

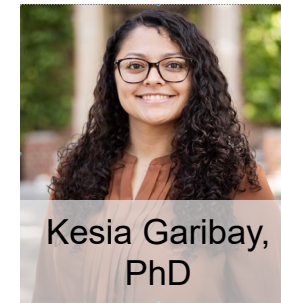
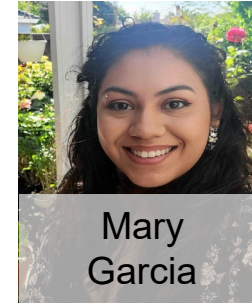
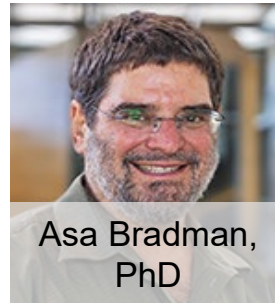
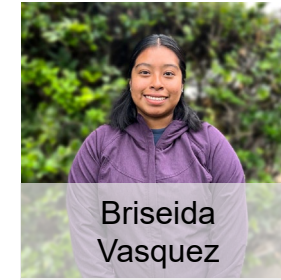
Evaluation of exposure results report back to participants in the Biomonitoring Component of the San Joaquin Valley Pollution and Health Environmental Research (BiomSPHERE) study



Nancy J. Burke, Ph.D.
Professor of Public Health
University of California, Merced

Biomonitoring California SGP Meeting
August 3, 2026

CCAC



No disclosures to report

- Introduction
- Background
- Methods
- Results
- DERBI Focus Group Findings
- Conclusions and Recommendations



Introduction

- Goal: Evaluate the biomonitoring results return materials and processes from the perspective of BiomSPHERE participants
 - Assess participant understanding and impacts of the information on their lives
 - Provide evidence-based recommendations to improve future report-back procedures
- Results return process last evaluated in 2017



