

Supplemental Material

Time trends and developmental patterns of polybrominated diphenyl ether concentrations over a 15-year period between 1998 and 2013

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Table S1. Within congener Spearman correlation coefficients (p-values) between plasma PBDE concentrations measured between birth and age 9 years.

	Birth	Age 2	Age 3	Age 5	Age 7	Age 9
BDE-47						
Birth	1.00					
Age 2	-0.03 (0.82)	1.00				
Age 3	0.09 (0.36)	0.79 (<0.01)	1.00			
Age 5	0.35 (0.02)	0.80 (<0.01)	0.77 (0.07)	1.00		
Age 7	0.17 (0.02)	0.33 (0.04)	0.33 (<0.01)	0.61 (<0.01)	1.00	
Age 9	0.12 (0.13)	0.39 (0.01)	0.15 (0.38)	0.31 (0.07)	0.80 (<0.01)	1.00
BDE-99						
Birth	1.00					
Age 2	0.04 (0.78)	1.00				
Age 3	0.09 (0.36)	0.83 (<0.01)	1.00			
Age 5	0.32 (0.04)	0.63 (0.02)	0.49 (0.33)	1.00		
Age 7	0.13 (0.06)	0.36 (0.04)	0.41 (<0.01)	0.62 (<0.01)	1.00	
Age 9	0.10 (0.20)	0.36 (0.06)	0.35 (0.06)	0.24 (0.16)	0.77 (<0.01)	1.00
BDE-100						
Birth	1.00					
Age 2	0.21 (0.13)	1.00				
Age 3	0.22 (0.02)	0.89 (<0.01)	1.00			
Age 5	0.18 (0.26)	0.82 (<0.01)	0.83 (0.04)	1.00		
Age 7	0.13 (0.07)	0.42 (<0.01)	0.36 (<0.01)	0.72 (<0.01)	1.00	
Age 9	0.10 (0.20)	0.45 (<0.01)	0.31 (0.07)	0.36 (0.03)	0.86 (<0.01)	1.00
BDE-153						
Birth	1.00					
Age 2	0.26 (0.05)	1.00				
Age 3	0.12 (0.22)	0.89 (<0.01)	1.00			
Age 5	0.40 (<0.01)	0.84 (<0.01)	0.71 (0.11)	1.00		
Age 7	0.10 (0.14)	0.70 (<0.01)	0.63 (<0.01)	0.87 (<0.01)	1.00	
Age 9	0.07 (0.39)	0.82 (<0.01)	0.67 (<0.01)	0.89 (<0.01)	0.93 (<0.01)	1.00

Table S2. Between congener Spearman correlation coefficients (p-values) for plasma PBDE concentrations measured repeatedly between birth and age 9 years.				
Birth (n=327)	BDE-47	BDE-99	BDE-100	BDE-153
BDE-47	1.00			
BDE-99	0.83 (<0.01)	1.00		
BDE-100	0.76 (<0.01)	0.79 (<0.01)	1.00	
BDE-153	0.47 (<0.01)	0.50 (<0.01)	0.66 (<0.01)	1.00
Age 2 (n=56)				
BDE-47	1.00			
BDE-99	0.94 (<0.01)	1.00		
BDE-100	0.93 (<0.01)	0.92 (<0.01)	1.00	
BDE-153	0.75 (<0.01)	0.71 (<0.01)	0.89 (<0.01)	1.00
Age 3 (n=115)				
BDE-47	1.00			
BDE-99	0.96 (<0.01)	1.00		
BDE-100	0.94 (<0.01)	0.91 (<0.01)	1.00	
BDE-153	0.76 (<0.01)	0.73 (<0.01)	0.90 (<0.01)	1.00
Age 5 (n=42)				
BDE-47	1.00			
BDE-99	0.92 (<0.01)	1.00		
BDE-100	0.88 (<0.01)	0.81 (<0.01)	1.00	
BDE-153	0.58 (<0.01)	0.55 (<0.01)	0.82 (<0.01)	1.00
Age 7 (n=203)				
BDE-47	1.00			
BDE-99	0.93 (<0.01)	1.00		
BDE-100	0.92 (<0.01)	0.90 (<0.01)	1.00	
BDE-153	0.49 (<0.01)	0.51 (<0.01)	0.67 (<0.01)	1.00
Age 9 (n=160)				
BDE-47	1.00			
BDE-99	0.94 (<0.01)	1.00		
BDE-100	0.90 (<0.01)	0.89 (<0.01)	1.00	
BDE-153	0.46 (<0.01)	0.43 (<0.01)	0.65 (<0.01)	1.00

