



CHAPTER ONE

EPIDEMIOLOGY IN HEALTH CARE ADMINISTRATION

Chapter Outline

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Philosophic Framework
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The Concept of Populations and Communities
Managing Health Care for Populations and Communities
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Learning Objectives

Upon completing this chapter, the reader will be able to do all of the following:

- Define epidemiology
- Discuss the history of epidemiology
- Define managerial epidemiology
- Discuss the distinction between observational and experimental epidemiology
- Describe the uses of epidemiology
- Describe the field of social epidemiology
- Discuss the concept of populations and population health care management

Introduction

Epidemiology is recognized as a core discipline within the field of public health. It is a unique discipline that formally began as a result of the sanitary reform movement in seventeenth- and eighteenth-century England. Epidemiology is formally defined in a number of ways. First, epidemiology is the study of the distribution and determinants of diseases and injuries in human populations (Mausner and Kramer, 1985). A second definition emphasizes the study of all factors that affect the occurrence of health and disease in populations and their interdependence. Finally, epidemiology is the study of the distribution and determinants of health-related states and events in defined populations and the application of this study to the control of health problems (Last, 1995).

Common to all of these definitions is the concept of populations. Individuals are not the focus of epidemiology; *groups* of individuals are. Populations may represent large groups, such as the total population of the United States, or small groups, such as the employees of a factory, store, or government agency. Central to the concept of populations is that groups of individuals exhibit certain commonalities. For example, a group of individuals who are related geographically, such as those living in the same city, represent a population. A group of individuals who work in the same setting are a population. And a group of individuals who live and work together are a population, as in the case of military personnel. Groups of individuals of the same race or ethnic group are also considered populations.

Historically, epidemiology is a discipline that has experienced long and distinct development stages. It is reasonable to think that epidemiology began when humans first walked on earth. Darwin's theory of the "survival of the fittest" can be extended to assume that early humans acquired, over time, an understanding of the relationship between environment and health. One simple example is the use of animal hides and furs as protective clothing.

The relationship between the environment and health and disease is mentioned in the Old Testament. However, it wasn't until the Greek civilization was established that epidemiology began to emerge as a scientific discipline. Hippocrates (460–377 B.C.) wrote the classic work "On Airs, Waters, and Places," the first known treatise on what is referred to today as environmental epidemiology. His writing discussed the link between the environment and human health. Hippocrates provided accurate descriptions of the diseases tetanus, typhus, and phthisis (Singer and Underwood, 1962). His contribution, which is also the first documented use of observational techniques, earned Hippocrates the title of "father of epidemiology" and the designation as the first epidemiologist (Newcomb and Marshall, 1990).

In the 1600s, John Graunt developed the demographic approach to health and disease investigations. Graunt used quantitative methods to study sex differences in deaths and diseases, geographic differences in death rates (rates were found to be higher

in cities), and age differences in death rates (infant mortality rates were high). His work represents a significant advancement in epidemiology from an observational to a quantitative discipline, and Graunt is considered the founder of the discipline known as demography (Dupaquier and Dupaquier, 1985). His work is referred to as the starting point of modern epidemiology (Newcomb and Marshall, 1990).

Another seventeenth-century epidemiologist was Thomas Sydenham, who is called the English Hippocrates (Meynell, 1988). Sydenham reemphasized and expanded the theories of Hippocrates. He was the first to describe the clinical manifestations of the condition known as Bell's palsy. He reinitiated scientific observations of health, Hippocrates' contribution, into the core fabric of modern epidemiology.

Medical registration of deaths began in Great Britain in 1801. William Farr (1807–1883), a statistical abstracter in the General Registry Office in London, established a national system of recording causes of death (Eyler, 1980). This standard classification system was the precursor to the International Classification of Diseases and Related Conditions (ICD). Farr's other contributions included involvement in the first modern census, use of the census to collect specific information on diseases and conditions (blindness and deafness), and invention of the standardized mortality rate (Newcomb and Marshall, 1990).

