Lead Paint Alliance Toolkit for Establishing Laws to Control the Use of Lead in Paint

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Outline

• Overview of the Toolkit
• Module Bi: Health impacts
• Module Biili: Economic impacts
Overview of the Toolkit

- Provides information on health and environmental concerns
- Explains test methods
- Describes existing paint market
- Shows how to establish laws

Structure:
- Understanding the Problem
- Identifying the Market
- Taking Action
Understanding the Problem

Modules in this section:

• Module A. Lead Paint and the Problem
• Module B.i. Health Hazards of Lead
• Module B.ii. Environmental Impact of Lead
• Module B.iii. Economic Impact
• Module C.i. Analytical Methods for Measuring Lead in Blood
• Module C.ii. Analytical Methods for Measuring Lead in Paint
Identifying the Market

Modules in this section:
• Module D. Industry Perspective on the Elimination of Lead Paint
• Module E. Alternatives to Lead in Paint
• Module F. Summary of Lead in Paint Testing in Developing Countries
• Module G. Challenges for Small and Medium Paint Manufacturers
Taking Action

Modules in this section:

• Module H (i-iv). 4 Case Studies on Existing Lead Paint Laws (European Union, United States, Uruguay and Philippines)
• Module I. Conducting lead awareness-raising campaigns
• Module J. Developing Legal Limits on Lead in Paint
Module Bi
Health Hazards of Lead
Sources of lead release

Natural (volcanic, weathering of rocks)

Anthropogenic sources:

- mobilization of lead in raw materials such as fossil fuels and other extracted and treated ores and metals
- direct releases from waste to soil and aquatic environments
- releases during the manufacture, use and disposal of products using lead (e.g. paint, batteries, toys)
  - prior to the removal of lead from gasoline in most countries, leaded gasoline was a significant source of lead

Lead is mainly emitted in particle form, is transported through the atmosphere and settles on soil, plants, water etc
Multiple pathways of exposure to lead from paint

- Paint manufacture
- Paint application & removal
- Decaying paint
- Lead-painted toys, furniture

Lead in air → Inhalation
Lead in dust & soil → Ingestion

Body burden e.g. blood lead concentration.
Health outcomes e.g. reduced IQ, abdominal colic, anaemia
Ingestion is an important route of exposure for children

Children may ingest contaminated dust and paint chips

Children with pica are at particularly high risk – severe poisoning may occur

Picture is a radiograph of a child with lead poisoning from eating lead paint, showing paint chips (white spots) dispersed throughout the gut
Lead accumulates in the body

Bound to red blood cells and distributes to soft tissues, e.g. brain and kidneys, and to bone

Stored in bone for many years (half-life = 10 – 25 years)

Lead in bone provides a pool from which lead can move back into blood and to target organs
e.g. during pregnancy, lactation and the menopause
Lead is a multi-system toxicant

Brain & nervous system damage
Hearing problems
Muscle & joint pain
Anaemia
High blood pressure
Reproductive problems (adults)

Decreased IQ
Learning difficulties
Speech, language and behaviour problems
Slow or reduced growth
Kidney damage
Digestive problems
No known threshold for toxic effects – US National Toxicology Program assessment of evidence

Table 1.1: NTP conclusions on health effects of low-level Pb by life stage

<table>
<thead>
<tr>
<th>Life Stage</th>
<th>Blood Pb Level</th>
<th>NTP Conclusion</th>
<th>Principal Health Effects</th>
<th>Bone Pb Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children</td>
<td>&lt;5 μg/dL</td>
<td>Sufficient</td>
<td>Decreased academic achievement, IQ, and specific cognitive measures; increased problem behaviors</td>
<td>Tibia and dentin Pb are associated with attention-deficit hyperactivity disorder and cognition. Children does not have reduced fetal growth.</td>
</tr>
<tr>
<td></td>
<td>Limited</td>
<td>Decreased academic achievement &amp; IQ, &amp; increased problem behaviours</td>
<td>Effects on kidney, reduced fetal growth</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&lt;10 μg/dL</td>
<td>Sufficient</td>
<td>Delayed puberty, decreased IQ, and decreased head circumference</td>
<td>Any age – asthma, eczema, cardiovascular</td>
</tr>
<tr>
<td></td>
<td>Limited</td>
<td>Increased hypersensitivity to allergens and increased IgE</td>
<td>Any age – asthma, eczema, cardiovascular</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Inadequate</td>
<td>Any age – asthma, eczema, cardiovascular</td>
<td>Any age – asthma, eczema, cardiovascular</td>
<td></td>
</tr>
<tr>
<td>Adults</td>
<td>&lt;5 μg/dL</td>
<td>Sufficient</td>
<td>Reduced risk of seizures</td>
<td>The association between bone Pb and cardiovascular effects is more consistent than for blood Pb.</td>
</tr>
<tr>
<td></td>
<td>Limited</td>
<td>Increased incidence of essential tremor</td>
<td>No data</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&lt;10 μg/dL</td>
<td>Sufficient</td>
<td>Increased blood pressure, increased risk of hypertension, and increased incidence of essential tremor</td>
<td>The association between bone Pb and cognitive decline is more consistent than for blood Pb.</td>
</tr>
<tr>
<td></td>
<td>Limited</td>
<td>Psychological effects, decreased cognitive function, decreased hearing, increased incidence of ALS, and increased cardiovascular-related mortality; maternal blood Pb associated with increased incidence of spontaneous abortion and preterm birth</td>
<td>No data</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Inadequate</td>
<td>Immune function, stillbirth, endocrine effects, birth defects, fertility or time to pregnancy**, sperm parameters**</td>
<td>No data</td>
<td></td>
</tr>
</tbody>
</table>

**Abbreviations**: ALS, amyotrophic lateral sclerosis; IgE, immunoglobulin E; IQ, intelligence quotient

*Increased serum IgE is associated with hypersensitivity; however, as described in Section 1.4.3, increased IgE does not equate to disease.

