

Supplementary Materials – “Cumulative risk assessment of five phthalates in European children and adolescents”

Table S1: Overview of analytical methods, limit of quantification (LOQs) and quantification frequencies per study

Phthalate	Metabolite	Age group	Study abbreviation	LOQ (µg/L)	% > LOQ	Analytical method
Di(2-ethylhexyl) phthalate (DEHP)	Mono(2-ethyl-5-hydroxyhexyl) phthalate (5-OH-MEHP)	Children	3xG	0.2	100	LC-MS/MS
			CROME	0.2	100	LC-MS/MS
			ESTEBAN	0.2	100	LC-MS/MS
			GerES V-sub (unweighted)	0.2	100	LC-MS/MS
			InAirQ	0.74	99	LC-MS/MS
			NEB II	0.5	100	LC-MS/MS
			OCC	0.14	100	LC-MS/MS
			SLO CRP	0.2	100	LC-MS/MS
			SPECIMEn-NL	0.2	100	LC-MS/MS
		Adolescents	BEA	0.2	100	LC-MS/MS
			CELSPAC: TE	0.2	99	LC-MS/MS
			CROME	0.2	100	LC-MS/MS
			ESTEBAN	0.2	100	LC-MS/MS
			FLEHS IV	0.2	100	LC-MS/MS
			GerES V-sub (unweighted)	0.2	100	LC-MS/MS
			NEB II	0.5	100	LC-MS/MS
			PCB cohort follow-up	0.2	100	LC-MS/MS
			SLO CRP	0.2	100	LC-MS/MS
	Mono-2-ethyl-5-oxohexyl phthalate (5-oxo-MEHP)	Children	3xG	0.2	100	LC-MS/MS
			CROME	0.2	99	LC-MS/MS
ESTEBAN			0.2	100	LC-MS/MS	
GerES V-sub (unweighted)			0.2	100	LC-MS/MS	
InAirQ			0.74	95	LC-MS/MS	
NEB II			0.5	100	LC-MS/MS	
OCC			0.2	100	LC-MS/MS	
SLO CRP			0.2	100	LC-MS/MS	
SPECIMEn-NL			0.2	100	LC-MS/MS	
Adolescents		BEA	0.2	100	LC-MS/MS	
		CELSPAC: TE	0.2	100	LC-MS/MS	
		CROME	0.2	100	LC-MS/MS	
			ESTEBAN	0.2	100	LC-MS/MS

			FLEHS IV	0.2	99	LC-MS/MS
			GerES V-sub (unweighted)	0.2	100	LC-MS/MS
			NEB II	0.5	100	LC-MS/MS
			PCB cohort follow-up	0.2	100	LC-MS/MS
			SLO CRP	0.2	100	LC-MS/MS
	Mono(2-ethyl-5-carboxypentyl) phthalate (5-cx-MEPP)	Children	3xG	0.2	100	LC-MS/MS
			CROME	0.2	100	LC-MS/MS
			ESTEBAN	0.2	100	LC-MS/MS
			GerES V-sub (unweighted)	0.2	100	LC-MS/MS
			InAirQ	0.37	100	LC-MS/MS
			NEB II	2	100	LC-MS/MS
			OCC	0.22	100	LC-MS/MS
			SLO CRP	0.2	100	LC-MS/MS
			SPECIMEn-NL	0.2	100	LC-MS/MS
		Adolescents	BEA	0.2	100	LC-MS/MS
			CELSPAC: Teenagers	0.2	100	LC-MS/MS
			CROME	0.2	100	LC-MS/MS
			ESTEBAN	0.2	100	LC-MS/MS
			FLEHS IV	0.5	100	LC-MS/MS
			GerES V-sub (unweighted)	0.2	100	LC-MS/MS
NEB II			2	100	LC-MS/MS	
PCB cohort follow-up			0.2	99	LC-MS/MS	
SLO CRP			0.2	100	LC-MS/MS	
Butyl benzyl phthalate (BBzP)	Monobenzyl phthalate (MBzP)	Children	3xG	0.2	98	LC-MS/MS
			CROME	0.2	97	LC-MS/MS
			ESTEBAN	0.2	100	LC-MS/MS
			GerES V-sub (unweighted)	0.2	100	LC-MS/MS
			InAirQ	0.37	87	LC-MS/MS
			NEB II	0.2	100	LC-MS/MS
			OCC	0.08	99	LC-MS/MS
			SLO CRP	0.2	100	LC-MS/MS
			SPECIMEn-NL	0.2	96	LC-MS/MS
	Adolescents	BEA	0.2	96	LC-MS/MS	
		CELSPAC: TE	0.3	95	LC-MS/MS	

