

Introduction to Epidemiology

5th Edition

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Dedication

To James, Grant, Kristina, Phillip, Dallin, Marie, and Andrew

Contents

<i>About the Author</i>	<i>xiii</i>
<i>Preface</i>	<i>xv</i>
<i>New to the Fifth Edition</i>	<i>xvii</i>
<i>Introduction</i>	<i>xix</i>
CHAPTER 1 <i>Foundations of Epidemiology</i>	<i>1</i>
Objectives	1
Activities in Epidemiology	3
Role of Epidemiology in Public Health Practice	4
Epidemics, Endemics, and Pandemics	6
Case Concepts in Epidemiology	7
The Epidemiology Triangle	8
Some Disease Transmission Concepts	10
Modes of Disease Transmission	12
Chain of Infection	12
Other Modes of Causation	13
Levels of Prevention	15
Conclusion	19
<i>Exercises</i>	<i>19</i>
<i>Study Questions</i>	<i>19</i>
<i>References</i>	<i>21</i>

CHAPTER 2	<i>Historic Developments in Epidemiology</i>	23
	Objectives	23
	Hippocrates, the First Epidemiologist	24
	Disease Observations of Sydenham	25
	The Epidemiology of Scurvy	26
	Epidemiology of Cowpox and Smallpox	27
	Epidemiology of Childbed Fever in a Lying-In Hospital	28
	John Snow's Epidemiologic Investigations of Cholera	29
	Epidemiologic Work of Pasteur and Koch	32
	The Invention of the Microscope	33
	John Graunt and Vital Statistics	34
	Occupational Health and Industrial Hygiene	35
	Florence Nightingale	36
	Typhoid Mary	38
	Vitamins and Nutritional Diseases	38
	Beginning of Epidemiology in the United States	39
	Historical Development of Morbidity in Epidemiology	41
	The Framingham Heart Study	42
	Cigarette Smoking and Cancer	42
	Conclusion	43
	<i>Exercises</i>	44
	<i>Study Questions</i>	44
	<i>References</i>	45
CHAPTER 3	<i>Practical Disease Concepts in Epidemiology</i>	47
	Objectives	47
	Fundamentals of Communicable and Noncommunicable Diseases and Conditions	48
	Natural History of Disease	49
	Classifying Diseases	50
	Portals of Entry to the Human Body	55
	Incubation Periods for Selected Infectious Diseases	56
	Later Stages of Infection	58
	Zoonoses	58
	International Classification of Diseases	61
	Notifiable Diseases in the United States	61
	Protecting Public Health Through Immunization	64
	Herd Immunity	65
	Communicable Disease Prevention and Control	69

	Environmental Control	69
	Host-Related Control and Prevention	70
	Infection Control and Prevention Measures	71
	Changing Emphasis in Epidemiologic Studies	72
	Nutritional Deficiency Diseases and Disorders	74
	Chronic Diseases and Conditions	75
	Prevention and Control	75
	Disability	76
	Conclusion	80
	<i>Exercises</i>	80
	<i>Study Questions</i>	80
	<i>References</i>	81
CHAPTER 4	<i>Design Strategies and Statistical Methods in Descriptive Epidemiology</i>	83
	Objectives	83
	Descriptive Study Designs	85
	Types of Data	89
	Ratios, Proportions, and Rates	90
	Tables, Graphs, and Numerical Measures	98
	Measures of Statistical Association	107
	Conclusion	110
	<i>Exercises</i>	111
	<i>Study Questions</i>	111
	<i>References</i>	114
CHAPTER 5	<i>Descriptive Epidemiology According to Person, Place, and Time</i>	117
	Objectives	117
	Person, Place, and Time	118
	Person	118
	Place	132
	Time Trends	133
	Evaluation	146
	Public Health Surveillance	146
	Causal Insights	150
	Conclusion	151
	<i>Exercises</i>	152
	<i>Study Questions</i>	152
	<i>References</i>	153

