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Seasonal Variation in Exposure to Endocrine Disrupting Chemicals

Megan E. Romano^{1,2}, Geetika Kalloo², Taylor Etzel², and Joseph M. Braun²

¹Department of Epidemiology, Geisel School of Medicine at Dartmouth, Lebanon, New Hampshire ²Department of Epidemiology, Brown University School of Public Health, Providence, Rhode Island

To the Editor

In environmental epidemiology, seasonal variation is common for exposures ranging from air pollutants¹ to pesticides.² However, seasonal trends of endocrine disrupting chemicals present in personal care products have not been well described.³ Season of measurement may be important when studying endocrine disrupting chemicals such as benzophenone-3 and triclosan if health outcomes and these exposures vary with season. Benzophenone-3 is an endocrine disruptor of emerging concern, as it is an ultraviolet light filter commonly incorporated into sunscreens and it is nearly ubiquitously present in the urine of individuals in the United States (US).⁴ Triclosan, an antimicrobial agent added to many consumer products, was recently banned from hand soap by the US Food and Drug Administration.⁵ In this research letter, we highlight the potential importance of accounting for seasonal variability of endocrine disruptors in future etiologic research using urinary benzophenone-3 and triclosan concentrations among mother-child pairs in the Health Outcomes and Measures of the Environment (HOME) Study, a prospective pregnancy and birth cohort in the greater Cincinnati, Ohio metropolitan area.⁶

The current analysis was conducted on 389 mothers who provided at least one urine sample during pregnancy and 336 of their children who provided at least one urine sample during one of six study visits conducted between 1 and 8 years of age. Urinary benzophenone-3 and triclosan were quantified by analytic chemistry methods,⁷ and urinary creatinine was measured using enzymatic methods. The institutional review boards at Cincinnati Children's Hospital Medical Center and participating delivery hospitals approved study protocols. All mothers provided written informed consent for themselves and their children. We hypothesized that urinary benzophenone-3 would be greater during summer months when

Corresponding Author: Megan E. Romano, One Medical Center Drive, Hinman 7927, Lebanon, NH 03756, Phone: (603) 650-1837, Megan.E.Romano@Dartmouth.edu.

The authors have no conflicts of interest to declare.

Investigators interested in accessing data from the HOME Study should contact Drs Joseph M. Braun and Kimberly Yolton [joseph_braun_1@brown.edu and kimberly.yolton@cchmc.org] to request a project proposal form. The HOME Study Data Sharing Committee meets regularly to review proposed research projects and ensure that they do not overlap with extant projects and are an efficient use of scarce resources (e.g. cord blood). Statistical code is available upon request from the authors.

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sunscreen use is more common and that urinary triclosan would be greater during peak influenza season due to increased hand washing activity. We constructed box-and-whisker plots to describe benzophenone-3 and triclosan concentrations by month of collection for mothers and children separately. We used linear mixed models adjusted for year of collection and log₁₀-urinary creatinine to calculate the geometric means of and percent differences in benzophenone-3 and triclosan concentrations during the months of June-August (summer) and December-March (peak influenza season), respectively, relative to other months. The children's models also included age in months at time of urine sample collection.

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We observed a small increase in model-derived percent difference in urinary benzophenone-3 among mothers (72%; 95% CI: 23, 140) and a substantially greater increase among children (630%; 95% CI: 450, 855) during June-August compared to other months. The trend among children was also apparent from the plotted distributions (Figure). Urinary benzophenone-3 concentrations are associated with sunscreen use among National Health and Nutrition Examination Survey (NHANES) participants;⁸ thus, the observed increases among the HOME Study participants likely correspond to sunscreen use during summer. In contrast, we observed somewhat elevated urinary triclosan among mothers (24%; 95% CI: -2, 55) during December-March, but no obvious seasonal variation among mothers or children (-8%; 95% CI: -21, 10). Prior research observed higher urinary triclosan concentrations from pregnant women during autumn.³

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The observed seasonal variation in benzophenone-3 suggests that investigators should consider whether the potential health effects of these and other endocrine-disrupting chemicals in personal care products might be influenced by seasonality. For example, because season is related to both benzophenone-3 exposure and vitamin D deficiency, a study assessing the relationship between benzophenone-3 and vitamin D deficiency (or related diseases) should account for season of measurement. While similar caution might be necessary when investigating the influence of triclosan on seasonal infections or allergies, our data do not suggest that this is the case. By extension, endocrine-disrupting chemicals subject to seasonal variation could potentially confound associations between other seasonal exposures of interest and health outcomes.

