

Supplementary material

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Supplementary table 1: Number and proportion of non-quantified values, minimum and maximum lower limits of quantification, and distribution of levels of biomarkers of persistent organic pollutants measured in 468 women of the French E3N cohort study in 1995-1999

	Non quantified values			Lower limit of quantification		Distribution		
	N	Number	Proportion (%)	Min	Max	Min	Median	Max
Per-and polyfluoroalkyl substances (PFASs) in ng/mL of serum								
perfluorotetradecanoic acid (PFTeDA)	467	429	91.86	0.08	0.61	<LOQ	<LOQ	0.44
perfluorotridecanoic acid (PFTrDA)	467	442	94.65	0.06	0.13	<LOQ	<LOQ	0.23
perfluorododecanoic acid (PFDoDA)	467	402	86.08	0.04	0.07	<LOQ	<LOQ	0.15
perfluoroundecanoic acid (PFUnDA)	467	5	1.07	0.04	0.04	<LOQ	0.15	1.13
perfluorodecanoic acid (PFDA)	467	1	0.21	0.04	0.04	<LOQ	0.21	1.68
perfluorononanoic acid (PFNA)	467	0	0.00	-	-	0.07	0.57	2.34
perfluorooctanoic acid (PFOA)	467	0	0.00	-	-	0.97	5.16	36.14
perfluoroheptanoic acid (PFHpA)	467	38	8.14	0.04	0.07	<LOQ	0.13	2.30
perfluorohexanoic acid (PFHxA)	467	465	99.57	0.08	0.17	<LOQ	<LOQ	0.27
perfluoropentanoic acid (PFPeA)	467	467	100.00	0.10	0.17	<LOQ	<LOQ	<LOQ
perfluorobutanoic acid (PFBA)	467	422	90.36	0.14	12.60	<LOQ	<LOQ	12.93
perfluorotridecanesulfonic acid (PFTrDS)	467	467	100.00	0.04	0.06	<LOQ	<LOQ	<LOQ
perfluorododecanesulfonic acid (PFDoDS)	467	467	100.00	0.04	0.06	<LOQ	<LOQ	<LOQ
perfluoroundecanesulfonic acid (PFUnDS)	467	467	100.00	0.04	0.06	<LOQ	<LOQ	<LOQ
perfluorodecanesulfonic acid (PFDS)	467	462	98.93	0.04	0.06	<LOQ	<LOQ	0.06
perfluorononanesulfonic acid (PFNS)	467	467	100.00	0.04	0.06	<LOQ	<LOQ	<LOQ
perfluorooctanesulfonic acid (PFOS)	467	0	0.00	-	-	2.98	33.66	165.50
linear isomer of perfluorooctanesulfonic acid (n-PFOS)	467	0	0.00	-	-	1.61	17.08	92.22
perfluoroheptanesulfonic acid (PFHpS)	467	0	0.00	-	-	0.04	0.37	1.33
perfluorohexanesulfonic acid (PFHxS)	467	0	0.00	-	-	0.17	1.47	32.23
perfluoropentanesulfonic acid (PFPeS)	467	116	24.84	0.02	0.03	<LOQ	0.03	0.21
perfluorobutanesulfonic acid (PFBS)	467	467	100.00	0.09	0.15	<LOQ	<LOQ	<LOQ
perfluorooctanesulfonamide (PFOSA)	467	2	0.43	0.10	0.10	<LOQ	0.59	5.22
N-ethylperfluorooctane sulfonamidoacetic acid (N-EtFOSAA)	467	1	0.21	0.10	0.10	<LOQ	0.57	12.41
N-methylperfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	467	4	0.86	0.10	0.10	<LOQ	0.38	6.19
2,3,3,3-tetrafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)propanoic acid (GenX)	467	467	100.00	0.10	0.17	<LOQ	<LOQ	<LOQ
dodecafluoro-3H-4,8-dioxanonanoate (DONA)	467	467	100.00	0.02	0.03	<LOQ	<LOQ	<LOQ
9-chlorohexadecafluoro-3-oxanonane-1-sulfonate (F53B major)	467	461	98.72	0.03	0.05	<LOQ	<LOQ	0.09
11-chlororeicosafluoro-3-oxaundecane-1-sulfonate (F53B minor)	467	466	99.79	0.02	0.03	<LOQ	<LOQ	0.18
Organochlorine pesticides (OCPs) in pg/mL of plasma								
p,p'-dichlorodiphenyltrichloroethane (p,p'-DDT)	468	176	37.61	5.12	31.33	<LOQ	32.41	1471.82
o,p'-dichlorodiphenyltrichloroethane (o,p'-DDT)	468	345	73.72	0.20	5.22	<LOQ	<LOQ	80.39
p,p'-dichlorodiphenyldichloroethylene (p,p'-DDE)	468	0	0.00	-	-	48.79	1708.20	24224.60
o,p'-dichlorodiphenyldichloroethylene (o,p'-DDE)	468	12	2.56	0.10	0.30	<LOQ	1.03	8.57
p,p'-dichlorodiphenyldichloroethane (p,p'-DDD)	468	55	11.75	0.10	0.69	<LOQ	2.96	109.66
o,p'-dichlorodiphenyldichloroethane (o,p'-DDD)	468	393	83.97	0	0.99	<LOQ	<LOQ	7.19
γ-hexachlorocyclohexane (γ-HCH)	468	308	65.81	1.87	37.83	<LOQ	<LOQ	138.52
α-hexachlorocyclohexane (α-HCH)	468	402	85.90	0.79	16.26	<LOQ	<LOQ	79.70
Δ-hexachlorocyclohexane (Δ-HCH)	468	464	99.15	0	15.67	<LOQ	<LOQ	6.11
β-hexachlorocyclohexane (β-HCH)	468	0	0.00	-	-	97.89	952.76	8948.27
α-chlordane	468	468	100.00	0.10	1.08	<LOQ	<LOQ	<LOQ
γ-chlordane	468	467	99.79	0.10	1.182266	<LOQ	<LOQ	2.86
oxychlordane	468	0	0.00	-	-	10.34	64.88	207.49
trans-nonachlor	468	0	0.00	-	-	10.15	45.42	239.70
cis-nonachlor	468	0	0.00	-	-	1.38	7.19	39.80

