

The environmental injustice of beauty: framing chemical exposures from beauty products as a health disparities concern



Ami R. Zota, ScD, MS; Bhavna Shamasunder, PhD, MES

The American Congress of Obstetrics and Gynecology (ACOG) committee opinion¹ emphasizes that toxic environmental chemicals are a threat to human reproduction and that there may be differential vulnerability by life stage or social position. More recently, doctors around the world echoed these concerns through the International Federation for Obstetrics and Gynecology (FIGO) committee opinion. FIGO recommended that reproductive health professionals recognize disproportionate burdens to toxic chemical exposures in certain patient populations and champion policies that secure environmental justice.² Environmental justice integrates concepts of environmental racism and inequality and is defined as the unequal distribution of environmental benefits and pollution burdens based on race.³ An understanding of how both social and environmental factors jointly may influence health is necessary for the elimination of health disparities.⁴ The Environmental Protection Agency definition, adopted by FIGO, elaborates on this principle for regulatory purposes and defines environmental justice as “the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income.”^{2,5}

Beauty product use is an understudied source of environmental chemical exposures and may be 1 avenue for health professionals to intervene among vulnerable populations such as women of color. Consumer products, and personal care products specifically, are a source of exposure to toxic chemicals for all women.⁶⁻⁸ Beauty products (1 category of personal care products) have limited and inconsistent disclosure of chemical

ingredients, and most lack adequate data on health and safety.^{6,9}

Racial/ethnic differences in beauty product use are documented across multiple categories including skin care, hair care, and feminine hygiene (Table). However, evidence points to the limits of the examination of these exposures in isolation. Rather, we argue that health practitioners should consider an “environmental injustice of beauty” approach that incorporates the social factors that influence beauty product use and the potential for cumulative impacts that may arise because of co-occurring environmental exposures. This approach provides a more comprehensive picture of how environmental factors may shape reproductive health disparities.

Preexisting vulnerabilities and cumulative impacts

Beauty products contain multiple chemicals, such as formaldehyde, phthalates, parabens, lead, mercury, triclosan, and benzophenone, that can adversely impact health.^{6,9,10} Exposure to ≥ 1 of these chemicals has been linked to endocrine disruption, cancer, reproductive harm, and impaired neurodevelopment in children.¹¹⁻¹⁴ Women 18–34 years old are more likely to be “heavy buyers” who purchase >10 types of products per year.¹⁵ These women and their offspring may experience heightened vulnerability to toxic environmental chemicals if products are used during sensitive periods of development such as preconception or pregnancy.² Low-income and racial/ethnic minority groups may be further susceptible because they are exposed more frequently to multiple environmental and social risk factors and face poorer health outcomes.¹⁶ Nationally representative data of US reproductive-aged women suggest that women of color have higher levels of certain endocrine-disrupting chemicals, such as phthalates and parabens, in their bodies compared with white women and that these racial/ethnic differences are not explained by socioeconomic status.¹⁷⁻²⁰

Workers in the beauty industry, who are predominantly women of color and immigrant women, can also face occupational health hazards from chemicals in professional cosmetic products and ad-hoc workplace safety standards.²¹⁻²³ Cumulative assessments of environmental risk factors among socially marginalized groups historically have prioritized place-based pollution sources, such as polluting industries or high traffic density^{24,25}; however, beauty product exposures may be elevated in some of the same communities that encounter disproportionate exposures to place-based pollution.^{26,27}

Social and economic dimensions of product use

The beauty product industry is estimated at \$400 billion globally.²⁸ According to market analyses and consumer

From the Department of Environmental and Occupational Health, George Washington University Milken Institute School of Public Health, Washington DC (Dr Zota); and the Urban and Environmental Policy Department, Occidental College, Los Angeles, CA (Dr Shamasunder).

Received May 6, 2017; revised July 7, 2017; accepted July 15, 2017.

Supported by a grant from the Passport Foundation and the National Institute of Environmental Health Sciences (NIEHS: R00ES019881) and faculty research support from Occidental College.

The content is solely the responsibility of the authors and does not necessarily represent the official views of any of the funding agencies.

The authors report no conflict of interest.

