

Supplementary data

Phthalate exposure and all-cause and cause-specific mortality in overweight and obese adults: a national cohort study

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1. eTables

eTable 1. Association of individual urinary phthalate metabolite with all-cause mortality, CVD mortality and cancer mortality among individual with overweight and obesity.

	All-cause mortality	CVD mortality	Cancer mortality
mono-ethyl phthalate (MEP)			
Continuous	1.03 (0.97,1.08)	1.07 (0.98,1.18)	1.01 (0.9,1.12)
Tertile 1	1.0 (reference)	1.0 (reference)	1.0 (reference)
Tertile 2	0.95 (0.76,1.17)	1.10 (0.75,1.63)	1.07 (0.68,1.69)
Tertile 3	1.12 (0.91,1.37)	1.38 (1.01,1.87)	1.06 (0.63,1.77)
mono-benzyl phthalate (MBzP)			
Continuous	1.11 (1.05,1.17)	1.07 (0.95,1.2)	1.13 (0.99,1.28)
Tertile 1	1.0 (reference)	1.0 (reference)	1.0 (reference)
Tertile 2	0.97 (0.78,1.2)	0.89 (0.61,1.28)	1.00 (0.61,1.63)
Tertile 3	1.15 (0.92,1.44)	0.95 (0.64,1.40)	1.13 (0.67,1.90)
mono-n-butyl phthalate (MnBP)			
Continuous	1.16 (1.05,1.27)	1.11 (0.95,1.28)	1.17 (1.00,1.37)
Tertile 1	1.0 (reference)	1.0 (reference)	1.0 (reference)
Tertile 2	1.21 (0.96,1.52)	1.58 (0.99,2.53)	1.12 (0.76,1.64)
Tertile 3	1.40 (1.11,1.76)	1.54 (0.95,2.50)	1.25 (0.83,1.86)
mono-isobutyl phthalate (MiBP)			
Continuous	1.11 (1.02,1.21)	1.07 (0.94,1.22)	1.06 (0.87,1.29)
Tertile 1	1.0 (reference)	1.0 (reference)	1.0 (reference)
Tertile 2	1.06 (0.85,1.32)	0.97 (0.69,1.35)	0.96 (0.63,1.46)
Tertile 3	1.12 (0.85,1.49)	0.95 (0.61,1.48)	0.88 (0.45,1.71)
mono-(3-carboxypropyl) phthalate (MCPP)			
Continuous	1.01 (0.94,1.08)	1.05 (0.93,1.18)	0.90 (0.78,1.04)
Tertile 1	1.0 (reference)	1.0 (reference)	1.0 (reference)
Tertile 2	1.01 (0.82,1.25)	0.89 (0.62,1.26)	0.91 (0.59,1.40)
Tertile 3	1.10 (0.90,1.35)	1.26 (0.90,1.75)	0.72 (0.47,1.09)
mono-2-ethyl hexyl phthalate (MEHP)			
Continuous	1.09 (1.01,1.18)	1.13 (0.95,1.34)	1.03 (0.89,1.2)
Tertile 1	1.0 (reference)	1.0 (reference)	1.0 (reference)
Tertile 2	1.01 (0.80,1.28)	1.12 (0.77,1.62)	1.12 (0.72,1.73)
Tertile 3	1.20 (0.96,1.49)	1.26 (0.83,1.92)	1.17 (0.75,1.83)
mono-(2-ethyl-5hydroxyhexyl) phthalate (MEHHP)			
Continuous	1.10 (1.02,1.18)	1.11 (0.95,1.29)	1.01 (0.85,1.2)
Tertile 1	1.0 (reference)	1.0 (reference)	1.0 (reference)
Tertile 2	1.02 (0.84,1.25)	1.15 (0.78,1.70)	0.73 (0.48,1.13)
Tertile 3	1.39 (1.11,1.74)	1.61 (1.06,2.44)	0.81 (0.46,1.43)
mono-(2-ethyl-5-oxohexyl) phthalate (MEOHP)			
Continuous	1.10 (1.02,1.18)	1.13 (0.97,1.32)	1.00 (0.84,1.20)
Tertile 1	1.0 (reference)	1.0 (reference)	1.0 (reference)
Tertile 2	1.15 (0.93,1.41)	1.35 (0.98,1.86)	0.76 (0.50,1.15)
Tertile 3	1.34 (1.08,1.66)	1.79 (1.19,2.68)	0.81 (0.48,1.38)
mono-(2-ethyl-5-carboxypentyl) phthalate (MECPP)			
Continuous	1.10 (1.01,1.21)	1.15 (0.93,1.41)	0.96 (0.78,1.18)
Tertile 1	1.0 (reference)	1.0 (reference)	1.0 (reference)
Tertile 2	1.04 (0.82,1.32)	1.26 (0.79,2.01)	0.62 (0.38,1.00)
Tertile 3	1.29 (0.99,1.67)	1.47 (0.89,2.42)	0.74 (0.41,1.34)

