Supporting Information

Determinants of Serum Polybrominated Diphenyl Ether (PBDE) Levels among Pregnant Women in the CHAMACOS Cohort

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19 pages, 4 tables, 3 figures

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Table S1. Molecular weights of PBDE congeners (g/mol).

Congener	IUPAC Name	Molecular weight
BDE-17	2,2', 4 - tribromodiphenyl ether	406.91
BDE-28	2,4,4' - tribromodiphenyl ether	406.90
BDE-47	2,2',4,4' - tetrabromodiphenyl ether	485.81
BDE-66	2,3',4,4' - tetrabromodiphenyl ether	485.81
BDE-85	2,2',3,4,4' - pentabromodiphenyl ether	564.69
BDE-99	2,2',4,4',5 - pentabromodiphenyl ether	564.71
BDE-100	2,2',4,4',6 - pentabromodiphenyl ether	564.71
BDE-153	2,2',4,4',5,5' - hexabromodiphenyl ether	643.61
BDE-154	2,2',4,4',5,6' - hexabromodiphenyl ether	643.60
BDE-183	2,2',3,4,4',5,6' - heptabromodiphenyl ether	722.51

Table S2. Molar PBDE concentrations in CHAMACOS maternal prenatal and delivery serum samples (pmol/g lipid).

	n	LOD[a]	DF (%)	Geo Mean (95% CI)	Min	25th	50th	75th	90th	Max
BDE-47										
Maternal prenatal (26 wk)	321	1.5	99.7	30.6 (27.3, 34.2)	<LOD	15.8	29.9	51.0	103.8	1567
Maternal delivery	116	0.3	99.2	26.4 (22.1, 31.6)	<LOD	13.9	25.9	47.5	81.6	455
BDE-99										
Maternal prenatal (26 wk)	321	0.4	99.7	7.6 (6.8, 8.5)	<LOD	4.0	6.7	11.4	22.5	527
Maternal delivery	116	0.3	99.2	5.8 (4.8, 6.9)	<LOD	2.7	5.3	10.8	18.5	162
BDE-100										
Maternal prenatal (26 wk)	321	0.4	99.7	4.7 (4.2, 5.3)	<LOD	2.6	4.3	7.4	14.9	245
Maternal delivery	116	0.3	99.2	4.2 (3.6, 5.0)	<LOD	2.3	4.3	7.8	12.3	52.1
BDE-153										
Maternal prenatal (26 wk)	321	0.4	99.7	3.6 (3.2, 4.0)	<LOD	2.0	3.1	5.7	11.5	150.5
Maternal delivery	116	0.3	100	3.3 (2.8, 3.8)	0.7	1.7	3.5	5.8	9.5	24.1
Sum of 4 congeners [b]										
Maternal prenatal (26 wk)	321	--	100	47.8 (42.8, 53.2)	5.9	24.7	45.0	76.5	152.1	2489
Maternal delivery	116	--	100	41.0 (34.7, 48.5)	3.1	21.4	39.6	72.0	120.5	686
Sum of 10 congeners [c]										
Maternal prenatal (26 wk)	321	--	100	52.3 (47.0, 58.2)	7.6	27.2	50.1	81.2	164.2	2657
Maternal delivery	116	--	100	45.5 (38.8, 53.5)	6.4	24.3	42.5	77.9	130.0	736

[a] Average of LODs (ng/g lipid).
[b] Molar sum of 4 PBDE congeners with DFs>95%: BDE-47; BDE-99; BDE-100; BDE-153.
[c] Molar sum of 10 PBDE congeners: BDE-17; BDE-28; BDE-47; BDE-66; BDE-85; BDE-99; BDE-100; BDE-153; BDE-154; BDE-183.

Table S3. Demographic, housing and diet information and total molar PBDE concentrations among pregnant women in the CHAMACOS cohort (n=416).

