Burden of Disease from Toxic Waste Sites in India, Indonesia, and the Philippines in 2010
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BACKGROUND
- Toxic waste sites have not been systematically assessed in low- and middle-income countries
- Lead accounts for 0.6% of global Disability Adjusted Life Years (DALYs)
- Toxic chemicals collectively account for 5.7% of global DALYs
- Prior burden of disease calculations have not included exposures from toxic waste sites

OBJECTIVE
- To calculate the burden of disease in DALYs attributable to toxic waste sites in India, Indonesia, and the Philippines

RESULTS
- 373 sites
- Population = 8,629,750
- 7,000 individuals/site
- ~3.5 million children
- ~2.2 million women of childbearing age
- Lead and hexavalent chromium account for >99% of total DALYs
- We obtained characteristics of toxic waste sites from the Blacksmith Institute’s database:
  1. Dominant chemical pollutant
  2. Pathway of exposure
  3. Exposed population
- For each chemical we:
  • Identified the relevant health effect (cancer and/or non-cancer)
  • Selected the related disability weight
  • We calculated disease incidence using US EPA reference doses, reference concentrations, and slope factors
- In these 3 countries, toxic waste sites cause >820,000 DALYs
- Children and women of childbearing age constitute 65% of exposed population
- Lead and chromium cause vast majority of DALYs
- Remediation of these sites to international standards could save ~800,000 DALYs

We then calculated YLDs and YLLs for each chemical:

<table>
<thead>
<tr>
<th>Chemical</th>
<th># of sites</th>
<th>Population</th>
<th>YLD</th>
<th>YLD</th>
<th>DALYs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chromium</td>
<td>128</td>
<td>3,231,750</td>
<td>63,174</td>
<td>235,483</td>
<td>298,657</td>
</tr>
<tr>
<td>Lead</td>
<td>79</td>
<td>1,829,900</td>
<td>523,630</td>
<td>0</td>
<td>523,630</td>
</tr>
</tbody>
</table>

In addition to screen sites, an additional 5,000 sites are estimated to exist in these countries

LIMITATIONS
- Only 8 chemicals and 1 chemical per site
- Limited environmental sampling
- No biomarkers or completed pathways of exposure
- Reliance on slope factors and reference doses/concentrations

CONCLUSIONS
- In these 3 countries, toxic waste sites cause >820,000 DALYs
- Children and women of childbearing age constitute 65% of exposed population
- Lead and chromium cause vast majority of DALYs
- Remediation of these sites to international standards could save ~800,000 DALYs

NEXT STEPS
- Calculate the global burden of disease attributable to toxic waste sites

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