Adjusted for age, sex, race/ethnicity, education, family income status, smoking, alcohol drinking, physical activity, total energy intake, healthy eating index score, and survey year.

Boldface indicates statistically significance.

eTable 2. Association of urinary phthalate metabolites with all-cause mortality, CVD mortality and cancer mortality among individual with excess adiposity (n = 3197).

Variable	Model	Tertile 1 HR (95% CI)	Tertile 2 HR (95% CI)	Tertile 3 HR (95% CI)	P for trend	Ln(X)
All-cause mortality						
LMW	Model 1	1 [Reference]	1.08 (0.87,1.34)	1.34 (1.11,1.61)	0.00	1.08 (1.01,1.14)
	Model 2	1 [Reference]	1.01 (0.81,1.25)	1.28 (1.04,1.58)	0.02	1.06 (1.00,1.13)
HMW	Model 1	1 [Reference]	1.17 (0.95,1.45)	1.39 (1.10,1.76)	0.01	1.11 (1.02,1.21)
	Model 2	1 [Reference]	1.16 (0.93,1.43)	1.36 (1.07,1.74)	0.00	1.13 (1.03,1.23)
DEHP	Model 1	1 [Reference]	1.08 (0.86,1.35)	1.27 (0.98,1.63)	0.07	1.08 (0.99,1.17)
	Model 2	1 [Reference]	1.10 (0.86,1.41)	1.36 (1.04,1.76)	0.02	1.11 (1.03,1.21)
CVD mortality						
LMW	Model 1	1 [Reference]	1.20 (0.77,1.87)	1.67 (1.26,2.22)	0.00	1.13 (1.02,1.25)
	Model 2	1 [Reference]	1.12 (0.70,1.79)	1.64 (1.21,2.23)	0.00	1.12 (1.01,1.23)
HMW	Model 1	1 [Reference]	1.32 (0.93,1.86)	1.57 (1.01,2.44)	0.05	1.08 (0.93,1.24)
	Model 2	1 [Reference]	1.29 (0.89,1.87)	1.53 (0.93,2.52)	0.09	1.10 (0.94,1.29)
DEHP	Model 1	1 [Reference]	1.03 (0.72,1.47)	1.37 (0.91,2.07)	0.13	1.04 (0.92,1.18)
	Model 2	1 [Reference]	1.07 (0.72,1.58)	1.49 (0.91,2.44)	0.11	1.08 (0.94,1.25)
Cancer mortality						
LMW	Model 1	1 [Reference]	0.89 (0.56,1.43)	1.03 (0.64,1.65)	0.90	1.02 (0.91,1.15)
	Model 2	1 [Reference]	0.84 (0.53,1.33)	0.94 (0.58,1.52)	0.82	1.00 (0.88,1.13)
HMW	Model 1	1 [Reference]	0.82 (0.54,1.25)	0.85 (0.52,1.38)	0.54	0.97 (0.79,1.20)
	Model 2	1 [Reference]	0.82 (0.52,1.29)	0.85 (0.51,1.43)	0.58	0.99 (0.79,1.22)
DEHP	Model 1	1 [Reference]	0.65 (0.42,1.02)	0.76 (0.43,1.34)	0.38	0.95 (0.77,1.17)
	Model 2	1 [Reference]	0.63 (0.38,1.02)	0.77 (0.42,1.42)	0.47	0.97 (0.77,1.21)

Model 1: adjustment for age, sex, and urinary creatinine.
Model 2: model 1 + race/ethnicity, family income, education, smoking, alcohol drinking, physical activity, total energy intake, HEI2010 score, survey year.

eTable 3. Stratified analyses for the association of urinary phthalates levels with all-cause mortality among individuals overweight and obesity.

