Update on MAMAS and other Projects

Nerissa Wu, MPH, Ph.D.
Robert Voss, MPH
California Department of Public Health

Biomonitoring California
Scientific Guidance Panel Meeting
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BIOMONITORING CALIFORNIA

- Program updates/announcements
- Project updates
- Measuring Analytes in Maternal Archived Samples (MAMAS)
  - Project overview
  - Round 1 data presentation

Program Announcements

- Program funding
  - 2015-16 budget includes $800K two-year augmentation
  - Biomonitoring California budget comprised of:
    - Permanent state funding
    - CDC cooperative agreement
    - 2014-16 augmentation
    - 2015-17 augmentation

- Biomonitoring team updates
  - Dr. Yu-Chen Chang joined EHL

Biomonitoring Staff

Jeffrey Aduviso	Laura Fenster	Duyen Kauffman	Dan Sultana
Josephine Alvaran	Jeff Fowles	Gail Krowech	Robert Voss
Paramjit Behniwal	Ryszard Gajek	Ying Li	Jed Waldman
Reber Brown	Qi Gavin	June-Soo Park	Miaomiao Wang
Shirley Cao	Tan Guo	Myrto Petreas	Yunzhu Wang
Yu-Chen Chang	Weihong Guo	Sissy Petropoulou	Berna Watson
Key-Young Choe	Suhash Harwani	Laurel Plummer	Nerissa Wu
Robin Christensen	Arthur Holden	Martha Sandy	Rana Zahedi
Sabrina Crispo-Smith	Sara Hoover	Jianwen She	Jun Qiang Zhou
Dina Dobraca	Erika Houtz	Martin Snider	Wei Zou
Amy Dunn	Lauren Joe		

Project Updates

- Pilot BEST
  - On-going data analyses
  - Evaluation of results return
  - Posted results on website for: PCBs, PAHs, organochlorine pesticides, pyrethroid pesticide metabolites
- Expanded BEST
  - Received lab results for 2nd set of chemicals: environmental phenols, PAHs, phthalates, pesticides, and metals (in urine), and POPs (in serum)
  - Round 2 results return planned for August
  - Data analyses (metals, PFCs)

Proposed Studies

- Flame Retardant and Environmental Exposure Study (FREES):
  - Collaboration with the UC Davis, Environmental Working Group, Green Science Policy Institute, and Silent Spring Couch and Foam Cushioning Replacement Study
  - Participants will remove or replace flame retardant-containing foam in the home
  - UC Davis study will look at FR levels in dust
  - Biomonitoring California will look at FR levels in blood and urine

Proposed Studies *(2)*

- Asian/Pacific Islander Community Exposures (ACE) Project
  - Collaboration with APA Family Services
  - Community-based study to biomonitor Chinese, Vietnamese, Filipino, and Lao populations in San Francisco and conduct education and outreach related to safe fish consumption
  - Project will fill data-gap related to specific Asian sub-populations

Measuring Analytes in Maternal Archived Samples (MAMAS)

- Review of Biobank
- MAMAS-1 pilot sampling
- MAMAS-2 statewide expansion
- Benefits and challenges

California Biobank

Genetic Disease Screening Program (GDSP)

Biobank counties: Fresno, Kern, Kings, Madera, Tulare, Orange and San Diego

MAMAS Pilot Study

	Phase I	Phase II
Number of Samples	460	540
Source	Biobank: San Diego County Orange County	GDSP (non-Biobank): -Los Angeles -Riverside & San Bernardino Counties -Alameda & Contra Costa Counties -Northern Tier
Year	2012	2015
Sample volume	Approx. 0.5 mL	Approx. 1 mL
Analytes	Metals (200) PFCs (200) POPs (60)	Metals/PFCs (440) POPs (100)
Status	Laboratory analysis complete Data analysis in progress	Samples scheduled to arrive July – Dec 2015

MAMAS – Phase II samples will be pulled from four geographic regions: Los Angeles County; San Bernardino & Riverside Counties; Contra Costa & Alameda Counties; and the Northern Tier

