Assignment 1: Feedback

This sheet is general feedback on the assignment. It is not a solution sheet. There are additional notes on students’ work.

Overall, the assignment was done very well.

You should read these notes carefully and make sure you understand the issues.

A reasonable part of the mark awarded is for effort.

1. Whooping-cough trial

(a) This answer is a matter of opinion, and in any case it would be necessary to see the actual pamphlet to evaluate it properly.

(b) Again, very much a matter of opinion. If you think that experiments should not be performed on children, how should treatments for children be evaluated?

(c) Essentially the purpose of four letters, when two would do, was to increase blinding; to produce additional confusion.

(d) –

(e) i. –

ii. The derivation here was basically OK, but there are minor glitches that should be corrected.

- Firstly, the result for the variance of a function is an approximation. So it should be written as

\[ \text{Var}[f(X)] \approx [f'(\mu)]^2 \sigma^2 \]

and not, as some wrote it,

\[ \text{Var}[f(X)] = [f'(\mu)]^2 \sigma^2 \]

- Secondly, there is an occasional tendency not to properly distinguish between parameters and random variables, and hence to assert, wrongly, claims such as \( \lambda_i = x_i \), where what is meant is \( \hat{\lambda}_i = x_i \).

iii. I saw

\[ \text{Var}(\log \hat{\phi}) = \frac{1}{x_1} + \frac{1}{x_2} \]

or similar such expressions. Yuk! If you mean the estimate of the variance, that’s a different matter . . .

In the derivation of the variance of log \( \hat{\phi} \), the reason for disappearance of the person-years terms was not always provided very convincingly: the point is that the person-years are regarded as fixed, so on the log scale they are an additive constant, and don’t contribute to the variance. In some cases this was a bit too implicit.
iv. The confidence interval was generally correctly calculated. Explaining a confidence interval is difficult, but it’s probably best to avoid a statement that, if expressed mathematically, amounts to
\[ \Pr(0.18 < \phi < 0.25) = 0.95, \] since \( \phi \) is not random. You can use the word “confident”.

2. Enable and Marzapine

On the information available, this was difficult to assess. What if people non-responsive to Marzapine were also non-responsive to Enable? How many people were excluded on the basis of this criterion? Sometimes with a question like this you can provide useful insights by a structure or simple model for what’s going on. For example: define the (Enable – Marzapine) effect to be \( \theta_1 \) (on some suitable scale), with \( \theta_1 \) for subjects known to be non-responsive to Marzapine, and \( \theta_2 \) for subjects not known to be non-responsive to Marzapine.

The study will estimate \( \theta_2 \). The value we’re interested in is \( \theta = p\theta_1 + (1-p)\theta_2 \), where \( p \) = proportion of the otherwise eligible subjects who are non-responsive to Marzapine . . . etc.

3. Exact upper CI for Poisson

(a) Occasionally there were important slips in your derivations. You shouldn’t assume terms given in another proof; you need to properly define terms. Sometimes crucial steps were not explained or justified. If you understood the proof in lectures, a diagram would have helped a lot.

(b) This graph was well done.

(c) Obviously the normal CI coverage is trivial. I wanted you to think about the difference between the standard, familiar cases and the sort of coverage you get from these exact intervals.

4. Women prisoners

(a) –

(b) If you use the 3 methods carefully it’s pretty clear that she used the exact method.

(c) The question is: what is the true SMR? The CI is an interval estimate for the true SMR, or parameter. But in this case, how can we express the meaning of this parameter? The cohort study does not really sample from a population. Usually, we resort to thinking of a kind of pseudo-sampling exercise: we are viewing the study as representative, in some sense, of a wider context (e.g. female ex-prisoners in Australia, or in a broader calendar period than that studied). But there can be legitimate debate about this point. And at this stage, you should be thinking a bit more deeply about these foundational issues when confronted by inferences. The same issue can arise in any observational study. Non-statistical judgments always need to be made about the generalisability of the results.