

Title: Adolescent use of hair dyes, straighteners and perms in relation to breast cancer risk

Authors: Alexandra J. White, Allyson M. Gregoire, Kyla W. Taylor, Carolyn Eberle, Symielle Gaston, Katie M. O'Brien, Chandra L. Jackson, Dale P. Sandler

Supplemental Material Table of Contents:

Table S1. Study population characteristics at baseline by race/ethnicity and chemical straightener use, Sister Study, 2003-2009.....Pg 2

Table S2. Associations between hair product use between the ages of 10-13 years and breast cancer risk by ER status, Sister Study, 2003-2018.....Pg 3

Table S3. Associations between hair product use between the ages of 10-13 years and breast cancer risk by extent, Sister Study, 2003-2018.....Pg 4

Table S1. Study population characteristics at baseline by race/ethnicity and chemical straightener use, Sister Study, 2003-2009

Characteristic	Non-Hispanic white (N =39,542)				Black (N=4,300)			
	Straightener Use		Perm Use		Straightener Use		Perm Use	
	None N (col %)	Any N (col %)	None N (col %)	Any N (col %)	None N (col %)	Any N (col %)	None N (col %)	Any N (col %)
Age								
≤45	4618 (12.3%)	114 (8.4%)	3224 (13.5%)	1469 (10.3%)	135 (13.8%)	521 (17.4%)	578 (15.9%)	77 (22.8%)
46-49	5524 (14.7%)	226 (16.7%)	4763 (19.9%)	931 (6.5%)	141 (14.4%)	544 (18.2%)	610 (16.8%)	73 (21.7%)
50-54	6871 (18.3%)	509 (37.7%)	5106 (21.4%)	2162 (15.2%)	211 (21.6%)	677 (22.7%)	801 (22.1%)	84 (24.9%)
55-59	7386 (19.7%)	381 (28.2%)	4172 (17.5%)	3421 (24%)	233 (23.9%)	621 (20.8%)	797 (22%)	61 (18.1%)
60-64	5975 (15.9%)	84 (6.2%)	2916 (12.2%)	2988 (21%)	148 (15.2%)	396 (13.3%)	513 (14.1%)	30 (8.9%)
≥65	7169 (19.1%)	36 (2.7%)	3698 (15.5%)	3271 (23%)	108 (11.1%)	229 (7.7%)	328 (9%)	12 (3.6%)
Age at menarche, mean (SD)	12.7 (1.5)	12.5 (1.47)	12.7 (1.48)	12.6 (1.52)	12.7 (1.81)	12.4 (1.69)	12.5 (1.72)	12.2 (1.83)
Household education during early life								
Less than High School Degree	5371 (14.3%)	119 (8.8%)	3066 (12.8%)	2275 (16%)	379 (38.8%)	1098 (36.7%)	1384 (38.2%)	97 (28.8%)
High School Degree	13789 (36.7%)	522 (38.7%)	8507 (35.6%)	5532 (38.8%)	353 (36.2%)	1053 (35.2%)	1294 (35.7%)	115 (34.1%)
Some College/Technical School	7377 (19.6%)	255 (18.9%)	4490 (18.8%)	2971 (20.9%)	137 (14%)	486 (16.3%)	543 (15%)	77 (22.8%)
Bachelor's Degree or Higher	11006 (29.3%)	454 (33.6%)	7816 (32.7%)	3464 (24.3%)	107 (11%)	351 (11.7%)	406 (11.2%)	48 (14.2%)
Household income during early life								
Well off	2531 (6.7%)	149 (11%)	1889 (7.9%)	751 (5.3%)	36 (3.7%)	81 (2.7%)	106 (2.9%)	10 (3%)
Middle Income	23648 (63%)	886 (65.6%)	15261 (63.9%)	8794 (61.7%)	413 (42.3%)	1234 (41.3%)	1484 (40.9%)	159 (47.2%)
Low income	9174 (24.4%)	270 (20%)	5388 (22.6%)	3853 (27.1%)	338 (34.6%)	1120 (37.5%)	1350 (37.2%)	113 (33.5%)
Poor	2190 (5.8%)	45 (3.3%)	1341 (5.6%)	844 (5.9%)	189 (19.4%)	553 (18.5%)	687 (18.9%)	55 (16.3%)

Table S2. Associations between hair product use between the ages of 10-13 years and breast cancer risk by ER status, Sister Study, 2003-2018.