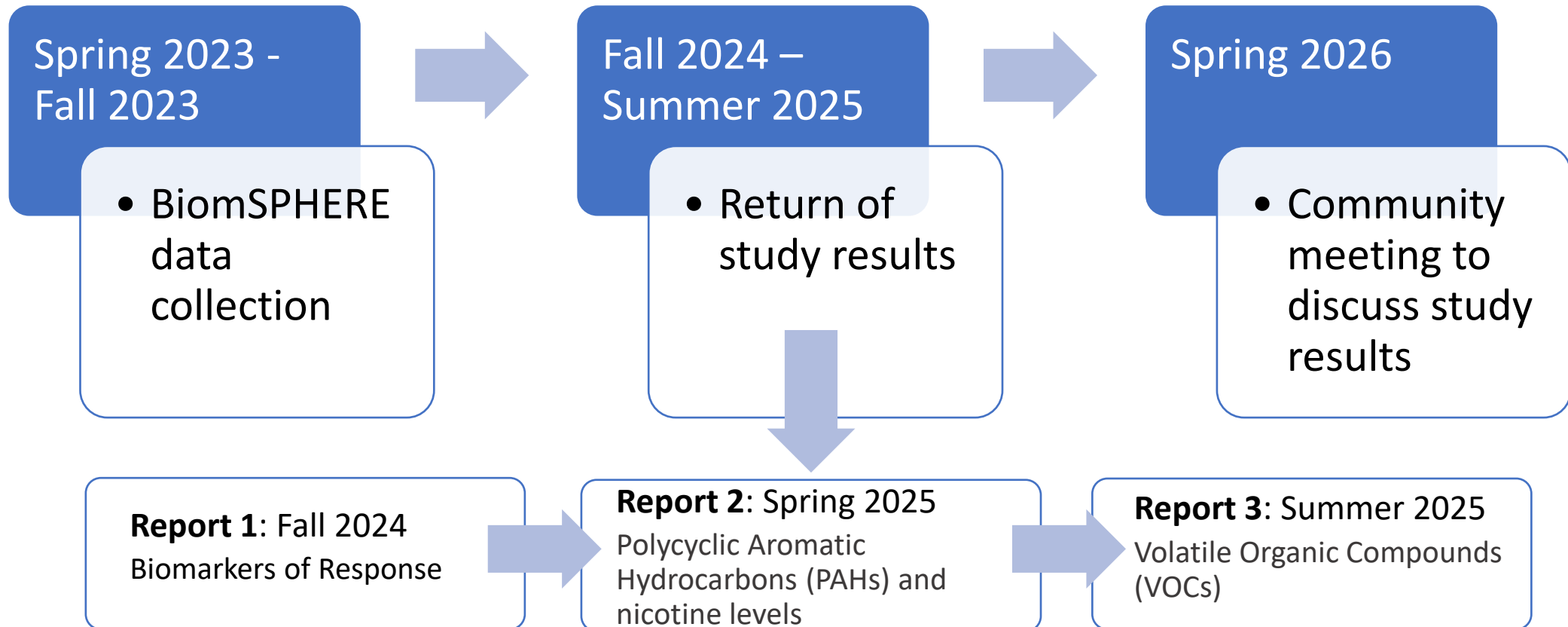
Background

- Results returned via standard paper mail or secure email
 - Email 1 = password protected pdf
 - Email 2 = unique password
- Each report included exposure results for the participating parent and child



Background

Results were distributed in phases as laboratory analyses were completed



Background: BiomSPHERE

- 64 Parent/child Pairs from Fresno and Stockton, CA
 - Participants spoke English (52%) and Spanish (48%)
 - Predominantly Latino (69%)
 - 95% were parents and 5% grandparents; 97% were female
 - Mean age was 42 years (range 26 to 66 years)
 - 37% percent had not graduated from high school; a combined majority had either some college or AA degree (23%) or were college graduates or above (28%)
 - A majority of families rented their homes (55%)





METHODS

Methods

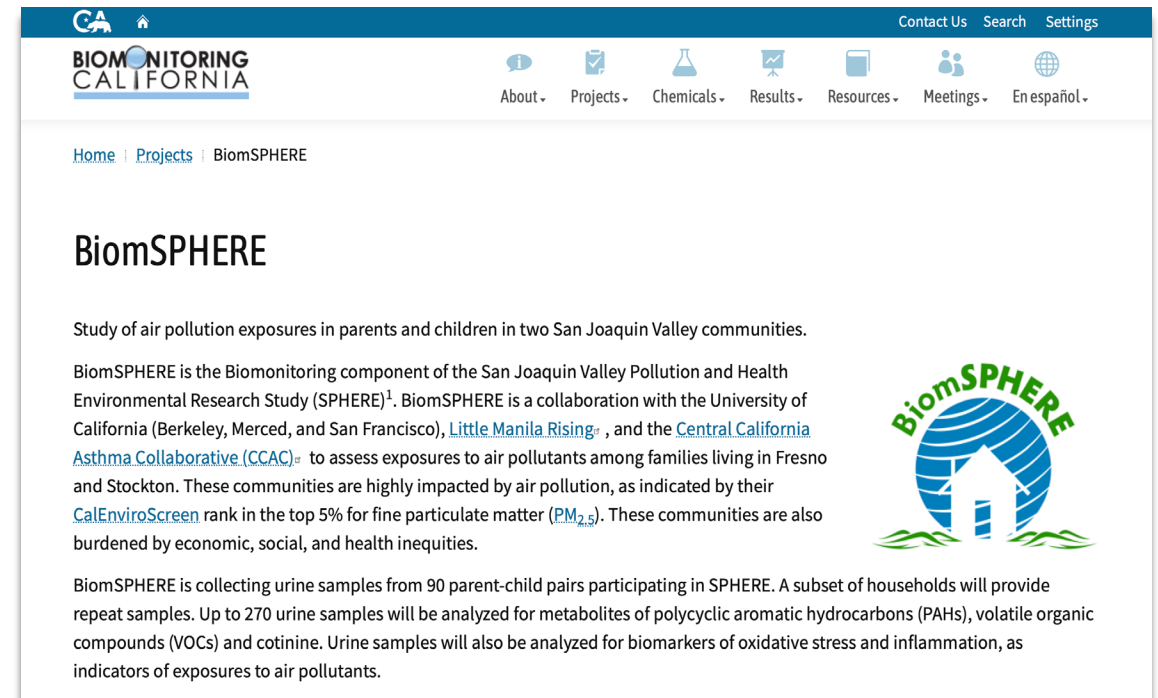
- Mixed methods approach
 - Surveys (over phone)
 - In-depth interviews (in home)
 - Focus groups
- All BiomSPHERE participants invited to take part in their preferred language
 - Surveys: 27 Spanish, 19 English (n=46)
 - Interviews: 17 Spanish, 8 English (n=25)
 - Focus Groups: 2 Spanish, 1 English (n=3 focus groups, 17 participants)