Characteristic		LMW				HMW				DEHP			
		Tertile 1	Tertile 2	Tertile 3	P value for interaction	Tertile 1	Tertile 2	Tertile 3	P value for interaction	Tertile 1	Tertile 2	Tertile 3	P value for interaction
Age, years	< 60	1 [reference]	1.08 (0.67,1.75)	1.06 (0.62,1.82)	0.6592	1 [reference]	0.91 (0.56,1.47)	1.56 (0.9,2.71)	0.7017	1 [reference]	0.77 (0.5,1.19)	1.09 (0.62,1.93)	0.6488
	60+	1 [reference]	0.94 (0.73,1.23)	1.14 (0.92,1.42)		1 [reference]	1.25 (1,1.56)	1.42 (1.1,1.83)		1 [reference]	1.34 (1.04,1.74)	1.42 (1.06,1.9)	
Sex, %	Male	1 [reference]	0.94 (0.73,1.22)	1.22 (0.95,1.55)	0.798	1 [reference]	1.25 (0.96,1.63)	1.44 (1.09,1.91)	0.7448	1 [reference]	1.3 (1.02,1.65)	1.33 (0.98,1.79)	0.7437
	Female	1 [reference]	1.01 (0.74,1.36)	1.18 (0.83,1.66)		1 [reference]	1.14 (0.81,1.62)	1.64 (1.09,2.47)		1 [reference]	0.92 (0.63,1.34)	1.46 (0.97,2.21)	
Race/ethnicity	White	1 [reference]	1 (0.76,1.32)	1.31 (1.05,1.64)	0.0814	1 [reference]	1.23 (0.97,1.56)	1.53 (1.16,2.01)	0.9279	1 [reference]	1.14 (0.88,1.48)	1.33 (1.1,1.77)	0.1896
	non-white	1 [reference]	0.79 (0.6,1.04)	0.78 (0.54,1.11)		1 [reference]	1.12 (0.76,1.65)	1.26 (0.83,1.91)		1 [reference]	1.21 (0.8,1.83)	1.68 (1.04,2.74)	
Diet quality	Lower	1 [reference]	1.11 (0.81,1.51)	1.36 (1.04,1.79)	0.2109	1 [reference]	1.17 (0.86,1.58)	1.45 (1.05,2)	0.7369	1 [reference]	0.94 (0.69,1.29)	1.15 (0.83,1.6)	0.9014
	Higher	1 [reference]	0.86 (0.65,1.13)	1.07 (0.81,1.4)		1 [reference]	1.15 (0.88,1.51)	1.53 (1.1,2.13)		1 [reference]	1.23 (0.95,1.61)	1.6 (1.18,2.19)	
Physical activity	Lower	1 [reference]	0.93 (0.71,1.22)	1.32 (1.01,1.73)	0.0102	1 [reference]	1.11 (0.83,1.5)	1.38 (1.02,1.87)	0.1493	1 [reference]	1.05 (0.8,1.4)	1.2 (0.91,1.59)	0.2148
	Higher	1 [reference]	1 (0.72,1.41)	1.04 (0.79,1.37)		1 [reference]	1.26 (0.9,1.76)	1.55 (1.07,2.26)		1 [reference]	1.14 (0.86,1.52)	1.52 (1.04,2.2)	

Adjusted for age, sex, race/ethnicity, education, family income status, smoking, alcohol drinking, physical activity, total energy intake, healthy eating index score, and survey year.

Boldface indicates statistical significance.

eTable 4. Stratified analyses for the association of urinary phthalates levels with CVD mortality among individuals overweight and obesity.

