

UNIVERSITY OF HAWAII, MANOA

MAUI WILDFIRE EXPOSURE STUDY

UHERO

THE ECONOMIC RESEARCH ORGANIZATION
AT THE UNIVERSITY OF HAWAII

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MAUI

MAUIWES.INFO FOR MORE
INFORMATION

Received at 08/05/2024 WASSP
Committee meeting from UHERO

Academic-Community Partnerships - Health Disparities



Pacific Alliance Against COVID-19 recruited over 30,000 participants and performed over 50,000 COVID tests during the pandemic in partnership with several FQHCs and Schools
www.PAAC.info



Over 2000 state of Hawaii residents are enrolled in biannual cohort to understand social determinants of health and be ready for the next disaster
www.uhero.hawaii.edu



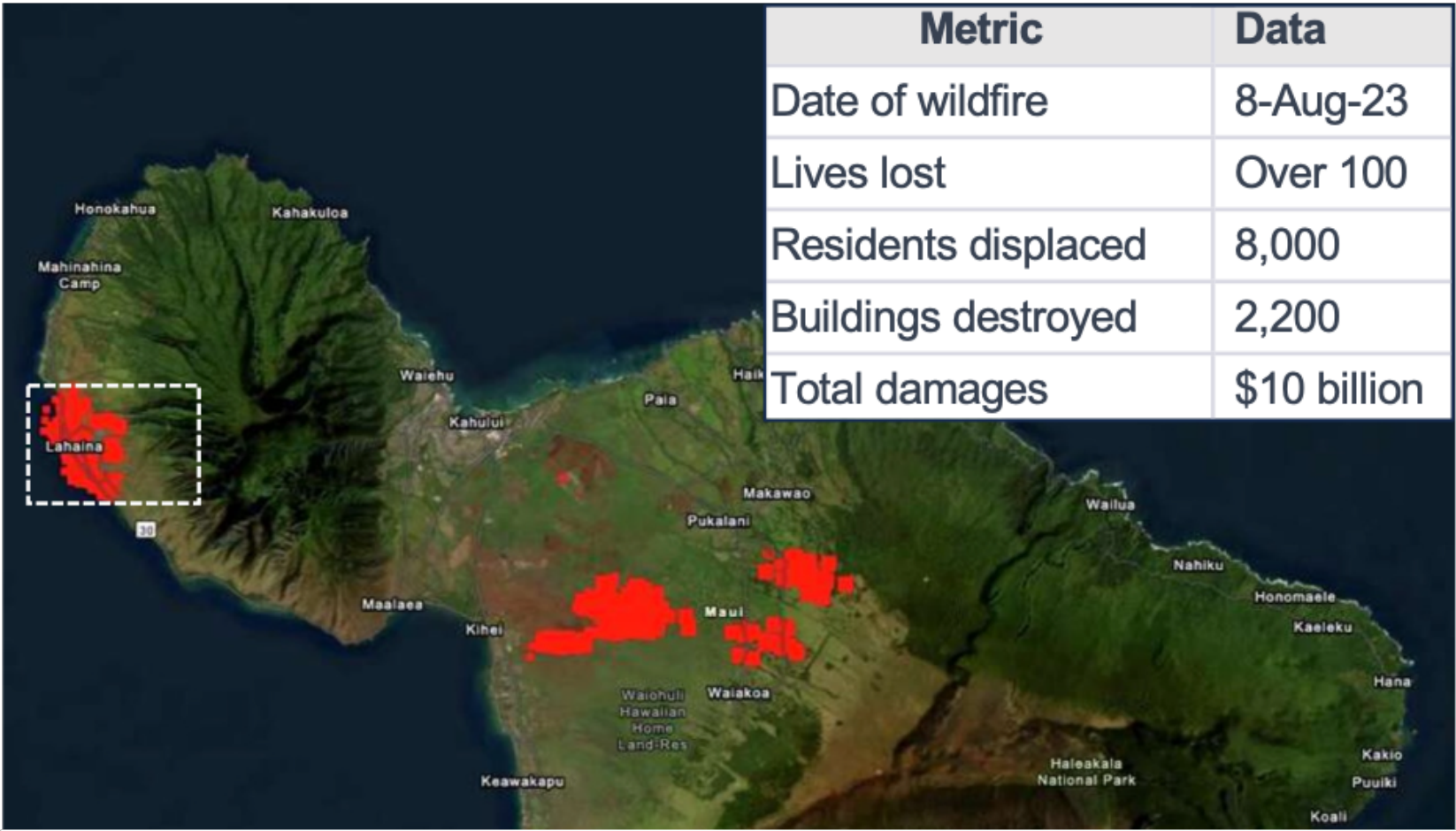
Hawai'i Social Epigenomics Early Diabetes Cohort

2100 residents, primarily Native Hawaiian and Pacific Islanders are enrolled to understand the early origins of diabetes

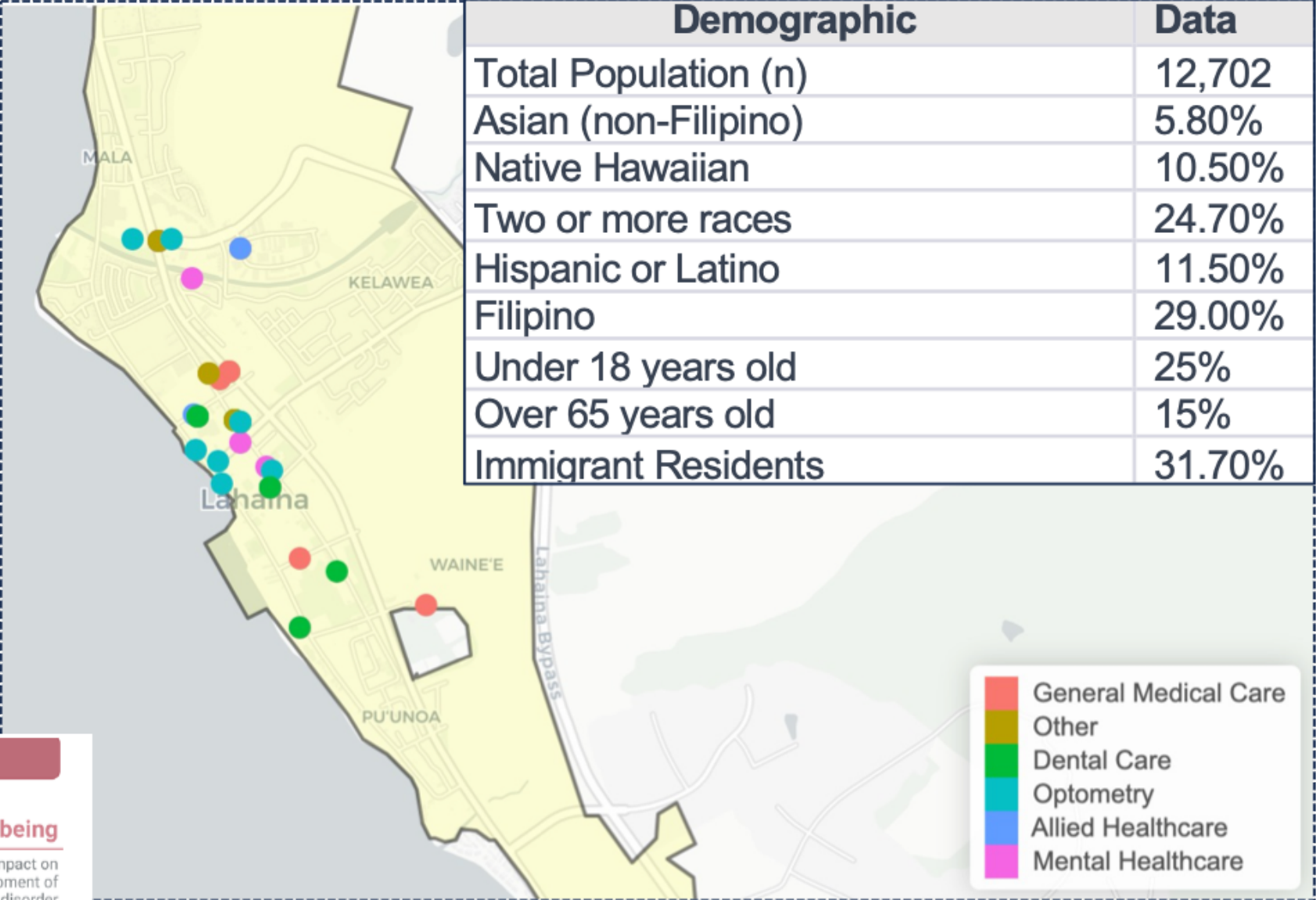
www.hiseed.org

BLENDED RESEARCH AND HEALTH EDUCATION/SERVICE APPROACH

August 2023 Fires on Maui - Population and Connection



Metric	Data
Date of wildfire	8-Aug-23
Lives lost	Over 100
Residents displaced	8,000
Buildings destroyed	2,200
Total damages	\$10 billion



Demographic	Data
Total Population (n)	12,702
Asian (non-Filipino)	5.80%
Native Hawaiian	10.50%
Two or more races	24.70%
Hispanic or Latino	11.50%
Filipino	29.00%
Under 18 years old	25%
Over 65 years old	15%
Immigrant Residents	31.70%

Short to Mid-Term Effects of Exposure

Headaches, dizziness, reduced O₂ transport

Smoke pollutants (including CO and CO₂) can reduce oxygen transport, causing symptoms of oxygen deprivation.

Eye irritation and vision complications

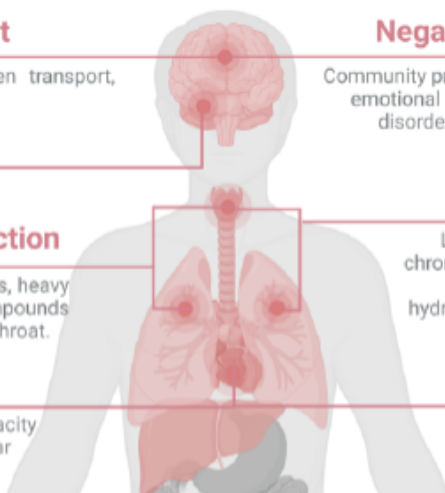
Fine particulate matter can directly irritate the eyes.

Respiratory irritation and reduced lung function

Fine particulate matter (PM_{2.5}; can include inorganic compounds, heavy metals, etc), gases (CO, CO₂, SO₂, NO_x, etc), volatile organic compounds (aldehydes, benzene, etc), and other pollutants irritate lungs and throat.

Cardiovascular stress and complications

Smoke pollutants (including CO) can reduce oxygen-carrying capacity of blood. Such cardiovascular stressors can lead to cardiovascular complications and exacerbate existing heart conditions.



Long-Term Effects of Exposure

Negative impact on psychological health and well-being


Community proximity to and consequences of wildfire events can leave a lasting impact on emotional and psychological well-being. Such an impact can lead to the development of disorders including post-traumatic stress disorder (PTSD), major depressive disorder (MDD), and anxiety, among other negative experiences.

Increased risk for cancer and respiratory illnesses


Long-term exposure to fine particulate matter can lead to the development of chronic respiratory conditions like chronic obstructive pulmonary disease (COPD), asthma, and bronchitis. Such pollutants may include polycyclic aromatic hydrocarbons (PAHs), which are carcinogenic. Additional physiological stressors can lead to compromised immune functioning, increasing risk for infection.

Increased risk for heart attack and stroke

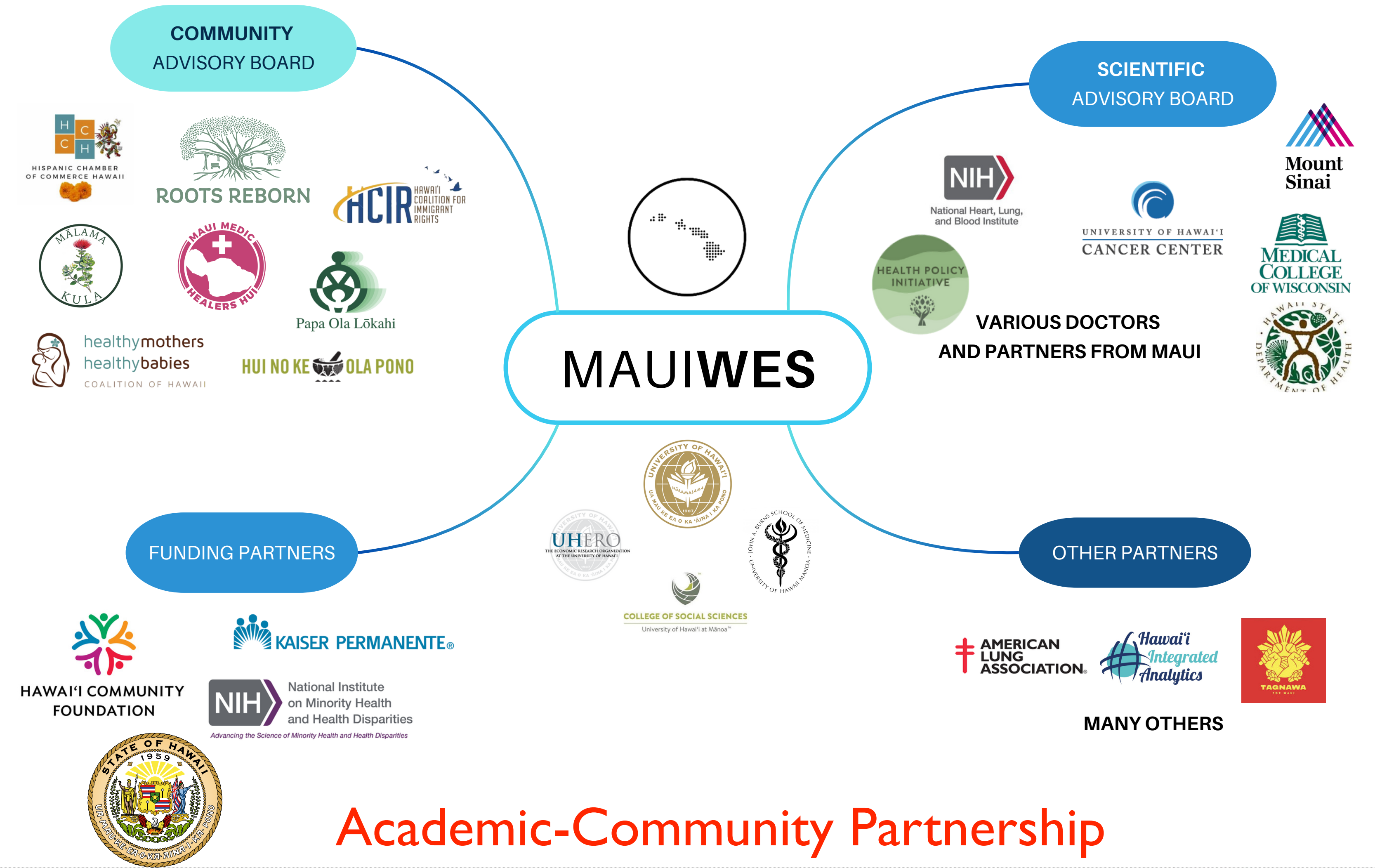
Chronic exposure to airborne pollutants can prolong irritation and inflammatory responses. Such long-term stress on cardiovascular pathways can cause hypertension and increase risk for cardiometabolic disorders.



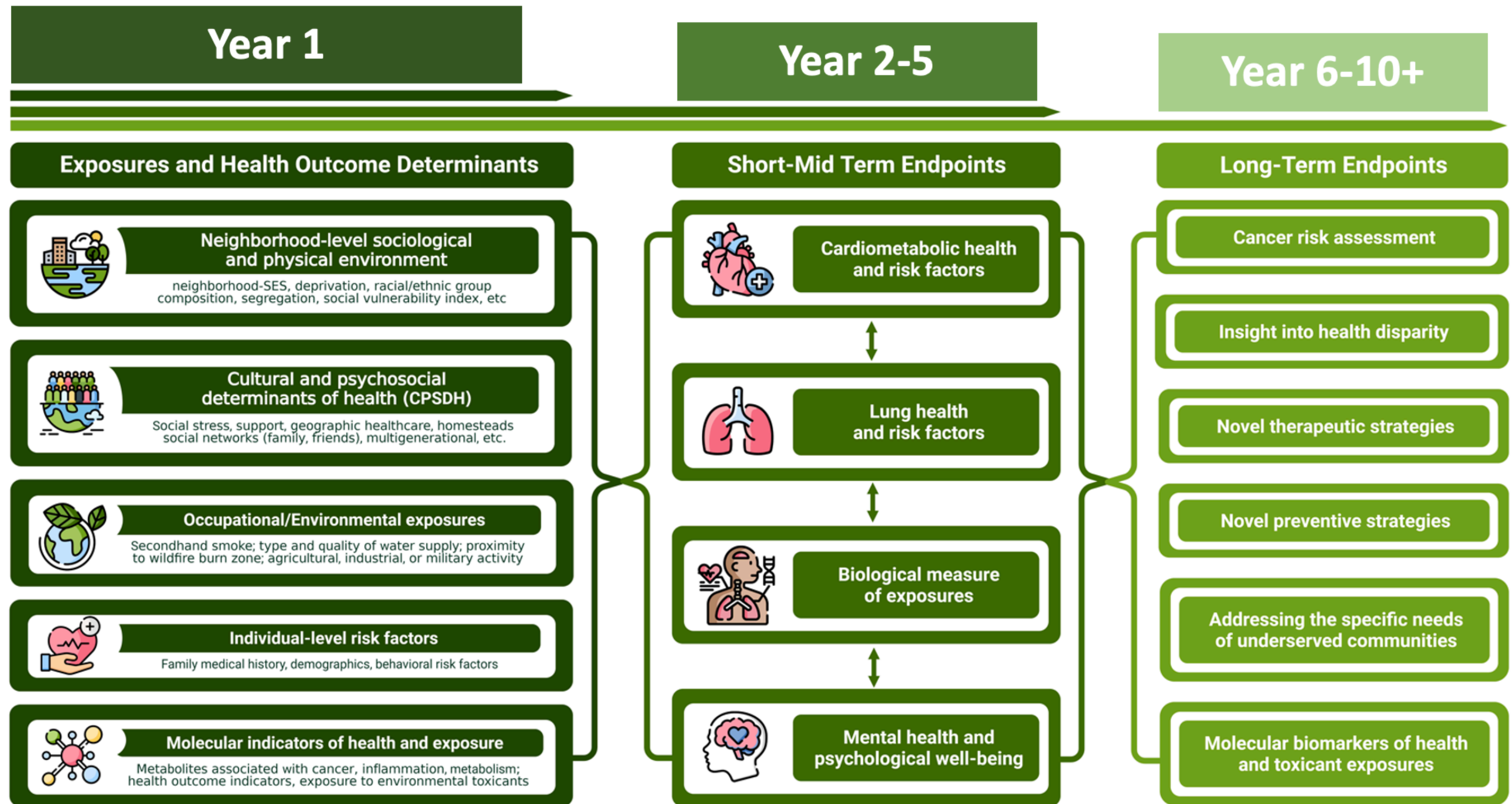
“Aloha Lahaina”
– K. Maunakea
Kula born, Haku Mele & Hawaiian Healer



Maui Wildfire Exposure Study (MauiWES) - Team



MauiWES - Goals and Timeline



Objective: Establish a cohort of ~2,000 individuals impacted by the wildfires to understand better and address short- and long-term health outcomes.

