INTER-SECTORAL EXPERT WEBINAR ON LEAD POLLUTION AND EXPOSURE IN G20 COUNTRIES

WELCOME.

THE MEETING WILL START AT

8:00 AM ET

ANGELA BANDEMEHR

Moderator, US EPA

VALERIE HICKEY

Global Director for
Environment, World Bank

SARAH NELEN

Acting Director, Green Diplomacy and Multilateralism, European Commission, EU

MARK KASMAN

Director, Office of International Affairs, US EPA

MEETING OBJECTIVES

- Raise awareness within and across G20 tracks about the issue of lead sources and exposure;
- Provide information about the sources and impacts of lead exposure and actions to prevent and reduce them; and
- Share experiences about how to address lead source and exposure in G20 countries with a focus on low- and middle-income countries.

MEETING AGENDA

$8 – 8^{15}$ AM:	**WELCOME AND INTRODUCTION** • Welcome • Overview of Agenda and Webinar Objectives
$8^{15} – 9^{05}$ AM:	**BACKGROUND ON COUNTRIES AND REGIONS MOST EFFECTED BY LEAD POISONING** • Global health burden and cost of lead exposure in children and adults • Summary of existing information and activities on lead exposure and sources in lower- and middle-income countries • Lead and Drinking Water: Opportunities to reduce exposure and improve health • Partnership for a Lead-Free Future
$9^{05} – 9^{15}$ AM:	**QUESTION AND ANSWER SESSION**
$9^{15} – 9^{55}$ AM:	**WHAT IS BEING DONE?** • Recycling of Used Lead Acid Batteries • Addressing Sources of Lead Exposure: Focus on Educational Settings • Surveillance of Blood Lead Levels • Lead Prevention and Reduction in Industrial Emissions
$9^{55} – 10^{25}$ AM:	**DISCUSSION OF EXPERIENCES AND OPTIONS FOR ACTION**
$10^{25} – 10^{30}$ AM:	**SUMMARY AND CLOSING**

GLOBAL HEALTH BURDEN AND COST OF LEAD EXPOSURE IN CHILDREN AND ADULTS

Michael Brauer, Institute for Health Metrics

Institute for Health
Metrics and Evaluation

Global lead exposure and disease burden

Michael Brauer

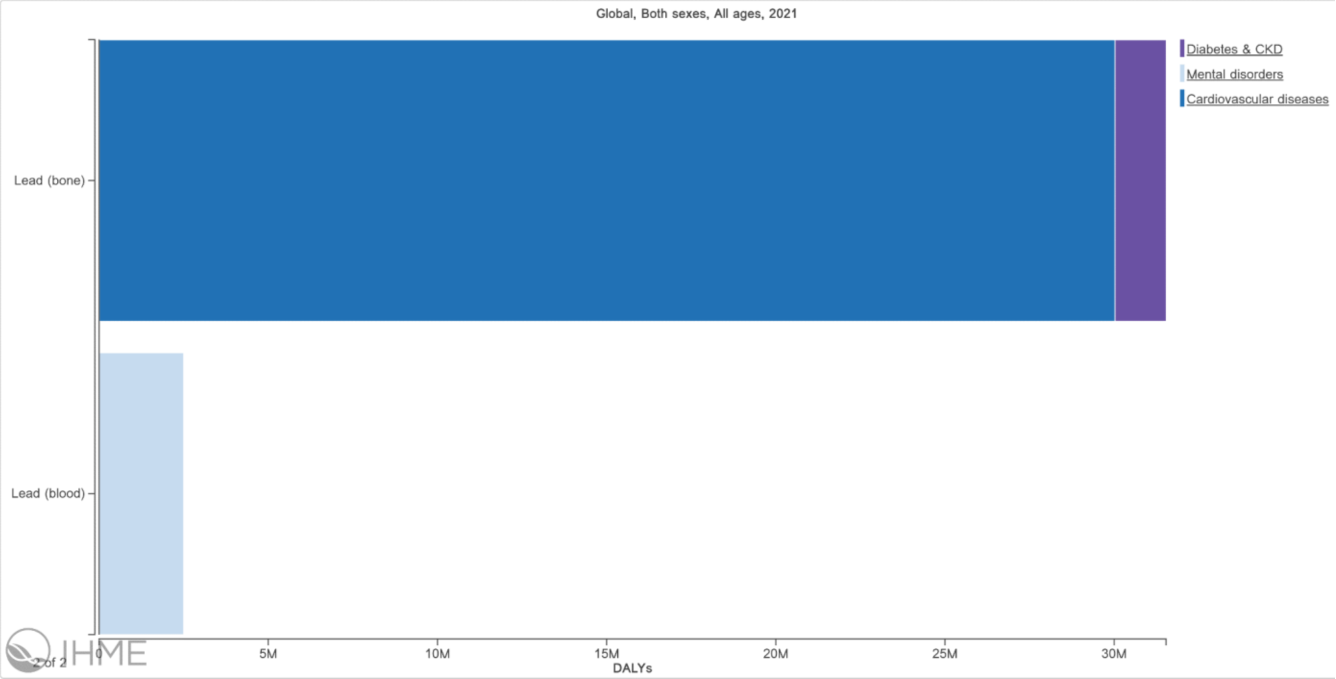
November 5, 2024

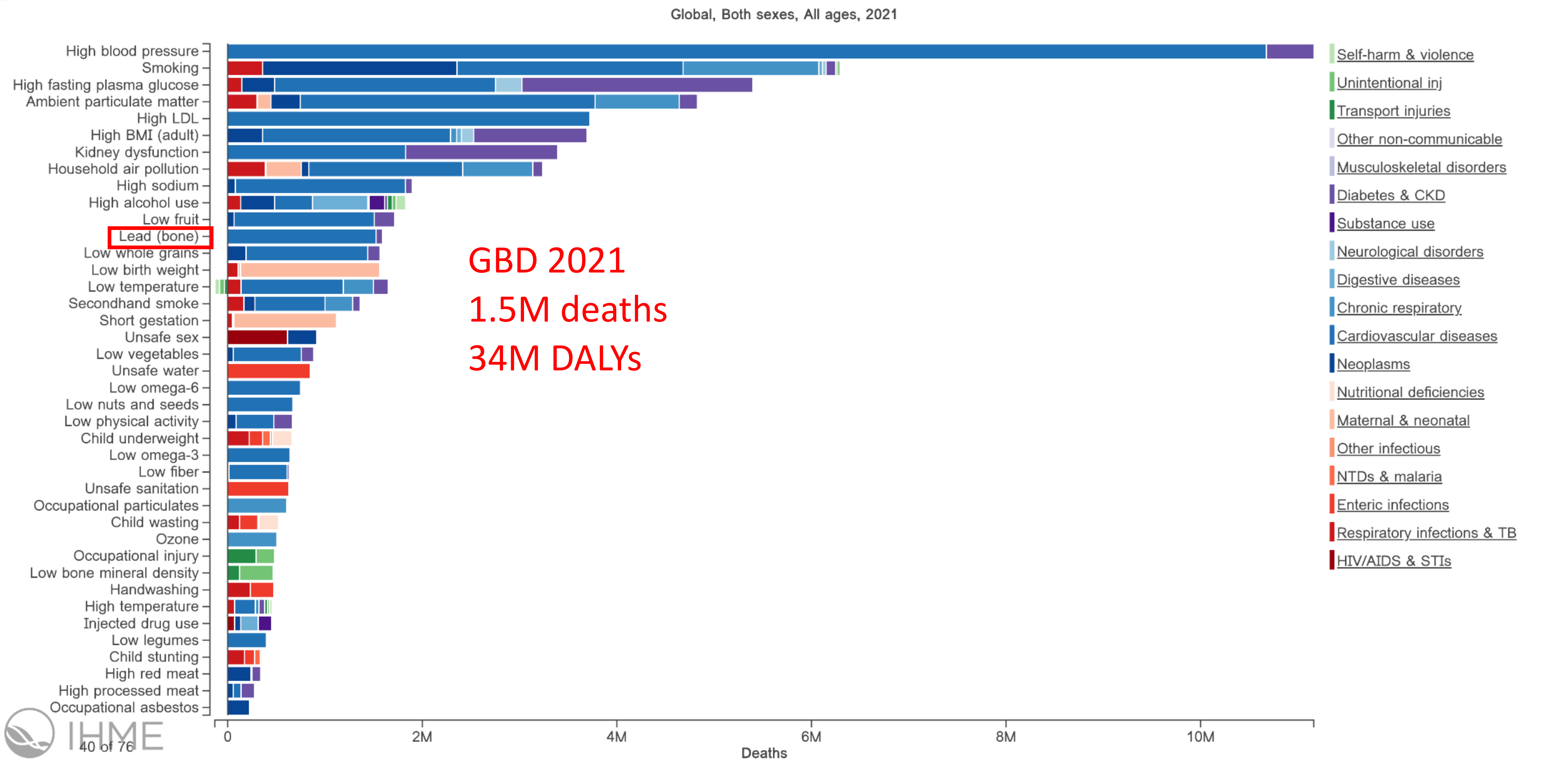
UNIVERSITY of WASHINGTON

Lead exposure and global disease burden

In general…

- **Blood** lead levels
  - Reflect more recent exposures
  - Predict **IQ loss** in children
- **Bone** lead levels
  - Reflect cumulative exposures
  - Predict Cardiovascular Disease (**CVD)** in adults
- **Adult CVD drives total burden**





Global, Both sexes, All ages, 2021
High blood pressure
Smoking
High fasting plasma glucose
Ambient particulate matter
High LDL
High BMI (adult)
Kidney dysfunction
Household air pollution
High sodium
High alcohol use
Low fruit
Lead (bone)
Low whole grains
Low birth weight
Low temperature
Secondhand smoke
Short gestation
Unsafe sex
Low vegetables
Unsafe water
Low omega-6
Low nuts and seeds
Low physical activity
Child underweight
Low omega-3
Low fiber
Unsafe sanitation
Occupational particulates
Child wasting
Ozone
Occupational injury
Low bone mineral density
Handwashing
High temperature
Injected drug use
Low legumes
Child stunting
High red meat
High processed meat
Occupational asbestos
GBD 2021
1.5M deaths
34M DALYs
0
2M
4M
6M
8M
10M
Deaths
Self-harm & violence
Unintentional inj
Transport injuries
Other non-communicable
Musculoskeletal disorders
Diabetes & CKD
Substance use
Neurological disorders
Digestive diseases
Chronic respiratory
Cardiovascular diseases
Neoplasms
Nutritional deficiencies
Maternal & neonatal
Other infectious
NTDs & malaria
Enteric infections
Respiratory infections & TB
HIV/AIDS & STIs
IHME

Figure 2. Leading 25 Level 3 risk factors by attributable DALYs, percentage of total DALYs (2000 and 2021) and percentage change in attributable number of DALYs and age-standardised DALY rates from 2000 to 2021 for both sexes and for all ages

31% **increase** in lead burden 2000 – 2021

Leading risks 2000	Percent DALYs 2000	Leading risks 2021	Percent DALYs 2021	Percent change number of DALYs 2000-2021	Percent change age-standardized rate of DALYs 2000-2021
1 Particulate matter pollution	10.5 (8.6 to 12.0)	1 Particulate matter pollution	8.1 (6.7 to 9.5)	-16.2 (-24.3 to -6.8)	-40.7 (-45.9 to -35.1)
2 Child growth failure	9.4 (7.3 to 11.0)	2 High systolic blood pressure	7.8 (6.5 to 9.0)	36.2 (29.8 to 43.7)	-22.8 (-26.2 to -18.7)
3 Low birth weight and short gestation	9.1 (8.6 to 9.7)	3 Smoking	5.7 (1.8 to 9.5)	12.6 (3.7 to 21.6)	-33.6 (-38.8 to -28.5)
4 High systolic blood pressure	6.2 (5.3 to 7.1)	4 Low birth weight and short gestation	5.6 (5.0 to 6.3)	-32.5 (-40.6 to -21.6)	-33.1 (-41.2 to -22.1)
5 Smoking	5.5 (1.8 to 8.9)	5 High fasting plasma glucose	5.4 (4.8 to 5.9)	90.5 (83.7 to 96.4)	9.8 (6.0 to 13.7)
6 Unsafe water source	4.0 (2.4 to 5.1)	6 High body-mass index	4.3 (2.0 to 6.5)	100.1 (91.1 to 109.7)	18.1 (12.7 to 24.1)
7 Unsafe sanitation	3.4 (2.9 to 4.0)	7 High LDL cholesterol	3.0 (1.9 to 4.0)	28.3 (22.9 to 35.0)	-25.0 (-28.2 to -20.9)
8 High fasting plasma glucose	3.1 (2.7 to 3.4)	8 Kidney dysfunction	2.9 (2.6 to 3.2)	50.5 (42.6 to 58.1)	-10.0 (-14.9 to -5.3)
9 High LDL cholesterol	2.6 (1.6 to 3.4)	9 Child growth failure	2.7 (1.7 to 3.7)	-68.0 (-75.8 to -59.9)	-69.7 (-77.1 to -62.0)
10 Unsafe sex	2.6 (2.1 to 3.1)	10 High alcohol use	2.5 (2.1 to 3.1)	13.1 (4.5 to 22.7)	-25.2 (-30.9 to -19.4)
11 High alcohol use	2.4 (2.0 to 3.1)	11 Unsafe water source	1.5 (0.8 to 2.1)	-58.3 (-65.4 to -50.5)	-64.6 (-70.4 to -57.1)
12 High body-mass index	2.4 (1.1 to 3.6)	12 Unsafe sex	1.5 (1.4 to 1.7)	-34.3 (-43.5 to -18.4)	-51.8 (-58.2 to -40.9)
13 No access to handwashing facility	2.3 (-0.5 to 4.7)	13 Diet low in fruits	1.5 (0.7 to 2.2)	24.0 (17.7 to 37.5)	-25.4 (-29.1 to -17.9)
14 Kidney dysfunction	2.1 (1.9 to 2.3)	14 Diet high in sodium	1.4 (0.3 to 3.2)	28.9 (4.8 to 42.8)	-25.8 (-39.0 to -18.4)
15 Occupational injuries	1.6 (1.5 to 1.7)	15 Diet low in whole grains	1.4 (0.7 to 2.1)	31.2 (25.6 to 38.1)	-22.4 (-25.5 to -18.3)
16 Secondhand smoke	1.6 (0.1 to 2.8)	16 Secondhand smoke	1.2 (0.5 to 1.9)	-14.4 (-42.7 to 291.6)	-43.8 (-58.0 to 27.5)
17 Diet low in fruits	1.3 (0.6 to 2.0)	17 Iron deficiency	1.2 (0.9 to 1.6)	1.9 (-2.0 to 4.9)	-17.8 (-20.9 to -15.4)
18 Iron deficiency	1.3 (1.0 to 1.6)	18 Lead exposure	1.2 (-0.0 to 2.3)	30.6 (16.7 to 49.2)	-22.2 (-27.0 to -17.2)
19 Suboptimal breastfeeding	1.2 (0.9 to 1.5)	19 Unsafe sanitation	1.2 (0.9 to 1.4)	-62.4 (-68.6 to -53.7)	-67.9 (-73.4 to -59.7)
20 Diet high in sodium	1.2 (0.3 to 2.7)	20 Occupational injuries	1.1 (1.0 to 1.2)	-26.1 (-33.5 to -18.0)	-44.3 (-49.8 to -38.3)
21 Diet low in whole grains	1.2 (0.6 to 1.7)	21 Drug use	1.0 (0.8 to 1.1)	31.5 (24.1 to 38.4)	-4.3 (-9.4 to 0.3)
22 Lead exposure	1.0 (-0.0 to 1.9)	22 No access to handwashing facility	0.9 (-0.2 to 1.8)	-59.2 (-67.7 to -51.3)	-64.4 (-73.7 to -56.9)
23 Low temperature	0.9 (0.8 to 1.0)	23 Low temperature	0.9 (0.8 to 1.0)	10.6 (-2.2 to 23.9)	-38.5 (-43.6 to -33.1)
24 Drug use	0.8 (0.7 to 0.9)	24 Diet low in vegetables	0.7 (0.4 to 1.0)	23.6 (14.3 to 34.3)	-27.0 (-32.2 to -20.8)
25 Diet low in fiber	0.6 (0.3 to 1.0)	25 Diet low in omega-6 polyunsaturated fatty acids	0.6 (-1.9 to 2.2)	32.9 (22.9 to 39.7)	-20.9 (-24.6 to -16.0)
26 Diet low in vegetables	0.6 (0.4 to 0.9)	27 Diet low in fiber	0.6 (0.3 to 0.9)	-0.4 (-7.2 to 11.3)	-39.3 (-43.3 to -32.8)
30 Diet low in omega-6 polyunsaturated fatty acids	0.5 (-1.6 to 1.8)	34 Suboptimal breastfeeding	0.3 (0.3 to 0.4)	-68.9 (-73.8 to -62.2)	-69.1 (-73.9 to -62.4)

Legend:
Environmental/occupational risks
Behavioural risks
Metabolic risks

Figure 2. Leading 25 Level 3 risk factors by attributable DALYs, percentage of total DALYs (2000 and 2021) and percentage change in attributable number of DALYs and age-standardised DALY rates from 2000 to 2021 for both sexes and for all ages

22% **decrease** in age-standardized lead burden 2000 – 2021

Leading risks 2000	Percent DALYs 2000
1 Particulate matter pollution	10.5 (8.6 to 12.0)
2 Child growth failure	9.4 (7.3 to 11.0)
3 Low birth weight and short gestation	9.1 (8.6 to 9.7)
4 High systolic blood pressure	6.2 (5.3 to 7.1)
5 Smoking	5.5 (1.8 to 8.9)
6 Unsafe water source	4.0 (2.4 to 5.1)
7 Unsafe sanitation	3.4 (2.9 to 4.0)
8 High fasting plasma glucose	3.1 (2.7 to 3.4)
9 High LDL cholesterol	2.6 (1.6 to 3.4)
10 Unsafe sex	2.6 (2.1 to 3.1)
11 High alcohol use	2.4 (2.0 to 3.1)
12 High body-mass index	2.4 (1.1 to 3.6)
13 No access to handwashing facility	2.3 (-0.5 to 4.7)
14 Kidney dysfunction	2.1 (1.9 to 2.3)
15 Occupational injuries	1.6 (1.5 to 1.7)
16 Secondhand smoke	1.6 (0.1 to 2.8)
17 Diet low in fruits	1.3 (0.6 to 2.0)
18 Iron deficiency	1.3 (1.0 to 1.6)
19 Suboptimal breastfeeding	1.2 (0.9 to 1.5)
20 Diet high in sodium	1.2 (0.3 to 2.7)
21 Diet low in whole grains	1.2 (0.6 to 1.7)
22 Lead exposure	1.0 (-0.0 to 1.9)
23 Low temperature	0.9 (0.8 to 1.0)
24 Drug use	0.8 (0.7 to 0.9)
25 Diet low in fiber	0.6 (0.3 to 1.0)
26 Diet low in vegetables	0.6 (0.4 to 0.9)
30 Diet low in omega-6 polyunsaturated fatty acids	0.5 (-1.6 to 1.8)

Leading risks 2021	Percent DALYs 2021	Percent change number of DALYs 2000-2021	Percent change age-standardized rate of DALYs 2000-2021
1 Particulate matter pollution	8.1 (6.7 to 9.5)	-16.2 (-24.3 to -6.8)	-40.7 (-45.9 to -35.1)
2 High systolic blood pressure	7.8 (6.5 to 9.0)	36.2 (29.8 to 43.7)	-22.8 (-26.2 to -18.7)
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18 Lead exposure	1.2 (-0.0 to 2.3)	30.6 (16.7 to 49.2)	-22.2 (-27.0 to -17.2)
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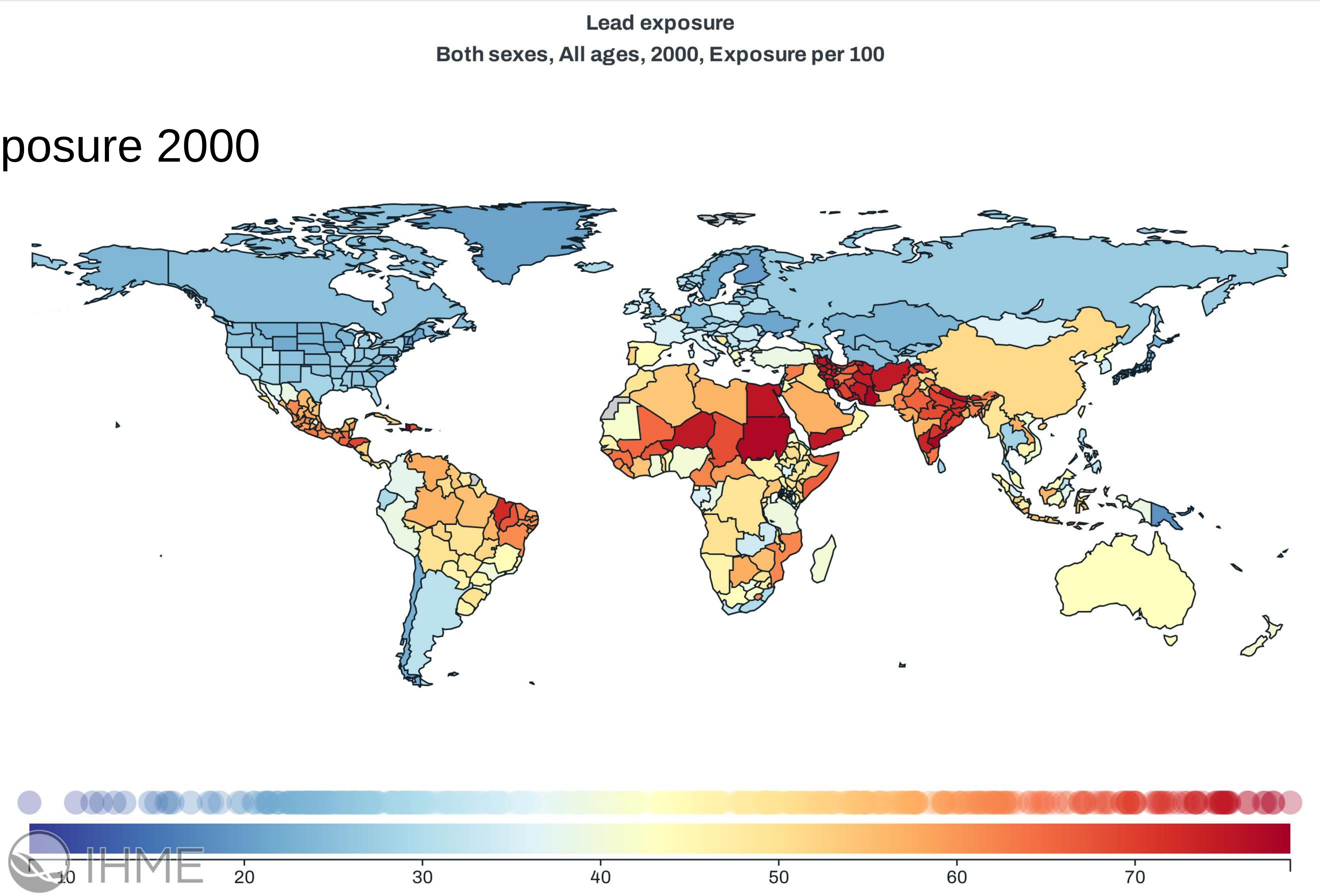
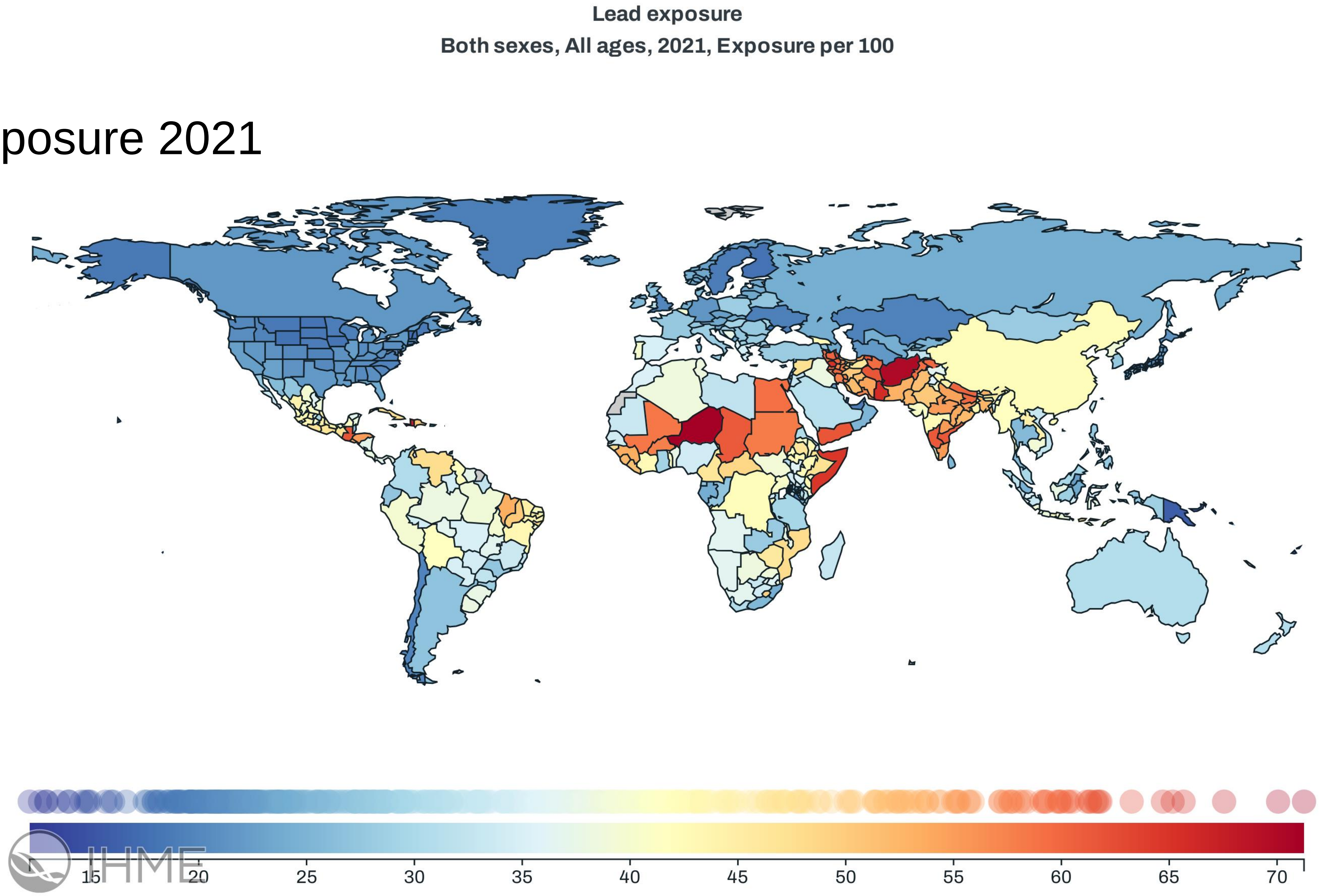
Legend:
Environmental/occupational risks
Behavioural risks
Metabolic risks

