Supplemental Table 1. Overview of PFAS measurements in each of the nine HBM4EU aligned studies (n=1957).

		HBM4EU aligned studies – Teenagers (12-19 years) sampling frame								
		North		East	South			West		
		NEBII	Riksmaten adolescents 2016-17	PCB cohort (follow-up)	SLO CRP	CROME	BEA	ESTEBAN	FLEHS IV	GerES V-sub
	HBM4EU QA/QC	Yes	Data generated outside	Yes	Yes	Yes	Yes	Approved posterior	Yes	Approved posterior
	Medium	Plasma	Serum	Serum	Serum	Serum	Serum	Serum	Serum	Plasma
	Method	UPLC	UPLC	LC	LC	LC	LC	LC	LC	LC
	Forms	L+B	L (PFOS, PFOA, PFHxS L+B)	L+B	L+B	L+B	L (PFOS L+B)	L	L	L (PFOS L+B)
PFPeA	N obs	NA	NA	292	94	52	299	143	300	300
	LOQ (µg/L)			0.01	0.04	0.04	0.16	0.05	0.20	0.25
	<LOQ (%)			47.3	12.8	≥70%	≥70%	≥70%	≥70%	≥70%
PFHxA	N obs	NA	300	292	94	52	299	143	300	300
	LOQ (µg/L) [a]		0.06-0.29	0.02	0.04	0.04	0.25	0.20	0.20	0.25
	<LOQ (%)		≥70%	0.3	≥70%	0	≥70%	≥70%	≥70%	≥70%
PFHpA	N obs	177	300	292	94	52	299	143	300	300
	LOQ (µg/L) [a]	0.05	0.06-0.29	0.01	0.03	0.03	0.20	0.20	0.20	0.25
	<LOQ (%)	22.0	≥70%	9.6	47.9	≥70%	≥70%	≥70%	≥70%	≥70%
PFOA	N obs	177	300	292	94	52	299	143	300	300
	LOQ (µg/L) [a]	0.05	0.02-0.29	0.01	0.07	0.07	0.16	0.05	0.20	0.50
	<LOQ (%)	0	0	0.3	0	0	0	0	0	13.7
PFNA	N obs	177	300	292	94	52	299	143	300	300
	LOQ (µg/L) [a]	0.05	0.06-0.29	0.02	0.01	0.01	0.16	0.20	0.20	0.50
	<LOQ (%)	0	6.0	6.2	0	0	10.7	0.7	18.0	≥70%
PFDA	N obs	177	300	292	94	52	299	143	300	300
	LOQ (µg/L) [a]	0.05	0.06-0.29	0.03	0.01	0.01	0.20	0.20	0.20	0.25
	<LOQ (%)	0.6	41.0	32.2	0	0	≥70%	39.2	52.3	≥70%

PFUnDA	N obs	177	300	292	94	52	299	143	300	300
	LOQ (µg/L) [a]	0.05	0.06-0.29	0.01	0.01	0.01	0.20	0.05	0.20	0.25
	<LOQ (%)	16.9	53.0	57.5	3.2	25.0	≥70%	6.3	≥70%	≥70%
PFDoDA	N obs	177	300	292	94	52	299	143	300	300
	LOQ (µg/L) [a]	0.05	0.06-0.29	0.04	0.02	0.02	0.12	0.05	0.20	0.25
	<LOQ (%)	≥70%	≥70%	≥70%	≥70%	≥70%	≥70%	≥70%	≥70%	≥70%
PFBS	N obs	177	300	292	94	52	299	143	300	300
	LOQ (µg/L) [a]	0.05	0.04-0.54	0.04	0.04	0.04	0.10	0.19	0.20	0.25
	<LOQ (%)	≥70%	≥70%	≥70%	≥70%	≥70%	≥70%	≥70%	≥70%	≥70%
PFHxS	N obs	177	300	292	94	52	299	143	300	300
	LOQ (µg/L) [a]	0.05	0.02-0.46	0.02	0.01	0.02	0.34	0.19	0.20	0.25
	<LOQ (%)	0	11.0	0.3	0	0	≥70%	0.7	2.3	27.7
PFHpS	N obs	177	NA	292	94	52	299	143	300	NA
	LOQ (µg/L)	0.05		0.01	0.02	0.02	0.25	0.19	0.20	
	<LOQ (%)	58.8		17.5	17.0	0	≥70%	≥70%	≥70%	
PFOS	N obs	177	300	292	94	52	299	143	300	300
	LOQ (µg/L) [a]	0.05	0.06-0.56	0.04	0.09	0.09	0.33	0.10	0.20	0.25
	<LOQ (%)	0	0	0	0	0	0	0	0	0

