



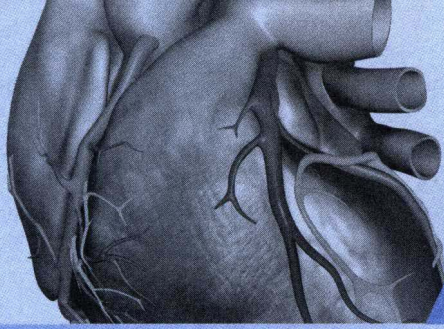
*Essentials of*  
**Public Health  
Biology**

**A Guide for the Study of  
Pathophysiology**

**Constance Urciolo Battle**

*Series Editor: Richard Riegelman*

ESSENTIAL PUBLIC HEALTH



# *Essentials of* Public Health Biology

## A Guide for the Study of Pathophysiology

Constance Urciolo Battle, MD

Adjunct Professor

Department of Prevention and Community Health  
School of Public Health and Health Services

Clinical Professor of Pediatrics  
Children's National Medical Center  
School of Medicine and Health Sciences

The George Washington University  
Washington, DC



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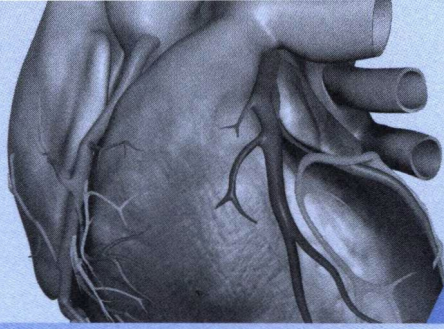
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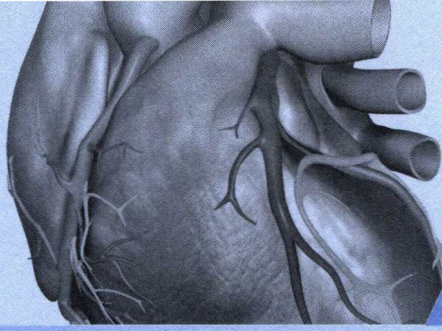


# Dedication

*TO MY BEST TEACHERS  
with appreciation*

*Ursula, Bill, and Christopher and Susan  
who taught me more than anyone about life  
and*

*Raphael G. Urciolo, PhD  
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# Acknowledgments

**Assistant Editor**

Adella Brown, BS  
School of Public Health and Health Services  
The George Washington University  
Washington, DC

**Special Thanks to**

William S. Battle, PhD  
New York, NY

Cynthia Kahn, MLS, MPH, AHIP  
Reference and Instruction Librarian  
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Washington, DC

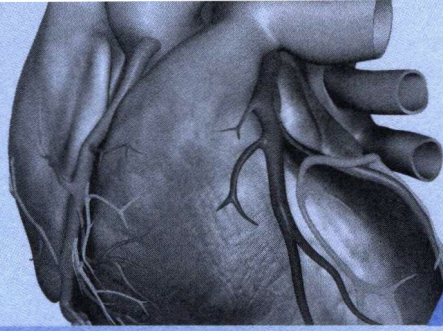
Kristina Krupincza, BS  
School of Public Health and Health Services  
The George Washington University  
Washington, DC

Raluca Popovici, MPH  
School of Public Health and Health Services  
The George Washington University  
Washington, DC

Jane Watkins, MAR  
Decatur, IL

Tareq A. Yousef, BS  
School of Public Health and Health Services  
The George Washington University  
Washington, DC

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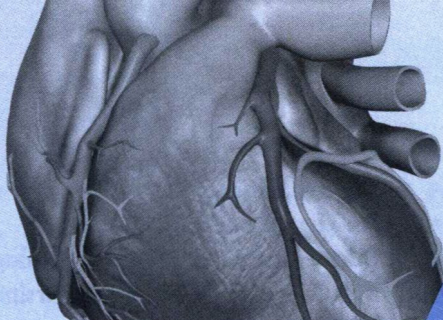
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## ***About the Editor:***

Richard K. Riegelman, MD, MPH, PhD, is a professor of Epidemiology-Biostatistics, Medicine, and Health Policy and founding dean at The George Washington University School of Public Health and Health Services in Washington, DC.



