

SUPPLEMENTAL MATERIAL

Article: Urinary Bisphenol A (BPA) Concentrations among Workers in Industries that Manufacture and Use BPA in the United States

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Supplemental Table S1. Creatinine-adjusted total BPA (µg/g) by industry and job for each urine collection time point. Total BPA was detected in all samples above the detection limit (0.1 µg/L).

	Day 1				Day 2		
	Pre-shift 1	Mid-shift 2	End-Shift 3	Post-shift 4	Pre-shift 5	Mid-shift 6	End-shift 7
Industry							
Phenolic resin mfg.							
n	28	28	28	26	26	26	24
GM	6.56	16.9	37.7	39.6	22.1	48.6	60.3
GSD	2.90	3.97	4.67	4.72	4.67	3.72	5.37
Median	5.14	15.9	51.8	43.8	23.5	61.0	80.5
Min., Max.	0.78, 112	1.64, 205	1.87, 320	2.51, 521	1.15, 221	5.53, 582	3.02, 1230
BPA & PC resin mfg.							
n	18	18	18	17	17	17	17
GM	69.4	141	247	239	186	211	332
GSD	4.12	3.35	3.71	2.98	3.12	3.67	3.63
Median	96.3	127	230	236	132	117	204
Min., Max.	6.56, 553	17.8, 1340	25.9, 4720	26.7, 2160	20.4, 2300	38.0, 2790	26.3, 3050
BPA-filled wax mfg./reclaim							
n	14	14	14	14	14	14	14
GM	111	304	491	571	348	525	584
GSD	4.66	4.77	5.01	4.90	3.95	4.03	3.86
Median	103	338	514	546	328	708	668
Min., Max.	14.5, 1580	22.2, 2350	42.6, 4460	52.8, 5400	51.2, 2880	51.4, 3530	56.8, 3420
BPA mfg.							
n	7	7	7	7	7	7	7
GM	37.4	93.0	123	143	104	105	177
GSD	4.01	9.44	11.1	10.2	8.73	10.9	14.7
Median	21.3	31.1	61.7	69.6	47.6	46.6	63.4
Min., Max.	9.94, 441	16.2, 6300	14.4, 13100	17.0, 7780	11.5, 4350	13.6, 8610	14.3, 18900
BPA-filled wax mfg., casting patterns/molds, wax melt/burn-out							
n	10	10	10	10	10	10	10
GM	25.4	37.0	81.1	102	85.9	88.7	157
GSD	5.14	3.72	4.45	5.52	7.93	5.65	4.96
Median	37.2	48.8	97.1	144	119	109	193
Min., Max.	2.54, 257	6.24, 245	10.3, 1010	10.3, 2530	6.33, 5790	9.83, 2460	16.0, 1520

Job							
Flaker operator							
n	12	12	12	11	11	11	11
GM	4.81	10.8	30.3	28.0	17.3	32.0	31.7
GSD	2.07	2.93	4.73	5.76	5.12	3.80	4.17
Median	4.67	9.58	43.6	22.4	17.0	20.3	21.8
Min., Max.	0.78, 11.0	1.64, 58.1	2.83, 316	2.51, 521	1.32, 221	5.53, 346	4.15, 457
Make/load BPA							
n	12	12	12	11	11	11	11
GM	49.1	121	197	217	165	208	295
GSD	5.38	8.02	10.4	9.04	8.40	10.3	12.3
Median	25.1	48.6	110	135	153	121	133
Min., Max.	6.56, 553	16.2, 6300	14.4, 13100	17.0, 7780	11.5, 4350	13.6, 8610	14.3, 18900
Kettle operator – resin mfg.							
n	22	22	22	21	21	21	19
GM	11.3	38.4	70.5	75.9	44.2	86.2	160
GSD	3.42	5.01	4.94	4.00	4.82	3.59	5.27
Median	11.3	44.5	80.9	110	69.1	98.7	173
Min., Max.	1.73, 112	1.98, 771	1.87, 798	3.77, 611	1.15, 672	6.08, 1330	3.02, 2720
Maintenance – BPA & PC resin mfg.							
n	7	7	7	7	7	7	7
GM	157	122	185	190	142	132	180
GSD	1.79	1.75	1.59	1.62	1.53	1.55	1.41
Median	128	120	223	210	125	117	185
Min., Max.	89.8, 453	57, 317	74.8, 312	77.1, 348	90.7, 297	67.7, 269	112, 339
Molten BPA-filled wax work: reclaim, melt/burn-out							
n	6	6	6	6	6	6	6
GM	94.9	277	569	576	337	389	621
GSD	18.0	12.2	10.6	13.5	11.7	10.9	7.02
Median	501	1060	1780	2100	1250	1320	1430
Min., Max.	2.54, 1580	8.81, 2350	10.3, 4460	10.3, 5400	8.78, 2880	15.9, 3530	36.2, 3420
Make BPA-filled wax							
n	14	14	14	14	14	14	14
GM	63.0	133	248	304	213	320	392
GSD	3.46	4.33	4.25	4.27	4.74	4.28	3.67
Median	96.3	145	236	261	195	404	497
Min., Max.	3.29, 273	6.24, 2110	11.8, 2880	15.1, 4010	6.33, 5790	9.83, 2460	18.3, 1890
Solid BPA-filled wax work: wax patterns, mold assembly, lab QC							
n	4	4	4	4	4	4	4
GM	25.2	32.2	47.6	69.0	61.7	54.7	80.1
GSD	1.94	2.61	2.62	3.26	3.94	2.94	3.69
Median	25.8	32.3	44.4	70.0	67.4	53.6	92.9
Min., Max.	11.3, 55.4	10.9, 104	15.8, 165	16.9, 292	11.1, 307	14.9, 209	16.0, 351

