MEETING

STATE OF CALIFORNIA

ENVIRONMENTAL PROTECTION AGENCY

OFFICE OF ENVIRONMENTAL HEALTH HAZARD ASSESSMENT

ENVIRONMENTAL CONTAMINANT BIOMONITORING PROGRAM

SCIENTIFIC GUIDANCE PANEL

CAL/EPA HEADQUARTERS

SIERRA HEARING ROOM

1001 I STREET

SACRAMENTO, CALIFORNIA

WEDNESDAY, MARCH 8, 2017

9:56 A.M.

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

PANEL MEMBERS:

Asa Bradman, M.S., Ph.D., Chairperson

Scott Bartell, M.S., Ph.D.

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

Oliver Fiehn, Ph.D.

Marion Kavanaugh-Lynch, M.D., M.P.H.

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

Thomas McKone, Ph.D.

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

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

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY:

Gina Solomon, M.D., M.P.H., Deputy Secretary for Science and Health

OFFICE OF ENVIRONMENTAL HEALTH HAZARD ASSESSMENT:

Lauren Zeise, Ph.D., Director

Amy Dunn, M.P.H., Research Scientist III, Safer Alternatives Assessment and Biomonitoring Section

Sara Hoover, M.S., Chief, Safer Alternatives Assessment and Biomonitoring Section

Carol Monahan Cummings, Chief Counsel

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

DEPARTMENT OF PUBLIC HEALTH:

Robin Christensen, M.S., Biomonitoring California Grant Coordinator, Sequoia Foundation

Nerissa Wu, M.P.H., Ph.D., Chief, Chemical Exposure Investigations Unit, Environmental Health Investigations Branch

DEPARTMENT OF TOXIC SUBSTANCES CONTROL:

Myrto Petreas, Ph.D., M.P.H., Chief, Environmental Chemistry Branch

GUEST SPEAKERS:

Patrick Breysse, Ph.D., C.I.H., Director, National Center for Environmental Health, Centers for Disease Control and Prevention

Julia Brody, Ph.D., Executive Director and Senior Scientist, Silent Spring Institute

Irva Hertz-Picciotto, M.P.H., Ph.D., Department of Public Health Sciences, School of Medicine, UC Davis Environmental Health Sciences Core Center

Thomas Webster, DSc, School of Public Health, Boston University

ALSO PRESENT:

Davis Baltz

Nancy Buermeyer, Breast Cancer Prevention Partners

Marion Guyer, M.D., M.P.H., M.B.A., Alameda Health System

Catherine Porter, J.D., California Healthy Nail Salon Collaborative

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

ALSO PRESENT:

Lovisa Romanoff, M.S., M.P.H., Centers for Disease Control and Prevention

Meredith Williams, Ph.D., California Department of Toxic Substances Control

I N D E X

P R O C E E D I N G S

MS. HOOVER: I just wanted to say hello, everyone. My name's Sara Hoover of OEHHA, and we're going to get started.

First I want to just let you all know that we're getting started, so just a reminder that you should speak directly into the microphone and introduce yourself before speaking. This is for the benefit of the people participating via webcast and for the transcriber.

The materials for this meeting were provided to SGP members as well as posted on the Biomonitoring California website. We actually have more than the usual allotment of meeting materials at the back table in folders that guests are welcome to take.

We actually have one break today, at lunch at 12:15.

Now I'm just going to do a little bit of logistics. To get to the restrooms, you want to exit in the back of the room, walk through the lobby, then make a left. The restrooms will be in that small hallway on your right.

In the event of an emergency, in which we need to evacuate the building, please use the exit in the back of the room, walk down the stairs and exit through the main building doors.

And now I would like to introduce Dr. Lauren Zeise, Director of the Office of Environmental Health Hazard Assessment, who will get us started.

Lauren.

DIRECTOR ZEISE: Thanks.

Good morning, everyone. I want to welcome you to this meeting of the California Environmental Contaminant Biomonitoring Program, also known as Biomonitoring California. And thank you all for participating, sharing your expertise. So an early thanks.

As we start the meeting, I'd like to take a moment to acknowledge a milestone in our program. This is our 10th year, so we're celebrating our 10th year of the Biomonitoring Program.

(Applause.)

(Cheers.)

DIRECTOR ZEISE: And, you know, it was established in -- by legislation, SB 1379, and signed into law by Governor Schwarzenegger in 2006. And in 2007 there was a tremendous amount of hard work to pull things together to start the program; and it included the first meeting of the Scientific Guidance Panel, which was held in Sacramento across the street. And then, you know, guiding the development of the program were the goals that were laid out in the legislation. And it was a very

innovative program, as we've -- as we've seen over the years.

So the goals were first to determine levels of environmental contaminants in a representative sample of California, Californians, and to help identify highly exposed communities. So that underlying it was -- and in the legislation was an environmental justice motivation in terms of looking for highly exposed communities, tracking trends of chemicals over time and helping to assess the effectiveness of public health in regulatory efforts to decrease exposures to specific chemicals.

So in our past several meetings, you've seen how these goals have guided our efforts. And as a case in point, if we turn back to our November meeting, the Panel gave input on a number of activities clearly touching on these goals.

The first was the diesel exposure study that's being designed for a Bay Area community, the multi-regional study that's being launched this year, community outreach efforts to identify priorities and potential biomonitoring in environmental communities, and our laboratories' semi-targeted screening methods that are continuing to be developed to get at more -- a greater body of chemicals to look at.

The SGP also had a rich discussion with one of

Biomonitoring California's collaborators, Dr. Peggy Reynolds of the Cancer Prevention Institute of California.

She presented data from her collaborations with the Department of Toxic Substances Control laboratory, showing a preliminary data on decreases of perfluorinated compounds in Californians -- California women through the California Teachers Study. She also showed data that showed that drinking water with contaminants -- with perfluorinated contaminants was associated with greater concentrations of these chemicals in biofluids in these women that were tested. So pretty significant findings.

The SGP also provided advice in November on possible classes of chemicals used in UV applications, such as sunscreens, that could be considered in future potential biomonitoring studies as designated chemicals. So we got some guidance on that.

So we've got a great agenda ahead of us to help us envision and think about our priorities for the next decade. And we're going hear a lot more about that from our Chair, Dr. Asa Bradman, in a moment. But I wanted to make sure everybody knew about and invite you all to our 10th Annual -- our -- sorry -- our 10th Anniversary celebration to celebrate the program's 10 years. We're going to adjourn the Panel meeting at 2:30 to start the event, and it's going to feature guest speakers, it's

going to highlight some of the accomplishments of our program, and it will be followed by a reception outside in the atrium outside this room that was graciously sponsored by Biomonitoring California staff.

So we hope you all can join us.

And now I'll turn the meeting over to our Chair, Dr. Asa Bradman.

CHAIRPERSON BRADMAN: Thank you, Lauren, for that great introduction.

Is that better?

Okay. Again, I just want to thank Lauren for that introduction. And also I want to say before I kind of get into the nitty gritty here is that today's really I think an interactive -- our goal is really to be interactive today. We have this very formal dais up here and this room is used for hearings. But let's kind of imagine that we're all sitting like in a circle, and really that -- the goal today is really to have a discussion about -- to learn about -- review what we found, celebrate that, and also think about where we want to go going forward.

So with that, the primary goal of today's meeting is to provide the program input on this overarching question:

Given limited resources, what should be the main

priorities of Biomonitoring California going forward?

This overarching question will shape our deliberations during the entire meeting today, and we'll have a dedicated afternoon session facilitated by Dr. Gina Solomon to discuss the question in detail. So please keep that in your minds as we move forward today.

In the morning we'll be hearing a program update from Dr. Nerissa Wu, who will be providing more detail on aspects of new multi-regional study and noting some areas for input.

Is that better?

Okay. I need a little lapel mic here.

Then our guest speaker, Dr. Patrick Breysse of CDC, will present on the importance of biomonitoring and addressing national, regional, and community chemical exposures. We're also pleased to welcome three guest discussants: Dr. Irva Hertz-Piccioto -- Irva, did I see you?

-- Dr. Tom Webster, and Dr. Julia Brody, who will each give brief remarks on our main discussion question before we break for lunch.

We'll have about 15 minutes for questions and brief discussion after each of the morning items and additional one hour of discussion after lunch.

As Dr. Zeise noted, we adjourn the SGP meeting at

2:30 p.m. today to start our event to acknowledge and celebrate the 10-year anniversary of the Biomonitoring Program.

In terms of public comment, this is a formal meeting until 2:30, and I'll call for audience questions as time allows after each morning item. If you ask a question in the morning session, please remember to identify yourself.

Formal public comment will occur during the afternoon discussion. If you'd like to provide formal comment in the afternoon, please fill out a comment card which can be obtained from the table near the entrance of the room. Turn in the cards to Amy Dunn, right here.

And any public comments during the discussion session will be subject to time limits if necessary. But again we'll have I think many opportunities to discuss today.

If you're joining the meeting via webcast, you can provide comments via email at biomonitoring@oehha.ca.gov; OEHHA being O-E-H-H-A. Emailed comments relevant to the topic under discussion will be read aloud during the afternoon session.

I want to note also that the program welcomes public input via email at anytime, not just during the session.

And also note, we'll be in a very tight time frame today, so we're going to strictly adhere to time limits.

So I'd like to now introduce Dr. Nerissa Wu, who's the Acting Chief of the Exposure Assessment Section in the Environmental Investigations Branch at CDPH and Acting Lead of Biomonitoring California. Dr. Wu will be presenting on the topic, "Biomonitoring California - Where We Are Now."

Thank you.

(Thereupon an overhead presentation was presented as follows.)

DR. WU: Good morning. Hello. Oh, that's different.

Good morning. Welcome everybody to this special 10th Anniversary celebration and Scientific Guidance Panel meeting. I want to thank everyone for coming out to Sacramento, particularly today, March 8th, International Women's Day.

(Applause.)

DR. WU: I know there's also been a call today for a Day Without Women general strike. There were huge amounts of logistics in getting this meeting together, so we were not going to make Sara reschedule and replan this meeting.

But I do want to at least acknowledge the day. And certainly women play a very key role in the biomonitoring program as well as public health research overall. So I just want to acknowledge that.

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DR. WU: I will be giving the customary program updates - that's a little sneak preview of Michael - including administrative and budget updates, and then some project news.

There have been a number of staff changes that I want to highlight:

In EHIB we have Thien Phan and Karyn Taylor, who have joined us to do participant outreach and field work on a number of studies.

We have Kathleen Attfield, who's our new Research Scientist III in Epi and Biostats.

In EHLB we have Julian Perez as our new sample manager.

And ECL has added Joginder Dhaliwal, Songmei Gao, and Grace Lao, three new staff people.

So welcome to all of you. And we look forward to hearing your contributions to the program.

We've also had to say goodbye to a few staff. Weihong Guo from ECL and Wei Zhou from EHL have moved on to new positions.

And we're very sad to announce that Duyen Kauffman from EHIB at the end of this week will no longer be at CDPH. But it's also a big relief; she's not going very far. She's going across the aisle to Sara's team in OEHHA. And so her talents and her experience with results return will still be part of the Biomonitoring Program, and EHIB will just have to miss her the rest of the week.

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DR. WU: And as you know, Michael DiBartolomeis has separated from State service after more than 25 years. He has had an extremely productive prolific career including over 15 years working with OEHHA and pesticide assessment. He headed the occupational lead prevention -- lead poisoning prevention project at Occupational Health and created and headed the California Safe Cosmetics Program before moving over to EHIB and heading this program for four years. So we miss him and his leadership, and we hope he's enjoying his new life in Hawaii.

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DR. WU: Michael was just one of many people who have supported and advocated for this program over the years. As we report out today on all that we've accomplished to date, I just want to recognize the many people who have been part of this program. Many of you

are still sitting here today. This slide can't possibly capture everyone who's been part of the program, from SGP to State staff. It's an amazing group of people to work with and it's a privilege every day to work with you.

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DR. WU: And now to the program budget news, which will resonate well with our discussion later today. One thing that's been consistent over the years has been our concern about a long-term sustainable budget, and we report about this at every SGP meeting.

The history between 2009 and 2014, our program budget has been a combination of our baseline State funding and about 2.6 million annually from the CDC cooperative agreement, for a total of a $4.8 million annual budget.

As shown here in 2014, the cooperative agreements available from CDC were reduced from 2.6 to $1 million annually. And we were very fortunate to get the second round of cooperative agreement funding, but it did mean that our budget was reduced by that 1.6 million annually.

We have compensated partially through the budget change proposal, and we've been granted two-year limited term chunks of funding since 2014. And in this last year we were fortunate to have some EJ funding, $1,000,000 this year to spend specifically on EJ projects for this year

only.

But these limited term funds, although they're great, are uncertain by their very nature and it's really difficult to build a program out without knowing what we can count on in the future. We've made it work. We have a very hard working staff. We've kicked the can down the road. But we're kind of at the end of the road at this point. And so as you see from this graph, we are starting to see real impacts of the budget.

There is currently no extension of our limited term funding in the current proposed Governor's budget, which means that fiscal year 2017-18 when one of our BCPs expires, we see a reduction in our budget and corresponding loss of staff.

We're also scheduled in 2018-19 to have a second batch of limited term funding come to an end. And you see the graph continues down until 2019, when the CDC cooperative agreement also comes to an end. And at that point we'll be at about 50 percent of the budget that we currently have.

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DR. WU: A decreased budget results in loss of staff and expertise, particularly in the labs; and this directly translates into a loss of capacity across the program. So BPA alternatives, PFAS method, expanded

phthalates method, all of the great panels that we talk about here as being so important to develop, those are things that we will no longer be able to maintain.

For methods that we can support, it does mean that turnaround time is sometimes longer. We have equipment maintenance issues as our equipment ages. We have fewer staff to do quality review. So our turnaround time for results return is affected as well.

Over in EHIB we can't take on as many projects as we would like to with our limited staff. And as we talk about our projects, especially the multi-regional project, we're having to make a lot of study design choices based on budget.

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DR. WU: Despite that reduced funding, we are still trying to meet our program priorities. The statewide representative sampling, which has always been a key part of our program and a priority for us to meet, we are determined to get out into the field next year. But we've had to make a lot of adaptations and turn it into a more budget-friendly modular proposal.

Consumer product exposures, like working with the Safer Consumer Products Program. We enjoy this collaboration and the Biomonitoring Program provides exposure information which is very valuable. But a lot of

the relevant panels, which would be relevant to consumer product exposures, are the things that we can no longer support.

Our laboratory capabilities, which are so key to our program, you know, maintaining these important panels but also looking forward to chemicals of concern that are coming along and developing methods to meet those needs, their ability to do so is severely impacted.

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DR. WU: And we work hard to leverage the funding we do have. So an example of this is the environmental justice funding that we had this past year. In one fiscal year we've been very productive. For the Asian/Pacific Islander Project, we're moving into the second phase, focusing on the Vietnamese community. Because we were very poised and ready to go out into the field, we've been able to get that project together quickly; and later this month we should be out collecting samples.

We've conducted outreach to a number of different organizations, over a hundred, and we're continuing to survey and discuss our overlapping priorities with a number of organizations. We have webinars and conference calls with organizations throughout the State of California planned in the coming months. And we are putting together our new community newsletter to

distribute information on the Biomonitoring Program to a wider audience, and we hope that's going out in the next month.

And still to come we have the diesel exhaust exposure study, which will be developed later on this year looking at toddler parent pairs in Bay Area communities.

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DR. WU: And we continue to move forward with a number of studies that were initiated in priority years. Project BEST, our Kaiser collaboration in the Central Valley; we're just about finishing up analytical work on this. We've done some arsenic retesting on participants who had elevated arsenic levels. We had 15 participants come back for a second round of testing because of a first elevation, and five people came back actually for a third round of testing because their results were still showing an elevation. And one person who was elevated in all three rounds of testing is continuing to consult with our staff and Dr. Craig Steinmaus from OEHHA to talk about potential exposure sources.

We're also finishing up the perchlorate analysis. There were some delays because of equipment issues. But those results should be available to us this month and going back to participants in the spring.

The FREES project, flame retardant and

environmental exposure study, for which we're looking at participant flame retardant levels both before furniture replacement and at the 6-, 12-, and 18-month point. We have completed the 6-month sampling and the analyses are just about ready, so we will be giving those results back to participants in the spring. And at our next SGP meeting we should be able to report back to you some of those results.

We're about a third of the way through our 12-month point sample collection. So it will all be interesting.

The Asian/Pacific Islander Community Exposures Project which was started with the Chinese population in San Francisco, we finished sample collection in November, and we should have metals and PFAS data to give back in the spring. And as I mentioned earlier, ACE II, the second round, working with the Vietnamese Voluntary Foundation in San Jose, will be going out into the field later this month or early April and starting to enroll participants and collect samples.

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DR. WU: So let's move on to the multi-regional sampling plan, which we talked about extensively last time. Just to give a brief overview and remind you of the overall protocol, we've decided to split the state into

eight regions. And we'll concentrate on one region at a time, cycling through the regions to collect data, which ideally we would be able to do within a two- to three-year period and get a whole statewide sample that way.

The reality is, given our budget, we probably won't be able to get to more than one region per year. So that certainly compromises our ability to compare between regions. But we still will have very complete regional data and an ability to compare between regions depending on when our data was collected for that region.

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DR. WU: Last time we talked about this there were a number of questions from the panel and from the audience about recruitment. And we talked a lot about how we would successfully meet our goal of recruiting 500 participants across the regions. We talked about random recruitment versus community-based recruitment, and stressed the importance of being inclusive, including the cultural and linguistic diversity of California, getting beyond San Francisco Bay to include rural as well as urban communities, and to represent highly exposed communities.

Your input was great. Actually we've tried to incorporate many of the comments as we've continued to develop the protocol.