# Contributors

**Dale Avers, PT, DPT, PhD**

Director  
Transitional Doctor of Physical Therapy Program  
Assistant Professor  
Physical Therapy  
SUNY Upstate Medical University  
Syracuse, NY

**Lawrence M. Barat, MD, MPH**

Malaria Advisor  
U.S. Agency for International Development  
Washington, DC

**Christopher J. Battle, BA**

Clinical Research Coordinator  
The Innovative Clinical Research Center  
Alexandria, VA

**Harolyn M.E. Belcher, MD, MHS**

Neurodevelopment Pediatrician  
Director of Research  
Kennedy Krieger Institute  
Family Center  
Baltimore, MD

**Yanis Ben Amor, PhD**

Associate Research Scientist  
The Earth Institute  
Columbia University  
New York, NY

**Mary Beth Bigley, DrPH, MSN, ANP**

Assistant Professor  
Nursing Education  
The George Washington University  
Washington, DC

**Richard A. Billingsley, RN, MSN, MSLS**

Adjunct Professor/Coordinator  
Information and Instruction  
Himmelfarb Health Sciences Library  
The George Washington University Medical Center  
Washington, DC

**Ami Shah Brown, PhD, MPH**

Director of Vaccine Operations  
Human Hookworm Vaccine Initiative  
Assistant Professor  
Microbiology, Immunology, and Tropical Medicine  
The George Washington University and the Sabin  
Vaccine Institute  
Washington, DC

**Christina L. Catlett, MD**

Associate Director  
The Johns Hopkins Office of Critical Event Preparedness  
and Response  
Baltimore, MD

**James F. Cawley, MPH, PA-C**

Professor and Interim Director  
Physician Assistant Program  
Professor of Prevention and Community Health  
School of Public Health and Health Services  
The George Washington University  
Washington, DC

**Judy Cheng, PharmD, MPH, FCCP, BCPS**

Professor  
Pharmacy Practice  
Massachusetts College of Pharmacy and Health Sciences  
Boston, MA

**Vincent A. Chiappinelli, PhD**

The Ralph E. Loewy Professor  
Chair  
Pharmacology and Physiology  
The George Washington University Medical Center  
Washington, DC

**John M.P. Cmar, MD**

Associate Program Director  
Johns Hopkins University/Sinai Hospital Program in  
Internal Medicine  
Faculty  
Divisions of Internal Medicine and Infectious Diseases  
Sinai Hospital of Baltimore  
Baltimore, MD

**Lawrence J. D'Angelo, MD, MPH**

Chief  
Division of Adolescent and Young Adult Medicine  
Director  
Burgess Clinic and HIV Services  
Children's National Medical Center  
Professor of Pediatrics  
Medicine, Prevention, and Community Health and  
Epidemiology  
The George Washington University  
Washington, DC

**Ayman El-Mohande**

Prevention and Community Health  
School of Public Health and Human Services  
The George Washington University  
Washington, DC

**Mark S. Elliott, PhD**

Associate Professor  
Biochemistry and Molecular Biology  
The George Washington University Medical Center  
Washington, DC

**Frances F. Fiocchi, MPH, DrPH (Cand.)**

School of Public Health and Health Services  
The George Washington University  
Washington, DC

**Daniel J. Foley, MS**

Epidemiologist  
Substance Abuse and Mental Health Services Administration  
U.S. Department of Health and Human Services  
Rockville, MD

**Julia B. Frank, MD**

Associate Professor of Psychiatry  
Director of Medical Student Education Psychiatry  
Psychiatry and Behavioral Sciences  
School of Medicine and Health Sciences  
The George Washington University  
Washington, DC

**David S. Goldstein, MD, PhD**

Chief  
Clinical Neurocardiology Section  
Division of Intramural Research  
National Institute of Neurological Disorders and Stroke  
National Institutes of Health  
Bethesda, MD

**Tenagne Haile-Mariam, MD**

Assistant Professor  
Emergency Medicine  
School of Medicine and Health Sciences  
The George Washington University  
Washington, DC

