

Discrete Response Model

Lecture 1

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Relative Risk

MLE

The MLE of RR can be found by substituting MLEs of π_1 and π_2 into the equation for RR:

$$RR = \frac{\hat{\pi}_1}{\hat{\pi}_2} = \frac{w_1 / n_1}{w_2 / n_2} = \frac{w_1 n_2}{w_2 n_1}$$

A $(1 - \alpha)100\%$ Wald confidence interval for $\log(RR)$ is

$$\log(\hat{\pi}_1 / \hat{\pi}_2) \pm Z_{1-\alpha/2} \sqrt{\text{Var}(\log(\hat{\pi}_1 / \hat{\pi}_2))}$$

where

$$\begin{aligned} \text{Var}(\log(\hat{\pi}_1 / \hat{\pi}_2)) &= \frac{1 - \hat{\pi}_1}{n_1 \hat{\pi}_1} + \frac{1 - \hat{\pi}_2}{n_2 \hat{\pi}_2} \\ &= \frac{1}{w_1} - \frac{1}{n_1} + \frac{1}{w_2} - \frac{1}{n_2} \end{aligned}$$

MLE

$(1 - \alpha)100\%$ Wald confidence interval for RR is then

$$\exp \left[\log(\hat{\pi}_1 / \hat{\pi}_2) \pm Z_{1-\alpha/2} \sqrt{\text{Var}(\log(\hat{\pi}_1 / \hat{\pi}_2))} \right]$$

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