

Case Study 1

Emily Gentles Phuc Nguyen Joseph Lawson

Jan 21, 2020

Case Discussion

- ▶ Data obtained from a subset of women enrolled in the CPP during pregnancy

Goal: Assess how exposure to DDE and PCBs relates to the risk of premature delivery and the relative severity thereof

Exploratory Data Analysis

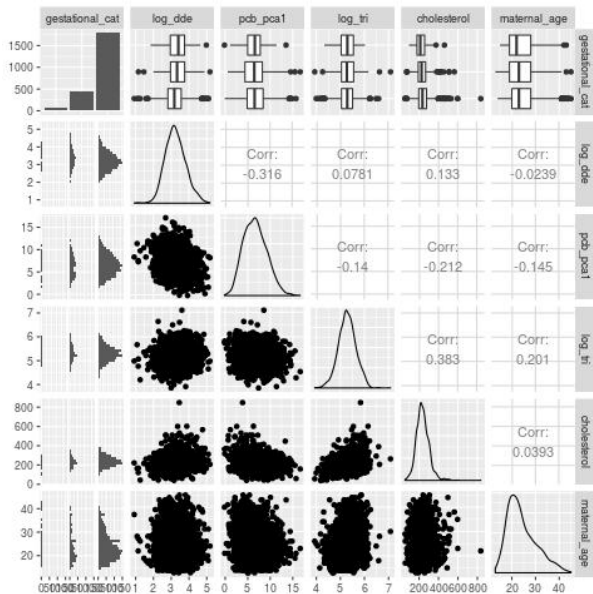
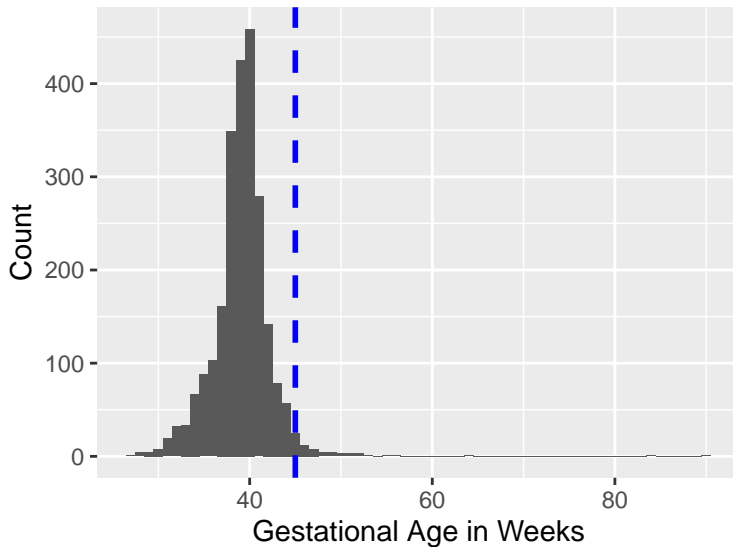
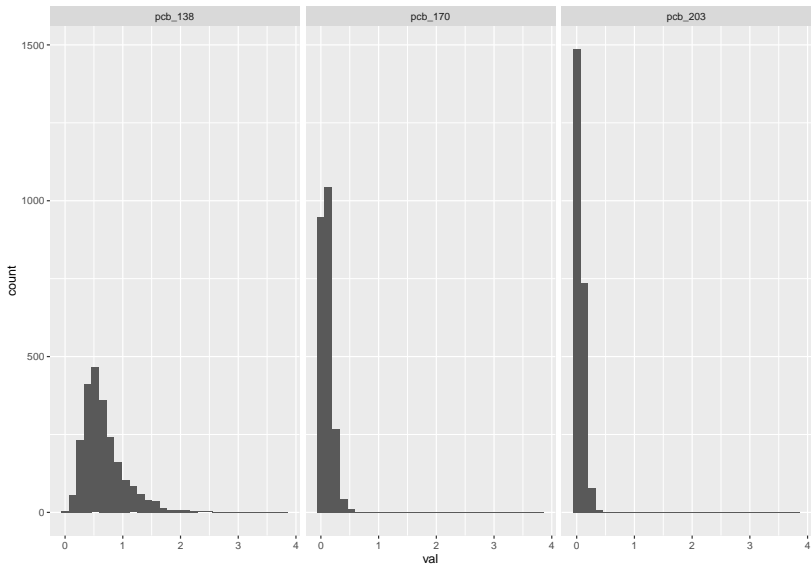


