



University of Hawai'i

Hawai'i
Integrated
Analytics



UHERO

THE ECONOMIC RESEARCH ORGANIZATION
AT THE UNIVERSITY OF HAWAII

Maui Wildfire Exposure Study

Ruben Juarez

HMSA Professor in Health Economics
College of Social Sciences
UHERO &
Dept. of Economics

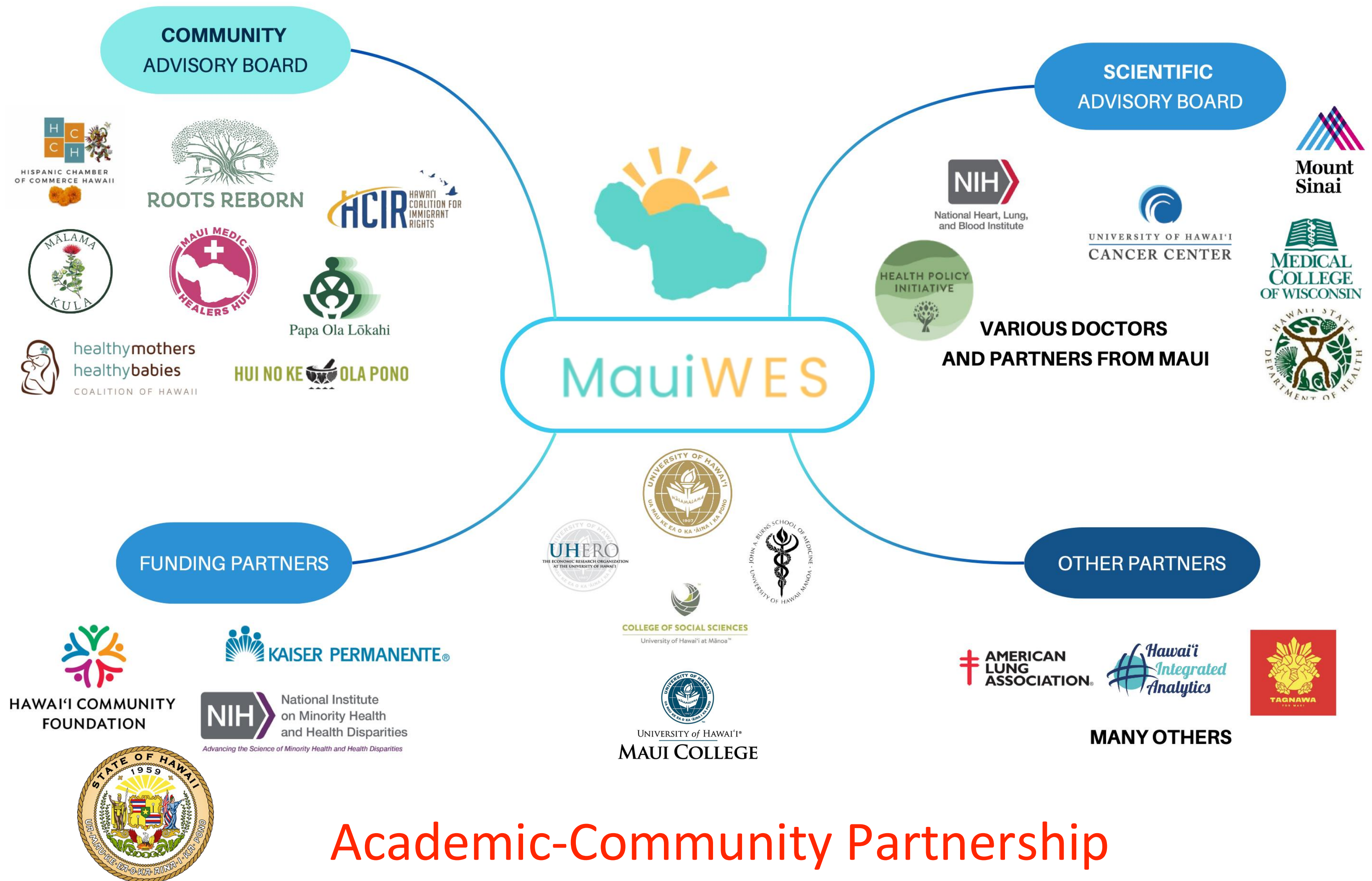
Alika Maunakea

Professor & Director
Epigenomics Research Program
John A. Burns School of Medicine
Dept. of Anatomy, Biochemistry &
Physiology



MauiWES.org

Maui Wildfire Exposure Study (MauiWES) - Team



Survey, Biomonitoring, and Health Screening

Data Components

Questionnaires

- Demographics
- Housing Stability
- Food Security
- Employment
- Exposure
- Resiliency
- Social Support
- Health Behaviors
- Perceived Trust
- Etc...

