

Association of phthalates, parabens and phenols in personal care products with pubertal timing in girls and boys

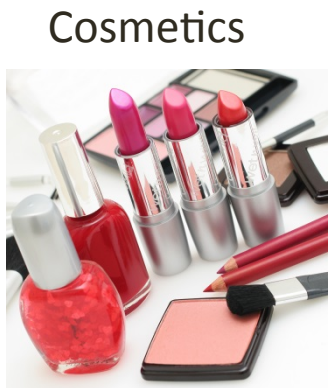


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University of California, Berkeley

Collaborative on Health and the Environment
Generation Chemical Webinar
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Personal Care Products: What's the Concern?

- The average woman uses 12 personal care products a day
- The average teenage girl uses 17
- More than 12,500 chemicals are used in cosmetics and personal care products



These Chemicals Can Enter our Bodies

Ingestion



Inhalation



Dermal Absorption



Suspected Endocrine Disruptors in Personal Care Products

Phthalates

- Diethyl phthalate (DEP)
- Di-n-butyl phthalate (DBP)
- Di-isobutyl phthalate (DiBP)



Parabens

- Methyl Paraben (MP)
- Propyl Paraben (PP)

Antibacterials

- Triclosan (TCS)

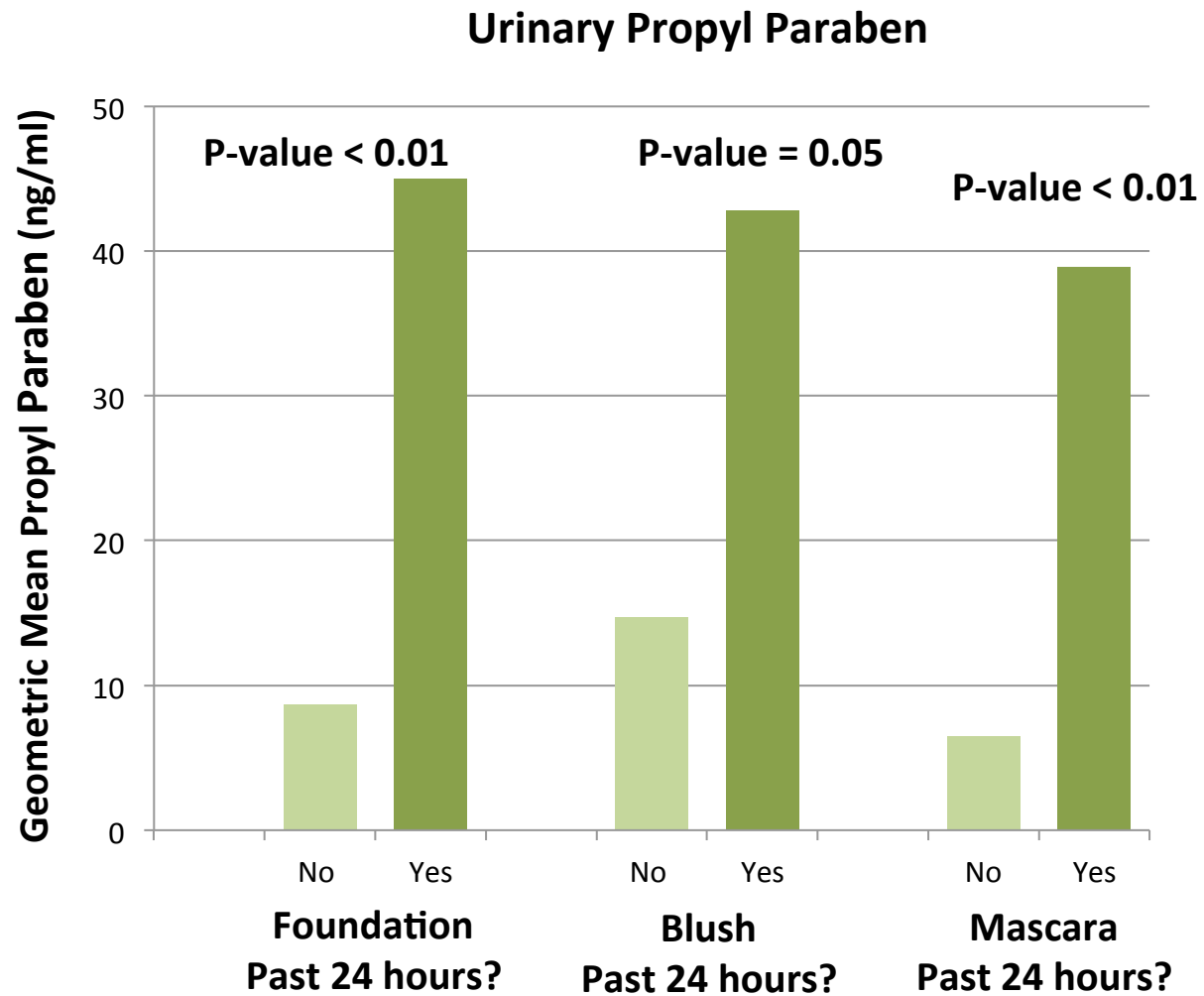
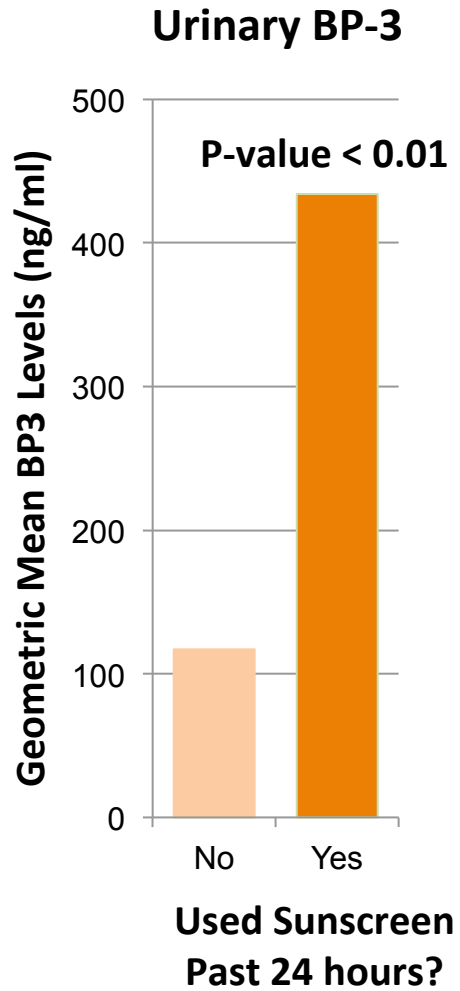


