Emerging Per- and Polyfluoroalkyl Substances (PFAS) in Human Milk from Sweden and China

Supporting Information

Raed Awad[a,b*], Yihui Zhou[c], Elisabeth Nyberg[d], Shahla Namazkar[a], Wu Yongning[e], Qianfen Xiao[c], Yaije Sun[f], Zhiliang Zhu[f], Åke Bergman[a,c,g] and Jonathan P. Benskin[a*]

[a] Department of Environmental Science (ACES), Stockholm University, 106 91 Stockholm, Sweden
[b] Swedish Environmental Research Institute (IVL), 114 28 Stockholm, Sweden
[c] State Key Laboratory of Pollution Control and Resource Reuse, College of Environmental Science and Engineering, Tongji University, Shanghai 200092, China
[d] Department of Contaminants, Swedish Environmental Protection Agency, Virkesvägen 2, SE-106 48 Stockholm
[e] NHC Key Laboratory of Food Safety Risk Assessment, China National Center for Food Safety Risk Assessment, Beijing, 100021, China
[f] Key Laboratory of Yangtze River Water Environment (Ministry of Education), College of Environmental Science and Engineering, Tongji University, Shanghai 200092, China
[g] Department of Science and Technology, Örebro University, 701 82 Örebro, Sweden

*Corresponding authors:
Raed.Awad@ivl.se / Jon.Benskin@aces.su.se

Includes: Detailed information on human milk samples from China and Sweden (**Table S1**); List of retention times and monitored ions for UPLC-MS/MS analysis (**Table S2**); UPLC Mobile phase gradient profile (**Table S3**); PFCA and PFCA-precursor concentrations in Chinese samples (**Table S4**); PFSA and PFOS-precursor concentrations in Chinese samples (**Table S5**); Concentrations of PFAS alternatives in Swedish and Chinese samples (**Table S6**); Percent recovery of PFASs fortified in bovine milk (**Table S7**); PFAS concentrations measured in SRM 1954 (**Table S8**); Estimated daily intakes calculated from Swedish and Chinese samples (**Table S9**).

Table S1. Detailed information on human milk from Shanghai, Jiaxing and Shaoxing in China and Stockholm in Sweden.

