

QRA for Animal, Plant and Public Health

October 5-8: University House, ANU, Canberra, ACT

This course will help you to:

- Work confidently with Microsoft Excel
- Scope out and plan for a QRA
- Construct quantitative likelihood scenarios
- Build a QRA model using Palisade @Risk
- Run and interpret the results of a QRA

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Quantitative risk analysis (QRA) is a powerful tool for evaluation and communication. It can be used alone, or as an adjunct to qualitative assessment.

QRA rests on a defined quantitative model and estimates, and these can substantially enhance the transparency of an assessment. The quantitative model need not be complex, but will capture sufficient detail to represent key elements of the underlying biological, physical or fiscal processes. The process of model development helps the analyst and stakeholders to understand the assessment, and provides a framework for specifying correlations and other statistical relationships. The underlying model also provides the framework for sensitivity analysis, which can be used to identify key steps in the assessment that most significantly influence the outputs.

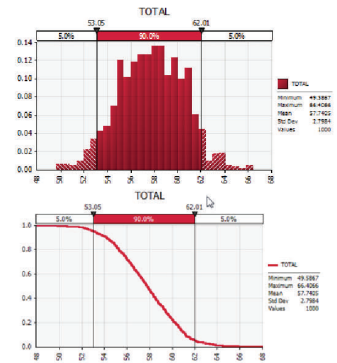
QRA is a technical field, but accessible with training to most researchers and policy makers. With an understanding of

QRA, an Agency can develop its own assessments and will be better placed to evaluate the work of others. It will also be better able to judge those situations where QRA will be helpful, or where qualitative assessment is more appropriate.

In this course we provide the building blocks for understanding QRA, and developing and interpreting quantitative models. We use and recommend the Monte Carlo package, @Risk, and provide expert tuition in this and other products within the Palisade Decision Suite.

The course is held over 4 consecutive days. We teach both theory and the practical application of QRA, with demonstrations and worked examples that participants follow on their own laptops. We also set aside a 1/2 day session on the final day, during which participants can work up and discuss their own QRA model.

Group participation and learning is encouraged, and each day



Monte Carlo simulation provides a powerful way to analyse and visualise risk

is staggered with discussion sessions and social breaks. We also include a catered evening function, and a guest lecture from the Executive of Biosecurity Australia on the role of QRA in import risk analysis.

Contact and registration details (including our group discounts) are provided at the end of this brochure.

Who Should Take this Course?

This course will appeal to any researchers and public policy professionals who undertake or use risk assessment in their work.

We do not assume any prior training in risk assessment, and begin the course with an introduction to the relevant standards and Guides. Likewise, we do not assume any background

in statistics, although we do recommend that participants familiarise themselves with the basics of Microsoft Excel.

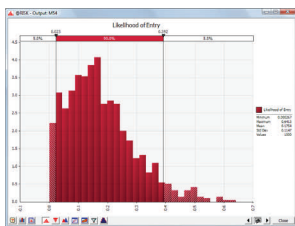
We provide advance materials at the point of registration, and these will help participants who wish to prepare themselves for the course.

We also stress the value of enjoyment in learning, and

encourage participants to work comfortably within their own abilities and backgrounds.

Our materials are systematic and well-referenced, and will provide participants with the framework needed to continue their development after the course.

Day 1: the Basics



Monte Carlo analysis provides a distribution of possible outcomes

Day 1 covers the fundamentals of risk assessment, including the sometimes confusing differences in terminology that we see in the various standards and guides.

We also explore Excel and the Palisade products, and explain how they are used in the context of QRA.

In theory ...

- Risk analysis standards
 - ISO 31000 and AS/NZS:4360
 - the OIE Code
 - the IPPC ISPM 2 and 11
 - the Codex model for food safety
- Understanding likelihood scenarios
- The role and limitations of quantitative risk analysis (QRA)

- Common applications of QRA
 - financial risk management
 - project risk management
 - schedule risk management
 - contract liability risk management
 - import risk analysis
 - food safety risk analysis

In practice ...

- Using Microsoft Excel effectively
- Introduction to Palisade Decision Suit
 - @Risk
 - PrecisionTree
 - TopRank
 - NeuralTools
 - StatTools
 - Evolver

“Understanding uncertainty and variation can influence the way we build and interpret quantitative models”

Uncertainty and Variation

In this course we teach the principles and practice of stochastic Monte Carlo modelling.

One of the key roles of stochastic modelling is to evaluate the impact of uncertainty and natural variation on our understanding of risk.

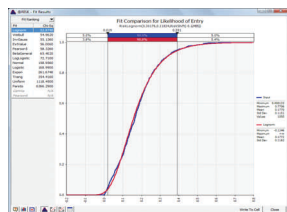
Stochastic models commonly include both probability distributions and statistical processes. Probability distributions can be shaped from expert opinion, or estimated from data. In some cases, probability distributions may have a form that is defined by convention or background understanding of the underlying process. Bacterial growth, for example, is generally thought to follow an exponential distribu-

tion.

But not all of the variability we know to be present in a process can be attributed to uncertainty. In some cases, the variability arises from processes that we understand and can model explicitly. If we do this, we include the extent of variability that we know is present, but do not overlay it.

Understanding uncertainty and natural variation is important to QRA, and can influence the way we build and interpret quantitative models.

