Causality and the interpretation of probability in the social and health sciences

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The aim of this project was to assess which interpretation of probability best fits causal analysis in the social and health sciences. We tried to identify an interpretation that can accommodate probability as it applies to both the population and the individual. We argued that population-level probabilities should be interpreted as frequencies, and single-case probabilities should be thought of as degrees of belief shaped by empirical and logical constraints.

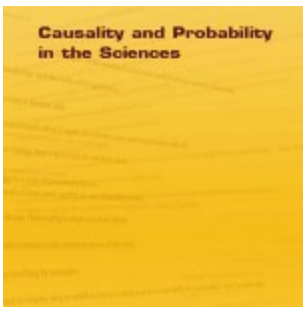
We also tried to determine which interpretation of causality best fits causal analysis in the social and health sciences. We argued that causal relationships should be thought of as causal beliefs shaped by empirical and logical constraints. In particular, empirical knowledge of both mechanistic and probabilistic relationships shape our causal beliefs.

Project Outputs

Conference: **Causality and probability in the sciences**
Workshop: **Causality and probability in the biomedical sciences**

Federica Russo & Jon Williamson (eds): **Causality and probability in the sciences**, London: College Publications, Texts In Philosophy series, 2007. Introduction: , Buy: UK, US

Causal inference is perhaps the most important form of reasoning in the sciences. A panoply of disciplines, ranging from epidemiology to biology, from econometrics to physics, make use of probability and statistics in order to infer causal relationships. However, the very foundations of causal inference are up in the air; it is by no means clear which methods of causal inference should be used, nor why they work when they do.
This book brings philosophers and scientists together to tackle these impor-



tant questions. The papers in this volume shed light on the relationship between causality and probability and the application of these concepts within the sciences. With its interdisciplinary perspective and its careful analysis, Causality and probability in the sciences heralds the transition of causal inference from an art to a science.

Federica Russo and Jon Williamson: **Interpreting causality in the health sciences**, International Studies in the Philosophy of Science, in press.

*We argue that the health sciences make causal claims on the basis of evidence both of physical mechanisms and of probabilistic dependencies. Consequently, an analysis of causality solely in terms of physical mechanisms, or solely in terms of probabilistic relationships, does not do justice to the causal claims of these sciences. Yet there seems to be a single concept of cause in these sciences – pluralism about causality will not do either. Instead, we maintain, the health sciences require a theory of causality that unifies its mechanistic and probabilistic aspects. We argue that the *epistemic* theory of causality provides the required unification.*

Federica Russo and Jon Williamson: **Interpreting probability in causal models for cancer**, in Federica Russo and Jon Williamson (eds): Causality and probability in the sciences, London: College Publications, 2007.

How should probabilities be interpreted in causal models in the social and health sciences? In this paper we take a step towards answering this question by investigating the case of cancer in epidemiology and arguing that the objective Bayesian interpretation is most appropriate in this domain.

Related Work

Federica Russo: **Frequency-driven probabilities in quantitative causal analysis**, submitted for publication.

Jon Williamson: **Bayesian nets and causality: philosophical and computational foundations,** Oxford University Press 2005. View here

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