**Victoria A. Harden, PhD**

Director, Emerita  
Office of NIH History  
U.S. National Institutes of Health  
Bethesda, MD  
Scholar in Residence  
American University  
Washington, DC

**Katrina D. Hawkins, MD**

Resident in Medicine  
Internal Medicine  
The George Washington University Medical Center  
Washington, DC

**Peter J. Hotez, MD, MPH, PhD**

President  
Sabin Vaccine Institute  
Walter G. Ross Professor and Chair  
Microbiology, Immunology, and Tropical Medicine  
The George Washington University  
Washington, DC

**Stephen D. Hursting, PhD, MPH, RD**

Professor and Margaret McKean Love Chair  
Nutrition, Cellular, and Molecular Sciences  
University of Texas at Austin  
Professor  
Carcinogenesis  
University of Texas M. D. Anderson Cancer Center  
Austin, TX

**Cynthia Rose Kahn, MTLs, MPH, AHIP**

Reference and Instruction Librarian  
Himmelfarb Health Sciences Library  
The George Washington University Medical Center  
Washington, DC

**Michelle M. Kalis, PhD**

Professor of Pharmacology  
Vice President for Academic Affairs/Provost  
Massachusetts College of Pharmacy and Health Sciences  
Boston, MA

**Karen L. Kemmis, PT, DPT, MS, CDE**

Physical Therapist  
Physical Medicine and Rehabilitation  
SUNY Upstate Medical University  
Syracuse, NY

**Paul L. Kimmel, MD**

Professor  
Medicine  
The George Washington University Medical Center  
Washington, DC

**Patricia S. Latham, MD**

Associate Professor of Pathology and Medicine  
School of Medicine and Health Sciences  
The George Washington University  
Washington, DC

**Jackie A. Lavigne, PhD, MPH**

Chief  
Office of Education  
Division of Cancer Epidemiology and Genetics  
National Cancer Institute  
National Institutes of Health  
Bethesda, MD

**Geoffrey S.F. Ling, MD, PhD**

Professor and Vice-Chair  
Neurology  
Uniformed Services University of the Health Sciences  
Bethesda, MD

**Joseph D. McInerney, MA, MS**

Executive Director  
National Coalition for Health Professional Education  
in Genetics  
Lutherville, MD

**Mary Pat McKay, MD, MPH**

Associate Professor  
Emergency Medicine and Public Health  
Director, Center for Injury Prevention and Control  
The Ronald Reagan Institute of Emergency Medicine  
The George Washington University  
Washington, DC

**Richard V. Milani, MD**

Vice-Chairman  
Cardiology  
Director  
Non-Invasive Laboratories  
Ochsner Heart and Vascular Institute  
Ochsner Clinic Foundation  
New Orleans, LA

**Veronica Miller, PhD**

Executive Director, Forum for Collaborative HIV Research  
Research Professor  
Prevention and Community Health  
School of Public Health and Health Services  
The George Washington University  
Washington, DC

**Wayne C. Miller, PhD**

Professor  
Exercise Science  
School of Public Health and Health Services  
The George Washington University  
Washington, DC

**Matthew Mintz, MD**

Associate Professor of Medicine  
School of Medicine and Health Sciences  
The George Washington University  
Washington, DC

**Randall K. Packer, PhD**

Professor of Biology  
Biological Sciences  
The George Washington University  
Washington, DC

**David M. Parenti, MD**

Professor  
Medicine, Microbiology, Immunology, and Tropical Medicine  
Division of Infectious Diseases  
The George Washington University Medical Center  
Washington, DC

**Pamela Zubow Poe, PhD, MA**

Research Scientist  
Health Promotion Research Center  
University of Washington  
Seattle, WA

**Raluca Popovici, MPH**

School of Public Health and Health Services  
The George Washington University  
Washington, DC

**Sudhindra Pudur, MD, MBBS**

Fellow  
Renal Diseases  
The George Washington University Medical Center  
Washington, DC

**Sophia Raff, MPH**

Executive Coordinator  
Medicine, Microbiology, Immunology, and Tropical Medicine  
The George Washington University Medical Center  
Washington, DC