RESULTS

Participants

- Of 64 BiomSPHERE adults, 46 agreed to participate in our survey
- 25 of those survey respondents participated in in-depth in-person interviews
- 17 survey respondents participated in focus groups



Findings: Receipt and Comprehension

100%

Appreciated receiving
their results

98%

Felt respected by the
team and process

67%

Preferred paper mail

- Over 80% of participants did not fully read either report
- Color-coded visualizations would augment ability to interpret complex chemical data

*"I wish you could have had maybe like a scale... like **green**, **yellow**, **red**... I just don't know what four thousand naphthalene means."*

Findings: Comprehension

52%

Did not understand
Report 1

50%

Did not understand
Report 2

Language Disparity

66%

Spanish Speakers

32%

English Speakers

- Participants realized they had misinterpreted data in group discussions
- Were unaware that scientists also share a limited understanding of the health implications of reported levels, despite language in the report noting this

"I want to see the numbers, but I want to see them in a way that someone who is not a scientist can read and understand it. Like what is 4,000 based out of what, 100,000... what does that mean, so I still don't know if that's good or bad."

Findings: Health Literacy Barriers

Technical complexity and dense presentation hindered participant understanding

- Reports described as inaccessible, not written for the general public
- Participants reported confusion regarding measurement units
- Participants used skimming strategies, ignoring explanatory text in favor of tables that remained too visually dense to interpret accurately

"It felt like a foreign language... written for scientists."

"I just read graphs... I figured, oh, if I just read the table, it's going to summarize whatever this whole thing is."

Findings: Understanding Comparisons

When asked how useful the comparisons were,
>90%
 found them helpful

When asked if their levels were higher or lower than the reference,
~30%
 selected "I don't know"

Your Results for Biomarkers of Response to
 Air Pollution Exposure

Biomarker measured in urine	Sample collection date	Your result	Adults in BiomSPHERE		
			Middle level	Highest result found	Number of adults with this biomarker in their urine
8-Isoprostane	10/17/2023	3.5	5.7	11.8	64 of 64
	10/18/2023	5.8			
	10/19/2023	NA*			
	10/20/2023	1.3			
8-OHdG	10/17/2023	Not found	37.9	68.0	64 of 64
	10/18/2023	30.2			
	10/19/2023	NA*			
	10/20/2023	60.7			
PGE2	10/17/2023	4.5	1.1	10.1	63 of 64
	10/18/2023	2.3			
	10/19/2023	NA*			
	10/20/2023	6.7			
CC16	10/17/2023	1.1	1.9	49.7	63 of 64
	10/18/2023	5.6			
	10/19/2023	NA*			
	10/20/2023	10.2			

Results are reported in nanograms per milliliter (ng/mL) and were adjusted using specific gravity.

"...the only thing I really looked at was if something was higher than someone else's. That's where I was concerned... I just wanted to know if it could hurt us or like what?"

Findings: Emotional Impact and Worry

56%

Reported feeling 'worried' after receiving results

78%

Reported increased concern for their child's health

76%

Reported concern that their own health was affected



Findings: Emotional Impact and Confusion

- Participants expressed concern with results that were difficult to understand or sources that couldn't be identified
- A major point of confusion was finding nicotine exposure markers in children from non-smoking homes

"And you wouldn't even think... how do you protect your kid when you're like, well, we're not smoking. Like, how do you protect your kid?"