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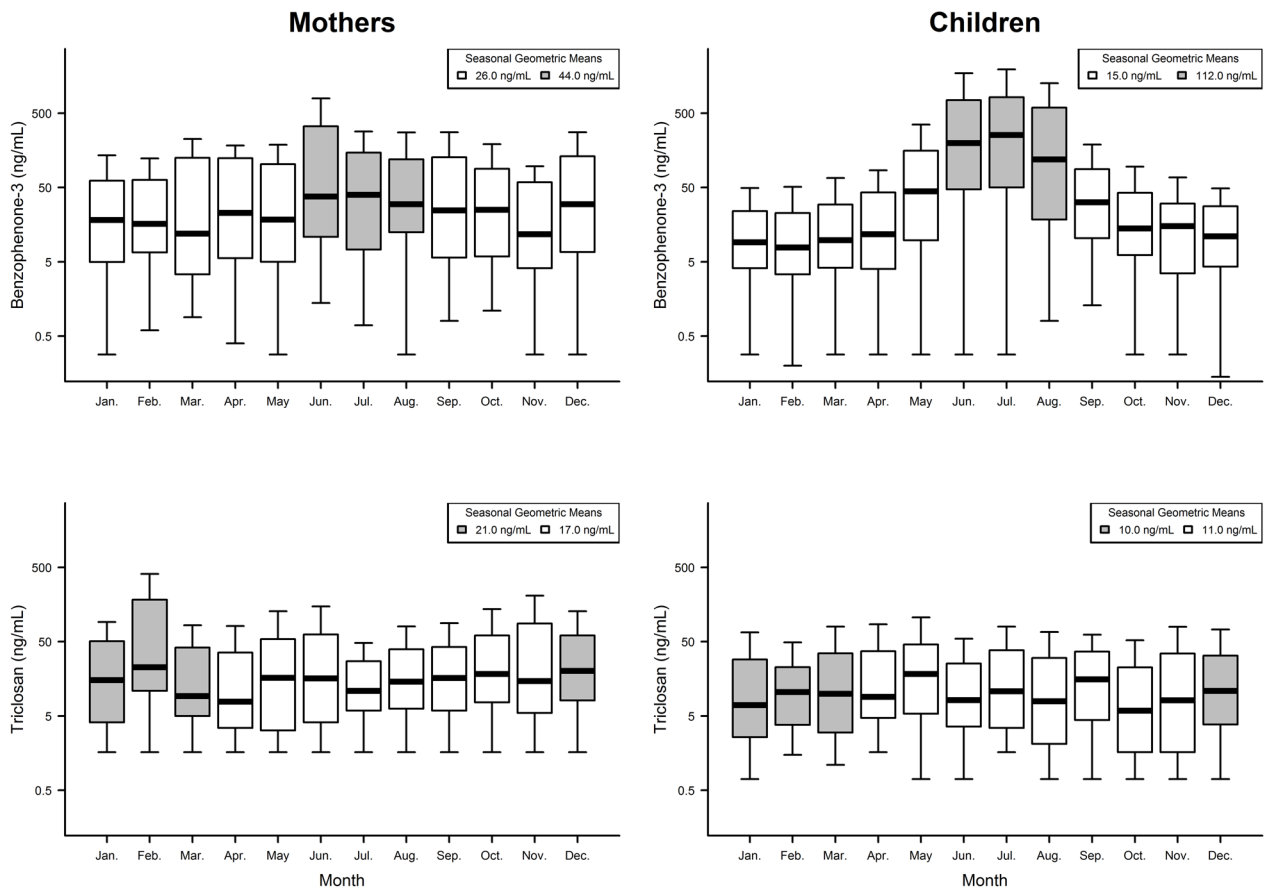


Figure. Maternal and childhood urinary benzophenone-3 and triclosan concentrations by month of collection among mothers and children in the HOME Study (2003-2006).