A colleague of William Farr, John Snow, used epidemiologic principles to study outbreaks of cholera in London in the 1850s (Lilienfeld, 2000). Snow demonstrated how scientific evidence can be used to support hypotheses and analytic investigations. He identified the source of the infectious agent, contaminated water, and the etiology of the cholera outbreak (Collins, 2003). His work has been described as a brilliant use of descriptive and quantitative epidemiologic principles (Winkelstein, 1995).

The years leading up to World War II marked the beginning of another important period in the development of epidemiology as a scientific discipline. Epidemiologic methods continued to evolve, with a focus on individual diseases and conditions. The case-control study design was developed during the 1930s. Cohort studies were pursued to observe the relationship of tobacco use and disease. Case-control studies became very popular in hospital-based studies, beginning around 1950 (Levin and others, 1950; Wynder and Graham, 1950; Doll and Hill, 1950). Since then, epidemiology has continued to develop as cohort studies and clinical trials have gained popularity. Well-known cohort studies include the Framingham Heart Study (Gordon and others, 1977) and the Bogalusa Heart Study (Voors and others, 1976).

At the dawn of the twenty-first century, epidemiology has begun to expand its focus to health status, health-related quality of life, and burden of disease. As a result of the terrorist attacks on the United States on September 11, 2001, epidemiology has taken on new roles in bioterrorism preparedness and management of health care services. With the significant number of emerging infectious diseases (including AIDS and SARS), epidemiology's initial role in the study of epidemics will regain prominence.

Philosophic Framework

Our population-based perspective on epidemiology lends itself quite well to the objectives of health care management in the twenty-first century. These new objectives—focused on populations, not individual patient care—have forced a modification in the focal point of the science of epidemiology, which calls for the specialized concentration known as managerial epidemiology. Managerial epidemiology is one result of the contemporary demands of epidemiology and has become the core discipline for planning and managing health care for populations. A functional definition of managerial epidemiology—the use of epidemiology for designing and managing the health care of populations—is the study of the distribution and determinants of health and disease, including injuries and accidents, in specified populations and the application of this study to the promotion of health, prevention, and control of disease, the design of health care services to meet population needs, and the elaboration of health policy.

This adaptation of epidemiology to a managerial focus has been nurtured by many different external forces. One set of forces is the transition from a traditional role of the health care executive to a population orientation. The traditional role of the health care executive has been in a facility context, encompassing such general management functions as planning, organization, leadership, and control. These functions all emphasize the management of facilities and personnel that provide health care services. Planning involves many activities, but in general, it is the determination of courses of action for individuals and organizations. Organization is essential for the coordination of activities and resources, both human and physical. Leadership is centered on the ability or skill to motivate and manage people. Control involves monitoring and periodically evaluating these activities.

The discipline of health care management continues to evolve from the individual patient perspective toward a managed population perspective. The current stage of evolution is highlighted by management of a network of services, management across traditional organizational boundaries, and management of the continuous improvement of quality of care (Shortell and Kaluzny, 1997).

The primary evolutionary pressures on the discipline of managerial epidemiology are cost containment and an underlying desire to maintain and improve the quality of health care. Epidemiology has emerged as a primary discipline in achievement of the population-oriented objectives of health care management.

Focus and Uses of Epidemiology

Epidemiology initially centered on observations and descriptions of health and disease and factors associated with health and disease. During its maturation into a science, experimental considerations were added to the discipline in the twentieth

century. Over time, epidemiology developed a specificity for individual diseases, etiologic constellations (injury, chronic disease, and infectious disease epidemiology, for example), and situational uses (including environmental, occupational, molecular, and managerial epidemiology). Both observational and experimental aspects are characteristic in all of the uses of epidemiology.

