data generating model:

$$Y = Cb + E\alpha + G\beta + W\eta + \varepsilon$$

C: clinical factor
$C = (C_1, \dots, C_{q1})$, $b = (b_1, \dots, b_{q1})^T$, q1=3, b is generated from unif (1, 2.2)

E: environmental factor
$E = (E_1, \dots, E_{q2})$, $\alpha = (\alpha_1, \dots, \alpha_{q2})^T$, q1=4, α is generated from unif (1.2, 2.5)
E have 2 continuous variables and 2 discrete variables.

G: genes
$G = (G_1, \dots, G_P)$, $\beta = (\beta_1, \dots, \beta_P)^T$, P=100, the nonzero $(\beta_1, \dots, \beta_8)$ is generated from unif(1, 2.5) and other β is 0.
#nonzero: 8

W: GxE interactions
$W = (G_1 \times E_1, \dots, G_1 \times E_{q2}, \dots, G_p \times E_1, \dots, G_p \times E_{q2},)$, $\eta = (\eta_1, \dots, \eta_{PXq2})^T$
the nonzero η_1, η_{10}, η_{19}, η_{32}, η_{57}, η_{70}, η_{96}, η_{97}, η_{138}, η_{144}, η_{157}, η_{170} are generated from unif(1.8, 2.5) and other η is 0.
#nonzero: 12

Estimate the coefficients of β and η with marginal model:

$$Y = Cb + E\alpha + X\beta + W'\eta' + \varepsilon$$

$X = G_j$, $W' = (X \times E_1, \dots, X \times E_{q2})$, $\eta' = (\eta'_1, \dots, \eta'_{q2})^T$

Simulation Results

n=200, p=50, error distribution: N(0,1)

Bayesian Lasso (95% confidence interval)

	TP(main)	FP(main)	TP(interaction)	FP(interaction)
mean	4.6	0	2.4	0.9
sd	1.8	0	1.64	0.89

Bayesian Lasso Spike and Slab (MPM)

	TP(main)	FP(main)	TP(interaction)	FP(interaction)
mean	7.75	2.2	2.65	1.9
sd	0.45	1.62	1.58	1.62

LAD Bayesian Lasso (95% confidence interval)

	TP(main)	FP(main)	TP(interaction)	FP(interaction)
mean	6.85	0.65	4.2	3.8
sd	1.17	0.88	1.61	1.34

LAD Bayesian Lasso spike and slab (MPM)

	TP(main)	FP(main)	TP(interaction)	FP(interaction)
mean	7.9	7.7	10.1	62.6
sd	0.32	3.69	0.84	14.38

Simulation Results

n=200, p=50, error distribution: t(2)

Bayesian Lasso (95% confidence interval)

	TP(main)	FP(main)	TP(interaction)	FP(interaction)
mean	3.55	0	1.8	1.15
sd	2.18	0	1.209	0.883

Bayesian Lasso Spike and Slab (MPM)

	TP(main)	FP(main)	TP(interaction)	FP(interaction)
mean	7.95	2.25	2.25	1.35
sd	0.158	1.97	1.55	1.21

LAD Bayesian Lasso (95% confidence interval)

	TP(main)	FP(main)	TP(interaction)	FP(interaction)
mean	6.6	0.5	3.75	5.2
sd	1.069	0.516	1.726	2.76

LAD Bayesian Lasso spike and slab (MPM)

	TP(main)	FP(main)	TP(interaction)	FP(interaction)
mean	7.85	8.35	9.65	62.5
sd	0.47	2.96	1.64	13.19