ESB Number	Lab code	Sampling date (year)	Age of mother (year)	Birth place (years residency)	Current place of residence (years residency)	Age of child (days)	No. of children
Shanghai-001	F1	2015	30	Xingjiang (20)	Shanghai (10)	39	1
Shanghai-002	F2	2015	38	Jiangsu (30)	Shanghai (8)	47	2
Shanghai-003	F3	2015	28	Chongqing (21)	Shanghai (7)	52	2
Shanghai-004	F4	2015	31	Neimenggu (22)	Shanghai (9)	34	2
Shanghai-005	F5	2016	25	Henan (19)	Shanghai (6)	43	1
Shanghai-006	F6	2016	31	Shanghai (31)	Shanghai (31)	74	1
Shanghai-007	F7	2016	32	Fujian (16)	Shanghai (16)	54	2
Shanghai-008	F8	2016	36	Jiashan (9)	Shanghai (27)	46	1
Shanghai-009	F9	2016	24	Shanghai (24)	Shanghai (24)	NA[a]	1
Shanghai-010	F10	2016	27	Shanghai (27)	Shanghai (27)	NA[a]	1
Jiaxing-001	F11	2015	30	Jiaxing (20)	Jiaxing (10)	59	2
Jiaxing-002	F12	2015	28	Jiaxing (28)	Jiaxing (28)	34	2
Jiaxing-003	F13	2015	39	Jiaxing (39)	Jiaxing (39)	49	2
Jiaxing-004	F14	2015	35	Jiaxing (23)	Jiaxing (12)	40	2
Jiaxing-005	F15	2015	26	Jiaxing (26)	Jiaxing (26)	40	2
Jiaxing-006	F16	2016	40	Jiaxing (40)	Jiaxing (40)	26	2
Jiaxing-007	F17	2016	28	Jiaxing (28)	Jiaxing (28)	57	1
Jiaxing-008	F18	2016	27	Jiaxing (27)	Jiaxing (27)	45	1
Jiaxing-009	F19	2016	28	Jiaxing (28)	Jiaxing (28)	51	1
Jiaxing-010	F20	2016	40	Anhui (19)	Jiaxing (21)	43	2
Shaoxing1	F21	2010	NA	Shaoxing (NA[a])	Shaoxing (>10)	NA[a]	1
Shaoxing3	F22	2010	NA[a]	Shaoxing (NA[a])	Shaoxing (>10)	NA[a]	1
Shaoxing4	F23	2010	NA[a]	Shaoxing (NA[a])	Shaoxing (>10)	NA[a]	1
Shaoxing7	F24	2010	NA[a]	Shaoxing (NA[a])	Shaoxing (>10)	NA[a]	1
Shaoxing8	F25	2010	NA[a]	Shaoxing (NA[a])	Shaoxing (>10)	NA[a]	1
Shaoxing9	F26	2010	NA[a]	Shaoxing (NA[a])	Shaoxing (>10)	NA[a]	1
Shaoxing16	F27	2010	NA[a]	Shaoxing (NA[a])	Shaoxing (>10)	NA[a]	1
Shaoxing19	F28	2010	NA[a]	Shaoxing (NA[a])	Shaoxing (>10)	NA[a]	1
Shaoxing20	F29	2010	NA[a]	Shaoxing (NA[a])	Shaoxing (>10)	NA[a]	1
Shaoxing29	F30	2010	NA[a]	Shaoxing (NA[a])	Shaoxing (>10)	NA[a]	1
C2016/07896	F31	2016	34	NA[a](NA[a])	Stockholm (>10)	NA[a]	1
C2016/07897	F32	2016	31	NA[a](NA[a])	Stockholm (>10)	NA[a]	1
C2016/07898	F33	2016	27	NA[a](NA[a])	Stockholm (>10)	NA[a]	1
C2016/07900	F34	2016	27	NA[a](NA[a])	Stockholm (>10)	NA[a]	1
C2016/07901	F35	2016	26	NA[a](NA[a])	Stockholm (>10)	NA[a]	1
C2016/07902	F36	2016	25	NA[a](NA[a])	Stockholm (>10)	NA[a]	1
C2016/07903	F37	2016	27	NA[a](NA[a])	Stockholm (>10)	NA[a]	1
C2016/07912	F38	2016	31	NA[a](NA[a])	Stockholm (>10)	NA[a]	1
C2016/07913	F39	2016	33	NA[a](NA[a])	Stockholm (>10)	NA[a]	1
C2016/07914	F40	2016	26	NA[a](NA[a])	Stockholm (>10)	NA[a]	1

[a]NA= Not available.

Table S2. List of retention times and monitored ions for UPLC-MS/MS analysis.