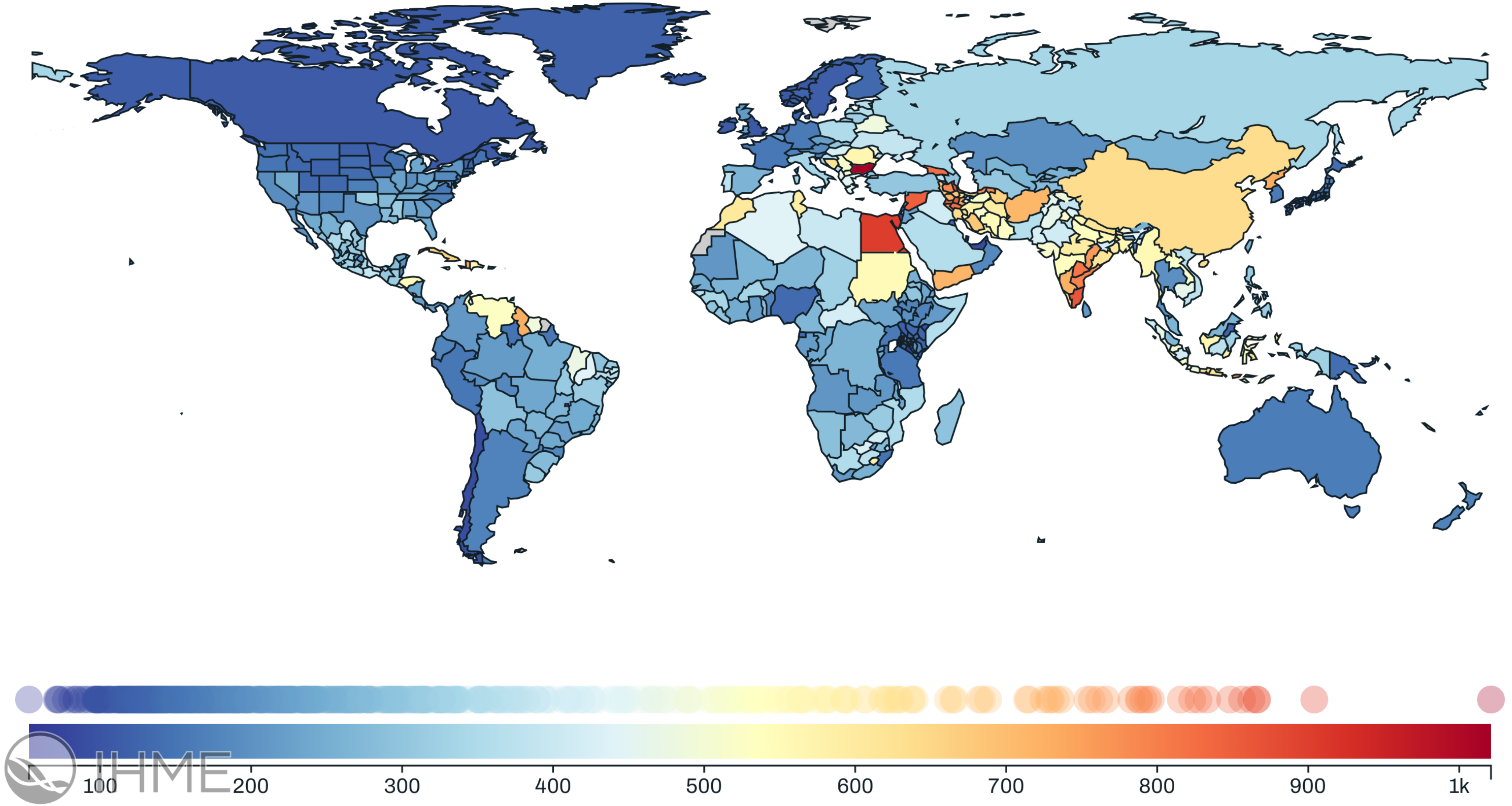
Exposure 2000



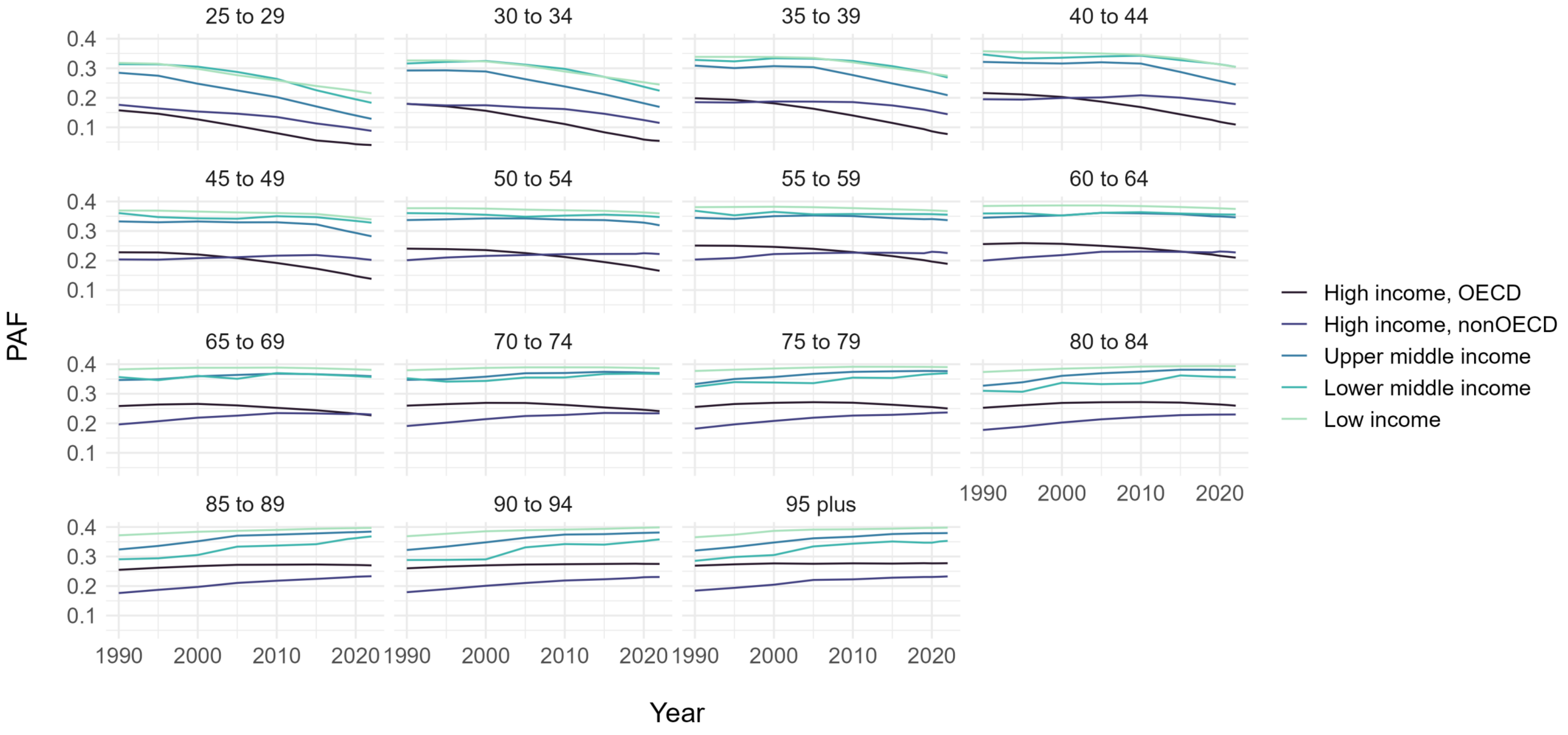
Exposure 2021



DALYs (rate) 2021

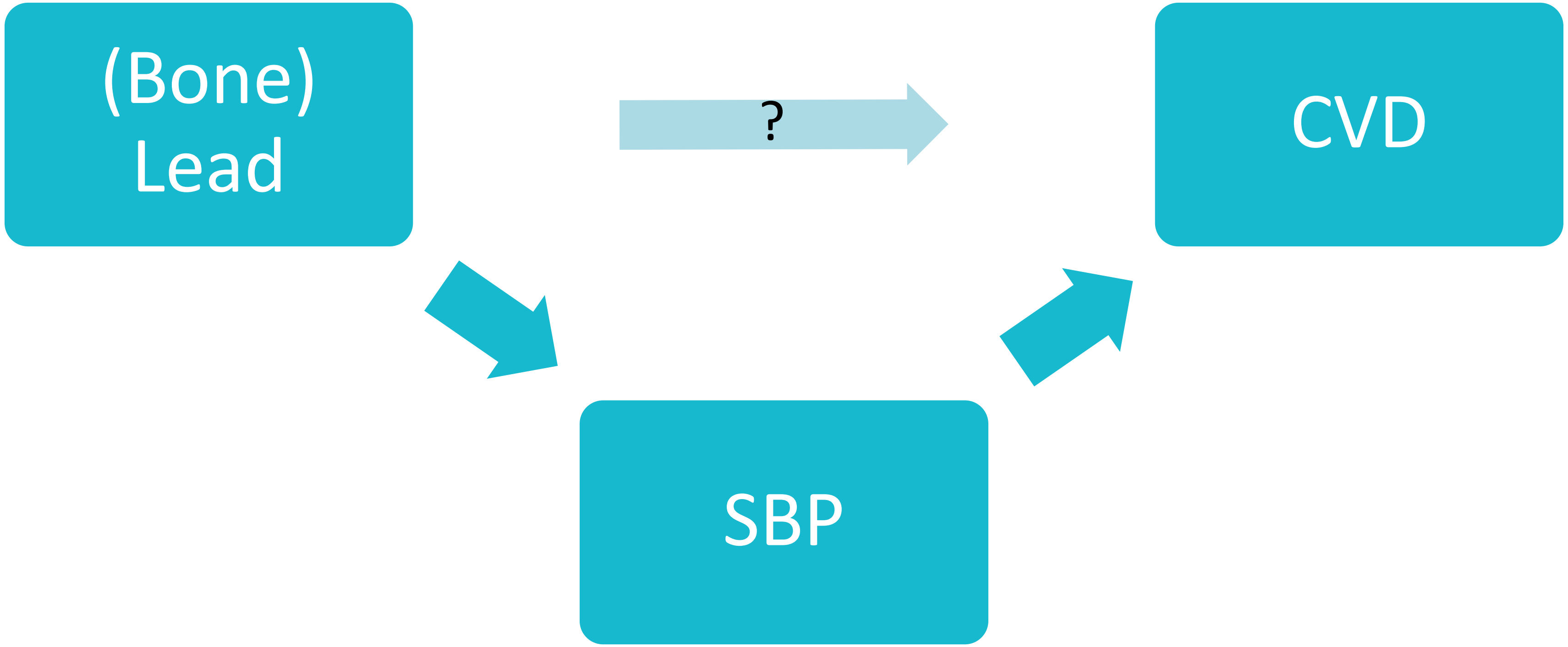


Age-specific trend in PAFs for bone lead and IHD by income category, 1990-2022

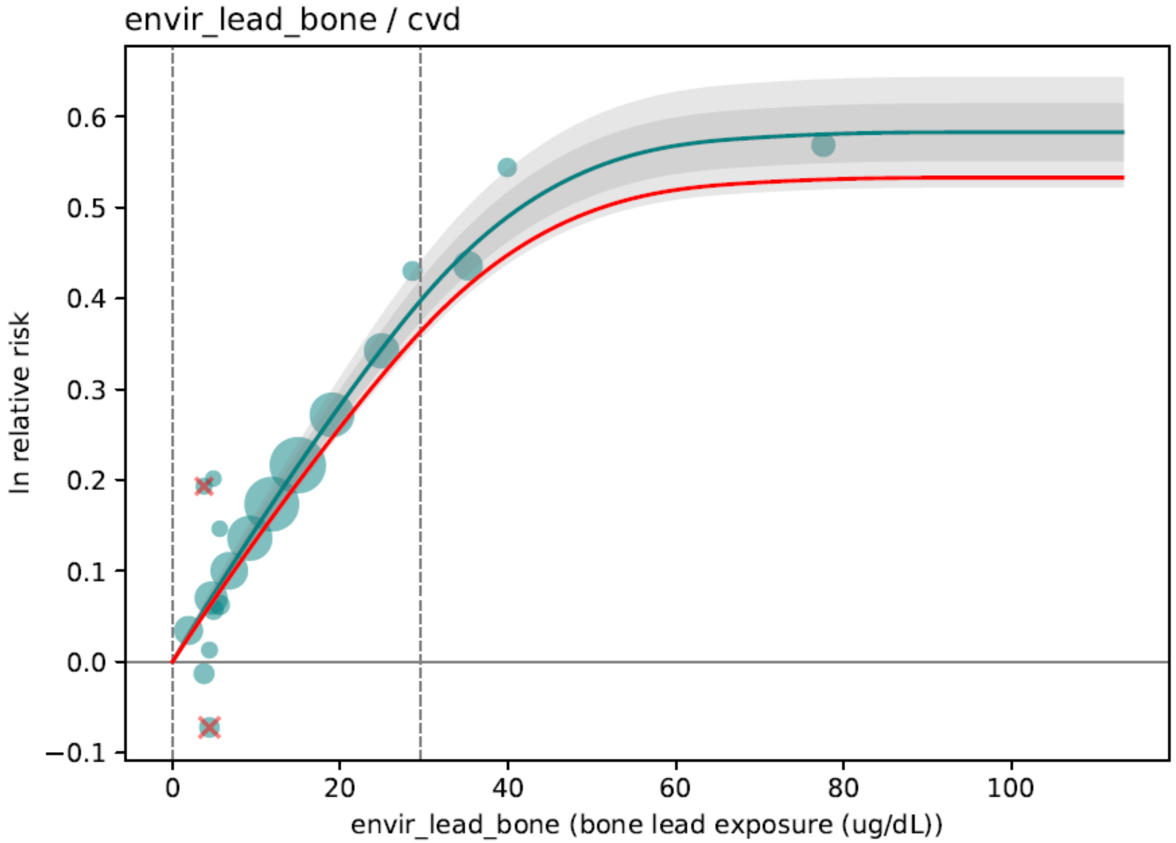


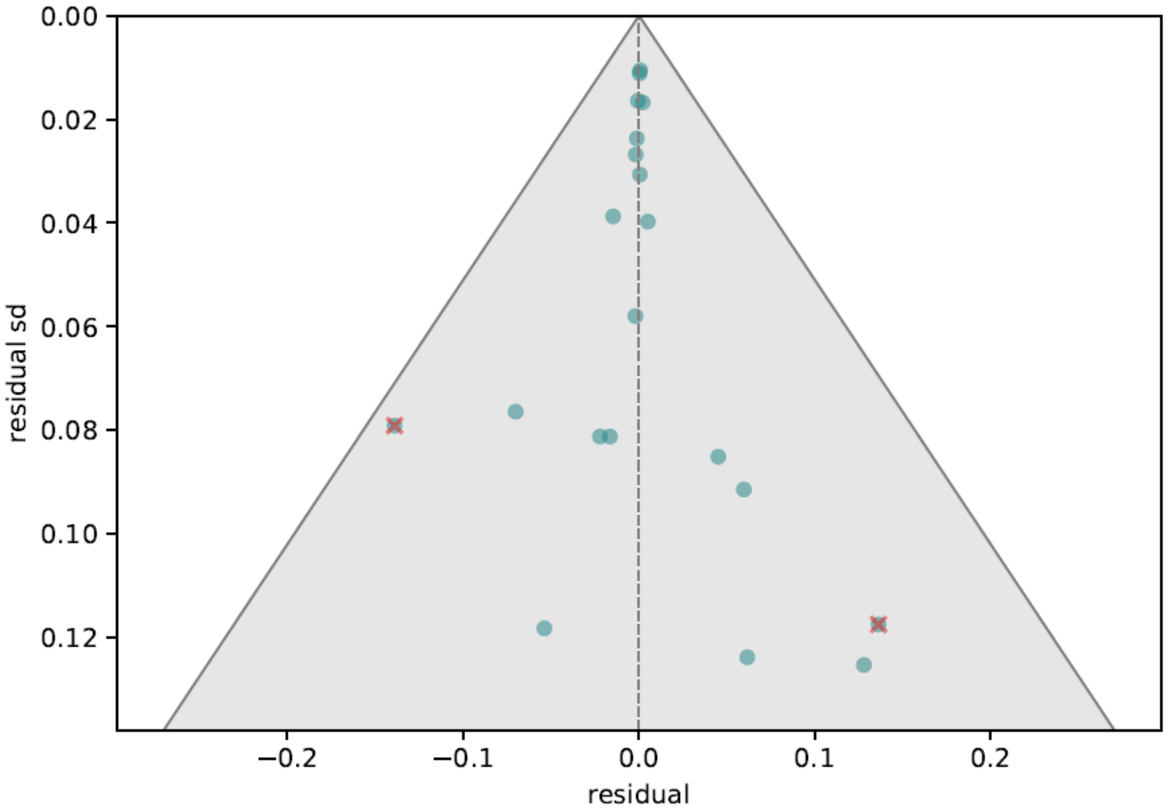
Lead and CVD

- GBD 2021 and earlier: Effects of bone lead on CVD only modeled via **mediation through systolic blood pressure (SBP)**



Burden od Proof model including published studies and deciles from new NHANES analysis