Launch: Data gathering started on January 26, 2024...

Survey, Biomonitoring, and Health Screening

Data Components

Questionnaires

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

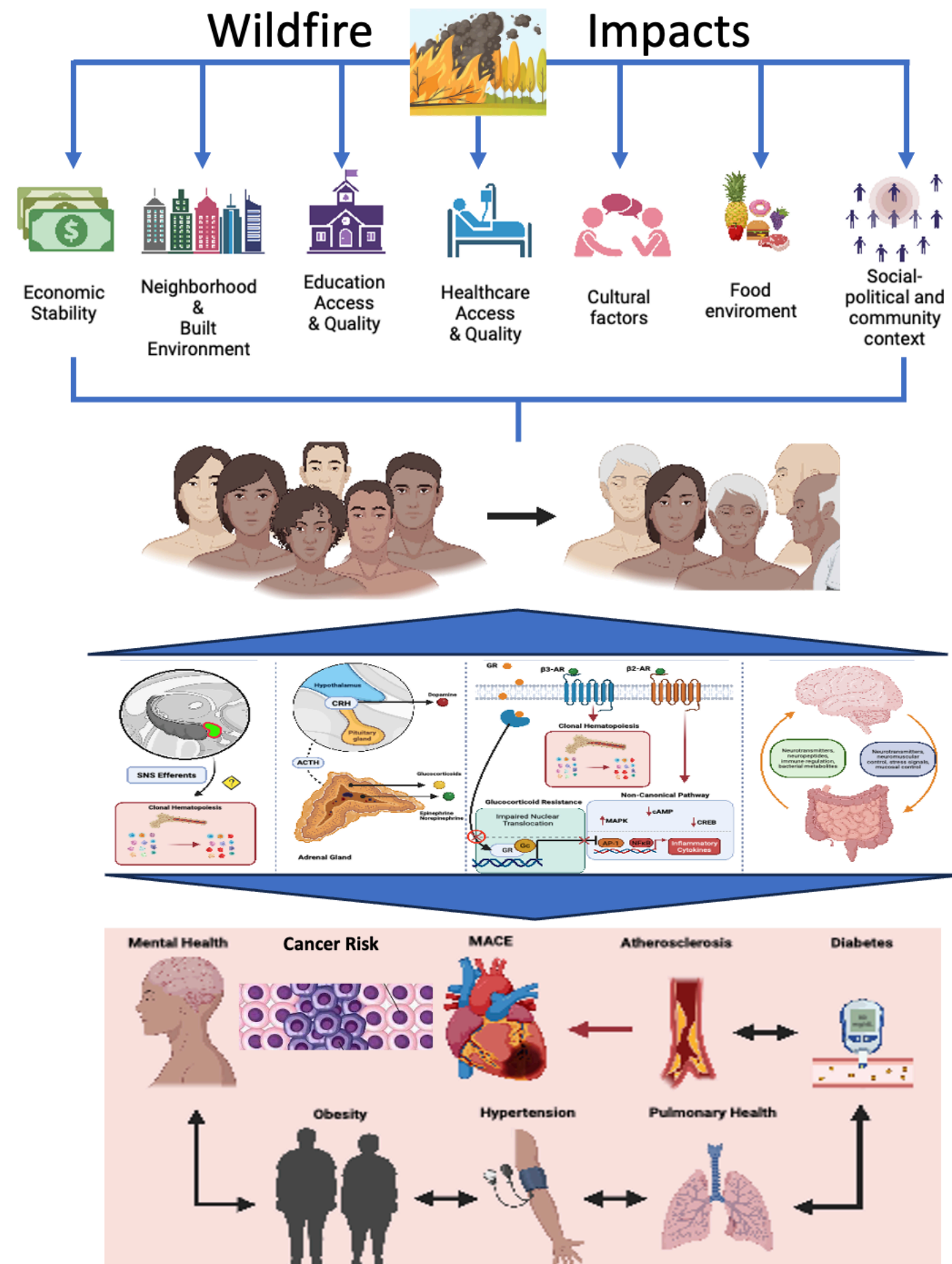
Biospecimens

- Stress Response
- Inflammation
- Environmental Toxicants

Health Exam

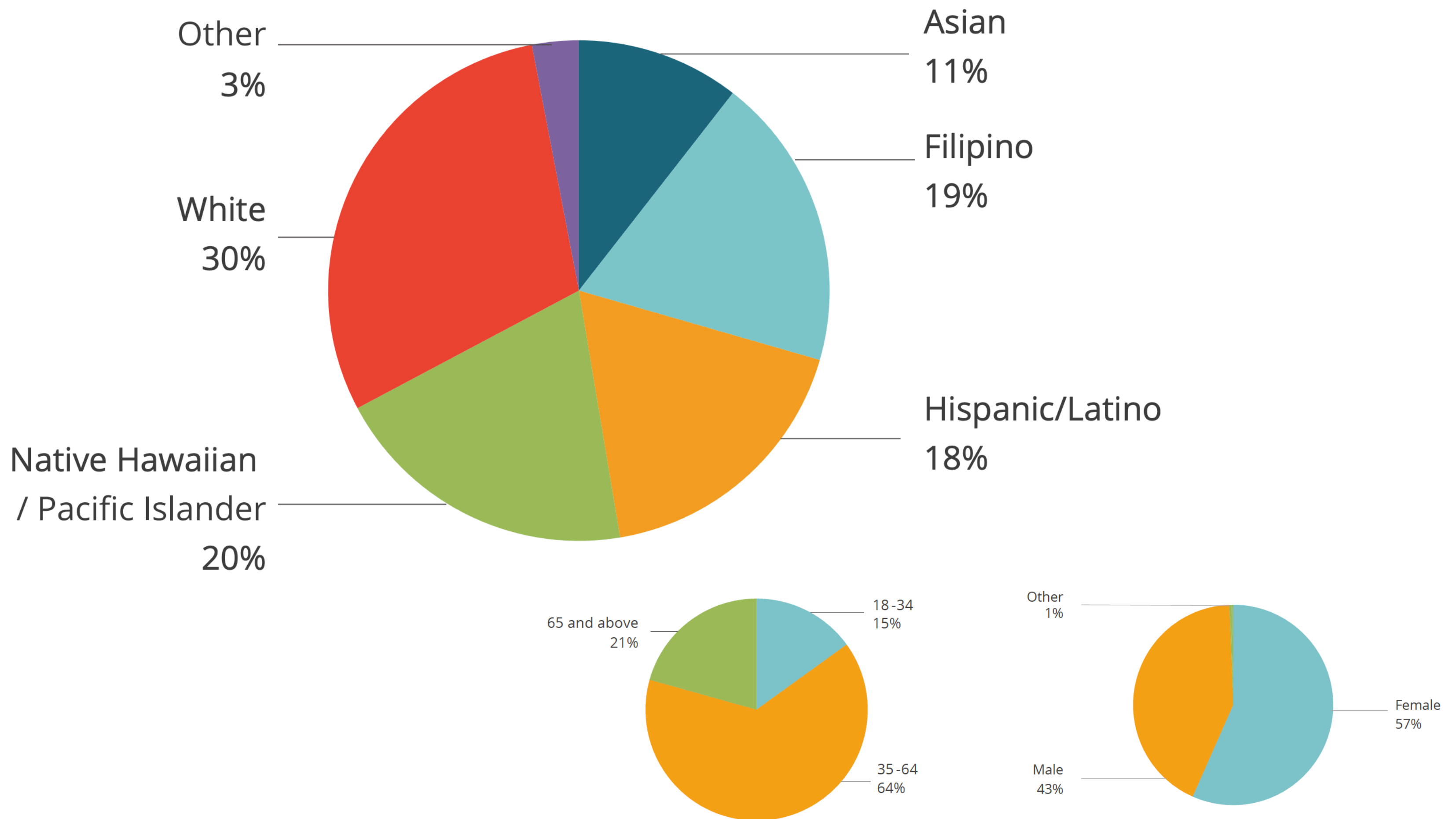
- Lung Health
- Cardiovascular Health
- Metabolic Health
- Mental Health
- Cancer Risk (EMR)

Participant Involvement



Enrolled: 900+ multiethnic adults to date (~ 18 recruitment days)

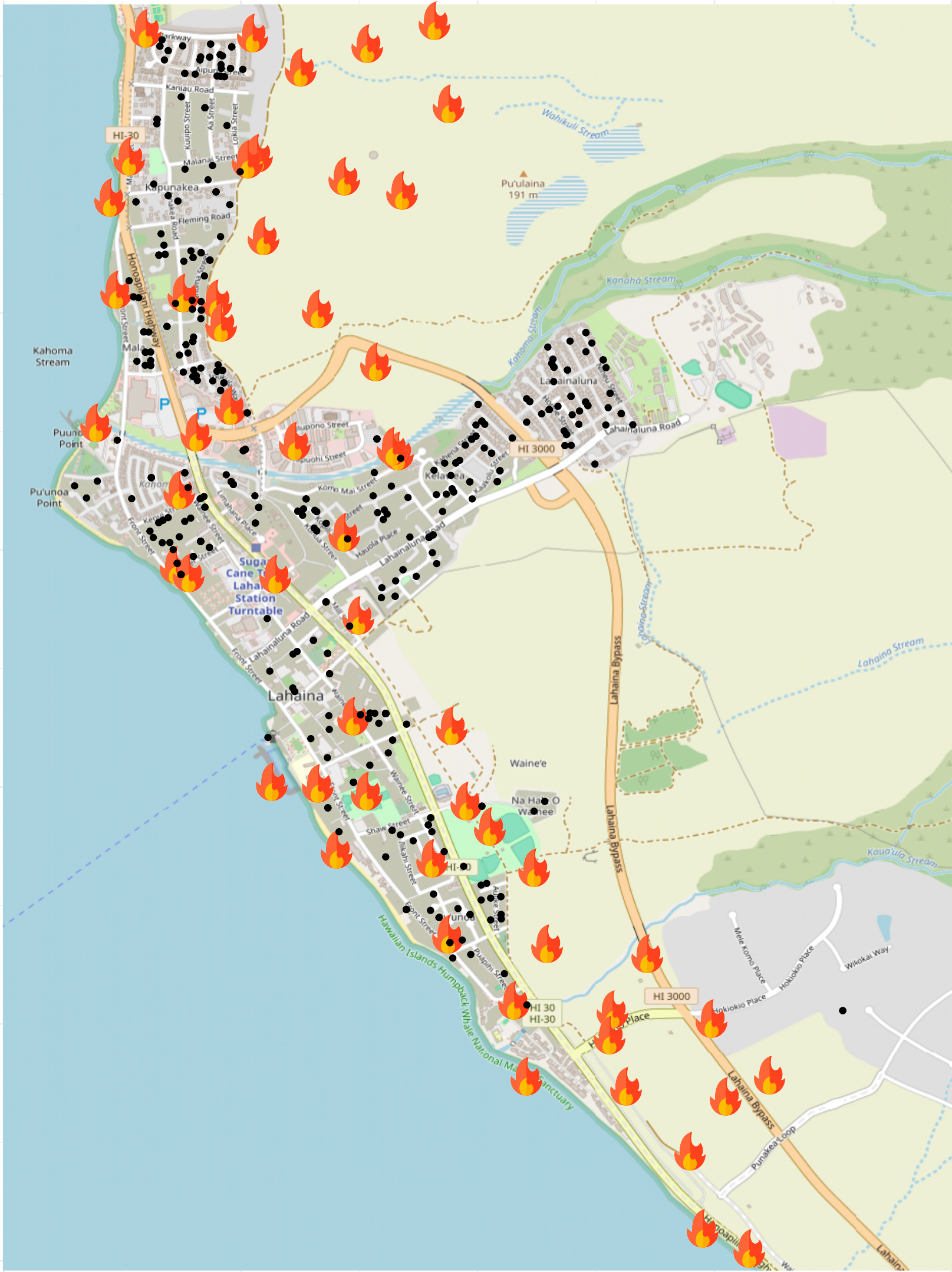
Diverse Cohort Representative of Impacted Population



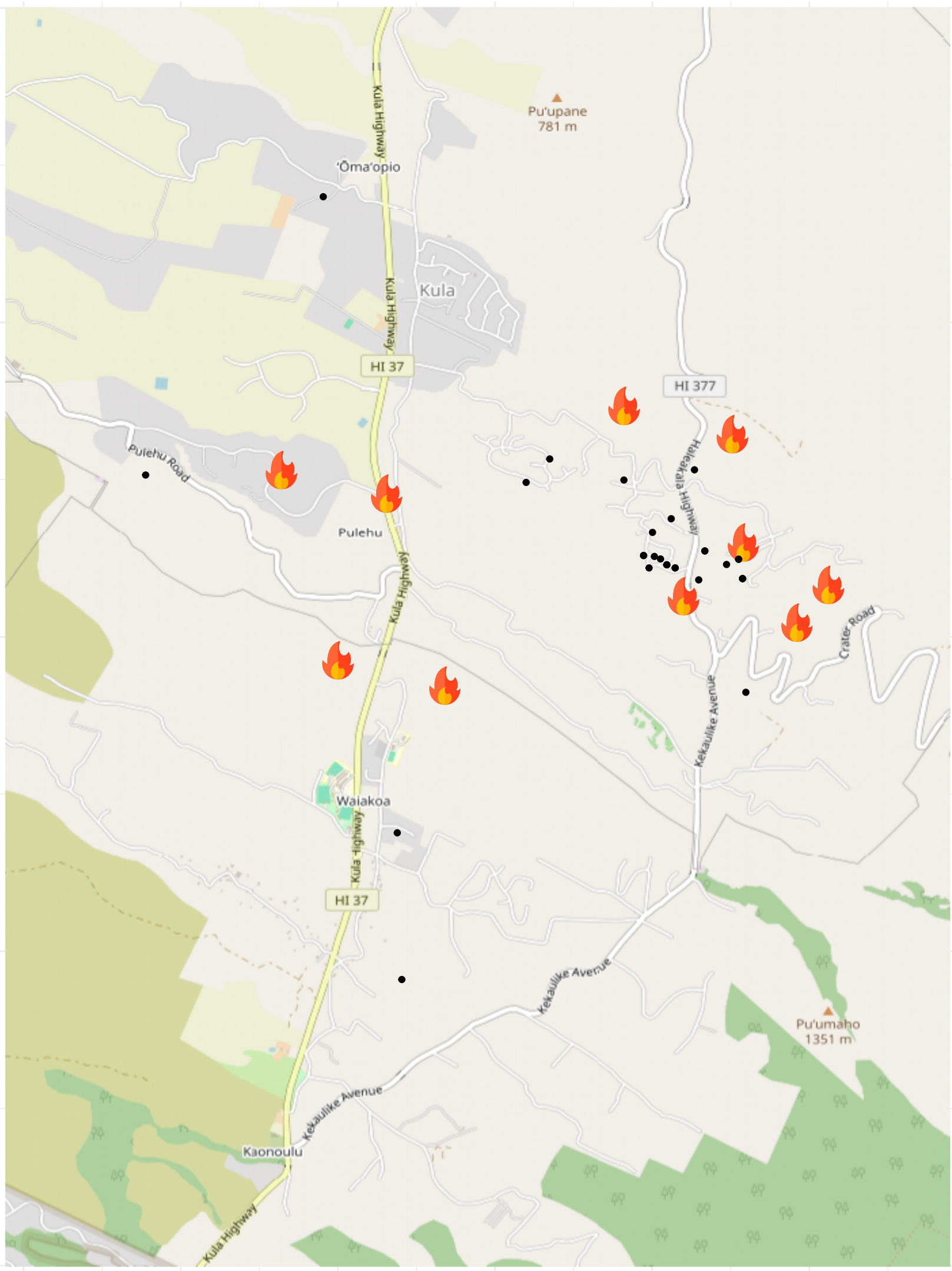
This is the most comprehensive and ethnically diverse study to evaluate short- & long-term health following a natural disaster in Hawai'i.

