

The Generalized Linear Model allows one to use non-normal errors. Generalized Linear models are written as follows.

Identity Link: $Response = \mu + \varepsilon$

Log Link: $Response = e^\mu + \varepsilon$

Logit Link: $\frac{p}{1-p} = e^\mu + \varepsilon$

Power Link: $Response = \mu^k$

<u>Error is</u>	<u>Canonical link is</u>
Normal	Identity
Poisson	Log
Binomial	Logit

where μ is the systematic or structural model ($\beta_0 + \beta_1 X_1 + \beta_2 X_2 \dots etc$) ε is the error, and the canonical link is the link typically used with a particular error type.

1. Obligate cave-dwelling organisms (troglobytes) are potentially interesting models for a number of evolutionary questions, including those of population genetics. One question is the extent to which apparently isolated cave populations contain genetically-differentiated populations, and how cave populations are genetically related to surface populations. Kane et al (1992 *Evolution* 46: 272-278) studied 10 populations of the amphipod *Gammarus minus* and generated (in part) the following data:

Population	Gene Locus ACO-1		
	AA	Aa	aa
Spring	40	15	2
Cave	13	18	7
Cave 2	8	13	4

1a. Compute the odds of being heterozygous (Aa) for the spring and cave 2 populations.

	Spring	Cave 2	Odds ratio
Heterozygous	_____	_____	_____

1b. Compute the odds ratio for Cave 2 relative to spring.

1c. Write a generalized linear model to test whether the odds of being heterozygous differ between all three populations.

1d. Complete the first two columns

of the analysis of deviance table for your model. -----> Source df

2. An earth scientist is interested in the mineralogic composition of the schist on the Canadian shield. She obtains 45 samples, 5 at each of 3 depths in each of 3 types of schist. Define a symbol for the odds of finding garnet in each group of 5 samples. Write a generalized linear model to analyze whether the odds of finding garnet depend on schist type and depth in the bed.