

Economic Costs of Childhood Lead Exposure

Toolkit for establishing
laws to eliminate
lead paint

2021 Update

Module B iii.

 NYU School of Medicine
NYU LANGONE MEDICAL CENTER

 Global Alliance to
Eliminate Lead Paint

Outline

- Understanding the Economic Cost of Childhood Lead Exposure
- How these costs were calculated
- Economic costs in low- and middle-income countries in different regions of the world
- Comparison of economic costs with developed countries and overseas development assistance
- Information about web-based awareness tool
- Data for selected countries by region
- Summary, References and Contacts



Understanding the Economic Cost of Childhood Lead Exposure

- Exposure to lead has **permanent negative impacts to children's developing brains**, with staggering economic costs.
- **Lifelong consequences** are borne by the affected children, their families, and societies at large.
- One key impact is reduction in intelligence quotient (IQ), which can be correlated with **decreases in lifetime earning potential**.
- Research by New York University estimates **the economic costs of preventable lead exposure** in children for Low- and Middle-Income Countries (LMICs).

How the Data were Calculated

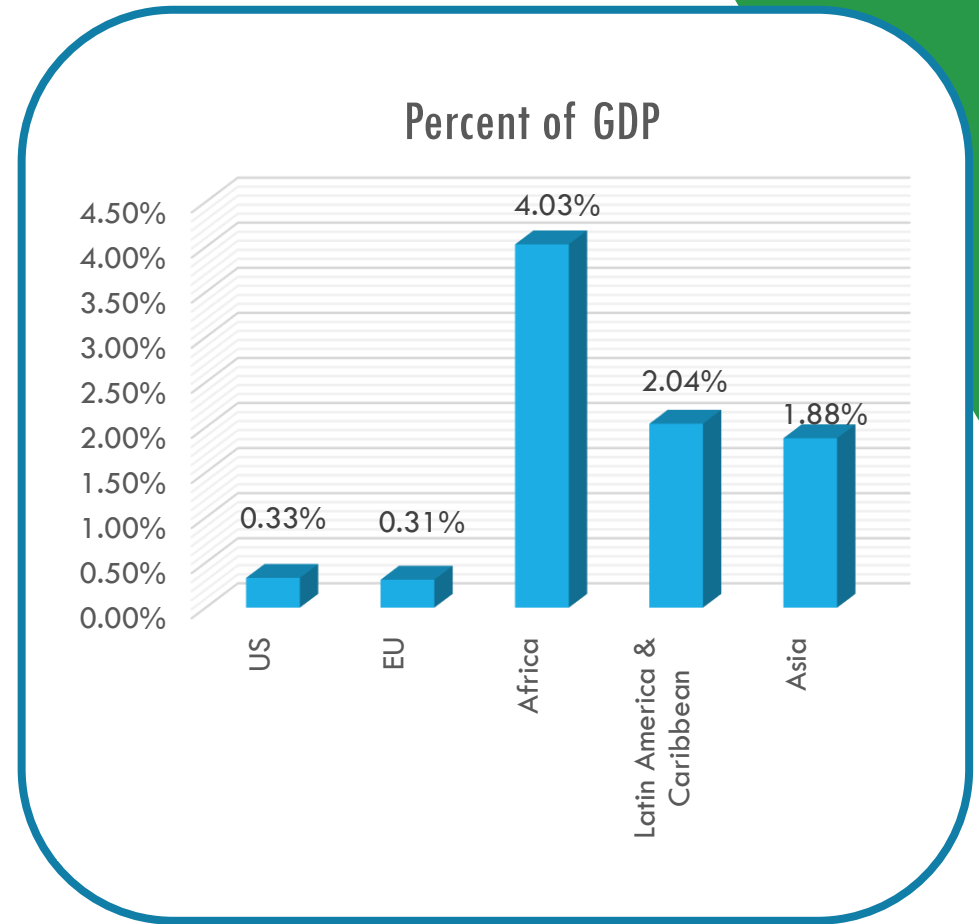
- The analysis focused on the impact of lead on the developing brain, leading to a **reduction in IQ points**, and how this **translates in reduced lifetime earning potential for the affected children**.
- Researchers developed a model to predict mean blood lead levels (BLLs) in children in LMICs where there were no available data, then calculated:
 - ✓ Total IQ loss from lead exposure
 - ✓ Corresponding lost lifetime economic productivity (LEP)
 - ✓ LEP due to reductions in IQ score
 - ✓ Total lost LEP per country