Broad Residential Representation of MauiWES Cohort

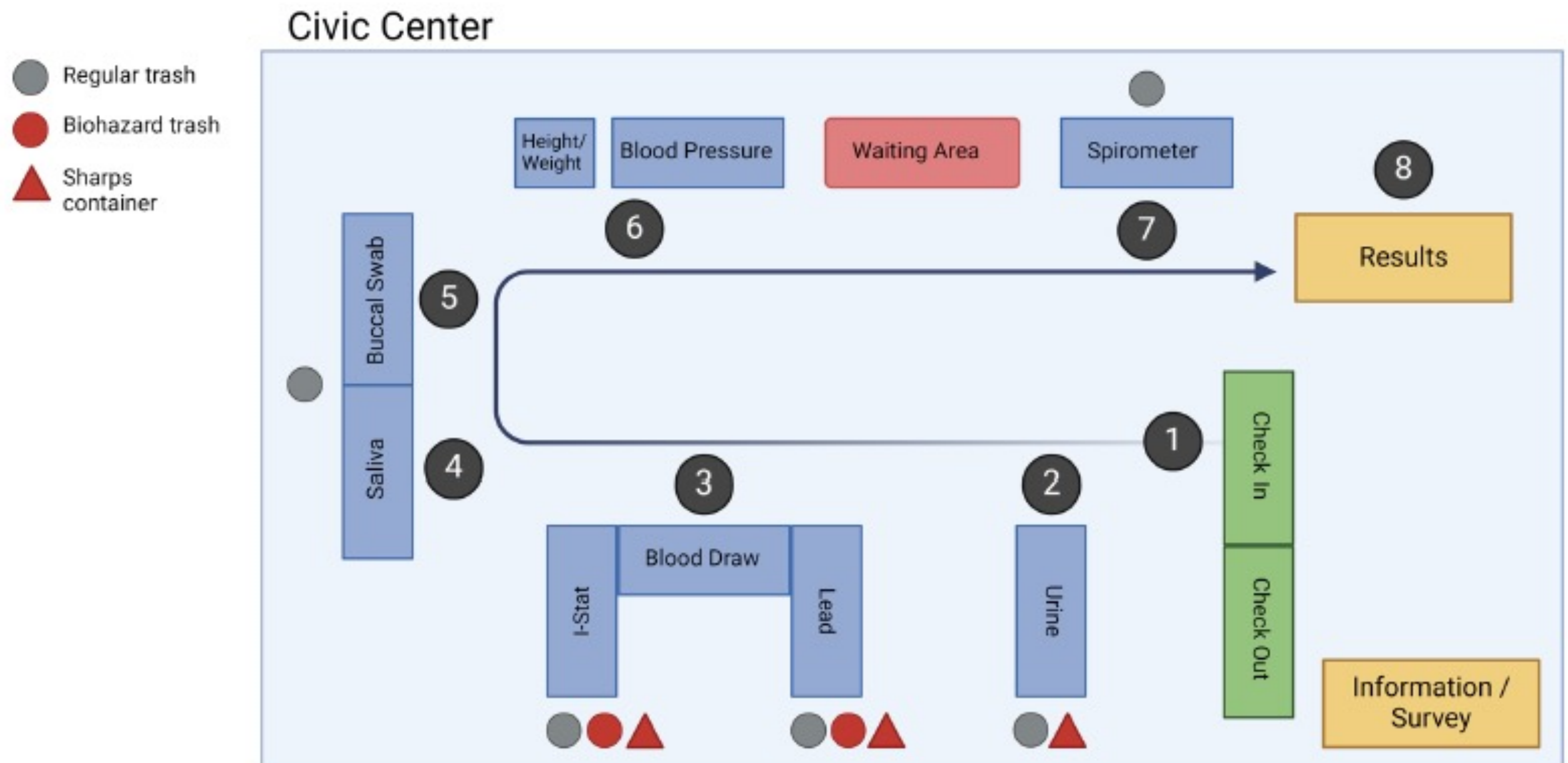
Lahaina




Kula



Pop-up Health Screening Stations



Example of Participant Results Sheet



Your Health Statistics Today

Thank you for participating in Maui Wildfire Exposure Cohort Study, or MauiWES. As part of the study, we collected the following health statistics. Here it is a summary of some of your tests today. Please remember these are not to be used for diagnosis, only for research. We recommend that you follow up with your physician if you have questions about today's results.



Blood Pressure:
Blood pressure readings fall into four broad categories, ranging from normal to stage 2 high blood pressure (hypertension). The level of your blood pressure determines what kind of treatment you may need. To get an accurate blood pressure measurement, your doctor should evaluate your readings based on the average of two or more blood pressure readings at three or more office visits.

Your Blood Pressure Today was Systolic: ____ (mm Hg) and Diastolic ____ (mm HG)

Top number (systolic)	Bottom number (diastolic)	Your category
Below 120	and Below 80	Normal Blood Pressure
Between 120-139	or Between 80-89	Prehypertension
Between 140-159	or between 90-99	Stage 1 hypertension
160 or more	or 100 or more	Stage 2 hypertension

Spirometer:
A spirometer is a device used to measure the amount of air you can breathe in and out. It helps assess your lung function. The main test we are focusing today is the Forced Vital Capacity. This test focuses on how much air you can forcefully exhale after taking a deep breath. It provides valuable information about your lung health and can help detect respiratory problems. Your Forced Vital Capacity is ____ liters.
Category: ☐ Normal. ☐ Low.
Normal values in healthy patients aged 20-60 range from 5.5 to 4.75 liters in males and from 3.75 to 3.25 liters in females.

Blood Tests:
The blood tests today were performed with the iStat system by Abbot. The i-Stat system is a portable device used for on-the-spot blood testing. It's like a mini laboratory that can analyze small amounts of blood to give immediate results. It works with different cartridges that perform different tests. We are running two cartridges, CG4+ and CHEM8+. The CG4 cartridge is specifically designed to measure blood gases and electrolytes, while the CHEM8 cartridge focuses on a broader range of tests related to blood chemistry. The main results we would like to share with you are:
Glucose: _____. Category: ☐ Normal. ☐ Low. ☐ High.
Normal Range: Less than 140 milligrams per deciliter (mg/dL) or less than 7.8 millimoles per liter (mmol/L). Levels above 300mg/dl or below 70mg/dl are concerning. Glucose is a type of sugar that our bodies use as a source of energy. It comes from the food we eat, especially carbohydrates. Keeping blood glucose levels in balance is crucial. If levels are too high (hyperglycemia) or too low (hypoglycemia), it can cause health problems. Chronic high blood sugar levels, specifically, can lead to conditions like diabetes.
Creatinine: _____. Category: ☐ Normal. ☐ High.
Normal range: 0.6 to 1.2 milligrams per deciliter (mg/dL). High creatinine levels can indicate a range of underlying health conditions, including kidney infection and kidney failure. Doctors typically consider high creatinine levels to be above 1.2 milligrams per deciliter (mg/dL) for males and 1.0 mg/dL for females.
Lactate: _____. Category: ☐ Normal. ☐ High.
A normal blood lactate level is 0.5-1 mmol/L. An increase in lactate production is typically caused by impaired tissue oxygenation, either from decreased oxygen delivery or a disorder in oxygen use. It can be an indicative of severe lung disease, respiratory failure, or pulmonary edema.



Today we collected various data points, **Including:**

- Height
- Weight
- Spirometer readings
- CG4+
- CHEM8+

- Blood
- Urine
- Saliva
- Cheek swabs.

This data will be used for a range of tests, and the results will be made **available to you** on your personal dashboard as soon as they are ready. You are welcome to share your data with your medical provider if you have any questions or concerns.


What can you expect?
Within the next 7 days, your **dashboard profile** will be accessible, and we will continue to update it with new data as it becomes available. Every time it is updated, **we will notify you via email.**

The Hawai'i CARES line
Available 24/7
Call or Text
988

Replacement of vital records
Including birth and marriage certificates
vitrec.chawaii.gov


For more resources, please go to:
health.hawaii.gov/mauiwildfires

To log-in to your online data dashboard visit hia.llc/login or scan the QR code below.




Additional resources will be added to your dashboard in the future. If you have any questions, please feel free to email us at MauiWES@hawaii.edu.

Thank you for your participation in this study.
We appreciate your contribution.



JOHN A. BURNS
SCHOOL of MEDICINE



Dissemination - Participant Data Portal and Dashboard

- Participants are provided with RAPID results for relevant health conditions and some environmental hazard exposures with more comprehensive tests to be analyzed later



- We will connect participants to their results and at-risk individuals will be referred to relevant services/providers using a *de novo* **Wildfire Exposures Data Dashboard**



MauiWES Main Findings to Date

Main trends detailed in the report:

1. Mental and physical health issues
2. Access to care
3. Housing, job, and food insecurity

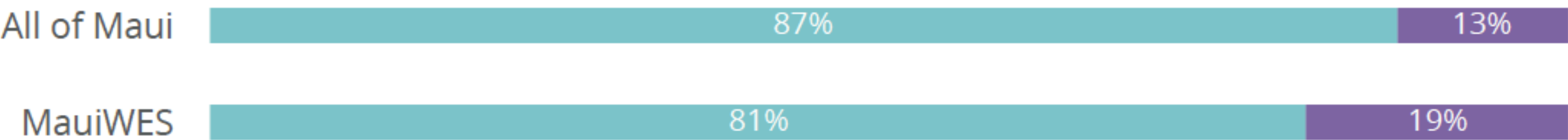
Postfire Declines in Mental Health

Alarming rates of mental health issues among survivors: 52% of participants showed depressive symptoms, 19% reported low self-esteem, 30% had moderate to severe anxiety, and 4.4% had considered suicide in the past month.

Depression



Self-esteem

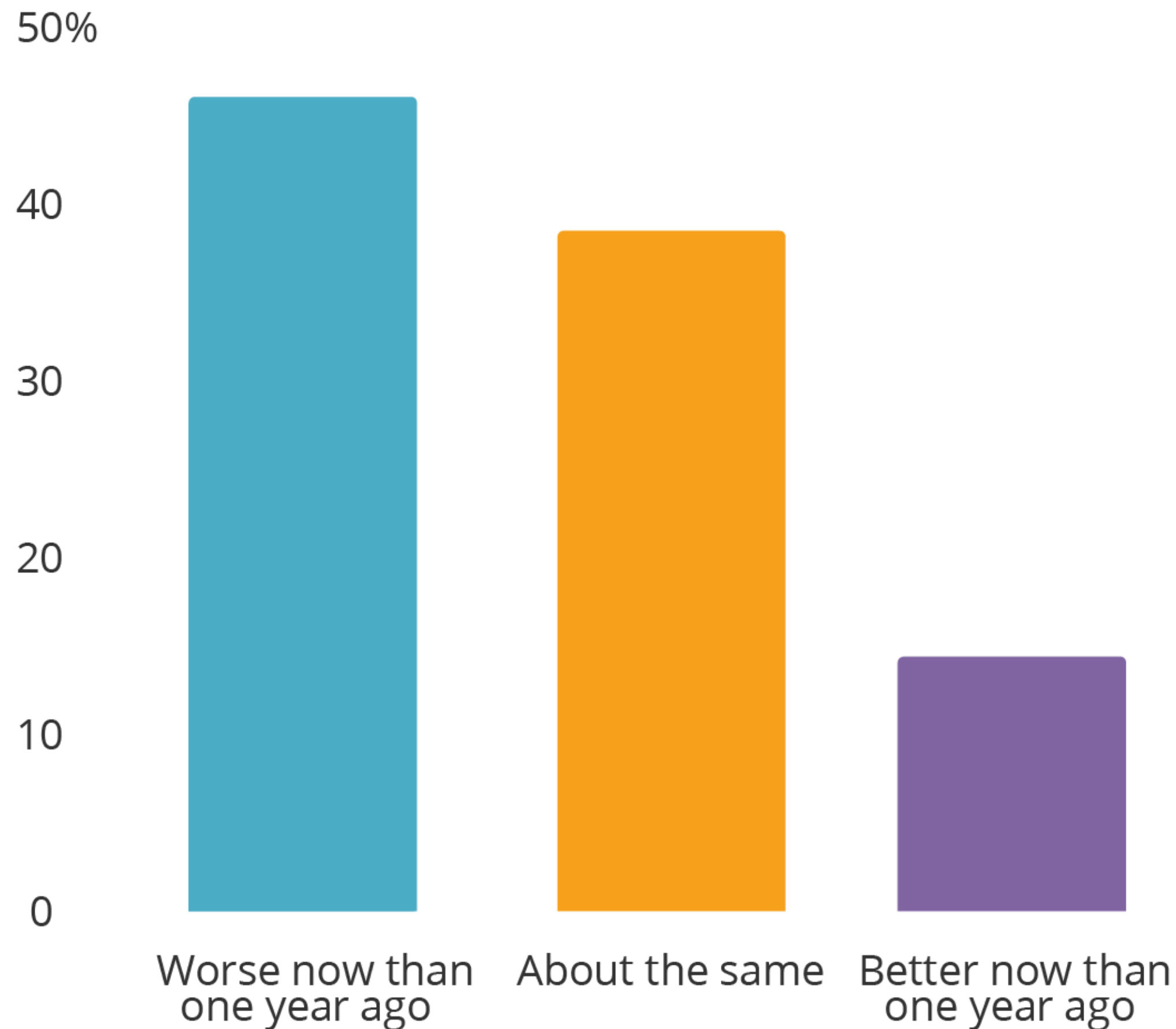


Suicidal ideation



Postfire Declines in Physical Health

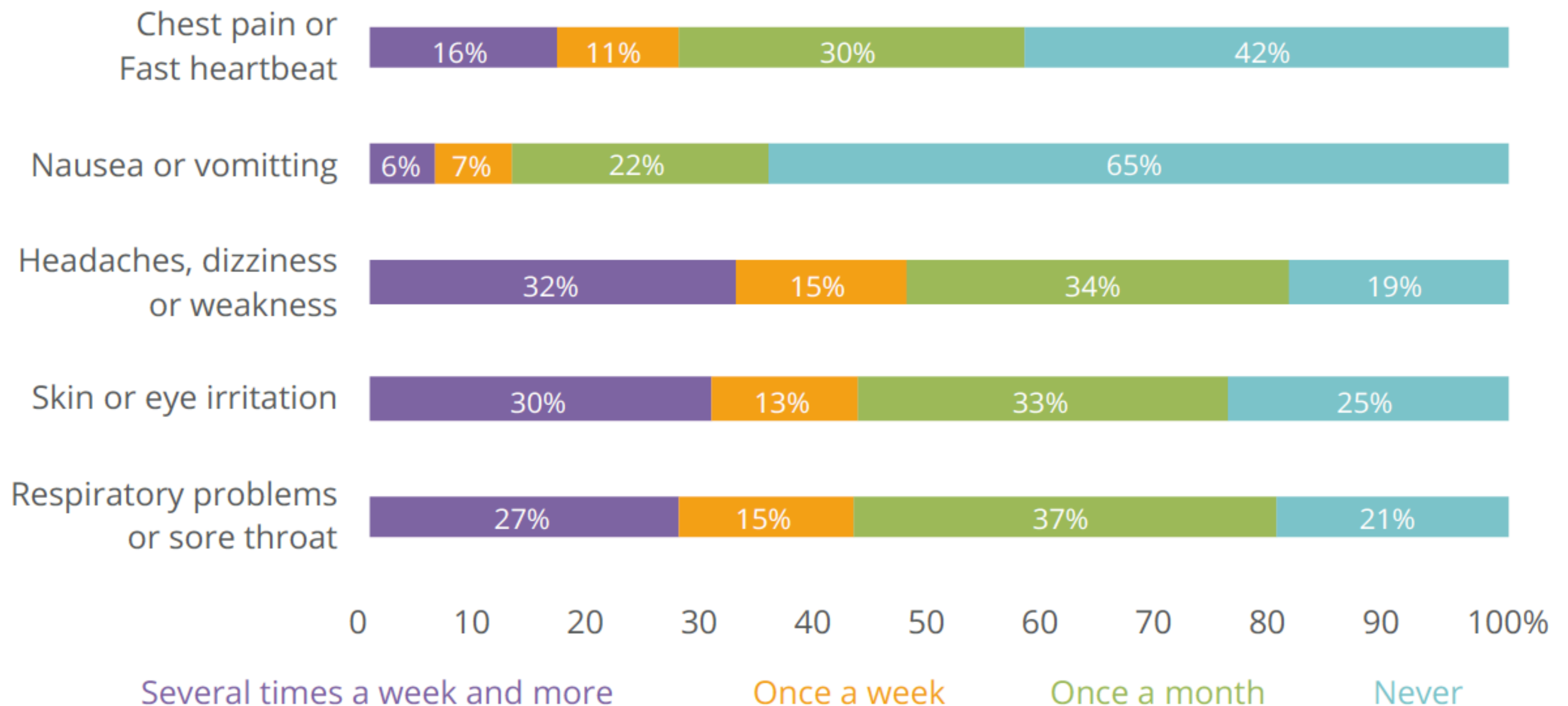
Nearly half of the participants reported worsened health since the wildfires, particularly among those with higher exposure to wildfire ash, debris, and smoke.



