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. **PLEASE NOTE:** Workshops that do not meet the minimum number of required registrations will be cancelled on October 31, 2016.

<table>
<thead>
<tr>
<th>Workshop #</th>
<th>Workshop Title</th>
<th>Day/Time</th>
<th>Cost</th>
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</thead>
<tbody>
<tr>
<td>WK1S</td>
<td>Monte Carlo simulation and probability bounds analysis in R with hardly any data</td>
<td>Sunday, December 11&lt;sup&gt;th&lt;/sup&gt; 8:30AM-5:30PM</td>
<td>$300</td>
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<tr>
<td>WK6S</td>
<td>Categorical Regression Modeling</td>
<td>Sunday, December 11&lt;sup&gt;th&lt;/sup&gt; 8:30AM-5:30PM</td>
<td>$300</td>
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<tr>
<td>WK7S</td>
<td>Probabilistic Dose-Response Assessment: New Guidance from the World Health Organization</td>
<td>Sunday, December 11&lt;sup&gt;th&lt;/sup&gt; 8:30AM-5:30PM</td>
<td>$300</td>
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<tr>
<td>WK8S</td>
<td>Cumulative Risk Assessment: Addressing Combined Environmental Stressors Impacts</td>
<td>Sunday, December 11&lt;sup&gt;th&lt;/sup&gt; 8:30AM-5:30PM</td>
<td>$350</td>
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<tr>
<td>WK9S</td>
<td>Methods for Quantifying and Valuing Population Health Impacts</td>
<td>Sunday, December 6&lt;sup&gt;th&lt;/sup&gt; 8:00AM-12:00PM</td>
<td>$275</td>
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<tr>
<td>WK10S</td>
<td>Eliciting Judgments from Experts and Non-experts to Inform Decision-Making</td>
<td>Sunday, December 11&lt;sup&gt;th&lt;/sup&gt; 8:00AM-12:00PM</td>
<td>$250</td>
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<tr>
<td>WK11S</td>
<td>Exposure-Response Array Training</td>
<td>Sunday, December 11&lt;sup&gt;th&lt;/sup&gt; 1:00PM-5:00PM</td>
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<tr>
<td>WK12T</td>
<td>Monte Carlo simulation and probability bounds analysis in R with hardly any data</td>
<td>Thursday, December 15&lt;sup&gt;th&lt;/sup&gt;, 8:30-5:30</td>
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FULL DAY WORKSHOPS – SUNDAY December 11th, 8:30AM-5:30PM

WK1S: Monte Carlo simulation and probability bounds analysis in R with hardly any data
Cost: $300
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.

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.

**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.

**WK8S: Cumulative Risk Assessment: Addressing Combined Environmental Stressors**  
**Cost:** $350  
**Instructor(s):** Linda K. Teuschler, LK Teuschler & Associates; Rick Hertzberg, Biomathematics Consulting; Margaret MacDonell, Argonne National Laboratory; Moiz Mumtaz, ATSDR; Jane Ellen Simmons, USEPA; Amanda M. Evans, Association of Schools of Public Health Research Fellow; Michael Wright, USEPA; Glenn E. Rice, USEPA  
**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.
WK9S: 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.

WK10S: Eliciting Judgments from Experts and Non-experts to Inform Decision-Making  
Cost: $250  
Instructor(s): Aylin Sertkaya, Eastern Research Group, Inc. (ERG); Cristina McLaughlin, FDA; Frank Hearl, NIOSH; Christy Parson, U.S. EPA; Elizabeth L. Durmowicz, U.S. FDA  
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, and 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 electronic cigarettes.

**PM WORKSHOPS - SUNDAY December 11th, 1:00-5:00PM**

**WK11S: Methods for Quantifying and Valuing Population Health Impacts**  
Cost: $250  
Instructor(s): George Woodall, US Environmental Protection Agency; Ingrid Druwe, US Environmental Protection Agency  
Description: The use of exposure-response arrays in risk assessment has increased and created a need for guidance and training to orient risk assessors and other individuals on the uses and applications of exposure-response arrays, and recommendations for producing informative arrays suitable for publication. This training course (including 3 PowerPoint presentation modules, practice exercises, and tutorials) is intended to fill this need by presenting the basic principles of exposure-response arrays and providing guidance on using some of the tools available at present. It is not intended to present strict guidelines, but rather provide guidance and best practices to those wishing to learn more about this up-and-coming risk assessment tool. Current projects will also be discussed which are designed to encourage risk assessors and other interested parties to explore innovative approaches in presenting exposure-response data, develop and improve upon the tools to create exposure-response arrays, and share these innovations with the risk assessment community in an open-source environment.

**FULL DAY WORKSHOPS – THURSDAY, December 15th, 8:30AM-5:30PM**

**WK12T: Monte Carlo simulation and probability bounds analysis in R with hardly any data**  
Cost: $300  
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.