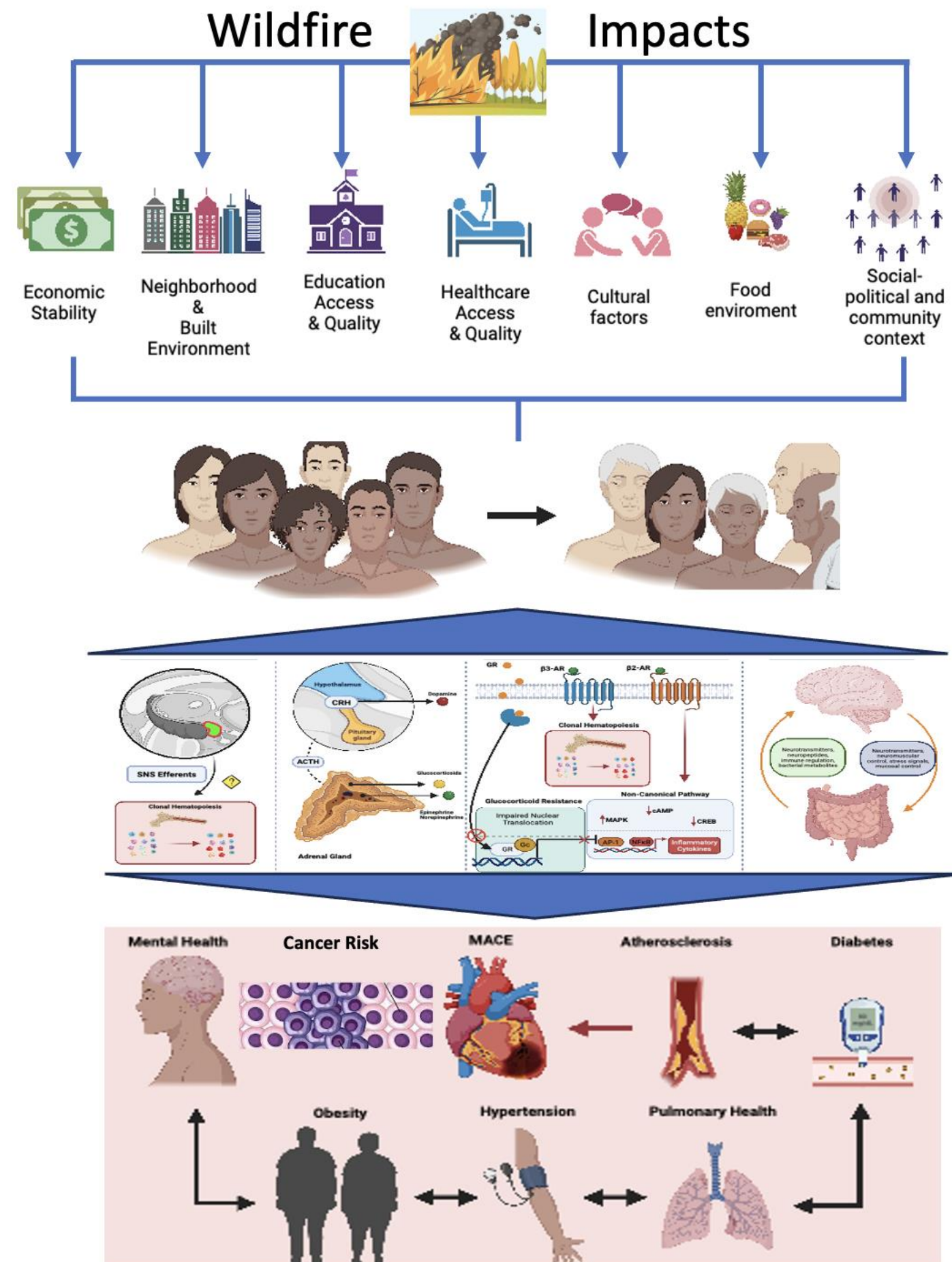
Biospecimens

- Stress Response
- Inflammation
- Environmental Toxicants

Health Exam

- Lung Health
- Cardiovascular Health
- Metabolic Health
- Mental Health
- Cancer Risk (EMR)

Participant Involvement



Enrolled: 2000+; first health screen since the fires for many.

Health Screenings & Referrals for Over 2000 Participants



So far, we've reached over

2000

**People affected by the
2023 Maui fires**

825

**Followed up with
Healthcare
Provider**

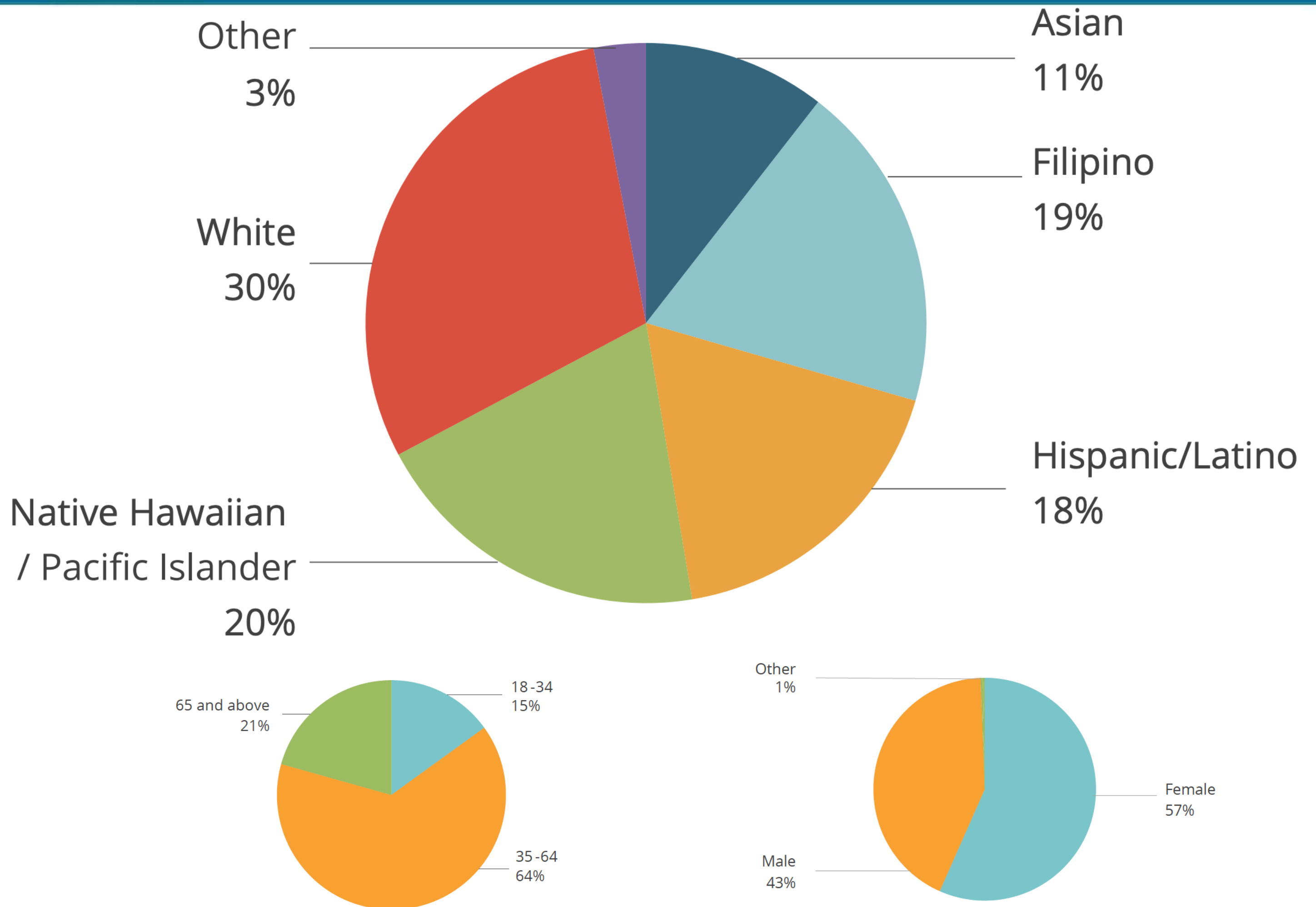
760

**Made lifestyle
changes after
receiving
results**

320

**Accessed
mental health
services**

Diverse Cohort Representative of Impacted Population



This is the most comprehensive and ethnically diverse study to evaluate short- & long-term health following a natural disaster in Hawai'i.

Maui Health Registry

For those unable to join MauiWES, we launched the MauiWES Health Registry for passive data collection, monitoring, and referral

[MauiRegistry.com](https://mauiregistry.com):

Now live, we are developing a comprehensive medical registry to facilitate information sharing and passive health monitoring through medical records (>5,000 affected).



Join Hands, Share Stories, Rebuild with Maui Registry

Welcome to Maui Registry, a platform dedicated to the people of Maui who have experienced the 2023 Maui Wildfire disaster. By sharing your experiences, you can help others find hope, learn, and connect with services in our community.

