

# **Cases in Field Epidemiology**

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## ***A Global Perspective***

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## **DEDICATION**

To my wife, Renee, and daughters, Josie and Julie.  
And to my mother, Una, and to Henry and Frieda,  
for having made me feel like each good work I try to do  
has made them proud.



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# Table of Contents

Preface xi

About the Editor xv

Contributors xvii

## **PART I Outbreak Investigations 1**

### **CHAPTER 1**

**An Overview of Outbreak Investigation 3**

*Mark S. Dworkin, MD, MPH&TM, FACP*

### **CHAPTER 2**

**How an Outbreak is Investigated 7**

*Mark S. Dworkin, MD, MPH&TM, FACP*

## **PART II Outbreak Investigations of Infectious Diseases 17**

### **CHAPTER 3**

**Leptospirosis at the Bubbles 19**

*Kenrad E. Nelson, MD, PhD*

### **CHAPTER 4**

**Cholera for a Dime 29**

*Paul A. Blake, MD, MPH*

### **CHAPTER 5**

**Legionnaire's Disease: Investigation of an Outbreak of  
a New Disease 43**

*Steven B. Thacker, MD, MSc*

### **CHAPTER 6**

**The Investigation of Toxic Shock Syndrome in  
Wisconsin, 1979–1980 and Beyond**

*Jeffrey P. Davis, MD*

### **CHAPTER 7**

**The Early Days of AIDS in the United States: A  
Personal Perspective 65**

*Harold W. Jaffe, MD, MA, FFPH*

**CHAPTER 8**

**Verify the Diagnosis: A Pseudo-Outbreak of Amebiasis in Los Angeles County 73**

*Frank Sorvillo, PhD*

**CHAPTER 9**

**Measles Among Religiously Exempt Persons 83**

*Charles E. Jennings*

**CHAPTER 10**

**An Outbreak of Fulminant Hepatitis B in a Medical Ward in Israel 91**

*Ronald C. Hershov, MD, MPH*

**CHAPTER 11**

**What Went Wrong? An Ancient Recipe Associated with Botulism in Modern Egypt 101**

*J. Todd Weber, MD*

**CHAPTER 12**

**Controlling an Outbreak of Shigellosis with a Community-Wide Intervention in Lexington County, Kentucky 109**

*Janet Mohle-Boetani, MD, MPH*

**CHAPTER 13**

**Pork Tapeworm in an Orthodox Jewish Community: Arriving at a Biologically Plausible Hypothesis 115**

*Peter M. Schantz, VMD, PhD and Mary E. Bartlett, BA*

**CHAPTER 14**

**The Massive Waterborne Outbreak of *Cryptosporidium* Infections, Milwaukee, Wisconsin, 1993 121**

*Jeffrey P. Davis, MD*

**CHAPTER 15**

**A Community Outbreak of Hepatitis A Involving Cooperation Between Public Health, the Media, and Law Enforcement, Iowa, 1997 145**

*Patricia Quinlisk, MD, MPH; Yvan J.F. Hutin, MD; Ken W. Carter; Thomas M. Carney; and Kevin Teale, MA*

