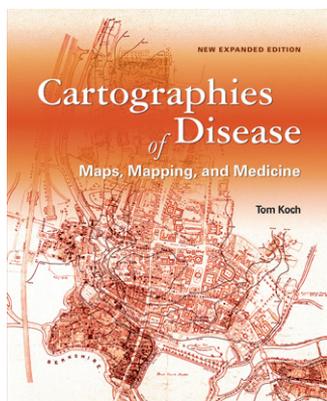


Disease Maps, History, and More



Cartographies of Disease: Maps, Mapping, and Medicine, new expanded edition By Tom Koch

Redlands, CA: Esri Press, second edition; 2017
421 pages; \$79.99
ISBN: 9781589484672

Maps have long been used to moor viewers in spaces and times, informing of roads or rivers, populations, or even disease cases that were present and interconnected. Yet more than description or direction, maps also tell stories of irregular disease patterns, outbreak onsets, cost of care variations, and the like that are of special use to epidemiologists, cartographers, economists, and those engaged in public health studies.

Cholera in 2010 was the topic of such maps in Haiti, along with space–time cluster analysis telling an epidemiological tale of first-time cholera arrival and subsequent spread throughout the country.¹ Later, when more data and scientific studies became available, daily maps during the first week of the outbreak pinpointed the site where the epidemic began (Figure 1).² Still later, a Haiti map told of the two-year cumulative attack rates of cholera burdening residents of the 140 communes constituting the country.³ When the story took a political twist with the incrimination of United Nations peacekeepers from Nepal, local maps were used to both educate and deceive, creating fodder for an epidemiological and policy detective saga.⁴

AN EXPANDED EDITION

For aficionados of such disease maps, there was no better source in 2005 than Tom Koch's seminal book *Cartographies of Disease*,

Maps, Mapping and Medicine.⁵ Koch, in 2017, has authored an expanded version, addressing various errors and omissions and adding two chapters on more recent diseases, including Ebola in Africa. The first of the new chapters starts with sequential US maps during 2000 to 2004 of West Nile virus in humans and ends with Ebola outbreaks in 2014 in the West African countries of Sierra Leone and Liberia.

The second new chapter explores Ebola and the use of maps in greater detail, starting with local outbreaks that became an expanding epidemic. While the epidemic began in 2013 in rural Guinea, officials realized too late that the local population regularly traveled across open national borders between Guinea, Liberia, and Sierra Leone. It was their origin and destination patterns that predicted the dynamic spread of the disease, which was not immediately recognized in static disease maps. Koch tells of spatial epidemiologists who typically use travel patterns and contact data to describe spread, but this is limited in the African region where the Ebola epidemic was rapidly developing.

Using global positioning systems and geographic information systems, coupled with the power

of satellite transmission, Koch opines that new forms of maps can be more widely generated to present diffusion patterns well beyond the more static earlier maps. In his concluding chapter, Koch offers insights on such cartographic methods that might well affect how outbreaks like Ebola can be better addressed and potentially contained.

CARTOGRAPHIC HISTORY

Bringing his material to life, Koch will likely quench the thirst of those who enjoy and appreciate maps. The high-quality book features many illustrations, including maps and map components, shown in glorious color. He covers much ground in his 400-plus pages, starting with a map of plague in Bari (now in Italy) in 1694 and ending in 2015 in Africa with a map of the environmental niche of the fruit bat, a likely reservoir of Ebola. Included among his 14 chapters are three chapters featuring John Snow, one of the 19th-century pioneers of epidemiology, and his maps of the mid-19th-century cholera epidemic in London, England.