heptachlor	468	468	100.00	0	0.99	<LOQ	<LOQ	<LOQ
trans-heptachlor epoxide	468	466	99.57	0.10	2.27	<LOQ	<LOQ	3.05
cis-heptachlor epoxide	468	0	0.00	-	-	6.80	46.75	294.78
α -endosulfan	468	468	100.00	3.45	69.85	<LOQ	<LOQ	<LOQ
β -endosulfan	468	467	99.79	2.76	55.76	<LOQ	<LOQ	28.37
endosulfan sulfate	468	449	95.94	1.18	23.45	<LOQ	<LOQ	31.82
dieldrin	468	0	0.00	-	-	1.58	57.78	406.01
aldrin	468	422	90.17	0.10	2.07	<LOQ	<LOQ	7.49
endrin	468	367	78.42	0.49	10.74	<LOQ	<LOQ	44.24
mirex	468	338	72.22	3.15	8.08	<LOQ	<LOQ	54.48
hexachlorobenzene (HCB)	468	0	0.00	-	-	35.27	246.95	2105.32
pentachlorobenzene (PeCBz)	468	24	5.13	1.48	6.11	<LOQ	5.71	47.09

Organochlorine pesticides (OCPs) in ng/g of fat

p,p'-dichlorodiphenyltrichloroethane (p,p'-DDT)	468		37.61			<LOQ	4.98	339.52
o,p'-dichlorodiphenyltrichloroethane (o,p'-DDT)	468		73.72			<LOQ	<LOQ	16.29
p,p'-dichlorodiphenyldichloroethylene (p,p'-DDE)	468		0.00			6.30	259.58	3226.77
o,p'-dichlorodiphenyldichloroethylene (o,p'-DDE)	468		2.56			<LOQ	0.16	1.77
p,p'-dichlorodiphenyldichloroethane (p,p'-DDD)	468		11.75			<LOQ	0.47	25.30
o,p'-dichlorodiphenyldichloroethane (o,p'-DDD)	468		83.97			<LOQ	<LOQ	1.16
γ -hexachlorocyclohexane (γ -HCH)	468		65.81			<LOQ	<LOQ	24.65
α -hexachlorocyclohexane (α -HCH)	468		85.90			<LOQ	<LOQ	12.37
Δ -hexachlorocyclohexane (Δ -HCH)	468		99.15			<LOQ	<LOQ	1.10
β -hexachlorocyclohexane (β -HCH)	468		0.00			12.49	144.42	1428.07
α -chlordane	468		100.00			<LOQ	<LOQ	<LOQ
γ -chlordane	468		99.79			<LOQ	<LOQ	0.48
oxychlordane	468		0.00			1.41	10.03	32.17
trans-nonachlor	468		0.00			1.31	7.10	29.03
cis-nonachlor	468		0.00			0.18	1.12	4.62
heptachlor	468		100.00			<LOQ	<LOQ	<LOQ
trans-heptachlor epoxide	468		99.57			<LOQ	<LOQ	0.52
cis-heptachlor epoxide	468		0.00			0.88	7.22	36.43
α -endosulfan	468		100.00			<LOQ	<LOQ	<LOQ
β -endosulfan	468		99.79			<LOQ	<LOQ	2.94
endosulfan sulfate	468		95.94			<LOQ	<LOQ	5.87
dieldrin	468		0.00			0.26	8.95	61.30
aldrin	468		90.17			<LOQ	<LOQ	1.18
endrin	468		78.42			<LOQ	<LOQ	5.13
mirex	468		72.22			<LOQ	<LOQ	8.53
hexachlorobenzene (HCB)	468		0.00			4.57	36.84	345.52
pentachlorobenzene (PeCBz)	468		5.13			<LOQ	0.89	6.26

