

Are epidemiologists becoming victims of the success of their discipline?

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There are conflicting messages about epidemiology these days. On the one hand, the wider community appears to appreciate the discipline more and more, as reflected in the frequency of appearance and quotation of epidemiological papers in scientific journals and the lay media, the increasing number of applicants for epidemiologic training and, not least, the increasing recognition by the American public that epidemiology is not the domain of dermatology focusing on the epidermis. On the other hand, critics of epidemiology have multiplied and they come from both within the discipline and outside it¹. It is difficult to take stock of the complex dynamics, but there are clear indications that epidemiology faces an identity crisis. Such signs are the changing demographics of epidemiology that, at least in the United States, is no more restricted to people with formal medical training, and the expansion of epidemiology to fields ranging from molecular research to large scale environmental changes. One of the lesser consequences of these developments is that the older definitions of the discipline of epidemiology, e.g., the study of the distribution and determinants of disease frequency in human populations², have become less inclusive. Today, epidemiology can be thought of as the study of causation of health-related phenomena in humans. In this context, epidemiology, in addition to traditional epidemiological activities, covers outcome or clinical epidemiology, molecular processes underlying human disease, the long-term impact of large-scale environmental changes on human health, and the complex social interactions that affect health in individuals and populations.

It is always uplifting to start with good news, or at least good prospects. There is a rich future in clinical or outcome epidemiology^{3,4}, where it is safe to say that every outstanding clinician should be competent in, or at least

familiar with, epidemiological concepts and techniques.

There are, of course, differences between clinical and traditional epidemiology. Confounding by indication dominates clinical epidemiology in that therapeutic and other interventions, which are frequently the exposures to be evaluated, are so strongly related to the clinical indications (and contra-indications) that dictate their application, as to seriously undermine the utilisation of observational (case-control and cohort) studies. The need for accuracy in individual prediction and, thus, the limited tolerance to random error also permeate clinical epidemiology. Lastly, an overall difference in outcome frequency and the necessary emphasis of clinical research on quality of life aspects, clearly distinguish clinical from mainstream epidemiology. Nevertheless, training for the two sub-disciplines is much more similar than different and it is no coincidence that most prominent clinical epidemiologists are physicians with training in traditional epidemiology. Molecular epidemiology is the likely focus of many among future epidemiologists. Biomarkers of exposure and of early disease have not been as useful as predicted 10 years ago and they are unlikely to become so in the immediate future⁵. Biomarkers of susceptibility, however, are currently being intensively studied⁶ and the investigation of genetic polymorphisms and their interaction with environmental exposures is likely to become the preoccupation of a whole generation of young health professionals. Whether this activity will become scientifically successful and, perhaps more importantly, useful to the society, is difficult to predict at this stage. There is already a strong reaction to the use of biomarkers of susceptibility in the field of occupational epidemiology.

Social epidemiology is a term coined to accommodate the noble desire of many epidemiologists to improve health

through the identification of social determinants of disease or unhealthy behaviour. The overriding importance of social and behavioural factors in disease etiology has long been recognised, but neither epidemiology nor other fields have been particularly successful in identifying specific social factors and their mode of action in disease causation. There is a considerable scope for research in this area and epidemiologists, as well as other health professionals, should certainly be advocates for the elimination of social inequalities. Epidemiology, however, is a discipline and epidemiologists are the servants of this discipline. The mission of epidemiology is not to eradicate poverty⁷. This should be the objective of economists, sociologists and, more so, political leaders. Epidemiologists could dedicate their lives to social objectives, if they wish, but this dedication should be distinct from their professional obligations and scientific responsibilities.

There are several other areas of epidemiology with a promising future and some of them are quite obvious. Pharmacoepidemiology is one of them, as the pharmaceutical industry, which has both the interest and the resources to support post-marketing surveillance, continues to expand. Quite surprisingly, deductive epidemiology of infectious diseases – that is epidemiological investigations of the specific conditions under which a disease with known etiology and epidemiologic characteristics has developed in a particular setting – is assuming increased importance. This is because localised outbreaks of diseases, particularly food-borne diseases such as those caused by strains of salmonella, *E. coli*, or even prions, or the threat of such outbreaks, are increasingly recognised by the public.

There is also a very broad scope for research in inductive epidemiology of diseases of unknown etiology, including cancer, neurodegenerative disorders and congenital abnormalities. Last, but not least, intense epidemiological research will be required to address concerns about factors, like non-ionising electromagnetic radiation, that have limited or no health importance⁸. Indeed, simple statistical considerations indicate that more work is required for the documentation of no effect than for the convincing demonstration of adverse consequences.

Given this generally bright outlook, why are we afraid that epidemiologists will become a victim of the success of their discipline? Our concern stems from the fact that as epidemiologic concepts and methods are becoming demonstrably crucial in every area of health-related research and practice, health professionals will look at epidemiology as an integral part of their own training, rather than a distinct discipline. Will, for instance, molecular researchers, or clinicians opt for collaboration with epidemiologists or will they realise that training in epidemiology is a prerequisite for their own professional success? If epidemiology becomes as important as anatomy or physiology in the training of medical doctors, won't it be unavoidable that epidemiologists will be marginalised to teaching, consulting and sophisticated, but not necessarily relevant, methodologic research? We do not have the answers, but we believe it is crucial to distinguish between the bright future of epidemiology and the uncertain future of epidemiologists.

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