

CALIFORNIA ENVIRONMENTAL CONTAMINANT BIOMONITORING PROGRAM

(BIOMONITORING CALIFORNIA)

SCIENTIFIC GUIDANCE PANEL MEETING

CONVENED BY:

OFFICE OF ENVIRONMENTAL HEALTH HAZARD ASSESSMENT

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH

STATE OF CALIFORNIA

THE CALIFORNIA ENDOWMENT

LAUREL ROOM

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OAKLAND, CALIFORNIA

WEDNESDAY, AUGUST 22, 2018

10:00 A.M.

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

PANEL MEMBERS:

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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.

Veena Singla, Ph.D.

José R. Suárez, M.D., Ph.D., M.P.H.

OFFICE OF ENVIRONMENTAL HEALTH HAZARD ASSESSMENT:

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

Martha Sandy, Ph.D., Chief, Reproductive and Cancer Hazard
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CALIFORNIA DEPARTMENT OF PUBLIC HEALTH:

Kathleen Attfield, Sc.D, Research Scientist III, Exposure
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Jennifer Mann, Ph.D., Research Scientist IV, Exposure
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A P P E A R A N C E S C O N T I N U E D

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

DEPARTMENT OF TOXIC SUBSTANCES CONTROL:

Sabrina Crispo Smith, Ph.D., Senior Research Scientist,
Biomonitoring Section, Environmental Chemistry Laboratory

Miaomiao Wang, Ph.D., Research Scientist III,
Environmental Chemistry Laboratory

GUEST SPEAKERS:

Simona Balan, Ph.D., Senior Environmental Scientist,
Department of Toxic Substances Control

Antonia Calafat, Ph.D., Chief, Organic Analytical
Toxicology Branch, Division of Laboratory Sciences,
National Center for Environmental Health, Centers for
Disease Control and Prevention

Erika Houtz, Ph.D., Project Environmental Engineer and
PFAS Analytical Lead, Arcadis

Darrin Polhemus, Deputy Director, Division of Drinking
Water, State Water Resources Control Board

ALSO PRESENT:

Nancy Buermeyer, Breast Cancer Prevention Partners

Janet Nudelman, Breast Cancer Prevention Partners

Ernest Pacheco, Communications Workers of America

Anna Reade, Ph.D., Natural Resources Defense Council

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

Andria Ventura, Clean Water Action

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1 P R O C E E D I N G S

2 MR. BARTLETT: Good morning, everyone. So we'll
3 be starting shortly. So go ahead and if you could find
4 your seat.

5 (Thereupon an overhead presentation was
6 presented as follows.)

7 MR. BARTLETT: Good morning again. Thank you all
8 for coming. My name is Russ Bartlett. I'm with the
9 Office of Environmental Health Hazard Assessment.

10 So today's meeting is also available -- I'll
11 start the...

12 Okay. So today's meeting is available via
13 webinar. So when you're speaking into the microphone,
14 please introduce yourself before speaking. This is for
15 the benefit of the people participating via the webinar
16 and for the transcriber. So for those of you listening
17 via the webinar, please keep you microphones muted at all
18 times.

19 The materials for the meeting were provided to
20 SGP Science Guidance Panel members and posted on the
21 Biomonitoring California website. A small number of
22 copies of the meetings materials are available at the
23 table just outside the door, if you didn't see those.

24 We will break at 12:25 p.m. for lunch and take
25 another short break at about 3:10 p.m.

1 Just some logistical things for...

2 So just a quick -- if you mute -- if you're on
3 the phone, please go ahead and mute your phone and please
4 keep it muted for the duration of the webinar
5 presentation.

6 Thank you.

7 Thank you.

8 Is that better?

9 Excellent.

10 Just some logistics for restrooms, there are two
11 doors to the restrooms...

12 MS. HOOVER: Hello. I'm Sara Hoover. I'm Chief
13 of the Safer Alternatives Assessment and Biomonitoring
14 Section. And the logistical issue that we're experiencing
15 right now is that everyone joins the webinar muted. They
16 have the ability to unmute themselves. So anybody on the
17 webinar, you must remain muted. You get one -- one grace,
18 where we re-mute you. And then if you don't stay muted,
19 we're going to have to take you off the webinar. So just
20 please be aware to keep yourself muted at all times.
21 There's no participation via phone, or the webinar in
22 terms of speaking. So if you're listening on the phone or
23 via webinar, you must send your comments to the email
24 address that you were provided and is on the screen right
25 now.

1 Okay. So I'm not sure where -- you were at the
2 materials, right, and the break?

3 MR. BARTLETT: (Nods head.)

4 MS. HOOVER: So we're going to break at 12:25 for
5 lunch. I usually like to give everybody an hour and 15
6 minutes. But this time, because we have such a packed
7 amazing agenda, one hour. So you have to do a real quick
8 -- quick lunch break and be back by 1:25 for the afternoon
9 session. We'll have another short break at 3:10.

10 Emergency exit and restrooms, I think you can
11 actually get to the restroom back there too.

12 MR. BARTLETT: Indeed.

13 MS. HOOVER: And I'm pointing -- for those on the
14 webinar, I'm gesturing and pointing.

15 And I think that is it. And now I am pleased to
16 introduce Lauren Zeise who's Director of the Office of
17 Environmental Health Hazard Assessment.

18 Lauren.

19 DIRECTOR ZEISE: Thanks, Sara. And good morning,
20 everyone. I'd like to welcome you to this meeting of the
21 Scientific Guidance Panel for the California Environmental
22 Biomonitoring Program, also known as Biomonitoring
23 California.

24 So thank you all for participating on the web,
25 sharing your time on the panel and in the audience in the

1 room. We really appreciate your sharing your expertise
2 with us.

3 I'll just recap a few things from the March 2nd
4 meeting that we held in Davis. The Panel heard about
5 ongoing program activities, including an update on the
6 California Regional Exposures Study. And then in the
7 afternoon, we delved into evaluating community exposures
8 to air pollutants. Yana Garcia of CalEPA kicked off the
9 session. And we heard from Heather Arias of the
10 California Air Resources Board who talked about the
11 Community Air Protection Programs established under
12 Assembly Bill 617. And we also heard from Victor De Jesús
13 of the Centers for Disease Control and Prevention, who
14 described advances in biomonitoring methods for volatile
15 organic compounds.

16 So we post a summary of the meeting and the input
17 received from our guests, and the Panel, and the public on
18 the Program's website at biomonitoring.ca.gov.

19 So very excited about today's meeting. We're
20 going to be discussing perfluoroalkyl and polyfluoroalkyl
21 substances, or PFASs, and asking for input on possible
22 next steps for Biomonitoring California and measuring
23 exposures in this very large class of chemicals. So we're
24 going to be engaging our guests and representatives from
25 other programs within CalEPA, the Panel, the audience, and

1 those on the webinar. So you're going to hear a lot more
2 about this soon from Meg Schwarzman, our Chair -- the
3 Panel's Chair.

4 So now, I'm just going to briefly turn to some
5 Panel business. And most importantly welcoming our newest
6 member of the Science Guidance Panel, Dr. Veena Singla.
7 Welcome, Veena.

8 And before I swear Veena in, I just want to
9 formally thank and acknowledge Scott Bartell of UC Irvine.
10 We really appreciate his service, and all the input he
11 offered in his support of the Program.

12 So please join me in welcoming Veena, who was
13 appointed --

14 (Applause.)

15 DIRECTOR ZEISE: Veena was appointed by the
16 Senate Rules Committee to fill the vacancy left by Scott.
17 So she's an Associate Director of Science and Policy for
18 the Program on Reproductive Health and the Environment,
19 PRHE, at UC San Francisco.

20 Her research intro -- her research includes
21 studying indoor environmental quality and how exposures to
22 multiple chemicals affects health outcomes, especially in
23 vulnerable populations.

24 So Veena's work has led to groundbreaking
25 policies to evaluate safer chemicals and promote

1 substitution of harmful chemicals in consumer products.
2 Prior to joining PRHE, she worked as staff scientist for
3 the Natural Resources Defense Council. Veena holds a
4 Ph.D. in cell biology from UCSF.

5 So welcome.

6 And now we will formally swear in Veena.

7 So, Veena, if you could stand up, please.

8 And we'll share -- oh, maybe if you want to take
9 your mic here and just turn it on.

10 Good. Okay.

11 So right hand. Okay.

12 I Veena Singla --

13 PANEL MEMBER SINGLA: I Veena Singla --

14 DIRECTOR ZEISE: -- do solemnly swear --

15 PANEL MEMBER SINGLA: -- do solemnly swear --

16 DIRECTOR ZEISE: -- that I will support and
17 defend the Constitution of the United States --

18 PANEL MEMBER SINGLA: -- that I will support and
19 defend the Constitution of the United States --

20 DIRECTOR ZEISE: -- and the Constitution of the
21 State of California --

22 PANEL MEMBER SINGLA: -- and the Constitution of
23 the State of California --

24 DIRECTOR ZEISE: -- against all enemies, foreign
25 and domestic --

1 PANEL MEMBER SINGLA: -- against all enemies,
2 foreign and domestic --

3 DIRECTOR ZEISE: -- that I will bear the true
4 faith and allegiance to the Constitution of the United
5 States --

6 PANEL MEMBER SINGLA: -- that I will bear truth
7 faith and allegiance to the Constitution of the United
8 States --

9 DIRECTOR ZEISE: -- and the Constitution of the
10 State of California --

11 PANEL MEMBER SINGLA: -- and the Constitution of
12 the State of California --

13 DIRECTOR ZEISE: -- that I take this obligation
14 freely --

15 PANEL MEMBER SINGLA: -- that I take this
16 obligation freely --

17 DIRECTOR ZEISE: -- without any mental
18 reservation or purpose of evasion --

19 PANEL MEMBER SINGLA: -- without any mental
20 reservation or purpose of evasion --

21 DIRECTOR ZEISE: -- and that I will well and
22 faithfully --

23 PANEL MEMBER SINGLA: -- and that I will well and
24 faithfully --

25 DIRECTOR ZEISE: -- discharge the duties upon

1 which I am about to enter

2 PANEL MEMBER SINGLA: -- discharge the duties
3 upon which I am about to enter.

4 DIRECTOR ZEISE: Welcome to the Panel.

5 (Applause.)

6 DIRECTOR ZEISE: So now I'll turn the meeting
7 over to Meg Schwarzman our Chair.

8 CHAIRPERSON SCHWARZMAN: Thank you. Thank you.
9 And welcome, Veena. We're very pleased to have you on the
10 Panel.

11 I am sick. And so I want to ask your forgiveness
12 in advance for any mental or physical lapses --

13 (Laughter.)

14 CHAIRPERSON SCHWARZMAN: -- during the day.

15 I'm really glad to be here. This is an
16 interesting meeting that OEHHA has arranged and organized,
17 and I'm glad to be here for it.

18 My job is to announce the Panel goals for the
19 meeting. As you've heard, we're focused on perfluoroalkyl
20 and polyfluoroalkyl substances, PFASs. And I would direct
21 you to this piece of paper, which is in all of your
22 folders, because we're going to use the term PFASs
23 throughout the day, rather than referring individually to
24 their acronyms. But anyway, this piece of paper is very
25 useful because it tells you full names, and lab analytes,

1 abbreviations, et cetera. So that's your crib sheet for
2 the day.

3 In the morning session, we will hear our usual
4 program update and some presentations from Biomonitoring
5 California staff on -- we need someone muted on the
6 website -- webinar.

7 So we're -- yeah.

8 MS. HOOVER: So just for those of you on the
9 webinar, you must -- you enter muted. Do not unmute your
10 line. You have to stay muted throughout the whole
11 meeting. If you want to give comments, send an email. So
12 please -- please make sure you keep your mics muted on the
13 phone or your computer. Thank you.

14 CHAIRPERSON SCHWARZMAN: So after our Program
15 update, staff will -- Biomonitoring California staff will
16 present some updates on results from studies that include
17 PFAS results. And then we'll have time, as we usually do,
18 for questions and discussion from both the Panel and the
19 audience before we break for lunch.

20 Then our afternoon session goal, and the charge
21 for the Panel at this meeting, is to provide input to the
22 Biomonitoring California Program on sort of priority next
23 steps in measuring PFASs in California.

24 So we'll hear from some guest speakers and also
25 discussants this afternoon. That will sort of help us

1 provide context for that conversation. And the discussion
2 is meant to focus a few key sort of general topics. One
3 is key exposure sources to PFASs in California, especially
4 thinking about which groups might be particularly impacted
5 and sort of how to focus resources, best approaches for
6 expanding PFAS biomonitoring in California, and how the
7 Program can focus on sort of highest priority public
8 health issues related to PFASs in the State.

9 And in the way that the program typically does,
10 they're always looking for ways to kind of partner or
11 collaborate with other State agencies and programs in ways
12 that have typically helped the Program get so much kind of
13 bang for the buck in the past.

14 So one note about kind of how we're going to
15 manage audience and Panel -- well, audience participation
16 today. We're not going to be using comment cards because
17 of some of the sort of freer flowing discussion times.
18 What we would like is for you to please feel free to
19 engage in the discussion, ask questions, and provide
20 comments. But we want you to do that by coming up to the
21 podium where there's a microphone. And so you can just
22 form a line. And if at some point, it gets unmanageable,
23 we'll take different steps. But please feel free to
24 contribute. That's what we'd like to have happen, but
25 let's do it just via the podium instead of with the

1 comment cards.

2 If you're joining via the webinar as -- excuse me
3 -- Russ and Sara already said, you can provide comments
4 via email to biomonitoring@oehha.ca.gov. And as relevant
5 we'll read those comments allowed, paraphrasing them if
6 necessary.

7 So do please keep your comments brief and focused
8 on the items under discussion. We have, as usual, at the
9 end of the day, an opportunity for open comment, public
10 comment, but otherwise we'll be focused on the topics
11 under discussion at the time.

12 Okay. So now I would like to introduce
13 Nerissa -- Nerissa Wu, who is Chief of the Exposure
14 Assessment Section in the Environmental Health
15 Investigations Branch, EHIB, at the California Department
16 of Public Health, CDPH. And she is overall lead for
17 Biomonitoring California, and she's going to provide the
18 update on current program activities.

19 (Thereupon an overhead presentation was
20 presented as follows.)

21 DR. WU: Okay. Hi, everyone. Good morning.
22 Welcome. It's good to see you, Veena, on the other side
23 of the podium.

24 (Laughter.)

25 DR. WU: So we have a really great agenda. It's

1 very packed as Meg has already said with very extended and
2 timely focus on PFASs.

3 But I am going to start with an overview of the
4 Program, and a little bit of a progress report on the CARE
5 Study.

6 Where am I pointing this thing?

7 --o0o--

8 DR. WU: Not at me. Not at myself.

9 So here we are fiscal year 2018-19. We've been
10 talking about our fiscal picture over some time. Here we
11 are. The purple and green slices there indicate some
12 limited term funding we've had over the past two years.
13 But we have not had the opportunity to extend or add to
14 that funding in this last budget cycle, and so those
15 limited term positions have come to an end, as we've been
16 projecting.

17 You also see that we are now finishing up the
18 fourth year of our five-year CDC cooperative agreement.
19 And that you see in the last slice there, the '19-'20
20 fiscal year. We have heard the CDC is planning to release
21 a funding opportunity early in 2019. And, of course, we
22 will intend to apply for that. But these opportunities
23 are competitive, and there's no guarantee that we'll have
24 that funding opportunity again.

25 --o0o--

1 DR. WU: So the challenge for our Program, and
2 our priority really is to stay as focused and as
3 productive as possible -- and I've created this slide just
4 to show what our sample collection activity has been over
5 the life of the Program. And you see, despite the climate
6 of reduced resources, we've been very active. We've ACE I
7 and ACE II, which we've completed. We're in the process
8 of returning results for the Foam Replacement and
9 Environmental Exposure Study. East Bay Diesel is going to
10 be out in the field collecting samples until mid-November.
11 And we've just finished this large sample collection in
12 Los Angeles as part of the CARE Study. And we're now
13 poised to go into the field for CARE II. So lots of
14 activity. And we'll -- we're going to do our best to
15 continue this momentum despite the funding picture I've
16 painted for you.

17 --o0o--

18 DR. WU: So I want to turn to the California
19 Regional Exposure Study. And for those people who haven't
20 been following this closely, this is our statewide
21 surveillance project. And as we've discussed, we've split
22 California into eight regions and we move region to
23 region, one per year, conducting sampling in each region
24 with 300 to 500 people per region as our goal.

25 And we are biomonitoring both for metals and for

1 the -- for the perfluoroalkyl and polyfluoroalkyl
2 substances, the PFASs, which will be the focus of today's
3 meeting.

4 And we also take the opportunity to collect
5 exposure data through surveying whenever we have
6 participants. We do have the potential, in this modular
7 approach, to include additional panels as resources and
8 methods are available to us. And for region one, we were
9 able to add on 1-nitropyrene, the biomarker of diesel
10 exposure and environmental phenols for a subset of our
11 participants. And we hope to be able to do so for region
12 two as well.

13 --o0o--

14 DR. WU: So last time we talked, we were out --
15 were just getting out in the field. We've been doing
16 community meetings, getting the word out about the CARE
17 Study, setting up a field office, and then getting our
18 recruitment going. You see here just a collage of
19 different activities associated with the CARE Study.

20 --o0o--

21 DR. WU: And just an overview of the process, we
22 have interested people filling out a pre-screening form.
23 It tells us a little bit about them. It tells us that
24 they're interested in the study. And then from that
25 pre-screening pool, we select our study participants. And

1 then that way we're able to try to match our study
2 population to the overall region population.

3 --o0o--

4 DR. WU: We did notice -- let me go back a
5 second. And last time we reported out, we were just
6 starting to see people come into the study. And we
7 noticed that our study population was starting to skew
8 white and highly educated. And we were not equally
9 successful in the different regions of Los Angeles County.
10 So we started to really focus on our community
11 partnerships to really up that recruitment effort. And we
12 started to work in partnership with some organizations
13 that were able to reach out specifically into those
14 underrepresented areas, and into underrepresented
15 demographics to recruit people into the study.

16 And then they held -- some of these community
17 organizations held events where participants could come
18 and do the whole process of the study, fill out their
19 consent form, do their survey, and have their samples
20 collected all at one time. And that helped us boost our
21 participation across the board.

22 --o0o--

23 DR. WU: So this is what we see represented here.
24 We had 810 people fill out the pre-screen form. And this
25 is after we've taken out ineligible people, people who

1 filled it out multiple times, people who put in fake
2 names. Of that 810 interested individuals, we invited 639
3 people to participate. And I should mention this is on a
4 rolling basis. So we invited in waves, and as people
5 declined to enroll, we would continue to invite people
6 throughout the process.

7 --o0o--

8 DR. WU: Four hundred twenty-five of those
9 invited participants actually enrolled and initiated
10 participation. And about 75 percent of them completed the
11 study steps. So 326 people from that recruitment effort
12 completed the study steps.

13 From our community events, we had an additional
14 104 people sign up and complete the study. So we have 430
15 total participants from CARE L.A. I should note that of
16 these, 428 of these participants asked for their results
17 back. So that's almost everybody. And 408 of the 430
18 participants, again a very high percentage, consented to
19 donate their samples for additional analyses in addition
20 to metals and PFASs that we noted.

21 --o0o--

22 DR. WU: So how do people find out about the CARE
23 Study? And these numbers are based on the 326 people who
24 we directly recruited, not through the community events.
25 And it turned out that every type of our outreach was

1 successful to an extent. We had randomly mailed
2 postcards. We had craigslist. We went and did networking
3 events, going to workshops and community meetings. And
4 then we had sort of an indirect recruitment through fliers
5 that are posted at different places, word of mouth, and
6 social media.

7 And each one of them were successful to an
8 extent, particularly going to workshops and then to
9 community meetings. And there was also a difference in
10 how people made it through the study with postcards and
11 sort of the indirect kind of recruitment being most
12 successful in having people join the study and then make
13 it all the way through. That was a significantly higher
14 percentage than people who signed on through craigslist.

15 Of course, you have to see this in the context of
16 how much it cost for each type of recruitment. A
17 postcard, designing a postcard, producing it, and mailing
18 it out is much more expensive than something like
19 craigslist or social media, which is essentially free. So
20 that is something we have to think of as a Program, in
21 terms of where our resources are, but also the
22 effectiveness of each of these, because, as I said, each
23 of these -- each of these played an important role in our
24 recruitment, and they reached a slightly different
25 demographic. So we don't want to give up on any one of

1 these recruitment methods.

2 --o0o--

3 DR. WU: And how representative was the CARE
4 Study eventually?

5 Well, by race and ethnicity, I think we did a
6 pretty good job of pulling in a representative sample. We
7 did a pretty good job of matching L.A. County's racial
8 breakdown. And not shown here, but we also tried to match
9 the geographic distribution of the county. L.A. is broken
10 down into service provider areas. And we use the
11 population of each of those areas as a goal for our
12 sampling in that area, and we were able to meet that.

13 The population did skew female. We had about 60
14 percent women in the study. And we didn't do as well with
15 socioeconomic status as measured by highest education
16 level attained. You can see we have a very highly
17 educated study population. And that's not an issue that's
18 unique to a biomonitoring study, but it is one of the
19 things we are thinking about as we move to region two.

20 --o0o--

21 DR. WU: So lessons learned on how we're trying
22 to approach them. As I said, all forms of outreach were
23 important, and we do want to continue all of them,
24 particularly we're going into a region that's a lot less
25 dense. So maybe things like the postcard will end up

1 being more important. The targeted outreach, which we
2 saw, was very successful, particularly to diversify our
3 participant pool. We really are working on our community
4 relationships and forming partnerships.

5 We have heard from participants and also from
6 people who declined to participate that the incentive we
7 offered, \$20, was really low. And that to ask people to
8 take time off from work and maybe travel to sample
9 collection, \$20 isn't really adequate, so we are
10 increasing that to \$50 for this next phase. And we hope
11 that helps us with our recruitment overall, but also for
12 diversification of our population.

13 Just looking at how our participants flow through
14 the system. We found that we lost some at two key points.
15 One was at enrollment, some when we invited people to
16 participate. Some people just didn't respond. They lost
17 interest.

18 Once somebody enrolled, they generally went
19 through the study doing the consent, and the survey, and
20 even making an appointment. But then we tended to lose
21 people at sample collection. Again, that's the hardest to
22 get people to do. It's the least convenient. So again,
23 we're working on the logistics to make these things more
24 convenient, easy to fulfill, and the incentive I think
25 will help with boosting participation at those spots.

--o0o--

DR. WU: So now we move on to region two. And in some ways, it's kind of hard to apply the lessons from L.A. to this new region, because it's a really different region. And I'm starting to think of this as a pilot of our less urban regions, so -- and I'm hoping that not every region is its own little pilot.

But region two is Imperial, Inyo, Mono, San Bernardino, and Riverside. So as you see, it's a huge geographic area. The population is really concentrated as you can see from those pink dots. Very concentrated on the west side. It's easier to get around. Los Angeles is very difficult logistically, because it's so congested and hard to plan getting to different sites.

But there are many logistics involved here. How do we get to all these areas, and maintain our sample integrity, keep the samples cold, before we can get them to a centralized location to ship up to our labs.

There are fewer -- we have fewer community connections in this region, just our history of our work. There may actually be fewer community groups just because of the sparse population. So we're really working hard to be creative and think beyond our traditional partnerships to get to know the community.

It's also a difficult region. We're trying to --

1 this is a statewide study, but we also want to represent
2 the region and we want to be representative of the
3 counties. So we have to think about how do we create our
4 sampling goals to be both representative, but also have
5 enough samples in different populations, so that we can do
6 some statistical analyses.

7 --o0o--

8 DR. WU: So we have broken region two into these
9 sampling zones, so that we can think about the logistics
10 and recruitment and our sampling goals. We have zone A
11 and B, which is the urban part of Riverside, and San
12 Bernardino Counties. And we have zone C, which represents
13 the suburban and rural areas of Riverside and San
14 Bernardino. And zone D is Imperial County, and zone E is
15 Inyo and Mono Counties.

16 And we've sent our initial sampling goals based
17 roughly on the population of those zones, but we are going
18 to oversample in some of the zones just so we can have
19 representation. And we will oversample again in some race
20 and ethnicity groups.

21 --o0o--

22 DR. WU: And here's a timeline for finishing up
23 region one and also preparing for region two. We are
24 currently engaged in early notification of participants
25 for region one. We have participants -- as results roll

1 in from the lab, we have people who have elevated levels
2 of mercury, arsenic, lead, or cadmium. And calls are
3 going out as soon as possible to those participants to let
4 them know those results.

5 We're planning for a results return effort, and
6 that's for all of the panels that I've mentioned, PFAS,
7 metals, environmental phenols, and 1-nitropyrene. And we
8 have that scheduled for December 2018. So just in a few
9 months.

10 At the same time concurrently, we're in region
11 two building up our community partnerships, starting to
12 recruit. And then early 2019, we're out in region two
13 starting our field work, and also finishing up in region
14 one doing some report back to the communities.

15 So there's a lot of overlapping work, a lot of
16 overlapping tasks. It is also a lot of overlapping staff.
17 It is the same people doing all of these things, so we are
18 very busy.

19 --o0o--

20 DR. WU: And here we are back at the CARE map.
21 Every step of the CARE project has potential challenges
22 for us. We are creating materials, designing them and
23 adapting them for each region. The logistic challenges of
24 running a study remote from our office has presented quite
25 a challenge. But while each region is unique and requires

1 adaptation, I do think that as we go through region by
2 region, there are lots of lessons learned, and it will
3 become easier as we go.

4 And I also hope that as the data starts coming
5 in, the data is going to be very interesting, and I hope
6 it starts to generate interest across the state, and boost
7 our participation.

8 And then again after we cycle through the eight
9 regions 2026 - this is a cyclical study - we will be back
10 in L.A. County.

11 --o0o--

12 DR. WU: So just in closing, I just want to give
13 a shout-out to our staff. We're only able to accomplish
14 this through their incredibly hard work and dedication.

15 And before I turn this over to Sara, I just want
16 to say Amy Dunn is not longer on the slide. I'm going to
17 throw it over to Sara to talk some more about that. But I
18 want to actually express my personal thanks and
19 appreciation for all the work she has done.

20 CHAIRPERSON SCHWARZMAN: We'll have a moment for
21 questions in just a sec.

22 MS. HOOVER: Yeah. So obviously -- normally, we
23 have a quick goodbye, but Amy has been with the Program
24 since it started. Actually, before my section even
25 started in 2008, Amy was with the Program. So she's been

1 there right from the beginning. So we want to give her a
2 special thank you for everything she's done. And she
3 recently transferred out of my section into a new role at
4 OEHHA. She is acting as the scientific lead on a major
5 department-wide effort to help plan for our future,
6 including addressing our very difficult challenges in
7 recruitment and retention of our new generation of
8 scientists.

9 Some of her major accomplishments, while she was
10 with the Program included drafting Biomonitoring
11 California's Public Involvement Plan, and paying --
12 playing a pivotal role in working on the development of
13 and improvements to the Biomonitoring California's
14 website.

15 And we're lucky enough that during her
16 transition, she's still been helping us with the website.
17 So we're taking that over. And we just want to give a big
18 thank you to Amy. She's listening, so let's give her a
19 hand.

20 (Applause.)

21 (Cheers.)

22 MS. HOOVER: Thank you.

23 CHAIRPERSON SCHWARZMAN: Yeah. So thanks so
24 much. We now have 10 minutes or so. And we'll start with
25 questions for Nerissa from the Panel about the Program

1 update.

2 Yeah, Jenny.

3 PANEL MEMBER QUINTANA: Hi. I had some questions
4 about recruitment. You gave some numbers about the
5 percent recruitment by different methods.

6 DR. WU: Yes.

7 PANEL MEMBER QUINTANA: And I'm just wondering if
8 you looked at education level by the type of recruitment
9 method, because, as you said, it's a little of a concern
10 that our population doesn't quite seem to mirror the
11 population of L.A. in that particular area.

12 DR. WU: Right.

13 PANEL MEMBER QUINTANA: So did you see whether
14 postcards, I would guess, would be more likely to be
15 higher educated people?

16 DR. WU: Yeah. I think craigslist was the most
17 successful in that -- in the lower education population.
18 But they had -- do you want to -- and word of mouth. Why
19 don't you come up here. Jennifer actually has run the
20 statistics on all the recruitment methods. So I'm going
21 to have her come up here and respond to this.

22 This is Jennifer Mann who is on my staff and who
23 is going to be speaking in the next ten minutes about
24 another project she is doing. But she has also been doing
25 a lot of the evaluation work on the CARE Study. So why

1 don't you address this.

2 DR. MANN: Yeah, just to answer that question.
3 It was word of mouth, and also the targeted outreach where
4 we went to specific community organizations. Both of
5 those worked in recruiting less educated people.

6 PANEL MEMBER QUINTANA: So another question --

7 DR. MANN: A lot of people were referred to the
8 study by friends, family members, things like that that
9 were less educated. That seemed to -- those seemed to be
10 the two avenues by which people came to us who had lower
11 education levels.

12 PANEL MEMBER QUINTANA: So it's great that it's
13 effective to have word of mouth. But it also makes me
14 wonder if you have so few samples to represent L.A., if
15 you're getting people that live near each other, or
16 they're friends with each other, are you getting
17 representative samples? So I'm just kind of curious how
18 many community events led to those community event
19 recruited participants? Was it one event, ten events, 100
20 events? Like how many different events were held?

21 DR. WU: We had five different events. And
22 again, it was two months into our recruitment, so it
23 wasn't throughout the whole recruitment period that we
24 held those events. And I think to us it illustrated the
25 importance of being more -- having our -- having our

1 participation with our community partners be a little more
2 robust. I mean at that point -- to that point, we had
3 done a lot of networking through them. But I think after
4 that point in April, we started -- we were more fully
5 engaged with them asking them to do more active
6 recruitment.

7 Just as an aside, I think something else we
8 talked about at our last meeting was the messaging on our
9 postcard, how it might not -- how the phrasing we use
10 might not be -- might not translate into something
11 meaningful to -- across the board. And so we have done a
12 lot of work on the postcard. We ran some focus groups
13 both in English and Spanish, and collected a lot of good
14 feedback about the kinds of information we should include.

15 And so our recruitment information, both the
16 mailed postcard, but also the flier that will be going out
17 through community groups looked quite different this time
18 around.

19 PANEL MEMBER QUINTANA: Okay. And I guess I have
20 one suggestion, which is I think the community outreach
21 and the community groups and being there, so they could do
22 it all at once instead of having to take a bus and go get
23 a sample is really a great idea. And you said you're
24 trying to tap into existing efforts. And I was thinking
25 about the AB 617 and the community air monitoring groups

1 that are kind of very active and maybe they could have a
2 formal kind of connections and partnerships with those air
3 monitoring groups, because -- and maybe talk about how
4 some of this monitoring could pick up air pollution, such
5 as the 1-nitropyrene might be one avenue.

6 And again, my comments are only -- I know you
7 have limited resources, so they're just asking for
8 information rather than any criticism.

9 DR. WU: We've also recently heard about CDPH's
10 efforts in developing school site health centers. And
11 that's another avenue we're looking into, because I think
12 those are -- those are already developed community
13 centers. So that's something we're -- we're -- we haven't
14 accessed before.

15 PANEL MEMBER QUINTANA: I'm sorry, I had one more
16 question. Just -- I think it's probably for your
17 colleague. It's -- I didn't see the age breakdown of your
18 participants.

19 DR. WU: Do you remember offhand?

20 I think the median age was 44, but I can't
21 remember offhand.

22 DR. MANN: Yeah, that sounds right. She thought
23 the median age was 44. That sounds right to me. It
24 varied by the way that people came into the study. So
25 people who answered to the postcard tended to be older.

1 People who did -- found out about it through craigslist
2 tended to be younger. So there were patterns like that
3 all the way through.

4 PANEL MEMBER QUINTANA: So it is a little more
5 difficult if you have a very wide age range, especially
6 with metals that tend to peak at certain ages. You know,
7 so we had talked a long time ago about trying to recruit a
8 tiny narrow age range and decided to go with adults, I
9 think, at some point.

10 But I was just kind of curious. Keep an eye on
11 that issue and how much we might revisit that.

12 DR. WU: Yeah. One of the challenges with
13 designing this is that there's so many slices of the
14 population we would like to take a closer look at. We
15 would love to have a bigger sample. And I was looking
16 back at the transcript from our last meeting where Meg
17 said, well, what's your wish list? What can't you do?

18 And there are so many ways we could -- I mean, we
19 could have done a much bigger study, and taking these
20 little microcosms of the population. And we would love to
21 do that if we ever had the budget to. But put that on our
22 wish list.