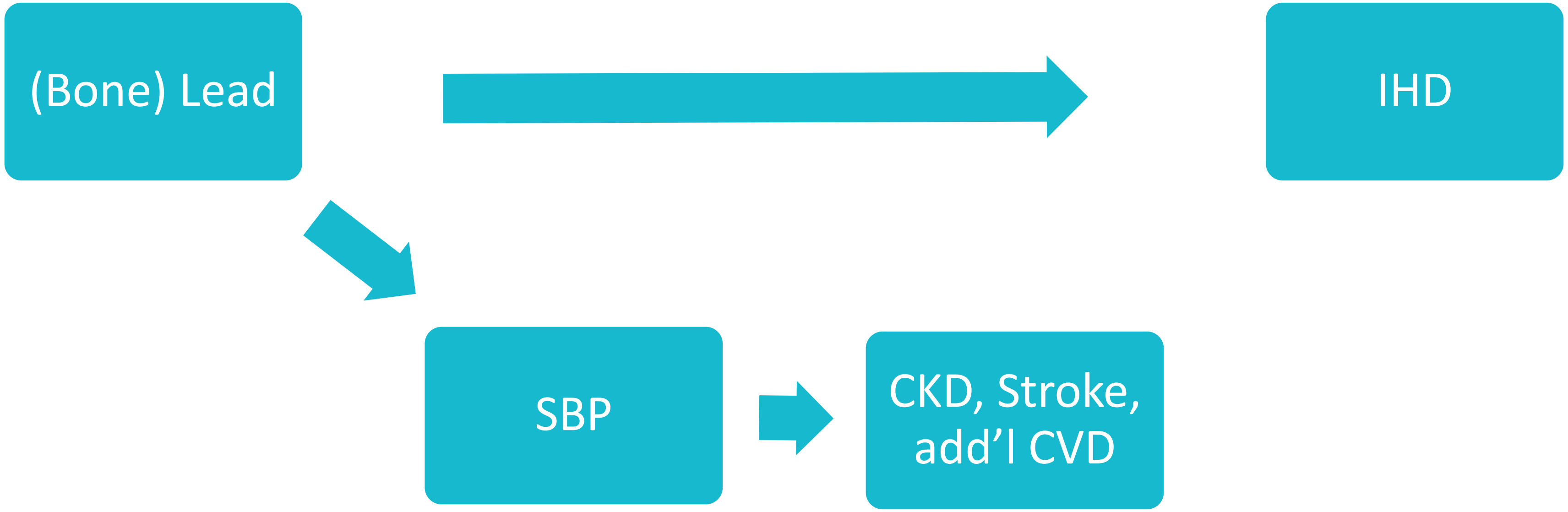


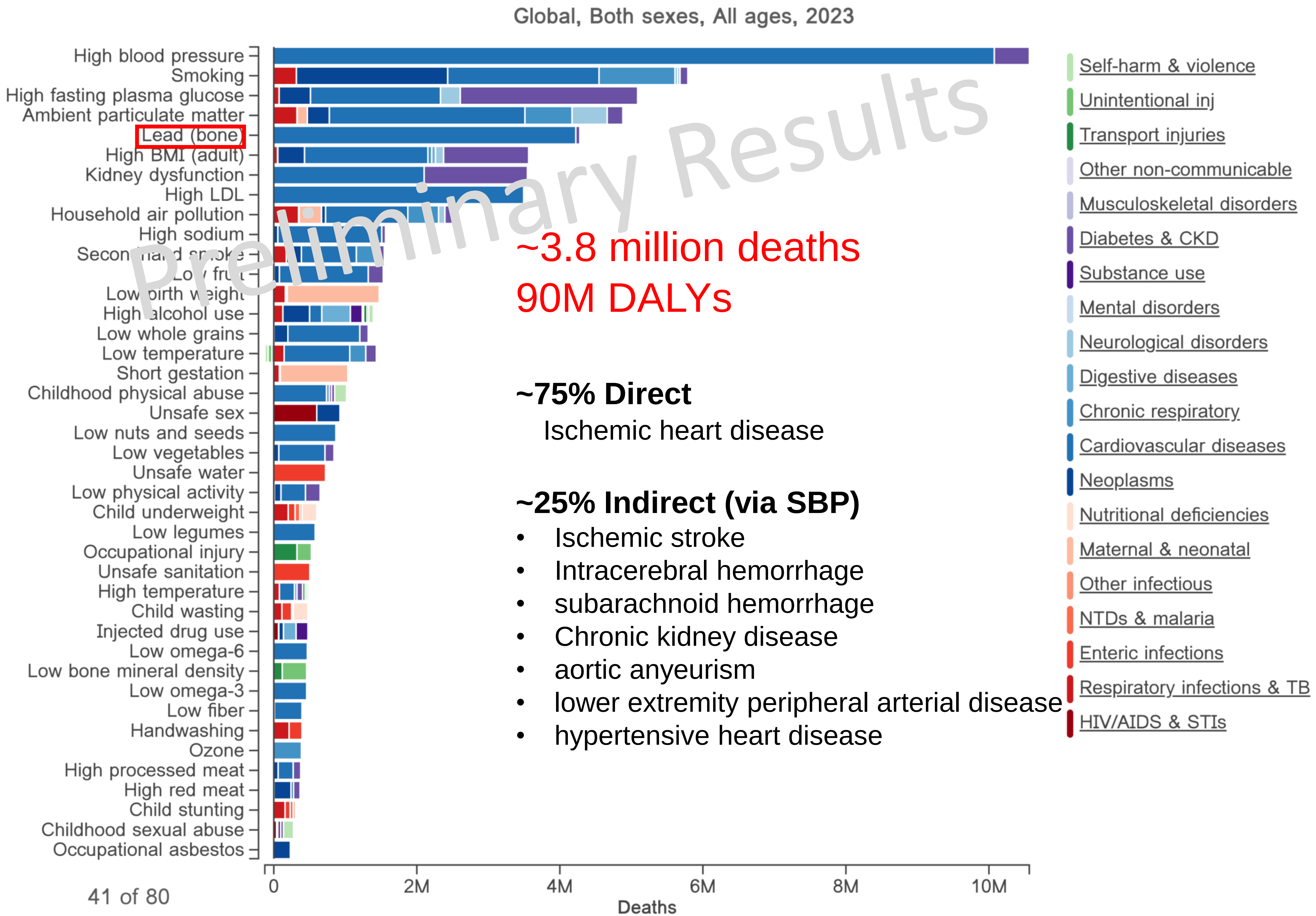


- Stars: ★ ★ ★
- Risk score: 0.196 (0.08-29.60 ug/dL)
- Publication bias: 0
- Covariates: none

Lead and CVD

- Direct - Ischemic heart disease
- Indirect (mediated via SBP): Stroke, Chronic Kidney Disease, specif CVD causes (Aortic aneurysm, lower extremity peripheral arterial disease, hypertensive heart disease)





~3.8 million deaths

90M DALYs

~75% Direct

Ischemic heart disease

~25% Indirect (via SBP)

- Ischemic stroke
- Intracerebral hemorrhage
- subarachnoid hemorrhage
- Chronic kidney disease
- aortic anyeurism
- lower extremity peripheral arterial disease
- hypertensive heart disease

Lead exposure and global disease burden

- **Global lead burden is large (and higher than previously estimated) ~ 3.8M deaths in 2023**
- **Lead exposures are decreasing**
- **Lead attributable burden is increasing**
  - **Driven by adult cardiovascular disease**
  - **Largely due to population growth and aging**
  - **Reflects (much higher) historical exposure**
  - **% avoidable is unclear**
- **Continued exposure reductions will decrease future burden for both adults and children**

GLOBAL HEALTH BURDEN AND COST OF LEAD EXPOSURE IN CHILDREN AND ADULTS

Bjorn Larsen, Consultant to the World Bank

The global health burden and cost of lead exposure in children and adults

Inter-sectoral expert webinar on lead pollution and exposure in G20 countries

Washington DC

November 5, 2024

Bjorn Larsen and Ernesto Sanchez-Triana*

World Bank

*** The findings, interpretations, and conclusions herein are those of the author(s) and do not necessarily reflect the views of the International Bank for Reconstruction and Development/The World Bank and its affiliated organizations or those of the Executive Directors of The World Bank or the governments they represent**

This presentation draws on recent research at the World Bank:

Lancet Planetary Health (September 2023):
‘Global health burden and cost of lead exposure in children and adults: a health impact and economic modelling analysis’
by Bjorn Larsen and Ernesto Sanchez-Triana

Global health burden and cost of lead exposure in children and adults: a health impact and economic modelling analysis

Bjorn Larsen, Ernesto Sánchez-Triana

Summary

Background Lead exposure is a worldwide health risk despite substantial declines in blood lead levels following the leaded gasoline phase-out. For the first time, to our knowledge, we aimed to estimate the global burden and cost of intelligence quotient (IQ) loss and cardiovascular disease mortality from lead exposure.

Methods In this modelling study, we used country blood lead level estimates from the Global Burden of Diseases, Injuries, and Risk Factors Study (GBD) 2019. We estimated IQ loss (presented as estimated loss in IQ points with 95% CIs) in the global population of children younger than 5 years using the blood lead level–IQ loss function from an international pooled analysis. We estimated the cost of IQ loss, which was calculated only for the proportion of children expected to enter the labour force, as the present value of loss in lifetime income from the IQ loss (presented as cost in US dollars and percentage of gross domestic product with a range). We estimated cardiovascular deaths (with 95% CIs) due to lead exposure among people aged 25 years or older using a health impact model that captures the effect of lead exposure on cardiovascular disease mortality that is mediated through mechanisms other than hypertension. Finally, we used values of statistical life to estimate the welfare cost of premature mortality (presented as cost in US dollars and percentage of GDP). All estimates were calculated by World Bank income classification and region (for low-income and middle-income countries [LMICs] only) for 2019.

Findings We estimated that children younger than 5 years lost 765 million (95% CI 443–1098) IQ points and that 5 545 000 (2 305 000–8 271 000) adults died from cardiovascular disease in 2019 due to lead exposure. 729 million of the IQ points lost (95·3% of the total global IQ loss) and 5 004 000 (90·2% of total) cardiovascular disease deaths due to lead exposure occurred in LMICs. IQ loss in LMICs was nearly 80% higher than a previous estimate. Cardiovascular disease deaths were six times higher than the GBD 2019 estimate. The global cost of lead exposure was US$6·0 trillion (range 2·6–9·0) in 2019, which was equivalent to 6·9% (3·1–10·4) of the global gross domestic product. 77% (range 70–78) of the cost was the welfare cost of cardiovascular disease mortality, and 23% (22–30) was the present value of future income losses from IQ loss.

Interpretation Our findings suggest that global lead exposure has health and economic costs at par with $PM_{2.5}$ air pollution. However, much work remains to improve the quality of blood lead level measurement data, especially in LMICs.

Funding The Korea Green Growth Trust Fund and the World Bank's Pollution Management and Environmental Health Program.

Lancet Planet Health 2023; 7: e831–40

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The World Bank, Washington, DC, USA (B Larsen MBA, E Sánchez-Triana PhD)

Correspondence to: Bjorn Larsen, The World Bank, Washington, DC 20434, USA
BL@bjorn-larsen.com

The estimated health burden from lead exposure

We estimated two health effects of lead exposure:

- IQ losses in 2019 in the entire child population under five years of age
- Cardiovascular disease mortality (CVD) in the adult population in 2019

We used country BLL estimates from GBD 2019:

- ❑ Average BLLs were 3.5 times higher in LMICs than in HICs (4.6 vs. 1.3 µg/dL) in 2019

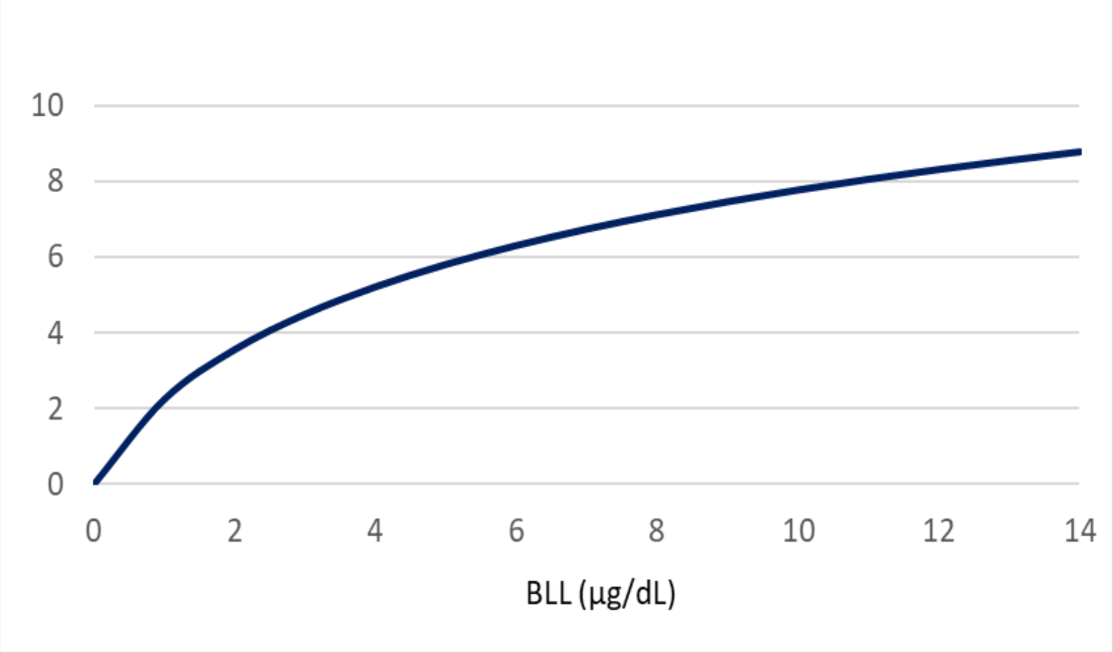
We estimate that:

- ➢ As many as **28%** of children and adults in LMICs may have BLL > 10 µg/dL
- ➢ As many as **46%** of children and adults in LMICs may have BLL > 5 µg/dL

We find that:

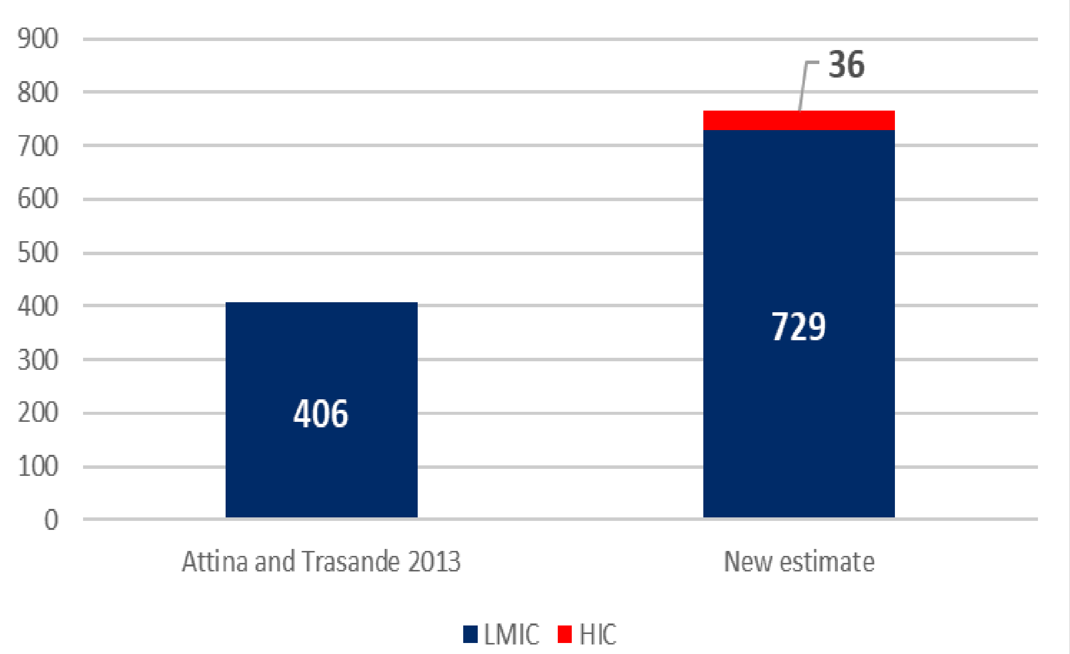
Annual global IQ losses in children from lead exposure may be 765 million IQ points, or 80% higher than previously estimated

IQ loss (points)



IQ loss in relation to BLL in children (from Crump et al. 2013)

Global annual IQ losses in children (million points)



New estimate by Larsen and Sanchez-Triana (2023) is based on the BLL – IQ loss relation in Crump et al (2013)

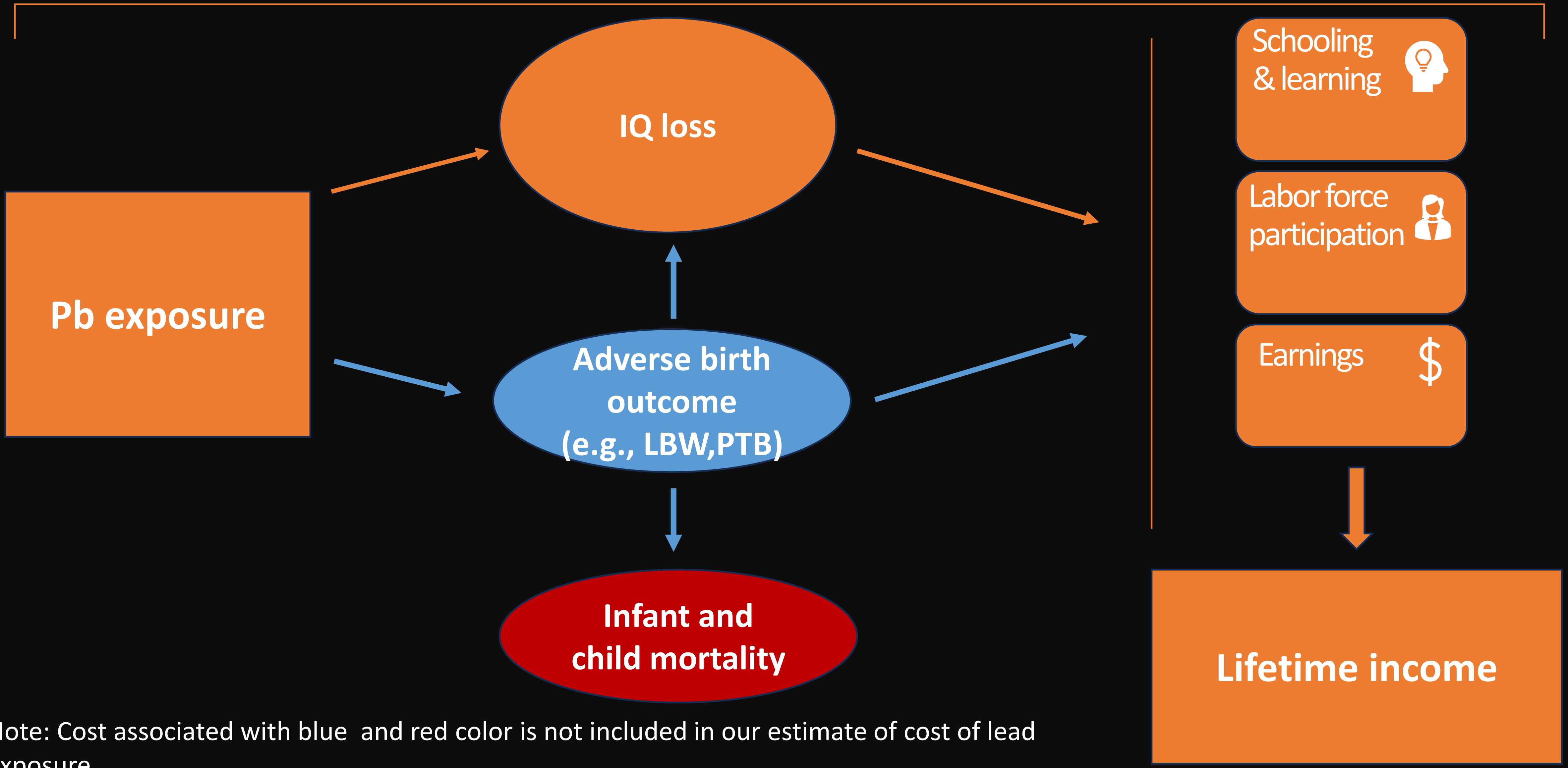
Crump K, Van Landingham C, Bowers T, Cahoy D, Chandalia J. 2013. A statistical reevaluation of the data used in the Lanphear et al. (2005) pooled-analysis that related low levels of blood lead to intellectual deficits in children. Crit Rev Toxicol, 43: 785–99.

Impacts and costs of IQ losses from lead exposure:

We estimate that:

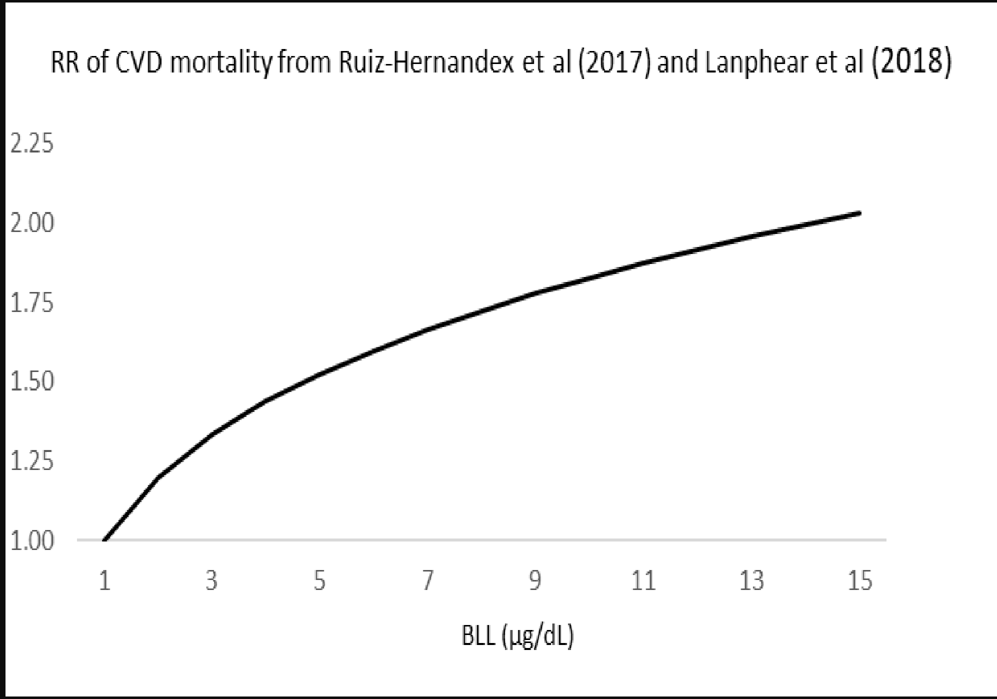
- 95% of global IQ loss in 2019 from lead exposure occurred in LMICs
- The average child in LMICs loses nearly 6 IQ points over the first years of life
- This IQ loss results in an estimated 12% loss in lifetime income
- The average IQ loss of 6 points implies that the population with IQ > 120 points is reduced by about 50%

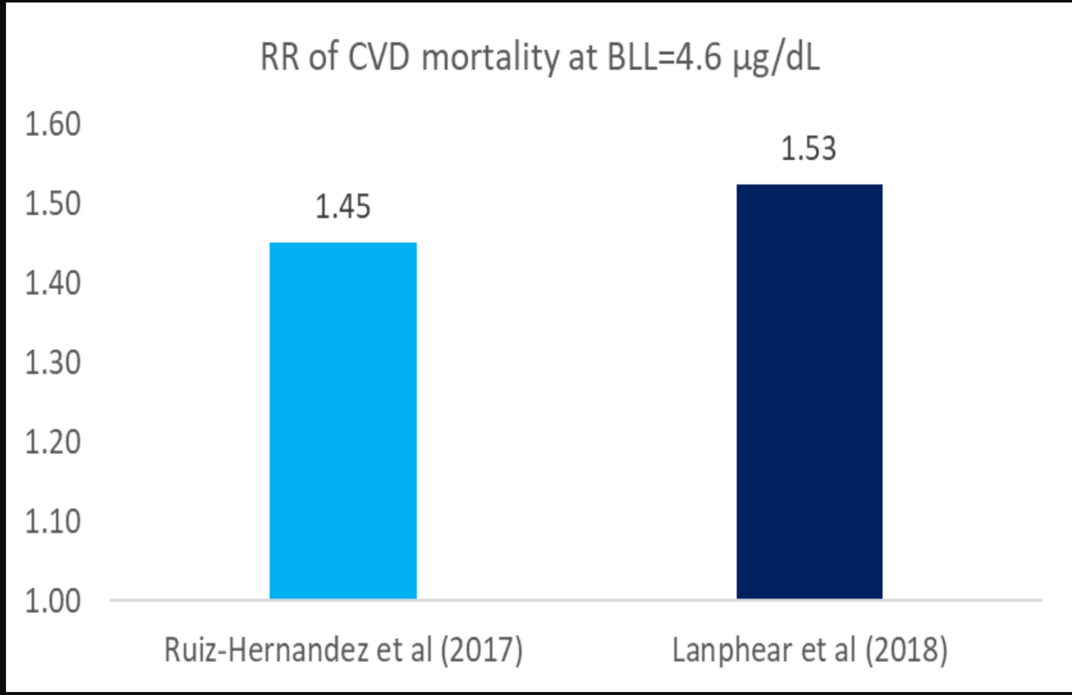
The estimated cost of childhood lead exposure may be conservative



Note: Cost associated with blue and red color is not included in our estimate of cost of lead exposure