Observational Epidemiology

Observational epidemiology involves the observation of health and disease in a population and the analysis of these observations. Observational study activities are the most common in epidemiology. Observational study methods include descriptive studies, historically the first type of epidemiologic study, and analytic epidemiologic study designs (cross-sectional, cohort, and case-control designs). Cross-sectional studies measure the prevalence of health and disease in a population. Cohort and case-control studies measure the incidence and risk of health and disease in a population. Chapter Four presents a thorough discussion of these concepts.

Experimental Epidemiology

Experimental epidemiology is concerned with planned studies in which the exposure to potential health and disease risk factors is controlled. The objective of this method is to improve the validity, or accuracy, of epidemiologic studies. Exposure to potential risk factors is accomplished by random assignment. This randomization is used to avoid bias in the study and to ensure validity. Clinical trials are the most commonly used experimental study design. Chapter Four discusses experimental epidemiology in greater detail.

Preventive Medicine

Epidemiology and medicine have always been linked as scientific disciplines. Epidemiology is an important tool of community health and preventive medicine. Specific uses of epidemiology have included determining etiologic or causal factors of diseases; describing factors that are associated with adverse conditions; community diagnosis of the distribution of disease; predicting disease occurrence, impact, and distribution; estimating the individual risk of suffering from diseases; evaluating preventive therapeutic and intervention activities; measuring the efficacy of health measures; studying historical disease trends; identifying disease syndromes; planning for current health needs; and predicting future needs.

Epidemiology plays a major role in controlling the distribution, frequency, and severity of disease in populations. This is accomplished through prevention of new cases (known as primary prevention), as well as by eliminating existing disease profiles

and improving the health status and survival of individuals with those diseases (known as secondary and tertiary prevention). Primary prevention involves the removal or modification of intrinsic and extrinsic factors that effect a change in health status from absence of disease to preclinical disease. Primary preventive measures include health promotion and specific preventive measures. Health promotion involves health education and the provision of conditions that influence health (adequate food, housing, clothing, and so on). Specific preventive measures target diseases and groups of individuals, often based on the risk of acquiring a disease. These measures include purification of water supplies, immunization, protection from occupational hazards (for example, proper clothing and protective equipment), and protection from accidents (seat belts, for example).

Secondary prevention, which involves screening, early disease detection, and early treatment, often allows for the reversal or delay of the progression from preclinical to clinical disease. This is particularly beneficial in diseases for which control measures exist, such as hypertension. Tertiary prevention involves arresting the progression from clinical disease to disability and reversal of progression from disability to death, with restoration of function through rehabilitation.

Current Issues in Health Care Administration

The health policy experiments of various states, and the periodic policy debates at the federal level, focus on the evaluation and reformation of the manner in which health is promoted and disease and associated disability are controlled in the United States. The notions of improved or even universal access to more comprehensive and cost-effective health care services and the reduction of unnecessary or unproven services are central to such health system reform discussions. Understanding the health status and needs of populations is essential to the proper planning and organization of the health care system.

Contemporary reform of the U.S. health care delivery system from a federal standpoint began in 1965, when Title XVIII of the Social Security Act Amendments created Medicare and Title XIX created Medicaid. Medicare provided financing of health care services for citizens over the age of 65 and for the disabled. Medicaid provided financing of health care services for the medically indigent. These programs were driven by the concept of social equity and represent the first time that the federal government became involved with the financing and delivery of health care services for the general population.

In 1973, Congress passed the Health Maintenance Organization Act, which encouraged the formation and proliferation of health maintenance organizations (HMOs). The intent of this legislation was cost containment. The federal government

began to recognize that the HMO model, when successful, reduces the cost of providing health care services and can motivate secondary and even primary prevention activities. This reform movement emphasized the federal government's concern with the cost of health care. A major change in the Medicare program occurred in 1982 with the creation of the prospective payment system (PPS). PPS was created by an act of Congress and focused on in-hospital Medicare charges (often known as "Part A"). A result of PPS was the establishment of diagnosis-related groups (DRGs) to permit the comparison of like admissions and the regulation of their cost. In 1990, Medicare was further reformed with the establishment of the resource-based relative value scale (RBRVS) for reimbursement of physician services (often known as "Part B"). RBRVS is an extension of PPS, and its intent is also cost containment. In 2000, additional PPS efforts were implemented by Medicare's mandate to use the ambulatory patient classification (APC). Payment for services under the outpatient PPS system is based on combining outpatient services into APC groups.

