pre-1978 homes.

[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."

STUDY AIM AND METHOD

This study was undertaken to highlight the presence of high levels of lead in household dust and the associated health hazards. In order to be able to compare the results from the study with recommendations, previous published data, and information about hazardous levels of lead in household dust, the dust wipe method described by the U.S. Department of Housing and Urban Development (HUD) was followed (HUD, 2012). In addition, results from dust wipe analyses have been shown to correlate with children´s blood lead level (Gulson, et al., 2013). The laboratory performing the analyses is accredited for performing lead dust analyses, and the detailed method is described in Appendix 1. A total of 12 private homes, 5 day-care centers and 4 preparatory schools were sampled for this study. Collection of dust wipe samples at different locations is shown in Figure 1.

Figure 1. Collection of Floor Dust Wipe Samples at Different Locations.

RESULTS IN BRIEF

Few countries have regulatory standards limiting the maximum allowed lead content of dust. In the U.S., a surface dust lead loading from a floor area in housing that contains levels equal to or higher than 40 μg/ft^2 is defined by the US EPA as a dust-lead hazard.

However, the 40 μg/ft^2 standard is based on the aim of keeping blood lead levels in 95% of the children exposed at or below 15 μg/dL (Gaitens, et al., 2009). This level is far higher than the 5 μg/dL the US CDC uses for identifying children in need of medical monitoring and lead exposure prevention measures. It should be noted that scientific studies performed over the last decades show that dust lead loadings as low as 10 μg/ft^2 can contribute to blood lead levels harmful to the developing brain (see e.g. Lanphear, et al, 1998; Dixon, et al., 2009).

The results of the lead dust analysis are shown in Appendix 2. Of the 21 locations where lead dust samples were collected, 12 were private homes with children, 5 were day-care centers and 4 were preparatory schools. Of these 21 locations, dust samples from 10 contained lead levels equal to or above 10 μg/ft^2, 3 of which were private homes, 4 day-care centers and 3 preparatory schools. All dust samples from nine of the 12 private homes contained lead levels less than 10 μg/ft^2. Since lead was detected on several painted surfaces in these homes using an x-ray fluorescence (XRF) device, the low levels indicate thorough cleaning practices in the homes. In addition, all samples from one day-care center and one preparatory school also registered lead dust levels below 10 μg/ft^2.

Samples from two preparatory schools contained lead dust levels equal to or greater than 40 μg/ft^2 and the highest level detected was 110 μg/ft^2. This sample was taken in an area near a classroom wall decorated with artworks where paint had chipped off.

Brightly colored walls, gates, doors, furniture and fixtures, as well as the presence of chipping paint were the main considerations in the choice of all sampling locations. XRF screening of painted surfaces prior to the collection of the dust samples indicated varying levels of lead in painted surfaces at the locations sampled as shown in Appendix 2.

In addition, it was generally observed that areas such as entryways to the homes, day-care centers or schools registered a relatively higher level of dust lead as compared to other sites within a room. This can be attributed to the frequency of people carrying dust on their footwear upon entering or exiting rooms.

The distribution of the lead dust levels summarized according to location is shown in Table 1.

Table 1. Summary of Lead Dust Wipe Sample Results.

Type of Location	No. of Locations	Total No. of Samples	No. of Samples (<10 µg/ft²)	No. of Samples (10-39 µg/ft²)	No. of Samples (≥40 µg/ft²)
Private Homes	12	36	33	3	0
Day-care Centers	5	15	9	6	0
Preparatory Schools	4	12	5	1	6
Total	**21**	**63**	**47**	**10**	**6**

CASE STUDY

The EcoWaste Coalition's lead dust sampling team visited 21 private homes, day-care centers and preparatory schools during the summer of 2014 when children were out of school classrooms and on vacation. This helped us thoroughly evaluate potential sources of lead contamination in the various sampling locations.

Based on the laboratory analyses, samples from two of these 21 sampled locations, both preparatory schools, contained lead levels well above 40 μg/ft^2 in the dust collected and would be defined as lead dust hazards by the U.S. EPA. However, as cited earlier, there is a growing body of evidence showing that floor dust level at 10 μg/ft^2 may cause significant, irreversible and detrimental effects to developing fetuses and children. Ten of the 21 locations where samples were taken—three preparatory schools, four day-care centers and three private homes—could be considered as lead-dust hazards if a 10 μg/ft^2 cut-off level was used instead of 40 μg/ft^2.