CVD mortality risk from Pb exposure: Evidence from large studies in the United States

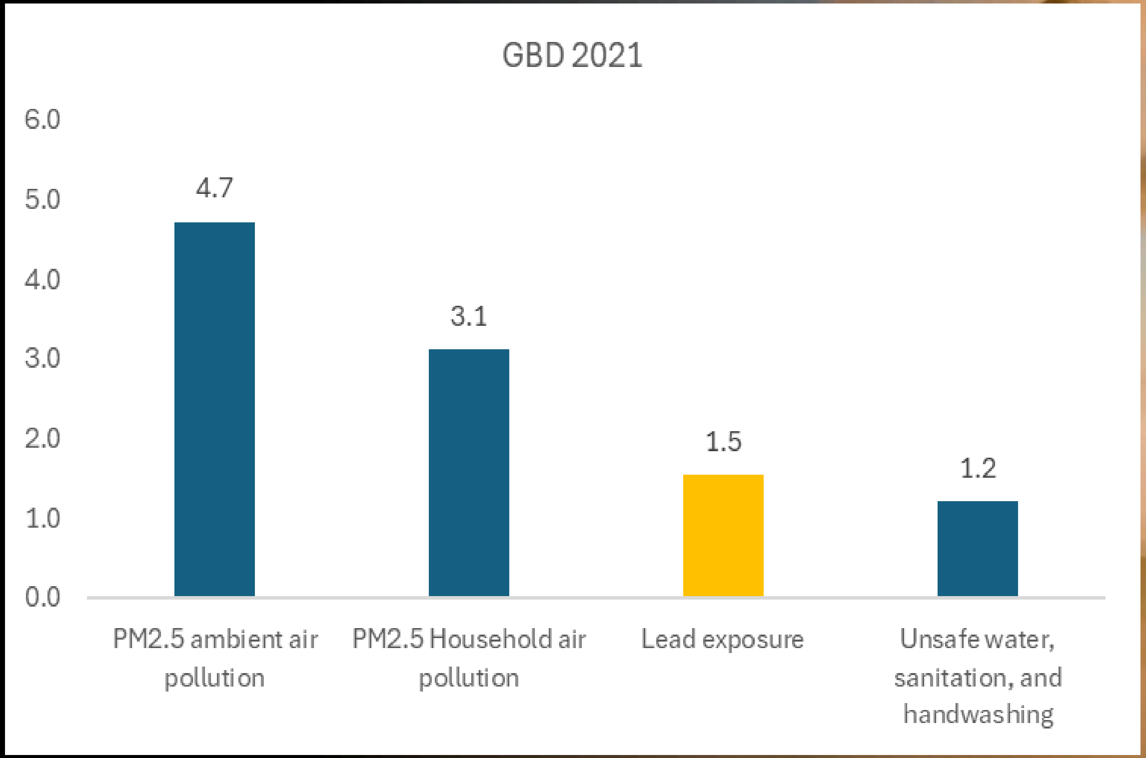


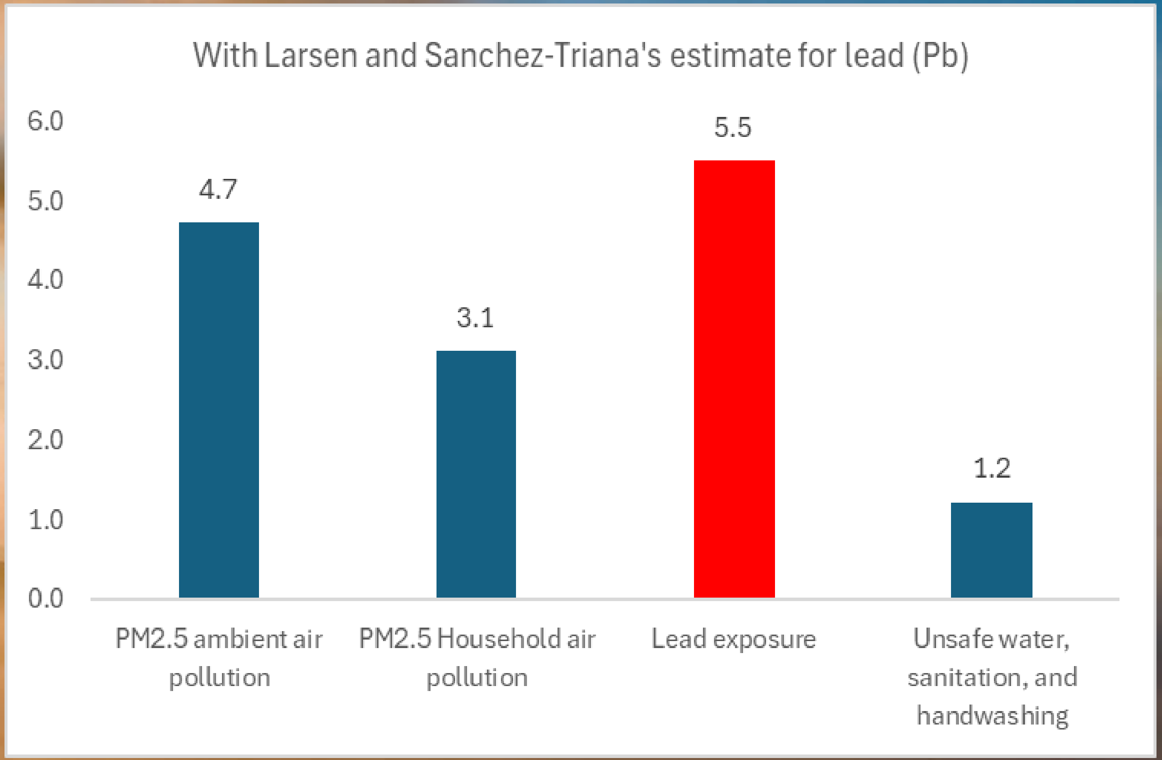


We used the average of Ruiz-Hernandez et al (2017) and Lanphear et al (2018) for our central estimate of mortality risk.

CVD mortality from lead exposure may be nearly 4 times higher than estimated by the GBD 2021

Annual deaths (million) from major environmental risk factors





Source: New estimate for Pb is from Larsen and Sanchez-Triana (2023)

Why is our CVD mortality estimate so much higher than the estimate by GBD 2021?

- The estimate by GBD 2021 only includes the effect of Pb on CVD mortality through Pb's effect on blood pressure.
- The estimate by Larsen and Sanchez-Triana (2023) includes a whole range of cardiovascular effects of Pb, such as atherosclerosis (the build-up of plaque in the arteries) and decreased heart rate variability (a marker of poor cardiovascular health) (Lamas et al. 2023).

Journal of the American Heart Association

AHA SCIENTIFIC STATEMENT

Contaminant Metals as Cardiovascular Risk Factors: A Scientific Statement From the American Heart Association

Gervasio A. Lamas, MD, FAHA, Chair; Aruni Bhatnagar, PhD, FAHA; Miranda R. Jones, MHS, PhD; Koren K. Mann, PhD; Khurram Nasir, MD, MPH, FAHA; Maria Tellez-Plaza, MD, PhD; Francisco Ujueta, MD, MS; Ana Navas-Acien, MD, PhD, Vice Chair; on behalf of the American Heart Association Council on Epidemiology and Prevention; Council on Cardiovascular and Stroke Nursing; Council on Lifestyle and Cardiometabolic Health; Council on Peripheral Vascular Disease; and Council on the Kidney in Cardiovascular Disease

ABSTRACT: Exposure to environmental pollutants is linked to increased risk of cardiovascular disease. Beyond the extensive evidence for particulate air pollution, accumulating evidence supports that exposure to nonessential metals such as lead, cadmium, and arsenic is a significant contributor to cardiovascular disease worldwide. Humans are exposed to metals through air, water, soil, and food and extensive industrial and public use. Contaminant metals interfere with critical intracellular reactions and functions leading to oxidative stress and chronic inflammation that result in endothelial dysfunction, hypertension, epigenetic dysregulation, dyslipidemia, and changes in myocardial excitation and contractile function. Lead, cadmium, and arsenic have been linked to subclinical atherosclerosis, coronary artery stenosis, and calcification as well as to increased risk of ischemic heart disease and stroke, left ventricular hypertrophy and heart failure, and peripheral artery disease. Epidemiological studies show that exposure to lead, cadmium, or arsenic is associated with cardiovascular death mostly attributable to ischemic heart disease. Public health measures reducing metal exposure are associated with reductions in cardiovascular disease death. Populations of color and low socioeconomic means are more commonly exposed to metals and therefore at greater risk of metal-induced cardiovascular disease. Together with strengthening public health measures to prevent metal exposures, development of more sensitive and selective measurement modalities, clinical monitoring of metal exposures, and the development of metal chelation therapies could further diminish the burden of cardiovascular disease attributable to metal exposure.

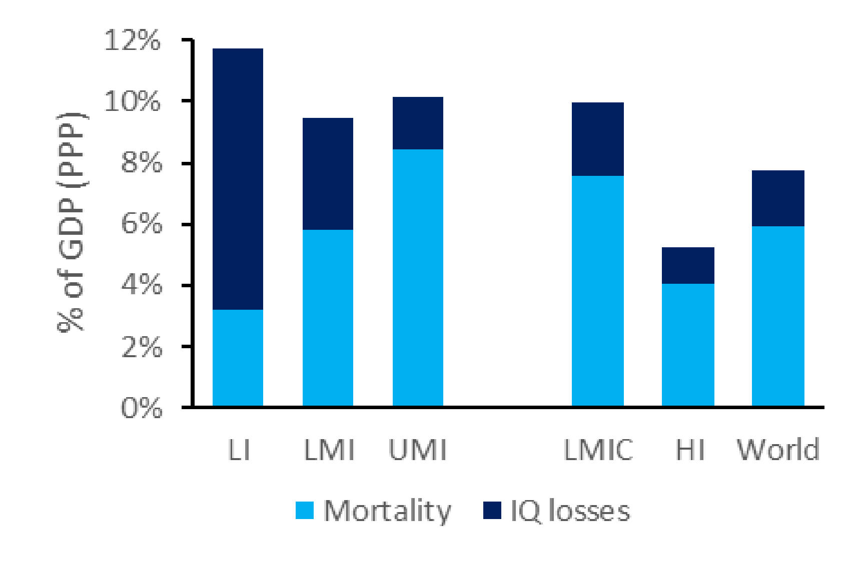
Key Words: AHA Scientific Statements ■ arsenic ■ cadmium ■ cardiac risk factors ■ coronary disease ■ heavy metals ■ lead ■ myocardial infarction

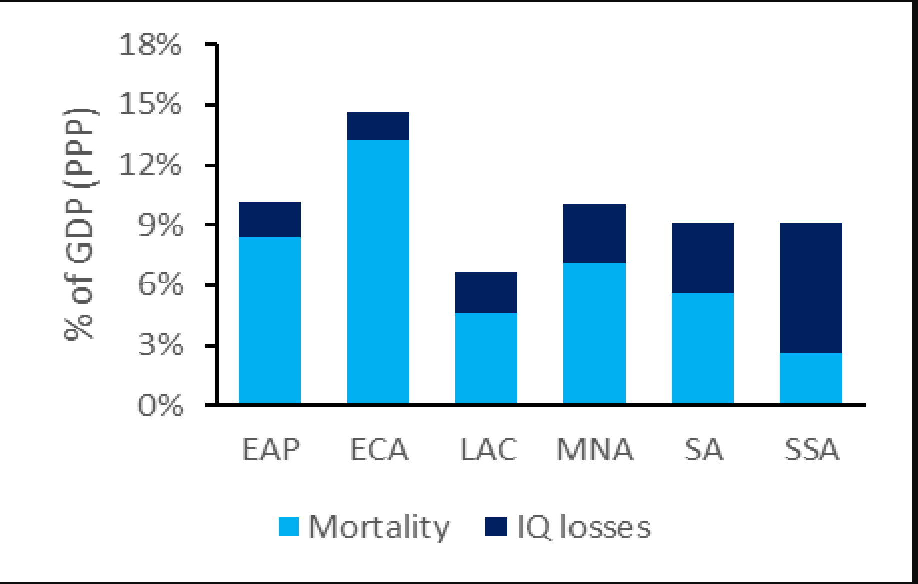
Lamas GA, Bhatnagar A, Jones MR, et al. 2023. Contaminant metals as cardiovascular risk factors: a scientific statement from the American Heart Association. J Am Heart Assoc, 12: e029852.

Global cost of lead exposure may be as high as the cost of $PM_{2.5}$ ambient and household air pollution combined

Productivity cost of IQ losses from Pb exposure in 2019: $2.4 trillion (PPP); 1.8% of global GDP (PPP)
Welfare cost of CVD mortality from Pb exposure in 2019: $7.9 trillion (PPP); 5.9% of global GDP (PPP)

Welfare cost of PM2.5 health effects in 2019: $8.1 trillion (PPP); 6.1% of global GDP (PPP)





Global cost of PM2.5 air pollution is from World Bank (2022): The Global Health Cost of PM2.5 Air Pollution: A Case for Action Beyond 2021. doi:10.1596/978-1-4648-1816-5.
Global cost of Pb exposure is from Larsen and Sanchez-Triana (2023).

Thank you

SUMMARY OF EXISTING INFORMATION AND ACTIVITIES ON LEAD EXPOSURE AND SOURCES IN LOWER- AND MIDDLE-INCOME COUNTRIES

Drew McCartor, President and CEO, Pure Earth

Lead Poisoning

Assessing & Mitigating Exposure Sources in LMICs

Drew McCartor
Executive Director
PURE EARTH

Lead's Global Toll

- **1 in 2 children** in LMICs has an estimated blood lead level ≥ 5 µg/dL (WHO's intervention threshold)[1]
- **815,000,000** children globally[1]
- **765M IQ points** permanently lost annually[2]
- An average child in LMICs loses **6 IQ points**[2]
- LMICs have **95% of the burden**
- Find country data at **www.leadpollution.org**

1 Rees, Nicholas, and Richard Fuller. The toxic truth: children's exposure to lead pollution undermines a generation of future potential. Unicef, 2020.
2 Larsen, Bjorn, and Ernesto Sánchez-Triana. "Global health burden and cost of lead exposure in children and adults: a health impact and economic modelling analysis." The Lancet Planetary Health 7.10 (2023): e831-e840.

Common Exposure sources:

Exposure sources change by country, state, city, and even household.

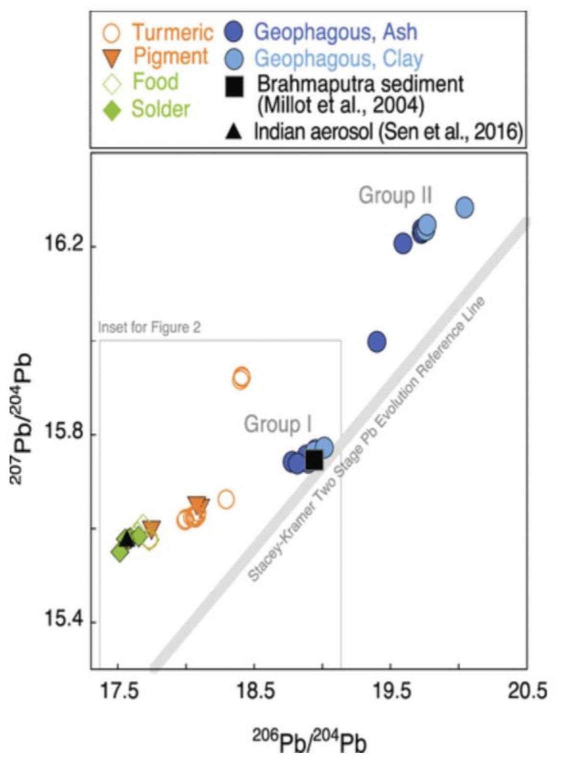
- Contaminated soil (from lead-using ind.)
- Metal cookware
- Ceramic cookware
- Paint
- Cosmetics & religious powders
- Foods & Spices
- Occupational (take home also)
- Toys
- Jewelry and amulets
- Water (including from pipes)
- Traditional medicines
- Solder in food cans
- Smoking
- Other consumer products

How Do We Identify Exposure Sources?

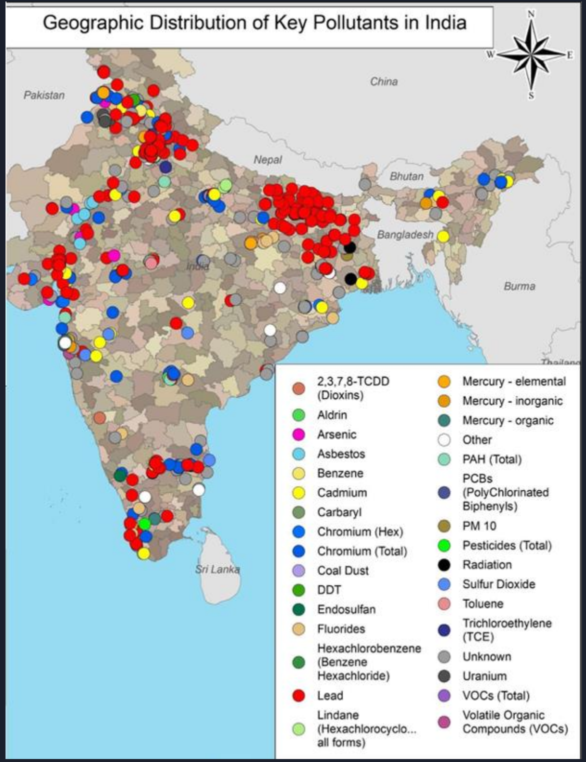
1. Home-Based Assessments

2. Market Goods Screening

3. Isotopic Analysis



4. Toxic Site Assessments



None of these tools is perfect. Using multiple source assessment methods paints the fullest picture.

1. Home-Based Assessments

- Following a blood testing program
- Conducted in homes with elevated BLLs
- Test all suspected products and environmental media for lead
- Establish correlations between elevated BLLs and the presence of certain contaminated products
- Pure Earth is developing an expanded protocol that includes household-level intervention to replace contaminated goods and then retest BLLs.

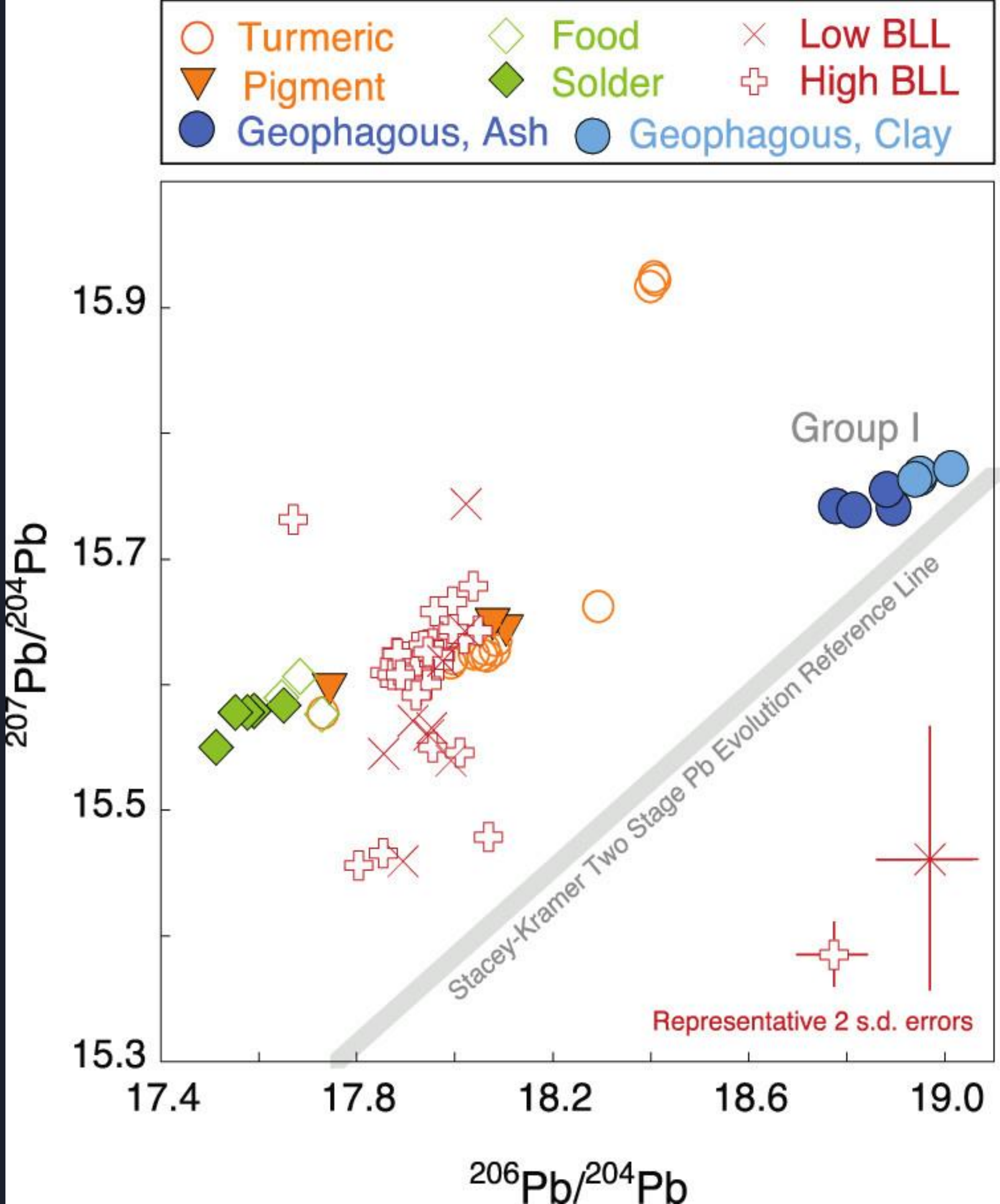
2. Rapid Market Screening

5,000 products and foods from 100 markets across 25 countries. Results:

- **18% of all items exceeded the threshold value for that product type**
- **Aluminum cookware: 52%**
- **Ceramic cookware: 45%**
- **Paint: 41%**
- **Toys: 13%**
- **Cosmetics: 12%**
- **Download the REPORT**