Sunscreens

- Benzophenone-3 (BP-3)



Personal Care Products are the Main Source of Exposure

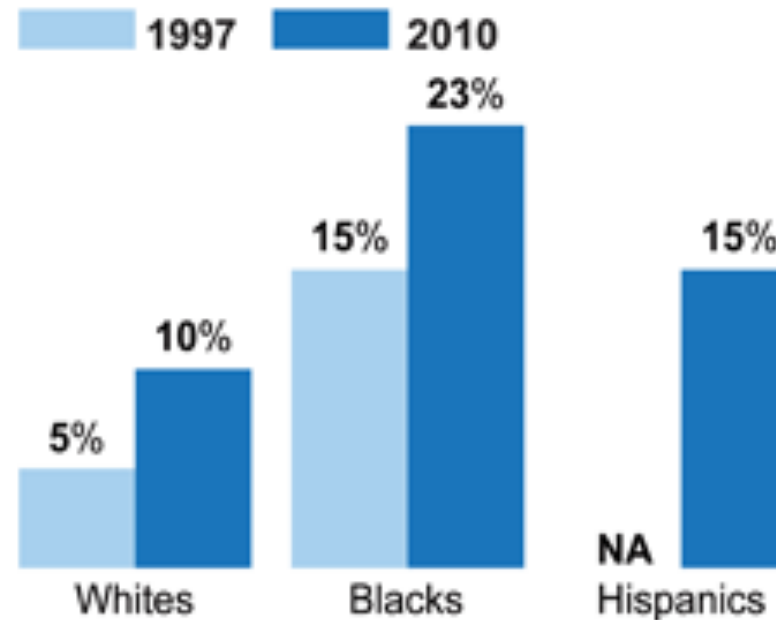


Timing of Puberty in Girls is Getting Earlier



Girls reach puberty earlier raising health concerns

Percentage of 7-year-old girls with early breast development:



Source: Pediatrics

By Frank Pompa, USA TODAY

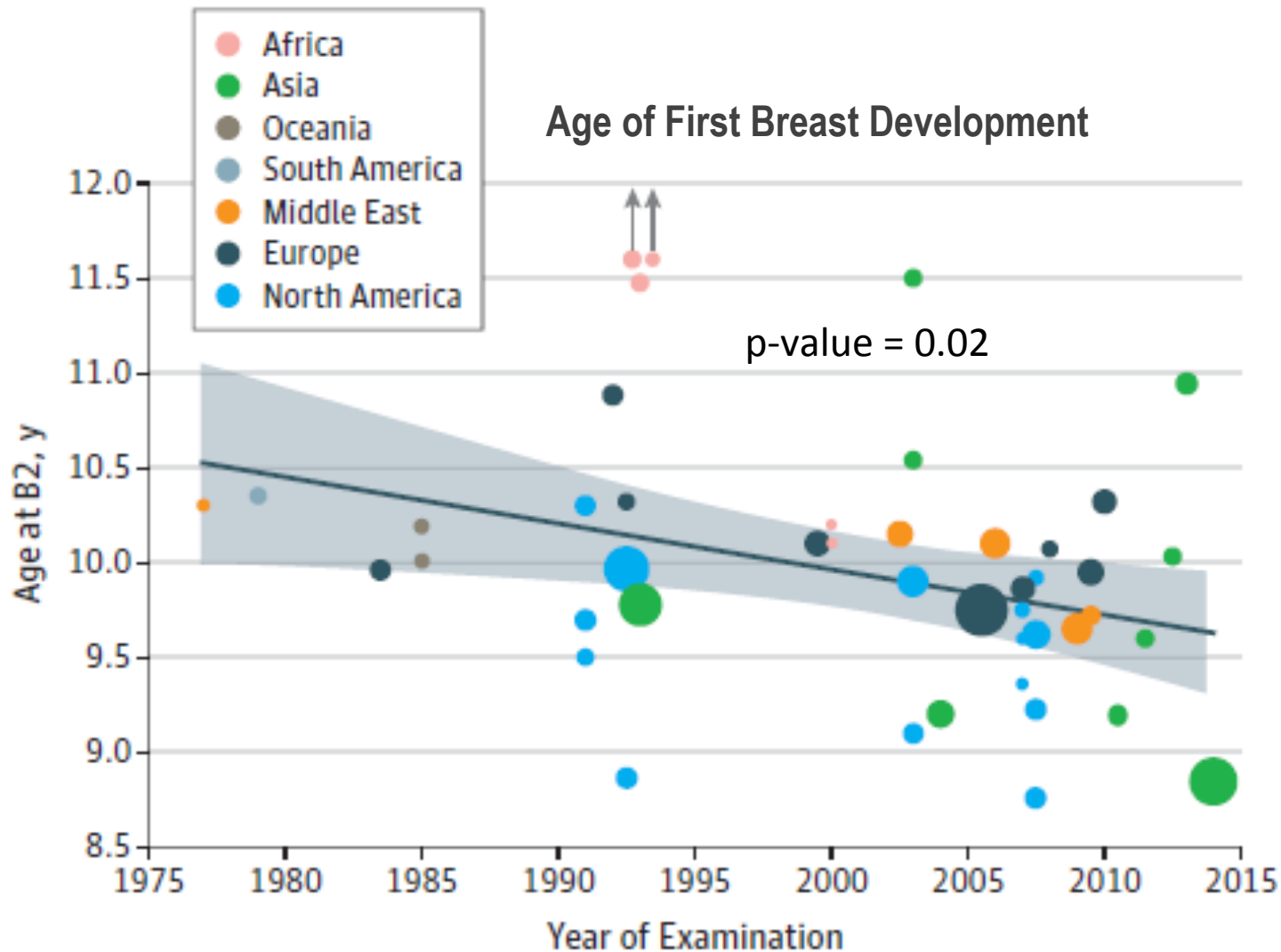
blood and urine samples from girls and will be able to determine their exposure to toxins.

Animal and human studies suggest certain chemicals affect male sexual development.

The herbicide atrazine, for example, has been shown to typically "castrate" some male fish and turn others into females that lay eggs, according to a study in *Proceedings of the National Academy of Science*.

