Supplementary Table S1. Baseline characteristics of the population before and after exclusion

Characteristic	Before exclusion	After exclusion	*P*-value
Age (years)	46.09 ± 16.27	46.77 ± 16.03	0.732
Gender			0.906
Men	1,601 (48.63%)	1,226 (48.74%)	
Women	1,750 (51.37%)	1,330 (51.26%)	
Race			0.182
Mexican American	526 (9.09%)	391 (8.41%)	
Other Hispanic	387 (6.24%)	287 (5.73%)	
Non-Hispanic White	1,151 (62.77%)	947 (65.66%)	
Non-Hispanic Black	762 (12.47%)	575 (11.89%)	
Other race	525 (9.44%)	356 (8.32%)	
Education level			0.474
High School or lower	736 (15.5%)	525 (13.43%)	
High school or more	2,517 (84.48%)	2,031 (86.57%)	
Marital status			0.984
Married	1,708 (56.95%)	1,360 (58.34%)	
Never married	639 (18.11%)	488 (17.27%)	
Other	908 (24.94%)	708 (24.39%)	
PIR	2.97 ± 1.67	3.03 ± 1.66	0.263
BMI (kg/m^2)	29.38 ± 7.08	29.42 ± 7.12	0.236
Cotinine (ng/mL)	56.55 ± 122.94	58.52 ± 126.59	0.906
Drinking status			0.139
No	896 (22.23%)	703 (20.77%)	
Yes	2,159 (77.71%)	1,853 (79.23%)	
Family history of asthma			0.548
No	2,608 (77.13%)	2,015 (78.53%)	
Yes	672 (20.55%)	541 (21.47%)	

Note. Continuous variables were expressed as mean with standard deviation (Mean ± SD), whereas categorical variables were presented as cases (*n*) and percentages (%). The Student's t-test or the Mann-Whitney U-test was used for continuous variables, while the chi-square test was used for categorical variables. Abbreviation: PIR, family poverty income ratio; BMI, body mass index. “Other Race” stands for “Including multi-racial”. “Other marital status” includes “Widowed”, “Divorced”, “Separated” and “Living with partner”.

Supplementary Table S2. The LOD, detection rates and median (IQR) of the phenols and parabens

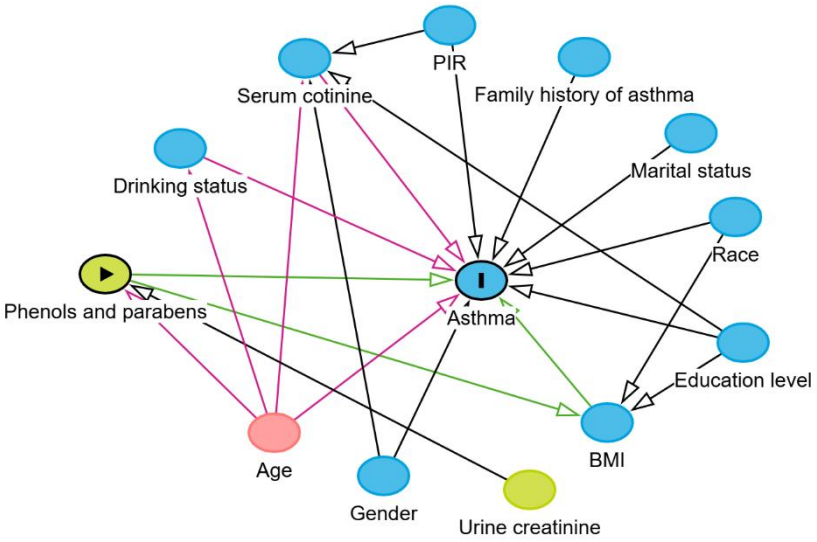
	LOD (ng/mL)	Detection rates (%)	Median (IQR) (ng/mL)
BPA	0.2	95.39%	1.10 (0.60, 2.40)
BPF	0.2	54.28%	0.30 (0.14, 1.00)
BPS	0.1	90.12%	0.40 (0.20, 1.00)
TCS	1.7	70.94%	4.50 (1.20, 27.10)
MeP	1	98.67%	37.10 (11.50, 151.00)
PrP	0.1	98.61%	4.70 (0.90, 28.70)
2,5-DCP	0.1	97.85%	1.80 (0.70, 8.00)
2,4-DCP	0.1	93.69%	0.60 (0.20, 1.30)

Note. Abbreviation: LOD, limit of detection.

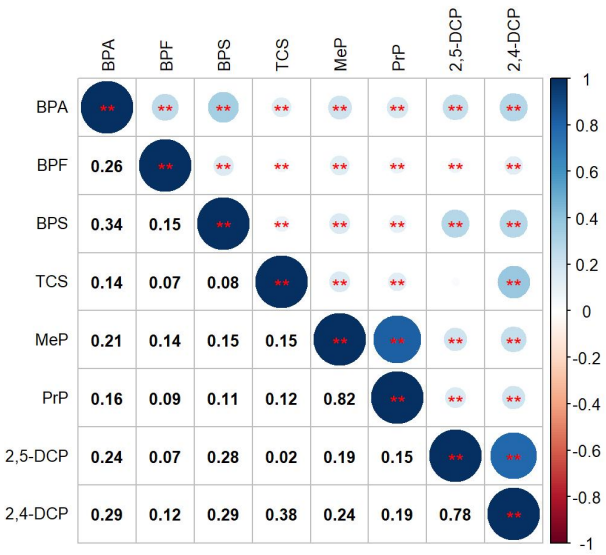
Supplementary Table S3. Association between phenol and paraben exposure and asthma, excluding individuals with chronic bronchitis and COPD