Abbreviations: mfg.=manufacturing, n=number of urine samples, PC=polycarbonate, QC=quality control

Supplemental Table S2. Creatinine-adjusted total BPA ($\mu\text{g/g}$) compared to the NHANES 2013-2014 GM of 1.27 $\mu\text{g/g}$ for adults aged 20+ years, two-tailed t-test.

	n	Sample Set	GM $\mu\text{g/g}$	p-value ^a
Industry				
Phenolic resin mfg.	28	Baseline	6.56	<0.0001
	158	Post-baseline	33.8	<0.0001
BPA & PC resin mfg.	18	Baseline	69.4	<0.0001
	104	Post-baseline	218	<0.0001
BPA-filled wax mfg./reclaim	14	Baseline	111	<0.0001
	84	Post-baseline	457	<0.0001
BPA mfg.	7	Baseline	37.4	0.0007
	42	Post-baseline	121	<0.0001
BPA-filled wax mfg., casting patterns/molds, wax-melt/burn-out	10	Baseline	25.4	0.0003
	60	Post-baseline	84.5	<0.0001
Job				
Flaker operator	12	Baseline	4.81	<0.0001
	68	Post-baseline	23.2	<0.0001
Make/load BPA	12	Baseline	49.1	<0.0001
	68	Post-baseline	192	<0.0001
Kettle operator – resin mfg.	22	Baseline	11.3	<0.0001
	126	Post-baseline	69.5	<0.0001
Maintenance – BPA & PC resin mfg.	7	Baseline	157	<0.0001
	42	Post-baseline	156	<0.0001
Molten BPA-filled wax work: reclaim, melt/burn-out	6	Baseline	94.9	0.0147
	36	Post-baseline	441	<0.0001
Make BPA-filled wax	14	Baseline	63.0	<0.0001
	84	Post-baseline	254	<0.0001
Solid BPA-filled wax work: wax patterns, mold assembly, lab QC	4	Baseline	25.2	0.0029
	24	Post-baseline	55.3	<0.0001

^a Sample GM compared to NHANES 2013-2014 GM of 1.27 $\mu\text{g/g}$ for adults aged 20+ years.

Abbreviations: mfg.=manufacturing; n=number of urine samples; PC=polycarbonate; QC=quality control

Supplemental Table S3: Unadjusted (volume-based) total and free BPA concentrations by collection time point.

Time Point	Day 1					Day 2		
	All	Pre-shift 1	Mid-shift 2	End Shift 3	Post-shift 4	Pre-shift 5	Mid-shift 6	End-shift 7
Total BPA, µg/L								
n	525	77	77	77	74	74	74	72
No.<LOD	0	0	0	0	0	0	0	0
AM (SD)	658 (2190)	190 (391)	375 (1070)	666 (2040)	776 (2030)	668 (1750)	819 (2320)	1150
GM (GSD)	107 (6.82)	43.2 (5.64)	69.7 (6.45)	133 (5.83)	119 (7.22)	125 (6.60)	149 (6.83)	191 (7.07)
Median	108	30.0	62.4	125	97.0	126	149	200
25 th , 75 th Percentiles	25.4, 379	10.8, 144	15.3, 265	37.3, 392	21.1, 479	44.0, 379	34.0, 470	47.2, 671
Range	1.1, 32,900	1.90-2060	1.7-8300	4.5-15,700	3.7-13,800	1.7-10,200	1.1-16,700	1.4-32,900
Free BPA, µg/L								
n	525	77	77	77	74	74	74	72
No. <LOD (%)	153 (29.1)	30 (39.0)	21 (27.3)	20 (26.0)	25 (33.8)	21 (28.4)	19 (25.7)	17 (23.6)
AM (SD)	3.71 (10.4)	1.37 (3.16)	1.84 (3.96)	4.14 (11.6)	4.76 (12.9)	4.98 (14.7)	3.56 (7.30)	5.51 (13.0)
GM (GSD)	0.52 (7.47)	0.26 (5.86)	0.41 (6.08)	0.64 (7.38)	0.47 (8.79)	0.60 (7.68)	0.68 (7.44)	0.82 (8.40)
Median	0.050	0.20	0.30	0.70	0.45	0.90	0.60	0.85
25 th , 75 th Percentiles	0.50, 2.3	ND, 1.20	ND, 1.90	ND, 2.60	ND, 2.0	ND, 1.90	ND, 3.70	0.15, 4.30
Range	ND-88.8	ND-18.5	ND-24.3	ND-66.1	ND-73.8	ND-86.4	ND-41.1	ND-88.8

LOD=0.1 µg/L, LOD/2 used for non-detects

Abbreviation: ND=not detected

Supplemental Table S4: Specific-gravity adjusted total and free BPA concentrations by collection time point.

