



*Biology and Medicine*

2  
CLINICAL  
EPIDEMIOLOGY

BY  
JOHN R. PAUL

*Revised Edition*



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**CLINICAL  
EPIDEMIOLOGY**

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*Biology and Medicine*

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EDITED BY

PETER P. H. DE BRUYN, M.D.

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*Dedicated to the memory  
of  
two former friends and colleagues—  
Leslie T. Webster, M.D.  
(1894–1943)  
and  
James D. Trask, M.D.  
(1890–1942)  
both epidemiologists, in experimental  
and clinical fields, respectively*

## *Preface to the Series*

During the past few decades the investigative approaches to biological problems have become markedly diversified. This diversification has been caused in part by the introduction of methods from other fields, such as mathematics, physics, and chemistry, and in part has been brought about by the formulation of new problems within biology. At the same time, the quantity of scientific production and publication has increased. Under these circumstances, the biologist has to focus his attention more and more exclusively on his own field of interest. This specialization, effective as it is in the pursuit of individual problems, requiring ability and knowledge didactically unrelated to biology, is detrimental to a broad understanding of the current aspects of biology as a whole, without which conceptual progress is difficult.

The purpose of "The Scientist's Library: Biology and Medicine" series is to provide authoritative information about the growth and status in various areas in such a fashion that the individual books may be read with profit not only by the specialist but also by those whose interests lie in other fields. The topics for the series have been selected as representative of active fields of science, especially those that have developed markedly in recent years as the result of new methods and new discoveries.

The textual approach is somewhat different from that ordinarily used by the specialist. The authors have been asked to emphasize introductory concepts and problems, and the present status of their subjects, and to clarify terminology and methods of approach instead of limiting themselves to detailed

*Preface to the Series*

accounts of current factual knowledge. The authors have also been asked to assume a common level of scientific competence rather than to attempt popularization of the subject matter.

Consequently, the books should be of interest and value to workers in the various fields of biology and medicine. For the teacher and investigator, and for students entering specialized areas, they will provide familiarity with the aims, achievements, and present status of these fields.

PETER P. H. DE BRUYN

Chicago, Illinois



## *Preface to the Revised Edition*

In presenting a review of epidemiology, I have tried in this revision, as in the first edition, to avoid the inclusion of too many technical details or the introduction of too much sophistication into the subject. In a swiftly moving field such as this one, with new ideas and methods coming along all the time, one can easily err on the side of introducing too many new and complicated methods and of attempting to be too erudite. On the other hand, one can readily err by attempting to achieve simplicity that actually becomes naivete. Indeed one can easily simplify away from the truth because it is easier to use short cuts instead of complicated explanations.

As in the previous edition many of the chapters have been taken from lectures given to medical students. Some of them represent the basis of a course of instruction, which has been variously entitled "Principles of Epidemiology," or "Clinical Epidemiology." This course has been offered, since 1945 at Yale University partly to medical students or as an introduction to public health students. Understandably its context has undergone great changes within the past dozen years.

Epidemiology has often been regarded as a discipline useful only to those engaged in public health activities, or in schools of hygiene, or departments or ministries of health. One may ask then why medical students or physicians should be concerned with it, particularly since their busy hours of work and reading are so taken up already. Of the various answers that one might give to this question a primary one is that more and more authors of textbooks of internal medicine have come to recognize the importance of including a section on epidemiology,

if a modern description of a given disease is to be complete. Another is that as preventive medicine comes increasingly to the fore, an awareness has developed that epidemiology stands today in somewhat the same relationship to that subject as do some of the more familiar basic medical sciences to curative medicine. Anatomy, pathology, microbiology, physiology, and pharmacology are all considered basic and introductory to the study of disease processes and to the clinical care of patients; in like manner the concept of epidemiology, as presented here, can at least substitute as one of these "preclinical" subjects. A concept concerned with the circumstances under which a person or people get sick or remain sick is basic to any attempt to alter these circumstances so as to protect individuals from future illness. Thus preventive medicine is, in this sense, applied epidemiology. It is this which has brought the epidemiological aspect of medicine increasingly to the fore as part of the modern physician's academic job.

For a variety of reasons the scope of this book has many inadequacies and obviously falls far short of orthodox concepts of epidemiology which are taught in schools of hygiene or public health in this country and probably elsewhere. There the subject is usually presented in a much broader form illustrated by large populations, and also with far more emphasis on epidemiology as a statistical science. Such is not the purpose of this small volume. It is not exactly a primer, but its purpose, as already expressed, is to introduce the subject to doctors or students of medicine, biologists, sociologists, or others, in semi-technical terms and with examples they might use. Thus the book is for those who consider themselves amateur human ecologists, or perhaps for "epidemiological clinicians." In particular, it is for clinical investigators. It is not for those whose interests are pre-eminently statistical.

Another deficiency may be that the approach suffers from being too heavily weighted with examples of infectious disease with a relative neglect of non-infectious conditions. This selection of topics has been done advisedly, for as was stated in the first edition of this text, this book is meant to be an introduction to the subject, and it is easier to begin with infectious disease.