Non-dioxin-like polychlorinated biphenyls (NDL-PCBs) in pg/mL of plasma

2,4,4'-trichlorobiphenyl (PCB-28)	468	0	0.00	-	-	3.85	12.69	348.48
2,2',5,5'-tetrachlorobiphenyl (PCB-52)	468	0	0.00	-	-	0.97	4.44	56.01
2,2',4,5,5'-pentachlorobiphenyl (PCB-101)	468	0	0.00	-	-	1.39	6.27	59.50
2,2',3,4,4',5'-hexachlorobiphenyl (PCB-138)	468	0	0.00	-	-	35.16	604.14	1809.65
2,2',4,4',5,5'-hexachlorobiphenyl (PCB-153)	468	0	0.00	-	-	153.92	1276.72	3717.55
2,2',3,4,4',5,5'-heptachlorobiphenyl (PCB-180)	468	0	0.00	-	-	303.31	991.36	3309.42

Non-dioxin-like polychlorinated biphenyls (NDL-PCBs) in ng/g of fat

2,4,4'-trichlorobiphenyl (PCB-28)	468	0	0.00			0.50	1.98	41.47
2,2',5,5'-tetrachlorobiphenyl (PCB-52)	468	0	0.00			0.14	0.69	8.24
2,2',4,5,5'-pentachlorobiphenyl (PCB-101)	468	0	0.00			0.17	0.98	6.93
2,2',3,4,4',5'-hexachlorobiphenyl (PCB-138)	468	0	0.00			4.54	92.91	326.83
2,2',4,4',5,5'-hexachlorobiphenyl (PCB-153)	468	0	0.00			19.88	198.04	538.83

2,2',3,4,4',5,5'-heptachlorobiphenyl (PCB-180)	468	0	0.00				36.69	155.35	399.09
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Dioxin-like polychlorinated biphenyls (DL-PCBs) in pg/mL of plasma

2,3,3',4,4'-pentachlorobiphenyl (PCB-105)	468	0	0.00	-	-		3.78	37.77	257.15
2,3,4,4',5-pentachlorobiphenyl (PCB-114)	468	0	0.00	-	-		2.36	11.81	44.67
2,3',4,4',5-pentachlorobiphenyl (PCB-118)	468	0	0.00	-	-		19.61	243.60	1284.61
2,3',4,4',5'-pentachlorobiphenyl (PCB-123)	468	0	0.00	-	-		0.19	2.11	15.76
2,3,3',4,4',5-hexachlorobiphenyl (PCB-156)	468	0	0.00	-	-		35.09	125.95	375.49
2,3,3',4,4',5'-hexachlorobiphenyl (PCB-157)	468	0	0.00	-	-		6.89	27.58	110.40
2,3',4,4',5,5'-hexachlorobiphenyl (PCB-167)	468	0	0.00	-	-		8.08	42.88	137.10
2,3,3',4,4',5,5'-heptachlorobiphenyl (PCB-189)	468	0	0.00	-	-		4.83	11.72	48.90

Dioxin-like polychlorinated biphenyls (DL-PCBs) in ng/g of fat

2,3,3',4,4'-pentachlorobiphenyl (PCB-105)	468	0	0.00				0.49	5.98	42.99
2,3,4,4',5-pentachlorobiphenyl (PCB-114)	468	0	0.00				0.36	1.84	6.16
2,3',4,4',5-pentachlorobiphenyl (PCB-118)	468	0	0.00				2.53	37.10	194.84
2,3',4,4',5'-pentachlorobiphenyl (PCB-123)	468	0	0.00				0.02	0.34	2.31
2,3,3',4,4',5-hexachlorobiphenyl (PCB-156)	468	0	0.00				4.24	19.17	55.68
2,3,3',4,4',5'-hexachlorobiphenyl (PCB-157)	468	0	0.00				0.83	4.19	13.31
2,3',4,4',5,5'-hexachlorobiphenyl (PCB-167)	468	0	0.00				1.01	6.66	21.31
2,3,3',4,4',5,5'-heptachlorobiphenyl (PCB-189)	468	0	0.00				0.58	1.85	5.90

