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Supplemental Material

Personal care product use in men and urinary concentrations of select phthalate metabolites and parabens: results from the Environment And Reproductive Health (EARTH) Study

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Product Use Questionnaire in the Environment And Reproductive Health (EARTH) Study.

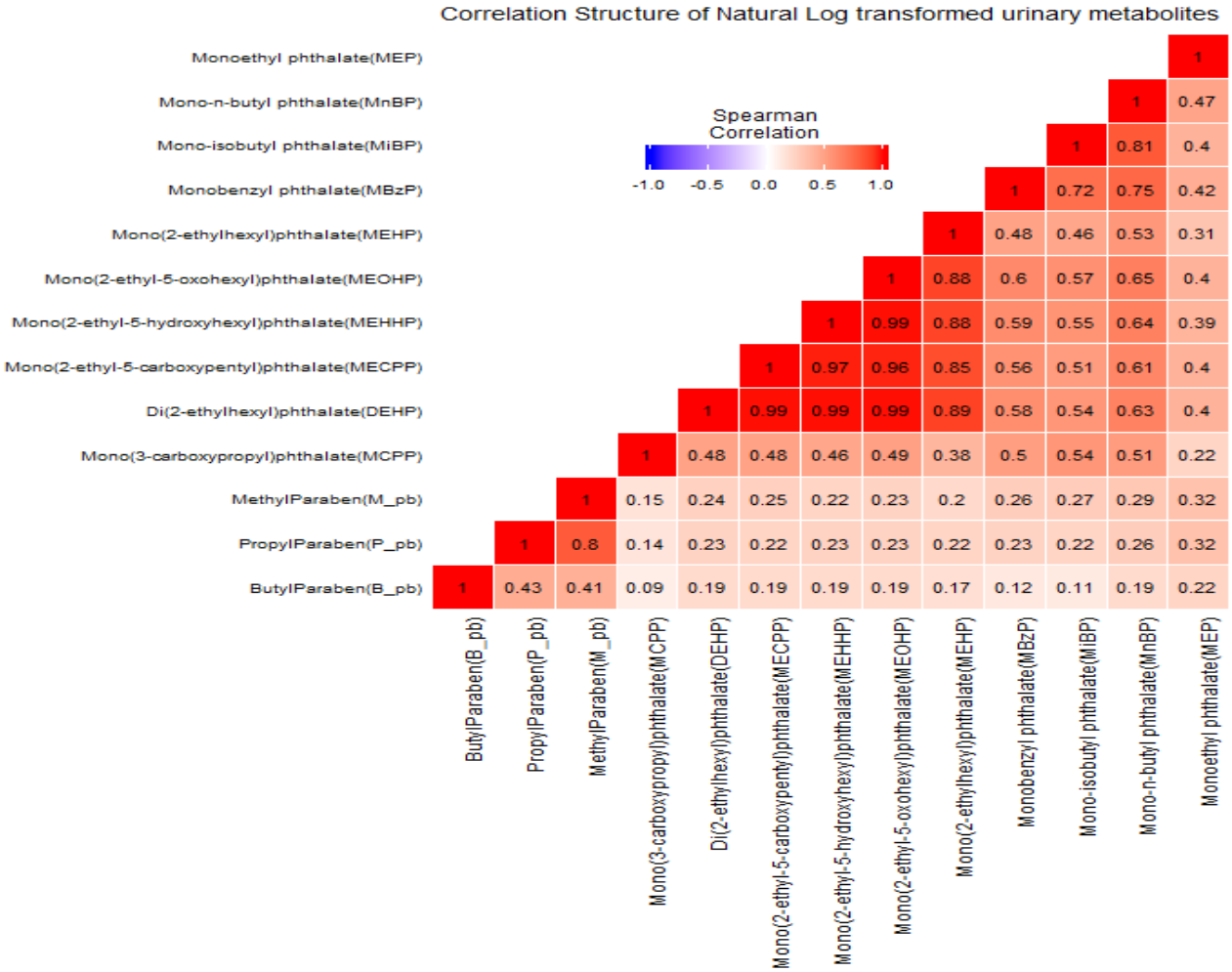
DATE: ____ / ____ / ____ TIME: ___ : ___ AM / PM

PRODUCT USE QUESTIONNAIRE
(Complete on same day as urine collection)

EARTH Study

1. Please indicate use of any of these products in the PAST 24 HOURS.	Used in past 24 hours? No	Used in past 24 hours? Yes	Time last used? (Please circle AM or PM)	Yesterday or today? Yesterday	Yesterday or today? Today	Scented? Scented	Scented? Not Scented	Scented? Don't know	Comments
Deodorant	◯	◯	___:___ AM / PM	◯	◯	◯	◯	◯	
Shampoo	◯	◯	___:___ AM / PM	◯	◯	◯	◯	◯	
Conditioner/Creme Rinse	◯	◯	___:___ AM / PM	◯	◯	◯	◯	◯	
Hairspray/Hair Gel	◯	◯	___:___ AM / PM	◯	◯	◯	◯	◯	
Other hair care products *(e.g., mousse, hair bleach, relaxer, Perm, straightener)*	◯	◯	___:___ AM / PM	◯	◯	◯	◯	◯	
Toothpaste	◯	◯	___:___ AM / PM	◯	◯				
Mouthwash	◯	◯	___:___ AM / PM	◯	◯				
Shaving Cream	◯	◯	___:___ AM / PM	◯	◯	◯	◯	◯	
Cologne/Perfume	◯	◯	___:___ AM / PM	◯	◯	◯	◯	◯	
Aftershave	◯	◯	___:___ AM / PM	◯	◯	◯	◯	◯	
Bar Soap	◯	◯	___:___ AM / PM	◯	◯	◯	◯	◯	
Liquid Soap/Body Wash	◯	◯	___:___ AM / PM	◯	◯	◯	◯	◯	
Hand Sanitizer	◯	◯	___:___ AM / PM	◯	◯	◯	◯	◯	
Hand/Body lotion	◯	◯	___:___ AM / PM	◯	◯	◯	◯	◯	Contains sunscreen? ◯ Yes ◯ No
Face moisturizer/lotion	◯	◯	___:___ AM / PM	◯	◯	◯	◯	◯	Contains sunscreen? ◯ Yes ◯ No
Colored Cosmetics *(e.g., hair dye, makeup)*	◯	◯	___:___ AM / PM	◯	◯	◯	◯	◯	Contains sunscreen? ◯ Yes ◯ No
Suntan/Sunblock Lotion	◯	◯	___:___ AM / PM	◯	◯	◯	◯	◯	
Nail Polish	◯	◯	___:___ AM / PM	◯	◯	◯	◯	◯	
Nail Polish Remover	◯	◯	___:___ AM / PM	◯	◯	◯	◯	◯	
Other toiletries *(e.g., wax, vaseline, lip balm)* _____	◯	◯	___:___ AM / PM	◯	◯	◯	◯	◯	Contains sunscreen? ◯ Yes ◯ No

Figure S1. Spearman correlation between urinary concentrations of phthalate metabolites and parabens among 965 samples provided by men in the Environment And Reproductive Health (EARTH) Study.



[a] 1037 urine samples were analyzed for phthalate metabolites and 965 for parabens.
[b] For Spearman correlations, data was restricted to 965 urine samples for which both phthalate metabolites and parabens were measured.

Table S1. Adjusted [a] percent change associated with the weighted score: (based on binary use up-to 24 hours use and 6 hours) using the weighted binary score (WBS) in the 10 imputed data.