Symptoms & Health Screenings Validate Self-reports

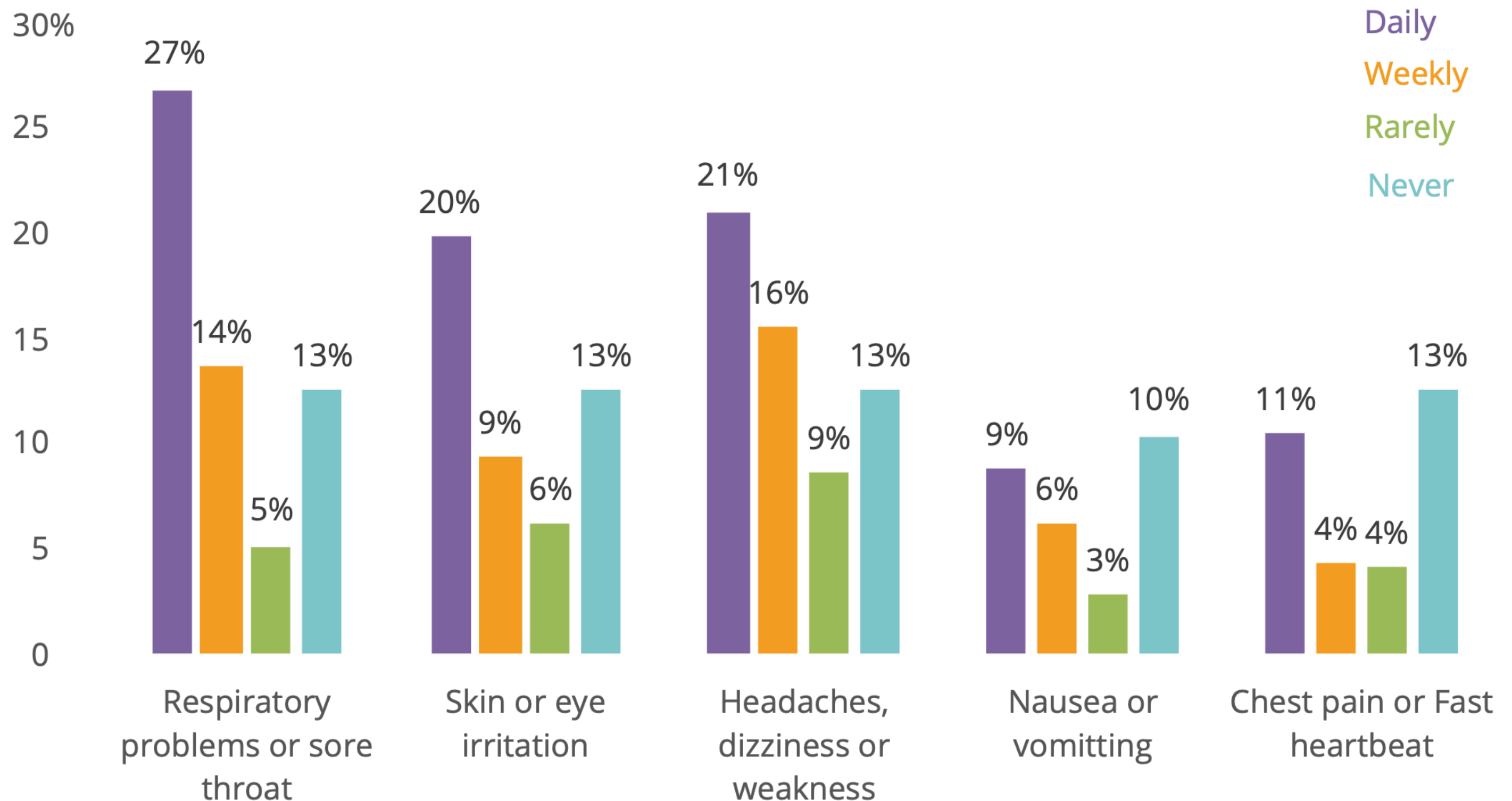
Respiratory issues (coughing, wheezing, difficulty breathing), skin/eye irritation, fatigue or weakness are the most common symptoms reported among participants.

How often have you experience the following symptoms since the wildfires?



Self-reported Exposure Associates with Symptoms

Percentage of responses of “Always/ Frequently” experiencing the symptoms since wildfires by the exposure to wildfire debris, smoke or ash

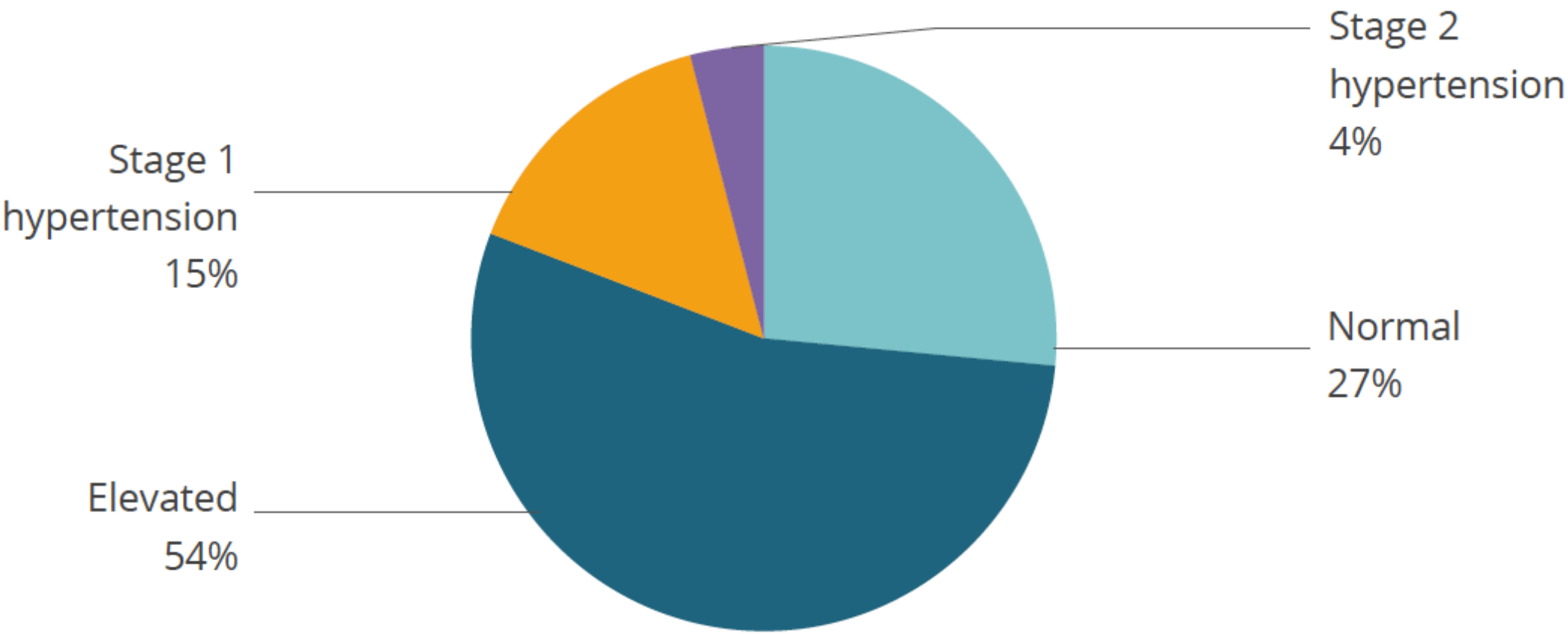


Individuals who reported frequent exposures to wildfire debris, smoke, and ash tended to experience more symptoms

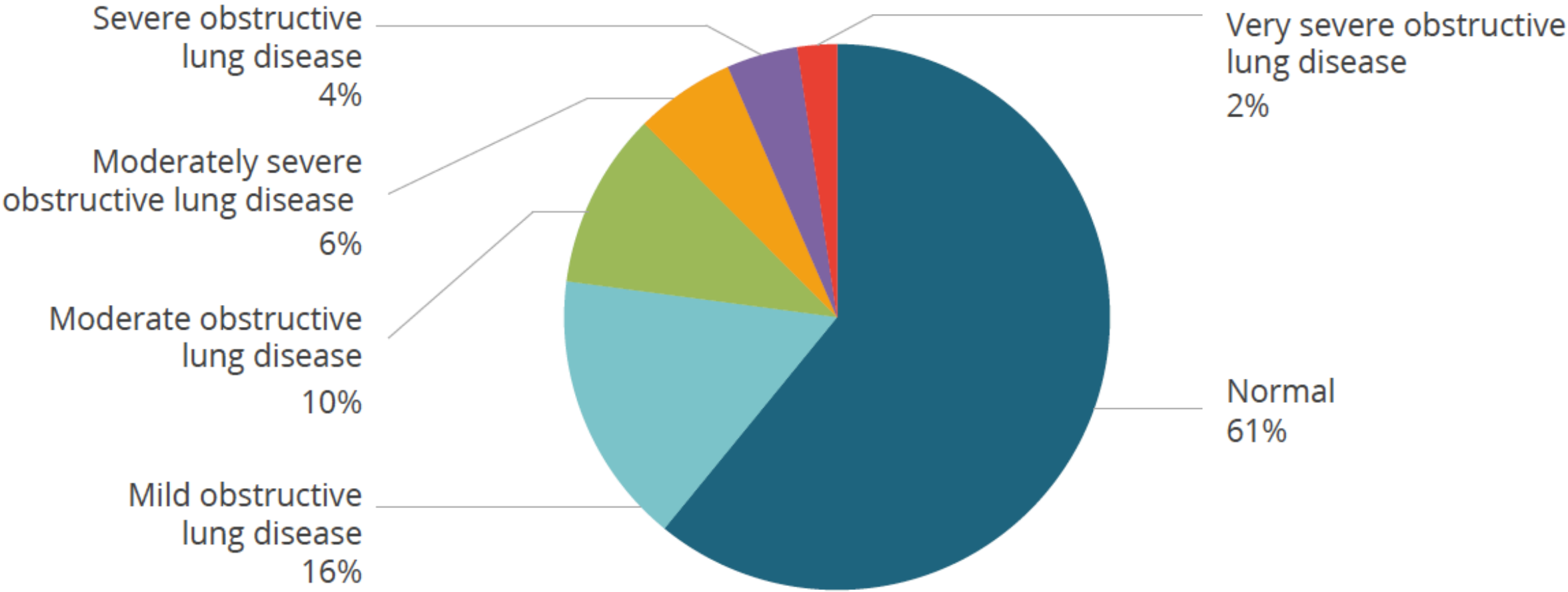
Prevalence of Cardiopulmonary Risk

~74% of participants face a heightened risk of cardiovascular disease due to high blood pressure at elevated to hypertension levels. Up to 60% may suffer from poor lung health based on spirometry measures, with 40% with mild to severe lung obstruction.

Blood Pressure Categories



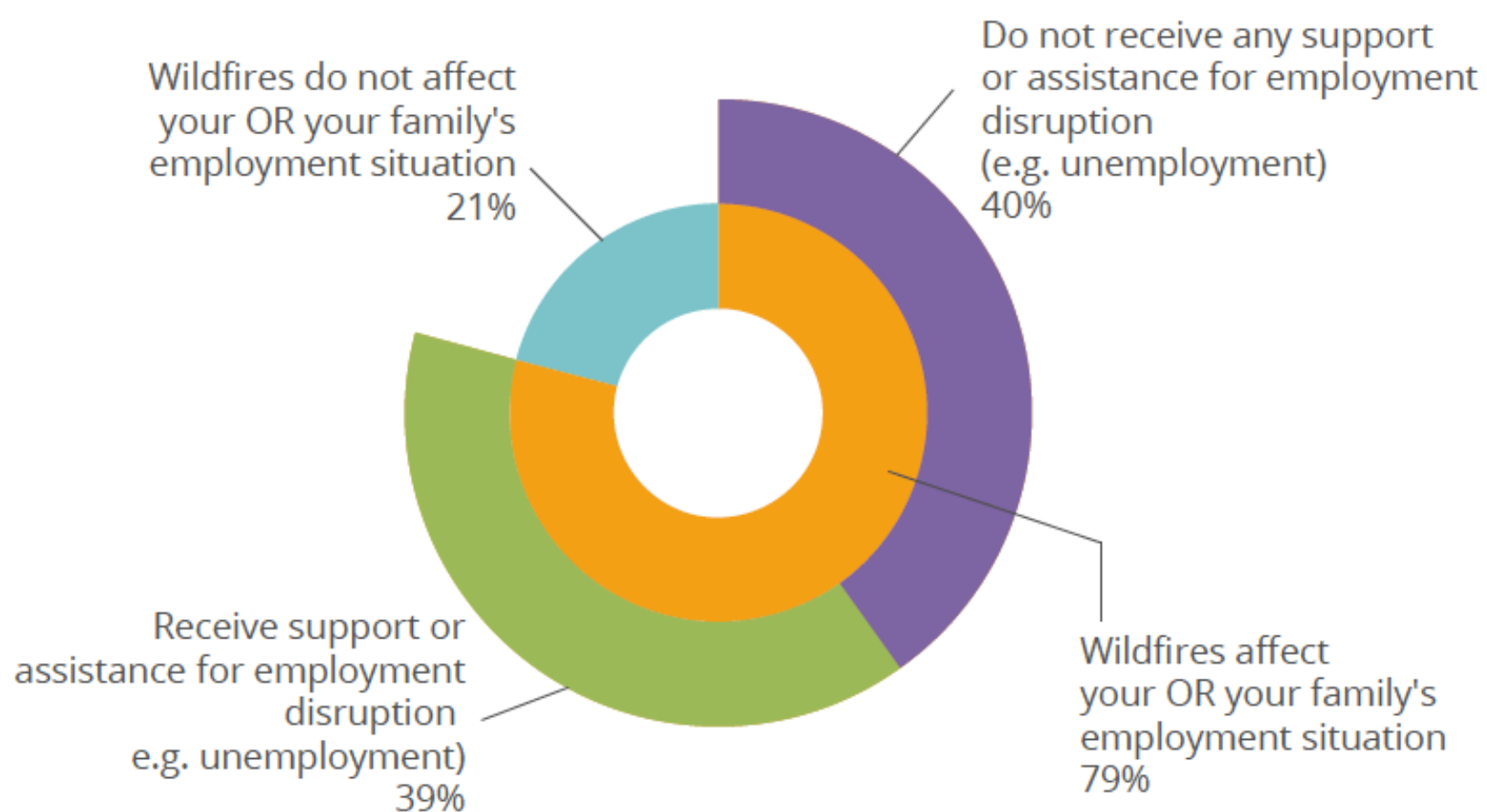
FEV1 Category



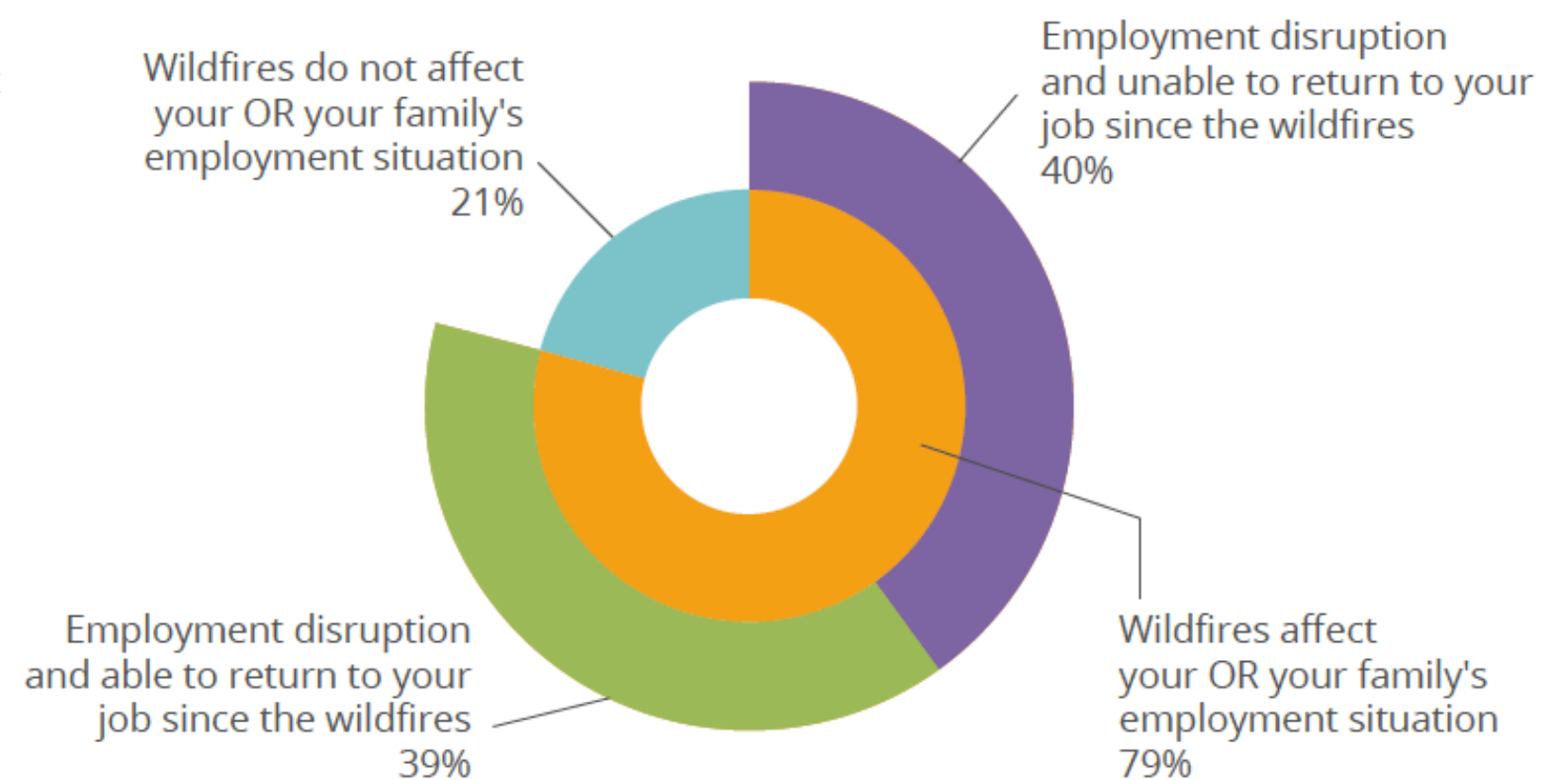
Postfire Job/Income Loss

Over 70% of MauiWES participants reported loss of income after the fires, with about 1/3 reporting job loss and looking for employment.

Did the wildfires affect your OR your family's employment situation? Did you receive support or assistance for employment disruption (e.g., unemployment)?

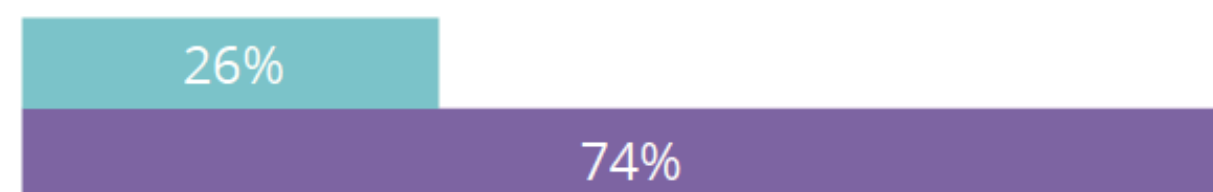


Did the wildfires affect your OR your family's employment situation? Have you been able to return to your job since the wildfires?

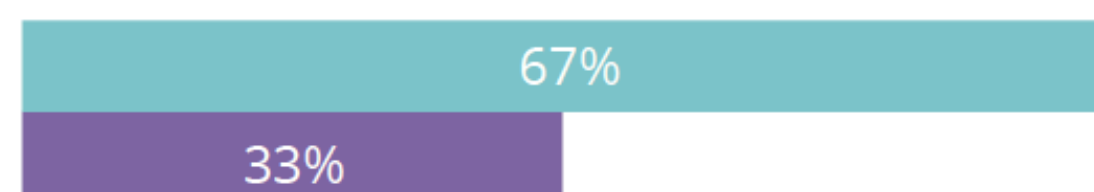


Employment effect of wildfires

Have you or your household experienced a decrease in income following the wildfires?



