

Socioeconomic and Racial Disparities in Cumulative Phthalates Exposure Among U.S. Reproductive-Aged Women From NHANES

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Background and Aims: Prenatal phthalates exposure is associated with increased risk of adverse male reproductive outcomes. The National Academy of Sciences (NAS) recommends chemical risk assessments account for exposure to multiple phthalates affecting the same common adverse health outcome. However, few, if any studies have characterized cumulative burdens of environmental contaminants in potentially vulnerable populations or attempted to identify high-risk subpopulations. We used NAS recommendations to develop cumulative metrics for phthalates exposures among a representative sample of U.S. reproductive-aged women, and examine racial/ethnic and socioeconomic differences.

Methods: We analyzed urinary phthalate data in 2324 women (aged 15 to 44 years) from National Health and Nutritional Examination Survey, 2001-2008. We analyzed metabolites of di-n-butyl phthalate (DBP), diisobutyl phthalate (DIBP), butyl benzyl phthalate (BBP), and di(2-ethylhexyl) phthalate (DEHP) (all anti-androgens). We summed concentrations of 6 metabolites (Σ phthalates). We also created a weighted phthalate score (Σ phthalates_BMD) using theoretical benchmark dose (BMD) values provided by the NAS.

Results: Metabolites of BBP and DEHP generally decreased during the study period whereas DIBP metabolite significantly increased. African American women had higher Σ phthalates_BMD scores than their White or Mexican-American counterparts ($p = 0.04$) after controlling for education, income, age, and creatinine levels. Education was not a significant predictor but in models stratified by race, lower educational attainment was associated with higher Σ phthalates_BMD scores among African American women ($p=0.04$). Women with less than a high school education had approximately 20% higher Σ phthalates_BMD scores than those with more than high school education (least square geometric means (\pm standard error): 3.70 ± 1.09 versus 2.97 ± 1.07 , respectively). Similar socio-demographic trends were observed for Σ phthalates.

Conclusions: African American women in the US, particularly those with less education, may be at increased risk of phthalate-induced health risks, and further research is warranted to identify drivers of environmental health disparities.