Association between Serum DDE/PCBs and Risk of Preterm Delivery

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STA 723 - Project 1

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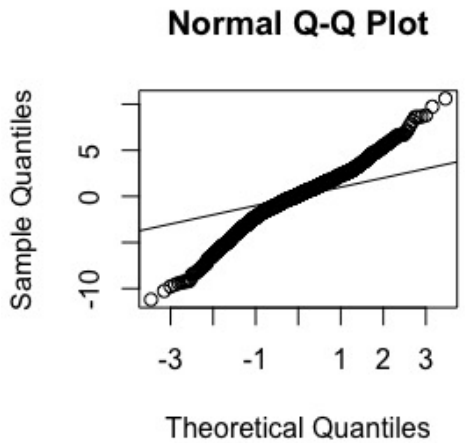
Problem Statement

- PCBs and DDT are toxic compounds banned in the U.S. in 1970s
- Exposure risk persists due to preternatural stability in environment and fatty tissue (NPIC 1999; Korrick 2008)
- Prenatal exposure associated with growth retardation, liver problems, and neurological deficiencies (see review by Korrick, et al. 2008)
- Provided data on gestation times for 2380 human pregnancies, want to probe association between PCB/DDT exposure and preterm delivery risk

Model

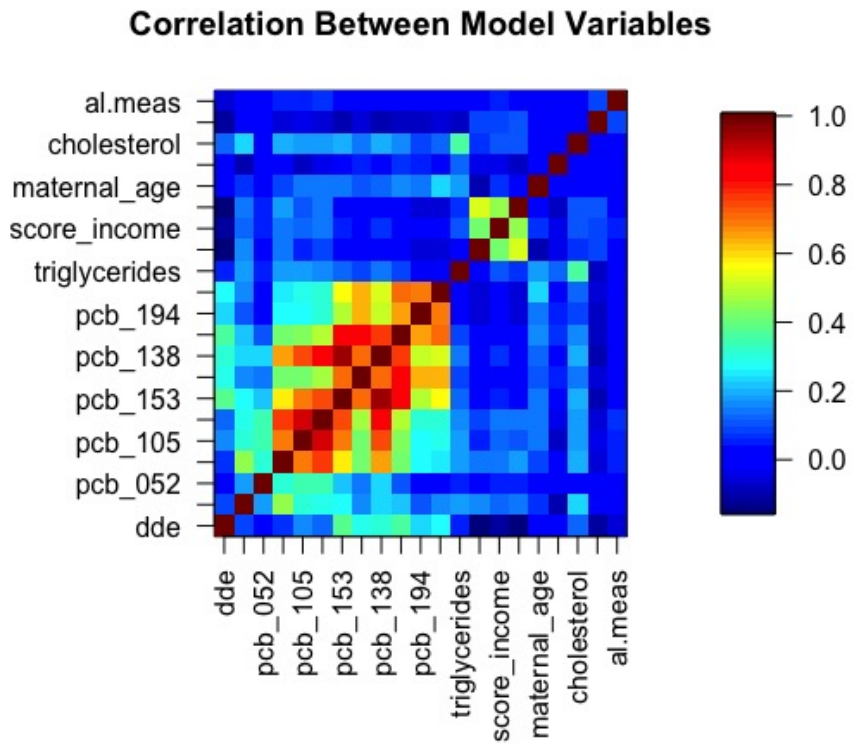
- Data describes gestation time, DDE/PCB exposure, and numerous biological and socioeconomic covariates for each mother
- Even after dropping ridiculous gestation-time observations (> 45 weeks), residuals of exploratory linear model fit are clearly non-Gaussian



- To do inference we need to identify a model that can answer scientific questions without relying on unwarranted assumptions
- Logistic, Multinomial, Box-Cox, Quantile Regression

