The International Journal of Biostatistics

Volume 8, Issue 2

2012

Article 1

CAUSAL INFERENCE IN HEALTH RESEARCH

Special Issue on Causal Inference in Health Research

Erica E. M. Moodie, *McGill University*

Jay S. Kaufman, *McGill University*

Robert W. Platt, *McGill University*

Recommended Citation:

Moodie, Erica E. M.; Kaufman, Jay S.; and Platt, Robert W. (2012) "Special Issue on Causal Inference in Health Research," *The International Journal of Biostatistics*: Vol. 8: Iss. 2, Article 1.

DOI: 10.2202/1557-4679.1400

Special Issue on Causal Inference in Health Research

Erica E. M. Moodie, Jay S. Kaufman, and Robert W. Platt

Abstract

We provide a brief editorial introduction to a special issue of *The International Journal of Biostatistics* dedicated to some of the papers presented at a workshop held at the *Centre de recherches mathématiques* in Montreal, Québec, in May 2011.

KEYWORDS: causal inference

The goal of most biomedical studies and indeed much statistical inference is to uncover causal relationships. However it is not generally possible to conclude causality from standard statistical inference procedures, merely that the observed association between two variables is not due to chance. Causal inference attempts to uncover the structure of the data and eliminate all non-causative explanations for an observed association. The need for causal inference procedures is apparent in many fields, but is perhaps most pressing in the field of health research, where quantifying the efficacy of new therapies, or uncovering the etiology of diseases, is often complicated due to difficulties inherent in observational studies. Even in experimental studies, partial compliance with treatment regimens can compromise a well-designed trial. The complexity of models, and corresponding inference procedures, is heightened in the context of longitudinal studies, where time-varying confounding may be present.

In May 2011, a workshop on Causal Inference in Health Research was held at the *Centre de recherches mathématiques* (CRM) in Montreal, Québec, as part of a Thematic Semester on Statistics. The meeting drew 123 participants from Statistics/Biostatistics, Epidemiology, and Econometrics with a common interest in causal inference. Participants came from universities and institutions in Canada, the United States, England, Denmark, Belgium, Australia, Algeria, France, and Cameroon. The workshop opened with speakers on a variety of topics and a poster session. The following four days were each themed: time varying treatments and optimal treatment strategies; randomized trials and vaccine efficacy; multiple bias modeling; and missing data methods.

Dr. James M. Robins, the Mitchell L. and Robin LaFoley Dong Professor in the Departments of Epidemiology and Biostatistics at the Harvard School of Public Health, was the 2011 recipient of the CRM's Aisenstadt chair recognizing his contributions to mathematical and statistical sciences. The principal focus of Dr. Robins' research has been the development of analytic methods appropriate for drawing causal inferences from complex observational and randomized studies with time-varying exposures or treatments, including g-estimation of structural nested models, inverse probability-of-treatment weighted estimators of marginal structural models, and the parametric g-formula estimator. He has applied his methods to a variety of health research questions, including the effect of a non-randomized treatment with aerosolized pentamidine on the survival of AIDS patients and the effect of smoking cessation on subsequent myocardial infarction and death within the MRFIT randomized trial.

During his residency in Montreal as Aisenstadt chair, Dr. Robins gave a series of three lectures. His first talk, "Ontological Primacy of Causation vs. Manipulation: The Case of the Pure Direct Effect", was given as part of the Causal Inference in the Health Research Workshop. His second lecture, entitled "Modern Mathematical Methods for Drawing Causal Inferences from

Observational Data", was geared towards a more general audience. Dr. Robins gave a third lecture during a workshop on Analysis of Survival and Event History Data on "Higher Order Inference in Complex Models".

This Special Issue of the *International Journal of Biostatistics* presents materials discussed at or stemming from the workshop, and represents some of the breadth of topics considered in this lively and enriching meeting.