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# Alex Broadbent: *Philosophy of Epidemiology*

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Alex Broadbent's *Philosophy of Epidemiology* is the latest volume in Palgrave Macmillan's *New Directions in the Philosophy of Science* series. Other monographs in the series focus on mathematics, biology, astronomy, et al.—the usual topics of discourse when philosophers engage science. The present volume is a welcome addition not just to the series but also for the field of epidemiology. As Broadbent notes, "Although a few philosophers have studied epidemiology, there have been no philosophical studies of epidemiology" (p. 2). There is one now.

As noted in the book's foreword, the core theme of *Philosophy of Epidemiology* "has to do with the nature and role of explanation and prediction in epidemiological analyses" (p. xii). These are practical matters which are familiar to epidemiologists, but being largely mechanical (rather than primarily conceptual) in nature, "this explains why philosophers of science have neglected epidemiology" (p. 2).

Broadbent is a young philosopher, trained at Cambridge, and currently on the faculty of philosophy at the University of Johannesburg. He also has had visiting appointments at Harvard and Vienna. A rising star in the philosophy of science, he is uniquely (for philosophers of science) dedicated to developing epidemiology as a focus of study. Significantly, this includes elaborating and critiquing the philosophical foundations of epidemiology and offering suggestions intended to strengthen and even redirect the output of working epidemiologists. Since 2008, he has published a series of insightful papers on epidemiology, its methods, and issues related to causation. He also authored a report in 2011 entitled, *Epidemiology, Risk and Causation: Conceptual and Methodological Issues in Public Health Science*, published by the PHG Foundation, an organization promoting research on genomics and population health and located in Cambridge, UK.

The present book's twelve chapters focus on a succession of important matters that help define the epidemiologic endeavor: inductive reasoning, causation, prediction,

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stable inference, relative vs. attributable risk, multifactoriality. Decision-making regarding these issues confronts epidemiologists on a continuing basis, yet epidemiologists rarely, if ever, engage them with the intention and depth exhibited here. An important contribution of this book is Broadbent's provision of some historical context for how these issues have been constructed and engaged (or not engaged) throughout the 200-year history of the field. Yet, he is not merely interested in description; he has a more ambitious program in mind. As he notes in summarizing his book, "The common theme through much of this discussion has been the importance of explanation and the relative de-emphasis of causation" (p. 182). This derives in part from the recognition, noted by Mervyn Susser and others, that, in epidemiology, experimental methods are difficult to apply. As a primarily observational rather than experimental science, epidemiology has evolved a unique set of traits that militate against the current overemphasis on seeking to identify causes of disease.

Early on, Broadbent identifies six characteristic features of the young science of epidemiology. These include (a) an emphasis on causation, (b) and (c) the absence of a prominent role for either experiment or theory, (d) the relative domain-insensitivity of its research methods, (e) the centrality of population thinking, and, most importantly, (f) that "the stakes are high" (p. 7). That is, there are epistemic as well as moral consequences of making incorrect inferences: there may be a cost in human lives, including the lives of large populations. These are jumping-off points for most of the discussion that ensues, which Broadbent summarizes thusly: "Causation and causal inference are overemphasized in epidemiology and in epidemiologic methodology, and explanation and prediction deserve greater emphasis. . . . What epidemiologists really seek to do is *explain*" (p. 8).

Building on this principal disconnect between how epidemiologists typically see their mission and how Broadbent believes they should see it, most of the first half of the book aims "to supply a theoretical framework for the analysis of conceptual challenges in epidemiology" (p. 114). A lengthy prolegomenon for what follows, these six chapters unpack numerous themes in much more detail than can be elaborated on in this review. While these may be of more immediate interest to academic philosophers than to working epidemiologists, the latter would be well rewarded by a deliberate and mindful reading of this material. There are a hundred pages here, for example, on the problem of causal interpretation based on probabilistic evidence, the challenge of producing and basing inferences on stable estimates, the mysterious lacuna of philosophical and epidemiologic discussion of prediction, the overselling of certain distractions (related to extrapolation, laws of nature, mechanisms) as idealized solutions to the problem of prediction, and much more.

