CALIFORNIA ENVIRONMENTAL CONTAMINANT BIOMONITORING PROGRAM (BIOMONITORING CALIFORNIA) SCIENTIFIC GUIDANCE PANEL MEETING

CONVENED VIA HYBRID FORMAT BY:

OFFICE OF ENVIRONMENTAL HEALTH HAZARD ASSESSMENT

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

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APPEARANCES

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Timur S. Durrani, MD, MPH, MBA

Oliver Fiehn, PhD

Ulrike Luderer, MD, PhD(Remote)

Thomas McKone, PhD

Penelope (Jenny) Quintana, PhD, MPH(Remote)

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Jeff Wagner, PhD, Supervisor, Environmental Health Laboratory Branch

Nerissa Wu, PhD, MPH, Supervisor, Exposure Assessment Section, Environmental Health Investigations Branch

GUEST SPEAKER:

Mohammad Heidarinejad, PhD, PE, Illinois Institute of Technology

Ileanna Navarro, Central California Environmental Justice Network

ALSO PRESENT:

John Balmes, MD, University of California, Berkeley

Julie Von Behren, MPH, University of California, San Francisco

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PROCEEDINGS

DR. KIMBERLY GETTMANN: Good afternoon. I'd like to welcome the Panel members.

Good afternoon. I'd like to welcome the Panel members and the audience to the November meeting of the Scientific Guidance Panel for Biomonitoring California, more formally known as the California Environmental Contaminant Biomonitoring Program. Thank you all for joining us today. I am Kim Gettmann, OEHHA's Deputy Director for Scientific Programs.

The Panel last met on August 27th, 2025. The August meeting included updates on Biomonitoring California Program activities including a presentation on the BiomSPHERE Study results. The Panel also heard from two guest speakers on the use of silicone wristbands to assess personal chemical exposures, followed by a discussion on the use of the silicone wristbands to complement biomonitoring studies.

STEPHANIE JARMUL: Sorry, can you talk a little bit more into the mic. It's hard to hear.

DR. KIMBERLY GETTMANN: Is this better?

STEPHANIE JARMUL: Yes.

DR. KIMBERLY GETTMANN: Okay. Thank you.

Key discussion topics included: potential source of elevated inorganic arsenic in participants of the

California Regional Exposures Study in Los Angeles, or CARE-LA; analytical considerations when biomonitoring for microplastics; the utility of microsampling devices to collect blood for biomonitoring studies; the evaluation of results return materials that study participants receive. The Panel also discussed results from the BiomSPHERE study, including the higher levels of 2-naphthol, a metabolite of naphthalene, in BiomSPHERE participants compared to levels in the NHANES.

In the afternoon, the Panel discussed the possibility of using silicone wristbands to complement biomonitoring studies with guest speakers and Program staff. Key discussion topics on the wristbands included: the utility of wristbands of passive air samplers compared to other methods of passive air samp -- or air monitoring; best practices, ideal study design, and quality assurance/quality control procedures necessary to ensure accuracy of measurements of chemicals on wristbands; chemicals or chemical groups that are appropriate, or not appropriate, to measure using silicone wristbands, and variables that might influence chemical concentrations on the wristbands; ideal populations the Program should consider for use of silicone wristbands in biomonitoring studies; and participant's perspectives on receiving wristband results.

The summary and transcript of the meeting is posted on the August meeting page of the Program's website at biomonitoring.ca.gov. I'd like to announce Amy Padula will be our Acting SGP Chair for this meeting. I will now invite Panel members to introduce themselves by name and affiliation. Let's start with Jenny Quintana who is attending remotely. Jenny has been granted a reasonable accommodations to attend this meeting remotely and maintain with her camera off.

PANEL MEMBER QUINTANA: Hi, everybody, I'm Penelope or nicknamed Jenny, Quintana from the San Diego State University School of Public Health, Division of Environmental Health.

DR. KIMBERLY GETTMANN: Thank you.

I will now call on Panel members Lara Cushing and Ulrike Luderer from UC Irvine who will also be attending remotely.

PANEL MEMBER CUSHING: Hi. I'm Lara Cushing, Associate Professor of Environmental Health Sciences at UCLA.

PANEL MEMBER LUDERER: Hello. I'm Ulrike Luderer. I'm Professor of Environmental and Occupational Health at UC Irvine.

DR. KIMBERLY GETTMANN: Thank you. And now I will start at the end with Tom.

STEPHANIE JARMUL: Sorry. This is Stephanie Jarmul. Just to make an announcement that there are very few microphones. I apologize, so we'll need to pass them around and make sure you talk directly into them when you're speaking. Thank you.

PANEL MEMBER McKONE: I'm Tom McKone, Professor Emeritus of Environmental Health Sciences at the University of California, Berkeley, School of Public Health.

DR. KIMBERLY GETTMANN: José.

PANEL MEMBER SUÁREZ: José Suárez, Associate Professor in the Herbert Wertheim School of Public Health and in the Department of Pediatrics at UC San Diego.

DR. KIMBERLY GETTMANN: Oliver.

PANEL MEMBER FIEHN: Oliver Fiehn, UC Davis. I'm a Professor in the Genome Center.

DR. KIMBERLY GETTMANN: Amy.

ACTING CHAIR PADULA: Amy Padula, Associate Professor in the Department of Obstetrics, Gynecology, and Reproductive Sciences at the University of California, San Francisco.

DR. KIMBERLY GETTMANN: Timur.

PANEL MEMBER DURRANI: I'm Timur Durrani. I'm Professor of Medicine at UCSF in the Division of Occupational, Environmental, and Climate Medicine.

DR. KIMBERLY GETTMANN: And Carl.

PANEL MEMBER CRANOR: Carl Cranor. I'm a distinguished Professor Emeritus at UC Riverside in Philosophy and Professor -- and distinguished Professor -- not distinguished Professor -- Faculty Member of Environmental Toxicology at University of California, Riverside.

DR. KIMBERLY GETTMANN: Now, I'll hand off this -- hand off the meeting to Acting Panel Chair Amy Padula, who will provide more details about today's meeting.

ACTING CHAIR PADULA: Thank so much, Kim.

So as a reminder, for Panel members, please comply as usual with the Bagley-Keene Open Meeting requirements, that all discussions and deliberations of the Panel about subject matters at issue today need to be conducted during the meeting, not on breaks or with individual members of the Panel on- or off-line, including via phone, email, text, or chats. And Panel members who are attending remotely must visibly appear on camera, with the exception of Jenny, during the open portion of the meeting. And if you are unable to keep your camera on during the meeting, because it's technologically impractical, please make an announcement when you turn your camera off.

And additionally, if someone older than 18 is in the room with Panelists, who are attending remotely, you must disclose the presence of that person and their -- and their general relationship to you. So I just want to confirm with our Panelists that are online, Lara, Ulrike, and Jenny.

PANEL MEMBER CUSHING: (Nods head). (Thumb up).

PANEL MEMBER LUDERER: (Nods head). (Thumb up).

ACTING CHAIR PADULA: And as for an overview of the meeting, so we will hear an update on Program activities, including a presentation on persistent organic pollutant levels in Californians. The second portion of the meeting will include a joint presentation of collaborators -- collaborators on results and impacts of the Farmworker Women and Respiratory Exposure to Smoke From Swamp Cooler Air, the FRESSCA-Mujeres study. And finally, we'll hear about and have an opportunity to provide input on plans for the Scientific Guidance Panel meetings in 2026. And there will be time for questions from the Panel and audience after each presentation. And if SGP members wish to speak or ask a question, please raise your hand and I'll call on you. Jenny, you can speak up, since I'm not sure if I'll see your hand, but -- and then you can ask your question or provide comment.

If online webinar attendees have questions or

comments during the question period after each talk, you can submit them via the Q&A feature of Zoom or by email to biomonitoring@oehha.ca.gov. We will not be using the chat function during this meeting, and please keep your comments brief and focused on the items under discussion. Relevant comments will be read aloud and paraphrased when necessary.

If align -- if online attendees wish to speak during the public period -- public comment period and discussion session, please use the "Raise Hand" feature in the Zoom webinar and Rebecca Belloso will call on you at the appropriate time. Please make sure that you join the webinar under the name you would like to be identified as when commenting, including if you would like to be -- if would like to remain anonymous. If you are attend -- attending in person and wish to comment during the public comment period and discussion session, please come to the front or raise your hand, and I will call on you at the appropriate time.

For the benefit of the transcriber, we encourage you to clearly identify yourself before providing comment and write your name and affiliation on the sign-in sheet at the back of the room. However, there's no obligation to identify yourself and you are free to comment anonymously, if you wish. At the end of the meeting,

there will be time for open public comment period.

And I think now we will begin the first presentation. So Nerissa Wu will be the -- providing the first presentation. And she leads the Exposure Assessment Section in the Environmental Health Investigations Branch at the California Department of Public Health and the Program Lead for Biomonitoring California, and she will provide an update on the current Program activities.

(Slide presentation).

DR. NERISSA WU: All right. Thank you, Amy. And welcome everybody to our last Scientific Guidance Panel meeting of the year.

[SLIDE CHANGE]

DR. NERISSA WU: As usual, I will be giving the Program update covering the usual things that I talk about, surveillance, community-focused studies, laboratory work and our outreach and communications activities.

[SLIDE CHANGE]

DR. NERISSA WU: As you remember, we have a number of surveillance studies in the works. We have: CARE, the California Regional Exposures Study; STEPS, the Studying Trends in Exposure in Prenatal Samples; and MAMAS, Measuring Analytes in Maternal Archived Samples. I will actually only be touching on CARE and STEPS, because we have a more detailed presentation on MAMAS from the

presenter after me.

[SLIDE CHANGE]

DR. NERISSA WU: So news from the CARE study. Toki Fillman's work, in which she has presented on associations between PFAS in drinking water and serum PFAS levels, she's presented it here as a topic of discussion. This work has just been published in the Journal of Exposure Science and Environmental Epidemiology. It's open access and there's also a link available on our website if you are looking for that publication.

So in addition to that paper, we also have a two-page fact sheet, which gives a high level summary of the paper. And it's currently in our review chain, but we expect to have that released publicly soon.

[SLIDE CHANGE]

DR. NERISSA WU: Also, from the CARE Study, we talked about at our last meeting about new data on speciated arsenic and phenols for CARE-LA. We've been meeting with different researchers to discuss potential directions and approaches to research and to that -- and to exposure sources. We did also say that we're going to post the summary statistics for speciated arsenic and phenols. We haven't yet done so, because we noted a small calculation error on the slides. And so we'll be correcting that. We'll be posting the summary statistics,

and we'll also issue a new set of slides. The storyline doesn't change. It's a very numerical -- it's a very small numerical change, but we just want to make sure we have the most accurate numbers in our -- on our public website.

So we also have new laboratory results, speciated arsenic for CARE-2 study participants has just been received by EHIB. So we'll be conducting results return and summary statistics for those. And then, of course, that data can be folded in with the CARE-LA data, giving us more power to do statistical analyses.

We're also working on the phenols analyses for the CARE-2 participants and we expect to have those next year.

[SLIDE CHANGE]

DR. NERISSA WU: And STEPS. And this is a study that used -- uses banked prenatal screening samples from the Genetic Disease Screening Program to determine population estimates of PFAS exposures over time. In Orange County - I think last time we talked about this - there were a number of samples that had to be rerun for QA issues. That's been completed, data is in review, and it's projected that we'll have the data finalized and reported to us in early December. And the lab is continuing to make progress with the Fresno County

samples. We're around 75 percent of the lab run. And we can't really talk a lot about the STEPS data yet, because it's still being finalized, but we're really excited to see the data, because it's going to help us understand, not only the temporal trends, but also help us understand what PFASs we need to keep our eyes on.

And in related news, this is not STEPS, but related to the issue of identifying the universe of PFASs of concern, we have sent samples from the Intra-Program Pilot study, the IPP, to Amina Salamova's lab for measurement of ultra-short chain PFASs, and we're expecting that data to be reported to us in early 2026 as well.

[SLIDE CHANGE]

DR. NERISSA WU: So turning to community-focused studies, I will be providing updates on these three community studies: ACE, the Asian/Pacific Islander Community Exposures Project; BiomSPHERE, the Biomonitoring component of the San Joaquin Valley Pollution and Health Environmental Research Study; and I'll be introducing CHAIRS, the Community Health and Air Quality Implications of Refinery Retirements in Los Angeles.

[SLIDE CHANGE]

DR. NERISSA WU: For ACE, you've heard Kelly Chen talk about her work, looking at the associations between

seafood consumption and PFAS serum levels. This has been submitted to the journal Exposure and Health. And we just heard on Monday that that manuscript has been accepted, so we expect that to be coming out in publication quite soon.

And our outreach and communication folks have been working on different ways to get this really important message out to broad audiences. So, as I mentioned, for Toki's paper, there will be a two-page summary of findings that will be distributed, as well as a postcard that's in lay language, very simple message that will go out to all study participants, but we'll also be distributing it at community events and to our community partners to pass along to their constituents.

There's also a suite of social media postings on PFASs generally, but more specifically about seafood and drinking water. And this approach to publication also applies to another paper we have coming out, that I don't have a slide on, because it's such recent news. I want to mention that Kathleen Attfield's paper on flame retardant levels following household furniture replacement has also been accepted for publication and will be out in early December.

And similar to ACE, we have a suite of communications materials coming out on that. So I should really acknowledge our Biomonitoring Outreach and

Communications group, which has been super, super productive and active and responsive to all of these -- all of these findings and publications we have going out.

[SLIDE CHANGE]

DR. NERISSA WU: In BiomSPHERE, the focus has been on results return evaluation, which we talked a little bit about last time. We've been working with UC Merced and the Central California Asthma Coalition to assess our results return materials. We returned BiomSPHERE results over the summer. And then CCAC reached out to recruit participants to be part of one-on-one interviews about their experience with our results return materials. They then asked those interview participants to be part of a focus group to discuss both the existing paper materials that they had seen, but then also to look at the same type of materials, but presented through the Silent Spring DERBI platform.

They have just finished running three focus groups, two in Spanish, one in English, each with five to eight participants. So we don't have transcribed notes from that. We've just gotten some anecdotal findings from them. But, you know, the challenges we face that are inherent to biomonitoring, of course, are present in this -- in this evaluation as well. Our biomonitoring message is complex and it's hard to boil down to short

simple sentences, and results are not really a one-size-fits-all situation. We do hear from participants who want all the science, they want all the details, but we also are hearing from many participants that they really need a much more apparent readily accessible message back to them about their results.