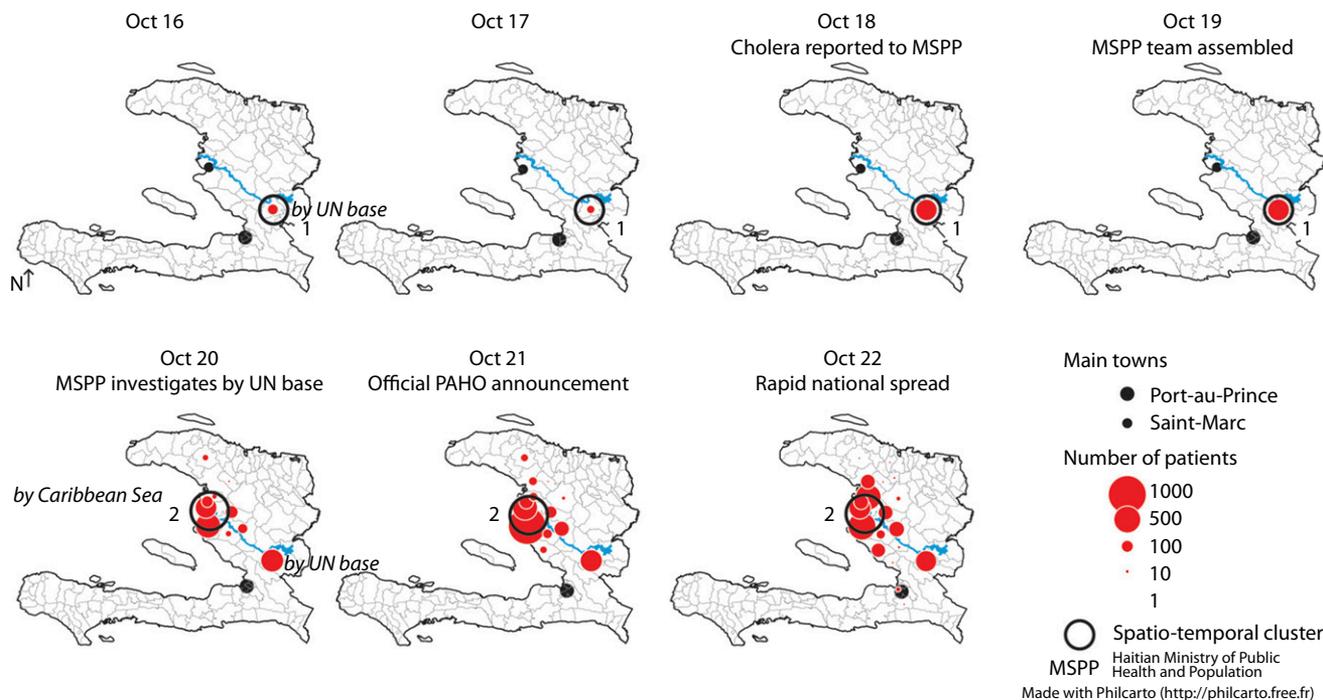
Other chapters present early three-dimensional computerized maps of schistosomiasis in South America during the 1960s; still

ABOUT THE AUTHOR

Ralph R. Frerichs is professor emeritus with the Department of Epidemiology, University of California, Los Angeles Fielding School of Public Health.

Correspondence should be sent to Ralph R. Frerichs, Department of Epidemiology, UCLA Fielding School of Public Health, 650 Charles E. Young Drive South, Rm. 71-254 CHS, Los Angeles, CA 90095-1772 (e-mail: frerichs@ucla.edu). Reprints can be ordered at <http://www.ajph.org> by clicking the "Reprints" link.

This book review was accepted February 16, 2017.
doi: 10.2105/AJPH.2017.303734



Note. MSPP = Haitian Ministry of Public Health and Population; PAHO = Pan American Health Organization; UN = United Nations.

FIGURE 1—Evolution of Cholera Cases During the First Week of the Haitian Cholera Epidemic: October 2010

others present highly detailed repeated maps of HIV/AIDS in Thailand, showing the decline in disease because of public health campaigns from 1991–1993 to 1998–2000.

HIV/AIDS SPATIAL DIFFUSION

HIV/AIDS was also the interest of cartographer Peter Gould, who viewed the disease on maps with spatial diffusion procedures. As described by Koch, in the 1980s and early 1990s, US officials were “not doing enough to educate young people in a way that was comprehensive and convincing.”^(p265) Gould addressed the challenge with a series of diffusion maps presented over time.