**Ronald G. Riechers, II, MD**

Assistant Professor  
Neurology  
Uniformed Services University of the Health Sciences  
Bethesda, MD

**Sabrina Roundtree, MPH**

Public Health Practitioner  
Morgan State University  
Baltimore, MD

**Richard H. Schlagel, PhD**

Elton Professor of Philosophy Emeritus  
Philosophy  
The George Washington University  
Washington, DC

**Christopher Scott, IV, MS**

Medical Student  
School of Medicine and Health Sciences  
The George Washington University  
Washington, DC

**Sylvia Silver, DA**

Associate Dean for Health Sciences  
Professor  
Pathology  
The George Washington University Medical Center  
Washington, DC

**Gary L. Simon, MD, PhD**

Walter G. Ross Professor of Medicine  
Director  
Division of Infectious Diseases  
Vice Chairman  
Medicine  
The George Washington University School of Medicine  
Washington, DC

**Carol A. Smith, MS**

Assistant Professor  
Pathology  
Clinical Laboratory Science Program  
The George Washington University  
Washington, DC

**E. Richard Stiehmel, MD**

Professor  
Pediatrics  
University of California, Los Angeles School of Medicine  
Los Angeles, CA

**Elaine J. Sullo, MLS, MAEd, AHIP**

Reference and Instruction Librarian  
Himmelfarb Health Sciences Library  
The George Washington University Medical Center  
Washington, DC

**Brian A. Szekely, BA, MS (Cand.)**

Biomedical Science and Pathobiology  
Virginia Polytechnic Institute and State University  
Blacksburg, VA

**Michael J. Tabacco, MS, DDS**

Assistant Clinical Professor of Prosthodontics  
Restorative Dentistry  
School of Dentistry, University of Maryland  
Baltimore, MD

**Mellen Duffy Tanamly, MSPH**

Adjunct Assistant Professor  
Prevention and Community Health  
School of Public Health and Health Services  
The George Washington University Medical Center  
Washington, DC

**Elizabeth Tedrow, BS**

Resource Development Coordinator  
Self Reliance Foundation  
Acesso Hispano  
Washington, DC

**Cynthia M. Tracy, MD**

Professor of Medicine  
Associate Director of Cardiology  
Director of Electrophysiology  
Medicine  
The George Washington University Medical Center  
Washington, DC

**Michele N. Wagner, MPH**

National Sleep Foundation  
Washington, DC

**Daniel Webb, MPH**

School of Public Health and Health Services  
The George Washington University  
Washington, DC

**Jennifer A. Weber, RD, MPH**

Manager, National Nutrition Policy  
American Dietetic Association  
Washington, DC

**Patience H. White, MD, MA**

Chief Public Health Officer, Arthritis Foundation  
Professor of Medicine and Pediatrics  
Division of Rheumatology  
The George Washington University Medical Center  
Washington, DC

**Tareq A. Yousef, BS**

School of Public Health and Health Services  
The George Washington University  
Washington, DC

**Special Contributions****Joseph F. Pauley, B.S.Ed.**

Adjunct Professor, Education Leadership Program  
George Mason University  
President, Process Communications, Inc.  
Potomac, MD

**Richard A. Billingsley, RN, MSN, MSLS**

Adjunct Professor/Coordinator  
Information and Instruction  
Himmelfarb Health Sciences Library  
The George Washington University Medical Center  
Washington, DC

**Kristina Krupincza, BS**

School of Public Health and Health Services  
The George Washington University  
Washington, DC

**Daniel Adam Lyons, BS, BA**

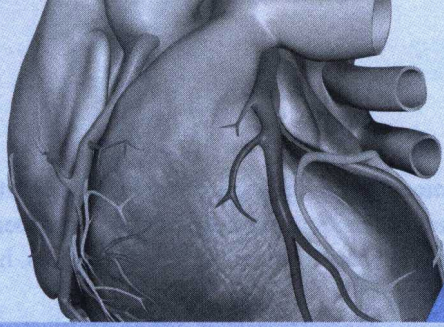
University of Missouri–Columbia  
Kansas City, MO

**Tareq A. Yousef, BS**

School of Public Health and Health Services  
The George Washington University  
Washington, DC