Estimated Costs by Region

- The research findings indicate that, in LMICs, lead exposure is still a major contributor to reduced IQ scores in children
- 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
 - **Latin America & Caribbean:** \$142.3 billion, i.e. 2.04% of regional GDP
 - **Asia:** \$699.9 billion, i.e. 1.88% of regional GDP
- The research reviewed published literature for studies estimating blood lead levels in LMICs, following the World Bank country classification by income (World Bank 2012a). The Central and Eastern European Region is not included in this classification.

Comparison to High-Income Economies

- Overall burden associated with childhood lead exposure in LMICs amounted to **1.20% of world GDP** in 2011; approximately \$977 billion of international dollars in 2008
- For comparison, economic impact of lead exposure in **high-income economies** (such as U.S. and European Union [EU] countries) is \$50.9 and \$55 billion, respectively
- The chart shows regional cost comparisons to the U.S. and the EU (as percent of GDP)



Comparison of Net Overseas Development Assistance (ODA) for 2008 with Cost of Childhood Lead Exposure in Selected Sub-Saharan Countries

Country	Net ODA for 2008 (US \$, millions)	Lost economic productivity per each 1-year cohort of children under 5yrs (US \$, millions)
Cameroon	\$299	\$1,260
Côte d'Ivoire	\$200	\$881
Ethiopia	\$1,845	\$1,790
Ghana	\$726	\$860
Kenya	\$955	\$1,504
Mali	\$532	\$460
Mozambique	\$1,345	\$812
Nigeria	\$638	\$4,866
Rwanda	\$452	\$316
South Africa	\$882	\$8,854
Uganda	\$1,009	\$1,062
Zambia	\$705	\$721

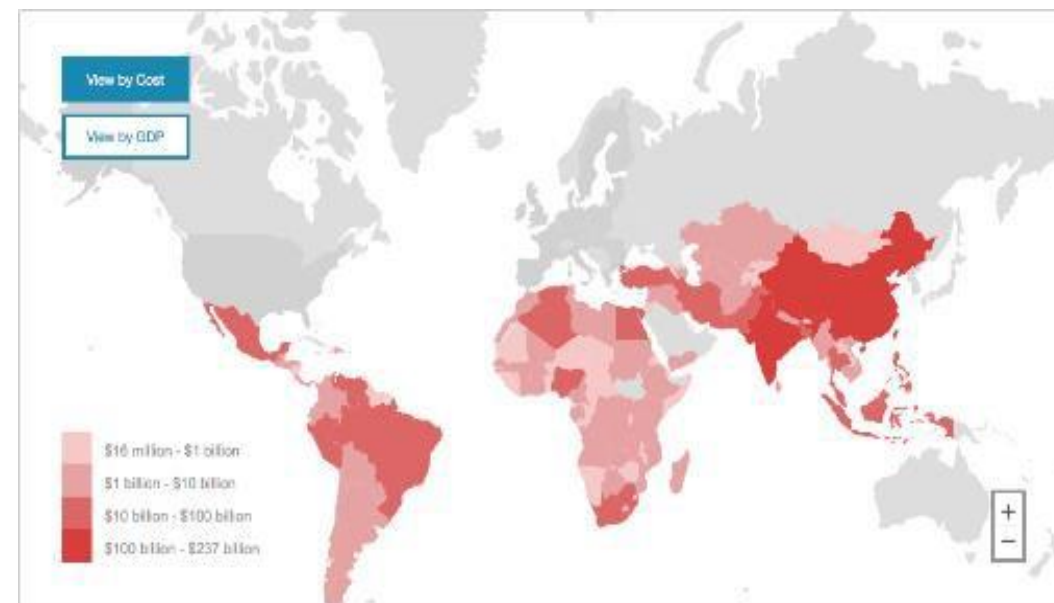
The table shows that the economic impacts of childhood lead exposure are comparable or greater than the net official development assistance (ODA) received by some low-income countries.