[a] In Riksmaten adolescents 2016-17 the laboratory presented PFAS in ng/g (µg/kg), which was reported to HBM4EU in µg/L assuming that 1 ml blood serum equals 1 gram blood serum.
Abbreviations: L, linear form; L+B, linear and branched forms; LC, Liquid chromatography-tandem mass spectrometry; LOD, limit of detection; LOQ, limit of quantification; perfluoropentanoic acid (PFPeA), perfluorohexanoic acid (PFHxA), perfluoroheptanoic acid (PFHpA), perfluorooctanoate (PFOA), perfluorononanoic acid (PFNA), perfluorodecanoic acid (PFDA), perfluoroundecanoic acid (PFUnDA), perfluorododecanoic acid (PFDoDA), perfluorobutane sulfonic acid (PFBS), perfluorohexane sulfonic acid (PFHxS), perfluoroheptanane sulfonic acid (PFHpS) and perfluorooctane sulfonic acid (PFOS); SD, standard deviation; UPLC, ultraperformance liquid chromatography-tandem mass spectrometry.

Supplemental Table 2. Correlations between different blood PFAS concentrations in the HBM4EU aligned studies (n=1957).

	PFPeA	PFHxA	PFHpA	PFOA	PFNA	PFDA	PFUnDA	PFHxS	PFHpS	PFOS
PFPeA	1 (94)									
PFHxA	NA (0)	1 (344)								
PFHpA	NA (0)	0.12 (292)	1 (469)							
PFOA	0.32 (94)	0.55 (344)	0.58 (469)	1 (1957)						
PFNA	0.14 (94)	0.45 (344)	0.56 (469)	0.67 (1657)	1 (1657)					
PFDA	0.20 (94)	0.13 (52)	0.16 (177)	0.31 (323)	0.58 (323)	1 (323)				
PFUnDA	0.08 (94)	0.17 (52)	0.04 (177)	0.44 (466)	0.68 (466)	0.61 (323)	1 (466)			
PFHxS	0.16 (94)	0.06 (344)	0.34 (469)	0.52 (1658)	0.52 (1358)	0.23 (323)	0.49 (466)	1 (1658)		
PFHpS	0.27 (94)	0.23 (344)	0.27 (292)	0.49 (438)	0.63 (438)	0.59 (146)	0.36 (146)	0.74 (438)	1 (438)	
PFOS	0.23 (94)	0.24 (344)	0.43 (469)	0.56 (1957)	0.65 (1657)	0.59 (323)	0.58 (466)	0.54 (1658)	0.89 (438)	1 (1957)

Note: Indicated as Spearman rank r (n observations). r <0.4 is indicated in green. r >0.4 is indicated in red.

Supplemental Table 3. Associations between PFAS and BMI z-score (age and sex standardized) additionally adjusted for breastfeeding (in months) in five individual HBM4EU aligned studies with available breastfeeding data and for birthweight (in grams) in three HBM4EU aligned studies with available birthweight data.

