

Commentary: Ways of asking and ways of living: reflections on the 50th anniversary of Morris' ever-useful *Uses of Epidemiology*

Nancy Krieger

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'Epidemiology is the only way of asking some questions in medicine, one way of asking others (and no way at all to ask many).'

Jeremy M. Morris
Uses of Epidemiology (1957, p. 96)¹

To be of use. To Jeremy Morris (b. 1910), writing a half-century ago in his now classic text, *Uses of Epidemiology*,¹ the promise—and responsibility—of epidemiology was clear: to generate scientific knowledge about the 'presence, nature and distribution of health and disease among the population' (p. 96),¹ ultimately in order to 'abolish the clinical picture' (p. 98).¹ Committed to improving the 'health of the community' (p. 96),¹ Morris argued that 'one of the most urgent social needs of the day' that epidemiology could address was 'identifying harmful ways of living' and 'rules of healthy living' (p. 98).¹ Uniquely equipping epidemiology to carry out this task was, in his view, its population and historical perspective and its dual engagement with studying 'human biology' and 'the social aspects of health and disease' (p. 97).¹ Viewing epidemiology as a necessary complement to what he deemed equally vital clinical and laboratory research (p. 99),¹ Morris affirmed that the discipline's distinct uses 'all stem from the fact that in epidemiology the group is studied and not merely particular individuals or cases in the group' (p. 97).¹

How might epidemiologists enhance their capacity to do useful research? Morris' answer: by use of better methods. Only the sort of methods Morris had in mind were not the kinds of technical methods emphasized by the 'modern epidemiology' of recent years,² as necessary as he knew them to be. Rather, Morris' objective was to articulate a methodical approach for epidemiological thinking:

In this book I am concerned mainly with epidemiology as a way of learning, of asking questions, and getting answers that raise further questions: that is, as a *method* (p. 3).¹

Using his technique, Morris systematically delineated seven 'uses' of epidemiology (Table 1), concerned with describing

current and changing distributions of community health and the natural history of disease, identifying syndromes, evaluating health services, predicting risk and elucidating aetiology (p. 96).¹ He first presented this list in his 1955 paper on 'Uses of Epidemiology',³ reprinted in this issue of the *International Journal of Epidemiology*. As this initial article and the subsequent book *Uses of Epidemiology* amply made clear, the first step was to get the questions right—after which of course it would be necessary to confront the 'practical matters' and 'kinds of difficulties that arise' when conducting epidemiological studies (p. 14).¹

In this commentary, I reflect on three key principles that underlie Morris' approach to asking questions, as timely today as they were 50 years ago. These are: (i) *epidemiology is an historical science*, (ii) *epidemiology is a population science* and (iii) *epidemiology is a causally pragmatic and contextual science*. A corollary is that epidemiology necessarily must engage with the jointly social and biological aspects of health and disease, given its commitment to what Morris termed the 'health of the community' (p. 96).¹

Epidemiology is an historical science

The pre-eminence of historical thinking in Morris' approach is attested to by the book's opening pages. Its introduction commences with a review of the past century's trends, from 1850 to 1950, in mortality rates for women and men, 55- to 64-years-old, in England and Wales. Morris observed that rates for both groups began to fall in 1900, reflecting the impact of 'sanitary reform', and fell until 1920, after which 'rather abruptly there was a change' (p. 1).¹

Female mortality kept its downward course, but the reduction of male mortality has slowed and almost stopped. As one result of this, the death rate among men aged 55 to 64 which was about 10 per cent higher than for women a hundred years ago, and about 33 percent higher after the first world war, is now approach about 90 percent higher... What has been happening?... The most important is the emergence of three diseases from obscurity to become exceedingly common, disease which particularly affect men

Department of Society, Human Development and Health, Harvard School of Public Health, Kresge 717, 677 Huntington Avenue, Boston, MA 02115, USA.
E-mail: nkrieger@hsph.harvard.edu