The detection of high lead dust levels in preparatory schools and childcare facilities, which could have as many as 20 young children in a room per shift, is a matter of serious concern. More often than not, these basic child development centers are brightly painted and decorated with colorful alphabet letters and numbers, animals, plants, flowers and cartoon figures. Also, the chairs, tables, as well as book and toy shelves were usually coated with blue, green or yellow paints that had seen better days and not a few needed extensive repairs.

Table 2. Comparative Results for Two Preparatory Schools.

Sampling Location	XRF Results on Some Furniture and Fixtures	Floor Dust-Lead Levels (μg/ft^2)
Preparatory School 1	Concrete Wall Design (butterfly, yellow) – 190 ppm lead	110
	Concrete Wall Design (tree trunk, brown) – 632 ppm lead	61
	Blackboard (green) – 157 ppm lead	56
Preparatory School 2	Chair (yellow) – 36,000 ppm lead Wooden Wall Lining (red) – 21,300 ppm lead Wooden Wall Lining (yellow) – 21,100 ppm lead Table (blue) – 2,320 ppm lead Blackboard (green) – 2,010 ppm lead	87
	Shelf (yellow) – 26,000 ppm lead Shelf (blue) – 1,880 ppm lead	76
	Concrete Wall Design (duck, yellow) – 16,500 ppm lead Window Grills (beige) – 15,900 ppm lead Concrete Wall Design (grass, green) – 1,540 ppm lead	61

In one preparatory school, the sampling team saw colorful artworks on the classroom wall with crumbling paints. The floor dust sample obtained in this area contained lead at a level of 110 μg/ft^2. In another preparatory school, floor dust samples contained lead levels up to 87 μg/ft^2. The floor dust lead levels at these two locations were almost two to three times higher than the current U.S. EPA lead dust hazard threshold limit of 40

μg/ft^2. As in other sampling locations, these two schools underwent lead paint screening using a handheld XRF spectrometer prior to the dust sampling. Table 2 below presents the XRF screening results vis-à-vis the floor dust results of these two schools.

The relatively lower floor dust lead levels in one school (preparatory school 2) with higher lead levels in paint shown by the XRF screening, as indicated in the preceding table, may be due to the better upkeep and maintenance of the school, which is swept and mopped clean daily. This emphasizes the importance of keeping any place frequented by children safe from lead dust through regular sweeping, mopping the floor and wet wiping of surfaces (please see Appendix 3 for some practical suggestions). The higher dust lead loading in preparatory school 1 may be due to either thicker paint, which when deteriorated would result in higher lead loading, or additional surfaces with high lead content, such as outside or other interior surfaces.

Homeowners or school head teachers at other locations with lower floor dust levels despite the presence of potential sources of lead dust pollution from painted doors, windows and walls, told the sampling team that floors are cleaned on a regular basis. This, again, underscores the positive consequence of having homes and schools properly maintained and cleaned in terms of minimizing lead in dust when leaded paint is present.

However, the threat of childhood lead poisoning may still arise in such homes and schools with lead-painted surfaces including furniture and fixtures. This underlines the need for more systematic interventions such as proper lead paint hazard reduction and the use of certified lead safe paints to permanently eliminate lead-based paint hazards.

While the dust sampling participants were generally aware of the problem with toxic lead in toys and paints and their adverse health effects, thanks to the combined efforts of the EcoWaste Coalition, government regulators and the mass media, their understanding of the hazard of lead-containing dust in the home or school environment is still low. This highlights the need for public information and education activities on the need for lead safe paint products and preventing exposure to lead dust during renovation and repainting, which are recognized as the primary pathway of lead poisoning in children.

