Table SI-1: Demographics of participating mothers in the 2002, 2010 and 2018 Irish breast milk surveys.

Year of Study	*Pool Identification*	*County/Hospital Identification*	*Number of Mothers in Pool*	*Mean Age (Range)*	*Mean BMI (Range)*
2002	Dublin	Dublin	10	31.8[a]	21.5[a]
2002	Cork	Cork	7	32.9[a]	25.1[a]
2002	Wicklow	Wicklow	10	26.5[a]	24.2[a]
2002	Donegal	Donegal	10	25.9[a]	22.5[a]
2010	**Overall Pool**	**All Participating Centres**	**109**	**32.7 (20-41)**	**23.3 (15.8-38.9)**
2010	Pool 1	Coombe Hospital, Dublin	10	33.6 (26-41)	27.7 (18.4-38.9)
2010	Pool 2	Galway University Hospital	10	32.3 (20-39)	21.8 (15.8-25.7)
2010	Pool 3	Galway University Hospital	10	31.8 (27-36)	22.8 (19.8-28.0)
2010	Pool 4	Galway University Hospital	10	32.7 (27-37)	22.8 (20.3-26.6)
2010	Pool 5	Rotunda Hospital, Dublin	11	32.5 (23-39)	22.5 (18.1-27.2)
2010	Pool 6	Holles St. Hospital, Dublin	11	32.5 (30-40)	23.3 (19.1-34.8)
2010	Pool 7	Holles St. Hospital, Dublin	10	30.2 (23-37)	24.1 (17.5-34.6)
2010	Pool 8	Coombe Hospital, Dublin	10	34.2 (30-38)	22.1 (17.9-24.9)
2010	Pool 9	Rotunda Hospital, Dublin	10	33.2 (30-35)	23.0 (18.1-30.4)
2010	Pool 10	Coombe Hospital, Dublin	10	32.4 (27-40)	23.3 (19.7-27.1)
2010	Pool 11	Holles St./Rotunda Hospitals	7	34.7 (30-41)	23.0 (20.6-28.7)
2018	**Overall Pool**	**All Participating Centres**	**92**	**33.5 (23-40)**	**19.1 (13.5-29.7)**
2018	Pool 1	Galway University Hospital	10	33.4 (23-38)	20.2 (17.0-23.8)
2018	Pool 2	Galway University Hospital	9	33.4 (30-38)	18.3 (15.8-20.7)
2018	Pool 3	Galway University Hospital	8	33.9 (29-39)	18.3 (15.5-21.4)
2018	Pool 4	Galway University Hospital	6	32.2 (26-37)	21.8 (16.6-26.6)
2018	Pool 5	Galway University Hospital	6	34.5 (32-36)	18.9 (15.0-27.3)
2018	Pool 6	Galway University Hospital	4	36.8 (34-39)	18.4 (16.5-21.5)
2018	Pool 7	Galway University Hospital	7	32.9 (32-34)	21.2 (15.9-29.7)
2018	Pool 8	Galway University Hospital	9	32.9 (30-37)	17.7 (15.2-19.1)
2018	Pool 9	Coombe Hospital, Dublin	6	34.3 (30-37)	19.4 (15.8-23.5)
2018	Pool 10	Coombe Hospital, Dublin	3	33.7 (32-36)	15.3 (13.5-16.4)
2018	Pool 11	Coombe Hospital, Dublin	4	32.3 (29-37)	21.9 (20.8-22.8)
2018	Pool 12	Coombe Hospital, Dublin	8	31.3 (30-32)	18.7 (16.2-20.6)
2018	Pool 13	Coombe Hospital, Dublin	9	35.2 (33-40)	19.8 (17.2-22.5)
2018	Pool 14	Coombe Hospital, Dublin	7[b]	32.6 (30-36)	19.0 (16.5-22.5)
2018	Pool 15	Galway University Hospital	9[b]	33.7 (30-37)	17.6 (15.0-19.4)
2018	Pool 16	Coombe Hospital, Dublin	3	36.0 (34-38)	21.3 (18.8-25.0)

7[b] *Double Pool - All 7 samples also in other Pools.* 9[b] *Double Pool - 7 of 9 Samples also in other Pool*

Sampling methods

Determination of lipid content

Approximately 10 g of the freeze dried material was weighed into a suitable sized beaker and weight recorded. Into each beaker, approximately 3g of diatomaceous earth (DE) was added and mixed. After sample extraction, a Rocket flask was weighed before adding in the sample extract and proceeding with Rocket evaporation. After the sample had been dried down in the Rocket, the Rocket flask was placed in the oven at 60 °C overnight to ensure all residual solvent had evaporated. The Rocket flask was removed from the oven allowed to cool and weighed. The % fat content was calculated by using the following formula:

SI Equation 1:

$$weight\ of\ flask\ \&\ sample - weight\ of\ flask = weight\ of\ sample\ (lipid\ content)$$

Samples were spiked with known quantity of internal standard (IS).

Internal standard solution preparation

DIOXNOP Internal Standard

^{13}C-DIOXNOP-100 (^{13}C-mixture of dioxins and non-ortho PCBs at 100pg/µl)

Take 400µl of the standard solution EDF-4067 and 40µl of the standard solution MBP-CP and dilute with 3560µl of toluene. Shake well and store at room temperature in a tightly closed Duran bottle. **^{13}C-DIOXNOP-0.5** (^{13}C-mixture of dioxins and non-ortho PCBs at 0.5pg/µl) **Spiking solution**

Pipette 125µl of the standard solution ^{13}C-DIOXNOP-100 into a volumetric flask (25ml) and make up to the mark with nonane. Shake well and store at room temperature in a tightly closed Duran bottle.

MOPIP Internal Standard-Spiking solution

13C-MOPIP-5 (13C-mixture of mono-ortho and indicator PCBs at 5pg/µl)

Pipette 100µl of the standard solution MBP-MO and 100µl of standard solution EC-4058 into a volumetric flask (100ml) and make up to the mark with nonane. Shake well and store at room temperature in a tightly closed Duran bottle.

Table SI-3.1: Dioxin internal standards (IS) details.

Compound Product code	**Component details**	**Conc. (µg/mL)**	**Supplier**	**Data sourced from**
EDF-4067- **TETRA-OCTACDD&CDF STANDARD SOLUTION (13C12, 99%) (2378 ISOMERS)** 1.2 mL in Nonane	2,3,7,8-TCDD (13C12,99%) 2,3,7,8-TCDF (13C12,99%) 1,2,3,7,8-PeCDD (13C12,99%) 1,2,3,7,8-PeCDF (13C12,99%) 2,3,4,7,8-PeCDF (13C12,99%) 1,2,3,4,7,8-HxCDD (13C12,99%) 1,2,3,6,7,8-HxCDD (13C12,99%) 1,2,3,7,8,9-HxCDD (13C12,99%) 1,2,3,4,7,8-HxCDF (13C12,99%) 1,2,3,6,7,8-HxCDF (13C12,99%) 1,2,3,7,8,9-HxCDF (13C12,99%) 2,3,4,6,7,8-HxCDF (13C12,99%) 1,2,3,4,6,7,8-HpCDD (13C12,99%) 1,2,3,4,6,7,8-HpCDF (13C12,99%) 1,2,3,4,7,8,9-HpCDF (13C12,99%) OCDD (13C12,99%) OCDF (13C12,99%)	1 µg/mL All compounds	Cambridge Isotope Laboratories, Inc. (CIL)	https://shop.isotope.com/productdetails.aspx?itemno=EDF-4067