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DR. WU: This is a pilot. And I often have to remind our team of this, that this is the first region, so it's going to be difficult and the hardest region to get all of the pieces in order. But it is a great opportunity for us to evaluate some of the protocol. And then subsequent regions where we'll be building off of what we learn in this first region, there will be room for tweaks and improvements.

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DR. WU: So this is an overview of the protocol from participant recruitment all the way through sample analysis. And I'll go into each one of these steps in more detail.

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DR. WU: So we're going to recruit participants in two ways: Through a randomized protocol and through community outreach. The randomized sample we'll select through a postcard mailing, where we're going to just randomly select mail routes in each region distributed geographically, and we'll send postcards to each household in the route. We're estimating that we'll get about a 1 percent response rate. So if we mail 65,000 postcards, we expect to get about 650 respondents from that.

And the question has come up, why do postcards at all? If we're expecting such a low response rate, why not

just focus on community-based recruitment? I think partly because our mandate is to do representative sampling. We should at least try a randomized approach. It also does help reach people who are not part of community groups, who are not hooked into social media or other means to environmental groups. And focusing on community groups can be biased in its own way. So a combination of these two approaches I think will give us our best chance at a representative sample.

At the same time we're sending out these postcards, we'll be conducting community outreach, putting information out into community centers, presenting the project to community groups, and being available to get people signed up, having environmental and health organizations e-blast the information to Nextdoor and to Facebook and to their own web pages. And the audiences of both of these campaigns will be given the same message, which is if you're interested in participating, go to this website and participate in this pre-screening survey - it's a very short demographic survey - and you'll be put into this pre-screening pool.

We are trying to lower the barriers to participation to be as inclusive as possible. So we will have email and phone numbers on our information. So if somebody just does not feel comfortable putting their

information on line, they can call us, we will walk them through the pre-screening protocol and get them into that pre-screening pool.

Pre-screening information is also available in English and Spanish. There are obviously lots of people who don't speak those two languages. So if somebody's interested in participating but needs linguistic support, we are noting that on the pre-screening survey, and we'll provide an interpreter for them if they are selected for the participation in the study.

But it doesn't eliminate the barriers to participation. You still have to get the postcard and figure it out. But at least we'll have lowered the barriers to participation; and we are really committed to making this as inclusive as possible.

So we anticipate between these two methods - and we'll have about 2,000 people in our pre-screening pool - 70 percent or so we expect will be eligible. There may be people who sign up but for one reason or another are not eligible for the study. Either they haven't lived in L.A. County, our first region, long enough or they're underage or for some other reason they're not eligible for participation.

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DR. WU: But of that eligible pool, we want to

select our participant pool, and we want to have them represent the region's diversity as well as possible. So, for example, L.A. County, which we have selected as our first region, we'll start with the regional -- the regional racial breakdown and then we'll do -- we'll adjust this somewhat.

You can see the L.A. County racial breakdown is presented in the first slide and what proportionate sampling would look like based on that racial breakdown.

We'll then adjust the sampling somewhat so that we have enough people in each racial strata so that we can do some statistical analysis. L.A. County itself is pretty racially diverse so we don't need to do a lot of adjusting to that sampling.

But, for example, for Gold Country, one of our regions in the eastern part of the state, which is considerably less racially diverse, you can see here how we would have to adjust the sampling in order to get some more representation across each race.

We do want to have a sample that's diverse also with regard to sex and age and geography within the region. But with only 500 samples per region, we're really not going to be able to have large numbers per strata.

And the other thing is we don't really know how

recruitment's going to go and how the distribution across all of these parameters will look once we have people in our pre-screening pool. So we will try to select participants across these parameters. But ultimately we're going to have to be flexible depending on who enrolls in the study.

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DR. WU: Once we have our participant pool selected, our 500 people, we'll be sending out emails and snail mail packages on what the study entails, and in -- the informed consent. The informed consent can be submitted electronically or it can be mailed back to us.

We anticipate that of our participant pool we may lose about 50 percent of the people who said, "Oh, I'm interested," but then never actually get the informed consent back to us. So, as we lose people from the study, we will then go back to our pre-screening pool and select more people and add them to the participant pile.

Once we have an informed consent from a participant, they're enrolled in the study. They'll be given access to an online questionnaire. And we've elected to do an online questionnaire because we just don't have staff to go out and implement an interview.

We'll be keeping the questionnaire short and focused. Because it's self-administered, we have to be really

careful to make sure the questions are clear and understandable. But for participants who just -- who don't want to do a questionnaire on line, we will offer telephone assistance. Also for participants who want language assistance, we'll conduct the questionnaires on the phone with the assistance of a translator.

Once questionnaires have been completed and turned in, participants will be given access to an online sampling app that will allow them to select a date and time and location of sample collection. If we're on the phone with them doing the survey, of course we'll go through that process with them and get them scheduled in for sample collection.

We anticipate that we will lose more people at this point, people who go through the questionnaire and then just never follow up for sample collection. And, again, we have that reserve pool of people who have gone through pre-screening. And we'll have to keep pulling from people as we lose participants.

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DR. WU: We're hoping to minimize our losses by making it very easy for people to provide samples. And we've considered two different models for sample collection. One is sample collection at a centralized location, which has the benefit of being less expensive if

you have lots of people showing up. But if you have high overhead because of site rental and our staff being there, and not a lot of people scheduling, it actually becomes very expensive. So we have to be very careful about how our participants get scheduled into these events.

It offers better control over sample storage because we have a freezer right there.

On the other hand, it's not very inclusive, because there are people who just will not be able to get to centralized locations. They'll have transportation issues. Their work hours aren't conducive for other traveling. And so we will offer some days of mobile phlebotomy where our staff will go out to a workplace or to a home and visit with the person and actually collect the samples there. This is very labor intensive, very expensive for our staff to do, but it does offer the ability for us to be inclusive.

These meetings, regardless of which method you use, should be very short - a quick blood draw, a urine sample - and then we will be doing a very brief questionnaire on very recent exposures, in the last 24 to 48 hours in exposures.

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DR. WU: And this would give us our 500 samples from Region 1. We are working on this electronic tracking

process. So we'll have the ability to track people as they go through the system; we'll be able to run reports and look at metrics for where we're losing participants, how our demographics look in our participant pool. And we'll be able to use this mapping tool to say, well, here's where our participants are, and maybe we need to have another sample event there.

So the use of this electronic tracking, which is something new in our program, will allow us to be much more efficient and effective in tracking our participants.

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DR. WU: Once we have those samples, we're going to be analyzing them for select metals - certainly mercury, cadmium, lead, and arsenic. One of the outstanding questions is, what other metals would be interesting for us to consider?

We also would like to do the perfluorinated compounds. And there's some debate about the panel of 12 analytes, the original PFCs, or the expanded PFAS panel of 38 analytes. Some of the debate has to do with the cost of running the panels. But we would like your input on how we decide between those two panels.

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DR. WU: Of course the results will be available to participants, as always. We'll likely move to an

electronic system with an option for participants to receive a paper version if they choose. And we'll follow our usual protocol for flagging participants who meet a threshold of concern for metals results.

We'd also like to do follow-up with participants who fall into the highest and lowest percentiles per PFC or PFAS result, and follow-up questionnaires for select participants, so that we can collect more of the information that won't be available through the short, self-administered questionnaires.

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DR. WU: So our plan's to be out in the field early 2018, which means that the next nine months will be spent getting our protocol finalized, meeting with L.A. County partners and community partners to do some usability testing of the protocol, getting our protocol through the IRB and addressing their concerns, and then continuing in late 2017, early 2018 to do community outreach and recruitment.

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DR. WU: There are a number of outstanding questions, and we'd love your input on these:

The analytical panel question, which I've already talked about.

Exposure questionnaires. There's always this

balance between all of the things we want to ask and the attention span of a participant. And so some input on what are those key things that we must include would be great.

Key stakeholders in L.A. County, our first region, and also other regions, who should we be including in that outreach? If you have good contacts for us, recommendations for stakeholders we should be reaching out to, that would be helpful.

And how do we go forward to the next region? We're starting in L.A. County. But as we're getting our feet on the ground there, we already need to be looking into the next region and setting up some of those partnerships. So how do we decide which should be the next region? Should we be con -- should we be looking at what would be an interesting comparison to L.A. County or looking at areas where we haven't done a lot of work? So how we think about that question would be a good place for you to offer some input.

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DR. WU: So with that, I'd like to turn it back over to the SGP if you guys have any questions or input.

CHAIRPERSON BRADMAN: So we have time now for discussion by the Panel.

Dr. Bartell.

PANEL MEMBER BARTELL: I guess you could see I had a question in my eyes.

(Laughter.)

PANEL MEMBER BARTELL: I was just curious whether participants will be paid.

DR. WU: We do have the ability through our CDC funding to offer an incentive, obviously through State funding that's not allowed. So budget permitting, we are planning a small incentive, maybe a $10 incentive to participants. As we go forward and no longer have CDC funding, we'll have to change that protocol.

And so there's been some debate about how -- whether when we start up it would be helpful to have that incentive, but whether it would be harmful to have an incentive for some regions but not others. So it's a little bit of an open question.

PANEL MEMBER BARTELL: Yeah, I guess it could also harm you if you have portions of this with longitudinal repeated measures designs where you're going back to the same people and they're maybe expecting the $10 since you gave it to them on the first time.

And then another quick question for the randomized part of the survey with postcards. You know, you're expecting a pretty low response rate, which is probably realistic. But I'm wondering if you have any

ability to collect even like -- or record basic like demographic information, maybe connecting the randomized addresses to other databases, like commercial databases, marketing databases, so that you get at least a little demographic information to tell you to what extent you've, you know, got selective participation by SES or race or age.

DR. WU: Right. We do have the mail codes -- we can get the mail code information from the Postal Service, which will tell us things like number of single-family homes versus multi-family homes. I don't think it has demographics, does it?

MS. CHRISTENSEN: It has.

DR. WU: Robin's been looking into that, so I'll have her answer this question.

MS. CHRISTENSEN: It has limited demographics. It has -- you can access certain ranges of income and, like Nerissa said, household and whether there are children within the family or not. So it's mostly marketing.

PANEL MEMBER BARTELL: It's just a comment. I think it's something worth thinking about, you know, particularly when you have such a low response rate and a goal is to have a representative sample. To whatever extent you can get either individual level information

matched to those addresses you're mailing the postcards to or, you know, census-tract kind of level data, that would help you determine -- not only determine to what extent you have maybe some participation selection bias, but also maybe even allowing you to use some techniques from missing data analysis techniques and statistics to try to adjust the estimates after the fact.

DR. WU: Okay.

PANEL MEMBER BARTELL: It's done, for example, in polling -- for election polling. You know, this kind of information is collected to whatever extent possible since there's pretty strong participation biases there as well.

DR. WU: I'm not sure how well the mail codes match up with things like census tract on it's -- it's got its own sort of division of -- by geography because it's on -- it's based on how many routes a carrier can cover.

But that is something -- that's an interesting thought to look into.

PANEL MEMBER LUDERER: Very interesting presentation, and I'm excited to hear about this regional study going forward.

And I have a question related to what Dr. Bartell just asked, which is: So it sounds like for the random sampling that you're doing, the unit is the household. And I'm wondering whether you're going to be making any

effort to try to recruit multiple members from within the same family, because that could provide very, you know, informative information about household exposures potentially that the family members might have in common. And a related question is, are you planning on recruiting children and what age?

DR. WU: Okay. At this point we are limiting it to 18 years or up. We would love to be able to do children and particularly parent-child pairs at some point. Household of course is very interesting to look at.

At this point I think we're trying to spread as wide as possible and get one member per household, though we won't limit it going forward to one member per household. If two people sign up, I don't think we're de-duplicating by household necessarily.

In the future, when we -- when we have our, you know, plentiful resources and can come back and look at things like specifically household exposures, that would be great to be able to do.

And one of the things that our informed consent will allow is to contact people for future studies if they opt into that check box. And so that is something that we might consider in the future.

CHAIRPERSON BRADMAN: Dr. McKone.

PANEL MEMBER McKONE: It's really interesting. I appreciate hearing about what you're doing, and it looks -- it's a neat design. It's wonderful we're getting into this.

Could you go back to the questions slide --

DR. WU: Oh, yeah.

PANEL MEMBER McKONE: -- that you had for us.

So the one I was interested in is on the exposure questionnaires; and, you know, you're kind of asking us what to look at. And I'm thinking you might want to convene, if it's possible, an expert -- half-day expert panel, identify exposure scientists who are doing big studies. There's several going on. We should look at who's doing studies and ask, all right, if there's five things you could ask in a questionnaire, what would it be? Because I think we would all come up with a little bit different points. And I think you need to kind of vet this, especially for people who are really thinking about this. So find the -- you know, work through some organization to try to identify exposure scientists in California who are out in the field. And then they'll say "Oh, wish we knew what kind of furniture, or if they just bought a new couch or not" or "I wish we knew how much they clean their house" or "I wish we knew their diet." I mean, because I don't think you're going to be able to ask

50 questions. You're going to wear everybody out. It's going to take all day. They're going to have to be fairly focused. And it would be really nice to find like especially the top 10 that a lot of exposure scientists agree on. I think you could get that probably in a half day just -- probably has to be a public meeting or -- I don't know. But, you know, just getting them in a room to brainstorm and think this through and then vet it.

DR. WU: That's a great idea. And we've -- our approach has been -- we have OEHHA's experts and we have questionnaire experts at EHIB who have been combing through existing questionnaires and looking through the literature and using questions that have been vetted through NHANES and other studies to come up with what they -- you know, what seems to be the top questions and that have been successful in other studies at getting the actual information we're looking for. But it would be great to have a panel to help us evaluate that.

PANEL MEMBER McKONE: Uh-huh. And if I just add, you know, on the next -- the region that should be next. I understand there's a compelling reason to only do one region on the first pilot. But I'm wondering if it might be possible to do more than one region on the second simply because you get more geographical coverage. It might be more -- more of a logistics nightmare, but maybe

not so much if you pick two regions that are not too far apart. And then you could get two regions that would contrast with L.A. but could be two different kinds of contrasts. Same number of people but just, you know, randomly split up between two ar -- and, again, it -- it's just, there's this quest for understanding California exposure. And, you know, the criticism we're going to get is, "Great, we did it. Now we understand L.A. region exposure but what about all the rest of the state?"

So the sooner we could show a little broader geographical coverage, I think the more we can kind of put back that kind of criticism that we're still not doing a California-wide probabilistic sample in the way NHANES does a national probabilistic sample.

But, anyway, just a thought.

DR. WU: Yeah. No, I totally hear that. It would be great if we could do two. And that was our original goal, to cover two to three regions in one year.

The reality is a lot of the cost is the logistics, getting on the ground, getting staff out there, having phlebotomists in the field; I mean, your samples collected. And we just don't have the staff to cover more than one in a year or one at a time. It's already difficult getting our staff to consent to move to these places for weeks at a time.

So I don't -- I think at this point, given our budget, it just doesn't seem realistic that we could do that.

CHAIRPERSON BRADMAN: Question.

Dr. Schwarzman.

PANEL MEMBER SCHWARZMAN: Thanks so much. I wanted to pick up on -- actually I had a couple questions -- short questions and then a comment if that's okay.

Partly on something you mentioned about the loss of ability to maintain analytic panels with the decreasing budget. How -- you've mentioned specifically PFASs, and I wonder the time frame of that and how it relates to including PFASs in this first regional sample.

DR. WU: Do you want to, Myrto, or June-Soo, do you want to address that in terms of the PFAS panel?

I mean, I can address it in terms of saying that the PFAS panel is more expensive to run than the PFC panel, so some of the decision may be purely on whether we have the resources to run it.

PANEL MEMBER SCHWARZMAN: My question is really one of timing, like is it locked in for this first pass at the regional sample, or is that open for question now, not just in the future?

DR. WU: You want to talk about it.

DR. PETREAS: Myrto Petreas, DTSC, from the lab. The Panel isn't -- well, we're doing it now, so we're doing it for certain other studies. So it's not an issue of being ready. We are ready. The question is timing, how long will it take? It's more expensive, the standards take longer. And will we have the staff available at the time?

PANEL MEMBER SCHWARZMAN: Well, it is in question whether there's the capacity, the funding to do that for this first regional sample.

DR. PETREAS: During the time, which is two years from now?

PANEL MEMBER SCHWARZMAN: Yes.

DR. PETREAS: As we speak now, we do it.

PANEL MEMBER SCHWARZMAN: Got it. Thank you.

And very briefly, a key stakeholder in L.A. County, one group that I've worked with, is Black Women for Wellness. I don't know if you've already connected with them. Maybe you have.

DR. WU: Yes.

PANEL MEMBER SCHWARZMAN: And connecting to what Dr. Bartell said initially, I'm wondering -- I wanted to explore a little bit this idea of the mail codes. And I understand they don't correspond exactly to census tract. But I'm interested in census tract partly because of the

extensive work done for CalEnviroScreen with collecting census-tract-level SES measures and preexisting disease measures, and the power that that could provide for helping us get more sort of insights into any biomonitoring findings if we could relate them to the census tract level.

And so I'm just wondering if there are any things that we can strategize about before collecting the data that would help us make those links to census-tract-level information that's already existing in CalEnviroScreen.

And, likewise, I'm kind of thinking more about just in leveraging the amount of information that we can get from biomonitoring findings by connecting with CalEnviroScreen, including like what is the granularity of the information that we'll have on L.A. County because there's so much disparity within L.A. County that's captured by CalEnviroScreen, that maybe we could understand some of those differences if we could relate them to the census-tract-level information. And I don't know if this is pie-in-the-sky thinking, but it's so appealing if we could find a way of linking that information.