YEAR 1: MauiWES Main Findings for Adults

Main trends identified:

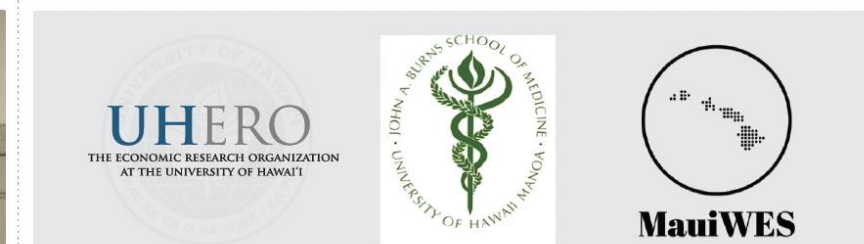
1. Elevated rates of mental and physical health conditions
2. Persistent barriers to accessing healthcare services
3. Widespread housing instability, unemployment, and food insecurity
4. *Concerning levels of exposure to heavy metals and environmental contaminants*



PUBLIC HEALTH REPORT

MAUI WILDFIRE EXPOSURE STUDY: COMMUNITY HEALTH, WELLBEING, AND RESILIENCE

MAY 15, 2024



YEAR 2: MauiWES Findings For Keiki and Adults

Main trends identified:

1. Small but measurable improvements in mental health for adults
2. Self-rated health is getting better for adults
3. Uninsured rate cut by a third yet some remaining gaps in access to care remaining
4. Elevated rates of mental and physical health conditions for Keiki

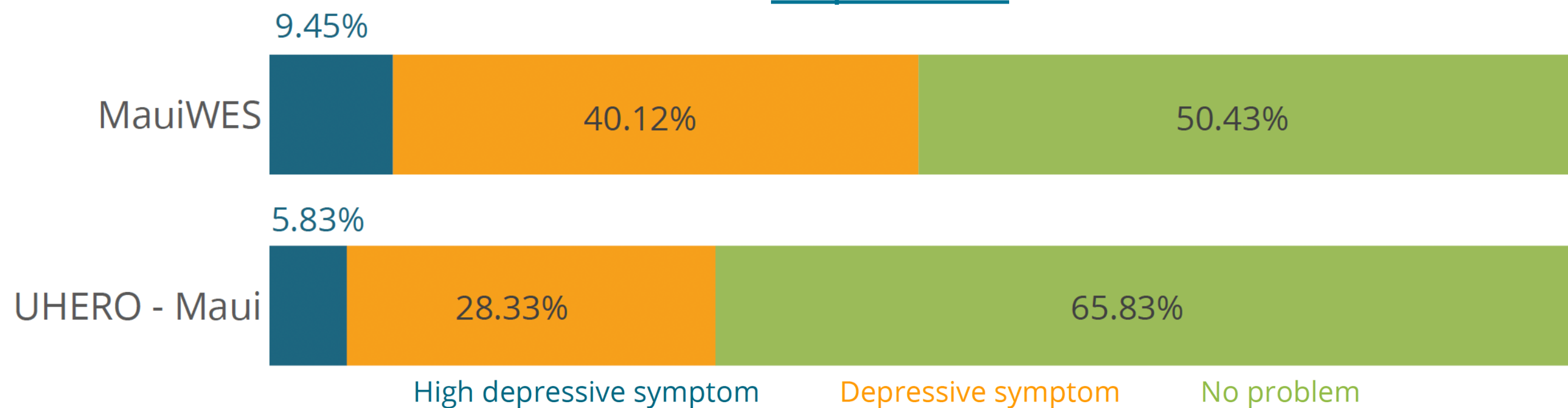


Post-fire Declines in Mental Health for Adults

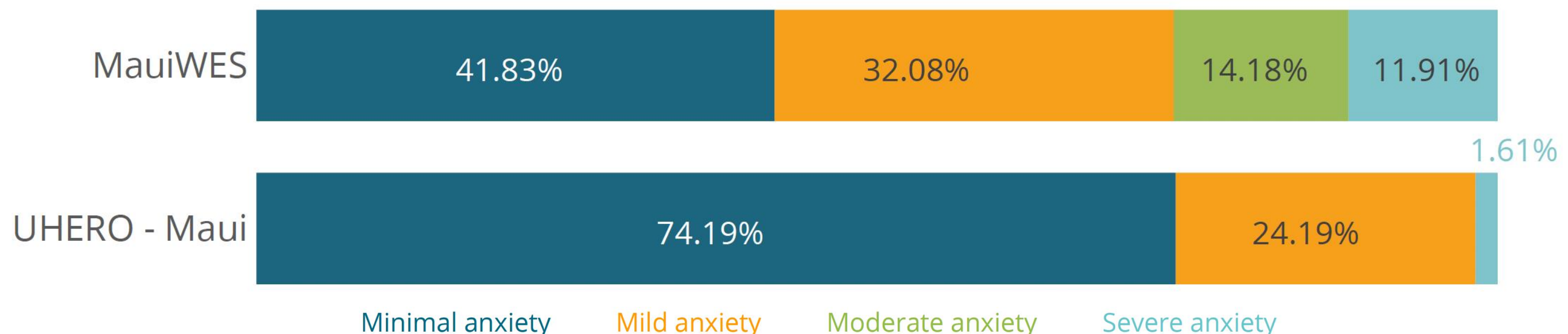
Alarming rates of mental health issues among adult survivors:

- 50% of participants showed depressive symptoms
- 26% had moderate to severe anxiety
- 4.2% had considered suicide in the past month

Depression



Anxiety

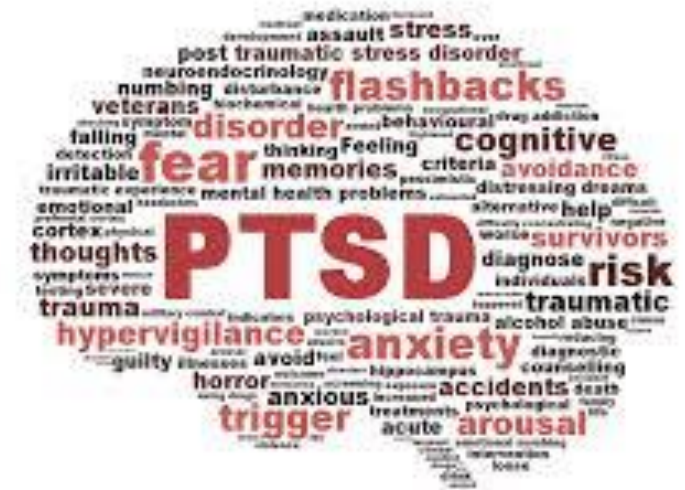


Many participants are showing improvements—moving from severe to milder levels of depression and anxiety—but overall distress remains high.