Characteristic		LMW				HMW				DEHP			
		Tertile 1	Tertile 2	Tertile 3	P value for interaction	Tertile 1	Tertile 2	Tertile 3	P value for interaction	Tertile 1	Tertile 2	Tertile 3	P value for interaction
Age, years	< 60	1 [reference]	1.64 (0.37,7.24)	1.2 (0.35,4.1)	0.7922	1 [reference]	1.19 (0.29,4.92)	2.94 (0.79,10.96)	0.3488	1 [reference]	1.05 (0.31,3.6)	1.77 (0.53,5.9)	0.7014
	60+	1 [reference]	0.99 (0.66,1.48)	1.39 (1,1.93)		1 [reference]	1.33 (0.85,2.06)	1.27 (0.79,2.05)		1 [reference]	1.31 (0.89,1.94)	1.36 (0.83,2.23)	
Sex, %	Male	1 [reference]	1.21 (0.74,1.98)	1.46 (0.92,2.32)	0.8078	1 [reference]	1.75 (1.03,2.97)	1.73 (1.06,2.83)	0.4127	1 [reference]	1.82 (1.2,2.77)	1.63 (1,2.66)	0.6583
	Female	1 [reference]	1 (0.54,1.85)	1.57 (0.87,2.86)		1 [reference]	1.08 (0.58,2)	1.29 (0.57,2.91)		1 [reference]	0.72 (0.35,1.47)	1.51 (0.76,3.01)	
Race/ethnicity	White	1 [reference]	1.17 (0.73,1.89)	1.65 (1.13,2.41)	0.0357	1 [reference]	1.46 (0.92,2.31)	1.55 (0.92,2.61)	0.9489	1 [reference]	1.27 (0.84,1.92)	1.46 (0.9,2.37)	0.356
	non-white	1 [reference]	0.75 (0.39,1.43)	0.49 (0.23,1.07)		1 [reference]	1.13 (0.53,2.41)	1.05 (0.45,2.47)		1 [reference]	1.28 (0.59,2.78)	1.74 (0.61,5)	
Diet quality	Lower	1 [reference]	1.06 (0.56,2.02)	1.66 (1.11,2.49)	0.1886	1 [reference]	0.95 (0.54,1.69)	1.17 (0.59,2.32)	0.7575	1 [reference]	0.7 (0.44,1.13)	1.06 (0.55,2.04)	0.9107
	Higher	1 [reference]	1.1 (0.63,1.9)	1.28 (0.77,2.14)		1 [reference]	1.94 (1.06,3.58)	2.01 (1.12,3.62)		1 [reference]	2.22 (1.2,4.09)	2.29 (1.23,4.24)	
Physical activity	Lower	1 [reference]	0.94 (0.58,1.53)	1.56 (0.94,2.57)	0.1916	1 [reference]	1.25 (0.76,2.06)	1.27 (0.71,2.27)	0.7233	1 [reference]	1.04 (0.62,1.74)	1.14 (0.67,1.94)	0.8312
	Higher	1 [reference]	1.36 (0.69,2.66)	1.34 (0.76,2.34)		1 [reference]	1.73 (0.86,3.5)	2.07 (1.04,4.12)		1 [reference]	1.57 (0.82,2.99)	2.23 (1.1,4.54)	

Adjusted for age, sex, race/ethnicity, education, family income status, smoking, alcohol drinking, physical activity, total energy intake, healthy eating index score, and survey year.

Boldface indicates statistical significance.

eTable 5. Stratified analyses for the association of urinary phthalates levels with cancer mortality among individuals overweight and obesity.													
Characteristic		LMW				HMW				DEHP			
		Tertile 1	Tertile 2	Tertile 3	P value for interaction	Tertile 1	Tertile 2	Tertile 3	P value for interaction	Tertile 1	Tertile 2	Tertile 3	P value for interaction
Age, years	< 60	1 [reference]	0.73 (0.3,1.77)	0.94 (0.37,2.37)	0.8667	1 [reference]	0.58 (0.29,1.13)	1.14 (0.53,2.46)	0.8953	1 [reference]	0.4 (0.19,0.84)	0.71 (0.29,1.73)	0.5962
	60+	1 [reference]	0.88 (0.55,1.41)	1.02 (0.64,1.62)		1 [reference]	0.97 (0.58,1.61)	0.98 (0.57,1.69)		1 [reference]	0.98 (0.58,1.66)	1 (0.57,1.74)	
Sex, %	Male	1 [reference]	0.65 (0.38,1.11)	0.82 (0.51,1.31)	0.0775	1 [reference]	1.08 (0.66,1.77)	1.28 (0.75,2.2)	0.9695	1 [reference]	0.88 (0.52,1.51)	1.05 (0.57,1.94)	0.9376
	Female	1 [reference]	1.09 (0.49,2.44)	1.42 (0.59,3.37)		1 [reference]	0.64 (0.34,1.2)	0.79 (0.37,1.72)		1 [reference]	0.54 (0.26,1.15)	0.62 (0.26,1.5)	
Race/ ethnicity	White	1 [reference]	0.86 (0.5,1.49)	0.98 (0.55,1.72)	0.9382	1 [reference]	0.82 (0.49,1.37)	1.03 (0.57,1.87)	0.6057	1 [reference]	0.7 (0.4,1.23)	0.78 (0.38,1.61)	0.8345
	non-white	1 [reference]	0.57 (0.31,1.07)	1.19 (0.62,2.27)		1 [reference]	0.94 (0.52,1.69)	0.94 (0.48,1.83)		1 [reference]	0.72 (0.35,1.47)	1.07 (0.41,2.75)	
Diet quality	Lower	1 [reference]	1.15 (0.57,2.3)	1.23 (0.67,2.24)	0.8357	1 [reference]	1.07 (0.52,2.19)	1.03 (0.51,2.09)	0.5436	1 [reference]	0.54 (0.23,1.28)	0.53 (0.22,1.31)	0.2071
	Higher	1 [reference]	0.65 (0.36,1.16)	0.93 (0.48,1.79)		1 [reference]	0.68 (0.41,1.15)	1.06 (0.59,1.93)		1 [reference]	0.84 (0.52,1.35)	1.24 (0.64,2.43)	
Physical activity	Lower	1 [reference]	1.05 (0.56,1.97)	1.39 (0.72,2.68)	0.5248	1 [reference]	0.75 (0.41,1.39)	0.73 (0.4,1.35)	0.2469	1 [reference]	0.72 (0.4,1.29)	0.57 (0.28,1.14)	0.1856
	Higher	1 [reference]	0.69 (0.37,1.27)	0.83 (0.46,1.48)		1 [reference]	0.79 (0.43,1.45)	1.24 (0.58,2.65)		1 [reference]	0.59 (0.32,1.12)	1.08 (0.46,2.55)	