			CROME	0.2	96	LC-MS/MS	
			ESTEBAN	0.2	99	LC-MS/MS	
			FLEHS IV	0.2	98	LC-MS/MS	
			GerES V-sub (unweighted)	0.2	100	LC-MS/MS	
			NEB II	0.2	100	LC-MS/MS	
			PCB cohort follow-up	0.3	92	LC-MS/MS	
			SLO CRP	0.2	100	LC-MS/MS	
Di-isobutyl phthalate (DiBP)	Monoisobutyl phthalate (MiBP)	Children	3xG	0.4	100	LC-MS/MS	
			CROME	0.2	100	LC-MS/MS	
			ESTEBAN	1	100	LC-MS/MS	
			GerES V-sub (unweighted)	1	100	LC-MS/MS	
			InAirQ	0.74	100	LC-MS/MS	
			NEB II	0.5	100	LC-MS/MS	
			OCC	0.47	100	LC-MS/MS	
			SLO CRP	1	100	LC-MS/MS	
			SPECIMEn-NL	1	100	LC-MS/MS	
		Adolescents	BEA	1	100	LC-MS/MS	
			CELSPAC: TE	0.2	97	LC-MS/MS	
			CROME	0.2	100	LC-MS/MS	
			ESTEBAN	1	100	LC-MS/MS	
			FLEHS IV	0.5	100	LC-MS/MS	
			GerES V-sub (unweighted)	1	100	LC-MS/MS	
			NEB II	0.5	100	LC-MS/MS	
PCB cohort follow-up	0.2		99	LC-MS/MS			
SLO CRP	1		100	LC-MS/MS			
Di-n-butyl phthalate (DnBP)	Mono-n-butyl phthalate (MnBP)	Children	3xG	0.4	100	LC-MS/MS	
			CROME	0.2	100	LC-MS/MS	
			ESTEBAN	1	100	LC-MS/MS	
			GerES V-sub (unweighted)	1	100	LC-MS/MS	
			InAirQ	0.74	99	LC-MS/MS	
			NEB II	0.5	100	LC-MS/MS	
			OCC	0.53	100	LC-MS/MS	
			SLO CRP	1	100	LC-MS/MS	
			SPECIMEn-NL	1	100	LC-MS/MS	

		Adolescents	BEA	1	100	LC-MS/MS
			CELSPAC: TE	0.4	91	LC-MS/MS
			CROME	0.2	100	LC-MS/MS
			ESTEBAN	1	100	LC-MS/MS
			FLEHS IV	0.5	100	LC-MS/MS
			GerES V-sub (unweighted)	1	100	LC-MS/MS
			NEB II	0.5	100	LC-MS/MS
			PCB cohort	0.4	99	LC-MS/MS
			SLO CRP	1	100	LC-MS/MS
Di-isononyl phthalate (DiNP)	Mono-hydroxy-isononyl phthalate (OH-MiNP)	Children	3xG	0.2	85	LC-MS/MS
			CROME	0.2	96	LC-MS/MS
			ESTEBAN	0.2	100	LC-MS/MS
			GerES V-sub (unweighted)	0.2	100	LC-MS/MS
			InAirQ	0.15	93	LC-MS/MS
			NEB II	0.5	100	LC-MS/MS
			OCC	0.1	99	LC-MS/MS
			SLO CRP	0.2	100	LC-MS/MS
			SPECIMEn-NL	0.2	100	LC-MS/MS
		Adolescents	BEA	0.2	100	LC-MS/MS
			CELSPAC: TE	0.7	98	LC-MS/MS
			CROME	0.2	99	LC-MS/MS
			ESTEBAN	0.2	100	LC-MS/MS
			FLEHS IV	0.2	100	LC-MS/MS
			GerES V-sub (unweighted)	0.2	100	LC-MS/MS
			NEB II	0.5	99	LC-MS/MS
			PCB cohort follow-up	0.7	100	LC-MS/MS
			SLO CRP	0.2	100	LC-MS/MS
	Mono-carboxy-isononyl phthalate (cx-MiNP)	Children	3xG	0.2	65	LC-MS/MS
			CROME	0.2	99	LC-MS/MS
			ESTEBAN	0.2	100	LC-MS/MS
			GerES V-sub (unweighted)	0.2	100	LC-MS/MS
			InAirQ	0.15	99	LC-MS/MS
			NEB II	2	100	LC-MS/MS
			OCC	0.11	100	LC-MS/MS
			SLO CRP	0.2	100	LC-MS/MS

			SPECIMEn-NL	0.2	100	LC-MS/MS
		Adolescents	BEA	0.2	100	LC-MS/MS
			CELSPAC: TE	0.4	100	LC-MS/MS
			CROME	0.2	99	LC-MS/MS
			ESTEBAN	0.2	100	LC-MS/MS
			FLEHS IV	0.2	100	LC-MS/MS
			GerES V-sub (unweighted)	0.2	100	LC-MS/MS
			NEB II	2	100	LC-MS/MS
			PCB cohort follow-up	0.4	99	LC-MS/MS
			SLO CRP	0.2	100	LC-MS/MS