MBP-CP Mass-Labelled Coplanar PCB Solution 1.2 ml x 10ug/ml in nonane	3,3',4,4'-Tetrachloro[13C12]biphenyl **77**L 3,4,4',5-Tetrachloro[13C12]biphenyl **81**L 3,3',4,4',5-Pentachloro[13C12]biphenyl **126**L 3,3',4,4',5,5'-Hexachloro[13C12]biphenyl **169**L	10 µg/ml All compounds	Greyhound Chromatography andAllied Chemicals Ltd	https://www.greyhoundchrom.com/mbpcp-110711
MBP-MO Mass-Labelled Mono-Ortho PCB Solution 1.2 ml x 5ug/ml in nonane	2,3,3',4,4'-Pentachloro[13C12]biphenyl **105**L 2,3,4,4',5-Pentachloro[13C12]biphenyl **114**L 2,3',4,4',5-Pentachloro[13C12]biphenyl **118**L 2',3,4,4',5-Pentachloro[13C12]biphenyl **123**L 2,3,3',4,4',5-Hexachloro[13C12]biphenyl **156**L 2,3,3',4,4',5'-Hexachloro[13C12]biphenyl **157**L 2,3',4,4',5,5'-Hexachloro[13C12]biphenyl **167**L 2,3,3',4,4',5,5'-Heptachloro[13C12]biphenyl **189**L	5 µg/ml All compounds	Greyhound Chromatography and Allied Chemicals Ltd	https://www.greyhoundchrom.com/mbpmo-110712
EC-4058 13C LABELED PCB MIXTURE IN NONANE PCBS-28/52/101/138/153/180/209	2,4,4'-TriCB (13C12,99%) **28** 2,2',5,5'-TetraCB (13C12,99%) **52** 2,2',4,5,5'-PentaCB (13 C12,99%) **101** 2,2',3,4,4',5'-HexaCB (13C12,99%) **138** 2,2',4,4',5,5'-HexaCB (13 C12,99%) **153** 2,2',3,4,4',5,5'-HeptaCB (13C12,99%) **180** DecaCB (13C12,99%) **209**	5 µg/ml All compounds	Cambridge Isotope Laboratories, Inc. (CIL)	https://shop.isotope.com/productdetails.aspx?itemno=EC-4058
Recovery Standard **ED-911-1** 1,2,3,4 Tetrachlorodibenzene-p-dioxin 13C12 > 99% 1.2ml in nonane	1,2,3,4 Tetrachlorodibenzene-p-dioxin 13C12 1,2,3,4 -TCDD	1 µg/ml	Cambridge Isotope Laboratories, Inc. (CIL)	https://shop.isotope.com/productdetails.aspx?itemno=ED-911-1
Recovery Standard **MDF-1234689** 1,2,3,4,6,8,9 Heptachlorodibenzofuran 13C12 > 98%, 1.2ml in nonane	1,2,3,4,6,8,9 Heptachlorodibenzofuran 13C12 1,2,3,4,6,8,9- HpCDF	50 µg/ml	Greyhound Chromatography and Allied Chemicals Ltd	https://www.greyhoundchrom.com/mdf1234689-110435

Table SI-4.1: GCHRMS Monitored Masses for native congener and internal standards for DIOXNOP analytical method

IS =Internal standard, n=native.

Analyte(s)	GCHRMS Monitored Masses
TCDD	319.8965 (n), 321.8937(n), 331.9368 (IS), 333.9368 (IS)
PeCDD	355.8546 (n), 357.8516 (n), 367.9949 (IS), 369.8919 (IS)
HxCDD	389.8157 (n), 391.8128 (n), 401.8559 (IS), 403.8529 (IS)
HpCDD	423.7767 (n), 425.7738 (n), 435.8169 (IS), 437.8140 (IS)
OCDD	457.7377 (n), 459.7346 (n), 469.7779 (IS), 471.7750 (IS)
TCDF	303.9016 (n), 305.9987 (n), 315.9419 (IS), 317.9389 (IS)
PeCDF	339.8598 (n), 341.8569(n), 351.9000 (IS), 353.8970 (IS)
HxCDF	373.8208 (n), 375.8179 (n), 385.8610 (IS), 387.8580 (IS)
HpCDF	407.7818 (n), 409.7789 (n), 419.8220 (IS), 421.8190 (IS)
OCDF	441.7428 (n), 443.7399 (n), 453.7830 (IS), 455.7801 (IS)
PCB 77, 81	289.9224 (n), 291.9194(n), 301.9626 (IS), 303.9597 (IS)
PCB 126	327.8775 (n), 325.8804 (n), 339.9178 (IS), 337.9207 (IS)
PCB 169	359.8415 (n), 361.8385(n), 371.8817 (IS), 373.8788 (IS)

Table SI-4.2: GCHRMS Monitored Masses for native congener and internal standards for MOPIP analytical method

Analyte (s)	GCHRMS Monitored Masses
PCB-101,123, 118,114,105	325.8804 (n), 323.8834 (n), 337.9207 (IS), 335.9237 (IS)
PCB-153,138,167,156,157	359.8415 (n), 361.8386(n), 371.8817 (IS), 373.8788 (IS)
PCB-028	257.9585 (n), 259.9554(n), 269.9986 (IS), 271.9957 (IS)
PCB-052	289.9224 (n), 291.9194(n), 301.9626 (IS), 303.9597 (IS)
PCB-180, 189	393.8025 (n), 395.7996 (n), 405.8427 (IS), 407.8398 (IS)

<u>PCB numbers</u>

Indicator PCBs: PCB-028, 101, 153, 138 and 180.

<u>Dioxin like (dl) PCBs</u>

Non-Ortho PCBs: PCB-081, 077, 126 and 169;

Mono-Ortho PCBs: PCB-123,118, 114, 105, 167, 156, 157 and 189.

Quality Control and Assurance

The method blank used in this method was diatomaceous earth (DE).

The QC sample can be:

- A naturally incurred reference material if available.
- A certified reference material.
- A ‘spike’ which is a sample spiked at some level on the curve with both native compounds and 13C labelled standards.
- A previously analysed proficiency scheme (PT) sample

The QC sample is quantified and the total WHO-TEQ is plotted on control charts, which are used to monitor the stability of the analytical method.

Table SI-5.1: Arithmetic mean for each congener present in the Rikilt PT sample

Please note: The mean values below were obtained from a number of repeat analysis of a Rikilt proficiency test (PT) sample, (a sunflower oil sample) in the State Laboratory. This PT sample was introduced to routine analysis as a quality control (QC) sample, as all congeners had measurable values greater than the acceptable WHO-TEQ values for vegetable oils and their by-products outlined in Commission Regulation (EU) No 277/2012. The Rikilt sample was included in every analytical batch and was used to help determine if the instrument analysis was fit for purpose to report samples for the presence or absence of Dioxins and PCBs.

