Health and economic impacts of lead and lead paint
Outline

• Overview
• Sources and routes of exposure
• Health effects
• Societal impacts
Overview

• Lead exerts toxic effects in almost all body systems.
• Lead is especially harmful for children and pregnant women and there is no known safe exposure level.
• Lead paint is a source of human exposure to lead
• Added to paint to obtain specific characteristics, e.g., colour, rapid drying, corrosion resistance
• Safer, non-lead paint additives are available.
• Lead paint is an avoidable source of exposure to lead.
Multiple pathways of exposure to lead from paint

- Paint manufacture
- Paint application & removal
- Decaying paint
- Lead-painted toys, furniture
- Lead in air
  - Inhalation
  - Body burden e.g. blood lead concentration
  - Health outcomes e.g. reduced IQ, abdominal colic, anaemia
- Lead in dust & soil
  - Ingestion
Lead is a multi-system toxicant

- No known level of exposure without harmful effects
- Mimics calcium and iron in the body so has effects in multiple body systems
- Accumulates in bone
- Long-term effects include reduced IQ, antisocial behaviour, cardiovascular & renal disease
Children are especially vulnerable

• Greater exposure:
  ➢ spend more time on the ground and in contact with contaminated soil and dust
  ➢ hand-to-mouth activity, mouthing
  ➢ absorb 4–5 times more lead from the gut than adults

• Early childhood is critical period for neurological and organ development

• Damage may be permanent
  ➢ reduced potential for intellectual development
  ➢ increased likelihood of behavioural disorders
Pregnant women are vulnerable

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

• Lead exposure may cause reduced fetal growth

• Lead exposure in pregnancy increases risk of complications e.g. hypertension, premature birth
Lead causes significant burden of disease

Estimates from Institute for Health Metrics and Evaluation (IHME), 2017 data

• 1.06 million deaths from long-term effects
• 24.4 million disability adjusted life years (DALYs) lost
• 63.2% of the global burden of idiopathic developmental intellectual disability
• 10.3% of hypertensive disease

https://vizhub.healthdata.org/gbd-compare/
Small IQ reduction has significant societal impact

Distribution of IQ scores in sample population

**Mean IQ = 100**

Distribution of IQ scores in sample population

**Mean IQ = 95**
Economic costs of lead exposure are high

• Estimated economic losses due to reduced IQ is ~1.2% of global GDP

• Largest economic burden is borne by low- and middle-income countries – approx. $977 billion

• Regional economic losses in Africa approx. $134.7 billion (4.03% of regional GDP)

• Attina TM, Trasande L. Economic costs of childhood lead exposure in low- and middle-income countries. Environ Health Perspect. 2013 Sep;121(9):1097-102
Economic benefits of action are significant

• Banning lead paint now saves future costs
  ➢ Avoids future costs of lead exposure resulting from use of lead paint now, e.g., cost of reduced IQ, cost of criminality
  ➢ Avoids future costs of hazard controls for legacy paint e.g. remediation
    o estimated costs of remediating lead-painted homes:
      France: US$ 194 – 499 million
      USA: US$ 1 – 11 billion


Conclusions

• Lead has wide-ranging effects on health – these have personal, societal and economic impacts

• Lead paint is an important source of exposure to lead

• Prevention - through banning lead paint - is better (and cheaper) than dealing with consequences later

• There is now an opportunity to take action on lead paint to protect future generations from this source of lead exposure