

Multivariate
Regression

$k=2$
 $\theta = (\lambda_{c_1}, \lambda_{c_2}, \dots, \lambda_{E_{285}})$
 $(G_i | \lambda_{c_i} | P, B) \sim \text{Poisson}(\lambda_{c_i})$
 $i=1, \dots, n_c = 287$
 (indep)

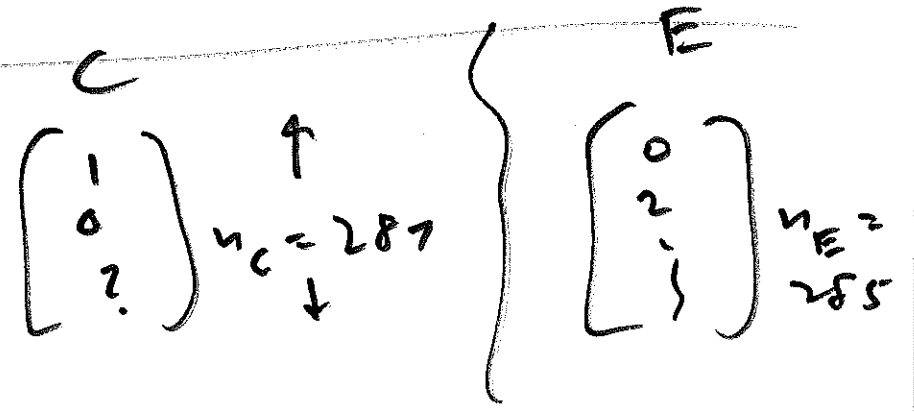
$(E_j | \lambda_{E_j} | P, B) \sim \text{Poisson}(\lambda_{E_j})$
 $j=1, \dots, n_E = 285$

too many parameters

$(G_i | \lambda_c | P, B) \stackrel{IID}{\sim} \text{Poisson}(\lambda_c)$ $(k=2)$
 $i=1, \dots, n_c$
 $\theta = (\lambda_c, \lambda_E)$

$(E_j | \lambda_E | P, B) \stackrel{IID}{\sim} \text{Poisson}(\lambda_E)$
 $j=1, \dots, n_E$

2 independent samples



$y_i =$ # hosp. for person i ($i=1, \dots, n=572$)

y	1	0	1	...	0
x	0	1	...	1	0

$x \leftarrow$ dummy variable
 $\begin{cases} 1 = E \\ 0 = C \end{cases}$
 $I(E)$

($i=1, \dots, n$)

$(y_i | \lambda_i) \sim \text{Poisson}(\lambda_i)$

$\lambda_i \sim \text{Poisson}(\lambda_i)$

$\log(\lambda_i) = \sigma_0 + \sigma_1 x_i$

$\in \mathbb{R}$ (regression coefficients)

fixed

FEP model

simple linear regression

$x_i = 0 \rightarrow \log \lambda_i = \sigma_0 + \sigma_1 \cdot 0$

$\lambda_i = e^{\sigma_0} = \lambda_c$

$x_i = 1 \rightarrow \log \lambda_i = \sigma_0 + \sigma_1$

$\leftrightarrow \lambda_i = e^{\sigma_0 + \sigma_1} = \lambda_E$

$$\frac{\lambda_E - \lambda_c}{\lambda_c} = \frac{e^{\sigma_0 + \sigma_1} - e^{\sigma_0}}{e^{\sigma_0}} = e^{\sigma_1} - 1 = \delta_1$$

$(e^x = 1 + x + o(x^2))$

$(Y_i | \lambda_i, P, \mathcal{B}) \sim \text{Poisson}(\lambda_i)$ (k=1, ..., k=5) ③

$$\log(\lambda_i) = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \dots + \beta_k x_{ik}$$

(0)E
↓
richness
↓
age
↓
social isolation
↓

random-effects
Poisson regression
(RE-PR) model

θ_i in
THTR
2(B)

random effects

$+ e_i$
IID $N(0, \sigma_e^2)$
↑
conventional