Measuring Analytes in Maternal Archived Samples (MAMAS): Demographics

- Pregnant women
- San Diego and Orange Counties

- Selected by race/ethnicity
- Asian subgroups with n>30: Chinese, Filipino, Vietnamese

- Consistent second trimester sampling

		N (460)	%
Age			
	<25	87	18.9
	25-35	305	66.3
	>35	68	14.8
Race/Ethnicity			
	White	120	26.1
	Black	120	26.1
	Hispanic	120	26.1
	Asian	100	21.7
Medi-Cal			
	No	327	71.1
	Yes	133	28.9

MAMAS chemicals

- Metals
- Perfluorochemicals (PFCs)
- Persistent Organic Pollutants (POPs):
  - Organochlorine pesticides (OCPs)
  - Polychlorinated biphenyls (PCBs)
  - Polybrominated diphenyl ethers (PBDEs)

	MAMAS Phase I	MAMAS Phase II	MIEEP (2010-11)	NHANES *(cycle)*
Metals	200	440	77	Limited for blood
PFCs	200	440	77	17 (2011-12)
POPs	58	100	77	67-71 (2003-04)

MIEEP: Maternal and Infant Environmental Exposure Project

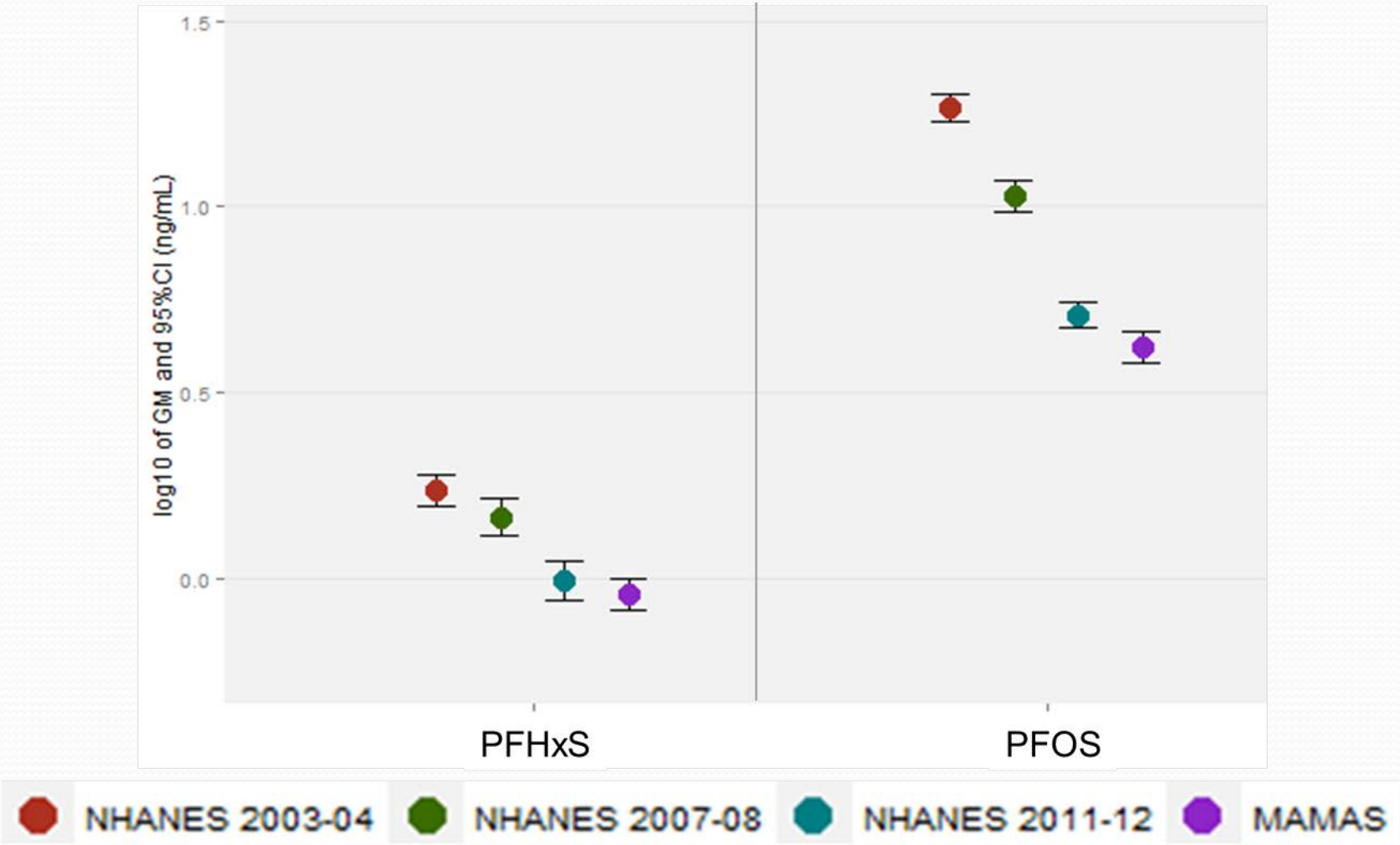
PFC detection frequencies

	Percent detected, sorted by MAMAS (%)		
PFC*	CTS	FOX	MAMAS
PFHxS	100	100	**100**
PFNA	100	100	**100**
PFOA	99.9	100	**100**
PFOS	99.9	100	**100**
PFHpA	75.9	75.2	**83.5**
PFDeA	94.2	100	**83**
Me-PFOSA-AcOH	98.5	100	**79.5**
PFUA	96.8	100	**78**
PFOSA	69.6	95	**33.5**
Et-PFOSA-AcOH	85.9	65.3	**29**
PFDoA	10.3	0	**8**

CTS: California Teachers Study
FOX: Firefighter Occupational Exposures Project

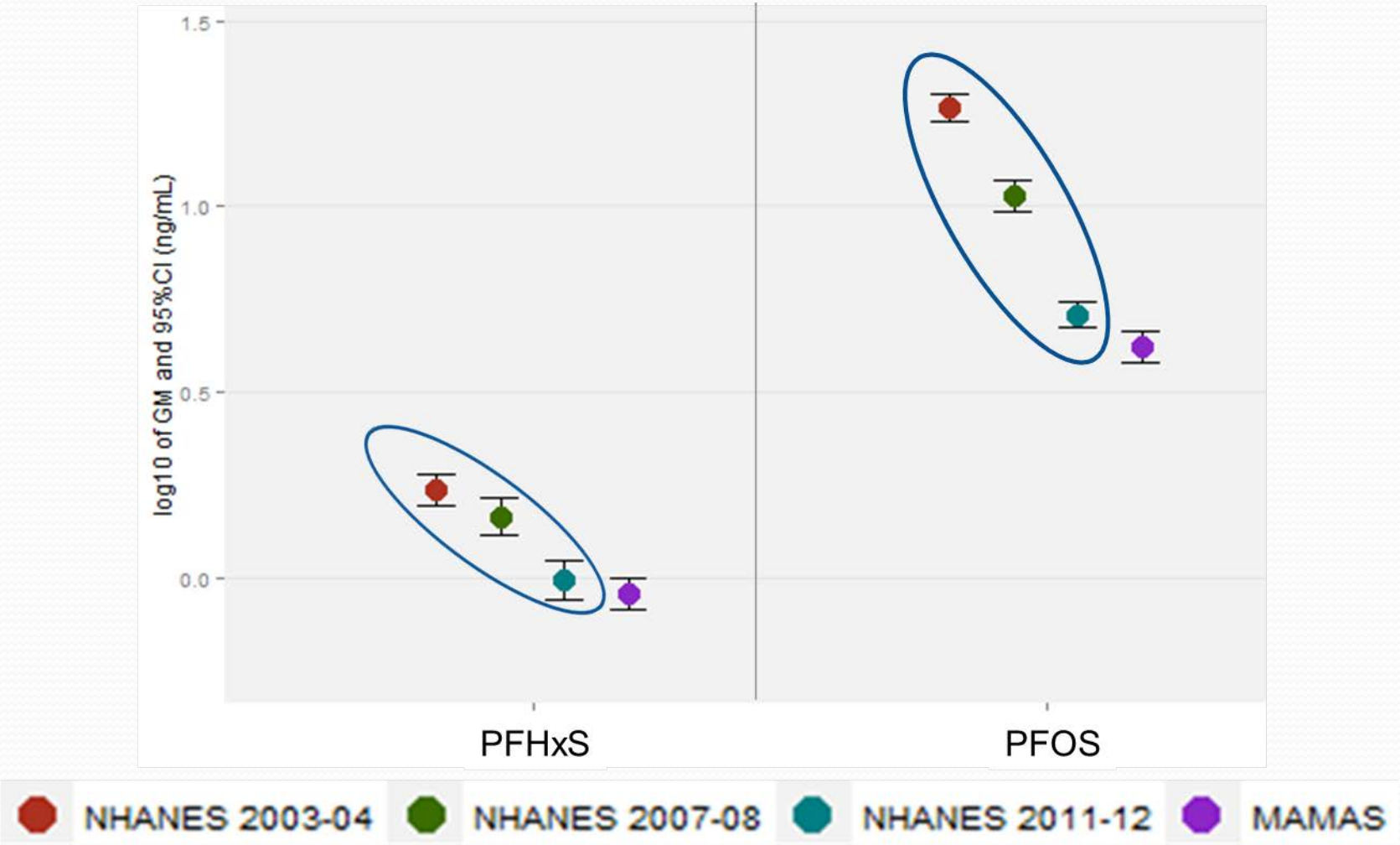
*Description of PFCs: http://biomonitoring.ca.gov/chemicals/perfluorochemicals-pfcs