Are you currently looking for work due to changes in your employment caused by the wildfires?

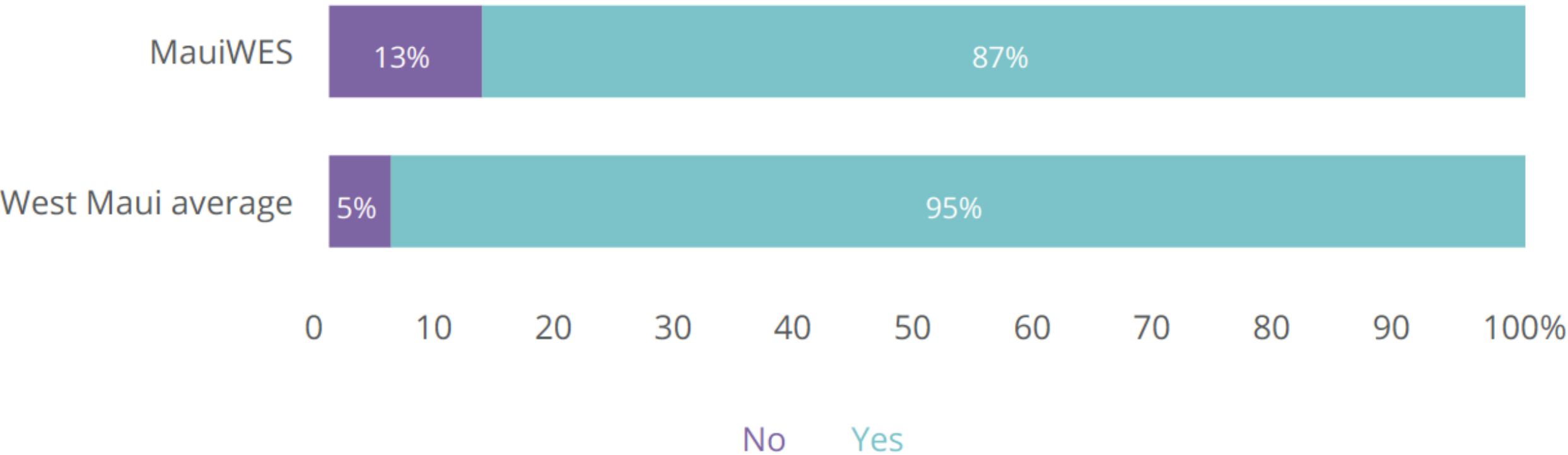


0 10 20 30 40 50 60 70 80%

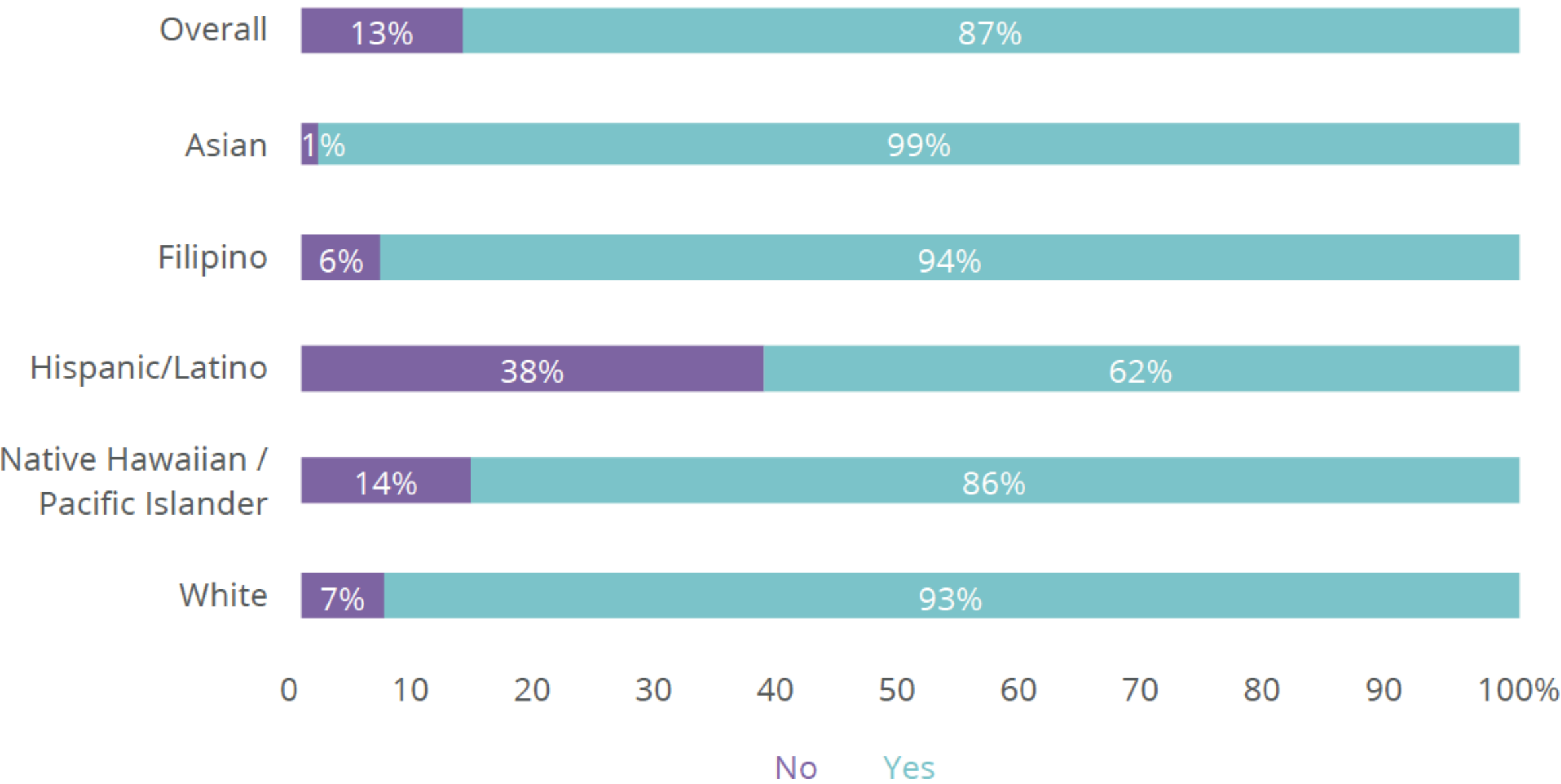
Postfire Loss of Health Insurance Coverage

Significant disparities in health insurance coverage were also found, with over 10% of participants lacking insurance, notably more than 30% among Hispanics.

Do you currently have health insurance?



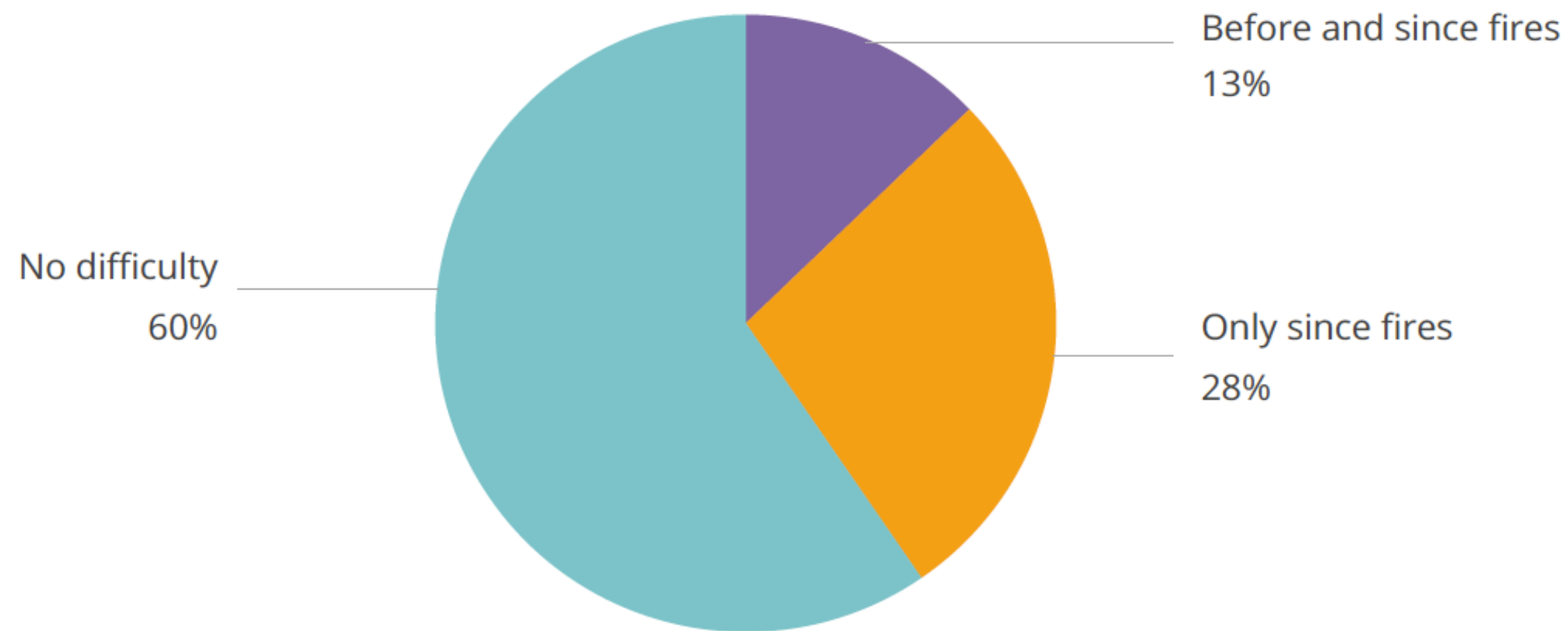
Do you currently have health insurance?



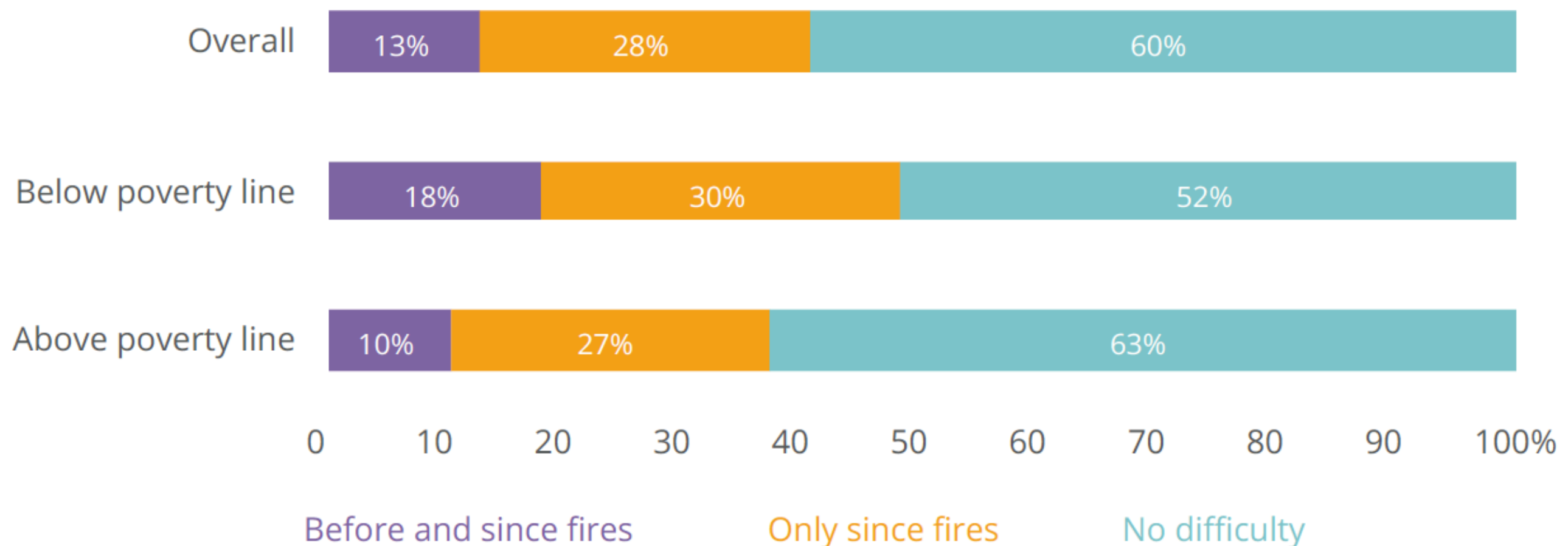
Increased Difficulty in Accessing Medical Care

~ 4/10 people in the MauiWES cohort report having trouble getting medical care and medications, compared to ~ 1/10 before the fires.

Did you have any difficulties accessing medical care or medications?

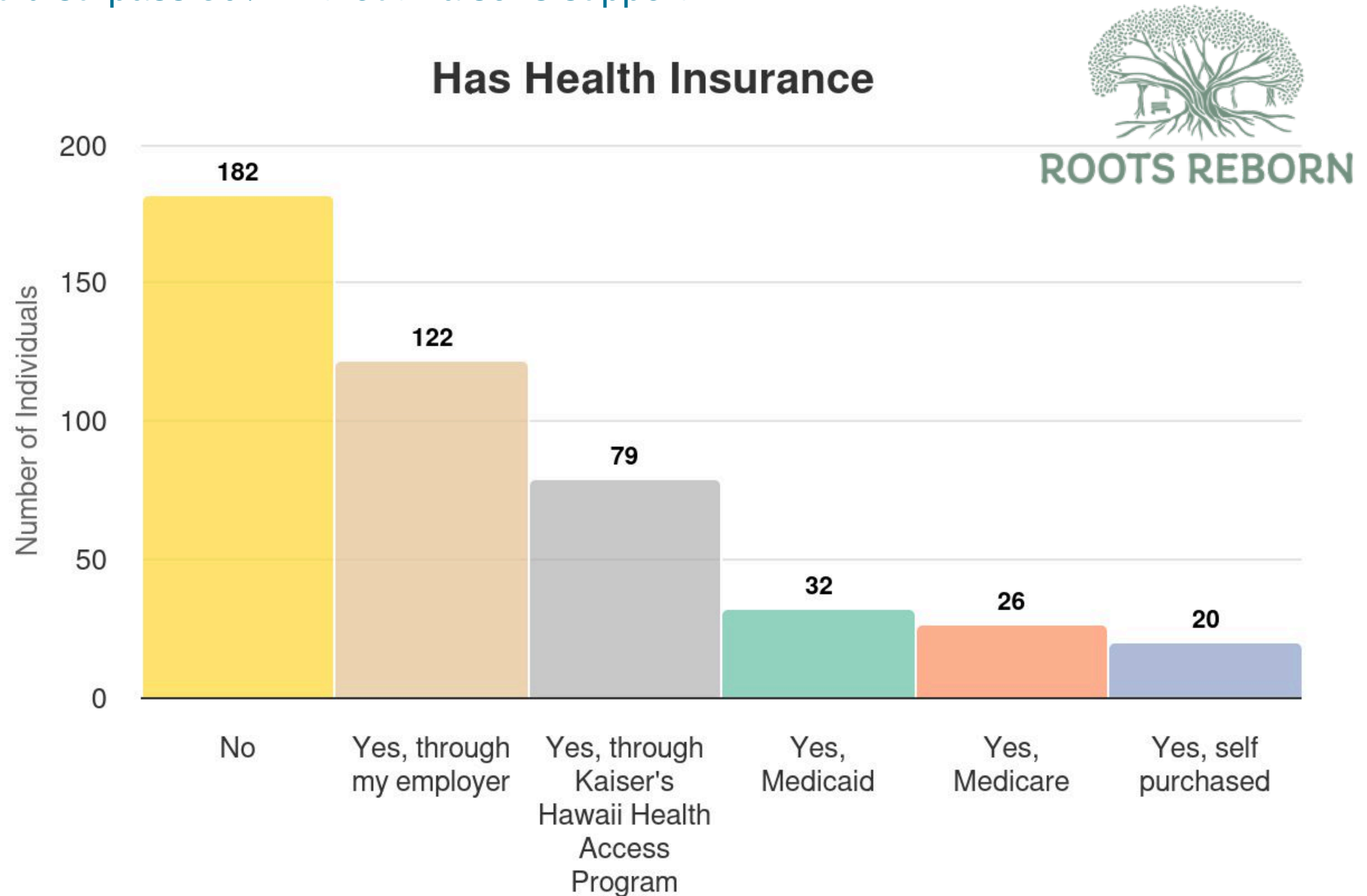


Did you have any difficulties accessing medical care or medications? - by poverty line



Roots Reborn work with Immigrant Populations in Maui

Over 40% of RR Maui's immigrant population lacks health insurance—a number that would surpass 50% without Kaiser's support