	Day 1					Day 2		
	All	Pre-shift	Mid-shift	End Shift	Post-shift	Pre-shift	Mid-shift	End-shift
Total BPA, µg/L								
n	525	77	77	77	74	74	74	72
No. <LOD	0	0	0	0	0	0	0	0
AM (SD)	763 (2190)	211 (417)	452 (1160)	817 (2080)	937 (2070)	796 (1960)	874 (2030)	1300 (3970)
GM (GSD)	150 (6.56)	50.6 (5.74)	103 (5.77)	195 (5.66)	201 (6.34)	156 (6.75)	202 (6.20)	279 (6.63)
Median	161	34.3	96.6	224	241	177	217	271
25 th , 75 th Percentiles	34.8, 461	11.9, 201	23.9, 266	62.9, 459	55.2, 575	40.4, 520	73.5, 552	101, 1320
Range	1.63-32,900	2.07-2470	4.08-9050	4.80-15,700	3.86-13,200	1.63-11,300	3.77-14,800	3.06-32,900
Free BPA, µg/L								
n	525	77	77	77	74	74	74	72
No. <LOD (%)	153 (29.1)	30 (39.0)	21 (27.3)	20 (26.0)	25 (33.8)	21 (28.4)	19 (25.7)	17 (23.6)
AM (SD)	4.43 (11.4)	1.43 (2.83)	2.16 (3.56)	5.60 (14.3)	5.35 (12.8)	5.56 (15.9)	4.34 (8.65)	6.82 (13.6)
GM (GSD)	0.73 (7.13)	0.31 (5.82)	0.61 (5.65)	0.94 (7.21)	0.79 (7.31)	0.75 (7.45)	0.93 (6.91)	1.20 (8.36)
Median	0.76	0.20	0.51	0.86	0.71	0.95	0.80	1.11
25 th , 75 th Percentiles	0.13, 3.0	ND, 1.35	ND, 2.23	ND, 3.41	ND, 2.92	ND, 2.40	ND, 3.86	0.17, 7.51
Range	ND-98.7	ND-14.1	ND-16.4	ND-88.8	ND-70.8	ND-98.7	ND-53.6	ND-88.8

LOD=0.1 µg/L, LOD/2 used for non-detects

Abbreviation: ND=not detected

Supplemental Table S5. Linear regression models evaluating the effect of BMI (kg/m²) on ln(total BPA_{CR}, µg/g) at time points 2-7 after adjusting for age (years) and ln(total BPA_{CR}, µg/g) at time point1 (baseline).

Model	Term	β (SE)	p-value
Day 1 – Mid Shift (Time Point 2)	Intercept	0.720 (0.810)	0.3772
	ln(total BPA _{CR}) at baseline	0.894 (0.0641)	<0.0001
	Age	-0.0124 (0.0101)	0.2235
	BMI	0.0326 (0.0199)	0.1059
Day 1- End Shift (Time Point 3)	Intercept	1.416 (1.027)	0.1719
	ln(total BPA _{CR}) at baseline	0.794 (0.0812)	<0.0001
	Age	-0.0195 (0.0128)	0.1324
	BMI	0.0515 (0.0252)	0.0448
Day 1 – Post Shift (Time Point 4)	Intercept	1.024 (1.044)	0.3302
	ln(total BPA _{CR}) at baseline	0.799 (0.0825)	<0.0001
	Age	-0.0179 (0.0128)	0.1678
	BMI	0.0630 (0.0258)	0.0173
Day 2 – Pre Shift (Time Point 5)	Intercept	0.0167 (1.028)	0.9871
	ln(total BPA _{CR}) at baseline	0.840 (0.0812)	<0.0001
	Age	-0.0155 (0.0126)	0.2244
	BMI	0.0746 (0.0254)	0.0045
Day 2 – Mid Shift (Time Point 6)	Intercept	1.950 (1.032)	0.0629
	ln(total BPA _{CR}) at baseline	0.709 (0.0815)	<0.0001
	Age	-0.0225 (0.0127)	0.0795
	BMI	0.0486 (0.0255)	0.0610
Day 2 – End Shift (Time Point 7)	Intercept	1.046 (1.155)	0.3681
	ln(total BPA _{CR}) at baseline	0.719 (0.0913)	<0.0001
	Age	-0.0153 (0.0144)	0.2895
	BMI	0.0784 (0.0285)	0.0075

Abbreviations: BMI = body mass index

Bolded values: p<0.05

Supplemental Table S6: Results of stepwise forward selection regression for specific-gravity adjusted total BPA (total BPA_{SG}, µg/L) at time points 2-7, n=448 samples (151 worker-days, and 77 workers).