PFHxS and PFOS in MAMAS and NHANES*



* NHANES is females, all ages.

PFHxS and PFOS in MAMAS and NHANES*



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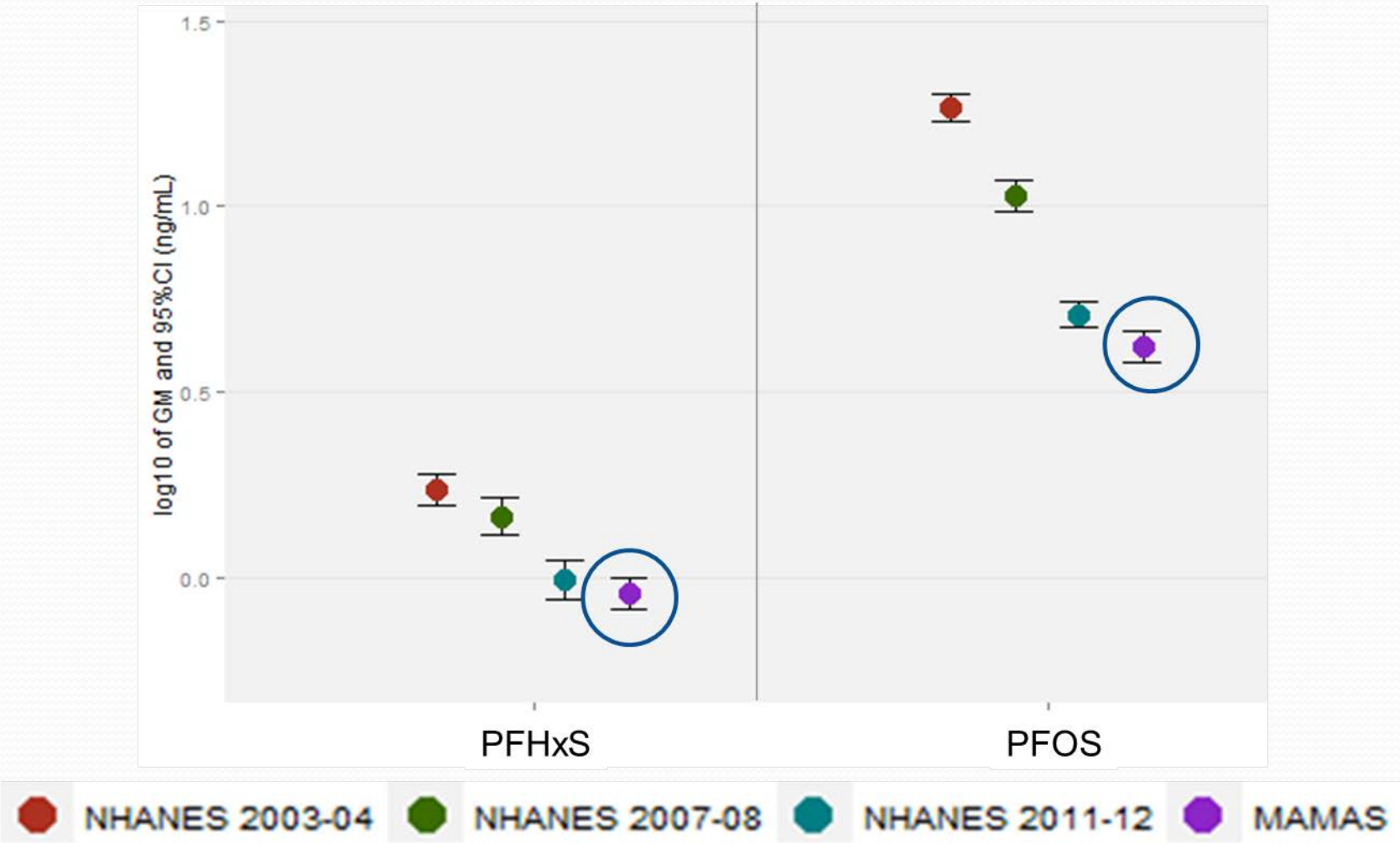
PFHxS and PFOS in MAMAS and NHANES* *(2)*