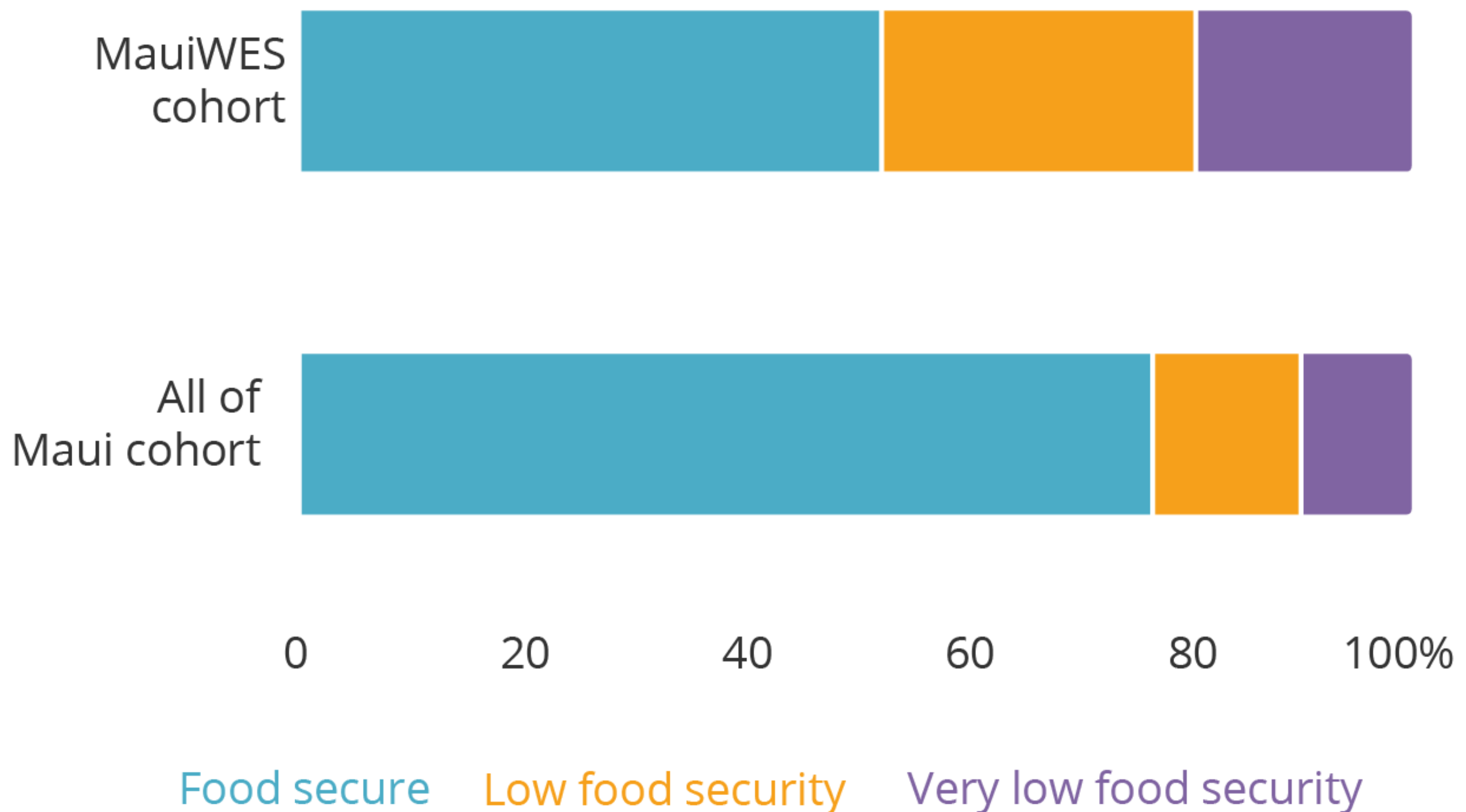


Council for Native Hawaiian Advancement



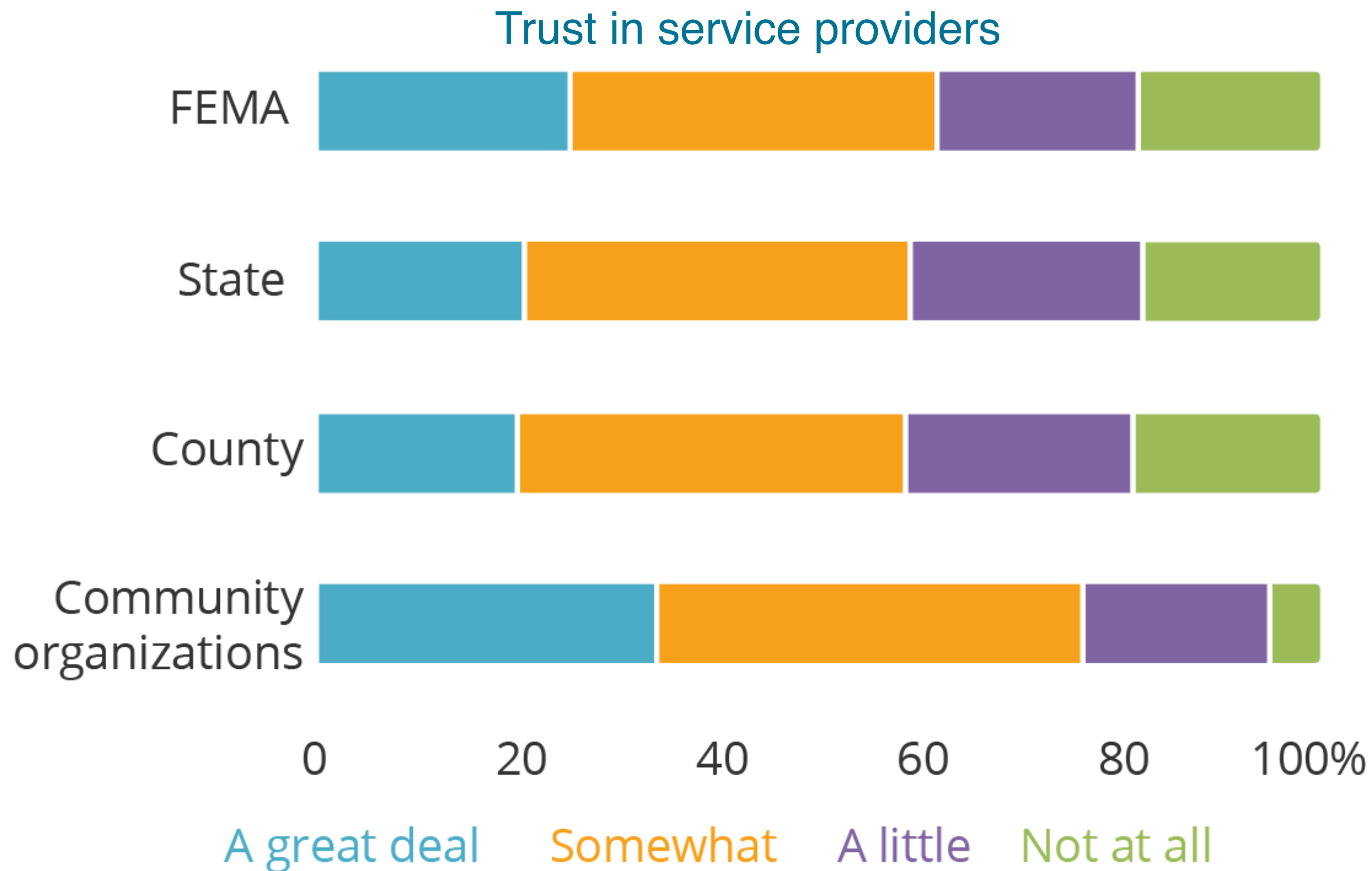
Increased Food Insecurity

Almost half of respondents experienced very low or low food security. This is substantially higher than in the pre-fire UHERO Rapid Survey cohort for all of Maui where less than a quarter of participants were found insecure.



Resiliency - Trust and Social Connectedness

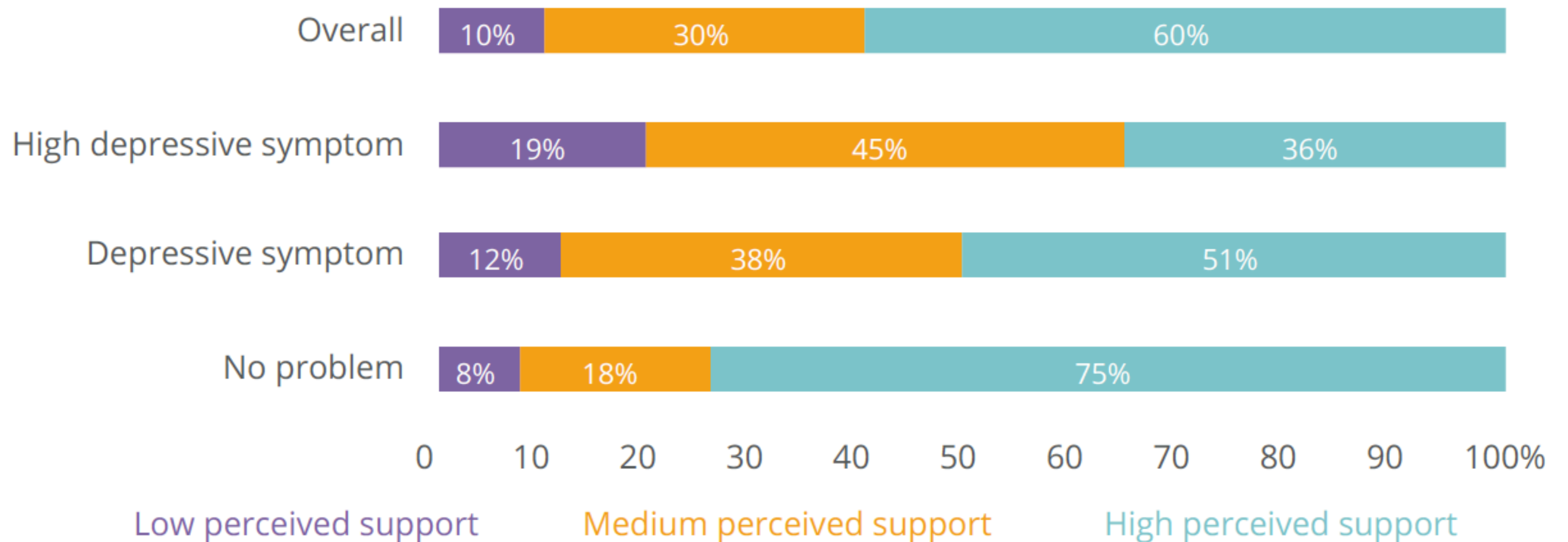
MauiWES participants trust and use community organizations more than FEMA or local government services for wildfire aid.



Resiliency - Trust and Social Connectedness

Participants reporting high levels of perceived social support tend to have less depressive symptoms than those reporting low levels of perceived social support who also tend to experience more difficulties accessing care.

Multidimensional Scale of Perceived Social Support by depression



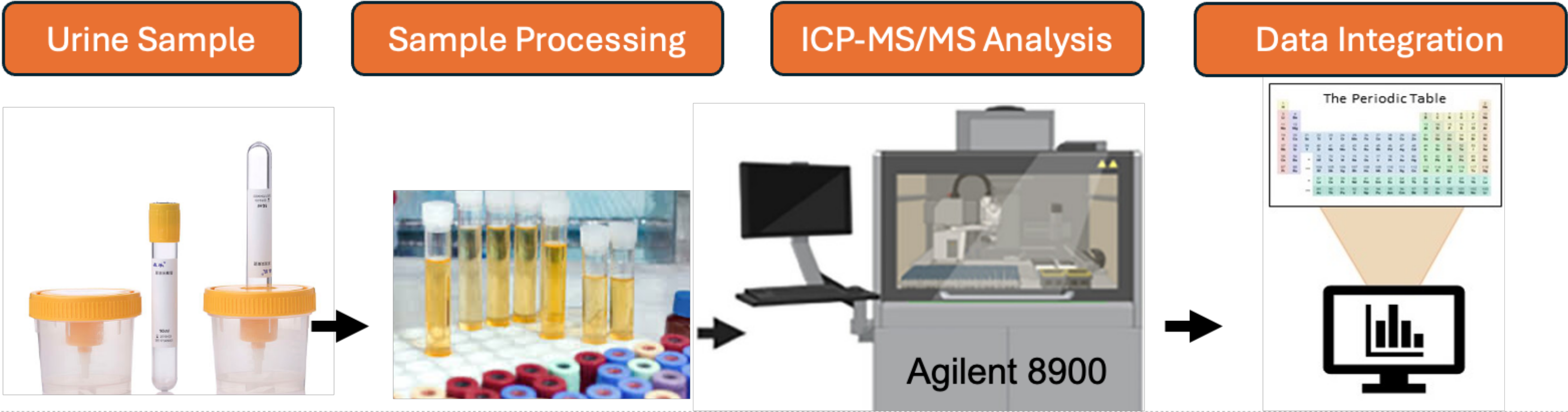
Inductively Coupled Plasma-Tandem Mass Spectrometry of Urine Samples for Heavy Metal Exposures

