

HOME ASSIGNMENT 1

The home assignment consists of 4 parts (below), which all should be answered. The home assignment is due on Tuesday, March 8, 2005. It is worth 15% of the course mark. All aids except personal assistance are allowed.

The home assignment requires you to carry out different analyses of a dataset from a clinical trial on the efficacy of a teat sealant for intra-mammary infections in cows carried out as part of the graduate thesis work of Carolyn Sanford, Department of Health Management, AVC. The dataset is confidential and is made available only on the internal network. As these data are yet unpublished, it is strictly forbidden to communicate them to anybody without permission of both the course instructor and the owner of the dataset.

The clinical trial comprised 30 cows of which one was later dropped due to incompliance with the protocol. Each of these cows were tested (by culture) prior to dry-off for the presence of bacteria in the milk; by this test 15 (14) of the cows tested positive and 15 tested negative. Cows that tested negative had two quarters treated with the teat sealant (TS), and the other two quarters treated with dry-cow treatment (DC). Cows that tested positive had two quarters treated with TS and DC, and the other two quarters treated with DC alone. For all cows the quarters were divided into left and right sides, and treatments were randomized onto sides (i.e., the two quarters on the same side were given the same treatment). Milk samples were obtained on days 1–7 after calving, and the somatic cell counts were determined. High somatic cell counts are indicative of intra-mammary infection. The purpose of the trial was to compare the treatment groups with respect to the (log) somatic cell count profiles, and it was hypothesized that any beneficial effect of the treatment would be most pronounced at days 1–4. It was also of interest to compare quarters that were closed and open prior to dry-off.

| Variable name | Explanation |
|---------------|--|
| cowid | unique cow identification |
| day | day of measurement |
| scc | somatic cell count |
| qtr | quarter (lf=left front, rh=right hind, etc.) |
| side | quarter side (0=right, 1=left) |
| ts | teat sealant (0=no, 1=yes) |
| cul | culture test of cow (0=negative, 1=positive) |
| tx | treatment (dc, ts, dcts) |
| qopen | quarter open prior to dry-off (0=no, 1=yes) |

For all of the requested analyses below, reflect on which data can be included in the analysis and whether it is helpful or necessary to restructure (possibly reduce) the data before the analysis.

Part 1

Produce relevant graphical summaries of the data, and analyse the data by one or more summary statistics.

Part 2

Analyse the data using two or more multivariate methods.

Part 3

Analyse the data using the repeated measures ANOVA method.

Part 4

Analyse the data using linear mixed models. Make sure to include a thorough examination of relevant covariance structures.