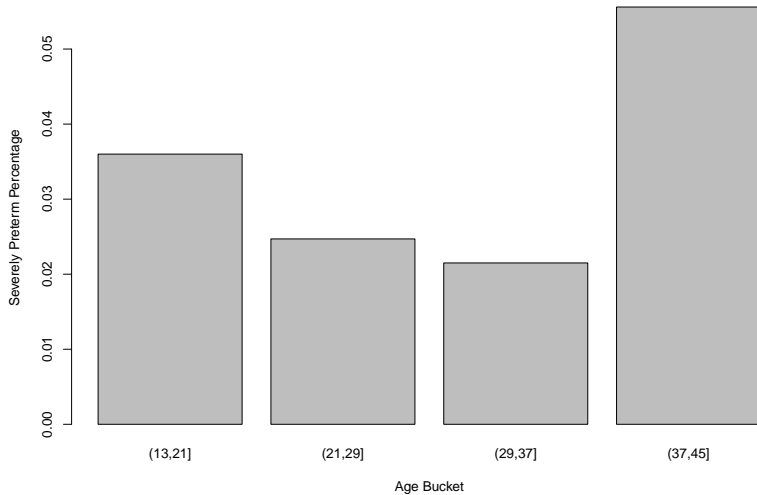
Figure 1: corr-plot

► Data issues: uncertainty, inflation, and missingness





Severely Preterm Probability vs Maternal Age



Analysis

- ▶ Ordinal Logistic Regression with Term, Preterm, and Severely Preterm Gest. Categories
 - ▶ Useful interpretation in terms of risk
 - ▶ Uses naturally ordinal structure
 - ▶ Differentiates between different severities
 - ▶ Addresses non-normality of response
- ▶ Keep obs with Gest. Age 44 or less
- ▶ Impute score data with MICE to check usefulness
- ▶ Remove obs with missing PCB value
- ▶ Include blood cholesterol/triglyceride levels, as well as center and SES/Lifestyle metrics
- ▶ As albumin is highly missing, include indicator for whether it was tested at all

- ▶ Model Comparison indicated ($p=0.97$) that the first principle component of the pcb_* values is sufficient.
- ▶ Indication ($p=0.39$) against including Score Variables (post imputation)
- ▶ Indication ($p=0.24$) against including Center interactions
- ▶ Indication ($p=0$) for including Center as variable
 - ▶ Indicates heterogeneity in preterm birth risk accross medical centers

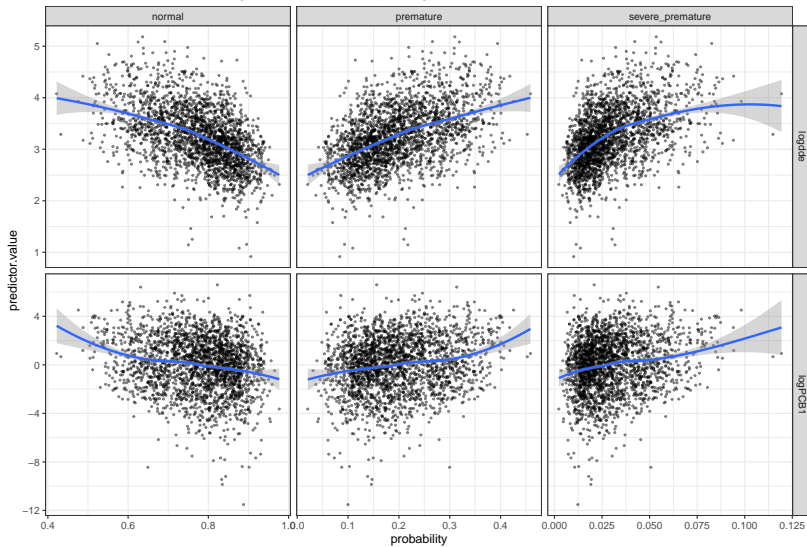
- ▶ Indication ($p=0.39$) against PCB-DDE interaction effect
- ▶ Indication ($p=0.11$) (weakly) against Triglyceride interaction with PCE/DDE
 - ▶ Hypothesized that there might be because of fat-solubility of the contaminants of interest
- ▶ Indication ($p=0.02$) for inclusion of quadratic term in maternal age
 - ▶ Makes sense given heightened birth risk at (relatively) young and old ages of pregnancy (for possibly different reasons)
- ▶ Strong indication that the indicator of testing for Albumin is associated with longer gestational period on the margin

Results

- ▶ (log) DDE and PCB both significantly associated with preterm delivery likelihood even when adjusting for other factors
- ▶ Interpretation that 1% increase in DDE/PCB approximately associated with a -0.22% change and a -0.06% change, respectively in the log odds of of a gestational age occurrence below a given ordinal threshold.
 - ▶ Note for interpretability that the PCB coefficient is relative to the (standardized/centered) first principle component of the pcb_* measurements

Coe	f Est 2.	5 % 97.	5 %
log(dde)	-0.223	-0.425	-0.022
logPCB1	-0.061	-0.118	-0.006

Fitted Probabilities vs DDE (ug/dL)/PCB (princ comp.) (log scale)



▶ Control Variables of Significance:

- ▶ Center
- ▶ Triglycerides (g/dL)
- ▶ Cholesterol (g/dL)
- ▶ Maternal Age (years)
- ▶ Albumin (Testing Indicator)