So again, illustrating it's really important for us to continue to do these evaluations, and particularly to include a diverse group of participants, so that we are aware of and hearing about the challenges that they face when they see our materials.

[SLIDE CHANGE]

DR. NERISSA WU: I'm going to briefly introduce the CHAIRS Study, Community Health and Air Quality Implications of Refinery Retirements in Los Angeles. This is a collaboration with UCLA with Lara, UC Irvine, and with Yale University. So the goal of this study is to assess the retirement of two petroleum refineries in Los Angeles, if it's associated with changes in exposure to air pollutants and various markers of health.

So the study will include Fresh Air wristbands. They are a little bit different than the silicone wristbands we talked about last time. There will be stationary monitors and collection of health indicators, including blood pressure, lung function, and airway

inflammation.

So the role of Biomonitoring California is to look at biomarkers of exposure. There will be up to 150 residents of the surrounding communities, including Carson and Wilmington. Participants will provide four urine samples in total, two while the refineries are active, so study enrollment and sample collection is already underway. And then the refineries are scheduled to be shut down at the end of the year and then two more samples will be collected in fall 2026.

Right now, we're planning to have EHL analyze the urine samples for metals, along with speciated -- sorry, along with specific gravity and creatinine for dilution correction, and then aliquots will be stored for potential analyses of VOCs and PAHs. So that's just a very quick overview. There will be subsequent meetings when we talk more about the details of that study.

[SLIDE CHANGE]

DR. NERISSA WU: And then just briefly, I've already mentioned our lab activities in conjunction with our projects. EHL is working to provide CARE-2 data. We just got our speciated arsenic, which is awesome, and phenols analyses are underway for the remaining 194 participants of CARE-2.

[SLIDE CHANGE]

DR. NERISSA WU: And ECL is focused on analyzing the STEPS samples. They still have Fresno and then the Los Angeles samples. And then we will be getting more samples from the 2024 births.

They also just completed proficiency testing for persistent organic pollutants, including PCBs, PBDEs and organochlorine pesticides. And then in addition to conducting analyses for existing studies, both labs are preparing to participate in the next round of the Intra-Program Pilot Study, which is designed to evaluate the use of microsamplers for PFASs and metals.

[SLIDE CHANGE]

DR. NERISSA WU: So I give this Program update a few times a year, and it often feels like I'm not doing a great job of conveying all the different activities that are going on and how much -- how much multi-tasking is going on among our staff. And this graph does not really -- I'm not sure it helps. It's a schematic of all the steps that a study might involve, but I think it's more helpful actually to look at it this way. And I have this animation, which I apologize if it's not really helping illustrate my point here.

[SLIDE CHANGE]

DR. NERISSA WU: Let me show it to you this way. I just wanted to convey all the various studies and the

types of Program activities that are taking place right now. We are involved with sample collection for CHAIRS and for IPP-8, looking at microsamplers. Our labs are involved with analyzing STEPS samples, as well as CARE-2, and they are preparing to receive samples from CHAIRS and IPP-8.

Our statisticians are working on results return and summary stats for the prior round of IPP, looking at PAHs, as well as speciated arsenic for CARE-2. And they're doing further statistical analysis related to CARE, MAMAS, SAPEP, BiomSPHERE, and FRESSCA-Mujeres. And there are multiple panels involved with each of those, which each involve literature search and consideration of what the exposure sources might be. And then, of course, as I mentioned, for all the publications or findings that come out of that work, our communications group is working on fact sheets and other public-facing materials related to all of these studies.

[SLIDE CHANGE]

DR. NERISSA WU: And then in addition, there are many activities that are related to moving the science of biomonitoring forward. That's not necessarily attached to a particular project. So we have development of laboratory methods, evaluation and standardization of statistical methods, creation of templates for

communication materials across the board, review of scientific literature, and assessment of field methods. And all of this is again moving the science of biomonitoring forward, so that we can incorporate it into future biomonitoring studies.

[SLIDE CHANGE]

DR. NERISSA WU: And none of it gets done without this awesome group of people.

[SLIDE CHANGE]

DR. NERISSA WU: And that ends what I have for you today.

ACTING CHAIR PADULA: So we can take questions from the Panel to start and this is just an opportunity for clarifying questions. There will be a discussion later.

PANEL MEMBER McKONE: Very interesting. I have some questions about the refinery studies. So there's two refineries that are shutting down. You're going to do some samples now, while they're still operating and then after they're closed, right?

DR. NERISSA WU: Yes.

PANEL MEMBER McKONE: Is there an opportune -- so I assume the closure will involve remediation. A lot of refineries have a lot of contaminated materials on the site that actually slowly outgas some of the things

that -- is there a way then to go back even a couple years later, when they've fully remediated the site and eliminated some of the, like, smoldering residues?

DR. NERISSA WU: Good point. Well, I actually will call on Lara or Stephanie to answer that.

STEPHANIE JARMUL: Great question, Tom. Well, we are planning on going back next fall to collect additional samples. And depending on funding, we are hoping to add a third year onto the study to come back the following year again to see if any of the levels have changed subsequent.

PANEL MEMBER McKONE: While you're there, I have one more.

STEPHANIE JARMUL: Okay.

PANEL MEMBER McKONE: So refineries have continuous emissions, but they're also notorious for flares, which are off-normal and, in theory, they're not -- they don't get permits for flares, because it's a safety -- you know, they have to burn gases. So my understanding is actually some significant emissions that come out of flares, but if you're doing a urine sample, it's just a snapshot. Is there -- I mean, again, has anyone given thought to like a biomarker that would reflect a longer term cumulative exposure? I don't know what that would be. It's the magic exposome.

STEPHANIE JARMUL: I mean maybe if we were able

to collect blood, but I -- that is not the current plan for the study. You know, metals that we're measuring, they can have lot longer half-lives. Might be indicative of longer term exposures, but for the PAHs and VOCs, what we're measuring, that is more like a cross-sectional point in time.

PANEL MEMBER McKONE: Okay.

STEPHANIE JARMUL: Yeah, but I know there was a recent flare-up in one of the refineries in LA I think a few months ago. So hopefully, there's no more, but -- and hopefully we don't cap -- we capture it if there is one, but yeah.

PANEL MEMBER McKONE: Thank you. No, very interesting study.

ACTING CHAIR PADULA: Any other questions?

I actually have one, if that's okay. I wanted to know -- I imagine this will get discussed maybe more at another time, but the Fresh Air bands, I'm just wondering how they differ from the silicone in terms of what they're measuring or how long they're measuring it.

STEPHANIE JARMUL: So the -- and Lara, correct me if I'm wrong, but the Fresh Air wristbands are different, in that it's more like a passive air sampler, so they're not actually, you know, cutting and testing the silicone itself. Yes, it's technically a silicone wristband, but

there's actually a little mini-sampling device on it, which is more catered to capture air exposures particularly, instead of air and dermal that the wristband would.

ACTING CHAIR PADULA: Thank you.

DR. NERISSA WU: You could just stay up here.

STEPHANIE JARMUL: I know.

ACTING CHAIR PADULA: Jenny -- go ahead please, Jenny.

PANEL MEMBER QUINTANA: Hi. I just had a clarifying question about the CHAIRS-LA study. What were the inclusion or exclusion criteria for the participants?

STEPHANIE JARMUL: Lara, do you want to take that one more specifics?

PANEL MEMBER CUSHING: Sure. They have to be adults, 18 and over. Just because we didn't have the resources to do justice to a children's study, we were pretty limited in resources, so we decided to focus on adults. They have to live within a couple of kilometers of the refinery property boundary. They have to have lived at their -- in the neighborhood for at least a year and have no plans to move in the next year, and they cannot be tobacco smokers. And that was primarily because that would probably, really drive the -- you know, the personal exposure measures if we were to include tobacco

smokers. And they had to speak English, Spanish, or Tagalog.

PANEL MEMBER QUINTANA: So they couldn't be smokers or live with smokers?

PANEL MEMBER CUSHING: They could live with smokers.

PANEL MEMBER QUINTANA: They could live with smokers?

PANEL MEMBER CUSHING: Yeah, but they couldn't be --

PANEL MEMBER QUINTANA: But you would have that information captured, right?

PANEL MEMBER CUSHING: Yes.

PANEL MEMBER QUINTANA: Okay. Because that might affect things. And also I was just curious if you either ask about this or had a requirement that they not commute a long way, or spend a certain amount of time at home, or was that just something you capture with questionnaires in terms of their commuting behavior or on-road exposures?

PANEL MEMBER CUSHING: We capture it in the questionnaire. It's not an exclusion criteria. Part of the -- yeah, I think just mostly for practicality reasons, logistical reasons. So we will have some commuters in the population for sure.

PANEL MEMBER QUINTANA: Thank you.

STEPHANIE JARMUL: And this is Stephanie. For the urine samples at least, we'll be collecting the first morning voids at least, which should be more indicative of their at-home exposures.

PANEL MEMBER QUINTANA: Thank you.

ACTING CHAIR PADULA: Okay. Thank you so much, Nerissa.

Oh, are there any more questions?

Okay. Okay. So -- in the next agenda item, we will be hearing from Ian Tang. Ian Tang is a Research Scientist in the Environmental Health Investigations Branch at CDPH and he will give a presentation on persistent organic pollutants, or POPs, levels in Californians.

(Slide presentation).

DR. IAN TANG: Thank you for the introduction. I'm Ian, and today I'll be talking about persistent organic pollutant levels, and many of the studies from Biomonitoring California. And specifically, we're trying to get to the question of how we ask, "Shouldn't hexachlorobenzene be decreasing in Californians?" And a version of this presentation was given at the Joint International Societies of Exposure Science and Environmental Epidemiology. And that was in Atlanta earlier this year.

[SLIDE CHANGE]

DR. IAN TANG: So just to recap, persistent organic pollutants are persistent due to their strong halogenated bonds with carbon. They bioaccumulate due to their lipophilic properties and they're also toxic to multiple organ systems. They include organochlorine pesticides, such as the ones listed here, beta-HCH, DDT, DDE, HCB or hexachlorobenzene, trans-nonachlor, oxychlordane, and also polychlorinated biphenyls.

[SLIDE CHANGE]

DR. IAN TANG: So widespread use of POPs occurred from the 1940s to the 1970s. HCB was introduced in the 19 -- in 1945. And around 1970 -- in the 1970s restrictions began for POPs and HCB was regulated in the United States in 1984.

By 2004, POPs were regulated by the Stockholm Convention. And in 2006, Biomonitoring California began and also started conducting studies.

[SLIDE CHANGE]

DR. IAN TANG: So last year, you all heard that participants in MAMAS 1 had HCB levels around six to eight nanograms per gram, but subsequent MAMAS in 2000 -- 2015 and 2016 showed that there was an increase to about above 10 nanograms per grams per lipid. And there was also a hundred percent detection frequency for HCB.

So we looked at all the other POPs and found that overall they're decreasing with each subsequent MAMAS. And so this led us to do some investigations on HCB, which is one of the most persistent of the persistent organic pollutants and the half-life is about 6 to 11 years, depending on the media. It's also used as a fungicide primarily, but it can also be a byproduct of other chlorinated solvents, such as PCE and TCE.

[SLIDE CHANGE]

DR. IAN TANG: So given that POPs have been restricted for almost 20 years around the world and over 40 years in the United States, I think that we would expect to see a decline in POPs over time. The fact that we don't see this with MAMAS, led us to try and look at this trend across all Biomonitoring California studies. And so the hypothesis that we were looking at is are POPs actually decreasing?

[SLIDE CHANGE]

DR. IAN TANG: So we combined all of our student -- studies together into one data set and restricted it to women of reproductive age just to match what we had in MAMAS. The total N was 649 women and a third was Hispanic and the mean age was 30 years old. So here's a table of all of the studies that we've conducted where we have POPs data. And luckily, they've been all

analyzed by DTSC, so it's all the same lab. And we -- the studies span from 2010 to 2017. And there's some overlap between some studies.

So these -- this subset includes mothers, firefighters, Kaiser Permanente members, and also prenatal screening participants across different regions of California.

[SLIDE CHANGE]

DR. IAN TANG: We analyzed all of the different OCPs, as I mentioned earlier. And we also looked at PCB 153, since it's one of the most abundant PCB congeners. To look at the time trends, we used linear regression with the sample year of collection used to predict the log-transformed analyte concentration and we adjusted for age and race/ethnicity.

POPs were lipid-normalized. We also set the level of detection to be standardized across all the studies to the highest one and beta coefficients were back-transformed to percent change, and we also looked at Spearman correlation coefficients to examine possible monotonic trends.

[SLIDE CHANGE]

DR. IAN TANG: So here are the geometric means by year, excluding PBDE -- p,p'-DDE just because the magnitude is large. You can see that HCB here in gold

appears to be increasing with time, while all of these other POPs are decreasing or have low concentrations.

[SLIDE CHANGE]

DR. IAN TANG: And just to show DDE it's also sort of decreasing by time.

[SLIDE CHANGE]

DR. IAN TANG: And here are the adjusted percent changes of POP concentration by year. I also have the geometric means listed over there. P,p'-DDE has the highest geometric mean of 39.9 nanograms per gram lipid. And HCB has the second highest at 10.5, while all the other POPs are around two to three nanograms per gram.

The adjusted percentage change I've highlighted in green, indicates a decreasing percent change. And as you can see all these POPs are decreasing by year, except for hexachlorobenzene. We had crude estimates and they were not very different from these adjusted estimates.

[SLIDE CHANGE]

DR. IAN TANG: So there are several limitations to this analysis. We used different populations from different geographic regions. And we're really not able to differentiate the effects of study from year. And also, we had a low number of individuals in some years. We conducted several sensitivity analyses. We looked at the trends among men and women, women of all ages. We

also excluded individuals of high LODs. And we also used a meta-regression to control for study heterogeneity. We found out these estimates were generally similar to these -- this primary analysis. And in the future, we hope to add one more study, which would hopefully double our sample size and also adjust for more confounders, such breast feeding, pregnancy, and nativity.

