CALIFORNIA ENVIRONMENTAL CONTAMINANT BIOMONITORING PROGRAM

(BIOMONITORING CALIFORNIA)

SCIENTIFIC GUIDANCE PANEL MEETING

CONVENED BY:

OFFICE OF ENVIRONMENTAL HEALTH HAZARD ASSESSMENT

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH

STATE OF CALIFORNIA

THE CALIFORNIA ENDOWMENT

LAUREL ROOM

2000 FRANKLIN STREET

OAKLAND, CALIFORNIA

THURSDAY, JULY 25, 2019

10:00 A.M.

JAMES F. PETERS, CSR
CERTIFIED SHORTHAND REPORTER
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A P P E A R A N C E S

PANEL MEMBERS:

Megan R. Schwarzman, M.D., M.P.H., Chair

Carl Cranor, Ph.D., M.S.L.

Oliver Fiehn, Ph.D.

Ulrike Luderer, M.D., Ph.D.

Thomas McKone, Ph.D.

Penelope (Jenny) Quintana, Ph.D., M.P.H.

Veena Singla, Ph.D.

OFFICE OF ENVIRONMENTAL HEALTH HAZARD ASSESSMENT:

Lauren Zeise, Ph.D., Director

Allan Hirsch, Chief Deputy Director

Russ Bartlett, M.P.H., Senior Environmental Scientist, Safer Alternatives Assessment and Biomonitoring Section, Reproductive and Cancer Hazard Assessment Branch

Sara Hoover, M.S., Chief, Safer Alternatives Assessment and Biomonitoring Section, Reproductive and Cancer Hazard Assessment Branch

Shoba Iyer, Ph.D., Safer Alternatives Assessment and Biomonitoring Section, Reproductive and Cancer Hazard Assessment Branch

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH:

Kathleen Attfield, Sc.D., Research Scientist, Exposure Assessment Section, Environmental Health Investigations Branch

Robin Christensen, Sc.M., Chief, Biomonitoring Investigation and Outreach Unit, Exposure Assessment Section, Environmental Health Investigations Branch

A P P E A R A N C E S C O N T I N U E D

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH:

Jianwen She, Ph.D., Chief, Biochemistry Section, Environmental Health Laboratory Branch

Jed Waldman, Ph.D., Chief, Environmental Health Laboratory

Nerissa Wu, Ph.D., Chief, Exposure Assessment Section, Environmental Health Investigations Branch

CALIFORNIA DEPARTMENT OF TOXIC SUBSTANCES CONTROL:

Anne Cooper Doherty, Ph.D., Senior Enviromental Scientist

PRESENTERS:

Rebecca Moran, S.M., Staff Research Associate, Department of Public Health Sciences, University of California, Davis

Gina Solomon, M.D., M.P.H., University of California, San Francisco

ALSO PRESENT:

Joe Charbonnet, Ph.D., Green Science Policy Institute

Gino Cortopassi, Ph.D., University of California, Davis

Sandipan Datta, Ph.D., University of California, Davis

Michael Lipsett, M.D., Retired, California Department of Public Health

Joel Tenney, Israel Chemicals

I N D E X

I N D E X C O N T I N U E D

P R O C E E D I N G S

PANEL MEMBER BARTELL: Good morning, and welcome. My name is Russ Bartlett. I'm with the Office of Environmental Health Hazard Assessment.

Just go through a few logistics before we begin. All the meeting materials were supplied to our SGP Panel members, but there still are meeting materials available on the table outside where you signed in.

The restrooms are located to the door just to the left where the Panel members are and immediately to your left. You can also access the restrooms through a door that I'm pointing over there to that side of the room. And if you just go straight and to the left, the rest rooms will be there.

Emergency exit, if we do need to do that, you can go through that door, where I just pointed to, immediately turn left and you'll be back on Franklin Street. You can also access that here to the rest room door, turn left, and you'll be at the door to exit on Franklin Street.

So for the benefit of those who are joining us by webinar or teleconference, today is very important that speakers, if you're using the microphone, please speak very clearly, and also speak close to the microphone, and even hold the microphone like I am doing right now.

This is demonstrating that.

(Laughter.)

MR. BARTLETT: In addition, webinar and teleconference folks, you'll notice that when you joined the webinar today, you were automatically muted. We ask you to please stay muted for the duration of the meeting today. If you do somehow become unmuted, Biomonitoring California staff will immediately put you back into mute mode.

(Laughter.)

MR. BARTLETT: If you are muting -- unmuting more than one or twice, we can expel you from the webinar --

(Laughter.)

MR. BARTLETT: -- but let's not get to that.

(Laughter.)

MR. BARTLETT: Yes. Thank you.

And at this time, I would like to introduce the Director of the Office of Environmental Health Hazard Assessment, Dr. Lauren Zeise.

Thank you.

DIRECTOR ZEISE: Thank you, Russ. So I'd like to welcome the Panel and the audience to this summer meeting, summer 2019 meeting, of the Scientific Guidance Panel, of the California Environmental Contaminant Biomonitoring Program, also known as Biomonitoring California. Thank you all for participating, and sharing your expertise, and

time.

So just a quick overview of the spring meeting of the Biomonitoring Program Science Guidance Panel. The primary focus of that meeting was to discuss the Program's priorities, both near term and longer term. So after a Program update, the Panel provided input on projects to include under Biomonitoring California's submission to the Centers for Disease Control and Prevention, the CDC funding opportunity for the State Program.

And unfortunately, as many of you have heard, your proposal was not selected for CDC funding. So to let you know we're currently engaged in internal discussions on how to address the budget shortfall, and also how to adjust the Program, so those are ongoing internal discussions.

We heard presentations from our three newest Panel Members, Singla -- Veena Singla, Eunha Hoh, and José Suárez. And they discussed research around using measurements in dust to identify chemicals of concern in the indoor environment, applying non-targeted screening analysis to reveal compounds not traditionally biomonitored, and designing intervention studies to evaluate innovative ways for exposure reduction.

And the Panel also provided input on chemical groupings for possible future considerations as potential

designated chemicals, recommending that OEHHA conduct a preliminary screening of quaternary ammonium compounds, or QACs. And we're going to be hearing a presentation on that screening in the afternoon for those compounds and requesting -- and having the Panel look at recommending -- recommendations in that regard and next steps.

So a summary of the input from the March of meeting along with a complete transcript is posted on the March SGP meeting page on biomonitoring.ca.gov. And now I'll hand over to our SGP Chair Meg Schwarzman, who will provide more details about today's meeting and begin the formal part of the meeting.

PANEL MEMBER SCHWARZMAN: Thank you.

Okay. Our adjustment method worked really well here. If you're not speaking right into the mic, I'll just glare at you.

(Laughter.)

CHAIRPERSON SCHWARZMAN: So if you see me glaring at you, that's my reminder with minimal interruption.

We'll try that.

(Laughter.)

CHAIRPERSON SCHWARZMAN: It worked here anyway.

So my job now - thank you, Lauren - is to just do a quick review of the day -- the day's agenda and what our goals are. So as usual, first, we'll receive a Program

update this morning. And then the Panel will provide input on the major Program priorities that are going to be included in the upcoming report to the Legislature from the Program.

The second part of the morning session, we will focus on biomonitoring results from the Foam Replacement Environmental Exposure Study, FREES. And from the dust and foam sampling that occurred in the larger study that was led by UC Davis.

And we'll have time for questions after each talk. Then we'll break for lunch. And after lunch, we'll hear a presentation about applying a class approach for evaluating hazards posed by organohalogen flame retardants based on a report that was sponsored by the Consumer Products Safety Commission and prepared by a Committee of the National Academy of Sciences.

The afternoon discussion session with our guest speakers and audience will focus on two things, one is drawing insights from the flame retardant findings that we'll hear about this morning, and looking ahead for the Program in terms of possible future work on flame retardants.

Following the afternoon break, we'll hear a presentation on the -- as Lauren just mentioned, on the preliminary screening of quaternary ammonium compounds for

possible consideration as a potential designated chemical class. And the Panel will provide input on their highest priority chemical group for preparation as a potential designated chemical document.

It could be QACs, based on today's presentation, or we can select from the many differ chemical groups that have been screened by the Program previously. So we'll outline what those possible selections are before the -- before the Panel has to provide input.

So the last item of the day will be an open public comment period. If you want to provide comments during the meeting, please fill out a comment card available at the table just outside the door or from Russ also --

MR. BARTLETT: They're at the table outside the door.

CHAIRPERSON SCHWARZMAN: The table outside the door. Okay -- and turn it into Russ Bartlett.

Okay. I will call on you on the appropriate moment during the comment periods or in the afternoon discussion section session. And for the benefit of our transcriber, please clearly identify yourself before providing your comment and write your name and affiliation on the card, so that we can make those -- sorry, on the sign-in sheet, so we can make them correspond.

If you're joining the meeting via the webcast, you can provide comments via email. And the address is biomonitoring@oehha - O-E-H-H-A - .ca.gov. And we'll read relevant comments allowed, paraphrasing them when necessary. Please keep your comments brief and focused on the items under discussion. And we'll only impose time limits if we need to, based on the rest of the agenda items.

So our first item is the Program update presentation of the major priorities, which will be done by Robin Christensen. She is the Chief of the Biomonitoring Investigation and Outreach Unit in the Exposure Assessment Section in the Environmental Health Investigations Branch at CDPH, California Department of Public Health.

(Thereupon an overhead presentation was presented as follows.)

(Laughter.)

CHAIRPERSON SCHWARZMAN: She'll provide an update on current program activities and outline our -- the proposed major priorities that will be included in the upcoming report to the Legislature. And I flagged that because that, if you were listening to our goals for the day, is one of the things that we really want to get clear direction from the Panel. The Program wants clear

direction from the Panel about those priorities to be included in the report to the Legislature.

So listen carefully.

Robin.

MS. CHRISTENSEN: Hello. All right.

Hi, everybody. I'm Robin Christensen. As you mentioned, I am a Health Program Manager with the California Department of Public Health. I will be giving the Program update today. And before we begin, I wanted to say that due to my oversight, slides 20 and 22 are swapped in your materials. So same materials, just flip-flopped.

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MS. CHRISTENSEN: I wanted to start off today talking about a few updates.

So first of you -- first, many of you know that we have had some leadership changes at CDPH. Dr. Karen Smith has recently stepped down and Susan Fanelli is our Acting Director. She's working with Dr. Charity Dean, Assistant Director, and recruitment is currently underway for Dr. Smith's replacement.

The Program has also had some recent staff changes as well. Dr. Juan VillaRomero has worked for three years with DTSC on the PFAS analyses. His position was funded through CDC through Sequoia Foundation. He is

currently still working with DTSC and he is now a State employee, but he is no longer working with the Biomonitoring California Program.

At EHLB, Dr. Ryszard Gajek has retired in June. He was the Supervisor of the Lead and Inorganic Testing Unit since 2012. And he supported both Biomonitoring California and also the Childhood Lead Poisoning Prevention Program. We really want to thank both Juan and Ryszard for their many contributions to the Program.

And we also want to welcome Marley Zalay who has joined OEHHA as a Senior Environmental Scientist. Marley has several years experience conducting exposure assessments for occupational and environmental exposures. And she received her M.P.H. from UC Berkeley.

And finally, as Lauren mentioned, we were not awarded a third round of CDC cooperative agreement funding. This is disappointing, but the summary statement that we received was actually fairly positive. We scored higher than we did in the two prior rounds of funding. And we have taken the feedback from the objective review panel and we are considering it. And we've asked for more detail from CDC.

The competition overall was quite strong. They had 17 competitive applications and Biomonitoring California would like to congratulate Iowa, Michigan,

Minnesota, New Hampshire, New Jersey, and New York State for receiving cooperative agreement funding through 2024.

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MS. CHRISTENSEN: So this is a very big loss for our Program, but we did prepare for this possibility. And the CARE Study is currently on track for Region 3. We are looking for ways where we can save money. For example, looking for low-cost temporary office space. We are relying more on in-kind support. And we're trying to figure out how to reduce the time spent in the field, since field work itself can be quite a big cost. The design itself and the timeline are currently looking as though they remain on track.

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MS. CHRISTENSEN: So just a little bit of a reminder of the CARE Study. This is our statewide surveillance study and it is one of the primary mandates of the Program. The purpose is to provide levels on background or baseline levels of chemicals, specifically metals and PFASs across the State. And we do that by recruiting a representative group of Californians across each of the eight regions in the state.

We've already been to Los Angeles County and we visited the Inland Valley our second region, and we're looking forward to visiting Region 3, San Diego and

Orange.

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MS. CHRISTENSEN: So as I said, CARE L.A. was our first region. We conducted our field work here from February through June 2018. And this was metals and PFASs for everyone, and 1-NP in a subset of 159 individuals. Individual results were returned in January 2019. And for a subset of the population, 60 women, they received additional analyses for environmental phenols. And those results were returned to them in March 2019.

Data will be available to the public in September, both on the website and also at a public meeting. We are currently setting up to visit the South Coast Air Quality Management District's 5th Annual Environmental Justice Conference. It's a very good meeting. It is free and open to the public and it's in downtown Los Angeles.

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MS. CHRISTENSEN: So this information here, how representative is CARE L.A. was actually shared at the March SGP. So it's here as a bit of a reminder. We found that CARE L.A. was fairly representative across races, with the exception of Hispanics. Thirty-five percent, or about 150 people, had some or no college. And that's less than half of what you'd expect in the population as a

whole. So these were two areas that we identified in CARE L.A. as needing room for improvement in Region 2.

Gender, not shown on this slide, was about 61 percent female in the population. And the average age of CARE L.A. was about 50 years old.

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MS. CHRISTENSEN: So our staff our currently in the process of doing further data analysis. They're examining distributions by demographics, and making comparisons between our regions, and with NHANES data. They're also looking at sources of exposure from the data collected from our exposure surveys.

Some of this information, as I said, will be available to the public in September, and we are all really excited to find out what CARE data can tell us about exposures in L.A. County.

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MS. CHRISTENSEN: So all of this work in CARE L.A. is occurring simultaneously to the labs analyzing CARE 2 samples. CARE 2, which includes Riverside, San Bernardino, Imperial, Mono and Inyo counties started sample collection on February 14th, 2019 and wrapped up on April 30th.

This -- as I said, the labs are currently analyzing these samples, but I wanted to give you a little

bit of an update on how progress worked in the field.

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MS. CHRISTENSEN: So as you know, CARE has a two-stage recruitment process in order to ensure that our sample reflects the population. The first stage involves completing a pre-screen. And the pre-screen surveys lets us know that people are interested in participating. From the pre-screen pool, we then invite -- select and invite individuals to participate in the study. And this resulted in almost 700 people interested in participating and 555 people who received invitations.

Of that group, 436 began enrollment and initiated the process. This means that they completed their informed consent form and completed at least some study steps. 331 people completed all of the study steps, which gives us a completion rate of 60 percent based off of those who were invited.

But based off of our experience in CARE L.A. and also based on the response to the pre-screen form, we knew as early as February that we were going to have some trouble achieving goals -- our selection goals for black and Hispanic males in the region. So you can look at this total number and see 331 looks good. It meets our goal of over 300 participants in the region, but it didn't reflect the population the way that we wanted it to.

So in CARE L.A. what we had done was we adopted all-in-one model, where we worked closely with community groups to help us recruit from their membership. They brought individuals in and we worked with them all at once in about a 45-minute meeting to collect their samples and all of their survey information.

So that worked really well in some respects, but it strayed from our surveillance model quite a bit, and it was more community based. So in CARE 2, we adopted what we call the walk-in model. Where we identified these groups that we were having difficult reaching and we recruited them directly. We said -- we made posters on -- and fliers and hung them up in the community. We put postings on craigslist that targeted specifically black and Hispanic males, and we said come on in, but you don't need to complete the survey in advance. We're going to complete everything all at once.

It was similar to the walk-in but it had added flexibility for individuals. They were able to come in on their own time. They didn't have to make an appointment on any particular day. They would call the office and then they would drive in. And this actually helped quite a bit to help us meet our goals.

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MS. CHRISTENSEN: All right. So this slide here

is different from the prior slide, only that it shows the total number. So after the walk-ins along with the traditional pathway through the pre-screen we ended with 359 individuals who completed the study steps.

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MS. CHRISTENSEN: So how did people find out about CARE 2? Well, more than half found us through the postcard, which is double what we found in CARE L.A.

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MS. CHRISTENSEN: So the postcard was very, very useful. And we plan on continuing to use that in the future. Friends, families, local groups, health fairs, meetings, craigslist. This all kind of falls into a looser category of networking. And that also contributed quite a bit, as you can see.

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MS. CHRISTENSEN: In terms of representation in CARE 2, despite the walk-ins, we still came in a bit under on our goal for Hispanics in particular. Overall, we did do a much better job at reflecting the population in Region 2 than in L.A., and we even did a little bit better on education. There's still room for improvement there though.

Representation by gender also improved. Region 2, 56 percent women, down from 61 percent in CARE L.A.

Our average age remained around -- right around 50.

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MS. CHRISTENSEN: So our epidemiologists are analyzing CARE L.A. data. Our labs are analyzing CARE 2 samples. And meanwhile, we are also planning for CARE 3 field work to begin early next year.

Our outreach team has already visited Orange County. And we have two upcoming visits to San Diego County coming up. We are making minor changes to our survey tools and putting forth our IRB amendments. And we are hoping to set up in the field in January 2020 with sample collection beginning in February. This is a really rapid cycle. We're working hard to keep pace with the annual pace of the study.

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MS. CHRISTENSEN: Okay. So I'm going to transition briefly to the East Bay Diesel Exposure Project, or EBDEP. EBDEP recruited 40 families with children living in the Oakland and Richmond area. They collected urine, dust, and air filters at two different time points.

Current progress Chris Simpson's lab has already completed analyses of the 1-NP metabolites in the urine samples and 1-NP in both the dust and the air filters. That data is currently under review, and it's being

processed. And EBDEP staff are currently working to get ready for results for return to participants in early September.

Following the September results return, they'll be holding a series of community meetings in October. And those are tentatively scheduled for West Oakland, East Oakland, and Richmond. The EBDEP participants and other stakeholders will also be invited to our November SGP meeting, where Dr. Asa Bradman will be presenting summary results on the study.

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MS. CHRISTENSEN: For the rest of my time with you today, I will be talking about draft priority language for Biomonitoring California.

So as a Program, we meet about annually to discuss strategies and priorities for the Program. And I think Michael DiBartolomeis and Nerissa has presented that information to you before.

At the March SGP, we also sought your suggestions for Program priorities. And we've taken your suggestions and we've taken our own and we have come back to you with six draft priority areas to help draft -- help guide our activities over the next few years.

We're bringing these priorities to you, so that you can give us any additional input, or edits, or ask any

clarifying questions.

So Priority 1 is about improving the CARE Study. I've already mentioned a couple of ways where we've tried to improve how we reflect the population. But one of the things that we really want to focus on is improving our study cycle timeline. The 8-year study timeline was already a compromise when the study design was conceived. And the plan was always to scale up the study, if we were ever able to do so.

Originally, the Program conceived of the statewide surveillance study as taking somewhere between two to three years and costing somewhere in the neighborhood of $10 million. That was in 2006. We've never been able to achieve that. And it's not feasible with our current resources. In the absence of CDC funding, we are trying to reevaluate and proceed in a feasible manner and a feasible timeline.

So looking forward, we are trying to really consider how we can approach statewide surveillance for the state on our new time frame. Our study cycle is looking a little fuzzy beyond CARE 3. It could become an every other year cycle, for example. We could cluster three or four regions at a time and take a year for a break and make compromises in other areas of the Program. For example, urine-only collection, which would miss out

on valuable information on PFASs and on metals in blood. We could move to more of a convenience sample design, which would allow us to accept the first 300 people. It would certainly be easier, faster, and lower cost, but it would never reflect the California population.

So although these options are technically feasible, none of them are ideal, and all of them will fall short of the mandate in one way or another. And more importantly, all would probably add less value for stakeholders, researchers, and others.

Statewide surveillance is always going to be one of our driving priorities, in part because it provides useful baseline data to inform all of our other work, including --

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MS. CHRISTENSEN: -- conducting biomonitoring studies that seek to better understand and mitigate environmental health inequities. EBDEP is a great example of this, and there's room for more exploration of some of the social determinants that play into our environment. We know that there is historical discrimination that has been institutionalized into our zoning, our housing, our industries, occupations and traffic patterns.

SGP has frequently mentioned pesticides in farming communities, immigrant groups, and occupational

groups. And that falls under this priority as well.

Where CARE surveillance data can provide the baseline, targeted biomonitoring studies can identify the communities that are most at risk of disproportionate exposures and harm from these chemicals.

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MS. CHRISTENSEN: Priority 3, this is the one out of order. Priority 3, we would like to work with stakeholders to assist local environmental and public health responses. We currently already do this to some extent. And as a Program, we can expand our approach and be better prepared for future requests.

We know, for example, that counties frequently contact CDPH to request assistance on -- or guidance on local mercury or arsenic cases. And we have also begun to receive inquiries about exposures during wildfires.

There's still a lot that's unknown about exposures to dust and water after the fire. And that is something that we have also talked about within this group. So this priority is one way that our Program can add value to environmental and public health work that's already being carried out at the local level.

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MS. CHRISTENSEN: Priority 4, maintaining our laboratories. And I want to say at this point, these are

not ranked in any order, because if they were, the Priority 4 should be Priority number 1.

Without maintaining our core laboratory capabilities and upgrading our capacity, we're going to be unable to address any of the other work, any of the other priorities on this list.

The SGP often recommends biomonitoring new classes of chemicals. And in order to do this, we really need to prioritize our laboratories and make sure that they are sustainable for the future.

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MS. CHRISTENSEN: Priority 5 is about increasing public access to our data and to our findings. Biomonitoring California is a data-generating machine, but we are not yet a data-releasing machine. So as a program, we would like to prioritize releasing data to the public to help support evidence-based decision making. For example, our statewide PFAS data from CARE could go a long way to help inform the State's drinking water standards. And EBDEP could do the same with certain diesel -- certain policies on diesel.