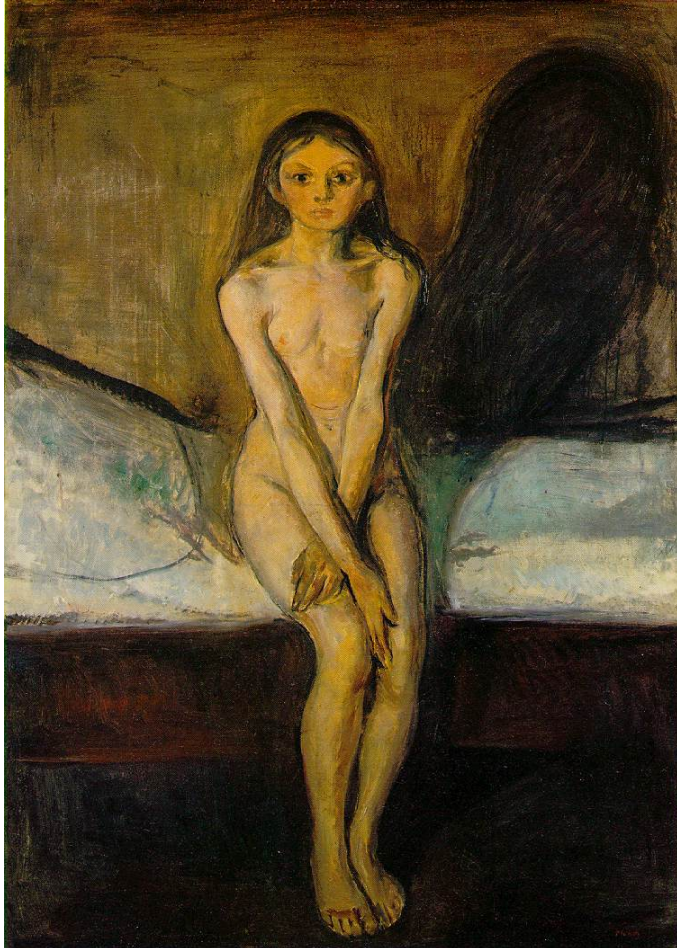
And a 2008 study found that baby boys are more likely to have genital changes, such as undescended testicles and smaller penises, if they were exposed before birth to high levels of phthalates, hormone-disrupting chemicals found in many consumer products.

Evidence Suggests this is a Global Phenomenon



Age at onset of breast development has decreased by one year over past 40

How Do We Measure Pubertal Timing?



Edvard Munch, National Gallery, Oslo

Girls:

- Breast development (thelarche)
- Pubic hair development (pubarche)
- Menarche

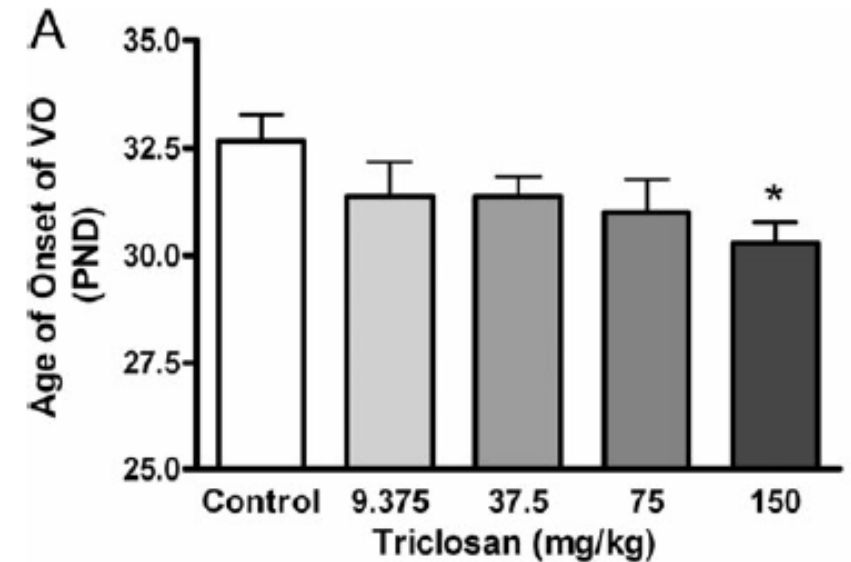
Boys:

- Testicular volume >3 ml
- Genital development
- Pubic hair development

Trend towards earlier puberty in girls is quite well-established.
Trend in boys is less clear.

Associations with Puberty: Animal Studies

- LMW phthalates:
 - Earlier puberty in female rats
 - Later puberty in male rats
- Parabens:
 - Earlier puberty in female rats
 - Later puberty in male rats
- Triclosan:
 - Earlier puberty in female rats



Mean age of onset of vaginal opening following an oral exposure to triclosan from PND 21 to 42 in the female pubertal assay (From: Stoker et al, *Tox Sci*, 2010)

Research Question

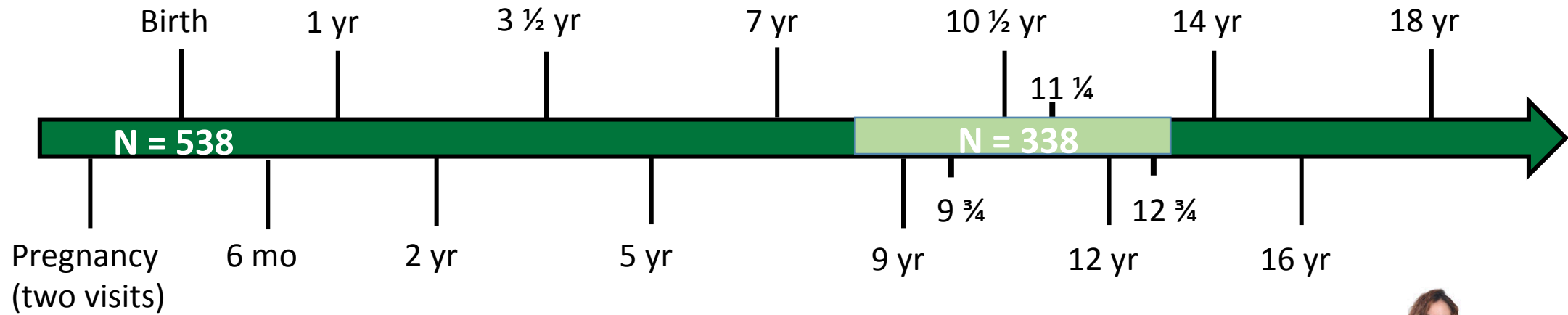
Is timing of puberty in children associated with personal care product chemical exposure at two critical time points:

- In utero (biomarkers in maternal urine during pregnancy)
- Pre-puberty (biomarkers child urine at age 9)