Table 1 *Uses of Epidemiology: Morris' seven 'uses' (p. 96)¹*

1. In *historical study* of the health of the community and of the rise and fall of disease in the population; useful 'projections' into the future may also be possible.
2. For *community diagnosis* of the presence, nature and distribution of health and disease among the population, and the dimensions of these in incidence, prevalence and mortality; taking into account that society is changing and health problems are changing.
3. To study the *workings of health services*. This begins with the determination of needs and resources, proceeds to analysis of services in action and, finally, attempts to appraise. Such studies can be comparative between various populations.
4. To estimate, from the common experience, the *individual's chances* and risks of disease.
5. To *help complete the clinical picture* by including all types of cases in proportion; by relating clinical disease to the sub-clinical; by observing secular changes in the character of disease, and its picture in other countries.
6. In *identifying syndromes* from the distribution of clinical phenomena among sections of the population.
7. In the *search for causes* of health and disease, starting with the discovery of groups with high- and low-rates, studying these differences in relation to differences in ways of living; and, where possible, testing these notions in actual practice among populations.

and are very frequent in middle-age: duodenal ulcer, cancer of the bronchus and 'coronary thrombosis' (pp. 1–2).¹

A graph comparing women and men for 1930–50 for all-cause mortality vs 'all causes less coronary heart disease and cancer of the respiratory system' showed a widening gap over time for the former, but parallel declines, with no widening gap, for the latter (p. 2).¹

What points stand out from this example? First, disease rates change over time, sometimes very quickly, and epidemiologists need to track and account for these temporal changes. This requires attention to causes of disease distribution, as related to—but not simply reducible to—causes of disease mechanisms. Second, the change in disease rates over time can vary by type of disease; specificity matters. Whereas some disease rates may uniformly fall, others may rise, and this differential patterning over time provides important aetiological clues. Third, women and men do not exhibit a fixed all-cause mortality ratio; instead, the ratio is historically contingent. For some types of mortality, women and men exhibit similar temporal trends; for others, they do not. Commonalities and divergences both matter, with this principle relevant to comparisons of disease distribution across any groups (i.e. not just women vs men). The implication is that societal levels and distributions of disease are malleable, not an essential property of either the populations afflicted or their ailments, and so can potentially be altered. Indeed, to Morris, the central question posed by his presentation of the data was: 'What are the *social* changes that underlie the *biological* changes expressed' (p. 19)¹ in the observed patterns?

Morris brought his historical orientation to not only the past but also the present and future. History provided the foundation for his view that epidemiology was a 'mode of understanding of the changing picture of disease: study of changing *people* and their changing *ways of living* in changing *environments*; and the causes of disease that may be identified in these' (p. 120).¹ Writing about 'Changing people in a changing society' (p. 19),¹ Morris emphasized that:

Diagnosis of the state of community health must be dynamic and the remarkable changes now occurring in the character of health problems . . . will be a recurrent theme of the present exposition. In a society that is changing as rapidly and radically as our own (and these changes may well be small compared with what is in store for us and slight compared with the demographic—cultural—technological

revolutions in some countries of S.E Asia or Africa) epidemiology has a special duty to observe contemporary social movements for their impact 'upon the people,' to diagnose what new problems are arising, where we are making progress and where falling back (p. 19).¹

Questions he posed sparked by this orientation included (pp. 19,22):¹

What are the implications to Public Health of more married women going out to work? And less of the older men? Of still increasing urban—and suburbanisation? The rapid growth of new towns? Smokeless zones (still with sulphur)? The building of new power stations? Of less physical activity in work and more bodily sloth generally? Of the quickening transformations in industry? Of the prospect of an age of leisure? Or the growth of mass media and the use being made of these? Of the eleven-plus examination? Of the more than 1000 extra motor vehicles per day? Of the rising consumption of sugar; our astonishing taste for sweet – we eat more per head than any other population? Of the cheapening of fats? The multiplying interferences with food? The many physical and chemical exposures, known and potentially hazardous? More smoking in women? The prodigious increase of X-rays and antibiotics?