Adjusted for age, sex, race/ethnicity, education, family income status, smoking, alcohol drinking, physical activity, total energy intake, healthy eating index score, and survey year.
Boldface indicates statistically significance.

eTable 6. Sensitivity analysis for the association of urinary phthalate metabolite with mortality without NHANES 2001–2002.

Variable	Model	Tertile 1 HR (95% CI)	Tertile 2 HR (95% CI)	Tertile 3 HR (95% CI)	Ln(x)
All-cause mortality					
LMW	Model 1	1 [Reference]	0.95 (0.74,1.23)	1.17 (0.93,1.47)	1.02 (0.95,1.10)
	Model 2	1 [Reference]	0.92 (0.70,1.19)	1.14 (0.89,1.46)	1.01 (0.94,1.09)
	Model 3	1 [Reference]	0.92 (0.71,1.20)	1.14 (0.89,1.46)	1.01 (0.94,1.09)
HMW	Model 1	1 [Reference]	1.10 (0.87,1.40)	1.41 (1.08,1.85)	1.11 (1.00,1.23)
	Model 2	1 [Reference]	1.09 (0.87,1.38)	1.38 (1.07,1.79)	1.14 (1.03,1.25)
	Model 3	1 [Reference]	1.09 (0.86,1.38)	1.37 (1.06,1.78)	1.13 (1.02,1.25)
DEHP	Model 1	1 [Reference]	1.09 (0.86,1.38)	1.27 (0.97,1.65)	1.09 (0.99,1.20)
	Model 2	1 [Reference]	1.13 (0.89,1.43)	1.30 (1.00,1.68)	1.12 (1.03,1.23)
	Model 3	1 [Reference]	1.12 (0.89,1.42)	1.28 (0.99,1.67)	1.12 (1.02,1.22)
CVD mortality					
LMW	Model 1	1 [Reference]	0.96 (0.61,1.51)	1.46 (1.07,2.00)	1.07 (0.95,1.22)
	Model 2	1 [Reference]	0.93 (0.58,1.50)	1.43 (1.01,2.03)	1.06 (0.94,1.21)
	Model 3	1 [Reference]	0.96 (0.60,1.53)	1.44 (1.00,2.06)	1.06 (0.94,1.21)
HMW	Model 1	1 [Reference]	1.23 (0.80,1.89)	1.60 (0.96,2.67)	1.15 (0.93,1.42)
	Model 2	1 [Reference]	1.23 (0.76,1.98)	1.58 (0.92,2.71)	1.19 (0.95,1.48)
	Model 3	1 [Reference]	1.22 (0.75,1.96)	1.52 (0.89,2.59)	1.16 (0.93,1.46)
DEHP	Model 1	1 [Reference]	1.21 (0.83,1.76)	1.53 (0.94,2.51)	1.14 (0.93,1.39)
	Model 2	1 [Reference]	1.27 (0.85,1.91)	1.60 (0.93,2.75)	1.18 (0.96,1.45)
	Model 3	1 [Reference]	1.24 (0.84,1.84)	1.53 (0.91,2.59)	1.16 (0.94,1.43)
Cancer mortality					
LMW	Model 1	1 [Reference]	0.83 (0.50,1.39)	0.96 (0.55,1.68)	1.00 (0.87,1.14)
	Model 2	1 [Reference]	0.82 (0.49,1.35)	0.94 (0.54,1.66)	0.98 (0.86,1.13)
	Model 3	1 [Reference]	0.82 (0.49,1.37)	0.94 (0.54,1.66)	0.98 (0.85,1.13)
HMW	Model 1	1 [Reference]	0.80 (0.52,1.25)	1.04 (0.61,1.78)	0.95 (0.76,1.19)
	Model 2	1 [Reference]	0.85 (0.54,1.34)	1.11 (0.64,1.91)	1.00 (0.81,1.24)
	Model 3	1 [Reference]	0.84 (0.53,1.32)	1.09 (0.63,1.90)	1.00 (0.80,1.24)
DEHP	Model 1	1 [Reference]	0.73 (0.48,1.13)	0.81 (0.44,1.50)	0.93 (0.74,1.17)
	Model 2	1 [Reference]	0.78 (0.50,1.21)	0.89 (0.47,1.66)	0.98 (0.79,1.22)
	Model 3	1 [Reference]	0.77 (0.49,1.20)	0.87 (0.46,1.66)	0.98 (0.78,1.23)