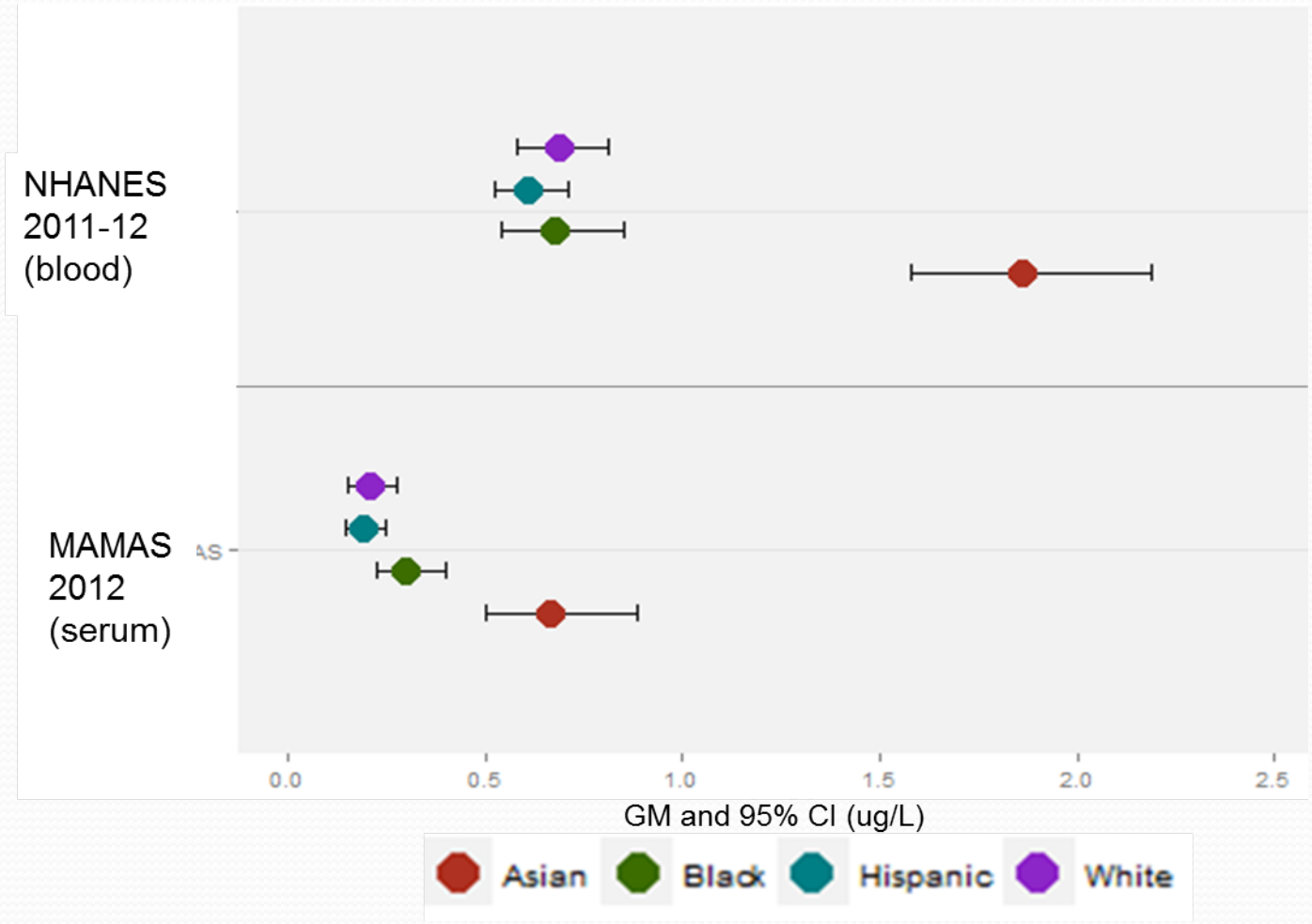
* NHANES is females, all ages.