	Study	n	Model 2 β (95% CI)	Model 2 + Breastfeeding β (95% CI)	Model 2 + Birthweight β (95% CI)
				P75/P25	P75/P25
ΣPFAS	NEBII	146	-0.06 (-0.25, 0.14)	-0.06 (-0.26, 0.14)	-0.06 (-0.25, 0.14)
	Riksmaten adolescents 2016-17	300	0.03 (-0.11, 0.17)	0.02 (-0.12, 0.16)	
	PCB cohort follow-up	291	0.12 (-0.04, 0.28)	0.12 (-0.04, 0.28)	0.10 (-0.06, 0.27)
	CROME	52	0.32 (-0.08, 0.72)	0.38 (-0.05, 0.80)	
	FLEHS IV	300	-0.21 (-0.37, -0.05)	-0.21 (-0.37, -0.05)	-0.21 (-0.37, -0.06)
ΣsPFAS	NEBII	146	-0.02 (-0.21, 0.17)	-0.02 (-0.21, 0.16)	-0.02 (-0.20, 0.17)
	Riksmaten adolescents 2016-17	300	0.02 (-0.12, 0.16)	0.01 (-0.13, 0.15)	
	PCB cohort follow-up	291	0.14 (-0.03, 0.31)	0.14 (-0.03, 0.31)	0.12 (-0.05, 0.30)
	CROME	52	0.41 (0.00, 0.82)	0.49 (0.06, 0.93)	
	FLEHS IV	300	-0.21 (-0.36, -0.05)	-0.20 (-0.36, -0.04)	-0.20 (-0.36, -0.05)
	GerES V-sub	300	-0.12 (-0.25, 0.02)	-0.13 (-0.27, 0.01)	-0.12 (-0.25, 0.01)
ΣcPFAS	NEBII	146	-0.17 (-0.39, 0.06)	-0.17 (-0.40, 0.06)	-0.17 (-0.40, 0.06)
	Riksmaten adolescents 2016-17	300	-0.00 (-0.14, 0.14)	-0.00 (-0.14, 0.13)	
	PCB cohort follow-up	291	0.05 (-0.11, 0.21)	0.05 (-0.11, 0.22)	0.04 (-0.13, 0.20)
	CROME	52	0.06 (-0.30, 0.41)	0.07 (-0.29, 0.43)	
	FLEHS IV	300	-0.17 (-0.33, -0.02)	-0.18 (-0.34, -0.02)	-0.18 (-0.34, -0.03)
PFHxA	PCB cohort follow-up	291	-0.09 (-0.23, 0.06)	-0.09 (-0.24, 0.06)	-0.09 (-0.24, 0.06)
	CROME	52	0.20 (-0.10, 0.50)	0.22 (-0.17, 0.62)	
PFHpA	NEBII	146	-0.19 (-0.38, 0.00)	-0.17 (-0.36, 0.02)	-0.16 (-0.35, 0.03)
	PCB cohort follow-up	291	-0.19 (-0.33, -0.05)	-0.19 (-0.33, -0.05)	-0.22 (-0.36, -0.07)
PFOA	NEBII	146	-0.16 (-0.36, 0.04)	-0.16 (-0.36, 0.04)	-0.16 (-0.36, 0.04)
	Riksmaten adolescents 2016-17	300	-0.00 (-0.14, 0.15)	-0.00 (-0.15, 0.14)	
	PCB cohort follow-up	291	0.06 (-0.10, 0.21)	0.06 (-0.10, 0.21)	0.05 (-0.11, 0.20)

