Book Reviews

GIS in Public Health Practice
Ravi Maheswaran and Massimo Craglia, editors
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308 pages; $99.95

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If the publication of a textbook focusing on a specific intellectual tradition or scientific method marks its establishment as a legitimate field of study, it would appear that the use of geographic information systems (GIS) in public health is firmly entrenched. The past several years have seen four special journal issues on this subject (two each in *Journal of Public Health Management and Practice* in 1999 and in *Journal of Medical Systems* in 2004), a series of comprehensive essays in the *Annual Review of Public Health* (2003), and an increasing volume of methods papers and applications throughout our peer-reviewed literature. Since Maheswaran and Craglia's edited text on *GIS in Public Health Practice* is at least the third English-language text on this subject, its contents and potential utility must be assessed within the context of this rapidly evolving field.

Maheswaran and Craglia provide a comprehensive text consisting of 18 chapters arranged in four sections ranging from disease mapping and spatial analysis to applications in communicable disease control and environmental health, to applications in health planning and policy, and to public health issues involved in the adoption and use of GIS in research and daily public health practice. The book includes 29 co-authors of the various chapters, bringing expertise and GIS examples primarily from the United Kingdom but also from Germany, Finland, Italy, New Zealand, and the United States. Most of the contents of the text were originally presented at a conference held at Sheffield, United Kingdom, in 2001.

Following the obligatory introductory chapter, the first section of the book consists of three general chapters on issues in geographic analysis, disease mapping, and clustering of disease. Each of these chapters provides useful overviews of their subjects, with adequate illustrations and references for readers who wish to learn more about each topic. However, because the fields of spatial statistics and spatial epidemiology continue to evolve, readers wishing to access the most current approaches and methodological debates would be advised to also consult the latest peer-reviewed periodical literature.

The second section consists of five chapters focusing on applications of GIS in communicable disease and environmental health. Kistemann and Queste's chapter on communicable disease control is cursory and does not take a public health informatics approach. However, it includes a useful summary of methodological and institutional problems in the application of GIS to public health issues, including the "gee whiz" effect that is frequently the by-product of disease mapping exercises gone awry. The second chapter on communicable disease applications unfortunately fares no better, consisting of numerous charts and maps that show how easily GIS can generate output; perhaps this chapter was included to remind readers that GIS is not a substitute for sound research design and analytical strategies. Fortunately, the three following chapters concretely demonstrate how GIS can be used for environmental exposure assessment across small areas, to model outdoor pollution exposures, and in the conceptualization and building of health and environment information systems. American readers will need to study the bureaucratic framework for collection and management of health and environmental databases before considering how to apply the ideas underlying these mostly British applications.

The third section includes four chapters focusing on GIS applications in health planning and policy. The first chapter briefly describes how health GIS has been used in one of the British National Health Service regions, while the second discusses the use of GIS at the district level. Both of these chapters have limited relevance for the American context, not least due to their paucity of references and narrow range of examples. Lovett et al. provide an excellent presentation on the use of GIS to assess health care access, detailing the methods employed to study regional access to primary care. The chapter by Elmes focuses on GIS in public health planning from the U.S. perspective; this is the only chapter with an explicit emphasis on the North American context. Examples are relatively current, although new applications and resources continually emerge.

The final section includes chapters on GIS and public health in the context of evolving information systems, and ethical and legal issues focus on the European context. Readers can find much stronger and more useful essays on privacy, confidentiality, and protection of health information in administrative and research databases elsewhere. Likewise, the chapter on attitudes of patients and the public toward use of their health information makes literally no mention of the GIS context. On the other hand, Löytönen and Sabel's chapter on mobile phone positioning and accessibility of health services is informative, forward-looking, and relevant throughout the developed world. The book concludes with a SWOT (strengths, weaknesses, opportunities, and threats) analysis assessing the current status and future role of GIS in the field of public health practice.

As with any edited volume, some chapters are more useful than others. The strongly Anglo/Euro-centric focus of many GIS applications may limit this book's appeal for American public health professionals. It would, however, be a mistake to dismiss this book on these grounds; any objective observer should be forced to conclude that there is more to be learned from studying public health GIS applications elsewhere than by focusing exclusively on U.S. examples.

