

SUPPORTING INFORMATION

Time trends in per- and polyfluoroalkyl substances (PFASs) in California women: declining serum levels, 2011-2015.

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Contains: text describing laboratory methods, two tables (Table S1 and S2), and one figure (Figure S1) in 4 pages (including cover).

Laboratory Methods: Serum PFASs Measurements

Online SPE-HPLC-MS/MS Analysis 100 μ L of serum was diluted with 0.1M formic acid and spiked with 10 isotopically labeled internal standards (MPFAC-MXA internal standards mix stock, Wellington laboratories, and isotope labeled N-EtFOSAA (d5-N-EtFOSAA)). 400 μ L of the sample mixture was then injected into the online SPE-HPLC-MS/MS system (Symbiosis TM Pharma, IChrom Solutions, Plainsboro, NJ, and Sciex 4000 QTrap mass spectrometer, Sciex, Redwood City, CA) for clean-up and analysis. Online SPE clean-up was accomplished by the C18 cartridge (HySphere C18 HD, 7 μ m, 10 mm x 2 mm, Sparkholland, Plainsboro, NJ) and sample mixture was loaded with 2mL of 0.1M formic acid. After washing, the valve was changed to the eluting position, and the gradient passed through the cartridge, eluting the target analytes to a C8 HPLC column (BETASIL C8 column (3 mm x 50 mm, 5 μ m), Thermo Fisher Scientific, Waltham, MA) for separation. The gradient started at 20% MeOH at a flow rate of 0.3 mL/min, ramped to 55% MeOH at 8 minutes, 70% MeOH at 8.5 min, 75% MeOH at 8.6 minutes, 80% MeOH at 12 minutes, 90% MeOH at 12.1 minutes, 95% MeOH at 14.5 minutes, held for 3 minutes, then back to 30% MeOH at 17.6 minutes and held for 5 minutes.

The eluate was introduced to the MS/MS (ABSciex API 4000 QTrap mass spectrometer, ABSciex, Foster City, CA) for multiple-reaction-monitoring (MRM) analysis. The operating conditions were: curtain gas 28 psi, ionSpray voltage -4200V, temperature at 300°C, entrance potential -10V and collision cell exit potential -15V. Individual parameters were optimized for each target analyte. For quantification, seven- point external calibration curves were processed together with each batch of samples. The analyte area ratios (analyte area/internal standard area) vs. the standard concentration were obtained and linear regression was performed, with coefficient $R^2 > 0.97$ generally obtained.

Quality Control Measures Within each batch analysis of 20 actual samples, two in-house spiked calf serum samples (QCL and QCH) and NIST 1958 Standard Reference Material (which contains four of the analytes (PFOS, PFOA, PFNA and PFHxS)) were run in duplicate for quality control. Accuracy and reproducibility were monitored in QC charts and all reported results should meet standard QC criteria. We participate the AMAP (Arctic Monitoring and Assessment Program) 3 times per year, which contains PFHxS, PFNA, PFOA, PFOS and PFUndA, as well as proficiency tests from CDC (which contains 7 analytes; PFHxS, PFNA, PFOA, PFOS, PFUndA, PFDA and Me-PFOSAA, and twice per year) since 2012. Z score values of -2.0 to + 2.0 were generally accomplished. The data are kept together with QC data in the validation data package.

Table S1. Spearman Rank Correlation Coefficients between PFAS compounds measured in sera of study participants (n=1,257), 2011-2015.*

	PFHpA	PFOA	PFNA	PFDA	PFUnDA	PFHxS	PFOS	PFOSA	EtFOSAA	MeFOSAA
PFHpA										
PFOA	0.46									
PFNA	0.36	0.67								
PFDA	0.33	0.59	0.76							
PFUnDA	0.22	0.34	0.58	0.67						
PFHxS	0.18	0.51	0.35	0.29	0.22					
PFOS	0.20	0.61	0.59	0.50	0.36	0.61				
PFOSA	0.07	0.23	0.16	0.14	0.18	0.29	0.35			
EtFOSAA	0.13	0.23	0.20	0.22	0.17	0.22	0.36	0.53		
MeFOSAA	0.11	0.25	0.27	0.22	0.14	0.25	0.40	0.61	0.45	

* all p-values < 0.05

Table S2. Age distribution of study participants (CTS) and National Health and Nutrition Examination Survey (NHANES) participants included in Figure S1 (restricted to non-Hispanic white women age ≥ 40 years).