The five maps of AIDS in two-year increments from 1982 to 1990 showed in clear graphic form how the disease spread from large urban areas to smaller

communities throughout the country. In Koch’s telling, Gould’s maps were later animated and presented as videos or film clips on the evening news. For more general audiences, Gould imbedded in the maps risk factors such as using shared needles or having unprotected sex. Users could then change the risk factors and simulate in map form a different imagined future.

THE POLITICAL CONTEXT OF MAPS

Far from dry writing, Koch shares his ideas on mapping and more in a lively style. For example, he maintains that “science is not about being right,” but rather that it is “about convincing others that an idea or thesis is right by using methodologies others respect and with data that others accept.”^(pxxv) Perhaps he would agree, however, that the notion of truth is constantly

debated in science, sometimes taking years to resolve and, then with new facts, re-resolve.

Even clear maps may not immediately influence the process. Such debates and resolutions occurred more slowly in historical times, as exemplified by the political pressure Great Britain’s sanitary reform movement put on John Snow during the mid-1800s. It took many years for the sanitation establishment to accept the insights from epidemiology that Snow and others provided, which finally occurred later in the 19th century.⁶

Now with near-instant communication, scientific findings are quickly known but also quickly and widely challenged, hindering full resolution. In the Haiti cholera epidemic, scientific evidence incriminating the United Nations peacekeepers from Nepal as the source of the disease (including very clear repeated maps of the first seven

outbreak days) was made available in late April 2012 (as an epub ahead of print). Yet continued debate and political pushback delayed any resolution until late 2016, when the secretary general of the United Nations offered a weak apology, acknowledging that the United Nations had played a role in the outbreak, set up a trust fund to help eliminate the disease, but still was not willing to publically acknowledge how it was started.⁷ Maps and scientific data may have helped scientists and the public to understand what occurred in Haiti, but in the face of political opposition, full acceptance and accountability by the agency involved was not forthcoming.

CONTROVERSIES ABOUT MAPS

Koch had much to say about John Snow and his maps,

countering an opinion put forward by Vinten-Johansen et al. in their definitive book on Snow.⁶ The most famous map issued by John Snow was of cholera in the Golden Square outbreak of 1854 in London (subsequently known as the Broad Street pump outbreak). Yet Vinten-Johansen et al. stated that Snow's map played no part in his investigation either early in September or during the weeks after the outbreak was over.⁶

To Koch, this meant Vinten-Johansen et al. believed the map was “at best an afterthought, simple graphics almost inexplicably added to the official reports.”^(p122) But Koch strongly countered this reasoning, stating that maps at the time were already “an accepted tool for the analysis of spatial propositions and the distillation of spatial arguments,”^(p122) which was important to Snow's work.

3. Barzilay EJ, Schaad N, Magloire R, et al. Cholera surveillance during the Haiti epidemic—the first 2 years. *N Engl J Med*. 2013;368(7):599–609.

4. Frerichs RR. *Deadly River: Cholera and Cover-up in Post-earthquake Haiti*. Ithaca, NY: ILR Press; 2016.

5. Koch T. *Cartographies of Disease: Maps, Mapping, and Medicine*. Redlands, CA: Esri Press; 2005.

6. Vinten-Johansen P, Brody H, Paneth N, Rachman S, Rip M. *Cholera, Chloroform, and the Science of Medicine: A Life of John Snow*. New York, NY: Oxford University Press; 2003.

7. Sengupta S. UN apologizes for role in Haiti's 2010 cholera outbreak. *New York Times*. December 2, 2016:A12.

AND MORE

Putting such issues aside, this is a superb book with wonderful map illustrations and is recommended to public health professionals who value maps as a presentational and educational medium; it provides insights into both disease occurrence and pathways to control, elimination, or both. **AJPH**

Ralph R. Frerichs, DVM, DrPH

ACKNOWLEDGMENTS

I wish to thank Martine Piarroux for creating Figure 1.

REFERENCES

1. Piarroux R, Barrais R, Faucher B, et al. Understanding the cholera epidemic, Haiti. *Emerg Infect Dis*. 2011;17(7):1161–1168.

2. Frerichs RR, Keim PS, Barrais R, Piarroux R. Nepalese origin of cholera epidemic in Haiti. *Clin Microbiol Infect*. 2012;18(6):E158–E163.