Data Source:

<https://med.nyu.edu/departments-institutes/pediatrics/divisions/environmental-pediatrics/sites/default/files/pediatrics/worldmap/images/ODA-table-color.pdf>

Web-Based Awareness Tool

- **Interactive map** based on the findings of this analysis in LMICs displays cost and corresponding percent GDP loss by country
- Provides **comparison information**:
 - among countries in the same region
 - to the costs in EU countries and the U.S

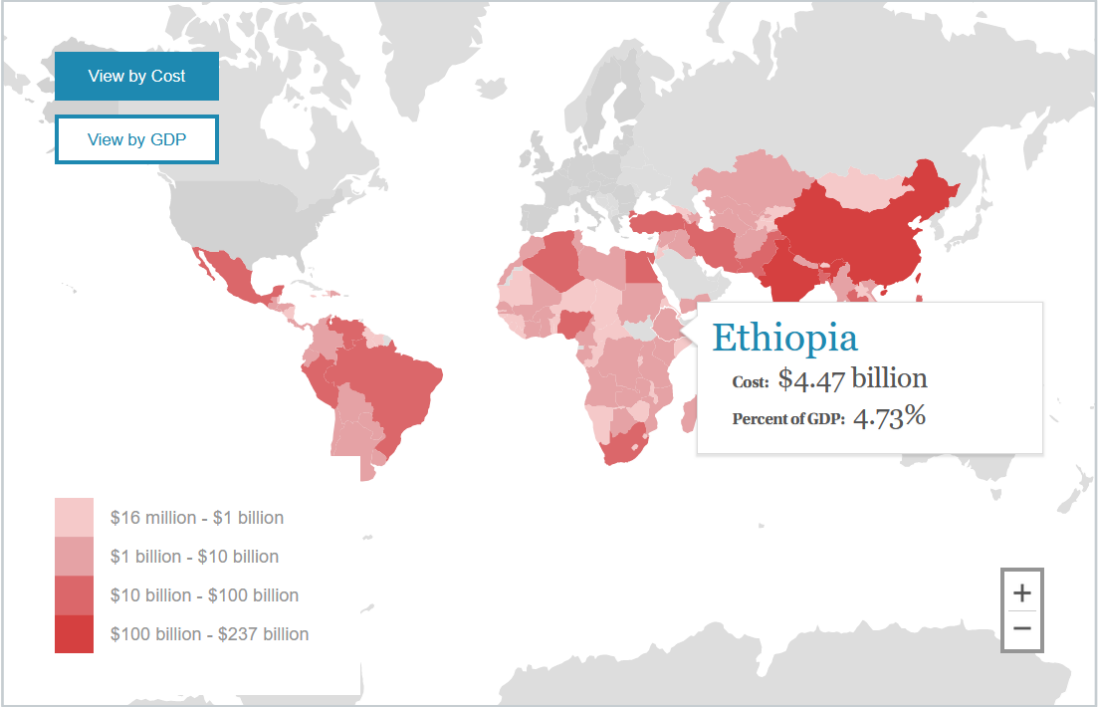


nyulmc.org/pediatricleadexposure

The map helps stakeholders and decision makers understand and quantify the **preventable economic burden of childhood lead exposure** in Low- and Middle-income Countries.

How the Map Works

1. Hover over country to view brief summary of information



2. Click for more detailed information

< Back to Map

Ethiopia
Region: Africa
Sub-Region: Eastern Africa

Cost: **\$4.47 billion**
Cost as percent of GDP: **4.73%**

Average Blood Lead Level: **6.45 µg/dl**
Presumed IQ Loss: **8 million points**
Lost Lifetime Economic Productivity per IQ Point: **\$567**
Population under 5 years of age: **2 million children**

Cost Compared to the region: **15 Millions** to **300 Billions**

Percent GDP Loss Compared to the region: **0%** to **10%**

Sample Data for Selected LMICs – Africa

Country	Annual Cost (I\$)*	% GDP
Uganda	3.54 billion	7.58
Zambia	1.44 billion	6.59
Malawi	878 million	6.22
Tanzania	4.13 billion	6.06
Benin	861 million	5.81
Rwanda	789 million	5.77
Democratic Republic of Congo	990 million	5.4
Cameroon	2.52 billion	5.28
Kenya	3.75 billion	5.26
Sudan	4.93 billion	5.17
Côte d'Ivoire	1.76 billion	4.85
Ethiopia	4.47 billion	4.73
Ghana	2.15 billion	4.57
Nigeria	16.2 billion	3.94
Burundi	179 million	3.45
South Africa	17.7 billion	3.17

*Annual cost represents lost economic productivity per each 1-year cohort of children under 5yrs (international \$, millions)

Full report by New York University researchers available online and by request.