Current initiatives in health policy have centered on the provision of prescription medications and access to care for the uninsured. Medicare coverage has not included a benefit for outpatient prescription medication. The result has been that a significant proportion of elderly Americans must purchase medications using out-of-pocket resources. The latest information suggests that 86% of Medicare beneficiaries use prescription medications (Davis and others, 1999). In addition, about 35% of Medicare beneficiaries have no prescription medication insurance coverage. The Medicare Prescription Drug, Improvement, and Modernization Act of 2003 (Public Law 108-173) is intended to provide access to prescription drug coverage for seniors and individuals with disabilities for the first time in the history of the Medicare program.

Another segment of the population that has been targeted by health policy is children. In spite of Medicaid coverage, a significant number of children are uninsured. Congress passed the Balanced Budget Act of 1997, which created the State Children's Health Insurance Program, referred to as SCHIP. This program is intended to cover children of families who earn too much to be eligible for Medicaid benefits. It is similar to Medicaid in that each state administers its own unique program. Common services covered are physician office visits, immunizations, hospitalizations, and emergency room visits. That same year, Congress passed legislation that allows states to provide health insurance to more children in working families. These programs build on the Medicaid program that started covering children and adults in the mid-1960s. The Children's Health Insurance Program (CHIP) provides health insurance to children free or at low cost through state-sponsored programs. The costs vary by state and by family income, but when there are charges, they are minimal. Depending on income level and the specific state program, it may be possible for an entire family to receive health insurance.

Because health care reform activities will continue, understanding the health status of populations is a crucial success factor for health care executives. The health

status of the population is dependent on the environmental conditions, socioeconomic factors, and the structure of the health care system. Future health policy efforts should focus on recognition of the health care needs of the population, with emphasis on services and programs associated with disease prevention, chronic disease, and long-term care, as well as acute care. This can occur by refocusing efforts and objectives of the health care system to promote quality of care, quality of life, and quality of physical function of individuals in the population.

Health care reform efforts inevitably result in a deviation from the traditional public health disease prevention and intervention model, which focuses on communicable and infectious diseases. Public health has begun to direct some of its efforts to behavioral interventions that are designed to reduce smoking, substance abuse, violence, risky sexual behaviors, and obesity. Disease screening, prenatal and child care, health education, and immunization have garnered increased attention. Planning and implementation of such services does not focus on the individual but is centered at the community or larger population levels.

The Concept of Populations and Communities

The concept of populations was first documented in the seventeenth century and has recently grown in its application to health care administration. A population is not defined by a fixed, standard number of individuals but by the specific group under study. It is common to associate the concept of a population with the total population, but subpopulations are more often the concern. The students in a school constitute a population, as do the students in a classroom.

Populations are typically defined by geographic boundaries—for example, residents in a country, regions of a country, states, cities, and sections of a city. Within these geographically circumscribed populations are specific subpopulations defined by age, sex, race, and other characteristics. This method of population definition occurs, in part, due to the ease of identifying population membership and the existing infrastructure for health and disease data collection. Geographically defined areas usually correspond to political or governmental units, with their associated public health agencies.

Subpopulations are the basic unit of comparison in epidemiology. The risk of acquiring a disease is studied across subgroups within a population. In a managed care environment, knowledge of health and risk of disease across subpopulations provides essential information for the actuarial estimation of prevention and treatment costs. Managed care focuses on the identification of health and disease characteristics of groups of individuals in a population of covered lives.

An important consideration is that populations differ; traditional methods of measuring health in populations assume that populations are homogeneous (Tsevat, Slozan,

and Kuntz, 1996), but this is not the case. Populations can be divided into several categories based on many variables, in addition to demographics. These different categories of patients are correlated with differing health care needs and associated differences in the utilization of health care resources (Kindig, 1997).