	n (%)	Molar sum (pmol/g lipid) GeoMean (95% CI) [a]
Demographic information		
Age categories		
≤25 years	243 (58.4)	54.3 (48.3, 61.2)
>25 years	173 (41.6)	56.0 (48.6, 64.5)
Country of birth		
US Born	57 (13.7)	99.4** (76.5, 129.2)
Born in Mexico/other	359 (86.3)	50.1 (45.6, 55.0)
Time residing in the U.S.		
≤5 years	224 (53.9)	44.6 (39.5, 50.5)
6 to 10 years	83 (19.9)	59.5 (50.9, 69.4)
11+ years	62 (14.9)	62.5 (50.3, 77.7)
Entire life	47 (11.3)	109.7** (81.0, 148.5)
Years residing in the U.S.		
Pearson r	416 (100)	0.33**
Education		
<= 6 years school	179 (43.0)	46.8 (41.4, 53.0)
7-12 years school	151 (36.3)	57.4 (49.1, 67.0)
High school grad +	86 (20.7)	71.4* (57.4, 89.0)
Poverty		
Above poverty threshold	143 (36.7)	59.4 (49.9, 70.7)
At or below poverty threshold	247 (63.3)	53.5 (48.1, 59.5)
Pre-pregnancy BMI categories		
Under/Normal weight (<25)	164 (39.5)	47.8 (41.7, 54.8)
Overweight/Obese (>=25)	251 (60.5)	60.4* (53.6, 68.1)
Pre-pregnancy BMI		
Pearson r	415 (99.8)	0.15*
Weight gain during pregnancy (lbs)		
Pearson r	409 (98.3)	-0.10*
Parity		
0 children	151 (36.3)	49.6 (42.4, 58.2)
1 child	128 (30.8)	56.4 (47.6, 66.9)
≥2 children	137 (32.9)	60.2 (52.3, 69.3)

* ANOVA p-value<0.05; ** p-value<0.001

[a] Geometric means and 95% confidence interval except when Pearson coefficient (r) is presented.

Table S3 (cont). Demographic, housing and diet information and total molar PBDE concentrations among pregnant women in the CHAMACOS cohort (n=416).

	n (%)	Molar sum (pmol/g lipid) GeoMean (95% CI) [a]
Breastfeeding history previous births		
None	192 (46.2)	53.3 (46.3, 61.4)
<12 months	118 (28.4)	57.8 (49.7, 67.3)
≥12 months	106 (25.5)	55.2 (45.9, 66.3)
Maternal smoking during pregnancy		
No	393 (94.5)	54.4 (49.6, 59.6)
Yes	23 (5.5)	67.4 (43.9, 103.5)
Housing characteristics		
No. pieces of stuffed furniture in home		
0	48 (12.7)	45.8 (33.5, 62.5)
1-2	239 (63.1)	52.8 (47.2, 59.1)
3 +	92 (24.3)	67.8* (54.7, 84.1)
Any carpet in the home		
No	29 (7.7)	54.9 (36.7, 82.2)
Yes	350 (92.3)	55.1 (49.9, 60.9)
% of rooms with carpet		
Pearson r	379 (91.1)	0.04
Resident density		
<1 person per room	39 (10.4)	65.4 (45.5, 93.8)
≥1 person per room	337 (89.6)	54.1 (49.0, 59.8)
Quality of housekeeping		
Less clean	21 (5.5)	49.4 (35.0, 69.5)
Average	207 (54.6)	58.2 (50.3, 67.4)
Excellent	151 (39.8)	52.3 (45.9, 59.5)
Diet		
Daily servings of dairy		
Pearson r	416 (99.8)	-0.06
Daily servings of meat		
Pearson r	416 (99.8)	0.05
Total daily fat intake		
Pearson r	393 (94.5)	-0.04
Consumption of fish		
<=1 per month	226 (56.2)	55.6 (49.1, 62.9)
>1 per month	176 (43.8)	54.3 (47.2, 62.4)

* ANOVA or Pearson's correlation p-value<0.05; ** p-value<0.001
[a] Geometric means and 95% confidence interval except when Pearson coefficient (r) is presented.

Description of serum PBDE congener analytical laboratory methods

The methods used by the CDC for serum PBDE analysis have been described previously (Sjödin et al. 2004). Briefly, serum samples were fortified with 13C-labeled internal standards, and formic acid was added to the samples as a denaturant and the samples were finally diluted with water before solid phase extraction (SPE). Liquid handling before extraction was automated using a 215 Liquid Handler (Gilson Inc, Middleton, WI), and SPE was automated using the Rapid Trace SPE workstation (Caliper Life Sciences, Hopkinton, MA). Removal of coextracted lipids was performed on a two-layered cleanup cartridge packed in and SPE tube, containing silica (top layer) and a mixture of silica and sulfuric acid (bottom layer), using the SPE work stating for automation

Final analytical determination of target analytes is performed by gas chromatography-isotope dilution high resolution mass spectrometry (GC-IDHRMS).

