Project: Improved Statistical Methods for Environmental Science

Client: National Institute of Water and Atmospheric Research, New Zealand

Project Lead: Bryan Manly

Completion Date: OngoingThis is a WEST subcontract for a project funded by the New Zealand Foundation for Research, Science and Technology, which is funded by the New Zealand government to promote applied science.

Bryan Manly has been involved in this project for many years now. It has resulted in a number of papers in refereed statistics journals on cumulative sum (CUSUM) methods for environmental monitoring, and on randomization methods of inference for analysis of variance, and the comparison of sample means and variances. The current work on this project is concerned with randomization tests for environmental bioequivalence in situations where the control and treated areas display different variances for the variable of interest.

Originally the concept of bioequivalence was used in drug trials, where a new drug was considered bioequivalent to an established drug if its potency was, say, 80% or more of the potency of the established drug. Similarly, a damaged but restored area of land might be considered to be bioequivalent to a control area if the density of native vegetation on the restored area is at least 80% of that on the control area. These types of indicators of bioequivalence (e.g., 80% of the control area) are satisfactory if the amount of variation is similar in the damaged or control areas. If this is not the case then different types of tests for bioequivalence are needed. These are being developed in this project.Research Papers Arising from This ProjectManly, B.F.J. and Francis, R.I.C.C. (1999). Analysis of variance by randomization with unequalvariance. Australian and New Zealand Journal of Statistics 41: 411-29.Manly, B.F.J. and MacKenzie, D. (2000). A cumulative sum type of method for environmentalmonitoring. Environmetrics 11: 151-66.Manly, B.F.J. and Francis, R.I.C.C. (2002). Testing for mean and variance differences with samplesfrom distributions that may be non-normal with unequal variances. Journal of Statistical Computation and Simulation (in press).Manly, B.F.J. and MacKenzie, D. (2002). CUSUM environmental monitoring in time and space.Environmental and Ecological Statistics (in press).

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