Findings: Help-Seeking Gap

Of the 24 participants who reported they did not understand Report 1, 67% did not seek additional information

Of the 23 participants who reported they did not understand Report 2, 78% did not seek additional information

Interview and focus group findings suggest an expectation of consultation



Rebecca Belloso, MPH



Health Program Specialist
Biomonitoring California
Office of Environmental Health
Hazard Assessment (OEHHA)
(916) 322-5657
Rebecca.Belloso@oehha.ca.gov
(Hablo Español)

Findings: Self-efficacy and Motivation

On a 5 point self-efficacy scale

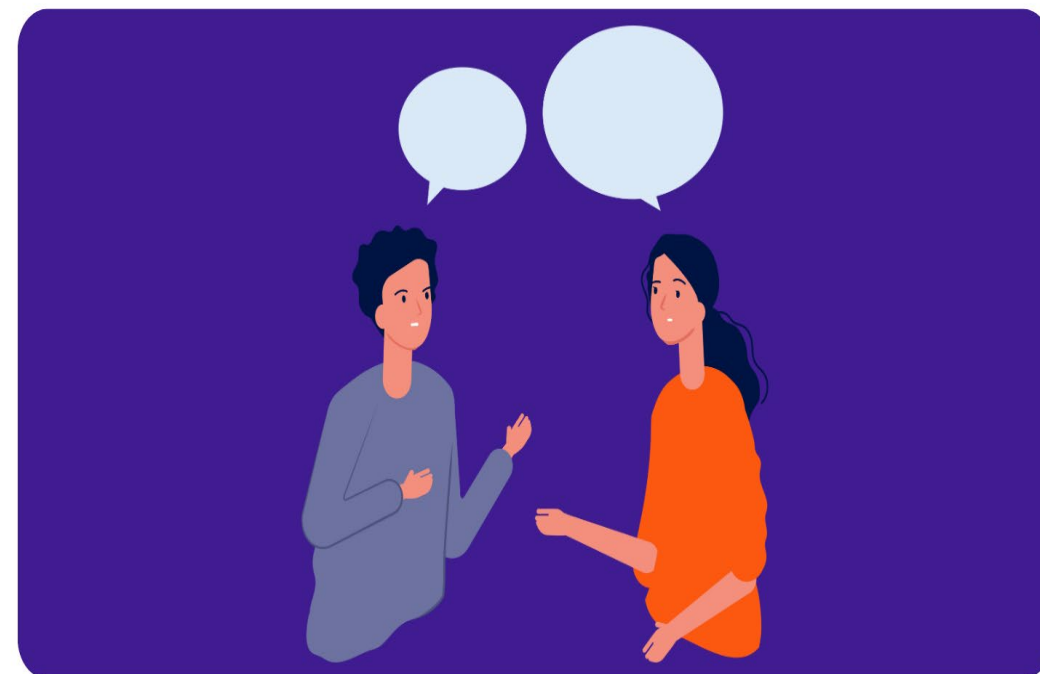
4.1 Confidence in talking to friends or relatives about results

3.9 Motivation to use the report to make healthier life choices

3.9 Confidence in taking steps to reduce exposure within the household

3.5 Confidence in understanding personal results

3.3 Motivation to work with others to reduce community-wide exposure



Findings: Readiness for Action

33%

Reported immediate home changes (adding/removing items) since receiving their results

80%

Expressed intent to look for more information

57%

Expressed desire to join an environmental organization

The primary barrier to action identified was a delay in decision-making

Participants described waiting until they could speak with a researcher to clarify the report's implications before committing to specific changes

Findings: Contextual Powerlessness

Qualitative data revealed structural constraints endemic to the environmental justice context of the San Joaquin Valley:

- **Renters:** Reported feeling limited in the changes they could make in multi-family settings
- **External challenges:** Participants reported feeling discouraged by the threat of wildfires, poor air quality, and nicotine exposure

100%

Agree companies must limit pollutants

65%

Disagree that government protects them





DERBI Focus Group Findings

Background

Objective: To determine if participants would prefer the DERBI interface for receiving personal results over their original (e)mailed results report

- Presented using demonstration data
- Participants provided with a QR code to log in using personal devices (or provided tablet)
- Facilitators distributed a short worksheet
 - Ability to locate and understand information; perceived ease or difficulty in comprehension
- Participants given ~15 minutes to explore interface and answer worksheet questions
- Facilitators led semi-structured discussion exploring reactions to design and layout, ease of navigation, and effectiveness of built-in tools (glossaries and summaries)