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MS. CHRISTENSEN: Scientific data itself is important, but it is also important for us to be expanding and translating these findings into meaningful guidance

and health education for individuals, health care providers, community organizations, and the lay public. The newsletter is one tool that is aimed at a lay audience and we are working hard to expand our content and materials. We are, for example, developing new materials to share at our public meetings, on our website, and with our participants.

So these are our draft priority areas heavily informed by your input from March. And we wanted to take this time today to report back to you and get any additional input you may have.

I think the elephant in the room is what do we do with these priorities in light of the loss of CDC cooperative agreement funding?

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MS. CHRISTENSEN: Priorities will help to guide our activities, but the activities themselves will likely be scaled down. In other words, the Program will not stop trying to achieve our mandates, but we will adapt and we will be making some compromises.

As I've mentioned, Region 3 is more or less on track, but this change in funding does have clear and immediate impacts on our work. CDC funding helped to support CARE's Study field work including recruitment, phlebotomy, and participant stipends. It also provided

significant support and flexibility to our laboratories.

Certain technical supplies may be more difficult to acquire. It may take longer to acquire supplies and maintenance of instruments may become a challenge.

We may find that we need to scale back what we are able to take on. But CDC cooperative agreement funding by its nature was never meant to be a long-term, stable source of funding for the Program.

As Lauren mentioned, we are working internally to find solutions. But in the meantime, in the absence of CDC funding, our activities will remain pragmatic, while our priorities are going to be hopeful.

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MS. CHRISTENSEN: So I'd like to thank everybody in the room today, and especially our Biomonitoring California staff who work very hard to accomplish this terrific Program.

Thank you.

CHAIRPERSON SCHWARZMAN: Thanks so much, Robin. I want to open it up to clarifying questions first and then we'll start a discussion. So clarifying questions from the Panel specifically?

Yes. Jenny.

PANEL MEMBER QUINTANA: Hi. Thank you for that. I just had a clarifying question about the CARE studies.

You didn't comment on the geographical representation. And I was wondering about that, because we have community meetings. They tend to be very geographically clustered. And so is that something you're going to look at in the future how geographically representative your sample was in L.A., for example, or is that something that you already know?

MS. CHRISTENSEN: You know, that's not something that I have offhand when I said that I'm excited to see what the CARE L.A. findings look like. I meant that truly from myself as well. I've been told that I will receive some of that information next week. But maybe somebody in this room would like to comment?

DR. WU: Hi. This Is Nerissa Wu, Biomonitoring California. When we set up our goals for sampling, we do create zones within the region, so that we are trying to represent across different geographic neighborhoods.

For example, L.A. County is broken down by the Service Provider Areas. And so we did have specific goals for each one of those SPAs in L.A. And within Region 2, which is geographically very wide spread, we had zones that represented the urban core, and then the more suburban ring, and then up into Inyo and Mono to make sure that we are getting geographic spread across each region.

We are concerned -- you alluded to -- sorry to

interrupt you. We are concerned with clustering. When we look at community groups and recruitment through, for example, the all-in-ones that Robin mentioned, where you might have people who have a -- who are already associated in some way and might have similar exposure patterns, and how that clustering might impact our data. So we are wary of that when we create our recruitment protocols.

PANEL MEMBER QUINTANA: So with the zones, do you know if you met those zone goals or not?

MS. CHRISTENSEN: Just very roughly, yes, that was one of the easiest ways to meet the goal. We did struggle a bit in Mono and Inyo counties. The population is very small. And so for our goals in those areas, we actually were trying to oversample, so that we could say something, because if it was in direct proportion to what was in the population, we'd end up with like one person from either county. So we came in under where we wanted to be, but we definitely over-shot the one person per county, yeah.

(Laughter.)

CHAIRPERSON SCHWARZMAN: Yeah, Carl.

PANEL MEMBER CRANOR: Carl Cranor. I want to look at your draft priorities here for second. Taking the biomonitoring information and moving forward -- sorry. Is the -- do you have good relationships with people that can

affect some of these priorities?

For example, I mean, sometimes it may be matter of what people eat that cause problems. But I'm wondering if you have a sense from your studies, to what extent can individuals control what happens to them, as opposed to our State and maybe private institutions that may call for changes in their behavior? Those are rather different things. I sometimes worry that there's too much emphasis on personal choices and not enough emphasis on institutional choices.

Thank you.

MS. CHRISTENSEN: Well, I am really sympathetic to that concern. I share that concern. We -- both are important. The individual has a lot -- has control over many things in their lives, but they do not have control over everything. We find like that in some situations regulation, policy change, may go further to removing chemicals from our lives.

That said, it's not in our -- we are not here to advocate for policy change or any regulations. We are providing individuals with helpful guidance, that -- so that they can make changes in their lives. And that is something that we can do, and it's also -- it's also something that people want. They -- after a person participates in a biomonitoring study, they are often

looking to what they can do first and foremost.

The bigger changes that you discuss, they take time, they take effort, and for the average participant, they want to know what changes they can make in the short term.

PANEL MEMBER CRANOR: Sure.

DIRECTOR ZEISE: I just wanted to add something. One of the -- in addition to your remarks. One of the major things as part of the Biomonitoring Program in establishing legislation was the issue of regulatory effectiveness. And I think information coming from the Program has been very useful in us understanding how different actions by the State, by the Legislature, by the agencies have affected exposures. So there is that as well.

MS. CHRISTENSEN: Thank you.

CHAIRPERSON SCHWARZMAN: Ulrike.

PANEL MEMBER LUDERER: Can you hear me?

Okay. Thank you very much for that presentation. I have a question about the draft priority maintaining core laboratory capabilities, which I agree is fundamental to all the other priorities. And I was wondering if you, or maybe the laboratory managers, I mean, can say something about how -- how that is going and how the -- you know, the baseline funding, once you factor in

maintaining the core laboratory capabilities, you know, what -- how much room is there for -- how much is left over essentially?

CHAIRPERSON SCHWARZMAN: Can I expand on that question for just a sec to add a piece, because I was wondering a similar thing is I know the laboratories don't only exist for the purpose of Biomonitoring California. So how much is the Biomonitoring California responsible for maintaining those core functions? And, you know, the DTSC lab does lots of other work also and maintains some panels, and core functions. So if we could understand a little bit about that balance, that might be helpful.

MS. CHRISTENSEN: I am not the right person to answer that question at all, but I can say that I've heard from both the Jed and June-Soo and Sabrina that the existing Biomonitoring California budget that goes to the laboratories is probably already maxed out in terms of what they are able to do.

I have heard that they're -- it is often supplemented by other sources of funding when that's possible. Jed, do you want to weigh in any further?

DR. WU: This is Nerissa again. And I am also not a laboratorian, so maybe Jed will come up here afterwards, but it's not only in the total volume of money, it's also in the flexibility of what State funding

can do. So things like being able to support our instrumentation with preventive maintenance. We have instruments breaking down all the time and State funding is just not flexible enough to be able to, you know, support them over the long term to say, well, it makes sense for us to have a contract to have somebody come and support these machines.

We can't quickly get supplies. We can't quickly change direction. I mean, there's so many things we're interested in looking at, but we can't change staff quickly. We can't change equipment -- we can't go out and procure equipment quickly. There's things like -- actually, Jed is up here now, so he'll be able to give you more detail.

Let me turn --

DR. WALDMAN: This is Jed Waldman for the Environmental Health Lab. I think Nerissa hit it pretty much on the head. We are always squeezed, you know, budget-wise. That's just part -- a fact of life for any State program. When we have the funding, we were squeezed. Without the funding, we'll be squeezed.

But the loss of flexibility to support the kind of project that we're describing here of CARE being in the field, trying to turn around samples quickly is -- that is probably the most devastating loss for us, because as some

of you who have collaborated with us there's a strict timeline.

Working with State funds can mean a long delay in instrument repair, unlike when we can use -- when we've been able to use CDC funds to turn that around much more quickly. An instrument breaks down between June and August, we're -- we don't even have access to State funds while the budget is changing. So I would say that's probably the biggest problem.

CHAIRPERSON SCHWARZMAN: Oh, great. One more.

DR. SHE: I think that at this moment the leverage between -- oh, Jianwen She, Biomonitoring Laboratory leader for CDPH.

So at this challenging times, I think we need to be able to think about the collaborations. And, for example, the leverage between the different programs, how we can benefit. Because the laboratory instrument not used for Biomonitoring Program alone. Some machine used by the lab to support other activities. So the leverage between the Program needs to be strengthened.

Second part regarding staffing, we always experience staffing come here, get trained, then move out, because we do not have the uphand movement for the staff, the opportunities. So I think that we still need to publish more scientifically. We are a world class

laboratory, attract young people, post docs, and fellows, which we did in the past, and to support the method development.

So that's -- there are other bureaucratic -- data purchase system. I think Jed already touched. We need to look for the way to compensate that flexibility with some more fund. So try to maintain majority of our laboratory capacity we already developed.

But regarding the new method, we may be need to slow down a little bit and think of what's our real focus.

CHAIRPERSON SCHWARZMAN: Can I ask one other related lab question, which is certain studies rely on collaborating labs, like current ones involve UC Davis that we'll hear about, and UW, you were just talking about, University of Washington.

MR. CHRISTENSEN: Um-hmm.

CHAIRPERSON SCHWARZMAN: Can you say anything more general about that, or anyone from the lab or the Program, who can reflect on the -- what those collaborating labs give the Program and what they don't give the Program? You know, like, what can be -- I realize you have to pay for the lab collaboration. It's not free. But in terms of this maintaining basic instrumentation and capacity, to what extent can those collaborations help with that versus there's no substitute

for, you know, our own lab?

MS. CHRISTENSEN: I will be happy to share my opinion, which is not necessarily the same as the opinion of others in the group. I think that the collaborations are particularly useful for the panels for which we don't have a method. It helps us to bring in things that are more on the boundary of research, or new or exciting things.

The burden of creating a new method is huge. It takes quite a bit of time. It's one analyst working like close to full time for at least a year. And that's not necessarily something that we want to prioritize our Program focusing its limited resources on.

But as others develop the new methods and we are able to make use of them, and then they become more commonplace, it is easier to transfer and learn from others. So that is one role that they can play.

It also can help us out in areas where we might not have a large volume or a continuous stream. Both the PFAS and the metals are two great examples of methods that we are always going to have within the Program, because there is a constant demand for it. So it would not make sense to shop those out.

You want to weigh in?

DR. WU: Sure. I mean, I think there's always

this tradeoff between building a Program that can do -- that can be broad and one that can be deep. And we've wrestled with that here with our prioritization. Do we want to really focus and maintain our instruments, maintain our staff and have very few methods that are very reliable or do we want to be exploring all these?

And there are so many chemicals and new panels that we want to be exploring, but that does require method development, new staff, new equipment. So as Robin alluded to, sometimes it is great to be able to shop it out to, for example, University of Washington. There are -- there are tradeoffs with that as well though. I mean, for one thing the funding -- the flexibility of funding to contract with outside labs can be very difficult and it varies from year to year.

So if we're trying to do surveillance and collect data year to year, we don't -- it's not a reliable method. We don't know that we'll be able to contract out year-to-year to the same lab. And that comparability of data is another way that I worry about going to contract labs. When we have our staff, we have regular PT, we have very rigorous standards, and we can compare the data year to year. That's a very valuable part of surveillance.

If we're going between different labs and perhaps changing from one panel to another, we lose some of the

cohesion of surveillance. That's really important to us.

CHAIRPERSON SCHWARZMAN: Jenny.

PANEL MEMBER QUINTANA: Hi. This is a kind of a narrow clarifying question. But I thought I heard you say that the State funding, either it was difficult or impossible to get service contracts for the instruments. And when you're talking about turning samples around quickly, you know, it's a horrifying thought not to have a service contract for instruments. And I don't know anyone in a lab that's happy operating without a service contract. They're getting so complicated these instruments.

And so I just want to clarify that I heard that correctly and I want to also state I think it's very important that that funding be there for service contracts.

MS. CHRISTENSEN: This may vary between our lab at DTSC and the lab at CDPH, but Sabrina will weigh in.

DR. CRISPO SMITH: Hi. Sabrina Smith from DTSC. Can you hear me?

Is that good?

Sabrina Smith from DTSC.

I want to first speak a little bit to the original question, which is why I stood up, was DTSC funding. We have biomonitoring funding. We have other

funding. We share that other funding with the rest of the lab. And actually, particular biomonitoring studies need to be funded through specific funding. We can't grab funding from other sections to use for our purposes. We do sometimes work on similar instruments, so things like service contracts can be split.

But, yeah, there's not a way -- we do some in-kind work. A couple of the people listed up there are actually not under the Biomonitoring California staff, but we do in-kind work for -- with them

The second about service contracts. I don't know -- I can't speak to California Department of Public Health, but I do know that a large portion of my budget every year goes to service contracts through the State funding. And the reason for that, as you said, we do not want to be waiting weeks for our instruments to be fixed. But service contracts are expensive, and so that does take away from supply money.

And the CDC funding was something where we were like, oh, we always have this additional funding. If they come with an additional project for us to do, we can quickly bump up our supplies. But we do take into account service contracts, at least at DTSC.

CHAIRPERSON SCHWARZMAN: Yeah. Oliver.

PANEL MEMBER FIEHN: Woops.

My name is Oliver Fiehn. I am directing a laboratory with 17 mass spectrometers. We have two service contracts. And that means for 15 mass spectrometers, we do not use service contracts, because they don't break down very often. We have a history that we know for roughly how many machines will break down per year, and so we will call in engineers when we need them.

That is saving a lot of money. I would not be able to fund service contracts for 17 mass spectrometers. This is not a sustainable business model. Unless you have a machine that you know is so, how can I say, often breaking down, then you need obviously a service contract. But when you have enough machines and you have a budget that, you know, where you can pay an engineer to come when you need it, that engineer may be $5,000, may be plus repair parts. It will be usually $8,000 at the end. But it's much less than a service contract that easily comes for $30,000 a piece, per year. So I am just saying that, you know, there might be savings possible.

DR. WALDMAN: Jed Waldman, Environmental Health Lab again.

I agree with you totally, we have more than a dozen mass spec instruments, and we don't have service -- preventative maintenance on all of them. It would be prohibited. We have mostly staff who are Ph.D.s. And we

believe that most, especially in the ICP mass spec lab very good at maintaining themselves.

With a high resolution instrument, that's one that is relied on, we do spend the money and it's quite expensive. As you say, 30 to 50 thousand dollars per year. It gives us better service and it keeps the instruments that have a turnaround time issue.

However, the State makes those service contracts very challenging in the -- but without them, the arrangement when we have a breakdown can take weeks to months. And so it's a tradeoff in terms of timing versus money. I can have a doctorate -- doctoral level person spending a week going through the paperwork, and that's not a good use of their time.

So back to the CDC funds. And I think the question of some of our partners are also extramural funded collaborations and we can use those resources as well. Doing this sort of work within the State bureaucracy is a set of challenges and this hybrid program has really helped us to date.

CHAIRPERSON SCHWARZMAN: I think this is a useful conversation, but I want to make sure we get onto the discussion.

Tom, did you have a question or a discussion?

PANEL MEMBER McKONE: I was going to ask a

question. Are we moving now to discussion?

CHAIRPERSON SCHWARZMAN: Yes. Let's move --

Okay. Great. Our job till about 11:15 is to have a conversation about these priorities that the Program is proposing putting into the report today legislature, and see if there are any sort of edits or adjustments that we would suggest or other ideas. And before we wrap-up the conversation, we'll try to put a fine point on it. We don't -- we're not going to take a vote, but -- so that we get a concise set of recommendations back to the Program. So we can open it up to more discussion about these priorities going beyond the lab discussion.

Tom.

PANEL MEMBER McKONE: Okay. Right up to it.

So I would suggest, in looking at this, that there's two -- and I think the discussions we had afterwards led to this point, that there are two kind of overarching priorities. And then the other ones kind of fold under these or within them. And so the overarching to me I think are, A, which we talked, to keep the equipment running, to keep the capacity there. Because without that, you can't do much else.

But the other one is to keep the samples moving. And this is where I think in thinking about the priorities

is kind of this -- and I think this is a good point for discussion, do we try and follow the CARE plan or do we also try and set it up, given the funding constraints is finding opportunities to keep the samples flowing. And I think that was in the priorities. There were a number of cases where you talk about opportunities to collaborate with others.

And so I think the real tricky priority to keep the samples coming in is to spend time identifying partners, who -- maybe not funding partners, but partners who need the capacity to do biomonitoring or are very interested in it, and then figure out how to use that to meet the other priorities of the Program.

So a little bit different way, but I just think this -- the need to keep -- you know, you -- with the funding problems, you may not get the samples you necessarily want all the time, but it's worth it to go out and search for opportunities to keep samples moving, because I think the more information you get, the more it helps the Program, and also having a good partner. I mean, who knows, you may discover somebody, you know, an agency or a community, or something that really gets so invested in this that they have some political clout to get some more funding for it.

CHAIRPERSON SCHWARZMAN: Can I just tag onto

that, Tom, to say would you agree that part of keeping the samples moving is it's not just sample collection, right, it's analysis? So you're not just saying bring a bunch of data in?

PANEL MEMBER McKONE: No. Yeah, that's what I'm saying, you know, you want to have things coming -- I mean, like I'm thinking of the example of wildfires. I mean, it created a -- I mean, there are a lot of people really worried about what are the impacts. But there's a very important opportunity, and it may not fit necessarily with the plan that's there, parts of it. But seeing these opportunities and seeing a community who has a concern and maybe can leverage some funding, and say, look, we have a lot of samples, if you can analyze them, or we could pay for some of it.

And again, I don't know how that works. But in someways having the equipment there and also keeping the equipment busy are kind of two priorities to --

CHAIRPERSON SCHWARZMAN: I guess, what I was meaning to flag was not just the lab analysis, but the -- do the epidemiology on it, because I think -- I just wanted to acknowledge that, because it's two distinct efforts within the Program. It requires different expertise and both requires funding, and you don't get output from the Program without both, right?

And it's one of the things that I think we've talked about on the Panel is kind of creative ways to say recruit more doctoral student labor, essentially. You know, doctoral students who need data sets to do their dissertations. And can -- is that a place that we can expand biomonitoring capacity without any more money to accomplish one of those two pieces. One is obtaining the samples and analyzing them in the lab and then the other is working with the data.

DR. WU: Can I ask a clarifying question?

Are you suggesting that we move away from surveillance? Because it sounds to -- we can keep samples moving by working with collaborators. And certainly, there is valuable biomonitoring information to be gained from the targeted studies that are done around the state by other entities.

But that does move us away from the CARE Study. And one of the values of it is its consistency and its -- the time trend over -- you know, the swath of time over which we're collecting samples year after year to make this comparison. So we could move away from it and come back to it at some point. But it -- but then it sort of isolates our two first regions. And then when we come back, it's hard to know what that comparison means. Do we compare the same regions over time? Do we continue to

look around the state?

I mean, I guess I'm looking for clarification on whether you feel that surveillance should not be one of our priorities, because I'm not sure how to do -- how to fit what you're saying into the model we have right now, which I'm not saying is wrong, but --

PANEL MEMBER McKONE: Well, I would say surveillance is really -- that was why the Program was established. I guess what I'm just asking in tight budgets is -- and I don't have the answer. I'm just -- this is a discussion point. Is CARE the priority or is it CARE and other opportunities for surveillance, particularly those that would be complementary to CARE and maybe even fold into it.

And I say that because you were talking at one point about you may delay CARE for a year. And I would say, if that happens and you found another surveillance opportunity, you know, do you spend that year like pushing everything back or taking other surveillance opportunities, you know -- you know, where community has -- comes and says we need something or has a question?

And again, this is a bit hypothetical, but I thought -- you know, I guess the priority question is do you keep the Program as it's envisioned now with CARE -- with -- well, I would say with surveillance, because we've

done a lot of very -- we've done a lot of very useful surveillance exercises in the past, which were the foundation for designing and building CARE.

So I guess that's the discussion point is how do we look for surveillance opportunities that may not be exactly what you want, but could keep the -- kind of the machinery of the Program going or stick with what you want and try and -- I mean, the other thing to do is look for -- you know, look for additional endowment funding or things like that.

CHAIRPERSON SCHWARZMAN: Veena.

PANEL MEMBER SINGLA: Hi. Good morning. This is Veena Singla. Thank you so much for that very informative presentation.

I had kind of an overarching comment and question just in thinking about the priorities and what's more important. You know, it's certainly sort of an intersection or cross-walk between a number of different factors: of course, the mandate of the Program and what's the most important for public health and those priorities, and then thinking about scientifically what are some of the priorities and advancing the science.

But I think also trying to understand a little bit better in terms of funding, thinking about priorities. So, you know, Robin, you mentioned that the CDC

cooperative funding was never seen as -- you know, meant to be or seen as long-term funding for the Program and that was understood.

So I'd like to understand better what is the vision for long-term funding for the Program? Is more State funding envisioned to play a role there? And I think that will help us think about how the long-term priorities for funding could intersect with the priorities for the Program, if that -- does that makes sense?

MS. CHRISTENSEN: Yes. And that's hard to answer. I can envision a lot of things for the Program. And it would -- I could envision a future where we have unlimited State funding that met our original goal, but we can't make that happen. And there are a number of other programs that are also in a similar boat.

So the people who are prioritizing these things will be weighing our needs against those of others and making decisions based on that.

CHAIRPERSON SCHWARZMAN: Carl.

I'm going to go right down the line, like this.

DR. LIPSETT: Actually, Meg, could I

CHAIRPERSON SCHWARZMAN: Oh, sorry, yes.

DR. LIPSETT: I know this is out of order here, but I think I can respond to -- oh, yes, I will.

I'm Michael Lipsett. I was involved with this

Program from the very beginning. And I think I can provide a little bit of clarity with respect to what the notions of long term and shorter term funding. So the legislation for this Program came into effect just before the recession of 2007/'08/'09. The Program would actually have been axed. It was initially under general funding. But for the intervention of some very dedicated people in the legislature, it shifted much of it to State funding as well.

We wrote the first grant to the CDC in, I think, about a year and a half after the Program started. And it was intended to provide, you know, the -- at least an interim type of support until this -- until the economy recovered. And the concept the thought at that time was that once the economy recovered, that the State would be funding the Program at a better level.