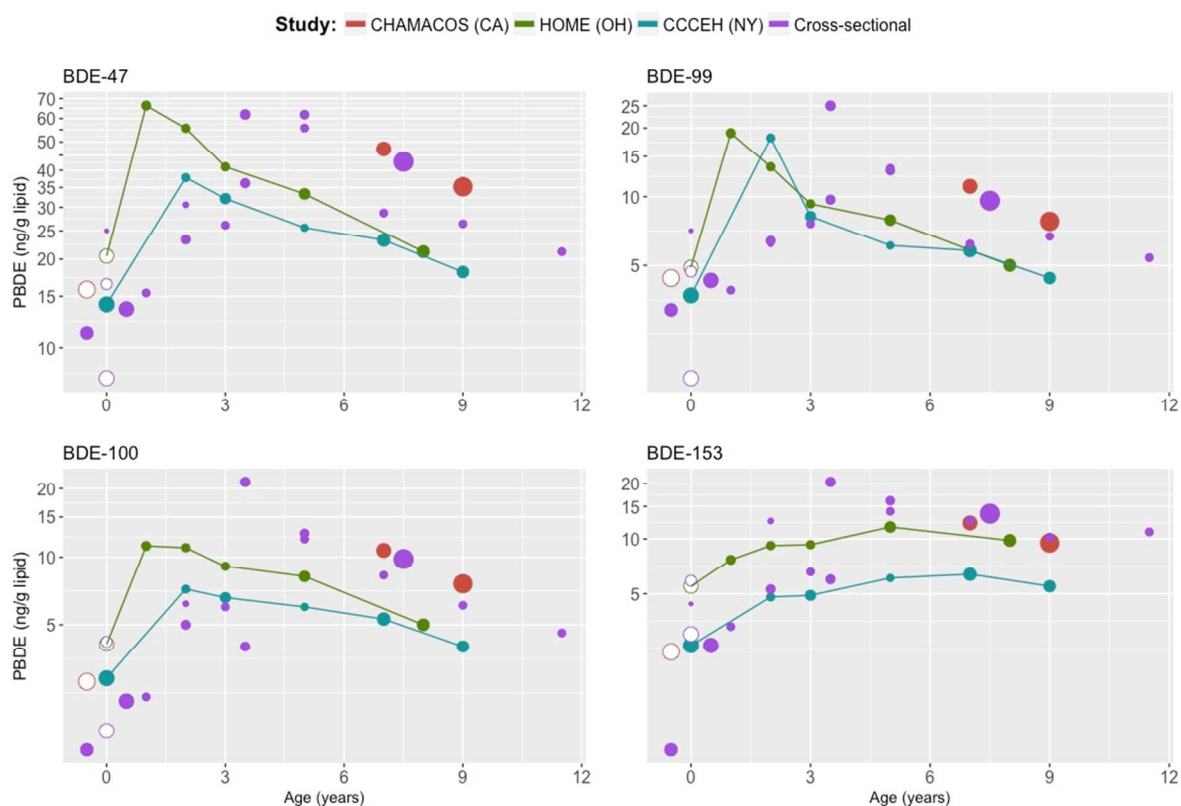
Table S3. BIC and $2\log_e(B_{10})$ for evaluating LCGA model fit		
Null vs. Alternative model [number of trajectories]	BIC	$2\log_e(B_{10}) \approx 2(\Delta\text{BIC})$
BDE-47		
2 vs 3	-579.59 vs -571.88	15.42
3 vs 4	-571.88 vs -558.10	27.56
4 vs 5	-558.10 vs -552.37	11.46
5 vs 6	-552.37 vs -554.36	-3.98
BDE-99		
2 vs 3	-505.75 vs -496.44	18.62
3 vs 4	-496.44 vs -483.93	25.02
4 vs 5	-483.93 vs -480.39	7.08
5 vs 6	-480.49 vs -475.42	10.14
BDE-100		
2 vs 3	-412.02 vs -399.98	24.08
3 vs 4	-399.98 vs -363.40	73.16
4 vs 5	-363.40 vs -366.19	-5.58
5 vs 6	-366.19 vs -362.75	6.88
BDE-153		
2 vs 3	-223.13 vs -192.72	60.82
3 vs 4	-192.72 vs -186.56	12.32
4 vs 5	N/A ^a	
5 vs 6	N/A ^a	
$2\log_e(B_{10})$: interpreted as the degree of evidence favoring the alternative model		
^a 5 and 6 group solutions were not possible to estimate for BDE-153		

Table S4. Comparison of geometric mean PBDE concentrations (ng/g lipid) measured in plasma or serum samples by several recent U.S.-based studies.