Model 1: adjustment for age, sex, and urinary creatinine.

Model 2: model 1 + race/ethnicity, family income, education, smoking, alcohol drinking, physical activity, total energy intake, HEI2010 score, survey year.

Model 3: model 2 + BMI.

Boldface indicates statistical significance.

eTable 7. Sensitivity analysis for the association of urinary phthalate metabolite with mortality after additional adjustment for BPA.

Variable	Tertile 1 HR (95% CI)	Tertile 2 HR (95% CI)	3 HR (95% CI)	Ln(x)
All-cause mortality				
LMW	1 [Reference]	0.91 (0.70,1.18)	1.11 (0.87,1.41)	1.00 (0.93,1.07)
HMW	1 [Reference]	1.06 (0.84,1.35)	1.32 (1.01,1.72)	1.11 (1.00,1.24)
DEHP	1 [Reference]	1.09 (0.86,1.38)	1.24 (0.94,1.62)	1.10 (1.00,1.21)
CVD mortality				
LMW	1 [Reference]	0.94 (0.59,1.51)	1.39 (0.97,1.98)	1.05 (0.93,1.19)
HMW	1 [Reference]	1.18 (0.73,1.92)	1.44 (0.82,2.55)	1.14 (0.90,1.46)
DEHP	1 [Reference]	1.20 (0.80,1.78)	1.46 (0.84,2.56)	1.14 (0.91,1.43)
Cancer mortality				
LMW	1 [Reference]	0.81 (0.49,1.36)	0.92 (0.53,1.61)	0.98 (0.85,1.12)
HMW	1 [Reference]	0.82 (0.51,1.32)	1.06 (0.61,1.82)	0.98 (0.79,1.22)
DEHP	1 [Reference]	0.75 (0.48,1.19)	0.85 (0.45,1.59)	0.97 (0.77,1.21)

Adjusted for urinary bisphenol A, age, sex, race/ethnicity, education, family income status, smoking, alcohol drinking, physical activity, total energy intake, healthy eating index score, and survey year.

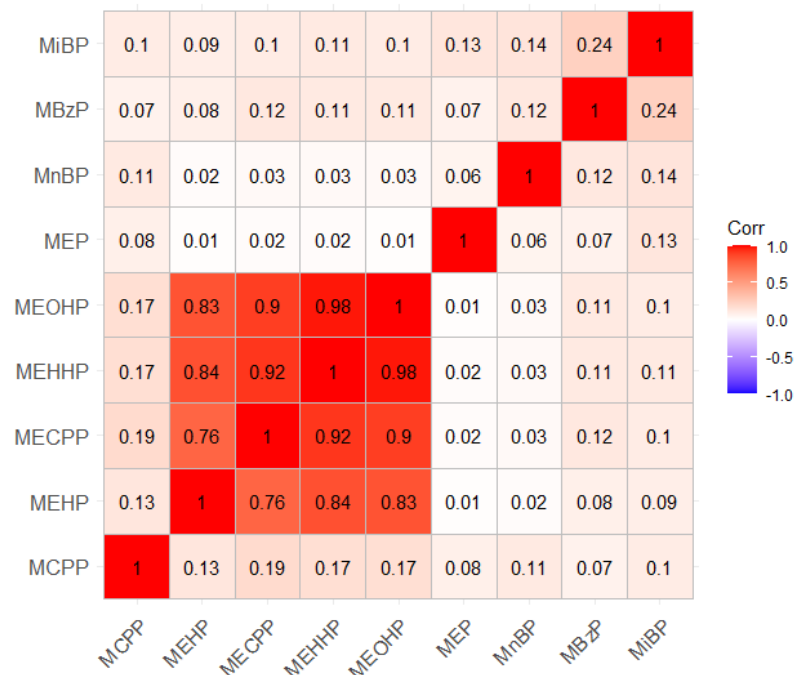
eTable 8. Hierarchical posterior inclusion probabilities (PIPs) from BKMR for CVD mortality.

