

## Essay Review

### **Epidemiology and the People's Health. Theory and Context.**

Nancy Krieger. Oxford: Oxford University Press, 2011, pp. 400. \$39.95.  
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Nancy Krieger has played a central role in the development of ideas about social and cultural influences on population health, and in exploring the role of 'theory' in epidemiology. Many readers will recall her seminal question (1994) about the 'web of causation'—has anyone seen the spider?<sup>1</sup> Now she has written a large, well-structured, critically argued and exhaustively referenced book, the culmination of two decades of her wrestling with and writing about the fundamental questions: Does epidemiologic theory exist; if not, should it exist; and what form should it take?

Krieger's essential concern has been that epidemiology, as an applied research discipline, has 'grown like Topsy' over several centuries without apparently feeling the need to ask what general model(s) of causation of health disorders should underlie research enquiries and data interpretations. Why do we think the levels and distributions of health in a population change over time, and why do they differ from those in other populations? Epidemiology textbooks of the past several decades have offered little guidance on what an epidemiologic theory is.

'Epidemiologic theory', writes Krieger in her opening chapter, 'is about explaining the people's health'. It is about explaining the health status of populations in societal and ecological context, and is *not* about explaining why specific individuals become ill or stay healthy. That polarity echoes Geoffrey Rose's much-quoted paper of 1985, *Sick Individuals and Sick Populations*,<sup>2</sup> arguing that the causes of changes in rates of disease in whole populations may differ from the causes of cases of disease within a population—and that we usually short-change the former (population-level) category of enquiry.

So, why do we need theory? Well, says Krieger, theory is essential for formulating, testing and assessing competing explanations; in other words, for good science—and that 'can make a difference for the good'.

First, though, what do we mean by 'theory'? Krieger's discussion of the history, role, meaning and form of theory is erudite, well-referenced and engagingly written. She pauses to ask herself questions as this forensic examination evolves. For the enthusiastic reader there are many supplementary details on offer—for example, there is a three-page text box listing contested views of the definitions of science, theory and hypothesis.

If we know what a theory looks like, how do we get there? Darwin's theory of biological evolution formed gradually in his mind as he sought to explain his observations on the fossil record, along with new ideas about geological formations and the planet's age, biological gradations in neighbouring populations and threats to indigenous species from exotic introduced species. Darwin was observing, synthesizing and thinking (nervously) outside the orthodox frame. Three centuries earlier, Copernicus had been through a similar, observation-based, process of creative lateral thinking. He (nervously) formulated his heliocentric theory and, like Darwin, was reluctant to publish.

Those were grand theories, and, as 'heresies', they challenged fundamental world views. The Watson-Crick theory of the Double Helix (1954), the mirror-imaging replication of the genetic code for transmission to cellular progeny, did not challenge a world view or a scientific orthodoxy. Rather, it offered a mechanism, an understanding of genetic inheritance. It launched the now burgeoning field of molecular biology, including the molecular genetics that many epidemiologists incorporate in studies. True to the principle that scientific knowledge is provisional, there has been recent criticism of the mechanistic DNA-as-software model, particularly as epigenetics research reveals that much gene activity is influenced by exogenous environmental (e.g. micronutrient) factors.

Is it wise to imagine a unifying, or bedrock, Theory of Epidemiology? Wisely, Krieger uses the generic phrase 'epidemiologic theory', which allows a range of complementary theories, applicable as appropriate. Indeed, in suggesting six features that epidemiologic theory should have, she states that there would be not just 'one' theory, but many—to accommodate diverse societal and technological contexts.

Krieger also reminds us that theories are not value-free. They have groundings in history and culture, they reflect prevailing ideas. The genealogy of epidemiology includes now discredited ideas from 50–100 years ago of scientific racism, of innate differences in inferiority–superiority. Their lingering influence, she writes, affects how epidemiologists analyse racial, ethnic and socio-economic differences in health status.

These various, necessary, concessions and caveats start to make Krieger's task of clarifying the theoretical basis for studying and improving the people's health look daunting. There seems to be a centrifugal tendency; no single unifying theory will emerge.

Have others fared any better? In fact, few have tackled this issue. Stephen Kunitz, in *The Health of Populations: General Theories and Particular Realities* (2004), takes a somewhat different socio-historical approach.<sup>3</sup> In the past, he argues, changes in population health status were often explored in relation to aspects of industrialization and their social and material correlates. The diversity of explanations reflected the restricted academic and ideological frames of individual commentators. Were health gains due to sanitation, improved food supplies, better health literacy, advances in general material circumstances, or early policies and unionism to protect workers' health? More recently, says Kunitz, attention has focused on relative disadvantage (income differentials within populations), loss of sense of community, cultural disenfranchisement of indigenous people, perils of consumerism and globalization.

Kunitz concludes that it is all rather diverse and inconstant across time and place. Perhaps there is no generalizable explanation, no unifying theory about causal influences on collective health status. Yet, he hopes, epidemiological studies of multi-level causation in particular settings, each addressing context-specific history, circumstances and particular factors, might yield more convergent, generic, theories of causation.

Nancy Krieger's book has a clear and ordered structure, examining ideas of causation across a sequence of historical periods. These five chapters deal with the following issues and ideas.

