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Type of question could inform the taxonomy of bias

C. Mary Schooling^{1,2} and Benjamin J. Cowling¹

¹School of Public Health, Li Ka Shing Faculty of Medicine, The University of Hong Kong, Hong Kong

²City University of New York School of Public Health and Hunter College, New York, U.S.A

To the Editor

Schwartz et al. provide a very comprehensive classification of the biases that can arise in different types of epidemiologic studies, and draw attention to the need for common definitions and terminology in textbooks.¹ Differences between textbooks in terminology and definitions can lead to confusion in students and epidemiologists. In many disciplines progress has often been made through the use of symbolic representations of concepts, so growing use of directed acyclic graphs in epidemiology has provided greater clarity for basic concepts.²

Schwartz et al. were careful to distinguish between the biases that can arise in descriptive studies and the biases that can arise in studies assessing causal effects.¹ One point that is perhaps worth emphasizing when making this distinction is that descriptive studies may include studies describing associations between exposures and disease.

Descriptive studies are often thought of as studies describing population attributes such as disease incidence or prevalence, but also encompass studies describing attributes of people at increased risk of disease. Notably, attributes that most conveniently describe people at increased risk of disease, such as age, sex, smoking status, lipid levels, or blood pressure, may or may not be causal and are usually selected because they are feasible and straightforward to use for risk stratification in the general community or specific sub-populations. As such, consideration of the role of confounders, colliders, and mediators is not relevant to these descriptive studies of associations, but generalizability from a sample to a population is important, hence the requirement for external validity.

In contrast, studies assessing causal effects need to account for biases due to confounding by common causes of exposure and disease, and for biases due to selection into the study, often on common effects of exposure and disease. Biases arising from imprecise measurement of exposure and disease should also be addressed. For studies assessing causality, considerations of internal validity are therefore very important, but considerations of external validity arguably less so, because “science works on the assumption that the laws of

Corresponding author: Benjamin J. Cowling, School of Public Health, The University of Hong Kong, 21 Sassoon Road, Pokfulam, Hong Kong. bcowling@hku.hk.

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nature are constant”³ with explicit, formal conditions for this assumption to be valid being developed.⁴

Clearly distinguishing between descriptive studies and studies assessing causality will ensure that considerations concerning relevant biases and validity are applied. More importantly such a clear distinction between different types of studies should ensure more focused research effort, because this distinction makes it obvious that descriptive studies of attributes that are expensive to measure are less likely to be useful, whilst studies assessing causality address scientific questions which can build on scientific principles and processes.

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