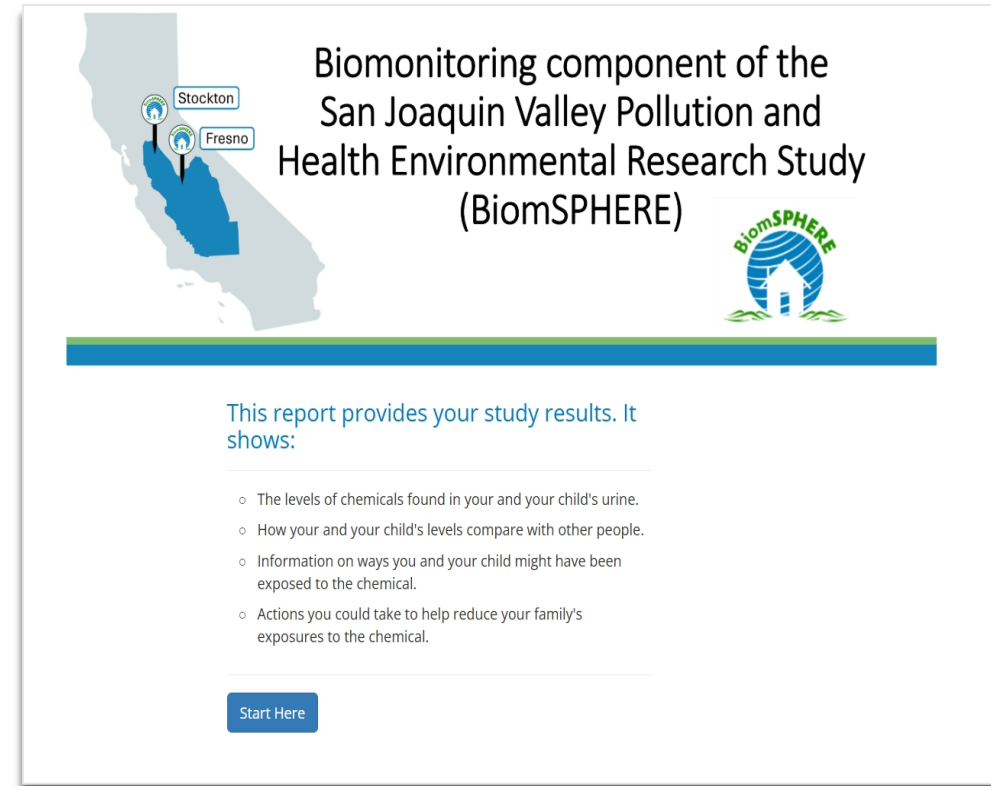
Navigation

Participants appreciated colors and graphics as improvements over paper results

Digital format introduced new usability barriers

- Participants stalled on landing page, missing additional tabs or failing to scroll (exacerbated on smartphones)
- Participants failed to realize dot plot graphics were interactive missing exposure amounts revealed by cursor hovering

Spanish-speaking participants experienced greater challenges navigating the interface and accessing information



Digital Literacy

Built-in educational tools failed to bridge health literacy gap by replacing scientific language with more scientific language

- “3-HPMA is a metabolite of acrolein. Okay. So what’s acrolein?”

Learning a new interactive interface introduced a technological hurdle that compounded existing health literacy barriers

- Only one participant reported feeling confident navigating the site independently



Home: Results Summary
About BiomSPHERE

Your Family's Results
◦ Volatile Organic Compounds

Table of Your Results

Overall Study Results
San Joaquin Valley Air Quality Resources

Glossary

Volatile Organic Compound (VOC) metabolites

Abbreviation	Name	Other names ¹
3-HPMA	3-Hydroxypropyl mercapturic acid	N-Acetyl-S-(3-hydroxypropyl)-L-cysteine
PMA	Phenylmercapturic acid	N-Acetyl-S-(phenyl)-L-cysteine
2-HPMA	2-Hydroxypropyl mercapturic acid	N-Acetyl-S-(2-hydroxypropyl)-L-cysteine