Target	Retention Time (min)	Quant. Ion (*m/z*)	Qual Ion (*m/z*)	Standard	Internal Standard	IS Ion	Data quality[a]
L-PFHpA	2.18	363/319	363/169	L-PFHpA	13C-PFHpA	367/322	Quant.
L-PFOA	2.49	413/369	413/169	L-PFOA	13C-PFOA	417/372	Quant.
Br-PFOA	~2.40	413/369	413/169	L-PFOA	13C-PFOA	417/372	Semi-Quant.
L-PFNA	2.76	463/419	463/219	L-PFNA	13C-PFNA	468/423	Quant.
L-PFDA	3.02	513/469	513/269	L-PFDA	13C-PFDA	515/470	Quant.
L-PFUnDA	3.27	563/519	563/269	L-PFUnDA	13C-PFUnDA	565/520	Quant.
L-PFDoDA	3.52	613/569	613/169	L-PFDoDA	13C-PFDoA	615/570	Quant.
L-PFTriDA	3.74	663/619	663/169	L-PFTrDA	13C-PFDoA	615/570	Quant.
L-PFTeDA	3.97	713/669	713/169	L-PFTeDA	13C-PFDoA	615/570	Quant.
L-PFPeDA	4.20	763/719	763/169	L-PFTeDA	13C-PFDoA	615/570	Semi-Quant.
L-PFBS	1.69	298.9/80	298.9/99	L-PFBS	18O-PFHxS	403/84	Quant.
L-PFHxS	2.92	399/80	399/99 399/119	L-PFHxS	18O-PFHxS	403/84	Quant.
Br-PFHxS	2.50	399/80	399/99 399/119	L-PFHxS	18O-PFHxS	403/84	Semi-Quant.
L-PFOS	3.07	498.9/80	498.9/99	L-PFOS	13C-PFOS	503/80	Quant.
Br-PFOS	~2.95	498.9/80	498.9/99	L-PFOS	13C-PFOS	503/80	Semi-Quant.
L-PFDS	3.57	598.9/80	599/99	L-PFDS	13C-PFOS	503/80	Quant.
Br-PFDS	~3.47	599/80	599/99	L-PFDS	13C-PFOS	503/80	Semi-Quant.
L-FOSA	4.17	498/78	498/478 498/169	L-FOSA	13C-FOSA	506/78	Quant.
Br-FOSA	4.05	498/78	498/478 498/169	L-FOSA	13C-FOSA	506/78	Semi-Quant.
L-MeFOSAA	3.10	570/419	570/483	L-MeFOSAA	D3-MeFOSAA	573/419	Quant.
Br-MeFOSAA	~3.00	570/419	570/483	L-MeFOSAA	D3-MeFOSAA	573/419	Semi-Quant.
L-EtFOSAA	3.23	584/419	584/526	L-EtFOSAA	D5-EtFOSAA	589/419	Quant.
Br-EtFOSAA	~3.13	584/419	584/526	L-EtFOSAA	D5-EtFOSAA	589/419	Semi-Quant.
7:3 FTCA	2.87	441/337	441/148	7:3 FTCA	13C-PFNA	468/423	Semi-Quant.
ADONA	2.28	377/251	377/85	ADONA	13C-PFHpA	367/322	Semi-Quant.
9Cl-PF3ONS	3.24	531/351	531/83	9Cl-PF3ONS	13C-PFUnDA	565/520	Semi-Quant.
11Cl-PF3OUdS	3.73	631/451	631/99	11Cl-PF3OUdS	13C-PFDoDA	615/570	Semi-Quant.
Recovery standards							
M8-PFOA	2.49	421/376					
M8-PFOS	3.07	506.9/80					

[a]Quant. = quantitative (exactly matched standard used for quantification); Semi-quant = Semi-quantitative (structurally-similar standard used for quantification)

Table S3. UPLC mobile phase gradient profile.

LC Gradient Program			LC Flow Rate
Time (min)	**Mobile phase A (%)[1]**	**Mobile phase B (%)[2]**	**(mL/min)**
0.0	90	10	0.40
0.3	90	10	0.40
4.5	20	80	0.40
4.6	0	100	0.40
7.5	0	100	0.55
9.5	90	10	0.40

[1] Mobile phase A: 90 % water and 10 % acetonitrile containing 2 mM ammonium acetate.
[2] Mobile phase B: 100 % acetonitrile containing 2 mM ammonium acetate.

Table S4. PFCA and PFCA-precursor concentrations (pg/mL) in procedural blanks and human milk from Shanghai, Jiaxing, Shaoxing and Stockholm. Results from Stockholm have been previously reported in Nyberg et al. 2018.