DR. WU: Well, we should certainly take our mail code map and, as we go to select our targeted audiences for the postcard, we should overlay that over at

CalEnviroScreen and attempt to do that recruitment in a thoughtful way.

I mean, we want to cover geography as well as many different demographic parameters. And then as we do our recruitment, our community-based recruitment, we are starting to map out places where we should be doing that outreach. And again, we should be looking at CalEnviroScreen -- we will be looking at CalEnviroScreen and at a general distribution across California through other means to figure out where we need to be -- where we need to be addressing different population centers. I mean, not only just numbers of populations but particular segments of the population.

PANEL MEMBER SCHWARZMAN: That's great to hear. I'm not sure I was totally clear about what I meant. What I'm suggesting is if we can in collecting -- or recruiting participants and collecting the data on who participates, if there's a way of maintaining sufficient information to link each participant's results to a census tract within CalEnviroScreen that would help us say we don't know about this individual person and their SES, you know, descriptors, but they come from this census tract that we do have that information in CalEnviroScreen, because there's so much that went into compiling that information in CalEnviroScreen and it's relatively, you know, granular

in that it's down to the census tract. And it doesn't tell us about the individual, and I understand the potential flaws there. But if there's a way of collecting enough information on the participants that would allow us to place them in a census tract, then we could potentially leverage some of the information that's already in CalEnviroScreen.

DR. WU: Yeah, we will have their address, their home of res -- well, their place of residence or place of work, things like that. So we'll be able to geocode those; and similar to what we've done in Project Best looking at water sources, we'll be able to overlay that on CalEnviroScreen information.

PANEL MEMBER SCHWARZMAN: Great.

CHAIRPERSON BRADMAN: I want to ask, is there anyone in the audience or on line -- I don't know if we've had any email questions. But this is an opportunity also for comment from participants, so please feel free to ask questions.

I want to leave a few minutes for this because we -- make sure we make time for this.

Okay. No one -- go ahead, Dr. Quintana.

PANEL MEMBER QUINTANA: I'll be really brief. This is Jenny Quintana. I had a couple quick suggestions and then a question. I actually had the same question you

did about incorporating CalEnviroScreen. It's a very powerful tool, and it seems that closer integration with our program would be excellent.

But our brief comments or suggestions are to really encourage the use of multiple languages on the postcards. Even if it makes a really big postcard, I think that helps with inclusiveness.

And also to see if you've thought about video consent. That's being allowed by many human subjects committees. And it might be moving to videos and cell-phone based -- smartphone-based questionnaires, and consenting seems to be the wave of the future.

And my last question is -- one of the questions for our panel was which substances to look at. Of course, we think of L.A., we think of traffic, disparities in exposure to traffic. And so at some point it would be very nice to look at polyaromatic hydrocarbon metabolites in the urine and metabolites of 1-nitropyrene. I understand that funding's an issue, but have you given much thought to sample archiving, where some of these things take quite a bit of urine volume, for example, and costs money to collect, transport, store. But I think it would be very important to archive samples in a large enough volume and in a manner that would allow further analyses. But of course it does take money just to

archive.

DR. WU: Right. Let me address those in order. Let's see.

We are working to get as modernized in the tech world as we can through use of apps like DocuSign for the informed consent, SurveyMonkey-type applications for the questionnaire, applications that will text out and email reminders to participants about their upcoming appointments.

So we're really working towards that kind of protocol. It has to be IRB approved and it has to get through the CDPH IT -- the people who control our IT.

So as much as possible we will be making this as multimedia as possible, to make it as accessible and as -- you know, people walk around with their phones all the time. That would be a great way to get in touch with people. We want to be inclusive to the people who aren't on their phones, and we need to be savvy about security and confidentiality and potential breaches of those apps. But, yes, we are working on bringing ourselves into the smart phone era.

We haven't really looked into video consent. We have talked about this electronic informed consent. But I remember you brought that up last time, and that is something I will look into.

In terms of traffic disparities and sampling. So when we see the participants one time, we have the ability to get one urine sample. So there's a limit on the volume we're going to have.

We are planning on having on the informed consent the usual check box for "I will" -- "I consent to have my samples stored for future analyses." And we will store as much a sample as we have left over.

MS. BUERMEYER: Thank you. Nancy Buermeyer with the Breast Cancer Prevention Partners, formerly the Breast Cancer Fund. Sorry, I still haven't figured that out yet.

Just really quickly, you've talked a lot about the randomized question -- or the randomized postcard recruitment. In doing the community recruitment, I know there's been a lot of interest particularly in L.A. County around sampling near oil extraction facilities, which live in people's neighborhoods. And I don't know if the panels you're looking at are relevant to that kind of exposure. But are those the kinds of things you'll look at in the community recruitment piece of this?

DR. WU: I'm sorry. I'm not quite sure I understood the question because I was having a little side dialogue here. Are we looking at -- I'm sorry. Are we looking at things like oil and gas extraction for -- as part of the community outreach?

MS. BUERMEYER: Yes.

DR. WU: Okay. And recruitment.

I think we are looking at -- I mean, through our Environmental Justice Project, which is outreaching to a number of different environmental justice community groups, we are bringing a lot of different people to the table through whom we'll be doing this recruitment. So it will bring people who are concerned about a number of issues, not just the panel that we're looking at into contact with the Biomonitoring Program. And we hope that we are successful in recruiting through that means.

I don't know that our panels are particularly relevant to the oil and gas extraction folks, and we don't have methods for the chemicals that are relevant for those exposures at this point. But again, we'd be able to archive samples; and at some point if we're able to go back and do some analyses, that would be interesting. And we'll have the geocodes for those participants.

CHAIRPERSON BRADMAN: We have one minute. So we have time for a very brief question. And there'll also be time for discussion this afternoon. So we got one minute.

Thanks.

MS. PORTER: Hi. I'm Catherine Porter with the California Healthy Nail Salon Collaborative. And I just want to underscore the importance of the comment about

language access and the translation of the postcard. It seems like similarly the pre-screen survey ought to be also translated, or create some sort of mechanism maybe more -- via some sort of spoken video survey. Because I think if language access is not sufficiently and correctly addressed, then the whole sense of randomizing is going to be lost.

Thank you.

CHAIRPERSON BRADMAN: All right. Thank you for that comment.

I don't think we have time for more discussion right now. But again, we'll have plenty of time this afternoon. And we're actually right on time right now.

And I wanted to introduce Dr. Breysse, who will be speaking to us.

We're fortunate to have Dr. Breysse here as our distinguished guest speaker. I've actually known Dr. Breysse for almost 20 years now through our work with the Children's Center at UC Berkeley. Dr. Breysse is the Director of the National Center for Environmental Health and the Agency for Toxic Substances and Disease Registry. He joined CDC in 2014, after 30 years at Johns Hopkins where he held a number of high-level positions, including Co-Director of the Center for Childhood Asthma in the Urban Environment.

He has a long-standing commitment to investigating the relationship between environmental factors and health. And today he'll be talking about the importance of biomonitoring in addressing national, regional, and community chemical exposures.

So thank you so much for coming out here for our meeting. And I think we all look forward to your presentation.

(Thereupon an overhead presentation was presented as follows.)

DR. BREYSSE: Thank you very much for having me. I'm happy to be here today.

So as you heard, I'm new to the federal government. The years I spent in academia, I appreciated the importance of biomonitoring in a research perspective. But now at CDC we have to think more broadly about what it means from a general public health perspective. And some of those topics I'd like to touch base on today.

So today I'm going to talk to you about the importance of biomonitoring, addressing national, regional, community chemical exposures. But I'm also here today in part to help recognize the importance of work you do here in California. So we see California as leading among states in terms of their biomonitoring efforts, and I'd like to congratulate you and recognize that. And I'm

here in part today because of that.

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DR. BREYSSE: But I'd like to begin by saying a few words about some of our priorities. So as you heard, I'm the Director of -- I have two hats. I'm the Director of the National Center for Environmental Health, which is one of the centers within CDC, the Centers for Disease Control and Prevention; but I'm also the head of Agency for Toxic Substances and Disease Registry, ATSDR. And in spite its name, we're not really for toxic substances, but --

(Laughter.)

DR. BREYSSE: -- it's an agency that's affiliated with CDC. And its name actually was codified in legislation so we have a hard time changing that name.

But it's kind of like IBM. Most people don't remember what ATSDR stands for but a lot of people have heard of ATSDR, and so I'll refer to it in that way.

And so one of our goals, one of our priorities is to be a leader in public health -- public environmental health surveillance. And biomonitoring plays an important role in that. So we have an environmental public health tracking program where we look at a variety of environmental indicators. We try and link them with health indicators. And that's our effort to create to the

extent feasible a national surveillance program. Now, it's not national because we can only fund a number of states for -- we don't fund every state, but we'd obviously like to fund every state.

A number of our priorities is also to eliminate harmful sources of lead from children's environments. So we began focusing on this actually before the Flint situation. But the Flint situation brought lead to the national forefront. And we've been dealing with lead for decades as public health professionals. And I think there's a lot of consensus now that we know what to do to eliminate harmful sources in children's environments. Instead of trying to manage it and use surveillance - canary in a coal mine situation - we need to just eliminate lead from children's environments.

We also see there's growing concern about safe drinking water in America. One of the things I learned from Flint from talking to people about water -- and Flint was more than a lead problem, as many of you know, in terms of drinking water. The general public has an impression of two things at least, in Flint they did, that their water is, number one, sterile, and that it's contaminant free. And of course it's neither of those things. And to try to convince the public that that's okay. And in terms of the contaminants, some of the

contaminants are contaminants we put there as part of the disinfection process. It's a complex message to make.

But we do know there are many situations across the country where there are harmful substances in our drinking water that do need our attention, and it's gaining greater and greater national focus and it's something that we want to address at CDC.

Now, the ATSDR is an agency whose mission it is to address health concerns in communities associated with hazardous substances disposal and spills. ATSDR's budget, like many things, has been flat for 20 years. The issue of hazardous waste in this country has only grown over that period of time. And we're looking for ways to expand ATSDR's capacity to investigate harmful exposures in communities. We're looking for more resources, being more creative; and biomonitoring plays a big role in that.

Finally, the laboratory is one of the most important parts of the National Center for Environmental Health. There are three divisions within the National Center for Environmental Health. One of them is the Division of Laboratory Sciences. And the Laboratory Sciences is -- our laboratory is a model for the country and indeed for the world.

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DR. BREYSSE: So I'd like to just say a few words

about the role of state-level biomonitoring.

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DR. BREYSSE: So we would look towards states to the extent feasible to provide population-based representative exposures in terms of their -- by their state or by some locality within a community. So it's important to get local biomonitoring data. And the goal obviously of the biomonitoring data is to identify where exposures occur, quantify those exposures, with a goal of reducing those exposures. And so the data at that level are crucial.

So our Biomonitoring Program through NHANES produces a national picture and it helps design national policy, national programs. But we rely heavily on locally collected data to look for situations where there's exposures that need to be reduced or eliminated in order to improve health.

So we know that data drives action. And when we characterize exposures in communities, it's important that we use those data to drive thing -- actions like reducing exposures, getting people different water sources, providing bottled water in the interim if we need to. And I recognize that California's a leader in setting trends and a model for other states, and I congratulate you for that.

But we need to spend -- we need to have a greater emphasis I think across the nation of developing this local-level biomonitoring data. And we need to improve capability in the states in order to do that.

I'd like to give one example of why this is important. It's an example you're well familiar with here in California. And it's something you've already talked about.

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DR. BREYSSE: And that's the perfluoro and polyfluoro substances issue. So this is an issue that I know you're addressing but people are addressing with it nationally. I think you guys are ahead of the game compared to most other states. But we know there's many current and past uses that create opportunities for exposure, we know there's many sources that create pathways in communities that we need to quantify and address. I won't spend a lot of time with this because this is something obviously you've all thought about, you're all very familiar with here. But this is playing out across the country right now, and we're helping states and local communities address this issue. Many of them don't have the resources of the State of California, and many of the communities have heightened concern about what their exposures are.

And so we know this is important.

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DR. BREYSSE: Again, I won't spend a lot of time because -- there's widespread human exposure to the PFAS chemicals. We know they're persistent in the environment, degrees of persistence. We know that EPA has identified them as contaminants of emerging concern, so we're collecting more and more data about them in environmental media like water. We know there's concern about increased cancer risk. We know there's concern about the developing fetus and children. And we know for a fact through the EPA's monitoring and comparing to the long-term health advisory level, that there are many communities across the country that have PFASs in their drinking water above the EPA's current long-term health advisory level.

So the publication of the EPA's long-term health advisory level about a year ago set off a wave of concern across the county, as community after community found out that they had levels that were above this.

DR. BREYSSE: And here we see a map. And this is -- you don't need to spend a lot of time on the colors or the details. But the dots are -- through the unregulated contaminant rule of monitoring the EPA did, their version 3, we have identified at least - I say 65 because we think the number might change - communities

with drinking water levels potentially above the long-term health advisory level for EPA.

And we know that the rule always samples municipal drinking water systems that are above a certain level. And so we're only talking about communities that have larger drinking water systems.

And there are a large number of Americans who either get their drinking water from private wells or from smaller unregulated drinking water systems. So in many ways this is perhaps the tip of the iceberg.

And if I address all your attention to northern Alabama on this map. So this is an area where we've done a lot of work at ATSDR because of a community where there's a large area that was affected from a water treatment plant that had sewage sludge that was contaminated and they used the sewage sludge to amend agricultural areas, so they created a water situation which then was magnified by the water treatment plant magnifying that material and then spreading it on the land.

And so we know -- but if you look at it -- in northern Alabama there, while there's a couple of drinking water systems that were elevated because of the regulation monitoring, if you look at water systems that were not part of that regulation rule, there was a number of other

water systems that were contaminated as well. So the issue was much bigger than just one or two communities you might have thought were affected by just looking at what the unregulated contaminant rule sampling would predict.

So we see we have issues across the country already in dealing with this. So this is something that's a big issue in California and I think it's a national issue, and we've taken it as a priority at ATSDR and NCEH.

So this is a biomonitoring meeting; I have to present a little bit of data.

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DR. BREYSSE: And so we know from NHANES, if we look at the NHANES cycle on the horizontal graphic -- graph, but versus the geometric mean level on the vertical graph for PFOA and PFOS, we see a very nice public health response. As the manufacturers decided to stop making those chemicals, we've seen substantial decreases particularly in PFOS over time.

But if you look at another PFAS chemical, PFHxS, we don't see a corresponding decrease. In fact, we see it's relatively level. So while we may have some success with PFOA and PFOS, as we've heard already there's a large number of chemicals in these families, that just because PFOA and PFOS are going down, it doesn't mean everything's going down and it doesn't mean the problem's been solved.

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DR. BREYSSE: So one of the important goals about monitoring, as you heard, is to set up -- if you look back, to look at these trends over time. These trends over time are important for setting policy. And we are looking for data hopefully in the future from state and local communities along these lines so that the -- the information you're collecting as part of the initiative we just heard about, we have population representative sampling, is crucial to understanding trends over time. And it's crucial for collecting data that you can use to compare across communities as well.

In many cases, as we'll see in a minute, we have a number of communities in the U.S. where they're offering opportunity for convenience sampling for biomonitoring purposes. And we argue that while it's important for individual people who want to know what's in their body, they have a right to know that, for public health purposes, having population representative samples are important, like I said, to look at the trends over time and to compare across communities and to generate data that might be helpful for future health effect studies.

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DR. BREYSSE: So you see, by looking at the priorities that we started with in terms of strengthening

ATSDR, expanding our laboratory work, improving public health surveillance and focusing on safe water, the PFAS issue crosses all those priority areas for us as an agency.

So ATSDR, all those communities that have contaminated drinking water systems, we're looking at where it's coming from. Right? And if it's a site-specific release, that's an ATSDR issue. That's now something that ATSDR should help states deal with in terms of chemical release into our drinking water system now creates exposures in communities.

Now, it's important to recognize that just because there's contaminant in the source water, it doesn't necessarily mean that that's what's coming out of people's taps. So the unregulated contaminant monitoring rule is really looking at what the sources of the drinking water is. And we know there's complex mixtures of waters in many cases in drinking water systems. And so one of the things we would like to know more about is actually what's coming out of people's taps, not just what's going into the drinking water system at the drinking water plant.

So ATSDR is involved in helping communities address this by looking at what the source might be and treating it like they would any hazardous waste site

investigation. We have a number of sites that have requested ATSDR assistance, and we're actually engaged in getting a dozen or so sites across the U.S. right now that are PFAS-related sites. Many of them are military sites or former military sites or sites that use firefighting foam; and some of them are also former or current industrial sites as well.

So the laboratory also plays a critical role, similar to your biomonitoring here, in order to keep up with looking at the chemicals that are in the environment and making sure the biomonitoring matches what the people are exposed to. And this is a challenge, as you're aware, because the chemical formulation of the PFAS chemicals are changing as they try to eliminate the longer-chained chemicals, they're coming in with a little shorter-chained chemicals. And so looking at what's in the environment, we have to look at also kind of the corresponding development of the biomonitoring methods to measure that as well.

The Public Health Tracking Network, as you know, is our surveillance program, and so we're looking to incorporate this biomonitoring data there. And obviously since this is a water issue, it fits nicely into our Safe Water Program

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DR. BREYSSE: So our current work is develop a technical tool support for states that gives them advice on how to characterize water -- PFAS exposure in the water distribution system; advice on how to conduct biomonitoring, collecting a population-based representative sample.

The convenience samples that many communities across the U.S. are taking right now, like I said before, do not provide the public health basis for looking at trends and making policy decisions, as we commented before.

We have an exposure and health effects question bank that people can choose from.

We provide blank letters of support and interpretation to provide information back to communities.

We have a variety of risk communication materials.