Reference

Sjödin, A.; Jones, R.S.; Lapeza, C.R.; Focant, J.F.; McGahee, E.E.; Patterson, D.G, Jr. Semiautomated high-throughput extraction and cleanup method for the measurement of polybrominated diphenyl ethers, polybrominated biphenyls, and polychlorinated biphenyls in human serum. *Anal. Chem.* **2004,** *76(7)*, 1921-1927.

Table S4a. Results from multiple regression analyses of log-transformed BDE-47 levels (ng/g lipid) and exposure predictors in pregnant women (n=352).

	% Change (95% CI)	p-value
Years residing in the US (continuous)	4.2 (2.8, 5.5)	<0.001
Pre-pregnancy BMI (overweight/obese ($\geq$25))	21.7 (-2.0, 51.0)	0.08
Weight gain during pregnancy (kgs)	-0.8 (-2.6, 0.9)	0.35
No. pieces of stuffed furniture in home ($\geq$3)	23.9 (-2.0, 56.8)	0.05
SES (at or below poverty threshold)	-2.5 (-20.9, 20.1)	0.81

Model R-squared=0.13

Table S4b. Results from multiple regression analyses of log-transformed BDE-99 levels (ng/g lipid) and exposure predictors in pregnant women (n=352).

	% Change (95% CI)	p-value
Years residing in the US (continuous)	3.1 (1.7, 4.5)	<0.001
Pre-pregnancy BMI (overweight/obese ($\geq$25))	23.4 (-1.1, 54.1)	0.06
Weight gain during pregnancy (kgs)	-0.6 (-2.4, 1.2)	0.52
No. pieces of stuffed furniture in home ($\geq$3)	33.3 (4.7, 69.6)	0.02
SES (at or below poverty threshold)	-0.5 (-19.8, 23.2)	0.96

Model R-squared=0.10

Table S4c. Results from multiple regression analyses of log-transformed BDE-100 levels (ng/g lipid) and exposure predictors in pregnant women (n=352).

	% Change (95% CI)	p-value
Years residing in the US (continuous)	4.7 (3.3, 6.0)	<0.001
Pre-pregnancy BMI (overweight/obese ($\geq$25))	12.8 (-8.5, 39.0)	0.26
Weight gain during pregnancy (kgs)	-1.3 (-3.0, 0.4)	0.14
No. pieces of stuffed furniture in home ($\geq$3)	26.7 (0.9, 59.0)	0.04
SES (at or below poverty threshold)	2.2 (-16.5, 25.0)	0.83

Model R-squared=0.16

Table S4d. Results from multiple regression analyses of log-transformed BDE-153 levels (ng/g lipid) and exposure predictors in pregnant women (n=352).

	% Change (95% CI)	p-value
Years residing in the US (continuous)	5.4 (4.2, 6.7)	<0.001
Pre-pregnancy BMI (overweight/obese (≥25))	-8.6 (-24.4, 10.6)	0.36
Weight gain during pregnancy (kgs)	-2.1 (-3.6, -0.5)	0.009
No. pieces of stuffed furniture in home (≥3)	27.6 (3.7, 57.0)	0.02
SES (at or below poverty threshold)	4.9 (-12.7, 26.1)	0.61

Model R-squared=0.22

Figure S1. Total maternal PBDE levels by years residing in the U.S. (n=416).

