

Fast Food: A Source of Exposure to Phthalates and Bisphenol A in a Nationally Representative Sample

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Introduction

Certain phthalates and bisphenol A (BPA) are industrial chemicals widely used in consumer products that can adversely impact human health. Diet is hypothesized to be a major source of exposure but little is known about the impact of specific food sources.

- **BPA:** Bisphenol A is found in polycarbonate, plastic products, and epoxy resin (food can lining)
- **DEHP & DINP:** Di (2-ethylhexyl) Phthalate & Di-iso-nonyl Phthalate are plasticizers that impart flexibility to polyvinyl chloride (PVC): tubing, plastic gloves, food containers, building material, etc.

Exposures are associated with:

- Metabolic disorders and diabetes ¹
- Reduction in couple fecundity ²
- Allergic diseases, behavioral and neurodevelopment impairment in children ³
- Increased asthma risk in children ⁴

Is Fast Food an Exposure Source?

- ✓ Processed
- ✓ Packaged
- ✓ Handled



OBJECTIVE: To test the association between fast food consumption and urinary levels of high molecular weight phthalates (DEHP& DINP) and BPA

Methods

- National Health and Nutrition Examination Survey (NHANES), 2003-2010 data
- NHANES Mobile Exam Center
 - 24-hour food recall
 - Urine sample
- Nationally representative of persons aged 6 to 85 years old
- **Exposure:** Fast Food (kilocalories) modeled dichotomously (Yes/No); categorically (0%, 1-49% 50%+) total dietary intake
- **Outcome:** Urinary measures of BPA, DEHP (MEHP, MEHHP, MEOHP, MECPP metab) & DINP (MCOP metab)
- **Sample Size** BPA n: 8792
DEHP n: 8876
DINP n: 6628
- Confounders: age, sex, household poverty-income ratio (PIR), race/ethnicity, body mass index (BMI), NHANES cycle year, urinary creatinine and survey weights.
- Regression Model Analysis in SAS Version 9.3 (SAS Institute, Inc., Cary, NC)