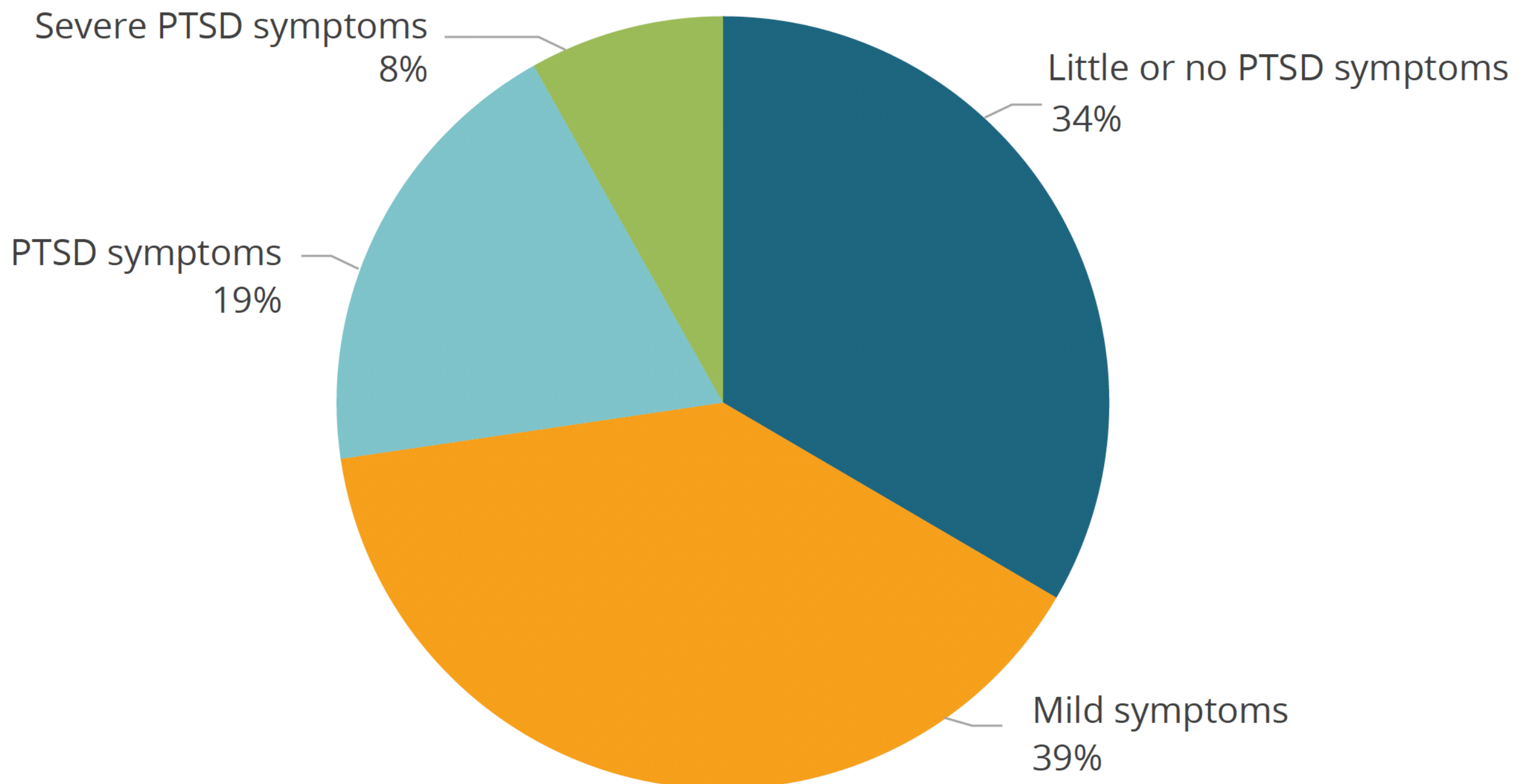
Post-fire Declines in Mental Health for Adults

High rates of PTSD among survivors:

- 39% mild symptoms
- 19% PTSD
- 8% Severe PTSD



PTSD



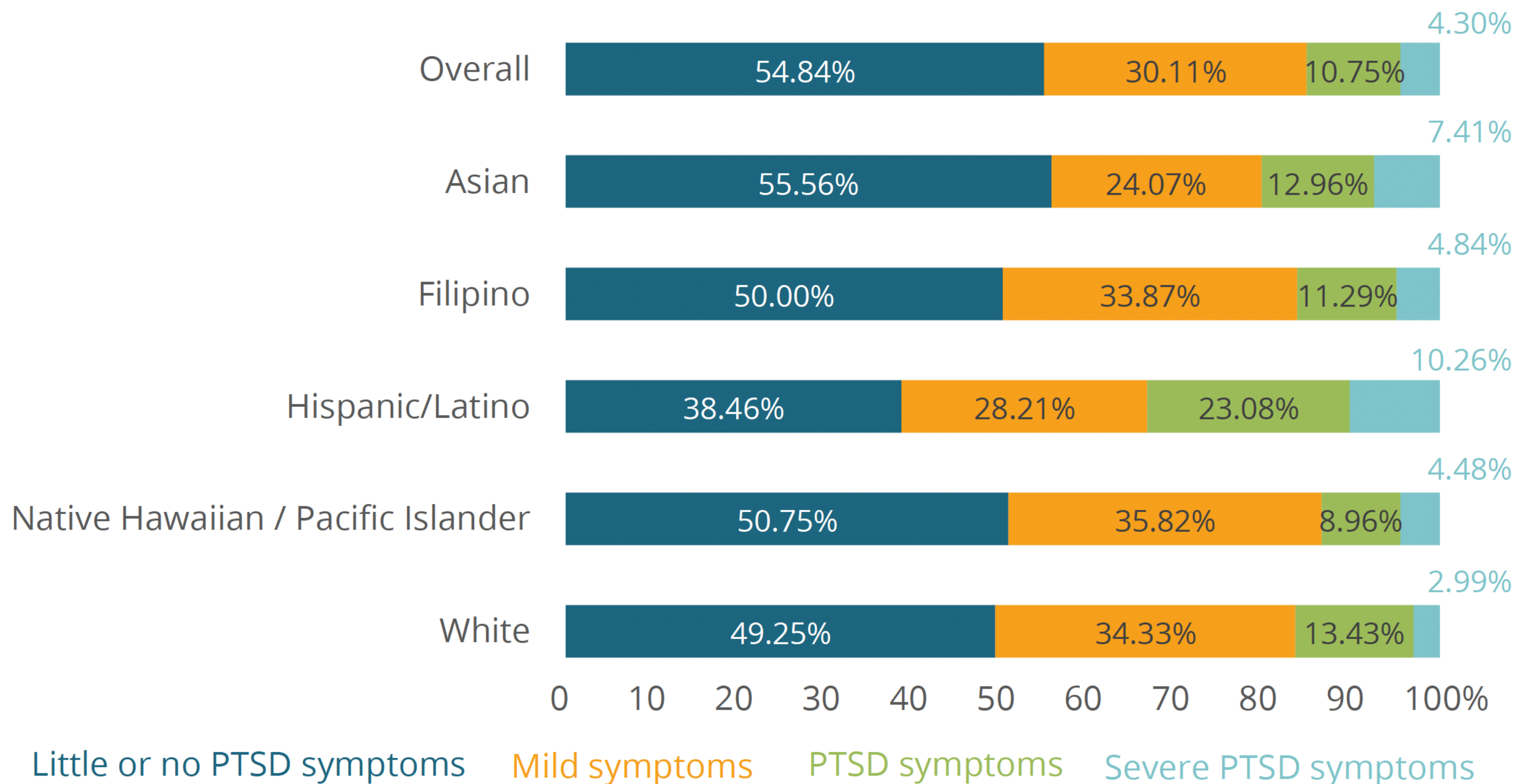
PTSD in Children

High rates of PTSD among children:

- 30% mild symptoms, 11% symptoms, 4% severe PTSD
- Hispanics had highest rates compared to other groups