Day 2: QRA Theory



Simulation results can be viewed within @Risk in a range of formats, or output to Excel

Day 2 lays down the important theoretical concepts underpinning QRA.

We understand that statistics and distribution theory are difficult for many, and build the work up from a systematic outline with numerous practical examples.

- Understanding statistical terminology
- Introduction to distribution theory
- The key statistical processes
 - Poisson process
 - Binomial process
 - Hypergeometric process

- Commonly used probability distributions
- Estimating distribution parameters
 - expert opinion
 - data
 - characteristics of the underlying process
- Uncertainty and variation

Day 2 is a big day, and we round it off with a catered social evening.

Day 3: Building QRA Models

Day 3 is all about creating and parameterising a QRA model from its fundamental building blocks. There are many approaches to this, and we explain how we generally start with pictures and work up through formulae to a fully specified model.

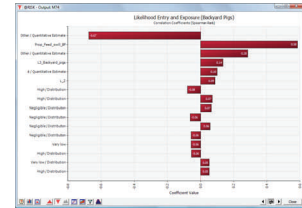
In theory ...

- What is in a QRA model?
- Understanding the model-building process
- Representing the model graphically
- Converting graphs to calculations

In practice ...

- Drawing effective likelihood scenarios and event trees
- Converting scenarios to quantitative models
 - Manually

- Using PrecisionTree
- Specifying and parameterising input distributions through the @Risk interface
- Correlating inputs
- Running models within @Risk
- Working with @Risk outputs, including
 - the @Risk outputs interface
 - plots and graphs
 - tabulated statistics
 - sensitivity analysis



Sensitivity analysis can be used to identify the most important input variables

Correlations and Sensitivity Analysis

QRA rests on the principle of an underlying quantitative algebraic model.

This can be a simple linear additive or multiplicative arrangement, or a complex multi-branched event tree with a range of possible outcomes.

The quantitative model is an important part of the transparency of the assessment, and should adequately represent the biological, physical or fiscal process we wish to study.

The underlying model can also provide the framework for specifying the correlations amongst input variables. Correlations arise in a stochastic model where high or low values in one variable more

commonly occur with high or low values in another. The vigilance of quarantine staff, for example, might be positively correlated with the prevalence of a disease. Correlations are frequently underplayed in QRA, and yet can meaningfully alter an assessment.

Sensitivity analysis is another key aspect of QRA, as it allows us to identify the steps or variables in an assessment that most substantially influence the outcome. Knowing this, we can take measures to obtain better data to estimate those steps, or focus risk treatment on them.

“Correlations are frequently underplayed in QRA, and yet can meaningfully alter an assessment”

Day 4: Putting it all Together

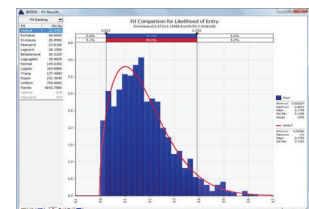
Day 4 starts with a practical session, where participants are encouraged to construct and parameterise their own QRA model. Following this, we review the course material and finish with a brief discussion about some of the fringe issues for QRA.

Practical session ...

- Design your own QRA model
- Implement your model within @Risk
- Run your model and interpret the results
- Review and improve your model
- Discuss your model with the class

Review session ...

- The role of QRA
 - The key theoretical concepts
 - The common pitfalls
- The icing on the cake:
- Advanced techniques for statistical estimation
 - Calculation versus simulation



@Risk can fit a probability distribution to simulation outputs

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Specialists in Risk Management

QRA for Animal, Plant and Public Health

Dr. Sam Beckett

Sam Beckett is a consultant epidemiologist and risk analyst and Associate Director of Broadleaf Capital International. Sam has a PhD in risk management and postgraduate training in epidemiology and applied statistics. He drafted and revised Biosecurity Australia's Guidelines for Import Risk Analysis, and provided methodology support for the Australian Government's successful landmark court case on the importation of pig meat. He also led the development of a quarantine strategy for the \$13 billion LNG development on Barrow Island.

Sam is part-time lecturer in risk management with the University of Sydney, and was for 6 years the Head Examiner in Epidemiology membership to the Australian College of Veterinary Scientists. He is currently the designated epidemiologist for the National Animal Health Surveillance Strategy Reference Group.

Sam has contributed more than 30 papers on epidemiology and risk analysis to international journals and conferences, and has spoken on these topics in France, Switzerland, Italy, the United States, New Zealand and Australia. He has also provided editorial critique for Preventive Veterinary Medicine, as well as to the OIE (Office International des Épizooties — or World Organisation for Animal Health) Scientific and Technical Reviews, the Australian Veterinary Journal and the New Zealand Veterinary Journal.

Course Registration

The course will be held at University House, Australian National University in Canberra, ACT.

Some accommodation is available at University House and other ANU campus facilities, as well as a range of motels within Canberra's Civic precinct.

Participants will need to bring a laptop running Microsoft Excel, and a demonstration or purchased copy of Palisade @Risk.

The cost of the course is \$3,000 (GST excl). This includes teaching materials, as well as lunch, tea and coffee on each of the 4 days.

Group registrations of three or more from any Agency will receive a 10% discount.

To register for the course, or to enquire about future courses and group discounts, please contact:

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