**CHAPTER 16**

**Tracking a Syphilis Outbreak Through Cyberspace 163**

*Jeffrey D. Klausner, MD, MPH*

**CHAPTER 17**

**Eschar: The Story of the New York City Department of Health 2001 Anthrax Investigation 173**

*Don Weiss MD, MPH and Marci Layton, MD*

**CHAPTER 18**

**Ebola Hemorrhagic Fever in Gabon: Chaos to Control 191**

*Daniel G. Bausch, MD, MPH&TM*

**CHAPTER 19**

**Whipping Whooping Cough in Rock Island County, Illinois 203**

*Mark S. Dworkin, MD, MPH&TM, FACP*

**CHAPTER 20**

**Emergency Yellow Fever Mass Vaccination in Post-Civil War Liberia 217**

*Gregory Huhn, MD, MPH&TM*

**CHAPTER 21**

**A Mumps Epidemic, Iowa, 2006 245**

*Patricia Quinlisk, MD, MPH*

---

**PART III Outbreak Investigations of Intoxications and Other Noninfectious Causes 259**

---

**CHAPTER 22**

**Something Borrowed, Something Blue: A Wedding to Remember 261**

*Cortland Lohff, MD, MPH; Tom Boo, MD; and Patricia Quinlisk, MD, MPH*

**CHAPTER 23**

**Toxic School Lunch: Chemical Poisoning of Elementary School Children in Joliet, Illinois 273**

*Alpesh Patel, MBBS, MPH, CERC, CPHA and Mark S. Dworkin, MD, MPH&TM, FACP*

**CHAPTER 24**

**When Your Food Glows Blue 287**

*Eduardo Azziz-Baumgartner, MD, MPH*



**CHAPTER 25**

**What Do People Eat When They Have No Food?  
A Tragic Story of Poverty, Monsoon Floods,  
and Weeds 301**

*Emily S. Gurley, MPH*

**CHAPTER 26**

**Toxic Tryptophan? Investigating the Eosinophilia  
Myalgia Syndrome in Minnesota 313**

*Edward A. Belongia, MD*

**CHAPTER 27**

**A Mystery Illness in Panama 337**

*Lauren S. Lewis, MD, MPH*

**CHAPTER 28**

**“We’re Prepared to Believe You”—Investigating Cancer  
Cluster Reports 349**

*Tim E. Aldrich, PhD, MPH*

---

**PART IV Cases in Environmental and  
Occupational Health 371**

---

**CHAPTER 29**

**Fine Wines and Cohorts Take Time: The History  
of a Cohort Study of Workers Exposed to Ethylene  
Oxide 373**

*Leslie Stayner, PhD and Kyle Steenland, PhD*

**CHAPTER 30**

**Why Have the Children of Chernivtsi Lost All of  
Their Hair? 389**

*Daniel Hryhorczuk, MD, MPH*

**CHAPTER 31**

**Not in My Backyard: An Investigation of the Health of  
a Community Living Near a Landfill 401**

*Preethi Pratap, PhD*

---

**PART V Investigating Hard-to-Reach  
and Special Populations 413**

---

**CHAPTER 32**

**Back to School: Using Basic Epidemiologic Data on  
Asthma in Urban School Children to Improve  
Respiratory Health 415**

*Victoria Persky, MD*

**CHAPTER 33**

**Sex, Drugs, and Community-Based Ethnography:  
Field Investigations Involving Difficult-to-Reach  
Populations Around the World 421**

*W. Wayne Wiebel, PhD*

**CHAPTER 34**

**Investigation of Attitudes Toward Immunization in an  
Old-Order Amish Community 439**

*Jonathan S. Yoder, MSW, MPH*

**CHAPTER 35**

**Performing a Seroprevalence and Ocular Study in  
Rural Guatemala—Toxoplasmosis, a Chronic Infectious  
Disease 449**

*Jeffrey L. Jones, MD, MPH and Beatriz López, QB*

**Index 461**



# Preface

Field epidemiology is the most exciting epidemiological work. That may be a bold statement, but I can't think of any other public health activity that gets more people excited while they are doing their work and talking about it long after they have returned from the field. Reading field investigations in scientific publications is often very interesting. Personal stories and media coverage of field epidemiology are sometimes responsible for students deciding on public health as a career, even changing from one long-planned career to this useful and rewarding type of work. At public health conferences, it is not unusual for presentations of field investigations to attract large and enthusiastic audiences. However, what is not usually conveyed in these presentations or their subsequent scientific publications are the many challenges and unique circumstances that the investigators had to deal with along the way. There is much to be learned from what lies between the lines of the introduction, methods, results, and conclusions.

The term “epidemiology” is defined as the distribution and determinants of disease. The term “field” is used to reflect that an epidemiological investigation involved some degree of getting out of the office and into

the environment where the disease distributed or gaining a firsthand account or understanding of the factors that may have been responsible for or associated with the disease. As a result, investigations of disease that involve field epidemiology have taken their investigators to all parts of the world—from urban homeless shelters to refugee camps and distant tropical islands where there may be no electricity. I think that this is one of the great benefits of a career practicing field epidemiology. It is a ticket to places that you would never otherwise have gone. In my own public health career, for one reason or another, I have gotten to work and learn inside a ham processing plant, numerous restaurants, many hospitals, many schools, a county jail, a facility for the developmentally disabled, a hotel, a recreational water park, sports competition and work out areas, sunny docks on the northern Washington state coastline, rural snow-blanketed cabins, a Catholic shrine, a village in India, abandoned houses, and the homes of the Amish. I could go on, but it is not necessary. Equally remarkable is that the list of another epidemiologist is likely to be different, but not less diverse. What makes it possible to work in so many completely different environments is a good

grounding in basic epidemiological principles, including the steps of outbreak investigation and other epidemiological methods, as well as healthy doses of common sense, perseverance, and humility.