RECOMMENDATIONS

GOVERNMENT AND GOVERNMENT AGENCIES

- Ensure strict compliance and enforcement of the DENR Chemical Control Order (CCO) on Lead and Lead Compounds, which prohibits the use of lead in all types of paint beyond 90 ppm (dry weight).
- Establish strong enforcement measures, including periodic monitoring, to ensure paint companies are in compliance with the 90 ppm regulatory standard for all paints.
- Provide incentives to paint companies to swiftly transition from lead to non-lead paint production.
- Require paint can labels with sufficient information indicating the lead content and provide a warning of possible lead dust hazards when disturbing painted surfaces.
- Source only lead safe paints for interiors and exteriors of public buildings and amenities (e.g., parks and playgrounds), government-sponsored housing, schools, day-care centers, medical and sports facilities among others. Specifically, for the Department of Education (DepEd), along with the Department of Environment and Natural Resources (DENR), the Department of Health (DOH) and public interest stakeholders, to embark on an investigative study on lead paint hazards in the public educational system.
- Facilitate training on lead-safe working practices when applying paint to previously painted surfaces.

PAINT INDUSTRY

- Discontinue the use of lead as driers or pigments and other purposes in paint formulations and shift to non-lead substitutes.
- Commit to an expedited switch to producing paint products with lead content below 90 ppm, and provide lead-dust hazard warnings on paint can labels.
- Commit to a third-party certification and labelling program to ensure that all paints sold in the market meet the regulatory standard of 90 ppm that will help customers distinguish between paints that are safe from lead and those that are not.
- Provide information to paint vendors and painters on lead dust hazards that can be distributed to customers.

CONSUMERS

- Ask for certified lead safe paints for healthier homes and patronize businesses that sell unleaded paints.
- If you are concerned about lead paint in your home, please see recommendations in Appendix 3 of this report.

PUBLIC HEALTH ORGANIZATIONS

- Support policy measures that will eliminate childhood lead exposure from all sources.
- Join in efforts to inform the public about childhood health and occupational health risks linked with lead paints and lead dust.
- Promote efforts to make blood lead testing available.
- Encourage specification of "lead safe paints" and need for lead-safe work practice labeling on purchase orders of larger paint consumers such as schools, day-care centers and large housing property owners or managers.

ALL STAKEHOLDERS

- Support policy measures that will eliminate childhood lead exposure from all sources.
- Join in efforts to inform the public about childhood health and occupational health risks linked with lead paints and lead dust.
- Support a third-party certification and labelling program that will ensure all paints sold in the market meet the regulatory standard of 90 ppm and help customers in having an informed choice when buying paints.

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APPENDIX 1. Lead Dust Wipe Sampling Methodology

SELECTION OF SAMPLING LOCATIONS

Floor dust wipe samples were taken indoors in 21 houses, day-care centers and preparatory schools. The following criteria were used in selecting sample locations:

- Structure is either inhabited or frequented by children age 6 years old and below
- Housing or children frequented structure in areas with no visible other potential sources of lead contamination (such as industrial or recycling areas)
- Houses or children frequented structure with damaged paint on the interior surfaces
- Houses or children frequented structure whose interiors are planted in bright colors
- Houses or children frequented structure with painted surfaces that are subjected to a lot of wear and tear, such as wooden windows and wooden door/doorframes
- Houses that have undergone repainting, general renovations, or significant maintenance projects

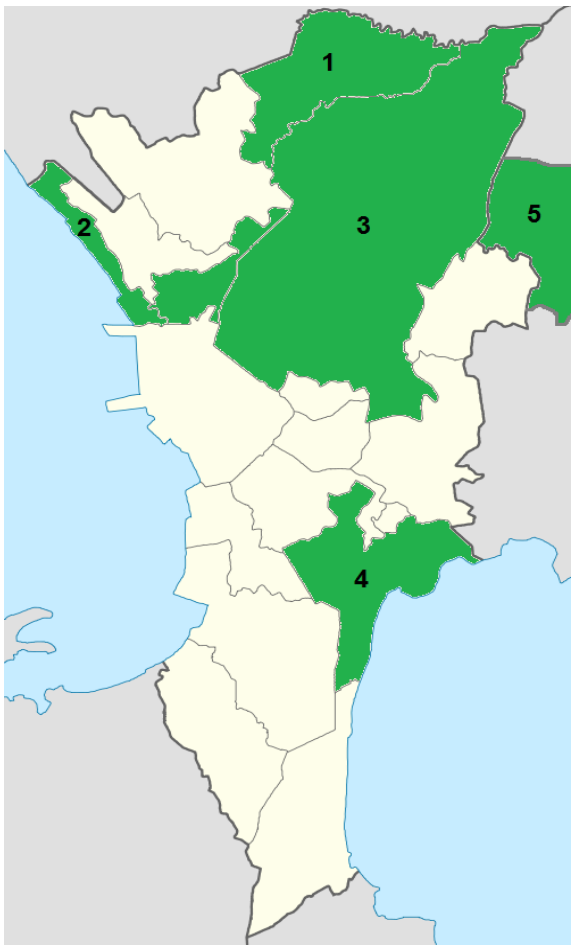

Figure 2. Dust samples were collected in the cities of (1) Caloocan, (2) Navotas, (3) Quezon and (4) Taguig, and in (5) San Mateo, Rizal.