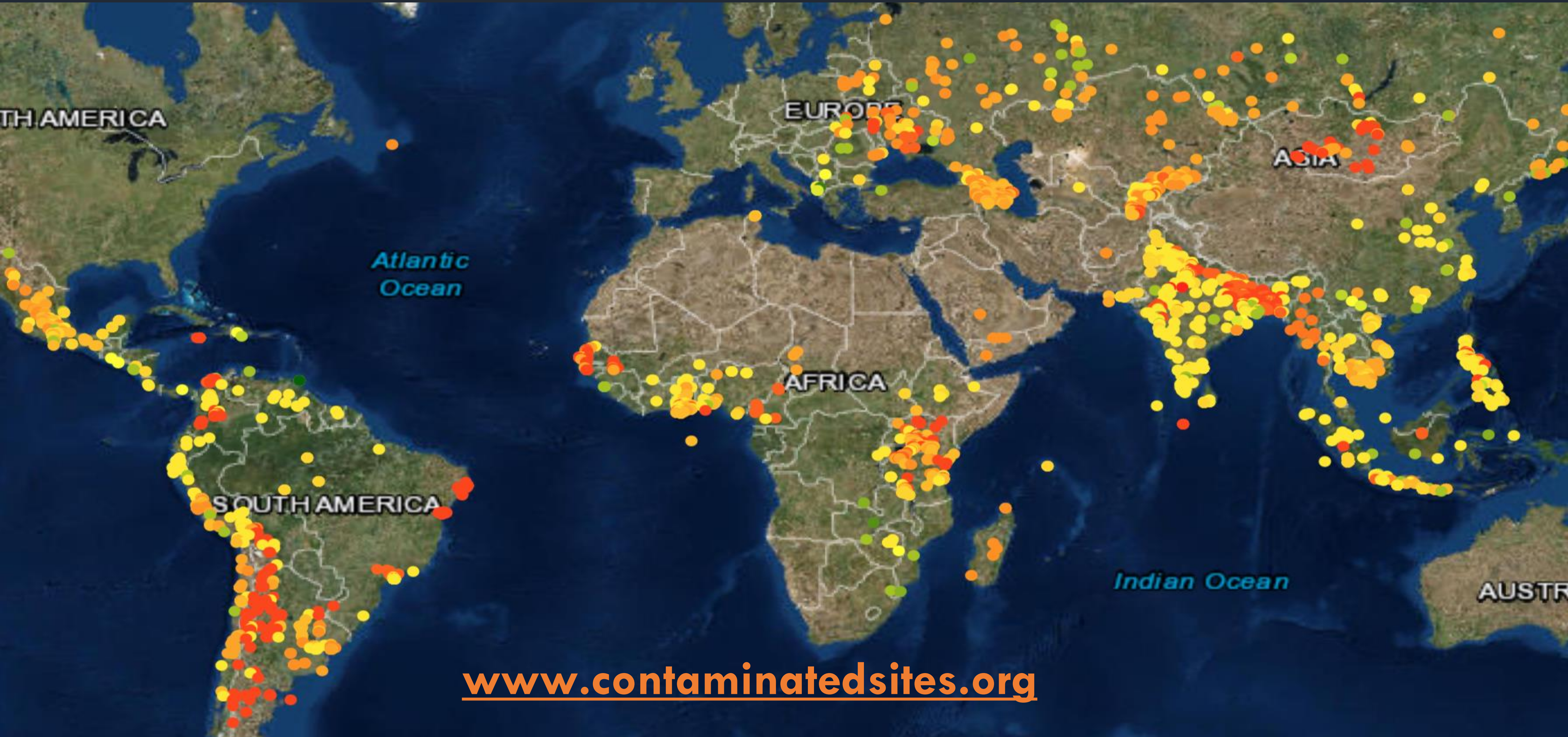
3. Isotopic Analysis

- There are 4 lead isotopes (Pb-204, Pb-206, Pb-207, Pb-208)
- Isotopes depend on lead's age & origin
- Analysis compares isotope of lead in blood with isotopes in local exposure sources
- Isotopic analysis was used in Bangladesh to identify that turmeric was a primary exposure source for rural women
- Can be helpful if local lead sources have different isotopic fingerprints



4. Identifying & Assessing Contaminated Sites

(Pure Earth's program: 5,000+ sites, 35% Lead, 20% ULAB recycling)



Snapshot of Source Assessment Activities

(Pure Earth activities only, 2021-2025)

							Metal Cookware					
	Country	Polluted Sites	Home-Based Assessment	Market Goods Assessment	Food Chain	Cosmetics	Supply Chain	Leaching	Assessing Pots in Schools	ULAB	Spices	Pottery
Africa	Ghana	2024	2022	2022-2023	2024	2025	2025	2025	2024	2025		
	Egypt		2025	2022-2023								
Latin Am	Colombia		2025	2022-2023			2025	2025				
	Perú		2025	2022-2023			2025					
	Mexico		2025	2022-2023								2025
Asia	India	2023	2022 -2025	2022-2023			2024- 2025		2024		2022 -2023, 2025	
	Kyrgyzstan		2024 - 2025									
	Bangladesh	2022	2021	2022-2023				2025				
	Indonesia	2021, 2023	2023, 2025	2022-2023			2024	2025	2024			
	Philippines	2025	2022	2022-2023								

Photo Credit: Pure Earth

Recent & Current Programs

(Pure Earth only)

1. Blood lead level testing

- Bangladesh, Colombia, Georgia, Ghana, India (Bihar, Tamil Nadu, Maharashtra), Indonesia, Philippines, Kyrgyzstan, Peru, Egypt

2. Exposure sources analysis

- Home-based source analysis (10 recent & upcoming)
- Rapid Market Screening (25 countries)
- Toxic Sites Identification Program (5K sites assessed)

3. Source-specific interventions

- Spices, battery recycling, ceramics, metal cookware, cosmetics, contaminated site remediation

Other active int'l organizations include: LEEP, IPEN, Vital Strategies, Oeko Institut, WHO, UNICEF, UNEP, and others.

Thank You

LEAD IN DRINKING WATER: OPPORTUNITES TO REDUCE EXPOSURE AND IMPROVE HEALTH

Jennifer De France, Technical Officer, World Health Organization

Lead and drinking-water:
Opportunities to reduce exposure and improve health

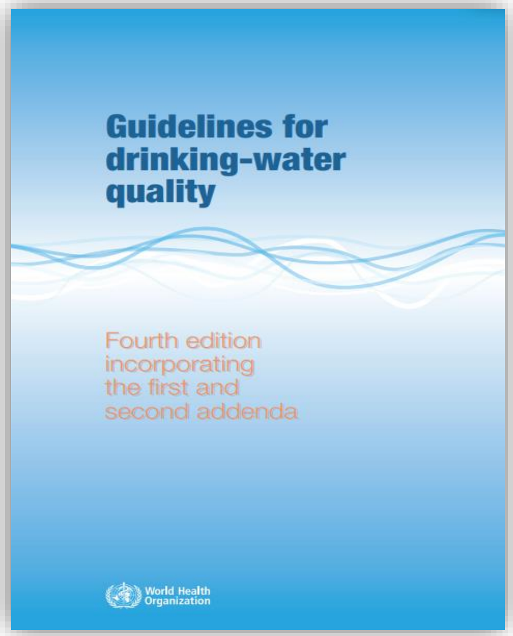
Jennifer De France, WHO

Inter-sectoral expert webinar on lead pollution and exposure in G20 countries

5 November 2024

WHO’s work on Lead in Drinking-water

Norms



Technical guidance

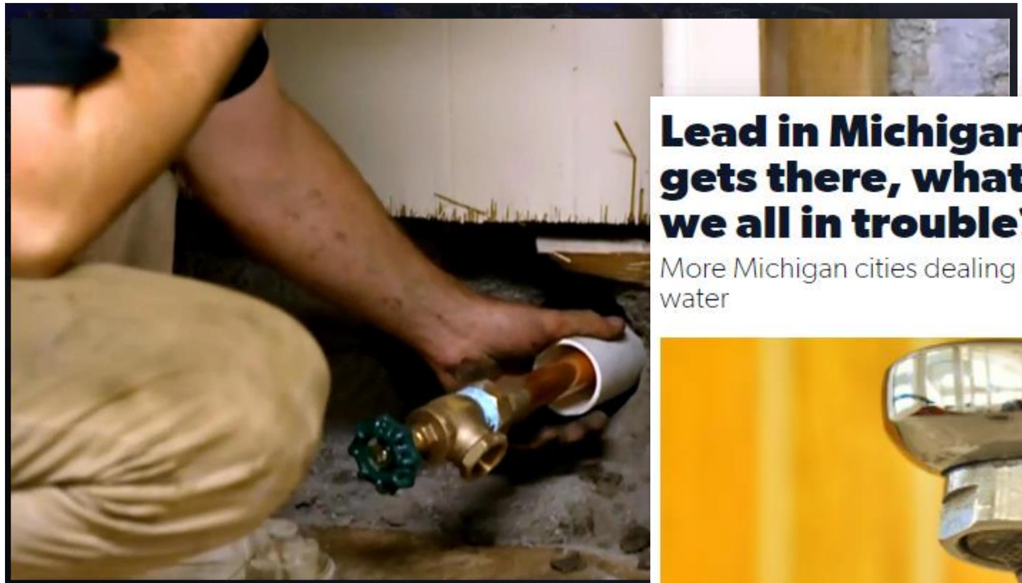
“The primary source of lead in drinking-water is leaching from lead-containing materials in water systems.”

“Prevention is the most effective action.”

Community of practice

Lead in Drinking-water

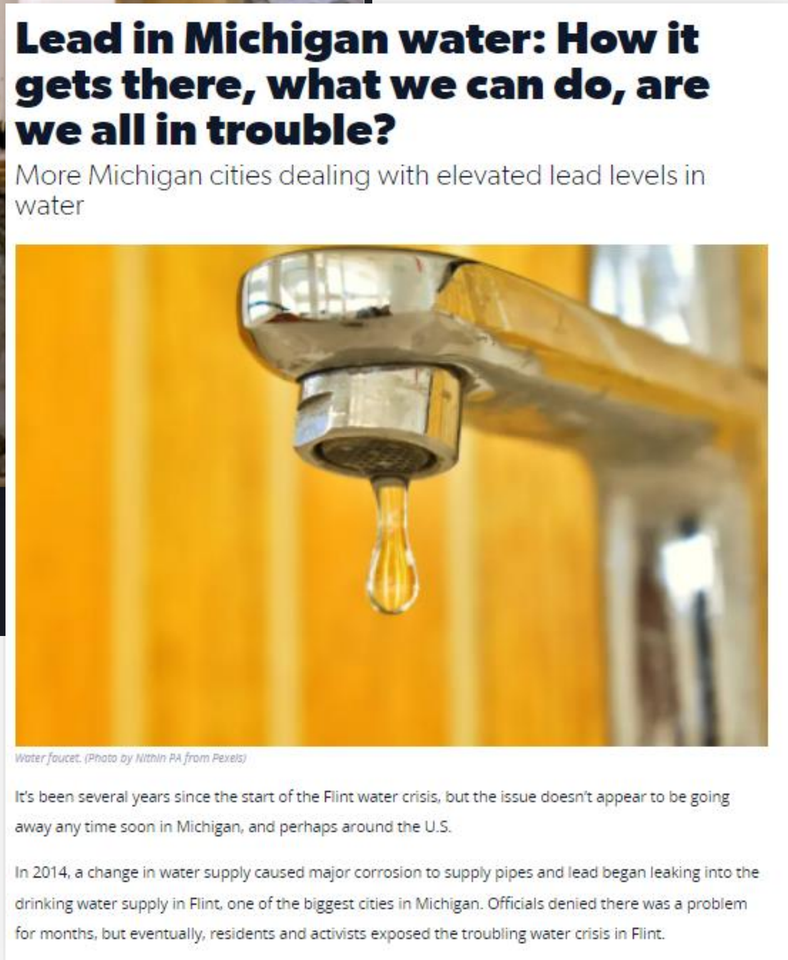
Public concern and health concern



Alarming amounts of lead found in Syracuse, New York, drinking water

Through a new report, officials have discovered that Syracuse, New York, has some of the highest levels of lead found in drinking water in decades. Some people want it declared an emergency, but Syracuse city officials are pushing back, saying the latest water testing showed lead levels have improved.

OCT 24, 2024



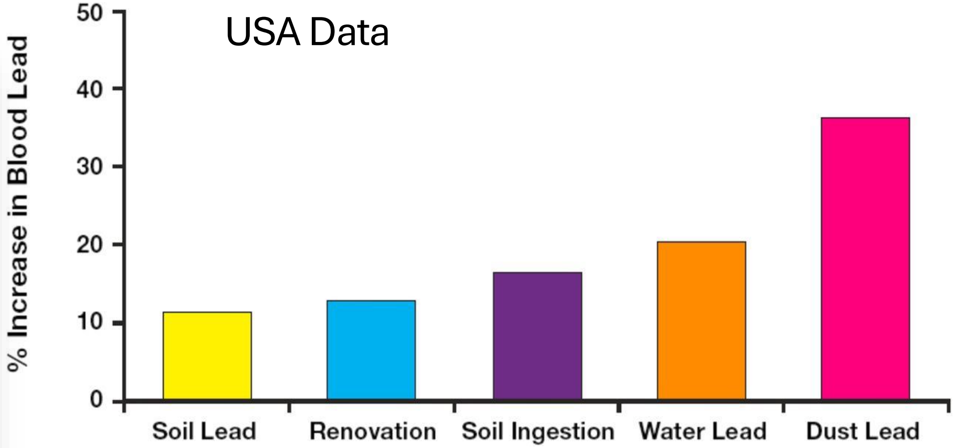
Lead in Michigan water: How it gets there, what we can do, are we all in trouble?

More Michigan cities dealing with elevated lead levels in water

Water faucet. (Photo by Nithin PA from Pexels)

It's been several years since the start of the Flint water crisis, but the issue doesn't appear to be going away any time soon in Michigan, and perhaps around the U.S.

In 2014, a change in water supply caused major corrosion to supply pipes and lead began leaking into the drinking water supply in Flint, one of the biggest cities in Michigan. Officials denied there was a problem for months, but eventually, residents and activists exposed the troubling water crisis in Flint.



Contribution of lead exposure to children's blood lead concentrations. Adapted from Lanphear et al[31] and Spanier et al.[45]

Pediatrics. 2016;138(1). doi:10.1542/peds.2016-1493

Harmful

Important

Preventable

But how prevalent?

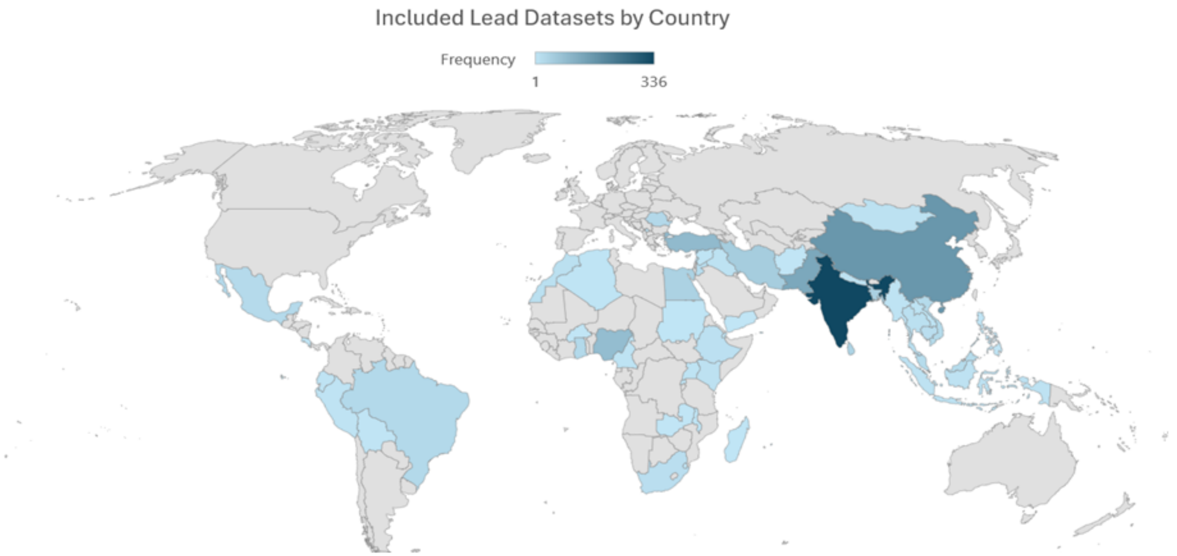
Lead in drinking-water occurs at levels of concern across sources, regions

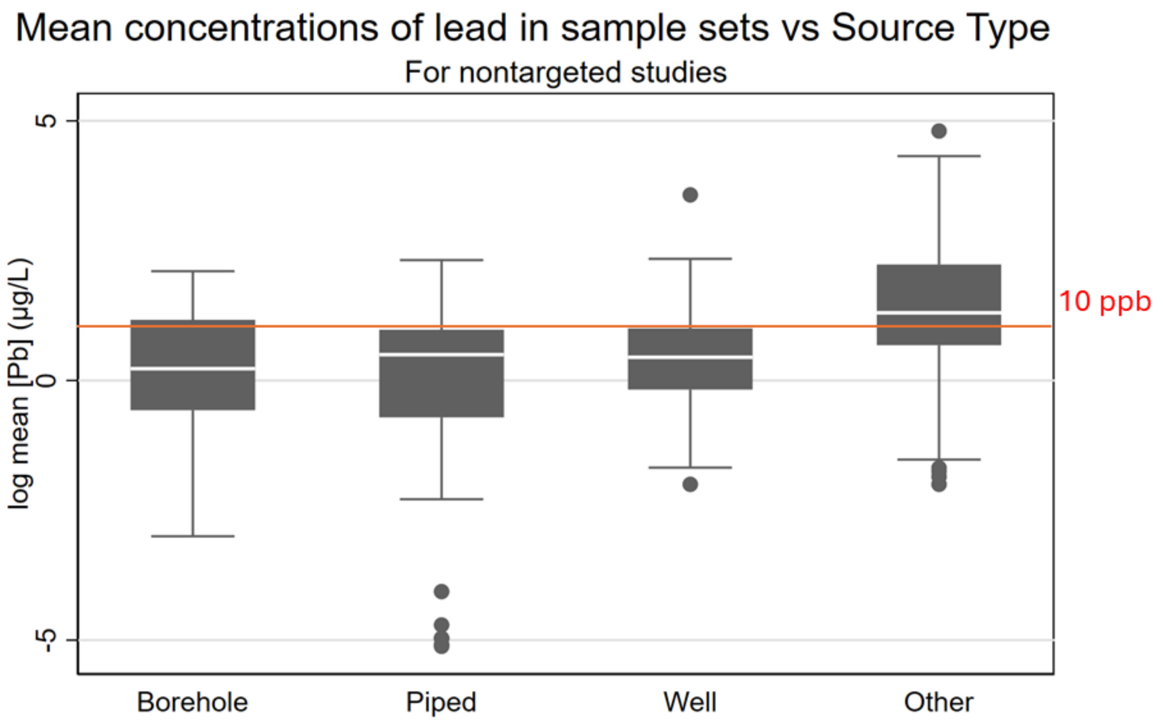
Preliminary Results

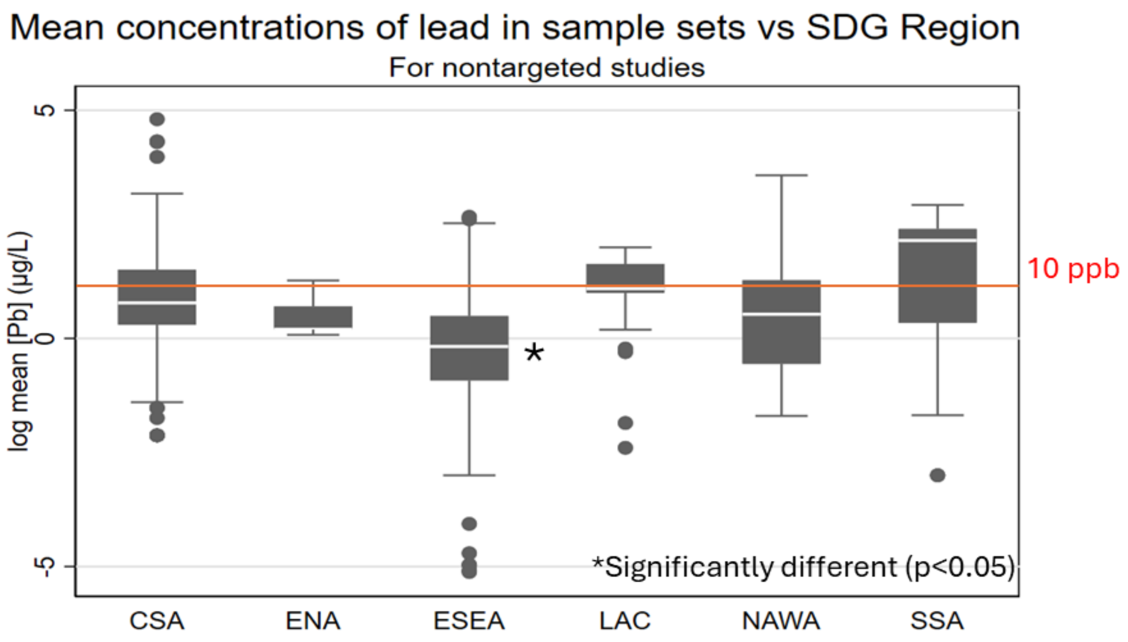
Data: 881 datasets, 48,000 observations to date

- Five countries comprise 60% of data
- Lack of nationally-representative data

- Overall (n=881): 31% > 10 ppb
- "Nontargeted" (n=329): 25% > 10 ppb





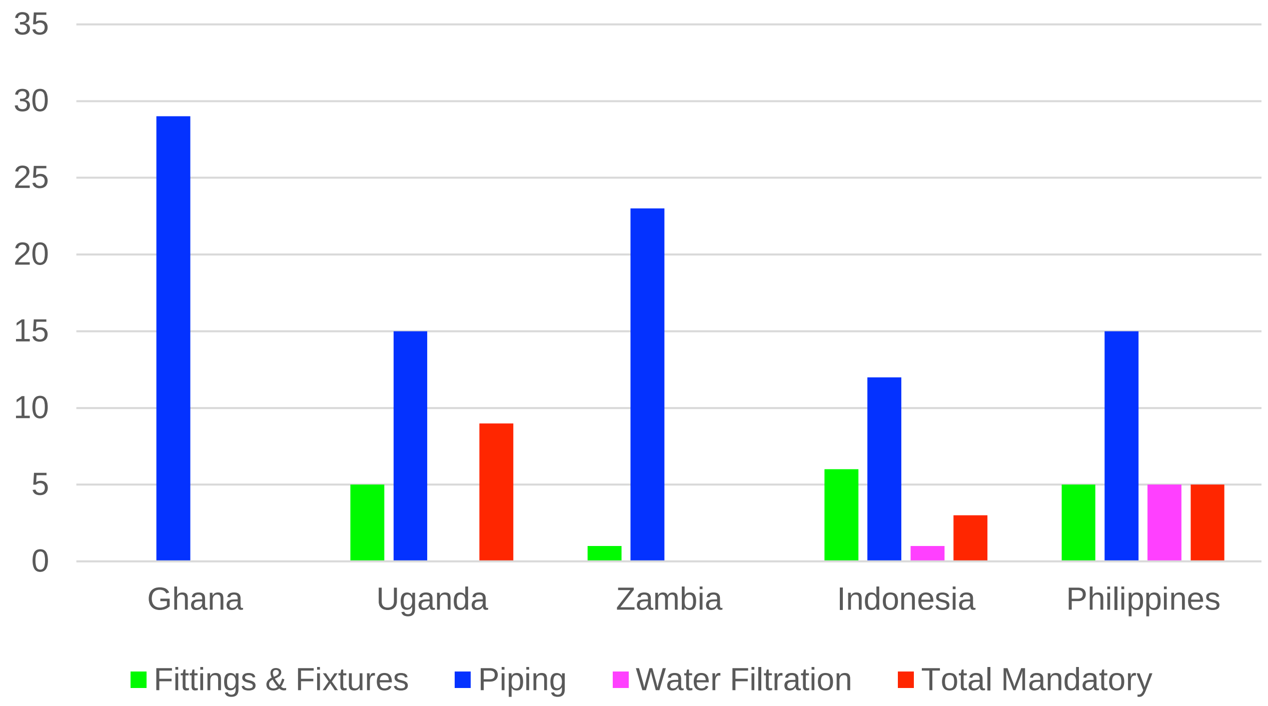


Preliminary results, from a systematic review being led by UNC WATER INSTITUTE

Stopping the Flow of Lead-Leaching Products

Working to formalize markets and to improve supply chains of "lead-free" components

- 2 studies led by IAPMO* in partnership with USAID and the US Department of Commerce
- Confirm what we knew anecdotally
  - Major gaps in what products are regulated
  - When a product regulation does exist, it is frequently not required nor enforced



* International Association of Plumbing and Mechanical Officials

Implications

- Available evidence indicates global challenge
  - Opportunity for primary prevention

- Evidence sufficient to act now
  - Simultaneously scale up water quality monitoring AND primary prevention
  - Without regulation and enforcement, it is difficult to prevent lead leaching components from entering supply chains in any given country
  - Requires multi-stakeholder engagement

Who and How to take action

The lead issue requires actions from multiple stakeholders

Regulatory Agencies

- Include lead in standards and monitoring
- Adopt standards for lead in water systems
- Facilitate the certification of plumbers
- Take a lead on lead, informing users and cooperate with other stakeholders

Plumbers

- Use certified materials, following national requirements.
- Separate different metals or alloys from each other.
- Use higher-quality materials where water is corrosive

Water Suppliers

- Identify lead-containing materials
- Monitor lead in drinking-water
- Progressively remove lead-containing components
- Use appropriately certified parts
- Manage the corrosivity of the water
- Cooperate with authorities in informing users about exposure to lead.

