

Response modeled with **explanatory variables**.

- 1 Tarsus length **continuous**
 - Hatch island **factor, 5 levels**
 - Sex **factor, 2 levels**
 - NAO **covariate**
- 2 Dispersal, **categorical, binary**
 - Hatch island **factor, 5 levels**
 - Sex **factor, 2 levels**
 - NAO **covariate**
 - Wing length **covariate**
- 3 Number of off-spring **categorical, counts**
 - Dispersal **factor, 2 levels**
 - Hatch island **factor, 5 levels**
 - Body mass **covariate**

Example: Chronically medical conditions

- Women in rural area see GP less then women in urban area.
- Why? Less sick or less accessible?

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Data

Group 1: No. of chronically conditions for 26 town women with ≤ 3 GP visits.

Group 2: No. of chronically conditions for 23 town women with ≤ 3 GP visits.

Do women in the two groups with the same number of visits have the same need?

Model and hypothesis

y_{jk} : Woman j from group k .

H_0 Same need: $Y_{jk} \sim Po(\theta)$

H_1 Different needs: $Y_{jk} \sim Po(\theta_k)$

Maximum Likelihood Estimation (MLE)

Likelihood function: Joint probability function for all data seen as function of parameter(s).

MLE: Optimum for parameter(s).

- 1 Find likelihood function $L(\theta, y)$
- 2 Find optimum:
 - Find log-likelihood: $l(\theta, y) = \log(L(\theta, y))$
 - Solve $\frac{\partial}{\partial \theta} l(\theta, y) = 0$ for θ

Standardized residuals

Normal model: $E(Y_i) = \mu_i$, $Y_i = N(\mu_i, \sigma^2)$

Poisson model: $E(Y_i) = \theta_i$, $Y_i \sim Po(\theta_i)$

- $r_i = \frac{y_i - \hat{\mu}_i}{\hat{\sigma}}$
- $r_i = \frac{y_i - \hat{\theta}}{\sqrt{\hat{\theta}}}$

If model is correct: Approximately: $r_i \sim N(0, 1)$

Plots for r_i

- qq-plot
- against each explanatory variable
- other potential explanatory variables
- plot r_i vs \hat{y}_i (check assumption of constant variance / homoscedasticity)
- plot r_i in order y_i was measured.

- We recommend binary data with at least one continuous and one nominal/ordinal explanatory variable.
- But any data / model that fit the course is OK.
- Discuss with Ingelin and Thiago!

Find a friend and start today!