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Applied Epistemology and Argumentation in Epidemiology

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ABSTRACT: On other occasions I have argued that ‘informal logic’ should not really be seen as a kind of ‘weak’ form of logic, but rather as ‘applied epistemology.’ This categorization is intended to create an analogy with *applied ethics*. *Applied ethics* has created a robust research project and stimulated ethical thinking both in and outside philosophy. As with *applied ethics*, I believe that as philosophers explore the actual application of their principles and theories (ethical or epistemological) they will discover new insights into the powers and limitations of their theories. Application is not just about philosophy being ‘useful,’ it is also an intellectual and theoretical challenge and to a discipline that often suffers from undo abstraction.

In this paper, I will argue that those who are interested in philosophy of science and applied epistemology should look not at physics but at epidemiology for a model of how a ‘hard’ science actually establishes causal claims. Epidemiology is a very epistemologically self-conscious and highly successful science. It is not characterized by the over arching laws à la Newton, nor does the Popperian principle of falsifiability work at all well within the discipline. Falsification is as elusive as proof, not only because epidemiology is fundamentally a stochastic science, but also because no experiment is sufficiently conclusive to falsify a claim. No one, though, would deny the enormous success of epidemiology in contributing to both an understanding of and enhancement of human health.

While research in epidemiology is characterized by the use of elaborate statistical methods, claims are not established simply by the ‘statistically significant’ results of particular studies or experiments. This claim may seem surprising to anyone who has looked at medical research. Most such research uses the mathematical tests developed in statistics to assess the likelihood that a result of the study is ‘real’ -- not merely a result of chance. But because of inevitable confounding factors and because few studies actually meet the random sampling criteria for the application of these statistical methods, researchers must still argue for the plausibility and significance of their results. When we observe the epistemological practices of epidemiology we see that a primary tool of this successful science is argumentation and judgement. Claims are established not by critical experiments or the confirmation of precise predictions, rather they are established (as they are in many sciences) by an evaluation of all relevant experimental and study results.

Establishment of a causal claim typically involve arguments:

- about quality and significance of results,

- that confounding factors were appropriately controlled,
- by analogy from animal experiments, other lab experiments, and accepted biological models,
- about the application of numerous epistemological norms
- replying to counter-arguments and objections.

Such sweeping characterization of a discipline is obviously hard to defend and I will not attempt to do so. What I will do in this paper is review a bit of the history of epistemological reflection in epidemiology, quote some reflective epidemiologists' views about their discipline, review a classic paper in epidemiology which illustrates the central role of argumentation in epidemiology, and look at the current debate concerning the effects of environmental tobacco smoke (ETS).

In doing so I will make a *prima facie* case that applied epistemologists can both learn from and give advice to epidemiologists. For example: one of the interesting implications that emerges from my study about the nature of argument in epidemiology is the central role that judgement must play in the assessing of scientific claims. Unfortunately this provides considerable opportunity for bias. While the pernicious influence of bias is a problem in any discipline, the natural sciences, because of their emphasis on 'letting the data speak for itself', have been largely able to avoid the kind of influence that bias plays in say political 'science' or economics. But as the historic debate about the effects of smoking, the current debate around the so-called 'passive smoking' and recent pharmaceutical testing scandals illustrate, bias can be a crucial factor in epidemiological work. Fair-mindedness and a careful respect for the strength and problems of the research, despite one's own views (or worse the views of one's funders) is crucial in any discipline, but more so in one in which 'judgement calls' play a crucial role. Such observations have implications not only for constraints on scientific funding, but also for models of adjudication of scientific results. What evaluative weight, for example, should be given to the fact that research was funded by a manufacturer? How can we make appropriate use of a researcher's statements of conflict of interest without slipping into the *ad hominem* fallacy? In concluding, I believe I have shown that epidemiology can be a valuable source of worthy philosophical problems for those philosophers interested in the application of epistemological principles in science.