**Daniel Webb, MPH**

School of Public Health and Health Services  
The George Washington University  
Washington, DC



# Preface

- Why this textbook?
- Background
- Purpose for (or of) compiling this book
- Overview
- The compilation and editing process
- The contributing authors
- Ancillaries

*Understanding how and why illness and the manifestations of a disease occur and incorporating this knowledge into public health decision-making is the very essence of public health practice.*

## WHY THIS TEXTBOOK?

Excellent pathophysiology textbooks abound in multiple editions, aimed mainly at nursing, exercise science, and health science students. Almost any one of these two dozen or so comprehensive texts could be utilized effectively by instructors educating students in the basic scientific concepts, mechanisms, and principles of human biology.

None of these two dozen U.S. major texts, however, places pathophysiology within the context of the disciplines and profession of public health. This textbook is a science-based biology and clinical guide book that can stand alone or can be used by instructors as an adjunct to their favorite pathophysiology textbook.

## BACKGROUND

There are three important characteristics of students today who choose to pursue the study of public health. *First*, even at the undergraduate and graduate levels, they have recognized and acknowledged with Thomas Friedman that the world is indeed flat.<sup>1</sup> These students understand that the great changes taking place in our time due to advances in technology and communication put people all over the globe in touch as never before with both positive and negative consequences. This global awareness draws them to undertake studies in public health.

In 2003, the Institute of Medicine, in *Who Will Keep the Public Healthy? Educating Public Health Professionals for the 21st Century*, recommended that **all** undergraduate students should have access to education in public health, not just dedicated public health majors and master's students.<sup>2</sup> In fact, the *second* aspect of note is that today, undergraduate students across the country and from all sorts of majors and schools are seeking to elect a course or two in public health out of conviction or curiosity.<sup>3–5</sup>

The *third* aspect is that today's public health students do not come to this study with clinical backgrounds as once was the case. Consequently, the study of biology is essential now.

Biology (and other closely related sciences) is the foundational discipline for a public health practitioner. A basic understanding of the essentials of public health biology is the *sine qua non* for the introductory student as the cornerstone upon which rest all the other five core discipline areas (biostatistics, epidemiology, environmental health sciences, health policy and management, and social and behavioral sciences).

Turnock, Afifi, and Breslow maintain that one of the unique characteristics of public health study, and one that continues to differentiate this field of study from other social movements or social action, is its grounding in science.<sup>6,7</sup> The relationship between public health and science is particularly clear for the medical and physical sciences that govern our understanding of the biological aspects of humans, microorganisms, and vectors. This relationship also governs the risks present in our physical environment. Turnock further states that the public health and science connection is true for the other sciences that affect our understanding of human culture and behavior and thereby influence health and illness, namely, the social sciences.<sup>6</sup> It is necessary to appreciate that anthropology, sociology, and psychology help us to understand **how** human culture and behavior profoundly influence health and illness.

The purpose of a major multiyear project of the American Society of Zoology, *Science as a Way of Knowing*<sup>8</sup> was to provide background materials to those who taught introductory biology courses, for they have both the responsibility and opportunity to prepare students to function in a world that is dominated by science and technology. The study of biology as a science for public health students is a *way of knowing*, of understanding, of learning to think critically, and of going deeper, and of preparing one's self to ask and finally to address complex interdisciplinary questions. These processes help public health practitioners recognize flaws in their thinking about biological information.

Through a comprehensive, multidisciplinary effort, the Association of Schools of Public Health's Education Committee has produced a document outlining the core Master's of Public Health *competencies*.<sup>9,10</sup> The final set, updated in 2007, included the five core disciplines mentioned earlier and added a second group of integrated and interdisciplinary cross-cutting set of overall competency domains that included public health biology.<sup>11</sup> Further, public health biology illustrative **sub-competencies** were posted in June 2007.<sup>12</sup>

Thus, in the past as well as today, through multidisciplinary effort, the field of public health has been rooted in science. Public health is a scientific endeavor that begins by understanding its own biological and molecular context.