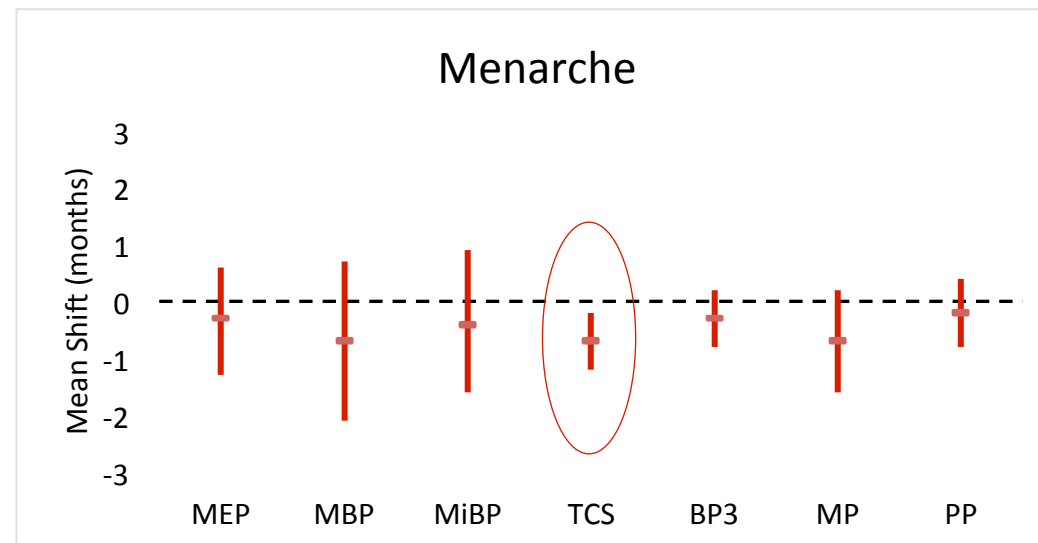
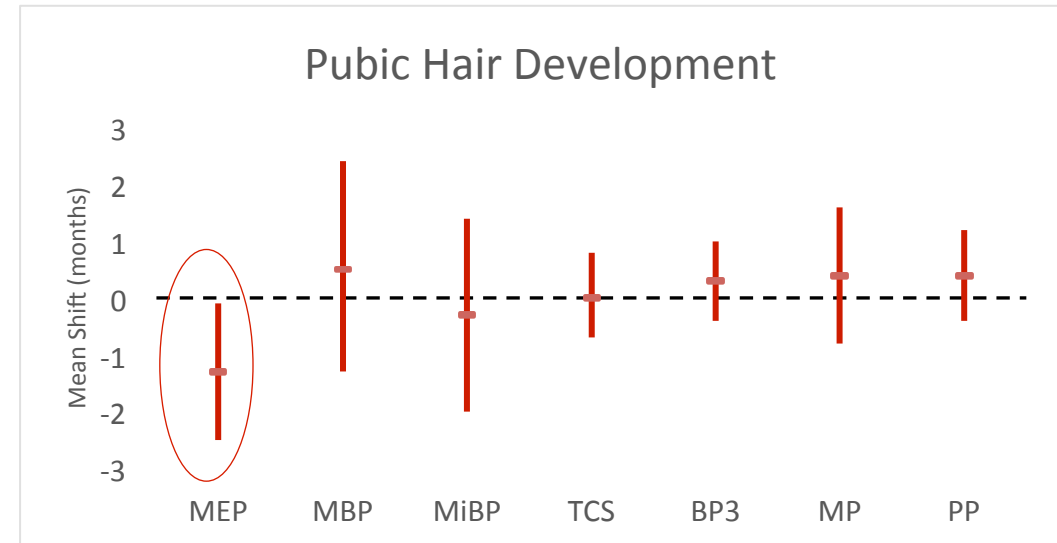
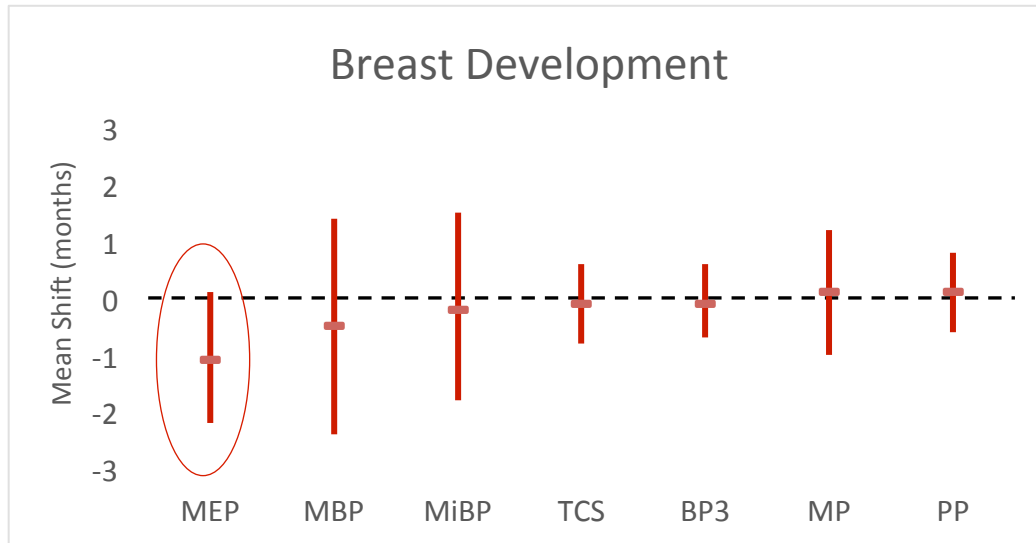
CHAMACOS