	Percent change associated with the weighted score for the 14 PCPs: (based on binary use up-to 24 hours use)		Percent change associated with the weighted with the weighted score: (based on binary use up-to 6 hours use)	
Urinary biomarker	**% Change (95% CI)**	**p-value**	**% Change (95% CI)**	**p-value**
MEP	700 (258, 1686)	2.42E-06	961 (485, 1823)	1.80E-14
MnBP	39.0 (-29.5, 174)	0.33	13.7 (-18.5, 58.6)	0.45
MiBP	47.0 (-23.1, 181)	0.24	16.1 (-19.6, 67.6)	0.43
MBzP	20.6 (-41.3, 148)	0.60	-1.79 (-40.1, 61.1)	0.94
MEHP	-2.20 (-58.6, 131)	0.96	-21.4 (-56.7, 42.9)	0.43
MEOHP	9.14 (-46.5, 123)	0.81	-25.3 (-58.4, 34.2)	0.32
MEHHP	6.20 (-50.1, 126)	0.87	-20.6 (-55.5, 41.9)	0.43
MECPP	3.60 (-48.3, 107)	0.92	-19.6 (-51.8, 34.1)	0.40
∑DEHP [b]	5.46 (-47.6, 112)	0.88	-21.4 (-53.7, 33.5)	0.37
MCPP	3.48 (-59.5, 165)	0.94	-33.9 (-60.3, 9.99)	0.11
Methylparaben	1013 (-90.8, 135010)	0.29	1806 (417, 6925)	0.00008
Propylparaben	1398 (-96.1, 575248)	0.35	3626 (535, 21763)	0.0002
Butylparaben	192 (-77.1, 3617)	0.40	458 (58.3, 1868)	0.009

Abbreviations**:** PCP; personal care product, 95% CI; 95% confidence intervals, MEP; Monoethyl phthalate, MnBP; Mono-n-butyl phthalate, MiBP; Mono-isobutyl phthalate, MBzP; Monobenzyl phthalate, MEHP; Mono(2-ethylhexyl) phthalate, MEOHP; Mono(2-ethyl-5-oxohexyl) phthalate, MEHHP; Mono(2-ethyl-5-hydroxyhexyl) phthalate, MECPP; Mono(2-ethyl-5-carboxypentyl) phthalate, DEHP; (Di(2-ethylhexyl) phthalate) metabolites, MCPP; Mono(3-carboxypropyl) phthalate.

[a] Analysis adjusted for urine specific gravity (continuous), race (Caucasian or not), age (continuous), BMI (continuous), calendar year (continuous), time of sample collection (early morning (5am< and <=9am), late morning (9am< and <=12pm) or afternoon(>12pm)), current smoking (yes/no), warm season (April through September) (yes/no) and the product use within 24 hours (yes/no).

[b] ∑DEHP metabolites= MEHP+ MEOHP+ MEHHP+ MECPP weighted by the molecular weight.

Table S2. Adjusted [a] odds ratio for detected versus undetected urinary butylparaben associated with last 24 hours personal care product use in the 10 imputed data.

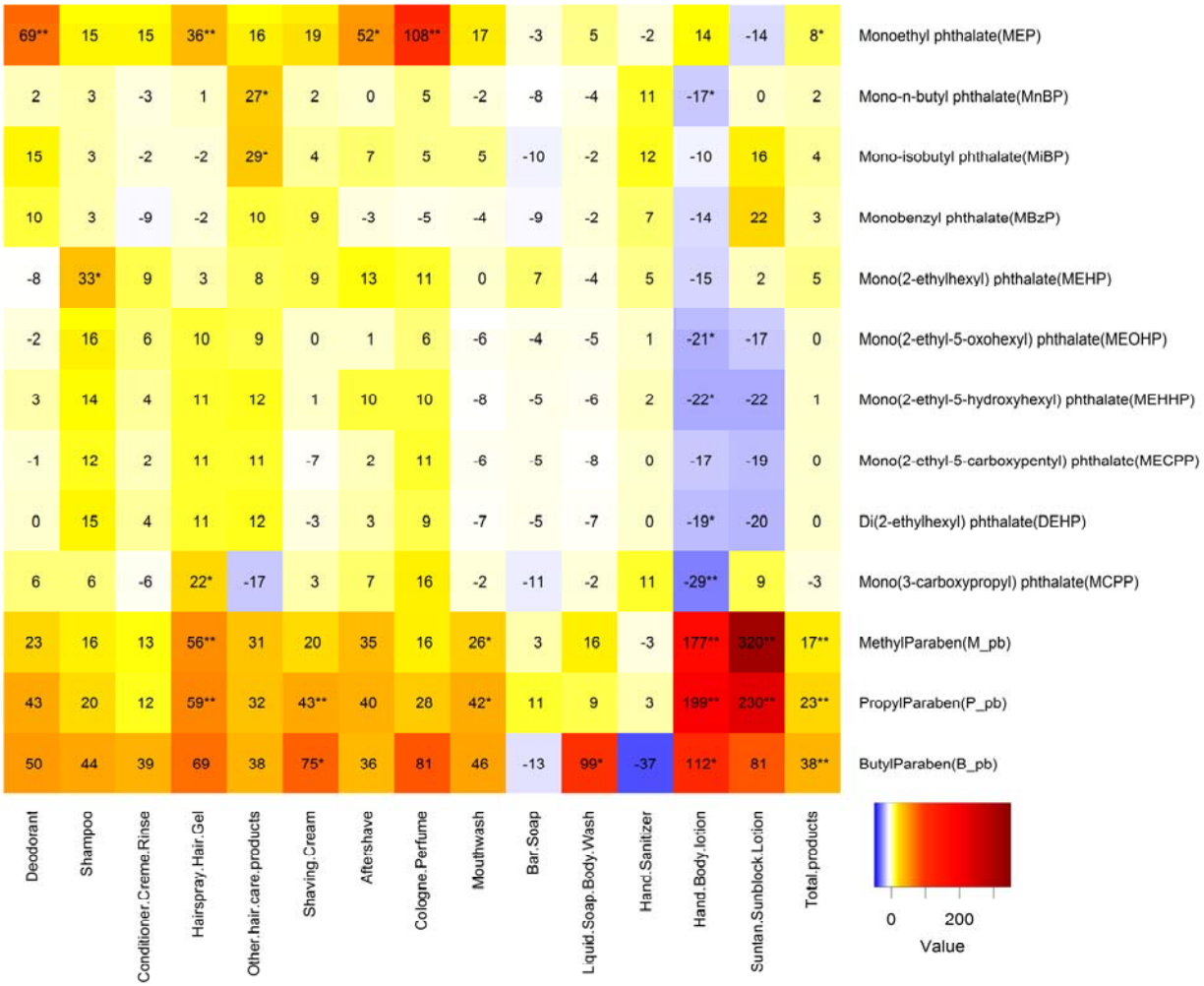
Personal care prodcut	Odds ratio (OR) (95% CI)	p-value
Total_poduct	1.14 (1.06, 1.23)	0.0004
Deodorant	1.08 (0.72, 1.63)	0.70
Shampoo	1.21 (0.86, 1.70)	0.26
Conditioner/Creme Rinse	1.24 (0.84, 1.83)	0.28
Hairspray/Hair Gel	1.34 (0.92, 1.96)	0.13
Other hair care products (e.g., mousse, hair bleach, relaxer, Perm, straightener)	1.62 (0.93, 2.84)	0.09
Shaving Cream	1.18 (0.90, 1.56)	0.23
Aftershave	1.08 (0.69, 1.68)	0.75
Cologne/Perfume	1.16 (0.81, 1.68)	0.41
Mouthwash	1.38 (1.00, 1.90)	0.049
Bar Soap	0.92 (0.65, 1.32)	0.66
Liquid Soap/Body Wash	1.39 (1.01, 1.93)	0.046
Hand Sanitizer	0.92 (0.63, 1.33)	0.65
Hand/Body lotion	1.39 (0.98, 1.96)	0.06
Suntan/Sunblock Lotion	2.27 (1.00, 5.18)	0.05