Such questions (of contemporary history, it might be said) could readily be multiplied.

And indeed they have: a half a century later, epidemiologists are still actively engaged in pursuing Morris' research agenda, whether or not aware just how long these questions have been on the table.

The essential point is that Morris' appreciation of history as alive, relevant and embodied is what allowed him to propose a rich research and action agenda for epidemiology and public health that is relevant to this day. Encouragingly, recent work^{4,5} is reviving the view, held by eminent epidemiologists in prior generations, including William Guy (1810–1885),⁶ August Hirsch (1817–1894),⁷ Wade Hampton Frost (1880–1938)⁸ and Edgar Sydenstricker (1880–1936),⁹ that epidemiology is an historical science.^{10–12} Equally compelling, Morris, by his example, offers useful refutation of the narrow-minded view that asking where scientific questions come from is an unscientific question, as claimed by Popper's philosophy of science^{13,14}—one adopted by key proponents of 'modern epidemiology',^{2,15} and which is

premised on divorcing the creative questions scientists ask from the societies in which they live. Being grounded in the history of one's times and one's field is instead a very good place to start.^{2,4,10-12,16}

Epidemiology is a population science

A second key principle is contained in Morris' definition of epidemiology as: '*the study of health and disease of populations and of groups in relation to their environment and ways of living*' (p. 16).¹ Repeatedly, Morris emphasized that epidemiology was concerned with 'populations', not just cases or individuals (pp. 2-3,16,61,97,120).¹

By contrast with clinical medicine, the unit of study in epidemiology is the *population* or *group*, not the *individual*. Death, or any other event, are studied only if information can be obtained, or inferred, about the population in which the events occurred (p. 3).¹

Put bluntly, if the topic of study was not population rates and risks, it was not epidemiology.

To Morris, one obvious reason for the population approach was that erroneous inferences could be made about disease occurrence or progression if only a skewed set of clinical cases were studied (p. 41).¹

There may be hundreds or thousands of patients on the books of a diabetic clinic, but numbers alone will not ensure that the frequency in the clinic of vascular or nervous complications truly reflects the frequency of these in diabetes, and not merely among this particular (and may be indefinable) group of diabetics. For example, diabetics *with* such complications may be particularly referred to a university clinic. That is to say, having stated a question (about the frequency of complications), the next step is to decide how to ask it and the appropriate method for getting a correct answer. Merely multiplying the number of clinical cases will not necessarily help and indeed may multiply error. It would be better to try and assure that all the clinical cases occurring in a sufficiently large population are included, or a representative sample of such; that is to say this is an epidemiological question, and the appropriate method of asking it is epidemiological (p. 41).¹

Another was that knowledge of group levels and distributions is essential for investigating aetiology and preventing disease. Using the example of socioeconomic inequalities in reproductive outcomes, Morris wrote (p. 16).¹

Such demonstration of inequalities between groups is the standard function of epidemiology. Obviously there will be great and small individual differences *within* these social classes. But resolution of these differences, and summarising the group experiences as such, is also obviously useful. In general, description of group differences is the essential part of method. Thus it may often provide the first indication that there *is* a problem for consideration.

It is the beginning for the search for causes of disease. (p. 16).¹

As Morris reminded his readers, 'The main use of epidemiology is to discover populations or groups with high rates of disease, and with low, in the hope that causes of disease and of freedom from disease can be postulated' (p. 61).¹

Morris further recognized that epidemiology's population vantage was critical not only for elucidating aetiology but for even identifying the outcomes of concern. Noting that population comparisons could give insight into what constituted both 'disease' and what was '*healthy*, or "*normal*" (not just the common, or average)' (p. 51),¹ Morris observed:

Thus, extending the customary picture obtained in any one country, population studies are beginning to make it clear that blood cholesterol levels may vary considerably from one country to another. Western populations may have higher levels than those in 'under-developed' countries, and may have different trends with age. The question at once arises: what are the *normal* ranges of blood cholesterol? May it be that most people in the West have *pathologically* high levels?...That is to say, it must now be considered what is the appropriate population or 'universe' for the study of physiological norms...My own first introduction to it was...when I was told of the laboratory technician in China who believed that what *we* call megloblastic degeneration of the bone marrow was 'normal'. (p. 51).¹

The implication is that it can be erroneous to categorize a study population's outcomes or exposures by percentiles (e.g. quartiles, deciles), or to focus on mean differences between groups, as typically is done, without first considering where the average lies within the full range of documented levels.