Corresponding author: Ami R. Zota, ScD, MS. azota@gwu.edu

0002-9378 • © 2017 The Authors. Published by Elsevier Inc. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).
<http://dx.doi.org/10.1016/j.ajog.2017.07.020>

TABLE

Examples of disproportionate beauty product exposures among vulnerable populations

External factors	Vulnerable populations	Product use	Chemical exposures	Potential adverse outcomes
Colorism	Dark skinned women (globally)	Skin-lightening creams	Mercury	Mercury poisoning, neurotoxicity, kidney damage
Hair texture preferences	African American women (United States)	Hair relaxers and other hair care products	Parabens and estrogenic chemicals from placenta	Uterine fibroid tumors, premature puberty, and endocrine disruption
Odor discrimination	African American women (United States)	Vaginal douches and other feminine care products	Phthalates and talc powder	Gynecologic cancers and endocrine disruption

Zota & Shamasunder. Beauty products, environmental chemicals, health disparities. *Am J Obstet Gynecol* 2017.

profiles, multicultural beauty products have outpaced the overall cosmetics market.²⁹ African American consumers purchase 9 times more ethnic hair and beauty products than other groups^{30,31} and disproportionately purchase hair relaxers and straighteners. Latinos are the fastest growing ethnic beauty market segment,³² and Asian Americans spend 70% more than the national average on skin care products.³³

Mass distribution of images that idealize whiteness can influence sales of hair straighteners, skin lighteners, and odor-masking products.^{34,35} Racial discrimination based on European beauty norms can lead to internalized racism, body shame, and skin tone dissatisfaction, factors that can influence product use to achieve straighter hair or lighter skin. Thus, beauty product use may be 1 way that structural discrimination becomes biologically embedded.^{36,37}

Targeted racial/ethnic marketing can influence product use and related health inequities by taking advantage of mainstream beauty norms.^{38,39} In a well-described example of the influences of marketing practices on health disparities, highly targeted menthol cigarette marketing in low-income inner city African American neighborhoods^{38,39} created a racialized geography of tobacco-related health disparities.⁴⁰ Targeted marketing of beauty products may similarly influence reproductive health disparities.

We document evidence of demographic differences in product use and chemical exposures in the beauty industry. We then describe how external factors, such as targeted advertising, can influence product use.

Skin-lightening face creams

Women in Africa, India, the Middle East, Southeast Asia, and the Americas regularly use skin-lightening cosmetics.^{41,42} Skin-lightening creams can contain hydroquinone, topical corticosteroids, or inorganic mercury.⁴³ Multiple cases of mercury poisoning, which is characterized by damage to the kidneys and the central nervous system, have been reported after use of skin-lightening products.⁴⁴ The US Food and Drug Administration set a maximum allowable level of 1 ppm of mercury in skin products.⁴⁵ However, skin products with mercury continue to be unregulated and available outside of the United States, and these products are still used by certain populations in the United States, including Dominican and Mexican American women.⁴⁵⁻⁴⁷ In a population-based study

of New York City residents, those with the highest urine mercury levels were foreign-born Dominican women of reproductive age, and skin-lightening creams were identified as a source of exposure among highly exposed populations.⁴⁵ Similarly, a medical case study reported that a pregnant Mexican American woman's elevated blood mercury level of 15 $\mu\text{g/L}$ (nearly 3 times the Centers for Disease Control and Prevention early reporting threshold) was linked to face creams that contained >20,000 ppm of mercury.⁴⁶

Skin-lightening creams are sold globally, marketed to darker skinned women. Scholars point to the success of the global skin-lightening industry as evidence for the global preference for white/light skin^{42,48} and colorism, a social hierarchy based on gradations of skin color that discriminates against darker skin.⁴² A study of 45 skin-bleaching products that were sold in Harlem, NY, found product marketing of skin lighteners traffics in derogatory images that devalue African American skin to sell these products.⁴⁹ Lighter skin tone is an important predictor of higher self-esteem for African American women and is associated with higher educational attainment and earnings among women of color.^{50,51}

Hair relaxers and straighteners

Compared with white women, African American and African Caribbean women are more likely to use a greater number and variety of hair products⁵² and to have their hair chemically or professionally treated.³¹ Use of these products often begins at an early age; in a survey of 201 African American girls, almost one-half of the parents/guardians reported the first application of chemical relaxers to their child's hair between the ages of 4 and 8 years.⁵³ Hair products used by African American women are more likely to contain placenta (a potential source of estrogen hormones)^{54,55} and industrial chemicals, such as parabens,⁵² that affect estrogenic pathways.⁵⁶ Premature reproductive development, such as breast budding, was documented in African American girls exposed to estrogen- or placenta-containing hair products.⁵⁷ Use of ethnic hair products among African American women has been associated with increased risk of earlier menarche⁵⁸ and uterine fibroid tumors.⁵⁹ It has also been proposed as a plausible risk factor for excess premenopausal breast cancer risk that has been observed among African American women.⁶⁰