CHAPTER 6	<i>General Health and Population Indicators</i>	155
	Objectives	155
	Health Indicator	156
	Birth	157
	Mortality	159
	Types of Mortality Rates	163
	Infant Mortality	165
	Abortion Rate	170
	Maternal Mortality Rate	172
	Proportional Mortality Ratio	172
	Case Fatality Rate	174
	Years of Potential Life Lost	175
	Conclusion	176
	<i>Exercises</i>	178
	<i>Study Questions</i>	178
	<i>References</i>	182
CHAPTER 7	<i>Design Strategies and Statistical Methods in Analytic Epidemiology</i>	185
	Objectives	185
	Observational Analytic Studies	186
	Case-Control Study Design	186
	Odds Ratio in Case-Control Studies	190
	Bias in Case-Control Studies	191
	Controlling for Bias in Case-Control Studies	193
	Strengths and Weaknesses of Case-Control Studies	194
	Case-Crossover Study Design	195
	Nested Case-Control Study Design	196
	Cohort Study Design	196
	Risk Ratio in Cohort Studies	198
	Rate Ratio in Cohort Studies	199
	Double-Cohort Studies	201
	Selecting the Study Cohort	201
	Bias in Cohort Studies	202
	Controlling for Bias in Cohort Studies	204
	Strengths and Weaknesses of Cohort Studies	204
	Effect Modification	204
	Conclusion	206
	<i>Exercises</i>	206

	<i>Study Questions</i>	207
	<i>References</i>	207
CHAPTER 8	<i>Experimental Studies in Epidemiology</i>	209
	Objectives	209
	Experimental Study Designs	210
	Randomization	211
	Blinding	212
	Nonrandomization	213
	Designing a Randomized Controlled Trial	213
	Selected Special Types of Randomized Study Designs	216
	Strengths and Weaknesses of Double-Blind Randomized Clinical Trials	218
	Ethics in Experimental Research	218
	Conclusion	220
	<i>Exercises</i>	221
	<i>Study Questions</i>	222
	<i>References</i>	222
CHAPTER 9	<i>Causal Inference</i>	225
	Objectives	225
	Causal Inference	226
	Causal Criteria	228
	Hypothesis Development and Testing	231
	Confidence Intervals	235
	Web of Causation	236
	Conclusion	245
	<i>Exercises</i>	246
	<i>Study Questions</i>	246
	<i>References</i>	248
CHAPTER 10	<i>Field Epidemiology</i>	251
	Objectives	251
	Conducting a Field Investigation	252
	Investigation of a Food-Borne Illness	258
	Basic Epidemiologic Questions	261
	Disease Clusters	263
	Conclusion	270
	<i>Exercises</i>	271

	<i>Study Questions</i>	271
	<i>References</i>	272
CHAPTER 11	<i>Chronic Disease Epidemiology</i>	273
	Objectives	273
	Chronic Disease Epidemiology	274
	The Environment and Chronic Health Problems	276
	Behavior and Chronic Health Problems	284
	Heredity and Chronic Health Problems	289
	Multifactorial Etiology in Chronic Disease Epidemiology	291
	Priorities in Disease Prevention and Control	291
	Conclusion	293
	<i>Exercises</i>	293
	<i>Study Questions</i>	294
	<i>References</i>	295
CHAPTER 12	<i>Clinical Epidemiology</i>	299
	Objectives	299
	Clinical Epidemiology	300
	Screening and Diagnosis	300
	Evaluating the Screening Test	302
	Prognosis	304
	Health Outcomes Research	309
	Conclusion	310
	<i>Exercises</i>	310
	<i>Study Questions</i>	311
	<i>References</i>	311
GLOSSARY		313
APPENDIX I	<i>Case Studies</i>	329
	Case Study I: Snow on Cholera	329
	Case Study II: Working Through a Food-Borne Illness Epidemic Investigation: Typhoid Fever in Schenectady	351
	Case Study III: Common-Source Outbreak of Waterborne Shigellosis at a Public School	358
	Case Study IV: Retrospective Analysis of Occupation and Alcohol-Related Mortality	364

Case Study V: Retrospective Cohort Study of the Association of Congenital Malformations and Hazardous Waste	367
Case Study VI: History and Epidemiology of Polio Epidemics	373
APPENDIX II <i>Health Indicators in Reproductive Epidemiology</i>	389
APPENDIX III <i>Classifications and Specialty Journals in Epidemiology</i>	391
APPENDIX IV <i>Epidemiologic Associations and Societies</i>	393
APPENDIX V <i>Selected Answers to Chapter Questions</i>	395
INDEX	403

About the Author

Ray M. Merrill, PhD, MPH, MS, has been actively involved in epidemiology since his professional career began in 1995. As a Cancer Prevention Fellow at the National Cancer Institute, he worked with leading researchers in the area of cancer epidemiology. In 1998, he joined the faculty in the Department of Health Science at Brigham Young University in Provo, Utah, where he continued his research in epidemiology. Beginning in 1999, he has also held an adjunct faculty position in the Department of Family and Preventive Medicine at the University of Utah. In 2001, he spent a sabbatical working in the Unit of Epidemiology for Cancer Prevention at the International Agency for Research on Cancer Administration, Lyon, France. He has won various awards for his research in epidemiology and is currently a Fellow of the American College of Epidemiology. He teaches various classes in epidemiology and biostatistics, and is the author of over 150 peer-reviewed publications. Dr. Merrill is currently a full-time professor of epidemiology and biostatistics at Brigham Young University.

