MANAGERIAL EPIDEMIOLOGY FOR HEALTH CARE ORGANIZATIONS

SECOND EDITION

Peter J. Fos and David J. Fine

With contributions by
Brian W. Amy
Miguel A. Zúniga

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The previous edition of this book was published under the title *Designing Health Care for Populations: Applied Epidemiology in Health Care Administration*, ISBN 0-7879-5226-5.

Published by Jossey-Bass
A Wiley Imprint
989 Market Street, San Francisco, CA 94103-1741 www.josseybass.com

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Library of Congress Cataloging-in-Publication Data

Fos, Peter J.
Managerial epidemiology for health care organizations / Peter J. Fos, David J. Fine.— 2nd ed.
p. ; cm.
Rev. ed. of: Designing health care for populations / Peter J. Fos, David J. Fine. 1st ed. c2000.
Includes bibliographical references and index.
ISBN-13 978-0-7879-7891-4
ISBN-10 0-7879-7891-4 (alk. paper)
1. Epidemiology. 2. Health services administration.
[DNLM: 1. Epidemiologic Methods. 2. Health Services Administration. 3. Health Care Surveys. 4. Health Planning—methods. 5. Quality of Health Care.] I. Fine, David J. II. Zúniga, Miguel A. III. Fos, Peter J. Designing health care for populations. IV. Title.
RA652.F67 2005
614.4—dc22
2005003186

Printed in the United States of America
SECOND EDITION
HB Printing 10 9 8 7 6 5 4 3 2 1

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PREFACE

This book is intended to introduce the student and practitioner of health care management to the notion of health care for populations and the science of epidemiology. Outside the field, epidemiology may be viewed as a questionably relevant but complicated set of terms, formulas, and statistics. In fact, epidemiology is a core discipline pertinent to all branches of health care, including management. The motivating purpose of the text is to illustrate both the relevance and the benefit of epidemiology in the field of health care management and population health management, and it has been jointly written by authors who bring both a managerial and an epidemiologic perspective to the work. Contemporary applications of epidemiology in health care management are found in monitoring the quality and effectiveness of clinical services, strategic and program planning, marketing, and managing insurance and managed care. Traditional applications are found in such areas as tumor registries, infection control programs, and public health programming. This text is an updated version of the first edition of this book, published in 2000. This new edition has been substantially rewritten to introduce epidemiologic principles, reinforce the traditional uses of epidemiology, and illustrate its contemporary uses in planning, evaluating, and managing health care for populations.

Teaching the practical application of epidemiology in health care management is an important purpose of this text. Each chapter first presents epidemiologic principles, followed by examples and applications. Concepts, examples, and case studies

allow students and practitioners to understand epidemiology and its application in the design and management of health care for populations.

The text is organized in the following manner. Chapter One introduces the reader to the science of epidemiology. Definitions of epidemiology and an overview of its history in management are presented. Also, epidemiology's transition from its traditional role in health care management to its new role in population health care management is outlined. The chapter also features a historical perspective on the development of epidemiology into a scientific discipline. Chapter Two describes the health and needs of populations and their relevance to management. Included in this chapter is a discussion of the commonly available sources of data. Chapter Three presents epidemiologic measures used in health care, with an emphasis on measures of importance to managers. Chapter Four presents study designs and measures of the cause-and-effect relationship of health and disease across and among populations. Clinical trials, as an example of experimental study designs, are presented, along with the more commonplace observational designs. Chapter Five introduces the concept of confounding, the problem of misleading data interpretation, and methods to address this problem. It includes a discussion of the standardization of epidemiologic data and risk adjustment.

Chapter Six introduces clinical epidemiology as the core discipline of clinical outcomes research, clinical effectiveness, and medical management. Topics covered include validity and reliability, other measures of test performance, infectious disease epidemiology (including epidemiologic surveillance and monitoring infections), and the role of epidemiology in bioterrorism. Chapter Seven, which was written by Brian W. Amy, presents the relationship of epidemiology to planning health care for populations. Emphasis is placed on community health evaluation, performance improvement, and planning based on need. Chapter Eight, which is the result of the work of Miguel A. Zúniga, provides a discussion of health outcomes assessment and the relationships among traditional epidemiologic concepts; benchmarking, best practices, practice guidelines, and the measurement of quality of care are examined. Chapter Nine focuses on the use and benefit of epidemiology in planning and marketing. Chapter Ten describes the relationship between epidemiology and economic analysis, including the manner in which epidemiologic measures are used in the evaluation of health care delivery and the formulation of health care policy for populations. Burden of disease is discussed, with a focus on the economic impact of disease.