Abbreviations: OR; odds ratio, 95% CI; 95% confidence intervals, MEP; Monoethyl phthalate, MnBP; Mono-n-butyl phthalate, MiBP; Mono-isobutyl phthalate, MBzP; Monobenzyl phthalate, MEHP; Mono(2-ethylhexyl) phthalate, MEOHP; Mono(2-ethyl-5-oxohexyl) phthalate, MEHHP; Mono(2-ethyl-5-hydroxyhexyl) phthalate, MECPP; Mono(2-ethyl-5-carboxypentyl) phthalate, DEHP; (Di(2-ethylhexyl) phthalate) metabolites, MCPP; Mono(3-carboxypropyl) phthalate.

[a] Analysis adjusted for urine specific gravity (continuous), race (Caucasian or not), age (continuous), BMI (continuous), calendar year (continuous), time of sample collection (early morning (5am< and <=9am), late morning (9am< and <=12pm) or afternoon(>12pm)), current smoking (yes/no), warm season (April through September) (yes/no) and the product use within 24 hours (yes/no).

[b] Generalized estimating equations (GEE) was used for modeling butylparaben as binary variable: detected vs undetected in the 10 imputed data.

Figure S2. Heatmap for adjusted % change in urinary concentrations of phthalate metabolites and parabens associated with self-report use of personal care products (PCPs) within 24 hours of urine sample collection among 400 men who contributed 1037 urine samples in the Environment And Reproductive Health (EARTH) Study in the complete case data.



[a] Significance indicated as *: if p-value < 0.05, **: if p-value < 0.01
[b] DEHP means: ∑DEHP metabolites= MEHP+ MEOHP+ MEHHP+ MECPP weighted by the molecular weight
[c] Analysis was based on complete case analyses.
[d] Analysis adjusted for urine specific gravity (continuous), race (Caucasian or not), age (continuous), BMI (continuous), calendar year (continuous), time of sample collection (early morning (5am< and <=9am), late morning (9am< and <=12pm) or afternoon(>12pm)), current smoking (yes/no), warm season (April through September) (yes/no) and the product use within 24 hours (yes/no).
[e] Total products: the crude sum of PCP used within 24 hours.
[f] The last column for the total products represents percent changes associated with each additional type of PCP used, regardless of which PCP.
[g] Urinary biomarkers were ordered according to the molecular weights within phthalates and within parabens.
[h] Combined other hair care products included mousse, hair bleach, relaxer, perm and straightener.

Table S3. Adjusted [a] odds ratio for detected versus undetected urinary butylparaben associated with last 24 hours personal care product use in the complete case data.

Personal care prodcut	OR (95% CI)	p-value
Total_poduct	1.16 (1.04, 1.29)	0.0055
Deodorant	1.10 (0.72, 1.66)	0.6691
Shampoo	1.23 (0.87, 1.72)	0.2444
Conditioner/Creme Rinse	1.18 (0.80, 1.74)	0.4109
Hairspray/Hair Gel	1.36 (0.93, 1.97)	0.1087
Other hair care products (e.g., mousse, hair bleach, relaxer, Perm, straightener)	1.81 (0.98, 3.35)	0.0572
Shaving Cream	1.20 (0.91, 1.60)	0.1967
Aftershave	0.99 (0.61, 1.61)	0.978
Cologne/Perfume	1.29 (0.87, 1.90)	0.201
Mouthwash	1.43 (1.03, 1.98)	0.0331
Bar Soap	0.94 (0.65, 1.36)	0.7558
Liquid Soap/Body Wash	1.41 (1.01, 1.96)	0.0407
Hand Sanitizer	0.93 (0.66, 1.31)	0.6812
Hand/Body lotion	1.36 (0.91, 2.05)	0.1355
Suntan/Sunblock Lotion	3.44 (1.60, 7.40)	0.0016

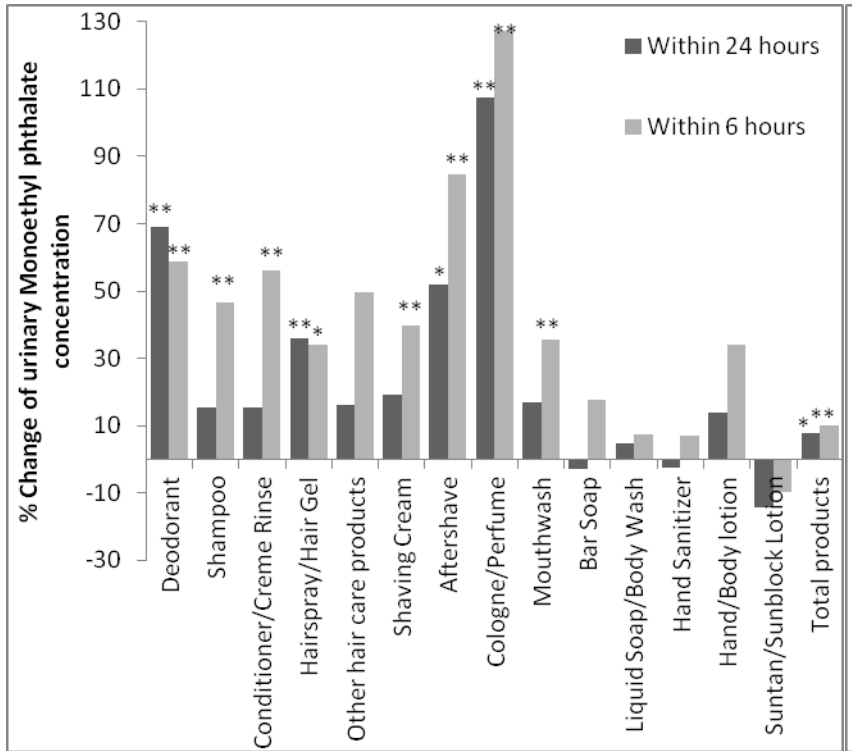
Abbreviations: OR; odds ratio, 95% CI; 95% confidence intervals, MEP; Monoethyl phthalate, MnBP; Mono-n-butyl phthalate, MiBP; Mono-isobutyl phthalate, MBzP; Monobenzyl phthalate, MEHP; Mono(2-ethylhexyl) phthalate, MEOHP; Mono(2-ethyl-5-oxohexyl) phthalate, MEHHP; Mono(2-ethyl-5-hydroxyhexyl) phthalate, MECPP; Mono(2-ethyl-5-carboxypentyl) phthalate, DEHP; (Di(2-ethylhexyl) phthalate) metabolites, MCPP; Mono(3-carboxypropyl) phthalate.

[a] Analysis adjusted for urine specific gravity (continuous), race (Caucasian or not), age (continuous), BMI (continuous), calendar year (continuous), time of sample collection (early morning (5am< and <=9am), late morning (9am< and <=12pm) or afternoon(>12pm)), current smoking (yes/no), warm season (April through September) (yes/no) and the product use within 24 hours (yes/no).