23 CHAIRPERSON SCHWARZMAN: Other questions from the
24 panel for Nerissa?

25 Yeah, José.

1 PANEL MEMBER SUÁREZ: Well, firstly
2 congratulations on the progress you've done in L.A. Just
3 to follow up on the questions here, could you just remind
4 us how many postcards you sent out, and how you selected
5 which households were going to receive them?

6 DR. WU: Okay. We sent out 65,000 postcards.
7 They were selected based on mail codes. We divided the
8 mail codes up by service provider area, and then segmented
9 by quart -- income quartile and then randomly selected
10 from each income quartile, so weighting towards the lower
11 income quartile. So that was fairly evenly distributed
12 among quartiles and by geographic area across L.A. with a
13 slight weighting towards the lower two quartiles.

14 PANEL MEMBER SUÁREZ: Oh, I see. Okay. So the
15 selection was -- so I'm looking here at the proportions
16 across the different -- different sources. So 22 percent
17 were from postcard. That would be from that 810, right?
18 So we're talking about something like 380 households that
19 were invited through the postcard. It would be CARE L.A.
20 participation slide.

21 DR. WU: Yeah, can you move back to -- it's not
22 working.

23 Well, that wasn't what I wanted to do.

24 I guess you can continue talking.

25 PANEL MEMBER SUÁREZ: Well, in any case, we

1 can -- we can talk about it, but -- so as long as I don't
2 have you distracted. I don't know who's -- but in any
3 case, so you sent out 63,000, and then you came down to
4 330 from that 63,000, right?

5 DR. WU: I'm sorry, let me -- I'm sorry. I am
6 distracted.

7 PANEL MEMBER SUÁREZ: Yeah, the previous one.
8 There we go. Right. So that 22 percent there in the
9 postcard, that's 22 percent of the 810, I suppose, right?

10 DR. WU: Yes. Oh, actually, I'm sorry. It's 22
11 percent of the people who came in through pre-screen. So,
12 yes, it is the 810 that finished.

13 PANEL MEMBER SUÁREZ: Okay. So that that would
14 be from the 810, 22 percent of the 810?

15 DR. WU: No, I think it's of -- it's of -- no,
16 sorry, this is of the pre-screen population.

17 PANEL MEMBER SUÁREZ: Right.

18 DR. WU: The first column is the pre-screen, so
19 it is the 810.

20 PANEL MEMBER SUÁREZ: Okay.

21 DR. WU: Yes. And it comes up to a rate of about
22 0.3 percent. It's an incredibly ineffective rate when you
23 look at it that way. Granted. We acknowledge that. And
24 that was one of the -- that's one of the things we were
25 trying to test in this population, like is it worth doing

1 a postcard? It's expensive. We all know we get a million
2 postcards and throw them right out in the mail. We've
3 done a lot of focus grouping on this. At the same time
4 though, we're not really willing to throw it out yet,
5 because we were able to get a certain segment of the
6 population. And again, looking at region two where you
7 have these, you know, very dense populations with lots of
8 community groups, there are all these remote areas that we
9 think the postcard actually might be more -- more
10 effective, but we'll see.

11 PANEL MEMBER SUÁREZ: So I think you mentioned
12 that you -- from the 63,000 that you sent out, what was
13 the fraction that you actually got responses from?

14 DR. WU: It was 0.3 percent.

15 PANEL MEMBER SUÁREZ: Oh, 0.3. And then from
16 there, did I hear that you randomly selected?

17 DR. WU: So as people came in through the
18 pre-screening, and this is from all the different sources,
19 there was -- there's a process -- and Kathleen could
20 actually speak to this more effectively. There's a
21 process by which we were selecting people into the study
22 based on which bins were -- which racial and geographic
23 bins were already filled.

24 And then as people either elected to participate
25 or not, we would refill those bins from the pre-screening.

1 It was a rolling process. So if we found that, for
2 example, white women, those bins filled up pretty quickly,
3 so later on in the pre-screening process, we were no
4 longer -- we were no longer pulling those from our
5 pre-screening pool in certain areas of L.A.

6 PANEL MEMBER SUÁREZ: Got it. So it looks like
7 by far this is the most expensive of all the different
8 recruitment efforts, right?

9 DR. WU: It was the most expensive. Although
10 networking events, if we have staff going down to Los
11 Angeles, and there's a lot of travel involved, a lot of
12 staff time, that is also quite expensive. So having
13 effective partnerships, where we can have other people
14 doing that networking for us would help.

15 Yeah, I mean, again this is balanced between our
16 hands-on approach and our effective recruitment in
17 specific areas versus giving up on some types of
18 recruitment, and maybe giving up on those sectors of the
19 population. So it's -- there are going to be trade-offs
20 that we have to make.

21 And Kathleen points out, so the postcard is the
22 only random recruitment effort, because everything else is
23 targeted to particular communities.

24 CHAIRPERSON SCHWARZMAN: Other Panel questions?

25 Yeah, Carl.

1 PANEL MEMBER CRANOR: Just a quick -- just a
2 quick question about your -- under region one, were you
3 looking for metals or did metals show up? And if metals
4 showed up, why -- what's your explanation for that? This
5 is on the last page -- next to last page under task.

6 DR. WU: So elevated early notification is -- I
7 guess, I'm not sure what your question is. But walking
8 through the process, as we get results back from the lab,
9 we -- part of our protocol is that we will let people
10 know -- before the results return packets are available,
11 we will call people, just because there might be some
12 clinical significance to elevated levels of -- at least
13 for metals I mentioned. So that is -- that's just always
14 been our protocol.

15 We weren't -- I mean, we have certain
16 expectations of what percentage of people have elevated
17 metals just from our previous experience with the
18 population, but we weren't targeting certain areas where
19 we expected to see elevated levels.

20 PANEL MEMBER CRANOR: I guess I'm a little
21 surprised that metals showed up. Do you have any
22 explanation why they rose to the top as it were in your
23 biomonitoring, as opposed to other possibilities?

24 Pardon. Oh, okay. Thank you. That was the
25 question, were they targeted or did they show up

1 afterwards?

2 DR. WU: Well, we -- we chose to measure metals.
3 I think we -- we talked about this also in our last panel,
4 metals being sort of a universal health concern, and also
5 something which is elevated in certain populations across
6 California.

7 CHAIRPERSON SCHWARZMAN: We have just a couple
8 minutes, if there's audience questions for Nerissa about
9 the Program update?

10 MS. HOOVER: And I'll just clarify a couple
11 things about the process. A little different than normal.
12 So here's Nancy.

13 (Laughter.)

14 MS. HOOVER: So that's not different than
15 normal --

16 (Laughter.)

17 MS. HOOVER: -- which is great. Welcome.
18 Welcome.

19 (Laughter.)

20 MS. HOOVER: So I think the way we can do it --
21 so we're monitoring email. There's no public comment via
22 email. If when you realize you're in a -- we're in a
23 session with the ability to have public comment or
24 questions, you should come up and stand here, and then
25 that's a signal for Meg, because we don't have a lot of

1 spare time. So that will be like -- then you can just
2 look over. If there's a line, you can call on them.

3 So I'll turn that over to Nancy.

4 MS. BUERMEYER: Thank you very much. Nancy
5 Buermeyer with the Breast Cancer Prevention Partners. I
6 just want to echo what a great job you guys have done and
7 how exciting this statewide rolling effort is.

8 I have a question and an offer. We have also
9 been doing outreach around communities around the state
10 for a project we're working on. So to the extent we can
11 help you with outreach to communities, we'd be delighted
12 to partner with you on that.

13 And my question, and this may be obvious to the
14 Panel, so I apologize if it is. But as you go through the
15 different regions, are you going to look for different
16 analytes or are you going to use the same set of analytes
17 that you looked at. So like are you going to look at
18 pesticides in the Central Valley for instance?

19 Thanks.

20 DR. WU: Thanks, Nancy. And we will take any
21 offers of assistance from anyone. And if you have
22 partnerships in region two, we'd be really happy to hear
23 about them. Get to that.

24 MS. BUERMEYER: That's a stretch, but we'll try.

25 DR. WU: We will be looking at the PFAS and

1 metals panels across the state. As I said, we do have the
2 ability to pop in different analytes. I mean, we are
3 collecting -- when we take all the samples, we aliquot
4 them and freeze them. And I alluded to the donation of
5 samples for additional analyses. Most participants are
6 really willing and very interested in seeing what else we
7 can see in their samples.

8 We did some EJ listening sessions last year to
9 ask what were the priorities in different regions, air
10 quality, air pollutants rose to the top. So we hope we
11 can add those on in a number of regions. Pesticides of
12 course in agricultural regions. We're a little bit --
13 we're subject to the availability of the method and
14 funding. But we would like to make some of this
15 configurable to what is of interest and importance to the
16 region.

17 CHAIRPERSON SCHWARZMAN: Thank you.

18 Ulrike.

19 PANEL MEMBER LUDERER: I just have a quick
20 question related to what you were just talking about. And
21 first of all, I did want to congratulate you also on the
22 amazing creativity and effort that went into getting this
23 statewide sample started.

24 The question that I have is have you gotten any
25 feedback from the participants about other analytes that

1 they would be interested in knowing -- you know, having
2 measured?

3 DR. WU: I think actually people -- there are
4 people in the audience who had a lot more interaction with
5 participants than I did. I think one of the things we did
6 hear a lot, we had a lot of people who were concerned with
7 fracking in L.A., who participated because they had
8 learned about environmental pollutants through fracking.
9 So some of the VOC methods that we talked about last time
10 is interesting to us to add on. I can't think -- diesel,
11 traffic, air quality, those are the things that have risen
12 to the top and have been mentioned to us. A lot of people
13 mentioned the traffic in L.A. and their exposure to air
14 pollutants.

15 CHAIRPERSON SCHWARZMAN: We have just a minute
16 left. Is that another question?

17 MR. PACHECO: Yeah, I have a question.

18 Ernie Pacheco, Communications Workers of America.
19 Hi, Nerissa.

20 I was going to ask you this question at break,
21 but I guess I'll ask now. So I'm continuing to work to
22 try to get some of our people to participate. I haven't
23 had much luck, but we're actual -- I'm actually seeing
24 interest now, because we have a lot of people that are
25 exposed to smoke and toxics from the wildfires around the

1 state. And I'm wondering whether or not that actually
2 would screen them out, if you know that they have high...

3 DR. WU: Hi. That's a good question. Thank you
4 so much. Ernie has been really helpful in region one, and
5 we hope will be again in region two.

6 We do ask a question about wildfires. This was
7 prompted by the fires in L.A. last year. But this is
8 becoming a perennial occurrence, and we need to ask about
9 it. We don't rule people out. And actually, we're very
10 interested to hear if people have had -- whether it's been
11 sort of just not inadvertent exposure to the study -- to
12 smoke, or if they've been occupationally exposed to smoke,
13 or if they've had to evacuate. So we do have a question
14 which tries to get at how exposed were they to the
15 wildfires. And through our own like just tracking of the
16 news, we'll be able to figure out which fires they're
17 talking about.

18 But that is something of interest to us.
19 Separate from the CARE Study, we're actually really
20 interested in looking at wildfire exposures particularly
21 to firefighters, particularly with these wildland urban
22 interface fires. And so at maybe a subsequent meeting
23 we'll talk a little bit more about a little work that
24 we're doing with firefighters.

25 CHAIRPERSON SCHWARZMAN: Thank you so much,

1 Nerissa for that update. And also on that issue, I would
2 just add one thing because it was a topic at our last
3 meeting. And I appreciate your raising it, Ernie, because
4 I think the Program is looking for ways to do sort of a
5 more rapid response ability to test in the case of fires.
6 And the idea of just being able to incorporate that into
7 some of the existing studies is interesting.

8 So we're going to transition to another set of
9 talks. Presenting some of Biomonitoring California's
10 results on PFASs from other studies. So Jennifer Mann and
11 Kathleen Attfield are both Research Scientists in
12 Nerissa's group at CDPH.

13 Jennifer came to CDPH this year, leaving my
14 division at UC Berkeley after 15 years as an
15 epidemiologist at the UC Berkeley School of Public Health.
16 She holds a Ph.D. in epidemiology from the UC Berkeley.

17 Kathleen was stationed at CDPH as an
18 Epidemiologic Intelligence Service Officer for the CDC,
19 Centers for Disease Control and Prevention, in 2014. And
20 then she joined State service in 2016. She holds a
21 Doctorate of Science from the Harvard School of Public
22 Health. So Jennifer is going to provide a brief overview
23 of selected PFAS results from different Biomonitoring
24 California studies. And then Kathleen will discuss her
25 analysis of findings from the ACE Project that we've just

1 been talking about -- I'm sorry, from the ACE Project.

2 (Thereupon an overhead presentation was
3 presented as follows.)

4 DR. MANN: So today I'm going to give a brief
5 overview of per and polyfluoroalkyl substance, also called
6 PFASs. I'm going to discuss the biomonitoring studies
7 where PFASs have been measured in California. And
8 finally, I'll propose ways we could track changes in PFASs
9 over time with upcoming Biomonitoring California projects.

10 --o0o--

11 DR. MANN: Here I show the definitions of
12 perfluoroalkyl and polyfluoroalkyl substances. And I have
13 examples of structures for each. So perfluoroalkyl
14 substances are also known as perfluorinated chemicals, or
15 PFCs. The acronyms will abound in this talk and other
16 talks today.

17 Perfluoroalkyl substances are ones where all of
18 the hydrogen atoms that attach to carbon atoms have been
19 replaced by fluorine atoms. And all 12 of the PFASs on
20 the original lab panel are PFCs. The expanded lab panel
21 includes some of the newer polyfluorinated chemicals. And
22 those are ones where the hydrogen atoms on at least one of
23 the carbon atoms have been replaced by fluorine. And the
24 entire class is on the designated and priority chemical
25 list for Biomonitoring California.

1 --o0o--

2 DR. MANN: So how are these used?

3 Well, manufacturing of some longer chain PFASs
4 has been phased out in the U.S., but thousands of PFASs
5 are still produced and used worldwide. And major uses
6 include treatments and sprays to make a wide variety of
7 materials resistant to stains, water, and grease,
8 manufacturing and industrial applications, and
9 firefighting foams.

10 --o0o--

11 DR. MANN: I'm not going to give you a detailed
12 background on the class, but here's a brief summary of our
13 concerns. These chemicals are highly persistent in the
14 environment, because the carbon fluorine bond is one of
15 the strongest in nature, and some PFASs bioaccumulate.
16 For example, the half-life of PFOS in people is about five
17 years.

18 Furthermore, some PFCs are detected in a high
19 percentage of biomonitoring samples. Our knowledge of
20 health effects comes from studies of just a few PFASs, all
21 PFCs. But so far, health concerns include effects on the
22 developing fetus and child, potential damage to the liver,
23 affects on the immune system, and increased risk of
24 health -- of both thyroid disease and cancer. We still
25 know very little about the toxicity of most PFASs,

1 including the polyfluorinated chemicals.

2 --o0o--

3 DR. MANN: So this is a list of Biomonitoring
4 California studies in which PFASs were or will be
5 measured. So the 12 PFASs on the first panel are all
6 PFCs. But the expanded panel includes additional PFCs and
7 several polyfluorinated chemicals. And your handout
8 actually designates which PFASs are on the original panel,
9 and you can see the ones that are on the expanded panel.

10 So we measured the expanded panel of PFAS in --
11 sorry PFASs in MAMAS round two.

12 Let's see, how do I do this?

13 So MAMAS has three rounds. We've only completed
14 the first round. So beginning with MAMAS round two, we
15 look at that. And then also we use the expanded panel in
16 both ACE studies, which Kathleen will talk a little bit --
17 will talk about right after me.

18 And then for CARE L.A., we actually looked at the
19 original panel of those 12 PFASs. But in later studies,
20 we may use -- we may use the expanded panels.

21 --o0o--

22 DR. MANN: So these are studies that have been --
23 where data collection has been completed that had PFASs as
24 part of them. And the first five studies, so going down
25 the line from FOX all the way through to the Expanded BEST

1 study, we have data posted on the website so you can see
2 it for PFASs.

3 ACE I and ACE II are also completed, but the data
4 have not yet been posted, and we'll be hearing more about
5 those two studies as I said earlier from Kathleen shortly.

6 The PFAS -- PFAS data for the second round of
7 MAMAS has been collected. And laboratory work on PFASs is
8 expected to be completed by late October, early November.
9 And the results will be returned to participants in early
10 December.

11 Care L.A. we are still analyzing the PFAS data.

12 --o0o--

13 DR. MANN: I mentioned earlier that some PFASs,
14 such as PFOS and PFOA, have been phased out. Despite that,
15 these are two of six PFASs that have high detection
16 frequencies in Biomonitoring California studies.
17 Comparing detection frequencies is a bit tricky because
18 the level of detection can vary occasionally by an order
19 of magnitude in the seven studies with finalized PFAS
20 data.

21 And the fluctuation and levels of detection
22 sometimes means that one study has a much lower or higher
23 detection frequency than the others. And for that reason,
24 I calculated the average detection frequency for each PFAS
25 in the original panel across the seven studies.

1 So all six of the PFASs that you see on this
2 slide have average detection frequencies greater than 90
3 percent. And the first five on this list have detection
4 frequencies of 95 percent or greater in at least six of
5 seven studies.

6 --o0o--

7 DR. MANN: And I just want to make a note that
8 all but two of these PFASs are measured in drinking water
9 as part of the third unregulated contaminant rule, MeFOSAA
10 PFUA are not.

11 --o0o--

12 DR. MANN: So we calculated geometric mean -- we
13 can calculate a geometric mean when we have a detection
14 frequency of at least 65 percent. For these PFASs, the
15 detection frequency is low enough that we couldn't
16 calculate a geometric mean in all or almost all studies.

17 Just a couple of notes, PFBS, which replaced PFOA
18 in Scotchgard, has had very low detection frequencies in
19 NHANES since it began being measured in 1999. Detection
20 frequencies for PFOSA have fallen over time with each
21 subsequent study having a lower detection frequency. And
22 as of 2013, NHANES is no longer measuring it.

23 And the polyfluorinated compound measured in ACE
24 I and ACE II as part of the expanded panel all had very
25 low detection frequencies or were not detected.

1 --o0o--

2 DR. MANN: So I'm going to shift a little bit
3 here and talk about time trends in PFASs. So given the
4 phase-out I mentioned earlier and the fact that
5 replacement PFASs appear to be less bioaccumulative --
6 sorry -- tracking time trends in exposures are really
7 important. So this study actually did that.

8 This -- our participants from the California
9 Teachers Study in this slide is just showing what happens
10 when we plot the concentrations observed in each
11 participant by date of study. And they used that approach
12 to look at the rate of decline between 2011 and 2015. And
13 I should note that this was a lab collaboration with
14 Biomonitoring California. And over the 10 to 12 year
15 period, in the 10 -- sorry.

16 --o0o--

17 DR. MANN: So this is another slide where we had
18 a happy accident. We found -- there is a publication that
19 just came out in 2018, which actually looked at
20 perfluorinated chemicals from banked genetic screening
21 samples that were collected in 2000 to 2003. So we can
22 compare those with what we see in MAMAS.

23 So the green dot is the banked genetic screening
24 samples. The red dots are the samples from MAMAS. And
25 you can see that there's been pretty big declines -- sorry

1 about that.

2 --o0o--

3 DR. MANN: There's been pretty big declines in
4 four of the different five. And that's not surprising,
5 given the timing of these data. But when we look at PFNA,
6 there's no decline at all over this very long time period.

7 --o0o--

8 DR. MANN: So where do we go from here?

9 MAMAS is a very useful way of analyzing temporal
10 trends and exposure to PFASs in pregnant women. The PFAS
11 data from the second round of MAMAS, 2015, are being
12 finalized right now. And we plan to measure PFASs in
13 MAMAS III, which includes banked samples from 2016. We
14 have to remember that there's no questionnaire data, and
15 that each round of data is from a different part of the
16 state.

17 Furthermore, the handling of samples might not be
18 ideal for PFASs. However, there are a lot of advantages
19 of using this pop -- of using this population
20 understanding what's happening in pregnant women. And we
21 have the added advantage of being able to use untargeted
22 screening of PFASs to understand what PFASs seems to be
23 emerging in people.

24 And the CARE Study is also another opportunity
25 for us to look at PFASs over time. As we mentioned

1 earlier, we just completed the first of eight regions, or
2 hopefully we'll continue doing that study over time. And
3 questionnaire data are available for that study.

4 So it promises to be a very good resource for
5 understanding temporal trends. And now, I'm going to hand
6 it off to Kathleen.

7 (Thereupon an overhead presentation was
8 presented as follows.)

9 DR. ATTFIELD: All right. Good morning. And
10 thank you, Jennifer, for introducing us to the Program's
11 investigations into PFAS levels in California.

12 So today, I'm going to talk about serum PFAS
13 levels and their predictors seen in our recent studies in
14 the San Francisco Bay Area Asian and Pacific Islander
15 communities.

16 --o0o--

17 DR. ATTFIELD: So the Biomonitoring Program
18 initiated the Asian/Pacific Islander Community Exposures
19 Study, which we will call ACE from now on, in 2016 in
20 response to seeing elevated levels of arsenic and mercury
21 in these subgroups in our EBEST Study.

22 Because of the Program's desire and mandate to
23 perform community investigations, the Program decided to
24 build off of existing educational programs on safer fish
25 consumption with Asian populations we were working with in

1 San Francisco, so that we could learn more about the
2 patterns of metal and PFAS exposures. So PFAS were also
3 seen to be elevated in the subgroups in EBEST.

4 So this became the ACE Study. And the project
5 aims to address the data gaps related to specific
6 subpopulations, and be able to address their specific
7 exposure scenarios to learn more about those.

8 --o0o--

9 DR. ATTFIELD: So we have two phases of ACE. ACE
10 I was conducted in collaboration with APA Family Support
11 Services and recruited Chinese-American participants,
12 primarily in San Francisco. Samples were collected in
13 2016. Then in ACE II, we had -- we worked with the
14 Vietnamese Voluntary Foundation recruiting
15 Vietnamese-Americans mostly in the San Jose area. And
16 these samples were collected last year in 2017.

17 --o0o--

18 DR. ATTFIELD: So today what I'm going to walk us
19 through is looking at the various distributions of the
20 PFAS levels that are seen in these two groups and
21 demographic characteristics that have -- seem to be
22 associated with five of the most frequently detected
23 compounds from our panel. And as Jennifer told us, the
24 expanded panel was done on this study. And I have
25 detection frequency slides for you, which is probably more

1 appropriate for the afternoon discussion, but they are in
2 reserve should anybody be interested in bringing those up
3 later on.

4 --o0o--

5 DR. ATTFIELD: So ACE I and ACE II both recruited
6 100 participants. A few of the participants were unable
7 to provide a blood sample, so we have 96 from ACE I and 99
8 from ACE II. The mean ages were pretty similar in the
9 mid-40s for both. And they were just under about 50
10 percent male in both studies.

11 Our household income was a little different -- a
12 little higher in ACE I than in ACE II. But the median
13 levels are still much lower than what is typical for our
14 region's median near San Francisco Bay Area.

15 Most of our participants were born outside of the
16 United States with a mean of 51 percent of their life
17 being spent in the U.S. in ACE I, and 36 percent of life
18 spent in the U.S. in ACE II. Accordingly, many of our
19 participants -- they participated in a language other than
20 English, and even more spoke a different language at home.
21 ACE II skewed more heavily towards recent non-English
22 speaking immigrants than ACE I.

23 --o0o--

24 DR. ATTFIELD: So for the five PFASs that I'm
25 going to be talking about today, first, before we compare

1 to other populations, within ACE I and ACE II, we saw that
2 levels were pretty similar for these three, for PFOS,
3 PFUDa and PFNA. And they were a little higher for PFOA
4 and PFHxS in ACE II. And all of these were detected in
5 greater than 98 percent of our participants.

6 --o0o--

7 DR. ATTFIELD: So it is rather difficult to
8 compare levels between studies for PFAS levels, because
9 there are time trends involved that Jennifer showed you
10 the nice graph from the Teachers Study of, and age and sex
11 can be different between studies and effect levels.

12 So I have a graph in the next slide to help you
13 more than a -- you know, a table of numbers. But it
14 includes both a comparison to NHANES Asian groups in
15 2013-2014, but I've also created an extrapolated number
16 for us using the declines --

17 --o0o--

18 DR. ATTFIELD: -- seen in the California Teachers
19 Study to sort of give us a ballpark of maybe what we would
20 expect for the similar ideas -- for the similar levels in
21 the similar years.

22 So let's get to that graph.

23 --o0o--

24 DR. ATTFIELD: So to walk from left to right,
25 first, I'm going to compare to NHANES Asian populations.

1 Our gray and black are ACE I and ACE II. The light blue
2 is our NHANES Asian 2013-2014 levels. And then the dark
3 blue is the approximation of what we might expect for
4 2016-2017.

5 And it was really only straightforward to
6 calculate that for the first three there. That's why
7 there are only three with the dark blue.

8 Woops. Sorry.

9 So starting off from the left to the right, PFOA
10 levels were pretty similar between ACE -- our ACE
11 population and the Asians in NHANES, even when considering
12 a time trend. PFOS levels are higher in ACE than in
13 NHANES, especially if you consider that time trend, so the
14 dark blue bar there.

15 PFHxS levels are pretty similar to NHANES. And
16 PFUDA levels are a little higher than the NHANES Asians,
17 especially if we're to think of a time trend. PFNA levels
18 were pretty similar. So in addition within NHANES, we see
19 differences between Asians and the general population. So
20 that is in PFOS levels, those tend to be higher in Asians,
21 and PFNA levels tend to be higher in Asians. So that's
22 particularly interesting for our results for the PFOS that
23 ours are higher than Asians, and Asians are higher than
24 the general population.

25 --o0o--

1 DR. ATTFIELD: So in beginning to look at what
2 factors from our demographic characteristics are
3 associated with PFAS, this is the list of variables that
4 were seen to be associated with one or more of those five
5 PFASs.

6 I'll let you read through them.

7 And then in my next slide, I started looking
8 at --

9 --o0o--

10 DR. ATTFIELD: -- which ones contributed the most
11 when you put them together in statistical models.

12 So the analyses that I did at this point combined
13 ACE I and ACE II data. And I'm just going to walk you
14 quickly across this table before I start populating it
15 with numbers.

16 So here, I'm going to be looking at the percent
17 adjusted change. So, for example, our first variable here
18 is sex, so contrasting males to females. So if a number
19 of 50 was in there, that's a 50 percent increase seen in
20 males over females in the serum levels.

21 Then we do, in some compounds, see differences by
22 age in females versus males. So I've just broken those
23 out into separate columns to make it easier for
24 readability. Then contrasting non-English interview
25 language to English, contrasting different birth countries

1 to the United States, and then portion of life in the
2 United States as fraction from a zero to one, or you can
3 think of it as zero to 100 percent.

4 --o0o--

5 DR. ATTFIELD: So first, for PFOA, sex is highly
6 associated with serum levels at 125 percent increase.
7 This association with age is different for males and
8 females. So we see female concentrations increasing with
9 age, about one percent, while males are slightly
10 decreasing. And in total, this explains about 13 percent
11 of the variability of the model as can be seen in that
12 right-hand column of the R^2 .

13 So PFOS has a much, much less strong association
14 with sex. It's barely affected by it, and there's not
15 observed an interaction between sex and age.

16 We did see an association with the non-English
17 interview language, sort of an indication of
18 acculturation, and with birth country, with the strongest
19 effects seen in those born in China, the 94 percent
20 increase.

21 And just for reference, where there's an
22 asterisk, those are the ones that are actually not
23 statistically significant. Everything else will be at a P
24 less than 0.05.

25 So moving on to PFHxS. Again, a substantial

1 increase, 368 percent, with male sex as observed. And the
2 similar difference in affects on age by sex, as we'd seen
3 in PFOA. So increases in the males -- the females, and
4 just a slight decrease in the males.

5 Here we see an association with birth country
6 again, though this time more with birth in Vietnam. And a
7 greater portion of life spent in the United States was
8 associated with a decrease in the PFHxS levels. And this
9 explained about 49 percent of the variability in these
10 models.

11 So PFUdA, no association with sex actually bears
12 out in the complete model or with age. And the
13 associations are more seen in the acculturation type
14 variables. So with the non-English interview language,
15 and with the portion of life spent in the United States.

16 --o0o--

17 DR. ATTFIELD: And finally, PFNA returns to
18 having a stronger effect of greater percent, 82 percent,
19 adjusted change in males versus females, along with the
20 sex-dependent increase in age. And only portion of life
21 in the U.S. also remained in the model with a similar
22 decrease with a greater portion of life spent in the U.S.

23 So everything together for reference.

24 And then to put this in context of what we see
25 with other studies. So male sex is generally seen to be

1 higher in many of the PFAS levels. This is not unusual,
2 except for -- sorry, I haven't advanced the slide.

3 --o0o--

4 DR. ATTFIELD: -- PFUdA. Also, the age-sex
5 interaction has been seen for those three compounds in
6 NHANES in analysis in 1999 to 2008 data, as well as in Red
7 Cross study of 2000 to 2015 samples.

8 Other studies have seen more of an effect of
9 education and income. That did not bear out so much in
10 this study. And for this study, we're able to look at
11 birth country and time spent in the United States. And
12 that's really not been previously investigated, though we
13 may be able to look at it in our BEST data.

14 --o0o--

15 DR. ATTFIELD: So, since a majority of our
16 participants were born out of the country, we do need to
17 consider if they can be bringing a body burden of PFAS
18 with them when they immigrate to the United States.

19 So starting off with China, there is continued
20 production of PFOS and PFOA in China. And there are these
21 sizable areas of contamination of waterways. So this map
22 is a map of waterways and sediments. And just for
23 reference, the green bar is the PFOA, and water in there
24 are levels that over 100 nanograms per liter.

25 --o0o--

1 DR. ATTFIELD: So there are biomonitoring studies
2 going on there. Not a national program, of course. But
3 they have ranges of results, some of them are comparable
4 to the United States and some of them have very high
5 levels. So, an example, of very high levels, there's a
6 study of employees of a contaminated fishery where the
7 PFOS median level was 10,400 micrograms per liter. So if
8 you can cast your mind back, we were looking at like seven
9 in this study.

10 And in West Virginia and Ohio, where there was
11 drinking water contamination, their levels were around 80
12 at the median. So it's quite a -- quite a contrast. And
13 then residents near a fluorochemical industrial park with
14 PFOA, median levels of 9.4. And ours were around two, so
15 that's for contrast.

16 And currently, we do not have something to
17 compare to for Vietnamese-Americans, there are no current
18 PFAS biomonitoring studies in Vietnam.

19 --o0o--

20 DR. ATTFIELD: For next steps for this study and
21 for analysis. So we do have quite an extensive
22 questionnaire that I've been plumbing. And we're going to
23 be pulling out more interesting factors from that to learn
24 about the participants.

25 One limitation of this is we -- lots of us are

1 very interested in drinking water contributions. And this
2 is not the ideal study to look at that. For one, it's a
3 very limited geography, so very limited variability, and
4 inputs. And we don't have water consumption types of
5 questions in this, though more in the CARE Study, which
6 will have greater -- also greater geographic variability
7 to make that a much more reasonable place to be looking at
8 those contributions.

9 We will also be looking at trying to tease apart
10 product use of imported products versus domestic products
11 in thinking about acculturation and body burdens brought
12 to the U.S. versus acquired here.

13 --o0o--

14 DR. ATTFIELD: So takeaways from this work is
15 that community studies can reveal more about subgroup
16 populations within California, and that our regional
17 immigration and racial ethnicity patterns may contribute
18 to differences in PFAS levels and other contaminants that
19 we may see across the state that might become evident in
20 our CARE Studies as they're sort of different racial
21 make-ups in our regions.

22 --o0o--

23 DR. ATTFIELD: And moving on, I'd like to thank
24 our participants, our community partners, and all the
25 wonderful Biomonitoring California staff that have worked

1 on this study.

2 And that is the end of mine.

3 (Applause.)

4 DR. ATTFIELD: Are we moving directly on to her?

5 CHAIRPERSON SCHWARZMAN: Thank you to both
6 Jennifer and Kathleen.

7 DR. ATTFIELD: Oh, I'm sorry.

8 CHAIRPERSON SCHWARZMAN: We have 10 minutes for
9 Panel questions and audience questions. But I just want
10 to point out that after our next talk, we have a half hour
11 for discussion. So I want to keep this focused to
12 questions for our -- these last two presenters, Jennifer
13 and Kathleen.