[SLIDE CHANGE]

DR. IAN TANG: So, what's going on? Our studies sort of indicated geometric mean, about 10 nanograms per gram lipid. We compared this to NHANES and found that HCB levels, depending on the population, sort of varies around 6 to 12 nanograms per gram. And this table shows the weighted arithmetic mean for NHANES Hispanic females.

A subsequent study looking at NHANES cycles from 2005 to 2015 cycles found a least square geometric mean range of 8.9 to 9.6 nanograms per gram lipid. And they only found a negative 1.6 percent change for HCP -- HCB across all of these cycles, whereas the other POPs had a percent change of about 8.

And just going through this, other populations such as in Belgium, Atlanta, a controlled set for an ALS case control study found that the median or geometric mean was about 7 to 13 nanograms per gram lipid.

[SLIDE CHANGE]

DR. IAN TANG: So the next question is where are the possible exposures that could be leading to HCB plateauing in humans? HCB has been detected in some of the foods, but the residues tend to be very low. There's a possibility that HCB in the ocean or in the soil is being disrupted and revolatilizing into the atmosphere, leading to re-emissions. There's no -- really no known hazardous waste incinerator or industry that produces HCB in California, but we can't rule out that there are industrial sources from other parts of the world that could be transported through long-range transport.

Lastly, HCB can be a byproduct of the other chlorinated solvents. And also, there's been a lot of historical use, such as it's -- it was used as a wood preservative, rubber -- and rubber, aluminum, magnesium and also a dye.

[SLIDE CHANGE]

DR. IAN TANG: So the literature on HCB in the environment is also compelling. A lot of studies have shown that it's either staying stable or increasing. One of them is shown here where there were air monitors in the North American Great Lakes. And you can see HCB in the bottom right-hand corner seems to be stable, while all the other persistent organic pollutants are decreasing over time. And this timeline was from 1990 to 2015.

Another study looked at air monitors comparing HCB levels from 2016 and 2006. And so these circles on the maps represent that ratio of 2016 over 2006, and over 68 percent of these sampling sites had a ratio above 1.2. And that large black circle on the map indicates it's in the country of Latvia, and there have been bio -- have been studies in the Baltic Sea also showing that HCB trends were either stable or increasing.

[SLIDE CHANGE]

DR. IAN TANG: So we have a lot of questions, more so than we have answers. Are HCB concentrations plateauing? Is this because of a new or exist -- existing exposures? Are these a level of concern? And this really shows that HCB can still -- because it's a persistent organic pollutant, it can still be affecting our society, even thought it's been regulated for so long. And even if it's being emitted somewhere, it could still end up everywhere.

And it also shows how important our surveillance of POPs are given the restrictions. And if anyone has any clues on how to identify possible sources, that would be great.

[SLIDE CHANGE]

DR. IAN TANG: And so I'd like to acknowledge all the collaborators, funding sources, and our participants

over the years.

ACTING CHAIR PADULA: Any questions from the Panel?

PANEL MEMBER FIEHN: Yeah. That's fascinating or scary, but it's certainly interesting. Now, I understand that your study was focused on females because of the MAMAS, the samples that you had, but what about other people? Have other people also looked in men? There must be other, you know, literature where people try to look at historic trends?

DR. IAN TANG: There are a few out there and they've also included men and there's also been a few studies on children as well. And it appears that the trend is similar in terms of HCB staying stable. We've talked to some of our NHANES colleagues and they also see the same trends in both men and women, yeah.

PANEL MEMBER FIEHN: Yeah. And a follow-up. I mean hexachlorobenzene is, of course, you know, well, all the carbons are satisfied with chlorine. Is that a physical/chemical reason why maybe it's just much more stable?

DR. IAN TANG: It is quite stable. I'm not sure if I can answer any more about that. Does anyone have any thoughts?

PANEL MEMBER FIEHN: Okay.

PANEL MEMBER McKONE: It's very stable, but it's also very lipophilic. And there are other compounds that have shown this kind of long term-behavior, the dioxin-like compounds. And you cited Ron Hites. He had actually some really interesting papers about retention of dioxin-type compounds in all kinds of lipid membranes. And I suspect this might be doing the same thing. What happens is it's very lipophilic, it's very persistent. It goes into anything that's lipid and then slowly outgases as the -- I mean, the -- it goes into the atmosphere and then it maintains a constant concentration in the atmosphere, and then the atmosphere feeds the food chain.

DR. IAN TANG: Right.

PANEL MEMBER McKONE: I suggest, if you want some insight, you might want to talk to Matt MacLeod at Stockholm University. He actually gave us a presentation -- when did Matt talk to us?

AUDIENCE MEMBER: Two years ago?

PANEL MEMBER McKONE: I mean, anyway. He's -- I mean he knows OEHHA, but he's done a lot of work on persistent pollutants, and global transport, and re-emission -- emission re-emission cycles, and how like lipid and soil feeds food chains on a continuing basis.

DR. IAN TANG: Right.

PANEL MEMBER McKONE: So you might want to just

see if he has some insight about this. He's probably -- I mean, there are others, but I think he's one of the best people out there doing this kind of work.

DR. IAN TANG: Thank you so much. We'll reach out.

ACTING CHAIR PADULA: And I just want to open it up to a discussion for both of the presentations, both Nerissa's and Ian's -- oh, and sorry. Go ahead first, Lara.

PANEL MEMBER CUSHING: Thanks. Yeah. You mentioned wanting to control for nativity in some of the additional analysis you'd like to do. And I was just curious, do you know how -- what the proportion of immigrants is in your pooled sample and how it might have changed over time? I'm not sure if that could be a factor, but I know, you know, the year when HCB was banned in different countries, you know, differed.

DR. IAN TANG: Um-hmm, right.

PANEL MEMBER CUSHING: So I was just wondering if you had taken a look at the distribution of immigrants over time in the pooled sample?

DR. IAN TANG: Yeah. That's an excellent question. I can't -- I don't know what the distribution on the top of my head is. We're still in the process of harmonizing all this data in terms of across all the

studies. However, some of these studies are -- for instance, in some of the BEST studies, are in the Central Valley, and a lot of those individuals are immigrants. And so I would -- I think it's a little bit different for each study, but, yeah, we'll definitely take a look at the distribution and try to understand it a little bit better.

ACTING CHAIR PADULA: Go ahead, Jenny.

PANEL MEMBER QUINTANA: Hi. Thank you. And I did have the same question as Lara and either country of origin or where they were born, because I think also their mother's body burden might affect the children. But specifically, I'm wondering, did you have data on BMI or obesity levels? I'm -- I know that I tried look at the literature on obesity and POPs, and it's confusing. It's not a straightforward story to me at least. I mean, I was trying to wade through it.

And I guess a related question for the Panel looking forward, I'm kind of curious how Ozempic or those kind of drugs might affect our biomonitoring? I know that rapid weight loss, you know, does tend to flood the body with some of the stored pollutants. And so just looking forward, maybe that would be something to look at as well. So that's a bunch of questions in one. Thank you.

DR. IAN TANG: That is a really interesting point about Ozempic and how that might sort of remobilize POPs,

and then think it's something we can capture in early -- in surveys. But, yeah, in terms of your previous question on BMI, some of our studies, we do have BMI. However, because the most recent studies that we have is based on MAMAS, and they are coming from the Biobank, they're prenatal screen samples, we don't necessarily have good data on everyone for that.

So it is something that we're considered -- considering. Maybe we can run a sensitivity analysis subsetting it among individuals where we do have BMI. But, yes, an important point. Thank you.

PANEL MEMBER QUINTANA: Thank you.

ACTING CHAIR PADULA: Go ahead, please. And please introduce yourself, if you could.

DR. MARTHA SANDY: Sure. Martha Sandy, OEHHA.

I wonder, Ian, if you could go back and show us, you had a slide on your sensitivity analyses and pulling in all men and women. And then maybe one of the slides looking at other POPs and just read for us what they were, because to get to Dr. McKone's point and the question about what's special about hexachlorobenzene. Some of the other POPs I think are also fully chlorinated, or brominated, or we could think about PCBs, and PBDEs, and things like that.

ACTING CHAIR PADULA: Would you go back?

DR. IAN TANG: So it was the sensitivity analyses and then maybe this slide?

DR. MARTHA SANDY: The -- I think you had some nice graphs time trends too.

DR. IAN TANG: Oh, I see.

DR. MARTHA SANDY: But the sensitivity analysis with the -- all the different groups, you tried -- because you were looking at women of child-bearing age, and then you looked more broadly.

DR. IAN TANG: Right.

DR. MARTHA SANDY: To go over that again just to pull that up.

DR. IAN TANG: I see. Okay. So I have the results of those, if that's --

DR. MARTHA SANDY: Or just to remind us what you did.

DR. IAN TANG: Yeah. Okay. Sure. Yeah, for the sensitivity analyses, we combined both men and women across all of our different studies together. We also -- because in our -- in this -- in the analyses showed here, we also restricted to women of reproductive age. We expanded it out to all women. And also because the MAMAS had different -- they had higher LODs, because they were using banked serums, the LOD is a little bit higher. And so, if we were to sort of model it, it would change the

shape of the regression. So we wanted to restrict and standardize the LODs across all of the different -- all the different studies and also see what happens if we just excluded the women who had the highest LODs to see if that was biasing the results or the trend that we're seeing.

With meta-regression, we also looked at it -- the geometric mean by studies. And so this is a way to control for the study heterogeneity that we have, so it's expanding. It's coming from the individual level back out to the population level. And so the magnitudes are much more different, they're much larger, and a little bit more unstable. But I think that that's something we would expect to see when we're able to account for this study variability.

Does that answer your question?

DR. MARTHA SANDY: Yes.

DR. IAN TANG: Okay. Yes. Hi.

PANEL MEMBER SUÁREZ: José Suárez, UC San Diego.

Thank you all for the presentation. I just had a couple of questions about your -- the newer methodology for calculating the percent change --

DR. IAN TANG: Um-hmm.

PANEL MEMBER SUÁREZ: -- if I can dive in a little bit deeper with that.

DR. IAN TANG: Yeah. So we calculated the beta

and this was using the log-transformed concentrations. And so we back-calculated it using exponentiation of the beta minus 1 times 100.

PANEL MEMBER SUÁREZ: I guess my question is, so if we -- if you wouldn't mind showing us the -- let me see the slide -- let's see, I think it's slide number 8 is the one that lets us --

DR. IAN TANG: Okay.

PANEL MEMBER SUÁREZ: -- take a look at things a little bit, right?

So we're looking at the trends there, excluding DDE, because the magnitudes --

DR. IAN TANG: Um-hmm.

PANEL MEMBER SUÁREZ: -- are way higher. That's the next chart. Overall, from your analyses, you're showing that they were decreasing, except for hexachlorobenzene, right?

DR. IAN TANG: Um-hmm.

PANEL MEMBER SUÁREZ: If we're looking at the figure here though however, it's kind of hard to look at that, but if you -- it's very hard to look, but oxychlordane and p,p'-DDT, which are the two lines in the bottom --

DR. IAN TANG: Um-hmm.

PANEL MEMBER SUÁREZ: -- they actually seem to be

increasing over time once you look very carefully at that.

DR. IAN TANG: Yeah.

PANEL MEMBER SUÁREZ: And part of where I'm going to with this is, so you calculated the percent change from 2010 through 2016, right, that's the percent change?

DR. IAN TANG: Yes. Yeah.

PANEL MEMBER SUÁREZ: And so part of the concern here too is that in 2010, there are only 34 participants that have a measurement, right?

DR. IAN TANG: Yeah.

PANEL MEMBER SUÁREZ: So how much you can generalize or how stable you think those concentrations are, are probably lower than once you start going towards 2015-2016, where you reached 236 and 206, right?

DR. IAN TANG: Um-hmm.

PANEL MEMBER SUÁREZ: And the other part worth taking a look at too is when you're calculating percent change, especially with variables that are highly skewed, right? So these -- I presume that are pretty skewed, as they tend to be, right? Then, when they're in the very low concentrations, even tiny changes can result in very substantial percent change. So you must have had to, at some point, restrict outliers to be able to come up with numbers that are not, you know, 300 percent decreases, 500 percent decreases.

DR. IAN TANG: Uh-huh.

PANEL MEMBER SUÁREZ: So, in other words, I would suggest also looking at the absolute difference --

DR. IAN TANG: Sure.

PANEL MEMBER SUÁREZ: -- by the time period. And then something worth considering it, is it worth it to compare back to a sample with only 34 observations in it or can you start maybe grouping them and say, well, the 2020 and the 2012 one, you group all of those as your baseline category.

DR. IAN TANG: I see.

PANEL MEMBER SUÁREZ: And from there, you can start doing the comparisons and maybe you can start getting a little more stability with your -- with the estimates.

DR. IAN TANG: Right. Yeah. I think that's a great point on the starting value being N equals 34. We are trying to get an additional study around the same time, specifically the California Teachers Study, which will increase our sample size up I think by a thousand. So that hopefully should address some of the concerns there. But I do take your point. I think the idea of combining the -- like earlier studies together to gain a little bit more numbers is a good idea. And yeah, it's an -- it's an interesting point trying to think of what a --

what the percent change would represent, because I think we were thinking that the slight increase over time that we see could be because of the level of detection differences. But, yeah, it's -- we'll look into it some more. Yeah. Thank you. This is a lot of feedback -- good feedback.

PANEL MEMBER SUÁREZ: And technically, this should coincide, right?

DR. IAN TANG: Um-hmm.

PANEL MEMBER SUÁREZ: So even with these -- it's hard to see it in this figure.

DR. IAN TANG: Um-hmm.

PANEL MEMBER SUÁREZ: I had to like really zoom in quite close to see that there's slight increases in those two, right?

DR. IAN TANG: Um-hmm. Yes.

PANEL MEMBER SUÁREZ: So of -- I think just some methodological adjustments there --

DR. IAN TANG: Sure.

PANEL MEMBER SUÁREZ: -- I think might be good.

DR. IAN TANG: Okay.

PANEL MEMBER SUÁREZ: But look at the absolute as well.

DR. IAN TANG: Yeah.

PANEL MEMBER SUÁREZ: -- to see if that starts

matching up a little bit closer to this.

DR. IAN TANG: Okay. Yeah, thank you so much.

ACTING CHAIR PADULA: Any additional questions?