The Program really would not exist without the CDC funding. It was -- it really was an enormous help in getting everything established. And it was great that it continued for 10 years. But at this point, I think despite the sort of guarded optimism within the State staff here, this is really a catastrophe for the Program. And I think that -- I would like to suggest for the Panel's consideration that you might -- I know you're not political, but you might want to just weigh in as a Panel

and send some sort of letter to the Governor, or the heads of the different departments about the importance of the Program, and that there be strong consideration given to providing additional State funding for this Program.

CHAIRPERSON SCHWARZMAN: So I just want to encourage everybody to be quite concise in their comments. We only have until 11:15.

DR. LIPSETT: Sorry, Meg.

CHAIRPERSON SCHWARZMAN: No. Thank you for that. Thank you for that. It wasn't targeted at you, Michael.

(Laughter.)

CHAIRPERSON SCHWARZMAN: Because we need to wrap-up this conversation, but I want to make sure that all these ideas get together before we have to kind of make a formal recommen -- not formal, make a recommendation.

PANEL MEMBER LUDERER: Okay. I'll try to be very concise. So I just kind of wanted to continue on with this idea of the surveillance versus, you know, targeted studies and collaborations. And I really think that they are both important and they can really kind of synergize one another. And, you know, I think one of the things that we heard this morning already was about the usefulness of neighborhood groups in assisting with the recruitment for the different -- the different pieces of

CARE that are ongoing or have already happened.

And what -- and over time as you go back to some of these communities, you know, those relationships I think really have the potential to grow and for targeted studies to evolve out of those relationships. So I, you know, want to encourage maintaining those kinds of relationships over time.

CHAIRPERSON SCHWARZMAN: Jenny.

PANEL MEMBER QUINTANA: Hi. Two very concise comments. The first concise one was none of the priorities seem to include what Lauren Zeise brought up, which was the regulatory effectiveness of policies. And I would say that should be an explicit and separate priority, and that would really bring in, for example, the Diesel -- like East Bay Diesel Exposure Project and looking at reductions due to clean diesel. So that's one comment.

And then the other comment is, just to be blunt, I felt like the surveillance, the CARE studies were starting out very underfunded. They weren't a complete and perfect snapshot of the communities. And in so much as surveillance is not a perfect snapshot, they are less useful for surveillance purposes.

You know, if they're not a completely random population-based sample, and we see from the education

variable at least, they do not seem to reflect perfectly the communities, even though heroic efforts were made. But these things take a huge amount of funding and time -- staff time, and calling people, and calling, you know, all these different stakeholders. It just takes a huge amount of time to do it.

And I just feel like I think that you should think about suspending that part personally, until there's actually funding to do it, because you can't do everything. You're stretched so thin. And I think the laboratory is a core piece. And I do think that there are projects going on that you can accomplish some of the same goals by getting samples to analyze. And I just think it's -- you can't do everything with less funding basically. And it's -- and this is -- I just want to add that you've done heroic and wonderful things, so not a criticism at all, but just the reality.

CHAIRPERSON SCHWARZMAN: Let's have a comment from Carl and then we need to call public comment and then we'll take the next step here.

PANEL MEMBER CRANOR: I'll try to be quick.

Budget. What's the sense. You may not want to talk about this, but the diagnosis. The Program was born in a recession and we're -- California in particular and California revenues are soaring, and the question is who

is or is not assisting the Biomonitoring Program? What barriers does one run into? I understand you may not want to talk about this, but it does seem to me we should -- we should be and are in a better State fiscal position, in terms of California GDP. We're the, what, 6th largest country in the world, or something like that, and the budget is a problem.

CHAIRPERSON SCHWARZMAN: I just want to check at this point for public comment, whether we have any cards or any comments online?

MR. BARTLETT: Thank you, Meg. And also, I just want to remind folks on the webinar that if you want to submit a question or comment, please do so by emailing at biomonitoring@oehha.ca.gov. The chat features are not operating on the webinar today.

Thank you.

CHAIRPERSON SCHWARZMAN: So, Russ, does that mean we have no public comment at this point?

MR. BARTLETT: So that's right. At this time, we have no online, we have no emails, for comments.

Thank you.

CHAIRPERSON SCHWARZMAN: Okay. Anyone in the audience who would like to make a comment with regard to this conversation?

Okay. There's one. Gina.

DR. SOLOMON: Just a quick question. This is Gina Solomon. Public Health Institute and UCSF. Just a quick question. I was trying to get a handle with the CARE study as to how much of the cost is actually getting teams into the field? Because if so, just looking at CARE 4, just wondering if there would be any advantage to skipping ahead to the Bay Area and addressing the travel costs in that year while trying to get funding for the future?

(Laughter.)

MS. CHRISTENSEN: Oh, gosh. Well, yes, we did consider that. We did consider that. But the fact is for CARE 3, we have sufficient funding. We are looking to scale down. So I can give you numbers from CARE 2 and CARE L.A. But we are hoping to make sure that our model becomes a bit more economical.

I would say that field work probably costs on the level of about $200,000, give or take. And that has to do -- it's about two months of time. It supports temporary staff, temporary skilled staff, all of the supplies, the locations that we need to book, and all of the costs associated with the participant incentives.

Moving to the Bay Area, I'm not actually sure that it would save much money, but it is something that would make it certainly easier for our staff to take on.

We would need less temporary staff for example, and we'd take on more in-kind work.

MS. HOOVER: Meg, can I just make a quick suggestion. We have about seven minutes left and we've heard some really good feedback. But could we just run through -- maybe you could click through the priorities --

MS. CHRISTENSEN: Sure.

MS. HOOVER: -- and just get, you know, the Panel's brief even nodding or shaking your head, and we'll track that in our notes about what -- you know, the idea is we want to know what you want us to include in the upcoming report to the Legislature. We would like formal input on that.

You can also email us after. That's fine. You can provide input, but we'd prefer to get your input in the public meeting with specific suggestions on these six. We've heard some, but if you'd just click through and give a nod.

CHAIRPERSON SCHWARZMAN: I want to -- okay. I have a clarifying issue. So to me it seems like there's two questions here. One is does the Panel agree with these priorities and recommend that the Program include them in the report to the Legislature as the Program's priorities. But another parallel conversation that's happening here is the budget is tight, there's less money

than we hoped there would be, what should the Program elevate and what should it step away from? And I'm confused currently about whether you need input on both at the same time.

MS. CHRISTENSEN: Well, this was put on the agenda with the thought to just the first. And it was put on the agenda before we found out about our funding.

So, primarily, I am looking for your input on the first part of your question. We have been taking notes on all of your concerns and the additions suggest -- additional suggestions. So if there's time and you would like to weigh in further on how to prioritize within this set, I'm also all ears.

MS. HOOVER: And let me just add that in terms of all the comments about budget, as before, when you separately wrote a letter, brought it to the Panel for signature, you can make that choice as Chair with one other person. That's not something we want to talk about right now.

CHAIRPERSON SCHWARZMAN: Right.

Veena.

PANEL MEMBER SINGLA: Veena Singla. So in terms of thinking about priorities for the Leg Report, this relates to what my earlier comment, which I think I didn't -- I didn't say very well. But, you know, if the

thought is that the State would support the Program more in the future, there has to be a demonstrated value of the Program to those who are making those decisions.

So in thinking about what's going to be put forward in the Leg Report, I think that's a really important frame as to being able to show like what value this Program has brought and will bring in the priorities and information that's communicated in that report.

And I think in -- out of the -- these priorities, there's two that stand out to me in that regard. I think working with stakeholders, this is local environmental and public health responses, is one. And the understanding and mitigating environmental health inequities is the other.

CHAIRPERSON SCHWARZMAN: Could you just say I got the inequities is number -- here is number 2, but the other one that you said was number three, right?

PANEL MEMBER SINGLA: (Nods head.)

CHAIRPERSON SCHWARZMAN: It's in our -- it's numbered differently here, but it's like slide 22.

PANEL MEMBER SINGLA: Correct.

CHAIRPERSON SCHWARZMAN: All right. Okay. Just for clarity.

Okay. I withheld my comment while I was collecting them from the Panel. So I just want to say,

because it's a point that Jenny brought up, but I was having a couple other thoughts about it, is there's this inherent tension between surveillance and all the other things that the Program does. And I want to acknowledge like what Tom said about the Program was established with a clear goal of surveillance.

And I agree with Jenny that in light of how the Program is supported or not at this point and what the realities of how surveillance is done is performed in the state of -- or in the setting of really limited resources, and in the context of the existence of CDC biomonitoring, which doesn't accomplish state surveillance, but at least does some population-level U.S. surveillance, that my strong feeling is that California Biomonitoring can demonstrate its value more through the number 2 that Veena just flagged, conducting biomonitoring studies to better understand and mitigate environmental health inequities, because those are often specific to the state and to our regions.

And the -- another one that Jenny flagged, which is number 5, which is our slide 20, of increasing access to the findings. It's not -- it's not the individuals that I mean, because you already do a lot of individual report back. I mean, the -- the policy relevant research that -- where, for example, the PFAS findings could

support drinking water standards that are specific to the State or the East Bay Diesel Biomonitoring Project could support decisions about ports, and highways, and that kind of thing. That that's the place that California Biomonitoring could most demonstrate its value now in line with what Veena is saying.

So although I hate to recommend that this Program step away from its core, you know, reason for being when it was established of surveillance, in light of the Program having been essentially starved of sufficient budget to do that, that's my view on it.

So that's not exactly an edit of the priorities, but I feel like it's an important framing as you go into the Leg Report. That's my view of that.

So with that, would you please flip through the priorities that are here, and we can get -- this is not a formal vote, but we want an indication from each Panel member whether you think that that is a priority that should be included in the Leg Report.

Hands. Yeah, just hands. And you're allowed to vote for all of them, right? Like this is not --

(Laughter.)

CHAIRPERSON SCHWARZMAN: You don't have to choose your top 3 or something. Okay.

Clarifying question?

PANEL MEMBER QUINTANA: So just to clarify, this is -- I thought you said it was independent of our funding problems right now. Should we vote as if this was a --

CHAIRPERSON SCHWARZMAN: Yes. The question is the Program --

PANEL MEMBER QUINTANA: If we had more money, how would we do the priorities? I mean, bluntly.

CHAIRPERSON SCHWARZMAN: Yes. The Program is saying these are their priorities, do we support that?

MS. CHRISTENSEN: Priority one?

(Hands raised.)

CHAIRPERSON SCHWARZMAN: Does anyone -- do you support?

Okay. Great.

Two.

MS. CHRISTENSEN: Priority 2.

(Hands raised.)

(Laughter.)

CHAIRPERSON SCHWARZMAN: Priority 3?

(Hands raised.)

CHAIRPERSON SCHWARZMAN: Priority 4.

(Hands raised.)

(Laughter.)

CHAIRPERSON SCHWARZMAN: And priority 5?

(Hands raised.)

CHAIRPERSON SCHWARZMAN: Okay. Oh, one more. Sorry about that. My error.

Priority 6?

(Laughter.)

(Hands raised.)

CHAIRPERSON SCHWARZMAN: So what I see from this --

MS. HOOVER: Six, you have to do one more time.

CHAIRPERSON SCHWARZMAN: Oh, yeah, I think we did that.

Six?

(Hands raised.)

PANEL MEMBER McKONE: Do you have half votes on that?

(Laughter.)

MS. HOOVER: Okay. Great.

CHAIRPERSON SCHWARZMAN: A little less enthusiasm for number 6, but otherwise, I would say the Program has the Panel's blessing to include these draft priorities in the Leg Report.

MS. CHRISTENSEN: Thank you. And we've listened to your feedback and we'll put -- be including more in the narrative in the Leg Report.

Great.

CHAIRPERSON SCHWARZMAN: Oh, the question on the

Panel is should we indicate, as a Panel, that there's an additional interest in a priority that addresses regulatory effectiveness?

MS. HOOVER: We heard it.

CHAIRPERSON SCHWARZMAN: Okay. Program heard that and we don't need a show of hands it sounds like. Okay. So we've accomplished what we were meant to accomplish in this time.

Thank you. And that was a good discussion and lots of thought-provoking questions.

We are going to go -- move on to hear about the FREES Study. And so with that I'm going to introduce Rebecca Moran, who is a Staff Research Associate in the Department of Public Health Sciences at University of California, Davis.

Rebecca received her Master's in Environmental Health from the Harvard School of Public Health. She's been a project manager at UC Davis for the last 10 years, where her work focuses on the indoor environment, including studies on flame retardants, reducing particulate matter exposures through the use of air cleaners, cleaning product use patterns, and associations between biomarkers of exposure and other measures of indoor environmental contaminants, such as levels in dust.

Rebecca will be presenting on the flame retardant

concentrations in house dust before and after replacing foam containing furniture.

Thanks.

(Thereupon an overhead presentation was presented as follows.)

MS. MORAN: Thank you. So I'm going to be talking -- closer. Okay. I'm going to be talking today about a study we did at UC Davis looking at flame retardant concentrations -- sorry. Okay -- looking at retardant concentrations in house dust both before and after participants replaced upholstered furniture with flame retardant-free options in the main living area of their home.

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MS. MORAN: Thank you.

So our main motivation for this study was California revised the State's furniture flammability standard known as TB117 to -- from an open flame standard to a smolder standard, which allowed manufacturers to meet the standard without adding chemical flame retardants to the foam and upholstered furniture. The revised standard is TB117 2013. And as a result of this, consumers can now purchase flame retardant-free couches for their home.

The main goal of our study was to determine whether flame retardant concentrations in house dust

decreased when the couches or the seat cushion foam was replaced with a flame retardant-free option.

Biomonitoring California collaborated with the study to measure flame retardant levels in biological samples, both blood and urine from a subset of the participants that were enrolled in the household dust study. And this will be discussed in the next presentation.

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MS. MORAN: Just briefly, a little background on the use of flame retardants over time. So when TB117 first started in 1975, this required furniture manufacturers to meet an open flame standard. And the cheapest and easiest way for them to meet this standard was to add chemical flame retardants in the foam of upholstered furniture.

One of the first mixes -- one of the problems with these chemical flame retardants is that they're not bound to the foam. And so over time, they migrate out of the furniture into the house dust. Some of the first mixes were made up of polybrominated diphenyl ethers, or PBDEs. These were phased out in the mid-2000s due to human health concerns.

As these were phased out, we saw an increase in alternative flame retardants, preliminary mixes, one of

them known as Firemaster® 550 and other mixes of organophosphate flame retardants or OPFRs. In terms of this presentation, we're including both halogenated and non-halogenated flame retardants in this OPFR group.

In 2015, TB117 2013 went into full effect, allowing the manufacturers to meet a smolder standard by using resistant fabrics or barrier methods and no longer had to add chemical flame retardants to the foam. The new furniture was tagged with a new tag that indicated whether the item contained additional chemical flame retardants or did not, and this was important for the logistics of our study.

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MS. MORAN: So in the study, we recruited two groups. When we started in mid-2015, we started recruiting participants in the Bay Area or Sacramento area of Northern California. These participants had to currently own a couch that was likely to contain flame retardants. We were able to do a telephone screener with interested participants and they had to either have a tag -- a TB117 tag on their couch or know the history of when their coach was purchased, so that we knew that it was likely to contain these flame retardant chemicals.

They also had to be planning to replace their couch or the foam in their couch within one year of

enrollment in the study. And they had to be replacing it with a flame retardant-free option. This was a bit of a challenge for some of the participants when we first started the study. So we gave them an entire year to accomplish this task.

Each of these participants was responsible for replacing their own couch or the foam in their couch. And so each household took a different amount of time to either find a couch that was flame retardant-free that they liked or decide whether they were going to just replace the foam in their couch.

About a year after we started the study, we recruited a second group from San Jose. All of these participants lived in one of two low-income apartment complexes that helped us with recruitment for the study. For this group, we went down and held community meetings to assist with recruitment. And these interested participants were able to be screened in person. This was particularly important for this group, because a lot of times they didn't know the history of the couch or any of the furniture in their home. It was either passed down to them through many people over time or it was purchased from a secondhand store.

So with this group, we could screen them in person and go walk through the home, take a look at their

couch, see if it had the TB117 tag, or if it had any other indications a tag that listed the manufacture date or any other way that we could tell when it was likely manufactured and whether it was likely to contain flame retardants. We did have several homes where we weren't able to make this determination and thus they weren't eligible for this study.

These homes did not have to replace their own couch. The study supplied a flame retardant-free option for them. So the way this worked was each household was given a budget that they could spend at Ikea, where we had determined which lines at Ikea had been turned over to have flame retardant-free options.

This was quite the feat in logistics, but we were able to pull it off with the help of Green Science Policy Institute. And each home that enrolled in the study was provided with a flame retardant-free couch of their choice. And oftentimes, they had enough money to get an additional chair, or maybe a coffee table, or some other furniture for their home.

All the homes in the study were on the same timeline, so all their visits occurred at the same time, usually within a day or two of each other and all the couches were replaced at the exact same time.

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MS. MORAN: Each home had four visits that consisted of us coming into their home, collecting a dust sample from their main living room, and asking questions about the furniture in their home, and doing a walk-through inventory of what was in each room in their home.

Dust was collected at a visit prior to them replacing their couch, and then one at 6 months, 12 months, and 18 months after the couch was replaced in their home.

So if we look at the first group that we recruited, our Bay Area Sacramento group, all of their pre-replacement visits occurred between July 2015 and August 2016. This group, as I mentioned, took quite a while to replace the couches in their home as there were some logistic challenges for them. It took anywhere from 18 days all the way up to the year that they had to replace their couch with a median time of 2.8 months.

The majority of participants in the study were able to replace their couch in under 6 months with approximately a quarter taking 7 to 12 months to replace their couch or the foam in their couch.

All the couches were replaced between August 2015 and November 2016, and then their dust sample visits post-replacement occurred 6 months, 12 months, and 18

months after they replaced the couch in their home.

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MS. MORAN: Our second group from San Jose we enrolled them about a year after we started their study. And their pre-replacement visits occurred in May 2016. It took us two months to arrange the logistics of gathering all the orders, placing the orders, and delivery of the couches. Every couch was replaced in July of 2016. They had their 6, 12, and 18 month post-replacement visits. And study concluded in February of 2018.

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MS. MORAN: So overall, we enrolled 28 households in the Bay Area/Sacramento group. All 28 of the households completed the initial pre-replacement visit and had a dust sample collected. Twenty-two of the households actually completed the replacement of their couch. It ended up with over half of the households replacing the foam in their coach instead of the entire couch, with 8 households replacing the couch, and 2 actually removing a couch with flame retardants from their living room.

So in these homes, it was interesting. One home had already a flame retardant-free couch plus one that contained flame retardants, so they just took the one out that contained flame retardants. Another one had some chairs that did not contain flame retardants. They were

very old chairs and so they decided to remove their couch. They didn't find a replacement that was suitable for them, and so that was how they stayed in the study.

In our -- I'm sorry, 21 of the households completed the entire study in this group, making it all the way to the 18-month dust collection. In our San Jose group, we enrolled 14 households, 13 of those households completed the initial dust sample collection visit prior to replacing their couch, 11 households had their couch replaced and completed the 6-month post-replacement visit, and the 12-month post-replacement visit. And 8 households completed the entire study.

This group was a little bit more challenging as it was difficult to contact many of the participants in between the visits, as phone numbers often changed or sometimes they moved units, and we had to track them down.

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MS. MORAN: There are many methods to collecting dusts in studies such as this. This study we used the Mighty-Mite Vacuum Method. This mostly collects surface dust. But it uses an easily readily-available Mighty-Mite Vacuum with a crevice tool attachment that comes with the vacuum. Dust is collected into a cellulose extraction thimble held into the crevice tool with an O ring.

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MS. MORAN: This is a pretty standard protocol for collecting dust. We collect dust from the main living area of the household. And the idea is to collect the equivalent of the room's floor surface area. So if there's a section of the floor that's covered that you can't vacuum because it's covered by furniture, you go up and over the furniture. But in this study, we did not want to sample the furniture, because we didn't want to falsely elevate those initial dust samples that we collected when the main source was going to be removed from the room.

Typically, in this protocol, you don't go underneath the furniture, so we didn't do that in this study either.

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MS. MORAN: Okay. Once the dust samples were collected, they were transferred back to our lab at UC Davis and stored in minus 20 freezer until they were extracted and analyzed. The dust samples were sieved in a 106 micron sieve. And 100 milligrams of dust was extracted with hexane and acetone using sonication and then extracted again with acetone.

The samples were run through a gas chromatography quadrupole time-of-flight mass spectrometer. Each run was 80 minutes with an increase of temperature from 35 to 325

degrees Celsius in electron ionization mode. The samples were analyzed for 7 brominated flame retardants and 7 non-brominated flame retardants.

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MS. MORAN: We have just completed the analysis of all of the samples for this study. And so we only have preliminary data at this point that we are going to talk about today. And we're going to show data for four of the most common PBDEs found in upholstered furniture and 4 OPFRs that are commonly shown in furniture. We'll be showing PBDE 47, 99, 100, and 153, and also TCIPP, TPHP -- it's also know as TPP, TCEP, and TDCPP.

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MS. MORAN: So if we just take our dust samples and look at them plotted over time, on this graph we see for each of these eight flame retardants that the black lines show an overall decrease in concentrations between the pre-replacement visit and the 18-month post-replacement visit. The dashed red lines show an overall increase.

There's not a clear picture here, but we do see overall a decrease between the pre-replacement and the 6-months post-replacement visit. And we do see quite a bit of decrease throughout the study. Again, these are just preliminary results. And we haven't completed our

statistical analysis yet.

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MS. MORAN: If we look at our second group, the San Jose group, there are less households in this group. It's a little more clear, but we do see a combination of decreases and increases over the course of the study.

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MS. MORAN: One other piece of information that we had in the study was we collected some foam samples from the couches that were removed from the homes from as many people as we could. This was more difficult in the Bay Area Sacramento group, where they were replacing their own couch. There was a variable timeline to replace their couch and some people were replacing the foam in their couch only.

So we were able to get a small piece of seat cushion foam from some of the couches if the participant was willing and the foam was accessible. We successfully got 13 seat cushion samples out of the 22 households that replaced their couch.

The San Jose group was a little easier. Because we were replacing the couch for them, we took possession of their old couch when we moved the new couch in, so we were able to collect as many samples as we wanted from each of those couches.