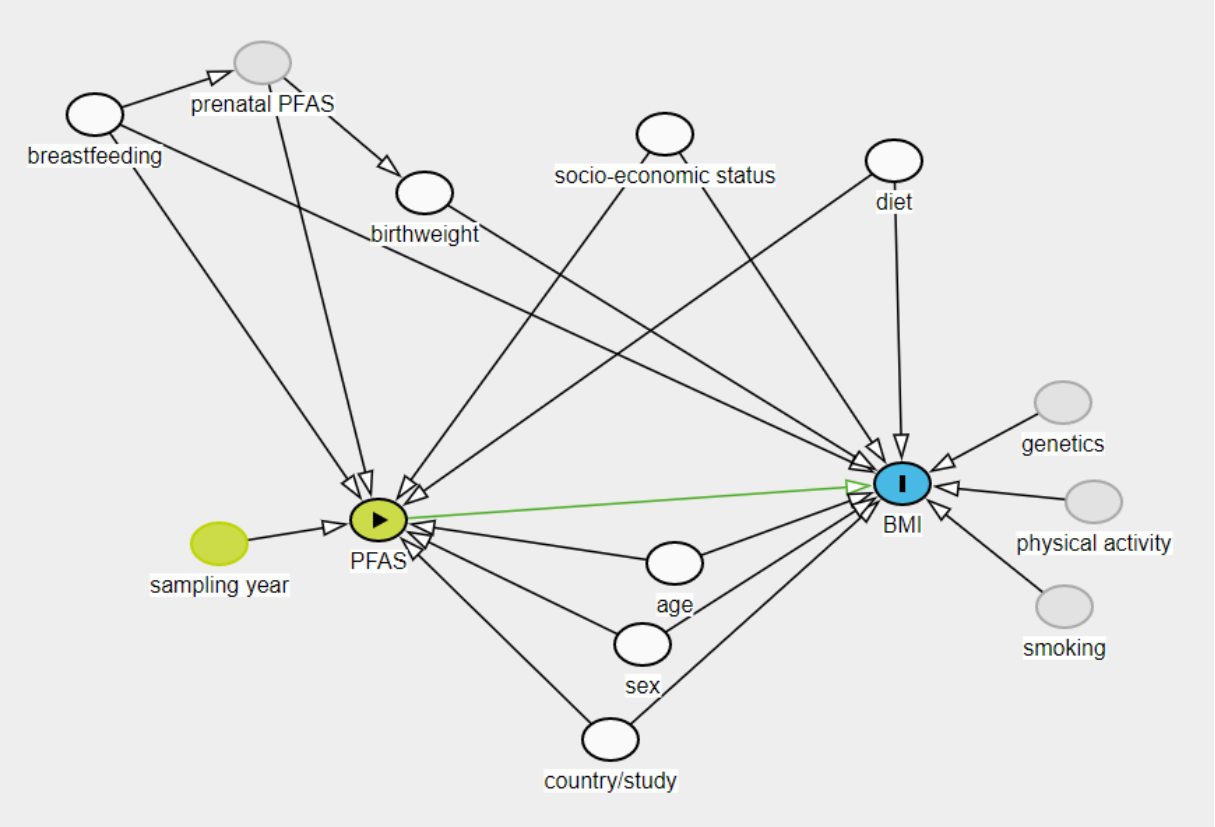
	CROME	52	0.00 (-0.38, 0.37)	0.00 (-0.38, 0.38)	
	FLEHS IV	300	-0.16 (-0.33, 0.00)	-0.16 (-0.33, 0.00)	-0.17 (-0.34, -0.01)
	GerES V-sub	300	-0.08 (-0.23, 0.07)	-0.09 (-0.24, 0.07)	-0.07 (-0.21, 0.08)
PFNA	NEBII	146	-0.09 (-0.30, 0.12)	-0.09 (-0.30, 0.12)	-0.09 (-0.30, 0.13)
	Riksmaten adolescents 2016-17	300	0.02 (-0.10, 0.15)	0.03 (-0.10, 0.15)	
	PCB cohort follow-up	291	-0.03 (-0.16, 0.10)	-0.03 (-0.16, 0.10)	-0.05 (-0.18, 0.08)
	CROME	52	0.22 (-0.22, 0.66)	0.25 (-0.20, 0.71)	
	FLEHS IV	300	-0.19 (-0.34, -0.03)	-0.20 (-0.35, -0.05)	-0.19 (-0.34, -0.04)
PFDA	NEBII	146	-0.01 (-0.22, 0.20)	-0.01 (-0.22, 0.21)	-0.01 (-0.22, 0.20)
	CROME	52	0.14 (-0.25, 0.52)	0.17 (-0.23, 0.58)	
PFUnDA	NEBII	146	-0.05 (-0.28, 0.19)	-0.07 (-0.30, 0.16)	-0.07 (-0.31, 0.16)
	CROME	52	0.28 (-0.22, 0.77)	0.31 (-0.20, 0.81)	
PFHxS	NEBII	146	0.02 (-0.15, 0.19)	0.02 (-0.15, 0.19)	0.03 (-0.14, 0.20)
	Riksmaten adolescents 2016-17	300	0.04 (-0.09, 0.17)	0.04 (-0.09, 0.17)	
	PCB cohort follow-up	291	0.19 (0.06, 0.33)	0.19 (0.06, 0.33)	0.18 (0.05, 0.32)
	CROME	52	0.33 (0.06, 0.60)	0.34 (0.07, 0.61)	
	FLEHS IV	300	-0.12 (-0.25, 0.00)	-0.11 (-0.24, 0.01)	-0.13 (-0.25, -0.01)
	GerES V-sub	300	-0.01 (-0.16, 0.14)	-0.02 (-0.17, 0.13)	-0.01 (-0.16, 0.14)
PFHpS	PCB cohort follow-up	291	0.08 (-0.02, 0.18)	0.08 (-0.02, 0.18)	0.07 (-0.03, 0.17)
	CROME	52	0.38 (0.08, 0.63)	0.42 (0.13, 0.71)	
PFOS	NEBII	146	-0.04 (-0.24, 0.15)	-0.05 (-0.24, 0.15)	-0.04 (-0.24, 0.16)
	Riksmaten adolescents 2016-17	300	0.03 (-0.11, 0.17)	0.02 (-0.12, 0.16)	
	PCB cohort follow-up	291	0.12 (-0.07, 0.30)	0.12 (-0.07, 0.30)	0.09 (-0.09, 0.28)
	CROME	52	0.37 (-0.07, 0.81)	0.47 (-0.01, 0.94)	
	FLEHS IV	300	-0.19 (-0.34, -0.03)	-0.19 (-0.34, -0.03)	-0.18 (-0.33, -0.03)
	GerES V-sub	300	-0.13 (-0.27, 0.01)	-0.14 (-0.29, -0.00)	-0.13 (-0.27, 0.00)