Pearson r=0.34; p<0.001
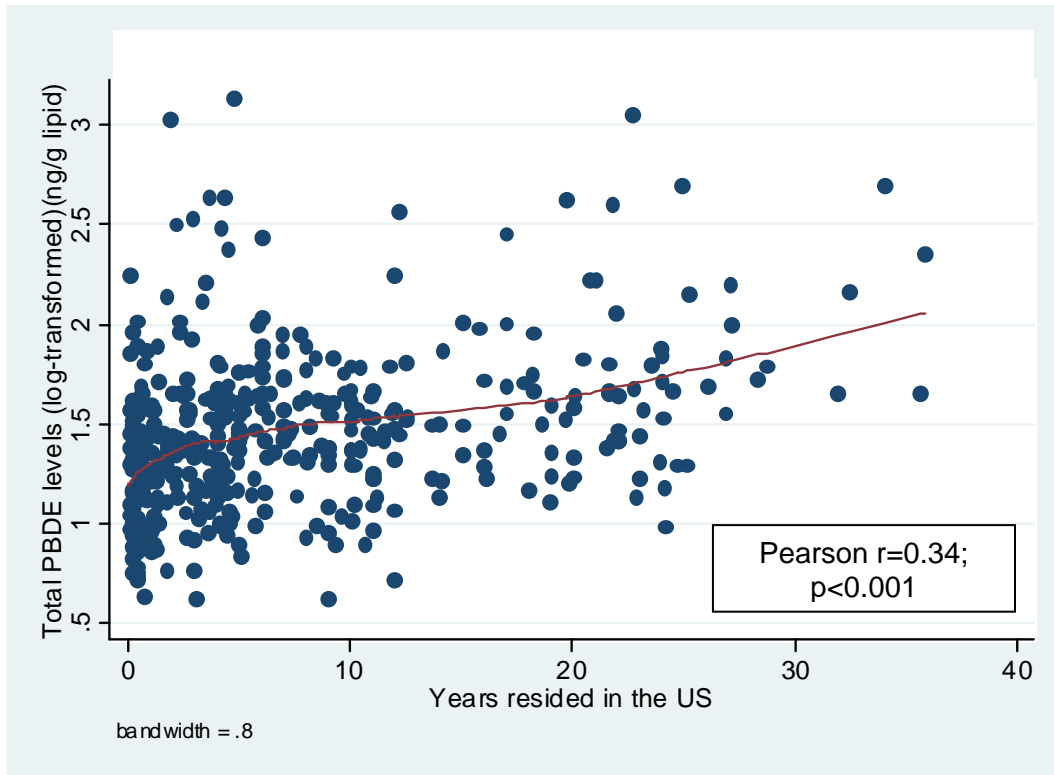
Figure S2a. Plot of matched maternal prenatal (~26 weeks gestation) and delivery total serum PBDE levels (n=21) (sum of 10 congeners) (log-transformed).
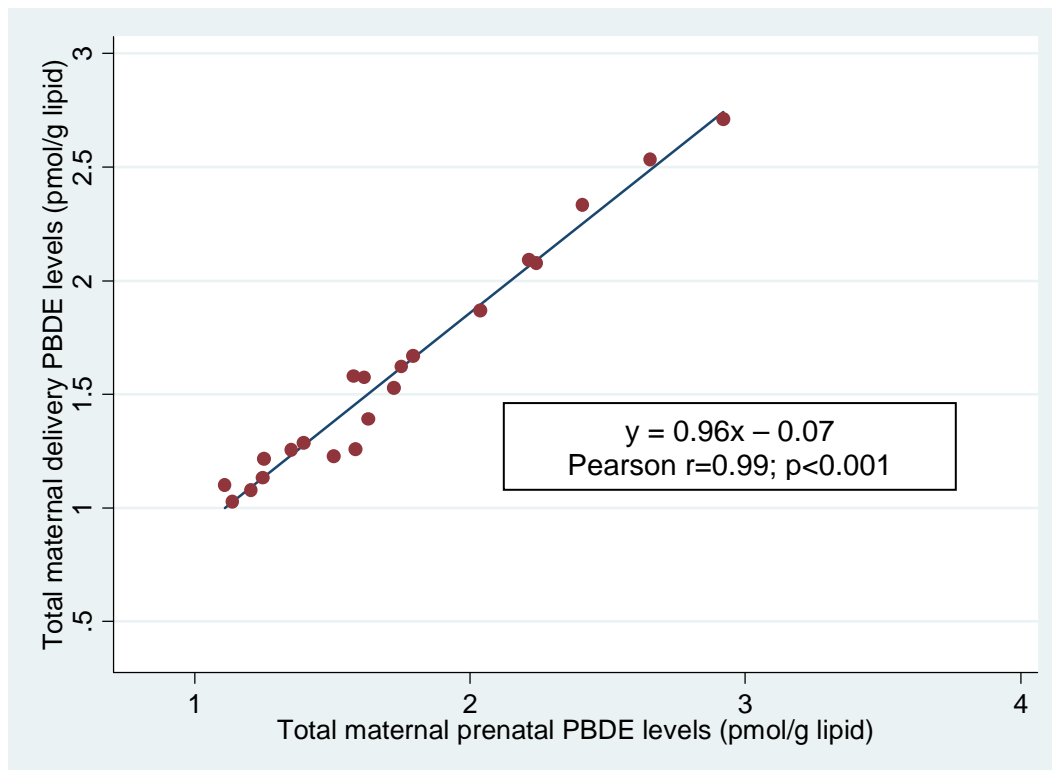

