

AN INTRODUCTION TO MANAGERIAL EPIDEMIOLOGY

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Epidemiology is the study of the distribution and determinants of disease in human populations. Epidemiology has developed the tools by which we (1) measure the burden of disease in specific populations, (2) determine differences in the burden of disease between populations, (3) explore the origins or causes of differences in disease burdens, and (4) determine the effect of treatments and interventions on reducing the burden of disease. In other words, we can think of epidemiology as the tools we use to determine everything we know about interventions, treatments, and healthcare services that affect the health of populations.

The term **population health** is a concept without a concise and consistently understood definition. According to some it refers to “the health of a population as measured by health status indicators and as influenced by social, economic, and physical environments, personal health practices, individual capacity and coping skills, human biology, early childhood development, and health services” (Dunn and Hayes 1999). Kindig and Stoddard (2003) define it as “the health outcomes of a group of individuals, including the distribution of such outcomes within the group.” The authors further argue that population health ought to be concerned not only with the determinants of health but also the outcomes of health within a defined population. For the health services manager, the breadth of that defined population depends on the type of organization with which he is affiliated, but such populations may include, for example, subscribers, patient panels of physicians, admissions to the hospital, patients, covered lives, or residents. However, increasingly, even within the medical care sector, the “population” refers to the community served by the healthcare organization.

This book examines ways to apply the principles and tools of epidemiology to the management of health services. Much like managerial accounting applies the principles of accounting to various management functions, this book applies the principles of epidemiology to the management of health services in populations.

Health services management can be described many ways. One common way is to list the functions that managers perform, describe them one by one, elaborate on the descriptions, and form connections. Rakich, Longest,

population health
The distribution of health outcomes among a defined group of people.

and Darr (2008) list the functions as planning, staffing, organizing, directing, and controlling. With each of these functions, health services managers must make decisions. For example, in the planning function, they decide which services they will provide and which they will not. As part of the staffing function, managers determine the skills required to provide specified services and decide on the type and number of staff needed to provide them. The organizing function requires managers to decide how various parts of the organization will relate to each other to maximize positive impact on health outcomes. As part of the directing function, managers provide vision and leadership to focus the organization on important goals. With the controlling function, managers determine if the organization is effective in producing the desired results. Each of these managerial functions requires decisions, and the decisions made in one functional domain almost always have consequences in other functional areas.

Managerial epidemiology uses the principles and tools of epidemiology to help managers make better-informed decisions in each of these functional domains; that is, *managerial epidemiology* is the application of the principles and tools of epidemiology to the decision-making process. The first edition of this text was organized specifically around the functions of a manager and devoted only one chapter to descriptive epidemiology. The second edition expanded descriptive epidemiology to four chapters, included longer case studies integrated into the text, and added application chapters on cardiovascular disease, HIV/AIDS, and Alzheimer's disease. This third edition includes end-of-chapter exercises for most chapters, 15 capstone cases at the end of the book, and a chapter on leadership.

This book is organized into four main parts. Descriptive epidemiology is covered in Part I (Chapters 2 through 7), with specific applications to healthcare planning and quality of care. The application of epidemiology to financial management is discussed in Part II (Chapters 8 and 9). Part III, on evidenced-based decision making, comprises Chapters 10 through 14. Part IV provides three chapters of application by describing in epidemiological terms three diseases important to modern society. Part IV also includes a new chapter on epidemiology and leadership. Part V provides 14 in-depth capstone case studies that focus on most of the chapters in the text.

Chapter 2 provides an overview of disease transmission and control, with a specific focus on infectious diseases. This includes the relationship between agent, host, and environment; concepts of disease transmission, incidence, and prevalence rates; the various kinds of epidemics; and methods to prevent and control disease. The two case studies in this chapter are about a food poisoning outbreak at the fictitious Bluegrass Hospital and an outbreak of influenza in a New York nursing home.

Chapter 3 deals with the measurement and interpretation of morbidity data, including the nature, definition, and natural history of disease, and

sources of morbidity data. This chapter focuses on describing the important characteristics of diagnostic and screening tests. The three case studies in this chapter address developing product lines for a managed care organization, comparing the performance of digital and film mammography screening, and evaluating the performance of two different methods of prostate cancer screening executed in sequence.