But how was an epidemiologist to determine who and what constituted meaningful populations or groups? And where did individuals fit in? Here, Morris offered brief but suggestive answers. To Morris, the "'population" may be of a whole country, or any particular and defined section of it' (p. 3),¹ categorized in relation to people's 'environment, their living conditions and special ways of life' (p. 61),¹ e.g. their social class, occupation and economic resources (p. 16),¹ and also their 'age', 'race' and 'sex' (p. 65).¹ These populations, in turn, set the context of the individuals within them, including the constraints on and options for their individual agency. To Morris, greater 'understanding of properties of *individuals* which they have in virtue of their *group* membership' (p. 120),¹ was essential, given 'the changing character of health problems' (p. 39),¹ precisely because the

...prevention of disease in the future is likely to be increasingly a matter of individual action and personal responsibility. Compare the Victorian programme for laying drains and today's campaign on washing the hands. In brief, we must look forward to building a new kind of partnership between community and individual in place of the old where so often in Public Health the community did things for the individual (p. 39).¹

Table 2 Definitions of 'population' and 'individual', contending assumptions, and problematic usage in contemporary 'population health' literature**Population:** *Oxford English Dictionary*:¹⁷

General use: 'the collective inhabitants of a country, town or other area'

Technical uses: Statistics. A (real or hypothetical) totality of objects or individuals under consideration, of which the statistical attributes may be estimated by the study of a sample or samples drawn from it; *Genetics*. A group of animals, plants, or humans, within which breeding occurs.

Individual: *Oxford English Dictionary*:¹⁷

Obsolete: 'one in substance or essence; forming an indivisible entity; indivisible'

Current: 'of, pertaining to or peculiar to, a single person or thing, or some one member of a class; characteristics of an individual' ('Logic and Metaph. An object which is determined by properties peculiar to itself and cannot be sub-divided into others of the same kind')

Contending assumptions:**1. Relationship of 'population' and 'individuals'**

—**Harré, 'Individual/Society: History of the Concept' (2004)**¹⁹: 'Philosophical dimensions of the distinction between individuals and collectives include the problem of universals (how are similarities among members of collectives to be explained?), of emergent properties (do collectives have properties that are different from those of their members?) and of internal and external relations (are the properties of individuals brought into being by membership of collectives?). In political philosophy the problem of the authority of the state as a collective led to accounts by Hobbes, Locke and Rousseau in terms of a (mythical) moment of a social contract between members to create a sovereign. In contrast Vico saw the state as a development of the existing social structures of families. Utilitarians assumed, problematically, that properties of groups of people were merely aggregates of attributes of individuals. Mill defended a radical distinction between individual and collective as the ground of political freedom. Hegel and Marx made collectives fundamental. Individuals acquired different attributes by virtues of membership of social aggregates which changed as the history of humanity unfolded. Durkheim too assumed that there were social facts not reducible to attributes of individuals. Sociology, as the study of collectives, can focus on attributes of individual members (idiography) or attributes of groups (nomothetic research). The debates around ontological and methodological individualism continue still'.

2. Individuality in context vs individualism

—**Williams, Keywords (1983) (pp. 164–165)**¹⁸: 'The modern sense of *individual* is then a result of the development of a certain phase of scientific thought and of a phase of political and economic thought. But already from eC19 a distinction began to be made within this. It can be summed up in the development of two derived words: *individuality* and *individualism*. *Individuality* has the longer history, and comes out of the complex meanings in which *individual* developed, stressing both a unique person and his (indivisible) membership of a group. *Individualism* is a C19 coinage: 'a novel expression, to which a novel idea has given birth' (tr. Tocqueville, 1835): a theory not only of abstract individuals but of the primacy of individual states and interests'.