$$y = 0.96x - 0.07$$
Pearson r=0.99; p<0.001

Figure S2b. Plot of matched maternal prenatal (~26 weeks gestation) and delivery serum BDE-47 levels (n=21) (log-transformed).
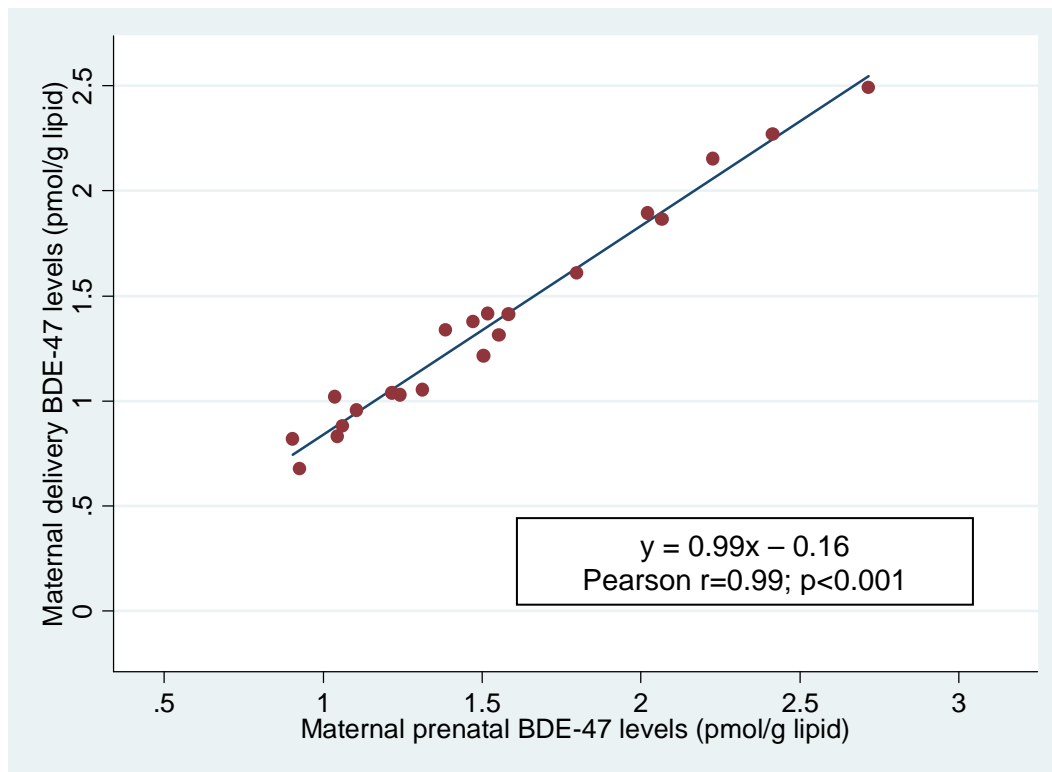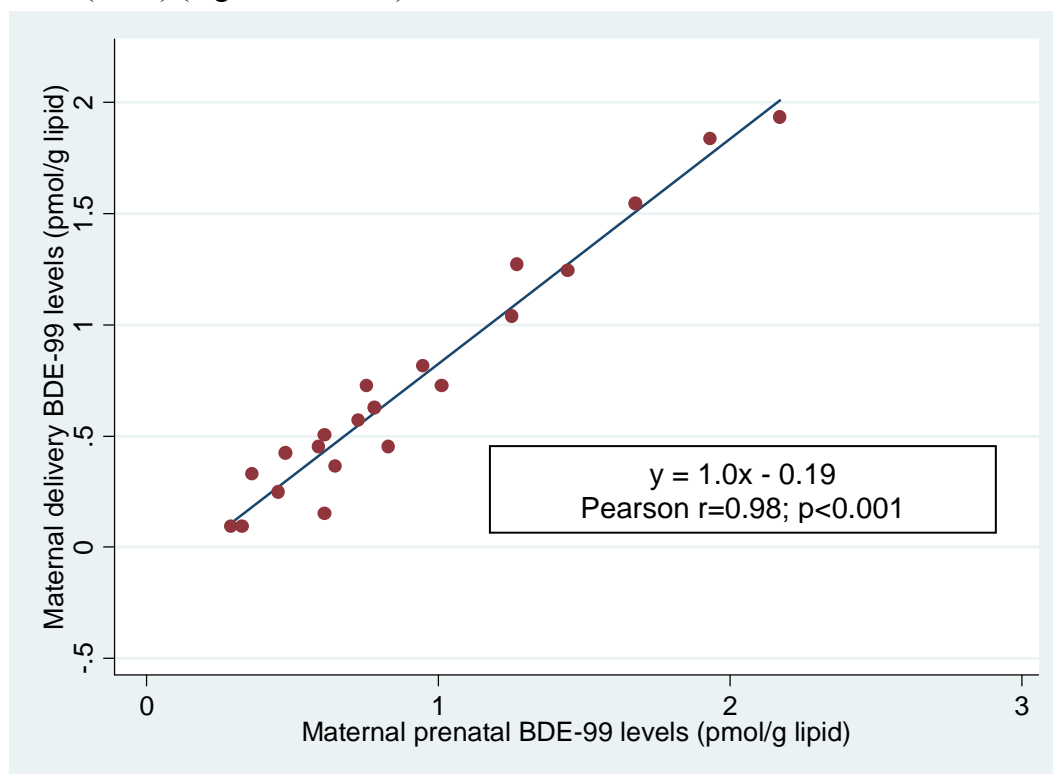