Results

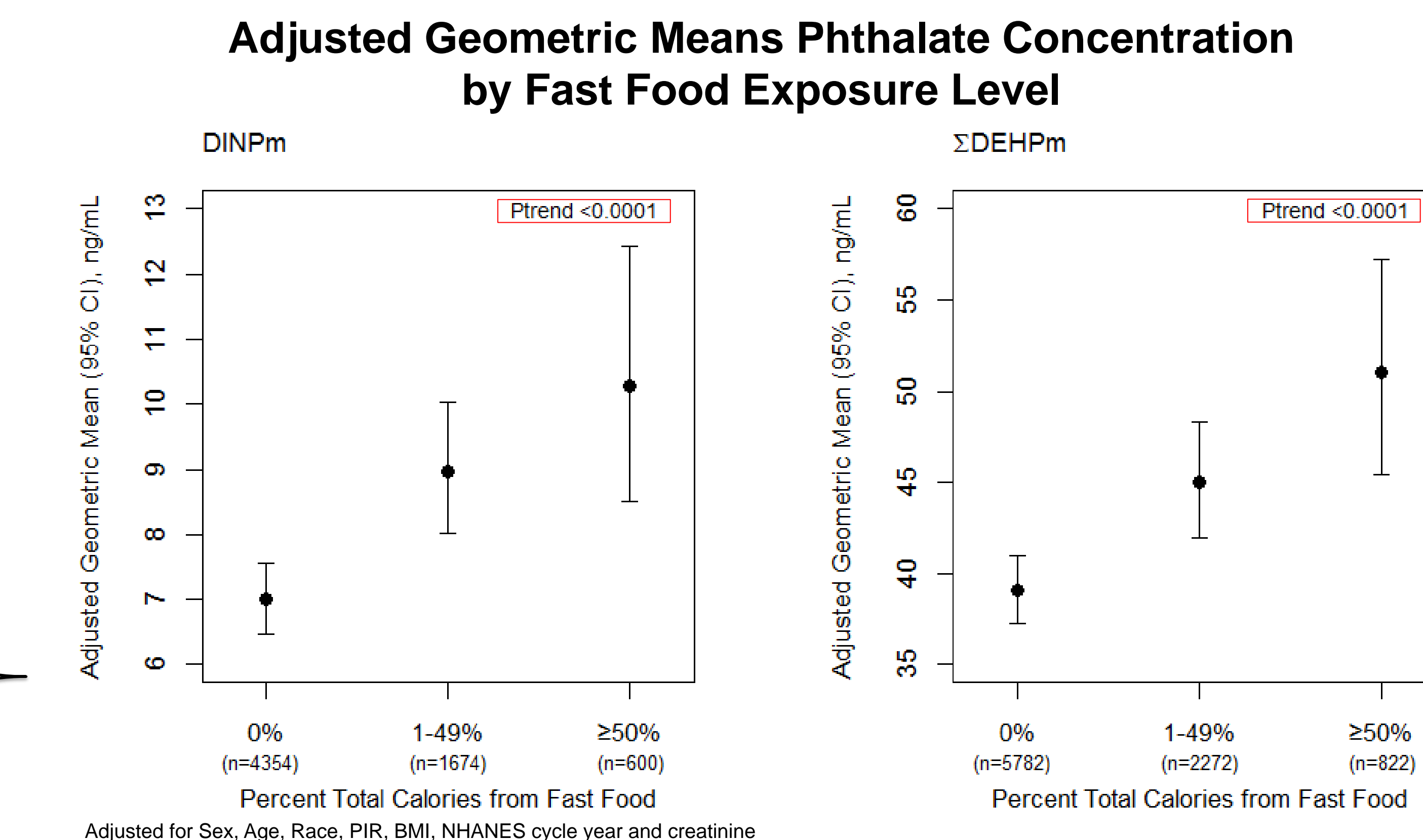
- Majority of participants had **detectable levels** of chemicals: **Phthalates >97%** and **BPA >90%**
- **35%** had **consumed fast food** in the last 24 hours

Main Analysis:

Percent Change in Chemical Concentration by Fast Food Exposure Level, NHANES 2003-2010