Variable	Group	GroupPIP	CondPIP
mono-ethyl phthalate (MEP)	1	0	0
mono-benzyl phthalate (MBzP)	2	0.018	1.00
mono-n-butyl phthalate (MnBP)	3	0.128	1.00
mono-isobutyl phthalate (MiBP)	4	0.039	1.00
mono-(3-carboxypropyl) phthalate (MCP)	5	0.002	1.00
mono-2-ethyl hexyl phthalate (MEHP)	6	0.017	0.069
mono-(2-ethyl-5-hydroxyhexyl) phthalate (MEHHP)	6	0.017	0.154
mono-(2-ethyl-5-oxohexyl) phthalate (MEOHP)	6	0.017	0.408
mono-(2-ethyl-5-carboxypentyl) phthalate (MECPP)	6	0.017	0.369

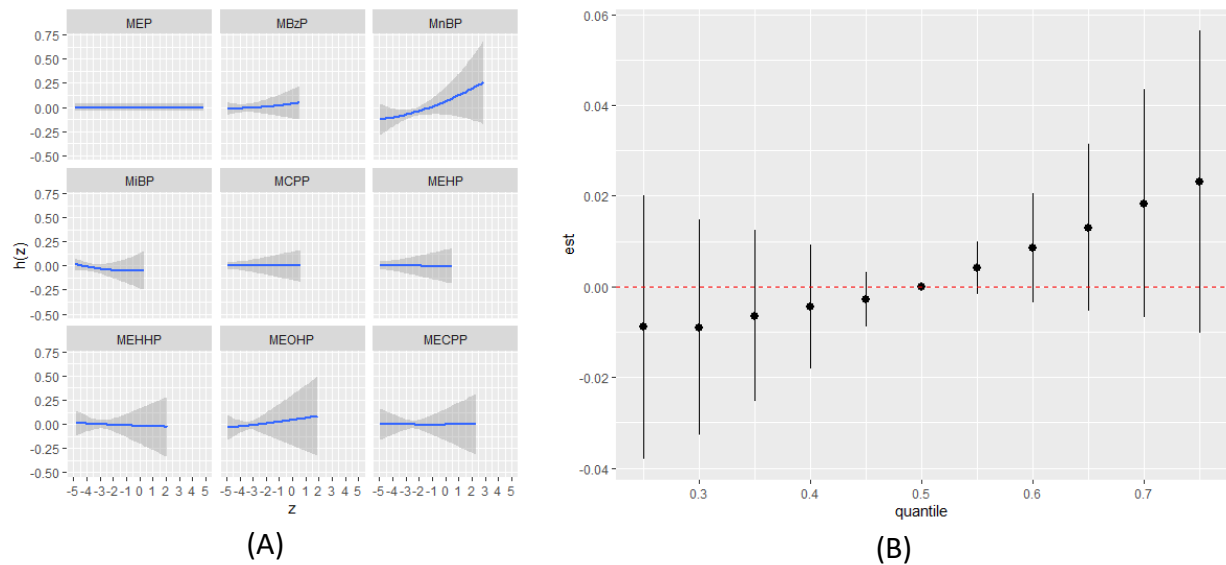
eTable 9. Hierarchical posterior inclusion probabilities (PIPs) from BKMR for cancer mortality.