Chapters 4 and 5 show how descriptive epidemiology applies to two important functions of a manager: planning and quality measurement. The application of epidemiology to planning is the topic of Chapter 4. Here the authors differentiate between community and institutional planning, discuss human resources planning and healthcare marketing, and summarize the basic principles of needs assessment. Two case studies are integrated into the text, discussing community health planning for a managed care organization in eastern Kentucky and determining bed demand for cardiac care in a new hospital construction project. Chapter 5 applies epidemiologic principles to quality of care issues. The chapter discusses the various ways quality can be assessed using epidemiologic measures and explores the concepts of rates, surveillance, risk adjustment, and quality measurement using various quality indicators. Ambulatory care-sensitive conditions (ACSCs) and avoidable hospitalization rates are discussed as measures of quality within the context of managed care. Finally, the chapter explores ways in which epidemiology can play a fundamental role in total quality management. The three case studies woven into this chapter include one on methicillin-resistant *Staphylococcus aureus* surveillance at a university hospital, another on complication rates in a small rural hospital, and a third on inpatient quality-of-care indicators at Bluegrass Hospital.

Chapter 6 concentrates on mortality and discusses the sources and measurement of mortality data, methods for standardizing mortality rates by age, and the process of risk-adjusting mortality rates. Four case studies are included in this chapter: one that compares breast cancer mortality rates among immigrants and emigrants to/from Australia and Canada, one dealing with standardizing mortality rates for both age and gender, a third examining risk-adjusted mortality using contingency tables in Pennsylvania, and a fourth on risk-adjusted mortality using the multivariate approach of New York State.

Chapter 7 focuses on descriptive epidemiology in terms of measuring morbidity and mortality burden across time, place, and person, and includes discussion of spot maps, clusters, and geographic information systems (GIS). Case studies in this chapter address infant mortality disparities by race and using GIS to decide where to locate an HIV clinic in Kentucky.

Chapter 8 reviews the principles of epidemiology as they relate to financial management. Here the authors thoroughly discuss the concept of risk, differentiate between the kinds of risk (or exposure) facing the patient, and describe the capitation environment. In addition to a discussion on the basics of capitation and risk adjustment, the chapter suggests ways of using

morbidity and risk factors to adjust capitation rates. Case studies in this chapter discuss incorporating risks into capitation rates and how a managed care organization could adjust for smoking and obesity in its capitation rates.

Cost-effectiveness analysis (CEA) is described in Chapter 9. The discussions include the process of program specification, measuring costs and effectiveness (including quality-adjusted life years), controlling for biased estimates and uncertainty, and choosing among programs using cost-effectiveness ratios. Case studies in this chapter include the Oregon Medicaid Prioritization of Health Services Program, the cost-effectiveness of health insurance, and a CEA for targeted or universal prostate cancer screening.

Chapter 10 presents the basic statistical tools used in epidemiology and distinguishes between descriptive and inferential epidemiology, within the context of decision making for the healthcare manager. The chapter discusses the difference between continuous and categorical variables with measures of central tendency and variability for each type, and it describes various types of sampling methods. For inferential statistics, the authors discuss hypothesis testing, the concept of a p-value, and the distinction between type I (a) and type II (b) errors.

Chapters 11, 12, and 13 detail various epidemiologic study designs. Chapter 11 explores the case-control design by describing selection of cases and controls; the concepts of exposure, relative risk, and confounding variables; attributable fraction; and various kinds of bias, with a focus on misclassification bias. Prospective and retrospective cohort studies are compared in Chapter 12. The authors discuss selection, exposure, and relative risk within the context of a cohort study; the difference between attributable fraction and attributable risk; and the methods by which incidence is measured over time. Randomized clinical trials are the subject of Chapter 13, which includes the concepts of protocols, randomization, historical controls, crossover designs, and treatment effects. The authors also describe the importance of blinding, ethics, and integrity within the randomization process, the technique of meta-analysis, and the research design known as a community trial. Case studies in these chapters examine coffee and pancreatic cancer, smoking and low birth-weight newborns, smoking and prostate cancer, the Rand Health Insurance Experiment, and inpatient staffing at Henry Ford Hospital, among others.