And finally, we also provide water sampling protocols from the EPA. So if you're in a person's home and you're collecting a blood sample from them and you're interested in what their PFAS level is, it might be an excellent opportunity to also look at the water sample of that home to know what the actual source is there.

So these are the toolkits that we're beginning to make available to states. We hope to have this roll out

very soon.

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DR. BREYSSE: So at the international level, I was -- I had the pleasure of attending a European commission meeting on human biomonitoring. And the kind of issue we're talking about here in California and across this country are happening in Europe as well.

So many countries in Europe have their national biomonitoring programs. There's no European-wide biomonitoring program, and so they don't have data that are necessarily comparable. And so I'm happy to say that within Europe they're looking to harmonize procedures for biomonitoring. They're trying to create a European-wide network similar to what you're trying to do across different communities in California. So we can get some European-wide data as well. And they've turned to us for help and advice on that.

And so I'm happy that we're playing a leadership role in helping to respond to that.

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DR. BREYSSE: So one of the important outputs of our biomonitoring program is -- I'm sure you're aware, is the National Report on Human Exposure to Environmental Chemicals. And I'm told this is one of the most highly cited documents, publications that CDC produces.

And so this is a very important document that highlights kind of the 300 plus chemicals, looking at the levels collected in NHANES across the time period appropriate for the NHANES sampling.

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DR. BREYSSE: So we published updated tables in 2017, a two-volume set. It's a two-volume set because it's easier to download. It was getting too big. It was only one volume.

The first volume gives the general U.S. population-wide data.

The second volume gives pooled samples for a very purposeful analysis of comparing smokers and non-smokers. And so smoking continues to be an important priority area for the CDC, not just our laboratory. And we provide the support for biomonitoring that helps document changes and trends in exposure, especially as we look at, you know, the new ways to kind of take on -- take on nicotine or tobacco products. We see wide changes in the type of chemicals appearing in your body.

So the present data we present 304 chemicals in the current report. Twenty are reported for the first time, and 96 are updated since 2015.

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DR. BREYSSE: So here we see some of the new

chemicals include DEET metabolites, atrazine metabolites, triclocarban, and six blood VOCs. So we continue to change and add things as new science emerges.

We make sure we link the chemicals to the CAS registry number so there's a common way to reference things.

This report we began to look at linear and branched isomers for people on PFAS. So these are new data. In the past we looked at them without specifying between whether the linear or branched chain. And we're not sure exactly how important this is going to be just now, but it could provide important information about a potential where the source of a material might come, because the -- whether they're linear or branch depends in part on the manufacturing technique. And so it might help with source identification among other things.

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DR. BREYSSE: Here we see a group of chemicals. I don't need to go over -- read the whole list. These are the chemicals with updated data. And so you see we're continuing to update data as part of this biomonitoring report.

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DR. BREYSSE: And this longitudinal data is I think what's important. Having cross-sectional data is a

crucial starting point, but the longitudinal data I think creates the national picture that we need for the evidence to look at the increases and decreases in exposure or the changes that might have come with different chemicals being introduced into the environment.

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DR. BREYSSE: In this slide we list the new chemicals reported for the first time. And, again, I won't necessarily read them all, but you'll see they include a number of the PFAS chemicals we're looking at for the very first time.

We see a number of volatile organic compounds increased. We see triclocarban as an important consumer product -- personal care product that we're looking at as well.

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DR. BREYSSE: So what are the goals of our efforts at CDC? It's harmonized biomonitoring approaches across the country. So in part through data that we funded -- we provided the State of California and other states. Our goal is to work with the APHL to come up with harmonized approaches. So we make sure that we collect data that we can compare across the country.

So we've had a longstanding collaboration with the public health laboratories and with APHL. And our

goal here is to increase the capacity and capability across the country for high-quality biomonitoring. We're developing a National Biomonitoring Plan, and we're looking for resources to increase funding to states wherever possible. And we're establishing this formal national biomonitoring network that we talked about before.

So the National Biomonitoring Network has a vision of a formal national network of regional, State, and local laboratories conducting high-quality human biomonitoring science for use in public health practice and in response to environmental health emergencies.

So having this network all close and knitted together using harmonized methods that communicates with one another right away, can respond to regional issues, and that also provides support if there's a national emergency is a crucial I think resource for the country.

So we're formalizing the network, so there'll be a steering committee; there'll be work groups that address study design, laboratory methods and how to join them in terms of membership. There'll be a central platform for sharing issues on biomonitoring practice. We're working to harmonize - and they use that word very carefully - not standardize methods, because there are a number of ways to get high-quality measurements to have the same limit of

detection, have the same quality control. And it's not necessary for us to necessarily specify exactly how that measurement has to be taken. Rather we specify things like the quality control that it needs to achieve, limits of detection it needs to achieve, and so forth.

But ultimately we want to incorporate biomonitoring more into public health surveillance and into public health practice. This is really our goal.

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DR. BREYSSE: Well, in terms of final thoughts. As we forge ahead we need to leverage expertise and resources outside environmental health. We had a meeting last week at CDC where we invited -- it was a telephone conference meeting. We invited agencies across the federal government who'd have an interest in PFAS chemicals. And they range from, you know, the Food and Drug Administration, Department of Agriculture, Consumer Products Safety Commission, the Environmental Protection Agency, NIEHS, EPA. So we know that there are people beyond the environmental health community that have an interest in biomonitoring, and so we need to make sure we reach out to them and bring them into the fold, but talk to them more about what they're concerned about and how that might affect the measures we take and how we interpret the measurements we make.

We need to do a better job of increasing local and state-level data. As I mentioned before, California's a leader in that regard. And we'd love to see other states come up to your capability.

And, finally, we make sure that we share our data and we pool our data so we can have data-driven knowledge to help individuals and communities address their health concern, because we can't forget that's ultimately what we're here to do.

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DR. BREYSSE: So with that, I'd be happy to take a few questions.

Thank you for your time.

(Applause.)

CHAIRPERSON BRADMAN: Thank you. That was really interesting, and I really appreciate the encouragement and attempt to really build networks and collaboration, both locally and internationally. And I think there's a lot of real opportunity here to address environmental health and public health issues.

So are there any questions?

Dr. Quintana.

PANEL MEMBER QUINTANA: Hi. I had a question just asking for your opinion. We heard earlier that California Biomonitoring has limited resources. So given

the very interesting and helpful data that's come from the NHANES, DEH, the CDC program, what do you think are the holes that state-level monitoring could really focus on to kind of supplement what's already been going on at the national level? What -- in your mind, what are the issues you're not able to address through that program?

DR. BREYSSE: Yeah, so we sacrifice the ability to look at more fine level, in terms of community-level exposures, by emphasizing our national average.

And so we would look to states like California to see if the picture in California is the same as the nation. Or compare a community to another community, how does that compare to California as a state, how does that compare to the nation?

In many cases our benchmark for talking to communities about what it means to have this stuff measured in your body is compare it to a national average. Now, oftentimes that's an okay place to start, but it's not the only thing we'd like to know. And so having more geographic specificity about what the biomonitoring levels are like, and knowing what some of the local determinants might be, could clearly help us I think focus our efforts as we look at where it might be different, where it might be higher, where it might be lower, and what the determinants of why it might be higher or lower should be,

will help drive public health policy. So we looked to the states for that specificity wherever possible.

PANEL MEMBER QUINTANA: And a quick follow-up question. I saw that you added, for example, atrazine to the latest report, which I would think would have a very high amount of geographical differences. And so have you looked at kind of a hypothesis generating differences in your data that could be confirmed by state-level monitoring? Geography hasn't been a main feature of these reports till now.

DR. BREYSSE: I don't think we're necessarily starting with a real hypothesis-generating goal for what we do. But if I speak wrong, I'll look for some of my lab colleagues here with me.

But our goal is to look at the data and characterize the data. And then we turn to the public health community to use that to generate hypotheses to ask questions about what it means. As you know, there are, you know, tens of thousands of publications that utilize the data that we publish through the laboratory for looking at, you know, analytical epidemiology or exploratory epidemiology. And I think that's one of the greatest services that these data provide. And a similar service can be provided by local information like you can provide in California.

CHAIRPERSON BRADMAN: Dr. Luderer.

PANEL MEMBER LUDERER: Thank you.

That was a really interesting presentation.

Kind of a related question. And also getting back to one of the questions that Nerissa asked at the end of her presentation about which panel of perfluorinated substances should be measured. You know, that's the original smaller panel vs. the larger one. And I think given what you've been telling us with the national data, with these new chemicals coming into the market and being substituted for the older ones where we're happily seeing declines in the biomonitoring data, would you agree that that might be an argument for doing the larger panel if at all financially feasible?

DR. BREYSSE: Well, I haven't seen the two things lined up. But I think we are doing a larger panel than just the straightforward PFCs used to be. So we're looking towards doing more. And we're in conversations with EPA, I'll say right now. As they are identifying new compounds in different environmental media, we want to know what they are. So wherever possible, biomonitoring methods will keep up with what the environmental sampling methods are. So that if they start seeing an increase in something, we're in a position to say whether we're seeing it in human tissues or not.

CHAIRPERSON BRADMAN: Dr. Cranor and then Dr. Schwarzman. Then I have a question.

PANEL MEMBER CRANOR: This is probably going to be a strange question, but I will ask.

You collect blood and urine. Do you store it, and for how long?

DR. BREYSSE: We do store it, but I don't know how long we store it for.

Lovisa Romanoff from the laboratory.

MS. ROMANOFF: So we store it until our analysis has been completed, and then we actually return it to NCHS.

PANEL MEMBER CRANOR: And then they store it?

DR. BREYSSE: To where?

MS. ROMANOFF: And then they store it. And I don't know exactly how long they store it.

NCHS, the center who's responsible for NHANES. So NHANES stores their samples.

PANEL MEMBER CRANOR: And it remains stored there?

MS. ROMANOFF: Yes, yes.

PANEL MEMBER CRANOR: Okay.

MR. ROMANOFF: Yeah.

PANEL MEMBER CRANOR: So one concern that somebody had -- I've had about biomonitoring is that -- it

serves very useful purposes but it's limited in terms of the public health. With advances in cellular toxicology and -- and I'm not even sure I'll use the right terms here -- molecular information about what's going on in human bodies, can you use -- is there any authority to use the stored blood samples, for example? This person not only is exposed but they had a reaction that is in the direction of not good. That could be a way of extending the public health impact, it seems to me, of biomonitoring.

DR. BREYSSE: Yeah, I think that would have to be done outside something like NHANES. I don't think we keep that individual level data in such a format that we could identify people who have some outcome in the future or that we might want to go back and explore what they had available in their blood.

But what we -- I think what we do make available is if there's some biomarker of effect that you could look at in a blood sample, that might be a reason to ask for access to a limited number of samples for the future.

PANEL MEMBER CRANOR: Oh, right. I wasn't necessarily thinking about individuals, although you may want -- you may want to protect them of course.

DR. BREYSSE: Absolutely.

PANEL MEMBER CRANOR: But is this concentration

triggering at the cellular molecular level effects that are not desirable?

DR. BREYSSE: That's entirely possible. And for our state recommendations, we're recommending that they might archive blood and serum -- and urine samples for those purposes as well.

So for PFASs, you know, you might want to look at early changes in -- if you have some new marker of -- I'll pick one of the health effects -- of cholesterol metabolism, you might want to be able to go back with blood samples and look and see is there early indicators of cholesterol metabolism that might be predictive of disease in the future. So those are all --

PANEL MEMBER CRANOR: Exactly.

DR. BREYSSE: -- important hypotheses I think you could do, if you archive samples. I'm not sure NHANES samples would be useful for that -- utilized for that purpose, in part because I don't really know the parameters by which people could have access to the samples in the -- at some point in the future.

CHAIRPERSON BRADMAN: Dr. Schwarzman.

PANEL MEMBER SCHWARZMAN: Thanks so much for the presentation.

My question is a little bit related to what Dr. Luderer asked with regard to emerging chemical

replacements. And, you know, you said something specifically and presented some data about the sort of shift in PFA -- PFASs. And I wonder how -- and you talked a little bit about chemicals that are measured in the environment and starting to look at those. But that's a fairly late sign, I would say. And I wonder if NHANES is looking a little bit more upstream at what's coming out in replacements, for example, in phthalates, phthalate plasticizers specifically, or -- anyway, other -- other -- OPFR flame retardants, other chemical uses; not so much classes of compounds but applications, uses of chemicals, their function, that is shifting from one compound to another in the marketplace.

DR. BREYSSE: Let me -- let me -- before I answer, let me just tell you what the parameters are that restrict what can be done here.

So NHANES collects a fixed amount of blood that can be -- that has to be used for very specific purposes, some that come to the laboratory for chemical analysis as well as maybe some other biochemical analysis the lab might do.

It's very hard for our lab to say we need more blood to do more samples. Now, that doesn't mean with the same amount of blood we can't add new analytes. You could always do that. But it's going to -- it's going to

require in some cases, you know, very creative chemists to figure out how do we do more with the same amount of blood going forward. So there's always that tradeoff.

So I do know that they're looking for -- they're always considering adding new chemicals, as you just saw. And the process to add new chemicals is not easy because it has to go all the way up to HHS I think for approval. And so -- I do know that they're petitioned all the time to add new chemicals, and they consider that.

But the analytical challenge is often what drives it to our lab. We'll first look and say, "Can we" -- "is it feasible for us to do it with the amount of blood we have," before they even kick it up the ladder and say is it something that we want to get approved through the National Center for Health Statistics, which is the group that runs NHANES.

CHAIRPERSON BRADMAN: I had a couple of questions then. One is just very specific.

Are there any plans to measure glyphosate in urine?

And then I also want to get back to the question we had about our own program that's been an issue for a while is the age. I know NHANES focuses -- the youngest age group is 6 to 11. And I know I'd like to encourage in general more sampling of younger kids; and I'm wondering

if there's any plans to do that.

DR. BREYSSE: Well, glyphosate is under consideration. It's one of the chemicals they're considering. And I don't know what the status of that is.

Is there anything formally decided?

And I think they are evaluating looking at younger children for some things. And so I pushed the same thing myself.

We have no reference values for kids less than 6. And in communities, you know, across the country we're measuring, you know, PFAS, for example, in -- you know, in small children. And we know nothing about how to -- what to compare them to. So I think that's a big if.

So NHANES is looking at reaching out to lower children. I just don't know -- younger children. I just don't know what the status of that is right now.

Well, Lovisa, are you familiar with where they are?

MS. ROMANOFF: (Shakes head.)

DR. BREYSSE: Okay. We can get that in you. But I'll send that to an email, Lovisa.

CHAIRPERSON BRADMAN: Okay. That would be great.

And again going back to primary children, just a little side note. IRB at Berkeley back in the day, 10, 15 years ago, they didn't let us return results to

individuals. And we worked with them and then they did let us. And one of the key factors for them was that we can make comparisons to representative data nationally, and just to underscore how important that is to make comparisons. And on the local basis it's really definitely important.

Another comment too about looking at health effects and things like that. And perhaps that's something that can be done at the state level. Just to give an example, I think of what Dr. Cranor was talking about. We, for example, did an analysis of stored samples and looked at -- we did metabolomic analysis of stored urine samples, and then we looked at the relationship of urinary metabolites related to lipid metabolism, for example, in phthalate -- measurements of phthalates.

So -- and actually we see some associations between some of those lipid-related metabolites and exposure, and those are consistent actually with some epidemiologic and animal data.

There was an example where this study was real exploratory and I think these things -- these types of projects need to be, you know, confirmed in a larger population, et cetera. But I think there are, you know, public-health-related outcomes that we can look at and store examples that will inform both exposure and

potential impacts.

Any other questions in the panel?

PANEL MEMBER CRANOR: One more.

Just to add to that, it seems to me it's a very efficient use of resources that one already has if you've stored enough blood that can be pulled out for a further purpose. And that's part of what was behind this, is that you're doing it for one purpose, it has limits, it's important, but it could be perhaps without great expense used for other purposes since you already have it.

DR. BREYSSE: Yeah, having participated in one of these from my previous life though, there's a huge effort that goes into you have a little bit of something archived and you're not quite sure what's going to be most important in the future. And once you give it to somebody for something, you're removing the opportunity for a host of unknown things that might come down in the future. And so these decisions that go through trying to decide if this is a good use or not really are big kind of complex decisions that have lots of discussions, because you really have some people say, "Oh, my God, the answer of a lifetime may require this blood 10 years from now. If we give it away now, we don't have it."

(Laughter.)

DR. BREYSSE: You know, those are literally kind

of the unknowns you have to wrestle with. And I was on a panel for a larger cohort study at Hopkins where we had a lot of archived stuff and we went -- we agonized over these decisions.

CHAIRPERSON BRADMAN: So we have just a couple of minutes. Are there any questions from the audience? I think we have a couple of minutes.

Are there any questions?

Gina.

CAL/EPA DEPUTY DIRECTOR SOLOMON: Gina Solomon, Cal/EPA.

Just a wonderful presentation. Thank you.

Can you talk about any semi-targeted or non-targeted testing that you're doing, if any, in your laboratory.

DR. BREYSSE: What do you mean by that? I'm not quite sure.

CAL/EPA DEPUTY DIRECTOR SOLOMON: Just whether you're using -- whether you're doing any agnostic testing of not targeting specific chemicals but looking -- okay. I see head shaking.

DR. BREYSSE: No. I think we -- we have to -- since this is part of really the national survey, we have to have a very specific reason for what we measure laid out and approved in advance.

CHAIRPERSON BRADMAN: I think this question has to be very brief. And if we don't have time to address it, we'll have much more time in the afternoon.

So go ahead.

DR. GUYER: Hi. I'm Marion Guyer. I'm an internist with Alameda Health System and I used to work with Kaiser. I'm wondering if there are any sort of private/public partnerships of linking up with health organizations to get your samples.

