

The model is

$$y_i \sim \mathcal{N}(\mu_i, \sigma^2)$$

$$\mu_i = \beta_0 + \beta_{1i} A_i$$

$$\beta_{1i} = \beta_2 + \beta_{B_i}^B + \beta_{C_i}^C + \beta_{D_i}^D$$

which combined gives us

$$\mu_i = \beta_0 + A_i(\beta_2 + \beta_{B_i}^B + \beta_{C_i}^C + \beta_{D_i}^D)$$

or

$$\mu_i = \beta_0 + \beta_2 A_i + \beta_{B_i}^B A_i + \beta_{C_i}^C A_i + \beta_{D_i}^D A_i$$