1. Synonyms used by the National Health and Nutrition Examination Survey (NHANES):
<https://www.cdc.gov/nchs/nhanes/>

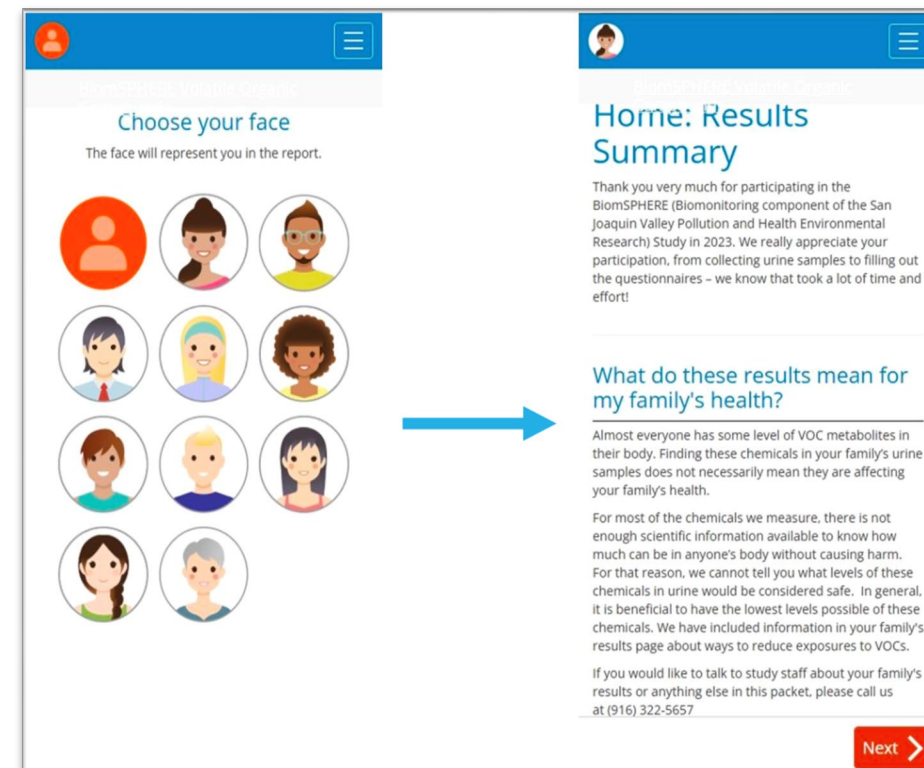
Glossary
Common Questions

Motivation

Without the social support of a focus group, confusion at home led to disengagement

Participants reported they would “just stop” if they did not understand the tool while alone

- *“For me, on paper yes, but I’m not as motivated as I am here. At home I just got lazy...I said, well, since I don’t understand anything, I’ll just stop.”*



Positives

- Better overall user-friendliness
- Use of color and graphics
- Glossary
- FAQ tools

Sample Collection for Biomonitoring Method Development and Refinement






Home

Your Results

- Polycyclic Aromatic Hydrocarbons (PAHs)

Table of Your Results

- How to Read Your Table of Results

Overall Study Results

About the Study

Common Questions

Glossary

Download Your Report

Overview

Thank you for participating in our method development study in 2022 to help us improve our laboratory methods. Your results for PAHs can be viewed here until **June 30th, 2026**.

Chemicals We Found In Your Samples

Your sample had detectable levels of at least one [PAH](#) metabolite.

What do these results mean for my health?

Finding these chemicals in your urine samples does not necessarily mean they are affecting your health. Almost everyone has some level of PAH metabolites in their body.

For most of the chemicals we measure, there is not enough scientific information available to know how much can be in anyone's body without causing harm. For that reason, we cannot tell you what levels of these chemicals in urine would be considered safe. In general, it is beneficial to have the lowest levels possible of these chemicals. We have included information on your results page about ways to reduce exposures to PAHs.

If you would like to talk to study staff about your results or anything else in this packet, please call us at (510) 367-4166 or email us at BiomonitoringCalifornia@cdph.ca.gov.