We took a large block of the seat cushion foam. We took some armrest foam and fabric samples from the seat armrest, backing, and decking of the couch. And we got samples from all 11 of the households that replaced their couch.

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MS. MORAN: So if we just take a look at what was found in the couches themselves, we saw in the Bay Area/ Sacramento group in the seat cushions that we had 3 couches with PBDEs and many, many couches had the OPFRs.

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MS. MORAN: But what we have noticed is when we looked at what was found in the San Jose couches, here you can see that the dark blue rows show what was found in the seat cushion foam and the white rows show what was found in the other samples taken from the couch, so the other foam and fabric samples.

What we found interesting was we did not see agreement. So in a few of the couches, PBDEs were found in the other components of couch, but not in the seat cushion. And in many of the couches, some of the OPFRs that were not in the seat cushion were found in the other components of the couch.

So what we know is that we had more complete information about what was in the couches from the San

Jose group, then we do from the Bay Area group, as well as having information about every couch in the San Jose group compared to the Bay Area group.

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MS. MORAN: So we wanted to look at just these homes where we knew what was in the couch to see if we had a clear picture. And for the San Jose homes, where we had information -- more detailed information about the couch and more complete information from every household that we see couches where PBDEs were detected clearly declined over time.

It's a little less clear for the OPFRs. TPHP had a clear decline over time, but the other OPFRs, we are not seeing a clear pattern.

When we look at the Bay Area group, and we plot the homes where we did have a foam sample and we knew what was likely in the couch, we also decided to look at a few of the homes where it -- we didn't have a sample of what was in the couch, and it was very obvious that they start out with a very high level of some of the flame retardants and they declined over time.

So we decided to look at both, just as an initial snapshot, what could we do to fill in some of the missing data? And we see a clear picture here of decline in flame retardants over the course of the study.

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MS. MORAN: Again, this is just a snapshot. We have just gotten the results back. We have not yet been able to return them to the participants. And we are just beginning the statistical analysis for this data.

But so far what we've learned is that the timing for people to replace the foam or replace their couch was variable and complicated our logistics for completing this study. But overall, we did have good completion rates for the homes that replaced their own foam or bought their own couch.

We did overall see decreases in the dust concentrations after the homes replaced their couch or the foam in their couch. But incorporating the information of what flame retardants were detected in the actual couch helped us interpret the data. This is limited by the less detailed information that we have from the Bay Area group and the less samples that we were able to collect in that group.

We saw some of those unexpected increases in some of the homes for some of the flame retardants. And we hope to investigate this a little further using the survey data that we collected and home inventories that were collected as potential sources of other flame retardants in the home.

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MS. MORAN: So we'd like to thank everybody that made the study possible. Our participants, we could not have done this study without them. Myrto Petreas and June-Soo Park analyzed all of the foam and fabric samples for our couches. Arlene Blum and her group at Green Science Policy were really instrumental in making this study happen and aiding in recruitment of participants, and all the logistics of replacing the couches in our San Jose group.

And Katya Roudneva and Tasha Stoiber collected many of the dust samples in the study. And Veronica Chin at Green Science Policy Institute really spearheaded the logistics of replacing all of the couches for San Jose.

CHAIRPERSON SCHWARZMAN: Thank you so much. We have about a little over 10 minutes for questions from the Panel and the audience. And this time I'm going to take the Chair's prerogative to ask the first question --

MS. MORAN: Sure.

CHAIRPERSON SCHWARZMAN: -- which is understanding -- thank you so much for this presentation, and understanding that this is preliminary data and you haven't finished working with it to the extent that you will --

MS. MORAN: Yes.

CHAIRPERSON SCHWARZMAN: -- the -- looking at slide 16. Slide 16, is it possible to put that back up? That -- let's see San Jose results. That one, yes.

It's nice to see this split out, that when you know there's brominated flame retardants in the coach, you see the decrease --

MS. MORAN: Yeah.

CHAIRPERSON SCHWARZMAN: -- in the first 6 months to a year, and -- but when there are the OPFRs, it's a lot more variable.

MS. MORAN: Yeah.

CHAIRPERSON SCHWARZMAN: And I'm wondering if you know, just off the top of your head, the other sources of the OPFRs that might be in the house that's contributing to this.

MS. MORAN: So that's an interesting question. It's something that we hope to look into a little bit more using the home inventory data that we have, what could have been brought into the home that would contain these other flame retardants. There's a lot of items in the home that -- particularly furniture and electronics -- mostly the furniture that we want to look at to see what potentially was brought into the home or maybe moved to a different room in the home closer to the room that we were sampling.

CHAIRPERSON SCHWARZMAN: Do you know the product categories that tend to contain the OPFRs?

MS. MORAN: Off the top of my head, I don't know that we do.

CHAIRPERSON SCHWARZMAN: Thank you.

Other questions?

Yeah, Veena.

PANEL MEMBER SINGLA: Just a comment related to that is the children's products oftentimes can contain these particular OPFRs. So it would be in interesting to see. I wonder if some of these households had babies and --

MS. MORAN: Many of them did. Most of our households had either children or grandchildren and had baby products. And we did inventory what baby products were in the home at each visit.

PANEL MEMBER SINGLA: Okay. Yeah. I think that would be really interesting to look at, because the strollers, high chairs, car seats, bassinet pads, sleeping pads, a lot of children's products have these particular flame retardants.

CHAIRPERSON SCHWARZMAN: Yeah.

MR. CHARBONNET: And just to tag onto that. This is Joe Charbonnet from the Green Science Policy Institute.

I'll add that the organophosphate esters that we

see used as flame retardants are probably even more abundantly used as plasticizers and plastics. So I would -- I would be aware of that, that you might be seeing in these applications other than just flame retardants.

Also, they are the oxidation product of organo -- or of phosphites, which are antioxidants. So they might be coming from a completely unanticipated source in that regard, too, and they're used quite abundantly there, so -- I recognize that makes your work significantly harder.

(Laughter.)

CHAIRPERSON SCHWARZMAN: Thank you.

Other questions, panel or audience?

CHAIRPERSON SCHWARZMAN: Yes, in the back, but you have to come up to the microphone, please.

MR. TENNEY: Sure. Joel Tenney with -- okay. Good. Joel Tenny, Israel Chemicals.

How did you factor in --

CHAIRPERSON SCHWARZMAN: Closer, please.

MR. TENNEY: -- cleaning habits to something like this? Do people -- did they change their behaviors after they changed couches or was it consistent?

MS. MORAN: Sure. That's some of the data that we did collect in our questionnaire was cleaning habits

over time and we have not looked into that at this point in time.

MR. TENNEY: Okay. Good.

MS. MORAN: But we hope to.

CHAIRPERSON SCHWARZMAN: There was another -- yes, please.

DR. SHE: Thank you, Rebecca. I have one question regarding the brominated flame retardants, you know, that's 200 aligned congeners. Which one you think the most dominant one? I think you didn't look at the PBDE two line, which might be a dominant one, and then you pick up 77, 99, 100. What's the logic behind you pick up different congeners?

MS. MORAN: So if I understand the question correctly, why did we pick to show these specific congeners, is that -- was that your question?

DR. SHE: Yes.

MS. MORAN: Okay. So one of the interesting things is that some studies have shown that the penta mixture of PBDEs, which is primarily 47, 99, and 100 were used in upholstered furniture kind of prior to the mid-2000s. So those were just the ones that we chose to look at initially when we looked at this data.

CHAIRPERSON SCHWARZMAN: Other questions?

Yes.

PANEL MEMBER QUINTANA: Hi. In some studies of house dust they've done, we've used a cyclone vacuum that can, you know, express the dust as -- in nanograms per gram of dust or also nanograms per meter squared, so loading versus concentration.

MS. MORAN: Like in AVS3?

PANEL MEMBER QUINTANA: Yeah, but -- so to get back to the other question, change in behavior, it looks like you did at least vacuum the same area with your vacuum --

MS. MORAN: Yes.

PANEL MEMBER QUINTANA: -- and so you might look at the amount of grams of dust collected as an issue whether or not you did perhaps change behavior, or become aware of dust or something.

DR. DORAN: Yes.

PANEL MEMBER QUINTANA: You might have that variable too.

MS. MORAN: Yes. Yeah, we have included that as well.

CHAIRPERSON SCHWARZMAN: Other questions and we have couple minutes for discussion too, in case anyone has any thoughts they want to contribute.

Yes, Kathleen.

DR. ATTFIELD: I was just going to add a comment

on additional sources for the TPP OPFR, that can also be a phthalate substitute. So it is showing up in some consumer products, like nail polish as well.

CHAIRPERSON SCHWARZMAN: That's the plasticizer application basically, yeah.

DR. ATTFIELD: Yeah.

CHAIRPERSON SCHWARZMAN: Questions or comments?

And if not, we will move on to Kathleen's presentation.

So, Kathleen Attfield is a Research Scientist in the Exposure Assessment Section in the Environmental Health Investigations Branch at CDPH. And we'll have another 10 minutes for questions and discussion after Kathleen's presentation.

(Thereupon an overhead presentation was presented as follows.)

DR. ATTFIELD: Good morning. Thank you very much. I'm Kathleen Attfield from CDPH. And today, I'm going to be talking about the biomonitoring portion of the study that Rebecca just presented to us.

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DR. ATTFIELD: So as we've heard from Rebecca, the study was first conceived to be looking at dust in foam in homes where people have either replaced foam in their couches or the actual couches themselves.

And Biomonitoring California was able to complement this with the addition of urine and serum analyses in a subset of the people. And this portion of the study was entitled the Foam Replacement Environmental Exposure Study, FREES. So that's really referring to biomarkers going forward, just so you know.

And our DTSC laboratory did the analysis of the urine and the blood with the previously established methods.

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DR. ATTFIELD: So our biomonitoring analytes that we were able to look at reflect many, but not all, of the flame retardants that the dust study is looking at. So for the polybrominated diphenyl ethers, we are going to focus today on the congeners that were mentioned that were -- that have been very prominent in foam furnishings. So the 47, 99, 100, and 153. We did look at other congeners, which I will briefly mention later.

For the organophosphate flame retardants, I'll be presenting 3 metabolites of the 4 that Rebecca showed us earlier, though they did also look at a wider range of OPFRs. Just to help you navigate through all the wonderful acronyms, everything that she present -- well, the three that she presented, the parent metabolites, are all the tri versions, the triphenyl phosphate, the Tris

tris(1,3-dichloroisopropyl)phosphate, tris(2-chloroethyl) phosphate.

And what makes it rather easier for the metabolites is these all break down and we look at the di versions or the bi versions. So for TPP, you have 3 phenyl groups here and we're going to be looking at the diphenyl phosphate, the DPP.

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DR. ATTFIELD: So to quickly situate you in time of what is happening with biomarkers in the flame retardant realm, for the PBDEs, we know that in the United States two of the formulations, the penta and the octa PBDE formulations were phased out in 2005. And we are seeing decreased levels of these environmentally.

And also, it looks like these are mostly showing declines in biomarker levels, but not universally. There are some more recent studies that show that maybe things are beginning to plateau for some of these congeners.

Due to the ongoing presence in the environment of these very long-lived chemicals, it does pose a challenge for scientists to accurately assess and calculate the biological half-lives. So we've still got quite a range to get -- to have our estimates here for the BDEs 47, 99, 100, between 0.4 and 5.4 years; and for BDE-153 has much longer half-life estimates of 3.5 to 11.7 years.

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DR. ATTFIELD: For the OPFRs, as would be expected with the timeline that Rebecca showed, these are now increasing in environmental samples, since the PBDE partial phase-out.

And it looks like that biomarkers are following suit, but these are increasing in biological samples. So we only have data so far from one cycle of the U.S. National Health and Examination -- Nutrition and Examination study from the 2013-2014 cycle. Already seeing that the 4 OPFRs that Rebecca presented, their metabolites are detected in over 81 percent of those samples.

One thing to really keep in mind is the -- we've got two very different classes of chemicals going on here. These have much shorter half-lives. PBDE was years. These are in a matter of hours. So this -- any particular biomarker level you see for OPFRs is going to reflect a much shorter time period and a much more recent time period, so that will affect the analysis going forward that I show you.

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DR. ATTFIELD: So our objectives for this analysis was to test if the changes in biological levels of these flame retardants were different between the couch

and foam replacers and a comparison group. So the wonderful thing about having this comparison group is that we can hopefully account for these general population trends that I just presented to you.

We're also going to be able to look at change within people so that can help us reduce the impact of between-person differences, hopefully those that might reflect from perhaps, sex, rage -- race or age, for example.

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DR. ATTFIELD: Our comparison group has the formal title of the Intraprogram Pilot Study, IPP. I'll try to call it comparison group, so it's not too many acronyms. It's essentially a periodic sampling of volunteers from the staff associated with Biomonitoring California, OEHHA, DTSC, and CDPH. This is for testing and demonstrating of our laboratory methods.

So, in 2016 to 2017, we were focusing on flame retardants. And for the analysis that I'm doing, I have removed anyone who perhaps moved or replaced their furniture. So we can sort of think of them as more stable group of people to compare to the FREES participants.

We will see that they have pretty much similar demographics and we hope that they are also comparable in having perhaps similar sort of environmental awareness to

our FREES participants that might affect aspects of behavior, such as was brought up by one of the commenters.

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DR. ATTFIELD: Our participant numbers, so we're shifting from household to people. So we have 25 people from the dust study that also elected to participate in the biological sampling and made it to the 12-month sampling point as well. Just a side note, this includes the Bay Area as well as the San Jose participants, but it was only 3 of the folks from the San Jose group represented in the 25.

There's only 23 in the end that have overlap with the dust samples, because there were 2 people who didn't remain in the dust sampling to that 12-month timepoint. Our comparison group had 28 people.

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DR. ATTFIELD: On our participant characteristics, it actually worked out that we have an identical proportion of female-to-male participants, 68 percent female. For race, pretty similar proportions of white to Asian, sort of 60 to 70 percent. A little more diversity in our FREES group.

Now, we're going to revisit the timeline, because the timing of the samples is -- makes the comparison a little bit tricky.

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DR. ATTFIELD: So for the dust we saw that there was a sample taken at the pre-couch replacement. There's a variable period of time before the couch replacement, hence the broken line, at 6 months, 12 months, and 18 months.

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DR. ATTFIELD: For our FREES population, we tried to make these as contemporaneous as possible, so about the same time as the pre-couch replacement, 6 months, 12 months and 18 months. Of note, at 6 months, we only did the urine sample, so we only have OPFRs for that 6-month time point.

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DR. ATTFIELD: Now, to compare this to our IPP, our comparison group, I slid down the FREES. So the first sample that was taken from our comparison group was a bit later. So it was sort of more time to have exactly a year timespan versus the more variable time period of the FREES. So a bit more around the time of the couch replacement and the second sample 12 months later, approximately.

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DR. ATTFIELD: So to put that in tabular form, that did work out that the time period between the two

samples for FREES was about 1.23 years for median and just over 1 for our IPP group. The IPP group did start later for our first samples, so in August of 2016. Whereas, as Rebecca mentioned, it was a year time period for collecting that first sample, for us September 2015 to September 2016.

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DR. ATTFIELD: Because of these small number of participants and the possibility of other sources that may be impacting results and these variable time periods, we started out with a pretty simple way of looking at these differences between the groups. So a testing of the slope, so the change in concentration over time.

So let me visualize this for you.

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DR. ATTFIELD: So here's a schematic of a hypothetical PBDE. This is not real data.

(Laughter.)

DR. ATTFIELD: Don't get fixated on any particular points here. So we're calling 0 month that first measurement for this -- for the comparison group, so the dots on the left are the first sample. You see the slopes down to the dots on the right-hand side. Now, I'm making the assumption that we're all in the phase of eliminating PBDEs from our bodies using first order

kinetics, so we're expecting a log-linear decrease over time. So that's what's pictured there.

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DR. ATTFIELD: And then adding FREES for comparison, again samples on the left are your first sample time points with time before couch replacement being negative months. And then on the right-hand side, the second measurements and the slopes in between.

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DR. ATTFIELD: So then we're going to be able to compare the overall slopes, so that's what we're going to be looking at.

So I'm -- one thing of note also is this is kind of -- there's a bit of a conservative test, because we're going to have to average in the time before that couch replacement.

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DR. ATTFIELD: So on to our preliminary results. So to compare our initial concentrations of PBDEs, so here I've represented the geometric means of the four congeners, combining FREES and IPP together. We can't, at this point in time, compare to NHANES, because they're just doing pooled samples after 2003, 2004. So here, I'm showing our best comparison, which is the California Teachers Study. So our levels are pretty comparable to

what's seen there, even though we're a bit, you know, later in time than the Teachers Study.

Quick nod to the other BDEs that were measured. Pretty low frequency of detection, mostly under 12 percent.

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DR. ATTFIELD: Breaking the two groups apart, our FREES participants did start higher than our IPP comparison group. But again, since we're looking at change over time, this should hopefully not have a lot of bearing.

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DR. ATTFIELD: So now just showing that graphic again, but with real data. This our BDE-47. So hopefully, it should be pretty visually apparent. I'll show you tables in a second. But that we do see a greater change in the PBDE -- in BDE-47 for our FREES group.

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DR. ATTFIELD: So in shifting to tabular result form, just -- I'm going to switch to percent change over one year. So this graphic is showing you log change, but we're going to go back to raw values, so it's a little easier to comprehend.

So for BDE-47, so that what you just saw translates into about a 21 percent change for our

comparison group versus a 43 percent decrease for our FREES population. Pretty similar in BDE-99. 100 is a bit smaller of a change, 16 percent for the comparison group, 36 percent decrease with our FREES participants.

And there's actually a typo on this slide, it's BDE-153 there at the bottom is -- as you'll see, it's just about the same percentage of change. And that actually is not much of a surprise, since it has a much longer half-life for one, and it has much lower predominance in the mixture that's put into foam furnishings compared to the others.

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DR. ATTFIELD: So moving on to our OPFRs, so these are initial OPFR concentrations. Take this comparison with a little grain of salt. They are unadjusted, because we're using specific gravity in this analysis, where as NHANES presents creatinine-adjusted. So our levels are a little higher here for our California samples. Also, it could have to do with that we're in California, but also it's a later time period.

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DR. ATTFIELD: Again, breaking these out by our comparison group and FREES, we have higher levels in our FREES group for the BCEP and the DPP, and pretty similar levels for the BDCPP.

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DR. ATTFIELD: So the analytical approach a little different than the other one, because of these such short half-lives the sort of passage of time is not really going to play as big a role. We might expect an initial drop and then pretty stable results, if you were to look at the 6-, 12-, and 18-month values. So I'm just showing you -- I'll be showing you linear regressions with repeated measurements accounting for the repeated measurements. And then because we do have data for FREES only and have this concern about the short half-lives involved, I will show you some correlations between those three different measurements.

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DR. ATTFIELD: So our first one, BCEP. So for this one, we'll see that the FREES levels do go down a little bit. But that is not statistically significant. Whereas, for our IPP, we actually saw an increase in levels of over the 0 to the 12 months, an 84 percent increase.

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DR. ATTFIELD: So we have the concern though of the short half-life chemicals and what kind of variability we might just sort of naturally see within people and their difference sources of exposure.

So these -- for BCEP for the 6-, 12-, and 18-months samples, those had a kind of moderate level of correlation about 0.59 to 0.6 state. And if you look at intra-class correlations, which are the ratio of between variability to the between and within variability, it's about 0.57. To have excellent reliability, you'd want it to be above 0.8.

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DR. ATTFIELD: For BDCPP, we see -- for this one, we actually see a significant decline in our FREES participants, a 53 percent decrease, while our IPP comparison group declines by about 18 percent.

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DR. ATTFIELD: However, I'm afraid to say that it has even worse correlation between the 6, 12, and 18 months. So again, these are some, you know, preliminary look at some of these data. So there's going to be a little interpretation work going forward. So the rhos the correlation being between 0.3 and 0.4.

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DR. ATTFIELD: For the DPP metabolite, our FREES levels actually stayed pretty stable, while the comparison group went down about 30 percent.

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DR. ATTFIELD: These also have moderate levels

correlations, about 0.4, 0.5. And the ICC shows that the within is rather dominant. So especially for these short half-life chemicals, in addition to the intervention, we need to think about what other aspects may be changing in the homes and in the lives and behaviors of our participants. So we also have quite an extensive questionnaire for our participants, both before and after. So there are some things we can begin to look at related to those.

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DR. ATTFIELD: So some very generally obvious ones that people might want us to look at, just starting off with those. So handwashing frequency. We didn't actually see that that had much of an association with initial concentrations or change over time. And we didn't have many people telling us that they changed their handwashing frequency. Of course, that requires them being able to assess their own changes in handwashing over a year.

Its known that PBDEs can be enriched in meat -- in animal products. So we did look at differences between vegetarians and meat eaters. And again, this is in our FREES population only, and did not see associations there, nor with hours at a work computer, another possible source of flame retardants into your breathed in or dermal

exposures of dust.

We did actually see an association with sleeping on a foam mattress with initial PBDE concentrations. This did not affect the change over time that we were looking at though.

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DR. ATTFIELD: So the sensitivity test that I started to look at. Again, since it's a small "n" that we're dealing with, it's not possible to put lots of things into your model. But I did look at sex and race. We didn't see any differences with race, and gender/sex had very little bearing, though we saw a bit of a greater change in BDE-99 with being female.

I was a little concerned to look at the fact that our FREES population started higher in the PBDEs. And, of course, I'm assuming a log-linear decrease, but that's an assumption. So I did limit the FREES group just to those with a similar range of values to the IPP. And that actually didn't make -- didn't really make any change in the difference there.

Also, looking at clustering of people in the same homes, because we had about eight couples from the FREES group that participated in the biomarker portion of this study. There's that possibility by clustering and that actually didn't end up having much of an effect. We had

some couples who had very similar values, and we had other couples that really didn't have very similar values at all.

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DR. ATTFIELD: So this -- while we're seeing a decrease in those PBDE values and sort of variable results in our OPFR values, I do believe we do have a fair amount of work in interpretation before we can think about saying that the couch was the sole contributor to this change, and that also, as we saw from Rebecca's results, not all of the couches that did end up getting biopsied showed PBDEs in those initial couches. So there's -- in the foam of the seat cushions. So there's some work to be done to look at this further.

