DISEASE SURVEILLANCE

A Public Health Informatics Approach

Edited by

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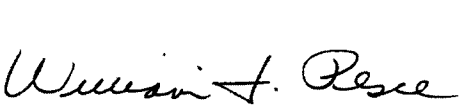

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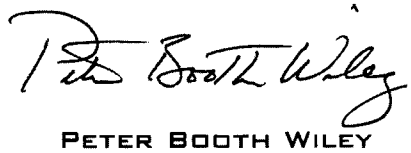

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To those public health workers who get the call at 5 P.M.
on Friday afternoon and give freely of their own time
to protect the health of the populations they serve.
It is hoped that the advance disease surveillance methods
described in this book will help them to use their time
and talents more efficiently to accomplish their mission.

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Contents

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Preface

During the last quarter of the twentieth century, countries with advanced healthcare systems felt comfortable in their ability to manage the spread of diseases that would have had high morbidity and mortality in earlier years. Smallpox had been eradicated and the memory of the Spanish Influenza outbreak of 1918 had faded. Toward the end of the twentieth and into the twenty-first century, the overuse of antibiotics, resulting in disease resistance, the rapid spread of HIV, and the increasing threat of bioterrorism were examples of public health issues that were beginning to increase pressure to enhance existing disease surveillance processes.

Among these concerns, the clandestine release of a deadly pathogen on an unsuspecting population maybe the most insidious public health threat. Most pathogens available as bioweapons can cause high mortality and could lead to the collapse of the healthcare delivery and emergency response systems in an area under attack. The contamination and the possible closure of major medical centers, even if only temporary, would have a serious impact on the health of the population. To mitigate the consequences of this type of public health event, an effective detection and treatment campaign must be launched early in the course of the outbreak.

Because of the threat of bioterrorism and the emergence of new infectious diseases, disease surveillance systems that utilize modern technology are becoming commonplace in public health agencies. The objective of this book is to present the components of an effective disease surveillance program that utilize modern technology. These components include the research, development, implementation, and operational strategies that are finding their way into successful practice.

Advanced disease surveillance systems automatically acquire, archive, process, and present data to the user. The development and maintenance of the systems require skilled personnel from the fields of medicine, epidemiology, biostatistics, and information technology. In addition, for the surveillance systems to be useful, they must adapt to the changing environment in which they operate and accommodate emerging public health requirements that were not conceived previously.

Research and innovation have led to the implementation of surveillance methods that would have been considered impossible or radical only a few years ago. For example, the case definitions or events under surveillance, which traditionally rely on diagnosis, have been altered in many systems to rely on less specific pre-diagonstic health indicators of syndromes. Correctly filtering data into syndromes or other categories for analysis requires knowledge of the underlying diseases and health-seeking behaviors of the population. Additionally, for analytical tools to have high specificity, they must take into account the normal range of all of the variables that comprise the

background for the health indicators. Tools that fuse data and information from inhomogeneous indicators are necessary to provide decision-maker with comprehendable output. Similarly, information technologists must automate data ingestion and cleansing, optimize system architecture, and create user-friendly interfaces while meeting the challenge of using and customizing commercial, off-the-shelf products.

Users' requirements must have a higher priority than solutions that are technologically exciting. Continuing dialogue must exist among the users and the multidisciplinary development team to establish an effective surveillance capability that fits within the environment where it will be deployed. Without close interaction between these groups, effective advanced disease surveillance will be compromised. Changes to traditional thinking have resulted in the implementation of improved methods that are more suited to meeting the current challenges facing health departments. Because it is difficult to anticipate future public health emergencies, a continuing adaptation is required to maintain satisfactory system performance.

The field of public health informatics is growing rapidly as applications of technology are being applied to permit health departments to recognize and manage disease in the populations they serve. This book is intended for use (1) as a textbook for public health informatics students, (2) as a reference for health departments that are exploring modern information technology to support their surveillance activities, and (3) as training material for workshops that are components of disease surveillance and public health conferences.

The contents of this book provide insight into not only the technology but also into the difficulties and the successes that the public health community has had with the implementation and operational use of advanced disease surveillance systems. Hence, chapter authors provide not only the views of academics and developers of the technology, but also of users from health departments in the United States, Canada, United Kingdom, South America, and Asia. This wide variety of perspectives will hopefully provide a broad and balanced treatment of issues related to developing and operating advanced surveillance systems.

The book is divided into three parts. Following an introductory chapter (Chapter 1), the first part (Chapters 2 through 5) presents the methods and technologies needed to implement a modern disease surveillance system, including the data sources currently being used in syndromic surveillance systems (Chapter 2); the mechanisms for the acquisition of data for surveillance systems (Chapter 3); an overview of analytical methods for the recognition of abnormal trends within the data captured for surveillance (Chapter 4); and some basics of systems architectures, text parsing, and data visualization techniques (Chapter 5).

The second part of the book (Chapters 6 through 9) is devoted to case studies of modern disease surveillance systems and provides examples of several implementations in the United States, Canada, Europe, and Asia. These chapters indicate the breadth of the techniques used across the globe in applications of modern technology to disease surveillance.

The third and last part of this book (Chapters 10 through 12) addresses practical questions regarding the evaluation of disease surveillance systems, education of future

public health informatics personnel and disease surveillance practitioners, and a look to the future to consider how technology will continue to influence the practice of disease surveillance.

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Index