

Causal thinking and causal language in epidemiology: it's in the details

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Abstract

Although epidemiology is necessarily involved with elucidating causal processes, we argue that there is little practical need, having described an epidemiological result, to then explicitly label it as causal (or not). Doing so is a convention which obscures the valuable core work of epidemiology as an important constituent of public health practice. We discuss another approach which emphasizes the public health "use value" of research findings in regard to prediction and intervention independent from explicit metaphysical causal claims. Examples are drawn from smoking and lung cancer, with particular focus on the original 1964 Surgeon General's report on smoking and the new version released in 2004. The intent is to help the epidemiologist focus on the pertinent implications of research, which, from a public health point of view, in large part entails the ability to predict and to intervene. Further discussion will center on the importance of differentiating between technical/practical uses of causal language, as might be used in structural equations or marginal structural modeling, and more foundational notions of cause. We show that statistical/epidemiological results, such as "smoking two packs a day increases risk of lung cancer by 10 times" are in themselves a kind of causal argument that are not in need of additional support from relatively ambiguous language such as "smoking causes lung cancer." We will show that the confusion stemming from the use of this latter statement is more than mere semantics. Our goal is to allow researchers to feel more confident in the power of their research to tell a convincing story without resorting to metaphysical/unsupportable notions of cause.

Introduction

Causal thinking and causal language in epidemiology

A primary goal of epidemiological research is the ability to determine how exposures are related to outcomes. We are interested, at the population level, in what caused the cancer, the heart attack, the cholera epidemic or the food poisoning. Our methods have developed rapidly over the last four decades to account for, among other things, confounders, retrospective and longitudinal data, and bias. In

an effort to systematize the causal enterprise, similar to efforts in other relatively young fields of scientific inquiry, epidemiologists have sought to tie such methods to an overarching causal rubric such as Popperian falsification, Mill's analysis of causation in terms of necessity and sufficiency, *ceteris paribus* conditions/control of confounding [1] and/or counterfactuals. Such efforts, while being very useful in advancing the field and providing guidance for understanding exposure and outcome relationships, have