2017 Society for Risk Analysis Annual Meeting
Continuing Education Workshops

Workshops are offered Sunday and Thursday, either Full Day, a.m. Half-Day, or p.m. Half Day. Full descriptions of each workshop are provided below.

Workshop #	Workshop Title	Day/Time	Cost
WK1S	Bayesian Benchmark Dose Analysis	Sunday, December 10th 8:00am-12:00pm	$200
WK2S	Methods for Quantifying and Valuing Population Health Impacts	Sunday, December 10th 8:00am-12:00pm	$275
WK14S	Eliciting Judgments from Experts and Non-experts to Inform Decision-making	Sunday, December 10th 8:00am-12:00pm	$250
WK3S	Risk 101 – Understanding Epistemic, Ontological and Aleatory Uncertainty for Risk Profiling	Sunday, December 10th 1:00pm-5:00pm	$250
WK4S	Use of risk assessments – key challenges and recent advances	Sunday, December 10th 1:00pm-5:00pm	FREE
WK5S	New approaches to risk analysis in human biosecurity	Sunday, December 10th 8:30am-5:30pm	$200
WK6S	Categorical Regression Modeling	Sunday, December 10th 8:30am-5:30pm	$300
WK7S	Cumulative Risk Assessment: Addressing Combined Environmental Stressors	Sunday, December 10th 8:30am-5:30pm	$349
WK8S	Monte Carlo simulation and probability bounds analysis in R with hardly any data	Sunday, December 10th 8:30am-5:30pm	$290
WK10T	Health Risk Assessment of Environmental Chemical Mixtures: Concepts, Methods, Applications	Thursday, December 14th 8:00am-12:00pm	$230
WK11T	Probabilistic Dose-Response Assessment: New Guidance from the World Health Organization	Thursday, December 14th 8:30am-5:30pm	$300
WK12S	Developing Calibrated Risk Models and Improving Your Risk Intelligence	Thursday, December 14th 8:30am-5:30pm	$285
WK13T	Monte Carlo simulation and probability bounds analysis in R with hardly any data	Thursday, December 14th 8:30am-5:30pm	$290

AM WORKSHOPS - SUNDAY December 10th, 8:00AM-12:00PM

WK1S: Bayesian Benchmark Dose Analysis

Cost: $200

Instructor(s): Kan Shao, Indiana University

Description: This half-day workshop will provide participants with knowledge of benchmark dose (BMD) modeling in a Bayesian framework (including model averaged BMD estimation), hands-on experience on the recently developed web-based Bayesian BMD (BBMD) estimation system and its application to chemical risk assessment. The Bayesian BMD modeling and analysis involves using Markov Chain Monte Carlo (MCMC) algorithm to fit mathematical dose-response models to toxicity data (mainly dichotomous and continuous data) and estimating the distributions of model parameters and quantities of interest (e.g., BMD) by posterior samples. This important feature makes the Bayesian BMD method particularly useful for probabilistic dose-response assessment, which has been strongly advocated by the WHO/IPCS expert panel. Another extremely useful feature of this workshop is the introduction on the model averaging techniques for BMD estimation, which has been suggested as a preferred approach to address model uncertainty in dose-response assessment. In this workshop, participants will not only learn the concepts of model-averaged BMD analysis, but also learn how to use the BBMD system to estimate model-averaged BMD and to incorporate expert judgement in the analysis. Moreover, knowledge and experience from this workshop will certainly better prepare registrants for Dr. Chiu's workshop on WHO/IPCS probabilistic dose-response assessment. Participants should bring their own laptops with recent internet browser installed (the latest version of Google Chrome is preferred).