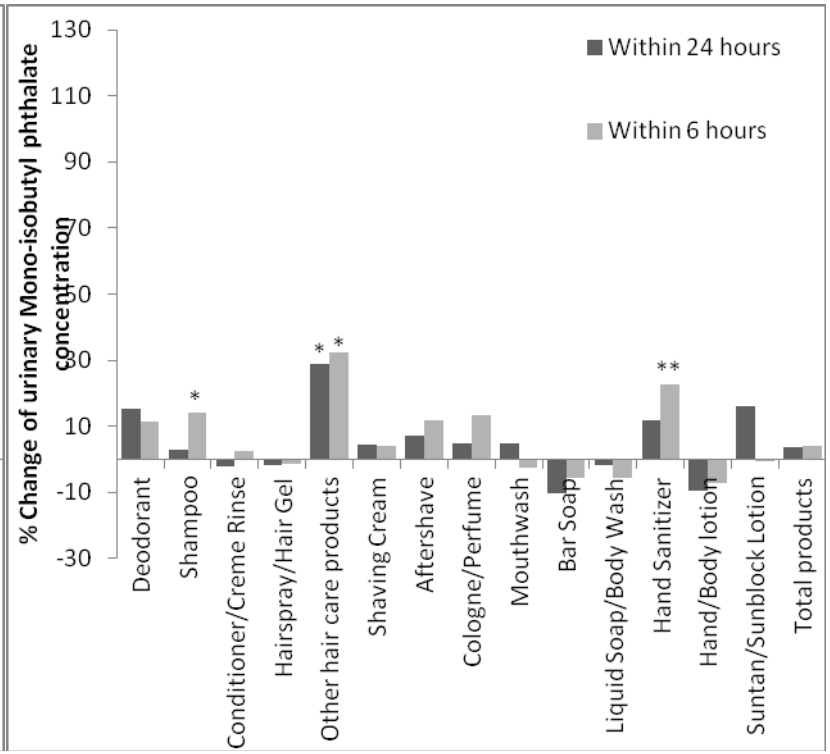
[b] Generalized estimating equations (GEE) was used for modeling butylparaben as binary variable: detected vs undetected in the complete case data.

Figure S3. (Panels A to E): Adjusted % change in urinary concentrations of parabens and phthalate metabolites associated with use of 14 personal care products (PCPs) within 24 and 6 hours of urine collection in the complete case analysis.

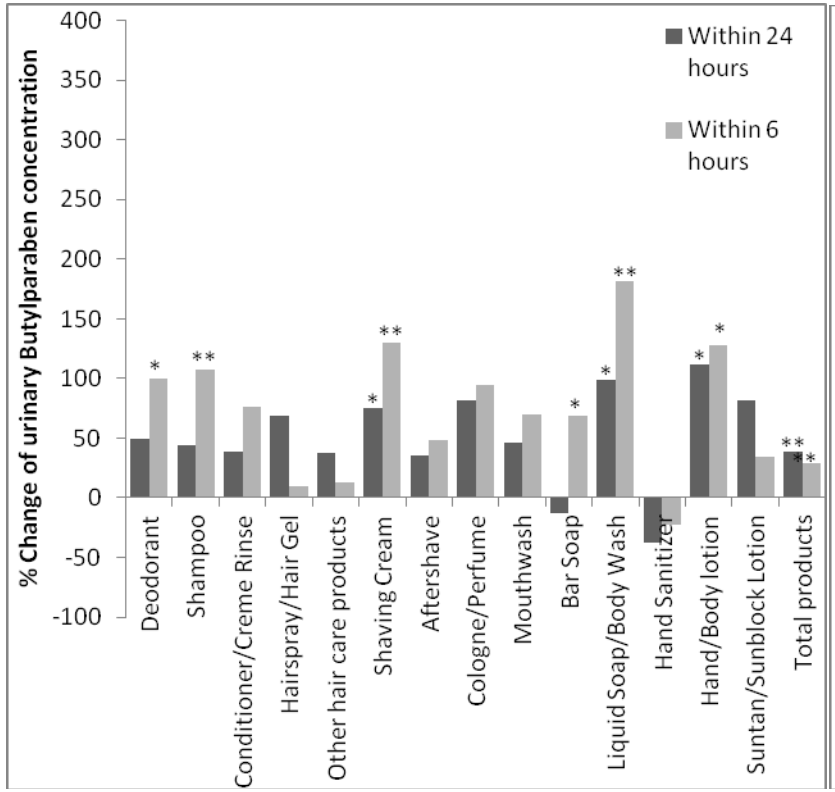
Panel 3A. Monoethyl phthalate (MEP) urinary concentration



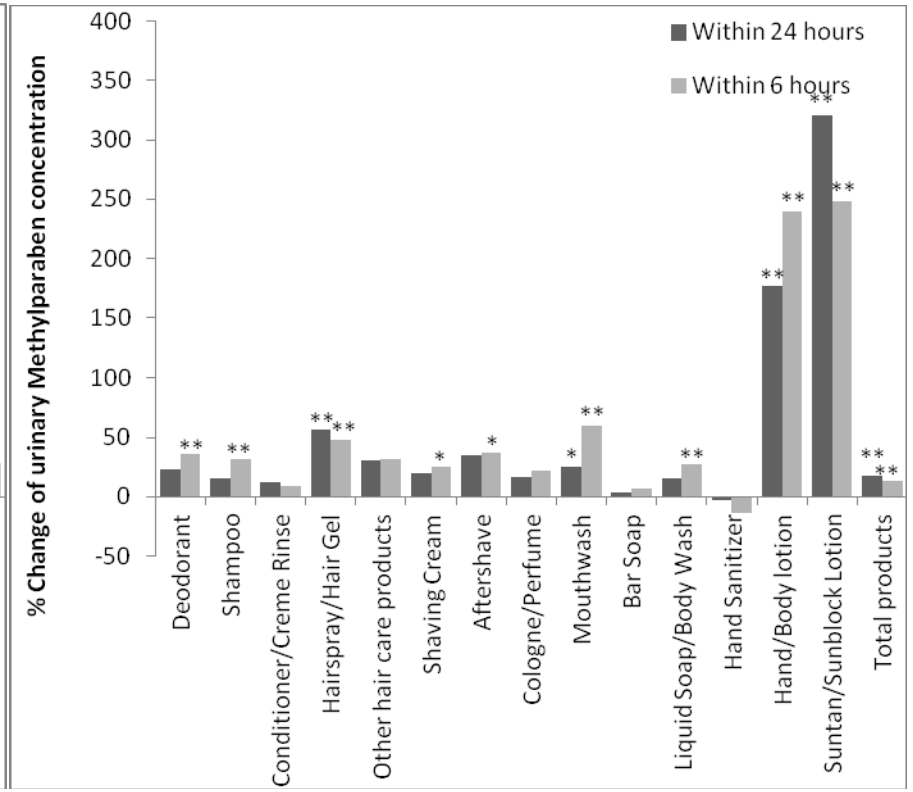
Panel 3B. Mono-isobutyl phthalate (MiBP) urinary concentration