Two months prior to sampling, representatives of the EcoWaste Coalition contacted adult house residents, day-care center and preparatory school teachers whose homes and places of work were identified as having potential lead dust sources in the cities of Caloocan, Navotas, Quezon and Taguig, as well as San Mateo, Rizal (Figure 2). Permission to sample a total of 21 homes and schools was given. In all cases, residents were provided with information about the hazards of lead exposure, the reasons why lead dust sampling at their house or school might be appropriate; and the lead dust sample collection and analysis process. The results from the individual locations (Appendix 2) were shared with each participant prior to the release of this report. Residents were also given information about proper procedures for cleaning lead dust (Appendix 3). The sampling was conducted by representatives of the EcoWaste Coalition.

MATERIALS

The following materials were used for dust wipe sampling:

- Disposable wipes, ASTM standard for lead in surface dust
- Gloves, non-sterilized and non-powdered
- Zip Lock bags
- Tape
- Square plastic template (1 x 1 ft.)
- Wet wipes for cleanup
- Centrifuge tubes (50 mL size), certified lead free

SAMPLE COLLECTION

The dust samples were collected according to the dust wipe method described by the U.S. Department of Housing and Urban Development (HUD, 2012):

1. The surface to be sampled was determined.
2. The template (square-sized with an area of 1 ft^2) was carefully placed on the sample area and the outside edges were taped to the floor to keep it from moving while wiping.
3. The wipes were inspected in order to make sure they were moist, and the plastic containers to make sure they were unopened and still uncontaminated.
4. The caps of the plastic containers were partly unscrewed, and a clean pair of disposable gloves was put on.
5. A first pass with the wipe was applied side-to-side with as many "S"-like motions as are necessary to completely cover the entire sample area.
6. The wipe was folded with the contaminated side facing inward, and a second pass was made top-to-bottom in the same "S"-like manner as the previous pass.
7. The wipe was again folded with the contaminated side facing inward, and a third wipe pass was applied around the perimeter of the sampled area.
8. The wipe was again folded with the contaminated side facing inward again, and inserted without touching anything else into the centrifuge tube. The lid was securely fastened, and the tube labeled.

Field blanks were prepared after every 20 samples by removing a wipe from the package with a new pair of gloves, shaking the wipe open and refolding it in a manner similar to that used during the actual wipe sampling procedure. The blank was inserted in the same way into a centrifuge tube without touching any other surface or object, and the tube labeled with a sample number. All blanks were labeled in a similar way as the dust samples to keep them undisclosed to the lab. Field sampling forms were filled-in and kept throughout the sampling to keep track of each sample identity and details.

The samples were then sent to a laboratory in the US for their total lead content analysis using method NIOSH 7082 (LEAD by Flame AAS).

The lab analyses were performed by the Forensic Analytical Laboratories in Hayward, CA, USA. The lab is fully accredited by the American Industrial Hygiene Association (AIHA), the National Voluntary Laboratory Accreditation Program (NVLAP), and the California Department of Health Services (Cal DHS). The metals laboratory is also successful participants in the ELPAT (Environmental Lead Proficiency Analytical Testing) Program.

Appendix 2. Lead Dust Wipe Study Results According to the Type of Location

Appendix 2.1. Lead Dust Wipe Samples in 4 Preparatory Schools.

