



The role of epidemiology in graduate medical education

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The field of epidemiology:

Epidemiology is considered the foundation science of public health. Although a relatively young science,¹ epidemiology has played an important role in the control of human epidemics, the identification of etiologic factors in both infectious and chronic diseases, and the provision of tools necessary to evaluate public health control programs.

Epidemiology has been defined as "the study of the distribution and determinants of health-related states or events in specified populations, and the application of this study to control of health problems".² Epidemiologists focus on human populations rather than on individuals. A basic tenet of epidemiology is that health related events do not occur randomly in the population; by studying how these events are distributed in the population, one may discover etiologic clues.

A central task in epidemiology is the measurement of disease occurrence within the population. The epidemiologist describes the distribution of a health related event in terms of person, place, and time. Hence information is needed not only on the number of disease cases, but it is also necessary to identify and enumerate the population at risk.

Epidemiology compares diseased with non-diseased persons in the population to assess differences in one or more exposure factors; it also compares exposed to unexposed persons to identify associations with disease. The application of epidemiologic principles demonstrated the role of smoking in lung cancer, coronary heart disease, chronic obstructive pulmonary disease, cerebrovascular disease, peripheral arterial occlusive disease, and many other negative health outcomes. Perhaps this is a classic example of the importance of epidemiology.

With the recognition of new pathogenic agents and "emerging" infectious diseases such as HIV/AIDS, Ebola hemorrhagic fever, Legionnaire's Disease, Lyme Disease, Hantavirus Pulmonary Syndrome related to Sin Nombre Virus, West Nile encephalitis in the U.S., and Bovine Spongiform Encephalopathy, the importance of infectious disease epidemiology has been underscored. The popularity of Laurie Garrett's *The Coming Plague*³ and Richard Preston's *The Hot Zone*⁴ clearly demonstrate the layman's fascination with infectious diseases and the epidemiologic process.

The "epidemiologic" perspective has led to the development of unique methodologic approaches, which have been successfully applied to delineate etiologic factors in newly identified syndromes, such as Toxic shock syndrome, Reye's Syndrome, Eosinophilia myalgia syndrome, and AIDS.

In clinical practice, even the busiest clinician may interact with only a finite number of patients; in contrast, as the population is the "patient" for the epidemiologist, there is a much wider potential influence. A clear example is that of the eradication of smallpox. Through intensive surveillance, immunization, and containment programs, smallpox, an endemic illness with an estimated global incidence of 10-15 million in 1967, was officially declared "eradicated" by the World Health Organization in 1980. The eradication of poliomyelitis is now a goal being actively pursued by the international epidemiologic community.

Until the 1970s virtually all epidemiologists were physicians, studying the distribution of various diseases. Today, however, epidemiology is a separate and unique field of study. "Being either a physician or a statistician, or even both simultaneously, is neither a necessary nor sufficient qualification for being an epidemiologist. What is necessary is an understanding of the principles of epidemiologic research and the experience to apply them."¹

Epidemiology training options for physicians:

The training of physicians in epidemiology follows different tracts: the U.S. Centers for Disease Control and Prevention (CDC) offers a unique "applied" training experience: the Epidemic Intelligence Service (EIS). Admission into the EIS is highly competitive. EIS Officers participate in a two year on-the-job training program that focuses on mastering applied epidemiologic skills such as conducting outbreak investigations and public health surveillance activities. Although the greatest proportion of EIS trained physicians stay with the CDC after completing their training, many go on to careers as epidemiologists or public health physicians within local or state departments of health, or other federal, or international agencies. Others go into academic medicine or public health, and many go into private or hospital-based practices.

Physicians who desire more "classical" academic training in epidemiology may pursue an MPH or MS degree in epidemiology. The MPH degree is seen as a public health "professional" degree and as such involves learning epidemiologic concepts within the broader public health context. Additional requirements include course work in the related fields of biostatistics, environmental health sciences, health services administration, and social/behavioral sciences. The MS degree is more of an academic or research degree, and focuses more on mastery of epidemiologic and biostatistical methods.

Preventive medicine residency training is another option for post-graduate training in epidemiology and public health. The residency training program is three years in length. The first year includes completion of one year of clinical training in a primary care specialty; the second year includes completion of an MPH degree; and the final year is dedicated to a supervised preventive medicine/public health practicum.⁵

A number of academic institutions offer joint MD/MPH degree programs. These programs are geared towards preparing physicians for a career in public health. The program usually takes five years to complete, with the insertion of a 12 month MPH curriculum between the second and third year of medical school.⁶

Medical students planning a career in academic medicine or a research institution may consider pursuing a dual MD/PhD degree. These programs generally require seven years to complete, with three years of research intensive PhD training placed between the

second and third year of medical school.

Clinical research training programs are also available within selected schools of medicine. In these programs, epidemiologic research methods are introduced and applied to the clinical setting (as opposed to the wider population-based focus of public health). Stephen Hulley's *Designing Clinical Research*⁷ emphasizes the value of epidemiology to the physician engaged in clinical research.

But one needn't be a physician researcher to benefit from an understanding of epidemiologic concepts: the ability to critically read the medical literature is dependent to a large extent upon an appreciation and understanding of epidemiologic principles. David Sackett's *Clinical Epidemiology*⁸ underscores the value of epidemiology to the practicing physician. In addition, The British medical journal *The Lancet* has recently embarked upon an 11 week series (commencing 5 January 2002), to address the application of epidemiology to clinical practice and the critical review of published manuscripts.⁹

Epidemiology training at the University of Hawaii:

The John A. Burns School of Medicine (JABSOM) currently offers both the MPH and MS degrees in epidemiology through the Department of Public Health Sciences and Epidemiology. Although 40 credit hours are normally required for completion, students with extensive background in their specialization and/or research methods (such as practicing physicians or current fellows) may graduate with 30-34 credits. Physicians and fellows may be able to complete the MPH degree program in one calendar year, while most students complete the MPH in 16-20 months. The MS degree generally takes more time to complete due to the written thesis requirement.

Although an Accreditation Council for Graduate Medical Education (ACGME) accredited preventive medicine residency training program is currently unavailable at JABSOM, there is interest in developing a new program in the future as the University of Hawaii rebuilds its academic program in public health.

JABSOM is in the planning process of developing joint MD/MPH and MD/PhD programs for select medical student to pursue concurrent, advanced academic training in epidemiology. The MD/MPH program would take at least five years to complete, while the MD/PhD program would take at least seven years to complete. An epidemiologically-based master's degree and certificate program in clinical research is also in the planning stages.

Epidemiology has a vital role in graduate medical education. Its successful applications are necessary for quality clinical research and the critical appraisal of published research manuscripts. Although it is not necessary for all physicians to become epidemiologists, in order to attain "scientific literacy", it is absolutely essential that all physicians familiarize themselves with epidemiologic methods and principles.

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