Outbreak investigations are a type of field epidemiology. However, an epidemiologist working in the field need not be involved in an outbreak. If the epidemiologist is involved in an outbreak, it does not have to be caused by an infectious disease. This book provides a spectrum of investigations from many countries that illustrate the unique and genuinely interesting world of field epidemiology, while teaching and reviewing scientific and epidemiological methods and facts that derive from a broad spectrum of investigations and careers investigating public health problems in the field. Compared to many other countries, field epidemiology is highly developed within the United States. As a result, this book includes more examples from the United States than elsewhere. However, excellent work is performed throughout the world and training programs are emerging that are helping to bridge the gap.

This book is not intended to replace an epidemiology textbook, but rather to complement it. Given its unique style, it does not and cannot realistically review all epidemiological methods. The methods that are reviewed are those that happen to be relevant to the investigations included. In fact, some methods are mentioned but not explained because to do so would interrupt the flow of the case study too much and the methods are better addressed in authoritative epidemiology or biostatistics textbooks. This book is intended to illustrate the application of epidemiologic methods and to demonstrate to its readers how interesting epidemiology can be. It also provides readers who have not yet selected their career path with an idea of what this work can be like. As I have read and reread each of these chapters in the preparation of this book, I found myself drawn to the story and excited by each example of a real-world application of information that may have been taught during the acquisition of a public health degree or would need to be learned afterwards in the work world. It was common for authors to tell me how much they enjoyed writing the chapter. The enjoyment of experiencing these investigations comes through in their writing and illustrates how special this kind of work can be.

It is my intention to reach out to both the experienced and less experienced investigator, students interested in any of the applications of field epidemiology, as well as anyone interested in the study of epidemics by presenting extraordinary and illustrative investigations. It is my hope that these outbreak descriptions will clarify what was involved in the investigation beyond what

is found in a published scientific article. The first-person style is intended to create a reader friendly format that is more like a story that can entertain while instructing. They also provide a context for the investigations by introducing the reader to where the authors were in their careers at the time, with whom they were working, and the real-world conditions they had to face while practicing field epidemiology. In an article titled “In Philadelphia 30 Years Ago, an Eruption of Illness and Fear” written for *The New York Times* by Lawrence K. Altman recalling the Legionnaires’ disease outbreak of 1976, he described an interview with a patient that left the epidemiologic team unable to explain why that patient developed the disease, but four other Legionnaires, with whom he spent a great deal of time, did not develop the disease. He goes on to recognize that dead ends like these in epidemiologic investigations are not what scientific journals publish. The concise and focused scientific article that becomes what most persons know of the outbreak investigation (along with other factors) “creates a false impression that investigations and discoveries are simpler than they really are.” (*The New York Times*, August 1, 2006). These investigations are typically very complex and bring together many challenges, including recalling and applying epidemiologic knowledge; making numerous decisions, often quickly and under stressful conditions; working as a team that includes team members one has never worked with before; working in an environment away from the office where most of one’s resources are located; and many more.

These examples of applied field epidemiology are appropriate for students interested in infectious disease outbreaks and students interested in noninfectious disease topics such as environmental health, cancer, substance abuse, and other chronic diseases. In fact, it is healthy for an education in infectious disease epidemiology to include exposure to the approach and tools used by persons who investigate chronic disease and environmental health problems and vice versa. A broader understanding of investigation can lead to creative and useful ideas during future investigations. Within these chapters, one finds the intersection of behavioral, environmental, and political factors that influence real public health decisions.

It is a privilege to be able to access this information because some issues that are relevant to epidemiologic investigation do not arise during epidemiology training through traditional textbooks. Yet the speed of an investigation and even its success could be influenced by the level of the investigators’ familiarity with these issues. Many field epidemiologists gain such exposure only through practice, including trial and error, or through

exposure to great mentors. This book intends to bridge the gap between the inexperienced and the experienced by offering more complete information about what happened, why decisions were made in a certain way, and even the working conditions and little pains or pleasures of the investigator. Candid accounts should not be taken for granted, because sometimes not everyone involved feels comfortable revealing how things unfolded. In fact, in the preparation of this book, one investigation was completely written in an entertaining and educational fashion, but was not cleared by the agency with the authority to do so. There were many valuable lessons from that investigation, but it is uncertain if and when those lessons will ever be shared. Because clearance was not given, it was not published in this book.

