Benchmark Analysis for Joint-Action Data in Quantitative Risk Assessment

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Benchmark analysis is a widely used tool in public health risk assessment, and the theory of finding estimators for minimum exposure levels, called Benchmark Doses (BMDs), to induce a pre-specified Benchmark Response (BMR) is well developed for the case of an adverse response to a single stimulus. For cases where two agents are studied in tandem, however, the benchmark approach is far less developed and essentially unimplemented in practice. This talk will show how the benchmark paradigm can be adapted from the single-dose setting to joint-action, two-agent studies. Focus will be on both, response outcomes expressed as proportions and continuous response outcomes. The resulting joint low-dose guidelines can then help improve public health planning and risk regulation when dealing with low-level exposures to combinations of hazardous agents.

Mimicking the single-exposure setting, representations of risk will be based on a joint-action dose-response model involving both agents. Based on such a model, this talk will illustrate the concept of a benchmark profile (BMP): a two-dimensional extension of the single-dose BMD at which both agents achieve the specified BMR. The talk will detail estimation of the BMP and also presents various methods to construct lower simultaneous confidence bands (BMPLs) on the BMPs. Such BMPLs can then be used to quantify the joint-risk and consequently for risk guidelines.

Short Bio: Dr. Roland Deutsch, a native of Linz, Austria, received his Master's degree in Applied Statistics at the Johannes-Kepler-University Linz in 2002. In 2003, he moved to Columbia, SC to pursue a PhD-degree in Statistics at the University of South Carolina, which was successfully completed in 2007. Dr. Deutsch is currently an Assistant Professor at the University of North Carolina at Greensboro. His main research interests are in Environmetrics, Computational Statistics, Sampling, Multivariate Statistics, Nonparametric Statistics, Statistical Genetics and Statistics in Sports.

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