Anxiety



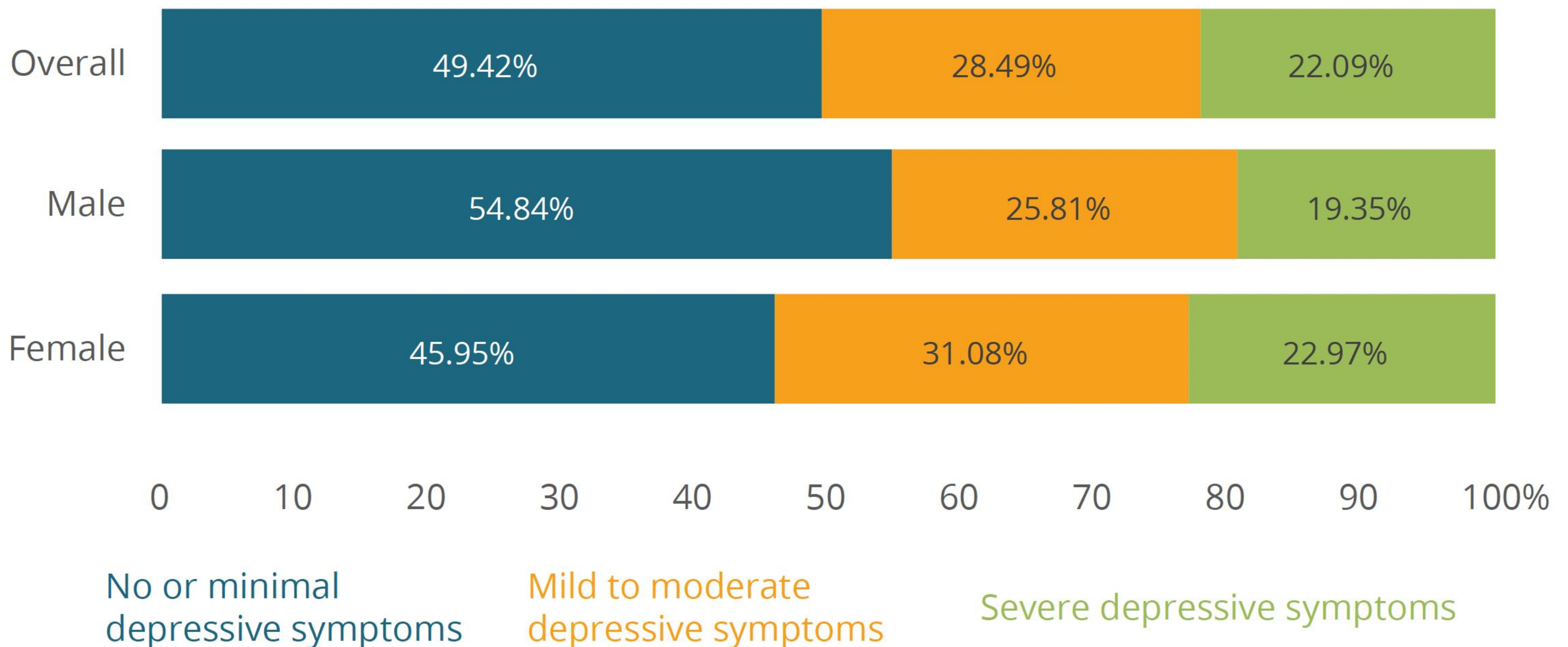
Depression for Children

High rates of depression issues among children:

- 50% of children showed depressive symptoms, similar to adults
- 1 in 5 severe depressive symptoms
- Female more likely to have depressive symptoms than male

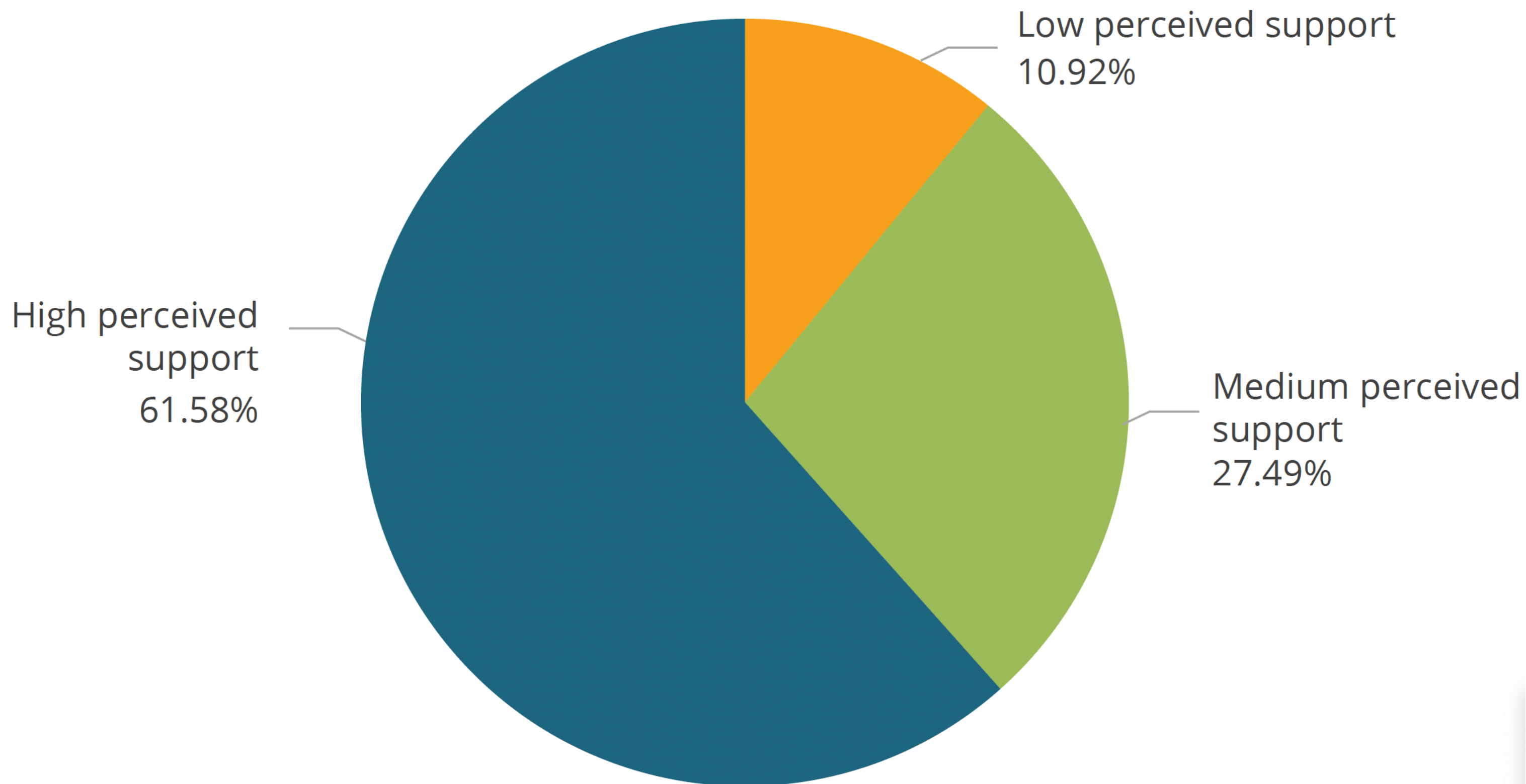


Depression



Notable Improvements from last year and Perceived Social Support is a key mediator