So we will be coordinating with UC Davis and Silent Spring to look at these and complement our questionnaire data. We have some questions they don't have and they have some we don't. And that will help us to be able to interpret these results a little better.

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DR. ATTFIELD: Some limitations. We have way more questionnaire information on our FREES participants than our comparison group. So that may limit our ability to think about some aspects of behavior change that could

have happened.

Of course, this -- even with the most extensive questionnaire, you are asking people about change over a year's time, so we may not have captured all these behavior changes. That might be pertinent. And again, the small size and other sources of flame retardants may make it a bit difficult to assess other sources of confounding and variability.

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DR. ATTFIELD: To situate this in the context of some other intervention or time-change studies, there was a study looking at interventions on handwashing and house cleaning, closely focusing on OPFRs, doing those one week each. They did see up to a 52 percent decrease in OPFRs. Our highest decrease for OPFRs was 53 percent, but they also saw some increases. So again, short half-life chemicals, there can be some variability that's difficult.

A study of looking at before and after a gymnastics practice can show that even in the space of a few hours, you can have a dramatic increase in an OPFR level, here a 50 percent increase in DPP.

For within person variability, there have been a few studies on OPFRs. Here, I just showed you one over five weeks. So again, the interclass correlations around the same range, a bit better actually than what we saw,

0.54 to 0.67. What -- again, what makes great reliability is over 0.8. And that you more often see in long-life half-life chemicals, such as PBDEs. So there was a study looking at variability over a year of three measurements and very excellent correlation over time showing between mostly predominating. And ours were -- our ICCs for PBDEs were like 0.81 to 0.97, so quite high similar to that.

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DR. ATTFIELD: So to conclude, our PBDE measurements, we did see them decreasing at a faster rate in FREES compared to our comparison group, except for the BDE-153. Our OPFR measurements shows different patterns and could be complicated by their short half-lives.

And we're working further to understand how much we can attribute this intervention to any one of those particular changes.

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DR. ATTFIELD: So I definitely would like to acknowledge our participants that had a lot of work to be a part of this study and the staff of Biomonitoring California, and our collaborators.

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DR ATTFIELD: And with that, I can take questions.

CHAIRPERSON SCHWARZMAN: Questions from the Panel

or the audience?

Yeah, Ulrike.

PANEL MEMBER LUDERER: Thank you. That's a very interesting presentation. My question is you mentioned that you don't have very much data about -- from the comparison group. That might explain why they had lower levels to begin with of the PBDEs. But I'm wondering if you had any information, you know, maybe particularly about furniture with -- containing foam and presence of that or if you really just don't have that information.

DR. ATTFIELD: We really have very little information. The most we asked about the furniture again was did you replace major articles of items.

Yeah, I mean, one thing I think is of interest is the variability is lower in our comparison group. And that -- you know, to be completely postulating, perhaps it's, you know, having more of a shared daily environment. Those of us that sort of share office space and so have that sorts of dust in our environment.

CHAIRPERSON SCHWARZMAN: Go ahead, Jenny.

PANEL MEMBER QUINTANA: Very quickly. Since you're looking at a home-based exposure, do you have any information about how many hours they had spent in the home out of the last 24 hours prior to collection of the urine sample or the samples? Because that -- if they had

spent time away from home, that may have not contributed -- the home environment might not have contributed to the levels.

DR. ATTFIELD: Right. I actually don't think we have the previous 24-hour. We do have a lot of information sort of on your general patterns, you know, how much you work at home versus work at other places, travel in the car, travel in a plane. But I'm afraid I don't think we have the last 24 hours, but I'll look, and make sure. Good question.

CHAIRPERSON SCHWARZMAN: I had a question also about your discussion of association with behaviors. It's slide 33. And my question is just whether the study is actually powered to detect those. You know, you found basically not very many associations, except sleeping on a foam mattress affecting PBDE --

DR. ATTFIELD: RIGHT.

CHAIRPERSON SCHWARZMAN: -- initial PBDE levels.

DR. ATTFIELD: Right. So that's a very pertinent question and that is why you see four bullet points on this slide, that there are many other questions, but not really enough variability to really have any confidence in looking at those comparisons.

My hesitation on handwashing frequency is a little more on people's ability to accurately assess their

own patterns actually, than the power aspect to this question. This one was powered okay. That would be more my grain of salt.

CHAIRPERSON SCHWARZMAN: And I also wondered about slide 27, where the BCEP levels go down a bit, but not significantly. And I wondered if, you know, as with our discussion about some of the other OPFRs, if just the furniture isn't the main contributor to exposure to this flame retardant?

DR. ATTFIELD: Right. And we haven't combined --

CHAIRPERSON SCHWARZMAN: Chemical in general.

DR. ATTFIELD: -- the foam and dust data with the biomarker data yet. So I can't yet answer that question. Foam is tricky, because not everybody gave a foam biopsy of their couches, so -- but we will have dust to be able to look at.

CHAIRPERSON SCHWARZMAN: And sort same for anything where the FREES levels aren't changing significantly compared to the comparison group for OPFRs, you know, maybe -- maybe the intervention isn't the main driver of that exposure.

DR. ATTFIELD: Oh, it's completely possible, yeah.

CHAIRPERSON SCHWARZMAN: Other questions and comments?

Veena.

PANEL MEMBER SINGLA: Just a quick comment. I just wanted to say this is -- I think it's super interesting and exciting results. I'm really looking forward to seeing the further analysis. And I know this study was a lot of work to coordinate and complete, so --

DR. ATTFIELD: Thank you to my predecessors.

PANEL MEMBER SINGLA: Yeah. So --

DR. ATTFIELD: I was not one of the ones that -- I had one field visit.

PANEL MEMBER SINGLA: I just wanted to offer my compliments and congratulations.

CHAIRPERSON SCHWARZMAN: All right. Anything else?

If we have nothing else, that means we get a few extra minutes for lunch.

MS. HOOVER: No public comment.

CHAIRPERSON SCHWARZMAN: Oh, no public comment. Okay.

So I have a couple things to say about lunch break and then we'll stop. One is that we have a little over an hour. We'll convene promptly at 1:25. Russ will start us off at 1:25. And so there's a handout in your packets with this map that shows some close by lunch places to help with that.

And for Panel Members, just a reminder to comply as usual with the Bagley-Keene requirements and not discuss Panel business during lunch, and also that holds for the afternoon break.

And with that, we'll conclude the morning session and reconvene at 1:25.

Thanks.

(Off record: 12:15 p.m.)

(Thereupon a lunch break was taken.)

A F T E R N O O N S E S S I O N

(On record: 1:26 p.m.)

CHAIRPERSON SCHWARZMAN: Thank you all for coming back on time. We are going to jump right into Gina Solomon's presentation. So I want to take a moment to introduce her.

Gina Solomon is a principal investigator at the Public Health Institute in Oakland and a clinical professor of medicine at the University of California, San Francisco. She served as the Deputy Secretary for Science and Health at the California Environmental Protection Agency from 2012 to 2017, and as a Senior Scientist at the Natural Resources Defense Council from 1996 to 2012.

Gina has worked on children's environmental health, reproductive toxicity, cumulative impacts and the use of novel data streams to screen chemicals for toxicity. She serves on multiple boards and committees at the National Academy of Sciences and on the U.S. EPA Board of Scientific Counselors Chemical Safety for Sustainability Subcommittee. She is a former member of the SGP as well.

Gina will be talking about an NAS report on organohalogen flame retardants and chemical classes.

Thank you, Gina.

(Thereupon an overhead presentation was

presented as follows.)

DR. SOLOMON: All right. Thank you for the invitation to come present before the Panel. And I'm glad to be here to continue the conversation on flame retardants.

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DR. SOLOMON: So just last month, a committee of the National Academies -- oh, right. This disclaimer. This is not the official presentation of the committee, though I did run the slides by the chair and the Academy staff, so that -- and they concurred that this reflects the report, but it also is tailored to this meeting and this group and my opinion.

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DR. SOLOMON: And so the Committee to address -- to develop a scoping plan to assess the hazards of organohalogen flame retardants just finished up and the report came out just last month. And this is the Committee. It was actually a really -- it was my -- I have to say it was my favorite National Academies Committee. Am I allowed to say that?

(Laughter.)

DR. SOLOMON: It was a really interdisciplinary group of people, and very enthusiastic and hard working group. So people put a lot of time and thought into the

report which was on a very tight timeline.

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DR. SOLOMON: And here's the picture of the front of the report, but you can download it on the National Academies' website. The report came into being because of the Consumer Product Safety Commission, which was the sponsoring agency. But it really came into being, because CPSC was petitioned by a large and diverse group of organizations, including those you see listed here and a number of others, that requested that CPSC take a class approach to organohalogen flame retardants, and in fact ban them in four different categories of children's related products or products that kids might be exposed to in, one way or another, in the home.

And interestingly enough, the CPSC staff reviewed the petition - this was several years ago now - recommended to the Commission that the petition be denied. But the Commission, at that time, did -- in 2016, approved or voted to move forward with this petition. So the next step was to pull together and sponsor this National Academies committee to take a look at this issue and try to figure out -- or describe ways to approach the task.

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DR. SOLOMON: And as many of you know or all of you know, the National Academies, you're sort of a slave

to your Statement of Task -- more than sort of. You are a slave to the Statement of Task. And so this is the Statement of Task sort of abbreviated: so surveying available data for flame retardants; identifying at least one approach for scientifically assessing OFRs as a class for hazard assessment; and then provide a plan on how to move forward.

But in the box is an important quote, that "CPSC needs the hazard assessment plan...when executed, to be readily integrated with a separate quantitative exposure assessment to complete a human health risk assessment".

And that's an important decision context, because it's very different from, for example, Biomonitoring California's decision context about listing chemicals as classes, where we're not expecting to have to do a risk assessment of those classes that are designated or prioritized.

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DR. SOLOMON: The committee started out by looking at the general idea of approaching chemicals as classes. And there's a lot of, I think, pretty useful language in the report describing all the reasons why chemical-by-chemical risk assessment has serious problems.

You know, the -- and the whole row of reports at the bottom all are cited to make the point that actually

there's an entire thread by now of NAS reports that have made these points. You know, if you look at Science and Decisions, which talked about where insufficient data often results in this sort of unofficial default that a chemical is non-toxic. There is the problem of untested chemicals being substituted. And Dr. Mike Wilson's work was actually cited in the report as an -- you know, where one of the places that -- where that, you know, was sort of developed. And then this issue of cumulative risk and cumulative exposure tending to be ignored, if you're just looking at one chemical at a time.

And so the committee concluded that a class-based approach really makes a lot of sense. That there's a new approach to risk assessment that needs to be developed and it should be class based. So that I think was helpful.

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DR. SOLOMON: The -- there's a sort of a nuance here, which is that the class that was defined for us of organohalogen flame retardants we sort of quickly looked at it and went, well, okay, you know, do we have to look at it all as a single class or is there the possibility of looking at smaller units or subclasses for conducting a hazard assessment?

And the committee concluded that it's still a class approach, even if you break a larger class down into

subclasses, though, you know, there's a certain point at which the subclasses become so small - and I'll get to that later - that it's almost the same as doing chemical by chemical.

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DR. SOLOMON: There is a nod to Biomonitoring California in the report. So you guys and OEHHA should be proud of this work, because it talked about adopting the class approach in the Biomonitoring Program and then how that was further adopted in the Safer Consumer Products program. And there's even specific language about the flame retardant classes that were identified, designated and prioritized by this Panel. So -- but it makes the distinction that these have not been used to conduct risk assessments.

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DR. SOLOMON: So the committee laid out a proposed approach to defining a chemical class, starting with the question of can you define a single class? And this is complicated and big, but it's not actually as bad as it looks when you start to go through it.

Because the first question is obvious, can you define a single class and can you do it based on physiochemical properties, or biology, or some combination of those two? And if not, then, you know, can you define

subclasses? And if not, then you may have to do individual assessments. But if you can, then you define your subclasses. You do a quick literature survey to get a sense of the data availability in each of those subclasses and whether there's any data at all on any subclass member. And if so, then you can potentially move forward and do a more in-depth hazard assessment as described in the lower part of this flowchart.

But, you know, it's pretty straightforward and we tried to actually sort of break it up into steps and then do it actually, and found it to be really an interesting exercise. So the first step for the flame retardants was to figure out, okay, what are the flame retardants? We asked CPSC. They said they couldn't provide us with a list. There was a list in -- appended to the petition, so we certainly looked and used that as one of the sources. We actually asked the American Chemistry Council, because they were very interested in engaging in the process, asked them if they could give us a list of organohalogen flame retardants. They were not willing to do that. So we had to make our own list.

And so we started -- and we called that list the seed set, because then we used it to generate what we called an expanded set of chemical analogs that were structurally similar. And then we did an exercise to see,

can you distinguish the chemicals that we think are being used as flame retardants from otherwise somewhat similar chemicals that we don't think are currently being used as flame retardants. And if we couldn't designate -- couldn't distinguish, then it makes it a little hard to call it a single class and then move forward and define subclasses, which is what we ended up doing in this case.

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DR. SOLOMON: So the seed set chemical list, there's seven data sources all listed at the bottom. Eastmond(2015) is the petition. The Danish EPA has done a lot of really useful work on this, and we used their work quite a bit. And we identified 161 organohalogen flame retardants in those sources and then got rid of the duplicates and mixtures and got down to 148 and published that list. So that's available now out there. It's the best we could do as a committee.

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DR. SOLOMON: Then defining -- trying to define similar analogs, we took the full 200,000 organohalogens that are, you know, out there, used Tanimoto Similarity Index threshold of 80 percent to just sort of do a cut of what similar analogs are there and came up with a bit over 1,000. And then looked at physicochemical properties and ToxPrint Chemotypes types to try to -- and I don't want to

get too into the details here. But it's basically this idea of, well, can -- you know, can we sort of break our 148 out from this larger pool of over 1,000.

And it basically just showed that there's a lot of organohalogens out there that share really pretty much all the same chemical properties and structural properties as the known flame retardant ones. And so they could maybe in the future become flame retardants or they might not, but it's -- you can't distinguish them.

So it was really hard to call it a scientifically defined class, except by use. And use doesn't work in a risk assessment context. It works in other contexts, but not in a risk assessment context.

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DR. SOLOMON: So all that is to say that we ended up defining subclasses. And there's lots of different ways to define subclasses. We ended up using a combination of structure and biology, but we also realized that you can define subclasses so narrowly that you can -- you know, we could have ended up with 100 -- almost 148 different subclasses. There's no point.

And so we cautioned against that and proposed defining them broadly. So we looked at predicted biological activity, came up with eight biology-informed categories. Also, looked at different chemotypes in the

seed set and merged the information and ended up coming up with 14 biological/structural subclasses.

The smallest class had four members. There could have been some classes that had one or two members and we ended up deciding to merge those into the most closely related classes.

That also meant that we had some chemicals that were in more than one class. That could be okay. They would just be assessed maybe twice or, you know, in two different classes.

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DR. SOLOMON: And so this is our 14 subclasses. And so you sort of get a sense of the -- how we sort of defined them. And I don't know that there's too much we want to get into there, except for you could see some of the favorites there, the polyhalogenated diphenyl ethers there with 12 members. Polyhalogenated organophosphates just below them with 22 members and then a whole bunch of other subclasses that are -- you know that we're not -- haven't been looking at as closely.

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DR. SOLOMON: And in the next step, we did a data survey just looking at big data sets out there. Toxicogenomics Database, the EPA Chemical Dashboard, Hazardous Substances Data Bank, you know, IRIS, ToxCast.

ChEMBL, by the way, is a UK. I wasn't familiar with that, but it's a UK-based data source on chemicals.

And there's a much bigger table in the report, but this gives you a sense of how it looks. Our eight data sources going across the bottom on that X-axis. The number of seed chemicals with data in each of these classes. And you can see that, you know, most cases -- in a lot of cases there were zero data in any given data source. And in some cases, there was data on, you know, one or two chemicals in the subclass. And in a few cases, like the polyhalogenated organophosphates which is the second row down, you see that there were -- there's, you know, much more data available. Like in that Comparative Toxicogenomics Database, there was data on ten of them, and data -- a little data on some in most of the data sources.

So you get a sense of more data rich versus data poor subclasses by just sort of scanning this kind of quick almost like a data inventory or data survey.

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DR. SOLOMON: And so we decided to pick two subclasses to focus on and to try to take further in a case study. And we picked the polyhalogenated organophosphates because they were relatively data rich, as I showed you from the previous slide. And the

bisphenol aliphatics, because they had some data, but not -- wait, are they on there?

Shoot. Sorry. They're not on this little clip from the table, but they're much more data poor, but not so data poor that we couldn't do anything with them.

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DR. SOLOMON: So here's what we did. We did an in-depth literature search looking at traditional toxicology data. We did a big zebrafish deep dive, because we had a zebrafish expert on the Panel, and a ToxCast and Tox21 deep dive. And we focused, just to try to make it more manageable, on developmental toxicity - and in the case of the bisphenols, thyroid homeostasis - and tried to evaluate and integrate the data, and ended upcoming to the same conclusion for both subclasses, which was that the available data were too heterogenous and too inconsistent to come to a conclusion.

And it was super frustrating, which is why I put the bomb down in the lower right-hand corner. We were actually hoping that it would be a lot neater and tidier, and that we would see the same kinds of effects. But what we ended up seeing, and I don't want to get into too much detail, but, you know, were -- results that were actually diametrically opposed from one chemical to the next in the subclass, or, in some cases, very strong zebrafish data

with fairly negative rodent data.

And it was really, without getting really deep into each study and figuring out which ones were weak and further evaluating it, we weren't able to just, you know, immediately say, okay, there's consistent findings.

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DR. SOLOMON: And so what we did, instead of going deeper at this point, because this was top level recommendations, we laid out options for what to do next.

So, you know, option 1 would be basically to say, okay, you know, you extend the most conservative conclusion regarding hazard to the entire subclass, and that would be reasonable, though it's sort of more of a policy decision. Option 2 is reclass. If you have some members that are sort of borderline and they're behaving a little differently, you might move them out of the class. Another is to dig in more deeply to the data to try to explain the discordance. It may be -- have something to do with study design or study quality, and that could allow the assessment to move forward. We didn't have the amount of time we would have needed to do that, or generate some more data that could increase clarity.

And we made really clear that that would not have to be, you know, traditional toxicology data. It could be high-throughput data. It could -- you know, that would

just sort of help explain the discordance.

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DR. SOLOMON: We also laid out other possible options that we saw across the classes. There were some classes where there's basically no data on any member of the subclass. You can't go much further if you have nothing on any anything. And so there's a need to generate some data or to broaden the subclass, so that you're pulling -- maybe pulling in some of the non-flame retardant analogs for example or reclassify into a different subclass, or if you had data on just one or two chemicals in the subclass and nothing at all on the rest, you can make a fairly scientifically based, scientifically informed policy decision to treat them all like the ones with data, or try to, you know, extrapolate based on predictors or generate some data on the others to allow you the confidence to extrapolate, or there's the data-rich subclass.

We really only had one example here, which was the PBDEs among the flame retardants. And we actually concluded that for the PBDEs, you could, with a fair amount of scientific confidence, extrapolate across the entire subclass a designation of "potentially hazardous", which is what CPSC uses. So if you have concordant data that works well.

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DR. SOLOMON: So just to wrap-up, things that I think came out of this report, a pretty strong statement that a class approach to chemicals is scientifically justifiable, and, in fact, useful in all kinds of decision contexts, including in risk assessment. The approach to forming classes may differ depending on the decision context. So in risk assessment, you might have to form narrower classes.

And then we recommended coming up with classes based on a combination of chemistry and biological indicators or predictors. And then we said basically if the data are relatively concordant, it's perfectly scientifically justifiable to extrapolate to chemicals in the same subclass with no data, but that, you know, when you have discordant data, it gets harder.

And then there was a real emphasis on using predictive high-throughput toxicology approaches to help, you know, extrapolate within or across classes. And the discordant data I think we were all hoping that we would be able to make some more -- some clearer conclusions about the subclasses that we focused on. And so that was a disappointment. But, you know, the results were what the results were.

And then we, you know, only had a certain amount

of time to take the analysis as far as we did. So there's a lot more I think that could be done to move this forward, and hopefully a CHAP panel which would be the next step in the CPSC process, will be able to, you know, get past that hurdle and move these assessments forward.

So, thank you very much and I'm happy to take any questions.

CHAIRPERSON SCHWARZMAN: Thank you, Gina. We have about 10 minutes for questions, a little bit more. I just wanted to start with one of my own, which is - slide with the bomb, where the dats are too heterogeneous or inconsistent on biological activity. How do you define biological activity there? That is, is it -- they have to have the same endpoint or a similar mechanism, they work on the same, or can it be any of those, or a combination?

DR. SOLOMON: It could be any of those or a combination. I mean, we -- the main situation that we ran into was where we had -- well, actually, we had differences between the zebrafish studies and the rodent studies, where the zebrafish studies were indicating developmental toxicity, and the rodent studies were fairly negative for developmental tox.

And then in the case of the bisphenols, we had, especially for thyroid endpoints, we had some that were positive -- some zebrafish studies that were very positive

and some that were negative.

And so, you know, it -- so they were for the same endpoint and/or constellation of endpoints in pretty similar -- not exactly the same methods. You know, there's different methods for doing zebrafish studies. And so it was just to the point that it would have taken a lot more digging to figure out, okay, is there some reason why the studies out of this lab were positive and that lab were negative, or, you know -- and there may well be, we just couldn't do it.

CHAIRPERSON SCHWARZMAN: So the heterogeneity that you're talking about is mainly there's some that are positive and some that are negative, not that you're finding that within one of the classes you defined, some, you know, work on this receptor versus other's work on that receptor?

DR. SOLOMON: Not so much. Yeah, it was more --

CHAIRPERSON SCHWARZMAN: So it's positive versus negative.

DR. SOLOMON: Yeah, it was more that -- though that may be an explanation. There also were some possible explanations, you know, people were -- again, you know, you can come up with your hypotheses. It just was -- we need to dig deeper to test them. So, for example, some of these were much larger molecules than others. And so, you

know, were they actually getting into the organism. So there may be a difference of in the toxicity within a subclass based on molecular size with a little bit more digging probably could sort that out.