Preface

The field of epidemiology has come a long way since the days of infectious disease investigations by scientists such as Louis Pasteur, Robert Koch, and John Snow. Historically, the main causes of death were due to a single pathogen, a single cause of disease. Epidemiologists had the challenge of isolating a single bacteria, virus, or parasite. In modern times, advances in nutrition, housing conditions, sanitation, water supply, antibiotics, and immunization programs have resulted in a decrease in various infectious diseases but an increase in many noninfectious diseases and conditions. Consequently, the scope of epidemiology has expanded to include the study of acute and chronic noninfectious diseases and conditions. Advances in biology, medicine, statistics, and social and behavioral sciences have greatly aided epidemiologic study.

This book was written as an introductory epidemiology text for the student who has minimal training in the biomedical sciences and statistics. *Introduction to Epidemiology* is based on the premise that the advanced analyses of empirical research studies, using advanced statistical methods, are more akin to biostatistics than epidemiology and, therefore, are not included in this book. Many recent books bearing the title of epidemiology are in fact biostatistics books, with limited information on the basics of epidemiological investigations or the study of epidemics. Epidemiology is unique from biostatistics in that emphasis is placed on completing the causal picture. Identifying causal factors and modes of transmission, with the assistance of statistical tools and biomedical information, reflect the primary aim of epidemiology. This book maintains that focus.

Chapter 1 presents the foundations of epidemiology, including definitions, concepts, and applications of the field. Chapter 2 covers historical developments in epidemiology. Chapter 3 looks at several important disease concepts in epidemiology. Chapters 4–6 focus on descriptive epidemiology. Several design strategies and statistical measures are presented. Chapter 7 presents design strategies and statistical methods used in analytic epidemiology. Chapter 8 covers design strategies and ethical issues associated with experimental studies. Chapter 9 considers the basics of causal inference. Chapter 10 focuses on basic concepts and approaches used in field epidemiology. Chapter 11 presents chronic disease epidemiology. Chapter 12 presents epidemiology in clinical settings.

New to the Fifth Edition

The fifth edition of this classic text, like previous editions, continues its mission of providing a comprehensive introduction to the field of epidemiology. Emphasis is placed on the application of the basic principles of epidemiology according to person, place, and time in order to solve current public health problems. Guidance is provided on issues such as how to identify and describe public health problems, formulate research hypotheses, select appropriate research study designs, manage and analyze epidemiologic data, interpret study results, and apply the results to preventing and controlling disease and health-related events. Attention is given to real-world public health problems involving both infectious and chronic diseases and conditions. Issues relating to observational and experimental epidemiology are covered. Emphasis is given on how to solve public health problems that are urgent and unexpected.

Additions to this edition include a greater distinction between the roles of clinicians and epidemiologists in promoting health and well-being; an expansion on the history of epidemiology; greater detail and explanation of descriptive and analytic study designs used in epidemiology; an expansion of the role of causal inference in epidemiology; an additional approach to evaluating diagnostic tests; a new section on cluster analysis; a completely revised chapter on chronic disease epidemiology; and an entirely new chapter on clinical epidemiology.

This fifth edition offers an easy and effective approach to learning epidemiology, including case reports and news files. The case reports and news files represent applications of commonly used research designs in epidemiology. The chapter topics were selected to represent the fundamentals of epidemiology. Learning objectives are presented at the beginning of each chapter. The chapters are divided into concise sections with several examples. Tables and figures are used to summarize and clarify important concepts and information. Key words are bolded in the text and defined. Study questions with descriptive answers are provided at the end of each chapter.

Introduction

Epidemiology is a fun and challenging subject to study, as well as an interesting field to pursue as a career. Most undergraduate degree programs and graduate programs in public health, environmental health, occupational health and industrial hygiene, health education and health promotion, health services administration, nursing, and other health-related degree programs require a basic introductory course in epidemiology. *Introduction to Epidemiology* also can be a valuable guide for practicing epidemiologists. Thus, it is hoped that this book will be a useful and practical source for introductory epidemiology courses, as well as epidemiologists working in the field. Readers of this book may be specialists in international projects in developing countries, industrial hygienists within major industrial plants, infectious disease nurses in hospitals and medical centers, chronic disease epidemiologists in government agencies, behavioral scientists conducting behavioral health epidemiological investigations, or staff epidemiologists in local public health departments.