Variable	Group	GroupPIP	CondPIP
mono-ethyl phthalate (MEP)	1	0	0
mono-benzyl phthalate (MBzP)	2	0.107	1.00
mono-n-butyl phthalate (MnBP)	3	0.006	1.00
mono-isobutyl phthalate (MiBP)	4	0.025	1.00
mono-(3-carboxypropyl) phthalate (MCP)	5	0.005	1.00
mono-2-ethyl hexyl phthalate (MEHP)	6	0.114	0.075
mono-(2-ethyl-5-hydroxyhexyl) phthalate (MEHHP)	6	0.114	0.242
mono-(2-ethyl-5-oxohexyl) phthalate (MEOHP)	6	0.114	0.229
mono-(2-ethyl-5-carboxypentyl) phthalate (MECPP)	6	0.114	0.454

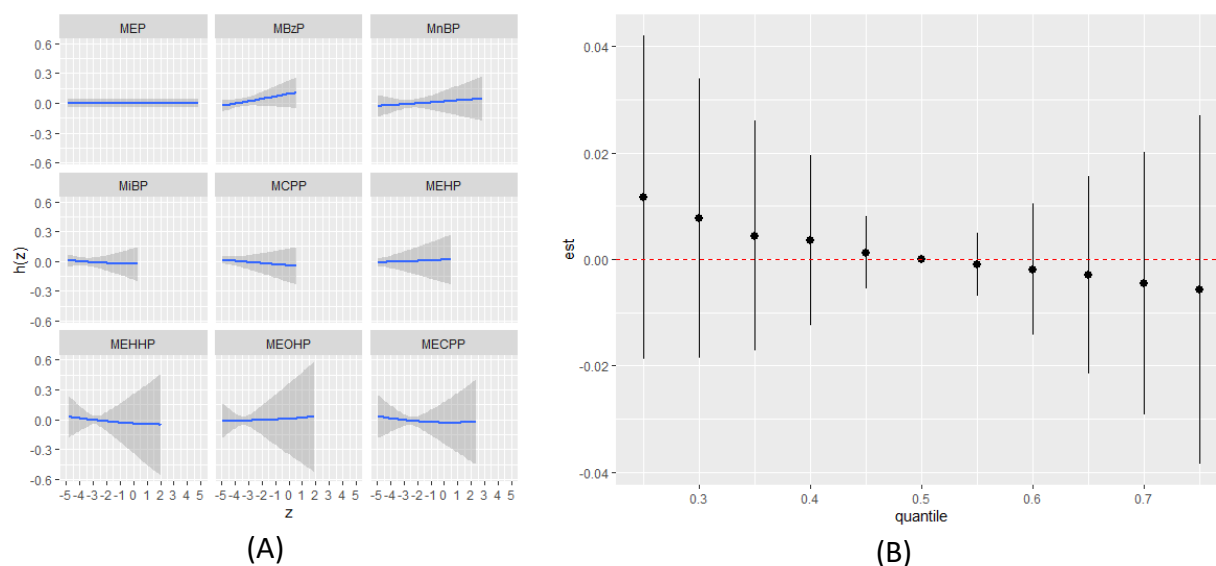
2. eFigures



eFigure 1. Spearman correlation coefficients among phthalate exposure.



eFigure 2. Phthalate exposure and CVD mortality. (A) Exposure–response curves for phthalates exposure and CVD mortality; (B) Overall association (percentage change and 95% credible intervals) of the phthalates exposure to CVD mortality. Note: mono-ethyl phthalate (MEP), mono-benzyl phthalate (MBzP), mono-n-butyl phthalate (MnBP), mono-isobutyl phthalate (MiBP), mono-(3-carboxypropyl) phthalate (MCPP), mono-2-ethyl hexyl phthalate (MEHP), mono-(2-ethyl-5-hydroxyhexyl) phthalate (MEHHP), mono-(2-ethyl-5-oxohexyl) phthalate (MEOHP), and mono-(2-ethyl-5-carboxypentyl) phthalate (MECPP).



eFigure 3. Phthalate exposure and cancer mortality. **(A)** Exposure–response curves for phthalates exposure and cancer mortality; **(B)** Overall association (percentage change and 95% credible intervals) of the phthalates exposure to cancer mortality. Note: mono-ethyl phthalate (MEP), mono-benzyl phthalate (MBzP), mono-n-butyl phthalate (MnBP), mono-isobutyl phthalate (MiBP), mono-(3-carboxypropyl) phthalate (MCP), mono-2-ethyl hexyl phthalate (MEHP), mono-(2-ethyl-5-hydroxyhexyl) phthalate (MEHHP), mono-(2-ethyl-5-oxohexyl) phthalate (MEOHP), and mono-(2-ethyl-5-carboxypentyl) phthalate (MECPP).