^a Dependent Variable: ln(total BPA _{SG})	B (SE)	p-value	Factor ^b
Intercept	1.379(0.717)	0.0575	
ln(total BPA _{SG}) at time point 1 (baseline)	0.793 (0.0615)	<0.0001	2.21 ^c
Time Point		<0.0001	
2 (mid-shift Day 1)	Ref.		
3 (end-shift Day 1)	0.645 (0.0741)	<0.0001	1.91 ^d
4 (post-shift Day 1)	0.610 (0.101)	<0.0001	1.84
5 (pre-shift Day 2)	0.358 (0.119)	0.0028	1.43
6 (mid-shift Day 2)	0.562 (0.133)	<0.0001	1.75
7 (end-shift Day 2)	0.842 (0.143)	<0.0001	2.32
BMI, kg/m ²	0.0652 (0.0193)	0.0011	1.07
Handled bulk sacks, bags, drums or buckets of BPA			
No	Ref.		
Yes	0.714 (0.207)	0.0006	2.04 ^e
Wore gloves		0.0044	
None	Ref.		
Fabric or Leather	-0.00294 (0.251)	0.9907	1.0
Chemical-resistant	0.517 (0.253)	0.0418	1.68
Wore a Tyvek [®] coverall			
No	Ref.		
Yes	0.655 (0.234)	0.0054	1.92

^a Mixed model with a first order autoregressive covariance structure. Results adjusted for ln(total BPA_{SG}) at time point 1 (baseline), time point, and BMI. Remaining covariates presented in order of entry into the model. Estimated lag-one autocorrelation coefficient=0.8310.

^b e^β

^c Indicates a 2.21 times increase in total BPA_{SG} when total BPA_{SG} at time point 1 (baseline) increases by a factor of e.

^d Indicates that total BPA_{SG} increased by 1.89 times at time point 3 (end-shift Day 1) as compared to time point 2 (mid-shift Day 1). Time points 4, 5, 6 and 7 are also compared to time point 2.

^e Indicates that participants who reported “Yes” had a 2.04 times increase in total BPA_{SG} as compared to those who reported “No”.

Abbreviations: BMI=body mass index; Ref.=referent group

Supplemental Table S7. Results of univariate linear regression models for total BPA ($\mu\text{g/L}$) at baseline (N=77) and post - baseline (N=448) with $\ln(\text{creatinine})$ treated as a covariate.

^aBaseline: Dependent variable: $\ln(\text{total BPA, } \mu\text{g/L})$ at time point 1, n=77	β (SE)	p-value
Industry		<0.0001
Phenolic resin mfg.	Ref.	Ref
BPA & PC resin mfg.	2.315 (0.420)	<0.0001
BPA-filled wax mfg./reclaim	2.788 (0.451)	<0.0001
BPA mfg.	1.733 (0.574)	<0.0035
BPA-filled wax mfg., casting patterns/molds, wax melt/burn-out	1.327 (0.503)	<0.0102
Job		<0.0001
Flaker operator – resins	Ref.	Ref
Make/load BPA	2.321 (0.571)	0.0001
Kettle Operator – resin mfg.	0.855 (0.500)	0.0917
Maintenance – BPA & PC resin mfg.	3.478 (0.689)	<0.0001
Molten BPA-filled wax work: reclaim, melt/burn-out	2.979 (0.702)	<0.0001
Make BPA-filled wax	2.569 (0.552)	<0.0001
Solid BPA-filled wax work: wax patterns, mold assembly, lab QC	1.655 (0.808)	0.0443
Total hours off work before collecting first urine sample	-0.00912 (0.00437)	0.0402
Current smoker (Yes/No=Ref.)	0.900 (0.418)	0.0345
^b BMI, kg/m^2	-0.0369 (0.0356)	0.3031
Number of canned foods consumed past 24-h	0.208 (0.348)	0.5509
Age, years	-0.0156 (0.0198)	0.4170
Number of cans (Food or Beverage) consumed past 24-h		0.9266
None	Ref.	Ref
1-2	0.115 (0.459)	0.8036
>2	0.195 (0.518)	0.7071
Number of canned beverages consumed past 24-hr	0.0280 (0.112)	0.8037
^cPost Baseline: Dependent variable: $\ln(\text{total BPA, } \mu\text{g/L})$ at time points 2-7, n=448		
Handled bulk sacks, bags, drums or buckets of BPA (Yes/No=Ref.)	0.950 (0.178)	<0.0001
Wore a Tyvek® coverall (Yes/No=Ref.)	1.022 (0.205)	<0.0001
Wore a respirator (Yes/No=Ref.)	0.745 (0.157)	<0.0001
Handled empty bulk sacks, bags or drum liners of BPA (Yes/No=Ref.)	0.797 (0.177)	<0.0001
Number of process/bulk samples taken containing BPA (>3, ≤ 3 =Ref.)	0.932 (0.234)	<0.0001
Actual shift length worked (treated as ordinal), h	0.275 (0.0982)	0.0054
Glove worn		0.0094
None	Ref.	Ref
Leather or fabric	0.0262 (0.257)	0.258
Chemical-resistant	0.512 (0.258)	0.0484
Job		0.0574
Flaker operator – resins	Ref.	Ref.
Make/load BPA	-0.108 (0.460)	0.8145
Kettle operator – resin mfg.	0.158 (0.371)	0.6703
Maintenance – BPA & PC resin mfg.	-1.2031 (0.570)	0.0381
Molten BPA-filled wax work: reclaim, melt/burn-out	0.287 (0.553)	0.6049
Make BPA-filled wax	0.189 (0.441)	0.670
Solid BPA-filled wax work; wax patterns, mold assembly, lab QC	-0.669 (0.580)	0.2523
Percent of shift in production areas vs. offices/control rooms ($\geq 50\%$, $< 50\%$ =ref.)	0.390 (0.193)	0.0447
Total hours off work before collecting first urine sample	0.00380 (0.00270)	0.1635
Age, years	-0.0102 (0.0111)	0.3639
Number of times washed hands during work shift		0.2718
1-4	Ref.	Ref
5-7	-0.0962 (0.148)	0.5156
>7	0.151 (0.193)	0.4335
Smoked during work shift (Yes/No=Ref.)	0.229 (0.253)	0.3662