Operators and installers of hand pump supplies

- Monitor lead in the water
- Replace lead-containing parts and separate different metals
- Use certified parts, following national requirements
- Use drillers with good local knowledge

Property owners and consumers

- If lead levels are too high, flush the tap, install a filter, or use an alternative safe source for consumption
- Have lead-containing components replaced and different metals separated.
- Always hire properly trained plumbers

Other opportunities

The lead issue requires actions from multiple stakeholders

G20 Call to Action on Strengthening Drinking-water, Sanitation, and Hygiene Services

Access to safe drinking water, sanitation, and hygiene is a prerequisite to health and nutrition and is critical to sustainable development outcomes. We reaffirm our commitment to ensure safe drinking water and sanitation. With the world experiencing climate change, environmental degradation, biodiversity loss, pollution, and disasters, achievement of the SDG 6 targets of universal access to water and sanitation by 2030 is off track. Globally, achieving the targets requires a six-fold increase in current rates of progress for safely managed drinking-water, a five-fold increase for safely managed sanitation and a three-fold increase for basic hygiene.[1]

Achieving universal access to Water, Sanitation and Hygiene (WASH) in many fragile contexts requires even greater acceleration, and inequalities in

GLOBAL LEAD FREE WATER .ORG

Key take aways

- Lead in water is a health issue and a high public concern
- Lead in materials that are in contact with water can contaminate it, therefore prevention is the most effective action
- Lead in drinking-water needs to considered in regulations and enforcement
  - To prevent lead leaching components from entering supply chains
  - Ensure drinking-water has low lead levels and that remedial actions are effective
- Lead in drinking-water should be considered as part of broader efforts for a lead-free future

PARTNERSHIP FOR A LEAD-FREE FUTURE

Abheet Solomon, United Nations Children’s Fund

Partnership for a Lead-free Future

END CHILDHOOD LEAD POISONING

PARTNERSHIP FOR A LEAD-FREE FUTURE

unicef for every child

Partnership for a Lead-free Future

unicef for every child

Goal

End childhood lead poisoning by 2040*

Vision

A world in which all children grow up free from lead exposure

Mission

1. Champion country-led efforts to end widespread childhood lead poisoning in low- and middle-income countries, including the generation of action plans to phase out lead from consumer products and to ensure safer industrial stewardship of lead.
2. Accelerate the development, adoption, and enforcement of lead mitigation standards and policies by providing a platform for exchange of successful practices and strategies, awareness campaigns and public outreach materials, resources, and technical assistance.
3. Foster key partnerships between government, industry, donors, philanthropies, civil society organizations, and other key stakeholders within and across countries to facilitate equitable and sustained progress toward a lead-free future.

END CHILDHOOD LEAD POISONING

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* Every child has a blood lead level below 5 μg/dl, and progressively reducing levels "closer to zero" below that point

Partnership for a Lead-free future:

Partner Roles

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Mission

1. Champion country-led efforts to end widespread childhood lead poisoning in low- and middle-income countries, including the generation of action plans to phase out lead from consumer products and to ensure safer industrial stewardship of lead.

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3. Foster key partnerships between government, industry, donors, philanthropies, civil society organizations, and other key stakeholders within and across countries to facilitate equitable and sustained progress toward a lead-free future.

Partnership commitments

Multilaterals

Coherent guidance, tools and assistance in support of country action

Governments

Lead the agenda and implement multisectoral action plans for a lead-free future

Industry

End the use of lead in consumer products and ensure safe stewardship in industrial applications

NGOs

Support country-led implementation and share learnings

Academia

Improve research and evidence-base to advance the agenda

Donors

Coordinated investments in support of a lead-free future

END CHILDHOOD LEAD POISONING

PARTNERSHIP FOR A LEAD-FREE FUTURE

Partnership for a Lead-free Future:

Scope

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In-scope	Out-of-scope
Enhance prioritization of the agenda;	**Global funding mechanism:** Instead, is reliant on coordinated international donor support matched by domestic investments
Drive implementation support;	**Global governance:** Instead, is reliant on existing institutions and multilateral environmental and health agreements
Accelerate strategies, innovation and access to technologies	

END CHILDHOOD LEAD POISONING

PARTNERSHIP FOR A LEAD-FREE FUTURE

Partnership for a Lead-free Future:
Functions of the Secretariat

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The UNICEF-hosted Secretariat will*:

Host a central knowledge and resource hub to support country-led efforts

- Repository of blood lead level surveys and source assessments
- Guidance, tools, expert videos and other assets for a lead-free future
- Catalogue of products/technologies and regional laboratories
- Mapping of key stakeholders and countries of operation
- Roster of individual experts working available to support the issue

Support coordinated action amongst partners and mobilize new partners

- Support coordinated inter-government action to drive the salience of the issue
- Host global learning sessions in support of country-led efforts
- Expand industry partnerships to support targeted action on specific-sources of exposure

Catalyze collective action to accelerate global progress and address implementation gaps

- Support the advancement of various sources of exposure through thematic working groups and communities of practice
- Work with relevant institutions to advance global policy setting agenda
- Maintain a list of short-term country-specific needs for interested donors

* Subject to availability of funds

END CHILDHOOD LEAD POISONING

PARTNERSHIP FOR A LEAD-FREE FUTURE

Partnership for a Lead-free Future:
Benefits to partner governments

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Access up-to-date guidance, tools and other global assets to support country action towards a lead-free future

Learn from other countries making progress on the issue and share your progress with them. Influence global policy setting and prioritization to address the issue.

Access technical assistance and support to help resolve bottlenecks in implementation of country plans. Flag implementation gaps.

Partnership for a Lead-free Future:

Current partners

Governments			Civil society	Foundations and private sector
Armenia	Ireland	Tanzania	Center for Global Development (CGD)	American Spice Trade Association (ASTA)
Bangladesh	Kenya	Togo	CHAI	Children's Investment Fund Foundation (CIFF)
Bhutan	Malawi	United States	GAHP	Conrad H. Hilton Foundation
Cambodia	Mali	Vietnam	GDI	Dangote
Canada	Morocco	Yemen	IAPMO	Gates Foundation
Dominican Republic	Nepal		Institute of Health Metrics Evaluation (IHME)	Homeworld Collective
Ethiopia	Nigeria		IPEN	Open Philanthropy
Georgia	Norway		Lead Exposure Elimination Project (LEEP)	P150
Ghana	Philippines		Pahle India Foundation	Renessaince Phil
Guinea	Republic of Ireland		Pure Earth	Rockefeller Philanthropic Advisors
Indonesia	Sierra Leone		Resolve to Save Lives	
			Stanford University	
			Vital Strategies	

END CHILDHOOD LEAD POISONING

PARTNERSHIP FOR A LEAD-FREE FUTURE

What does it take to 'end childhood lead poisoning'?

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- A whole of government approach
- Data on blood lead levels and the primary sources of exposure
- Balancing short- versus long-term responses
- Acting immediately on low-hanging fruits
- Having private sector part of the solution

END CHILDHOOD LEAD POISONING

END CHILDHOOD LEAD POISONING

PARTNERSHIP FOR A LEAD-FREE FUTURE

Five actions to 'end childhood lead poisoning'

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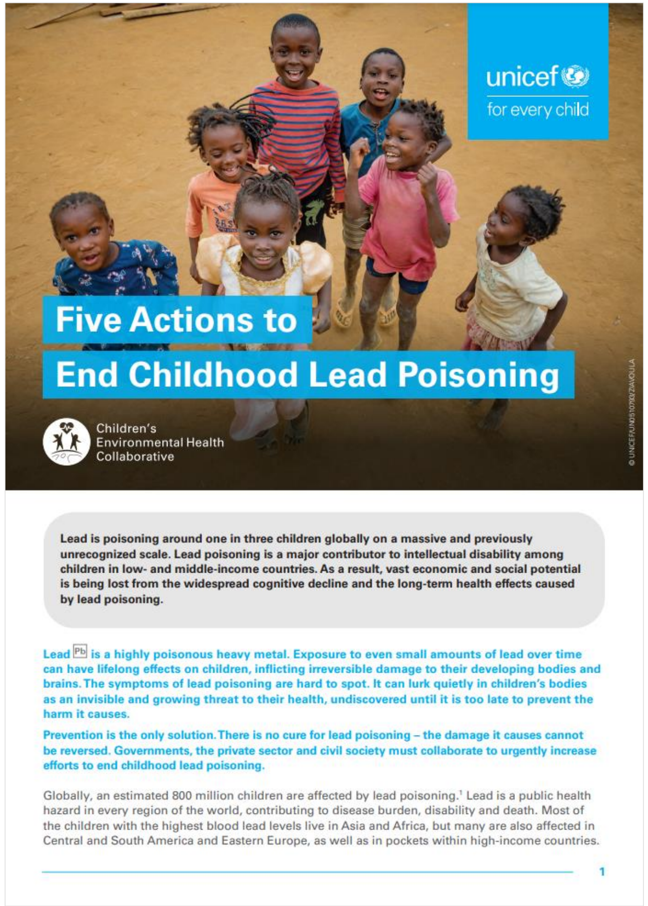

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Five Actions to End Childhood Lead Poisoning

Children's Environmental Health Collaborative

Lead is poisoning around one in three children globally on a massive and previously unrecognized scale. Lead poisoning is a major contributor to intellectual disability among children in low- and middle-income countries. As a result, vast economic and social potential is being lost from the widespread cognitive decline and the long-term health effects caused by lead poisoning.

Lead (Pb) is a highly poisonous heavy metal. Exposure to even small amounts of lead over time can have lifelong effects on children, inflicting irreversible damage to their developing bodies and brains. The symptoms of lead poisoning are hard to spot. It can lurk quietly in children's bodies as an invisible and growing threat to their health, undiscovered until it is too late to prevent the harm it causes.

Prevention is the only solution. There is no cure for lead poisoning – the damage it causes cannot be reversed. Governments, the private sector and civil society must collaborate to urgently increase efforts to end childhood lead poisoning.

Globally, an estimated 800 million children are affected by lead poisoning.[1] Lead is a public health hazard in every region of the world, contributing to disease burden, disability and death. Most of the children with the highest blood lead levels live in Asia and Africa, but many are also affected in Central and South America and Eastern Europe, as well as in pockets within high-income countries.

1

Link

END CHILDHOOD LEAD POISONING

Governments take leadership and prioritize action

1. Assess childhood lead exposure and its sources
2. Act decisively across sectors
3. Develop capacities to protect children
4. Toughen measures to reduce lead in the environment
5. Eliminate the sources of lead poisoning

END CHILDHOOD LEAD POISONING
PARTNERSHIP FOR A LEAD-FREE FUTURE

Governments can take leadership and prioritize action

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1. Assess childhood lead exposure and its sources
2. Act decisively across sectors
3. Develop capacities to protect children
4. Toughen measures to reduce lead in the environment
5. Eliminate the exposures causing lead poisoning

1 Assess childhood lead exposure and its sources

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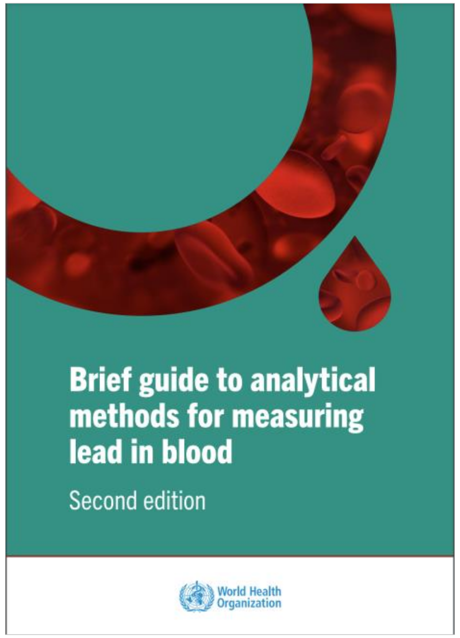
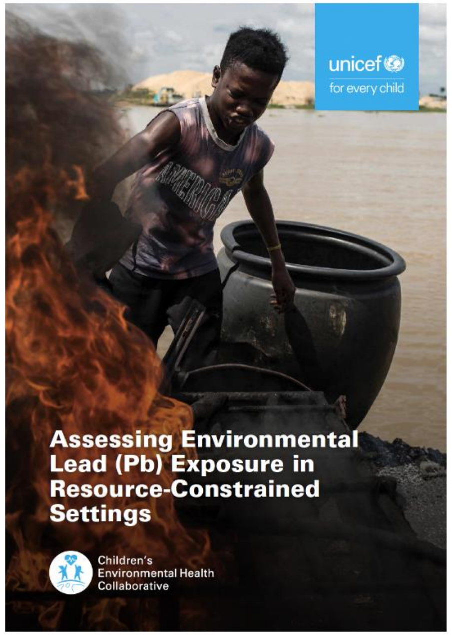
1. Assess childhood lead exposure and its sources

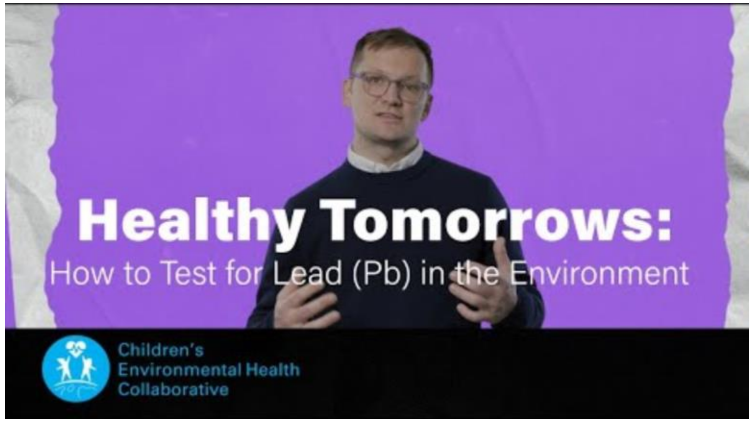
2. Collecting data on the levels of childhood lead poisoning

3. Source assessment (available)





Tool #3



2 Act decisively across sectors

unicef for every child

4. Developing a country-specific strategy to address lead poisoning
5. Communicating about lead

Links

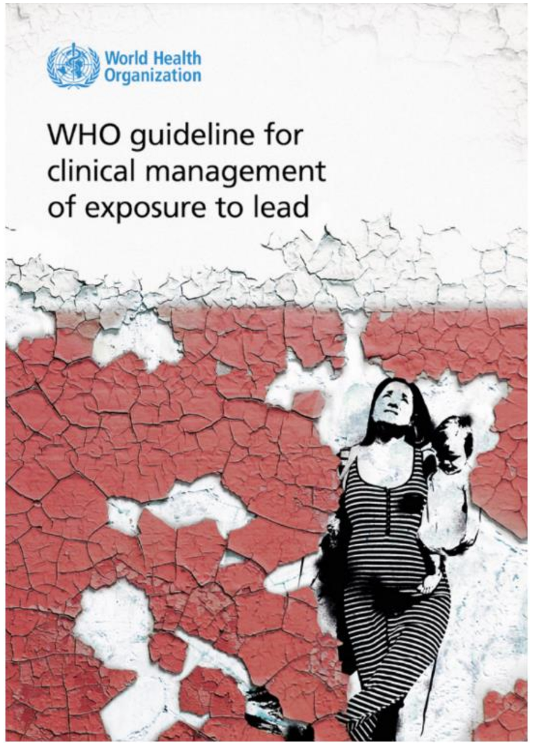
END CHILDHOOD LEAD POISONING

PARTNERSHIP FOR A LEAD-FREE FUTURE

3 Develop capacities to protect children

unicef for every child

6. Health Systems Capacity
7. Lead Surveillance System



END CHILDHOOD LEAD POISONING
PARTNERSHIP FOR A LEAD-FREE FUTURE

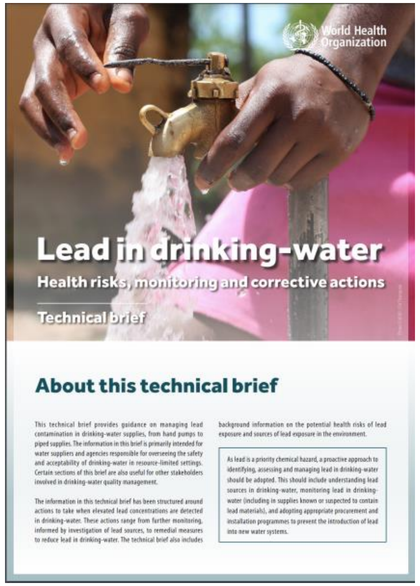
4 Toughen measures to reduce lead in the environment

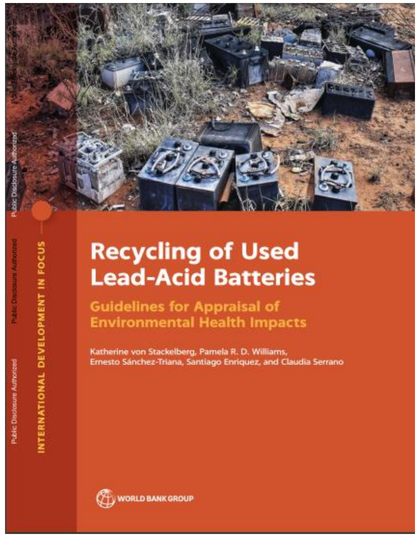
unicef for every child

8. National Environmental standards, law and regulations
9. Environmentally sound management of lead
10. Environmental protection capacity

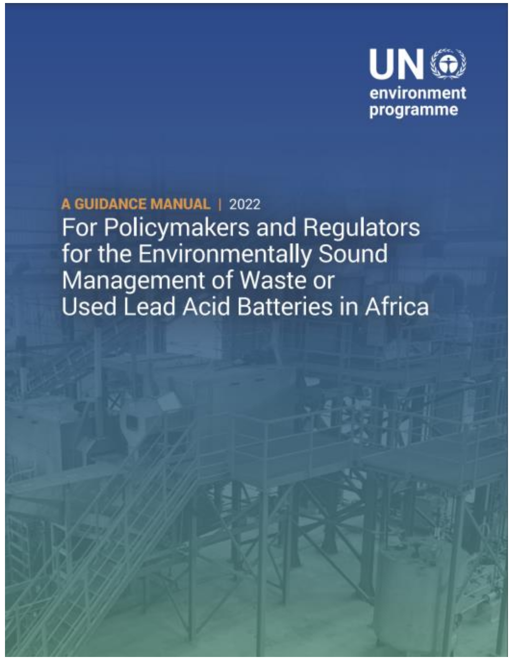
BAN LEAD PAINT

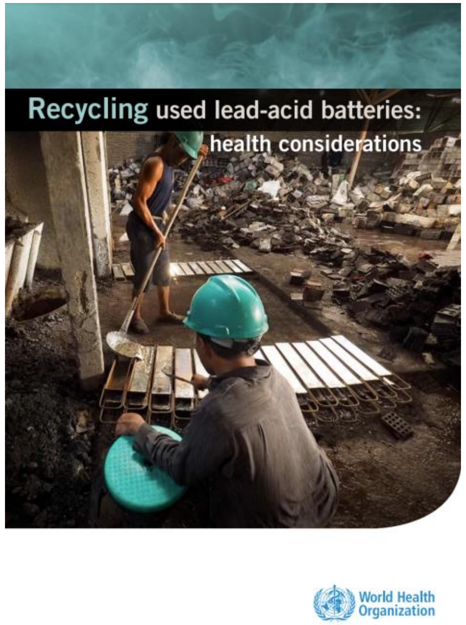
Lead Paint Alliance Resource Materials





11. Addressing unsafe and informal recycling
12. Remediation





Benchmarking progress

unicef for every child

Actions	Benchmarks for measuring progress
1. Assess childhood lead exposure and its sources	• The Government fully recognizes that childhood lead poisoning is an issue of serious concern in the country that must be addressed. • The Government has data on the levels of childhood lead exposure as the basis for action. • The Government has a potential list of sources of childhood lead exposure in the country as the basis for action.
2. Act decisively across sectors	• Institutional mandates to address the issue of lead poisoning across health and environment sectors are in place. • Coordination mechanisms involving education, trade and industry, labour and other relevant sectors are in place. • Strategy or plan to address lead poisoning is in place and this is reflected across the priorities of key sectors.
3. Develop capacities to protect children	• Health workers are trained to prevent and manage lead poisoning. • The health system is physically and institutionally equipped to prevent and manage lead poisoning with essential supplies, testing laboratory capacity and procedures. • Risk communication measures to increase awareness and protect children are being implemented. • Surveillance system to periodically monitor childhood lead poisoning and address the sources is in place.
4. Toughen measures to reduce lead in the environment	• Appropriate laws, standards, and regulations to eliminate or limit the use of lead in all consumer products are in place. • National standards/regulations and strategies for the environmentally sound management of lead in industrial applications are established. • There is environmental protection capacity to identify and address the sources of lead poisoning.
5. Eliminate the sources of lead poisoning	• National standards to ensure the elimination or limit the use of lead in all consumer products and the environmentally sound management of lead in industrial applications are being enforced. • Policy and economic measures that promote environmentally sound and safe recycling while promoting livelihood opportunities for the informal recyclers of used lead-acid batteries and electronic waste are being implemented. • Contaminated soil and water in the environment is being addressed through remediation measures or replacement of infrastructure.

