

Virtual Mentor

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HISTORY OF MEDICINE

The Lesson of John Snow and the Broad Street Pump

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In the mid-1800s, London physician John Snow made a startling observation that would change the way that we view diseases and how they propagate. He created a map depicting where cases of cholera occurred in London's West End and found them to be clustered around a water pump on Broad Street. This led him to believe that cholera was a waterborne disease, a conclusion that went against the Victorian "miasma theory" in which Londoners ascribed the source of cholera to bad airs or vapors entering the human body [1]. John Snow's conviction about the source for the London outbreak and his concern for public health compelled him to oppose the popular beliefs of his time and convince the local council in London's West End to disable the water pump on Broad Street. Although Dr. Snow could not identify the culprit under his microscope, the bean-shaped bacteria *Vibrio cholera* that thrives in brackish water, he had his map as evidence.

This map is a tremendous contribution to the field of epidemiology, for Dr. Snow recognized that part of treating disease requires viewing patients not as individual, isolated cases, but within the larger environment in which they live. From this perspective, he realized that he could best protect the health of his community by shutting down a water pump rather than waiting for cholera patients to visit his clinic in need of treatment. To achieve this, he used his geographic correlations of the outbreak as the logic to support a public health intervention to control London's cholera epidemic. Although John Snow's model is accepted as a way to frame our understanding of infectious diseases today, it can also give physicians a blueprint for approaching illness, particularly illness caused by or related to the patient's environment.

Today, epidemiologists view the strength, severity, and propagation of infectious diseases as a product of human and physical environment. They have pioneered our understanding of large-scale phenomena, like recent outbreaks of H1N1 (or swine flu), by tracking cases, monitoring the threat of a global pandemic, and cautioning the public through mass media. In a sense, each physician is called to be an epidemiologist on a smaller scale, viewing the people and cases of disease passing through a clinic within the context of their community and, more broadly, the environment surrounding that community, like Dr. Snow's patients in London's West End.

A [clinical case](#) in the issue of *Virtual Mentor* you are now reading discusses the role of a rural physician in bringing attention to a water source contaminated by runoff

from nitrate-based fertilizers used in agriculture. It examines the ethical responsibility a physician bears when several cases of methemoglobinemia in young children caused by environmental pollution occur in the local community and argues that the physician has a duty to notify authorities, help raise awareness, and address the pollution in the local water supply.

Some may regard the role of public health advocate to be independent and separate from the practice of medicine, undertaken only by those doctors who feel motivated to become activists and who identify specific causes to champion. But advocacy within our communities can have immediate and preventive effects on the prevalence of disease. Furthermore, community physicians are often the first to observe the effects of environment on the health of their patients. For these reasons, we can consider advocacy as part of our service to the community, part of the practice of medicine, and part of the oath we have taken to protect, restore, and ensure the health of our patients to the best of our abilities. Perhaps doctors have an ethical obligation to treat not only the “internal pathophysiology” of disease, for example how microorganisms like cholera cause illness, but also the “external pathophysiology” of health and disease—how our environment serves as a factor in determining our health.

Each passing day, week, and month bring new discoveries of how profoundly affected we are by our environment, as public attention is called toward the threat of mercury in fish, pollutants in the air, or trace amounts of medications in municipal water supplies. Certainly, more research must be conducted on how conditions rising in prevalence like asthma and cancer may be correlated with our environment. This research will largely be done in laboratories and in large-scale surveys and studies. Nonetheless, physicians are embedded in communities that are being affected by their environments now, making environmental education and advocacy a way to directly improve the health of the community. Doctors must stay informed about environmental changes and their impact on human health in the same way that they stay up-to-date on the latest diagnostic tools, current antibiotic guidelines, and new treatment modalities. Being aware of the big picture can shape how we use that knowledge to influence our practices and policies. As physicians, we can be watchful over the smaller communities that we serve; we can identify environmental factors that affect the health of our patients and their families; and, when we come across something that is causing harm to our patients, we can have the courage of John Snow to turn off the Broad Street pump.

References

1. Johnson S. *The Ghost Map: The Story of London's Most Terrifying Epidemic—And How it Changed Science, Cities and the Modern World*. New York, NY: Riverhead Books; 2006.

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