Polybrominated diphenyl ethers (PBDEs) in pg/mL of plasma

2,2',4,4'-tetrabromodiphenyl ether (PBDE-47)	468	1	0.21	0.39	0.39	<LOQ	2.50	102.50
2,2',4,4',5-pentabromodiphenyl ether (PBDE-99)	468	5	1.07	0.14	0.45	<LOQ	0.69	17.49
2,2',4,4',6-pentabromodiphenyl ether (PBDE-100)	468	2	0.43	0.12	0.33	<LOQ	0.85	22.40
2,2',4,4',5,5'-hexabromodiphenyl ether (PBDE-153)	468	1	0.21	0.91	0.91	<LOQ	2.52	30.49

Polybrominated diphenyl ethers (PBDEs) in ng/g of fat

2,2',4,4'-tetrabromodiphenyl ether (PBDE-47)	468	1	0.21			<LOQ	0.37	15.57
2,2',4,4',5-pentabromodiphenyl ether (PBDE-99)	468	5	1.07			<LOQ	0.10	2.66
2,2',4,4',6-pentabromodiphenyl ether (PBDE-100)	468	2	0.43			<LOQ	0.13	3.40
2,2',4,4',5,5'-hexabromodiphenyl ether (PBDE-153)	468	1	0.21			<LOQ	0.38	4.18

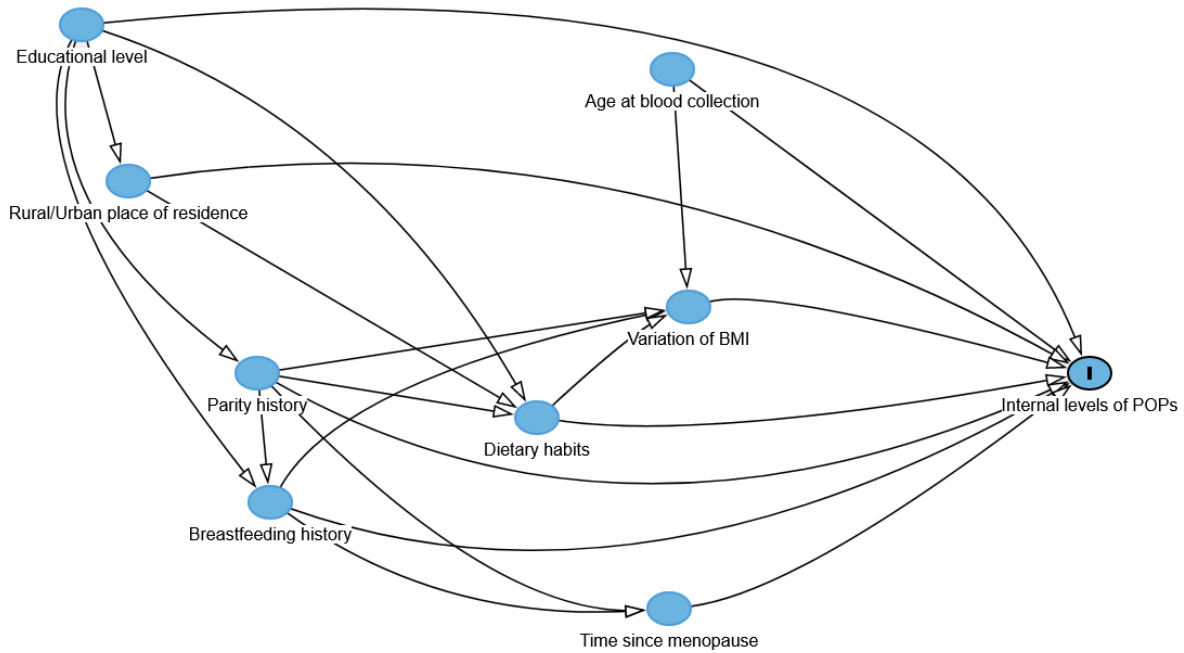
LOQ: Lower limit of quantification. Note that the LOQ of a given substance varies depending on the samples. We considered any non-quantified values to be lower than any quantified value. Range (minimum and maximum) of lower limit of quantification are presented for each substance per mL of plasma.