Note: Coefficients from linear regression mixed effects models (fitted with a random intercept for study) per study specific IQR increase (difference between 25^{th} to 75^{th} percentile) in log transformed PFAS. Models were adjusted for Model 2: highest level of education in the household, fish consumption and additionally adjusted for breastfeeding or birthweight. **Abbreviations**: ΣPFAS, molar weight sum including PFHxS, PFOS, PFOA and PFNA; ΣsPFAS, molar weight sum including PFHxS and PFOS; ΣcPFAS, molar weight sum including PFOA and PFNA; IQR, interquartile range.

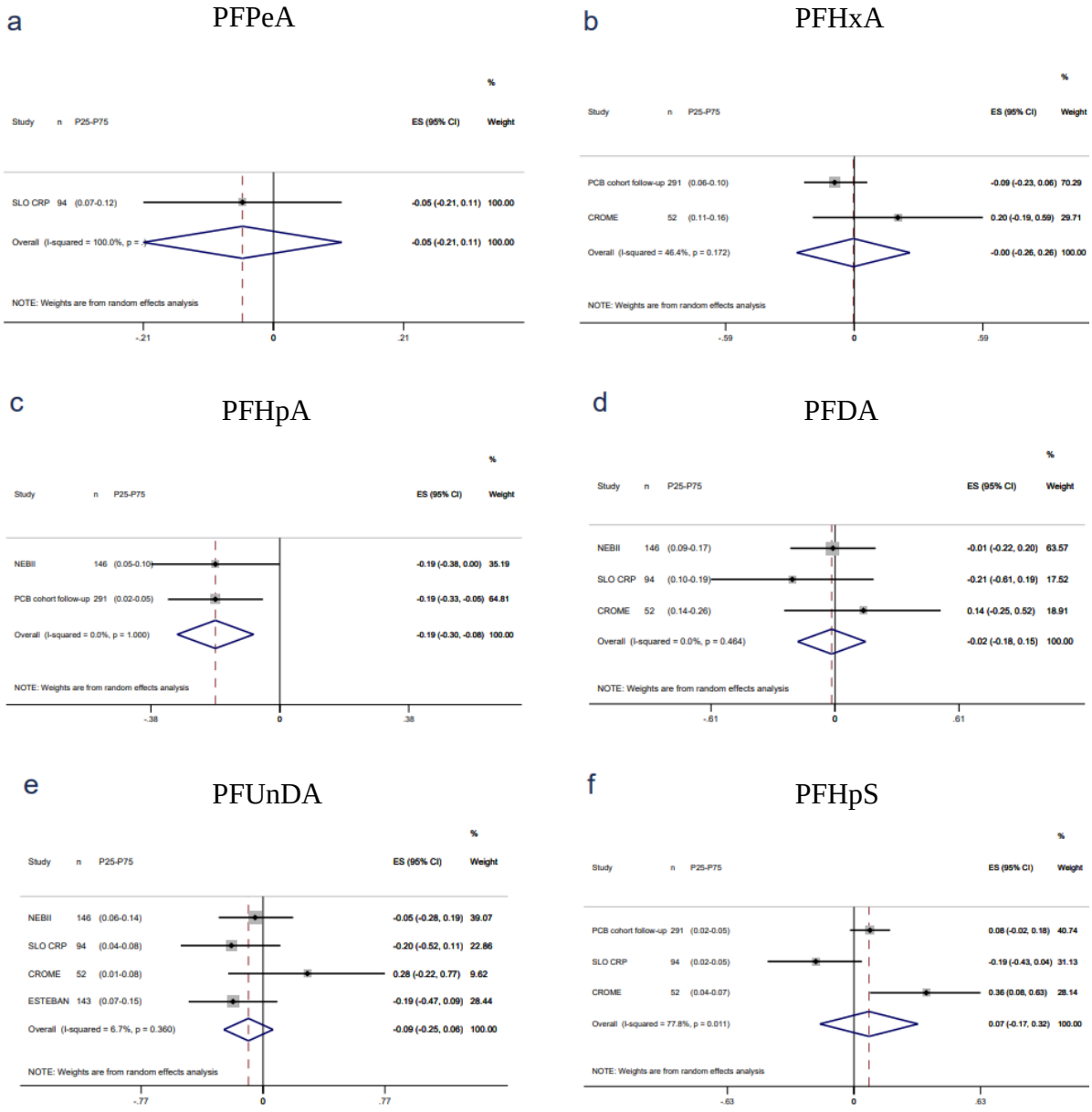
Supplemental Table 4. Associations between PFAS and BMI z-score (age and sex standardized) in pooled HBM4EU aligned studies stratified by sex.