An emerging field in epidemiology is social epidemiology. Social epidemiology is defined as the “study of the social distribution and social determinants of states of health” (Berkman and Kawachi, 2001, p. 35). The aim of social epidemiology is to identify socioenvironmental exposures that may be related to physical and mental health outcomes. The principal concern of social epidemiology is the study of how society and social organization influence the health and wellness of individuals and populations. In practice, social epidemiology studies the frequency, distribution, and social determinants of the states of health in a population. Social epidemiology links the traditional epidemiologic concepts with those from economics, sociology, demography, and biology.

Social epidemiology is attempting to explain the pathway between exposure to social characteristics of the environment and its effects on health. Social epidemiology allows for the incorporation of the social experience of populations into the traditional etiologic cause-and-effect relationship. This incorporation allows for a better understanding of how, where, and why social inequalities affect health.

Managing Health Care for Populations and Communities

Encouraged by the rapid growth of managed care, health care managers are in a transition from the traditional role of management to a population health care management model. A population-based orientation is new to many health care executives and will require an additional set of management skills. The “reformed” health care executive will directly interact with the community and its health insurance vehicles in the planning of medical services to be delivered, including allocation of human and material resources to preventive, curative, restorative, and rehabilitative services. The executive’s duties include the design of medical interventions and the monitoring and evaluation of medical services and programs. Clinical outcome measurement and comparison will become a major source of information for management decision making. Population health care design and planning will gain importance in the evolving integrated delivery systems of the future.

Due to the community-based nature of health care, the population in a hospital service area can be challenging to describe. By definition, a community is all the people living in a particular area. These people are either loosely or closely associated due to political or economic advantage. Given the combination of the varying characteristics of a community, the different independent providers in an area, and the choice behavior of the consumers of health care, understanding the needs and concerns of the population is a difficult task. Population information is indispensable

for planning and targeting the needs of the community. Administrative claims data, disease registries, and clinical information systems are valuable sources of current data for health care executives.

The overall health status of the population is an important concern of the health care executive in the population health care management model. Understanding patterns of health and disease in the population allows for appropriate planning for services and programs to meet legitimate health care needs. Cost containment, with the resulting health promotion and preventive services emphasis of portions of the delivery system, promises at last to align social and economic objectives, such that improving the health of the population has become a measurement of success for integrated providers in the health care system. Contemporary health care executives must be able to acquire data and understand the community by conducting their own investigative studies on the populations served. Such knowledge will be essential to profitability in fully capitated, full-risk-assumption models of care.

Objectives of the population health care management model focus on the health of the population and cost containment. Efforts to reduce utilization, which are not emphasized in the facility-based management model, and to shift utilization to low-cost facilities (for example, outpatient settings or home care) are critical executive concerns under conditions of population-based management. Another objective of population health care management is to organize and align providers in network schemes. Clinical improvement focuses on improving the health status of the population and the integration of care across all settings and all providers. Quality of care is documented and studied, and efforts are made to continually improve quality measures.

The change in the role of management is manifested by the modification of management objectives. In the traditional role, management's objectives include the maintenance of high-quality facilities and equipment, achievement of clinical improvement by attracting the "best-quality" health care providers, and increase in market share and volume of delivered services across populations.

In the population health care management model, the management objectives change to include the reduction in volume of services utilized, shift of utilization to lower-cost settings, achievement of clinical improvement by focusing on the health status of the population, integration of health care services, organization of providers into networks, and evaluation and documentation of quality.

The Role of Epidemiology

Epidemiology will play a major role in the twenty-first-century management of health care systems. The evolving nature of health care administration will forever require the principles and application of epidemiology due to the population-based perspective, as

is seen in the managed care model. Information about the prevalence of disease and disability in the population will serve as the obvious focal point for planning health care services and organizing health care delivery systems. Likewise, the insurance concept of community rating relative to risk of disease and hospitalization is founded in epidemiology and is dependent on epidemiologic data.