Longitudinal Birth Cohort Study



Findings: Associations with Timing of Puberty

Association of Prenatal Urinary Metabolites (continuous) and Puberty in Girls



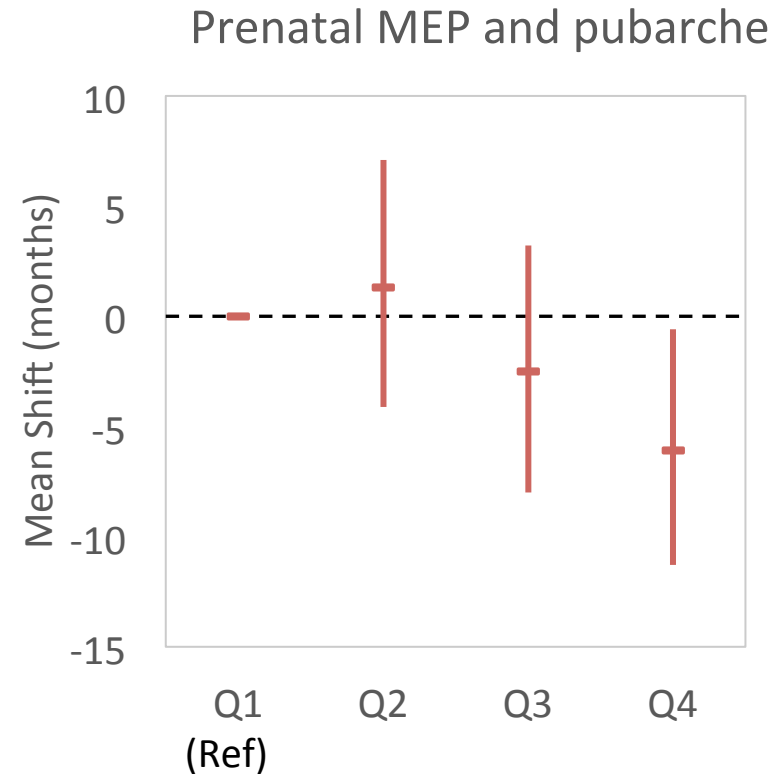
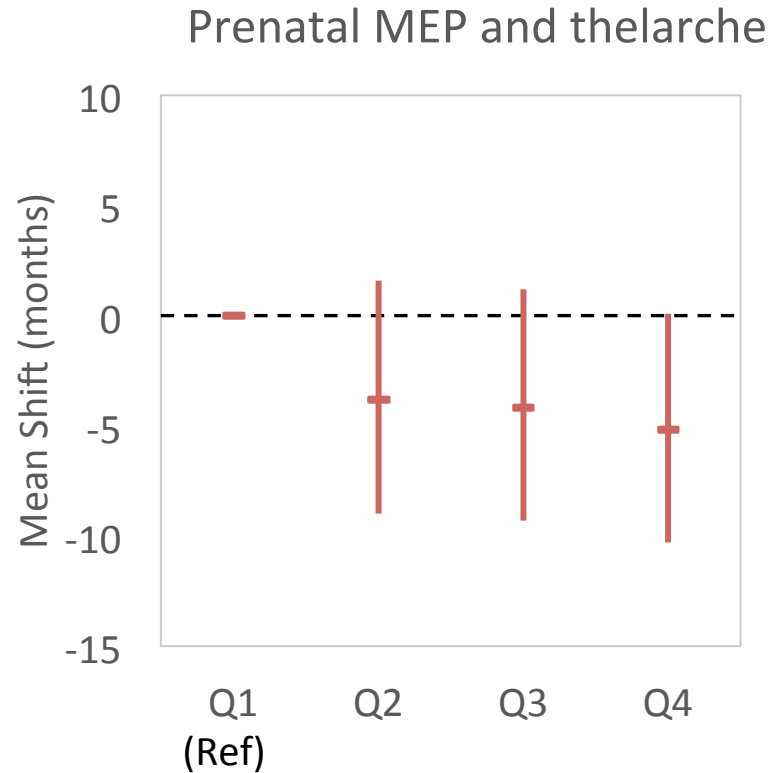
Adjusting for:

- Family income
- Mother's education
- Mother's years of residence in US
- Mother's pre-pregnancy BMI

Quartiles of Prenatal MEP and Puberty in Girls



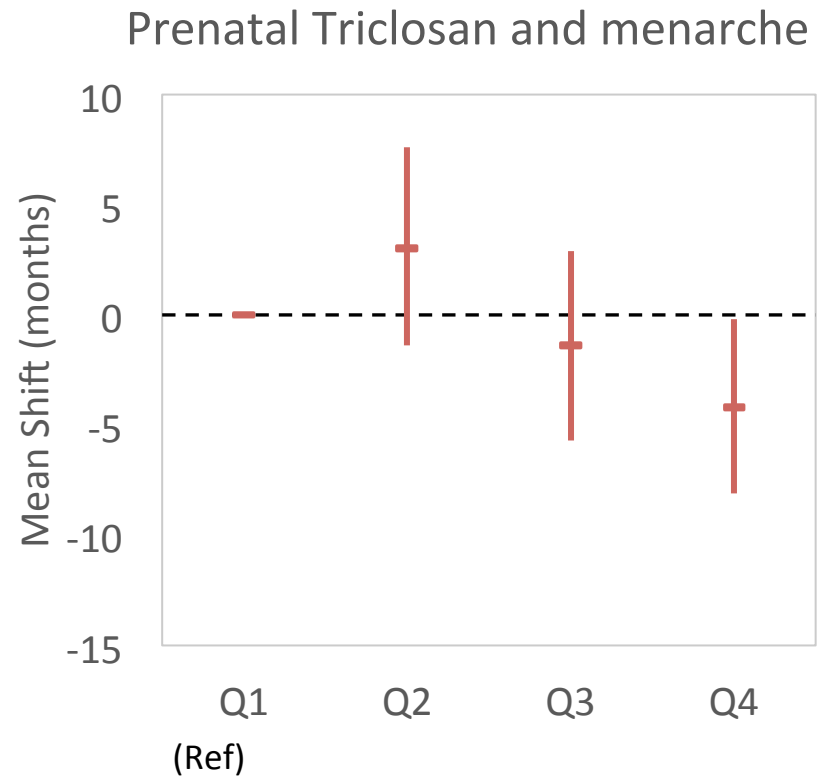
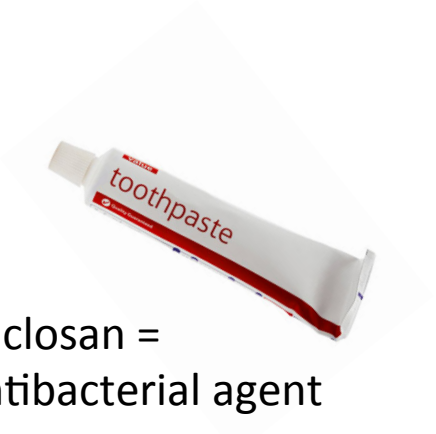
MEP = metabolite of diethyl phthalate



- Adjusting for:
- Family income
 - Mother's education
 - Mother's years of residence in US
 - Mother's pre-pregnancy BMI

- Highest quartile of prenatal MEP associated with 5-6 months earlier pubertal onset