I just have one additional follow-up question. It sounds like the upcoming subanalyses by parity and things will be, of course, interesting. I was also wondering, since some of those women were -- some of the cohorts were pregnant and some of them were not, have you -- have you lumped the pregnant and non-pregnant ones yet or -- I mean, I know most of them are MAMAS, but there's one other.

DR. IAN TANG: Yeah. We've lumped them all together in this case, yeah. For example, in -- women of reproductive age who were not pregnant would be included in this, yes. Yeah.

PANEL MEMBER SUÁREZ: It's fascinating and I have kind of a follow-up question of that, which is breast feeding --

DR. IAN TANG: Uh-huh.

PANEL MEMBER SUÁREZ: -- do you happen to have information about breast feeding duration or breast feeding or not, given that there's a good amount of data showing that a lot of these POPs can be excreted by breast milk?

DR. IAN TANG: Exactly. Yes. So that is data

that we have collected and we've harmonized. However, they're not available for everyone in MAMAS, and also some of the clinical data for some of our cohorts, we don't have that data. So if we were to actually do this analysis, adjusting for more confounders, then we would expect the sample size to decrease just because of the data availability.

PANEL MEMBER SUÁREZ: Yeah, I'd be very curious though I wonder -- I wonder how many of these studies -- I mean, it's not a huge sample size --

DR. IAN TANG: Yeah.

PANEL MEMBER SUÁREZ: -- but if there's -- I'll just be personally very interested in seeing duration of breast feeding and how that correlates.

DR. IAN TANG: Yeah. Definitely, yeah. Yeah, we -- well we have, yeah, some of that data. So it's very exciting. We're so -- I think we're waiting for the CTS data to come in and then see how we can reanalyze the data.

There -- at ISEE/ISES, there was also a couple of folks who wanted to collaborate and maybe add in more cohorts. We've been also considering that as well just to see if we can just gain more power and more people in each year. So we're still thinking about how to do that, since there's like different labs, and different techniques, and

different populations and stuff.

DINA DOBRACA: Can I ask the SGP a question?

ACTING CHAIR PADULA: Yes.

Who are you?

DINA DOBRACA: Oh, my name is Dina Dobraca. I'm a Research Scientist with the California Department of Public Health. I was wondering there was one PCB used in this analysis as like the -- expected to be most detected, persistent PCB, but to get to the point that was brought up previously about how chlorinated HCB is, are there any other PCBs or dioxin-like compounds that one would like to see, if we could get that data?

PANEL MEMBER SUÁREZ: Is the question going towards the -- well, I think the underlying part --

AALEKHYA REDDAM: Sorry. Can you identify yourself for the transcript?

PANEL MEMBER SUÁREZ: Oh, sure. José Suárez. So part of this too is HCB has a substantially longer half-life than the other ones -- than most of them, not all of them. It's not the one that has the longest -- probably of the ones you measured, the longest, but among the longest half-lives, right?

So I wonder if you're -- do you think your question goes in that direction? Should we -- are there other more persistent pesticides or, excuse me, chemicals

that should be measured that were very prevalent at some point and maybe we should be monitoring that a little bit better?

DINA DOBRACA: Yeah. I'm basically asking the SGP for the recommendation of if we have the data or could get the data, what would they recommend?

PANEL MEMBER McKONE: Can I follow-up? Tom McKone, Panel. They have to be careful. It isn't just persistent. And this is where it helps to talk to somebody who does fate modeling or fate analysis, because it isn't just the half-life. It is the vapor pressure, the solubility, and the lipid -- I mean, the water solubility, air solubility, vapor pressure, and how these play together and where the reaction takes place. So if something is -- degrades in water, but is really not soluble. It's not in water. It's how much gets into -- so again, you can't really understand this, because we've got about at least six different parameters that you have to put together.

And that's why I say people like Matt MacLeod who do this know how to take this. And they actually -- he's run all these chemicals through -- they're -- how to rank them in terms of their overall persistence, based not just on their persistence in one medium, but in the total environment. And that relates to how they make their way

around the environment. Like some things go into sediment and get buried and other things go into sediment and just sit there and slowly go into the water column. And as the concentration in the water column goes down, they go into the atmosphere and then get circulated.

So some get buried, some get circulated and you don't know that without really running it through these sorts of fate analyses. And then you could start seeing how these substances all compare to each other. And again, it's already been done. You know, I think you just call somebody who's been involved in persistent pollutants for 10, 15 years, and they'll say, oh, yeah, here's the paper. We ranked them all in terms of their global persistence and their likelihood they'll end up in the food chain, and their likelihood they end up in human lipids.

ACTING CHAIR PADULA: Any further questions?

STEPHANIE JARMUL: Just a reminder that they can ask questions on the Program update as well, in case there are any.

ACTING CHAIR PADULA: Right.

STEPHANIE JARMUL: Nerissa is very happy I said that.

(Laughter).

PANEL MEMBER DURRANI: Hi. Timur Durrani. This

is I guess for both of you. I've heard three different labs now, it's sounds like, Environmental Health Lab, Environmental Chemistry, and DTSC. And Nerissa, it sounded like part of the support role is to develop, come up with a lab's development and so forth. So can you talk a little bit about how that goes about and how you choose which lab, and which analytes go where, and that kind of thing?

DR. NERISSA WU: Sure. There are two labs as part of the Biomonitoring Program. And one is the Environmental Health Lab at CDPH and they generally measure metals, and then the urinary nonpersistent chemicals, like PAHs and VOCs. And then our persistent organic pollutants and PFASs are measured by the Environmental Chemistry Lab. That's over at DTSC.

Now, one of the pressures on the Program is there are all these emerging chemicals and trying to keep up with methods or expand our PFASs methods -- or PFAS method to include more of these emerging PFASs, it is quite a challenge for the lab. It's a very long process to go through that method development. So sometimes what we'll do, as I mentioned Amina Salamova's lab, is we'll work with an academic or private lab that's working on a new method. We might see in one of our pilot studies what's coming up that we want to consider and then try to

incorporate that method into one of the labs. In the case of PFASs, it would be over at DTSC. But it's something we have to consider carefully, because the -- just the resources and time that go into method development are considerable.

I don't know. Maybe one of the lab folks is online wants to address that.

ACTING CHAIR PADULA: Go ahead, Lara.

PANEL MEMBER CUSHING: Yeah. I had kind of a related question, which is I was just wondering if this would be more Nerissa or maybe you'll be presenting on this at a future meeting about the IPPs, and like the -- because I know there was -- there's one about PFAS, but also PAHs and VOCs. So I was just kind of curious where those are, and how they went or are going, and what may be planned?

DR. NERISSA WU: So the IPP, the Intra-Program Pilot, it's our method development. It's beyond laboratory methods. It's really just trials of different laboratory or field processes that we want to try out on sort of an internal group, before we use it in a general biomonitoring study. So for example, in the past we looked at QACs with -- also with an external lab to see if it was something that we would consider bringing into a biomonitoring study. The PAHs were -- it was an

expansion -- or I guess an improvement of the method.

And so, again a demonstration that the data were usable, that we saw detection levels that we would expect to see. And it's an opportunity for us to kind of do a dress rehearsal and try out the method and make sure that the data is usable or useful before we promise it to external partners.

The last one, so PAHs we did run, and we're actually about to return those results to the participants. And I guess we -- we're -- as part of our consideration of 2026 topics, I mean, this might be something that comes up, we could talk about them as a body of work or we could have a discussion about why we chose to test a new method and what -- kind of what the outcome of that is. And this is particularly true for something like the microsampling devices, which I think everyone is really interested in hearing about. We'll be doing an assessment of both, you know, are we -- are there differences in capillary blood versus venal samples, how do the PFAS and metals results look between those two sampling techniques, but also what's the acceptability among participants? Do they -- do they like having samples collected in that way? Are they more or less painful than venipuncture?

So there -- I think there will be a lot of

results that come out of the next round of IPP that we'd be happy to share with you. But I think that would be a good addition to our discussion in 20 -- for the 2026 topics about the things we would like to see.

DR. KATHLEEN ATTFIELD: And it's a small point. I'm Kathleen Attfield, a Research Scientist Supervisor over at EHIB. Just to point out, of course, that these IPPs are always small. It's like less than 40 people, so we don't try to use that data as sort of understanding anything about the California population per se. It's more about method development, and testing, and field implementation testing.

ACTING CHAIR PADULA: Okay. If there are no other questions, I want to just thank Nerissa and Ian again for a great presentation, and we will take a 10-minute break and return at 2:20. Thanks so much.

DR. IAN TANG: Thank you all for your comments.

(Off record: 2:10 p.m.)

(Thereupon a recess was taken.)

(On record: 2:20 p.m.)

ACTING CHAIR PADULA: In the next agenda item, we will be hearing from several collaborators on the FRESSCA-Mujeres project. Ileana Navarro, Policy Associate at the Central California Environmental Justice Network; Dr. Mohammad Heidarinejad, an Assistant Professor in the

Department of Civil, Architectural, and Environmental Engineering at the Illinois Institute of Technology, and Stephanie Jarmul, Chief of the Safer Alternatives Assessment and Biomonitoring Section at OEHHA.

So today, they will give a joint presentation on the results and impacts of the FRESSCA-Mujeres study.

(Slide presentation).

STEPHANIE JARMUL: Thank you, Amy. I'll just briefly give an overview. Is this going to work?

[SLIDE CHANGE]

STEPHANIE JARMUL: There we go. So Ileana is going to be giving a study background. Ileana is attending online, so there she is. And then Mohammad will be providing an intervention analysis for the PM data. I will be giving the biomonitoring results, and then I'll pass it back over to Ileana who will discuss the FRESSCA community impacts and perspectives, and some next steps for the project. And with that, I'll turn it over to Ileana.

[SLIDE CHANGE]

ILEANA NAVARRO: Hi, everyone. My name is Ileana with the Central California Environmental Justice Network, or CCEJN, as Stephanie mentioned. Thank you so much for having me today. I'm super excited to share about the study and share those community impacts that we feel were

very impactful.

To start off, agricultural workers in California's San Joaquin Valley, they face this critical health challenge of spending super long hours working outdoors and then having to return to home without the proper air filtration. And this has left them disproportionately exposed to wildfire smoke.

And these exposures include wildfires, but also dust and smoke from agricultural fields and emissions from oil and gas operations. And I have here some photos taken from community members of their -- of their exposures. Many low-income families here also rely on evaporative coolers, or swamp coolers, which are the more affordable alternatives to air conditioners. And these systems they pull in massive amounts of unfiltered outdoor air, and then when the wildfires smoke -- when there's wildfires, the smoke, with the extreme heat, hit simultaneously and these homes become super hazardous. And this is what led us to launching the FRESSCA-Mujeres and FRESSCA Project.

Next slide.

[SLIDE CHANGE]

ILEANA NAVARRO: I'm going to be sharing with you all some videos from the community members that had the opportunity to record their experience through a community workshop led by Story Center. And this here is Erika's

story.

(Thereupon a video was played.)

ILEANA NAVARRO: We're going to pause it really quick right here just to continue talking more about the study, but we'll come back to this video at the end.

Next slide.

[SLIDE CHANGE]

ILEANA NAVARRO: The goal of FRESSCA -- of the FRESSCA Project was to address this need by developing an affordable filtration intervention for homes with swamp coolers. We also then built on this project and launched FRESSCA-Mujeres, which aimed to evaluate the effectiveness of the air filtration interventions at reducing in-home exposures and learn more about female agriculture workers' exposures to air pollution specifically in the Valley. And we recruited from Fresno, Kings, and Kern counties.

[SLIDE CHANGE]

ILEANA NAVARRO: This slide was presented by Jeff Wagner at last November's meeting, but just as a brief reminder, we have three funding sources and many interdisciplinary partners on the full study team, which included folks from -- folks involved in FRESSCA and FRESSCA-Mujeres.

[SLIDE CHANGE]

ILEANA NAVARRO: And then before Mohammad and

Stephanie go into details about the results, we wanted to provide a brief overview of the study components. The FRESSCA Pilot Project was conducted in 2022. And during that phase, we enrolled 25 homes from Kern and Fresno counties. We developed indoor and outdoor PM monitors and different types of filtration interventions in these homes, and participants also completed questionnaires.

Then in 2023, we launched FRESSCA-Mujeres. And then during this phase, we enrolled about 50 female agricultural workers from Kern, Kings, and Fresno counties. We installed portable air cleaners in all the homes and swamp cooler filters on half of the homes. It was designed this way, so that we can ensure that all participants had some sort of filtration in case of a wildfire event. And then to characterize exposures and evaluate the intervention, we measured air pollutant levels inside and outside of the homes, collected participant's urine to measure exposure biomarkers, and conducted questionnaires.

And now, I'll hand it over to Mohammad to provide details on the filtration intervention analysis.

Thank you.

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DR. MOHAMMAD HEIDARINEJAD: Thanks, Ileana. Thanks to Stephanie. My name is Mohammad Heidarinejad,

I'm an Associate Professor at Illinois Tech. I'm excited to be here to present on behalf of the FRESSCA team. Looking into the FRESSCA, we had three different phases.

One phase was laboratory testing, pilot intervention, and the full intervention. The laboratory and the pilot was conducted in 2022. And the full intervention was in 2023. Before looking into the lab testing, I want to explain a little bit what the difference between the pilot year and the full intervention.

So we used the pilot year to learn more about the lessons learned that we deployed for the full intervention. So technically the number of homes increased significantly from the pilot year to the full intervention. They come -- the counties are almost identical. And in terms of the intervention, we usually deploy them in June, July and retrieve the interventions in October. And the goal was to make sure if there is a wildfire, we can capture the intervention for the air cleaning during that time.

One of the things we learned for the pilot year was if you look at the intervention types in the pilot year, we had so many different portable air cleaners. We decided to limit those numbers making sure all the portable air cleaners are HEPA filters. Also, we want to

make sure during the full intervention all the homes have means of air cleaning, meaning all the homes we call it single invention, at least had a portable air cleaner. And half of the other homes, they had double interventions, meaning in addition to their portable air cleaners, we were also like filtering the swamp coolers to make sure the outdoor air coming in is filtered.

One of the other things we learned during the pilot year, making sure that we can focus and understanding the usage of the portable air cleaners and the swamp coolers. So all the homes almost, if possible, during the full intervention, they had plug load logger, so they could see if they're operating the device, if they're operating at low, medium, or high speed.