Clinical epidemiology is the focus of Chapter 14. This chapter acquaints the reader with how physicians can use epidemiology to make clinical decisions. Having some familiarity with how physicians think can be useful and pragmatic for healthcare managers. In this chapter, the authors distinguish between tradition-based and evidence-based medical practice, where epidemiologic studies can inform the latter. The chapter describes the clinical encounter in terms of diagnosis, treatment, and prevention and discusses how epidemiology should provide the evidence necessary for rational decisions. Case studies in this chapter include making a diagnosis for a patient

presenting with chest pain; treatment options for a patient diagnosed with gastroesophageal reflux disease; prevention and control strategies; family history and numbers-needed-to-treat; and the use of clinical decision-making tools.

Chapters 15, 16, and 17 focus on the application of epidemiologic principles to three major diseases that incur a substantial burden on society, in terms of both human suffering and financial resources. Two of the diseases, cardiovascular disease and Alzheimer's, are classified as chronic diseases. The third disease, HIV/AIDS, is relatively new and has elements of both an infectious and a chronic disease. These chapters present a capstone experience for the reader with a focus on these three diseases. Case studies in these chapters include screening for coronary artery calcium using electron beam computed tomography, testing for HIV with the EIA test, the cost-effectiveness of HIV testing, and study designs for Alzheimer's disease, among others.

Chapter 18 and the capstone cases are integrative and summarizing. Chapter 18 considers how epidemiology provides the context by which both public health and healthcare leaders engage in decision making. The final section of the book includes 15 unrelated capstone cases. Students can use these large cases to review basic concepts from previous chapters. Instructors can employ these cases to teach basic concepts using a case study approach to learning.

Following is a detailed, multifaceted case study (with solution) involving a fictitious managed care organization in the Boston area. Throughout this text, the terms *managed care* and *managed care organization* are used to describe the 30-year movement to share risk between payers and providers to better align incentives. Managed care is the framework that supports Medicare Advantage plans, employer-based self-insured health plans with narrow networks or limited provider panels, and, most recently, accountable care organizations. The purpose of this case study is to convince the reader that managers need to embrace the methods of epidemiology. Step into Mr. Jones's shoes as he wrestles with the issues.

CASE STUDY 1.1. GROUP HEALTH EAST

Group Health East (GHE) is a 100,000-member managed care organization (MCO) located in southern New England. GHE is a mixed-model MCO affiliated with two large multispecialty groups—Physicians Associates (PA) and Bayside Multispecialty Group (BMS)—in addition to 500 individual physicians in the community. PA provides in-house

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services in the north clinic; BMS provides services in the south. GHE is affiliated with two major metropolitan hospitals in the Boston area. The CEO, Mr. Jones, is a 55-year-old hospital executive who crossed over into the managed care sector three years ago. GHE is going through a time of transition attributable to increased market competition, and it faces a number of important decisions that will affect its future. These decisions relate to organizational structure, staffing, incentives and performance appraisals, surveillance of adverse outcomes, strategic planning, and rate setting.

Each large GHE clinic maintains a functional organizational design with two main divisions—Support Services and Clinical Services—and separate departments in each division based on specific functions, such as housekeeping in Support Services and medicine in Clinical Services. An organization-wide medical staff, as well as separate medical staff organizations, practice at each of the two clinics. Based on his experience in large academic medical centers in the acute care sector, and on the recommendation of the system's governing board, Mr. Jones is considering moving to a matrix model organizational design, with separate product lines that affiliate with, and draw services from, the functional departments (e.g., nursing).

Mr. Jones is wrestling with a number of critical and fundamental questions:

- What are the advantages and disadvantages of a matrix model for GHE in terms of direct and indirect costs as well as benefits, such as improved coordination?
- How many product lines should the organization identify?
- How should the organization determine which product lines ought to maintain separate identities as part of the matrix design?

In the past, Mr. Jones has distanced himself from clinical issues, and he is unfamiliar with the disease burden of the enrolled population served by the MCO. However, he wants to make better use of the experts within the organization to provide him with the epidemiological input that he needs. What kinds of data are needed to make him better informed?