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

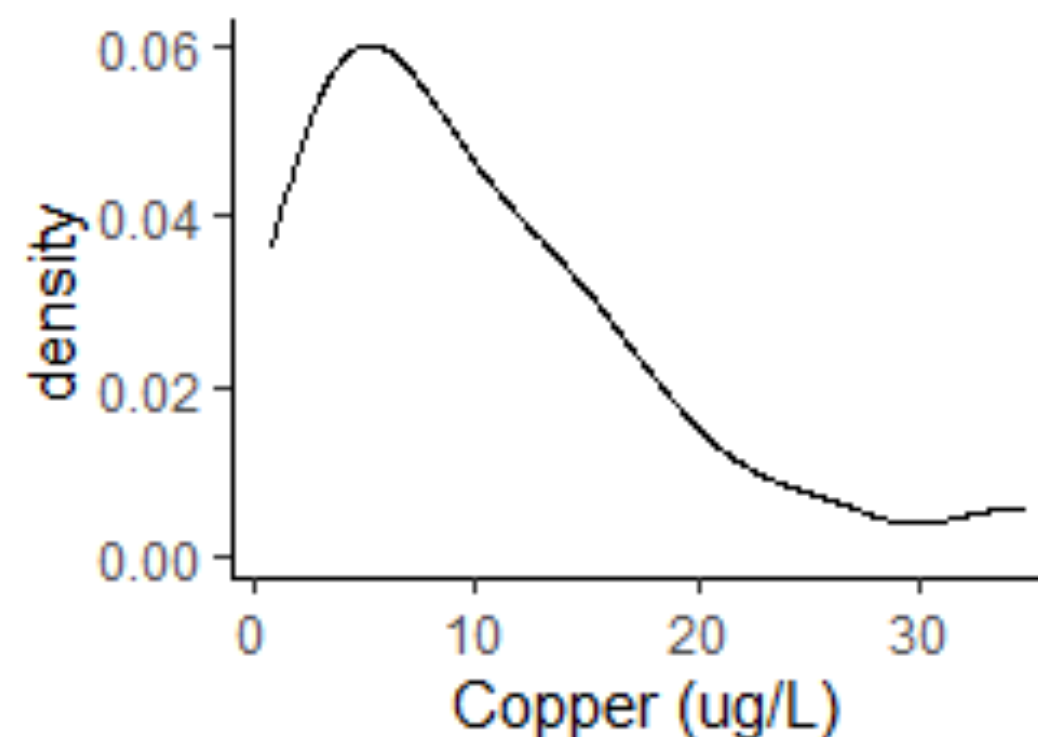
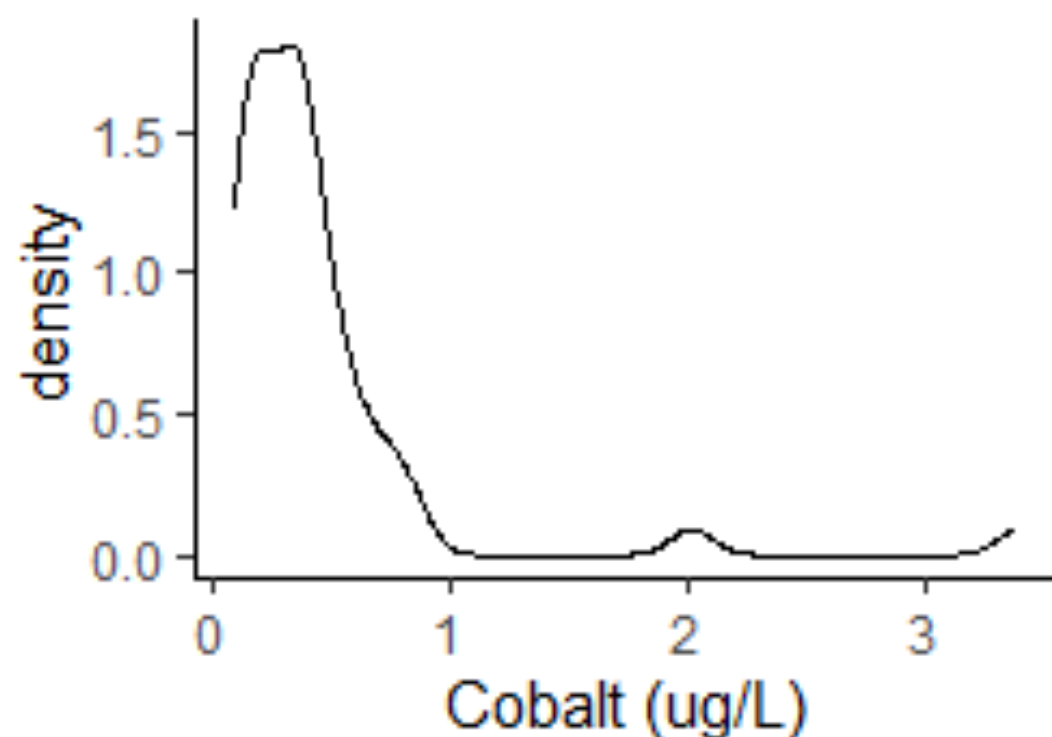
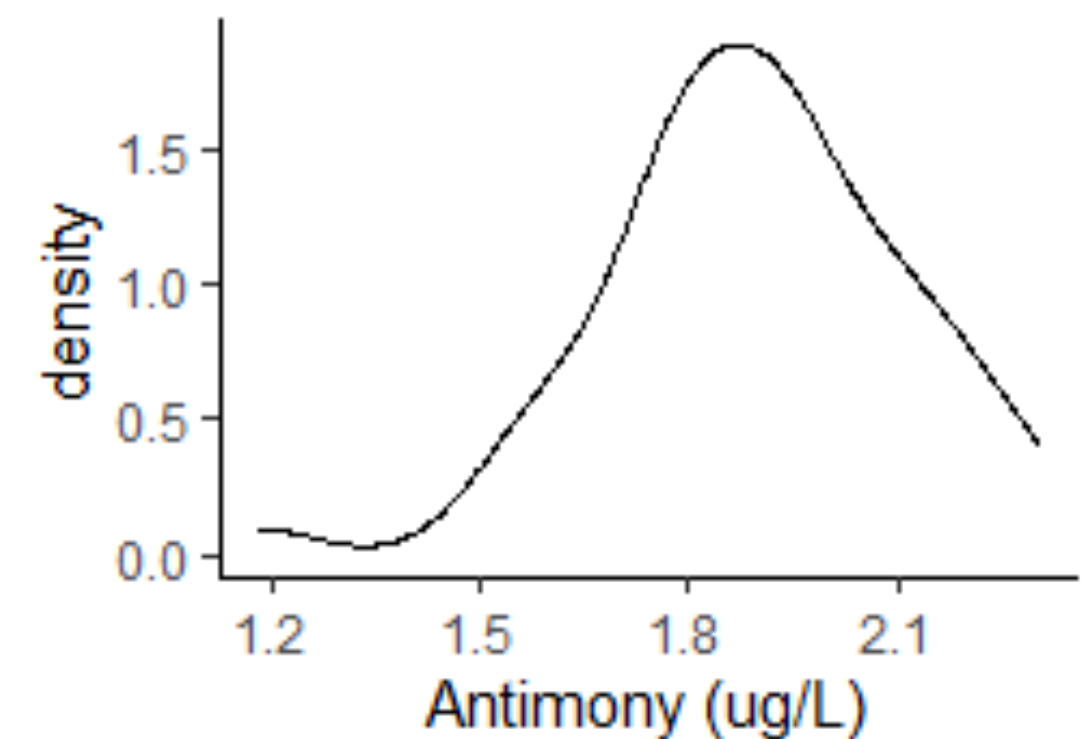
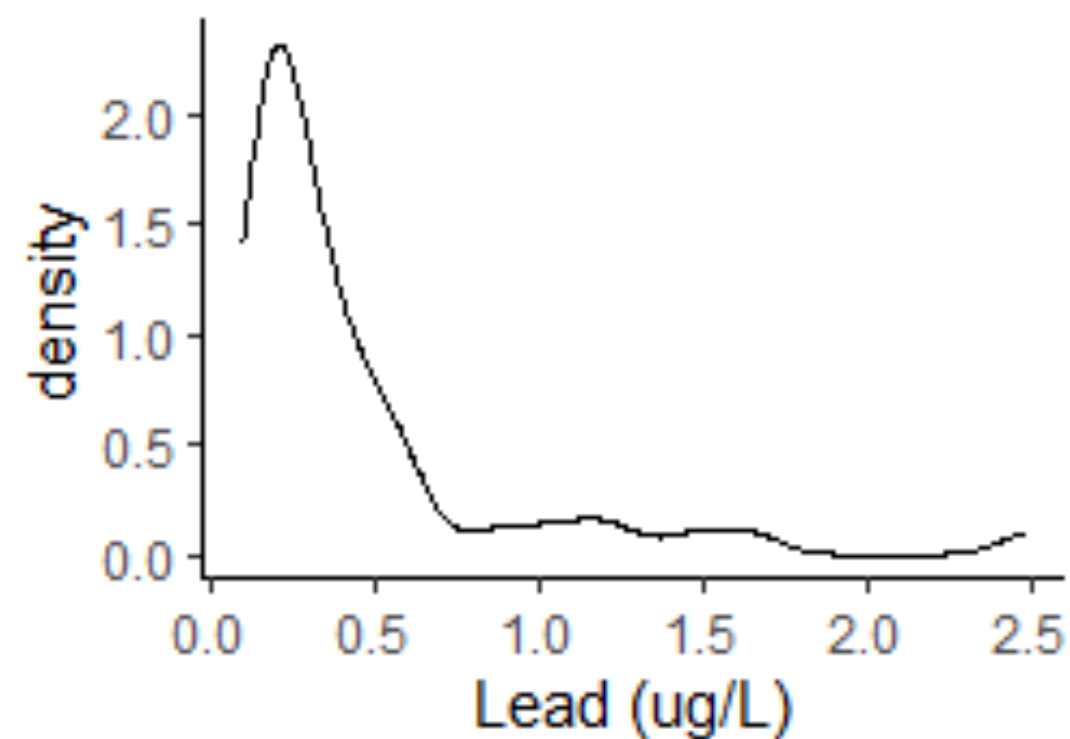
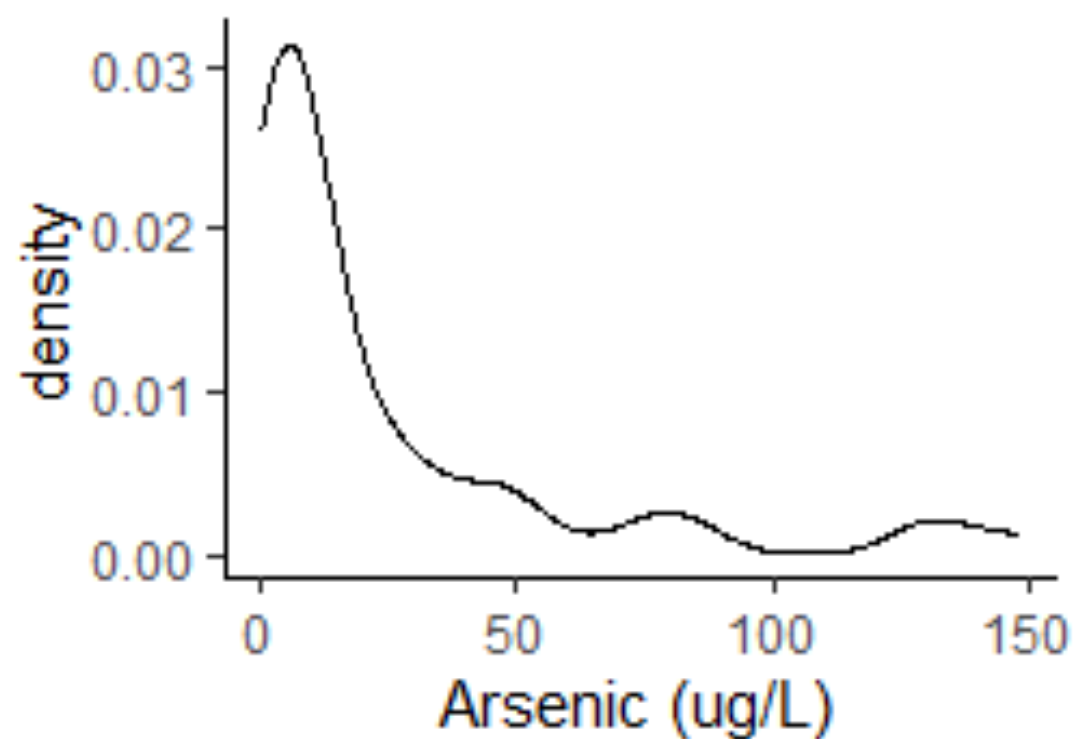


33 elements: Li, Mg, Al, K, Ca, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, As, Br, Se, Sr, Mo, Ru, Pd, Cd, Sn, Sb, Cs, Ba, Tb, W, Re, Hg, Tl, Pb, Bi, U



Preliminary Heavy Metal Exposure Results

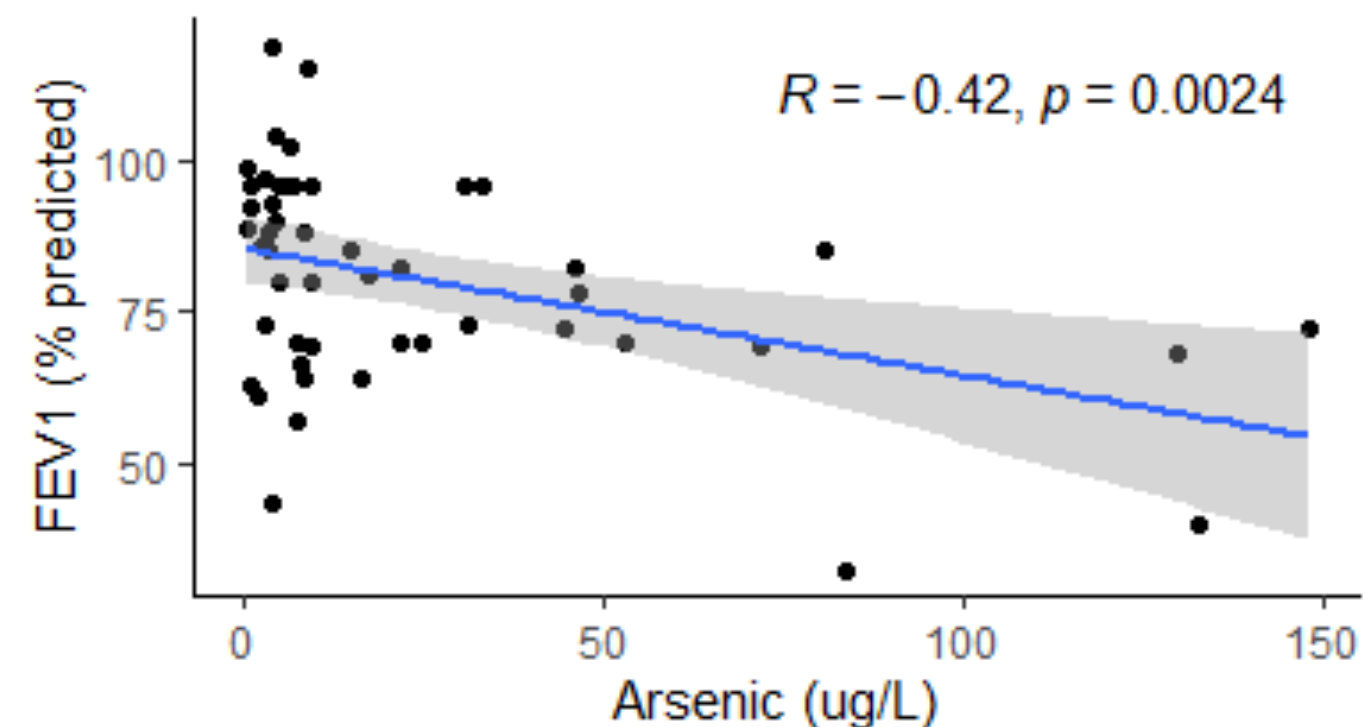
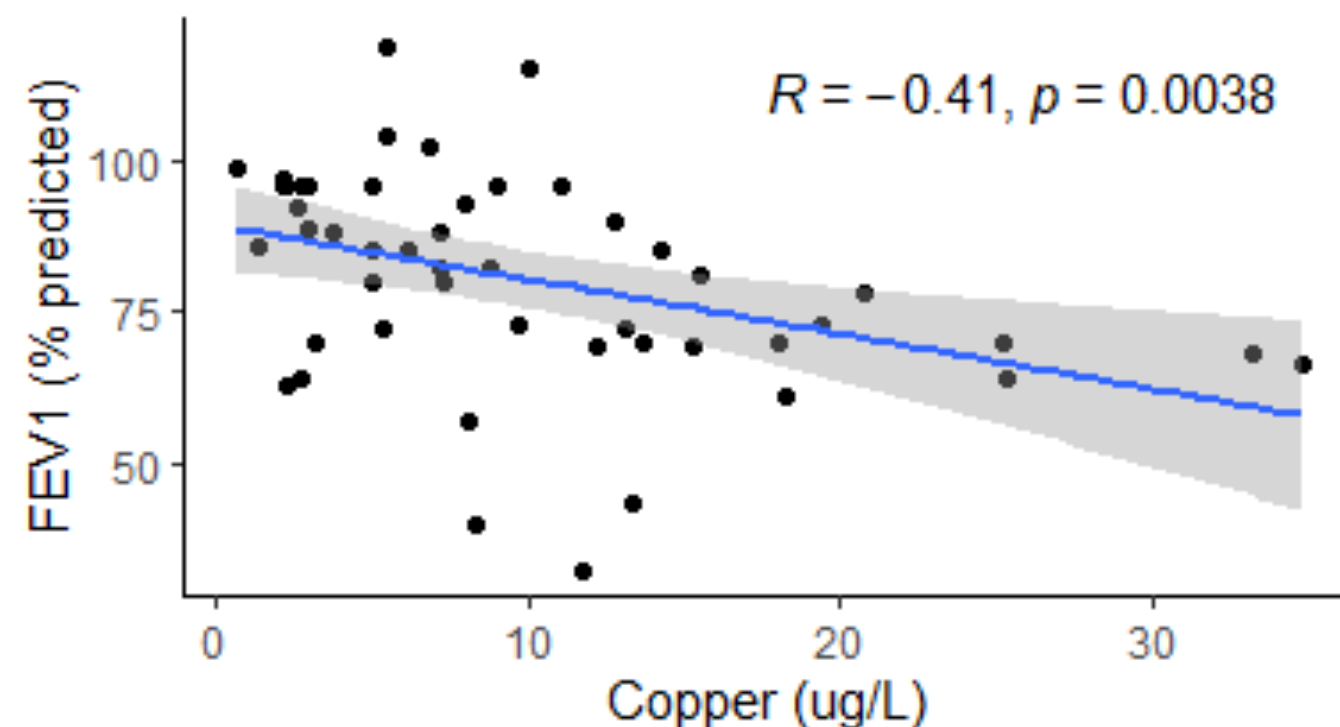
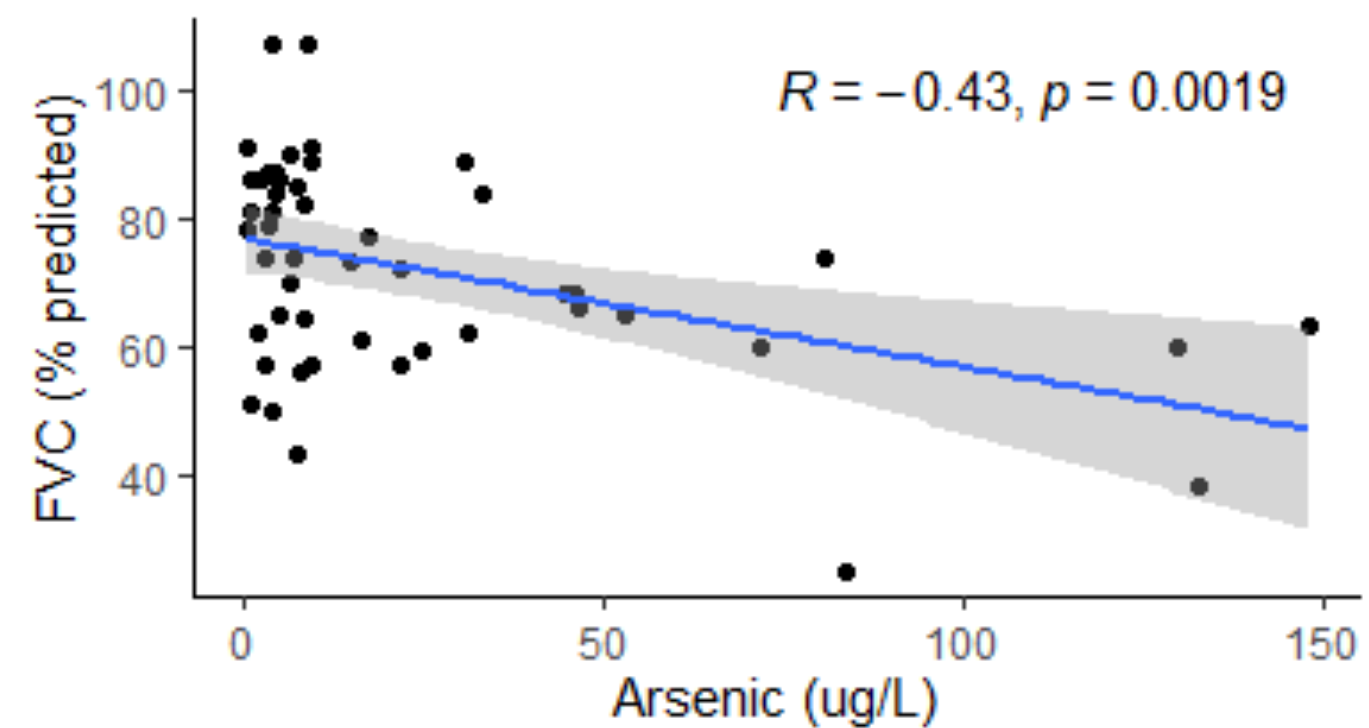
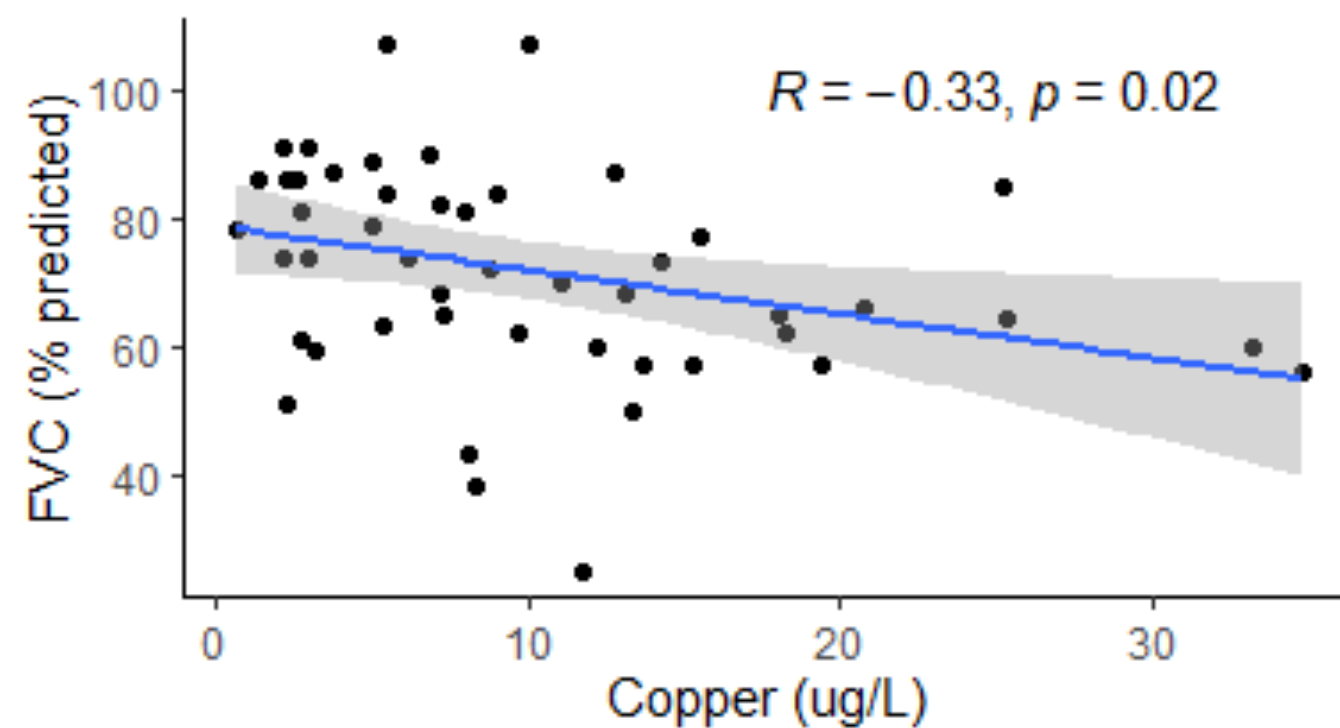
Performed heavy metal analysis for the first batch of samples (50/767). The distribution for Arsenic, Lead, Antimony, Cobalt, Copper in urine samples are shown below.



