

SUNSCREEN METABOLITE CONCENTRATIONS AND SOCIOECONOMIC STATUS: A STUDY OF SUN PROTECTION DISPARITIES

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INTRODUCTION

- Benzophenone-3 (BP3), an ingredient in sunscreens, is absorbed through the skin, excreted in the urine, and causes hormone disruptions.¹⁻³
- Conversely, as BP3 leaves a minimal white cast on the skin, is less greasy, and is more water-resistant, it is widely used in high-quality costly sunscreens.
- Household income influences sunscreen purchase and use.
- The relationship between BP3-containing sunscreen use and household income is not well-studied, therefore, we examined this relationship in a large cohort of the US population.

METHODS

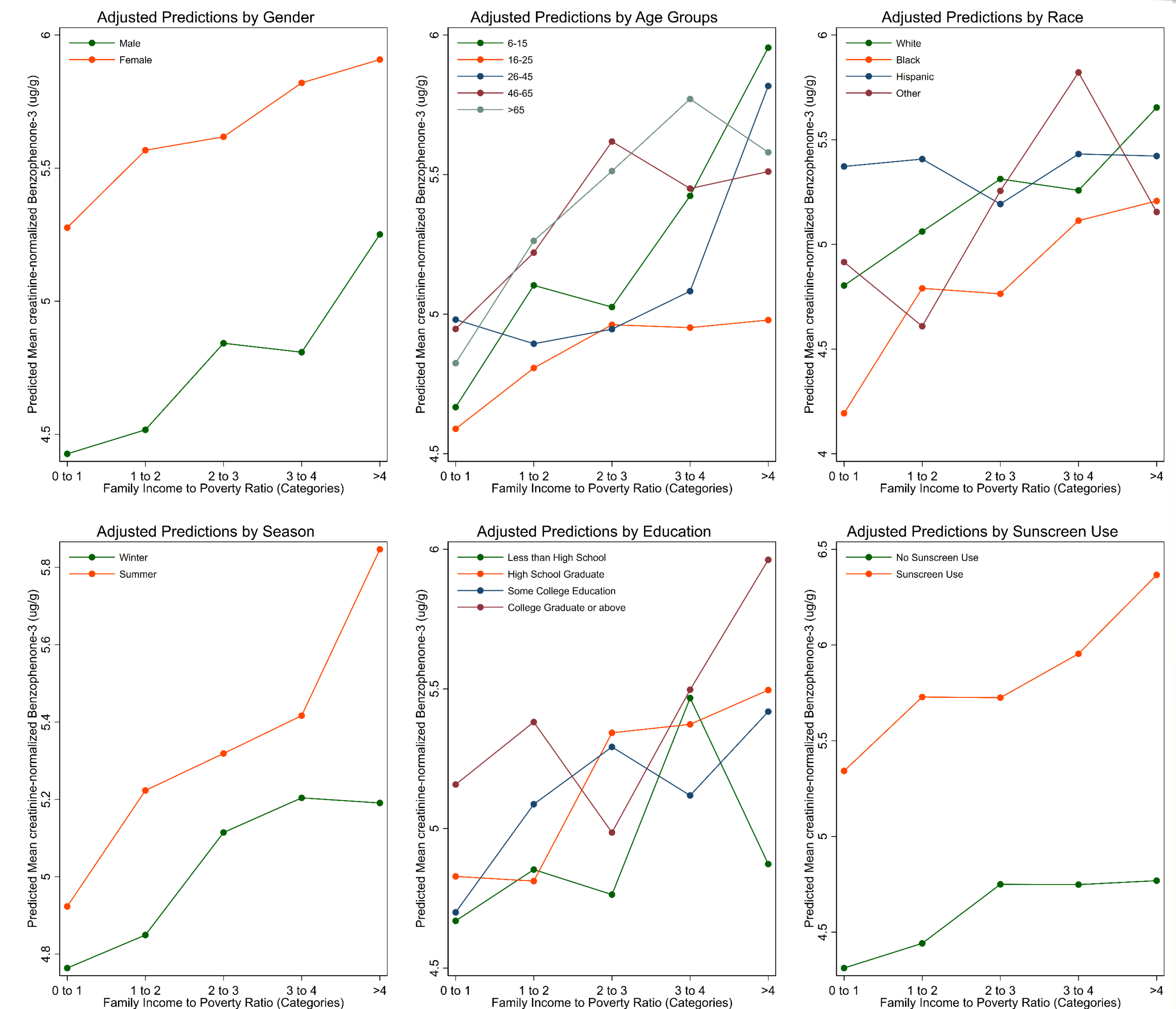
- We used the continuous NHANES data from 2003 to 2016.
- Creatinine-normalized urinary BP3 (CnBP3) levels were calculated from urinary BP3 and creatinine to account for urinary dilution/concentration.
- The household income to poverty threshold ratio (HIPR) was used to account for the effect of inflation.
- Missing data were imputed using multiple imputations by chained equations with a Gibbs-like algorithm.
- To examine the relationship between CnBP3 and HIPR, we used generalized linear models (GLMs) with log-link and gamma distributions to account for the long right-hand tail of the CnBP3 distribution.

METHODS

- Models were adjusted for age, gender, race, education level, season, and sunscreen use, and survey cycle.
- Effect modification by each variables was explored with using interaction.

RESULTS

- Of the 16691 study participants, 8404(50.3%) were females, 6561(39.3%) were Whites, and 3949(23.7%) were Blacks.
- The mean(SD) age was 36.6(22.7) years, and median(IQR) CnBP-3 was 12.2(44.9) $\mu\text{g}/\text{gm}$.
- In unadjusted GLMs, CnBP3 levels were 54% lower in the 16-25 age-group than the 6-15 age-group (95%CI=-0.82%, -0.25%; $P<0.001$); there was no significant difference between 6-15 and rest of the age-groups.
- Females had 2.2-times higher CnBP-3 than males (95%CI=1.57, 3.00; $P<0.0001$). Blacks had 67% lower (95%CI=-0.76%, -0.55%; $P<0.001$) and Hispanics had 44% lower (95%CI=-0.56%, -0.28%; $P<0.001$) CnBP-3 than Whites.
- Sunscreen-users had 5.9-times higher CnBP3 than non-users (95%CI=4.67, 7.48; $P<0.001$).
- Finally, in unadjusted models, participants with HIPR >4, had over 4.23-times higher CnBP3 than those with HIPR <1 (95%CI=3.10, 5.78; $P<0.001$) and this association remained significant after adjustment; participants with HIPR >4 had 2.06-times higher CnBP-3 than those with HIPR <1 (95%CI=1.53, 2.77; $P<0.001$).



Models were adjusted for Age, Race, Gender, Survey Cycle, Season, Education, and Sunscreen use

Figure: Effect Modification (Interaction) of the HIPR and CnBP3 levels

Effect Modification (Figure):

- There was no effect of gender, age, survey cycle, education level on the relationship between HIPR and CnBP3. However, race and use of sunscreen significantly modified the relationship between HIPR and CnBP3.
- The difference in CnBP3 levels between HIPR >4 and HIPR <1 group was significantly smaller in Hispanics than Whites (interaction $P=0.009$). But significantly higher CnBP3 levels in sunscreen users than non-sunscreen users ($P=0.04$).

CONCLUSIONS

We found a statistically significant association between HIPR categories and CnBP3. Findings may allow the study of effective strategies to reduce BP3 exposure and protect high-exposure populations.

REFERENCES

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