Supplementary table 2: Comparison between the characteristics of women included in the study sample (N=468) with those of all women in the E3N cohort (N=98,995)

	E3N cohort N=98,995	Study sample N=468
Age at inclusion in the cohort (years), Mean (Standard deviation)	49.41 (6.67)	48.87 (9.96)
School educational level (years), Number (Percent)		
Missing value	3,730 (3.77)	14 (2.99)
<12	13,433 (13.57)	43 (9.19)
[12-14]	47,516 (48.00)	236 (50.43)
>14	34,316 (34.66)	175 (37.39)
Place of residence at inclusion in the cohort , Number (Percent)		
Missing value	8,576 (8.66)	35 (7.48)
Urban areas	77,042 (77.82)	392 (83.76)
Rural areas	13,337 (13.51)	41 (8.76)
Body mass index at inclusion in the cohort (kg/m ²), Mean (Standard deviation)	22.63 (3.21)	22.57 (2.94)
Missing value, Number (Percent)	2,314 (2.34)	7 (1.50)
History of breastfeeding , Number (Percent)		
Missing value	12,376 (12.50)	24 (5.13)
No breastfeeding	36,035 (36.40)	146 (31.20)
Cumulative duration of breastfeeding <6 months	34,257 (34.61)	191 (40.81)
Cumulative duration of breastfeeding ≥6 months	16,327 (16.49)	107 (22.86)
Parity , Number (Percent)		
Missing value	12 (0.01)	0
Nulliparous	12,185 (12.31)	54 (11.53)
One or two children	57,318 (57.89)	260 (55.56)
More than two children	29,480 (29.78)	154 (32.91)
Adherence to the sPNNS-GS2 , Mean (Standard deviation)	3.82 (2.96)	3.98 (2.94)
Missing value or declaration of aberrant energy intakes, Number (Percent)	25,964 (26.23)	9 (1.92)

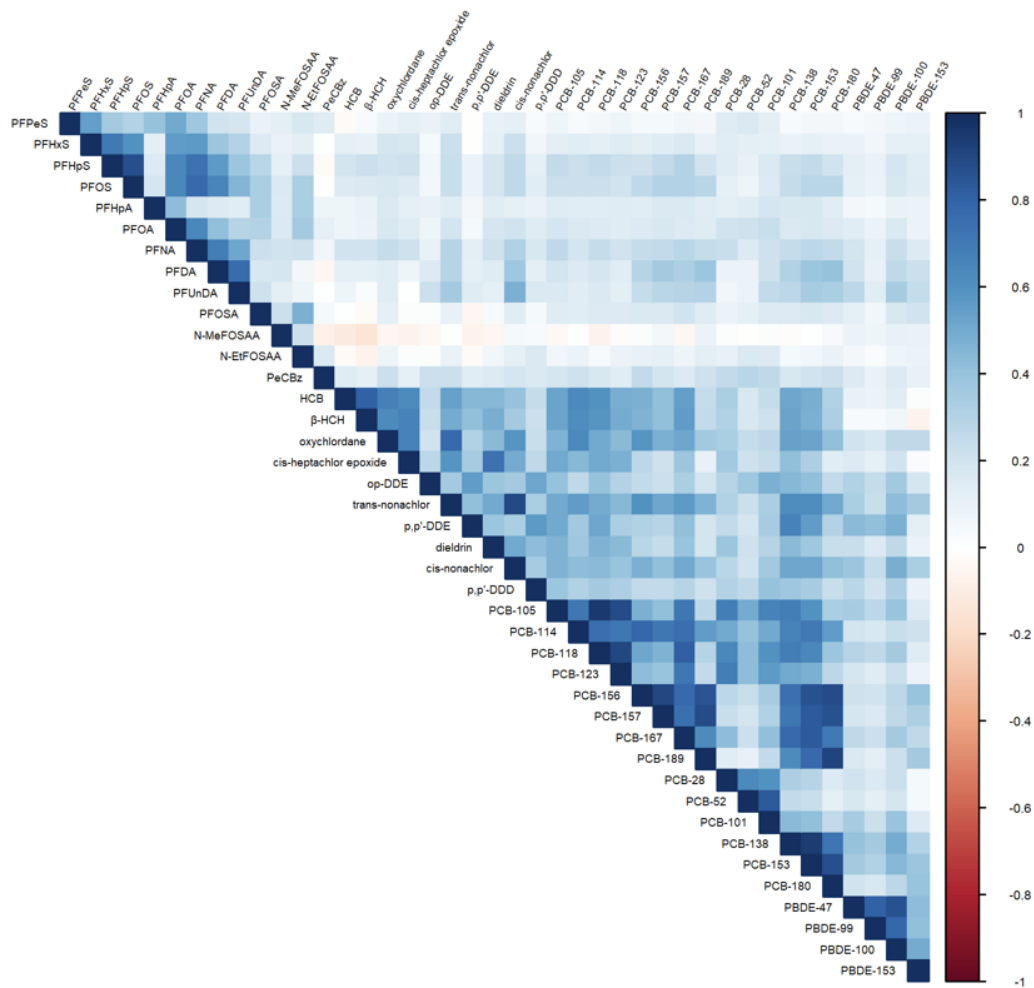
Number (percentage) of missing data are indicated in an additional line, if any.