Current smoker (Yes/No=Ref.)	0.215 (0.257)	0.4051
Industry		0.3716
Phenolic resin mfg.	Ref.	Ref.
BPA & PC resin mfg.	-0.0480 (0.383)	0.9006
BPA-filled wax mfg./reclaim	0.627 (0.412)	0.1322
BPA mfg.	0.0295 (0.450)	0.9480
BPA-filled wax mfg., casting patterns/molds, wax melt/burn-out	-0.114 (0.389)	0.7708
Spilled BPA (Yes/No=Ref.)	0.108 (0.242)	0.6556
Changed clothes/uniform before leaving work (Yes/No=Ref.)	0.144 (0.202)	0.4768
Chewed tobacco during work shift, (Yes/No=Ref.)	0.0860 (0.301)	0.7758
Chewed gum during work shift, (Yes/No=Ref.)	0.0614 (0.189)	0.7438
Type of shirt, (Short/Long=ref.)	0.0641 (0.217)	0.7684
Cleaned up a BPA spill (Yes/No=Ref.)	-0.0528 (0.238)	0.8246
Ate food during work shift (Yes/No=Ref.)	0.00204 (0.136)	0.9880

^aWhen covariates with a univariate p-value ≤ 0.2 (current smoker, hours off, job and industry) were included in a model, and after adjusting for ln(creatinine) at time point 1 (baseline), only industry remained significant, $p=0.0272$

^bWhen BMI adjusted for age, $p=0.3240$

^c Models adjusted for ln(total BPA) at time point 1 (baseline), time point, BMI, ln(creatinine), and ln(creatinine) at time point 1 (baseline).

Abbreviations: mfg.=manufacturing; PC=polycarbonate; QC=quality control; Ref.=referent group

Supplemental Table S8: Results of stepwise forward regression model for total BPA ($\mu\text{g/L}$) at time points 2-7
 N=448 samples (151 worker-days, 77 workers) with $\ln(\text{creatinine})$ treated as a covariate.

^a Dependent Variable: $\ln(\text{total BPA, } \mu\text{g/L})$	B (SE)	p-value	Factor ^b
Intercept	0.0985 (1.19)	0.9341	
$\ln(\text{total BPA})$ at time point 1 (baseline)	0.853 (0.0645)	<0.0001	2.35 ^c
$\ln(\text{creatinine, mg/dL})$ at time point 1 (baseline)	-0.628 (0.208)	0.0035	0.53
$\ln(\text{creatinine, mg/dL})$	0.882 (0.0416)	<0.0001	2.41
Time Point		<0.0001	
2 (mid-shift Day 1)	Ref.		
3 (end-shift Day 1)	0.638 (0.0700)	<0.0001	1.89 ^d
4 (post-shift Day 1)	0.644 (0.0966)	<0.0001	1.90
5 (pre-shift Day 2)	0.290 (0.115)	0.0117	1.34
6 (mid-shift Day 2)	0.609 (0.128)	<0.0001	1.84
7 (end-shift Day 2)	0.915 (0.138)	<0.0001	2.50
BMI, kg/m^2	0.0589 (0.0200)	0.0042	1.06
Handled bulk sacks, bags, drums or buckets of BPA			
No	Ref.		
Yes	0.620 (0.200)	0.0021	1.86 ^e
Number of process/bulk samples taken containing BPA			
≤ 3	Ref.		
> 3	0.791 (0.226)	0.0005	2.21
Wore a Tyvek ^o coverall			
No	Ref.		
Yes	0.623 (0.229)	0.0067	1.86

^aMixed model with a first order autoregressive covariance structure. Results adjusted for $\ln(\text{total BPA})$ at time point 1 (baseline), time point, BMI, $\ln(\text{creatinine})$ and $\ln(\text{creatinine})$ at time point 1 (baseline). Remaining covariates presented in order of entry into the model. Estimated lag-one autocorrelation coefficient (ρ)=0.8530

^b e^β

^c Indicates a 2.35 times increase in total BPA when total BPA at time point 1 (baseline) increases by a factor of e.