Age Group	2011-2012				2013-2014			
	CTS		NHANES		CTS		NHANES	
	n	%	n	%	n	%	n	%
40-44 years	6	1.2	24	12.3	0	0	31	11.0
45-49 years	10	2.0	21	10.8	12	3.3	30	10.6
50-54 years	18	3.7	22	11.3	20	5.5	27	9.5
55-59 years	39	8.0	22	11.3	24	6.5	36	12.7
60-64 years	80	16.4	20	10.3	66	18.0	30	10.6
65-69 years	115	23.5	19	9.7	89	24.3	33	11.7
70-74 years	99	20.2	21	10.8	75	20.4	25	8.8
75-79 years	56	11.5	11	5.6	59	16.1	21	7.4
80+ years	66	13.5	35	17.9	22	6.0	50	17.7
Total:	489	100.0	195	100.0	367	100.0	283	100.0

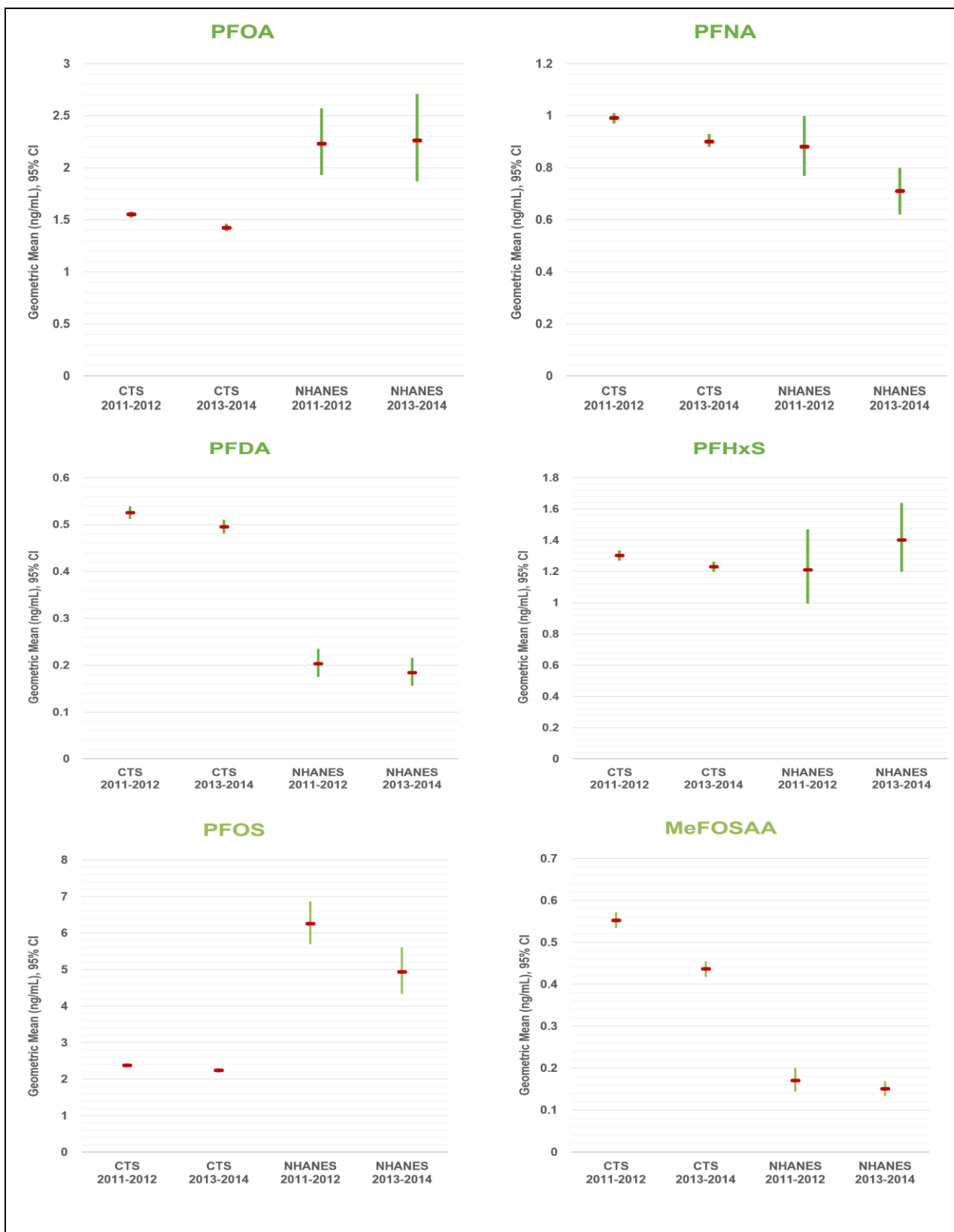


Figure S1. Geometric means and 95% confidence intervals (95% CIs) of serum PFAS concentrations for participants in this study (CTS) versus National Health and Nutrition Examination Survey (NHANES) participants for blood samples collected in 2011-2012 and 2013-2014. Restricted to non-Hispanic white women age ≥ 40 years: CTS: n=489 (2011-2012); n=367 (2013-2014). NHANES: n=195 (2011-2012); n=283 (2013-2014). PFAS with detection frequencies $\leq 65\%$ in this subsample of NHANES were not included in comparison.