sPNNS-GS2: simplified "Programme National Nutrition Santé - guidelines score 2"

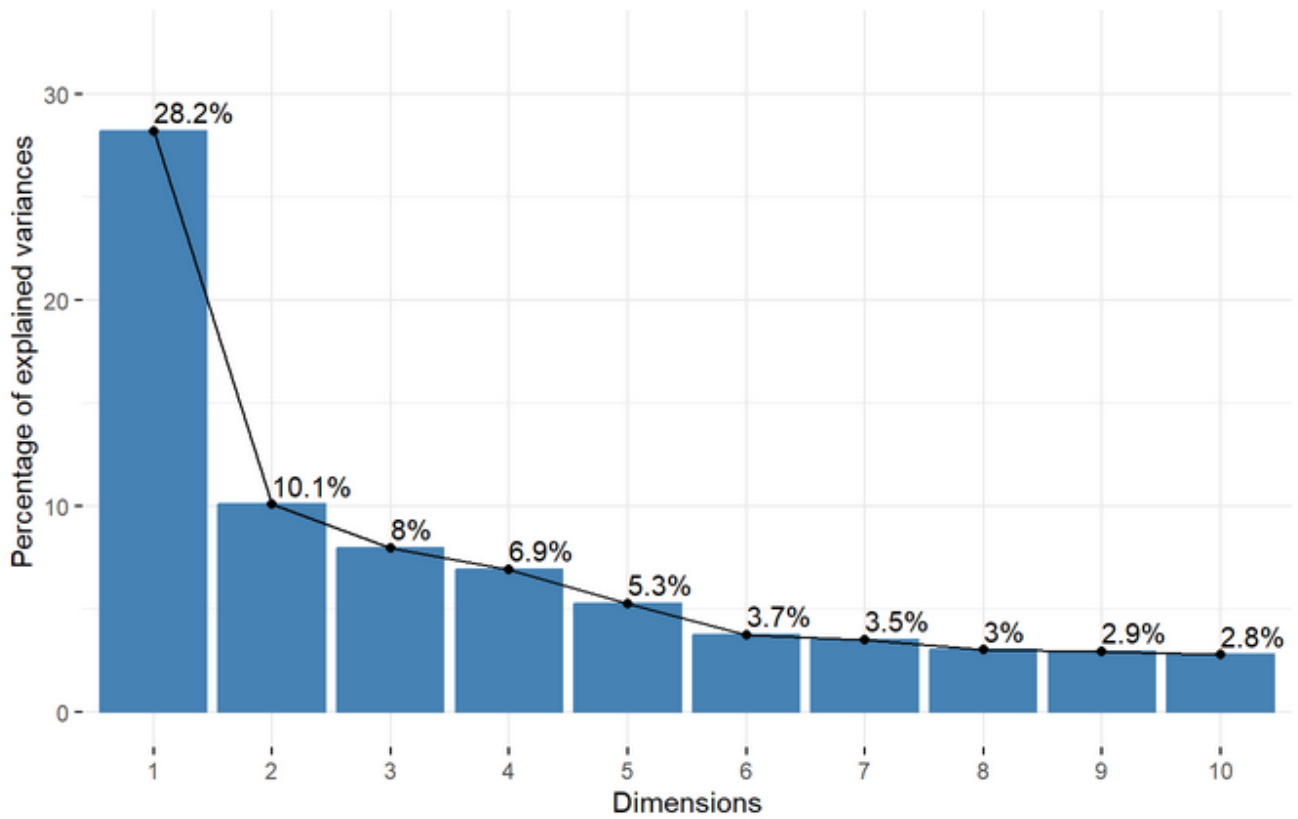


Supplementary figure 1: Directed acyclic graph to identify possible adjustments sets to estimate the direct effects of anthropometric, socio-demographic, hormonal, reproductive and dietary variables on profiles of biomarkers of persistent organic pollutants. The online software DAGitty was used: www.dagitty.net.