^d Indicates that total BPA is increased 1.89 times at time point 3 (end-shift Day 1) as compared to time point 2 (mid-shift Day 1). Time points 4, 5, 6 and 7 are also compared to time point 2.

^e Indicates that participants who reported "Yes" had a 1.86 times increase in total BPA_{CR} as compared to those who reported "No".

Abbreviations: BMI=body mass index; Ref.=referent group

Supplemental Table S9. Linear regression models evaluating the effect of BMI (kg/m²) on ln(total BPA, µg/L) at time points 2-7 after adjusting for age (years), ln(total BPA, µg/L) at time point 1 (baseline), ln(creatinine, mg/dL) at baseline, and ln(creatinine) at each modeled time point.

Model	Term	β (SE)	p-value
Day 1 – Mid Shift (Time Point 2)	Intercept	-0.0592 (1.425)	0.9670
	ln(total BPA) at baseline	0.894 (0.0660)	<0.0001
	ln(creatinine) at baseline	-0.726 (0.245)	0.0041
	ln(creatinine)	0.861 (0.154)	<0.0001
	Age	-0.0102 (0.0108)	0.3501
	BMI	0.0328 (0.0202)	0.1095
Day 1- End Shift (Time Point 3)	Intercept	0.645 (1.798)	0.7211
	ln(total BPA) at baseline	0.765 (0.0860)	<0.0001
	ln(creatinine) at baseline	-0.575 (0.318)	0.0748
	ln(creatinine)	0.750 (0.189)	0.0002
	Age	-0.0165 (0.0137)	0.2344
Day 1 – Post Shift (Time Point 4)	Intercept	0.0476 (0.0256)	0.0673
	ln(total BPA) at baseline	-0.610 (1.866)	0.7449
	ln(creatinine) at baseline	0.806 (0.0850)	<0.0001
	ln(creatinine)	-0.684 (0.282)	0.0179
	ln(creatinine)	1.0135 (0.168)	<0.0001
Day 2 – Pre Shift (Time Point 5)	Age	-0.0161 (0.0137)	0.2447
	BMI	0.0617 (0.0264)	0.0222
	Intercept	-0.687 (1.926)	0.7224
	ln(total BPA) at baseline	0.840 (0.0835)	<0.0001
	ln(creatinine) at baseline	-0.671 (0.303)	0.0301
Day 2 – Mid Shift (Time Point 6)	ln(creatinine)	0.798 (0.304)	0.0106
	Age	-0.0137 (0.0134)	0.3101
	BMI	0.0760 (0.0260)	0.0048
	Intercept	-0.676 (1.772)	0.7039
	ln(total BPA) at baseline	0.721 (0.0836)	<0.0001
Day 2 – End Shift (Time Point 7)	ln(creatinine) at baseline	-0.490 (0.303)	0.1098
	ln(creatinine)	1.0120 (0.213)	<0.0001
	Age	-0.0190 (0.0134)	0.1627
	BMI	0.0459 (0.0269)	0.0920
	Intercept	-1.626 (2.0172)	0.4232
Day 2 – End Shift (Time Point 7)	ln(total BPA) at baseline	0.735 (0.0945)	<0.0001
	ln(creatinine) at baseline	-0.526 (0.326)	0.1113
	ln(creatinine)	1.0583 (0.207)	<0.0001
	Age	-0.0119 (0.0153)	0.4411
	BMI	0.0756 (0.0290)	0.0112