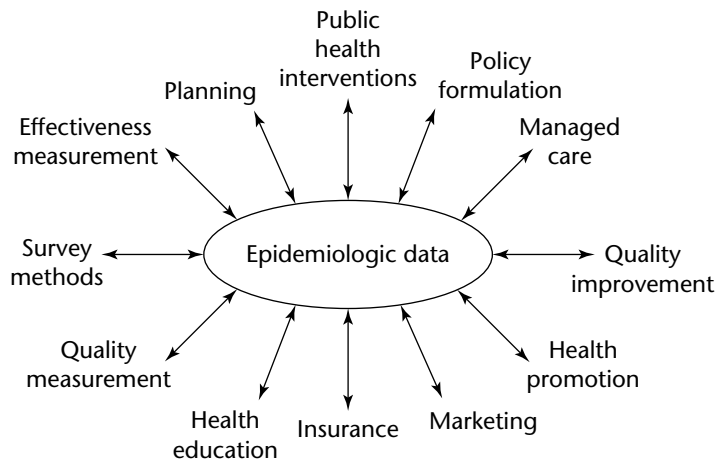
With the continuing threat of emerging infectious diseases, epidemiology will gain renewed prominence in assisting health care managers. New diseases, along with some previously thought to be eradicated, will become common in hospitals and other health care facilities. Severe acute respiratory syndrome (SARS) is a very specific concern. Most cases of SARS have occurred after close contact with SARS patients. The largest number of infected persons was among hospital workers or other types of caregivers. In spite of infection control measures, SARS transmission occurred across many hospital workers. A case-control study of hospital workers in Hong Kong indicated that inconsistent use of goggles, gowns, gloves, and caps was associated with a higher risk for SARS infection. Infection is strongly associated with the amount of personal protection equipment used, the duration of infection control training, and the level of understanding of infection control procedures (Lau and others, 2003). These requirements are known as “universal precautions” and are a mandatory training activity for human resource departments in order to be in compliance with OSHA standards.

Epidemiologic data and information will be crucial for health care managers. Epidemiologic data have become a useful source of information that can guide managerial decisions and outcomes. The relationship of epidemiologic data to the many aspects of managerial epidemiology is illustrated in Figure 1.1.

Summary

Epidemiology—once viewed by health care executives as a fringe element of public health—is in fact an essential discipline for the management of contemporary health systems. Knowledge of health and disease in a population is as important to the health care executive as it is to the public health officer. The ongoing evolution of health care administration requires additional disciplines and tools. Epidemiology provides a wealth of principles and applications that will affect planning, marketing, quality control, and policy formulation, which are fully dependent on epidemiologic data.

The perspective of management in the health care industry is changing from a fee-for-service, individual-patient-encounter, facility-based perspective to managing the health of populations. This population orientation of health care management requires a communitywide understanding of health and disease, with the health care executive participating directly in planning medical services and other interventions.

FIGURE 1.1. EPIDEMIOLOGIC DATA.

Cost containment (through reduction in utilization of services) and improvement of the overall health of the population are important objectives of the population-based management model. Emerging infectious diseases and the threat of terrorism have resulted in epidemiology becoming thoroughly incorporated into health care administration.

Epidemiologic data are needed to plan and design health care systems, based on communities and groups of communities. Knowledge of epidemiology and an understanding of epidemiologic data are basic requirements for the successful health care executive. The following chapters will introduce terminology, measurements, and techniques of epidemiology. In addition, specific applications to health care management, health care planning, and health care policy will illustrate the benefits of using epidemiology in health care management.

Study Questions

1. Define epidemiology. Give an example of the use of epidemiology, based on this definition, in solving a health care management problem.
2. Discuss epidemiology from a historical perspective. What is the expected next development in epidemiology as a scientific discipline?
3. Identify five other uses of epidemiology, and cite a health care management example of each use.
4. Discuss why health care managers should use population-based data for planning.