The rubber hits the road, as the saying goes, in the fascinating material that follows: Chapter 7, "Making and Assessing Epidemiological Predictions"; Chapter 8, "Puzzles of Attributability"; Chapter 9, "Risk Relativism, Interaction, and the Shadow of Physics"; and Chapter 10, "Multifactorialism and Beyond." I say fascinating because I have not seen these issues dissected as thoroughly and accessibly as they are here by Broadbent. This is not to say that epidemiologists do not reflect on what is meant by things like risk, causation, and multifactorialism—significant essays and reviews have appeared on these topics consistently for

decades in the epidemiologic literature—but Broadbent brings a philosopher's gifts to bear, including meticulous and thoughtful critique informed by knowledge of epistemology and logic.

These four chapters strike at the heart of what Broadbent believes to be the "particular problems arising in particular parts of the methodology or conceptual framework of epidemiology" (p. 114). In these chapters, he accomplishes the following: (a) describes what makes for the delivery of stable predictive claims for exposure-outcomes associations; (b) traces the uses of the concept of relative risk, including its measurement, and contrasts it with attributable risk (or what he terms excess fraction), while acknowledging that this dichotomy is itself "misguided" (p. 139); (c) enumerates errors that epidemiologists commonly make in interpreting attributable risk (termed the exclusive cause fallacy and the counterfactual fallacy); (d) develops alternative measures to relative risk based on assessment of susceptible and healthy populations; and (e) critiques the overused term "multifactorial"—after all, "every kind of event we ever encounter is multifactorial" (p. 149)—and seeks to identify an alternative to this idea and the discarded monocausal model of disease, which he terms the contrastive model.

In Chapter 11, "Epidemiology and the Law," Broadbent closes with a thoughtful consideration of how epidemiologic evidence comes into play in court. The crux of the matter (and this is my own summary, not the author's) is that epidemiology produces findings quantifying exposure-outcomes associations that presumably exist on average, across a population, and *caeteris paribus*, all things being equal; by contrast, the legal standards operating in civil or criminal trials may require types of "causal" evidence that epidemiology is not able to provide. Various positions have been staked out in the literature on how to deal with this issue, and Broadbent methodically steps through each of them with a critical eye and toward a proposed resolution.

This book contains much sophisticated, detailed discussion of philosophical issues, especially regarding methodological norms and challenges in epidemiology, which may be difficult for many epidemiologists to work through, for two distinct reasons. For one, it is challenging to discover that the tacit presumptions undergirding one's professional field may be shaky. For another, epidemiologists, the present reviewer included, are not typically trained in philosophy. A lot of what we do may seem fast and loose not because we do not care about philosophical issues or do not understand them fully (although the latter is likely), but because epidemiology is a field founded in a concern for practicality, such as determining the source of acute outbreaks of disease or investigating the putative causes of chronic illnesses that impact large populations. Therefore, we tend to brush over philosophical matters related to our causal inferences, often tacking on such discussions briefly at the end of our papers, if at all, and rarely reasoning through them before getting started.

Broadbent's monograph is valuable to epidemiologists precisely for this reason, because it asks us to wrestle with challenges created by the field's core presumptions, challenges that in turn create logical inconsistencies that may limit the effectiveness of the scientific information that we produce. This includes the production of empirical

evidence implicating putative causes or exposures or risks that, presumably, merit the attention of health policymakers.

In the final analysis, it is not clear that Broadbent offers easy resolutions for every seemingly intractable problem that he identifies. But that is not a criticism. The book's intent is more to identify critical issues and lay out a philosophical program for engaging them, with the hope that epidemiologists begin to think more carefully through their professional and disciplinary assumptions and ongoing work. In that respect, *Philosophy of Epidemiology* is a terrific success.

In summary, it is a cliché to state that a book belongs on everyone's shelf; but in this instance, cliché or not, it is a valid recommendation. Every epidemiologist, whether an academic or a field professional, would benefit from a careful reading of this excellent book. Broadbent's dissection of the tacit presumptions of epidemiology is acute and his recommendations for the field have great merit.