14 Tom.

15 PANEL MEMBER McKONE: Just a little -- I have a
16 question related to bioaccumulation. But, you know, one
17 of the things chemically about the PFASs in these
18 compounds is they'd be completely inert if we didn't put
19 that sulfonic acid hook. And it's the hook that allows
20 them to attach to your clothing or couch, and also to
21 proteins.

22 Right, so one of the -- the really interesting
23 things is unlike sort of the classic bioaccumulation from
24 things like PCBs, and dioxins, and chlorinated pesticides,
25 which is really driven entirely by lipid solubility. I

1 mean, it is explained by lipid solubility.

2 Here, it's really a different mechanism. It has
3 to be some -- you know, getting that sulfonic acid hook
4 has to attach to something. And it's not lipids, it's
5 really something else. So the question I have is, you
6 know, have -- how much are you really thinking about the
7 implications of the mechanism of bioaccumulation, both in
8 terms of what you're seeing and the implications for maybe
9 how persistent these are, so that we can -- I mean, this
10 whole issue of whether it's coming over with people
11 carrying it in their bodies already or not is very tied to
12 that.

13 So I don't know, are you investing a little time
14 and effort into getting a little more understanding of
15 bioaccumulation, because it's going to be important, I
16 think, in the interpretation of results?

17 DR. ATTFIELD: Yeah, I think it's definitely
18 going to be part of the interpretation as we work more
19 with this data. And I think we might be talking a little
20 bit about that in the afternoon panel, because it also
21 bears out in what media we're looking for in the
22 compounds, because some compounds are more persistent than
23 others, and some are coming -- more enriched in serum and
24 maybe urine is a better platform for looking at some of
25 the shorter half-life chemicals -- the shorter chain ones.

1 So, yes, we'll be looking into that.

2 Is there any other comments?

3 PANEL MEMBER MCKONE: It's a really good study,
4 though, by the way. I should have started with that.

5 (Laughter.)

6 PANEL MEMBER MCKONE: This is really useful --

7 DR. ATTFIELD: It's interesting.

8 PANEL MEMBER MCKONE: -- and important. And, you
9 know, this is going to be so valuable as we build this up,
10 because these compounds are -- they are very persistent.
11 I mean, fluorinated compounds are inert and very
12 persistent. And the only thing we've got going for us is
13 that they've got this hook on the end. And that may be
14 the way to break them, but you're getting on the pathway
15 to understanding at least what's in our population. So I
16 do want to congratulate you on a really good study.

17 MS. HOOVER: Just to pipe in here for those on
18 the webinar, someone tried to send a question through the
19 chat. Please send your questions to the biomonitoring
20 email address, biomonitoring@oehha.ca.gov. I think we
21 caught the question. So I think I'm just going to say
22 that right now. I think the question was if we asked
23 about rice cookers in the ACE Study, so...

24 DR. ATTFIELD: Yes, we -- yes, that -- that
25 analysis is not finalized, so it's -- I can't really go

1 into too much depth on it. But we did ask about not only
2 what type of rice cooker you're using, but how long do you
3 tend to store your rice in the rice cookers, because there
4 are sort of different traditions of you use it right away,
5 or you use it -- you leave it for several days. So that
6 is one thing we are looking at.

7 CHAIRPERSON SCHWARZMAN: Other questions from the
8 Panel?

9 Go ahead.

10 PANEL MEMBER FIEHN: I was really amazed about
11 this very high concentration in -- measured in China in
12 this environmental, you know, accident, I guess, in the
13 fishery. Is there anything known about adverse effects of
14 those employees?

15 DR. ATTFIELD: I think they're still studying
16 them. I don't think there's acute effects that they've
17 observed just yet.

18 CHAIRPERSON SCHWARZMAN: Go ahead, Ulrike.

19 PANEL MEMBER LUDERER: Yeah. Thank you both of
20 you for your presentations, and the really great work that
21 the program is doing.

22 I had a question about the first presentation
23 where there were -- I think you made a comment that the
24 banked samples from the -- I guess the biobank from the
25 MAMAS study are not optimal for PFASs. And I was

1 wondering if you could say more about that.

2 DR. MANN: No, I didn't mean that. I meant they
3 were collected for another purpose. So how they're stored
4 over time and the length of time that they've been stored,
5 that is -- and, you know, when they're analyzed, they're
6 analyzed by us. But originally, they were handled by
7 different people. So that's really more what I meant.
8 They're not optimal. They're appropriate, but just not --

9 PANEL MEMBER LUDERER: So they may have been
10 frozen and thawed and refrozen, or what is it that you're
11 concerned about?

12 DR. WU: Well, we're advised by CDC guidelines
13 when we're taking blood samples to advise our staff not to
14 wear particular products, because there may be PFASs in
15 our cosmetic products. And so there's some -- we have
16 some control over our own sample collection. These
17 samples are collected at, you know, just different
18 clinician's offices, or Quests, or different offices
19 around the state, by -- you know, thousands of these
20 offices.

21 So there's very little control. They're looking
22 at proteins and hormones. So there really is no
23 consideration if this is appropriate for their program,
24 whether or not there's environmental contamination.

25 CHAIRPERSON SCHWARZMAN: Yeah. Veena.

1 PANEL MEMBER SINGLA: My question is also for
2 Jennifer. In terms of the expanded panel of PFASs, you
3 mentioned you did see decreases in detection frequency
4 over time for some of them. Were there any with
5 increases?

6 DR. MANN: No, not that we saw, not statistically
7 significant increases. I did show that slide that looked
8 at the earlier banked genetic screening samples for PFNA.
9 And they seemed to be looking a little bit higher or about
10 the same 12 years later. So that's the one example I can
11 think of sort of more possible increase, possible
12 stability.

13 Right. And the -- the -- what I was referring to
14 when I was talking about declined detection frequency was
15 actually PFOSA, which is on our original panel. It's a
16 PFC.

17 CHAIRPERSON SCHWARZMAN: Other questions from the
18 Panel?

19 Carl.

20 PANEL MEMBER CRANOR: Quick question. You're
21 looking mostly for the long-chain molecules as opposed to
22 there -- there's -- a batch of new ones are short chain,
23 all of them?

24 DR. MANN: Yeah. The original panel included
25 more of the longer chain carboxylates sulfonic acids,

1 so -- but the expanded panel includes all sorts of PFASs.

2 PANEL MEMBER CRANOR: Thank you.

3 CHAIRPERSON SCHWARZMAN: Is that it from the
4 Panel for now.

5 Okay. Please, Andrea.

6 MS. VENTURA: Hi. I'm Andria Ventura with Clean
7 Water Action. And I was really excited about this,
8 because I am currently working on subsistence fishing,
9 particularly in San Francisco Bay, but protected
10 subsistence fishers. And we know that we have PFAS in
11 California waterways. Our understanding of what's out
12 there is just emerging thanks to some of the scientists in
13 the room.

14 What I'm wondering is as you look at people
15 coming over with a body burden, are you -- or will your
16 questionnaire also include what are their practices here
17 around fishing and fish consumption out of California
18 waters?

19 And my other question has to do -- and this will
20 come up with drinking water later as well. One of the
21 studies I was reading about short chain was that the
22 half-life in the body may not be the issue. It may be the
23 fact that we're constantly exposed to them. And I'm
24 wondering if you're looking at that at all in relation to
25 fish consumption and polluted waterways?

1 DR. ATTFIELD: So I can speak to what we were
2 doing in the ACE Study, and a little bit of CARE Study on
3 that. So we actually have quite a lot of questions about
4 fish consumption patterns and fish purchasing patterns,
5 both of -- did you sort of -- did you acquire it from your
6 own fishing? I mean, we don't call it quite subsistence
7 fishing, but different types of local fishing, so where
8 you tend to purchase it, if it's from a store or from a
9 market, et cetera, and the frequency with which you are
10 buying it and consuming it.

11 And then we have a little bit about that on the
12 CARE Study, but not quite in the same amount of depth.
13 CARE we did have to pare things down to keep things
14 efficient for our participants.

15 CHAIRPERSON SCHWARZMAN: Yes, next public.

16 DR. ATTFIELD: Yeah, since we are asking about
17 the frequency of consumption, hopefully that can help.
18 But we don't have any questions about sort of how long,
19 you know, how many years have you been in the practice of
20 eating -- or eating or purchasing in a particular pattern.
21 But hopefully the frequency of consumption can help us
22 think about sort of persistence of exposure versus -- you
23 know, anything that's periodic for a short-chain substance
24 is going to be very, very difficult to capture.

25 DR. READE: Hi. My name is Anna Reade. I'm with

1 Natural Resources Defense Council.

2 And I was actually going to follow up on Andria's
3 question about fishing. Sorry. And we know that there's
4 been some tests that show that PFOA, PFHxS, and PFBS have
5 been found in fish. And I was wondering if you were able
6 to look at the shorter PFBS or are you planning on doing
7 it?

8 DR. ATTFIELD: Yeah. So the expanded panel was
9 done on our ACE population, so that's 32 compounds. And
10 as Sara is gesturing it's in the handouts and the
11 checkmarks indicate -- the check marks are the expanded,
12 and the little C's are the original, is that correct?

13 MS. HOOVER: Yes.

14 DR. ATTFIELD: Okay. So PFBS, yes, we are
15 looking at that and some other short-chain compounds.

16 DR. READE: I'm sorry. I should have asked if it
17 was in urine as well, or if you're just doing --

18 DR. ATTFIELD: We are doing serum. We do not
19 have a urine method.

20 DR. READE: Okay. And then the other question I
21 was going to ask is about if you were able to ask if they
22 were breast feeding or -- at all in the questionnaire,
23 because that tends to be an elimination route?

24 DR. ATTFIELD: So we actually don't have that in
25 the ACE questionnaires, but we do have it in the CARE

1 questionnaire.

2 CHAIRPERSON SCHWARZMAN: Great. Thank you, both
3 Kathleen and Jennifer for your excellent presentations.

4 Next, I want to introduce Sabrina Crispo-Smith
5 from the Department of Toxic Substances Control. She's a
6 Senior Research Scientist in the Biomonitoring Section of
7 the Environmental Chemistry Laboratory there. And she
8 holds a Ph.D. in chemistry from the University of British
9 Columbia.

10 She's going to talk about biomonitoring results
11 for the case study of firefighters heavily exposed to
12 firefighting foam. And she'll also provide a brief update
13 on other PFAS work at the Environmental Chemistry Lab.

14 --o0o--

15 (Thereupon an overhead presentation was
16 presented as follows.)

17 DR. CRISPO SMITH: Can everybody hear me okay?

18 No, not all.

19 Can you hear me now?

20 (Yeses.)

21 DR. CRISPO SMITH: Okay. All right.

22 Thank you for the introduction. As was stated, I
23 work in the Environmental Chemistry Laboratory at DTSC.
24 And I was asked to close out this session with an overview
25 of what we are working in regards to the PFASs analysis.

1 Let me get situated here.

2 --o0o--

3 DR. CRISPO SMITH: So I'm going to begin my talk
4 with a quick overview of the current methods we have in
5 our lab, both targeted and untargeted, which we've been
6 using to analyze PFASs in human serum. And I'll continue
7 with a discussion of a recent study that we have been
8 working on, where we applied our three methods to three
9 firefighters that were accidentally exposed to
10 firefighting foam, and then finish up with covering some
11 of the current and proposed work for our lab.

12 --o0o--

13 DR. CRISPO SMITH: So since this is a lab talk,
14 I'm going to start by showing you the method in which we
15 use. So this is one of our -- I think it was referred to
16 as traditional in Jennifer's talk -- traditional or
17 classic method that we use for targeted PFAS method. This
18 is the 12-component method that was done on the earlier
19 studies. And here is a list of all of the components
20 measured in this study. So actually, PFBS is listed in
21 there.

22 This method was started in our lab around 2010
23 and contains the compounds that are -- were also included
24 in the CDC NHANES studies during this time.

25 --o0o--

1 DR. CRISPO SMITH: This is the new targeted
2 method that we used for PFAS. And I meant to mention it
3 last time. I'm using the word targeted, because these two
4 methods are looking at specific compounds, so we're not
5 going to find anything additional to what we're looking
6 for. This method has been used on ACE I and ACE II, the
7 data that Kathleen just presented.

8 --o0o--

9 DR. CRISPO SMITH: And it includes both the
10 classic list, and some additional -- sorry it's
11 bouncing -- some additional shorter chain carboxylic acid
12 groups, one additional sulfonic group, and then some
13 replacement precursors, including some telomers, both
14 carboxylates and sulfonates, and then some additional
15 compounds that are used in other commercial products.

16 --o0o--

17 DR. CRISPO SMITH: The third method that I'm
18 going to speak about today is in-house is a non-targeted
19 method. Sorry. And it can be referred to as non-targeted
20 or semi-targeted, because we're looking at a specific
21 group of compounds.

22 And it uses a time of flight mass spectrometer to
23 scan samples for all measurable compounds found within a
24 sample under certain conditions. This method produces a
25 lot of data which needs to be screened through filters,

1 and then matched to a database to confirm compound
2 identification.

3 Different levels of confirmation are possible for
4 this method depending on the confidence of the
5 identification. So I will now discuss these -- how these
6 methods have been used in our limited study.

7 --o0o--

8 DR. CRISPO SMITH: So first some background on
9 the limited study. So in 2015, a physician -- a concerned
10 physician requested that we do analysis on three
11 firefighters who have been accidentally exposed to fire
12 fighting foam. We weren't given much more information
13 than that. So there are a lot of questions with this,
14 which is why it's called a limited study. We didn't get
15 to question the people who gave us the samples.

16 We don't actually know the specifics of the
17 accidental exposure, what type of foam they were exposed
18 to, or even the time between the exposure and the
19 collection of the serum, and also any other information on
20 possible PFAS exposure. So we now choose our method just
21 to see what we could determine just from the serum above
22 the exposure.

23 So we first ran the classic method, so the
24 12-component method.

25 --o0o--

1 DR. CRISPO SMITH: We measured the compounds for
2 these nine components here. The other three that are not
3 listed were below detection limits for these three
4 firefighters. Most of the levels listed here are -- fall
5 below the 95 percentile of the NHANES -- the CDC NHANES
6 results from 2013 and '14. But there were two exceptions.

7 --o0o--

8 DR. CRISPO SMITH: The PFOS and hexa-sulfonate.

9 --o0o--

10 DR. CRISPO SMITH: So when you compare the NHANES
11 data from the 2013 and '14 for males only, because we do
12 know males have slightly higher levels, the three
13 firefighter concentrations are shown here in the blue
14 diamonds. Two of them actually are above the 95
15 percentile with the PFOS levels for firefighter A and C
16 being 20 to 40 percent higher than the 95 percentile for
17 PFOS, and 20 to 60 percent higher for the hexa-sulfonate.

18 And the firefighter B serum - you can find it
19 within the lines - falls within the range of the NHANES
20 participants.

21 We then also compared the results to the FOX
22 Study, which is one of the firefighter studies we did in
23 2010-2011. Now one thing to note is that levels have been
24 decreasing over time. And although the participants'
25 levels were higher than the median, which is that green

1 dot there, in the study - two times higher for PFOS and
2 three to five times higher for PFHxS - they do not exceed
3 the maximum value of the FOX Study. But as with our three
4 firefighters, we do not know what the high -- what kind of
5 ex-exposure the maximum person had and whether or not it
6 was similar to the other firefighters within this study.
7 So the meaning of the maximum value at this time is
8 unclear.

9 --o0o--

10 DR. CRISPO SMITH: So I'm going to just take an
11 aside. Firefighting foam was mentioned earlier in
12 Jennifer's talk, but I just want to give just a brief
13 overview. So the aqueous fire -- film-forming foam, or
14 AFFF, are proprietary mixtures which is are used to put
15 out fuel-based fires mainly. And they contain fluorinated
16 surfactants. And one of the interesting things is that
17 there are two different manufacturing processes for these
18 foams. There's an earlier one, which was one process,
19 which is actually electric chemical fluorination that
20 would end up producing some side-products of PFAS --
21 PFSA's, so the sulfonic acids, like the PFOS and the PFHxS.

22 But the newer telomerization process, which when
23 3M stopped using the electric Chemical in 2002 - sorry -
24 the new method does not produce these PFSA's, but can
25 possibly produce fluorotelomers and possibly the

1 carboxylates as degradation products. And this kind of
2 gives us a fingerprint of what type of AFFF exposure could
3 have happened.

4 And now another thing to note, and it was alluded
5 to earlier as well, is that firefighter PFAS levels are
6 higher than the general population. The factors that can
7 affect the levels are whether or not the're male or
8 female, the number of years on the job, the type of
9 exposure, and actually the number of blood donations as
10 well.

11 We don't know any of this information of our
12 three firefighters in this study, but we were curious to
13 see what we could find just from our methods to see how
14 they compare.

15 --o0o--

16 DR. CRISPO SMITH: So the next thing we did was
17 we looked at the expanded method for these three
18 firefighters. And we found detection frequencies for four
19 of these compounds. Now, the two FtS compounds are
20 interesting as they are -- have been found to be
21 degradation products in environmental samples exposed to
22 the firefighting foam. But we did find that the levels
23 were similar to the levels found in ACE I and ACE II.

24 Although they were similar to the higher level,
25 because as was stated in Kathleen's -- sorry --

1 presentation, the detection frequencies for all these four
2 compounds within the ACE I and II were below 50 percent.

3 So we weren't really sure what this meant for the
4 firefighting foam used by the firefighters. Does it mean
5 that there's an older version of the firefighting foam,
6 which is why we don't see the sulfonates very high, the
7 FtSs, or did it mean the compounds were transformed or
8 metabolized into compounds we were not targeting?

9 So at this point, we decided to test the samples
10 for the semi-targeted method to see if there were
11 additional compounds we were not targeting, but were
12 measurable in these three firefighters.

13 --o0o--

14 DR. CRISPO SMITH: So here are the -- I just want
15 to start by saying, this analysis, the semi-targeted
16 analysis, data analysis is still ongoing. So these will
17 just be very preliminary results. So the initial analysis
18 from a -- sorry -- the initial screening results 3,369
19 features, which I'm just going to point out, features that
20 are kind of potential compounds that could be found in the
21 study -- in the serum were extracted.

22 This number is similar in range of other serum
23 samples that have been measured in the lab. But when we
24 applied a mass filter for the -- to find the
25 fluorine-containing structures within the firefighter's

1 samples, versus another study done within our lab on
2 pregnant women, we found that approximately 15 percent of
3 these could be fluorine-containing features, which is over
4 two times higher than what we find in the pregnant women
5 population that we've been -- yeah.

6 --o0o--

7 DR. CRISPO SMITH: So after screening the data
8 for the fluorine containing features, we then -- the
9 non-targeted group, then compared these features to the
10 library search results. So the in-house database that we
11 have created from literature in the U.S. EPA market PFAS
12 list contains over 13,000 -- 1,300 compounds combined.
13 And from this review, we found the targeted analysis list,
14 and they were at high confidence levels, although no
15 compound -- other compounds or environmental breakdown
16 products were found in the serum samples via the library
17 search related to the AFFF expected breakdown products or
18 compounds.

19 So that begged the question -- this poses two new
20 questions. Were the compounds in the foam non-persistent
21 in humans or were they transformed? Did the compounds
22 from the firefighting -- did the compounds the
23 firefighters were exposed to all end up as PFAS and
24 hexasulfonate, or are there additional potential compounds
25 to be found?

1 Sorry.

2 --o0o--

3 DR. CRISPO SMITH: So as this process has just
4 started, we do not have a definitive chemical fingerprint
5 for the foam to which the firefighters were exposed. But
6 some of the scan data has been suggestive. From a list of
7 potential compounds and the scan data I just mentioned,
8 the non-targeted group has proposed the following
9 structure from one of the compounds. And this proposed
10 structure was determined from the accurate mass of the
11 compound, isotope patterns, and formula examination.

12 --o0o--

13 DR. CRISPO SMITH: And this structure could be a
14 breakdown product of one of these perfluoroalkyl
15 sulfonamide amino carboxylates probably with N equals 4.
16 And it actually is a product of the electric chemical
17 fluorination process. And as I said earlier, the electric
18 chemical fluorination process also can produce the PFASs
19 that we also saw in the targeted analysis.

20 So as I stated, this is preliminary data. But as
21 more information about the potential compound is analyzed,
22 such as this fragmentation pattern, we may become more
23 confident in our assessment.

24 Additionally, as the lab continues that detective
25 work in the processing of the yet unknown other features

1 or potential compounds, additional information about the
2 type of exposure could be determined.

3 So although the study isn't complete, it does
4 show both the possible power of the non-targeted and
5 semi-targeted analysis to find compounds that we aren't
6 targeting but could be potential PFASs exposure, but
7 there's still some work to be done.

8 --o0o--

9 DR. CRISPO SMITH: Sorry.

10 So in the prior example, we moved from targeted
11 to semi-targeted analysis as a way to look at exposure.
12 This process could be applied to the current and future
13 Biomonitoring California projects such as MAMAS, where we
14 may be able to find additional PFASs that we are not
15 currently targeting or can target based on the
16 availability of certified standards.

17 Another one of our projects, a collaboration
18 between DTSC, UCB -- UC Berkeley, and UCSF studying
19 exposures in pregnant women is being performed in reverse.
20 That is in this project, it's starting with the
21 non-targeted analysis of the samples. Once completed,
22 class or classes of compounds found to be detectable at
23 high rates in the participants will be selected for
24 targeted analysis. In this way, our laboratory will be
25 able to focus on important exposures to Californians and

1 hopefully be able to detect, as new emerging chemicals of
2 concern start to be measurable in California populations.

3 In addition to the current time of flight mass
4 spectrometer set-up we have, which is a liquid
5 chromatography system, we will be installing this fall
6 another time of flight system connected to a gas
7 chromatographer -- gas chromatograph that will aid in also
8 monitoring exposure to compounds that are too non-polar
9 for our current system to monitor.

10 --o0o--

11 DR. CRISPO SMITH: So this is my second to the
12 last side. I have no idea how I'm doing for time.

13 MS. HOOVER: You're doing great.

14 (Laughter.)

15 DR. CRISPO SMITH: Okay. So this just back to
16 targeted analysis for a bit. A couple of our future work
17 for our targeted analysis is to automate the on-line -- an
18 on-line solid phase extraction for our expanded PFAS
19 methods. One of the reasons that it doesn't apply to all
20 studies is that at the moment our expanded method is a
21 manual extraction, which takes a lot longer time and a lot
22 more staff time.

23 Additionally, we're going to be adding some new
24 compounds that have become available in the past year,
25 expanding the current list of compounds that we have or

1 groups that we already have in our targeted analysis. And
2 then also adding the new replacement PFAS compounds, which
3 I think Antonia will be speaking about a bit this
4 afternoon.

5 --o0o--

6 DR. CRISPO SMITH: So I'm at the acknowledgments.
7 So I'd like to thank Miaomiao Wang and also all of the
8 group of the non-targeted analysis group for the results
9 here, other staff within DTSC Biomonitoring staff, and
10 also Biomonitoring California staff.

11 --o0o--

12 DR. CRISPO SMITH: And there is some references.

13 Thank you.

14 (Applause.)

15 CHAIRPERSON SCHWARZMAN: Thank you, Sabrina. We
16 have 10 minutes for questions, and then we'll have a
17 broader discussion.

18 Yeah, Oliver.

19 DR. CRISPO SMITH: I knew you were going to be
20 first.

21 PANEL MEMBER FIEHN: Thank you for your wonderful
22 presentation and interesting results you have found
23 confirming our suspicions that we should look more
24 broader, but also, of course, that we find, you know,
25 higher exposures in people who are actually exposed,

1 right?

2 (Laughter.)

3 DR. CRISPO SMITH: Yes.

4 PANEL MEMBER FIEHN: I mean that's good.

5 (Laughter.)

6 PANEL MEMBER FIEHN: So my question is a little
7 bit -- or my comments, I guess, is a little bit be
8 careful.

9 DR. CRISPO SMITH: Yes.

10 PANEL MEMBER FIEHN: And you know that you're
11 careful.

12 DR. CRISPO SMITH: Yes, trying to be.

13 PANEL MEMBER FIEHN: In terms of the numbers of
14 potential fluorinated products.

15 DR. CRISPO SMITH: Yes.

16 PANEL MEMBER FIEHN: The reason is, A, you did
17 not show MS/MS -- or you did not use MS/MS. So I would
18 encourage you to use so-called iterative MS/MS generation,
19 and the newest of software release that's possible to get
20 really exhaustive MS/MS spectra for all your features.

21 And secondly, the MGF software doesn't work. So
22 it simply does not work. Don't use it. There are better
23 software for that.

24 And, you know, there is further alternatives that
25 you might want to explore. If you use methanol

1 extractions in plasma, you get like a boatload of lipids
2 that get really into the depth of, you know, overshadowing
3 everything else. Even with solid phase extraction, you
4 still have, because they're lipophilic, you know, really
5 problematic, you know, very abundant lipids. And then you
6 look for very low abundant contaminants.

7 So there are sample preparation methods these
8 days to take out the lipid fractions from different
9 companies, but let through other non-lipophilic or other
10 types of compounds.

11 DR. CRISPO SMITH: Okay. Like Phenomenex.

12 PANEL MEMBER FIEHN: There are different -- I can
13 tell you maybe offline. I mean, that's something that we
14 can do offline. I'm just saying that these are
15 possibilities.

16 DR. CRISPO SMITH: Thank you.

17 PANEL MEMBER QUINTANA: Hi. I had a simple first
18 question which is what was the period of time between
19 their exposure and the time they gave you a sample?

20 DR. CRISPO SMITH: We were not given that. It
21 was in one of the things we don't know. We -- we're not
22 sure how long it was between the exposure and when the
23 serum was collected.

24 PANEL MEMBER QUINTANA: And my second question is
25 just arises from the fact that in our laboratory Dr. Eunha

1 Hoh in our faculty, we're doing non-targeted analysis of
2 dust and of air samples from U.S.-Mexico border. And when
3 you find these compounds, you know, it's really exciting
4 that we're finding all these compounds for which there's
5 no ChemMaps track number or there's -- there's all these
6 new compounds.

7 But then how do you move towards targeted
8 analysis if we're struggling with the fact you can't buy a
9 standard? And so -- so we're trying to figure out how do
10 we prioritize what we're going to try to focus on. Are
11 you going to synthesize your own standards or what are you
12 going to do?

13 So we're kind of struggling with that right now.
14 And so I'm just curious about your comments.

15 DR. CRISPO SMITH: Yeah, that is one of the
16 issues with the non-targeted analysis, I guess, looking
17 back at my TOF group people. I do know that there are
18 companies that are willing to synthesize compounds for you
19 for an exorbitant price. I guess one of our hopes, as you
20 start letting the scientific community know about either
21 these groups or these possible structures that companies
22 may kind of hop on the, you know, try to get ahead of what
23 people will be wanting in the future.

24 But at this time, we don't have a synthesis group
25 within our lab. So it is a question that is a good one.

1 And I don't have a perfect answer for you right now. But
2 if we notice that we are finding certain structures that
3 aren't -- okay. Sorry -- that aren't available for
4 purchase for quantitation, then we may be willing to spend
5 more money in that area, even if it does cost money to
6 have these things synthesized than to continue just doing
7 the targeted analysis that we are obviously missing
8 things.

9 That's how I feel as a scientist in the lab. I
10 know I don't get control over everything, but that's, I
11 guess, one of the points.

12 PANEL MEMBER QUINTANA: Thank you.

13 CHAIRPERSON SCHWARZMAN: Other Panel questions?
14 Sara.

15 MS. HOOVER: Just one follow-up. That's a great
16 question. And we're going to be talking about that this
17 afternoon. That's one of the major purposes of this
18 meeting is to figure out how should we go forward with
19 PFASs. So great lead-in to the afternoon.

20 I wanted to say one thing about the morning
21 comment that I saw flash in that was from Jen Jackson. I
22 didn't identify her. So if Jen is still listening, could
23 you please email us your affiliation and your comment, so
24 we have a record of that.

25 And we have another question for Sabrina from

1 Carin Huset a research scientist at the Minnesota
2 Department of Health. "When you measure PFOS and PFOA, do
3 you quantitate the isomers separately, (e.g. linear isomer
4 separately from branched isomers)? If so, is there a
5 difference in the isomer profiles observed in your three
6 firefighters?"

7 DR. CRISPO SMITH: All right. Hi. So -- this is
8 Sabrina again. So we actually are just quantitating
9 the -- well with the original method, the 12-compound
10 methods, the isotopes are within the same peak. And then
11 with the new method that we do separate them out, but we
12 do quantitate them by integrating both peaks on the same
13 calibration curve. I did actually look at this a little
14 bit by just looking at the peak areas between the three
15 firefighters and some of the ratios within ACE and I
16 didn't find any specific like, oh, this is, you know, 50
17 percent versus like the three. I think one -- three to
18 five percent -- or one to three percent the isomers versus
19 the large peak.

20 I found the same within the ACE and the
21 firefighters. So I didn't really bring that up in the
22 talk, but I didn't see an isotopic signal -- sorry, an
23 isomer signature in fire -- in the firefighters. That was
24 different than the other populations.

25 CHAIRPERSON SCHWARZMAN: Other questions for

1 Sabrina?

2 Thank you so much for your talk.

3 (Applause.)

4 CHAIRPERSON SCHWARZMAN: So we now have until we
5 break for lunch, which is at 12:25, to have a discussion
6 based on the morning's talks. And we've heard a lab
7 update just now, and discussion of those findings. We've
8 heard a general program update, and then the really
9 exciting study results on several biomonitoring studies
10 that have looked at PFASs, and that can all be the subject
11 for discussion now until lunch. And I'll open it up here.
12 Tom looks like he's ready.

13 PANEL MEMBER MCKONE: Hi. Thank you. There we
14 are. So this may be something we pick up this afternoon
15 too, but it's something that it kind of rises out of the
16 PFAS kind of discussion, which is -- and I think it
17 relates to a lot of what we do in the Biomonitoring
18 Program, which is we do tend to look backwards. That is
19 we look at the chemicals that have been used and not the
20 chemicals that are going to be used. And I know one -- I
21 mean, when we looked at the siloxanes, that was many years
22 ago, we were kind of getting ahead of the curve.

23 So what I bring up is, you know, my meetings with
24 environment -- I met with an environmental chemist in
25 Europe who's working on clothing. And he said you know

1 what you have to understand is people expect certain
2 functions from clothing, stain resistance, water
3 resistance, brightness. You know, you've got to wash
4 them. They have to stay bright. And he said there's
5 hundreds of compounds that go into your -- he said, you
6 know, nobody buys cotton pants. It's cotton pants with
7 about a hundred other chemicals that go in there to make
8 them function the way we want them to function.

9 And, you know, historically we got a lot of that
10 function from, you know, compounds that we're now finding
11 in the environment and everywhere else. The fluorinated
12 compounds are really great at stain resistant, and in
13 water resistance. I mean you can spill wine on your pants
14 and it beads up and you just wipe it off, right.

15 (Laughter.)

16 PANEL MEMBER MCKONE: So one of the things I
17 think we have to be keeping an eye on in this program is
18 not just the, you know, like the fluorinated compounds
19 that are still out there somewhat, and definitely
20 yesterday's issue, but also what's coming, particularly in
21 Europe, where there's a real push there to really get away
22 from anything that's persistent. And there's a lot of
23 researchers in green chemistry and other areas really
24 pushing. And so what we have to do is think function.
25 And the functions that are going to be there, not chem --

1 not always chemicals.

2 I know we think chemicals, but -- and the
3 depressing part of the conversation is people will not buy
4 anything anymore that doesn't have -- we've gotten so used
5 to or so much expecting our clothes to function the way
6 they function that nobody is going to buy clothes that
7 look dingy after you wash them. We expect them to look
8 bright. We have to do that with chemicals. They don't
9 just stay that way, and stain resistant, et cetera. So we
10 have to keep an eye on what those chemicals will be.

11 Well, this is the fluorinated chemicals, but then
12 another class there's all this same problem that people
13 expect function and we have to find out how that function
14 is going to be met.

15 So again, this kind of a -- I'm not -- I'm just
16 raising this as a broad issue that we have to keep
17 focusing on as we move forward in the program, so we
18 aren't just looking at the present or looking backwards,
19 but also looking a little bit into the future.

20 CHAIRPERSON SCHWARZMAN: Yeah, If I could take
21 off on that for just a second. I think it's an
22 interesting point to raise, because I think it's something
23 that biomonitoring struggles with very publicly, you know,
24 to -- it's benefit is how do you select compounds when you
25 don't know where the market -- when there's no -- there's

1 no automatic source of information about where the market
2 is headed, and the market gets some signal from regulatory
3 or advocacy efforts to move away from something, but you
4 don't know what they're moving toward. And so we have
5 this perennial problem of kind of looking backward.