The move to a matrix model is expected to affect staffing in a number of significant ways. Although the new model is expected to

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improve efficiency with regard to coordination of services, the effect of the new organizational structure is unclear in terms of the number of employees needed, both professional and otherwise, by the organization. More specifically, Mr. Jones is worried that the new structure will increase the total number of required physician generalists and specialists. His concern is founded, at least in part, on the uncertainty associated with the new structure and physician productivity. The focus on product lines may also break the market into segments in ways that would increase the demand for services. In addition to these staffing concerns, the nurse practitioners in two of the five satellite clinics have voiced concerns about workload and the amount of time they can spend with each patient.

Mr. Jones is dealing with a number of critical staff questions:

- How can he estimate the number of affiliated physicians that will be needed to support the north and south clinics when the matrix model of organization is in place?
- Will the new structure increase or decrease physician productivity?
- What kinds of data are necessary to determine staffing needs for nurse practitioners at the satellite clinics?

A recommendation from the board has also moved GHE to consider restructuring the incentive and performance appraisal system, specifically for physicians. Based on the experience of US Healthcare, GHE would like to link capitation payments to outcomes. Currently, GHE negotiates separate capitation contracts with both PA and BMS, wherein the two groups are paid monthly per-member-per-month payments based on the total number of enrolled members for which each group is responsible. Separate capitation contracts are negotiated with other affiliated physicians in the community. GHE withholds 20 percent of capitation payments until the end of the fiscal year and returns all or part of that amount based on expenses in three categories: hospitalization, emergency room use, and out-of-plan specialty services. GHE would like to provide incentives for physicians to deliver good quality care by linking capitation payments to patient outcomes. Although Mr. Jones has resisted this idea, the board has insisted that he develop a plan based on performance appraisal. Since Mr. Jones has eschewed contact with the medical staff in the past, he

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approaches this challenge with some degree of trepidation. He has many questions:

- What aspects of performance, or quality of care, should be considered?
- Is it necessary to measure different outcomes for each type of physician specialist, or can generic outcomes be assessed?
- How will the outcome measures incorporate risk?
- To what degree should capitation payments depend on performance appraisal?
- Will performance appraisal be the responsibility of GHE, the group practices, or both?
- How will performance be assessed for the 500 individual physicians in the community?

For the last three years, GHE has retained most of the withhold payments because of substantial hospitalization expenses. This action has increased friction between GHE and the two physician groups. The director for hospital services has presented Mr. Jones with a case-mix breakdown by diagnosis-related group (DRG). The concern seems to be that many of the hospital episodes are potentially avoidable. GHE does not currently have a surveillance program that would flag these specific episodes, nor does it have a system to identify conditions that could result in hospital care if ambulatory care is deficient. The chief financial officer (CFO) calculates the potentially avoidable cost to be \$18.8 million. Dr. Practice, medical director for BMS, urges Mr. Jones to reduce these episodes by developing a more sophisticated system for targeting ACSCs that are at risk for costly hospitalization.

Mr. Jones faces a number of decisions:

- Which ACSCs need to be included in the surveillance system?
- How will these conditions be identified among the enrolled population?
- How will avoidable hospital episodes be monitored over time?
- How will GHE measure progress in this area?

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GHE has contracts with several of the largest employers in the Boston area and with 50 midsized businesses. Each employer contract is negotiated separately with past utilization primarily determining the capitation rates, although within companies the employees are assessed the same premium (i.e., they are community rated). The GHE board has urged Mr. Jones to become more proactive in setting capitation rates. More specifically, the board has encouraged him to include not just the estimated disease burden of the enrolled population, based on past experience, but also the burden of risk factors to which enrollees are exposed (e.g., obesity, smoking, and alcoholism).

Mr. Jones is puzzling over finding answers to a number of sensitive, but imperative, questions:

- How can the present and future disease burden of the enrollees be accurately measured or estimated?
- What are the significant risk factors of disease that can be measured?
- To what extent do they predict future morbidity?
- How should these risk factors be included in setting capitation rates?
- How feasible would such a rate-setting system be?
- To what extent would such a system affect profitability and market share?

In addition to all of these decisions, Mr. Jones is laboring over a five-year strategic plan. GHE has been well positioned in the market and is having difficulty meeting the demand for services at both the north and south clinics, and GHE enrollment has grown by 30 percent in the last five years. Moreover, the GHE plan has evolved to include a substantial number of elderly and poor members as the result of a decision made five years ago to accept Medicare and Medicaid risk contracts. Mr. Jones is concerned that the membership profile has changed over the last several years, and he does not know the effect this will have on the kinds of services promised to enrollees. The planning director, Mr. Thompson, has been a strong advocate of building a new clinic on the western side of Boston, where several large

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employers have been the source of thousands of new members in the last few years.