Type/ location	ID	PFHpA	L-PFOA	Br-PFOA	PFNA	PFDA	PFUnDA	PFDoDA	PFTriDA	PFTeDA	PFPeDA	7:3 FTCA
	LOD:	10	5	5	3	10	3	3	3	3	3	3
	LOQ:	33	50	17	10	34	10	10	10	10	10	10
Blank	**Blank01**	<10	23	<5	<3	<10	<3	<3	<3	<3	<3	<3
Blank	**Blank02**	<10	23	<5	<3	<10	<3	<3	<3	<3	<3	<3
Blank	**Blank03**	<10	<5	<5	<3	<10	<3	<3	<3	<3	<3	<3
Blank	**Blank00**	<10	29	<5	<3	<10	<3	<3	<3	<3	<3	<3
Blank	**Blank22**	<10	29	<5	<3	<10	<3	<3	<3	<3	<3	<3
Blank	**Blank04**	<10	11	<5	<3	<10	<3	<3	<3	<3	<3	<3
Shanghai	**1**	<10	155	<5	20	17	18	<3	<3	<3	<3	<3
Shanghai	**2**	<10	308	<5	28	30	26	4	11	<3	3	4
Shanghai	**3**	<10	69	<5	8	10	<3	<3	<3	4	<3	<3
Shanghai	**4**	<10	104	<5	<3	<10	<3	<3	<3	<3	<3	<3
Shanghai	**5**	<10	157	<5	13	13	10	<3	4	<3	<3	<3
Shanghai	**6**	<10	119	<5	13	<10	27	<3	3	7	<3	<3
Shanghai	**7**	<10	104	<5	20	23	17	<3	4	<3	<3	<3
Shanghai	**8**	<10	200	<5	18	28	26	<3	4	6	<3	<3
Shanghai	**9**	<10	65	<5	24	42	13	<3	<3	3	<3	<3
Shanghai	**10**	<10	109	<5	23	33	15	<3	6	4	<3	<3
Jiaxing	**1**	14	177	<5	42	47	37	10	14	6	<3	12
Jiaxing	**2**	15	312	5	46	67	28	5	8	<3	<3	12
Jiaxing	**3**	<10	265	7	28	51	49	7	6	3	<3	<3
Jiaxing	**4**	<10	301	6	37	116	76	11	16	4	<3	<3
Jiaxing	**5**	<10	266	<5	43	139	87	10	26	12	4	8
Jiaxing	**6**	<10	411	8	11	15	11	<3	<3	<3	<3	<3
Jiaxing	**7**	<10	220	<5	15	25	<3	<3	<3	<3	<3	<3
Jiaxing	**8**	<10	328	<5	32	46	22	7	4	4	<3	<3
Jiaxing	**9**	17	195	8	27	30	16	6	6	<3	<3	<3
Jiaxing	**10**	<10	184	<5	42	105	51	7	11	<3	<3	26
Shaoxing	**1**	<10	<50	<5	10	<10	<3	3	3	<3	<3	<3
Shaoxing	**2**	<10	53	<5	10	<10	<3	<3	<3	3	<3	<3
Shaoxing	**3**	<10	151	5	13	14	10	<3	3	<3	<3	<3
Shaoxing	**4**	<10	74	<5	13	17	16	4	8	<3	<3	<3
Shaoxing	**5**	<10	82	<5	39	106	58	9	13	5	<3	<3
Shaoxing	**6**	<10	88	<5	30	71	60	10	17	<3	4	8
Shaoxing	**7**	<10	55	<5	13	11	14	<3	<3	3	<3	<3
Shaoxing	**8**	<10	140	<5	30	105	99	11	11	<3	<3	<3
Shaoxing	**9**	<10	130	<5	15	40	24	6	8	5	4	<3
Shaoxing	**10**	<10	132	<5	33	94	51	8	12	<3	<3	3
Type/ location	**ID**	**PFHpA**	**L-PFOA**	**Br-PFOA**	**PFNA**	**PFDA**	**PFUnDA**	**PFDoDA**	**PFTriDA**	**PFTeDA**	**PFPeDA**	**7:3 FTCA**
	LOD:	10	2	2	2	2	1	1	1	1	1	1
	LOQ:	33	7	7	7	7	3	3	3	3	3	3
Stockholm	**F31**	<10	63	<2	16	12	12	4	7	4	<1	3
Stockholm	**F32**	<10	70	6	<2	15	8	4	6	2	<1	<1
Stockholm	**F33**	<10	83	<2	11	<2	9	<1	6	3	<1	<1
Stockholm	**F34**	<10	32	<2	18	<2	13	2	3	6	<1	<1
Stockholm	**F35**	<10	21	2	<5	<2	7	3	<1	<1	<1	<1
Stockholm	**F36**	<10	24	<2	10	<2	<1	<1	<1	<1	<1	<1
Stockholm	**F37**	11	38	<2	<2	<2	<1	4	5	<1	<1	<1
Stockholm	**F38**	<10	3	<2	16	<2	<1	<1	<1	3	<1	<1
Stockholm	**F39**	<10	46	<2	10	<2	<1	<1	<1	<1	<1	<1
Stockholm	**F40**	<10	50	3	9	<2	<1	3	3	4	<1	<1

Table S5. PFSA and PFOS-precursor concentrations (pg/mL) in samples analyzed in procedural blanks and human milk from Shanghai, Jiaxing, Shaoxing and Stockholm. Results from Stockholm have been previously reported in Nyberg et al. 2018.