6 And I just wanted to extend the conversation a
7 little bit about -- for ideas about how the staff can
8 think about function, and solicit ideas from the Panel.
9 One resource that I know of is that the Hazard Data
10 Commons has added a function -- a search function that's
11 still in its basically beta form and it's a little
12 difficult to use still, but they're working on to search
13 by function. And I wonder if that would be an interesting
14 place to start, and then start querying people involved in
15 the industries.

16 Like, for example, I'm thinking, you know,
17 outdoor apparel industry has trade associations that
18 may -- you know, you could have a conversation with that
19 says well, here's some things that we're finding are
20 getting submitted as labeled for this function. And a lot
21 of those labels actually come from Europe I think in
22 the -- in terms of the current data sources that the
23 Chemical Data Commons uses for that search function, and
24 start having some conversations around that. So that's
25 one small idea that I have that I'd be curious to hear how

1 others might help the program think about function and
2 find -- you know, it's easy to take that step from
3 chemical to function, but then to figure out what else is
4 serving that function is really the harder step that
5 you're recommending.

6 But if we have -- if we as a panel or as an
7 audience have ideas for how the Program might do that, I
8 think that would be really welcome.

9 Yeah, Carl.

10 PANEL MEMBER CRANOR: This is just to echo your's
11 and Tom's point. I do think we need to figure out and try
12 to think through how we can anticipate some of the things
13 that are coming. I think that's a real problem for
14 biomonitoring, because if it's not out there very much,
15 you're not going to detect it very much. And it's not a
16 problem yet perhaps, but it might become a problem if
17 something becomes widely used. But on the other hand, we
18 know that -- well, for example, as I understand it, DuPont
19 when it ran into problems with long-chained perfluorinated
20 compounds quickly went to short-chain compounds. They're
21 out there. Nobody seems to know very much about them. I
22 think it's going to be difficult for biomonitoring, but
23 what can we do to stay with the curve or perhaps ahead of
24 it?

25 CHAIRPERSON SCHWARZMAN: Nancy.

1 MS. BUERMEYER: Nancy Buermeyer, Breast Cancer
2 Prevention Partners. I think it's a really interesting
3 question, and it's a real conundrum not just for the
4 Biomonitoring Program, but for the entire movement,
5 because there is so much secrecy through the chemical
6 industry, not only about what the chemical is or the mere
7 identity of a chemical, but where it's used.

8 We have so little use information for any
9 products that it makes it extraordinarily difficult. I
10 mean, we just got a bill passed last year to even tell us
11 what chemicals are in cleaning products. I mean, like,
12 that's pretty basic.

13 So I think it's a much broader problem than just
14 the Biomonitoring Program. And, you know, we certainly
15 would love to be as helpful as we can, but it's a basic
16 problem with the way we don't regulate chemicals in this
17 country.

18 CHAIRPERSON SCHWARZMAN: One other data source
19 that I'll just interject that's not super helpful probably
20 for perfluorinated compounds, but I think, you know,
21 Biomonitoring California is all aware that there is just
22 the -- CARB just released the new consumer products
23 surveys from 2013 and 2014, which for at least volatile
24 and semi-volatile compounds provides sales data. And
25 there is an -- I've been working with the data a little

1 bit, and there's an indirect way to make a link between a
2 CAS number and a -- a the linked CAS number and product
3 category and then you can go to the sales data. So it's a
4 little bit indirect and we have to connect the dots.

5 But I think there are ways to work with that data
6 which are now provided not in PDF --

7 (Laughter.)

8 CHAIRPERSON SCHWARZMAN: -- in the latest
9 iteration. So that's -- if you're looking at trends,
10 that's difficult, because you still have to work with the
11 PDF data. But in any case, that's one source potentially
12 for some volatiles and semi-volatiles.

13 Yes, please.

14 DR. READE: Hi. Anna Reade with NRDC again.
15 Thank you for the -- I'm really excited about the
16 non-targeted testing. I'm wondering if we could possibly
17 look at what's now being used or being tested for in food
18 packaging, because the FDA did ban a group of long-chain
19 PFASs, and possibly that could be a point in the direction
20 of where other markets will go in terms of the types of
21 new PFASs they're using in the market.

22 CHAIRPERSON SCHWARZMAN: Yeah, Veena.

23 PANEL MEMBER SINGLA: Adding -- adding -- kind of
24 building off of -- off of that comment and thinking about
25 how to understand which kinds of compounds are used for

1 various functions, I think product testing data that
2 exists could be helpful for that, looking at what kinds of
3 PFASs have been found in food packaging, versus clothing,
4 versus cosmetics, versus stain-resistant treatments, and
5 trying to understand which subgroup of PFASs those
6 compounds belong to, and what some of the replacements
7 within the subgroup might be being used.

8 And I also wanted to mention to the extent that
9 it may be helpful, the chemical inventory reset under the
10 Toxic Substances Control Act, which is now available
11 on-line through U.S. EPA, is about 40,000 chemicals that
12 companies have reported as being in active commerce. So
13 that may be a source to look for both, which PFASs have --
14 are being reported as not being manufactured or used
15 anymore and which new ones may have come on-line.

16 CHAIRPERSON SCHWARZMAN: Yeah, Sara.

17 MS. HOOVER: I actually have just a related
18 question, which is relevant to Veena. I'm curious if
19 anybody -- I haven't had a chance to delve into this, but
20 if any -- any of the Panel members or anyone else have
21 delved into this OECD data base that they just released
22 with 4,730 unique CAS numbers. They're not necessarily
23 unique PFASs. But just curious if anybody's delved into
24 that or if anybody -- Tom, with your European connections,
25 if anyone has a sense of -- we're always wondering -- you

1 know, we hand wave and say there's thousands of PFASs in
2 use globally, but, you know, just playing off that point a
3 little bit more, like what's happening in the U.S., versus
4 Europe, versus China?

5 I think it is hard to get to the, you know, core
6 of the story, which is what you were pointing to Tom.
7 Just wanted to throw that out there as another talking
8 point.

9 CHAIRPERSON SCHWARZMAN: Has anyone on the Panel
10 delved into that?

11 I think we don't have an answer for you, Sara.
12 (Laughter.)

13 CHAIRPERSON SCHWARZMAN: There's an audience
14 question or comment.

15 DR. WANG: There's a master list of PF -- I'm
16 sorry. Hi. This is Miaomiao Wang from DTSC.

17 So for the PFAS master list, U.S. EPA just
18 compiled a master list of PFAS. And they have 5,000
19 compounds of PFAS. They're not totally fluorinated. But
20 there are chlorine and bromide, but most of this is the
21 most up-to-date and the most complete list. So you can
22 find the whole list, download it from the -- their
23 website.

24 CHAIRPERSON SCHWARZMAN: Andria.

25 MS. VENTURA: Hi. Andria with Clean Water Action

1 again. I'm back to say something radical and completely
2 politically unviable.

3 (Laughter.)

4 MS. VENTURA: But you have to put it out there
5 sometime to get there in the decades to come.

6 It seems to me, as I've been working on PFAS
7 chemicals and this issue that Dr. Malone brought up, and
8 to build on what Nancy said before is that, you know,
9 you're piecing together lists and trying to figure out
10 what's out there, both the scientists, there's NGOs, all
11 of us. And at some point, there needs to be a different
12 paradigm where we look at a class of chemicals that we
13 have -- you know, at least have the red flag on, even if
14 we have not proven everything definitively.

15 And there has to be a place, whether it's in the
16 United States or whether it's in California, where if
17 those chemicals are used in products that come in to say
18 the state, or are being used in processes in the state,
19 that has to be registered with some agency in the state,
20 or the country. You know, that would be ideal. Not going
21 to happen in the near future.

22 And that I know is a crazy idea. It's -- you
23 know, but what we need to start thinking about, and why
24 I'm saying this crazy idea, is because one of the things
25 biomonitoring and other issues -- you know, in other

1 processes in the state as we look at these chemicals,
2 whether it's in water, whether it's through biomonitoring,
3 whether it's through DTSC Safer Consumer Products, what we
4 need to start doing is building the case for that paradigm
5 for classes of chemicals.

6 That's something that I hope -- you know, I'd
7 like to put in your thoughts as to a scientist how do we
8 start building that case? We'll run with it as NGOs You
9 know, we'll try to make that happen over the years. This
10 is a long-term vision. I totally get that, but at some
11 point we have to turn this around, because we can't -- we
12 will never catch up.

13 And it's something our legislature doesn't
14 understand. It's something that at the federal level I
15 don't think we understand, but we can maybe start thinking
16 in those terms.

17 So there's my crazy idea for the day.

18 CHAIRPERSON SCHWARZMAN: Thank you, Andria.

19 Tom, please.

20 PANEL MEMBER MCKONE: I just want to make a
21 comment that, you know, that -- that idea has -- has
22 succeeded in one area in California, which is pesticide,
23 where in California the pesticide use register -- I mean,
24 if you're going to use a pesticide on your crop, or in any
25 kind of house treatment, or anything, it has to be

1 registered with the State. And it's very useful. I've
2 been involved in work, where we were doing biomonitoring
3 in the Salinas Valley, right? And it was really, I mean,
4 not perfect, but you could find out what pesticides were
5 used. And then when you look in people and find that
6 pesticide, you go, oh, it was used, and it's in the
7 people, or you know what to look for, too.

8 And you see it now it is behind. I mean, it
9 doesn't -- it isn't up-to-date, but, you know, it --
10 that's a nice model. And I don't know why we can't extend
11 that.

12 MS. HOOVER: Closer to the mic.

13 PANEL MEMBER McKONE: I don't know why we
14 couldn't extend that to like other areas of chemical use,
15 because it makes life easy in the pesticide world.

16 CHAIRPERSON SCHWARZMAN: The other thing that I
17 would add is, of course, you know what Andria has asked
18 for, is to some degree provided in Europe -- is this
19 okay -- through REACH registration. It's not use-specific
20 obviously, but at least above. If a chemical substance is
21 produced or imported over one ton per year per producer,
22 that information, the fact of the chemical being used or
23 imported, has to be reported to the -- to ECHA, to the
24 European Chemicals Agency.

25 So that information should be available through

1 ECHA, even though the hazard data isn't very consequential
2 until you get to higher tonnage bands. At least perhaps
3 that's a way of starting to identify trends in categories
4 of chemicals used within a class.

5 DR. WU: And we have seen some trends towards us
6 with for brominated flame retardants are now labeling laws
7 on furniture. It was a long fight, and, you know, I
8 understand there's still lots of out-of-compliance
9 furniture, but, you know, it's going in the right
10 direction.

11 And I believe there's an Assembly Bill that has
12 been proposed by Congressman Ting to label food packaging
13 with -- oh, is it no longer. Okay.

14 MS. VENTURA: Not moving forward.

15 DR. WU: Okay. Well, there are attempts being
16 made -- right, there are attempts being made. There are
17 people who understand the importance of an informed
18 consumer population. It's a long way to go.

19 I do want to just -- I think this is a great
20 conversation. But just in terms of tools that
21 Biomonitoring has, I mean, PFASs are just one part of our
22 world. There are lots of other chemicals we need to try
23 to keep up with. I think this work with a semi-targeted
24 screening is really exciting, because it gives us a
25 fighting chance to figure out what the world of chemical

1 is -- chemicals is, but also some of the work that OEHHA
2 is doing in designating chemicals as classes. I don't
3 know if that's something that could be done in terms of
4 function as opposed to chemical classes.

5 But that allows us to be a little more flexible
6 in looking for and measuring larger groups of chemicals,
7 rather than having to go one by one. But in measuring
8 some of the chemicals that we're looking for and
9 projecting future use for, some of our results return --
10 it complicates some of our results return, because you
11 want to be -- we want to be looking at sentinels for early
12 use, you know, maybe increasing uses of new chemicals.
13 But it's a hard message to convey to a population when
14 you're measuring. We don't want to just be like randomly
15 searching for stuff or giving back results that are very
16 hard to interpret, because we don't know a lot about the
17 toxicology. We don't know about -- a lot about the use.

18 But some of the samples that have been talked
19 about by some of our speakers, the MAMAS samples, for
20 example, where we're not obligated to give back samples,
21 because we don't know anything about the participants.
22 Those kind of anonymous samples can help us as just like
23 early sentinels of chemical use. And I want to encourage
24 continuation of that kind of work.

25 CHAIRPERSON SCHWARZMAN: Sara.

1 MS. HOOVER: Hi. A couple things. Sara Hoover
2 OEHHA.

3 First, with regard to the group designation. So
4 Gail Krowech is in the audience. And she and I with Gina
5 Solomon's, and Lauren's, and Martha's input, we developed
6 this approach for identifying chemical classes, and, yes,
7 it indeed does include function sometimes.

8 So you'll see -- you know, we did brominated and
9 chlorinated compounds used as flame retardants, because we
10 didn't want every single brominated and chlorinated
11 compound to be captured in that. In other places we use,
12 you know, just the chemical class, like the PFASs. So we
13 can definitely look at different types of categories.

14 The most important thing though is you need to
15 understand the nature of the chemicals in the category,
16 because really our lists are -- essentially, you know,
17 we're not a regulatory program. We're a program that is
18 about measuring exposures. So when we put a group of
19 chemicals on the list, we want to have some handle on, you
20 know, why is this important for exposures and could we
21 measure it in biomonitoring. So that's a piece of what
22 our criteria are.

23 I'd also like to do two public comments if I
24 could right now.

25 The first comment is from Jessica Bowman, who's

1 the executive director of the FluoroCouncil. And I'm
2 going to read her comment.

3 She says that, "A comment was made that there is
4 not much data on short-chain PFAS. This is a misinformed
5 comment, because regulators have required industry to
6 develop significant data on these newer PFAS chemistries.
7 We have a robust body of data on short-chains posted on
8 our website [fluorocouncil.com/health-environment/
9 scientific-studies/](http://fluorocouncil.com/health-environment/scientific-studies/). We also have a lot of information
10 posted about uses of the chemistry.

11 "We are also looking into the OECD list of PFAS
12 and have some concerns about it. It includes some
13 substances that do not meet the technical definition of
14 PFAS. It's also important to understand that most of the
15 substances on that list are not commercially relevant. We
16 are looking to improve the list to provide more context.

17 "I'll also note that the PFAS used in food
18 contact applications are clearly posted on FDA's food
19 contact notification database".

20 So thank you for that comment.

21 A second comment came in from Sharyle Patton,
22 who's the Director of the Health and Environment Program
23 at Commonweal.

24 And Sharyle says in terms of, "Identifying
25 chemicals another concern has to do with chemicals that

1 might be created or may emerge when PFAS-containing
2 products burn. Given wild land/urban fires occurrences
3 increasing, these may be a source of exposure. PTFE, the
4 polymer used in turnout gear can be a serious problem when
5 high temperatures occur".

6 CHAIRPERSON SCHWARZMAN: Great. Thank you for
7 those, Sara.

8 Other questions or comments from the audience or
9 the Panel on this topic?

10 Yeah, go ahead.

11 PANEL MEMBER QUINTANA: Hi. This is Jenny
12 Quintana. I wanted to change gears just a little bit and
13 be a little less big picture and get down to some smaller
14 picture. And that's going back to the L.A. CARE study and
15 thinking about lessons learned for the next phase. I was
16 thinking about this program. I have one big picture
17 comment, which is why we're doing this program at all at
18 California Biomonitoring. And one is there are a lot of
19 uniqueness to people that live in California and exposures
20 that could occur in California. And you really brought
21 this out when you looked at some of your ACE Study with
22 foreign-born population versus not foreign born, and
23 acculturation issues.

24 And so letting me think about the study for the
25 next phase, rather than just having a category of Latino

1 or Hispanic, should you also have targets that mirror the
2 foreign born or not foreign born status as is found in the
3 region? Or -- the categories look very, very basic, and
4 not even current in the sense they don't have a mixed race
5 category as high as I think it typically is.

6 And so it just made me think about in terms of
7 lessons learned, do we -- in thinking about these unique
8 populations in California, do you -- should we be really
9 trying to target a more refined view of a population for
10 the next study?

11 DR. WU: Well, I think the slide I presented was
12 a simplification of the racial breakdown. We did collect
13 multi-racial information on people who are multi-racial.
14 I believe 11 percent of our study population checked off
15 more -- one or more -- sorry, more than one racial
16 category. So it was reflected in that sense of L.A.
17 County. It matched pretty well with L.A. County's
18 demographics.

19 We simplified their racial categorization for
20 selection purposes. We had to assign them into one
21 category or another just for the facility of selection
22 purposes. It is -- I mean, race is a really complicated
23 issue. For one thing, I mean, we are in part looking
24 for -- looking at race as a surrogate for culture, and
25 what your exposure -- how your exposures may be different.

1 And culture doesn't -- or race doesn't really adequately
2 capture that.

3 So we know that it would be great to have more
4 information on acculturation and background and what that
5 means for your exposure. But that's really hard to do. I
6 mean, in part a limited number of samples, and we're, of
7 course, subject to who volunteers to be part of our study.

8 We do have information on the participants for
9 things like what -- where were you born? And I -- do we
10 have how long have you lived in this country? How long
11 have you lived in this country as part of that. So we
12 might be able to look at some of that once we have enough
13 of a population in the CARE Study.

14 But in terms of trying to target specific
15 countries of origin or residents in the United States, we
16 have 300 to 500 people that we can include. And we have
17 already many, many bins that we're trying to fill. And I
18 think it's -- it just -- it leads us -- I mean, I think it
19 would be very hard to recruit towards that kind of
20 question with this kind of surveillance study.

21 But it does lead to -- I mean, if we could do
22 more targeted studies and really look at these. For
23 example, in ACE we were able to really drill down and look
24 at a country of origin, and look at some acculturation
25 issues. We had, you know, pages of questions on fish.

1 That's just not something we can do in the CARE Study.

2 And my hope is that the CARE Study would be
3 useful for hypothesis building. But also, as other groups
4 do studies, the CARE Study gives us a California
5 representation, so we can say -- well, is this group high
6 in this particular group of chemicals because they're
7 Asian, or is it because they live in California. When we
8 compare it to NHANES, we just don't have the ability to
9 parse out those distinctions. But the CARE data will be
10 able to help us to draw those distinctions.

11 PANEL MEMBER QUINTANA: Well, I guess I'm not --
12 I guess I'm still suggesting should we think about -- at
13 least for a very large category like Latinos, you could
14 target, if you're foreign born or not, you could target
15 what language do you prefer to speak the questionnaire in?
16 That's a very -- that's not a very big subcategory if
17 you're filling in bins, you know. And it is help -- does
18 help it be more representative of the population.

19 So that was just a -- I know that you might go
20 really far down this pathway and be very difficult. But
21 there might be some very simple measures that would help
22 increase diversity and representation for California.

23 DR. WU: We did try to recruit across language.
24 And we were not entirely successful at doing that. We
25 had, I think, 54 Spanish speakers in the population. And

1 we were completely unsuccessful at getting other language
2 speakers. I think that is also not unique to
3 biomonitoring. It is difficult to reach across language
4 barriers. People have other concerns other than
5 participating in a biomonitoring study. And in the
6 current climate, I think it is difficult to go in as a
7 government group and collect information on people who
8 might have other concerns about giving up their
9 information.

10 But it is -- it is one of the things we are
11 cognizant of for the next region, particularly it's a very
12 heavy Spanish-speaking population.

13 CHAIRPERSON SCHWARZMAN: Go ahead.

14 PANEL MEMBER SUÁREZ: Kind of going back a little
15 bit with a big picture view of the California
16 Biomonitoring Program, or any biomonitoring program are
17 really what are the objectives, right?

18 So one is really to understand what the exposures
19 are in a population, which will help us get into targeting
20 which groups are at greater risk. Now, some of the issues
21 with that particular comment with a lot of the persistent
22 compounds is that, well, we can't identify who is at
23 greater risk, but we can't really do anything about it,
24 which is one of the reasons why screening in this case --
25 this particular scenario would not be ideal, because

1 you've screened for things that you can't do anything
2 about, at least at the individual level, which kind of
3 takes us to a next stage probably a different objective of
4 screening or the biomonitoring is to understand how good
5 our policies are.

6 So that's why we have all these different time
7 trends of exposure. We can see that certain chemicals are
8 starting to decrease. After the ban on say DDT, we now
9 are seeing with NHANES and just about anywhere that DDT
10 concentrations have been going down at least here in the
11 United States. And then not only the same thing with for
12 PFAS and whatnot.

13 And this -- this is something that has me
14 thinking as well with trying to get to what Tom was
15 talking about with what are some of the views -- more
16 proactive views of a Biomonitoring Program. So in a way,
17 can we get -- we can never really stay ahead of the curve
18 when we're talking about use. We're always behind the
19 curve, right?

20 So there's a new chemical that's synthesized and
21 introduced by industry for whatever purpose and then we're
22 merely trying to catch up with that. But then the
23 proactive or more progressive view is, well, how can we be
24 not so far behind of that curve where we're not only
25 studying those chemicals that were banned 20 years ago,

1 but we're trying to keep up with some of the newer ones.

2 And, of course, then the challenge becomes, well,
3 what are the chemicals that we should be including there,
4 given that we still don't know enough information about
5 toxicology about those chemicals, first of all. We can at
6 least look at the structure and say, well, they become --
7 belong to a certain class, and they could potentially have
8 similar effects of -- as other chemicals in that same
9 class, and whatnot.

10 So to not really digress too much, given the
11 comment that you were -- that you mentioned that is a
12 certain -- there are certain criteria about which
13 chemicals should be thought of to be then included in the
14 Biomonitoring Program. I would really like to hear a
15 little bit more about what has been done. Maybe not right
16 now, if it's not something that is really -- there's a
17 method behind it specifically.

18 But it might be something worth discussing more
19 about, to try to stay a little bit -- not too far behind
20 that curve of the usage.

21 MS. HOOVER: Just to -- so this is Sara Hoover,
22 and, yes, we're not going to talk about that today, but I
23 will share offline our paper, where we go into our method.
24 It's also laid out in the law. So if you read the law for
25 bio -- establishing legislation, it explains the criteria.

1 So actually which I probably emailed to you when
2 you -- in your orientation. So I'll re-send it, but along
3 with the paper, which gives a little more details.

4 PANEL MEMBER SUÁREZ: Thank you.

5 PANEL MEMBER FIEHN: We have discussed a little
6 bit of -- about privacy and access to information. And
7 that is, of course, a very grave concern for everyone.
8 And we have received comments from people who say there's,
9 you know, a lot of information out there that it's maybe
10 not correctly incorporated yet. And I'd like here to
11 encourage everyone who is involved in analytical chemistry
12 of, you know, these types of compounds and compound
13 classes to release the information that you have, if
14 you're working for the public.

15 So there is a lot of people who have databases.
16 They call them in-house databases. They have protocols.
17 They call them in-house protocols. You know, that is only
18 so much helpful, because other people may face the same
19 problems, and we should not try to reinvent wheels when
20 it's not necessary.

21 So spectral libraries should be on-line and
22 should be public. And data should be on-line and public,
23 if it's possible to make them on-line and public.
24 Sometimes you can't make them on-line and public, but
25 there is lots of databases and repositories out there now

1 that people can, you know, look at those data, help in the
2 analysis, confirm analysis, and also confirm identity of
3 compounds, or even say, well, I have a different opinion
4 on that.

5 So this is, I think, how we should go forward at
6 least as when we're working for the public.

7 CHAIRPERSON SCHWARZMAN: Thank you.

8 Any other comments or questions before we adjourn
9 for lunch?

10 Okay. In that case, I just want to mention a
11 couple things before we adjourn. One is that staff have
12 helpfully provided a little map of places that are within
13 a five-minute walk as some suggestions for lunch. We have
14 an hour for lunch. We'll be convening -- promptly
15 reconvening at 1:25.

16 And finally, I need to provide the following
17 informal Bagley-Keene reminder, which is that as -- that
18 you need to comply with the usual Bagley-Keene
19 requirements and refrain from discussing Panel business
20 during lunch and the afternoon break. And that's only for
21 Panel members.

22 Okay. So we will yeah -- 1:25, I said it. So
23 we'll reconvene at 1:25, and we'll adjourn the morning
24 session.

25 Thanks.

1 (Applause.)

2 (Off record: 12:22 p.m.)

3 (Thereupon a lunch break was taken.)

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

2 (On record: 1:24 p.m.)

3 CHAIRPERSON SCHWARZMAN: Okay. We are going to
4 reconvene the meeting.

5 Thank you all for finding your way back. And I'm
6 going to -- the first thing I'm going to do is just turn
7 it over to Sara Hoover. She's the Chief of the Safer
8 Alternatives Assessment and Biomonitoring Section of
9 OEHHA. And she is going to give us a brief overview of
10 the afternoon session and introduce our guest speakers.

11 (Thereupon an overhead presentation was
12 presented as follows.)

13 MS. HOOVER: Thank you, Meg. And thanks everyone
14 for returning promptly. So you got a pretty good idea
15 this morning about what we're trying to do here today.
16 And I think we've made an excellent start in the morning
17 session. So our focus this afternoon is to try to delve a
18 little bit more into our discussion topics, which is
19 measuring exposures to PFASs in California, next steps.

20 And this being the Biomonitoring California
21 Scientific Guidance Panel, we really are looking for
22 specific input to Biomonitoring California.

23 --o0o--

24 MS. HOOVER: Russ, advance.

25 A few technical difficulties here with the...

1 No, it's on. Weird.

2 Back. Two more slides back.

3 Okay. All right. I think this is the slide we
4 were -- sorry, we're having some technical difficulties
5 here.

6 So -- and these informal discussion questions
7 that we came up with, we've actually been thinking about
8 them and sharing them for months with our guest
9 discussants, our guest speakers, with Biomonitoring
10 California staff. So a lot of what we've already
11 presented and what you will hear presented revolve around
12 these questions too.

13 So one of the questions is what do we know from
14 currently available data? Which of the newer PFASs are of
15 greatest concern in terms of potential for exposure in
16 California? Is there any information on that we can tap
17 into? Do we know what some of the most significant
18 exposure sources are to PFASs in California? And should
19 we be focusing on particular groups that might be more
20 heavily impacted?

21 I'll try again.

22 --o0o--

23 MS. HOOVER: Ah. Okay. Now, it's working.

24 All right. Now, we actually touched on this a
25 little bit this morning already. Possible ways to expand

1 measurements of PFASs. I think most of us have a general
2 sense of it's a good idea to look for more PFASs, but
3 that's a question. Should we expand? Are our panels
4 sufficient?

5 And if we do decide to expand measurement, what
6 should we focus on? Should we expand and automate an
7 expanded panel of PFASs for targeted measurement, so we're
8 looking for specific chemicals and quantifying what we
9 see?

10 Should we instead or in addition focus on
11 semi-targeted analysis that Sabrina was talking about,
12 which is a way to more broadly screen for
13 fluorine-containing compounds, but you don't have the
14 confidence of exactly what you're seeing? So if you
15 really want to have that confidence, you have to follow up
16 with targeted measurement.

17 And then another important point that we've
18 discussed many times, and I think it's worth mentioning
19 is, not just biomonitoring but in terms of looking for
20 important chemicals to use environmental sampling as a
21 complimentary approach. And we welcome your ideas on
22 possible ways to move forward

23 --o0o--

24 MS. HOOVER: The other really important point,
25 and we're kind of following up what we did in March, where

1 we talked to the Air Resources Board about potential
2 collaborative opportunities related to community exposure
3 to air pollutants, we're doing the same thing today. So
4 you'll see two of our guest discussants are colleagues of
5 ours from CalEPA. And we really want to look at future
6 opportunities to help tackle high priority concerns.

7 But we also want to look are there any near-term
8 ways? So we all have talked about our limited resources
9 of the program. That's a reality that we're always
10 dealing with. But you also can see that we've done an
11 amazing job with a small amount of resources. We have a
12 lot of materials, expertise, interesting studies. So are
13 there some near-term ways with existing resources to look
14 at ways to help enrich exposure assessment and regulatory
15 efforts by others in the state.

16 In terms of possible future opportunities, for
17 example, it might be possible to conduct a targeted
18 biomonitoring study in a community impacted by PFASs in
19 drinking water.

20 Another example might be to conduct an
21 intervention study related to PFASs in consumer products
22 or foods. And again, we welcome other ideas, and other
23 possible support opportunities.

24 --o0o--

25 MS. HOOVER: So with that, I also want to say, as

1 always at these meetings, we have a limited amount of time
2 for talking in the meeting. Although, I think we've had a
3 lot of incredible feedback already. But I welcome people
4 at any time to send input after the meeting to this email
5 address.

6 And with that, I'd like to introduce our
7 afternoon speakers. So we're really thrilled to welcome
8 Antonia Calafat and Erika Houtz. Antonia is the Chief of
9 the Organic Analytical Toxicology Branch at the Division
10 of Laboratory Sciences in the National Center for
11 Environmental Health of CDC. She earned a Ph.D. in
12 chemistry from the University of the Balearic Islands.
13 She leads CDC's Biomonitoring Program for assessing human
14 exposures to a wide range of environmental chemicals,
15 including pesticides, consumer product chemicals like
16 phthalates, triclosan and parabens, flame retardants and
17 PFASs and other persistent organic compounds.

18 Antonia is a world-renowned expert in
19 biomonitoring science and has been a mentor and friend to
20 our Program since its inception.

21 Erika is the PFAS analytical lead at Arcadis.
22 And she joined Arcadis, which is a consulting company, in
23 2016 after two years as a research scientist at DTSC. She
24 holds a Ph.D. in environmental engineering from UC
25 Berkeley. She specializes in investigating the

1 environmental impacts of PFASs, including developing
2 analytical methods for measurements in a range of media,
3 and researching the fate and transport of PFASs in natural
4 and engineered systems.

5 Some of her PFAS projects at Arcadis include
6 developing guidance and conceptual models for
7 characterizing contaminated sites, evaluating the efficacy
8 of treatment, technologies, and working with laboratories
9 to commercialize new analysis techniques.

10 So first, welcome to our speakers. Thank you so
11 much for coming. And now I'm going to turn it over to
12 Antonia. She will be talking about her recent work,
13 developing a urinary biomonitoring method for PFASs,
14 including some pilot results and the challenges of this
15 approach.

16 After Antonia speaks, we'll have some time for
17 questions. And then Erika will be discussing insights
18 about exposures to PFASs gained through environmental
19 measurements.

20 Antonia

21 (Thereupon an overhead presentation was
22 Presented as follows.)

23 (Applause.)

24 DR. CALAFAT: Thank you, Sara. It's always a
25 pleasure to be here speaking in front of the Panel. So I

1 want to thank you for the invitation to be here once
2 again.

3 And I know we're pressed for time, so -- and
4 being the first speaker before or after the lunch is kind
5 of a challenge. So I hope I won't keep you -- just don't
6 want to put you to sleep.

7 --o0o--

8 DR. CALAFAT: Well, we don't start well.

9 So we heard this morning from Jennifer about
10 different sources of exposure to PFASs. I call them
11 PFASs, so just allow me this. And some of the -- one of
12 the sources that has attracted quite a bit of attention
13 recently is drinking water, contaminated drinking water.

14 And in this slide, I just wanted to say that we
15 have known that these chemicals end up in water for quite
16 a bit. Some of these papers go back to just 2003 with one
17 of the first papers by Jennifer Field delivering in the
18 field.

19 And -- but since probably the past couple of
20 years oh so, then there has been more attention after EPA
21 just went with the -- with their health assessment in --
22 for PFOS and PFOA, and the discovery of more and more
23 PFASs in drinking water supplies throughout the United
24 States.

25 --o0o--

1 DR. CALAFAT: PFAS had a quite a diverse family.
2 And we heard about this a little bit in the morning, so
3 I'm not going to be talking much about it, but just to
4 tell that there are hundreds of hundreds of chemicals, so
5 it's thousands of chemicals. And what all of them have in
6 common is that they possess this perfluoroalkyl moiety.
7 And I'm a chemist by training, but I'm not going to bother
8 you with chemistry, except just to say that I have put
9 some of the main classes of chemicals for PFASs, for lack
10 of a better term. And on the left side we have the ones
11 that we have been monitoring in NHANES, and on the right
12 side are the ones that we are monitoring right now.

13 So those within this family's, three are main --
14 the main families, and all of them are within your list --
15 your targeted list of chemicals in California: The
16 carboxylic acids, exemplified by PFOA; the sulfonic acids
17 by PFOS; the amides that MeFOSAA is one of them. And on
18 the right side I'm including some that are the ones that
19 have been attracting attention because they have been
20 found in drinking water. And those are some of the
21 species that have an ether, so they have this ether bond
22 structure, if you want, of functionality in their -- in
23 their structure.

24 And these are only just two examples. One is
25 GenX, the other one is a DONA. And then we have -- some

1 of these are carboxylic acids, so kind of equivalent to
2 PFOA but it's an ether functionality, and the sulfonic
3 acids exemplified by this compound. And the truth is that
4 there are many, many others.