Multidimensional Scale of Perceived Social Support



Inductively Coupled Plasma-Tandem Mass Spectrometry

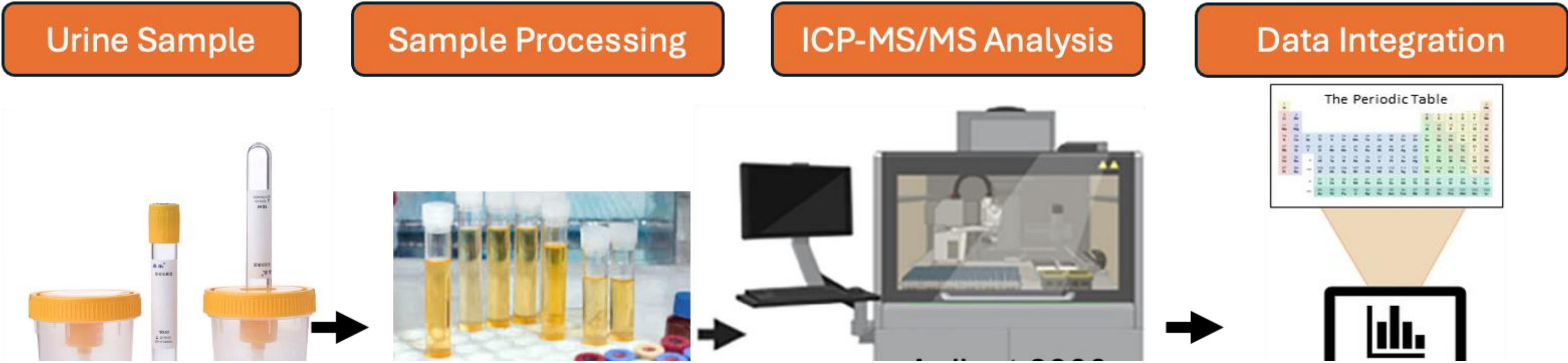


The ash samples were collected on November 7-8, 2023 from 100 properties in Lahaina, which had been constructed from the 1900s to the 2000s.

Parameter	Unit	Lab Report #1	Lab Report #2	Lab Report #3	Mean Lab Reports	Soil Environmental Action Level
Arsenic	mg/kg	297	269	275	280	23
Lead	mg/kg	383	416	431	410	200
Antimony	mg/kg	26	24	26	25	6.3
Cobalt	mg/kg	27	23	26	25	4.7
Copper	mg/kg	1,400	1,970	1,630	1,667	630



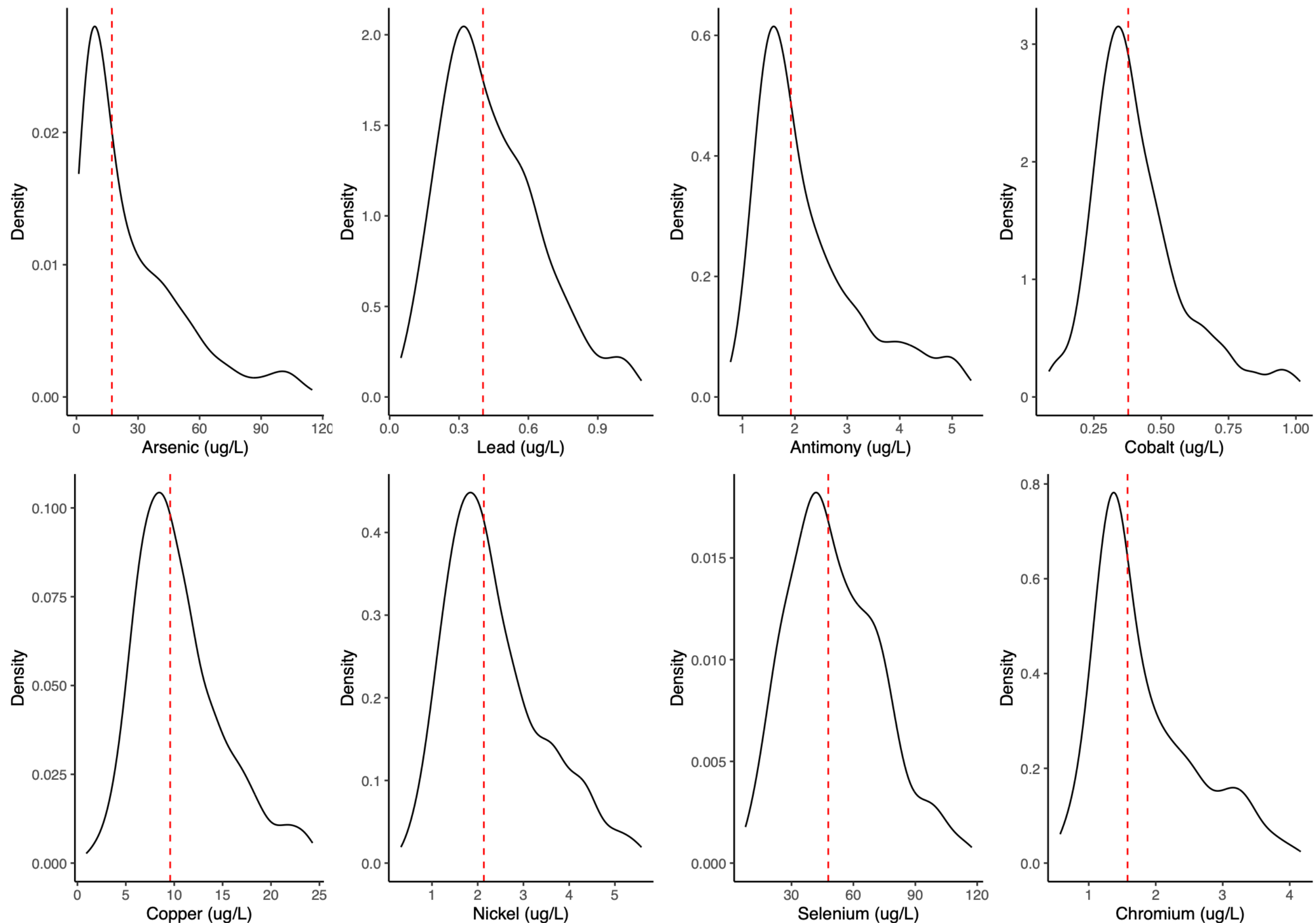
33 elements: Li, Mg, Al, K, Ca, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, As, Br, Se, Sr, Mo, Ru, Pd, Cd, Sn, Sb, Cs, Ba, Tb, W, Re, Hg, Tl, Pb, Bi, U



(Columbia Uni. Core)

