ELEVATED BLOOD LEAD LEVELS AMONG BURMESE CHILDREN IN FORT WAYNE, IN: ENVIRONMENTAL RISK FACTORS

*A COMPARISON OF DATA ANALYSES TO SUPPORT THE INDIANA STATE DEPARTMENT OF HEALTH LEAD MONITORING INITIATIVES

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Lead as a Concern for Children

- Physiological characteristics that increase vulnerability

- Lead has no function in the body thus a zero concentration is ideal
Modern Standards

- From a policy perspective, bans over the years have drastically reduced the amount of lead in the environment.
  - average blood level of children under 5:
    - 15.1 mcg/dL in 1980
    - 1.51 mcg/dL in 2008
International Lead Poisoning

- Low-level environmental exposures are still common in developing or impoverished areas of the world.

- High-risk factors for children:
  - Medicaid recipients
  - Refugees
  - Users of alternative medicine/cosmetics
  - Minority status
A 2009 study

CDC discovered elevated blood lead levels among Burmese children in Fort Wayne, Indiana (Allen County), which was linked to dermal applications of "Thanaka," a face cream commonly used among this culture.
Allen County Demographics

- Fort Wayne, Indiana
  - large proportion of Burmese refugees, with around 5,000 in 2008

- Allen County has an Asian resident rate almost twice as high Indiana as a whole, which is 1.58% as of 2010
Cultural Risk Factors

- Leaded gasoline still used in Myanmar
- Malnutrition among refugees
- Traditional medicine
- “Synergistic” effect of lead poisoning must be considered
Fish Consumption

- US Department of Agriculture Survey
  - general adult population = average of 17.5g fish/day
  - subsistence groups (i.e. Native Americans) = 142-170g

- King County, Washington study among Asian Pacific Islanders (APIs)
Materials

- blood lead level samples from children under 6 living in Allen County (2010-2013)

- 119 fish tissue samples taken out of Allen County (1990-2010)

- 23 cosmetic/alternative medicines (2014)
Results - ISDH Surveillance

Surveillance Samples - Mean Lead Concentration (ppm)
Results-Fish Tissue Sampling

Average Lead Concentration of All Combined Fish Species by Year

Mean Lead Concentration (mcg/kg wet weight)

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<thead>
<tr>
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<tbody>
<tr>
<td>Lead Concentration</td>
<td>-50</td>
<td>0</td>
<td>50</td>
<td>100</td>
<td>150</td>
<td>200</td>
<td>250</td>
<td>300</td>
<td>350</td>
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</tbody>
</table>

Results - Fish Tissue Sampling

Fish Sample Preparations Higher than WHO Standard of 300mcg/kg

<table>
<thead>
<tr>
<th></th>
<th>Count</th>
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</thead>
<tbody>
<tr>
<td>whole</td>
<td>4</td>
</tr>
<tr>
<td>skin-on fillets</td>
<td>7</td>
</tr>
<tr>
<td>skin-off fillets</td>
<td>1</td>
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</table>
## Results - Blood Lead Data

- **Descriptive: sample sizes**

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asian/Pacific Islander</td>
<td>185 (8.2%)</td>
<td>175 (8.3%)</td>
<td>180 (9%)</td>
<td>180 (9.2%)</td>
<td>720</td>
</tr>
<tr>
<td>Black</td>
<td>620 (27.6%)</td>
<td>506 (24%)</td>
<td>505 (25.1%)</td>
<td>467 (23.9%)</td>
<td>2098</td>
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<tr>
<td>Hispanic</td>
<td>230 (10.2%)</td>
<td>221 (10.4%)</td>
<td>211 (10.5%)</td>
<td>204 (10.5%)</td>
<td>866</td>
</tr>
<tr>
<td>White</td>
<td>1215 (54%)</td>
<td>1210 (57.3%)</td>
<td>1114 (55.4%)</td>
<td>1099 (56.4%)</td>
<td>4638</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>2250</td>
<td>2112</td>
<td>2010</td>
<td>1950</td>
<td>8322</td>
</tr>
</tbody>
</table>
Results - Blood Lead Data

Figure 6: Proportion of APIs on Medicaid by Year

- Year 2010: Yes, 160; No, 20
- Year 2011: Yes, 140; No, 30
- Year 2012: Yes, 160; No, 20
- Year 2013: Yes, 140; No, 30

Legend:
- Blue: Yes
- Red: No
Results - Blood Lead Data

Figure 5: Percent of Children with Blood Lead Levels above 5ug/dL by Race or Ethnic Group

- Asian/Pacific Islanders
- Hispanics
- Blacks
- Whites

2010: Asian/Pacific Islanders = 30.0%, Hispanics = 15.0%, Blacks = 10.0%, Whites = 5.0%
2011: Asian/Pacific Islanders = 25.0%, Hispanics = 10.0%, Blacks = 7.5%, Whites = 4.0%
2012: Asian/Pacific Islanders = 20.0%, Hispanics = 8.5%, Blacks = 6.2%, Whites = 3.0%
2013: Asian/Pacific Islanders = 15.0%, Hispanics = 7.0%, Blacks = 5.0%, Whites = 2.5%
Results - Blood Lead Data

Figure 4: Mean Blood Lead Level for Whites versus Asian Pacific Islanders from 2010-2013

Average Blood Lead Level (µg/dL) vs. Year (2010-2013)
Discussion

- The surveillance investigation into ayurvedic treatments among Burmese residents allows ISDH to better understand cultural practices that may play an important role for perceived vigor or vitality.

- Regular monitoring in the future can help keep contaminated products off the shelves.
Discussion

- Fish sampling patterns and trends

- More direct correlation between Burmese subsistence fishermen and the rivers depicted in this study is needed
  - Environmental sampling of smaller water bodies
Discussion

- Theoretical Exposure Assessment

- Synergistic effect of lead exposure must be considered
Discussion

- Trends among Asian Pacific Islander Children
  - Medicaid as a risk factor
  - Positive change in mean blood lead levels, but less so with incidence when compared to whites only, in recent years
Policy Recommendations

- Increased lead education geared towards Burmese residents is needed to better establish boundaries in regards to exposure.

- Screening for this culture should be placed on an extremely high priority list to avoid discovering blood lead levels as high as the 2009 investigation.
Study Limitations

- WHO dietary standard of 300mcg/kg for lead in fish and seafood
- Only 14 of 119 fish tissue samples were from the whole animal while the rest were either a skin-on or skin-off fillet
- Blood lead level data used in this study was obtained from a de-identified ISDH dataset for each year.


References


References


References