Problematic usage in contemporary 'population health' literature (no reference to contending assumptions):

—**Kindig: 'Understanding population health terminology' (2007) (pp. 141–142)**³⁰: 'Although the term population health combines the concepts of both population and health, each term also has its own important meaning. Population refers to a group of individuals, in contrast to the individuals themselves, organized into many different units of analysis, depending on the research or policy purpose. Whereas many interventions (e.g. much of medical care) focus exclusively on individuals, population health policy and research concentrate on the aggregate health of population groups like those in geographic units (cities and prisons) or other characteristics (ethnicity, religion and HMO membership). This focus is necessary because many determinants of health have their effect at a group level (air quality, education standards, Medicare policy and immunization) and because health differences across groups (men and women, rural and urban and black and white) are as important to population health outcomes and determinants as are differences between any two individuals. Therefore, population health research takes into account environmental and system variables that affect individuals, but it focuses on their impact on the health of the group, not the individuals themselves'.

—**Kindig and Stoddard: 'What is population health?' (2003) (p. 381)**³¹: Population health is 'the health outcomes of a group of individuals, including the distribution of such outcomes within the group'.

—**Young: Population Health: Concepts and Methods (1998) (p. 3)**³³: 'In everyday usage, 'population' means the number of people in a given area. This can be defined geographically or politically, as in a country, although physical boundaries are not always necessary, as when referring to groups of people sharing common characteristics (e.g. ethnicity and religion) who are scattered throughout a particular geographical or political unit... Statisticians use "population" in a special sense, especially when discussing sampling. The word sometimes refers to a particular universe, the total number of units (animal, vegetable or mineral) from which a sample is drawn... Much of biostatistics is concerned with estimating population parameters from a sample. Populations also have specific meaning for geneticists, who define them in terms of sharing genes'.

The implication is that only by grappling with links between individuals and their communities would epidemiology and public health be able to understand and alter individual and population 'ways of living' so as to create a healthier world.

Behind Morris' approach to 'populations' and 'individuals' lay a host of assumptions that have long been debated in the 'population sciences', whether social, ecological or biological (Table 2).^{17–24} Making explicit some of the contentious issues involved in understanding these complex terms is Raymond Williams' reminder (Table 1) that: (i) the origin of 'individual' lies in it being 'indivisible' from the group of which it is a part and (ii) recognition of 'individuality' does not imply embracing the philosophical stance of 'individualism' (pp. 161–65).¹⁸ At an

abstract level, the ongoing arguments centre on whether the designations of 'population' and 'individual' are:

- (i) externally imposed constructs vs categories reflective of intrinsic properties;
- (ii) meaningful as categories unto themselves vs acquire meaning only in context and in relationship to those excluded;
- (iii) necessarily distributional (variation is inherent and informative) vs fixed (variation is error or 'noise' that deviates from the true population value) and
- (iv) mutually constitutive (each shapes the properties of the other) vs aggregative (individual characteristics precede and produce, but are not shaped by, population characteristics).

Table 3 Two different epidemiological views of ‘multiple causation’: in context (Sydenstricker, 1933⁹ and Morris, 1957¹) vs decontextualized ((MacMahon *et al.*, 1960⁴⁹ and Rothman, 1988²)