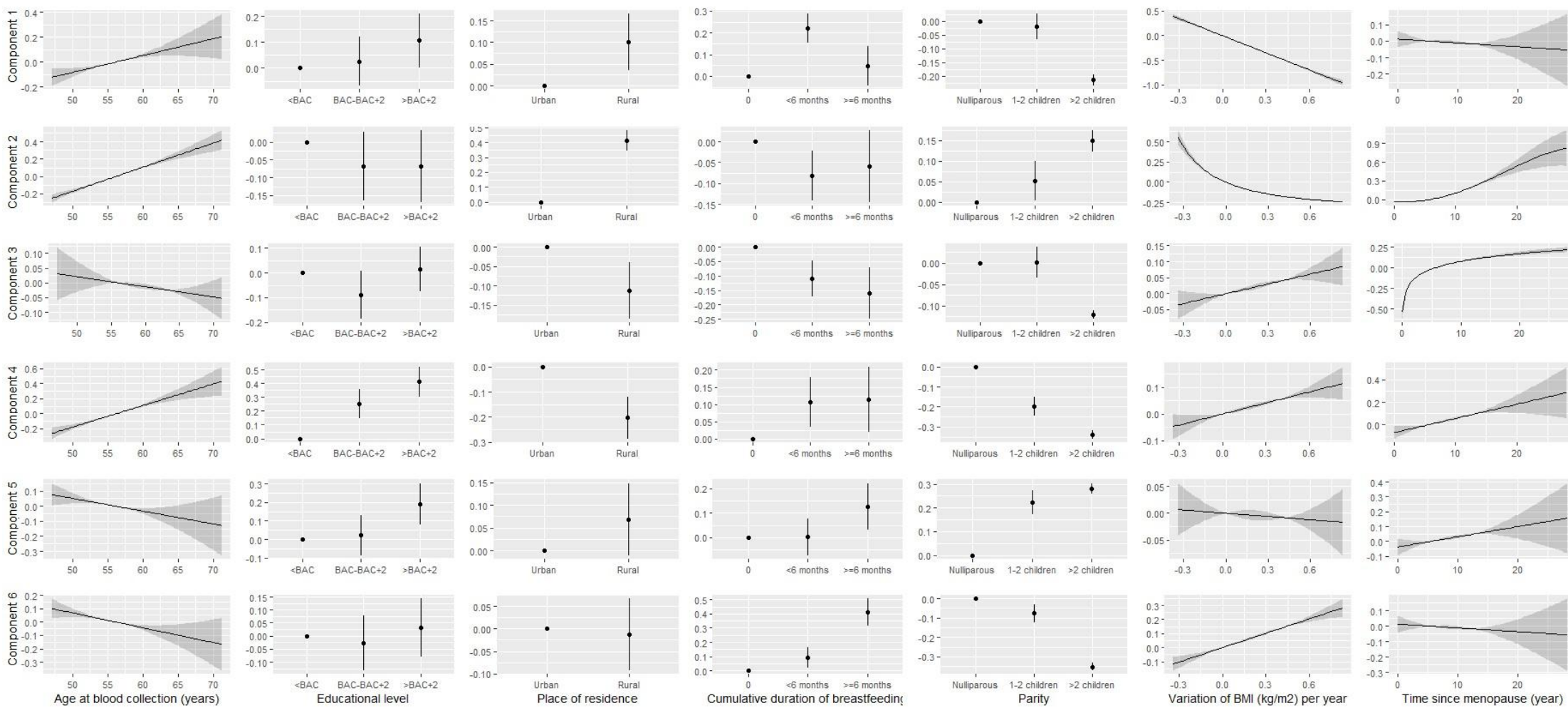
For each variable of interest, we checked that adjustment for all the other variables of interest allowed us to estimate its direct effect on the outcome.