5 --o0o--

6 DR. CALAFAT: There are many properties in this,
7 because there's such a light number of compounds, and that
8 obviously they encompass a wide range of properties and
9 functionalities. But in this light, I just wanted to show
10 for the purpose of the talk then some properties that are
11 common and some that are not common to these -- to these
12 compounds. And I'm going to start by, you know, just
13 saying that I'm going to be talking about, like I say, the
14 legacy compounds. When I talk about legacy PFASs are
15 going to be those that we have included in NHANES count
16 from day one. That was NHANES 1999-2000.

17 And there are some that have a long alkyl chain,
18 and there's -- just is defined by the number of carbons in
19 the structure. And they have some with a short alkyl
20 chain, again the number of carbons. And then there are
21 some that I'll call them alternative and emerging, for a
22 lack of a better term. So this is just a way to -- the
23 nomenclature just to distinguish between the different
24 compounds I'm going to be talking today.

25 What these compounds have in common is that they

1 all have been detected in the environment quite just by
2 the spread detection in the environment, and that some of
3 them have persistent in people. And this year, I'm
4 talking persistent in people because when you do
5 biomonitoring, then you're going to have to be looking at
6 what matrix do you want to use for biomonitoring. And
7 it's going to be largely, not exclusively, but impacted by
8 the toxico-chemistry or the toxico-chemical properties of
9 the compounds.

10 So, in general, the long alkyl chain PFASs have
11 long half-life in humans. By contrast, the short alkyl
12 chain and the alternative or emerging PFASs have a shorter
13 half-life. The use of the long alkyl chains is
14 decreasing, because many of them were discontinued --
15 production was discontinued of this CA chemistry, related
16 chemistry, PFOS-related chemistry in the early 2000, 2002.

17 There were also changes in manufacturing for
18 2000 -- for PFOA that were implemented up to 2013, I
19 believe. And this means that these compounds, they use --
20 at least on paper, are -- is going to be going down, when
21 they use of other compounds to replace the functionality
22 that these chemicals were providing and that you cannot
23 use them any longer than are on the rise. And this
24 pertains to the short alkyl chain and the emergency -- the
25 alternative or emerging compounds.

1 We know quite a bit about human exposure to the
2 legacy PFASs through our work in NHANES. And in here what
3 I said less known for the short alkyl chain is because in
4 NHANES we only had two of the short alkyl chain, compared
5 to the long -- the many more long alkyl chain compounds.

6 But regarding with the alternative and emerging
7 compounds, quite a -- there's no match known or regarding
8 human exposure.

9 --o0o--

10 DR. CALAFAT: So this is just a schematic view of
11 what we have been doing in NHANES. After all, we started
12 the PFAS program at CDC in the early 2000s. Our first
13 method paper was published in 2004, so we're talking 14
14 years ago already. And we included these compounds in
15 NHANES starting with the year -- the cycle 1999/2000. And
16 that was before the changes in manufacturing practices.
17 And we continued up to 2013 to 2014.

18 In 2001 and 2002, we had no serum available for
19 NHANES to do the analysis. That's why there is this gap.
20 You can see that we monitor two short alkyl chains since
21 1999-2000. One of them we started with 2003-2004. And
22 for all the others, we have been monitoring them for
23 several cycles. As mentioned earlier today, I can't
24 remember now if it was Jennifer or Kathleen or Sabrina --

25 (Laughter.)

1 DR. CALAFAT: Anyway, the FOSA and EtFOSAA we
2 discontinued measuring them in NHANES for the cycle 2013
3 and '14, because simply we were no longer detecting these
4 compounds. In a world of limited resources, we just have
5 to try to be as efficient as possible. And then so we
6 decided to pull them out of the panel, and no longer
7 monitor these -- are monitoring these compounds at least
8 for NHANES.

9 In terms of the emerging and alternative PFASs,
10 and I here include like GenX, then we do not have yet
11 information on NHANES, but we're working on it, as you
12 will see.

13 --o0o--

14 DR. CALAFAT: And in this slide, I'm just
15 talking -- seeing what NHANES data have shown us so far.
16 In terms of the long alkyl chain PFASs, then we have, as I
17 mentioned before, data from 1999-2000 before the changes
18 in manufacturing practices and after.

19 And in all cases, we observed widespread exposure
20 to the long alkyl chain PFASs, and in this graph -- and
21 then clearly we have seen a reduction in concentrations and
22 we assume related to reduction in exposures for all these
23 different compounds beautifully illustrated, in my
24 opinion, for PFOS, which is almost like a textbook graph
25 that shows that, you know, like the chemical is removed

1 from the market and concentrations in people are going to
2 start going down.

3 And I'm presenting here the geometric mean
4 concentrations. And I'll tell you why.

5 --o0o--

6 DR. CALAFAT: Because for the short alkyl chain
7 compounds, and as I mentioned in only two of them that we
8 have been looking at, Perfluorobutane sulfonate, or C4 --
9 the C4, PFAS, and perfluorooctanoic acid as C7. And in
10 this compound -- for these compounds, what I'm showing in
11 this graph is the 95th percentile. And I know there are
12 many numbers, but there's -- the main point is that the
13 95th percentile these concentrations are fairly low --
14 fairly low concentrations, difficult to see whether there
15 is even a clear trend, and very limited exposure -- I
16 mean, detection frequencies. The LOD is were around 0.1
17 part -- 0.1 parts per billion. This is true for many of
18 the other, the long alky chain compounds.

19 And then yet we were detecting like only like --
20 let's say, we can only Calculate the 95th percentile,
21 because we have very little detection frequency. So we
22 always were wondering why are we seeing so little of these
23 compounds? Is this because there's limited exposure to
24 these chemicals, or is it because serum is not the best
25 biomonitoring matrix.

1 Remember, these are -- have relatively short
2 half-life on the order of days or months compared to years
3 for the long alkyl chain compounds.

4 --o0o--

5 DR. CALAFAT: And for this reason then we decided
6 to just say okay. They just go and develop a new method.
7 And when you go and think about developing a new method
8 for assisting exposure to this alternative and short chain
9 PFASs, then you need to think about the matrix. And the
10 choice of the matrix is really critical, and is largely
11 based on the half-life of the chemicals in humans.

12 And then, in general, with some exceptions, we
13 use urine for non-persistent chemicals and blood for
14 persistent chemicals. This is because although
15 analytically as an analytical chemist, we can measure
16 pretty much anything as long as we have a standard -- an
17 instrument and a good chemist, then we can measure many
18 different compounds, but we need tradition information to
19 demonstrate that these compounds are really valid exposure
20 biomarkers.

21 So perhaps the perfluorobutane sulfonate and the
22 perfluorooctanoic acid in serum were not good biomarkers.
23 We need to look for those in urine because those are
24 short-lived compounds.

25 --o0o--

1 DR. CALAFAT: So most of us are chemists at CDC
2 listed in my branch in our division. And then we decided
3 to develop a method to look at these chemicals in urine.
4 The method had to fulfill the requirements that CDC
5 demands from biomonitoring methods that has to use the
6 minimum amount of sample, include the maximum number of
7 compounds -- relevant compounds I should say, and just --
8 I said -- and have the highest sensitivity. So we
9 developed the method in just that -- woops. Sorry.

10 --o0o--

11 DR. CALAFAT: -- that that looks at -- okay.

12 --o0o--

13 DR. CALAFAT: Well, I'm going too fast. Sorry
14 about that -- that uses 50 microliters urine. And we can
15 use -- look at 18 PFASs -- different PFASs, includes short
16 and long alkyl chain PFASs in addition to three of the
17 alternatives.

18 And with this method that we just recently
19 published in Chemosphere earlier this year, I'm just going
20 to show this very nice chromatogram. This is of our QC
21 sample that has been spiked with concentrations going from
22 0.5 to around 3 parts per billion of the analyte. And in
23 here you can see that we have some of the short chain that
24 obviously are going to be coming earlier in the
25 chromatogram, because they're smaller and much more polar

1 and water soluble.

2 This is one of the alternatives, the GenX -- what
3 is called GenX. This is the DONA. And then the last one
4 eluting is the alternative sulfonate.

5 And in between you're going to have supreme
6 match. All of these are short chain. And with the two
7 alternatives, all of these are long alkyl chain compounds.

8 --o0o--

9 DR. CALAFAT: SO having a method is great. But
10 if you don't apply the method, then it doesn't do you any
11 good. So we applied the method and to -- we purchased --
12 we bought 50 paired urine/serum samples from a commercial
13 company. These were specimens that were collected from
14 donors and adults. They were in 2016. We have no
15 information about the demographics of those participants.

16 And then again this is a busy table, but I'm
17 going to -- you know, I'm showing the frequency of
18 detection, a median, a 90th, a 95th, and a maximum. And
19 limit those detections, so the sensitivity of that method
20 was for all compounds 0.1 parts per billion, or a 100
21 parts per trillion.

22 And what we could see -- so it's really okay to
23 compare the frequency of detection, because for all the
24 compounds we had the same LOD. So if you're seeing a low
25 frequency of detection compared to something that you have

1 a high frequency of detection, then it means either again
2 that you have higher exposure to one particular compound
3 versus another, assuming that they are all good
4 biomarkers.

5 This -- the results that we show from the -- in
6 serum we're mimicking very much what we found in NHANES,
7 high detection frequency for PFOA, and perfluorooctanoic
8 acid, the C8 and the C9 carboxylates. And then the
9 perfluorohexanesulfonate and the PFOS, the C6 and the C8
10 sulfonates. And hardly any of the short alkyl chain
11 compounds were detected. And we also did not detect in
12 serum any of the three alternative compounds.

13 In urine, to make a longer story short, we only
14 detected one compound, perfluorobutanoic acid, the C4
15 carboxylate equivalent. And when we detect it, then we
16 detect it in not even 60 percent of the samples. So if
17 this was NHANES, we wouldn't be able to establish a
18 geometric mean. And the medium concentration was only 0.2
19 parts per billion, only about twice the LOD. So the
20 concentrations of these short alkyl chain compounds in
21 urine were hovering the concentration -- I mean, around
22 the LOD. Not too high.

23 We also have access at CDC to some samples that
24 we collect periodically.

25 --o0o--

1 DR. CALAFAT: I should say these are convenience
2 samples of male and female adults. And I should say that
3 these are all male and female adults from Georgia. So
4 these are people that collect -- provide anonymously some
5 samples, and then they're actually CDC workers that
6 provide. So they may not live in Atlanta, per se, but
7 they are all in Georgia.

8 And they -- we have no reason to believe that
9 they are exposed to PFASs. So they're -- we use these
10 samples for all our methods to just -- when it's time to
11 do our QCs to do our work -- our first examination of
12 trends, or whether the method is suitable or not.

13 And again, what we can see in here, then we had
14 some samples that collected in 2001, and some samples
15 collected up to 2015. The numbers are different. And in
16 a way we're comparing apples and oranges. But again, just
17 to show that we -- for these short alkyl chain compounds,
18 including the C4 as carboxylate and sulfonic acid C5, C6,
19 and C7 acids, then we do not seem to see much of these
20 compounds, at least in these urine samples.

21 For the samples collected in 2015, we seem to see
22 kind of an increasing concentrations for the
23 perfluorobutanoic acid. But again, the 90th percentile is
24 fairly low or is a little higher than the percentile that
25 we had in those 50 samples.

--o0o--

DR. CALAFAT: These data compare quite well with the data that had been published in other parts of the world. And this is -- I don't pretend that you will go and look at this table. This is just a table taken from this paper published in 2014 that look at the concentrations in urine and in serum in 120 children in South Korea.

And what they found was again that the short alkyl chain compounds, C5, C6, and C7 the concentrations in urine, were higher than the concentrations in serum, something that we would expect if these compounds are ended, short lived, or just have short residence in the body. And the long chain PFASs were not detected in urine exactly we found.

--o0o--

DR. CALAFAT: So in order to interpret all these data I presented today, then I think very important to consider a few pointers. And then if you think about drinking water source of exposure to PFASs, then the levels of these PFASs in water tend to be in the parts per trillion range, at least for non-persistent chemicals.

Normally, when you do biomonitoring, the concentrations in the people are much lower than the concentrations in the environment. This means that if for

1 short alkyl chain PFASs, for the short-lived PFASs in
2 drinking water, then exposures are episodic. They may
3 happen with a certain frequency in your drinking water,
4 but you're voiding your bladder also periodically. So
5 these chemicals are not staying in the body very long.

6 Then the concentrations that you're expecting to
7 find in the urine are going to be fairly low. So with our
8 detection methods or our detection limit of 100 parts per
9 trillion, we may not actually be able to detect much of
10 these compounds in the urine for the short alkyl chain.
11 Because if you think about it for the persistent
12 compounds, for those that have high half-lives of years,
13 PFOS/PFOA, we detected them in the serum, but the levels
14 were parts per billion, and low parts per billion. So you
15 would expect lower concentrations for the non-persistent
16 chemicals. So in a way, the data that we are -- we are
17 obtaining do make a lot of sense to me.

18 The NHANES serum data that we have since
19 1999-2000 again matches with these observations, because
20 we have medians that are in the low parts per billion
21 range for those long alkyl chain PFASs. And for the short
22 alkyl chain PFASs, then we hardly detect them. And when
23 we do, the concentrations are around, you know, 0.1, 0.2
24 parts per billion.

25 The pilot data that we have again suggests that

1 long alkyl chain PFASs are not going to be found in urine.
2 Those are circulating in the body, and they're excreted in
3 urine, it's true, but very low concentrations. So urine
4 is probably not the way to look at those.

5 And at least in the samples that we have so far,
6 we have very limited evidence that there is detection of
7 any of the other short alkyl chain PFASs or those
8 fluorinated alternatives.

9 --o0o--

10 DR. CALAFAT: So if you need to remember
11 something about what I said today, just remember the third
12 bullet. And then based on the paired urine/serum data, I
13 think that it would be -- you really should be looking at
14 serum for the long alkyl chain PFASs or any of those PFASs
15 that have a relatively long half-life in the body. And do
16 not use serum for the short alkyl chain compounds.
17 Just -- it probably is much better if you go and look at
18 it -- look at them in urine.

19 --o0o--

20 DR. CALAFAT: We are planning on continuing
21 NHANES. Although, we're seeing those beautiful trends and
22 decreased concentrations for some of these compounds. And
23 we know that these PFASs are being produced in other parts
24 of the world. And after all, several of those have been
25 categorized as POPs.

1 And then so they can -- you know, who knows, they
2 may just show up again, you know, some years from now. We
3 don't know. And then we stop monitoring them, then we
4 will never know.

5 We are actually in the process of finalizing the
6 analysis of -- oops. I don't know if it was me that moved
7 something -- in urine --

8 (Laughter.)

9 DR. CALAFAT: Oh, okay -- in urine that the
10 NHANES 2013-2014, and that -- in which we are measuring
11 PFAS and the alternatives. And what's beautiful about
12 this data set is that we are -- these are matched
13 urine/serum samples from NHANES participants.

14 So we already measured PFASs, our regular panel,
15 the one that I showed in one of the first slides, in
16 serum. We also measured some of those PFASs in one subset
17 of samples of children 3 to 11 years of age. And now,
18 we're going to have urine data from everyone three years
19 of age -- I'm sorry, that's 2013 -- six year of age and
20 above for -- in urine. And let's see what these data are
21 going to show.

22 We are also planning on looking at some PFASs in
23 paired urine/serum samples from exposed populations, and
24 continue our R&D on alternative PFASs.

25 --o0o--

1 DR. CALAFAT: And as one of the speakers
2 mentioned before, then one wouldn't be able -- I wouldn't
3 have the privilege of being here presenting the work done
4 at CDC without the hard work of several of my colleagues.
5 In particular, Zsuzsanna Kuklenyik who started the PFAS
6 biomonitoring program back in the -- when I said she was a
7 co-author in the 2004 paper.

8 Kayoko took over from Zsuzsanna when she moved
9 somewhere else. And Xiaoyun Ye, who's untimely death last
10 month just cut short her career, and a beautiful person
11 who contributed tremendously to public health.

12 So I just want to acknowledge the contributions,
13 the contribution of my co-workers in the branch, the
14 Organic Analytical Toxicology Branch, and our peers at the
15 National Center for Environmental Health.

16 --o0o--

17 DR. CALAFAT: And I'll be happy to answer any
18 questions.

19 (Applause.)

20 CHAIRPERSON SCHWARZMAN: Thank you so much,
21 Antonia. We have ten minutes for questions for her before
22 we move on to our next speaker.

23 Yes, Jenny.

24 PANEL MEMBER QUINTANA: Thank you for that.

25 I was happy to hear you mention you'll be looking

1 at urine of children because I was thinking that for many
2 analytes, the concentrations are much higher for children
3 due to their small stature and their intake. So have you
4 had any preliminary data or have you had a chance to look
5 at that at all?

6 DR. CALAFAT: I mean, the serum data we already
7 have the data.

8 PANEL MEMBER QUINTANA: The urine.

9 DR. CALAFAT: And those were -- actually, the
10 concentrations were quite similar to the concentrations in
11 the adults. What was interesting is that many of the
12 children -- this -- because remember this is 2013-2014, so
13 children who were three to 11 years of age, many of the
14 children were born after the changes in production and
15 changes in manufacturing practices of these PFASs. Yet,
16 we pretty much detected in serum -- this is serum. So
17 PFOA, PFOS, the main four, PFNA and the
18 perfluorohexanesulfonate in every single child.

19 It could, you know, like that there was -- we
20 know that this -- the children are born, you know, like
21 just through gestation. Then there is some tests. The
22 children are born with already have some of those PFASs.
23 Breast feeding, as well, we didn't have information to
24 look into that. But the concentrations were quite
25 similar.

1 In terms of the urine, I -- as you know, I cannot
2 speak about data -- NHANES data that are not public yet.
3 And actually, I have not even seen the final data that we
4 would have -- because by now, I only have -- we only have
5 like a sample ID. We don't know whether that sample is
6 from a child or from an adult, but it's going to be
7 interesting to see what happens later.

8 In terms of the long alkyl chain, I can tell you
9 that there were not dramatic differences. It's not that
10 the children had much higher concentrations. But again,
11 let's just remember that many of the children were born
12 after the concentrations in the environment are much lower
13 than the concentrations that parents presumably were
14 exposed to.

15 For the short alkyl chain, there was no
16 difference. We didn't detect them in children. We didn't
17 detect them in adults in serum.

18 PANEL MEMBER QUINTANA: So I guess I have another
19 comment too that if something has short half-life, if the
20 exposure is very constant like water, then the levels in
21 the urine should be pretty constant even though the
22 half-life is short. But if the exposure is infrequent --
23 let's say when you go out once a week for pizza and it's
24 in the pizza box, then you'd have to get lucky when you
25 took that sample to detect it. So there's some issue

1 about sources, and how often they're exposed, which is
2 interesting.

3 DR. CALAFAT: Yeah. This is the challenge when
4 you're talking about non-persistent chemicals, because
5 sometimes people say non-persistent chemicals they have a
6 short half-life. Short half-life is one aspect of why you
7 may not detect them so readily, but it's not the only one.
8 It's just the nature of the exposure. So exposures are
9 not constant. We, for many of our work, the exposures
10 that we're experiencing, at least the current use
11 chemicals at exposures that are -- that just happen, you
12 know, recurrently, they may not have the same intensity
13 every time, and then you never know exactly how frequently
14 they're going to happen.

15 So if -- the truth is though that with many of
16 the other non-persistent chemicals, then you manage to get
17 some detection in the urine compared to the detection in
18 the -- in the -- if you're looking at urine. And you may
19 remember I think the last time I was here, I was talking
20 about phthalates. And then phthalates are non-persistent
21 chemicals. Yet, you know, exposures are again happen from
22 time to time. Many times, they're from diet. So we eat
23 every day, but we don't eat the same thing every day, and
24 we don't eat all the time, at least some of us, and
25 then --

1 (Laughter.)

2 DR. CALAFAT: So then the -- but yet, we manage
3 to detect those concentrations in urine, we've had very
4 similar detection frequencies. So the fact that we're not
5 detecting some of these compounds in the urine, some of
6 the short alkyl chain PFASs, it just gives me some
7 reassurance -- maybe perhaps -- I don't know reassurance
8 is the right word, but some hope that maybe the exposures
9 are -- I mean, they may be concerning the environment.
10 These chemicals are very stable. They're going to be
11 staying with us for a long time.

12 But maybe for human exposures, they may not be
13 something -- the exposure may not be as high as we would
14 have had anticipated, if we are looking at the right
15 biomarker.

16 These compounds metabolized somehow, and we are
17 not looking at the right biomarker is the same thing as
18 looking in the wrong matrix. You have to have the right
19 biomarker. So that's why I'm saying that we are
20 continuing our work to just make sure that what we're
21 looking at is actually what we should be looking at.

22 CHAIRPERSON SCHWARZMAN: Go ahead, José.

23 PANEL MEMBER SUÁREZ: So I have a question
24 about -- so it's very interesting, at least for -- even
25 for epidemiological studies, and, of course, for different

1 surveillance systems, the measurement of chemicals in
2 urine, which especially for children, it's quite useful to
3 have that matrix as an option, at least to measure
4 potentially -- I think from your report, the ones that you
5 saw were PFBS and some PFHpA, right? Do you know what the
6 within individual versus the between individual
7 variability of these compounds in urine?

8 DR. CALAFAT: For these compounds, we know very
9 little, because we have only started the analysis in urine
10 very recently. I say that as a chemist and all the
11 chemicals tend to be -- I mean, they have different names,
12 they have different structures, but they have something
13 that makes it kind of -- that common.

14 So that -- for biomonitoring is kind of that
15 half-life and the type of exposure. So if I assume that
16 for the short -- the short-lived compounds and the type of
17 exposures that they have. In general, when you have
18 compounds that are coming from diet, the reproducibility
19 in concentrations tend to be pretty poor, at least among
20 adults. Because as I said, we eat every day, but we take
21 to it something different every day.

22 However, if you have -- if the chemicals are
23 coming from exposure that tends to be more like a
24 personnel care product use, then that reproducibility is a
25 little better, maybe because you tend to use the same

1 product day after day. It may not be good the
2 reproducibility within a day, because you take the shower,
3 let's say, in the morning, and then you collect the sample
4 in the evening, so, you know, you're going to have some
5 big changes.

6 So the way that people have moved in the field of
7 nonpersistent chemicals to address this unavoidable
8 variabilities in collecting multiple samples. So it's not
9 a perfect situation, but multiple samples are much better
10 in characterizing exposure to these non-persistent
11 chemicals that a single sample would be.

12 PANEL MEMBER SUÁREZ: Right, so, but that hasn't
13 been done. You haven't done that yet?

14 DR. CALAFAT: No, we are not even close.

15 CHAIRPERSON SCHWARZMAN: Yeah, veena.

16 PANEL MEMBER SINGLA: Thank you so much for that
17 very informative presentation. You spoke about the
18 diversity of PFASs as a chemical class. Could you speak a
19 little bit about the 18 PFASs that were included in your
20 method and kind of the coverage of the chemical class
21 amongst those?

22 DR. CALAFAT: So, yeah, we went from a C3 to a
23 C12, so -- in terms of the legacy compounds, so -- and
24 they're as small as 3 as large as 12. We looked at the
25 ethers, so those three -- the three alternatives -- this

1 new -- I mean, I don't like to say new chemistry, because
2 maybe it's new for me, but these chemicals have been
3 around for a while. So it's new for us, because we have
4 not addressed them before, but -- so for this different
5 chemistry, so to speak. So we had those three
6 alternatives. Those were the ones that we had adequate
7 access to standards.

8 As somebody mentioned earlier today, then, you
9 know, when you're doing quantification, and biomonitoring
10 is about quantification, then you need to have reliable
11 standards, otherwise, then you can have everything else.
12 The matrix, you have everything, but if your standards are
13 not adequate, they don't work. And we also had three of
14 the amides in all those legacy, but those we actually were
15 not able to look them in urine, only in serum.

16 But -- so we did as much as we could in trying to
17 make a method that would be -- provide reliable
18 information with -- encompassing a wide range of chemistry
19 at least in our view.

20 CHAIRPERSON SCHWARZMAN: I had one final
21 question, which is maybe you said all you can already
22 about this, but I was wondering if you could say any of
23 your thinking about why the levels of -- why the
24 detects -- the percent detect is so low for some of the
25 shorter chain PFASs, which, as far as we know, is really

1 what a lot of companies have switched to from longer
2 chain. And so it gets at this issue of, you know,
3 persistence -- lack of persistence is one of the issues.

4 And yet, we see for other chemicals like
5 phthalates or the phenols that also are not persistent but
6 to which there's presumably relatively constant exposure
7 that there are very high percent detect of those.

8 DR. CALAFAT: Yeah.

9 CHAIRPERSON SCHWARZMAN: And so what are your
10 thoughts about why we're not really seeing them? And is
11 it because of this issue of them -- the main exposure
12 route being diet or --

13 DR. CALAFAT: So, I mean, I think that it may be
14 multiple fold. But one thing that we need to keep in mind
15 is NHANES is representative of the general population. So
16 what this data suggests to me is that perhaps overall
17 exposure to these chemicals is not as prevalent as to
18 other nonpersistent chemicals.

19 Then in certain areas, there may be certain focal
20 points, and that's why I think it's going to be very
21 interesting for us to just have access to some of these
22 samples from areas that have known contamination, and at
23 least, let's say, for example, from drinking water, and
24 then collect urine and serum and then just evaluate what
25 we find to determine whether, okay, in these populations

1 that are -- that is known -- known to have exposure, can
2 we just see -- can we detect these compounds? And if so,
3 at least within the ones that we measure, can we detect
4 them more than we do in NHANES.

5 If it's diet, again, I just think that perhaps
6 this would mean that the presence of these chemicals in
7 the various sources that are contributed into the levels
8 that we're detecting are not as widespread distributed in
9 the United States as would be for let's say some of the
10 other chemicals like the phthalates just because -- just
11 to stick to the same example.

12 CHAIRPERSON SCHWARZMAN: Thank you so much.

13 We're actually out of time in this segment. And
14 if you have an issue, we're going to have a bunch more
15 discussion time. So please just jot down your question or
16 comment, and we'll return to them. And I want to turn it
17 over to Erika.

18 (Thereupon an overhead presentation was
19 presented as follows.)

20 DR. HOUTZ: Hi. I'm Erika Houtz and I work for
21 an environmental consulting company called Arcadis. Most
22 of my PFAS-related experience has been in the more
23 environmental sample arena, so groundwater, wastewater,
24 stormwater runoff, soils and. I did a little bit of work
25 on human samples when I worked for DTSC. And so I'm going

1 to be talking about different things we might conclude
2 about PFAS exposures from what we've seen in environmental
3 data.

4 Is my volume good on this?

5 --o0o--

6 DR. HOUTZ: A little bit closer. Okay.

7 I'll just skip the overview and go straight to
8 the first slide.

9 So first, I wanted to discuss major locations of
10 PFAS point source contamination, at least as we understand
11 this right now. So these might be specific communities
12 that are more highly exposed due to a high level of PFAS
13 generation in their community. So primary manufacturing
14 is possibly the most important source of exposure in some
15 communities. It sort of depends on how it's getting out
16 into the environment and potentially impacting people.
17 But certainly in terms of environmental concentrations, we
18 see much of the highest levels around the areas that are
19 actually manufacturing these chemicals.

20 But we also see that in manufacturing sectors
21 where they're applying PFASs to their products. So you
22 might see that in the treatment of textiles or in the
23 blending of firefighting foams, for example.

24 And then next on the list, we have two sources
25 that are highly related to firefighting foams. In

1 particular, firefighting foams that are used to put out
2 fuel-based fires. Usually, we're talking about aqueous
3 film forming foam or AFFF. There are some other
4 PFAS-containing foams, but the AFFF foams are the most
5 important.

6 And one of the things that's really use -- or
7 critical to think about in terms of the use of foams is
8 that they're released directly to the environment. They
9 have a very direct pathway, by which they might get into
10 groundwater or surface water that could be used as a
11 drinking water supply.

12 And also sort of getting at a question that I
13 think it was Meg just posed about why we're seeing, you
14 know, not very high levels, PFASs, in general, are not
15 used at very high amounts in most of the products they're
16 found in. It's other kinds of POPs that we've maybe
17 worried about in the past or potential use of percentage
18 levels in certain products. That's really uncommon for
19 how PFASs are used in most products.

20 But an exception to that is actually these
21 firefighting foams. They're in the neat formulations at
22 about one percent level according to the safety data
23 sheets. They are blended with water before they're used,
24 but -- so they're a relatively high concentration source
25 of these chemicals.

1 And then other kinds of point sources that I
2 would say we understand sort of less well in terms of how
3 much of an issue they are, are again mostly related to
4 firefighting foams, municipal fire training sites,
5 refineries, large railyards, metal plating facilities.
6 This came up earlier. PFASs are used as mist suppressants
7 to -- I believe to protect workers from metal fumes. So
8 it's kind of an interesting confluence of some of the
9 things that we are concerned about.

10 Wastewater treatment plants and landfills can
11 also be concentrators of PFASs, particularly if they're
12 receiving some type of waste from manufacturing or
13 another, you know, major PFAS product.

14 And I just wanted to talk about -- a little bit
15 about where we see some of these different sources,
16 particularly as we're thinking about California. And I
17 must confess that honestly most of the -- my understanding
18 of these PFAS point sources are not in California. I'm
19 not entirely sure if that's just due to the types of
20 projects that I've worked on or where in reality the
21 contamination is occurring. But I think a lot of it is
22 that some of the stuff is not going on in California.

23 --o0o--

24 DR. HOUTZ: So primary manufacturing, I was told
25 by the FluoroCouncil, typically occurs near where there's

1 some kind of a -- I think it's calcium fluoride source.
2 So in North Carolina, we've heard a lot about GenX. This
3 is a current primary manufacturing as in they're making
4 GenX a North Carolina type of issue.

5 PFOS and PFOA were historically manufactured in
6 Alabama and Minnesota. And PFOA in West Virginia and
7 Ohio. That's where we have seen that C8 study come out
8 of.

9 And then in terms of secondary manufacturing,
10 where PFASs are applied to other products, there's been a
11 big issue with PFNA in New Jersey, I believe, due to a
12 PVDF manufacturing process. That's why PFNA is of
13 interest in that state, but you don't usually see it come
14 up in other places.

15 And then similarly, PFOS and PFOA have become
16 issues due to different kinds of secondary manufacturing
17 throughout the New England area and Michigan. And we see
18 some types of PFAS-associated manufacturing in the
19 southeastern U.S. related to furniture and carpeting
20 manufacture.

21 I'm not familiar with any major secondary
22 manufacturing locations in California. Although there
23 might be. Military fire training in crash sites and
24 airports, we know these are nationwide issues. We know
25 that mainly from work the DOD has done investigating

1 potential PFAS releases associated with their use of
2 firefighting foams.

3 And then I also wanted to highlight refineries.
4 I haven't seen hardly any data on PFASs associated with
5 them. But we know they have the same kind of need for the
6 firefighting foams that some of these other entities have
7 had.

8 --o0o--

9 DR. HOUTZ: So just to summarize what some of
10 these major potential sources in California might be
11 military fire training and crash sites. There's a decent
12 amount of data on that available related to work the Air
13 Force has done, for example.

14 There could be secondary manufacturing. I am not
15 personally familiar with any -- within the state, but
16 there might be.

17 Airports, refineries, metal plating, and also
18 just in terms of more broad exposure, not necessarily
19 point source exposure, general consumer product use is
20 another source of exposure for anybody. And wastewater
21 treatment plants can sort of concentrate a lot of these
22 different consumer product uses.

23 --o0o--

24 DR. HOUTZ: Most of the environmental data
25 available that's been collected so far is on the

1 perfluoroalkyl sulfonates and carboxylates. A couple
2 different reasons for this. You can readily analyze for
3 these compounds at commercial laboratories, and drinking
4 water, ground water, soil, some labs can do fish. Air is
5 a very uncommon matrix to find methods for. There's more
6 toxicity data available for these compounds, which has led
7 to the development of either standards or sort of
8 guideline values, which then sort of creates the driver to
9 actually collect this data. And as a result, state and
10 federal requirements for sampling have focused on these
11 compounds.

12 There are a couple of other compounds that there
13 is a reasonable amount of data for, this methyl FOSAA
14 ethyl FOSAA. They are part of the U.S. EPA drinking water
15 method, also FOSA. And then 6:2 and 8:2 FtS are two
16 compounds that are associated with firefighting foam used.
17 There's a decent amount of data available on -- and
18 they're also associated with other industries beyond
19 firefighting groups.