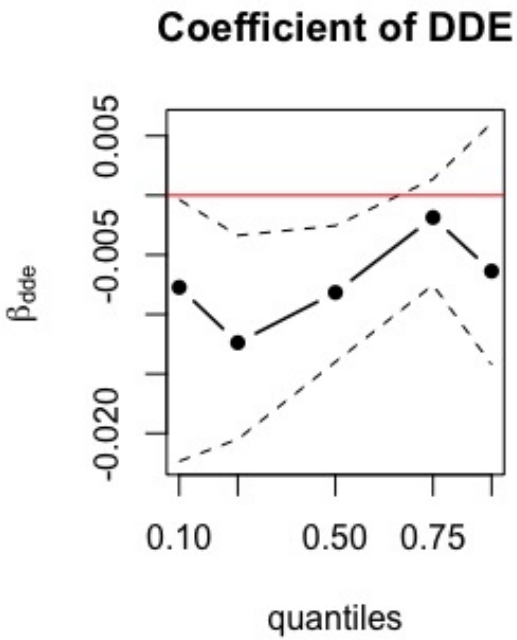
Regression Model Details

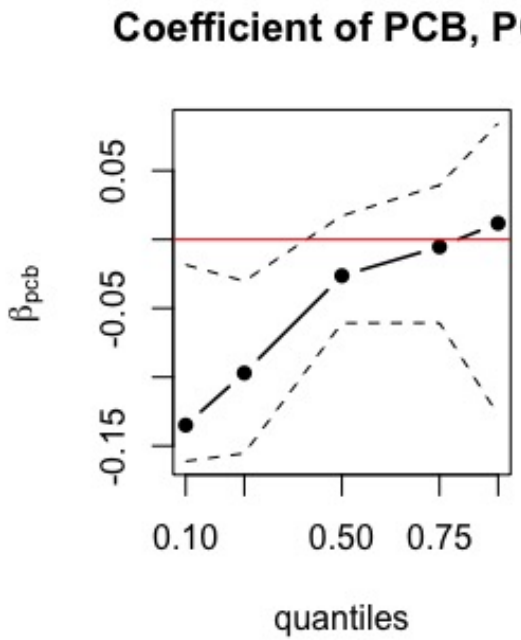
- Observe High Correlation among PCB features and socioeconomic scores
- For interpretability/parsimony, we construct linear approximations to these features (PCA)



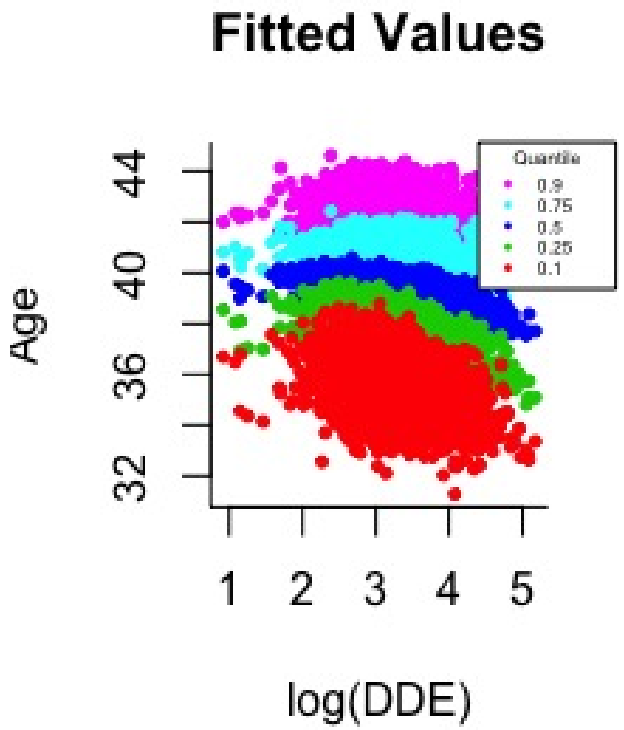
Model Fit

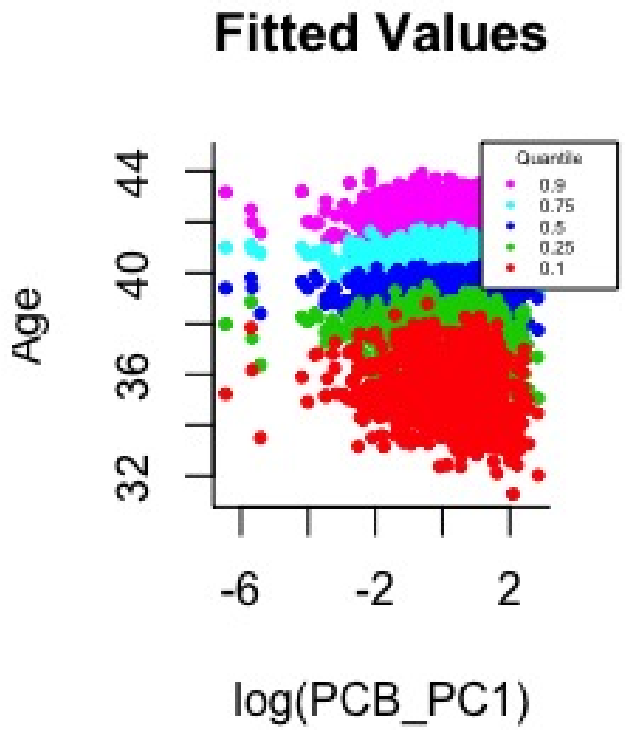
- Potential confounders are UTIs, STIs, ethnicity, age of mother (< 18, > 35), drugs, alcohol, lack of social support, stress, long hours, and more (NIH, NICHD 2019)
- Control for those factors we have data on
- Also control for blood cholesterol/triglyceride levels, since hydrophobic chemicals are carried through the body in liposomes





Inferences and Conclusion





- Marginal fitted values of gestational age in weeks vs. logged exposures
- Evident associated with risk of preterm birth, with particularly strong depression for worst-case-scenario outcomes