In context	<p>Sydenstricker, <i>Environment and Health</i> (1933) (p. 206)⁹: ‘The most practicable procedure obviously is to arrive at a reasonably accurate understanding of one specific environmental factor at a time... Yet it is a dangerous procedure because the too cocksure are likely to overlook important factors other than the one which is the especial object of study for the moment. It is for this reason that so broad a concept of the environment has been insisted upon and the perils of too narrow an outlook upon the complexities of the subject of environment and health have been so persistently emphasized in this monograph’.</p> <p>Morris, <i>Uses of Epidemiology</i> (1957) (p. 65)¹: ‘The notion of ‘pattern of causes’ is a relatively modern restatement. With the glories of the bacteriological discovery, there was a period of emphasis on the ‘germ theory’ of disease and such formulations. Today the interest would not be in the cause of syphilis by the (of course necessary) <i>treponema pallidum</i>. We would be concerned rather to understand the occurrence of syphilis among causes in host and environment as well: basic influences of race, of sex, and of age, and in such causes as the psychology of promiscuity, the economics of prostitution, the life of the merchant seaman, the horrors of war, the denial of family life in contract migrant labour, causes of which in one combination or another may produce a case of syphilis’.</p>
Decontextualized	<p>MacMahon <i>et al.</i>, <i>Epidemiologic Methods</i> (1960) (p.18)⁴⁹: ‘In fact, effects are never dependent on single causes. The concept of ‘chains of causation’ although common has the defect of oversimplification... the whole genealogy might be thought of more appropriately as a web, which in its complexity and origins lies quite beyond our understanding... many variables may be related to a single effect through a ‘direct–indirect’ mechanism in which D is causally related to D, D–E, E–F, and so on until maybe Q plays an important role in the development of the disease... the longer the chain the weaker the association. A preventive attack on the disease depends on finding an element in the chain which can be eliminated and which is sufficiently close to Q in the mechanism for its elimination to have a substantial effect on Q’.</p> <p>Rothman, <i>Modern Epidemiology</i> (1988) (p. 11)²: ‘We can define a cause of disease as an event, condition, or characteristic that plays an essential role in producing the occurrence of the disease... the cause of any effect must consist of a constellation of components that act in concert. A ‘sufficient cause’ may be defined as a set of minimal conditions and events that inevitably produce disease; ‘minimal’ implies that none of the conditions or events is superfluous. In disease etiology, the complete of a sufficient cause may be considered equivalent to the onset of disease’.</p>

In the case of people and hence epidemiology, both social and biological considerations are at play, with the questions more pointedly becoming: are the categories defining ‘populations’ societally created or biologically innate?—and do individuals belong to these groups by fiat, choice or necessity?

Suggesting epidemiologists’ understanding of ‘population’ and ‘individual’ could benefit from Morris’ ‘both/and’, instead of ‘either/or’, approach to conceptualizing individuals-in-populations-in-society and individuality-in-context are two current examples of problematic usage of these terms. In the United States, notions of ‘population groups’ and ‘special populations’ figure prominently in epidemiological studies and official definitions of ‘health disparities’,^{25–28} without any explicit explanation of why certain ‘population sub-groups’ are singled out and considered ‘special’.^{10,29} One hint, however, is that these ‘special populations’—women, children, people of colour, the disabled, the elderly, lesbian and gays, the poor and people in rural areas²⁹—include just about everyone other than white, relatively affluent, urban, able-bodied, heterosexual, middle-aged white men.^{10,29} Moreover, within the growing discourse on ‘population health’, much of the literature surprisingly offers only scant^{5,30–33} or no^{34–36} definition—let alone nuanced discussion—of what ‘population’ means and the assumptions involved; instead, most rely on a head-count or administrative stance (Table 1).

The danger of epidemiology being vague about—or, worse, deliberately decontextualizing and depoliticizing—the criteria for defining ‘populations’ and their ‘individuals’ is it can lead to getting the causal arrows backwards. Consider only the case of racial/ethnic health inequities and the contrast between construing these disparities as an embodied biological expression of racism vs a consequence of ‘race’ as an ‘innate’ characteristic of ‘individuals’.^{37–40} If epidemiology is to live up to its claim—and Morris’ mandate—that we are a ‘population’

science, then epidemiologists have to be explicit about the societal divisions and/or biological criteria that inform when and how we demarcate ‘populations’ for study and view the individuals within them.