20 Decent amount of data on GenX, particularly North
21 Carolina. I would say the peer-reviewed literature is a
22 good place to look, if you want to find out anything and
23 everything that's been measured so far. A lot of it is
24 through non-targeted methods, not using authentic
25 analytical standards. So I'm not saying the data is not

1 legitimate, but it's important to understand that it's
2 sort of tentative identification in measurement.

3 --o0o--

4 DR. HOUTZ: So typically drinking water
5 exceedances have driven PFAS environmental data collection
6 efforts, meaning that if there's been some type of
7 drinking water measurement of usually PFOS, PFOA above a
8 threshold value, that sort of triggers the environmental
9 investigation.

10 And certainly, the U.S. EPA's UCMR3 data
11 collection effort that occurred from 2013 to 2015, it sort
12 of revealed different large -- mainly large-scale drinking
13 water systems that had detectable levels of six different
14 PFASs. And then that was sort of the initiating event for
15 a number of environmental investigations that followed.

16 Small scale private wells may have some of the
17 highest PFAS levels, just because when you're talking
18 about discharge to a surface waterbody, particularly if
19 it's a large river, there's a lot more dilution. Whereas,
20 you could have a groundwater drinking well, particularly a
21 private well that is right in the middle of some major
22 contamination source.

23 So certainly what we've seen in the environmental
24 investigation community is that it's often private wells
25 that require the most immediate attention, and have the

1 highest detections. And so it's also, I just want to
2 point out, not always the government that is initiating
3 drinking water testing. There have been a couple of
4 notable events that have happened where private citizens
5 have taken their water to get tested. And that has sort
6 of led to cascading set of events, in terms of either
7 drinking water treatment, or further environmental
8 investigation.

9 I believe in Hoosick Falls that it's a private
10 citizen that sort of kicked off understanding that there
11 was a PFOA problem in that area. And then there was also
12 a student project in Sweden where -- it was like a summer
13 project where a high school teacher had a bunch of kinds
14 bring in drinking water from their homes. And that was
15 sort of how that particular region learned that they had a
16 lot of PFAS contamination in their drinking water.

17 And then also the military is doing a lot of the
18 PFAS investigations. And most of their environmental
19 investigations are really focused on potential pathways to
20 drinking water.

21 --o0o--

22 DR. HOUTZ: This may be a map a few -- a few of
23 you have seen a number of times. It's just sort of a
24 summary of the U.S. EPA UCMR3 survey results. The black
25 dots represent detectable levels of PFAS. The green dots

1 represent -- you know what, I think the black dots, I'm
2 sorry, they represent sampling locations not detectable
3 levels necessarily. The green dots represent values where
4 greater than 70 parts per trillion PFOS, PFOA were
5 measured. And most of those detections were groundwater
6 sourced systems.

7 --o0o--

8 DR. HOUTZ: I did briefly want to highlight on
9 potential environmentally related non-drinking water
10 exposures. And these are issues that come up a lot,
11 particularly in community events, where, you know, some
12 kind of communication about potential PFAS exposures has
13 been -- has been issued.

14 Fish consumption is another non-drinking water
15 exposure pathway that could be affected by some type of
16 environmental release. Michigan recently issued a do not
17 fish consumption advisory in a particular part of
18 Michigan, Huron River I believe.

19 Sometimes crops, either just like a home garden
20 or a larger scale agricultural system could be affected by
21 PFAS releases. Actually, one thing that's been pretty
22 serious occasionally with crops is when PFAS-impacted
23 biosolids have been -- have been spread over an
24 agricultural area.

25 Airborne exposure is possible. You really don't

1 see a lot about that, because most of these compounds are
2 not volatile. Usually, it would be some type of particle
3 associated exposure. And then soil ingestion is another
4 potential, but typically not hugely concerning, way of
5 ingesting these compounds.

6 And I did want to point out that the U.S. EPA
7 health advisory for PFAS/PFOA in drinking water assumes
8 that is a 20 percent relative source contribution, so 80
9 percent is coming from other sources.

10 --o0o--

11 DR. HOUTZ: Other drivers of environmental data
12 collection are academic studies or, in some cases, known
13 or suspected major PFAS releases. I believe it was this
14 work that was done through -- partly through EPA and
15 partly through academic institutions in North Carolina
16 that identified GenX and the Cape Fear Region.

17 And then there are a couple of regulations around
18 groundwater that sometimes drive environmental data
19 selection efforts. A few of them are noted here.

20 --o0o--

21 DR. HOUTZ: Okay. So in terms of identifying new
22 potential compounds or as Antonia was saying not
23 necessarily new in the world of chemistry but new to us.
24 A couple of -- I'll go over a couple of ways we might go
25 about -- thinking about that and doing that.

--o0o--

DR. HOUTZ: There's only one U.S. EPA method for PFASs and it is for drinking water. And it is validated for 12 of the perfluoroalkyl acids, and two of the polyfluorinated precursor compounds. Things get a little murkier when we're talking about groundwater and soil methods, because there are no standard EPA methods.

So most labs are offering methods that follow this Quality Systems Manual 5.0 -- sorry, 5.1. It is an agreed document between DOD and EPA, I believe that kind of guides environmental investigations. There's also two methods from ASTM for non-potable water and soil.

And so these methods, not the EPA method, but the other ones have the potential to add more analytes than just the 14 under 537. So if you have a particular compound you want to add, they might be potentially compatible with these two methods.

--o0o--

DR. HOUTZ: I'm not going to talk about this in detail, but we could talk about it in the Q&A section. These are just additional tools where you can measure either PFAS mass or tentatively identify particular PFAS structures. So the top three methods are essentially surrogate methods for total organofluorine compounds. The top assay is specific for PFASs and it does provide some

1 information about the perfluoroalkyl chain length.

2 The total organofluorine methods are not
3 necessarily specific for PFASs, but still could be useful
4 in identifying a major concentration of organofluorine
5 compounds.

6 And then high resolution mass spectrometry can be
7 used to -- as Sabrina was discussing early, to identify
8 other compounds that we don't have authentic analytical
9 standards for. But I do just want to stress that it's
10 going to depend a lot on how you prep the sample, what you
11 might see on that instrument, and also whether it's GC or
12 an LC.

13 --o0o--

14 DR. HOUTZ: So I'm thinking about what new PFASs
15 we may want to investigate and where to do so. I want to
16 talk about three examples or three points of interest.
17 One is domestic wastewater. This is likely to reflect
18 PFASs that are currently in use. And the detection limits
19 for most compounds are probably going to be too high to
20 identify PFASs that are being contributed through
21 non-point sources.

22 But this may be a way to percolate the samples
23 that are highly concentrated to identify new current use
24 PFASs. Another place you can look are the discharge
25 points of known or suspected sources, assuming you have

1 access to that location, or at the point of exposure, or
2 particular receptor.

3 --o0o--

4 DR. HOUTZ: So this is a study that DTSC and San
5 Francisco Estuary Institute did in 2014. The take-home
6 point is that we were looking at domestic wastewater from
7 different wastewater treatment plants around the Bay Area
8 and comparing 2009 data to 2014. In both cases, there
9 were six treatment plants tested, not necessarily the same
10 six in both years.

11 And we did see statistically significant
12 increases in two of the short-chain compounds PFBA and
13 PFHxA. And we saw non-statistically significant declines
14 in the average concentrations of PFOA and PFAS. So this
15 is just to illustrate, even in a five-year period, we
16 could see pretty -- pretty different trends in the
17 wastewater effluent.

18 --o0o--

19 DR. HOUTZ: This is an example of a conceptual
20 site model, basically looking at different sources, and
21 receptors, and identifying potential pathways --

22 --o0o--

23 DR. HOUTZ: -- just in the context of where to
24 investigate to identify new PFASs, because either you can
25 do it at the source or somewhere along the pathway or at

1 the receptor.

2 --o0o--

3 DR. HOUTZ: I would say there are pros and cons
4 to identifying at either the source or the receptors.
5 Some of the pros of identifying at the source of a release
6 will be that you'll have higher detections. And from an
7 engineering point of view, you also have the potential to
8 manage the problem, if you identify one.

9 Plus, you'll be able to identify the compounds
10 that were released potentially versus their transformation
11 products, which could be useful depending on what your --
12 your goals are.

13 Some of the cons of identification of the source
14 are that the compound may not actually end up resulting in
15 an exposure. Maybe it's a Relatively immobile compound,
16 and it's just not going to make its way to a receptor. So
17 you may have to employ fate and transport prediction in
18 modeling to kind of understand what's likely to get out of
19 a receptor.

20 And then also, you know, as with anything, there
21 can be multiple things impacting a receptor, so that's
22 another disadvantage of identifying at the source.

23 Some of the pros of identifying at the receptor
24 is that it's pretty reflective of current exposure. And
25 in many cases, we may be more concerned about

1 transformation products and what was actually released.
2 And also, this approach will screen out compounds that
3 weren't getting to the receptor.

4 But some of the cons are that honestly the
5 compounds may not be there at high enough levels to
6 detect. I mean, in some ways that could be a probe,
7 because perhaps if you can't detect it, it's not important
8 any way. But, you know, different things impact a
9 detection limit. Additionally, identification at a
10 receptor may screen out certain compounds that may migrate
11 there eventually.

12 --o0o--

13 DR. HOUTZ: So a few concluding thoughts. When
14 collecting new data, these are some of the things that
15 certainly we think about.

16 Identifying compounds without authentic
17 analytical standards or measuring them with non-standard
18 methods may not stand up to public, regulatory, or legal
19 scrutiny.

20 And if the data becomes publicly available, and
21 you're collecting it more for exploratory purposes or
22 potentially, you know, like you would do in an academic
23 paper, an interested public will want to know what it
24 means regardless of whether there are standards currently
25 developed.

1 So I've seen this occur, for example, with
2 somebody -- somebody gets a report back about the
3 groundwater well, and they have PFBS, and say it's 80
4 parts per trillion, well, that's above the health standard
5 for PFOS/PFOA and how do we interpret that for that
6 particular compound? I'm not saying collecting too much
7 data is necessarily a bad thing, but there can be
8 drawbacks.

9 And another point, which is really important,
10 particularly from a treatment point of view, but also from
11 bioaccumulation, as the mobility of certain PFASs
12 increase, they're usually associated with decreasing
13 bioaccumulation, which is, you know, why we might think
14 about looking at urine versus serum.

15 And so the compounds measured at the receptor may
16 be more mobile, but potentially cause less concern, since
17 they're less bioaccumulative. However, the really mobile
18 PFASs are very challenging to treat in drinking water and
19 other types of waters, just because they don't -- they
20 don't adhere well to a lot of the treatment technologies
21 like GAC and ion exchange that are currently used for
22 treatment of these compounds.

23 --o0o--

24 DR. HOUTZ: So in summary, California has some
25 potential major PFAS sources. Manufacturing doesn't

1 appear to be one of the major ones in this state, but
2 there are other potential large point sources. Most of
3 the environmental data collection is on a small subset of
4 compounds, so it can be a bit of a challenge to look to
5 the environmental data to know what to look for next,
6 unless you're really mining the academic literature.

7 Typically, drinking water exceedances drive what
8 kind of environmental samples are collected. And there
9 are a variety of methods that can be used to identify
10 either a total PFAS, or total organofluorine
11 concentration, or to tentatively identify individual
12 compounds, and where you investigate will, you know,
13 determine what you find.

14 --o0o--

15 DR. HOUTZ: So thank you for your attention. And
16 I also wanted to -- for those that are -- want to read
17 more deeply about specific PFAS topics, the ITRC panel has
18 a 250 person working group on their PFAS working group.
19 And there are seven fact sheets that are ten pages or less
20 at this website that are all peer reviewed among the
21 community.

22 So I would recommend going there if you want to
23 read more about fate and transport, or AFFF, those types
24 of topics.

25 CHAIRPERSON SCHWARZMAN: Thank you very much,

1 Erika.

2 We have --

3 (Applause.)

4 CHAIRPERSON SCHWARZMAN: We have a little time
5 for questions, about five minutes.

6 Yeah, Tom.

7 PANEL MEMBER MCKONE: I have a brief question of
8 clarification. On your earlier slide, you had a note
9 about railyards and a picture of a railyard, but what's
10 the source in railyards?

11 DR. HOUTZ: I think similarly firefighting foams.

12 PANEL MEMBER MCKONE: Okay.

13 CHAIRPERSON SCHWARZMAN: Martha.

14 DR. SANDY: Thank you for your talk. I have a
15 few questions about -- so I'm Martha Sandy, sorry,
16 OEHHA -- the traditional, the PFOA and the PFOS, the old
17 guard there. How common are they or ubiquitous are they
18 in like environments -- indoor environments consumer
19 products? Do you have a -- I'm just wondering, do you
20 have a problem when you're doing measurements worried
21 about background levels or do you have any problem with
22 contamination in analytical laboratories with PFOA and
23 PFOS?

24 DR. HOUTZ: Yes. So PFOA and PFOS, often one or
25 the other, not typically both, does show up in certain --

1 so consumer products, I haven't seen frankly any real
2 recent data on that. I've seen some historical
3 publications on PFOS/PFOA presence in consumer products.
4 And, yeah, you do see them in a variety of products that
5 contain fluoro chemicals.

6 But in a laboratory setting, PFASs are kind of
7 all over the place. So usually if you're analyzing PFASs,
8 you have designated equipment kind of like clean areas to
9 prevent cross contamination. So like, for example, low
10 retention pipette tips that are desirable for the analysis
11 of some kind of sticky POPs containing PFASs, And
12 particularly if you're pipetting ethanol or another
13 solvent that can desorb those compounds from the pipette,
14 you know, that will introduce contamination.

15 And similarly, most LC-MSs, the instrument most
16 commonly used to measure these compounds, contain a lot of
17 PTFE tubing, which will leach fluoro chemicals seemingly
18 forever based on my experience

19 (Laughter.)

20 DR. HOUTZ: So either the tubing is replaced or
21 there are different things an analytical chemist will do
22 to separate out the background contamination.

23 DR. SANDY: Thank you.

24 CHAIRPERSON SCHWARZMAN: Gina

25 DR. SOLOMON: Gina Solomon with UCSF. And thank

1 you for that talk. I was hoping you could talk a little
2 bit more about some of those alternative methods, the TOP,
3 the PIGE, and the organo -- total organic fluorine, and
4 what you see as some of the pros and cons of those
5 different methods, and also the degree to which some of
6 those might potentially be useful as sort of a cross-check
7 on some of the more targeted methods to see if you're kind
8 of capturing the fluorinated universe with the more
9 targeted methods?

10 DR. HOUTZ: Sure. I'm just going to go back to
11 this slide, so we can -- so there are two methods of
12 measuring just organofluorine. They both require
13 isolating any organofluorine fraction from inorganic
14 fluoride, for instance. So there's different ways you can
15 do that, but one method is called PIGE, Photo[SIC] Induced
16 Gamma Emissions Spectroscopy where you shine a -- here we
17 go. You shine a beam of light on a product. The thing
18 that's nice about this method is that you don't actually
19 have to do much prep, because it measures fluorine on a
20 thin surface.

21 And so that is a way of measuring total fluorine
22 or hopefully total organofluorine, if you've been able to
23 clean your sample. And then you can also extract PFASs
24 using, for example, granular activated carbon, and then
25 incinerate that carbon and measure the resulting fluoride

1 on an ion chromatograph.

2 So these are two methods in which you can measure
3 organofluorine. I think that those two methods are --
4 yeah, they're kind of nice screening tools to see if you
5 do have any organofluorine present. I would be careful
6 deploying it with like wastewater, because there are a lot
7 of other kinds of fluorine containing organic chemicals
8 that are not, strictly speaking, PFASs.

9 For example, I think there are some x-ray
10 compounds or compounds that are used some kind of medical
11 screening that contain fluorine that you would -- you
12 know, that would give you a signal for organofluorine even
13 if it's not strictly PFAS.

14 So we've often seen these types of tools used
15 for -- particularly PIGE, for commercial products just
16 trying to understand if they contain, you know, like maybe
17 your testing a paper plate to see if it has some type of
18 organofluorine content.

19 TOP assay is a method that converts
20 polyfluorinated compounds to compounds that we can easily
21 measure.

22 And by mesh, you
23 (Microphone went out.)

24 DR. HOUTZ: Thank you.

25 And so by measuring the sample before and after,

1 you can get kind of a surrogate number for precursors
2 present in that sample. That's a method that I worked on
3 in grad school, and we've applied it to a number of
4 environmental samples. And I would say we typically see
5 that something like 20 to 70 percent of the PFAS fraction
6 in most environmental samples that we looked, particularly
7 ones that have been impacted by firefighting foams,
8 contain these precursor type compounds.

9 It's pretty rare that we would see -- that we
10 would look for a targeted list, not see anything, but then
11 have a huge hit with one of these other techniques. I
12 would say that, in my experience, analyzing a variety of
13 environmental and human samples, it's pretty rare to not
14 detect PFOS/PFOA or one of the shorter compounds, but then
15 to get a huge measurement from something like TOP assay or
16 AOF. But it also kind of depends on what the release is
17 and how recent it is.

18 So one example that I would say would be really
19 useful with one of these tools, say you're dealing with a
20 spill of aqueous film-forming foam that was recently
21 manufacturing. AFFF doesn't contain anything that we look
22 for in these normal targeted analyte lists. So, you know,
23 if you use one of these surrogate measurements, then you
24 can actually have an understanding of how much
25 contamination is there, particularly if you're trying to

1 clean it up.

2 CHAIRPERSON SCHWARZMAN: Thank you, Erika, very
3 much. We're going to move on now to some guest
4 discussants. I want to introduce Simona Balan and Darrin
5 Polhemus. Simona is a senior environmental scientist at
6 DTSC -- excuse me -- where she leads the Safer Consumer
7 Products team working on PFASs. Before joining DTSC, she
8 was a senior scientist at the Green Science Policy
9 Institute managing international products on the --
10 international projects on the use of flame retardants and
11 PFASs in consumer products. She earned a Ph.D. in
12 Environmental Science Policy and Management from UC
13 Berkeley. And I had the pleasure of having her in a
14 class.

15 Darrin Polhemus is the Deputy Director of the
16 Division of Drinking Water in the State Water Resources
17 Control Board. His division administers the federal and
18 California Safe Drinking Water Acts regulating over 7,400
19 public water systems throughout the state.

20 The Division also issues permits for recycled
21 water usage, oversees the work of county health
22 departments that are responsible for small water systems,
23 and develops regulations pertaining to drinking water.
24 Darrin has a BS in Agricultural Engineering from
25 California Polytechnic State University.

1 So we'll start with Simona and then go to Darrin,
2 and then we'll have time for questions.

3 (Thereupon an overhead presentation was
4 presented as follows.)

5 DR. BALAN: All right. Good afternoon, everyone.
6 And thank you for inviting me here to talk about how
7 biomonitoring could help the Safer Consumer Products
8 Program.

9 And I just want to start briefly for those of you
10 who are not familiar with our program with just a quick
11 intro.

12 --o0o--

13 DR. BALAN: We are part of DTSC. And we are
14 tasked with implementing the Safer Consumer Product
15 Regulations. So we have a four-step process. We start
16 with a list of about 2,500 entries of candidate chemicals.
17 It's basically a list of lists from 23 other authoritative
18 bodies, including the priority chemicals for biomonitoring
19 in California.

20 And if we identify a consumer product that
21 contains one of these candidate chemicals that we think is
22 of concern because of exposure and adverse impacts, then
23 we can call that product chemical combination a priority
24 product, and add it to the California Code of Regulations.
25 If we do that, manufacturers have to do an alternatives

1 analysis, and answer the question as to whether this
2 chemical is necessary in the product, and if there's a way
3 to do the product with a safer alternative, whether it's
4 chemical or non-chemical.

5 And based on the results of the alternatives
6 analysis, we then issue a regulatory response, which can
7 range from no action, if none is needed, to a ban, or
8 anything in between.

9 --o0o--

10 DR. BALAN: So biomonitoring can be particularly
11 important for the second step, the identification of
12 priority products, because we have to address two factors
13 in our regulations. We have to show that there are
14 potential exposures to a candidate chemical in the
15 product, and that one or more of these exposures have the
16 potential to contribute to or cause significant or
17 widespread adverse impacts.

18 --o0o--

19 DR. BALAN: And because the universe of consumer
20 products is so big, every three years we issue a priority
21 product workplan, where we identify a smaller range of
22 product categories that we will focus on, as well as some
23 possibly priorities that will be guiding our work over
24 those three years.

25 So because back in 2015, the Scientific Guidance

1 Panel voted to add the entire class of PFASs to the list
2 Of priority chemicals, they have now become part of our
3 candidate chemicals list. So we have been looking at the
4 entire class of PFASs in the product categories in our
5 2015 and 2017 workplan.

6 And these are the product categories that were in
7 that workplan, and all of them contain products with
8 PFASs. So we've -- we've researched some of them, and we
9 particularly focused our initial workshop on carpets and
10 rugs, upholstered furniture, and cleaners and protectors,
11 or care and treatment products for carpets and upholstery.

12 And following that, we decided to start by taking
13 a closer look at carpets and rugs. And we have proposed
14 to regulate carpets and rugs containing PFASs -- any PFASs
15 as a class. So this is here a screen shot of our -- the
16 cover of our technical document that talks about the
17 rationale for choosing this product chemical combination.

18 --o0o--

19 DR. BALAN: But it's -- the exposure is really
20 not straightforward. So this is just one of our
21 conceptual exposure model diagrams just to illustrate the
22 complexity of assessing exposure from consumer products to
23 PFASs, to humans, or biota. So humans, or animals I
24 guess, could become exposed to PFASs from carpets and rugs
25 by dermal contact. All right. That's probably not a

1 major source of exposure, but that's a direct source.

2 Inhalation as well of volatile fluorotelomer
3 alcohols that are released from carpets in an indoor
4 environment could be another source. And ingestion is
5 probably the more complex one, because ingestion could be
6 happening directly from dust that's contaminated with
7 PFASs emitted from carpets and rugs inside a room, but it
8 could also be indirect through environmental
9 contamination, because carpets and rugs that at the end of
10 their life end up in landfills could then be long-term
11 sources of PFASs into the environment, including in
12 groundwater and other drinking water sources.

13 And sludge or biosolids from wastewater treatment
14 plants that treat landfill leachate could then also be
15 applied to agricultural fields and make their way into the
16 food chain. So there is direct and indirect routes of
17 exposure to PFASs.

18 --o0o--

19 DR. BALAN: As we were doing our research, we
20 identified several key data gaps. Some of those are
21 related to biomonitoring some not, but I thought it would
22 be good to mention them.

23 And just to point out, none of these data gaps
24 are precluding us from moving forward with our proposal to
25 regulate carpets and rugs of PFASs, but they would

1 definitely be good to know as we move forward and for the
2 scientific community.

3 So first of all, like other speakers have
4 mentioned, publicly available data are limited to
5 perfluoroalkyl acids and a few of their precursors, and
6 mostly the longer chains. Yes, there is some data on
7 short chains, but it's mostly environmental monitoring.
8 And as Antonia is pointing out, some of that is serum
9 data, so it's just probably not as relevant.

10 So we definitely could use more data. There's
11 also not a very clear relationship between the
12 environmental presence of these PFASs and actual adverse
13 health impacts. Those links haven't been made very clear
14 so far.

15 And even more importantly, we don't fully
16 understand the effects of mixtures. We've looked at
17 individual compounds, and there are now a few studies that
18 show that mixtures of PFASs may cause adverse impacts,
19 even at levels when the individual compounds don't, or
20 PFASs may be exacerbating that adverse impacts of other
21 contaminants, such as PCB 11, I believe, was one that was
22 studied, including the short-chain PFASs.

23 There's also an unclear -- or less clear
24 understanding of the relative importance of the different
25 sources of exposure. So for a typical Californian is the

1 major source of exposure from drinking water, is it from
2 food, is it from consumer products? I don't think we have
3 a good answer to that so far.

4 --o0o--

5 DR. BALAN: So here's how I see biomonitoring
6 studies potentially helping support our program, and
7 adding to the body of literature out there. I think we
8 need more studies on short-chain PFASs in different
9 matrices, even beyond urine to whole blood. So there was
10 some studies that found short-chain PFASs in whole blood,
11 even if they didn't detect them in serum, as well as other
12 matrices. Like in nails and hair, there have been a
13 couple of new studies from China that looked at
14 perfluoroalkyl acids in nails, and found them to be a
15 fairly good matrix for studying these compounds.

16 I also think we need to look at the intermediate
17 degradation products. For instance, perfluoroalkyl acids
18 are not added intentionally to the consumer products that
19 we've looked at, but they are the final degradation
20 products of those PFASs added. And the intermediate
21 products include fluorotelomer carboxylic acids,
22 fluorotelomer aldehydes. There was a recent study just
23 published this year by FDA scientists that looked at the
24 metabolism of 6:2 FTOH that eventually degrades to PFHxA.
25 But 5:3 fluorotelomer carboxylic acid is an intermediate

1 fluorotelomer.

2 And they found that even those 6:2 fluorotelomer
3 alcohol and PFHxA are not persistent. This 5:3
4 fluorotelomer carboxylic acid appears to be persistent
5 inside cells and may lead to toxicity in there.

6 I also think we need studies that are focused on
7 California's most vulnerable and sensitive subpopulations,
8 including workers. For instance, we know that there are
9 higher levels of fluorotelomer alcohols in retail -- in
10 stores that sell carpets, and upholstery, and outdoor
11 clothing or outdoor equipment.

12 But I haven't seen a study that actually
13 biomonitored those workers and looked at their serum -- or
14 their body burden of these chemicals and if that really
15 has an impact to their exposure.

16 And lastly, I think it would be great to have
17 some intervention studies before and after removal of
18 specific consumer product exposures sources, but, of
19 course, that's really challenging to do for the longer
20 chain PFASs that have such a long half-life in the human
21 body. But for the shorter chain PFASs, this may be --
22 this may be possible especially, you know, with the right
23 matrix.

24 --o0o--

25 DR. BALAN: So these studies would definitely

1 help us think about the next round of priority products
2 that we may be selecting from the 2018-2020 priority
3 product workplan. All but one of the product category in
4 this new workplan contain products with PFASs, everything
5 except for lead acid batteries. So this is the menu that
6 we'll be analyzing over the next three years. So I look
7 forward to hearing the results of future studies, and
8 thank you for the opportunity to speak again. This will
9 conclude my remarks. Thank you for listening.

10 (Applause.)

11 (Thereupon an overhead presentation was
12 presented as follows.)

13 SWRCB DEPUTY DIRECTOR POLHEMUS: So good
14 afternoon. I'm Darrin Polhemus. I'm Deputy Director for
15 the Division of Drinking Water at the State Water Board,
16 as was previously mentioned. And I was going to go
17 quickly through what we've done at the Water Board for
18 drinking water components of PFAS.

19 --o0o--

20 SWRCB DEPUTY DIRECTOR POLHEMUS: So what do we
21 know? Starting there. So U.S. EPA did collect the UCMR
22 data, UCMR3, as was discussed. Those are the materials,
23 the six PFASs that were in it. From that in California,
24 there were 133 detections. And you can see how it broke
25 out amongst the materials that were found.

1 Additionally, we had voluntarily reported to our
2 data gathering system 297 other detections that were done
3 through water testing, at water systems throughout
4 California. And you can see how those were displayed
5 there.

6 That amounts for a total of 430 samples that did
7 come back with detections above the UCMR detection limit,
8 which was 20 and 40 parts per trillion, depending upon
9 PFOA, PFOS, and some of the other ones, so rather high
10 detection limits in that first round.

11 --o0o--

12 SWRCB DEPUTY DIRECTOR POLHEMUS: So following
13 that, U.S. EPA issues their health advisory at 70 parts
14 per trillion combined of the PFOA and PFOS only. They
15 immediately called us after issuing that and took an
16 unusual step. Usually, when they issue a health advisory,
17 they don't do this. But in this instance, they did. They
18 advised us to contact all the water systems that were
19 above the 70 part per trillion health advisory level, and
20 see if we could get them to reduce their source, either
21 take them offline or address them.

22 There were six water systems in California that
23 were -- fit that bill where they were serving water that
24 was above the 70 parts per trillion. Four of them took
25 those sources offline. One of them was discovered the it

1 had treatment trains afterwards that were likely removing
2 the material. And they didn't see it in the actual
3 distribution water. And one of them set up a blending
4 mechanism to blend with a well that didn't have it, so it
5 would drop below the 70 part per trillion level.

6 --o0o--

7 SWRCB DEPUTY DIRECTOR POLHEMUS: I'm going to run
8 through a quick series of maps just to give you a closer
9 view of the U.S. -- United States of America map that had
10 all of the UCMR data to show you kind of where we found
11 it. This first one is -- I'm sorry, we can get you the
12 full map later, but I'm just trying to do a screen shot of
13 where it was at. You can see we had just a few Northern
14 California -- or Central California sources, and then
15 group of them in Southern California in the L.A. basin
16 area, where there were some below and some above the 70
17 part per trillion. And particular map is for PFOA/PFOS
18 only.

19 --o0o--

20 SWRCB DEPUTY DIRECTOR POLHEMUS: This next slide
21 is zoomed in then on Southern California. You can see the
22 locations for the PFOA and PFOS detections.

23 --o0o--

24 SWRCB DEPUTY DIRECTOR POLHEMUS: And then if we
25 jump to another set of maps that then throws in all six,

1 you can see that there really wasn't any difference in
2 spread between the first two. There's kind of more dots
3 clustered in the same general areas, but it didn't broadly
4 expand where they were at. So they seem to be
5 co-concurring at least at the moment for the six materials
6 that were part of the PFOA/PFOS.

7 --o0o--

8 SWRCB DEPUTY DIRECTOR POLHEMUS: And the same
9 thing here when you zoom in, you can see like I think the
10 biggest change is there's a bunch more detections in the
11 Camp Pendleton Marine Base southern -- very bottom
12 right-hand corner of the map there.

13 --o0o--

14 SWRCB DEPUTY DIRECTOR POLHEMUS: So based on
15 this, I want to explain quickly what kind of our first
16 regulatory response -- or step is. So under statutes for
17 our authorities in the Division of Drinking Water, we can
18 issue notification levels, which are non-regulatory,
19 non-mandatory. Non-regulatory -- I'm going to say that a
20 couple times -- advisory level that we issue, so that
21 public water systems will understand that we have some
22 concerns with that level, and should, you know, address it
23 appropriately under their kind of own powers, but they're
24 not required to.

25 So we set that for chemicals where there's no

1 MCL. This is kind of like a pre-first step maybe in
2 arriving at an MCL, but not all notification levels do.
3 There are numerous notification levels for materials that
4 never made it all the way to a maximum contaminant level,
5 regulatory setting level.

6 And from that, we also set a response level
7 associated with that. That's usually a multiplier of
8 generally it's been 10 times the notification level. In
9 this instance, I'll explain that it was a little bit
10 different for particular reasons.

11 --o0o--

12 SWRCB DEPUTY DIRECTOR POLHEMUS: So there is --
13 as I mentioned before, the notification level is advisory
14 to the drinking water system. The only requirement is is
15 if they do voluntarily test -- I should go back to the
16 slide. Sorry. It was on this part. It's the third
17 bullet. If they do voluntarily test, and if they detect
18 above -- or they detect a material above the notification
19 level, then the statutes do say that they are bound then
20 to both report it to us, so that we have that data at
21 Division of Drinking Water, and that they are to notify
22 their governing board of directors, so who -- if it's a
23 city council that's over the water system, or a board of
24 directors of a water system.

25 And that's the extent of it. They can then

1 choose, and we often suggest that they do advise the
2 public, but they are not required to.

3 And the response level differentiates -- at that
4 level, we again only recommend. It's up to them to take
5 actually the source offline or treat the system.

6 --o0o--

7 SWRCB DEPUTY DIRECTOR POLHEMUS: So there is a --
8 there is a slight change when you go to our regulations,
9 in that we have put in our regulations for groundwater
10 replenishment projects, where drinking water will be used
11 from recycled products where the water is recycled, it's
12 put in the ground, and it's extracted later as a drinking
13 water source. We do in those instances are -- have our
14 regulations require the monitoring for notification for
15 any material that has a notification level. And so in
16 this case, they would be required to test for PFOA and
17 PFOS.

18 That same rule will end up in our Surface Water
19 Augmentation Regs, which are going to be official as of
20 October 1st. They're in the administrative approval
21 process and will be coming on the books. And it's
22 basically the same -- the same requirement. And I would
23 anticipate that we would continue that trend with any type
24 of scenario where we're using recycled water that's going
25 to end up in a drinking water source. So that's

1 established by regulation not statute.

