Case Study 1-Group 1

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Introduction

- Data: Subset of National Collaborative Perinatal Project (CPP), comprised of 2380 observations of pregnant women [Longnecker et al., 2001].
- Goal: Assess how DDE and PCBs associate with risk of premature delivery, adjusting for confounding variables.

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- Missing data: Multivariate Imputations by Chained Equations (MICE package in R) for covariates. Deleted albumin because 93 percent missing. Only one observation missing in dde and pcb, deleted.
- Limit of Detection (LOD): Exists in some PCBs. All LODs are negligible compared to data scale (e.g. 0.01 compared to 0.3)

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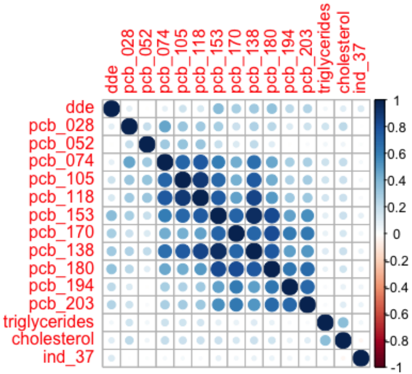

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Loadings:

	Comp.1	Comp.2	Comp.3	Comp.4	Comp.5
pcb_028	0.161	0.243	0.833	0.342	0.154
pcb_052	0.116	0.376	0.223	-0.886	
pcb_074	0.306	0.314		0.189	-0.217
pcb_105	0.320	0.333	-0.208		-0.282
pcb_118	0.342	0.306	-0.248		-0.199
pcb_153	0.376		-0.160		0.332
pcb_170	0.325	-0.274		-0.123	0.323
pcb_138	0.383		-0.225		0.165
pcb_180	0.344	-0.277			0.375
pcb_194	0.253	-0.419	0.158	-0.100	-0.585
pcb_203	0.268	-0.409	0.203	-0.106	-0.290

	Comp.1	Comp.2	Comp.3	Comp.4	Comp.5
Standard deviation	2.4458646	1.3261098	0.94105657	0.89065865	0.70742028
Proportion of Variance	0.5440699	0.1599370	0.08054181	0.07214604	0.04551399
Cumulative Proportion	0.5440699	0.7040069	0.78454872	0.85669476	0.90220875

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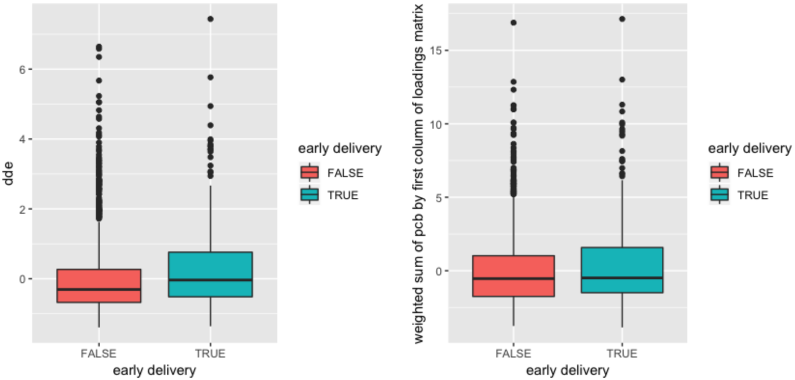

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- Nonlinear Model

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- Generalized Additive Model (GAM)

$$g(Y_i) = \beta_0 + \sum_{j=1}^{m} f_i(x_{ij}) + \sum_{k=1}^{l} \beta_k z_{ik}$$

- Choice of g: probit or logit.
- $x_{.j}$s include DDE, PCBs, maternal age, etc.
- $z_{.k}$s include categorical variables and some confounding variables.

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- Bayesian Generalized Additive Model

$$g(Y_i) = \beta_0 + \sum_{j=1}^{m} f_j(x_{ij}) + \sum_{k=1}^{l} \beta_k z_{ik}$$

- Adds priors on the common regression coefficients, priors on the standard deviations of the smooth terms.

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- Generalized Additive Mixed Model (GAMM)
- Bayesian GAMM

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- Including Interactions: Bayesian Factor Analysis (Ferrari, F. and Dunson, D.B. 2019)