Analytes	Rikilt QC (av. PT value) pg/ul	Analytes	Rikilt QC (av. PT value) pg/ul
PCB-105	90.1	2378-TCDD	0.298
PCB-114	87.4	12378-PeCDD	0.287
PCB-118	79.7	123478-HxCDD	0.272
PCB-123	79.6	123678-HXCDD	0.32
PCB-156	85.7	123789-HxCDD	0.266
PCB-157	79.6	1234678-HpCDD	0.348
PCB-167	78.3	OCDD	0.692
PCB-189	69.5	2378-TCDF	0.328
PCB-028	3250	12378-PeCDF	0.312
PCB-052	2570	23478-PeCDF	0.315
PCB-101	2660	123478-HxCDF	0.318
PCB-138	3230	123678-HxCDF	0.311
PCB-153	2550	123789-HxCDF	0.294
PCB-180	3050	234678-HxCDF	0.295
		1234678-HpCDF	0.308
		1234789-HpCDF	0.295
		OCDF	0.365
		PCB 77	6.85
		PCB 81	5.56
		PCB 126	6.06
		PCB 169	5.01

Reporting Dioxin Samples the TEF concept

A Toxic-Equivalence Factor (TEF) is an agreed estimate of a compound-specific toxicity or potency relative to the toxicity or potency of an index chemical. An expert scientific panel determines these TEF values, using all the available data and considering any uncertainties that can be related to the available data. In 2005, following an expert panel meeting WHO defined the WHO 2005 TEF values for Dioxin and Dioxin-Like Compounds. The TEF for TCDD is 1.0. When the TEF methodology is applied to Dioxin-Like Compound mixtures, each individual compound's exposure concentration is multiplied by its specific TEF. The product of the TEF and the concentration of the specific congener is a reflection of the estimated risk associated with that specific chemical; this is referred to as the Toxic Equivalence (TEQ).

Table SI-6.1: Summary of WHO (2005) Toxic Equivalence Factor (TEF) for each Dioxin Congener used for Toxic Equivalence (TEQ) calculations (Van den Berg et al, 2006).

Congener	TEF	Congener	TEF
Dibenzo-p-Dioxin (PCDDs)		**Non-Ortho PCB**	
2,3,7,8-TCDD	1	PCB-81	0.0003
1,2,3,7,8-PeCDD	1	PCB-77	0.0001
1,2,3,4,7,8-HxCDD	0.1	PCB-126	0.1
1,2,3,6,7,8-HXCDD	0.1	PCB-169	0.03
1,2,3,7,8,9-HxCDD	0.1		
1,2,3,4,6,7,8-HpCDD	0.01		
OCDD	0.0003		
DibenzoFurans (PCDFs)		**Mono Ortho PCB**	
2,3,7,8-TCDF	0.1	PCB-123	0.00003
1,2,3,7,8-PeCDF	0.03	PCB-118	0.00003
2,3,4,7,8-PeCDF	0.3	PCB-114	0.00003
1,2,3,4,7,8-HxCDF	0.1	PCB-105	0.00003
1,2,3,6,7,8-HxCDF	0.1	PCB-167	0.00003
2,3,4,6,7,8-HxCDF	0.1	PCB-156	0.00003
1,2,3,7,8,9-HxCDF	0.1	PCB-157	0.00003
1,2,3,4,6,7,8-HpCDF	0.01	PCB-189	0.00003
1,2,3,4,7,8,9-HpCDF	0.01		
OCDF	0.0003		
Abbreviations used: 'T' - tetra, 'Pe' - penta, 'Hx' - hexa, 'Hp'- hepta, 'O' – octa			
CDD' - ChlorodibenzoDioxin, 'CDF' - Chlorodibenzofuran, 'CB' – Chlorobiphenyl			

One of the TEF methodology's functions is to determine reliable upper and lower estimates of the TEQ to determine the potential range the TEQ may have. The below equations (SI Equation 2 and 3) are used to calculate both upper and lower exposure concentrations for *n* compounds in a mixture of DLC in TCDD

TEQ. The concentration of an individual congener is multiplied by its specific TEF value to yield its exposure equivalence to TCDD (*i*=1). TEQs are calculated by summing the products of each congener.

SI Equation 2

$$TEQu = \sum_{i=1}^{n} (C_i \, x \, TEF_{iU})$$

SI Equation 3

$$TEQl = \sum_{i=1}^{n} (C_i \, x \, TEF_{iL})$$

Where;

TEQ_U= Upper estimate of TEQ range

TEQ_L= Lower estimate of TEQ range

C_i = Concentration of the i^{th} individual compound

TEF_{iU}= Upper estimate of the i^{th} compound's TEF; for i=1, TEF_{iU}=1

TEF_{iL}= Upper estimate of the i^{th} compound's TEF; for i=1, TEF_{iL}=1[a, b, c]

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[a] Van den Berg et al '*The 2005 World Health Organization Reevaluation of Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-Like Compounds'* TOXICOLOGICAL SCIENCES 93(2), 223–241 (2006), doi:10.1093/toxsci/kfl055

[b] Recommended Toxicity Equivalence Factors (TEFs) for Human Health Risk Assessments of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin and Dioxin-Like Compounds, EPA/100/R 10/005 December 2010, prepared by EPA's Office of Research and Development and was then reviewed and completed by a Technical Panel under the auspices ofEPA's Risk Assessment Forum. Available online https://archive.epa.gov/raf/web/pdf/tefs-for-Dioxin-epa-00-r-10-005-final.pdf accessed on 03/04/20

[c] EPA. 2013. Use of Dioxin TEFs in Calculating Dioxin TEQs at CERCLA and RCRA Sites. Available on https://semspub.epa.gov/work accessed on 02/04/20

Estimation of infant intake of PCDD/F via breast milk

In order to evaluate a nursing infant's dietary intake of target dioxins and furans in this study SI Equation 4 was used:

SI Equation 4

$$\text{EDI (pg-TEQ}_{2005}\text{ kg}^{-1}\text{ body weight day}^{-1}) = \frac{CxM}{W}$$

Where;

EDI = estimated daily intake;

C= geometric average PCDD/F and dl-PCB concentrations in the study groups (pg-TEQ_{2005} g^{-1} milk);

M = the mean breastmilk intake (amount of human milk consumed per day) over the period of six months of breastfeeding (in $gday^{-1}$);

W = the mean body weight of a baby aged three months.

A body weight of 6.1 kg and an average human milk intake of 800 mL and high consumption of 1200 mL were used (EFSA, 2018). The median lipid content analysed was 3.47 g per 100 mL of breast milk, resulting in a medium and high lipid intake of 27.76 g/mL and 41.64 g/mL respectively. UB for PCDD/F and PCB concentrations were utilised to evaluate the exposure in the worst case scenario. In order to reduce the result of extreme values, geometric average of PCDD/F and dl-PCB concentrations were employed.

Table SI-7.1: Nursing infant's dietary intake of PCDD/F and PCBs (pg TEQ kg^{-1} bw per day) via breast milk at medium intake (800 mL)

EDI	**Geometric UB/LB[a,b]**	**95th UB/LB[a,b]**
PCDD/F	14	22
Non-ortho PCB	6.1	8.3
Mono-ortho PCB (DI-PC)	0.63	1.0
SUM PCB	6.7	9.3
SUM PCDD/F-PCB	20	31

Table SI-7.2: Nursing infant's dietary intake of PCDD/F and PCBs (pg TEQ kg^{-1} bw per day) via breast milk at medium intake (1200 mL)

EDI	**Geometric UB/LB[a,b]**	**95th UB/LB[a,b]**
PCDD/F	21	33
Non-ortho PCB	9.1	12
Mono-ortho PCB	0.95	1.5
SUM PCB	10	14
SUM PCDD/F-PCB	31	47

[a]"Lower-bound" means the concept which requires using zero for the contribution of each non-quantified congener.