Plot with y-axis labeled "Maternal delivery BDE-47 levels (pmol/g lipid)" and x-axis labeled "Maternal prenatal BDE-47 levels (pmol/g lipid)".

$y = 0.99x - 0.16$
Pearson r=0.99; p<0.001

Figure S2c. Plot of matched maternal prenatal (~26 weeks gestation) and delivery serum BDE-99 levels (n=21) (log-transformed).

y = 1.0x - 0.19
Pearson r=0.98; p<0.001

Figure S2d. Plot of matched maternal prenatal (~26 weeks gestation) and delivery serum BDE-100 levels (n=21) (log-transformed).

y = 0.97x - 0.11
Pearson r=0.99; p<0.001
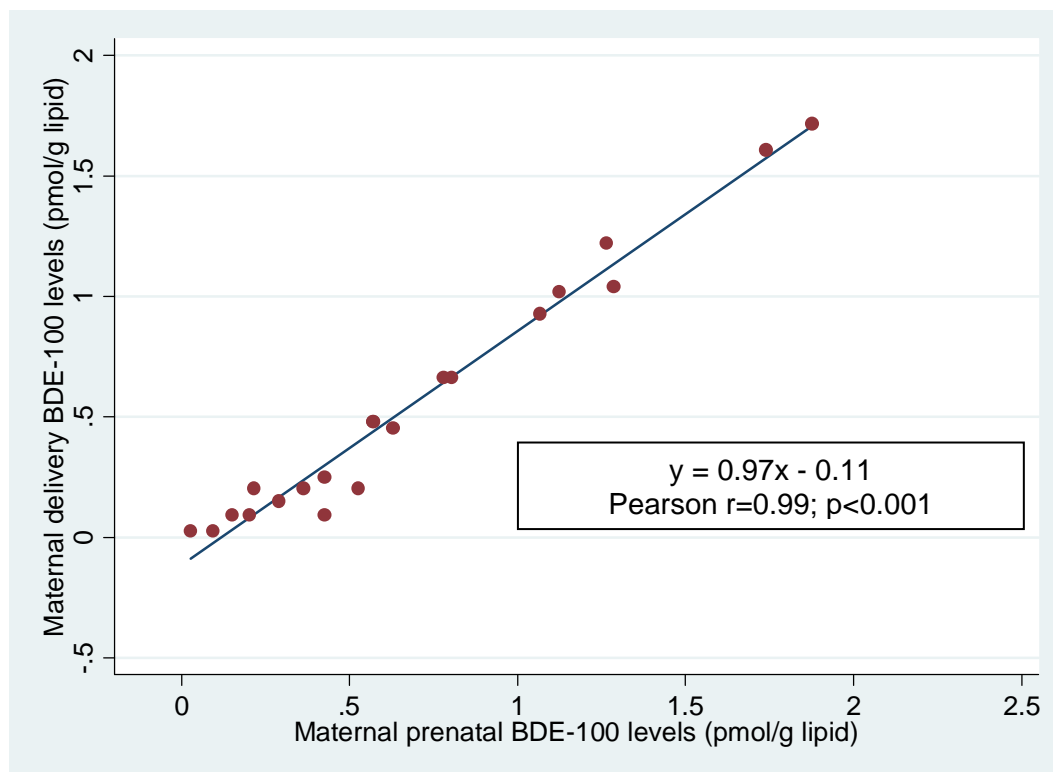
Figure S2e. Plot of matched maternal prenatal (~26 weeks gestation) and delivery total serum BDE-153 (n=21) (log-transformed).

