

ISEE 2017: Pre-Conference Workshop Proposal

Title: DAGs & the Environment: Practical & Data-based Applications of Causal Inference Methodologies in Environmental Health Research

Contact Information for Proposed Workshop:

Sunni L. Mumford, Ph.D.
Division of Intramural Population Health Research
Eunice Kennedy Shriver National Institute of Child Health and Human Development
6710B Rockledge Dr. MSC 7004
Bethesda, MD 20892
(301) 435-6946
mumfords@mail.nih.gov

Enrique F. Schisterman, Ph.D.
Division of Intramural Population Health Research
Eunice Kennedy Shriver National Institute of Child Health and Human Development
6710B Rockledge Dr. MSC 7004
Bethesda, MD 20892
(301) 435-6893
schistee@mail.nih.gov

Frauke Hennig (Dipl.-Stat)
AG Environmental Epidemiology
Institute of Occupational and Social Medicine, Centre for Health and Society,
Heinrich-Heine-University of Düsseldorf
Universitätsklinikum Düsseldorf
Postfach 101007
40001 Düsseldorf
frauke.hennig@uni-duesseldorf.de

Sarah Lucht (MSc. Epidemiology)
AG Environmental Epidemiology
Institute of Occupational and Social Medicine, Centre for Health and Society,
Heinrich-Heine-University of Düsseldorf
Universitätsklinikum Düsseldorf
Postfach 101007
40001 Düsseldorf
sarah.lucht@uni-duesseldorf.de

Purpose of the workshop including specific learning objectives:

Purpose

As environmental epidemiologists struggle to find the most appropriate model to answer important etiological questions, directed acyclic graphs (DAGs) provide an excellent tool to find the minimal adjustment set, sources of biases, and an unbiased model for inference, while clearly specifying the assumptions of the model. Model specification based on DAGs allow researchers to clearly address issues of confounding, residual confounding, selection bias, overadjustment, collinearity, and intermediate variables that also act as confounders. However, much of the discussion regarding DAGs is theoretical, and examples of how to utilize DAGs in typical research settings are limited. Therefore, for the proposed workshop, we aim to provide 1) an introduction to DAG theory focusing on recent advancements regarding overadjustment and collinearity (i.e., issues particularly common in environmental epidemiologic settings), 2) specific environmental epidemiological examples in which DAGs have been applied (including how to incorporate expert knowledge into DAGs and specific software applications), and 3) details on how to use a well-constructed DAG to specify an appropriate statistical model for causal inference. Specifically, we will show using multiple examples how to construct a DAG based on a well-defined research question, determine the appropriate covariate adjustment set using DAG software, when and how to apply marginal structural models for causal inference, provide SAS code for estimation, and interpret results using examples relevant to environmental epidemiology. This workshop will help bridge the gap between methodological advancements and practical applications in research settings by providing real world examples and tools for implementation.

Learning Objectives:

- To provide a background on recent advancements in DAGs regarding overadjustment and collinearity.
- To provide hands-on examples of practical applications of DAGs to studies of environmental epidemiology.
- To provide helpful tools to construct and interpret directed acyclic graphs and determine the minimal adjustment set based on prior knowledge and/or observational data.
- To demonstrate when and how to apply marginal structural models for causal inference.
- To bridge the gap between methodological advancements and practical applications in research settings.

Target workshop audience:

Researchers interested in applying advanced methods in epidemiologic research.

Workshop length: Full-day

Minimum # of participants: 25

Maximum # of participants: 50

Anticipated per-attendee fee to cover materials and supplies: None

AV requirements: Projector and screen for powerpoint

Room set-up requests: None

Detailed description of the event:

Proposed Schedule

Morning Session: DAG Theory and Examples

Introduction to session and speakers (5 min)

Introduction to causal directed acyclic graphs (DAGs) (25 min)

Presenter: Sunni Mumford

Bias from overadjustment and unnecessary correction (30 min)

Presenter: Enrique Schisterman

Collinearity (30 min)

Presenter: Enrique Schisterman

Coffee Break

To adjust or not to adjust for serum lipids in studies of the health effects of lipophilic environmental contaminants (30 min)

Presenter: Sunni Mumford

DAG Example & Marginal Structural Models (1 hour)

Presenter: Sunni Mumford

Afternoon Session: Data-based Application of DAGs

Introduction (5 min)

Marriage between Graph and Probability Theory (25 min)

Presenter: Sarah Lucht

Data-based Structure Learning (incorporation of expert knowledge) (30 min)

Presenter: Sarah Lucht

Gap between Probability and Causality (equivalent DAGS, multiple minimal adjustment sets (MSAS)) (60 min)

Presenter: Frauke Hennig

Coffee Break

Software application & example (structure learning, identification of MSAS, exposure effect estimation) (60 min)

Presenter: Frauke Hennig

Summary/Discussion (15 min)