[b] UB and LB same values

Results

Table SI-8.1: Full individual Dioxins, Furans and Dioxin-Like PCBs TEF and TEQ Values for each Pool from 2018 Irish Human milk Study

PCDD/F ng/kg fat UB	**Pool 1**	**Pool 2**	**Pool 3**	**Pool 4**	**Pool 5**	**Pool 6**	**Pool 7**	**Pool 8**	**Pool 9**	**Pool 10**	**Pool 11**	**Pool 12**	**Pool 13**	**Pool 14**	**Pool 15**	**Pool 16**	**Mean**	**Median**	**Min**	**Max**
2,3,7,8-TCDF	0.21	0.24	0.24	0.29	0.24	0.43	0.22	0.18	0.3	0.28	0.45	0.41	0.59	0.46	0.31	0.34	0.32	0.295	0.18	0.59
1,2,3,7,8-PeCDF	0.17	0.18	0.15	0.21	0.23	0.48	0.17	0.11	0.24	0.13	0.17	0.34	0.49	0.39	0.25	0.22	0.25	0.215	0.11	0.49
2,3,4,7,8-PeCDF	3.92	2.84	2.9	2.54	4.54	6.56	2.71	2.59	5.16	2.78	3.31	3.57	2.96	2.96	3.94	2.34	3.48	2.96	2.34	6.56
1,2,3,4,7,8-HxCDF	0.87	0.65	0.67	0.65	1.03	1.76	0.73	0.63	1.41	0.97	0.77	0.96	1.05	0.84	1.06	0.64	0.92	0.855	0.63	1.76
1,2,3,6,7,8-HxCDF	0.97	0.75	0.68	0.63	1.18	1.84	0.7	0.64	1.32	0.89	0.87	0.97	1.05	0.91	1.15	0.73	0.96	0.9	0.63	1.84
2,3,4,6,7,8-HxCDF	0.31	0.43	0.33	0.4	0.6	1.01	0.44	0.34	0.68	0.45	0.52	0.55	0.62	0.49	0.65	0.46	0.52	0.475	0.31	1.01
1,2,3,7,8,9-HxCDF	< 0.05	<0.05	< 0.05	< 0.05	< 0.05	0.11	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.12	0.11	0.06	< 0.05	0.1	0.11	0.06	0.12
1,2,3,4,6,7,8-HpCDF	0.39	0.63	0.53	0.46	0.58	0.8	0.57	0.46	0.75	0.68	0.64	0.69	1.01	0.81	0.7	0.51	0.64	0.635	0.39	1.01
1,2,3,4,7,8,9-HpCDF	< 0.05	< 0.05	< 0.05	< 0.05	0.06	< 0.05	< 0.05	< 0.05	< 0.05	0.07	< 0.05	< 0.05	0.1	0.08	< 0.05	< 0.05	0.08	0.075	0.06	0.1
OCDF	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.09	< 0.05	< 0.05	< 0.05	< 0.05	0.09	0.09	0.09	0.09
2,3,7,8-TCDD	0.28	0.31	0.28	0.32	0.36	0.61	0.33	0.27	0.49	0.42	0.41	0.31	0.33	0.29	0.39	0.32	0.36	0.325	0.27	0.61
1,2,3,7,8-PeCDD	1.15	0.92	0.85	0.78	1.32	1.99	0.91	0.82	1.17	1.36	1.58	0.94	0.79	0.82	1.11	0.98	1.09	0.96	0.78	1.99
1,2,3,4,7,8-HxCDD	0.37	0.33	0.34	0.36	0.42	0.66	0.31	0.36	0.68	0.68	0.47	0.35	0.37	0.28	0.45	0.44	0.43	0.37	0.28	0.68
1,2,3,6,7,8-HxCDD	2.73	1.42	1.64	1.5	2.26	3.24	1.47	1.52	3.07	3.39	2.25	1.68	1.88	1.42	2.35	1.96	2.11	1.92	1.42	3.39
1,2,3,7,8,9-HxCDD	0.46	0.42	0.44	0.42	0.64	0.8	0.38	0.36	0.73	0.68	0.6	0.42	0.44	0.43	0.53	0.52	0.52	0.45	0.36	0.8
1,2,3,4,6,7,8-HpCDD	1.6	1.96	1.53	2.11	2.94	3.42	2.04	2.37	3.48	4.19	3.2	1.79	2.18	1.75	2.72	2.46	2.48	2.275	1.53	4.19
OCDD	14.88	16.84	15.89	14.15	22.06	23.51	17.09	20.69	40.34	22.95	18.8	16.59	14.86	14.47	22.22	17.27	19.54	17.18	14.15	40.34
WHO-PCDD/F-TEQ ng/kg UB	**3.23**	**2.55**	**2.48**	**2.33**	**3.73**	**5.62**	**2.53**	**2.31**	**4.09**	**3.41**	**3.63**	**2.89**	**2.67**	**2.54**	**3.38**	**2.56**	**3.12**	**2.78**	**2.31**	**5.62**
Non-Ortho-PCBs ng/kg fat UB																				
PCB-81	0.76	0.79	0.89	0.96	0.83	1.31	0.66	0.75	0.61	0.9	1.46	0.88	0.72	0.63	0.71	0.69	0.85	0.775	0.61	1.46
PCB-77	4.17	5.97	6.31	7.51	6.12	10.52	4.9	5.61	2.07	6.45	7.99	4.81	2.05	2.56	2.16	2.27	5.09	5.255	2.05	10.52
PCB-126	12.32	9.5	10.14	9.24	13.71	18.88	9.44	8.64	14.12	11.26	14.3	10.33	10.36	8.49	13.33	11.83	11.62	10.81	8.49	18.88
PCB-169	7.17	5.73	5.74	4.44	9.28	9.94	5.34	4.72	11.38	6.72	7.09	6.24	6.15	5.04	7.91	5.13	6.75	6.195	4.44	11.38
WHO-Non-Ortho-PCB-TEQ ng/kg UB	**1.45**	**1.12**	**1.19**	**1.06**	**1.65**	**2.19**	**1.1**	**1.01**	**1.75**	**1.33**	**1.64**	**1.22**	**1.22**	**1**	**1.57**	**1.34**	**1.37**	**1.275**	**1**	**2.19**