BMI = body mass index

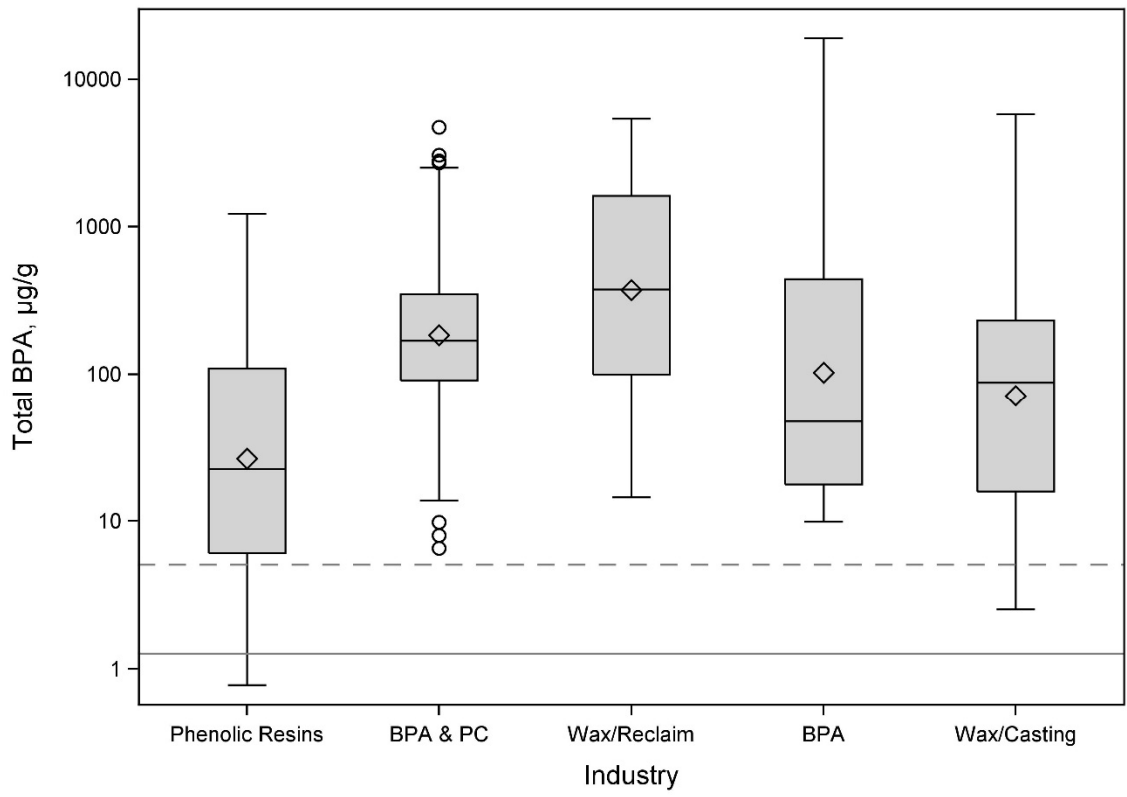
Bolded values: p<0.05

Supplemental Table S10: Estimated 24-h BPA intake ($\mu\text{g}/\text{kg}$ bw-day) for Day 1 by imputed urine volume, N=74

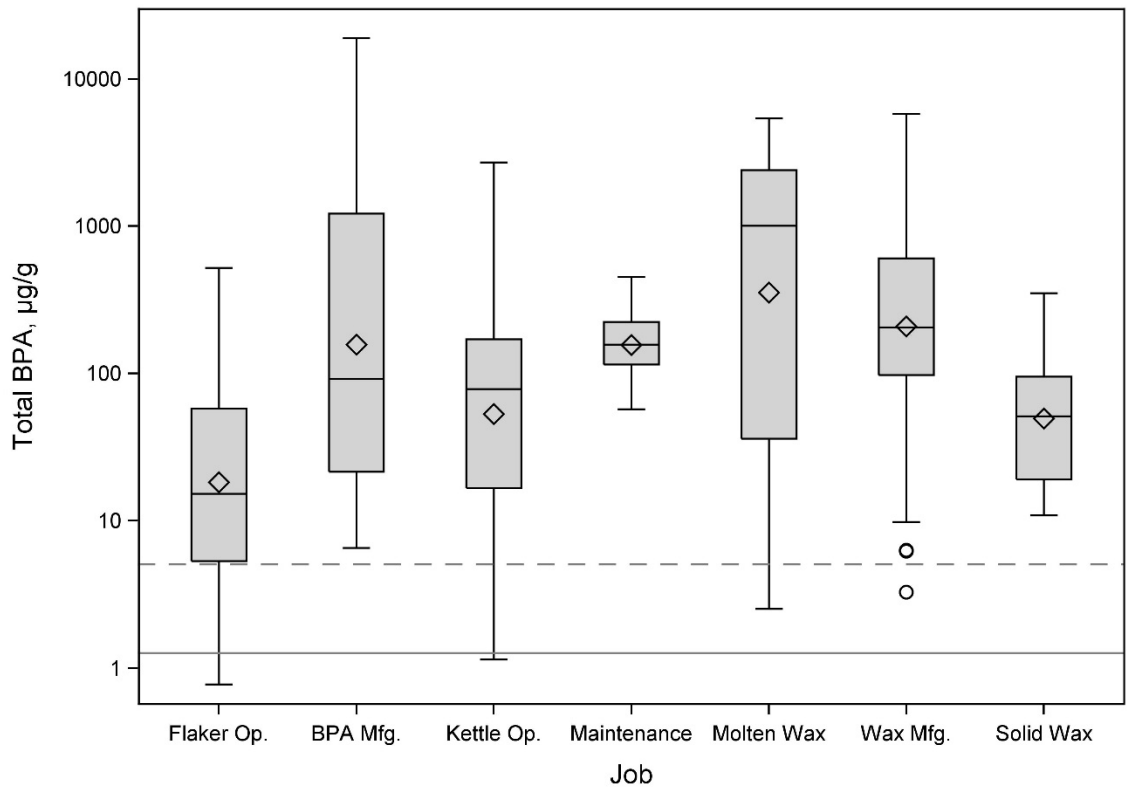
	Imputed 24-h urine volume		
	0.6 L	1.2 L	2.0 L
AM (\pm SD)	3.98 (\pm 10.4)	7.95 (\pm 20.8)	13.3 (\pm 34.7)
GM (GSD)	0.88 (5.68)	1.77 (5.68)	2.95 (5.68)
Range	0.035-73.9	0.069-148	0.12-246
No. above 50 $\mu\text{g}/\text{kg}$ -day ^a (%)	1 (1.4)	2 (2.7)	6 (8.1)
No. above 4 $\mu\text{g}/\text{kg}$ -day ^b (%)	15 (20.3)	21 (28.4)	33 (44.6)

