

Arsenic and Antimony Exposures in Batken Oblast, Kyrgyzstan

BACKGROUND & SUMMARY

Situated in the Batken Oblast of Kyrgyzstan, Kadamjai Rayon is home to multiple active and abandoned mining operations. High rates of non-communicable disease (NCD) prompted a partnership between MSF¹, MOH², SHL³, TIFO⁴, and local stakeholders to assess environmental health risks in the communities of Aidarken and Chauvai .

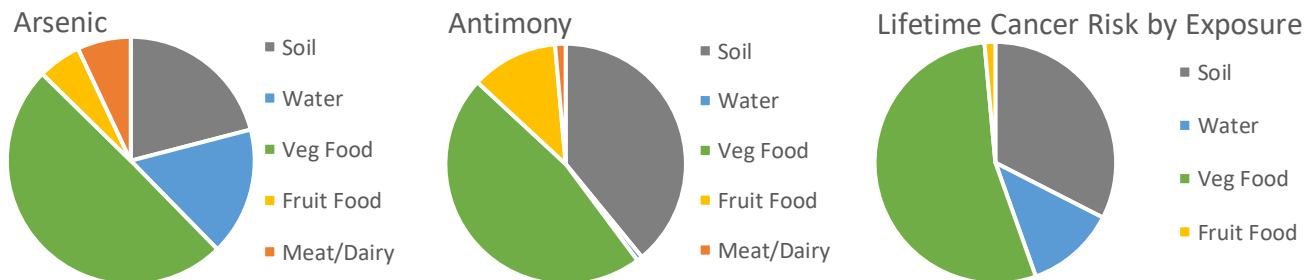
Dangerously high levels of arsenic and antimony were found in environmental and human biomonitoring samples. Significant gaps in understanding related to antimony absorption and toxicity, unquantified exposure sources, and lack of reliable NCD data remain a challenge.



ENVIRONMENTAL AND HUMAN HEALTH RISK ASSESSMENT (HHRA) RESULTS

The three contaminants of concern are arsenic, antimony, and mercury. Excessively high concentrations of As and Sb (orders of magnitude above standards) were identified in soil and locally grown vegetables, with minimal contamination of water and locally grown fruits.

- In both communities, As and Sb-contaminated vegetables and soil are a significant risk.
- Hg poses a risk in vegetables and soils in Aidarken, and methyl Hg is a concern at abandoned waste sites.
- In both communities, As presents significant risk of increased cancer rates.

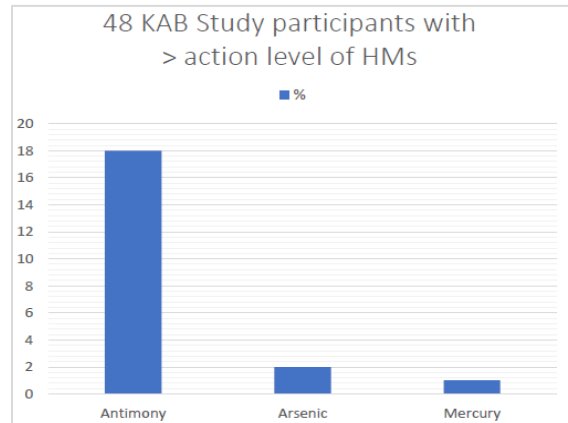
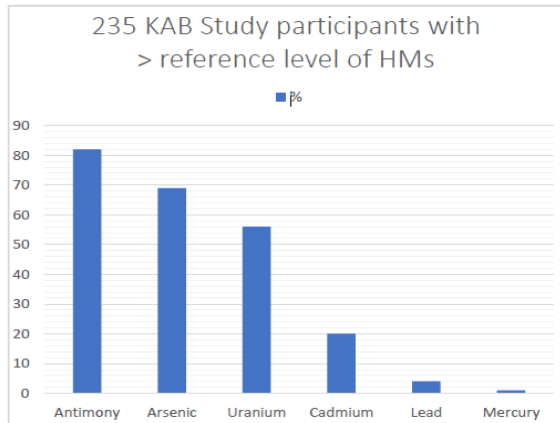


Relative arsenic (left) and antimony (middle) intakes at typical exposures for an Aidarken 6-year-old child. Contribution to total lifetime cancer risk (right) by different environmental media for a Chauvai resident.

¹Médecins Sans Frontières (Doctors Without Borders), ²Kyrgyz Ministry of Health, ³Kadamjai Rayon Sanitary Hygienic Laboratory, ⁴TerraGraphics International Foundation

BIOMONITORING

The human biomonitoring study focused on women of child-bearing age and children living in high-risk areas. Blood and urine samples were collected from 254 participants and analyzed for metals identified in the environmental assessment. Results showed elevated levels of antimony and arsenic.



- > 90% of participants (mostly children) have chronic, abnormal exposure to one or more heavy metals.
- ~ 20% of participants have chronic exposure to arsenic and/or antimony exceeding action values.
- Sb appears may be the most significant hazard, with levels 13-23 times above reference levels.

OPPORTUNITIES FOR FUTURE RESEARCH

- Cross-sectional study to determine prevalence rate of NCDs in relation to Sb and As contamination
- Expand study area to include households outside high-risk zones in the communities
- Further investigation into sources of arsenic (i.e., airborne dust, imported rice and other foods)
- Household follow-up to support individualized health interventions in partnership with MOH/SHL
- Expand the EH study to assess additional mining towns in Kadamjai Rayon and/or Batken Oblast

ACHIEVEMENTS AS FOUNDATIONS FOR ADDITIONAL WORK

- Developed a comprehensive understanding of heavy metal contamination in two mining towns.
- Identified As and Sb, rather than Hg, as the main drivers of environmental health risks.
- Partnered with in-country experts and prioritized local capacity building and MOH project leadership.
- Implemented one of the largest environmental (>600 samples) and biomonitoring (254 participants) investigations in the region to date.
- Identified risks associated with locally-grown produce and their importance in local diets.
- Adapted protocols to work within local contexts for improved project efficacy and sustainability.
- Designed public health education programs to reduce environmental exposures.
- Trained health care staff in how to increase local awareness of exposures reduction through behavior change.



For more information on the Kadamjai Rayon Environmental Health Project and research opportunities, contact Dr. Casey Bartrem at casey@terrafound.org and visit the TIFO website at www.terrafound.org.