	Model 2 – B (95% CI) P75/P25				**P-interaction**
	n	**Males**	**n**	**Females**	
ΣPFAS	628	-0.12 (-0.22, -0.03)	698	0.02 (-0.06, 0.11)	0.003
ΣsPFAS	778	-0.13 (-0.22, -0.05)	848	0.01 (-0.06, 0.09)	0.005
ΣcPFAS	765	-0.15 (-0.23, -0.07)	847	-0.02 (-0.10, 0.05)	0.002
PFPeA	52	-0.04 (-0.25, 0.16)	42	-0.08 (-0.31, 0.16)	0.886
PFHxA	154	0.05 (-0.16, 0.27)	189	-0.18 (-0.35, -0.01)	0.102
PFHpA	185	-0.17 (-0.36, 0.02)	252	-0.24 (-0.37, -0.10)	0.489
PFOA	915	-0.17 (-0.25, -0.09)	997	-0.01 (-0.09, 0.06)	0.002
PFNA	765	-0.11 (-0.20, -0.02)	847	-0.05 (-0.12, 0.03)	0.173
PFDA	141	-0.08 (-0.33, 0.18)	151	0.06 (-0.16, 0.28)	0.726
PFUnDA	203	-0.07 (-0.26, 0.12)	232	-0.10 (-0.26, 0.06)	0.196
PFHxS	778	-0.06 (-0.14, 0.02)	848	0.05 (-0.02, 0.13)	0.048
PFHpS	206	0.04 (-0.09, 0.17)	231	0.03 (-0.09, 0.14)	0.754
PFOS	915	-0.13 (-0.22, -0.04)	997	0.02 (-0.05, 0.10)	0.004

Note: Coefficients from linear regression mixed effects models (fitted with a random intercept for study) per study specific IQR increase (difference between 25^{th} to 75^{th} percentile) in log transformed PFAS. Models were adjusted for Model 2: highest level of education in the household, fish consumption and stratified for sex. **Abbreviations**: ΣPFAS, molar weight sum including PFHxS, PFOS, PFOA and PFNA; ΣsPFAS, molar weight sum including PFHxS and PFOS; ΣcPFAS, molar weight sum including PFOA and PFNA; IQR, interquartile range.



Supplemental Figure 1. Directed Acyclic Graph (DAG) for the association between PFAS and BMI. DAG was created in dagitty (dagitty.net). Green circles indicate exposure/ancestor of exposure, blue circles indicate outcome/ancestor of outcome, grey circles indicate unobserved variable and white circles indicate adjusted variable, green arrows indicate the causal path and red arrows indicate if there is a biasing path.



Supplemental Figure 2. Associations between PFAS and BMI z-score (age and sex standardized) using linear regression meta-analysis models combining the HBM4EU aligned studies. Associations are shown per study specific IQR increase (difference between 25th to 75th percentile) in log transformed PFAS and are adjusted according to model 2 (highest level of household education and fish consumption). a) PFPeA, b) PFHxA, c) PFHpA, d) PFDA, e) PFUnDA, f) PFHpS.