WK2S: Methods for Quantifying and Valuing Population Health Impacts

Cost: $275

Instructor(s): Kevin Brand, University of Ottawa; Sandra Hoffman, USDA

Description: The workshop reviews standard practices and emerging issues related to the quantification of a population's health state. Particular attention is paid to the array of metrics available for this purpose, their use in quantifying population health impacts, and how these impact projections can be integrated into economic valuations. Risk assessment typically couples exposure information with an exposure-response relationship to estimate changes in incidence rates (e.g., a mortality rate). Expressed in this fashion (along an incident rate scale) these impact measures fall short. They do not capture the burden of disease, are not readily interpretable, complicate the comparison of disease outcomes, and are not suited to a single number summary. This workshop focuses on the methods required to get readily interpretable, comparable, bottom-line, summaries of health impact. A dizzying array of metrics can be used to quantify health impacts. Consider for example ``avoidable deaths,'' PEYLLs, life-expectancy, lifetime risk, HALEs, QALYs, DALEs, DALYs and `attributable-fractions' to name just a few. In this workshop we survey and bring order to these variants, classifying the metrics into a couple of categories. A finer grained classification is provided based on how the metric is calculated; for example does it adjust for the size and age structure of the population under study. The key choices and their influence upon projected outcomes will be outlined. Finally, a survey of the key steps and considerations that are required to map the health impacts, expressed in units such as change in life-expectancy, into health-economic evaluations will be offered.

WK14S: Eliciting Judgments from Experts and Non-experts to Inform Decision-making

Cost: $250
Instructors: Aylin Sertkaya, Cristina McLaughlin
Description: Decision makers must frequently rely on data or information that is incomplete or inadequate in one way or another. Judgment, often from experts and occasionally from non-experts, then plays a critical role in the interpretation and characterization of those data as well as in the completion of information gaps. But how experts or non-experts are selected and their judgments elicited matters – they can also strongly influence the opinions obtained and the analysis on which they rely. Several approaches to eliciting judgments have evolved. The workshop will cover topics ranging from recruitment, elicitation protocol design, different elicitation techniques (e.g., individual elicitations, Delphi method, nominal group technique, etc.) to aggregation methods for combining opinions of multiple individuals. The role of judgment elicitation and its limitations, problems, and risks in policy analysis will also be addressed. The workshop will include presentation of two case studies that will include a discussion of the selection process; elicitation protocol development, elicitation technique utilized, and the various issues that arose before, during, and after the elicitation process and the manner in which they were resolved. The class will also include two hands-on exercises where participants will 1) learn about calibration of experts using a mobile application and 2) apply the Delphi and nominal group techniques to examine risk management issues associated with a popular topic.

PM WORKSHOPS - SUNDAY December 10th, 1:00-5:00PM

WK3S: Risk 101 – Understanding Epistemic, Ontological and Aleatory Uncertainty for Risk Profiling

Cost: $250
Instructor(s): Ronald Der, University of Liverpool
Description: This presentation targets faculty and training personnel examining risk perceptions through multiple views of uncertainty to risk novices. The proposed 1/2-day workshop presentation/tutorial focuses on understanding the nature of aleatory, epistemic and ontological uncertainty and their impact on continuums of judgment. Judgment is heavily influenced by perception, as such how we prime ourselves to treat with uncertainty & risk requires a clearer understanding of their philosophical underpinnings.

WK4S: Use of Risk Assessments – Key Challenges and Recent Advances

Cost: FREE
Instructor(s): Willy Røed, University of Stavanger, Norway; Roger Flage, University of Stavanger, Norway

Description: The workshop addresses key challenges and recent advances in the use of risk assessments in different industries. It is relevant for delegates familiar with basic risk analysis methods, who would like to enlighten their perspectives on how to plan, execute and use risk assessment to adequately support decision-making. A main topic is how to effectively deal with uncertainties and knowledge in risk assessments. The workshop includes lectures, case study examples, and discussions among the participants.

