

# JOINT EFFECTS OF PRENATAL EXPOSURE TO PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS) AND POLYBROMINATED DIPHENYL ETHERS (PBDE) ON MATERNAL AND NEWBORN TELOMERE LENGTH

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## Per- and poly- fluoroalkyl substances (PFAS) & Polybrominated diphenyl ethers (PBDEs)

- Present in nonstick cookware, food containers, fire fighting foam, furniture, textiles, etc.
- Bioaccumulate and  $\geq 98\%$  of individuals in US have detectable PFAS levels
- New chemicals constantly phased in, not regulated
- Detectable in cord blood and placenta



## SHORTERN NEWBORN TELOMERE LENGTH ASSOCIATED WITH ENVIRONMENTAL CHEMICALS

- Arsenic
- Phthalates
- Metals
- PFAS (adult populations)

## RESEARCH GAPS

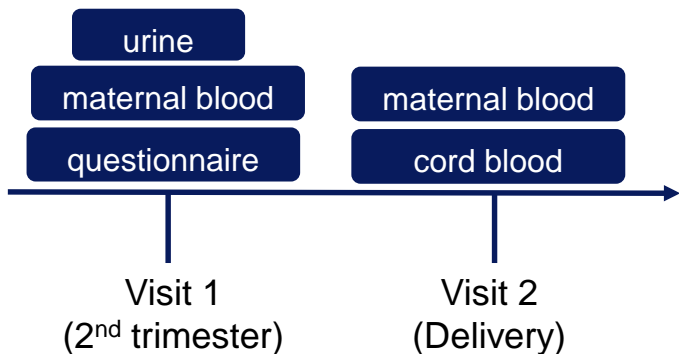
- Effects on maternal telomeres?
- Simultaneous exposure to multiple chemicals??



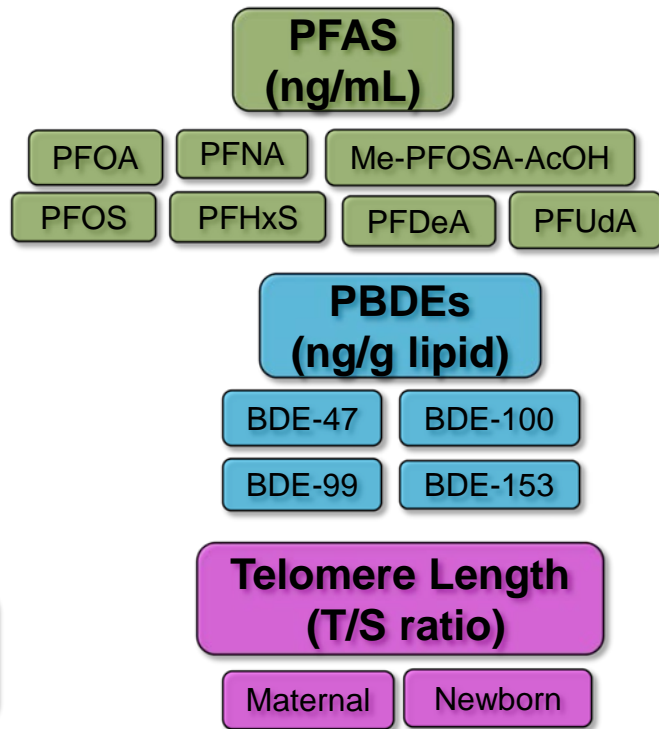
**RESEARCH QUESTION:** Is prenatal exposure to PFAS and PBDEs associated with maternal and newborn telomere length?

# CHEMICALS IN OUR BODIES BIRTH COHORT

- Based in San Francisco, CA
- Designed to examine joint effects of chemicals and non-chemical stressors
- Recruitment since 2014
- Key features:
  - Extensive stress questionnaire
  - Demographically diverse



**N=289 newborn TL**  
**N=110 for maternal TL**



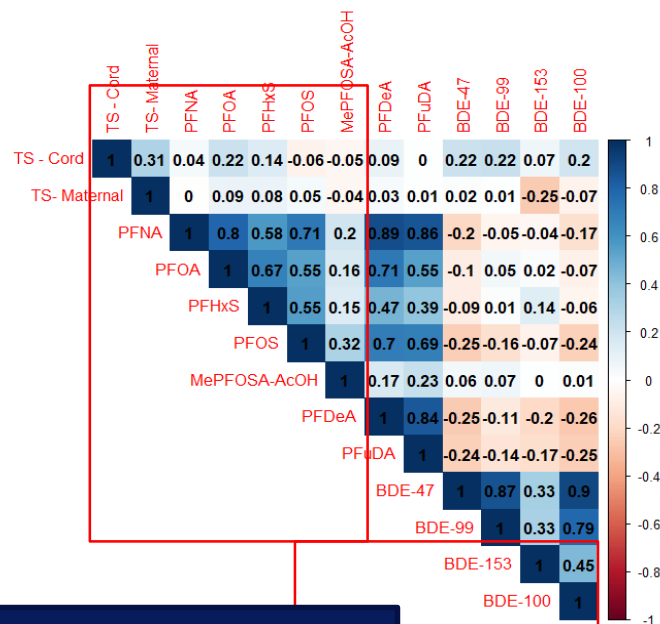
# STUDY POPULATION

	Newborn (N=289)	Maternal (N=110)
	%	%
<b>Maternal Education</b>		
Less than High School	9	13
High School Degree or Some College	20	21
College Degree	27	31
Graduate Degree	44	34
<b>Maternal Race/Ethnicity</b>		
Non-Hispanic White	43	42
Non-Hispanic Black	3	4
Asian/Pacific Islander	21	15
Latina	29	35
Other	3	5
<b>Parity</b>		
No Prior Births	55	46
One or More Prior Births	45	54