Mr. Jones has a number of questions at this point:

- What kinds of needs assessment approaches should be used at this juncture?
- What measures of morbidity can be used to predict the demand for clinic services?
- How should risk factors of disease enter into the needs assessment?

As part of the strategic plan, Mr. Jones is considering a major effort to reduce the proportion of members who are overweight or obese. Part of this initiative involves including such risk factors as obesity in capitation rates. The other part is a proactive, multiprogram, coordinated effort at weight reduction with financial incentives. Mr. Jones is curious about the extent to which obesity plays a role in various kinds of diseases.

He has a number of questions:

- What different kinds of studies support the relationship between obesity and disease?
- How can one tell the difference between a good study and a bad one?
- To what degree does obesity increase the risk of various kinds of disease?
- What proportion of various diseases can be attributed to obesity?
- Is it possible to calculate how much disease could be avoided if the obesity risk factor were reduced?

GHE faces substantial, probably painful, changes outside and within the organization. Mr. Jones has lost the respect of his senior staff, he has frustrated midlevel managers, and he has alienated the medical staff. He is being urged by others, including the governing board and affiliated medical groups, to make critical and significant decisions within the organization. Mr. Jones will make more efficient and effective decisions if he gathers the relevant epidemiologic measures and evaluates these data from an epidemiologic perspective.

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ANSWER GUIDE

Many believe that enrolled members of a managed care organization form an excellent denominator for epidemiology purposes, and clearly they are a population, in the context of population health. They represent a delineated at-risk population, from which one could establish morbidity and mortality rates (Chapters 3 and 6) using the total number of members, or covered lives, as the denominator. This also suggests that managed care organizations, properly run, can not only influence the acute care of the members for which they are responsible but can also assume responsibility for the health of the enrolled population. Using epidemiology tools with this group can improve the decision-making process, particularly if enlightened leadership is focused on improving population health and not exclusively on the bottom line. This paradigm shift—from a reactive medical care system that treats illness to a proactive one concerned with maintaining health—is discussed in Chapter 8.

Mr. Jones needs to make some decisions regarding the move to a matrix model organization for GHE. With a matrix model organization, the product lines are on one axis, and functional departments on the other. The first set of decisions involves choosing which product lines should be arrayed along one axis of the matrix organization. Clearly, the disease burden of the subscribers is one area that could be used to make that decision. A review of DRGs would provide insight into the morbidity burden associated with hospital episodes. The frequency of diagnoses and/or procedures could be evaluated in the ambulatory setting with the commonly used physician coding scheme Current Procedural Terminology (CPT). Mr. Jones could develop rates of hospitalization by specific condition, or rates of ambulatory care encounters by CPT code. Conditions with the highest rates in either setting or both settings could be evaluated as candidates for separate product lines.

Since Mr. Jones is an epidemiologically informed manager, he is concerned about the health of the entire population at risk, which in this case would be the enrolled members of GHE. Because of this concern, Mr. Jones should collect and evaluate risk factor data (e.g., smoking, obesity) on his subscribers to identify potential areas of improvement. Risk factor intervention programs could improve the financial health of GHE as well. GHE may want to complete a behavioral risk factor study on subscribers to determine which programs

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need to be developed. The target should be risk factors that are modifiable through changes in behavior. These behavioral modification programs (e.g., smoking cessation) may be separate product lines, or part of another product line. For example, smoking cessation could be a stand-alone product line or part of a chronic obstructive pulmonary disease and emphysema line.

Mr. Jones may also want to decide about product lines based on the cost of care for various kinds of morbidity, and the extent to which the enrolled population has, or is at risk of developing, those conditions (Chapter 8). With a focus on the high-cost conditions, Mr. Jones would need to know the prevalence of disease and the prevalence of risk factors that may lead to disease. The DRGs and CPT codes could be used to develop rates. It may be more difficult to associate a specific cost with each code, especially in a managed care environment, but Mr. Jones could borrow the Medicare “prices” assigned to DRGs and CPT codes and assume a fee-for-service environment for the sake of prioritizing product lines.