Hair valuations of “good” (straighter/longer) and “bad” (tightly coiled/kinky) hair can place burdens on African American women to change their hair texture.^{61,62} African American women experience more hair-related anxiety and are twice as likely than white women to experience social pressure at work to straighten their hair.⁶³ For example, the US army historically banned several hairstyles traditionally used by African American women, such as twists and multiple braids, in favor of styles that encouraged straightening or other practices to change hair texture.⁶⁴

Feminine hygiene and other fragranced products

African American women are more likely than white women to use vaginal douches and other fragranced feminine cleansing products such as sprays and wipes.¹⁹ In a nationally representative sample of reproductive-aged women, those who reported frequent douching had 150% higher exposures to diethyl phthalate, which is a chemical commonly found in fragrances, than douche nonusers.¹⁹ Differences in diethyl phthalate exposures between African American and white women were no longer statistically significant after douching practices were accounted for, which suggests that vaginal douching may contribute to racial/ethnic disparities in phthalates exposure. Prenatal exposure to diethyl phthalate can alter maternal sex steroid hormone concentrations during pregnancy⁶⁵ and may increase the risk of adverse health outcomes in offspring.^{66,67} Vaginal douching can also increase risks of bacterial vaginosis⁶⁸ and pelvic inflammatory disease⁶⁹ and has been discouraged by ACOG.⁷⁰

Use of talc powder on the genitals is another practice that is practiced disproportionately by US African American women.⁷¹ Talc-based body powder is a possible human carcinogen when used in the genital areas. A pooled analysis of epidemiologic studies found a 24% increased risk of ovarian cancer from genital powder use.⁷² These risks may be greater among African American women than white women.^{73,74}

Odor discrimination is a less described but important driver of the feminine cleansing practices described earlier. According to Ferranti,⁷⁵ imagined odor of African American women was used historically as a basis for moral judgement and an attempt to control sexual behavior. As a result, African American women deodorized and douched to be identified with sexual virtue. Advertisers used targeted marketing towards African American women with messages that encouraged self-consciousness of potential vaginal odors. These habits became embedded as a cultural norm and now persist outside of marketing efforts.⁷⁵

Comment

Obstetrics-gynecology providers should be aware of the potentially toxic effects of commonly used beauty products, recognize disparities across these demographics, and be prepared to counsel patients who have questions about these and other environmental exposures. Although there are few published clinical guidelines, emerging consortiums with published scientific consensus statements can provide

support to clinicians.^{1,76} Health professional societies can also promote health-protective policies that include improved ingredient testing and disclosure. Last, health scientists can collaborate in research to help address existing data gaps. Research on the “exposome,” or the totality of a person’s environmental exposures from conception to death, is a priority for the National Institutes of Environmental Health Sciences.⁷⁷ Researchers are trying to integrate beauty products into the exposome by characterizing the biologic activity of beauty products using *in vitro* study designs⁵⁶ and estimating the joint effects of chemicals and psychosocial stress on reproductive endpoints.⁷⁸ Future research should also consider the heterogeneous social and economic factors that drive product use. Collectively, this multipronged approach can help advance the ACOG and FIGO recommendations to secure environmental justice and promote health equity. ■

ACKNOWLEDGMENTS

The authors thank Dr Tracey Woodruff (UCSF Program on Reproductive Health and the Environment, funded in part through the National Institute of Environmental Health Sciences and the US Environmental Protection Agency, no conflicts of interest) for her guidance on the manuscript development and Dr Robin Dodson (Silent Spring Institute; no conflicts of interest) and Ms Patrice Sutton (UCSF Program on Reproductive Health and the Environment, funded in part through the National Institute of Environmental Health Sciences and the US Environmental Protection Agency, no conflicts of interest) for their comments on an earlier draft of the manuscript; the anonymous reviewers for their insights; and Dr Nate DeNicola (GW School of Medicine & Health Sciences; no conflicts of interest) and Lois Wessel, CNFP (School of Nursing and Health Studies, Georgetown University; no conflicts of interest), who was funded in part by the Environmental Protection Agency, for helpful comments on our final manuscript.