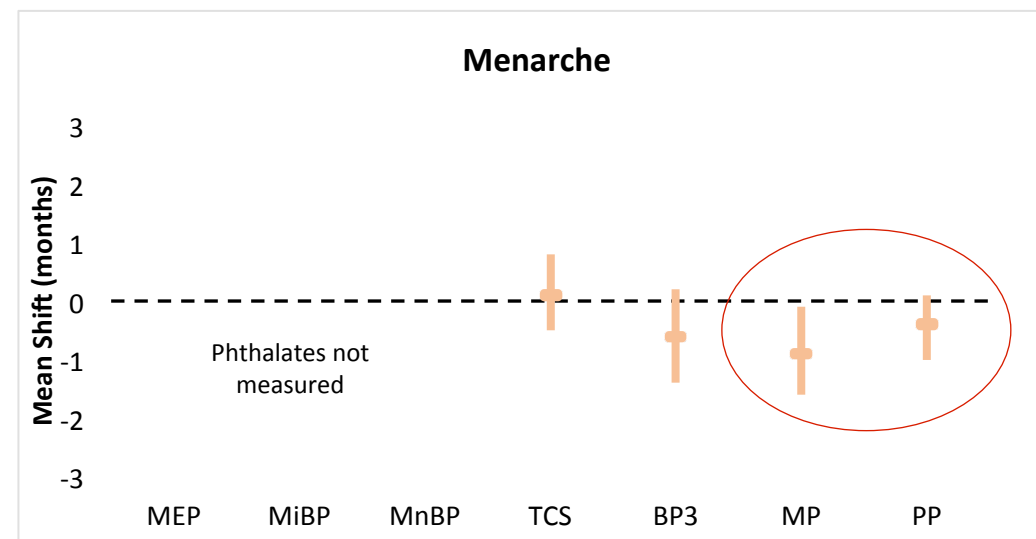
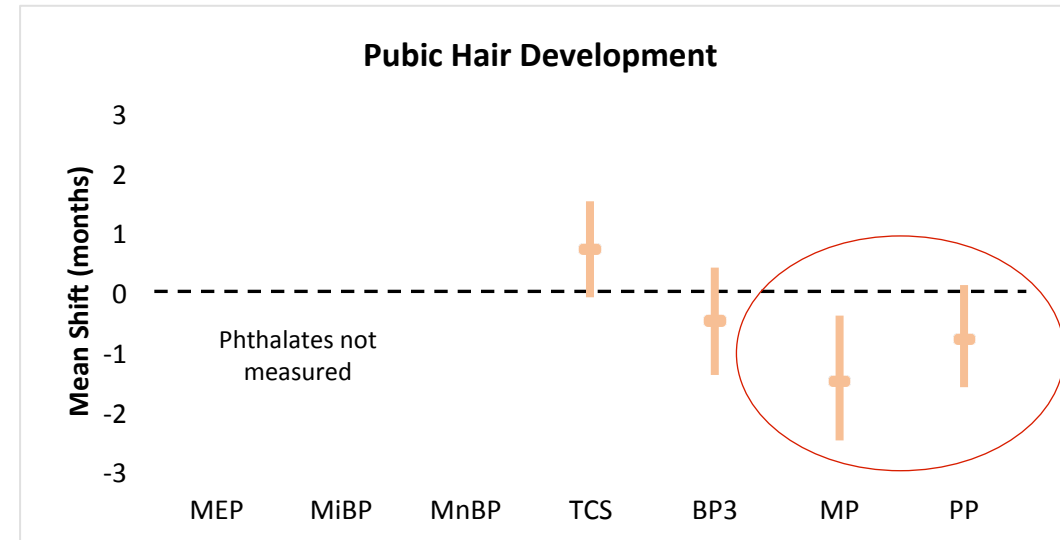
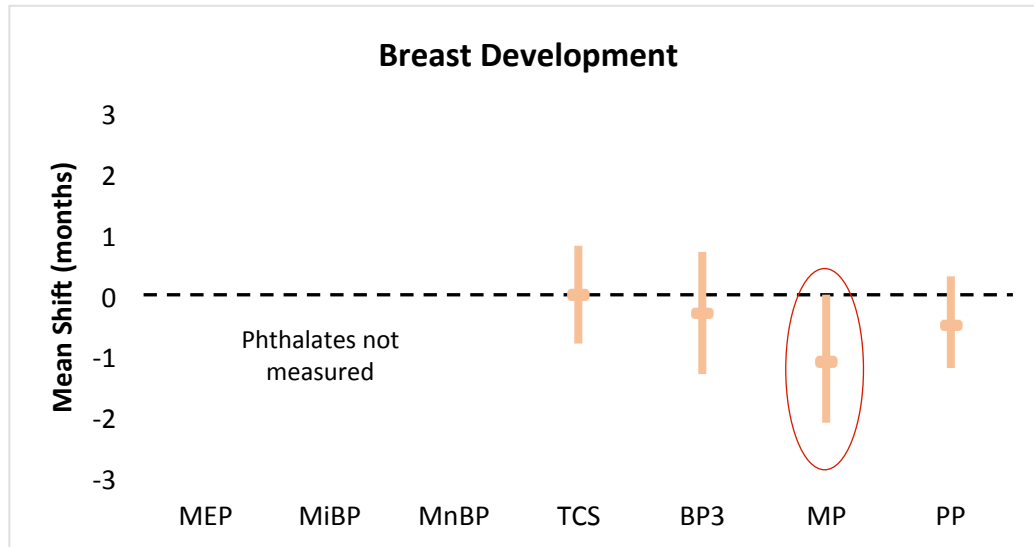
Quartiles of Prenatal Triclosan and Menarche in Girls



- Adjusting for:
- Family income
 - Mother's education
 - Mother's years of residence in US
 - Mother's pre-pregnancy BMI

- Highest quartile of prenatal Triclosan associated with 4 months earlier menarche

Association of Childhood (age 9) Urinary Metabolites (continuous) and Puberty in Girls