DR. BREYSSE: Not that I know of. We -- the lab -- in addition to the NHANES sampling we do, the laboratory does a lot -- collaborates on a large number of studies across the country that are hypothesis-driven research projects that have NIH funding. And so I imagine some of those probably have some private partnership/government relationship with them.

But we do -- the laboratory does a lot more than just the NHANES stuff. So they assist -- they assist states that don't have the laboratory capacity you have in California, and recognize that most states don't. And so where there's a need at the state level, you know, we can help fill that.

And we also, like I said, collaborate on, you know, dozens if not many dozens of health studies that have very specific biomonitoring needs associated with

them; range from everything, you know, PAHs, the whole host of persistent organic pollutants, and you name it. So some of those probably have the relationship that you talked about.

CHAIRPERSON BRADMAN: I'm going to interrupt there and say at this point we have to -- and thank you so much, Dr. Breysse. And we're actually exactly on time. I want to note that that clock up there is a minute fast.

(Laughter.)

CHAIRPERSON BRADMAN: So we're doing well.

But now I want to introduce our guest discussants. We're going to be having brief remarks from our three guest discussants on the question that we raised earlier:

"Given limited resources, what should be the main priorities of Biomonitoring California going forward?"

After they've all finished their remarks, we will have about 15 minutes for clarifying questions.

So I'm really pleased to first -- to introduce our first guest, Dr. Hertz-Piccioto. She is the Director of the Environmental Health Sciences Center at UC Davis and an expert on the effects of environmental exposures on pregnancy, the newborn and child development. She collaborated with Biomonitoring California to measure urinary phthalates in a small subset of pregnant women who

previously had a child diagnosed with autism spectrum disorder as part of her longitudinal study on markers of autism risk infants. She has served on many expert panels, including OEHHA's Carcinogen Identification Committee for Proposition 65.

And I should say we had the privilege of actually testifying last week before the Senate -- California Senate Committee on Environmental Quality.

So welcome.

DR. HERTZ-PICCIOTTO: Thanks, Asa.

(Thereupon an overhead presentation was presented as follows.)

DR. HERTZ-PICCIOTTO: So these are some reflections. I actually have had no real contact with the program since that very beginning where the first call went out for, you know, possible sampling.

And so these are -- so I spent a little bit of time looking at your website and thinking about what's up there. So here are just some reflections, and so -- as an outsider.

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DR. HERTZ-PICCIOTTO: First thing I wanted to do is praise all those people who labored year after year after year to get this program in place. And, you know, now it's been in place for a while but people may forget,

but it was many years of trying to first get it through the legislature and then finally get it -- and then get it through the Governor's office. So thanks to, if any of those people are in this room.

And then encouragement. This is real -- it's really come quite a ways in the last 10 years that -- in terms of what you'e doing and how -- and just growing the program.

I'm going to raise a couple questions about how priorities -- how decisions are made and make some suggestions about things -- ways to approach those issues of next steps and some perspectives and maybe a few words of caution.

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DR. HERTZ-PICCIOTTO: So 2006 -- I always love the language of these -- when you actually look at the statutes. The people of the State of California do, you know, these things. And truly, you know, that is supposed to be the spirit and should be and in this case definitely is.

So SB 1379 mandated the Biomonitoring Program.

In terms of who? The mandate actually says it should be, you know, representative of the population. And obviously, you folks have been struggling with the fact that it's kind of an unfunded aspect of the mandate

that really is very expensive to try to do representative sampling, and have tried to sort of come up with compromises. And I think that's kind of an ongoing question.

In terms of this is maybe one of my words of caution, I -- listening to the presentation this morning, I question the validity of using traditional approaches for sampling the population when we know those are absolutely incapable of getting us anything representative, and thinking maybe a little more broadly about new ways to achieve representative samples.

And this is something I know you folks have been grappling with. It's -- I'm not really bringing anything new here. But, you know, I have some questions about that design we heard this morning.

In terms of what to measure, that was actually laid out quite clearly in the statute, that it -- in terms of certain general criteria, in terms of toxicity, potential for toxicity, the degree of exposure in the human California population, and the laboratory limits in terms of limits of detection. But the -- and, you know, you have -- looking at what you're doing, you've got this amazing array of analytes that you're now able to measure, and it appears that you've got lots of experts working to use, you know, the state-of-the-art methodologies in those

chemical analyses.

But the question of why and prioritization is the one I want to just spend a few minutes focusing on.

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DR. HERTZ-PICCIOTTO: So this is the language in the statute. And you'll notice that there are about eight sort of goals that are set here, from establishing trends -- time trends, validating modeling and survey methods, supporting epi studies, identifying highly exposed communities. And maybe this next one: Addressing data gaps is kind of related to supporting epidemiologic studies, in forming health risk responses to unanticipated emergency situations, assessing the effectiveness of current regulations, and helping to set priorities for reform.

So my question is, to what extent do these goals enter into the decision-making as you evaluate proposals for projects? And do you want to put some focus on areas that you maybe have not been actually addressing and thinking through how to -- how to solicit projects or put in place projects that would be doing things that maybe you're not yet doing from this list.

Now, I know you've definitely identified some highly exposed kinds of populations. The firefighters was one. So that's an area where there's some work that's

been done. But I'm not sure about the, you know, effectiveness of current regulations.

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DR. HERTZ-PICCIOTTO: So a couple of thoughts I have here. I do want to say, in terms of establishing trends in chemical exposures, it's a good thing to do. But I think it's really a problematic approach for identifying health outcome associations, and that one has to be really, really cautious. And, you know, I've been studying autism very intensively for the last 15 years. There's been a very strong time trend that we've shown as not entirely due to a real increase, but yet a big part of it probably is a real increase.

And all kinds of crazy studies get published about these other time trends that have been running in parallel. Those are all problematic studies. And then there is the dilemma, which I think is actually not so hard to reconcile, but why is it that we see things that should result in a decrease? For instance, increased use of folic acid. We see folic acid as a preventative. We found it to be preventative. And maybe there actually hasn't been as much of an increase in use as we thought.

But the parallel between an exposure and the outcome is not going to -- there's so many exposures that are changing over time, that that's just a -- that's not a

good use of the trend part. Not to say that you don't want to know what the trends are of the exposures, but just caution about how to interpret that.

One thing that could address this sort of problem though is this use of non-targeted screens when you really don't know, you know, kind of what could explain some kinds of trends. And as hypothesis generating, I think non-targeted chemical analysis is really a good way to go.

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DR. HERTZ-PICCIOTTO: Validating models, there are all kinds of issues related to testing assumptions. One example I'm going to suggest here is we need to have a good validation of PUR, the pesticide use reports, which has already been done against air sampling, and it's shown to be very, very valid from a report out of DPR. But then taking that the next step to the biomarkers of pesticide exposures and figuring out whether the biomarkers actually -- maybe they're not the gold standard for the variety of reasons that have to do with, you know, the variability of exposure over time. But that would be good to really figure that issue out.

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DR. HERTZ-PICCIOTTO: From -- I want to make just one suggestion on -- because my time's running out and I don't want to run over -- fracked communities as a

possible highly exposed community. There -- 20 percent of oil in California comes from fracking. And there's a big cluster of that going on in Kern County.

Forest fires as a possible emergency exposure to be considering. As far as effectiveness of current regulations, this regulation that Asa -- Dr. Asa Bradman and I were testifying about last week, that might be a place as that regulation, if it goes forward, doing some monitoring to see what the impacts of that might be.

And then helping set priorities for reform is a -- you know, that might be a thing.

So my thought is look at your goals and see about how you might use those goals to guide the work going forward.

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DR. HERTZ-PICCIOTTO: Just a final word about the UC Davis Environmental Health Sciences Center. We are targeting the San Joaquin Valley for a variety of reasons on this slide.

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DR. HERTZ-PICCIOTTO: And this is -- we're bringing together scientists from the exposure sciences, disease mechanisms, communities and policy and epi, and we have a lot of different kinds of outcomes we're looking at. We have a lot of cores. And we actually spend a lot

of time with our community stakeholders. And in fact, Dr. Zeise has recently joined our stakeholder community. But with that, we've actually -- and we're doing a lot of development of new faculty and community-based participatory research.

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DR. HERTZ-PICCIOTTO: And at this point, you know, I think the idea of partnering with the Biomonitoring Program, because these community groups are coming to us for scientific consultations on their environmental health problems, and I think that maybe biomonitoring in some cases, other activities of CalEPA and OEHHA and DPR -- DPH are possible.

So I'm going to close with that.

(Applause.)

CHAIRPERSON BRADMAN: Thank you so much.

Now I want to introduce Dr. Tom Webster, who is a Professor of Environmental Health at the Boston University School of Public Health. His wide-ranging research interests include the study of exposure and health concerns associated with chemicals in consumer products, health effects of exposure to mixtures, spatial epidemiology, and the community context for environmental health. He was one of the first U.S. investigators to study flame retardants in the early 2000s, and has trained

a number of biomonitoring scientists, working in universities, and state programs across this country.

So welcome.

(Thereupon an overhead presentation was presented as follows.)

DR. WEBSTER: Including Nerissa, who was one of my students back in the day.

(Laughter.)

DR. WEBSTER: So thank you very much for asking me to be here. I actually grew up in San Diego. So I'm always happy to come to California, particularly in the winter.

So, you know, I just -- a few things. You all know this. I mean, I think that what you're doing here in California and what NHANES does is a fundamental public health practice of doing exposure surveillance, and there's lots of good reasons. One of the reasons for state efforts is the geography that we talked about that NHANES isn't really designed to do. And of course I'm very interested in time trends. You all know the story about PBDEs, that this came out of the Swedish surveillance system. And I think of it as the graph that launched a thousand ships and burnt the topless towers of Ilium.

(Laughter.)

DR. WEBSTER: So among the issues for biomonitoring are who to sample, which we heard about. And I'm going to talk more about what to look for. And my job as an academic is to try to peer five to ten years into the future.

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DR. WEBSTER: So I think of what we face as the Hydra problem; that we cut off one head and ten more grow back. And at least under the current regulatory regime, I don't see any end to that in the near future.

So in a rational world we would do things differently, but we don't.

So what do we do?

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DR. WEBSTER: Now the two groups of compounds I actually know something about are the flame retardants and the PFASs.

So flame retardants, you know, we started off really with PBDEs, although there were things before that. And there's been an explosion of brominated flame retardants. Basically these are variations on a theme. And one of the horrible things about this is now people are now finding photolytic breakdown products that they have dioxin-like properties. So would that scare the heck out of you?

And then there's the phosphorus-based flame retardants, which again these are sort of exploding and people kind of add more things on up -- a lot of them we don't even know what they are. Some of them don't even have CAS numbers. So...

--o0o--

DR. WEBSTER: Similarly on PFASs, there was a really lovely paper that just came out called "PFASs - a Never-Ending Story." And we're just really scratching the surface of those as well.

--o0o--

DR. WEBSTER: Now, one of the interesting things about those compounds is some of them are water soluble; they bind protein, which is odd; and there's the precursors. So a lot of things that we measure in people are breakdown products of a lot of other stuff.

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DR. WEBSTER: I like this paper that came out of this group. And I think that's a good idea.

(Laughter.)

--o0o--

DR. WEBSTER: Now I want to turn to really where I think our field is going at least from the academic point of view. I mean, I think non-targeted analysis is happening. And I really like the idea of screening for

stuff in things like dust. I think this is a great place to look.

The other things that we've been looking at are screening things in products such as foam. And we're now working on screening stuff in silicone wrist bands. And we found all kinds of interesting things.

There was a really interesting new paper that just came out on azo dyes, that if this is true that this is the major brominated compound found in house dust, that's going to be incredible. I don't know if it's true. But it's certainly worth thinking about.

And then a related really interesting idea is to look at total organic fluorine and total organic bromine. This won't work for phosphates, but for fluorine and bromine. And there's been some very nice work.

Leo Yeung, who's working with Scott Mabury now, did some great stuff on this. And he wrote this nice paper where you take the total amount of organic fluorine in blood and then see how much of it you can identify and do a mass balance. You get an idea of what else is out there. So I like that idea a lot.

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DR. WEBSTER: There's some really nice stuff going on using bioassays. We've been -- you may be familiar with the CALUX method for AhR agonists. We've

been looking a lot at PPAR-gamma agonists, and we've developed this assay both in rodents and we're using it to measure human serum now so you can get an idea of the total biological content of stuff.

And then the next step is to use something called effect-directed analysis, where you have a cycle of bioassays and fractionation. So you take the whole sample, you analyze it for the total activity, you chemically fractionate it, and then you reanalyze the fractions. And you keep doing this till you get to the point where you can do targeted and non-targeted analysis to try to figure out what's actually driving activity.

We've been doing this with dust and looking at PPAR-gamma agonists and found some really interesting stuff.

I'd like to be able to do this with blood. I don't think we're there yet, but we may be there at some point.

So, anyway, I think these kind of activities are going to be very helpful in the future and -- you know, I'm not saying California Biomonitoring should do any of this. I think this is the kind of stuff that us academics are going to have to work out. And then as the technology develops when we come up with new things that this chemical looks like it may be picking up in dust, that

then the biomonitoring people can start looking for it in blood. I think there's a good history of that. That's the way it has -- say it happened with the organophosphate flame retardants where we first found them in dust. Then people developed methods to look in urine. And now CDC I think is adding those into theirs. So there's a nice track record of that.

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DR. WEBSTER: In terms of mixtures, I think this is another really important thing. And I really like this paper from 2002 called "Something from 'Nothing.'" And what they did in this in vitro experiment was to show that compounds, each below their no-effect level for estrogenic activity, when you mix them together, you got a whopping big response.

And this is particularly important for endocrine disruptors involving homodimer receptors, things like estrogen and androgen and similar mechanisms. And I think there's lots of really interesting things that could come out of this as another way of thinking where we're going to go.

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DR. WEBSTER: Finally, as we start -- I think we're -- in five to ten years we're going to be drowning in data on exposure. I hope so anyway.

(Laughter.)

DR. WEBSTER: And one of the things we can think of is not just individual compounds but patterns of compounds and correlations between compounds. So we had a symposium on this at ISES last year. And what we're starting to see in comparing data from cohorts around the world are things that look like this. These are heat maps of correlation. The darker is stronger positive correlations. And they come in these kind of block diagonal patterns. That means you have groups of compounds that are very highly correlated with each other, and then they're not so correlated with other things. So there's lots to think about there about why that might be.

But I think this has real implications actually for biomonitoring as well. So, for example, in the PCB world people have long used sort of the marker PCB approach. You don't have to measure all the PCBs because they're all really correlated within groups. You can measure a couple of them so you get a lot bigger bang for the buck. And you don't have to, you know, go down to the decimal point on some with the minor ones.

So I'll stop there.

(Applause.)

CHAIRPERSON BRADMAN: Thank you, Tom.

Now I'd like to introduce Julia Brody. Dr. Brody

is the Executive Director and Senior Scientist at Silent Spring Institute and an expert in breast cancer and environmental exposures.

She recently led a collaborative project connecting breast cancer advocacy and environmental justice in a study of household exposures to endocrine disruptors and air pollutants. She's dedicated to finding accessible ways to report results of biomonitoring studies to participants, and the Program is hoping to collaborate with Dr. Brody in this area.

So thank you. We're very pleased to have you here.

(Thereupon an overhead presentation was presented as follows.)

DR. BRODY: I'm delighted to be here. And I know that -- this was mentioned early. I know that some of the individuals and organizations that created this program are in the room. And I want to just express my enormous gratitude and admiration for the work you did to create this program. It's -- it was wonderful to reflect on 10 years and think about how strong and important this program has been.

And in that -- in thinking about what's happened in this last 10 years, I think that the science has evolved in ways that tell us even more that exposure

biomonitoring is a crucial tool for public health. This -- and we know that from NHANES. But I think that the ways in which we've learned more about chronic disease, the multifactorial nature of disease, the interplay between exposures from all realms of life, and the effect of early exposures on later disease lead us to a new paradigm for public health in which exposure data becomes even more important as a guide for action.

There have been a couple of major statements on this, beginning with the President's Cancer Panel Report; the Institute of Medicine "Breast Cancer and Environment" report, which Irva led, also addresses this issue that epidemiology is always going to lag and be limited; and that when we have toxicologic information about chemicals and exposure information, we have a basis for action.

So that led me to think about, okay, what should you do to make your data most useful for -- as a public health resource?

And I have several ideas about that. But one of them starts with another piece of the law, which requires that results be made to individuals.

And this is a passion of my own, so you have to forgive me for talking about that. But I think that to make this data important for public health also means communicating about it with regular people, including your

study participants and also citizens statewide, so that people begin to understand that this is actionable information and what it means.

I got into the business of reporting results because participants in the Cape Cod Breast Cancer and Environment study, which is a deeply community-embedded study founded by activists who founded Silent Spring Institute, called us up and asked for their results. And so we got into reporting results really for ethical reasons, because it seemed like the right thing to do.

But as a result of that, I -- we were -- this was new territory for us, as for other health scientists. So we began studying it. We wanted to be sure we were doing this in a responsible way, that people did understand their results and were not overly alarmed or inappropriately alarmed about them.

Yeah, like I try to remember that the field of public health is all about generating worry, right? We -- that's -- so it's part of our job?

(Laughter.)

DR. BRODY: But only the right worry.

(Laughter.)

DR. BRODY: So we have now in collaboration with Rachel Morello-Frosch here in California and Phil Brown at Northeastern, we have interviewed over 200 people who got

their personal results in about 10 studies. And we found that people do want their results, they do understand them, they do understand uncertainty, they -- they go through really major conceptual shifts in thinking about pollution. So people often come into studies thinking pollution comes from industry or waste dumps, which is not untrue, but they get their own results. They start reflecting on other sources in consumer products. And for many people it's the first time that they became aware that we don't require safety testing for chemicals before they're put into products.

