Kadamjay Area Biomonitoring (KAB) Study, Kadamjay, Kyrgyzstan. A cross-sectional study

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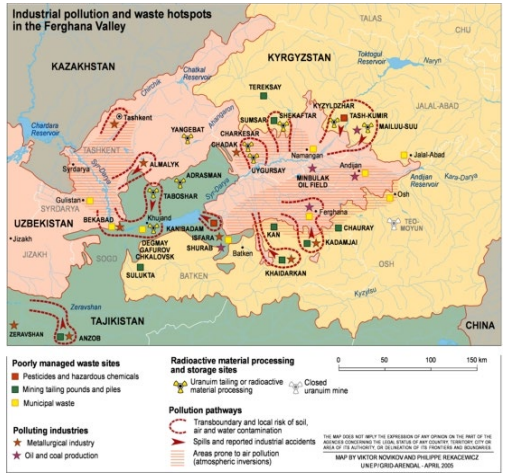
Introduction

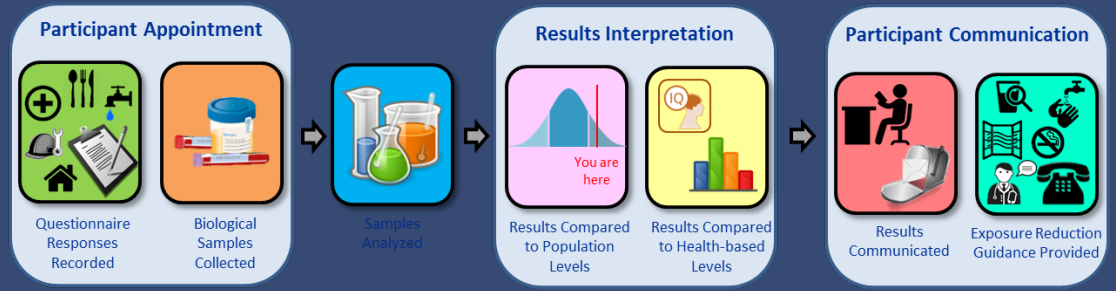
- The Kadamjay district is characterized by the presence of mercury and antimony mining and metallurgic processing facilities



- A human health risk assessment was conducted to identify areas where human exposure to heavy metals may present the greatest human health exposure risks
- The KAB study was designed to characterize the individual levels of heavy metal and pathways of exposure in the community highest exposed areas.

Methods

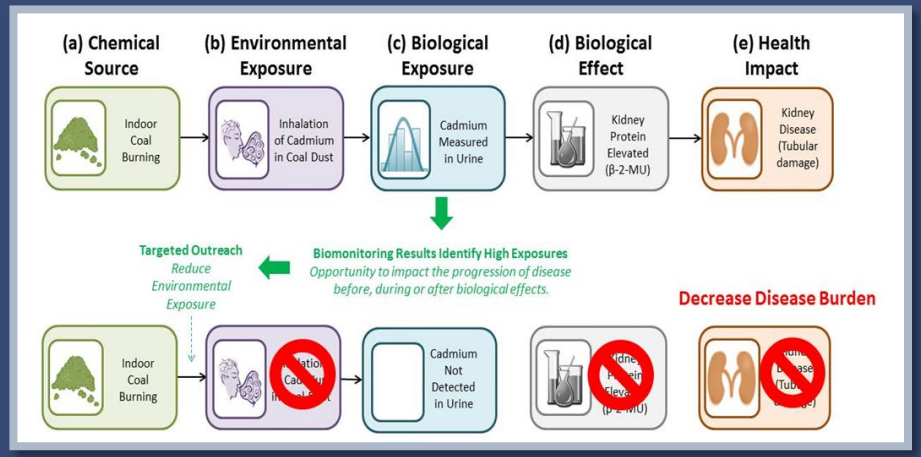
- Cross-sectional study design and simple random sampling to select individuals living in highest exposed areas
- Eligible members of the household: child aged ≥ 5 - ≤ 14 years; female ≥ 15 - ≤ 49 years
- Sample size of 240 individuals (based on WHO recommendations) + 10% (non-response estimation)
- The blood and urine specimens were analyzed at the Jožef Stefan Institute (Ljubljana, Slovenia).
- Sample results were compared to appropriate reference values (e.g., reference range, or clinically relevant action values).



Antimony levels appear to be **14-30 times greater than population-based reference levels** determined from previous biomonitoring studies in North America or Europe

The results suggest that there is a **significant level of community exposure to heavy metals** that could be associated with negative health outcomes.

These results will inform health-protective interventions designed to **reduce heavy metal exposure and improve health outcomes**.



Results

- Blood and/or spot-collected urine specimen were collected from 255 participants
- 235 study participants (92%) had levels of at least one chemical in either blood or urine that exceeded a reference value: 209 (82%) for antimony, 176 (69%) for arsenic, 143 (56%) for uranium, 51 (20%) for cadmium, 11 (4%) for lead and 3 (1%) for mercury
- 48 (19%) had values above the action level and were offered individual clinical follow-up by the study physician: 45 (18%) for antimony, 4 (2%) for arsenic and 2 (1%) for mercury

Participant results compared to KAB study reference values.

Chemical	*All Participants (n = 255)*		*Children < 15 years old (n = 124)*	
	Above Reference Value	Above Action Value	Above Reference Value	Above Action Value
Antimony	209 (82%)	45 (18%)	113 (91%)	20 (16%)
Arsenic	182 (71%)	4 (2%)	86 (69%)	1 (1%)
Cadmium	51 (20%)	0 (0%)	23 (19%)	0 (0%)
Lead	11 (4%)	0 (0%)	11 (9%)	0 (0%)
Mercury	3 (1%)	2 (1%)	1 (1%)	1 (1%)
Uranium	143 (56%)	0 (0%)	71 (57%)	0 (0%)

Comparison of the 95th percentile of urine antimony exposure in KAB study compared to population-based studies designed to establish "reference values".

Age	Agency	Value (µg/L)
3 to 14	Germany (2003-2006)	0.30*
5 to 14	**Kadamjay (2021)**	**4,3**
3 to 79	Canada (2009-2011)	0,17
3 to 80	United States (2015-2016)	0,201
5 to 49	**Kadamjay (2021)**	**5,4**

*German Human Biomonitoring Value used as the urine antimony "Reference Value" for children in the KAB study.

Acknowledgment

Local MoH Team, representatives of Aidarken and Uch-Korgon General Medical Practitioner Centres. The KAB Study Participants, Residents of Aidarken, Eshme, and Chauvai Areas. IRB and ERB of MSF and MoH KR, respectively.

This work has been approved by the Ethics Review Board in Kyrgyzstan and the MSF ERB.

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