The other thing we learned during the pilot year, making sure having some sort of memory in the monitors for indoor air quality and outdoor air quality could increase the capture rate.

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DR. MOHAMMAD HEIDARINEJAD: So now, we want to look at a little bit before getting to the full intervention, the year, looking at the results. We want to learn about what is the focus we did in the laboratory to develop the filtration solution for the swamp coolers.

So the team made a visual survey of the homes and

they looked at the homes, their swamp coolers in terms of size, dimensions, and their location. Eighty-five them, we called them horizontal-flow, meaning they were going through the walls or the windows and they were not on the roof. And so we decided to focus on that because of the safety, also the predominance of horizontal swamp coolers. As you can see in the bottom, there are four figures. The three on the left-hand side show these are usually cubic, but also you have some sort of swamp coolers, they may have a little bit different basic dimensions, mostly two narrow side and then maybe one dominant side there. So we looked at different filter types. We'll talk about it more. And then ultimately we focused on these to make sure that --

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DR. MOHAMMAD HEIDARINEJAD: -- we can develop the solution for that.

In the laboratory, when we -- the team made this survey, they identified seven manufacturers for the swamp coolers in the area. We picked three of them that they were more common. And we acquired them in the lab. As you can see in the image on the right-hand side, a few different ways of mounting the filters.

These swamp coolers were tested. Even in the bottom right-hand side, you can see that we build the

enclosure of plenum type on it. We decided to abandon that, because it takes a lot of time to -- to do that. The overarching goals for this laboratory testing and the making sure the filtration for the swamp cooler was making sure the media could withstand the wet surfaces, because these swamp coolers have wet surfaces, making sure that it's not restrictive in terms of the flow. So we kind of have a 20 percent limit in terms of the flow that would be reduced.

Also, it should be cost effective and the owners should be able to acquire the pieces needed to put it together, so meaning limited training or no training is needed for that. Also, we want to make sure this solution is not permanent. It's only during the wildfire season. So as you can see in the results, which are these are good for a few weeks.

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DR. MOHAMMAD HEIDARINEJAD: With that, we did the testing. So if you're looking at the figure here, we have two figures. The left-hand side shows two type of the coolers. They have centrifugal fans and the right-hand side has the axial fan. The vertical axis shows the flow rate. So if you look at the number, usually multiplied by 0.6, you get it in CFM. So if you are looking at it, maximum gets to about 3,000 CFM. The horizontal axis

shows the pressure drop in these coolers.

So we did testing blocking different side of the cooler, as you can see the dashed line here. So you get system -- should I repeat it from the beginning?

(Laughter).

DR. MOHAMMAD HEIDARINEJAD: So one thing we realized here, if you're looking at it, so like the dashed lined shows when we did the testing of blocking different side of the cooler, and we get the system curve for that. The goal was to make sure it's only 20 percent restricted in terms of the flow rate. So if you are looking at the line here for the bottom basically line, that's the cutoff, in terms of the pressure drop. And this one is for the upper line. You are looking at a few different combination of filters being deployed here. So we looked MERV 13, MERV 11, even like some sort of thin shapes being used in terms of the filtration. Also, different because of the filters are tested. Almost all the filters you see on the left-hand side of this, they meet the criteria here.

For the axial fan, that like shape, it has like two narrow sides. Unfortunately, a lot of the filter solutions didn't work, but we ended up finding some sort of innovative way in the field to deploy filters for those coolers.

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DR. MOHAMMAD HEIDARINEJAD: Now, looking in terms of the filtration efficiency, basically removal efficiency of these filters. If we are looking at -- let's say we just focus on the left-hand side looking at this arrow, like meaning if no filter is being used for these swamp coolers, these pads are usually good for more than 5 micrometers. But less than that, when we usually have the widest part, they are not good so meaning it -- we need to have some sort of filtration for the swamp coolers. And usually, we know these wildfires, it's important to focus on 0.3 to 0.5 micrometer. So as you could see here, about like, you know, 50, 60 percent or more than that removal efficiency could be achieved with this filter.

Similar patterns could be seen for like different cooler types. The left-hand side, these are the laboratory, you know, filters. We selected these in coordination and with the manufacturers, also, talking to the advisory group. The right-hand side shows the filters that they were locally available and they were tested. There are a little bit more that if we have time, we can come back and explain some of those.

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DR. MOHAMMAD HEIDARINEJAD: So now, we have the solution for the filtration for the swamp coolers. So

getting to the pilot and full intervention year. So we installed PurpleAir to monitor indoor in all the homes in terms of their air quality and eight nearby outdoor stations. Also to make sure that we can make determination, we co-locate these PurpleAirs for calibration. So we calibrate them with respect to others. And we ended up getting the calibration factors for each of these monitors.

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DR. MOHAMMAD HEIDARINEJAD: One of the things I mentioned in the pilot year, we learned if you solely rely on the WiFi, the capture rate may not be sufficient. So if you're looking at the figure here, these are 46 monitors and the vertical access here shows the capture rate. These are different homes and different monitors that we had. We still had a few with the WiFi on the left-hand side, but most of them they had on-site storage. So as you could see, the capture rate increased significantly when you have the on-site memory. In case the WiFi get disconnected, you still have the on-site storage to collect the data. That was one of the lessons learned that we used for the full intervention.

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DR. MOHAMMAD HEIDARINEJAD: Now, let's look at more detail in terms of the field intervention. We call

it single intervention, meaning all the homes they had a portable HEPA air cleaner. So if there's a wildfire, at least they could use these portable air cleaners. And for the other half of the homes, we call it double intervention, meaning both the portable air cleaner and the swamp cooler is also filtered air. So like any outdoor air come into this space, it's being filtered through these swamp coolers. So we'll see the results of that in the next few slides there. So we call this one double intervention versus single intervention.

Before looking at some time series data, let's look at some spot measurements. So one of the goals was to make sure it's not restricted in terms of the flow rate. So we kind of have the 20 percent limit there. So looking in July when the filters were deployed versus October, we call it new versus used. So as you could see over time, when the filters were removed or retrieved, so the flow rate reduction increased more from 13 to 17 percent, we are still within the 20 percent range that we have. So indicating that the solutions that were deployed they meet the criteria that we have for the design.

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DR. MOHAMMAD HEIDARINEJAD: Now, the next step is before again looking at time series, let's look at another spot measurements. Important part is the particulate

removal efficiency, meaning how effective these filters and the solutions are, so looking at new versus used, meaning July versus October when the filters were retrieved. So as you could see for different size-resolved bins, from 0.3 to 1 micrometer. So over time, the particulate removal efficiency dropped from 49 percent to 36 percent. And as expected for like the filters, as you go up, the filtration efficiency goes up, but also again decrease over time significantly, indicating that the solution is good, but only works for a few weeks possibly.

Now, we want to look at if really these double intervention solution work. So you'll see a box plot here. We call it constrained PM indoor and outdoor ratio, the vertical axis. So it goes from 0 to 1. And the horizontal axis shows two groups. The first group here is the double intervention, meaning homes with PAC, portable air cleaners, and the EC filter. The right-hand side shows only single intervention, meaning the portable air cleaners being used.

So one of the things you are seeing here, the median for the I/O ratio is slightly increased when the ECs become on, like these dark blue from 57 to 63 percent, meaning that slightly the outdoor origin particulate matters are coming to the space, but the filters are still

able to filter most of that. But when we are looking at the homes with only PAC filtration, that number increased significantly from 55 percent to 78 percent, meaning that those outdoor air coming from the coolers, they are not filtered, and the portable air cleaner is not able to catch up with that. So indicating the double intervention is what we are looking at it for here as a promising solution.

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DR. MOHAMMAD HEIDARINEJAD: Looking at the same thing we saw before, like, you know, new versus used, like the first three weeks and also the last three weeks of the deployment. So you see the same thing here, the I/O ratio for the first three weeks versus the last three weeks. So the first three weeks, we are not seeing noticeable changeover in terms of I/O when the filters are deployed.

But over time, as you could see, that I/O ratio increased from 55 to 69 percent, meaning the filters are not able to catch up over time a little bit more than what you see at the beginning. There are several reasons for that, but it's again indicating the solution is temporary, but could work well during the wildfire season.

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DR. MOHAMMAD HEIDARINEJAD: Now, before like getting to the summary, let's look at two times. One we

call it non-wildfire period, meaning like most of the times that these filters were deployed in that three, four months. And as you could see here, again the same thing on the I/O ratio, like for double intervention, slight increase, not significant, similar result happening here for the PAC only, like over you'll see like more outdoor air origin like PM2.5 are coming in, and the PACs are not able to catch up with that.

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DR. MOHAMMAD HEIDARINEJAD: We can look at during the wildfire season, we had two times in August and also in September. You could see the impact is a similar pattern, but it's a little bit more severe here. So for like single interventions, like meaning the homes again with no filtration on their swamp coolers, that number increased more than what we saw during the non-wildfire times.

One thing to emphasize here, during the study year, we had wildfire, but it was not as severe as previous years. But again, looking at the results here confirm this solution works well.

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DR. MOHAMMAD HEIDARINEJAD: In summary, we looked at these air filtration solutions for both the pilot and intervention year, and the solution with the filtering the

swamp coolers. We call it DIY, do it yourself, meaning the homeowners with no training can do that. We also looked at materials and filters that could be mostly accessible and available to be installed.

One thing, we had it earlier, didn't get a chance to get into that in more detail, we used MERV 13. It's recommended for the filters. It also followed the same recommendation that EPA and ASHRAE has. Also having portable air cleaners with HEPA filters are effective in terms of lowering the PM2.5 and PM10 levels in homes.

And ultimately, the solution is it could be good for a few weeks, but their efficiency and effectiveness will decrease over time. So overall, it's important to make sure these swamp coolers, when they are drawing a significant amount of outdoor air, are filtered during the wildfire season.

Before passing it to Stephanie, I want to thank the colleagues who worked on this. We have a few of them here in person and few online and happy to respond to any questions after the presentation.

Stephanie, I'll pass it to you.

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STEPHANIE JARMUL: Thanks so much, Mohammad. And also big shout-out to the larger FRESSCA team and also the team at SAABS for doing a lot of these analyses that I'll

be presenting on today for the biomonitoring data.

So other than the PM data, we also measured levels of PAHs, VOCs, and metals in indoor and outdoor air. Those results were presented at a previous SGP meeting by Jeff Wagner last November. So today, we'll be discussing the PAH, VOC, and metals data in the urine samples. The FRESSCA-Mujeres study also did measure biomarkers of stress in urine, and included saliva telomere length and silicone wristbands to measure pesticides for a small subset of participants, but we will not be covering those data today.

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STEPHANIE JARMUL: So here's a look at our demographics. We had 51 participants who provided at least one urine sample. They were all non-smoking, Hispanic/Latina women who primarily spoke Spanish. The mean age was 41, and a majority owned their home, and had Medi-Cal or Medicare, and most participants were either farmworkers or worked in some sort of food packaging and processing facility.

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STEPHANIE JARMUL: So we put together this timeline to try to help clarify what data were collected and when, since there's so many moving parts. And as we'd stated, the study was designed to try to capture exposures

during a wildfire event. So what -- we collected a first morning void sample in the spring/summer months to establish sort of baseline exposures. Surveys were also conducted at that time.

At the same time, we installed PurpleAir monitors to monitor for PM and passive air samplers for PM and metals at the homes of the participants. And then we installed the portable air cleaners in all the homes and the swamp cooler filters in half the homes, in hopes to prepare for a wildfire event. As we did not have any major event, we waited until October to collect the urine samples. We collected one in the evening and then another a first morning void. This design was chosen to see if there might be any potential differences in the metabolites of PAHs and VOCs, after spending time in the filtered air. And that's because the PAHs and VOC half-lives are short, generally within six to eight hours.

And then active air sampling was conducted for the 24-hour period preceding the collection of the fall morning samples. And we collected VOCs, PAHs, and metals data for that.

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STEPHANIE JARMUL: So getting into the data analysis. Non-detects were imputed with reporting limit over the square root of two and we did not conduct any

analyses, if we had detection frequencies less than 65 percent. The urine results were adjusted for specific gravity to account for dilution and adjust -- and were log transformed. However, we did use creatinine-adjusted values for our comparisons with NHANES.

The number of samples may change depending on the analysis, as not all participants provided all three urine samples. And then for any of our geospatial analyses that we're including today, we were provided with approximate participant locations to not include any PID.

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STEPHANIE JARMUL: So here are the detection frequencies we had in the chemicals measured in urine. And you can see we had pretty high detection frequencies for almost all the chemicals, though 1,3-butadiene, benzene, and manganese all had low detection frequencies, and therefore they'll not be included in the analyses on the following slides.

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STEPHANIE JARMUL: So one of the questions we had was we wanted to see if the levels of PAH and VOC metabolites decreased after spending time in filtered air. We did not look at metals for this question as our half-lives were much longer. And we would not expect to see a difference in such a short amount of time. We also

checked if we could see any difference in metabolite levels based on intervention types, similar to the question that Mohammad wanted to answer using the PM data.

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STEPHANIE JARMUL: So participants, as I mentioned, provided urine samples in the evening, generally when they got home from work, and then again about 12 hours later after sleeping at home in the morning sample. And so what this plot shows is the estimated percent change in concentration between a participant's fall evening and fall morning urine sample. The color blue here - this may be a little hard to see - means the difference was significant. And so you can see that metabolites of fluorene, phenanthrene, and pyrene were either about the same or lower during this time period, while metabolites of naphthalene increased, particularly 2-NAP. And this might point to perhaps an indoor exposure source of naphthalene that we'll get into a little bit later.

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STEPHANIE JARMUL: And then looking at the VOC changes, again this plot shows the estimated percentage change in VOC metabolite concentrations overnight. And similar to the PAHs, you can see that metabolites of VOCs were about the same or lower during this time period, and

with acrolein being significant and about 20 percent lower in the morning samples than the evening samples.

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STEPHANIE JARMUL: So as I stated, metabolites of both PAHs and VOCs generally decreased after spending time indoors, except for naphthalene. This might partially be explained by air filtration, but it could also be due to differences in behaviors during work versus while they're at home.

We did look at differences in the spring versus fall samples based on paired t-tests of the morning samples. Since, as we mentioned, we were originally expecting much higher pollutant levels in the fall due to a wildfire event. However, as there was no major wildfire event, we did not see any significant differences between the fall and spring morning samples.