2 --o0o--

3 SWRCB DEPUTY DIRECTOR POLHEMUS: So this is the
4 first notification level issued by the State Water Board
5 itself, since the Drinking Water Program was transferred
6 from the Department of Public Health to the State Water
7 Board for PFOA and PFOS. We issued them together. It was
8 done with the help of OEHHA and some recommendations and
9 review that they did for us, and helped us in going
10 through the -- what health information there was
11 associated with it.

12 In essence, we chose to issue notification levels
13 at the two levels you see there, 14 parts per trillion for
14 PFOA, 13 parts per trillion PFOS. These are consistent
15 with also the State of New Jersey actions that have been
16 taken previously.

17 So we basically have issued those. They're now
18 standing. There are laboratories that are getting
19 certified through or ELAP program so that they are
20 qualified to test for these materials and we will wait to
21 see what kind of data comes in. A lot of water systems do
22 voluntarily test for these materials. They're concerned
23 about their exposure of the public from those systems. So
24 we do expect to get a fair portion of data. It will be a
25 couple months, a year or so, before we actually expect to

1 see a bunch of it coming? But we'll standby and see what
2 we get from that.

3 It will be luckily at lower levels than the UCMR3
4 data. So we did establish a revised testing method for
5 this, 537, revision 1.1. It does have lower detection
6 levels than was used in the UCMR3, so we'll see if we can
7 get below the numbers and just get a better feel for what
8 the overall level in the water systems are.

9 --o0o--

10 SWRCB DEPUTY DIRECTOR POLHEMUS: Also, next steps
11 are were we issued these two notification levels as
12 initial notification levels just kind of a term I made up
13 as we were pushing it out to be clear that we were
14 continuing to look at it, and that we may revise our
15 stance on it, as we and OEHHA continue to look a little
16 deeper into it. So we can change that as we get a little
17 farther along.

18 And we're -- you know, this first -- this is
19 really the first step in helping us gather further data to
20 see whether I will make a formal request of OEHHA to
21 develop a PHG associated with that. And then that would
22 be a precursor to establishing a maximum contaminant
23 level.

24 And that's it.

25 (Applause.)

1 CHAIRPERSON SCHWARZMAN: Thank you very much. We
2 have a comment -- a little time here for questions, sorry,
3 for both our discussants. And then after a break, we'll
4 have a big discussion time.

5 Did you have a question, Jenny?

6 PANEL MEMBER QUINTANA: Hi. Thank you for that
7 talk. I had a quick question about the temporal nature of
8 exceedances. Were these like a single sample that was
9 over in a year, or would it be over every time the water
10 was tested, or would it change over time? I know that for
11 San Diego we have different blends of water depending on
12 the different time of year. And I'm just curious about
13 your exceedances, if that was a single one and many
14 non-exceedances, because we were talking about temporal
15 exposures earlier?

16 SWRCB DEPUTY DIRECTOR POLHEMUS: Right. You know
17 the data set is all over the map on that. There are some
18 of them that have just pulled -- some of the water systems
19 pulled one sample for the UCMR, some of them followed up
20 with other samples. And so, you know, when I mentioned
21 there was 430 detects, some of those are one water system
22 they kept testing, you know, every quarter or every month
23 to try to see what was going on in their particular water
24 system.

25 So you've got to look at kind of each data line

1 and see whether it represents a multiple set or not.

2 PANEL MEMBER QUINTANA: My other question is have
3 they looked at this in reclaimed water or what's kind of
4 tastefully called toilet to tap water?

5 SWRCB DEPUTY DIRECTOR POLHEMUS: Yeah, we don't
6 use that term.

7 (Laughter.)

8 SWRCB DEPUTY DIRECTOR POLHEMUS: Let's ban it
9 from the room. For highly recycled water, yes, that was
10 what I was mentioning is that -- so whenever we issue
11 permits associated with recycling water that will end up
12 as drinking water, right now we only have indirect
13 methods. You put it in the ground and it takes, you know,
14 six months to actually be extracted as drinking water. We
15 are just doing one where you can put it into a reservoir
16 that has six months retention time as well.

17 You know, we are slowly building closer and
18 closer to direct potable reuse, where there -- you know,
19 the time will be hours to minutes from end of treatment to
20 serving it in a water system. But that's a ways off.
21 There's a lot of scientific studies underway at the moment
22 before we get there. But we do require PFOA/PFOS, because
23 now they have a notification level to be tested in
24 indirect recycling projects at the moment. And that I'm
25 sure will continue for the -- yeah.

1 PANEL MEMBER LUDERER: Thank you for that talk.
2 That was really interesting. I was wondering whether for
3 these exceedances, is there any kind of a requirement for
4 investigation to kind of understand where these chemicals
5 are coming from for a particular water system, or is that
6 kind of on a more of a case-by-case basis, whether the
7 system chooses to do that. As you mentioned that one
8 where they did multiple samples.

9 SWRCB DEPUTY DIRECTOR POLHEMUS: Yeah, it I
10 think, you know, the -- it's varied. Some of them are
11 pursuing trying to figure out the sources, and some of the
12 ones we're looking at as well along with them to try to
13 understand what a potential source is, especially the ones
14 in L.A., they -- you know, they don't seem to be near an
15 airport. Maybe there's some manufacturing in the past
16 that seemed to release it.

17 So there's -- you know some of them are curious,
18 some of them are kind of like obvious. The Camp Pendleton
19 ones are kind like, okay, well, you know, the military is
20 looking all over, because they are finding that they used
21 it a lot and it's showing up there. So it kind of varies.

22 At the moment, anybody that's exploring it is
23 doing it on their own. There is none from our, you know,
24 clean water, groundwater, regulatory side, and clean-up
25 type programs. We don't have any active -- anybody

1 actively pursuing a clean-up case against someone that is
2 known to have been a discharger in it. So we're way early
3 in the game, kind of at the detection stage, and figuring
4 out what it really means to the water system. And then,
5 obviously they can move into to potential remedies as they
6 get further long.

7 CHAIRPERSON SCHWARZMAN: I have one very brief
8 question about the UCMR3. And that's just a single point
9 in time 2013-2014, is that right?

10 SWRCB DEPUTY DIRECTOR POLHEMUS: Yeah, I was one
11 -- basically, one pulled samples from multiple sources out
12 of a water system they had. That also is really skewed to
13 large water systems -- large water systems do test or --
14 under the UCMR, and then they select a very small number
15 of small water systems to test. So it's not a really
16 complete sample when it comes to that standpoint.

17 CHAIRPERSON SCHWARZMAN: And as far as you know,
18 we don't have other sources of data over time about the
19 presence of perfluorinated compounds in drinking water
20 right, where, there's repeat tests at the same location.

21 SWRCB DEPUTY DIRECTOR POLHEMUS: No, the UCMR
22 data is the very first stab at it. And then, like I say,
23 some of them continue to do testing and reported that to
24 us, so we have a very small trend in some instances, but
25 it's a really small data set at this point.

1 CHAIRPERSON SCHWARZMAN: Thank you.

2 My other question is for Simona actually, because
3 I know that a lot of work goes into this Safer Consumer
4 Products selection process when looking at a particular
5 product category, and then a -- the combination of a class
6 of chemicals within the product category. And I was just
7 wondering what you could tell us about kind of what you've
8 learned about occurrence and use of PFCs in a variety of
9 product categories, and how you settled on carpeting, and
10 just the -- what you learned from that in terms of as --
11 as we try to think about where chemicals are coming from
12 that people might be exposed to?

13 You know, we're thinking about drinking water and
14 the firefighting foams. And then what did you learn about
15 commercial products -- or, sorry, consumer products?

16 DR. BALAN: So we looked at the product
17 categories in our 2015-2017 workplan. We looked at
18 carpets and rugs, upholstered furniture, cleaners and
19 protectors which fall under cleaning products, personal
20 care products, and clothing.

21 The personal care products is complicated,
22 because the PFASs that are used in personal care products
23 have no toxicity data as far as we know. There are a
24 couple studies that found perfluoroalkyl acids as
25 impurities in those personal care products -- in some

1 personal care products, but it's not enough to justify for
2 us to move forward.

3 So I think we need more studies to find out if
4 perfluoroalkyl acids are impurities, more widespread in
5 personal care products.

6 We chose -- so we looked more in detail at
7 upholstered furniture and carpets because they are pretty
8 big sources of exposure indoors. One of our policy
9 priorities was chemicals that are in indoor air and dust.
10 So that's why carpets and rugs really met that policy
11 priority. They are very big sources indoors. As you can
12 see it's a big surface indoors. And more approximately
13 half of California households have carpets, and a lot of
14 office spaces, a lot of commercial spaces.

15 So we thought that, you know, it's obvious a very
16 widespread exposure source in California directly. Like
17 most Californians are going to come in contact with
18 carpets on a regular basis. And also they're a really
19 major source of exposure indirectly through landfills.
20 They're one of the big contributors to landfills. So
21 that's why we chose to move with that, because it is a
22 major source of exposure.

23 Now, that doesn't mean that we're not interested
24 in the other product categories, but this made sense to
25 start with, because it's so obvious.

1 CHAIRPERSON SCHWARZMAN: Can you say do you have
2 a second choice?

3 (Laughter.)

4 DR. BALAN: Do I have a second choice?

5 (Laughter.)

6 CHAIRPERSON SCHWARZMAN: Sorry. I should have
7 asked your boss.

8 (Laughter.)

9 DR. BALAN: Yeah, no. I mean we -- we looked at
10 those three in the beginning. And now we move forward
11 with this one. And I don't know if we're going to do
12 another one, it was going to be -- I don't know. But for
13 now carpets and rugs.

14 CHAIRPERSON SCHWARZMAN: Thank you. That's
15 helpful. Thank you.

16 Yes, go ahead, Anna.

17 DR. READE: Hi. Anna Reade with NRDC again. I
18 was wondering about the water data, if we know anything
19 more about water systems around DOD sites, not just Port
20 Hueneme. I think the DOD did a recent study, I think
21 2017, that showed really, really high levels of PFOA and
22 PFOS being detected in some of these DOD sites up to parts
23 per million in the water. And so I'm just wondering if we
24 know more about those sites.

25 SWRCB DEPUTY DIRECTOR POLHEMUS: Yeah. At this

1 point, there's no data for the water systems immediately
2 surrounding them. We did some looking, you know, after we
3 saw the high levels from the military data set too. So
4 that's something to future explore to see what we can find
5 there. And most of the really high ones though I think
6 results were in contamination clean-up wells, not in
7 drinking water sources to my knowledge.

8 So I believe they're all the water sources that
9 were -- not the parts per million levels, those were
10 clean-up wells.

11 CHAIRPERSON SCHWARZMAN: Andria.

12 MS. VENTURA: So Andria Ventura again with Clean
13 Water Action. So first of all, thank you to both of your
14 departments. Thank you for the notification level and to
15 OEHHA as well and for the Safer Consumer Products looking
16 at these chemicals.

17 I just -- I'm going to express my ignorance here.
18 I'm a little confused about the maps that we saw, because
19 I know that there was a study in 2016 Environmental
20 Working Group, UC Berkeley and a few others were involved,
21 look -- trying to extrapolate drinking water sources that
22 were considered contaminated, and wastewater treatment
23 manufacturing sites, et cetera, like metal plating I
24 think. I know some people are working on that. But the
25 map doesn't look like we have a whole lot. And yet, my

1 understanding is that while California doesn't have the
2 big major spills or legal cases, like we see in the Ohio
3 River Valley or in North Carolina or Hoosick Falls, New
4 York, we have the most detections. So I'm truly asking a
5 question is I didn't understand the map, and if you could
6 clarify that for me.

7 SWRCB DEPUTY DIRECTOR POLHEMUS: Sure, I'll try
8 to. So the map only represents data from drinking water
9 wells specifically. So I think it sounds like -- and I'm
10 not familiar with the map you mentioned or the study, but
11 it sounded like it included known environmental tests and
12 environmental sites. So this was largely the UCMR data
13 with a few other sprinkles in of just drinking water
14 source wells that were submitted to us specifically or
15 from the UCMR3 data.

16 So it's just limited to that, and definitely
17 should not be representing -- it really only represents
18 known water sources that had PFOA, PFOS, or the other four
19 materials that were part of the UCMR3. It does not
20 represent, in any stretch of the imagination, whether it
21 may be environmental contamination, or other type of
22 groundwater, or surface water exposures, or any of that
23 stuff. It was really focused on just drinking water
24 sources.

25 CHAIRPERSON SCHWARZMAN: Unless there are final

1 questions -- one more. Okay. Yeah, great.

2 DR. HOUTZ: One thing I wanted to say about the
3 UCMR3 data. The reason why California -- I honestly am
4 not sure if California had the largest number of systems
5 with 70 ppt or more. I actually think they didn't. But
6 many of the systems were tested like three or four times
7 over that 2013 to 2015, period and individual intake wells
8 within a system. So it could appear that California had
9 the most detections if there were like more intake wells
10 or their wells were tested more frequently in that period,
11 but I'm not sure that would necessarily translate to more
12 impacted drinking water terms.

13 There -- it may have been the most. I'm not
14 sure. I know Alabama had like eight. California I can't
15 remember off the top of my head how many systems were
16 impacted above 70 ppt.

17 CHAIRPERSON SCHWARZMAN: So we are going to take
18 a -- oh, did you have a follow up?

19 DR. READE: Do you have time?

20 CHAIRPERSON SCHWARZMAN: Yeah, we have a minute.

21 DR. READE: I think the map that you're referring
22 to Andria is they retested Eaton Eurofins Laboratories
23 retested a lot of their samples at -- so the reporting
24 limits for the UCMR data was much higher than the ability
25 to detect with their methods. And when they retested

1 their samples, which I think represented about a third of
2 the UCMR data, showed that if you did reporting levels at
3 2.5 or 5 parts per trillion, that there was much higher
4 levels of detection. And that if you extrapolate that out
5 in California, you would get water systems instead of
6 being like in the tens contaminated, more in the hundreds
7 of water systems contaminated. That's my understanding.

8 MS. VENTURA: That's helpful.

9 MS. HOOVER: This is Sara. And all I want to say
10 is it's time for a break, as Meg was saying. And also
11 Nerissa very kindly brought some snacks for people. So
12 not paid for by State funds. Help yourself.

13 (Laughter.)

14 CHAIRPERSON SCHWARZMAN: So we're going to take a
15 break. And a reminder about the informal Bagley-Keene
16 requirement. And we're going to reconvene exactly at 3:25

17 Thank you.

18 (Off record: 3:09 p.m.)

19 (Thereupon a recess was taken.)

20 (On record: 3:25 p.m.)

21 CHAIRPERSON SCHWARZMAN: Okay. I think we're
22 going to start our -- the remainder of our afternoon
23 session. From now through the end of the meeting, minus a
24 little time at the end for some wrap-up, we actually have
25 a open discussion period.

1 Maybe I should revisit briefly the key questions
2 and discussion questions --

3 MS. HOOVER: I'll bring the slides up too, if you
4 wanted to go through them.

5 (Thereupon an overhead presentation was
6 presented as follows.)

7 CHAIRPERSON SCHWARZMAN: Great -- that the
8 Biomonitor California Program has sort of put forward,
9 that today's presentations were meant to inform.

10 One is -- let's see, these are summations --

11 MS. HOOVER: It' a slight paraphrase.

12 CHAIRPERSON SCHWARZMAN: Yeah. Okay. So we'll
13 just go from the slide, because that's what people are
14 looking at.

15 Number one, which of the newer PFASs are of
16 greatest concern, thinking about exposure in California.

17 Number two, what are some of the most significant
18 exposure sources of PFASs in California? And are certain
19 groups, either by geographic area, community, or
20 profession more heavily impacted than others, and should
21 those be a target of studies?

22 Is there another slide -- of

23 --o0o--

24 MS. HOOVER: Yeah, there's a few slides.

25 CHAIRPERSON SCHWARZMAN: How else can

1 Biomonitoring California expand?

2 Woops. Back one.

3 MS. HOOVER: It's -- that's pretty much in front
4 of you the second one if you --

5 CHAIRPERSON SCHWARZMAN: Great.

6 MS. HOOVER: Oh, here we go. It's up. Sorry.

7 CHAIRPERSON SCHWARZMAN: Expand measurement of
8 PFASs. Are there ways to expand or automate the panels in
9 a targeted way? Should the Program be focusing on
10 semi-targeted analysis to look more generally at fluorine
11 containing compounds. And what about environmental sample
12 monitoring to complement biomonitoring? And are there
13 other approaches that the program should be considering?

14 --o0o--

15 CHAIRPERSON SCHWARZMAN: And then finally
16 thinking about collaborations with other State programs,
17 either exposure assessment, maybe not necessarily in
18 state, or regulatory efforts on PFASs. And what are
19 possible future opportunities to tackle high priority
20 concerns about PFASs?

21 So, for example, conducting a targeted
22 biomonitoring study in a community that's impacted by high
23 drinking water contamination levels or conducting an
24 intervention study related to PFASs in consumer products
25 or in foods, and, of course, any other ideas.

1 So I think you get a sense that the Program
2 would -- about the areas that the Program would like
3 input. And maybe just start -- since I don't see anyone
4 just like jumping at the -- oh, Ulrike is. I'll turn it
5 over to Ulrike, and then I have something up my sleeve.

6 (Laughter.)

7 PANEL MEMBER LUDERER: This is something that I
8 was thinking about after Antonia's talk, this whole
9 question of why so many of these short-chain PFASs are not
10 being detected in the urine. And, you know, one -- and
11 I'm wondering whether you have any ideas or any sense
12 about whether -- how much that may be due to -- which is
13 something that you mentioned, which is that maybe they're
14 metabolized and we're not measuring the metabolites.

15 And then kind of related to that sort of thinking
16 about Sabrina's talk this morning with the non-targeted
17 methods, you know, whether that -- you know, that is
18 potentially a way of getting at that question and trying
19 to discover what some of these metabolites are that we
20 maybe should be biomonitoring.

21 DR. CALAFAT: Okay. So I have no evidence that
22 those -- the short chain do not seem to metabolize. I
23 mean, it has been known for quite a while. I mean, those
24 are -- I mean, as I said, they're not new. They may be
25 new to us, but the short chain, then they're just known to

1 be excreted as they were and not metabolized. For the new
2 chemistries or the alternative chemistries like those in
3 those ethers, then what we have seen was that not -- not a
4 metabolism in -- of the compounds, that the compounds
5 would be excreted.

6 So it seems that we may be looking at the right
7 biomarker. Nevertheless, sometimes, you know, like you
8 find out something later as you go away. I should say
9 that these -- the inclusion of those three alternatives
10 was largely driven by the detection of GenX in -- with the
11 paper from EPA in North Carolina, and then just saying,
12 you know, okay, that this is something that is being found
13 now. Then is there anyway that we can be looking at those
14 in NHANES, so -- and the standards were available.

15 In terms of the non-targeted analysis, I guess
16 that everything really depends on the purpose of the study
17 on what you're trying to find out. Several of the
18 speakers pointed out, the non-targeted analysis is very
19 invaluable tool for exploratory purposes.

20 At CDC, we do have several of the non-targeted
21 instruments, if you want. And we have been using those
22 for many years to identify potential metabolites, and
23 compounds that we would like to go and monitor.

24 Our mandate so far is quantitative, so that's why
25 we have not gone into the -- into the non-targeted world.

1 As a chemist, non-targeted, untargeted has pros and cons.
2 So eventually a non-targeted is going to be followed by a
3 targeted approach.

4 And I do know that having thousands of PFASs in
5 the market, having tens of thousands of chemicals in the
6 market, our program at CDC only evaluates exposure to a
7 handful of them. So we are not really just covering
8 everything. So it's not that we're trying to have the
9 most comprehensive approach.

10 I think that depending on the needs of the
11 program and the intended use of the data, complementing,
12 you know, like a non-targeted approach with a targeted
13 approach with let's say, you know, if you want to identify
14 sources and say, you know, like -- or think that you have
15 a potential source of exposure, and you want to know what
16 you're already looking at from that source that you know
17 and what you don't know, then that approach would be
18 great.

19 For a California-wide biomonitoring program, I
20 don't know whether a non-targeted approach would be that
21 valid in biological samples. I think it could be
22 incredibly valuable in products, in environmental matrices
23 that after all are some of the sources that we're all
24 exposed to. So if you're finding something at quite high
25 levels in the environment, is it of interest to look at

1 them in people? So I think that that combination of --
2 biomonitoring is very close to my heart, but is only one
3 of the tools. And I don't pretend that can do everything.

4 DR. BALAN: I have follow up. So another reason
5 why we may not be seeing as many -- as high levels of the
6 short chains in urine may also be because the short chains
7 could partition into other organs. There have been
8 studies that show that the shorter chain perfluoroalkyl
9 acids are in higher levels in certain organs, even higher
10 than the longer chains.

11 So I don't remember exactly which organs, but the
12 studies have looked at brain, kidney, liver. And, of
13 course, that's not something you can do in biomonitoring,
14 but cadaver studies have looked at that. So that's
15 something to consider. I think one of my colleagues found
16 a Ph.D. Thesis recently that was proposing that there
17 seems to be a steady state of these shorter chains in the
18 human body, and they partition in these organs. And we're
19 only eliminating a little bit through urine, but there's a
20 continued -- a constant amount that remains a steady state
21 in different organs.

22 So that may be one explanation.

23 CHAIRPERSON SCHWARZMAN: Lauren.

24 DIRECTOR ZEISE: Yeah, I just have a -- sort of a
25 follow-up question around this issue of detection levels,

1 because we're -- you know, for the long chains anyway, we
2 have levels of concern in the low parts per trillion, but
3 we're measuring them -- measuring them in humans in the
4 sort of hundred parts per trillion level. So there's a --
5 the issue is, you know, what is our level of concern and
6 the extent to which if we -- if we end up with a lower
7 level of concern for some of these other chemicals, would
8 it be -- how possible is it to sort of drive down the
9 detection level?

10 DR. CALAFAT: And I guess that if we were
11 thinking that looking at the -- let's say the short-lived
12 compounds in the body, those that presumably have a low --
13 a short half-life, then, as I said, you know, our method
14 included -- was from 3C -- 3C -- sorry, C3, if I say it,
15 to C12. So obviously, there's probably no reason -- not
16 probably. There's no reason to look at long chains in
17 urine.

18 So if we were to develop a method in urine only
19 for the -- through a short chain, or the short-lived
20 compounds, then probably one can lower the detection
21 limits, and then increase the sensitivity from the 100
22 parts per trillion to a lower level -- to higher -- you
23 know, like let's say maybe 50 or 10.

24 I -- for liquid chromatography, those are pretty
25 good detection limits using that small amount of sample.

1 Going much lower than that, you're probably going to face,
2 you know, some other considerations the lab with some
3 blanks levels that then they're going to render your
4 analysis pretty much. Even if your detection limits can
5 be much lower, then you're not going to be able to hold
6 that low, because your blind values.

7 So to make a long story short, I think that
8 probably you can have methods that have better
9 sensitivity, so lower detection limits. However, you
10 probably would want to really nail down what are the
11 compounds you're interested in in order to give the
12 chemist a better chance to develop the method. Otherwise,
13 it's always going to be a compromise and may not reach the
14 detection limits that are necessary.

15 DR. ATTFIELD: Can I slide in --

16 CHAIRPERSON SCHWARZMAN: Kathleen, sure.

17 DR. ATTFIELD: -- some extra information from the
18 ACE study, which I didn't present earlier, but just
19 because it's relevant to this conversation here.

20 So for our shorter chain ones that were in serum
21 that the chemists worked very hard on, I think their
22 limits of detection were a bit lower than perhaps what you
23 were presenting today.

24 So the PFHxA, the six, was in greater than 98
25 percent of the ACE's participants, whereas I think what

1 you presented was zero, and PFBA was 60 -- around 65
2 percent and PFBS also is still very low, and PFHpA in
3 about 25 percent. So we are seeing it in some of the
4 serum samples.

5 DR. CALAFAT: But what were the median levels?

6 DR. ATTFIELD: Oh, sorry, I don't have that off
7 the top of my head. But they would be -- they would
8 likely be on low -- in low concentrations.

9 DR. CALAFAT: Okay. Yeah, because, I mean,
10 obviously the lower is your level -- your sensitivity --
11 sorry, the higher your sensitivity, the lower your LOD,
12 the higher is your detection frequency. That's why I
13 always say given detection frequencies with our limit of
14 detection doesn't say much, but also is what is your range
15 of concentrations we're looking at.

16 DR. HOUTZ: And you may recall that Sabrina had
17 mentioned the ACE samples were analyzed with an off-line
18 extraction method, which I think that was something we
19 started when I was at DTSC. And we did that because the
20 online SPE method that CDC developed works really well
21 down to a certain chain link, and then for like the C5 and
22 the C4 carboxylates acids, it just won't retain them. So
23 you have to go to like these more time intensive
24 procedures like liquid-liquid extraction, in some cases,
25 that only work for the short-chain compounds.

1 There are different kinds of SPE cartridges you
2 could use for the on-line equipment, but I think that was
3 why we ended up going that route.

4 CHAIRPERSON SCHWARZMAN: Carl had a question.

5 PANEL MEMBER CRANOR: I have a series of
6 questions and comments in total ignorance. Okay. And
7 it's not clear what comes first. You're concerned about
8 detecting short-chain concentrations in people. But we
9 don't know -- I'm not sure, but somebody in the room may
10 know what the level of concern should be.

11 So aren't there ways to expedite that so that you
12 have some sense of what detection level you're looking
13 for. I'm thinking animal -- animal data, that takes
14 awhile. But there's mechanistic data. Well, are the
15 mechanisms in common between the long-chain and the
16 short-chain that the studies will reveal and so forth and
17 so on?

18 So I don't -- sometimes you don't know what comes
19 first. Lauren and others may know what the level of
20 concern is. But it seems to me these two go together, and
21 they need to be somewhat solved together.

22 Comments. Total ignorance. I'm just asking.

23 CHAIRPERSON SCHWARZMAN: Does anyone want to
24 respond to any of that?

25 MS. NUDELMAN: You know, can I just -- just tag

1 team to that question.

2 Yes, I will. So my name is with Janet Nudelman.
3 I'm with Breast Cancer Prevention Partners. And I just
4 wanted to tag team with your question there, and make it
5 broader if that's okay. Because my question is, is the
6 safety data or the understanding of safety generalizable
7 to the perfluorinated chemicals as a class?

8 And I'm asking that question -- and I will
9 profess my ignorance. I'm not chemist. I am a lobbyist.
10 I do public policy. Because there is a movement afoot
11 across the country where advocates within the
12 environmental health movement are seeking to ban the
13 perfluorinated chemicals as a class to avoid regrettable
14 substitutes.

15 And so -- so I'm going to put that question out
16 there. I know there's a -- as we learn more about some of
17 these chemicals, and they start to be phased out of
18 production, there are new perfluorinated chemicals coming
19 in to production that no one knows anything about. And
20 that's what I keep hearing we just don't have the science
21 on them.

22 So the question is, is the safety data
23 generalizable enough that we should be concerned about
24 them as a class and just say, you know, let's get rid of
25 them all?

1 CHAIRPERSON SCHWARZMAN: Yeah, go ahead.

2 DIRECTOR ZEISE: Maybe I could just make a
3 comment that, you know, this is all -- this is dealing
4 with the toxicity side of the question. And this issue of
5 the extent to which we can generalize as an area of active
6 research right now. NTP has a program looking at a series
7 of perfluorinated compounds. EPA does as well.

8 And so it is an area of active research to try to
9 sort out using some of the newer toxicology methods that
10 don't take nearly as long as the long-term animal
11 bioassays that are so familiar with us for -- that we have
12 on -- well, we're going to have very soon on PFOA, but we
13 do have insights from standard traditional toxicology
14 studies. So it is an area.

15 But this issue between concern level and
16 detection level is something that I think is really an
17 important area.

18 MS. HOOVER: And, Meg, I want to just also
19 tag-team with a public comment and question that came in
20 for Darrin, because it's not exactly related, but it's --
21 it's related enough, I want to get it in here. So this is
22 from Elmer Diaz, who is a toxicologist with the Washington
23 State Department of Health.

24 And the question is do you have any
25 recommendations for notification levels for other PFASs

1 detected in drinking water? So instead of just the PFOA
2 and PFOS combined, if you find those are below 70 ppt, but
3 what about others if you combine any -- there's a list of
4 examples. But the general idea is if you have more PFASs
5 and those total to above 70 ppt, would you take action?

6 Then it goes on to say that in Washington they
7 are adding other PFAS chemicals in the advisory
8 requirement, including PFHxS, PFNA, and PFHpA. As a
9 result, we will notify water utilities and the public to
10 take action and provide public notice to specific
11 populations like pregnant and nursing women.

12 And I do want to note when I'm paraphrasing
13 comments, the entire comment will go to our transcriber,
14 and it will be appended to the -- to the transcript.

15 SWRCB DEPUTY DIRECTOR POLHEMUS: Yeah, so that's
16 a -- I mean, that's an open question. Lauren and I often
17 ask the same thing of each other. And I -- it's out
18 there. We need to figure out whether we need to look at
19 the other ones or not. We only have information at the
20 moment to issue the notification level for PFOA and PFOS.
21 And we're continuing to look at the other ones to see
22 where and what we should do associated with those.

23 I should note too that we -- just for
24 clarification point, in case it's confusing. So the
25 health advisory for U.S. EPA was 70 parts per trillion

1 combined. We issued our notification levels separate.
2 The notification level for PFOA and PFOS as 14 and 13.
3 And they stand as single levels as we push them. We did
4 then get complicated in that we said our response level,
5 which then is when we recommend a water system really
6 think about taking their water source offline or treating
7 it.

8 We set that at the 70 combined to match what had
9 already been put out by U.S. EPA instead of a different
10 level to keep that the same. So our notification levels,
11 when they need to notify their governing bodies are single
12 on PFOA and PFOS at those lower levels.

13 CHAIRPERSON SCHWARZMAN: Yeah.

14 DIRECTOR ZEISE: Just OEHHA is continuing to look
15 at the literature and more to come in terms of this
16 question, the extent to which we can go beyond what we've
17 already done.

18 CHAIRPERSON SCHWARZMAN: Yeah, I would just say
19 that we suffer from, you know, in this tox side of the
20 question, just the science being behind some other
21 compounds like we have a National Academy of Sciences
22 report that's been out for a while on, you know, doing
23 sort of additive or looking at phthalates, you know, that
24 have similar modes of action. We don't have that same
25 level of science for the perfluorinated compounds,

1 especially the diversity of the perfluorinated compounds.

2 So I think we're -- it's relevant questions. We
3 just don't -- we're not there yet, in terms of the level
4 of science from making those kinds of recommendations.

5 And, Sara, did want to say something?

6 MS. HOOVER: And, Meg, I just want to say one
7 thing, which is just reminding everyone that we have the
8 luxury in Biomonitoring California to go forward without
9 that information. And one of the things that the Panel is
10 continually urging us to do is to try to catch things on
11 the upswing, so to really go for emerging chemicals.

12 So again, sort bringing it back to the exposure
13 question, and let's see if -- I don't know if I can
14 reverse this or not, probably like in a few minutes it
15 will reverse.

16 (Laughter.)

17 MS. HOOVER: The concept -- so just to refresh
18 everyone's memory, we have the 12 PFASs, the traditional
19 PFCs that we're continuing to measure, we're continuing to
20 see. And then we have an expanded panel of 30. And you
21 heard Sabrina talking about additional targeted PFASs that
22 we're going to be looking at, and the interesting
23 semi-targeted analyses. So this would be more in our wish
24 list. But in terms of like looking forward, you know, we
25 have these options of maybe looking at total fluorine,

1 maybe trying to look at periodically checking MAMAS
2 samples to do semi-targeted.

3 You know, we have different options that we can
4 just move forward on the entire class, because that's
5 already on our list. So if you'd think about it, you
6 know, from the exposure point of view, and any specific
7 ideas.

8 I mean, I've offered a bunch of ideas, obviously,
9 that we already have thought of, but think about it from
10 the point of view just -- when we start work -- while I'm
11 taking the next two days off, but when we start work on
12 Monday --

13 (Laughter.)

14 MS. HOOVER: -- what would be -- what would we be
15 focusing on or are we on the right track?

16 CHAIRPERSON SCHWARZMAN: I wanted to suggest
17 something, or let -- at least explore something that's on
18 your list, but to explore it a little bit more, which is
19 I've always been interested in the concept of
20 interventional biomonitoring studies. And so I just
21 wanted to explore it a little bit and not necessarily say
22 that that's the be all and end all in this place.

23 One thing that strikes me about an intervention
24 biomonitoring study just to kind of explore the pluses and
25 minuses a little bit with regards to PFASs is I think of

1 them, at least my way of thinking about them, is that
2 they're to explore specific hypothesis, and that they're
3 really useful for that.

