Statistics and Scientific Method – a workshop for non-statisticians

Liverpool 16-20 September 2013

Held under the auspices of EU-PARAVAC consortium

This one-week course will consider how to design experiments and vaccine trials to maximize statistical power and will involve nine half-day sessions with lectures, practical sessions and work shops. The workshop will be organized by Professor Peter Diggle, Professor Diana Williams and members of the biostatistics group at University of Liverpool.

The programme will be sufficiently flexible so that specific questions and experimental designs can be discussed.

Sessions will include:

1. Overview
    a. Introduction to data analysis
        i. Physics experiment – distance and time
        ii. Inputs/outputs to experiment
        iii. Random variation
    b. Introduction to R session
        i. As a calculator
        ii. Vectors and matrices
        iii. Simple graphics
        iv. Simple commands
        v. Reading in data files
2. Design and Inference
    a. Analysis of asthma trial
        i. Exploratory plots
        ii. Comparing effectiveness of drugs
    b. Simulating data (R session)
3. Modelling
    a. Simple linear model
    b. Data transformations
    c. Extending the linear model – interaction terms/multivariate
4. Random effects
    a. Started with Generalized linear models
    b. Random effects
    c. Plotting the PANSS schizophrenia data (R session)
    d. Random effects for the sleep study data (R session)
        i. Plotting individual fitted lines
        ii. Mixed effects model using random intercepts
5. Time series
    a. Harmonic regression models
    b. Autocorrelation

    c. Correlograms
    d. Writing simple functions (R session)
6. Spatial statistics
    a. Spatial data formats
    b. Geostatistical regression modelling
    c. Spatial correlation/variograms
    d. Testing for spatial correlation
    e. Plotting geo-statistical data (R session)
    f. Polygon creation (R session)
    g. Map making (R session)
7. Vaccine trials (at different phases and with type examples e.g. Haemonchus, Fasciola, Echinococcus).

Recommended reading:

Diggle, P.J. and Chetwynd, A.G. (2011). Statistics and Scientific Method: an Introduction for Students and Researchers. Oxford: Oxford University Press.
Verzani, J. (2005). Using R for Introductory Statistics. Boca Raton: Chapman and Hall/CRC Press