## *Preface to the Revised Edition*

Nevertheless, the conditions usually regarded as non-infectious have received more attention in this second edition; for instance, besides coronary artery disease, the epidemiology of carcinoma and particularly carcinoma of the lung have been included.

For assistance in the preparation of the text as well as for valuable criticism I am greatly indebted to the following colleagues at the Yale University School of Medicine: Dr. Anthony M-M. Payne, Dr. Lloyd Stevenson, Dr. Colin M. White, Dr. Wilbur G. Downs, Dr. Richard M. Taylor, Dr. Jack Henderson, and Dr. Alvan R. Feinstein; and to Dr. Margaret J. Albrink, Morgantown, W.Va.; Dr. Oglesby Paul, Chicago, Ill.; and Dr. Michael B. Shimkin, Philadelphia, Pa. And for similar assistance, as well as that of preparing the indexes of both the first and second edition texts and helping in other ways, I owe much to Dr. Dorothy M. Horstmann and Dr. Robert M. McCollum.

I also wish to acknowledge the assistance of Mr. Armin Hemberger and Miss Virginia Simon for preparing some of the illustrations and that of Mrs. Raymond Fitch, Mrs. Harry Wenzel, and my wife for typing parts of the manuscript.

I am also indebted to the following agencies and publishing companies: the American Cancer Society, New York, N.Y.; the California State Board of Health, San Francisco, Calif.; the *Journal of the American Medical Association*, Chicago, Ill.; the J. B. Lippincott Company, Philadelphia, Pa.; E. & S. Livingstone Ltd., Edinburgh, Scotland; the *Yale Journal of Biology and Medicine*, New Haven, Conn.; and finally to the U.S. Public Health Service for its kind permission to reproduce certain tables and illustrations from its Surveillance Reports furnished by the Communicable Disease Center, Atlanta, Ga., and for certain other courtesies.

JOHN R. PAUL

New Haven, Connecticut

## *Preface to the First Edition*

Epidemiology has usually been regarded as a discipline useful only to those engaged in public health activities, either in schools of hygiene or public health or in departments or ministries of health, municipal, state, or national. One may ask then why a practicing physician or any physician should be concerned with it, particularly since his busy hours of work and his reading are so overcrowded already. Of the various answers that one might give to this question, a primary one is that epidemiology stands today in somewhat the same relationship to the practice of *preventive medicine* as do some of the more familiar basic medical sciences to *curative medicine*. Pathology, pathologic physiology, and pharmacology are basic and introductory to the clinical care of patients; in like manner the concept of epidemiology, as presented here—a science concerned with the *circumstances* under which a person or persons get sick or remain sick—is basic to any attempt to alter these circumstances so as to protect individuals from future illness. In this new sense physicians certainly have a place in this field. Indeed the last ten years have seen a growing familiarity by clinicians with epidemiologic methods as applied to the behavior of a variety of diseases, both infectious and noninfectious. One could make a long list of examples: tuberculosis, coronary artery disease, and carcinoma of the lung, to name a few. Each has its epidemiologic aspect.

As for the scope of this book, it has inadequacies, and it obviously falls far short of the orthodox concept of epidemiology taught in schools of hygiene or public health in this country or elsewhere. There the subject is usually presented in a much broader form and often as a statistical science dealing with large

## *Preface to the First Edition*

groups of people and utilizing special mathematical methods. Such is not the purpose of this small volume. It is not exactly a primer, but its purpose is to *introduce* this subject to doctors or students of medicine, biology, or sociology in non-technical language and with examples they might use. Another deficiency may be that the approach is too heavily weighted with examples drawn from the field of infectious disease, with a relative neglect of noninfectious diseases. This selection of topics has been done advisedly. As stated above, the book is essentially an introduction to our subject, and it is easier to begin with infectious disease.

The idea of presenting in book form a review of epidemiology came from Dr. Peter P. H. De Bruyn of the University of Chicago, who has given much helpful advice. Many of the chapters have been taken from previous papers or lectures by the author, and some of them represent the basis of a course of instruction originally entitled "Principles of Epidemiology," currently called "Clinical Epidemiology," which has been given as an elective at Yale University over the past dozen years, both to public health students and to medical students.

For help in the preparation of the text, particularly on the statistical side, I am indebted for valuable criticism to Dr. Colin White, associate professor of biometry of the Department of Public Health, Yale University School of Medicine. Thanks are due also to my colleagues Dr. Dorothy M. Horstmann and Dr. Richard M. Taylor, both of the Section of Epidemiology and Preventive Medicine, Yale University School of Medicine.

I also wish to acknowledge the assistance of Mr. Armin Hemberger and Miss Sigrid Angerer for preparing some of the illustrations, and that of Mrs. Mara Iwan, Mrs. Renee Reidy, and my wife for typing parts of the manuscript.