Metals results

- Currently can report Hg, Mo, Se, Sr, and Tl
- Metal contamination in collection tubes
  - Two blank studies completed
  - Affects As, Cd, Co, Cr, Mn, Pb, Sb, U, and possibly others

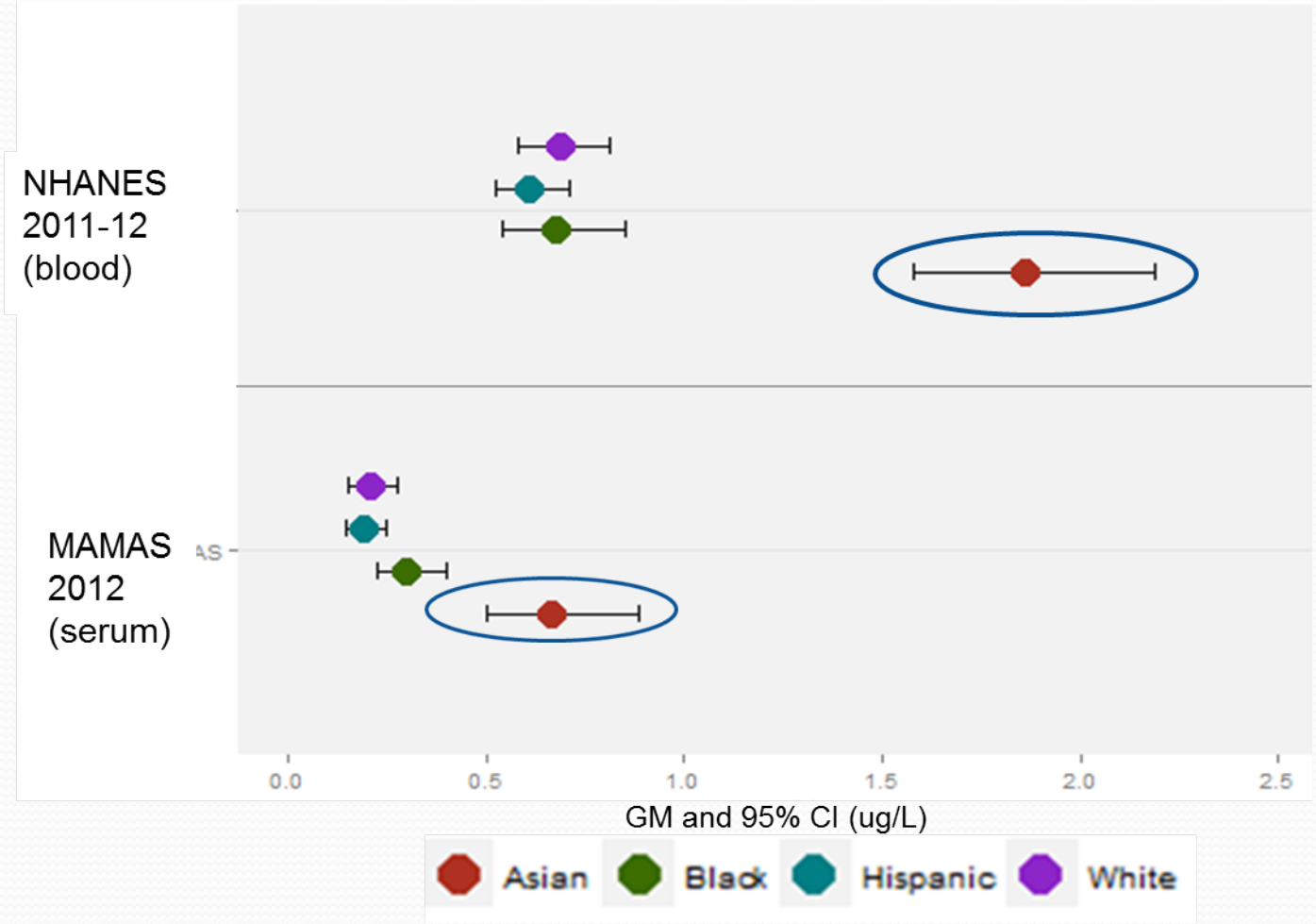
Detection frequencies (%) for MAMAS serum metals	
Hg	99
Mo	100
Se	100
Sr	100
Tl	100