Author, year	State	PBDE analysis	N	Age (yrs)	BDE-47	BDE-99	BDE-100	BDE-153
Cowell (present) ^c	NY	Longitudinal	327	0	14.1	3.7	2.9	2.6
Mazdai 2003 ^{a,d}	IN	Cross sectional	12	0	25.0	7.1	4.1	4.4
Herbstman 2007 ^{a,c}	MD	Cross sectional	297	0	13.6	4.3	2.3	2.6
Herbstman 2010 ^{a,c}	NY	Cross sectional	201	0	11.2	3.2	1.4	0.7
Stapleton 2011	NC	Cross sectional	137	0	16.5	4.7	4.2	5.9
Castorina 2011 ^d	CA	Longitudinal	416	0	15.8	4.4	2.8	2.4
Horton 2013 ^{a,d}	NY	Cross sectional	316	0	7.9	1.6	1.7	3.0
Vuong 2015 ^d	OH	Longitudinal	274	0	20.5	4.9	4.1	5.5
Vuong 2017	OH	Longitudinal	76	1	66.3	19.0	11.2	7.7
Sjodin 2014 ^a	TX	Cross sectional	50	0-2	15.4	3.9	2.4	3.3
Vuong 2017	OH	Longitudinal	61	2	55.6	13.5	11.0	9.2
Cowell (present)	NY	Longitudinal	56	2	37.8	18.1	7.2	4.8
Lunder 2010 ^a	U.S.	Cross sectional	20	1-3	30.6	6.2	6.2	12.5
Stapleton 2012	NC	Cross sectional	77	1-3	23.3	6.4	5.0	5.3
Vuong 2017	OH	Longitudinal	61	3	41.1	9.3	9.1	9.3
Cowell (present)	NY	Longitudinal	115	3	32.1	8.2	6.6	4.9
Sjodin 2014 ^a	TX	Cross sectional	50	2-4	26.1	7.6	6.0	6.6
Jacobson 2016	GA	Cross sectional	80	1-5	36.2	9.7	4.0	6.0
Rose 2010	CA	Cross sectional	94	2-5	61.9	25.0	21.4	20.4
Sjodin 2014 ^a	TX	Cross sectional	50	4-6	55.7	13.3	12.0	14.1
Wu 2015	CA	Cross sectional	67	2-8	61.8	13.0	12.7	16.1
Vuong 2017	OH	Longitudinal	127	5	33.3	7.9	8.2	11.6
Cowell (present)	NY	Longitudinal	42	5	25.6	6.1	6.0	6.1
Eskenazi 2013	CA	Longitudinal	270	7	47.3	11.1	10.7	12.2
Cowell (present)	NY	Longitudinal	203	7	23.2	5.8	5.3	6.4
Sjodin 2014 ^a	TX	Cross sectional	50	6-8	28.7	6.2	8.3	12.5
Vuong 2017	OH	Longitudinal	173	8	21.2	5.0	5.0	9.8
Windham 2010	CA/OH	Cross sectional	599	6-9	42.8	9.6	9.8	13.7
Sagiv 2015	CA	Longitudinal	546	9	35.2	7.8	7.6	9.5
Cowell (present)	NY	Longitudinal	160	9	18.1	4.4	4.0	5.5
Sjodin 2014 ^a	TX	Cross sectional	50	8-10	26.4	6.7	6.1	10.2
Gump 2014 ^b	NY	Cross sectional	43	10	8.5	2.3	0.9	NA
Sjodin 2014	TX	Cross sectional	50	10-13	21.2	5.4	4.6	10.9

^aMedian, ^bArithmetic mean, ^cUmbilical cord blood, ^dMaternal blood during pregnancy

Figure S5. Age-specific comparison of PBDE concentrations across several U.S.-based studies.



White points outlined in color indicate concentrations measured in maternal (versus cord) blood collected during the prenatal period. The size of each point indicates relative sample size. CHAMACOS: The Center for the Health Assessment of Mothers and Children of Salinas Study (Eskenazi 2013); HOME: Health Outcomes and Measures of the Environment Study (Vuong 2017); CCCEH: Columbia Center for Children’s Environmental Health Mothers and Newborns Cohort. Details and references for cross-sectional studies are provided in the Supplemental Material, Table S4.

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