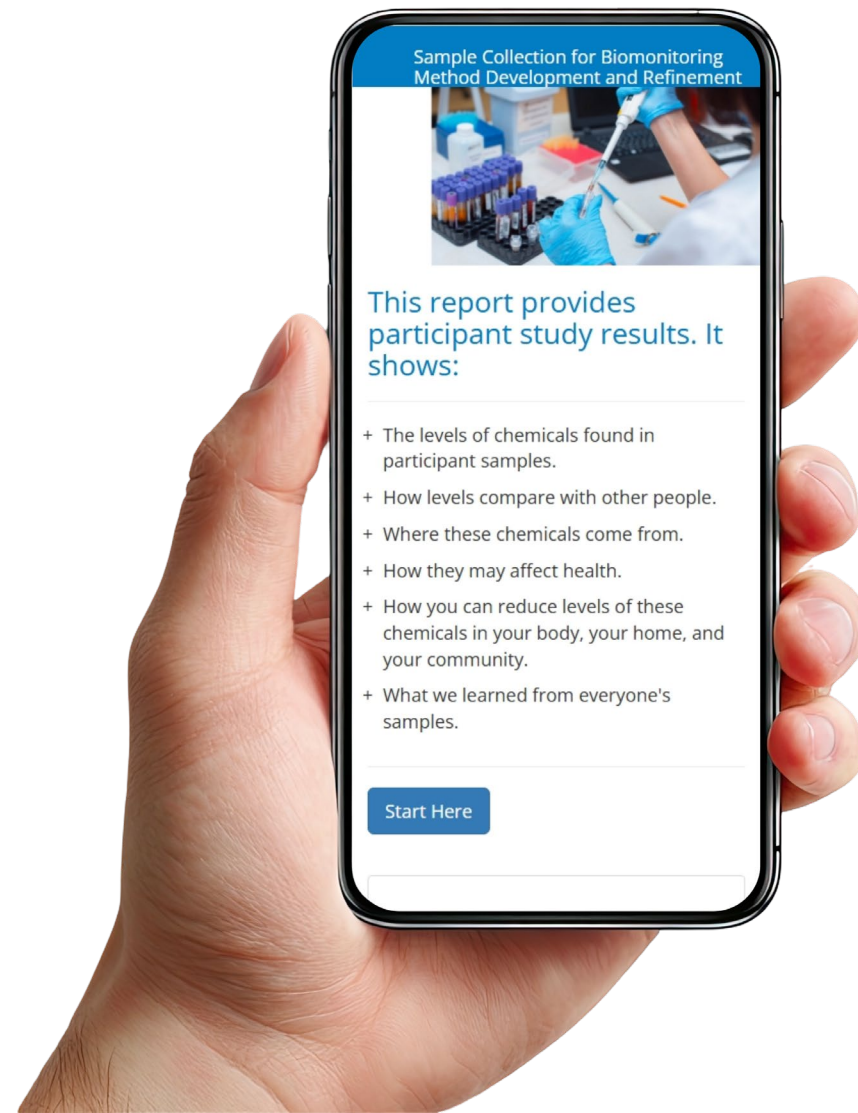
Overall Study Results

Our results show that all participants were exposed to at least one PAH.

[Read more](#)

Technical Accessibility

- Challenges with:
 - Navigating pages
 - Accessing all the information in DERBI
 - Using smartphones
 - Interactive elements on graphs
 - Findings glossary and FAQ
- Trouble accessing for some who don't use web-based materials often
- Access code delivery



Conclusions and Recommendations

Conclusions

- Participants felt respected receiving their BiomSPHERE results and interested in exploring them
- The complexity of information created barriers to comprehension and action
- Participants expected some form of additional follow-up to explain the results they received and were reluctant to proactively seek answers

Participants want to learn about their exposures and the ways they can reduce these exposures even when facing structural conditions that limit their options

Recommendations

Shift from passive to active support

Implement a scheduled, opt-out consultation model rather than a passive "call us" system

Simplify and contextualize data

Prioritize visual simplicity with color-coded graphics instead of dense tables

Address health literacy and numeracy challenges

Define units of measurement in plain language to avoid percentage confusion

Acknowledge structural constraints

Continue to provide individual level action recommendations that are within participants' control to change

Enhance accessibility

Offer a voice/audio summary option. Provide facilitated support like webinars, tutorial videos, or guidance for motivational scaffolding

Simplify digital access

Use a single, intuitive password for all participant files to reduce friction

Thank you!

nburke2@ucmerced.edu