Type/ location	ID	PFBS	L-PFHxS	Br-PFHxS	L-PFOS	Br-PFOS	L-PFDS	Br-PFDS	L-FOSA	Br-FOSA	L-MeFOSAA	Br-MeFOSAA	L-EtFOSAA	Br-EtFOSAA
	LOD:	3	3	2	2	2	2	2	6	6	3	3	3	3
	LOQ:	10	10	7	7	7	7	7	72	20	10	10	10	10
Blank	**Blank01**	<3	<3	<2	<2	<2	<2	<2	<6,1	<6	<3	<3	<3	<3
Blank	**Blank02**	<3	<3	<2	<2	<2	<2	<2	13	<6	<3	<3	<3	<3
Blank	**Blank03**	<3	<3	<2	<2	<2	<2	<2	49	<6	<3	<3	<3	<3
Blank	**Blank00**	<3	<3	<2	<2	<2	<2	<2	10	<6	<3	<3	<3	<3
Blank	**Blank22**	<3	<3	<2	<2	<2	<2	<2	32	<6	<3	<3	<3	<3
Blank	**Blank04**	<3	<3	<2	<2	<2	<2	<2	10	<6	<3	<3	<3	<3
Shanghai	**1**	<3	16	<2	60	5	<2	<2	<72	<6	<3	<3	<3	<3
Shanghai	**2**	<3	<3	2	177	22	<2	<2	<72	<6	<3	<3	<3	<3
Shanghai	**3**	7	<3	<2	26	<2	<2	<2	<72	<6	<3	<3	<3	<3
Shanghai	**4**	5	5	<2	16	6	<2	<2	<72	<6	<3	<3	<3	<3
Shanghai	**5**	<3	7	<2	64	7	<2	<2	<72	<6	<3	<3	<3	<3
Shanghai	**6**	<3	<3	3	73	8	<2	<2	<72	<6	<3	<3	<3	<3
Shanghai	**7**	<3	5	<2	34	4	<2	<2	<72	<6	<3	<3	<3	<3
Shanghai	**8**	11	16	<2	68	15	<2	<2	<72	<6	<3	<3	<3	<3
Shanghai	**9**	<3	18	<2	73	6	<2	<2	<72	<6	<3	<3	<3	<3
Shanghai	**10**	<3	7	3	60	5	<2	<2	<72	<6	<3	<3	<3	<3
Jiaxing	**1**	<3	5	3	76	9	<2	<2	<72	<6	<3	<3	<3	<3
Jiaxing	**2**	<3	13	<2	60	9	<2	<2	<72	<6	<3	<3	<3	<3
Jiaxing	**3**	<3	19	<2	321	20	<2	<2	<72	<6	<3	<3	<3	<3
Jiaxing	**4**	<3	15	<2	203	26	<2	<2	<72	<6	<3	<3	<3	<3
Jiaxing	**5**	<3	10	<2	259	24	<2	<2	<72	<6	<3	<3	<3	<3
Jiaxing	**6**	<3	6	<2	41	5	<2	<2	<72	<6	<3	<3	<3	<3
Jiaxing	**7**	8	19	5	21	6	<2	<2	<72	<6	<3	<3	<3	<3