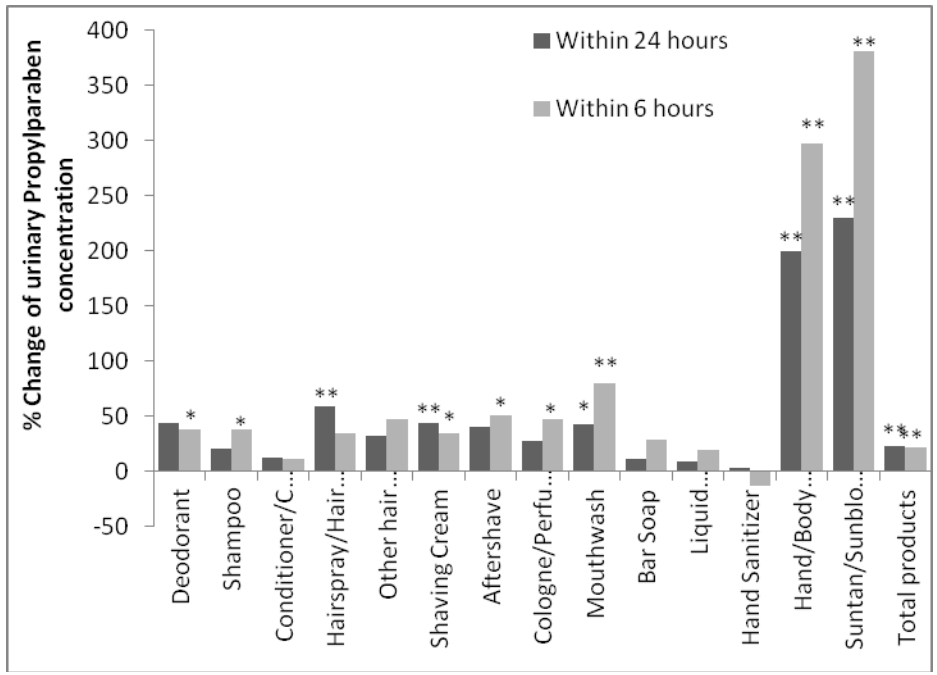
Panel 3C. Butylparaben urinary concentration



Panel 3D. Methylparaben urinary concentration



Panel 3E. Propylparaben urinary concentration



[a] Statistical significance indicated as *: if p-value < 0.05, **: if p-value < 0.01

[b] Analysis adjusted for urine specific gravity (continuous), race (Caucasian or not), age (continuous), BMI (continuous), calendar year (continuous), time of sample collection (early morning (5am< and <=9am), late morning (9am< and <=12pm) or afternoon(>12pm)), current smoking (yes/no), warm season (April through September) (yes/no) and the product use within 24 hours (yes/no).

[c] Total products: the crude sum of PCP used within 24 hours

[d] The total products' bars represent percent changes associated with each additional type of PCP used, regardless of which PCP.

[e] Combined other hair care products included mousse, hair bleach, relaxer, perm and straightener

Table S4. Adjusted [a] percent change associated with the weighted score: (based on binary use up-to 24 hours use and 6 hours) using the weighted binary score (WBS) in the complete case data.

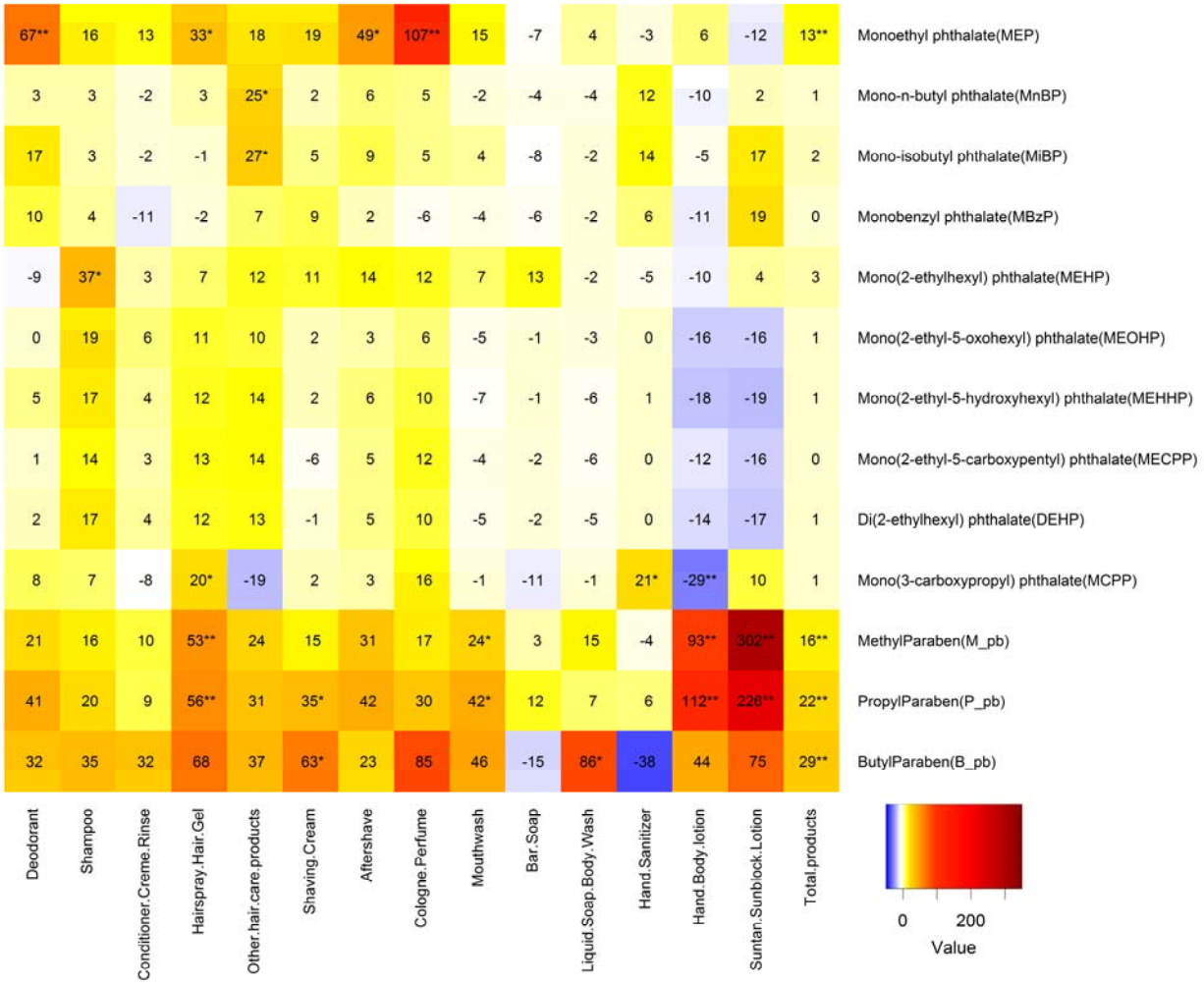
	Percent change associated with the weighted score: (based on binary use up-to 24 hours use)		Percent change associated with the weighted score: (based on binary use up-to 6 hours use)	
Urinary biomarker	**% Change (95% CI)**	**p-value**	**% Change(95% CI)**	**p-value**
MEP	281 (23, 1081)	0.02	429 (31, 2027)	0.02
MnBP	1 (-51, 107)	0.98	107 (4, 313)	0.04
MiBP	-16 (-59, 70)	0.62	62 (-31, 281)	0.26
MBzP	52 (-13, 164)	0.14	22 (-40, 147)	0.58
MEHP	-28 (-63, 39)	0.33	-41 (-74, 30)	0.19
MEOHP	-17 (-60, 74)	0.62	-34 (-70, 43)	0.29
MEHHP	-7 (-56, 96)	0.84	-28 (-67, 58)	0.41
MECPP	-26 (-64, 56)	0.43	-45 (-73, 12)	0.10
∑DEHP [b]	-15 (-57, 72)	0.66	-38 (-70, 26)	0.19
MCPP	-45 (-79, 46)	0.23	-69 (-88, -15)	0.02
Methylparaben	7597 (2087, 26997)	<.0001	9957 (2812, 34641)	<.0001
Propylparaben	4949 (721, 30966)	<.0001	23225 (3536, 149522)	<.0001
Butylparaben	577 (133, 1864)	0.0004	198 (-14, 928)	0.08