But then it becomes a little tricky, because they're all part of the same subclass. Then do you divide the subclass again based on size? Maybe, but, you know, then you start again slicing and dicing. And then that -- again, if you're trying to move forward a class concept, it can start to get complicated.

CHAIRPERSON SCHWARZMAN: Thank you.

Tom.

PANEL MEMBER McKONE: All right. Now, it's on.

So I was curious about you didn't go into a deep dive on the structure activity classification and binning. I guess the point I'm curious about is not so much what methods, because there's so many different approaches, but is there a way of knowing is it like so non-specific -- I mean, the different SAR or QSA -- quantitative-structure activity, methods are going to do different binnings and classifications. Are you concerned that somebody using that, that there's such tremendous sensitivity, that it might not be useful as a way to organize bins or is it useful? Is there some sort of robustness that starts showing up among some of the methods?

DR. SOLOMON: I may not be the best person to answer that question. Some of the committee members who are like -- you know, were more steeped in this might be better. We -- the committee -- since there were several people in the committee who were very versed in these approaches, they actually ran -- looked at a number of different tools for doing that -- you know, doing the binning.

So we did -- you know, at least fully moved it through two completely different sort of approaches, and they didn't come out that different. I mean, then the groups had to reconcile. And it is useful. We discovered to look in a number of different databases and use a number of different tools. But that again emphasizes, you know, if you're going to do this, you know, our committee had like top people in some of these fields that were very versed in the methods.

But, you know, this -- and if you're going to do something like this here, we would need to have more expertise potentially in -- you know, like on the staff.

PANEL MEMBER McKONE: I mean, just to follow up, so I guess the question that you answered actually is that -- is, you know, the opportunity for major misclassification, right? In what you're doing, a misclassification isn't the end of the world, because

you're just trying to get insight about organizing.

But the fact you said that they explored this and they tried to find, you know, multiple methods, and that they -- means that probably there isn't an opportunity -- there is not an opportunity for like a significant misclassification because your explored alternative ways.

DR. SOLOMON: Hard to say. I mean, you know, there could be misclassifications. There were calls that border line and the two methods -- the methods that were done were not fully consistent with each other. And so there was this whole sort of resolution process where things, you know, sort of decisions about where to place chemicals.

But -- and then there's the question of, okay, you know, how -- we realize we were spending quite a bit of time on this and that it could become an endless do-loop for an agency. You know, if an agency is trying to form classes and subclasses, and then putting them out for comment, and then somebody saying, no, this should be in this class and that should be in this class, and then you get a little more data, and then you reclassify. And you might never actually do an assessment, if you're in this endless classification and reclassification.

And so there were -- actually, the language in the report saying avoid -- you know, once you settle on

your classes avoid reclassifying, at least until later in the process. Once you're, you know, down into the hazard assessment and you start -- you know, if you find discordant date, you might have to reclassify some at that point, but don't just kind of keep doing the exercise.

CHAIRPERSON SCHWARZMAN: Go ahead and then Carl.

PANEL MEMBER LUDERER: Thanks, Gina. That was a really great talk. My question is actually about the discordant data. And maybe this is, you can't say in general, necessarily. But, in general, were the discordant data among different chemicals within the class or even, you know, for same the chemical that you had a lot of discordant data or did both occur?

DR. SOLOMON: It was mostly different chemicals in the same class. That was what was so problematic about it from our perspective. It was that you, you know, have two chemicals that were in the same subclass that would have very -- you know, they had very different outcomes in very -- sometimes in the same study. So there were a number, for example, of zebrafish studies that looked at a whole bunch of different flame retardants. And they -- you know, there were chemicals that were positive and chemicals that were negative. And sometimes those had been placed in the same class, so that was -- you've got the same lab, the same method, the same study, different

findings. Can you still class them? It's a question.

PANEL MEMBER LUDERER: A follow-up. I mean, another benefit though of this, even in that situation, if you're looking more chemical by chemical, is taking into account all of these data that are not the traditional toxicology data, you know, animal bioassays, et cetera, and really taking -- making use of all those mechanistic data that haven't traditionally been used as much in hazard identification.

CHAIRPERSON SCHWARZMAN: Carl.

DR. SOLOMON: Yeah. I think that came through in the report loud and clear, that -- and it was -- and that's going to -- it's a big shock to CPSC, because I think they have been a little bit not as -- not as much sort of at the forefront of adopting current methods, either in risk assessment or in toxicology.

So when they briefed us on their risk assessment methods, it was, you know, sort of consistent with how things were done here quite some years ago.

PANEL MEMBER CRANOR: Thank you, Gina.

I think this is a great idea. And there may be some ideas that can be borrowed from other fields that help here. The National Academy took up some of their new tests in November of 2017, I think, and it was just a workshop. It wasn't a publication. But there, I talked

and suggested some ideas you can borrow from the law to help organize this.

So in the law, the idea of a presumption is used, that you have a social goal that you may want to accomplish or a social goal you don't want to contravene. And then you use that to organize your law, unless there's evidence to the contrary. There's a rebuttable presumption.

But, in effect, that's already been used in the sciences. I think of a paper by Ron Melnick on epoxides. He says, boy, we've got, you know, 5 or 6 of these that are really carcinogenic. We don't know anything about the rest of them. He, in effect, said, let's presume or consider a default that the rest of them are pretty toxic, unless there's evidence to the contrary. And so this idea can be used to help organize this thought. So one suggestion, comment about something you said, if a substance causes reproductive problem in zebrafish but not in animals, it seems to me it's a bad idea to cause reproductive problems in anything.

And so that may put it on a warning list to organize -- help organize the thoughts. And so just a suggestion that I've already talked about at an event that might help.

DR. SOLOMON: Yeah. And our option 1, if the

data are discordant is to make a decision to extend the most conservative conclusion regarding hazard to the entire subclass. So that is -- was recognized as being a potentially viable approach, though it is more of a policy than a -- you know, it's more a policy decision.

PANEL MEMBER CRANOR: Right. Well, you -- in both regulatory law and science, sometimes those presumptions are -- well are often called defaults. And they have may be based on the science or they may be based on the policy. So, for example, linearized extrapolations is maybe largely policy. You don't want to underestimate the risks to subpopulations and so forth. So you've got two things in play there, if you keep it in mind.

CHAIRPERSON SCHWARZMAN: One thing I was hearing with that is that the epoxides example you give is where there's already an established class, right? And so that's making --

PANEL MEMBER CRANOR: There was some -- I think there was some things on his list that somebody said were not -- were not epoxides, but they were derivatives of benzene, for example. So there were some surprises, but he had a dozen.

MS. HOOVER: Carl.

PANEL MEMBER CRANOR: I'm sorry.

CHAIRPERSON SCHWARZMAN: Joe, did you have a

question or a --

And I just wanted to alert everybody that we have a discussion that follows this. So there will be lots more chance for discussion too, but please.

MR. CHARBONNET: Oh, well, maybe this is better for then than now.

So Joe Charbonnet, Green Science Policy.

My question relates to a lot of what's been talked about. And I'm wondering if you, Gina, or anyone is thinking about the EPA's recent move towards getting away from animal testing and eventually phasing it out. And a lot of that is being framed as animal wellness, but FOIA emails recommend there may be ulterior motives, and how could a dearth of in vivo data influence our ability to get concordant data around classes, and their behaviors in biological systems?

DR. SOLOMON: Well, my two cents on that is that I feel that the issue of concordant versus discordant data and the issue of animal testing versus higher throughput approaches might be more separate, because you can end up with discordant data in any kind of toxicology platform or concordant data in any kind of toxicology platform. And in fact, the high-throughput data can give you a little more insight into mechanism and things where you're able to get a better -- maybe better sense of what's going --

actually going on that might explain any discordance.

So -- but in terms of the phasing out of animal testing, it's -- yeah, that's something that's a longer term issue. And I think it's something that there's not a consensus on, but, you know, the Toxicity Testing in the 21st Century Committee sort of helped launch this type of approach towards using more high-throughput testing. But there's plenty of language in that report that says we, you know, shouldn't be getting rid of animal testing certainly any time in the foreseeable future, because there's all kinds of really useful information that's provided in -- that -- you know, I can't speak for EPA's reasoning there, because it -- there's a lot of obvious gaps, as -- there have been a few studies that have come out from OEHHA and also DPR looking at some of the platforms like ToxCast and finding major holes. So until those are addressed, it wouldn't make sense to move away from animal testing for sure.

CHAIRPERSON SCHWARZMAN: Thank you. We can continue this conversation -- did you have a question for Gina?

PANEL MEMBER FIEHN: Yes.

CHAIRPERSON SCHWARZMAN: Okay. Great. We have a minute.

PANEL MEMBER FIEHN: Oliver Fiehn.

I wondered about the surprise of having discordant data between zebrafish and rodents. Obviously, the environments, the developmental stages, many things are very different. And that is true for any model system. There are model systems usually used for some purpose or another.

And, you know, I would biologically expect that. You know, the rodents -- or even within the rodents, there are mice, and, you know, rabbits, and there's like rats, and so on. They're all -- guinea pigs. They're all different. And you wouldn't even have -- they have discordant data, even if it was just rodents.

So the question really is have you ever discussed weighting of priorities within the hierarchies of data that allow risk assessments?

DR. SOLOMON: Good question. We didn't in the Committee. You know, historically, in toxicology, rodent data has tended to be the gold standard for whatever reasons. And, you know -- and in the situation with the organophosphate flame retardants, actually the rodent data were much -- much more tended to be negative than the zebrafish data.

And we as a committee were not totally sure that we believed the -- you know, all the rodent data are considered a gold standard. We weren't sure we believed

those studies more than the zebrafish studies. And so we didn't try to sort of come to any kind of weighting or hierarchy of conclusions.

But that could be done in the next phase. We basically -- our charge was very much to come up with an approach. And then actually, in some ways, you know, piloting the approach wasn't even required, but we thought that it would be helpful to show all the steps. And so the, you know, follow-on efforts are going to have to really get into those kinds of questions about, okay, if you truly have discordance, what are all the things to do?

And we came up with a set of sort of basic options, but there are a lot of suboptions under those, with a lot of detail, like especially option 3, which is performing analyses to explain the discordance could also involve, you know, coming up with, you know, decisions about how to weight certain studies over others.

CHAIRPERSON SCHWARZMAN: Gina, thank you so much.

DR. SOLOMON: Thank you.

CHAIRPERSON SCHWARZMAN: Really appreciate that.

So the next thing on our agenda is a discussion session that leads us up until the break, where we get to think about flame retardants. And Sara Hoover is going to introduce this discussion session. She's Chief of the Safe Alternatives Assessment and Biomonitoring Section of

OEHHA, and she'll introduce what we're going to do here.

(Thereupon an overhead presentation was presented as follows.)

MS. HOOVER: Hi, every -- hello, everyone. Thank you so much for the amazing talks. I'm so impressed and it's been really fascinating.

The purpose of this little intro is not to constrain any discussion, but just to give ideas for prompting discussion, if we need them. So you can consider anything from the morning or the afternoon with regard to the FREES presentation, the UCD presentation, and Gina's presentation. So just some ideas about things you can think about that would be potentially helpful to the Program.

If you think about the earlier presentations on FREES biomonitoring results and UCD's study of dust and furniture, are there any particular findings that you'd like to highlight? So thinking about the work that was presented. We could think about some of the lessons learned from conducting this type of pretty complex intervention study and what that might imply for the Program going forward.

Are there any initial recommendations for reducing exposures to flame retardants that might be drawn from the preliminary results? And as we heard, you know,

there's a lot more analysis to be done. So do you have any suggestions for additional data analysis that might help inform the concept of getting recommendations out of the study?

With regard to chemical selection, so Gina talked about this work that Gail and I worked on with Gina. Actually, she was a big motivator for the class work that we did. On the current list of designated chemicals for the Program, we include a number of flame retardant classes. Brominated and chlorinated organic compounds used as flame retardants, the entire class of those. We also have the entire class of non-halogenated aromatic phosphates. Those are not limited by their function as flame retardants. It's the entire class, including any function.

One was recently added, a non-halogenated, non-aromatic flame retardant, an OPFR, that's measured by CDC. So given what's on the list already, are there any other classes of flame retardants that you might want to point us to to consider. And one obvious example here is capturing all OPFRs and not just the aromatics.

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MS. HOOVER: In terms of future biomonitoring efforts, this is something that Gina raised as a possible topic. So as I just said, the class that we have on the

list, the brominated and chlorinated class, was intentionally broad. We made it as broad as possible to capture every possible member. But as Gina was just talking about, there's value in potentially looking at subclasses. So should we look at subclasses? Is there any value in us trying to look at methods for specific subclasses of organohalogen flame retardants. And I'm talking about biomonitoring methods.

And do you have any input on what the Program should prioritize going forward for future biomonitoring studies of flame retardants? And I will put a caveat on all of this. This is not related to resources. This is related to conceptually what would be important to do, given adequate resources.

So over to you, Meg, and feel free to use any of these questions or just have an open discussion.

CHAIRPERSON SCHWARZMAN: Thank you.

I just want to ask first of all, does anyone want to see these slides again? I thought they went pretty fast.

MS. HOOVER: Sure. You can refer to them. They'll stay up and you can refer back to them.

And now I'm telling everyone to use the mic.

(Laughter.)

MS. HOOVER: In answer to your question, I was

intending that we can leave these slides up. You can ask Russ to move them back and forth as needed. And if, yeah, you want to go through them slowly now, that would be fine.

CHAIRPERSON SCHWARZMAN: I feel like I need a little bit more time with the questions. Is that only me?

Everyone wants a little more time with the questions. So maybe we could just leave each slide up for couple minutes and then we'll give everybody a chance to have some thoughts before we jump right into discussion.

Maybe you could move to the next slide.

Thanks.

MS. HOOVER: Let me just add, you don't have to memorize this one. You have the designated list in your packets and it's also on the table.

(Laughter.)

CHAIRPERSON SCHWARZMAN: Okay. Maybe it's reasonable to start a discussion, at that point. Thank you for the extra time.

One thing that I'm reflecting on just to start the conversation is an issue that Gina raised in presenting the NAS report, which is there are many ways to think about a class, right? And one of them that we're talking about here is use-specific. We're looking at the chemicals that are used in a particular application, which

they'll have some chemical similarities, because they're used to accomplish the same function, but they -- there may be huge heterogeneity in the -- in every other aspect of chemical structure, and performance, and biological effects, and all of that.

And that, you know, what Gina was raising is that you can't really do hazard assessment around a class of chemicals that are organized by a function. And that you have to do some finer subdivision about that. And if I understand this discussion right, a lot of the questions here are focusing around the actual function of looking at flame retardants, chemicals used as flame retardants.

And so I just kind of wanted to highlight that, because I think it's a complexity of the conversation of when we bring the FREES study results together with this idea about thinking about chemical classes, which is more structural and biological function than it is performance. That is the chemicals are grouped biological effect and by structure, not because of what they do in the world.

And that point was underscored also earlier with the OPFRs showing up in the dust, and biomonitoring studies, and how hard it is to tease apart the -- you know we may not be seeing some of the effects that we would expect to see with furniture replacement, because of the diversity of sources of exposure to those chemicals.

I'm not making one point here.

(Laughter.)

CHAIRPERSON SCHWARZMAN: I'm sort of complexifying the conversation which may or may not be helpful. But I just wanted to acknowledge those few underlying tensions.

MS. HOOVER: Yes. I will second those complexities. And I just want to clarify, you do not have to slavishly stick to talking about classes of flame retardants. And, in fact, that was something that Gail and I confronted with the non-halogenated aromatic phosphates, we specifically did not tag those as flame retardants, because we felt like some of their other uses were more significant.

Currently, we have this new tiny category -- well, the other complexity on our list is we defined the group. We specifically called it not a class. The group of brominated and chlorinated organic compounds used as flame retardants, we're very well aware that it's not a chemical class. That's many, many chemical classes.

In that are also halogenated phosphates. So we have OPFRs that fall into that, because they're chlorinated, for example. Now, we have a new category, because CDC started measuring organophosphate flame retardants. That's the group they defined. And then they

added, you know, one that we don't have, which is one that's not chlorinated.

So I think that -- I mean, one of the reasons I posed the question about chemical selection is just that we're always interested. And I know the panel is always interested in emerging. You know, I think we've captured a lot just with OPFRs. We don't have all the OPFRs for sure. So that's one example.

We wouldn't necessarily have to define them as OPFRs, but are there chemicals of interest that we're not capturing?

CHAIRPERSON SCHWARZMAN: Great. So any other -- more defined comments?

Oh, Joe, did you have something you wanted to add?

MR. CHARBONNET: Joe Charbonnet with Green Science Policy. I'm sure our stenographer is really appreciating having to spell my last name three times there.

(Laughter.)

MR. CHARBONNET: Just on the subject of designating emerging flame retardants, I'd really love to see a lot more work on the polymeric flame retardants. I think that's the direction that the industry is moving in a lot of ways with flame retardants, and there's very,

very little study done on them.

We know that, you know, at least in their polymeric state, of course, they're -- they're less likely -- they're less bioavailable. But what little research has been done shows that they break down. And seeing the increasingly high production volumes and diverse uses of these chemicals when they first came out in polystyrene insulation, but they're going other places too. And no one is thinking about these.

And not to say that PBDEs aren't important. Certainly, they are. But these are the things that are going to be poisoning my children. And maybe, you know, if we could think a little bit more about them and less the things that poisoned my parents.

(Laughter.)

MS. HOOVER: Let me just ask you a clarifying question. When you say the polymeric flame retardants, can you give a few specific examples of what you mean by that?

MR. CHARBONNET: Yeah. So the ones that seem the most used right now is kind of commonly called polyFR. It's polystyrene -- or it's styrene, butadiene, polymer, brominated.

MS. HOOVER: Brominated is captured.

MR. CHARBONNET: Yeah, so it is. But the

polymers are different in a lot of ways too. So that's --

MS. HOOVER: I hear you and I think what you're saying is you want to see more study of it and more highlight. What I'm saying is partially because of how we define the class, we've captured that one already, so it's on our list.

So the other thing I should clarify for people who are just looking at our list, we have the group and we have footnotes, and it indicates whether it's the entire group or just those listed. So on the list of brominated and chlorinated, we don't have everything on the list, but everything is included, whether or not it's on the list. So you can feel some reassurance based on that, we've got some of those.

MR. CHARBONNET: All right.

CHAIRPERSON SCHWARZMAN: But there is this difference between what's designated versus is there any study looking at it?

MS. HOOVER: Right.

CHAIRPERSON SCHWARZMAN: So you're asking a question about designated chemicals, which enables biomonitoring to look at them, but it doesn't mean that there will be a study looking at it, but we're allowed to recommend that.

MS. HOOVER: Yeah.

CHAIRPERSON SCHWARZMAN: So that kind of gets to that point.

Veena.

PANEL MEMBER SINGLA: Yes. I'd just add to the comment about the polymerics that there's -- as far as I know, there's not even methods developed for biomonitoring for polymerics. Very little is known even about potential exposure patterns. So I think that's certainly an emerging area.

And the other comment I wanted to make was related to the morning's discussion about one of the potential priorities for the Program looking at regulatory efficacy and thinking about the replacement -- PBDE replacement flame retardants. And I think what we saw with the results from the FREES study is that with some of these replacement flame retardants that are more short-lived like the organophosphate flame retardants and have a multitude of other uses, the exposure patterns are quite complicated.

So thinking about if there is a way to look at the California flame retardant ban that's going to be coming into effect in 2020, that would be targeting a lot of those replacement flame retardants and furniture, children's products, mattresses, and is there a way to potentially measure efficacy of that policy, you know,

looking at time trends?

We were able to see it with PBDEs, because of the kinds of chemicals they are and the particular uses. Is there a way we can try to look at that with the new flame retardant ban that's going to be coming into effect knowing that the exposures are a lot more complicated.

DR. WU: Well, of course, a great way to be able to look at the regulatory efficacy would be to have a surveillance program --

(Laughter.)

DR. WU: -- which was robust enough to include things like OPFRs. And we've always wanted to include additional analytes. But as we discussed this morning, we're kind of going in the wrong direction.

But that is, I mean, just another argument for having surveillance. I mean the targeted stuff is great, but we can't -- we don't have anything to compare it to, unless we have baseline data.

CHAIRPERSON SCHWARZMAN: Yeah, please.

PANEL MEMBER LUDERER: And actually the comment that I was going to make was very similar to that, was sort of in response to this -- the question about recommendations for interventions from the flame retardant study results that we've seen so far. And, to me, you know, I think the thing that was striking, and I think

that -- you know, that your comment just refers back to it is really showing the benefit of these like larger societal level interventions. You know, we could see the secular trend and the decline in PBDEs in the comparison population as well, you know.

And so that is a, you know, I think a plea to, you know, to continue doing, you know, the surveillance type of measurements. And even on some of those older compounds that we may think are no longer a problem just to be able to continue showing the benefits of those kinds of regulatory interventions.

DR. WU: Yeah, absolutely. I think also the FREES slides when Kathleen was showing the comparisons and levels between FREES and the IPP group, and NHANES from like 2003/04 is the last cycle. And we don't have California-specific data. And we all know that California looks different in terms of flame retardant exposure.

So without California-specific data, yes, we would turn to NHANES, but it's a really imperfect comparison.

CHAIRPERSON SCHWARZMAN: Maybe this is a moment for me to ask you, Nerissa, because one of the things that was coming up for me as we have this conversation that we don't want to have about the tradeoff between surveillance and more targeted studies. So just to acknowledge, we'd

like it all, because there's separate and very important roles for each.

But one of the things that I was running up against with the surveillance is that because of previous limitations, our current surveillance is like just the CARE Study even unaffected by the lack of CDC funding is like stretching over eight years. And the kinds of changes that we see over eight years in population trends in biomonitoring can be pretty dramatic. And I just wondered if you have any reflections on that.

DR. WU: It was -- it was our goal, when we set up CARE, that it would be scalable. In fact, the first description we wrote of the CARE Study was that we would have these eight regions, but be able to conduct biomonitoring in eight regions over two to three years, because we're really aware of not only that these trends happen, you know, faster than the eight-year cycle might be able to portray, but also because there are these time trends that are then introduced, which really limits our ability to do any kind of geographic comparison.