**The NTP concludes that there is inadequate evidence that blood Pb levels <10 μg/dL are associated with fertility, time to pregnancy, and sperm parameters; however, given the basis of the original nomination, the NTP evaluated the evidence that higher blood Pb levels (i.e., >10 μg/dL) are associated with reproductive and developmental effects, and those conclusions are discussed in Section 1.4.6 and presented in Table 1.2.
Who is at risk? Children

Children have greater exposure:

- play on the ground, hand-to-mouth activity, mouthing objects
- absorb 4-5 times more lead from the gut than adults

Fetal period and early childhood are critical periods for neurological and other organ development

Damage to the neurological system may be permanent

- reduces a child's potential for intellectual development
- increases the likelihood of behavioural disorders
Who is at risk? Pregnant women

Pregnancy mobilizes lead stored in bone, releasing it back into blood where it can be circulated to maternal tissues and the fetus.

Increased risk of hypertension during pregnancy – may be greater risk of pre-eclampsia.

Exposure of pregnant women can result in exposure of the fetus – may cause reduced fetal growth.
Lead causes significant burden of disease

- 853,000 deaths in 2013 from long-term effects
- Estimated to account for:
  - 9.3% of the global burden of idiopathic intellectual disability
  - 6.6% of the global burden of stroke
  - 4% of the global burden of ischaemic heart disease

(estimates by Institute for Health Metrics and Evaluation 2015)
Small IQ reduction has significant societal impact (mean IQ 100)

(Reference 4)
Small IQ reduction has significant societal impact (mean IQ 95)
Module Biii?
Economic Impact of Childhood Lead Exposure
Estimated Costs of Childhood Lead Exposure in Low- and Middle-Income Countries

• Total estimated cost in LMICs = $977 billion (range $728.6–1162.5 billion) of international dollars in 2008

• Regional economic losses estimated as:
  ➢ Africa: $134.7 billion, i.e. 4.03% of regional GDP

• Source: Attina TM, Trasande L (2013) Economic Costs of Childhood Lead Exposure in Low- and Middle-Income Countries. Environ Health Perspect 121(9): 1097-110
Developing Countries have been left behind

- Overall burden associated with childhood lead exposure in LMICs amounted to 1.20% of world GDP in 2011; approximately $977 billion international dollars in 2008.

- For comparison, economic impact of lead exposure in the U.S. and in EU countries is $50.9 and $55 billion, respectively.
Costs of Childhood Lead Exposure

Total Estimated Cost of lead exposure in countries shown = $977 Billion USD

http://www.med.nyu.edu/pediatrics/research/environmentalpediatrics/leadexposure
Costs of Childhood Lead Exposure, % of GDP
Country specific example: Cameroon

<table>
<thead>
<tr>
<th>Region</th>
<th>Cost</th>
<th>Average Blood Lead Level</th>
<th>Presumed IQ Loss</th>
<th>Lost Lifetime Economic Productivity per IQ Point</th>
<th>Population under 5 years of age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cameroon</td>
<td>$2.52 billion</td>
<td>6.45 µg/dl</td>
<td>2 million points</td>
<td>$1,247</td>
<td>611,000 children</td>
</tr>
</tbody>
</table>

Cost as percent of GDP: 5.28%

Cost Compared to the region:

- 15 Millions
- 300 Billions

Percent GDP Loss Compared to the region:

- 0%
- 10%
### Comparison with Net Overseas Development Assistance in Africa

<table>
<thead>
<tr>
<th>Country</th>
<th>Net ODA for 2008 (US $, millions)</th>
<th>Lost economic productivity per each 1-year cohort of children under 5yrs (US $, millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cameroon</td>
<td>$299</td>
<td>$1,260</td>
</tr>
<tr>
<td>Côte d'Ivoire</td>
<td>$200</td>
<td>$881</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>$1,845</td>
<td>$1,790</td>
</tr>
<tr>
<td>Ghana</td>
<td>$726</td>
<td>$860</td>
</tr>
<tr>
<td>Kenya</td>
<td>$955</td>
<td>$1,504</td>
</tr>
<tr>
<td>Mozambique</td>
<td>$1,345</td>
<td>$812</td>
</tr>
<tr>
<td>Nigeria</td>
<td>$638</td>
<td>$4,866</td>
</tr>
<tr>
<td>Rwanda</td>
<td>$452</td>
<td>$316</td>
</tr>
<tr>
<td>South Africa</td>
<td>$882</td>
<td>$8,854</td>
</tr>
<tr>
<td>Tanzania</td>
<td>$1,373</td>
<td>$1,241</td>
</tr>
<tr>
<td>Uganda</td>
<td>$1,009</td>
<td>$1,062</td>
</tr>
<tr>
<td>Zambia</td>
<td>$705</td>
<td>$721</td>
</tr>
</tbody>
</table>

Sources: Attina & Trasande, 2013; OECD iLibrary; ODA Official development assistance disbursements
Summary

• There is no safe level of lead – children are especially at risk

• The economic impact of lead exposure is enormous

• The Lead Paint Alliance Regulatory Toolkit provides helpful information to establish laws to eliminate lead in paint
Thank you

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