

# Health Informatics



J.A. Magnuson • Paul C. Fu, Jr.  
Editors

# Public Health Informatics and Information Systems

Second Edition

 Springer

*Editors*

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# Foreword

As a medical student in the early 1980s, I was rather scandalized to discover that my required textbook of medicine did not provide standard treatment protocols for even the most common of medical conditions. What good is a textbook, I asked myself, if it does not provide even this most basic treatment information? The textbook in question was the (then) current edition of the *Principles and Practices of Medicine*, originally published by William Osler in 1892 and continually updated by Johns Hopkins University School of Medicine faculty in many editions to this day. In succeeding years, of course, I came to realize that field-encompassing textbooks cannot and should not be concerned with the specific treatments and protocols of the day, but rather – as Osler understood – the principles and practices that perennially define the field from generation to generation. This is similarly the essence and focus of this, the second edition of this public health informatics textbook: the principles and practices that define and shape this growing and exciting discipline.

Having said that, there is a reason why Osler’s venerable textbook has been updated through dozens of editions and an ever-changing cast of editors: the challenges and context for a discipline, whether medicine or public health informatics, are ever-changing, and textbooks that seek to guide, inform, and inspire new students of a given discipline must change likewise.

The first edition of *Public Health Informatics and Information Systems* [1] was begun as a straightforward compendium of key public health–relevant information systems: mortality and natality data systems, survey-based systems (like the Behavioral Risk Factor Surveillance System), and so forth. But the editors quickly came to feel that a more comprehensive focus on *informatics* was needed, for two primary reasons: (1) the burgeoning information age presented the field of public health with extraordinary and unprecedented opportunities to improve its efficiency and effectiveness, and even to revolutionize the ways in which public health itself was practiced; and (2) an absence of familiarity with the basic tenets of informatics had led, and would inevitably lead in the future, to costly (and sadly predictable) failures to develop effective, integrated, and sustainable new information system applications for public health.

With this in mind, the project evolved into what would become the first American public health informatics textbook, and its first edition was expanded to include a broad presentation of the principals and practices, as well as the context and basic science, of

public health informatics. To be sure, the major information systems in general use by public health professionals were described and explained. But two concluding parts of the book were included, to describe then-emerging information systems and challenges; and to illustrate through a diverse series of case studies the kinds of value that were being accrued through public health information system development, as well as the special challenges that the development of these systems often entailed. Through these case studies, undergirded by the material that preceded them, the essential principles and practices of public health informatics were illustrated in real-world terms.

This second edition, developed by JA Magnuson and Paul Fu, Jr., continues this focus and tradition. The basic sections of the original textbook have been preserved, providing the student with the context and science of public health informatics; descriptions of key public health information systems; overviews of new challenges and emerging systems; and a series of illustrative case studies. The material in every section has been enormously updated, however, to reflect astonishingly rapid advances in information technology as well as profound changes in the societal and legislative context for both healthcare and public health.

By way of illustration, consider that when the first edition was published in 2003, social media and social networking applications were essentially unknown. Facebook<sup>®</sup>, for example, was not launched until 2004. Yet as of September 2012, Facebook<sup>®</sup> had over one billion active users—roughly one-seventh of the entire global population (and a much higher proportion in developed countries). Consider also that the US Patient Protection and Affordable Care Act was only signed into law in March 2010 (roughly 3 years ago at this writing), and will not take full effect until 2014. Yet this game-changing legislation is already altering the landscape for healthcare in ways that powerfully promote truly health-oriented (as opposed to procedure-oriented) healthcare. By highlighting the importance of prevention—in financial as well as ethical terms—the Act also promotes closer connections and collaboration between the healthcare and public health sectors.

These and many other rapid technological and societal developments present today's informatics professionals with enormous, unprecedented opportunities to apply information science and technology in innovative ways to promote the public's health. There has never been a better time to exert passionate and creative leadership to improve existing systems of prevention and public health, and to invent new and yet-undreamt-of approaches to promote human health and well-being.

With that, let me invite the student of public health informatics to take full advantage of the information and guidance in this textbook to ignite your passion and develop your creative informatics leadership; and let me congratulate the editors on this much-improved second edition.

Seattle, WA, USA

Patrick W. O'Carroll, MD, MPH, FACPM, FACMI

## Reference

1. O'Carroll PW, Yasnoff WA, Ward ME, Ripp LH, Martin EL, editors. Public health informatics and information systems. New York: Springer; 2003.

# Preface

When the first edition of *Public Health Informatics and Information Systems* was published in 2002, Public Health Informatics was a relatively young field. That first edition was invaluable in helping to establish the field of study and provide structure for the emerging discipline. A decade later, great progress has been made, but Public Health Informatics is still an emerging field that needs continued focus in order to grow into its full potential.

This edition builds upon the foundation established by the first edition. We have expanded into new areas that have become important due to changing technologies and needs, as well as updating and augmenting many of the original core tenets. The breadth of material included in this work makes it suitable for both undergraduate and graduate coursework in Public Health Informatics, enabling instructors to select chapters that best fit their students' needs.

## Structure and Objective of This Book

The template for the chapters in this book contains learning objectives, an abstract or overview, the chapter content, review questions, and references. The book itself is organized into five parts:

- Part I. *Context for Public Health Informatics* provides a background for the textbook. This part begins with an introduction to the subject of Public Health Informatics and a review of the history and significance of information systems and public health. The context of biomedical informatics is discussed and the governmental and legislative context of informatics is reviewed.
- Part II. *The Science of Public Health Informatics* reviews the technology and science behind the field of informatics. Informatics infrastructure and information architecture are discussed. This part examines data sources and tools, and the critical issue of information standards. The topics of privacy, confidentiality, security, and ethics are explored. Electronic health records are examined, as well as project management and system evaluation.

- Part III. *Key Public Health Information Systems* are studied in this part. The areas of disease prevention and epidemiology, and environmental health, are reviewed. Specific systems and instances for public health laboratories, risk factor information systems, the National Vital Statistics System, and immunization information systems are discussed.
- Part IV. *New Challenges and Emerging Solutions* addresses some of the newest challenges facing Public Health Informatics, as well as emerging solutions. Included are new means of data collection and accessibility, geographic information systems, health information exchange, decision support and expert systems, delivery of preventive medicine, and case-based learning.
- Part V. *Case Studies: Information Systems and the Strata of Public Health* highlights informatics case studies from the different strata of public health. The case studies begin with local and regional public health, progressing to state examples for both high population and low population states. Then, national perspectives are represented by examples from the USA, Canada, and a collaborative chapter illustrating informatics experiences in Malawi and Rwanda.

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# Acknowledgements

This book reflects the hard work and dedication of many people.

As editors, we want to acknowledge the contributions of our chapter authors, who generously managed to find the time to share their wealth of knowledge and experience. Their contribution was absolutely critical to this effort, and we are grateful that so many leaders in the field of Public Health Informatics were willing to participate in this project.

We are also grateful to the editors of the previous edition, whose hard work and inspiration pioneered a path for Public Health Informatics. The enthusiasm and encouragement given to us by that edition's senior editor, Patrick O'Carroll, is especially appreciated.

Finally, we would like to acknowledge the skill and support of our editor at Springer, Grant Weston, and our developmental editor Connie Walsh. Their encouragement, guidance, and skills were invaluable.

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