- Mean maternal age was 34 years
- Mean gestational age at delivery was 39 weeks
- Mean pre-pregnancy BMI was 25 kg/m<sup>2</sup>

# MIXTURE METHODS

- Quantile g-computation
  - Estimates the effect of simultaneously increasing all exposures in the mixture by one quantile
- Bi-directional exposure-outcome relationships
- Individual PFAS and PBDEs are given positive or negative weight



## 3 MIXTURE GROUPS

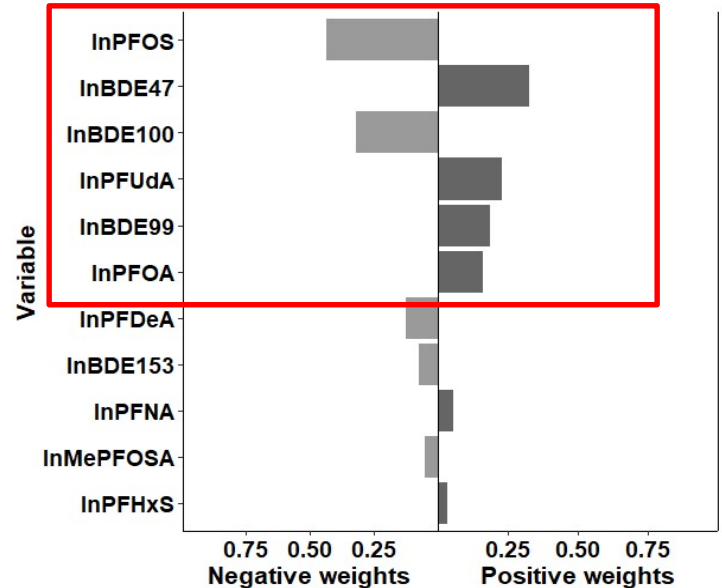
- All PFAS and PBDEs combined
- PFAS alone
- PBDEs alone

Newborn Telomere Length		
	$\beta$	95% CI
<b>Overall</b>	0.04	(-0.01, 0.09)
<b>PFAS</b>	0.01	(-0.03, 0.05)
<b>PBDEs</b>	0.04	(0.00, 0.07)

*Beta estimates are interpreted as the effect on telomere length of increasing every exposure in the mixture by one quantile.*

*Adjusted for age, race/ethnicity, education, pre-pregnancy BMI, and parity*

**Increasing PFAS and PBDEs associated with longer newborn telomeres**



*Weights correspond to overall mixture model*

*Negative and positive weights both sum to 1 and correspond to the effect size relative to other effects in the same direction and should not be directly compared.*

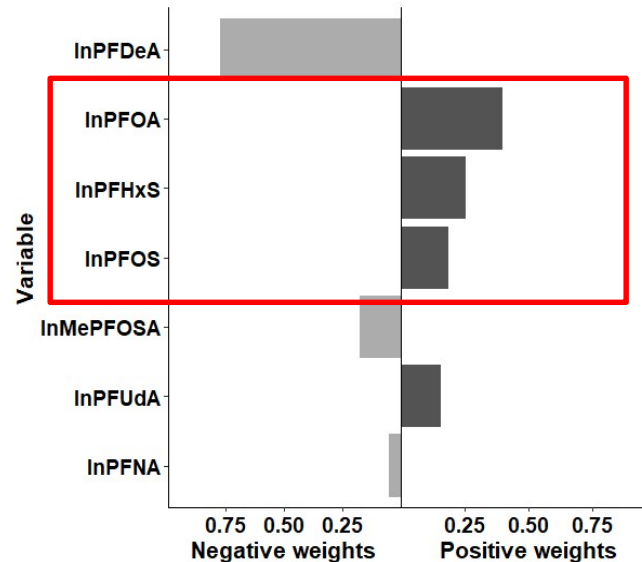
## Maternal Telomere Length

	$\beta$	95% CI
<b>Overall</b>	0.03	(-0.03, 0.09)
<b>PFAS</b>	0.04	(-0.01, 0.09)
<b>PBDEs</b>	-0.02	(-0.06, 0.01)

*Beta estimates are interpreted as the effect on telomere length of increasing every exposure in the mixture by one quantile.*

*Adjusted for age, race/ethnicity, education, pre-pregnancy BMI, and parity*

**Increasing PFAS, not PBDEs, associated with longer maternal telomeres**



*Weights correspond to PFAS alone mixture model*

*Negative and positive weights both sum to 1 and correspond to the effect size relative to other effects in the same direction and should not be directly compared.*



## STRENGTHS

- Demographically and racial/ethnically diverse study population
- Mixture methods better reflect “real life” exposures

## LIMITATIONS

- Small sample size

## CONCLUSIONS

- PFAS and PBDEs associated with longer newborn telomere length
- Associations primarily driven by PBDEs
- PFAS moderately associated with longer maternal telomeres

# THANK YOU

## **CIOB STUDY PARTICIPANTS, LEADERSHIP, AND RESEARCH TEAM**

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