4 Like, the study that showed that urinary
5 bisphenol A didn't decrease with fasting time was
6 tremendously helpful in -- you know in a -- in this one
7 small group of people that was exploratory in starting to,
8 you know, question the assumption that diet was the
9 primary source of exposure to bisphenol A.

10 And I feel like that kind of -- when you have a
11 very specific hypothesis that you want to prove or
12 disprove, it's a very interesting tool. And maybe you
13 want to -- it points also toward the downsides of
14 intervention studies, which is that they're not as broadly
15 applicable. So, you know, there's all of the work of
16 creating and conducting a study. And if it's an
17 intervention study, it's probably fairly narrowly focused,
18 and you're not going to be testing -- probably less likely
19 to be testing like metals, and 1-nitropyrene, and, you
20 know, PFASs, right, because the same intervention wouldn't
21 be relevant for all of those compounds.

22 So I just wanted to kind of put that out there as
23 a point of discussion and hear other people's thoughts
24 about whether there's a specific question with regard to
25 PFASs that might be interesting to explore through an

1 intervention study, given the kind of pluses and minuses.

2 Carl, was that about this or did you have a
3 separate question.

4 PANEL MEMBER CRANOR: Pardon.

5 CHAIRPERSON SCHWARZMAN: About this?

6 PANEL MEMBER CRANOR: Yeah, sort of.

7 CHAIRPERSON SCHWARZMAN: Yeah, great.

8 PANEL MEMBER CRANOR: It seems to me -- well,
9 here's the question to go to another hypothesis related.
10 Do the short-chain PF -- PFASs cluster? You could do some
11 testing to find out if they're clustering in wherever,
12 drinking water, or bodies, or whatever. And if they're
13 clustering, then maybe that tells you something. It does
14 tell you something important that they're going to
15 together. And then you have a toxicological question when
16 they cluster, does that raise more of a problem by some
17 set of tests that could be perhaps moderately quickly done
18 to give you a key to levels of concern.

19 So sort of a -- it's another way of thinking
20 about perhaps intervention and finding out if they occur
21 together.

22 CHAIRPERSON SCHWARZMAN: Go ahead, Veena.

23 PANEL MEMBER SINGLA: So I think the idea of an
24 intervention study is really interesting. And I wonder if
25 a study related to food and food packaging and the dietary

1 contribution to exposure may be an interesting place to
2 look, because there is a number of policy initiatives,
3 both, you know, locally within California, as well as in
4 other states that are focused on food packaging as a
5 source of PFAS exposure. So trying to design a study
6 that -- to better understand the role of food and food
7 packaging in exposure to PFASs generally and to specific
8 PFASs, understanding the profile and if intervention is
9 actually effective in reducing exposure could be very
10 valuable.

11 CHAIRPERSON SCHWARZMAN: Gina.

12 DR. SOLOMON: Gina Solomon, Public Health
13 Institute. Yes, I -- just responding to the suggestion of
14 an intervention study, which I think makes a lot of sense.
15 And I think that particularly for the shorter chains,
16 which are not persistent, we can take advantage of that in
17 these kinds of intervention studies by, you know, quickly
18 seeing changes over time. So that's a big plus.

19 And food packaging would be a great one to do.
20 There are a couple other possibilities. It appears that
21 many of the major carpet manufacturers in response to the
22 pending regulatory actions in California are already
23 making some significant changes. And we're moving some
24 PFAS chemicals from their products. And so there might be
25 an opportunity because of what we're doing right here in

1 California to -- if we're able to mobilize fairly quickly
2 see some changes there.

3 And then the other place where there's a lot
4 going on in California is around chrome plating. The fume
5 suppressants that used to be used were the long-chain, you
6 know, chemicals. Those have been switched out. OEHHA
7 actually did an evaluation and is -- and knows exactly
8 which chemicals are in the formulations that are currently
9 being used at these chrome platers, which of course tend
10 to be in communities that are disproportionately impacted
11 from other sources. There are people who live right next
12 to chrome plating facilities, worker exposures.

13 And so there might be an opportunity there. And
14 the Air Resources Board is in the process of doing an Air
15 Toxics Control Measure for chrome platers, and the
16 questions relate to, okay, should they use fume
17 suppressant chemicals, or should they put in place other
18 requirements such as enclosures or things like that, that
19 would mean that no fume suppressant would be needed?

20 And so that policy decision, depending on which
21 way it goes, could -- you know, it would be interesting to
22 see what that -- how that relates to exposure.

23 CHAIRPERSON SCHWARZMAN: Ulrike, you wanted to --
24 okay. Nerissa and Ulrike.

25 DR. WU: I just had a couple of comments. One

1 about the clustering of different short-chain PFASs. Some
2 of the work we're doing with biobank could help us look at
3 whether there's some kind of pattern, the ratio between
4 the different PFAS that is indicative of a regular, like
5 just everyday background exposure, or if there are
6 different signals in the ratio that might indicate a
7 specific kind of exposure. So that's stuff that I hope we
8 can use the biobank samples to get a better handle on.

9 In terms of intervention, I think those are
10 always great. They tell a really good story, and provide
11 compelling data. I'd say that just our experience with
12 interventions, particularly like the foam replacement
13 study, it's really good if you have an exposure that if
14 it's a behavioral change, that's something that you have a
15 very strong hypothesis about, and it's a change that's
16 reasonably controllable, that people are going to adhere
17 to, because it's very -- otherwise, you have very messy
18 data, and it's very difficult to build a story out of
19 that. But some of the ideas I've heard and some of the
20 environmental interventions in particular might be a good
21 candidate for that kind of study.

22 PANEL MEMBER LUDERER: Following up on the idea
23 of the intervention studies too, and maybe thinking about
24 an occupational environ -- intervention study, and we've
25 heard quite a bit about firefighters, and the -- the

1 AFFF's exposures. And from I think it was the FOX study,
2 there was actually some indication that firefighters who
3 had their -- the PPE professionally cleaned more often
4 had, you know, lower levels of certain PFASs in that --
5 that were biomonitoring compared to those that didn't. And
6 that might be an interesting intervention study that would
7 look both at an occupation that seems to be at, you know,
8 high risk of higher exposures from these chemicals, as
9 well as an intervention that could be done to reduce
10 exposures.

11 CHAIRPERSON SCHWARZMAN: Nancy.

12 MS. BUERMEYER: Nancy Buermeyer - excuse me -
13 with the Breast Cancer Prevention Partners.

14 Just on the -- just anecdotally on the
15 firefighter front, there is going to be some data coming
16 out of UC Berkeley for the women's firefighter study done
17 in San Francisco. And I know PFOS are one of the first
18 set of chemicals that they've actually gotten some data
19 sorted out for. So I'm assuming they're preparing
20 publications as we speak, so -- and that compared office
21 workers with women firefighters. And so it should be
22 interesting to see.

23 In terms of looking at ways to design studies,
24 just one of the issues I wanted to talk about was, you
25 know, the issues around point sources, we have a

1 particular interest in consumer products. And one of the
2 areas that we've been working more and more with is with a
3 coalition called the Campaign for Healthier Solutions,
4 which looks at products specifically from Dollar Stores.

5 And to the extent that we're looking at
6 communities that have been highly impacted and get lots of
7 different exposures from lots of different sources, adding
8 that sort of consumer product piece, maybe in conjunction
9 with Safer Consumer Products Program, might tell us some
10 interesting information about the plethora of ways folks
11 are exposed to this, and looking at that particular
12 vulnerable population who weren't particularly overburden.

13 So I don't know if the data shows that there's
14 more perfluorinated compounds in Dollar Store or not, but
15 we also were thinking that Dollar Store locations might be
16 an interesting place to look to recruit CARE Study
17 participants as well, particularly if we're trying to get
18 folks with -- from different economic perspectives and
19 potentially from lower educational levels. Doing a little
20 stand outside a Dollar Store might be something to think
21 about.

22 Thanks.

23 CHAIRPERSON SCHWARZMAN: I'm going to encourage
24 us to move away from intervention studies, even though I
25 brought it up, just because it's --

1 (Laughter.)

2 CHAIRPERSON SCHWARZMAN: -- probably not the only
3 thing that the program wants to hear about, but I just
4 wanted to throw one more little thing out about it, which
5 is just an idea that would connect biomonitoring
6 intervention study with the Safer Consumer Products
7 Program, which would be an intervention removing
8 perfluorinated treated -- PFAS-treated carpets from day
9 care centers or pre-schools.

10 And that could be an interesting -- confounded by
11 home exposures, but anyway an intervention study could
12 help look at that.

13 MS. HOOVER: Thank you, Meg, for that segue. So
14 I wanted to just ask if Erika and/or Antonia could -- we
15 had some conversations before the meeting. They were
16 really helpful in terms of measuring the 12 versus
17 measuring the 30, or how we might use non-targeted as a
18 qualitative way to check things over time. I wonder if
19 one of you could just comment on some of the conversation
20 we had, just so we get, you know, into the meeting, and
21 let other people hear about that. I could summarize it,
22 but I think you'd do a better job than me.

23 DR. HOUTZ: Sure. So I think typically, at least
24 in terms of, well, both environmental data and the serum
25 data, some of the limited testing we had done at DTSC with

1 the expanded list, usually it's pretty rare that you won't
2 see one of like the top six most frequently detected
3 PFASs, but you would see something else. I would dare say
4 we've almost never seen that, where we -- where we haven't
5 found PFOS, PFOA, PFBS PFBA, but we saw some signals for
6 another -- another -- yeah, anything else -- yeah.

7 So usually I think that in terms of like just
8 understanding whether you have a PFAS source or not,
9 particularly if we're talking about a more general kind of
10 exposure and not an exposure that's, you know, maybe next
11 to a manufacturing facility or something that's really
12 turning out a lot of something different that you would --
13 you would expect to be able to identify that PFAS exposure
14 through a more constrained analyte list. That's -- I
15 guess that's kind of like my gut feeling from like the
16 array of data that I have seen.

17 And in terms of like where you potentially want
18 to deploy a total organofluorine method, or a top assay
19 type of method, or non-targeted method, I think kind of
20 what I was just saying, where you're dealing with a source
21 that's like a really newly manufactured kind of thing that
22 you would really expect a different kind of chemistry to
23 be there than, you know, a more historical source, that
24 might be an opportunity where you would want to use one of
25 these alternative techniques.

1 And then I think we have a lot of use for
2 screening methods in the environmental community. I won't
3 go into that, since that's not the focus of our discussion
4 here.

5 DR. CALAFAT: And just adding today is one thing
6 that we discussed yesterday was looking at kind of like
7 what I call exposure profiles. If you want -- it's really
8 concentration profiles. But if you have data from NHANES,
9 it gives you an idea. Again, these are all the potential
10 sources, and I don't mean that we know the sources. But
11 you'll get a general sense for what are the ratios between
12 the different compounds or among the different compounds
13 within the same class that you find. Let's say, for
14 PFASs, NHANES, PFOS is the one found at the highest
15 concentration.

16 Then it's followed by PFOA, and PH -- the
17 hexanesulfonate, a little lower. Then it's
18 perfluorooctanoic acid and the others are so much lower.
19 So just looking at this ratio between these four. And
20 again this is for sources in which these compounds are
21 either the major components or can serve as sentinels, if
22 you want.

23 So when you have a source that is overwhelming
24 resulting in exposure that may be accidental, different,
25 then those ratios are going to be totally off. So just

1 think about the C8 study, contamination, industrial
2 contamination with PFOA, C8. So see the PFOA was high.
3 All the others were NHANES like.

4 Hoosick Falls again was PFOA. You think about
5 areas in which you have AFFF. So the perfluorohexane
6 sulfonate tends to move up, and then you still have PFOA,
7 and you have PFOS, but your ratios are totally off. So
8 that gives you an indication that you have an unusual
9 exposure. You may not be able to know what is the source.
10 But if you have some additional information, you may be
11 able to do some type of environmental testing, maybe you
12 have some question on information, you have maybe water
13 data, then you're going to be able to determine all
14 products of what those exposures are.

15 So that's something that again you just would
16 have to have some data about just general background
17 exposures. And then in occupational settings, the ratios
18 may be of two, but that may be because the pathway of
19 exposure is different. So, you know, for some of these
20 chemicals, we assume that the majority of the exposure is
21 ingested versus if you're going into a manufacturing
22 plant, perhaps is inhalation or is dermal and is going to
23 be very little of congestants.

24 So you're going to have very different ways the
25 chemicals are getting into the body. And that's something

1 that you also will have to be looking into.

2 So I guess that I always say in a perfect world,
3 we would like to have all the answers to our questions.
4 But I just think that little by little, we're just -- just
5 finding some answers, and just better understanding
6 exposure. And in this regard, they're being more capable
7 to just improve public health.

8 So with this, I think I'm just to going leave it.
9 I think did I miss anything of what we talked yesterday?

10 MS. HOOVER: No.

11 DR. CALAFAT: Okay.

12 CHAIRPERSON SCHWARZMAN: Veena.

13 PANEL MEMBER SINGLA: On this topic of thinking
14 about additional analytes to potentially prioritize. And
15 kind of building off I think what Sara had said a little
16 bit earlier about thinking about trying to catch things on
17 upswing, right, and not -- and not being behind, something
18 useful to do might be to look at EPA's chemical data
19 reporting information, and production volume trends for
20 PFASs to understand which PFASs have production volumes
21 that have been increasing over the previous reporting
22 cycles, and that those may be PFASs that would be
23 interesting to target for analysis.

24 I think looking both at EPA's chemical data
25 reporting as well as REACH production volume time trends

1 would be interesting. I think it was mentioned earlier
2 Europe is a little bit ahead in terms of phasing out some
3 of the long-chain. So the replacements might be coming in
4 earlier there.

5 CHAIRPERSON SCHWARZMAN: Other -- Sara, yeah.

6 MS. HOOVER: Well, we have a slight pause. So I
7 do have a very long comment that I was saving that came
8 in, and I will just quickly paraphrase it.

9 This comment is from Alex Franco, who is a
10 graduate student at UC Berkeley, and was an intern at the
11 Natural Resources Defense Council looking at PFASs in
12 California.

13 First some very complimentary kudos to
14 Biomonitoring California's efforts in measuring and
15 quantifying environmental chemicals. And that Alex was
16 using our data to look at levels of PFASs compounds that
17 were detected in serum and comparing it to NHANES.
18 Advocating for the use of urine as a matrix to look at
19 some of the new PFASs that are also detected in various
20 environmental media in California like urban runoff,
21 household dust, consumer products, food packaging, and
22 indoor air.

23 So again, bringing up the point we were talking
24 about about trying to look at both environmental media to
25 human biomarkers of exposure to compare that information.

1 And then last the Department of Defense has
2 reported contamination in the hundreds, thousands, and
3 millions ppt for an on- and off-base water systems.
4 There's the suggestion of, you know, going along the lines
5 of should we look at specifically impact communities, this
6 recommendation is to try to do a targeted study around
7 military sites and civilian airports to try to see if
8 those with higher exposures potentially, if it's borne out
9 with our information.

10 So again, applause for our efforts, excitement
11 for the results of our future studies.

12 And back to you, Meg.

13 CHAIRPERSON SCHWARZMAN: Thank you. Just to
14 reflect on that for one second. We certainly have seen in
15 the maps clustering of -- at Camp Pendleton -- or in and
16 around Camp Pendleton, San Diego area, if that's right.
17 So it's a relevant question in California.

18 SWRCB DEPUTY DIRECTOR POLHEMUS: Yeah, I -- Camp
19 Pendleton is where the map showed it from the UCMR. I
20 know there's other high sites at other military bases in
21 California that weren't displayed on that map. I didn't
22 have data at the time the maps were done. I think like
23 Edwards Air Force Base, and some of the other ones have
24 shown pretty high values as well. So as we get those,
25 we'll understand more. But I think that is definitely a

1 trend I've heard as well.

2 CHAIRPERSON SCHWARZMAN: Other?

3 DR. HOUTZ: Yeah. I have a remark I wanted to
4 make. It's not really about an intervention type of
5 study. And it would just be interesting to check in with
6 what Minnesota is doing in this space, because they have a
7 drinking water standard for PFOS and PFOA that is 400 ppt
8 for each of them. They've proposed lowering them.

9 They also have one for PFBA and PFBS of 4,000
10 ppt. So a factor of -- I think that's right. Does that
11 sound right? A factor of 10 higher, something like that.
12 And they use -- I believe, you know, there are some
13 manufacturing impacted water systems in Minnesota that
14 used granular activated carbon to remove PFOS and PFOA.

15 And I would suspect that people who are drinking
16 that water may be exposed to more elevated levels of some
17 of these replacement compounds. And that might be an
18 interesting community to understand if those higher levels
19 of the short-chain compounds in their drinking water might
20 lead to higher levels in urine or blood. Perhaps, the
21 State is already doing something on that. They have a
22 pretty great public health lab there.

23 Karen Husette was on the line at some point.

24 CHAIRPERSON SCHWARZMAN: Yeah, go ahead.

25 DR. BALAN: So another thing that we learned from

1 the consumer product research is that at least for the
2 coatings, like the ones applied on carpets and rugs, the
3 PFASs used right now, as of the mid-2000s, are side-chain
4 fluorinated polymers. So there are no non-polymeric PFASs
5 intentionally added.

6 I'm not sure about food packaging. That is
7 probably similar, but I haven't looked into that yet. So
8 the chemicals that the PFASs that you would be
9 biomonitoring from that are the fluorotelomer compounds
10 that are the intermediary degradation products as well as
11 the perfluoroalkyl acids.

12 So I think that would be real interesting. The
13 perfluoroalkyl acids are really the final degradation
14 products. And even though this class of PFASs seems so
15 big, the majority of PFASs eventually degrade to the
16 perfluoroalkyl acids, so they can give a glimpse into the
17 life cycle of the entire class.

18 So I think at least for consumer products
19 focusing on biomonitoring for the fluorotelomer compounds,
20 including the alcohols, the aldehydes, the carboxylates,
21 and the perfluoroalkyl acids would be very useful and
22 interesting.

23 CHAIRPERSON SCHWARZMAN: So we have less than 10
24 minutes left. So if anyone is sitting on a comment, now
25 is your time. Yeah, go head Jenny.

1 PANEL MEMBER QUINTANA: I think that you asked
2 for guidance about which direction to go, and I feel like
3 we haven't quite got there yet.

4 MS. HOOVER: I mean, I think -- you know, we can
5 definitely mine a lot of great information from the whole
6 day. But, yeah, if you have specific suggestions that you
7 haven't yet said, that would be -- this is actually great
8 timing to run through and provide any specific input that
9 you might have.

10 PANEL MEMBER QUINTANA: So I can't help but think
11 of the graph that Nerissa showed with the budget going
12 down.

13 (Laughter.)

14 PANEL MEMBER QUINTANA: So I think that one thing
15 to think about for either direct intervention study, or
16 documenting the results of a policy change, which is kind
17 of like an intervention, we should perhaps focus on
18 getting our hands on existing samples, because it's very
19 expensive to recruit human subjects and get samples.
20 That's a very expensive piece.

21 So I don't know if we should be trying to find
22 existing samples. It sounds like we want to have blood
23 samples before -- you were saying you have to be really
24 careful how they were collected, if they're serum samples.
25 So it may not be possible with archived samples from, I

1 don't know, alpha fetoprotein samples or whatever, from
2 moms taken at whatever week that is, 14 weeks.

3 But I think we should be thinking about very cost
4 effective ways to do it as part of this discussion, as
5 well.

6 MS. HOOVER: I just want to chime in that as
7 Nerissa pointed out, we're doing that with MAMAS. So
8 that's our -- and we're doing -- we're measuring PFASs in
9 MAMAS including the expanded panel. So one of the -- and,
10 in fact, she also mentioned -- so I'm just throwing this
11 in as our own recommendation to ourself, and you can see
12 what you think, but we're planning on also using MAMAS
13 potentially, because we do not have to return results. So
14 we have more leeway on the analysis we can run. We can
15 run semi-targeted non-targeted analyses on those samples,
16 and we could do that over time. And that would be a way
17 of trying to, you know -- and compare that to the targeted
18 analyses and see how we're doing, you know if our --

19 (Phone busy signal through sound system.)

20 MS. HOOVER: That sounds -- okay. Can somebody
21 go -- okay. So technical difficulties here.

22 PANEL MEMBER QUINTANA: Well, I guess my
23 recommendation for that would be to use pooled samples, if
24 you're doing non-targeted or semi-targeted, because then
25 you get more bang for your buck so they wouldn't alter

1 your recommendation.

2 Maybe I don't understand what the MAMAS samples
3 are. They're a subset of the other samples, right, but
4 they're not -- like, how many -- like, what comprises that
5 sample, I guess?

6 DR. WU: We get such a weird variety of noises in
7 this room today.

8 (Laughter.)

9 DR. WU: This is just the latest thing.

10 I think just -- because we have talked about
11 MAMAS samples in the past, but it was awhile ago. They
12 are from the genetic disease -- they're from the Genetic
13 Disease Screening Program Prenatal Screening Program.
14 These are second trimester moms who have gone through
15 prenatal screening. So they are -- it's about 70 percent
16 of pregnant women in the state of California. Although
17 that percentage is going down, is there other alternative
18 screening technologies. It doesn't get older women. And
19 it doesn't get artificial reproductive technology people.

20 So it's -- there are ways in which it's not
21 representative, but it is 70 percent of pregnant women.
22 It's a very small serum sample. And as we spoke about
23 earlier, they are not collective with the intention of
24 environmental contaminants. And so we -- there is some
25 concern about what might be happening to those samples as

1 they're collected and are not preserved in the way we
2 would want to preserve samples.

3 Does that get to your question?

4 PANEL MEMBER QUINTANA: I mean, all of them,
5 right -- how do you select the ones that you do?

6 DR. WU: So when we started the MAMAs project,
7 they were only available from certain counties. So the
8 MAMAS I data that Jennifer presented, that was from San
9 Diego and Orange County.

10 The MAMAS II batch, which we have not presented
11 yet, those are from scattered counties around California.
12 And then the 2016 samples are from another set of
13 counties. So they are not consistently from the same
14 region, because at that point, we're still trying to
15 figure out how we could use them as a statewide
16 surveillance surrogate. But I think as we start to hone
17 in on how we want to use them for some of these, like
18 looking forward into PFASs, or experimental and
19 non-targeted screening, I think we will design our
20 sampling a little bit differently and maybe pick one --

21 (Phone busy signal went off.)

22 DR. WU: Oh, God.

23 (Laughter.)

24 DR. WU: -- some specific geographic focus. But
25 that is a -- they are -- they are available to us across

1 the state. And so we just need to think about how we want
2 to stratify them, if we want to do it by race ethnicity or
3 if we want to do it by geography. But there is not a lot
4 of information available on the women who contribute them.
5 So there aren't -- like, we don't have any exposure
6 information. So they're not -- they're not -- there are
7 not that many ways in which we can stratify our sample,
8 aside from a couple demographic factors about the mother.

9 PANEL MEMBER QUINTANA: Well, my understanding
10 was you did a subset of the moms in San Diego and Orange
11 County, or did you do all of them?

12 DR. WU: No, we did -- how much was MAMAS?

13 PANEL MEMBER QUINTANA: It wasn't that many
14 samples.

15 DR. WU: It was 200. It was about -- so it was
16 200 of the moms. Yeah, it's a very small subset.

17 PANEL MEMBER QUINTANA: Yeah, I was going to say
18 it's like 49,000 births in San Diego County, so it's a
19 year.

20 DR. WU: Okay. Martha reminds me to mention that
21 we do have to pay for them. They are -- biobank is a
22 program within genetic disease, and they are required to
23 charge and cover their costs of the biobank, and so they
24 are not free. They are much less expensive than to go out
25 in the field to collect samples, but there is still a

1 cost.

2 But, yeah, we picked, I think it was, 200 for
3 PFOS and 200 for POPs in our first round.

4 PANEL MEMBER QUINTANA: Did you stratify on any
5 characteristic or age, ethnicity, or anything?

6 DR. WU: We picked by race and ethnicity. We
7 divided it up, so that it was equal parts of four major --

8 (Webex voiceover came through sound system.)

9 DR. WU: Oh, my God.

10 (Laughter.)

11 CHAIRPERSON SCHWARZMAN: So we have one more
12 question to fit in before we end, if I could.

13 DR. WU: Okay.

14 CHAIRPERSON SCHWARZMAN: So, José, please.

15 PANEL MEMBER SUÁREZ: Thank you.

16 I have a comment disguised as a question, mainly
17 because I am -- this is not my area of expertise the
18 perfluorinated compounds.

19 (Webex voiceover came through sound system.)

20 PANEL MEMBER SUÁREZ: Okay.

21 (Laughter.)

22 PANEL MEMBER SUÁREZ: So given that my
23 understanding is that the budget for the Program is
24 decreasing. So in other words, it becomes of great
25 importance to start selecting which ones of the chemicals

1 we should be prioritizing more. Now, with -- my
2 understanding with the long-chain perfluorinated
3 compounds, say PFOA or PFAS, the main reason why, of
4 course, they were phased out is because of their
5 persistence, one; and then the other component are the
6 health -- the adverse health effects that have been,
7 endocrine disruption or reproductive and developmental
8 problems, which then led to the substitution. The
9 industry changing from the long-chain to the short-chain
10 or different types, in which, I think the persistent
11 component, from my understanding, has been removed, right?
12 So the half-lives of these compounds are much shorter.

13 So from that check point, in a way -- I mean, not
14 to sound cynical, but this is a success, right? So
15 they've replaced these persistent ones with these newer
16 ones. So my question really is posing as how much
17 information do we know right now about the short-chain
18 with having potential health effects, which is why we
19 really should be monitoring these chemicals?

20 Of course, I'm a fair proponent of the
21 precautionary principle, absolutely. But I'm just trying
22 to bring in these questions more of a -- like a devil's
23 advocate piece of it.

24 DR. WU: Well, I think, as Lauren mentioned
25 before, the toxicology is still a work-in-progress. And

1 there are -- there's so much unknown about where we should
2 be focusing that toxicology work, because we don't know
3 what's really being used. It would be great if we could
4 get a handle on this before everyone is exposed. I mean,
5 our pattern of our work has been, oh, look, this chemical
6 is in everyone. Now, we know how bad it is, and we have
7 to kind of work retroactively to try to get it out of
8 products.

9 So some of the work we're talking about today is
10 to try to get a handle on this ahead of time and see those
11 increases, and focus on those chemicals before they're
12 ubiquitous, right?

13 PANEL MEMBER SUÁREZ: Well, yeah, to one extent.
14 But at the same time, biospecimens are being collected,
15 right? And they can't be stored. And there's so many
16 chemicals that are being produced. I don't know what the
17 estimate it now, but a few years ago, it was -- they were
18 registering up to 1,200 new chemicals per year, the
19 industry. And out of that, which ones are the ones that
20 we should be concerned about, and which ones not? Well,
21 you know, who knows really, because there's so many of
22 them, and the toxicology is way behind.

23 So just my question is should we be focusing a
24 lot of effort on this -- on the short-chain at this
25 moment? We can still go back into future into the

1 specimen and look at that retrospectively, if that turns
2 out to be of issue.

3 This is just a question that I'm posing. And I'm
4 not being skeptical of the whole field, but I'm just
5 trying to get some clarity.

6 DR. BALAN: I just wanted to clarify that
7 persistence, in this case, refers to bio-persistence,
8 right so the persistence inside organisms. Because
9 environmental -- in terms of the environmental
10 persistence, they're also extremely persistent in the
11 short-chains as well. They have no non-degradation
12 pathway in the environment. So we are faced with some
13 chemicals that, you know, they don't degrade in the
14 environment, and so we are continuously exposed to them,
15 right? I think that's -- that's one of the concerns that
16 just like I guess Meg was talking earlier about other
17 compounds that are not persistent, but we have continuous
18 exposure, so they're pseudo-persistent.

19 So they're persistent in the environment, but not
20 in biological organisms. And I think studies are still
21 trying to figure out the inherent toxicity of these
22 compounds. There was a paper that was just published
23 earlier this year by some -- by a group in Sweden, Gomis
24 et al., where they found out that if you -- if you
25 consider the differences in toxicokinetics, the shorter

1 chains, including PFHxA and GenX, one of the ethers are
2 equally or more toxic to liver cells than the longer chain
3 PFASs.

4 So there is some emerging evidence from modeling
5 or from in vitro studies that there is some toxicity. And
6 the fact that they still don't degrade into the
7 environment could be of concern, if we keep having higher
8 amounts.

9 CHAIRPERSON SCHWARZMAN: Thank you very much for
10 that. We need to wrap-up it up, because the -- we lose
11 access to the room, and I want to turn it over to Lauren
12 for a moment who's going to offer some concluding
13 thoughts.

14 DIRECTOR ZEISE: Well, I guess what I could do is
15 just kind of wrap-up. I think we've danced around and
16 actually focused on this issue of getting in front of
17 emerging concerns throughout the day. In fact, it started
18 this morning. And there were a number of suggestions for
19 how we might do that by going into the chemical data
20 commons, discussing connecting with trade associations,
21 looking at CARB's new Consumer Products Survey, product
22 testing, EPA's new reset of the chemical inventory, the
23 Fluoro Industry Counsel website, and so forth.

24 So just how can we get in front of this whole
25 issue of what chemicals should we actually focus on? And

1 that's kind of longer term, because we have the panel of
2 12 and the panel of 30 or 32 that's in front of us now,
3 but that should inform what's important and what we look
4 at.

5 We spent a fair amount of time thinking about why
6 aren't we actually detecting these, and the CTC work. And
7 lots of ideas were put forward. And there -- then there's
8 this question of well, what about -- so we discussed
9 possible migration and storage in organs of the shorter
10 chain, whether or not we were looking at the right
11 analytes, metabolites.

12 But all in all, I think coming out of the
13 conversation, it seemed like, for the most part, there was
14 an understanding they're probably pretty stable. So we
15 might well have the right analyte in mind for the most
16 part, but maybe there's this issue of detection. And it
17 seems the Program is beginning to look for ways and
18 actually has been successful in the way in which they've
19 faced extract -- their extraction methods of actually
20 getting at lower detection levels, so this whole issue of
21 trying to go lower to be in front actually of what is of
22 concern to everyone of what's the concern level. But
23 absent that, it seems like there was pretty much a
24 consensus of sort of moving towards lower levels made
25 sense.

1 And then there was a discussion of intervention
2 studies. And I think I heard pretty good support for the
3 idea of the Program moving ahead with looking for
4 opportunities. And some of the suggestions was around
5 food packaging, the -- looking at carpets and working with
6 the DTSC Safer Consumer Products Program, interfacing with
7 CARB maybe in their efforts to reduce exposure to some of
8 the long-term fume suppressants used in chrome plating,
9 and that this had an interface with the disadvantaged
10 communities. So there was this focus on communities that
11 certainly want to pay attention to.

12 Firefighters and interfacing with the San
13 Francisco -- looking at the results coming out of the San
14 Francisco Firefighters Study, but that was another group.

15 And then this interesting idea of using Dollar
16 Stores to kind of focus on communities where there could
17 be disadvantage but maybe even increased exposure through
18 a certain consumer products. So the idea of thinking of
19 ways to focus recruitment in areas where we could target
20 some vulnerable populations, so -- and I -- you know, then
21 we had a very interesting sort of ending discussion, which
22 we've all just heard. I won't go into that.

23 But anyway, I have to say I found it a very rich
24 day, and want to thank everyone for, you know, all the
25 input they gave the Program. So now just turn it back

1 over to Meg.

2 CHAIRPERSON SCHWARZMAN: Thank you for that
3 Lauren. With that, I will move toward adjourning the
4 meeting. I'm to announce that a transcript of the meeting
5 will be posted on the Biomonitoring California website
6 when it's available.

7 The next SGP meeting, if you haven't had enough
8 today, will be November 8th in Richmond. And I want to
9 thank --

10 MS. HOOVER: Just one little thing.

11 CHAIRPERSON SCHWARZMAN: Oh, yes.

12 MS. HOOVER: I want to make just one request for
13 our transcriber. If you made a comment today, if you
14 could make sure your name is written out with the correct
15 spelling on the sign-in sheet or give it to directly to
16 Jim, he would appreciate it.

17 CHAIRPERSON SCHWARZMAN: Thank you.

18 So thank you to all the Panel members and to
19 Biomonitoring California staff, and all the participants
20 today for the interesting discussion.

21 We'll adjourn the meeting.

22 (Applause.)

23 (Thereupon the California Environmental
24 Contaminant Biomonitoring Program, Scientific
25 Guidance Panel meeting adjourned at 4:28 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 31st day of August, 2018.



JAMES F. PETERS, CSR
Certified Shorthand Reporter
License No. 10063