While the strengths and opportunities clearly outweigh the weaknesses and threats, several areas warrant special concern. Public health GIS will never be more relevant than

the quality of the data and analytical methods employed. Although contemporary off-the-shelf applications are vastly more sophisticated in their analytical offerings than those available just four years ago, many methods still require complex data processing involving exporting data files, analyzing using specialized software (e.g. SaTScan, TerraSeer) and then importing the results for mapping and visualization using the analyst's GIS software. Newly graduated GIS specialists can command salaries well in excess of the capabilities of most local and many state health agencies, with the result that many GIS public health practitioners develop their skills on the job, attending occasional seminars but lacking training in fundamentals of cartographic and geographic methodologies. Concerns for privacy and confidentiality may limit the availability of public health data for analysis of point distributions, and public health agencies seeking to adopt GIS technologies must be prepared for continual investment in staff training, hardware, and software, if they wish to use GIS wisely.

Maheswaran and Craglia have provided a useful though unbalanced text on the subject of GIS in the context of public health practice. The text is well-edited, allowing for the varying writing styles of the many authors, and contains numerous maps, figures, and tables, with references at the conclusion of each chapter. Large public health agencies and health research libraries should consider adding this title to their collections, and public health GIS specialists may find several chapters of sufficient value to warrant its purchase. Instructors will probably prefer other titles for course adoption, or may wish to select review papers and methods articles from the peer-reviewed literature. The publication of this book, despite its shortcomings, does demonstrate that GIS has emerged as a specialization in public health, and is here to stay.

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The Great Influenza: The Epic Story of the Deadliest Plague in History
John M. Barry
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If one were to poll Americans regarding infectious diseases they most fear, they will likely mention SARS (Sudden Acute Respiratory Syndrome) and HIV/AIDS (Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome), possibly even the West Nile virus, depending on the time of year. Thanks to vaccines, it is doubtful that influenza would top that list, this year's vaccine shortage notwithstanding. Few remain alive to recall the terror of 24 weeks in 1918–1919, when a particularly aggressive strain of influenza A virus killed anywhere from 50–100 million people globally—more than the entire AIDS epidemic to date, certainly more than SARS or West Nile. Out of a United States population of only 105 million, approximately 675,000 people died. In his recently published account of the influenza epidemic of 1918–1919, author John M. Barry revisits what should be an unforgettable lesson from history. In a masterful compilation of events, letters, articles, and narratives past and present, he not only describes the advent and course of the pandemic, but more importantly, wraps these events in the context of societal and cultural factors which both facilitated the pandemic's emergence, and ultimately led to discovery of its causative agent. Mr. Barry presents the concept of two wars being waged in 1918: the Great War between nations, and the war between the scientists of the day and this virus. As he illustrates, the wars are inextricably linked. Mr. Barry's description of events is compiled as a caution to today's public health practitioners and policy-makers, certainly in terms of rising to meet an infectious disease challenge of unprecedented proportions, but also in terms of emphasizing the responsibilities of our public health leadership in education and communication.

To put the scientific war on the virus in context, Mr. Barry begins by describing the changes in medicine in the U.S. from the turn of the 20th century, which by today's standards was still in the Dark Ages. Miasma theory of disease was more popular than germ theory. Medical students were not college graduates, needed only a few courses for medical school graduation (and could fail nearly half of those), *and* would graduate without any experience with patients or laboratory techniques. Treatments for illness often caused greater morbidity and mortality than the illness itself. In fact, advances at European medical institutions were quickly obliterating American science. Impetus for change in the U.S. arrived with the trust left by Johns Hopkins in 1873 for the purpose of founding a new university and hospital. Thanks to the foresight of the Hopkins trustees, the new university would be built upon the European model of academic and scientific rigor and creativity. It would be staffed with the best minds of the time, including William Henry Welch, William Osler, and William Halsted. Mr. Barry posits that the ultimate effect of "the Hopkins," as it was then called, was to spur the medical sciences in the U.S. to new heights with the revolutionary training of its students and by creating scientific competition which generated the founding of the Rockefeller Institute and major reforms in other medical schools. Diseases such as diphtheria, tetanus, meningitis, yellow fever, and cholera were being contained and controlled, if not cured and prevented altogether. This was an exciting time of discovery in the U.S., and optimism reigned.