REFERENCES

1. American Congress of Obstetricians and Gynecologists Committee. Committee opinion no. 575: Exposure to toxic environmental agents. *Fertil Steril* 2013;100:931-4.
2. Di Renzo GC, Conry JA, Blake J, et al. International Federation of Gynecology and Obstetrics opinion on reproductive health impacts of exposure to toxic environmental chemicals. *Int J Gynaecol Obstet* 2015;131:219-25.
3. Chavis BJ, Lee C. Toxic wastes and race in the United States: a national report on the racial and socio-economic characteristics of communities with hazardous waste sites. New York: United Church of Christ Commission on Racial Justice; 1987.
4. Brulle RJ, Pellow DN. Environmental justice: human health and environmental inequalities. *Annu Rev Public Health* 2006;27:103-24.
5. United States Environmental Protection Agency. Environmental Justice Available at: <http://www.epa.gov/environmentaljustice/>. Accessed June 21, 2017.
6. Chow ET, Mahalingaiah S. Cosmetics use and age at menopause: is there a connection? *Fertil Steril* 2016;106:978-90.
7. Mitro SD, Dodson RE, Singla V, et al. Consumer product chemicals in indoor dust: a quantitative meta-analysis of US studies. *Environ Sci Technol* 2016;50:10661.
8. Woodruff TJ, Zota AR, Schwartz JM. Environmental chemicals in pregnant women in the United States: NHANES 2003-2004. *Environ Health Perspect* 2011;119:878.
9. Dodson RE, Nishioka M, Standley LJ, Perovich LJ, Brody JG, Rudel RA. Endocrine disruptors and asthma-associated chemicals in consumer products. *Environ Health Perspect* 2012;120:935.