	Crude model		**Model I**		**Model II**	
	OR (95 %*CI*)	*P*-Value	*OR* (95 %*CI*)	*P*-Value	*OR* (95 %*CI*)	*P*-Value
Log BPA	1.05 (0.93-1.18)	0.458	1.05 (0.93-1.19)	0.403	1.01 (0.89-1.15)	0.889
Log BPF	1.12 (1.03-1.22)	0.007	1.12 (1.04-1.22)	0.005	1.09 (1.00-1.19)	0.043
Log BPS	0.99 (0.89-1.10)	0.802	0.99 (0.89-1.10)	0.800	0.99 (0.89-1.10)	0.867
Log TCS	0.96 (0.89-1.04)	0.336	0.96 (0.89-1.04)	0.339	0.96 (0.89-1.05)	0.395
Log MeP	0.94 (0.83-1.06)	0.315	0.95 (0.84-1.08)	0.434	0.97 (0.85-1.10)	0.644
Log PrP	1.10 (1.00-1.22)	0.046	1.06 (0.95-1.17)	0.294	1.06 (0.96-1.18)	0.235
Log 2,5-DCP	0.95 (0.86-1.05)	0.287	0.95 (0.86-1.05)	0.327	0.96 (0.87-1.07)	0.493
Log 2,4-DCP	0.98 (0.83-1.15)	0.795	0.98 (0.83-1.15)	0.788	0.97 (0.81-1.15)	0.685

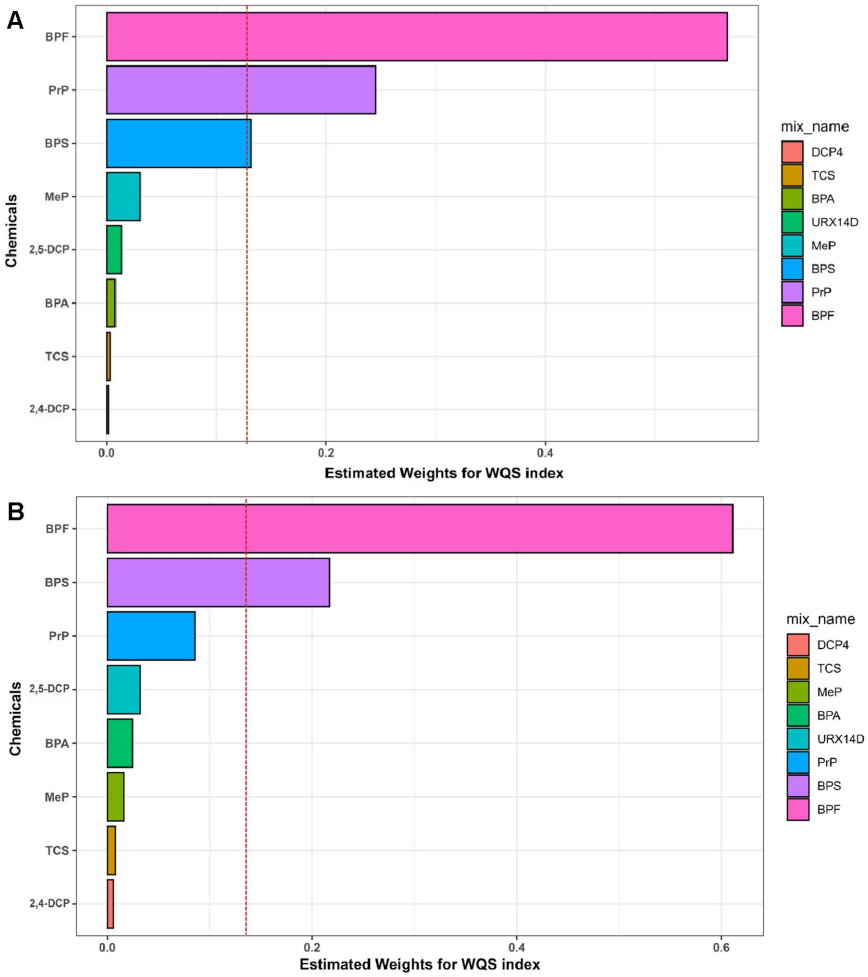
Note. Crude model did not adjust for any covariates. Model I adjusted for age, gender. Model II adjusted for all covariates. Abbreviation: COPD, chronic obstructive pulmonary disease; BPA, bisphenol A; BPF, bisphenol F; BPS, bisphenol S; TCS, triclosan; MeP, methyl paraben; PrP, propyl paraben; 2,5- DCP, 2,5-dichlorophenol; 2,4-DCP, 2,4-dichlorophenol. Bold font: Indicating statistical difference ($P < 0.05$).



Supplementary Figure S1. Directed acyclic graph of hypothesized associations between phenols and parabens exposure and asthma.Red circles represent ancestors of the exposure and outcome (i.e. confounders), blue circles represent ancestors of the outcome (i.e. causal determinants of the outcome). Green lines represent causal paths, and red lines represent biasing paths. Black lines typically represent standard causal paths (i.e., causal effects without special bias attributes). The minimally sufficient adjustment set (MSAS) was determined using DAGitty, a software for creating causal diagrams to minimize confounding bias in epidemiology.



Supplementary Figure S2. Pearson correlation coefficients among 8 phenols and parabens (*N* =2,556), NHANES, USA, 2013–2016. ** *P* < 0.01.



Supplementary Figure S3. The weight of each phenols and parabens associated with the asthma were calculated by the WQS model in crude model (A) and in Model I (B). Crude model did not adjust for any covariates. Model I adjusted for age, gender.