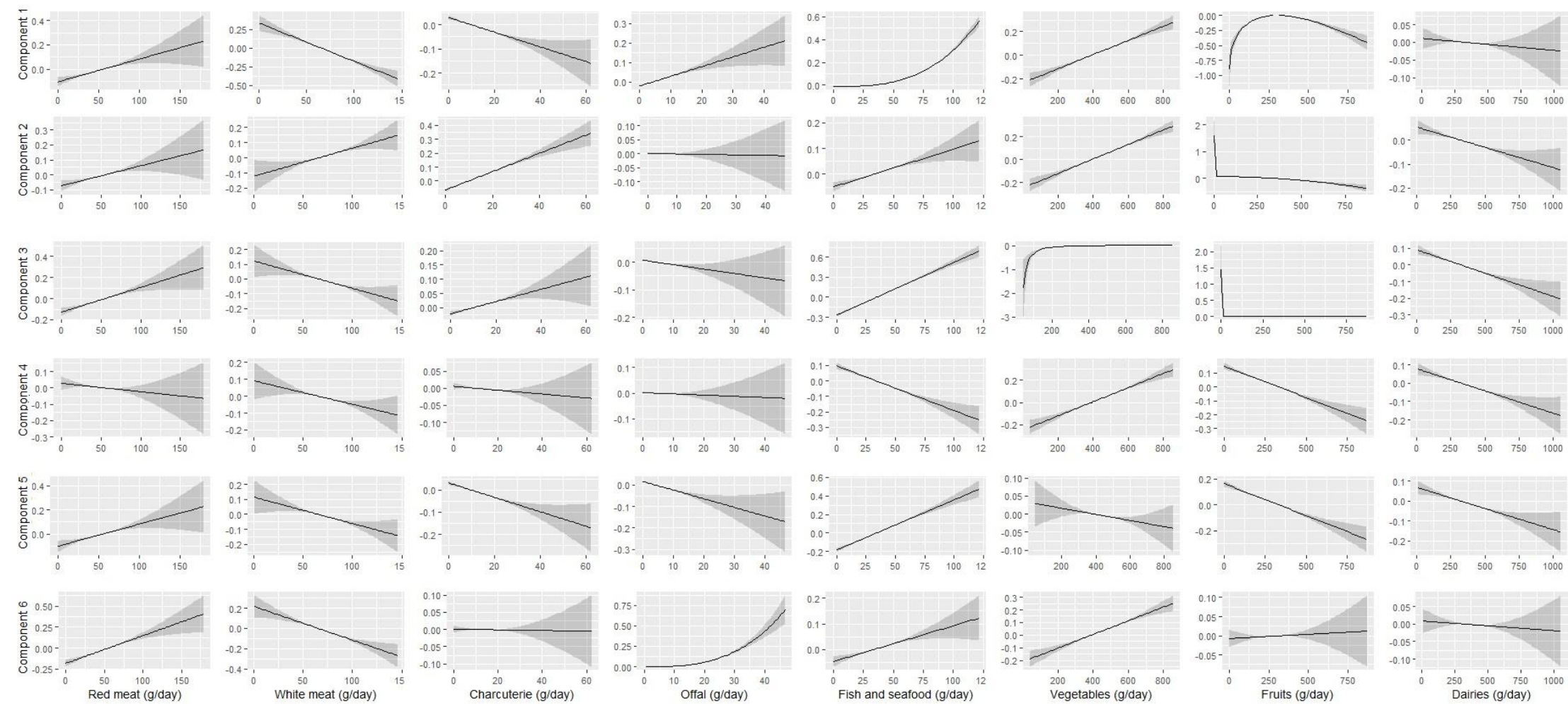
Supplementary figure 2: Heatmap with the Spearman rank correlation coefficients between biomarkers of 41 persistent organic pollutants in the blood samples of women of the French E3N cohort study (N=467).



Supplementary figure 3: Scree-plot showing the percentages of explained variance by the first 6 principal components identified by performing a principal component analysis on biomarkers of 41 persistent organic pollutants in the blood samples of women of the French E3N cohort study (N=467).



Supplementary figure 4A: Shape of the associations between anthropometric, socio-demographic and lifestyle characteristics and six profiles of persistent organic pollutants in the blood samples of women of the French E3N cohort study (N=467).



Supplementary figure 4B: Shape of the associations between dietary consumption and six profiles of persistent organic pollutants in the blood samples of women of the French E3N cohort study (N=467).

	Principal component 1		Principal component 2		Principal component 3		Principal component 4		Principal component 5		Principal component 6	
	β [95% CI]	p	β [95% CI]	p	β [95% CI]	p	β [95% CI]	p	β [95% CI]	p	β [95% CI]	p
Adherence to sPNNS-GS2, for one year	0.01 [-0.07,0.1]	0.73	-0.03 [-0.12,0.05]	0.448	-0.09 [-0.18,0]	0.046	0.02 [-0.07,0.11]	0.621	0.02 [-0.07,0.11]	0.617	NL	0.040
Adherence to sPNNS-GS2, shape of the association												

NL: Non-linear relationship

Supplementary figure 5: Estimation of regression coefficients (β) and their 95% Confidence Intervals (95% CI) and shapes of the associations between adherence to French dietary guidelines and six profiles of persistent organic pollutants in the blood samples of women of the French E3N cohort study (N=467)