So I've come to think that this is not just the right thing to do, but it's also an important public health program. So that you should think about communications not as ancillary, but this should become a central part of the work.

I was excited to hear you're planning to move to digital methods. We just developed a digital exposure report back interface, DERBI, which you can read about in the Environmental Health Perspectives. And we've deployed it now in the Centers for Disease Control Green Housing Study and in the Child Health and Development Studies as part of the California Breast Cancer Research Program.

So we're excited to have other teams try to use these digital methods. They -- they're not just --

they're economically efficient for sure. But they also I believe can create better reports because they allow layering of information, that you can have many languages, you can have -- people can navigate to what they're interested in. So you can be responsive to the person who just wants their headlines and the person who wants to dig in.

We're developing a smartphone platform for the Superfund project PROTECT in Puerto Rico; and for the BCERP project in Santiago, Chile. So this will be -- this will provide digital access at all income levels. I just looked at the Pew Research Center, and the only people who are not -- who won't have access are people over -- very low income people over 65. So -- and not that we shouldn't -- not that we should ignore them, but we will be able to reach other demographics with this smartphone platform.

One of the things that people want to know is how to reduce their exposures. And I think this is a challenge for all of us. We do provide that information in people's reports and sometimes it's easy.

Like triclosan is not -- you can get rid of triclosan in your life pretty -- well, we think you can get rid of it pretty well. And with -- if we keep the triclosan rule, you'll really be able to get rid of it.

But that just shows you there are some exposures you can get rid of yourself and then there's some that you cannot control yourself. And I think we need to think about how to incorporate it into biomonitoring projects' approaches to help people engage in exposure reductions, if they want to, for these other chemicals that are harder to reduce.

There is actually a happy story in California that's in line with this about flame retardants. Ruthann Rudel was the first person to measure brominated flame retardants in the U.S. We found them at 10 times the level in Eur -- on Cape Cod we found them 10 times the level in dust as they had been in Europe. We wondered if that was unusual. We came to California, to Richmond and Bolinas, where we found even higher levels.

We went to NHANES. We got access to the biomonitoring data, and were able to compare California blood to the rest of the country and saw that blood levels were twice as high in Californians.

And some of you in the room also took that story from there to change the California flammability standard. Other researchers, including Tom and others, came in and confirmed our results, extended them into epidemiologic studies that showed effects -- neurological effects. But it was that NHANES biomonitoring data was a vital piece that made it possible to translate into a public health

change.

And I'm sorry I'm out of time. And I look forward to having further opportunities this afternoon to talk about your important next steps.

(Applause.)

CHAIRPERSON BRADMAN: Thank you so much.

All three of those presentations were really good and I hope will inflame some discussion right now.

And just a reminder that we'll also have time for more in-depth discussion this afternoon. So if we don't get into everything that you you'd like to, please hold your questions and thoughts for then.

But right now we have some time.

From the panel, any questions?

Dr. McKone.

PANEL MEMBER McKONE: Thank you.

All wonderful presentations. It was like -- it's nice to get outside views. So thank you all for coming here, some a great distance.

So one of the things I wanted to bring -- Dr. Webster brought up an interesting point that caught my attention about total bromine, total fluorine, and I just wanted to explore that a bit further. I have two questions.

One is, if you just looked at total bromine or

fluorine in blood, are there any sources other than endogenous chemicals? It's not in -- there's no really --

DR. WEBSTER: At least for fluorine and bromine there are naturally occurring compounds that contain them, but not very many.

PANEL MEMBER McKONE: So it's a pretty strong indicator?

DR. WEBSTER: Pretty strong indicator.

PANEL MEMBER McKONE: Right. And then my second question --

DR. WEBSTER: Not true of phosphorous obviously.

PANEL MEMBER McKONE: Right. No, that's a different story.

But the second question is, is this sort of an easy screen to do? In other words, like we really take an interest in specific compounds. But it might be, you know, cheaper and easier to do a lot of people and just do total fluorine, total bromine. It doesn't tell you a lot, but it lets you begin to bend people and look at trends. And I'm just wondering if that -- I don't know what the cost and --

DR. WEBSTER: Yeah. Well, I'm not an analytical chemist and I'm -- so I can't say. You can't do total fluorine and bromine. You have to do extractable organic, because you have the ions there, right? So you have to

set those aside, and then the chemists do their magic. So I -- you know. I mean, but there have been a handful of groups that have tried this. And I think it's actually a quite promising approach for those two groups of compounds.

PANEL MEMBER McKONE: And just to follow up. It reminds me of the method of -- I guess it was fluorescence, where you could take a couch and just do total bromine with a really quick fluorescence, right?

DR. WEBSTER: Right. That's right.

PANEL MEMBER McKONE: And I mean, if we could do something like that with blood - I don't know if it's possible - but, just again, it's the -- anything we could do that is a broad screen, not specific. But, again, you know, it's helpful because otherwise we can only do in-depth studies and very, very few people. So you kind of like to have -- I like this idea of having a broad screen. Doesn't give you a lot of information, but it gives you a -- it gives you an abundance of information. And then you can decide where to dig in anyway.

DR. WEBSTER: It is possible to do it in blood, individual blood samples.

CHAIRPERSON BRADMAN: Any other comments, questions from the Panel?

Dr. Schwarzman.

PANEL MEMBER SCHWARZMAN: Thanks so much. Such interesting presentations. I really appreciate it.

I had two thoughts. One question for Tom, if you don't mind, is, can you say anything else other than your -- your slides that showed the correlation among exposures to different compounds in like classes I think is very intriguing for this idea of identifying marker compounds and reducing our need to test for multiple congeners and all of that.

Aside from PCBs and PBDEs, could you identify for us other classes of compounds that you think might be good candidates for that kind of identifying a marker compound -- or marker congener?

DR. WEBSTER: So one of the exposure science issues about the graphs I showed you is why do they look like that? So, for example -- so just real quick, I mean it could be some of it is an artifact, right?

And so I think we would need to do those studies first in order to be sure that we're getting what we think we're getting. But I think with PCBs and PBDEs we're on pretty solid ground.

PANEL MEMBER SCHWARZMAN: But at this point you don't think we necessarily have those correlations established for other classes -- compounds.

DR. WEBSTER: You know, I guess I don't want to

go out on a limb about other ones because I just don't know as much about them. I mean, I think the PFASs is -- I don't think we're there yet on those. That's much more complicated business.

PANEL MEMBER SCHWARZMAN: Okay. Thank you. I'm just thinking of -- looking toward our afternoon conversation about being judicious with our resources, how we can apply that.

And the other thing I guess I just wanted to reflect on from Dr. Brody's presentation is this -- the sort of power of looking at outcomes from interventions, and whether they're policy interventions or changes in the marketplace, and think about what other compounds are shifting or what other policy changes are happening that we can look at trends, you know, taking Dr. Hertz-Picciotto's caution into mind about using data to evaluate -- to relate trends in exposures with trends in health outcomes, you know, if that is less our goal, which I think is quite wise. And if our goal is more looking -- comparing exposures to exposures rather than exposures to outcomes, that -- one of my thoughts for the afternoon discussion just to kind of put that forward is this notion of measuring the effect of interventions.

And I just wanted to kind of reflect back on that and see if Dr. Brody has anything else you want to add

about what other interventions, policy or otherwise, we might want to look at with respect to changes in exposure levels over time.

DR. BRODY: Oh, I think that's a great direction to go. And we have already seen changes in flame retardants in California. We went back to the homes where we originally found the very high levels, and we could see the effect of companies removing PBDEs, and we could see Fire Master 550 rising.

And we are now in Massachusetts testing. We eventually came around to revising our own Boston flammability standard to match the new California one. And that affects all the college dorms.

And so we are now going to look before and after the revision to the new standard. So I think -- but those are environmental samples. And I mean, you do see -- in the CDC data you see the big trends after the ban of smoking in public places. And I think that kind of data is just so valuable from the point of view of sustaining those interventions. So I think that's a great direction to go.

And -- but I also think the much high -- if you're using biomonitoring, going back to the same person multiple times gives you so much better statistical power. That's something to think about.

CHAIRPERSON BRADMAN: Dr. Cranor.

PANEL MEMBER CRANOR: This is a question about, in a sense, the conservative nature of science. My friend Philippe Grandjean often lists the number of papers that have been published in the last X years -- 10 years, and they're clustered around a very small number of substances that people are worried about. There might be a ton of papers on lead still. We know a lot about lead. For biomonitoring, I think it's perforce conservative because you're looking at exposures you think are there and things you're worried about.

Is there a way -- and then -- so I'm putting you as a panel on the -- to help us think about this - and to some extent California does it - but to think about the ways in which biomonitoring can anticipate shifts -- and that's been some of the discussion here already today -- but shifts and new things that we should be thinking about, are there ways that that can be done with biomonitoring to pick them up before they become adverse health effects?

DR. BRODY: That's a great goal. And I think some of the non-targeted analysis is a strategy for doing that, because you have the potential to find something that you weren't looking for.

I was thinking further about this, how to make

the biggest public health impact from biomonitoring. And I do think that taking on non-targeted analysis and mixtures and the early biological effects are an important part of that. And that is all new.

DR. HERTZ-PICCIOTTO: So I noticed in looking through some of the, you know, last 10 years that there's been a lot of sort of piggybacking onto existing studies where individual level data was really important for the researchers and such. But from the perspective of -- you know, what Julia just mentioned -- in terms of public health and understanding trends over time and picking things up, there's -- for a lot of compounds it might be -- and using a non-targeted screen where you really are giving 10 -- a thousand, 10 thousand analytes, and the possibility of using pooled samples as a way to really capture a broader swath of population, because you save money by, you know, pooling the samples. You lose information. You're not going to have the individual-level data to give back. And where there's huge, huge variability, you know, it's going to wash out.

But some sort of -- you can come up with a sampling scheme that's going to involve, you know, some individual and some pooled samples or pools of different sizes and get a sense of what that kind of variability would be.

And maybe, you know, increase the power of the program for surveillance purposes, you know. And it's one thought that I have about that.

DR. BRODY: I think that idea of combining both pooled and individual is interesting. I would be very sad to see the individual samples go because of the variability issue that you mentioned. I was interested that it came up, the possibility of following up on high exposures. And I think that's a very good strategy for finding important sources of health, important exposures. And I actually had there been more time would have asked if NHANES might consider doing that. I know NHANES now reports back on lead and mercury, but I wondered about reporting back on some of the very high exposures that get detected so that you would have the opportunity to interact with those people and find out what's different about them.

DR. WEBSTER: I'll just add on that. I think the answer on the pooling is it depends what the question is. But Enrique Schisterman, who's a statistician, sent some really nice stuff on sort of optimal mixtures of pooled and individual to try to answer certain questions. So I think that there's something there.

Back to your question. I mean, that was really part of what I was trying to address in the second part of

my talk, is trying to think where are we going. And given the resources you have, I'm not saying you should do any -- necessarily do any of those, but be nimble enough that when us in the academic community find things or develop new methods, that you might be able to add something in. The way we did with the fluorine -- the phosphorus-based flame retardants that now once academics sort of established those methods' importance, then they can become routinized within the surveillance program.

MS. HOOVER: This is really a great spot to break for lunch.

So --

(Laughter.)

MS. HOOVER: -- I want to remind people that this was the clarifying question piece. And all of our guest discussants and Dr. Breysse will be back for the afternoon.

So, Asa, close up.

CHAIRPERSON BRADMAN: Thank you.

(Laughter.)

CHAIRPERSON BRADMAN: I was going to give one more question.

(Laughter.)

CHAIRPERSON BRADMAN: But we're exactly on time right now. We have another minute. So I just want to

remind everyone we have an hour and 10 minutes for lunch. So we want everyone back by 1:25. If you want to set your phones right now so it will ring at 1:23 so you'll walk over - even 1:20. That would be good.

There's a cafeteria on the first floor, which will be a quick dining option. And there's a couple things out in the park. But again, we want to make sure we reconvene on time.

Normally I think we have a Bagley-Keene statement. But we're not making any decisions today, so there's nothing formal like that. So I think this is an opportunity actually, during lunch, we can talk about the key question we're addressing today, and would encourage that.

(Laughter.)

MS. HOOVER: Not the opposite.

CHAIRPERSON BRADMAN: What?

So anyway, I look forward to the discussion we have this afternoon.

Thank you.

(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: 1:25 p.m.)

MS. HOOVER: Okay. We're going to get started. If everybody could take your seats so we can kick things off for the afternoon.

CHAIRPERSON BRADMAN: We're going to get started. So I think we have a couple people straggling in.

MS. HOOVER: We're going to just go for it.

CHAIRPERSON BRADMAN: Well, it's -- I'll use this time right now to introduce Dr. Solomon. And hopefully, they will arrive shortly.

But, anyway, I'm pleased to introduce Dr. Gina Solomon. She's the California EPA Deputy Secretary for Science and Health. And Dr. Solomon will be facilitating the afternoon discussion on our question of the day:

"Given Limited Resources, What Should be the Main Priorities for Biomonitoring California Going Forward?"

So...

(Thereupon an overhead presentation was presented as follows.)

CAL/EPA DEPUTY DIRECTOR SOLOMON: Thanks.

CHAIRPERSON BRADMAN: I think we have some opening remarks. And I look forward to this afternoon. I think this is going to be real crucial for our meeting today.

CAL/EPA DEPUTY DIRECTOR SOLOMON: I'm on?
MS. HOOVER: We can give them two more minutes.
CAL/EPA DEPUTY DIRECTOR SOLOMON: Should I dance?
(Laughter.)
CHAIRPERSON BRADMAN: Do a song.
MS. HOOVER: Why don't I just give an outline.
While we're waiting for our stragglers - and we have about one minute to go before we officially start - the way this is going to work is Gina's going to facilitate. She's going to be calling on Panel, guest discussants, audience, as she sees fit, after giving her opening remarks.
And then at about 2 o'clock, we're going to call for formal public comment. So if you haven't been able to get your comment in, make sure you've -- you turned in a comment card, and we'll be sure to call on you.
And then we'll go back to some discussion. And right around -- what time are we right now -- right around 2:20 Gina will start to wrap up. And then at 2:30 we're going to officially adjourn the SGP meeting and kick off our celebration. At that time the webcasts will end, recording will continue. That will be only for our private use. But I just want everyone to be aware of that.
So if you have any concerns about being recorded,

you can let us know. That will continue at 2:30, but the webcasts will stop.

Okay. Gina.

CAL/EPA DEPUTY DIRECTOR SOLOMON: Great. Thanks, Sara.

So the -- this is actually an exciting opportunity, because it's not that often that we get to stop for a few minutes and step back and look at the big picture and do some real strategic longer-term thinking. And it's been quite a while actually I think for this panel.

I remember early on in the program when -- I was actually on the Panel, and there was a lot of strategic thinking about how to shape the program. And I think that actually has served us well over many years and really helped guide the program. But now, as, you know, everyone heard, there are, you know, ongoing funding challenges, and so we're struggling with how to make the most of our limited resources.

And over lunch, I shoveled food in my mouth as quickly as I could while also juggling PowerPoint; and I put together this presentation based on the discussion that I heard this morning, because what I was hearing were all these great suggestions and then some tension about, well, how do we do all of these things?

And so I put a four-way tug-of-war. I would have done a five-way tug-of-war if I could have in the middle.

But, you know, it isn't really necessarily a tug-of-war. What we're looking for out of these tensions is some synergy. And so I put this up here to show what just sort of popped into my head. Others may think of things that I missed. And I think that maybe it would be helpful to sort of start by articulating what we see as some of these, you know, tensions for resources, and then move from there into thinking about where we see synergies and ways to kind of, you know, escape that zero sum game of, well, we have to do this or that. You know, how -- is there a way that we can do both and that we can accomplish multiple goals at once.

And then just to run through this very briefly. You know, we've done a lot over the years of looking at various communities and really trying to focus on disproportionately exposed communities: Occupational -- and that certainly was the case with the FOX study and working with the Asian-Pacific Islander Study -- racial and ethnic groups. It is, you know, an issue -- you know, definitely something that's been a focus of this work.

Socioeconomic considerations, environmental justice.

And then we talked just this morning about the

geographic zones that we're going to be trying to cover, which are vast in this State.

And then, Julia, you did I thought a really great job of emphasizing the importance of really putting resources into the communication piece and how important that really is. And it is something also that has been a priority, and we should think more about how to leverage that and make it even more effective.

I think a lot of energy has gone into communicating with participants, maybe a little less with policy makers and the public. So I'd like to sort of shine a little bit of attention on that and think about how to move that forward.

And then obviously there are the lab issues: How do we test for more chemicals? And there are a lot of things that the labs have done to move that hugely forward, including the ability to do semi-targeted and non-targeted testing; and to test for these entire classes of chemicals at once. So that is huge but also very resource intensive. I think it's been one of our strengths though as a -- at Biomonitoring California.

And then how do we make this health relevant? I mean, I just love the FREES Study of doing testing pre and post couch, you know, foam swap, because that really is super health and policy relevant. And a lot of the time

trend data.

And so those kinds of things.

And the testing for unknowns I put it between because really when you pick up something new, that's immediately policy relevant.

And then obviously we want to test as many people as we can. And there are different approaches for doing that, one of which came up this morning; and there was some discussion about, well, do we want to pool or not want to pool?

So let's -- so I'd like to turn it over -- and actually since the discussion with our panelists this morning was sort of shortened, I would love to go back to you guys, maybe just for some reactions to whether I captured everything that you were saying and that came up, whether I missed anything, and whether, you know, you see any additional areas of -- that we should be thinking about as we try to figure out how to move forward.