Mono-Ortho-PCBs ng/kg fat UB	Pool 1	Pool 2	Pool 3	Pool 4	Pool 5	Pool 6	Pool 7	Pool 8	Pool 9	Pool 10	Pool 11	Pool 12	Pool 13	Pool 14	Pool 15	Pool 16	Mean	Median	Min	Max
PCB-123	41	34	31	35	42	52	27	24	47	24	38	31	29	30	40	35	35	34.5	24	52
PCB-118	3070	2206	2179	2089	2990	3285	1802	1744	3770	1813	2579	2198	2119	1908	2896	2047	2418	2188.5	1744	3770
PCB-114	164	99	96	85	152	183	92	86	219	105	135	120	99	106	142	107	125	106.5	85	219
PCB-105	717	498	496	508	661	805	437	407	703	475	583	471	471	425	684	495	552	497	407	805
PCB-167	683	336	298	279	447	461	200	188	701	232	344	327	253	215	355	241	347	312.5	188	701
PCB-156	1461	761	766	649	1294	1504	719	670	2637	953	895	811	844	673	1217	767	1039	827.5	649	2637
PCB-157	273	173	170	147	296	329	153	143	385	204	205	185	182	163	281	169	216	183.5	143	385
PCB-189	127	64	71	52	102	147	62	67	274	71	64	71	77	57	111	68	93	71	52	274
WHO-Mono-Ortho-PCB-TEQ ng/kg UB	**0.2**	**0.13**	**0.12**	**0.12**	**0.18**	**0.2**	**0.1**	**0.1**	**0.26**	**0.12**	**0.15**	**0.13**	**0.12**	**0.11**	**0.17**	**0.12**	**0.1448**	**0.125**	**0.1**	**0.26**
WHO-PCB-TEQ ng/kg UB	**1.64**	**1.25**	**1.31**	**1.17**	**1.83**	**2.39**	**1.21**	**1.11**	**2.02**	**1.44**	**1.79**	**1.35**	**1.34**	**1.11**	**1.74**	**1.46**	**1.51**	**1.395**	**1.11**	**2.39**
WHO-PCDD/F-PCB-TEQ ng/kg UB	**4.87**	**3.8**	**3.79**	**3.5**	**5.56**	**8.01**	**3.74**	**3.42**	**6.11**	**4.86**	**5.42**	**4.24**	**4.01**	**3.65**	**5.13**	**4.02**	**4.63**	**4.13**	**3.42**	**8.01**

Table SI-8.2: Full individual Indicator PCBs TEF and TEQ Values for each Pool from 2018 Irish Human milk Study

Indicator-PCBs µg/kg fat UB	Pool 1	Pool 2	Pool 3	Pool 4	Pool 5	Pool 6	Pool 7	Pool 8	Pool 9	Pool 10	Pool 11	Pool 12	Pool 13	Pool 14	Pool 15	Pool 16	Mean	Median	Min	Max
PCB-28	0.37	0.43	0.56	0.51	0.43	0.41	0.38	0.35	0.4	0.39	0.63	0.42	0.49	0.44	0.44	0.38	0.44	0.425	0.35	0.63
PCB-52	0.09	0.12	0.12	0.13	0.12	0.17	0.11	0.12	0.14	0.15	0.21	0.12	0.12	0.16	0.15	0.1	0.13	0.12	0.09	0.21
PCB-101	0.17	0.19	0.17	0.2	0.21	0.21	0.14	0.15	0.21	0.21	0.29	0.2	0.17	0.21	0.26	0.16	0.2	0.2	0.14	0.29
PCB-153	16.77	8.68	8.49	6.44	13.11	13.64	7.08	7.04	30.77	8.41	9.25	9.82	9.05	7.57	12.49	7.52	11.01	8.865	6.44	30.77
PCB-138	9.81	4.72	4.68	3.85	7.01	7.29	3.9	3.81	15.89	4.43	5.02	5.29	5.02	4.24	5.95	4.05	5.94	4.87	3.81	15.89
PCB-180	8.72	4.24	4.55	3.05	9.05	8.51	4.4	4.44	21.5	4.53	4.78	4.79	4.98	3.62	7.17	4.4	6.42	4.665	3.05	21.5
Sum Indicator PCBs µg/kg UB	**35.94**	**18.39**	**18.56**	**14.18**	**29.93**	**30.23**	**16**	**15.91**	**68.91**	**18.12**	**20.18**	**20.64**	**19.82**	**16.23**	**26.47**	**16.61**	**24.13**	**19.19**	**14.18**	**68.91**

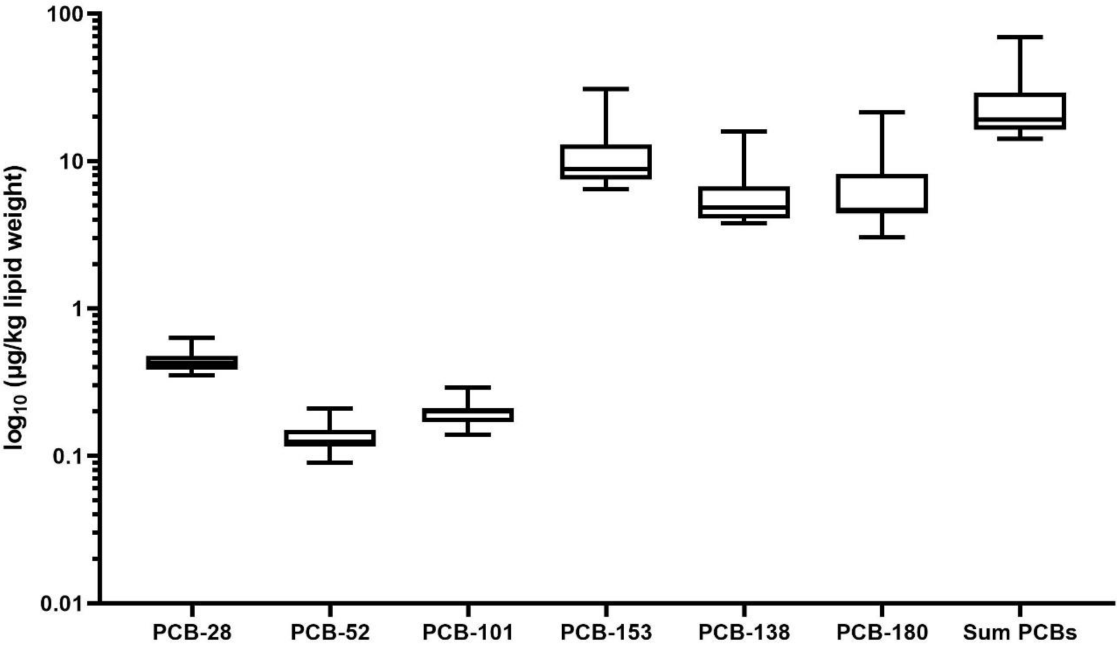

Figure SI-8.1: Boxplot of PCB indicator concentrations (µg/kg lipid weight) in each pool, n=16.