We also did not see a significant difference in metabolite levels based on the intervention type. And Jeff Wagner's team had a similar finding for the PAHs and VOCs in air. Again, since we didn't have a major wildfire event, I think it would be hard to see differences at that level of granularity in the biomarkers especially. And also our Ns reduced even further when we had to split them among the two intervention groups.

And additionally, it was found that a majority of

participants were not actually running their swamp coolers the night that we collected the urine samples and had the 24-hour air sampling, which makes even more sense why we weren't able to see a difference.

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STEPHANIE JARMUL: Okay. So the next question we had was how do the levels of metals in PAH and VOC metabolites in FRESSCA-Mujeres compare to NHANES?

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STEPHANIE JARMUL: Starting with metals

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STEPHANIE JARMUL: So we used a geometric means of each participant's geometric mean across all three time periods to compare to NHANES. We saw similar results when we compared NHANES to each time period separately, which is why we felt comfortable with this approach. You can see here that the geometric means of antimony, arsenic, and cadmium were similar or lower in FRESSCA compared to NHANES non-smoking women.

Mercury was higher, though not significant. Nickel was the only metal where we saw significantly higher levels than NHANES. However, we also had seven cases of mercury and/or arsenic levels above Biomonitoring California's Levels of Concern, which I'll be going into more details a bit later.

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STEPHANIE JARMUL: So for nickel, it was about 1.5 times higher in FRESSCA compared to NHANES. We didn't find anything unfortunately that jumped out based on the questionnaire data. And we asked questions such as working with metals, either through their occupation or hobbies, and we didn't see any difference based on occupation. We also did not have any detects in the FRESSCA air sampling data that was for the 24 hours before sample collection. However, we did have a number of detects in the passive air samplers and also the EC filters. And those were up for a much longer period of time.

So the fact that we're seeing nickel in those samples might be more relevant due to the long half-life of nickel. This also indicates exposures might still be coming from air, since they were captured in those filters and the samplers and will be -- and nearby oil and gas activities might be a potential exposure source, which again we'll talk about a little bit later. And just to check, we did look at the drinking water data and did not find any detects of nickel in the drinking water data for these participants.

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STEPHANIE JARMUL: So as I discussed, we had five

participants who had mercury above Biomonitoring California's Level of Concern and they all received early notification. Three of those participants agreed to participate in an additional exposure survey. The image to the right here includes a number of products imported from other countries that CDPH has found to contain mercury. These are skin creams. Two of them were used by our participants and we connected these participants with a team at CDPH who was actually able to test the skin creams of the participants and found mercury in all the samples of their skin creams.

And CDPH also conducted home assessments for two of those participants and did not find any other exposure sources in the home, which confirmed that the skin creams are the most likely source of these high mercury levels in the participants.

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STEPHANIE JARMUL: And then we had three participants who had total arsenic above Biomonitoring California's Levels of Concern, and again received early notification from our team. One participant had high levels of organic arsenic, which is likely due to seafood consumption and then less of a concern. Two participants did though have elevated inorganic arsenic levels. One agreed to participate in an additional exposure survey.

Unfortunately, nothing really stood out based on the results of that survey, but we think we can at least rule out drinking water for this participant as they were using vended water for drinking and cooking, which removes arsenic. And we also did not find any high levels of arsenic in the drinking water data for this participant.

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STEPHANIE JARMUL: Okay. So next, we wanted to look at VOCs and any potential differences in the metabolites in FRESSCA compared to NHANES.

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STEPHANIE JARMUL: So metabolites of acrylonitrile and crotonaldehyde were similar or lower than NHANES, but acrolein and propylene oxide were significantly higher in our FRESSCA population than NHANES non-smoking women.

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STEPHANIE JARMUL: And so we wanted to look into what exposure sources might be contributing to the high levels of acrolein and propylene oxide metabolites in our participants. And while all samples, so spring and both fall and morning samples -- fall morning/evening samples were generally higher than NHANES, we still did see higher levels in the post-work evening samples for both acrolein and propylene oxide. So it's 27 percent higher in the

acrolein metabolites and 16 percent higher in the propylene oxide metabolites.

We also found for acrolein that the levels were 17 percent higher for each additional hour worked outside. We think that this points to potentially exposure sources that are happening outside the home for these participants. And we did also find evidence that acrolein and propylene oxide were ingredients in pesticides that were applied in the region in 2023. And that was based on DPR data. And unfortunately, we did not have FRESSCA-Mujeres indoor or outdoor air monitoring data for acrolein or propylene oxide.

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STEPHANIE JARMUL: Okay. And as I alluded to, additionally for both acrolein and also nickel, we wanted to see if the high levels in our population might be explained by oil and gas activities in the Central Valley. Elevated levels of acrolein were found in the air in Lost Hills, a community within Kern County, which is one of our counties. And that's based on data from CARB's SNAPS report. Nickel is also often detected in air around oil and gas activities such as oil refineries. And you can see in this map that there are literally hundreds of oil and gas wells in these communities and a number of oil refineries as well.

We only had six participants however who lived within 3,200 feet of an active well. And we chose that buffer, because it is considered the health protection zone around oil and gas operations. And that's out of Senate Bill 1137, though we are planning on looking at some larger buffer zones in the future as well.

And even though only six participants lived within 3,200 feet of a well, we don't have the locations of participant work locations, which may be more relevant to their exposure period, since that would be where they would be exposed to unfiltered outdoor air. And, yes, we do not have those locations unfortunately.

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STEPHANIE JARMUL: Okay. Switching to PAH metabolites in urine.

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STEPHANIE JARMUL: So again, we compared the geometric means of participants in FRESSCA to NHANES, and found that the PAH metabolites were all lower in FRESSCA-Mujeres women, which was good news, except for 2-naphthol. So you might recall hearing a lot about 2-naphthol from our SAPEP and BiomSPHERE studies, where it was also elevated.

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STEPHANIE JARMUL: So you can see in this graph

here, we compared the levels from FRESSCA-Mujeres, which were all non-smoking Hispanic women to a subset of women from our BiomSPHERE study, which were also Hispanic women. And then we wanted to look specifically at the Hispanic women in NHANES since, from some of our previous analyses, we know that it is generally higher than the average levels in NHANES adults, either women or adults, both male and female.

And you can see here that the FRESSCA Hispanic women had similar levels of 2-NAP compared to Hispanic women in BiomSPHERE. And then the levels of 2-NAP in both FRESSCA and BiomSPHERE Hispanic women were still 2.5 times higher than Hispanic women in NHANES and four times higher than women in NHANES.

Just want to note here, you can see that the most recent data we're still working with in NHANES is from 2015 to 2016, which is almost a decade ago.

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STEPHANIE JARMUL: And we also saw something similar in our BiomSPHERE study with these correlations. And you can see that the PAHs were all significantly correlated with each other, including 1-NAP, except for 2-naphthol. The difference is pretty stark here, so we think there's definitely a unique exposure to 2-NAP that is not relevant to the other PAHs.

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STEPHANIE JARMUL: So we showed earlier on in our slides that the 2-NAP levels were 16 percent higher in the morning samples versus the evening samples, again pointing potentially to an indoor exposure source. We did not find any significant associations with cleaning product or air freshener use, which is different from what we had found in BiomSPHERE. Unfortunately though, similarly to BiomSPHERE, we did not find any significant associations with diet, such as consumption or cooking in fried or smoked foods. But we might be missing some other associations with dietary sources that we did not capture in our questionnaire.

Additionally, some recent data that we've come across in terms of speaking with other biomonitoring programs indicates that 2-NAP is generally increasing both in the country and actually globally, but nowhere near the levels that we are seeing in SAPEP, BiomSPHERE, and FRESSCA.

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STEPHANIE JARMUL: So again, still trying to piece together the puzzle that is 2-NAP in our populations. But with that, I will turn it back over to Ileana who will discuss the community impacts and perspectives of the FRESSCA-Mujeres study.

ILEANA NAVARRO: Thank you, Stephanie.

Can we go to the next slide, please.

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ILEANA NAVARRO: Thank you. So the community response to FRESSCA has been overwhelmingly positive and incredibly insightful. Participants expressed deep gratitude for the portable air cleaners, for the free maintenance to their swamp coolers that we provided. And they reported noticeable improvements in their indoor air quality and even in their health.

Although we didn't experience a major wildfire event during the study period, many participants told us that the interventions made a real difference during dust storms, which we get a lot. With the swamp cooler filters in place, participants felt far less dust penetrated their homes, making these events a little bit more manageable.

However, participants did note that the biggest challenge was the bulky filters and the difficulty to install them and remove them. Beyond air quality though, participants were genuinely shocked to learn about the mercury-containing skin creams. A few actually owned these products, as you heard, and were super grateful to understand the health risks that they -- that they were posing. Most importantly, participants felt empowered by being part of this research.

It was a bit hard to grasp the technical analysis in the results packets that they received at the end of the study, but most participants already knew that they were being affected someway or another. They just didn't understand at what levels. And this study brought them that sense of credibility to their stories they've been telling for years, but no one has really taken seriously.

And at the end, they really just wanted to know that their participation would lead to better and more accessible filtration options for the agricultural communities in -- in the Valley.

Next slide.

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ILEANA NAVARRO: And as mentioned at the beginning, I'm going to play the rest of Erika's video where she talks more about the FRESSCA -- how the FRESSCA study impacted her.

(Thereupon a video was played.)

ILEANA NAVARRO: Next slide, please.

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ILEANA NAVARRO: Lastly, I'm just going to talk about the next steps for the FRESSCA-Mujeres project. We are planning to promote ways to reduce exposures in the FRESSCA-Mujeres communities and beyond through portable air -- portable air cleaners in homes, swamp cooler

filters during a wildfire event, and conducting some community engagement to reduce those exposures to mercury skin creams that we found and to arsenic. We also want to continue research to identify potential exposure sources of naphthalene and other chemicals of interest. Through this -- we want -- to do this, we want to combine data from the FRESSCA-Mujeres, BiomSPHERE, and the SAPEP to identify trends and also assess geospatial predictors of traffic exposures.

And with that, that is the end of my portion of the presentation. I'll pass it back to Stephanie.

Thank you all.

STEPHANIE JARMUL: Thank you so much, Ileana.

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STEPHANIE JARMUL: And here, we have our very large study team for the FRESSCA study, with whom we could not have done any of this work. So thanks. And some of them are here today, so it's nice to see them.

[SLIDE CHANGE]

STEPHANIE JARMUL:

And, of course, thank you to our community members who participated in this project, the scientific advisors and the Community Advisory Group. And here's the funding statement.

[SLIDE CHANGE]

STEPHANIE JARMUL: And with that, we'll take any questions for any of the three of us.

ACTING CHAIR PADULA: Thank you, team, for a great presentation. Any -- starting off with clarifying questions from the Panel.

Go ahead, Tom.

PANEL MEMBER McKONE: Tom McKone. I'm really and also kind of fascinated by the 2-naphthol and why that differed. And so you looked at diet, but I was wondering if you looked at how food is prepared differently in California, like -- or even such a thing as our natural gas. I assume they're using gas. There's a different composition than the average we would see in NHANES. And then thoughts I had about what might account for the different indoor level of naphthalene.

STEPHANIE JARMUL: That is an interesting thought, because I'm pretty sure all of the FRESSCA participants used gas appliances and had a gas stove. So I don't -- yeah, we never really looked into if there could be different compositions of the gas in California or particularly in the Central Valley. So that's some associations we can run. I think we're mostly looking at VOCs for those associations. But, yeah, we should look into naphthalene specifically. Thank you.

ACTING CHAIR PADULA: Carl.

PANEL MEMBER CRANOR: It's a simple question, but did you have a measure of toxicity in selecting the substances you studied or did you just take what was present?

STEPHANIE JARMUL: Sorry. Do you mean how did we choose the metabolites to measure?

PANEL MEMBER CRANOR: Yes.

STEPHANIE JARMUL: Well, we had chosen PAHs, VOCs, and metals, because, as we mentioned, the goal of the study was to capture a wildfire event and we were aware that these are generally apparent in wildfire smoke. And the exact metabolites we're able to run, it was a bit limited by what our labs were able to run. And, of course, it to be on the designated list, but there was evidence that all the ones that we chose are often present in wildfire smoke.

PANEL MEMBER DURRANI: Timur Durrani. I thought you mentioned that you guys had also measured biomarkers of stress in urine. Can you talk a little bit about that?

STEPHANIE JARMUL: Yeah. So for our other studies, we measured only three or four biomarkers of stress through Nina Holland's lab. And for the FRESSCA study, this is -- this is not really Biomonitoring California's part of the study, but as the FRESSCA-Mujeres study, they measured 19 different biomarkers of stress

from a lab out of New York. And so we do have plans to look a little bit more closely at that data and see if we can see any associations between the biomarkers of exposure and effect. But we're not as clear how to handle all those 19, so it might take us a little bit longer to try to make sense of all the data.

ACTING CHAIR PADULA: Go ahead, Jenny.

PANEL MEMBER QUINTANA: I'm sorry if you touched on this, but could agricultural burning contribute to the naphthalene exposures or metabolites? I wasn't sure if that was an area that had a large contribution, but I think -- I know many -- much of the Central Valley does have a fairly large contribution.

Thank you.

STEPHANIE JARMUL: I think it could. Although, we aren't seeing very high levels in air for naphthalene. You know, it's always the most abundantly detected PAH, but at levels that we see in other areas too where we don't see the same high levels of 2-NAP in the urine.

PANEL MEMBER QUINTANA: Thank you.

PANEL MEMBER SUÁREZ: How about the prevalence of the use of mothballs in this population?

STEPHANIE JARMUL: Unfortunately, we did not ask about mothballs. This is going on at the same time as our BiomSPHERE study, so before we really learned that we

should add that to a future study, which we are going to do for the CHAIRS study. We did not ask specifically about mothball use. But for every single person to be using mothballs, it just seems unlikely. Although, it might still be possible.

PANEL MEMBER SUÁREZ: I mean, not every single -- I mean, it -- was it substantially higher in every single person or are we just --

STEPHANIE JARMUL: I think --

PANEL MEMBER SUÁREZ: -- looking at the average here comparing --

STEPHANIE JARMUL: I think every single person had very high levels. Of course, there was a range. I don't know, Dan, if you have a little bit more details on that, but...