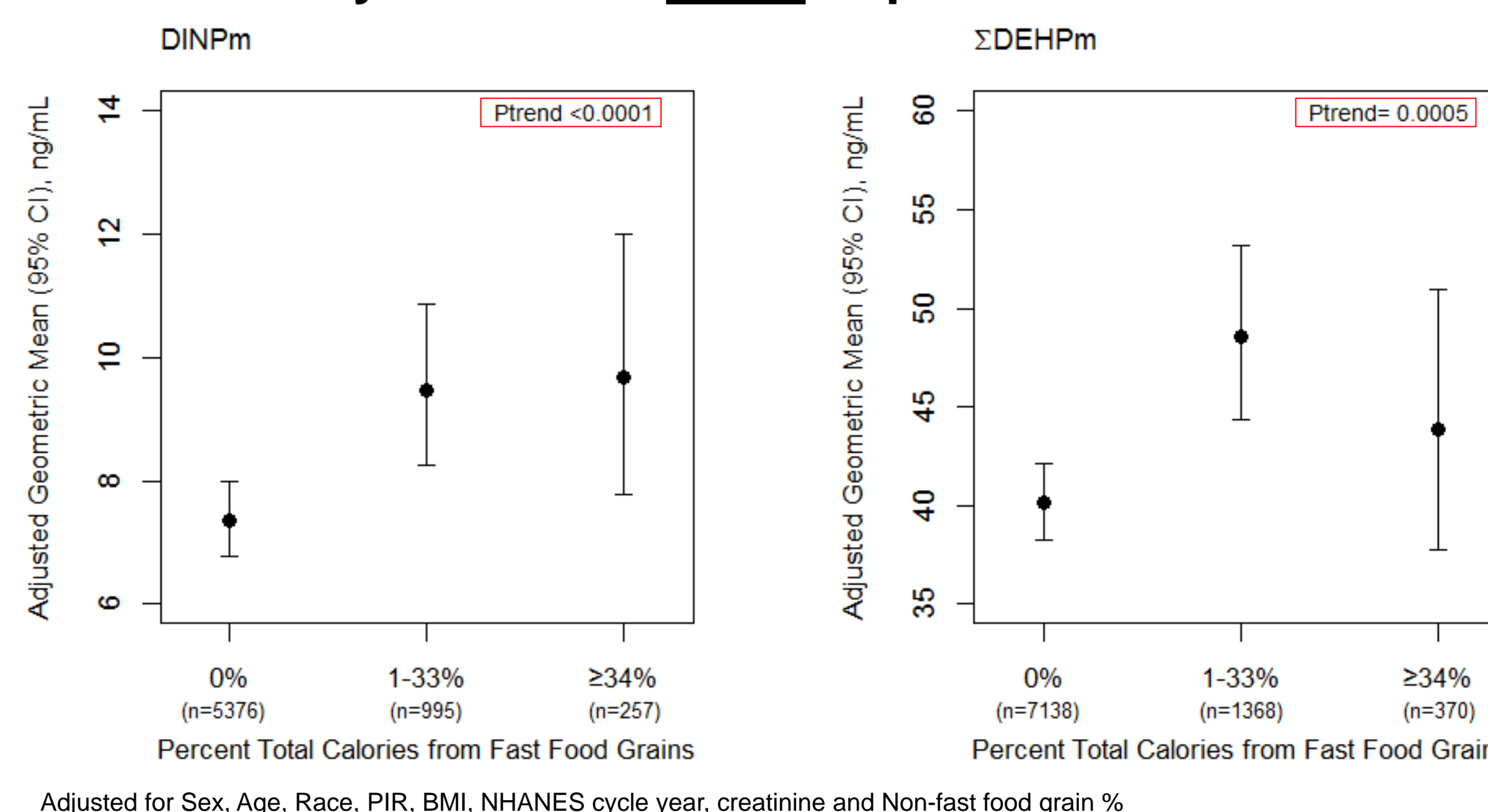
	Adjusted ¹ BPA Percent Change (95%CI)	Adjusted ¹ ΣDEHPm Percent Change (95%CI)	Adjusted ¹ DINPm Percent Change (95%CI)
Crude Consumption			
Did Not Eat Fast Food	ref-	ref-	ref-
Ate Fast Food	2.4 (-2.6,7.6)	18.6** (10.4,27.5)	32.2** (20.0,45.5)
Fast Food as % of Total Calories			
0% Fast Food	ref-	ref-	ref-
1-49% Fast Food	0.3 (-5.3,6.1)	15.1* (6.8,24.1)	28.0** (16.1,41.1)
50-100% Fast Food	10.6 (-0.8,23.4)	30.6** (16.9,45.8)	46.8** (24.6,72.8)

¹Adjusted for Sex, Age, Race, PIR, BMI, NHANES cycle year and creatinine
* p<0.01; ** p<0.0001