Jiaxing	**8**	6	13	<2	59	8	<2	<2	<72	<6	<3	<3	<3	<3
Jiaxing	**9**	8	9	<2	38	3	<2	<2	<72	<6	<3	<3	<3	<3
Jiaxing	**10**	7	18	2	111	12	<2	<2	<72	<6	<3	<3	<3	<3
Shaoxing	**1**	<3	<3	<2	16	5	<2	<2	<72	<6	<3	<3	<3	<3
Shaoxing	**2**	<3	<3	<2	8	4	<2	<2	<72	<6	<3	<3	<3	<3
Shaoxing	**3**	6	<3	<2	23	<2	<2	<2	<72	<6	<3	<3	<3	<3
Shaoxing	**4**	4	<3	<2	53	3	<2	<2	<72	<6	<3	<3	<3	<3
Shaoxing	**5**	<3	4	<2	117	10	<2	<2	<72	<6	<3	<3	<3	<3
Shaoxing	**6**	5	<3	<2	308	27	<2	<2	<72	<6	<3	<3	7	<3
Shaoxing	**7**	6	<3	<2	14	<2	<2	<2	<72	<6	<3	<3	<3	<3
Shaoxing	**8**	<3	<3	<2	77	5	<2	<2	<72	<6	<3	<3	<3	<3
Shaoxing	**9**	5	<3	<2	104	5	<2	<2	<72	<6	<3	<3	<3	<3
Shaoxing	**10**	5	<3	<2	49	10	<2	<2	<72	<6	<3	<3	<3	<3
Type/ location	**ID**	**PFBS**	**L-PFHxS**	**Br-PFHxS**	**L-PFOS**	**Br-PFOS**	**L-PFDS**	**Br-PFDS**	**L-FOSA**	**Br-FOSA**	**L-MeFOSA**	**Br-MeFOSA**	**L-EtFOSAA**	**Br-EtFOSAA**
	LOD:	1	1	1	1	1	1	1	1	5	5	5	5	5
	LOQ:	3	3	3	2	2	2	2	2	17	17	17	17	17
Stockholm	**F31**	<1	7	2	56	6	3	<1	<1	<5	<5	<5	<5	<5
Stockholm	**F32**	5	6	2	28	13	<1	<1	<1	<5	<5	<5	<5	<5
Stockholm	**F33**	<1	8	<1	43	7	<1	<1	<1	<5	<5	<5	<5	<5
Stockholm	**F34**	11	5	<1	58	14	<1	<1	<1	<5	<5	<5	<5	<5
Stockholm	**F35**	7	13	<1	47	8	<1	<1	4	<5	<5	<5	<5	<5
Stockholm	**F36**	5	11	<1	53	8	<1	<1	<1	<5	<5	<5	<5	<5
Stockholm	**F37**	21	<1	4	31	3	<1	<1	3	<5	<5	<5	<5	<5
Stockholm	**F38**	8	7	<1	23	0	<1	<1	<1	<5	<5	<5	<5	<5
Stockholm	**F39**	<1	<1	<1	24	0	<1	<1	<1	<5	<5	<5	<5	<5
Stockholm	**F40**	9	9	<1	26	8	<1	<1	2	<5	<5	<5	<5	<5