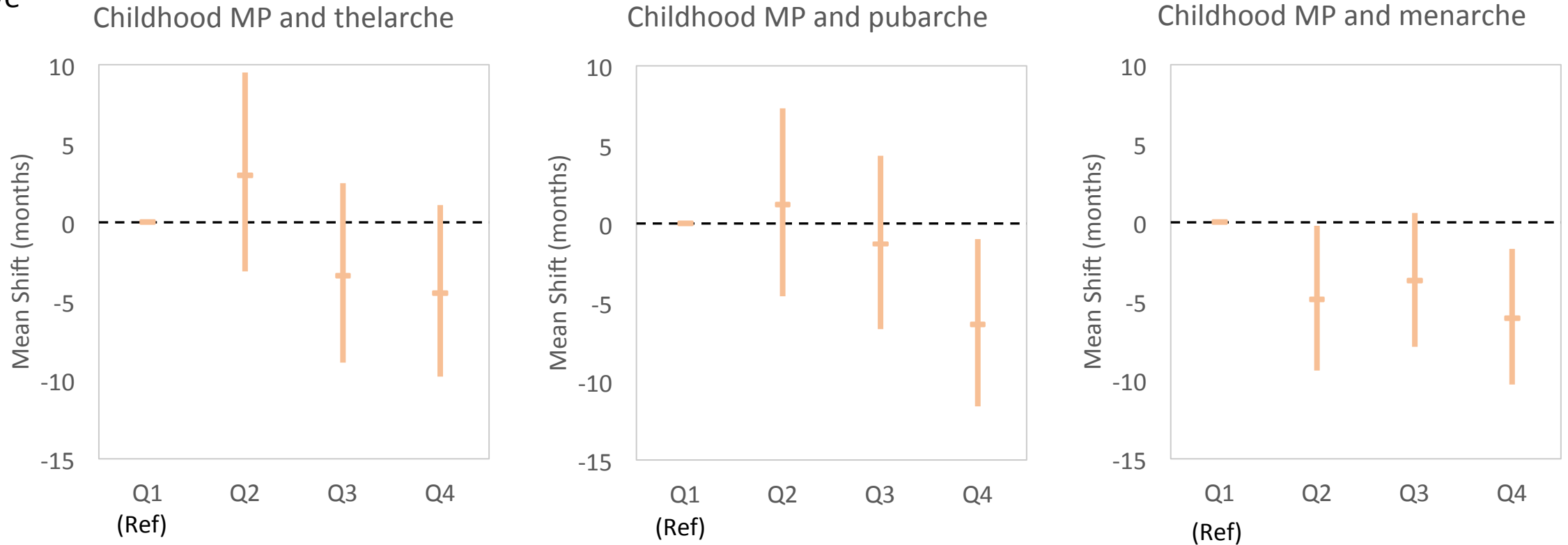


Adjusting for:

- Family income
- Mother's education
- Mother's years of residence in US
- Mother's pre-pregnancy BMI

Quartiles of Childhood (age 9) Methyl Paraben and Pubertal Milestones in Girls

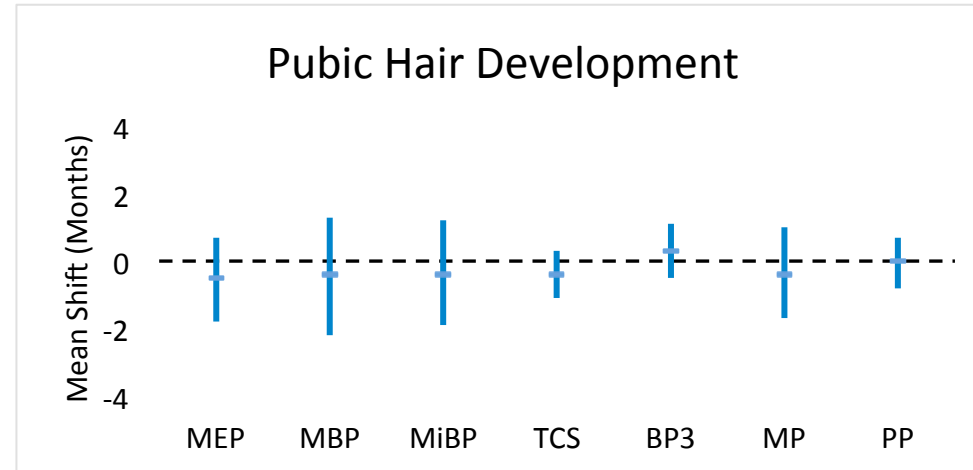
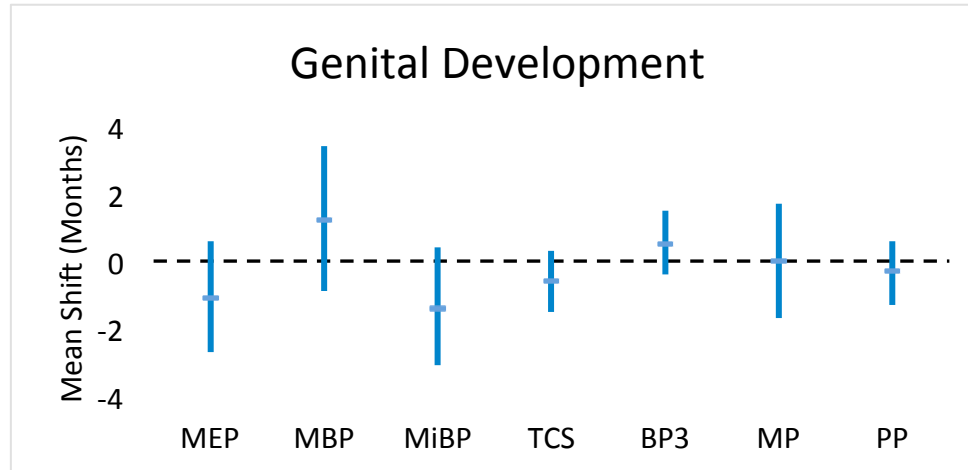
Methyl paraben =
preservative