## PURPOSE FOR (OR OF) COMPILING THIS TEXTBOOK

The intent of this book is to present a dynamic approach to the study of biology rather than to impart a static body of knowledge. I will not dare to suggest that facts are not essential, nor would I ever go so far as Samuel McChord Crothers did.<sup>13</sup> In a chapter entitled, "The Anglo-American School of Polite Unlearning," he stressed the importance of unlearning. The idea was whimsically carried forward by Russell Backer in an essay in which he suggested founding a University of Un-Learning and proposed that a Non-Bachelor of Un-Arts would be awarded to students who clearly manifested their ignorance of factual knowledge.<sup>14</sup> Baker points to the importance of an *approach* to learning rather than rote memorization. My intention with this textbook is to provide an approach to the study of the biology of public health that goes way beyond memorizing facts.

In a critical look at our future, Sterling points to a speech given almost two hundred years ago by Ralph Waldo Emerson, who said that a scholar has the obligation to "organize knowledge into verifiable, sensible, and schematic fashion."<sup>15,16</sup> Likewise, students of public health have the same obligation to organize their knowledge of biology in a verifiable, sensible, and schematic fashion so that they can convey it to others in a variety of settings.

My goal in writing this book both for the student and the instructor is to create a bridge between the study of biology and the study of public health biology.

Components of the approach that I have included are:

- Applying principles of biology to issues of public health
- Developing critical thinking skills
- Rooting information in a historical perspective
- Emphasizing an integrative approach to the study of biology
- Recognizing how changes in the individual manifest themselves across the human lifespan
- Considering biologists' proximate and evolutionary causes of diseases<sup>17</sup>
- Assessing the impact of scale: looking at things from the next largest frame of reference and the next smallest
- Envisioning the next fifty years: What are the unintended consequences of what we do or fail to do today?

- Analyzing not only the causes of disease but also the evolution of our understanding of those causes
- Appreciating that there is also an evolution of our understanding of what public health is, can do, and can do potentially

## OVERVIEW

[*Essentials*] of *Public Health Biology* augments teaching pathophysiology by contextualizing it within a broad public health framework and perspective. It is appropriate for introductory students in public health at both the undergraduate and graduate levels. It also can be used by any undergraduate student interested in exploring the underpinnings of public health.

This book is organized into six units. The first unit addresses the underlying concepts of health and disease, using some alternate or different ways of looking at the different layers of complexity. The second unit addresses outcomes and applications of human behavior. The third unit addresses alterations in body physiology and pathophysiology that result from disease or injury. The fourth unit is devoted to the topic of infectious diseases, both the future as well as the past of public health. The fifth unit addresses the chronic diseases that have gained ascendancy since the mid-1950s. The sixth and final unit addresses some necessary professional skills for practitioners of public health.

Insofar as possible, each chapter addresses the following:

- significant or startling facts
- history/overview/introduction
- basic science facts/key concepts review
- case studies: scenario, defining the issues, patient's understanding
- clinical and public health perspectives
- questions for further research, study, reflection, and discussion
- exercises/activities
- Healthy People 2010
- key terms
- references
- resources
- cross references to other chapters

A major overarching theme is an emphasis on the comparison between the clinical perspective and the public health perspective, between medicine and public health. Other themes, explicit or embedded in most chapters, include: fundamental, indispensable biological facts; major issues and challenges to the health of the public; developmental perspectives across the lifespan; historical perspectives; Healthy People 2010 objectives; and childhood origins of adult diseases.

Two sections of each chapter in particular (**Basic Science Facts/Key Concepts Review** and **Public Health Perspective**) will be a useful summary/review for master's degree students in public health who are preparing for the certifying examination. These students are also encouraged to review the study guides on the Web site of the National Board of Public Health Examiners available in 2008.<sup>18</sup> The competencies and sub-competencies developed by the ASPH Education Committee can be found in the **Ancillaries** to this book for instructors and students. A grid prepared for this textbook for all introductory students is also posted on the Web site to assist students in focusing on the important biological aspects of public health.