FULL DAY WORKSHOPS – SUNDAY December 10th, 8:30AM-5:30PM

WK5S: New Approaches to Risk Analysis in Human Biosecurity

Cost: $200

Instructor(s): Raina MacIntyre, UNSW Sydney

Description: Dual use research of concern (DURC) is research intended to benefit humankind, but which can also cause harm, either through laboratory accidents or deliberate release. Genetic engineering of pathogens and synthetic genomics (the ability to create synthetic viruses are examples of DURC. Open access science, biohacking (DIY biology labs) and tools such as CRISPR Cas 9 have accelerated the risk of such technology, and risk-analysis in this area is not yet well developed. There are many similarities to cybersecurity; this area has seen quantum advances in science and technology outpacing our regulatory frameworks and approaches to risk mitigation. Risk analysis of this and other new technologies will be explored in this workshop. We will also cover methods for predictive modeling which can assist in risk analysis and rapid identification of epidemics, as well as tools were differentiating natural and unnatural epidemics. The workshop will be a combination of lectures, interactive case studies, group work and discussion, and will lead participants through the relevant background and new approaches to risk analysis.

Workshop participants who will benefit include professionals in operational response or policy and planning from health, defense, emergency services, law enforcement or other government and non-government agencies.

WK6S: Categorical Regression Modeling

Cost: $300

Instructor(s): J. Allen Davis, U.S. EPA; Jeff Gift, U.S. EPA; Jay Zhao; U.S. EPA

Description: The objective of this full-day course is to provide participants with interactive training on the use of the U.S. Environmental Protection Agency's (EPA) Categorical Regression software (CatReg) and its application to risk assessment. Categorical regression modeling involves fitting mathematical models to toxicity data that has been assigned ordinal severity categories (i.e., minimal, mild, or marked effects) and can be associated with up to two explanatory variables corresponding to exposure conditions, usually concentration and duration. CatReg calculates the probabilities of observing the different severity categories over the continuum of the explanatory variables describing exposure conditions. The categorization

of observed responses allows the expression of dichotomous, continuous, and descriptive data in terms of response severity and supports the analysis of data from single studies or multiple studies. CatReg can also estimate the lower confidence limit on the dose (the equivalent of a BMDL) associated with a given severity probability and exposure duration. Additionally, the meta-analytical capability of CatReg allows for the filtering of data in order to determine statistically significant different responses between sexes, strains, and/or species. Recently, EPA has released a new graphic-user interface for CatReg that will greatly increase the efficiency with which users can perform categorical regression analyses; this version of the software will be the focus of this training workshop. Participants need to bring their own laptops, with CatReg installed, to the workshop. The latest version of the software program can be found at: www.epa.gov/ncea/catreg. Disclaimer: The views expressed in this abstract are those of the authors and do not necessarily reflect the views or policies of the U.S. EPA.

WK7S: Cumulative Risk Assessment: Addressing Combined Environmental Stressors

Cost: $349

Instructor(s): Linda K. Teuschler, LK Teuschler & Associates; Rick Hertzberg, Biomathematics Consulting; Margaret MacDonell, Argonne National Laboratory; Moiz Mumtaz, ATSDR; Jane Ellen Simmons, USEPA; Michael Wright, USEPA; Glenn E. Rice, USEPA; Peter McClure, SRC

Description: Cumulative risk assessment (CRA) addresses the impacts of multiple chemical and nonchemical stressors on real world individuals and communities, resulting in complex exposures for individuals and populations with a variety of vulnerabilities, in applications that range from environmental justice and community sustainability to individual health promotion and protection. Nonchemical stressors include biological and physical agents (e.g., microbes and noise) as well as socioeconomic stressors and psychosocial conditions (e.g., associated with natural disasters). Public concerns that can initiate CRAs include (1) elevated environmental measurements or biomonitoring data; (2) multiple sources of pollutants or stressors; and (3) changes in disease rates or patterns (e.g., leukemia cluster) or ecological effects (e.g., loss of wildlife diversity). This workshop focuses on human health and begins with an overview of three CRA elements: analysis, characterization, and quantification (as feasible) of the combined risks from multiple stressors. Teaching methods include lectures and hands-on exercises. Presentations highlight basic concepts, methods, and resources for conducting a population-based CRA. A central theme is integrating exposure and dose-response information with population characteristics during planning and scoping based on initiating factors. Vulnerability factors are addressed, e.g., diet/nutritional status, behaviors, genetic traits, socioeconomic status, sensitivities, and psychosocial stress. Methods for estimating human health risks are discussed and applied, including epidemiologic approaches and assessing the joint toxicity of chemical mixtures. In the exercises, participants develop chemical, biological and physical stressor groups using exposure and toxicity factors, link them with population vulnerability factors and conduct a risk characterization. Participants are asked to bring a calculator.