Sampling Location	Sampling Site	Paint Characteristics (including XRF results)	Floor Dust-Lead Level (µg/ft²)*
1	Site 1	near wall with chipping paint and yellow butterfly designs containing 190 ppm lead	110
	Site 2	near wall with chipping paint and brown tree trunk design containing 632 ppm lead	61
	Site 3	near blackboard containing 157 ppm lead	56
2	Site 1	near blackboard containing 2,010 ppm lead; near wooden wall with red and yellow lining containing 21,300 ppm lead and 21,100 ppm lead, respectively	87
	Site 2	near concrete wall designed with yellow ducks containing 16,500 ppm lead; near beige window grills containing 15,900 ppm lead	61
	Site 3	entryway to classroom; near blue wall lining containing 122 ppm lead; near yellow cabinet and blue shelf	76
3	Site 1	near yellow shelf with chipping paint containing 8,730 ppm lead	<8
	Site 2	near green shelf with chipping paint containing 1,930 ppm lead	<8
	Site 3	entryway; near yellow door with chipping paint containing 6,360 ppm lead	21
4	Site 1	near black window grills containing 1,250 ppm lead	<8
	Site 2	near flesh window grills containing 288 ppm lead	<8
	Site 3	near orange window grills containing 259 ppm lead	<8

**There is accumulating evidence that dust lead levels as low as 10 µg/ft² can be considered a lead-dust hazard.*

Appendix 2.2. Lead Dust Wipe Samples in 5 Day-care Centers.

Sampling Location	Sampling Site	Paint Characteristics (including XRF results)	Floor Dust-Lead Level (µg/ft²)*
1	Site 1	near blackboard containing 1,380 ppm lead	<8
	Site 2	near gate with red metal frame containing 6,150 ppm lead	37
	Site 3	near yellow bench with chipping paint containing 6,970 ppm lead	<8
2	Site 1	near yellow rectangular table with chipping paint containing 13,300 ppm lead; near blackboard containing 2,850 ppm lead	9
	Site 2	near yellow round table with chipping paint containing 4,920 ppm lead	<8
	Site 3	entryway; near beige gate with chipping paint containing 2,770 ppm lead	33
3	Site 1	near pink concrete wall containing 537 ppm lead	15
	Site 2	near yellow cupboard containing 447 ppm lead; near white sink with chipping paint containing 739 ppm lead	18
	Site 3	near gray shelf and gray table containing 291 ppm lead and 187 ppm lead, respectively	22
4	Site 1	near yellow chairs with chipping paint containing 11,600 ppm lead	<8
	Site 2	near blue chair with chipping paint containing 4,320 ppm lead	8
	Site 3	near yellow table with chipping paint containing 3,270 ppm lead	10
5	Site 1	entryway; near beige gate with chipping paint containing 1,160 ppm lead	<8
	Site 2	near yellow table with chipping paint containing 3,860 ppm lead	<8
	Site 3	near blackboard containing 112 ppm lead	<8

**There is accumulating evidence that dust lead levels as low as 10 µg/ft² can be considered a lead-dust hazard.*

Appendix 2.3. Lead Dust Wipe Samples in 12 Private Homes.

Sampling Location	Sampling Site	Paint Characteristics (including XRF results)	Floor Dust-Lead Level (µg/ft²)*
1	Site 1	entryway; near orange gate containing 100,000 ppm lead	26
	Site 2	entryway; near yellow-green door	<8
	Site 3	entryway; near green wall with chipping paint	<8
2	Site 1	entryway; near yellow door with chipping paint containing 5,520 ppm lead	<8
	Site 2	near yellow wall with chipping paint containing 1,490 ppm lead; near green window frame with chipping paint containing 1,800 ppm lead	8
	Site 3	below the carpet; near brown shelf	14
3	Site 1	entryway; near beige concrete bench containing 3,270 ppm lead	10
	Site 2	near white concrete wall with chipping paint containing 3,440 ppm lead	<8
	Site 3	entryway; near brown door	<8
4	Site 1	entryway; near gate with chipping paint containing 19,500 ppm lead and 18,600 ppm lead for the yellow and green paints, respectively	<8
	Site 2	entryway; near green wall	<8
	Site 3	near green wall and baby's crib	<8
5	Site 1	entryway; near light brown door containing 2,530 ppm lead	<8
	Site 2	entryway; near flesh door with chipping paint containing 418 ppm lead	<8
	Site 3	entryway; near white gate containing 16,600 ppm lead	<8
6	Site 1	entryway; near black door with chipping paint containing 1,080 ppm lead; near concrete wall with brown lining containing 2,190 ppm lead	<8
	Site 2	entryway; near brown metal stair railings with chipping paint containing 5,660 ppm lead	<8
	Site 3	near brown cupboard door containing 988 ppm lead	<8
7	Site 1	entryway; near green window grills containing 2,050 ppm lead	<8
	Site 2	near stairs with beige-colored spiral metal designs with chipping paint containing 3,370 ppm lead	<8
	Site 3	entryway; near flesh door containing 878 ppm lead	<8
8	Site 1	near brown concrete wall lining containing 1,520 ppm lead	<8
	Site 2	entryway; near white door containing 1,930 ppm lead; near white door grills containing 27,000 ppm	<8