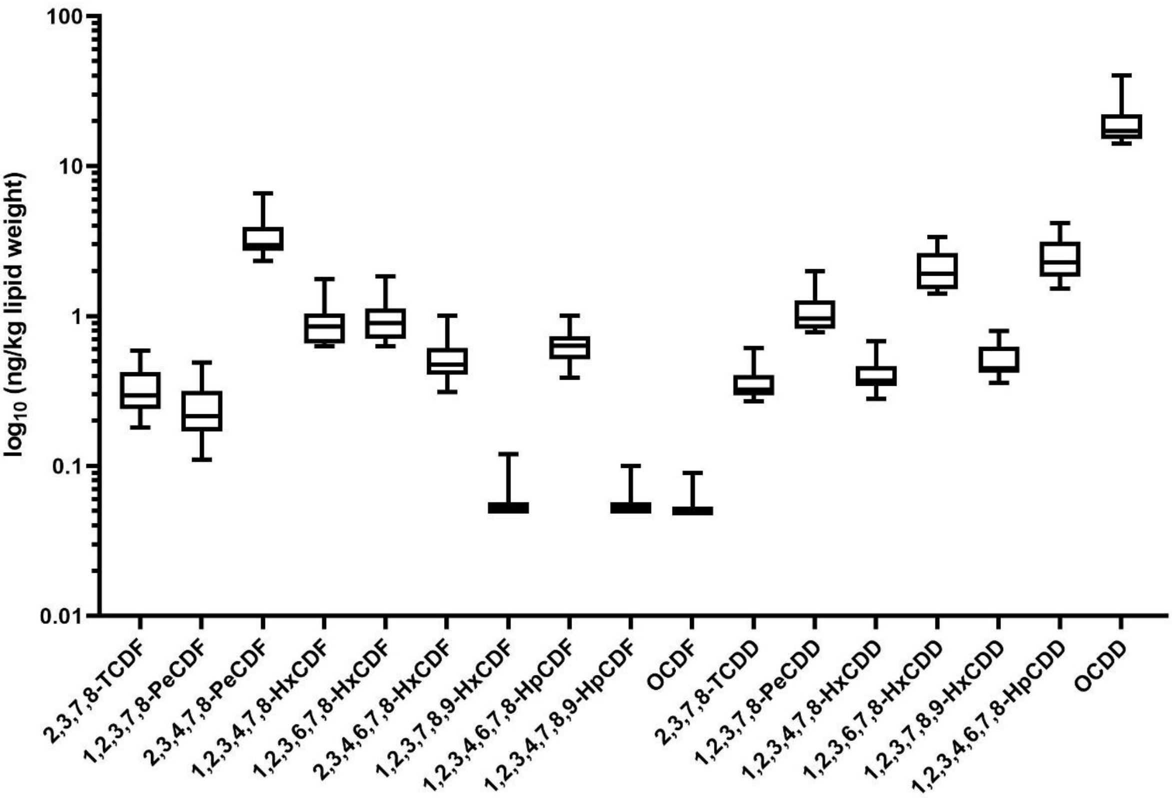

Figure SI-8.2: Boxplot for PCDD/F Dioxin and Furan concentrations (ng/kg lipid weight) in each pool, n=16.

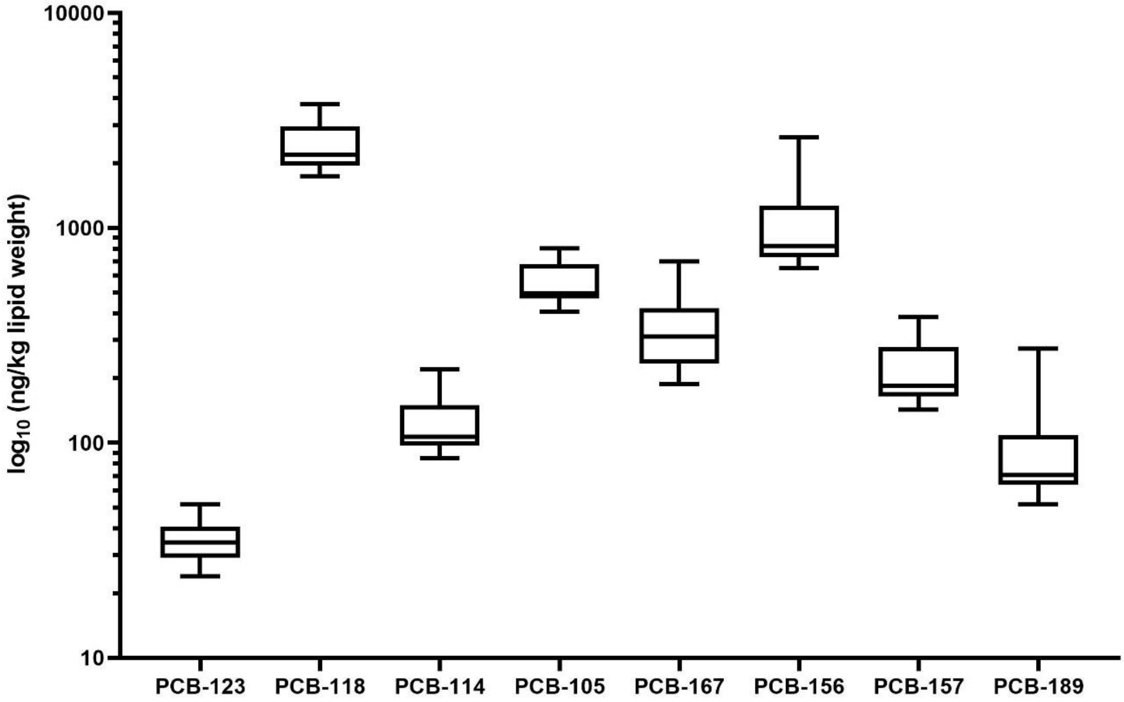

Figure SI-8.3: Boxplot of concentrations (ng/kg lipid weight) of dioxin like PCBs in pools (n=16) of human milk from Ireland.

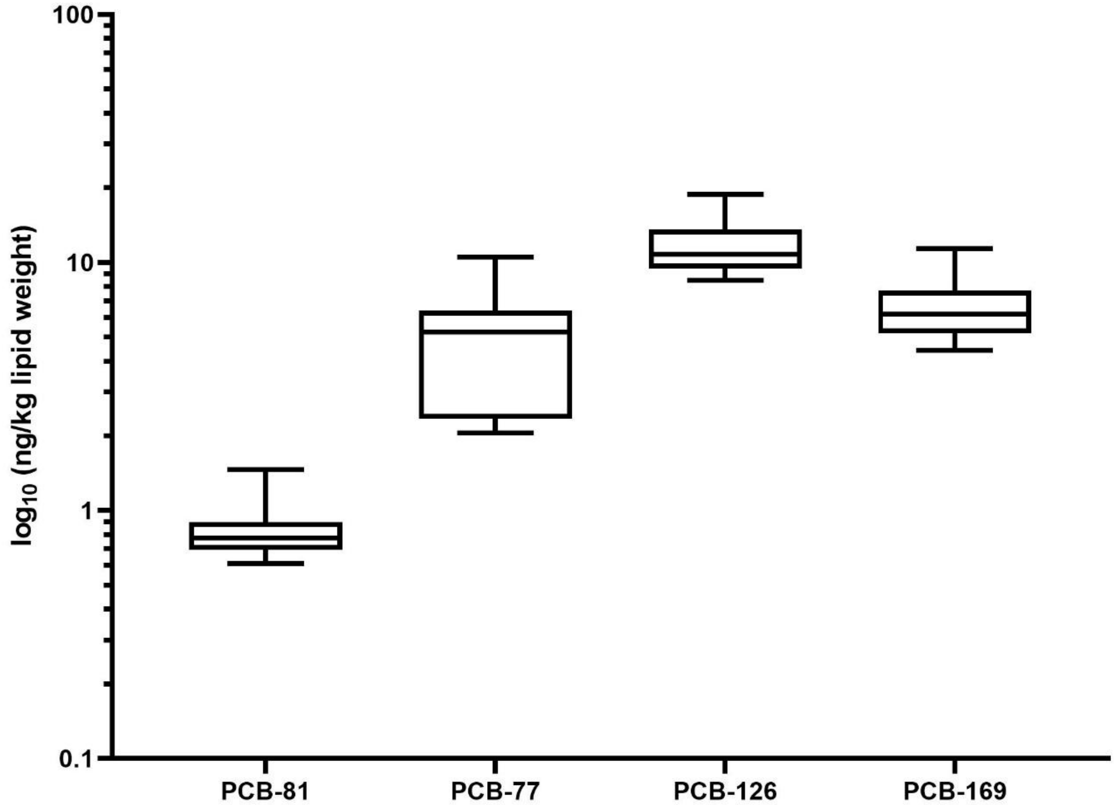

Figure SI-8.4: Boxplot dioxin like PCB concentrations (ng/kg lipid weight) in pooled (n=16) Human milk samples.