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## *Contents*

### PART I. PRINCIPLES, DEFINITIONS, AND HISTORY

I. DEFINITIONS AND ATTITUDES	3
II. HISTORY—FROM ANCIENT GREECE TO 1800	13
III. HISTORY—THE NINETEENTH CENTURY AND THE BEGINNING OF THE MODERN PERIOD	23
IV. CLINICAL APPROACHES TO THE USE OF EPIDEMIOLOGY	33
V. CONCEPTS OF ETIOLOGY: THE SEED, THE SOIL, AND THE CLIMATE	48

### PART II. METHODS AND USES

VI. EXPERIMENTAL EPIDEMIOLOGY	59
VII. METHODS AND TERMS: I. MORTALITY RATES	70
VIII. METHODS AND TERMS: II. ILLNESS RATES	78
IX. METHODS AND TERMS: III. CHARTING OF DATA	87
X. POPULATION INFORMATION	98
XI. HOST SUSCEPTIBILITY AS IT CONCERNS MAN	109
XII. SEROLOGICAL EPIDEMIOLOGY	119
XIII. THE ENVIRONMENT: GEOGRAPHIC PATHOLOGY	130
XIV. THE ENVIRONMENT: MICROCLIMATE	142

### PART III. SAMPLE DISEASES

XV. RHEUMATIC FEVER	155
XVI. POLIOMYELITIS	177
XVII. INFECTIOUS AND SERUM HEPATITIS	196

*Contents*

XVIII. ARTHROPOD-BORNE VIRAL INFECTIONS	221
XIX. ISCHEMIC HEART DISEASE	235
XX. CANCER	253
XXI. SMOKING AND CARCINOMA OF THE LUNG	272

APPENDIXES

I. MEDICAL CERTIFICATION OF CAUSE OF DEATH	283
II. GUIDES FOR PLANNING SEROLOGIC SURVEYS	286

INDEX

INDEX	295
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## *Figures*

1. Thomas Sydenham (1624–89)	<i>Following page</i>	18
2. Noah Webster (1758–1843)	<i>Following page</i>	18
3. Plaque Commemorating John Snow		26
4. Diagram of a Familial Epidemic of Poliomyelitis		41
5. Family Diagram: A Case of Pneumonia		43
6. Spectrum of Genetic and Environmental Factors		53
7. Illness and Mortality Rates of Mice Exposed to Mouse Typhoid		62
8. Comparative Mortality of Susceptible and Resistant Mice		66
9. Death Rate from Eight Leading Causes (Connecticut, 1900 and 1950)		76
10. Age-specific Case Rates for Tonsillitis, Otitis, Scarlet Fever, and Rheumatic Fever		80
11. Epidemiologic Diagram of a Series of Events in One Family		88
12. Epidemic of Streptococcal Infection Associated with Rheumatic Fever		90
13. Outbreak of Serum Hepatitis		93
14. Spot Map of Poliomyelitis in a Boys' Camp		96
15. Sex-specific Mortality Rates (United States, 1900–54)		100
16. Population Pyramid of the United States in 1960		102
17. Life Expectancy at Birth—Selected Countries		103
18. Death Rates from Chronic and Infectious Diseases (U.S., 1900–50)		106
19. Death Rates among White and Negro Children and Adolescents		114
20. Tuberculin and Schick Test Surveys in School Children, Selected Localities		120



## *Figures*

21. Age-specific Rates of Poliovirus Antibody-formation—Three Areas	123
22. Spot Map of 270 Cases of Sarcoidosis among U.S. Servicemen	134
23. Differences in Mortality among Men of Different Social Classes in England and Wales	146
24. Declining Mortality Rates for Rheumatic Fever (U.S., 1919–48)	161
25. A Rheumatic Family over Five Generations	166
26. Diagram of Family with Three Rheumatic Fever Cases	168
27. Seasonal Occurrence of Rheumatic Fever and Streptococcal Diseases	171
28. Incidence of Rheumatic Fever in Children Related to Income Levels	173
29. Poliomyelitis Incidence Rates (U.S., 1935–63)	180
30. Age Distribution of Poliomyelitis (Connecticut, 1916 and 1955)	182
31. Fluctuation of Hepatitis Cases (Denmark, 1928–47)	201
32. Incidence of Hepatitis Cases (U.S., 1952–65)	202
33. Seasonal Pattern of Hepatitis in Sweden over a Seventeen-year Period	205
34. Age Incidence of Hepatitis in Germany	209
35. Hypothetical Cycles of West Nile Virus Infection	229
36. Trends in Mortality from Heart Diseases (U.S., 1920–45)	237
37. Incidence of Coronary Disease (IHD) in London Busmen (1949–58)	240
38. Annual Age-specific IHD Rates among du Pont Company Employees	243
39. Cancer (all kinds) Age- and Sex-specific Mortality Rates, New York State	257
40. Trends in Tobacco Use	274
41. Death Rates from Bronchogenic Carcinoma. Comparison with Number of Cigarettes Smoked	278