Some of these chapters deal with events that unfolded quickly (like poisonings and most infectious disease outbreaks), while other chapters review a career with selected experiences presented and lessons learned along the way or an investigation that took many months or years to complete. Not every investigation results in a slam-dunk definitive answer or involves cooperation from those who have a stake in the results. That's the real world, as opposed to a television episode. This book desires to present the real world. Therefore, such investigations are included despite their possible limitations or loose ends. And finally, some chapters simply reveal how certain kinds of applications of epidemiology were carried out, whether it involved recruiting children to be bled as part of a seroepidemiologic study, creating a survey intended for a difficult to access population, or experiencing work within a unique setting like a school system.

Readers will likely recognize that a few chapters are much longer than others. This was not an accident of editing, but a conscious decision to have certain topics expanded to allow a fuller discussion of the investigation or the circumstances in which it took place. Therefore, instructors might choose to teach or assign reading from the longer chapters into two parts.

At the end of the chapters are learning questions. The authors or I have written these questions to stimulate review of important material presented in the chapter and class discussion. They are not intended to be a complete review of all the material presented. Therefore, students or instructors will find it beneficial to identify other epidemiologic issues or methods, judgment calls, and lessons learned in the chapters as both a teaching tool and possibly a way of testing from the book.

How do you enter a career that includes field epidemiology? Many of the authors share a glimpse into their entry into this work. Often, it includes training or

working for local, state, or federal government. The most famous training program in the United States is the Centers for Disease Control and Prevention's two-year Epidemic Intelligence Service (EIS) program (<http://www.cdc.gov/eis/index.html>). This program is mentioned in many of the chapters because it is an excellent program for learning surveillance and field epidemiology methods while applying them to current important public health problems. Typically, persons accepted into the EIS have a professional degree, such as a PhD, MD, VMD, or equivalent. The Council of State and Territorial Epidemiologists, in partnership with other organizations including the CDC, also has a program known as the CDC/CSTE Applied Epidemiology Fellowship (<http://www.cste.org>). Persons who are recent masters- or doctoral-level graduates in epidemiology or a related field are placed with mentors (much like the EIS program) in state or federal programs. Some programs are offered elsewhere in the world. For example, the European Centre for Disease Prevention and Control has the European Programme for Intervention Epidemiology Training program and many countries around the world now offer epidemiology training similar to the EIS program through collaboration with the CDC's Field Epidemiology Training Program (FETP <http://www.cdc.gov/globalhealth/FETP/>). There are other opportunities to get experience and readers are encouraged to speak to their local and state health departments to explore possible training, employment, and volunteer opportunities. Enjoy reading this book. I hope that it will stimulate many students to pursue the exciting and challenging work of field epidemiology and that it will be helpful to the many public health professionals who work in the field.

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Photo courtesy of the Editor, Mark S. Dworkin



# About the Editor

**Mark S. Dworkin, MD, MPH&TM, FACP**, is a medical epidemiologist and is board certified in internal medicine and infectious diseases. After receiving his medical degree from Rush Medical College (Chicago), he trained in Internal Medicine at Rush Presbyterian St. Luke's Medical Center and in Infectious Diseases at Tulane University Medical Center, he also obtained a Master's Degree in Public Health and Tropical Medicine from the Tulane University School of Tropical Medicine and Public Health in New Orleans. He then served for two years in the Centers for Disease Control and Prevention's (CDC) Epidemic Intelligence Service stationed at the Washington State Department of Health where he investigated many outbreaks including those due to pertussis, *Salmonella*, *Cryptosporidium*, *Trichinella*, and measles. Dr. Dworkin worked at the CDC in Atlanta for four years in the Division of HIV/AIDS Prevention and performed many epidemiologic analyses related to opportunistic infections. During 2000 to 2006, he was the Illinois Department of Public Health State Epidemiologist in the Division of Infectious Diseases and team leader for the rapid response team (an outbreak

investigation team). He is now an associate professor in the Division of Epidemiology and Biostatistics at the University of Illinois at Chicago School of Public Health and an attending physician at the HIV outpatient Core Center of the John H. Stroger, Jr. Hospital of Cook County (formerly Cook County Hospital) and provides on-call coverage to a private practice infectious disease group in the Chicago area. Dr. Dworkin lectures at Northwestern University and the University of Chicago. He has authored or co-authored many scientific publications on various topics including outbreak investigations, surveillance, HIV/AIDS opportunistic infections, salmonellosis, tick-borne illnesses, and vaccine-preventable infections. Current research interests include food safety education of restaurant food handlers, persons with AIDS, and a variety of consumer populations. Additional information may be viewed at this web page: <http://tigger.uic.edu/~mdworkin/Dworkinweb.htm>. Dr. Dworkin has been awarded both the Commendation Medal and the Achievement Medal by the United States Public Health Service.





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