Table S6. Concentrations (pg/mL) of PFAS alternatives in samples analyzed in procedural blanks and human milk from Shanghai, Jiaxing, Shaoxing and Stockholm in the present work.

Type/ location	ID	ADONA	9Cl-PF3ONS	11Cl-PF3OUdS
	LOD:	3	2	2
	LOQ:	10	7	7
Blank	**Blank01**	<3	<2	<2
Blank	**Blank02**	<3	<2	<2
Blank	**Blank03**	<3	<2	<2
Blank	**Blank00**	<3	<2	<2
Blank	**Blank22**	<3	<2	<2
Blank	**Blank04**	<3	<2	<2
Shanghai	**1**	5	79	2
Shanghai	**2**	<3	976	87
Shanghai	**3**	<3	40	<2
Shanghai	**4**	8	34	<2
Shanghai	**5**	5	92	<2
Shanghai	**6**	<3	196	6
Shanghai	**7**	<3	31	<2
Shanghai	**8**	<3	119	<2
Shanghai	**9**	<3	67	<2
Shanghai	**10**	<3	64	<2
Jiaxing	**1**	<3	159	8
Jiaxing	**2**	<3	131	5
Jiaxing	**3**	3	208	25
Jiaxing	**4**	<3	328	23
Jiaxing	**5**	<3	443	19
Jiaxing	**6**	<3	64	<2
Jiaxing	**7**	<3	30	<2
Jiaxing	**8**	<3	89	5
Jiaxing	**9**	8	71	2
Jiaxing	**10**	7	202	8
Shaoxing	**1**	4	21	<2
Shaoxing	**2**	<3	17	<2
Shaoxing	**3**	<3	79	<2
Shaoxing	**4**	5	57	4
Shaoxing	**5**	<3	364	22
Shaoxing	**6**	<3	161	5
Shaoxing	**7**	<3	31	3
Shaoxing	**8**	<3	210	18
Shaoxing	**9**	<3	109	10
Shaoxing	**10**	<3	214	13
Stockholm	**F31**	<3	<2	<2
Stockholm	**F32**	<3	<2	<2
Stockholm	**F33**	<3	<2	<2
Stockholm	**F34**	<3	<2	<2
Stockholm	**F35**	<3	<2	<2
Stockholm	**F36**	<3	<2	<2
Stockholm	**F37**	<3	<2	<2
Stockholm	**F38**	<3	<2	<2
Stockholm	**F39**	<3	<2	<2
Stockholm	**F40**	<3	<2	<2

Table S7. Percent recovery ± standard error of the mean (SEM) of PFAS fortified in bovine milk analyzed with a low- (1-20 ng; n = 4), or high- (4-60 ng; n = 4) spike of PFASs.

Analyte	Percent recovery ± SEM (n=4), high spike	Percent recovery ± SEM (n=4), low spike
L-PFHpA	75 ± 0.2	76 ± 1.2
L-PFOA	81 ± 0.5	76 ± 1.1
Br-PFOA	N/A	N/A
L-PFNA	79 ± 1.7	78 ± 1.8
L-PFDA	85 ± 1.3	87 ± 2.7
L-PFUnDA	88 ± 1.3	88 ± 2.2
L-PFDoDA	88 ± 1	87 ± 0.9
L-PFTriDA	86 ± 1.6	81 ± 1.3
L-PFTeDA	91 ± 2	76 ± 0.7
L-PFPeDA	N/A	N/A
L-PFBS	66 ± 1	34 ± 0.8
L-PFHxS	80 ± 1.2	79 ± 0.8
Br-PFHxS	N/A	N/A
L-PFOS	83 ± 1	76 ± 1.6
Br-PFOS	N/A	N/A
L-PFDS	85 ± 1.9	71 ± 0.9
Br-PFDS	N/A	N/A
L-FOSA	77 ± 0.7	74 ± 0.7
Br-FOSA	N/A	N/A
L-MeFOSAA	73 ± 0.9	73 ± 5
Br-MeFOSAA	N/A	N/A
L-EtFOSAA	70 ± 1	68 ± 2.8
Br-EtFOSAA	N/A	N/A
7:3 FTCA	19 ± 0.9	3.3 ± 0.2
ADONA	101 ± 0.9	92 ± 2.5
9Cl-PF3ONS	86 ± 1.7	103 ± 2.7
11Cl-PF3OUdS	82 ± 1.2	91 ± 0.6

ND = Not detected

N/A= not fortified due to lack of standard

Table S8. Mean PFAS concentrations (pg/mL) ± 95% CI in SRM 1954 (n=3) measured in the present work compared to Nyberg *et al.* (2018) and Keller *et al*. (2010). (NR= not reported, ND= not detected)