So we went into it hoping that we would be able to demonstrate the value and the need to accelerate the coverage of the CARE study from an eight-year cycle down to a three-year cycle. The eight-year cycle, I will say, even though it is imperfect and seems so slow, is like

killing our staff to try to even complete that kind of work. It's -- we're in three different regions right now and it's the same people doing the field work, and the epi work, and the outreach work. And so, it just -- it's so important to recognize how rigorous this work is and to do it well, to do the field work well, and the recruitment well in a way that we get representative participants. It is so labor intensive. And so, even to keep CARE at the level we are at, we just need more funding to do it well.

CHAIRPERSON SCHWARZMAN: Thank you.

Jenny.

PANEL MEMBER QUINTANA: We talked in the past a little bit about trying to do surveillance using previously collected samples throughout the state, and, you know, there's breast milk banks at all hospitals, and there's the -- you know, the alpha-fetoprotein blood samples, and there's all these things that we hadn't really explored very much, because of laboratory needs for a really nice sample collected in a nice tube, and -- but I'm wondering if we should be thinking about those again, because they're already collected and a lot of data is available, and could be chosen to be super representative, or if you had any discussions about that kind of thing.

DR. WU: So I think you're referring to the MAMAS study, which we started, looking at the maternal -- the

archived samples from the prenatal screening biobank. And that is still a resource that we would like to take advantage of. It's pregnant moms.

About 70 percent of pregnant women in California come in for prenatal screening through our Genetic Disease Screening Program. And that is a resource for things like -- we've talked about using it for some of the new PFASs or some of the new -- maybe some non-targeted screening where returning of results would not be a concern, and where it's kind of on the cutting edge of new emerging chemicals of concern.

It is difficult, because we have very little information on the participants themselves. There's very little information available to us on the demographics. And we have no information on the exposure from those people, so we don't -- we can't really say very much about, you know, where they might be exposed or what population they represent.

The other thing is that the samples are gathered for hormone -- hormonal and protein analyses and not for environmental sampling. So we can't use them for metals, because there's metal contamination in the serum separator gel. It's a very small volume that's left over, so there are very few analytes that we can actually look at in it.

There are a number of other -- yeah, it's only

women of reproductive age, which I know is a population of concern. And it is fairly thorough coverage of California, but it doesn't get to -- I mean, it doesn't get to reflection of our overall population, which is a goal of our surveillance.

PANEL MEMBER QUINTANA: So I guess my comment was more general, should we spend more time looking at everything like that there is and deciding what could be done? Because it's so expensive to get samples, it might be cheaper to do four times as many samples with less information about the person than, you know, fewer samples, with lots of information about the person. I don't know. I'm just brainstorming here.

MS. HOOVER: This is Sara again. I just wanted to give a pitch for the CARE study, regardless of the time scale. And we're already using that data on metals. So metals, you know, has been very interesting in terms of looking at different populations and the different exposures. Yes, there can be time trends, but you can also see differences regardless of time. So it's been incredibly valuable already to have CARE L.A. data to compare it to a firefighter's study, to compare it to the ACE Project results, which, breaking news, those will be posted all on our website probably in the next week, which you heard about at a past SGP meeting.

But, I mean, to me, I understand what everyone is saying about the limitations and the costs, but it's our fundamental mandate. And it's a really high priority for DPH, and it's -- you know, it's the major mandate of the law. So we're still going to keep plugging. And I still think there's great value. In spite of the difficulties with CARE, we've already seen that value.

Also, we get inquiries now about people wanting to join the CARE Study. So that's another thing. It's been a real presence for the program across the state.

PANEL MEMBER QUINTANA: My last comment. Sorry.

But I think we're skewing towards educated people. I mean, it's valuable, but I'm not sure it really represents the state in a way that was anticipated for the State.

MS. HOOVER: No, I mean, like we said, we hear you. We understand the limitations. And basically, I mean, I just have to give a plug to Nerissa, because the reason why we even have any of this is because of her creativity and how do we do something with -- we don't have a 10 million -- we don't have the program that was envisioned. We do not have a California HANES. We cannot afford a $10 million program. So what can we do?

And with all of the limitations, we still are getting value out of it. So that's not to say we're not

doing targeted studies. We are. So we're continuing on targeted studies as well. You're going to hear more about that in November, some of our new work with AB 617 communities.

So, yeah, I mean, we could talk about this all day, so we can move on from it. But we hear you, but I think we -- there's still a lot of value in it.

DR. SHE: One comment regarding evaluate the efficacy of regulation policy on the reduce of the -- comment on the evaluation of the efficacy of the regulation policies on the chemical exposure.

I think given the fact that California do not have so much resource, we do need to consider the paradigms. Do we need to always do the individual samples? You can pool it. Otherwise, like Dr. Meg mentioned, if you did eight years, you still do not have a foundation on the same years after you did eight CARE regions. I think the paradigm switch, especially for persistent chemicals. Maybe use pooled strategies, as long as you do very little samples, but you pooled, maybe give you more information than we try to do with an individual.

So each paradigm, we're supposed to address different questions. CDC already do the pooled samples on dioxin-related compounds. That may be one option for the

Program to consider.

CHAIRPERSON SCHWARZMAN: Veena.

PANEL MEMBER SINGLA: I want to go back for a minute to PBDEs, because, you know, certainly agree that thinking about emerging and replacement flame retardants is super important. But unfortunately, the reality is PBDEs are still -- we are still all exposed to PBDEs, and they're not going away. And that a lot of the indications we have is that in the life cycle, as more and more PBDE-containing products go to landfill and disposal, that communities near those disposal sites could be exposed.

So I think that's a -- thinking about the PBDEs lifecycle and understanding that better, and which communities and populations may be vulnerable to those exposures would be important.

And somewhat related to that too is with more flooding, and fires, and natural disasters, what we're seeing in other places is persistent contaminants mobilized by those natural events. And so that might be another angle to consider with PBDEs and some of the persistent flame retardants. And also trying to understand flame retardant combustion byproducts, because there's a lot of concern when these products burn in these fires about brominated dioxins, and furans, and other toxic combustion byproducts that could be produced.

And my third thought about priorities for flame retardant studies would be to focus on infants and children as a population, where we know there's higher exposure patterns with PBDEs and some of the replacement flame retardants. So to understand if -- if we're continuing to see that pattern and if some of the policy interventions may be addressing some of those exposures with children's products potentially being a source of some of the high exposures.

CHAIRPERSON SCHWARZMAN: I want to pause for a second and see if there's public comment, either cards or on-line?

MR. BARTLETT: Just give me a second. We're checking. I'll flag you if there are.

CHAIRPERSON SCHWARZMAN: Okay. Other discussion points. We have a little more time before we have to move on to our next -- yeah, Gina, please.

DR. SOLOMON: This really relates to this -- this relates to the question about whether the Program should develop methods for specific subclasses of organohalogen flame retardants. In some ways, I'm thinking about it a little bit more broadly, which is that what the SGP has tended to do is, you know, boldly move forward which has been great, and designate, and prioritize entire classes.

But then there is this gulf - and, Meg, you

pointed this out - that, you know, between what is then, you know, the entire class that's identified and then what actually gets biomonitored in the end. And that's defined by the resources, the available lab methods, all kinds of different limitations.

But, you know -- and again, this is in an ideal world, if we were able to find more resources for it. It does seem like there could be a role potentially for this panel in looking -- you know, in revisiting periodically some of the broad groups of chemicals, and thinking about what do we know? You know, are some of these that are already on the list coming up, because we think that their use may be increasing. You know, is there something that would make us, you know, flag specific chemicals or subgroups of chemicals within these -- this larger grouping to kind of try to push those forward, get a little bit more attention to them?

And so I guess I'm just sort of wondering about whether there is a role to -- at this point, to reflect a little bit back on some of the big chemical classes or groups, and see if -- see sort of what we've learned and what we might have just sort of left behind that we might still need to learn instead of kind of saying, oh, yeah, that group is on the list, we're good. Because we might not be. Just a thought.

MS. HOOVER: And I also want to say - this is Sara again - Gina give us some good ideas about taking the information from the NAS report. So actually Russ and I have been working on looking at all the information in the NAS report, seeing if there's flame retardants that we should capture that are not specifically listed, so to highlight more. We did some of that back in February, but we're looking at that again. We're also making a list of the subclasses from NAS and which of the few that we do measure, which subclasses they fall into. So we are doing some of that work and we can share that when it's ready.

CHAIRPERSON SCHWARZMAN: And is that -- Sara, are you talking about designated chemicals or chemicals that have been in one or more studies?

MS. HOOVER: I'm talking about both actually. I'm talking about analyzing the designated list. So one of the filters that we've used for highlighting chemicals is we try to pick either well-known chemicals, you know, legacy chemicals that are important, chemicals that are currently produced and in use. So we don't -- you know, we don't list thousands of chemicals, even though there are thousands potentially in the classes.

So we're taking another look at the NAS chemicals to potentially add more just to highlight them on the list. But we're also looking at the current lab methods

available in ECL, for example, and what flame retardants we're currently measuring, and what classes they fall into by the NAS subclass classification.

CHAIRPERSON SCHWARZMAN: With the idea, if I could extend that just for a moment, that you might identify some subclasses that are not really very well represented in the --

MS. HOOVER: There's going to be a lot. Yeah, I mean, there's going to be a lot. Because the list of analytes that we measure is relatively small compared to the large list of flame retardants and classes. And I think that an interesting -- and, you know, again, caveat, we're limited by resources; methods development is difficult. But maybe there will be an opportunity where we have methods for certain types and there's a similar class, and maybe it would be interesting and possible to add something on, pending additional resources.

I will throw in one other plug that hasn't come up that would be of interest for flame retardants, and that is more non-targeted screening. And this is actually an opportunity with State funding, because that was something that CDC did not fund, because it's too -- it's not surveillance and it's more research. So again, this would be a really -- and that's something that was actually highlighted in the letter that you worked on

about the importance of State funding in order to look at that kind of information.

CHAIRPERSON SCHWARZMAN: Other comments?

Yes.

PANEL MEMBER QUINTANA: Just following up on non-targeted analysis and what Gina said, I mean, it seems to me it could be -- that could be employed to see what things are up and coming, because they're being detected or have you had discussions about using it to prioritize what's going to be biomonitored?

MS. HOOVER: I'm sorry?

PANEL MEMBER QUINTANA: Using non-targeted analysis to help prioritize and identify chemicals that are perhaps being more commonly detected --

MS. HOOVER: Are you asking me a question or are you --

PANEL MEMBER QUINTANA: I am asking you a question.

MS. HOOVER: Sounds like a good proposal to me. Are you asking me what I meant by non-targeted?

PANEL MEMBER QUINTANA: No, I'm asking you if you had thought about applying the non-targeted analysis in order to help prioritize new flame retardants that are being used with more frequency or ones we've never seen before, things like that?

MS. HOOVER: Yeah, I mean, that's kind of always been our -- I mean, I think -- Gail and I have been talking about this topic for 10 years and how exciting non-targeted analyses would be for all kinds of reasons. And instead of us searching the literature, trying to watch for emerging chemicals, let's do some measurements and see what's emerging, so -- and you heard -- you may remember Sabrina's talk where they talked about some of the fluorinated, you know, non-targeted screening they're doing and all the fluorinated features they see. So that is -- we don't have all of those. You know, we're not covering all of those, so that could be a similar angle potentially on some of the flame retardants or some of the halogen -- you know, you'd see halogenated compounds. You're not going to be looking by function. But it could be a good way to look for what do we think is important. Are we seeing peaks that we want to go and try to target and identify?

CHAIRPERSON SCHWARZMAN: Go ahead.

PANEL MEMBER LUDERER: Yeah. I wanted to just circle back a little bit to the comment that you started out with about the class, as -- you know, based on use in addition to chemical structure versus this idea that, you know, for hazard identification, the chemical similarities, as well as biological similarities, I think

make a lot of sense, but then I think we need to think about that classes that are defined in different ways may make more sense for the different applications. You know, if we're talking about hazard identification versus, here, we're talking about biomonitoring and looking at exposure. And there, you know, if you think about, okay, flame retardants, these may be very different chemicals and, you know, maybe in structure, you know, obviously, but the exposures may occur together. And so it makes sense to group them as a class from that exposure perspective. So I think that they have different uses in different situations, you know, how you define your class. I just wanted to bring that up.

CHAIRPERSON SCHWARZMAN: One question I have about that for the Program is just I'm getting the sense that you're using the term "group" for things that are not -- wouldn't be chemical classes, is that right?

Other comments, or questions, or proposals, ideas, musings?

(Laughter.)

CHAIRPERSON SCHWARZMAN: Yeah.

MS. HOOVER: Just to bring it back maybe to some of the morning talks. We heard, you know, it's still very preliminary, but is there anything anybody wants to raise about the talks from this morning or any of the speakers

want to raise to say more about the work that we've already done, and what we can draw from it, and where we might want to go?

CHAIRPERSON SCHWARZMAN: I had one thought about -- I really, really appreciated the -- all of the work that went into both elements of the study, the dust, intervention and the biomonitoring elements of the study. And it's so interesting to get to see the results. And one of the things that stuck with me in a sense is the limitations of the hypothesis-driven research, which has to do -- which I think we're mainly seeing -- we see it less maybe with the PBDEs, because we know how those were used. They stick around long enough that we can get a good measurement.

But as we were seeing with the OPFRs for multiple reasons, but the primary ones being short half-lives and a diversity of exposure sources, that it's so much harder to understand what's happening in the data. It's so much harder to understand what's driving the changes you're observing either in the dust or in the people. And it was just making me think more about what are the right applications, or what environments, and what questions are best answered by an intervention study like that. Like, we're all enamored of intervention studies, because we all want to take a picture, make a change, and then take

another picture and see if it's change -- if what we expected to change, changed.

But when the second picture is really confusing --

(Laughter.)

CHAIRPERSON SCHWARZMAN: -- you know, we haven't necessarily learned much. And I -- it just underscored for me the importance of designing -- when looking at an intervention study, choosing your -- two things. One is choosing the relevant questions really carefully to make sure they're ones that can -- that will be answered well by an intervention study, partly looking at things like the half-life of the chemical, things like that. And then the other is making sure that the -- in a sense, the narrowness of the questions suits the narrowness of the study.

And the -- I think this is something we've talked about a lot already with the studies. The diversity of exposure sources of the OPFRs beyond flame retardancy applications makes it really hard to tell when you only remove one of the uses of the chemical, like that -- those chemicals are used for flame retardants, but they're used for many other things also. So you only remove the source that's the flame retardant and it's so much harder to see what's happening.

So anyway, it's a very sort of targeted like closely design -- narrowly designed study for a reason. But looking back on it, maybe the OPFRs weren't a great match with the intervention. And I understand why it was done that way. It makes perfect sense.

MS. HOOVER: Actually, I just want to throw a little pitch in here for the people who designed the study. This is not a surprise. This was very expected.

CHAIRPERSON SCHWARZMAN: Right. No, no. I'm not --

MS. HOOVER: So -- but actually for me the -- and I know --

CHAIRPERSON SCHWARZMAN: I'm not pointing out flaws. I mean in thinking about --

MS. HOOVER: No. No. No. I understand. But I kind of want to highlight that as a finding of the study, because just the fact that you do see all -- that all over the map, that's interesting. You know, that's interesting to show and to try to ferret out, well, what is going on here. In fact, that there were any changes seen in OPFRs is actually very interesting.

So it's not a surprise. And we knew, in a way, we always called FREES kind of a pilot. I was amazed and impressed with the results so far. And I think there's more to be pulled out of it. But that being said, it was

a very complex, difficult intervention. And I know Nerissa, and maybe Kathleen, have comments on how hard it was and how you would do things differently.

DR. WU: Well, I actually have a comment on intervention studies in general. And they are a great illustration of what we do, and why we do it, and how people can make -- they can -- how their shopping preferences or their personal choices can impact their exposures. It's really immediate, very visceral kind of piece of data you can give people. And that's great.

And as much as our work is to illustrate and inform and educate people about exposure, I think intervention studies -- sure, we should do a whole bunch of them. I mean, even if it's not cutting edge. I mean, there's been a lot of work done on pesticides when you eat organic, or the HERMOSA Study was great.

But I mean, repeating studies like that have a lot of value in terms of story telling. In terms of trying to figure out the larger exposure picture and answer the question of what can I do though, the FREES Study was -- there are lots of things that make it maybe not the greatest match for intervention. I mean, you want something that is quick, so people don't have to do the intervention over this really long period of time, because you're going to have people falling out of compliance.

It has to be something easy. Replacing your furniture is not as easy as, you know, having somebody bring you organic meals every day. It's just a -- it's a more difficult intervention. The long -- the short half-lives, of course, created a whole issue.

So, I mean, I think it's something to be mindful of that we should do studies like this, you know, resources allowing, to illustrate the point of our importance, but we also have to pick the right match.

I do want to -- I know Kathleen and Rebecca also presented their data with caveats and caution. I mean, what we don't -- we also don't want to be over-interpreting our data and coming up with a finding that says, look, this is something you can do. We don't really know that yet and we don't want to recommend people do something that is potentially expensive and burdensome to them when we don't -- when we're not clear on what the result of that is. So hopefully we'll know more about the results of these.

CHAIRPERSON SCHWARZMAN: I appreciate that and I would expand on it too to say that it's an excellent story, but I would add to that story it, of course, goes well beyond individuals, because when you change the flame retardancy standard, it -- you don't have to change out your couch, you know.

(Laughter.)

CHAIRPERSON SCHWARZMAN: If there's societal solutions that that points to also. When you, you know, ban a pesticide, then people don't have to make the choice between which food they're going to buy and make, right?

DR. WU: Sure. I think it was Carl who made that point earlier about individual recommendations versus societal. And we, as a State Program, are not in the position of lobbying or advocating for policy change. But biomonitoring is often the first kind of politicizing moment or awareness moment for people, where they're like why is it that I have all this stuff in my body? Why is it that I have to know all these names of chemicals when I go shopping for things? Why is it that there are all these chemicals in everyone's drinking water?

I mean those are questions that we want people to be asking. And the ability to return results to individuals, and this gets to the whole biobank and pooled sample thing, our ability to tell people their individual chemical story really feeds into that in a way that I think pooled and biobank samples can't do.

CHAIRPERSON SCHWARZMAN: Yeah, I think it's very useful for that. I just wanted to say it's also useful, even though that's not what you're setting out to propose, that other people get to take the data and say, look, we

could do something at a societal level that doesn't rely on people making these choices for themselves.

DR. ATTFIELD: I was going to return to your point about looking at this hypothesis-driven part of the intervention. And just to put it out there that we're actually going to have sort of expanded ability to look at other things, because, you know, there were more people than the 25 that made it to the 12-month point. We have more samples at zero. We have like more than 45 people who gave a sample in the comparison group. Maybe they're not all matched.

So we're going to be able to look at other things beyond just the hypothesis, perhaps ratios and relationships with the dust. I think -- I think beyond perhaps the sort of limits of the intervention hypothesis test, there will be other good lessons on biomonitoring we can learn.

CHAIRPERSON SCHWARZMAN: It's wonderful to hear. And I know what we heard today was like the first pass at the first analyses you were able to do. And so it will be exciting to hear all the subsequent layers.

It's time for our break, but I realize I've just said a lot. And so if anyone has any final thoughts, that -- and I can turn the mic over for a moment.

In that case, we'll take a break at this point.

Like I said before lunch, just stay mindful of the Bagley-Keene requirements and we will gather at 3:10.

(Off record: 2:55 p.m.)

(Thereupon a recess was taken.)

(On record: 3:10 p.m.)

MR. BARTLETT: If you could go ahead and sit down and, we'll continue.

Thank you.

(Thereupon an overhead presentation was Presented as follows.)

CHAIRPERSON SCHWARZMAN: Now, to hear our final presentation about the potential designated chemicals for future consideration.

So Shoba Iyer is a staff toxicologist in the Safer Alternatives Assessment and Biomonitoring Section of OEHHA. She'll present the preliminary screening of quaternary ammonium compounds for possible future consideration as designated chemicals. She'll also remind us of the chemical groups that were previously reviewed by the Panel, which could also be prioritized for consideration.

And the point of today's present -- discussion -- so at a previous meeting we had requested this first screening. And the point of today's conversation after this presentation is to choose one preferably, or at least

a top two, recommendations from the Panel about which chemicals to proceed with for future consideration.

So I'm just underscoring that because panelists -- ears open, we're going to ask you for a decision about this.

Thank you, Shoba.

DR. IYER: All right. This is working.

Yes.

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DR. IYER: So I'll repeat a little bit of what Meg just said. The purpose of this agenda item is to respond to the Scientific Guidance Panel's request for a preliminary screening of quaternary ammonium compounds or QACs. At the March 2019 SGP meeting, the Panel expressed interest in this class, noting that QACs are abundant, produced in large volumes, and have known health effects.

We'll be inviting Panel and public input on next steps, which could include future consideration of QACs as potential designated chemicals. The SGP could instead recommend that we follow up on another chemical class that was previously screened such as a class of pesticides.

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DR. IYER: Just as background for our discussion today, these are the criteria for recommending designated chemicals, which framed our preliminary research on QACs.

As you all know, the criteria cover these areas shown on the slide. I'll remind you that these criteria are not joined by the word "and". For this preliminary screen, we focused our research primarily on the first criterion, exposure or potential exposure to the public or specific subgroups.

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DR. IYER: In my presentation today, I'll provide a description of QACs as a class. I'll cover information we located on the potential for exposure, including: example uses and products; volume of use and environmental detections; I'll note some possible health concerns associated with members of the class; and I'll talk about biomonitoring information.

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DR. IYER: The general chemical structure of QACs includes the cation NR4+. These compounds contain a nitrogen atom with four covalent bonds. The R groups are often, but not always an alkyl chain or benzyl ring. These chemicals are used for a variety of applications including as antimicrobials, preservatives, anti-static agents, softening agents, and surfactants.

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DR. IYER: Now, I'll show you the chemical structures of some QACs. This is the general chemical

structure for benzylalkyldimethyl ammonium compounds, or BACs. And this is the chemical structure for a specific BAC. This is the general chemical structure for dialkyldimethyl ammonium compounds, or DADMACs. And this is the specific chemical structure for a DADMAC, didecyldimethyl ammonium chloride.