PANEL MEMBER SUÁREZ: That would be unusual.

DAN SULTANA: Yeah, it was generally higher for -- in the study.

STEPHANIE JARMUL: Oh, that's right. When we talked to the Minnesota Biomonitoring team about some higher levels that they were seeing, though not as high as hours, they had asked a question about mothballs. And I think they only found like a few people had been using them in their population.

PANEL MEMBER SUÁREZ: Right. I mean, I wonder if

their difference isn't in their population versus here.

STEPHANIE JARMUL: It's true there were -- yeah, they didn't have as many Hispanic people in their populations. And interestingly enough, they had found elevated levels in Black participants, which if you recall in BiomSPHERE, we had found a similar finding, although we only had a few Black participants in the study, so we couldn't really make any conclusions, but it's interesting that they're finding a similar trend.

And then there is a study that recently came out in the east coast, I think Maryland/D.C. area. It was a small study looking at occupational exposures to hairdressers, both Black and Latina women. And that's the only study we found that has come close to the levels that we're seeing in our population, which is very interesting, but our population was not obviously hairdressers, so -- yeah, that's something else that we're looking over.

PANEL MEMBER DURRANI: Timur Durrani. Can you talk about the exposure survey that went on for -- I know you did it for mercury, but for arsenic. How did that go about or is that -- can someone review how did that occur once you see this level above a threshold.

STEPHANIE JARMUL: So I might pass it to McKenna, but -- so, when we are notified that the levels are above our Level of Concern, we essentially send them a packet

that is -- let's them know that the levels are above a concern and potential exposure sources and then we invite them to participate in another exposure survey that asks more detailed questions about potential exposure sources. So for arsenic, you know, we even asked about like teas, supplements, where they got their drinking water source from, things like that. And for that one participant who conducted the additional survey, we were not able to find anything significant that stood out. We asked even about like specific brands that we looked into and couldn't find anything.

McKENNA THOMPSON: I think you covered it.

(Laughter).

ACTING CHAIR PADULA: We can also open it up to a general discussion, if we haven't already.

PANEL MEMBER SUÁREZ: I have more questions. And part of it is the same thing trying to understand what you make of it. So looking at that same table here comparing the VOCs. And this is José Suárez, by the way. Sorry.

Naphthalene, right, is higher, but then the other part is substantially lower for pretty much everything else. What are your thoughts on that?

STEPHANIE JARMUL: You mean, for the PAHs in general, why they're lower?

PANEL MEMBER SUÁREZ: Well, the ones that are at

least shown here, right?

STEPHANIE JARMUL: Yeah. That is a very interesting question. I'm not really sure why they are so much lower? You know, they're significantly lower in our population, which, you know, we take as good news, but I can't really say why.

PANEL MEMBER SUÁREZ: Yeah. I mean, it's something that once you're getting to that part of it, writing and doing the discussion, it is also a very interesting finding, what is it about these populations that are leading with that, but it sounds like somebody maybe has a thought.

McKENNA THOMPSON: I was just going to point out, I believe our -- this is McKenna Thompson from OEHHA.

(Laughter).

McKENNA THOMPSON: I believe our collaborators at UC Berkeley have found that PAHs in air in the Central Valley in general have been going down over the past 10 years, so that could be a contributing factor.

STEPHANIE JARMUL: And is that due to like different regulations?

McKENNA THOMPSON: (Nods head).

STEPHANIE JARMUL: Yeah.

DR. JOHN BALMES: Yes.

STEPHANIE JARMUL: Okay. Great.

(Laughter).

That was John Balmes in the affirmative.

DR. JOHN BALMES: Less diesel emissions and less agricultural burning.

STEPHANIE JARMUL: Okay. John Balmes said less diesel emissions and less agricultural burning. Okay.

PANEL MEMBER SUÁREZ: Would it be enough to explain this lower concentration versus NHANES for that matter? Are the -- is the pollution substantially lower as a result of that in the Valley than the average U.S. area?

DR. JOHN BALMES: No, actually -- this is John Balmes again. Actually, the levels are higher in -- they've gone down substantially, but they're higher than many parts of the country. I mean, the Fresno area and actually at the Bakersfield area, those are two of the most polluted cities in the country --

PANEL MEMBER SUÁREZ: Yeah, that was --

DR. BALMES: -- from traffic related air pollution.

PANEL MEMBER SUÁREZ: That was my understanding too, but I was coming back to this, right.

STEPHANIE JARMUL: Great point. Great question that we'll look into further.

PANEL MEMBER SUÁREZ: I can --

ACTING CHAIR PADULA: You have a question.

PANEL MEMBER SUÁREZ: I have more questions, but I'll --

SUSAN HURLEY: After him.

PANEL MEMBER SUÁREZ: Oh, no. Please, please go ahead.

SUSAN HURLEY: Okay. Well, it's kind of related to that just that -- oh, Susan Hurley from CDPH, Biomonitoring.

Just following up on John's point. While the levels of a lot of PAHs in the air may be going -- or may be higher in California. The other thing to remember is we do have this temporal issue, where we're comparing our levels to data in NHANES that was collected 10 years ago. So we can't tell if this is a geographic issue or a temporal issue.

DR. BALMES: That's a very good point.

STEPHANIE JARMUL: Great point. And even that for fluorene it was 2011 to 2012, so even longer than -- and I don't know how hopeful we are that any new data might be coming out soon.

STEPHANIE JARMUL: José.

(Laughter).

PANEL MEMBER SUÁREZ: José Suárez. So another big thing was compliance that you were concerned about.

Tell me a little bit more about -- do you have any numbers about compliance in that sense. And part of the concern seems to be the overnight use tool of running -- actually running the swamp cooler or not using it, for that matter.

DR. MOHAMMAD HEIDARINEJAD: Yeah. I mean, usually, in general, like during the nighttime it's cooler. So they are not running the coolers that much that's needed for the study here. So maybe like change of the study design. Is it like better to do it maybe during the day or something, rather than like morning and nighttime?

STEPHANIE JARMUL: Well, I guess the problem is if they were at work during the day though, then it wouldn't be capturing those exposures anyways. Can you talk a little bit more about -- Mohammad, about the plug load loggers --

DR. MOHAMMAD HEIDARINEJAD: Sure.

STEPHANIE JARMUL: -- and how they work to determine --

DR. MOHAMMAD HEIDARINEJAD: Yeah. Like if the -- like for all the devices like portable air cleaners and swamp coolers as much as possible, so we had plug load loggers. So we -- meaning that we know when they are running it and how are they running it? Are they running it at low speed, medium speed, or high speed? So we're

able to capture like their usage and understand -- especially for portable air cleaners and the swamp coolers. If you are running it at a low speed for portable air cleaners, so you're not getting enough clean air delivery rate, CADR.

So ideally you want to make sure you run it at high speed to get that portable air cleaner like removal efficiency needed. The same thing with like the swamp coolers. If you're running it at a higher speed, meaning they're pulling more air coming in, even if you have the filters on, they might not be effective at some point.

But I would say in terms of like compliance and running it during the nighttime, we were able to identify a method to know when they're running their swamp cooler based on the outdoor temperature. We call it like predicted to be on and also like measured on. And during the nighttime usually it's cooler, so they are not running those coolers, as much as you could see in terms of the filtration efficiency there.

DR. MARTHA SANDY: Martha Sandy, OEHHA. So I wasn't part of the study design team, but a couple years previous to when this study -- when they were in the field, we had multiple summers with lots of wildfire smoke events, when it was hot, you know, the dog days of August, for instance, and you would predict they would have had

their swamp coolers on at night. I'm just -- and someone may want to add more.

DR. MOHAMMAD HEIDARINEJAD: Yeah, that's -- I mean, that's really in terms of the why part. I think the maximum we got in that September was about maximum, maybe 35 microgram per cubic meter compared to what you see during the wildfire time, usually that get to 100, 150. So we didn't have that magnitude at that time.

The other one is like, of course, the extreme heat become a factor there. When it's like significantly warmer, you run the cool air more than before.

DR. NERISSA WU: So this is Nerissa. I had a question. Did you get any feedback from participants about the use of the swamp coolers, in terms of noise or the expense of running it? As an intervention, is it something that be would acceptable to the families to have them on?

DR. MOHAMMAD HEIDARINEJAD: Sure. I mean, we had a survey. I think, Julie, you looked at the survey, but I can answer a few things. Like looking at the pilot year, for example, we had DIY air cleaners, like these Corsi-Rosenthal, you know, air cleaners there. Like usually they didn't like it because it was moving a lot of air in the room, so they were like putting it in the closet or somewhere else, so that's why we decided in the

full intervention to go with smaller units, that they are more effective, but smaller, and they don't run that amount of air flow in the space.

In terms of the swamp coolers, I think one of the complaints they had was if you are getting these swamp coolers with different like very, like, you know, random shapes, like the narrow ones, so you end up maybe using like four or six maybe filters rather than three or four that is like recommended. So that's why it becomes a little bit bulky and they didn't like that one.

But I think it's an iterative process. Over time you like run different filters install them, get the feedback, and overtime you can polish these DIY solutions with a combination of filters, and, you know, like, you know, seeing like sheet filters that could be appended to those like narrow version of the swamp coolers.

Julie, I don't know if you want to add anything about the survey. We did a survey of the 50 homes, correct?

JULIE VON BEHREN: Hi. Julie Von Behren, UCSF.

We did ask some satisfaction related surveys for the ECUs. And one of the things that I just wanted to add to what you already said was that cost was a definite issue. We asked about a price point. Would they be comfortable spending, because it is a DIY. And I think it

was pretty low, like $20 or less, is what they indicated.

DR. MOHAMMAD HEIDARINEJAD: That's true, yeah. I think if I recall correctly, it was 20. Thank you, Julie. And our solution from the beginning, we were aiming about maybe $100. But we ended up going a little bit higher than that. Also like, Ileana, if you have more from the field, that would be good.

ILEANA NAVARRO: You know, we -- I don't think we ever received any complaints about noise or the air cleaners being too loud, nor the air filters on the swamp coolers. I think what Mohammad said about it being bulky and just the size of it was the only issue, but yeah, no complaints about noise.

ACTING CHAIR PADULA: Go ahead, Carl.

Sorry, you need a mic.

PANEL MEMBER CRANOR: Thank you. Carl Cranor. UC Riverside. I want to ask a big question. You've studied a group of substances that are worth studying. If you took the universe of airborne toxicants, what have you left out? Do you know? Have you thought about them?

(Laughter).

STEPHANIE JARMUL: I mean, we do think about them ahead of all of our studies and sort of what's most relevant to measure. We always do research ahead of time to figure out what we might expect to see based on the

exposure sources that we're interested in, particularly air pollution. And again though, it also depends on what we're able to measure based on our designated list and also what our labs can measure. So I think that is a big limitation is sort of what methods have been developed or not been developed. But I'm sure there are things that we are missing and we continue to evolve and add more chemicals as we can. But if you have any ideas --

PANEL MEMBER CRANOR: Let me ask -- let me ask you about one of them.

STEPHANIE JARMUL: Okay.

PANEL MEMBER CRANOR: Air particulates are really nasty. I mean, you haven't done those I suppose or these are components of air particulates, but should the air particulates be studied in a similar way?

STEPHANIE JARMUL: Are you talking about particulate matter, in particular, like a biomarker for particulate matter?

PANEL MEMBER CRANOR: Sure.

(Laughter).

STEPHANIE JARMUL: You know, I'm pretty sure -- I don't know if Jeff Wagner is on. I think he's done some work sort of looking more closely at like breaking down the particulate matter in air and getting more ideas of like what it's actually made up of. Jeff, are you on and

want to talk a little bit more about that?

DR. JEFF WAGNER: Yeah.

(Laughter).

DR. JEFF WAGNER: So -- I'll go on camera. Yeah. We are -- our lab did -- in addition to the continuous monitoring that Mohammad was talking about today, we did electron microscopy of the particulate matter. And so we were able to get the different size fractions, the different chemical components and some source information about the different particle types.

So we looked at fine particles, coarse particles, metals in the particles, but I have a feeling you might also be asking about what Stephanie mentioned, which is some kind of biomarker of the particles themselves. And that's an interesting question. I'm only familiar with that type of work for microplastics personally, as far as particles that don't dissolve and persist in particulate form in various fluids and tissues. So I don't know, that's an interesting question. Also asbestos. Other types of persistent particles that don't break down and would be detectable in tissues or fluids. I think that's an interesting question.

REBECCA BELLOSO: Hi. This is Rebecca Belloso from OEHHA. We do have three comments from attendees online. So I'll start reading the first one.

It's from an anonymous attendee. "I remember hearing about widespread outdoor grilling in the Central Valley and that it contributes to poor air quality. Would this contribute to naphthalene? Though it seems odd that other PAHs didn't increase given grilled food contains high levels."

STEPHANIE JARMUL: I think they stated it.

(Laughter).

STEPHANIE JARMUL: They answered my question. But also, again, we did find naphthalene in the air, although not at particularly higher levels than we've seen in other studies. And we did not see any associations with naphthalene in air and the naphthalene metabolites. But we only had eight outdoor air monitors. So we didn't have as specific of data for the outdoor air as we did for the indoor for the chemicals, including naphthalene.

REBECCA BELLOSO: Thank you. The second question is also from an anonymous attendee. "I believe nap-containing mothballs are not allowed to be sold in California."

STEPHANIE JARMUL: Great point. That is also true. Although, you still could technically buy them. I think we've even found them in some stores and you can buy them online, but you are not supposed to.

(Laughter).

REBECCA BELLOSO: And the third question is also from one anonymous attendee. "How does your LOD compare to NHANES for naphthalene?"

And I believe Dan Sultana may have an answer to that.

DAN SULTANA: Yeah. So our -- it was a -- the -- it was about half of what the NHANES LOD was, but both NHANES and FRESSCA have hundred percent detection rates. So we don't think it's as elevated -- LOD difference isn't explaining the higher levels we're seeing.

ACTING CHAIR PADULA: Any other questions online?

Okay, José.

PANEL MEMBER SUÁREZ: Since we're talking about naphthalene, I'm looking at here the -- your -- the results that you have for the overnight difference.

STEPHANIE JARMUL: Um-hmm.

PANEL MEMBER SUÁREZ: So this is -- so these differences are actually not the night and the morning. Kind of. Tell me a little bit about that, because it is -- you collected the urine in the morning and then in the evening, right?