Chapter 2 surveys a broad sweep of early history. Over millennia, people and cultures everywhere have formulated ideas ('theories?') about the causation of disease. The Athenian Greeks were interested in what caused poor health in the 'demos' (recall the Greek roots of the word 'epi-demiology')—the privileged stratum of free adult males. The under-classes (metics and slaves) had no choices in relation to their health, and died young. Over the centuries, explanations of health and disease have varied as a function of societal and ecological context, and the state of critical empirical knowledge.

Chapter 3 reviews the more recent history of ideas about disease causation, during 1600–1900. Krieger singles out the ideas of poison (propounded by Paracelsus), filth (the sanitary reformers) and, from mid-19th century, class and race (Engels in England, Virchow in Prussia and various reformist social commentators in America dealing with theories of race and with the backwash from Blumenbach's earlier theory of racial separateness and difference and the misinterpreted experiences of colonialism).

Chapter 4 takes us to the first half of the 20th century: germs and genes—and the social environment. A critical reformulation of causal ideas emerged in those decades. Koch and others had discovered germs. Mendel's work had shown that inheritance was particulate (and not by blending—the unsatisfactory idea

that tortured Darwin). Germs and genes thus allowed the idea of specificity of biological transmission of disease. But the role of the social environment was not so easily dismissed. In 1935, Greenwood (London School of Hygiene and Tropical Medicine) wrote, with compelling analogy, of the essential interplay of three factors in the genesis of infectious disease—the seed, the soil and the methods of husbandry. We know those today as the pathogen, the host individual and the social environment.

Krieger's account of the ideas and debates about genes, eugenics and racial and familial biological inferiority reads darkly today. (Yet this was not very long ago, and ideas do not vanish without trace.) Names such as Sydenstricker, Greenwood, Hamilton and Du Bois are associated with the subsequent re-balancing of theories about disease causation, re-setting them within the wider social environment.

Chapters 5 and 6 take us into more familiar territory. First, the 1950–1980 period, when biomedical and lifestyle models of the risk of (non-communicable) disease flourished. This somewhat reductionist era, which sought out biomedical risk factors (hypertension, elevated blood lipids, etc.) and behavioural risk factors (smoking, alcohol consumption, etc.), spawned the dominant and methodologically important ideas of 'modern epidemiology'. That phase of epidemiology's development was facilitated by modern computing power and increasingly sophisticated statistical analyses (well known from Ken Rothman's textbooks). Then, from the mid-1990s, this narrative of evolving ideas of causation enters the deeper and more layered waters of 'social epidemiology', including its socio-political and psycho-social models. (I was pleased to read Krieger's discussion and recognition of the pioneering, seminal, but under-published work of John Cassel, University of North Carolina, in the 1970s—my first Head of Department and occasional mentor.)

In Chapter 7, Krieger explores the ongoing, more integrative, approaches to understanding disease phenomena and dynamics within populations. This is the realm of 'systems' thinking, allowing interplay between hierarchical levels of influence, across differing spatiotemporal scales and involving feedback processes. Such concepts from the science of ecology, which themselves have emerged and evolved over the past 150 years, have provided stimulus to many contemporary epidemiologists, including the author's own formulation of an 'eco-social' model. Reflecting her social sciences orientation, Krieger invokes the idea of the 'embodiment' of social experience as a central aspect of disease causation (not a term that comes naturally to many epidemiologists). Eco-social thinking, she proposes, should be informed by consideration of both political economy and political ecology.

There is an enlightening discussion of how several recent major debates within the ecological sciences

map onto ongoing debates within contemporary epidemiology, as we strive to incorporate into our thinking: (i) the ideas and processes of multi-level causal influences; (ii) relationships between those 'levels', including emergent properties at higher levels ('herd immunity' is a classic, but rare, proven example); (iii) dynamics of cross-level interactions (with or without equilibration); and (iv) allowance for historical influences and the role of contingency. This discussion would have been further enriched by exploration of how the equivalent issues are being addressed within the wider 'eco' realm. How are epidemiologists faring in studying, estimating and forecasting the impacts on the people's health of human-induced climate change, biodiversity loss, agroecosystem stresses and the other great and systemic changes that have become a major, and worrying, feature of the modern age?<sup>4</sup>

Krieger concludes that chapter by arguing that the conceptual, substantive and methodological challenges posed by eco-social theory are vitally important—because 'if we get our theories wrong, we can do great harm; if we get them right... we stand a better chance of generating valid knowledge relevant to explaining disease distribution and altering it for the good'. The ensuing final chapter then demonstrates, from four case examples, how the outcomes of research and social intervention, successful or unsuccessful, depend on what and how theories are applied.

Next come 75 pages of references. (The downside to this exhaustive bibliography is that the main text is

replete with Harvard-style in-text referencing, rendering it sometimes difficult to connect sentence segments that are interspersed between bracketed multiple-reference speed-bumps.)

The last-page coda is worthy of this scholarly book's heroic exploration of the long history and the complex dimensions of ideas about the causes of disease in human populations. Nancy Krieger writes that our commitment to the people's health demands the best work, with the clearest possible thinking: 'Embracing, extending, debating, and improving epidemiologic theory is one very good place to start.'

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