Finally, Mr. Jones may want to know the time, place, and person descriptors of the enrolled population with regard to morbidity. Some product lines may be age-specific, such as juvenile diabetes and Alzheimer’s disease. Others may be affected by specific settings or places in which the enrolled population lives or works. For example, lead screening and abatement might be important in older neighborhoods or among certain groups, such as employees of a battery factory.

Mr. Jones also faces a number of staffing issues. These include the uncertainty about how the new matrix model would affect GHE staffing patterns, particularly with regard to the generalist/specialist mix, and the concerns of the nurse practitioners in the satellite clinics. Mr. Jones uses the morbidity data (Chapter 3) from the product line analysis to project the number of enrolled members that can be expected in each product line. He assumes an optimistic and pessimistic scenario with regard to demand increases from market segmentation. Further, he uses industry benchmarks to predict the number of generalists and specialists needed to treat each product line, assuming productivity remains constant. For the satellite clinics, he collects weekly workload statistics by clinic for each practitioner and analyzes these data to determine if a statistically significant increase in patient load exists.

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He compares each quarter to the previous quarter and each week to the same week one year ago. A statistically significant increase in workload that persists over time would argue for increased staffing in this area.

Having made some progress in organizational design and staffing, Mr. Jones moves ahead to directing issues. As you recall, the board had charged Mr. Jones with looking at an incentive system that would reward outcomes. He begins to review the literature on outcomes and is amazed at some of the material he finds, such as the work in New York and Pennsylvania on coronary artery bypass surgery. Using risk adjustment and other epidemiologic tools, they have provided information to consumers, providers, and plans on expected and actual mortality associated with that procedure (Chapter 6).

Furthermore, the board has been encouraging Mr. Jones to consider applying for accreditation by the National Committee on Quality Assurance (NCQA). Mr. Jones looks into that process and realizes that a couple of outcome measures might be in order. Specifically, the NCQA expects health plans to examine quality by reporting results on the Healthcare Effectiveness Data and Information Set (HEDIS). As Mr. Jones examines the measures that compose HEDIS, he realizes that they are good outcome indicators, and many are drawn from a planning document he has seen before, *Healthy People 2010*. He recalls the previous problem, that of product lines in a matrix organization, and realizes that a behavioral risk factor survey of enrolled members might also provide information about baseline levels of several of the key HEDIS measures for his population.

Mr. Jones realizes that there are other outcome and baseline variables that he needs to know about the population. Two commonly used outcome measures, for example, are the 36-item short form survey (SF-36) and patient satisfaction measures. SF-36 was developed as the result of the Rand Medical Outcomes Study. This measure allows individuals to classify their health status on general, mental, and physical scales.

After careful consideration, he decides to take several interim steps. First, he decides to incorporate a quality indicator in the decision about how much (if any) of the 20 percent withholding to return to each physician. Further, he determines that the quality indicator should be tied to the HEDIS measures and patient satisfaction. With

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that in mind, he proposes to conduct a patient satisfaction survey and undertake a behavioral risk factor survey of his enrollees. He also is persuaded of the need to know the health status of his plan members, and does a random sample survey using the SF-36.

Mr. Jones is convinced that the withholding incentive system will work better with quality indicators, but he is appropriately concerned about hospitalization costs consuming most of the withholding cache in recent years. This has caused considerable discord among physician providers who feel they are being penalized for provided high-quality care, albeit in a hospital setting. Fortunately, Mr. Jones is aware of a promising solution to the problem. The CFO has acquired hospital case-mix information on GHE enrollees for the past several years. Several of the diagnoses that have prompted admissions are for ACSCs, such as asthma, diabetes, and congestive heart failure. These conditions typically should not result in hospitalization if effective primary care is provided. Thus any hospital episode related to these conditions is considered a preventable or avoidable hospitalization.

ACSCs (Chapter 5) can be categorized into one of three areas. Some conditions are totally preventable, such as hospitalization for an immunizable disease, such as measles. Other conditions should not typically require hospitalization if primary care is sought early enough, such as cellulitis or community-acquired pneumonia. The third group includes chronic diseases, which, if tightly controlled, should not require hospitalization. These diseases include asthma, diabetes, and congestive heart failure. Mr. Jones needs to ponder the burden of diseases like these in the enrolled population and the financial cost to GHE for these conditions. While epidemiology is not critical to the consideration of the latter, it certainly is to the former.

