

MA5771: Applied Generalized Linear Models

Week 5 Quiz 1

Quiz Problem 5.1 (10 points) Suppose that a given dose–response experiment records the dose of poison d and proportion y of insects out of m that are killed at each dose, such that the model has the systematic component $g(\mu) = \beta_0 + \beta_1 d$.

- (1) Show that the ED50 for such a model using a probit link function is $ED50 = \frac{\beta_0}{\beta_1}$.
- (2) Show that the ED50 for such a model using the logarithmic link function is $ED50 = \frac{\log(0.5) - \beta_0}{\beta_1}$.

Quiz Problem 5.2 (20 points) An experiment studied the survival of mice after receiving a test dose of culture with five different doses of antipneumococcus serum (in cc) (data set: `serum`). Fit and interpret a logistic regression model to the data with systematic component $\text{Survivors/Number} \sim 1 + \log(\text{Dose})$. Note that $\log(\text{Dose})$ instead of dose is used in the model.

- (1) Based on $\hat{\beta}_0 = 11.2375$ and $\hat{\beta}_1 = 1.7094$ to find ED50. Show your details.
- (2) The standard error obtained from `dose.p()` is 0.1116. Find 95% confidence interval for ED50.