		lead	
	Site 3	entryway; near blue wooden wall lining containing 570 ppm lead; near white door with chipping paint containing 1,740 ppm lead	<8
9	Site 1	beneath spiral staircase with chipping yellow paint containing 33,400 ppm lead	<8
	Site 2	near brown window grills containing 1,020 ppm lead	<8
	Site 3	near cupboard with brown metal frame with chipping paint containing 4,410 ppm lead	<8
10	Site 1	entryway; near flesh door with chipping paint containing 238 ppm lead	<8
	Site 2	near flesh window grills with chipping paint containing 340 ppm lead	<8
	Site 3	beneath wooden stairs with flesh paint containing 139 ppm lead	<8
11	Site 1	near entryway; near pink concrete wall with chipping paint containing 1,050 ppm lead; near orange door frame containing 1,210 ppm lead	<8
	Site 2	near pink concrete wall with chipping paint containing 2,400 ppm lead; near table with red metal legs containing 16,300 ppm lead	<8
	Site 3	near stairs with chipping gray concrete wall lining containing 4,060 ppm lead	<8
12	Site 1	near blue wooden wall with chipping paint containing 1,510 ppm lead	<8
	Site 2	near blue concrete wall containing 515 ppm lead; near brown window grills containing 6,380 ppm lead	<8
	Site 3	near green cupboard door with chipping paint containing 162 ppm lead	<8

**There is accumulating evidence that dust lead levels as low as 10 µg/ft² can be considered a lead-dust hazard.*

Appendix 3. Keeping Your Home Lead Dust Free

Keep your home clean through wet wiping. Ordinary household dust and dirt may contain lead. Children can swallow lead or breathe lead contaminated dust if they play in places with abundant dust or dirt and then put their fingers or toys in their mouths, or if they eat without washing their hands first.

- Keep the areas where your children play as dust-free and clean as possible.
- Wash pacifiers and bottles after they fall on the floor. Keep extras handy.
- Clean floors, window frames, window sills and other surfaces weekly. Use a mop, sponge or paper towel with warm water and a general all-purpose cleaner.
- Thoroughly rinse sponges and mop heads after cleaning dirty and dusty areas.
- Wash toys and stuffed animals regularly.
- Make sure your child does not chew on anything covered with lead paint, such as painted window sills, cribs or playpens.

Handle surfaces painted with lead carefully. Families have been poisoned by scraping or sanding lead paint without adequate dust control because these activities generate large amounts of lead dust. Lead dust from repairs or renovations of older buildings can remain in the building long after the work is completed. Heating paint to loosen it so that it can be removed may release lead into the air.

- Don't burn painted surfaces (wood, metal, etc.) as it may contain lead and thus release dangerous amounts of lead into the air.
- Don't utilize dry sanding of surfaces since it will create and disburse large amounts of lead dust if the surface contains lead paint.
- Children and pregnant women should not be present in housing undergoing substantial renovationg, or participate in activities that disturb old paint such as prior to repainting, or clean up paint debris after work is completed.
- Isolate areas when wet sanding or scraping or other activities disturbing painted surfaces from living and play areas. Close and lock doors to keep children away from dusty areas or where paint is chipping or peeling. Cover holes in walls or seal off openings so children are not exposed to lead dust.

Try to avoid bringing lead dust into the home. People may unknowingly bring lead at home via their hands, feet or clothes.

- If possible, people working in construction, demolition or painting or who work with batteries, or in a radiator repair shop or lead factory should wear protective outer clothing and foot covers, or change their clothes and shower before going home. If that is not possible, keep work clothes separate from other household items and away from children.
- Try to keep children from eating dirt and make sure they wash their hands when they come inside or eat.

Eat right. Feed children healthy, low-fat foods high in calcium, iron and vitamin C. Lead in the body stops good vitamins, such as iron and calcium, from working right.