Abbreviations: 95% CI; 95% confidence intervals, MEP; Monoethyl phthalate, MnBP; Mono-n-butyl phthalate, MiBP; Mono-isobutyl phthalate, MBzP; Monobenzyl phthalate, MEHP; Mono(2-ethylhexyl) phthalate, MEOHP; Mono(2-ethyl-5-oxohexyl) phthalate, MEHHP; Mono(2-ethyl-5-hydroxyhexyl) phthalate, MECPP; Mono(2-ethyl-5-carboxypentyl) phthalate, DEHP; (Di(2-ethylhexyl) phthalate) metabolites, MCPP; Mono(3-carboxypropyl) phthalate.

[a] Analysis adjusted for urine specific gravity (continuous), race (Caucasian or not), age (continuous), BMI (continuous), calendar year (continuous), time of sample collection (early morning (5am< and <=9am), late morning (9am< and <=12pm) or afternoon(>12pm)), current smoking (yes/no), warm season (April through September) (yes/no) and the product use within 24 hours (yes/no).

[b] ∑DEHP metabolites= MEHP+ MEOHP+ MEHHP+ MECPP weighted by the molecular weight.

Figure S4. Heatmap for adjusted % change in urinary concentrations of phthalate metabolites and parabens associated with self-report use of personal care products (PCPs) within 24 hours of urine sample collection among 400 men who contributed 1037 urine samples in the Environment And Reproductive Health (EARTH) Study in the imputed missing as zero.



[a] Significance indicated as *: if p-value < 0.05, **: if p-value < 0.01
[b] Imputation for the missing values of PCP-use was assumed to be "0" i.e. no use.
[c] DEHP means: ∑DEHP metabolites= MEHP+ MEOHP+ MEHHP+ MECPP weighted by the molecular weight
[d] Analysis adjusted for urine specific gravity (continuous), race (Caucasian or not), age (continuous), BMI (continuous), calendar year (continuous), time of sample collection (early morning (5am< and <=9am), late morning (9am< and <=12pm) or afternoon(>12pm)), current smoking (yes/no), warm season (April through September) (yes/no) and the product use within 24 hours (yes/no).
[e] Total products: the crude sum of PCP used within 24 hours
[f] The last column for the total products represents percent changes associated with each additional type of PCP used, regardless of which PCP.
[g] Combined other hair care products included mousse, hair bleach, relaxer, perm and straightener

Table S5. Adjusted [a] odds ratio for detected versus undetected urinary butylparaben associated with last 24 hours personal care product use in the imputed missing as zero.

Personal care prodcut	OR (95% CI)	P-value
Total_poduct	1.14 (1.05, 1.23)	0.001
Deodorant	1.05 (0.70, 1.57)	0.83
Shampoo	1.23 (0.87, 1.73)	0.24
Conditioner/Creme Rinse	1.13 (0.78, 1.64)	0.52
Hairspray/Hair Gel	1.35 (0.94, 1.93)	0.10
Other hair care products (e.g., mousse, hair bleach, relaxer, Perm, straightener)	1.63 (0.91, 2.90)	0.10
Shaving Cream	1.19 (0.90, 1.57)	0.22
Aftershave	0.95 (0.61, 1.49)	0.82
Cologne/Perfume	1.28 (0.87, 1.88)	0.21
Mouthwash	1.40 (1.02, 1.93)	0.04
Bar Soap	0.93 (0.65, 1.33)	0.68
Liquid Soap/Body Wash	1.33 (0.97, 1.84)	0.08
Hand Sanitizer	0.88 (0.62, 1.24)	0.45
Hand/Body lotion	1.11 (0.78, 1.57)	0.56
Suntan/Sunblock Lotion	3.25 (1.53, 6.93)	0.002

Abbreviations: OR; odds ratio, 95% CI; 95% confidence intervals, MEP; Monoethyl phthalate, MnBP; Mono-n-butyl phthalate, MiBP; Mono-isobutyl phthalate, MBzP; Monobenzyl phthalate, MEHP; Mono(2-ethylhexyl) phthalate, MEOHP; Mono(2-ethyl-5-oxohexyl) phthalate, MEHHP; Mono(2-ethyl-5-hydroxyhexyl) phthalate, MECPP; Mono(2-ethyl-5-carboxypentyl) phthalate, DEHP; (Di(2-ethylhexyl) phthalate) metabolites, MCPP; Mono(3-carboxypropyl) phthalate.

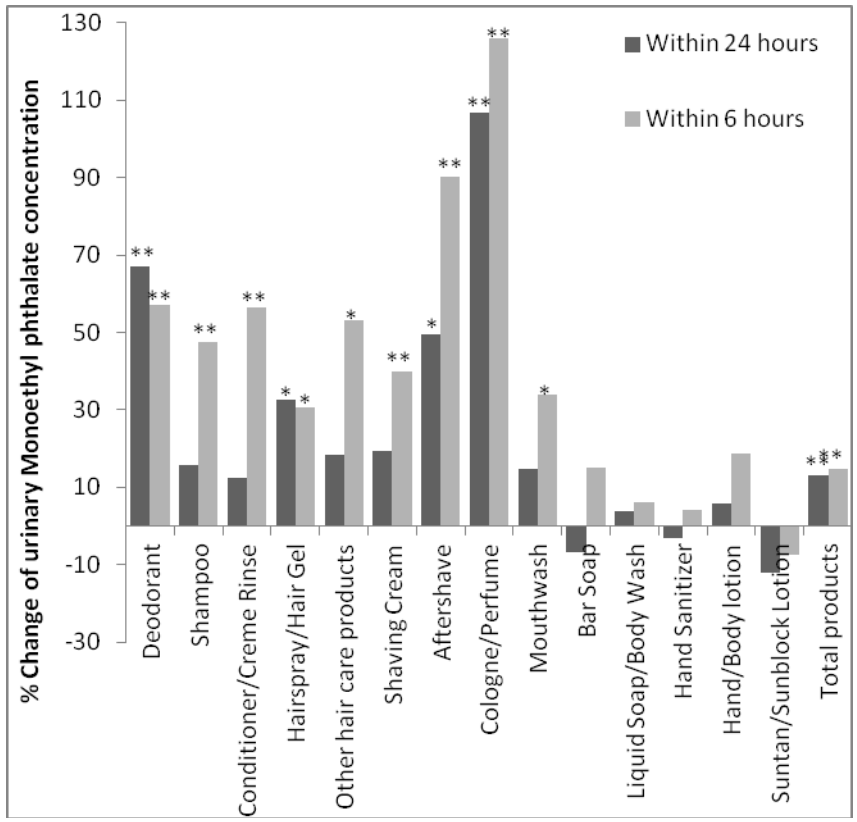
[a] Analysis adjusted for urine specific gravity (continuous), race (Caucasian or not), age (continuous), BMI (continuous), calendar year (continuous), time of sample collection (early morning (5am< and <=9am), late morning (9am< and <=12pm) or afternoon(>12pm)), current smoking (yes/no), warm season (April through September) (yes/no) and the product use within 24 hours (yes/no).