END CHILDHOOD LEAD POISONING

PARTNERSHIP FOR
A LEAD-FREE FUTURE

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QUESTION AND ANSWER SESSION

RECYCLING OF USED LEAD ACID BATTERIES

Sabrina Andrade dos Santos Lima, General Coordinator of Reverse Logistics and Deputy Director of the Solid Waste Management Department, Brazil

Reverse logistics systems for lead-acid batteries

Reverse Logistics in Brazil

Reverse logistics process

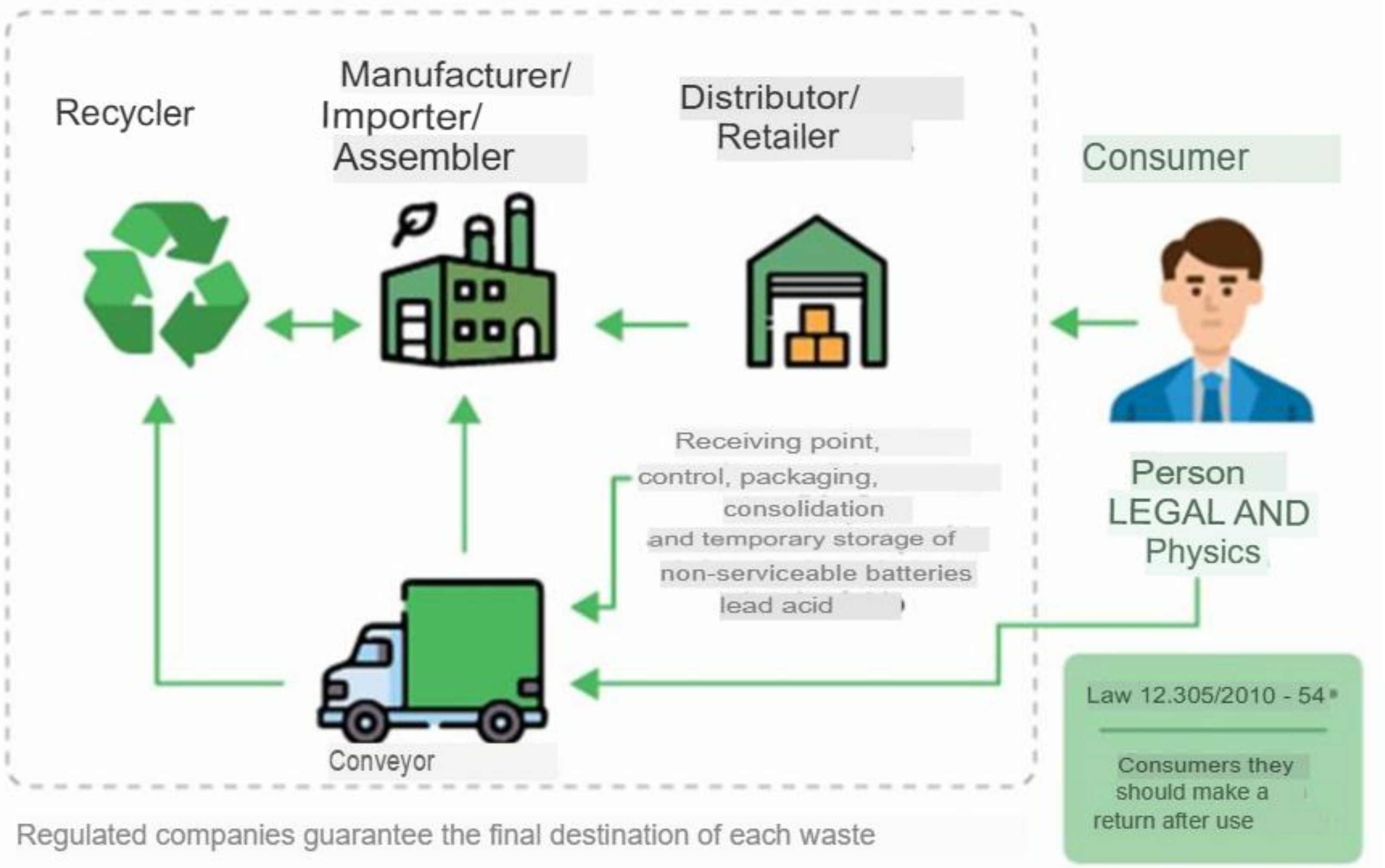


Figure 1: battery reverse logistics system

Fonte: Relatório anual de resultados 2023 – IBER.

Reverse Logistics in Brazil

Management Entity:
Brazilian Institute of Recyclable Energy-IBER

Regulations:
- Conama Resolution n.º 401/2008
- IBAMA Normative Instruction n.º 8 de 2012
- Sectorial Agreement 14/08/2019

Unserviceable Battery have an average recycling potential of 99%, meaning that minimal losses are generate in the process of recycling the material.

Lead-acid batteries are made up of plastics, lead and acid solution, which account for aproximately 6%, 52%, and 30%, respectively, of their total weight.

What is the importance of reverse logistics?

The recycling process is precise and well-established to ensure the industrial reuse of these three components in the manufacture of new energy storage devices.

Moreover, it has been continuously improved to ensure the environmentally responsible disposal of inputs that are harmful to human health and the environment, such as sulfuric acid.

Sectorial Agreement

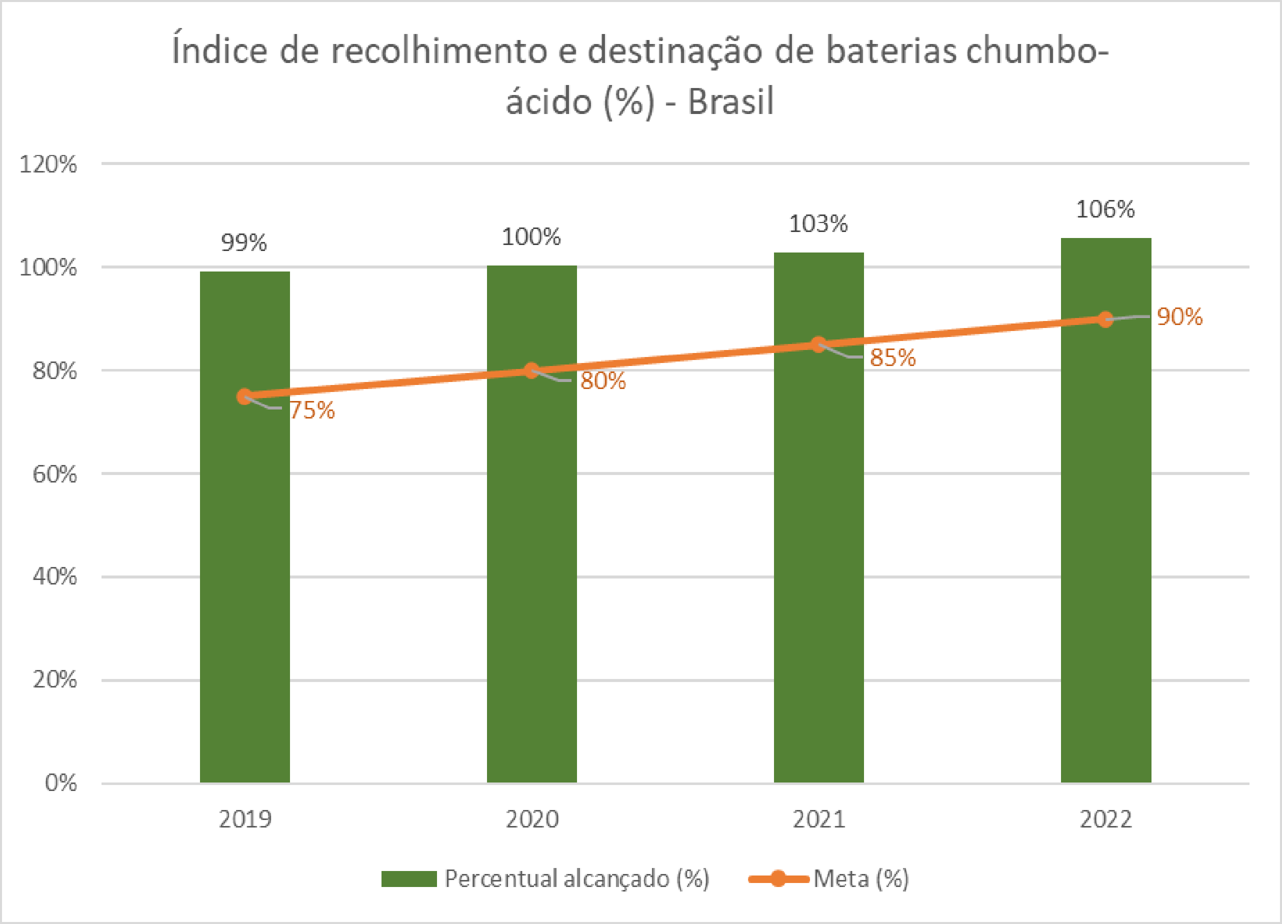
- Object
- Definitions
- System Description
- Definition of obligations
- Goals
- Monitoring, Control, and Supervision

Processo de logística reversa métodos de coleta, entidade gestora, rastreabilidade , monitoramento e fiscalização

INSTITUTO BRASILEIRO DE ENERGIA RECICLÁVEL

Ano	2019	2020	2021	2022
Meta de recolhimento e destinação de Baterias inservíveis - **Região Norte**	60%	65%	70%	75%
Meta de recolhimento e destinação de Baterias inservíveis - **Região Nordeste**	70%	75%	80%	85%
Meta de recolhimento e destinação de Baterias inservíveis - **Região Centro Oeste**	65%	70%	75%	80%
Meta de recolhimento e destinação de Baterias inservíveis - **Região Sudeste**	80%	85%	90%	95%
Meta de recolhimento e destinação de Baterias inservíveis - **Região Sul**	75%	80%	85%	90%
Meta de recolhimento e destinação de Baterias inservíveis - **Brasil**	75%	80%	85%	90%

Tabela 3: Metas de recolhimento e destinação Acordo Setorial



Fonte: Acordo Setorial 2019, Relatório anual de resultados 2023 – IBER.

MINISTÉRIO DO MEIO AMBIENTE E MUDANÇA DO CLIMA

GOVERNO FEDERAL BRASIL UNIÃO E RECONSTRUÇÃO

Problematic situations

RECYCLER ↔ **MANUFACTURER/ IMPORTER/ ASSEMBLER** ← **DISTRIBUTOR/VAREJISTA** ← **CONSUMER**

Point of receipt, control, packaging, consolidation and temporary storage of lead acid waste batteries

LEGAL ENTITY AND INDIVIDUAL

Licensed and unlicensed companies carrying out contamination

They do not have control of reverse logistics

Leakage in transport
Tampering with the batteries

Sale of batteries to scrap dealer, misuse of batteries

Situations found – JULY/24

6 recycling companies denounced practicing possible environmental infractions.

Complaint received with images captured by drone from the company's facilities where, according to the document, it is possible to identify fugitive smoke emission, releasing lead particulate into the atmosphere, the slag landfill exposed to the open, lack of floor for the containment of effluents or waste generated in the process resulting in soil contamination...

WWTP with signs of overflow - lack of containment of the lagoon

Incorrectly disposed of material and soil contamination

Fugitive smoke emission.

Slag landfill is exposed in the open

Challenges

- Complex logistic
- Costs involved
- Consumer awarenessa and education
- Fiscalization Supervision

Thank you!

ADDRESSING SOURCES OF LEAD EXPOSURE: FOCUS ON EDUCATIONAL SETTINGS

Dr. Angela Mathee, Chief Specialist Scientist at the South African Medical Research Council, South Africa

Angela Mathee
amathee@mrc.ac.za

SOURCES & RESPONSES TO LEAD EXPOSURE IN EDUCATIONAL SETTINGS IN SOUTH AFRICA

PRESENTATION OUTLINE

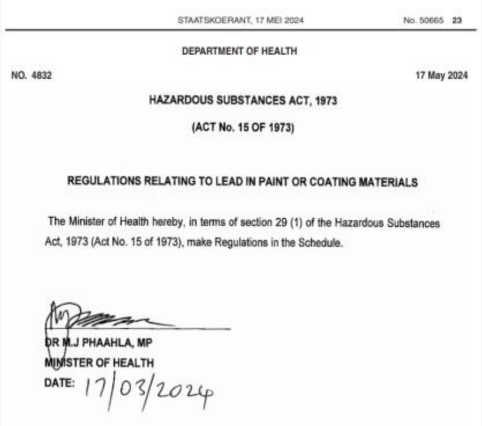
- Contextual challenges in poorly resourced settings
- Sources of lead exposure in the school setting
- Actions to date
- The unfinished agenda

LEAD EXPOSURE RISKS IN SCHOOL SETTINGS: CONTEXTUAL FACTORS

- Poverty is widespread
- Multiple sources of exposure (e.g. paint [& its numerous applications], cookware, ceramic ware, industry etc)
- High risk locations
- Simultaneous, chronic environmental exposure
- Formal + informal sectors
- Limited resources for amelioration

STRENGTHENING LEAD PAINT LAWS

- 2006 – South Africa introduces lead paint regulations (600 ppm) ***(Carmen)***
- May 2024 – revised regulations:
  - Maximum permissible level $\leq$ 90 ppm lead in paint.
  - Sets out sampling procedures, quality assurance principles & analytical methods.
  - Details labeling requirements (globally harmonized system of classification and labeling for chemicals).


STAATSKOERANT, 17 MEI 2024 No. 50665 23

DEPARTMENT OF HEALTH

NO. 4832 17 May 2024

HAZARDOUS SUBSTANCES ACT, 1973

(ACT No. 15 OF 1973)

REGULATIONS RELATING TO LEAD IN PAINT OR COATING MATERIALS

The Minister of Health hereby, in terms of section 29 (1) of the Hazardous Substances Act, 1973 (Act No. 15 of 1973), make Regulations in the Schedule.

DR MJ PHAAHLA, MP
MINISTER OF HEALTH
DATE: 17/03/2024

saMRC advancinglife

THE LEAD PAINT & PIGMENT LEGACY








samrc advancinglife

LEAD CONCENTRATIONS IN SCHOOL PAINT SAMPLES

AREA	N	RANGE (µg/g)	% ≥ 5 000 µg/g
Rural Northern Cape	4	88.0 – 23 222	25%
Kimberley	4	119.3 – 18 833	25%
Cape Town	11	236.0 – 35 434	36%
Johannesburg	10	1.4 – 8 653	20%
ALL AREAS	29	1.4 – 23 222	28%

samrc advancinglife

PAINT LEAD CONCENTRATIONS IN CITY PARKS

	n	Mean	Minimum	Maximum	% $\geq$ 1 mg/cm^2	Peeling paint
Tshwane	88	1.2	0.00	6.1	42%	Yes
Ekurhuleni	26	0.9	0.02	3.8	31%	Yes
Johannesburg	323	1.4	0.00	7.3	49%	Yes
TOTAL	437	1.4	0.00	7.3	41%	Yes

*reference value: 1 mg/cm^2




UNHEALTHY PLANNING

- The role of urban planners in disease prevention & health promotion
- Absence of basic, minimum buffer zones between point sources of pollution & human settlements
- Chronic exposure to lead in soil & dust.
- Lost opportunity for PREVENTION of lead poisoning.
- Training materials, programmes & modules on lead poisoning for urban planners.

SOWETO MINING & HEALTH STUDY

samrc advancinglife

LEAD/ZINC MINE IN NAMIBIA

RISKS FOR CHILDREN IN SCHOOLS CLOSE TO POINT SOURCES OF POLLUTION

- Elevated lead concentrations in produce from school vegetable gardens.
- Risk of chronic lead exposure
- Special concern for children with pica.
- Further risk of lead in cookware & ceramic ware.

Scientific Letter

Heavy metal contamination in a school vegetable garden in Johannesburg

T Kootbodien, A Mathee, N Naicker, N Moodley

Background. Feeding schemes based on school garden produce have been proposed as an effective solution to food insecurity and hunger among learners in South Africa. However, few studies have looked at the potential contamination of school food gardens when situated near mine tailing dams.

concentrations of the vegetable samples were analysed in the laboratories of the South African Agricultural Research Council.

Results. High levels of arsenic were found in the school soil samples, and elevated concentrations of lead and mercury in the school vegetables. Calculation of the estimated daily intake for a

LEAD IN SCHOOL COOKWARE

- School feeding programmes.
- Use of pots made from recycled aluminium waste.
- Final step: finishing with silver paint.
- Informal sector, cottage industry.
- Leaching of lead & arsenic
- Where used, potentially a daily, chronic source of exposure.
- School + home

FOR CONSIDERATION

- Role of urban planners in prevention of lead exposure & poisoning.
  - Amend the curricula of urban planners.
- Legacy of old lead paint.
  - Research & assessment of sources at schools
  - Lead Safe Schools programmes
- Surveillance and Research
  - Blood lead and environmental surveillance in high risk areas
  - Action to eliminate sources (e.g. artisanal waste aluminium pots).
  - Research and evaluation of interventions
- The unfinished agenda.

The South African Medical Research Council

recognizes the catastrophic and persisting consequences of colonialism and apartheid, including land dispossession and the intentional imposition of educational and health inequities.

Acknowledging the SAMRC's historical role and silence during apartheid,
we commit our capacities and resources to the continued promotion of justice and dignity in health research in South Africa.

transformation

WORKING TOGETHER FOR EXCELLENCE

saMRC
advancinglife

SURVEILLANCE OF BLOOD LEAD LEVELS

Dr. Meera Dhuria, Joint Director, National Center for Disease Control, India

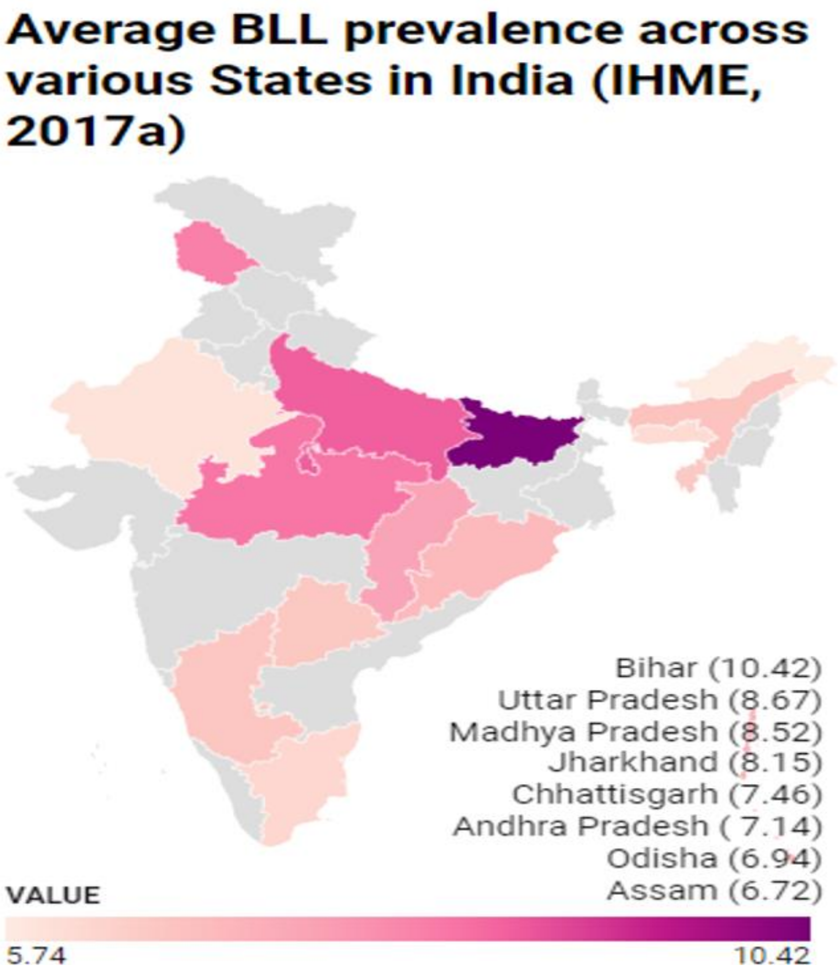
Opportunity for setting up a surveillance system for chemical toxicants in India

Inter-sectoral expert webinar
on Lead Pollution and Exposure in G-20 Countries
5 November, 2024

Dr Meera Dhuria, *MBBS, MD, MBA (HCA)*
Joint Director,
National Centre for Disease Control

India Country Background

State Wise Blood Lead Level Prevalence



- As per report published by CSIR NITI, a total of 23 states of India exceed the 5ug/dL blood lead level (BLL) limit#

Summary of legislations and policies required to reduce and control the exposure to Pb- NITI Aayog, Govt. Of India

- Develop, implement and enforce environmental safety standards for Pb-acid battery manufacturers and recyclers
- Enforce legislation regulating E-waste recycling and proper formal recycling
- Develop and implement policies to exclude the use of Pb in gasoline and paint, ceramic potteries, cosmetics, and medicines
- Implement regulations for air quality parameters for smelting operations.
- Pb parameters to be included in national drinking water quality standards
- Education and awareness among the public on lead toxicity and its impact on human health.
- Remediation of Pb-contaminated areas/sites
- Encourage the usage of non-Pb composites in paint
- Assessments at the local level like households, schools and communities
- Public- Private partnership for exposure reduction

National Biomonitoring Program on Chemical Toxicants

- Chemical toxicants- Chemicals to be prioritized
- **Technical Working Group** under the Ministry of Health and Family Welfare (MoHFW), in 2023, proposed:
    - a **National Biomonitoring Programme for Chemical Toxicants**
    - establishment of a **National Surveillance System** to assess and report exposure to environmental chemicals, including heavy metals

Objectives

- Assess the Exposure Level
- Identifying Vulnerable Groups
- Monitor Trends
- Inform Policymakers
- Educate and Raise Awareness

Timeline

15 Feb, 23	• **Expert Group Meeting on Lead Poisoning, MoHFW**
26 Sep, 23	• **Technical Working Group (TWG) constituted**
20 Oct, 23	• **First meeting of TWG**
2 Nov, 23	• **Meeting with Stakeholder Laboratories**
29 Nov, 23	• **Second Meeting of TWG**
14-15 Mar, 24	• **Stakeholder Engagement Workshop**
11 Sep, 24	• **Technical working group for establishing National Surveillance System**

- The alarming situation of heavy metal toxicity in various parts of India calls for surveillance for chemical events (acute and chronic exposures), leveraging the existing Integrated Health Information Platform IHIP machinery

- Aim for development of a national database for mapping risk, exposure and effects of chemical toxicants

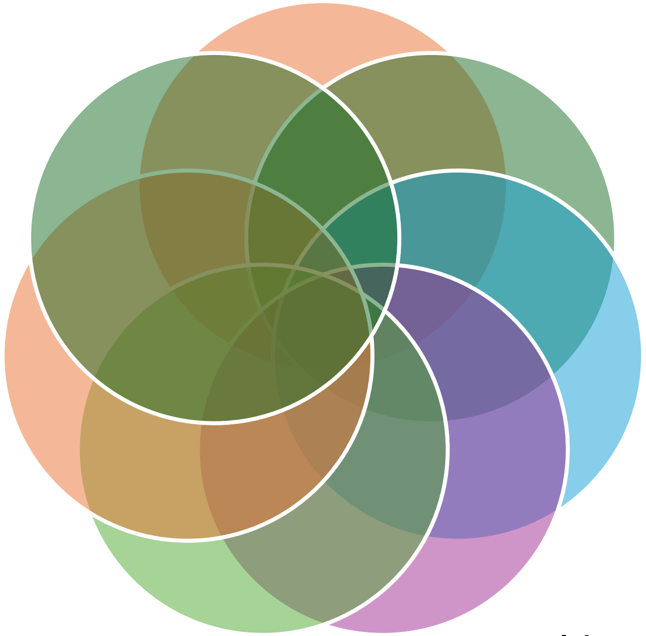
- The goal is to provide crucial data to identify potential health risks, guide policy-making decisions and enable targeted interventions to mitigate the adverse effects of heavy metal and other chemical exposures in India.

Inter-sectoral Coordination

Clinicians

International organisations like UNICEF, USAID, WHO etc.

Laboratories



Academic institutes and researchers

Food, drug, water and pollution regulators

NGOs, Civil Society Organisations, Professional bodies

Non Health Ministries- Environment, Mines, Drinking water and sanitation, Commerce and Industry, Chemicals and fertilizers etc.