WK8S: Monte Carlo simulation and probability bounds analysis in R with hardly any data

Cost: $290

Instructor(s): Scott Ferson, Applied Biomathematics
Description: This revamped full-day workshop features hands-on examples worked in R on your own laptop, from raw data to final decision. The workshop introduces and compares Monte Carlo simulation and probability bounds analysis for developing probabilistic risk analyses when little or no empirical data are available. You can use your laptop to work the examples, or just follow along if you prefer. The examples illustrate the basic problems risk analysts face: not having much data to estimate inputs, not knowing the distribution shapes, not knowing their correlations, and not even being sure about the model form. Monte Carlo models will be parameterized using the method of matching moments and other common strategies. Probability bounds will be developed from both large and small data sets, from data with non-negligible measurement uncertainty, and from published summaries that lack data altogether. The workshop explains how to avoid common pitfalls in risk analyses, including the multiple instantiation problem, unjustified independence assumptions, repeated variable problem, and what to do when there's little or no data. The numerical examples will be developed into fully probabilistic estimates useful for quantitative decisions and other risk-informed planning. Emphasis will be placed on the interpretation of results and on how defensible decisions can be made even when little information is available. The presentation style will be casual and interactive. Participants will receive handouts of the slides and a CD with software and data sets for the examples.

WK9S: Fundamentals of the Risk Assessment Paradigm, From Hazard

HALF DAY WORKSHOPS – THURSDAY, December 14th, 8:00AM-12:00PM

WK10T: Health Risk Assessment of Environmental Chemical Mixtures: Concepts, Methods, Applications

Cost: $230
Instructor(s): Glenn E. Rice, USEPA; Linda K. Teuschler, LK Teuschler & Associates; Rick Hertzberg, Biomathematics Consulting; Moiz Mumtaz, ATSDR; Jeff Swartout, USEPA
Description: This problems-based, half-day, introductory workshop focuses on methods to assess health risks posed by exposures to chemical mixtures in the environment. Chemical mixtures health risk assessment methods continue to be developed and evolve to address concerns over health risks from multichemical exposures. This workshop presents key concepts and terminology used in chemical mixtures risk assessment and discusses component methods that utilize assumptions of response addition and dose addition, including the following dose-additive methods: the hazard index, interaction-based hazard index, relative potency factors, and toxicity equivalence factors. Integrated additivity methods also will be described. The risk assessment examples developed in the workshop are adapted from real-world mixture analyses, e.g., waste site contaminants, pesticide applications, and drinking water disinfection by-product exposures. The "hands-on" exercises demonstrating the methods are an essential part of this workshop. Discussions include real world examples, exercise results, and answers to general questions. (We ask participants to bring a calculator or laptop). The views expressed

in this abstract are those of the authors and do not necessarily reflect the views or policies of the USEPA.