Mercury by race in MAMAS and NHANES



Note: NHANES 2011-12, total blood mercury for all females.

Mercury by race in MAMAS and NHANES *(2)*



Note: NHANES 2011-12, total blood mercury for all females.

POPs detected in MAMAS

- Congeners shown were detected in at least 40% of samples
- DFs and GMs were less than NHANES (2003-04)*

	DF(%)
HCB	100
DDE	100
BDE-47	75.9
BDE-99	43.1
BDE-100	62.1
BDE-153	63.8
BDE-183	74.1
PCB-118	69.0
PCB-138	67.2
PCB-153	91.4
PCB-170	63.8
PCB-180	82.8

Note: *NHANES 18-45 year aged, overall and pregnant subgroups.

POPs detected in MAMAS *(2)*

- Congeners shown were detected in at least 40% of samples
- DFs and GMs were less than NHANES (2003-04)*
- Exception: BDE-183
  - DFs in CTS and FOX < 5%

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HCB	100
DDE	100
BDE-47	75.9
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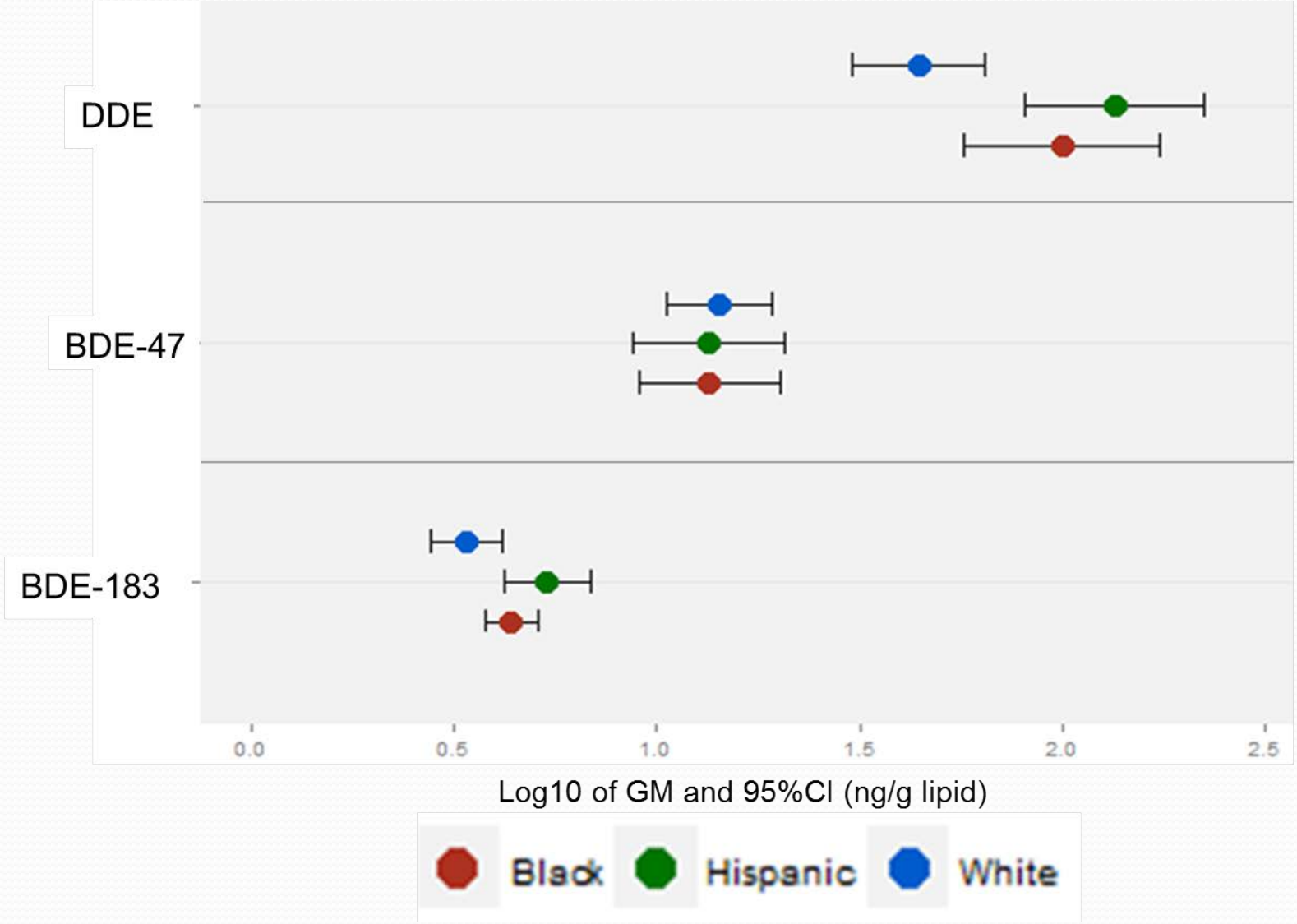
Note: *NHANES 18-45 year aged, overall and pregnant subgroups.

PBDEs: Consistent with recent studies

GM or other comparison values (ng/g lipid)				
Congener	MAMAS (2012)	MIEEP (2010-11)	CTS (2011)	FOX (2010-11)
BDE-47	13.7	9.56	14.1	32.2
BDE-99	*Median=4.3 (df=43%)	**Median=2.7	(df=42%)	6.19
BDE-100	2.8	2.17	2.46	5.68
BDE-153	6.49	2.64	5.46	15.4
BDE-183	4.2	---	---	---

*Values shown for context only; not statistically valid due to low DF
**DF not reported

MAMAS: 3 POPs by race



MAMAS:
Potential for state-wide sampling

Benefits

- Inexpensive
- Representative racially and geographically
- Samples can be fairly large
- Continuous sampling stream might facilitate timely surveillance (limited by other project timelines)

Challenges

- Serum only, limited sample volume
- Limited representation of CA: pregnant women
- Additional, specific bias:
  - Only those achieving pregnancy
  - Likely omits higher risk pregnancies
  - Omits older and younger women
- No exposure histories possible
- No control over sampling protocol

Future directions for MAMAS

<u>Next steps:</u>

- Combine with MAMAS II
- Continue to assess metals strategy

<u>Future possibilities:</u>

- Changes over time in California
- Sentinel monitoring of emerging chemicals
- Retrospective investigation in Biobank counties