Challenges and opportunities

- **Challenges**
  - Cost and availability of tests
  - Multiple development and health priorities
  - Small-scale industries and Un-organised sectors involved in manufacturing, transport and recycling
  - Health workforce and community awareness and capacity
- **Opportunities**
  - Start-up and tech-ecosystem
  - Digital and mobile service reach
  - Strong Universal Health Programme under Ayushman Bharat and increasing investment in Health
  - Political will and commitment

LEAD PREVENTION AND REDUCTION IN INDUSTRIAL EMISSIONS

Toon Smets, Policy Officer, European Commission

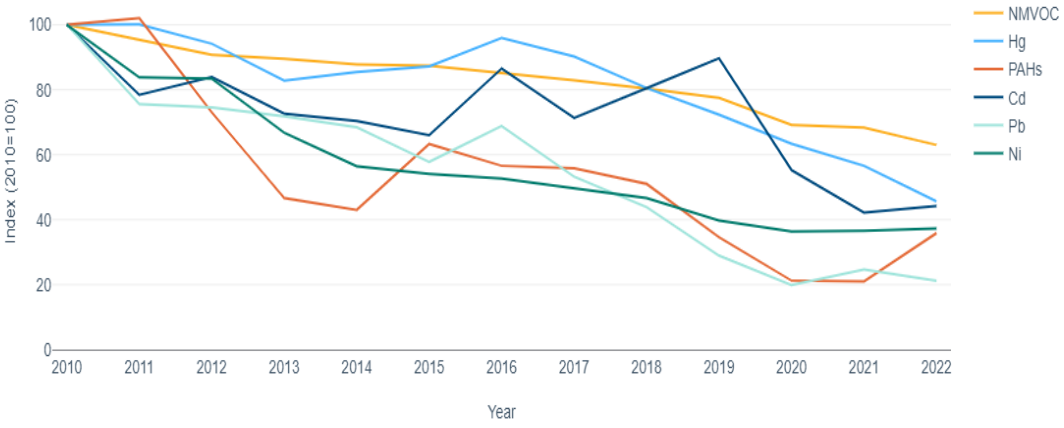
Lead prevention and reduction in industrial emissions in the EU

Inter-sectoral expert webinar on lead pollution and exposure in G20 members
5 November 2024

DG ENV Unit C4 – Industrial Emissions & Safety

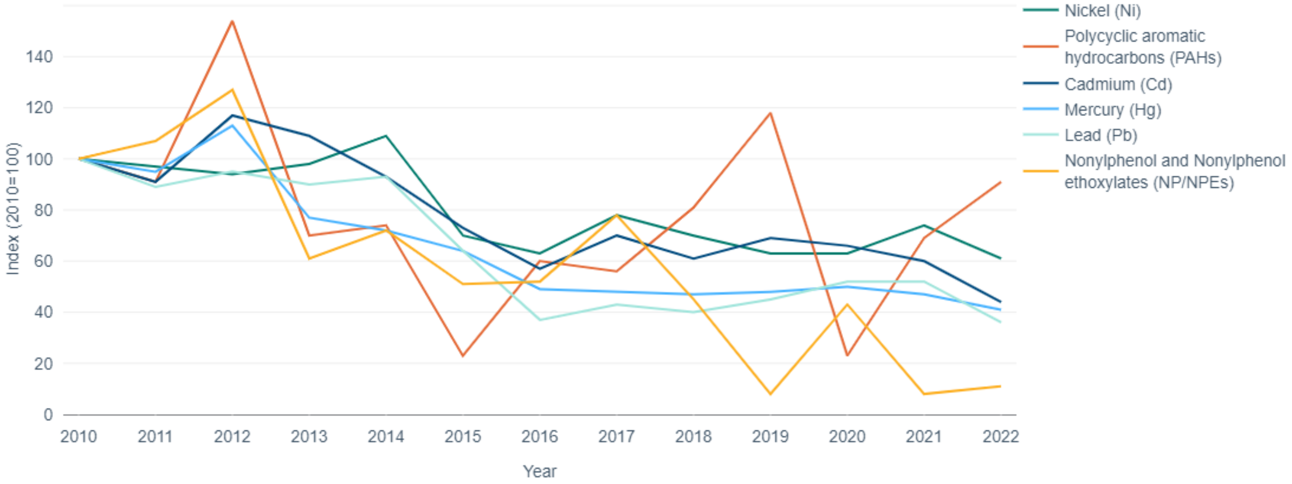
Reduction of lead emissions from industry

INDUSTRIAL POLLUTANTS RELEASES TO **AIR**



Between 2010 and 2022, **industrial releases to air** of the heavy metals mercury, cadmium, **lead**, nickel and their compounds decreased by 54%, 56%, **79%** and 63%, respectively.

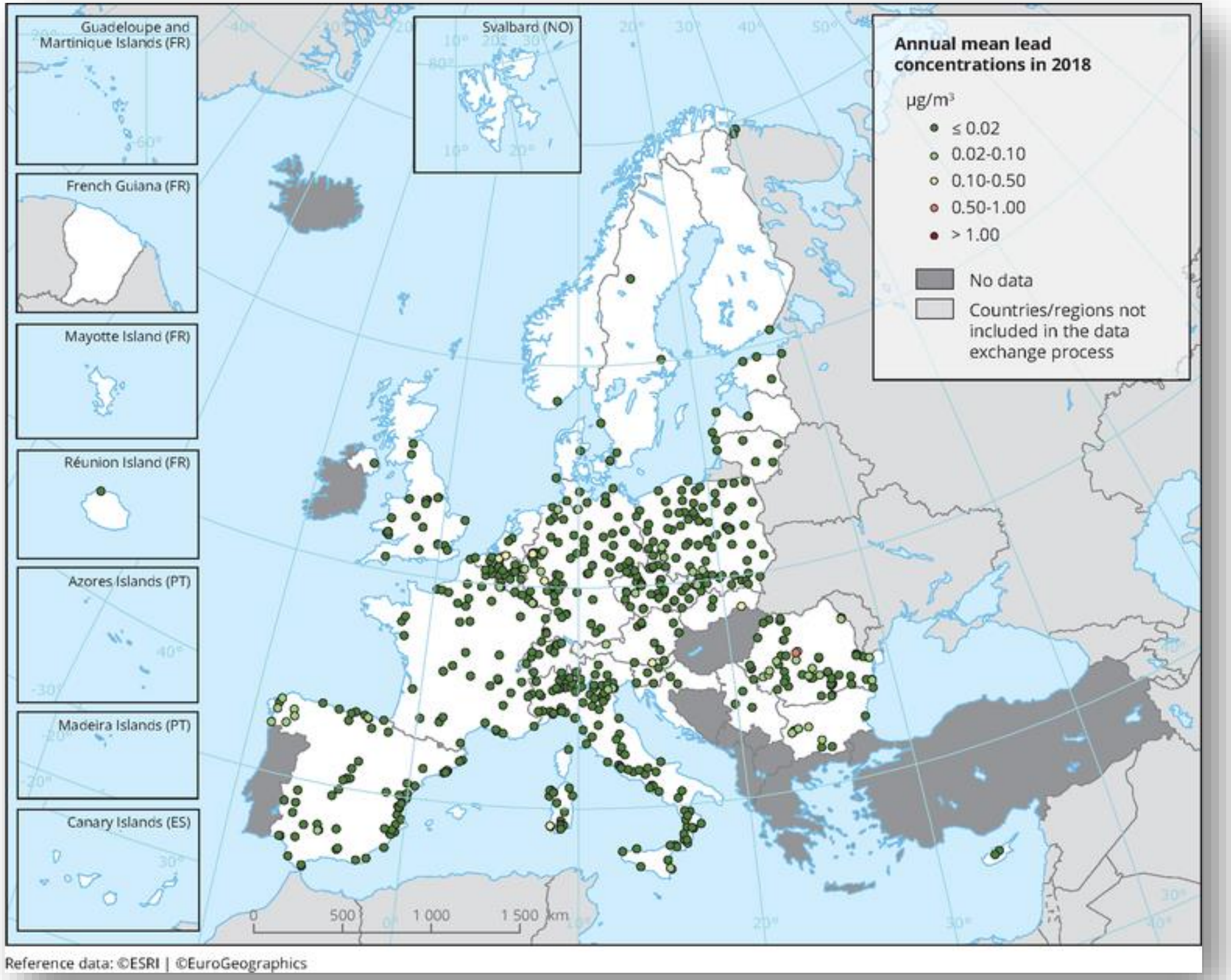
INDUSTRIAL POLLUTANTS RELEASES TO **WATER**



Industrial releases to water of the heavy metals nickel, cadmium, mercury, **lead**, and their compounds decreased by 39, 56, 59 and **64%**, respectively.

Data from Industrial Emission Portal: https://industry.eea.europa.eu/

Concentrations of lead in ambient air



Observed **concentrations of lead in ambient air** in 2018 (annual mean).

- Data from **695 stations** in 27 European countries were reported in 2018.
- **Only one urban industrial station** in Romania reported Pb concentrations **above the 0.5 µg/m³** limit value.
- Overall, **only two stations** reported Pb concentrations **above 0.25 µg/m³** (lower assessment threshold)

(dots in the last two categories (orange and red) correspond to concentrations above the EU annual limit value)

Data from:
https://www.eea.europa.eu/publications/air-quality-in-europe-2020-report

European Commission

Industrial lead emission reduction in the EU

In the last decades, lead (Pb) emissions from key industrial sectors (e.g. metallurgy, battery manufacturing, hazardous waste treatment, and fossil fuel combustion), have decreased across the EU.

Main legislative milestones:

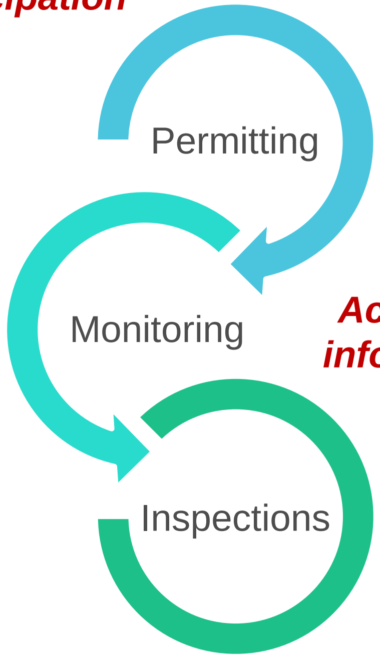
- The **Dangerous Substances Directive (76/464/EEC)** aimed at controlling water pollution from specific dangerous substances, including heavy metals like lead, but it primarily targeted **water discharges**, **not air emissions**. 1976
- The **Large Combustion Plants Directive (88/609/EEC)** regulated emissions of pollutants like sulfur dioxide and nitrogen oxides from large combustion plants, though **not explicitly lead**. 1988
- The **Air Quality Framework Directive (96/62/EC)** and related daughter directives, such as the 2002 directive on lead in ambient air, set **ambient quality standards** but did **not** impose direct **emission limits** on industrial sources.
- The **IPPC Directive (96/61/EC)** aimed to minimize pollution from various industrial activities across the EU. It required operators to **obtain permits for industrial installations**, and these permits were based on **Best Available Techniques (BAT)** to prevent or reduce emissions to air, soil and water. 1996
- The **IED (2010/75/EU)** later reinforced this legislation, making emission limit values more explicit and harmonized across EU countries. In 2024 a revised IED was published **(Industrial and Livestock Rearing Emissions Directive – IED 2.0)**. 2010 2024

EU’s Industrial Emissions Directive (IED 2.0)

IED is a permitting directive

Best Available Techniques Conclusions (BATC) are at the core of the IED permits

Public Participation

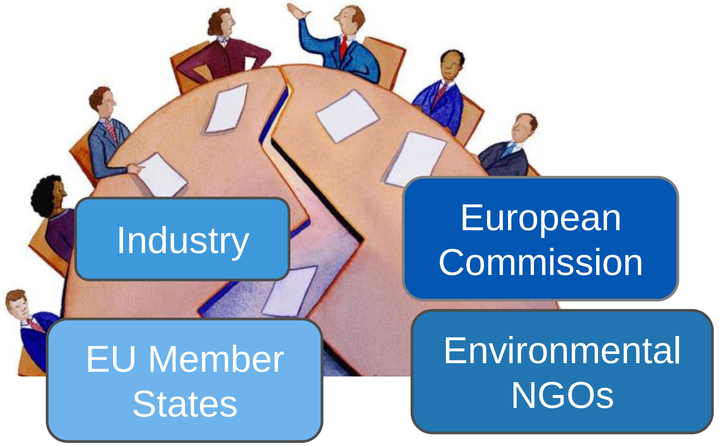


Access to justice

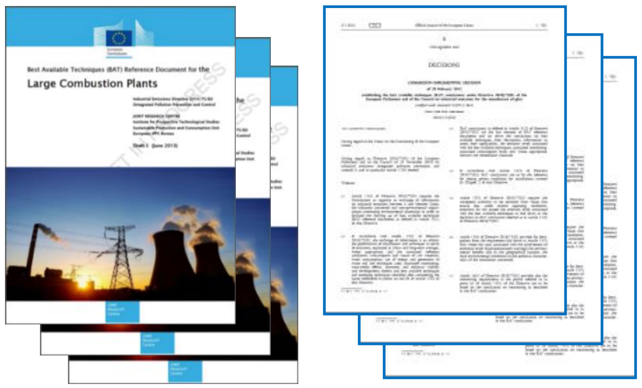
Access to information

Reduction of environmental impacts

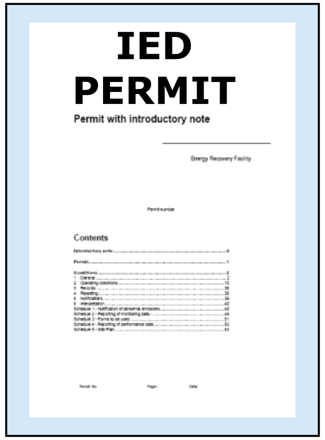
+20 years *‘Sevilla process’*



Highly inclusive exchange of information among technical experts resulting in BAT Reference Documents (BREFs)



BREFs include BATC



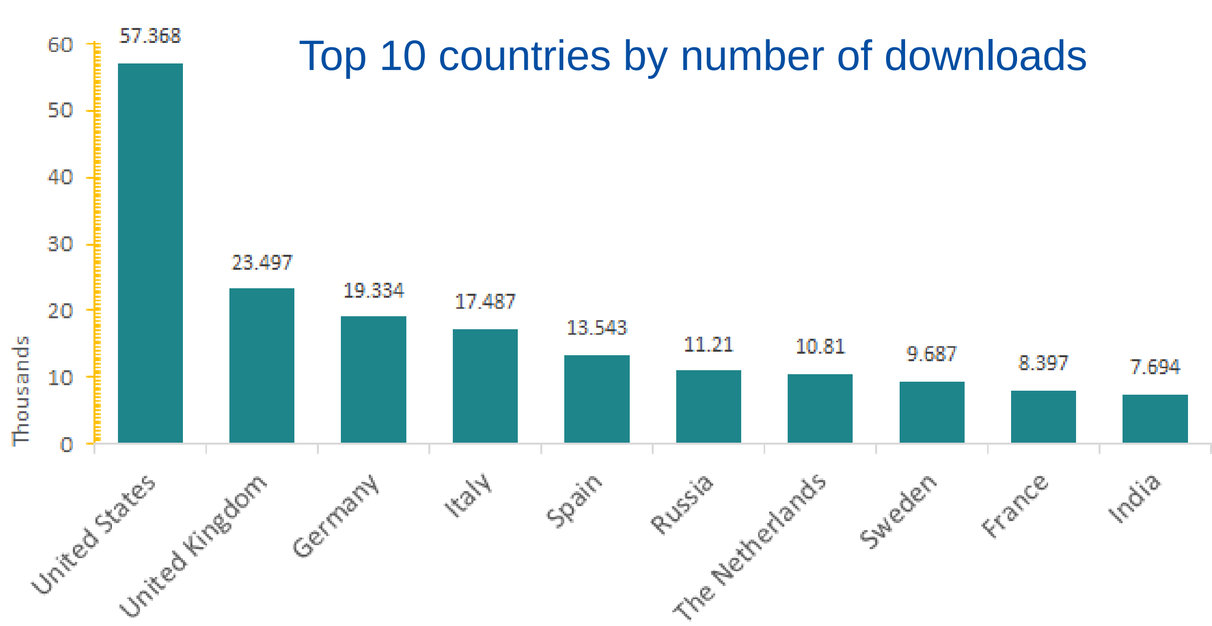
Sevilla process: worldwide outreach

BREFs: 'best sellers'

2023:

6 872 281	Website visits
215 900	BREF downloads

- BAT conclusions are also available in Arabic, Chinese and Russian
- BAT reference documents and BATC: https://eippcb.jrc.ec.europa.eu/reference



- **BAT-based systems around the world**
- **OECD expert group**
- **Cooperation activities**

Best Available Techniques (BAT)

Published BAT conclusions (with BAT on lead emissions):

- Ferrous Metals Processing Industry (FMP, 2022)
- Non-ferrous Metals Industries (NFM, 2016)
- Iron and Steel Production (IS, 2012)
- Manufacture of Glass (GLS, 2012)
- Refining of Mineral Oil and Gas (REF, 2014)
- Large Combustion Plants (LCP, 2021)
- Waste Incineration (WI, 2019)
- Waste Treatment (WT, 2018)
- Common Waste Gas Management and Treatment Systems in the Chemical Sector (CWW, 2016)

BAT 17. In order to reduce emissions to water, BAT is to treat the leakages from the storage of liquids and the waste water from non-ferrous metals production, including from the washing stage in the Waelz kiln process, and to remove metals and sulphates by using a combination of the techniques given below.

	Technique (1)	Applicability
a	Chemical precipitation	Generally applicable
b	Sedimentation	Generally applicable
c	Filtration	Generally applicable
d	Flotation	Generally applicable

…

BAT-associated emission levels for direct emissions to a receiving water body from the production of copper, lead, tin, zinc (including the waste water from the washing stage in the Waelz kiln process), cadmium, precious metals, nickel, cobalt and ferro-alloys

Parameter	BAT-AEL (mg/l) (daily average)					
	Production of					
	Copper	Lead and/or Tin	Zinc and/or Cadmium	Precious metals	Nickel and/or Cobalt	Ferro-alloys
Lead (Pb)	≤ 0,5	≤ 0,5	≤ 0,2	≤ 0,5	≤ 0,5	≤ 0,2

BAT 25. In order to reduce channelled emissions to air of dust, metals and metalloids from the incineration of waste, BAT is to use one or a combination of the techniques given below.

	Technique	Description	Applicability
(a)	Bag filter	See Section 2.2	Generally applicable to new plants. Applicable to existing plants within the constraints associated with the operating temperature profile of the FGC system.
(b)	Electrostatic precipitator	See Section 2.2	Generally applicable.

…

BAT-associated emission levels (BAT-AELs) for channelled emissions to air of dust, metals and metalloids from the incineration of waste

(mg/Nm³)

Parameter	BAT-AEL	Averaging period
Dust	< 2–5 (1)	Daily average
Cd+Tl	0,005–0,02	Average over the sampling period
Sb+As+Pb+Cr+Co+Cu+Mn+Ni+V	0,01–0,3	Average over the sampling period

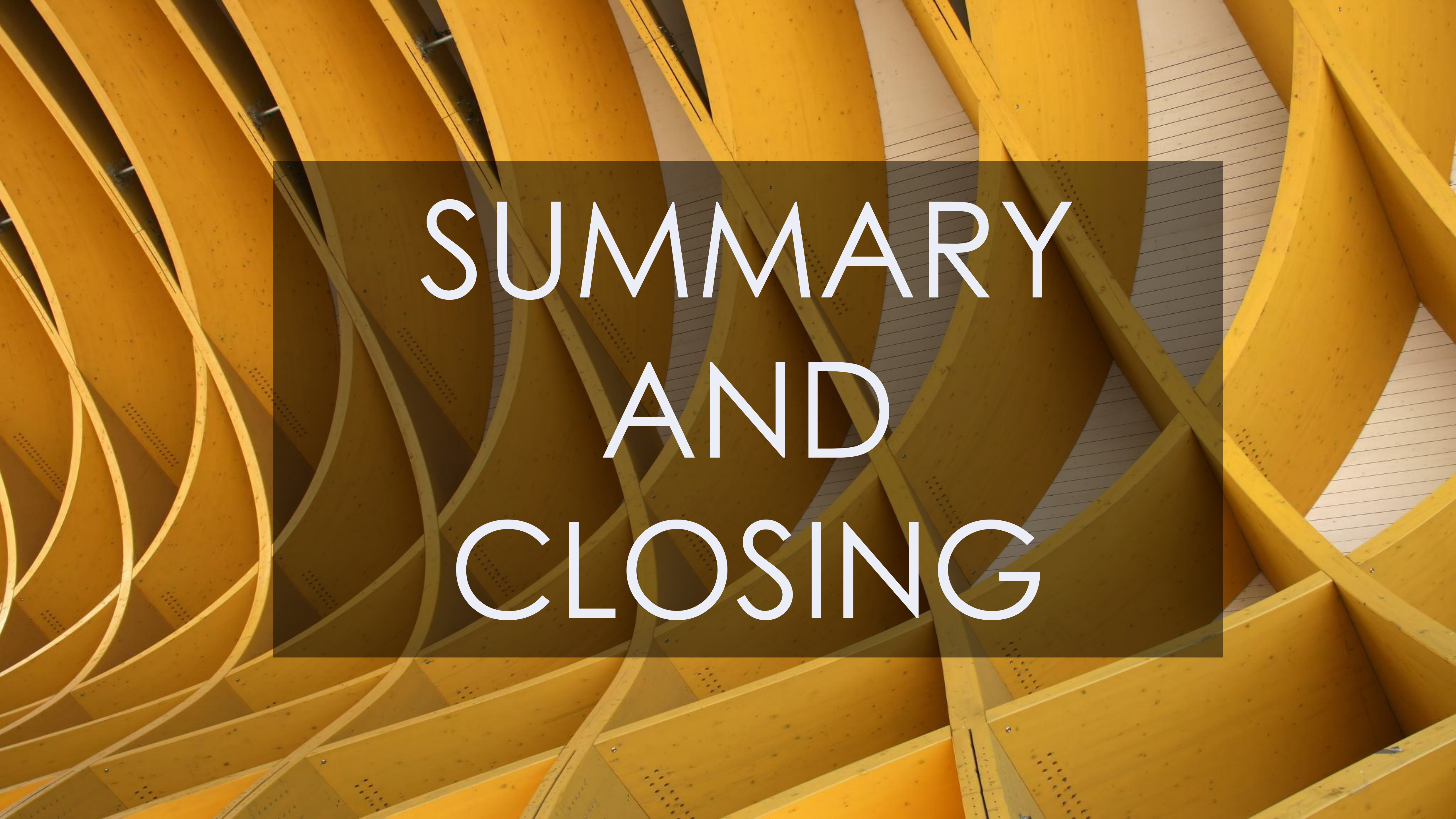
Thank you !

Email: ENV-IED@ec.Europa.eu

DG ENV - Industrial emissions and safety: https://environment.ec.europa.eu/topics/industrial-emissions-and-safety_en

European Commission

DISCUSSION OF EXPERIENCES AND OPTIONS FOR ACTION



SUMMARY AND CLOSING

Thank You