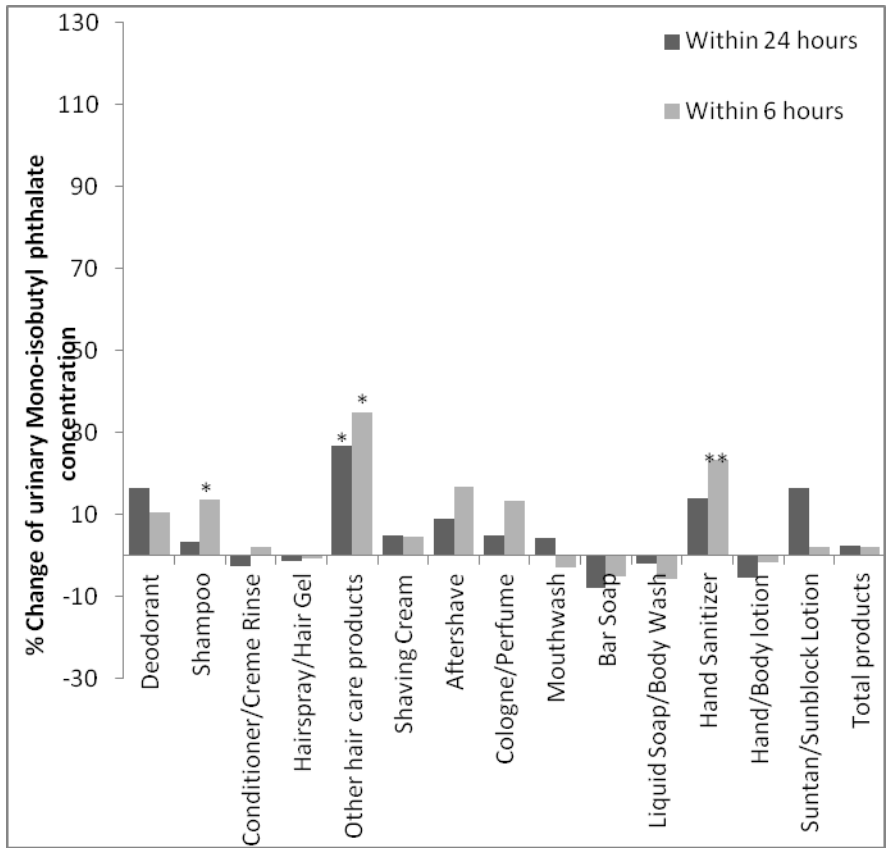
[b] Generalized estimating equations (GEE) was used for modeling butylparaben as binary variable: detected vs undetected in the imputed missing as zero.0.

Figure S5. (Panels A to E): Adjusted % change in urinary concentrations of parabens and phthalate metabolites associated with use of 14 personal care products (PCPs) within 24 and 6 hours of urine collection in the imputed missing as zero.

Panel 5A. Monoethyl phthalate (MEP) urinary concentration

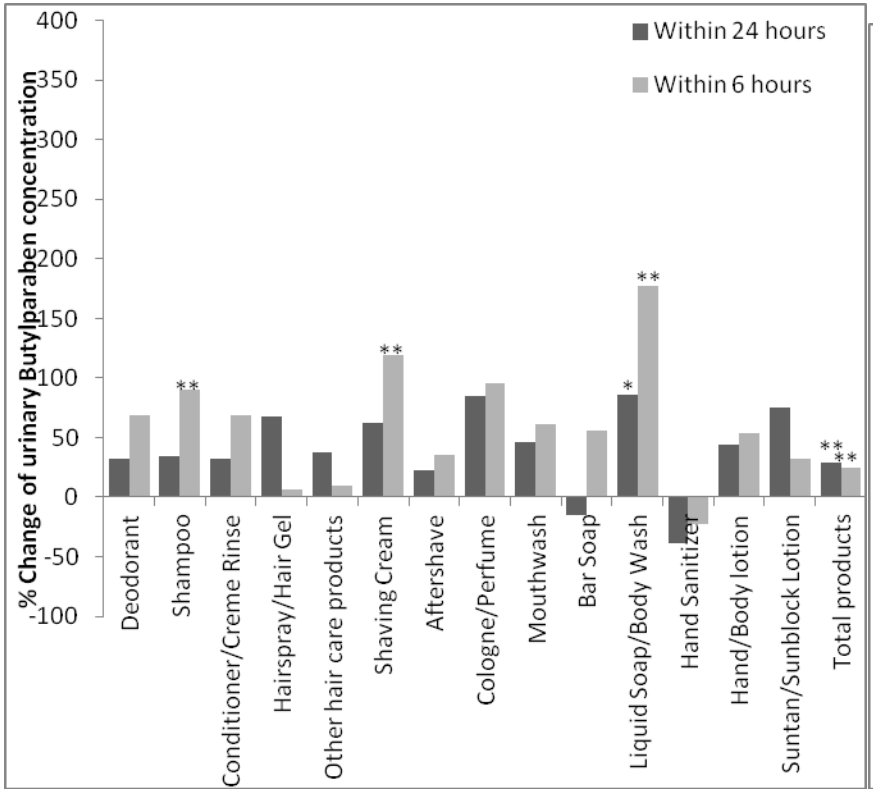
Panel 5B. Mono-isobutyl phthalate (MiBP) urinary concentration

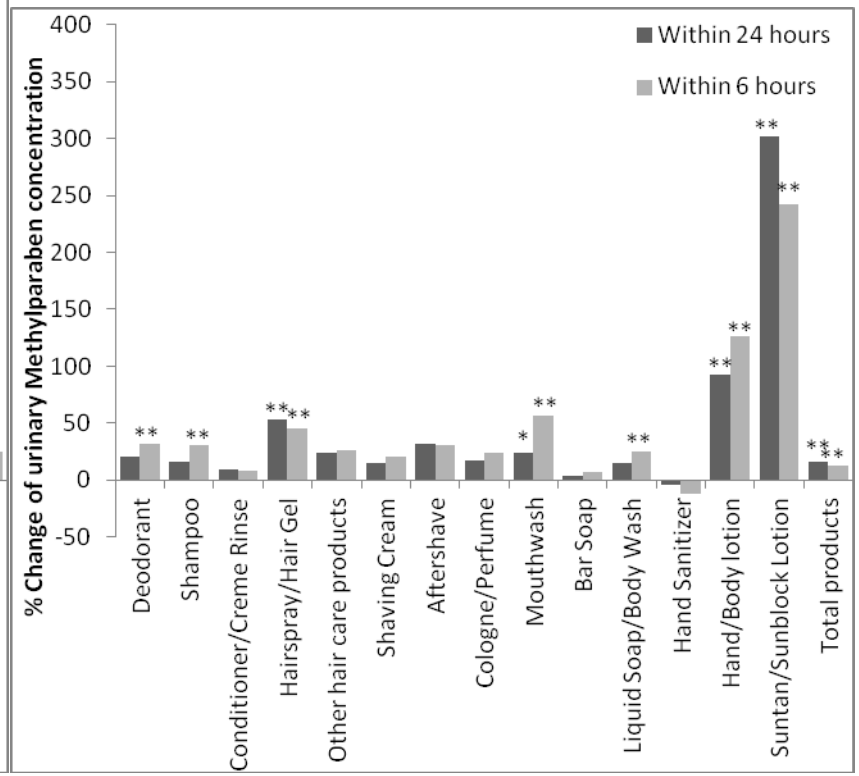

% Change of urinary Monoethyl phthalate concentration
130
110
90
70
50
30
10
-10
-30
Within 24 hours
Within 6 hours
Deodorant
Shampoo
Conditioner/Creme Rinse
Hairspray/Hair Gel
Other hair care products
Shaving Cream
Aftershave
Cologne/Perfume
Mouthwash
Bar Soap
Liquid Soap/Body Wash
Hand Sanitizer
Hand/Body lotion
Suntan/Sunblock Lotion
Total products