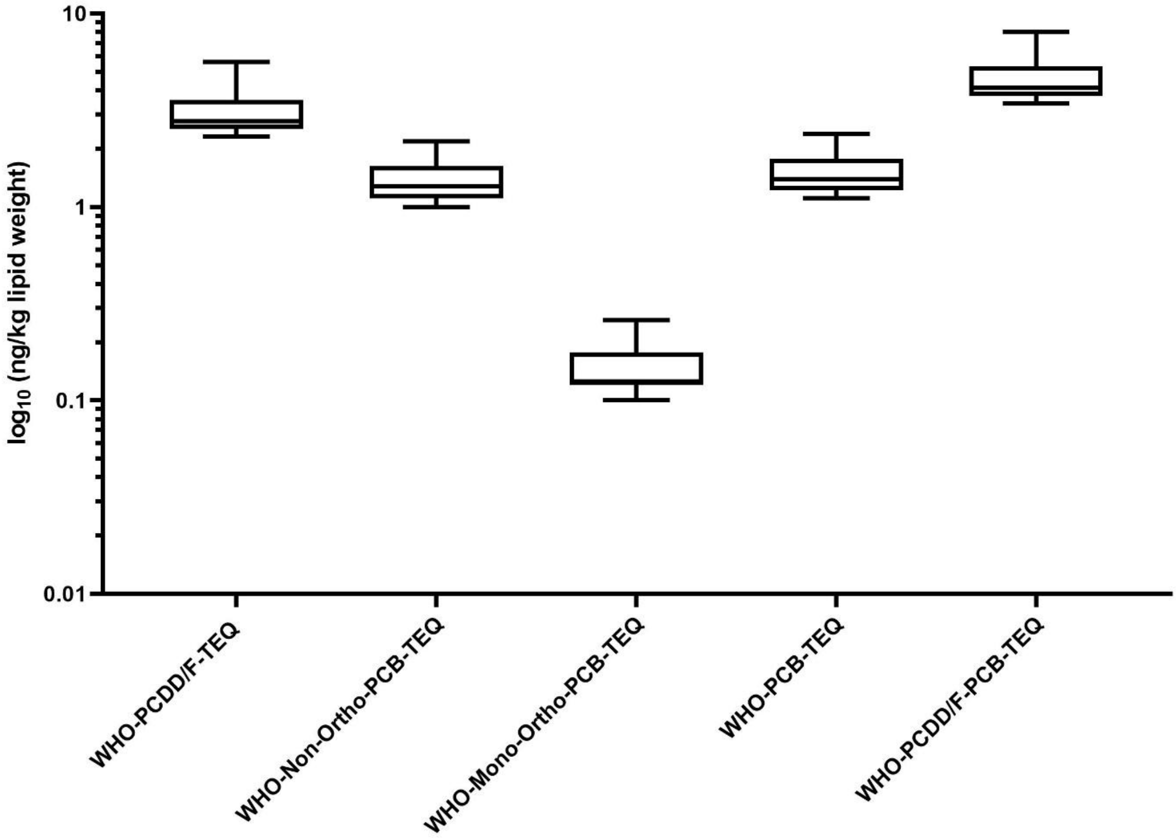

Figure SI-8.5: Boxplot of WHO TEQ concentrations (ng/kg lipid weight, Upper Bound) for PCDD/F and PCB congeners per pool, n=16 pools.

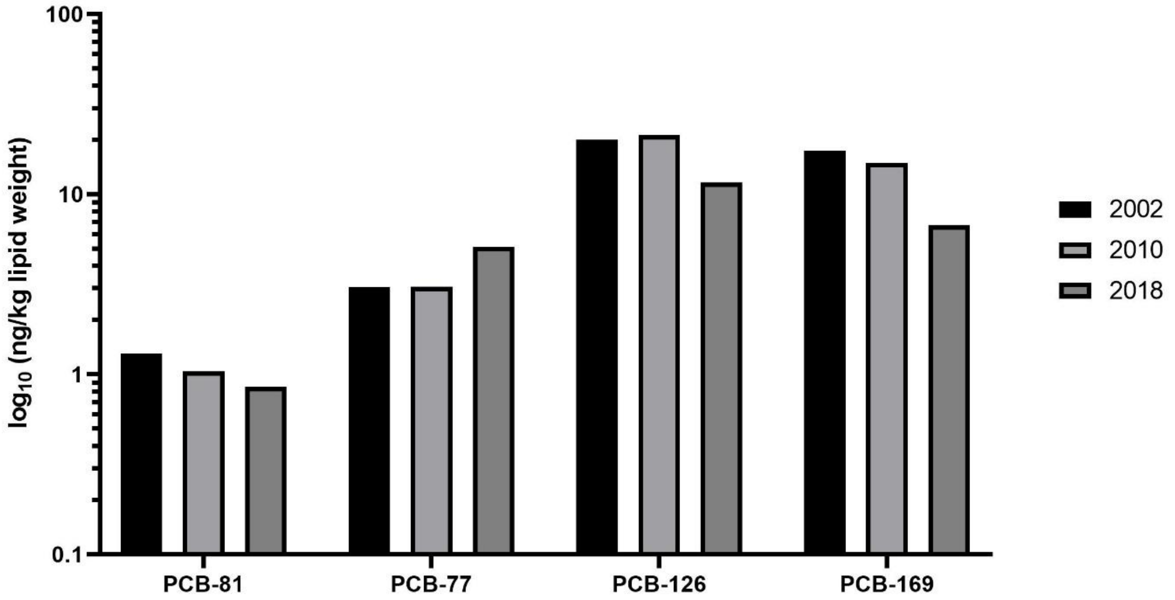

Figure SI-8.6: Comparison of mean Non-Ortho dioxin like PCB congeners (lipid weight, Upper Bound) in Irish human milk samples from 2002 (n=4), 2010 (n=11) and 2018 (n=16) surveys.