Preliminary Heavy Metal Exposure Results from Urine

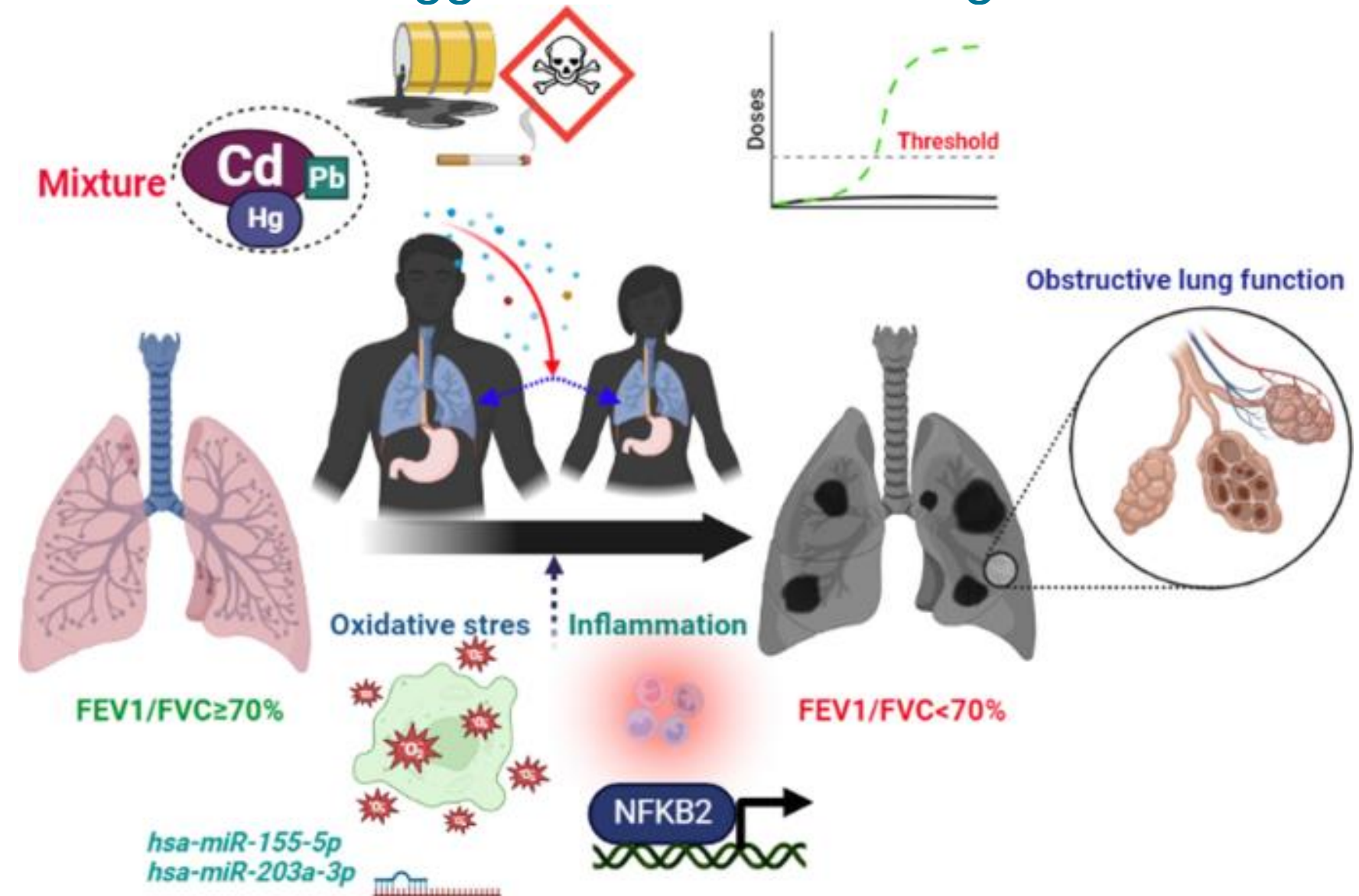
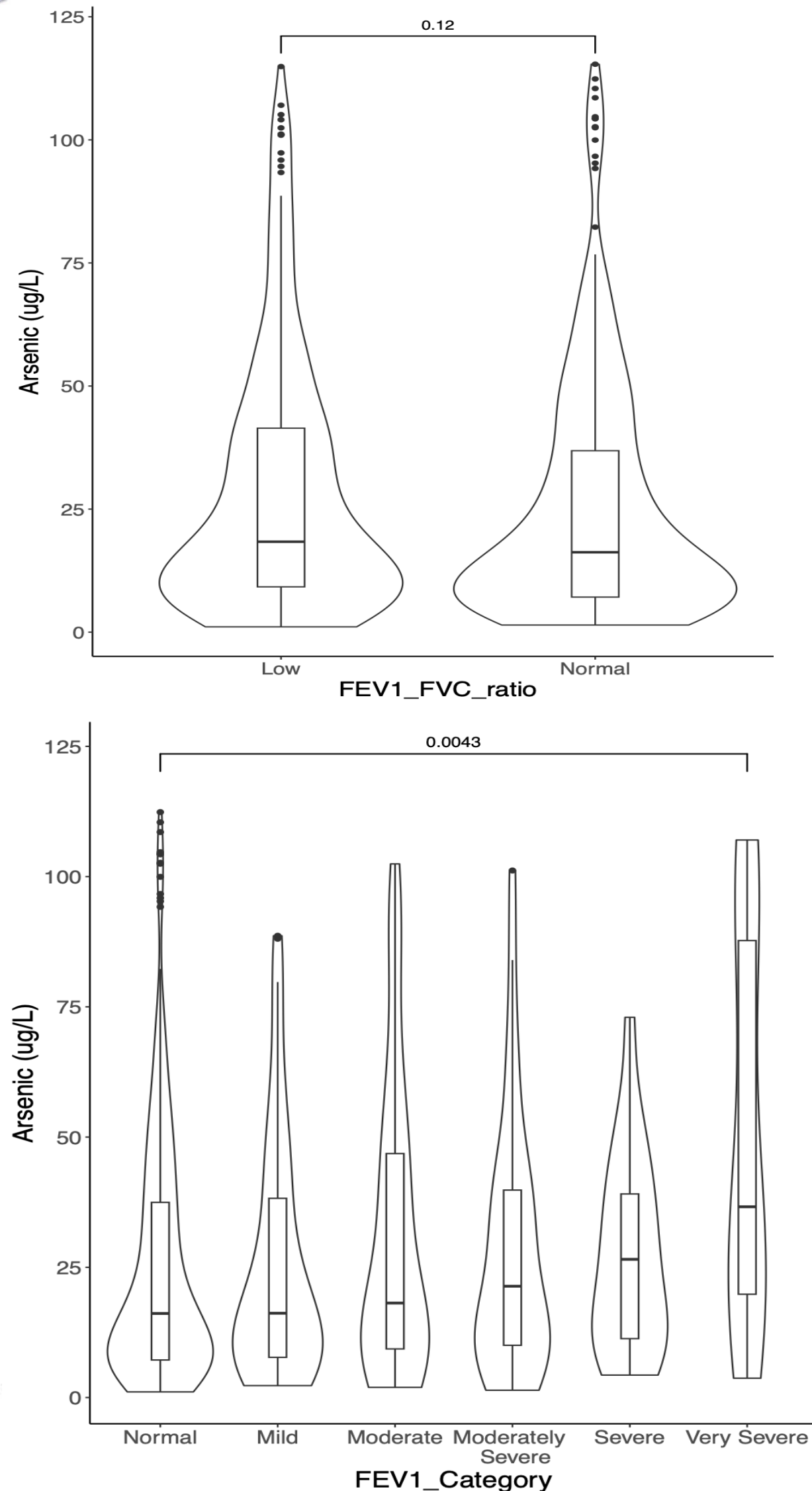
Performed heavy metal analysis for the first batch of samples (767). The distribution for Arsenic, Lead, Antimony, Cobalt, Copper, etc in urine samples:



Preliminary results showed that > 20% of participants had elevated levels of these metals.