LC = Liquid chromatography; MS/MS = tandem mass spectrometry; LOQ = limit of quantification. 3xG = Health – Municipalities – Births study (BE), CROME = Cross-Mediterranean Environment and Health Network study (EL), ESTEBAN = Health study on environment, biomonitoring, physical activity and nutrition study (FR), GerES V-sub (unweighted) = German Environmental Survey 2014-2017 subsample (DE), InAirQ = Transnational Adaption Actions for Integrated Indoor Air Quality Management study (HU), NEB II = Norwegian Environmental Biobank II (NO), OCC = Odense Child Cohort (DK), SLO CRP = Exposure of children and adolescents to selected chemicals through their habitat environment study (SI), SPECIMEn-NL = Survey on PEstiCide Mixtures in Europe (NL), BEA = Biomonitoring in Adolescents study (ES), CELSPAC:TE = Central European Longitudinal Studies of Parents and Children: Teenagers (CZ), FLEHS IV = Flemish Environment and Health Study IV (BE), PCB cohort follow-up = Endocrine disruptors and health in children and teenagers in Slovakia (SK).

Table S2a: Percentage of European children above various hazard indices (HI) and descriptive statistics for HIs per study

Region	Country	Study Name	N	% > HI = 1	% > HI = 0.2	% > HI = 0.1	GM _{HI}	95 th CI	P95 _{HI}	95 th CI	Min _{HI}	Max _{HI}
North	Norway	NEB II	300	22	94	100	0.61	0.55 - 0.67	2.01	1.72 - 3.51	1.72	3.51
	Denmark	OCC	300	3	63	87	0.24	0.22 - 0.26	0.82	0.65 - 1.08	0.65	1.08
South	Slovenia	SLO CRP	149	18	92	100	0.50	0.44 - 0.56	1.51	1.18 - 2.66	1.18	2.66
	Greece	CROME	161	19	94	98	0.57	0.51 - 0.63	1.80	1.44 - 2.61	1.44	2.61
East	Hungary	InAirQ	262	18	78	92	0.40	0.36 - 0.45	1.74	1.44 - 2.56	1.44	2.56
West	France	ESTEBAN	286	30	95	100	0.68	0.63 - 0.74	2.14	1.9 - 3.22	1.9	3.22
	Germany	GerES V-sub (unweighted)	300	15	91	99	0.51	0.47 - 0.55	1.42	1.21 - 1.72	1.21	1.72
	Belgium	3xG	133	19	87	96	0.51	0.44 - 0.59	1.91	1.59 - 3.44	1.59	3.44
	The Netherland	SPECIMEn-NL	89	5	79	100	0.34	0.31 - 0.39	0.88	0.67 - 1.41	0.67	1.41

N = number of study participants; HI = hazard index; GM_{HI} = geometric mean of the hazard index; 95th CI = confidence interval; P95_{HI} = 95th percentile of the hazard index; Min_{HI} = minimum value of the hazard index; Max_{HI} = maximum value of the hazard index. All values are rounded.

Table S2b: Percentage of European adolescents above various hazard indices (HI) and descriptive statistics for HIs per study

Region	Country	Study Name	N	% > HI = 1	% > HI = 0.2	% > HI = 0.1	GM _{HI}	95 th CI	P95 _{HI}	95 th CI	Min _{HI}	Max _{HI}
North	Norway	NEB II	181	20	96	100	0.6	0.54 - 0.67	2.29	1.9 - 3.62	1.9	3.62
South	Slovenia	SLO CRP	96	8	82	95	0.34	0.3 - 0.39	1.21	0.79 - 1.64	0.79	1.64
	Greece	CROME	150	11	79	94	0.35	0.31 - 0.4	1.17	1.04 - 1.79	1.04	1.7
	Spain	BEA	300	5	62	88	0.25	0.22 - 0.27	0.97	0.8 - 1.34	0.8	1.34
East	Czech Republic	CELSPAC: TE	300	28	90	97	0.57	0.52 - 0.63	2.15	1.93 - 2.45	1.93	2.45
	Slovakia	PCB cohort follow-up	287	47	94	98	0.84	0.76 - 0.92	2.99	2.67 - 3.21	2.67	3.21
West	France	ESTEBAN	304	15	92	99	0.5	0.46 - 0.54	1.43	1.26 - 2.15	1.26	2.15
	Germany	GerES V-sub (unweighted)	300	7	73	95	0.33	0.3 - 0.36	1.13	0.96 - 1.45	0.96	1.45
	Belgium	FLEHS IV	300	4	58	86	0.23	0.21 - 0.25	0.83	0.71 - 1.31	0.71	1.31

N = number of study participants; HI = hazard index; GM_{HI} = geometric mean of the hazard index; 95th CI = confidence interval; P95_{HI} = 95th percentile of the hazard index; Min_{HI} = minimum value of the hazard index; Max_{HI} = maximum value of the hazard index. All values are rounded.