Chapters Eleven through Fourteen present case studies of the application of epidemiology to the planning for and management of health care for populations. Chapter Eleven presents a case study focusing on emergency care. The intent of this chapter is to apply general concepts presented throughout the text to establishing a plan for expansion of emergency health care services. The case study in Chapter Twelve focuses on quality of hospital care, and the one in Chapter Thirteen illustrates the

application of epidemiology to the study of the pediatric inpatient services in a hospital network. Chapter Fourteen presents a case study focusing on community relations in a hospital service area, specific to both a pediatric and an adult population.

An appendix presents concepts not directly covered in the body of the text. These concepts are important for understanding the relevance of epidemiology to managing health care for populations. Topics included in the appendix are statistical power, hypothesis testing, categorical data analysis, sample size considerations, and the handling of outliers.

Each chapter is supplemented with study questions, intended to aid the reader in understanding and applying the epidemiologic concepts presented in a management context.

We anticipate that the primary users of this text will be health care management students and practitioners, for whom we have presented the material in a practical and applied manner. This book can serve as a classroom text as well as an on-the-job reference for practitioners. We expect that after reading and using this book, the student or practitioner will understand and appreciate the relevance of epidemiology and look forward to using it in everyday health care management practice.

This work has been the result of a multiyear collaboration. The special contributions of two of our former students, Miguel A. Zúniga, M.D., M.H.A., Dr.P.H., who is now the director of the Health Informatics program at the Medical College of Georgia, and Brian W. Amy, M.D., M.H.A., M.P.H., the State Health Officer in Mississippi, are gratefully acknowledged, particularly with respect to the chapter each contributed.

Finally, we would like to thank the students at Tulane University Medical Center School of Public Health and Tropical Medicine, the University of Wisconsin-Madison Medical School, the University of Indiana at South Bend, the University of St. Thomas Graduate School of Business, and the University of Alabama in Birmingham School of Health-Related Professions, whose comments on the first edition have been incorporated into this book. Their collective feedback has improved the book significantly.

P.J.F.
D.J.F.

For Lori Ann, Tammy, Tim, and Maggie
The loves of my life
PJF

For Jeffrey Fine
And his bright future
DJF

THE AUTHORS AND CONTRIBUTORS

Peter J. Fos is dean and professor of the College of Health at the University of Southern Mississippi. He earned his doctorate in health care decision analysis at Tulane University Graduate School following a career in clinical dentistry. Before he assumed the position of dean at the University of Southern Mississippi, he served as the chief science officer of the Mississippi State Department of Health, after spending almost twenty years at academic institutions, where he was active in curriculum development in the application of epidemiology to management, as well as the practice of managerial epidemiology, clinical effectiveness, and health outcomes research. He maintains adjunct faculty positions at Tulane University Health Sciences Center, the University of Mississippi Medical Center, the University of Alabama in Birmingham School of Health-Related Professions, and Dillard University.

David J. Fine is chief executive officer of the St. Luke's Episcopal Health System in Houston, Texas. Fine is a nationally and internationally known health care executive and consultant who has directed hospitals, hospital systems, multispecialty group practices, and managed care organizations. He has published extensively in leading journals and books. In 1985, Fine was the recipient of the prestigious Hudgens Medal from the American College of Healthcare Executives. He is a member of Delta Omega, the national public health honor society, and Omicron Delta Epsilon, the national economics honor society. Fine was recently named one of the one hundred most

influential people in health care today by *Modern Healthcare*. He is professor of medicine at Baylor College of Medicine, professor of public health at the University of Texas Health Sciences Center, and professor of the practice of management at Rice University.

Contributors

Brian W. Amy is Mississippi State Health Officer and head of the Mississippi State Department of Health. He holds faculty positions at the College of Health, The University of Southern Mississippi, and the University of Mississippi Medical Center.

Miguel A. Zúniga is associate professor, Department of Health Informatics, School of Allied Health Sciences, Medical College of Georgia. He previously held faculty positions at Tulane University Health Sciences Center and Texas A&M University Health Science Center.

Managerial Epidemiology for Health Care Organizations

CHAPTER ONE

EPIDEMIOLOGY IN HEALTH CARE ADMINISTRATION

Chapter Outline

Introduction
Philosophic Framework
Focus and Uses of Epidemiology
Current Issues in Health Care Administration
The Concept of Populations and Communities
Managing Health Care for Populations and Communities
The Role of Epidemiology
Summary
Study Questions

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