10. Pierce J, Abelmann A, Spicer L, et al. Characterization of formaldehyde exposure resulting from the use of four professional hair straightening products. *J Occup Environ Hyg* 2011;8:686-99.
11. Cogliano VJ, Grosse Y, Baan RA, et al. Meeting report: summary of IARC monographs on formaldehyde, 2-butoxyethanol, and 1-tert-butyl-2-propanol. *Environ Health Perspect* 2005;113:1205.
12. Wang A, Padula A, Sirota M, Woodruff TJ. Environmental influences on reproductive health: the importance of chemical exposures. *Fertil Steril* 2016;106:905-29.
13. Diamanti-Kandarakis E, Bourguignon J-P, Giudice LC, et al. Endocrine-disrupting chemicals: an Endocrine Society scientific statement. *Endocr Rev* 2009;30:293-342.
14. Gore A, Chappell V, Fenton S, et al. EDC-2: the endocrine society's second scientific statement on endocrine-disrupting chemicals. *Endocr Rev* 2015;36:E1-150.
15. Tabs Analytics. Millennial Women Key to Growth in Cosmetics Industry. 2016. Available at: <http://www.tabsanalytics.com/blog/millennial-women-key-to-growth-in-cosmetics-industry>. Accessed July 31, 2017.
16. Morello-Frosch R, Zuk M, Jerrett M, Shamasunder B, Kyle AD. Understanding the cumulative impacts of inequalities in environmental health: implications for policy. *Health Aff (Millwood)* 2011;30:879-87.
17. James-Todd TM, Chiu Y-H, Zota AR. Racial/ethnic disparities in environmental endocrine disrupting chemicals and women's reproductive health outcomes: epidemiological examples across the life course. *Curr Epidemiol Rep* 2016;3:161-80.
18. Varshavsky JR, Zota AR, Woodruff TJ. A novel method for calculating potency-weighted cumulative phthalates exposure with implications for identifying racial/ethnic disparities among US reproductive-aged women in NHANES 2001-2012. *Environ Sci Technol* 2016;50:10616-24.
19. Branch F, Woodruff TJ, Mitro SD, Zota AR. Vaginal douching and racial/ethnic disparities in phthalates exposures among reproductive-aged women: National Health and Nutrition Examination Survey 2001-2004. *Environ Health* 2015;14:1-8.
20. Kobrosly RW, Parlett LE, Stahlhut RW, Barrett ES, Swan SH. Socioeconomic factors and phthalate metabolite concentrations among United States women of reproductive age. *Environ Res* 2012;115:11-7.
21. Adewumi-Gunn TA, Ponce E, Flint N, Robbins W. A preliminary community-based occupational health survey of black hair salon workers in South Los Angeles. *J Immigr Minor Health* 2016:1-7.
22. Quach T, Gunier N, Tran A, et al. Characterizing workplace exposures in Vietnamese women working in California nail salons. *Am J Public Health* 2011;101:S271-6.
23. Quach T, Tsoh JY, Le G, et al. Identifying and understanding the role of key stakeholders in promoting worker health and safety in nail salons. *J Health Care Poor Underserved* 2015;26:104-15.
24. Scammell MK, Montague P, Raffensperger C. Tools for addressing cumulative impacts on human health and the environment. *Environ Justice* 2014;7:102-9.
25. Solomon GM, Morello-Frosch R, Zeise L, Faust JB. Cumulative environmental impacts: Science and policy to protect communities. *Annu Rev Public Health* 2016;37:83-96.
26. Harley KG, Kogut K, Madrigal DS, et al. Reducing phthalate, paraben, and phenol exposure from personal care products in adolescent girls: findings from the HERMOSA Intervention Study. *Environ Health Perspect* 2016;124:1600-7.
27. Castorina R, Bradman A, Fenster L, et al. Comparison of current-use pesticide and other toxicant urinary metabolite levels among pregnant women in the CHAMACOS cohort and NHANES. *Environ Health Perspect* 2010;118:856.
28. Gyan R, Analytics. Global Beauty Care Market (2014-2018) - Research and Markets. 2014. Available at: <https://www.marketresearch.com/product/sample-8483698.pdf>. Accessed July 31, 2017.
29. Kline. Multicultural Beauty and Grooming Products: U.S. Market Analysis and Opportunities, 2014. Available at: <http://www.klinegroup.com/reports/brochures/y746/brochure.pdf>. Accessed July 31, 2017.
30. Nielsen. African-American Consumers are More Relevant Than Ever. 2013. Available at: <http://www.nielsen.com/us/en/insights/news/2013/african-american-consumers-are-more-relevant-than-ever.html>. Accessed July 31, 2017.
31. Mintel. Black Hair Care 2013. Available at: <http://store.mintel.com/black-haircare-us-august-2013>. Accessed July 31, 2017.
32. Nielsen. Hispanic Consumers Are the "Foundation" for Beauty Category Sales. 2015. Available at: <http://www.nielsen.com/us/en/insights/news/2015/hispanic-consumers-are-the-foundation-for-beauty-category-sales.html>. Accessed July 31, 2017.
33. Nielsen. Beauty Is More Than Skin Deep for Asian-Americans. 2015. Available at: <http://www.nielsen.com/us/en/insights/news/2015/beauty-is-more-than-skin-deep-for-asian-americans.html>. Accessed July 31, 2017.
34. Bristol JM, Lee RG, Hunt MR. Race and ideology: African-American images in television advertising. *Journal of Public Policy and Marketing* 1995;14:48-59.
35. Parameswaran R, Cardoza K. Melanin on the margins: advertising and the cultural politics of fair/light/white beauty in India. *Journal of Communication Monographs* 2009;11:213-74.
36. Krieger N. Discrimination and health inequities. *Int J Health Serv* 2014;44:643-710.
37. Bailey ZD, Krieger N, Agénor M, Graves J, Linos N, Bassett MT. Structural racism and health inequities in the USA: evidence and interventions. *Lancet* 2017;389:1453-63.
38. Moore DJ, Williams JD, Qualls WJ. Target marketing of tobacco and alcohol-related products to ethnic minority groups in the United States. *Ethn Dis* 1996;6:83-98.
39. Smith NC, Cooper-Martin E. Ethics and target marketing: the role of product harm and consumer vulnerability. *Journal of Marketing* 1997;61:1-20.
40. Yerger VB, Przewoznik J, Malone RE. Racialized geography, corporate activity, and health disparities: tobacco industry targeting of inner cities. *J Health Care Poor Underserved* 2007;18:10-38.
41. Peltzer K, Pengpid S, James C. The globalization of whitening: prevalence of skin lighteners (or bleachers) use and its social correlates among university students in 26 countries. *Int J Dermatol* 2016;55:165-72.
42. Dixon AR, Telles EE. Skin color and colorism: global research, concepts, and measurement. *Annu Rev Sociol* 2017;43:405-24.
43. Ladizinski B, Mistry N, Kundu RV. Widespread use of toxic skin lightening compounds: medical and psychosocial aspects. *Dermatol Clin* 2011;29:111-23.
44. Chan TY. Inorganic mercury poisoning associated with skin-lightening cosmetic products. *Clin Toxicol* 2011;49:886-91.
45. McKelvey W, Jeffery N, Clark N, Kass D, Parsons PJ. Population-based inorganic mercury biomonitoring and the identification of skin care products as a source of exposure in New York City. *Environ Health Perspect* 2011;119:203-9.
46. Dickenson CA, Woodruff TJ, Stotland NE, Dobraca D, Das R. Elevated mercury levels in pregnant woman linked to skin cream from Mexico. *Am J Obstet Gynecol* 2013;209:e4-5.
47. Agrawal S, Sharma P. Current status of mercury level in skin whitening creams. *Current Medicine Research and Practice* 2017;7:47-50.
48. Hunter MK. Buying racial capital: skin-bleaching and cosmetic surgery in a globalized world. *The Journal of Pan African Studies* 2011;4:142-64.
49. Charles CAD. *The derogatory representations of the skin bleaching products sold in Harlem*. Rochester (NY): Social Science Research Network; 2011.
50. Hunter ML. "If You're Light You're Alright" light skin color as social capital for women of color. *GenD Soc* 2002;16:175-93.
51. Thompson MS, Keith VM. The blacker the berry: gender, skin tone, self-esteem, and self-efficacy. *Gender and Society* 2001;15:336-57.
52. James-Todd T, Senie R, Terry MB. Racial/ethnic differences in hormonally-active hair product use: a plausible risk factor for health disparities. *J Immigr Minor Health* 2012;14:506-11.