This is the general chemical structure for alkyltrimethyl ammonium compounds or ATMACs. And this is the chemical structure for a specific ATMAC. The alkyl chain for BACs, DADMACs, and ATMACs is typically between 8 and 22 carbons long.

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DR. IYER: On this slide I'll show you the chemical structures of selected QACs that do not belong to any of the three subclasses I just reviewed. There are a number of polymers with quaternary ammonium centers called polyquaternium compounds. Shown here is an example, polyquaternium 42.

Esterquats are another subclass of QACs, in which the alkyl chains contain ester linkages. Esterquats were introduced because they biodegrade more readily than long-chain DADMACs, while still achieving the intended chemical function. Cetylpyridinium chloride is an example of a QAC containing a pyridinium ring. And the herbicides diquat dibromide and paraquat dichloride are other types

of QACs.

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DR. IYER: We prepared a preliminary screening document that the Panel has in your packets and that we posted on the Biomonitoring California website. The document includes volume of use information for a variety of example QACs. On this slide, I'll cover some highlights on volume of QAC use.

Of the QACs we reviewed that have reported pesticide sales in California, about half have sales of more than 100,000 pounds in 2018. Of these, several had sales of over 1 million pounds. The QAC pesticides we reviewed that are used agriculturally in the state are generally applied at lower levels. The notable exception is paraquat dichloride. Over 1 million pounds were applied in 2017 and it was rank number 23 of the top 100 pesticides applied agriculturally.

Of the QACs that I reviewed, the national production volume for 20 of them was over 100,000 pounds in 2015. Of these, 11 had production volume of over 1 million pounds.

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DR. IYER: We wanted to get a feel for what kinds of consumer products contained QAC ingredients. So we did a little field research by visiting a couple Bay Area

stores. I'll now walk you through example products we located containing QAC ingredients.

(Laughter.)

DR. IYER: It's not clicking.

MR. BARTLETT: Yeah, just a minute.

DR. IYER: Sorry for the technical difficulties. Let me try this one more time.

PANEL MEMBER LUDERER: Close it. Open it again.

MR. BARTLETT: It won't let me close it either.

MS. HOOVER: Diana is coming in.

(Thereupon a discussion occurred off the record.)

DR. IYER: All right. I really want you guys to see these animations. I spent a lot of time on them.

(Laughter.)

DR. IYER: So as I was saying, I'm going to walk you through example products we located containing QAC ingredients. Various cleaning products like disinfecting surface wipes and sprays and other surface cleaners include QAC ingredients. The ingredients listed here are displayed as they were shown on product packaging. These includes BACs, DADMACs and a polyquaternium. These ingredient names come from multiple product labels.

Antibacterial hand soaps have QAC ingredients. Benzalkonium chloride, which is a BAC, is the active antibacterial ingredient and is a replacement for

triclosan and triclocarban in these soaps. Cetrimonium chloride is a BAC with a 16-carbon alkyl chain and is listed as an inactive ingredient in these hand soaps.

QAC ingredients are in hair conditioners. Behentrimonium compounds are common ingredients on many hair conditioner labels. These are ATMACs with alkyl chains that are 22 carbons long. We identified QAC ingredients in a variety of other personal care products, like other hair care items, facial cleanser and body wash, lotions, including a baby cream and mouth wash.

We located QAC ingredients in cosmetics. You'll see that synonyms like quaternium 15 and quaternium 18 are used on the product labels. Quaternium 15 is a formaldehyde releaser which is its mechanism for its biocidal activity.

Benzalkonium chloride is a common preservative in eye drops. Topical antiseptics like antibacterial hand wipes and antiseptic wound wash include benzalkonium chloride and benzethonium chloride. We located some oral antiseptics for relief of cold sores, for example, that contain benzalkonium chloride. Benzalkonium chloride is sometimes listed as the active antiseptic ingredient and sometimes as an inactive ingredient in these products.

The literature we reviewed describes the use of QACs in fabric softeners, but we found identifying the

specific QACs used in these products to be a challenge. Fabric softener packaging, both the liquid and dryer sheet forms, have ingredient language like, "Contains cationic softeners", or, "ingredients include biodegradable fabric softening agents", which is of course not specific. This QAC, diethylesterdimethyl ammonium chloride, was obtained from ingredient details on the manufacturer's website. And it is an example of an esterquat.

Some pesticides used at home include QAC ingredients. We located weed and grass killers at a local home and garden store that contain diquat dibromide. And there are swimming pool algaecides containing QAC ingredients.

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DR. IYER: So all this gives you a flavor of the very broad variety of consumer products that contain QAC ingredients.

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DR. IYER: Also, they are widely used in oil and gas operations, which includes hydraulic fracturing. Their functional applications here include as oil field biocides, emulsifiers, surfactants, corrosion inhibitors and clay stabilizers.

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DR. IYER: QACs, specifically the subclasses of

BACs, DADMACs, and ATMACs have been widely detected in sediment, sludge, and wastewater treatment plant influent and effluent. Of the studies I located that report these detections, some described samples collected from the New York/New Jersey area and the others were international.

Preliminary analyses of sediment samples collected from the San Francisco Bay have been conducted in Bill Arnold's lab at the University of Minnesota. These are pro-bono analyses conducted for the San Francisco Estuary Institute's Regional Monitoring Program for Water Quality in San Francisco Bay.

BACs, DADMACs, and ATMACs were detected in the San Francisco Bay sediment samples. And these detections are comparable to what Bill Arnold's lab has observed in wastewater effluent and lake sediment samples in Minnesota.

Other environmental detections reported included indoor house dust samples in Germany; air samples from a hospital where QAC-containing disinfectants were being used; and fish samples from Nordic countries.

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DR. IYER: There are health concerns associated with members of this class. Some QACs, including BACs, didecyldimethyl ammonium chloride and quaternium 15, which is a formaldehyde releaser, are linked with skin

irritation and sensitization.

Exposure to certain QACs is associated with respiratory effects. Increased risk of rhinitis and work-related asthma has been observed in studies of hospital and janitorial staff using cleaners and disinfectants with QAC ingredients.

The Association of Occupational and Environmental Clinics includes the class of quaternary ammonium compounds on their list of asthmagens. And I'll add that paraquat dichloride is a known lung toxicant.

Reproductive toxicity has been observed in mice exposed to a disinfectant that contained BACs and didecyldimethyl ammonium chloride. This exposure decreased fertility and impacted both male and female mouse reproductive functions. Developmental effects, such as decreased pup size and neural tube defects have been observed in multi-generational studies of mice and rats.

These studies found that the neural tube defects persisted in two generations after cessation of exposure to the disinfectant.

Assays in C. elegans and zebrafish provided evidence for reproductive and developmental effects respectively, of benzalkonium chloride and benzethonium chloride.

BACs and cetylpyridinium chloride have been found

to inhibit mitochondrial function in human cell culture. And BACs have been found to inhibit cholesterol biosynthesis in vitro.

Bacterial resistance to QACs is a concern reported in the literature. One particular study observed increased antibiotic resistance in microbes exposed to BACs, and they identified resistance genes in these microbial communities.

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DR. IYER: We located very little biomonitoring data. We did find literature reporting the use of hydrophilic interaction liquid chromatography for quantifying polar substances like QACs. Although, these aren't biomonitoring studies, we located two methods papers applying hydrophilic interaction liquid chromatography. Whitehead et al. 2010 used this chromatographic approach for detecting diquat dibromide and paraquat dichloride spiked into human urine.

And this paper by Steuer et al. 2016 describes a method for detecting phosphatidylcholine-derived QACs in human plasma, blood, and urine. These compounds, which are choline, betaine, L-carnitine, and O-acetyl-L-carnitine are of clinical interest as predictors of cardiovascular and renal disease. They are not QACs, but they do contain a quaternary ammonium

center, so the methodology reported by this group could be relevant for biomonitoring.

Gino Cortopassi of UC Davis, Terry Hrubec of Virginia Polytechnic Institute and State University, and Libin Xu of the University of Washington are collaborating on a small biomonitoring study that is in progress. For this study, they developed and applied a method for detected benzalkonium chloride and didecyldimethyl ammonium chloride in serum samples.

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DR. IYER: Now, I'm going to transition from the QACs preliminary screening portion of my talk and switch gears to review previously screened chemical classes.

In July 2016, one of the pesticide classes we screened was neonicotinoids. A publication released this June by CDC authors reported biomonitoring data for four neonicotinoids in NHANES. Consequently, these neonicotinoids, acetamiprid, clothianidin, imidacloprid, and thiacloprid are newly added to Biomonitoring California's designated chemical list.

In July 2016, we also screened the class of anilide pesticides, including propanil.

And in November 2016, we screened these chemical classes used in UV applications, benzophenones and phenolic benzotriazoles.

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DR. IYER: I'm now going to lay out the options for the Panel. The SGP could request that OEHHA prepare a potential designated chemical document on QACs. The Panel could request that OEHHA prepare a potential designated chemical document on a previously screened chemical class. They could advise no further action on any of these classes or suggest other chemical classes for possible consideration.

I'm happy to take any clarifying questions.

CHAIRPERSON SCHWARZMAN: Thank you so much for that presentation.

I have one question to launch the clarifying questions section, which is -- you may not know this yet, because it might require preparing a potential designated chemical document. But from what you've learned so far -- so there's a diversity of QACs obviously, a large diversity of QACs, do you have any sense for how many biomonitoring analytical methods would be required to analyze a sample for QACs? You know, if we're just interested in QACs, but there's a lot of them, are there -- the methods that you've described here sounds like captures a couple at least or several. Do you have a sense for the scale difference between the diversity of QACs and the analytical methods that would be required to

detect them?

DR. IYER: That's a good question. I'm not sure. I think it would require looking in more depth at the literature, if this hydrophilic interaction liquid chromatography approach is similar to maybe what's used in environmental detections, which is a body of the literature that I found -- that's most of the literature I was easily able to find on QACs. So, yeah, it would take a little more digging to see.

CHAIRPERSON SCHWARZMAN: And when they're detecting them environmentally, are there -- do they have good ways of grouping those detection analytical processes?

DR. IYER: That's a good question. I'm wondering if anyone --

CHAIRPERSON SCHWARZMAN: Yeah. Someone here who has something to say about that.

DR. IYER: Some more about the technical details might respond to that.

DR. DATTA: So the way that --

CHAIRPERSON SCHWARZMAN: Can you state your name?

DR. DATTA: I'm Sandipan Datta. I'm a researcher from UC Davis. I've been researching on QACs bioactivity. So basically -- I have a pharmaceutical sciences background.

So QACs, depending on their chemical structure, so when you determine the thing, it's like kind of a general thing -- general procedure that you do. And then you spike the necessary QACs and see when it comes up and like what fragmentation it gives. And then you just look for that particular signature.

So I'm assuming the general overall procedure is going to be the same. It's just you put in whatever you want to look for, see its signature coming up through the LC-MS, and see if you can get that same signature coming up in your samples.

CHAIRPERSON SCHWARZMAN: And is there significant variation about the matrix you would have to evaluate, like blood, serum, urine?

DR. DATTA: Yes. So like each matrix needs to be standardized and you need to develop a standard curve of the species of interest of QACs. And then you can -- you go for it, like you can do that.

CHAIRPERSON SCHWARZMAN: And did you have -- oh, Oliver and then Anne.

PANEL MEMBER FIEHN: We frequently see those in untargeted assays. So usually five to ten different ones without even looking, without the dedication, just by -- they show up in basically many, many matrices.

DR. DOHERTY: This is Anne Cooper Doherty with

DTSC. And I did my thesis on this however many years ago.

Is it working?

Okay. I did my thesis on QACs back in New York. So we did the -- some of the environmental analyses. And we could extract BACs, B-A-Cs, ATMACs, and the DADMACs from C8 to C18, in one extraction and run it with just two different dilutions and one method, and we were able to do it. The extraction could get a little dicey, because it's such a broad range of chemical properties, but we were able to do it for at least sediment and water.

CHAIRPERSON SCHWARZMAN: Thank you. Really helpful.

Other clarifying questions?

DR. CORTOPASSI: Yeah. I'm Gino Cortopassi. We've been studying the mitochondrial effects of the QAC.

CHAIRPERSON SCHWARZMAN: Can you hold your mic higher.

DR. CORTOPASSI: Sorry. Sorry about that.

We've been studying the mitochondrial effects of these QACs. And in this study with Terry Hrubec in Virginia and Libin Xu in University of Washington, we found that there was about -- there was about -- in a third of -- so we looked at 40 college students' blood from them. And in about a third of them, there was detectable QACs -- BAC and the DDAC at the 10 to 150

nanomolar level, so -- and these are college students who may not have been exposed to cleaning materials.

(Laughter.)

DR. CORTOPASSI: If they're like my college students.

(Laughter.)

DR. CORTOPASSI: So that's our kind of first estimate of -- that's our first estimate of the level in people, because it's never -- Oliver has -- finds it in matrices, but it's never been systematically looked at in humans what is the QAC level. So it's been assumed for 60 years, because they've been used as disinfectants for 60 years that they're used topically and they don't get inside to the body.

But they do aerosolize and they do cause repro tox and neurotox as aerosols. And so we looked in a systematic way. And there is a 10 to 150 nanomolar level of these in college students.

CHAIRPERSON SCHWARZMAN: Any other questions for Shoba?

Great. Thank you so much for the -- oh, sorry, Veena.

PANEL MEMBER SINGLA: Picking up a little bit on that comment. Is there a much known about potential exposure pathways from some of the products you've talked

about in terms of inhalation or dermal absorption?

DR. IYER: I didn't specifically review literature for that, but in examining the different types of products that they're in, you know, I can make like inferences. My guess is with cleaning products, particularly the sprays or I located scented disinfectant sprays, so that seems like it would be a likely source of higher exposure compared to I might think dermal.

But, you know, there's also -- some of the products I identified were like mouthwash, or the oral gel pain relievers where you might get oral exposure in those instances too. So the information I have is coming from the types of products we identified.

CHAIRPERSON SCHWARZMAN: Great. Thank you so much for that, Shoba.

Other things might occur, but you're off the hook for the moment.

So we have some time now to have a conversation as a Panel. And the questions that the Program would like us to answer are essentially what next steps, if any, the Program should take on quaternary ammonium compounds, and also considering the chemical groups that were previously screened, which may be we could end up back on that slide.

Russ, if you wouldn't mind, the list that includes the other chemical classes that were screened --

groups -- excuse me, chemical groups.

MR. BARTLETT: It's on 15. Okay.

CHAIRPERSON SCHWARZMAN: Great. Thank you.

So because the Program would like a recommendation from each of the Panel members about kind of top pick or top two picks for the groups of chemicals to proceed with taking to the next stage, and so this -- we have a chance now for discussion of that.

Ulrike, did you want to start?

PANEL MEMBER LUDERER: Okay. Quick question actually. So the question is about the neonicotinoids. So those four aren't on the designated chemical list. So is the question for us whether the designated list should be expanded to include all neonicotinoids, or whether it's to move those to the priority list?

MS. HOOVER: No. I mean, we are -- so this particular item is about which potential designated chemical document do you want us to work on next. That's it. So the reason why we let you know about this, which was breaking news to us, is that we've now captured some of the major neonicotinoids on the designated list.

Now, it's not the class, so that would be a possible suggestion. If you want us to do the entire class, that would broaden the listing. So, yeah, we just want you -- you all at the last meeting felt QACs are

really important, but others raised what about the pesticides we'd screened. So here's your chance to say here's what we want you to pick for our one document next year. So that's the concept.

PANEL MEMBER LUDERER: Thank you.

CHAIRPERSON SCHWARZMAN: I was previously pretty interested in the chemicals used in UV applications. And in this process, though, I'm having a little bit of a sense of like what could Biomonitoring California add? And there's -- given how little there is happening with quaternary ammonium compounds, and in light of their large volume in commerce, their diversity of exposure sources, the -- those two are at such opposite ends of the spectrum how much we know about their occurrence in people and the environment versus how frequently they're used and in such -- so many different applications that I'm very interested in that.

And I'm also kind of reflecting -- I appreciate this list and the sort of update of what's happening in each of these categories, because the -- some of the chemicals used in UV applications are increasingly being -- like people are moving away from them partly to do with some of the bans that are happening around sunscreens like in Hawaii and other states that are picking that up.

And while there's some interesting changes that could be potentially tracked from that, I -- it's kind of tipping me a little bit towards the QACs. Anyway, I'd be happy for other people's ideas.

Carl.

PANEL MEMBER CRANOR: Okay. It's live.

Given what Sara said and given this in front of us, I guess the question is does this overburden the staff? It does seem to me that the presentation that was just made was, in some respects, shocking. We should just, you know, find out more about that, but don't want to overburden you, so...

CHAIRPERSON SCHWARZMAN: Well, I think we have our pick, right? We can choose one.

PANEL MEMBER CRANOR: Okay.

CHAIRPERSON SCHWARZMAN: We can choose one. That's why we're having the discussion --

(Laughter.)

CHAIRPERSON SCHWARZMAN: -- is we can choose, do we want to suggest that the Program proceed with the next step on the QACs, or do we want to have them go back and do the neonics at the next stage, or et cetera.

MS. HOOVER: I can tell you that Shoba has done an amazing job already gathering information on QACs. So no, that would not overburden us, if you picked QACs.

(Laughter.)

CHAIRPERSON SCHWARZMAN: Oliver.

PANEL MEMBER FIEHN: Yeah. This Committee doesn't like to pick one.

(Laughter.)

PANEL MEMBER FIEHN: I think we can say that, because we are always concerned, concerned scientists here.

But if I look at those, I am mostly concerned about chemicals that are produced in very high doses and have direct contact to humans. That is what I am very concerned. Now, QACs are made to be biologically active. That's their purpose. And we get into the high contact and they get into the body.

I am most concerned about the QACs, and I would favor these to be prioritized. It doesn't mean that any of the others, incuding the UV protectants, are less important, because they also get into contact with humans directly.

Neonics are also important as we had learned before. You know, but if their just basic tonnage is lower and they're not directly applied usually. So if I had to pick one and we -- as I said, we don't like to pick one --

(Laughter.)

PANEL MEMBER FIEHN: -- that would be my priority.

CHAIRPERSON SCHWARZMAN: Thank you. You're starting us off on our march down the Panel, which is ultimately what we'd like to do and hear each person's priorities.

PANEL MEMBER SINGLA: I don't have too much to add to that, except to say that's my feeling too with the QACs. I'm favoring those, but with the UV chemicals coming in very close behind.

CHAIRPERSON SCHWARZMAN: And since Tom was sitting between these two, I will note that he -- because he had to leave, he put in his vote -- not vote, but he --

(Laughter.)

CHAIRPERSON SCHWARZMAN: -- he weighed in earlier in favor of a further assessment of the QACs.

Go ahead.

PANEL MEMBER LUDERER: Well, I'm going to do the same thing, and also just to really highlight the many occupational exposures and opportunities for, you know, studies of occupational worker populations, you know, cleaners, and other workers who work with these things every day and are exposed to them by dermal exposure and inhalation.

CHAIRPERSON SCHWARZMAN: Jenny.

PANEL MEMBER QUINTANA: I have even less to add.

(Laughter.)

PANEL MEMBER QUINTANA: So I agree with all of the previous speakers, and especially the occupational piece is a very important and vulnerable population.

PANEL MEMBER CRANOR: I wasn't present maybe for some of these other discussions, so it's a bit unfair comparison, but I was strongly impressed with the presentation that was just done, and the -- was it Veena or with the point of close --

MS. HOOVER: Mic.

PANEL MEMBER CRANOR: Sorry -- the point about close human exposures strikes me as quite important. So I'd favor that.

CHAIRPERSON SCHWARZMAN: So that's what you needed, right?

Okay. We accomplished our goal.

Sara is happy. We're all happy.

(Laughter.)

CHAIRPERSON SCHWARZMAN: Okay. I want -- we're a little ahead of schedule. I want to check now for open public comment, because now is the time where we can have comment to the Program on any topic relevant to the Program, not just to the advancement of QACs or any other chemical class toward potential designated chemicals. So

let's -- let me leave a moment here to make sure we're not missing requests for public comment.

MR. BARTLETT: Nothing online.

CHAIRPERSON SCHWARZMAN: Okay. Nothing online. Anything else in the room?

Please. You'll need a microphone.

DR. DATTA: So I'm Sandipan Datta. And I'm a researcher at UC Davis. So I was just wondering like what are the next steps, like once you have something as a designated chemical, like what is the next -- what are the next steps that you take in terms of like the designated chemicals?

CHAIRPERSON SCHWARZMAN: So let me summarize something briefly and then Program staff can chime in if I get something wrong. But the Program cannot biomonitor something unless it's on the designated chemical list. But being on the designated chemical list doesn't mean that it is biomonitored. So it's necessary, but not sufficient to have a chemical biomonitored. Then you have to design and launch a study that biomonitors for that chemical.

Fair? Anything to add?

Any other questions or comments?

Because if not, we'll end a little early, right?

Anything else to get in before the end of the

meeting?

Okay. Sorry. An early end.

In that case, I will just announce that -- well, first of all, I want to thank the staff and all the presenters today who presented an amazing wealth of work. And it's so gratifying to see results coming out. And, you know, it's easy for us to find holes in them, but there's also such a tremendous amount of value that we saw in them, and we also -- I think the Panel really recognizes the constraints that the Program is operating under, and it makes even more impressive every bit of results and findings that come out of the Program.

And so I'm always in awe and very appreciative of what you bring to the meetings.

With that, I will say that from today, a transcript of this meeting will be posted to the website, the Biomonitoring California website, when it's available. The next SGP meeting is on November 6th. It will be here, same building, same room. And so thank you to Biomonitoring staff, and the Panel, and everyone else who participated, and we'll adjourn the meeting.

(Applause.)

(Thereupon the California Environmental Contaminant Biomonitoring Program, Scientific Guidance Panel meeting adjourned at 3:50 p.m.)

C E R T I F I C A T E O F R E P O R T E R

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 Contamination 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 August, 2019.

JAMES F. PETERS, CSR
Certified Shorthand Reporter
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