## THE COMPILATION AND EDITING PROCESS

It has been said that the process of compiling a book teaches the editor most of all. I have learned a great deal from this project. Working with sixty-five authors of forty-five chapters was an enriching experience for me. Intending that their individuality be allowed to shine through these pages, I provided only the format for each chapter and made only one request, namely that the authors adhere to it insofar as was feasible. I further intended that the wide variety of subjects be juxtaposed to demonstrate their essential similarities and complementarities in moving the student from conceptualizing the field of biology to conceptualizing the field of public health biology. One editor recently tried this technique with a novel by passing his book through the hands of fifteen Irish authors, each of whom contributed one chapter of the book.<sup>19</sup> As he did, I tried to keep the flow cohesive throughout. My textbook also has a strong central plot line, advancing smoothly from section to section: it is critical to study biology as

an underpinning to studying the field of public health. Once students understand biology, they must make the shift to grasping the elements of public health biology. My strongest wish is that this textbook will assist students by informing their decision-making as they take their next step toward their public health practice.

## THE CONTRIBUTING AUTHORS

The levels of education of the authors range from undergraduate and master's level students (the target audiences) all the way to senior researchers with dual doctoral degrees. The contributing authors gave generously of their time and effort because of their conviction of the importance of understanding the biological basis of disease, and they made great effort to distill their vast knowledge and experience. For all this work I am grateful. The totality of their work sends the student to the next level with a strong foundation.

I have taught the Biologic Basis of Disease, a foundational course in the public health curriculum at the School of Public Health and Health Services of The George Washington University, to introductory students for the past five years. For over two decades, I served as the medical director and CEO of a 130-bed hospital for severely disabled children from birth to age 21. At this hospital, I attempted to provide the best outcomes for conditions that were the result of public health failures: prematurity, environmental exposures, nutritional deficiencies, intentional and unintentional injury, poisoning, infectious diseases, and many others. I realized that I was working on the wrong end of health care: how much better for these vulnerable children if their conditions had been prevented in the first place.

## ANCILLARIES

Jones and Bartlett Publishers offers additional online supplements to assist instructors and aid students in mastering public health biology. These materials are available for download from the text's web site: <http://www.jbpub.com/essentialpublichealth/battle/>.

Instructors, please contact your sales representative to learn more.

### Online Resources:

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#### FOR INSTRUCTORS:

- **Instructor's Manual** is provided as a text file and contains a sample syllabus, weekly homework assignments and samples, a list of my epigraphs (encapsulating my teaching philosophy) to the course that I teach, and teaching suggestions.
- **Major Integrating Homework Assignments and Samples:**
  - Critical thinking exercises
  - Understanding disease causation exercise
  - Essay topics and student samples
  - PowerPoint presentation of Mind Mapping and exercises
  - Miscellaneous exercises that suggest varied ways of thinking
  - Suggested interdisciplinary questions
- **Test Bank** is available as a text file. Multiple choice questions are provided for most chapters, where appropriate.
- **Answer Keys/Instructor's Guidelines** for each chapter's three levels of questions.
- **Answer Keys/Instructor's Guidelines** for each chapter's exercises/activities.
- **PowerPoint Lecture Outline Slides Presentation Packet** provides lecture notes for each applicable chapter. These materials can be customized by the instructor.
- **Informatics: Additional Overarching Exercises with Guidance for Instructors for Parts 1 through 5 and PowerPoint Lecture on Informatics.** This material provides instructors with additional strategies and exercises for their students to use for each section of the book. This material will reinforce and enrich the development of student skills in learning where and how to search for professional information beyond the exercises in each individual chapter.
- **Core Competencies in Public Health Biology:**
  - **Association of Schools of Public Health**
    - Masters Degree in Public Health Core Competency Development Project Version 2.3
    - Public Health Biology Illustrative Sub-Competencies

- Student Perceptions of Why it is Important to Study Public Health Biology
- **Cross Reference Grid Between Chapters and Competencies**

#### FOR STUDENTS:

- **Core Competencies in Public Health Biology:**
  - **Association of Schools of Public Health**
    - Masters Degree in Public Health Core Competency Development Project Version 2.3
    - Public Health Biology Illustrative Sub-Competencies
  - **Cross Reference Grid Between Chapters and Competencies**

Constance Urciolo Battle, MD  
 School of Public Health and Health Services  
 The George Washington University  
 Washington, DC

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