So, Irva, you're closest. May I start with you.

DR. HERTZ-PICCIOTTO: Well, I think one of the points that I was trying to kind of put front and center to this discussion is looking at, you know, those goals, those original goals, and thinking about really what are the priorities and -- you know, I think this captures kind of all of the issues of the program in its -- in its, you

know, what's happened over the last 10 years and sort of the kind of less -- I mean, some -- there is strategic issues -- there are strategic issues on here, but from the perspective of, you know, those original, I don't know, eight goals that had to do with, you know, validating, modeling, and survey methods. I'm not quite sure if that, you know, fits in here.

Definitely the identifying -- identifying highly exposed communities, which isn't quite the same as having identified them, you know -- you know, measuring to find out how high are they or that sort of thing.

You know, addressing gaps between chemical exposures and specific health outcomes, I think that's the kind of outcome focus that -- you know, there's some question how big of an emphasis do you want to put on that.

And then the setting priorities in terms of -- and assessing the effectiveness of regulations. So how -- how critical is that to the -- you know, what the program wants to achieve over the next 10 years. So that's all I would add here.

CAL/EPA DEPUTY DIRECTOR SOLOMON: Thanks.

And, Julia, do you have thoughts as -- especially on the communications piece but actually on all of them?

DR. BRODY: Well, I think you did an amazing job

of capturing -- capturing comments and putting them into bigger buckets. That's quite helpful.

And just to reflect on a couple of these -- a couple of them, the exposures sources. And that is clearly policy relevant. If you want to have the public health intervention, knowing the exposure sources is really key.

And there were some things mentioned this morning that were going in that direction, aside from the swap -- like an intervention is a really good clean way to do that. But the questionnaire is I imagine also intended to do that. And the point raised by Dr. Schwarzman about location can also do that.

The questionnaire, I thought the comment about convening some experts, I -- this is something I've been working on that I think is very tricky and perhaps not going to be super successful for some of these chemicals.

You may have seen, we just published results about fast food packaging. And it's really -- you can ask people if they ate pizza or had bakery stuff in a wrapper. But it's hard to really know what those questions should be and how to calibrate them or -- and it's like a fraction of the pizza boxes have this compound.

So I think maybe thinking about the exposure sources in connection to action is something that would be

a good place to focus some energy.

And I was also thinking about the strength of this program in trying to represent diversity in various ways and the opportunity because of the population in California, to think about diversity and try to engage with the issue of vulnerability and protective resilience. And that's like another way that this connects to broader issues in public health.

CAL/EPA DEPUTY DIRECTOR SOLOMON: Thanks.

And, Dr. Breysse, I'd love your thoughts in general as well, and also your thoughts about the chemicals that we're testing for in particular and whether there are others that you see from where you sit as being sort of emerging areas or already emerged chemicals that we should maybe be prioritizing to add to our list.

DR. BREYSSE: I'd like to begin by reminding people that on my slides you may have saw there was a disclaimer that says, you know, I'm not here to set policy on behalf of CDC. And if I accidentally say something that sounds like that, it's not the case.

(Laughter.)

DR. BREYSSE: So, you know, I'm here, I'm giving my thoughts as an individual rather than trying to set some sort of national policy. So I give that disclaimer to my comments as well as the disclaimer that was on my

slides.

So I want to just follow up on what was just said about the importance of sources and pathways. You have to remember that biomonitoring is one piece of a broader understanding that we need to have. And it tells us how much is in our body. And if we know something about the characteristics of chemicals and the half-life of the chemical and with questionnaire data, we can infer something about where it comes from. But without environmental sampling data, we don't really know what the complete picture is.

So while we -- it's important to know what we're accumulating and what's in our bodies. It's also important to know where it comes from. And that where it comes from is key to designing interventions and stopping exposure if we decide it indeed is too high.

And of course biomonitoring that way could play, as we just heard, a crucial role in evaluating the effectiveness of that intervention. If we think drinking water is a significant source of chemical X, we eliminate that from the drinking water, we can see a significant reduction in our body that will show us we're on track. But if we don't get significant reduction, what that suggests is maybe drinking water is not the predominant source of exposure. So I think we have to keep track of

that broader picture as well.

Now, in terms of chemicals for testing, you know, that's a huge challenge to answer that question. I think we have to all be surveilling the literature to see what chemical toxicity data are emerging, what chemicals are appearing on EPA databases, the kind of chemicals that are being nominated for testing through the National Toxicology Program. There's a number of sources for information like this where we can identify chemicals that we have to look at as potential for future concern.

I don't want to list a bunch of them right now. I didn't quite come prepared with that. But I think those are the kind of things we can look at for information on the types of chemicals. And, you know, in particular, seeing what people are nominating for the National Toxicology Program testing and the chemicals that are in the emerging contaminant database from EPA would be two important places to start in terms of things.

But obviously we can't measure everything. And we have to focus on things we think there is significant exposure, things we think there's at least enough information to worry about potential health effects. And so all that has to be integrated in decisions about how to add things.

And so as -- we talked a little bit about NHANES

and the work that we do and how -- what a challenge it is to add new chemicals to that - and I'm sure you guys have the same limitations that we do - so recognizing that it's a challenge.

And I just want to add one answer to a question if I can step back for a minute. Asa asked me about children. And so since 2015, NHANES has started sampling children down to age of 3. We haven't released any data yet, but that'll be coming out in the future. So we have lowered it below 6 down to 3. We'd still like to have data for kids less than 3, but obviously there's challenges -- real challenges with collecting blood and urine from children less than 3. But I think we are looking at children at younger ages, so I just wanted to give you that piece of information.

So thank you.

CAL/EPA DEPUTY DIRECTOR SOLOMON: And one -- just before you stop, one follow-up question about, you mentioned that CDC gets a lot of nominations for chemicals to add to the NHANES study. Where do those come from and is there like a way for us to find out what's being nominated to you?

DR. BREYSSE: No, I don't think there's a formal nomination process. But I know the lab director will get requests. I know I get requests. So I have over the last

six months probably requests from scientific activist groups, probably five or six requests for asking how do we get new chemicals added or saying we really got to start adding new chemicals.

So there's a lot of concern about pesticides now, in particular; in herbicides, so glyphosate is one that people have asked us on a number of occasions to add. The nicotinoids are also chemicals that we're being asked to include.

But, again, we have to figure out mechanistically if we can add something with the volume of blood we already have. And that makes it easier than if we have to ask for additional blood to run the samples.

So it comes from a variety of places.

CAL/EPA DEPUTY DIRECTOR SOLOMON: Sounds good. Thank you. That's very helpful.

So, you'll probably -- Dr. Webster, you'll probably see quite a number of the issues that you mentioned sort of sprinkled up there. And I was really interested in some of your thoughts about how to sort of -- you know, again on this testing for more chemicals area, you particularly had some suggestions in your remarks. And so I just wanted to give you an opportunity to take that a little step farther about how we could do some more of that.

DR. WEBSTER: Yeah. So let me say a little bit about the PFASs. So we have an interesting situation of trying to deal with a legacy problem and emerging contaminants at the same time.

Once these things get in an environment and get into the water, then, you know, we're going to be exposed for a long time, and we need to deal with that.

On the other hand, I actually think a lot of it is -- for most people is probably coming either from diet -- or from the indoor environment. And it's very complicated because then we have the precursor problem. And now what's happening is they're building shorter chain molecules with like ether bonds, and then those get broken down. So I think we need to start looking for some of those.

And, again, I'm not an analytical chemist, so it's easy for me to say. But I think that from my perspective as an exposure scientist and epidemiologist, I think we really need to start looking for those.

The other thing is I want to tell you why I am doing a study of nail salons. So I'm now doing a biomonitoring study of nail salons and workers in nail salons. And the reason why is I was interested in flame retardants and we found that the metabolites of diphenyl phosphate are higher in women than men.

And this has reminded me of a story that came out of CDC where one of the phthalates was higher in women compared to men, and it turned out had to do with personal care products. So I used the modern research tool called Google and started Googling what the hell do they use triphenyl phosphate for? And, sure enough, it's being used apparently as a replacement for some of the phthalates in nail polish as a plasticizer.

And so then, you know, one thing leads to another and now I'm working on nail salons. So -- which is sort of a horrible story. But I think that particularly what that teaches us is that we -- as we have the sort of regrettable substitution problem where we figure out one thing and we work really hard and spend 10 years and, okay, we get rid of that one, and then there's something else that pops up; that we need to start paying attention to that when that happens.

So I don't really have any more particular advice than that, other than I think that's a real phenomena, and unfortunately it's very hard to get the information from manufacturers. Right? So we have that issue.

But, you know, one way we can do it is by again testing things like dust; because if it's in personal care products, it's going to end up in dust. And actually testing products as well.

CAL/EPA DEPUTY DIRECTOR SOLOMON: Good. Thanks.

Let's shift a little bit to talking about who to test instead of what to test for. Because some questions came up this morning about where to go next, you know, in the multi-regional study, and what sensitive populations we should be focusing on in the next -- you know, coming up next phases. And I'd love actually to turn to the Panel here, because we've got more Californians on the Panel -- on that panel than on this panel.

And so actually I was hoping, Jenny, that you might start us off a little bit with some of your thoughts about the communities to focus on, both geographically and also from a vulnerability perspective.

PANEL MEMBER QUINTANA: Sure. Thank you.

This morning I was trying to think about what makes California special or different and what could California Biomonitoring do to address that.

And I thank Dr. Breysse for reiterating very nicely the importance of population-based samples as a reference to interpret findings. And so I just want to -- it reinforced my belief in that, as such an important part of California Biomonitoring.

But having given that, special populations I think, our refugees, immigrants, and foreign born, is very much, especially in San Diego, very much part of our

population and it's something that could have very different body burdens to certain chemicals.

I think that disparities are a big part of what is a focus in California, environmental justice disparities, EJ communities. And I do think the state has a big focus on pregnant women and children, so as a special population I guess. So that's some of the thoughts I had written down.

The other thing that sounds a little off topic but something else that makes California special is our biotech. So in San Diego we have J. Craig Venter Institute. And they are going great guns recruiting all these people and sampling their DNA and getting all their health information. But I realized -- I don't know if you've talked to them about biomonitoring or augmenting some of those other efforts that biotech is doing. And so that was just another unique California piece.

But again I'd like to bring it back to what you were talking about, and something else that's unique, is this CalEnviroScreen, the detail that we have, and really trying to build upon those disparities.

CAL/EPA DEPUTY DIRECTOR SOLOMON: Okay. Great Thanks.

Dr. Fiehn, I was hoping you might talk about some of these things. You were quiet this morning. And I --

PANEL MEMBER FIEHN: Yes, I was.

CAL/EPA DEPUTY DIRECTOR SOLOMON: -- you have a lot to contribute from your perspective.

PANEL MEMBER FIEHN: Sure. I'm an elemental chemist by training. I'm toxicologist by Ph.D. I guess.

So we -- I have been very interested in all these discussion points, and obviously we all agree that, you know -- the hydra -- I liked really the hydra approach there, which is something we are all concerned about, by chasing ghosts of the past and being very proud of achieving a reduction in levels, just to see the compounds, maybe even more potent compounds or at least of unknown toxicity compounds, popping up.

At the same time non-targeted approaches are not in the sense validated as targeted approaches are. So at least with targeted approaches that are absolute qualifications we know what we get, we can have very clear qualification criteria. And with non-targeted approaches it's much harder.

I would like to see a much broader use of databases, an upload of databases of spectra, making things publicly available, including spectra -- mass spectra, of pollutants of anything that the state labs do or have, or any other lab, should be uploaded to publicly available databases. So that other people can actually

find and validate if they find these same compounds to say, yes it is this compound and not something else.

That is an important part, these non-targeted screening approaches, to be sure that what you claim you found you actually found.

The second thing is, of course, we can also ask -- or as the CalEPA, use our influence on NIEHS and NIGMS and say, "You guys need to fund more method developmental and validation, including round-robin tests." So that different laboratories, not only the state laboratories but also other, let's say, university academia laboratories would have the ability to show their proficiency in getting high-quality data. So that is an important part, you know, in terms of reaching out to the .....community. But the NIEHS and NIGMS, they have to understand that they also have to fund these types of quality criteria assessments.

Eventually, I can see the -- I don't know when, but the CalEPA being an agency that gives us contracts to any lab. Because at the end of the day with too little resources, we have to be able to say how can we make the biggest bang out of the buck. And giving out contracts for quality control laboratories, that include state labs but it might be also including other labs.

What I was missing this morning when we talked

about budgets is a little bit like an idea where most of the funding actually goes - is it like 80 percent - for enrollments and, you know, phlebotomists and so on. Or is it 80 percent for getting data? Or is it so mixed that you can't just say, including, you know, because we have all these -- we just had a minute ago, these big balloons. And, you know, if we can put dollar signs to these big balloons, it's also one way to think about how to go further with less money.

What else? Then the idea of reaching out. It was several times mentioned that we would love to get our hands on more NHANES samples. You just mentioned the -- over there, the Kaiser samples were mentioned at some point. The one million people, you know, presidential campaign on genomics. You know, they actually try to get a lot of people in there. And if we can get a hold of them or get cooperative agreements so that we know who these people are or -- so, then of course, you know, that would be a huge resource that can also be leveraged in California.

So I think all these creative ideas need to be explored in -- and they have been explored before. I mean, that all this piggybacking was always an idea that -- you know, with the firefighters and so on, that was always part of the bag.

But I really think that we have to be vocal. And one thing we discussed at lunch is also to say, well, we are the CalEPA -- well, you are the CalEPA.

(Laughter.)

PANEL MEMBER FIEHN: And when the -- when maybe -- hopefully not, but maybe on the national level things might change. Then maybe CalEPA should step up.

And we have to be also vocal in terms of our own Governor and our own legislature to say we have to step up here in California to, you know, make sure that the resources are built and maintained, when resources at the national levels may be decreasing.

So these are my 15 cents.

(Laughter.)

CAL/EPA DEPUTY DIRECTOR SOLOMON: Thank you. Yeah, we may be spending the money to launch our own satellite for our Governor.

(Laughter.)

CAL/EPA DEPUTY DIRECTOR SOLOMON: Yes, go ahead, Dr. Breysse.

DR. BREYSSE: Can I just follow up in terms of non-targeted analysis.

So I think, you know, a good chemist will look for things that are appearing on a chromatogram that are not expected. And I know in our case there's been a

couple of times where we've identified new phthalates that are appearing just based on this non-targeted noticing that there's a consistent peak in an analysis that they don't know what it is; then they look at it and they find indeed it's a new phthalate that's creeping into the -- in the plasticizer business.

So I expect most chemists would see -- or be curious about seeing something that they hadn't quantified or that they weren't looking for in terms of a chromatogram.

So I think informally a lot of that non-targeted analysis goes on.

CAL/EPA DEPUTY DIRECTOR SOLOMON: Okay. Yeah.

Irva -- or -- okay. Let's go with Megan then.

Irva.

PANEL MEMBER SCHWARZMAN: Thanks. I just wanted to, sort of continuing this thread, return to a point that Dr. Webster raised in his presentation this morning that really stuck in my mind and I've been kind of mulling over, which is -- you know, you gave the example of the "Something from 'Nothing'" study that tested estrogenic mixtures. And, you know, while I recognize that we don't yet have established ways of testing serum or blood against these biological assays per se in an established systematic way, I think it's a very interesting avenue

that we might explore as a panel or as a program over the next -- in the future. And it's -- it's so intriguing to me because it's a move away from simply measuring presence of chemicals to measuring biological activity. And that's more direct than trying to make the leap from presence of chemicals to disease outcome over a physiologic response, but to look collectively, you know. And it helps address this issue of serial substitution and of, you know, the constant moving target of what chemicals we're testing for because we go beyond looking for individual chemicals that we've identified and made the case for and start looking for biological activity that may be the result of multiple different exposures. And estrogenicity is one example; androgenicity is another example; you know, thyroid active hormones; et cetera, et cetera, we could go on.

I don't mean to suggest -- it doesn't replace looking for specific chemical presence. But I would be really interested in it being a topic that we explore in the future on a Panel or just as the program about thinking about adding an element of looking for biological activity and whether that could be something that gets prioritized in method development that's something that California could add to what's being done nationally.

Anyway, I'm very intrigued by that idea and exploring it further in the future.

CHAIRPERSON BRADMAN: I just want to interrupt. And maybe after Irva, we budgeted some time for public comment too. So --

MS. HOOVER: Actually let's just go for it now, if you don't mind, Irva. I'm sorry. It's 2 o-clock. I just want to make sure we get our public comment in.

DR. HERTZ-PICCIOTTO: Well, I can make a real quick one.

MS. HOOVER: Okay. Go ahead.

DR. HERTZ-PICCIOTTO: I just want to -- connecting a couple of dots here.

Dr. FIEHN mentioned epigenetics. And you were talking about, you know, activity. And I -- I think the world of epigenetics has sort of changed the way we think about environment now, from the point of view that epigenetics has passed from generation to generation. So I think taking into account some of the possibilities for intergenerational kinds of things in some of the earlier mentioned family members when you're going in. And of course it would be great to get the grandparents and so forth.

But the other part of this is I think that less focus on trying to link exposures to outcomes, which I think is really not what this program can do best, but the epigenetic signatures related to environmental chemicals,

there's some work suggesting that those are completely conserved across species and so forth, and that those as outcomes using some of the kinds of databases that Oliver mentioned and that are in existence could be a very powerful and impactful way to link with partnerships. I mean, I don't think your funding is going to cover the epigenetic components, but getting, you know, DNA methylation signatures, histone modifications and so forth on some of these same people in partnerships with, you know, other organizations could be really paradigm changing.

CHAIRPERSON BRADMAN: Okay. Thank you.