Epidemiology is a causally pragmatic and contextual science

The third principle informing Morris’ book is that epidemiology, as a science, is fundamentally pragmatic^{41,42} and contextual in its orientation to causality (pp. 10,61–68,104).¹ To Morris, the objective is (p. 68):¹

... to learn enough of the probable pattern of causes for a programme of action to be stated that will disrupt the pattern, reduce the frequency of diseases and at not too great a cost in consequent other troubles. The attack may be on a single cause or on a group of causes among the many that have been identified (p. 68).¹

Influenced by mounting evidence that disease was best conceptualized as a consequence of interactions between people and their ‘environment’ (p. 104),¹ Morris accepted (pp. 66–68,71,122)¹ the then growing view, replacing the mono-causal ‘germ theory’, that diseases can be due to ‘multiple causes’ that can interact in complex ways (Table 3).^{9,11,24,43–45} To Morris, these different causes afforded more opportunities for prevention, albeit with the caveat that interventions, including medical treatments, based on any one or several of these causes, could have unintended and potentially harmful consequences (pp. 22,23,71,122).¹

Morris, however, did not view the idea of ‘multiple causation’ as a panacea. Although he considered it to be ‘a liberating and

clarifying concept' (p. 104),¹ compared with more narrow views that posited 'the' germ as 'the' cause of infectious disease without considering aspects of the 'host' and 'environment' involved in producing an actual case of disease (p. 65),¹ Morris also recognized that it had its drawbacks, especially insofar as prevention was concerned. In his view, '*multiple causality*' (italics in the original) (p. 104):¹

is an especially tricky notion because of the ease under its influence of losing the sense of proportion and so regarding everything as 'important'; it becomes so easily a stimulus to looser thinking. The whole history of preventive medicine shows that interference with one or a few of a complex of causes may be sufficient considerably to modify the occurrence of disease. As well as identifying the pattern of causes it is essential therefore to try to estimate their relative weight (p. 104).¹

In other words, however complex the causal processes may be, epidemiologists needed especially to identify those 'causes' substantially driving population levels and distribution of disease.

For Morris, this challenge translated, pragmatically, to addressing causes in context, located in what he termed the 'environment', 'living conditions' and 'ways of life' (p. 61).¹ Both specific and general 'factors' merited intervention. The former referred to particular exposures, e.g. various occupational hazards, such as cutting oils, linked to skin cancer (p. 61).¹ The latter included societal conditions such as 'income level' and 'poverty', linked 'with nutrition, and with child growth, development and health' (p. 62).¹ To Morris, these latter 'general factors' were important preventable 'causes of disease or of diseases, rather than of any specific disease' (p. 61),¹ e.g. the 'purity (and abundance) of water-supply' causally mattered for 'bowel infections of many kinds – and not merely the cholera' (p. 62).¹ If the point was to change overall patterns of health, including its social distribution, it was a false choice to focus on only one or the other; knowledge of both was needed, including how the 'general factors' structured exposures to specific hazards caused by societally produced ways of living.

To Morris and his like-minded colleagues,^{9,11,24,43–45} the challenge was to think big and small at the same time: to see the details of disease mechanisms while not losing sight of the social production of disease distribution overall. It was a stance, however, that became increasingly out of step with the post-World War II rise of biomedical individualism and modern epidemiology,^{10–12,46–48} whose decontextualized approach to 'risk factors' and 'multiple causation' found form in the still influential spiderless¹⁰ 'web of causation' that MacMahon *et al.*⁴⁹ proposed in 1960 in their classic textbook *Epidemiologic Methods*, the first such textbook in the field (Table 3). Recent efforts to theorize anew about multiple causation and the social determinants of health would do well to appreciate the nuances of Morris' perspective. The choice is not 'fundamental causes' vs 'specific risk factors', as some now argue.^{50–52} An historical and population perspective, geared to effective prevention and sustainable reduction of health inequities, instead entails attention to both.^{4,5,53,54}

Conclusion: the importance of ways of asking for knowledge for healthy ways of living

In summary, Morris' *Uses of Epidemiology*¹ remains useful precisely because it offers a lucid way of thinking that translates into a powerful way of asking questions. The work of science is descriptive and analytic, both generating and testing hypotheses. Each aspect must be rigorous. Epidemiology as much needs well-articulated theories of disease distribution as it does well-defined methods. Such theories can help us better frame and answer the kinds of questions epidemiology is uniquely equipped to answer, as one contribution joining with those of the many social, ecological, biological and physical disciplines and the diversity of methods, both quantitative and qualitative, that are needed to understand, protect and improve societal health and the well-being of life on this planet.