STEPHANIE JARMUL: So the first sample was collected, let's say, on a Tuesday after work. We instructed them immediately upon coming home from work take a urine sample. And then 12 hours later when they

woke up to take the first morning sample. Yeah, so it was --

PANEL MEMBER SUÁREZ: So it was evening and then morning.

STEPHANIE JARMUL: Exactly, yes.

PANEL MEMBER SUÁREZ: Okay. So then it makes sense. So, I mean, the interesting thing here is that the concentrations do go up overnight --

STEPHANIE JARMUL: I know.

PANEL MEMBER SUÁREZ: -- which really is pointing not at a nutritional source necessarily, unless it takes a little bit of time for it to -- if they ate something at 5 p.m., some meat that had it, maybe gets absorbed and you see it in the morning. The other one would be maybe there's something in the indoor environment that's leading to that.

STEPHANIE JARMUL: And it's -- you know, based on this recent study that came out on hairdressers, and just some more evidence that we had that, you know, it could be used in dyes and fragrances. I'm wondering if it's, you know, in some sort of personal care products and it's maybe being hidden under the label of fragrance. We don't know, but that's one of our pet theories.

PANEL MEMBER SUÁREZ: Under fragrance, you would think of naphthalene, really?

STEPHANIE JARMUL: Yeah.

DR. MOHAMMAD HEIDARINEJAD: These measurements are conducted in October?

STEPHANIE JARMUL: Correct. Yeah. This one is specifically October, yeah.

DR. MOHAMMAD HEIDARINEJAD: So that's why maybe during the night, they don't need to run the swamp cooler.

STEPHANIE JARMUL: Exactly. Yeah.

ACTING CHAIR PADULA: And that was the time that the swamp coolers were put on, even though there was no wildfire too, so there was kind of a less of (inaudible).

STEPHANIE JARMUL: Yeah. We had a hurricane during that season, where we actually -- I can't remember if you were there -- Mohammad was there, but a team had to go and remove -- at least CCEJN was very involved -- remove the filters during the hurricane and then put them back on. So it was a very strange year that that happened --

(Laughter).

STEPHANIE JARMUL: -- that we weren't really prepared for.

PANEL MEMBER SUÁREZ: No. I do want to congratulate you though for the work -- the whole -- I mean, you can tell there was so much thought process going in there. It is very challenging to do an intervention

like this, especially with the cost, the filtration, the monitoring, the biomonitoring, so many different components. In that sense, I think it was a very successful intervention, and not only from the indoor part of things. Of course, it didn't turn out with all the VOCs and things like those, but there are reasons to believe that, given the right conditions, it may actually be far more beneficial than what we're observing, right? There were no major events of fire that happened for you to really look at the differences.

So I think it's very encouraging that this is, you know, very easily implementable. And it seems to be moderately well received intervention by the different communities.

STEPHANIE JARMUL: Thank you. And just a big -- I want to make sure I give a big shout-out to Gina Solomon and Nayamin Martinez, who were the initial PIs of the FRESSCA and FRESSCA-Mujeres studies and sort of brought this larger great team together.

ACTING CHAIR PADULA: I just have one follow-up question to this conversation. I was wondering if we've -- if -- I guess some of this makes me want to look into the work of Ami Zota, who's done a lot on hair products and chemicals. And I was wondering if that's come up?

STEPHANIE JARMUL: Yes. We are looking into it. We are aware of it.

ACTING CHAIR PADULA: Okay.

STEPHANIE JARMUL: Yes.

ACTING CHAIR PADULA: Great. And then I was just also wondering about the energy costs, whether that was of concern?

DR. MOHAMMAD HEIDARINEJAD: Not a concern, because, in general, swamp coolers, like the cost of operation, it's about like maybe one quarter of if you're running like split systems.

ACTING CHAIR PADULA: Okay.

DR. MOHAMMAD HEIDARINEJAD: So like that's not a concern, but technically if you're adding a filter to the swamp coolers, you're increasing a little bit the power consumption, but not as much as like that could be a concern.

STEPHANIE JARMUL: Jenny has a question.

ACTING CHAIR PADULA: Great. Jenny, you want to go ahead.

PANEL MEMBER QUINTANA: Sure. I think there's time for just a quick question. Just -- I was just wondering about housing type and if it was -- differed from other housing? And I guess I was just thinking of that whole FEMA trailers and formaldehyde, know, thing

with the Hurricane Katrina. So it just made me think about housing type and if they're more likely to be manufactured housing or something like that.

Thank you.

DR. MOHAMMAD HEIDARINEJAD: They're usually like manufactured housing, smaller ones in terms of their like square footage, but they are usually smaller than the typical we see in the U.S.

STEPHANIE JARMUL: And I think for the biomonitoring samples, we did look into any potential differences based on housing type and we did not see any.

PANEL MEMBER QUINTANA: Thank you.

DR. MOHAMMAD HEIDARINEJAD: And just going back to the energy cost questions, like for different projects we are paying participants for running the portable air cleaner all the time, but that doesn't help to make sure they're running it.

(Laughter).

ACTING CHAIR PADULA: All right. If that's it for questions. I think we'll wrap-up and thank you to the FRESSCA team for a great presentation.

(Applause).

ACTING CHAIR PADULA: So in our next agenda item, we will be hearing from Stephanie again.

(Laughter).

ACTING CHAIR PADULA: Sorry, you can't sit down yet. She'll provide a brief overview of the planning for SGP meetings in 2026.

(Slide presentation).

STEPHANIE JARMUL: Thank you. Almost forgot about this one.

(Laughter).

STEPHANIE JARMUL: So as Amy mentioned, I'm just going to briefly discuss our plans for next year's SGP meetings.

[SLIDE CHANGE]

STEPHANIE JARMUL: So we worked with the Panel - always very difficult, since everyone one is so busy - to select the following dates for our meetings in 2026. So we have a meeting on Wednesday, March 4th from 1 to 4 p.m., and then on Monday, August 3rd from 10 a.m. to 4 p.m., and Monday, November 16th from 1 p.m. to 4 p.m. We're still going to be making determinations on each meeting's location. So we'll let everyone know closer to the meeting date and we'll update on our website, but we will still be having the hybrid format throughout 2026.

So we will also still have our standing agenda, which includes a general Program update, and then more detailed project updates, such as updates on our surveillance studies and community studies. As always,

we'll also have time for discussion and input from the Panel and audience. These are some other potential topics of interest that we've put forward that we could consider exploring.

[SLIDE CHANGE]

STEPHANIE JARMUL: And these include either internal or guest speaker presentations on the use of artificial intelligence in class-based semi-targeted screening. It seems we can't escape AI, even if we try. Exposure to microplastics, updates from international biomonitoring programs. I think it would be really interesting to hear what they're researching and some of their results, and then, of course, impacts of climate change, which has been on our list for a while, such as wildfires, droughts, et cetera, and their impacts on chemical exposures.

So now, we welcome any input from the Panel and audience on these suggestions and additional topics that we might consider. So I'll stop there and see if anyone would like to add anything or have any questions.

It sounds like we have something online.

REBECCA BELLOSO: Yes. We have Feng available. Let me unmute you.

STEPHANIE JARMUL: Feng, are you speaking?

REBECCA BELLOSO: I'm asking her to unmute.

Well, maybe we'll come back.

ACTING CHAIR PADULA: Maybe we'll take Tom's question first.

PANEL MEMBER McKONE: Okay. I don't have a question, I guess. Well, a comment. So the use of artificial intelligence is probably a good idea. I mean, I think stuff is really emerging and to see how it fits. I was looking at the climate change issue. And, I mean, I know we're already doing -- that you're already doing studies about how climate change affects exposures to PM and a whole range of pollutants. I was just wondering if there's a way to begin to integrate -- I mean, not to call it a biomarker of climate change stress, but if there's a way to begin to organize, you know, the multiple stressors that arise from a change in climate into some way of expressing through stress biomarkers or exposure biomarkers how things are changing in the population, so, you know, to kind of quote say a climate change biomarker. But it might be possible to do something like that, define, you know, an array of things you could see in blood that would in -- would show the rising change in those markers of stress and exposure that we could associate with climate change. It's kind of a wild thought, but I mean, it would be different than just individual studies that say wildfires or heat stress or

one thing at a time, but more of an aggregated approach.

STEPHANIE JARMUL: Yeah, that's a great idea. And it would be interesting to look at the biomarkers of stress. And the FRESSCA study did collect telomere length in saliva, which I think is also really interesting. And I don't know if that would be potentially something to look at too, maybe not by -- I don't if our Program could do that, but for others.

PANEL MEMBER SUÁREZ: I have a comment here for Oliver, actually, or questions --

(Laughter).

PANEL MEMBER SUÁREZ: -- or more so. Are you using AI when you're running untargeted analyses and things like that?

PANEL MEMBER FIEHN: Yeah. So in principle, AI is a multivariate analysis if you like. So if you have many, many parameters and you have some output, you can always use AI. So it's a little bit like a progression from machine learning that we had in the past, right? So it's not -- in the sense, AI was already invented in the 1960s, but they didn't have the computers for it, right? Now, we can get really complicated complex, you know, questions answered this way, as you all know. Now, for our non-targeted analysis, my own lab, we do it for retention time prediction, right?

So when you have -- let's assume you have a thousand or two thousand compounds that you see and you want to identify that. The question is how often are you wrong, right, and how can you be not so wrong when you say I found 2-naphthol or whatever, right, instead of like somewhere else that -- some other -- some other isomer, and that's why we use it, but we also use it for multi-omic integration.

So when you have, for example, the prediction of microbiomes that you want to see, what can -- what can they together produce? So any of these AI methods is really looking at large data sets and complex data sets. So the question is that I would have here is do we have those data sets and do we have some kind of outcomes that we could, you know, basically regress on? It's like a -- like a regression, just like a little more complicated than a regression, but yeah, right?

So that is -- that is how we use it these days. Can there be other uses? Yeah. I -- when I looked at this topic, I thought like do we have enough experts or literature to kind of fill it, right? That was a little bit my question.

STEPHANIE JARMUL: Sounds like you might be one of them?

(Laughter).

PANEL MEMBER FIEHN: Yeah, yeah, yeah, but, you know, okay. But in terms of environmental exposure, you know, that's the -- that's the -- that's the thing, and what exactly would we use it for, right? You know, when you look at all the presentations we've had here, there are usually unique barriers. You have a compound, you have a regression in time, or -- you know, and then you have -- or you have box plots, you know, before, after, right? So this is like classic statistics, right, which is fine, you know.

And also to Tom's question, right, can we get a multi-stress composite? That's an AI question actually, right? So but then the next question is do we have the data for it, right? And also some kind of where do we get the data? Is it like coherent? It's like -- it's not that easy. People -- it's easy to say AI. It's hard to get the data for it. That's what I'm thinking.

STEPHANIE JARMUL: Great question. Great answer.

(Laughter).

STEPHANIE JARMUL: Did Feng ever figure out how to unmute? Okay. Okay.

Well, we welcome input any time to our email or you can contact me directly.

Oh, Oliver does have something.

PANEL MEMBER FIEHN: So, you know, I had wondered

a little bit what our target lists to our chemical lists. Should we also want an update on that. And, you know, when we put things on the designated list, you know, have we considered measuring some of them, or are there new chemicals that we should discuss? I have the feeling we haven't done it for a while.

STEPHANIE JARMUL: Yeah. The last time was expanding the PFAS list a couple of years ago, but yeah. And certainly if there is any chemicals that people have in mind that are -- they have interest of adding to the list, if it's not already on, please let us know.

ACTING CHAIR PADULA: Maybe just before I wrap up, I'll just have maybe one other comment in that -- I mean, personally I'm really interested in the combination between that first AI or use of semi or even non-targeted screening, potentially in ones that have already been -- you know, biospecimens that are available or analyses that have already been run, and then rerun them with wildfire or even other climate change factors in mind. So kind of go back and reanalyze the data with kind of new exposure metrics, maybe separating them out by maybe a high climate stress versus not, and then see if there are any differences in some of these non-targeted things, based on that, and -- yeah.

STEPHANIE JARMUL: Thanks. That would be very

interesting to see.

ACTING CHAIR PADULA: At least, if it's already done, then it's maybe not so costly too.

(Laughter).

ACTING CHAIR PADULA: Great. I think then that puts us into the open public comment period. Thank you, Stephanie, for our Program plans for next year.

So we have about 10 minutes allotted for this period. So webinar attendees can submit written comments and questions via the Q&A function of the Zoom webinar or by email to biomonitoring@oehha.ca.gov, and we will read them out loud. And if you wish to speak, please alert us with using the raise hand feature in Zoom and Rebecca will call on you to share your comments live. And then if you're attending in person or wish -- and wish to comment, please come to the front or raise your hand and we'll call on you and bring you a microphone. And for the benefit of the transcriber, we encourage you to identify yourself before providing comment, and -- however, there's no obligation, if you would like to comment anonymously.

This is the quiet before the storm.

(Laughter).

ACTING CHAIR PADULA: And are there any online?

REBECCA BELLOSO: No, we haven't received any comments online.

ACTING CHAIR PADULA: So there will be a transcript of this meeting posted on the Biomonitoring California website when available. And as mentioned earlier, the next SGP meeting will take place on March 4th, 2026 from 1 to 4 in Oakland. And information regarding options for attending the meeting will be made available closer to the March meeting date.

But thank you to the Panel and audience and the meeting is adjourned.

(Thereupon the California Environmental Contaminant Biomonitoring Program, Scientific Guidance Panel meeting adjourned at 3:52 p.m.)

CERTIFICATE OF REPORTER

I, JAMES F. PETERS, a Certified Shorthand Reporter of the State of California, do hereby certify:

That I am a disinterested person herein; that the foregoing California Environmental Contaminant Biomonitoring Program Scientific Guidance Panel meeting was reported in shorthand by me, James F. Peters, a Certified Shorthand Reporter of the State of California, and thereafter transcribed under my direction, by computer-assisted transcription.

I further certify that I am not of counsel or attorney for any of the parties to said meeting nor in any way interested in the outcome of said meeting.

IN WITNESS WHEREOF, I have hereunto set my hand this 4th day of December, 2025.

JAMES F. PETERS, CSR
Certified Shorthand Reporter
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