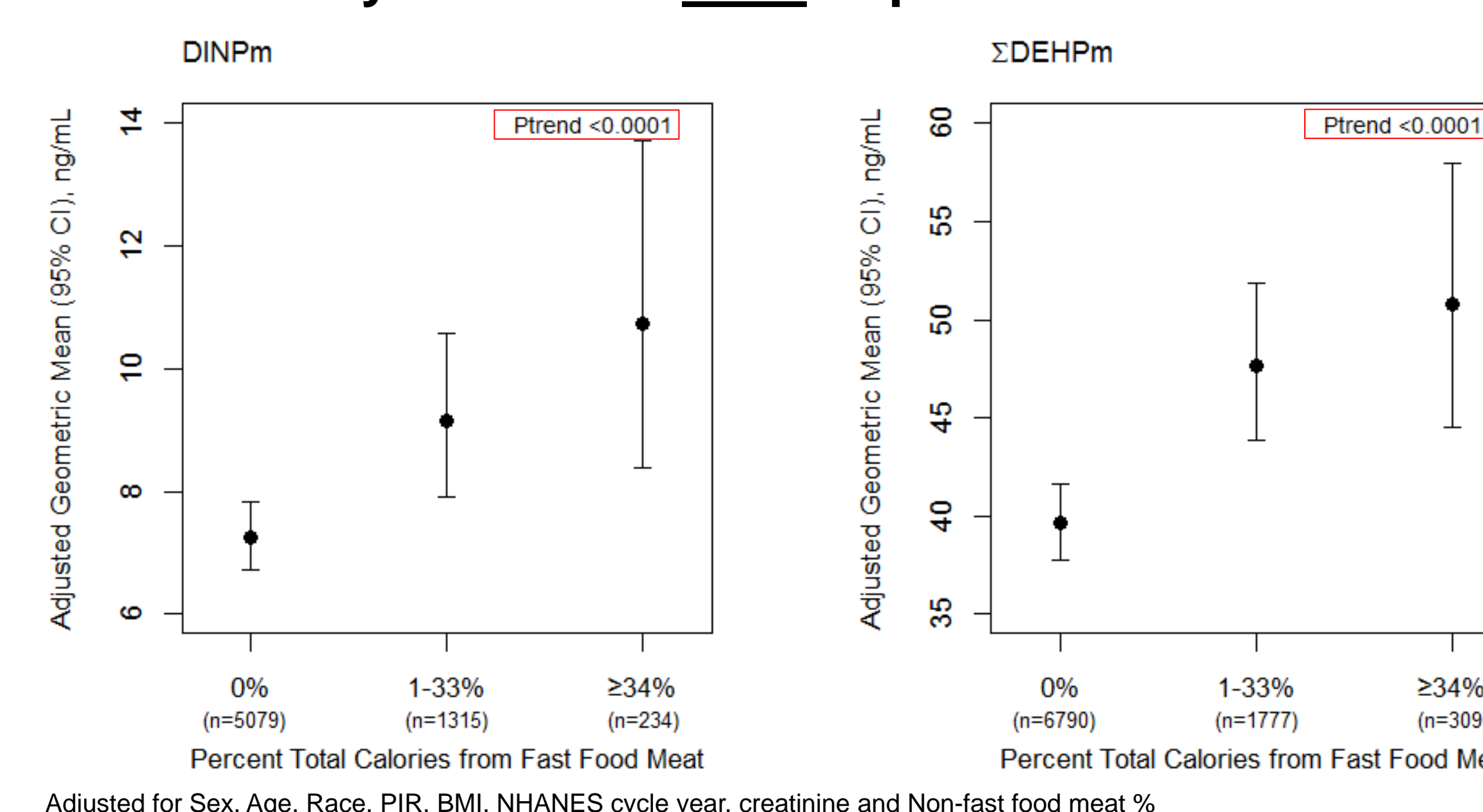


Sub-Analysis: In adjusted regression analysis of food groups - **meat** and **grains** were associated with **elevated phthalate levels**

Adjusted Geometric Mean Phthalate Concentration by Fast Food Grain Exposure Level



Adjusted Geometric Means Phthalate Concentration by Fast Food Meat Exposure Level



Conclusions

- Fast food is not a potential source of exposure for BPA
- Fast food is a significant route of exposure for high molecular weight phthalates (DEHP and DINP)
- Positive dose-response effect exists between fast food and DEHP and DINP (p<0.0001)
- Meat and grains are the drivers of this association between fast food and DEHP and DINP

Implications:

- Further research to investigate which components of the fast food industry (production and storage, cooking process, packaging, etc.) contribute to this association
- Greater policy awareness of phthalate substitution given evidence of the stronger DINP associations, a DEHP replacement phthalate

References

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