High Levels of Arsenic Associate with Poor Lung Function

FVC (% predicted): Measures total air exhaled & indicates restrictive lung disease if low.
FEV1 (% predicted): Shows air exhaled in 1 second & suggests obstructive lung disease if low.

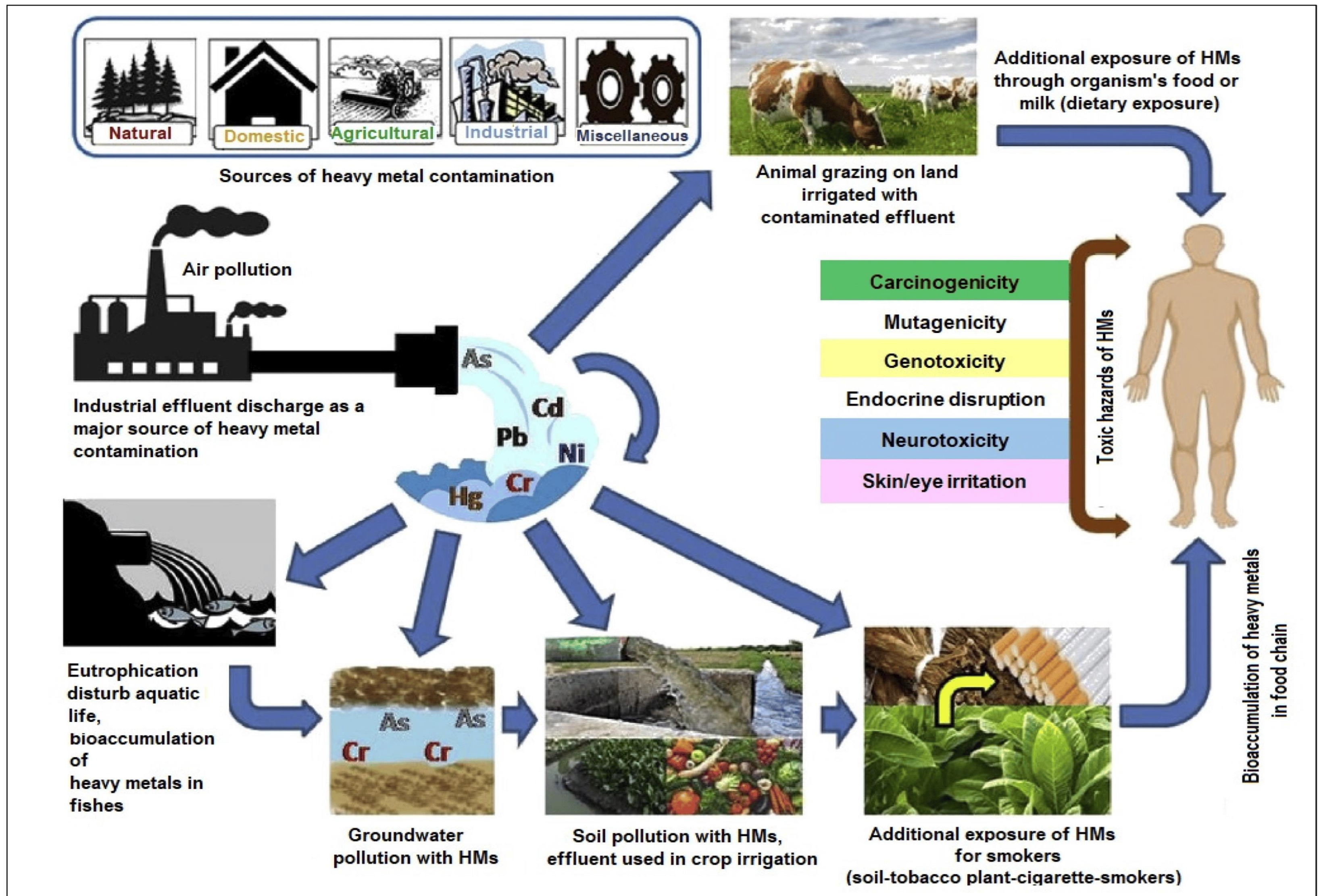


Nguyen, H.D. Effects of mixed heavy metals on obstructive lung function: findings from epidemiological and toxicogenomic data. *Environ Geochem Health* **45**, 8663–8683 (2023).



DOI: [10.3389/fenvs.2019.00066](https://doi.org/10.3389/fenvs.2019.00066)

Heavy Metal Exposures From Cereal Crops



Self-Reported Findings from MauiWES Keiki Cohort:

- 50% of children screened showed depressive symptoms
- 20% reported severe depressive symptoms
- 30% showed signs of anxiety disorder
- 15% experienced PTSD symptoms, with 4% severe PTSD

These numbers are likely underestimates:

- Children often under-report distress
- Cultural stigma in NHPI, Filipino, and immigrant communities hinders open discussion and help-seeking
- Language barriers and fear of judgment add to underreporting

Dual perspective:

- MauiWES data + frontline clinical practice
- We are near the 2-year post-disaster mark, when symptoms typically peak
- Immediate expansion of mental health support is critical now to prevent long-term trauma

Call to Action: Prioritize Health. Protect Our Keiki.



Maui County: Actions Speak Louder Than Words

- CDBG funds largely bypassed health & recovery
- Hazard Mitigation Plan must prioritize mental health alongside housing and infrastructure

Disseminate the Maui Health Registry

- Join us at MauiRegistry.org
- Looking for 5,000+ fire-affected individuals to be included in monitoring, referrals, and long-term care

Sustain and Expand MauiWES

- Largest post-disaster health study in Hawai'i
- We are likely shutting down by October 2025 without renewed support.
- Real-time data is saving lives—let's not go dark

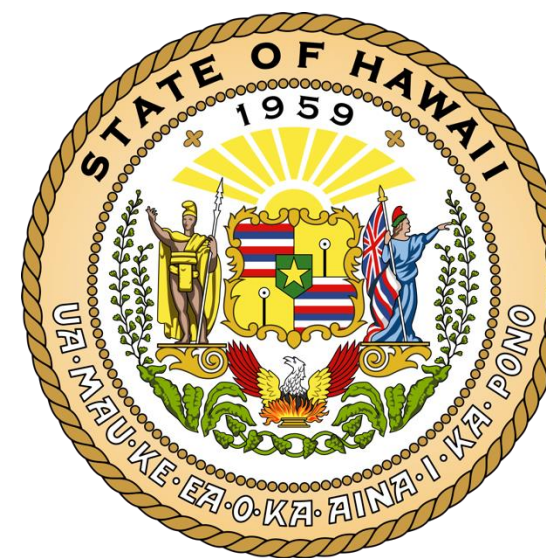
Fund School-Based, Culturally Rooted Mental Health Programs

- Trauma is rising—especially for youth and marginalized families
- Care must reflect culture, language, and trust

This is not just about health. This is about justice.



Mahalo to Our Partners and Funders



NIH R61MD019793

UHERO