y = 0.95x - 0.11
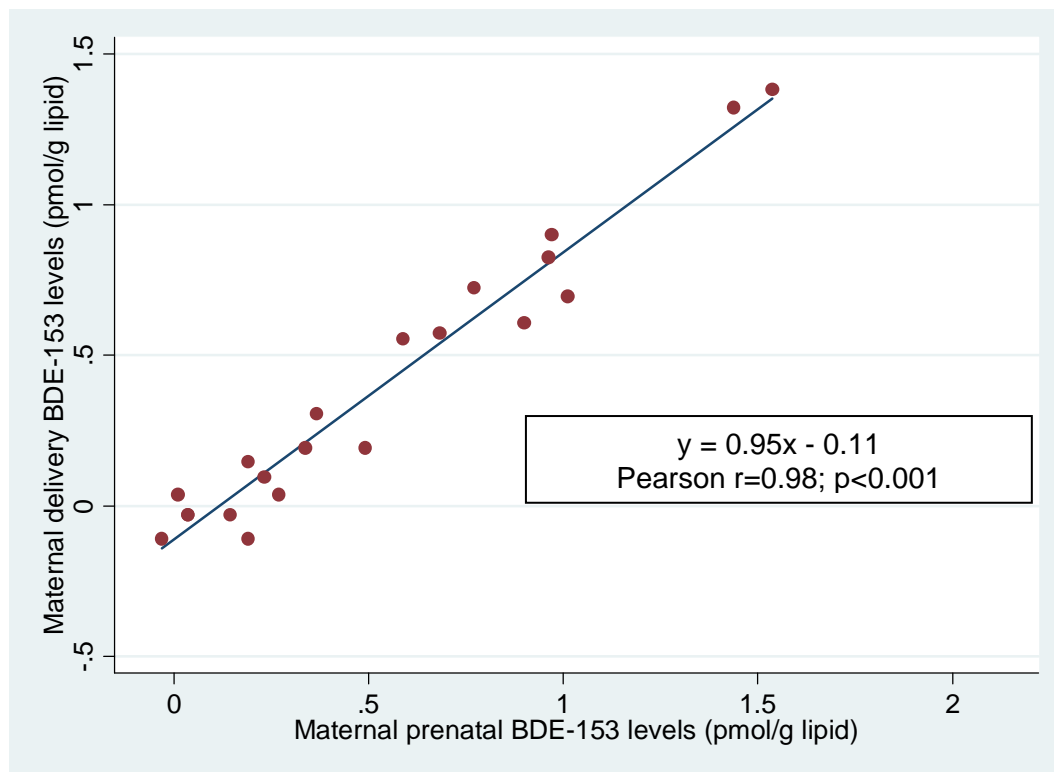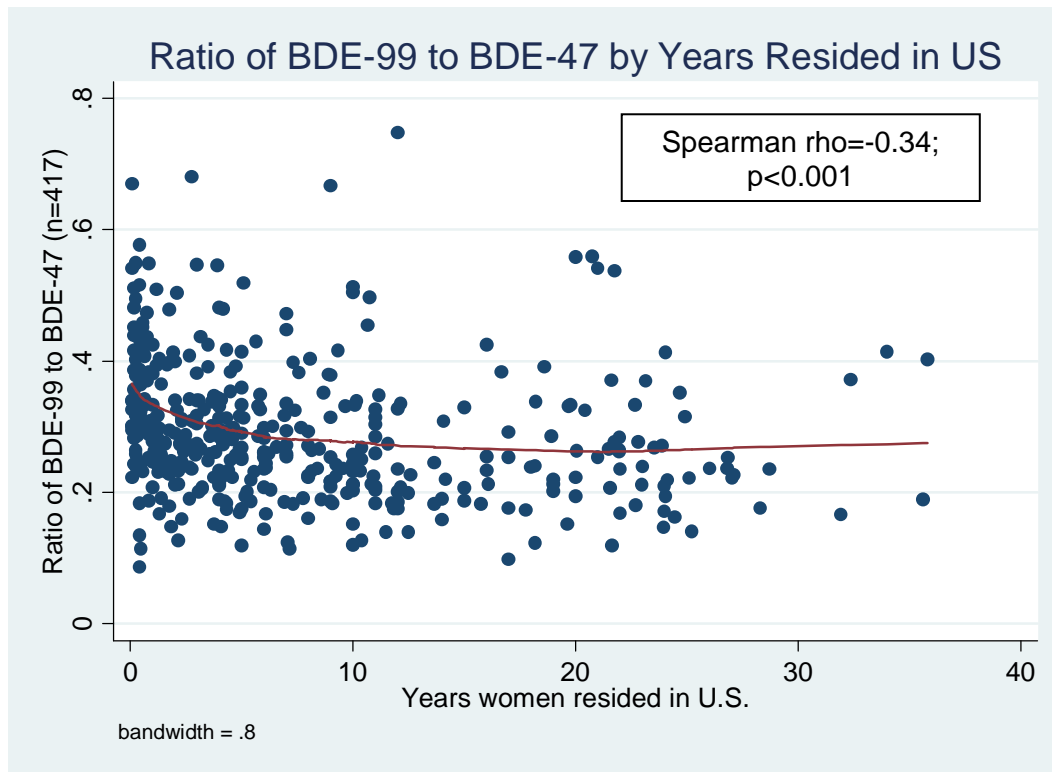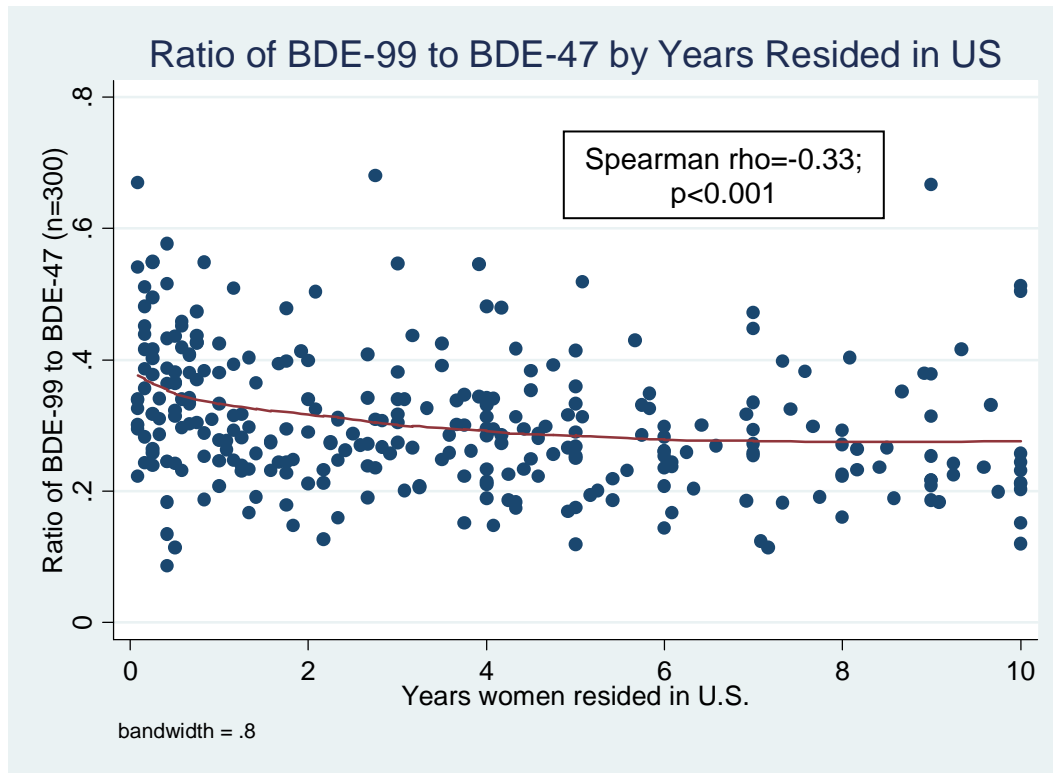Pearson r=0.98; p<0.001

Figure S3a. Ratio of BDE-99 to BDE-47 by years residing in the U.S. (n=416).

Dropping 3 observations with ratio's >1

Figure S3b. Ratio of BDE-99 to BDE-47 by years residing in the U.S. (truncated at 10 years; n=300).

Dropping 3 observations with ratio's >1