Statistical Science Workshop 6-7 March 2025 University of Waikato – Tauranga

10-11 March University of Auckland – Leigh Marine Lab

Instructor: David Schneider. Memorial University, St. John’s, Canada

Session 2 Model execution and checking, interpreting results

In this workshop you will learn to

Translate a research question into a statistical model

Execute the model and apply the model-checking loop

Calculate a measure of evidence for the research hypothesis (the likelihood ratio)

Calculate a measure of uncertainty on the likelihood ratio (p-value / confidence limit))

Report effect sizes with a measure of uncertainty

Interpret parameter estimates in light of the research question

*..statistics must be relevant to making inferences in science and technology.*

*The subject should be renamed statistical science and be focused on the experimental cycle, design-execute-analyse-predict. John Nelder 1999*

Goal of the first session Writing the statistical Model

Goal of the second session Executing a GLM in a statistical package

Using the model checking loop - - - - - - - >

Interpreting computer output

Interpreting the parameter estimates

Statistical Science Workshop Review of Session 1 – Writing the statistical model.

The learning goal in Session 1 was to write a statistical modal to address a research question.

This replaces the search for the “right test.”

Once learned, we can write a model for which we do not know the name.

For example, students can execute a latin square design, even though they do not know the name of the test.

Along the way, we learned several important concepts:

Separating response from explanatory variables

Using parameters to relate response to explanatory variables.

Identifying categorical (ANOVA) and ratio scale (regression) variables.

Using contrasts to compare means of a categorical variable.

Partitioning the degrees of freedom in an ANOVA table

We set up the model for four examples – two regressions, an ANOVA, and an ANCOVA.

In Session 2 we will use a generic recipe for statistical analysis, based on writing the model.

The recipe will be demonstrated for regression, using the first example, phosphorus content in corn.

You will apply this to the second example, fly heterozygosity, the second example of regression.

The recipe will then be demonstrated for ANOVA, using the third example, the pea section data.

You will then apply this to a new example, oat yields for treated and untreated plants.

As time permits, the fourth example (ANCOVA) will be demonstrated while you carry it out in the statistical package.