53. Wright DR, Gathers R, Kapke A, Johnson D, Joseph CL. Hair care practices and their association with scalp and hair disorders in African American girls. *J Am Acad Dermatol* 2011;64:253-62.
54. Li S-TT, Lozano P, Grossman DC, Graham E. Hormone-containing hair product use in prepubertal children. *Arch Pediatr Adolesc Med* 2002;156:85-6.
55. Tiwary CM. A survey of use of hormone/placenta-containing hair preparations by parents and/or children attending pediatric clinics. *Mil Med* 1997;162:252-6.
56. Myers SL, Yang CZ, Bittner GD, Witt KL, Tice RR, Baird DD. Estrogenic and anti-estrogenic activity of off-the-shelf hair and skin care products. *J Expos Sci Environ Epidemiol* 2015;25:271-7.
57. Tiwary CM. Premature sexual development in children following the use of estrogen-or placenta-containing hair products. *Clin Pediatr* 1998;37:733-9.
58. James-Todd T, Terry MB, Rich-Edwards J, Deierlein A, Senie R. Childhood hair product use and earlier age at menarche in a racially diverse study population: a pilot study. *Ann Epidemiol* 2011;21:461-5.
59. Wise LA, Palmer JR, Reich D, Cozier YC, Rosenberg L. Hair relaxer use and risk of uterine leiomyomata in African-American women. *Am J Epidemiol* 2012;175:432-40.
60. Donovan M, Tiwary CM, Axelrod D, et al. Personal care products that contain estrogens or xenoestrogens may increase breast cancer risk. *Med Hypotheses* 2007;68:756-66.
61. Banks I. *Hair Matters: Beauty, Power, and Black Women's Consciousness*. New York, NY: NYU Press; 2000.
62. Robinson CL. Hair as race: why "good hair" may be bad for black females. *Howard Journal of Communications* 2011;22:358-76.
63. Johnson AM, Godsil R, MacFarlane J, Tropp L, Goff PA. The "Good Hair" Study: explicit and implicit attitudes toward black women's hair: the Perception Institute, 2017. Available at: <https://perception.org/wp-content/uploads/2017/01/TheGood-HairStudyFindingsReport.pdf>. Accessed July 31, 2017.
64. James-Todd T, Fitzgerald T. Caution: 'Acceptable' Black Women's Hairstyles May Harm Health. WBUR: CommonHealth, 2014. Available at: <http://www.wbur.org/commonhealth/2014/07/14/black-womens-hairstyles-health>. Accessed July 31, 2017.
65. Sathyanarayana S, Barrett E, Butts S, Wang C, Swan SH. Phthalate exposure and reproductive hormone concentrations in pregnancy. *Reproduction* 2014;147:401-9.
66. Swan SH, Main KM, Liu F, et al. Decrease in anogenital distance among male infants with prenatal phthalate exposure. *Environ Health Perspect* 2005;1056-61.
67. Engel SM, Miodovnik A, Canfield RL, et al. Prenatal phthalate exposure is associated with childhood behavior and executive functioning. *Environ Health Perspect* 2010;118:565.
68. Holzman C, Leventhal JM, Qiu H, Jones NM, Wang J. Factors linked to bacterial vaginosis in nonpregnant women. *Am J Public Health* 2001;91:1664-70.
69. Scholes D, Daling JR, Stergachis A, Weiss NS, Wang S-P, Grayston JT. Vaginal douching as a risk factor for acute pelvic inflammatory disease. *Obstet Gynecol* 1993;81:601-6.
70. American College of Obstetricians and Gynecologists. Committee opinion no. 345: vulvodynia. *Obstet Gynecol* 2006;108:1049-52.
71. Wu AH, Pearce CL, Tseng C-C, Pike MC. African Americans and Hispanics remain at lower risk of ovarian cancer than non-Hispanic Whites after considering non-genetic risk factors and oophorectomy rates. *Cancer Epidemiol Biomarkers Prev* 2015;24:1094-100.
72. Terry KL, Karageorgi S, Shvetsov YB, et al. Genital powder use and risk of ovarian cancer: a pooled analysis of 8,525 cases and 9,859 controls. *Cancer Prev Res* 2013;6:811-21.
73. Cramer DW, Vitonis AF, Terry KL, Welch WR, Titus LJ. The association between talc use and ovarian cancer: a retrospective case-control study in two US states. *Epidemiology* 2016;27:334.
74. Schildkraut JM, Abbott SE, Alberg AJ, et al. Association between body powder use and ovarian cancer: the African American Cancer Epidemiology Study (AACES). *Cancer Epidemiol Biomarkers Prev* 2016;10:1411-7.
75. Ferranti M. An odor of racism: vaginal deodorants in African-American beauty culture and advertising. *Advertising & Society Review* 2011;11.
76. Bennett D, Bellinger DC, Birnbaum LS, et al. Project TENDR: targeting environmental neuro-developmental risks: the TENDR consensus statement. *Environ Health Perspect* 2016;124:A118.
77. National Institute of Environmental Health Sciences. 2012-2017 Strategic plan: advancing science, improving health; a plan for environmental health research. US Department of Health and Human Services; 2012 (NIH Publication No. 12-7935).
78. Barrett ES, Parlett LE, Sathyanarayana S, Redmon JB, Nguyen RH, Swan SH. Prenatal stress as a modifier of associations between phthalate exposure and reproductive development: results from a Multicentre Pregnancy Cohort Study. *Paediatr Perinat Epidemiol* 2016;30:105-14.