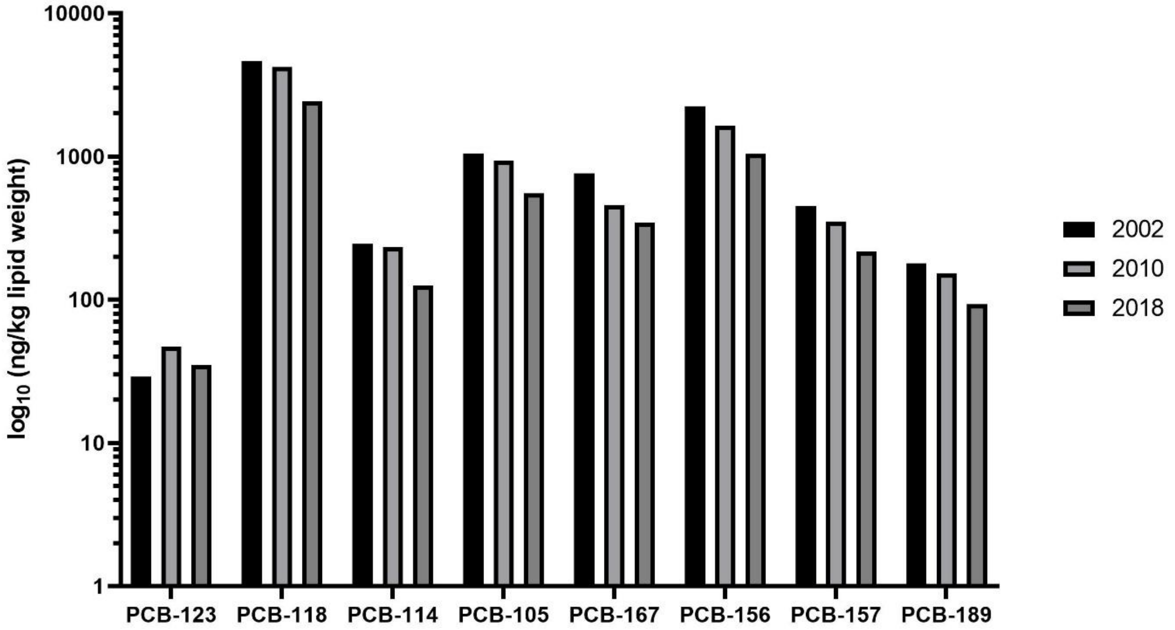

Figure SI-8.7: Comparison of mean Mono-Ortho dioxin like PCB congener (lipid weight, upper Bound) in Irish Human milk surveys from 2002 (n=4), 2010 (n=11) and 2018 (n=16) surveys.

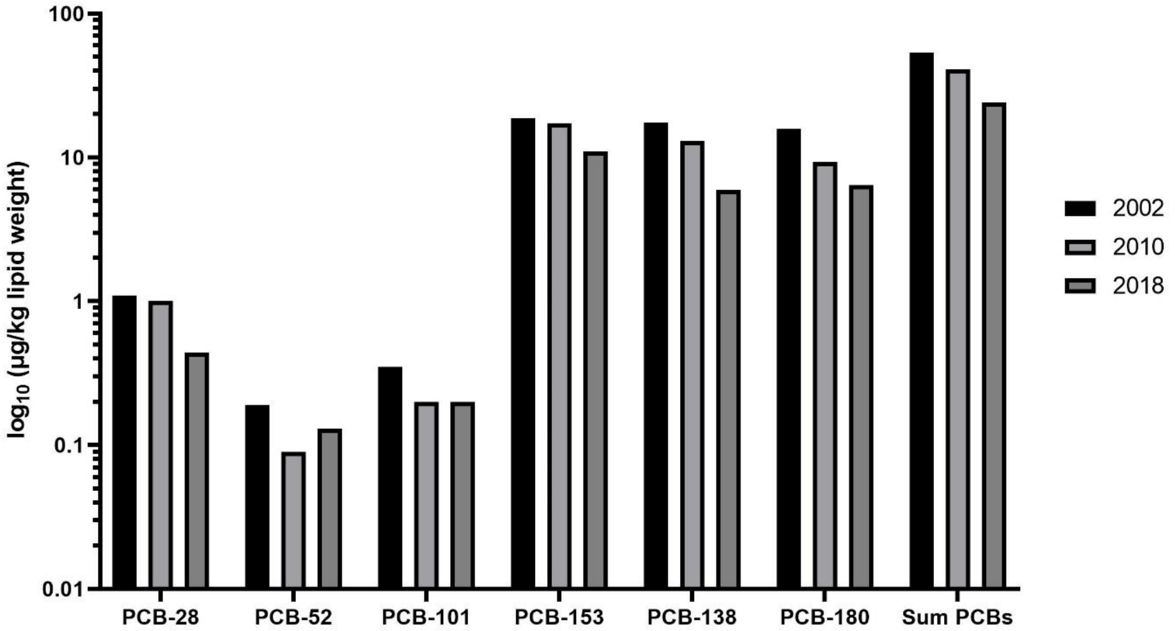

Figure SI-8.8: Comparison of mean Indicator-PCB for each congener (lipid weight, Upper Bound) in Irish Human milk surveys from 2002 (n=4), 2010 (n=11) and 2018 (n=16) surveys.

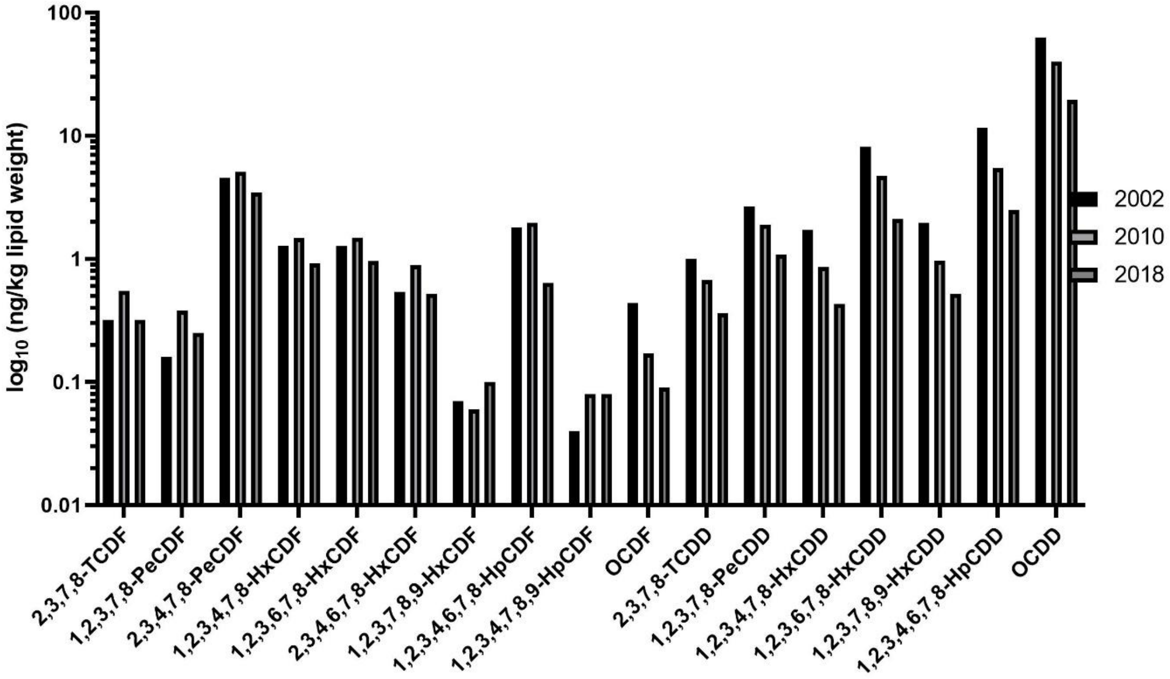

Figure SI-8.9: Comparison of mean PDCC/F for Dioxin and Furan compounds (lipid weight, Upper Bound) in Irish breast milk from 2002 (n=4), 2010 (n=11) and 2018 (n=16) surveys.