High levels of copper & arsenic associate with poor lung function

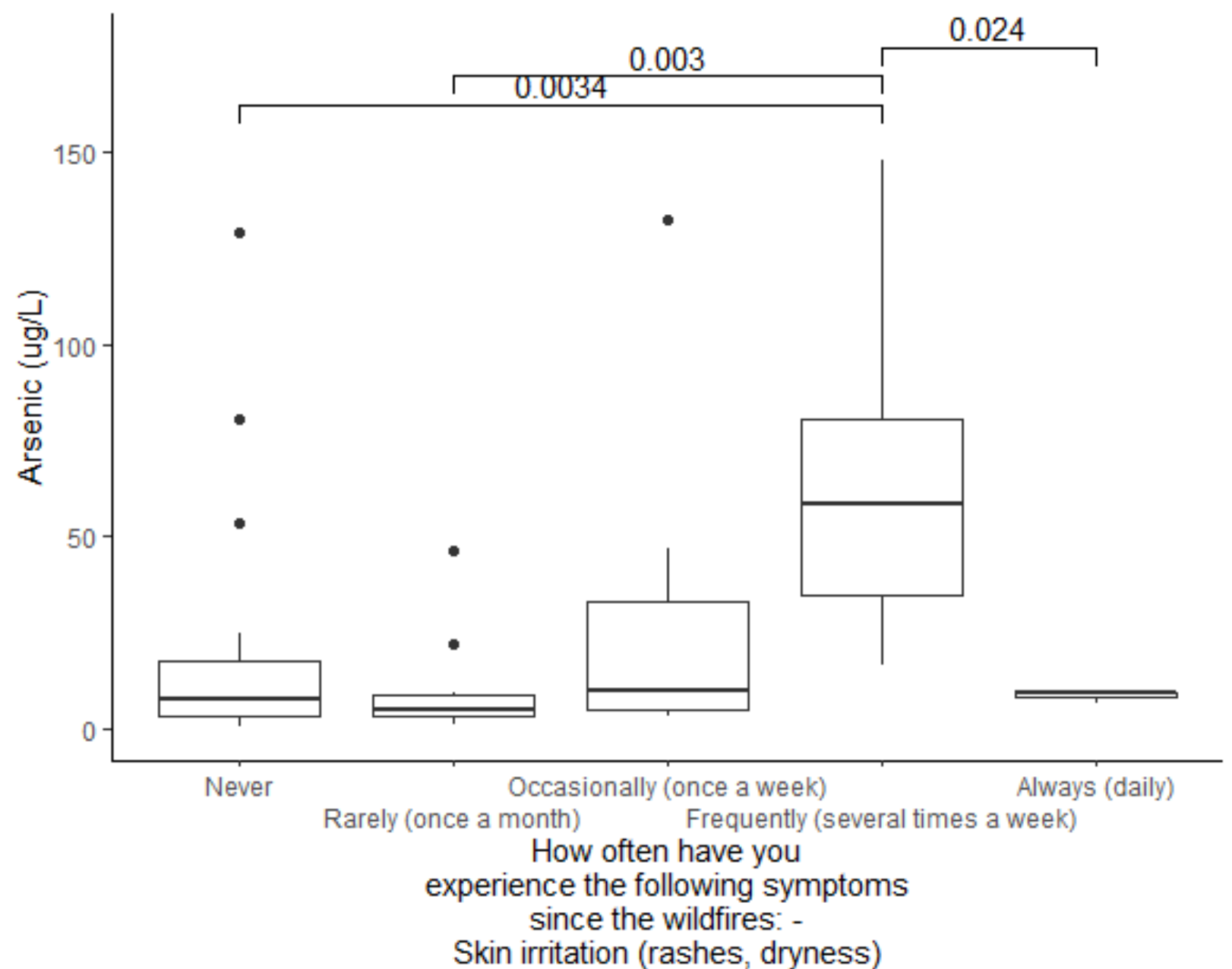
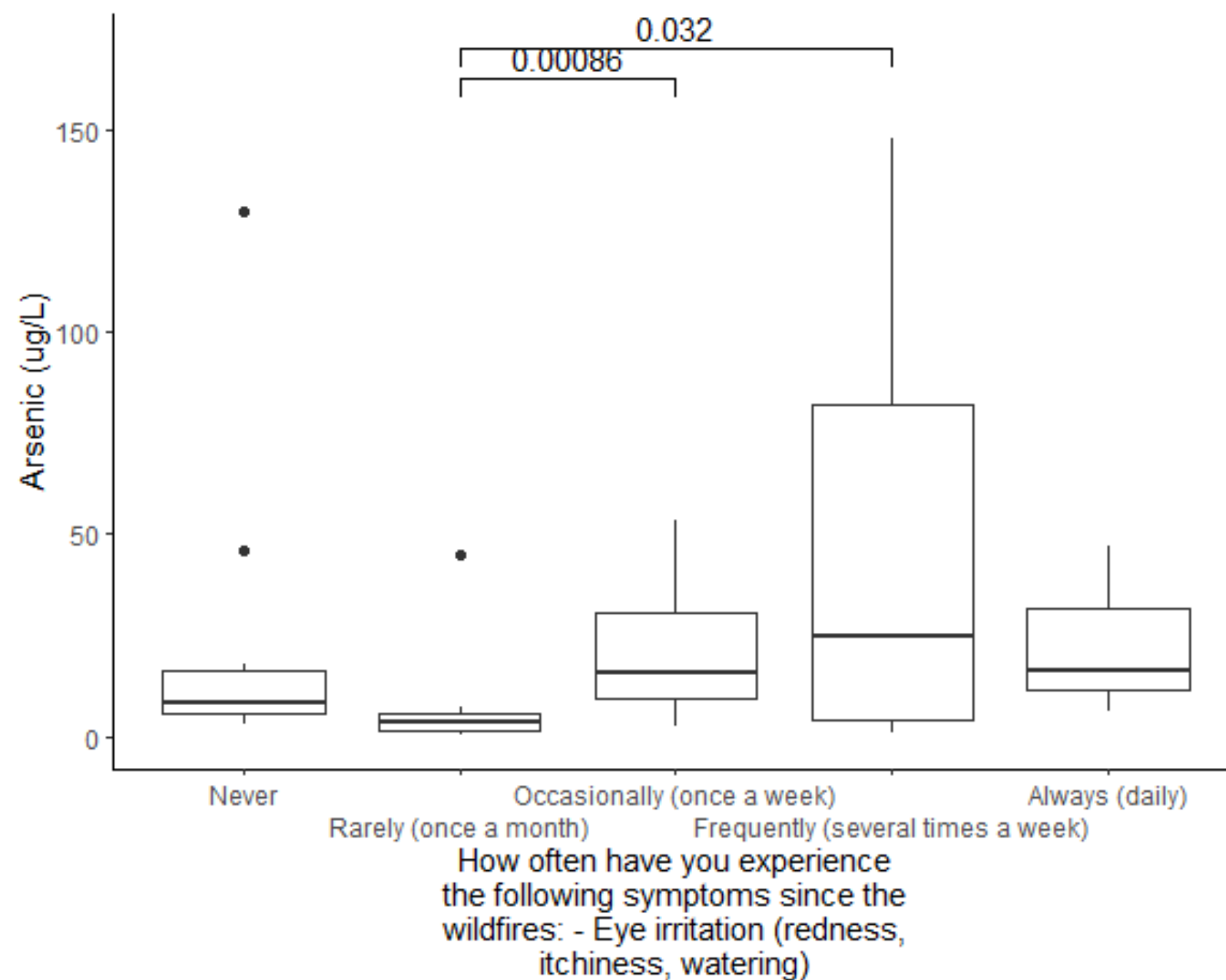
FVC (% predicted): Measures total air exhaled & indicates restrictive lung disease if low.

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



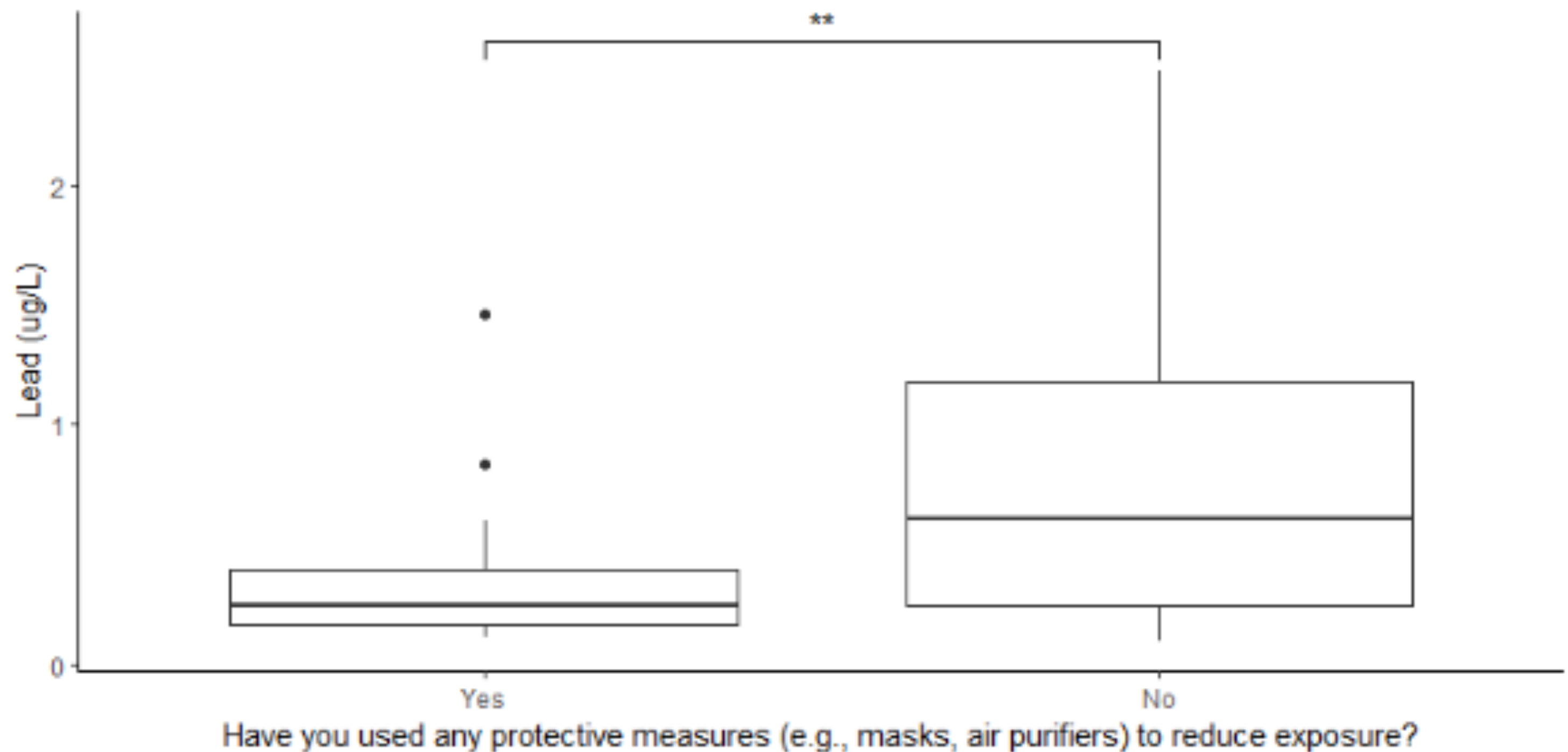
Self-reported symptoms associate with arsenic levels

Higher frequency of either **eye or skin irritation** shows a significantly higher level of arsenic from urine samples.



Protective measures associate with lower levels of urine lead

Participants who reported using protective measures to reduce exposure also had significantly lower levels of lead in their urine samples.

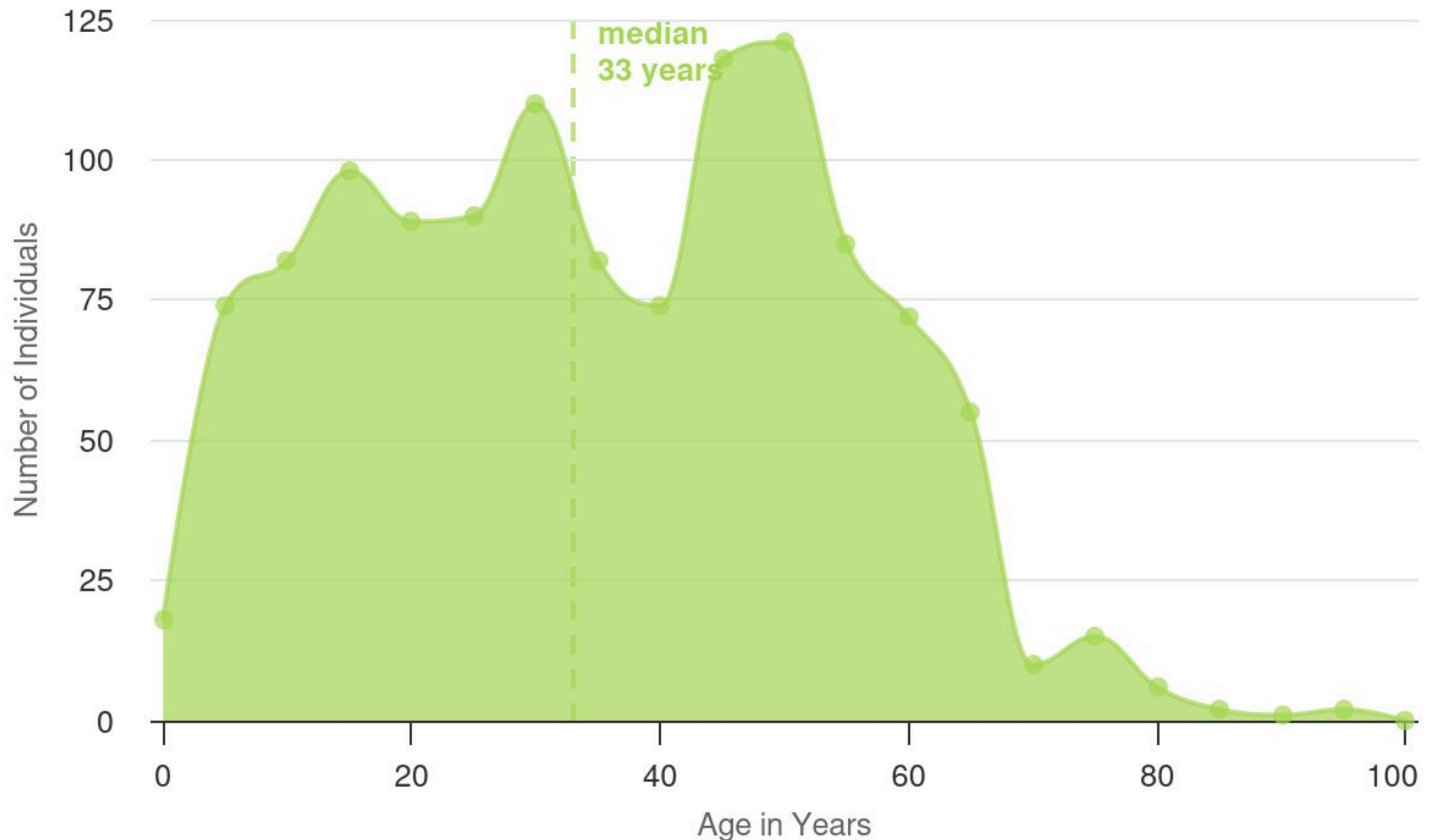


Roots Reborn work with Immigrant Populations in Maui

Children make up a large proportion of the immigrant community.



Ages of All Household Members



Where are we going from here

- **Expanding Our Study:** With newly awarded support from the State of Hawaii and NIH, we are scaling our study to **2,000** participants, including **children, first responders, and volunteers.**
- **Launching MauiRegistry.com:** The website is now live. We are developing a comprehensive medical registry to facilitate information sharing and passive health monitoring via medical records
- **Tailored Support Strategies and Monitoring:** We are committed to developing tailored interventions for the most vulnerable groups, including low-income households, food-insecure families, immigrants, individuals with pre-existing physical and mental health conditions, and people with disabilities. Our goal is to enhance healthcare access and address critical socioeconomic needs: **Integrating health services, promoting best practices, raising awareness.**

University of Hawai'i

**FREE HEALTH EXAM
EARN \$100 IN CASH**

Requirements:

- **18 years or older**
- **Survey, health exam, and clinical samples** to observe metals and other contaminants.
- **You will receive \$100 upon completing the study that day.**

Upcoming events

Makawao – Whole Body Wellness (1135 Makawao Ave)

Saturday, August 3, 10am to 4pm

Kihei – Island Health (2439 South Kihei)

- Sunday, August 4, 10am to 4pm

- Saturday, August 17, 10am to 4pm

- Sunday, August 18, 10am to 4pm

Lahaina Comprehensive Health Center

- Tuesdays in August, 10am to 4pm

Wailuku – UH Maui College

- Fridays in August, 10am to 4pm

Register online to save time.

www.MAUIWES.info



MauiWES



Mahalo nui!



JOHN A. BURNS
SCHOOL of MEDICINE

UHERO

Mahalo to Our Partners & Funders