Mr. Jones decides to implement a surveillance system (Chapter 5) for several high-cost and high-frequency ACSCs. This monitoring system will identify potential targets for intervention to decrease hospital costs. The surveillance system will describe ACSCs and preventable hospitalizations in terms of the epidemiologic concepts of time, place, and person. The problem of preventable hospitalization may occur during a particular time of year, within certain neighborhoods of the city, or among specific population groups. This problem may be caused by a lack of access to care, cultural barriers, or other factors, only some of which may be corrected by an organization intervention, such as an outreach program.

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The strategic plan is ambitious and difficult because GHE has undergone so much growth in recent years. Chapter 4 outlines the various kinds of needs assessment approaches that could be undertaken, such as those involving the use of surveys (e.g., the National Health Interview Survey), risk factor data (e.g., the Behavioral Risk Factor Surveillance System), or insurance claims. GHE could estimate future morbidity based on past utilization, hospital DRGs, or clinic records, or try to estimate future morbidity based on risk factors in the population (see Case Study 4.2, page 88, for example). The increase in proportion of members who are poor and elderly makes future planning even more difficult because past utilization may not necessarily predict future utilization. Medicare claims would be a good source of data to predict future physician and hospital utilization among the elderly population. Medicaid claims may be available to predict physician and hospital utilization among the Medicaid population.

With regard to Mr. Jones's weight reduction programs, different kinds of studies support the link between obesity and diseases. Chapters 11 to 13 discuss these studies. In general, case-control studies and cohort studies can be used to measure the degree to which a particular risk factor, such as obesity, increases the risk of disease. Randomized clinical trials are more often used to evaluate the efficacy of a particular intervention, such as a new weight loss medication. Various characteristics, or features, of each study reflect its quality, such as the strength of the relationship between the risk factor and the outcome, and whether there is a "dose-response" relationship between the risk factor and outcome. These features are discussed in Chapter 14. Different studies in the literature report on the relative risk of obesity and a given disease, such as heart disease (Chapter 15). Relative risk refers to the number of times more likely a person who is obese is to develop a disease compared with a person who is not obese. Mr. Jones could calculate the proportion of various kinds of diseases that can be attributed to obesity in the GHE-enrolled population by obtaining the relative risks associated with obesity and each disease and determining the prevalence of obesity in the GHE-enrolled population. This is called the *attributable fraction*. To estimate how much disease could be avoided, Mr. Jones would also need to go to the literature to determine the relative success of various weight loss programs.

Finally, Mr. Jones turns to the issue of setting capitation rates (Chapter 8). He is pleased with the previous decisions that he has

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made about product lines and quality of care. These decisions have put in place a mechanism to collect the data needed to determine capitation rates. Specifically, the SF-36 should give him information about the health of his population and how he might go about determining whether his enrollees are sicker than the normal population. If he could convince employers that GHE members are sicker, on average, than other insured people in the area, he might be able to argue for higher capitation rates. Mr. Jones realizes that the behavioral risk factor data could also be an important part of that discussion, particularly if the members of his plan have worse risk factor prevalence than others across the state.

He decides to examine the attributable morbidity associated with several major risk factors, to evaluate the extent to which such morbidity is responsible for a major portion of the per-member-per-month fee. He realizes that if he can bring these risk factors under control, through education, outreach, or other programmatic improvements, the potential exists to increase profitability, particularly if he can use the data that he has gathered in rate negotiations.

Mr. Jones has, as the result of learning more about epidemiological reasoning, begun to improve his ability to make decisions and solve problems. This case study illustrates a principle that we suggested at the beginning of this chapter—that epidemiology can be a useful tool in all managerial functions. Moreover, as is apparent, epidemiology tools can frequently be used simultaneously in several managerial functions. The epidemiology perspective influences a manager's practice style in positive ways, and epidemiology can function as an integrative approach to management decision making. The use of the epidemiologic method and the epidemiology perspective can improve management, and, more important, can help the manager reach the goal of improving population health.

Resources

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