In the 50 years since *Uses of Epidemiology* was published, much epidemiologic effort has been put into investigating the types of questions Morris posed and improving the methods to do so. Only recently, however, within the past two decades, has a renewed interest in epidemiological theory become apparent, prompted by the revitalization of social epidemiology and its focus on developing frameworks, concepts and models to explain and alter current and changing societal patterning of health, disease and health inequities.^{10–12,55–61} By building on the principles expressed in Morris' *Uses of Epidemiology*¹ and its deep appreciation for epidemiology as an historical, population-based and a causally pragmatic and contextual science, we stand a better chance of producing epidemiological knowledge truly useful for preventing disease, promoting health equity and advancing the public's health. Doing this work, as Morris forcefully points out in his latest contribution—a 2007 study (!) on 'Defining a minimum income for healthy living'⁶²—is 'directly in the tradition since World War II and the establishment of WHO for official acceptance of attainable levels of health as a human right and a prime goal of society' (p. 5).⁶² What better use of epidemiology is there?

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Calculating health and social change: an essay on Jerry Morris and *Late-modernist* epidemiology

Dorothy Porter

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The 50 years since Jerry Morris published his seminal work on *Uses of Epidemiology* in 1957¹ have witnessed significant transformations in and for the discipline of epidemiology. Not only have there been internal intellectual changes but significant transformations have also taken place in the external relations of the discipline. That is, the relationship of the discipline to the social and political environments of health that it dissects, constructs and is constructed by. Morris' foundational book, and the essay bearing the same name he published in the *British Medical Journal* 2 years earlier,² created a platform for the discipline that linked epidemiological knowledge and the rational values on which it was based overtly to its function in the social reform of health.³ Values and functions were integrated by Morris in the deconstruction of the 'burden of disease'; the use of population analysis as an aetiological method; in providing evidence on which to base clinical decision making; and in the analysis of needs in relation to the structure of public health and medical services provision. (The seven uses of epidemiology were identified by Morris as: demonstrating historical change; community diagnosis; identifying risks to individuals; analysis health service provision and needs; completing the clinical picture of disease; identification of syndromes; and discovering causes through observation of populations. Morris JN, *The Uses of Epidemiology*

(London: Livingstone, 1957); Morris JN, The uses of epidemiology, *Br Med J* 1955; 395–401.)

Morris' vision anticipated the major developments that would occur within and be critically linked to the discipline over the next five decades, such as the establishment of evidence-based clinical medicine.⁴ What I examine in this essay is how that vision signalled the emergence of a *late-modernist* epidemiological paradigm in Britain in the 1950s. The philosopher of science, Ian Hacking, identified the institutionalization of probabilistic thought not only within the modern disciplines of the natural sciences in the 19th century, but also in the social and political management of industrial societies as a definitional characteristic of cultural modernism.⁵ His analysis defined cultural modernism as the establishment of the social authority of statistical reasoning from the early 19th century. He also argued that this authority was dependent upon a positivist model of scientific reasoning in industrial societies—a legacy of Enlightenment rationalism. In this essay, I am in agreement with Hacking and with the medical anthropologist Vincanssne Adams that the institutionalization of the legitimate/political authority of positivist social statistics in health management in industrial societies is one of the defining characteristic of cultural modernism.⁶ I would also argue that the process that Hacking specifically discusses is the emergence of statistical-cultural modernism in the first stages of industrialization.

Department of Anthropology, History and Social Medicine, University of California, San Francisco, CA, USA. E-mail: PorterD@dahsm.ucsf.edu