Sample Data for Selected LMICs – Latin America

Country	Annual Cost (I\$)	% GDP
Argentina	9.78 billion	1.36
Belize	51.55 million	2.15
Bolivia	1.7 billion	3.28
Brazil	33 billion	1.43
Chile	6.45 billion	2.16
Colombia	8.9 billion	1.88
Costa Rica	1.33 million	2.29
Dominican Republic	3.15 billion	3.18
Ecuador	2.46 billion	1.98
El Salvador	1.31 million	3.05
Grenada	33.8 million	2.88
Guatemala	3.29 billion	4.49
Guyana	72.3 million	2.78
Haiti	439.9 million	3.68

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Data available by country.

Full report by New York University researchers available online and by request.

Sample Data for Selected LMICs – Latin America

(Continued)

Country	Annual Cost (I\$)	% GDP
Honduras	1.2 billion	3.81
Jamaica	387 million	1.77
Mexico	32.6 billion	1.86
Nicaragua	623 million	3.61
Panama	1.61 billion	2.87
Paraguay	1.26 billion	3.54
Peru	10.7 billion	3.54
Saint Lucia	53.5 million	3.24
Saint Vincent	32.8 million	2.77
Suriname	123 million	2.98
Uruguay	1.34 million	2.62
Venezuela	20.35 billion	5.42

Data available by country.

Full report by New York University researchers available online and by request.

Sample Data for Selected LMICs – Asia

Country	Annual Cost (\$)	% GDP
Armenia	414 million	2.29
Azerbaijan	2.49 billion	2.68
Georgia	427 million	1.73
Kazakhstan	8.18 billion	3.75
Kyrgyzstan	463 million	3.47
Tajikistan	830 million	5.09
Turkmenistan	1.47 billion	3.13
Uzbekistan	3.76 billion	3.87
Philippines	15 billion	3.82
Thailand	12.5 billion	2.07
India	236 billion	5.21
Afghanistan	2.74 billion	6.36
Bangladesh	15.9 billion	5.90
Pakistan	37.8 billion	7.75

Data available by country.

Full report by New York University researchers available online and by request.

Summary

- Estimating and aggregating future earnings foregone (lost LEP) provides a sense of the economic cost of childhood lead exposure.
 - The total cost in LMICs was estimated at \$977 billion (range \$728.6–1162.5 billion) of international dollars in 2008.
 - This cost is repeated each year as new children are born.
 - Investments in lead hazard control may produce large economic benefits.
 - A new interactive map enables stakeholders and decision-makers to view country information related to costs.
- View your country and see how it compares to others at: nyulmc.org/pediatricleadexposure

References

1. 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.
2. Bartlett ES, Trasande L. Economic impacts of environmentally attributable childhood health outcomes in the European Union. *Eur J Public Health*. 2014 Feb;24(1):21-6.
3. Trasande L, Liu Y. Reducing the staggering costs of environmental disease in children, estimated at \$76.6 billion in 2008. *Health Affairs (Millwood)*. 2011 May;30(5):863-70.
4. ODA Official development assistance: disbursements. OECD International Development Statistics. Available [here](#)

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The logo for NYU School of Medicine, featuring a stylized 'NYU' in a circle above the text 'NYU School of Medicine' and 'NYU LANGONE MEDICAL CENTER' below it.
NYU School of Medicine
NYU LANGONE MEDICAL CENTER

The logo for the Global Alliance to Eliminate Lead Paint, featuring the text 'Global Alliance to Eliminate Lead Paint' in white on a red brushstroke background.
**Global Alliance to
Eliminate Lead Paint**