

# A Model for Field Toxicity Tests

by

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## ABSTRACT

Toxicity tests conducted under field conditions present an interesting challenge for statistical modeling. In contrast to laboratory tests, the concentrations of potential toxicants are not held constant over the test. In addition, the number and identity of toxicants that belong in a model as explanatory factors are not known and must be determined through a model selection process. We present one model to deal with these needs. This model takes the record of mortalities to form a multinomial distribution in which parameters are modeled as products of conditional daily survival probabilities. These conditional probabilities are in turn modeled as logistic functions of the explanatory factors. The model incorporates lagged values of the explanatory factors to deal with changes in the pattern of mortalities over time. The issue of model selection and assessment is approached through the use of generalized information criteria and power divergence goodness of fit tests. These model selection criteria are applied in a cross-validation scheme designed to assess the ability of a model to both fit data used in estimation and predict data deleted from the estimation data set. The example presented demonstrates the need for inclusion of lagged values of the explanatory factors and suggests that penalized likelihood criteria may not provide adequate protection against overparameterized models in model selection.