Variability in Sample Concentrations, Biomarkers and Total Exposures to Pb, Cd and As among Population Subgroups in the National Human Exposure Assessment Survey in Arizona

**Research Problem**

- **Making Informed Decisions**
  - Accurate and reliable human environmental exposure related data are essential to make informed decisions to protect and promote public health.
  - These data must reflect the experience of the general population and specific at-risk population subgroups.
  - Existing exposure-related data are insufficient to adequately characterize demographic, geographic and temporal variation in baseline human environmental exposures.
  - Limited available data suggest that minority populations experience disproportionate exposures to environmental toxicants.

- **Scientific Approach**
  - **NHEXAS AZ**
    - Phase I of NHEXAS was conducted as 3 studies in AZ, EPA Region V and Baltimore, MD.
    - These 3 projects were designed to test and implement exposure-assessment strategies for use in a national survey (Phase II) or special studies (Phase III).
    - NHEXAS AZ used a probability proportional to size (PPS) multi-stage cluster sampling design to represent the non-institutionalized population of the State of Arizona.
    - Multi-media, multi-route, multi-pollutant.
    - 1225 Households contacted: 78% Response Rate.

  - **Exposure Calculations**
    - Air, soil, house dust, water, food, urine and blood samples were analyzed for 179/1225 intensively sampled households.
    - Intake calculated in µg/day for all pollutants.

**Results**

- **Pb, Cd and As Health Effects**
  - Pervasive pollutants with natural & anthropogenic sources.
  - Acute and chronic effects on most organs including respiratory, circulatory, renal, digestive, reproductive and central nervous systems.
  - As (known) and Cd (likely) are carcinogens.

- **Environmental Justice**
  - Defined as the provision of adequate protection from environmental toxicants for all people regardless of age, ethnicity, gender, health status, social class or race.

- **In general, environmental concentrations were low with many samples below the analytical method detection limit**.
  - Differences in sample concentrations observed between population subgroups (age, ethnicity, income, mining community status) were inconsistent with calculated exposures for some groups.
  - Personal behaviors, diet, use of consumer products, etc., significantly impact personal exposures.
  - These data do not consider subpopulation variability in susceptibility to environmental exposures.

**Conclusions**

- Additional research is needed to understand the relationship between sample concentrations, personal exposures, biomarkers and consequent health effects.