^a U.S. EPA Reference Dose (RfD) for BPA

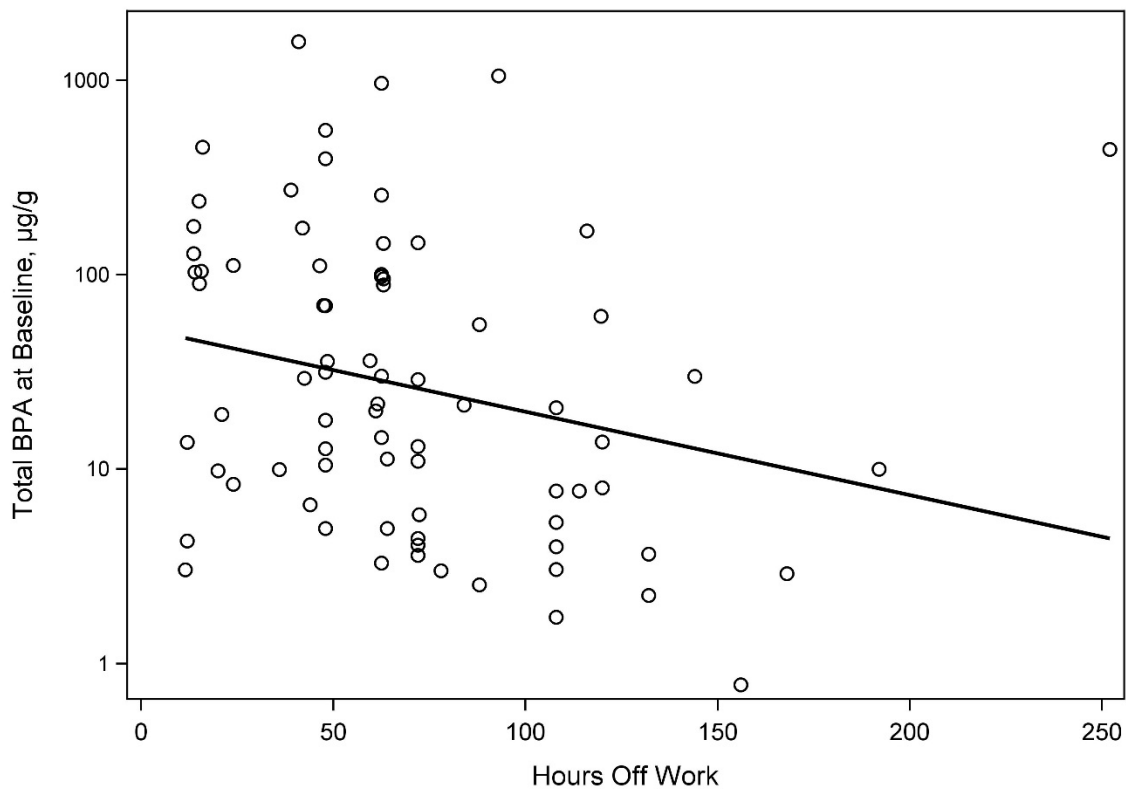
^b European Food Safety Authority temporary Tolerable Daily Intake (TDI) for BPA.



Supplemental Fig. S1. Box plots of total BPA ($\mu\text{g/g}$) by industry for all 525 samples (151 worker-days, 77 workers). Solid line is the geometric mean ($1.27 \mu\text{g/g}$), dashed line is the 95th percentile ($5.09 \mu\text{g/g}$) for total BPA from NHANES 2013-2014, adults 20 years and older. The box represents the interquartile range and the diamond represents the geometric mean. Abbreviations: PC=polycarbonate



Supplemental Fig. S2. Box plots of total BPA ($\mu\text{g/g}$) by job for all 525 samples (151 worker-days, 77 workers). Solid line is the geometric mean ($1.27 \mu\text{g/g}$), dashed line is the 95th percentile ($5.09 \mu\text{g/g}$) for total BPA from NHANES 2013-2014, adults 20 years and older. The box represents the interquartile range and the diamond represents the geometric mean. Abbreviations: Mfg. = Manufacturing



Supplemental Figure S3: Total BPA adjusted for creatinine at baseline vs. total hours off work before collecting first urine sample. N=77. Regression equation: Total BPA_{CR} at baseline = $e^{-0.00986 (\text{hours off work}) + 3.96557}$, $r^2 = 0.0636$.