Frequency of hair product use between the ages of 10-13 years	ER+		ER-		p-value ^b
	Cases (N=2,477)	Adjusted HR ^a (95% CI)	Cases (N=443)	Adjusted HR ^a (95% CI)	
Permanent dye use					
None	2367	1.00 (referent)	426	1.00 (referent)	
Sometimes or frequently	65	0.99 (0.78, 1.27)	11	0.87 (0.48, 1.58)	0.7
Semi-permanent dye use					
None	2385	1.00 (referent)	424	1.00 (referent)	
Sometimes or frequently	42	0.78 (0.58, 1.06)	13	1.29 (0.74, 2.24)	0.1
Temporary hair dye use					
None	2374	1.00 (referent)	424	1.00 (referent)	
Sometimes or frequently	53	0.78 (0.60, 1.03)	11	0.89 (0.49, 1.62)	0.7
Bleach use					
None	2335	1.00 (referent)	417	1.00 (referent)	
Sometimes or frequently	96	0.96 (0.78, 1.18)	19	1.06 (0.67, 1.69)	0.7
Straightener use					
None	2246	1.00 (referent)	392	1.00 (referent)	
Sometimes	104	0.98 (0.80, 1.22)	18	0.86 (0.52, 1.43)	
Frequently	87	1.08 (0.80, 1.46)	27	1.61 (0.88, 2.96)	
<i>p for trend</i>		0.7		0.3	0.3
Permanent wave use (perm)					
None	1507	1.00 (referent)	267	1.00 (referent)	
Sometimes	796	1.04 (0.95, 1.13)	149	1.20 (0.97, 1.48)	
Frequently	82	1.14 (0.91, 1.42)	15	1.26 (0.75, 2.13)	
<i>p for trend</i>		0.2		0.08	0.5

^aadjusted for race, household education and income at age 13

^b p-for-heterogeneity from a Wald test of hair product by subtype interaction terms in a joint Cox model

Table S3. Associations between hair product use between the ages of 10-13 years and breast cancer risk by extent, Sister Study, 2003-2018.

Frequency of hair product use between the ages of 10-13 years	Invasive		DCIS	
	Cases (N=2640)	Adjusted HR ^a (95% CI)	Cases (N=731)	Adjusted HR ^a (95% CI)
Permanent dye use				
None	2518	1.00 (referent)	698	1.00 (referent)
Sometimes or frequently	72	1.04 (0.82, 1.31)	15	0.75 (0.45, 1.25)
Semi-permanent dye use				
None	2530	1.00 (referent)	703	1.00 (referent)
Sometimes or frequently	55	0.97 (0.74, 1.26)	9	0.55 (0.28, 1.06)
Temporary hair dye use				
None	2523	1.00 (referent)	694	1.00 (referent)
Sometimes or frequently	62	0.86 (0.66, 1.10)	17	0.87 (0.53, 1.40)
Bleach use				
None	2479	1.00 (referent)	685	1.00 (referent)
Sometimes or frequently	107	1.03 (0.85, 1.25)	28	0.96 (0.65, 1.40)
Straightener use				
None	2376	1.00 (referent)	639	1.00 (referent)
Sometimes	114	0.98 (0.80, 1.21)	34	0.94 (0.64, 1.37)
Frequently	102	1.09 (0.82, 1.44)	43	1.30 (0.82, 2.06)
<i>p for trend</i>		0.7		0.4
Permanent wave use (perm)				
None	1597	1.00 (referent)	466	1.00 (referent)
Sometimes	853	1.05 (0.97, 1.15)	214	0.99 (0.83, 1.17)
Frequently	95	1.24 (1.01, 1.53)	15	0.72 (0.43, 1.21)
<i>p for trend</i>		0.04		0.4

^aadjusted for race, household education and income at age 13