

In this lab, we will look at the effect of family history on the probability of CHD. We can treat the presence of CHD, say  $Y$ , conditionally on family history, say  $X$ , as a Bernoulli random variable, i.e.,

$$Y \mid X \sim \text{Bernoulli}(\pi)$$

The probability mass function is:

$$\Pr(Y = y \mid X) = \pi^y (1 - \pi)^{(1-y)}$$

One possible relation between family history and the probability of CHD is :

$$\pi = \frac{e^u}{1 + e^u} = E(Y \mid X) = \mu$$

where

$$\eta = \beta_0 + \beta_1$$

(the logit link function).

$$l(\beta) = \sum_{i=1}^n y_i \left( \beta_0 + \sum_{j=1}^p \beta_j x_{i,j} \right) - \sum_{i=1}^n \log(\{1 + e^{\beta_0 + \sum_{j=1}^p \beta_j x_{i,j}}\})$$