And like Sara said, we want to budget some time now for public comment.

And, Amy, after we're through I want to make sure if anyone has submitted any comments by email that we should acknowledge.

MS. DUNN: No email comments.

CHAIRPERSON BRADMAN: Okay.

MS. HOOVER: Well, let me -- Asa, just one second.

So it turns out that our comment cards did not get unloaded onto the back table. So if anybody else wants to formally submit their name, you can use the yellow stickies back there. We have two people who've

requested to comment. So we'll start with Meredith Williams and followed by Davis Baltz.

DR. WILLIAMS: Thank you. I'm Meredith Williams, Department of Toxic Substances Control. And one of the responsibilities I have is for the Safer Consumer Products program. And I've had the chance to talk to you before about how relevant the work is of the Biomonitoring program.

And I do -- I'm very glad to see that we took the time today to take this step back, appreciate what was done to establish the program, build the program, and really get it up and running, because it's really doing some great work.

And I guess that sounds immodest since it's our department, but I'm still --

(Laughter.)

DR. WILLIAMS: -- I'm one step removed, so I'm going to be thankful.

I could echo so many of the comments today. I don't want to take time to really be redundant, but this theme of regrettable substitutes is worth some mention.

First of all, one of the primary reasons the Safer Consumer Products program was established was to try to break the cycle of regrettable substitutes, and so there are a couple things that biomonitoring has done that

are very helpful to us. The very fact that you have prioritized chemicals in groupings and classes gives us the ability to then turn around and look at these chemicals in groups and anticipate what kind of -- what kind of chemicals might be used. And so continuing to focus on opportunities to group chemicals by function or structure or other means I think is quite valuable.

For instance, right now we are looking at perfluorinated -- the PFASs in carpets, rugs, and indoor furniture, carpet-care cleaning products, things like that. And I think our ability to take that on was really enhanced by the fact that that whole class had been prioritized through Biomonitoring California.

And then that then does take me to non-targeted analysis. Again, I don't know what the answer is in terms of trying to integrate that into the program. But I do know it has an integral role to play in terms of how we think about the regrettable substitutes.

So Dr. Webster suggested partnering with academic institutions around the non-targeted analysis, and I think that's an idea worth exploring.

Switching gears a little bit. I do want to talk a little bit about environmental justice.

As we make decisions in our program, we would love to have great tools to be able to differentiate the

burdens that certain populations bear based on the consumer products they're exposed to. The nail salons areas is an area that we're looking at, and that's a -- you know, that's a typically immigrant population. So again the collect -- continuing to prioritize that area of the program to try to find these differential burdens for different parts of our communities I think is of very good value to us.

So I'll stop there.

MR. BALTZ: Good afternoon. I'm Davis Baltz. Some of you may remember me from years past, as I've tracked this program since the beginning.

I'd like to start and just express my appreciation, as others have, of the work of the program over the last 10 years. The staff have been innovative and entrepreneurial and really gone above and beyond to make this program a success. Nerissa Wu is the current leader, preceded by Michael DiBartolomeis, Rupali Das, Michael Lipsett. So thanks to all of you.

And also acknowledge the Scientific Guidance Panel, who throughout this last 10 years have provided thoughtful guidance and advice to the program.

And for the charter members - Dr. Luderer, Dr. McKone, Dr. Kavanaugh-Lynch, and Dr. Bradman - you are now fully vested.

(Laughter.)

MR. BALTZ: So when this program came into being 10 years ago, SB 1379, I was then with Commonweal, which was one of the two co-sponsors of the bill for the four years that it took to get through the legislature before Governor Schwarzenegger signed it, along with our co-sponsor, the Breast Cancer Prevention Partners, the rock band formerly known as Breast Cancer Fund.

(Laughter.)

MR. BALTZ: And the promise at that time was to be -- have a program that every two years would generate a statistically significant statewide survey of California's exposures to environmental chemicals. And in the alternate years have targeted community-based studies based on the needs of the State and exposures of concern. Well, as we all know, there was never enough money in the program to do these every-two-year studies, which was unfortunate; because if we had had that information, we would have been able to achieve some of the goals that were put up on an earlier slide to establish exposure trends over time, and then importantly to devise strategies to reduce exposure and see if they're working or not.

One of the key aspects of the program was also the results communication. And I know that's been

important for many people. Certainly it was for the co-sponsors. We felt it was probably a violation of medical practice to stick someone with a needle and take their tissues and analyze them and not tell them what happened in the aftermath of that.

And it's not something that's commonly done. And I think the program has learned a lot that is of value probably throughout the country on how to effectively convey results in a study like this. And as many of us commented publicly throughout the program's history, people can handle this information. They're grown-ups and they want to know. So to shield it from them is not really an option; and to convey it in a most effective way is certainly something that's important for the program to do.

So the challenge now, from the slide -- first slide that in the morning was the budget. And, you know, it's not a very positive outlook. At its inception, I think the estimate was $10,000,000 a year would be what was needed to fully fund the mandates of the program. We never come close to that. But $10,000,000 is a significant piece of money, but in the wider scheme of things, you know, some people might consider it as budget dust. And I'm not saying that this program should receive priority over other very important statewide programs, but

it's something that really needs to survive and hopefully strengthen and grow.

So speaking as someone from the public interest community, we need to roll up our sleeves now and figure out innovative ways to help fund this program. And certainly one thing is to go to the legislature and help them understand more fully why this program is important. It advances public health, it advances environmental issues, it advances occupational health and, frankly, human rights.

You will almost certainly save time over the long term with saved environmental remediation costs and reduced medical costs, as people reduce their exposures and don't need to seek medical care.

So I think given what we are seeing in Washington D.C. now with the attack on science, this is a good frame for us in the public interest community to go to decision makers with. The Biomonitoring Program is a scientific program and we need to preserve and strengthen science. Biomonitoring results are not alternate facts. They are proof that we're exposed. And we need to continue to make this information available and expand it so that all of the goals I just mentioned can be achieved.

So thanks so much.

MS. HOOVER: Before I turn it back to Gina, I

just want to point out, I put up our main discussion question, which was posted and circulated. And I know we're not going to actually have time to hear from everyone or even cover all of this, but I just wanted to remind people about some of the things we're interested in.

For example, something as simple as which metals to measure in the multi-regional study. We're measuring the usual suspects like arsenic, cadmium, lead, mercury. We have capacity for more, and that was in your packet.

Anybody listening to this in the audience, by webcast, any time you can email the program, and that email is available on the website, biomonitoring@oehha.ca.gov.

So I really encourage people to think about it and email us other metals you might be interested in like cobalt and manganese, other -- the geographical regions that we're looking at. We're starting in L.A. County. There was discussion about, wouldn't it be great to do two? Probably not. But what would be your next one in line, you know. So where -- where would you suggest we go after L.A. County? That's important to provide input on.

And then we have lots and lots of ideas about particularly sensitive populations or impacted communities, but it -- and there were some comments about

that, but additional comments.

Just wanted to flag that because we won't have time to hear from everyone. But I'm going to pass it back to Gina now for the last bit.

CAL/EPA DEPUTY DIRECTOR SOLOMON: Thanks, Sara.

Though I'm happy to take -- you know, if anybody in the audience has a comment on these issues, just pop your hand up and we can just make this a broader discussion for the next few minutes.

But I just wanted to turn back to the Panel one more time. And actually, I was hoping to hear from Dr. Kavanaugh-Lynch. You haven't spoken yet at this meeting. And I thought you might have some thoughts on the priority/sensitive populations in impacted communities that should be areas of focus in the next phases.

PANEL MEMBER KAVANAUGH-LYNCH: Thanks, Gina. I do have some thoughts.

I want to think about a little bit of reframing. From some of the comments that, well, everyone's made, but particularly Dr. Brody, in thinking about report-back not as a communication issue but as a public health tool. So Dr. Brody talked about how people who get their report-backs are then motivated to make individual change and public policy change. And frankly I've been struggling with how to frame this in a way that doesn't

sound political. And maybe it can't be. That one of the considerations should be where do we see opportunity and need for movement in the individual and public policy front and therefore can -- should part of our prioritization be where do we want to engage the public in making change?

And I think one opportunity for that is -- in my own opinion, is the communities impacted by fracking in California. Whether it could be a real opportunity to do biomonitoring that's not being done anywhere else in -- I mean, I believe in the country there is nobody else biomonitoring these communities. And it's an issue of serious concern for many, but for which we have very little evidence, or very little monitoring. So this could be one place where California could really, once again, lead the country and the world.

I wanted to reiterate Dr. Schwarzman's comments about monitoring for activity. Representing kind of the breast cancer world, what would be incredibly important, is to look not specifically at chemical by chemical but at -- at the combined effect that -- of several chemicals and maybe ones we don't even know about on particular disease outcomes, without having to make the connection to disease but just to look at biological activity.

So those are two of my thoughts.

CAL/EPA DEPUTY DIRECTOR SOLOMON: Thanks.

Anyone else from the Panel want to add anything?

PANEL MEMBER LUDERER: I'd like to just talk a little bit about the sort of the priority/sensitive populations and impacted communities in a little bit different way, and maybe think about some occupational populations that we can look at particularly as we know that the big growth in jobs is in the service sector. And we've heard today about the wonderful studies that are being done around nail salon workers. What are some other I think vulnerable worker populations largely in these service sectors that we might be able to focus on? Which, you know, some that come to mind would be people -- cleaners, house cleaners, janitors. Another group would be gardeners, you know, landscape workers, which obviously also overlap quite a bit with some of the populations that Dr. Quintana mentioned in terms of, you know, immigrant populations as well.

So I think we haven't -- we've had the FOX study. But I think it would be something that would be good for the program to do to try to see if we can look at some of these other occupational populations where we may not know as much about the exposures. I mean, we can imagine, for example, with janitors and cleaners, that some of these products that many of us are exposed to in our everyday

lives, but there would be much higher exposures because they're using these constantly throughout the day in their work. So those might be some very useful populations to consider monitoring.

CAL/EPA DEPUTY DIRECTOR SOLOMON: Other possibilities might be the health care sector, obviously another big service sector.

And I was sort of also thinking as Meredith was speaking about the building trades and some of the, you know, work in that area where people are actually handling a lot of these materials.

And, let's see, any other comments from the audience? There are a number of folks who haven't said anything, that I was surprised haven't said anything. But I just want to give you one last chance, because I know we're going to have to wrap up I think in like one minute.

And I don't want to be late because Sara will be upset.

(Laughter.)

CHAIRPERSON BRADMAN: I have one last comment.

Hopefully not the last.

But, anyway -- but you made a point, Marian, about not wanting to sound political. But rather I would say as a public health program and as public health professionals, we want to address issues and generate

information that can inform policy. And the political process is the decision making. And, you know, like our, you know, meeting last week on pesticide use near schools, that's a political process. But I don't think that the program should hesitate from trying to gather information on potentially politically fraught or difficult issues. All of these issues are, you know, fraught. We're looking at chemicals that are used in commerce, and commerce is important to our economy. However, understanding what the exposures are and what the public health implications are are also important and may impact how we -- you know, how we do commerce. And so I think in California we have the support and the understanding that generating the information is crucial. What happens to it after that is a separate process. And I think from the very beginning we talked about kind of keeping separate the risk management piece of the information from here from just generating the information of what the exposures are and then going from there.

MS. HOOVER: Let me just clarify something. No, it's not one minute. We have till 2:30. But a thing that was going to happen at 2:20 was that you're going to do a wrap-up. But I don't think that's necessary because we're going to have the transcript. So why don't we just continue the discussion through 2:30.

Meg.

PANEL MEMBER SCHWARZMAN: Thanks.

I so appreciate that point, Dr. Bradman. I think it is in our -- it's imperative, is -- you know, if our goal is public health is to think about the priorities from a public health perspective and go from there.

I wanted to return to a point that has surfaced several times today, but just to highlight it because it was my first thought in preparing for today and thinking about sort of the future steps for the Biomonitoring Program. And it's something that Dr. Hertz-Picciotto raised in going back to the statute and looking at the sort of established goals of the program. And that is this question of assessing the outcomes of policies that we have in place. Because we have so little feedback often between the public policy decision-making sphere and the environmental health assessment sphere. And to bridge those two worlds I think could be enormously influential, particularly in California because in California we have several unique public policy levers like Proposition 65, like pesticide use reporting, and making a link. So here we are in California where we have these unique public policy frameworks and very little data about their impact.

And if we had -- could generate -- and biomonitoring is such an influential method for generating

data about impact. If the public policy outcome is specifically meant to address chemical exposures and chemical levels in people, we have this I think very untapped opportunity so far to do direct assessments of the impact of public policies that are specific to California. And, you know, I know analyses like that are full of potentially confounding variables. You know, California's policies aren't the only thing that's influencing the use of chemicals or their discharge into the environment. But if we're not looking at it, we can't even begin to see whether they're having an impact. And so that's a piece of the discussion. And it's not the first time it's come up today, but I just wanted to really highlight it and flesh out my thinking on it a little bit.

CAL/EPA DEPUTY DIRECTOR SOLOMON: Dr. Quintana.

PANEL MEMBER QUINTANA: I just wanted to make a quick comment on behalf of communities. That working with communities, I more realize that it's so important to talk about solutions to the problem. So let's say we find out that children living near agricultural fields have higher pesticides in their bodies and perhaps the pathway might be house dust. It's helpful for this program to think about if we had money to do something like a targeted intervention: What kind of dust control methods would lower their exposure? Just like you're saying the

furniture replacement for the flame retardants. I think those -- even small studies give people a feeling of tools they can use. And that's something that can be assessed very effectively with biomonitoring.

CAL/EPA DEPUTY DIRECTOR SOLOMON: Great.

No other comments?

So I heard a lot -- I guess maybe I should summarize a little bit. I mean, I heard a lot of really helpful thoughts. And sort of -- some of them were very big-picture thoughts about how to move forward. I think one of the most -- one of the ones that seemed to get a lot of traction was this idea of looking at some of the early biomarkers of effect in connection with exposure monitoring in the hopes that we might be able to sort of ultimately move in that direction. And that's I think come up a little bit in the past, and it's something that deserves maybe more -- more consideration.

And also some places to specifically look, like the chemicals nominated to the NTP as being a really -- a good place to look for chemicals that may be emerging that we may not have yet looked at in -- you know, in the context of the Scientific Guidance Panel. And so those were really helpful thoughts about new priority analytes and other types of screening methods. A lot of very interesting suggestions around collaborating with

researchers in the field of -- fields of omics and so forth where we may not have that expertise in house in our program, but we might through collaborations be able to really do something very unusual and interesting there.

And then also on the chemical front, this idea of looking at Prop 65 specifically. We've looked at some things, you know, that might mark our differences from the rest of the country - flame retardants, in general; documenting declines in PBDEs; things like that. But, you know, I don't know the degree to which we've really focused on, okay, which Prop 65 chemicals could we biomonitor, and might we be able to see either changes over time or differences from NHANES. So that's an interesting lens.

Didn't hear a whole lot specifically on the metals, but that is definitely something we want input on. So as Sara mentioned, please keep thinking about that, because that's going to be important. We can do the usual suspect metals, but we should probably do something interesting while we're at it.

And then in terms of geographical regions, there was some good suggestions about, without getting too political, you know, wanting to think about areas where people might need more education on, you know, chemical -- environmental health issues and chemical issues, and both

for their own health and also so that they better understand the importance of public policy actions. And so, you know, that's something we should think about as we're picking geographical regions, maybe, that it's certainly definitely worth considering.

And then really a very strong call for occupational -- more occupationally focused studies, which I very much support, for given the fact that, you know, in workplaces people can be exposed to really much higher concentrations and greater frequencies. So that sounded like a very strong recommendation.

And then -- I didn't hear a lot about specific collaborations to pursue, except -- but there were some very good general directions of collaborations, especially around the omics and the biomarker-type studies.

So that's pretty much what I heard. I'm sure all of that plus way more is in the notes.

So I will hand back to -- oh, yeah. Go ahead, Sara.

MS. HOOVER: I just wanted to pick up on two -- just really strongly pointing to Dr. Brody's point and also Mel's point about using our -- we have incredible capacity on results return that we've worked very hard on since very early in the program, for many, many years. And I really like that framing. It's not just about

communicating. It's about a tool. It's a public health tool. And I like -- you know, we really have embraced that, and I think that's a good framing for it.

Thank you.

CAL/EPA DEPUTY DIRECTOR SOLOMON: Yeah. And thank you again to all of the folks who traveled so far to come here and -- also not so far.

(Laughter.)

CAL/EPA DEPUTY DIRECTOR SOLOMON:

Dr. Hertz-Picciotto.

-- but to share their thoughts and expertise. Because I think we learned quite a bit from our -- I certainly learned quite a bit from those presentations and that discussion this morning and afternoon.

So thank you all. And I'd love another round of applause for our speakers and discussants.

(Applause.)

DR. BRODY: One last comment from the East Coast.

Tag, you're it, California.

(Laughter.)

CHAIRPERSON BRADMAN: It's 2:30, and I'm going to officially adjourn the meeting. But then we'll switch over into kind of our celebration and review of the history, and then also some -- a reception later.

So I want to announce that the transcript of this

meeting will be posted on the Biomonitoring California website when it's available.

The next Scientific Guidance Panel meeting will be on July 20th, 2016, in Richmond.

So at this point, I'm officially adjourning the SGP meeting. And I now will hand off facilitation over to Dr. Lauren Zeise, Director of OEHHA, who will open the 10th Anniversary event.

I want to make one note though. The webcast is now ending. But we will continue to record the event. So beware.

(Thereupon the California Environmental Contaminant Biomonitoring Program, Scientific Guidance Panel meeting adjourned at 2:30 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 21st day of March, 2017.

JAMES F. PETERS, CSR
Certified Shorthand Reporter
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