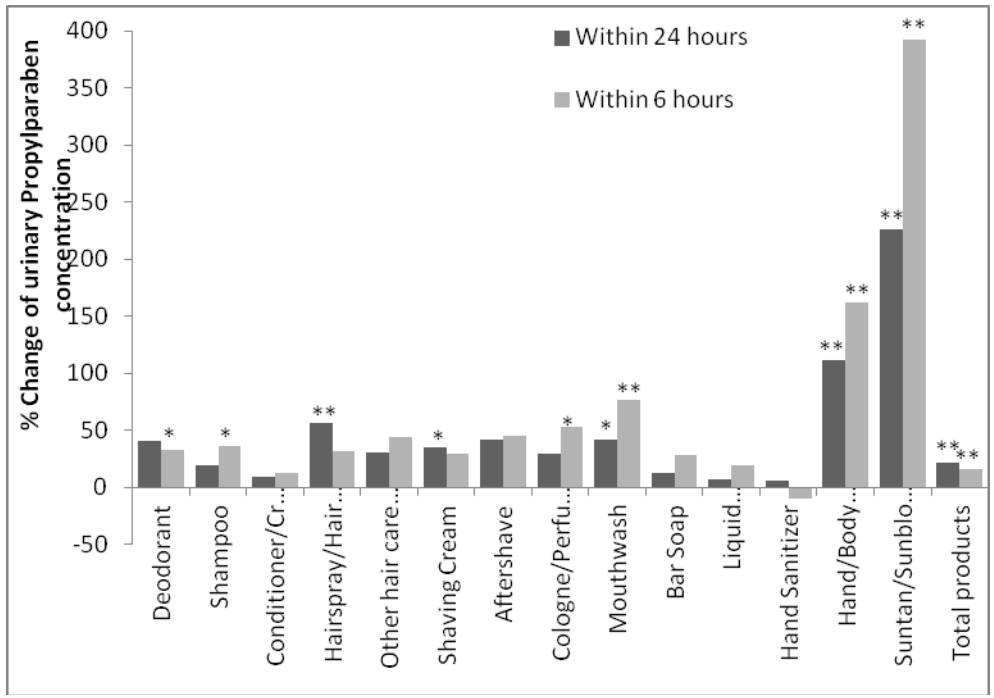
Panel 5C. Butylparaben urinary concentration

Panel 5D. Methylparaben urinary concentration


% Change of urinary Butylparaben concentration
400
350
300
250
200
150
100
50
0
-50
-100
Within 24 hours
Within 6 hours
Deodorant
Shampoo
Conditioner/Creme Rinse
Hairspray/Hair Gel
Other hair care products
Shaving Cream
Aftershave
Cologne/Perfume
Mouthwash
Bar Soap
Liquid Soap/Body Wash
Hand Sanitizer
Hand/Body lotion
Suntan/Sunblock Lotion
Total products


% Change of urinary Methylparaben concentration
400
350
300
250
200
150
100
50
0
-50
Within 24 hours
Within 6 hours
Deodorant
Shampoo
Conditioner/Creme Rinse
Hairspray/Hair Gel
Other hair care products
Shaving Cream
Aftershave
Cologne/Perfume
Mouthwash
Bar Soap
Liquid Soap/Body Wash
Hand Sanitizer
Hand/Body lotion
Suntan/Sunblock Lotion
Total products

Panel 5E. Propylparaben urinary concentration



[a] Statistical significance indicated as *: if p-value < 0.05, **: if p-value < 0.01
[b] Imputation for the missing values of PCP-use was assumed to be "0" i.e. no use.
[c] Analysis adjusted for urine specific gravity (continuous), race (Caucasian or not), age (continuous), BMI (continuous), calendar year (continuous), time of sample collection (early morning (5am< and <=9am), late morning (9am< and <=12pm) or afternoon(>12pm)), current smoking (yes/no), warm season (April through September) (yes/no) and the product use within 24 hours (yes/no).
[d] Total products: the crude sum of PCP used within 24 hours
[e] The total products' bars represent percent changes associated with each additional type of PCP used, regardless of which PCP.
[f] Combined other hair care products included mousse, hair bleach, relaxer, perm and straightener

Table S6. Adjusted [a] percent change associated with the weighted score: (based on binary use up-to 24 hours use and 6 hours) using the weighted binary score (WBS) in the imputed missing as zero.

	Percent change associated with the weighted score: (based on binary use up-to 24 hours use)		Percent change associated with the weighted score: (based on binary use up-to 6 hours use)	
Urinary biomarker	**% Change (95% CI)**	**p-value**	**% Change (95% CI)**	**p-value**
MEP	980 (496,1858)	<.0001	1483 (729,2924)	<.0001
MnBP	68 (11,155)	0.02	115 (34,246)	0.002
MiBP	89 (12,220)	0.02	102 (18,246)	0.01
MBzP	6 (-36,76)	0.81	10 (-37,94)	0.74
MEHP	3 (-38,71)	0.91	-4 (-47,75)	0.91
MEOHP	3 (-35,61)	0.91	13 (-28,76)	0.60
MEHHP	-1 (-38,60)	0.98	19 (-27,94)	0.49
MECPP	0 (-33,50)	0.99	12 (-21,59)	0.51
∑DEHP [b]	1 (-34,53)	0.98	12 (-24,65)	0.57
MCPP	47 (-19,167)	0.21	-9 (-51,72)	0.78
Methylparaben	6202 (2785,13668)	<.0001	9350 (3876,22362)	<.0001
Propylparaben	6512 (2099,19778)	<.0001	17283 (4909,60235)	<.0001
Butylparaben	199 (54,479)	0.001	487 (199,1055)	<.0001

Abbreviations: 95% CI; 95% confidence intervals, MEP; Monoethyl phthalate, MnBP; Mono-n-butyl phthalate, MiBP; Mono-isobutyl phthalate, MBzP; Monobenzyl phthalate, MEHP; Mono(2-ethylhexyl) phthalate, MEOHP; Mono(2-ethyl-5-oxohexyl) phthalate, MEHHP; Mono(2-ethyl-5-hydroxyhexyl) phthalate, MECPP; Mono(2-ethyl-5-carboxypentyl) phthalate, DEHP; (Di(2-ethylhexyl) phthalate) metabolites, MCPP; Mono(3-carboxypropyl) phthalate.

[a] Analysis adjusted for urine specific gravity (continuous), race (Caucasian or not), age (continuous), BMI (continuous), calendar year (continuous), time of sample collection (early morning (5am< and <=9am), late morning (9am< and <=12pm) or afternoon(>12pm)), current smoking (yes/no), warm season (April through September) (yes/no) and the product use within 24 hours (yes/no).

[b] ∑DEHP metabolites= MEHP+ MEOHP+ MEHHP+ MECPP weighted by the molecular weight.