As science in America was finally making strides, the threat of World War I loomed and eventually exploded into American life. Mr. Barry cites the war as an integral part of the spread of influenza, describing two significant effects of the war in support of his theory. First, it directly facilitated the spread of the 1918 influenza. In January of 1918 in Haskell County, Kansas, the county physician noted an unusual outbreak of a severe and lethal influenza which struck

down the young and healthy more than the typical influenza victims. He notified public health officials about this outbreak, but as the population of this region was sparse, the epidemic eventually waned. There were just a handful of soldiers home on leave in Haskell County from their training facility of Camp Funston, with 56,000 recruits. During the record-cold winter of 1918, soldiers were being crowded into barracks for warmth. Military health officers did not understand the public health dangers of overcrowding and poor ventilation. The high attack rate of this particular influenza strain, combined with the poor conditions at camp, would have easily facilitated the spread of influenza from just one or two soldiers. Although the true source of the strain remains a subject of controversy, those who agree with the theory that influenza was spread by visiting soldiers will be pleased with Mr. Barry's argument. He convincingly describes the movement of influenza, which can be tracked from this rural area of Kansas to Camp Funston, to other military camps as the movement of troops ensued, to France and the rest of Europe. Although Mr. Barry outlines other theories of origin (including a small influenza outbreak in China, one in India, and a bronchitis outbreak in Britain in 1916) Kansas appears most likely, based on his account. Indeed, one could argue, as Barry suggests, that had it not been for the war, the epidemic may have ended in Haskell County.

The war's second effect, which Barry highlights, was that by the spring of 1918, President Woodrow Wilson would stop at virtually nothing to achieve victory, including limiting vital information to the public—again facilitating continuation of the epidemic. As the virus spread from military camps to civilians, even as America's largest cities fell paralyzed by fear and death, President Wilson remained unmoved from his need to uphold his war plans, continuing to move newly trained soldiers to the fronts and recruiting and training young men. The press was censored, as were free speech and "un-American activities." The government's need to preserve morale, to maintain support and funding for the war, depended on keeping the public ignorant of the epidemic's impact within the military. Censorship was so pervasive that even local newspapers minimized the reports of morbidity and mortality. The full potential of this influenza outbreak was not fully recognized until it hit Camp Devens, near Boston, where solders, nurses, and doctors fell ill, were cyanotic hours later, and began dying at rates upwards of 100 per day. By this time, despite intense and ferocious efforts of America's best scientific and medical minds, the epidemic would be unstoppable. Barry describes the spread to Boston, to Chicago, and to Philadelphia, where nearly 800 people died on one day alone and blackened bodies piled up in the streets. Panic was inevitable.

Armed with the ammunition of new scientific discovery, virologists, bacteriologists, epidemiologists, and clinicians used the scientific method to the best of their abilities. They isolated bacteria associated with influenza and developed a vaccine against pneumococcus. But the true cause of influenza remained unknown for years. The same cadre of initial investigators—Simon Flexner, Milton Rosenau, Paul Lewis, George Whipple, Thomas Rivers, Karl Landsteiner, William Park, Oswald Avery, and others—had discovered much about the infection, but had failed to find its pathogen. Finally, in 1931, Richard Shope, a protégé of Lewis, published results from the search for an etiologic agent in swine influenza. It was indeed a virus. Building on his work, British investigators in 1933 isolated the virus responsible for human influenza. The wave of progress that had swept the U.S. in the early 1900's after the founding of the Johns Hopkins had failed to cure or prevent the flu pandemic—in a sense, losing the battle, but ultimately winning the war.

Mr. Barry ends his account of the epidemic on a final note of caution: the devastation in 1918–1919 was due to public terror and ignorance as much as the unpredictable nature of the virus and the wartime environment. The leadership of public health officials lies not only in managing health and disease, but in managing society's perceptions and understanding of health and disease. This was, and remains, the greatest challenge.

Mr. Barry's account of the Great Influenza is thorough and meticulously researched, and his warnings are timely and relevant. His hypotheses are supported by data, yet he acknowledges and describes alternative theories, such as those regarding the origin of the 1918 strain. Those readers with a penchant for history, biology, and a bit of suspense will thoroughly enjoy this book. It is somewhat long, especially the first few chapters on early 20th-century science; the Haskell County cases are not described until approximately 90 pages in. At times, the narrative may a bit difficult to follow as it jumps back and forth from military activities to various scientific endeavors. However, the epidemic's evolution was every bit as complicated as Mr. Barry describes, and his details regarding the scientific and military milieux are invaluable in understanding the sequences of events that led to such tragic outcomes, especially as we look to models of infectious disease predictions and containment in the future. His messages of hope and caution should be heard by the scientific, policy-making, and public health communities.

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