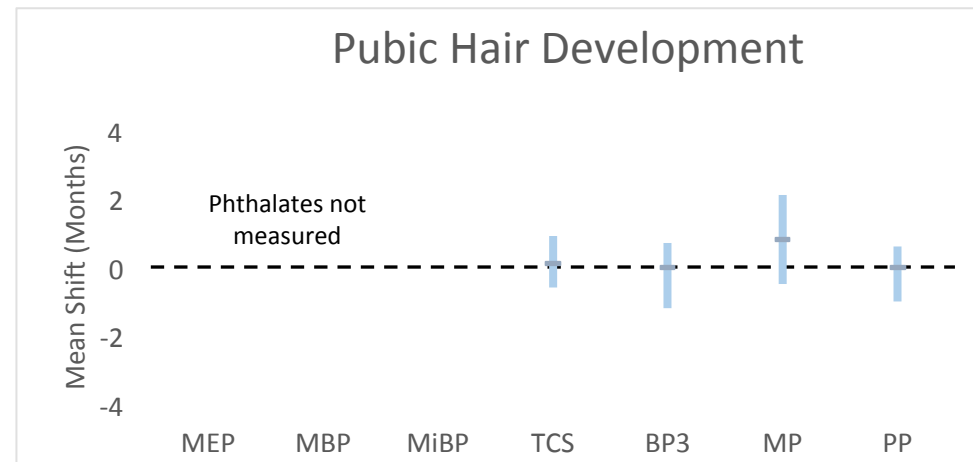
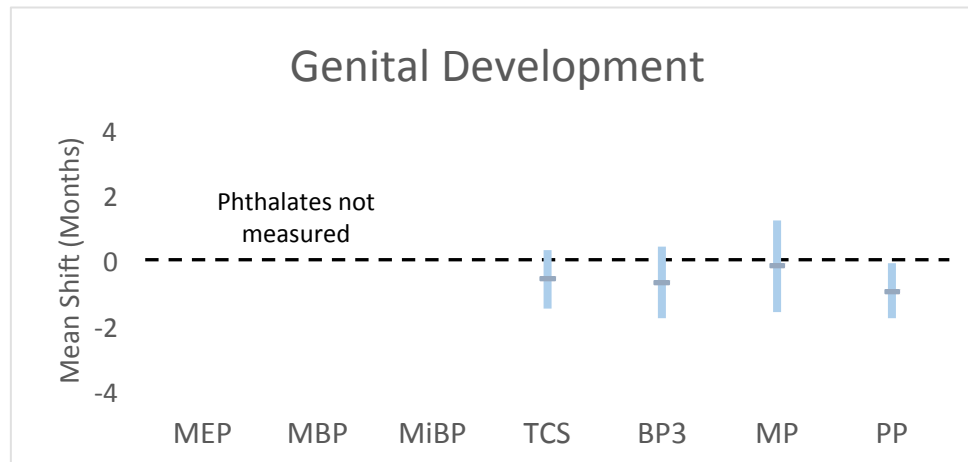
- Highest quartile of childhood methyl paraben concentrations associated with 6 months earlier pubarche and menarche

Association of Urinary Metabolites (continuous) and Puberty in Boys

Prenatal Exposure



Childhood Exposure (9 years)



In Summary...

- Several chemicals in personal care products were associated with earlier puberty in girls ... but not boys
- Associations with both prenatal and peripubertal exposures

Prenatal:

- Highest maternal exposure to diethyl phthalate → 6 months earlier pubarche
- Highest maternal exposure to triclosan → 4 months earlier menarche

Peripubertal:

- Highest childhood exposure to methyl and propyl parabens → 6 months earlier

Reasons for Caution

- First study to examine prenatal exposures to some of these personal care product chemicals
- Very specific population (low-income, rural Latinas in California)
- Urinary biomarkers reflect short-term exposures (24-48 hours)
- Associations with childhood exposures might reflect reverse causation.

Policy Implications

- We know that the chemicals in personal care products are getting into our bodies.
- Evidence that endocrine disrupting chemicals may be impacting pubertal timing
- The FDA has very limited authority over the cosmetics and personal care products industry
- Regulation of cosmetics is slowing starting to change (e.g. California Toxic-Free Cosmetics Act)

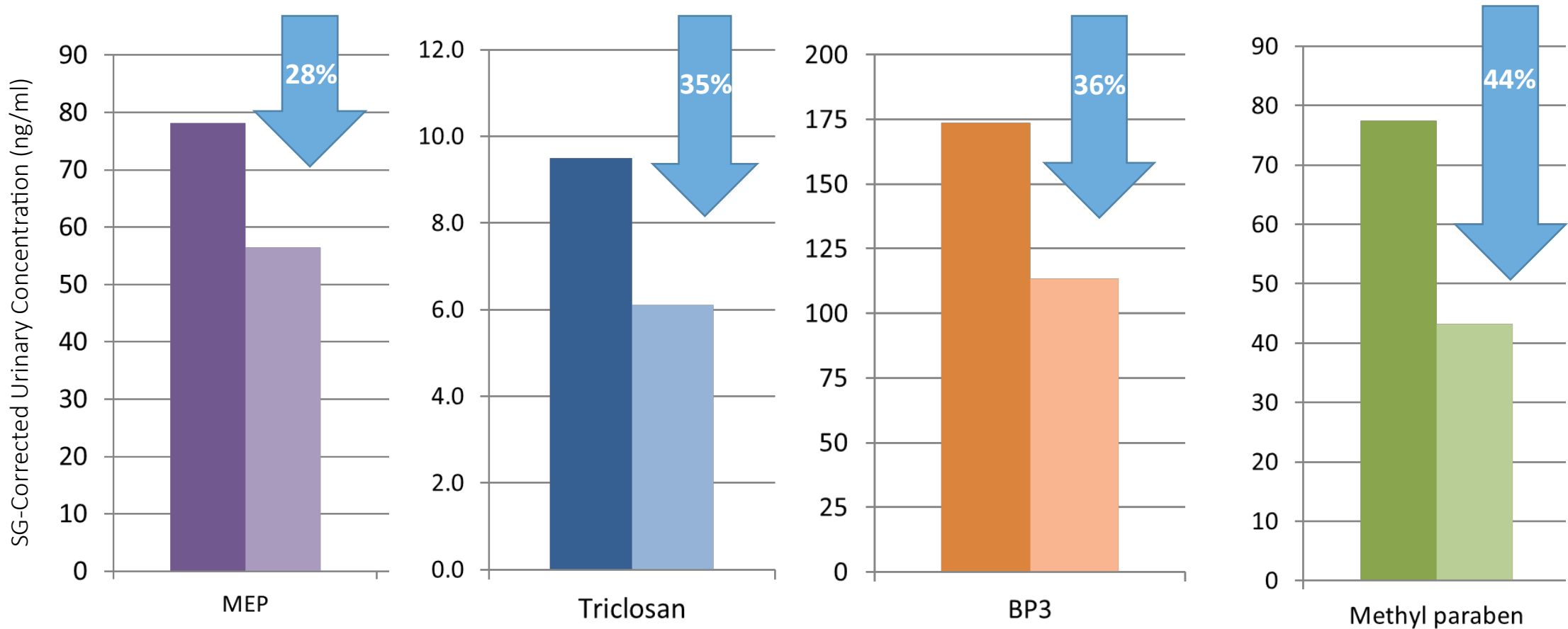
Switching your Products can Reduce Exposure!



- Enrolled 100 teen girls
- Collected pre-intervention urine sample
- Stop using regular personal care products for 3 days. Low chemical products instead.
- Collected post-intervention urine sample



Chemicals in the body decreased in 3 days



Thanks to:

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*And a very special
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