Analyte	**This Study**	**Nyberg *et al.***	**Keller *et al.***
L-PFHpA	11 ± 10	12.5 ± 7.2	NR - 14
L-PFOA	93 ± 38	74.3 ± 3.1	116 - 810
Br-PFOA	4.9 ± 1.4	NR	NR
L-PFNA	16 ± 5.1	15.7 ± 7.3	16 - 104
L-PFDA	9.2 ± 4.4	8.3 ± 4.3	6 - 127
L-PFUnDA	6.9 ± 3.9	3.4 ± 1.0	7 - 94
L-PFDoDA	2.6 ± 1.8	1.3 ± 0.5	3 - 44
L-PFTriDA	3.6 ± 3.5	1.1 ± 1.0	NR - 199
L-PFTeDA	4.8 ± 4.1	1.7 ± 1.5	NR
L-PFPeDA	ND	0.1 ± 0.2	NR
L-PFBS	4.4 ± 1.7	3.4 ± 4.4	ND - 7
L-PFHxS	19.8 ± 6.0	17.7 ± 4.6	NR
Br-PFHxS	ND	0.7 ± 1.4	NR
L-PFOS	93.4 ± 31	96.8 ± 17.4	NR
Br-PFOS	37.1 ± 9	85 ± 39.1	NR
L-PFDS	2.0 ± 2.3	0.9 ± 0.8	NR
Br-PFDS	1.3 ± 4.7	ND	NR
L-FOSA	3.6 ± 1.5	2.9 ± 1.6	NR
Br-FOSA	ND	0.5 ± 0.8	NR
L-MeFOSAA	ND	0.6 ± 1.2	NR
Br-MeFOSAA	ND	ND	NR
L-EtFOSAA	ND	0.7 ± 1.1	NR
Br-EtFOSAA	ND	ND	NR
7:3 FTCA	8.4 ± 13	0.7 ± 1	NR
ADONA	ND	NR	NR
9Cl-PF3ONS	ND	NR	NR
11Cl-PF3OUdS	ND	NR	NR

ND = Not detected

N/A= not fortified due to lack of standard

Table S9. Σ_{20}PFAS concentrations for individual samples measured in the present work, along with estimated daily intakes (EDIs) and estimated weekly intakes (EWIs) based on both Σ_4PFAS (PFOA, PFNA, PFHxS and PFOS) and Σ_{20}PFAS concentrations.

City	Sample	Σ_{20}PFAS (pg/mL)	EDI of Σ_{20}PFAS (ng/kg bw/d)	EWI of PFOS (ng/kg bw/w)	EWI of PFOA (ng/kg bw/w)	EWI of Σ_4PFAS (ng/kg bw/w)	EWI of Σ_{20}PFAS (ng/kg bw/w)
Shanghai	1	382	32	38	90	149	223
Shanghai	2	1678	140	116	180	314	978
Shanghai	3	168	14	16	40	63	98
Shanghai	4	183	15	13	61	77	106
Shanghai	5	372	31	42	91	145	217
Shanghai	6	455	38	48	69	127	265
Shanghai	7	246	21	22	61	98	144
Shanghai	8	514	43	49	116	184	300
Shanghai	9	319	27	46	39	110	186
Shanghai	10	331	28	38	64	121	193
Jiaxing	1	623	52	50	103	182	363
Jiaxing	2	717	60	40	185	259	418
Jiaxing	3	1012	84	199	158	384	590
Jiaxing	4	1168	97	134	179	343	680
Jiaxing	5	1355	113	165	155	350	789
Jiaxing	6	580	48	27	244	281	338
Jiaxing	7	353	29	15	130	168	206
Jiaxing	8	624	52	39	191	257	364
Jiaxing	9	449	37	24	118	163	261
Jiaxing	10	797	66	72	107	216	464
Shaoxing	1	99	8	12	19	39	58
Shaoxing	2	101	8	7	31	46	59
Shaoxing	3	312	26	15	91	116	182
Shaoxing	4	257	21	33	43	86	150
Shaoxing	5	837	70	74	50	149	487
Shaoxing	6	809	67	195	53	268	471
Shaoxing	7	150	13	9	32	51	88
Shaoxing	8	716	60	48	82	150	417
Shaoxing	9	467	39	64	76	150	272
Shaoxing	10	631	53	34	79	135	368
Stockholm	1	191	16	35	36	86	112
Stockholm	2	164	14	24	44	73	96
Stockholm	3	167	14	29	47	87	98
Stockholm	4	161	13	41	19	73	94
Stockholm	5	112	9	32	14	53	65
Stockholm	6	109	9	36	13	61	64
Stockholm	7	123	10	20	21	44	71
Stockholm	8	57	5	13	0	27	33
Stockholm	9	79	7	15	26	49	46
Stockholm	10	125	10	20	31	61	73