FULL DAY WORKSHOPS – THURSDAY, December 14th, 8:30AM-5:30PM

WK11T: Probabilistic Dose-Response Assessment: New Guidance from the World Health Organization

Cost: $300

Instructor(s): Weihsueh Chiu, Texas A&M University; Greg Paoli, Risk Sciences International

Description: WHO/IPCS recently published a guidance document on evaluating uncertainties in human health dose-response assessment. Rather than single values for the point of departure (POD) and for any adjustment/uncertainty factors, the WHO/IPCS approach uses uncertainty distributions that reflect the assumed or estimated uncertainties in each of those aspects. Additionally, it quantitatively defines the protection goals in terms of incidence (I) and magnitude (M) of the critical effect in the human population. By contrast, traditional approaches for developing dose-response toxicity values result in a single value (e.g., RfD, ADI) whose uncertainty is not known and for which the associated values for I and M are not quantified. By quantifying the overall uncertainties in the target human dose at explicitly specified values of I and M, the probabilistic approach developed by the WHO/IPCS expert group allows risk managers to better weigh the benefits from reduced human health effects associated with different risk management options against other considerations, including economic costs. Further, the probabilistic analyses can inform the value of information associated with different options for developing a higher tier assessment. This hands-on training Workshop is aimed at both risk professionals interested in applying the latest approaches to dose-response assessment, as well as students and researchers interested in developing new methods for dose-response. The Workshop will include an overview of the WHO/IPCS approach, case study exercises developing probabilistic dose-response toxicity values using an Excel spreadsheet tool, and a discussion of broader applications of the approach, including economic benefit-cost analyses. A laptop with Microsoft Excel is required.

WK12S: Developing Calibrated Risk Models and Improving Your Risk Intelligence

Cost: $285

Instructor(s): Kenneth Crowther, MITRE

Description: Our modern era is increasingly doing more complex work to support decisions, policy, security, infrastructure protection, emergency management, and so forth. We are developing methods and building tools on foundational understanding of probabilities, consequence modeling, and risk. But, how good is our understanding of unavoidable biases in probabilities, common numerical flaws in conceiving consequences, our ability to isolate risk understanding from risk taking behaviors. The unfortunate answer is that we do not know. Fortunately, methods for calibration have been emerging and being popularized over the last two decades from scholars like Phillip Tetlock, Roger Cooke, Doug Hubbard, Ilan Yaniv, Dylan

Evans, and others. These techniques require one to seek after objectively verifiable outcomes, but in return enable an individual or an organization to track their ability to understand the uncertain world and the effectiveness of judgments in response to uncertainty.

This course focuses on developing intuition and understanding of subjective probabilities, what they are, how they can be effectively elicited, calibrated, and how to overcome standards estimation biases. The result is that we will lay a strong foundation for quantitative risk analysis that is simple to deploy, comprehensible for even the relatively innumerate (i.e., those who do not like to deal in numbers), and agile for continuous tracking and improving estimates of probability and risk over time.

WK13T: Monte Carlo simulation and probability bounds analysis in R with hardly any data

Cost: $290

Instructor(s): Scott Ferson, Applied Biomathematics

Description: This revamped full-day workshop features hands-on examples worked in R on your own laptop, from raw data to final decision. The workshop introduces and compares Monte Carlo simulation and probability bounds analysis for developing probabilistic risk analyses when little or no empirical data are available. You can use your laptop to work the examples, or just follow along if you prefer. The examples illustrate the basic problems risk analysts face: not having much data to estimate inputs, not knowing the distribution shapes, not knowing their correlations, and not even being sure about the model form. Monte Carlo models will be parameterized using the method of matching moments and other common strategies. Probability bounds will be developed from both large and small data sets, from data with non-negligible measurement uncertainty, and from published summaries that lack data altogether. The workshop explains how to avoid common pitfalls in risk analyses, including the multiple instantiation problem, unjustified independence assumptions, repeated variable problem, and what to do when there's little or no data. The numerical examples will be developed into fully probabilistic estimates useful for quantitative decisions and other risk-informed planning. Emphasis will be placed on the interpretation of results and on how defensible decisions can be made even when little information is available. The presentation style will be casual and interactive. Participants will receive handouts of the slides and a CD with software and data sets for the examples.