ABSTRACT

The environmental injustice of beauty: framing chemical exposures from beauty products as a health disparities concern

The obstetrics-gynecology community has issued a call to action to prevent toxic environmental chemical exposures and their threats to healthy human reproduction. Recent committee opinions recognize that vulnerable and underserved women may be impacted disproportionately by environmental chemical exposures and recommend that reproductive health professionals champion policies that secure environmental justice. Beauty product use is an understudied source of environmental chemical exposures. Beauty products can include reproductive and developmental toxicants such as phthalates and heavy metals; however, disclosure requirements are limited and inconsistent. Compared with white women, women of color have higher levels of beauty product–related environmental chemicals in their bodies, independent of socioeconomic status. Even small exposures to toxic chemicals during critical periods of development (such as pregnancy) can trigger adverse health consequences (such as impacts on fertility and pregnancy, neurodevelopment, and cancer). In this commentary, we seek to highlight the connections between environmental justice and beauty product–related chemical

exposures. We describe racial/ethnic differences in beauty product use (such as skin lighteners, hair straighteners, and feminine hygiene products) and the potential chemical exposures and health risks that are associated with these products. We also discuss how targeted advertising can take advantage of mainstream beauty norms to influence the use of these products. Reproductive health professionals can use this information to advance environmental justice by being prepared to counsel patients who have questions about toxic environmental exposures from beauty care products and other sources. Researchers and healthcare providers can also promote health-protective policies such as improved ingredient testing and disclosure for the beauty product industry. Future clinical and public health research should consider beauty product use as a factor that may shape health inequities in women's reproductive health across the life course.

Key words: cosmetics, endocrine-disrupting chemicals, environmental justice, health disparity, toxic environmental chemicals